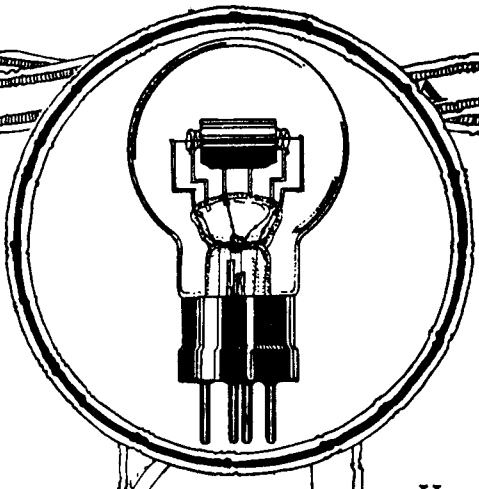
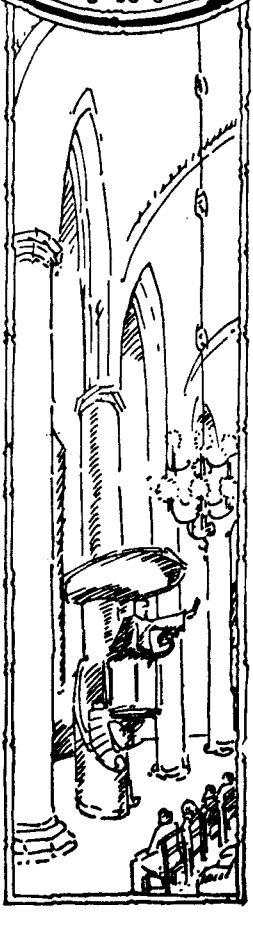


Philips ontvanglamp E

Gloeispanning v_f = 4 volt
Gloeistroom i_f = 0,7 ampère
Anodespanning v_f = 50—200 volt

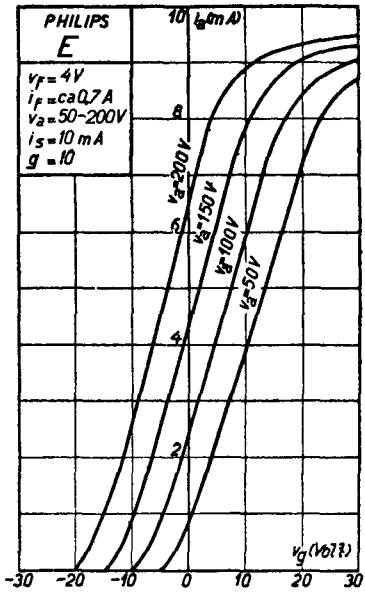
Het type E is een *hoogvacuum ontvanglamp* (triode) voor een *4-volts accu*, zoowel geschikt voor *detectie, hoog- en laagfrequentie-versterking als voor eindversterking.*

Zij is in staat om een groote energie zuiver te verwerken.



Philips ontvanglamp E

Gloeispanning	v_f	= 4 volt
Gloeistroom	i_f	= ca. 0,7 amp.
Anodespanning	v_a	= 50—200 volt
Verzadigingsstroom .	i_s	= 10 milliamp.
Ruststroom (max.) . .	i_{a_0}	= 6 milliamp.
Versterkingsfactor . .	g	= 10
Steilheid (max.)	S_{max}	= 0,4 mA/V
Inwendige weerst. (min.)	Ri_{min}	= 25000 ohm
Grootste diameter . .	d	= 55 mm
Lengte	l	= 85 mm



DETECTOR

Bij gebruik van deze triode als *detector* kan met een anodespanning van 50—70 volt volstaan worden.

VERSTERKER

De triode E is in staat om *voldoende energie* af te geven aan *elken luidspreker;* hierbij blijft de geluidsweergave volkomen zuiver.

Het is *noodzakelijk* om aan het rooster van de als laagfrequentieversterker gebruikte triode een passende negatieve spanning te geven. Deze moet bedragen:

3 —4,5 volt bij 100 volt anodespanning,
4,5—6 „ „ 150 „ „ „ „
6 —9 „ „ 200 „ „ „ „

HULS

De triode E is voorzien van de normale Philips huls met 4 pennen (huls A); zij kan echter ook met elke andere gebruikelijke huls geleverd worden.

Prijs f 3,75

INSTRUMENT CATHODE-RAY TUBE

10 cm diameter flat faced double gun oscilloscope tube, post-deflection acceleration by means of a helical electrode and low interaction between traces. The tube features beam-blanking.

QUICK REFERENCE DATA			
Final accelerator voltage	$V_{g_8(\ell)}$	3000	V
Display area	horizontal vertical	full scan 7	 cm
Deflection coefficient, horizontal	M_x	15	V/cm
vertical	M_y	7	V/cm

SCREEN

	colour	persistence
E10-12GH	green	medium short
E10-12GM	yellowish green	long
E10-12GP	bluish green	medium short

Useful screen diameter min. 85 mm

Useful scan (each gun) at $V_{g_8(\ell)}/V_{g_5} = 3$

horizontal full scan

vertical min. 70 mm

The useful scan may vertically be shifted to a max. of 5 mm with respect to the geometric centre of the face plate.

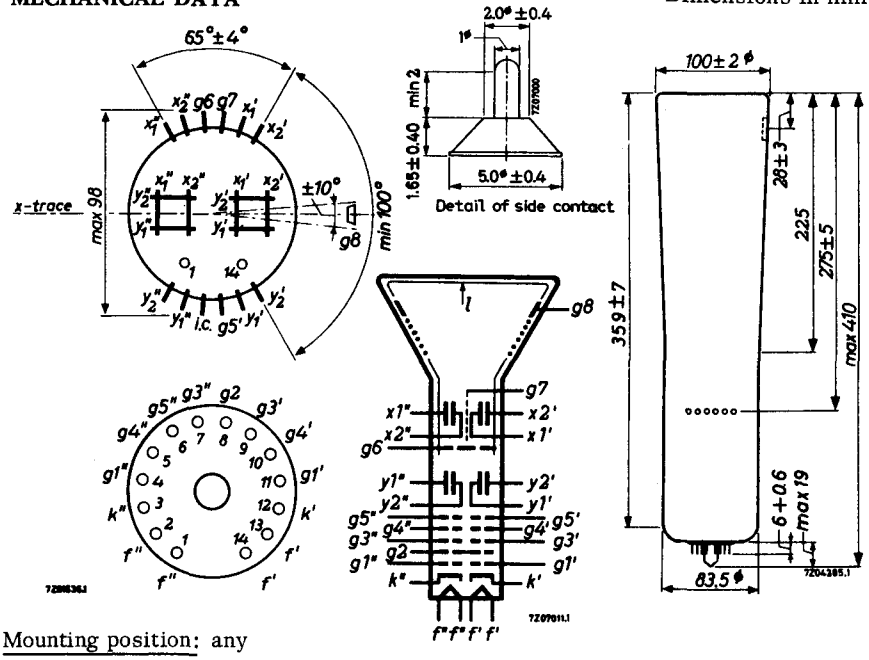
HEATING

Indirect by A.C. or D.C.; parallel supply

Heater voltage	each gun	V_f 6.3 V
Heater current	each gun	I_f 300 mA

MECHANICAL DATA

Dimensions in mm



Mounting position: any

The tube should not be supported by the base alone and under no circumstances should the socket be allowed to support the tube.

Base	14 pin all glass		
Dimensions and connections			
Overall length	max.	410	mm
Face diameter	max.	102	mm
Net weight	approx.	800	g
Accessories			
Socket, supplied with tube	type	55566	
Final accelerator contact connector	type	55563	
Side contact connector	type	55561	
Mu-metal shield	type	55545	

CAPACITANCES (each gun)

x_1' to all elements except x_2'	$C_{x_1'(x_2')}$	4.5	pF
x_2' to all elements except x_1'	$C_{x_2'(x_1')}$	3	pF
x_1'' to all other elements except x_2''	$C_{x_1''(x_2'')}$	3	pF
x_2'' to all other elements except x_1''	$C_{x_2''(x_1'')}$	4.5	pF
y_1 to all other elements except y_2	$C_{y_1(y_2)}$	2	pF
y_2 to all other elements except y_1	$C_{y_2(y_1)}$	2	pF
x_1 to x_2	$C_{x_1x_2}$	2	pF
y_1 to y_2	$C_{y_1y_2}$	1.5	pF
Grid No.1 to all other elements	C_{g_1}	5.2	pF
Cathode to all other elements	C_k	5	pF

FOCUSING electrostatic

DEFLECTION double electrostatic

x plates symmetrical

y plates symmetrical

Angle between x and y traces 90 ± 1^o

Angle between x-traces $\pm 0.8^o$ max. in the centre of the screen.

Angle between y-traces $\pm 1^o$ max. in the centre of the screen.

If use is made of the full deflection capabilities of the tube the deflection plates will intercept part of the electron beam; hence a low impedance deflection plate drive is desirable.

LINE WIDTH

Measured with the shrinking raster method in the centre of the screen.

Final accelerator voltage	$V_{g_8(\ell)}$	3000	V
Astigmatism control electrode voltage	V_{g_5}	1000	V [3]
First accelerator voltage	V_{g_2}	1000	V
Beam current	$I_{g_8(\ell)}$	10	μA
Line width	l.w.	0.50	mm

HELIX

Post deflection accelerator helix resistance: min. 100 MΩ

[3]) See page 6.

TYPICAL OPERATING CONDITIONS(each gun)

Final accelerator voltage	$V_{g_8(\ell)}$	3000	V
Intergun shield voltage	V_{g_7}	1000±100	V [1]
Geometry control electrode voltage	V_{g_6}	1000±100	V [1] [2]
Astigmatism control electrode voltage	V_{g_5}	1000±100	V [3]
Focusing electrode voltage	V_{g_4}	180 to 380	V
Deflection blanking electrode voltage	V_{g_3}	1000	V
Deflection blanking control voltage for beam blanking of a current $I_{g_9(\ell)}$ = 10 μA	ΔV_{g_3}	max. 40	V
First accelerator voltage	V_{g_2}	1000	V
Control grid voltage for visual extinction of focused spot	V_{g_1}	−25 to −90	V
→ Deflection coefficient, horizontal	M_x	12 to 18	V/cm
vertical	M_y	6 to 8	V/cm
Deviation of linearity of deflection		max. 2.5	% [4]
Geometry distortion		See note 5	
Interaction factor		2.10^{-3}	mm/Vdc [6]
Tracking error		1.5	mm [7]

1) 2) 3) 4) 5) 6) 7) See page 6

LIMITING VALUES (each gun, if applicable) (Absolute max. rating system)

Final accelerator voltage	$V_{g_8(\ell)}$	max.	3300	V
		min.	2700	V
Intergun shield voltage	V_{g_7}	max.	1200	V
Geometry control electrode voltage	V_{g_6}	max.	1200	V
Astigmatism control electrode voltage	V_{g_5}	max.	1200	V
		min.	800	V
Focusing electrode voltage	V_{g_4}	max.	1200	V
Beam blanking electrode voltage	V_{g_3}	max.	1200	V
First accelerator voltage	V_{g_2}	max.	1200	V
		min.	200	V
Control grid voltage,				
negative	$-V_{g_1}$	max.	200	V
positive	V_{g_1}	max.	0	V
positive peak	$V_{g_{1p}}$	max.	2	V
Cathode to heater voltage,				
cathode positive	V_{kf}	max.	200	V
cathode negative	$-V_{kf}$	max.	125	V
Average cathode current	I_k	max.	300	μA
Screen dissipation	W_ℓ	max.	3	mW/cm^2
Ratio $V_{g_8(\ell)}/V_{g_5}$	$V_{g_8(\ell)}/V_{g_5}$	max.	3	

CIRCUIT DESIGN VALUES (each gun, if applicable)

Focusing voltage	V_{g_4}	180 to 380	V/kV of V_{g_2}
Control grid voltage for visual cut-off focused spot	V_{g_1}	25 to -90	V/kV of V_{g_2}
Deflection coefficient $V_{g_8(\ell)}/V_{g_5} = 3$			
horizontal	M_x	10 to 20	V/cm per kV of V_{g_5}
vertical	M_y	6 to 8	V/cm per kV of V_{g_5}
Focusing electrode current	I_{g_4}	-15 to +10	μA
Control grid circuit resistance	R_{g_1}	max. 1.5	MΩ

---

1) This tube is designed for optimum performance when operating at the ratio $V_{g_8(\ell)}/V_{g_5} = 3$. Operation at other ratio may result in changes in deflection uniformity and geometry distortion. The geometry control electrode voltage and the intergunshield voltage should be adjusted for optimum performance. For any necessary adjustment its potential will be within the stated range.

2) This voltage should be equal to the mean x- and y plates potential.

3) The astigmatism control electrode voltage should be adjusted for optimum spot shape. For any necessary adjustment its potential will be within the stated range.

4) The sensitivity at a deflection of less than 75% of the useful scan will not differ from the sensitivity at a deflection of 25% of the useful scan by more than the indicated value.

5) A graticule consisting of concentric rectangles of 60 mm x 60 mm and 57 mm x 57 mm is aligned with electrical x axis of the tube. The edges of a raster will fall between these rectangles with optimum potentials applied.

6) The deflection of one beam when balanced dc voltage are applied to the deflection plates of the other beam, will not be greater than the indicated value.

7) With 50 mm vertical traces superimposed at the tube face centre and deflected horizontally $\pm$ 4 cm by voltages proportional to the relative deflection factors, horizontal separation of the corresponding points of the traces shall not be greater than the indicated value.

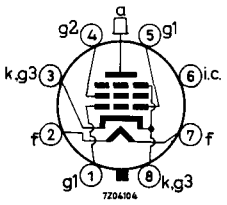
S.Q. TUBE

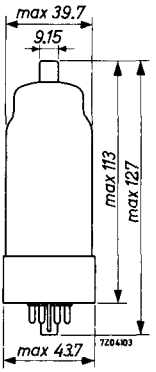
Special quality tube designed for use as wide band amplifier, cathode follower, series regulator tube for stabilised d.c. supply and output tube.

QUICK REFERENCE DATA			
Life test	10 000 hours		
Mechanical quality	Shock and vibration resistant		
Base	Octal		
Heating	Indirect A.C. or D.C.; parallel supply		
Heater voltage	V_f	6.3	V
Heater current	I_f	1.7	A
Anode current	I_a	100	mA
Mutual conductance	S	27.5	mA/V
Output power, one tube	W_o	11.5	W
two tubes, class AB	W_o	60	W

DIMENSIONS AND CONNECTIONS Dimensions in mm

Base: Octal





CHARACTERISTICS

Column I Nominal value or setting of the tube
II Range values for equipment design: Initial spread
III Range values for equipment design: End of life

		I	II	III	
Heater voltage	V_f	6.3			V
Heater current	I_f	1.7	1.62 - 1.78		A
Anode voltage	V_a	250			V
Grid No.2 voltage	V_{g_2}	150			V
Grid No.1 voltage	$-V_{g_1}$	15.5			V
Anode current	I_a	100			mA
Grid No.2 current	I_{g_2}	4			mA
Mutual conductance	S	27.5			mA/V
Amplification factor	$\mu_{g_2g_1}$	6.5			
Internal resistance	R_i	10			kΩ
Anode supply voltage	V_{ba}	275			V
Grid No.2 supply voltage	V_{bg_2}	180			V
Positive grid No.1 supply voltage	V_{bg_1}	15.7			V
Cathode resistor	R_k	300			Ω
Anode current	I_a	100	85 - 115	decrease max.40%	mA
Grid No.2 current	I_{g_2}	4	max. 6		mA
Mutual conductance	S	27.5	22.5 - 32.5	decrease max.30%	mA/V
Negative grid No.1 current	$-I_{g_1}$		max. 0.5	max. 1	μA
Cut off voltage					
Anode voltage	V_a	250			V
Grid No.2 voltage	V_{g_2}	150			V
Anode current	I_a	1			mA
Negative grid No.1 voltage	$-V_{g_1}$		max. 30		V

CHARACTERISTICS (continued)

		II	III	
Insulation resistance between one electrode and all *other electrodes measured* with V = 400 V	R_{isol}	min. 100	min. 20	MΩ

CAPACITANCES Without external shield

		I	II	
Grid No.1 to grid No.3, grid No.2, cathode and heater	C_{g_1/g_3g_2kf}	35		pF
Anode to grid No.3, grid No.2, cathode and heater	C_{a/g_3g_2kf}	17		pF
Anode to grid No.1	C_{ag_1}		max. 2	pF

SHOCK AND VIBRATION RESISTANCE

The following test conditions are applied to assess the mechanical quality of the tube. These conditions are not intended to be used as normal operating conditions.

Shock

The tube is subjected 5 times in each of 4 positions to an acceleration of 500 g supplied by an NRL shock machine with the hammer lifted over an angle of 30^{o}.

Vibration

The tube is subjected during 32 hours in each of 3 positions to a vibration frequency of 50 Hz with an acceleration of 2.5 g.

LIFE

Production samples are tested to be within the end of life values (column III) under the following conditions during 10 000 hours.

Anode supply voltage	V_{ba}	275	V
Grid No.2 supply voltage	V_{bg_2}	180	V
Grid No.1 supply voltage	$+V_{bg_1}$	15.7	V
Cathode resistor	R_k	300	Ω
Grid No.1 resistor	R_{g_1}	47	kΩ
Voltage between cathode and heater cathode positive	V_{kf} (k pos)	100	V

LIMITING VALUES (Absolute max. rating system)

Anode voltage	V_{a_o}	max. 2000	V
	V_a	max. 900	V
Anode and grid No.2 voltage (triode connection)	V_{a+g_2}	max. 250	V
Anode peak voltage	$+V_{ap}$	max. 8000	V
Pulse duration: 18% of a cycle			
Anode peak voltage	$-V_{ap}$	max. 2000	V
Anode dissipation	W_a	max. 27.5	W
Anode plus grid No.2 dissipation (triode connection)	W_{a+g_2}	max. 27.5	W
Grid No.2 voltage	$V_{g_{2_o}}$	max. 550	V
	V_{g_2}	max. 250	V
Grid No.2 dissipation	W_{g_2}	max. 5	W
Grid No.1 voltage	$-V_{g_1}$	max. 150	V
	$+V_{g_1}$	max. 15	V
Grid No.1 dissipation	W_{g_1}	max. 0.1	W
Grid No.1 resistor with fixed bias	R_{g_1}	max. 0.5	MΩ
with automatic bias	R_{g_1}	max. 1.0	MΩ
Cathode current	I_k	max. 300	mA
Cathode peak current	I_{kp}	max. 1.5	A
Pulse duration max. 4 ms			
Average value max. 150 mA			
Cathode peak current	I_{kp}	max. 4.6	A
Pulse duration max. 1.5 μs			
Average value max. 14 mA			
Voltage between cathode and heater			
Cathode positive	$V_{kf\ (k\ pos)}$	max. 200	V
Cathode negative	$V_{kf\ (k\ neg)}$	max. 100	V
Bulb temperature	t_{bulb}	max. 225	°C

LIMITING VALUES (continued)

Heater voltage: The average heater voltage should be 6.3 V.
Variations of the heater voltage exceeding the range of 6.0 V to 6.6 V will shorten the tube life. The tolerance of the heater current (column II) should be taken into account.

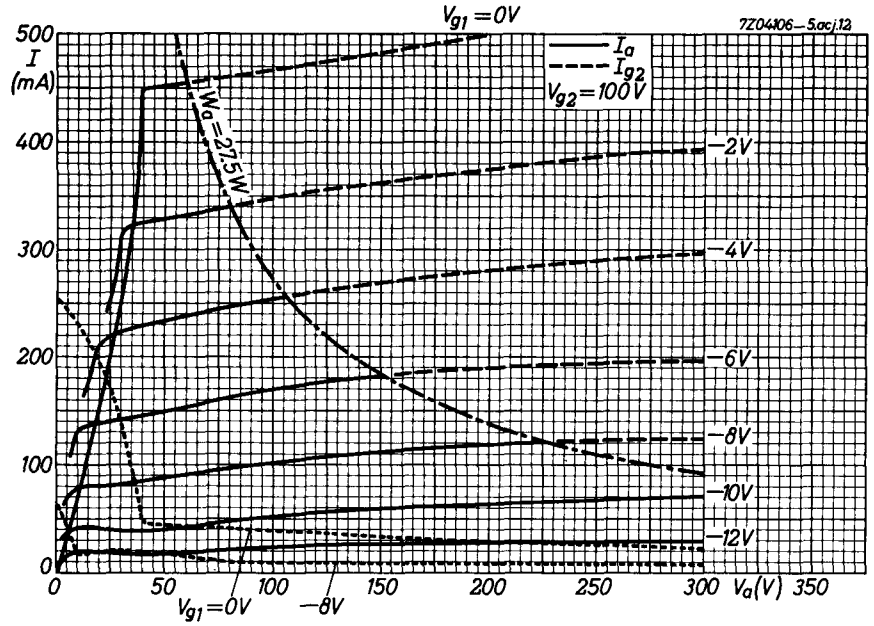
OPERATING CHARACTERISTICS

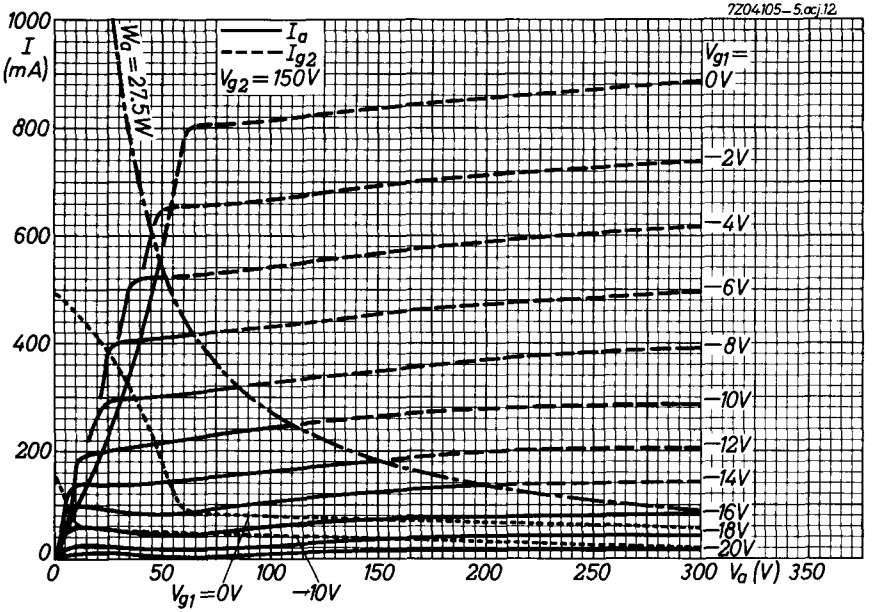
Output tube class A

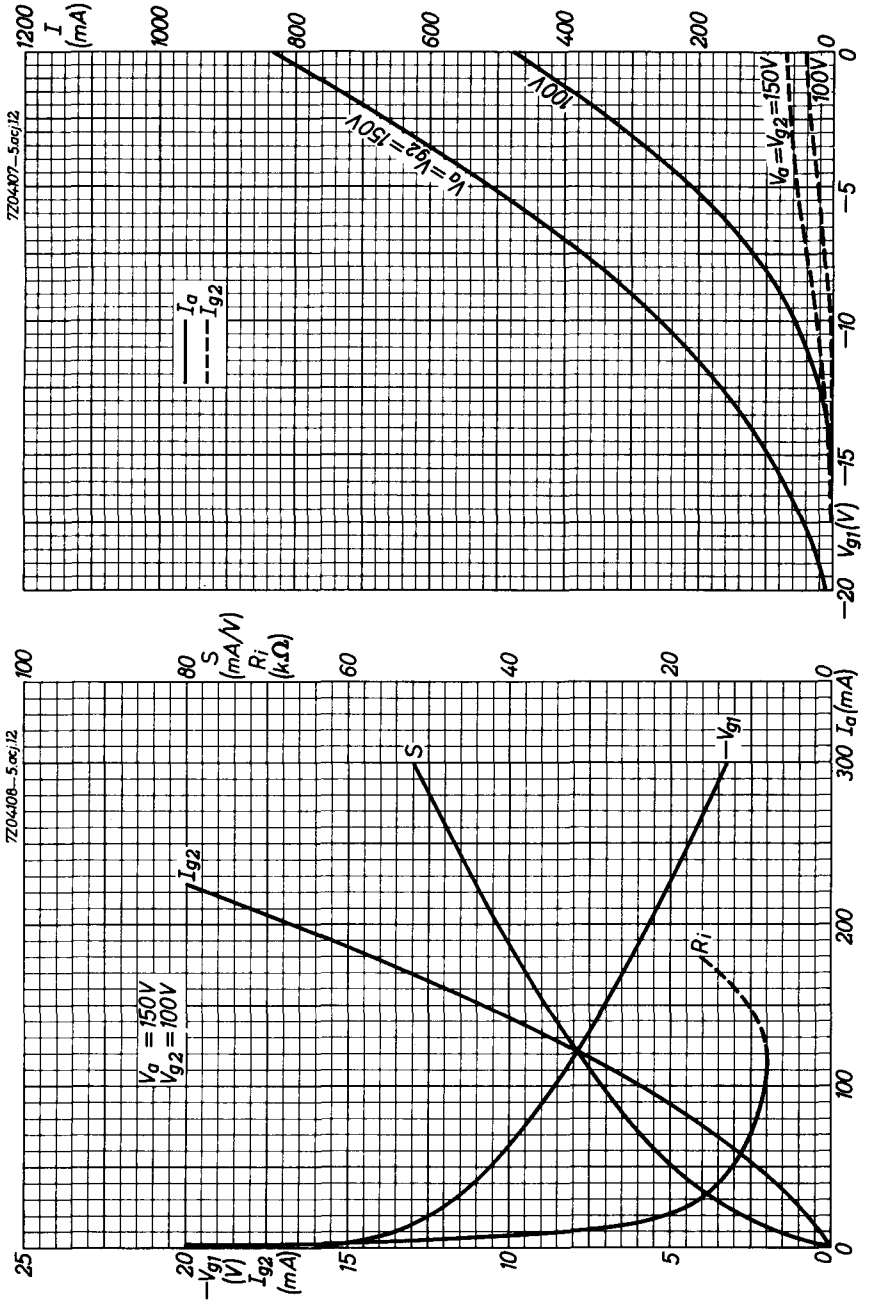
Anode voltage	V_a		250		V
Grid No.2 voltage	V_{g_2}		150		V
Grid No.1 voltage	$-V_{g_1}$		15.5		V
Load resistance	$R_{a\sim}$		2.7		kΩ
Input voltage	V_i		3.82		V_{RMS}
Anode current	I_a		100		mA
Grid No.2 current	I_{g_2}		18		mA
Output power	W_o		11.5		W
Total distortion	d_{tot}		10		%

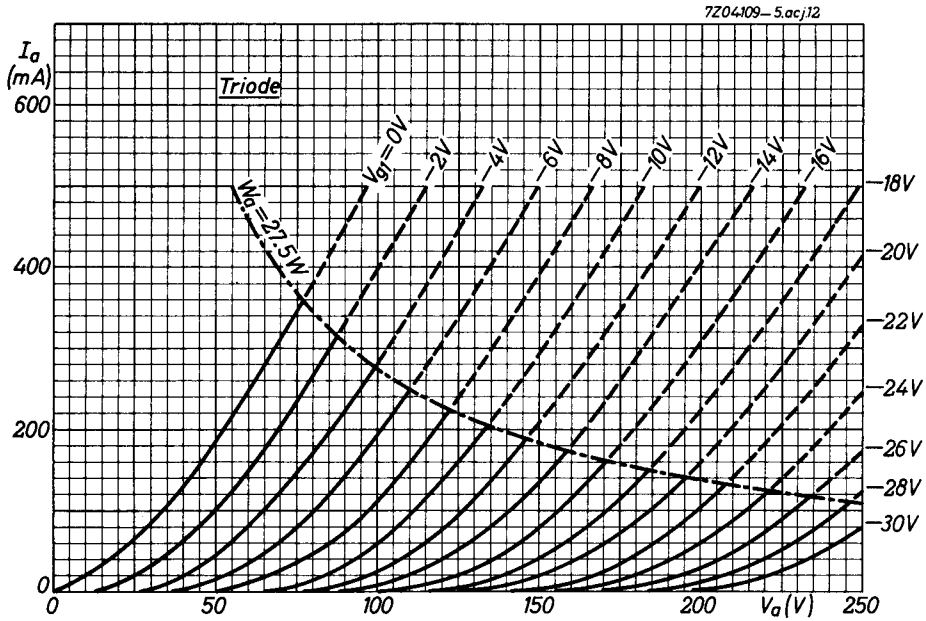
Output tube class AB (2 tubes)

Anode voltage	V_a		300		V
Grid No.2 voltage	V_{g_2}		150		V
Grid No.1 voltage	$-V_{g_1}$		17		V
Load resistance	$R_{aa\sim}$		1.6		kΩ
Input voltage	V_i	0	0.24	9.0	V_{RMS}
Anode current	I_a	2x80	-	2x182	mA
Grid No.2 current	I_{g_2}	2x2.5	-	2x22	mA
Output power	W_o	0	0.05	60	W
Total distortion	d_{tot}	-	-	5	%


7Z04106-5.acj.12
$V_{g1}=0V$
I_a
I_{g2}
$V_{g2}=100V$
$W_a=27.5W$
I (mA)
500
400
300
200
100
0
-2V
-4V
-6V
-8V
-10V
-12V
0
50
100
150
200
250
300
V_a(V) 350
$V_{g1}=0V$
-8V


7Z04105-5.acj.12
I_a
I_{g2}
$V_{g2}=150V$
$W_a=27.5W$
I (mA)
1000
800
600
400
200
0
V_{g1}=
0V
-2V
-4V
-6V
-8V
-10V
-12V
-14V
-16V
-18V
-20V
0
50
100
150
200
250
300
V_a(V) 350
$V_{g1}=0V$
-10V


7Z04107-5.ocj12
I (mA)
1200
1000
800
600
400
200
0
I_a
I_{g2}
$V_a = V_{g2} = 150V$
100V
$V_a = V_{g2} = 150V$
100V
0
-5
-10
-15
-20
V_{g1}(V)
7Z04108-5.ocj12
S (mA/V)
R_i (kΩ)
100
80
60
40
20
0
I_a(mA)
300
200
100
0
S
$-V_{g1}$
R_i
I_{g2}
V_a = 150V
V_{g2} = 100V
25
20
15
10
5
0
$-V_{g1}$ (V)
I_{g2} (mA)


7Z04109-5.acj12
Ia (mA)
Triode
600
400
200
0
0
50
100
150
200
Va(V)
250
Vg=27.5W
Vg1=0V
-2V
-4V
-6V
-8V
-10V
-12V
-14V
-16V
-18V
-20V
-22V
-24V
-26V
-28V
-30V

PHILIPS

Data handbook

Electronic components and materials

E130L

page	sheet	date
1	1	1968.12
2	2	1968.12
3	3	1968.12
4	4	1968.12
5	5	1968.12
6	6	1968.12
7	7	1968.12
8	8	1968.12
9	FP	2000.12.03

INSTUMENT CATHODE-RAY TUBE

14 cm diagonal, rectangular flat faced, split-beam oscilloscope tube with mesh and metal-backed screen.

QUICK REFERENCE DATA			
Final accelerator voltage	$V_{g7(\ell)}$	10	kV
Display area		100 x 80	mm^2
Deflection coefficient, horizontal	M_x	13,5	V/cm
vertical	M_y'	9	V/cm
	M_y''	9	V/cm
Overlap of the systems		100	%

SCREEN : Metal-backed phosphor

	Colour	Persistence
E14-100GH	green	medium short

Useful screen dimensions	min.	100 x 80	mm^2
Useful scan at $V_{g7(\ell)}/V_{g2,g4} = 6,7$			
horizontal	min.	100	mm
vertical (each system)	min.	80	mm
overlap		100	%
Spot eccentricity in horizontal direction	max.	7	mm
in vertical direction	max.	10	mm

HEATING : indirect by AC or DC; parallel supply

Heater voltage	V_f	6,3	V
Heater current	I_f	300	mA

MECHANICAL DATA

Dimensions in mm

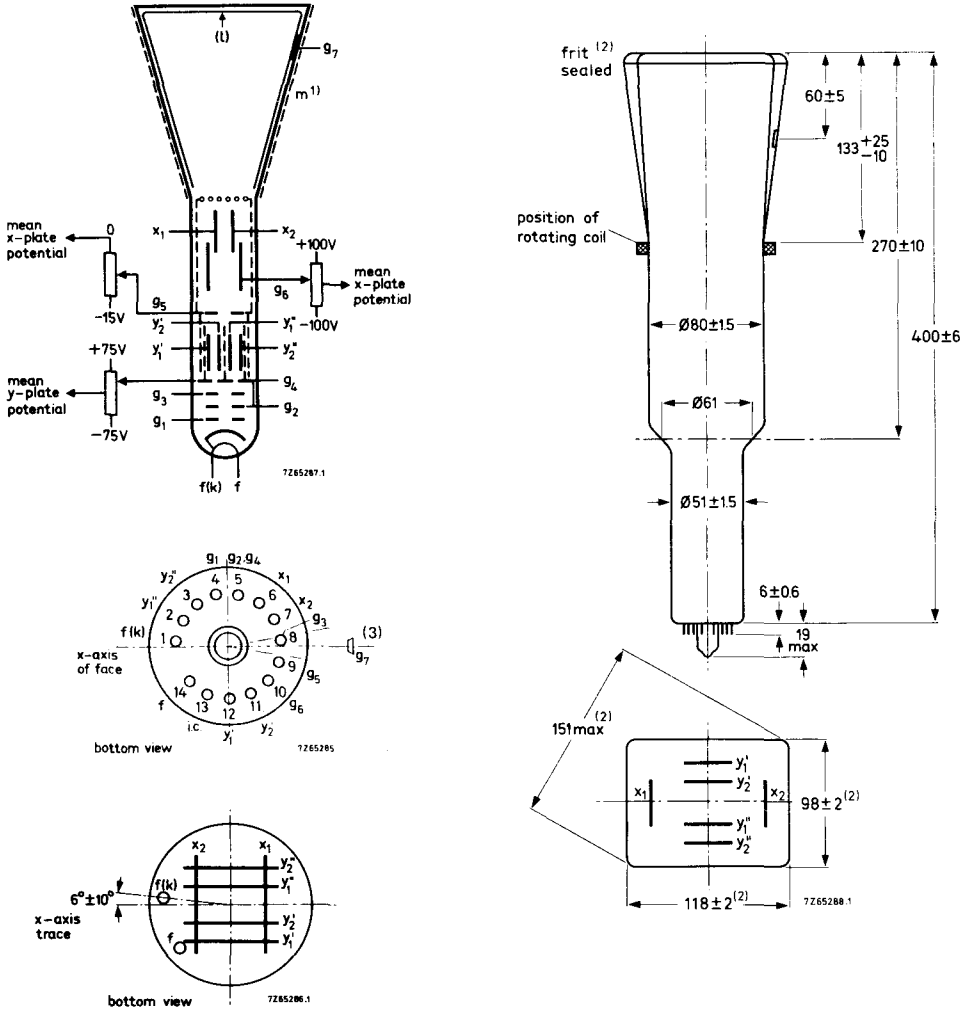


Fig. 1 Outlines.

(1) The external conductive coating should be earthed.
(2) The bulge at the frit seal may increase the indicated maximum dimensions by not more than 2 mm.
(3) The centre of the contact is located within a square of 10 mm x 10 mm around the true geometrical position.

Mounting position

The tube should not be supported by the base alone and under no circumstances should the socket be allowed to support the tube.

MECHANICAL DATA (continued)

Dimensions and connections

See also outline drawing.

Overall length (socket included)	max.	425	mm
Face dimensions	max.	120 x 100	mm^2
Net weight	approx.	900	g
Base	14-pin all glass		

Accessories

Socket (supplied with tube)	type	55566
Final accelerator contact connector	type	55563A

FOCUSING Electrostatic

DEFLECTION Double electrostatic
x-plates symmetrical
y-plates symmetrical

If the full deflection capacity of the tube is used, part of the beam is intercepted by the deflection plates; hence a low-impedance deflection plate drive is desirable.

Angle between x and y traces (each beam)		90 ± 1	°
Angle between corresponding y traces at screen centre	max.	45	'
Angle between x trace and horizontal axis of the face	max.	0	°

LINE WIDTH

Measured with the shrinking raster method under typical operating conditions, and adjusted for optimum spot size at a beam current of 5 μA per system.

Line width at screen centre	l.w	approx.	0,35	mm

CAPACITANCES

x_1 to all other elements except x_2	$C_{x_1(x_2)}$	8	pF
x_2 to all other elements except x_1	$C_{x2(x_1)}$	8	pF
y_1' to all other elements except y_2'	$C_{y1'(y2')}$	4	pF
y_2' to all other elements except y_1'	$C_{y2'(y_1')}$	5,5	pF
y_1'' to all other elements except y_2''	$C_{y1''(y_2'')}$	5	pF
y_2'' to all other elements except y_1''	$C_{y_2''(y_1'')}$	4	pF
External conductive coating to all other elements	C_m	800	pF

CAPACITANCES (continued)

x_1 to x_2	$C_{x_1x_2}$	3 pF
y_1' to y_2'	$C_{y_1'y_2'}$	1 pF
y_1'' to y_2''	$C_{y_1''y_2''}$	1 pF
Control grid to all other elements	C_{g_1}	6 pF
Cathode and heater to all other elements	$C_{kf/R}$	3 pF

NOTES

1. This tube is designed for optimum performance when operating at a ratio $V_{g7(\ell)}/V_{g2,g4} = 6,7$.

   The geometry control voltage V_{g_6} should be adjusted within the indicated range (values with respect to the mean x-plate potential).

2. A negative control voltage on g_5 (with respect to the mean x-plate potential) will cause some pincushion distortion and less background light. By varying the two voltages V_{g_5} and V_{g_6} it is possible to find the best compromise between background light and raster distortion.

3. The astigmatism control electrode voltage should be adjusted for optimum spot shape. For any necessary adjustment its potential will be within the stated range.

4. The sensitivity at a deflection less than 75% of the useful scan will not differ from the sensitivity at a deflection of 25% of the useful scan by more than the indicated value.

5. A graticule, consisting of concentric rectangles of 100 mm x 80 mm and 96 mm x 77 mm is aligned with the electrical x-axis of the tube. With optimum correction potentials applied a raster of each system will fall between these rectangles.

TYPICAL OPERATING CONDITIONS

Final accelerator voltage	$V_{g7(\ell)}$	10	kV	
Geometry control electrode voltage	V_{g6}	1500 ± 100	V	see note 1
Interplate shield voltage	V_{g5}	1500	V	
Background illumination control voltage	ΔV_{g5}	0 to −15	V	see note 2
Focusing electrode voltage	V_{g3}	350 to 650	V	
First accelerator voltage	$V_{g2,\ g4}$	1500	V	
Astigmatism control voltage	$\Delta V_{g2,\ g4}$	±75	V	see note 3
Control grid voltage for extinction of focused spot	V_{g1}	−20 to −70	V	
Deflection coefficient, horizontal	M_x	12,5 < 14	V/cm V/cm	
vertical	M_y'	9 < 10	V/cm V/cm	
	M_y''	9 < 10	V/cm V/cm	
Deviation of deflection linearity		< 2	%	see note 4
Geometry distortion				see note 5
Useful scan, horizontal		> 100	mm	
vertical		> 80	mm	
Overlap of the two systems, horizontal		100	%	
vertical		100	%	

LIMITING VALUES (Absolute max. rating system)

Final accelerator voltage	$V_{g7(\ell)}$	max. min.	12 9	kV kV
Geometry control electrode voltage	V_{g6}	max.	2200	V
Interplate shield voltage	V_{g5}	max.	2200	V
Focusing electrode voltage	V_{g3}	max.	2200	V
First accelerator and astigmatism control electrode voltage	$V_{g2,\ g4}$	max. min.	2200 1350	V V
Control grid voltage	$-V_{g1}$	max. min.	200 0	V V
Voltage between astigmatism control electrode and any deflection plate	V_{g4}/x V_{g4}/y	max. max.	500 500	V V
Grid drive average		max.	30	V
Screen dissipation	W_ℓ	max.	8	mW/cm^2
Ratio $V_{g7(\ell)}/V_{g2,\ g4}$	$V_{g7(\ell)}/V_{g2,\ g4}$	max.	6,7	
Control grid circuit resistance	R_{g1}	**max.**	1	MΩ

CORRECTION COILS

General

The E14-100GH is provided with a pair of coils for image rotation which enable the alignment of the x-trace with the x-lines of the graticule.

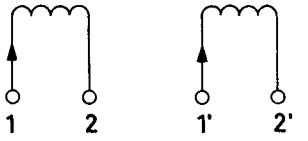


Fig. 2 Diagram of coil unit.

The image rotating coils are wound concentrically around the tube neck. Under typical operating conditions 50 A turns are required for the maximum rotation of 5°. Both coils have 850 turns. This means that a current of max. 30 mA per coil is required which can be obtained by using a 24 V supply when the coils are connected in series, or a 12 V supply when they are in parallel.

Connecting the coils

The coils have been connected to the 4 soldering tags as follows:

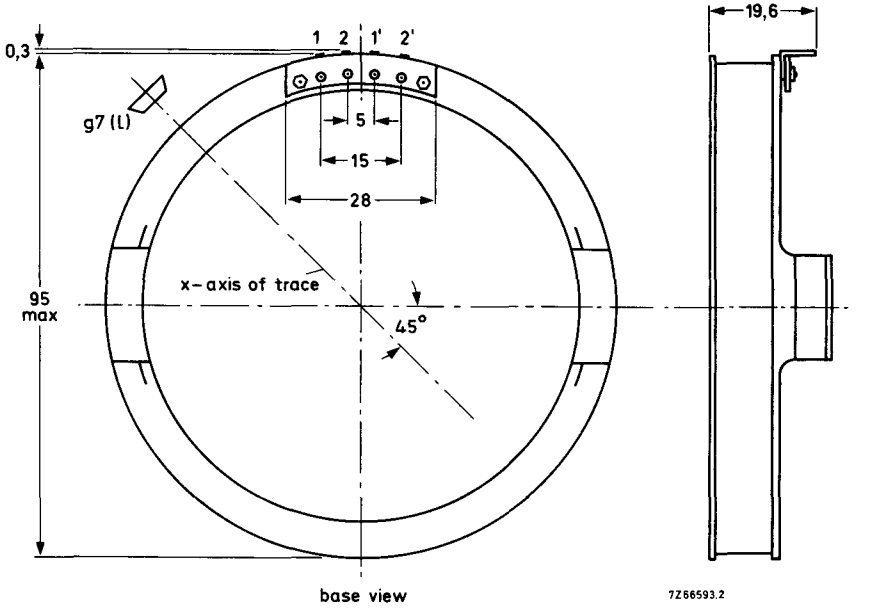


Fig. 3 Dimensions and connections.

BEAM CENTRING MAGNET

Inherent to the split-beam system a slight difference between the two beam currents can occur after splitting, resulting in different intensities of the two traces. In order to equalize the beam currents, a beam centring magnet should be mounted near the base of the gun and adjusted for the required field direction and field strength.

INSTRUMENT CATHODE-RAY TUBE

The E14-101GH is equivalent to the E14-100GH but has no rotating coil.

INSTRUMENT CATHODE-RAY TUBE

The E14-101GH is equivalent to the E14-100GH but has no rotating coil.

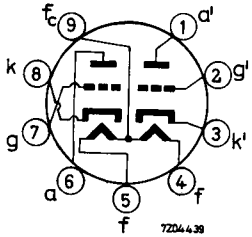
S.Q. TUBE

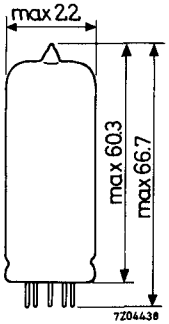
Special quality double triode designed for use in computer circuits.

QUICK REFERENCE DATA		
Life test	10 000 hours	
Low interface resistance		
Base	Noval	
Heating	Indirect A.C. or D.C.; parallel supply	
Heater voltage	V_f	6.3 or 12.6 V
Heater current	I_f	400 or 200 mA

DIMENSIONS AND CONNECTIONS Dimensions in mm

Base: Noval





CHARACTERISTICS

Column I Nominal value or setting of the tube
II Range values for equipment design: Initial spread
III Range values for equipment design: End of life

		I	II	III	
Heater voltage (pin 9 and 4 and 5)	V_f	6.3			V
Heater current	I_f	400	380 - 420		mA
Heater voltage (pin 4 and 5)	V_f	12.6			V
Heater current	I_f	200			mA
Anode voltage	V_a	150			V
Grid voltage	$-V_g$	1.85			V
Anode current	I_a	8.5			mA
Mutual conductance	S	6.4			mA/V
Amplification factor	μ	46			
Internal resistance	R_i	7.2			kΩ
Anode voltage	V_a	150			V
Cathode resistor	R_k	220			Ω
Anode current	I_a	8.5	6.3 - 10.7	min. 5.0	mA
Mutual conductance	S	6.4	5.3 - 8.1	min. 4.0	mA/V
Negative grid current	$-I_g$		max. 0.2	max. 1.0	μA
Cut off voltage	$-V_g$	7.5			V
Anode voltage	V_a	150			V
Anode current	I_a		max. 150	max. 150	μA
Difference in grid voltage of 2 sections	$\lvert V_g - V_g' \rvert$		max. 2	max. 2	V
Anode voltage	V_a	150			V
Anode current	I_a	0.15			mA

CHARACTERISTICS (continued)

		I	II	III	
Anode voltage	V_a	100			V
Grid voltage	$-V_g$	0.8			V
Anode current	I_a	8.5			mA
Mutual conductance	S	7.8			mA/V
Amplification factor	μ	50			
Internal resistance	R_i	6.4			kΩ
Anode voltage	V_a	100			V
Grid supply voltage	$+V_{bg}$	100			V
Grid resistor	R_g	0.5			MΩ
Anode current	I_a	17.8	13.6 - 22.0	min. 9.5	mA
Leakage current between cathode and heater Voltage between cathode and heater V_{kf} = 200 V Series resistor = 1 MΩ	I_{kf}		max. 15	max. 30	μA
Insulation resistance between two electrodes Voltage between electrodes V = 275 V			min. 100	min. 20	MΩ

CAPACITANCES Without external screen

Each system if applicable		I	II	
Anode to cathode and heater	$C_{a/kf}$	0.5	0.3 - 0.7	pF
Anode to cathode and heater	$C_{a'/k'f}$	0.45	0.25 - 0.65	pF
Grid to cathode and heater	$C_{g/kf}$	3.5	3.0 - 4.0	pF
Anode to grid	C_{ag}	2.2	1.8 - 2.6	pF
Anode to grid	$C_{a'g'}$	2.3	1.9 - 2.7	pF
Cathode to heater	C_{kf}	3.5		pF
Anode to anode other section	$C_{aa'}$		max. 1.3	pF
Grid to grid other section	$C_{gg'}$		max. 0.06	pF

LIFE

Production samples are tested to be within the end of life values (column III) under the following conditions during 10 000 hours.

Anode supply voltage	V_{ba}	150	V
Grid supply voltage	V_{bg}	150	V
Anode resistor	R_a	2.6	kΩ
Grid resistor	R_g	1.5	MΩ (I_g = 100 μA)
Voltage between cathode and heater (k pos)	V_{kf}	200	V

LIMITING VALUES (Absolute max. rating system)

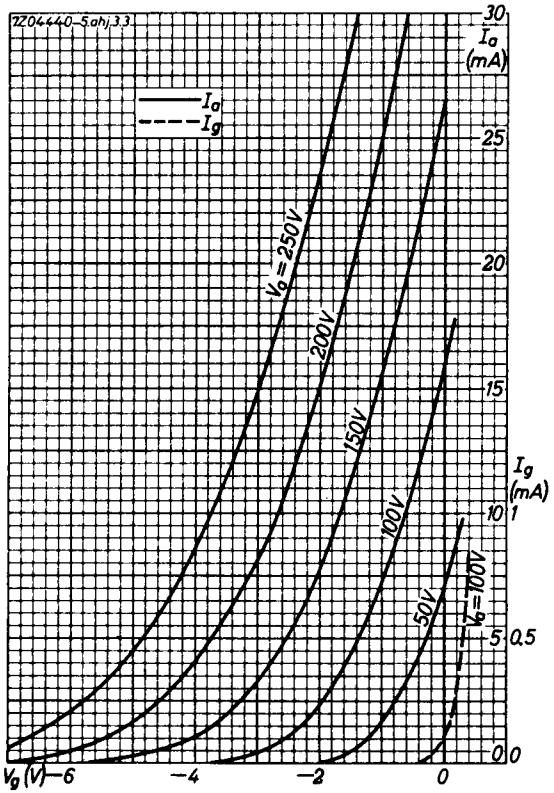
Anode voltage	V_{a_o}	max. 600	V
	V_a	max. 275	V
Anode dissipation	W_a	max. 2.0	W
Grid, voltage	$-V_g$	max. 100	V
Grid, peak voltage	$-V_{g_p}$	max. 200	V
Max. pulse duration = 10 μs			
Max. duty factor = 0.01			
Grid voltage	$+V_g$	max. 1	V
Grid current	I_g	max. 2	mA
Grid, peak current	I_{g_p}	max. 50	mA
Max. pulse duration = 10 μs			
Max. duty factor = 0.01			
Cathode current	I_k	max. 20	mA
Cathode, peak current	I_{k_p}	max. 200	mA
Max. pulse duration = 10 μs			
Max. duty factor = 0.01			

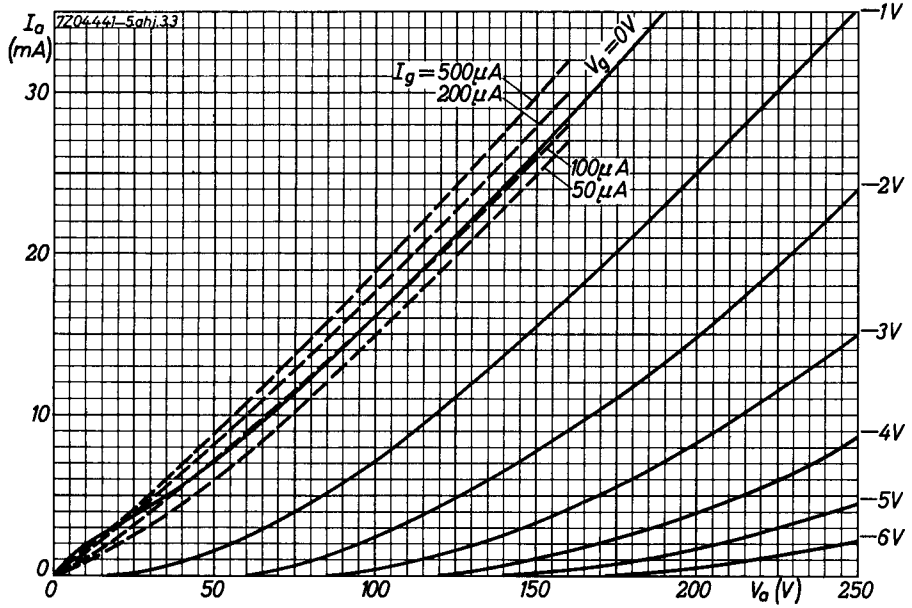
LIMITING VALUES (continued)

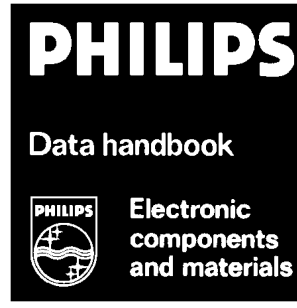
Voltage between cathode and heater,

Cathode positive (k pos.)	V_{kf}	max. 200	V
Cathode negative (k neg.)	V_{kf}	max. 100	V
Grid resistor with fixed bias	R_g	max. 0.5	MΩ
with automatic bias	R_g	max. 1.0	MΩ
Bulb temperature	t_{bulb}	max. 170	°C

Heater voltage: The average heater voltage should be 6.3 V.
Variations of the heater voltage exceeding the range of 6.0 V to 6.6 V will shorten the tube life.
The tolerance of the heater current (column 11) should be taken into account.




7Z04441-5ahj.33
I_a (mA)
30
20
10
0
0
50
100
150
200
V_a (V)
250
I_g=500μA
200μA
100μA
50μA
V_g=0V
-1V
-2V
-3V
-4V
-5V
-6V



E180CC

page	sheet	date
1	1	1968.12
2	2	1968.12
3	3	1968.12
4	4	1968.12
5	5	1968.12
6	6	1968.12
7	FP	2000.12.03

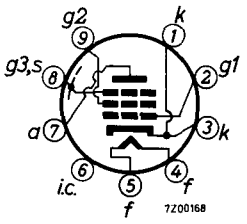
S.Q. TUBE

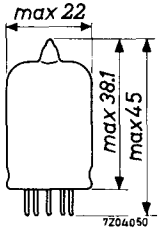
Special quality pentode designed for use as wide band amplifier.

QUICK REFERENCE DATA				
Life test	10 000 hours			
Low interface resistance				
Mechanical quality	Shock and vibration resistant			
Base	Noval. Gold plated pins			
Heating	Indirect A.C. or D.C.; parallel supply			
Heater voltage	V_f		6.3	V
Heater current	I_f		300	mA
Anode current	I_a		13	mA
Mutual conductance	S		16.5	mA/V
Equivalent noise resistance	R_{eq}		330	Ω
Hum voltage	V_{g1}	max.	100	μV

DIMENSIONS AND CONNECTIONS Dimensions in mm

Base: Noval





CHARACTERISTICS

Column I Nominal value or setting of the tube
II Range values for equipment design: Initial spread
III Range values for equipment design: End of life

		I	II	III	
Heater voltage	V_f	6.3			V
Heater current	I_f	300	285- 315		mA
Anode supply voltage	V_{ba}	190			V
Grid No.3 voltage	V_{g_3}	0			V
Grid No.2 supply voltage	V_{bg_2}	160			V
Grid No.1 supply voltage	V_{bg_1}	9			V
Cathode resistor	R_k	630			Ω
Anode current	I_a	13	12.2-13.8	min.11.5	mA
Grid No.2 current	I_{g_2}	3.3	2.9- 3.7		mA
Mutual conductance	S	16.5	14.2-18.8	min. 11	mA/V
Amplification factor grid No.2 to grid No.1	$\mu_{g_2g_1}$	50			
Internal resistance	R_i	90	min. 45		kΩ
Equivalent noise resistance	R_{eq}	330	max. 650		Ω
Negative grid No.1 current	$-I_{g_1}$		max. 0.5	max. 1.0	μA
Equivalent grid hum voltage	V_{g_1}		max. 100		μV_{RMS}
Grid resistor R_{g_1} = 0.5 MΩ					
Centre tap of heater transformer grounded					
Distortion	d_2	1.6			%
Load resistor R_a = 1 kΩ					
Input voltage V_i = 100 mV_{RMS}					
Cathode heating time		12	max. 18		sec

CHARACTERISTICS (continued)

		I	II	
Anode supply voltage	V_{ba}	180		V
Grid No.3 voltage	V_{g_3}	0		V
Grid No.2 supply voltage	V_{bg_2}	150		V
Cathode resistor	R_k	100		Ω
Anode current	I_a	11.5		mA
Grid No.2 current	I_{g_2}	2.9		mA
Mutual conductance	S	15.5		mA/V
Cut-off voltage	$-V_{g_1}$		max.4.5	V
Anode voltage	V_a	180		V
Grid No.2 voltage	V_{g_2}	150		V
Grid No.3 voltage	V_{g_3}	0		V
Anode current	I_a	0.8		mA
Start of grid No.1 current	$-V_{g_1}$		max.0.5	V
Grid No.1 current I_{g_1} = 0.3 μA				
Input resistance	r_{g_1}	2000		Ω
Frequency = 100 MHz				
Phase angle of the slope		9		o
Frequency = 50 MHz				
Pin 1 connected to pin 3				
Leakage current between cathode and heater	I_{kf}		max. 15	μA
Voltage between cathode and heater V_{kf} = 60 V				
Insulation resistance between two electrodes			min. 20	MΩ

CHARACTERISTICS AS TRIODE

(g_2 connected to anode)

		I	II	
Anode supply voltage	V_{ba}	160		V
Grid No.3 voltage	V_{g_3}	0		V
Grid No.1 voltage	$+V_{bg_1}$	9		V
Cathode resistor	R_k	620		Ω
Anode current	I_a	16.5		mA
Mutual conductance	S	21		mA/V
Amplification factor	μ	50		
Internal resistance	R_i	2.4		kΩ
Equivalent noise resistance	R_{eq}	225		Ω

CAPACITANCES With external shield

Anode to grid No.3, grid No.2, cathode and heater	C_{a/g_3g_2kf}	3	2.5 - 3.5	pF [1]
Grid No.1 to grid No.3, grid No.2, cathode and heater				
(I_k = 0 mA) :	C_{g_1/g_3g_2kf}	7.5	6.6 - 8.4	pF [1]
(I_k = 16.3 mA, f = 100 MHz) :	C_{g_1/g_3g_2kf}	11.1		pF [1]
Anode to grid No.1	C_{ag_1}	0.018	max.0.03	pF
Anode to cathode	C_{ak}		max. 0.1	pF
Grid No.1 to heater	$C_{g_{1f}}$		max. 0.1	pF

SHOCK AND VIBRATION RESISTANCE

The following test conditions are applied to assess the mechanical quality of the tube. These conditions are not intended to be used as normal-operating conditions.

Shock

The tube is subjected 5 times in each of 4 positions to an acceleration of 500 g supplied by an NRL shock machine with the hammer lifted over an angle of 30°.

Vibration

The tube is subjected during 32 hours in each of 3 positions to a vibration frequency of 50 Hz with an acceleration of 2.5 g.

[1]) Pin No.6 left floating

LIFE

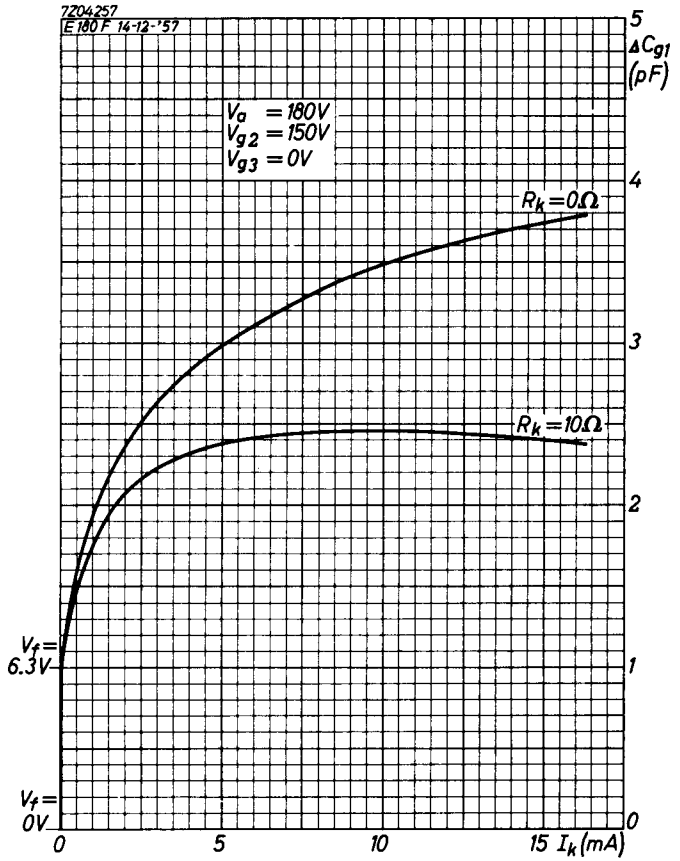
Production samples are tested to be within the end of life values (column III) under the following conditions during 10 000 hours.

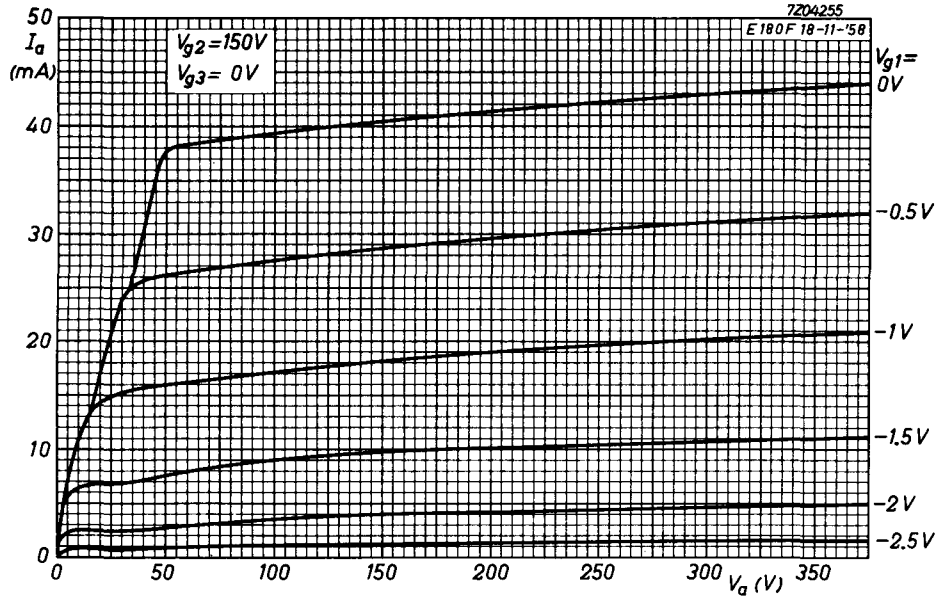
Anode supply voltage	V_{ba}	190	V
Grid No.3 voltage	V_{g_3}	0	V
Grid No.2 supply voltage	V_{bg_2}	160	V
Grid No.1 supply voltage	$+V_{bg_1}$	9	V
Cathode resistor	R_k	630	Ω

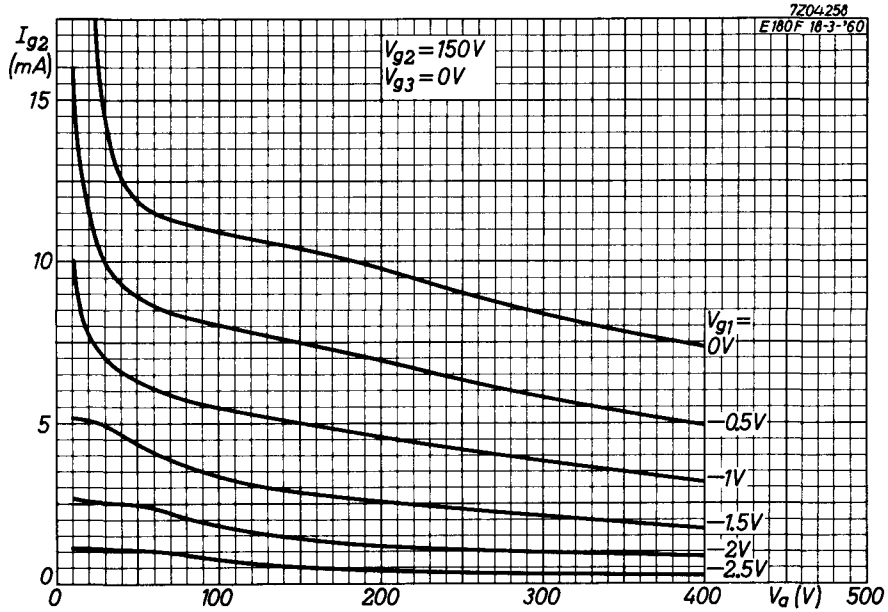
LIMITING VALUES (Absolute max. rating system)

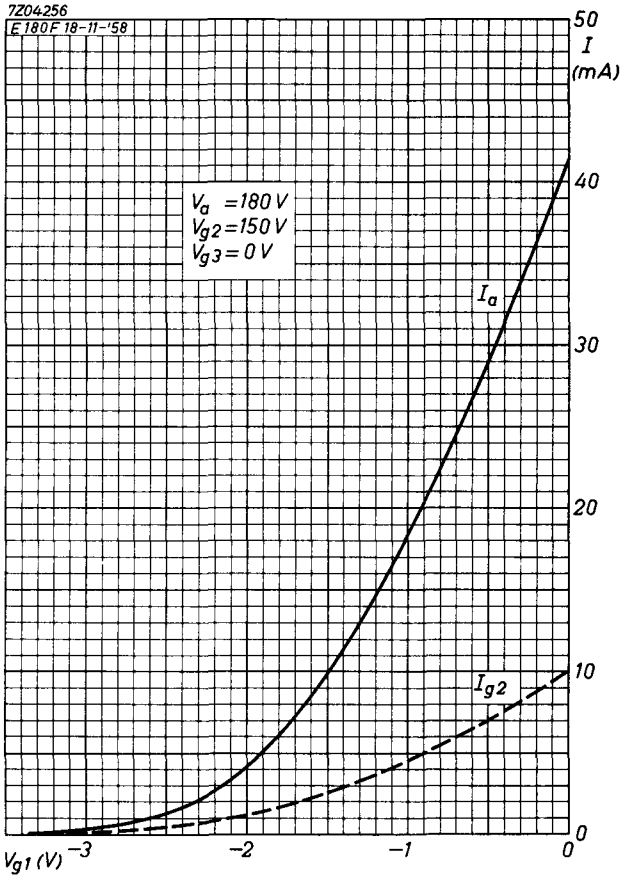
Anode voltage	V_{a_o}	max.	400	V
	V_a	max.	210	V
Anode dissipation	W_a	max.	3	W
Grid No.2 voltage	$V_{g_{2o}}$	max.	400	V
	V_{g_2}	max.	175	V
Grid No.2 dissipation	W_{g_2}	max.	0.9	W
Cathode current	I_k	max.	25	mA
Grid No.1 voltage	$+V_{g_1}$	max.	0	V
	$-V_{g_1}$	max.	50	V
Grid No.1 peak voltage	$-V_{g_{1p}}$	max.	100	V
Grid resistor, fixed bias	R_{g_1}	max.	0.25	MΩ
automatic bias	R_{g_1}	max.	0.5	MΩ
Voltage between cathode and heater	V_{kf}	max.	60	V
Bulb temperature	t_{bulb}	max.	155	°C

Heater voltage: The average heater voltage should be 6.3 V.
Variations of the heater voltage exceeding the range of 6.0 V to 6.6 V will shorten the tube life.
The tolerance of heater current (column II) should be taken into account.


7Z04257
E 180 F 14-12-'57
V_a = 180V
V_{g2} = 150V
V_{g3} = 0V
R_k = 0Ω
R_k = 10Ω
V_f = 6.3V
V_f = 0V
ΔC_{g1} (pF)
0
1
2
3
4
5
0
5
10
15 I_k (mA)


7Z04255
E180F 18-11-'58
I_a (mA)
V_{g2}=150V
V_{g3}= 0V
V_{g1}= 0V
-0.5V
-1V
-1.5V
-2V
-2.5V
V_a (V)


7Z04258
E180F 16-3-'60
I_{g2} (mA)
V_{g2}=150V
V_{g3}=0V
V_{g1}= 0V
-0.5V
-1V
-1.5V
-2V
-2.5V
V_a (V)


7Z04256
E180F 18-11-'58
V_a =180 V
V_{g2}=150 V
V_{g3}= 0 V
I_a
I_{g2}
50
I
(mA)
40
30
20
10
0
V_{g1} (V)
−3
−2
−1
0

PHILIPS

Data handbook

Electronic components and materials

E180F

page	sheet	date
1	1	1968.12
2	2	1968.12
3	3	1968.12
4	4	1968.12
5	5	1968.12
6	6	1968.12
7	7	1968.12
8	8	1968.12
9	FP	2000.12.03

PHILIPS

E181CC

SPECIAL QUALITY DOUBLE TRIODE for application in computer circuits
DOUBLE TRIODE A HAUTE SÉCURITÉ pour utilisation dans circuits de comptage
ZUVERLÄSSIGE DOPPELTRIODE zur Verwendung in Zählschaltungen

The E181CC will maintain its emission capabilities after long periods of operation under cut-off conditions but is not intended to be used in circuits critical as to hum, microphony and noise

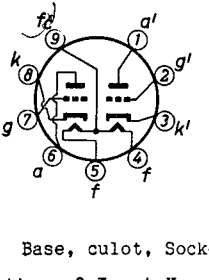
Le type de tube E181CC maintiendra ses qualités d'émission après une longue période d'opération dans la condition de coupure mais il n'est pas destiné aux applications critiques au regard de ronflement, de l'éffet microphonique ou de bruit de fond

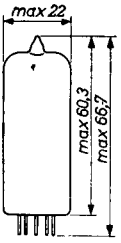
Die Röhre E181CC wird ihre Emissionseigenschaften auch nach einer langen Periode im blockierten Zustand beibehalten ist aber nicht bestimmt für Anwendungen die kritisch mit Bezug auf Brumm, Mikrofonie oder Rauschen sind

Heating : indirect by A.C. or D.C.; parallel supply
Chauffage: indirect par C.A. ou C.C.; alimentation parallèle
Heizung : indirekt durch Wechsel- oder Gleichstrom; Parallelspeisung

V_f = 6,3 V	V_f = 12,6 V
I_f = 400 mA[1])	I_f = 200 mA
Pins Broches 9- (4+5) Stifte	Pins Broches 4-5 Stifte

Dimensions in mm
Dimensions en mm
Abmessungen in mm





Base, culot, Sockel: NOVAL

[1])The maximum deviation of I_f at V_f = 6.3 V is ± 20 mA
La déviation de I_f à V_f = 6,3 V est de ± 20 mA au max.
Die Höchstabweichung von I_f bei V_f = 6,3 V ist ± 20 mA

Capacitances; Capacités, Kapazitäten

C_{ag}	=	2,2 pF	$C_{a'g'}$	=	2,3 pF
C_g	=	3,0 pF	$C_{g'}$	=	3,0 pF
C_a	=	0,55 pF	$C_{a'}$	=	0,5 pF
C_{kf}	=	3,5 pF	$C_{k'f}$	=	3,5 pF

$C_{aa'}$ = max. 1,3 pF
$C_{gg'}$ = max. 0,06 pF

Typical characteristics (each triode)
Caractéristiques types (chaque triode)
Kenndaten (jede Triode)

V_{ba}	=	-	-	100	V
V_a	=	100	150	-	V
V_g	=	-1,3	-3,0	-	V
R_k	=	0	0	470	Ω
I_a	=	8,5	8,5	4,6 ± 1,0[1]	mA
$-I_g$ (R_g = 0,1 MΩ)	=	-	-	max. 0,2[2]	µA
S	=	5,6	4,7	3,6 ± 0,9[3]	mA/V
µ	=	32	30		
R_i	=	5,7	6,5	-	kΩ

Typical characteristics for computer circuit design (each diode)
Caractéristiques types pour l'étudie dans circuits de comptage (chaque triode)
Kenndaten für Entwicklung von Zählschaltungen (jede Triode)

V_a	=	85	150	V
V_{bg}	=	85	-	V
R_g	=	425	0	kΩ
I_a	=	16,5 ± 4,5[4]	-	mA
I_a (V_g = -10 V)	=	-	max.0,1[5]	mA
V_g-$V_{g'}$ (I_a=$I_{a'}$= 0,1 mA)	=	-	0 ± 2[6]	V

1)..7)The end point of life is reached when one or more of the characteristics given below have changed to the indicated values:
Le tube est arrivé à la fin de sa durée si une ou quelques-unes des caractéristiques ci-dessous sont changées jusqu'aux valeurs indiquées:
Das Ende der Lebensdauer ist erreicht wenn eine oder mehrere der untenstehenden Kennwerte bis die angegebenen Werte geändert sind:

1) $I_a \leq$ 2,9 mA
2) $-I_g \geq$ 1 µA
3) S ≤ 2 mA/V
4) $I_a \leq$ 8,4 mA/V
5) $I_a \geq$ 0,1 mA
6) V_g-$V_{g'} \geq$ 2 V
   V_g-$V_{g'} \geq$ 2 V
7) $I_{kf} \geq$ 30 µA

Cathode-heater insulation
Isolation cathode-filament
Katoden-Heizfadenisolation

Vkf = 200 V (k pos.) Series resistor = 1 MΩ / Résistance série = 1 MΩ / Serienwiderstand = 1 MΩ I_{kf} = max. 15[7] µA

Insulation between two electrodes
Isolation entre deux électrodes
Isolation zwischen zwei Elektroden R = min. 20 MΩ

Limiting values (Absolute limits; each triode)
Caractéristiques limites (Limites Absolues; chaque triode)
Grenzdaten (Absolute Grenzwerte; jede Triode)

V_{a_o}	= max.	600 V	R_g	= max.	1 MΩ[9]
V_a	= max.	275 V	R_g	= max.	0,5 MΩ[10]
W_a	= max.	2,0 W	I_k	= max.	20 mA
$-V_g$	= max.	100 V	I_{kp}	= max.	200 mA[8]
$-V_{gp}$	= max.	200 V[8]	V_f	=	6,3 V ±5%
V_g	= max.	0,5 V		=	12,6 V ±5%
I_g	= max.	0,5 mA	V_{kf} (k neg.)	= max.	100 V
I_{gp}	= max.	50 mA[8]	V_{kf} (k pos.)	= max.	200 V
			t_{bulb}	= max.	170 °C[11]

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[7] See page 2; voir page 2; siehe Seite 2

[8] Pulse duration max. 10 µsec. at a duty cycle of 1%
Durée de l'impulsion 10 µsec au max. à un facteur de marche de 1%
Impulsdauer max. 10 µSek bei einem Arbeitsfaktor von 1%

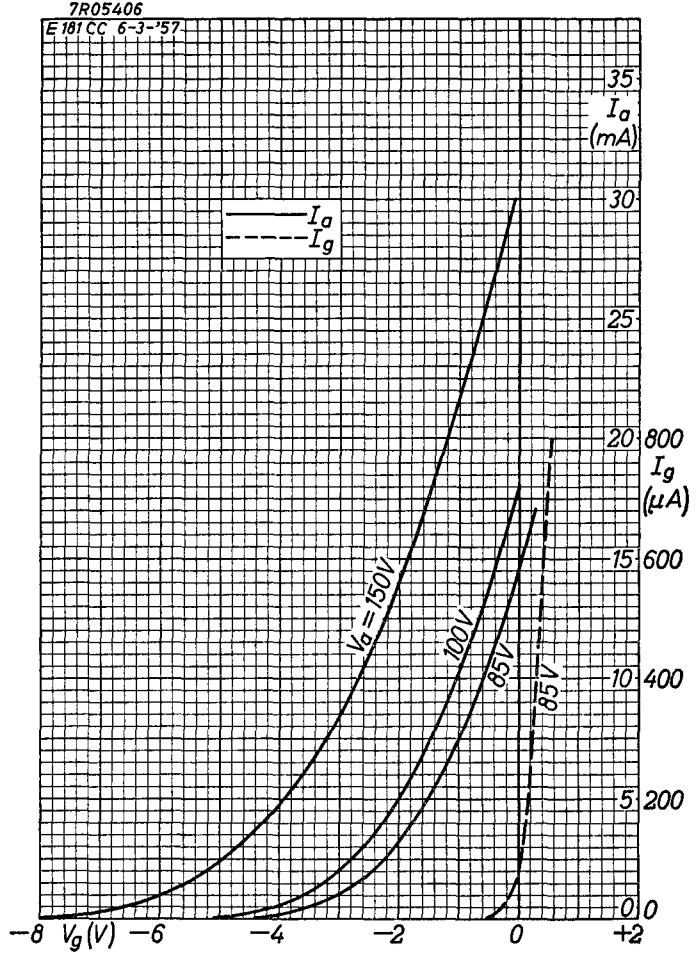
[9] Automatic grid bias
Polarisation de grille automatique
Automatische Gittervorspannung

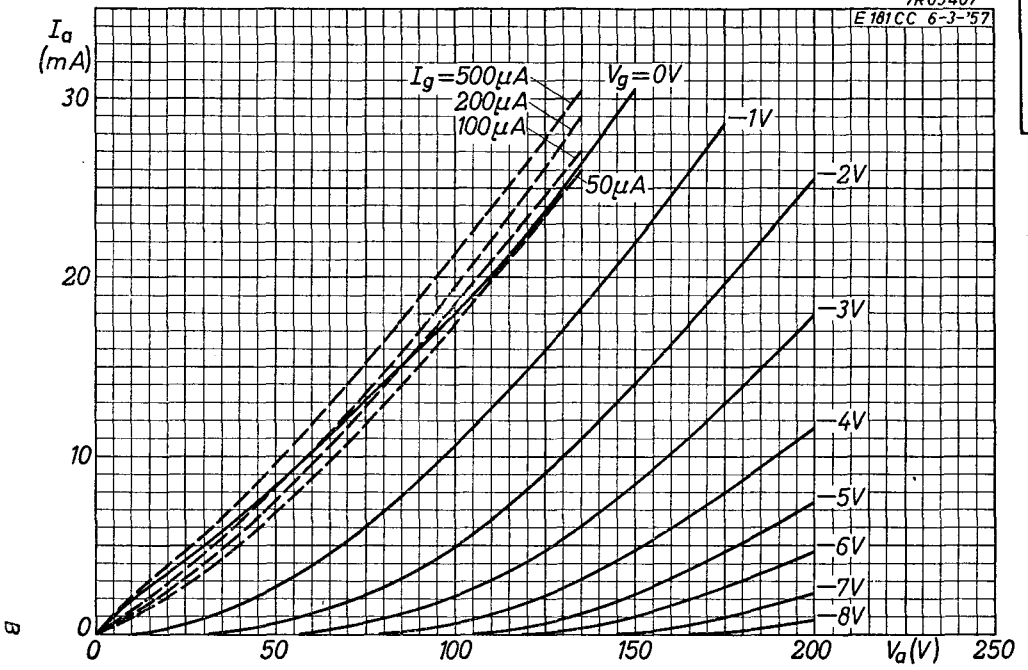
[10] Fixed grid bias
Polarisation de grille fixe
Feste Gittervorspannung

[11] Tube life and reliability of performance will be enhanced by operation at lower temperatures

La durée de vie et la sécurité de fonctionnement seront augmentées par opération à des températures plus basses

Lebensdauer und Betriebssicherheit werden durch Betrieb bei niedrigeren Temperaturen verbessert


7R05406
E181CC 6-3-'57
I_a
I_g
I_a (mA)
I_g (μA)
35
30
25
20
15
10
5
0
800
600
400
200
0
V_a = 150V
100V
85V
85V
−8 V_g (V) −6
−4
−2
0
+2


7R05407
E 181 CC 6-3-'57
I_a (mA)
I_g=500μA
200μA
100μA
50μA
V_g=0V
−1V
−2V
−3V
−4V
−5V
−6V
−7V
−8V
0
10
20
30
0
50
100
150
200
V_a(V)
250

PHILIPS

PHILIPS

Electronic Tube

HANDBOOK

E181CC

page	sheet	date
1	1	1957.03.03
2	2	1957.03.03
3	3	1957.03.03
4	A	1957.03.03
5	B	1957.03.03
6	FP	1999.06.09

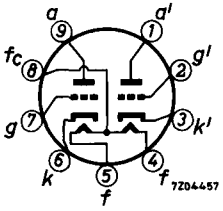
S.Q. TUBE

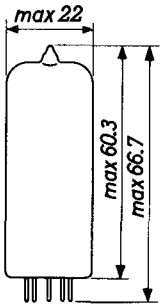
Special quality double triode designed for use in computer circuits.

QUICK REFERENCE DATA			
Life test	10 000 hours		
Low interface resistance			
Base	Noval		
Heating	Indirect A.C. or D.C.; Parallel supply		
Heater voltage	V_f	6.3 or 12.6	V
Heater current	I_f	640 or 320	mA
Anode current	I_a	36	mA
Mutual conductance	S	15	mA/V

DIMENSIONS AND CONNECTIONS Dimensions in mm

Base: Noval





CHARACTERISTICS

Column I Nominal value or setting of the tube
II Range values for equipment design: Initial spread
III Range values for equipment design: End of life

		I	II	III	
Heater voltage (pin 8 and 4+5)	V_f	6.3			V
Heater current	I_f	640	605- 675		mA
Heater voltage (pin 4 and 5)	V_f	12.6			V
Heater current	I_f	320			mA
Anode voltage	V_a	120			V
Grid voltage	$-V_g$	2			V
Anode current	I_a	36	26- 45		mA
Mutual conductance	S	15			mA/V
Amplification factor	μ	24			
Negative grid current	$-I_g$		max. 0.2	max.1.0	μA
Anode voltage	V_a	120			V
Cathode resistor	R_k	55			Ω
Mutual conductance	S	15	11.2-18.8	min. 8	mA/V
Anode voltage	V_a	90			V
Grid current	I_g	250			μA
Anode current	I_a		41- 62	min. 24	mA
Cut-off voltage	$-V_g$	14			V
Anode voltage	V_a	150			V
Anode current	I_a		max. 0.2		mA
Leakage current between cathode and heater Voltage between cathode and heater = 200 V	I_{kf}		max. 15	max. 30	μA
Insulation resistance between two electrodes			min. 100	min. 20	MΩ

CAPACITANCES Each system if applicable

		I	II	
Anode to cathode and heater	$C_{a/kf}$	1.1	0.75-1.45	pF
	$C_{a'/k'f}$	1.0	0.65-1.35	pF
Grid to cathode and heater	$C_{g/kf}$	6.0	5.3- 6.7	pF
Anode to grid	C_{ag}	4.0	3.4- 4.6	pF
	$C_{a'g'}$	4.1	3.4- 4.8	pF
Cathode to heater	C_{kf}	4.0		pF
Anode to anode other section	$C_{aa'}$	0.6	max. 0.8	pF
Grid to grid other section	$C_{gg'}$		max. 0.15	pF
Anode to grid other section	$C_{ag'}$		max. 0.1	pF

LIFE

Production samples are tested to be within the end of life values (column III) during 10 000 hours under the following conditions.

Anode supply voltage	V_{ba}	150	V
Anode resistor	R_a	1.5	kΩ
Grid supply voltage	V_{bg}	150	V
Grid resistor	R_g	62	kΩ
Voltage between cathode and heater (cath. neg.)	V_{kf}	120	V

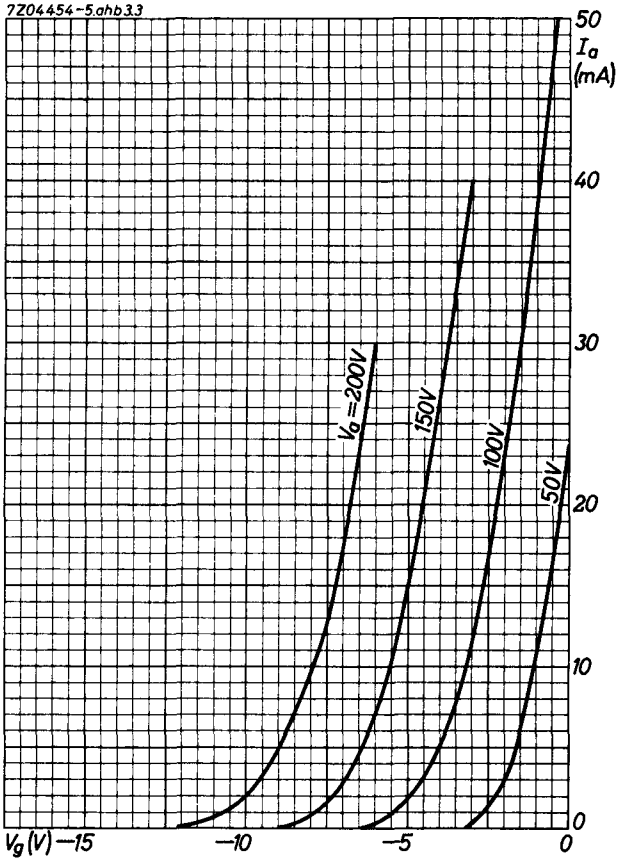
LIMITING VALUES (Absolute max. rating system)

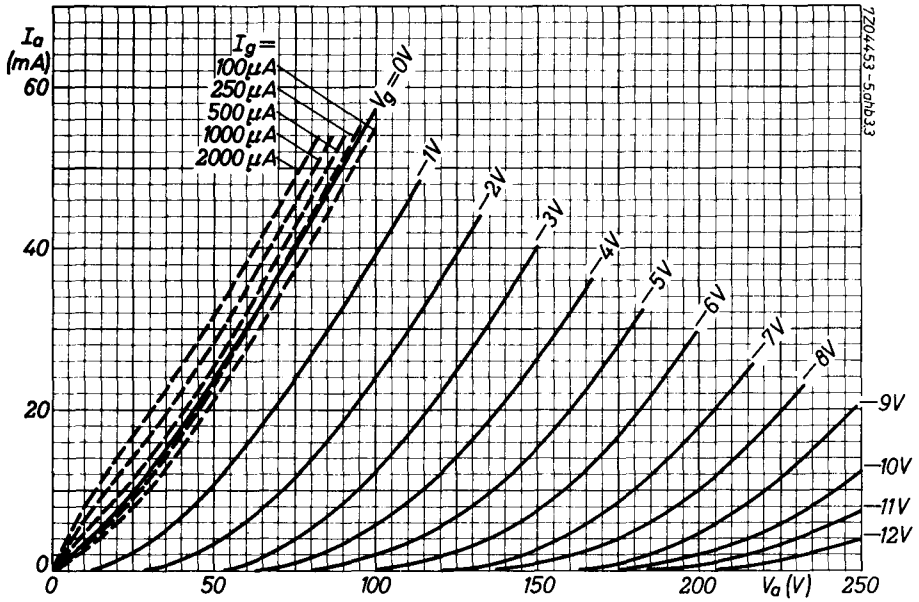
Anode voltage	V_{a_o}	max.	600	V
	V_a	max.	300	V
Anode dissipation	W_a	max.	4.5	W
Anode dissipation (both sections)	$W_{a+a'}$	max.	8.0	W
Grid voltage	$-V_g$	max.	100	V
	$+V_g$	max.	1	V

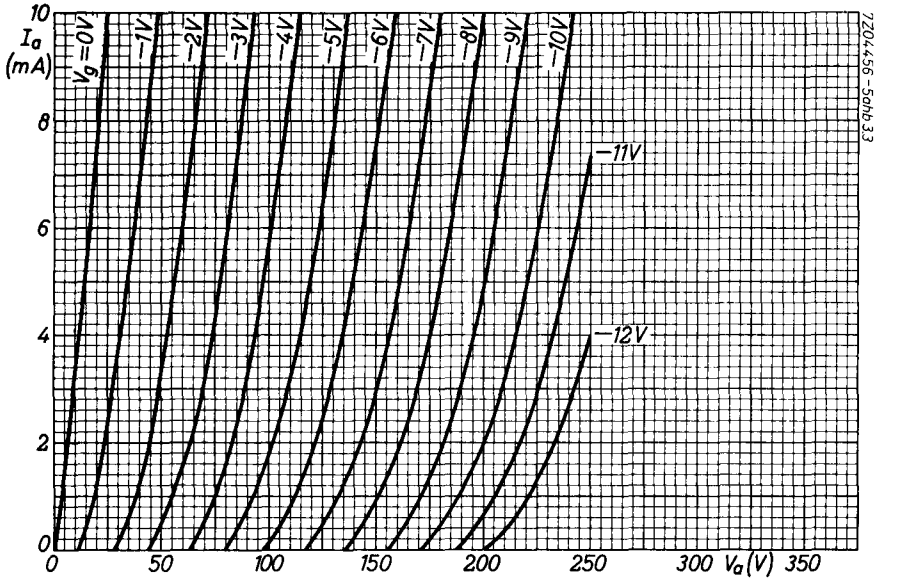
LIMITING VALUES (continued)

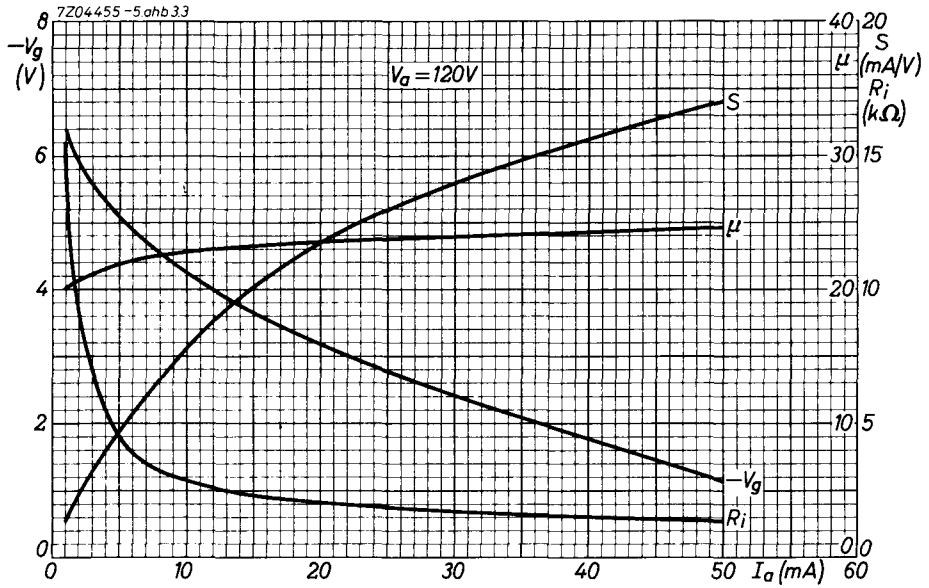
Grid voltage, peak	$+V_{gp}$	max.	30	V
	$-V_{gp}$	max.	200	V
Pulse duration max. 10 μs				
Duty factor max. 0.01				
Grid current	I_g	max.	8	mA
Grid peak current	I_{gp}	max.	200	mA
Pulse duration max. 10 μs				
Duty factor max. 0.01				
Cathode current	I_k	max.	60	mA
Cathode peak current	I_{kp}	max.	400	mA
Pulse duration max. 10 μs				
Duty factor max. 0.01				
Voltage between cathode and heater	V_{kf}	max.	200	V
d.c. component	V_{kf}	max.	120	V
Bulb temperature	t_{bulb}	max.	160	°C
Grid resistor with automatic bias	R_g	max.	1	MΩ
Grid resistor with fixed bias	R_g	max.	0.5	MΩ

Heater voltage: The average heater voltage should be 6.3/12.6 V.
Variations of the heater voltage exceeding the range of 6.0/12.0 V to 6.6/13.2 V will shorten the tube life.
The tolerance of heater current (column II) should be taken into account.


7Z04454-5.ahb3.3
50
I_a
(mA)
40
30
20
10
0
V_a=200V
150V
100V
50V
V_g(V) −15
−10
−5
0


I_a (mA)
60
40
20
0
I_g =
100 µA
250 µA
500 µA
1000 µA
2000 µA
V_g = 0V
-1V
-2V
-3V
-4V
-5V
-6V
-7V
-8V
-9V
-10V
-11V
-12V
0
50
100
150
200
V_a (V)
250
7204453-5ahb33


10
I_a (mA)
8
6
4
2
0
V_g = 0V
-1V
-2V
-3V
-4V
-5V
-6V
-7V
-8V
-9V
-10V
-11V
-12V
0
50
100
150
200
250
300
V_a (V)
350
7204456-5ahb33


7Z04455-5 ahb 33
$-V_g$ (V)
$V_a = 120V$
S
μ
$-V_g$
R_i
S (mA/V)
μ
R_i (kΩ)
I_a (mA)
0
2
4
6
8
10
20
30
40
50
60
5
15

PHILIPS

Data handbook

PHILIPS Electronic components and materials

E182CC

page	sheet	date
1	1	1968.12
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3	3	1968.12
4	4	1968.12
5	5	1968.12
6	6	1968.12
7	7	1968.12
8	FP	2000.12.04

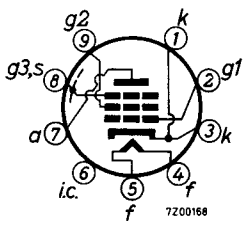
S.Q. TUBE

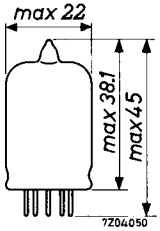
Special quality pentode designed for use as broad band amplifier.

QUICK REFERENCE DATA			
Life test	10 000 hours		
Mechanical quality	Shock and vibration resistant		
Low microphony level			
Base	Noval		
Heating	Indirect a.c. or d.c.; parallel supply		
Heater voltage	V_f	6.3	V
Heater current	I_f	320	mA
Anode current	I_a	13	mA
Mutual conductance	S	16.5	mA/V
Equivalent noise resistance	R_{eq}	330	Ω
Hum voltage	V_{g_1}	<100	μV

DIMENSIONS AND CONNECTIONS Dimensions in mm

Base: Noval





CHARACTERISTICS

Column I Nominal value or setting of the tube
II Range values for equipment design: Initial spread
III Range values for equipment design: End of life

		I	II	III	
Heater voltage	V_f	6.3			V
Heater current	I_f	320	300- 340		mA
Anode supply voltage	V_{ba}	190			V
Grid No.3 voltage	V_{g_3}	0			V
Grid No.2 supply voltage	V_{bg_2}	160			V
Grid No.1 supply voltage	$+V_{bg_1}$	9			V
Cathode resistor	R_k	630			Ω
Anode current	I_a	13	12.2-13.8	min.11.5	mA
Grid No.2 current	I_{g_2}	3.3	2.9- 3.7		mA
Mutual conductance	S	16.5	14.2-18.6	min. 11	mA/V
Amplification factor grid No.2 to grid No.1	$\mu_{g_2g_1}$	53			
Internal resistance	R_i	100			kΩ
Equivalent noise resistance frequency 45 MHz	R_{eq}	330			Ω
Negative grid No.1 current	$-I_{g_1}$		max. 0.2	max.0.5	μA
Anode supply voltage	V_{b_a}	180			V
Grid No.3 voltage	V_{g_3}	0			V
Grid No.2 supply voltage	V_{bg_2}	150			V
Cathode resistor	R_k	100			Ω
Anode current	I_a	11.5			mA
Grid No.2 current	I_{g_2}	2.9			mA
Mutual conductance	S	15.5			mA/V

CHARACTERISTICS (continued)		I	II	III	
Cut-off voltage	$-V_{g_1}$	4.5			V
Anode voltage	V_a	180			V
Grid No.3 voltage	V_{g_3}	0			V
Grid No.2 voltage	V_{g_2}	150			V
Anode current	I_a		max.0.8		mA
Leakage current between cathode and heater Voltage between cathode and heater V_{kf} = 100 V	I_{kf}		max. 10	max.20	μA
Insulation resistance between two electrodes Voltage between electrodes = 100 V	R_{ins}		min. 100	min. 50	MΩ
Hum voltage Grid No.1 resistor R_{g_1} = 0.5 MΩ Centre tapping of heater transformer grounded Cathode resistor by-passed	V_{g_1}		max.100		μV
Vibrational noise output					
With vibration frequency = 50-2000 Hz	V_{g_1}		max.500		mV_{RMS}
With vibration frequency = 50 Hz	V_{g_1}		max.200		mV_{RMS}

Anode supply voltage V_{b_a} = 216 V

Anode resistor R_a = 2 kΩ

Grid No.2 supply voltage V_{bg_2} = 160 V

Grid No.3 voltage V_{g_3} = 0 V

Cathode resistor R_k = 630 Ω
(not by-passed)

Grid No.1 supply voltage + V_{bg_1} = 9 V

Acceleration (peak value) = 10 g

CAPACITANCES . With external shield

		I	II	
Anode to grid No.3, grid No.2 cathode, heater and screen	C_{a/g_3g_2kfs}	3.45		pF
Grid No.1 to grid No.3, grid No.2 cathode, heater and screen	C_{g_1/g_3g_2kfs}	7.6		pF
Anode to grid No.1	C_{ag_1}		max.0.03	pF

SHOCK AND VIBRATION RESISTANCE

The following test conditions are applied to assess the mechanical quality of the tube. These conditions are not intended to be used as normal operating conditions.

Shock

The tube is subjected 5 times in each of 4 positions to an acceleration of 500 g supplied by an NRL shock machine with the hammer lifted over an angle of 30^{o}.

Vibration

The tube is subjected during 32 hours in each of 3 positions to a vibration frequency of 50 Hz with an acceleration of 2.5 g.

LIFE

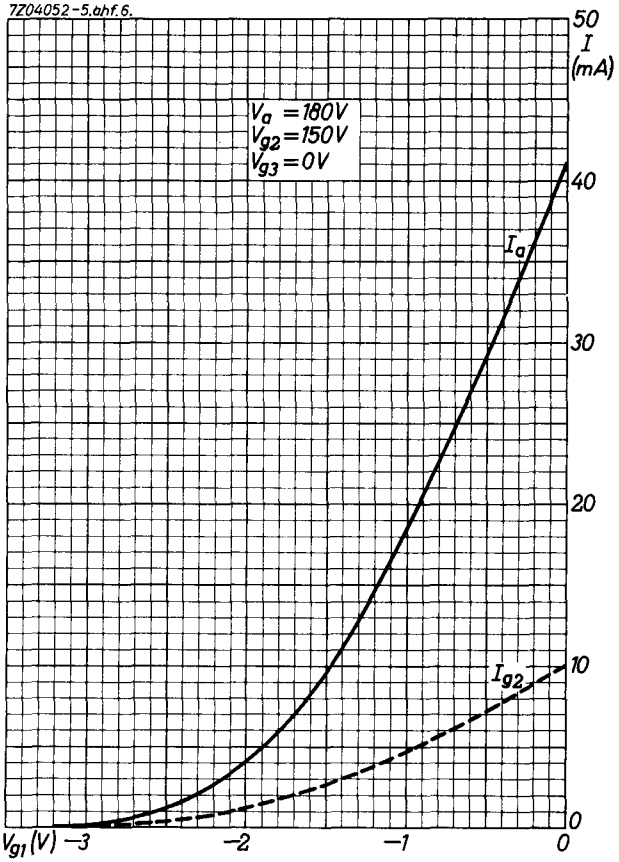
Production samples are tested to be within the end of life values (column III) under the following conditions during 10 000 hours.

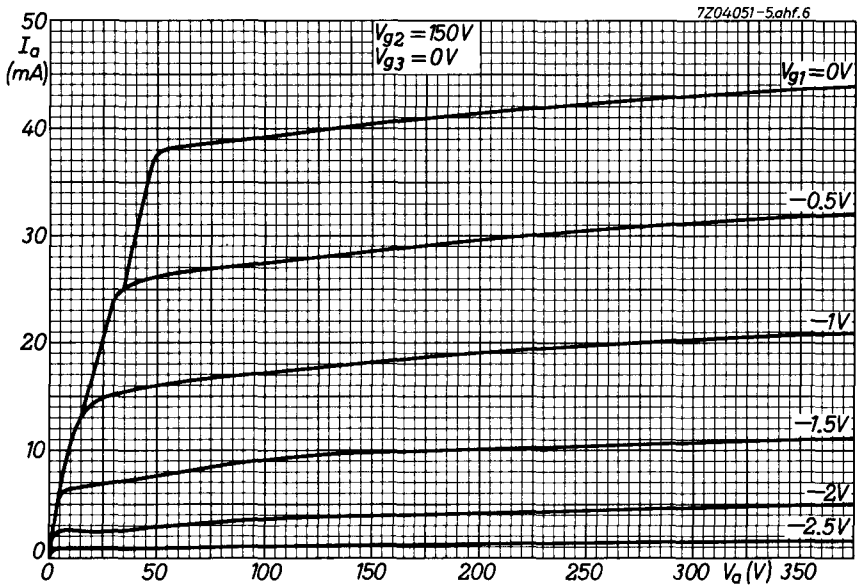
Anode supply voltage	V_{b_a}	190	V
Grid No.3 voltage	V_{g_3}	0	V
Grid No.2 voltage	V_{g_2}	160	V
Grid No.1 supply voltage	$+V_{bg_1}$	9	V
Cathode resistor	R_k	630	Ω
Voltage between cathode and heater (cathode negative)	V_{kf}	70	V

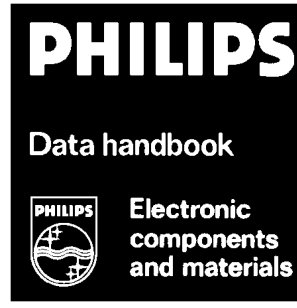
LIMITING VALUES (Absolute max. rating system)

Anode voltage	V_{a_o}	max.	400	V
	V_a	max.	210	V
Anode dissipation	W_a	max.	3	W
Grid No.2 dissipation	W_{g_2}	max.	0.7	W
Grid No.2 voltage	$V_{g_{2o}}$	max.	400	V
	V_{g_2}	max.	175	V
Grid No.1 voltage				
positive	$+V_{g_1}$	max.	0	V
negative	$-V_{g_1}$	max.	50	V
negative peak	$-V_{g_{1p}}$	max.	100	V
Grid No.1 resistor				
fixed bias	R_{g_1}	max.	0.25	MΩ
automatic bias	R_{g_1}	max.	0.5	MΩ
Cathode current	I_k	max.	25	mA
Voltage between cathode and heater	V_{kf}	max.	60	V
Bulb temperature	tbulb	max.	165	°C

Heater voltage: The average heater voltage should be 6.3 V.
Variation of the heater voltage exceeding the range of 6.0 V to 6.6 V will shorten the tube life.
The tolerance of heater current (column II) should be taken into account.


7Z04052-5.ahf.6.
V_a = 180V
V_{g2} = 150V
V_{g3} = 0V
I_a
I_{g2}
I (mA)
50
40
30
20
10
0
V_{g1} (V) −3
−2
−1
0


7Z04051-5ahf.6
I_a (mA)
V_{g2} = 150V
V_{g3} = 0V
V_{g1} = 0V
−0.5V
−1V
−1.5V
−2V
−2.5V
50
40
30
20
10
0
0
50
100
150
200
250
300
V_a (V) 350



E186F

page	sheet	date
1	1	1968.12
2	2	1968.12
3	3	1968.12
4	4	1968.12
5	5	1968.12
6	6	1968.12
7	7	1968.12
8	FP	2000.12.04

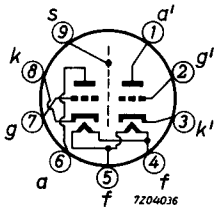
S.Q. TUBE

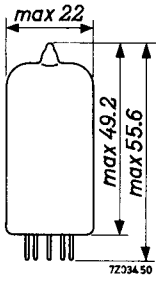
Special quality double triode designed for use as cascode amplifier, cathode follower etc. in R.F. and A.F. circuits.

QUICK REFERENCE DATA				
Life test	10 000 hours			
Low interface resistance				
Mechanical quality	Shock and vibration resistant			
Base	Noval. Gold plated pins			
Heating	Indirect A.C. or D.C.; parallel supply			
Heater voltage	V_f		6.3	V
Heater current	I_f		335	mA
Anode current	I_a		15	mA
Mutual conductance	S		12.5	mA/V
Equivalent noise resistance	R_{eq}		250	Ω
Noise factor (f = 200 MHz)	F		4.6	dB
Hum voltage	V_g	max.	50	μV_{RMS}

DIMENSIONS AND CONNECTIONS Dimensions in mm

Base: Noval





CHARACTERISTICS

Column I Nominal value or setting of the tube
II Range values for equipment design: Initial spread
III Range values for equipment design: End of life

		I	II	III	
Heater voltage	V_f	6.3			V
Heater current	I_f	335	318 - 352		mA
Anode supply voltage	V_{ba}	100			V
Grid supply voltage	$+V_{bg}$	9			V
Cathode resistor	R_k	680			Ω
Anode current	I_a	15	14.2-15.8	min.13.5	mA
Mutual conductance	S	12.5	10.5-14.5	min. 9	mA/V
Amplification factor	μ	33			
Negative grid current	$-I_g$		max. 0.1	max. 1.0	μA
Equivalent noise resistance Frequency f = 45 MHz	R_{eq}	250			Ω
Noise factor in cascode circuit, adapted to minimum noise Frequency f = 200 MHz	F	4.6.			dB
Input resistance Frequency f = 100 MHz	r_g	3			kΩ
Cut off voltage	$-V_{g_1}$	15			V
Anode voltage	V_a	150			V
Anode current	I_a		max. 5		mA
Anode supply voltage	V_{ba}	90			V
Cathode resistor	R_k	120			Ω
Anode current	I_a	12			mA
Mutual conductance	S	11.5			mA/V

CHARACTERISTICS (continued)

		I	II	III	
Leakage current between cathode and heater	I_{kf}		max. 6	max. 12	μA
Voltage between cathode and heater V_{kf} = 60 V (k neg) or = 120 V (k pos)					
Insulation resistance between two electrodes	R		min. 100	min. 20	MΩ
Voltage between electrodes V = 200 V					
Hum voltage	V_g		max. 50		μV_{RMS}
Grid resistor R_{g_1} = 0.5 MΩ					
Vibrational noise output	V_g		max. 100		mV
Anode supply voltage V_{ba} = 100 V					
Anode resistor R_a = 2 kΩ					
Grid supply voltage $+V_{bg}$ = 9 V					
Cathode resistor R_k = 680 Ω (by passed)					
Vibration frequency f = 10-50 Hz					
Acceleration = 2.5 g					
Vibrational noise output	V_g		max. 140		mV
Anode supply voltage V_{ba} = 270 V					
Anode resistor R_a = 18 kΩ					
Grid resistor R_g = 1 MΩ					
Cathode resistor R_k = 180 Ω					
By pass capacitor C_k = 50 μF					
Vibration frequency f = 50-5000 Hz					
Acceleration = 0.5 g					

CAPACITANCES. Both sections if not otherwise indicated.

		I	II	
Anode to cathode, heater and screen	$C_{a/kfs}$	1.75	1.55 - 1.95	pF
	$C_{a'/k'fs}$	1.65	1.45 - 1.85	pF
Anode to cathode and heater	$C_{a/kf}$	0.5	0.4 - 0.6	pF
	$C_{a'/k'f}$	0.4	0.3 - 0.5	pF
Grid to cathode, heater and screen	$C_{g/kfs}$	3.3	2.7 - 3.9	pF
Grid to cathode and heater	$C_{g/kf}$	3.3	2.7 - 3.9	pF
Anode to grid	C_{ag}	1.4	1.2 - 1.6	pF
Anode to cathode	C_{ak}	0.18	0.14 - 0.22	pF
Cathode to heater	C_{kf}	2.6		pF
	$C_{k'f}$	2.7		pF
Anode to screen	C_{as}	1.3	1.1 - 1.5	pF
Anode to grid, heater and screen	$C_{a/gfs}$	3.0	2.7 - 3.3	pF
	$C_{a'/gfs}$	2.9	2.6 - 3.2	pF
Cathode to grid, heater and screen	$C_{k/gfs}$	6.0	5.1 - 6.9	pF
Anode to anode other section	$C_{aa'}$	0.025	max. 0.045	pF
Grid to grid other section	$C_{gg'}$		max. 0.005	pF
Anode to grid other section	$C_{ag'}$		max. 0.005	pF
Grid to anode other section	$C_{ga'}$		max. 0.005	pF
Grid to cathode other section	$C_{gk'}$		max. 0.005	pF
Cathode to grid other section	$C_{kg'}$		max. 0.005	pF

SHOCK AND VIBRATION RESISTANCE

The following test conditions are applied to assess the mechanical quality of the tube. These conditions are not intended to be used as normal operating conditions.

Shock

The tube is subjected 5 times in each of 4 positions to an acceleration of 500 g supplied by an NRL shock machine with the hammer lifted over an angle of 30°.

Vibration

The tube is subjected during 32 hours in each of 3 positions to a vibration frequency of 50 Hz with an acceleration of 2.5 g.

LIFE

Production samples are tested to be within the end of life values (column III) under the following conditions during 10 000 hours.

Anode supply voltage	V_{ba}	100	V
Grid supply voltage	$+V_{bg}$	9	V
Cathode resistor	R_k	680	Ω
Grid resistor	R_g	47	kΩ
Cathode to heater voltage (k neg)	V_{kf}	60	V

LIMITING VALUES (Absolute max. rating system)

Anode voltage	V_{a_o}	max.	550	V
	V_a	max.	250	V
Anode voltage (Zero anode current)	$V_a(I_a = 0)$	max.	400	V
Anode dissipation	W_a	max.	1.65	W
	W_a	max.	2.0	W
Both sections	$W_{a+a'}$	max.	2.2	W
Grid dissipation	W_g	max.	30	mW
Grid voltage	$-V_g$	max.	110	V
Grid peak voltage	$-V_{g_p}$	max.	200	V
Pulse duration max. 200 μs				
Duty factor max. 0.1				
Cathode current	I_k	max.	22	mA
Cathode peak current	I_{k_p}	max.	110	mA
Pulse duration max. 200 μs				
Duty factor max. 0.1%				
Voltage between cathode and heater				
cathode positive	V_{kf}(k pos)	max.	150	V
cathode negative	V_{kf}(k neg)	max.	100	V
Bulb temperature	t_{bulb}	max.	165	°C
Grid resistor with fixed bias	R_g	max.	0.5	MΩ
with automatic bias	R_g	max.	1.0	MΩ

LIMITING VALUES (continued)

Heater voltage: The average heater voltage should be 6.3 V.
Variations of the heater voltage exceeding the range of 6.0 V to 6.6 V will shorten the tube life.
The tolerance of heater current (column II) should be taken into account.

OPERATING CHARACTERISTICS

Additive mixer					
Anode supply voltage	V_{ba}	60	90	150	V
Anode resistor	R_a	0	1	3.9	kΩ
Grid resistor	R_g	1	1	1	MΩ
Grid oscillator voltage	V_{osc}	2	2.5	3	V_{RMS}
Anode current	I_a	4.7	7.7	11	mA
Conversion conductance	S_c	2.9	3.5	4.1	mA/V
Internal resistance	R_i	8.3	7	6.1	kΩ
Output tube class A					
Anode voltage	V_a		220		V
Load resistance	$R_{a\sim}$		20		kΩ
Negative grid voltage	$-V_g$		6.5		V
Input voltage	V_i	0	1.5	4.5	V_{RMS}
Anode current	I_a	6.5	–	9.2	mA
Output power	W_o	–	0.05	0.5	W
Total distortion	d_{tot}			7	%

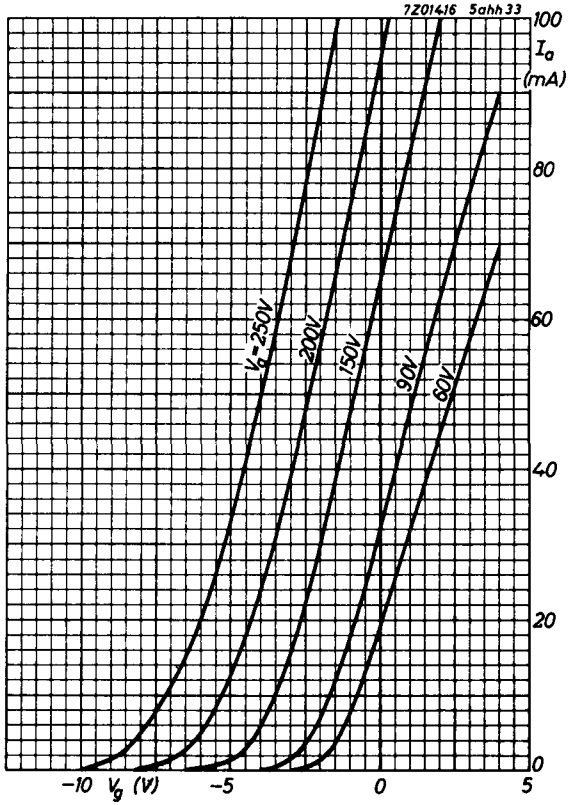
Output tube class B (two units). Constant sinusoidal input voltage (single tone).

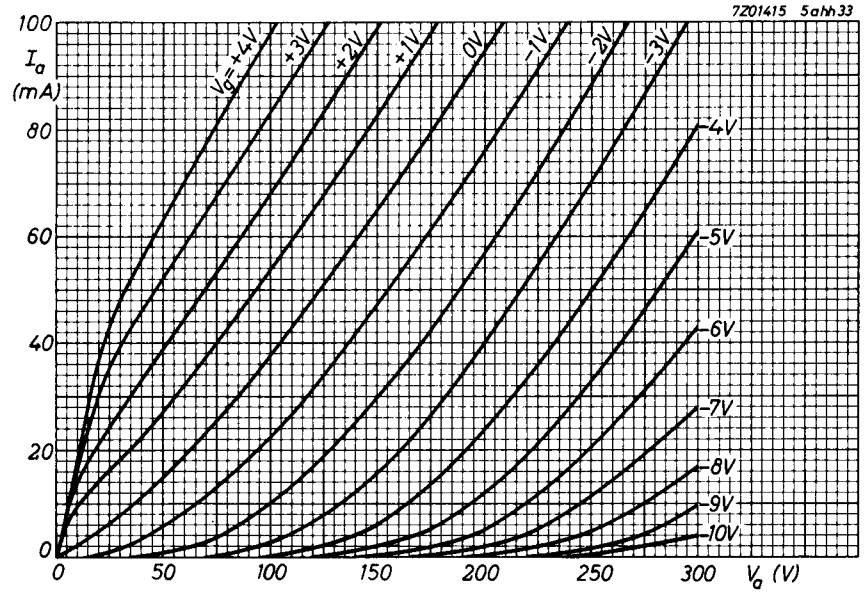
Anode voltage	V_a		200		V
Load resistance	$R_{aa\sim}$		22		kΩ
Negative grid voltage	$-V_g$		6		V
Input voltage	V_i	0	0.9	4.0	V_{RMS}
Anode current	I_a	2x5	–	2x9	mA
Output power	W_o	–	0.05	1.2	W
Total distortion	d_{tot}	–	–	3	%

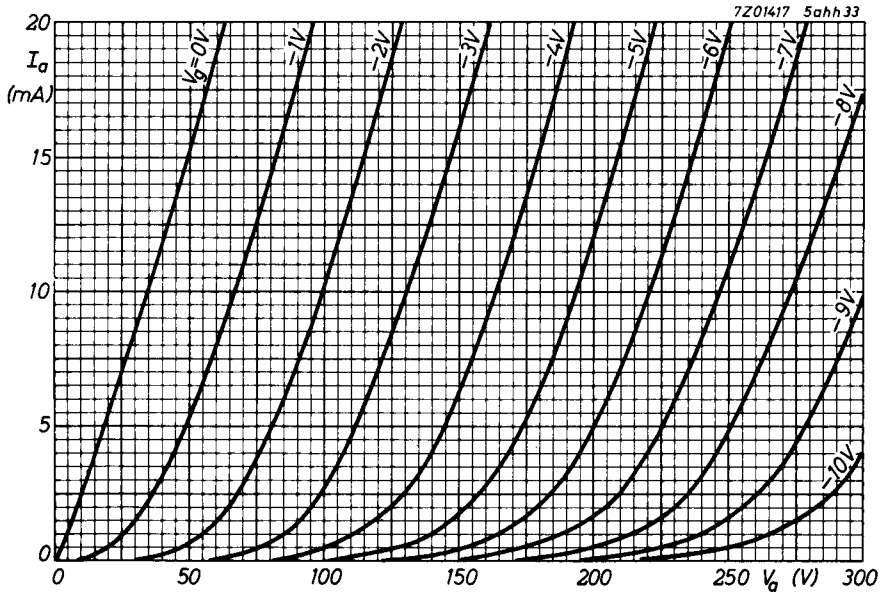
OPERATING CHARACTERISTICS (continued)

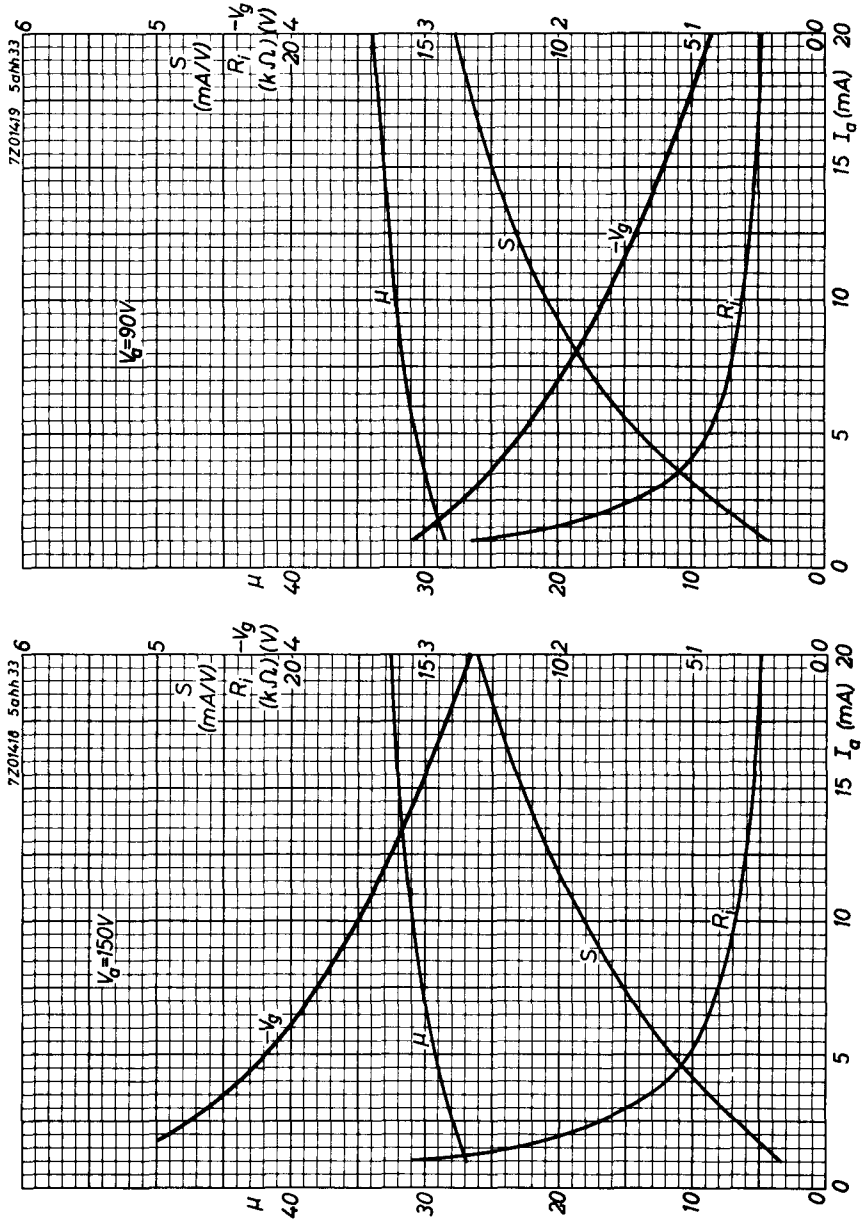
Output tube class B (two units). Speech and music input voltage

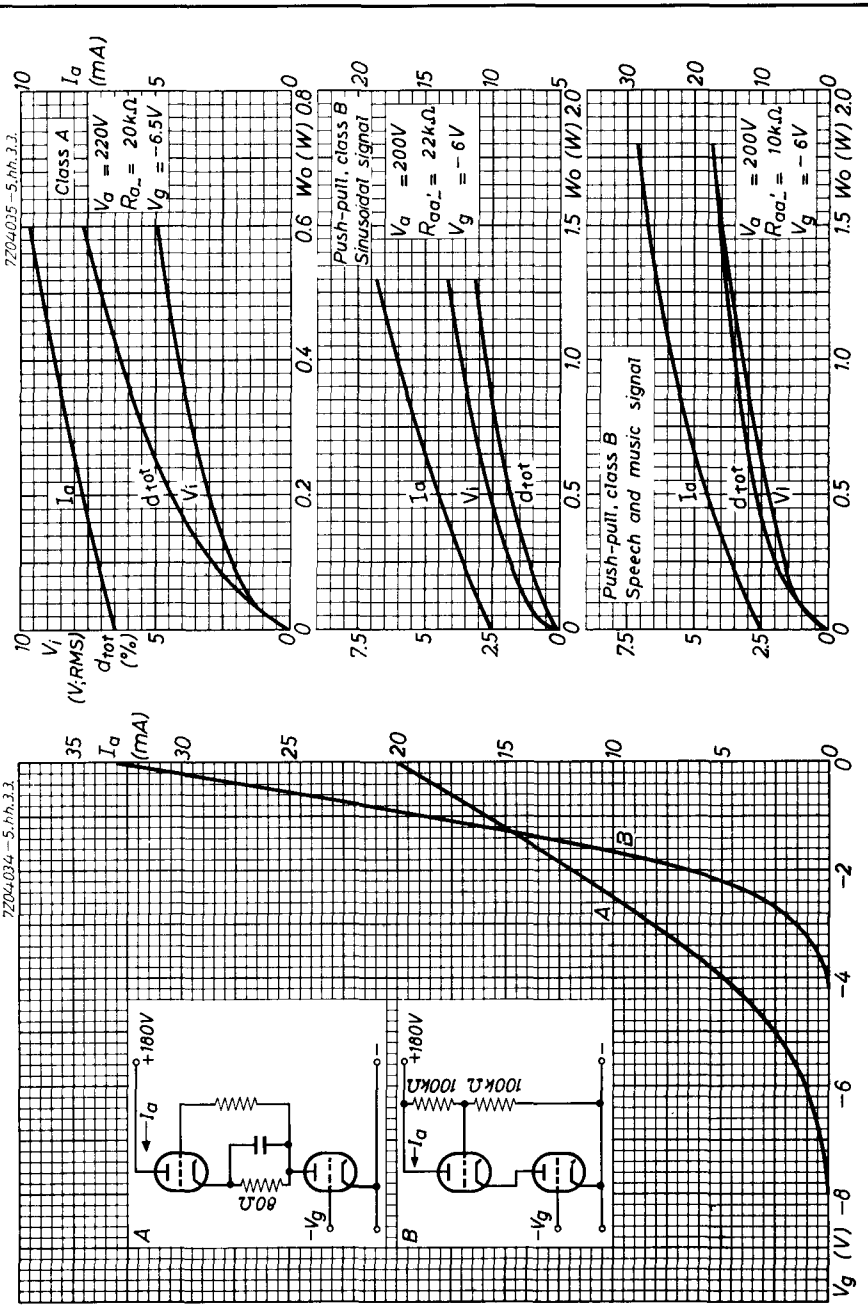
Anode voltage	V_a		200		V
Load resistance	$R_{aa\sim}$		10		kΩ
Negative grid voltage	$-V_g$		6		V
Input voltage	V_i	0	0.9	4.0	V_{RMS}
Anode current	I_a	2x5	–	2x13.5	mA
Output power	W_o	–	0.05	1.5	W
Total distortion	d_{tot}	–	–	4	%

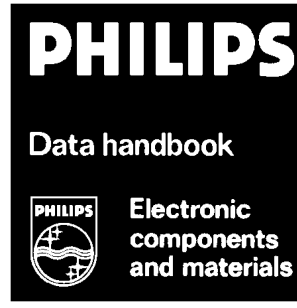



7Z01415 5ahh33
100
I_a
(mA)
80
60
40
20
0
V_g=+4V
+3V
+2V
+1V
0V
-1V
-2V
-3V
-4V
-5V
-6V
-7V
-8V
-9V
-10V
0
50
100
150
200
250
300
V_a (V)


7Z01417 5ahh33
20
I_a
(mA)
15
10
5
0
V_g=0V
-1V
-2V
-3V
-4V
-5V
-6V
-7V
-8V
-9V
-10V
0
50
100
150
200
250
300
V_a (V)


7Z01419 5ahh33
V_b=90V
S (mA/V)
R_i (kΩ)
$-V_g$ (V)
μ
S
$-V_g$
R_i
I_a (mA)
7Z01418 5ahh33
V_a=150V
S (mA/V)
R_i (kΩ)
$-V_g$ (V)
μ
S
$-V_g$
R_i
I_a (mA)


Class A
Va = 220V
Raa' = 20kΩ
Vg = -6.5V
Ia
d tot
Vi
Push-pull, class B
Sinusoidal signal
Va = 200V
Raa' = 22kΩ
Vg = -6V
Push-pull, class B
Speech and music signal
Va = 200V
Raa' = 10kΩ
Vg = -6V
Vi (V,RMS)
d tot (%)
Wo (W)
Ia (mA)
Vg (V)
A
B
+180V
-Ia
-Vg
80kΩ
100kΩ
100kΩ
2204035-5.hh.3.3
2204034-5.hh.3.3



E188CC

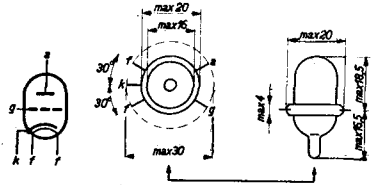
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9	9	1968.12
10	10	1968.12
11	FP	2000.12.04

ULTRA SHORT WAVE TRIODE (Acorn type)
TRIODE POUR ONDES ULTRA COURTES (Tube bouton)
ULTRAKURZWELLENTRIODE (Knopfröhre)

Heating : indirect
Chauffage: indirect
Heizung : indirekt

V_f = 6,3 V
I_f = 0,15 A

Dimensions in mm
Dimensions en mm
Abmessungen in mm



Capacitances
Capacités
Kapazitäten

C_{ag} = 1,5 pF
C_g = 1,1 pF
C_a = 0,6 pF
C_{gf} < 0,3 pF

Input resistance (λ = 6 m)
Résistance d'entrée (I_a=4,5mA)
Eingangswiderstand

r_g = 70 kΩ

Output resistance (λ = 6 m)
Résistance de sortie (I_a=4,5mA)
Ausgangswiderstand

r_a = 11 kΩ

Typical characteristics
Caractéristiques types
Kenndaten

V_a =	90	135	180	V
I_a =	2,5	3,5	4,5	mA
V_g =	-2,5	-3,75	-5	V
μ =	25	25	25	
S =	1,7	1,9	2,0	mA/V
R_i =	14,7	13,2	12,5	kΩ

Operating characteristics for use as resistance coupled A.F. amplifier
Caractéristiques d'utilisation en amplificatrice B.F. à couplage par résistance
Betriebsdaten als N.F.- Verstärker mit Widerstandskopplung

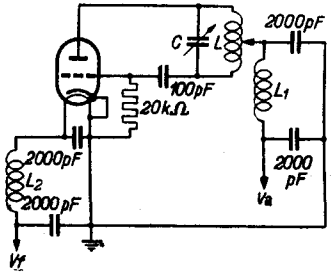
V_a (V)	R_a (MΩ)	R_k (kΩ)	I_a (mA)	$\frac{V_o}{V_i}$	V_o (V_{eff})	d_{tot} (%)
180	0,2	3,2	0,63	19,5	5	1,1
135	0,2	5	0,46	19	5	1,3
90	0,2	10	0,26	17,5	5	2,1

Operating characteristics for use as oscillator
Caractéristiques d'utilisation en oscillatrice
Betriebsdaten als Oszillator

V_a	=	180 V
I_a	=	7 mA
R_g	=	20 kΩ
I_g	=	1,5 mA
W_o (λ = 5 m)	=	0,5 W

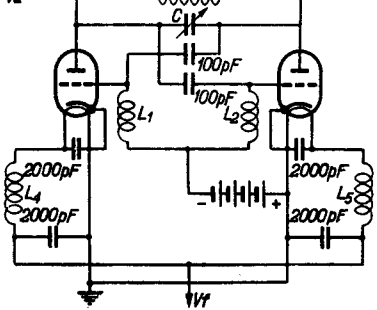
Limiting values
Caractéristiques limites
Grenzdaten

V_a	= max.	180 V
W_a	= max.	1,5 W
I_k	= max.	10 mA
V_g(I_g=+0,3μA)	= max.	-1,3 V
I_g	= max.	2 mA
R_g	= max.	5 MΩ
R_{kf}	= max.	20 kΩ
V_{kf}	= max.	50 V



Va (V)	λ (m)	Wo (mW)	Ia (mA)	Igl (mA)	C (pF)	Coil Bobine Spule	Ø Core Noyau Windung (mm)	l (mm)	n	Ø Wire Fil Draht (mm)
						L	18	25	7	1,5
180	2,5	310	7,0	1,5	5-50	L1-L2	13	40	20	1
						L	18	25	9	1,5
180	5	500	7,0	1,5	5-50	L1-L2	13	40	20	1

Fundamental circuit diagram for use as push-pull oscillator for wavelengths from 2,5 to 6,5 m.
Schéma de principe pour l'utilisation comme oscillatrice push-pull pour des longueurs d'ondes de 2,5 à 6,5 m.
Prinzipschaltung für die Verwendung als Gegentaktoszillator für Wellenlängen von 2,5 bis 6,5 m.



Va (V)	λ (m)	Wo (mW)	Ia[1] (mA)	C (pF)	Coil Bobine Spule	Ø Core Noyau Windung (mm)	l (mm)	n	Ø Wire Fil Draht (mm)
180	2,5	700	7	5-50	L	18	25	7	1,5
					L1=L2=L3=L4=L5	13	40	20	1
180	5	1100	7	5-50	L	18	25	9	1,5
					L1=L2=L3=L4=L5	13	40	20	1

1) each valve; par tube; pro Röhre

The negative grid bias Vgl depends on the anode voltage at which the valve must oscillate. The simplest way is to tap the negative grid bias from a potentiometer. Without grid bias the transmitter oscillates satisfactorily at an anode voltage of 20 to 50 V.
La polarisation de grille Vgl dépend de la tension d'anode à laquelle lestubes doivent osciller. Le mieux est de prendre la polarisation sur un potentiomètre. Sans polarisation l'émetteur accroche d'une manière satisfaisante avec une tension d'anode de 20 à 50 V.
Die negative Gitterspannung Vgl ist abhängig von der Spannung bei welcher die Röhren schwingen müssen. Am bequemsten ist es, die negative Gittervorspannung einem Spannungsteiler zu entnehmen. Ohne Gittervorspannung schwingt der Sender befriedigend bei einer Anodenspannung von 20-50 V.

Max. ratings
Limites fixées
Grenzdaten

Va	180	V
Wa	1,5	W
Ik	10	mA
Vg (Ig = + 0,3 µA)	-1,3	V
Ig	2	mA
Rgl	5	MΩ
Rfk	20000	Ω
Vfk	50	V 1)

1) D.C. voltage or R.M.S. value of the A.C. mains voltage.
Tension continue ou valeur efficace de la tension alternative du réseau.
Gleichspannung oder Effektivwert der Netzwechselspannung.

PHILIPS

Electronic Tube

HANDBOOK

E1C

page	sheet	date
1	1	1953.04.04
2	2	1953.04.04
3	3	1948.05.01
4	4	1948.05.01
5	FP	1999.06.09

PHILIPS

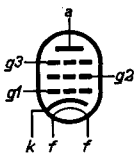
E1F

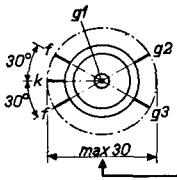
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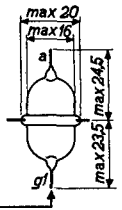
PENTODE for use as R.F. amplifier up to 430 Mc/s (Acorn type)
PENTHODE pour l'utilisation en amplificatrice H.F. jusqu'à 430 Mc/s (Tube bouton)
PENTODE zur Verwendung als H.F.- Verstärker bis 430 MHz (Knopfröhre)

Heating : indirect	V_f	= 6,3 V
Chauffage: indirect	I_f	= 0,15 A
Heizung : indirekt		

Dimensions in mm
Dimensions en mm
Abmessungen in mm







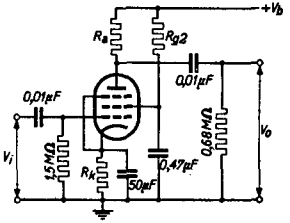
Capacitances	C_{ag1}	< 0,007 pF
Capacités	C_{g1}	= 3,0 pF
Kapazitäten	C_a	= 3,4 pF
	C_{g1f}	< 0,18 pF
Input resistance (λ = 6 m)	r_{g1}	= 65 kΩ
Résistance d'entrée (I_a= 2mA)		
Eingangswiderstand		
Output resistance (λ = 6 m)	r_a	= 250 kΩ
Résistance de sortie (I_a= 2mA)		
Ausgangswiderstand		

Typical characteristics			
Caractéristiques types	V_a =	90	250 V
Kenndaten	V_{g3} =	0	0 V
	V_{g2} =	90	100 V
	I_a =	1,2	2,0 mA
	V_{g1} =	-3	-3 V
	I_{g2} =	0,5	0,7 mA
	S =	1,1	1,4 mA/V
	R_i =	1,0	1,5 MΩ
	μ_{g2g1} =	25	28
	R_{eq} =	8	5,5 kΩ

PHILIPS

4672

Operating characteristics for use as resistance coupled A.F. amplifier
Caracteristiques d'utilisation en amplificatrice B.F. à couplage par résistances
Betriebsdaten als NF-Verstärker mit Widerstandskopplung



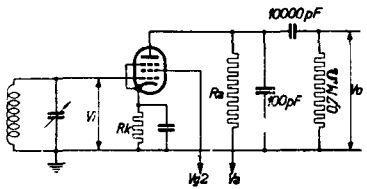
V_a (V)	R_a (MΩ)	R_{g2} (MΩ)	R_k (kΩ)	I_a (mA)	I_{g2} (mA)	$\frac{V_o}{V_i}$	V_o (V_{eff})	d_{tot} (%)
250	0,3	1,0	4,0	0,47	0,11	184	14	1,4
250	0,2	0,64	2,5	0,73	0,17	165	14	1,0
250	0,1	0,4	1,6	1,22	0,27	115	14	0,8
250	0,05	0,2	1,0	1,74	0,40	78	14	1,5
90	0,3	0,6	10	0,13	0,06	70	5	2,8
90	0,2	0,3	8	0,20	0,10	63	5	3,1
90	0,1	0,16	5	0,30	0,16	47	5	3,9
90	0,05	0,1	5	0,34	0,19	34	5	5,8

Limiting values
Caractéristiques limites
Grenzdaten

V_a	= max.	250 V
W_a	= max.	0,8 W
V_{g3}	= max.	100 V
W_{g3}	= max.	0,15 W
V_{g2}	= max.	100 V
W_{g2}	= max.	0,15 W
I_k	= max.	5 mA
V_{g1} (I_{g1}=+0,3µA)	= max.	-1,3 V
R_{g1}	= max.	3 MΩ
R_{kf}	= max.	20 kΩ
V_{kf}	= max.	50 V

Operating characteristics for use as anode detector (grid 3 connected to cathode).
Caractéristiques de service, détectrice plaque(grille 3 connectée à la cathode).
Betriebsdaten als Anodengleichrichter (Gitter 3 an Kathode).

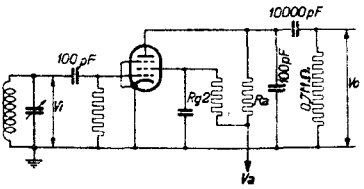
Ra (MΩ)	Va (V)	Vg2 (V)	Rk (Ω)	Ia[1] (mA)	Ig2 (mA)	Vo / Vi	Vo (V_{eff})	m (%)
0,3	250	60	5000	0,2	0,06	9	2	30



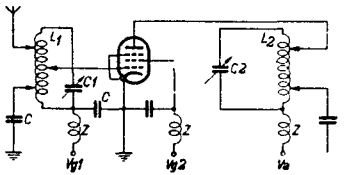
Operating characteristics, for use as resistance coupled grid detector (grid 3 to cathode).
Caractéristiques de service, détectrice grille à couplage par résistance (grille 3 connectée à la cathode).
Betriebsdaten als Gitterglеichrichter mit Widerstandskopplung (Gitter 3 an Kathode).

Ra (MΩ)	Va (V)	Rg2 (MΩ)	Ia[1] (mA)	Ig2 (mA)	Vo / Vi	Vo_{eff} (V)	d_{tot} (Vo_{eff}) (%)	$Vo_{max.}$ (m=30%) (V)	d_{tot} ($Vo_{max.}$) (%)
0,3	250	1	0,48	0,11	14	2	1	7,7	10
0,2	250	0,6	0,77	0,18	14	2	1,8	7,6	10
0,1	250	0,4	1,28	0,25	11,5	2	1,3	6,2	10
0,05	250	0,25	1,85	0,39	8,5	2	1,5	4,5	10
0,3	90	1	0,14	0,07	6	2	3	4;7	10
0,2	90	0,5	0,25	0,13	5,6	2	4	3,6	10
0,1	90	0,1	0,51	0,28	4,8	2	5,4	2,7	10
0,05	90	0,1	0,84	0,46	4,7	1	3,1	2,1	10

1) without signal; sans signal; ohne Signal.



Circuit diagram as H.F. amplifier.
Circuit de service comme amplificateur H.F.
Eine Schaltung als Hochfrequenz-Verstärker.



In case of U.H. frequency operation the exact tapping points on the coils L1 and L2 must be fixed experimentally in order to reduce the influence of the valve resistance on the circuit damping. The internal resistance of a pentode in case of U.H. frequency operation not being of much influence, it is not necessary to use the coil L2 with anode tapping to obtain satisfying results.

En ondes ultra-courtes, il faut déterminer expérimentalement les points de dérivation sur les bobines L1 et L2 tels que l'influence de la résistance du tube sur l'amortissement du circuit soit reduite au minimum. Comme en ondes ultra-courtes, la résistance interne d'une penthode n'exerge guère d'influence, il est superflu d'utiliser L2 avec dérivation d'anode.

Bei dem Betrieb bei U.H.-Frequenz sollen die genauen Abzweigungen an den Spulen L1 und L2 experimentell festgestellt werden, um den Einfluss des Röhrenwiderstandes auf die Kreisdämpfung zu erniedrigen. Da der Innenwiderstand einer Penthode bei U.H.-Frequenzen keinen grossen Einfluss hat, ist der Gebrauch der Spule L2 mit Anodenanzapfung nicht notwendig, um befriedigende Resultate zu bekommen.

Wave length Longueur d'ondes Wellenlänge	Turns Spires Windungen		External diam. Diam.extérieure Ausserer Durchmesser		Length Longueur Länge		Capacities Capacités Kapazitäten	
m	W		mm		mm		pF	
	L1=L2	Z	L1=L2	Z	L1=L2	Z	C1=C2	C
2,75-5,3	10	15	9,5	11,2	19	11,2	3-25	100-500
1-3	4	15	9,5	11,2	8	11,2	3-25	100-500
0,8	5	15	3,1	11,2	3,2	11,2	3-4	100-500

Max. ratings
Limites fixées
Grenzdaten

Va	250	V
Wa	0,8	W
Ik	5	mA
Vgl (Igl=+0,3 µA)	-1,3	V
Vg2	100	V
Wg2	0,15	W
Vg3	100	V
Wg3	0,15	W
Rgl	3	MΩ
Vfk	50	V
Rfk	20000	Ω

PHILIPS

Electronic Tube

HANDBOOK

E1F

page	sheet	date
1	1	1953.04.04
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3	3	1948.05.01
4	4	1948.05.01
5	5	1948.05.01
6	FP	1999.06.09

S.Q. TUBE

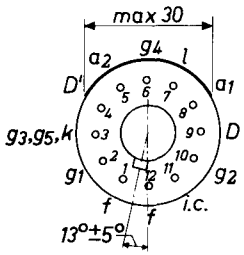
Special quality decade counter tube.

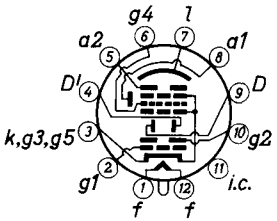
QUICK REFERENCE DATA		
Life test	10 000 hours	
Base	Duodecal (12 pins)	
Heating	Indirect A.C. or D.C.; Series or parallel supply	
Heater voltage	V_f	6.3 V
Heater current	I_f	300 mA

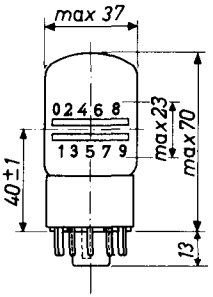
DIMENSIONS AND CONNECTIONS

Dimensions in mm

Base: Duodecal







APPLICATION DIRECTIONS

Mounting

Any mounting position, except horizontal with screen down, is permitted.

Sensitivity to magnetic fields

To prevent interference by magnetic fields the flux density of these fields should not exceed 2×10^{-4} Wb/m^2 (= 2 Gauss) in any direction.

APPLICATION DIRECTIONS

Ambient illumination

To obtain a clair reading the ambient illumination should range from 40-400 lux measured with an illumination-meter placed in vertical position. This illumination range incorporates the best compromise between the visibility of the figures of the mask and the luminescent picture.

CHARACTERISTICS

Heater voltage	V_f	6.3	V
Heater current	I_f	300	mA

CAPACITANCES

Anode No.2 to all other electrodes	$C_{a_2/R}$	10.5	pF
Deflection plate to all other electrodes	$C_{D/R}$	3.5	pF
Deflection plate to all other electrodes	$C_{D'/R}$	3.8	pF
Anode No.1 to all other electrodes	$C_{a_1/R}$	4.9	pF
Grid No.1 to all other electrodes	$C_{g_1/R}$	6.8	pF
Grid No.4 to all other electrodes	$C_{g_4/R}$	7.7	pF

OPERATING CHARACTERISTICS

Column I Nominal value
II Permitted values of spread and variation

		I	II	
Supply voltage	V_b	300		V
Grid No.1 supply voltage	V_{bg_1}	11.9	± 0.15	V
Grid No.2 supply voltage	V_{bg_2}	300		V
Deflection plate supply voltage	V_D	156	± 1.5	V
Luminescent screen voltage	V_ℓ	300		V
Cathode current	I_k	0.95		mA
Grid No.2 current	I_{g_2}	0.1		mA
Cathode resistor	R_k	15	± 1%	kΩ
Grid No.4 resistor	R_{g_4}	47	± 5%	kΩ
Anode No.1 resistor	R_{a_1}	39	±10%	kΩ
Anode No.2 resistor	R_{a_2}	1	± 1%	MΩ

OPERATING CHARACTERISTICS (continued)

Note

The tube should be used in the circuit of fig.2.
Provided the ratio of the supply voltages V_{bg_1} and V_D is strictly maintained the supply voltage V_b is allowed to vary within the range of V_b nom. $\pm 10\%$.
This condition can be realised by using a voltage divider R_1, R_2, R_3 with 1% precision resistors as indicated in the diagram fig.2.
A max. counting speed of 30 000 count/s can be obtained with this circuit.
The input pulse at D should have a positive value of 13.6 V $\pm 15\%$. The slope of the leading edge should be at least 20 x 10^6 V/s. The slope of the trailing edge should not exceed 1.2 x 10^6 V/s.

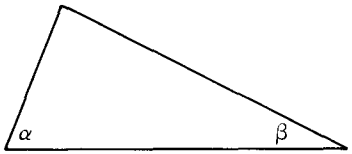
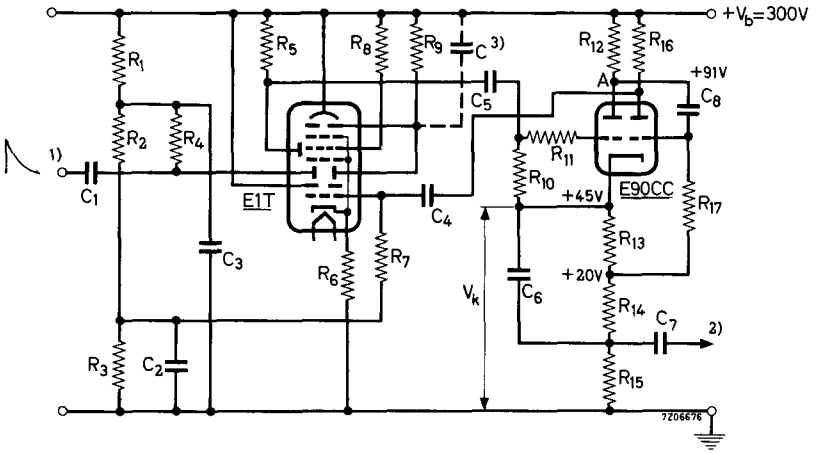


Fig.1

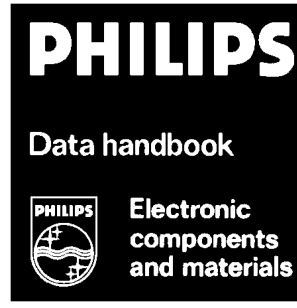
$\tan \alpha > 20 \times 10^6$ V/s
$\tan \beta < 1.2 \times 10.6$ V/s



R_1	68 kΩ ± 1%	R_{10}	0.56 MΩ ±10%	C_1	[1]
R_2	68 kΩ ± 1%	R_{11}	5.6 kΩ ±10%	C_2	0.39 μF ±20%
R_3	5.6 kΩ ± 1%	R_{12}	39 kΩ ± 2%	C_3	0.15 μF ±20%
R_4	15 kΩ ± 2%	R_{13}	4.7 kΩ ± 2%	C_4	6800 pF ±10%
R_5	39 kΩ ±10%	R_{14}	2.7 kΩ ± 2%	C_5	220 pF ±10%
R_6	15 kΩ ± 1%	R_{15}	1 kΩ ± 1%	C_6	68 pF ± 2%
R_7	0.33 MΩ ±10%	R_{16}	3.3 kΩ ± 2%	C_7	680 pF ± 5%
R_8	47 kΩ ± 5%	R_{17}	0.15 MΩ ± 2%	C_8	68 pF ± 2%
R_9	1 MΩ ± 1%				

1. Connected to the preceeding E90CC pulse shaper (C_1 = 6800 pF ±10%) or the preceeding E90CC interstage pulse shaper (C_1 = 680 pF ±5%).
2. Connected to deflection plate D of next counter tube.
3. This parasitic capacitance should be reduced to the minimum by keeping the wiring as short as possible.

LIMITING VALUE of supply voltage V_b (See operating characteristics):
V_b = max. 400 V



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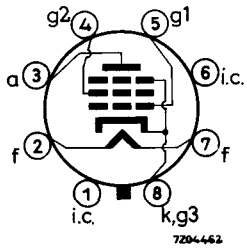
S.Q. TUBE

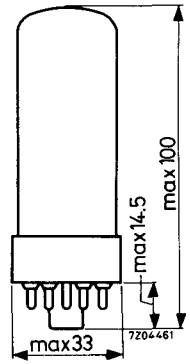
Special quality tube designed for use as wide band amplifier, power output tube and series regulator tube.

QUICK REFERENCE DATA			
Life test	10 000 hours		
Low interface resistance			
Mechanical quality	Shock and vibration resistant		
Base	Octal		
Heating	Indirect A.C. or D.C.; Parallel supply		
Heater voltage	V_f	6.3	V
Heater current	I_f	1.2	A
Anode current	I_a	100	mA
Mutual conductance	S	14	mA/V
Output power. Class B (two tubes)	W_o	30	W

DIMENSIONS AND CONNECTIONS Dimensions in mm

Base: Octal





CHARACTERISTICS

Column I Nominal value or setting of the tube
II Range values for equipment design: Initial spread
III Range values for equipment design: End of life

		I	II	III	
Heater voltage	V_f	6.3			V
Heater current	I_f	1.2	1.12-1.28		A
Anode voltage	V_a	100			V
Grid No.2 voltage	V_{g_2}	100			V
Cathode resistor	R_k	75			Ω
Anode current	I_a	100	85- 118	min. 65	mA
Grid No.2 current	I_{g_2}	5.2	4.0- 6.5		mA
Mutual conductance	S	14	11.5-16.5	min. 9.5	mA/V
Amplification factor	$\mu_{g_2g_1}$	5.6			
Internal resistance	R_i	5.0			kΩ
Cut off voltage	$-V_{g_1}$	35			V
Anode current	I_a	0.1			mA
Negative grid current	$-I_{g_1}$		max. 1	max. 2	μA
As triode. (Grid No.2 connected to anode)					
Anode voltage	V_a	100			V
Cathode resistor	R_k	85			Ω
Anode current	I_a	100			mA
Mutual conductance	S	14			mA/V
Amplification factor	μ	5.2			
Internal resistance	R_i	0.35			kΩ
Insulation resistance between;					
Anode and other electrodes	R_{ins}		min. 100		MΩ
Grid No.1 and other electrodes	R_{ins}		min. 100		MΩ
Leakage current between cathode and heater	I_{kf}		max. 20		μA

CAPACITANCES

		I	II	
Anode to grid No.2, grid No.3, cathode and heater	C_{a/g_2g_3kf}	9	8- 10	pF
Grid No.1 to grid No.2, grid No.3, cathode and heater	C_{g_1/g_2g_3kf}	18	16.5-19.5	pF
Anode to grid No.1	C_{ag_1}		max. 1.2	pF

SHOCK AND VIBRATION RESISTANCE

The following test conditions are applied to assess the mechanical quality of the tube. These conditions are not intended to be used as normal operating conditions.

Shock

The tube is subjected 5 times in each of 4 positions to an acceleration of 500 g supplied by an NRL shock machine with the hammer lifted over an angle of 30°.

Vibration

The tube is subjected during 32 hours in each of 3 positions to a vibration frequency of 50 Hz with an acceleration of 2.5 g.

LIFE

Production samples are tested to be within the end of life values (column III) during 10 000 hours

LIMITING VALUES (Absolute max. rating system)

Anode voltage	V_{a_o}	max.	650	V
	V_a	max.	400	V
Anode dissipation	W_a	max.	15	W
Anode + grid No.2 dissipation	W_{a+g_2}	max.	16	W
Grid No.2 voltage	$V_{g_{2_o}}$	max.	650	V
	V_{g_2}	max.	300	V
Grid No.2 dissipation	W_{g_2}	max.	5.5	W
Grid No.1 resistor	R_{g_1}	max.	0.5	MΩ
Cathode current T_{av} = 10 ms	I_k	max.	220	mA

LIMITING VALUES (continued)

Cathode peak current	I_{kp}	max. 1.2	A
Voltage between cathode and heater			
cathode positive	V_{kf}(k pos)	max. 250	V
cathode negative	V_{kf}(k neg)	max. 200	V
Bulb temperature	t_{bulb}	max. 220	°C

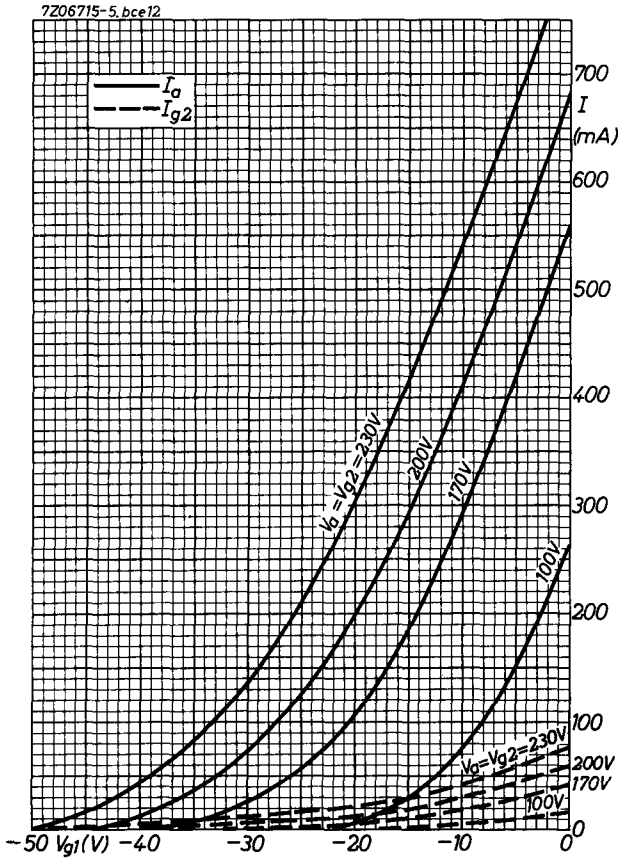
Heater voltage: The average heater value should be 6.3 V.
Variation of the heater voltage exceeding the range of 6.0 V to 6.6 V will shorten the tube life.
The tolerance of heater current should be taken into account.

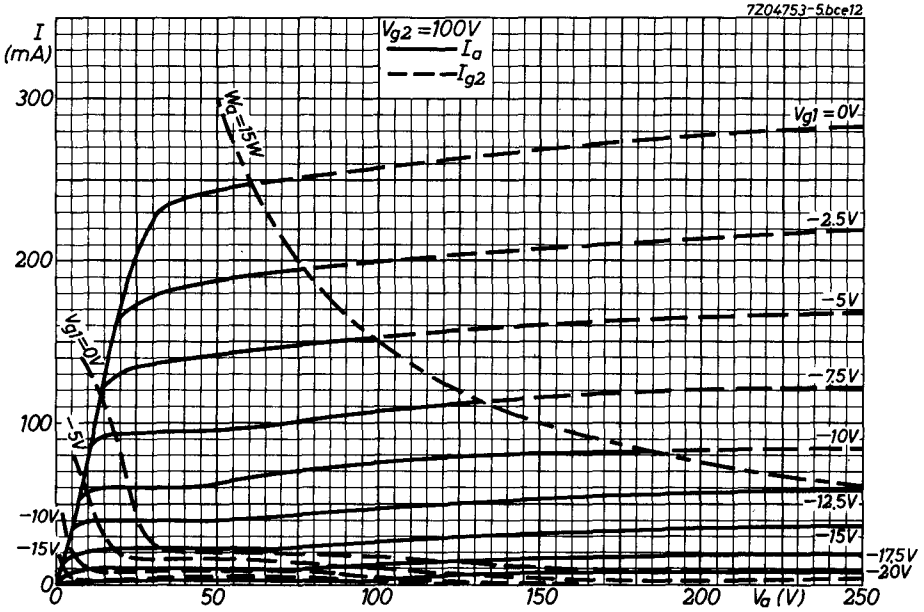
OPERATING CHARACTERISTICS

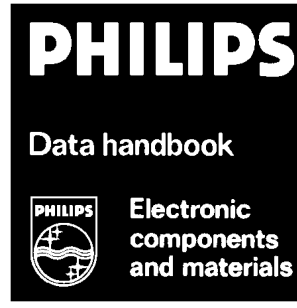
Output tube. Class B (two tubes). Excitation up to maximum output is continuously permitted.

Anode voltage	V_a		250	V
Grid No.2 voltage	V_{g_2}		170	V
Grid No.1 voltage	$-V_{g_1}$		34	V
Load resistor	$R_{aa\sim}$		3	kΩ
Grid No.2 resistor	R_{g_2}		2x0.5	kΩ [1]
Input voltage	V_i	0	22	V_{RMS}
Anode current	I_a	2x12	2x94	mA
Grid No.2 current	I_{g_2}	2x1	2x28	mA
Output power	W_o	0	30	W
Total distortion	d_{tot}	–	6	%

[1]) To avoid overloading of grid No.2 this resistor should not be by-passed.


7Z06715-5,bce12
I_a
I_{g2}
700
I
(mA)
600
500
400
300
200
100
0
$V_a = V_{g2} = 230V$
200V
170V
100V
$V_a = V_{g2} = 230V$
200V
170V
100V
−50 V_{g1}(V) −40
−30
−20
−10
0


7Z04753-5bce12
I (mA)
Vg2 =100V
Ia
Ig2
Wg=15W
Vg1 =0V
-2.5V
-5V
-7.5V
-10V
-12.5V
-15V
-17.5V
-20V
300
200
100
0
-10V
-15V
0
50
100
150
200
Va (V)
250



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6	6	1968.12
7	FP	2000.12.05

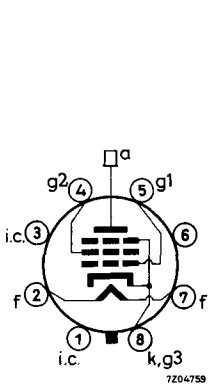
S.Q. TUBE

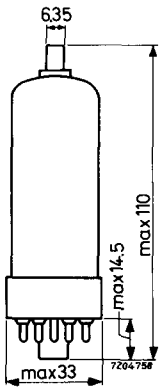
Special quality output pentode designed for use as line output tube, power output tube, wide band amplifier and series regulator tube.

QUICK REFERENCE DATA			
Life test	10 000 hours		
Low interface resistance			
Mechanical quality	Shock and vibration resistant		
Base	Octal		
Heating	Indirect A.C. or D.C.; parallel supply		
Heater voltage	V_f	6.3	V
Heater current	I_f	1.2	A
Anode current	I_a	100	mA
Mutual conductance	S	14	mA/V
Output power. Class B (2 tubes)	W_o	30	W

DIMENSIONS AND CONNECTIONS Dimensions in mm

Base: Octal





CHARACTERISTICS

Column I Nominal value or setting of the tube
II Range values for equipment design: Initial spread
III Range values for equipment design: End of life

		I	II	III	
Heater voltage	V_f	6.3			V
Heater current	I_f	1.2	1.12 - 1.28		A
Anode voltage	V_a	100			V
Grid No.2 voltage	V_{g_2}	100			V
Cathode resistor	R_k	75			Ω
Anode current	I_a	100	85 - 118	min. 65	mA
Grid No.2 current	I_{g_2}	5.2	4.0 - 6.5		mA
Mutual conductance	S	14	11.5 - 16.5	min.9.5	mA/V
Amplification factor	$\mu_{g_2g_1}$	5.6			
Internal resistance	R_i	5.0			kΩ
Cut-off voltage	$-V_{g_1}$	35			V
Anode current	I_a	0.1			mA
Negative grid No.1 current	$-I_{g_1}$		max. 1	max. 2	μA
Cut-off voltage	$-V_{g_1}$		max. 120		V
Anode voltage	V_a	7			kV_p
Grid No.2 voltage	V_{g_2}	190			V
Cathode current	I_k	60			μA
As triode (grid No.2 connected to anode)					
Anode voltage	V_a	100			V
Cathode resistor	R_k	85			Ω
Anode current	I_a	100			mA
Mutual conductance	S	14			mA/V
Amplification factor	μ	5.2			
Internal resistance	R_i	350			Ω

CHARACTERISTICS (continued)

		II	
Insulation resistance between:			
Anode and other electrodes	R_{ins}	min. 100	MΩ
Grid No. 1 and other electrodes	R_{ins}	min. 100	MΩ
Leakage current between cathode and heater	I_{kf}	max. 20	μA

CAPACITANCES

		I	II	
Anode to grid No. 2, grid No. 3, cathode and heater	C_{a/g_2g_3kf}	10	9 - 11	pF
Grid No. 1 to grid No. 2, grid No. 3, cathode and heater	C_{g_1/g_2g_3kf}	19	17.5 - 20.5	pF
Anode to grid No. 1	C_{ag_1}		max. 1.1	pF

SHOCK AND VIBRATION RESISTANCE

The following test conditions are applied to assess the mechanical quality of the tube. These conditions are not intended to be used as normal operating conditions.

Shock

The tube is subjected 5 times in each 4 positions to an acceleration of 500 g supplied by an NRL shock machine with the hammer lifted over an angle of 30°.

Vibration

The tube is subjected during 32 hours in each of 3 positions to a vibration frequency of 50 Hz with an acceleration of 2.5 g.

LIFE

Production samples are tested to be within the end of life values (column III) during 10 000 hours.

LIMITING VALUES (Absolute max. rating system)

Anode voltage	V_{a_o}	max.	650	V
	V_a	max.	400	V
Anode peak voltage	$+V_{a_p}$	max.	7	kV
	$-V_{a_p}$	max.	1.5	kV
Pulse duration = max. 18 μsec				
Duty factor = max. 0.22				
Anode dissipation	W_a	max.	15	W
Anode + grid No.2 dissipation	W_{a+g_2}	max.	16	W
Grid No.2 voltage	$V_{g_{2o}}$	max.	650	V
	V_{g_2}	max.	300	V
Grid No.2 dissipation	W_{g_2}	max.	5.5	W
Grid No.2 dissipation during heating up of EHT diode	W_{g_2}	max.	7.0	W
Grid No.1 peak voltage	$-V_{g_{1_p}}$	max.	1	kV
Pulse duration = max. 18 μsec				
Duty factor = max. 0.22				
Grid No.1 resistor	R_{g_1}	max.	0.5	MΩ
Grid No.1 resistor in line output circuits	R_{g_1}	max.	2.2	MΩ
Cathode current	I_k	max.	220	mA
Cathode peak current	I_{k_p}	max.	1.2	A
Averaging time = max. 10 msec				
Voltage between cathode and heater				
Cathode positive	V_{kf} (k pos)	max.	250	V
Cathode negative	V_{kf} (k neg)	max.	200	V
Bulb temperature	t_{bulb}	max.	220	°C

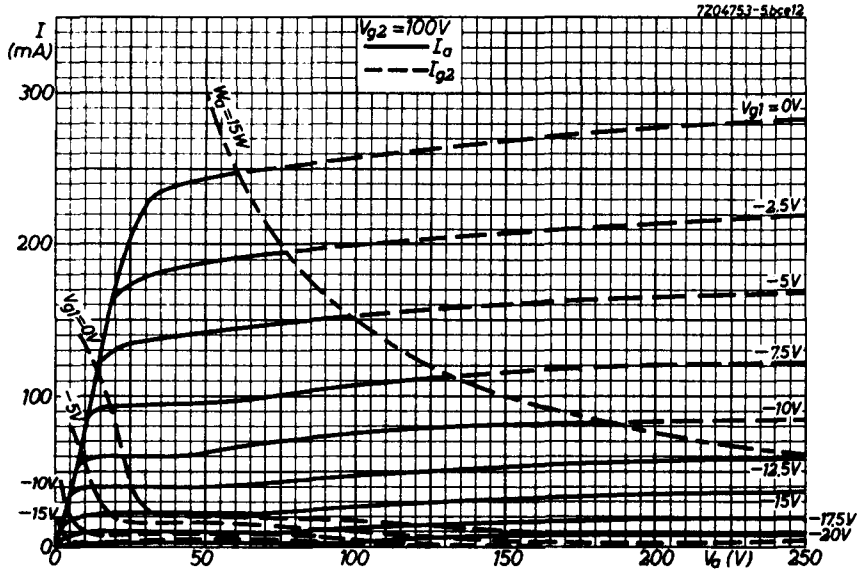
Heater voltage: The average heater value should be 6.3 V.
Variation of the heater voltage exceeding the range of 6.0 V to 6.6 V will shorten the tube life.
The tolerance of heater current should be taken into account.

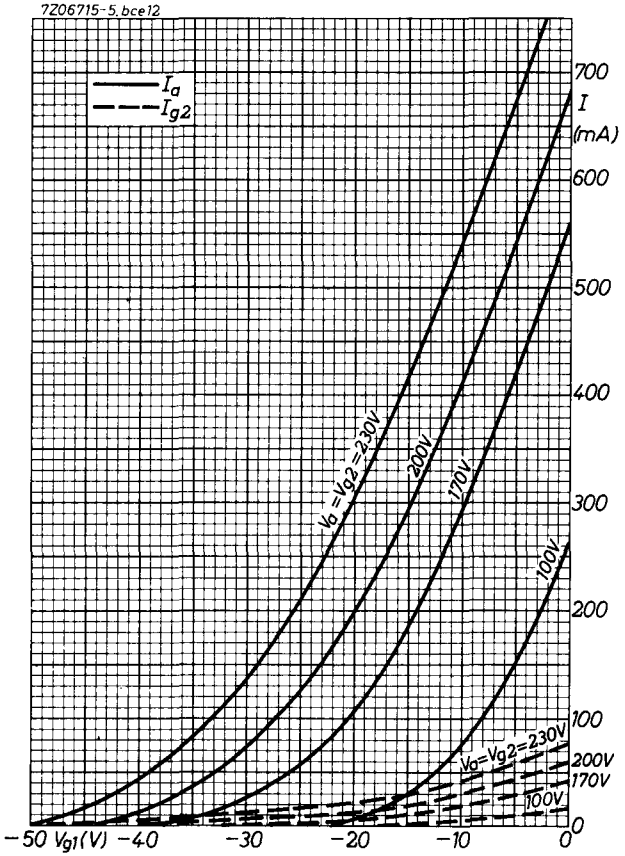
OPERATING CHARACTERISTICS

Output tube class B (2 tubes) Excitation to maximum output is continuously permitted.

Anode voltage	V_a		250	V
Grid No.2 voltage	V_{g_2}		170	V
Grid No.1 voltage	$-V_{g_1}$		34	V
Load resistance	$R_{aa\sim}$		3	kΩ
Grid No.2 resistor	R_{g_2}		2x0.5	kΩ [1]
Input voltage	V_i	0	22	V_{RMS}
Anode current	I_a	2x12	2x94	mA
Grid No.2 current	I_{g_2}	2x1	2x28	mA
Output power	W_o	0	30	W
Total distortion	d_{tot}		6	%

[1]) To avoid overloading of grid No.2 this resistor should not be by-passed.




7206715-5, bce12
I_a
I_{g2}
700
I
(mA)
600
500
400
300
200
100
0
$V_a = V_{g2} = 230V$
200V
170V
100V
$V_a = V_{g2} = 230V$
200V
170V
100V
−50 V_{g1}(V) −40
−30
−20
−10
0

PHILIPS

Data handbook

Electronic components and materials

E236L

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5	5	1968.12
6	6	1968.12
7	FP	2000.06.17

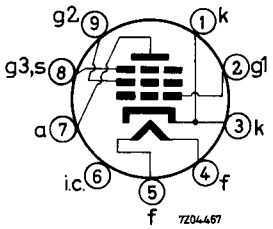
S.Q. TUBE

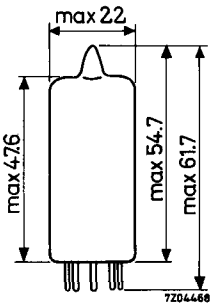
Special quality pentode designed for use as wide band amplifier.

QUICK REFERENCE DATA			
Life test	10 000 hours		
Low interface resistance			
Mechanical quality	Shock and vibration resistant		
Base	Noval. Gold plated pins		
Heating	Indirect A.C. or D.C.; Parallel supply		
Heater voltage	V_f	6.3	V
Heater current	I_f	315	mA
Anode current	I_a	20	mA
Transconductance	S	26	mA/V
Equivalent noise resistance	R_{eq}	220	Ω

DIMENSIONS AND CONNECTIONS Dimensions in mm

Base: Noval





CHARACTERISTICS

Column I Nominal value or setting of the tube
II Range values for equipment design: Initial spread
III Range values for equipment design: End of life

		I	II	III	
Heater voltage	V_f	6.3			V
Heater current	I_f	315	299- 331		mA
Anode supply voltage	V_{ba}	190			V
Grid No.2 supply voltage	V_{bg_2}	160			V
Grid No.3 voltage	V_{g_3}	0			V
Grid No.1 supply voltage	$+V_{bg_1}$	8			V
Cathode resistor	R_k	370			Ω
Anode current	I_a	20	18.8-21.2	min. 17	mA
Grid No.2 current	I_{g_2}	6	5.3- 6.7		mA
Mutual conductance	S	26	22- 30	min.17.5	mA/V
Internal resistance	R_i	100			kΩ
Amplification factor	μ_{g2g1}	60			
Negative grid current	$-I_{g_1}$		max. 0.3	max. 1.0	μA
Equivalent noise resistance	R_{eq}	220			Ω
Input resistance	r_{g_1}	1.4			kΩ
Pin 1 connected to pin 3					
Frequency 100 MHz					
S/C		2.2			mA/V/pF
$S/2\pi f(C_g + C_a + 5\ pF)$		180			MHz
Anode supply voltage	V_{ba}	180			V
Grid No.2 supply voltage	V_{bg_2}	150			V
Grid No.3 voltage	V_{g_3}	0			V
Cathode resistor	R_k	80			Ω
Anode current	I_a	17			mA
Grid No.2 current	I_{g_2}	5.1			mA
Mutual conductance	S	24.5			mA/V

CHARACTERISTICS (continued)

As triode (grid No.2 connected to anode, grid No.3 connected to cathode)

		I	
Anode supply voltage	V_a	160	V
Grid No.1 supply voltage	$+V_{bg_1}$	8	V
Cathode resistor	R_k	400	Ω
Anode current	I_a	24	mA
Mutual conductance	S	33	mA/V
Internal resistance	R_i	1.8	kΩ
Amplification factor	μ	60	
Equivalent noise resistance	R_{eq}	100	Ω

CAPACITANCES

		Without external shield		With external shield		
		I	II	I	II	
Grid No.1 to grid No.2, grid No.3, cathode, heater and screen	C_{g_1/g_2g_3kfs}	9.3	8.3-10.3	9.4	8.4-10.4	pF
Anode to grid No.2, grid No.3, cathode, heater and screen	C_{a/g_2g_3kfs}	2.6	2.3- 2.9	3.6	3.2- 4.0	pF
Anode to grid No.1	C_{ag_1}		max. 35		max. 30	mpF
Grid No.1 to grid No.2, grid No.3, cathode, heater and screen Cathode current I_k = 26 mA	C_{g_1/g_2g_3kfs}	15.5		15.6		pF

SHOCK AND VIBRATION RESISTANCE

The following test conditions are applied to assess the mechanical quality of the tube. These conditions are not intended to be used as normal operating conditions.

Shock

The tube is subjected 5 times in each of 4 positions to an acceleration of 500 g supplied by an NRL shock machine with the hammer lifted over an angle of 30°.

Vibration

The tube is subjected during 32 hours in each of 3 positions to a vibration frequency of 50 Hz with an acceleration of 2.5 g.

LIFE

Production samples are tested to be within the end of life values (column III) during 10 000 hours.

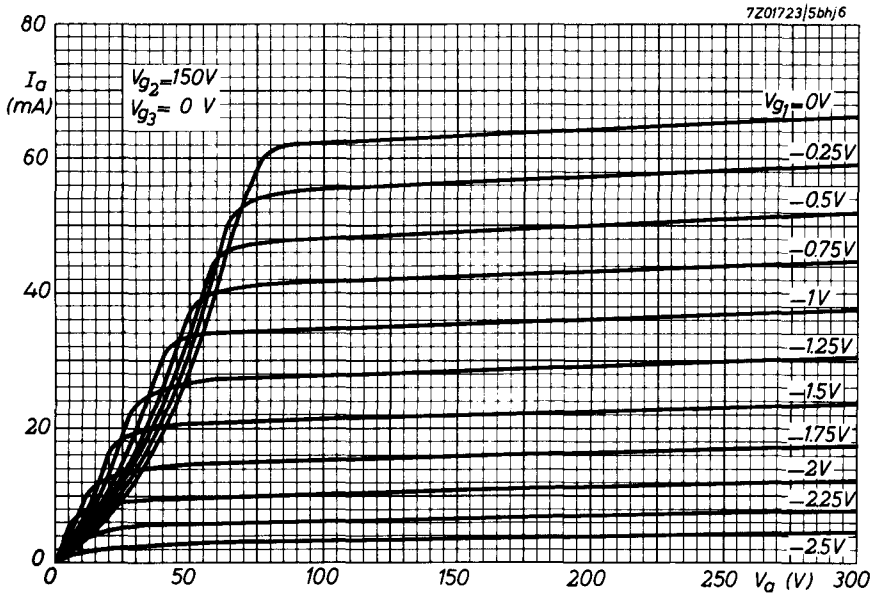
LIMITING VALUES (Absolute max. rating system)

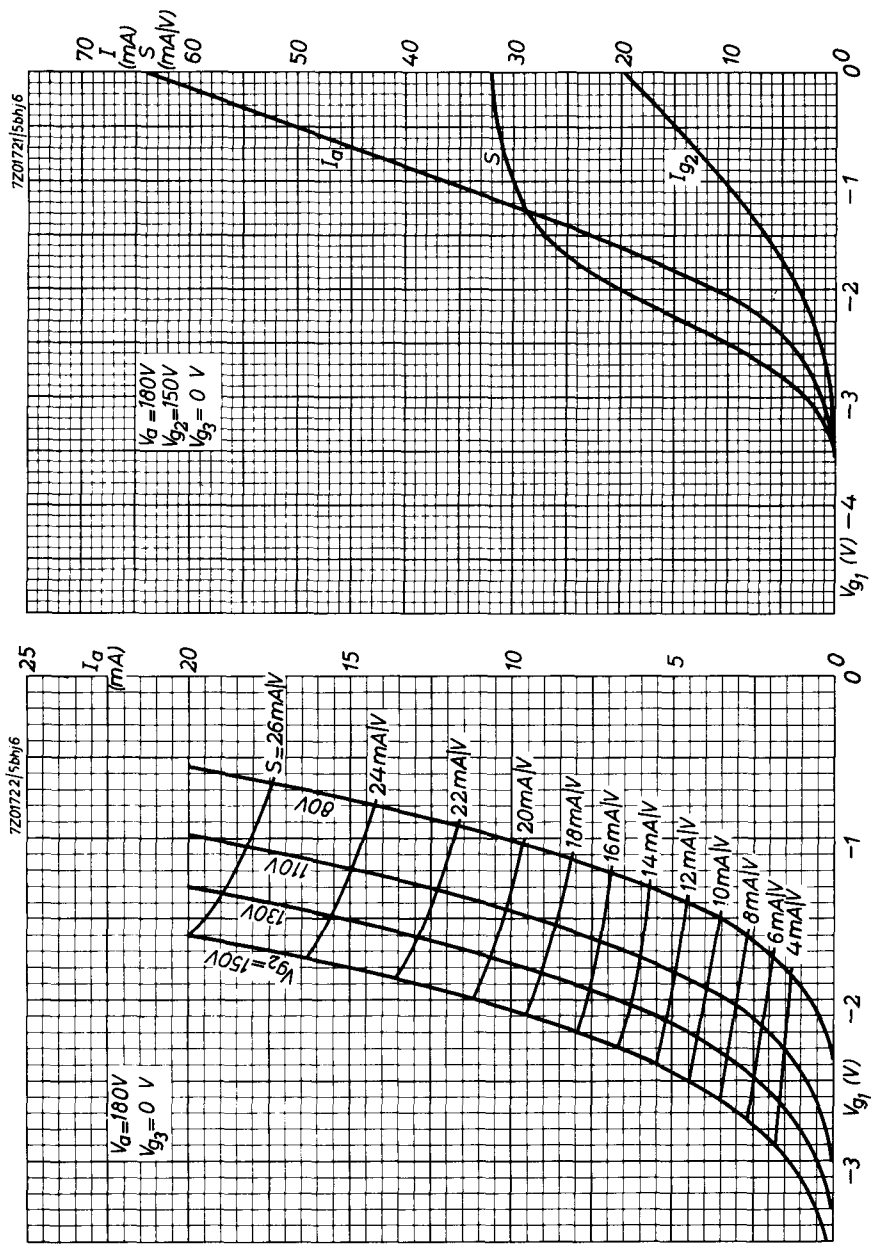
Anode voltage	V_{a_o}	max.	400	V
	V_a	max.	220	V
Anode dissipation	W_a	max.	4	W
Grid No.2 voltage	$V_{g_{2o}}$	max.	400	V
	V_{g_2}	max.	180	V
Grid No.2 dissipation	W_{g_2}	max.	1.1	W
Cathode current	I_k	max.	30	mA
Grid No.1 current	I_{g_1}	max.	5	mA
Grid No.1 voltage negative	$-V_{g_1}$	max.	50	V
positive	$+V_{g_1}$	max.	2	V
Grid No.1 resistor	R_{g_1}	max.	0.5	MΩ
Voltage between cathode and heater				
cathode positive	$V_{kf\,(k\ pos)}$	max.	120	V
cathode negative	$V_{kf\,(k\ neg)}$	max.	60	V
Bulb temperature	t_{bulb}		180	°C

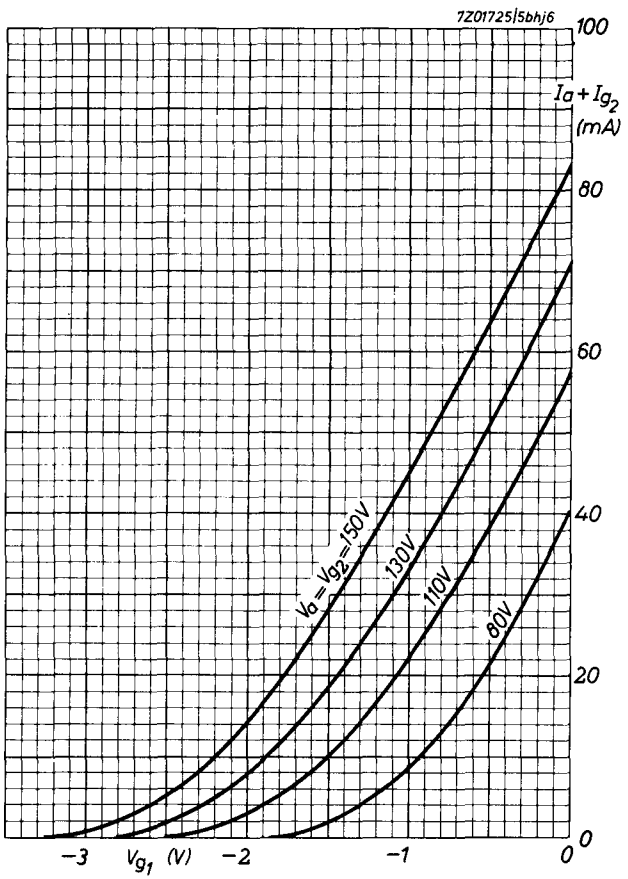
Heater voltage: The average heater voltage should be 6.3 V.
Variation of the heater voltage exceeding the range of 6.0 V to 6.6 V will shorten the tube life.
The tolerance of heater current should be taken into account.

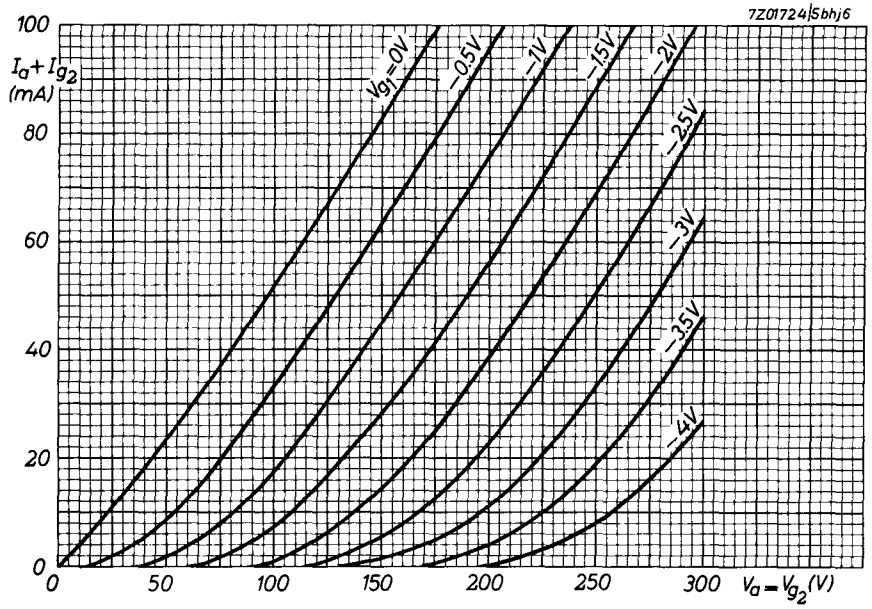
OPERATING CHARACTERISTICS

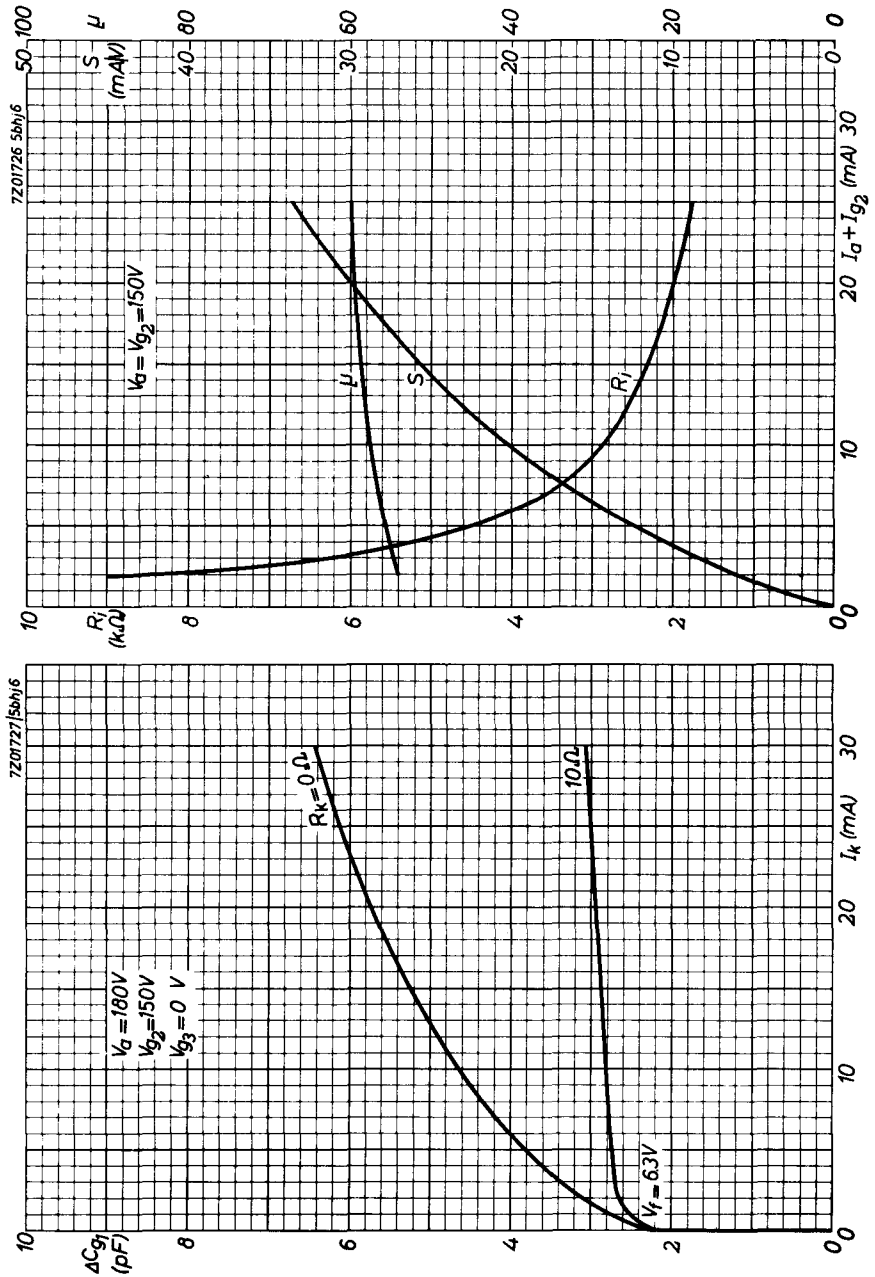
Anode supply voltage	V_{ba}	190	190	190	190	190	V
Grid No.3 voltage	V_{g_3}	0	0	0	0	0	V
Grid No.2 supply voltage	V_{bg_2}	160	160	160	160	120	V
Grid No.1 supply voltage	$+V_{bg_1}$	8	8	8	9	8	V
Cathode resistor	R_k	370	500	780	630	730	Ω
Anode current	I_a	20	15	10	13.5	10	mA
Grid No.2 current	I_{g_2}	6	4.5	3	4	2.8	mA
Mutual conductance	S	26	23	19	22	20	mA/V
Internal resistance	R_i	100	120	155	130	155	kΩ
Amplification factor	$\mu_{g_2g_1}$	60	58	56	58	56	
Equivalent noise resistance	R_{eq}	220	230	250	240	220	Ω
Input resistance	r_{g_1}	1.4	1.5	1.7	1.6	1.6	kΩ
Pin No.1 connected to pin No.3							
Frequency = 100 MHz							
Capacitance grid No.1 to grid No.2, grid No.3, cathode, heater and screen (no external shield)	C_{g_1/g_2g_3kfs}	15.5	15	14.3	14.8	14.8	pF
	$S/2\pi(C_g + C_a + 5\ pF)$	180	162	138	156	142	MHz
	S/C	2.2	1.9	1.6	1.85	1.7	mA/V/pF

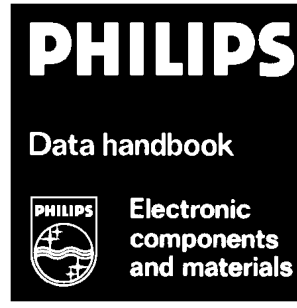

7Z01723|5bhj6
80
60
40
20
0
I_a (mA)
V_{g_2}=150V
V_{g_3}= 0 V
V_{g_1}=0V
−0.25V
−0.5V
−0.75V
−1V
−1.25V
−1.5V
−1.75V
−2V
−2.25V
−2.5V
0
50
100
150
200
250
V_a (V)
300


7Z01722|5bbj6
I_a (mA)
25
20
15
10
5
0
V_a=180V
V_{g3}= 0 V
V_{g2}=150V
130V
110V
80V
S=26mA/V
24mA/V
22mA/V
20mA/V
18mA/V
16mA/V
14mA/V
12mA/V
10mA/V
8mA/V
6mA/V
4mA/V
−3
−2
−1
0
V_{g1} (V)
7Z01721|5bbj6
I (mA)
S (mA/V)
70
60
50
40
30
20
10
0
V_a =180V
V_{g2}=150V
V_{g3}= 0 V
I_a
S
I_{g2}
−4
−3
−2
−1
0
V_{g1} (V)


7Z01725|5bhj6
100
$I_a + I_{g_2}$
(mA)
80
60
40
20
0
$V_a = V_{g_2} = 150V$
130V
110V
80V
−3
V_{g_1} (V)
−2
−1
0


7Z01724|5bhj6
100
$I_a+I_{g_2}$ (mA)
80
60
40
20
0
0
50
100
150
200
250
300
$V_a=V_{g_2}$ (V)
V_{g_1}=0V
−0.5V
−1V
−1.5V
−2V
−2.5V
−3V
−3.5V
−4V


7Z01726 5bhj6
$V_a = V_{g_2} = 150V$
R_i (kΩ)
S (mA/V)
μ
$I_a + I_{g_2}$ (mA)
7Z01727 5bhj6
$V_a = 180V$
$V_{g_2} = 150V$
$V_{g_3} = 0$ V
ΔC_{g_1} (pF)
$R_k = 0\Omega$
10Ω
$V_f = 6.3V$
I_k (mA)



E280F

page	sheet	date
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6	6	1968.12
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11	FP	2000.08.20

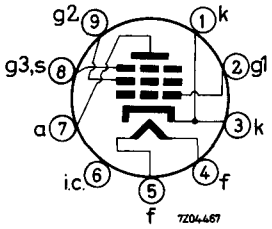
S.Q. TUBE

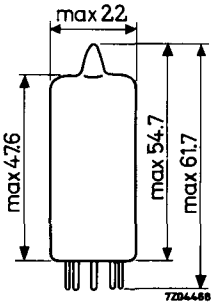
Special quality pentode designed for use as wide band amplifier for frequencies up to 250 MHz

QUICK REFERENCE DATA			
Life test	10 000 hours		
Low interface resistance			
Mechanical quality	Shock and vibration resistant		
Base	Noval. Gold plated pins		
Heating	Indirect A.C. or D.C.; parallel supply		
Heater voltage	V_f	6.3	V
Heater current	I_f	350	mA
Anode current	I_a	35	mA
Mutual conductance	S	26	mA/V
Equivalent noise resistance	R_{eq}	200	Ω
Noise factor at 100 MHz	F	7	dB

DIMENSIONS AND CONNECTIONS Dimensions in mm

Base: Noval





CHARACTERISTICS

Column I Nominal value or setting of the tube
II Range values for equipment design: Initial spread
III Range values for equipment design: End of life

		I	II	III	
Heater voltage	V_f	6.3			V
Heater current	I_f	350			mA
Anode supply voltage	V_{ba}	125			V
Grid No.2 supply voltage	V_{bg_2}	125			V
Grid No.3 voltage	V_{g_3}	0			mA/V
Grid No.1 supply voltage	$+V_{bg_1}$	12			V
Cathode resistor	R_k	300			Ω
Anode current	I_a	35	33 - 37	min. 31	mA
Grid No.2 current	I_{g_2}	11	9.9 - 12.1		mA
Mutual conductance	S	26	22 - 30	min.17.5	mA/V
Amplification factor	$\mu_{g_2g_1}$	27			
Equivalent noise resistance	R_{eq}	200			Ω
Noise factor at 100 MHz	F	7			dB
Adapted to minimum noise					
Negative grid current	$-I_{g_1}$		max. 0.3	max. 1.0	μA
Anode supply voltage	V_{ba}	135			V
Grid No.2 supply voltage	V_{bg_2}	125			V
Grid No.3 voltage	V_{g_3}	0			V
Grid No.1 supply voltage	$+V_{bg_1}$	12			V
Cathode resistor	R_k	360			Ω
Anode current	I_a	30			mA
Grid No.2 current	I_{g_2}	9.5			mA
Mutual conductance	S	25			mA/V
Amplification factor	$\mu_{g_2g_1}$	27			
Equivalent noise resistance	R_{eq}	200			Ω

CHARACTERISTICS (continued)

As triode (grid No. 2 connected to anode)
(grid No. 3 connected to cathode)

		I	II	
Anode supply voltage	V_{ba}	125		V
Grid No. 3 supply voltage	V_{bg_3}	0		V
Grid No. 1 supply voltage	$+V_{bg_1}$	12		V
Cathode resistor	R_k	350		Ω
Anode current	I_a	40		mA
Mutual conductance	S	32		mA/V
Amplification factor	μ	25.5		
Internal resistance	R_i	800		Ω
Equivalent noise resistance	R_{eq}	100		Ω
Leakage current between cathode and heater	I_{kf}		max. 5	μA
Voltage between cathode and heater V_{kf} = 100 V				
Insulation resistance				
Anode to other electrodes (V = 300 V)	R		min. 100	MΩ
Grid No. 1 to other electrodes (V = 50 V)	R		min. 100	MΩ

CAPACITANCES

		I	II	
Grid No. 1 to grid No. 2, grid No. 3 cathode, heater and screen	C_{g_1/g_2g_3kfs}	10		pF
Grid No. 1 to grid No. 2, grid No. 3 cathode, heater and screen	C_{g_1/g_2g_3kfs}	16		pF
Cathode current I_k = 46 mA				
Anode to grid No. 2, grid No. 3 cathode, heater and screen	C_{a/g_2g_3kfs}	2.6		pF
Anode to grid No. 1	C_{ag_1}		max. 50	mpF
Anode to cathode	C_{ak}		max. 50	mpF
Cathode to heater	C_{kf}	4.7		pF
Grid No. 1 to heater	C_{g_1f}		max. 50	mpF
Anode to heater	C_{af}		max. 100	mpF

SHOCK AND VIBRATION RESISTANCE

The following test conditions are applied to assess the mechanical quality of the tube. These conditions are not intended to be used as normal operating conditions.

Shock

The tube is subjected 5 times in each of 4 positions to an acceleration of 500 g supplied by an NRL shock machine with the hammer lifted over an angle of 30°.

Vibration

The tube is subjected during 32 hours in each of 3 positions to a vibration frequency of 50 Hz with an accelration of 2.5 g.

LIFE

Production samples are tested to be within the end of life values (column III) during 10 000 hours.

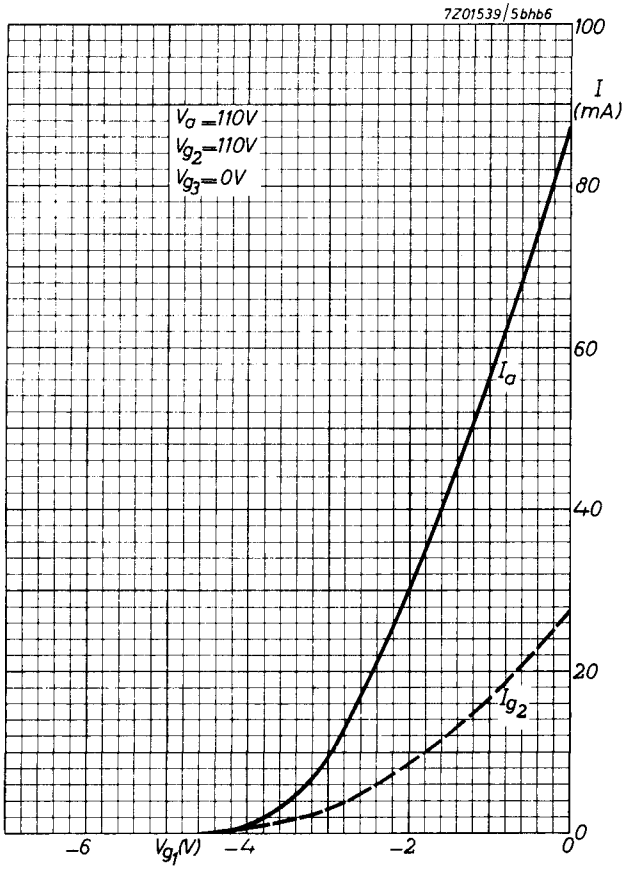
LIMITING VALUES (Absolute max. rating system)

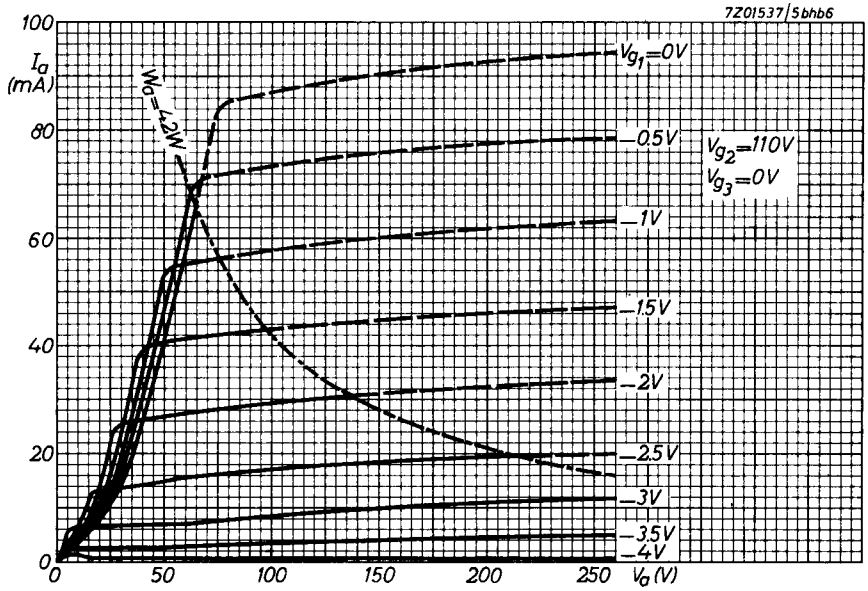
Anode voltage	V_{a_o}	max.	400	V
	V_a	max.	200	V
Anode dissipation	W_a	max.	4.2	W
Grid No.2 voltage	$V_{g_{2o}}$	max.	400	V
	V_{g_2}	max.	150	V
Grid No.2 dissipation [1])	W_{g_2}	max.	1.4	W
Grid voltage	$-V_g$	max.	50	V
Grid resistor, automatic bias	R_{g_1}	max.	0.5	MΩ
Cathode current	I_k	max.	50	mA
Voltage between cathode and heater	V_{kf}	max.	100	V
Bulb temperature	t_{bulb}	max.	180	°C

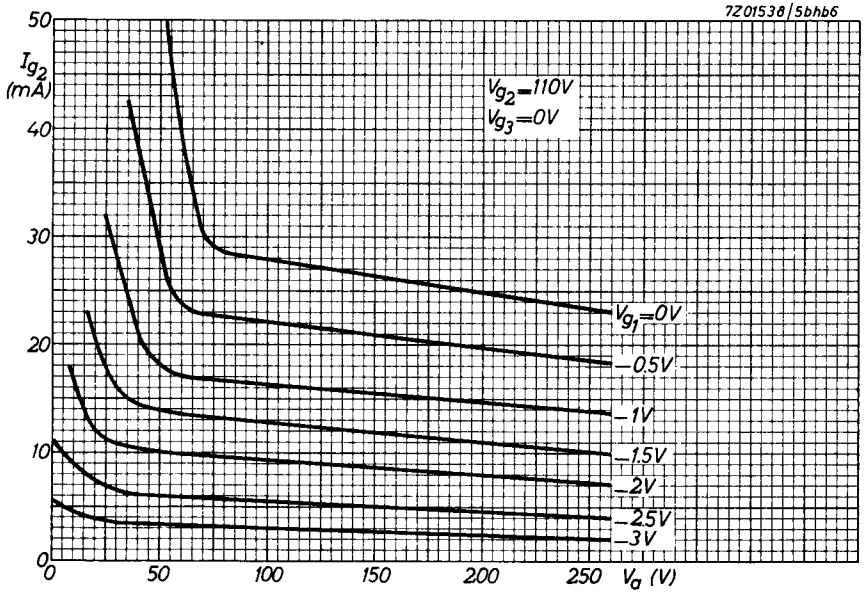
Heater voltage: The average heater voltage should be 6.3 V.
Variations of the heater voltage exceeding the range of 6.0 V to 6.6 V will shorten the tube life.
The tolerance of heater current should be taken into account.

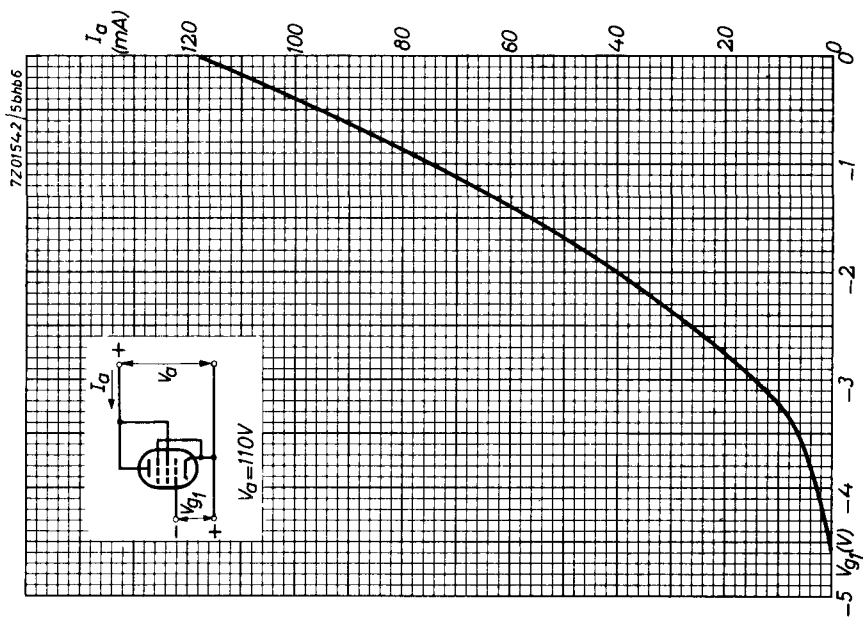
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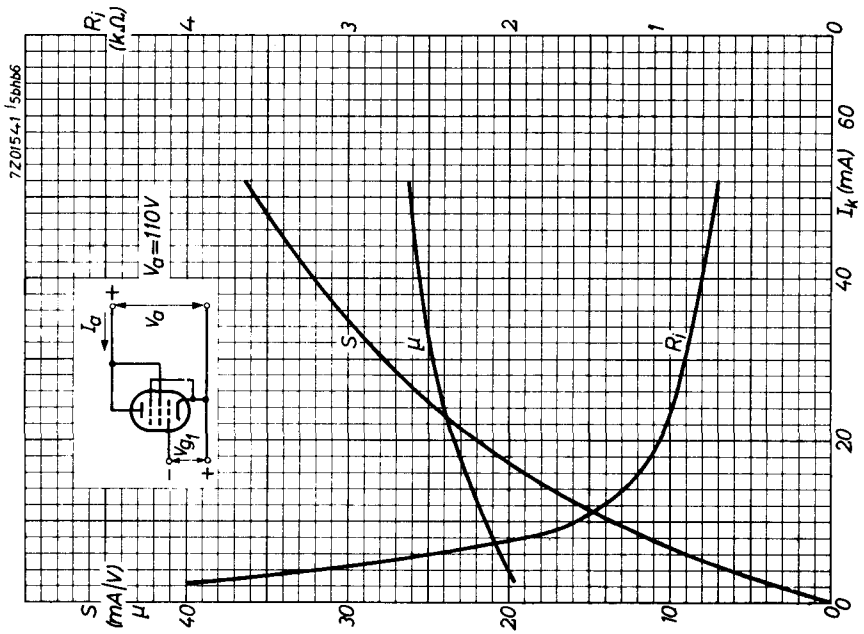
[1]) Grid No.2 dissipation : Care should be taken not to exceed the limiting value during switching in of positive voltages. If the cathode resistor is shunted by more than 10 μF a grid No.1 series resistor of minimum 1 kΩ should be applied.

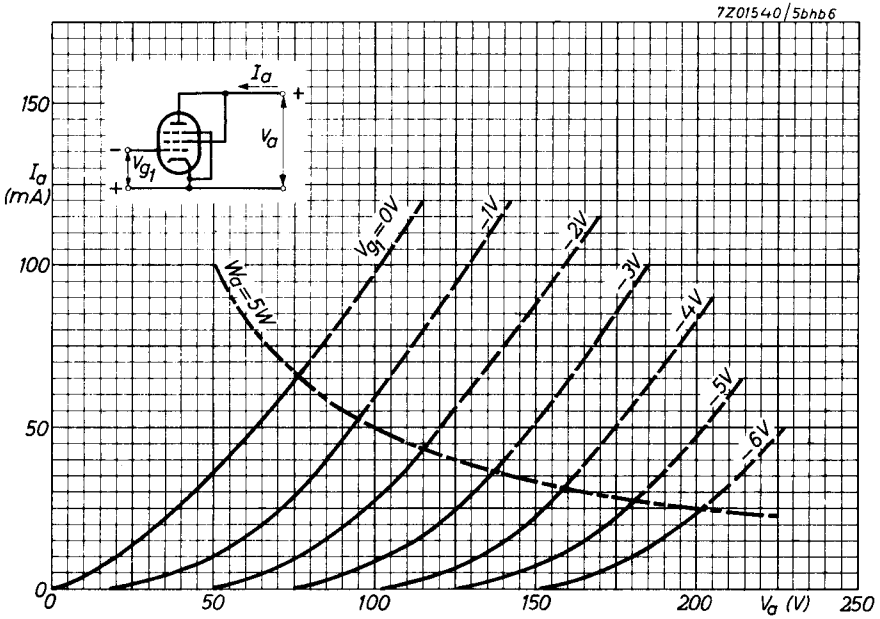

7Z01539/5bhb6
100
I
(mA)
80
60
40
20
0
V_a =110V
V_{g_2}=110V
V_{g_3}=0V
I_a
I_{g_2}
−6
V_{g_1}(V)
−4
−2
0

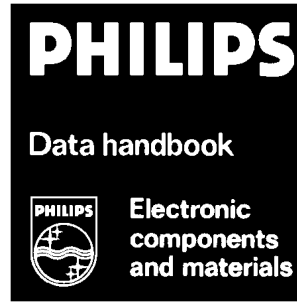

7Z01537/5bhb6
100
I_a (mA)
80
60
40
20
0
0
50
100
150
200
250
V_a (V)
V_{g_1}=0V
−0.5V
−1V
−1.5V
−2V
−2.5V
−3V
−3.5V
−4V
V_{g_2}=110V
V_{g_3}=0V
W_a=4.7W


7Z01538/5bhb6
50
I_{g_2} (mA)
40
30
20
10
0
0
50
100
150
200
250
V_a (V)
V_{g_2}=110V
V_{g_3}=0V
V_{g_1}=0V
−0.5V
−1V
−1.5V
−2V
−2.5V
−3V


7Z01542/5bhb6
I_a (mA)
120
100
80
60
40
20
0
-1
-2
-3
-4
-5 V_{g1}(V)
I_a
V_b
V_{g1}
V_a=110V


7Z01541/5bhb6
R_i (kΩ)
4
3
2
1
0
I_k (mA)
60
40
20
0
S (mA/V)
μ
40
30
20
10
0
V_a=110V
I_a
V_b
V_{g1}
S
μ
R_i


7Z01540/5bhb6
I_a
V_a
V_{g_1}
I_a (mA)
150
100
50
0
0
50
100
150
200
V_a (V)
250
V_{g_1}=0V
-1V
-2V
-3V
-4V
-5V
-6V
W_a=5W



E282F

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1	1	1968.12
2	2	1968.12
3	3	1968.12
4	4	1968.12
5	5	1968.12
6	6	1968.12
7	7	1968.12
8	8	1968.12
9	FP	2000.12.05

SPECIAL QUALITY, LONG LIFE DOUBLE TRIODE for use as A.F. amplifier in circuits with high signal to noise ratio

HEATING

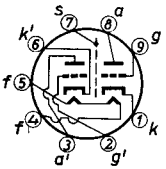
Indirect by A.C. or D.C.; parallel supply

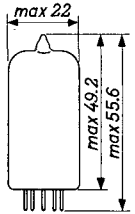
Heater voltage V_f = 6.3 V

Heater current I_f = 330 mA

In order to obtain a prolonged tube life, the deviation of the heater voltage should not exceed 5 % of the nominal value

Dimensions in mm





Base: NOVAL

CAPACITANCES

Grid to all other elements except anode	$C_g = C_{g'}$	= 2.0 pF
Anode to all other elements except grid	$C_a = C_{a'}$	= 2.0 pF
Anode to grid	$C_{ag} = C_{a'g'}$	= 1.2 pF
Grid to heater	C_{gf}	< 0.01 pF
	$C_{g'f}$	< 0.02 pF
Grid to grid of other section	$C_{gg'}$	< 0.01 pF
Anode to anode of other section	$C_{aa'}$	< 0.1 pF
Anode to grid of other section	$C_{ag'}$	< 0.06 pF
	$C_{a'g}$	< 0.01 pF

CHARACTERISTICS

Column I: Setting of the tube and typical (average) measuring results of new tubes
II: Characteristics range values for equipment design
III: Data indicating the end point of life

Heater current		I	II
Heater voltage	V_f =	6.3	V
Heater current	I_f =	330	313-347 mA

CHARACTERISTICS (continued)

Typical characteristics			I	II	III	
Anode voltage	V_a	=	250			V
Cathode resistor	R_k	=	1.6			kΩ
Anode current	I_a	=	1.25	1.1-1.4	0.8	mA
Mutual conductance	S	=	1.6	1.3-1.95	1.05	mA/V
Amplification factor	μ	=	100			
Internal resistance	R_i	=	62.5			kΩ
Negative grid current	$-I_g$	=		< 0.2	0.5	μA

			I	II	III	
Anode voltage	V_a	=	100			V
Cathode resistor	R_k	=	2			kΩ
Anode current	I_a	=	0.5			mA
Mutual conductance	S	=	1.25			mA/V
Amplification factor	μ	=	100			
Internal resistance	R_i	=	80			kΩ

Cut-off voltage			I	II	III	
Anode voltage	V_a	=	250			V
Anode current	I_a	=	20			μA
Grid voltage	$-V_g$	=		< 4		V

Grid current starting point			I	II	III	
Positive grid current	$+I_g$	=	0.3			μA
Negative grid voltage	$-V_g$	=		< 1		V

Insulation resistance			I	II	III	
Voltage between heater and cathode	V_{kf}	=	100			V
Insulation resistance	R_{isol}	=		> 20		MΩ
Voltage between anode and all other electrodes	V	=	300			V
Insulation resistance	R_{isol}	=		> 300		MΩ
Voltage between grid and all other electrodes	V	=	100			V
Insulation resistance	R_{isol}	=		> 300		MΩ

CHARACTERISTICS (continued)

Hum voltage. Measured with fully screened tube socket and centre tap of transfomer earthed

			I	II
Anode supply voltage	V_{ba}	=	250	V
Anode resistor	R_a	=	100	kΩ
Grid resistor	R_g	=	1	MΩ
Cathode resistor	R_k	=	3	kΩ
Cathode capacitor	C_k	=	1000	µF
Hum voltage (first triode section)	V_{ghum}	=		< 5 µV
Hum voltage (second triode section)	$V_{g'hum}$	=		< 15 µV

Vibrational noise (two systems in parallel)

			I	II
Anode supply voltage	V_{ba}	=	250	V
Anode resistor	R_a	=	5	kΩ
Grid voltage	V_g	=	-2	V
Vibrational frequency	f	=	25	c/s
Vibrational acceleration		=	2.5	g
Vibrational noise output	V_{noise}	=		< 10 mV[1]

Microphony

With respect to microphony the sensitivity of the circuit should not exceed 0.5 mV for 50 mW output of the output stage

LIFE EXPECTANCY: 10 000 hours

The data indicating the end point of life are given in column III under the heading "Characteristics"

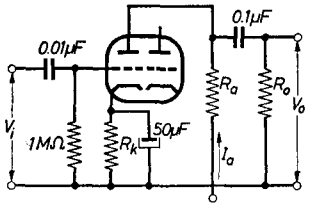
SHOCK RESISTANCE: acceleration 400 g [2])

VIBRATION RESISTANCE: vibrational acceleration of 2.5 g at a frequency of 50 c/s [2])

[1]) Measured in the frequency range from 20 to 5000 c/s

[2]) These test conditions are only given for evaluation of the ruggedness of the tube and should by no means be interpreted as suitable operating conditions

OPERATING CHARACTERISTICS for use as A.F. amplifier

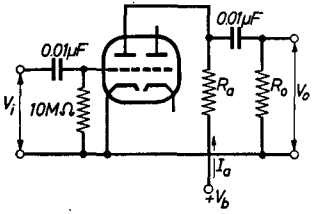


V_b (V)	R_a (kΩ)	R_k (Ω)	R_o (kΩ)	I_a (mA)	V_o [1] (V,RMS)	$\frac{V_o}{V_i}$	d_{tot} [2] (%)
200	47	1500	150	0.86	18	34	8.5
250	47	1200	150	1.18	23	37.5	7.0
300	47	1000	150	1.55	26	40	5.0
350	47	820	150	1.98	33	42.5	4.4
400	47	680	150	2.45	37	44	3.6
200	100	1800	330	0.65	20	50	4.8
250	100	1500	330	0.86	26	54.5	3.9
300	100	1200	330	1.11	30	57	2.7
350	100	1000	330	1.40	36	61	2.2
400	100	820	330	1.72	38	63	1.7
200	220	3300	680	0.36	24	56	4.6
250	220	2700	680	0.48	28	66.5	3.4
300	220	2200	680	0.63	36	72	2.6
350	220	1500	680	0.85	37	75.5	1.6
400	220	1200	680	1.02	38	76.5	1.1

[1]) Output voltage at grid current starting point

[2]) The distortion is about proportional to the output voltage

OPERATING CHARACTERISTICS for use as A.F. amplifier (continued)

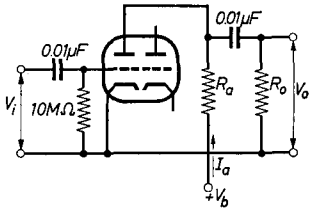


Input source resistance = 100 Ω

V_b (V)	R_a (kΩ)	R_o (kΩ)	I_a (mA)	V_o (V,RMS)	$\frac{V_o}{V_i}$	d_{tot} [2] (%)
200	47	150	1.02	18	37	5.6
250	47	150	1.45	23	39	4.2
300	47	150	2.02	26	41	2.9
350	47	150	2.50	33	44	2.7
400	47	150	3.10	37	45	2.5
200	100	330	0.70	20	50	3.9
250	100	330	1.00	26	51	2.6
300	100	330	1.29	30	54	2.0
350	100	330	1.62	36	56	1.8
400	100	330	1.95	38	58	1.6
200	220	680	0.39	24	58	4.6
250	220	680	0.56	28	62	2.7
300	220	680	0.74	36	66	2.2
350	220	680	0.88	37	67	1.7
400	220	680	1.09	38	68	1.4

[2]) The distortion is about proportional to the output voltage

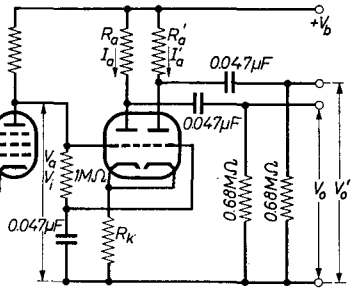
OPERATING CHARACTERISTICS for use as A.F. amplifier (continued)



Input source resistance = 330 kΩ

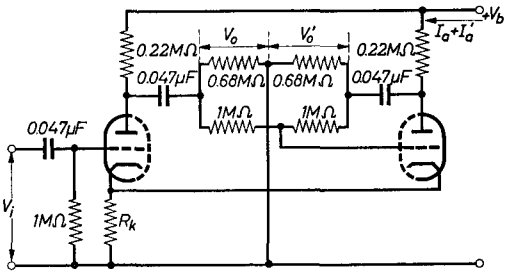
V_b (V)	R_a (kΩ)	Ro (kΩ)	I_a (mA)	$\frac{V_o}{V_i}$	dtot (%)		
					V_o=2 V	V_o=4 V	V_o=6 V
100	47	150	0.35	25	1.7	2.1	6.0
150	47	150	0.84	33	2.5	4.6	5.2
200	47	150	1.40	34	2.4	4.7	5.6
250	47	150	1.95	36	2.3	4.6	5.6
300	47	150	2.52	38	2.2	4.5	5.5
350	47	150	3.19	40	2.2	4.2	5.5
400	47	150	3.80	41	2.1	4.2	5.4
100	100	330	0.24	34	1.6	2.3	2.5
150	100	330	0.56	43	1.9	3.0	4.7
200	100	330	0.88	46	1.9	3.8	5.1
250	100	330	1.23	48	1.8	3.8	5.1
300	100	330	1.58	50	1.8	3.6	5.0
350	100	330	1.92	51	1.8	3.6	4.9
400	100	330	2.29	52	1.7	3.5	4.8
100	220	680	0.14	42	1.6	2.5	3.2
150	220	680	0.32	51	1.7	3.0	4.4
200	220	680	0.49	54	1.7	3.0	4.4
250	220	680	0.67	57	1.6	2.9	4.4
300	220	680	0.85	58	1.6	2.9	4.4
350	220	680	1.05	59	1.6	2.8	4.3
400	220	680	1.23	60	1.6	2.7	4.2

OPERATING CHARACTERISTICS for use as phase inverter



V_a should be adjusted to the specified value of Ia+Ia'

V_b (V)	V_a (V)	R_k (kΩ)	R_a;R_a' (kΩ)	Ia+Ia' (mA)	$\frac{V_o}{V_i}$	V_o [1] (V,RMS)	dtot [2] (%)
250	65	68	100	1.0	25	20 7	1.8 0.6
350	90	82	150	1.2	27	35 10	1.8 0.5



V_b (V)	R_k (Ω)	Ia+Ia' (mA)	$\frac{V_o}{V_i}$	V_o [1] (V,RMS)	dtot [2] (%)
250	1200	1.08	58	35 7	5.5 1.1
350	820	1.7'	62	45 9	3.5 0.7

[1]) Output voltage at grid current starting point

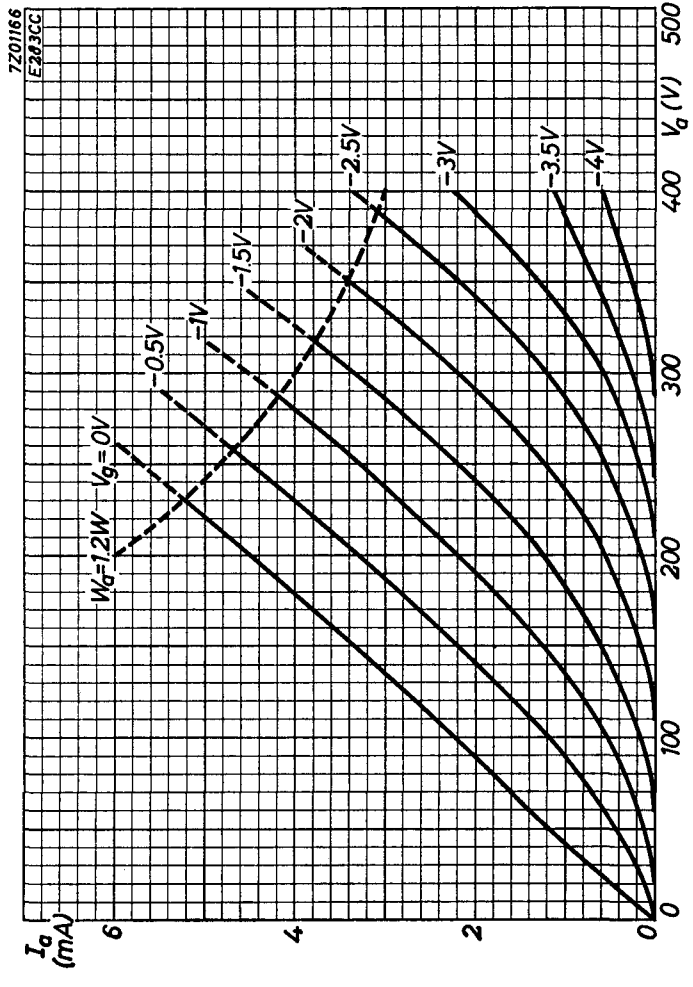
[2]) The distortion is about proportional to the output voltage

LIMITING VALUES (Absolute limits; each system)

Anode voltage in cold condition	V_{a_o}	= max. 600 V
Anode voltage	V_a	= max. 300 V
Anode dissipation	W_a	= max. 1.2 W
Negative grid voltage	$-V_g$	= max. 55 V
Positive grid voltage	$+V_g$	= max. 0.5 V
Grid circuit resistance with fixed bias	R_g	= max. 1.2 MΩ
Grid circuit resistance with automatic bias	R_g	= max. 2.2 MΩ
Grid circuit resistance in case of grid current bias	R_g	= max. 25 MΩ
Cathode current	I_k	= max. 9 mA
Voltage between heater and cathode	V_{kf}	= max. 200 V
Circuit resistance between heater and cathode	R_{kf}	= max. 20 kΩ [1]
Bulb temperature	t_{bulb}	= max. 170 °C

[1]) In a phase inverter circuit immediately preceding the output stage the maximum permissible value of R_{kf}=135 kΩ

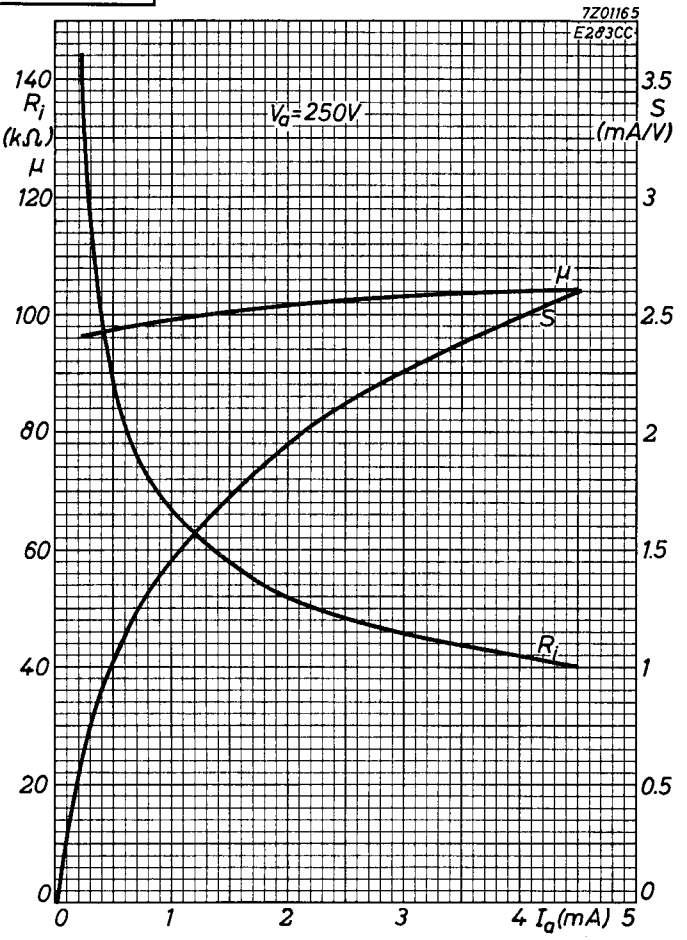
SQ **PHILIPS** **E283CC**



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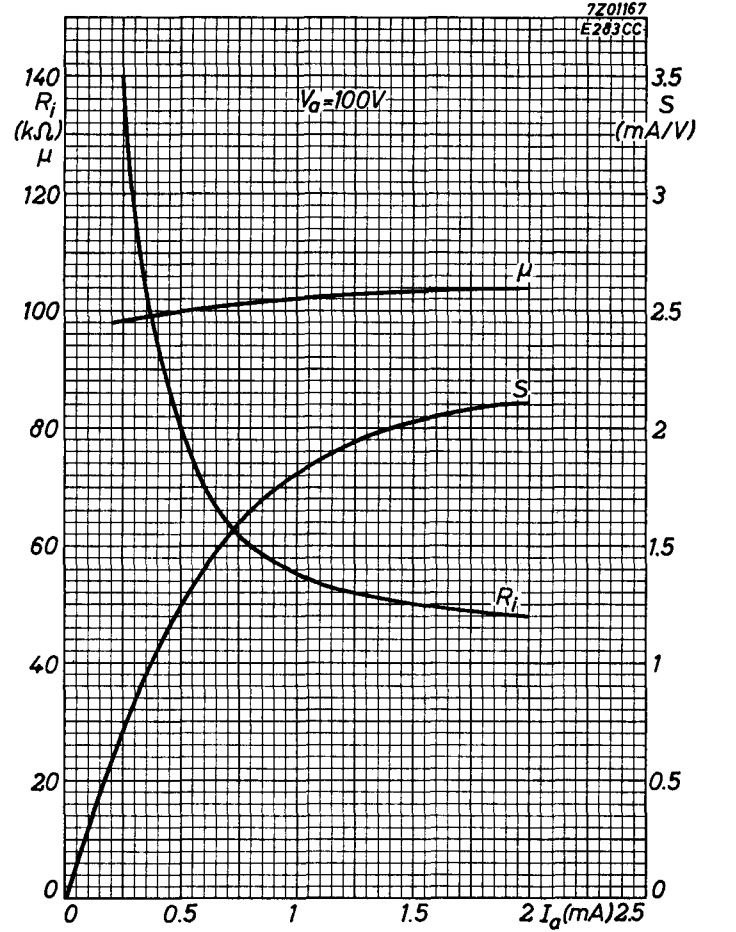
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E283CC PHILIPS SQ



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SQ **PHILIPS** **E283CC**



9.9.1962

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PHILIPS

Electronic Tube

HANDBOOK

E283CC

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2	2	1962.09.09
3	3	1962.09.09
4	4	1962.09.09
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11	C	1962.09.09
12	FP	1999.04.19

S.Q. TUBE

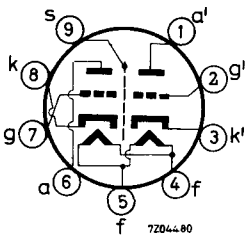
Special quality double triode designed for use in cascode circuits and as R.F. or I.F. amplifier.

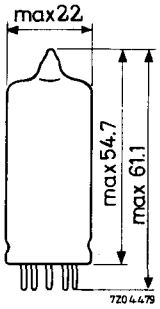
QUICK REFERENCE DATA			
Life test	10 000 hours		
Low interface resistance			
Mechanical quality	Shock and vibration resistant		
Base	Noval. Gold plated pins		
Heating	Indirect A.C. or D.C.; parallel supply		
Heater voltage	V_f	6.3	V
Heater current	I_f	475	mA
Anode current	I_a	30	mA
Mutual conductance	S	20	mA/V
Equivalent noise resistance (R.F.)	R_{eq}	200	Ω
Noise figure	F	5.7	dB

DIMENSIONS AND CONNECTIONS

Dimensions in mm

Base: Noval





CHARACTERISTICS

Column I Nominal value or setting of the tube
II Range values for equipment design: Initial spread
III Range values for equipment design: End of life

		I	II	III	
Heater voltage	V_f	6.3			V
Heater current	I_f	475	450 - 500		mA
Anode supply voltage	V_{ba}	100			V
Grid supply voltage	$+V_{bg}$	9			V
Cathode resistor	R_k	350			Ω
Anode current	I_a	30	28 - 32	min. 26.5	mA
Mutual conductance	S	20	17 - 22.5	min. 14.5	mA/V
Amplification factor	μ	25			
Internal resistance	R_i	1.25			kΩ
Equivalent noise resistance	R_{eq}	200			Ω
Noise figure in cascode circuit	F	5.7			dB
Adapted to minimum noise					
Negative grid current	$-I_g$		max. 0.2	max. 1	μA
Anode supply voltage	V_{ba}	60			V
Cathode resistor	R_k	80			Ω
Anode current	I_a	1.5			mA
Mutual conductance	S	15.5			mA/V
Amplification factor	μ	25			
Internal resistance	R_i	1.85			kΩ
Noise figure in cascode circuit	F	5			dB
Adapted to minimum noise					

CAPACITANCES Each system if applicable

Grid to cathode heater and screen	$C_{g/kfs}$	4.7	pF
Anode to cathode heater and screen	$C_{a/kfs}$	1.9	pF
	$C_{a'/k'fs}$	1.8	pF
Anode to grid	C_{ag}	1.8	pF
Cathode to grid heater and screen	$C_{k/gfs}$	7.8	pF
Anode to grid heater and screen	$C_{a/gfs}$	3.5	pF
	$C_{a'/gfs}$	3.4	pF
Anode to cathode	C_{ak}	0.25	pF
Anode to anode other section	$C_{aa'}$	max. 0.05	pF
Grid to grid other section	$C_{gg'}$	max. 0.005	pF

SHOCK AND VIBRATION RESISTANCE

The following test conditions are applied to assess the mechanical quality of the tube. These conditions are not intended to be used as normal operating conditions.

Shock

The tube is subjected 5 times in each of 4 positions to an acceleration of 500 g supplied by an NRL shock machine with the hammer lifted over an angle of 30^{o}.

Vibration

The tube is subjected during 32 hours in each of 3 positions to a vibration frequency of 50 Hz with an acceleration of 2.5 g.

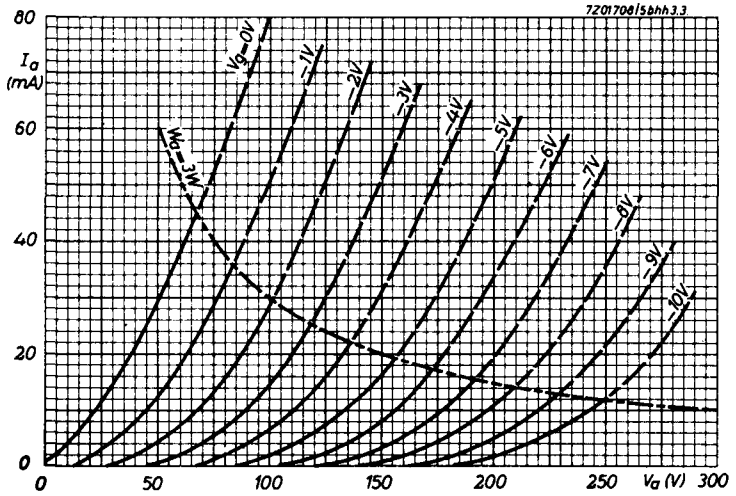
LIFE

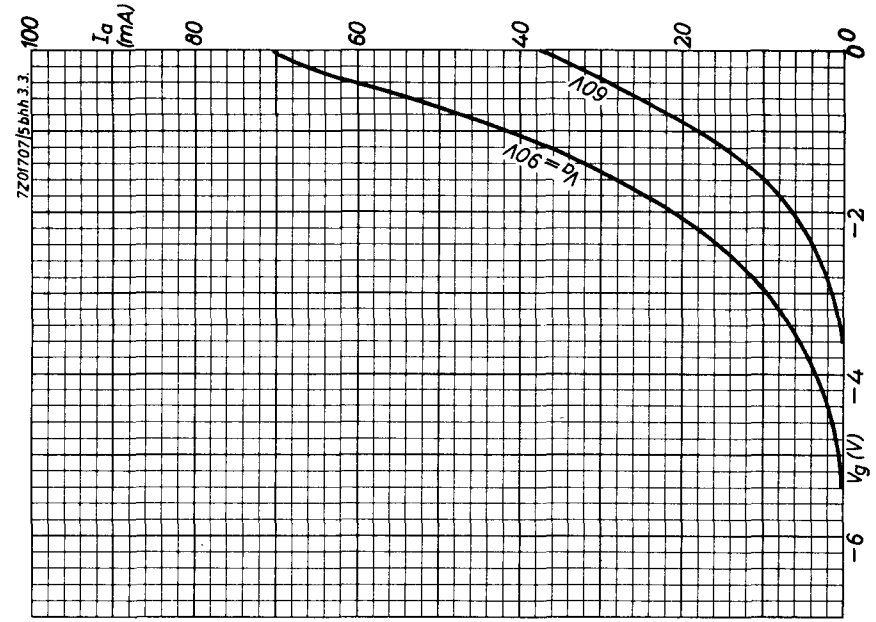
Production samples are tested during 10 000 hours.

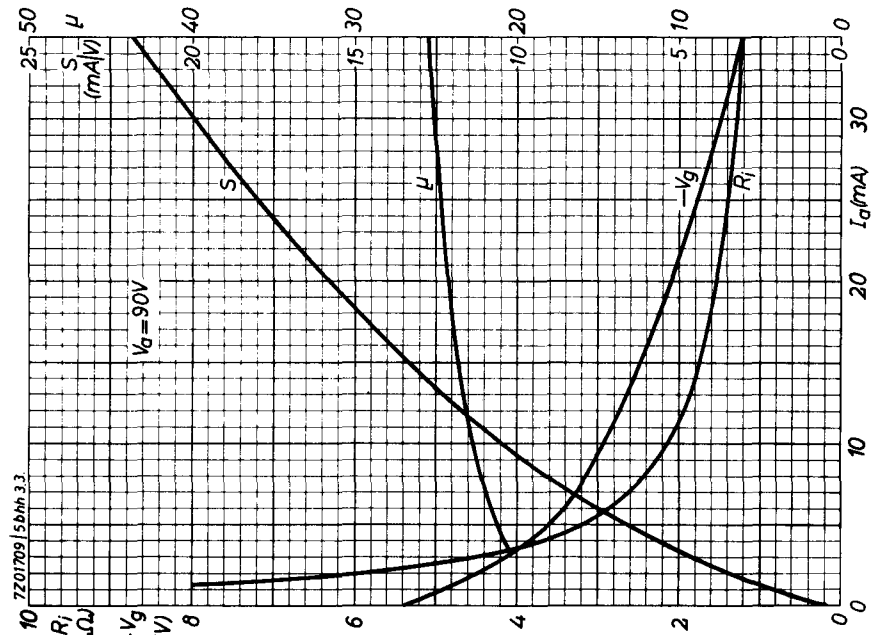
LIMITING VALUES (Absolute max. rating system)

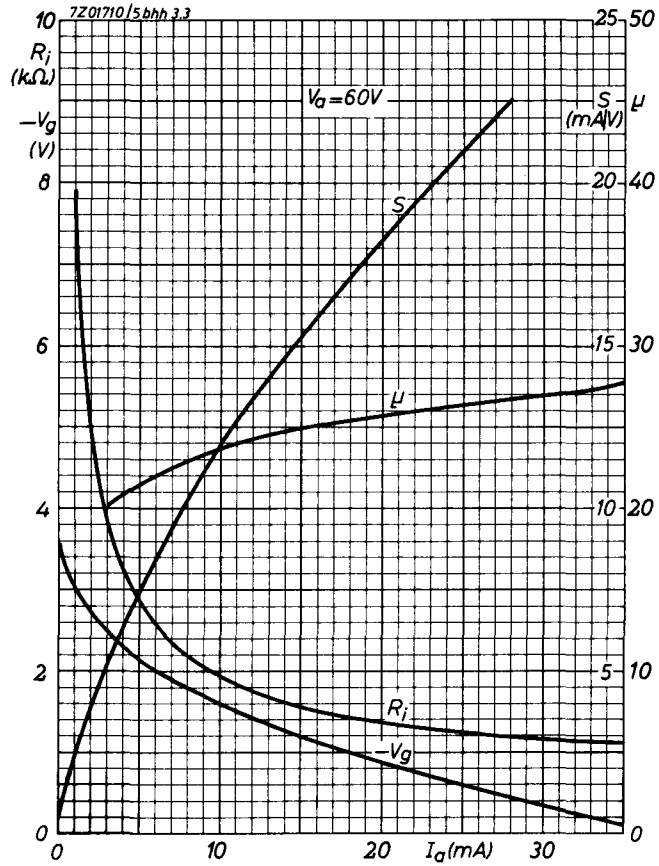
Anode voltage	V_{a_o}	max. 400	V
	V_a	max. 250	V
Anode dissipation	W_a	max. 3	W
Grid voltage	$-V_g$	max. 50	V
Grid peak voltage	$-V_{g_p}$	max. 150	V
Max. pulse duration 10 μsec			
Max. duty factor 0.01			
Grid resistor with automatic bias	R_g	max. 1	MΩ
Cathode current	I_k	max. 40	mA
Cathode peak current	I_{k_p}	max. 400	mA
Max. pulse duration 10 μsec			
Max. duty factor 0.01			
Voltage between cathode and heater	V_{kf}	max. 150	V
Bulb temperature	t_{bulb}	max. 190	°C

Heater voltage: The average heater voltage should be 6.3 V.
Variations of the heater voltage exceeding the range of 6.0 V to 6.6 V will shorten the tube life.
The tolerance of heater current (column II) should be taken into account.




7Z01707/5bhh3.3
I_a (mA)
100
80
60
40
20
0
V_a = 90V
60V
0
−2
−4
−6
V_g (V)


7Z01709/5bhh3.3
R_i (kΩ)
10
8
6
4
2
0
$-V_g$ (V)
S (mA/V)
25
20
15
10
5
0
μ
50
40
30
20
10
0
V_a = 90V
S
μ
$-V_g$
R_i
0
10
20
30
I_a (mA)


7Z01710/5.bhh 3.3
10
R_i (kΩ)
$-V_g$ (V)
8
6
4
2
0
V_a=60V
S
μ
R_i
$-V_g$
25
50
S (mA/V)
μ
20
40
15
30
10
20
5
10
0
0
10
20
I_a(mA)
30

PHILIPS

Data handbook

PHILIPS Electronic components and materials

E288CC

page	sheet	date
1	1	1968.12
2	2	1968.12
3	3	1968.12
4	4	1968.12
5	5	1968.12
6	6	1968.12
7	FP	2000.12.10

Röhrentype: Penthode, Universalröhre für Ultrakurzwellengeräte bis zu 3 m herunter zur Verwendung als H.F.- , Z.F.-, N.F.- Penthode, als Triodenoszillator, Mischröhre mit getrenntem Oszillator und Diode für Empfangsgleichrichtung.

Type de tube: Penthode, tube universel pour appareils à ondes ultra-courtes descendant jusqu'à 3 m prévu pour l'utilisation comme penthode H.F., M.F., et B.F., comme oscillateur triode, changeur de fréquence avec oscillateur séparé et diode détectrice.

Type of tube: Pentode, universal tube for ultra short-wave apparatus down to 3 m designed for use as H.F., I.F. or L.F. pentode, as triode oscillator, as frequency converter with separate oscillator and as detector diode.

Heizung indirekt, Gleich- oder Wechselstrom, Parallelspeisung
Chauffage indirect, CC ou CA, alimentation en parallèle
Heating indirect, D.C. or A.C., parallel heater supply

Vf 6,3 V
If 0,200 A

Kapazitäten (kalt)
Capacités (à froid)
Capacities (cold)

Cag1 < 0,005 µµF
Cg1 5,4 µµF
Ca 6,2 µµF
Cg3 6,1 µµF

Dämpfungswiderstände) (λ = 6 m, Ia=4,5 mA) Rg1 15000 Ω
Résist.d'amortissement) Ra 80000 Ω
Damping resistances)

A. Penthodenschaltung; montage penthode; pentode connection

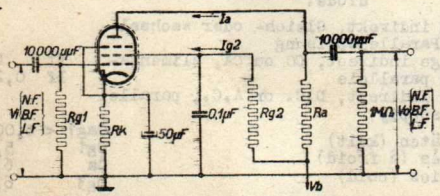
Daten zur Verwendung als H.F.- oder Z.F.-Verstärker
Caracteristiques pour l'utilisation comme amplificateur H.F. ou M.F.
Characteristics for use as H.F. or I.F. amplifier

Vb=Va		100			200		V
Rg2		0			67000		Ω
Vg3		0			0		V
Vg1	-2	-10	-13	-2	-20	-25	V
Vg2	100	100	100	-	-	200	V
Ia	4,5	-	-	4,5	-	-	mA
Ig2	1,5	-	-	1,5	-	-	mA
S	2400	24	2,4	2400	24	2,4	µA/V
Ri	0,4	>10	>10	0,9	>10	>10	MΩ
Raeq	4000	-	-	4800	-	-	MΩ

Daten zur Verwendung als N.F.-Verstärker mit Widerstandskopplung.
Caracteristiques pour l'utilisation comme amplificateur B.F. à couplage par résistance
Characteristics for use as L.F.amplifier with resistance coupling

E3F PHILIPS „MINIWATT"

Vb (V)	Ra (MΩ)	Rg2 (MΩ)	Rk (Ω)	Ia (mA)	Ig2 (mA)	Vo/Vi	dtot (Vo=3V) (%)	dtot (Vo=5V) (%)
200	0,3	1,2	4000	0,39	0,12	125	1	1,75
100	0,3	1,0	8000	0,19	0,06	66	2,4	4
200	0,2	0,8	3000	0,55	0,18	115	0,87	1,45
100	0,2	0,5	5000	0,3	0,11	65	1,56	2,6
200	0,1	0,32	1750	1,2	0,4	110	0,45	0,75
100	0,1	0,32	4000	0,4	0,15	48	2,7	4,5
200	0,05	0,16	800	2,1	0,72	76	0,5	0,85
100	0,05	0,1	1600	0,93	0,35	50	1,35	2,25

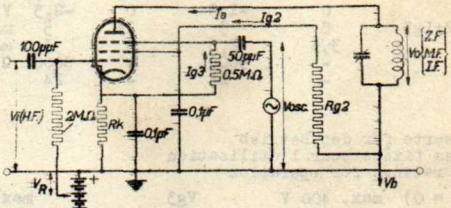


Daten zur Verwendung als Mischröhre mit getrenntem Oszillator (H.F.-Signal an Gitter 1, Oszillatorsignal an Gitter 3)
Caractéristiques pour l'utilisation comme changeur de fréquence à oscillateur séparé (signal H.F. applique à la grille 1, signal oscillateur à la grille 3)
Characteristics for use as frequency converter with separate oscillator (H.F.signal applied to first grid, oscillator signal to grid 3)

Va=Vb	100		200		V
Rg2	0		28500		Ω
Rg3	0,5		0,5		MΩ
Ig3	30		30		µA
Voseff	12		12		V
Rk	360		360		Ω
Vg1	-2	-7,8	-2	-15	V
Vg2	100	100	100	200	V
Ia	1,6	~	2	~	mA
Ig2	3,9	-	3,5	-	mA
Sc	675	6,75	750	7,5	µA/V
Ri	0,2	> 4	0,2	> 2	MΩ
Raeq	22000	-	23000	-	Ω

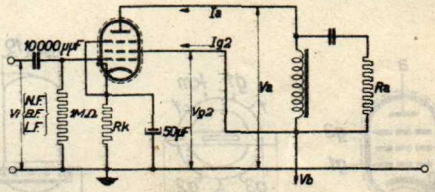
Va=Vb	100	200	V
Rg2	40000	140000	Ω
Rg3	0,5	0,5	MΩ
Ig3	20	20	µA
Voseff	6,5	6,5	V
Rk	1100	1100	Ω

Vg1	-2	-10	-2	-15	V
Vg2	60	100	60	200	V
Ia	0,6	-	0,8	-	mA
Ig2	1	-	1	-	mA
Sc	400	4	400	4	µA/V
Ri	0,4	>5	0,4	> 3	MΩ
Raeq	23000	-	32000	-	Ω



Daten zur Verwendung als N.F.-Endröhre
Caractéristiques pour l'utilisation comme tube de sortie B.F.
Characteristics for use as L.F. output tube

Va	100		200		V
Vg2	100		200		V
Vg3	0		0		V
Rk	400		400		Ω
Vg1	-2,2		-4,5		V
Ia	4		8		mA
Ig2	1,4		3		mA
S	2,4		2,8		mA/V
Ri	0,4		0,35		MΩ
Ra	25000		25000		Ω
Vieff	0,7	1,5	0,55	2,5	V
Wo	50	130	50	700	mW
dtot	-	10	-	10	%



B. Triodenschaltung; montage triode; triode connection.

Kenndaten
Caracteristiques typiques
Typical characteristics

V(a+g2+g3)	60		100		V
Rk	0	500	0	500	Ω
Vg1	0	-1,5	0	-2,5	V
Ia+Ig2+Ig3	8	3	15	5	mA
S	3,5	2,6	4	3	mA/V
Ri	-	9000	-	8000	Ω
μ	-	24	-	24	

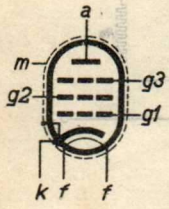
Grenzwerte für den Betrieb
Limites fixées pour l'utilisation
Limit ratings for operation

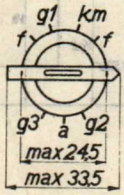
Va(Ia = 0)	max. 400 V	Vg3	max. 100 V
Va	max. 200 V	Wg3	max. 0,5 W
Wa	max. 2 W	Ik	max. 15 mA
Vg2(Ia=0)	max. 400 V	Vg1(Igl=+0,3μA)	max.-1,3 V
Vg2	max. 200 V	Rg1k	max. 3 MΩ
Wg2	max. 1 W	Rfk	max.5000 Ω
Vg3(Ia=0)	max. 400 V	Vfk	max. 50 V

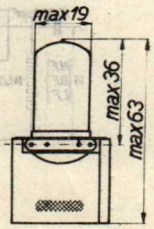
Kapazitätstoleranzen (kalt)
Tolerances des capacites (à froid)
Capacity tolerances (cold)

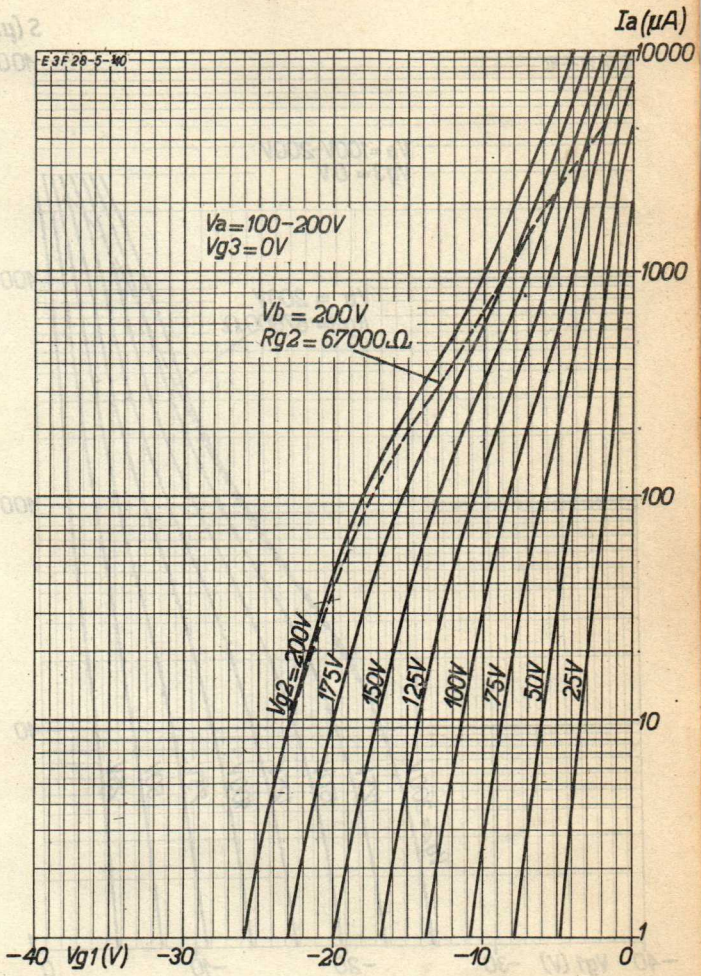
Ca	max. 6,6 μμF	Cg1	min.5 μμF
Ca	min. 5,8 μμF	Cg3	max.6,5 μμF
Cg1	max. 5,8 μμF	Cg3	min.5,7 μμF

Elektrodenanordnung, Elektrodenanschlüsse und max. Abmessungen in mm.
Disposition des électrodes, connexions des électrodes et dimensions max. en mm.
Electrode arrangement, electrode connections and max. dimensions in mm.

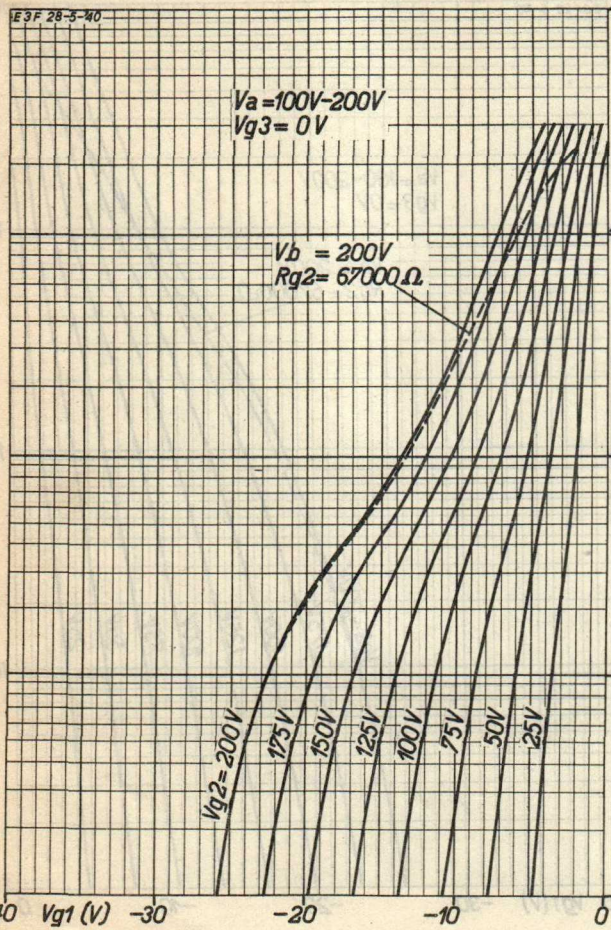







Ia (µA)
E3F 28-5-M0
10000
1000
100
10
1
Va = 100-200V
Vg3 = 0V
Vb = 200V
Rg2 = 67000Ω
Vg2 = 200V
175V
150V
125V
100V
75V
50V
25V
−40
Vg1 (V)
−30
−20
−10
0

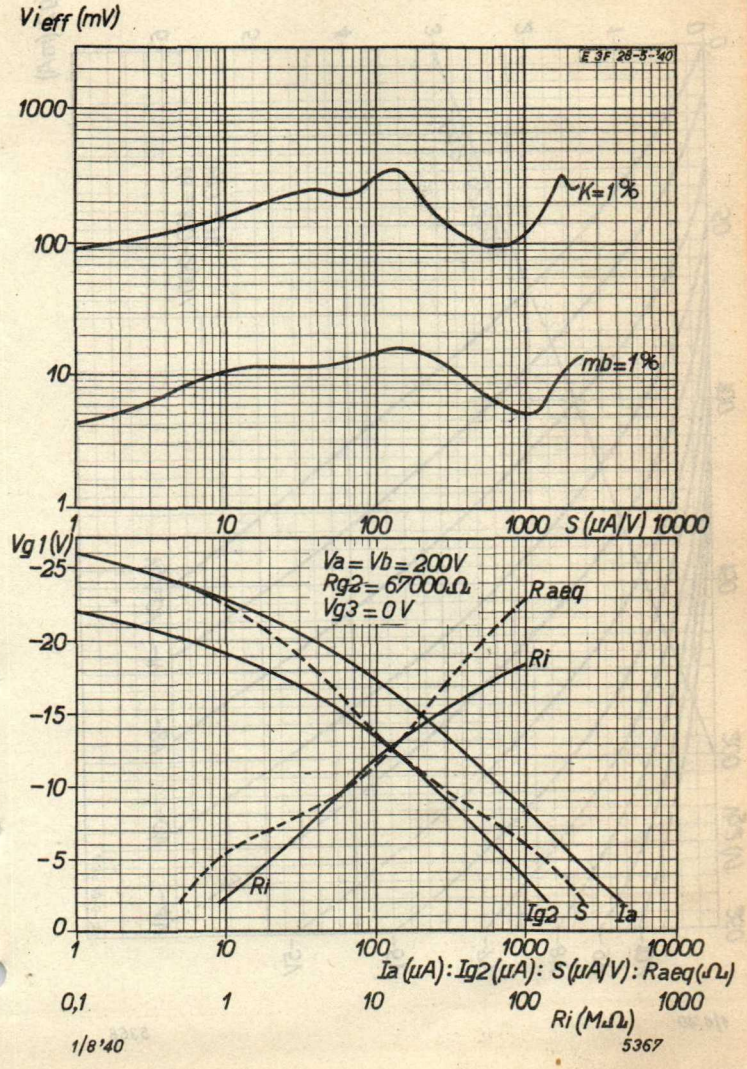
E3F PHILIPS „MINIWATT"

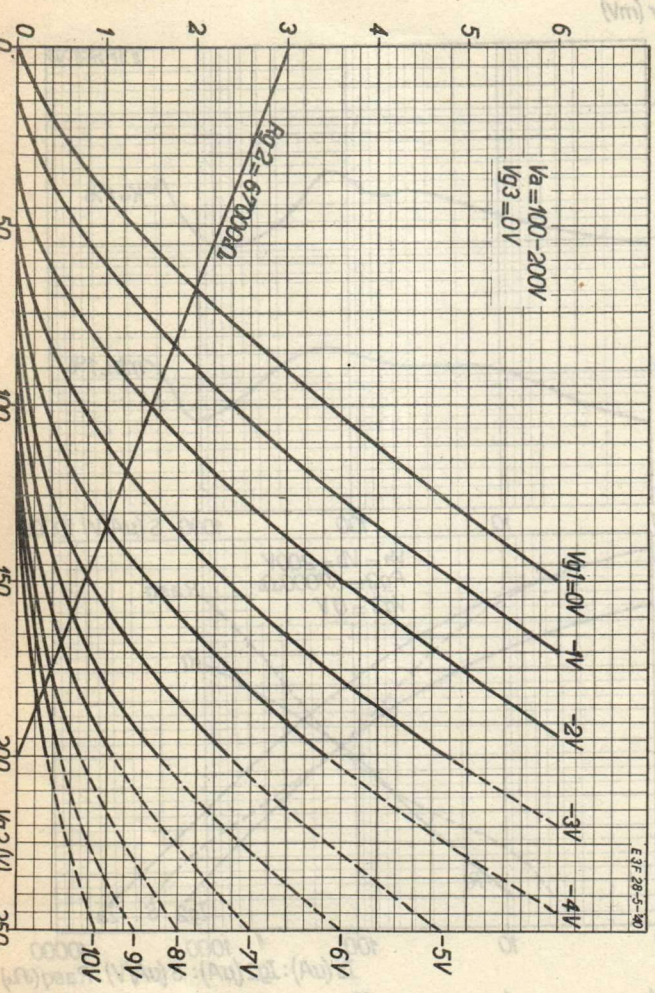


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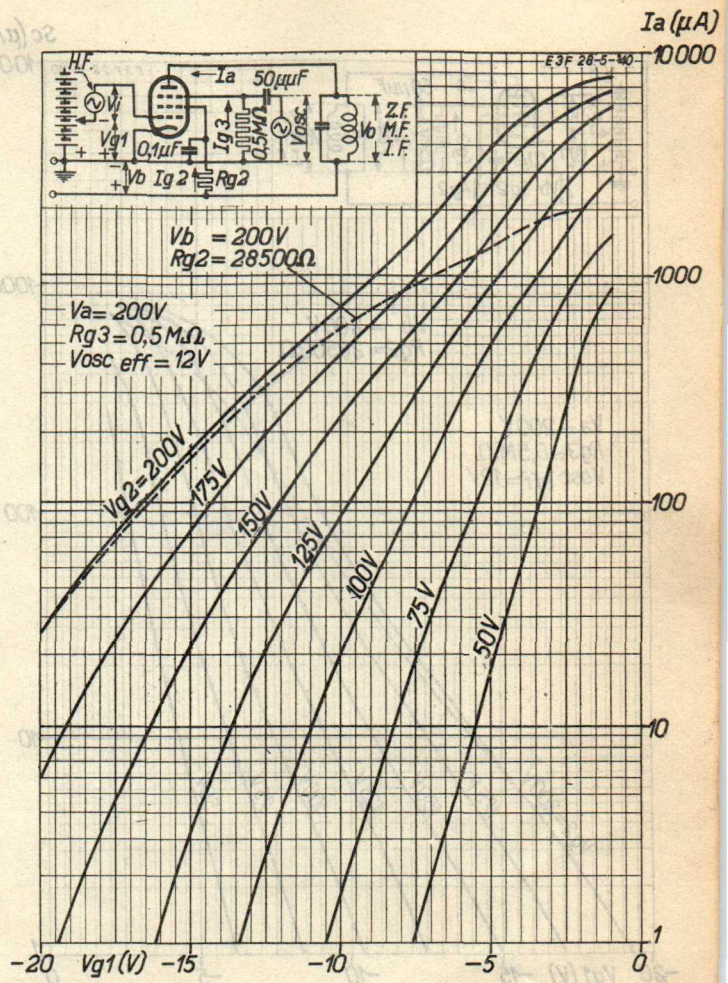
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PHILIPS „MINIWATT" E3F

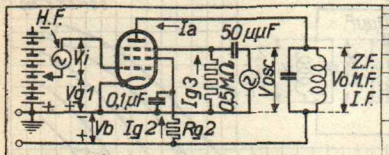



Ig2 (mA)
0
1
2
3
4
5
6
Ra2=67000Ω
Va=100-200V
Vg3=0V
Vg1=0V
-1V
-2V
-3V
-4V
-5V
-6V
-7V
-8V
-9V
-10V
0
50
100
150
200
250
Vg2 (V)
E3F 28-5-40

PHILIPS „MINIWATT" E3F



E3F PHILIPS „MINIWATT"



E 3 F 28-5-40

Sc (µA/V)

10000

1000

100

10

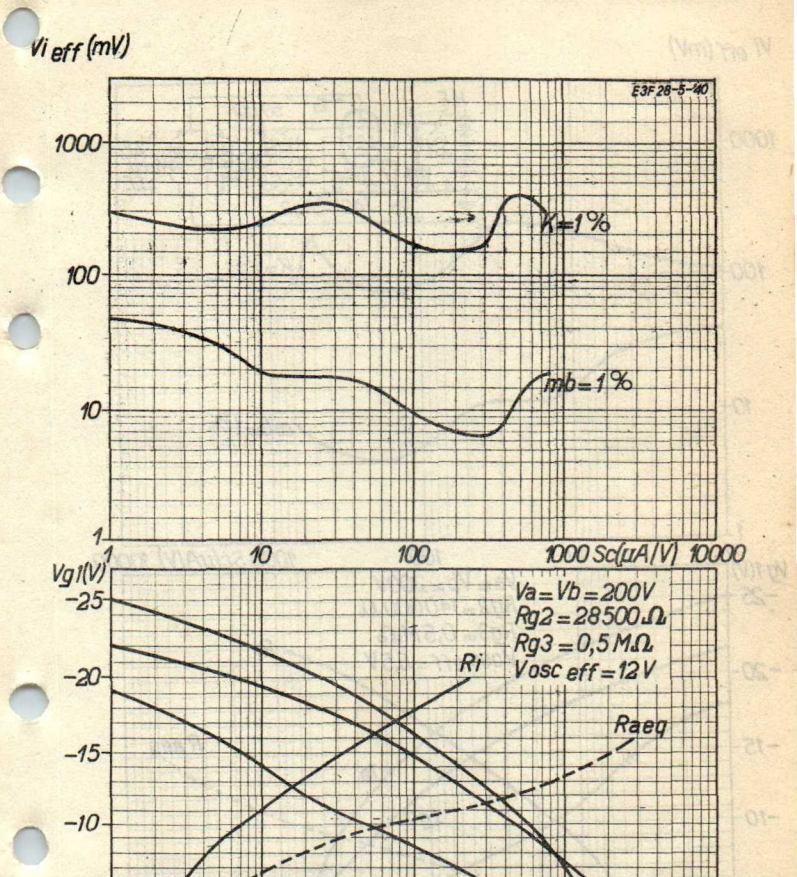
1

Vb = 200V
Rg2= 28500Ω

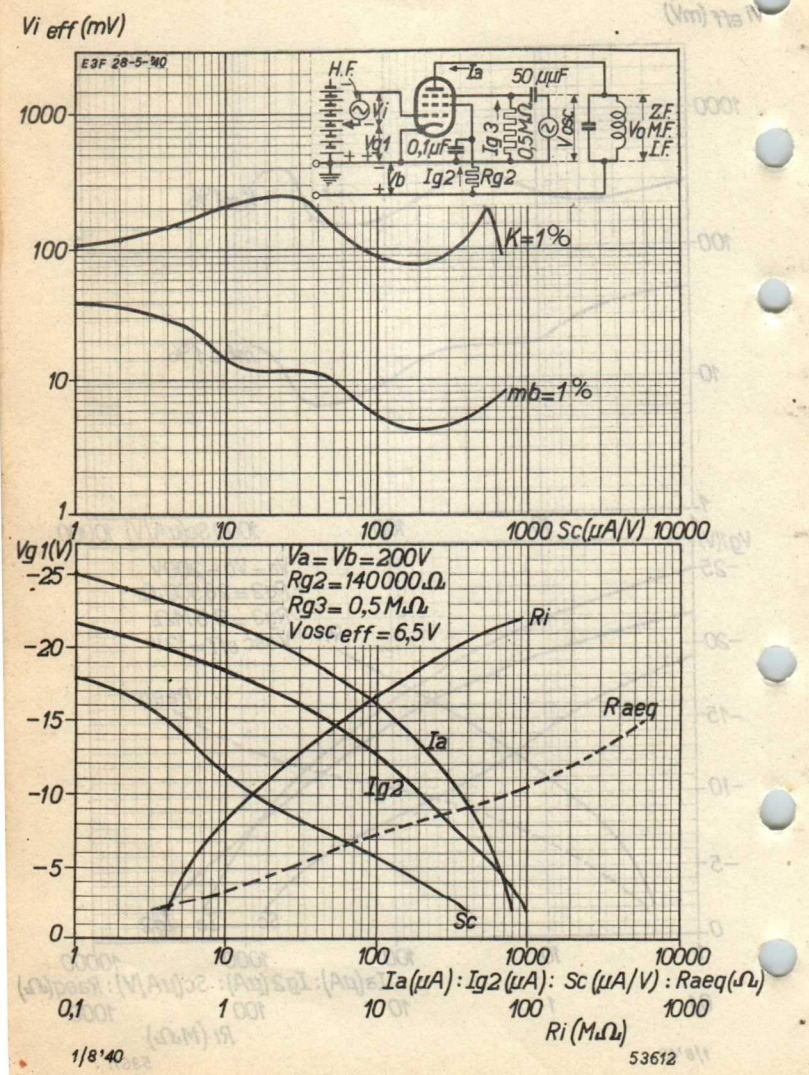
Va = 200V
Rg3=0,5 MΩ
Vosc eff = 12V

Vg2=200V
175V
150V
125V
100V
75V
50V

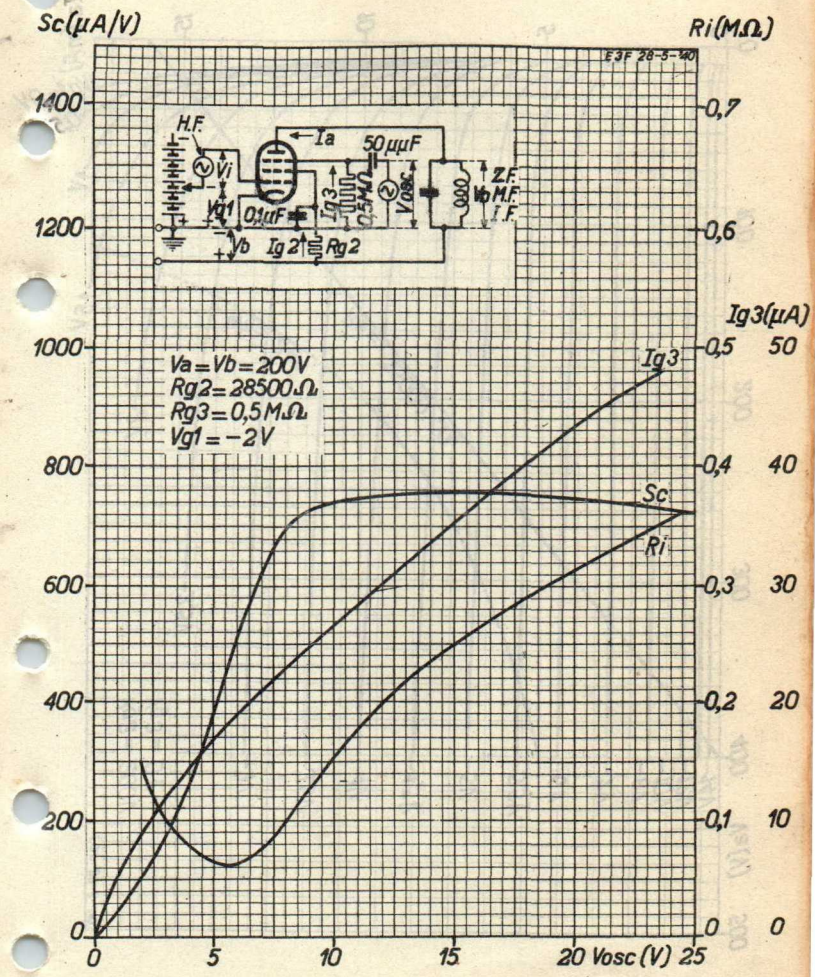
−20 Vg1 (V) −15 −10 −5 0


Vi eff (mV)
E3F 28-5-'40
1000
100
10
1
K=1%
mb=1%
1
10
100
1000 Sc(µA/V)
10000
Vg1(V)
−25
−20
−15
−10
−5
0
Va = Vb = 200V
Rg2 = 28500 Ω
Rg3 = 0,5 MΩ
Vosc eff = 12V
Ri
Raeq
Sc
Ia
Ig2
1
10
100
1000
10000
Ia(µA): Ig2(µA): Sc(µA/V): Raeq(Ω)
0,1
1
10
100
1000
Ri (MΩ)

E3F PHILIPS „MINIWATT"



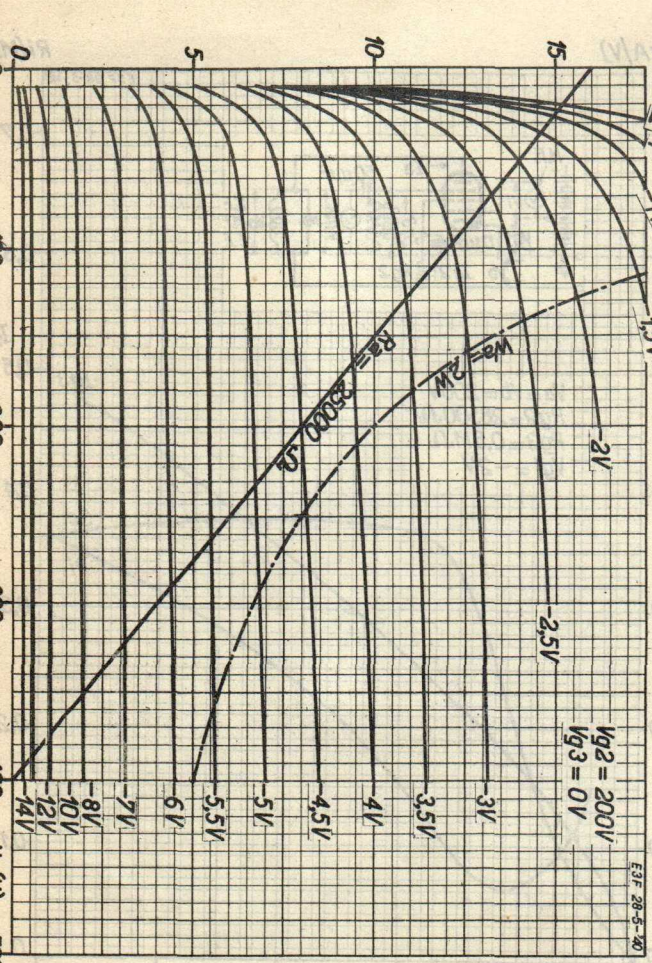
PHILIPS „MINIWATT" E3F

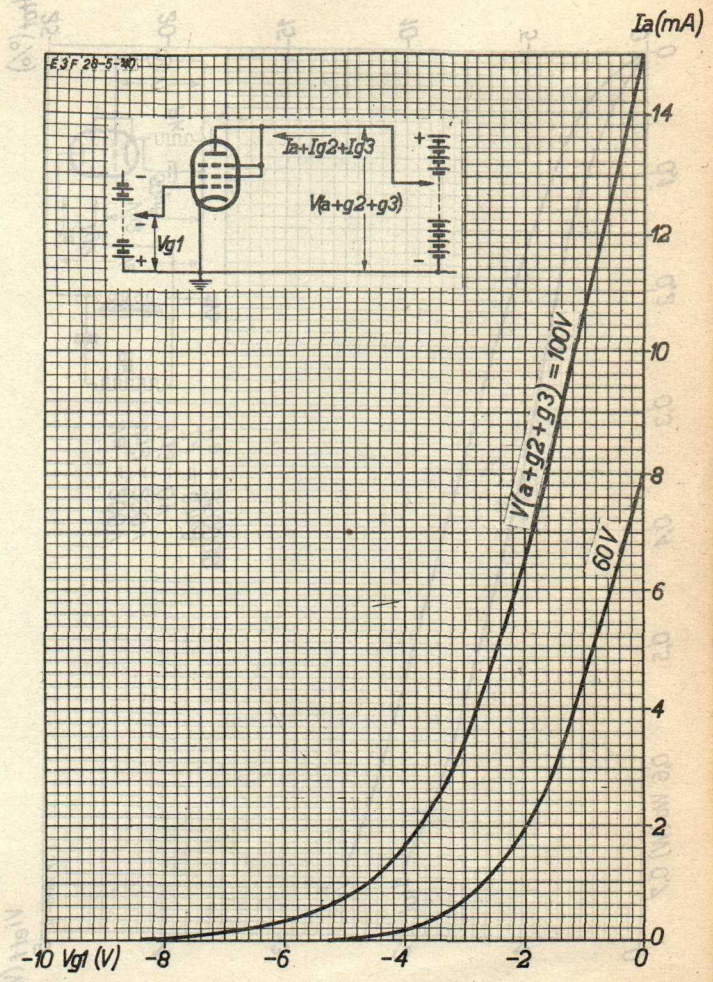


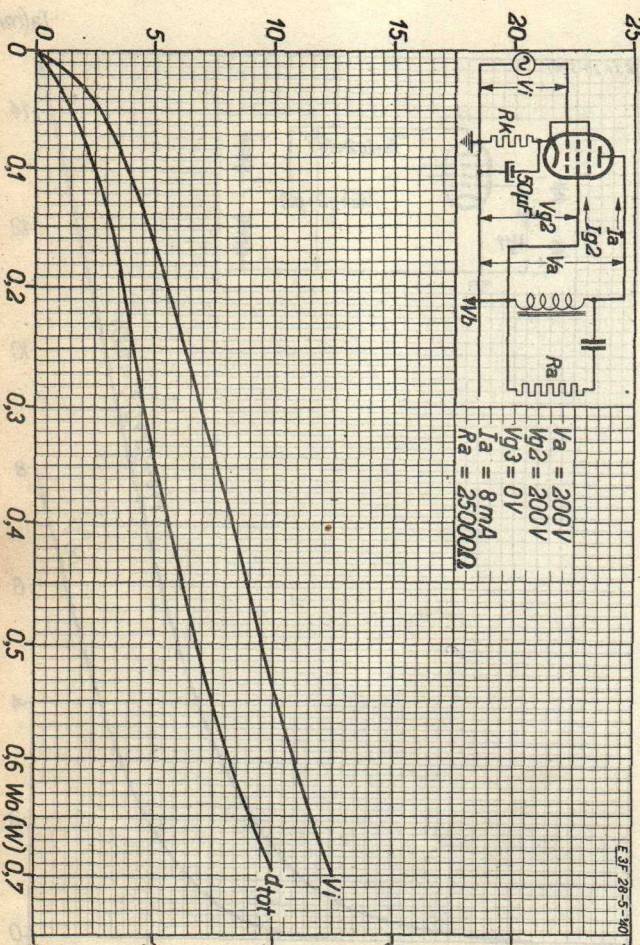
1/8'40

53613

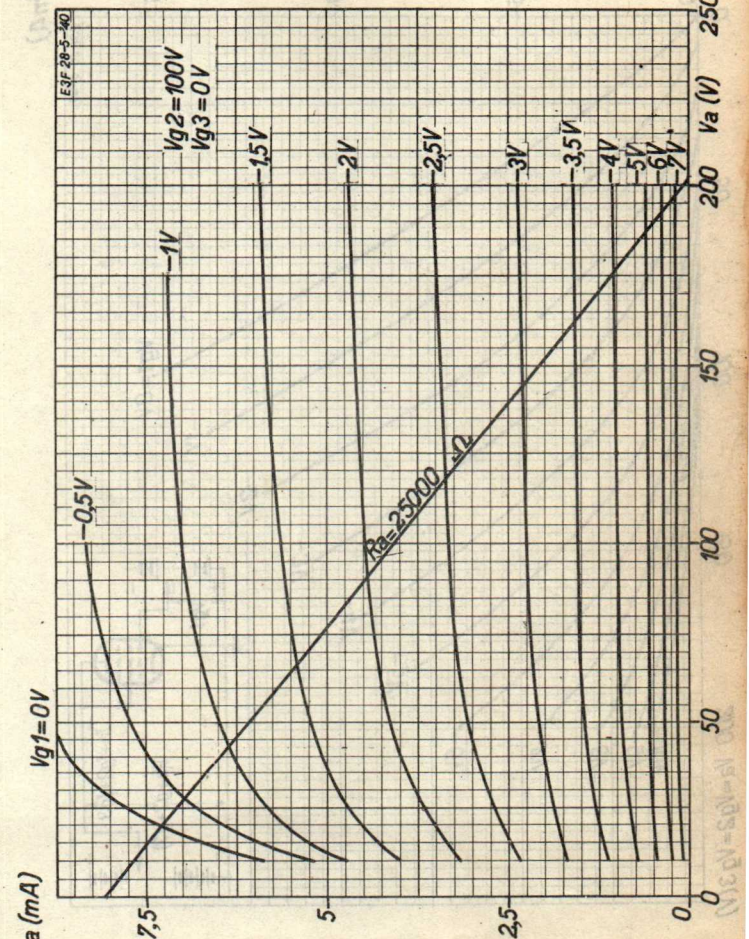
E3F PHILIPS „MINIWATT"



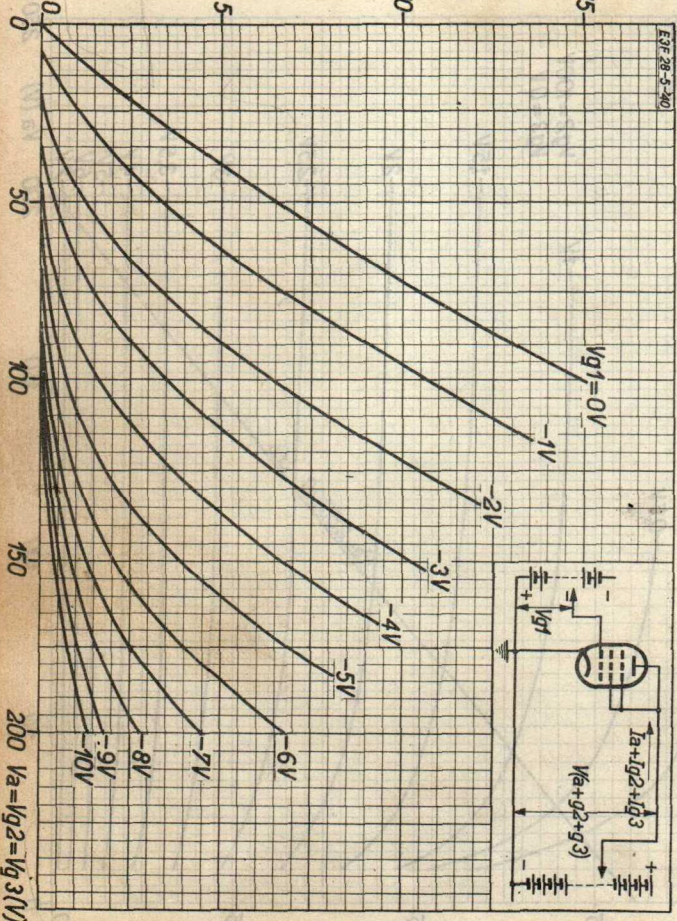

Ia(mA)
E3F 28-5-40
Ia+Ig2+Ig3
V(a+g2+g3)
Vg1
V(a+g2+g3) = 100V
60V
14
12
10
8
6
4
2
0
-10 Vg1 (V)
-8
-6
-4
-2
0


dtot (%)
25
20
15
10
5
0
Vi eff (V)
0
1
2
3
4
5
Wo (W)
0,1
0,2
0,3
0,4
0,5
0,6
0,7
dtot
Vi
Va = 200V
Vg2 = 200V
Vg3 = 0V
Ia = 8 mA
Ra = 2500Ω
Vi
Rk
50µF
Vg2
Ia
Ig2
Va
Vb
Ra
E3F 28-5-'40

PHILIPS „MINIWATT" E3F



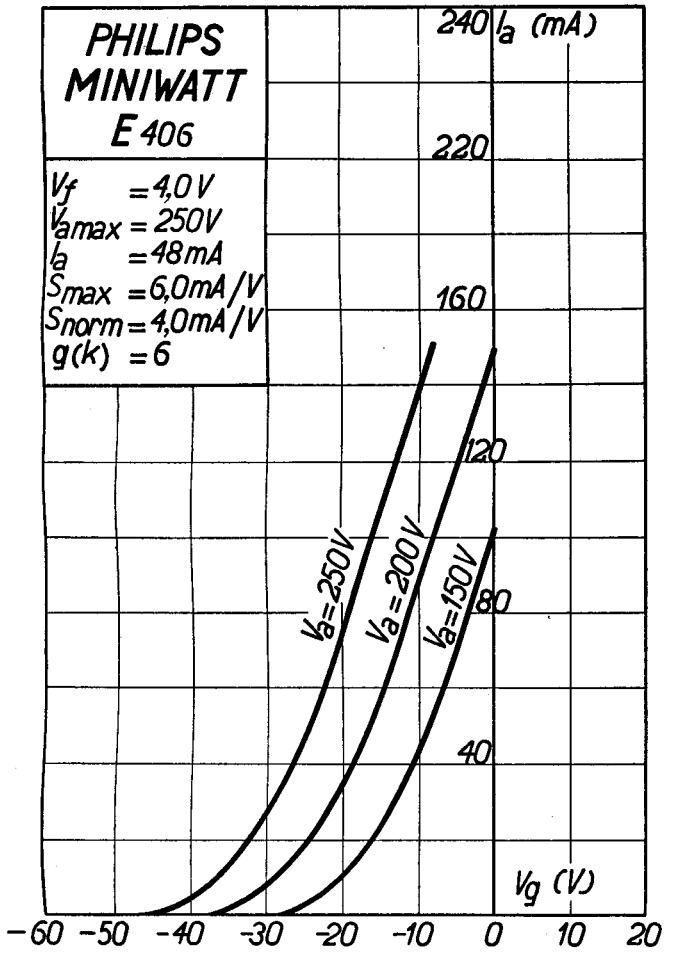
E3F PHILIPS „MINIWATT"



PHILIPS „MINIWATT"

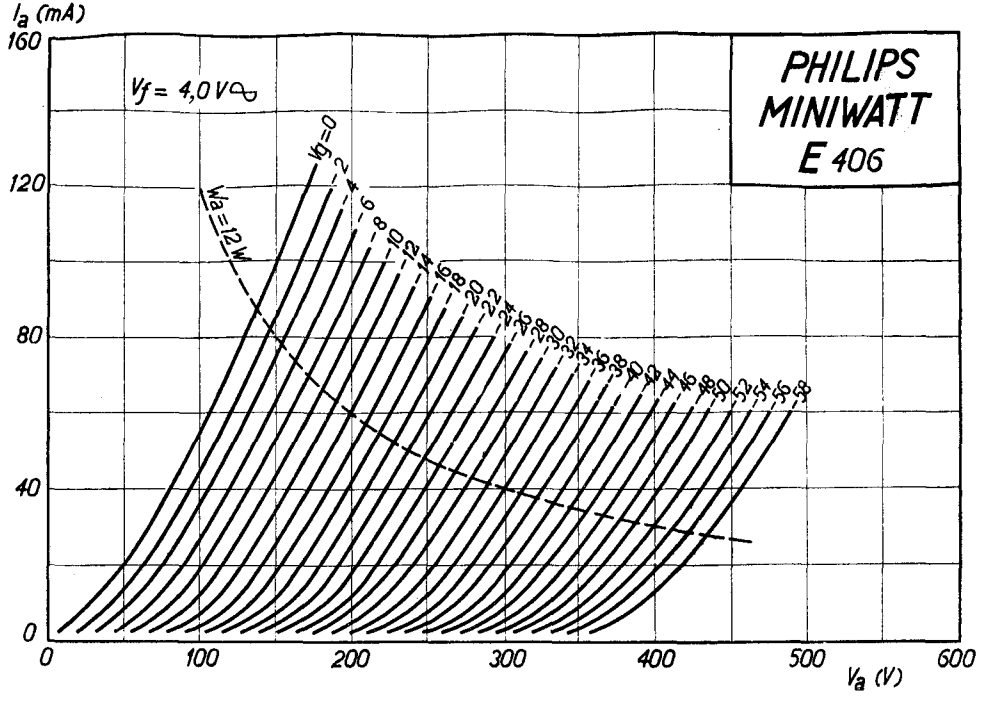
Heizspannung Tension de chauffage Filament voltage	V_f	=	4,0 V
Heizstrom Courant de chauffage Filament current	I_f	=	ca. env. 1,0 A appr.
Anodenspannung Tension anodique Anode voltage	$V_{a\,max}$	=	250 V
Normaler Anodenstrom Courant anodique normal Normal anode current	I_a	=	48 mA
Neg. Gittervorspannung Polarisation négative de grille Negative grid bias	V_g	=	ca. env. 24 V appr.
Verstärkungsfaktor Coefficient d'amplification Amplification factor	$g(k)$	=	6
Steilheit (max.) Inclinaison (max.) Slope (max.)	S_{max}	=	6,0 mA/V
Steilheit (norm.) Inclinaison (norm.) Slope (norm.)	S_{norm}	=	4,0 mA/V
Innerer Widerstand (norm.) Résistance intérieure (norm.) Internal resistance (norm.)	R_i	=	1500 Ohm
Anodenverlustleistung Dissipation anodique Anode dissipation	$W_{a\,max}$	=	12 W
Max. Länge Longueur max. Overall length	l	=	135 mm
Grösster Durchmesser Diamètre max. Max. diameter	d	=	60 mm
Sockel Culot Base		=	A 40
Sockelschaltung Connexion du culot Base connexion		=	S. I

Anwendung: Endstufe
Application: Tube final
Function: Power valve


PHILIPS
MINIWATT
E 406
V_f = 4,0 V
V_{amax} = 250V
I_a = 48mA
S_{max} = 6,0mA/V
S_{norm} = 4,0mA/V
g(k) = 6
240
I_a (mA)
220
160
120
80
40
V_a=250V
V_a=200V
V_a=150V
V_g (V)
−60 −50 −40 −30 −20 −10 0 10 20

PHILIPS „MINIWATT"

Max. Anodenspannung	V_{ao}	= 500 V
Tension anodique max.		
Max. anode voltage	V_{a_L}	= 250 V
Max. Anodenbelastung		
Dissipation anodique max.	W_a	= 12 W
Max. anode dissipation		
Max. Kathodenstrom		
Courant cathodique max.	I_c	= 70 mA
Max. cathode current		
Gitterstrom-Einsatzpunkt		
Point de commenc. du courant de grille	V_{gi}	= −2 V
Starting point of grid current		
Max. Widerstand im Gitterkreis	R_{g1}	= 0,6 M.Ohm
Résistance max. dans le circuit de grille		
Max. resistance in grid circuit	R_{g2}	= 0,2 M.Ohm
Nutzleistung		
Puissance utile	W_o ($V_{g\,eff}$ = 16 V; R_a = 2500 Ω)	= 1,75 W
Output		
Kapazitäten	C_{ag}	= 2,9 μμF
Capacités	C_{ak}	= 2 μμF
Capacities	C_{gk}	= 9,7 μμF


I_a (mA)
160
120
80
40
0
V_f = 4,0 V
PHILIPS
MINIWATT
E 406
W_a = 12 W
V_g=0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
32
34
36
38
40
42
44
46
48
50
52
54
56
58
0
100
200
300
400
500
600
V_a (V)

PHILIPS MODULATORLAMP



Schaal 2 : 3

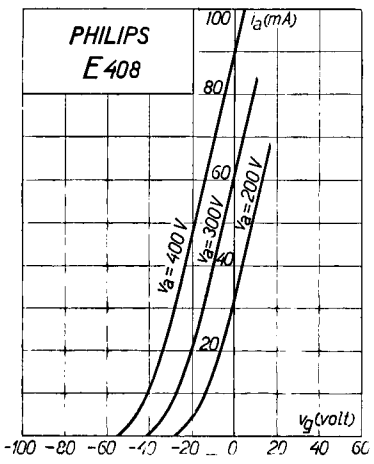
E 408

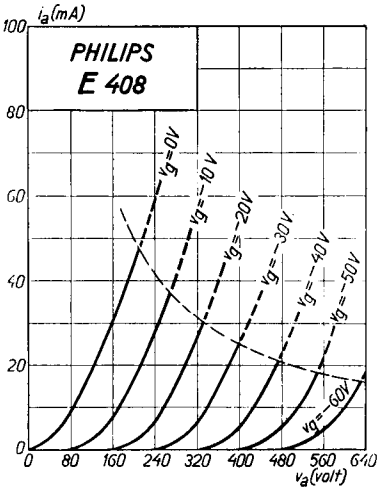
Deze eindversterkerlamp kan gebruikt worden als modulatorlamp voor anodespannings-(Heising) modulatie. De maximale anodedissipatie van 10 W mag niet worden overschreden.

Bij de normale anodespanning van 400 V mag dus de anodestroom hoogstens 25 mA bedragen, hetgeen bij een negatieve roosterspanning van ca. 30 V het geval is. Indien smoorspoelkoppeling wordt toegepast zijn er voor het moduleeren van één TC 04/10 twee E 408 noodig.

PHILIPS MODULATORLAMP

E 408





Gloeispanning	v_f	= 4,0 V
Gloeistroom	i_f	= ca. 0,9 A
Verzadigingsstroom	i_s	= ca. 400 mA
Anodespanning	v_a	= 200—400 V
Maximale anodedissipatie	w_a	= 10 W
Anodedissipatie beproefd op	w_{at}	= 20 W
Versterkingsfactor	g	= ca. 8
Steilheid	S	= ca. 2,0 mA/V
Inwendige weerstand	R_i	= ca. 4000 Ω
Grootste diameter	d	= 55 mm
Grootste lengte	l	= 120 mm

Philips „Miniwatt" E 408 N



3/4 nat. Gr.

Die E 408 N hat einen höchstzulässigen Anodenverlust von 12 W und eignet sich für Verwendung als Endverstärkerröhre in Rundfunkempfangsgeräten, sowie in Verstärkern zum Betriebe von 3 bis 4 elektromagnetischen oder einem oder mehreren elektrodynamischen Lautsprechern für Wohnzimmer oder für kleine Säle.

Diese Röhre kann auch in Verstärkern zum Betriebe von höchstens 100 Lautsprechern oder 400 Kopfhörern verwendet werden. Derartige Anlagen sind in Hotels, Krankenhäusern und ähnlichen Einrichtungen gebräuchlich.

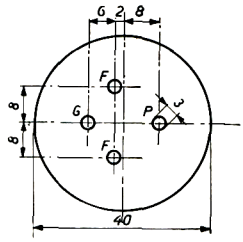
Die E 408 N kommt ausserdem als Vorverstärkerröhre zur PHILIPS MB 2/200 oder MA 4/600 als Endröhre in Betracht.

Für Wechselstromheizung wird der PHILIPS Heiztransformator Nr. 4009 empfohlen. Ein Heizwiderstand ist überflüssig.

Zur Lieferung der Anodenspannung wird die PHILIPS Gleichrichterröhre 505 oder 1071 empfohlen.

Die E 408 N wird normalerweise mit dem Sockel A 40 geliefert.

F = Heizfaden
G = Gitter
P = Anode



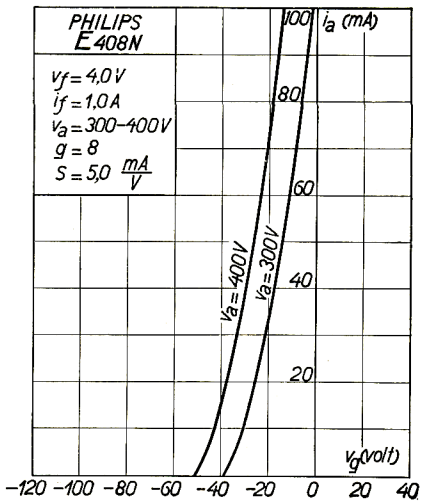
A 40

Philips „Miniwatt" E 408 N

Heizspannung	v_f	= 4,0 V
Heizstrom	i_f	= 1,0 A
Anodenspannung	v_a	= 300-400 V
Höchstzulässiger Anodenverlust	w_a	= 12 W
Verstärkungsfaktor	g	= 8
Steilheit	S	= 5,0 mA/V
Innerer Widerstand	R_i	= 1600 Ω
Negative Gittervorspannung (bei v_a = 400 V)	v_g	= 34 V
Normaler Anodenstrom (bei v_a = 400 V)	i_a	= 30 mA
Länge (ohne Stifte)	l	= 120 mm
Grösster Durchmesser	d	= 55 mm

Um Überlastung der Anode und Verzerrung zu vermeiden, ist folgende negative Gittervorspannung erforderlich:

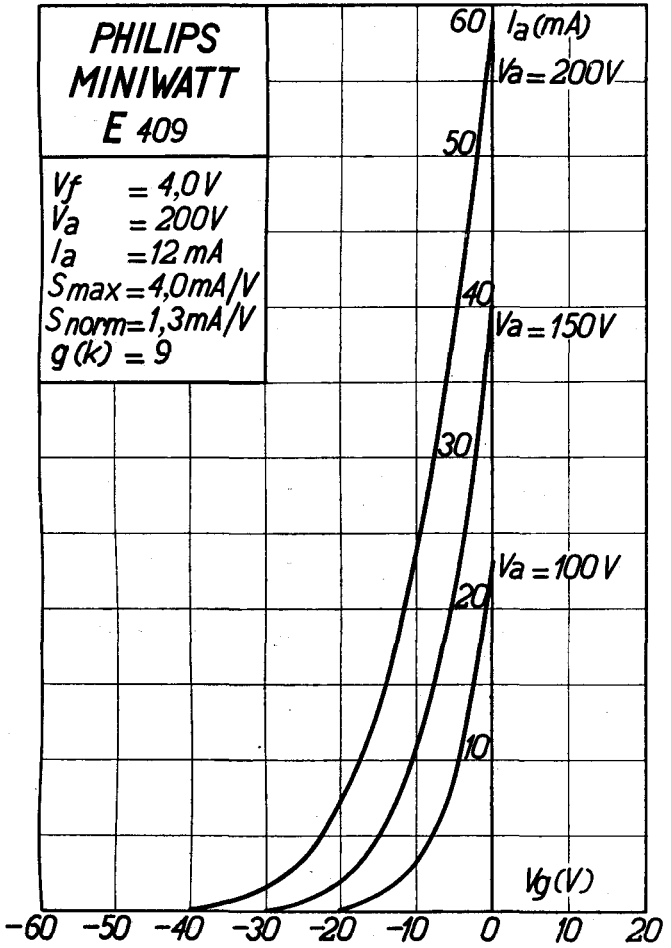
26 V bei 300 V Anodenspannung,
34 V „ 400 V „ .



PHILIPS „MINIWATT"

Heizspannung Tension de chauffage Filament voltage	V_f	=	4,0 V
Heizstrom Courant de chauffage Filament current	I_f	=	ca. env. 1,0 A appr.
Anodenspannung Tension anodique Anode voltage	$V_{a\ max}$	=	200 V
Normaler Anodenstrom Courant anodique normal Normal anode current	I_a	=	12 mA
Neg. Gittervorspannung Polarisation négative de grille Negative grid bias	V_g	=	ca. env. 16 V appr.
Verstärkungsfaktor Coefficient d'amplification Amplification factor	$g(k)$	=	9
Steilheit (max.) Inclinaison (max.) Slope (max.)	S_{max}	=	4 mA/V
Steilheit (norm.) Inclinaison (norm.) Slope (norm.)	S_{norm}	=	1,3 mA/V
Innerer Widerstand (norm.) Résistance intérieure (norm.) Internal resistance (norm.)	R_i	=	7000 Ohm
Max. Länge Longueur max. Overall length	l	=	91 mm
Grösster Durchmesser Diamètre max. Max. diameter	d	=	47 mm
Sockel Culot Base		=	0 35
Sockelschaltung Connexion du culot Base connection		=	S VII

Anwendung: Endstufe
Application: Tube final
Function: Power valve

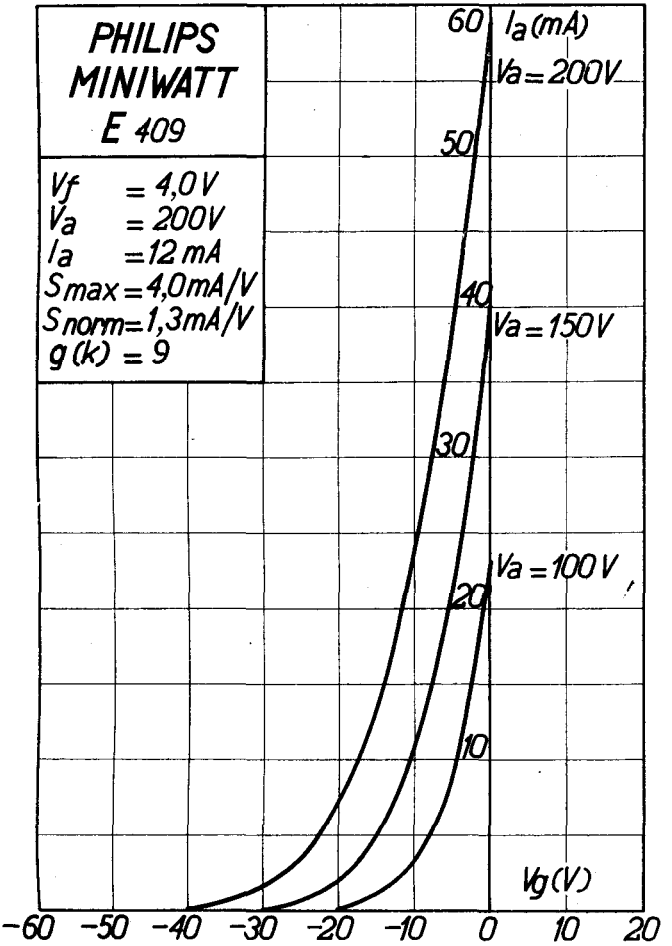

PHILIPS
MINIWATT
E 409
Vf = 4,0 V
Va = 200V
Ia = 12 mA
Smax = 4,0mA/V
Snorm = 1,3mA/V
g(k) = 9
60
Ia (mA)
Va = 200V
50
40
Va = 150V
30
Va = 100V
20
10
Vg (V)
-60
-50
-40
-30
-20
-10
0
10
20

E 409

PHILIPS „MINIWATT"

Heizspannung Tension de chauffage Filament voltage	V_f	=	4,0 V
Heizstrom Courant de chauffage Filament current	I_f	=	ca. env. 1,0 A appr.
Anodenspannung Tension anodique Anode voltage	$V_{a\ max.}$	=	200 V
Normaler Anodenstrom Courant anodique normal Normal anode current	I_a	=	12 mA
Neg. Gittervorspannung Polarisation négative de grille Negative grid bias	V_{g1}	=	ca. env. 16 V appr.
Verstärkungsfaktor Coefficient d'amplification Amplification factor	$g\,(k)$	=	9
Steilheit (max.) Inclinaison (max.) Slope (max.)	S_{max}	=	4 mA/V
Steilheit (norm.) Inclinaison (norm.) Slope (norm.)	$S_{norm.}$	=	1,3 mA/V
Innerer Widerstand (norm.) Résistance intérieure (norm.) Internal resistance (norm.)	R_i	=	7000 Ohm
Max. Länge Longueur max. Overall length	l	=	91 mm
Grösster Durchmesser Diamètre max. Max. diameter	d	=	47 mm
Sockel Culot Base		=	0 35
Sockelschaltung Connexion du culot Base connection		=	VII

Anwendung: Endstufe
Application: Tube final
Function: Power valve

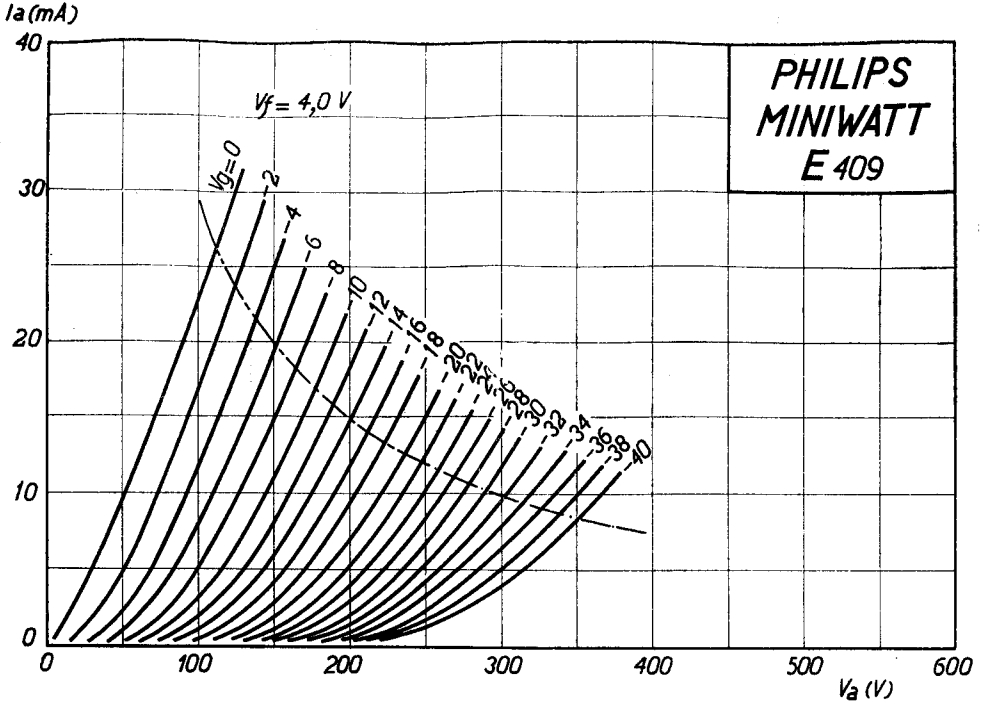

PHILIPS
MINIWATT
E 409
Vf = 4,0 V
Va = 200V
Ia = 12 mA
Smax = 4,0mA/V
Snorm = 1,3mA/V
g (k) = 9
60
50
40
30
20
10
Ia (mA)
Va = 200V
Va = 150V
Va = 100V
Vg (V)
−60
−50
−40
−30
−20
−10
0
10
20

E 409

PHILIPS „MINIWATT"

Max. Anodenspannung Tension anodique max. Max. anode voltage	V_{ao} V_{a_L}	= 400 V = 200 V
Max. Anodenbelastung Dissipation anodique max. Max. anode dissipation	W_a	= 3 W
Max. Kathodenstrom Courant cathodique max. Max. cathode current	I_c	= 30 mA
Gitterstrom-Einsatzpunkt Point de commenc. du courant de grille Starting point of grid current	V_{g1i}	= −1,3 V
Max. Widerstand im Gitterkreis Résistance max. dans le circuit de grille Max. resistance in grid circuit	R_{g1a} R_{g1f}	= 1 M.Ohm = 0,5 M.Ohm
Nutzleistung Puissance utile Output	W_o ($V_{g\,eff}$ = 10,5 V; R_a = 27000 Ohm)	= 0,22 W
Kapazitäten Capacités Capacities	C_{ag1} C_{ac} C_{g1c}	= 4 $\mu\mu$F = 3,2 $\mu\mu$F = 5,1 $\mu\mu$F

2/10'33


Ia (mA)
40
30
20
10
0
Vf = 4,0 V
Vg=0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
-22
-24
-26
-28
-30
-32
-34
-36
-38
-40
0
100
200
300
400
500
600
Va (V)
PHILIPS
MINIWATT
E 409

Philips „Miniwatt" E 414



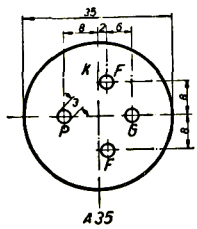
3/4 nat. Gr.

Die E 414 wurde für Transformatorverstärkung und besonders für jene Verstärker entworfen, in denen normale Röhren wegen Selbstklingens Schwierigkeiten ergeben. Diese Erscheinung tritt z.B. bei Mikrophonverstärkern öfters auf. Die Verwendung des PHILIPS N.F.-Transformators Nr. 4003, der in Verbindung mit dieser Röhre eine 42-fache, gleichmässige Verstärkung ergibt, wird sehr empfohlen.

Diese Röhre hat eine indirekt geheizte Kathode und wird für Heizung mit einem 4-V-Akkumulator hergestellt. Ein Heizwiderstand ist überflüssig.

Die E 414 wird normalerweise mit dem Sockel A 35 geliefert.

F = Heizfaden
K = Kathode
G = Gitter
P = Anode

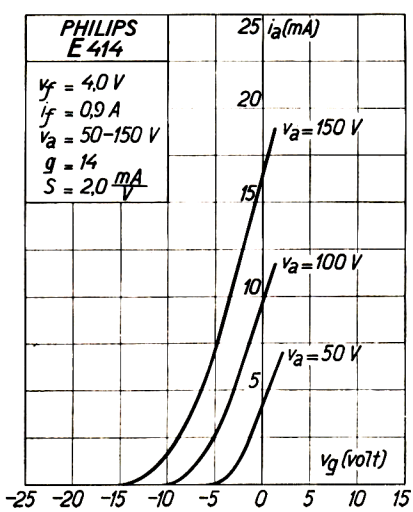


Philips „Miniwatt" E 414

Heizspannung	v_f	= 4,0 V
Heizstrom	i_f	= 0,9 A
Anodenspannung	v_a	= 50-150 V
Verstärkungsfaktor	g	= 14
Steilheit	S	= 2,0 mA/V
Innerer Widerstand	R_i	= 7000 Ω
Negative Gittervorspannung (bei v_a = 150 V)	v_g	= 6 V
Normaler Anodenstrom (bei v_a = 150 V)	i_a	= 6 mA
Länge (ohne Stifte)	l	= 92 mm
Grösster Durchmesser	d	= 52 mm

Für verzerrungsfreie Verstärkung ist folgende negative Gittervorspannung erforderlich:

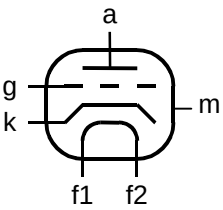
4,5 V bei 120 V Anodenspannung,
6 V „ 150 V „ .

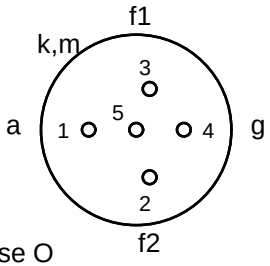


E415 PHILIPS

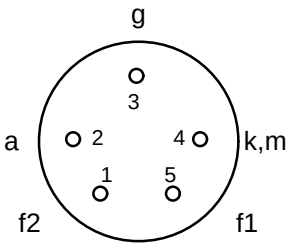
Triode

Dimensions (mm)	91 x 47	
Heating	Vf (V)	4
indirect, AC or DC, parallel	If (A)	1





Base O



Base N

Typical characteristics		
	Va (V)	200
	Ia (mA)	6
	Vg1 (V)	-8
	μ	15
	S (mA/V)	1.4
	Ri (kΩ)	11

E415 PHILIPS

Operating characeristics	Vb (V)	200
	Ra (kΩ)	100
	Rk (kΩ)	6
	Rg1 (kΩ)	1000
	Rg1' (kΩ)	500
	Vo (V)	20
	Vo/Vi	28.5

Philips „Miniwatt" E 424

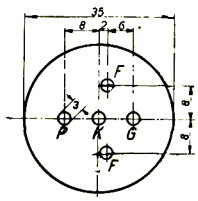


3/4 nat. Gr.

Die E 424 wurde besonders für N.F.-Transformatorverstärkung entworfen.
In Verbindung mit dem PHILIPS N.F.-Transformator Nr. 4003 wird eine gleichmässige und ausserge-wöhnlich kräftige (72 fache) Ver-stärkung erhalten.

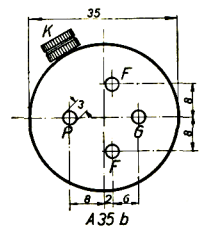
Diese Röhre besitzt eine indirekt geheizte Kathode und eignet sich für Wechselstromheizung. Zur Lieferung des Heizstromes wird der PHILIPS Heiztransformator Nr. 4009 empfohlen.
Ein Heizwiderstand ist überflüssig.

Die E 424 wird normalerweise mit dem Sockel O 35 geliefert, sie kann aber auch mit dem Sockel A 35 b geliefert werden.



O 35

F = Heizfaden
K = Kathode
G = Gitter
P = Anode



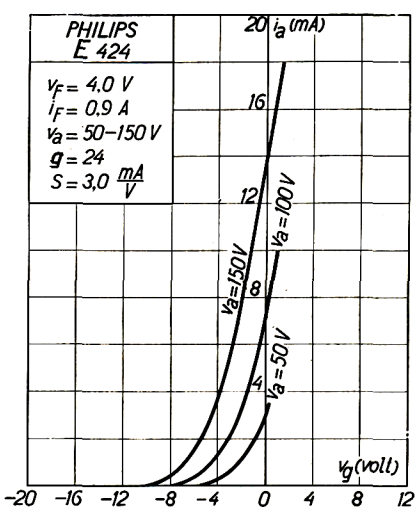
A 35 b

Philips „Miniwatt" E 424

Heizspannung	v_f	=	4,0 V
Heizstrom	i_f	=	0,9 A
Anodenspannung	v_a	=	50-150 V
Verstärkungsfaktor	g	=	24
Steilheit	S	=	3,0 mA/V
Innerer Widerstand	R_i	=	8000 Ω
Negative Gittervorspannung (bei $v_a = 150$ V)	v_g	=	4,5 V
Normaler Anodenstrom (bei $v_a = 150$ V)	i_a	=	3 mA
Länge (ohne Stifte)	l	=	92 mm
Grösster Durchmesser	d	=	52 mm

Verzerrungsfreie Verstärkung erfordert folgende negative Gittervorspannung:

3 V bei 120 V Anodenspannung,
4,5 V „ 150 V „ .



E 424N

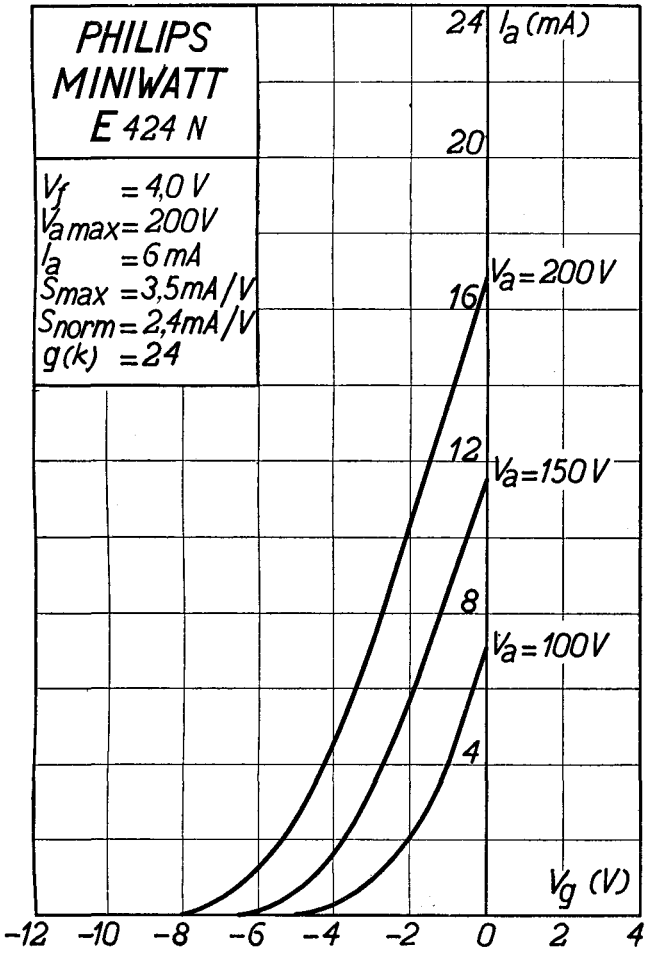
PHILIPS „MINIWATT"

Heizspannung Tension de chauffage Filament voltage	V_f	=	4,0 V
Heizstrom Courant de chauffage Filament current	I_f	=	ca. env. 1,0 A appr.
Anodenspannung Tension anodique Anode voltage	$V_{a\,max}$	=	200 V
Normaler Anodenstrom Courant anodique normal Normal anode current	I_a	=	6 mA
Neg. Gittervorspannung Polarisation négative de grille Negative grid bias	V_g	=	ca. env. 3,5 V appr.
Verstärkungsfaktor Coefficient d'amplification Amplification factor	$g(k)$	=	24
Steilheit (max.) Inclinaison (max.) Slope (max.)	S_{max}	=	3,5 mA/V
Steilheit (norm.) Inclinaison (norm.) Slope (norm.)	S_{norm}	=	2,4 mA/V
Innerer Widerstand (norm.) Résistance intérieure (norm.) Internal resistance (norm.)	R_i	=	10000 Ohm
Anoden-Gitterkapazität Capacité grille-plaque Anode-grid capacity	C_{ag}	=	2 $\mu\mu$F
Max. Länge Longueur max. Overall length	l	=	97 mm
Grösster Durchmesser Diamètre max. Max. diameter	d	=	50 mm
Sockel Culot Base		=	0 35
Sockelschaltung Connexion du culot Base connection		=	S. VII

Anwendung: Audion
Applications: Détecteur
Function: Detector

N.F.-Verstärkung
Amplification b.f.
L.F. amplification

Oszillator
Oscillateur
Oscillator


PHILIPS
MINIWATT
E 424 N
V_f = 4,0 V
V_a max = 200V
I_a = 6 mA
S_{max} = 3,5mA/V
S_{norm} = 2,4mA/V
g(k) = 24
I_a (mA)
24
20
16
12
8
4
V_a = 200 V
V_a = 150 V
V_a = 100 V
V_g (V)
−12
−10
−8
−6
−4
−2
0
2
4

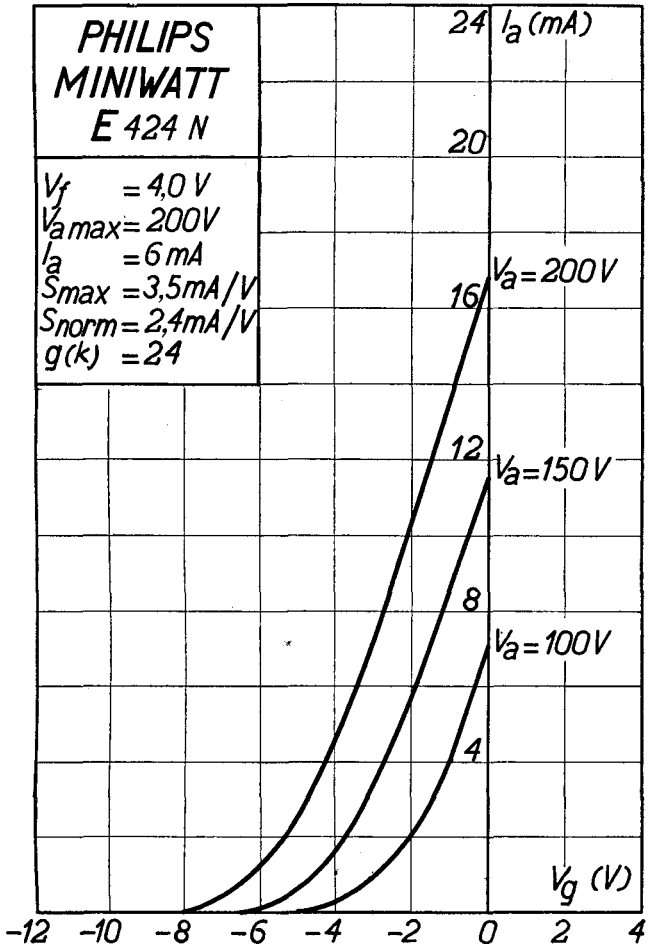
E 424N

PHILIPS „MINIWATT"

Heizspannung Tension de chauffage Filament voltage	V_f	=	4,0 V
Heizstrom Courant de chauffage Filament current	I_f	=	ca. env. 1,0 A appr.
Anodenspannung Tension anodique Anode voltage	$V_{a\,max.}$	=	200 V
Normaler Anodenstrom Courant anodique normal Normal anode current	I_a	=	6 mA
Neg. Gittervorspannung Polarisation négative de grille Negative grid bias	V_g	=	ca. env. 3,5 V appr.
Verstärkungsfaktor Coefficient d'amplification Amplification factor	$g(k)$	=	30
Steilheit (max.) Inclinaison (max.) Slope (max.)	$S_{max.}$	=	3,5 mA/V
Steilheit (norm.) Inclinaison (norm.) Slope (norm.)	$S_{norm.}$	=	2,4 mA/V
Innerer Widerstand (norm.) Résistance intérieure (norm.) Internal resistance (norm.)	R_i	=	12500 Ohm
Anoden-Gitterkapazität Capacité grille-plaque Anode-grid capacity	C_{ag}	=	2 $\mu\mu$F
Max. Länge Longueur max. Overall length	l	=	100 mm
Grösster Durchmesser Diamètre max. Max. diameter	d	=	46 mm
Sockel Culot Base		=	0 35
Sockelschaltung Connexion du culot Base connection		=	S VII

Anwendung: Applications: Function:	Audion Détecteur Detector
	N.F.-Verstärkung Amplification b.f. L.F. amplification
	Oszillator Oscillateur Oscillator

12/7'34

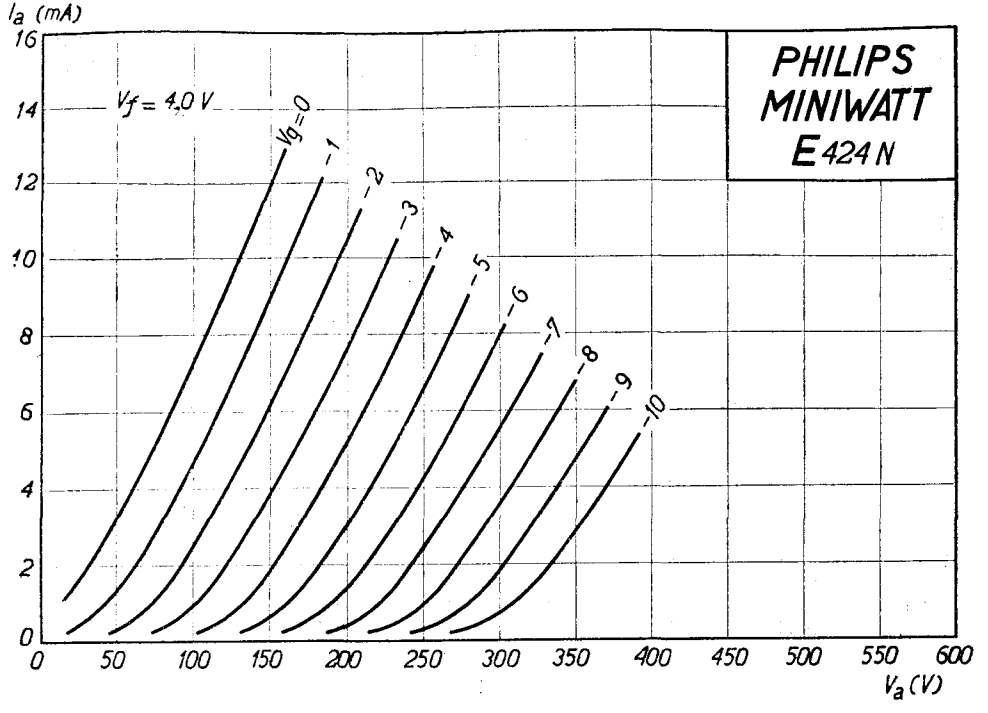

PHILIPS
MINIWATT
E 424 N
V_f = 4,0 V
V_a max = 200V
I_a = 6 mA
S_{max} = 3,5mA/V
S_{norm} = 2,4mA/V
g(k) = 24
24
I_a (mA)
20
16
12
8
4
V_a = 200 V
V_a = 150 V
V_a = 100 V
V_g (V)
-12
-10
-8
-6
-4
-2
0
2
4

E 424N

PHILIPS „MINIWATT"

Max. Anodenspannung Tension anodique max. Max. anode voltage	V_{ao} V_{aR} V_{aL}	= 400 V = 250 V = 200 V
Max. Anodenbelastung Dissipation anodique max. Max. anode dissipation	W_a	= 1,5 W
Max. Kathodenstrom Courant cathodique max. Max. cathode current	I_c	= 15 mA
Gitterstrom-Einsatzpunkt Point de commenc. du courant de grille Starting point of grid current	V_{gi}	= —1,3 V
Max. Widerstand im Gitterkreis Résistance max. dans le circuit de grille Max. resistance in grid circuit	R_{g1} R_{g2}	= 2,0 M.Ohm = 1,0 M.Ohm
Max. Spann. zwischen Faden und Kath. Tension max. entre filament et cathode Max. voltage between filam. and cathode	V_{fc}	= 50 V*)
Max. Widerst. zwischen Faden und Kath. Résist. max. entre filament et cathode Max. resist. betw. filament and cathode	R_{fc}	= 20000 Ohm
Kapazitäten Capacités Capacities	C_{ag} C_{ak} C_{gk}	= 2 $\mu\mu$F = 7 $\mu\mu$F = 5,5 $\mu\mu$F

*) Siehe Erläuterungen
Voir explications
See explanation

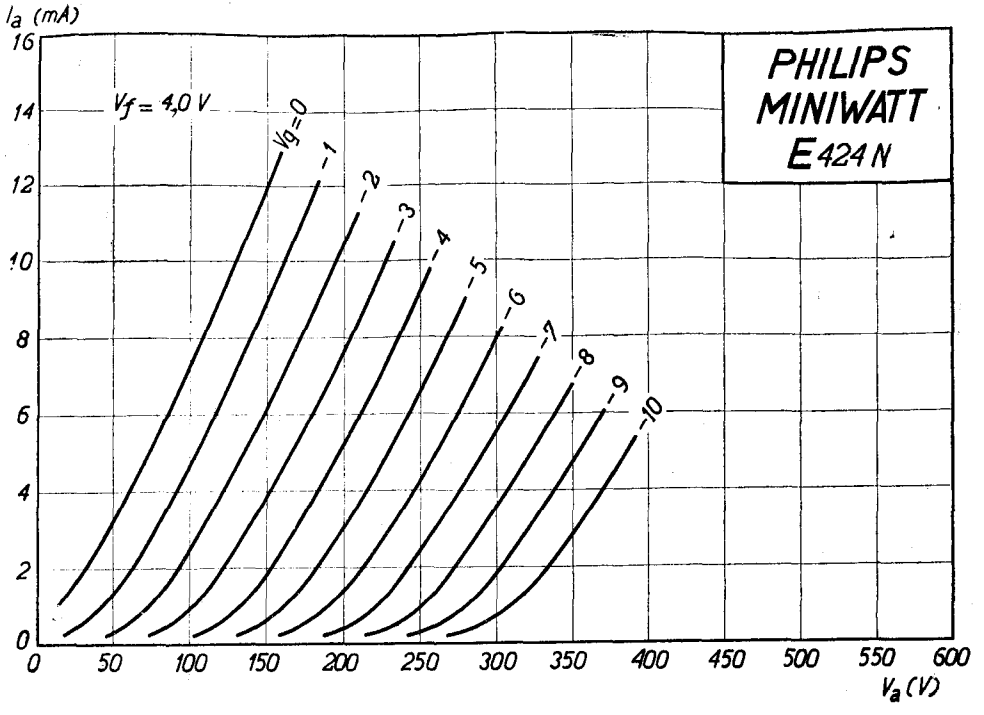

I_a (mA)
16
14
12
10
8
6
4
2
0
V_f = 4,0 V
V_g=0
-1
-2
-3
-4
-5
-6
-7
-8
-9
-10
PHILIPS
MINIWATT
E424N
0
50
100
150
200
250
300
350
400
450
500
550
600
V_a (V)

E 424N

PHILIPS „MINIWATT"

Max. Anodenspannung	V_{ao}	= 400 V
Tension anodique max.	V_{aR}	= 250 V
Max. anode voltage	V_{aL}	= 200 V
Max. Anodenbelastung Dissipation anodique max. Max. anode dissipation	W_a	= 1,5 W
Max. Kathodenstrom Courant cathodique max. Max. cathode current	I_c	= 15 mA
Gitterstrom-Einsatzpunkt Point de commenc. du cour. de grille Starting point of grid current	V_{gi}	= —1,3 V
Max. Widerstand im Gitterkreis	R_{g1}	= 2,0 M.Ohm
Résistance max. dans le circuit de grille		= 1,0 M.Ohm
Max. resistance in grid circuit	R_{g2}	
Max. Spann. zwischen Faden und Kath. Tension max. entre filament et cathode Max. voltage between filam. and cathode	V_{fc}	= 50 V*)
Max. Widerst. zwischen Faden und Kath. Résist. max. entre filament et cathode Max. resist. betw. filament and cathode	R_{fc}	= 20000 Ohm
	C_{ag}	= 2 $\mu\mu$F
Kapazitäten	C_{ak}	= 5,5 $\mu\mu$F
Capacités	C_{gk}	= 5,5 $\mu\mu$F
Capacities		

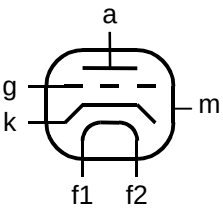
*) Siehe Erläuterungen
Voir explications
See explanation

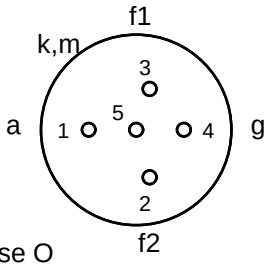

I_a (mA)
16
14
12
10
8
6
4
2
0
V_f = 4,0 V
V_g=0
-1
-2
-3
-4
-5
-6
-7
-8
-9
-10
PHILIPS
MINIWATT
E424N
0
50
100
150
200
250
300
350
400
450
500
550
600
V_a (V)

E428 PHILIPS

Triode

Dimensions (mm)	97 x 50	
Heating	Vf (V)	4
indirect, AC or DC, parallel	If (A)	1





Base O

Typical characteristics		
	Va (V)	200
	Ia (mA)	6
	Vg1 (V)	-3.5
	μ	28
	S (mA/V)	2.4
	Ri (kΩ)	11.5

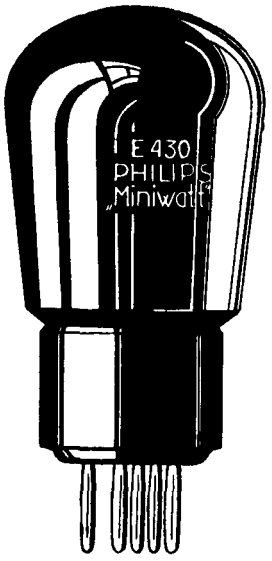
Operating characeristics	Vb (V)	200
	Ra (kΩ)	250
	Rk (kΩ)	7
	Rg1 (kΩ)	1000
	Rg1' (kΩ)	1000
	Vo (V)	10
	Vo/Vi	20

Philips Wisselstroomlamp

„Miniwatt"

E 430

Detector- en versterkerlamp met indirect verhitte kathode

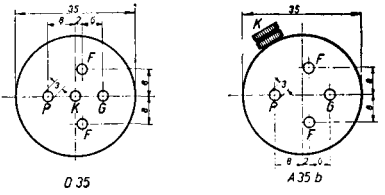


Deze lamp met indirect verhitte kathode is speciaal ontworpen als laagfrequent-versterkerlamp en detector voor weerstand-koppeling.

Door de groote steilheid en hoogen versterkingsfactor kan een aanzienlijke versterking verkregen worden.

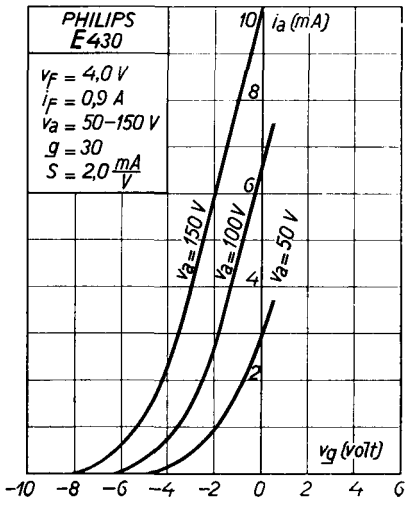
De lamp is ook zeer geschikt voor gebruik in geneutrodyniseerde hoogfrequentversterkers.

De eigenschappen van deze lamp zijn:



E 430 kan met bovenstaande hulzen geleverd worden.

Gloeispanning	v_f	= **4,0** V
Gloeistroom	i_f	= **0,9** A
Anodespanning	v_a	= **50—150** V
Versterkingsfactor	g	= **30**
Steilheid	S	= **2,0** mA/V
Inwendige weerstand	R_i	= **15000** Ω
Negatieve roosterspanning	v_g	= **3** V
Normale anodestroom	i_a	= **4** mA
Anode-roostercapaciteit	C_{ag}	= **2,5** $\mu\mu$F
Grootste lengte	l	= **92** mm
Grootste diameter	d	= **52** mm



Prijs: fl. **12,50**

Philips Wisselstroomlamp

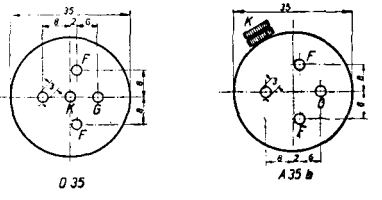
„Miniwatt"

E 435

Hoogfrequentversterkerlamp met indirect verhitte kathode

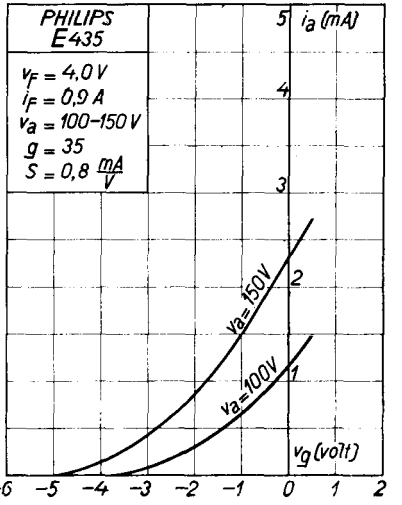


Deze lamp is een speciaal voor hoogfrequentversterking geconstrueerde wisselstroomlamp met indirect verhitte kathode, met zeer geringe anode-roostercapaciteit, Tengevolge van dit laatste is de werking van deze lamp in een hoogfrequentversterker volkomen stabiel, mits voldoende zorg aan de opstelling der onderdeelen wordt besteed. De te bereiken versterking is minder groot dan met E 442, maar toch zeer aanzienlijk. De lamp E 435 leent zich bijzonder voor het veranderen van bestaande toestellen voor accuvoeding (b.v. volgens het Koomansschema) voor wisselstroomvoeding.
De eigenschappen van dit lamptype zijn:



E 435 kan met bovenstaande hulzen geleverd worden.

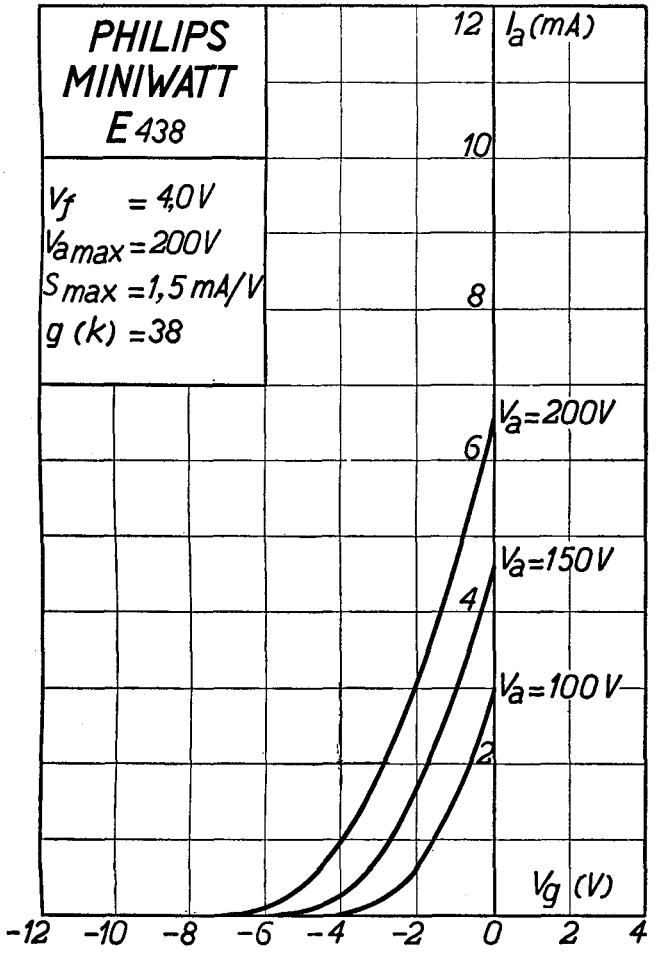
Gloeispanning	v_f	= **4,0** V
Gloeistroom	i_f	= **0,9** A
Anodespanning	v_a	= **100—150** V
Versterkingsfactor	g	= **35**
Steilheid	S	= **0,8** mA/V
Inwendige weerstand	R_i	= **44000** Ω
Negatieve roosterspanning	v_g	= **1** V
Normale anodestroom	i_a	= **1,5** mA
Anode-roostercapaciteit	C_{ag}	= **0,3** $\mu\mu$F
Grootste lengte	l	= **108** mm
Grootste diameter	d	= **52** mm



Prijs: fl. **12,50**

Heizspannung Tension de chauffage Filament voltage	V_f	=	4,0 V
Heizstrom Courant de chauffage Filament current	I_f	=	ca. env. 1,0 A appr.
Anodenspannung Tension anodique Anode voltage	$V_{a\,max.}$	=	200 V
Verstärkungsfaktor Coefficient d'amplification Amplification factor	$g(k)$	=	38
Steilheit (max.) Inclinaison (max.) Slope (max.)	$S_{max.}$	=	1,5 mA/V
Äusserer Widerstand Résistance extérieure External resistance	R_a	=	0,3 M.Ohm
Normaler Anodenstrom Courant anodique normal Normal anode current	I_a	=	0,3 mA
Neg. Gittervorspannung Polarisation négative de grille Negative grid bias	V_g	=	2,5 V
Innerer Widerstand (norm.) Résistance intérieure (norm.) Internal resistance (norm.)	R_i	=	120000 Ohm
Äusserer Widerstand Résistance extérieure External resistance	R_a	=	1 M.Ohm
Normaler Anodenstrom Courant anodique normal Normal anode current	I_a	=	0,1 mA
Neg. Gittervorspannung Polarisation négative de grille Negative grid bias	V_g	=	ca. env. 2,5 V appr.
Innerer Widerstand (norm.) Résistance intérieure (norm.) Internal resistance (norm.)	R_i	=	400.000 Ohm
Anoden-Gitterkapazität Capacité grille-plaque Anode-grid capacity	C_{ag}	=	3 $\mu\mu$F
Max. Länge Longueur max. Overall length	l	=	91 mm
Grösster Durchmesser Diamètre max. Max. diameter	d	=	47 mm
Sockel Culot Base		=	O 35
Sockelschaltung Connexion du culot Base connection		=	S VII

Anwendung: Audion mit Widerstandskopplung
Applications: Détecteur avec couplage par résistance
Function: Detector with resistance coupling
N.F.-Verstärker mit Widerstandskopplung
Amplificateur b.f. avec couplage par résistance
L.F. amplifier with resistance coupling

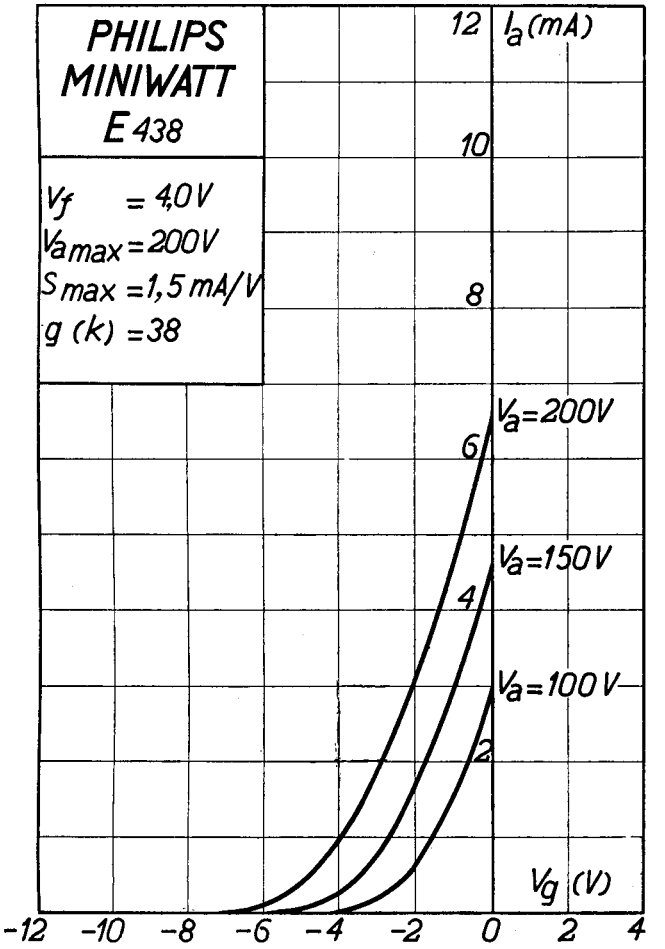

PHILIPS
MINIWATT
E 438
Vf = 4,0 V
Va max = 200 V
S max = 1,5 mA/V
g (k) = 38
12
Ia (mA)
10
8
6
4
2
Va = 200 V
Va = 150 V
Va = 100 V
Vg (V)
-12
-10
-8
-6
-4
-2
0
2
4

Heizspannung Tension de chauffage Filament voltage	v_f	=	4,0 V
Heizstrom Courant de chauffage Filament current	i_f	=	ca. env. 1,0 A appr.
Anodenspannung Tension anodique Anode voltage	$v_{a\,max}$	=	200 V
Verstärkungsfaktor Coefficient d'amplification Amplification factor	$g\,(k)$	=	38
Steilheit (max.) Inclinaison (max.) Slope (max.)	S_{max}	=	1,5 mA/V
Äusserer Widerstand Résistance extérieure External resistance	R_a	=	0,3 M.Ohm
Normaler Anodenstrom Courant anodique normal Normal anode current	i_a	=	0,3 mA
Neg. Gittervorspannung Polarisation négative de grille Negative grid bias	v_g	=	2,5 V
Innerer Widerstand (norm.) Résistance intérieure (norm.) Internal resistance (norm.)	R_i	=	120000 Ohm
Äusserer Widerstand **Résistance extérieure** **External resistance**	R_a	=	1 M.Ohm
Normaler Anodenstrom Courant anodique normal Normal anode current	i_a	=	0,1 mA
Neg. Gittervorspannung Polarisation négative de grille Negative grid bias	v_g	=	ca. env. 2,5 V appr.
Innerer Widerstand (norm.) Résistance intérieure (norm.) Internal resistance (norm.)	R_i	=	400.000 Ohm
Anoden-Gitterkapazität Capacité grille-plaque Anode-grid capacity	C_{ag}	=	3 $\mu\mu$F
Max. Länge Longueur max. Overall length	l	=	91 mm
Grösster Durchmesser Diamètre max. Max. diameter	d	=	47 mm
Sockel Culot Base		=	O 35
Sockelschaltung Connexion du culot Base connection		=	S VII

Anwendung: Audion mit Widerstandskopplung
Applications: Détecteur avec couplage par résistance
Function: Detector with resistance coupling

N.F.-Verstärker mit Widerstandskopplung
Amplificateur b.f. avec couplage par résistance
L.F. amplifier with resistance coupling

9/6'33

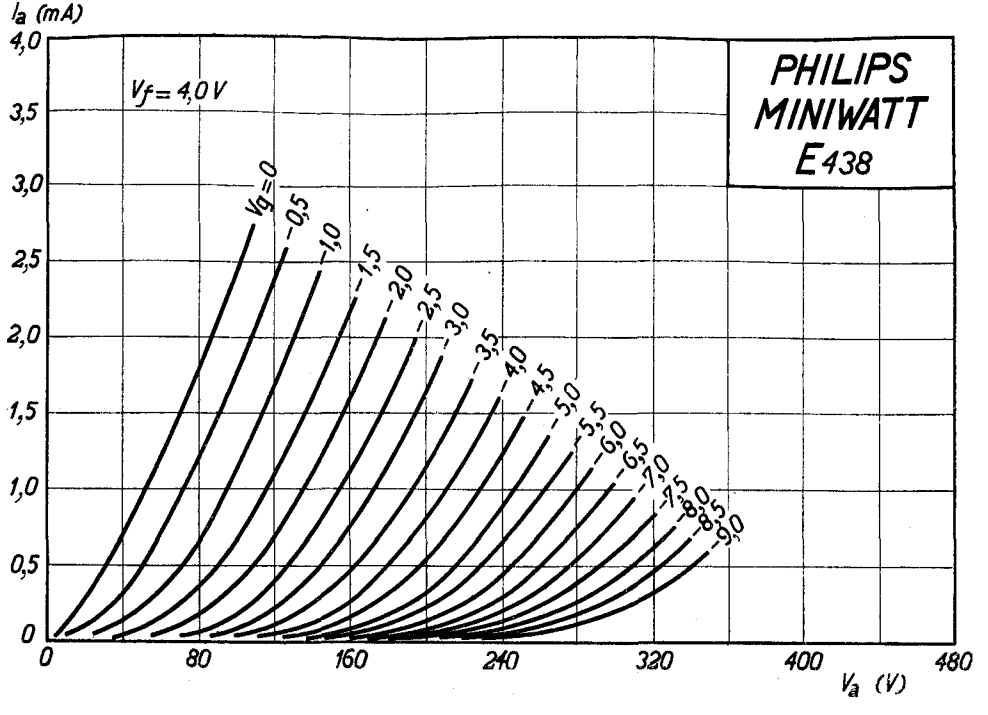

PHILIPS
MINIWATT
E 438
Vf = 4,0 V
Va max = 200 V
S max = 1,5 mA/V
g (k) = 38
12
Ia (mA)
10
8
6
4
2
Va = 200 V
Va = 150 V
Va = 100 V
Vg (V)
-12
-10
-8
-6
-4
-2
0
2
4

E 438

PHILIPS „MINIWATT"

Max. Anodenspannung Tension anodique max. Max. anode voltage	V_{ao} V_{aR} V_{a_L}	= 400 V = 250 V = 200 V
Max. Anodenbelastung *Dissipation anodique max.* Max. anode dissipation	W_a	= 1,5 W
Max. Kathodenstrom Courant cathodique max. Max. cathode current	I_c	= 15 mA
Gitterstrom-Einsatzpunkt Point de commenc. du courant de grille Starting point of grid current	V_{gi}	= −1,3 V
Max. Widerstand im Gitterkreis Résistance max. dans le circuit de grille Max. resistance in grid circuit	R_{g1} R_{g2}	= 2,0 M.Ohm = 1,0 M.Ohm
Max. Spann. zwischen Faden und Kath. Tension max. entre filament et cathode Max. voltage between filam. and cathode	V_{fc}	= 50 V*)
Max. Widerst. zwischen Faden und Kath. Résist. max. entre filament et cathode Max. resist. betw. filament and cathode	R_{fc}	= 20000 Ohm
Kapazitäten Capacités Capacities	C_{ag} C_{ak} C_{gk}	= 3 $\mu\mu$F = 5,5 $\mu\mu$F = 5,6 $\mu\mu$F

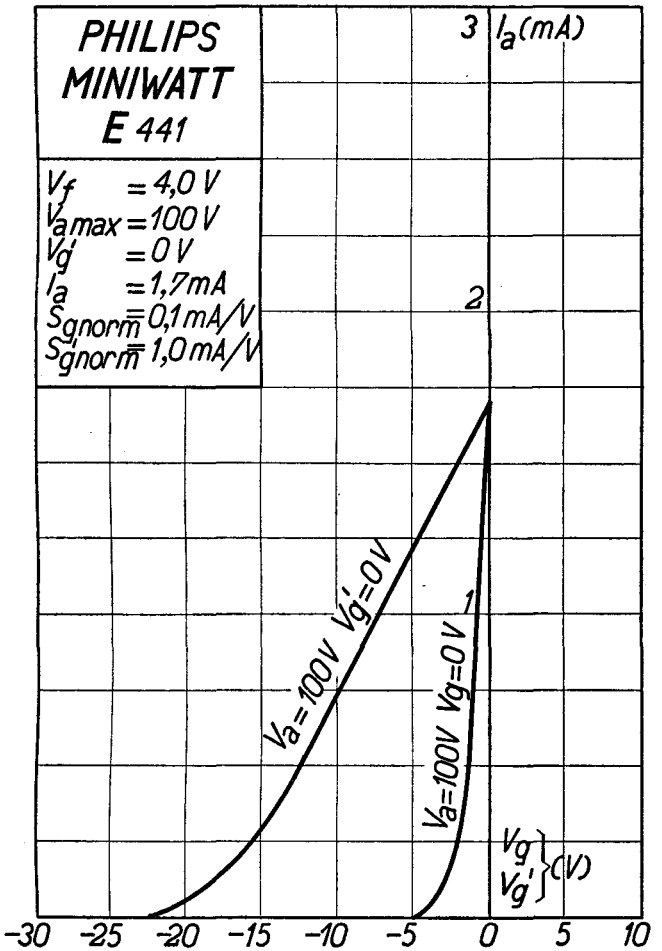
*) Siehe Erläuterungen
Voir explications
See explanation


I_a (mA)
4,0
3,5
3,0
2,5
2,0
1,5
1,0
0,5
0
$V_f = 4,0\,V$
$V_g = 0$
−0,5
−1,0
−1,5
−2,0
−2,5
−3,0
−3,5
−4,0
−4,5
−5,0
−5,5
−6,0
−6,5
−7,0
−7,5
−8,0
−8,5
−9,0
PHILIPS
MINIWATT
E 438
0
80
160
240
320
400
480
V_a (V)

PHILIPS „MINIWATT"

Heizspannung Tension de chauffage Filament voltage	V_f	=	4,0 V
Heizstrom Courant de chauffage Filament current	I_f	=	ca. env. 0,9 A appr.
Anodenspannung Tension anodique Anode voltage	$V_{a\ max}$	=	100 V
Hilfsgitterspannung Tension auxiliaire de grille Auxiliary grid voltage	$V_{g'}$	=	0 V
Normaler Anodenstrom Courant anodique normal Normal anode current	I_a	=	1,7 mA
Neg. Gittervorspannung Polarisation négative de grille Negative grid bias	V_g	=	0 V
Steilheit (norm.) Inclinaison (norm.) Slope (norm.)	$S_{g\,norm.}$	=	0,1 mA/V
Steilheit (norm.) Inclinaison (norm.) Slope (norm.)	$S_{g'\,norm.}$	=	1,0 mA/V
Max. Länge Longueur max. Overall length	l	=	92 mm
Grösster Durchmesser Diamètre max. Max. diameter	d	=	51 mm
Sockel Culot Base		=	0 35b
Sockelschaltung Connexion du culot Base connection		=	S XII

Anwendung:	Oszillator-Modulator
Application:	Oscillateur-modulateur
Function:	Oscillator-modulator


PHILIPS
MINIWATT
E 441
V_f = 4,0 V
V_a max = 100 V
V_g' = 0 V
I_a = 1,7 mA
S_{gnorm} = 0,1 mA/V
S_{gnorm} = 1,0 mA/V
3
2
1
I_a(mA)
V_a=100V V_g'=0V
V_a=100V V_g=0V
V_g
V_g'
(V)
-30
-25
-20
-15
-10
-5
0
5
10

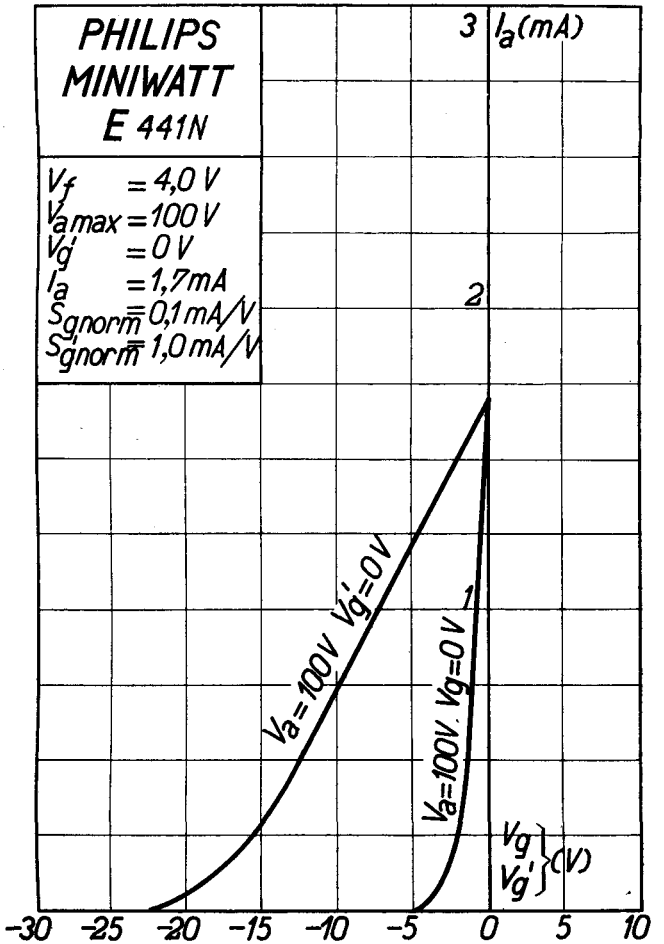
E 441N

PHILIPS „MINIWATT"

Heizspannung Tension de chauffage Filament voltage	V_f	=	4,0 V
Heizstrom Courant de chauffage Filament current	I_f	=	ca. env. 1,0 A appr.
Anodenspannung Tension anodique Anode voltage	$V_{a\ max.}$	=	100 V
Hilfsgitterspannung Tension auxiliaire de grille Auxiliary-grid voltage	V_{g2}	=	0 V
Normaler Anodenstrom Courant anodique normal Normal anode current	I_a	=	1,7 mA
Neg. Gittervorspannung Polarisation négative de grille Negative grid bias	V_{g1}	=	0 V
Steilheit (norm.) Inclinaison (norm.) Slope (norm.)	$S_{\text{norm.}}$	=	0,1 mA/V
Steilheit (norm.) Inclinaison (norm.) Slope (norm.)	$S_{g2\ \text{norm}}$	=	1,0 mA/V
Max. Länge Longueur max. Overall length	l	=	95 mm
Grösster Durchmesser Diamètre max. Max. diameter	d	=	45 mm
Sockel Culot Base		=	0,35b
Sockelschaltung Connexion du culot Base connection		=	S XII

Anwendung: Oszillator-Modulator
Application: Oscillateur-modulateur
Function: *Oscillator-modulator*

2/10'33


PHILIPS
MINIWATT
E 441N
V_f = 4,0 V
V_a max = 100 V
V_g' = 0 V
I_a = 1,7 mA
S_{gnorm} = 0,1 mA/V
S_{gnorm} = 1,0 mA/V
3
I_a (mA)
2
1
V_a=100V V_g'=0V
V_a=100V. V_g=0 V
V_g
V_g'
(V)
-30 -25 -20 -15 -10 -5 0 5 10

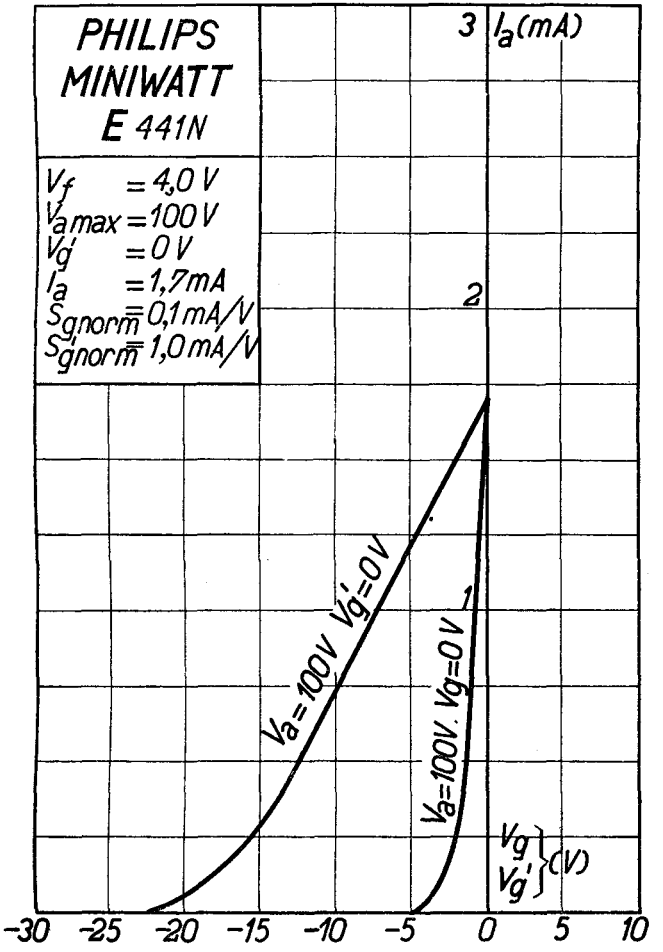
E 441N

PHILIPS „MINIWATT"

Heizspannung Tension de chauffage Filament voltage	V_f	=	4,0 V
Heizstrom Courant de chauffage Filament current	I_f	=	ca. env. 1,0 A appr.
Anodenspannung Tension anodique Anode voltage	$V_{a\ max.}$	=	100 V
Hilfgitterspannung Tension auxiliaire de grille Auxiliary-grid voltage	$V_{g'}$	=	0 V
Normaler Anodenstrom Courant anodique normal Normal anode current	I_a	=	1,7 mA
Neg. Gittervorspannung Polarisation négative de grille Negative grid bias	V_g	=	0 V
Steilheit (norm.) Inclinaison (norm.) Slope (norm.)	$S_{g\ norm}$	=	0,1 mA/V
Steilheit (norm.) Inclinaison (norm.) Slope (norm.)	$S_{g'\ norm}$	=	1,0 mA/V
Max. Länge Longueur max. Overall length	l	=	95 mm
Grösster Durchmesser Diamètre max. Max. diameter	d	=	45 mm
Sockel Culot Base		=	035b
Sockelschaltung Connexion du culot Base connection		=	S XII

Anwendung: Oszillator-Modulator
Application: Oscillateur-modulateur
Function: Oscillator-modulator

30/11'33


PHILIPS
MINIWATT
E 441N
V_f = 4,0 V
$V_{a\,max}$ = 100 V
$V_{g'}$ = 0 V
I_a = 1,7 mA
$S_{g\,norm}$ = 0,1 mA/V
$S_{g'\,norm}$ = 1,0 mA/V
3
I_a(mA)
2
1
V_a=100V $V_{g'}$=0V
V_a=100V. V_g=0 V
V_g
$V_{g'}$
(V)
-30 -25 -20 -15 -10 -5 0 5 10

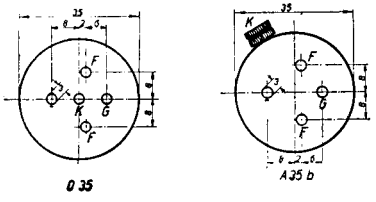
Philips Wisselstroomlamp

„Miniwatt"

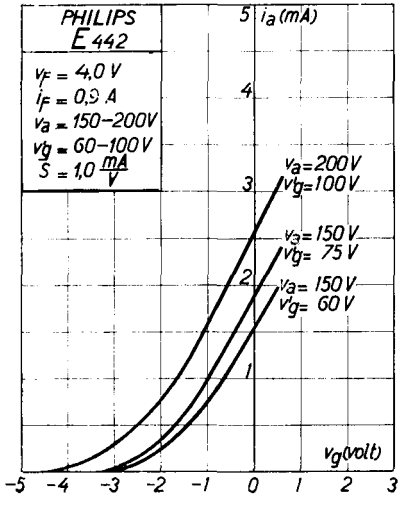
E 442

Schermrooster-hoogfrequentversterkerlamp met indirect verhitte kathode





E 442 kan met bovenstaande hulzen geleverd worden.



Dit is een speciaal voor hoogfrequentversterking geconstrueerde schermroosterlamp met indirect verhitte kathode.

Bij gebruik van goede spoelen kan een buitengewoon groote versterking verkregen worden, terwijl de eigenschappen van deze lamp de selectiviteit van het toestel zeer bevorderen.

Niettegenstaande de groote versterking is de werking van een hoogfrequentversterker, waarin deze lamp wordt toegepast, volkomen stabiel, mits voldoende zorg besteed wordt aan de juiste opstelling der onderdeelen; deze moet op zoodanige wijze plaats vinden, dat de plaat- en roosterkringen elkaar noch inductief noch capacitief beïnvloeden.

Bij juiste montage wordt geen burenstoring veroorzaakt. Uitvoerige aanwijzingen vindt men in het pakbriefje. De eigenschappen van deze lamp zijn:

Gloeispanning	v_f	= **4,0** V
Gloeistroom	i_f	= **0,9** A
Anodespanning	v_a	= **150—200** V
Schermroosterspanning	v'_g	= **60—100** V
Steilheid	S	= **1,0** mA/V
Negatieve roosterspanning	v_g	= **0,75** V
Normale anodestroom	i_a	= **1,8** mA
Anode-roostercapaciteit	C_{ag}	= **0,001** $\mu\mu$F
Grootste lengte	l	= **112** mm
Grootste diameter	d	= **47** mm

Prijs: fl. **12,50**

E 442S

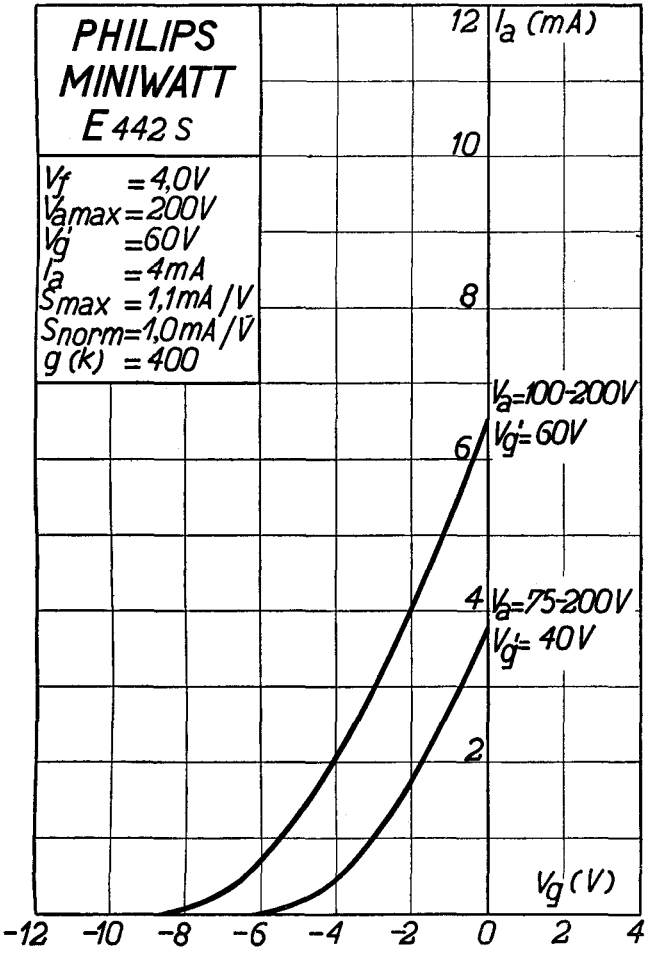
PHILIPS „MINIWATT"

Heizspannung Tension de chauffage Filament voltage	V_f	=	4,0 V
Heizstrom Courant de chauffage Filament current	I_f	=	ca. env. 1,0 A appr.
Anodenspannung Tension anodique Anode voltage	$V_{a\,max}$	=	200 V
Schirmgitterspannung Tension de grille-écran Screen-grid voltage	$V_{g'}$	=	60 V
Normaler Anodenstrom Courant anodique normal Normal anode current	I_a	=	4 mA
Neg. Gittervorspannung Polarisation négative de grille Negative grid bias	V_g	=	ca. env. 2 V appr.
Verstärkungsfaktor Coefficient d'amplification Amplification factor	$g(k)$	=	400
Steilheit (max.) Inclinaison (max.) Slope (max.)	S_{max}	=	1,1 mA/V
Steilheit (norm.) Inclinaison (norm.) Slope (norm.)	S_{norm}	=	1,0 mA/V
Innerer Widerstand (norm.) Résistance intérieure (norm.) Internal resistance (norm.)	R_i	=	400000 Ohm
Anoden-Gitterkapazität Capacité grille-plaque Anode-grid capacity	C_{ag}	=	0,02 $\mu\mu$F
Max. Länge Longueur max. Overall length	l	=	120 mm
Grösster Durchmesser Diamètre max. Max. diameter	d	=	52 mm
Sockel Culot Base		=	0 35
Sockelschaltung Connexion du culot Base connection		=	S X

Anwendung: Applications: Function:	H.F.-Verstärkung Amplification h.f. H.F. amplification	Z.F.-Verstärkung Amplification m.f. I.F. amplification

Anodengleichrichtung
Détection par caractéristique plaque
Anode bend detector

N.F.-Verstärker mit Widerstandskopplung
Amplificateur b.f. avec couplage par résistance
L.F. amplifier with resistance coupling

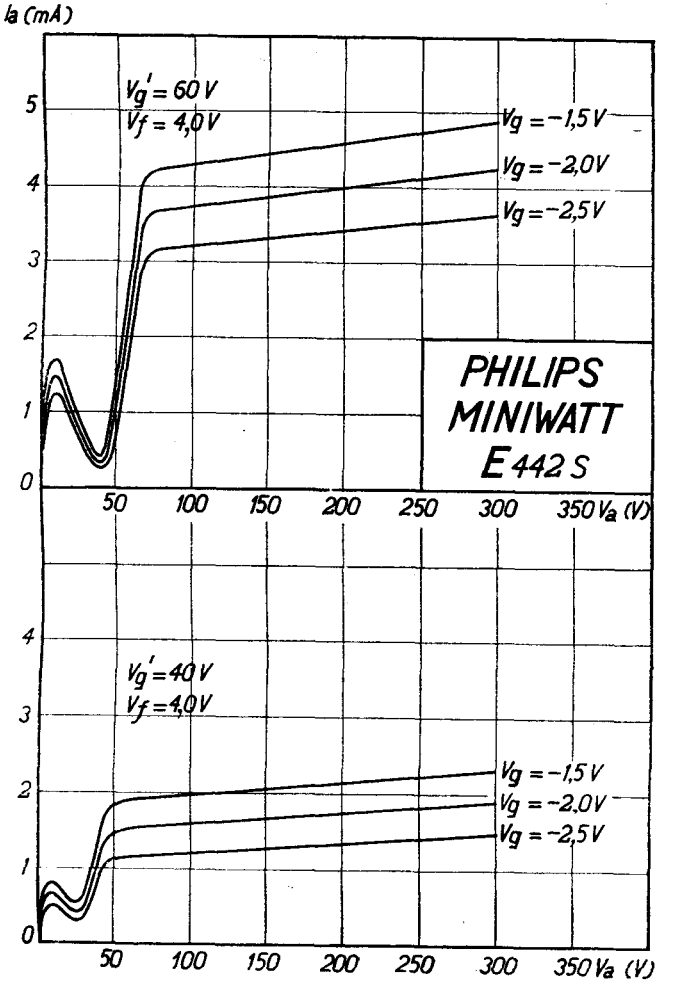

PHILIPS
MINIWATT
E 442 S
Vf = 4,0V
Vamax = 200V
Vg' = 60V
Ia = 4mA
Smax = 1,1mA/V
Snorm = 1,0mA/V
g (k) = 400
12
Ia (mA)
10
8
6
4
2
Va=100-200V
Vg'= 60V
Va=75-200V
Vg'= 40V
Vg (V)
-12
-10
-8
-6
-4
-2
0
2
4

E 442S

PHILIPS „MINIWATT"

Max. Anodenspannung Tension anodique max. Max. anode voltage	V_{ao} V_{aR} V_{aL}	= 400 V = 250 V = 200 V
Max. Anodenbelastung Dissipation anodique max. Max. anode dissipation	W_a	= 1,0 W
Max. Kathodenstrom Courant cathodique max. Max. cathode current	I_c	= 10 mA
Max. Schirmgitterspannung Tension de grille-écran max. Max. screen-grid voltage	$V_{g'o}$ $V_{g'}$	= 400 V = V_a —50 V max. 100 V
Max. Schirmgitterbelastung Dissipation de grille-écran max. Max. screen-grid dissipation	$W_{g'}$	= 0,25 W
Mittlerer Schirmgitterstrom Courant de grille-écran moyen Average screen-grid current	$I_{g'}$	= 0,5 mA
Ungefähre Grenzw. des Schirmgitterstr. Limites approxim. du cour. de gr.-écran Approx. limits of screen-grid current	$I_{g'}$ min. $I_{g'}$ max.	= 0.1 mA = 1,0 mA
Gitterstrom-Einsatzpunkt Point de commenc. du courant de grille Starting point of grid current	V_{gi}	= —1,3 V
Max. Widerstand im Gitterkreis Résistance max. dans le circuit de grille Max. resistance in grid circuit	R_{g1} R_{g2}	= 1,5 M.Ohm = 1,0 M.Ohm
Max. Spann. zwischen Faden und Kath. Tension max. entre filament et cathode Max. voltage between filam. and cathode	V_{fc}	= 50 V
Max. Widerst. zwischen Faden und Kath. Résist. max. entre filament et cathode Max. resist. betw. filament and cathode	R_{fc}	= 20000 Ohm
Kapazitäten Capacités Capacities	C_g C_a C_{ag}	= 8,8 $\mu\mu$F = 6,4 $\mu\mu$F = 0,02 $\mu\mu$F

19/8'33

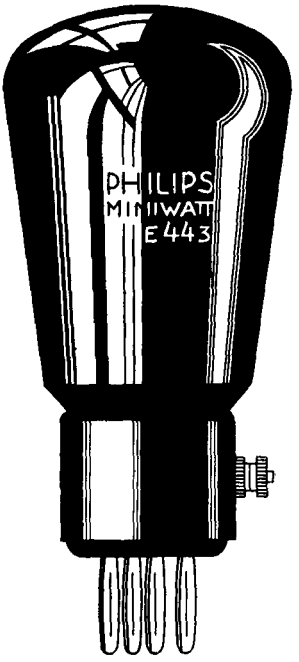

Ia (mA)
Vg' = 60 V
Vf = 4,0 V
Vg = −1,5 V
Vg = −2,0 V
Vg = −2,5 V
PHILIPS
MINIWATT
E 442 S
0
1
2
3
4
5
50
100
150
200
250
300
350 Va (V)
Vg' = 40 V
Vf = 4,0 V
Vg = −1,5 V
Vg = −2,0 V
Vg = −2,5 V
0
1
2
3
4
50
100
150
200
250
300
350 Va (V)

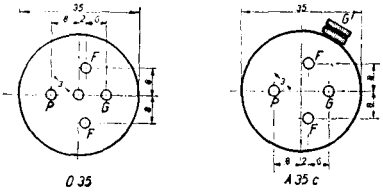
Philips Wisselstroomlamp

„Miniwatt"

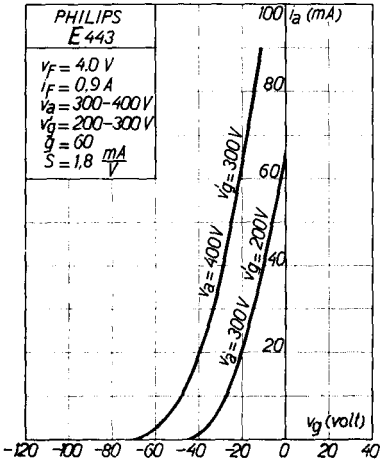
E 443

Penthode-eindlamp met direct verhitte kathode





E 443 kan met bovenstaande hulzen geleverd worden.



Dit is een penthode-eindlamp voor zeer groot vermogen.

Zij leent zich bij uitstek voor gebruik in versterkers voor het geven van demonstraties in zalen e.d.

Het bij 400 V in den anodekring opgenomen vermogen bedraagt 12 watt, terwijl door de bijzondere eigenschappen van de penthodelamp de afgegeven energie aanzienlijk grooter is dan die van een normale eindlamp bij hetzelfde in den anodekring opgenomen vermogen.

Deze lamp wordt toegepast in de Philips 10-watt versterkers.

Gloeispanning	v_f	**4,0** V
Gloeistroom	i_f	**0,9** A
Anodespanning	v_a	**300—400** V
Schermroosterspanning	v'_g	**200—300** V
Versterkingsfactor	g	**60**
Steilheid	S	**1,8** mA/V
Inwendige weerstand	R_i	**33000** Ω
Negatieve roosterspanning	v_g	**30** V
Normale anodestroom	i_a	**28** mA
Grootste lengte	l	**110** mm
Grootste diameter	d	**55** mm

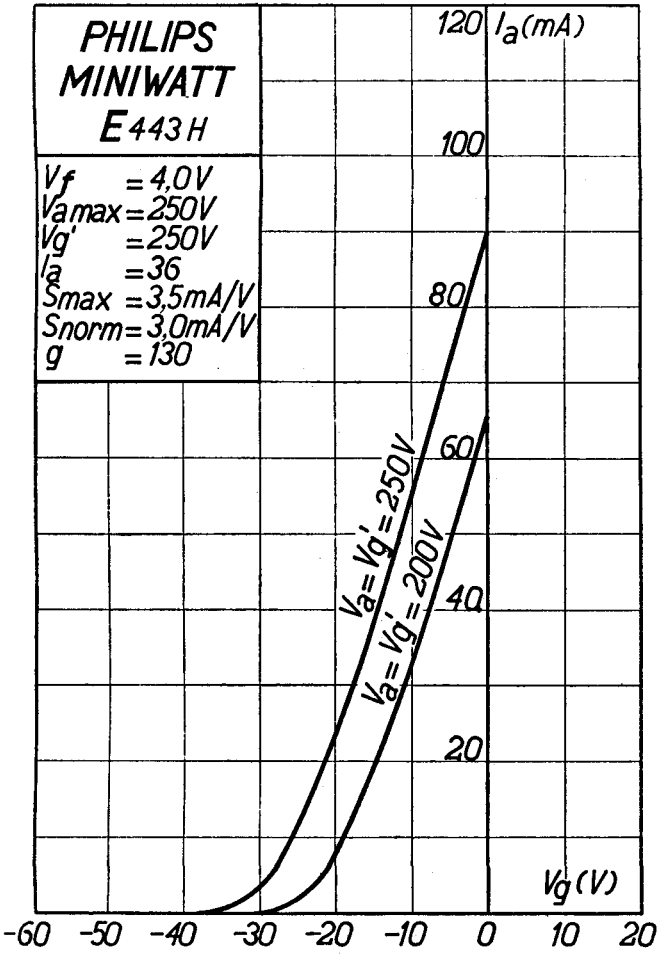
Prijs: fl. **22,50**

E 443H

PHILIPS MINIWATT

Heizspannung Tension de chauffage Filament voltage	v_f	=	4,0 V
Heizstrom Courant de chauffage Filament current	i_f	=	1,1 A
Anodenspannung Tension anodique Anode voltage	$v_{a\ max.}$	=	250 V
Schirmgitterspannung Tension de grille-écran Screen-grid voltage	$v_{g'}$	=	250 V
Normaler Anodenstrom Courant anodique normal Normal anode current	i_a	=	36 mA
Neg. Gitterspannung Polarisation négative de grille Negative grid bias	v_g	=	ca. env. 14 V appr.
Verstärkungsfaktor Coefficient d'amplification Amplification factor	$g\,(k)$	=	130
Steilheit (max.) Inclinaison (max.) Slope (max.)	$S_{\text{max.}}$	=	3,5 mA/V
Steilheit (norm.) Inclinaison (norm.) Slope (norm.)	$S_{\text{norm.}}$	=	3,0 mA/V
Innerer Widerstand (norm.) Résistance intérieure (norm.) Internal resistance (norm.)	R_i	=	43000 Ohm
Dissipation anodique Anode dissipation Anode dissipation	$W_{a\ max.}$	=	9 W
Max. Länge Longueur max. Overall length	l	=	123 mm
Grösster Durchmesser Diamètre max. Max. diameter	d	=	55 mm
Sockel Culot Base		=	0 35
Sockelschaltung Connexion du culot Base connection		=	S VIII

Anwendung: Endstufe:
Applications: Tube final:
Function: Power valve:

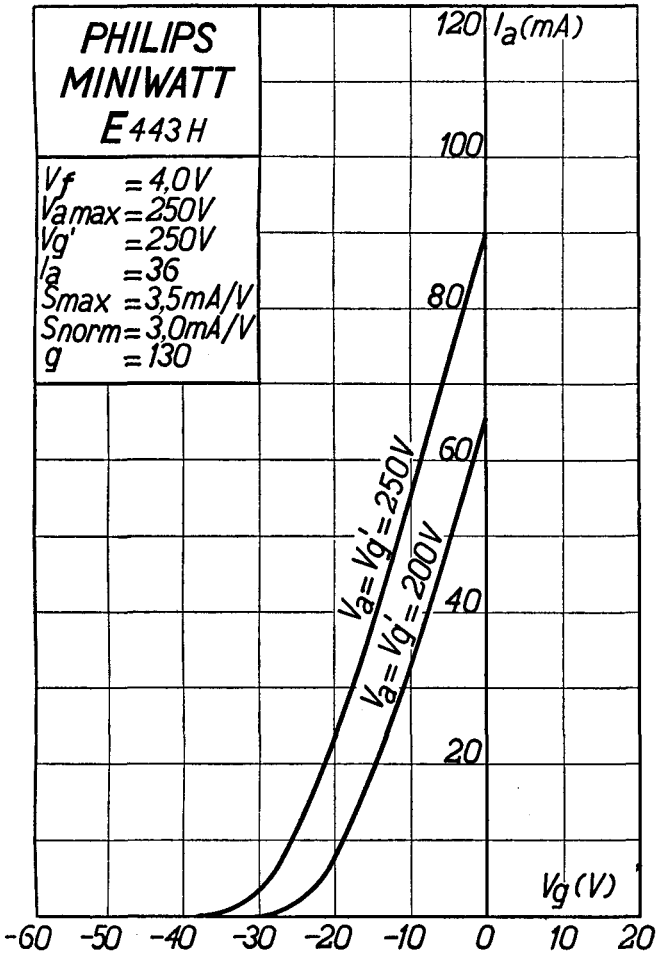

PHILIPS
MINIWATT
E443H
Vf = 4,0V
Vamax = 250V
Vg' = 250V
Ia = 36
Smax = 3,5mA/V
Snorm = 3,0mA/V
g = 130
120
Ia(mA)
100
80
60
40
20
Va = Vg' = 250V
Va = Vg' = 200V
Vg(V)
-60
-50
-40
-30
-20
-10
0
10
20

E 443H

PHILIPS „MINIWATT"

Heizspannung Tension de chauffage Filament voltage	V_f	=	4,0 V
Heizstrom Courant de chauffage Filament current	I_f	=	1,1 A
Anodenspannung Tension anodique Anode voltage	$V_{a\,max}$	=	250 V
Schirmgitterspannung Tension de grille-écran Screen-grid voltage	V_g /	=	250 V
Normaler Anodenstrom Courant anodique normal Normal anode current	I_a	=	36 mA
Neg. Gittervorspannung Polarisation négative de grille Negative grid bias	V_g	=	ca. env. 15 V appr.
Verstärkungsfaktor Coefficient d'amplification Amplification factor	$g(k)$	=	130
Steilheit (max.) Inclinaison (max.) Slope (max.)	S_{max}	=	3,5 mA/V
Steilheit (norm.) Inclinaison (norm.) Slope (norm.)	S_{norm}	=	3,0 mA/V
Innerer Widerstand (norm.) Résistance intérieure (norm.) Internal resistance (norm.)	R_i	=	43000 Ohm
Anodenverlustleistung Dissipation anodique Anode dissipation	$W_{a\,max}$	=	9 W
Max. Länge Longueur max. Overall length	l	=	123 mm
Grösster Durchmesser Diamètre max. Max. diameter	d	=	55 mm
Sockel Culot Base		=	0 35
Sockelschaltung Connexion du culot Base connection		=	S VIIl

Anwendung:	Endstufe
Application:	Tube final
Function:	Power valve


PHILIPS
MINIWATT
E 443 H
Vf = 4,0V
Va max = 250V
Vg' = 250V
Ia = 36
S max = 3,5mA/V
S norm = 3,0mA/V
g = 130
120
100
80
60
40
20
Ia (mA)
Va = Vg' = 250V
Va = Vg' = 200V
Vg (V)
-60
-50
-40
-30
-20
-10
0
10
20

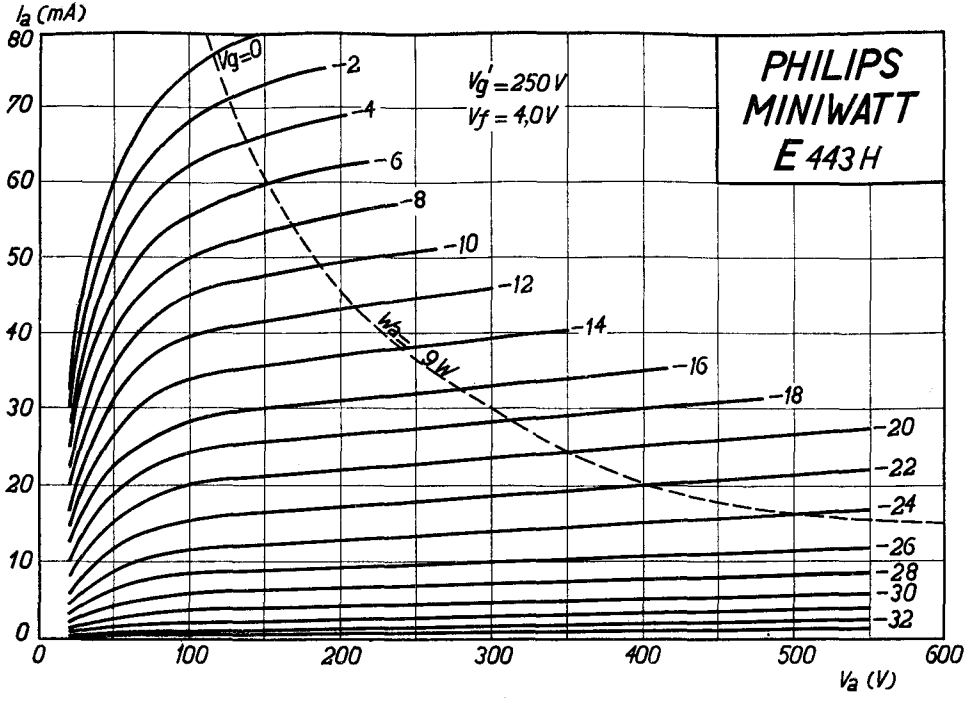
E 443H

PHILIPS „MINIWATT"

Max. Anodenspannung Tension anodique max. Max. anode voltage	V_{ao} V_{aL}	= 500 V = 300 V
Max. Anodenbelastung Dissipation anodique max. Max. anode dissipation	W_a	= 9 W
Max. Kathodenstrom Courant cathodique max. Max. cathode current	I_c	= 50 mA
Max. Schirmgitterspannung Tension de grille-écran max. Max. screen-grid voltage	$V_{g'o}$ $V_{g'}$	= 500 V = 250 V
Max. Schirmgitterbelastung Dissipation de grille-écran max. Max. screen-grid dissipation	$W_{g'}$	= 2,5 W
Mittlerer Schirmgitterstrom Courant de grille-écran moyen Average screen-grid current	$I_{g'}$	= 6,8 mA*)
Ungefähre Grenzw. des Schirmgitterstr. Limites approxim. du cour. de gr.-écran Approx. limits of screen-grid current	$I_{g' \min.}$ $I_{g' \max.}$	= 4,5 mA*) = 9 mA*)
Gitterstrom-Einsatzpunkt Point de commenc. du cour. de grille Starting point of grid current	V_{gi} $(V_f = 4$ V $\sim)$	= −2 V
Max. Widerstand im Gitterkreis Résistance max. dans le circuit de grille Max. resistance in grid circuit	R_{g1} R_{g2}	= 0,8 M.Ohm = 0,3 M.Ohm
Nutzleistung Puissance utile Output	W_{o1} (V_{geff} = 9 V*), (R_a = 7000 Ohm*) W_{o2} (V_{geff} = 9,7 V*), (R_a = 7000 Ohm*)	= 2,8 W*) = 3,1 W*)
Kapazitäten Capacités Capacities	C_{ag} C_{ak} C_{gk}	= 1,1 $\mu\mu$F = 14,1 $\mu\mu$F = 9,3 $\mu\mu$F

* Gemessen bei / Mesuré pour / Measured at $V_a = V_{g'} = 250$ V, $I_a = 36$ mA

19/8'33

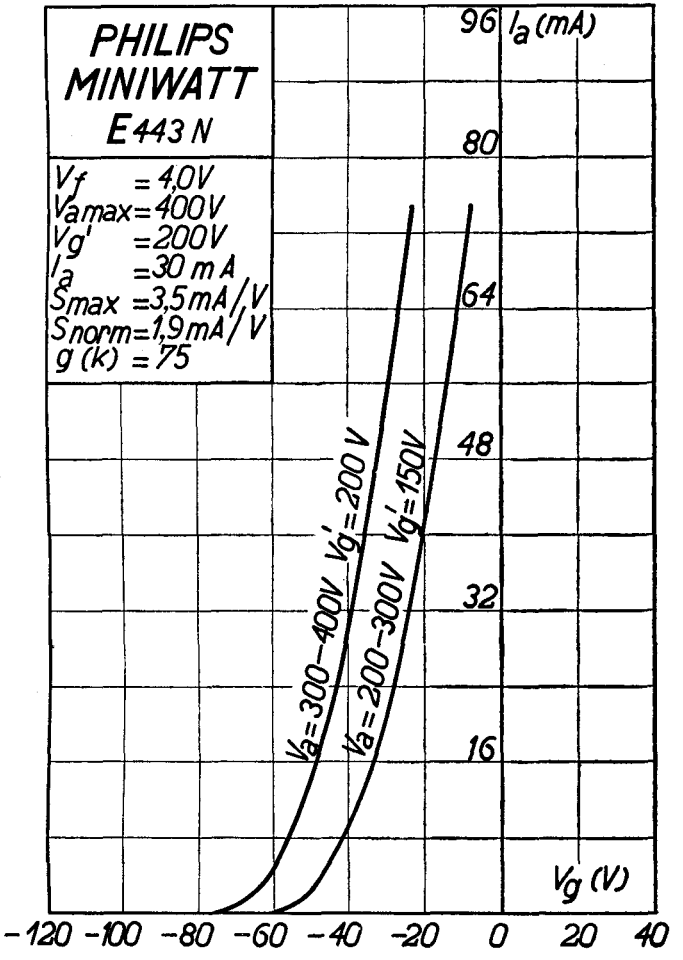

I_a (mA)
80
70
60
50
40
30
20
10
0
0
100
200
300
400
500
600
V_a (V)
V_g=0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
-22
-24
-26
-28
-30
-32
V_g' = 250 V
V_f = 4,0 V
W_a = 9 W
PHILIPS
MINIWATT
E 443 H

E 443N

PHILIPS „MINIWATT"

Heizspannung Tension de chauffage Filament voltage	V_f	=	4,0 V
Heizstrom Courant de chauffage Filament current	I_f	=	ca. env. 1,0 A appr.
Anodenspannung Tension anodique Anode voltage	$V_{a\ max}$	=	400 V
Schirmgitterspannung Tension de grille-écran Screen-grid voltage	$V_g{}'$	=	200 V
Normaler Anodenstrom Courant anodique normal Normal anode current	I_a	=	30 mA
Neg. Gittervorspannung Polarisation négative de grille Negative grid bias	V_g	=	ca. env. 40 V appr.
Verstärkungsfaktor Coefficient d'amplification Amplification factor	$g(k)$	=	75
Steilheit (max.) Inclinaison (max.) *Slope (max.)*	$S_{max.}$	=	3,5 mA/V
Steilheit (norm.) Inclinaison (norm.) *Slope (norm.)*	$S_{norm.}$	=	1,9 mA/V
Innerer Widerstand (norm.) Résistance intérieure (norm.) Internal resistance (norm.)	R_i	=	40000 Ohm
Anodenverlustleistung Dissipation anodique Anode-grid capacity	$W_{a\ max.}$	=	12 W
Max. Länge Longueur max. Overall length	l	=	110 mm
Grösster Durchmesser Diamètre max. Max. diameter	d	=	57 mm
Sockel Culot Base		=	0 40
Sockelschaltung Connexion du culot Base connection		=	S. VIII

Anwendung:	*Endstufe*
Application:	Tube final
Function:	Power valve

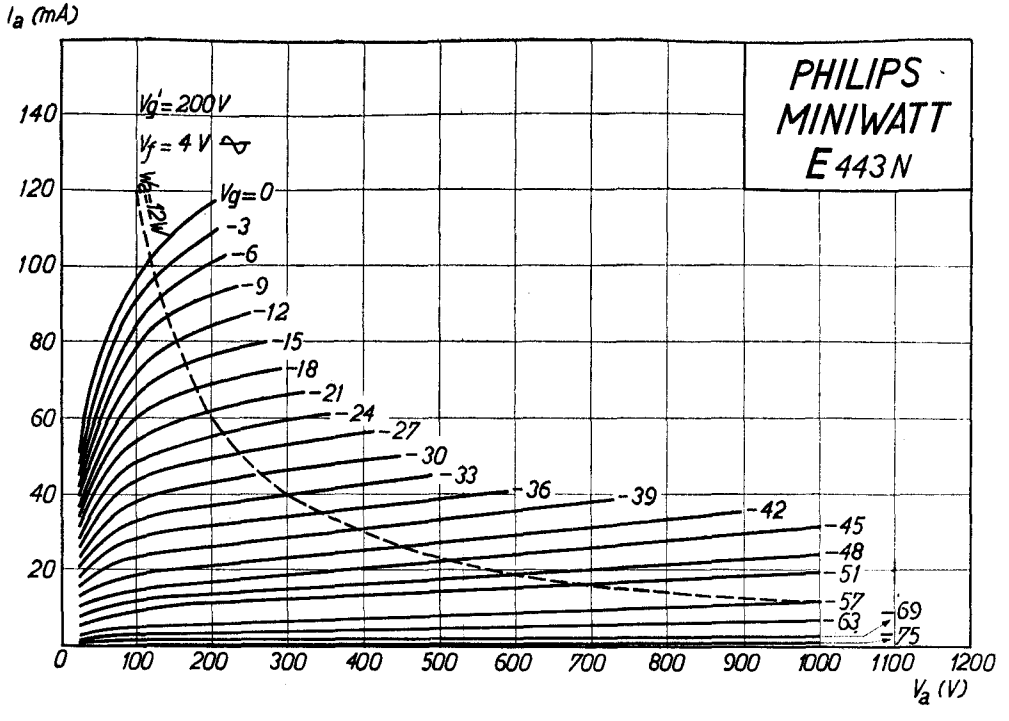

PHILIPS
MINIWATT
E 443 N
Vf = 4,0V
Vamax = 400V
Vg' = 200V
Ia = 30 mA
Smax = 3,5 mA/V
Snorm = 1,9 mA/V
g (k) = 75
96
80
64
48
32
16
Ia (mA)
Vg (V)
Va = 300–400V Vg' = 200 V
Va = 200–300V Vg' = 150V
-120
-100
-80
-60
-40
-20
0
20
40

E 443N

PHILIPS „MINIWATT"

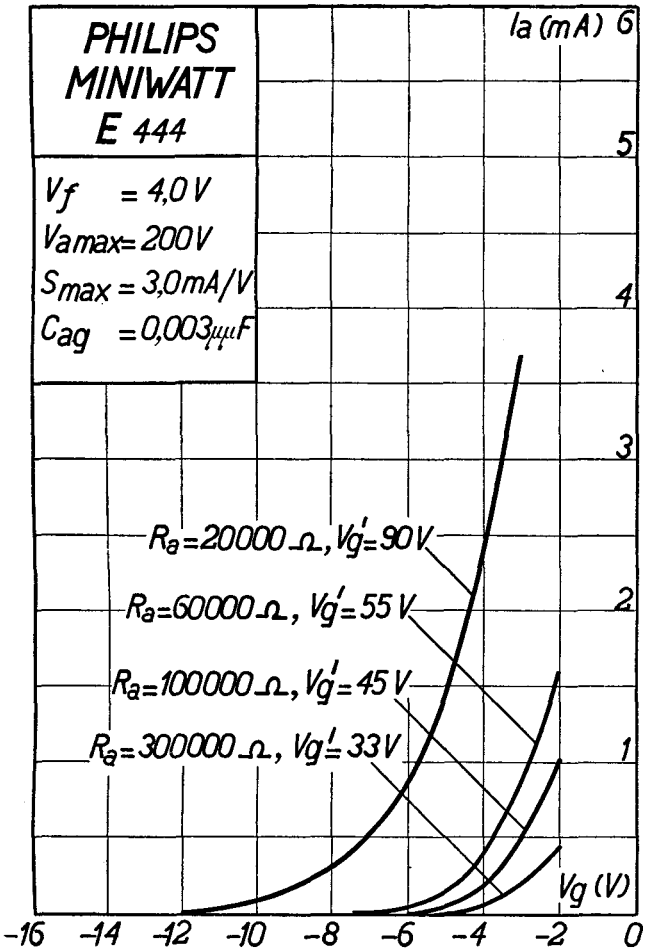
Max. Anodenspannung Tension anodique max. Max. anode voltage	V_{ao} V_{a_L}	= 650 V = 400 V
Max. Anodenbelastung Dissipation anodique max. Max. anode dissipation	W_a	= 12 W
Max. Kathodenstrom Courant cathodique max. Max. cathode current	I_c	= 60 mA
Max. Schirmgitterspannung Tension de grille-écran max. Max. screen-grid voltage	V_{g^1o} V_{g^1}	= 400 V*) = 200 V
Max. Schirmgitterbelastung Dissipation de grille-écran max. Max. screen-grid dissipation	W_{g^1}	= 1,5 W
Mittlerer Schirmgitterstrom Courant de grille-écran moyen Average screen-grid current	I_{g^1}	= 5,4 mA
Ungefähre Grenzw. des Schirmgitterstr. Limites approxim. du cour. de gr.-écran Approx. limits of screen-grid current	I_{g^1} min. I_{g^1} max.	= 3,5 mA = 7 mA
Gitterstrom-Einsatzpunkt Point de commenc. du courant de grille Starting point of grid current	V_{gi} (V_f = 4 V ∿)	= −2 V
Max. Widerstand im Gitterkreis Résistance max. dans le circuit de grille Max. resistance in grid circuit	R_{g1} R_{g2}	= 0,6 M.Ohm = 0,2 M.Ohm
Nutzleistung Puissance utile Output	W_{o1} ($V_{g\,eff}$ = 14 V, R_a = 14000 Ω) W_{o2} ($V_{g\,eff}$ = 20,2 V, R_a = 14000 Ω)	= 4 W = 5,4 W
Kapazitäten Capacités Capacities	C_{ag} C_{ak} C_{gk}	= 0,9 μμF = 8,3 μμF = 11 μμF

*) 650 V bei selbstregelender neg. Gitterspannung
650 V en appliquant une polarisation négative de grille automatique
650 V with automatic grid-bias


I_a (mA)
PHILIPS
MINIWATT
E 443 N
$V_g' = 200V$
$V_f = 4\ V$
$W_g = 12W$
$V_g = 0$
-3
-6
-9
-12
-15
-18
-21
-24
-27
-30
-33
-36
-39
-42
-45
-48
-51
-57
-63
-69
-75
140
120
100
80
60
40
20
0
100
200
300
400
500
600
700
800
900
1000
1100
1200
V_a (V)

Heizspannung Tension de chauffage Filament voltage	V_f	=	4,0 V	
Heizstrom Courant de chauffage Filament current	I_f	=	ca. env. 1,1 A appr.	
Anodenspannung Tension anodique Anode voltage	V_a	=	200 V	
Steilheit (max.) Inclinaison (max.) Slope (max.)	$S_{max.}$	=	3,0 mA/V	
Schirmgitterspannung Tension de grille-écran Screen-grid voltage	$V_{g'}$	=	33 V	$R_a = 0{,}3$ MΩ
Normaler Anodenstrom Courant anodique normal Normal anode current	I_a	=	0,35 mA	$R_a = 0{,}3$ MΩ
Neg. Gittervorspannung Polarisation négative de grille Negative grid bias	V_g	=	ca. env. 2,3 V appr.	$R_a = 0{,}3$ MΩ
Verstärkungsfaktor Coefficient d'amplification Amplification factor	$g(k)$	=	1000	$R_a = 0{,}3$ MΩ
Innerer Widerstand Résistance intérieure Internal resistance	R_i	=	2,5 M.Ohm	$R_a = 0{,}3$ MΩ
Schirmgitterspannung Tension de grille-écran Screen-grid voltage	$V_{g'}$	=	45 V	$R_a = 0{,}1$ MΩ
Normaler Anodenstrom Courant anodique normal Normal anode current	I_a	=	0,9 mA	$R_a = 0{,}1$ MΩ
Neg. Gittervorspannung Polarisation négative de grille Negative grid bias	V_g	=	ca. env. 2,3 V appr.	$R_a = 0{,}1$ MΩ
Verstärkungsfaktor Coefficient d'amplification Amplification factor	$g(k)$	=	800	$R_a = 0{,}1$ MΩ
Innerer Widerstand Résistance intérieure Internal resistance	R_i	=	1,0 M.Ohm	$R_a = 0{,}1$ MΩ
Anoden-Gitterkapazität Capacité grille-plaque Anode-grid capacity	C_{ag}	=	0,003 $\mu\mu$F	
Max. Länge Longueur max. Overall length	l	=	130 mm	
Grösster Durchmesser Diamètre max. Max. diameter	d	=	51 mm	
Sockel Culot Base		=	B 35	
Sockelschaltung Connexion du culot Base connection		=	S XV	

Anwendung: Diodengleichrichtung und N.F.-Verstärkung
Application: Détection par diode et amplification b.f.
Function: Rectifying at diode and l.f. amplification


PHILIPS
MINIWATT
E 444
V_f = 4,0 V
V_{amax} = 200 V
S_{max} = 3,0 mA/V
C_{ag} = 0,003 μμF
Ia (mA)
6
5
4
3
2
1
R_a = 20000 Ω, V_g' = 90 V
R_a = 60000 Ω, V_g' = 55 V
R_a = 100000 Ω, V_g' = 45 V
R_a = 300000 Ω, V_g' = 33 V
V_g (V)
-16
-14
-12
-10
-8
-6
-4
-2
0

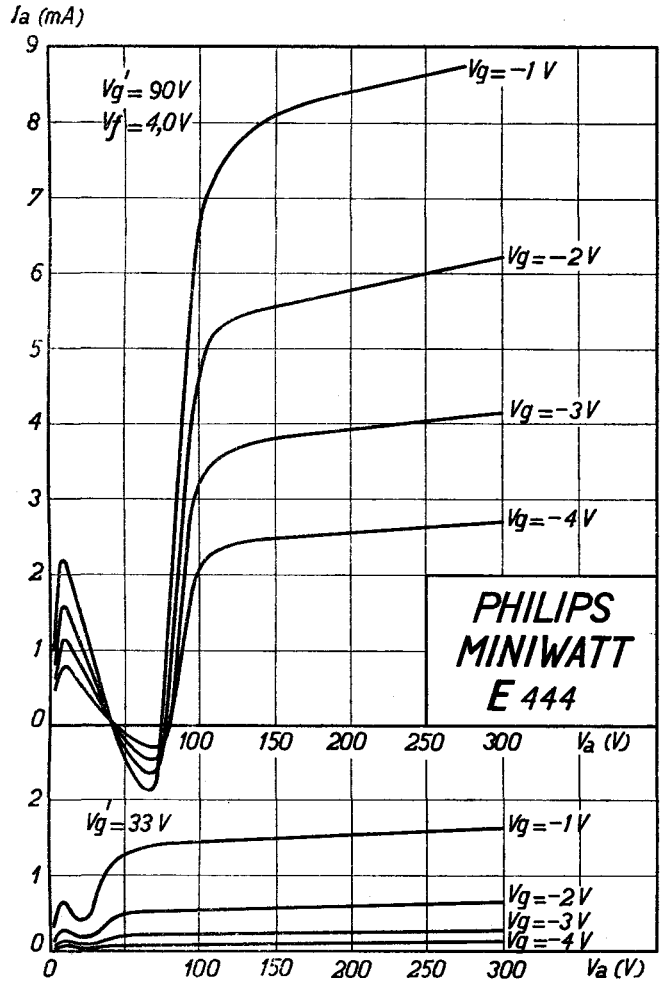
E 444

PHILIPS „MINIWATT"

Max. Anodenspannung Tension anodique max. Max. anode voltage	V_{ao} V_{a_R} V_{a_L}	= 400 V = 250 V = 200 V
Max. Anodenbelastung Dissipation anodique max. Max. anode dissipation	W_a	= 1,0 W
Max. Kathodenstrom Courant cathodique max. Max. cathode current	I_c	= 10 mA
Max. Schirmgitterspannung Tension de grille-écran max. Max. screen-grid voltage	$V_{g^I o}$ V_{g^I}	= 300 V = V_a -50 V max. 150 V
Max. Schirmgitterbelastung Dissipation de grille-écran max. Max. screen-grid dissipation	W_{g^I}	= 0,25 W
Mittlerer Schirmgitterstrom Courant de grille-écran moyen Average screen-grid current	I_{g^I}	= 0,5 mA*)
Gitterstrom-Einsatzpunkt Point de commenc. du courant de grille Starting point of grid current	V_{gi}	= -1,3 V
Max. Hilfsanodenspannung Tension anodique auxiliaire max. Max. auxiliary anode voltage	$V_{a^I\,\max}$	= 20 V
Max. Hilfsanodenstrom Courant anodique auxiliaire max. Max. auxiliary anode current	$I_{a^I\,\max}$	= 0,5 mA
Max. Widerstand im Gitterkreis Résistance max. dans le circuit de grille Max. resistance in grid circuit	R_{g1} R_{g2}	= 2 M.Ohm = 1 M.Ohm
Max. Spann. zwischen Faden und Kath. Tension max. entre filament et cathode Max. voltage between filam. and cathode	V_{fc}	= 50 V
Max. Widerst. zwischen Faden und Kath. Résist. max. entre filament et cathode Max. resist. betw. filament and cathode	R_{fc}	= 20000 Ohm
Kapazitäten Capacités Capacities	C_g C_a C_{ag}	= 12 $\mu\mu$F = 6,8 $\mu\mu$F = 0,003 $\mu\mu$F

*) Gemessen bei / Mesuré pour / Measured at

V_a	= 200 V
V_{g^I}	= 90 V
R_a	= 0,02 M.Ohm
I_a	= 3,3 mA


Ia (mA)
Vg' = 90V
Vf = 4,0V
Vg = −1 V
Vg = −2 V
Vg = −3 V
Vg = −4 V
PHILIPS
MINIWATT
E 444
Va (V)
Vg' = 33 V
Vg = −1 V
Vg = −2 V
Vg = −3 V
Vg = −4 V
Va (V)

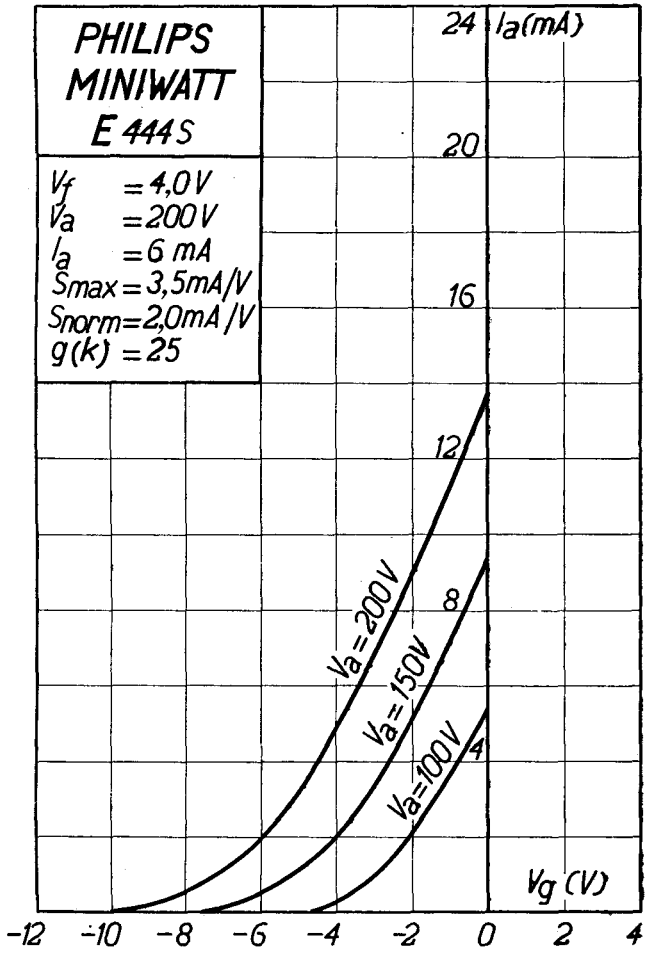
E 444S

PHILIPS „MINIWATT"

Heizspannung Tension de chauffage Filament voltage	v_f	=	4,0 V
Heizstrom Courant de chauffage Filament current	i_f	=	ca. env. 1,0 A appr.
Anodenspannung Tension anodique Anode voltage	$v_{a\,max.}$	=	200 V
Normaler Anodenstrom Courant anodique normal Normal anode current	i_a	=	6 mA
Neg. Gittervorspannung Polarisation négative de grille Negative grid bias	v_g	=	ca. env 3,5 V appr.
Verstärkungsfaktor Coefficient d'amplification Amplification factor	$g(k)$	=	30
Steilheit (max.) Inclinaison (max.) Slope (max.)	$S_{\,max.}$	=	2,5 mA/V
Steilheit (norm.) Inclinaison (norm.) Slope (norm.)	$S_{\,norm.}$	=	2 mA/V
Innerer Widerstand (norm.) Résistance intérieure (norm.) Internal resistance (norm.)	R_i	=	15000 Ohm
Max. Länge Longueur max. Overall length	l	=	115 mm
Grösster Durchmesser Diamètre max. Max. diameter	d	=	46 mm
Sockel Culot Base		=	C 35
Sockelschaltung Connexion du culot Base connection		=	S XIV

Anwendung: Gleichrichtung
Application: Détection
Function: Detection

4/10'33


PHILIPS
MINIWATT
E 444 S
V_f = 4,0 V
V_a = 200 V
I_a = 6 mA
S_{max} = 3,5 mA/V
S_{norm} = 2,0 mA/V
g(k) = 25
I_a (mA)
24
20
16
12
8
4
V_a = 200 V
V_a = 150 V
V_a = 100 V
V_g (V)
-12
-10
-8
-6
-4
-2
0
2
4

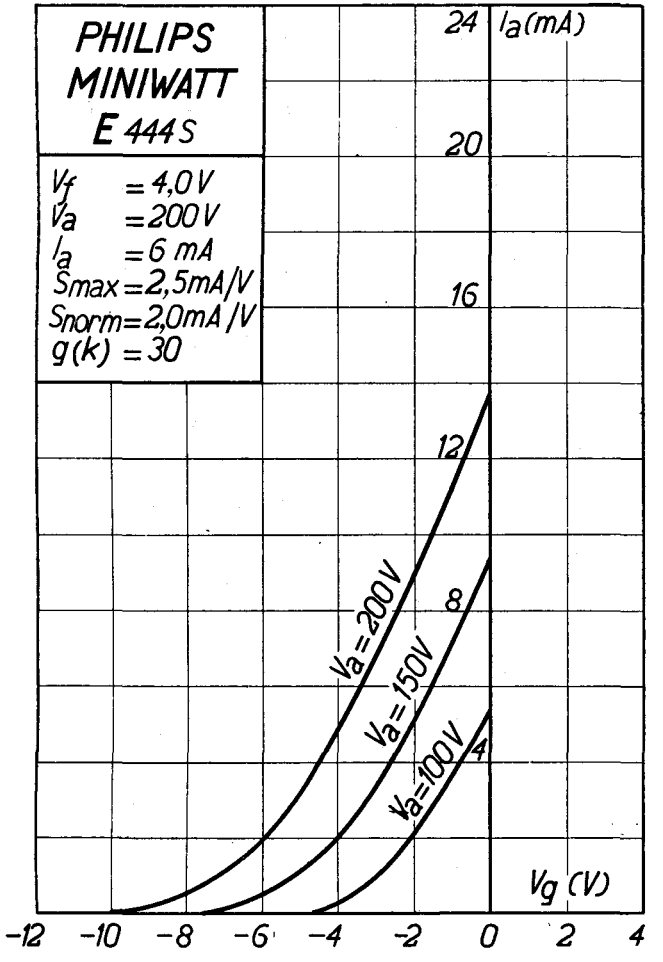
E 444S

PHILIPS „MINIWATT"

Heizspannung Tension de chauffage Filament voltage	v_f	=	4,0 V
Heizstrom Courant de chauffage Filament current	i_f	=	ca. env. 1,0 A appr.
Anodenspannung Tension anodique Anode voltage	$v_{a\,max.}$	=	200 V
Normaler Anodenstrom Courant anodique normal Normal anode current	i_a	=	6 mA
Neg. Gittervorspannung Polarisation négative de grille Negative grid bias	v_g	=	ca. env 3,5 V appr.
Verstärkungsfaktor Coefficient d'amplification Amplification factor	$g(k)$	=	30
Steilheit (max.) Inclinaison (max.) Slope (max.)	$S_{\,max.}$	=	2,5 mA/V
Steilheit (norm.) Inclinaison (norm.) Slope (norm.)	$S_{\,norm.}$	=	2 mA/V
Innerer Widerstand (norm.) Résistance intérieure (norm.) Internal resistance (norm.)	R_i	=	15000 Ohm
Max. Länge Longueur max. Overall length	l	=	115 mm
Grösster Durchmesser Diamètre max. Max. diameter	d	=	46 mm
Sockel Culot Base		=	C 35
Sockelschaltung Connexion du culot Base connection		=	S XIV

Anwendung: Gleichrichtung
Application: Détection
Function: Detection

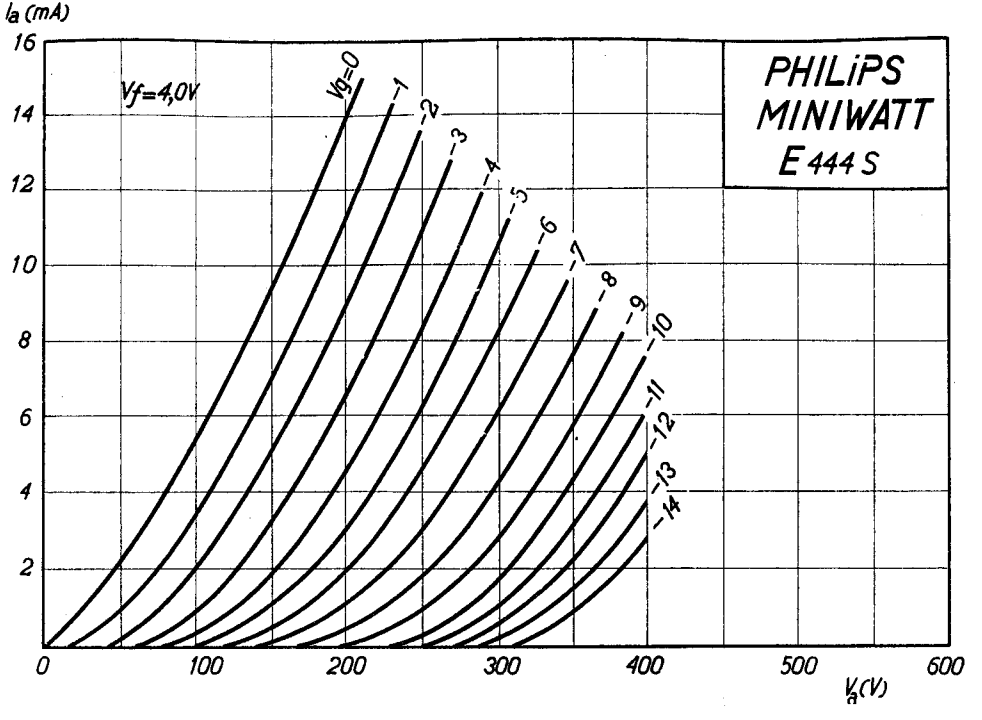
21/12'33


PHILIPS
MINIWATT
E 444 S
Vf = 4,0 V
Va = 200 V
Ia = 6 mA
Smax = 2,5 mA/V
Snorm = 2,0 mA/V
g(k) = 30
Ia (mA)
24
20
16
12
8
4
Va = 200 V
Va = 150 V
Va = 100 V
Vg (V)
-12
-10
-8
-6
-4
-2
0
2
4

E 444S

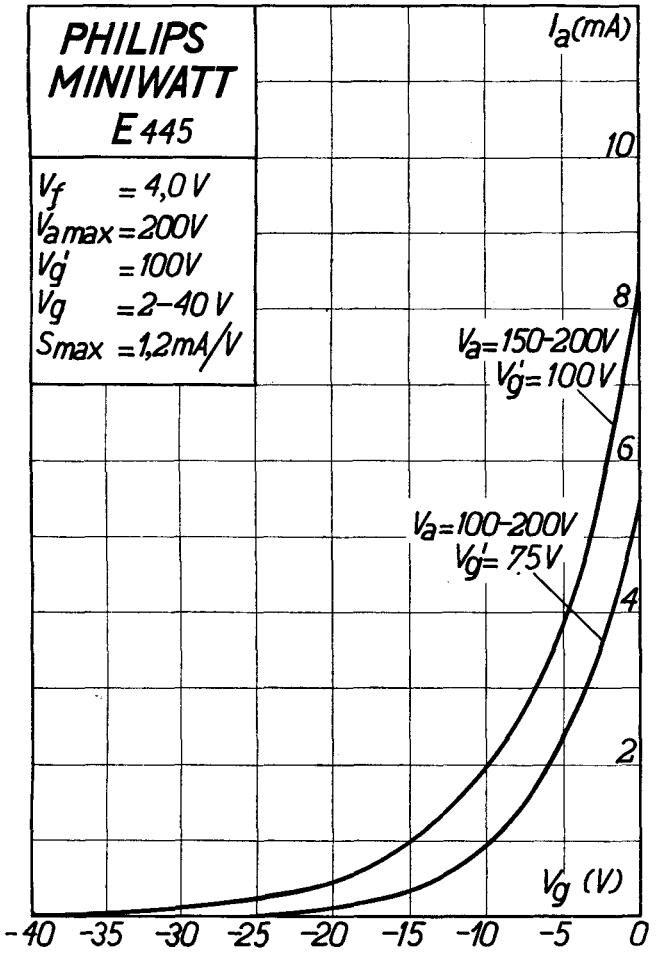
PHILIPS „MINIWATT"

Max. Anodenspannung Tension anodique max. Max. anode voltage	V_{ao} V_{a_R} V_{a_L}	= 400 V = 250 V = 200 V
Max. Anodenbelastung Dissipation anodique max. Max. anode dissipation	W_a	= 1,5 W
Max. Kathodenstrom Courant cathodique max. Max. cathode current	I_c	= 15 mA
Gitterstrom-Einsatzpunkt Point de commenc. du courant de grille Starting point of grid current	V_{gi}	= —1,3 V
Max. Hilfsanodenspannung Tension anodique auxiliaire max. Max. auxiliary anode voltage	$V_{a'\,max}$	= 20 V
Max. Hilfsanodenstrom Courant anodique auxiliaire max. Max. auxiliary anode current	$I_{a'\,max.}$	= 0,5 mA
Max. Widerstand im Gitterkreis Résistance max. dans le circuit de grille Max. resistance in grid circuit	R_{g1} R_{g2}	= 2 M.Ohm = 1 M.Ohm
Max. Spann. zwischen Faden und Kath. Tension max. entre filament et cathode Max. voltage between filam. and cathode	V_{fc}	= 50 V
Max. Widerst. zwischen Faden und Kath. Résist. max. entre filament et cathode Max. resist. betw. filament and cathode	R_{fc}	= 20000 Ohm


Ia (mA)
16
14
12
10
8
6
4
2
0
100
200
300
400
500
600
Va (V)
Vf=4,0V
Vg=0
-1
-2
-3
-4
-5
-6
-7
-8
-9
-10
-11
-12
-13
-14
PHILIPS
MINIWATT
E 444 S

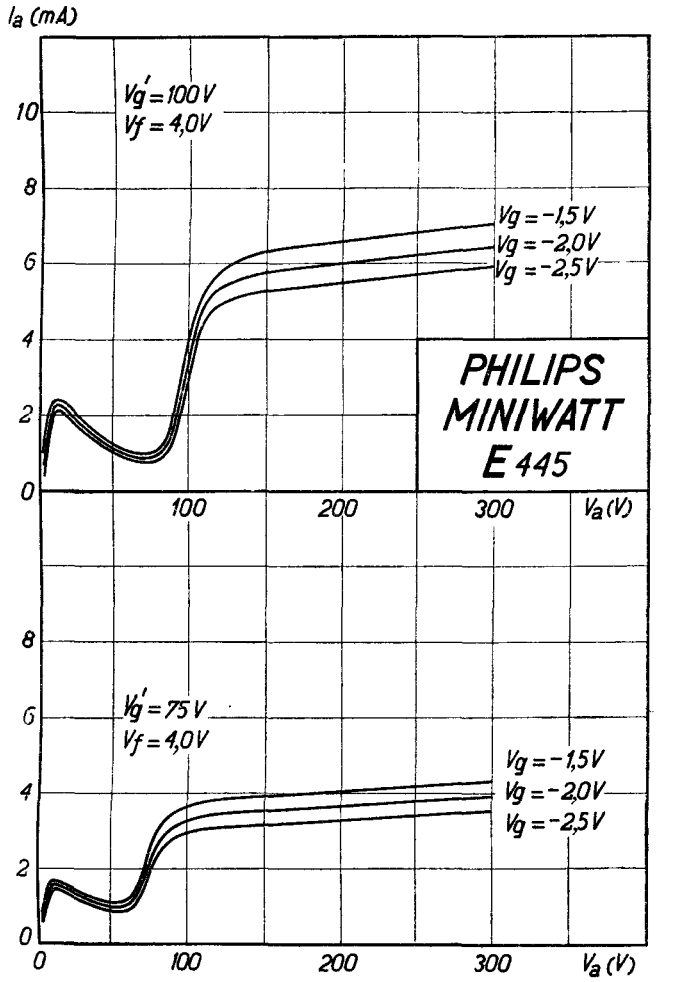
Heizspannung Tension de chauffage Filament voltage	v_f	=	4,0 V
Heizstrom Courant de chauffage Filament current	i_f	=	ca. env. 1,1 A appr.
Anodenspannung Tension anodique Anode voltage	$v_{a\,max.}$	=	200 V
Schirmgitterspannung Tension de grille-écran Screen-grid voltage	v_{g^1}	=	100 V
Normaler Anodenstrom Courant anodique normal Normal anode current (vg = -2 V)	i_a	=	ca. env. 6 mA appr.
Normaler Anodenstrom Courant anodique normal Normal anode current (vg = -40 V)	i_a	=	ca. env. 0,01 mA appr.
Verstärkungsfaktor Coefficient d'amplification Amplification factor	$g\,(k)$	=	300
Steilheit (max.) Inclinaison (max.) Slope (max.)	$S_{\max.}$	=	1,2 mA/V
Steilheit Inclinaison Mutual conductance (vg = -2 V)	S	=	1,0 mA/V
Steilheit Inclinaison Mutual conductance (vg = -40 V)	S	=	0,005 mA/V
Innerer Widerstand (norm.) Résistance intérieure (norm.) Internal resistance (norm.) (vg = -2 V)	R_i	=	300000 Ohm
Innerer Widerstand (norm.) Résistance intérieure (norm.) Internal resistance (norm.) (vg = -40 V)	R_i	>	10 M.Ohm
Anoden-Gitterkapazität Capacité grille-plaque Anode-grid capacity	C_{ag}	=	0,003 $\mu\mu$F
Max. Länge Longueur max. Overall length	l	=	127 mm
Grösster Durchmesser Diamètre max. Max. diameter	d	=	51 mm
Sockel Culot Base		=	0 35
Sockelschaltung Connexion du culot Base connection		=	S X

Anwendung:	H.F.-Verstärkung
Applications:	Amplification h.f.
Function:	H F. amplification Z.F.-Verstärkung Amplification m.f. I.F. amplification


PHILIPS
MINIWATT
E 445
V_f = 4,0 V
$V_{a\,max}$ = 200V
$V_{g'}$ = 100V
V_g = 2–40 V
S_{max} = 1,2mA/V
I_a(mA)
10
8
6
4
2
V_a=150-200V
$V_{g'}$=100V
V_a=100-200V
$V_{g'}$= 75V
V_g (V)
-40
-35
-30
-25
-20
-15
-10
-5
0

PHILIPS „MINIWATT"

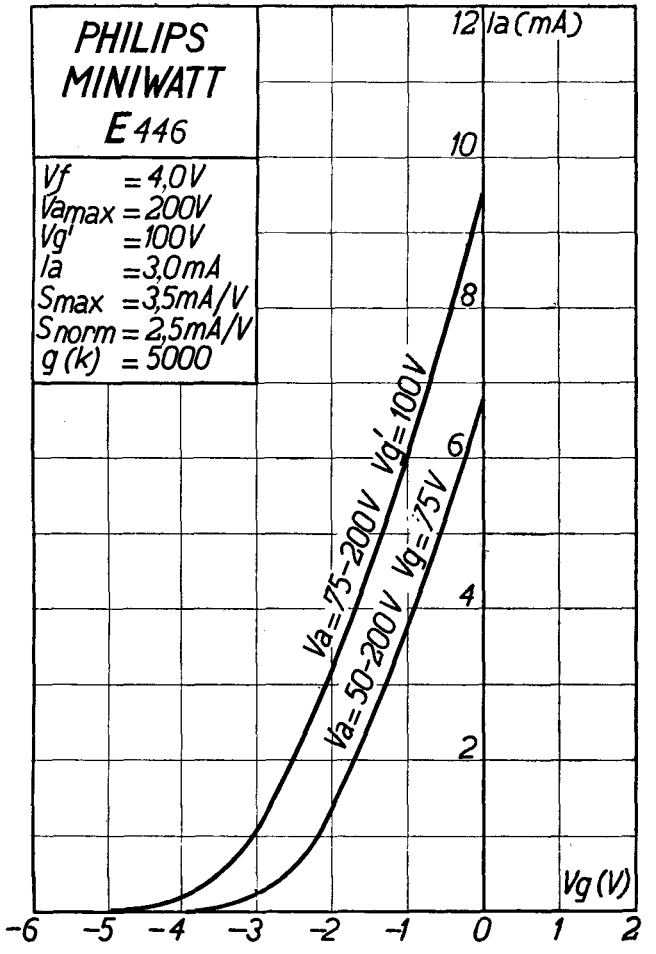
Max. Anodenspannung Tension anodique max. Max. anode voltage	V_{ao} V_{aR} V_{a_L}	= 400 V = 250 V = 200 V
Max. Anodenbelastung Dissipation anodique max. Max. anode dissipation	W_a	= 1,5 W
Max. Kathodenstrom Courant cathodique max. Max. cathode current	I_c	= 10 mA
Max. Schirmgitterspannung Tension de grille-écran max. Max. screen-grid voltage	$V_{g'o}$ $V_{g'}$	= 300 V = V_a 50 V max. 150 V
Max. Schirmgitterbelastung Dissipation de grille-écran max. Max. screen-grid dissipation	$W_{g'}$	= 0,25 W
Mittlerer Schirmgitterstrom Courant de grille-écran moyen Average screen-grid current	$I_{g'}$	= 0,8 mA
Ungefähre Grenzw. des Schirmgitterstr. Limites approxim. du cour. de gr.-écran Approx. limits of screen-grid current	$I_{g'}$ min. $I_{g'}$ max.	= 0,1 mA = 2,0 mA
Gitterstrom-Einsatzpunkt Point de commenc. du courant de grille Starting point of grid current	V_{gi}	= —1,3 V
Max. Widerstand im Gitterkreis Résistance max. dans le circuit de grille Max. resistance in grid circuit	R_{g1}	= 4 M.Ohm
Max. Spann. zwischen Faden und Kath. Tension max. entre filament et cathode Max. voltage between filam. and cathode	V_{fc}	= 80 V
Max. Widerst. zwischen Faden und Kath. Résist. max. entre filament et cathode Max. resist. betw. filament and cathode	R_{fc}	= 20000 Ohm
Kapazitäten Capacités Capacities	C_g C_a C_{ag}	= 11,3 $\mu\mu$F = 7,5 $\mu\mu$F = 0,003 $\mu\mu$F


Ia (mA)
Vg' = 100 V
Vf = 4,0V
Vg = −1,5 V
Vg = −2,0V
Vg = −2,5V
PHILIPS
MINIWATT
E 445
Va (V)
Vg' = 75 V
Vf = 4,0V
Vg = −1,5V
Vg = −2,0V
Vg = −2,5V
Va (V)

PHILIPS „MINIWATT"

Heizspannung Tension de chauffage Filament voltage	v_f	=	4 V
Heizstrom Courant de chauffage Filament current	i_f	=	ca. env. 1,1 A appr.
Anodenspannung Tension anodique Anode voltage	$v_{a\,max.}$	=	200 V
Hilfsgitterspannung Tension auxiliaire de grille Auxiliary grid voltage	$v_{g'}$	=	100 V
Normaler Anodenstrom Courant anodique normal Normal anode current	i_a	=	3 mA
Neg. Gittervorspannung Polarisation négative de grille Negative grid bias	v_g	=	ca. env. 2 V appr.
Verstärkungsfaktor Coefficient d'amplification Amplification factor	$g(k)$	=	5000
Steilheit (max.) Inclinaison (max.) Slope (max.)	$S_{max.}$	=	3,5 mA/V
Steilheit (norm.) Inclinaison (norm.) Slope (norm.)	$S_{norm.}$	=	2,5 mA/V
Innerer Widerstand (norm.) Résistance intérieure (norm.) Internal resistance (norm.)	R_i	=	2 Megohm
Anoden-Gitterkapazität Capacité grille-plaque Anode-grid capacity	C_{ag}	=	0,002 $\mu\mu$F
Max. Länge Longueur max. Overall length	l	=	138 mm
Grösster Durchmesser Diamètre max. Max. diameter	d	=	51 mm
Sockel Culot Base		=	0 35
Sockelschaltung Connexion du culot Base connection		=	S XVI

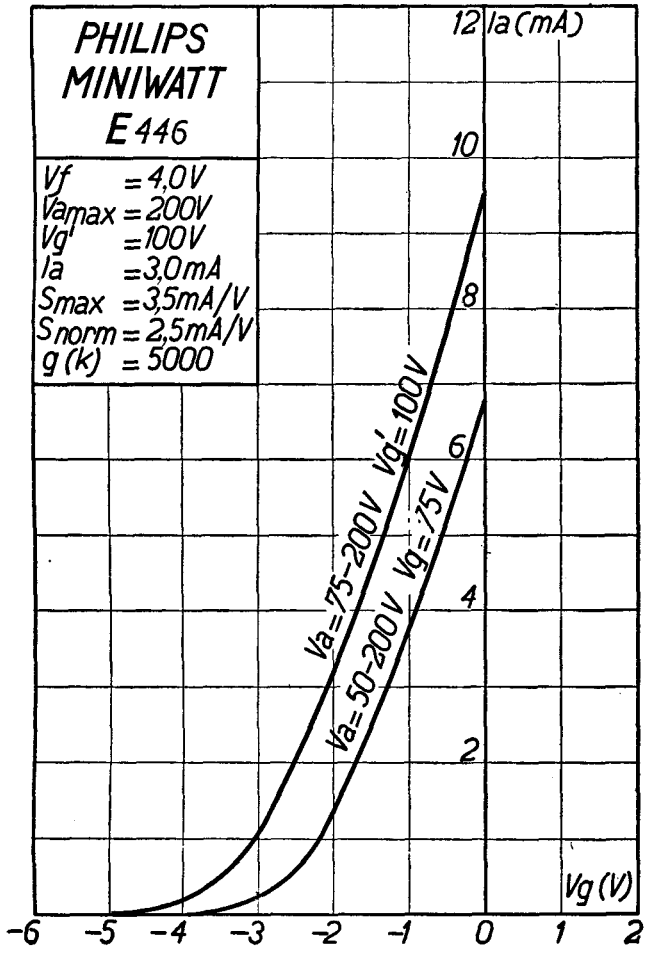
Anwendung: Applications: Function:	H.F.-Verstärkung Amplification h.f. H.F. amplification	Z.F.-Verstärkung Amplification m.f. I.F. amplification
	Gleichrichtung Détection Detection	
	N.F.-Verstärker mit Widerstandskopplung Amplificateur b.f. avec couplage par résistance L.F. amplifier with resistance coupling	


PHILIPS
MINIWATT
E 446
Vf = 4,0V
Vamax = 200V
Vg' = 100V
Ia = 3,0mA
Smax = 3,5mA/V
Snorm = 2,5mA/V
g (k) = 5000
12
Ia (mA)
10
8
6
4
2
Va=75-200V Vg'=100V
Va=50-200V Vg=75V
Vg (V)
-6
-5
-4
-3
-2
-1
0
1
2

PHILIPS „MINIWATT"

Heizspannung Tension de chauffage Filament voltage	V_f	=	4 V
Heizstrom Courant de chauffage Filament current	I_f	=	ca. env. 1,1 A appr.
Anodenspannung Tension anodique Anode voltage	$V_{a\,max}$	=	200 V
Hilfsgitterspannung Tension auxiliaire de grille Auxiliary grid voltage	V_g'	=	100 V
Normaler Anodenstrom Courant anodique normal Normal anode current	I_a	=	3 mA
Neg. Gittervorspannung Polarisation négative de grille Negative grid bias	V_g	=	ca. env. 2 V appr.
Verstärkungsfaktor *Coefficient d'amplification* Amplification factor	$g(k)$	=	5000
Steilheit (max.) Inclinaison (max.) Slope (max.)	S_{max}	=	3,5 mA/V
Steilheit (norm.) Inclinaison (norm.) Slope (norm.)	S_{norm}	=	2,5 mA/V
Innerer Widerstand (norm.) *Résistance intérieure (norm.)* Internal resistance (norm.)	R_i	=	2 Megohm
Anoden-Gitterkapazität Capacité grille-plaque Anode-grid capacity	C_{ag}	=	0,002 $\mu\mu$F
Max. Länge Longueur max. Overall length	l	=	138 mm
Grösster Durchmesser Diamètre max. Max. diameter	d	=	51 mm
Sockel Culot Base		=	0 35
Sockelschaltung Connexion du culot Base connection		=	S XVI

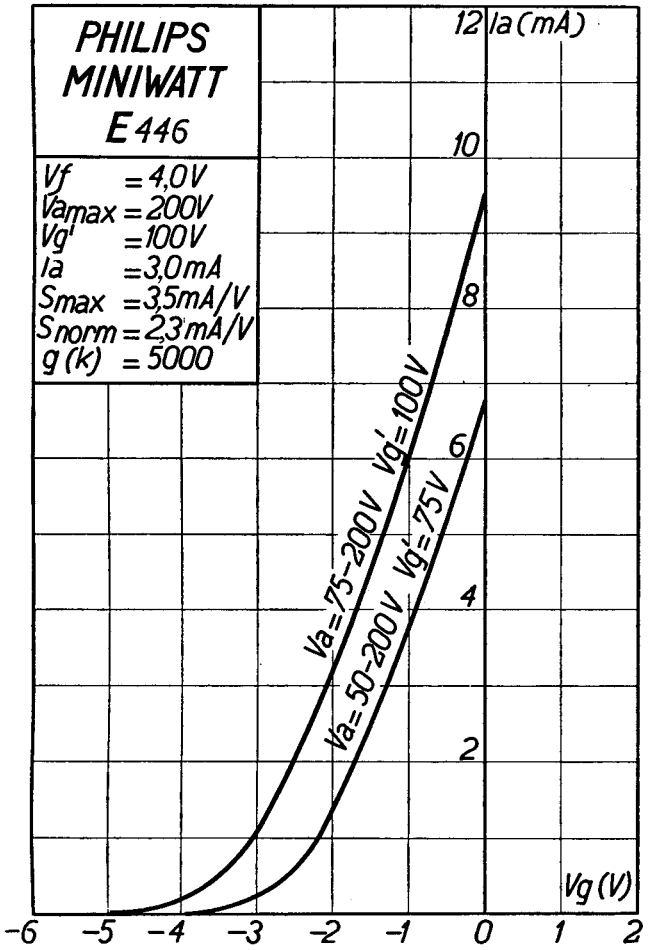
Anwendung: Applications: Function:	H.F.-Verstärkung Amplification h.f. H.F. amplification	Z.F.-Verstärkung Amplification m.f. I.F. amplification
	Gleichrichtung Détection Detection	
	N.F.-Verstärker mit Widerstandskopplung Amplificateur b.f. avec couplage par résistance L.F. amplifier with resistance coupling	


PHILIPS
MINIWATT
E 446
Vf = 4,0V
Vamax = 200V
Vg = 100V
Ia = 3,0mA
Smax = 3,5mA/V
Snorm = 2,5mA/V
g (k) = 5000
Ia (mA)
12
10
8
6
4
2
Vg (V)
-6
-5
-4
-3
-2
-1
0
1
2
Va = 75-200V Vg = 100V
Va = 50-200V Vg = 75V

PHILIPS „MINIWATT"

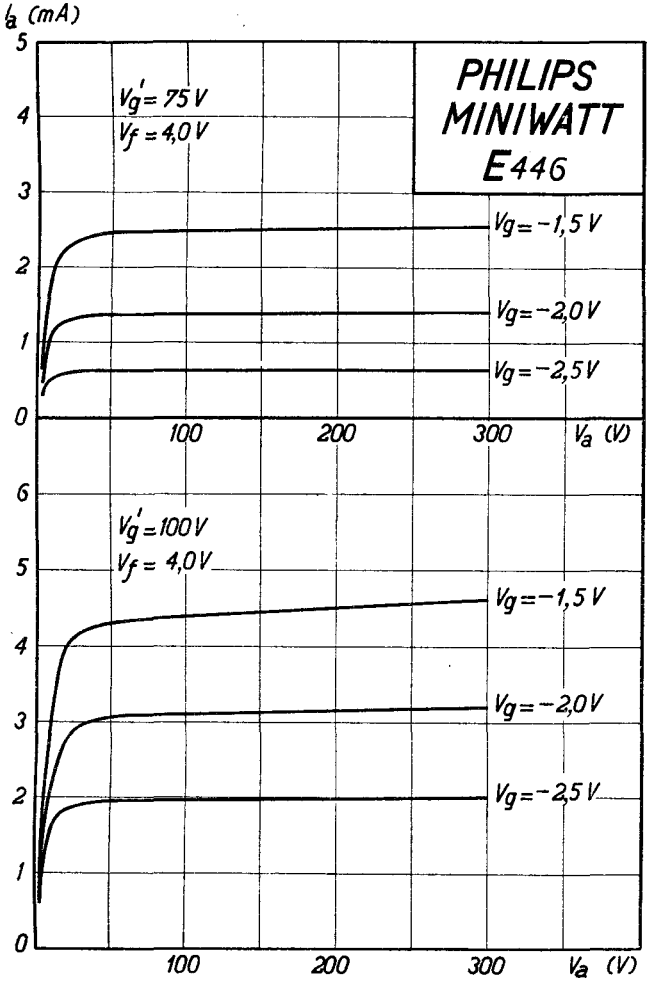
Heizspannung Tension de chauffage Filament voltage	V_f	=	4 V
Heizstrom Courant de chauffage Filament current	I_f	=	ca. env. 1,1 A appr.
Anodenspannung Tension anodique Anode voltage	$V_{a\ max.}$	=	200 V
Hilfsgitterspannung Tension auxiliaire de grille Auxiliary-grid voltage	$V_{g'}$	=	100 V
Normaler Anodenstrom Courant anodique normal Normal anode current	I_a	=	3 mA
Neg. *Gittervorspannung* Polarisation négative de grille Negative grid bias	V_g	=	ca. env. 2 V ca.
Verstärkungsfaktor Coefficient d'amplification Amplification factor	$g(k)$	=	5000
Steilheit (max.) Inclinaison (max.) Slope (max.)	$S_{max.}$	=	3,5 mA/V
Steilheit (norm.) Inclinaison (norm.) Slope (norm.)	$S_{norm.}$	=	2,3 mA/V
Innerer Widerstand (norm.) Résistance intérieure (norm.) *Internal resistance (norm.)*	R_i	=	2,2 Megohm
Anoden-Gitterkapazität Capacité grille-plaque Anode-grid capacity	C_{ag}	=	0,002 $\mu\mu$F
Max. Länge Longueur max. Overall length	l	=	138 mm
Grösster Durchmesser Diamètre max. Max. diameter	d	=	51 mm
Sockel Culot Base		=	0 35
Sockelschaltung Connexion du culot Base connection		=	S XVI

Anwendung: *Applications:* Function:	H.F.-Verstärkung *Amplification h.f.* H.F. amplification	Z.F.-Verstärkung *Amplification m.f.* I.F. amplification
	Gleichrichtung Détection Detection	
	N.F.-Verstärker mit Widerstandskopplung Amplificateur b.f. avec couplage par résistance L.F. amplifier with resistance coupling	


PHILIPS
MINIWATT
E 446
Vf = 4,0V
Vamax = 200V
Vg' = 100V
Ia = 3,0mA
Smax = 3,5mA/V
Snorm = 2,3mA/V
g (k) = 5000
Ia (mA)
12
10
8
6
4
2
Va = 75-200V Vg' = 100V
Va = 50-200V Vg' = 75V
Vg (V)
-6
-5
-4
-3
-2
-1
0
1
2

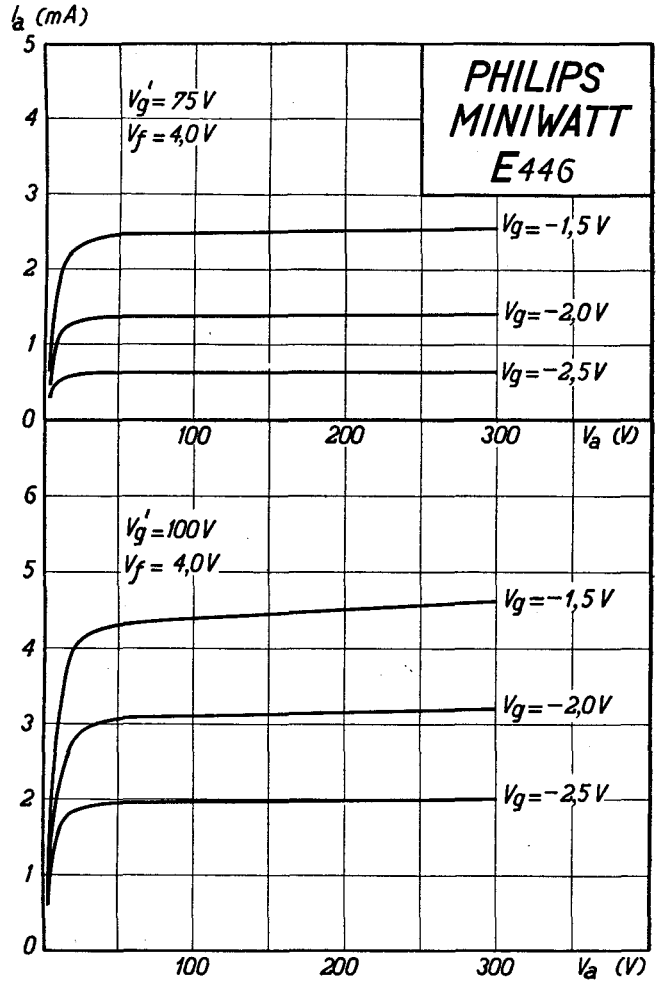
PHILIPS „MINIWATT"

Max. Anodenspannung Tension anodique max. Max. anode voltage	V_{ao} V_{aR} V_{aL}	= 400 V = 250 V = 200 V
Max. Anodenbelastung Dissipation anodique max. Max. anode dissipation	W_a	= 1,0 W
Max. Kathodenstrom Courant cathodique max. Max. cathode current	I_c	= 10 mA
Max. Schirmgitterspannung Tension de grille-écran max. Max. screen-grid voltage	$V_{g'}$ $V_{g'}$	= 400 V = 1,5 x Va max. 125 V
Max. Schirmgitterbelastung Dissipation de grille-écran max. Max. screen-grid dissipation	$W_{g'}$	= 0,3 W
Mittlerer Schirmgitterstrom Courant de grille-écran moyen Average screen-grid current	$I_{g'}$	= 1,2 mA
Ungefähre Grenzw. des Schirmgitterstr. Limites approxim. du cour. de gr.-écran Approx. limits of screen-grid current	$I_{g'}$ min. $I_{g'}$ max.	= 0,8 mA = 1,6 mA
Gitterstrom-Einsatzpunkt Point de commenc. du cour. de grille Starting point of grid current	V_{gi}	= −1,4 V
Max. Widerstand im Gitterkreis Résistance max. dans le circuit de grille Max. resistance in grid circuit	R_{g1}	= 1,5 M.Ohm = 1,0 M.Ohm
Max. Spann. zwischen Faden und Kath. Tension max. entre filament et cathode Max. voltage between filam. and cathode	V_{fc}	= 50 V
Max. Widerst. zwischen Faden und Kath. Résist. max. entre filament et cathode Max. resist. betw. filament and cathode	R_{fc}	= 20000 Ohm
Kapazitäten Capacités Capacities	C_g C_a C_{ag}	= 12,5 $\mu\mu$F = 10,2 $\mu\mu$F < 0,006 $\mu\mu$F


I_a (mA)
PHILIPS
MINIWATT
E446
$V_g' = 75\,V$
$V_f = 4{,}0\,V$
$V_g = -1{,}5\,V$
$V_g = -2{,}0\,V$
$V_g = -2{,}5\,V$
V_a (V)
$V_g' = 100\,V$
$V_f = 4{,}0\,V$
$V_g = -1{,}5\,V$
$V_g = -2{,}0\,V$
$V_g = -2{,}5\,V$
V_a (V)

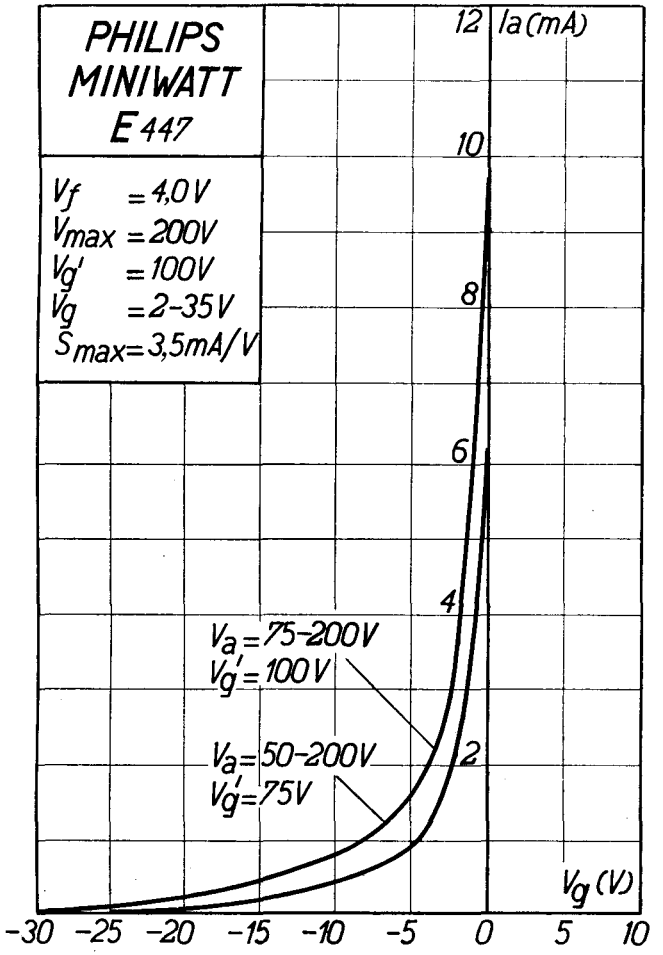
PHILIPS „MINIWATT"

Max. Anodenspannung Tension anodique max. Max. anode voltage	V_{ao} V_{aR} V_{aL}	= 400 V = 250 V = 200 V
Max. Anodenbelastung Dissipation anodique max. Max. anode dissipation	W_a	= 1,0 W
Max. Kathodenstrom Courant cathodique max. Max. cathode current	I_c	= 10 mA
Max. Schirmgitterspannung Tension de grille-écran max. Max. screen-grid voltage	$V_{g'o}$ $V_{g'}$	= 400 V = 1,5 x V_a max. 150 V
Max. Schirmgitterbelastung Dissipation de grille-écran max. Max. screen-grid dissipation	$W_{g'}$	= 0,3 W
Mittlerer Schirmgitterstrom Courant de grille-écran moyen Average screen-grid current	$I_{g'}$	= 1,1 mA
Ungefähre Grenzw. des Schirmgitterstr. Limites approxim. du cour. de gr.-écran Approx. limits of screen-grid current	$I_{g'}$ min. $I_{g'}$ max.	= 0,8 mA = 1,4 mA
Gitterstrom-Einsatzpunkt Point de commenc. du cour. de grille Starting point of grid current	V_{gi}	= —1,4 V
Max. Widerstand im Gitterkreis Résistance max. dans le circuit de grille Max. resistance in grid circuit	R_{g1} R_{g2}	= 1,5 M.Ohm = 1,0 M.Ohm
Max. Spann. zwischen Faden und Kath. Tension max. entre filament et cathode Max. voltage betw. filament and cathode	V_{fc}	= 50 V
Max. Widerstand zw. Faden und Kathode Résistance max. entre filam. et cathode Max. resistance betw. filam. and cathode	R_{fc}	= 20000 Ohm
Kapazitäten Capacités Capacities	C_g C_a C_{ag}	= 12,5 $\mu\mu$F = 9,9 $\mu\mu$F = 0,002 $\mu\mu$F


I_a (mA)
PHILIPS
MINIWATT
E446
$V_g' = 75\,V$
$V_f = 4{,}0\,V$
$V_g = -1{,}5\,V$
$V_g = -2{,}0\,V$
$V_g = -2{,}5\,V$
V_a (V)
$V_g' = 100\,V$
$V_f = 4{,}0\,V$
$V_g = -1{,}5\,V$
$V_g = -2{,}0\,V$
$V_g = -2{,}5\,V$
V_a (V)

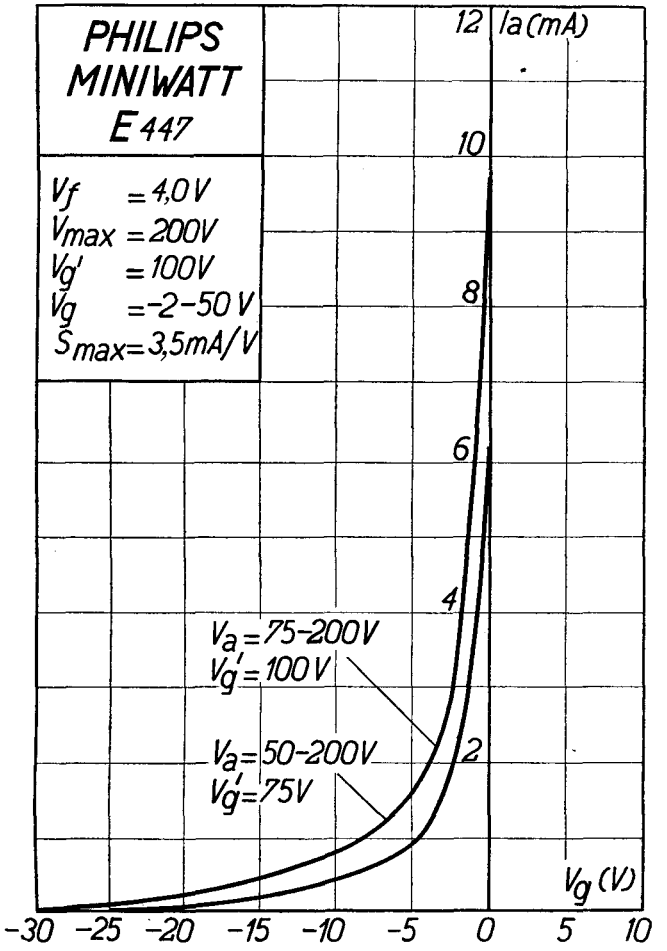
Heizspannung Tension de chauffage Filament voltage	v_f	=	4,0 V
Heizstrom Courant de chauffage Filament current	i_f	=	ca. env. 1,1 mA appr.
Anodenspannung Tension anodique Anode voltage	v_a	=	200 V
Schirmgitterspannung Tension de grille-écran Screen-grid voltage	$v_{g'}$	=	100 V
Normaler Anodenstrom Courant anodique normal Normal anode current (vg = -2 V)	i_a	=	ca. env. 4,5 mA appr.
Normaler Anodenstrom Courant anodique normal Normal anode current (vg = -35 V)	i_a	=	ca. env. 0,01 mA appr.
Verstärkungsfaktor Coefficient d'amplification Amplification factor	$g(k)$	=	2000
Steilheit (max.) Inclinaison (max.) Slope (max.)	S max.	=	3,5 mA/V
Steilheit Inclinaison Slope (vg = -2 V)	S	=	2 mA/V
Steilheit Inclinaison Slope (vg = -35 V)	S	=	0,005 mA/V
Innerer Widerstand (norm.) Résistance intérieure (norm.) Internal resistance (norm.) (vg = -2 V)	R_i	=	1 M.Ohm
Innerer Widerstand (norm.) Résistance intérieure (norm.) Internal resistance (norm.) (vg = -35 V)	R_i	>	10 M.Ohm
Anoden-Gitterkapazität Capacité grille-plaque Anode-grid capacity	C_{ag}	=	0,002 $\mu\mu$F
Max. Länge Longueur max. Overall length	l	=	138 mm
Grösster Durchmesser Diamètre max. Max. diameter	d	=	51 mm
Sockel Culot Base		=	0 35
Sockelschaltung Connexion du culot Base connection		=	S XVI

Anwendung:	H.F.-Verstärkung	Z.F.-Verstärkung
Applications:	Amplification h.f.	Amplification m.f.
Function:	H.F. amplification	I.F. amplification


PHILIPS
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E 447
V_f = 4,0 V
V_{max} = 200V
V_g' = 100V
V_g = 2-35V
S_{max} = 3,5mA/V
12
Ia (mA)
10
8
6
4
2
V_a = 75-200V
V_g' = 100V
V_a = 50-200V
V_g' = 75V
V_g (V)
-30
-25
-20
-15
-10
-5
0
5
10

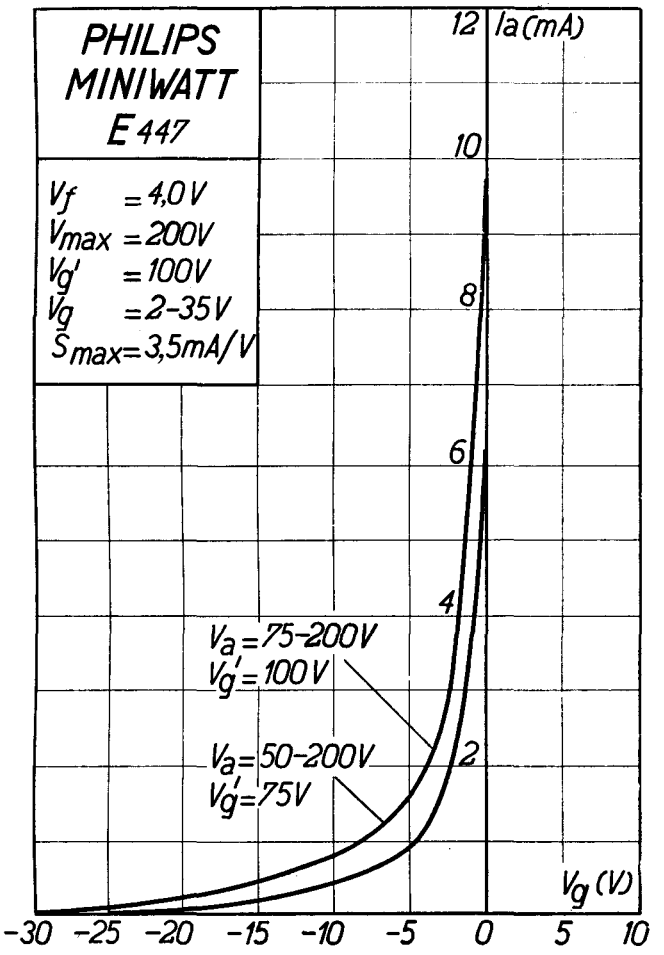
Heizspannung Tension de chauffage Filament voltage	V_f	=	4,0 V
Heizstrom Courant de chauffage Filament current	I_f	=	ca. env. 1,1 A appr.
Anodenspannung Tension anodique Anode voltage	V_a	=	200 V
Schirmgitterspannung Tension de grille-écran Screen-grid voltage	$V_{g/}$	=	100 V
Normaler Anodenstrom Courant anodique normal Normal anode current (vg = ca. env. appr. -2 V)	I_a	=	4,5 mA
Normaler Anodenstrom Courant anodique normal. Normal anode current (vg = ca. env. appr. -50 V)	I_a	=	0,01 mA
Verstärkungsfaktor Coefficient d'amplification Amplification factor	$g(k)$	=	2000
Steilheit (max.) Inclinaison (max.) Slope (max.)	$S_{max.}$	=	3,5 mA/V
Steilheit Inclinaison Slope (vg = ca. env. appr. -2 V)	S	=	2,3 mA/V
Steilheit Inclinaison Slope (vg = ca. env. appr. -50 V)	S	=	0,002 mA/V
Innerer Widerstand (norm.) Résistance intérieure (norm.) Internal resistance (norm.) (vg = ca. env. appr. -2 V)	R_i	=	1 M.Ohm
Innerer Widerstand (norm.) Résistance intérieure (norm.) Internal resistance (norm.) (vg = ca. env. appr. -50 V)	R_i	>	10 M.Ohm
Anoden-Gitterkapazität Capacité grille-plaque Anode-grid capacity	C_{ag}	=	0,002 $\mu\mu$F
Max. Länge Longueur max. Overall length	l	=	138 mm
Grösster Durchmesser Diamètre max. Max. diameter	d	=	51 mm
Sockel Culot Base		=	0 35
Sockelschaltung Connexion du culot Base connection		=	S XVI

Anwendung:	H.F.-Verstärkung	Z.F.-Verstärkung
Applications:	Amplification h.f.	Amplification m.f.
Function:	H.F. amplification	I.F. amplification


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E 447
Vf = 4,0 V
Vmax = 200V
Vg' = 100V
Vg = -2-50 V
Smax = 3,5mA/V
12
Ia (mA)
10
8
6
4
2
Va = 75-200V
Vg' = 100 V
Va = 50-200V
Vg' = 75V
Vg (V)
-30
-25
-20
-15
-10
-5
0
5
10

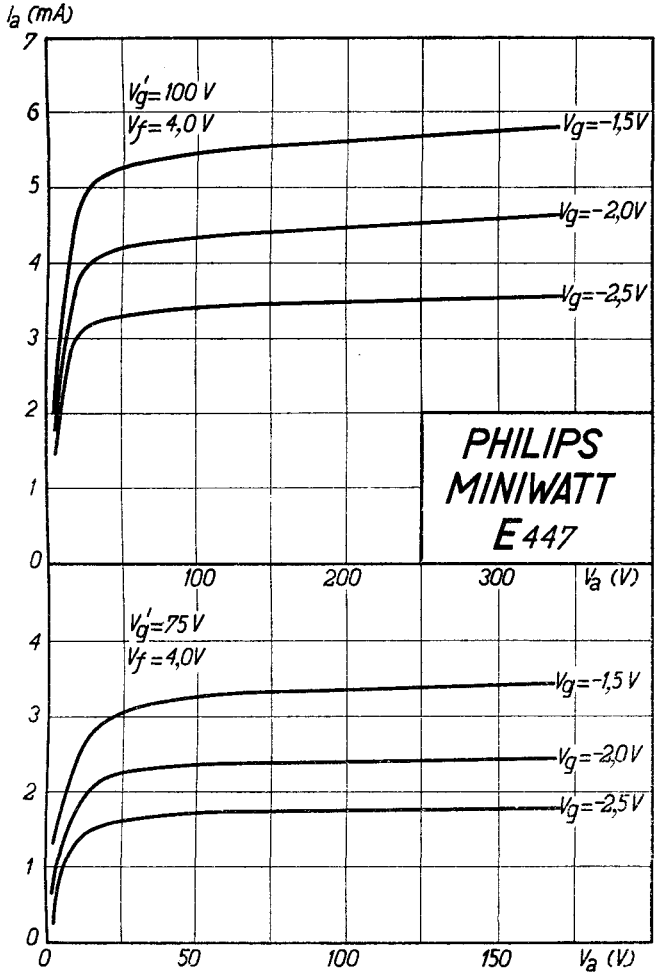
Heizspannung Tension de chauffage Filament voltage	V_f	=	4,0 V
Heizstrom Courant de chauffage Filament current	I_f	=	ca. env. 1,1 A appr.
Anodenspannung Tension anodique Anode voltage	V_a	=	200 V
Schirmgitterspannung Tension de grille-écran Screen-grid voltage	$V_{g'}$	=	100 V
Normaler Anodenstrom Courant anodique normal Normal anode current (Vg = -2 V)	I_a	=	ca. env. 4,5 mA appr.
Normaler Anodenstrom Courant anodique normal Normal anode current (Vg = -35 V)	I_a	=	ca. env. 0,01 mA appr.
Verstärkungsfaktor Coefficient d'amplification Amplification factor	$g(k)$	=	2000
Steilheit (max.) Inclinaison (max.) Slope (max.)	$S_{\text{max.}}$	=	3,5 mA/V
Steilheit Inclinaison Slope (Vg = -2 V)	S	=	2 mA/V
Steilheit Inclinaison Slope (Vg = -35 V)	S	=	0,005 mA/V
Innerer Widerstand (norm.) Résistance intérieure (norm.) Internal resistance (norm.) (Vg = -2 V)	R_i	=	1 M.Ohm
Innerer Widerstand (norm.) Résistance intérieure (norm.) Internal resistance (norm.) (Vg = -35 V)	R_i	>	10 M.Ohm
Anoden-Gitterkapazität Capacité grille-plaque Anode-grid capacity	C_{ag}	=	0,002 $\mu\mu$F
Max. Länge Longueur max. Overall length	l	=	138 mm
Grösster Durchmesser Diamètre max. Max. diameter	d	=	51 m
Sockel Culot Base		=	0 35
Sockelschaltung Connexion du culot Base connection		=	S XVI

Anwendung:	H.F.-Verstärkung	Z.F.-Verstärkung
Applications:	Amplification h.f.	Amplification m.f.
Function:	H.F. amplification	I.F. amplification


PHILIPS
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E 447
V_f = 4,0 V
V_{max} = 200 V
V_g' = 100 V
V_g = 2-35 V
S_{max} = 3,5 mA/V
12
Ia (mA)
10
8
6
4
2
V_a = 75-200 V
V_g' = 100 V
V_a = 50-200 V
V_g' = 75 V
V_g (V)
-30 -25 -20 -15 -10 -5 0 5 10

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Max. Anodenspannung Tension anodique max. Max. anode voltage	V_{ao} V_{aR} V_{aL}	= 400 V = 250 V = 200 V
Max. Anodenbelastung Dissipation anodique max. Max. anode dissipation	W_a	= 1,5 W
Max. Kathodenstrom Courant cathodique max. Max. cathode current	I_c	= 10 mA
Max. Schirmgitterspannung Tension de grille-écran max. Max. screen-grid voltage	V_{g^1} V_{g^1} V_{g^1}	= 400 V = 1,5 x Va max. 125 V
Max. Schirmgitterbelastung Dissipation de grille-écran max. Max. screen-grid dissipation	W_{g^1}	= 0,3 W
Mittlerer Schirmgitterstrom Courant de grille-écran moyen Average screen-grid current	I_{g^1}	= 1,9 mA
Ungefähre Grenzw. des Schirmgitterstr. Limites approxim. du cour. de gr. écran Approx. limits of screen-grid current	I_{g^1} min. I_{g^1} max.	= 1,3 mA = 2,5 mA
Gitterstrom-Einsatzpunkt Point de commenc. du courant de grille Starting point of grid current	V_{gi}	= —1,3 V
Max. Widerstand im Gitterkreis Résistance max. dans le circuit de grille Max. resistance in grid circuit	R_{g1}	= 4 M.Ohm
Max. Spann. zwischen Faden und Kath. Tension max. entre filament et cathode Max. voltage between filam. and cathode	V_{fc}	= 80 V
Max. Widerst. zwischen Faden und Kath. Résist. max. entre filament et cathode Max. resist. betw. filament and cathode	R_{fc}	= 20000 Ohm
Kapazitäten Capacités Capacities	C_g C_a C_{ag}	= 12,5 $\mu\mu$F = 10,2 $\mu\mu$F $\leqq$ 0,006 $\mu\mu$F

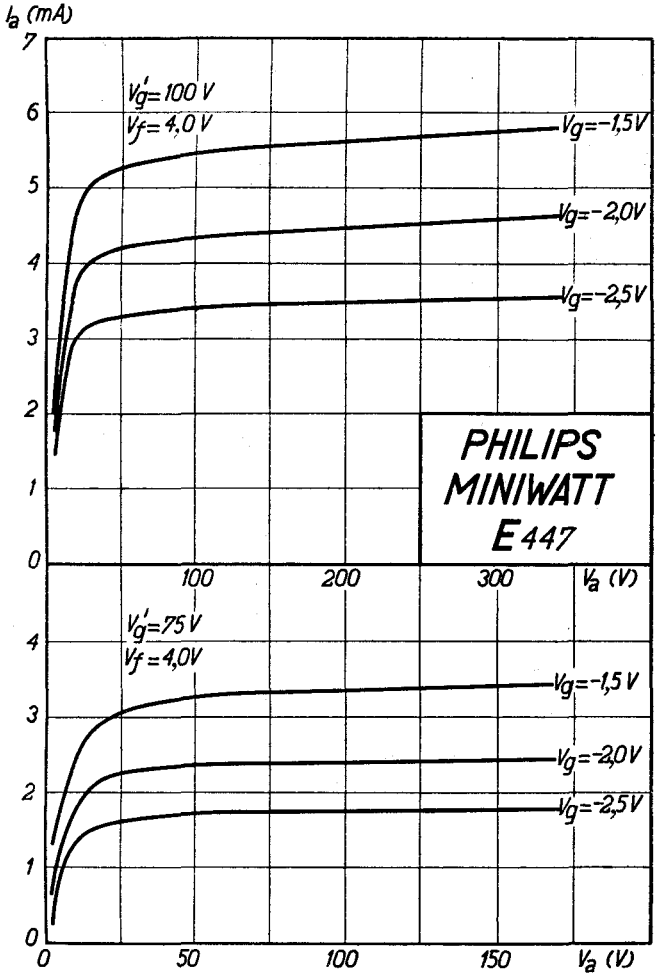

I_a (mA)
V_g'= 100 V
V_f = 4,0 V
V_g = −1,5 V
V_g = −2,0 V
V_g = −2,5 V
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E 447
V_a (V)
V_g' = 75 V
V_f = 4,0 V
V_g = −1,5 V
V_g = −2,0 V
V_g = −2,5 V
V_a (V)

E 447

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Max. Anodenspannung Tension anodique max. Max. anode voltage	V_{ao} V_{a_R} V_{a_L}	= 400 V = 250 V = 200 V
Max. Anodenbelastung Dissipation anodique max. Max. anode dissipation	W_a	= 1,5 W
Max. Kathodenstrom Courant cathodique max. Max. cathode current	I_c	= 10 mA
Max. Schirmgitterspannung Tension de grille-écran max. Max. screen-grid voltage	$V_{g'}$ $V_{g'}$	= 400 V = 1,5 x V_a max. 150 V
Max. Schirmgitterbelastung Dissipation de grille-écran max. Max. screen-grid dissipation	$W_{g'}$	= 0,3 W
Mittlerer Schirmgitterstrom Courant de grille-écran moyen Average screen-grid current	$I_{g'}$	= 1,8 mA
Ungefähre Grenzw. des Schirmgitterstr. Limites approxim. du cour. de gr.-écran Approx. limits of screen-grid current	$I_{g'}$ min. $I_{g'}$ max.	= 1 mA = 2,6 mA
Gitterstrom-Einsatzpunkt Point de commenc. du courant de grille Starting point of grid current	V_{gi}	= —1,3 V
Max. Widerstand im Gitterkreis Résistance max. dans le circuit de grille Max. resistance in grid circuit	R_{g1}	= 4 M.Ohm
Max. Spann. zwischen Faden und Kath. Tension max. entre filament et cathode Max. voltage between filam. and cathode	V_{fc}	= 80 V
Max. Widerst. zwischen Faden und Kath. Résist. max. entre filament et cathode Max. resist. betw. filament and cathode	R_{fc}	= 20000 Ohm
Kapazitäten Capacités Capacities	C_g C_a C_{ag}	= 12,5 $\mu\mu$F = 9,9 $\mu\mu$F = 0,002 $\mu\mu$F

23/5'33


I_a (mA)
V'_g= 100 V
V_f= 4,0 V
V_g=-1,5V
V_g=-2,0V
V_g=-2,5V
PHILIPS
MINIWATT
E447
V_a (V)
V'_g=75 V
V_f=4,0V
V_g=-1,5 V
V_g=-2,0V
V_g=-2,5V
V_a (V)

E 448

PHILIPS „MINIWATT"

Heizspannung Tension de chauffage Filament voltage	V_f	= 4 V
Heizstrom Courant de chauffage Filament current	I_f	= ca. env. 1,2 A appr.
Elektroden Spannungen Tensions d'électrodes Electrode voltages	V_a	= 200 V
	V_{g4}	= -3 V
	V_{g3}	= 200 V
	V_{g2}	= 100 V
	V_{g1}	= -1,5 V
Elektroden Strömen Courants d'électrodes Electrode currents	I_a	= 4 mA
	I_{g3}	= 10 mA
Max. Länge Longueur max. Overall length	l	= 130 mm
Grösster Durchmesser Diamètre max. Max. diameter	d	= 52 mm
Sockel Culot Base		= C 35
Sockelschaltung Connexion du culot Base connection		= S XVII

Anwendung: Oszillator-Modulator
Applications: Oscillateur-modulateur
Function: Oscillateur-modulateur

27/10'33

E 448

PHILIPS „MINIWATT"

Heizspannung Tension de chauffage Filament voltage	V_f	= 4 V
Heizstrom Courant de chauffage Filament current	I_f	= ca. env. appr. 1,2 A
Elektrodenspannungen Tensions d'électrodes Electrode voltages	V_a	= 200 V
	V_{g4}	= -3 V
	V_{g3}	= 200 V
	V_{g2}	= 100 V
	V_{g1}	= -1,5 V
Elektrodenströme Courants d'électrodes Electrode currents	I_a	= 4 mA
	I_{g1}	= 10 mA
Max. Länge Longueur max. Overall length	l	= 130 mm
Grösster Durchmesser Diamètre max. Max. diameter	d	= 52 mm
Sockel Culot Base		= C 35
Sockelschaltung Connexion du culot Base connection		= S XVII

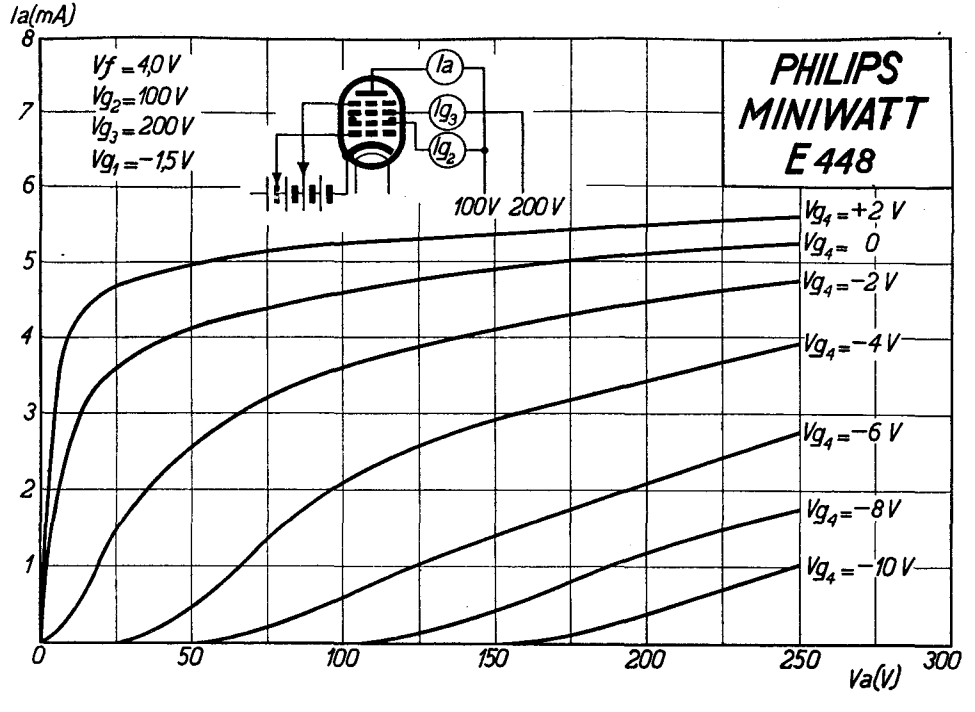
Anwendung: Oszillator-Modulator
Application: Oscillateur-modulateur
Function: Oscillator-modulator

E 448

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Max. Elektroden Spannungen ..... Tensions d'électrodes max. ..... Max. electrode voltages	V_{ao}	= 400 V
	V_{a_R}	= 250 V
	V_{a_L}	= 200 V
	V_{g3o}	= 400 V
	V_{g3R}	= 200 V
	V_{g3L}	= 200 V
	V_{g2o}	= 200 V
	V_{g2}	= 120 V
Max. Elektroden Belastungen ..... Dissipations d'électrodes max. ..... Max. electroden dissipations	W_a	= > 1 W
	W_{g3}	= > 2 W
	W_{g2}	= 0,4 W
Max. Kathodenstrom ..... Courant cathodique max. ..... Max. cathode current	I_c	= 15 mA
Mittlerer Schirmgitterstrom ..... Courant de grille-écran moyen ..... Average screen-grid current	I_{g2}	= ca. env. appr. 1,5 mA
Gitterstrom-Einsatzpunkt ..... Point de commenc. du courant de grille Starting point of grid current	V_{g4i}	= -1,3 V
	V_{g1i}	= -1,3 V
Max. Spann. zwischen Faden und Kath. Tension max. entre filament et cathode Max. voltage between filam. and cathode	V_{fc}	= 20 V
Kapazitäten ..... Capacités ..... Capacities	C_{g1g3}	= ca. env. appr. 0,015 $\mu\mu$F
	C_a	= 12,5 $\mu\mu$F
	C_{g1}	= 7 $\mu\mu$F
	$C_{g3}+_{g4}$	= 11,5 $\mu\mu$F

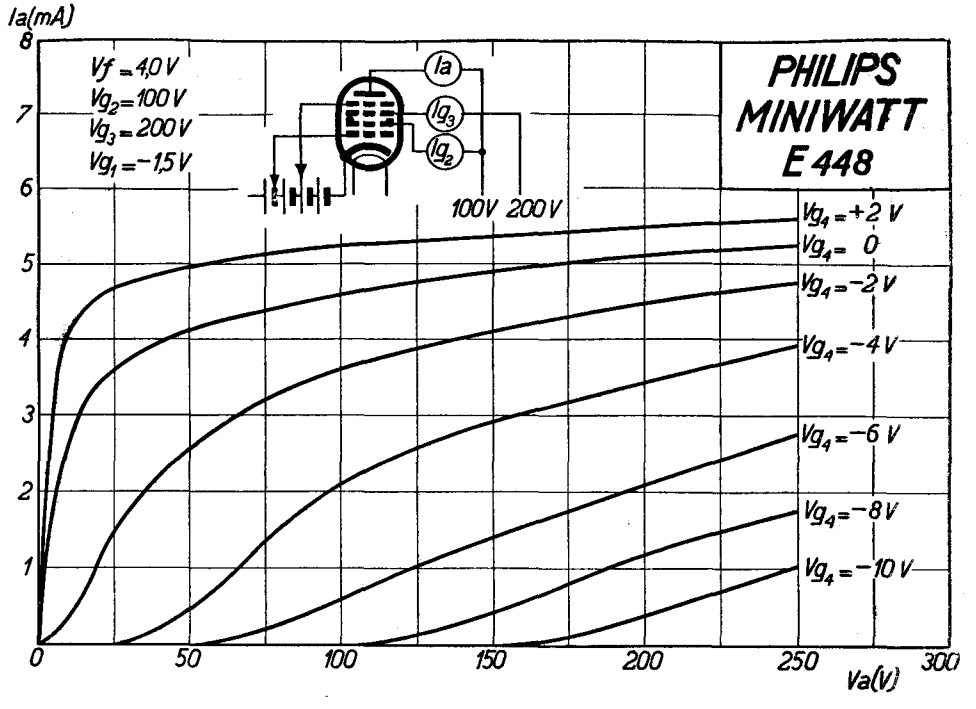
28/10'33

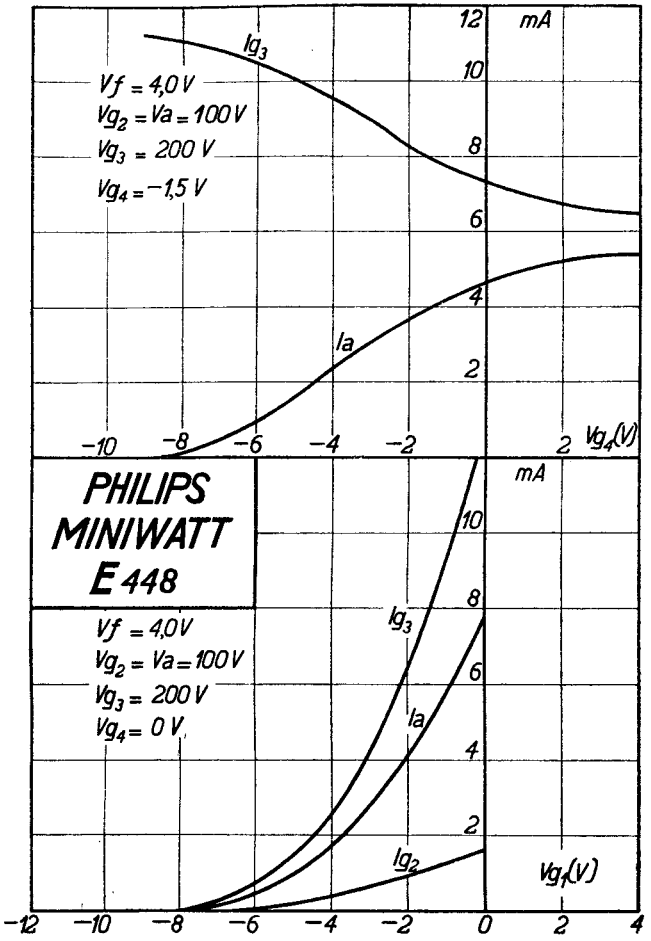

Ia(mA)
8
7
6
5
4
3
2
1
0
50
100
150
200
250
300
Va(V)
Vf = 4,0 V
Vg2 = 100 V
Vg3 = 200 V
Vg1 = −1,5 V
Ia
Ig3
Ig2
100 V
200 V
PHILIPS
MINIWATT
E 448
Vg4 = +2 V
Vg4 = 0
Vg4 = −2 V
Vg4 = −4 V
Vg4 = −6 V
Vg4 = −8 V
Vg4 = −10 V

E 448

PHILIPS „MINIWATT"

Max. Elektrodenspannungen ..... Tensions d'électrodes max. ..... Max. electrode voltages	V_{ao}	= 400 V
	V_{aR}	= 250 V
	V_{aL}	= 200 V
	V_{g3o}	= 400 V
	V_{g3R}	= 200 V
	V_{g3L}	= 200 V
	V_{g2o}	= 200 V
	V_{g2}	= 120 V
Max. Elektrodenbelastungen ..... Dissipations d'électrodes max. ..... Max. electroden dissipations	W_a	= > 1 W
	W_{g3}	= > 2 W
	W_{g2}	= 0,4 W
Max. Kathodenstrom ..... Courant cathodique max. ..... Max. cathode current	I_c	= 15 mA
Mittlerer Schirmgitterstrom ..... Courant de grille-écran moyen ..... Average screen-grid current	I_{g2}	= ca. env. 1,5 mA appr.
Gitterstrom-Einsatzpunkt ..... Point de commenc. du courant de grille Starting point of grid current	V_{g4i}	= -1,3 V
	V_{g1i}	= -1,3 V
Max. Spann. zwischen Faden und Kath. Tension max. entre filament et cathode Max. voltage between filam. and cathode	V_{fc}	= 20 V
Max. Widerst. zwischen Faden und Kath. Résistance max. entre filam. et cathode Max. résistance betw. filam. and cathode	R_{fc}	= 20,000 Ohm
Kapazitäten ..... Capacités ..... Capacities	C_{g1g3}	= ca. env. 0,015 $\mu\mu$F appr.
	C_a	= 12,5 $\mu\mu$F
	C_{g1}	= 7 $\mu\mu$F
	C_{g3+g4}	= 11,5 $\mu\mu$F


Ia(mA)
8
7
6
5
4
3
2
1
0
50
100
150
200
250
300
Va(V)
Vf = 4,0 V
Vg2 = 100 V
Vg3 = 200 V
Vg1 = −1,5 V
Ia
Ig3
Ig2
100V 200V
PHILIPS
MINIWATT
E 448
Vg4 = +2 V
Vg4 = 0
Vg4 = −2 V
Vg4 = −4 V
Vg4 = −6 V
Vg4 = −8 V
Vg4 = −10 V


12
mA
10
8
6
4
2
Ig3
Vf = 4,0 V
Vg2 = Va = 100 V
Vg3 = 200 V
Vg4 = −1,5 V
Ia
−10
−8
−6
−4
−2
2
Vg4(V)
PHILIPS
MINIWATT
E 448
mA
10
8
6
4
2
Ig3
Vf = 4,0 V
Vg2 = Va = 100 V
Vg3 = 200 V
Vg4 = 0 V
Ia
Ig2
Vg1(V)
−12
−10
−8
−6
−4
−2
0
2
4

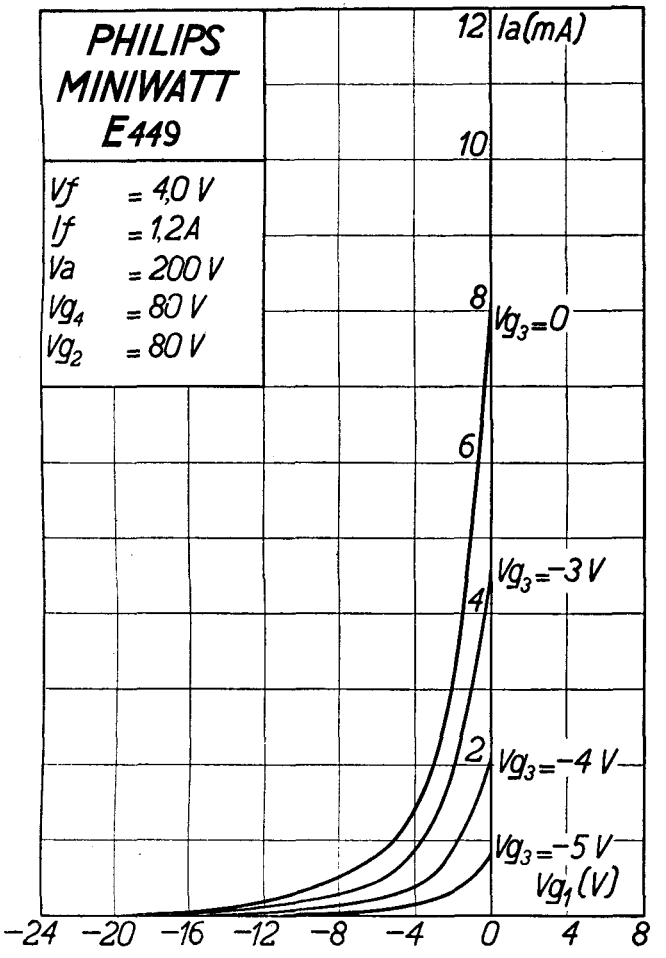
PHILIPS „MINIWATT"

Heizspannung Tension de chauffage Filament voltage	V_f	=	4 V
Heizstrom Courant de chauffage Filament current	I_f	=	ca. env. 1,2 A appr.
Elektrodenspannungen Tensions d'électrodes Electrode voltages	V_a V_{g2} V_{g4}	= = =	200 V 80 V 80 V
Steilheit Inclinaison Mutual conductance (Vg3 = -2 V; Vg1 = -2 V; Ia = 3 mA)	$S_{ag1\,max}$	=	3 mA/V
Steilheit Inclinaison Mutual conductance (Vg3 = -2 V; Vg1 = -2 V; Ia = 3 mA)	$S_{ag1\,norm}$	=	2 mA/V
Steilheit Inclinaison Mutual conductance (Vg3 = -7 V; Vg1 = -15 V; Ia = < 0,001 mA)	$S_{ag1\,norm}$	=	0,001 mA/V
Innerer Widerstand Résistance intérieure Internal resistance (Vg3 = -2 V; Vg1 = -2 V; Ia = 3 mA)	R_i	=	0,5 M.Ohm
Innerer Widerstand Résistance intérieure Internal resistance (Vg3 = -7 V; Vg1 = -15 V; Ia = < 0,001 mA)	R_i	>	50 M.Ohm
Max. Länge Longueur max. Overall length	l	=	130 mm
Grösster Durchmesser Diamètre max. Max. diameter	d	=	52 mm
Sockel Culot Base		=	C 35
Sockelschaltung Connexion du culot Base connection		=	S XVII

Anwendung: H.F.-Verstärkung
Applications: Amplification h.f.
Function: H.F. amplification

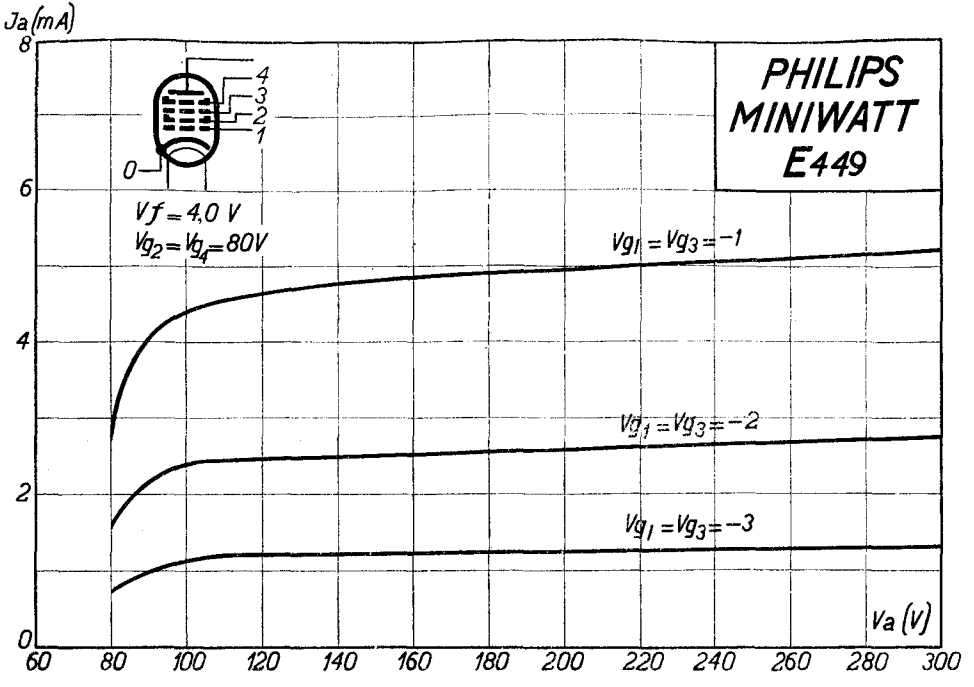
Z.F.-Verstärkung
Amplification m.f.
I.F. amplification

21/8/1933


PHILIPS
MINIWATT
E449
Vf = 4,0 V
If = 1,2A
Va = 200 V
Vg4 = 80 V
Vg2 = 80 V
12
Ia(mA)
10
8
Vg3=0
6
Vg3=-3 V
4
2
Vg3=-4 V
Vg3=-5 V
Vg1(V)
-24
-20
-16
-12
-8
-4
0
4
8

PHILIPS „MINIWATT"

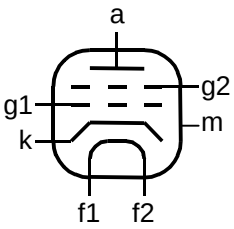
Max. Elektroden Spannungen	V_{ao}	= 400 V
	V_{aR}	= 250 V
Tensions d'électrodes max.	V_{aL}	= 200 V
Max. electrode voltages	V_{g4o}	= 200 V
	V_{g4}	= 150 V
	V_{g2o}	= 200 V
	V_{g2}	= 150 V
Max. Elektroden Belastungen	W_a	= 1 W
Dissipations d'électrodes max. . . .	W_{g4}	= 0,25 W
Max. electrode dissipations	W_{g2}	= 0,5 W
Max. Kathodenstrom	I_c	= 10 mA
Courant cathodique max.		
Max. cathode current		
Gitterstrom Einsatz	V_{g1i}	= -1,3 V
Commencement du courant de grille	V_{g3i}	= -1,3 V
Starting of grid current		
Max. Widerstand im Gitterkreis . . .	R_{g1a}	= 3 M.Ohm
Résistance max. dans le circuit de grille	R_{g3a}	= 3 M.Ohm
Max. resistance in grid circuit . . .		
Max. Spann. zwischen Faden und Kath.	V_{fc}	= 50 V
Tension max. entre filament et cathode		
Max. voltage betw. filament and cathode		
Kapazitäten	C_{g1a}	< 0,001 $\mu\mu$F
Capacités	C_g	= 6,5 $\mu\mu$F
Capacities	C_a	= 11,5 $\mu\mu$F

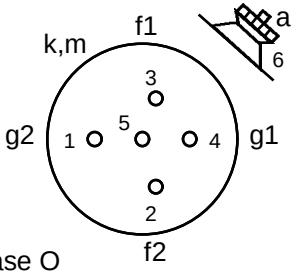

Ja (mA)
8
6
4
2
0
60
80
100
120
140
160
180
200
220
240
260
280
300
Va (V)
PHILIPS
MINIWATT
E449
4
3
2
1
0
Vf = 4,0 V
Vg2 = Vg4 = 80V
Vg1 = Vg3 = −1
Vg1 = Vg3 = −2
Vg1 = Vg3 = −3

E452T PHILIPS

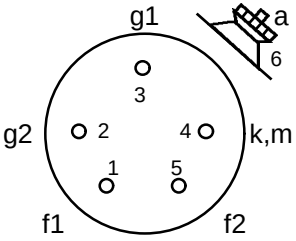
Tetrode, Detector, HF or MF amplifier

Dimensions (mm)	129 x 51	
Heating indirect, AC or DC, parallel	Vf (V) If (A)	4 1





Base O



Base N

Capacitances	Cag1 (pF)	0.003
Typical characteristics	Va (V)	200
	Ia (mA)	3.0
	Vg1 (V)	-2
	Vg2 (V)	100
	Ig2 (mA)	0.7
	µ	900
	S (mA/V)	2.0
	Ri (kΩ)	450

E452T PHILIPS

Operating characteristics	Vb (V)	200
	Ra (kΩ)	-
	Rg2 (kΩ)	200
	Rk (kΩ)	0.5
	Ia (mA)	3.0
	Ig2 (mA)	0.7
	Vg2 (V)	100
	Vk (V)	2
Limiting values	Pa max (W)	1

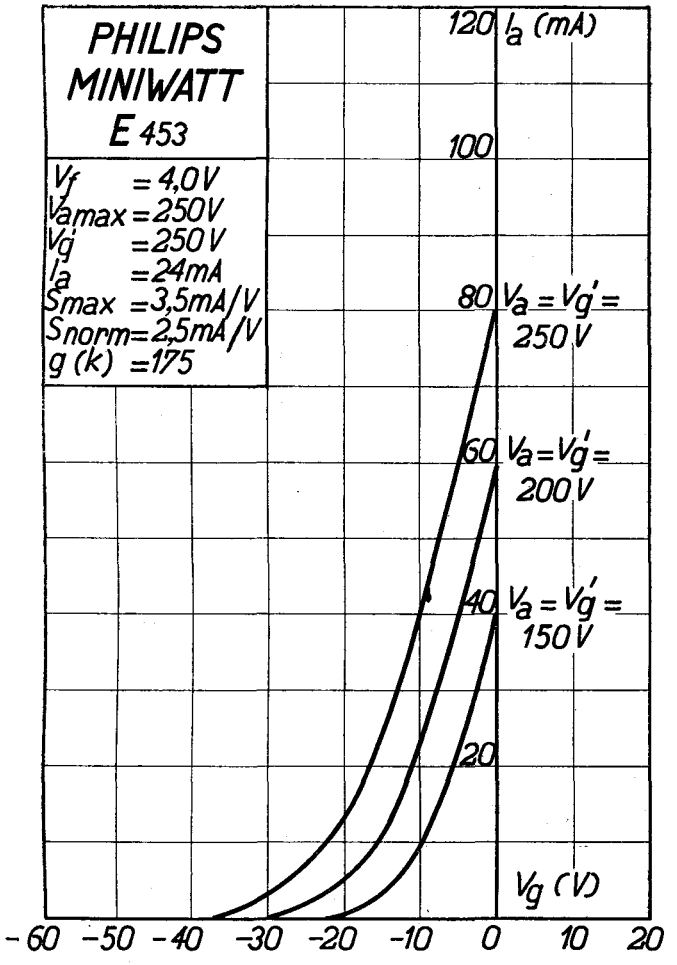
E 453

PHILIPS „MINIWATT"

Heizspannung Tension de chauffage Filament voltage	v_f	=	4,0 V
Heizstrom Courant de chauffage Filament current	i_f	=	ca. env. 1,1 A appr.
Anodenspannung Tension anodique Anode voltage	$v_{a\,max.}$	=	250 V
Schirmgitterspannung Tension de grille-écran Screen-grid voltage	$V_{g'}$	=	250 V
Normaler Anodenstrom Courant anodique normal Normal anode current	i_a	=	24 mA
Neg. Gittervorspannung Polarisation négative de grille Negative grid bias	v_g	=	ca. env. 15 V appr.
Verstärkungsfaktor Coefficient d'amplification Amplification factor	$g(k)$	=	175
Steilheit (max.) Inclinaison (max.) Slope (max.)	$S_{\text{max.}}$	=	3,5 mA/V
Steilheit (norm.) Inclinaison (norm.) Slope (norm.)	$S_{\text{norm.}}$	=	2,5 mA/V
Innerer Widerstand (norm.) Résistance intérieure (norm.) Internal resistance (norm.)	R_i	=	70000 Ohm
Anodenverlustleistung Dissipation anodique Anode dissipation	$w_{a\,max.}$	=	6 W
Max. Länge Longueur max. Overall length	l	=	105 mm
Grösster Durchmesser Diamètre max. Max. diameter	d	=	51 mm
Sockel Culot Base		=	B 35
Sockelschaltung Connexion du culot Base connection		=	S. XVIII

Anwendung: Endstufe
Application: Tube final
Function: Power valve

5/10'33


PHILIPS
MINIWATT
E 453
Vf = 4,0V
Vamax = 250V
Vg' = 250V
Ia = 24mA
Smax = 3,5mA/V
Snorm = 2,5mA/V
g (k) = 175
120
Ia (mA)
100
80
Va = Vg' = 250V
60
Va = Vg' = 200V
40
Va = Vg' = 150V
20
Vg (V)
-60
-50
-40
-30
-20
-10
0
10
20

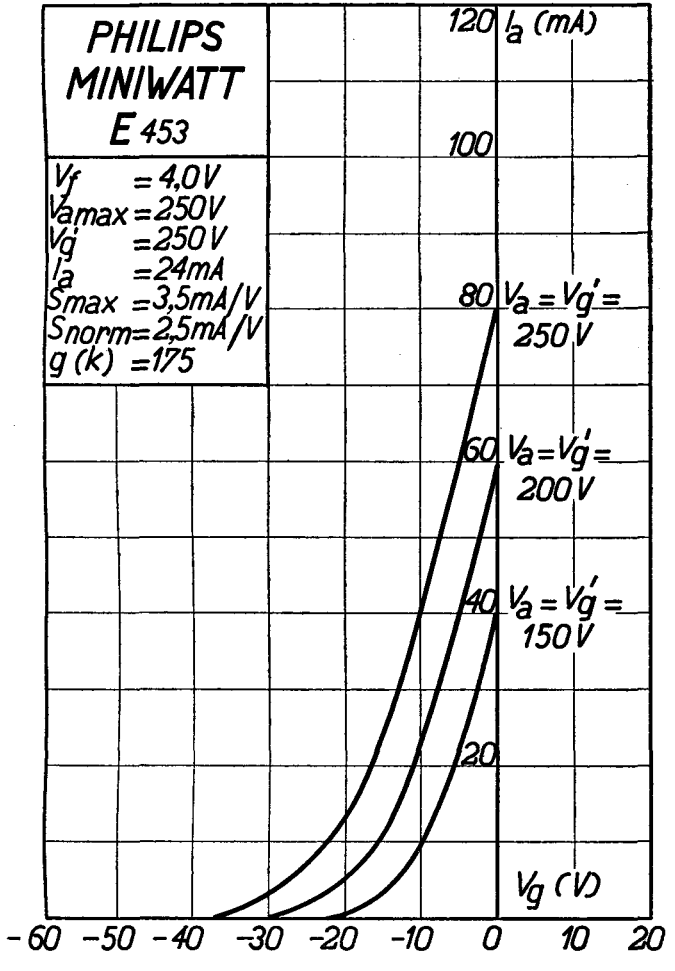
E 453

PHILIPS „MINIWATT"

Heizspannung Tension de chauffage Filament voltage	V_f	=	4,0 V
Heizstrom Courant de chauffage Filament current	I_f	=	ca. env. 1,1 A appr.
Anodenspannung Tension anodique Anode voltage	$V_{a\ max}$	=	250 V
Schirmgitterspannung Tension de grille-écran Screen-grid voltage	$V_{g'}$	=	250 V
Normaler Anodenstrom Courant anodique normal Normal anode current	I_a	=	24 mA
Neg. Gittervorspannung Polarisation négative de grille Negative grid bias	V_g	=	ca. env. 18 V appr.
Verstärkungsfaktor Coefficient d'amplification Amplification factor	$g(k)$	=	175
Steilheit (max.) Inclinaison (max.) Slope (max.)	$S_{\ max.}$	=	3,5 mA/V
Steilheit (norm.) Inclinaison (norm.) Slope (norm.)	$S_{\ norm.}$	=	2,5 mA/V
Innerer Widerstand (norm.) Résistance intérieure (norm.) Internal resistance (norm.)	R_i	=	70000 Ohm
Anodenverlustleistung Dissipation anodique Anode dissipation	$W_{a\ max.}$	=	6 W
Max. Länge Longueur max. Overall length	l	=	105 mm
Grösster Durchmesser Diamètre max. Max. diameter	d	=	51 mm
Sockel Culot Base		=	B 35
Sockelschaltung Connexion du culot Base connection		=	S XVIII

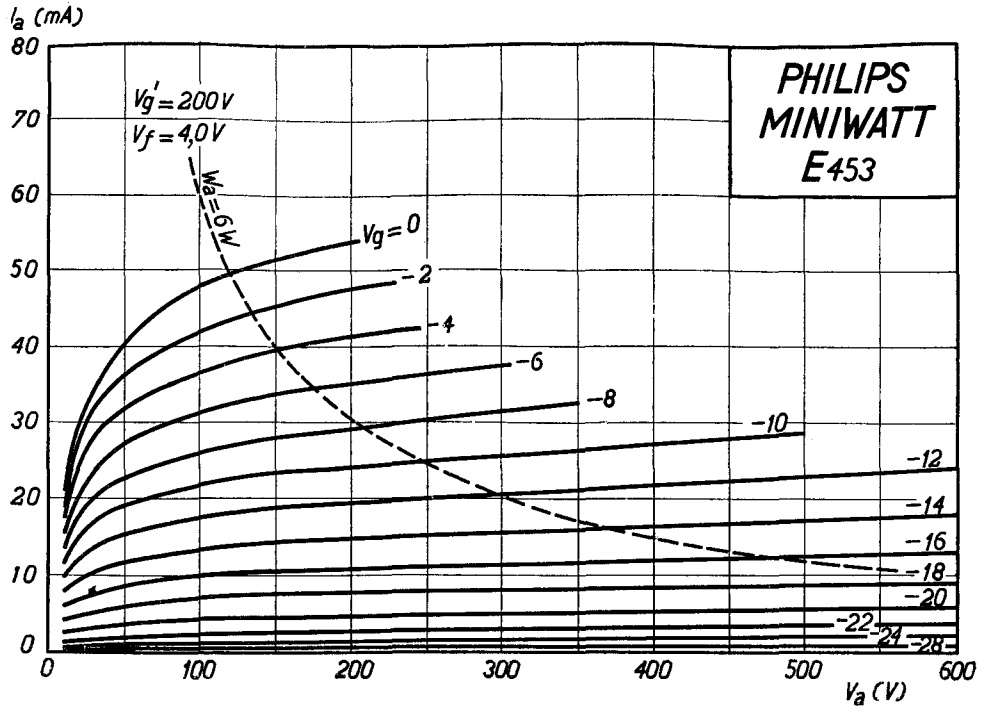
Anwendung: Endstufe
Application: Tube final
Function: Power valve

5/10'33


PHILIPS
MINIWATT
E 453
Vf = 4,0V
Vamax = 250V
Vg' = 250V
Ia = 24mA
Smax = 3,5mA/V
Snorm = 2,5mA/V
g (k) = 175
120
100
80
60
40
20
Ia (mA)
Va = Vg' = 250 V
Va = Vg' = 200 V
Va = Vg' = 150 V
Vg (V)
-60
-50
-40
-30
-20
-10
0
10
20

PHILIPS „MINIWATT"

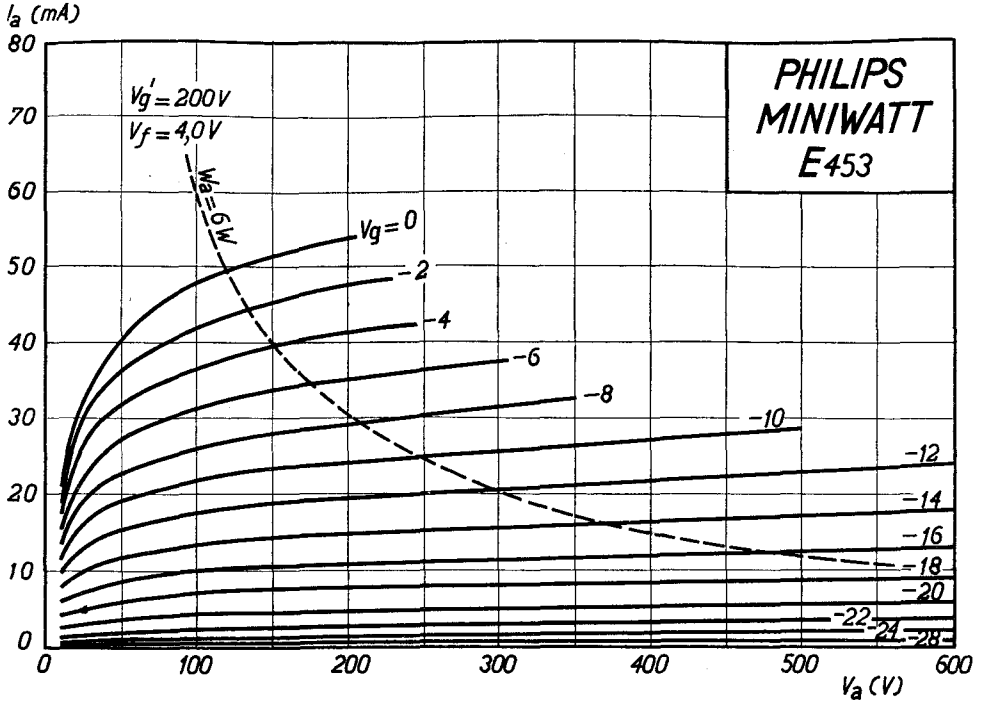
Max. Anodenspannung Tension anodique max. Max. anode voltage	V_{ao} V_{aL}	= 400 V = 250 V
Max. Anodenbelastung Dissipation anodique max. Max. anode dissipation	W_a	= 6 W
Max. Kathodenstrom Courant cathodique max. Max. cathode current	I_c	= 30 mA
Max. Schirmgitterspannung Tension de grille-écran max. Max. screen-grid voltage	$V_{g'o}$ $V_{g'}$	= 400 V = 250 V
Max. Schirmgitterbelastung Dissipation de grille-écran max. Max. screen-grid dissipation	$W_{g'}$	= 3 W
Mittlerer Schirmgitterstrom Courant de grille-écran moyen Average screen-grid current	$I_{g'}$	= 10 mA
Ungefähre Grenzw. des Schirmgitterstr. Limites approxim. du cour. de gr.-écran Approx. limits of screen-grid current	$I_{g'\,\min.}$ $I_{g'\,\max.}$	= 6 mA = 14 mA
Gitterstrom-Einsatzpunkt Point de commenc. du cour. de grille Starting point of grid current	V_{gi}	= —1,3 V
Max. Widerstand im Gitterkreis Résistancé max. dans le circuit de grille Max. resistance in grid circuit	R_{g1} R_{g2}	= 1 M.Ohm = 0,6 M.Ohm
Max. Spann. zwischen Faden und Kath. Tension max. entre filament et cathode Max. voltage betw. filament and cathode	V_{fc}	= 50 V
Nutzleistung Puissance utile Output	W_{o1} (V_{geff} = 6,0 V; R_a = 11000 Ohm) W_{o2} (V_{geff} = 9,5 V; R_a = 11000 Ohm)	= 1,6 W = 2,9 W
Kapazitäten Capacités Capacities	C_{ag} C_{ak} C_{gk}	= 1,2 $\mu\mu$F = 7,5 $\mu\mu$F = 7,3 $\mu\mu$F


I_a (mA)
80
70
60
50
40
30
20
10
0
$V_g' = 200V$
$V_f = 4{,}0V$
$W_a = 6W$
$V_g = 0$
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
-22
-24
-28
PHILIPS
MINIWATT
E453
0
100
200
300
400
500
600
V_a (V)

E 453

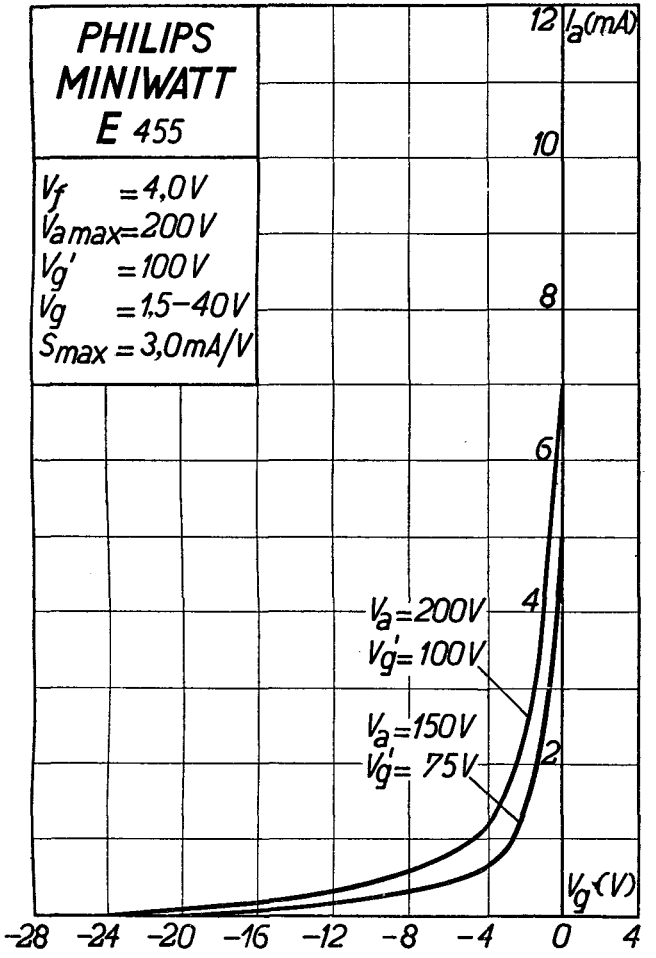
PHILIPS „MINIWATT"

Max. Anodenspannung Tension anodique max. Max. anode voltage	V_{ao} V_{aL}	= 400 V = 300 V
Max. Anodenbelastung Dissipation anodique max. Max. anode dissipation	W_a	= 6 W
Max. Kathodenstrom Courant cathodique max. Max. cathode current	I_c	= 30 mA
Max. Schirmgitterspannung Tension de grille-écran max. Max. screen-grid voltage	$V_{g'o}$ $V_{g'}$	= 400 V = 200 V
Max. Schirmgitterbelastung Dissipation de grille-écran max. Max. screen-grid dissipation	$W_{g'}$	= 3 W
Mittlerer Schirmgitterstrom Courant de grille-écran moyen Average screen-grid current	$I_{g'}$	= 7 mA
Ungefähre Grenzw. des Schirmgitterstr. Limites approxim. du cour. de gr.-écran Approx. limits of screen-grid current	$I_{g' \min.}$ $I_{g' \max.}$	= 4 mA = 12 mA
Gitterstrom-Einsatzpunkt Point de commerc. du cour. de grille Starting point of grid current	V_{gi}	= −1,3 V
Max. Widerstand im Gitterkreis Résistance max. dans le circuit de grille Max. resistance in grid circuit	R_{g1} R_{g2}	= 1 M.Ohm = 0,6 M.Ohm
Max. Spann. zwischen Faden und Kath. Tension max. entre filament et cathode Max. voltage betw. filament and cathode	V_{fc}	= 50 V
Nutzleistung Puissance utile Output	W_{o1} (V_{geff} = 5,3 V; R_a = 15000 Ohm) W_{o2} (V_{geff} = 8 V; R_a = 15000 Ohm)	= 1,6 W = 2,8 W
Kapazitäten Capacités Capacities	C_{ag} C_{ak} C_{gk}	= 1,2 $\mu\mu$F = 7,5 $\mu\mu$F = 7,3 $\mu\mu$F


I_a (mA)
80
70
60
50
40
30
20
10
0
$V_g' = 200V$
$V_f = 4{,}0V$
$W_a = 6W$
$V_g = 0$
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
-22
-24
-28
0
100
200
300
400
500
600
V_a (V)
PHILIPS
MINIWATT
E453

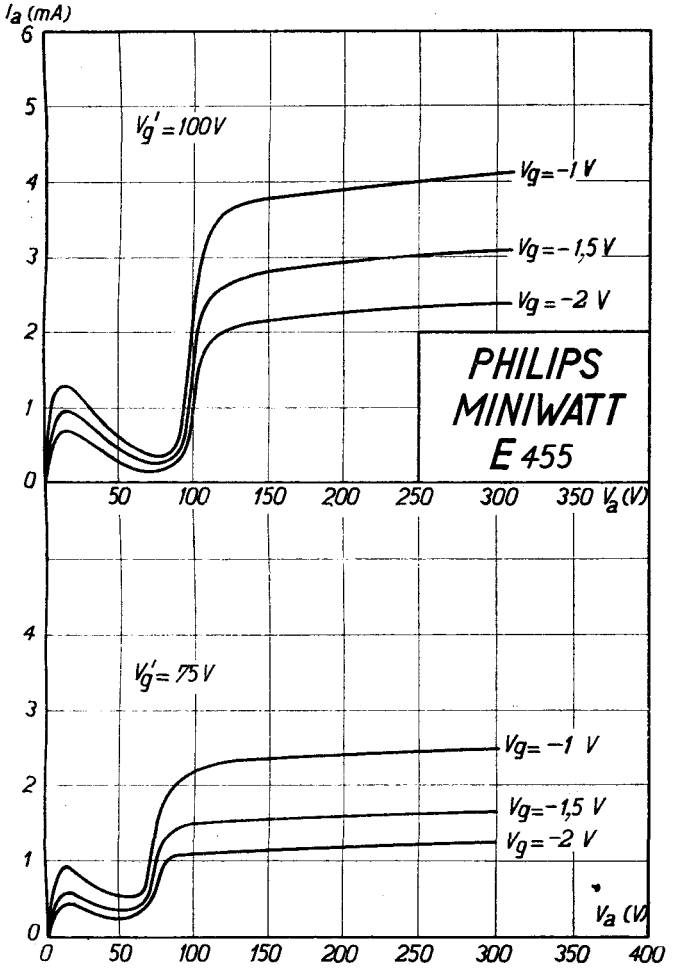
Heizspannung Tension de chauffage Filament voltage	V_f	=	4,0 V
Heizstrom Courant de chauffage Filament current	I_f	=	ca. env. 1,0 A appr.
Anodenspannung Tension anodique Anode voltage	$V_{a\,max}$	=	200 V
Schirmgitterspannung Tension de grille-écran Screen-grid voltage	V_g'	=	100 V
Normaler Anodenstrom Courant anodique normal Normal anode current (Vg = -1,5 V)	I_a	=	ca. env. 3 mA appr.
Normaler Anodenstrom Courant anodique normal Normal anode current (Vg = -40 V)	I_a	=	ca. env. 0,01 mA appr.
Verstärkungsfaktor Coefficient d'amplification Amplification factor	$g(k)$	=	700
Steilheit (max.) Inclinaison (max.) Slope (max.)	S_{max}	=	3,0 mA/V
Steilheit Inclinaison Slope (Vg = -1,5 V)	S	=	2,0 mA/V
Steilheit Inclinaison Slope (Vg = -40 V)	S	=	0,005 mA/V
Innerer Widerstand (norm.) Résistance intérieure (norm.) Internal resistance (norm.) (Vg = -1,5 V)	R_i	=	350000 Ohm
Innerer Widerstand (norm.) Résistance intérieure (norm.) Internal resistance (norm.) (Vg = -40 V)	R_i	>	10 M.Ohm
Anoden-Gitterkapazität Capacité grille-plaque Anode-grid capacity	C_{ag}	=	0,003 $\mu\mu$F
Max. Länge Longueur max. Overall length	l	=	127 mm
Grösster Durchmesser Diamètre max. Max. diameter	d	=	51 mm
Sockel Culot Base		=	0 35
Sockelschaltung Connexion du culot Base connection		=	S X

Anwendung:	H.F.-Verstärkung	Z.F.-Verstärkung
Applications:	Amplification h.f.	Amplification m.f.
Function:	H.F. amplification	I.F. amplification


PHILIPS
MINIWATT
E 455
V_f = 4,0 V
V_a max = 200 V
V_g' = 100 V
V_g = 1,5–40 V
S_{max} = 3,0 mA/V
12
I_a (mA)
10
8
6
4
2
V_a = 200 V
V_g' = 100 V
V_a = 150 V
V_g' = 75 V
V_g (V)
-28
-24
-20
-16
-12
-8
-4
0
4

PHILIPS „MINIWATT"

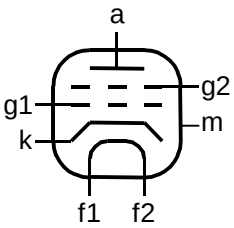
Max. Anodenspannung Tension anodique max. Max. anode voltage	V_{ao} V_{a_R} V_{a_L}	= 400 V = 250 V = 200 V
Max. Anodenbelastung Dissipation anodique max. Max. anode dissipation	W_a	= 1,0 W
Max. Kathodenstrom Courant cathodique max. Max. cathode current	I_c	= 10 mA
Max. Schirmgitterspannung Tension de grille-écran max. Max. screen-grid voltage	$V_{g'o}$ $V_{g'}$	= 300 V = V_a —50 V max. 150 V
Max. Schirmgitterbelastung Dissipation de grille-écran max. Max. screen-grid dissipation	$W_{g'}$	= 0,25 W
Mittlerer Schirmgitterstrom Courant de grille-écran moyen Average screen-grid current	$I_{g'}$	= 0,8 mA
Ungefähre Grenzw. des Schirmgitterstr. Limites approxim. du cour. de gr.-écran Approx. limits of screen-grid current	$I_{g'}$ min. $I_{g'}$ max.	= 0,3 mA = 1,7 mA
Gitterstrom-Einsatzpunkt Point de commenc. du courant de grille Starting point of grid current	V_{gi}	= —1,3 V
Max. Widerstand im Gitterkreis Résistance max. dans le circuit de grille Max. resistance in grid circuit	R_{g1}	= 4 M.Ohm
Max. Spann. zwischen Faden und Kath. Tension max. entre filament et cathode Max. voltage between filam. and cathode	V_{fc}	= 80 V
Max. Widerst. zwischen Faden und Kath. Résist. max. entre filament et cathode Max. resist. betw. filament and cathode	R_{fc}	= 20000 Ohm
Kapazitäten Capacités Capacities	C_g C_a C_{ag}	= 12,7 $\mu\mu$F = 8,4 $\mu\mu$F = 0,003 $\mu\mu$F

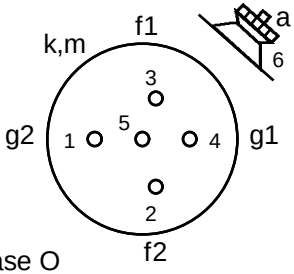

I_a (mA)
$V_g' = 100V$
$V_g = -1$ V
$V_g = -1{,}5$ V
$V_g = -2$ V
PHILIPS
MINIWATT
E 455
V_a (V)
$V_g' = 75$ V
$V_g = -1$ V
$V_g = -1{,}5$ V
$V_g = -2$ V
V_a (V)

E462 PHILIPS

Tetrode, HF or MF amplifier

Dimensions (mm)	127 x 50	
Heating indirect, AC or DC, parallel	Vf (V) If (A)	4 1





Base O

Capacitances	Cag1 (pF)	
Typical characteristics	Va (V)	200
	Ia (mA)	3.0
	Vg1 (V)	-2
	Vg2 (V)	100
	Ig2 (mA)	
	µ	900
	S (mA/V)	2.0
	Ri (kΩ)	450

Operating characteristics	Vb (V)	200
	Ra (kΩ)	-
	Rg2 (kΩ)	200
	Rk (kΩ)	0.5
	Ia (mA)	3.0
	Ig2 (mA)	
	Vg2 (V)	100
	Vk (V)	2
Limiting values	Pa max (W)	

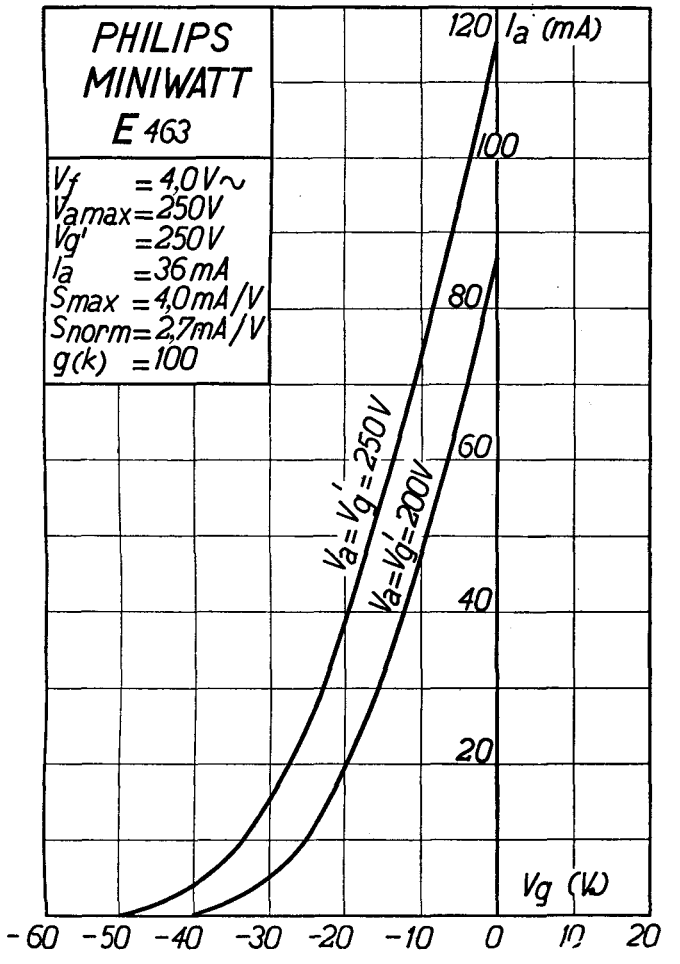
E 463

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Heizspannung Tension de chauffage Filament voltage	V_f	=	4 V
Heizstrom Courant de chauffage Filament current	I_f	=	ca. env. 1,35 A appr.
Anodenspannung Tension anodique Anode voltage	$V_{a\ max.}$	=	250 V
Schirmgitterspannung Tension de grille-écran Screen-grid voltage	$V_{g'}$	=	250 V
Normaler Anodenstrom Courant anodique normal Normal anode current	I_a	=	36 mA
Neg. Gittervorspannung Polarisation négative de grille Negative grid bias	V_g	=	ca. env. 22 V appr.
Verstärkungsfaktor Coefficient d'amplification Amplification factor	$g(k)$	=	100
Steilheit (max.) Inclinaison (max.) Slope (max.)	$S_{\ max.}$	=	4 mA/V
Steilheit (norm.) *Inclinaison (norm.)* Slope (norm.)	$S_{\ norm.}$	=	2,7 mA/V
Innerer Widerstand (norm.) Résistance intérieure (norm.) Internal resistance (norm.)	R_i	=	37000 Ohm
Anodenverlustleistung Dissipation anodique Anode dissipation	$W_{a\ max}$	=	9 W
Max. Länge Longueur max. Overall length	l	=	119 mm
Grösster Durchmesser Diamètre max. Max. diameter	d	=	55 mm
Sockel Culot Base		=	B 35
Sockelschaltung Connexion du culot Base connection		=	S XVIII

Anwendung: Endstufe
Application: Tube final
Function: Power valve

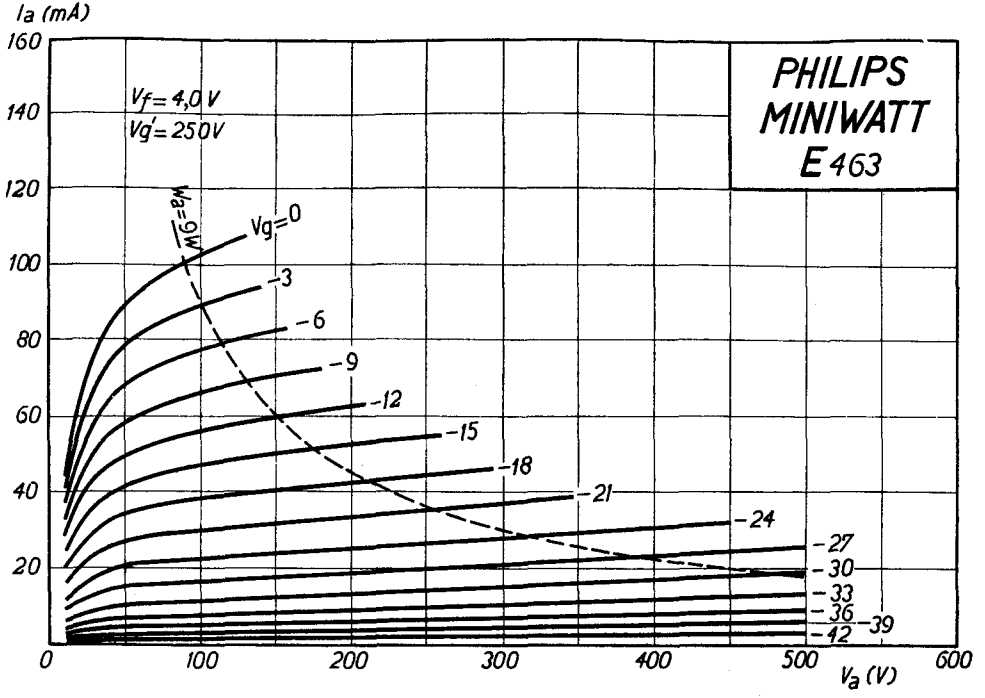
5/4'33


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E 463
Vf = 4,0V~
Vamax = 250V
Vg' = 250V
Ia = 36mA
Smax = 4,0mA/V
Snorm = 2,7mA/V
g(k) = 100
Ia (mA)
120
100
80
60
40
20
Va = Vg' = 250V
Va = Vg' = 200V
Vg (V)
-60
-50
-40
-30
-20
-10
0
10
20

E 463

PHILIPS „MINIWATT"

Max. Anodenspannung Tension anodique max. Max. anode voltage	V_{ao} V_{a_L}	= 500 V = 250 V
Max. Anodenbelastung Dissipation anodique max. Max. anode dissipation	W_a	= 9 W
Max. Kathodenstrom Courant cathodique max. Max. cathode current	I_c	= 50 mA
Max. Schirmgitterspannung Tension de grille-écran max. Max. screen-grid voltage	$V_{g'o}$ $V_{g'}$	= 500 V = 250 V
Max. Schirmgitterspannung Dissipation de grille-écran max. Max. screen-grid dissipation	$W_{g'}$	= 1,5 W
Mittlerer Schirmgitterstrom Courant de grille-écran moyen Average screen-grid current	$I_{g'}$	= 3,2 mA
Ungefähre Grenzw. des Schirmgitterstr. Limites approxim. du cour. de gr.-écran Approx. limits of screen-grid current	$I_{g'}$ min. $I_{g'}$ max.	= 2,4 mA = 4 mA
Gitterstrom-Einsatzpunkt Point de commenc. du courant de grille Starting point of grid current	V_{gi}	= -1,3 V
Max. Widerstand im Gitterkreis Résistance max. dans le circuit de grille Max. resistance in grid circuit	R_{g1} R_{g2}	= 0,7 Megohm = 0,3 Megohm
Max. Spann. zwischen Faden und Kath. Tension max. entre filament et cathode Max. voltage between filam. and cathode	V_{fc}	= 50 V
Nutzleistung Puissance utile Output	W_{o1} (V_{geff} = 7,8 V; R_a = 9000 Ohm)	= 2,5 W
	W_{o2} (V_{geff} = 12,3 V; R_a = 8000 Ohm)	= 4,1 W
Kapazitäten Capacités Capacities	C_{ag} $C_{a\,k}$ $C_{g\,k}$	= 1 $\mu\mu$F = 9,4 $\mu\mu$F = 7,8 $\mu\mu$F

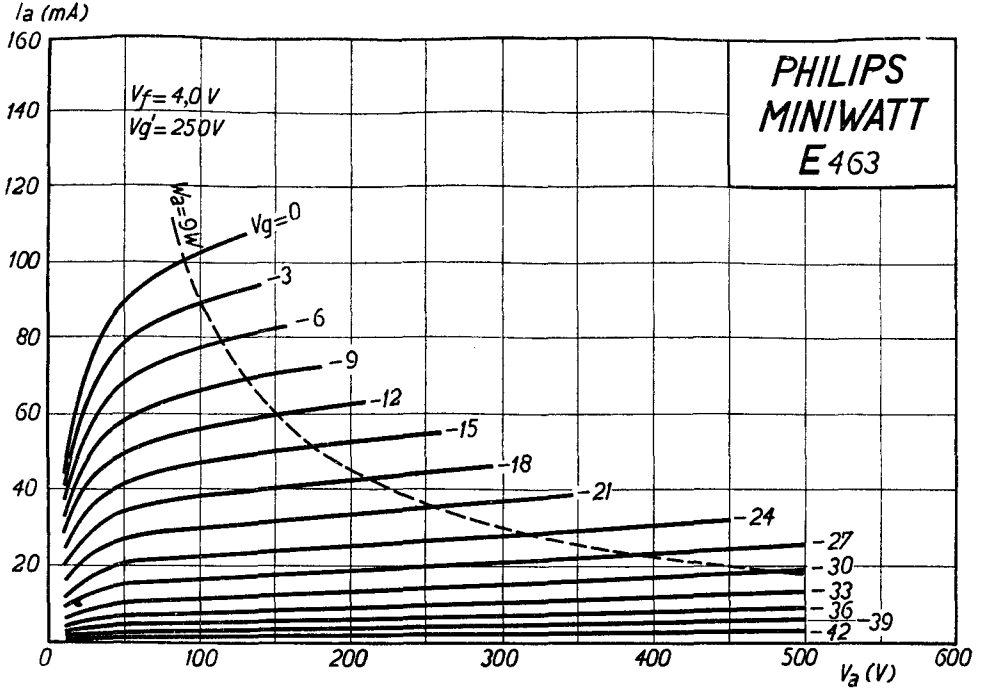

Ia (mA)
160
140
120
100
80
60
40
20
0
100
200
300
400
500
600
Va (V)
Vf = 4,0 V
Vg' = 250V
Wa = 9W
Vg = 0
-3
-6
-9
-12
-15
-18
-21
-24
-27
-30
-33
-36
-39
-42
PHILIPS
MINIWATT
E 463

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Max. Anodenspannung Tension anodique max. Max. anode voltage	V_{ao} V_{a_L}	= 500 V = 250 V
Max. Anodenbelastung Dissipation anodique max. Max. anode dissipation	W_a	= 9 W
Max. Kathodenstrom Courant cathodique max. Max. cathode current	I_c	= 50 mA
Max. Schirmgitterspannung Tension de grille-écran max. Max. screen-grid voltage	$V_{g\,o}$ V_{g}	= 500 V = 250 V
Max. Schirmgitterbelastung Dissipation de grille-écran max. Max. screen-grid dissipation	W_g	= 1,5 W
Mittlerer Schirmgitterstrom Courant de grille-écran moyen Average screen-grid current	I_g	= 3,2 mA
Ungefähre Grenzw. des Schirmgitterstr. Limites approxim. du cour. de gr.-écran Approx. limits of screen-grid current	I_g min. I_g max.	= 2,4 mA*) = 4 mA*)
Gitterstrom-Einsatzpunkt Point de commenc. du courant de grille Starting point of grid current	V_{gi}	= -1,3 V
Max. Widerstand im Gitterkreis Résistance max. dans le circuit de grille Max. resistance in grid circuit	R_{g1} R_{g2}	= 0,7 Megohm*) = 0,3 Megohm*)
Max. Spann. zwischen Faden und Kath. Tension max. entre filament et cathode Max. voltage between filam. and cathode	V_{fc}	= 50 V
Nutzleistung Puissance utile Output	W_{o1} (V_{geff} = 7,8 V)*) (R_a = 9000 Ohm)*) W_{o2} (V_{geff} = 12,3 V)*) (R_a = 8000 Ohm)*)	= 2,5 W*) = 4,1 W*)
Kapazitäten Capacités Capacities	C_{ag} C_{ak} C_{gk}	= 1 $\mu\mu$F = 9,4 $\mu\mu$F = 7,8 $\mu\mu$F

* Gemessen bei / Mesuré pour / Measured at: $V_a = V_g = 250$ V, $I_a = 36$ mA

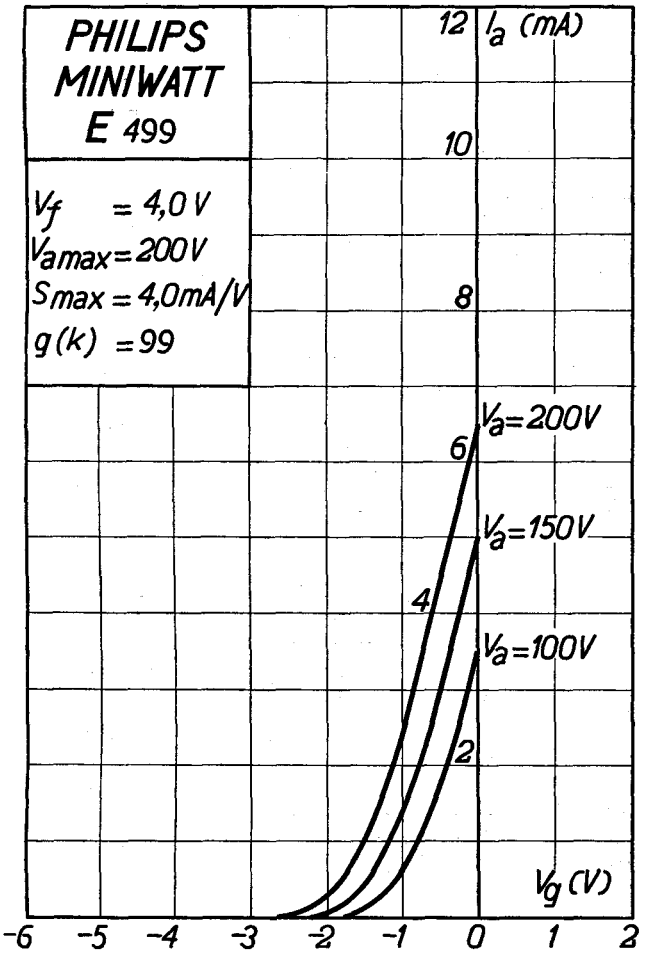
19.8.'33


Ia (mA)
160
140
120
100
80
60
40
20
0
100
200
300
400
500
600
Va (V)
Vf = 4,0 V
Vg' = 250V
Va=Vg
Vg=0
-3
-6
-9
-12
-15
-18
-21
-24
-27
-30
-33
-36
-39
-42
PHILIPS
MINIWATT
E 463

Heizspannung *Tension de chauffage* Filament voltage	v_f	=	4,0 V
Heizstrom Courant de chauffage Filament current	i_f	=	ca. env. 1,0 A appr.
Anodenspannung Tension anodique Anode voltage	$v_{a\,max.}$	=	200 V
Verstärkungsfaktor Coefficient d'amplification Amplification factor	$g\,(k)$	=	99
Steilheit (max.) Inclinaison (max.) Slope (max.)	$S_{max.}$	=	4,0 mA/V
Äusserer Widerstand Résistance extérieure External resistance	R_a	=	0,3 M.Ohm
Normaler Anodenstrom Courant anodique normal Normal anode current	i_a	=	0,2 mA
Neg. Gittervorspannung Polarisation négative de grille *Negative grid bias*	v_g	=	ca. env. 1,6 V appr.
Innerer Widerstand (norm.) Résistance intérieure (norm.) Internal resistance (norm.)	R_i	=	100000 Ohm
Äusserer Widerstand Résistance extérieure External resistance	R_a	=	1 M.Ohm
Normaler Anodenstrom Courant anodique normal Normal anode current	i_a	=	0,08 mA
Neg. Gittervorspannung Polarisation négative de grille Negative grid bias	v_g	=	ca. env. 1,5 V appr.
Innerer Widerstand (norm.) Résistance intérieure (norm.) Internal resistance (norm.)	R_i	=	330000 Ohm
Anoden-Gitterkapazität Capacité grille-plaque Anode-grid capacity	C_{ag}	=	1,5 $\mu\mu$F
Max. Länge Longueur max. Overall length	l	=	101 mm
Grösster Durchmesser Diamètre max. Max. diameter	d	=	46 mm
Sockel *Culot* Base		=	0 35
Sockelschaltung Connexion du culot Base connection		=	S X

Anwendung: Anodengleichrichtung
Applications: Détection par caractéristique plaque
Function: Anode bend detector

N.F.-Verstärker mit Widerstandskopplung
Amplificateur b.f. avec couplage par résistance
L.F. amplifier with resistance coupling

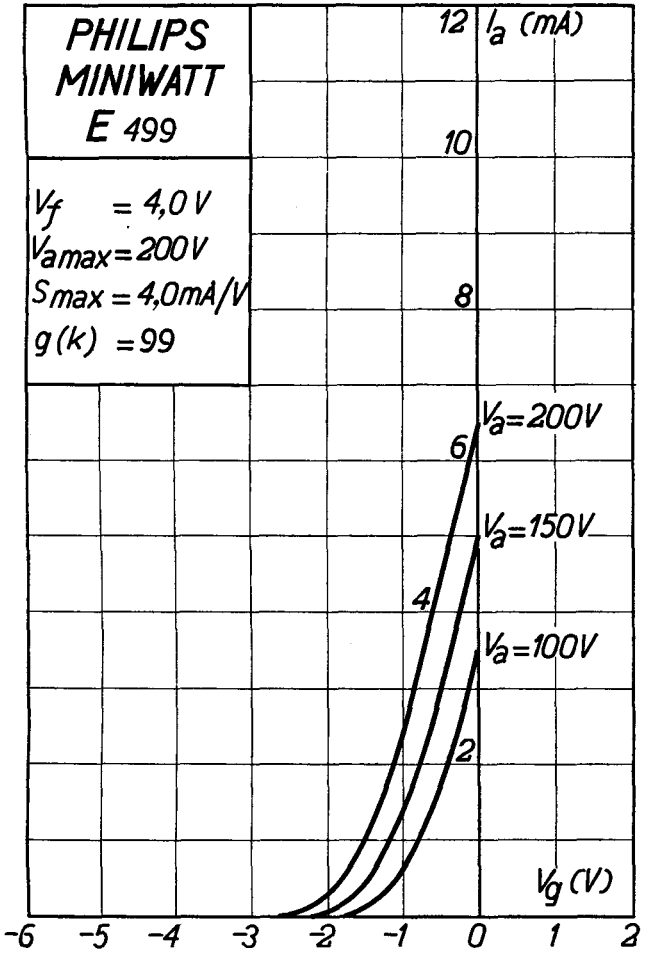

PHILIPS
MINIWATT
E 499
Vf = 4,0 V
Vamax = 200V
Smax = 4,0mA/V
g(k) = 99
12
Ia (mA)
10
8
6
4
2
Va=200V
Va=150V
Va=100V
Vg (V)
-6
-5
-4
-3
-2
-1
0
1
2

Heizspannung Tension de chauffage *Filament voltage*	v_f	=	4,0 V
Heizstrom Courant de chauffage *Filament current*	i_f	=	ca. env. 1,0 A appr.
Anodenspannung Tension anodique Anode voltage	$v_{a\,max.}$	=	200 V
Verstärkungsfaktor Coefficient d'amplification Amplification factor	$g\,(k)$	=	99
Steilheit (max.) Inclinaison (max.) Slope (max.)	$S_{max.}$	=	4,0 mA/V
Äusserer Widerstand Résistance extérieure External resistance	R_a	=	0,3 M.Ohm
Normaler Anodenstrom Courant anodique normal Normal anode current	i_a	=	0,2 mA
Neg. Gittervorspannung Polarisation négative de grille Negative grid bias	v_g	=	ca. env. 1,6 V appr.
Innerer Widerstand (norm.) Résistance intérieure (norm.) Internal resistance (norm.)	R_i	=	100000 Ohm
Äusserer Widerstand Résistance extérieure External resistance	R_a	=	1 M.Ohm
Normaler Anodenstrom Courant anodique normal Normal anode current	i_a	=	0,08 mA
Neg. Gittervorspannung Polarisation négative de grille Negative grid bias	v_g	=	ca. env. 1,5 V appr.
Innerer Widerstand (norm.) Résistance intérieure (norm.) Internal resistance (norm.)	R_i	=	330000 Ohm
Anoden-Gitterkapazität Capacité grille-plaque Anode-grid capacity	C_{ag}	=	1,5 $\mu\mu$F
Max. Länge Longueur max. Overall length	l	=	101 mm
Grösster Durchmesser Diamètre max. Max. diameter	d	=	46 mm
Sockel Culot Base		=	0 35
Sockelschaltung Connexion du culot Base connection		=	S VII

Anwendung: Anodengleichrichtung
Applications: Détection par caractéristique plaque
Function: Anode bend detector

N.F.-Verstärker mit Widerstandskopplung
Amplificateur b.f. avec couplage par résistance
L.F. amplifier with resistance coupling

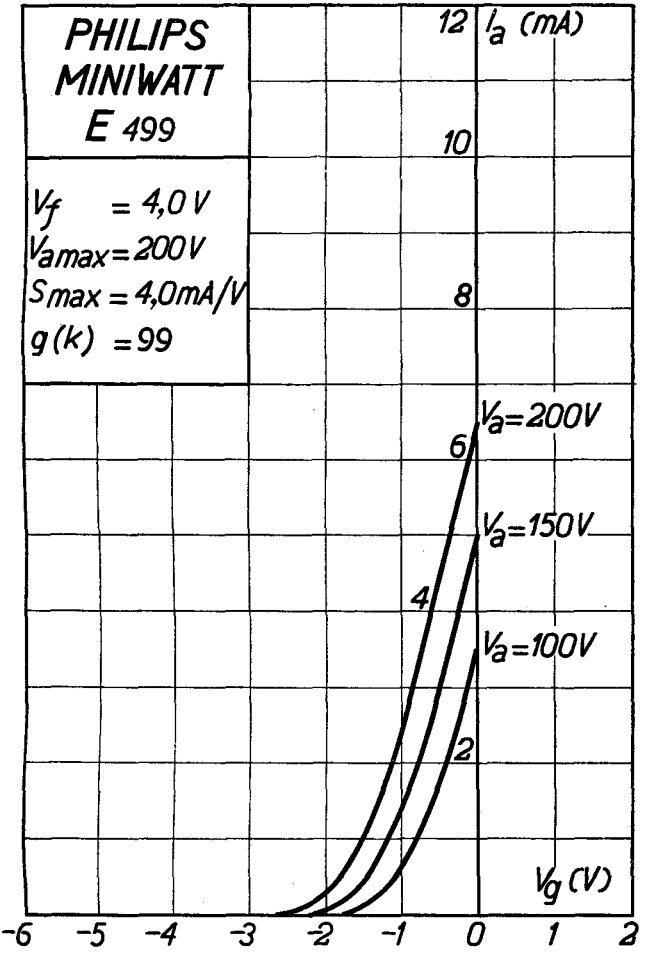
20/4/'33


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E 499
Vf = 4,0 V
Vamax = 200V
Smax = 4,0mA/V
g(k) = 99
12
Ia (mA)
10
8
6
4
2
Va=200V
Va=150V
Va=100V
Vg (V)
-6
-5
-4
-3
-2
-1
0
1
2

Heizspannung Tension de chauffage Filament voltage	V_f	= 4,0 V
Heizstrom Courant de chauffage Filament current	I_f	= ca. env. 1,0 A appr.
Anodenspannung Tension anodique Anode voltage	$V_{a\,max}$	= 200 V
Verstärkungsfaktor Coefficient d'amplification Amplification factor	$g(k)$	= 99
Steilheit (max.) Inclinaison (max.) Slope (max.)	S_{max}	= 4,0 mA/V
Äusserer Widerstand Résistance extérieure External resistance	R_a	= 0,3 M.Ohm
Normaler Anodenstrom Courant anodique normal Normal anode current	I_a	= 0,2 mA
Neg. Gittervorspannung Polarisation négative de grille Negative grid bias	V_g	= ca. env. 1,6 V appr.
Innerer Widerstand (norm.) Résistance intérieure (norm.) Internal resistance (norm.)	R_i	= 100000 Ohm
Äusserer Widerstand Résistance extérieure External resistance	R_a	= 1 M.Ohm
Normaler Anodenstrom Courant anodique normal Normal anode current	I_a	= 0,08 mA
Neg. Gittervorspannung Polarisation négative de grille Negative grid bias	V_g	= ca. env. 1,6 V appr.
Innerer Widerstand (norm.) Résistance intérieure (norm.) Internal resistance (norm.)	R_i	= 330000 Ohm
Anoden-Gitterkapazität Capacité grille-plaque Anode-grid capacity	C_{ag}	= 1,5 $\mu\mu$F
Max. Länge Longueur max. Overall length	l	= 101 mm
Grösster Durchmesser Diamètre max. Max. diameter	d	= 46 mm
Sockel Culot Base		= 0 35
Sockelschaltung Connexion du culot Base connection		= S X

Anwendung: Anodengleichrichtung
Applications: Détection par caractéristique plaque
Function: Anode bend detector

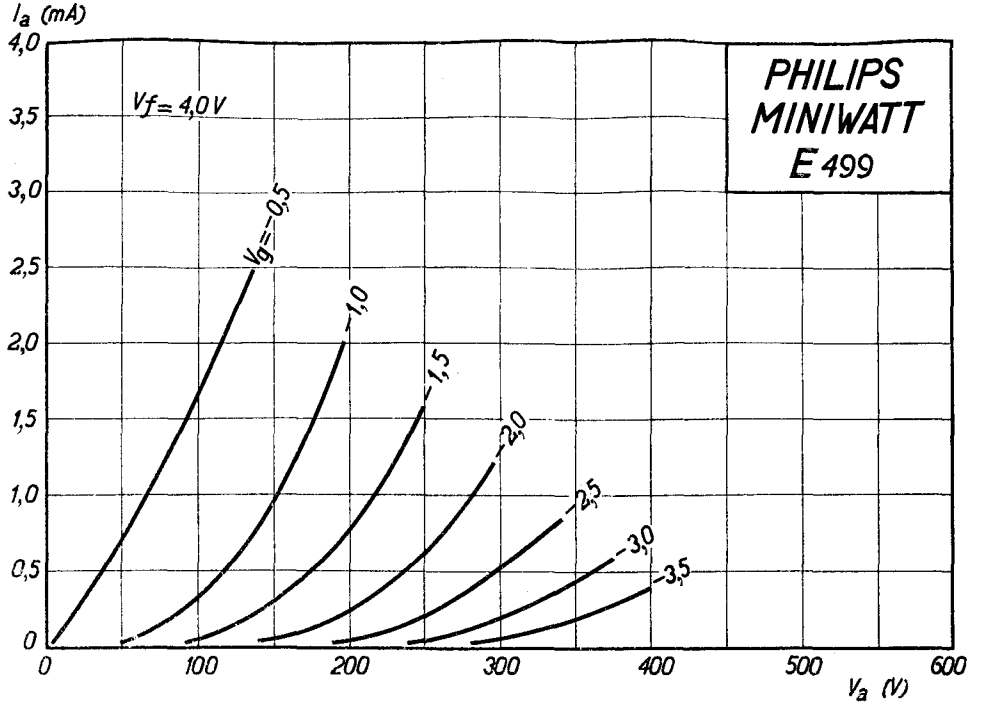
N.F.-Verstärker mit Widerstandskopplung
Amplificateur b.f. avec couplage par résistance
L.F. amplifier with resistance coupling


PHILIPS
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E 499
V_f = 4,0 V
$V_{a\,max}$ = 200 V
S_{max} = 4,0 mA/V
g(k) = 99
12
I_a (mA)
10
8
6
4
2
V_a=200V
V_a=150V
V_a=100V
V_g (V)
-6
-5
-4
-3
-2
-1
0
1
2

PHILIPS „MINIWATT"

Max. Anodenspannung	V_{ao}	= 400 V
Tension anodique max.	V_{aR}	= 250 V
Max. anode voltage	V_{aL}	= 200 V
Max. Anodenbelastung	W_a	= 1,5 W
Dissipation anodique max.		
Max. anode dissipation		
Max. Kathodenstrom	I_c	= 15 mA
Courant cathodique max.		
Max. cathode current		
Gitterstrom-Einsatzpunkt	V_{gi}	= −1,3 V
Point de commenc. du courant de grille		
Starting point of grid current		
Max. Widerstand im Gitterkreis	R_{g1}	= 1 M.Ohm
Résistance max. dans le circuit de grille	R_{g2}	= 0,5 M.Ohm
Max. resistance in grid circuit		
Max. Spann. zwischen Faden und Kath.	V_{fc}	= 50 V*)
Tension max. entre filament et cathode		
Max. voltage betw. filament and cathode		
Max. Widerstand zw. Faden und Kathode	R_{fc}	= 20000 Ohm
Résistance max. entre filam. et cathode		
Max. resistance betw. filam. and cathode		
Kapazitäten	C_{ag}	= 1,5 $\mu\mu$F
Capacités	C_{ak}	= 4,7 $\mu\mu$F
Capacities	C_{gk}	= 7,3 $\mu\mu$F

*) Siehe Erläuterungen
Voir explications
See explanation


I_a (mA)
4,0
3,5
3,0
2,5
2,0
1,5
1,0
0,5
0
V_f = 4,0 V
V_g = −0,5
−1,0
−1,5
−2,0
−2,5
−3,0
−3,5
PHILIPS
MINIWATT
E 499
0
100
200
300
400
500
600
V_a (V)

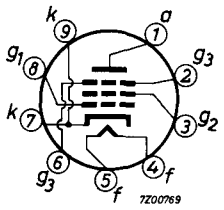
S.Q. TUBE

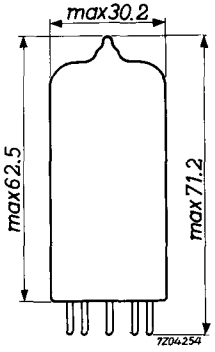
Special quality pentode designed for use as wide band output tube.

QUICK REFERENCE DATA			
Life test	10 000 hours		
Low interface resistance			
Mechanical quality	Shock and vibration resistant		
Base	Magnoval. Gold plated pins		
Heating	Indirect A.C. or D.C.; Parallel supply		
Heater voltage	V_f	6.3	V±5%
Heater current	I_f	600	mA
Anode current	I_a	50	mA
Mutual conductance	S	45	mA/V

DIMENSIONS AND CONNECTIONS Dimensions in mm

Base: Magnoval





CHARACTERISTICS

Column I Nominal value or setting of the tube
II Range values for equipment design: Initial spread
III Range values for equipment design: End of life

		I	II	III	
Heater voltage	V_f	6.3			V
Heater current	I_f	600			mA
Anode voltage	V_a	125			V
Grid No.3 voltage	V_{g_3}	0			V
Grid No.2 voltage	V_{g_2}	125			V
Grid No.1 voltage	$-V_{g_1}$	3			V
Anode current	I_a	50			mA
Grid No.2 current	I_{g_2}	5.5			mA
Mutual conductance	S	45			mA/V
Internal resistance	R_i	20			kΩ
Amplification factor	$\mu_{g_2g_1}$	30			
Input resistance	R_{g_1}	1			kΩ
Frequency = 50 MHz					
Anode supply voltage	V_{ba}	140			V
Grid No.3 voltage	V_{g_3}	0			V
Grid No.2 supply voltage	V_{bg_2}	140			V
Grid No.1 supply voltage	$+V_{bg_1}$	12			V
Cathode resistor	R_k	270			Ω
Anode current	I_a	50	48 - 52		mA
Grid No.2 current	I_{g_2}	5.5	4.5 - 6.5		mA
Grid No.1 to cathode voltage	$-V_{g_1k}$	3.0	2.3 - 3.7	1.8	V
Mutual conductance	S	45	38 - 52	ΔS = max.25%	mA/V
Negative grid current	$-I_g$			2	μA

CHARACTERISTICS (continued)

As triode (grid No.2 connected to anode)		I	
Anode voltage	V_a	125	V
Grid No.1 voltage	$-V_{g_1}$	3	V
Anode current	I_a	55.5	mA
Mutual conductance	S	50	mA/V
Internal resistance	R_i	600	Ω
Amplification factor	μ	30	

CAPACITANCES

Pentode connected		I	II	I	II	
		With shield		Without shield		
Anode to grid No.3, grid No.2, cathode and heater	C_{a/g_3g_2kf}	6.5	5.8- 7.2	4.0	3.6- 4.4	pF
Grid No.1 to grid No.3, grid No.2, cathode and heater	C_{g_1/g_3g_2kf}	18	15- 21	18	15- 20	pF
Grid No.1 to grid No.3, grid No.2, cathode and heater Cathode current I_k = 55.5 mA	C_{g_1/g_3g_2kf}	28		28		pF
Anode to grid No.1	C_{ag_1}	80	max. 120	110	max. 150	mpF
Triode connected (grid No.2 connected to anode)						
Anode to grid No.3, cathode and heater	C_{a/g_3kf}	10.5	9.4-11.6	7.8	7.0- 8.6	pF
Grid No.1 to grid No.3, cathode and heater	C_{g_1/g_3kf}	11.8	10-13.6	11.8	10-13.6	pF
Anode to grid No.1	C_{ag_1}	6.2	5.5- 6.9	6.3	5.6- 7.0	pF
Cathode to heater	C_{kf}	6.0		6.0		pF

SHOCK AND VIBRATION RESISTANCE

The following test conditions are applied to assess the mechanical quality of the tube. These conditions are not intended to be used as normal operating conditions.

Shock

The tube is subjected 5 times in each of 4 positions to an acceleration of 500 g supplied by an NRL shock machine with the hammer lifted over an angle of 30°.

Vibration

The tube is subjected during 32 hours in each of 3 positions to a vibration frequency of 50 Hz with an acceleration of 2.5 g.

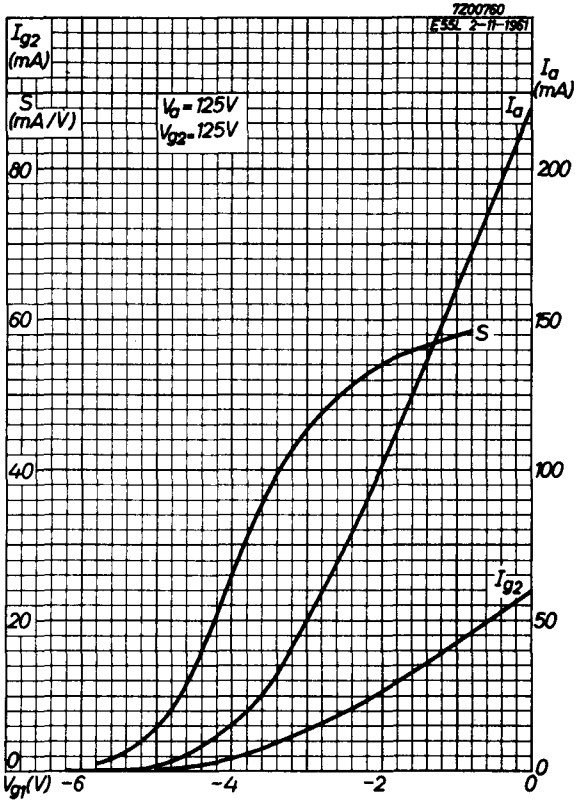
LIMITING VALUES (Absolute max. rating system)

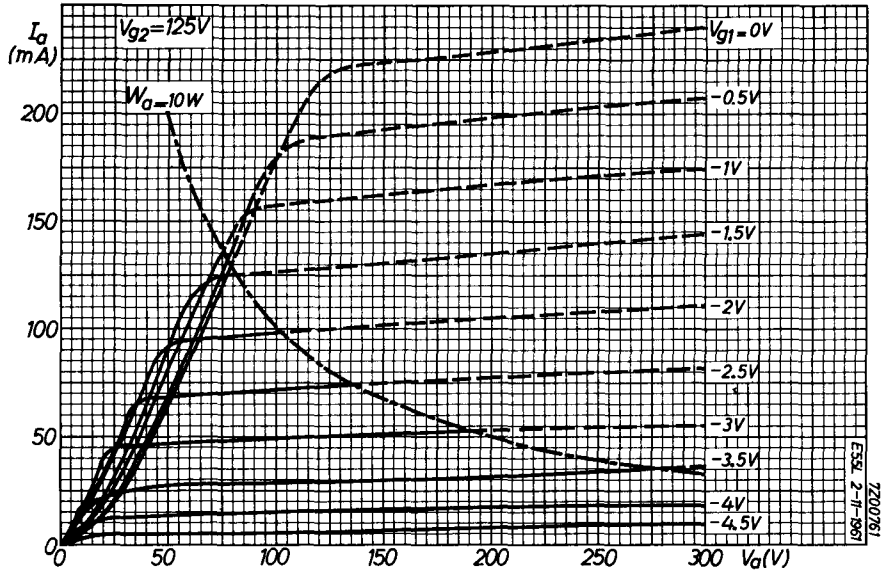
Anode voltage	V_{a_o}	max.	400	V
	V_a	max.	200	V
Anode dissipation	W_a	max.	10	W
Grid No.2 voltage	$V_{g_{2o}}$	max.	350	V
	V_{g_2}	max.	175	V
Grid No.2 dissipation	W_{g_2}	max.	1.5	W
Grid No.1 voltage, negative	$-V_{g_1}$	max.	55	V
positive	V_{g_1}	max.	0	V
Cathode current	I_k	max.	75	mA
Grid No.1 resistor	R_{g_1}	max.	125	kΩ
Voltage between cathode and heater	V_{kf}	max.	200	V
Bulb temperature	t_{bulb}	max.	180	°C

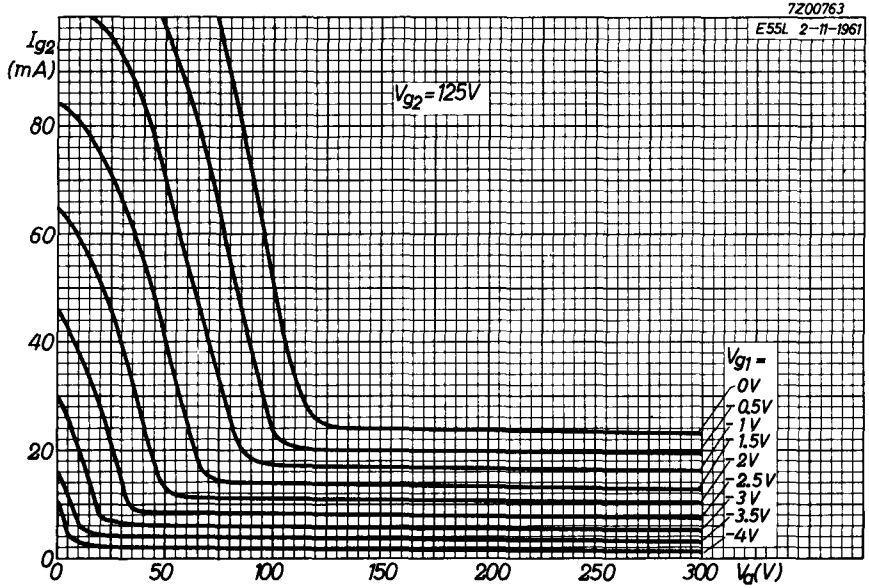
In applications where a long life is not required, I_k max. can be increased to 100 mA and t_{bulb} max. to 220 °C

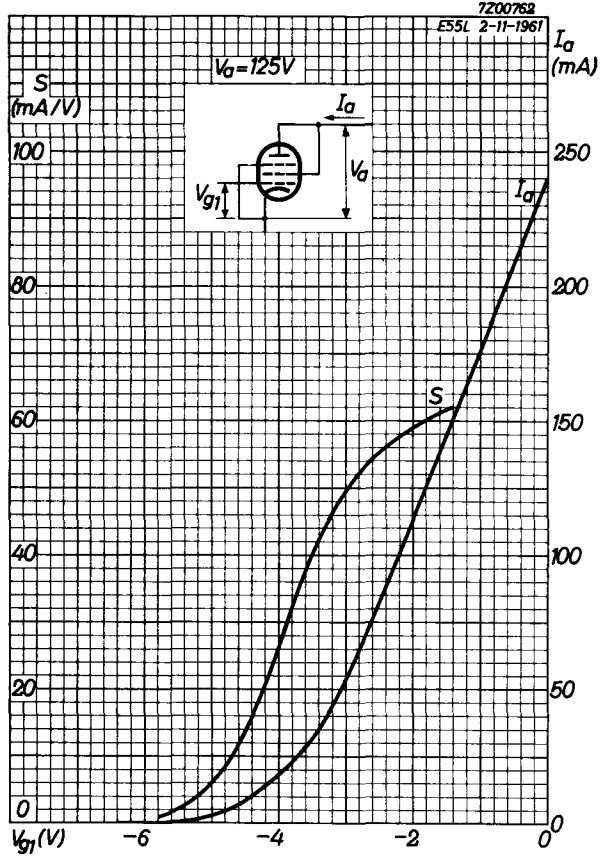
OPERATING CONDITIONS

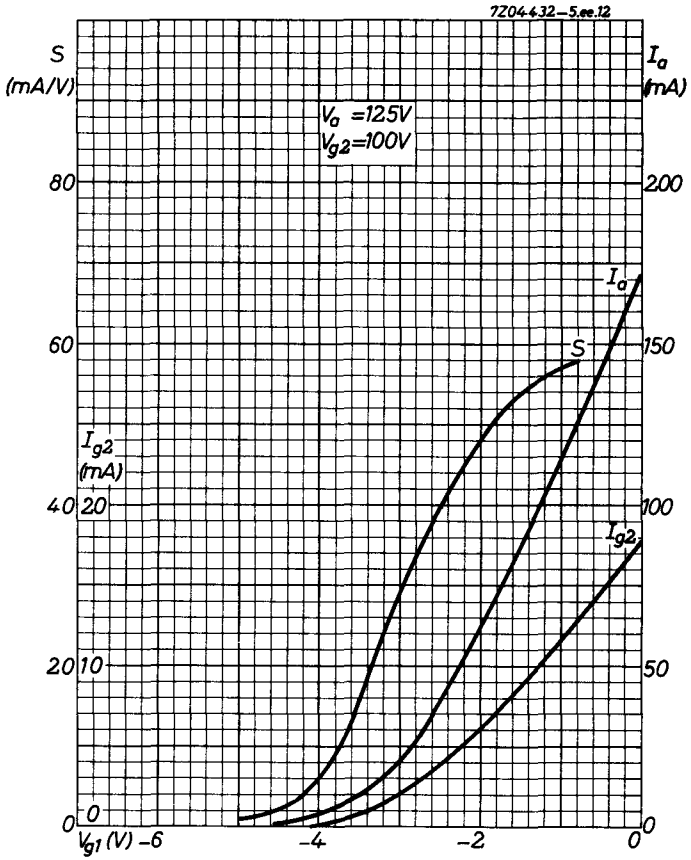
Anode supply voltage	V_{ba}	140	V
Grid No.2 supply voltage	V_{bg_2}	140	V
Grid No.3 voltage	V_{g_3}	0	V
Grid No.1 supply voltage	$+V_{bg_1}$	12	V
Cathode resistor	R_k	270	Ω
Anode current	I_a	50	mA
Grid No.2 current	I_{g_2}	5.5	mA
Mutual conductance	S	45	mA/V

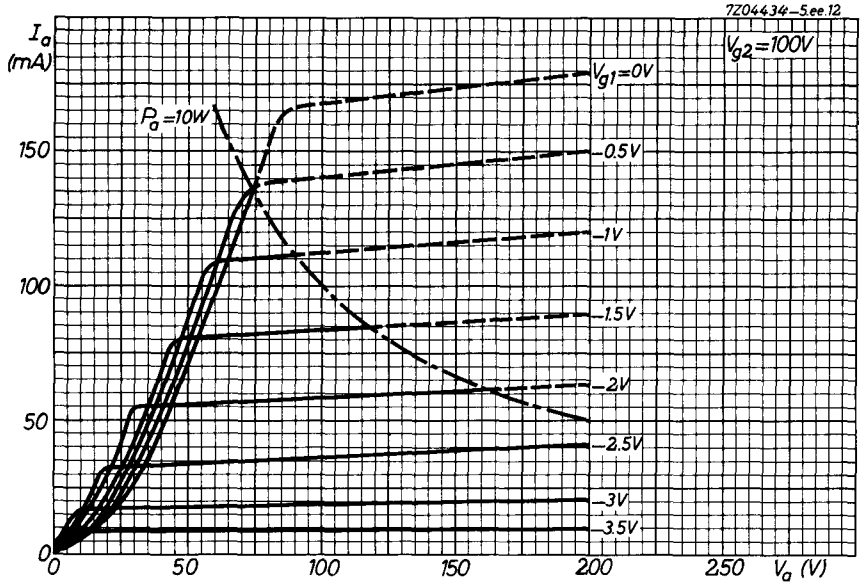


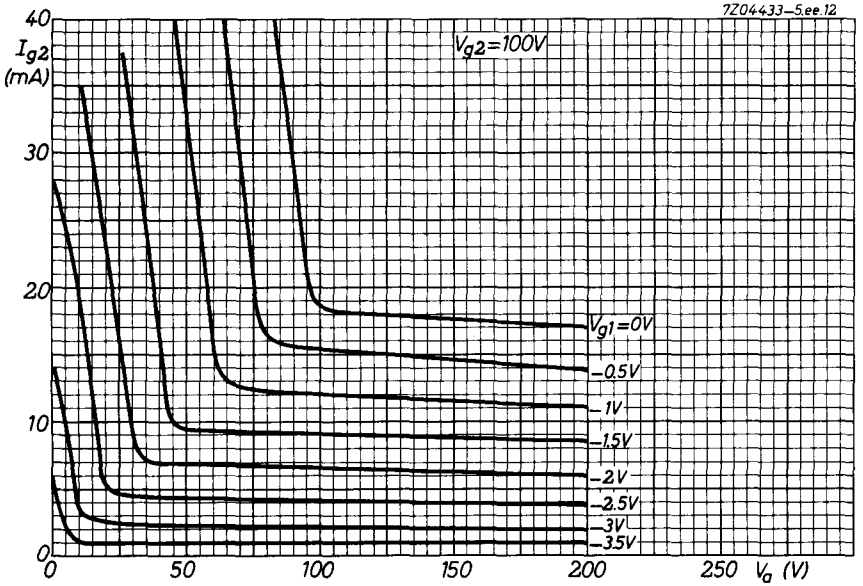

I_a (mA)
V_{g2}=125V
W_a=10W
V_{g1}=0V
-0.5V
-1V
-1.5V
-2V
-2.5V
-3V
-3.5V
-4V
-4.5V
200
150
100
50
0
0
50
100
150
200
250
300
V_a(V)
E55L 2-11-1961
7Z00761

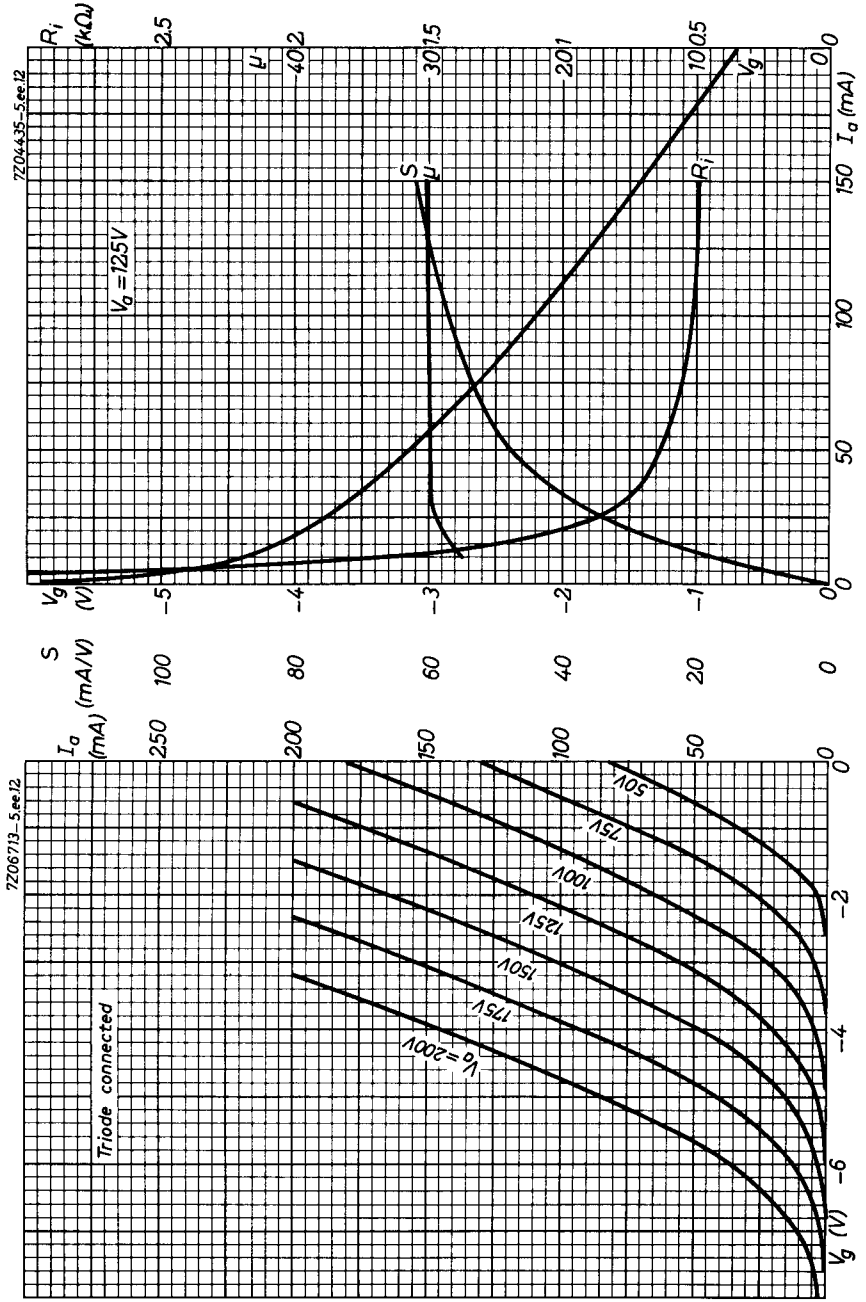

7Z00763
E55L 2-11-1961
I_{g2} (mA)
V_{g2}=125V
80
60
40
20
0
0
50
100
150
200
250
300
V_a(V)
V_{g1} =
0V
0.5V
1V
1.5V
2V
2.5V
3V
3.5V
-4V

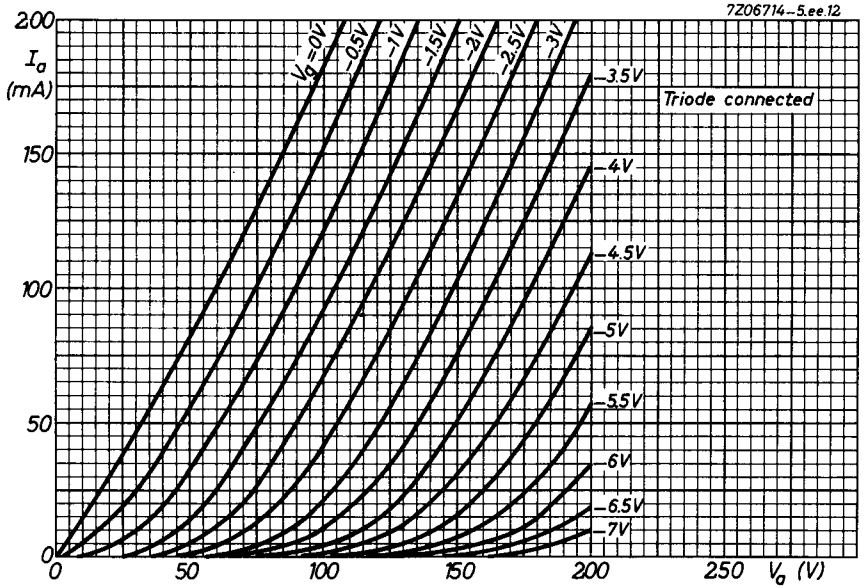

7Z00762
E55L 2-11-1961
V_a=125V
S
(mA/V)
I_a
(mA)
I_a
V_{g1}
V_a
S
100
80
60
40
20
0
250
200
150
100
50
0
V_{g1}(V)
−6
−4
−2
0


7Z04432−5.ee.12
S
(mA/V)
I_a
(mA)
V_a =125V
V_{g2}=100V
I_a
S
I_{g2}
(mA)
I_{g2}
80
60
40
20
20
10
0
0
200
150
100
50
0
V_{g1}(V) −6
−4
−2
0


7Z04434–5.ee.12
I_a (mA)
V_{g2}=100V
P_a=10W
V_{g1}=0V
–0.5V
–1V
–1.5V
–2V
–2.5V
–3V
–3.5V
0
50
100
150
200
250
V_a (V)


7Z04433–5.ee.12
I_{g2} (mA)
V_{g2}=100V
V_{g1}=0V
–0.5V
–1V
–1.5V
–2V
–2.5V
–3V
–3.5V
0
10
20
30
40
50
100
150
200
250
V_a (V)


7Z04435–5.ee.12
R_i (kΩ)
2.5
μ
40
2
30
1.5
20
1
10
0.5
V_g
0
I_a (mA)
150
100
50
0
V_a = 125V
S
μ
R_i
V_g (V)
−5
−4
−3
−2
−1
0
S (mA/V)
100
80
60
40
20
0
7Z06713–5.ee.12
I_a (mA)
250
200
150
100
50
0
Triode connected
V_a = 200V
175V
150V
125V
100V
75V
50V
−2
−4
−6
V_g (V)


7Z06714-5.ee.12
200
I_a (mA)
150
100
50
0
0
50
100
150
200
250
V_a (V)
V_g = 0V
-0.5V
-1V
-1.5V
-2V
-2.5V
-3V
-3.5V
-4V
-4.5V
-5V
-5.5V
-6V
-6.5V
-7V
Triode connected

PHILIPS

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11	FP	2000.11.11

S.Q. TUBE

Special quality double triode designed for use as A.F. and D.C. amplifier.

QUICK REFERENCE DATA				
Life test	10 000 hours Low interface resistance after long periods of operation under cut-off conditions			
Mechanical quality	Shock and vibration resistant			
Base	Noval. Gold plated pins			
Heating	Indirect A.C. or D.C. Series or parallel supply			
Heater voltage	V_f	12.6	6.3	V
Heater current	I_f	0.3	0.6	A
Anode voltage	V_a		250	V
Grid voltage	V_g		-5.5	V
Mutual conductance	S		2.7	mA/V

DIMENSIONS AND CONNECTIONS Dimensions in mm

Base: Noval

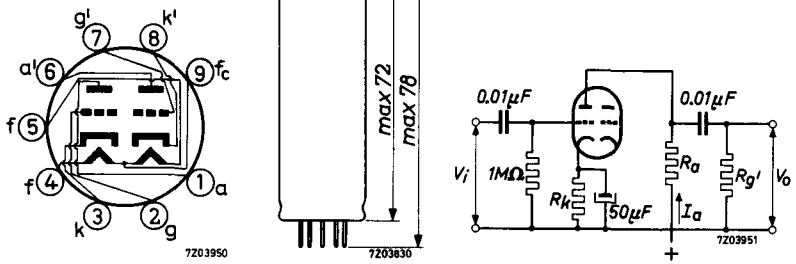


Fig.1

CHARACTERISTICS

Column I Nominal value or setting of the tube
II Range values for equipment design: Initial spread
III Range values for equipment design: End of life

		I	II	III	
Heater voltage	V_f	12.6			V
Heater current	I_f	300	285 - 315		mA
Anode voltage	V_a	250			V
Cathode resistor	R_k	920			Ω
Anode current	I_a	6.0	5.4 - 6.6	min. 4.3	mA
Transconductance	S	2.7	2.2 - 3.2	min. 1.8	mA/V
Amplification factor	μ	27			
Internal resistance	R_i	10	min. 7		kΩ
Negative grid current	$-I_g$		max. 0.5	max. 1.0	μA
Difference in anode current of two sections	$\lvert I_a - I_a' \rvert$		max. 3.0		mA
Anode voltage	V_a	250			V
Negative grid voltage	$-V_g$	5.5			V
Cut-off voltage	$-V_g$	17			V
Anode voltage	V_a	250			V
Anode resistor	R_a	1			MΩ
Anode current	I_a		max. 15		μA
Hum voltage Grid resistor R_g = 0.5 MΩ	V_g		max. 75		μV_{RMS}
Leakage current between cathode and heater Voltage between cathode and heater V_{kf} = 120 V	I_{kf}		max. 12		μA
Cathode heating time		16	max. 23		sec
Cathode cooling time			min. 13		sec

CAPACITANCES

		External screen		Without external screen		
		I	II	I	II	
Anode to cathode and heater	$C_{a/kf}$	3.5	2.8 - 4.2	0.45		pF
Grid to cathode and heater	$C_{g/kf}$	2.6	1.9 - 3.3	2.4		pF
Anode to grid	C_{ag}	3.0	2.4 - 3.6	3.1		pF
Grid to heater	C_{gf}		max.0.23		max.0.23	pF
Cathode to heater	C_{kf}	4.8		4.8		pF
Anode to cathode and heater	$C_{a'/k'f}$	3.0	2.3 - 3.7	0.55		pF
Grid to cathode and heater	$C_{g'/k'f}$	2.6	1.9 - 3.3	2.4		pF
Anode to grid	$C_{a'g'}$	3.0	2.4 - 3.6	3.0		pF
Grid to heater	$C_{g'f}$		max.0.23		max.0.23	pF
Cathode to heater	$C_{k'f}$	4.8		4.8		pF
Anode to anode other section	$C_{aa'}$	1.3	0.9 - 1.7	1.45		pF
Grid to grid other section	$C_{gg'}$		max. 13		max. 13	mpF
Anode to grid other section	$C_{ag'}$		max. 0.1		max. 0.1	pF
Grid to anode other section	$C_{ga'}$		max. 65		max. 65	mpF

SHOCK AND VIBRATION RESISTANCE

The following test conditions are applied to assess the mechanical quality of the tube. These conditions are not intended to be used as normal operating conditions.

Shock

The tube is subjected 5 times in each of 4 positions to an acceleration of 500 g supplied by an NRL shock machine with the hammer lifted over an angle of 30°.

Vibration

The tube is subjected during 32 hours in each of 3 positions to a vibration frequency of 50 Hz with an acceleration of 2.5 g.

LIFE

Production samples are tested to be within the end of life values (column III) under the following conditions during 10 000 hours.

Heater voltage	V_f	6.3	V
Anode voltage	V_a	250	V
Cathode resistor	R_k	920	Ω

LIMITING VALUES (Absolute max. rating system)

Anode voltage	V_{a_o}	max.	600	V
	V_a	max.	300	V
Anode dissipation	W_a	max.	2	W
Cathode current	I_k	max.	12	mA
Cathode current peak value	I_{k_p}	max.	150	mA
Grid current peak value max. 30 mA				
Duty factor max. 0.005				
Pulse duration max. 10 μs				
Cathode current peak value	I_{k_p}	max.	30	mA
Grid current peak value max. 2 mA				
Duty factor max. 0.2				
Pulse duration max. 400 μs				
Grid voltage	$-V_g$	max.	200	V
Grid current, average value	I_g	max.	0.3	mA
peak value	I_{g_p}	max.	30	mA
Voltage between cathode and heater	V_{kf}	max.	120	V
Bulb temperature	t_{bulb}	max.	170	°C
Grid resistor (automatic bias)	R_g	max.	1	MΩ
Grid resistor (fixed bias)	R_g	max.	0.5	MΩ

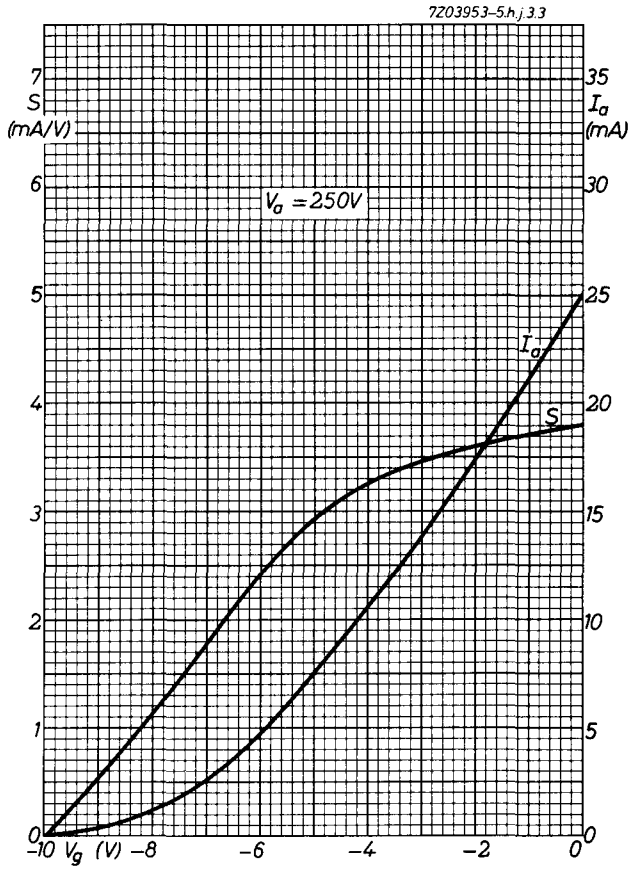
Heater voltage. The average heater voltage should be 6.3 V or 12.6 V.
Variations of the heater voltage exceeding the range of 6.0 V to 6.6.V or 12.0 to 13.2 V will shorten the tube life.
The tolerance of heater current (column II) should be taken into account.

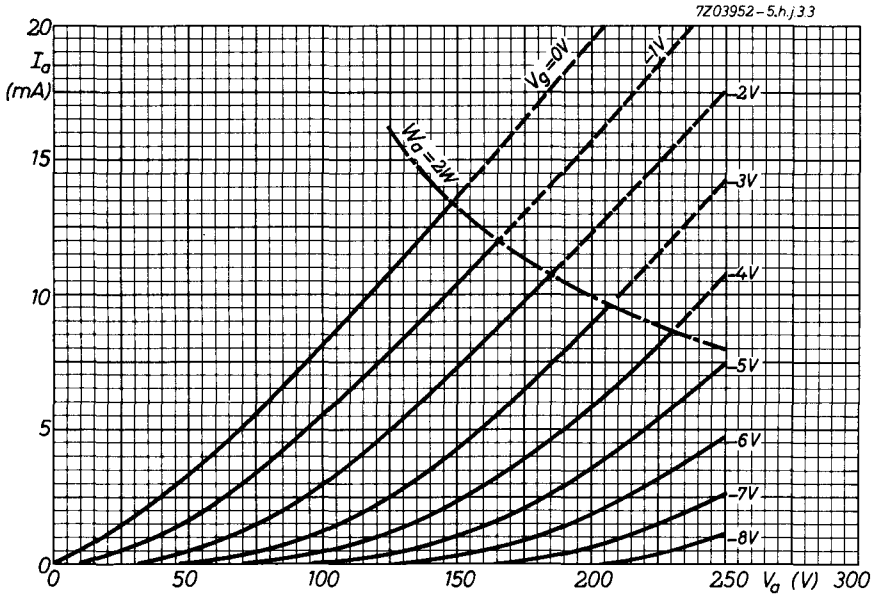
OPERATING CHARACTERISTICS

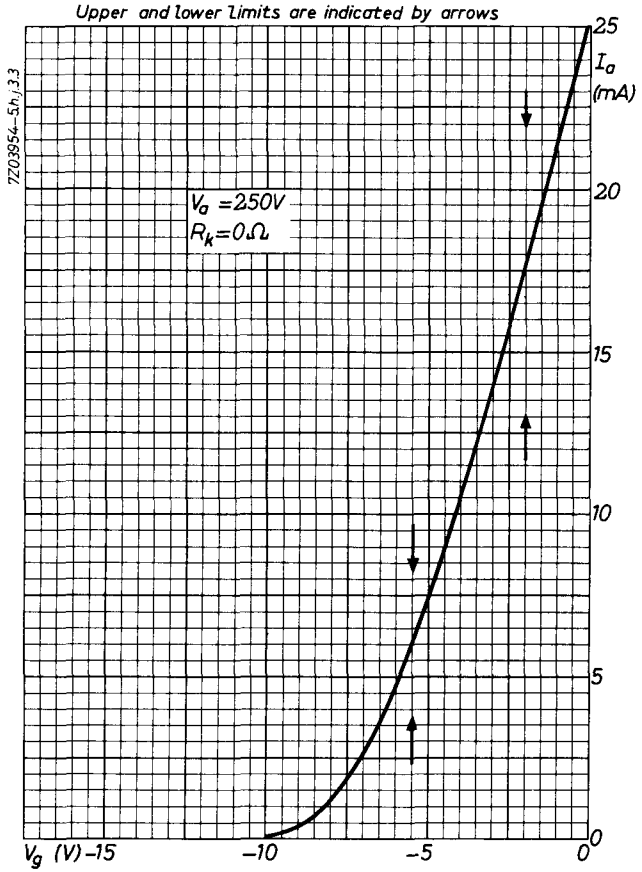
Resistance coupled A.F. amplifier. Fig.1 page 1

Anode supply voltage	V_{b_a}	200	250	300	350	400	V
Anode resistor	R_a	47	47	47	47	47	kΩ
Cathode resistor	R_k	1.2	1.2	1.2	1.2	1.2	kΩ
Grid resistor	R_g'	0.15	0.15	0.15	0.15	0.15	MΩ
Anode current	I_a	1.86	2.45	3.15	3.80	4.40	mA
Voltage gain	V_o/V_i	18.5	18.5	18.5	18.5	18.5	
Output voltage at $+I_g = 0.3\,\mu A$	V_o	20	30	40	50	60	V_{RMS}
Total distortion [1]	d_{tot}	3.3	3.8	4.0	4.1	4.2	%
Anode supply voltage	V_{b_a}	200	250	300	350	400	V
Anode resistor	R_a	100	100	100	100	100	kΩ
Cathode resistor	R_k	2.2	2.2	2.2	2.2	2.2	kΩ
Grid resistor	R_g'	0.33	0.33	0.33	0.33	0.33	MΩ
Anode current	I_a	1.00	1.30	1.65	1.95	2.30	mA
Voltage gain	V_o/V_i	20	20	20	20	20	
Output voltage at $+I_g = 0.3\,\mu A$	V_o	22	32	42	52	63	V_{RMS}
Total distortion [1]	d_{tot}	3.1	3.4	3.5	3.6	3.7	%
Anode supply voltage	V_{b_a}	200	250	300	350	400	V
Anode resistor	R_a	220	220	220	220	220	kΩ
Cathode resistor	R_k	3.9	3.9	3.9	3.9	3.9	kΩ
Grid resistor	R_g'	0.68	0.68	0.68	0.68	0.68	MΩ
Anode current	I_a	0.52	0.67	0.83	0.99	1.15	mA
Voltage gain	V_o/V_i	21	21	21	21	21	
Output voltage at $+I_g = 0.3\,\mu A$	V_o	19	29	38	47	58	V_{RMS}
Total distortion [1]	d_{tot}	2.3	2.6	3.0	3.1	3.2	%

[1] At lower output voltages the distortion is proportionally lower.


7Z03953-5.h.j.3.3
S (mA/V)
I_a (mA)
V_a = 250V
I_a
S
V_g (V)
7
6
5
4
3
2
1
0
35
30
25
20
15
10
5
0
-10
-8
-6
-4
-2
0


7Z03952-5.h.j33
20
I_a
(mA)
15
10
5
0
0
50
100
150
200
250
V_a (V)
300
V_g=0V
-1V
-2V
-3V
-4V
-5V
-6V
-7V
-8V
W_a=2W


Upper and lower limits are indicated by arrows
7Z03954-5h,j,3,3
V_a =250V
R_k=0Ω
25
I_a
(mA)
20
15
10
5
0
V_g (V) -15
-10
-5
0

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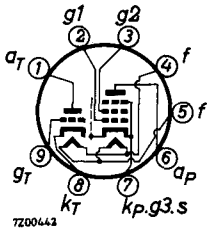
S.Q. TUBE

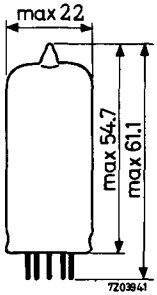
Special quality triode-pentode
The pentode section is designed for use as mixer and R.F. or A.F. amplifier. The triode section is designed for use as oscillator (max. freq. 300 MHz) multivibrator or blocking oscillator.

QUICK REFERENCE DATA			
Life test	10 000 hours		
Low interface resistance			
Mechanical quality	Shock and vibration resistant		
Base	Noval. Gold plated pins		
Heating	Indirect A.C. or D.C.; parallel supply		
Heater voltage	V_f	6.3	V
Heater current	I_f	330	mA
Pentode: Anode current	I_a	10	mA
Mutual conductance	S	6.2	mA/V
Amplification factor	μ	40	
Triode: Anode current	I_a	14	mA
Mutual conductance	S	5	mA/V
Amplification factor	μ	18	

DIMENSIONS AND CONNECTIONS Dimensions in mm

Base: Noval





CHARACTERISTICS

Column I Nominal value or setting of the tube
II Range values for equipment design: Initial spread
III Range values for equipment design: End of life

		I	II	III	
Heater voltage	V_f	6.3			V
Heater current	I_f	330	313 - 347		mA
Pentode section					
Anode supply voltage	V_{ba}	170			V
Grid No.2 supply voltage	V_{bg_2}	170			V
Cathode resistor	R_k	155			Ω
Anode current	I_a	10	7.5 - 12.5	min. 6	mA
Grid No.2 current	I_{g_2}	2.8	1.55 - 4.05		mA
Mutual conductance	S	6.2	5.2 - 7.2	min. 4.3	mA/V
Amplification factor grid No.2 to grid No.1	$\mu_{g_2g_1}$	40			
Internal resistance	R_i	0.4	min. 0.26		MΩ
Negative grid No.1 current	$-I_{g_1}$		max. 0.5	max. 1.0	μA
Triode section					
Anode supply voltage	V_{ba}	100			V
Cathode resistor	R_k	120			Ω
Anode current	I_a	14	10 - 18	min. 8.4	mA
Mutual conductance	S	5.0	4 - 6	min. 3.5	mA/V
Amplification factor	μ	18			
Negative grid current	$-I_g$		max. 0.5	max. 1.0	μA

CAPACITANCES Without external shield

		I	II	
Pentode				
Grid No.1 to grid No.2, grid No.3 cathode, heater and screen	C_{g_1/g_2g_3kfs}	5.6	5.2 - 6	pF
Anode to grid No.2, grid No.3 cathode, heater and screen	C_{a/g_2g_3kfs}	3.4	3 - 3.8	pF
Anode to grid No.1	C_{ag_1}		max. 25	mpF
Grid No.1 to heater	C_{g_1f}		max.0.16	pF
Triode				
Grid to cathode (triode), cathode (pentode) grid No.3, heater and screen	$C_{g/k_Tk_Pg_3fs}$	2.5	2.2 - 2.8	pF
Anode to cathode (triode), cathode (pentode) grid No.3, heater and screen	$C_{a/k_Tk_Pg_3fs}$	1.5	1.2 - 1.8	pF
Anode to grid	C_{ag}	1.5	1.2 - 1.8	pF
Grid to heater	C_{gf}		max.0.22	pF
Pentode to triode				
Anode (pentode) to anode (triode)	C_{aP-aT}		max.0.07	pF
Anode (pentode) to grid (triode)	C_{aP-gT}		max.0.02	pF
Grid No.1 (pentode) to anode (triode)	C_{g_1P-aT}		max.0.16	pF

MICROPHONY

The pentode section can be used without special precautions against microphony in circuits where an input voltage of more than 50 mV is required for an output of 50 mW.

SHOCK AND VIBRATION RESISTANCE

The following test conditions are applied to assess the mechanical quality of the tube. These conditions are not intended to be used as normal operating conditions.

Shock

The tube is subjected 5 times in each of 4 positions to an acceleration of 500 g supplied by an NRL shock machine with the hammer lifted over an angle of 30°.

Vibration

The tube is subjected during 32 hours in each of 3 positions to a vibration frequency of 50 Hz with an acceleration of 2.5 g.

LIFE

Production samples are tested to be within the end of life values (column III) under the following conditions during 10 000 hours.

Pentode section

V_{ba} = 170 V

V_{bg_2} = 170 V

R_k = 155 Ω

Triode section

V_{ba} = 100 V

R_k = 120 Ω

LIMITING VALUES (Absolute max. rating system)

Pentode section

Anode voltage	V_{a_o}	max. 550	V
	V_a	max. 275	V
Anode dissipation	W_a	max. 2.15	W
Grid No.2 voltage	V_{g2o}	max. 550	V
Grid No.2 voltage:			
Cathode current > 10 mA	V_{g_2}	max. 200	V
Cathode current < 10 mA	V_{g_2}	max. 225	V
Grid No.2 dissipation:			
Anode dissipation > 1.2 W	W_{g_2}	max. 0.7	W
Anode dissipation < 1.2 W	W_{g_2}	max. 0.8	W
Grid No.1 dissipation	W_{g_1}	max. 0.1	W
Negative grid No.1 voltage	$-V_{g_1}$	max. 100	V
Cathode current	I_k	max. 18	mA
Voltage between cathode and heater	V_{kf}	max. 100	V
Grid resistor (fixed bias)	R_{g_1}	max. 0.5	MΩ

LIMITING VALUES (Absolute max. rating system) (continued)

Triode section

Anode voltage	V_{a_o}	max.	550	V
	V_a	max.	275	V
Anode dissipation	W_a	max.	1.75	W
Grid dissipation	W_g	max.	0.1	W
Grid, voltage, peak value	V_{gp}	max.	30	V
Duty factor max. 0.04				
Pulse duration max. 0.8 ms				
Grid voltage	$-V_g$	max.	100	V
Cathode current	I_k	max.	18	mA
Cathode current peak value	I_{k_p}	max.	100	mA
Duty factor max. 0.04				
Pulse duration max. 0.8 ms				
Voltage between cathode and heater	V_{kf}	max.	100	V
Grid resistor (fixed bias)	R_g	max.	0.5	MΩ
Bulb temperature	t_{bulb}	max.	170	°C

Heater voltage: The average heater voltage should be 6.3 V.
Variation of the heater voltage exceeding the range of 6.0 V to 6.6 V will shorten the tube life.
The tolerance of heater current (column II) should be taken into account.

OPERATING CHARACTERISTICS

Pentode section as R.F. amplifier

Anode supply voltage	V_{ba}	170	V
Grid No.2 supply voltage	V_{bg_2}	170	V
Cathode resistor	R_k	155	Ω
Anode current	I_a	10	mA
Grid No.2 current	I_{g_2}	2.8	mA
Mutual conductance	S	6.2	mA/V
Amplification factor grid No.2 to grid No.1	$\mu_{g_2g_1}$	40	
Internal resistance	R_i	0.4	MΩ
Input resistance at 50 MHz	r_{g_1}	10	kΩ
Equivalent noise resistance	R_{eq}	1.5	kΩ

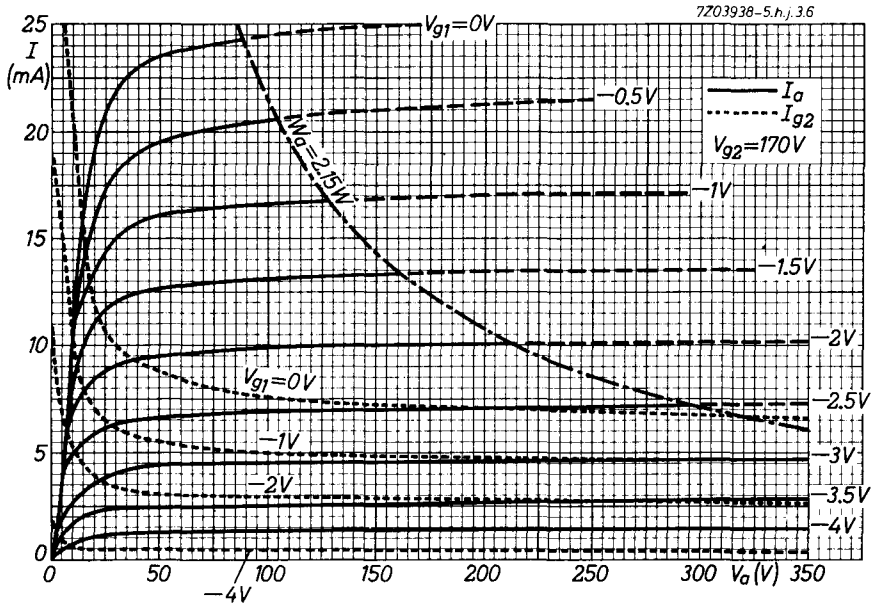
Pentode section as mixer

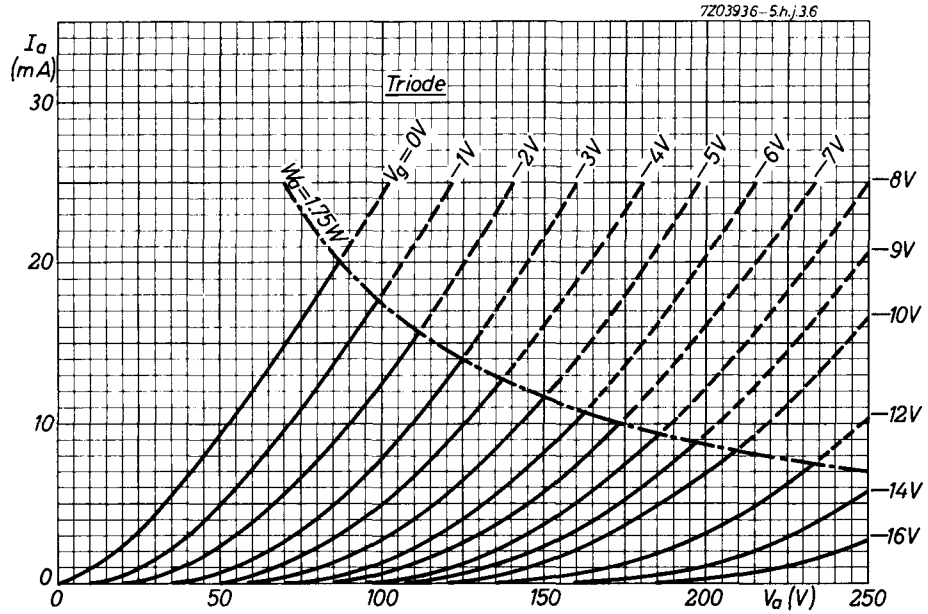
Anode supply voltage	V_{ba}	170	V
Grid No.2 supply voltage	V_{bg_2}	170	V
Grid No.1 resistor	R_{g_1}	0.1	MΩ
Cathode resistor	R_k	330	Ω
Oscillator voltage	V_{osc}	3.5	V_{RMS}
Anode current	I_a	8	mA
Grid No.2 current	I_{g_2}	2.5	mA
Grid No.1 current	I_{g_1}	12	μA
Conversion conductance	S_c	2.4	mA/V
Internal resistance	R_i	0.5	MΩ

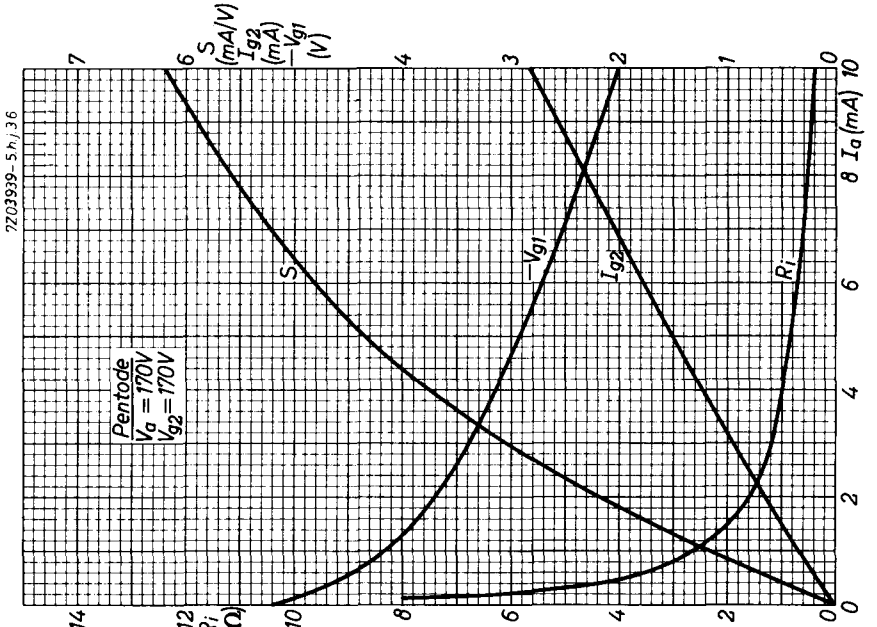
Triode as oscillator

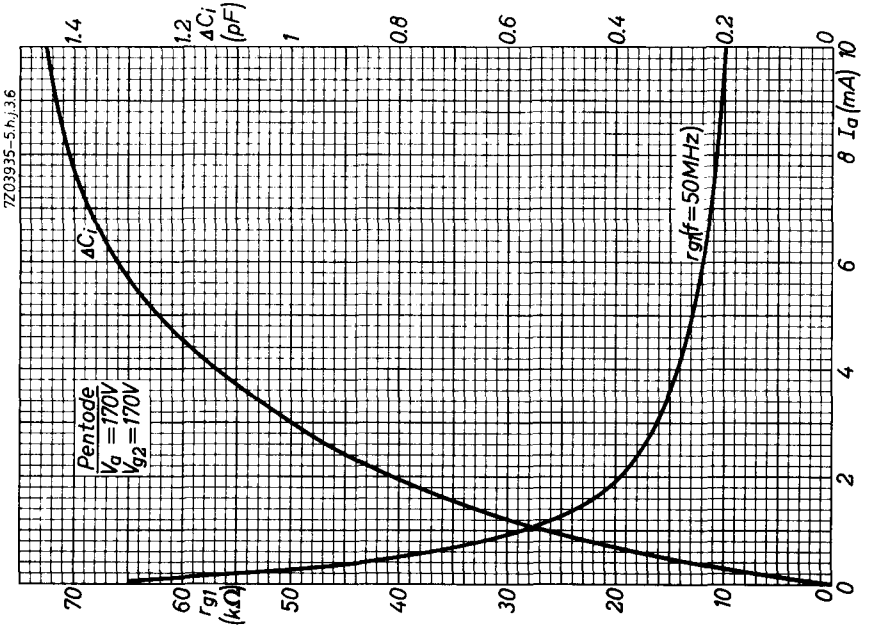
Operation in Colpitts circuit is recommended.

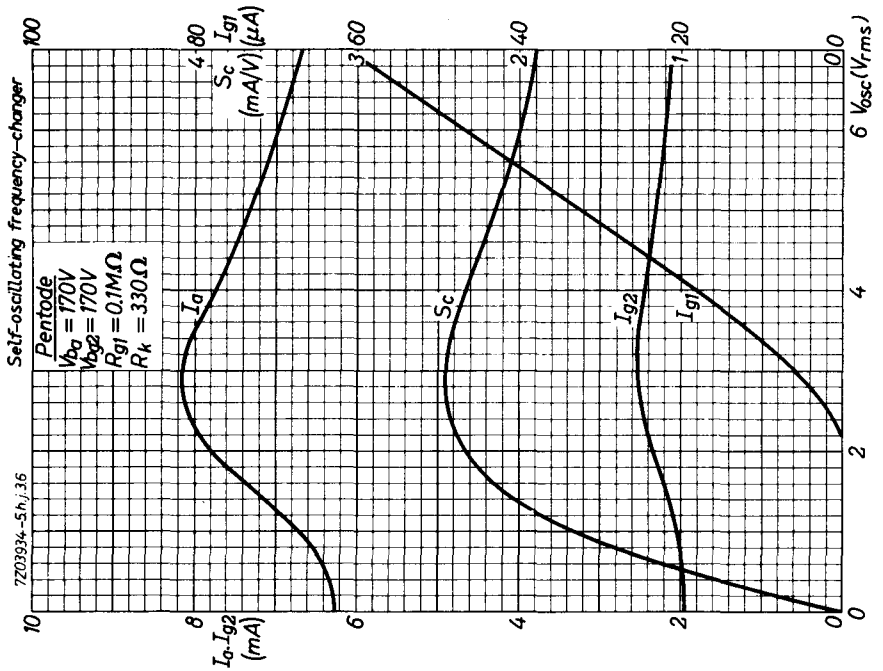
Operation in Hartley circuit is not recommended.

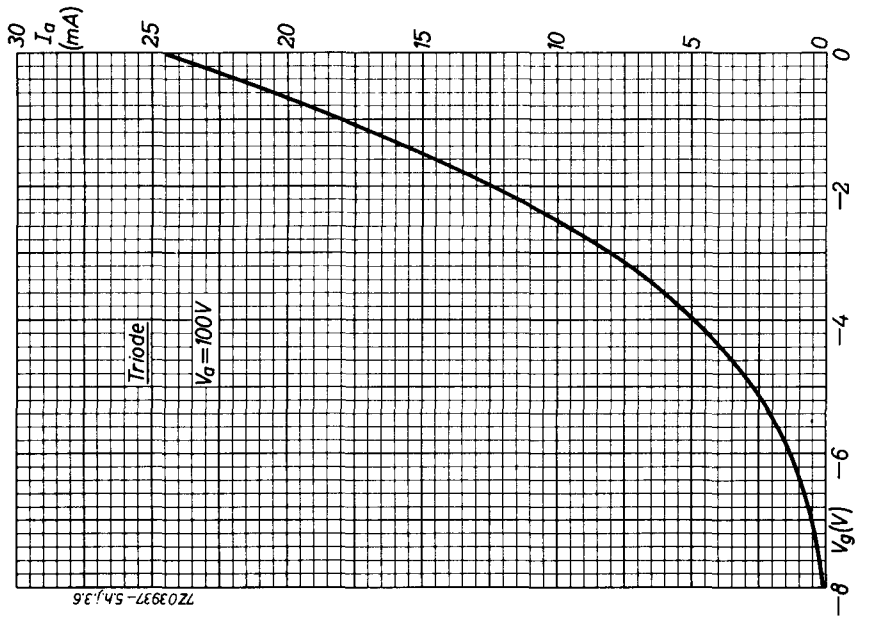

7Z03938-5.h.j.3.6
I (mA)
V_{g1}=0V
−0.5V
−1V
−1.5V
−2V
−2.5V
−3V
−3.5V
−4V
I_a
I_{g2}
V_{g2}=170V
W_g=2.15W
V_{g1}=0V
−1V
−2V
−4V
V_a (V)

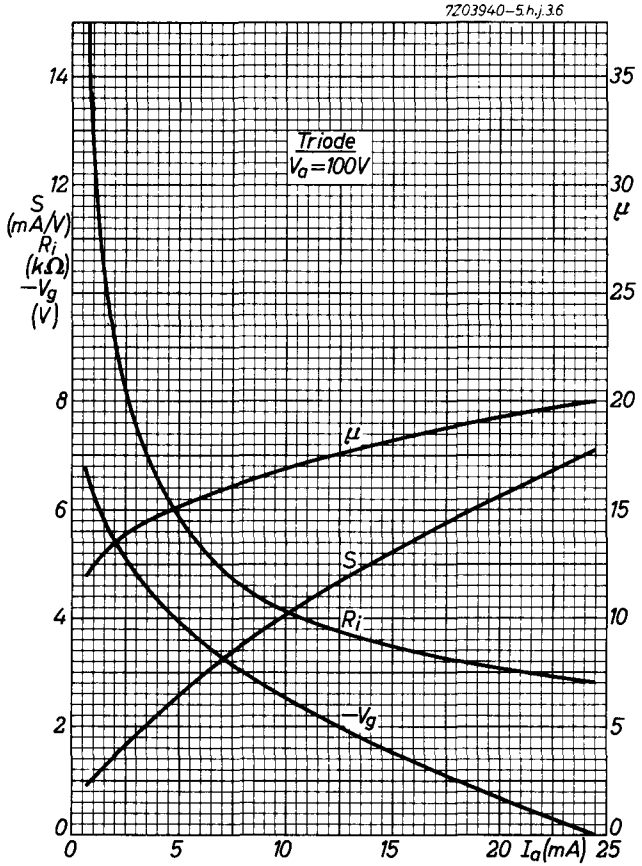

7Z03936-5.h.j.3.6
I_a (mA)
Triode
W_g=1.75W
V_g=0V
−1V
−2V
−3V
−4V
−5V
−6V
−7V
−8V
−9V
−10V
−12V
−14V
−16V
V_a (V)


7Z03939-5hj36
Pentode
Va = 170V
Vg2 = 170V
S (mA/V)
Ig2 (mA)
−Vg1 (V)
Ri (MΩ)
S
−Vg1
Ig2
Ri
θ Ia (mA)


7Z03935-5hj36
Pentode
Va = 170V
Vg2 = 170V
ΔCi (pF)
rgi (kΩ)
ΔCi
rgi (f=50MHz)
θ Ia (mA)


Self-oscillating frequency-changer
Pentode
V_{b_2} = 170V
V_{bg2} = 170V
R_{gl} = 0.1MΩ
R_k = 330Ω
I_a
S_c
I_{g2}
I_{gl}
I_a-I_{g2} (mA)
S_c (mA/V)
I_{gl} (μA)
V_{osc} (V_{rms})
7Z03934-5h.j.36


Triode
V_a = 100V
I_a (mA)
V_g (V)
7Z03937-5h.j.36


7Z03940-5.h.j.3.6
Triode
V_a=100V
S (mA/V)
R_i (kΩ)
$-V_g$ (V)
μ
S
R_i
$-V_g$
I_a(mA)
0
2
4
6
8
12
14
5
10
15
20
25
30
35

PHILIPS

Data handbook

Electronic components and materials

E80CF

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10	10	1968.12
11	FP	2000.11.11

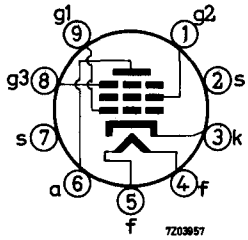
S.Q. TUBE

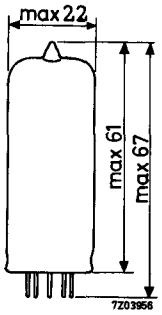
Special quality pentode designed for use as amplifier.

QUICK REFERENCE DATA			
Life test	10 000 hours		
Low interface resistance			
Mechanical quality	Shock and vibration resistant		
Base	Noval. Gold plated pins		
Heating	Indirect A.C. or D.C. Series or parallel supply		
Heater voltage	V_f	6.3	V
Heater current	I_f	300	mA
Anode current	I_a	3	mA
Mutual conductance	S	1.85	mA/V
Equivalent noise resistance (A.F.)	R_{eq}	40	kΩ
Hum voltage	V_{g_1}	max. 5	μV_{RMS}

DIMENSIONS AND CONNECTIONS Dimensions in mm

Base: Noval





CHARACTERISTICS

Column I Nominal value or setting of the tube
II Range values for equipment design: Initial spread
III Range values for equipment design: End of life

		I	II	III	
Heater voltage	V_f	6.3			V
Heater current	I_f	300	285 - 315		mA
Anode voltage	V_a	250			V
Grid No.3 voltage	V_{g_3}	0			V
Grid No.2 voltage	V_{g_2}	100			V
Cathode resistor	R_k	550			Ω
Anode current	I_a	3	2.5 - 3.5	min. 2.0	mA
Grid No.2 current	I_{g_2}	0.65	0.45 - 0.85	min. 0.35	mA
Mutual conductance	S	1.85	1.5 - 2.2	min. 1.2	mA/V
Internal resistance	R_i	1.5	min. 1.0		MΩ
Amplification factor grid No.2 to grid No.1	$\mu_{g_2g_1}$	25			
Equivalent noise resistance	R_{eq}		max. 40		kΩ
Frequency 0-10 kHz					
Grid No.1 resistor R_{g_1} = 0 Ω					
Negative grid No.1 current	$-I_{g_1}$		max. 0.1	max. 0.2	μA
Cut off voltage	$-V_{g_1}$	7.5			V
Anode voltage	V_a	250			V
Grid No.3 voltage	V_{g_3}	0			V
Grid No.2 voltage	V_{g_2}	100			V
Anode current	I_a		max. 20		μA
Hum voltage	V_{g_1}		max. 5		μV_{RMS}
Grid resistor R_{g_1} = 1 MΩ					
Cathode resistor bypassed					
Leakage current between cathode and heater			max. 12		μA
Voltage between cathode and heater V_{kf} = 120 V					

CAPACITANCES With external shield

		I	II	
Anode to grid No.2, grid No.3, cathode and heater	C_{a/g_2g_3kf}	7.3	6.8-7.8	pF
Grid No.1 to grid No.2, grid No.3, cathode and heater	C_{g_1/g_2g_3kf}	5.0	4.5-5.5	pF
Anode to grid No.1	C_{ag_1}		max. 25	mpF
Grid No.1 to heater	C_{g_1f}		max. 2	mpF
Cathode to heater	C_{kf}	3.7		pF

SHOCK AND VIBRATION RESISTANCE

The following test conditions are applied to assess the mechanical quality of the tube. These conditions are not intended to be used as normal operating conditions.

Shock

The tube is subjected 5 times in each of 4 positions to an acceleration of 500 g supplied by an NRL shock machine with the hammer lifted over an angle of 30°.

Vibration

The tube is subjected during 32 hours in each of 3 positions to a vibration frequency of 50 Hz with an acceleration of 2.5 g.

LIFE

Production samples are tested to be within the end of life values (column III) under the following conditions during 10 000 hours.

Anode voltage	V_a	250	V
Grid No.3 voltage	V_{g_3}	0	V
Grid No.2 voltage	V_{g_2}	100	V
Cathode resistor	R_k	550	Ω

LIMITING VALUES (Absolute max. rating system)

Anode voltage	V_{a_o}	max. 600	V
	V_a	max. 300	V
Anode dissipation	W_a	max. 1.3	W
Grid No.2 voltage	$V_{g_{2_o}}$	max. 600	V
	V_{g_2}	max. 200	V
Grid No.2 dissipation	W_{g_2}	max. 0.4	W
Negative grid No.3 voltage	$-V_{g_3}$	max. 100	V
Negative grid No.1 voltage	$-V_{g_1}$	max. 100	V
Cathode current	I_k	max. 9	mA
Voltage between cathode and heater			
Cathode positive	V_{kf} (k pos)	max. 120	V
Cathode negative	V_{kf} (k neg)	max. 60	V
Grid No.1 resistor	R_{g_1}	See curve on page G	
Bulb temperature		max. 170	°C

Heater voltage: The average heater voltage should be 6.3 V.
Variations of the heater voltage exceeding the range of 6.0 V to 6.6 V will shorten the tube life.
The tolerance of heater current (column II) should be taken into account.

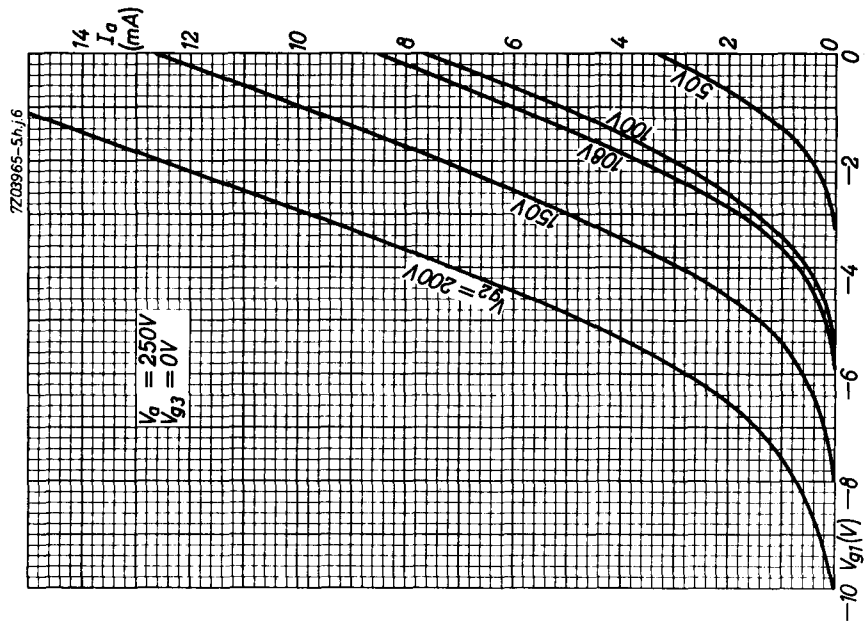
OPERATING CHARACTERISTICS

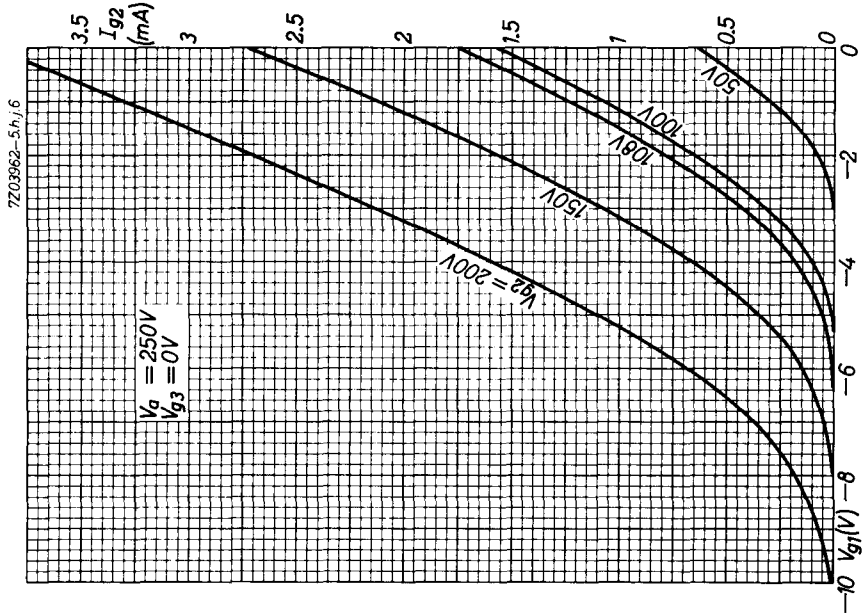
Resistance coupled A.F. amplifier

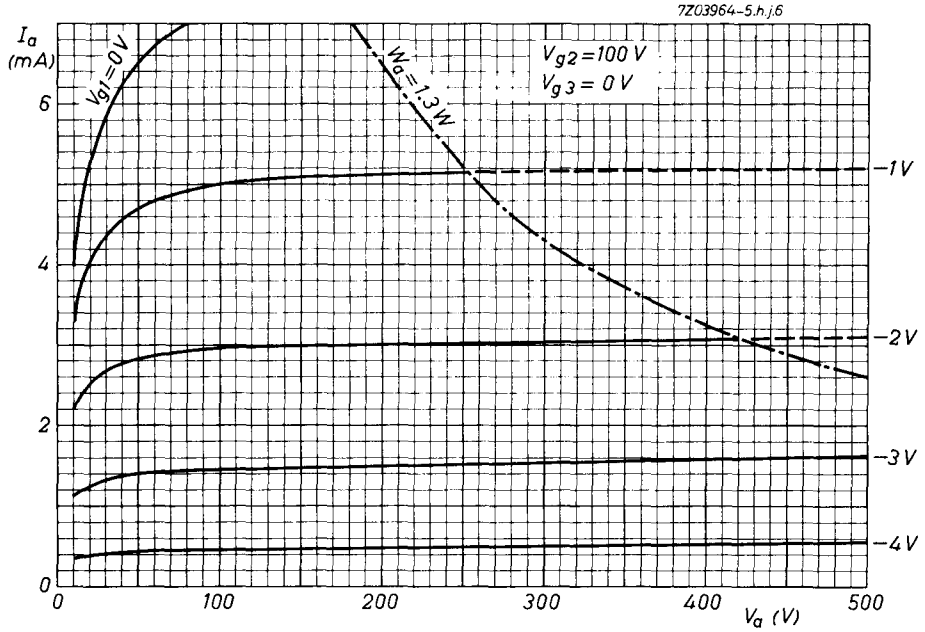
Anode supply voltage	V_{ba}	100	200	250	300	400	V
Grid No.2 supply voltage	V_{bg_2}	100	200	250	300	400	V
Anode resistor	R_a	0.22	0.22	0.22	0.22	0.22	MΩ
Grid No.2 resistor	R_{g_2}	1.0	1.2	1.2	1.2	1.2	MΩ
Cathode resistor	R_k	3.3	1.8	1.5	1.2	1.0	kΩ
Grid No.1 resistor	R_{g_1}	1	1	1	1	1	MΩ
Grid resistor next stage	$R_{g_1'}$	0.68	0.68	0.68	0.68	0.68	MΩ
Anode current	I_a	0.29	0.61	0.80	0.98	1.37	mA
Grid No.2 current	I_{g_2}	0.07	0.13	0.17	0.20	0.28	mA
Gain	V_o/V_i	120	165	175	190	200	
Output voltage at $+I_g = 0.3\ \mu A$	V_o	8	20	25	30	40	V_{RMS}
Total distortion	d_{tot}	1.7	1.6	1.4	1.1	0.9	%

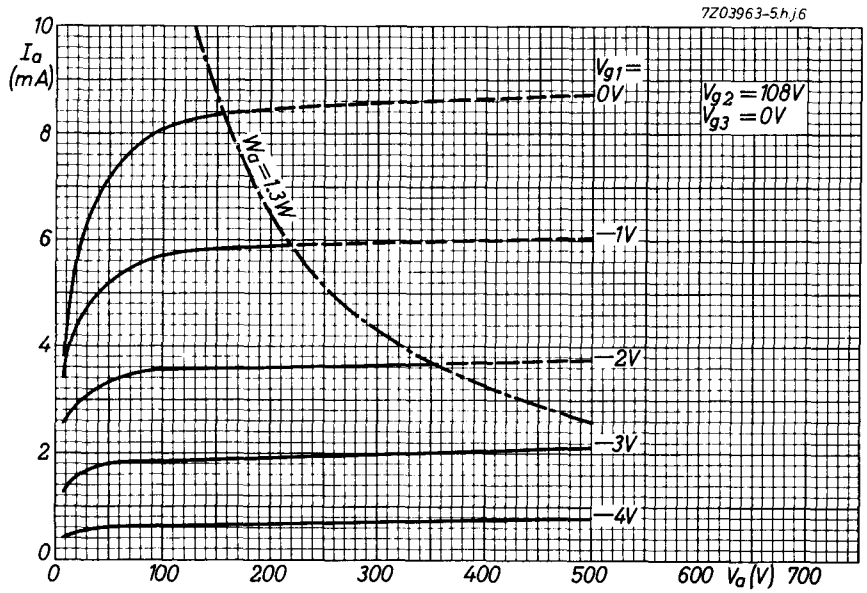
Electrometer pentode

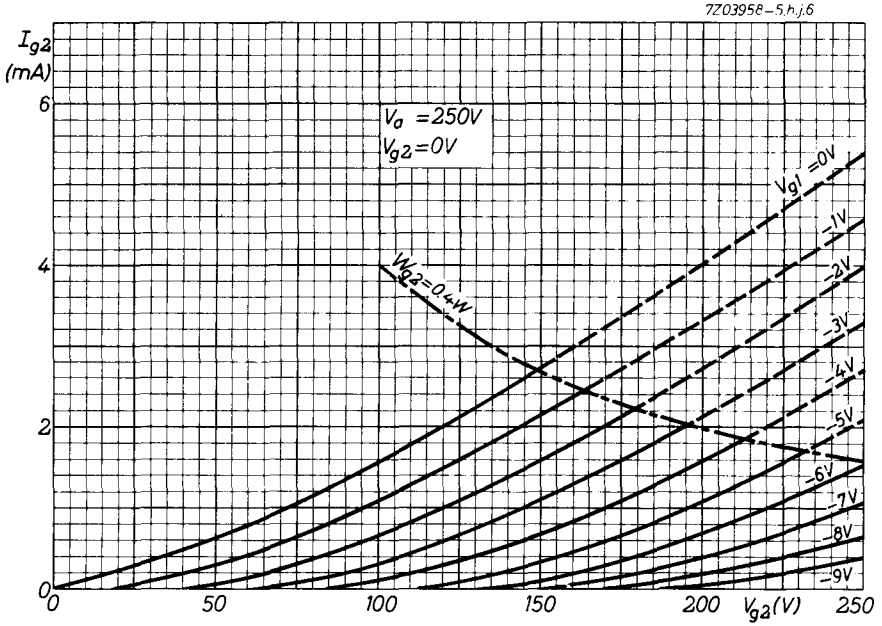
Heater voltage	V_f	4.5	V
Anode voltage	V_a	40	V
Grid No.3 voltage	V_{g_3}	0	V
Grid No.2 voltage	V_{g_2}	40	V
Negative grid No.1 voltage	$-V_{g_1}$	2.15	V
Anode current	I_a	40	μA
Grid No.2 current	I_{g_2}	9	μA
Negative grid No.1 current	$-I_{g_1}$	max. 10^{-10}	A

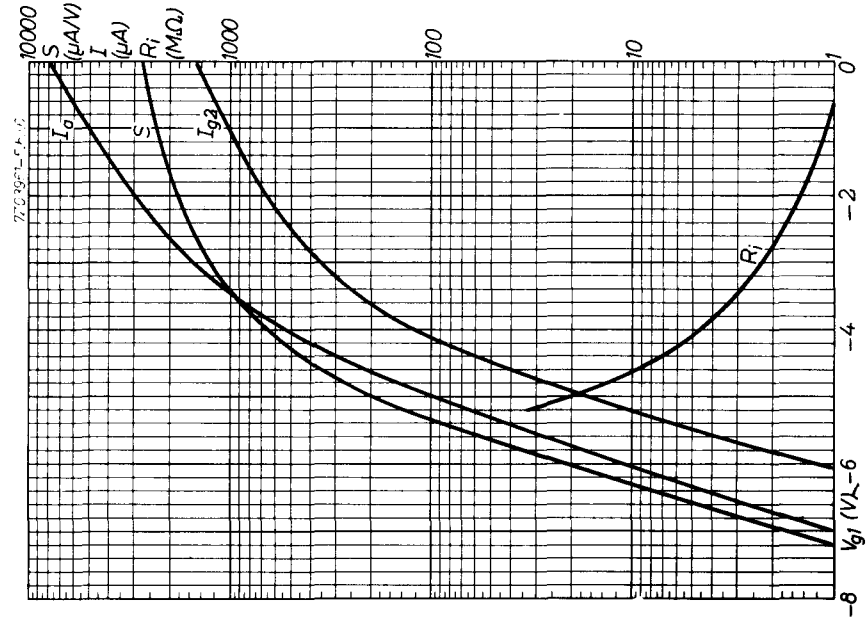

7Z03965-5h,j6
I_a (mA)
14
12
10
8
6
4
2
0
$V_a = 250V$
$V_{g3} = 0V$
$V_{g2} = 200V$
150V
100V
75V
50V
0
−2
−4
−6
−8
−10
V_{g1}(V)

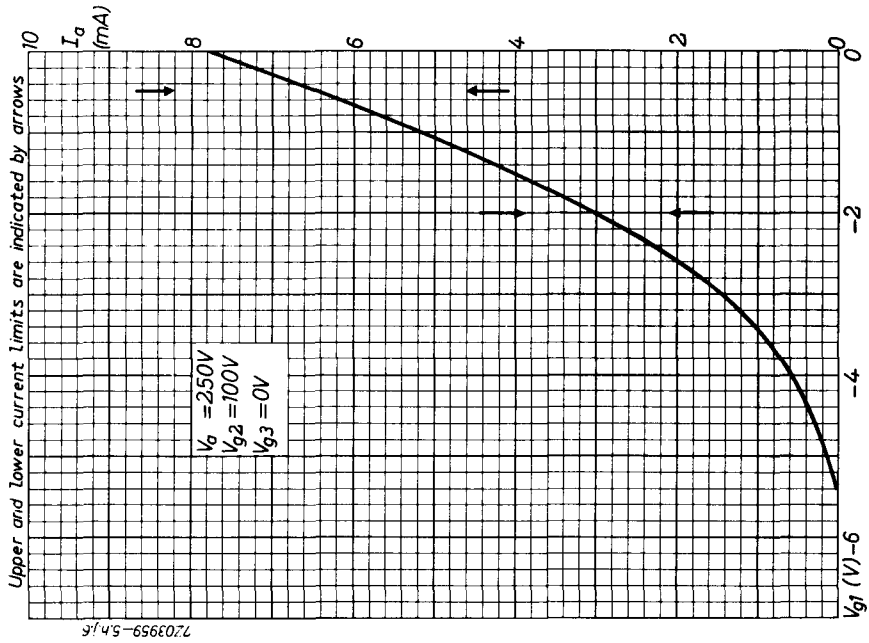

7Z03962-5h,j6
I_{g2} (mA)
3.5
3
2.5
2
1.5
1
0.5
0
$V_a = 250V$
$V_{g3} = 0V$
$V_{g2} = 200V$
150V
100V
75V
50V
0
−2
−4
−6
−8
−10
V_{g1}(V)

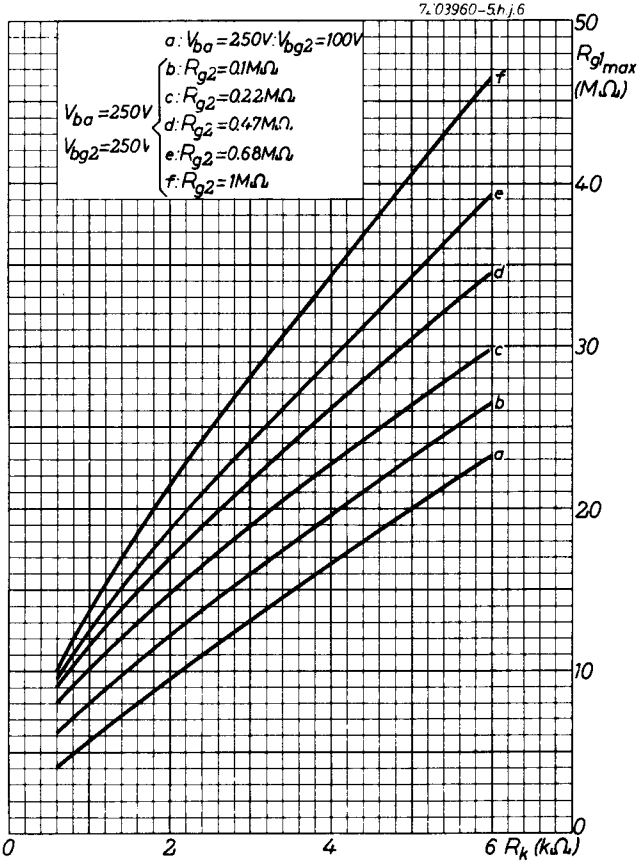

7Z03964-5.h.j.6
I_a (mA)
V_{g1}=0V
W_a=1.3W
V_{g2}=100V
V_{g3}=0V
-1V
-2V
-3V
-4V
0
2
4
6
0
100
200
300
400
500
V_a (V)


7Z03963-5.h.j.6
I_a (mA)
V_{g1}=0V
W_a=1.3W
V_{g2}=108V
V_{g3}=0V
-1V
-2V
-3V
-4V
0
2
4
6
8
10
0
100
200
300
400
500
600
700
V_a(V)


7Z03958-5.h.j.6
I_{g2} (mA)
6
4
2
0
0
50
100
150
200
250
V_{g2}(V)
V_a =250V
V_{g2}=0V
V_{g2}=0.4W
V_{g1} =0V
-1V
-2V
-3V
-4V
-5V
-6V
-7V
-8V
-9V


10000
S (μA/V)
I (μA)
Ri (MΩ)
1000
100
10
1
0
-2
-4
-6
-8
Vg1 (V)
Ia
S
Ig2
Ri


Upper and lower current limits are indicated by arrows
Ia (mA)
10
8
6
4
2
0
-2
-4
-6
Vg1 (V)
Va =250V
Vg2 =100V
Vg3 =0V
7203959-5.h.f.6


7.03960-5hj.6
a: V_{ba} = 250V; V_{bg2} = 100V
b: R_{g2} = 0.1MΩ
c: R_{g2} = 0.22MΩ
d: R_{g2} = 0.47MΩ
e: R_{g2} = 0.68MΩ
f: R_{g2} = 1MΩ
V_{ba} = 250V
V_{bg2} = 250V
R_{g1max} (MΩ)
50
40
30
20
10
0
0
2
4
6
R_k (kΩ)
a
b
c
d
e
f

PHILIPS

Data handbook

Electronic components and materials

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10	10	1968.12
11	FP	2000.11.17

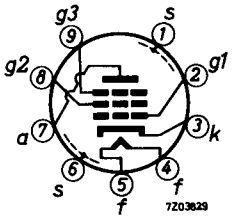
S.Q. TUBE

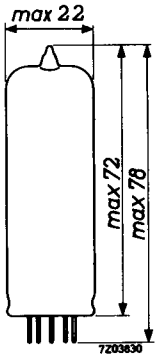
Special quality output pentode

QUICK REFERENCE DATA			
Life test	10 000 hours		
Low interface resistance			
Mechanical quality	Shock and vibration resistant		
Base	Noval. Gold plated pins		
Heating	Indirect A.C. or D.C. Series or parallel supply		
Heater voltage	V_f	6.3	V
Heater current	I_f	700	mA
Anode current	I_a	30	mA
Output power, one tube	W_o	2.7	W
two tubes class AB	W_o	5.7	W

DIMENSIONS AND CONNECTIONS Dimensions in mm

Base: Noval





CHARACTERISTICS

Column I Nominal value or setting of the tube
II Range values for equipment design: Initial spread
III Range values for equipment design: End of life

		I	II	III	
Heater voltage	V_f	6.3			V
Heater current	I_f	700	665 - 735		mA
Anode voltage	V_a	200			V
Grid No.3 voltage	V_{g_3}	0			V
Grid No.2 voltage	V_{g_2}	200			V
Cathode resistor	R_k	130			Ω
Anode current	I_a	30	26.5 - 33.5	min. 21	mA
Grid No.2 current	I_{g_2}	4.1	2.7 - 5.5	min. 2.0	mA
Mutual conductance	S	9.0	7.4 - 10.6	min. 6.0	mA/V
Amplification factor grid No.2 to grid No.1	$\mu_{g_2g_1}$	21.5			
Negative grid No.1 current	$-I_{g_1}$		max. 0.5	max.1.0	μA
Anode voltage	V_a	200			V
Grid No.3 voltage	V_{g_3}	0			V
Grid No.2 voltage	V_{g_2}	200			V
Anode current	I_a	30			mA
Load resistance	$R_{a\sim}$	7			kΩ
Output power	W_o	2.7	min. 2.0		W
Cut-off voltage	$-V_{g_1}$	14			V
Anode voltage	V_a	200			V
Grid No.3 voltage	V_{g_3}	0			V
Grid No.2 voltage	V_{g_2}	200			V
Anode current	I_a		max. 0.2		mA

CHARACTERISTICS (continued)

		I	II	III	
Hum voltage	V_{g_1}		max. 0.25		mV_{RMS}
Grid No.1 resistor R_{g_1} = 0.5 MΩ					
Cathode resistor by-passed					
Leakage current between cathode and heater	I_{kf}		max. 15	max. 20	μA
Voltage between cathode and heater V_{kf} = 120 V					
Insulation resistance between two electrodes	R		min. 50	min. 10	MΩ
Voltage between electrodes = 300 V					

CAPACITANCES

		I	II	
Grid No.1 to grid No.3, grid No.2, cathode heater and screen	C_{g_1/g_3g_2kfs}	10	9.2 - 10.8	pF
Anode to grid No.3, grid No.2, cathode heater and screen	C_{a/g_3g_2kfs}	6.8	6.3 - 7.3	pF
Anode to grid No.1	C_{ag_1}		max. 0.15	pF
Grid No.1 to heater	C_{g_1f}		max. 0.25	pF
Cathode to heater	C_{kf}	7.0		pF

SHOCK AND VIBRATION RESISTANCE

The following test conditions are applied to assess the mechanical quality of the tube. These conditions are not intended to be used as normal operating conditions.

Shock

The tube is subjected 5 times in each of 4 positions to an acceleration of 500 g supplied by an NRL shock machine with the hammer lifted over an angle of 30°.

Vibration

The tube is subjected during 32 hours in each of 3 positions to a vibration frequency of 50 Hz with an acceleration of 2.5 g.

LIFE

Production samples are tested to be within the end of life values (column III) under the following conditions during 10 000 hours.

Anode voltage	V_a	200	V
Grid No.3 voltage	V_{g_3}	0	V
Grid No.2 voltage	V_{g_2}	200	V
Cathode resistor	R_k	130	Ω

LIMITING VALUES (Absolute max. rating system)

Anode voltage	V_{a_o}	max.	600	V
	V_a	max.	300	V
Anode dissipation	W_a	max.	8	W
Negative grid No.3 voltage	$-V_{g_3}$	max.	100	V
Grid No.2 voltage	$V_{g_{2o}}$	max.	600	V
	V_{g_2}	max.	300	V
Grid No.2 dissipation	W_{g_2}	max.	2.6	W
Grid No.1 voltage	$-V_{g_1}$	max.	100	V
Cathode current	I_k	max.	50	mA
Voltage between cathode and heater	V_{kf}	max.	120	V
Bulb temperature	t_{bulb}	max.	225	°C
Grid No.1 resistor (automatic bias)	R_{g_1}	max.	1	MΩ

Heater voltage: The average heater voltage should be 6.3 V.
Variations of the heater voltage exceeding the range of 6.0 V to 6.6 V will shorten the tube life.
The tolerance of heater current (column II) should be taken into account.

OPERATING CHARACTERISTICS

Output tube class A

Anode voltage	V_a	200		250	V
Grid No.3 voltage	V_{g_3}	0		0	V
Grid No.2 voltage	V_{g_2}	200		250	V
Grid No.2 resistor	R_{g_2}			1	kΩ
Cathode resistor	R_k	130		270	Ω
Anode current	I_a	30		24	mA
Grid No.2 current	I_{g_2}	4.1		3.3	mA
Mutual conductance	S	9		–	mA/V
Internal resistance	R_i	52		–	kΩ
Load resistance	$R_{a\sim}$	7		10	kΩ
Output power	W_o	2.7		2.8	W
Total distortion	d_{tot}	10		10	%

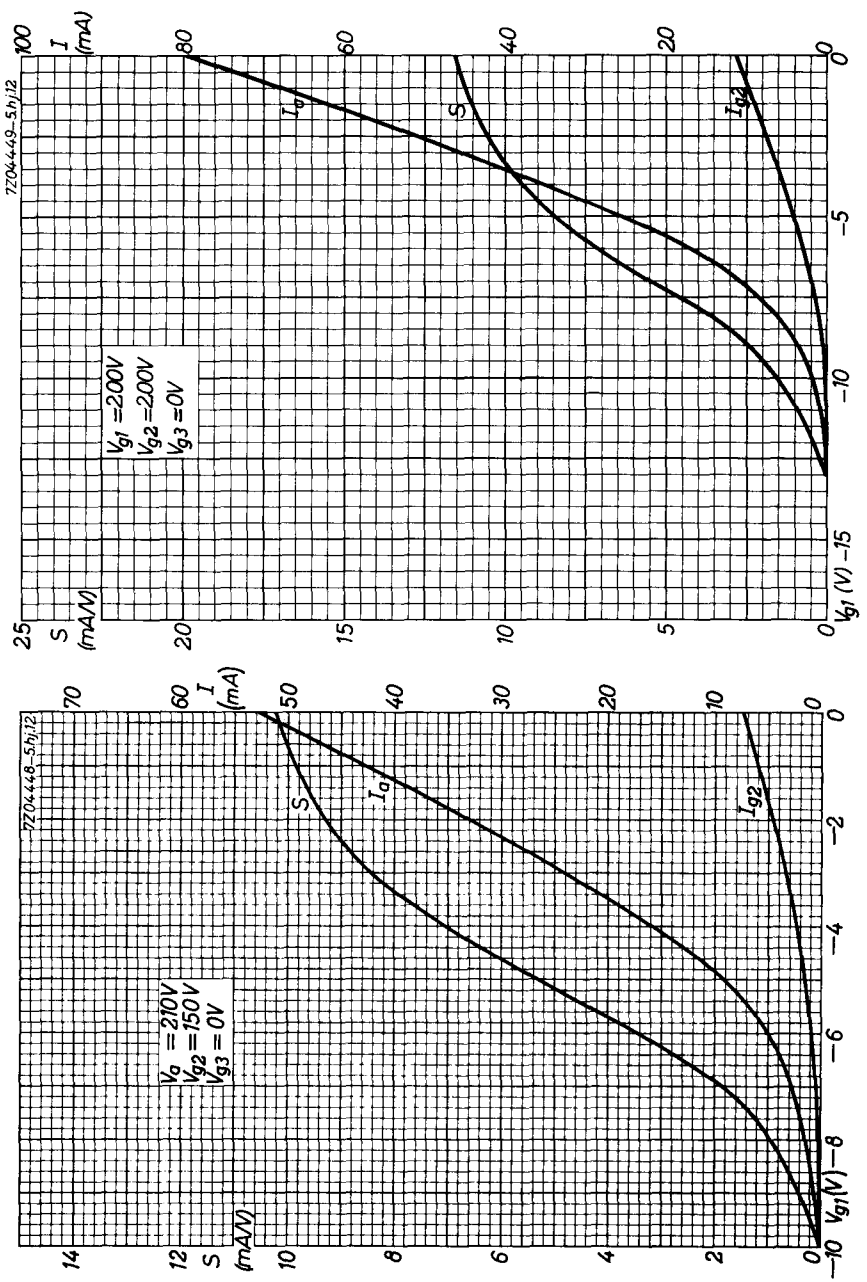
Output tube class AB (two tubes)

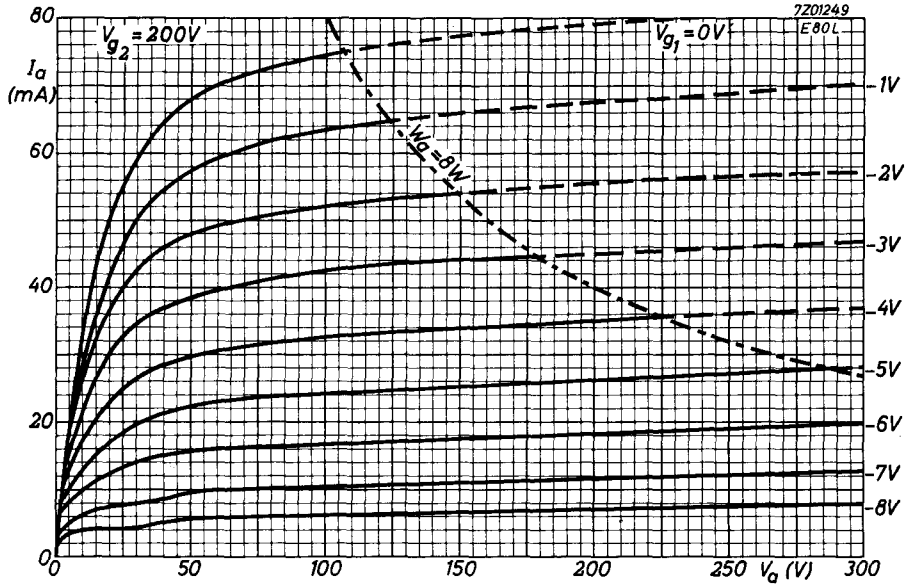
Anode voltage	V_a		200		V
Grid No.3 voltage	V_{g_3}		0		V
Grid No.2 voltage	V_{g_2}		200		V
Cathode resistor	R_k		130		Ω
Load resistance	$R_{aa\sim}$		9		kΩ
Input voltage	V_i	0	0.31	5.2	V_{RMS}
Anode current	I_a	2x20.6	–	2x24.6	mA
Grid No.2 current	I_{g_2}	2x2.8	–	2x4.9	mA
Output power	W_o	0	0.05	5.7	W
Total distortion	d_{tot}	–	–	3.0	%

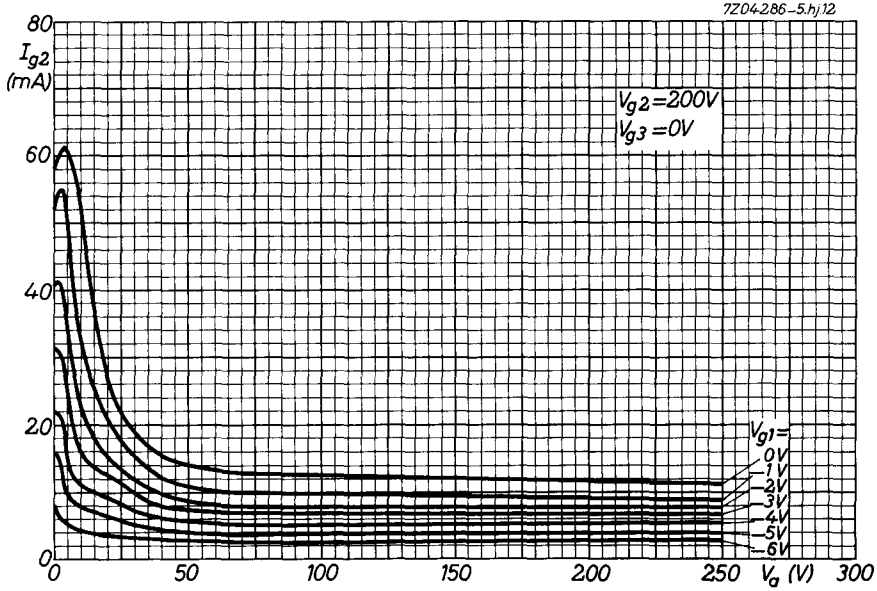
OPERATING CHARACTERISTICS (continued)

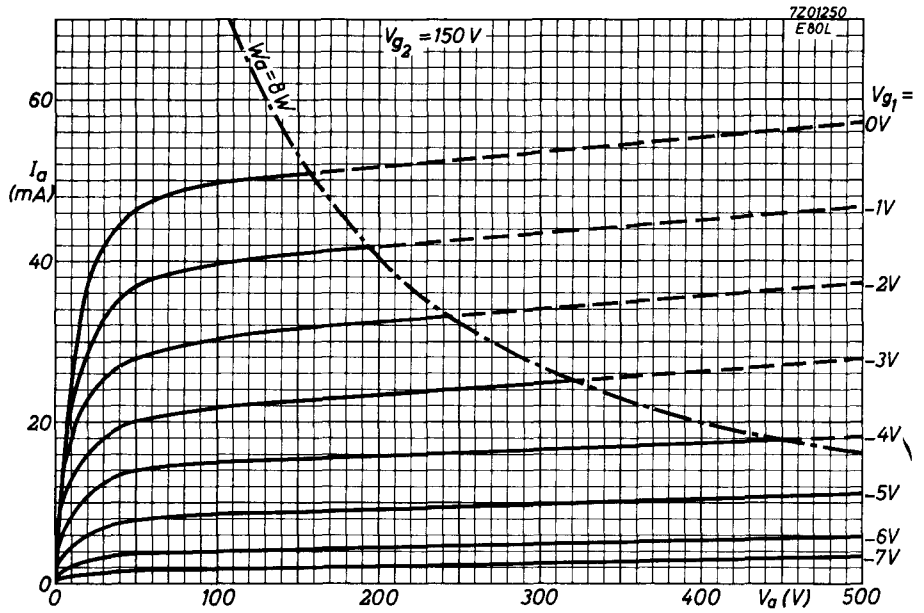
Output tube class AB (two tubes)

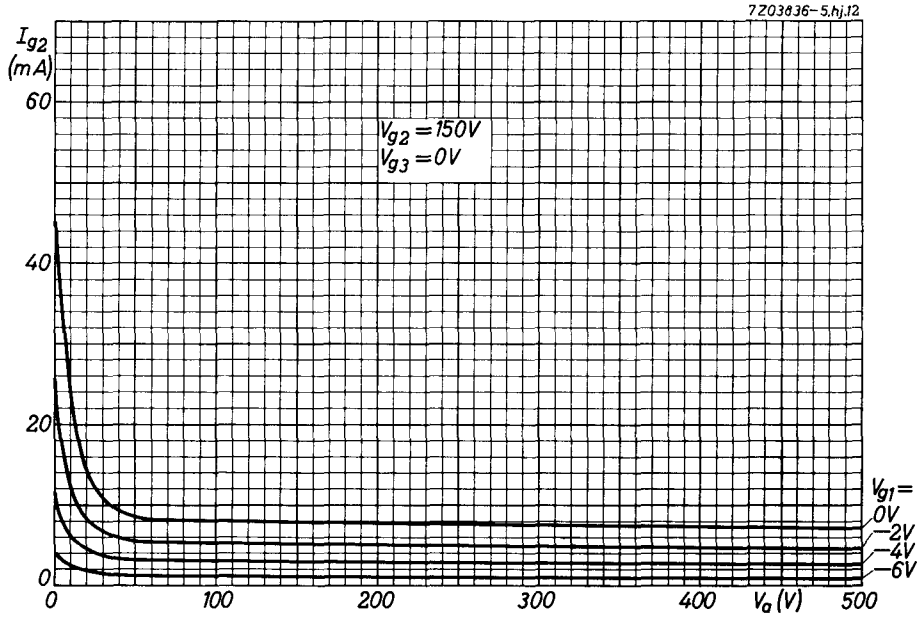
Anode voltage	V_a		250		V
Grid No.3 voltage	V_{g_3}		0		V
Grid No.2 voltage	V_{g_2}		250		V
Cathode resistor	R_k		150		Ω
Load resistance	$R_{aa\sim}$		9		kΩ
Input voltage	V_i	0	0.32	7.8	V_{RMS}
Anode current	I_a	2x23.5	–	2x29.5	mA
Grid No.2 current	I_{g_2}	2x3.2	–	2x6.6	mA
Output power	W_o	0	0.05	9	W
Total distortion	d_{tot}		–	4.5	%

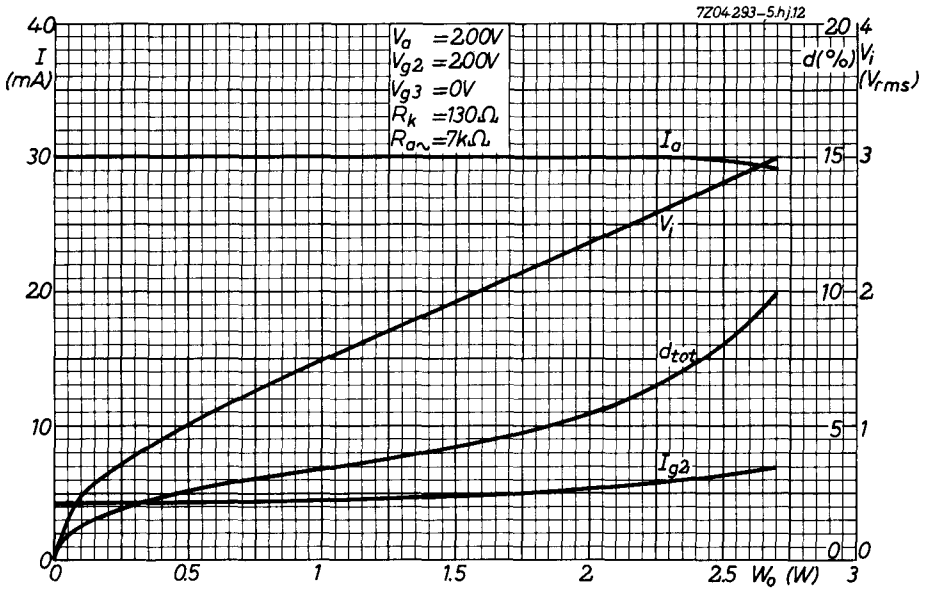

7Z04449-5hj12
I (mA)
S (mA/V)
V_{g1} (V)
I_a
I_{g2}
S
V_{g1} =200V
V_{g2} =200V
V_{g3} =0V
7Z04448-5hj12
V_a =210V
V_{g2} =150V
V_{g3} =0V

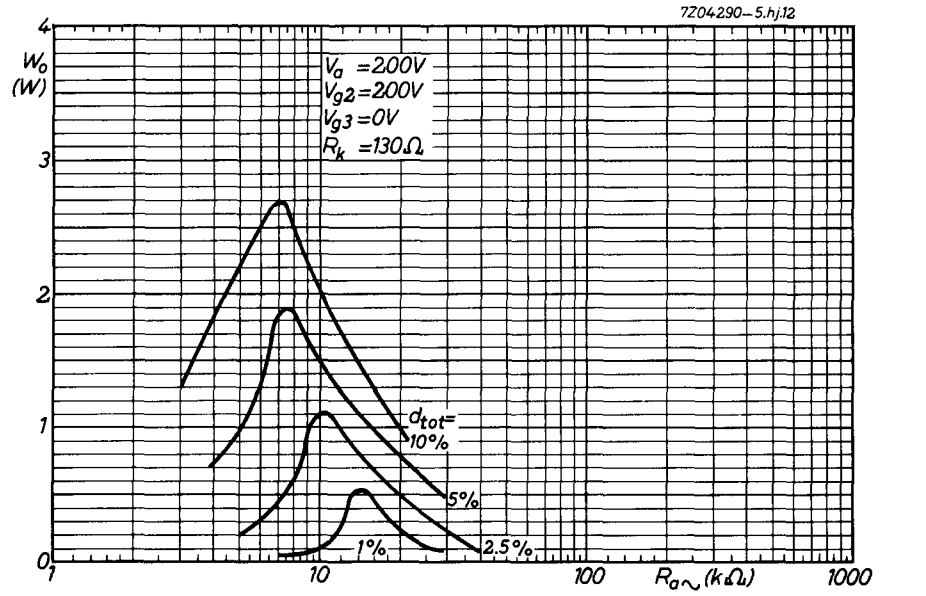

7Z01249
E80L
V_{g_2} = 200V
V_{g_1} = 0V
I_a (mA)
$-V_{g_1}$ = 8V
1V
2V
3V
4V
5V
6V
7V
8V
80
60
40
20
0
0
50
100
150
200
250
300
V_a (V)

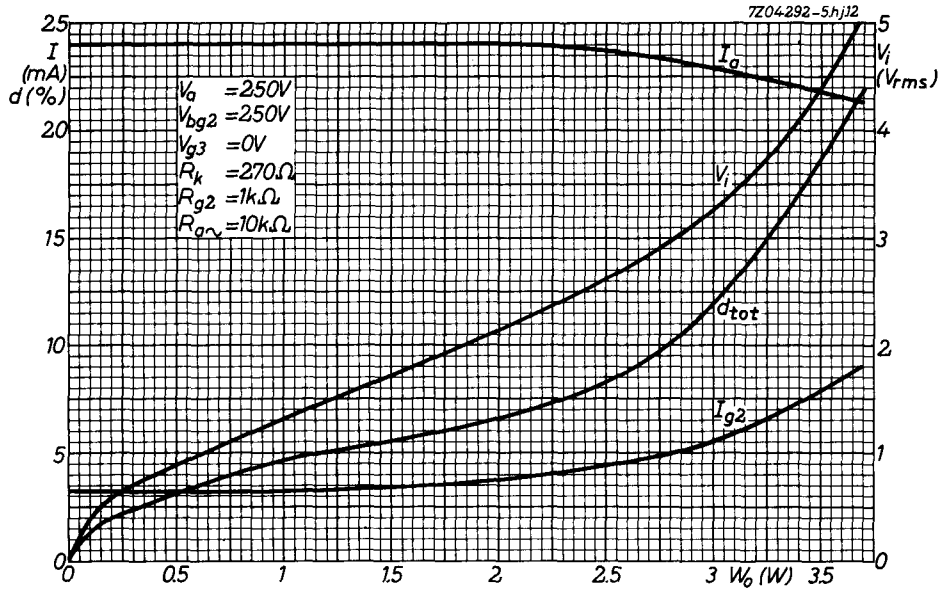

7Z04286-5.hj12
I_{g2} (mA)
V_{g2}=200V
V_{g3} =0V
V_{g1} =
0V
1V
2V
3V
4V
5V
6V
80
60
40
20
0
0
50
100
150
200
250
300
V_a (V)

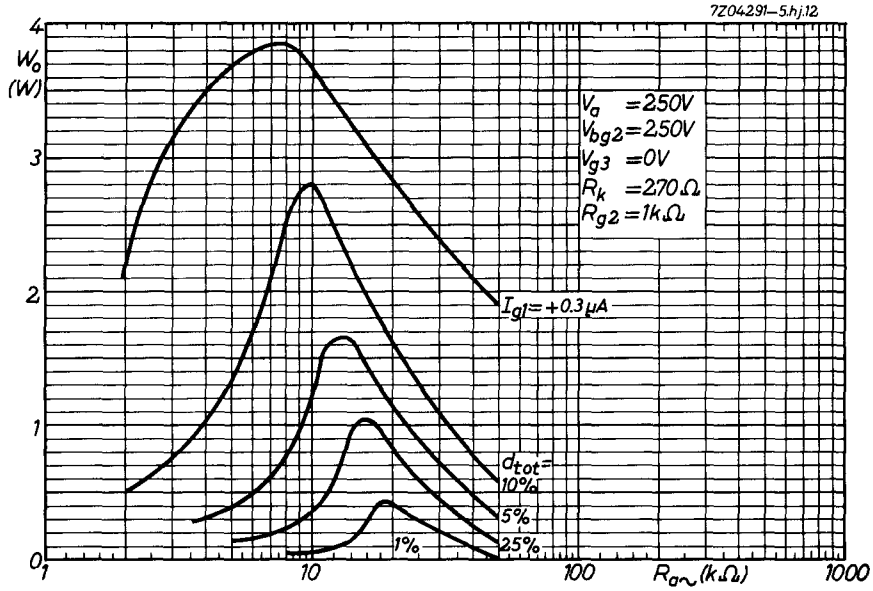

7Z01250
E80L
V_{g_2} = 150 V
W_a = 8 W
I_a (mA)
60
40
20
0
0
100
200
300
400
V_a (V)
500
V_{g_1} =
0V
-1V
-2V
-3V
-4V
-5V
-6V
-7V

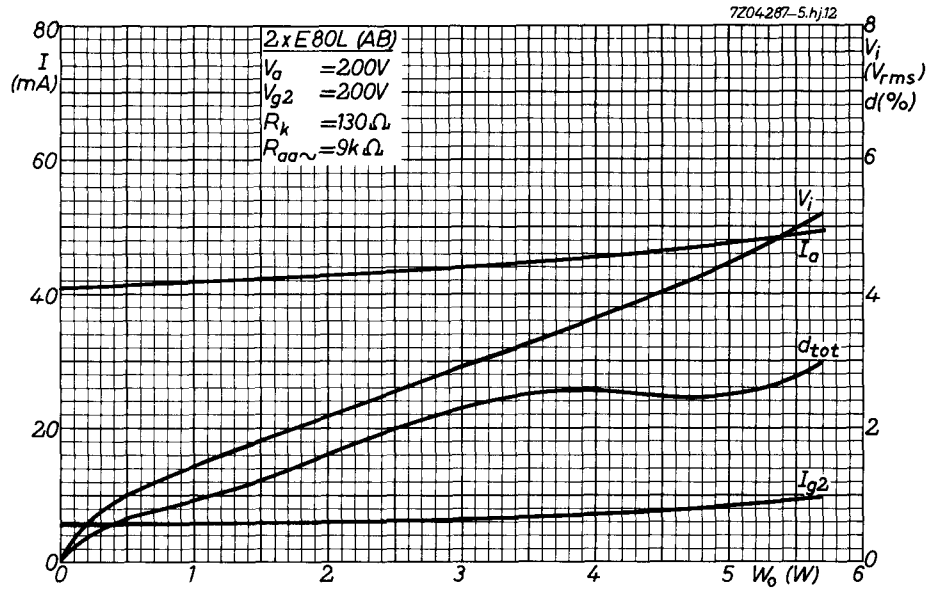

7Z03836-5.hj.12
I_{g2} (mA)
60
40
20
0
V_{g2} = 150V
V_{g3} = 0V
0
100
200
300
400
V_a (V)
500
V_{g1} =
0V
-2V
-4V
-6V

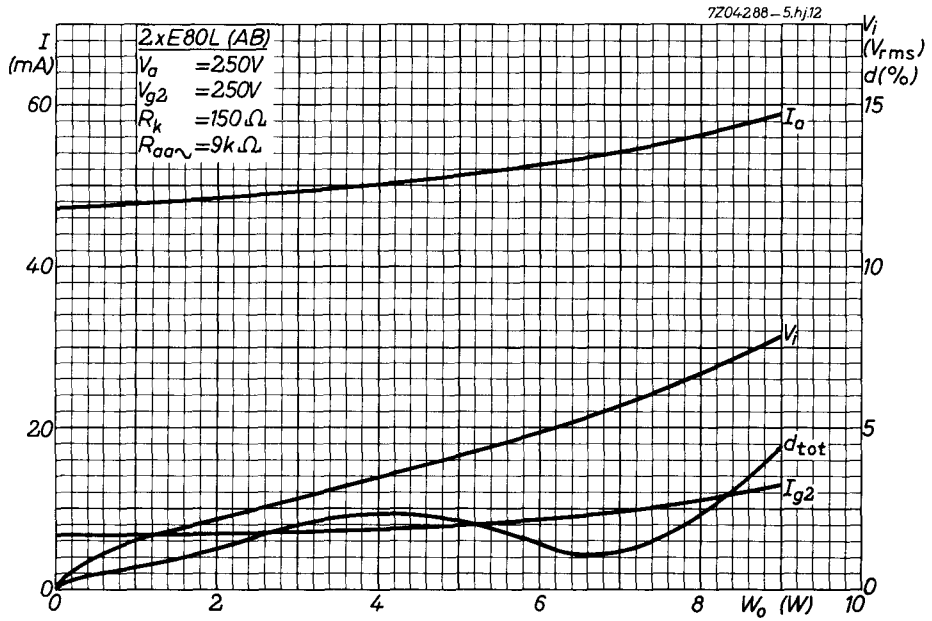

7Z04293–5.hj12
V_a =200V
V_{g2} =200V
V_{g3} =0V
R_k =130Ω
$R_{a\sim}$=7kΩ
I (mA)
d(%)
V_i (V_{rms})
I_a
V_i
d_{tot}
I_{g2}
W_o (W)


7Z04290–5.hj12
V_a =200V
V_{g2}=200V
V_{g3}=0V
R_k =130Ω
W_o (W)
d_{tot}=
10%
5%
2.5%
1%
$R_{a\sim}$ (kΩ)


7Z04292-5.hj12
I (mA) d(%)
V_i (V_{rms})
V_a =250V
V_{bg2} =250V
V_{g3} =0V
R_k =270Ω
R_{g2} =1kΩ
$R_{g\sim}$ =10kΩ
I_a
V_i
d_{tot}
I_{g2}
W_o (W)


7Z04291-5.hj12
W_o (W)
V_a =250V
V_{bg2}=250V
V_{g3} =0V
R_k =270Ω
R_{g2} =1kΩ
I_{g1}=+0.3μA
d_{tot}= 10%
5%
1%
25%
$R_{g\sim}$ (kΩ)


7Z04287–5.hj12
2xE80L (AB)
Va =200V
Vg2 =200V
Rk =130Ω
Raa~ =9kΩ
I (mA)
Vi (Vrms)
d(%)
Vi
Ia
dtot
Ig2
Wo (W)


7Z04288–5.hj12
2xE80L (AB)
Va =250V
Vg2 =250V
Rk =150Ω
Raa~ =9kΩ
I (mA)
Vi (Vrms)
d(%)
Ia
Vi
dtot
Ig2
Wo (W)

PHILIPS

Data handbook

Electronic components and materials

E80L

page	sheet	date
1	1	1968.12
2	2	1968.12
3	3	1968.12
4	4	1968.12
5	5	1968.12
6	6	1968.12
7	7	1968.12
8	8	1968.12
9	9	1968.12
10	10	1968.12
11	11	1968.12
12	12	1968.12
13	FP	2000.11.17

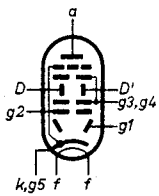
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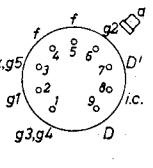
E 80 T

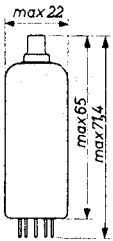
Special quality BEAM DEFLECTION TUBE with ribbon shaped beam
TUBE A DEVIATION DE FAISCEAU à haute securité de fonctionnement à faisceau laminaire
Zuverlässige ELEKTRONENSTRAHLABLENKRÖHRE mit bandförmigem Elektronenstrahl

Heating : indirect; parallel supply — V_f = 6,3 V ± 10%
Chauffage: indirect; alimentation parallèle — I_f = 150 mA
Heizung : indirekt; Parallelspeisung

Dimensions in mm
Dimensions en mm
Abmessungen in mm







Base, culot, Sockel: NOVAL

Capacitances
Capacités
Kapazitäten

C_{g_1}	=	2,2 pF	max. 3,5 pF[1]
C_D	=	3,0 pF	max. 4,5 pF[1]
$C_{D'}$	=	3,0 pF	max. 4,5 pF[1]
C_a	=	- pF	max. 2,0 pF[1]
C_{Dg_1}	=	- pF	max. 0,1 pF
$C_{D'g_1}$	=	- pF	max. 0,1 pF
$C_{g_1 g_2}$	=	- pF	max. 0,9 pF
C_{Da}	=	- pF	max. 0,02 pF
$C_{D'a}$	=	-	max. 0,02 pF

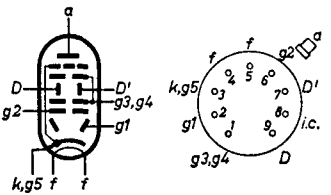
[1] To all electrodes
A toutes les électrodes
Gegen alle Elektroden

SQ PHILIPS E 80 T

Special quality BEAM DEFLECTION TUBE with ribbon shaped beam
TUBE A DEVIATION DE FAISCEAU à haute securité de fonctionnement à faisceau laminaire
Zuverlässige ELEKTRONENSTRAHLABLENKRÖHRE mit bandförmigem Elektronenstrahl

Heating : indirect; parallel supply — V_f = 6,3 V ± 10%
Chauffage: indirect; alimentation parallèle — I_f = 150 mA
Heizung : indirekt; Parallelspeisung

Dimensions in mm
Dimensions en mm
Abmessungen in mm



Base, culot, Sockel: NOVAL

Capacitances
Capacités
Kapazitäten

C_{g_1}	=	2,2 pF	max. 3,5 pF[1]
C_D	=	3,0 pF	max. 4,5 pF[1]
$C_{D'}$	=	3,0 pF	max. 4,5 pF[1]
C_a	=	- pF	max. 2,0 pF[1]
C_{Dg_1}	=	- pF	max. 0,1 pF
$C_{D'g_1}$	=	- pF	max. 0,1 pF
$C_{g_1g_2}$	=	- pF	max. 0,9 pF
C_{Da}	=	- pF	max.0,02 pF
$C_{D'a}$	=	-	max.0,02 pF

[1] To all electrodes
A toutes les électrodes
Gegen alle Elektroden

PHILIPS

Typical characteristics
Caractéristiques types
Kenndaten

V_a	=	100	V
$V_{(g_3+g_4)}$	=	250	V
V_{g_2}	=	70	V
V_{g_1}	=	0	V
V_D	=	120	V
$V_{D'}$	=	120	V [2]
I_a	=	1,35 ± 0,45	mA
I_k	=	2,0	mA
I_a ($\Delta V_{D'}$ = 7,5 V)	=	0,25	mA
V_{g_1} ($I_a \leq$ 50 µA)	=	-20	V

Limiting values
Caractéristiques limites
Grenzdaten

V_{a_o}	= max.	600	V
V_a	= max.	330	V
$V_{(g_3+g_4)_o}$	= max.	600	V
$V_{(g_3+g_4)}$	= max.	330	V
$V_{g_{2o}}$	= max.	600	V
V_{bg_2}	= max.	330	V
V_{g_2}	= max.	100	V
V_D	= max.	170	V
V_{D_p}	= max.	970	V
$-V_{D_p}$	= max.	800	V
$V_{D'}$	= max.	170	V
$V_{D'_p}$	= max.	670	V
$-V_{D'_p}$	= max.	500	V
V_{kf}	= max.	50	V
I_k	= max.	5,5	mA

[2]) Adjusted for max. anode current I_a
Réglé pour le courant anodique I_a maximum
Eingestellt auf maximalen Anodenstrom I_a

Typical characteristics
Caractéristiques types
Kenndaten

V_a	=	100	V
$V_{(g_3+g_4)}$	=	250	V
V_{g_2}	=	70	V
V_{g_1}	=	0	V
V_D	=	120	V
$V_{D'}$	=	120	V [2]
I_a	=	1,35 ± 0,45	mA
I_k	=	2,0	mA
I_a ($\Delta V_{D'}$ = 7,5 V)	=	0,25	mA
V_{g_1} ($I_a \leq$ 50 µA)	=	-20	V

Limiting values
Caractéristiques limites
Grenzdaten

V_{a_o}	= max.	600	V
V_a	= max.	330	V
$V_{(g_3+g_4)_o}$	= max.	600	V
$V_{(g_3+g_4)}$	= max.	330	V
$V_{g_{2o}}$	= max.	600	V
V_{bg_2}	= max.	330	V
V_{g_2}	= max.	100	V
V_D	= max.	170	V
V_{D_p}	= max.	970	V
$-V_{D_p}$	= max.	800	V
$V_{D'}$	= max.	170	V
$V_{D'_p}$	= max.	670	V
$-V_{D'_p}$	= max.	500	V
V_{kf}	= max.	50	V
I_k	= max.	5,5	mA

[2]) Adjusted for max. anode current I_a
Réglé pour le courant anodique I_a maximum
Eingestellt auf maximalen Anodenstrom I_a

Shock resistance: The tube is proof against the impact acceleration obtained with the N.R.L. impact machine for electronic devices, lifting the hammer over an angle of 30°

Résistance aux chocs: Le tube peut résister à l'accélération par choc obtenue avec la machine N.R.L. à impact pour dispositifs électroniques, en soulevant le marteau d'un angle de 30°

Stossfestigkeit: Die Röhre kann die Stossbeschleunigung vertragen die mit der N.R.L. Stossmaschine für elektronische Vorrichtungen erhalten wird, wobei der Hammer über einen Winkel von 30° gehoben wird.

Mounting position: The tube may be mounted in any position but must not be subjected to a magnetic field strength larger than 1 Gauss

Montage: Il est permis de monter le tube dans toute position voulue, mais il ne doit pas être soumis à des champs magnétiques d'intensité supérieure à 1 Gauss

Einbau: Die Röhre darf in jeder beliebigen Stellung montiert werden, darf aber nicht magnetischen Feldern deren Feld-Stärke grösser ist als 1 Gauss ausgesetzt werden

Shock resistance: The tube is proof against the impact acceleration obtained with the N.R.L. impact machine for electronic devices, lifting the hammer over an angle of 30°

Résistance aux chocs: Le tube peut résister à l'accélération par choc obtenue avec la machine N.R.L. a impact pour dispositifs électroniques, en soulevant le marteau d'un angle de 30°

Stossfestigkeit: Die Röhre kann die Stossbeschleunigung vertragen die mit der N.R.L. Stossmaschine für elektronische Vorrichtungen erhalten wird, wobei der Hammer über einen Winkel von 30° gehoben wird.

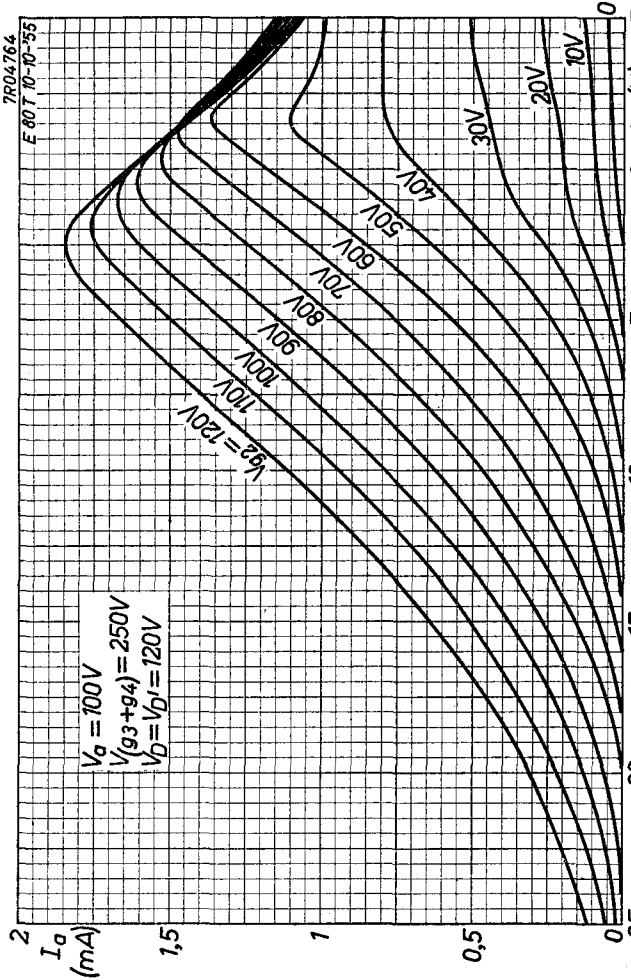
Mounting position: The tube may be mounted in any position but must not be subjected to a magnetic field strength larger than 1 Gauss

Montage: Il est permis de monter le tube dans toute position voulue, mais il ne doit pas être soumis à des champs magnétiques d'intensité supérieure à 1 Gauss

Einbau: Die Röhre darf in jeder beliebigen Stellung montiert werden, darf aber nicht magnetischen Feldern deren Feld-Stärke grösser ist als 1 Gauss ausgesetzt werden

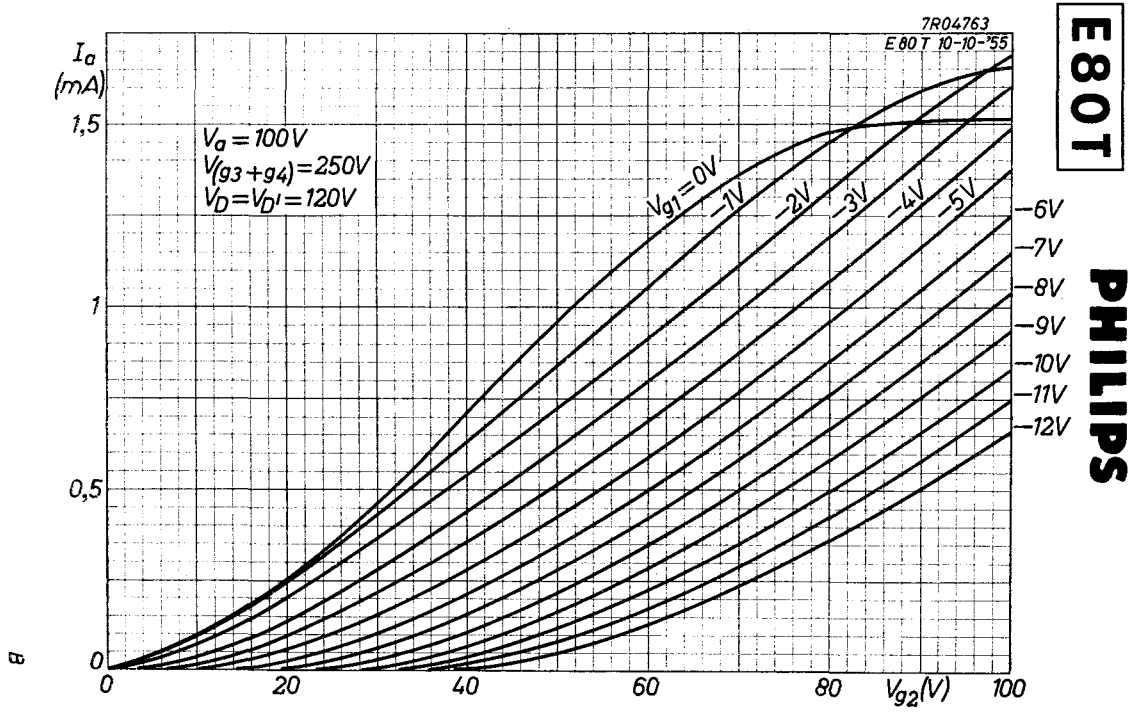
7R04764
E 80 T 10-10-55
$V_a = 100\,V$
$V_{(g3+g4)} = 250\,V$
$V_D = V_{D'} = 120\,V$
$V_{g2} = 120V$
110V
100V
90V
80V
70V
60V
50V
40V
30V
20V
10V
0V
I_a (mA)
2
1,5
1
0,5
0
V_{g1} (V)
5
0
−5
−10
−15
−20
−25

SQ **PHILIPS** **E80T**



6.6.1957

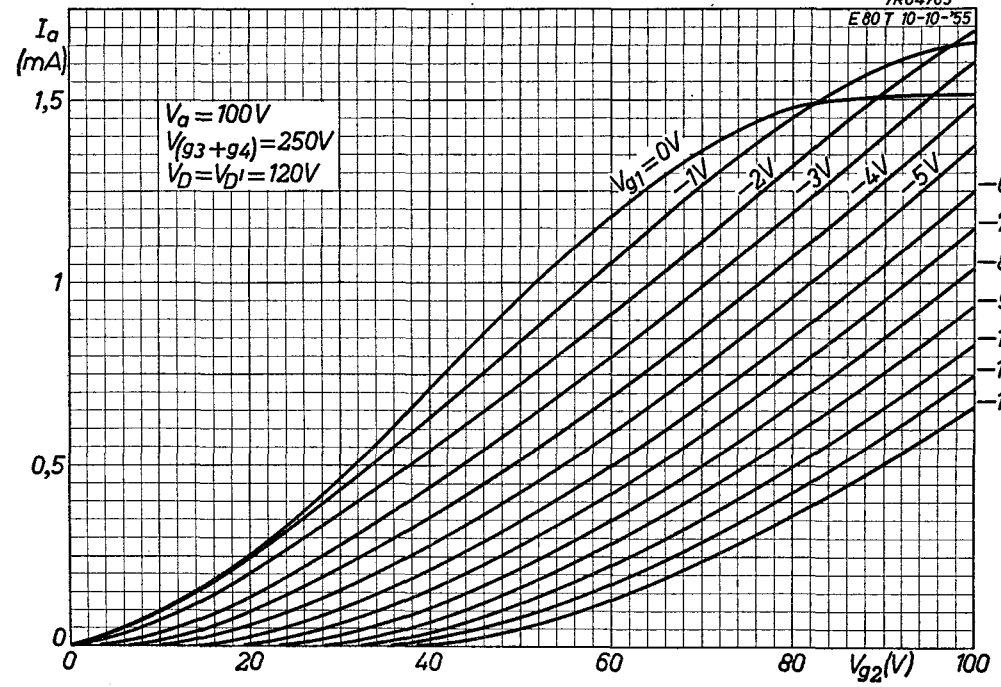
A



E80T

PHILIPS

B



E80T

PHILIPS

SQ

8

PHILIPS

E80T

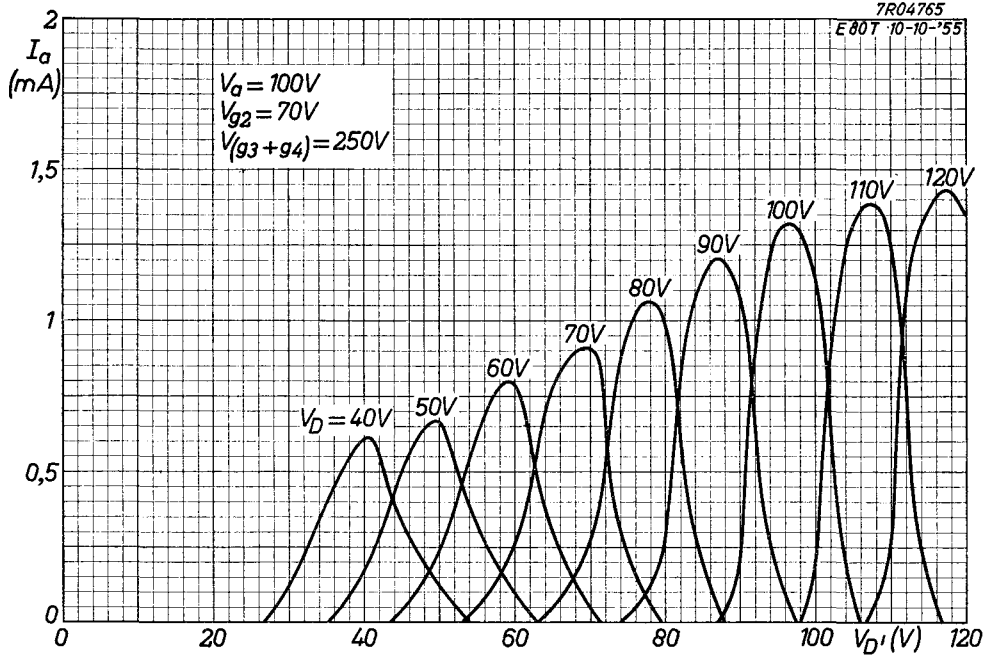
10.10.1955

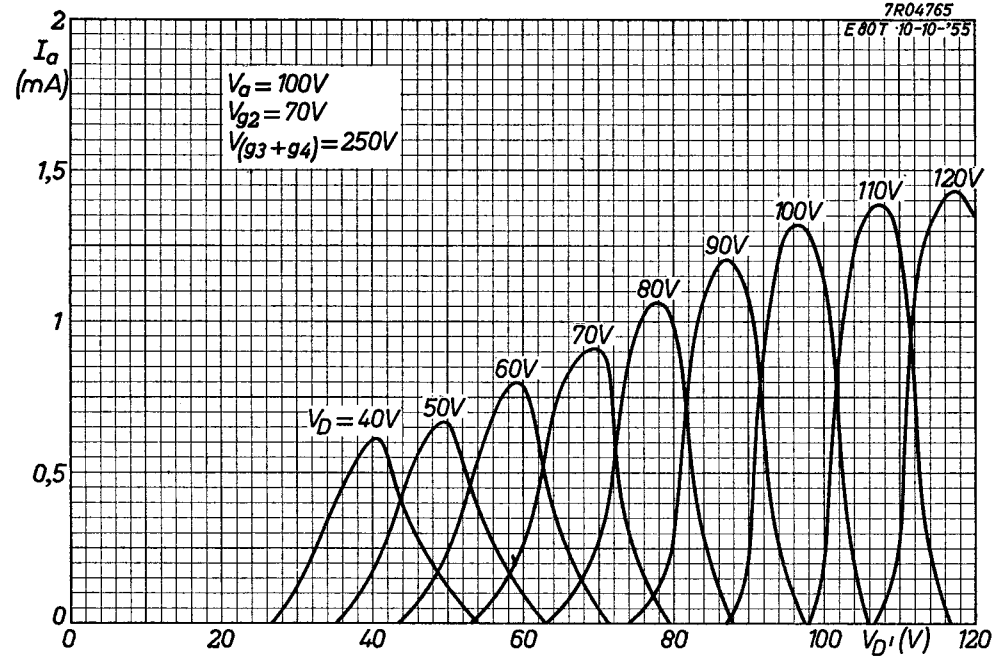
C

SQ PHILIPS E80T

6.6.1957

c


7R04765
E80T 10-10-'55
I_a (mA)
$V_a = 100V$
$V_{g2} = 70V$
$V_{(g3+g4)} = 250V$
$V_D = 40V$
50V
60V
70V
80V
90V
100V
110V
120V
2
1,5
1
0,5
0
0
20
40
60
80
100
120
$V_{D'}$ (V)



E80T

PHILIPS SQ

PHILIPS

Electronic Tube

HANDBOOK

E80T

page	sheet	date
1	1	1956.04.04
2	1	1957.06.06
3	2	1956.04.04
4	2	1957.06.06
5	3	1956.04.04
6	3	1957.06.06
7	A	1955.10.10
8	A	1957.06.06
9	B	1955.10.10
10	B	1957.06.06
11	C	1955.10.10
12	C	1957.06.06
13	D	1955.10.10
14	D	1957.06.06
15	FP	1999.06.11

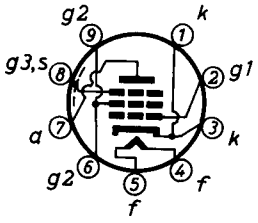
S.Q. TUBE

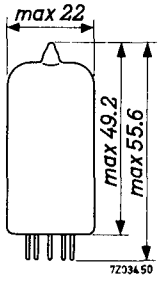
Special quality pentode designed for use as wide band amplifier.

QUICK REFERENCE DATA			
Life test	10 000 hours		
Low interface resistance			
Mechanical quality	Shock and vibration resistant		
Base	Noval. Gold plated pins		
Heating	Indirect A.C. or D.C.; Parallel supply		
Heater voltage	V_f	6.3	V
Heater current	I_f	340	mA
Anode current	I_a	35	mA
Mutual conductance	S	50	mA/V
Equivalent noise resistance	R_{eq}	110	Ω
Quality factor $\frac{S}{2\pi(C_{g_1}+C_a+5)}$		250	MHz

DIMENSIONS AND CONNECTIONS Dimensions in mm

Base: Noval





CHARACTERISTICS

Column I Nominal value or setting of the tube
II Range values for equipment design: Initial spread
III Range values for equipment design: End of life

		I	II	III	
Heater voltage	V_f	6.3			V
Heater current	I_f	340	320 - 360		mA
Anode supply voltage	V_{ba}	135			V
Grid No.3 voltage	V_{g_3}	0			V
Grid No.2 supply voltage	V_{bg_2}	165			V
Grid No.1 supply voltage	$+V_{bg_1}$	12.5			V
Cathode resistor	R_k	360			Ω
Anode current	I_a	35	(negligible spread)		mA
Grid No.2 current	I_{g_2}	5.0	4.4 - 5.6		mA
Mutual conductance	S	50	42 - 58	min. 35	mA/V
Internal resistance	R_i	42			kΩ
Amplification factor of grid No.2 to grid No.1	$\mu_{g_2g_1}$	57			
Negative grid current	$-I_{g_1}$		max. 0.1	max. 0.2	μA
Equivalent noise resistance	R_{eq}	110			Ω
Frequency = 45 MHz					
Input resistance	r_{g_1}	415			Ω
Frequency = 100 MHz					
Quality factor $\frac{S}{2\pi(C_{g_1}+C_a+5)}$					
a) without shield		250			MHz
b) with shield		245			MHz
Anode supply voltage	V_{ba}	120			V
Grid No.3 voltage	V_{g_3}	0			V
Grid No 2 supply voltage	V_{bg_3}	150			V
Cathode resistor	R_k	47			Ω
Anode current	I_a	35	31 - 39		mA

CHARACTERISTICS (continued)

		II	III	
Hum voltage	V_{g_1}	max. 150		μV
Grid No.1 resistor R_{g_1} = 0.5 MΩ				
Midtap heater transformer grounded				
Cathode resistor decoupled				
Leakage current between cathode and heater	I_{kf}	max. 10	max. 20	μA
Voltage between cathode and heater V_{kf} = 100 V				
Insulation resistance between anode and other electrodes	R	min. 100	min. 40	MΩ
Measured with V = 250 V				

CAPACITANCES

		Without external shield		With external shield		
		I	II	I	II	
Anode to grid No.3, grid No.2, cathode, heater and screen	C_{a/g_3g_2kfs}	3.5	3.2-3.8	4.1	3.9-4.3	pF
Grid No.1 to grid No.3, grid No.2, cathode, heater and screen						
(I_k = 0 mA)	C_{g_1/g_3g_2kfs}	14.5	13- 16	14.5	13- 16	pF
(I_k = 40 mA; f = 100 Mc/s)	C_{g_1/g_3g_3kfs}	24	22- 26	24	22- 26	pF
Anode to grid No.1	C_{ag_1}		max. 36		max. 32	mpF
Anode to cathode	C_{ak}	60	53- 67	33	26- 40	mpF
Anode to heater	C_{af}	31	26- 36	20	12- 28	mpF
Grid No.1 to heater	C_{g_1f}	60	40- 80	55	35- 75	mpF
Cathode to heater	C_{kf}			5.2	4.2-6.2	pF

SHOCK AND VIBRATION RESISTANCE

The following test conditions are applied to assess the mechanical quality of the tube. These conditions are not intended to be used as normal operating conditions.

Shock

The tube is subjected 5 times in each of 4 positions to an acceleration of 500 g supplied by an NRL shock machine with the hammer lifted over an angle of 30°.

Vibration

The tube is subjected during 32 hours in each of 3 positions to a vibration frequency of 50 Hz with an acceleration of 2.5 g.

LIFE

Production samples are tested to be within the end of life values (column III) under the following conditions during 10 000 hours.

Anode supply voltage	V_{ba}	165	V
Anode resistor	R_a	820	Ω
Grid No.3 voltage	V_{g_3}	0	V
Grid No.2 supply voltage	V_{bg_2}	165	V
Grid No.1 supply voltage	$+V_{bg_1}$	12.5	V
Cathode resistor	R_k	360	Ω
Anode current	I_a	35	mA
Voltage between cathode and heater	V_{kf}	100	V

LIMITING VALUES (Absolute max. rating system)

Anode voltage	V_{a_o}	max. 400	V
	V_a	max. 250	V
Anode dissipation	W_a	max. 5	W
Grid No.2 voltage	V_{g2_o}	max. 400	V
	V_{g_2}	max. 200	V
Grid No.2 dissipation	W_{g_2}	max. 1	W[1])
Grid No.1 voltage	$-V_{g_1}$	max. 25	V
Grid No.1 peak voltage	$-V_{g1p}$	max. 50	V
	$+V_{g1p}$	max. 50	V
Grid No.1 dissipation	W_{g_1}	max. 10	mW

Maximum averaging time = 1 s

[1]) Care should be taken not to exceed the rated W_{g_2} value due to switching of positive supply voltages.

LIMITING VALUES (Absolute max. rating system) (continued)

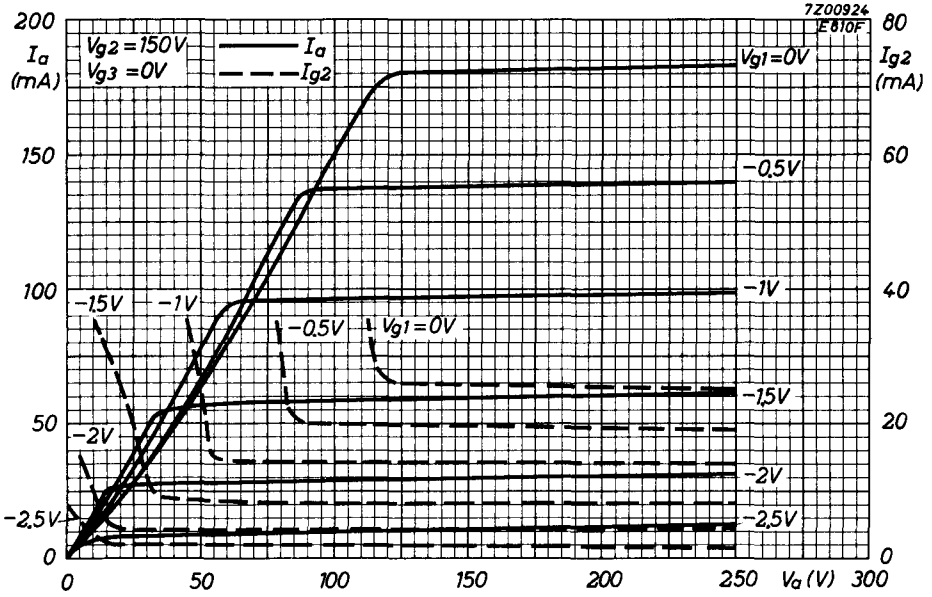
Grid No.1 resistor				
With fixed bias	R_{g_1}	max.	0.2	MΩ
With automatic bias R_k = 47 Ω	R_{g_1}	max.	0.6	MΩ
R_k = 360 Ω	R_{g_1}	max.	3.5	MΩ
Cathode current	I_k	max.	50	mA
Cathode current (Life expectancy 1000 hours)	I_k	max.	65	mA
Voltage between cathode and heater	V_{kf}	max.	100	V
Bulb temperature	t_{bulb}	max.	200	°C
Bulb temperature (Life expectancy 1000 hours)	t_{bulb}	max.	220	°C

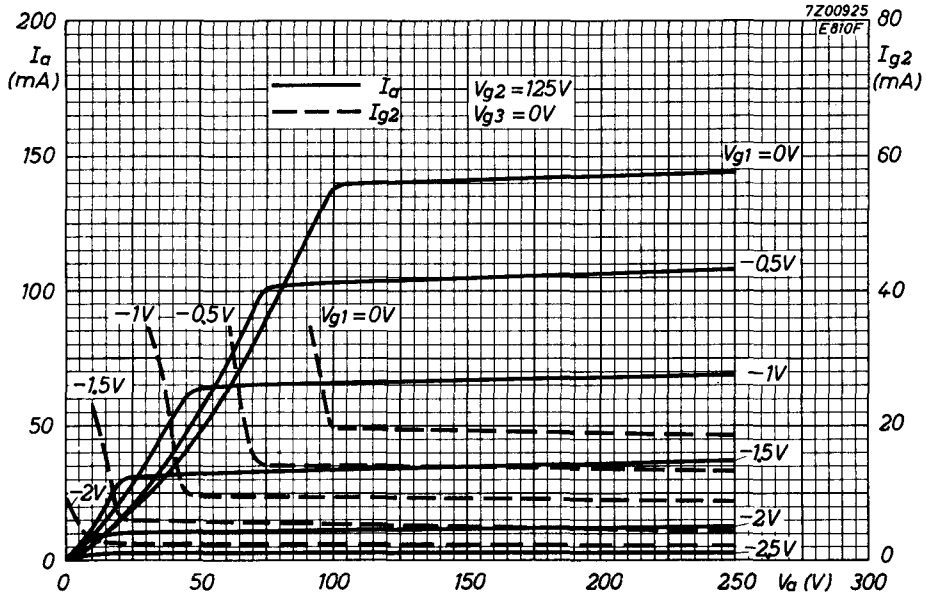
Heater voltage: The average heater voltage should be 6.3 V.
Variations of the heater voltage exceeding the range of 6.0 V to 6.6 V will shorten the tube life.
The tolerance of heater current (column II) should be taken into account.

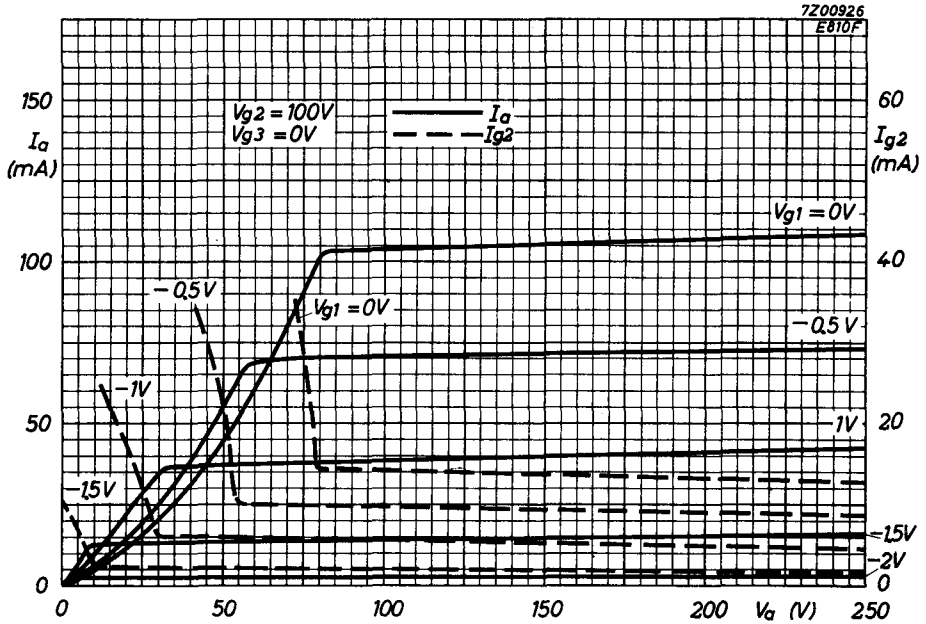
OPERATING CHARACTERISTICS

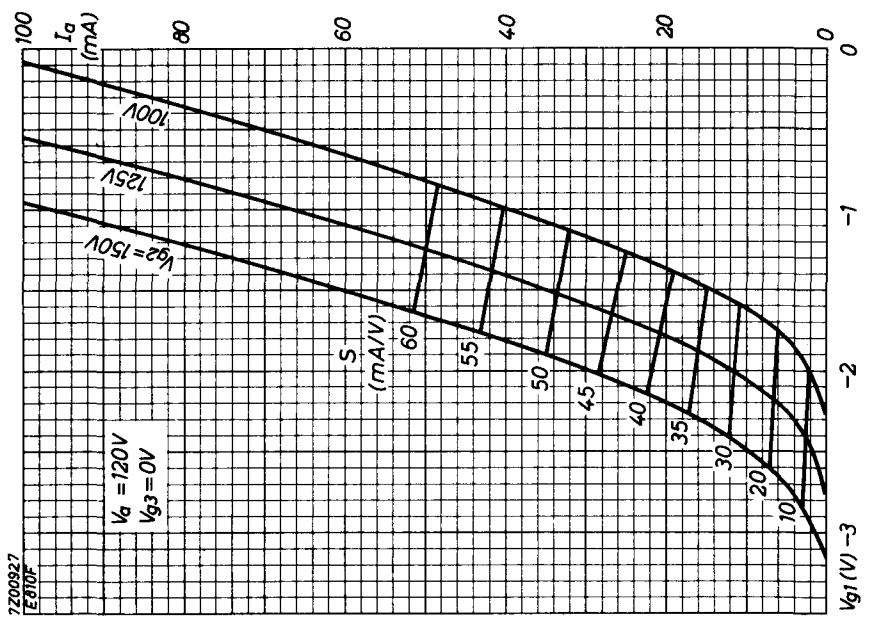
Output tube class A

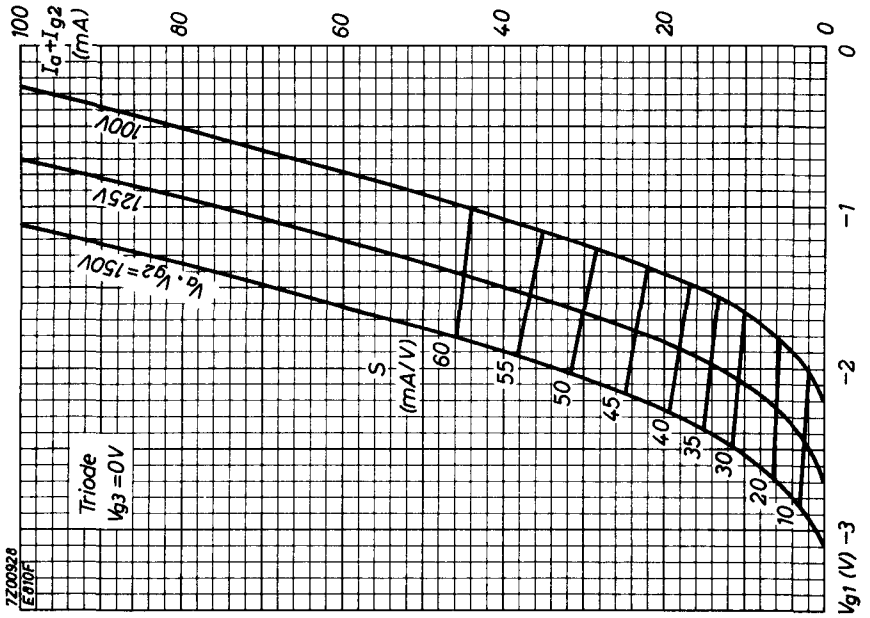
Anode supply voltage	V_{ba}	155	V
Grid No.3 voltage	V_{g_3}	0	V
Grid No.2 supply voltage	V_{bg_2}	165	V
Grid No.1 supply voltage	$+V_{bg_1}$	12.5	V
Cathode resistor	R_k	360	Ω
Cathode capacitor	C_k	1000	μF
Anode resistor	$R_{a\sim}$	560	Ω
Anode current	I_a	35	mA
Anode current, peak to peak	I_{ap}	40	mA
Total distortion	d_{tot}	7.5	%


7Z00924
E810F
200
Ia (mA)
150
100
50
0
80
Ig2 (mA)
60
40
20
0
Vg2 = 150V
Vg3 = 0V
Ia
Ig2
Vg1 = 0V
-0,5V
-1V
-1,5V
-2V
-2,5V
0
50
100
150
200
250
Va (V)
300


7Z00925
E810F
200
Ia (mA)
150
100
50
0
80
Ig2 (mA)
60
40
20
0
Ia
Ig2
Vg2 = 125V
Vg3 = 0V
Vg1 = 0V
-0,5V
-1V
-1,5V
-2V
-2,5V
0
50
100
150
200
250
Va (V)
300


7Z00926
E810F
150
Ia
(mA)
100
50
0
Vg2 = 100V
Vg3 = 0V
Ia
Ig2
60
Ig2
(mA)
40
20
0
Vg1 = 0V
−0,5V
−1V
−1,5V
−2V
0
50
100
150
200
Va (V)
250


7200927
E810F
I_a (mA)
V_a = 120V
V_{g3} = 0V
V_{g2} = 150V
125V
100V
S (mA/V)
60
55
50
45
40
35
30
20
10
V_{g1} (V)
100
80
60
40
20
0
-1
-2
-3


7200928
E810F
I_a+I_{g2} (mA)
Triode
V_{g3} = 0V
V_a = V_{g2} = 150V
125V
100V
S (mA/V)
60
55
50
45
40
35
30
20
10
V_{g1} (V)
100
80
60
40
20
0
-1
-2
-3

PHILIPS

Data handbook

Electronic components and materials

E810F

page	sheet	date
1	1	1968.12
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3	3	1968.12
4	4	1968.12
5	5	1968.12
6	6	1968.12
7	7	1968.12
8	8	1968.12
9	FP	2000.12.10

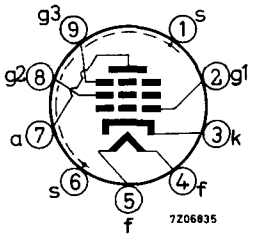
S.Q. TUBE

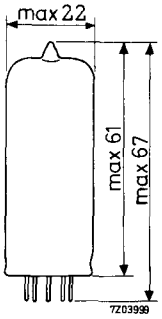
Special quality output pentode designed for use in telephone equipment.

QUICK REFERENCE DATA			
Life test	10 000 hours		
Base	Noval. Gold plated pins		
Heating	Indirect a.c. or d.c. Series or parallel supply		
Heater voltage	V_f	6.3	V
Heater current	I_f	375	mA
Anode current	I_a	20	mA
Output power	W_o	1	W

DIMENSIONS AND CONNECTIONS Dimensions in mm

Base: Noval





CHARACTERISTICS

Column I Nominal value or setting of the tube
II Range values for equipment design: Initial spread
III Range values for equipment design: End of life

		I	II	III	
Heater voltage	V_f	6.3			V
Heater current	I_f	375	355 - 395		mA
Anode voltage	V_a	210			V
Grid No.3 voltage	V_{g_3}	0			V
Grid No.2 voltage	V_{g_2}	210			V
Cathode resistor	R_k	120			Ω
Anode current	I_a	20	17 - 23	min.13.5	mA
Grid No.2 current	I_{g_2}	5.3	4.1 - 6.5	min. 3.1	mA
Mutual conductance	S	11	9.5-12.5	min. 7.8	mA/V
Internal resistance	R_i	0.3	min. 0.2		MΩ
Amplification factor grid No.2 to grid No.1	$\mu_{g_2g_1}$	36			
Equivalent noise resistance	R_{eq}	1.2			kΩ
Negative grid current	$-I_{g_1}$		max. 0.5	max. 1.0	μA
Hum voltage Grid resistor R_{g_1} = 0.5 MΩ Heater centre earthed Cathode resistor bypassed	V_{g_1}		max. 0.2		mV_{RMS}
Leakage current between cathode and heater Voltage between cathode and heater V_{kf} = 120 V	I_{kf}		max. 24		μA

CAPACITANCES

		I	II	
Anode to grid No.3, grid No.2 cathode heater and screen	C_{a/g_3g_2kfs}	6.5	5.9 - 7.1	pF
Grid No.1 to grid No.3, grid No.2 cathode heater and screen	C_{g_1/g_3g_2kfs}	11.2	10.4 - 12	pF
Grid No.1 to grid No.3, grid No.2 cathode heater and screen Measured with cathode current I_k = 25 mA	C_{g_1/g_3g_2kfs}	14.3		pF
Anode to grid No.1	C_{ag_1}		max. 0.02	pF
Grid No.1 to heater	C_{g_1f}		max. 0.2	pF
Cathode to heater	C_{kf}	4.2		pF

SHOCK AND VIBRATION RESISTANCE

The following test conditions are applied to assess the mechanical quality of the tube. These conditions are not intended to be used as normal operating conditions.

Shock

The tube is subjected 5 times in each of 4 positions to an acceleration of 500 g supplied by an NRL shock machine with the hammer lifted over an angle of 30°.

Vibration

The tube is subjected during 32 hours in each of 3 positions to a vibration frequency of 50 Hz with an acceleration of 2.5 g.

LIFE

Production samples are tested to be within the end of life values (column III) under the following conditions during 10.000 hours.

Anode voltage	V_a	210	V
Grid No.3 voltage	V_{g_3}	0	V
Grid No.2 voltage	V_{g_2}	210	V
Cathode resistor	R_k	120	Ω

LIMITING VALUES (Design centre rating system)

Anode voltage	V_{a_o}	max.	550	V
	V_a	max.	210	V
Anode dissipation	W_a	max.	4.5	W
Grid No.2 voltage	$V_{g_{2o}}$	max.	550	V
	V_{g_2}	max.	210	V
Grid No.2 dissipation	W_{g_2}	max.	1.2	W
Cathode current	I_k	max.	30	mA
Grid No.1 resistor:				
automatic bias	R_{g_1}	max.	0.5	MΩ
fixed bias	R_{g_1}	max.	0.25	MΩ
Voltage between cathode and heater	V_{kf}	max.	120	V
Bulb temperature	t_{bulb}	max.	170	°C

Heater voltage: The average heater voltage should be 6.3 V. Variations of the heater voltage exceeding the range of 6.0 V to 6.6 V will shorten the tube life. The tolerance of heater current (column II) should be taken into account.

OPERATING CHARACTERISTICS

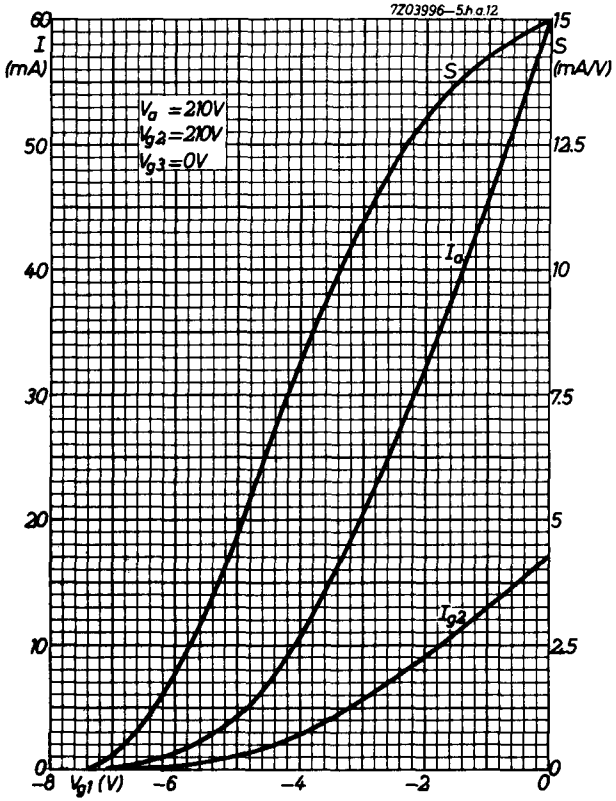
Output tube. Class A

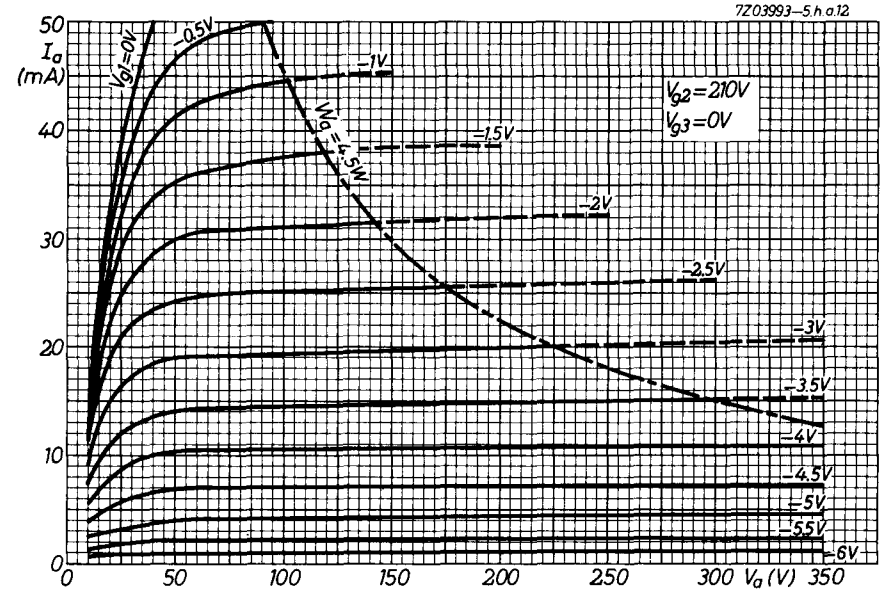
Anode voltage	V_a	210	V
Grid No.3 voltage	V_{g_3}	0	V
Grid No.2 voltage	V_{g_2}	210	V
Cathode resistor	R_k	120	Ω
Load resistance	$R_{a_\sim}$	15	kΩ
Anode current	I_a	20	mA
Grid No.2 current	I_{g_2}	5.3	mA
Output power	W_o	1	W
Total distortion	d_{tot}	5	%

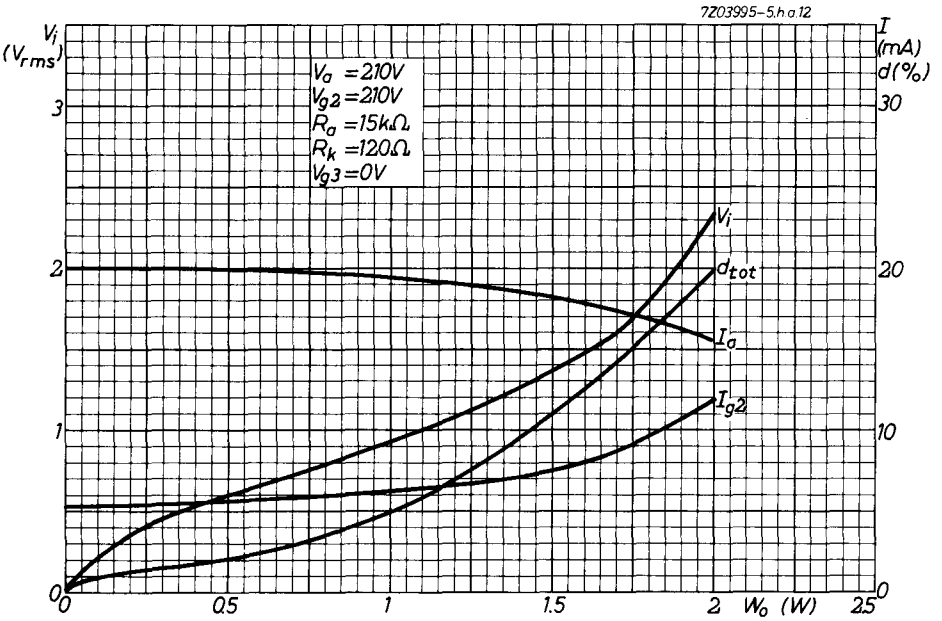
OPERATING CHARACTERISTICS (continued)

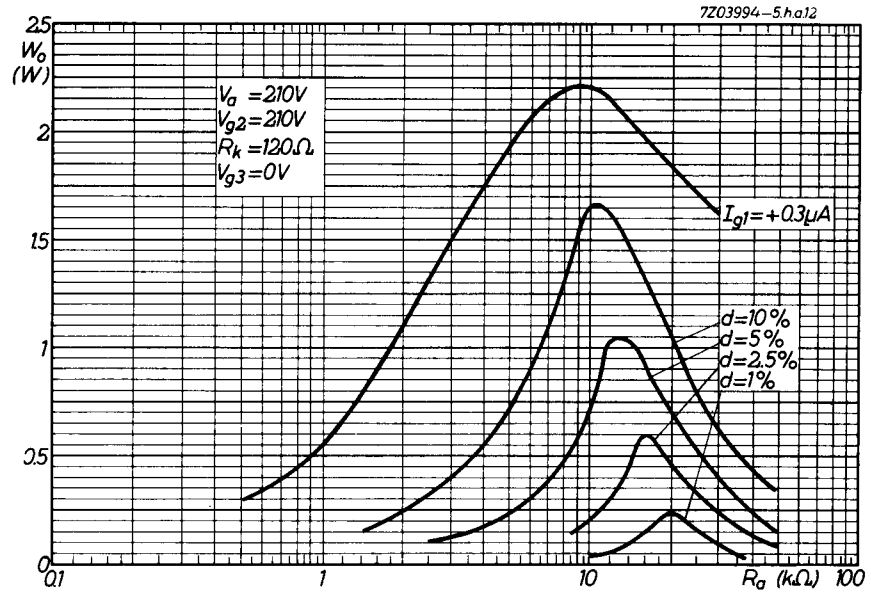
Amplifier

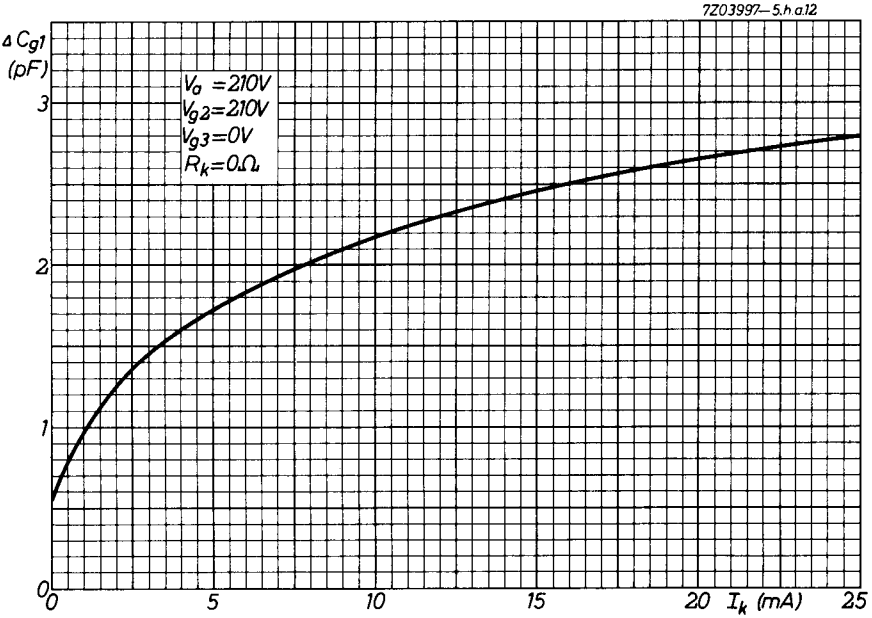
Anode voltage	V_a	210	V
Grid No.3 voltage	V_{g_3}	0	V
Grid No.2 voltage	V_{g_2}	210	V
Cathode resistor	R_k	180	Ω
Load resistance	$R_{a\sim}$	20	kΩ
Anode current	I_a	15	mA
Grid No.2 current	I_{g_2}	4	mA
Voltage gain	V_o/V_i	5.15	N

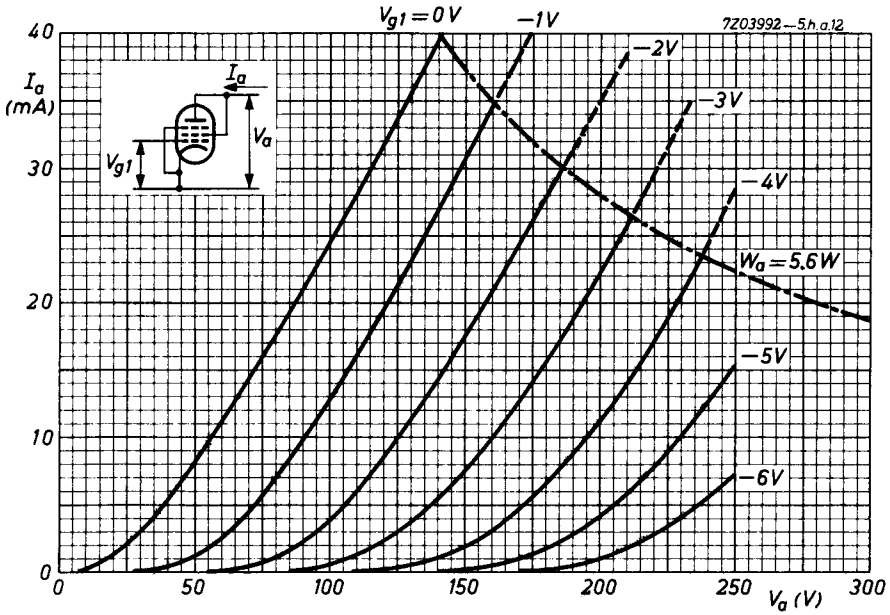



7Z03993-5.h.a.12
I_a (mA)
V_{g1}=0V
-0.5V
-1V
-1.5V
-2V
-2.5V
-3V
-3.5V
-4V
-4.5V
-5V
-5.5V
-6V
V_{g1}=-4.5V
V_{g2}=210V
V_{g3}=0V
V_a (V)


7Z03995-5.h.a.12
V_i (V_{rms})
I (mA)
d(%)
V_a =210V
V_{g2}=210V
R_a =15kΩ
R_k =120Ω
V_{g3}=0V
V_i
d_{tot}
I_a
I_{g2}
W_a (W)


7Z03994—5.h.a.12
W_o (W)
V_a =210V
V_{g2}=210V
R_k =120Ω
V_{g3}=0V
I_{g1}=+0.3μA
d=10%
d=5%
d=2.5%
d=1%
R_a (kΩ)


7Z03997—5.h.a.12
ΔC_{g1} (pF)
V_a =210V
V_{g2}=210V
V_{g3}=0V
R_k=0Ω
I_k (mA)


7Z03992–5.h.a.12
$V_{g1} = 0\,V$
−1V
−2V
−3V
−4V
−5V
−6V
$W_a = 5.6\,W$
I_a (mA)
V_a (V)
I_a
V_a
V_{g1}
0
10
20
30
40
0
50
100
150
200
250
300

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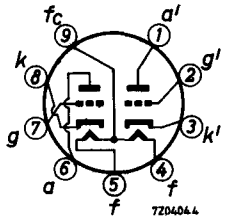
S.Q. TUBE

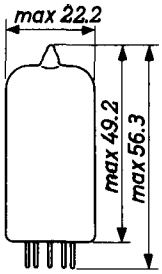
Special quality double triode designed for use as amplifier oscillator, multivibrator and blocking oscillator.

QUICK REFERENCE DATA			
Life	10 000 hours		
Low interface resistance			
Mechanical quality	Shock and vibration resistant		
Base	Noval		
Heating	Indirect A.C. or D.C.; Parallel supply		
Heater voltage	V_f	6.3 or 12.6	V
Heater current	I_f	300 or 150	mA
Anode current	I_a	10.5	mA
Mutual conductance	S	2.2	mA/V

DIMENSIONS AND CONNECTIONS Dimensions in mm

Base: Noval





CHARACTERISTICS (Both sections if applicable)

Column I Nominal value or setting of the tube
II Range values for equipment design: Initial spread
III Range values for equipment design: End of life

		I	II	III	
Heater voltage, pin 9 and 4 + 5	V_f	6.3			V
Heater current	I_f	300	285- 315		mA
Heater voltage, pin 4 and 5	V_f	12.6			V
Heater current	I_f	150			mA
Anode voltage	V_a	250			V
Cathode resistor	R_k	800			Ω
Anode current	I_a	10.5	8.7-12.3	min. 7.0	mA
Difference in anode current of both systems	I_a-I_a'		max. 1.6		mA
Mutual conductance	S	2.2	1.8- 2.6	min. 1.5	mA/V
Amplification factor	μ	17.0	15.7-18.3		
Internal resistance	R_i	7.7			kΩ
Cut-off voltage					
Grid voltage	$-V_g$	22			V
Anode current	I_a	10			μA
Grid voltage	$-V_g$		max. 30		V
Anode current	I_a	20			μA
Grid voltage	$-V_g$		min. 18		V
Anode current	I_a	5			μA
Negative grid current	$-I_g$		max. 0.5	max. 1.0	μA
Anode voltage	V_a	100			V
Grid voltage	V_g	0			V
Anode current	I_a	11.8			mA
Mutual conductance	S	3.1			mA/V
Amplification factor	μ	19.5			
Internal resistance	R_i	6.25			kΩ

CHARACTERISTICS (continued)

		I	II	
Leakage current between cathode and heater	I_{kf}		max. 6.5	μA
Insulation resistance:				
Between grid and other electrodes	R_{ins}		min. 500	MΩ
Voltage between electrodes = 100 V				
Between anode and other electrodes	R_{ins}		min. 500	MΩ
Voltage between electrodes = 300 V				
Vibrational noise output (20 to 5000 Hz)	V_o		max. 100	mV_{RMS}
Anode voltage V_a = 250 V				
Grid voltage $-V_g$ = 8.5 V				
Anode resistor R_a = 2 kΩ				
Vibration frequency = 40 Hz				
Acceleration = 10 g				
Units in parallel				
CAPACITANCES				
Anode to cathode and heater	$C_{a/kf}$	0.5	0.3 - 0.7	pF
	$C_{a'/k'f}$	0.4	0.2 - 0.6	pF
Grid to cathode and heater	$C_{g/kf}$	1.6	1.25 - 1.95	pF
Anode to grid	C_{ag}	1.5	1.2 - 1.8	pF

SHOCK AND VIBRATION RESISTANCE

The following test conditions are applied to assess the mechanical quality of the tube. These conditions are not intended to be used as normal operating conditions.

Shock

The tube is subjected 5 times in each of 4 positions to an acceleration of 500 g supplied by an NRL shock machine with the hammer lifted over an angle of 30°.

Vibration

The tube is subjected during 32 hours in each of 3 positions to a vibration frequency of 50 Hz with an acceleration of 2.5 g.

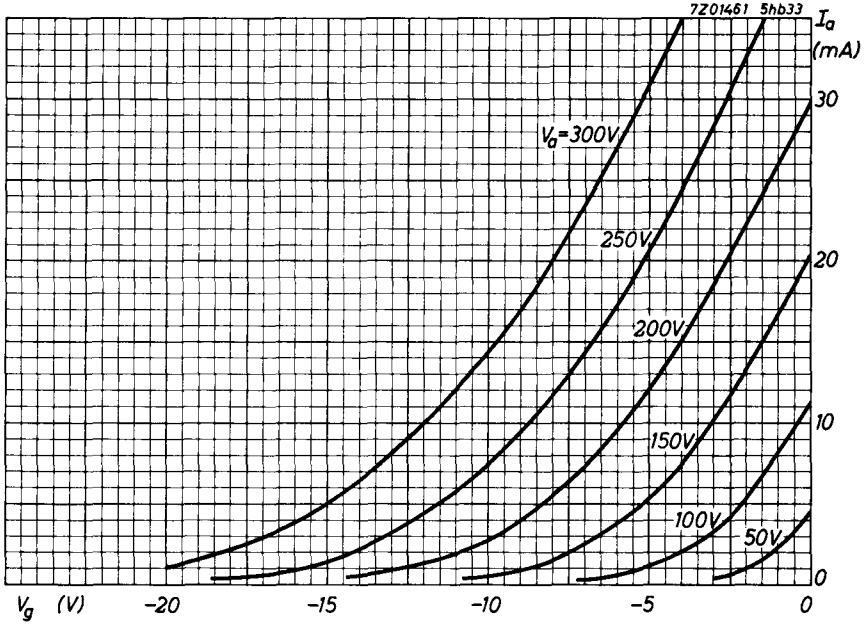
LIFE

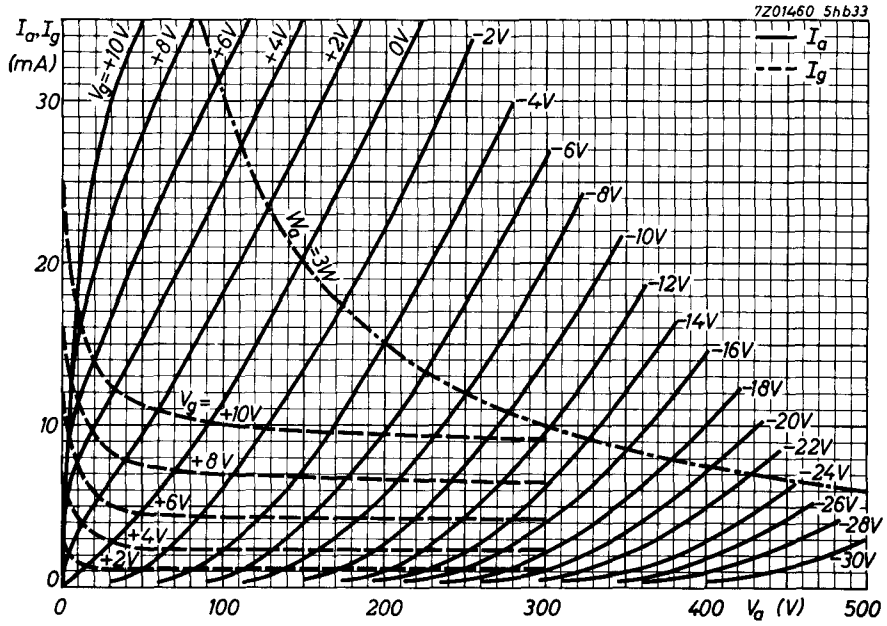
Production samples are tested to be within the end of life values (column III) during 10 000 hours.

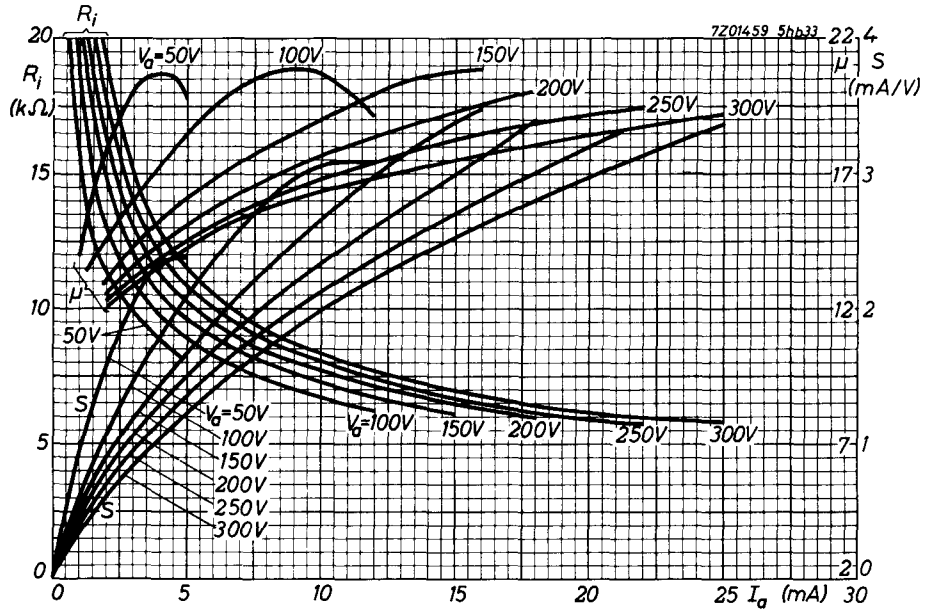
LIMITING VALUES (Absolute max. rating system)

Anode voltage	V_{a_o}	max. 600	V
	V_a	max. 330	V
Anode dissipation	W_a	max. 3	W
Grid voltage	$-V_g$	max. 55	V
	$+V_g$	max. 0	V
Grid current	I_g	max. 5	mA
Grid resistor: fixed bias	R_g	max. 0.5	MΩ
automatic bias	R_g	max. 1.0	MΩ
Cathode current	I_k	max. 22	mA
Voltage between cathode and heater	V_{kf}	max. 100	V
Bulb temperature	t_{bulb}	max. 165	°C

Heater voltage: The average heater voltage should be 6.3 V.
Variations of the heater voltage exceeding the range of 6.0 V to 6.6 V will shorten the tube life.
The tolerance of heater current (column II) should be taken into account.


7Z01461 5hb33
I_a (mA)
30
20
10
0
V_a=300V
250V
200V
150V
100V
50V
V_g (V)
-20
-15
-10
-5
0


7Z01460 5hb33
I_a
I_g
I_a, I_g (mA)
30
20
10
0
V_a=+10V
+8V
+6V
+4V
+2V
0V
-2V
-4V
-6V
-8V
-10V
-12V
-14V
-16V
-18V
-20V
-22V
-24V
-26V
-28V
-30V
V_g=+10V
+8V
+6V
+4V
+2V
0
100
200
300
400
500
V_a (V)


7Z01459 5bb33
R_i
R_i (kΩ)
V_a=50V
100V
150V
200V
250V
300V
μ
S
(mA/V)
V_a=100V
I_a (mA)
20
15
10
5
0
22
17
12
7
2
4
3
2
1
0
25
30

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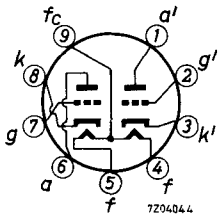
S.Q. TUBE

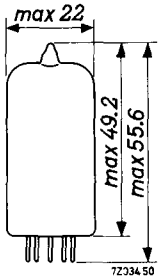
Special quality double triode designed for use as A.F. amplifier, phase inverter and amplifier in measuring equipment.

QUICK REFERENCE DATA			
Life test	10 000 hours		
Low interface resistance			
Low microphony level			
Mechanical quality	Shock and vibration resistant		
Base	Noval		
Heating	Indirect A.C. or D.C.; parallel supply		
Heater voltage	V_f	6.3 V or 12.6	V
Heater current	I_f	300 mA or 150	mA
Anode current	I_a	1.25	mA
Mutual conductance	S	1.6	mA/V
Amplification factor	μ	100	

DIMENSIONS AND CONNECTIONS Dimensions in mm

Base: Noval





CHARACTERISTICS (Both systems if applicable)

Column I Nominal value or setting of the tube
II Range values for equipment design: Initial spread
III Range values for equipment design: End of life

		I	II	III	
Heater voltage pin 9 and 4 + 5	V_f	6.3			V
Heater current	I_f	300	285 - 315		mA
Heater voltage pin 4 and 5	V_f	12.6			V
Heater current	I_f	150			mA
Anode voltage	V_a	250			V
Cathode resistor	R_k	1.6			kΩ
Anode current	I_a	1.25	1.1 - 1.4	min. 0.8	mA
Mutual conductance	S	1.6	1.3 - 1.95	min. 1.05	mA/V
Amplification factor	μ	100			
Internal resistance	R_i	62.5			kΩ
Negative grid current	$-I_g$		max. 0.2	max. 0.5	μA
Cut-off voltage Anode current I_a = 20 μA	$-V_g$		max. 4		V
Anode voltage	V_a	100			V
Anode current	I_a	0.5			mA
Cathode resistor	R_k	2			kΩ
Mutual conductance	S	1.25			mA/V
Amplification factor	μ	100			
Internal resistance	R_i	80			kΩ
Leakage current between cathode and heater Voltage between cathode and heater V_{kf} = 100 V	I_{kf}		max. 5		μA

CHARACTERISTICS (continued)

		I	II	
Insulation resistance:				
Between grid and other electrodes	R_{ins}		max. 300	MΩ
Voltage between electrodes = 100 V				
Between anode and other electrodes	R_{ins}		max. 300	MΩ
Voltage between electrodes = 300 V				
Vibrational noise output (20 to 5000 Hz)	V_o		max. 10	mV_{RMS}
Anode supply voltage V_{ba} = 250 V				
Anode resistor R_a = 5 kΩ				
Grid voltage $-V_g$ = 2 V				
Vibration frequency = 25 Hz				
Acceleration = 2.5 g				
Units in parallel				

CAPACITANCES

Grid to cathode and heater	$C_{g/kf}$	1.6		pF
Anode to cathode and heater	$C_{a/kf}$	0.46		pF
	$C_{a'/k'f}$	0.34		pF
Anode to grid	C_{ag}	1.7		pF
Grid to heater	C_{gf}		max. 0.15	pF
Anode to anode other system	$C_{aa'}$		max. 0.6	pF
Grid to grid other system	$C_{gg'}$		max. 10	mpF
Anode to grid other system	$C_{ag'}$		max. 60	mpF
	$C_{ga'}$		max. 60	mpF

LIMITING VALUES (Absolute max. rating system) (Each unit)

Anode voltage	V_{a_o}	max. 600	V
	V_a	max. 330	V
Anode dissipation	W_a	max. 1.2	W
Grid voltage	$-V_g$	max. 55	V
	$+V_g$	max. 0.5	V
Cathode current	I_k	max. 9	mA

LIMITING VALUES (continued)

Grid resistor: fixed bias	R_g	max. 1.2	MΩ
automatic bias	R_g	max. 2.2	MΩ
grid current bias	R_g	max. 25	MΩ
Voltage between cathode and heater	V_{kf}	max. 200	V
Resistance in cathode heater circuit in case of phase inverter circuit	R_{kf}	max. 135	kΩ
Bulb temperature	t_{bulb}	max. 170	°C
Microphony: Input voltage required for 50 mW output	V_i	min. 0.5	mV

Heater voltage: The average heater voltage should be 6.3 V
Variations of the heater voltage exceeding the range of 6.0 V to 6.6 V will shorten the tube life.
The tolerance of the heater current (column II) should be taken into account.

OPERATING CHARACTERISTICS

A.F. amplifier - circuit fig.1

Anode supply voltage	V_{ba}	200	250	300	350	400	V
Anode resistor	R_a	47	47	47	47	47	kΩ
Cathode resistor	R_k	1500	1200	1000	820	680	Ω
Grid resistor next stage	R_g'	150	150	150	150	150	kΩ
Anode current	I_a	0.86	1.18	1.55	1.98	2.45	mA
Output voltage (Grid current = 0.3 μA)	V_o	18	23	26	33	37	V_{RMS}
Voltage gain	V_o/V_i	34.0	37.5	40.0	42.5	44.0	
Total distortion	d_{tot}	8.5	7.0	5.0	4.4	3.6	%

OPERATING CHARACTERISTICS (continued)

A.F. amplifier - circuit fig.1 (continued)

Anode supply voltage	V_{ba}	200	250	300	350	400	V
Anode resistor	R_a	100	100	100	100	100	kΩ
Cathode resistor	R_k	1800	1500	1200	1000	820	Ω
Grid resistor next stage	R_g'	330	330	330	330	330	kΩ
Anode current	I_a	0.65	0.86	1.11	1.40	1.72	mA
Output voltage (Grid current = 0.3 μA)	V_o	20	26	30	36	38	V_{RMS}
Voltage gain	V_o/V_i	50	54.5	57.0	61.0	63.0	
Total distortion	d_{tot}	4.8	3.9	3.7	2.2	1.7	%
Anode supply voltage	V_{ba}	200	250	300	350	400	V
Anode resistor	R_a	220	220	220	220	220	kΩ
Cathode resistor	R_k	3300	2700	2200	1500	1200	Ω
Grid resistor next stage	R_g'	680	680	680	680	680	kΩ
Anode current	I_a	0.36	0.48	0.63	0.85	1.02	mA
Output voltage (Grid current = 0.3 μA)	V_o	24	28	36	37	38	V_{RMS}
Voltage gain	V_o/V_i	56	66.5	72.0	75.5	76.5	
Total distortion	d_{tot}	4.6	3.4	2.6	1.6	1.1	%

A.F. amplifier - circuit fig.2.

Anode supply voltage	V_{ba}	200	250	300	350	400	V
Anode resistor	R_a	47	47	47	47	47	kΩ
Grid resistor next stage	R_g'	150	150	150	150	150	kΩ
Anode current	I_a	1.02	1.45	2.02	2.50	3.10	mA
Output voltage	V_o	18	23	26	33	37	V_{RMS}
Voltage gain	V_o/V_i	37	39	41	44	45	
Total distortion	d_{tot}	5.6	4.2	2.9	2.7	2.5	%

OPERATING CHARACTERISTICS (continued)

A.F. amplifier - circuit fig.2. (continued)

Anode supply voltage	V_{ba}	200	250	300	350	400	V
Anode resistor	R_a	100	100	100	100	100	kΩ
Grid resistor next stage	$R_{g'}$	330	330	330	330	330	kΩ
Anode current	I_a	0.70	1.00	1.29	1.62	1.95	mA
Output voltage	V_o	20	26	30	36	38	V_{RMS}
Voltage gain	V_o/V_i	50	51	54	56	58	
Total distortion	d_{tot}	3.9	2.6	2.0	1.8	1.6	%

Anode voltage	V_{ba}	200	250	300	350	400	V
Anode resistor	R_a	220	220	220	220	220	kΩ
Grid resistor next stage	$R_{g'}$	680	680	680	680	680	kΩ
Anode current	I_a	0.39	0.56	0.75	0.88	1.09	mA
Output voltage	V_o	24	28	36	37	38	V
Voltage gain	V_o/V_i	58	62	66	67	68	
Total distortion	d_{tot}	4.6	2.7	2.2	1.7	1.4	%

A.F. amplifier - circuit fig.3.

Anode supply voltage	V_{ba}	100	150	200	250	300	350	400	V
Anode resistor	R_a	47	47	47	47	47	47	47	kΩ
Grid resistor next stage	$R_{g'}$	150	150	150	150	150	150	150	kΩ
Anode current	I_a	0.35	0.84	1.40	1.95	2.52	3.19	3.80	mA
Voltage gain	V_o/V_i	25	33	34	36	38	40	41	
Total distortion:									
at V_o = 2 V_{RMS}	d_{tot}	1.7	2.5	2.4	2.3	2.2	2.2	2.1	%
at V_o = 4 V_{RMS}	d_{tot}	2.1	4.6	4.7	4.6	4.5	4.2	4.2	%
at V_o = 6 V_{RMS}	d_{tot}	6.0	5.2	5.6	5.6	5.5	5.5	5.4	%

OPERATING CHARACTERISTICS (continued)

A.F. amplifier - circuit fig.3. (continued)

Anode supply voltage	V_{ba}	100	150	200	250	300	350	400	V
Anode resistor	R_a	100	100	100	100	100	100	100	kΩ
Grid resistor next stage	R_g'	330	330	330	330	330	330	330	kΩ
Anode current	I_a	0.24	0.56	0.88	1.23	1.58	1.92	2.29	mA
Voltage gain	V_o/V_i	34	43	46	48	50	51	52	
Total distortion:									
at V_o = 2 V_{RMS}	d_{tot}	1.6	1.9	1.9	1.8	1.8	1.8	1.7	%
at V_o = 4 V_{RMS}	d_{tot}	2.3	3.0	3.8	3.8	3.6	3.6	3.5	%
at V_o = 6 V_{RMS}	d_{tot}	2.6	4.7	5.1	5.1	5.0	4.9	4.8	%
Anode supply voltage	V_{ba}	100	150	200	250	300	350	400	V
Anode resistor	R_a	220	220	220	220	220	220	220	kΩ
Grid resistor next stage	R_g'	680	680	680	680	680	680	680	kΩ
Anode current	I_a	0.14	0.32	0.49	0.67	0.85	1.05	1.23	mA
Voltage gain	V_o/V_i	42	51	54	57	58	59	60	
Total distortion:									
at V_o = 2 V_{RMS}	d_{tot}	1.6	1.7	1.7	1.6	1.6	1.6	1.6	%
at V_o = 4 V_{RMS}	d_{tot}	2.5	3.0	3.0	2.9	2.9	2.8	2.7	%
at V_o = 6 V_{RMS}	d_{tot}	3.2	4.4	4.4	4.4	4.4	4.3	4.2	%

Phase inverter - circuit fig.4

Supply voltage	V_b	250		350		V
Anode voltage	V_a	65		90		V
Anode resistor	R_a, R_a'	100		150		kΩ
Cathode resistor	R_k	68		82		kΩ
Anode current	I_a+I_a'	1.0		1.2		mA
Voltage gain	V_o/V_i	25		27		
Output voltage (Grid current = 0.3 μA)	V_o	7	20	10	35	V_{RMS}
Total distortion	d_{tot}	0.6	1.8	0.5	1.8	%

V_a should be adjusted to the specified value for I_a+I_a'

OPERATING CHARACTERISTICS (continued)

Phase inverter - circuit fig.5.

Supply voltage	V_b	250		350		V
Cathode resistor	R_k	1200		820		Ω
Anode current	$I_a+I_{a'}$	1.08		1.7		mA
Voltage gain	V_o/V_i	58		62		
Output voltage (Grid current = 0.3 μA)	V_o	7	35	9	45	V_{RMS}
Total distortion	d_{tot}	1.1	5.5	0.7	3.5	%

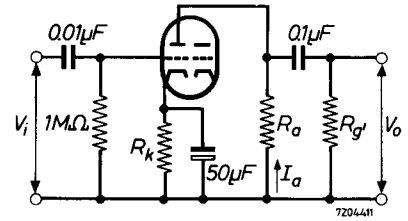


Fig. 1

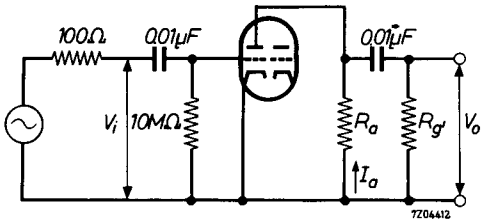


Fig. 2

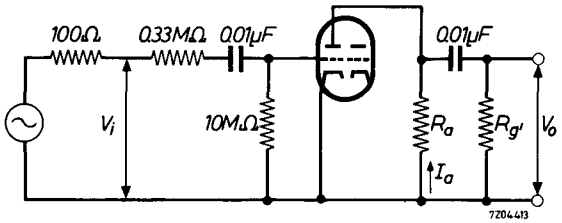


Fig. 3

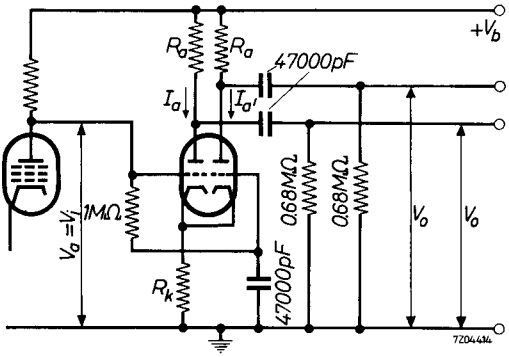

+Vb
Ra
Ra
47000pF
Ia
Ia'
0.68MΩ
0.68MΩ
Vo
Vo
Va = Vi
1MΩ
Rk
47000pF
7204434

Fig. 4

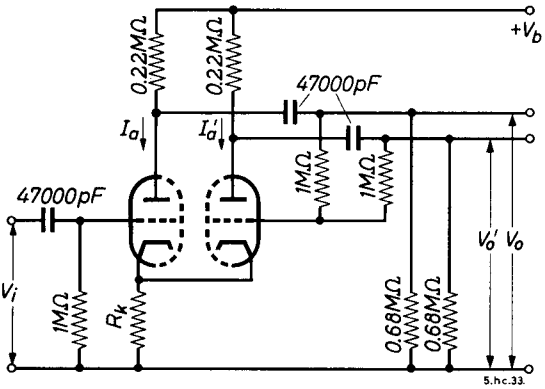
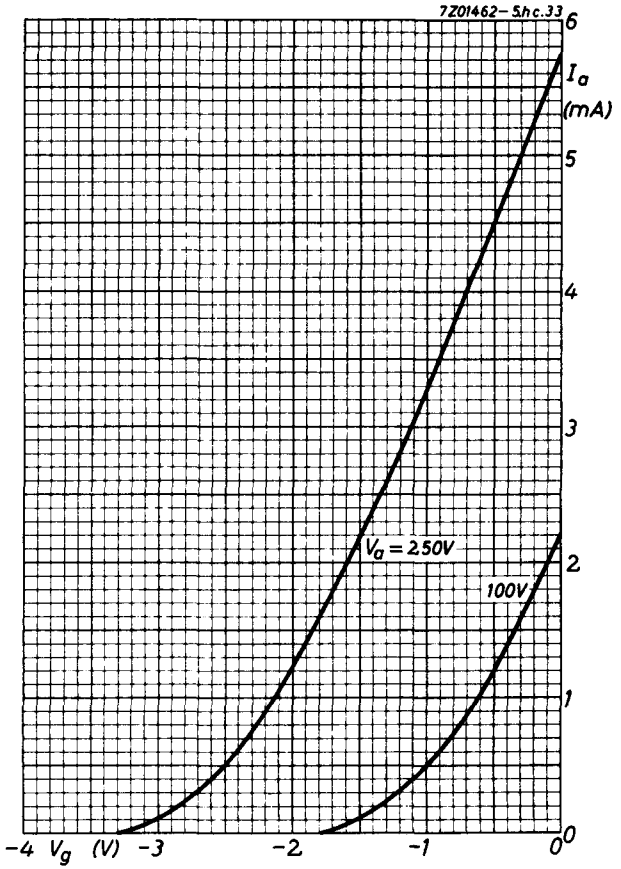
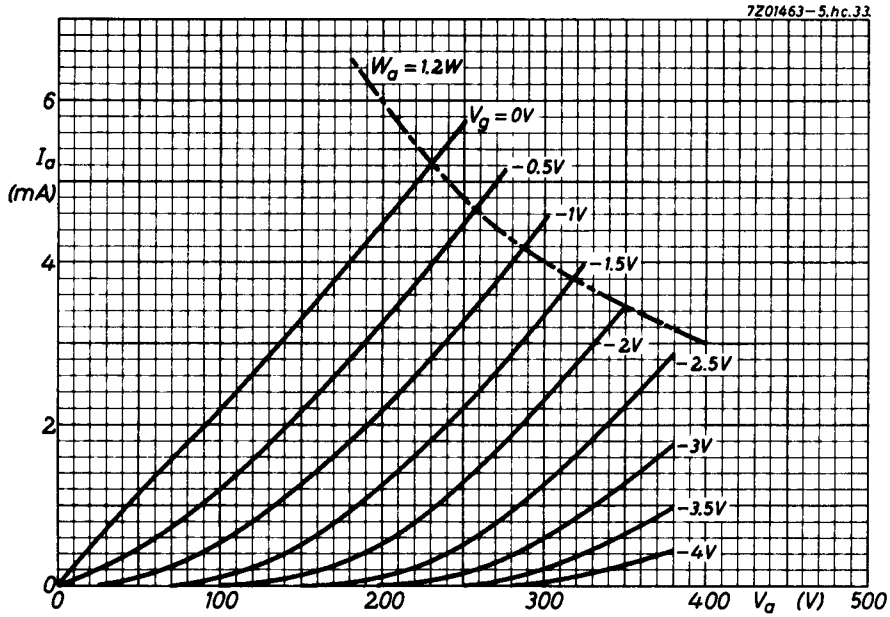
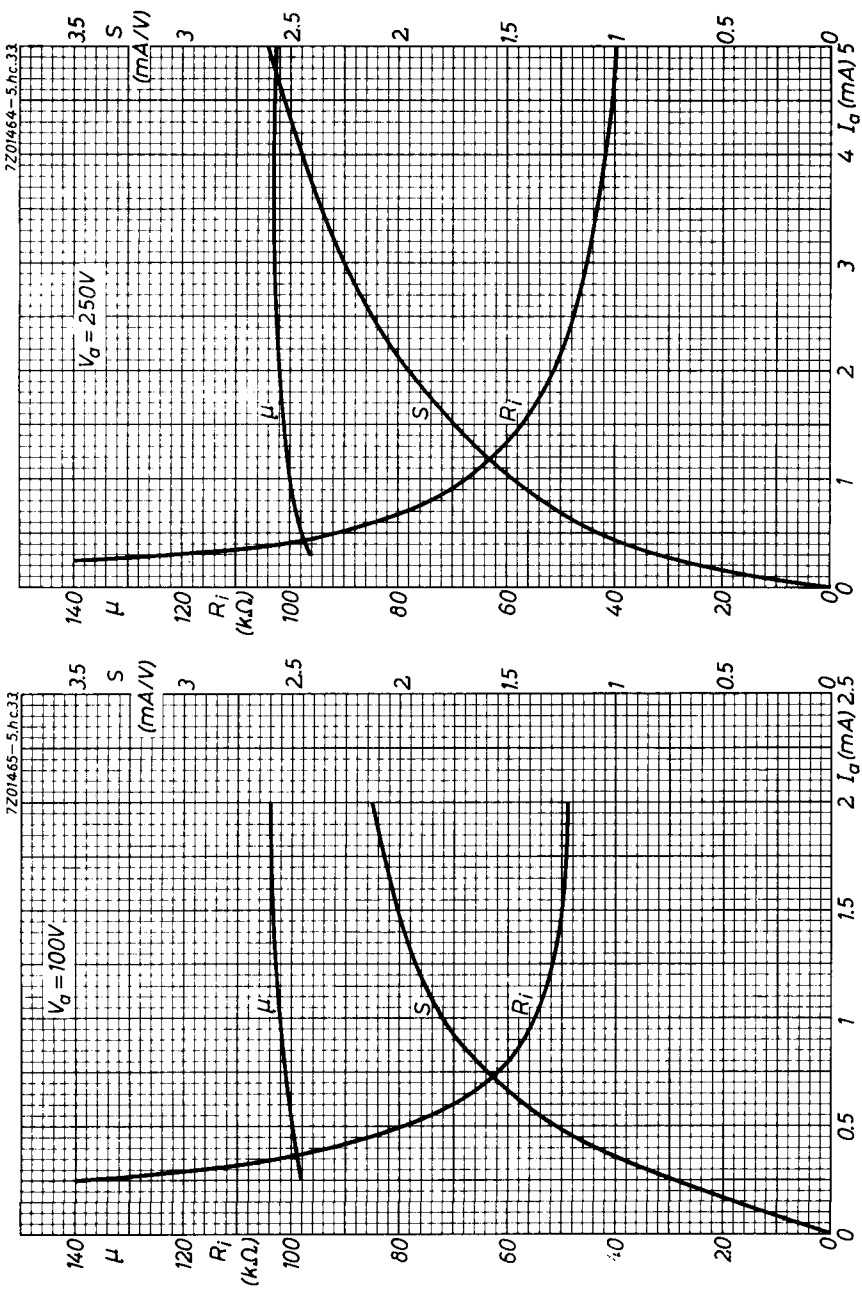

+Vb
0.22MΩ
0.22MΩ
47000pF
Ia
Ia'
1MΩ
1MΩ
47000pF
Vo' Vo
Vi
1MΩ
Rk
0.68MΩ
0.68MΩ
5.hc.33.

Fig. 5


7Z01462-5hc.33
6
I_a
(mA)
5
4
3
2
1
0
V_a = 250V
100V
-4 V_g (V) -3
-2
-1
0


7Z01463-5.hc.33
$W_a = 1.2W$
$V_g = 0V$
-0.5V
-1V
-1.5V
-2V
-2.5V
-3V
-3.5V
-4V
I_a (mA)
6
4
2
0
0
100
200
300
400
V_a (V)
500


7Z01464-5.hc.33
$V_a = 250V$
μ
S
R_i
S (mA/V)
μ
R_i (kΩ)
I_a (mA)
7Z01465-5.hc.33
$V_a = 100V$
μ
S
R_i
S (mA/V)
μ
R_i (kΩ)
I_a (mA)

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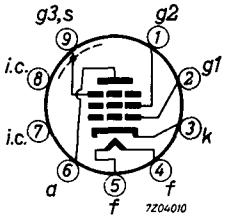
S.Q. TUBE

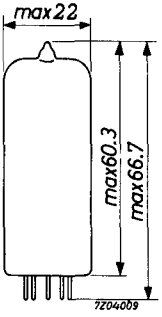
Special quality pentode designed for use in telephone equipment.

QUICK REFERENCE DATA			
Life expectancy	10 000 hours		
Low interface resistance			
Base	Noval. Gold plated pins		
Heating	Indirect A.C. or D.C. Series or parallel supply		
Heater voltage	V_f	6.3	V
Heater current	I_f	0.3	A
Anode current	I_a	10	mA
Mutual conductance	S	9	mA/V

DIMENSIONS AND CONNECTIONS Dimensions in mm

Base: Noval





CHARACTERISTICS

Column I Nominal value or setting of the tube.
II Range values for equipment design: Initial spread
III Range values for equipment design: End of life

		I	II	III	
Heater voltage	V_f	6.3			V
Heater current	I_f	300	285 - 315		mA
Anode voltage	V_a	210			V
Grid No.3 voltage	V_{g_3}	0			V
Grid No.2 voltage	V_{g_2}	120			V
Cathode resistor	R_k	165			Ω
Anode current	I_a	10	8.7 - 11.3	7	mA
Grid No.2 current	I_{g_2}	2.1	1.7 - 2.5	1.25	mA
Mutual conductance	S	9	7.8 - 10.2	6.4	mA/V
Internal resistance	R_i	0.5	min. 0.3		MΩ
Amplification factor grid No.2 to grid No.1	$\mu_{g_2g_1}$	38			
Equivalent noise resistance (R.F.)	R_{eq}	750	max.1000		Ω
Equivalent noise resistance (A.F.)	R_{eq}		max. 36		kΩ
Negative grid No.1 current	$-I_{g_1}$		max. 0.5	max.1.0	μA
Hum voltage Grid resistor R_{g_1} = 0.5 MΩ Cathode resistor by passed	V_{g_1}		max. 0.5		mV_{RMS}
Cut off voltage	$-V_{g_1}$	5	max.5.25		V
Anode voltage	V_a	210			V
Grid No.3 voltage	V_{g_3}	0			V
Grid No.2 voltage	V_{g_2}	120			V
Anode current	I_a	0.5			mA

CHARACTERISTICS (continued)

		I	II	III	
Leakage current between cathode and heater Voltage between heater and cathode V_{kf} = 100 V	I_{kf}		max. 15		μA
Insulation resistance between two arbitrary electrodes Voltage between electrodes V = 250 V	R		min. 100		MΩ

CAPACITANCES

Radiation capacitances measured to a surrounding cylinder, internal diameter 52 mm, height 98 mm.

		I	II	
Grid No.1 to grid No.2, grid No.3, cathode, heater and screen	C_{g_1/g_2g_3kfs}	8	8.7	pF
Grid No.1 to grid No.2, grid No.3, cathode, heater and screen Cathode current = 12.1 mA	C_{g_1/g_2g_3kfs}	10.8		pF
Anode to grid No.2, grid No.3, cathode, heater and screen	C_{a/g_2g_3kfs}	3.5	max. 4.1	pF
Anode to grid No.1	C_{ag_1}		max. 15	mpF
Grid No.1 to heater	$C_{g_{1f}}$		max.0.15	pF
Cathode to heater	C_{kf}	4		pF
Grid No.1 radiation capacitance	C_{rg_1}	max.25		mpF
Anode radiation capacitance	C_{ra}	max.25		mpF

LIFE EXPECTANCY

When the tube is operated under the following conditions the range values of the characteristics in column III may be expected not to be exceeded during an operation period of 10000 hours.

Anode voltage	V_a	210	V
Grid No.3 voltage	V_{g_3}	0	V
Grid No.2 voltage	V_{g_2}	120	V
Cathode resistor	R_k	165	Ω

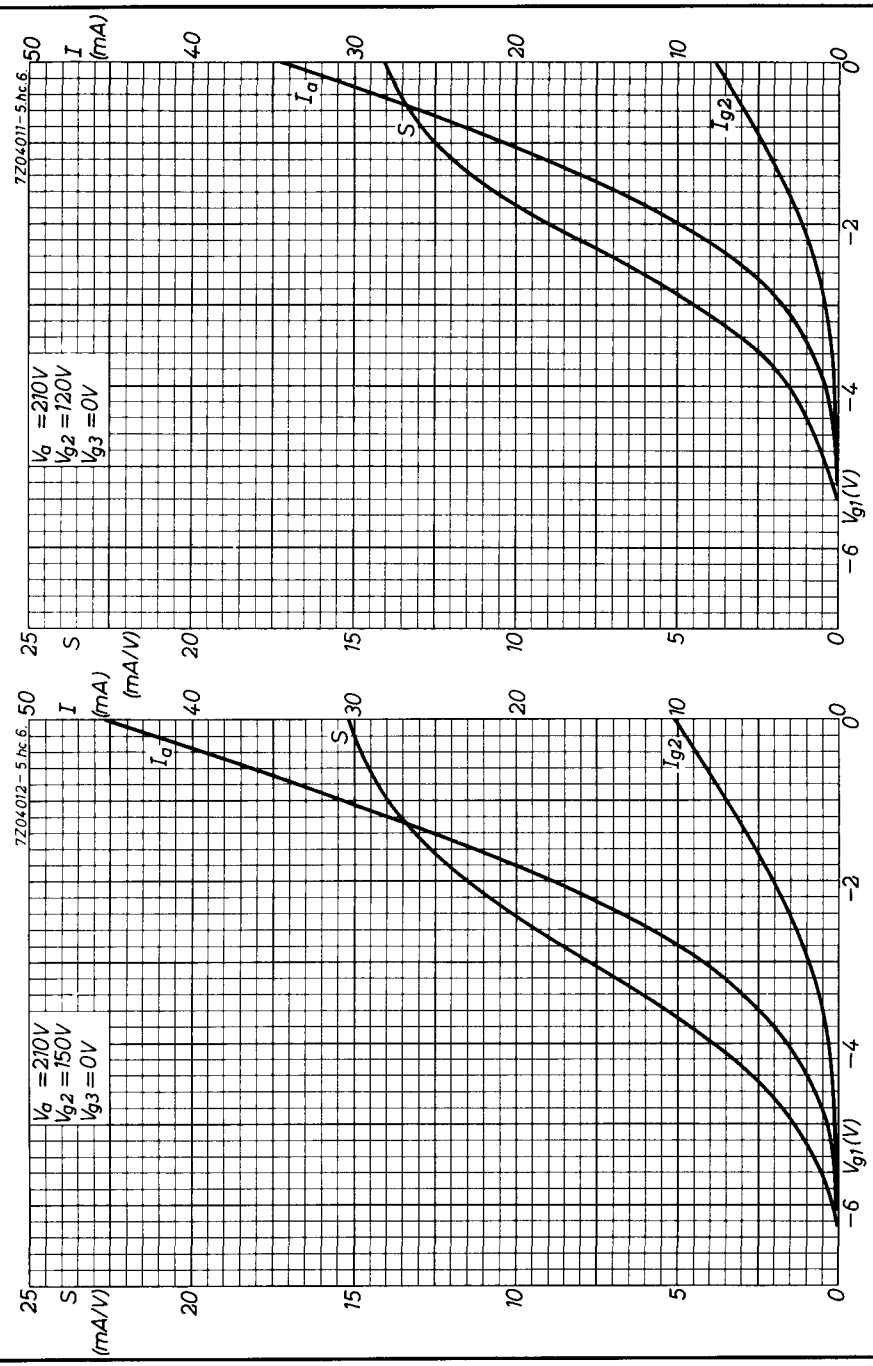
LIMITING VALUES (Design centre rating system)

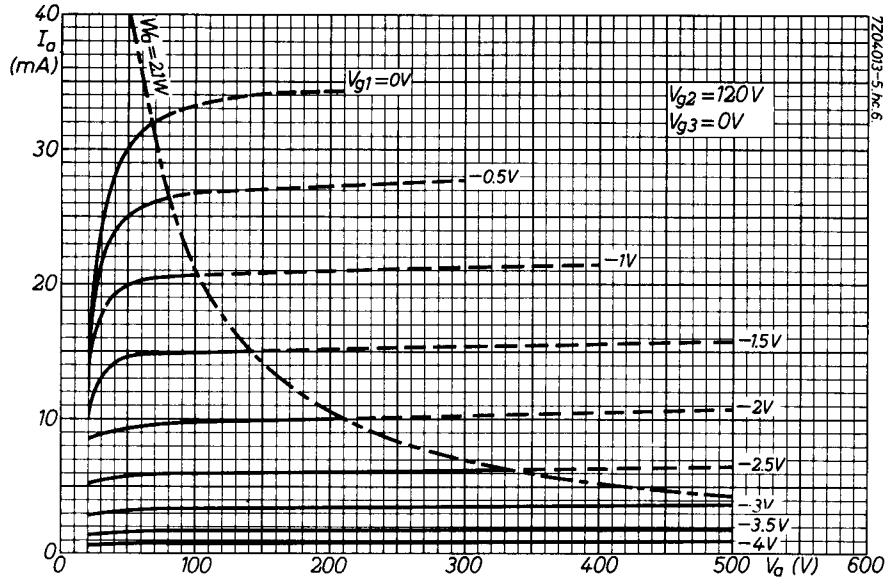
Anode voltage	V_{a_o}	max.	550	V
	V_a	max.	210	V
Anode dissipation	W_a	max.	2.1	W
Grid No.2 voltage	$V_{g_{2o}}$	max.	550	V
	V_{g_2}	max.	210	V
Grid No.2 dissipation	W_{g_2}	max.	0.35	W
Grid No.1 voltage	$-V_{g_1}$	max.	100	V
Grid No.1 voltage, peak	$-V_{g_{1p}}$	max.	200	V
Duty factor max. 0.1				
Pulse duration max. 200 μs				
Grid No.1 dissipation	W_{g_1}	max.	50	mW
Grid No.1 resistor (automatic bias)	R_{g_1}	max.	1	MΩ
Cathode current	I_k	max.	16	mA
Cathode current peak value	I_{k_p}	max.	80	mA
Duty factor max. 0.1				
Pulse duration max. 200 μs				
Voltage between heater and cathode	V_{kf}	max.	100	V
Bulb temperature (absolute maximum)	t_{bulb}	max.	170	°C

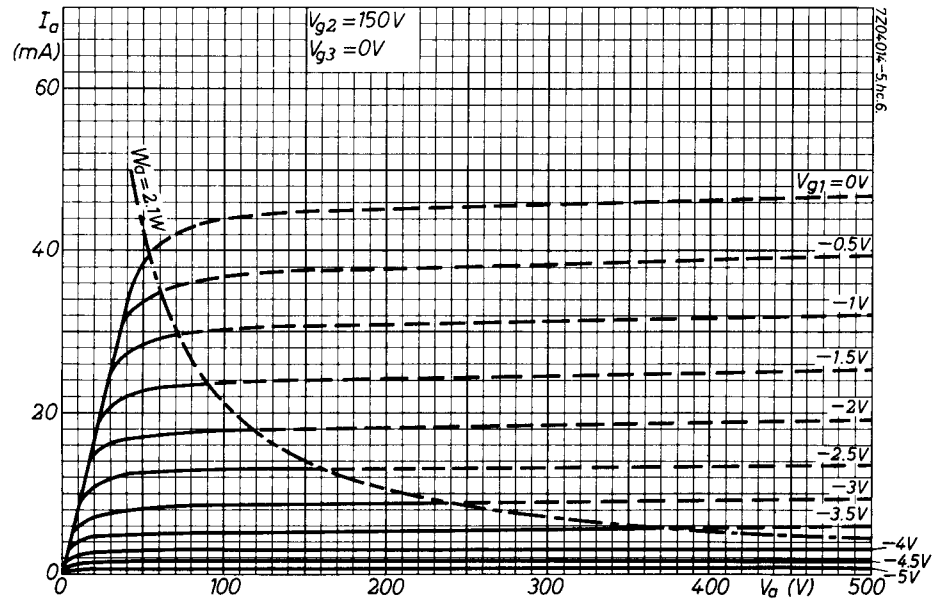
OPERATING CHARACTERISTICS

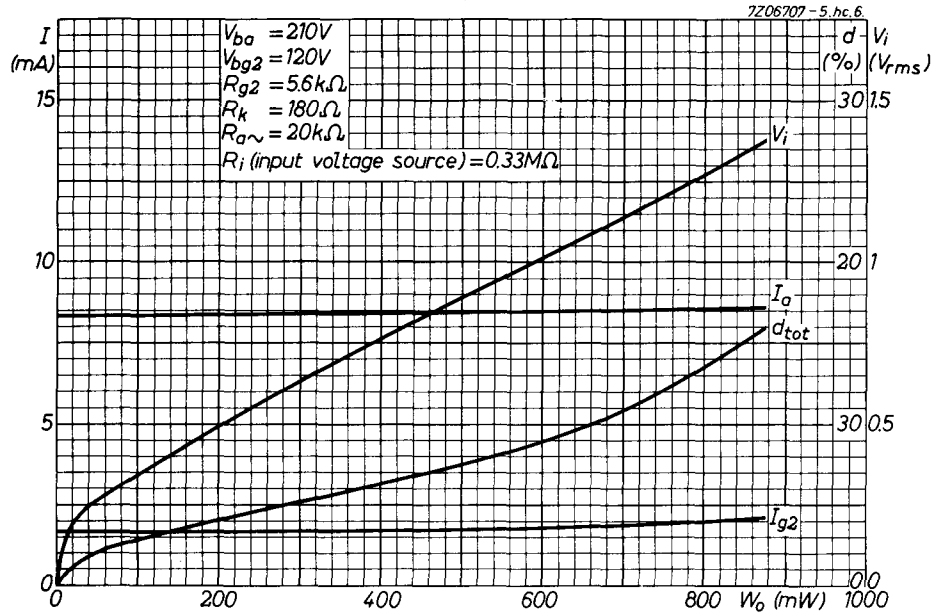
Output tube. Class A

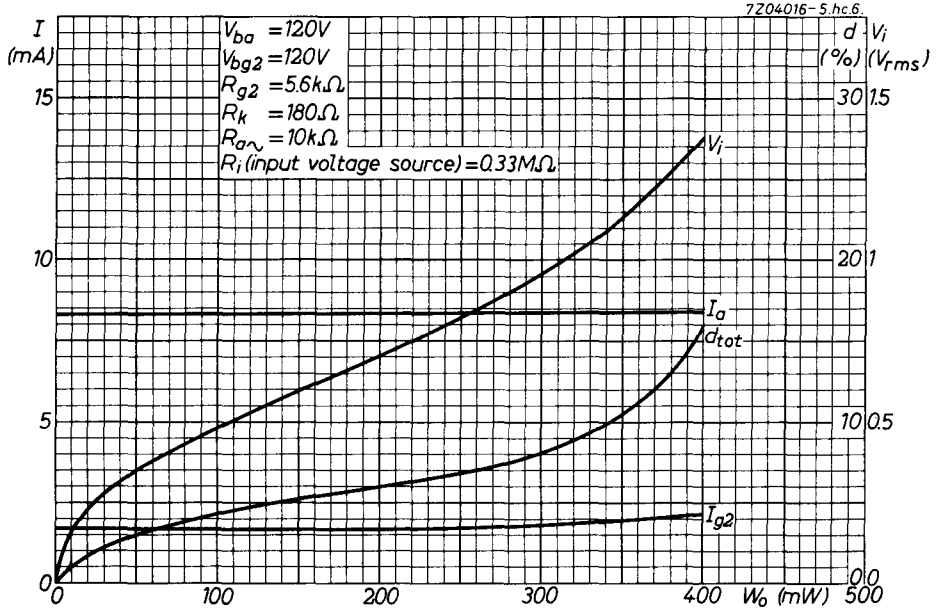
Anode voltage	V_a		120			210		V
Grid No.3 voltage	V_{g_3}		0			0		V
Grid No.2 supply voltage	V_{bg_2}		120			120		V
Grid No.2 resistor	R_{g_2}		5.6			5.6		kΩ
Cathode resistor	R_k		180			180		Ω
Anode current	I_a		8.3			8.3		mA
Grid No.2 current	I_{g_2}		1.7			1.7		mA
Mutual conductance	S		8.2			8.2		mA/V
Internal resistance	R_i		0.42			0.44		MΩ
Load resistance	$R_{a\sim}$		10			20		kΩ
Input voltage	V_i	0.35	1.1	–	0.25	1.1	–	V_{RMS}
Grid No.1 current	$+I_{g_1}$	–	–	0.3	–	–	0.3	μA
Grid No.1 resistor	R_{g_1}	–	–	0.33	–	–	0.33	MΩ
Total distortion	d_{tot}	–	10	–	–	10	–	%
Output power	W_o	50	340	400	50	660	870	mW

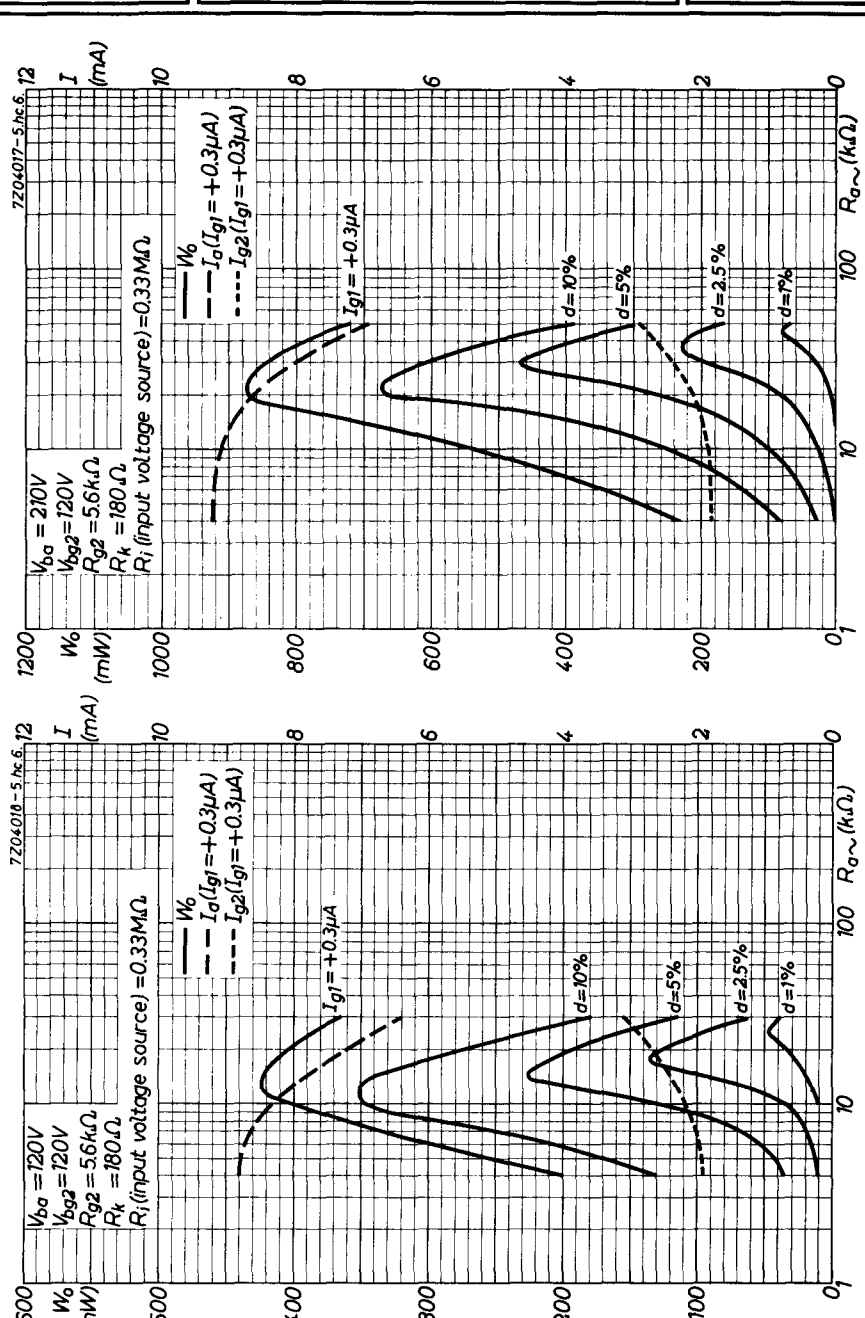

7Z04012-5 hc 6
I (mA)
S (mA/V)
V_a = 210V
V_{g2} = 150V
V_{g3} = 0V
I_a
S
I_{g2}
V_{g1} (V)
7Z04011-5 hc 6
I (mA)
S (mA/V)
V_a = 210V
V_{g2} = 120V
V_{g3} = 0V
I_a
S
I_{g2}
V_{g1} (V)

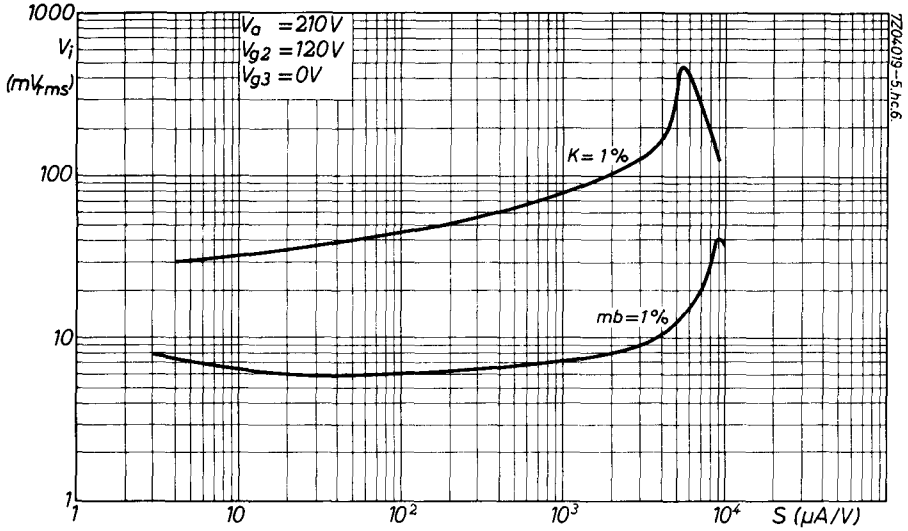

40
I_a (mA)
30
20
10
0
$W_a = 2.1W$
$V_{g1} = 0V$
$V_{g2} = 120V$
$V_{g3} = 0V$
−0.5V
−1V
−1.5V
−2V
−2.5V
−3V
−3.5V
−4V
0
100
200
300
400
500
V_a (V)
600
7204013-5-MC6

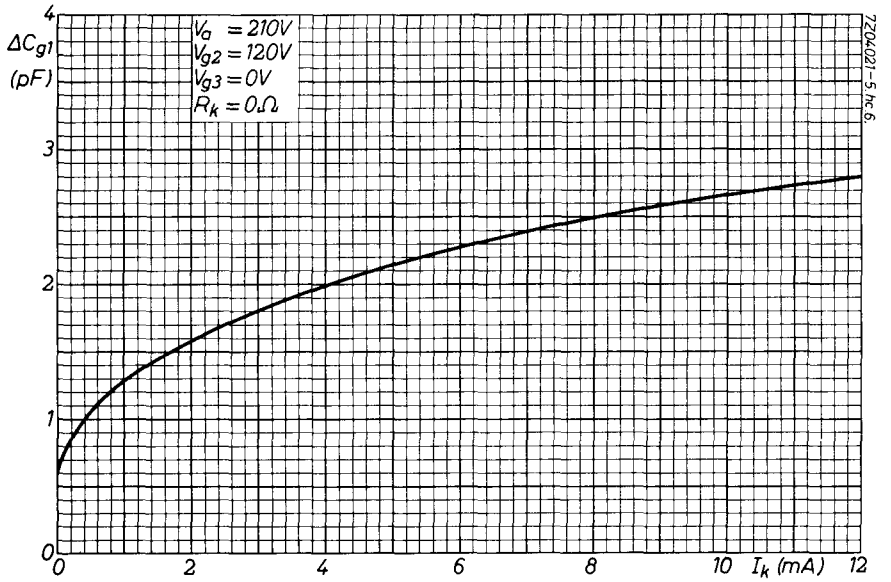

I_a (mA)
60
40
20
0
$V_{g2} = 150V$
$V_{g3} = 0V$
$W_a = 2.1W$
$V_{g1} = 0V$
−0.5V
−1V
−1.5V
−2V
−2.5V
−3V
−3.5V
−4V
−4.5V
−5V
0
100
200
300
400
V_a (V)
500
7204014-5-MC6

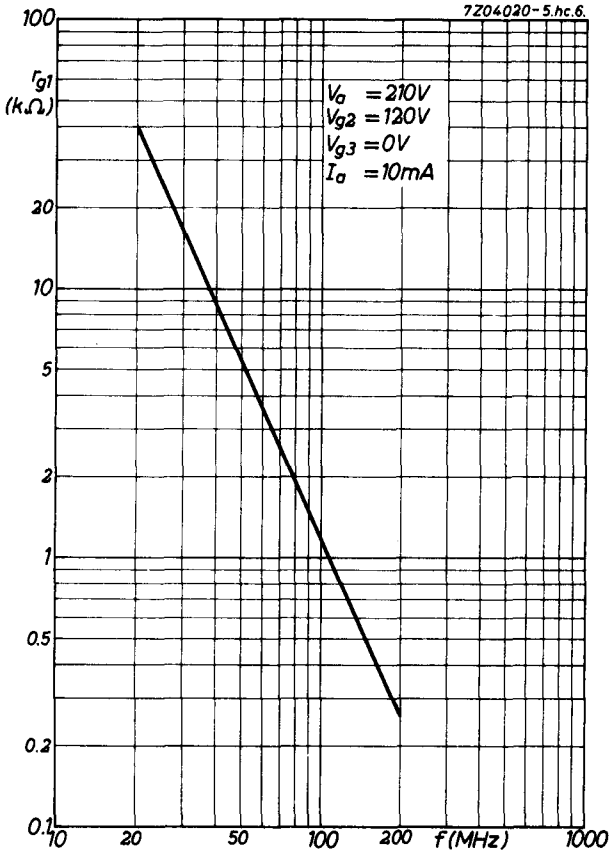

7Z06707 - 5.hc.6.
I (mA)
d (%)
Vi (Vrms)
Vba = 210V
Vbg2 = 120V
Rg2 = 5.6kΩ
Rk = 180Ω
Ra~ = 20kΩ
Ri (input voltage source) = 0.33MΩ
Vi
Ia
dtot
Ig2
Wa (mW)
0
200
400
600
800
1000
15
10
5
0
30
20
1.5
1
0.5
0.0


7Z04016 - 5.hc.6.
I (mA)
d (%)
Vi (Vrms)
Vba = 120V
Vbg2 = 120V
Rg2 = 5.6kΩ
Rk = 180Ω
Ra~ = 10kΩ
Ri (input voltage source) = 0.33MΩ
Vi
Ia
dtot
Ig2
Wa (mW)
0
100
200
300
400
500
15
10
5
0
30
20
1.5
1
0.5
0.0


7Z04017-5.hc.6.12
V_{ba} = 210V
V_{bg2} = 120V
R_{g2} = 5.6kΩ
R_k = 180Ω
R_i (input voltage source) = 0.33MΩ
W_o (mW)
I (mA)
$R_{a\sim}$ (kΩ)
I_{g1} = +0.3μA
d=10%
d=5%
d=2.5%
d=1%
W_o
$I_a(I_{g1}$ = +0.3μA)
$I_{g2}(I_{g1}$ = +0.3μA)
7Z04018-5.hc.6.12
V_{ba} = 120V
V_{bg2} = 120V
R_{g2} = 5.6kΩ
R_k = 180Ω
R_i (input voltage source) = 0.33MΩ
W_o (mW)
I (mA)
$R_{a\sim}$ (kΩ)
I_{g1} = +0.3μA
d=10%
d=5%
d=2.5%
d=1%
W_o
$I_a(I_{g1}$ = +0.3μA)
$I_{g2}(I_{g1}$ = +0.3μA)


1000
V_i
(mV$_{rms}$)
100
10
1
V_a = 210V
V_{g2} = 120V
V_{g3} = 0V
K = 1%
mb = 1%
1
10
10^2
10^3
10^4
S (μA/V)
ZZ0409-5/hc.6


4
ΔC_{g1}
(pF)
3
2
1
0
V_a = 210V
V_{g2} = 120V
V_{g3} = 0V
R_k = 0Ω
0
2
4
6
8
10
I_k (mA)
12
ZZ0421-5/hc.6


7Z04020-5.hc.6.
100
r_{g1}
(kΩ)
20
10
5
2
1
0.5
0.2
0.1
V_a = 210V
V_{g2} = 120V
V_{g3} = 0V
I_a = 10mA
10
20
50
100
200
f(MHz)
1000

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11	FP	2000.11.19

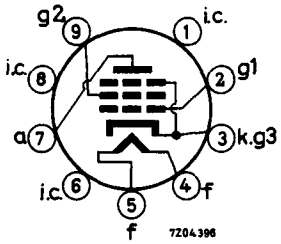
S.Q. TUBE

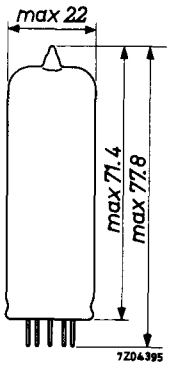
Special quality output pentode designed for use as wide band amplifier, series regulator tube and power output tube.

QUICK REFERENCE DATA			
Life test	10 000 hours		
Low interface resistance			
Mechanical quality	Shock and vibration resistant		
Base	Noval		
Heating	Indirect A.C. or D.C.; parallel supply		
Heater voltage	V_f	6.3	V
Heater current	I_f	760	mA
Anode current	I_a	48	mA
Mutual conductance	S	11.3	mA/V
Output power, one tube	W_o	6	W

DIMENSIONS AND CONNECTIONS Dimensions in mm

Base: Noval





CHARACTERISTICS

Column I Nominal values or setting of the tube
II Range values for equipment design: Initial spread
III Range values for equipment design: End of life

		I	II	III	
Heater voltage	V_f	6.3			V
Heater current	I_f	760	720 - 800		mA
Anode voltage	V_a	250			V
Grid No.2 voltage	V_{g_2}	250			V
Cathode resistor	R_k	135			Ω
Anode current	I_a	48	42 - 54	min. 32	mA
Grid No.2 current	I_{g_2}	5.5	4 - 7		mA
Mutual conductance	S	11.3	9.2 - 13.4	min. 7.5	mA/V
Amplification factor	$\mu_{g_2g_1}$	19			
Internal resistance	R_i	40			kΩ
Negative grid current	$-I_{g_1}$		max. 0.5	max. 1.0	μA
As triode					
Anode voltage	V_a	250			V
Cathode resistor	R_k	270			Ω
Anode current	I_a	34			mA
Mutual conductance	S	10.2			mA/V
Amplification factor	μ	18.5			
Internal resistance	R_i	1.8			kΩ
Leakage current between cathode and heater Voltage between cathode and heater V_{kf} = 100 V	I_{kf}		max. 12.5		μA
Insulation resistance between electrodes Voltage between electrodes = 300 V	R		min. 100		MΩ

CAPACITANCES

		I	II	
Anode to grid No.2, grid No.3 cathode and heater	C_{a/g_2g_3kf}	6.0	5.2 - 6.8	pF
Grid No.1 to grid No.2, grid No.3 cathode and heater	C_{g_1/g_2g_3kf}	10	9 - 11	pF
Anode to grid No.1	C_{ag_1}		max. 0.5	pF
Grid No.1 to heater	C_{g_1f}		max. 0.25	pF

SHOCK AND VIBRATION RESISTANCE

The following test conditions are applied to assess the mechanical quality of the tube. These conditions are not intended to be used as normal operating conditions.

Shock

The tube is subjected 5 times in each of 4 positions to an acceleration of 500 g supplied by an NRL shock machine with the hammer lifted over an angle of 30^{o}.

Vibration

The tube is subjected during 32 hours in each of 3 positions to a vibration frequency of 50 Hz with an acceleration of 2.5 g.

LIFE

Production samples are tested to be within the end of life values (column III) during 10 000 hours

LIMITING VALUES (Absolute max. rating system)

Anode voltage	V_{a_o}	max.	600	V
	V_a	max.	450	V
Anode dissipation	W_a	max.	13.5	W
Grid No.2 voltage	$V_{g_{2o}}$	max.	600	V
	V_{g_2}	max.	450	V
Grid No.2 dissipation				
Continuously	W_{g_2}	max.	2.2	W
Peak value in case of exitation by speech and music	$W_{g_{2p}}$	max.	4.4	W

LIMITING VALUES (continued)

Grid No.1 dissipation	W_{g_1}	max.	0.5	W
Grid No.1 voltage	$-V_{g_1}$	max.	100	V
Cathode current	I_k	max.	75	mA
Grid resistor				
Fixed bias	R_{g_1}	max.	0.5	MΩ
Automatic bias	R_{g_1}	max.	1.0	MΩ
Voltage between cathode and heater	V_{kf}	max.	100	V
Bulb temperature	t_{bulb}	max.	225	°C

Heater voltage: The average heater voltage should be 6.3 V.
Variations of the heater voltage exceeding the range of 6.0 V to 6.6 V will shorten the tube life.
The tolerance of heater current (column II) should be taken into account.

OPERATING CHARACTERISTICS

Output tube class A (one tube) 2)3)

Anode voltage	V_a	250		V
Grid No.2 voltage	V_{g_2}	250		V
Cathode resistor	R_k	135		Ω
Load resistance	$R_{a\sim}$	4.5		kΩ

Input voltage	V_i	0	0.3	3.5	4.4	4.8[1]	V_{RMS}
Anode current	I_a	48			50.5	50.5	mA
Grid No.2 current	I_{g_2}	5.5			10.0	11.0	mA
Output power	W_o	0	0.05	4.5	5.7	6.0	W
Total distortion	d_{tot}			7.5	10		%
Second harmonic	d_2			5.7	5.0		%
Third harmonic	d_3			4.5	8.0		%

OPERATING CHARACTERISTICS (continued)

Output tube class A (one tube) 2)3)

Anode voltage	V_a			250			V
Grid No.2 voltage	V_{g_2}			250			V
Cathode resistance	R_k			135			Ω
Load resistance	$R_{a\sim}$			5.2			kΩ
Input voltage	V_i	0	0.3	3.4	4.3	4.7[1])	V_{RMS}
Anode current	I_a	48			49.5	49.2	mA
Grid No.2 current	I_{g_2}	5.5			10.8	11.6	mA
Output power	W_o	0	0.05	4.5	5.7	6.0	W
Total distortion	d_{tot}			6.8	10		%
Second harmonic	d_2			3.0	2.0		%
Third harmonic	d_3			5.8	9.5		%

Anode voltage	V_a			250			V
Grid No.2 voltage	V_{g_2}			250			V
Cathode resistance	R_k			210			Ω
Load resistance	$R_{a\sim}$			7.0			kΩ
Input voltage	V_i	0	0.3		3.5	5.5[1])	V_{RMS}
Anode current	I_a	36			36.8	36	mA
Grid No.2 current	I_{g_2}	4.1			8.5	14.6	mA
Output power	W_o	0	0.05		4.2	5.6	W
Total distortion	d_{tot}				10		%
Second harmonic	d_2				1.7		%
Third harmonic	d_3				8.7		%

OPERATING CHARACTERISTICS (continued)

Output tube class A (one tube) [2])

Anode voltage	V_a			250		V
Grid No.2 voltage	V_{g_2}			210		V
Cathode resistor	R_k			160		Ω
Load resistance	$R_{a\sim}$			7.0		kΩ
Input voltage	V_i	0	0.3	3.4	3.8[1])	V_{RMS}
Anode current	I_a	36		36.6	36.5	mA
Grid No.2 current	I_{g_2}	3.9		7.3	8.0	mA
Output power	W_o	0	0.05	4.3	4.7	W
Total distortion	d_{tot}			10		%
Second harmonic	d_2			1.8		%
Third harmonic	d_3			9.3		%

Output tube class AB (two tubes) [2])

Anode voltage	V_a	250		300		V
Grid No.2 voltage	V_{g_2}	250		300		V
Cathode resistor	R_k	130		130		Ω
Load resistance	$R_{aa\sim}$	8		8		kΩ
Input voltage	V_i	0	8	0	10[3])	V_{RMS}
Anode current	I_a	2x31	2x37.5	2x36	2x46	mA
Grid No.2 current	I_{g_2}	2x3.5	2x7.5	2x4	2x11	mA
Output power	W_o	0	11	0	17	W
Total distortion	d_{tot}		3		4	%

OPERATING CHARACTERISTICS (continued)

Output tube class B (two tubes)

Anode voltage	V_a	250		300		V
Grid No.2 voltage	V_{g_2}	250		300		V
Grid No.1 voltage	$-V_{g_1}$	11.6		14.7		V
Load resistance	$R_{aa\sim}$	8		8		kΩ
Input voltage	V_i	0	8	0	10[3]	V_{RMS}
Anode current	I_a	2x10	2x37.5	2x7.5	2x46	mA
Grid No.2 current	I_{g_2}	2x1.1	2x7.5	2x0.8	2x11	mA
Output power	W_o	0	11	0	17	W
Total distortion	d_{tot}		3		4	%

As triode

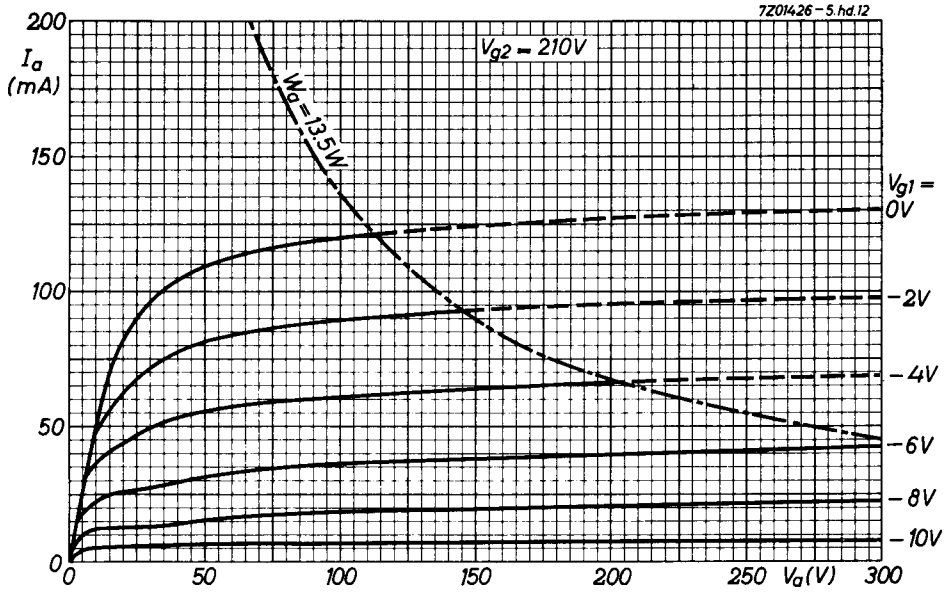
Output tube class A (one tube)

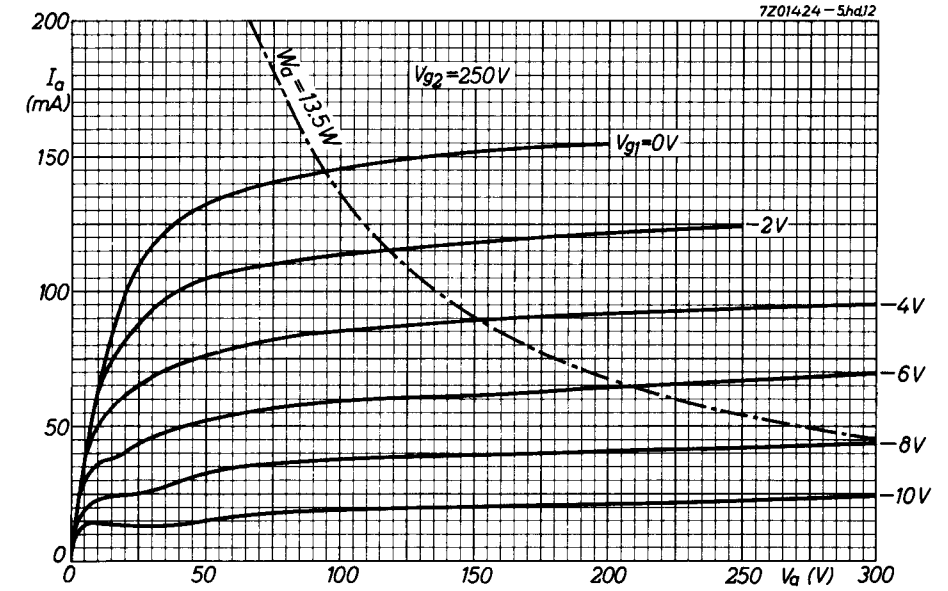
Anode voltage	V_a	250			V
Cathode resistor	R_k	270			Ω
Load resistance	$R_{a\sim}$	3.5			kΩ
Input voltage	V_i	0	1.0	6.7	V_{RMS}
Anode current	I_a	34		36	mA
Output power	W_o	0	0.05	1.95	W
Total distortion	d_{tot}			9.0	%

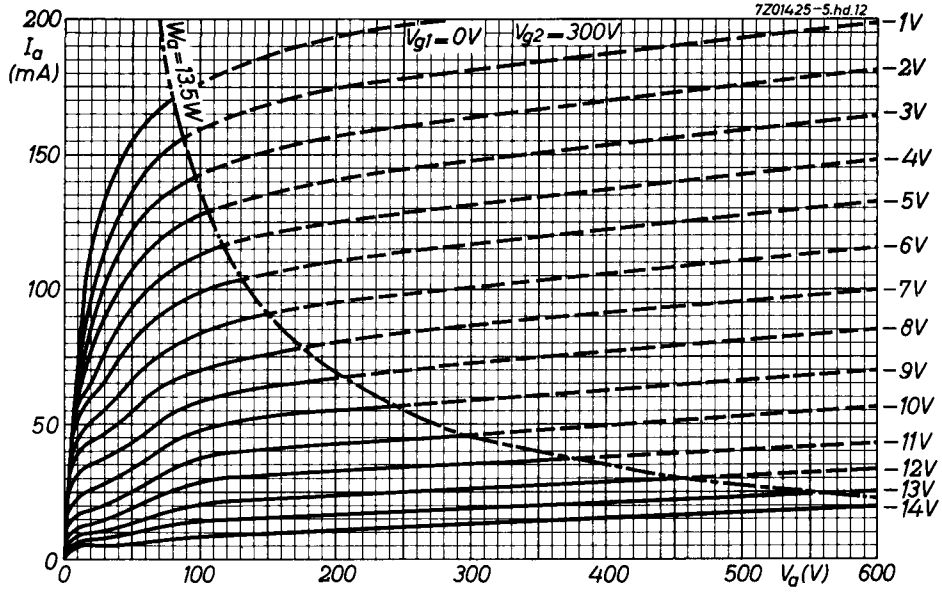
Output tube class AB (2 tubes)

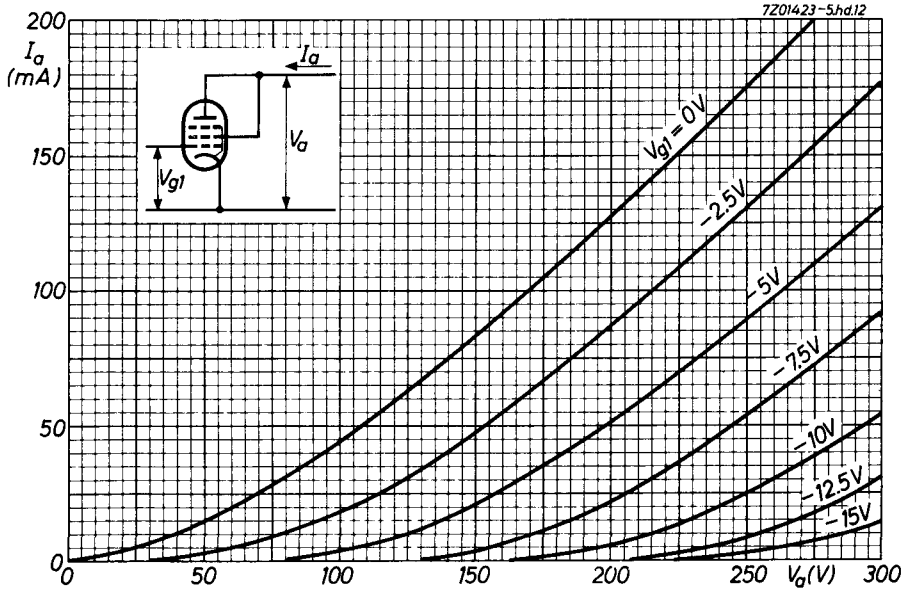
Anode voltage	V_a	250			300			V
Cathode resistor	R_k	270			270			Ω
Load resistance	$R_{aa\sim}$	10			10			kΩ
Input voltage	V_i	0	0.95	8.3	0	0.9	10	V_{RMS}
Anode current	I_a	2x20		2x21.7	2x24		2x26	mA
Output power	W_o	0	0.05	3.4	0	0.05	5.2	W
Total distortion	d_{tot}			2.5			2.5	%

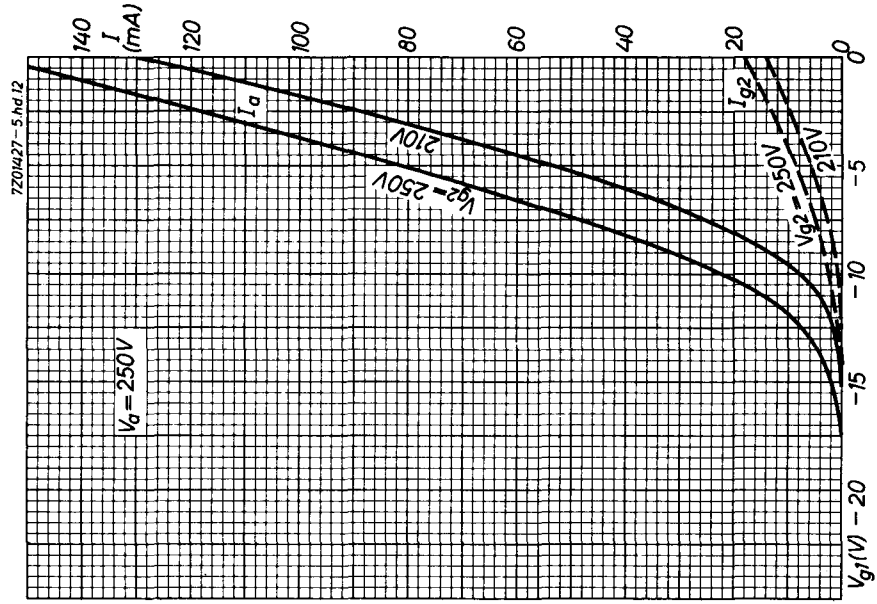
1) Grid No.1 current I_{g_1} = 0.3 μA
2) Measured with fixed bias
3) With speech and music signal

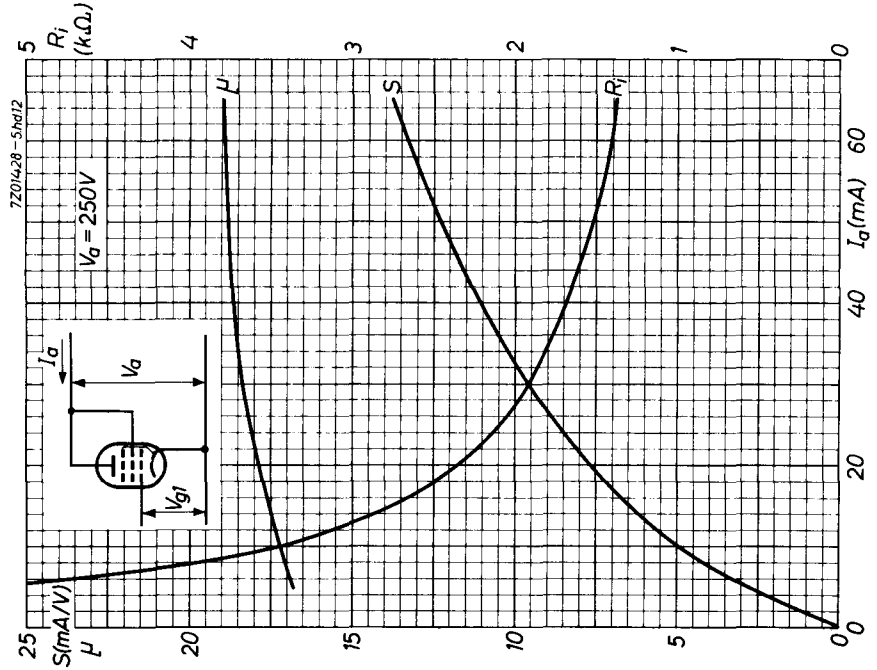

7Z01426-5.hd.12
I_a (mA)
V_{g2} = 210V
W_a = 13.5W
V_{g1} = 0V
-2V
-4V
-6V
-8V
-10V
V_a (V)
0
50
100
150
200
250
300

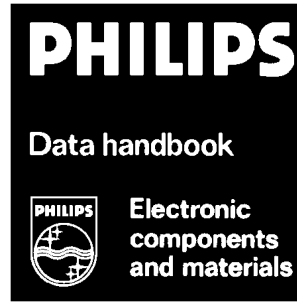

7Z01424-5.hd.12
I_a (mA)
V_{g2} = 250V
W_a = 13.5W
V_{g1} = 0V
-2V
-4V
-6V
-8V
-10V
V_a (V)
0
50
100
150
200
250
300


7Z01425-5.hd.12
200
I_a (mA)
150
100
50
0
W_a=13.5W
V_{g1}=0V
V_{g2}=300V
-1V
-2V
-3V
-4V
-5V
-6V
-7V
-8V
-9V
-10V
-11V
-12V
-13V
-14V
0
100
200
300
400
500
V_a(V)
600


7Z01423-5.hd.12
200
I_a (mA)
150
100
50
0
I_a
V_a
V_{g1}
V_{g1}=0V
-2.5V
-5V
-7.5V
-10V
-12.5V
-15V
0
50
100
150
200
250
V_a(V)
300


7Z01427-5.hd12
I (mA)
140
120
100
80
60
40
20
0
I_a
V_{g2} = 250V
210V
I_{g2}
V_{g2} = 250V
210V
V_a = 250V
0
-5
-10
-15
-20
V_{g1}(V)


7Z01428-5.hd12
R_i (kΩ)
5
4
3
2
1
0
V_a = 250V
μ
S
R_i
I_a
V_a
V_{g1}
S(mA/V)
μ
25
20
15
10
5
0
I_a(mA)
60
40
20
0



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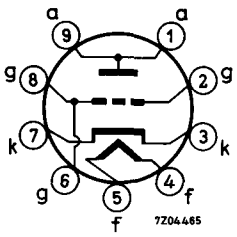
S.Q. TUBE

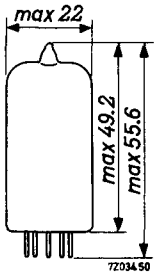
Special quality U.H.F. triode designed for use as oscillator, amplifier and self-oscillating mixer (max. frequency 800 MHz).

QUICK REFERENCE DATA			
Life	10 000 hours		
Low interface resistance			
Mechanical quality	Shock and vibration resistant		
Base	Noval. Gold plated pins.		
Heating	Indirect A.C. or D.C.; Parallel supply		
Heater voltage	V_f	6.3	V
Heater current	I_f	165	mA
Anode current	I_a	12	mA
Mutual conductance	S	14	mA/V

DIMENSIONS AND CONNECTIONS Dimensions in mm

Base: Noval





CHARACTERISTICS

Column I Nominal value or setting of the tube
II Range values for equipment design: Initial spread
III Range values for equipment design: End of life

		I	II	III	
Heater voltage	V_f	6.3			V
Heater current	I_f	165	155 - 175		mA
Anode supply voltage	V_{ba}	185			V
Grid supply voltage	$+V_{bg}$	8			V
Cathode resistor	R_k	800			Ω
Anode current	I_a	12	11.2 - 12.8	min. 10.5	mA
Mutual conductance	S	14	11.5 - 17	min. 9.5	mA/V
Amplification factor	μ	68			
Negative grid current	$-I_g$		max. 0.5	max. 1.0	μA
Cut-off voltage	$-V_g$		max. 5		V
Anode current I_a = 0.1 mA					
Equivalent noise resistance	R_{eq}	250			Ω
Input resistance	r_g	2			kΩ
Frequency = 100 MHz					
Phase angle of slope	φ_s	-7			o
Frequency = 100 MHz					
Leakage current between cathode and heater	I_{kf}		max. 10		μA
Voltage between cathode and heater V_{kf} = 100 V					
Insulation resistance between anode and other electrodes	R_{ins}		min. 100		MΩ
Voltage between anode and other electrode = 300 V					
Insulation resistance between grid and other electrode	R_{ins}		min. 100		MΩ
Voltage between grid and other electrode = 100 V					

CAPACITANCES

		I	II	
Anode to grid	C_{ag}	2	1.7 - 2.3	pF
Anode to cathode	C_{ak}	0.2	0.16 - 0.24	pF
Grid to cathode	C_{gk}	3.6	3.0 - 4.2	pF
Grid to heater	C_{gf}		max. 0.3	pF
Cathode to grid and heater	$C_{k/gf}$	6.6	5.5 - 7.7	pF
Anode to grid and heater	$C_{a/gf}$	2.1	1.75 - 2.45	pF
Grid to cathode and heater	$C_{g/kf}$	3.9	3.3 - 4.5	pF
Anode to cathode and heater	$C_{a/kf}$	0.3	0.25 - 0.35	pF
Grid to cathode	C_{gk}	5.6		pF
Anode current I_a = 12 mA				
With external shield				
Anode to grid and shield	$C_{a/gs}$	3.1	2.8 - 3.4	pF
Grid and shield to cathode and heater	$C_{gs/kf}$	4.2	3.6 - 4.8	pF
Anode to cathode and heater	$C_{a/kf}$	0.25	0.2 - 0.3	pF

SHOCK AND VIBRATION RESISTANCE

The following test conditions are applied to assess the mechanical quality of the tube. These conditions are not intended to be used as normal operating conditions.

Shock

The tube is subjected 5 times in each of 4 positions to an acceleration of 500 g supplied by an NRL shock machine with the hammer lifted over an angle of 30°.

Vibration

The tube is subjected during 32 hours in each of 3 positions to a vibration frequency of 50 Hz with an acceleration of 2.5 g.

LIFE

Production samples are tested to be within the end of life values (column III) during 10 000 hours.

Heater voltage: The average heater voltage should be 6.3 V. Variations of the heater voltage exceeding the range of 6.0 V to 6.6 V will shorten the tube life. The tolerance of heater current (column II) should be taken into account.

LIMITING VALUES (Absolute max. rating system)

Anode voltage	V_{a_o}	max. 440	V
	V_a	max. 250	V
Anode dissipation	W_a	max. 2.4	W
Grid voltage	$-V_g$	max. 50	V
Grid dissipation	W_g	max. 20	mW
Grid resistor	R_g	max. 1.2	MΩ
Cathode current	I_k	max. 20	mA
Voltage between cathode and heater	V_{kf}	max. 100	V
Bulb temperature	t_{bulb}	max. 165	°C
Frequency (as amplifier)	f	up to 800	MHz

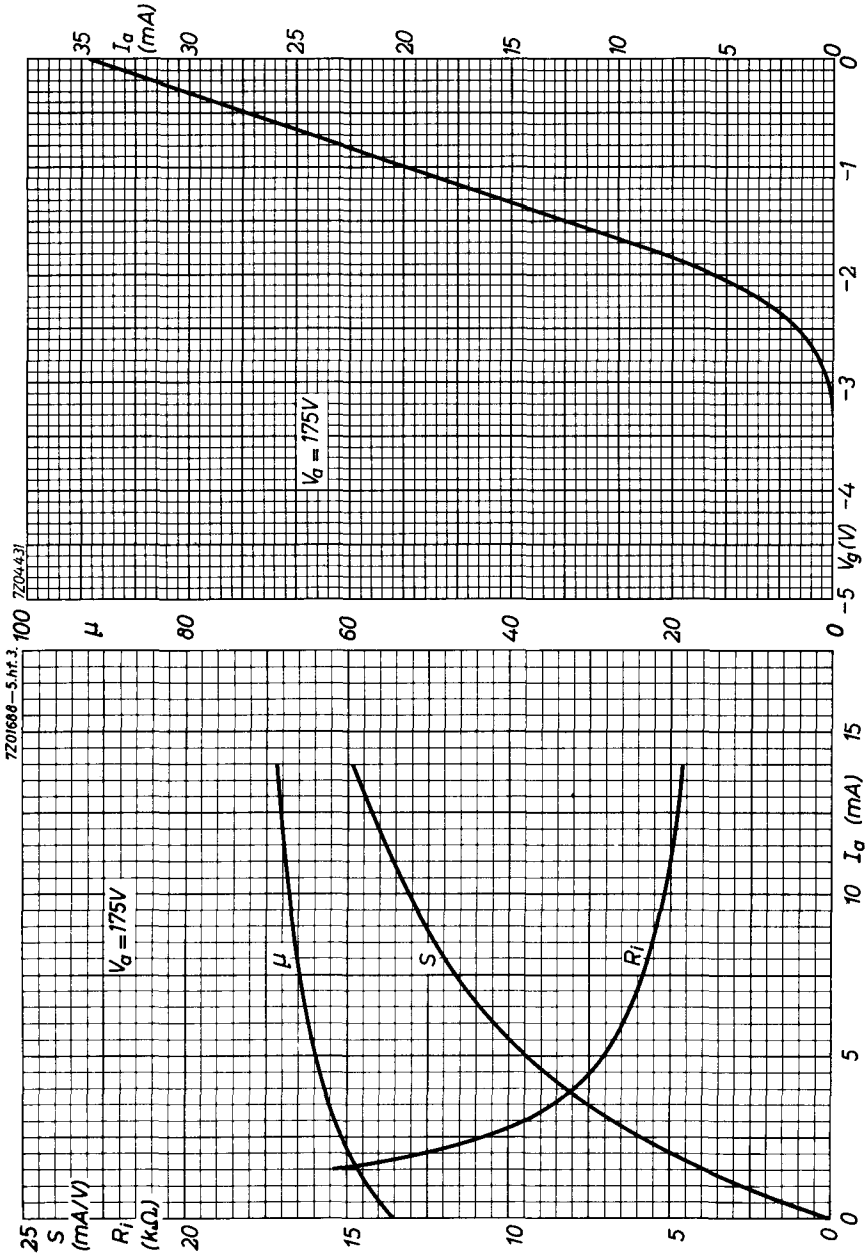
OPERATING CHARACTERISTICS

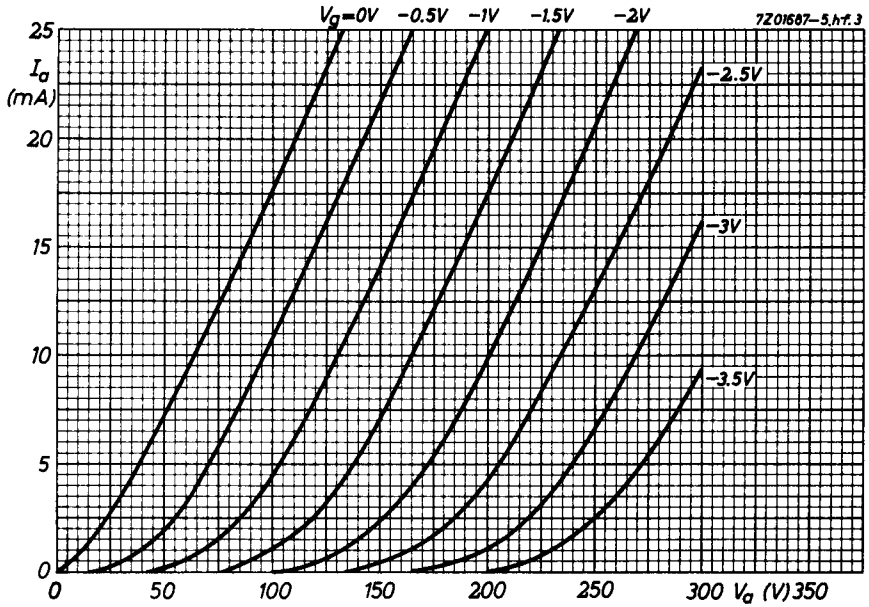
As R.F. amplifier, grounded grid

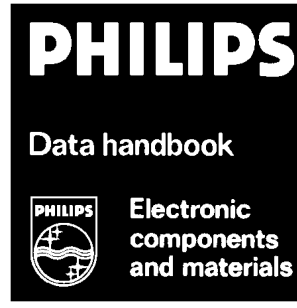
Anode supply voltage	V_{ba}	185	175	V
Grid supply voltage	V_{bg}	8	0	V
Cathode resistor	R_k	800	125	Ω
Anode current	I_a	12	12	mA
Mutual conductance	S	14	14	mA/V

As mixer

Anode supply voltage	V_{ba}	220	V
Anode resistor	R_a	5.6	kΩ
Grid resistor	R_g	47	kΩ
Anode current	I_a	12	mA
Grid current	I_g	50	μA


7Z01688—5.ht.3
7Z04431
I_a (mA)
V_a = 175V
V_g (V)
μ
S (mA/V)
R_i (kΩ)
I_a (mA)


V_g=0V
-0.5V
-1V
-1.5V
-2V
-2.5V
-3V
-3.5V
7Z01687-5.hf.3
I_a (mA)
25
20
15
10
5
0
0
50
100
150
200
250
300
350
V_a (V)



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6	6	1968.12
7	FP	2000.11.19

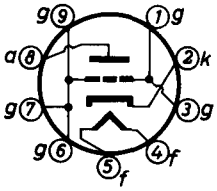
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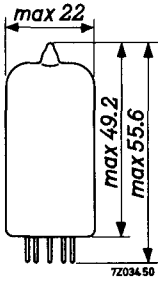
Special quality triode. Designed for use as grounded grid aerial amplifier for band IV and V.

QUICK REFERENCE DATA			
Life test	10 000 hours		
Low interface resistance			
Mechanical quality	Shock and vibration resistant		
Base	Noval. Gold plated pins		
Heating	Indirect A.C. or D.C.; parallel supply		
Heater voltage	V_f	6.3	V
Heater current	I_f	155	mA
Anode current	I_a	12.5	mA
Mutual conductance	S	13.5	mA/V
Noise figure at 850 MHz	F	9.6	dB
Equivalent noise resistance	R_{eq}	240	Ω

DIMENSIONS AND CONNECTIONS Dimensions in mm

Base: Noval





CHARACTERISTICS

Column I Nominal value
II Range values for equipment design: Initial spread

		I	II	
Heater voltage	V_f	6.3		V
Heater current	I_f	155	147- 163	mA
Anode voltage	V_a	160		V
Grid voltage	$-V_g$	1.25		V
Anode current	I_a	12.5		mA
Mutual conductance	S	13.5		mA/V
Amplification factor	μ	70		
Internal resistance	R_i	5.2		kΩ
Equivalent noise resistance	R_{eq}	240		Ω
Noise figure Frequency 850 MHz Bandwidth 15 MHz	F	9.6		dB
Anode supply voltage	V_{ba}	170		V
Cathode resistor	R_k	820		Ω
Grid supply voltage	$+V_{bg}$	9		V
Anode current	I_a	12.5		mA
Mutual conductance	S	13.5	10.5-16.5	mA/V
Anode supply voltage	V_{ba}	161		V
Cathode resistor	R_k	100		Ω
Grid supply voltage	V_{bg}	0		V
Anode current	I_a	12.5	9.5-16.1	mA
Mutual conductance	S	13.5		mA/V
Grid current, negative	$-I_g$		max. 0.1	μA
Leakage current between cathode and heater Voltage between cathode and heater V_{kf} = 125 V	I_{kf}		max. 15	μA

CHARACTERISTICS (continued)

		I	
Input series resonance frequency [1])	f_{inp}	1700	MHz
Output series resonance frequency [1])	f_{outp}	1000	MHz

CAPACITANCES

		With screen		Without screen		
		I	II	I	II	
Anode to cathode and heater	$C_{a/kf}$	50	35- 65			mpF
Grid to cathode and heater	$C_{g/kf}$	3.8	3.2-4.4			pF
Anode to grid	C_{ag}	1.7	1.4-2.0	1.1	0.9 - 1.3	pF

SHOCK AND VIBRATION RESISTANCE

The following test conditions are applied to assess the mechanical quality of the tube. These conditions are not intended to be used as normal operating conditions.

Shock

The tube is subjected 5 times in each of 4 positions to an acceleration of 500 g supplied by an NRL shock machine with the hammer lifted over an angle of 30°.

Vibration

The tube is subjected during 32 hours in each of 3 positions to a vibration frequency of 50 Hz with an acceleration of 2.5 g.

LIFE

Production samples are tested during 10 000 hours under the following conditions:

Anode supply voltage	V_{ba}	170	V
Grid supply voltage	$+V_{bg}$	9	V
Cathode resistor	R_k	820	Ω

[1]) Measured between the tube pin connected to the relevant electrode and a metal reference plane placed against the tube bottom. The relevant pin and the reference plane are connected to the measuring device so that the minimum distance is obtained between these two connecting points. The remaining tube pins are connected to the reference plane with a negligible impedance. The tube is screened by a cylinder with an internal diameter of 23 mm placed on the reference plane.

LIMITING VALUES (Absolute max. rating system)

Anode voltage	V_{a_o}	max.	400	V
	V_a	max.	200	V
Anode dissipation	W_a	max.	2.6	W
Cathode current	I_k	max.	16.5	mA
Grid voltage	$-V_g$	max.	50	V
Grid disspation	W_g	max.	50	mW
Grid resistor	R_g	max.	1	MΩ
Cathode resistor R_k = 100 Ω				
Voltage between cathode and heater				
Cathode positive	$V_{kf(k+)}$	max.	125	V
Cathode negative	$V_{kf(k-)}$	max.	60	V
Bulb temperature	t_{bulb}	max.	170	°C

Heater voltage: The average heater voltage should be 6.3 V.
Variation of the heater voltage exceeding the range of 6.0 V to 6.6 V will shorten the tube life.

OPERATING CHARACTERISTICS

Driver or output tube (circuit fig. 1)

Frequency	f		800		MHz
Bandwidth			8		MHz
Anode supply voltage	V_{ba}		200		V
Anode resistor	R_a		1.5		kΩ
Cathode resistor	R_k		150		Ω
Input voltage	V_i	0	0.5	1.65	V_{RMS}
Anode current	I_a	11.4		12.8	mA
Output voltage	V_o	0	2.0	6.0	V_{RMS} [1]
Inter modulation ratio			min. 26		dB
Sync. impuls compression			max. 30		%

[1] Value of the sync. level with video modulation according to CCIR and with Z = 60 Ω.

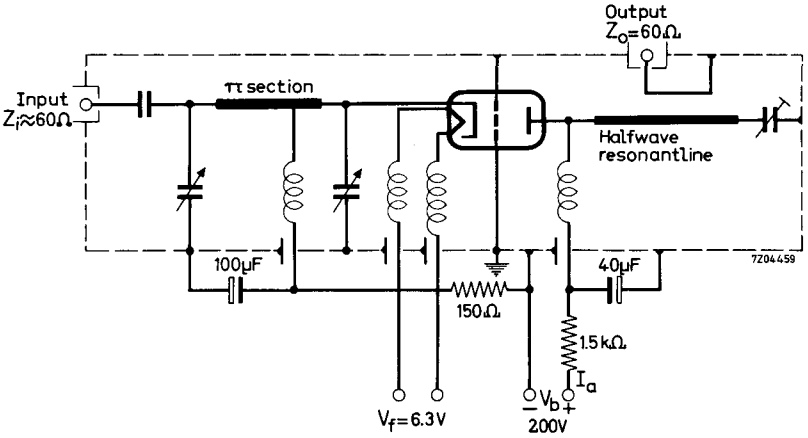
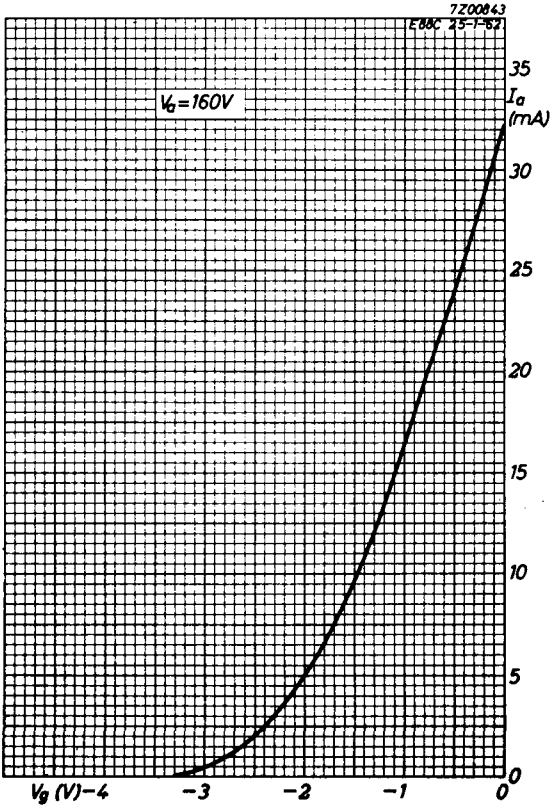
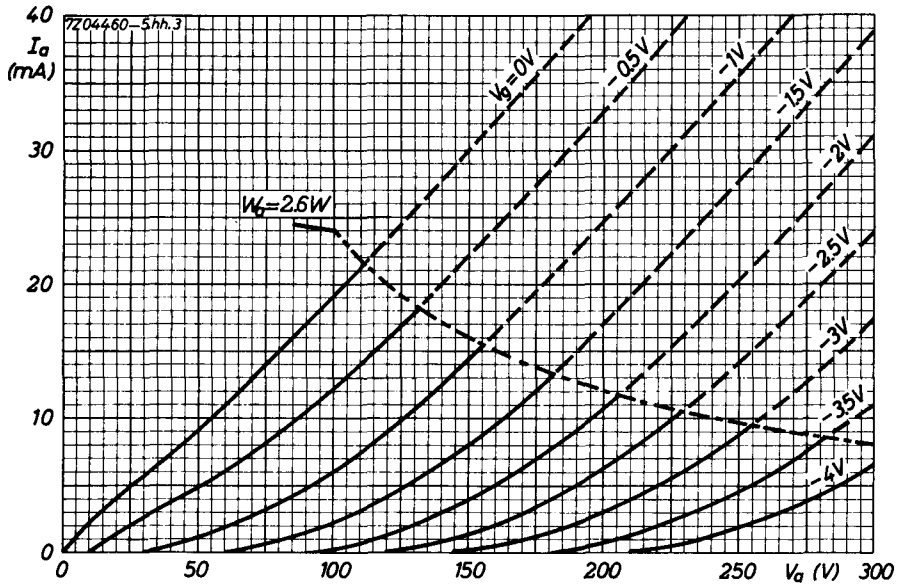

Output
Z_o=60Ω
Input
Z_i≈60Ω
π section
Halfwave
resonantline
100μF
40μF
150Ω
1.5kΩ
I_a
V_f=6.3V
V_b
200V
7Z04459

Fig.1


7Z00843
E88C 25-1-62
V_g=160V
I_a
(mA)
35
30
25
20
15
10
5
0
V_g (V) −4
−3
−2
−1
0


7Z04460-5hh.3
40
I_a (mA)
30
20
10
0
0
50
100
150
200
250
V_a (V)
300
V_g=0V
-0.5V
-1V
-1.5V
-2V
-2.5V
-3V
-3.5V
-4V
W_g=2.6W

PHILIPS

Data handbook

Electronic components and materials

E88C

page	sheet	date
1	1	1968.12
2	2	1968.12
3	3	1968.12
4	4	1968.12
5	5	1968.12
6	6	1968.12
7	FP	2000.11.19

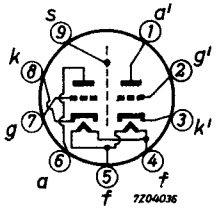
S.Q. TUBE

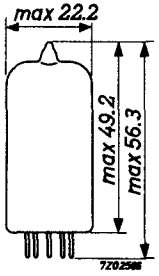
Special quality double triode designed for
Cascode circuits
H.F. or I.F. amplifiers
Mixer or phase inverter stages
Multivibrator and cathode follower in computers

QUICK REFERENCE DATA			
Life	10 000 hours		
Low interface resistance			
Mechanical quality	Shock and vibration resistant		
Base	Noval. Gold plated pins		
Heating	Indirect A.C. or D.C.; parallel supply		
Heater voltage	V_f	6.3	V
Heater current	I_f	300	mA
Anode current	I_a	15	mA
Mutual conductance	S	12.5	mA/V
Equivalent noise resistance	R_{eq}	300	Ω
Noise factor (f = 200 MHz)	F	4.6	dB

DIMENSIONS AND CONNECTIONS Dimensions in mm

Base: Noval





CHARACTERISTICS

Column I Nominal value or setting of the tube
II Range values for equipment design: Initial spread
III Range values for equipment design: End of life

		I	II	III	
Heater voltage	V_f	6.3			V
Heater current	I_f	300	285 - 315		mA
Anode supply voltage	V_{ba}	100			V
Grid supply voltage	$+V_{bg}$	9			V
Cathode resistor	R_k	680			Ω
Anode current	I_a	15	14.2 - 15.8	min. 13.5	mA
Mutual conductance	S	12.5	10.5 - 15	min. 9	mA/V
Amplification factor	μ	33			
Equivalent noise resistance Frequency = 45 MHz	R_{eq}	300			Ω
Noise figure Frequency = 200 MHz In cascode circuit adapted to minimum noise	F	4.6			dB
Input resistance Frequency = 100 MHz	r_g	3			kΩ
Start of grid current	V_g	0.75			V_{RMS}
Negative grid current	$-I_g$		max. 0.1	max. 1	μA
Anode voltage	V_a	90			V
Anode current	I_a	15			mA
Anode supply voltage	V_{ba}	90			V
Cathode resistor	R_k	120			Ω
Anode current	I_a	12			mA
Mutual conductance	S	11.5			mA/V

CHARACTERISTICS (continued)

		I	II	III	
Cut-off voltage	$-V_g$	6.5	5 - 8.5		V
Anode voltage	V_a	150			V
Anode current	I_a	0.1			mA
Difference in grid voltage of two sections	$\lvert V_g - V_g' \rvert$		max. 2	max. 2	V
Anode voltage	$V_a = V_a'$	150			V
Anode current	$I_a = I_a'$	0.1			mA
Anode supply voltage	V_{ba}	150			V
Negative grid voltage	$-V_g$	15			V
Anode current	I_a		max. 5		μA
In circuit fig.1 "pag.7"					
Anode supply voltage	V_{ba}	150			V
Anode current (not permitted continuously)	I_a	33	28 - 38		mA
Anode supply voltage	V_{ba}	60			V
Anode current	I_a		max. 9		mA
Leakage current between cathode and heater Voltage between cathode and heater = 90 V, cath.neg. Voltage between cathode and heater = 120 V, cath.pos.	I_{kf}		max. 6	max.12	μA
Insulation resistance between two electrodes Voltage between electrodes = 200 V	R_{ins}		min.100	min. 20	MΩ
Hum voltage Centre heater transformer earthed Grid resistor R_g = 0.5 MΩ	V_g		max.50		μV_{RMS}

CAPACITANCES Both sections if applicable

		I	II	
Anode to cathode, heater and screen	$C_{a/kfs}$	1.75	1.55 - 1.95	pF
	$C_{a'/k'fs}$	1.65	1.45 - 1.85	pF
Anode to cathode and heater	$C_{a/kf}$	0.5	0.4 - 0.6	pF
	$C_{a'/k'f}$	0.4	0.3 - 0.5	pF
Grid to cathode, heater and screen	$C_{g/kfs}$	3.3	2.7 - 3.9	pF
Grid to cathode and heater	$C_{g/kf}$	3.3	2.7 - 3.9	pF
Anode to grid	C_{ag}	1.4	1.2 - 1.6	pF
Anode to cathode	C_{ak}	0.18	0.14 - 0.22	pF
Cathode to heater	C_{kf}	2.6		pF
	$C_{k'f}$	2.7		pF
Anode to screen	C_{as}	1.3	1.1 - 1.5	pF
Anode to grid, heater and screen	$C_{a/gfs}$	3.0	2.7 - 3.3	pF
	$C_{a'/g'fs}$	2.9	2.6 - 3.2	pF
Cathode to grid, heater and screen	$C_{k/gfs}$	6.0	5.1 - 6.9	pF
Anode to anode other section	$C_{aa'}$		max. 0.045	pF
Grid to grid other section	$C_{gg'}$		max. 0.005	pF
Anode to grid other section	$C_{ag'}, C_{a'g}$		max. 0.005	pF
Grid to cathode other section	$C_{gk'}, C_{g'k}$		max. 0.005	pF

SHOCK AND VIBRATION RESISTANCE

The following test conditions are applied to assess the mechanical quality of the tube. These conditions are not intended to be used as normal operating conditions.

Shock

The tube is subjected 5 times in each of 4 positions to an acceleration of 500 g supplied by an NRL shock machine with the hammer lifted over an angle of 30°.

Vibration

The tube is subjected during 32 hours in each of 3 positions to a vibration frequency of 50 Hz with an acceleration of 2.5 g.

LIFE

Production samples are tested to be within the end of life values (column III) during 10 000 hours under the following conditions:

Anode supply voltage	V_{ba}	100	V
Grid supply voltage	$+V_{bg}$	9	V
Cathode resistor	R_k	680	Ω
Grid resistor	R_g	47	kΩ
Voltage between cathode and heater (cath.neg.)	V_{kf}	60	V
Anode current	I_a	15	mA

LIMITING VALUES Design centre rating system

Anode voltage	V_{a_o}	max.	550	V
Anode voltage (Zero cathode current)	V_a	max.	400	V
Anode voltage	V_a	max.	220	V
Anode voltage (Max. anode dissipation 0.8 W)	V_a	max.	250	V
Anode dissipation	W_a	max.	1.5	W
Anode dissipation (Max. anode dissipation of section 1 plus section 2 = 2 W)	W_a	max.	1.8	W
Grid dissipation	W_g	max.	30	mW
Grid voltage	$-V_g$	max.	100	V
Grid peak voltage Max. pulse duration 200 μsec Max. duty factor 0.1	$-V_{g_p}$	max.	200	V
Cathode current	I_k	max.	20	mA
Cathode peak current Max. pulse duration 200 μsec Max. duty factor 0.1	I_{k_p}	max.	100	mA

LIMITING VALUES (continued)

Voltage between cathode and heater				
Cathode positive	V_{kf}	max.	150	V
Cathode negative	V_{kf}	max.	100	V
Bulb temperature (Absolute max.)	t_{bulb}	max.	170	°C
Grid resistor (Anode current < 5 mA)	R_g	max.	1	MΩ

Heater voltage: The average heater voltage should be 6.3 V.
Variations of the heater voltage exceeding the range of 6.0 V to 6.6 V will shorten the tube life.
The tolerance of heater current (column II) should be taken into account.

OPERATING CHARACTERISTICS

Output tube class A

Anode voltage	V_a		220		V
Load resistance	$R_{a\sim}$		20		kΩ
Grid voltage	$-V_g$		6.5		V
Input voltage	V_i	0	1.5	4.5	V_{RMS}
Anode current	I_a	6.5		9.2	mA
Output power	W_o		0.05	0.5	W
Total distortion	d_{tot}			7	%

Output tube class B (two tubes)

Continuous single tone input signal

Anode voltage	V_a		200		V
Load resistance	$R_{aa\sim}$		22		kΩ
Grid voltage	$-V_g$		6		V
Input voltage	V_i	0	0.9	4.0	V_{RMS}
Anode current	I_a	2x5		2x9	mA
Output power	W_o		0.05	1.2	W
Total distortion	d_{tot}			3	%

OPERATING CHARACTERISTICS (continued)

Output tube class B (two tubes)

Speech and music inputsignal

Anode voltage	V_a		200		V
Load resistance	$R_{a-a\sim}$		10		kΩ
Grid voltage	$-V_{g_1}$		6		V
Input voltage	V_i	0	0.9	4.0	V_{RMS}
Anode current	I_a	2x5		2x13.5	mA
Output power	W_o		0.05	1.5	W
Total distortion	d_{tot}			4	%

Mixer

Anode supply voltage	V_{ba}	60	90	150	V
Anode resistor	R_a	0	1	3.9	kΩ
Grid resistor	R_g	1	1	1	MΩ
Oscillator voltage	V_{osc}	2	2.5	3	V_{RMS}
Anode current	I_a	4.7	7.7	11	mA
Conversion conductance	S_c	2.9	3.5	4.1	mA/V
Internal resistance	R_i	8.3	7	6.1	kΩ

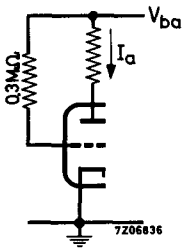
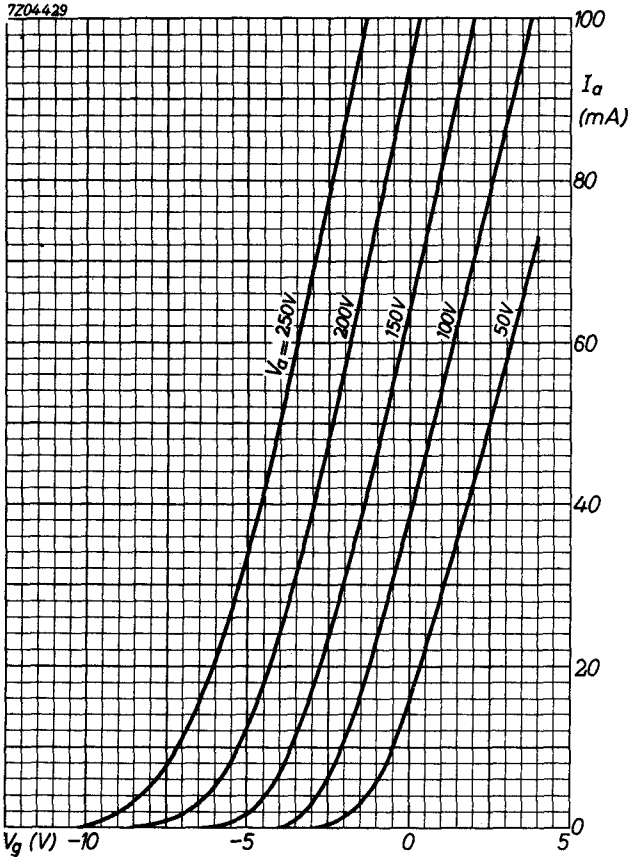
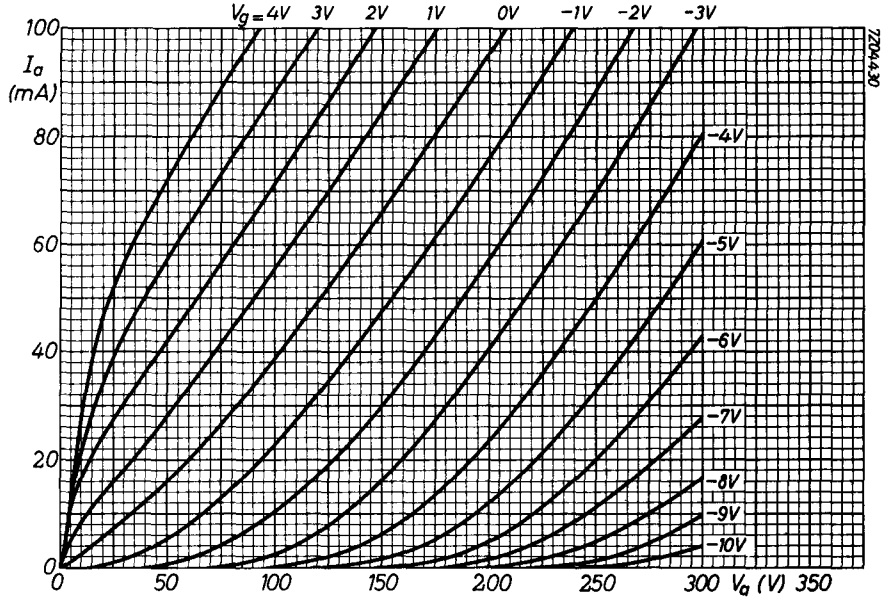
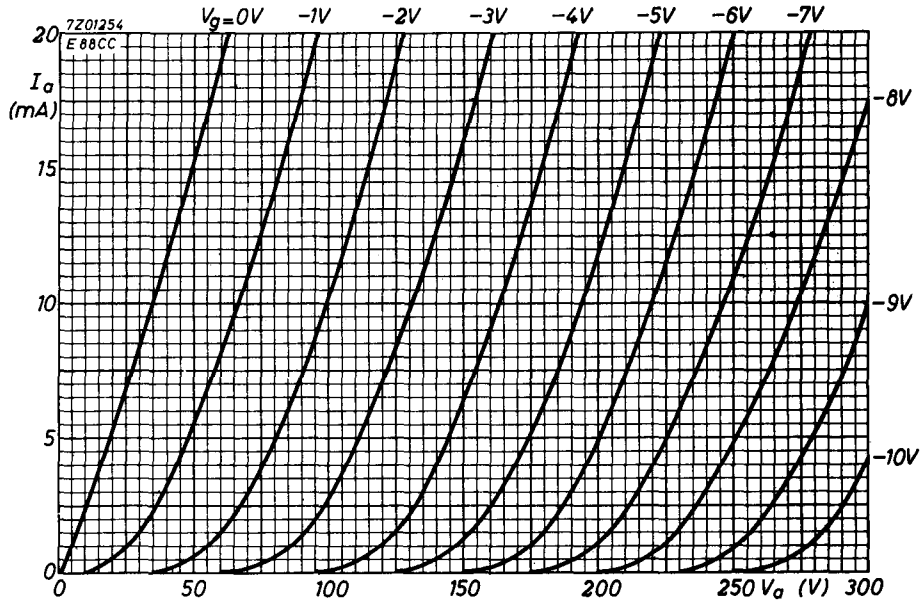
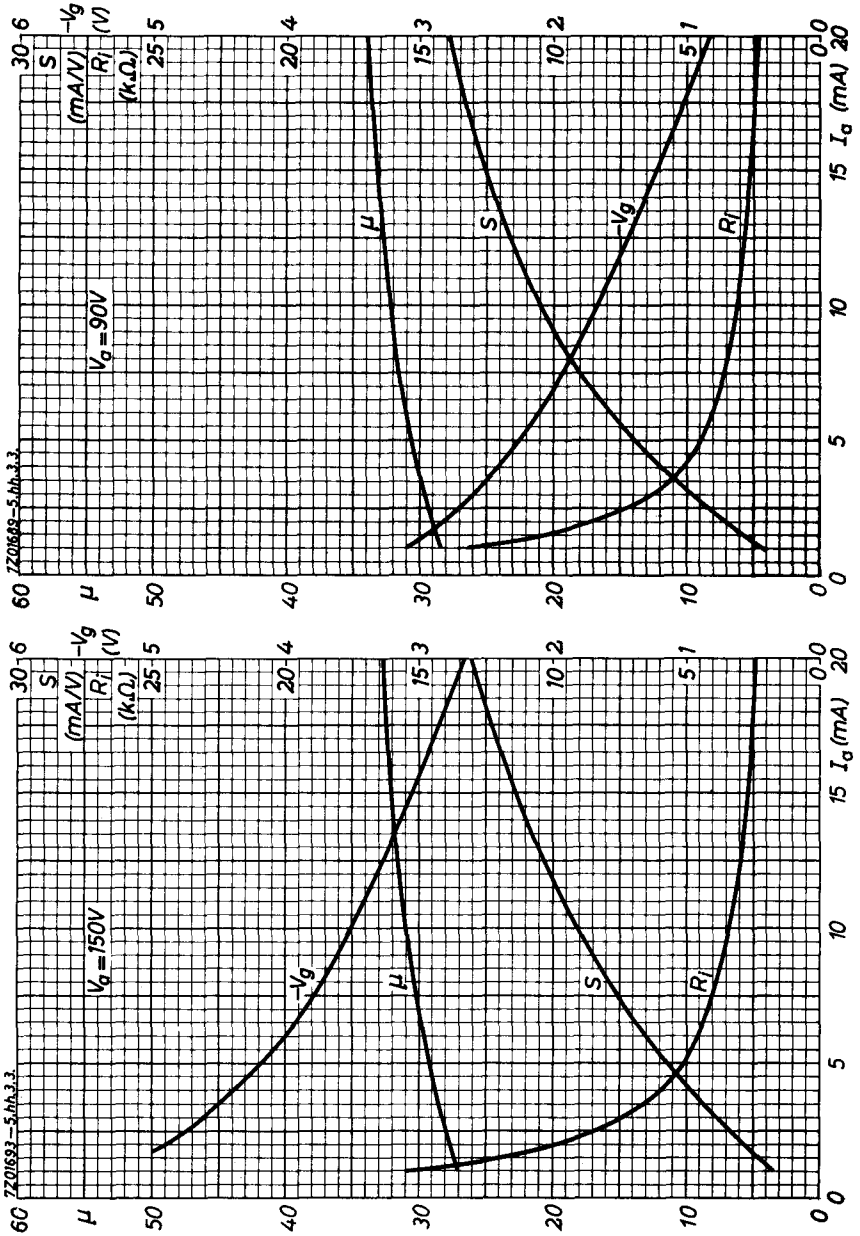


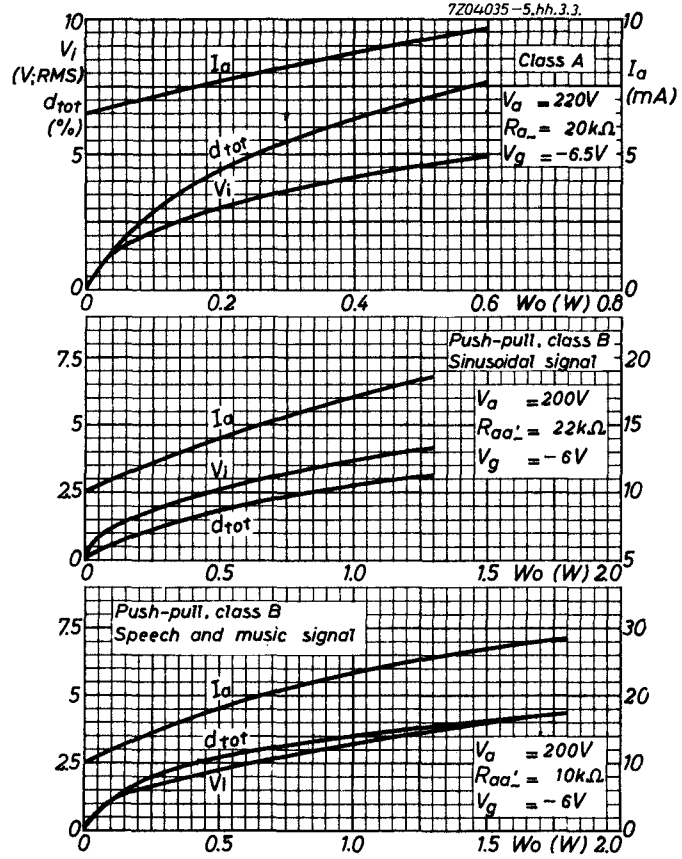
Fig.1

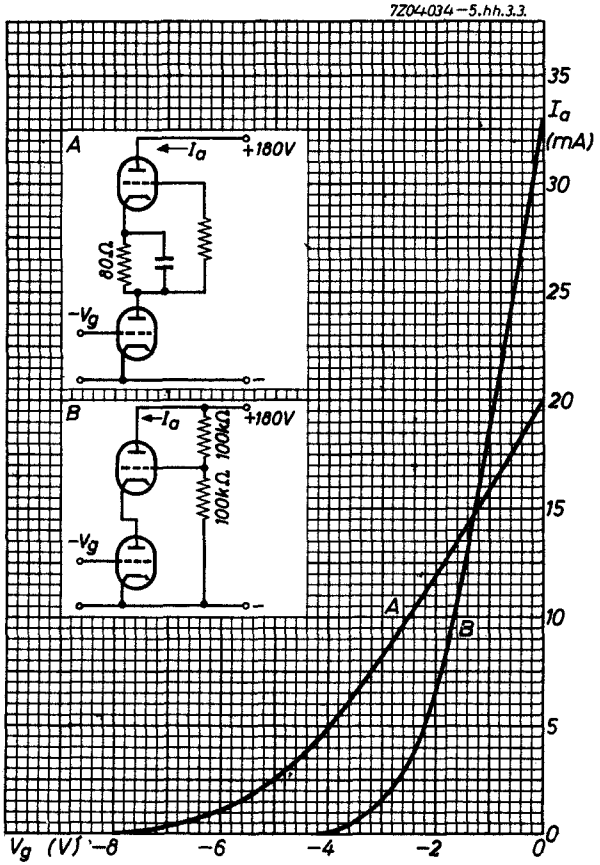

7Z04429
100
I_a
(mA)
80
60
40
20
0
V_a = 250V
200V
150V
100V
50V
V_g (V) −10
−5
0
5


V_g = 4V 3V 2V 1V 0V −1V −2V −3V
−4V
−5V
−6V
−7V
−8V
−9V
−10V
I_a (mA)
100
80
60
40
20
0
0 50 100 150 200 250 300 V_a (V) 350
7Z04430


7Z01254
E88CC
V_g = 0V −1V −2V −3V −4V −5V −6V −7V
−8V
−9V
−10V
I_a (mA)
20
15
10
5
0
0 50 100 150 200 250 V_a (V) 300


ZZ01693-5.bb.3.3
V_a = 150V
μ
S (mA/V)
R_i (kΩ)
$-V_g$ (V)
I_a (mA)
ZZ01693-5.bb.3.3
V_a = 90V
μ
S (mA/V)
R_i (kΩ)
$-V_g$ (V)
I_a (mA)


7Z04035-5.hh.3.3.
Class A
Va = 220V
Ra~ = 20kΩ
Vg = -6.5V
Vi (V;RMS)
dtot (%)
Ia (mA)
Wo (W)
Push-pull, class B
Sinusoidal signal
Va = 200V
Raa' = 22kΩ
Vg = -6V
Push-pull, class B
Speech and music signal
Va = 200V
Raa' = 10kΩ
Vg = -6V


7Z04034-5.hh.3.3.
A
I_a
+180V
80Ω
$-V_g$
B
I_a
+180V
100kΩ
100kΩ
$-V_g$
35
I_a
(mA)
30
25
20
15
10
5
0
A
B
V_g (V)
-8
-6
-4
-2
0

PHILIPS

Data handbook

Electronic components and materials

E88CC

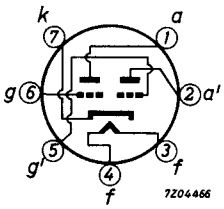
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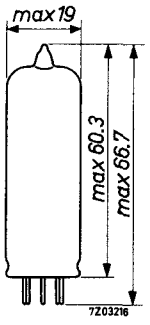
S.Q. TUBE

Special quality double triode designed for use in computer circuits.

QUICK REFERENCE DATA		
Life expectancy	10 000 hours	
Low interface resistance		
Base	Miniature, 7 pin	
Heating	Direct A.C. or D.C. Series or parallel supply	
Heater voltage	V_f	6.3 V
Heater current	I_f	400 mA

DIMENSIONS AND CONNECTIONS Dimensions in mm





CHARACTERISTICS

Column I Nominal value or setting of the tube
II Range values for equipment design: Initial spread
III Range values for equipment design: End of life

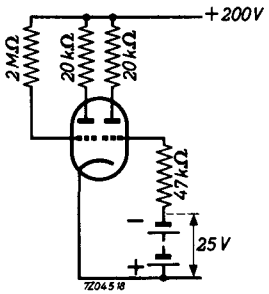
		I	II	III	
Heater voltage	V_f	6.3			V
Heater current	I_f	400	380 - 420		mA
Anode voltage	V_a	100			V
Negative grid voltage	$-V_g$	2.1			V
Anode current	I_a	8.5	4.5 - 12.5		mA
Mutual conductance	S	6.0			mA/V
Amplification factor	μ	27			
Anode voltage	V_a	100			V
Cathode resistor	R_k	250			Ω
Mutual conductance	S	6.0	4.5 - 7.5	min. 3.0	mA/V
Negative grid current	$-I_{g_1}$		max. 0.2	max. 1.0	μA
Anode supply voltage	V_{ba}	150			V
Anode resistor	R_a	20			kΩ
Grid resistor	R_g	47			kΩ
Anode current	I_a	5.6	5.0 - 6.2	min. 4.5	mA
Grid supply voltage	V_{bg}	0			V
Anode current	I_a		max. 0.1	max. 0.1	mA
Grid supply voltage	$-V_{bg}$	10			V
Difference in grid voltage of two sections	$\lvert V_g - V_g' \rvert$		max. 2	max. 2	V
Anode current	$I_a = I_a'$	0.1			V
Leakage current between cathode and heater	I_{kf}		max. 15	max. 30	μA
Voltage between cathode and heater	V_{kf}	100			V
Insulation between two electrodes	R_{ins}		min. 100	min. 20	MΩ
Voltage between electrodes	V	300			V

CAPACITANCES Each system if applicable.

		I	II	
Anode to cathode and heater	$C_{a/kf}$	0.35	0.25 - 0.45	pF
	$C_{a'/k'f}$	0.4	0.3 - 0.5	pF
Grid to cathode and heater	$C_{g/kf}$	3.4	2.9 - 3.9	pF
Anode to grid	C_{ag}	2.5	2.0 - 3.0	pF
Grid to heater	C_{gf}		max. 0.15	pF
	$C_{g'f}$		max. 0.3	pF
Anode to anode other section	$C_{aa'}$		max. 1.4	pF
Grid to grid other section	$C_{gg'}$		max. 0.22	pF
Anode to grid other section	$C_{ag'}$		max. 0.35	pF
Grid to anode other section	$C_{ga'}$		max. 0.15	pF
Cathode to heater	C_{kf}	6.5		pF

LIFE

Production samples are tested to be within the end of life values (column III) under the following conditions during 10 000 hours:



I_a = 8 mA

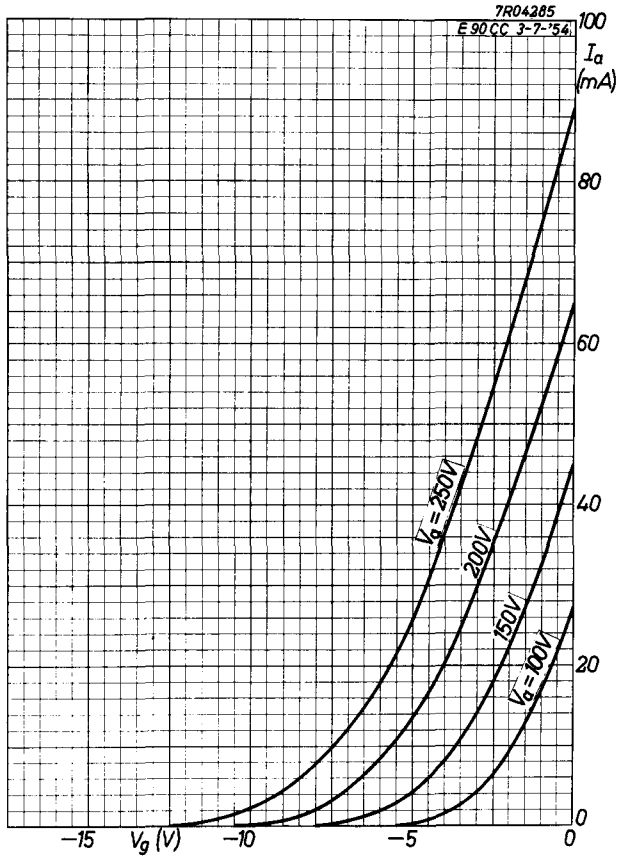
$I_{a'}$ = 0 mA

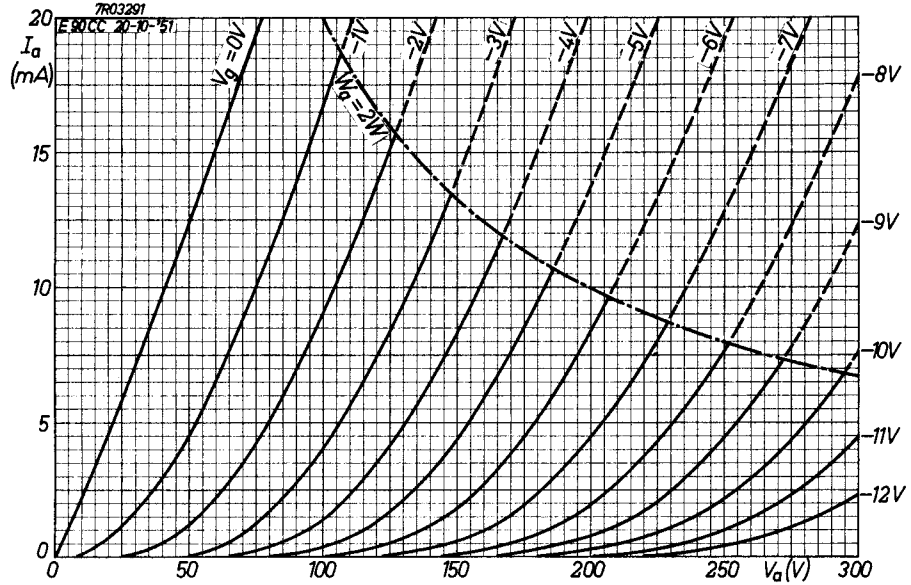
V_{kf} = 100 V (k pos)

LIMITING VALUES (Absolute max. rating system)

Anode voltage	V_{a_o}	max.	600	V
	V_a	max.	300	V
Anode dissipation	W_a	max.	2.0	W
Grid voltage	$+V_g$	max.	0	V
	$-V_g$	max.	100	V
Grid peak voltage	$-V_{g_p}$	max.	200	V
Grid current	I_g	max.	250	μA
Grid, peak current max. pulse duration 2.5 msec	I_{g_p}	max.	1	mA
Cathode current	I_k	max.	15	mA
Cathode peak current max. pulse duration 2 msec	I_{k_p}	max.	75	mA
Voltage between cathode and heater	V_{kf}	max.	100	V
Grid resistor, automatic bias	R_g	max.	1	MΩ
fixed bias	R_g	max.	0.5	MΩ
Bulb temperature	t_{bulb}	max.	170	°C

Heater voltage: The average heater should be 6.3 V.
Variations of the heater voltage exceeding the range of 6.0 V to 6.6 V will shorten the tube life.
The tolerance of heater current (column II) should be taken into account.


7R04285
E 90 CC 3-7-'54
100
I_a
(mA)
80
60
40
20
0
V_g = 250V
200V
150V
V_g = 100V
−15
V_g (V)
−10
−5
0


7R03291
E90CC 20-10-'51
I_a (mA)
20
15
10
5
0
0
50
100
150
200
250
V_a(V)
300
V_g=0V
-1V
-2V
-3V
-4V
-5V
-6V
-7V
-8V
-9V
-10V
-11V
-12V
W_a=2W

PHILIPS

Data handbook

PHILIPS Electronic components and materials

E90CC

page	sheet	date
1	1	1968.12
2	2	1968.12
3	3	1968.12
4	4	1968.12
5	5	1968.12
6	6	1968.12
7	FP	2000.11.24

Shock and vibration resistant SPECIAL QUALITY sharp cut-off R.F. PENTODE for use in industrial and mobile equipment
Heater voltage variations of ± 20 % are allowed during short periods

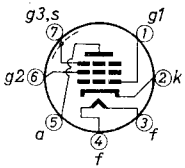
PENTHODE H.F. À HAUTE SÉCURITÉ à pente constante et résistante aux chocs et vibrations pour l'utilisation dans des équipements industriels et mobiles
Des variations de la tension de chauffage de ± 20 % et de courte durée sont permises

Stoss- und vibrationsfeste ZUVERLÄSSIGE HF-PENTODE mit konstanter Steilheit zur Verwendung in industriellen und mobilen Anlagen
Heizspannungsschwankungen von ± 20 % und kurzer Dauer sind zulässig

Heating : indirect by A.C. or D.C.; series or parallel supply
Chauffage: indirect par C.A. ou C.C. alimentation série ou parallèle
Heizung : indirekt durch Wechsel- oder Gleichstrom; Serien- oder Parallelspeisung

$V_f = 6{,}3$ V [1)]
$I_f = 150$ mA

Dimensions in mm
Dimensions en mm
Abmessungen in mm



Base, culot, Sockel: Miniature

[1)] Heater voltage variations of ± 20 % are allowed during short periods
Des variations de la tension de chauffage de ± 20 % et de courte durée sont permises
Heizspannungsschwankungen von ± 20 % und kurzer Dauer sind zulässig

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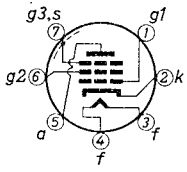
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V_f = 6,3 V [1)]
I_f = 150 mA

Dimensions in mm
Dimensions en mm
Abmessungen in mm



Base, culot, Sockel: Miniature

[1)] Heater voltage variations of ± 20 % are allowed during short periods
Des variations de la tension de chauffage de ± 20 % et de courte durée sont permises
Heizspannungsschwankungen von ± 20 % und kurzer Dauer sind zulässig

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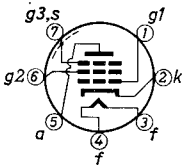
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Heating : indirect by A.C. or D.C.; series or parallel supply
Chauffage: indirect par C.A. ou C.C. alimentation série ou parallèle
Heizung : indirekt durch Wechsel- oder Gleichstrom; Serien- oder Parallelspeisung

$V_f = 6{,}3$ V [1)]
$I_f = 150$ mA

Dimensions in mm
Dimensions en mm
Abmessungen in mm



Base, culot, Sockel: Miniature

[1)] Heater voltage variations of ± 20 % are allowed during short periods
Des variations de la tension de chauffage de ± 20 % et de courte durée sont permises
Heizspannungsschwankungen von ± 20 % und kurzer Dauer sind zulässig

Characteristics(each triode)
Caractéristiques (chaque triode)
Kenndaten (jede Triode)

Column I: Setting of the triode and typical (average) measuring results of new tubes
II: Characteristic range values for equipment design
III: Data indicating the endpoint of life
Colonne I: Valeurs pour le réglage de la triode et les résultats moyens de mesures de tubes neufs
II: Gamme de valeurs caractéristiques pour l'étude d'équipements
III: Valeurs déterminant la fin de durée de vie
Spalte I: Einstelldaten der Triode und mittlere Messergebnisse neuer Röhren
II: Charakteristischer Wertbereich für Gerätentwurf
III: Werte die das Ende der Lebensdauer bestimmen

		I	II			I	II	III	
C_a [1]	=	4,4	3,8-5,0	pF	V_f	=	6,3		V
C_{g_1} [1]	=	5,2	4,6-5,8	pF	I_f	=	150	142-158	142-158 mA
C_{ag_1} [1]	=		<0,0035	pF					
					V_{ba}	=	250		V
V_{ba}	=	250		V	V_{g_3}	=	0		V
V_{g_3}	=	0		V	V_{bg_2}	=	150		V
V_{g_2}	=	150		V	R_k	=	100		Ω
V_{g_1}	=	-8,5		V	I_a	=	7,4	5,4-9,4	4,6 mA
R_a	=	0,25		MΩ	I_{g_2}	=	2,9	2,2-3,6	mA
I_a			< 35	µA	S	=	4,6	3,5-5,7	3,2mA/V
					$\mu_{g_2g_1}$	=	48		
V_{ba}	=	250		V	R_i	=	1,3		MΩ
V_{g_3}	=	0		V	R_{eq}	=	2,5		kΩ
V_{g_2}	=	150		V					
I_a	=	10		µA	V_{ba}	=	250		V
V_{g_1}	=	-7,7		V	V_{g_3}	=	0		V
					V_{bg_2}	=	150		V
V_f	=	5,0		V	V_{bg_1}	=	-0,5		V
V_{ba}	=	250		V	R_k	=	100		Ω
V_{g_3}	=	0		V	R_{g_1}	=	0,5		MΩ
V_{bg_2}	=	150		V	$-I_{g_1}$	=		< 0,2	0,5 µA
R_k	=	100		Ω					
S	=	3,6		mA/V	V_{kf}	=	100		V
					R [2]	=	1		MΩ
					I_{kf}	=		< 15	15 µA
					V [3]	=	300		V
					R_{isol} [3]	=		> 100	50 MΩ

Remark : Circuit operation with cathode bias is recommended
Observation: Utilisation avec polarisation négative par résistance cathodique est recommandée
Bemerkung : Betrieb mit negativer Vorspannung mittels Katodenwiderstandes wird empfohlen

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[1])[2])[3]) See page 5; voir page 5; siehe Seite5

Characteristics
Caractéristiques
Kenndaten

Column I: Setting of the tube and typical (average) measuring results of new tubes
II: Characteristic range values for equipment design
III: Data indicating the endpoint of life
Colonne I: Valeurs pour le réglage du tube et les résultats moyens de mesures de tubes neufs
II: Gamme de valeurs caractéristiques pour l'étude d'équipements
III: Valeurs déterminant la fin de durée de vie
Spalte I: Einstelldaten der Röhre und mittlere Messergebnisse neuer Röhren
II: Charakteristischer Wertbereich für Gerätentwurf
III: Werte die das Ende der Lebensdauer bestimmen

		I	II				I	II	III	
C_a [1]	=	4,2	3,6-4,8	pF	V_f	=	6,3			V
C_{g_1} [1]	=	5,0	4,4-5,6	pF	I_f	=	150	142-158	142-158	mA
C_{ag_1} [1]	=		<0,0035	pF						
					V_{ba}	=	250			V
V_{ba}	=	250		V	V_{g_3}	=	0			V
V_{g_3}	=	0		V	V_{bg_2}	=	150			V
V_{g_2}	=	150		V	R_k	=	100			Ω
V_{g_1}	=	-8,5		V	I_a	=	7,4	5,4-9,4	4,6	mA
Ra	=	0,25		MΩ	I_{g_2}	=	2,9	2,2-3,6		mA
Ia			< 35	µA	S	=	4,6	3,5-5,7	3,2	mA/V
					$\mu_{g_2g_1}$	=	48			
V_{ba}	=	250		V	R_i	=	1,3			MΩ
V_{g_3}	=	0		V	R_{eq}	=	2,5			kΩ
V_{g_2}	=	150		V						
Ia	=	10		µA	V_{ba}	=	250			V
V_{g_1}	=	-6,5		V	V_{g_3}	=	0			V
					V_{bg_2}	=	150			V
V_f	=	5,0		V	V_{bg_1}	=	-0,5			V
V_{ba}	=	250		V	R_k	=	100			Ω
V_{g_3}	=	0		V	R_{g_1}	=	0,5			MΩ
V_{bg_2}	=	150		V	$-I_{g_1}$	=		< 0,2	0,5	µA
R_k	=	100		Ω						
S	=	4,0		mA/V	V_{kf}	=	100			V
					R_{kf} [2]	=	1			MΩ
					I_{kf}	=		< 15	15	µA
					$V_{}$ [3]	=	300			V
					R_{isol} [3]	=		> 100	50	MΩ

Remark : Circuit operation with cathode bias is recommended
Observation: Utilisation avec polarisation négative par résistance cathodique est recommandée
Bemerkung : Betrieb mit negativer Vorspannung mittels Katodenwiderstandes wird empfohlen

---

[1] [2] [3] See page 5; voir page 5; siehe Seite 5

Characteristics
Caractéristiques
Kenndaten

Column I: Setting of the tube and typical (average) measuring results of new tubes
II: Characteristic range values for equipment design
III: Data indicating the endpoint of life
Colonne I: Valeurs pour le réglage du tube et les résultats moyens de mesures de tubes neufs
II: Gamme de valeurs caractéristiques pour l'étude d'équipements
III: Valeurs déterminant la fin de durée de vie
Spalte I: Einstelldaten der Röhre und mittlere Messergebnisse neuer Röhren
II: Charakteristischer Wertbereich für Gerätentwurf
III: Werte die das Ende der Lebensdauer bestimmen

		I	II			I	II	III	
C_a [1]	=	4,2	3,6-4,8	pF	V_f	=	6,3		V
C_{g_1} [1]	=	5,0	4,4-5,6	pF	I_f	=	150	142-158	142-158 mA
C_{ag_1} [1]	=		<0,0035	pF					
					V_{ba}	=	250		V
V_{ba}	=	250		V	V_{g_3}	=	0		V
V_{g_3}	=	0		V	V_{bg_2}	=	150		V
V_{g_2}	=	150		V	R_k	=	100		Ω
V_{g_1}	=	-8,5		V	I_a	=	7,4	5,4-9,4	4,6 mA
R_a	=	0,25		MΩ	I_{g_2}	=	2,9	2,2-3,6	mA
I_a			< 35	µA	S	=	4,6	3,5-5,7	3,2mA/V
					$\mu_{g_2g_1}$	=	48		
V_{ba}	=	250		V	R_i	=	1,0		MΩ ←
V_{g_3}	=	0		V	R_{eq}	=	2,5		kΩ
V_{g_2}	=	150		V					
I_a	=	10		µA	V_{ba}	=	250		V
V_{g_1}	=	-6,5		V	V_{g_3}	=	0		V
					V_{bg_2}	=	150		V
V_f	=	5,0		V	V_{bg_1}	=	-0,5		V
V_{ba}	=	250		V	R_k	=	100		Ω
V_{g_3}	=	0		V	R_{g_1}	=	0,5		MΩ
V_{bg_2}	=	150		V	$-I_{g_1}$	=		< 0,2	0,5 µA
R_k	=	100		Ω					
S	=	4,0		mA/V	V_{kf}	=	100		V
					R [2]	=	1		MΩ
					I_{kf}	=		< 15	15 µA
					V [3]	=	300		V
					R_{isol} [3]	=		> 100	50 MΩ

Remark : Circuit operation with cathode bias is recommended
Observation: Utilisation avec polarisation négative par résistance cathodique est recommandée
Bemerkung : Betrieb mit negativer Vorspannung mittels Katodenwiderstandes wird empfohlen

[1] [2] [3] See page 5; voir page 5; siehe Seite5

Life expectancy: 1000 hours under the following life-test conditions:
Durée prévue : 1000 heures sous les conditions d'essai de durée suivantes:
Erwartete Lebensdauer: 1000 Stunden unter folgenden Bedingungen einer Lebensdauerprobe:

V_f	= 6,3 V	R_k	= 100 Ω
V_{ba}	= 250 V	R_{g1}	= 500 kΩ
V_{g3}	= 0 V	V_{kf} (k neg)	= 135 V [4]
V_{bg2}	= 150 V		

The data indicating the endpoint of life are given in column III under the heading Characteristics
Les valeurs déterminant la fin de la durée sont données dans la colonne III des Caractéristiques
Die Werte die das Ende der Lebensdauer bestimmen sind angegeben worden in Spalte III der Kenndaten

Shock resistance: about 450 g [5]
Forces as applied by the NRL impact machine for electronic devices caused by 5 blows of the hammer, lifted over an angle of 30° in each of four different positions of the tube

Vibration resistance: 2.5 g [5]
Vibrational forces for a period of 32 hours at a frequency of 25 c/s in each of 3 positions of the tube

Résistance aux chocs: environ 450 g [5]
Des forces telles que celles appliquées par la machine à chocs NRL pour dispositifs électroniques, produites par 5 coups du marteau, soulevé d'un angle de 30° dans chacune de quatre positions différentes du tube

Résistance aux vibrations: 2,5 g [5]
Des forces de vibration pendant une période de 32 heures à une fréquence de 25 Hz dans chacune de trois positions du tube

Stossfestigkeit: etwa 450 g [5]
Stossbeschleunigungen gemäss NRL-Stossmaschine für elektronische Geräte, verursacht durch 5 Schläge des Hammers, der in jeder von vier verschiedenen Stellungen der Röhre über einen Winkel von 30° gehoben wird

Vibrationsfestigkeit: 2,5 g [5]
Vibrationskräfte während einer Periode von 32 Stunden bei einer Frequenz von 25 Hz in jeder von 3 Stellungen der Röhre

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[4][5] See page 5 ; voir page 5 ; siehe Seite 5

Life expectancy: 1000 hours under the following life-test conditions:
Durée prévue : 1000 heures sous les conditions d'essai de durée suivantes:
Erwartete Lebensdauer: 1000 Stunden unter folgenden Bedingungen einer Lebensdauerprobe:

V_f	= 6,3 V	R_k	= 100 Ω
V_{ba}	= 250 V	R_{g1}	= 500 kΩ
V_{g3}	= 0 V	V_{kf} (k neg)	= 135 V [4]
V_{bg2}	= 150 V		

The data indicating the endpoint of life are given in column III under the heading Characteristics
Les valeurs déterminant la fin de la durée sont données dans la colonne III des Caractéristiques
Die Werte die das Ende der Lebensdauer bestimmen sind angegeben worden in Spalte III der Kenndaten

Shock resistance: about 500 g [5]
Forces as applied by the NRL impact machine for electronic devices caused by 5 blows of the hammer, lifted over an angle of 30° in each of four different positions of the tube

Vibration resistance: 2.5 g [5]
Vibrational forces for a period of 32 hours at a frequency of 25 c/s in each of 3 positions of the tube

Résistance aux chocs: environ 500 g [5]
Des forces telles que celles appliquées par la machine à chocs NRL pour dispositifs électroniques, produites par 5 coups du marteau, soulevé d'un angle de 30° dans chacune de quatre positions différentes du tube

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Vibrationskräfte während einer Periode von 32 Stunden bei einer Frequenz von 25 Hz in jeder von 3 Stellungen der Röhre

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[4])[5]) See page 5 ; voir page 5 ; siehe Seite 5

Vibrational noise output
Tension de sortie de souffle par vibrations
Vibrations-Störausgangsspannung

V_{ba}	= 250 V	R_a	= 2 kΩ
V_{bg2}	= 150 V	R_k	= 100 Ω
V_{g3}	= 0 V	C_k	= 1000 µF

Vibrational acceleration
Accélération de vibration = 2,5 g
Schwingungsbeschleunigung

Frequency of vibration
Fréquence de vibration = 25 c/s
Schwingungsfrequenz

Noise output
Tension de sortie de souffle = max. 100 mV_{eff}
Störausgangsspannung

Limiting values (Absolute limits)
Caractéristiques limites (Limites absolues)
Grenzdaten (Absolute Grenzwerte)

V_{a_o}	= max. 600 V	$+V_{g1}$	= max. 0 V
V_a	= max. 330 V	$-V_{g1}$	= max. 55 V
W_a	= max. 2,6 W	I_k	= max. 15 mA
V_{g2_o}	= max. 600 V	V_{kf}	= max. 100 V
V_{g2} / W_{g2}	See page E / Voir page E / Siehe Seite E	t_{bulb}	= max. 140 °C [1]

Max. circuit values (Absolute limits)
Valeurs max. des éléments de montage (Limites absolues)
Max. Werte der Schaltungsteile (Absolute Grenzwerte)

R_{g1} fixed bias / en polarisation fixe / mit fester Gittervorspannung = max. 0,5 MΩ

R_{g1} automatic bias / en polarisation automatique / mit automatischer Gittervorspannung = max. 1 MΩ

[1]) Tube life and reliability of performance will be enhanced by operation at lower temperature
La durée de vie et la sécurité de fonctionnement seront augmentées par opération à des températures plus basses
Lebensdauer und Betriebssicherheit werden durch Betrieb bei niedrigeren Temperaturen verbessert

Vibrational noise output
Tension de sortie de souffle par vibrations
Vibrations-Störausgangsspannung

V_{ba}	= 250 V	R_a	= 2 kΩ
V_{bg2}	= 150 V	R_k	= 100 Ω
V_{g3}	= 0 V	C_k	= 1000 µF

Vibrational acceleration
Accélération de vibration = 2,5 g
Schwingungsbeschleunigung

Frequency of vibration
Fréquence de vibration = 25 c/s
Schwingungsfrequenz

Noise output
Tension de sortie de souffle = max. 100 mV_{eff}
Störausgangsspannung

Limiting values (Absolute limits)
Caractéristiques limites (Limites absolues)
Grenzdaten (Absolute Grenzwerte)

Va_o	= max. 600 V	$+V_{g1}$	= max. 0 V
Va	= max. 330 V	$-V_{g1}$	= max. 55 V
Wa	= max. 2,6 W	I_k	= max. 15 mA
$Vg2_o$	= max. 600 V	V_{kf}	= max. 100 V
V_{g2} / W_{g2}	See page E / Voir page E / Siehe Seite E	t_{bulb}	= max. 140 °C [1]

Max. circuit values (Absolute limits)
Valeurs max. des éléments de montage (Limites absolues)
Max. Werte der Schaltungsteile (Absolute Grenzwerte)

R_{g1} fixed bias / en polarisation fixe / mit fester Gittervorspannung = max. 0,5 MΩ

R_{g1} automatic bias / en polarisation automatique / mit automatischer Gittervorspannung = max. 1 MΩ

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[1]) Tube life and reliability of performance will be enhanced by operation at lower temperature
La durée de vie et la sécurité de fonctionnement seront augmentées par opération à des températures plus basses
Lebensdauer und Betriebssicherheit werden durch Betrieb bei niedrigeren Temperaturen verbessert

→

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[1]) Measured without external shield
Mesuré sans blindage extérieure
Gemessen ohne äussere Abschirmung

[2]) Series resistor
Résistance série
Serienwiderstand

[3]) Voltage and insulation resistance between two arbitrary electrodes
Tension et résistance d'isolement entre deux électrodes quelconques
Spannung und Isolationswiderstand zwischen zwei willkürlichen Elektroden

[4]) The value of 135 V for the heater to cathode voltage should not be interpreted as a suitable operating condition
La valeur de 135 V pour la tension filament-cathode ne sera pas interprétée comme qualifiée pour le fonctionnement du tube
Der Wert von 135 V für die Heizfaden-Katodenspannung soll nicht als eine geeignete Betriebsbedingung betrachtet werden

[5]) These test conditions are only given for evaluation of the ruggedness of the tube. They are by no means to be interpreted as suitable operating conditions
Ces conditions d'essai sont données seulement pour l'évaluation de la robustesse du tube. En aucun manière elles ne doivent être interprétées comme des conditions de fonctionnement normales
Diese Prüfbedingungen dienen lediglich zur Beurteilung der Robustheit der Röhre und sind keinesfalls als geeignete Betriebsbedingungen aufzufassen

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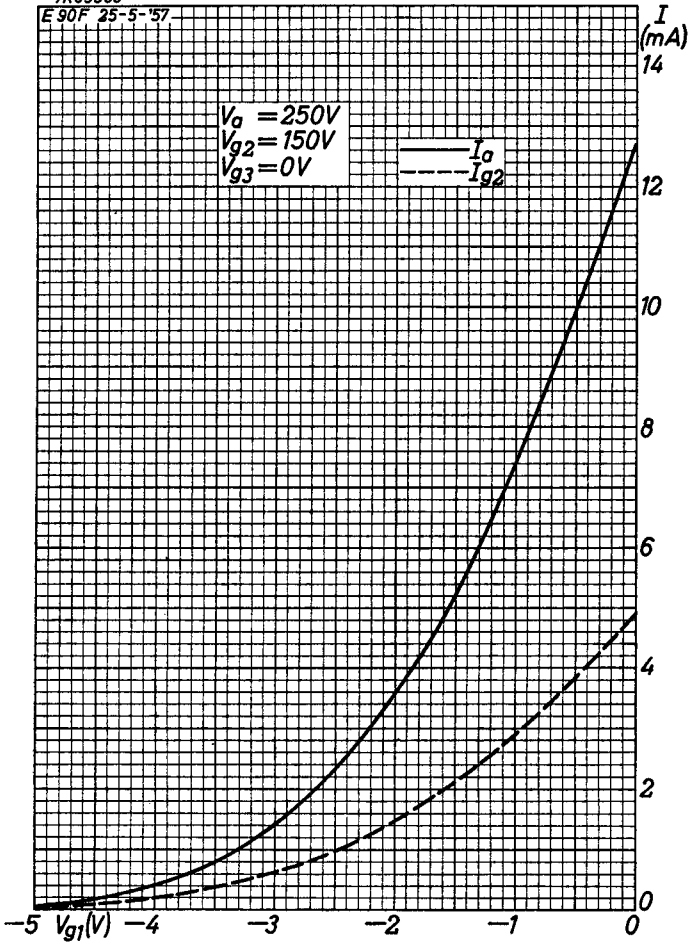
[1]) Measured without external shield
Mesuré sans blindage extérieure
Gemessen ohne äussere Abschirmung

[2]) Series resistor
Résistance série
Serienwiderstand

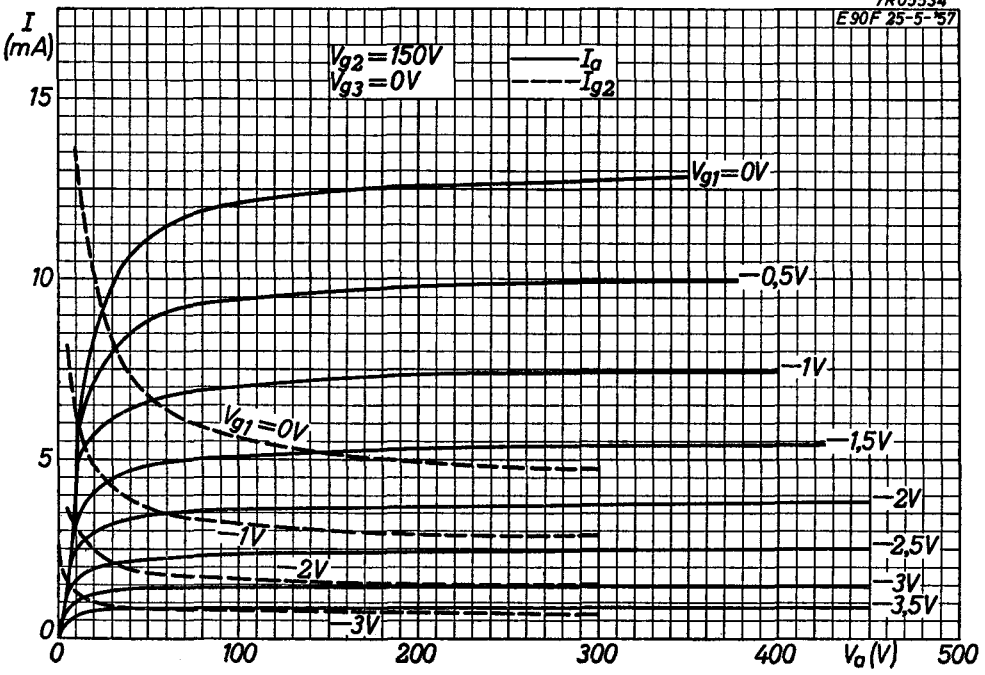
[3]) Voltage and insulation resistance between two arbitrary electrodes
Tension et résistance d'isolement entre deux électrodes quelconques
Spannung und Isolationswiderstand zwischen zwei willkürlichen Elektroden

[4]) The value of 135 V for the heater to cathode voltage should not be interpreted as a suitable operating condition
La valeur de 135 V pour la tension filament-cathode ne sera pas interprétée comme qualifiée pour le fonctionnement du tube
Der Wert von 135 V für die Heizfaden-Katodenspannung soll nicht als eine geeignete Betriebsbedingung betrachtet werden

[5]) These test conditions are only given for evaluation of the ruggedness of the tube. They are by no means to be interpreted as suitable operating conditions
Ces conditions d'essai sont données seulement pour l'évaluation de la robustesse du tube. En aucun manière elles ne doivent être interprétées comme des conditions de fonctionnement normales
Diese Prüfbedingungen dienen lediglich zur Beurteilung der Robustheit der Röhre und sind keinesfalls als geeignete Betriebsbedingungen aufzufassen

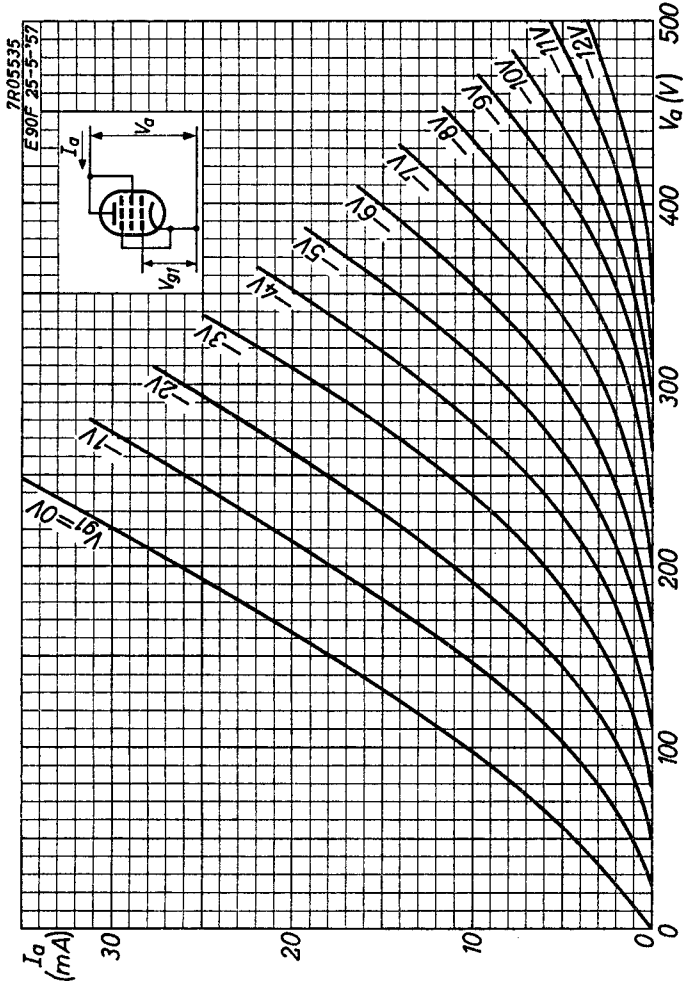

7R05533
E90F 25-5-'57
I (mA)
14
12
10
8
6
4
2
0
V_a = 250V
V_{g2} = 150V
V_{g3} = 0V
I_a
I_{g2}
−5 V_{g1}(V) −4 −3 −2 −1 0

6.6.1957 A

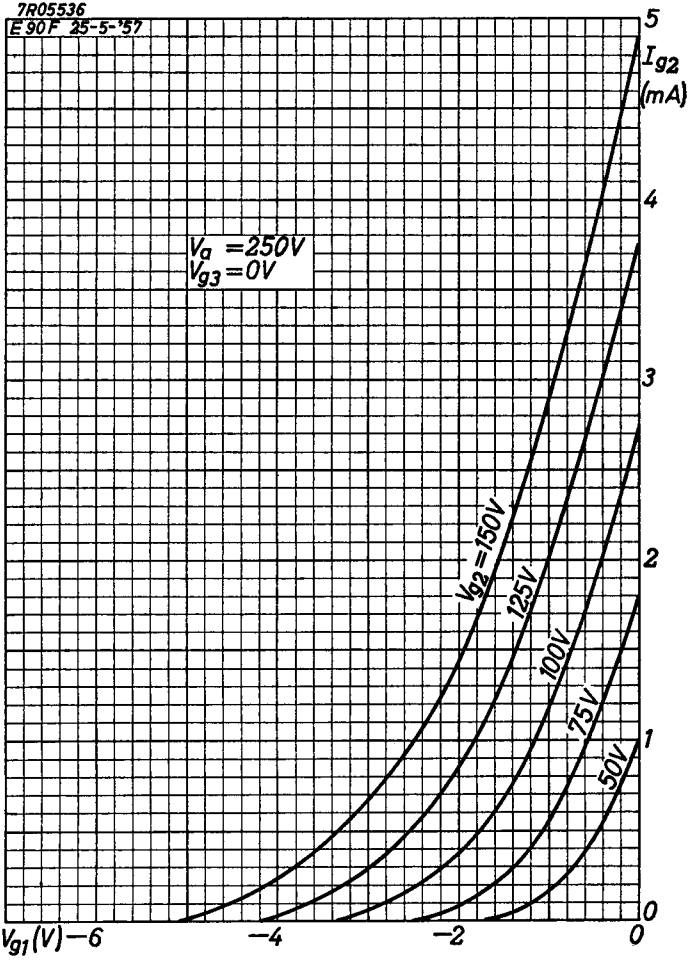

7R05534
E90F 25-5-'57
I
(mA)
15
10
5
0
$V_{g2}=150V$
$V_{g3}=0V$
I_g
I_{g2}
$V_{g1}=0V$
-0,5V
-1V
-1,5V
-2V
-2,5V
-3V
-3,5V
0
100
200
300
400
V_a (V)
500

B

PHILIPS


7R05535
E90F 25-5-'57
Ia
Va
Vg1
Ia (mA)
30
20
10
0
Va (V)
500
400
300
200
100
0
Vg1=0V
-1V
-2V
-3V
-4V
-5V
-6V
-7V
-8V
-9V
-10V
-11V
-12V

E90F **PHILIPS**



D

SQ **PHILIPS** **E90F**

6.6.1957

E



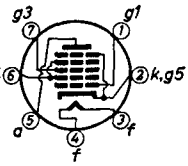
E90F

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12	5	1959.03.03
13	A	1957.06.06
14	B	1957.06.06
15	C	1957.06.06
16	D	1957.06.06
17	E	1957.06.06
18	FP	1999.06.11

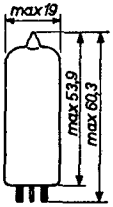
DUAL CONTROL HEPTODE for use in computer circuits
HEPTODE A DOUBLE COMMANDE pour utilisation dans circuits de comptage
DOPPELGESTEUERTE HEPTODE zur Verwendung in Zählschaltungen

Heating : indirect by A.C. or D.C. parallel supply
Chauffage: indirect par C.A. ou C.C. alimentation parallèle
Heizung . indirekt durch Wechsel- oder Gleichstrom; Paral - lelspeisung

$V_f = 6{,}3$ V[1])
$I_f = 270$ mA[2])



Dimensions in mm
Dimensions en mm
Abmessungen in mm



Base, culot, Sockel: MINIATURE

Capacitances (without external shield)
Capacités (sans blindage extérieur)
Kapazitäten (ohne äussere Abschirmung)

C_a	= 7,9 pF	C_{ag1}	< 0,08 pF
C_{g1}	= 5,4 pF	C_{ag3}	< 0,45 pF
C_{g3}	= 7,0 pF	C_{g1g3}	< 0,2 pF

[1]) In order to obtain a prolonged tube life, the maximum variation of V_f should be less than ± 5% (absolute limits)

Afin d'obtenir une vie prolongée du tube, la variation maximum de V_f sera moins de ± 5% (limites absolues)

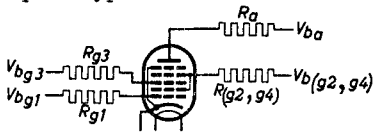
Zur Verlängerung der Lebensdauer der Röhre darf die maximale Heizspannungsschwankung nicht mehr als ± 5% (absolute Werte) betragen

[2]) At $V_f = 6.3$ V the spread of I_f from tube to tube can be ± 14 mA

Pour $V_f = 6{,}3$ V, l'écart de I_f d'un tube à l'autre peut être de ± 14 mA

Bei $V_f = 6{,}3$ V kann die Streuung von I_f der Röhren bis zu ± 14 mA betragen

Typical characteristics
Caractéristiques types
Kenndaten



V_{ba}	=	150	150	150	150 V
$V_{b\ (g2,g4)}$	=	75	75	75	75 V
V_{bg1}	=	0	0	-10	0 V
V_{bg3}	=	0	-10	0	+55 V
R_a	=	20	20	20	- kΩ
$R_{g2,g4}$	=	470	470	470	- Ω
R_{g1}	=	47	47	47	- kΩ
R_{g3}	=	47	47	47	- kΩ
I_a	=	>5,5 <7,0	<0,2	<0,2	- mA
I_{g3}	=	-	-	-	>0 mA

Insulation / Isolement / Isolation (V_f = 6,3 V; V_{kf} = 120 V) r_{kf} = min. 8 MΩ

Inverse grid No.1 and grid No.3 current
Courant inverse des grilles 1 et 3
Negativen Gitterstrom der Gitter 1 und 3

V_{ba}	=	150 V
$V_{b\ (g2,g4)}$	=	75 V
V_{bg1}	=	-1,5 V
V_{bg3}	=	-1,5 V
R_a	=	20 kΩ
$R_{g2,g4}$	=	470 Ω
R_{g1}	=	47 kΩ
R_{g3}	=	47 kΩ
$-I_{g1}$	= max.	0,2 µA
$-I_{g3}$	= max.	0,5 µA

Operating characteristics as mixer
Caractéristiques d'utilisation comme tube mélangeur
Betriebsdaten als Mischröhre

V_a	=	250 V
V_{g2+g4}	=	100 V
V_{g3}	=	-5 V
V_{osc}	=	10 V_{eff} [2]
R_{g1}	=	20 kΩ
I_a	=	3,3 mA
I_{g1}	=	530 µA
I_{g2+g4}	=	6,5 mA
S_c	=	450 µA/V
R_i	=	0,85 MΩ

Limiting values (Absolute limits)
Caractéristiques limites (Limites absolues)
Grenzdaten (Absolutwerte)

V_{ao}	= max. 500 V	W_a	= max. 1,0 W
V_a	= max. 250 V	W_{g2+g4}	= max. 1,0 W
$V_{(g2+g4)o}$	= max. 500 V	W_{g1}	= max. 0,5 W
V_{g2+g4}	= max. 100 V	W_{g3}	= max. 0,5 W
$-V_{g3}$	= max. 100 V	I_k	= max. 20 mA
$+V_{g3}$	= max. 0 V	I_{kp}	= max. 70 mA
$-V_{g3p}$	= max. 200 V	V_{kf}	= max. 120 V
$+V_{g3p}$	= max. 90 V	R_{g1}	= max. 0,5 MΩ [4]
$-V_{g1}$	= max. 100 V	R_{g1}	= max. 1,0 MΩ [5]
$+V_{g1}$	= max. 0 V	R_{g3}	= max. 0,5 MΩ [4]
$-V_{g1p}$	= max. 200 V	R_{g3}	= max. 1,0 MΩ [5]
$+V_{g1p}$	= max. [3]		

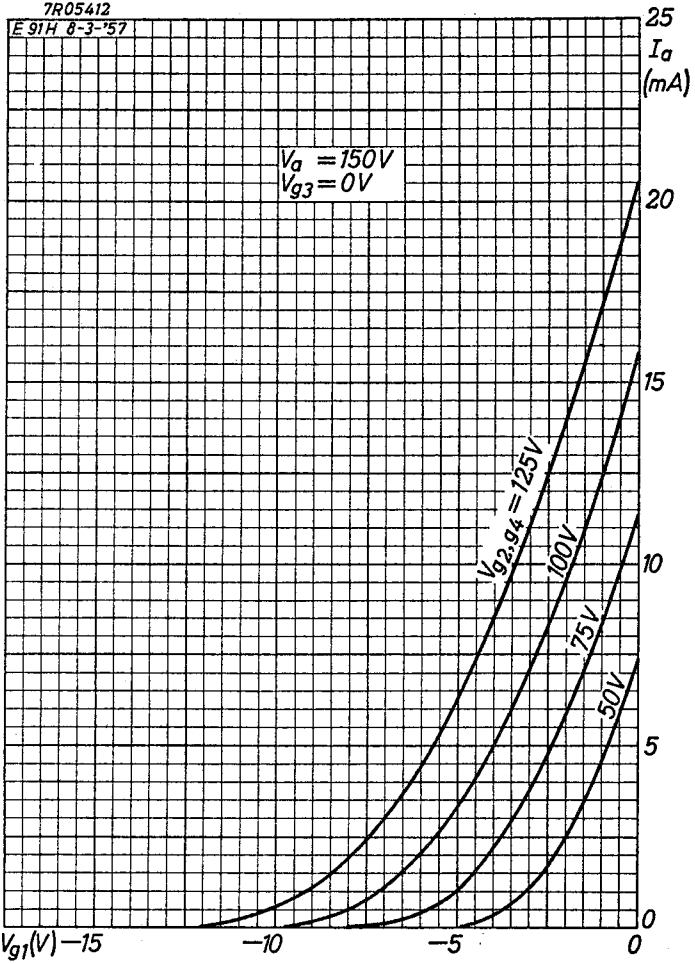
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[2]) Oscillator voltage on g1; signal voltage on g3
Tension d'oscillateur à g1; tension de signal à g3
Oszillatorspannung an g1; Signalspannung an g3

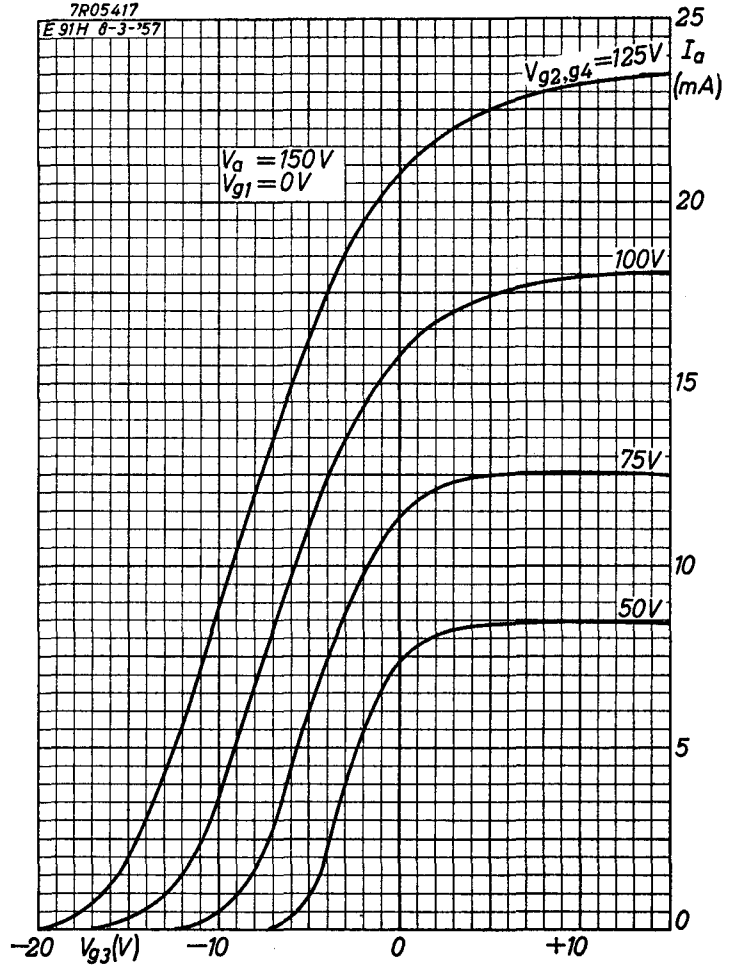
[3]) Limited by I_{kp} and W_{g1}
Limité par I_{kp} et W_{g1}
Begrenzt durch I_{kp} und W_{g1}

[4]) With fixed bias
En polarisation fixe
Mit fester Gittervorspannung

[5]) With automatic grid bias
En polarisation automatique
Mit automatischer Gittervorspannung

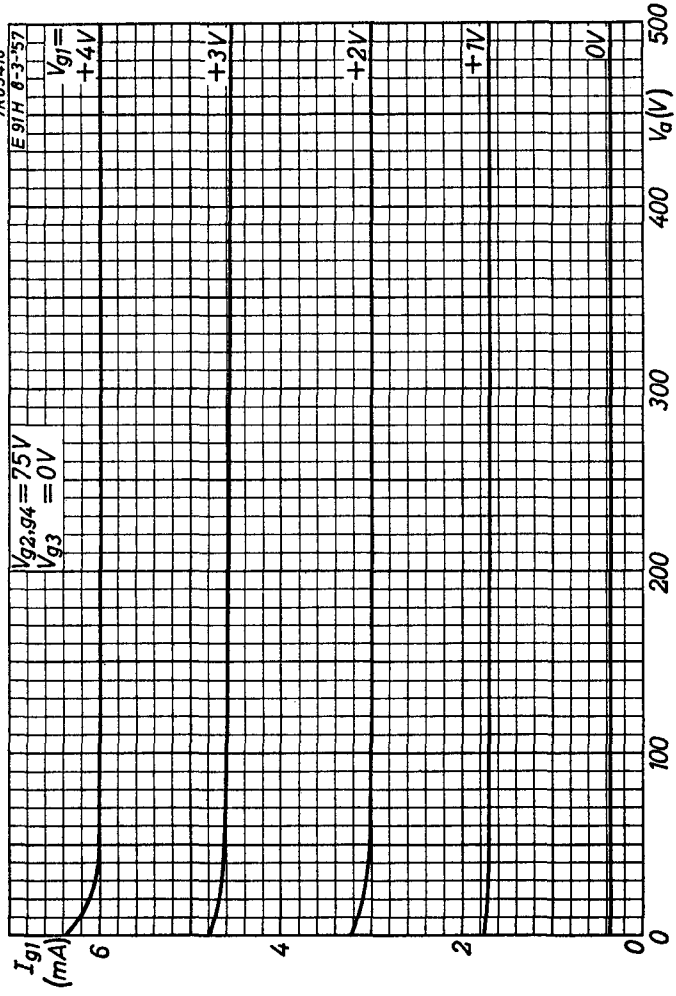

7R05412
E 91H 8-3-'57
I_a (mA)
25
20
15
10
5
0
$V_a = 150V$
$V_{g3} = 0V$
$V_{g2,g4} = 125V$
100V
75V
50V
V_{g1}(V) −15
−10
−5
0

E91H PHILIPS



B

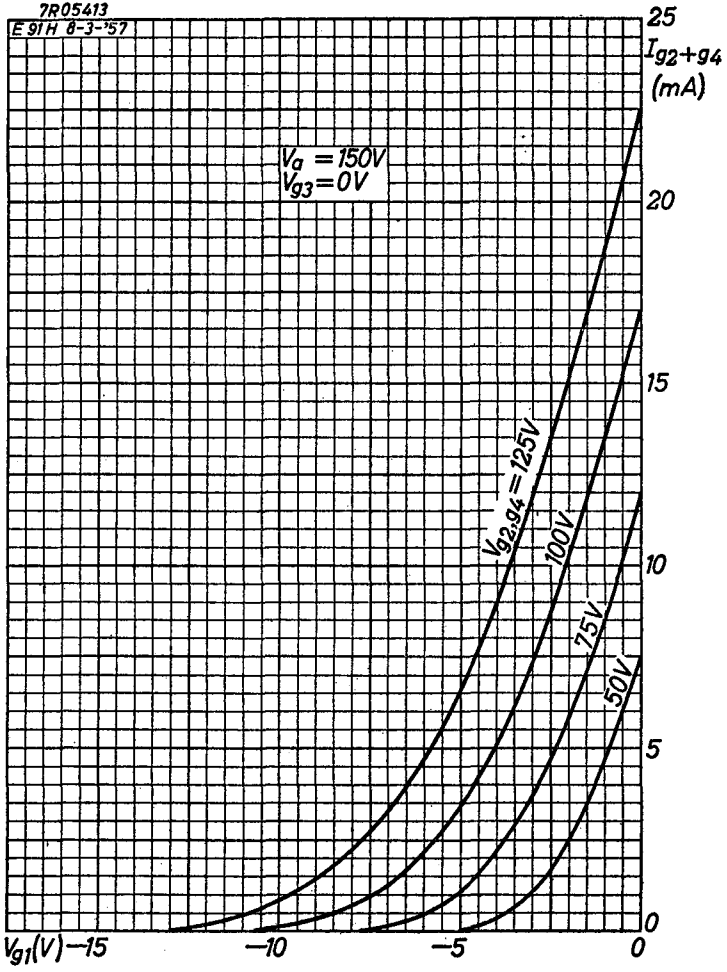
SQ **PHILIPS** **E91H**



6.6.1957

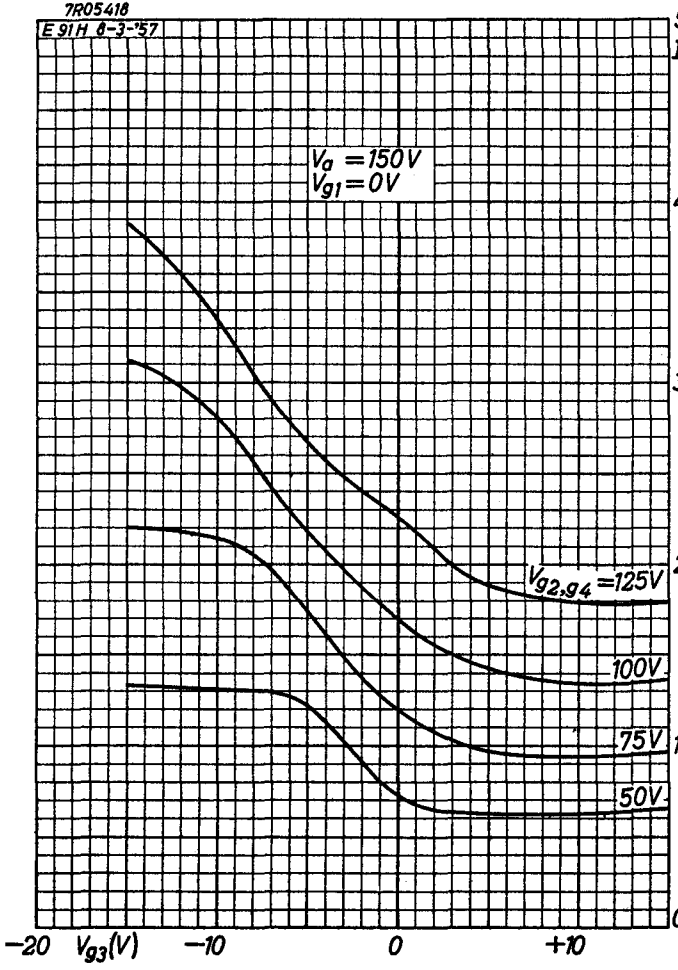
C

E91H PHILIPS



D

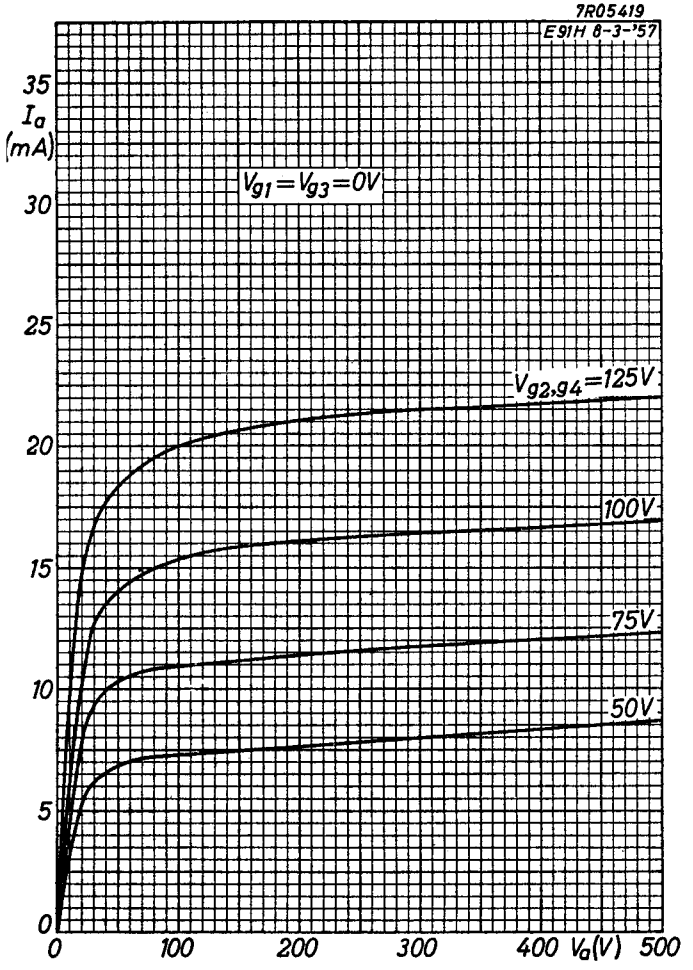
SQ PHILIPS E91H



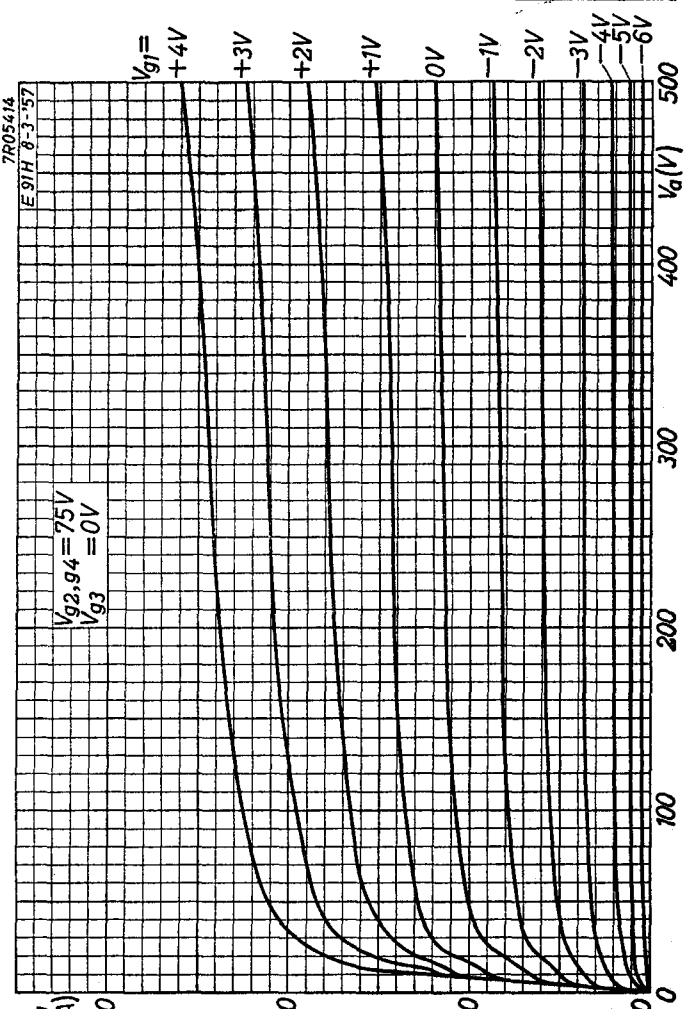
6.6.1957

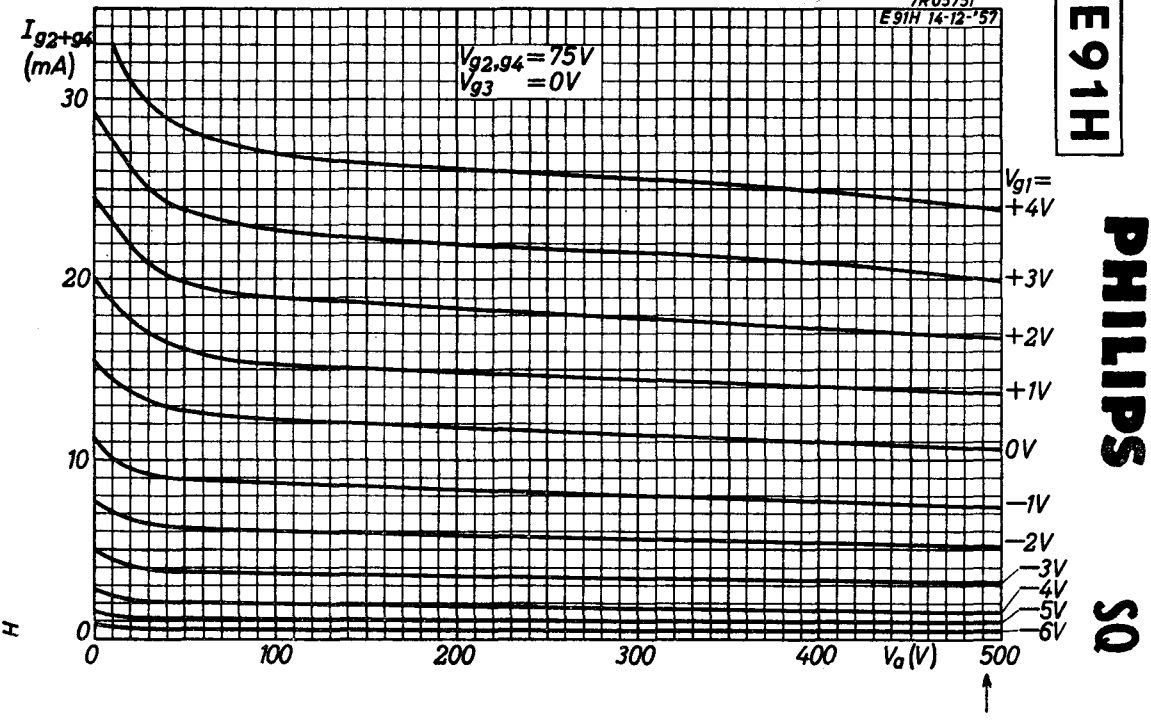
E

E91H PHILIPS

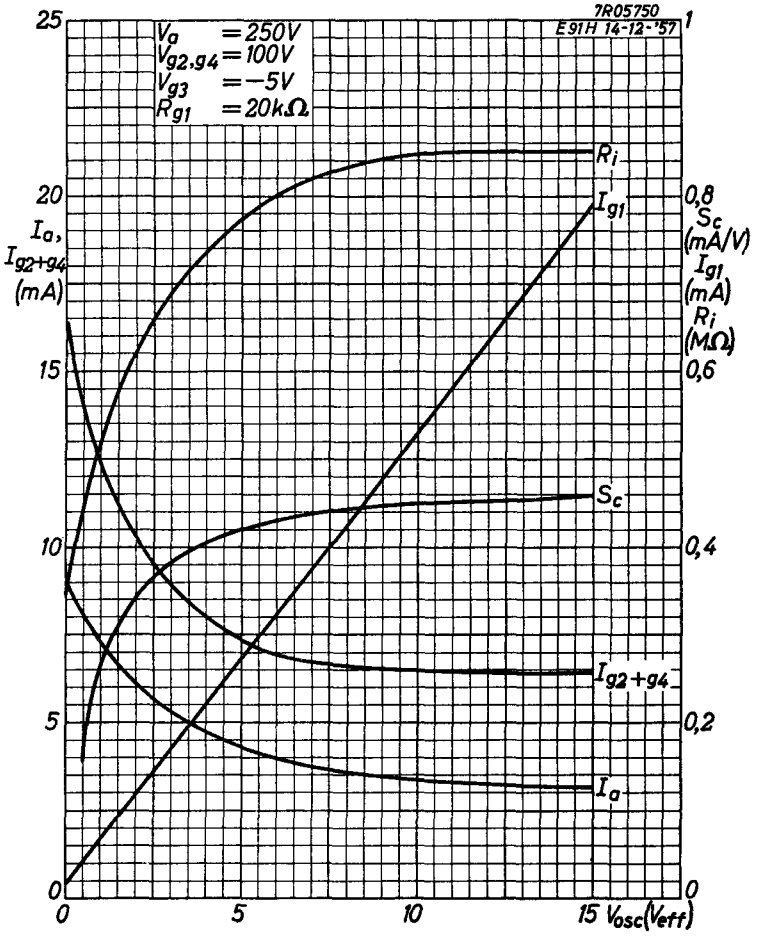


F


7R05414
E91H 8-3-'57
V_{g1}=
+4V
+3V
+2V
+1V
0V
−1V
−2V
−3V
−4V
−5V
−6V
$V_{g2,g4}$=75V
V_{g3} =0V
I_a (mA)
30
20
10
0
0
100
200
300
400
500
V_a(V)


7R05751
E91H 14-12-'57
E91H
PHILIPS
I_{g2+g4} (mA)
$V_{g2,g4}$ = 75V
V_{g3} = 0V
V_{g1} =
+4V
+3V
+2V
+1V
0V
−1V
−2V
−3V
−4V
−5V
−6V
30
20
10
0
0
100
200
300
400
V_a (V)
500
H
SQ

SQ PHILIPS E91H



12.12.1957



E91H

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3	3	1957.12.12
4	A	1957.06.06
5	B	1957.06.06
6	C	1957.06.06
7	D	1957.06.06
8	E	1957.06.06
9	F	1957.06.06
10	G	1957.12.12
11	H	1957.12.12
12	I	1957.12.12
13	FP	1999.06.11

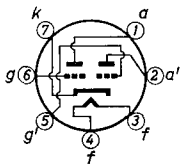
SPECIAL QUALITY LONG LIFE DOUBLE TRIODE for use in computer circuits
DOUBLE TRIODE À HAUTE SÉCURITÉ ET DE LONGUE DURÉE pour utilisation dans des circuits de comptage
ZUVERLÄSSIGE DOPPELTRIODE MIT LANGER LEBENSDAUER zur Verwendung in Rechenmaschinen

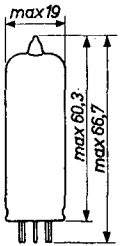
The E 92 CC will maintain its emission capabilities after long periods of operation under cut-off conditions but is not intended to be used in circuits critical as to hum, microphony or noise
Le tube E 92 CC conservera son pouvoir d'émission après de longues périodes de fonctionnement dans la condition de cut-off mais il n'est pas étudié pour les circuits critiques quant à l'effet microfonique, le bruit ou le ronflement
Diese Röhre behält ihre Emissionsfähigkeit auch nach langen Betriebsperioden in gesperrtem Zustand bei; sie ist aber nicht geeignet für Schaltungen die kritisch in Bezug auf Mikrophonie, Rauschen oder Brumm sind

Heating : indirect by A.C. or D.C. parallel supply
Chauffage: indirect par C.A. ou C.C. alimentation parallèle
Heizung : indirekt durch Wechsel- oder Gleichstrom; Parallelspeisung

V_f = 6,3 V
I_f = 400 mA

Dimensions in mm
Dimensions en mm
Abmessungen in mm





Base, culot, Sockel: MINIATURE

Characteristics (each triode)
Caractéristiques (chaque triode)
Kenndaten (jede Triode)

Column I: Setting of the triode and typical (average) measuring results of new tubes
II: Characteristic range values for equipment design
III: Data indicating the endpoint of life

Colonne I: Valeurs pour le réglage de la triode et les resultats moyens de mesures de tubes neufs
II: Gamme de valeurs caractéristiques pour l'étude d'équipements
III: Valeurs déterminant la fin de durée de vie

Spalte I: Einstelldaten der Triode und mittlere Messergebnisse neuer Röhren
II: Charakteristischer Wertbereich für Gerätentwurf
III: Werte die das Ende der Lebensdauer bestimmen

	I	II		I	II	III	
C_a	= 0,32	0,22-0,42	pF	V_f	= 6,3		V
C_g	= 3,1	2,2- 4,0	pF	I_f	= 400	380-420	380-420 mA
C_{ag}	= 2,2	1,8- 2,6	pF				
$C_{a'}$	= 0,38	0,28-0,48	pF	V_a	= 150		V
$C_{g'}$	= 3,1	2,2- 4,0	pF	V_g	= -1,7		V
$C_{a'g'}$	= 2,1	1,7- 2,5	pF	I_a	= 8,5	4,5-12,5	mA
$C_{aa'}$	=	<2,0	pF	$-I_g$	=	<0,2	1 µA
$C_{gg'}$	=	<0,29	pF	S	= 6,0		mA/V
				µ	= 45		
				I [1]	= 5,5	5,1-5,9	4,75 mA
V_a	= 150		V				
R_k	= 200		Ω	V_b	= 150		V
S	= 6,0	4,5- 7,5	mA/V	V_g	= -10		V
				R_a	= 20		kΩ
				R_g	= 47		kΩ
				I_a	=	<0,1	0,1 mA
				$V_b=V_{b'}$	= 150		V
				$R_a=R_{a'}$	= 20		kΩ
				$I_a=I_{a'}$	= 0,1		mA
				$R_g=R_{g'}$	= 47		kΩ
				$\|V_g-V_{g'}\|$	=	<2	2 V
				V_{kf} [2]	= 100		V
				R [3]	= 1		MΩ
				I_{kf}	=	<15	30 µA
				R_{isol} [4]	=	>20	20 MΩ

[1]) See fig.1 page 3
Voir fig.1 page 3
Siehe Abb.1 Seite 3

[2]) Cathode positive
Katode positiv

[3]) Series resistor
Résistance série
Serienwiderstand

[4]) See page 3
Voir page 3
Siehe Seite 3

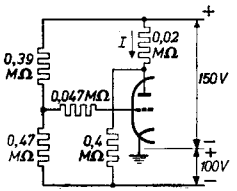
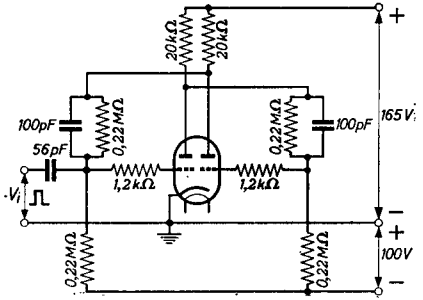


Fig. 1
Abb. 1

Life expectancy: 10 000 hours under the life test conditions according to fig. 2
Durée prévue : 10 000 heures sous les conditions d'un essai de durée selon la fig. 2
Erwartete Lebensdauer: 10 000 Stunden unter den Bedingungen einer Lebensdauerprobe gemäss Abb. 2



V_f = 6,3 V
V_{kf} = 100 V (k neg.)
V_i { f = 300 Hz
δ = 0,1

Fig. 2
Abb. 2

The data indicating the endpoint of life are given in column III under the heading Characteristics
Les valeurs déterminant la fin de la durée sont données dans la colonne III des Caractéristiques
Die Werte die das Ende der Lebensdauer bestimmen sind angegeben worden in Spalte III der Kenndaten

---

[4]) Insulation resistance between two arbitrary electrodes
Résistance d'isolement entre deux électrodes quelconques
Isolationswiderstand zwischen zwei willkürlichen Elektroden

Limiting values (each triode; absolute limits)
Caractéristiques limites (chaque triode; limites absolues)
Grenzdaten (jede Triode; absolute Grenzwerte)

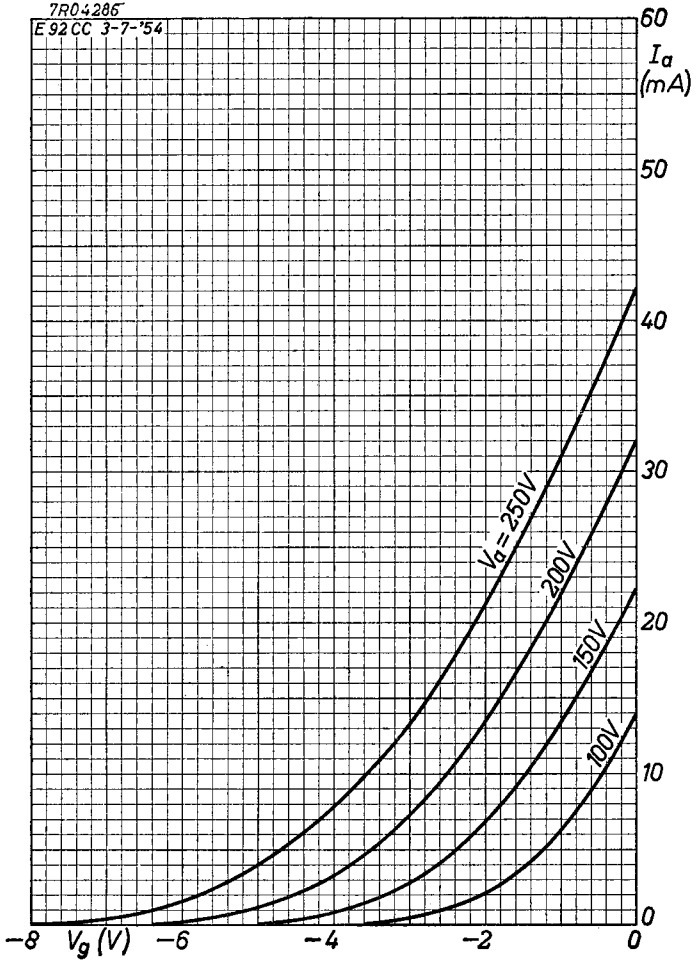
V_{ao}	= max.	600 V
V_a	= max.	300 V
W_a	= max.	2 W
$-V_g$ (T_{av} = max. 10 msec)	= max.	100 V
$-V_{gp}$	= max.	200 V
V_g	= max.	0,5 V
I_g (T_{av} = max. 10 msec)	= max.	250 µA
I_{gp}	= max.	1000 µA
R_g [1])	= max.	1 MΩ
R_g [2])	= max.	0,5 MΩ
I_k (T_{av} = max. 10 msec)	= max.	15 mA
I_{kp}	= max.	75 mA
V_{kf}	= max.	100 V
V_f	=	6,3 V ± 5 %
t_{bulb}	= max.	170 °C

---

[1]) With automatic grid bias
En polarisation automatique
Mit automatischer Gittervorspannung

[2]) With fixed grid bias
En polarisation fixe
Mit fester Gittervorspannung

SQ **PHILIPS** **E 92 CC**



9.9.1958

A

E92CC PHILIPS SQ

PHILIPS

Electronic Tube

HANDBOOK

E92CC

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3	3	1958.09.09
4	4	1958.09.09
5	A	1958.09.09
6	B	1958.09.09
7	FP	1999.04.19

SPECIAL QUALITY, SHOCK AND VIBRATION RESISTANT R.F. PENTODE with variable mutual conductance for mobile equipment. Heater voltage variations of ± 20 % are allowed during short periods

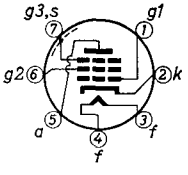
PENTODE H.F. À HAUTE SÉCURITÉ, RESISTANTE AUX CHOCS ET VIBRATIONS, à pente variable pour équipement mobile. Des variations de la tension de chauffage de ± 20 % et de courte durée sont permises

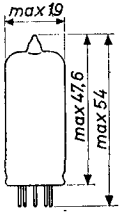
ZUVERLÄSSIGE, STOSS- UND VIBRATIONSFESTE HF-PENTODE mit veränderlicher Steilheit für transportable Geräte. Heizspannungsschwankungen von ± 20 % und kurzer Dauer sind zulässig

Heating : indirect by A.C. or D.C.; parallel or series supply
Chauffage: indirect par C.A. ou C.C.; alimentation parallèle ou série
Heizung : indirekt durch Wechsel- oder Gleichstrom; Serien- oder Parallelspeisung

$V_f = 6{,}3$ V [1)]
$I_f = 150$ mA

Dimensions in mm
Dimensions en mm
Abmessungen in mm





Base, culot, Sockel: MINIATURE

[1)] Heater voltage variations of ± 20 % are allowed during short periods
Des variations de la tension de chauffage de ± 20 % et de courte durée sont permises
Heizspannungsschwankungen von ± 20 % und kurzer Dauer sind zulässig

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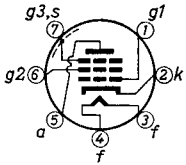
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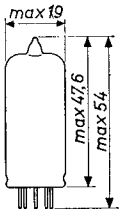
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$$\frac{V_f = 6{,}3\ V\ ^{1)}}{I_f = 150\ mA}$$

Dimensions in mm
Dimensions en mm
Abmessungen in mm.





Base, culot, Sockel: MINIATURE

---

1) Heater voltage variations of ± 20 % are allowed during short periods
Des variations de la tension de chauffage de ± 20 % et de courte durée sont permises
Heizspannungsschwankungen von ± 20 % und kurzer Dauer sind zulässig

Characteristics (each triode)
Caractéristiques (chaque triode)
Kenndaten (jede Triode)

Column I: Setting of the triode and typical (average) measuring results of new tubes
II: Characteristic range values for equipment design
III: Data indicating the endpoint of life
Colonne I: Valeurs pour le réglage de la triode et les résultats moyens de mesures de tubes neufs
II: Gamme de valeurs caractéristiques pour l'étude d'équipements
III: Valeurs déterminant la fin de durée de vie
Spalte I: Einstelldaten der Triode und mittlere Messergebnisse neuer Röhren
II: Charakteristischer Wertbereich für Gerätentwurf
III: Werte die das Ende der Lebensdauer bestimmen

	I	II		I	II	III
C_{ag_1} [1] =		<0,0035 pF	V_f =	6,3		V
C_a [1] =	5,2	4,6-5,8 pF	I_f =	150	142-158	142-158 mA
C_{g_1} [1] =	4,5	3,9-5,1 pF				
			V_{ba} =	250		V
V_a =	250	V	V_{bg_2} =	100		V
V_{g_2} =	100	V	V_{g_3} =	0		V
V_{g_3} =	0	V	R_k =	80		Ω
V_{g_1} =	-20	V	I_a =	9,2	7,2-11,2	6,2 mA
S =	15	µA/V	I_{g_2} =	3,3	2,6-4,0	mA
			S =	3,8	3,1-4,5	2,8 mA/V
V_f =	5,0	V	$\mu_{g_2g_1}$ =	27		
V_{ba} =	250	V	R_i =	1,0		MΩ
V_{bg_2} =	100	V				
V_{g_3} =	0	V	V_{ba} =	250		V
R_k =	80	Ω	V_{bg_2} =	100		V
S =	3,0	mA/V	V_{g_3} =	0		V
			V_{bg_1} =	-0,5		V
			R_k =	80		Ω
			R_{g_1} =	0,5		MΩ
			$-I_{g_1}$ =		<0,2	0,5 µA
			V_{kf} [2] =	100		V
			R [3] =	1		MΩ
			I_{kf} =		< 15	15 µA
			V =	300		V
			R_{isol} [4] =		>100	50 MΩ

[1]) Without external shield
Sans blindage extérieur
Ohne äussere Abschirmung

[2]) Cathode negative
Cathode négative
Katode negativ

[3]) Series resistor
Résistance série
Serienwiderstand

[4]) Voltage and insulation resistance between two arbitrary electrodes
Tension et résistance d'isolement entre deux électrodes quelconques
Spannung und Isolationswiderstand zwischen zwei willkürlichen Elektroden

Characteristics
Caractéristiques
Kenndaten

Column I: Setting of the tube and typical (average) measuring results of new tubes
II: Characteristic range values for equipment design
III: Data indicating the endpoint of life

Colonne I: Valeurs pour le réglage du tube et les résultats moyens de mesures de tubes neufs
II: Gamme de valeurs caractéristiques pour l'étude d'équipements
III: Valeurs déterminant la fin de durée de vie

Spalte I: Einstelldaten der Röhre und mittlere Messergebnisse neuer Röhren
II: Charakteristischer Wertbereich für Gerätentwurf
III: Werte die das Ende der Lebensdauer bestimmen

	I	II		I	II	III
C_{ag_1} [1]	=	<0,0035 pF	V_f	= 6,3		V
C_a [1]	= 5,0	4,4-5,6 pF	I_f	= 150	142-158	142- 158 mA
C_{g_1} [1]	= 4,5	3,9-5,1 pF				
			V_{ba}	= 250		V
V_a	= 250	V	V_{bg_2}	= 100		V
V_{g_2}	= 100	V	V_{g_3}	= 0		V
V_{g_3}	= 0	V	R_k	= 80		Ω
V_{g_1}	= -20	V	I_a	= 9,2	7,2-11,2	6,2 mA
S	= 10	1-50 µA/V	I_{g_2}	= 3,3	2,6-4,0	mA
			S	= 3,8	3,1-4,5	2,8 mA/V
V_f	= 5,0	V	$\mu_{g_2g_1}$	= 25		
V_{ba}	= 250	V	R_i	= 1,0		MΩ
V_{bg_2}	= 100	V	R_{eq}	= 3,5		kΩ
V_{g_3}	= 0	V				
R_k	= 80	Ω				
S	= 3,4	mA/V	V_{ba}	= 250		V
			V_{bg_2}	= 100		V
			V_{g_3}	= 0		V
			V_{bg_1}	=-0,5		V
			R_k	= 80		Ω
			R_{g_1}	= 0,5		MΩ
			$-I_{g_1}$	=	< 0,2	0,5 µA
			V_{kf} [2]	= 100		V
			R [3]	= 1		MΩ
			I_{kf}		< 15	15 µA
			V	= 300		V
			R_{isol} [4]	=	> 100	50 MΩ

[1]) Without external shield
Sans blindage extérieur
Ohne äussere Abschirmung

[2]) Cathode negative
Cathode négative
Katode negativ

[3]) Series resistor
Résistance série
Serienwiderstand

[4]) Voltage and insulation resistance between two arbitrary electrodes
Tension et résistance d'isolement entre deux électrodes quelconques
Spannung und Isolationswiderstand zwischen zwei willkürlichen Elektroden

Life expectancy: 1000 hours under the following life-test conditions:
Durée prévue : 1000 heures sous les conditions d'essai de durée suivantes:
Erwartete Lebensdauer: 1000 Stunden unter folgenden Bedingungen einer Lebensdauerprobe:

V_f	= 6,3 V	R_k	= 80 Ω
V_{ba}	= 250 V	R_{g1}	= 500 kΩ
V_{g3}	= 0 V	V_{kf}	= 135 V [1]
V_{bg2}	= 100 V		

The data indicating the endpoint of life are given in column III under the heading Characteristics
Les valeurs déterminant la fin de la durée sont données dans la colonne III des Caractéristiques
Die Werte die das Ende der Lebensdauer bestimmen sind angegeben worden in Spalte III der Kenndaten

Shock resistance: about 450 g [2])
Forces as applied by the NRL impact machine for electronic devices caused by 5 blows of the hammer, lifted over an angle of 30° in each of four different positions of the tube

Vibration resistance: 2.5 g [2])
Vibrational forces for a period of 32 hours at a frequency of 25 c/s in each of 3 positions of the tube

Résistance aux chocs: environ 450 g [2])
Des forces telles que celles appliquées par la machine à chocs NRL pour dispositifs électroniques, produites par 5 coups du marteau, soulevé d'un angle de 30° dans chacune de quatre positions différentes du tube

Résistance aux vibrations: 2,5 g [2])
Des forces de vibration pendant une période de 32 heures à une fréquence de 25 Hz dans chacune de trois positions du tube

Stossfestigkeit: etwa 450 g [2])
Stossbeschleunigungen gemäss NRL-Stossmaschine für elektronische Geräte, verursacht durch 5 Schläge des Hammers, der in jeder von vier verschiedenen Stellungen der Röhre über einen Winkel von 30° gehoben wird

Vibrationsfestigkeit: 2,5 g [2])
Vibrationskräfte während einer Periode von 32 Stunden bei einer Frequenz von 25 Hz in jeder von 3 Stellungen der Röhre

---

[1])[2]) See page 5; voir page 5; siehe Seite 5

Life expectancy: 1000 hours under the following life-test conditions:
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Erwartete Lebensdauer: 1000 Stunden unter folgenden Bedingungen einer Lebensdauerprobe:

V_f	= 6,3 V	R_k	= 80 Ω
V_{ba}	= 250 V	R_{g_1}	= 500 kΩ
V_{g_3}	= 0 V	V_{kf}(k neg.)	= 135 V [1] ←
V_{bg_2}	= 100 V		

The data indicating the endpoint of life are given in column III under the heading Characteristics
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Die Werte die das Ende der Lebensdauer bestimmen sind angegeben worden in Spalte III der Kenndaten

Shock resistance: about 500 g [2] ←
Forces as applied by the NRL impact machine for electronic devices caused by 5 blows of the hammer, lifted over an angle of 30° in each of four different positions of the tube

Vibration resistance: 2.5 g [2]
Vibrational forces for a period of 32 hours at a frequency of 25 c/s in each of 3 positions of the tube

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---

[1])[2]) See page 5; voir page 5; siehe Seite 5

Vibrational noise output
Tension de sortie de souffle par vibrations
Vibrations-Störausgangsspannung

V_{ba}	= 250 V	R_a	= 2 kΩ
V_{bg2}	= 100 V	R_k	= 80 Ω
V_{g3}	= 0 V	C_k	= 1000 µF

Vibrational acceleration
Accélération de vibration = 2,5 g
Schwingungsbeschleunigung

Frequency of vibration
Fréquence de vibration = 25 c/s
Schwingungsfrequenz

Noise output
Tension de sortie de souffle = max.100 mV_{eff}
Störausgangsspannung

Limiting values (Absolute limits)
Caractéristiques limites (Limites absolues)
Grenzdaten (Absolute Grenzwerte)

V_{ao}	= max. 600 V		
V_a	= max. 330 V	$+V_{g1}$	= max. 0 V
W_a	= max. 3,3 W	$-V_{g1}$	= max. 55 V
V_{g2o}	= max. 600 V	I_k	= max. 17 mA
V_{g2}	See page A / Voir page A / Siehe Seite A	V_{kf}	= max. 100 V
W_{g2}		t_{bulb}	= max. 140 °C [1]

Max. circuit values (Absolute limits)
Valeurs max. des éléments de montage (Limites absolues)
Max. Werte der Schaltungsteile (Absolute Grenzwerte)

R_{g1} fixed bias / en polarisation fixe / mit fester Gittervorspannung = max.0,5 MΩ

R_{g1} automatic bias / en polarisation automatique / mit automatischer Gittervorspannung = max. 1 MΩ

---

[1]) Tube life and reliability of performance will be enhanced by operation at lower temperature
La durée de vie et la sécurité de fonctionnement seront augmentées par opération à des températures plus basses
Lebensdauer und Betriebssicherheit werden durch Betrieb bei niedrigeren Temperaturen verbessert

Vibrational noise output
Tension de sortie de souffle par vibrations
Vibrations-Störausgangsspannung

V_{ba}	= 250 V	R_a	= 2 kΩ
V_{bg2}	= 100 V	R_k	= 80 Ω
V_{g3}	= 0 V	C_k	= 1000 µF

Vibrational acceleration
Accélération de vibration = 2,5 g
Schwingungsbeschleunigung

Frequency of vibration
Fréquence de vibration = 25 c/s
Schwingungsfrequenz

Noise output
Tension de sortie de souffle = max.100 mV_{eff}
Störausgangsspannung

Limiting values (Absolute limits)
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V_{g2} / W_{g2}	See page A / Voir page A / Siehe Seite A	V_{kf}	= max. 100 V
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→

Remark : Circuit operation with cathode bias is recommended
Observation: Utilisation avec polarisation négative par résistance cathodique est recommandée
Bemerkung : Betrieb mit negativer Vorspannung mittels Katodenwiderstandes wird empfohlen

---

[1]) The value of 135 V for the heater to cathode voltage should not be interpreted as a suitable operating condition
La valeur de 135 V pour la tension filament-cathode ne sera pas interprétée comme qualifiée pour le fonctionnement du tube
Der Wert von 135 V für die Heizfaden-Katodenspannung soll nicht als eine geeignete Betriebsbedingung betrachtet werden

[2]) These test conditions are only given for evaluation of the ruggedness of the tube. They are by no means to be interpreted as suitable operating conditions
Ces conditions d'essai sont données seulement pour l'évaluation de la robustesse du tube. En aucune manière elles ne doivent être interprétées comme des conditions de fonctionnement normales
Diese Prüfbedingungen dienen lediglich zur Beurteilung der Robustheit der Röhre und sind keinesfalls als geeignete Betriebsbedingungen aufzufassen

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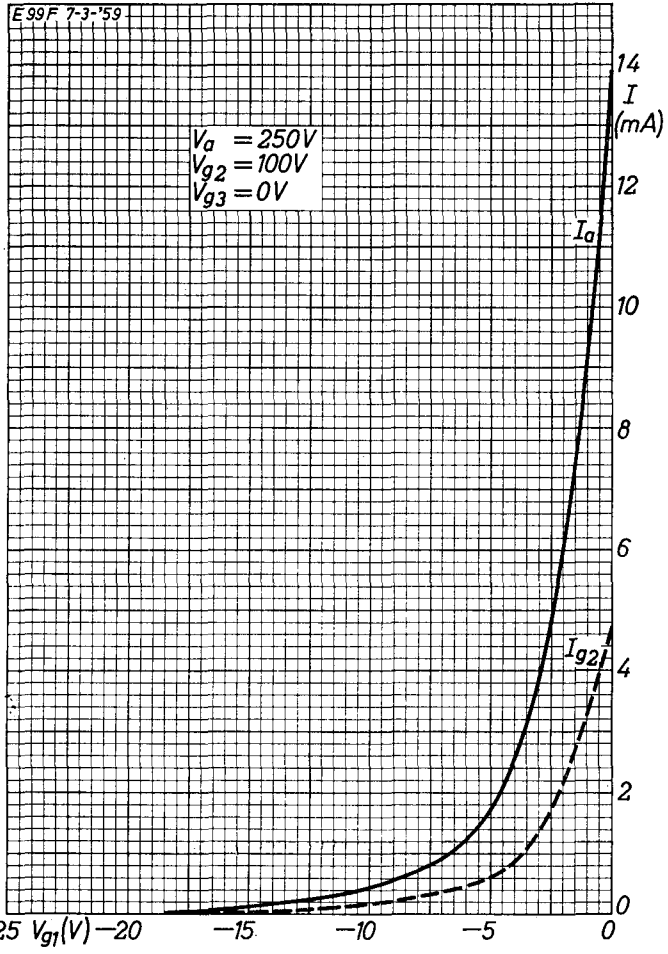
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E 99 F **PHILIPS** **SQ**

A

7R05959
E99F 16-6-58
Absolute limit
Limite absolue
Absolute Grenze
1
W_{g2} (W)
0,8
0,6
0,4
0,2
0
0
50
100
150
200
250
300
V_{g2}(V) 350

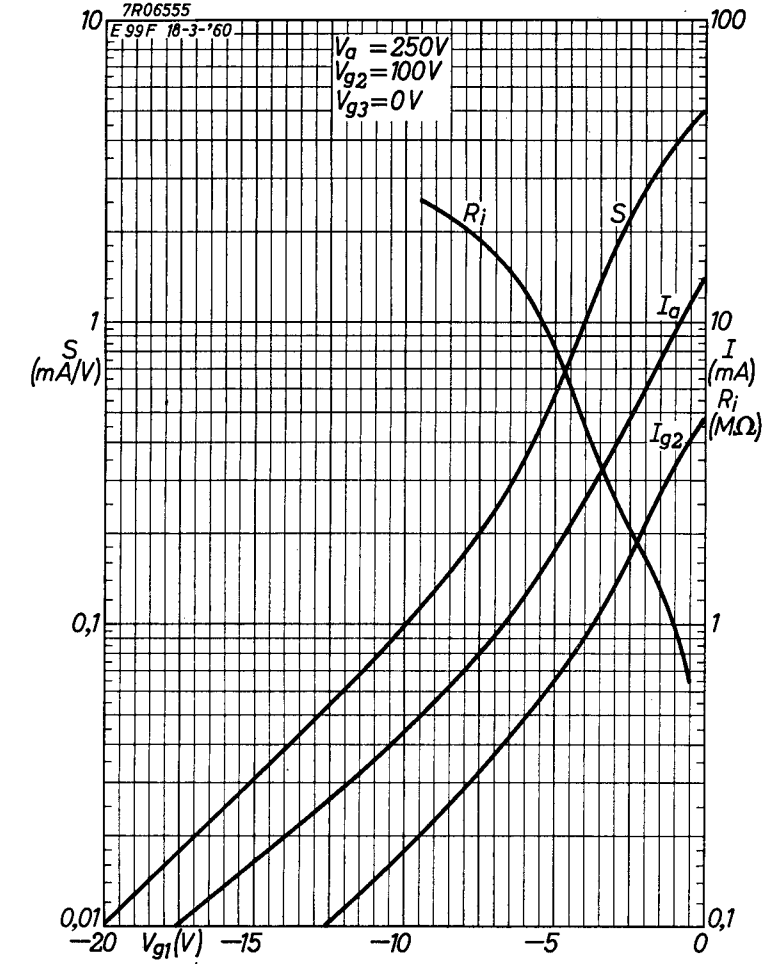
A


7R06233
E99F 7-3-'59
V_a = 250V
V_{g2} = 100V
V_{g3} = 0V
I_a
I_{g2}
I (mA)
14
12
10
8
6
4
2
0
−25 V_{g1}(V) −20
−15
−10
−5
0

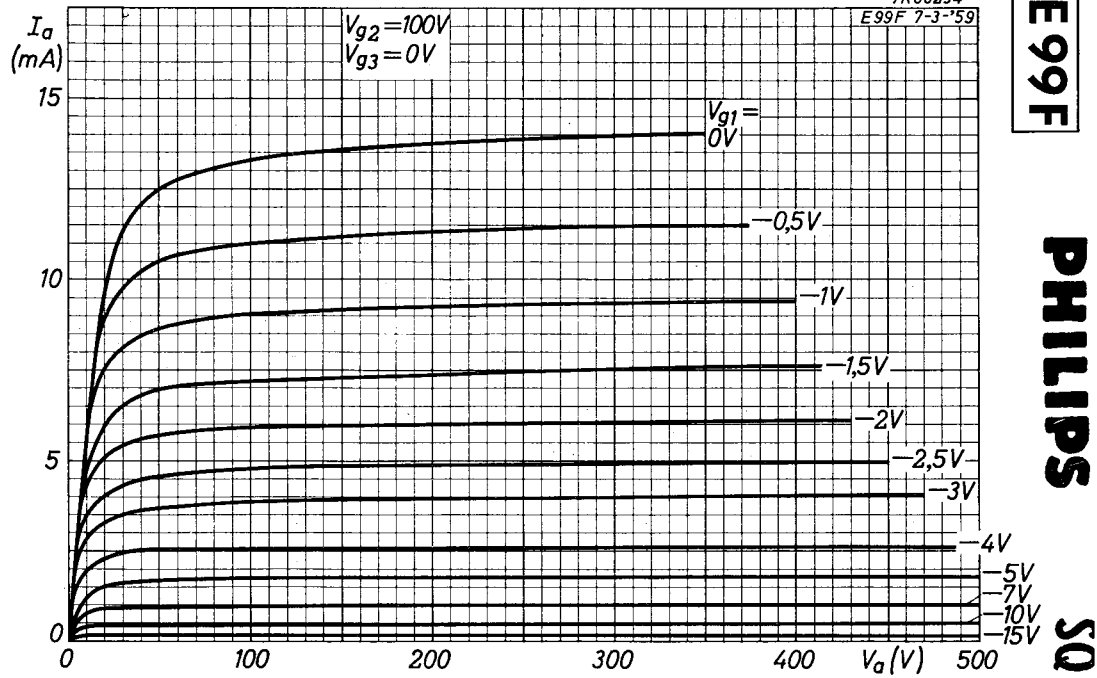
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B

SQ **PHILIPS** **E 99F**

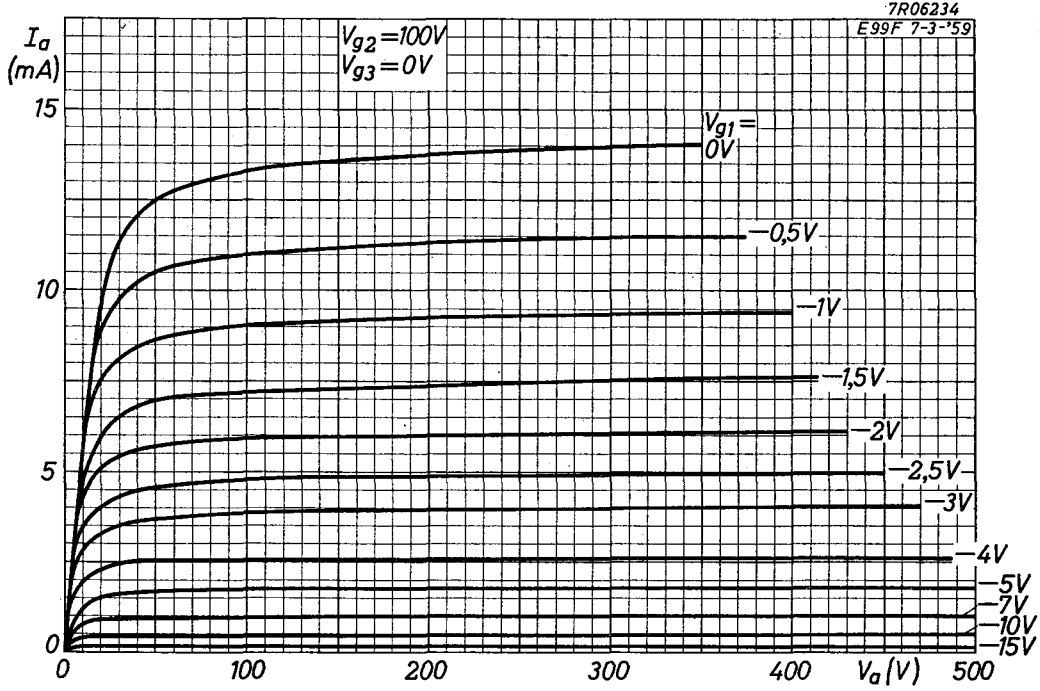


5.5.1960 B



E99F

PHILIPS



E 99 F

PHILIPS SQ

SQ **PHILIPS** **E99F**

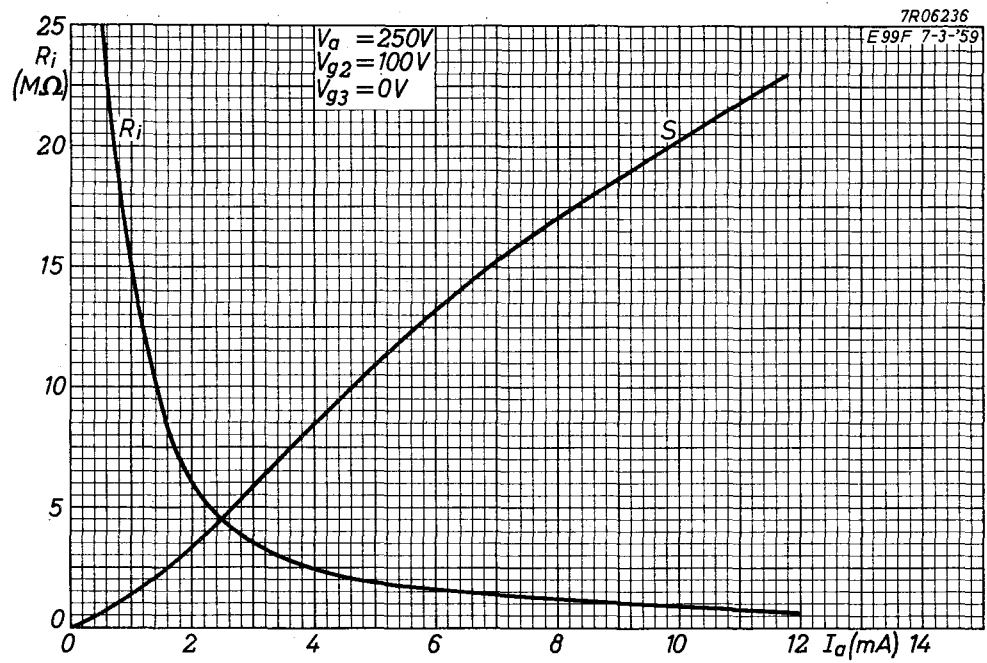
3.3.1959

D

7R06235
E99F 7-3-59
V_{g2}=100V
V_{g3}=0V
V_{g1}=
0V
-0,5V
-1V
-1,5V
-2V
-2,5V
-3V
-4V
-5V
-7V
-10V
I_{g2} (mA)
6
4
2
0
V_a (V)
0
100
200
300
400
500

5.5.1960

D



E99F

PHILIPS

SQ

PHILIPS

Electronic Tube

HANDBOOK

E99F

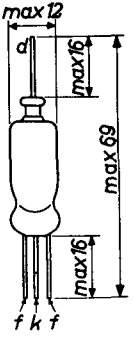
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7	4	1958.09.09
8	4	1959.03.03
9	5	1958.09.09
10	5	1959.03.03
11	A	1958.09.09
12	A	1959.03.03
13	B	1959.03.03
14	B	1960.05.05
15	C	1959.03.03
16	C	1960.05.05
17	D	1959.03.03
18	D	1960.05.05
19	E	1959.03.03

DIODE

Heating	: indirect by A.C. or D.C. parallel supply	
Chauffage	: indirect par C.A. ou C.C. alimentation- parallèle	V_f = 6,3 V
Heizung	: indirekt durch Wechsel- oder Gleichstrom;Parallel-speisung	I_f = 0,15 A

Dimensions in mm
Dimensions en mm
Abmessungen in mm







Capacitance
Capacités
Kapazitäten

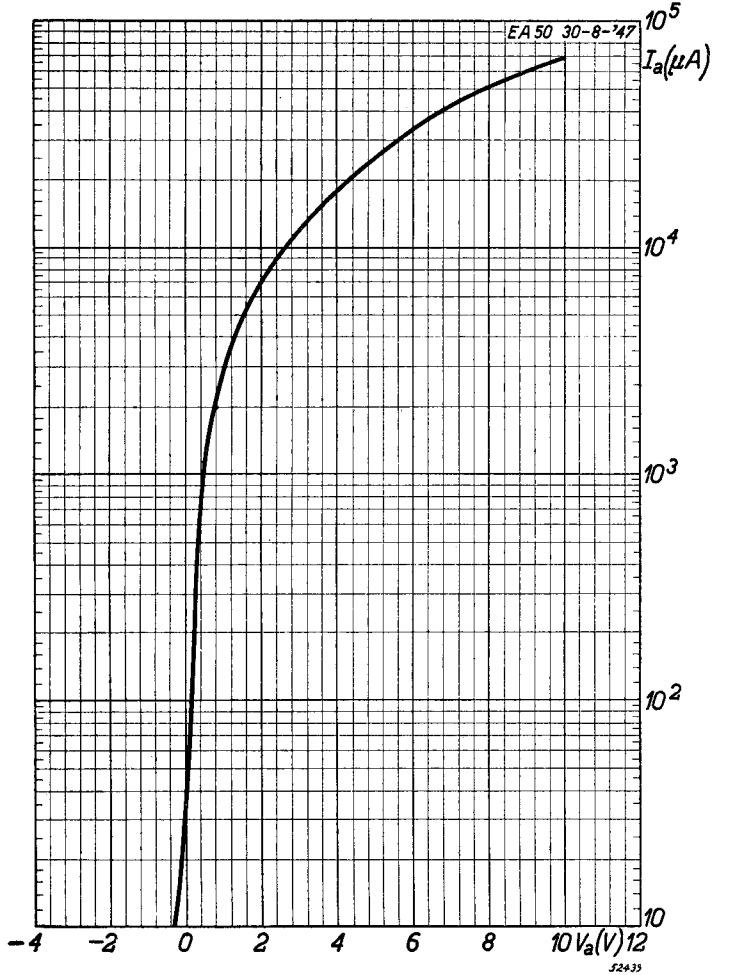
C_{dk} = 2,1 pF

Limiting values
Caractéristiques limites
Grenzdaten

$V_{d\ inv_p}$	= max.	560 V
I_d	= max.	5 mA
I_{dp}	= max.	30 mA
V_{kf}	= max.	100 V
R_{kf}	= max.	20 kΩ

EA 50

PHILIPS



A

PHILIPS

Electronic Tube

HANDBOOK

EA50

page	sheet	date
1	1	1953.11.11
2	A	1953.11.11
3	FP	1999.04.10

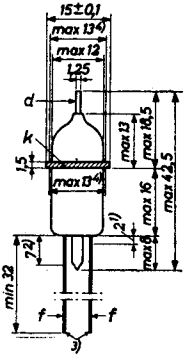
MEASURING DIODE for frequencies up to 1000 Mc/s
DIODE DE MESURE pour des fréquences jusqu'à 1000 MHz
MESSDIODE für Frequenzen bis 1000 MHz

Heating : indirect by A.C. or D.C. series or parallel supply
Chauffage: indirect par C.A. ou C.C. alimentation série ou parallèle
Heizung : indirekt durch Wechsel- oder Gleichstrom; Serien- oder Parallelspeisung

V_f = 6,3 V
I_f = 300 mA

Dimensions in mm
Dimensions en mm
Abmessungen in mm





Eccentricity of the anode pin with respect to the cathode: max. 0,25 mm
Excentricité de la broche de l'anode par rapport à la cathode: 0,25 mm au maximum
Exzentrizität des Anodenstiftes gegenüber der Katode: max. 0,25 mm

In order to avoid strain, the connections to the cathode should be made elastically
Afin d'éviter des tensions du verre, la cathode doit être connectée par des conducteurs flexibles
Um Glasspannungen zu vermeiden sind die Katodenzuleitungen federnd zu halten

---

1) This part of the leads should not be bent
Cette partie des fils ne sera pas pliée
Dieser Teil der Drähte soll nicht gebogen werden

2) This part of the leads should not be soldered
Ne pas faire de soudures à cette partie des fils
Dieser Teil der Drähte soll nicht gelötet werden

3)4) See page 2; voir page 2; siehe Seite 2

PHILIPS

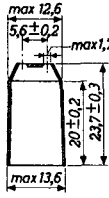
EA 52

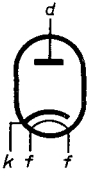
MEASURING DIODE for frequencies up to 1000 Mc/s
DIODE DE MESURE pour des fréquences jusqu'à 1000 MHz
MESSDIODE für Frequenzen bis 1000 MHz

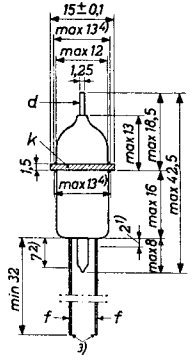
Heating : indirect by A.C. or D.C. series or parallel supply
Chauffage: indirect par C.A. ou C.C. alimentation série ou parallèle
Heizung : indirekt durch Wechsel- oder Gleichstrom; Serien- oder Parallelspeisung

V_f = 6,3 V
I_f = 300 mA

Dimensions in mm
Dimensions en mm
Abmessungen in mm







Protective cap [5])
Culot de protection
Schutzkappe

Eccentricity of the anode pin with respect to the cathode: max. 0.25 mm
Excentricité de la broche de l'anode par rapport à la cathode: 0,25 mm au max.
Exzentrizität des Anodenstiftes gegenüber der Katode: max. 0,25 mm

In order to avoid strain, the connections to the cathode should be made elastically
Afin d'éviter des tensions du verre, la cathode doit être connectée par des conducteurs flexibles
Um Glasspannungen zu vermeiden sind die Katodenzuleitungen federnd zu halten

---

[1]) This part of the leads should not be bent
Cette partie des fils ne sera pas pliée
Dieser Teil der Drähte soll nicht gebogen werden

[2]) This part of the leads should not be soldered
Ne pas faire de soudures à cette partie des fils
Dieser Teil der Drähte soll nicht gelötet werden

[3])[4])[5])See page 2; voir page 2; siehe Seite 2

MEASURING DIODE for frequencies up to 1000 Mc/s

HEATING

Indirect by A.C. or D.C.; series or parallel supply

Heater voltage V_f = 6.3 V
Heater current I_f = 300 mA

CAPACITANCE

Between anode and cathode	C_d	< 0.5 pF

TYPICAL CHARACTERISTICS

Heater voltage	V_f	= 6.3 V
Diode current	I_d	= 0.5 mA
Diode voltage	V_d	< 3 V

LIMITING VALUES (Absolute limits)

Peak inverse voltage

at frequencies lower than 100 Mc/s

$V_{d\ inv_p}$ (f < 100 Mc/s) = max. 1000 V

at frequencies higher than 100 Mc/s

$V_{d\ inv_p}$ (f > 100 Mc/s) = max. $\frac{100}{f}$ x 1000 V [1])

Cathode current (heater voltage from 5.6 to 7.0 volts)	I_k	= max. 300 µA
Peak cathode current (heater voltage from 5.6 to 7.0 volts)	I_{k_p}	= max. 5 mA [2])
Voltage between heater and cathode	V_{kf}	= max. 50 V
External resistance between heater and cathode	R_{kf}	= max. 20 kΩ
Heater voltage	V_f	= max. 7.0 V = min. 5.6 V

[1]) f in Mc/s

[2]) For frequencies lower than 100 c/s
I_{k_p} = max. 0.3 + 0.047f mA (f in c/s)

Capacitance
Capacité
Kapazität

C_d < 0,5 pF

Typical characteristics
Caractéristiques types
Kenndaten

		I_d	=	0,5 mA
		V_d	<	3 V
Insulation Isolement d-k Isolation		r_{dk}	>	10 000 MΩ

Limiting values (ABSOLUTE LIMITS)
Caractéristiques limites (LIMITES ABSOLUES)
Grenzdaten (ABSOLUTE GRENZEN)

V_d inv_p (f < 100 Mc/s)	= max.	1000 V	
V_d inv_p (f > 100 Mc/s)	= max.	1000 x $\frac{100}{f}$ V [5]	
I_k	= max.	300	µA
I_{k_p}	= max.	5	mA
V_{kf}	= max.	50	V
R_{kf}	= max.	20	kΩ
V_f	= min.	5,6	V
V_f	= max.	7,0	V

[3] Cadmiated lead; 0.4 mm diameter
Fil cadmié d'un diamètre de 0,4 mm
Kadmierter Draht; 0,4 mm Durchmesser

[4] Maximum diameter of the glass seal
Diamètre maximum du scellement de verre
Max. Durchmesser der Glaseinschmelzung

[5] f in Mc/s; f en MHz; f in MHz

Capacitance
Capacité
Kapazität

C_d < 0,5 pF

Typical characteristics
Caractéristiques types
Kenndaten

I_d = 0,5 mA

V_d < 3 V

Insulation
Isolement d-k
Isolation

r_{dk} > 10 000 MΩ

Limiting values (ABSOLUTE LIMITS)
Caractéristiques limites (LIMITES ABSOLUES)
Grenzdaten (ABSOLUTE GRENZEN).

V_d inv_p (f < 100 Mc/s)	= max.	1000 V
V_d inv_p (f > 100 Mc/s)	= max.	1000 x $\frac{100}{f}$ V [6]
I_k	= max.	300 µA
I_{k_p}	= max.	5 mA
V_{kf}	= max.	50 V
R_{kf}	= max.	20 kΩ
V_f	= min.	5,6 V
V_f	= max.	7,0 V

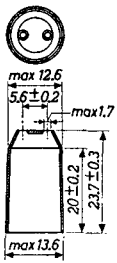
[3]) Cadmiated lead; 0.4 mm diameter
Fil cadmié d'un diamètre de 0,4 mm
Kadmierter Draht; 0,4 mm Durchmesser

[4]) Maximum diameter of the glass seal
Diamètre maximum du scellement de verre
Max. Durchmesser der Glaseinschmelzung

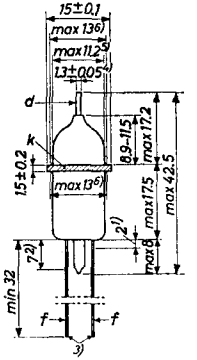
[5]) The temperature of the protective cap should not exceed 100 °C
La température du culot de protection ne surpassera pas 100 °C
Die Temperatur der Schutzkappe soll 100 °C nicht überschreiten

[6]) f in Mc/s; f en MHz; f in MHz

Dimensions in mm







Protective cap

The temperature of the protective cap should not exceed 100 °C

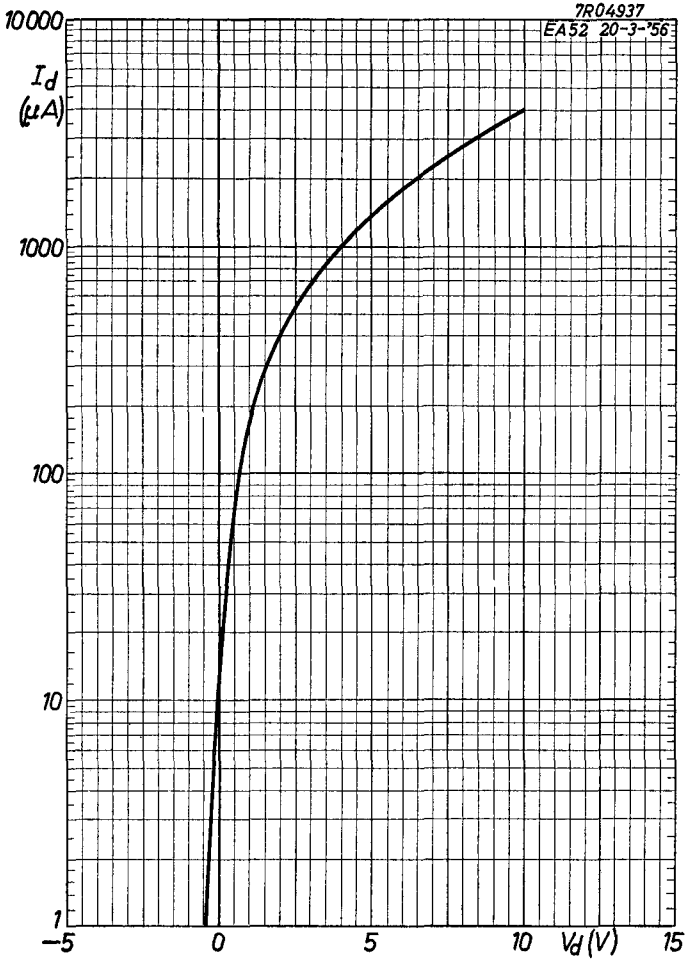
In order to avoid strain, the connection to the cathode disc should be sufficiently flexible

For curves of the EA52 please refer to type EA53

1) This part of the leads should not be bent
2) This part of the leads should not be soldered
3) Gold plated leads, 0.4 mm diameter
4) Eccentricity with respect to the cathode disc max. 0.25 mm
5) Eccentricity with respect to the cathode disc max. 0.35 mm
6) Maximum diameter of the glass seal

PHILIPS

EA52



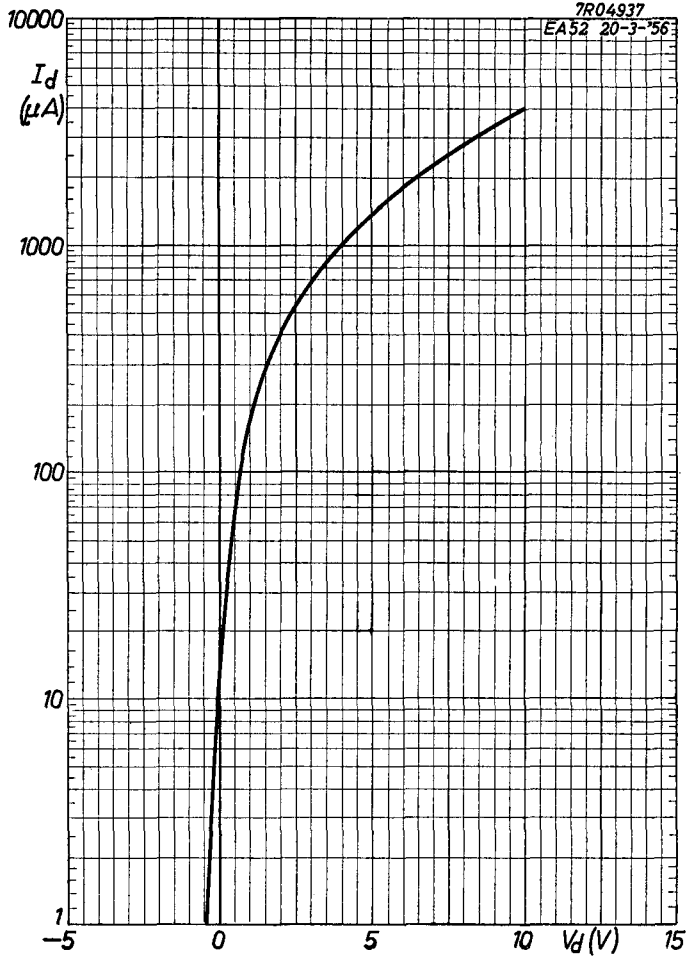
5.5.1957

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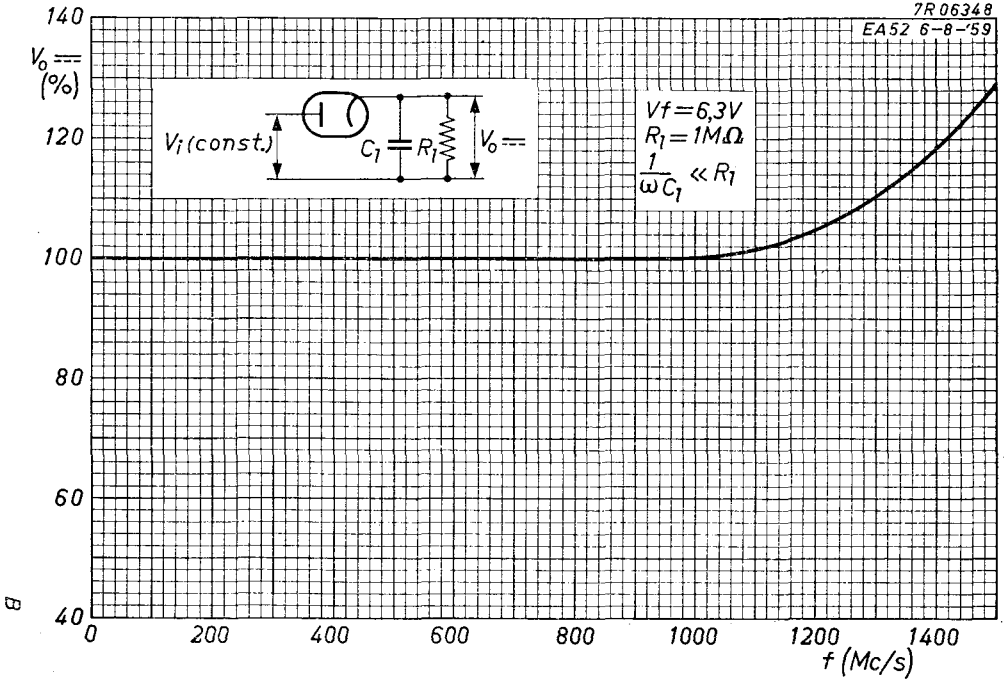
PHILIPS

EA 52

7R04937
EA52 20-3-'56



9.9.1959



EA52

PHILIPS

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Electronic Tube

HANDBOOK

EA52

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1	1	1957.05.05
2	1	1959.10.10
3	1	1962.12.12
4	2	1957.05.05
5	2	1959.10.10
6	2	1962.12.12
7	A	1957.05.05
8	A	1959.09.09
9	B	1959.09.09
10	FP	2005.05.06

MEASURING DIODE for frequencies up to 1000 Mc/s

HEATING

Indirect by A.C. or D.C.; series or parallel supply

Heater voltage	V_f = 6.3 V
Heater current	I_f = 300 mA

CAPACITANCE

Between anode and cathode	C_d < 0.5 pF

TYPICAL CHARACTERISTICS

Heater voltage	V_f	= 6.3 V
Diode current	I_d	= 0.5 mA
Diode voltage	V_d	< 3 V

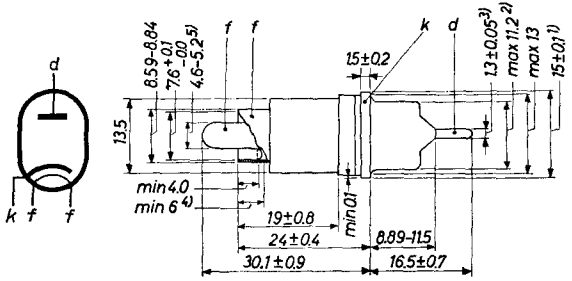
LIMITING VALUES (Absolute limits)

Peak inverse voltage			
at frequencies lower than 100 Mc/s			
$V_d\ inv_p$ (f < 100 Mc/s)	=	max.	1000 V
at frequencies higher than 100 Mc/s			
$V_d\ inv_p$ (f > 100 Mc/s)	=	max.	$\frac{100}{f}$ x 1000 V [1]
Cathode current (heater voltage from 5.6 to 7.0 volts)	I_k	= max.	300 µA
Peak cathode current (heater voltage from 5.6 to 7.0 volts)	I_{kp}	= max.	5 mA [2]
Voltage between heater and cathode	V_{kf}	= max.	50 V
External resistance between heater and cathode	R_{kf}	= max.	20 kΩ
Heater voltage	V_f	= max.	7.0 V
		= min.	5.6 V

[1]) f in Mc/s

[2]) For frequencies lower than 100 c/s
I_{kp} = max. 0.3 + 0.047 f mA (f in c/s)

Dimensions in mm



---

1) In order to avoid strain, the connection to the cathode disc should be sufficiently flexible

2) Eccentricity with respect to the cathode disc max.0.35 mm

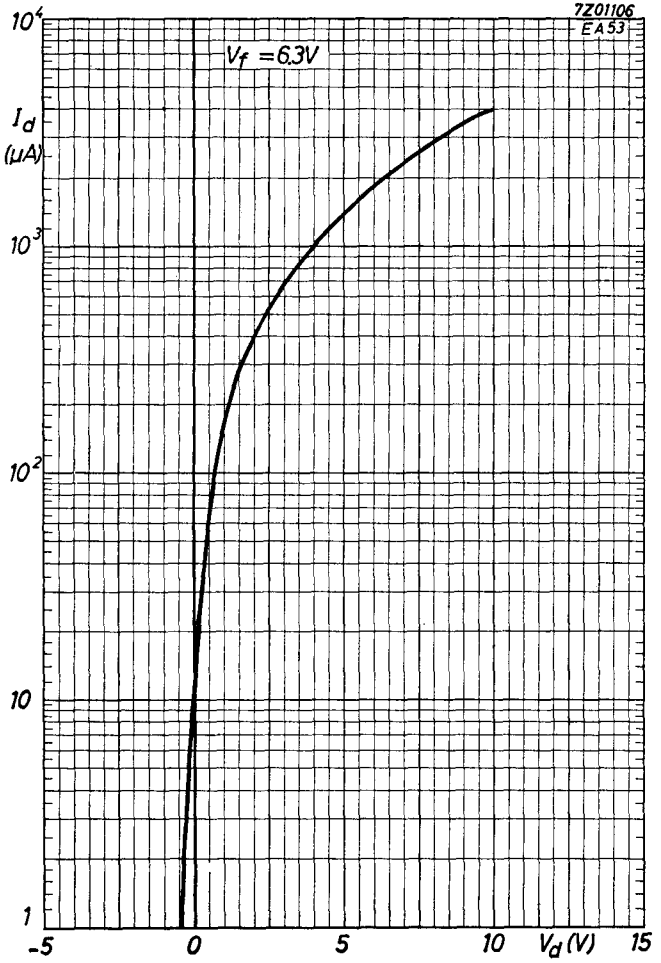
3) Eccentricity with respect to the cathode disc max.0.25 mm

4) This dimension defines the length of the cylindrical section

5) The max. dimension includes the eccentricity

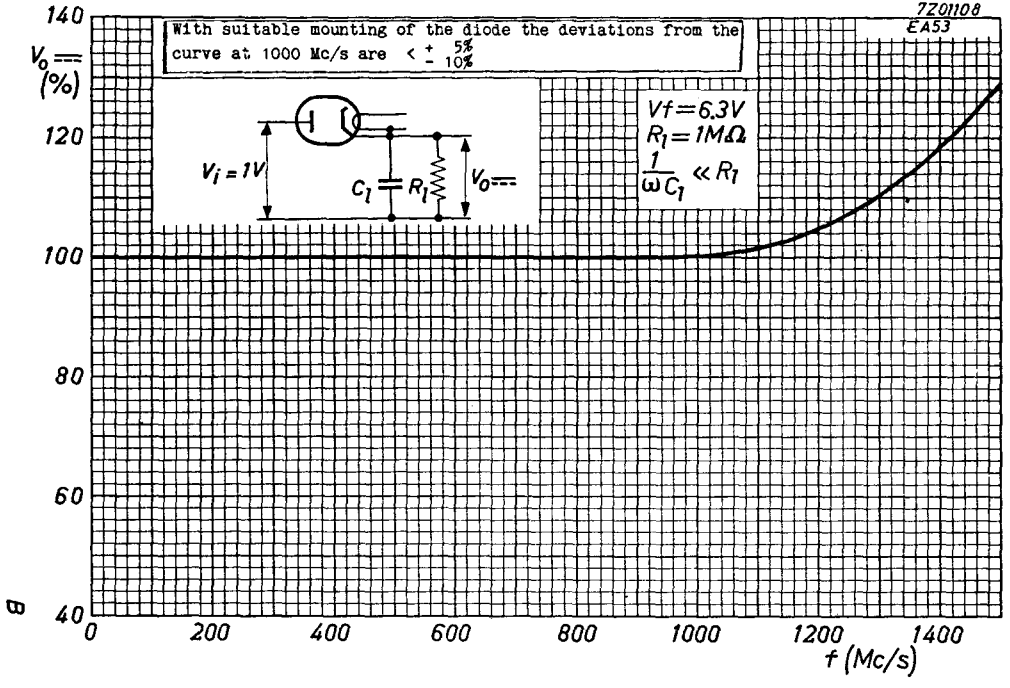
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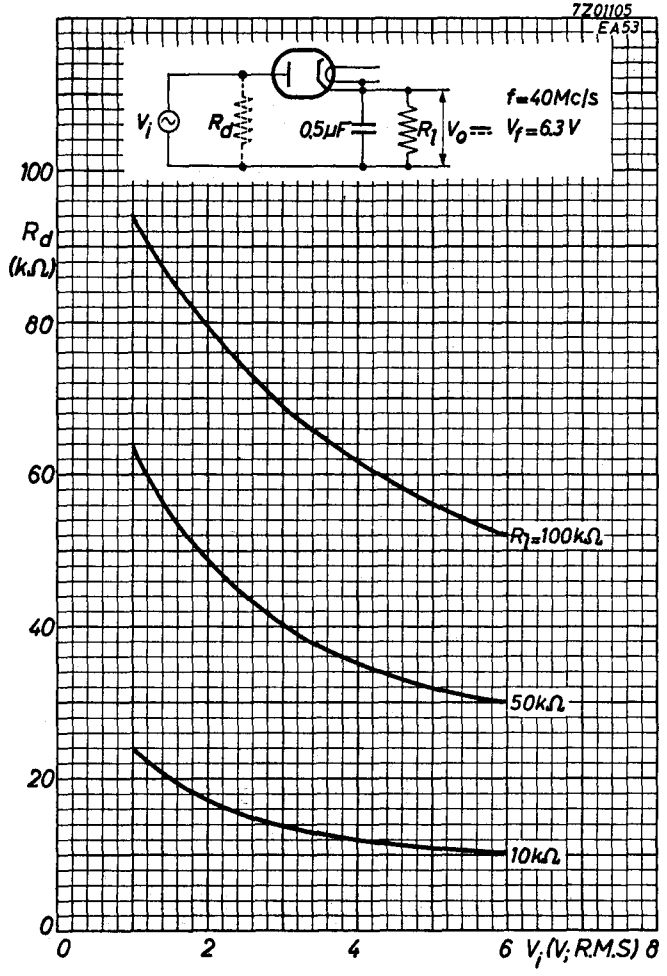
EA53



9.9.1962

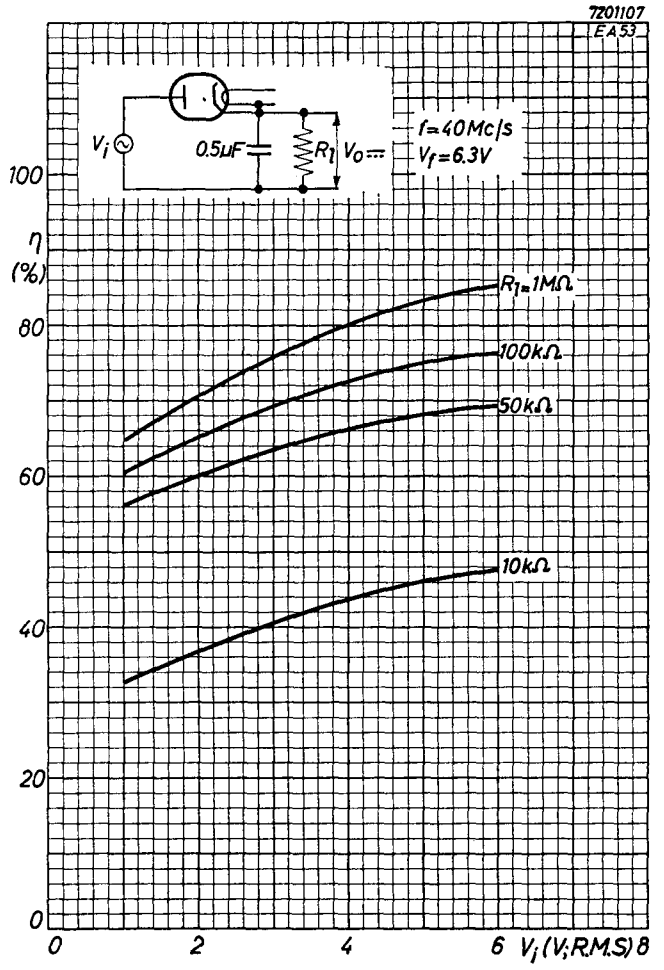
A


7Z01108
EA53
With suitable mounting of the diode the deviations from the curve at 1000 Mc/s are < ± 5% 10%
$V_i = 1V$
C_1
R_1
V_o ⎓
$Vf = 6.3V$
$R_1 = 1M\Omega$
$\frac{1}{\omega C_1} \ll R_1$
V_o ⎓ (%)
140
120
100
80
60
40
0
200
400
600
800
1000
1200
1400
f (Mc/s)
B


7Z01105
EA53
f=40Mc/s
V_f=6.3V
V_i
R_d
0,5µF
R_1
V_o
R_d (kΩ)
100
80
60
40
20
0
0
2
4
6
V_i (V; R.M.S.)
8
R_1=100kΩ
50kΩ
10kΩ

EA53

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D

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Electronic Tube

HANDBOOK

EA53

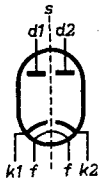
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1	1	1962.09.09
2	2	1962.09.09
3	A	1962.09.09
4	B	1962.09.09
5	C	1962.09.09
6	D	1962.09.09
7	FP	1999.06.12

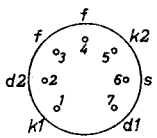
DOUBLE DIODE with separate cathodes
DIODE DOUBLE avec cathodes séparées
DOPPELDIODE mit getrennten Katoden

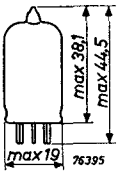
Heating : indirect by A.C. or D.C. series or parallel supply
Chauffage: indirect par C.A. ou C.C. alimentation parallèle ou série
Heizung : indirekt durch Wechsel- oder Gleichstrom; Serien- oder Parallelspeisung

V_f = 6,3 V
I_f = 0,3 A

Dimensions in mm
Dimensions en mm
Abmessungen in mm







Base, culot, Sockel: Miniature

Capacitances
Capacités
Kapazitäten

with external screening avec blindage extérieur mit äusserer Abschirmung			without external screening sans blindage extérieur ohne äusserer Abschirmung		
C_{d1}	=	3,0 pF	C_{d1}	=	2,5 pF
C_{d2}	=	3,0 pF	C_{d2}	=	2,5 pF
C_{d1d2}	<	0,026 pF	C_{d1d2}	<	0,068 pF
C_{k1}	=	3,4 pF	C_{k1}	=	3,4 pF
C_{k2}	=	3,4 pF	C_{k2}	=	3,4 pF

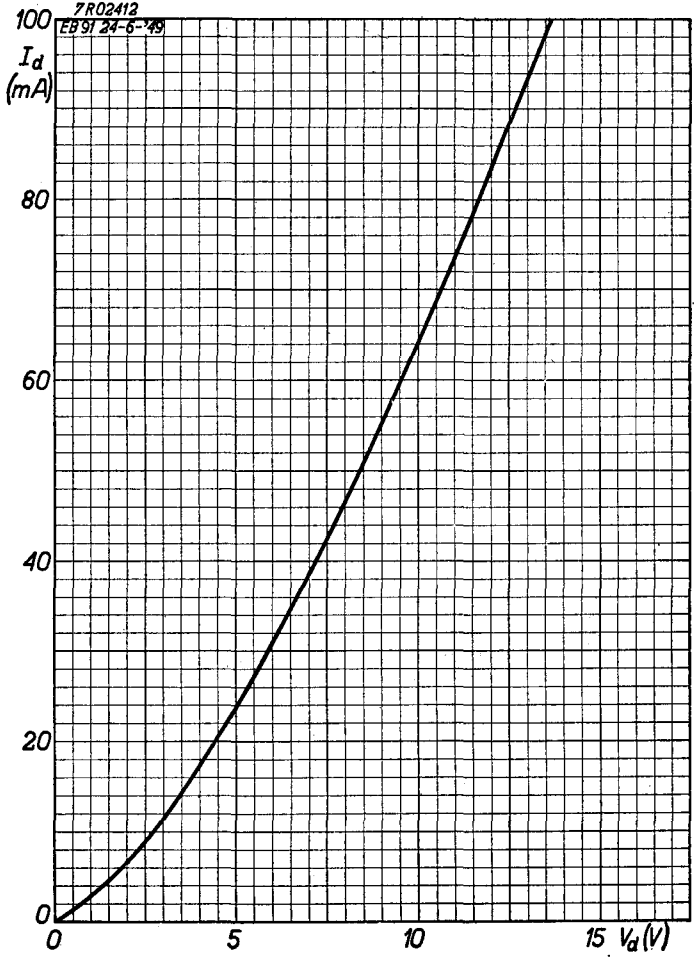
Limiting values for use as half-wave rectifier (per system)
Caractéristiques limites pour utilisation en redresseuse à une alternance (par système)
Grenzdaten bei Verwendung als Halbweggleichrichter (pro System)

V_{tr}	= max.	150	V_{eff}
I_o	= max.	9	mA
C_{filt}	= max.	8	µF
R_t	= min.	300	Ω
V_{kf_p} (k pos.,f neg.)	= max.	330	V[1])

Limiting values (per system)
Caractéristiques limites (par système)
Grenzdaten (pro System)

$V_{d\ inv_p}$	= max.	420	V
I_d	= max.	9	mA
I_{d_p}	= max.	54	mA
V_{kf_p} (k neg.,f pos.)	= max.	150	V
V_{kf_p} (k pos.,f neg.)	= max.	330	V[1])
R_{kf}	= max.	20	kΩ

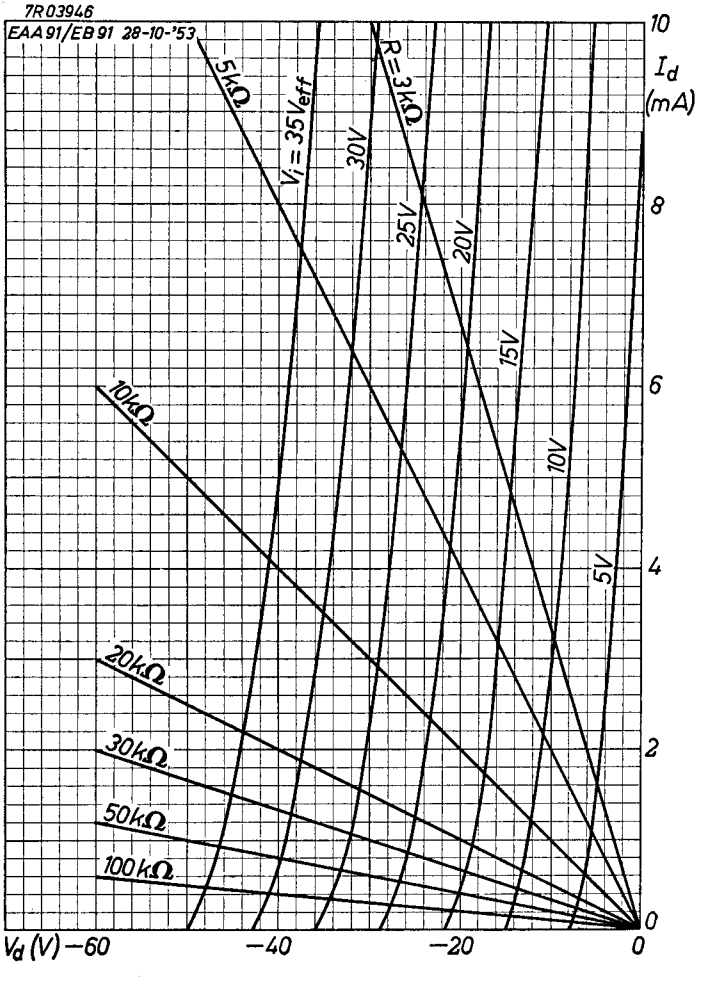
[1])D.C. component max. 200 V, A.C. component max. 165 V (rms value)
Composante C.C. max. 200 V, composante C.A. max. 165 V (valeur efficace)
Gleichspannungsanteil max. 200 V, Wechselspannungsanteil max. 165 V (Effektivwert)



6.6.1954

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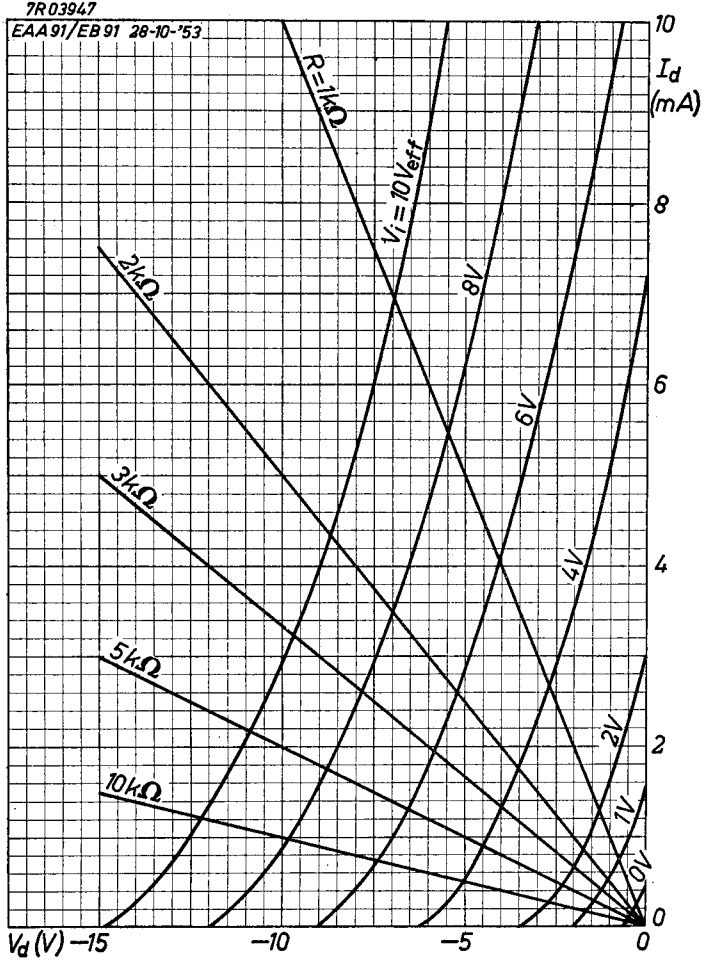
EAA 91 PHILIPS



B

PHILIPS

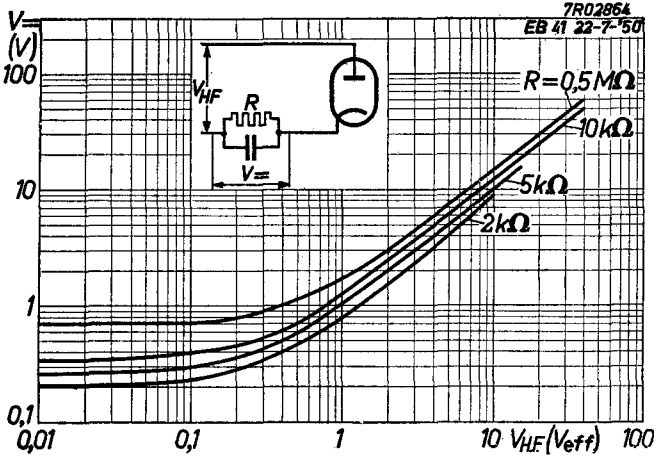
EAA 91

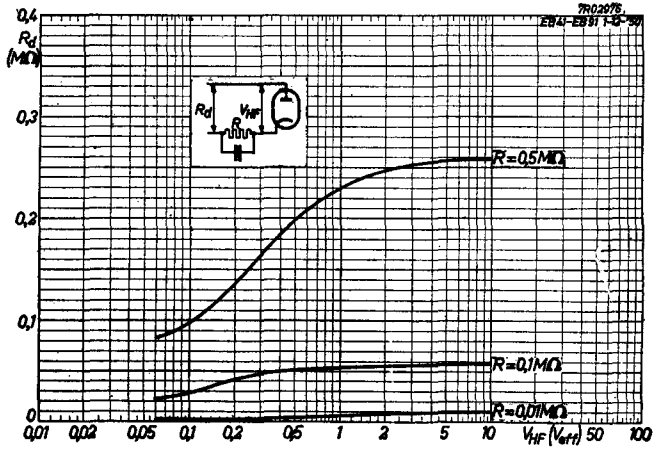


6.6.1954

C

PHILIPS


7R0286A
EB 41 22-7-'50
V=
(V)
100
10
1
0,1
0,01
0,1
1
10 V_HF (Veff)
100
V_HF
R
V=
R=0,5MΩ
10kΩ
5kΩ
2kΩ


7R0287A
EB41-EB91 1-12-'50
R_d
(MΩ)
0,4
0,3
0,2
0,1
0
0,01
0,02
0,05
0,1
0,2
0,5
1
2
5
10
V_HF (Veff)
50
100
R_d
V_HF
R
R=0,5MΩ
R=0,1MΩ
R=0,01MΩ

D

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Electronic Tube

HANDBOOK

EAA91

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6	D	1954.06.06
7	FP	1999.06.12

EAB 1 Dreifachdiode

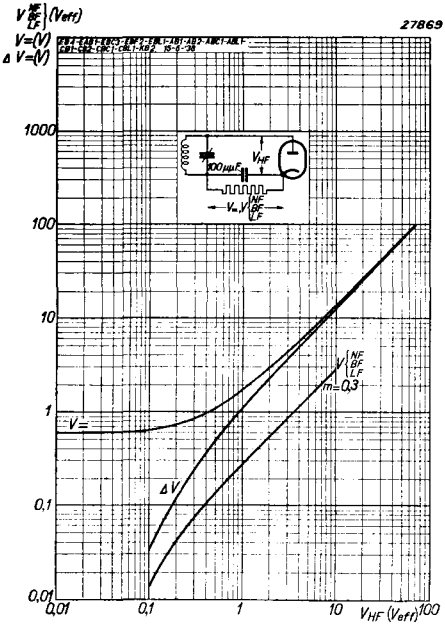


Abb. 3
Gleichspannung V und Zunahme der Gleichspannung ΔV an den Klemmen des Ableitwiderstandes einer Diode der EAB 1 als Funktion der unmodulierten H.F.-Wechselspannung. N.F.-Wechselspannung V_{NF} an den Klemmen des Ableitwiderstandes einer Diode als Funktion der zu 30% modulierten H.F.-Wechselspannung ($m = 0{,}3$). Diese Kurven gelten für Ableitwiderstände von 0,1 bis 1MΩ.

Die Dreifachdiode EAB 1 besteht aus drei Diodenanoden, die um eine gemeinsame horizontal gelagerte Kathode angebracht sind. Sie wurde insbesondere für die sogenannte Dreidiodenschaltung entworfen. Diese Schaltung hat den Zweck, die Verzerrung und andere unerwünschte Effekte, die infolge des bisher üblichen Systemes der Verzögerung der automatischen Lautstärkeregelung auftraten, zu beseitigen, und sie erfordert die Verwendung von drei Dioden. Die Dreidiodenschaltung kommt nur für hochwertige Empfänger in Betracht, und infolgedessen liegt es nahe, die Dioden nicht mit irgendeinem Verstärkersystem zusammenzubauen, da hiermit zwangsläufig Nachteile verbunden sind.

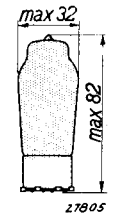
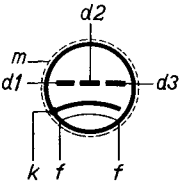


Abb. 1
Abmessungen in mm.



In der Dreidiodenschaltung wird eine Diode als Detektor, eine zweite für die automatische Lautstärkeregelung und eine dritte für die Verzögerung der automatischen Lautstärkeregelung verwendet.

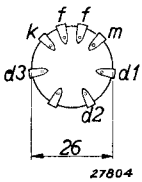


Abb. 2
Elektrodenanordnung und Sockelanschlüsse.

Die Diode zur Gleichrichtung des Signales zwecks Abtrennung der niederfrequenten Modulation ist mit Rücksicht auf sehr geringes Brummen am weitesten von der Einführung des Heizkörpers entfernt. In der Sockelschaltung der Abb. 2 ist diese Diode mit d_3 bezeichnet.

Die Diode, die am nächsten an der Heizkörpereinführung liegt und in der Sockelschaltung der Abb. 2 mit d_1 bezeichnet ist, hat eine sehr kleine Kapazität in Bezug auf die Detektordiode. Diese Kapazität ist kleiner als 0,08 μμF. Da die Diode zur automatischen Lautstärkeregelung aus verschiedenen Gründen meistens an den Primärkreis des vorangehenden Z.F.-Bandfilters angeschlossen wird, ist die Größe der Kapazität zwischen der A.L.R.-Diode und der Detektordiode äußerst wichtig. Sie bildet bekanntlich eine Kopplung zwischen den beiden Bandfilterkreisen, und dadurch kann die Trennschärfe ungünstig beeinflußt werden. Deswegen wird die Diode d_1 für die automatische Lautstärkeregelung in Betracht kommen. Die Diode d_2, die zwischen den Dioden d_1 und d_3 liegt, kann dann für andere Zwecke dienen, insbesondere für die in der Dreidiodenschaltung vorgesehene Verzögerung der automatischen Lautstärkeregelung.

Die Kapazitäten der Dioden in Bezug auf die Kathode sind möglichst klein gehalten.

HEIZDATEN

Heizung: indirekt durch Gleich- oder Wechselstrom, Serien- oder Parallelspeisung.

Heizspannung	$V_f = 6{,}3$ V
Heizstrom	$I_f = 0{,}200$ A

KAPAZITÄTEN

Zwischen Dioden d_1 und d_2	C_{d1d2}	$<$ 0,65	µµF
Zwischen Dioden d_1 und d_3	C_{d1d3}	$<$ 0,08	µµF
Zwischen Dioden d_2 und d_3	C_{d2d3}	$<$ 0,4	µµF
Zwischen Diode d_1 und Kathode	C_{d1k}	= 1,5	µµF
Zwischen Diode d_2 und Kathode	C_{d2k}	= 1,35	µµF
Zwischen Diode d_3 und Kathode	C_{d3k}	= 2,2	µµF

GRENZDATEN

Höchstzulässiger Scheitelwert der Signalspannung an Diode d_1	V_{d1}	= max. 200 V
Höchstzulässiger Scheitelwert der Signalspannung an Diode d_2	V_{d2}	= max. 200 V
Höchstzulässiger Scheitelwert der Signalspannung an Diode d_3	V_{d3}	= max. 200 V
Höchstzulässiger Gleichstrom durch Diode d_1	I_{d1}	= max. 0,8 mA
Höchstzulässiger Gleichstrom durch Diode d_2	I_{d2}	= max. 0,8 mA
Höchstzulässiger Gleichstrom durch Diode d_3	I_{d3}	= max. 0,8 mA
Höchstwert des Widerstandes zwischen Heizfaden und Kathode	R_{fk}	= max. 20.000 Ω
Höchstwert der Spannung zwischen Heizfaden und Kathode (Gleichspannung oder Effektivwert der Wechselspannung)	V_{fk}	= max. 100 V
Einsatzpunkt des Diodenstromes	$V_{d1}(I_{d1} = +0{,}3\ \mu A)$ $V_{d2}(I_{d2} = +0{,}3\ \mu A)$ $V_{d3}(I_{d3} = +0{,}3\ \mu A)$	= max —1,3 V

TRIPLE DIODE-TRIODE

Triple diode-triode intended for F.M. and A.M. signal detection and A.F. signal amplification.

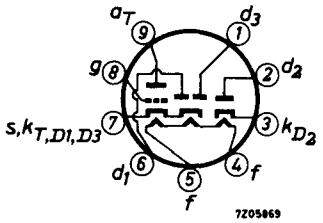
QUICK REFERENCE DATA			
Triode section			
Anode current	I_a	0.8	mA
Transconductance	S	1.45	mA/V
Amplification factor	μ	70	-

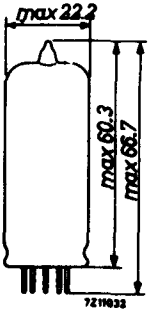
HEATING: Indirect by A.C. or D.C.; parallel supply

Heater voltage	V_f	6.3	V
Heater current	I_f	480	mA

DIMENSIONS AND CONNECTIONS Dimensions in mm

Base: Noval





CAPACITANCES

Triode section

Grid to all except anode	$C_{g(a)}$		1.9	pF
Anode to all except grid	$C_{a(g)}$		1.4	pF
Anode to grid	C_{ag}		2.0	pF
Grid to heater	C_{gf}	max.	0.04	pF

Diode sections

Diode No.1 to all	C_{d_1}		0.8	pF
Diode No.2 to all	C_{d_2}		4.8	pF
Diode No.3 to all	C_{d_3}		4.8	pF
Cathode (D_2) to all	C_{kD_2}		4.9	pF
Diode No.1 to heater	C_{d_1f}	max.	0.25	pF
Diode No.3 to heater	C_{d_3f}	max.	0.2	pF
Cathode (D_2) to heater	C_{kD_2f}		2.5	pF

Between triode and diode sections

Anode to diode No.1	C_{ad_1}	max.	0.12	pF
Anode to diode No.3	C_{ad_3}	max.	0.1	pF
Anode to cathode (D_2)	C_{akD_2}	max.	0.01	pF
Grid to diode No.1	C_{gd_1}	max.	0.07	pF
Grid to diode No.3	C_{gd_3}	max.	0.02	pF
Grid to cathode (D_2)	C_{gkD_2}	max.	0.005	pF

TYPICAL CHARACTERISTICS Triode section

Anode voltage	V_a	100	250	V
Grid voltage	V_g	-1	-3	V
Anode current	I_a	0.8	1.0	mA
Transconductance	S	1.45	1.4	mA/V
Amplification factor	μ	70	70	-
Internal resistance	R_i	48	50	kΩ

OPERATING CHARACTERISTICS

Triode section as RC coupled A.F. amplifier

Grid resistor R_g = 10 MΩ

Supply voltage	V_b	250	250	250	200	200	200	V
Anode resistor	R_a	220	100	47	220	100	47	kΩ
Grid resistor next stage	R_g'	0.68	0.33	0.15	0.68	0.33	0.15	MΩ
Anode current	I_a	0.76	1.40	2.20	0.56	1.00	1.60	mA
Voltage gain	V_o/V_i	54	47	36	53	44	34	-
Distortion:								
at output voltage V_o = 3 V_{RMS}	d_{tot}	0.2	0.25	0.3	0.3	0.4	0.5	%
at output voltage V_o = 5 V_{RMS}	d_{tot}	0.25	0.5	0.6	0.4	0.6	0.9	%
at output voltage V_o = 8 V_{RMS}	d_{tot}	0.6	0.8	1.0	0.9	1.0	1.5	%
Supply voltage	V_b	170	170	170	100	100	100	V
Anode resistor	R_a	220	100	47	220	100	47	kΩ
Grid resistor next stage	R_g'	0.68	0.33	0.15	0.68	0.33	0.15	MΩ
Anode current	I_a	0.46	0.82	1.25	0.21	0.35	0.52	mA
Voltage gain	V_o/V_i	51	42	32	44	35	26	-
Distortion:								
at output voltage V_o = 3 V_{RMS}	d_{tot}	0.4	0.5	0.6	1.0	1.3	2.0	%
at output voltage V_o = 5 V_{RMS}	d_{tot}	0.5	0.8	1.1	1.7	2.3	4.3	%
at output voltage V_o = 8 V_{RMS}	d_{tot}	1.1	1.3	2.0	–	–	–	%

TYPICAL CHARACTERISTICS Diode sections

Internal resistance diode No.1 Diode voltage V_{d_1} = +10 V	R_{iD_1}	5	kΩ
Internal resistance diode No.2 Diode voltage V_{d_2} = +5 V	R_{iD_2}	200	Ω
Internal resistance diode No.3 Diode voltage V_{d_3} = +5 V	R_{iD_3}	200	Ω
Ratio between R_{iD_2} and R_{iD_3}	R_{iD_2}/R_{iD_3}	min. 0.67 max. 1.5	

MICROPHONY Triode section

No special precautions against microphony are required in circuits where the input voltage is min. 10 mV for 50 mW output of the output tube at frequencies higher than 800 Hz. At lower frequencies the sensitivity may be increased according to figure 1.

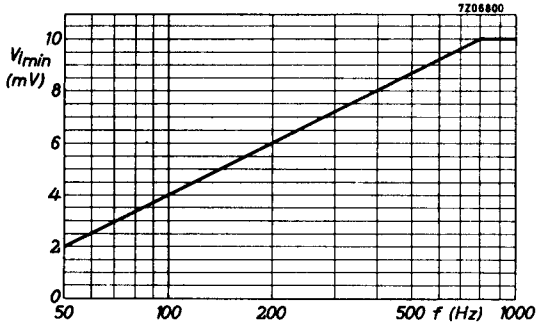


fig.1

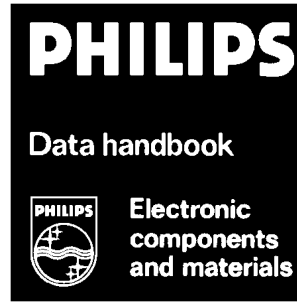
LIMITING VALUES (Design centre rating system)

Triode section

Anode voltage	V_{a_o}	max. 550	V
	V_a	max. 300	V
Anode dissipation	W_a	max. 1	W
Cathode current	I_k	max. 5	mA
Grid resistor	R_g	max. 3	MΩ
Grid resistor (grid current bias)	R_g	max. 22	MΩ
Cathode to heater voltage	V_{kf}	max. 150	V

Diode sections

Diode No.1 voltage, peak negative	$-V_{d_{1p}}$	max. 350	V
Diode No.2 voltage, peak negative	$-V_{d_{2p}}$	max. 350	V
Diode No.3 voltage, peak negative	$-V_{d_{3p}}$	max. 350	V
Diode No.1 current:			
D.C. component	I_{d_1}	max. 1	mA
peak	$I_{d_{1p}}$	max. 6	mA
Diode No.2 current:			
D.C. component	I_{d_2}	max. 10	mA
peak	$I_{d_{2p}}$	max. 75	mA
Diode No.3 current:			
D.C. component	I_{d_3}	max. 10	mA
peak	$I_{d_{3p}}$	max. 75	mA
Cathode (D_2) to heater voltage	$V_{kD_2/f}$	max. 150	V



EABC80

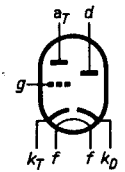
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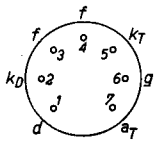
DIODE-TRIODE for use as U.H.F. frequency changer
DIODE-TRIODE pour utilisation en changeuse de fréquence U.H.F.
DIODE-TRIODE zur Verwendung als UHF-Mischröhre

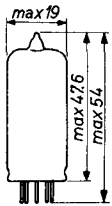
Heating : indirect by A.C. or D.C. series or parallel supply
Chauffage: indirect par C.A. ou C.C. alimentation série ou parallèle
Heizung : indirekt durch Wechsel- oder Gleichstrom; Serien- oder Parallelspeisung

V_f = 6,3 V
I_f = 0,3 A

Dimensions in mm
Dimensions en mm
Abmessungen in mm







Base, culot, Sockel: Miniature

Capacitances (with external screening)
Capacités (avec blindage extérieur)
Kapazitäten (mit äussere Abschirmung)

Triode section Partie triode Triodenteil			Diode section Partie diode Diodenteil		
C_g	=	2,0 pF	C_{dk}	=	1,7 pF
C_a	=	1,2 pF			
C_{ag}	=	1,7 pF			

Between diode and triode sections
Entre les parties diode et triode
Zwischen Dioden- und Triodenteilen

C_{dg}	<	0,1 pF
C_{da}	=	0,4 pF
C_{kT-kD}	=	0,4 pF

Typical characteristics of the triode section
Caractéristiques types de la partie triode
Kenndaten des Triodenteiles

V_a	=	200 V
V_g	=	-4,0 V
I_a	=	5,5 mA
S	=	2,5 mA/V
Ri	=	12,4 kΩ
μ	=	31

Limiting values of the triode section
Caractéristiques limites de la partie triode
Grenzdaten des Triodenteiles

V_{a_o}	= max.	300 V
V_a	= max.	250 V
W_a	= max.	2 W
I_k	= max.	10 mA
V_{kf}	= max.	50 V
R_{kf}	= max.	20 kΩ*

Limiting values of the diode section
Caractéristiques limites de la partie diode
Grenzdaten des Diodenteiles

V_{dinv_p}	= max.	350 V
I_d	= max.	5 mA
I_{d_p}	= max.	50 mA

Max. operating frequency as frequency changer
Fréquence max. pour utilisation en changeuse de fréquence
Max. Betriebsfrequenz als Mischröhre 300 Mc/s

Limiting frequency of oscillation
Fréquence limite en oscillatrice
Grenzfrequenz als Oszillator 600 Mc/s

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3	FP	1999.06.12

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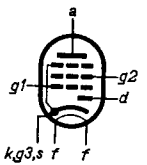
EAF 41

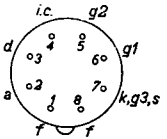
DIODE-PENTODE with variable mutual conductance for use as R.F., I.F. and A.F. amplifier
DIODE-PENTHODE à pente variable pour l'utilisation en amplificatrice H.F., M.F. et B.F.
DIODE-PENTODE mit veränderlicher Steilheit zur Verwendung als H.F.-, Z.F.- und N.F.- Verstärker

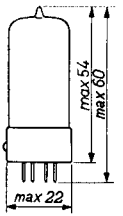
Heating : indirect by A.C. or D.C.; parallel supply
Chauffage: indirect par C.A. ou C.C.; alimentation en parallèle
Heizung : indirekt durch Wechsel- oder Gleichstrom; Parallelspeisung

V_f = 6,3 V
I_f = 0,2 A

Dimensions in mm
Dimensions en mm
Abmessungen in mm







Base, culot, Sockel: Rimlock

Capacitances Capacités Kapazitäten	Pentode section Partie penthode Pentodenteil	Diode section Partie diode Diodenteil
	C_a = 6,5 pF	C_d = 3,8 pF
	C_{g1} = 4,0 pF	C_{df} < 0,02 pF
	C_{ag1} < 0,002 pF	
	C_{g1f} < 0,05 pF	

Between diode and pentode sections
Entre les parties diode et penthode
Zwischen Dioden- und Pentodenteil

C_{dg1} <0,0015 pF
C_{da} < 0,15 pF

Operating characteristics of the pentode section as R.F. or I.F. amplifier
Caractéristiques d'utilisation de la partie penthode en amplificatrice H.F. ou M.F.
Betriebsdaten des Pentodenteiles als H.F.-oder Z.F.-Verstärker

V_a	=	250		V
R_{g2}	=	95		kΩ
R_k	=	300		Ω
V_{g1}	=	-2	-40	V
I_a	=	5	-	mA
I_{g2}	=	1,6	-	mA
S	=	1800	18	µA/V
R_i	=	1,2	> 10	MΩ
μ_{g2g1}	=	19	-	
R_{eq}	=	9,0	-	kΩ

Limiting values of the pentode section
Caractéristiques limites de la partie penthode
Grenzdaten des Pentodenteiles

V_{ao}	= max.	550 V
V_a	= max.	300 V
W_a	= max.	2 W
V_{g2o}	= max.	550 V
V_{g2} (I_a < 2,5 mA)	= max.	300 V
V_{g2} (I_a = 5 mA)	= max.	125 V
W_{g2}	= max.	0,3 W
I_k	= max.	10 mA
V_{g1} (I_{g1}=+0,3 µA)	= max.	-1,3 V
R_{g1}	= max.	3 MΩ
R_{kf}	= max.	20 kΩ
V_{kf}	= max.	50 V

Limiting values of the diode section
Caractéristiques limites de la partie diode
Grenzdaten des Diodenteiles

$V_{d\ invp}$	= max.	350 V
I_d	= max.	0,8 mA
I_{dp}	= max.	5 mA

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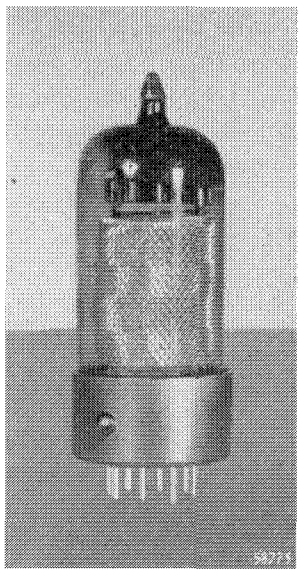
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EAF41

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EAF 42 (EAF 41) Diode-Pentode



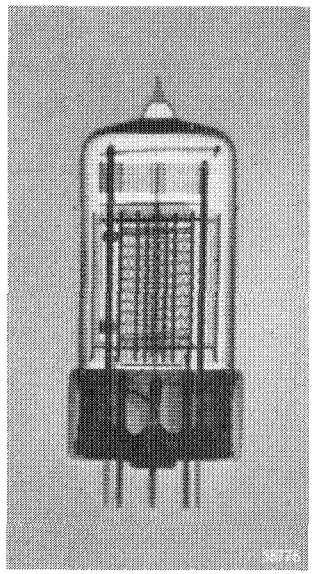


Fig. 1
Normal and X-ray photos of the EAF 42 (approximately actual size).

The EAF 42 is a diode-pentode having variable-mu characteristics, and can be used with a sliding screen grid voltage ; the pentode section is intended for use as a R.F., I.F., or A.F. amplifier, the slope at the working point being 2.15 mA/V (1.8 mA/V in the EAF 41) and the internal resistance 1.4 MΩ (EAF 41 - 1.2 MΩ). The diode part serves for detection or other purposes such as automatic gain control. There is no very great difference between the electrical characteristics of the EAF 41 and EAF 42 ; the main physical difference lies in the connection of the third grid, for in the EAF 41 this is connected internally to the cathode, whereas in the EAF 42 it has a separate pin in the valve base. This is a distinct advantage in small receivers having only four Rimlock valves, e.g. ECH 42 (or ECH 41) frequency changer, EAF 42 I.F. amplifier, detector and *delayed* gain control, EL 41 output valve and AZ 41 or EZ 40 rectifier. In spite of the small number of valves, a receiver of this type can be quite sensitive, its other qualities being improved by the delay on the gain control. Delay is obtained by employing the separately connected third grid of the EAF 42 as the so-called "delay diode". Further details are given in the following pages. If an EAF 41 be used instead of the EAF 42 in a receiver of this kind, the gain control cannot

be delayed, or at best only with difficulty, and the advantages of this arrangement are then lost[1]).

EAF 42 as I.F. amplifier

In the circuit of Fig. 2 the pentode section of the first valve EAF 42 is used as an I.F. amplifier with a sliding screen grid voltage; the optimum values for the series resistor are indicated in the table at the end of this section. In this circuit a control voltage of about 43 V applied to the control grid reduces the slope to 1/100 of the original value. If the EAF 42 and the ECH 41 or ECH 42 are employed together, the screen grids of the frequency changer

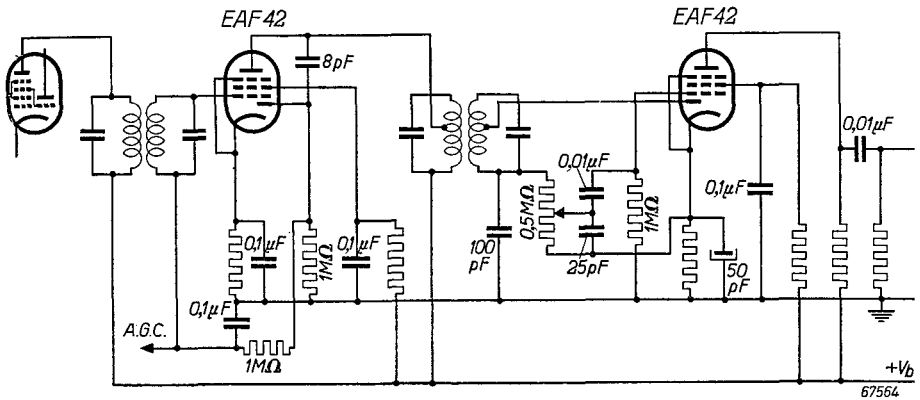


Fig. 2
Circuit diagram showing the EAF 42 as an I.F. amplifier (left-hand valve) and as a resistance-coupled A.F. amplifier (right-hand valve). The diode of the first valve is used for automatic gain control and that of the second as detector ; the values of the resistors not indicated above will be found in the tables at the end of this section.

valve and the I.F. amplifier EAF 42 can be fed from the same potentiometer, thus saving the extra components (see Fig. 3). Further particulars of such a circuit will be found in the description of the ECH 42, whilst data relating to the EAF 42 in this circuit are included among the tables and characteristics at the end of this section.
Adequate screening is ensured by a metal cage surrounding the pentode section of the valve; external screening is therefore unnecessary. Special attention has also been given to the screening between control grid and anode ; the

[1]) For this reason the EAF 41 in its original form is no longer being manufactured, but is replaced by the EAF 42. For replacement purposes in the re-valving of a set, the EAF 42 can take the place of the EAF 41, it being only necessary to short-circuit sockets 4 and 7 of the valveholder (see Fig. 8); in this way the connection between the third grid and the cathode (which is inside the EAF 41) is established externally of the EAF 42. In numerous receivers fitted with the EAF 41 this connection is already established.

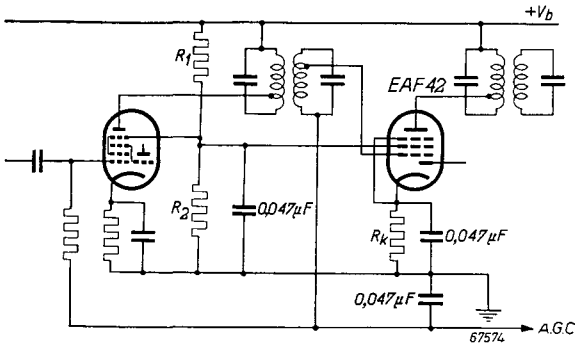


Fig. 3
Circuit in which the screen grids of the frequency changer (ECH 41 or ECH 42) and the I.F. amplifier (EAF 42) are fed from a common potentiometer, R_1, R_2.

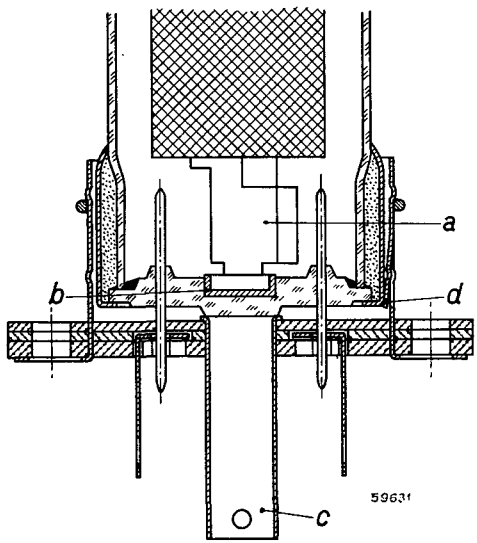


Fig. 4
Screening between anode and control grid in the EAF 42: *a* is a shield between the diametrically opposite anode and grid pins; *b* is a metal plate mounted in a recess in the glass base between the pins; *c* is a metal bush between the contacts of the valveholder.

respective pins are diametrically opposite each other on the base, and a shield is provided between these pins within the envelope (*a*, Fig. 4). This shield is continued underneath the base of the valve by a metal bush (*c*), connected to earth, which is fixed in the centre of the valveholder.

In order that the internal and external shielding shall be as continuous as possible, a further metal plate *b* is mounted in a small recess in the glass base, and is connected to the other shields in the valve. By this means it has been possible to reduce the anode-grid capacitance to something less than 0.002 pF, but in order to maintain this low capacitance it is essential to press the valve well home in the valveholder to minimize the gap between internal and external shields. It is also necessary to see that the metal skirt at the base of the valve is properly earthed (see note on page 18), by bending the lugs on the metal rim of the valveholder before inserting the valve, to ensure proper contact between this earthed rim and the skirt on the valve (see *d* in Fig. 4).

When calculating the amount of feedback to the grid circuit of the EAF 42 when it is used as an I.F. amplifier, it must be remembered that feedback occurs not only from the anode of the pentode but also from that of the diode. If the latter is employed for automatic gain control, it will usually be connected to the first tuned circuit of the I.F. transformer, to which the pentode anode is also connected. The I.F. voltages on the anodes of the

diode and pentode are thus in phase and of the same order of size, so that the effective feedback capacitance is roughly equal to the anode-to-grid capacitance plus the diode-grid capacitance ($C_{ag1}<0.002$ pF, $C_{dg1}<0.0015$ pF); on the other hand, if the diode is used for detection purposes, it is usually connected to the secondary of the I.F. transformer, in which case the diode voltage is 90° out of phase with the pentode anode voltage and will have a damping effect on the grid circuit.
In either case the feedback, even when high-quality coils are used ($Q=180$ to 200), will not have any serious consequences, provided that wiring capacitances are kept as low as possible. This can be achieved by fitting a screening plate under the valveholder, between pins 3 and 4, 6 and 7 (see Figs. 7 and 8).

EAF 42 as A.F. amplifier

In Fig. 2 the second EAF 42 is shown connected as an A.F. amplifier; tables are included in the technical data at the end of this section indicating the amplification and distortion for a number of different circuits, with various combinations of resistors and for several values of the control voltage. Fig. 5 is an example of the circuits in question, but, before looking more closely at the details, it may be better to consider the question of hum in the EAF 42 when used as a voltage amplifier, and, in particular, the hum produced by the magnetic field of the heater. As the EAF 42 is a variable-mu valve, it has a variable pitch grid, which means that the pitch of part of the grid is relatively wide, and it would seem to be more especially those electrons that pass between the widely spaced turns of the grid which are affected by the magnetic field produced by the heater. The result is a higher hum voltage than otherwise, especially when gain control is applied, as the greater part of the electrons then find their way through the more widely spaced turns of the grid. It may therefore be concluded that control applied to the A.F. amplifier will generally increase the equivalent hum voltage on the control grid, whilst a variable-mu valve is, from the point of view of hum, not the best kind of valve to use for A.F. amplification.

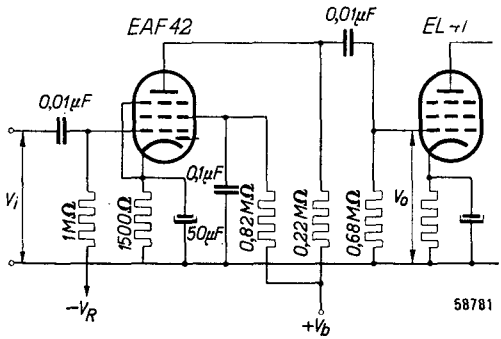


Fig. 5
Circuit diagram showing the EAF 42 as a resistance-coupled A.F. amplifier with control ($-V_R$) on the grid.

From the tables on page 43 it will be seen that the maximum obtainable amplification is 120, but as such a high gain is not usually required, the reserve can be used for negative feedback purposes and the quality of reproduction thereby considerably improved. A feedback factor of 6 or 7, which will reduce the distortion by the same amount, still leaves a total effective gain of about 20 in the A.F. stage.

Another reason why the full extent of the gain should not be utilized in the case of the EAF 42 is related to the possibility of microphony ; in many cases it will be found necessary to take special precautions in this direction. Some idea of the A.F. gain that may be obtained from the EAF 42 without risk of microphony is given by the fact that a circuit driving a loudspeaker with an acoustic efficiency of 5% will not usually necessitate any special precautions to prevent microphony when the control grid of the EAF 42 requires an A.F. input of at least 10 mV for 50 mW to be delivered to the speaker.

To illustrate the practical significance of this value of 10 mV, let us take the case of a circuit using an EAF 42 as the A.F. pre-amplifier and an EL 41 as the output valve. To produce an output of 50 mW the EL 41 requires an alternating input voltage of 0.32 V: if the voltage amplifier has a gain of 20 — this being usually considered sufficient — it will require an input of 16 mV, and this is well above the minimum value of 10 mV.

In fixing this limit, above which no trouble from microphony is met with, external influences such as cabinet resonance, which impose heavy requirements on the microphonic properties of the valve, have not been taken into account.

In such cases, as also when still more gain is required, it will generally be found necessary to take steps to avoid microphony, such as the use of anti-microphonic valveholders, or a vibration-damping cover on the valve itself.

In the table on page 45 the gain of the EAF 42 is given for a grid leak of 10 MΩ, with no cathode resistor. A grid leak of such high value may be used only if no extra source of grid bias is available; the reasons for this will be found in the description of the EBC 41.

Detection and automatic gain control

a. *Detection and A.G.C. using two EAF 42 valves*

In the circuit diagram of Fig. 2 the diode of the second EAF 42 functions as detector, whilst that of the first valve serves for the A.G.C.; the detector diode is connected to the secondary of the I.F. transformer and the A.G.C. diode to the primary. As the diodes are in different valves, there is no need to take any steps to minimize capacitance between them.

In the EAF 42 the diode anode is connected internally to the most suitable pin, to ensure a minimum of coupling between diode and pentode sections, but in order to keep the capacitance between the leads to the respective electrodes as low as possible, it is essential to fit a screening plate below the valveholder, between contacts 3 and 4, and 6 and 7, in the manner shown in Figs. 7 and 8.

Apart from the circuit under review, in which the diode of the A.F. amplifier is used for detection and that of the I.F. amplifier for A.G.C., it is also possible to reverse the functions of these diodes, although there is a disadvantage in so doing, in that, when the volume control is turned right back, any residual signal will be distorted. Such a signal is likely to occur, if only weakly, because the A.F. voltage on the diode of the EAF 42 used as A.F. amplifier tends to reach high values on strong input signals.

There need only be the slightest coupling between this diode and the pentode-anode to convey an A.F. signal to the latter, and, as this anode follows the volume control in the circuit, any such signal will be at once audible in the speaker. When the signal comes from the detector diode it is not distorted, since the A.F. voltage on that diode does not usually suffer from distortion, in contrast with the A.F. voltage on the A.G.C. diode which, owing to the bias voltage employed for the delaying action, is distorted and unpleasant to the ear.
In cases where the bias on the I.F. valve is derived from a cathode resistor, a further consequence of the interchange of the diode functions is that the control voltage increases less rapidly. When control is applied to the I.F. valve in the circuit shown in Fig. 2, the voltage across the cathode resistor, and therefore also the delay voltage for the diode, disappear, and the latter then supplies a higher control voltage.

b. *Detection and A.G.C. using one EAF 42*

As already mentioned, a receiver can be designed round the ECH 42 (or ECH 41), EAF 42, EL 41 and AZ 41 or EZ 40, which, despite the small number of valves, will still be reasonably sensitive. Since a circuit of this kind includes only one diode, this must serve for both detection and A.G.C. There is no objection to this, but, if the EAF 41 is used instead of the EAF 42, it is not a simple matter to delay the A.G.C., since a bias on the diode-anode, as frequently employed to produce the delaying effect, cannot then be used, as this prevents detection of weak signals. Moreover, neither the EAF 41 nor any of the other valves has an electrode suitable for use as so-called delay diode. (The action of such a diode will be explained in the following.) When the EAF 41 is used, therefore, the A.G.C. must be undelayed, but this involves certain difficulties, which are best illustrated by means of two extreme examples.
In the first case the whole of the rectified voltage from the diode is used for the A.G.C. This results in a very strong gain control and, also, noticeable attenuation of the weaker signals, which is not desirable. Further, with such control the output valve is driven fully only on strong signals. On the other hand, if only a small portion of the rectified voltage is taken for the purpose of A.G.C., these objections are certainly eliminated, but the control is then inadequate in the face of strong signals, and high I.F. voltages occur which, especially on deeply modulated signals, are likely to give rise to modulation distortion.
Naturally, a more or less satisfactory compromise can be made between these evils by allocating a suitable proportion of rectified voltage from the detector to the A.G.C., but better results are usually obtained when the control is delayed so as to attenuate the strong signals and not the weak ones; the output valve is then also able to deliver its full output on fairly weak signals.
The EAF 42 enables such delay to be applied quite conveniently, the separately connected third grid being then employed as "delay diode"; the relative circuit diagram is shown in Fig. 6. A potentiometer comprising R_1 (20 MΩ),

R_2 (1.5 MΩ) and R_3 (2.7 MΩ) is introduced between the H.T. voltage V_b (250 V) and a voltage of —7 V obtained from the bias on the output valve EL 41. The junction A between resistors R_1 and R_2 is connected to the third grid of the EAF 42 and further, through R_4 (1.8 MΩ), to a point B in the detector circuit. From another point C at the junction of resistors R_2 and R_3 the necessary bias $-V_R$ for the control grids of the frequency changer and I.F. amplifier is obtained. The various resistance values are so arranged as to give point A a small positive potential ($V_{g3} < 1$ V) with respect to cathode when no signal is being received.

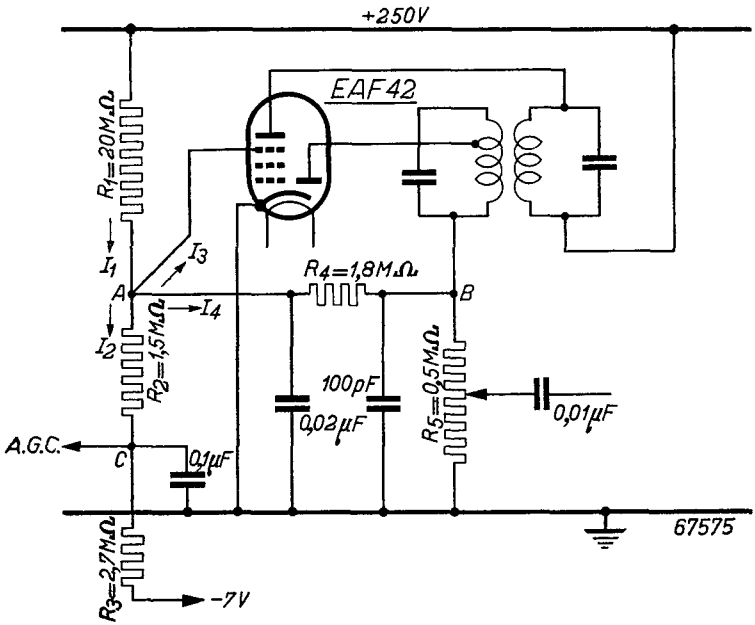


Fig. 6
Circuit diagram showing the EAF 42 used as an I.F. amplifier with the diode employed for detection and A.G.C., the third grid functioning as "delay diode".

By means of the given voltages and resistance values it is a simple matter to calculate that in this case the potential $-V_R$ will be about —2 V. This determines the working point of the frequency changer and I.F. amplifier. The values of the currents to and from point A are also easily computed. It is found that the current I_1 flowing in resistor R_1 is 12.5 μA, the current I_2 in resistor R_2 is 1.9 μA and the current I_4 in resistor R_4 0.4 μA. Voltage V_{g3}, that is the potential at point A, can be expressed to a close approximation as $V_{g3} = V_{g3_0} + I_3 . R_{g3}$, in which V_{g3_0} is the contact potential of the

third grid with respect to cathode and R_{g3} the internal resistance of the third grid, also to cathode.

Now, when an I.F. signal of gradually increasing strength is applied to the diode, the effect of detection is to render point B negative with respect to earth; the current I_4 therefore increases. As current I_1 is kept practically constant by the high resistance of R_1 (20 MΩ), whilst I_2 — and therefore also the variation in I_2 — may be ignored at a first approximation, the increase in I_4 takes place at the cost of I_3. So long as the current I_3 exists, however, the potential at point A will differ but slightly from that of the cathode. If the I.F. signal increases so much that $I_3=0$, V_{g3} has decreased from its original small positive value to V_{g3_0}, which also differs only slightly from 0 V. Since the bias on the EL 41 remains unchanged at —7 V, the voltage $-V_R$ does not alter very much either. Thus no control is applied to the frequency changer and I.F. valve so long as the current I_3 flows. However, as soon as the I.F. signal becomes so strong that the current I_3 disappears altogether, the increase in I_4 takes place at the cost of I_2, since I_1 cannot undergo any great change owing to the presence of the series-resistor of 20 MΩ.

From the circuit diagram it will be clearly seen that a reduction in I_2 (whereby I_2 may also change direction) renders C still more negative, so that control is applied to the valves.

Let us now see at what point the control begins to take effect. As mentioned above, this occurs when the current I_3 drops to zero. Now, this current is 10.2 μA in the absence of a signal, which means that the control commences to operate when the current I_4 is increased to about 10 μA by the I.F. signal: in actual fact, I_4 is 10.8 μA at the moment when $I_3=0$. A current I_4 of 10.8 μA means that there is a direct voltage of $10.8\times1.8=19.4$ V across resistor R_4, and this voltage also occurs across the volume control R_5, corresponding at the same time to the peak carrier voltage of the detected I.F. signal. Assuming that the modulation depth of the I.F. signal is 30%, the volume control will carry an A.F. signal of which the R.M.S. voltage is 0.3. $19.4/\sqrt{2}=4.1$ V. At this voltage, which is roughly what is required to load fully the output valve EL 41, the automatic gain control commences to operate.

In the foregoing, the various resistance values are introduced without further elucidation; naturally there is a certain freedom of choice in fixing the resistance values, and, with slightly modified conditions, it is quite possible that values other than those indicated would give better results. This point is referred to again in the description of a receiver incorporating the circuit described above (see page 137).

TECHNICAL DATA OF THE DIODE-PENTODE EAF 41

Heater data

Heating: Indirect, A.C. or D.C., parallel feed

Heater voltage	V_f	=	6.3 V
Heater current	I_f	=	0.2 A

EAF 41

Capacitances (measured on the cold valve)

Pentode section			
Input capacitance	C_{g1}	=	4.0 pF
Output capacitance	C_a	=	6.5 pF
Anode - control grid	C_{ag1}	<	0.002 pF
Heater - control grid	C_{g1f}	<	0.05 pF
Diode section			
Anode - cathode	C_d	=	3.8 pF
Anode - heater	C_{df}	<	0.02 pF
Between diode and pentode sections			
Diode anode - pentode control grid	C_{dg1}	<	0.0015 pF
Diode anode - pentode anode	C_{da}	<	0.15 pF

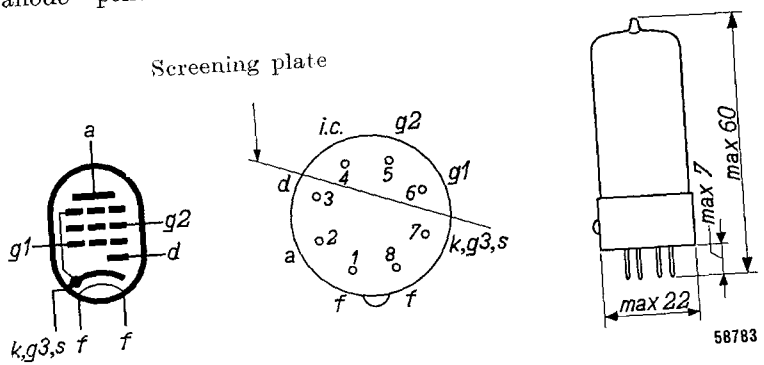


Fig. 7
Electrode arrangement, electrode connections and maximum dimensions in mm of the EAF 41. The screening plate, indicated by a line through the centre diagram, obviates undesirable coupling in the wiring. The letters i.c. at pin 4 indicate that this pin is internally connected to the electrode system and must not be connected to the external circuit.

Operating characteristics of the pentode section used as a R.F. or I.F. amplifier

(Circuit similar to that of the left-hand EAF 42 in Fig. 2)

Anode and supply voltage	$V_a = V_b$	=	250	V
Screen grid resistor	R_{g2}	=	95	kΩ
Cathode resistor	R_k	=	300	Ω
Grid bias	V_{g1}	=	−2	−40 V
Screen grid voltage	V_{g2}	=	100	250 V
Anode current	I_a	=	5.0	— mA
Screen grid current	I_{g2}	=	1.6	— mA
Mutual conductance	S	=	1800	18 μA/V
Internal resistance	R_i	=	1.2	>10 MΩ
Equivalent noise resistance	R_{eq}	=	9.0	— kΩ
Amplification factor of grid 2 with respect to grid 1	μ_{g2g1}	=	19	—

Operating characteristics of the pentode section used as a resistance-coupled A.F. amplifier (circuit similar to Fig. 5)

A. Supply voltage V_b=250 V Anode resistor R_a=0.2 MΩ
Cathode resistor R_k=1.6 kΩ Screen grid resistor R_{g2}=0.8 MΩ

Control voltage $-V_R$(V)	Anode current I_a(mA)	Screen grid current I_{g2} (mA)	Amplification V_o/V_i	Distortion (%) for an output of		
				3 V_{RMS}	5 V_{RMS}	10 V_{RMS}
0	0.86	0.28	105	1.0	1.5	2.7
5	0.68	0.22	33	1.0	1.6	3.5
10	0.56	0.18	21	1.1	1.8	3.9
18	0.39	0.12	12	1.3	2.0	5.0
25	0.24	0.08	8	1.8	2.8	7.5

B. Supply voltage V_b=250 V Anode resistor R_a=0.1 MΩ
Cathode resistor R_k=900 Ω Screen grid resistor R_{g2}=0.4 MΩ

Control voltage $-V_R$(V)	Anode current I_a(mA)	Screen grid current I_{g2} (mA)	Amplification V_o/V_i	Distortion (%) at an output of		
				3 V_{RMS}	5 V_{RMS}	10 V_{RMS}
0	1.57	0.50	85	0.9	1.3	2.5
5	1.18	0.37	29	1.1	1.6	3.5
10	0.91	0.28	16	1.3	2.2	4.1
18	0.60	0.18	9.5	1.6	2.8	5.5
25	0.36	0.12	6	2.5	4.1	9.0

EAF 41

Operating characteristics of the pentode section used as a resistance-coupled A.F. triode (screen grid connected to anode).

A. Supply voltage V_b=250 V Anode resistor R_a=0.1 MΩ
Cathode resistor R_k=900 Ω

Control voltage $-V_R$(V)	Anode current I_a+I_{g2}(mA)	Amplification V_o/V_i	Distortion (%) at an output of		
			3 V_{RMS}	5 V_{RMS}	10 V_{RMS}
0	1.96	15.5	1.4	2.0	5.2
5	1.40	8	1.0	1.7	3.8
10	1.10	6	0.9	1.4	3.0
18	0.75	4.5	1.2	1.6	3.3
25	0.45	3.3	1.6	2.2	5.2

B. Supply voltage V_b=250 V Anode resistor R_a=0.05 MΩ
Cathode resistor R_k=500 Ω

Control voltage $-V_R$(V)	Anode current I_a+I_{g2}(mA)	Amplification V_o/V_i	Distortion (%) at an output of		
			3 V_{RMS}	5 V_{RMS}	10 V_{RMS}
0	3.60	15.5	1.1	1.8	3.8
5	2.50	8	1.3	2.0	4.5
10	1.85	5.9	1.1	1.7	4.0
18	1.14	3.8	1.5	2.0	5.0
25	0.65	2.8	2.4	3.5	8.0

Limiting values of the pentode section

Anode voltage, valve biased to cut-off	V_{a_c}	= max.	550 V
Anode voltage	V_a	= max.	300 V
Anode dissipation	W_a	= max.	2 W
Screen grid voltage, valve biased to cut-off	V_{g2_o}	= max.	550 V
Screen grid voltage, with control	V_{g2}(I_a<2.5 mA)	= max.	300 V
Screen grid voltage, without control	V_{g2}(I_a=5 mA)	= max.	125 V
Screen grid dissipation	W_{g2}	= max.	0.3 W
Cathode current	I_k	= max.	10 mA
Grid current starting point	V_{g1}(I_{g1}= +0.3 μA)	= max.	−1.3 V
External resistance between grid 1 and cathode	R_{g1}	= max.	3 MΩ
External resistance between heater and cathode	R_{fk}	= max.	20 kΩ
Voltage between heater and cathode	V_{fk}	= max.	50 V

Limiting values of the diode section

Peak inverse anode voltage	$V_{d\,inv\,p}$	= max.	350 V
Diode current	I_d	= max.	0.8 mA
Peak diode current	I_{dp}	= max.	5 mA
Diode current starting point	$V_d(I_d = +0.3\mu A)$	= max.	−1.3 V
External resistance between heater and cathode	R_{fk}	= max.	20 kΩ
Voltage between heater and cathode	V_{fk}	= max.	50 V

TECHNICAL DATA OF THE DIODE-PENTODE EAF 42

Heater data

Heating : Indirect, A.C. or D.C., parallel feed

Heater voltage	V_f	=	6.3 V
Heater current	I_f	=	0.2 A

Capacitances

Pentode section

Input capacitance	C_{g1}	=	4.1 pF
Output capacitance	C_a	=	5.2 pF
Anode - control grid	C_{ag1}	<	0.002 pF
Heater - control grid	C_{g1f}	<	0.05 pF

Diode section

Anode - cathode	C_d	=	3.3 pF
Anode - heater	C_{df}	<	0.02 pF

Between diode and pentode sections

Diode anode - pentode control grid	C_{dg1}	<	0.0015 pF
Diode anode - Pentode anode	C_{da}	<	0.15 pF

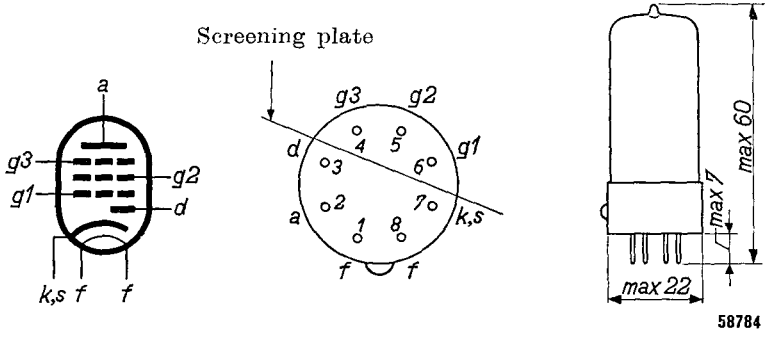


Fig. 8
Electrode arrangement, electrode connections and maximum dimensions in mm of the EAF 42. The screening plate shown in the centre diagram serves to reduce unwanted coupling in the wiring.

EAF 42

Operating characteristics of the pentode section used as a R.F. or I.F. amplifier

(For circuit diagram see left-hand EAF 42 in Fig. 2.)

Anode and supply voltage	$V_a = V_b$	=	250		V
Voltage, third grid	V_{g3}	=	0		V
Screen grid resistor	R_{g2}	=	110		kΩ
Cathode resistor	R_k	=	310		Ω
Grid bias	V_{g1}	=	−2	−43	V
Screen grid voltage	V_{g2}	=	85	250	V
Anode current	I_a	=	5.0	—	mA
Screen grid current	I_{g2}	=	1.5	—	mA
Mutual conductance	S	=	2000	20	μA/V
Internal resistance	R_i	=	1.4	>10	MΩ
Equivalent noise resistance	R_{eq}	=	7.5	—	kΩ
Amplification factor of grid 2 in respect of grid 1	μ_{g2g1}	=	16	—	

Anode and supply voltage	$V_a = V_b$	=	250		V
Voltage, third grid	V_{g3}	=	0		V
Screen grid resistor	R_{g2}	=	68		kΩ
Cathode resistor	R_k	=	220		Ω
Grid bias	V_{g1}	=	−2	−43	V
Screen grid voltage	V_{g2}	=	105	—	V
Anode current	I_a	=	6.9	—	mA
Screen grid current	I_{g2}	=	2.1	—	mA
Mutual conductance	S	=	2150	21.5	μA/V
Internal resistance	R_i	=	1.4	>10	MΩ
Equivalent noise resistance	R_{eq}	=	9	—	kΩ
Amplification factor of grid 2 in respect of grid 1	μ_{g2g1}	=	16	—	

Operating characteristics of the pentode section used as a R.F. or I.F. amplifier

(Screen grids of EAF 42 and ECH 41 fed by means of a common potentiometer; see Fig. 3, page 32. For details of the ECH 41 in this circuit, see page 69.)

Anode and supply voltage	$V_a = V_b$	=	250		V
Voltage, third grid	V_{g3}	=	0		V
Potentiometer for screen grid voltage supply	R_1	=	18		kΩ
	R_2	=	27		kΩ
Cathode resistor	R_k	=	220		Ω
Grid bias	V_{g1}	=	−2	−23.5	V
Screen grid voltage	V_{g2}	=	105	147	V
Anode current	I_a	=	6.9	—	mA
Screen grid current	I_{g2}	=	2.1	—	mA
Mutual conductance	S	=	2150	21.5	μA/V
Internal resistance	R_i	=	1.4	>10	MΩ
Equivalent noise resistance	R_{eq}	=	9	—	kΩ
Amplification factor of grid 2 with respect to grid 1	μ_{g2g1}	=	16	—	

Operating characteristics of the pentode section used as a R.F. or I.F. amplifier

(Screen grids of the EAF 42 and ECH 42 fed by means of a common potentiometer, see Fig. 3, page 32. For details of the ECH 42 in this circuit, see page 80.)

Anode and supply voltage	$V_a = V_b$	=	250		V
Voltage, third grid	V_{g3}	=	0		V
Potentiometer for screen grid voltage supply	R_1	=	22		kΩ
	R_2	=	27		kΩ
Cathode resistor	R_k	=	310		Ω
Grid bias	V_{g1}	=	−2	−20.5	V
Screen grid voltage	V_{g2}	=	85	137	V
Anode current	I_a	=	5.0	—	mA
Screen grid current	I_{g2}	=	1.5	—	mA
Mutual conductance	S	=	2000	20	μA/V
Internal resistance	R_i	=	1.4	>10	MΩ
Equivalent noise resistance	R_{eq}	=	7.5	—	kΩ
Amplification factor of grid 2 in respect of grid 1	μ_{g2g1}	=	16	—	

Operating characteristics of the pentode section used as a resistance-coupled A.F. amplifier (Fig. 5)

A. Supply voltage V_b=250 V Anode resistor R_a=0.22 MΩ
Cathode resistor R_k=1.5 kΩ Screen grid resistor R_{g2}=0.82 MΩ

Control voltage $-V_R$(V)	Anode current I_a (mA)	Screen grid current I_{g2} (mA)	Amplification V_o/V_i	Distortion (%) at an output of		
				3 V_{RMS}	5 V_{RMS}	8 V_{RMS}
0	0.80	0.26	120	0.9	1.0	1.2
5	0.65	0.20	40	1.3	1.5	2.5
10	0.52	0.17	23	1.3	1.6	2.7
15	0.41	0.14	16	1.5	2.0	3.2
20	0.31	0.11	11	1.8	2.7	5.5

B. Supply voltage V_b=250 V Anode resistor R_a=0.1 MΩ
Cathode resistor R_k=680 Ω Screen grid resistor R_{g2}=0.39 MΩ

Control voltage $-V_R$(V)	Anode current I_a (mA)	Screen grid current I_{g2} (mA)	Amplification V_o/V_i	Distortion (%) at an output of		
				3 V_{RMS}	5 V_{RMS}	8 V_{RMS}
0	1.52	0.53	100	0.8	0.9	1.0
5	1.20	0.40	35	1.0	1.4	2.4
10	0.94	0.30	20	1.2	2.0	3.2
15	0.70	0.23	13	1.4	2.3	3.7
20	0.52	0.17	9	1.8	3.0	6.0

EAF 42

Operating characteristics of the pentode section used as a resistance-coupled A.F. amplifier triode (screen grid connected to anode)

A. Supply voltage V_b=250 V Anode resistor R_a=0.1 MΩ
Cathode resistor R_k=680 Ω

Control voltage $-V_R$(V)	Anode current I_a+I_{g2}(mA)	Amplification V_o/V_i	Distortion (%) at an output of		
			3 V_{RMS}	5 V_{RMS}	8 V_{RMS}
0	2.00	15	0.9	1.1	1.2
5	1.50	8.5	1.1	1.6	2.4
10	1.17	6	1.1	1.6	2.4
15	0.90	5	1.1	1.6	2.4
20	0.68	4	1.2	1.7	2.6

B. Supply voltage V_b=250 V Anode resistor R_a=0.05 MΩ
Cathode resistor R_k=390 Ω

Control voltage $-V_R$(V)	Anode current I_a+I_{g2}(mA)	Amplification V_o/V_i	Distortion (%) at an output of		
			3 V_{RMS}	5 V_{RMS}	8 V_{RMS}
0	3.80	14	0.7	0.9	1.1
5	2.70	9	1.1	1.6	2.6
10	2.00	6.5	1.1	1.6	2.6
15	1.44	5	1.1	1.6	2.6
20	1.05	4	1.4	2.2	3.4

Operating characteristics of the pentode section used as a resistance-coupled A.F. amplifier, with a large leak resistance in the grid circuit

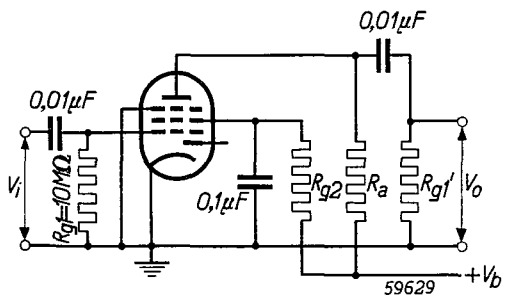


Fig. 9

A. *Pentode connection*

Supply voltage	V_b	=	250	250 V
Anode resistor	R_a	=	0.22	0.1 MΩ
Screen grid resistor	R_{g2}	=	1.0	0.39 MΩ
Grid leak	R_{g1}	=	10	10 MΩ
Grid leak of output valve	R_{g1}'	=	0.68	0.33 MΩ
Anode current	I_a	=	0.76	1.60 mA
Screen grid current	I_{g2}	=	0.23	0.56 mA
Amplification	V_o/V_i	=	160	100
Distortion at an output of				
3 V_{RMS}	$d_{tot}(V_o=3\ V_{RMS})$	=	0.55	0.35 %
5 V_{RMS}	$d_{tot}(V_o=5\ V_{RMS})$	=	0.75	0.55 %
8 V_{RMS}	$d_{tot}(V_o=8\ V_{RMS})$	=	1.0	0.7 %

B. *Triode connection* (screen grid connected to anode)

Supply voltage	V_b	=	250	250 V
Anode resistor	R_a	=	0.1	0.047 MΩ
Grid leak	R_{g1}	=	10	10 MΩ
Grid leak of output valve	R_{g1}'	=	0.33	0.15 MΩ
Anode current	I_a	=	2.15	4.50 mA
Amplification	V_o/V_i	=	14	13.5
Distortion at an output of				
3 V_{RMS}	$d_{tot}(V_o=3\ V_{RMS})$	=	0.7	0.5 %
5 V_{RMS}	$d_{tot}(V_o=5\ V_{RMS})$	=	1.2	0.8 %
8 V_{RMS}	$d_{tot}(V_o=8\ V_{RMS})$	=	2.0	1.4 %

Limiting values of the pentode section

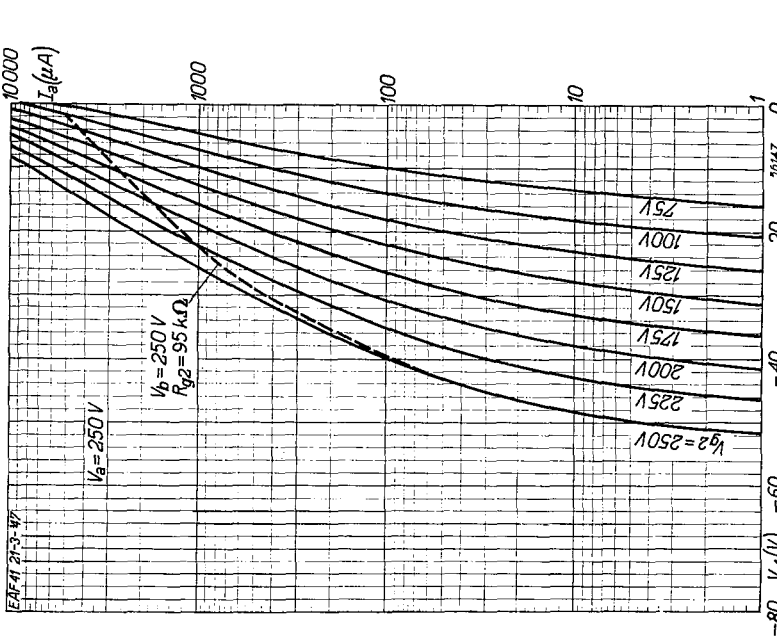
Anode voltage, valve biased to cut-off	V_{a_o}	=	max. 550	V
Anode voltage	V_a	=	max. 300	V
Anode dissipation	W_a	=	max. 2	W
Screen grid voltage, valve biased to cut-off	V_{g2_o}	=	max. 550	V
Screen grid voltage, controlled valve	$V_{g2}(I_a<2.5$ mA)	=	max. 300	V
Screen grid voltage, without control	$V_{g2}(I_a=5$ mA)	=	max. 125	V
Screen grid dissipation	W_{g2}	=	max. 0.3	W
Cathode current	I_k	=	max. 10	mA
Grid current starting point	$V_{g1}(I_{g1}=+0.3\ \mu A)$	=	max. −1.3	V
External resistance between grid 1 and cathode	R_{g1}	=	max. 3	MΩ[1])

[1]) If the working point of the valve is determined only by the potential difference across the grid leak (R_{g1}), i.e. no separate source of bias and no cathode resistor, the maximum value of R_{g1} may be increased to 22 MΩ.

External resistance between grid 3 and cathode . . .	R_{g3}	= max.	3	MΩ
External resistance between heater and cathode . . .	R_{fk}	= max.	20	kΩ
Voltage between heater and cathode	V_{fk}	= max.	100	V

Limiting values of the diode section

Peak inverse anode voltage .	$V_{d\,\mathrm{inv}\,p}$	= max.	350	V
Diode current	I_d	= max.	0.8	mA
Peak diode current	I_{dp}	= max.	5	mA
Diode current starting point	$V_d(I_d = +0.3\ \mu A)$	= max.	−1.3	V
External resistance between heater and cathode . . .	R_{fk}	= max.	20	kΩ
Voltage between heater and cathode	V_{fk}	= max.	100	V



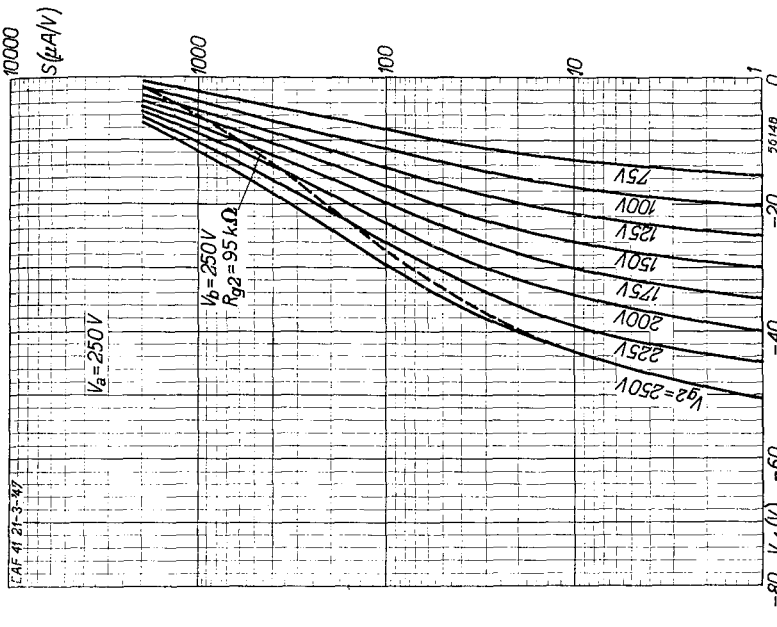


Fig. 10
Anode current (Fig. 10) and mutual conductance (Fig. 11) of the EAF 41 as functions of the grid bias for different screen grid voltages. The broken lines represent the anode current and slope with a 95 kΩ-resistor in series with the screen grid.

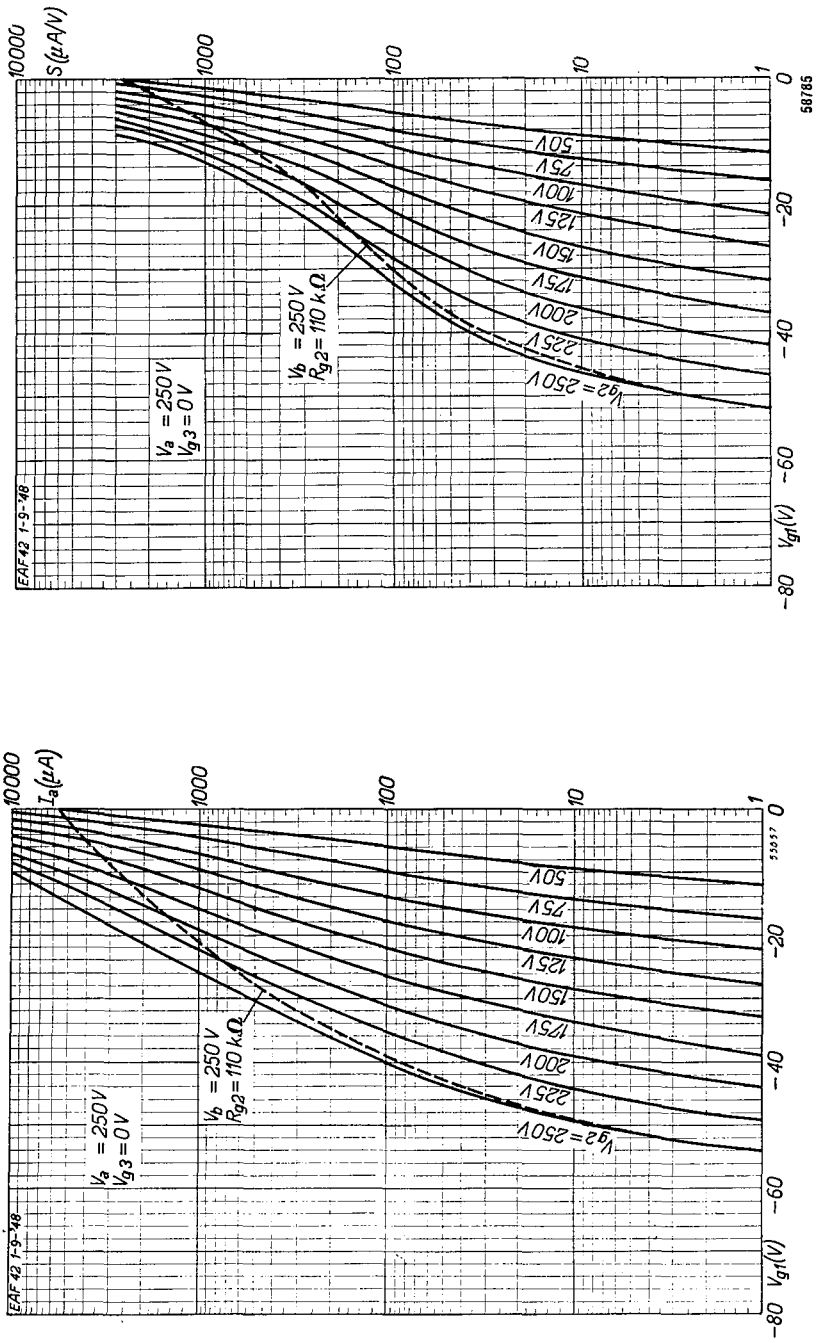


Fig. 13

Fig. 12

Anode current (Fig. 12) and mutual conductance (Fig. 13) of the EAF 42 as functions of the grid bias for various screen grid voltages. The broken lines represent the anode current and slope of the I.F. valve EAF 42 in the circuit of Fig. 2.

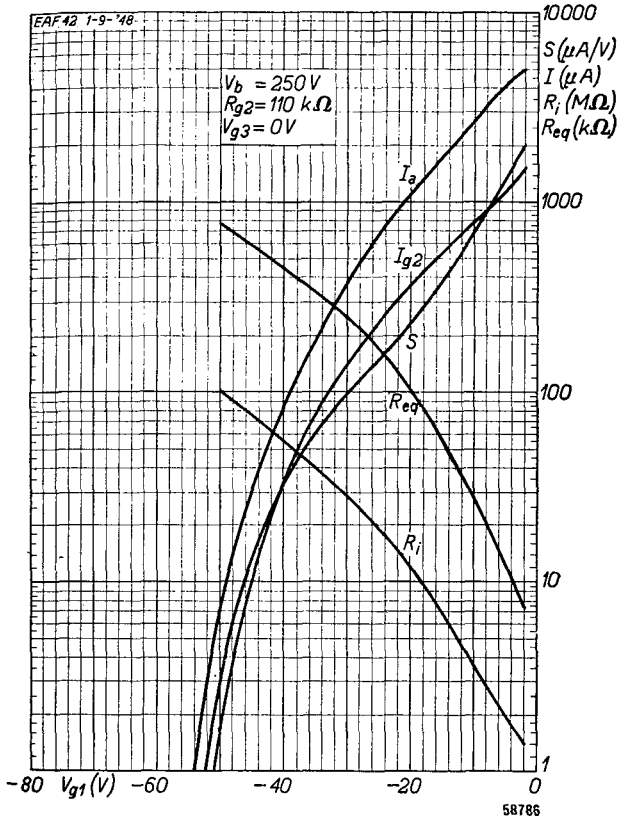


Fig. 14
Anode current (I_a), screen grid current (I_{g2}), mutual conductance (S), internal resistance (R_i) and equivalent resistance (R_{eq}) of the pentode section of the EAF 42 as functions of the grid bias, measured in the I.F. circuit shown in Fig. 2.

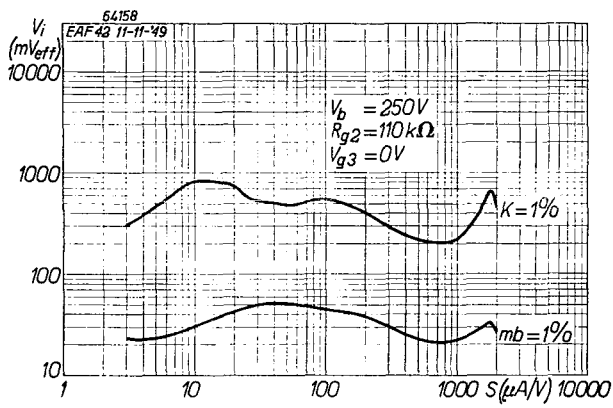


Fig. 15
R.M.S. voltage (V_i) of an interfering signal at the grid of the EAF 42, producing 1% cross modulation (curve $K = 1\%$), together with the R.M.S. value (V_i) of a hum voltage at the grid, resulting in 1% modulation hum (curve $m_b = 1\%$), measured as a function of the mutual conductance in the I.F. circuit shown in Fig. 2.

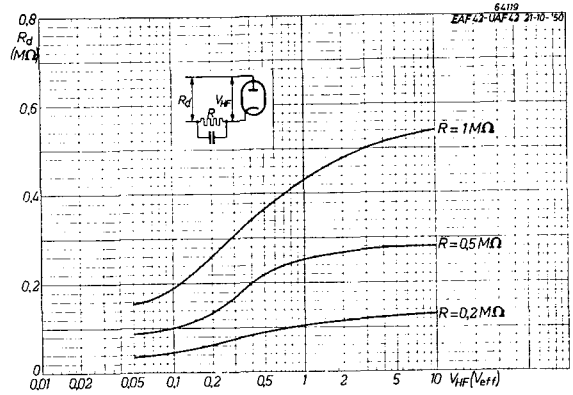


Fig. 16
Diode damping as a function of the applied R.F. voltage, for different values of the diode load resistance. This applies equally well to the diodes of the EAF 41 and the EAF 42.

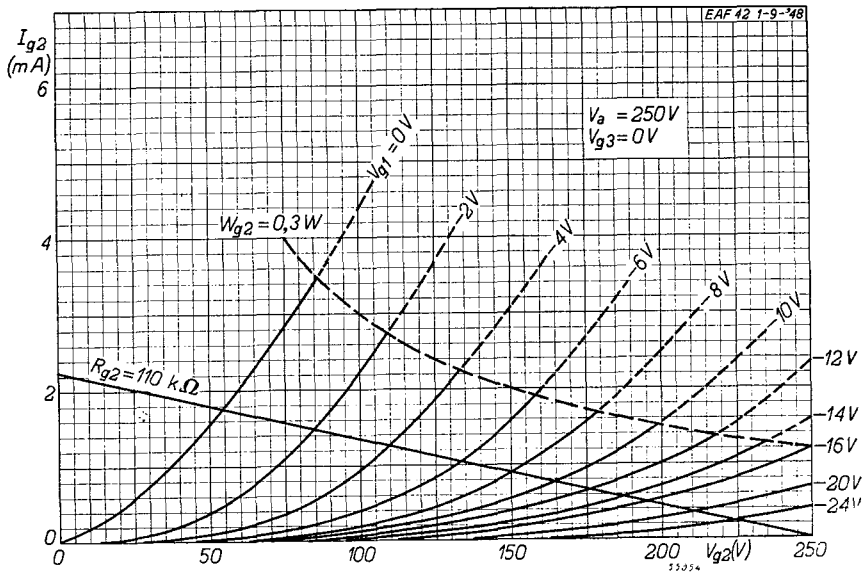


Fig. 17
Screen grid current (I_{g2}) of the pentode section of the EAF 42 as a function of the screen grid voltage (V_{g2}), with grid bias (V_{g1}) as parameter. The broken line indicates the maximum screen grid dissipation (0.3 W). The straight line refers to a series resistor of 110 kΩ in the screen grid circuit (see Fig. 2).

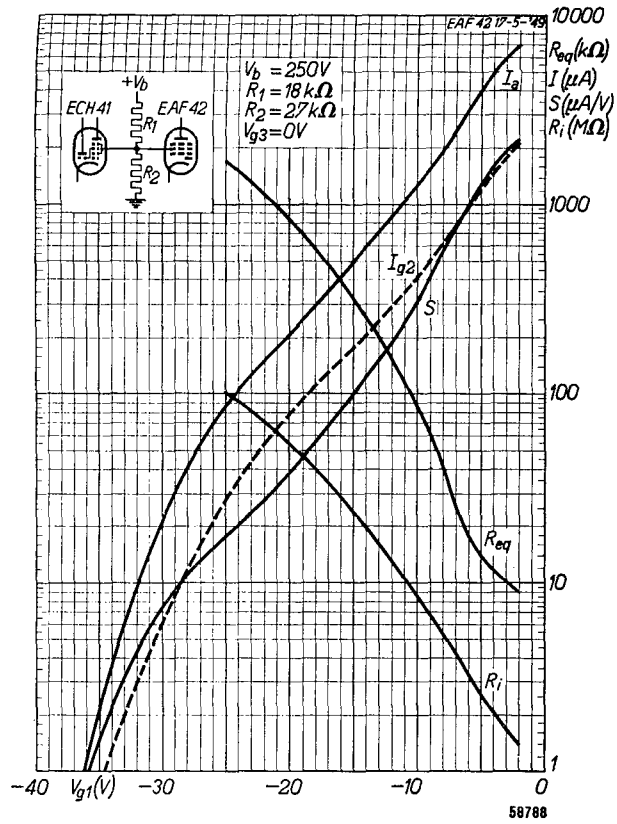


Fig. 18
As Fig. 14. In this case the screen grid voltage for the EAF 42 is derived from a potentiometer together with that of the ECH 41 (see Fig. 3).

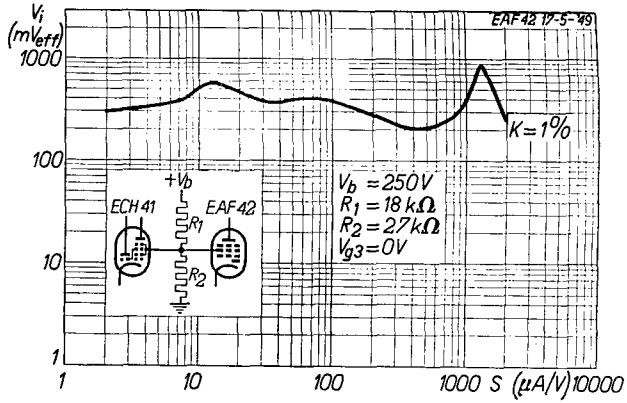


Fig. 19

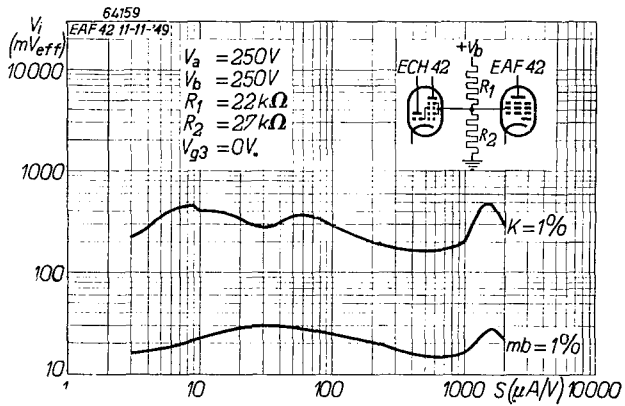


Fig. 20
As Fig. 15. The screen grids of the EAF 42 and frequency changer ECH 41 (Fig. 19) or ECH 42 (Fig. 20) are fed by means of a common potentiometer.

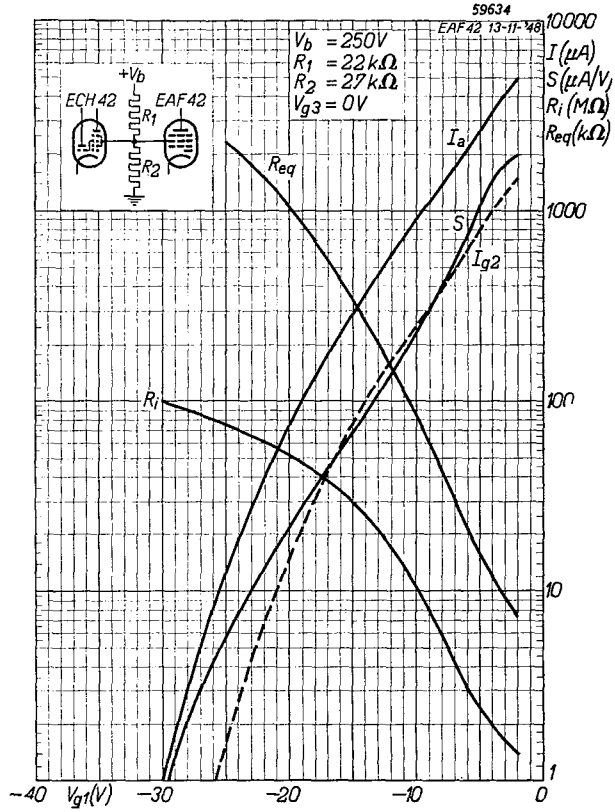


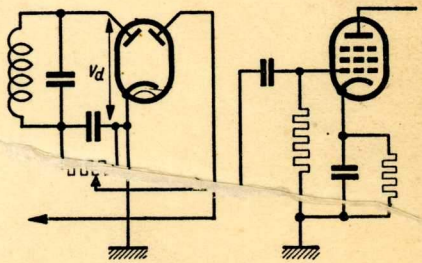
Fig. 21
As Fig. 14, but with the screen grids of the EAF 42 and frequency changer ECH 42 fed by means of a common potentiometer (see Fig. 3).

PHILIPS „MINIWATT"
EB 1
DUO-DIODE

Heizung ind.	Vf	= 6,3 V
Chauffage ind.	If	= ca. env. appr. 0,25 A
Heating ind.		

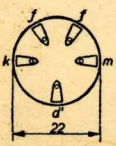
Grenzdaten
Dates limites
Limits.

Vd	max	= 200 V
Id	max	= 0,8 mA
Vfk	max	= 50 V
Rfk	max	= 20000 Ω



Elektrodenanordnung und Sockelschaltung.
Disposition des électrodes et connection du culot.
Arrangement of electrodes and base connection.



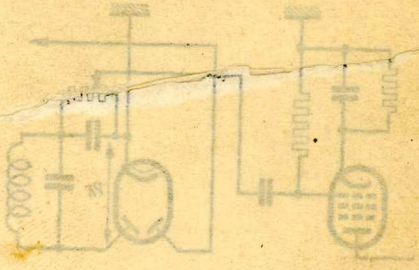












PHILIPS „MINIWATT"
EB11

EB11

Röhrentype: Doppeldiode mit getrennten Kathoden für Empfangsgleichrichtung und andere Zwecke.
Type de tube: Duodiode avec cathodes séparées pour la détection de signaux et d'autres utilisations.
Type of tube: Double diode with separate cathodes for signal detection and other services.

Heizung ind., Gleich- oder Wechselstrom, Parallel- oder Serienspeisung.
Chauffage ind., courant continu ou alternatif, alimentation en parallèle ou en série. Vf 6,3 V, If 0,200 A
Heating ind., A.C. or D.C., parallel or series filament supply.

Kapazitäten	Cd1k1 3,3 µµF
Capacités	Cd2k2 1,0 µµF
Capacities	Cd1d2 <0,004 µµF

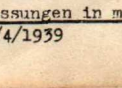
Grenzdaten.
Limites fixées pour les caractéristiques.
Limiting values.

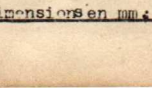
Vd1	max. 200 V[1]
Vd2	max. 200 V[1]
Id1	max. 0,8 mA
Id2	max. 0,8 mA
Vd1 (Id1 = +0,3 µA)	max. -1,3 V
Vd2 (Id2 = +0,3 µA)	max. -1,3 V
Vfk1	max. 100 V[2]
Vfk2	max. 100 V[2]
Vk1k2	max. 125 V[3]
Rfk1	max. 1 MΩ
Rfk2	max. 1 MΩ

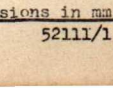
1) Scheitelwert; valeur de crête; peak value.

2) Gleichspannung oder Effektivwert der Wechselspannung.
Tension continue ou valeur efficace de la tension alternative.
D.C. voltage or R.M.S. value of the A.C. voltage.

3) Gleichspannung oder Scheitelwert der Wechselspannung bezw. Scheitelwert der Wechselspannung+Gleichspannung.
Tension continue ou valeur de crête de la tension alternative respectivement valeur de crête de la tension alternative + tension continue.
D.C. voltage or peak value of the A.C. voltage or peak value of the A.C. voltage + D.C. voltage.





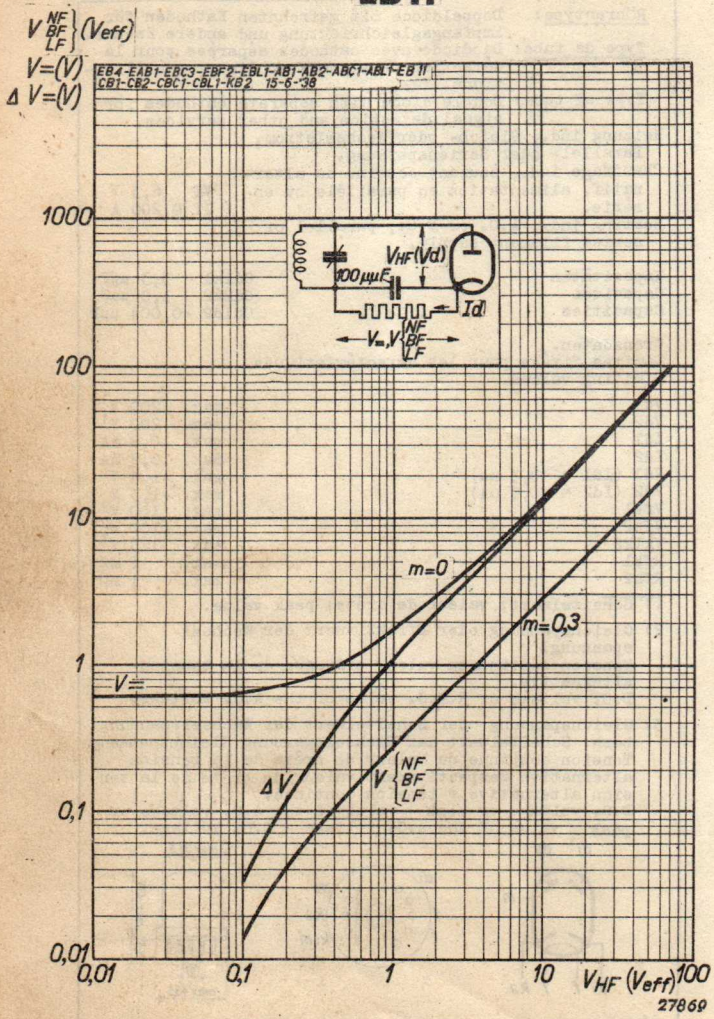


Abmessungen in mm; Dimensions en mm; Dimensions in mm.

EB11

PHILIPS „MINIWATT"

EB11



EB 4 Duodiode mit getrennten Kathoden

Die Duodiode EB 4 besitzt zwei nebeneinander aufgestellte getrennte Kathoden, die jede für sich von einer Anode umringt sind. Die beiden Diodensysteme sind durch eine Abschirmung voneinander getrennt. Die Abschirmung ist an einen besonderen Kontakt des Röhrensockels angeschlossen und kann deswegen bequem auf Nullpotential gebracht werden. Sie verhütet jede Rückwirkung durch Streuelektronen von einem System auf das andere.
Die Trennung der Kathoden bringt verschiedene Vorteile mit sich. Im allgemeinen kann man sagen, daß dadurch ein Freiheitsgrad mehr in die Schaltung eingeführt wird, der hier und da sehr willkommen ist. Eine weitgehende Herabsetzung der Kapazität zwischen den Diodenanoden verhütet die schädliche Kapazität zwischen den angeschlossenen Kreisen. Die beiden Diodensysteme sind einander vollkommen gleichwertig, und es ist deswegen gleichgültig, welches System als Detektor benutzt wird.

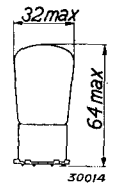
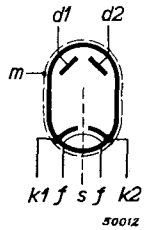


Abb. 1
Abmessungen in mm.



HEIZDATEN

Heizung: indirekt durch Gleich- oder Wechselstrom, Serien- oder Parallelspeisung.

Heizspannung . . . . . V_f = 6,3 V
Heizstrom . . . . . I_f = 0,200 A

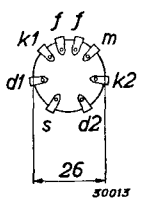


Abb. 2
Elektrodenanordnung und Sockelanschlüsse.

KAPAZITÄTEN

C_{d1d2} < 0,2 µµF.
C_{d1k1} = 1,2 µµF.
C_{d2k2} = 1,2 µµF.

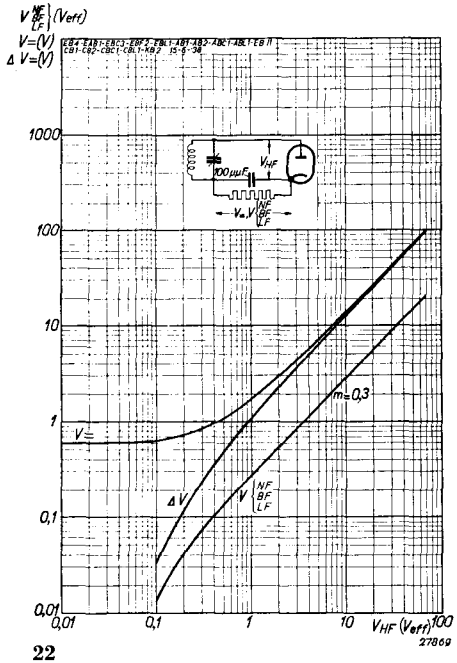


Abb. 3
Gleichspannung V und Zunahme der Gleichspannung ΔV an den Klemmen des Ableitwiderstandes einer Diode der EB 4 als Funktion der unmodulierten H.F.-Wechselspannung. N.F.-Wechselspannung V_{NF} an den Klemmen des Ableitwiderstandes einer Diode als Funktion der zu 30% modulierten H.F.-Wechselspannung (m = 0,3). Diese Kurven gelten für Ableitwiderstände von 0,1 bis 1 MΩ.

GRENZDATEN

Höchstzulässiger Scheitelwert der Signalspannung an Diode d_1	V_{d1}	= max. 200 V
Höchstzulässiger Scheitelwert der Signalspannung an Diode d_2	V_{d2}	= max. 200 V
Höchstzulässiger Gleichstrom durch Diode d_1	I_{d1}	= max. 0,8 mA
Höchstzulässiger Gleichstrom durch Diode d_2	I_{d2}	= max. 0,8 mA
Höchstwert des Widerstandes zwischen Kathode k_1 und Heizfaden	R_{fk1}	= max. 1 MΩ
Höchstwert des Widerstandes zwischen Kathode k_2 und Heizfaden	R_{fk2}	= max. 1 MΩ
Höchstwert der Spannung zwischen Kathode k_1 und Heizfaden (Gleichsp. oder Effektivwert der Wechselsp.)	V_{fk1}	= max. 100 V
Höchstwert der Spannung zwischen Kathode k_2 und Heizfaden (Gleichsp. oder Effektivwert der Wechselsp.)	V_{fk2}	= max. 100 V
Höchstwert der Spannung zwischen den beiden Kathoden (Gleichsp. oder Scheitelwert der Wechselsp. bzw. Gleichsp. + Scheitelwert der Wechselsp.)	V_{k1k2}	= max. 125 V
Einsatzpunkt des Diodenstromes	V_{d1} (I_{d1} = + 0,3 µA) / V_{d2} (I_{d2} = + 0,3 µA)	= max. —1,3 V

PHILIPS

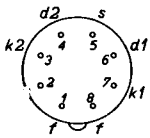
EB 41

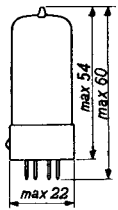
DOUBLE DIODE with separate cathodes
DIODE DOUBLE avec cathodes séparées
DOPPELDIODE mit getrennten Kathoden

Heating:	indirect by A.C. or D.C.; parallel supply	
Chauffage:	indirect par C.A. ou C.C.; alimentation en parallèle	V_f = 6,3 V I_f = 0,3 A
Heizung:	indirekt durch Wechsel- oder Gleichstrom; Parallelspeisung	

Dimensions in mm
Dimensions en mm
Abmessungen in mm







Base, culot, Sockel: RIMLOCK

Capacitances (measured without external screening)
Capacités (mesurées sans blindage extérieur)
Kapazitäten (gemessen ohne äussere Abschirmung)

C_{d1}	=	3,6 pF
C_{d2}	=	3,6 pF
C_{d1d2}	<	0,03 pF
C_{k1}	=	4,5 pF
C_{k2}	=	4,5 pF

Limiting values for use as half-wave rectifier (per system)
Caractéristiques limites pour l'utilisation en redresseuse demi-onde (par système)
Grenzdaten bei Verwendung als Halbweggleichrichter (pro System)

V_{tr}	= max.	150	V_{eff}
I_o	= max.	9	mA
C_{filt}	= max.	8	µF
R_t	= min.	300	Ω
V_{kf_p}	= max.	330	V [1]

Limiting values (per system)
Caractéristiques limites (par système)
Grenzdaten (pro System)

$V_{d\ inv_p}$	= max.	420	V
I_d	= max.	9	mA
I_{d_p}	= max.	54	mA
V_{kf}	= max.	150	V
V_{kf_p} (k pos.,f neg.)	= max.	330	V [1]
R_{kf}	= max.	20	kΩ

For curves of the EB 41 please refer to EB 91.
Pour les courbes du EB 41 voir EB 91.
Für die Kennlinien der EB 41 siehe EB 91.

[1] D.C. component max.200 V, A.C. component max.165 V (r.m.s.value).
Composante C.C.max.200 V, composante C.A.max.165 V (valeur efficace).
Gleichspannungsanteil max.200 V, Wechselspannungsanteil max.165 V (Effektivwert).

PHILIPS

Electronic Tube

HANDBOOK

EB41

page	sheet	date
1	1	1952.10.10
2	2	1952.10.10
3	FP	1999.06.14

DOUBLE DIODE

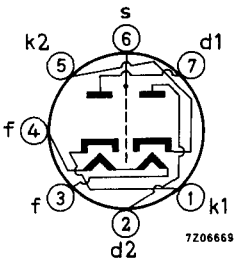
Double diode with separate cathodes.

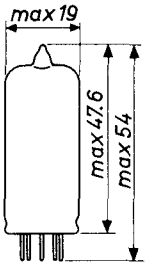
HEATING: Indirect by A.C. or D.C.; series or parallel supply

Heater voltage	V_f	6.3 V
Heater current	I_f	300 mA

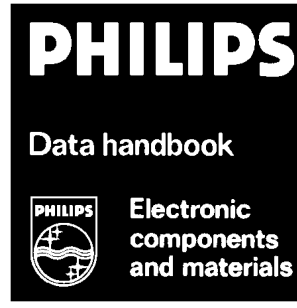
DIMENSIONS AND CONNECTIONS Dimensions in mm

Base: Miniature





For further data
please refer to type EAA91



EB91

page	sheet	date
1	1	1969.12
2	FP	1999.08.14

Vorläufige Daten.
Caractéristiques provisoires.
Tentative data.

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EBC11

EBC11

Heizung ind., Gleich- oder Wechselstrom, Parallel- oder Serienschaltung.
Chauffage ind., courant continu ou alternatif, alimentation en parallèle ou en série.
Heating ind., A.C. or D.C., parallel or series filament supply.

	Vf	6,3 V
	If	0,200 A

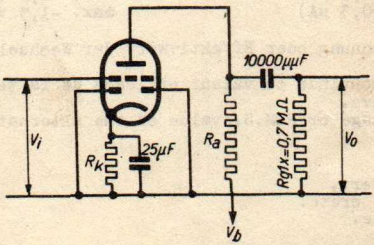
Kapazitäten
Capacités
Capacities

Cd1g	<0,001 µµF
Cd2g	<0,001 µµF
Cd1k	2,3 µµF
Cd2k	2,5 µµF
Cd1d2	<0,5 µµF
C(d1d2)g	<0,003 µµF
Cfg	<0,001 µµF
C(d1d2)a	<0,006 µµF

Betriebsdaten des Triodenteiles als N.F.-Verstärker mit Transformatorkopplung.
Caractéristiques de service de la partie triode comme amplificatrice B.F. avec couplage par transformateur.
Operating conditions for use of the triode system as l.f. amplifier with transformer coupling.

Va	100	200	250 V
Vg1	-3,2	-6,3	-8 V
Rk	1600	1600	1600 Ω
Ia	2	4	5 mA
µ	25	25	25
S	1,8	2,0	2,2 mA/V
Ri	14000	12500	11500 Ω

Betriebsdaten des Triodenteiles als N.F.-Verstärker mit Widerstandskopplung.
Caractéristiques de service de la partie triode comme amplificatrice B.F. avec couplage par resistance.
Operating conditions for use of the triode system as l.f. amplifier with resistance coupling.



EBC11

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Vorläufige Daten.
Caractéristiques provisoires.
Tentative data.

Vb (V)	Ra (MΩ)	Rk (mA)	Ia (mA)	Vo / Vi (ca.) (env.) (appr.)
250	0,2	5000	0,75	18
250	0,1	3000	1,4	18
250	0,05	2000	2,3	17
200	0,2	5000	0,65	18
200	0,1	3000	1,1	18
200	0,05	2000	1,8	17
100	0,2	5000	0,35	18
100	0,1	3000	0,6	18
100	0,05	2000	0,95	17

Grenzdaten.
Limites fixées pour les caractéristiques.
Limiting values.

Triodenteil.
Partie triode.
Triode section.

Vao	max. 550 V
Va	max. 300 V
Wa	max. 1,5 W
Ik	max. 10 mA
Vg (Ig = +0,3 µA)	max. -1,3 V
Rg	max. 3 MΩ
Rfk	max. 20000 Ω
Vfk	max. 100 V[1]

Diodenteil.
Partie diode.
Diode section.

Vd1	max. 200 V[2]
Vd2	max. 200 V[2]
Id1	max. 0,8 mA
Id2	max. 0,8 mA
Vd1 (Id1 = +0,3 µA)	max. -1,3 V
Vd2 (Id2 = +0,3 µA)	max. -1,3 V

1) Gleichspannung oder Effektivwert der Wechselspannung.
Tension continue ou valeur efficace de la tension alternative.
D.C. voltage or R.M.S. value of the alternating voltage.

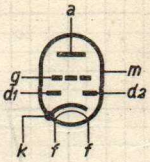
2) Scheitelwert.
Valeur de crête.
Peak value.

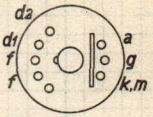
Vorläufige Daten.
Caractéristiques provisoires.
Tentative data.

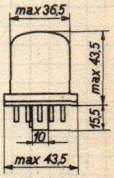
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EBC11

Elektrodenanordnung, Sockelanschlüsse und max. Abmessungen in mm.
Disposition des électrodes, connexions du culot et dimensions max. en mm.
Electrode arrangement, base connections and max. dimensions in mm.



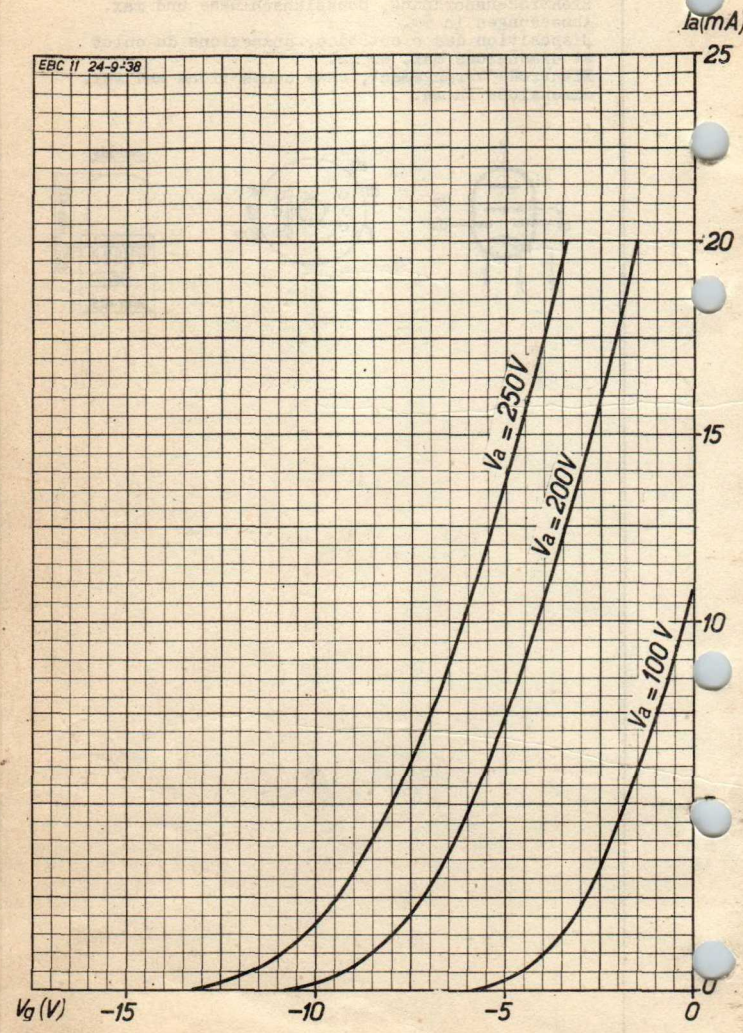




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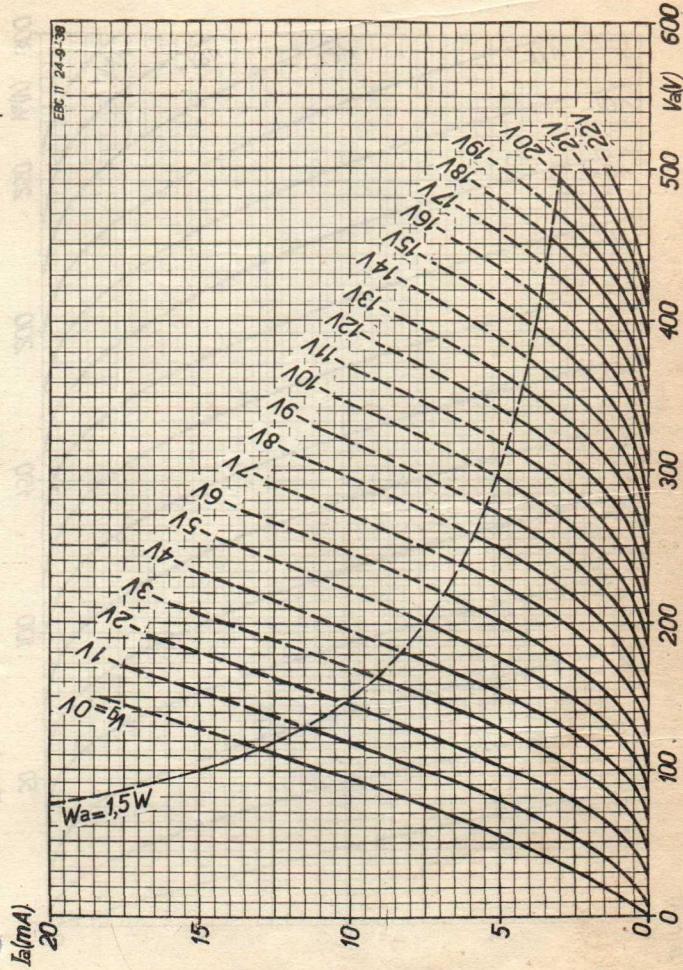
EBC11



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EBC11



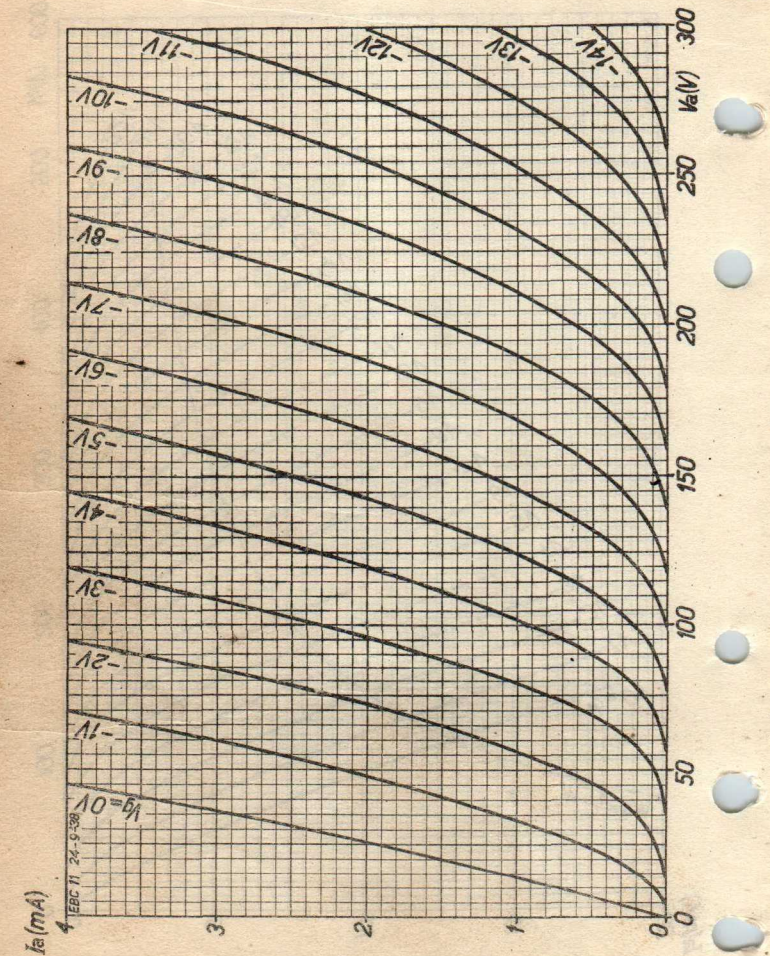
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EBC 3 Duodiode-Triode

Die Duodiode-Triode EBC 3 besteht aus einer Triode, die mit einem Doppeldiodensystem zusammengebaut ist. Beide benutzen ein und dieselbe Kathode in einem gemeinschaftlichen Kolben.

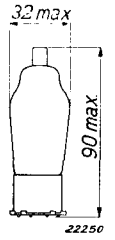
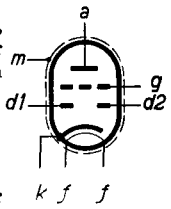


Abb. 1
Abmessungen in mm.

Das Diodensystem kann zur Gleichrichtung und zur verzögerten automatischen Lautstärkeregelung verwendet werden, der Triodenteil kann für Niederfrequenzverstärkung oder andere Zwecke dienen. Die mit der Triode erzielte Niederfrequenzverstärkung ist bei Widerstandskopplung etwa 20fach; sie genügt in den meisten Fällen. Die beiden Dioden sind am Sockel nach außen geführt, das Gitter der Triode ist mit dem Zapfen am Kolbenscheitel verbunden.

Die Röhre kann auch als Oszillator für die Regelmischheptode EH 2 benutzt werden.

Um eine Rückwirkung des Triodenteiles auf die Dioden zu vermeiden, ist zwischen diesen Systemen eine Abschirmung vorgesehen, die mit der Kathode verbunden ist. Die Metallisierung ist an einen besonderen Sockelkontakt angeschlossen.



HEIZDATEN

Heizung: indirekt durch Gleich- oder Wechselstrom, Serien- oder Parallelspeisung.

Heizspannung . . . . . V_f = 6,3 V
Heizstrom . . . . . I_f = 0,200 A

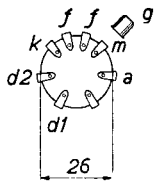


Abb. 2
Elektrodenanordnung und Sockelanschlüsse.

KAPAZITÄTEN

C_{kd1}	= 1,9 μμF	C_{ag}	= 1,4 μμF
C_{kd2}	= 2,5 μμF	C_{ak}	= 3,4 μμF
C_{d1d2}	< 0,5 μμF	C_{gk}	= 2,6 μμF
C_{gd1}	< 0,005 μμF		
C_{gd2}	< 0,005 μμF		

BETRIEBSDATEN

Triodenteil:			
Anodenspannung V_a =	100 V	200 V	250 V
Neg. Gittervorspannung V_g =	—2,1 V	—4,3 V	—5,5 V
Anodenstrom I_a =	2 mA	4 mA	5 mA
Verstärkungsfaktor μ =	30	30	30
Steilheit im Arbeitspunkt S =	1,6 mA/V	2,0 mA/V	2,0 mA/V
Innenwiderstand im Arbeitspunkt R_i =	19.000 Ω	15.000 Ω	15.000 Ω

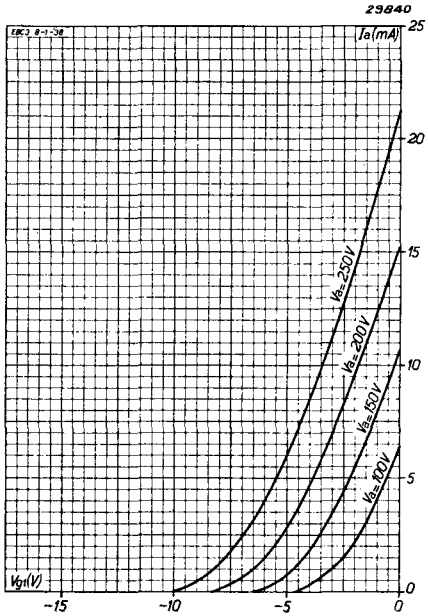


Abb. 3
Anodenstrom als Funktion der negativen Spannung am Gitter bei verschiedenen Anodenspannungen.

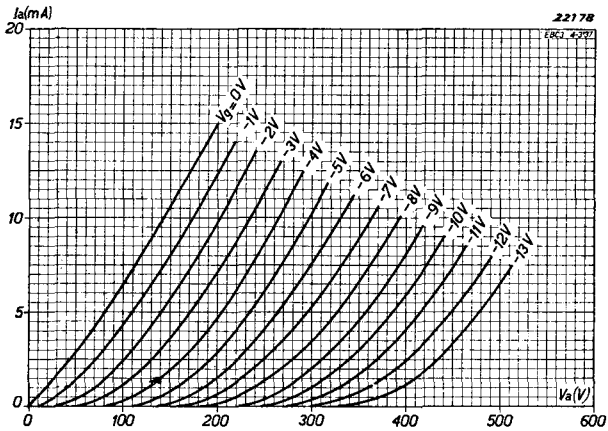


Abb. 4
Anodenstrom als Funktion der Anodenspannung bei verschiedenen negativen Gitterspannungen.

EBC 3

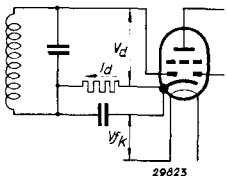


Abb. 5
Definition von Vd und Id.

GRENZDATEN

Triodenteil:

V_{ao}	=	max. 550 V
V_a	=	max. 300 V
W_a	=	max. 1,5 W
I_k	=	max. 10 mA
V_g (I_g = + 0,3 µA)	=	max. —1,3 V
$R_{gk\,(aut)}$	=	max. 3 MΩ
$R_{gk\,(fest)}$	=	max. 1,0 MΩ
V_{fk}	=	100 V[1])
R_{fk}	=	max. 20.000 Ω

Diodenteil:

V_d = max 200 V
(absoluter Spitzenwert)

I_d = max 0,8 mA
(Gleichstrom pro Diode)[2])

[1]) Gleichspannung oder Effektivwert der Wechselspannung.
[2]) Gleichstrom durch den Ableitwiderstand.

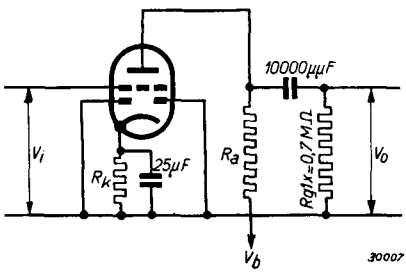


Abb. 6
Schaltung, auf der die Messungen der Tabelle beruhen.

Die Diode, die in der Sockelschaltung Abb. 2 mit d_2 bezeichnet wird, soll vorzugsweise für die Gleichrichtung dienen. Die andere Diode (d_1) kann dann für andere Zwecke, wie z.B. verzögerte automatische Lautstärkeregelung, Verwendung finden.

Die Kurven für die Zunahme der Gleichspannung (ΔV) am Ableitwiderstand als Funktion der unmodulierten Hochfrequenzwechselspannung und für die Niederfrequenzwechselspannung (V_{NF}) am Ableitwiderstand als Funktion der zu 30 % modulierten Hochfrequenzwechselspannung an einer der Dioden bei einem Ableitwiderstand von 0,5 Megohm sind dieselben wie für die Röhre EB 4; es wird deswegen auf die Kurven der letzteren Röhre verwiesen.

TABELLE

Für die Verwendung der Röhre EBC 3 als N.F.-Verstärker mit Widerstandskopplung vor verschiedenen Endröhren

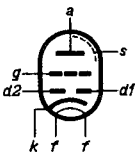
Spannung der Speisungsquelle *Vb* (Volt)	Anodenkopplungswiderstand *Ra* (Megohm)	Anodenstrom *Ia* (mA)	Kathodenwiderstand *Rk* (Ohm)	Spannungsverstärkung $\frac{Vo}{Vi}$	Für die Verwendung der EL 2 als nachfolgende Endröhre $Va = Vg_2 = 250$ V: Ausgangswechselspannung *Vo eff* (Volt)	Für die Verwendung der EL 2 als nachfolgende Endröhre $Va = Vg_2 = 250$ V: Gesamtverzerrung im Vorverstärker *dtot* (%)	Für die Verwendung der EL 3 od. EL 6 als nachfolgende Endröhre, $Va = Vg_2 = 250$ V: Ausgangswechselspannung *Vo eff* (Volt)	Für die Verwendung der EL 3 od. EL 6 als nachfolgende Endröhre, $Va = Vg_2 = 250$ V: Gesamtverzerrung im Vorverstärker *dtot* (%)	Für die Verwendung der EL 5 als nachfolgende Endröhre, $Va = 250$ V, $Vg_2 = 275$ V: Ausgangswechselspannung *Vo eff* (Volt)	Für die Verwendung der EL 5 als nachfolgende Endröhre, $Va = 250$ V, $Vg_2 = 275$ V: Gesamtverzerrung im Vorverstärker *dtot* (%)	Für die Verwendung der AD 1 als nachfolgende Endröhre, $Va = 250$ V: Ausgangswechselspannung *Vo eff* (Volt)	Für die Verwendung der AD 1 als nachfolgende Endröhre, $Va = 250$ V: Gesamtverzerrung im Vorverstärker *dtot* (%)	Bemerkungen
300	0,2	0,9	4000	26	11,2	< 1,0	3,7	< 1,0	8,5	< 1,0	31	1,8	Für Verwendung in Empfängern mit Parallelspeisung der Heizfäden
250	0,2	0,75	4000	26	11,2	< 1,0	3,7	< 1,0	8,5	< 1,0	31	2,2	
300	0,1	1,5	2500	25	11,2	< 1,0	3,7	< 1,0	8,5	< 1,0	31	2,0	
250	0,1	1,3	2500	25	11,2	< 1,0	3,7	< 1,0	8,5	< 1,0	31	2,6	
300	0,05	2,3	2000	22	11,2	< 1,0	3,7	< 1,0	8,5	< 1,0	31	2,0	
250	0,05	1,8	2000	22	11,2	< 1,0	3,7	< 1,0	8,5	< 1,0	31	2,6	
					Für die Verwendung der CL 1 als nachfolgende Endröhre		Für die Verwendung der CL 2 als nachfolgende Endröhre		Für die Verwendung der CL 4 als nachfolgende Endröhre		Für die Verwendung der EL 2 als nachfolgende Endröhre		
200 [1]	0,2	0,35	12500	22	9,6	1,7	10	1,8	5,0	<1,0	8,5	1,6	Für Verwendung in Empfängern mit Serienspeisung der Heizfäden
150 [1]	0,2	0,25	12500	21	—	—	10	2,7	4,0	1,0	6,5	1,7	
100 [1]	0,2	0,20	12500	19	—	—	10	4,6	2,4	1,0	—	—	
200 [1]	0,1	0,55	8000	21	9,6	2,1	10	2,3	5,0	1,2	8,5	1,8	
150 [1]	0,1	0,45	8000	20	—	—	10	3,0	4,0	1,2	6,5	1,8	
100 [1]	0,1	0,30	8000	18	—	—	10	4,9	2,4	1,2	—	—	
200 [1]	0,05	0,8	6000	19	9,6	3,0	10	3,2	5,0	1,5	8,5	2,6	
150 [1]	0,05	0,6	6000	18	—	—	10	4,3	4,0	1,6	6,5	3,0	
100 [1]	0,05	0,4	6000	17	—	—	10	7,0	2,4	1,6	—	—	

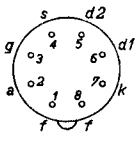
[1]) Auch Anodenspannung der nachfolgenden Endröhre.

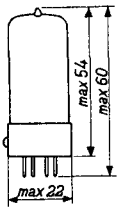
DUODIODE-TRIODE for use as A.F. amplifier
DUODIODE-TRIODE pour l'utilisation comme amplificatrice B.F.
DUODIODE-TRIODE zur Verwendung als NF-Verstärker

Heating:	indirect by A.C. or D.C.; parallel supply	
Chauffage:	indirect par C.A. ou C.C.; alimentation en parallèle	Vf = 6,3 V If = 0,23 A
Heizung:	indirekt durch Wechsel- oder Gleichstrom; Parallelspeisung	

Dimensions in mm
Dimensions en mm
Abmessungen in mm







Base, culot, Fuss: Rimlock

Capacitances Capacités Kapazitäten	Triode section Partie triode Triodenteil	Diode section Partie diode Diodenteil
	Cg = 2,7 pF	Cd1 = 0,8 pF
	Ca = 1,7 pF	Cd2 = 0,7 pF
	Cag = 1,5 pF	Cd1d2 < 0,3 pF
	Cgf < 0,05 pF	Cd1f < 0,1 pF
		Cd2f < 0,05 pF

Between triode and diode sections
Entre les parties triode et diode
Zwischen Trioden- und Diodenteilen

Cd1g < 0,007 pF
Cd2g < 0,03 pF
Cd1a < 0,01 pF
Cd2a < 0,01 pF

Typical characteristics of the triode section
Caractéristique types de la partie triode
Kenndaten des Triodenteiles

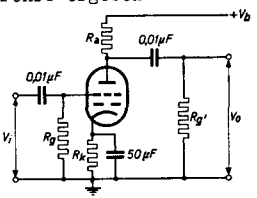
V_a	=	250 V
V_g	=	-3 V
I_a	=	1,0 mA
S	=	1,2 mA/V
μ	=	70
R_i	=	58 kΩ
R_{eq}(A.F.;B.F.;NF)	= max.	150 kΩ

Operating characteristics as A.F. amplifier
Caractéristiques d'utilisation en amplificatrice B.F.
Betriebsdaten als NF-Verstärker

This valve can be used without special precautions against microphonic effect in circuits in which the input voltage $V_i \geq 10$ mV for an output of 50 mW of the output valve

Ce tube peut être utilisé sans précautions spéciales contre l'effet microphonique dans des circuits dont la tension d'entrée $V_i \geq 10$ mV pour une puissance de 50 mW du tube de sortie

Diese Röhre darf ohne spezielle Massnahmen gegen Mikrophonie verwendet werden in Schaltungen die für eine Eingangsspannung $V_i \geq 10$ mV eine Leistung von 50 mW der Endröhre ergeben



V_b = 250 V

R_a (MΩ)	R_k (kΩ)	R_g (MΩ)	R_g' (MΩ)	I_a (mA)	$\frac{V_o}{V_i}$	d_{tot} (%) (V_o=5Veff)	d_{tot} (%) (V_o=10Veff)
0,22	1,8	1	0,68	0,70	51	0,55	0,9
0,1	1,2	1	0,33	1,15	43	0,6	1,1
0,22	0	22	0,68	0,76	52	0,5	0,8
0,1	0	22	0,33	1,40	44	0,7	0,9

Limiting values of the triode section
Caractéristiques limites de la partie triode
Grenzdaten des Triodenteiles

V_{ao}	= max.	550 V
V_a	= max.	300 V
W_a	= max.	0,5 W
I_k	= max.	5 mA
$-V_g(I_g=+0,3\ \mu A)$	= max.	1,3 V
R_g	= max.	3 MΩ [1]
V_{kf}	= max.	100 V
R_{kf}	= max.	20 kΩ

Limiting values of the diode sections(each diode)
Caractéristiques limites des parties diode (par diode)
Grenzdaten der Diodenteile (pro Diode)

$V_{d\ invp}$	= max.	350 V
I_d	= max.	0,8 mA
I_{dp}	= max.	5 mA
V_{kf}	= max.	100 V
R_{kf}	= max.	20 kΩ

For curves refer to type EBC81
Pour les courbes voir type EBC81
Für die Kennlinien siehe Typ EBC81

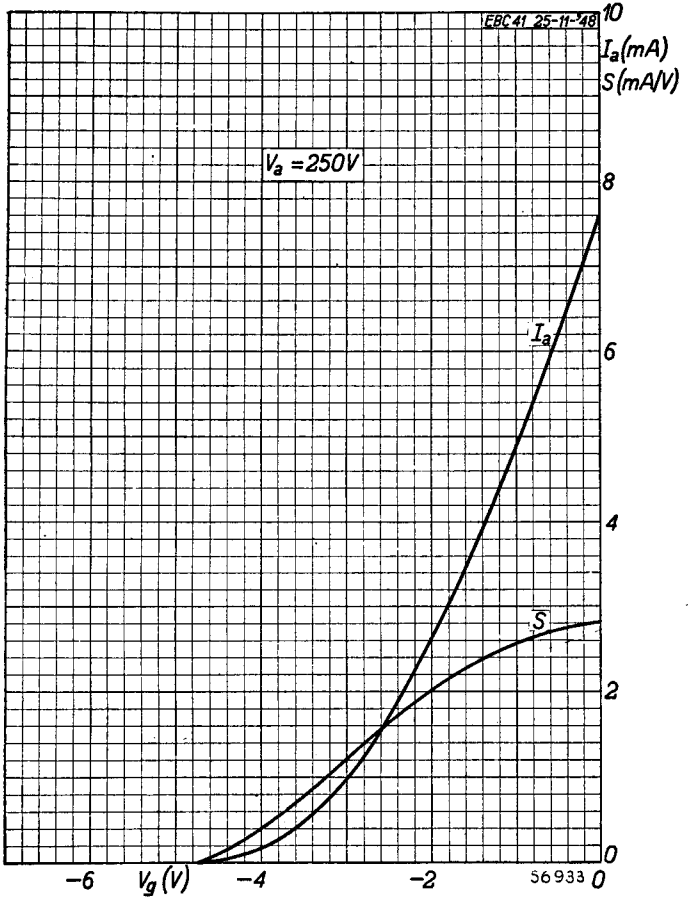
[1]) If the grid bias is obtained only by connecting a leakage resistor in the grid circuit, the max. value of R_g is 22 MΩ

Si la polarisation négative est obtenue seulement par moyen d'une résistance de fuite dans le circuit de la grille, la valeur maximum de Rg est de 22 MΩ

Wenn die negative Gittervorspannung nur mittels eines Ableitwiderstandes in der Gitterleitung erhalten wird, ist der Maximalwert von R_g 22 MΩ

PHILIPS

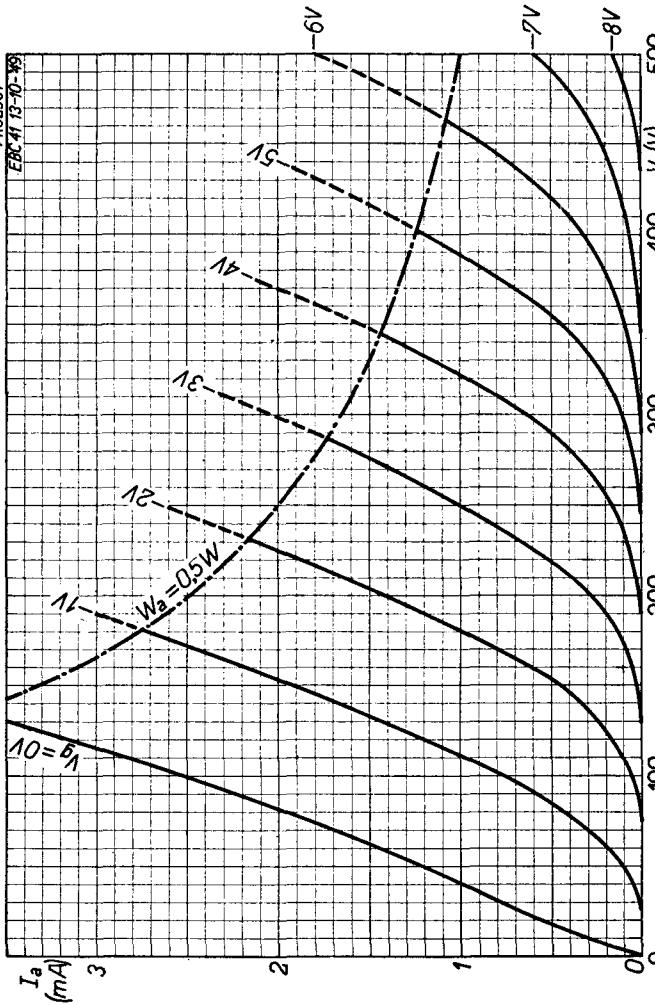
EBC 41

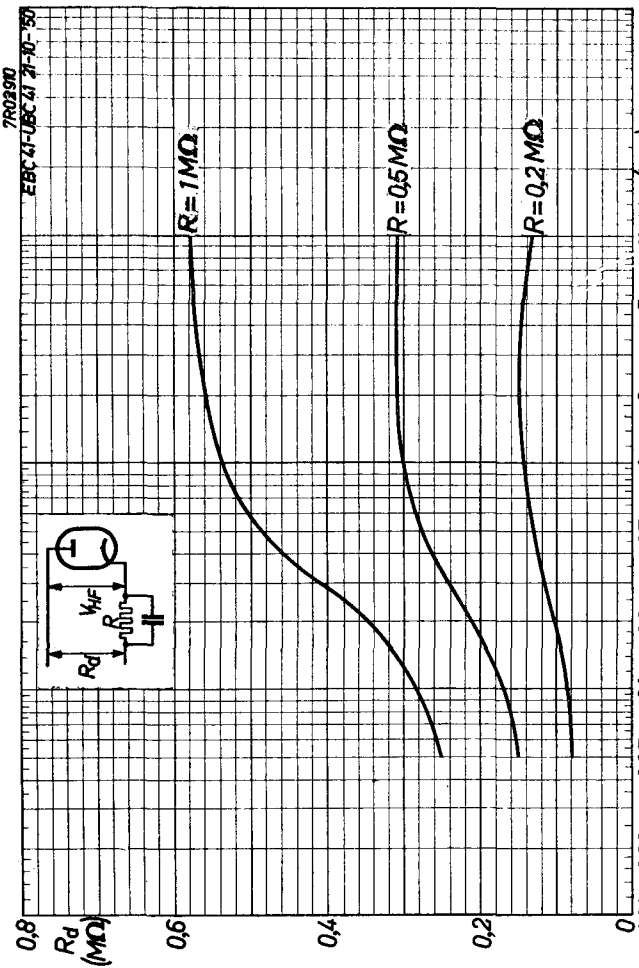


A

10.10.1949

EBC 41 PHILIPS

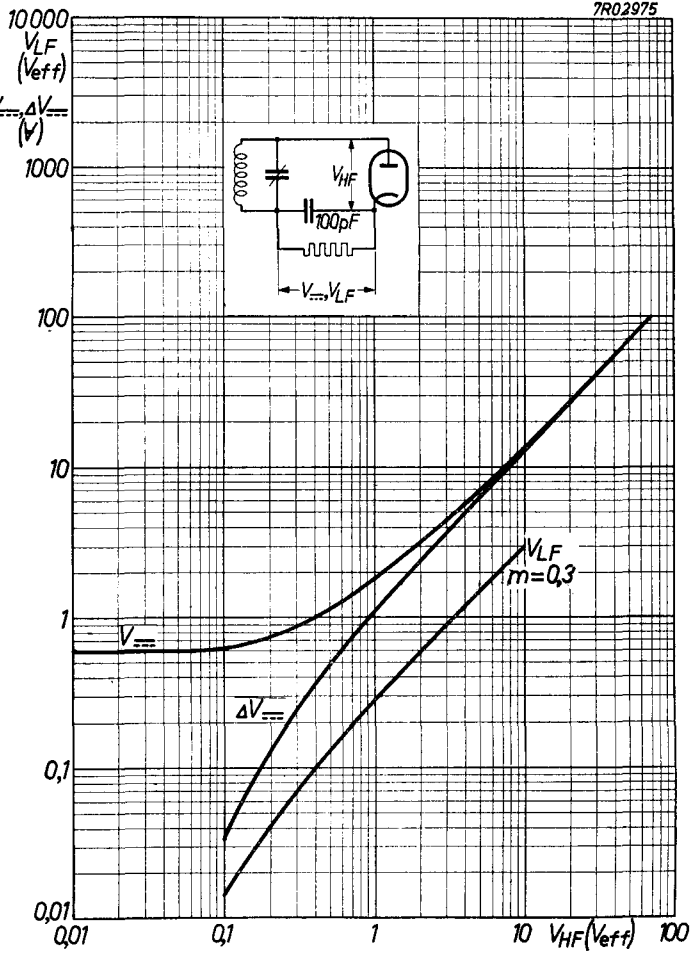



7R02390
EBC 41-UBC 41 21-10-'50
R = 1MΩ
R = 0,5MΩ
R = 0,2MΩ
R_d (MΩ)
0,8
0,6
0,4
0,2
0
0,01
0,02
0,05
0,1
0,2
0,5
1
2
5
10
V_{HF} (V_{eff})
V_{HF}
R
R_d

12.12.1950

C

EBC 41 PHILIPS



D

PHILIPS

Electronic Tube

HANDBOOK

EBC41

page	sheet	date
1	1	1953.10.10
2	2	1953.10.10
3	3	1958.02.02
4	A	1949.10.10
5	B	1949.10.10
6	C	1950.12.12
7	D	1950.12.12
8	FP	1999.06.14

DOUBLE DIODE-TRIODE

Double diode-triode. Triode intended for use as A.F. amplifier.

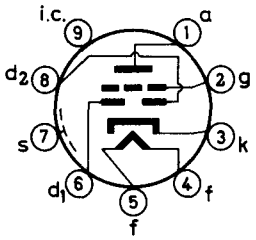
QUICK REFERENCE DATA			
Triode section			
Anode current	I_a	1.0	mA
Transconductance	S	1.2	mA/V
Amplification factor	μ	70	-

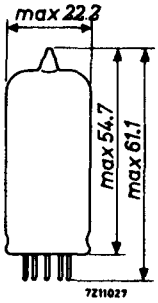
HEATING: Indirect by A.C. or D.C.; parallel supply

Heater voltage	V_f	6.3	V
Heater current	I_f	230	mA

DIMENSIONS AND CONNECTIONS Dimensions in mm

Base: Noval





CAPACITANCES

Triode section

Grid to all except anode	$C_{g(a)}$	2.3	pF
Anode to all except grid	$C_{a(g)}$	2.3	pF
Anode to grid	C_{ag}	1.2	pF
Grid to heater	C_{gf}	max. 0.05	pF

Diode sections

Diode No.1 to all	C_{d_1}	0.9	pF
Diode No.2 to all	C_{d_2}	0.9	pF
Diode No.1 to diode No.2	$C_{d_1d_2}$	max. 0.2	pF
Diode No.1 to heater	C_{d_1f}	max. 0.25	pF
Diode No.2 to heater	C_{d_2f}	max. 0.05	pF

Between diode and triode sections

Diode No.1 to grid	C_{d_1g}	max.0.007	pF
Diode No.2 to grid	C_{d_2g}	max.0.007	pF
Diode No.1 to anode	C_{d_1a}	max.0.005	pF
Diode No.2 to anode	C_{d_2a}	max.0.010	pF

TYPICAL CHARACTERISTICS

Triode section

Anode voltage	V_a	250	V
Grid voltage	V_g	-3	V
Anode current	I_a	1.0	mA
Transconductance	S	1.2	mA/V
Amplification factor	μ	70	-
Internal resistance	R_i	58	kΩ
Equivalent noise resistance (A.F.)	R_{eq}	max.150	kΩ

OPERATING CHARACTERISTICS

Triode section as A.F. amplifier, circuit Fig.1

Supply voltage	V_b	250	250	250	250	V
Anode resistor	R_a	0.22	0.1	0.22	0.1	MΩ
Cathode resistor	R_k	1.8	1.2	0	0	kΩ
Grid resistor	R_g	1	1	22	22	MΩ
Grid resistor next stage	R_g'	0.68	0.33	0.68	0.33	MΩ
Anode current	I_a	0.70	1.15	0.76	1.40	mA
Voltage gain	V_o/V_i	51	43	52	44	-
Distortion:						
at output voltage V_o = 5 V_{RMS}	d_{tot}	0.55	0.6	0.5	0.7	%
at output voltage V_o = 10 V_{RMS}	d_{tot}	0.9	1.1	0.8	0.9	%

Microphony

No special precautions against microphony are required in circuits where the input voltage is min. 10 mV for 50 mW output of the output tube.

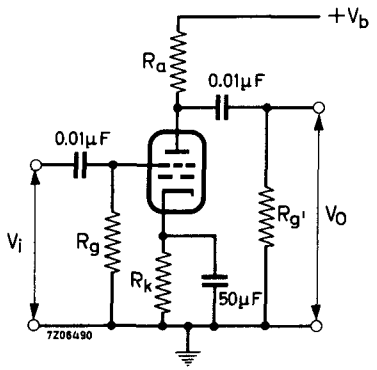


fig.1

LIMITING VALUES (Design centre rating system)

Triode section

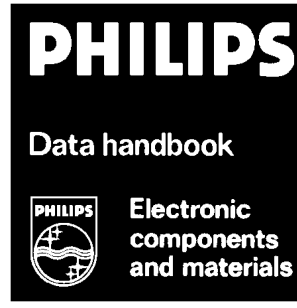
Anode voltage	V_{a_o}	max. 550	V
	V_a	max. 300	V
Anode dissipation	W_a	max. 0.5	W
Cathode current	I_k	max. 5	mA
Grid resistor	R_g	max. 3	MΩ
Cathode to heater voltage	V_{kf}	max. 100	V

Diode sections (each diode)

Diode voltage, negative peak	$-V_{d_p}$	max. 350	V
Diode current, average	I_d	max. 0.8	mA
peak	I_{d_p}	max. 5	mA
Cathode to heater voltage	V_{kf}	max. 100	V

Note

The use of a socket with skirt is advisable to reduce the capacitances between tube elements and external conductors.



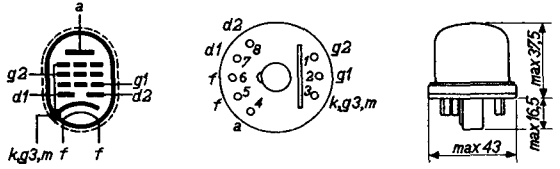
EBC81

page	sheet	date
1	1	1970.01
2	2	1970.01
3	3	1970.01
4	4	1972.01
5	FP	1999.08.14

DOUBLE-DIODE PENTODE for use as R.F., I.F. and A.F. amplifier
DOUBLE-DIODE-PENTHODE pour utilisation en amplificatrice H.F., M.F. et B.F.
DOPPELDIODE-PENTODE zur Verwendung als HF-, ZF- und NF-Verstärker

Heating : indirect — V_f = 6,3 V
Chauffage: indirect — I_f = 0,2 A
Heizung : indirekt

Dimensions in mm, dimensions en mm, Abmessungen in mm



Base, culot, Sockel: Y

Capacitances Capacités Kapazitäten	C_a = 6,2 pF		C_{d1d2} < 0,5 pF	
	C_{ag1} < 0,002 pF		C_{d1} = 2,3 pF	
	C_{g1} = 5,2 pF		C_{d2} = 2,7 pF	
	C_{g1f} < 0,001 pF		C_{d1f} < 0,5 pF	
			C_{d2f} < 0,12 pF	
$C_{d1g1}=C_{d2g1}$ < 0,001 pF			$C_{d1a}=C_{d2a}$ < 0,015 pF	
$C_{(d1+d2)g1}$ < 0,001 pF			$C_{(d1+d2)a}$ < 0,015 pF	

Operating characteristics as R.F. and I.F. amplifier
Caractéristiques d'utilisation en amplificatrice H.F. et M.F.
Betriebsdaten als HF- und ZF-Verstärker

V_a	=	100		200		250	V
R_{g2}	=	55		55		85	kΩ
R_k	=	300		300		300	Ω
μ_{g2g1}	=	19		19		19	
V_{g1}	=	-1	-18	-2	-35,5	-2	-45 V
V_{g2}	=	50	100	100	200	100	250 V
I_a	=	2,2	-	5	-	5	- mA
I_{g2}	=	0,9		1,8	-	1,8	- mA
S	=	1400	9	1800	9	1800	9 µA/V
R_i	=	0,5	>10	1,5	>10	2	>10 MΩ

Operating characteristics as A.F. amplfier
Caractéristiques d'utilisation en amplificatrice B.F.
Betriebsdaten als NF-Verstärker

A. V_b = 250 V; R_a = 0,2 MΩ; R_{g2} = 0,8 MΩ; R_k = 2 kΩ

$-V_R$ (V)	I_a (mA)	I_{g2} (mA)	$\frac{V_o}{V_i}$	d_{tot} (%) (V_o=3Veff)	d_{tot}(%) (V_o=5Veff)
0	0,8	0,24	98	0,78	1,3
5	0,65	0,18	29	0,90	1,5
10	0,54	0,14	20	0,90	1,5
15	0,42	0,11	14	1,10	1,8
20	0,34	0,08	10	1,60	2,7
25	0,24	0,06	7	2,20	3,7

B. V_b = 250 V; R_a = 0,1 MΩ; R_{g2} = 0,4 MΩ; R_k = 1 kΩ

$-V_R$ (V)	I_a (mA)	I_{g2} (mA)	$\frac{V_o}{V_i}$	d_{tot} (%) (V_o=3Veff)	d_{tot}(%) (V_o=5Veff)
0	1,5	0,46	83	0,7	1,15
5	1,15	0,34	27	1,1	1,90
10	0,88	0,26	15	1,1	1,90
15	0,70	0,19	10	1,1	1,90
20	0,54	0,15	8	1,8	3,0
25	0,38	0,11	5	2,7	4,4

Limiting values
Caractéristiques limites
Grenzdaten

V_{ao}	= max. 550 V	V_{g2_o}	= max. 550 V
V_a	= max. 300 V	V_{g2}(I_a<2 mA)	= max. 300 V
W_a	= max. 1,5 W	V_{g2}(I_a=5 mA)	= max. 125 V
		W_{g2}	= max. 0,3 W
		I_k	= max. 10 mA
Each diode; jede Diode chaque diode		V_{g1}(I_{g1}=+0,3µA)	= max. -1,3 V
$V_{d\ inv_p}$	= max. 350 V	R_{g1}	= max. 3 MΩ
I_d	= max. 0,8 mA	R_{kf}	= max. 20 kΩ
I_{dp}	= max. 5 mA	V_{kf}	= max. 100 V

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HANDBOOK

EBF11

page	sheet	date
1	1	1953.11.11
2	2	1953.11.11
3	FP	1999.06.15

EBF 2 Duodiode-Penthode-Selektode

Die Röhre EBF 2 besteht aus einem Penthodensystem in Kombination mit zwei Dioden, die dieselbe Kathode benutzen. Der Penthodenteil erhielt mit Rücksicht auf die Anwendung als Z.F.-Verstärker eine Regelröhrenkennlinie. Es wurde das Prinzip der gleitenden Schirmgitterspannung angewandt, auf welches der geringe Anodenstrom und die relativ hohe Steilheit zurückzuführen sind. Da die Kathode zu gleicher Zeit für die Dioden dient und eine 1,26-Watt-Kathode vorgesehen wurde, mußte die Steilheit des Penthodensystems etwas kleiner als die der EF 9 sein. Die Steilheit der EBF 2 beträgt im ungeregelten Zustand (bei — 2 V Gitterspannung) 1,8 mA/V; hiermit kann eine ausreichende Z.F.-Verstärkung erzielt werden.

Das Diodensystem ist durch äußerst sorgfältige Abschirmung vom Penthodensystem getrennt, so daß keine unerwünschten Rückwirkungen zwischen den beiden Teilen zu befürchten sind.

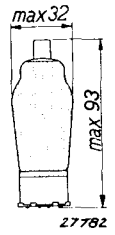
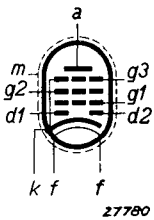


Abb. 1
Abmessungen in mm.

Die Kombination des Doppeldiodensystems mit einem Z.F.-Verstärkersystem gestattet die Aussparung einer besonderen Diode in den Fällen, wo eine N.F.-Verstärkerröhre ohne eingebaute Dioden Verwendung finden soll. Ein solcher Fall ergibt sich, wenn z.B. die Penthode EF 6 als Niederfrequenzverstärker mit oder ohne Gegenkopplung (negative Rückkopplung) vorgesehen wird. Insbesondere ist diese Röhre für die Anwendung in Kombination mit der N.F.-Verstärker- und Abstimmanzeigerröhre EFM 1 interessant.



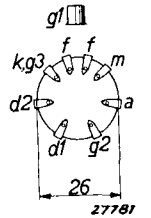


Abb. 2
Elektrodenanordnung und Sockelanschlüsse.

Die Kombination der Röhren EBF 2 und EFM 1 gestattet die Konstruktion von einfachen Empfängern, in welchen die beiden Röhren die Funktionen der Z.F.-Verstärkung, Gleichrichtung, Erzeugung der Regelspannung für die automatische Lautstärkeregelung, N.F.-Verstärkung und Abstimmanzeigung erfüllen.

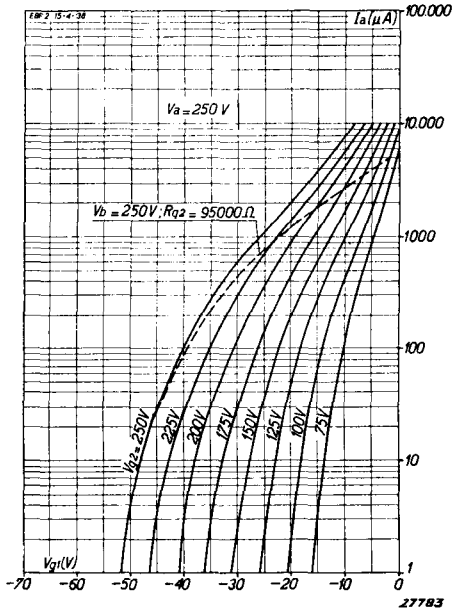


Abb. 3
Ia/Vg_1-Kurvenschar der EBF 2 mit Vg_2 als Parameter. Die gestrichelte Kurve gibt den Verlauf des Anodenstroms bei Regelung der Röhre für den Fall der Speisung des Schirmgitters über 95.000 Ω von 250 Volt aus.

Da die beiden Dioden um dieselbe Kathode gelagert sind wie das Penthodensystem und die Diode für automatische Lautstärkeregelung durch die Kathodenspannung der EBF 2 verzögert wird, beschränkt sich die Verzögerungsspannung ohne besondere Schaltungen auf die für den Penthodenteil im ungeregelten Zustand erforderliche Vorspannung.

Durch besondere Schaltungen ist auch eine größere Verzögerungsspannung der automatischen Lautstärkeregelung zu erzielen, die aber zwangsläufig zu einer schwächeren Wirkung der automatischen Lautstärkeregelung führt.

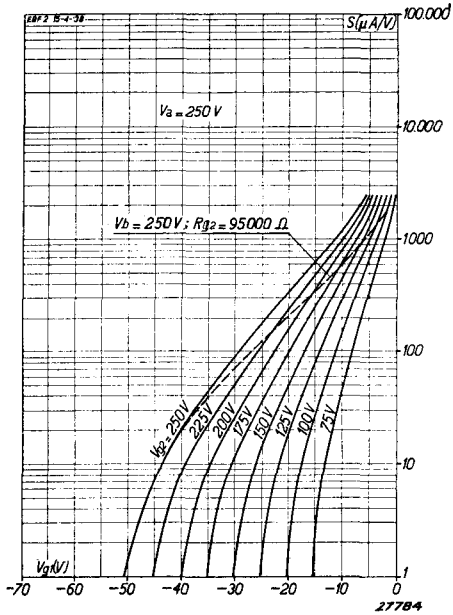


Abb. 4
S/Vg_1-Kurvenschar der EBF 2 mit Vg_2 als Parameter. Die gestrichelte Kurve gibt den Verlauf der Steilheit bei Regelung der Röhre für den Fall der Speisung des Schirmgitters über einen Vorwiderstand von 95.000 Ω von 250 Volt aus.

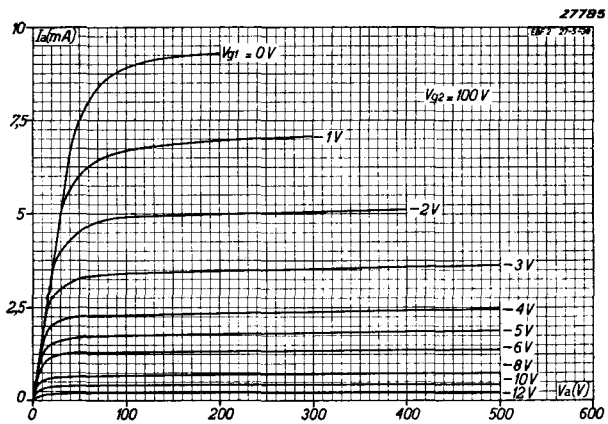


Abb. 5
Anodenstrom als Funktion der Anodenspannung bei verschiedenen negativen Gitterspannungen und einer festen Schirmgitterspannung von 100 Volt.

EBF 2

HEIZDATEN

Heizung: indirekt durch Gleich- oder Wechselstrom, Serien- oder Parallelspeisung.
Heizspannung . . . . . $V_f = 6{,}3$ V
Heizstrom . . . . . $I_f = 0{,}200$ A

KAPAZITÄTEN

C_{ag1}	< 0,002	µµF	$C_{(d1+d2)g1}$	< 0,001	µµF	C_{d2a}	< 0,25	µµF
C_{g1}	= 4,4	µµF	C_{d1k}	= 3	µµF	$C_{(d1+d2)a}$	< 0,4	µµF
C_a	= 8,6	µµF	C_{d2k}	= 3	µµF	C_{g1f}	< 0,01	µµF
C_{d1g1}	< 0,0005	µµF	C_{d1d2}	< 0,3	µµF			
C_{d2g2}	< 0,0005	µµF	C_{d1a}	< 0,3	µµF			

BETRIEBSDATEN DES PENTHODENTEILES ALS Z.F.-VERSTÄRKER

250 V

Anodenspannung	$V_a = 250$ V		
Schirmgitterwiderstand (an 250 V)	$R_{g2} = 95000\ \Omega$		
Kathodenwiderstand	$R_k = 300\ \Omega$		
Neg. Gittervorspannung	$V_{g1} = -2$ V [1]	$V_{g1} = -38$ V [2]	
Schirmgitterspannung	$V_{g2} = 100$ V	$V_{g2} = 250$ V	
Anodenstrom	$I_a = 5$ mA	—	
Schirmgitterstrom	$I_{g2} = 1{,}6$ mA	—	
Steilheit	$S = 1800$ µA/V	$S = 18$ µA/V	
Innenwiderstand	$R_i = 1{,}3$ MΩ	$R_i > 10$ MΩ	

200 V

Anodenspannung	$V_a = 200$ V		
Schirmgitterwiderstand (an 200 V)	$R_{g2} = 60000\ \Omega$		
Kathodenwiderstand	$R_k = 300\ \Omega$		
Neg. Gittervorspannung	$V_{g1} = -2$ V [1]	$V_{g1} = -32{,}5$ V [2]	
Schirmgitterspannung	$V_{g2} = 100$ V	$V_{g2} = 200$ V	
Anodenstrom	$I_a = 5$ mA	—	
Schirmgitterstrom	$I_{g2} = 1{,}6$ mA	—	
Steilheit	$S = 1800$ µA/V	$S = 18$ µA/V	
Innenwiderstand	$R_i = 1{,}0$ MΩ	$R_i > 10$ MΩ	

100 V

Anodenspannung	$V_a = 100$ V		
Schirmgitterspannung	$V_{g2} = 100$ V		
Kathodenwiderstand	$R_k = 300\ \Omega$		
Neg. Gittervorspannung	$V_{g1} = -2$ V [1]	$V_{g1} = -16{,}5$ V [2]	
Anodenstrom	$I_a = 5$ mA	—	
Schirmgitterstrom	$I_{g2} = 1{,}6$ mA	—	
Steilheit	$S = 1800$ µA/V	$S = 18$ µA/V	
Innenwiderstand	$R_i = 0{,}4$ MΩ	$R_i > 10$ MΩ	

[1]) Im ungeregelten Zustand.
[2]) Für eine Regelung der Steilheit 1 : 100 und Grenze des optimalen Regelbereiches.

GRENZDATEN

a) Penthodenteil

Max. zulässige Anodenkaltspannung	V_{ao}	= max.	550 V
Max. zulässige Anodenspannung	V_a	= max.	300 V
Max. zulässige Anodenbelastung	W_a	= max.	1,5 W
Max. zulässige Schirmgitterkaltspannung	V_{g2o}	= max.	550 V
Max. zulässige Schirmgitterspannung bei $I_a = 5$ mA	V_{g2}	= max.	125 V
Max. zulässige Schirmgitterspannung bei $I_a \leqq 2$ mA	V_{g2}	= max.	300 V
Max. zulässige Schirmgitterbelastung	W_{g2}	= max.	0,3 W
Obere Grenze des Schirmgitterstroms bei $I_a = 5$ mA, $V_{g2} = 100$ V	I_{g2}	= max.	2 mA
Untere Grenze des Schirmgitterstroms bei $I_a = 5$ mA, $V_{g2} = 100$ V	I_{g2}	= min.	1,2 mA
Max. zulässiger Kathodenstrom	I_k	= max.	10 mA
Grenze des Gitterstromeinsatzpunktes	V_{g1} ($I_{g1} = +0{,}3$ µA)	= max.	— 1,3 V
Höchstzulässiger Widerstand zwischen Gitter und Kathode	R_{g1k}	= max.	3 MΩ
Höchstzulässiger Widerst. zwischen Heizfaden und Kathode	R_{fk}	= max.	20.000 Ω
Max. zulässige Spannung zwischen Heizfaden und Kathode (Gleichspannung oder Effektivwert der Wechselspannung)	V_{fk}	= max.	100 V

b) Diodenteil

Max. zulässiger Scheitelwert der Wechselsp. an Diode d_1	V_{d1}	= max.	200 V
Max. zulässiger Scheitelwert der Wechselsp. an Diode d_2	V_{d2}	= max.	200 V
Max. zulässiger Gleichstrom durch Diode d_1	I_{d1}	= max.	0,8 mA
Max. zulässiger Gleichstrom durch Diode d_2	I_{d2}	= max.	0,8 mA
Grenze des Diodenstromeinsatzpunktes der Diode d_1	V_{d1} ($I_{d1} = +0{,}3$ µA)	= max.	— 1,3 V
Grenze des Diodenstromeinsatzpunktes der Diode d_2	V_{d2} ($I_{d2} = +0{,}3$ µA)	= max.	— 1,3 V

ANWENDUNG

Die EBF 2 kommt hauptsächlich zur Anwendung in Z.F.-Stufen in Frage. Die beiden Dioden können dann als Detektor bzw. als Gleichrichter für die automatische Lautstärkeregelung benutzt werden. Die Daten und Kurven sind sowohl für den Betrieb in Wechselstromempfängern bei einer Speisespannung von rund 250 Volt wie für Verwendung in G/W-Geräten mit Speisespannungen von rund 200 und 100 Volt gegeben. Bei Speisespannungen, die von 250 oder 200 Volt abweichen, kann der erforderliche Schirmgittervorwiderstand berechnet werden aus dem Schirmgitterstrom von 1,6 mA und dem Spannungsunterschied zwischen Speisespannung und Schirmgitterspannung von

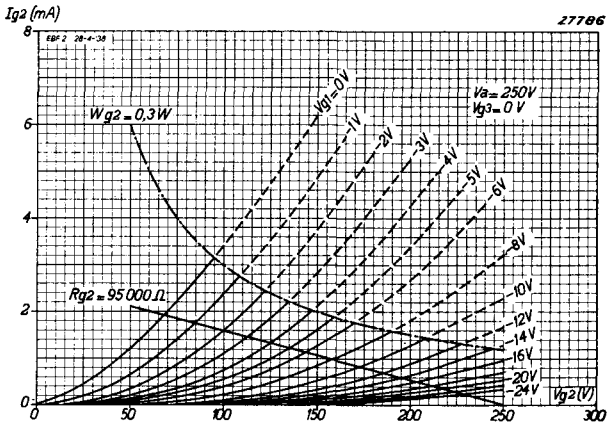


Abb. 6

Schirmgitterstrom als Funktion der Schirmgitterspannung für verschiedene Steuergitterspannungen. Die Kurven gelten näherungsweise für alle Anodenspannungen zwischen 100 und 250 Volt. Eingezeichnet wurden die Grenzlinie für maximale Schirmgitterdauerbelastung und die Widerstandsgerade entsprechend 95.000 Ω von 250 Volt Speisespannung aus.

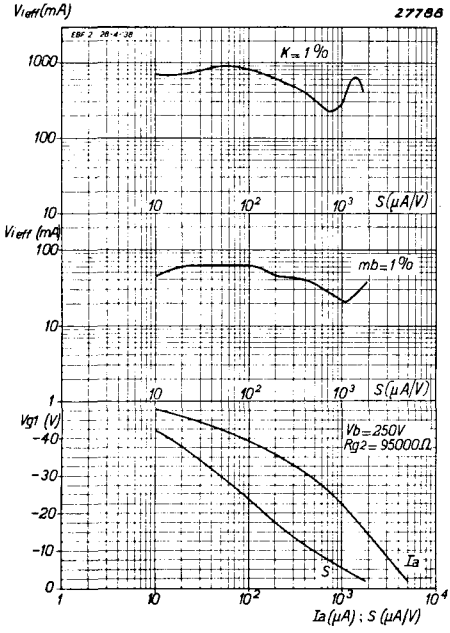


Abb. 7
Obere Kurve: Effektive Gitterwechselspannung als Funktion der Steilheit für 1% Quermodulation bei Speisung des Schirmgitters über einen Widerstand von 95.000 Ω von 250 Volt aus.
Mittlere Kurve: Effektive Gitterwechselspannung als Funktion der Steilheit für 1% Modulationsbrummen.
Untere Kurve: Steilheit S und Anodenstrom Ia als Funktion der negativen Gitterspannung.

Elektrolytkondensator von z.B. 25 µF überbrückt werden. Sonst würde infolge der Gleichrichtung durch die Krümmung der I_a/V_{g1}-Kennlinie an diesem Widerstand eine N.F.-Wechselspannung entstehen, die bei heruntergeregeltem Lautstärkeregler dem Gitter der N.F.-Verstärkerröhre zugeführt wird. Hierdurch entstünde ein Restsignal, und die völlige Unterdrückung der Lautstärke wäre unmöglich.
Die Diode d_2 soll vorzugsweise als Detektor, die Diode d_1 als Gleichrichter für die automatische Lautstärkeregelung benutzt werden. Nach der Schaltung von Abb. 10 erhält die A.L.R.-Diode d_1 ihre Verzögerung durch die Kathodenspannung der EBF 2. Da diese Spannung zur Erzielung einer maximalen Verstärkung im ungeregelten Zustand durchweg möglichst klein gewählt wird und den Daten nach 2 Volt beträgt, muß die N.F.-Verstärkung so groß sein, daß bei gerade voll ausgesteuerter Endröhre die Signale an der A.L.R.-Diode unter diesem Verzögerungspegel liegen.

100 Volt. Die in den Abb. 3, 4, 7 und 8 dargestellten Kurven für I_a und S sind dann selbstverständlich nicht mehr genau gültig. Bei 100 Volt Speisespannung kann das Prinzip der gleitenden Schirmgitterspannung nicht mehr angewendet werden und ist die Röhre mit einer festen Schirmgitterspannung von 100 Volt zu betreiben. Die Modulationsverzerrungskurve ist dann zwar ungünstiger, doch ist die EBF 2 bei Verwendung einer normalen N.F.-Verstärkung hinter dem Diodendetektor noch sehr gut brauchbar. Zu gleicher Zeit ergibt sich dann eine schnellere Regelung.
Wird an Stelle eines Serienwiderstandes zur Speisung des Schirmgitters ein Spannungsteiler verwendet, so kann durch geeignete Dimensionierung der Widerstände eine mehr oder weniger steile Steilheitscharakteristik erzielt werden. Die Modulationsverzerrungskurve wird sich dabei dementsprechend ändern.
Der Kathodenwiderstand muß durch einen

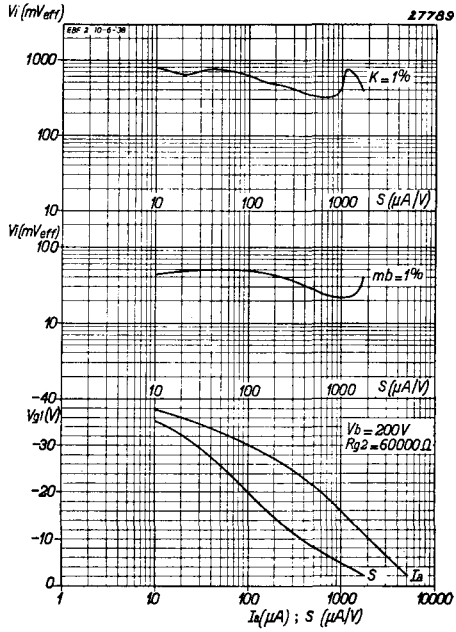


Abb. 8
Obere Kurve: Effektive Gitterwechselspannung als Funktion der Steilheit für 1% Quermodulation bei Speisung des Schirmgitters über einen Widerstand von 60.000 Ω von 200 Volt aus.
Mittlere Kurve: Effektive Gitterwechselspannung als Funktion der Steilheit für 1% Modulationsbrummen.
Untere Kurve: Steilheit S und Anodenstrom Ia als Funktion der negativen Gittervorspannung.

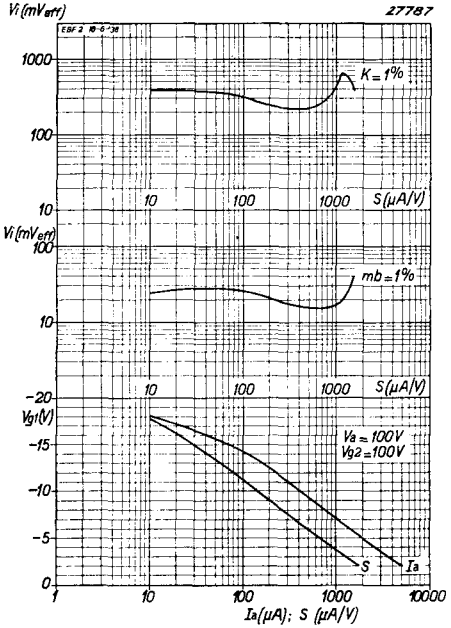


Abb. 9

Obere Kurve: Effektive Gitterwechselspannung als Funktion der Steilheit für 1% Quermodulation bei Va = 100 V und Vg_2 = 100 V (feste Schirmgitterspannung).
Mittlere Kurve: Effektive Gitterwechselspannung als Funktion der Steilheit für 1% Modulationsbrummen.
Untere Kurve: Steilheit S und Anodenstrom Ia als Funktion der negativen Gitterspannung.

Oft ist aber eine geringere N.F.-Verstärkung erwünscht oder kann die obenerwähnte große N.F.-Verstärkung nicht erzielt werden, so daß dann durch besondere Maßnahmen eine größere Verzögerung der automatischen Lautstärkeregelung erzielt werden muß, wenn die A.L.R. nicht bereits bei Signalen arbeiten soll, die zur vollen Aussteuerung der Endröhre noch nicht ausreichen.
Für die Kurven des Diodenteiles wird auf die entsprechenden Kurven der Röhren EAB 1 und EB 4 verwiesen, die für diese Röhren auch gültig sind.

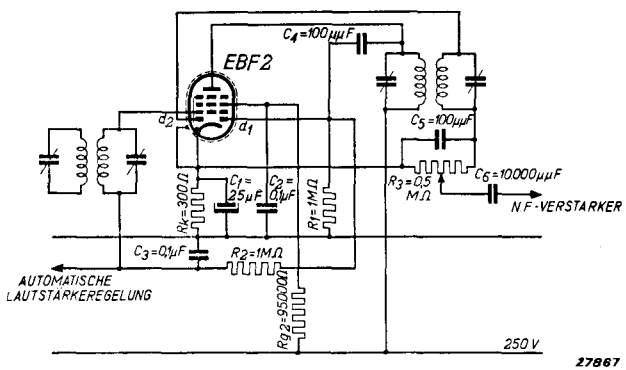


Abb. 10

Prinzipschaltbild für die Verwendung der EBF 2 als Z.F.-Verstärker. Diode d_2 dient als Detektor, Diode d_1 als Gleichrichter für die automatische Lautstärkeregelung.

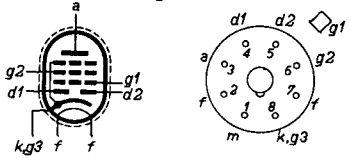
PHILIPS

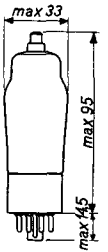
EBF 32

DUODIODE-PENTODE with variable mutual conductance for use as H.F. and I.F. amplifier
DUODIODE-PENTHODE à pente variable pour l'utilisation comme amplificatrice H.F. et M.F.
DUODIODE-PENTHODE mit veränderlicher Steilheit zur Verwendung als H.F.- und Z.F. Verstärker

Heating:	indirect by A.C. or D.C.; series or parallel supply.	
Chauffage:	indirect par C.A. ou C.C.; alimentation en parallèle ou en série	Vf = 6,3 V If = 0,2 A
Heizung:	indirekt durch Wechsel- oder Gleichstrom; Serien- oder Parallelspeisung	

Dimensions in mm
Dimensions en mm
Abmessungen in mm





Capacitances Capacités Kapazitäten	Pentode section Partie penthode Penthodenteil	Diode section Partie diode Diodenteil
	Cgl = 3,9 pF	Cd1k = 2,9 pF
	Ca = 8,5 pF	Cd2k = 2,9 pF
	Cagl < 0,002 pF	Cd1d2 < 0,45 pF
	Cglf < 0,01 pF	

Between diode and pentode sections
Entre les parties diode et penthode
Zwischen Dioden- und Penthodenteil

Cd1gl	< 0,001 pF	Cd1a	< 0,5 pF
Cd2gl	< 0,001 pF	Cd2a	< 0,25 pF

Operating characteristics of the pentode section as H.F. or I.F. amplifier
Caractéristiques d'utilisation de la partie penthode comme amplificatrice H.F. ou M.F.
Betriebsdaten des Penthodenteiles als H.F.- oder Z.F. Verstärker

Va=Vb	=	250		200		100	V
Rg2	=	95		60		0	kΩ
Rk	=	300		300		300	Ω
Vg1	=	-2	-38	-2	-32	-2	-16,5	V
Vg2	=	100	250	100	200	100	100	V
Ia	=	5,0	-	5,0	-	5,0	-	mA
Ig2	=	1,6	-	1,6	-	1,6	-	mA
S	=	1800	18	1800	18	1800	18	µA/V
Ri	=	1,3	>10	1,0	>10	0,4	>10	MΩ

Limiting values of the pentode section
Caractéristiques limites de la partie penthode
Grenzdaten des Penthodenteiles

Va_o	= max. 550 V	$Vg2_o$	= max. 550 V
Va	= max. 300 V	Wg2	= max. 0,3 W
Wa	= max. 1,5 W	Ik	= max. 10 mA
Vg2 (Ia < 2 mA)	= max. 300 V	Rg1	= max. 3 MΩ
Vg2 (Ia = 5 mA)	= max. 125 V	Rfk	= max. 20 kΩ
Vg1 (Ig1=+0,3µA)	= max. -1,3 V	Vfk	= max. 100 V

Limiting values of the diode section
Caractéristiques limites de la partie diode
Grenzdaten des Diodenteiles

Vd1	= max. 200 V[1]
Vd2	= max. 200 V[1]
Id1	= max. 0,8 mA
Id2	= max. 0,8 mA
Vd1 (Id1 = +0,3 µA)	= max. -1,3 V
Vd2 (Id2 = +0,3 µA)	= max. -1,3 V
Rfk	= max. 20 kΩ
Vfk	= max. 100 V

1) Peak value; valeur de crête; Scheitelwert

PHILIPS

Electronic Tube

HANDBOOK

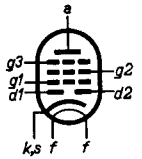
EBF32

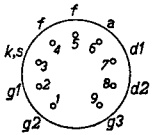
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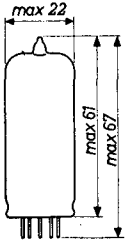
DUODIODE-PENTODE with variable mutual conductance for use as R.F., I.F. or A.F. amplifier
DUODIODE-PENTHODE à pente variable pour utilisation en amplificatrice H.F., M.F. ou B.F.
DUODIODE-PENTODE mit veränderlicher Steilheit zur Verwendung als HF-, ZF- oder NF- Verstärker

Heating:	indirect by A.C. or D.C.; parallel or series supply	
Chauffage:	indirect par C.A. ou C.C.; alimentation en parallèle ou en série	V_f = 6,3 V I_f = 0,3 A
Heizung:	indirekt durch Wechsel- oder Gleichstrom; Serien- oder Parallelspeisung	

Dimensions in mm
Dimensions en mm
Abmessungen in mm







Base, culot, Sockel: NOVAL

Capacitances Capacités Kapazitäten	Pentode section Partie penthode Pentodenteil	Diode section Partie diode Diodenteil
	C_a = 4,9 pF	C_{d1} = 2,2 pF
	C_{g1} = 4,2 pF	C_{d2} = 2,35 pF
	C_{ag1} < 0,0025 pF	C_{d1d2} < 0,35 pF
	C_{g1f} < 0,07 pF	C_{d1f} < 0,02 pF
		C_{d2f} < 0,005 pF

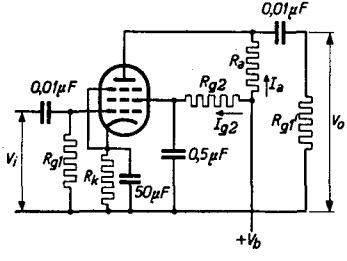
Between pentode and diode sections
Entre les parties penthode et diode
Zwischen Pentoden- und Diodenteilen

C_{d1g1} < 0,0008 pF
C_{d2g1} < 0,001 pF
C_{d1a} < 0,2 pF
C_{d2a} < 0,05 pF

Operating characteristics of the pentode section as R.F. or I.F. amplifier
Caractéristiques d'utilisation de la partie penthode en amplificatrice H.F. ou M.F.
Betriebsdaten des Pentodenteiles als HF- oder ZF-Verstärker

Va=Vb	=	250		V
Vg3	=	0		V
Rg2	=	95		kΩ
Rk	=	300		Ω
Vg1	=	-2	-41,5	V
Vg2	=	85	250	V
Ia	=	5	-	mA
Ig2	=	1,75	-	mA
S	=	2200	22	µA/V
Ri	=	1,4	>10	MΩ
µg2g1	=	18	-	
Req	=	6,8	-	kΩ

Operating characteristics of the pentode section as resistance coupled A.F. amplifier
Données caractéristiques de la partie penthode en amplificatrice B.F. avec couplage à résistances
Betriebsdaten des Pentodenteiles als NF-Verstärker mit Widerstandskopplung



This valve can be used without special precautions against microphonic effect in circuits in which the input voltage Vi ≧ 25 mV for an output of 50 mW of the output valve
Ce tube peut être utilisé sans précautions spéciales contre l'effet microphonique dans des circuits dont la tension d'entrée Vi ≧ 25 mV pour une puissance de 50 mW du tube de sortie
Diese Röhre darf ohne spezielle Massnahmen gegen Mikrophonie verwendet werden in Schaltungen die für eine Eingangsspannung Vi ≧ 25 mV eine Leistung von 50 mW der Endröhre ergeben

Vb = 250 V

Ra (MΩ)	Rg2 (MΩ)	Rg1 (MΩ)	Rk (Ω)	Rg1' (MΩ)	Ia (mA)	Ig2 (mA)	Vo/Vi	d_{tot} (%) Vo= $3V_{eff}$	Vo= $5V_{eff}$	Vo= $8V_{eff}$
0,22	0,82	1	1800	0,68	0,75	0,30	110	0,8	1,3	2,0
0,1	0,39	1	1000	0,33	1,5	0,53	80	0,9	1,5	2,2
0,22	1,0	10	0	0,68	0,75	0,25	160	0,8	1,4	2,1
0,1	0,47	10	0	0,33	1,5	0,50	110	0,8	1,4	2,1

Operating characteristics as resistance coupled A.F. amplifier in triode connection (g2 connected to anode)
Données caractéristiques en amplificatrice B.F. avec couplage à résistances montée en triode (g2 relié à l'anode)
Betriebsdaten als N.F.Verstärker mit Widerstandskopplung in Triodenschaltung (g2 verbunden mit Anode)

Vb = 250 V

Ra (MΩ)	Rg1 (MΩ)	Rk (Ω)	Rg1' (MΩ)	Ia (mA)	Vo/Vi	d_{tot} (%) Vo= $3V_{eff}$	Vo= $5V_{eff}$	Vo= $8V_{eff}$
0,1	1	820	0,33	2,08	14	1,6	2,5	4,3
0,047	1	560	0,15	4,10	13	1,3	2,0	2,9
0,1	10	0	0,33	2,16	15	2,0	3,1	4,8
0,047	10	0	0,15	4,50	15	1,7	2,7	4,1

Limiting values of the pentode section
Caractéristiques limites de la partie penthode
Grenzdaten des Pentodenteiles

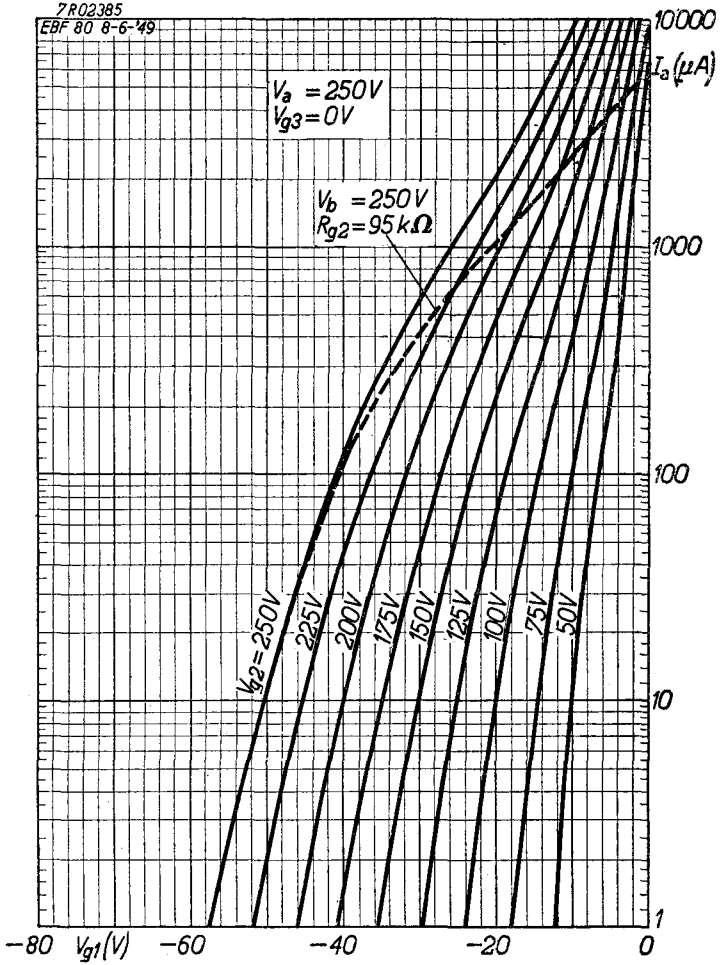
Va_o	= max.	550	V
Va	= max.	300	V
Wa	= max.	1,5	W
$Vg2_o$	= max.	550	V
Vg2(Ia <2,5 mA)	= max.	300	V
Vg2(Ia = 5 mA)	= max.	125	V
Wg2	= max.	0,3	W
Ik	= max.	10	mA
Vg1(Ig1=+0,3µA)	= max.	-1,3	V
Rg1 [1) 2)]	= max.	3	MΩ
R_{kf}	= max.	20	kΩ
V_{kf}	= max.	100	V

Limiting values of the diode section
Caractéristiques limites de la partie diode
Grenzdaten des Diodenteiles

$Vd1\ inv_p$	= max.	350	V
$Vd2\ inv_p$	= max.	350	V
Id1	= max.	0,8	mA
Id2	= max.	0,8	mA
$Id1_p$	= max.	5	mA
$Id2_p$	= max.	5	mA
R_{kf}	= max.	20	kΩ
V_{kf}	= max.	100	V

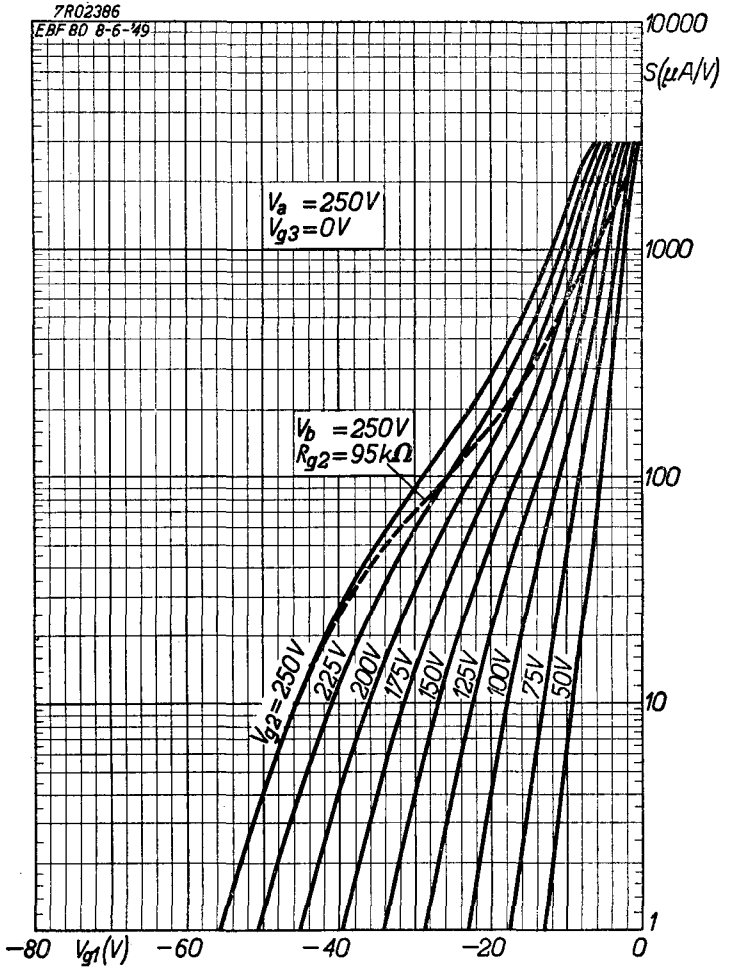
1) If the grid bias is obtained only by connecting a leakage resistor in the grid circuit, the maximum value of Rg1 is 22 MΩ.
Si la polarisation négative est obtenue seulement par moyen d'une résistance de fuite dans le circuit de la grille, la valeur maximum de Rg1 est de 22 MΩ.
Wenn die negative Gittervorspannung nur von einem Ableitungswiderstand in der Gitterleitung erhalten wird, ist der Maximalwert von Rg1 22 MΩ.

2) With automatic grid bias
Avec polarisation automatique
Mit automatischer Gittervorspannung


7R02385
EBF 80 8-6-49
V_a = 250V
V_{g3} = 0V
V_b = 250V
R_{g2} = 95 kΩ
I_a (μA)
10000
1000
100
10
1
V_{g2} = 250V
225V
200V
175V
150V
125V
100V
75V
50V
−80
V_{g1}(V)
−60
−40
−20
0

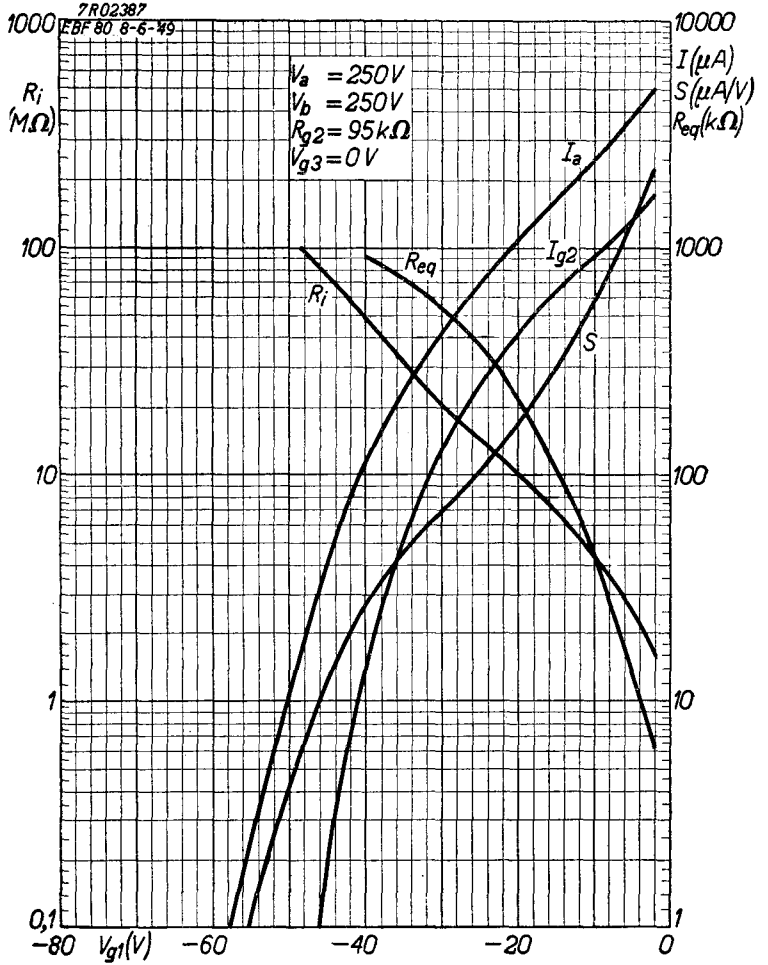
EBF 80

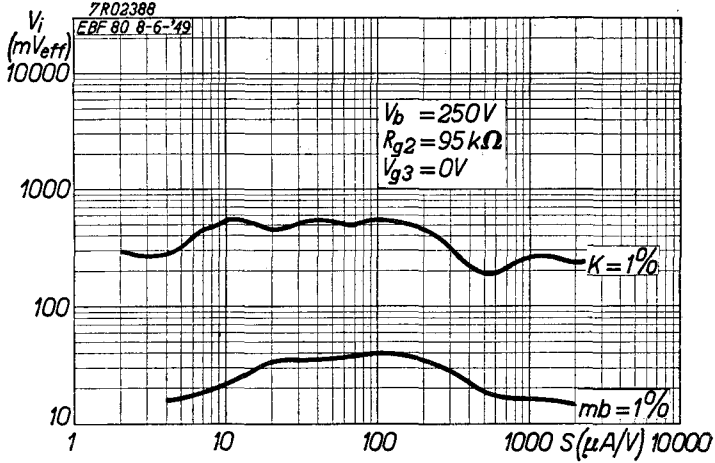
PHILIPS



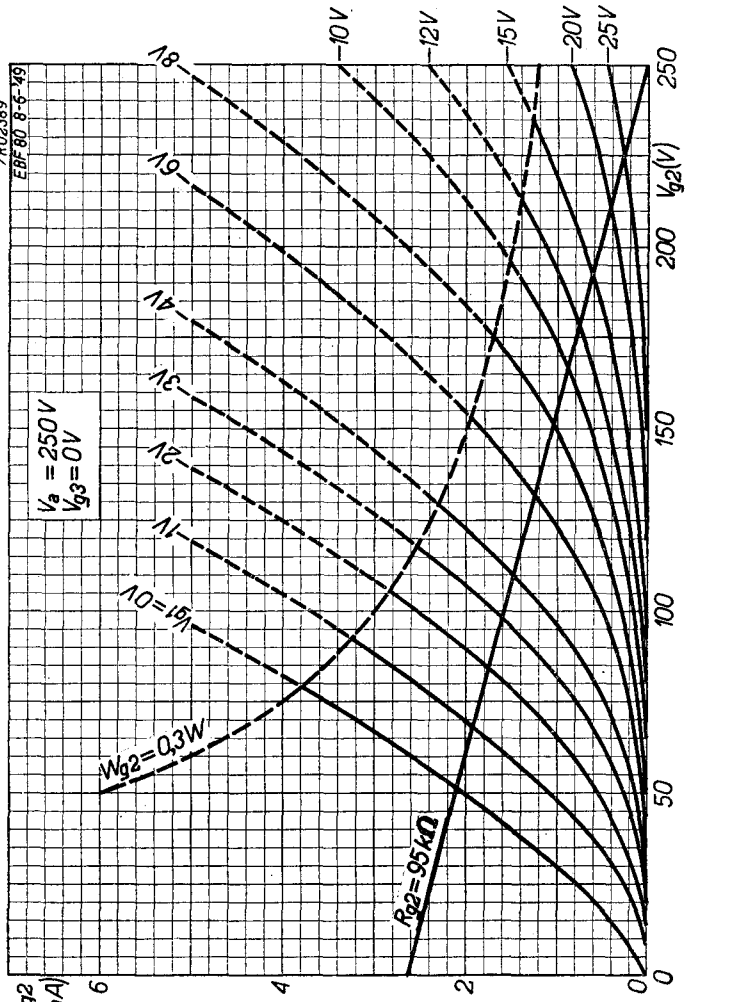
7R03066
EBF80;UBF80 2-2-'51
V_{g1}=
0V
-1V
-2V
-3V
-4V
-6V
-10V
V_{g2} = 85V
V_{g3} = 0V
W_a = 1,5W
I_a (mA)
15
10
5
0
100
200
300
400
500
V_a (V)

EBF 80 PHILIPS




7R02388
EBF 80 8-6-49
V_i (mV_{eff})
10000
1000
100
10
1
10
100
1000 S(μA/V) 10000
V_b = 250V
R_{g2} = 95 kΩ
V_{g3} = 0V
K = 1%
mb = 1%

EBF 80 PHILIPS



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4	4	1950.12.12
5	A	1951.02.02
6	B	1951.02.02
7	C	1951.02.02
8	D	1951.02.02
9	E	1951.02.02
10	F	1951.02.02
11	FP	1999.06.15

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EBF 83

DOUBLE-DIODE PENTODE for use as I.F. amplifier, detector and A.G.C. diode in carradio sets. The tube can be directly operated from a 6 V or 12 V storage battery

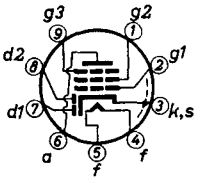
DOUBLE-DIODE PENTHODE pour l'utilisation comme amplificateur MF, comme détecteur et comme diode de C.A.V. dans récepteurs autoradio. On peut faire fonctionner le tube directement d'un accumulateur de 6 V ou de 12 V

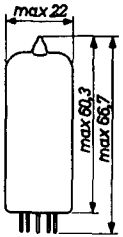
DOPPELDIODE PENTODE zur Verwendung als ZF-Verstärker, Signalgleichrichter und A.L.R.-Diode in Autoempfängern. Die Röhre kann direkt von einer 6 V- oder 12 V-Batterie betrieben werden

Heating : indirect. Series or parallel supply
Chauffage: indirect. Alimentation série ou parallèle
Heizung : indirekt. Serien- oder Parallelspeisung

V_f = 6,3 V
I_f = 300 mA

Dimensions in mm
Dimensions en mm
Abmessungen in mm





Base, culot, Sockel: NOVAL

Capacitances
Capacités
Kapazitäten

Pentode section Partie penthode Pentodenteil		Diode sections Parties diode Diodenteile	
C_a =	5,2 pF	C_{d1} =	2,5 pF
C_{g1} =	5,0 pF	C_{d2} =	2,5 pF
C_{ag1} <	0,0025 pF	C_{d1d2} <	0,25 pF

Between pentode and diode sections
Entre les parties penthode et diode
Zwischen Pentoden- und Diodenteilen

C_{d1g1} < 0,0008 pF
C_{d2g1} < 0,001 pF
C_{d1a} < 0,15 pF
C_{d2a} < 0,025 pF

Operating characteristics as I.F. amplifier
Caractéristiques d'utilisation comme amplificateur M.F.
Betriebsdaten als ZF-Verstärker

V_a	=	25	12,6	6,3 V
V_{g3}	=	0	0	0 V
V_{g2}	=	25	12,6	6,3 V
V_{g1}	=	[1])	[1])	[1]) V
I_a	=	1,7	0,45	0,12 mA
I_{g2}	=	0,5	0,14	0,04 mA
S	=	2,1	1,0	0,45 mA/V
R_i	=	0,2	1,0	0,65 MΩ

Limiting values
Caractéristiques limites
Grenzdaten

Pentode section
Partie penthode
Pentodenteil

V_a	= max.	50 V
V_{g2}	= max.	50 V
I_k	= max.	5 mA
R_{g1}	= max.	5 MΩ
V_{kf}	= max.	50 V

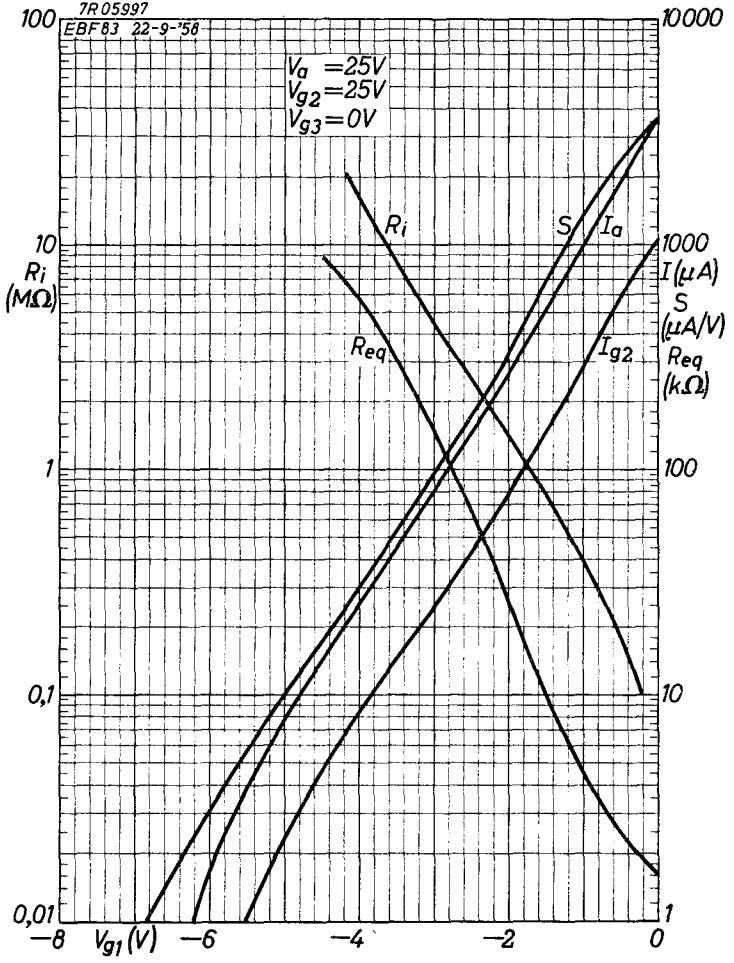
Diode sections
Parties diode
Diodenteile

I_{d1}	= max.	0,8 mA
I_{d2}	= max.	0,8 mA
I_{d1p}	= max.	5 mA
I_{d2p}	= max.	5 mA

[1]) Obtained by grid current biasing; R_{g1} = 2.2 MΩ
Obtenu par moyen de R_{g1} = 2,2 MΩ
Erhalten mittels R_{g1} = 2,2 MΩ

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EBF83

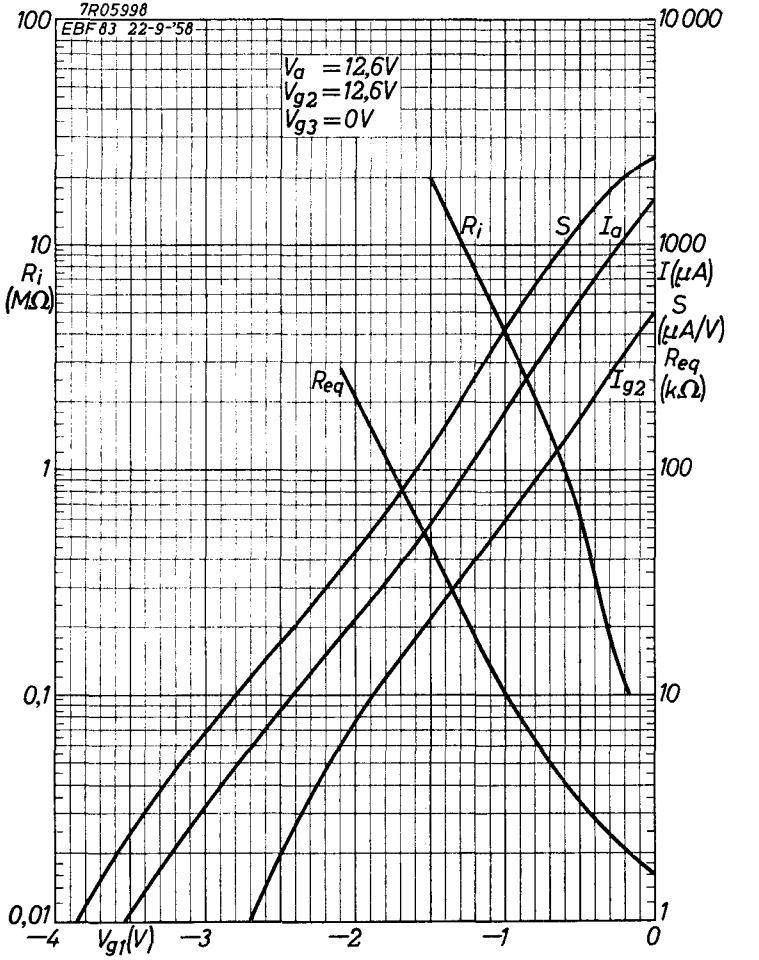


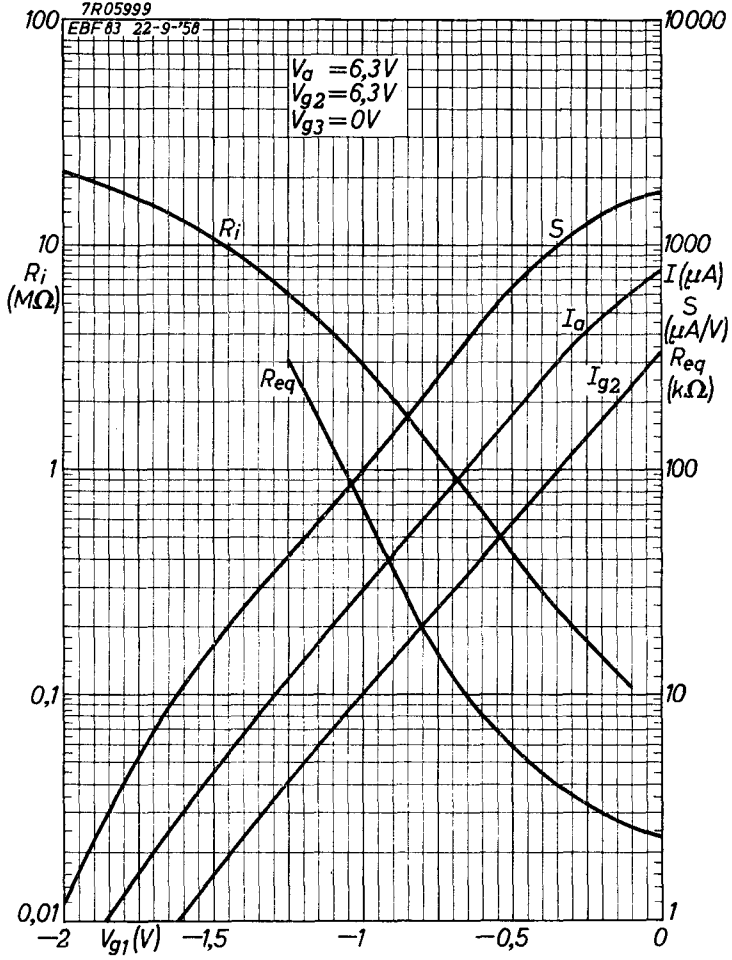
10.10.1958

A

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EBF83




7R05999
EBF83 22-9-'58
V_a =6,3V
V_{g2}=6,3V
V_{g3}=0V
R_i
S
I_a
I_{g2}
R_{eq}
100
10
1
0,1
0,01
R_i (MΩ)
10000
1000
100
10
1
I(μA)
S (μA/V)
R_{eq} (kΩ)
−2
V_{g1}(V)
−1,5
−1
−0,5
0

10.10.1958

C

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1	1	1957.12.12
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4	B	1958.10.10
5	C	1958.10.10
6	FP	1999.06.15

DOUBLE DIODE – PENTODE

Double diode-pentode. Pentode intended for use as R.F. or I.F. amplifier.

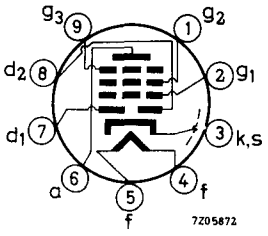
QUICK REFERENCE DATA			
Pentode section			
Variable transconductance			
Anode current	I_a	9	mA
Transconductance	S	4.5	mA/V
Amplification factor	$\mu_{g_2g_1}$	20	--

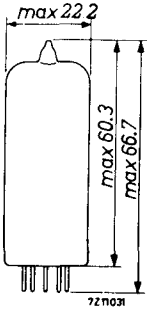
HEATING: Indirect by A.C. or D.C.; parallel or series supply

Heater voltage	V_f	6.3	V
Heater current	I_f	300	mA

DIMENSIONS AND CONNECTIONS Dimensions in mm

Base: Noval





CAPACITANCES

Pentode section			
Anode to all except grid No.1	$C_{a(g_1)}$	5.2	pF
Grid No.1 to all except anode	$C_{g_1(a)}$	5.0	pF
Anode to grid No.1	C_{ag_1}	max. 0.0025	pF
Grid No.1 to heater	C_{g_1f}	max. 0.05	pF
Diode sections			
Diode No.1 to all	C_{d_1}	2.5	pF
Diode No.2 to all	C_{d_2}	2.5	pF
Diode No.1 to diode No.2	$C_{d_1d_2}$	max. 0.25	pF
Diode No.1 to heater	C_{d_1f}	max. 0.015	pF
Diode No.2 to heater	C_{d_2f}	max. 0.003	pF
Between diode and pentode sections			
Diode No.1 to grid No.1	$C_{d_1g_1}$	max. 0.0008	pF
Diode No.2 to grid No.1	$C_{d_2g_1}$	max. 0.001	pF
Diode No.1 to anode	C_{d_1a}	max. 0.15	pF
Diode No.2 to anode	C_{d_2a}	max. 0.025	pF

TYPICAL CHARACTERISTICS

Pentode section

Anode voltage	V_a	250	250	200	170	V
Grid No. 2 voltage	V_{g_2}	100	80	100	100	V
Grid No. 3 voltage	V_{g_3}	0	0	0	0	V
Grid No. 1 voltage	V_{g_1}	-2	-1 [1])	-1.5	-1 [1])	V
Anode current	I_a	9	9	11	12	mA
Grid No. 2 current	I_{g_2}	2.7	2.7	3.3	4	mA
Transconductance	S	3.8	4.5	4.5	5	mA/V
Amplification factor	$\mu_{g_2g_1}$	20	20	20	20	-
Internal resistance	R_i	1.0	0.9	0.6	0.4	MΩ

OPERATING CHARACTERISTICS

Pentode section as R.F. or I.F. amplifier

Supply voltage	V_b	250		200		250		V
Anode resistor	R_a	0		0		0		Ω
Grid No. 3 voltage	V_{g_3}	0		0		0		V
Grid No. 2 resistor	R_{g_2}	56		30		62		kΩ
Grid No. 1 voltage	V_{g_1}	-2.0	-20	-1.5	-20	-1 [1])	-20	V
Anode current	I_a	9	-	11	-	9	-	mA
Grid No. 2 current	I_{g_2}	2.7	-	3.3	-	2.7	-	mA
Transconductance	S	3.8	0.2	4.5	0.12	4.5	0.2	mA/V
Internal resistance	R_i	1.0	-	0.6	-	0.9	-	MΩ

[1]) To avoid grid No. 1 current the negative grid No. 1 voltage should be min. 1.5 V.

LIMITING VALUES (Design centre rating system)

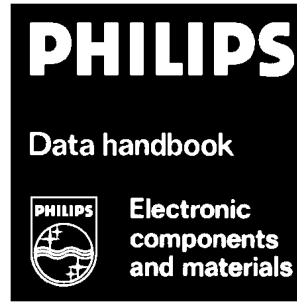
Pentode section

Anode voltage	V_{a_o}	max. 550	V
	V_a	max. 300	V [1]
Anode dissipation	W_a	max. 2.25	W
Grid No.2 voltage	$V_{g_{2o}}$	max. 550	V
Grid No.2 voltage			
at anode current I_a max. 4 mA	V_{g_2}	max. 300	V [1]
at anode current I_a min. 8 mA	V_{g_2}	max. 125	V
Grid No.2 dissipation	W_{g_2}	max. 0.45	W
Cathode current	I_k	max. 16.5	mA
Grid No.1 resistor	R_{g_1}	max. 3	MΩ
Grid No.3 resistor	R_{g_3}	max. 10	kΩ
Cathode to heater voltage	V_{kf}	max. 100	V

Diode sections (each diode)

Diode voltage, negative peak	$-V_{d_p}$	max. 200	V
Diode current, average	I_d	max. 0.8	mA
peak	I_{d_p}	max. 5	mA
Cathode to heater voltage	V_{kf}	max. 100	V

[1]) With supply from a storage battery and vibrator the max. voltage is 250 V.



EBF89

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1	1	1970.01
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3	3	1970.01
4	4	1970.01
5	FP	1999.08.14

EBL 1 Duodiode-Endpenthode

Die EBL 1 ist die Kombination einer Duodiode mit einer steilen 9-Watt-Endpenthode, die zusammen in einem Kolben untergebracht sind und eine gemeinsame Kathode benutzen. Der Penthodenteil hat Eigenschaften, die sich vollkommen mit denjenigen der steilen Endpenthode EL 3 decken. Die Röhre gestattet die Konstruktion sehr billiger Empfänger, z.B. Dreiröhrensuperhets, wo die Anzahl der Röhren bis auf das äußerste beschränkt bleiben soll und die ohne N.F. Verstärkerstufe trotzdem zu verhältnismäßig großen Leistungen imstande sein sollen. Die beiden Dioden sind unterhalb des Penthodenteiles gegenüber der Kathode angeordnet, in dem Sinne, daß beide Anoden, die nicht ganz einen Halbzylinder bilden, in derselben Höhe liegen. Dadurch sind die Dioden einander vollkommen gleichwertig. Das Diodensystem ist von dem Penthodensystem durch eine Abschirmung getrennt. Um eine Beeinflussung des Gitters des Penthodenteiles durch das Diodensystem zu verhüten, ist das Steuergitter am Kolben nach außen geführt.

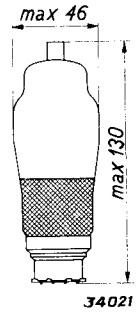
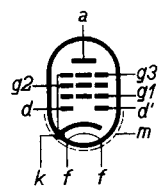


Abb. 1
Abmessungen in mm.



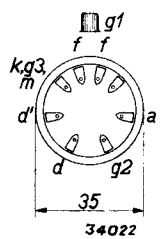


Abb. 2
Elektrodenanordnung und Sockelanschlüsse der EBL 1.

HEIZDATEN

Heizung: indirekt durch Wechselstrom, Parallelspeisung.

Heizspannung	V_f	= 6,3 V
Heizstrom	I_f	= 1,5 A

KAPAZITÄTEN

C_{dk}	= 2,9 µµF	C_{da}	= 0,2 µµF
$C_{d'k}$	= 3 µµF	$C_{d'a}$	= 0,2 µµF
C_{ag1}	< 1 µµF	C_{dg}	= 0,08 µµF
$C_{dd'}$	< 0,25 µµF	$C_{d'g}$	= 0,08 µµF

BETRIEBSDATEN

Anodenspannung	V_a	= 250 V
Schirmgitterspannung	V_{g2}	= 250 V
Kathodenwiderstand	R_k	= 150 Ω
Negative Gittervorspannung	V_{g1}	= −6 V
Anodenstrom	I_a	= 36 mA
Schirmgitterstrom	I_{g2}	= 5 mA
Steilheit im Arbeitspunkt	S	= 9,5 mA/V
Innenwiderstand	R_i	= 50000 Ω
Günstigste Anpassungsimpedanz	R_a	= 7000 Ω
Ausgangsleistung bei 10 % Verzerrung	W_o	= 4,3 W
Gitterwechselspannung bei 4,3 W	V_i	= 3,6 V_{eff}
Empfindlichkeit	$V_{i(50\ mW)}$	= 0,33 V_{eff}

GRENZDATEN

Penthodenteil:

V_{ao}	= max 550 V	W_{g2}	= max 1,5 W
V_a	= max 250 V	V_{g1} (I_{g1} = 0,3 µA)	= max −1,3 V
W_a	= max 9 W	R_{g1k}	= max 1 MΩ
I_k	= max 55 mA	R_{fk}	= max 5000 Ω
V_{g2o}	= max 550 V	V_{fk}	= max 50 V [1])
V_{g2}	= max 260 V		

Diodenteil:

Größter Spitzenwert der Signalspannung
$V_d = V_d' =$ max 200 V
Größter Diodenstrom
$I_d = I_d' =$ max 0,8 mA
(Gleichstrom durch den Ableitwiderstand).
Einsatzpunkt des Diodenstromes
V_d (I_d = 0,3 µA) = V_d' (I_d' = 0,3 µA) = max −1,3 V

[1]) Gleichspannung oder Effektivwert der Wechselspannung.

Die Kurven für die Zunahme der Gleichspannung (ΔV) am Ableitwiderstand als Funktion der unmodulierten Hochfrequenzwechselspannung und für die Niederfrequenzwechselspannung (V_{NF}) am Ableitwiderstand als Funktion der zu 30 % modulierten Hochfrequenzwechselspannung an einer der Dioden bei einem Ableitwiderstand von 0,5 Megohm sind dieselben wie für die Röhre EB 4; wir verweisen deswegen auf die Kurven der letzteren Röhre.
Die negative Gittervorspannung darf nur durch einen Kathodenwiderstand erzielt werden. Die halbautomatische Vorspannung kann eventuell angewendet werden, wenn der Kathodenstrom der Röhre mehr als 50 % des totalen Stroms durch den Widerstand zur Erzeugung des Spannungsabfalles beträgt. Die Leitungen zu den Elektroden sind möglichst kurz zu halten. Die Einschaltung eines Widerstandes von beispielsweise 1000 Ohm in die Steuergitterleitung und von 100 Ohm in die Schirmgitterleitung ist erforderlich.
Es sei noch bemerkt, daß die Schaltung einer Niederfrequenzverstärkung zwischen eine als Detektor benutzte Diode und den Penthodenteil zu Schwierigkeiten durch Brummen und Selbstschwingen Veranlassung geben kann. Deswegen darf höchstens eine 15fache Verstärkung zwischengeschaltet werden. Eine solche Verstärkung kommt beispielsweise bei der Verwendung der EBC 3 als Vorröhre mit einer schwachen N.F.-Gegenkopplung in Frage.

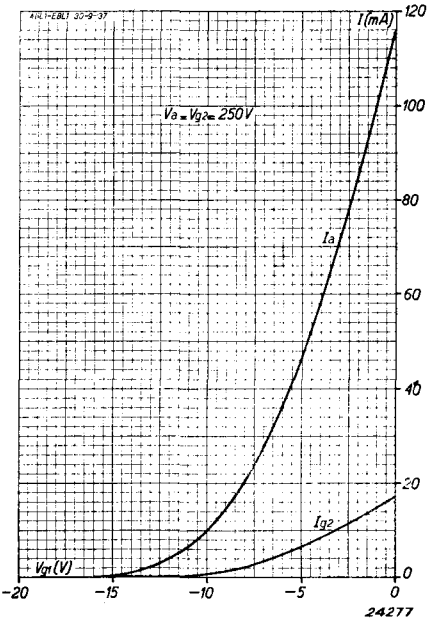


Abb. 3
Anodenstrom und Schirmgitterstrom als Funktion der negativen Gitterspannung bei $Va = Vg_2 = 250$ Volt.

Die für die Röhre EL 3 gegebenen Kurven, die die Ausgangsleistung bei Berücksichtigung des Spannungsabfalles im Ausgangstransformator geben, sind auch für die EBL 1 gültig.

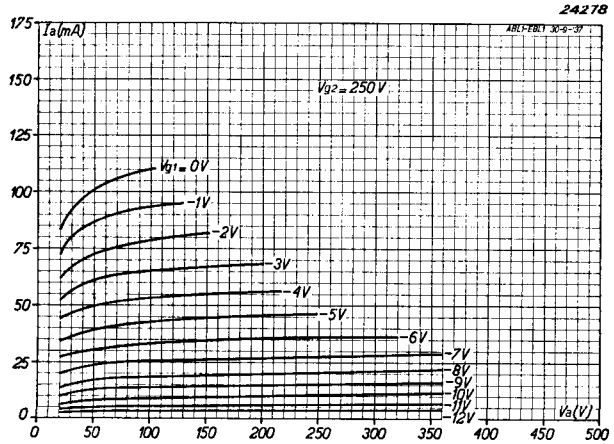


Abb. 4
Anodenstrom als Funktion der Anodenspannung bei V_{g_2} = 250 V und verschiedenen negativen Gitterspannungen.

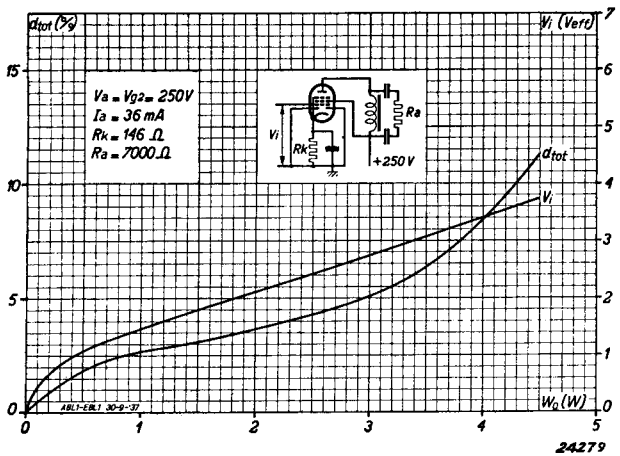


Abb. 5
Gitterwechselspannungsbedarf und Gesamtverzerrung d_{tot} als Funktion der Ausgangsleistung bei Verwendung der EBL 1 als einfacher Endverstärker.

PHILIPS

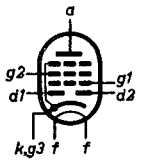
EBL 21

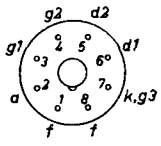
DUODIODE-OUTPUT PENTODE
DUODIODE-PENTHODE DE SORTIE
DUODIODE-ENDPENTODE

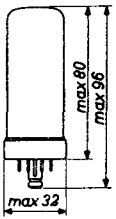
Heating: indirect by A.C. or D.C.; parallel supply
Chauffage: indirect par C.A. ou C.A.; alimentation en parallèle
Heizung: indirekt durch Wechsel- oder Gleichstrom; Parallelspeisung

V_f = 6,3 V
I_f = 0,8 A

Dimensions in mm
Dimensions en mm
Abmessungen in mm







Base, culot, Sockel: Loctal 8 p.

Operating characteristics class A
Caractéristiques d'utilisation classe A
Betriebsdaten Klasse A

V_a	=	250	250	V
V_{g2}	=	250	275	V
R_k	=	150	125	Ω
V_{g1}	=	-6	-6,2	V
I_a	=	36	44	mA
I_{g2}	=	4,5	5,8	mA
S	=	9,0	9,5	mA/V
R_i	=	50	50	kΩ
R_a	=	7	5,7	kΩ
W_o	=	4,5	5,5	W
d_{tot}	=	10	10	%
V_i (W_o = max.)	=	4,2	4,5	V_{eff}
V_i (W_o = 50 mW)	=	0,35	0,30	V_{eff}
μ_{g2g1}	=	23	23	

Operating characteristics class AB
Caractéristiques d'utilisation classe AB
Betriebsdaten Klasse AB

V_a	=		300		V
V_{g2}	=		300		V
R_k	=		130		Ω
R_{aa}	=		9		kΩ
V_i	=	0	0,3	7,0	V_{eff}
I_a	=	2x30	-	2x36	mA
I_{g2}	=	2x3,8	-	2x6,5	mA
W_o	=	0	0,05	13,2	W
d_{tot}	=	0	-	1,8	%

Limiting values
Caractéristiques limites
Grenzdaten

V_{ao}	= max.	550	V
V_a	= max.	300	V
W_a	= max.	11	W
V_{g2_o}	= max.	550	V
V_{g2}	= max.	300	V
W_{g2} (V_i = 0)	= max.	1,7	W
W_{g2} (W_o = max.)	= max.	3,5	W
I_k	= max.	60	mA
V_{g1} (I_{g1} = + 0,3 μA)	= max.	-1,3	V
R_{g1}	= max.	1	MΩ
R_{fk}	= max.	5	kΩ
V_{fk}	= max.	50	V
$V_{d\ invp}$	= max.	350	V
I_d	= max.	0,8	mA
I_{dp}	= max.	5	mA

In order to avoid excessive hum the gain between detection diode and pentode grid should not exceed 60
Pour éviter le ronflement excessif une amplification de 60 fois entre la diode détectrice et la grille de la penthode ne sera pas dépassée
Mit Rücksicht auf Brumm soll keine höhere als eine 60-fache Verstärkung zwischen der Empfangsdiode und dem Gitter der Pentode angebracht werden.

PHILIPS

Electronic Tube

HANDBOOK

EBL21

page	sheet	date
1	1	1953.04.04
2	2	1953.04.04
3	FP	1999.06.15

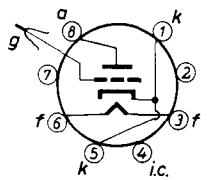
S.Q. TUBE

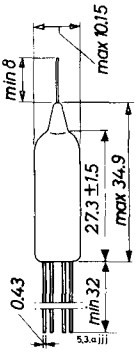
Special quality triode, designed for use as amplifier in measuring probes.

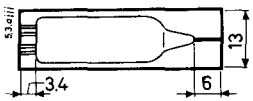
QUICK REFERENCE DATA				
Life test	1000 hours			
Envelope	Subminiature			
Low interface resistance				
Mechanical quality	Shock and vibration resistant			
Heating	Indirect A.C. or D.C.; parallel supply			
Heater voltage	V_f		6.3	V
Heater current	I_f		185	mA
Equivalent grid noise voltage	V_n	max.	1	mV
Anode current	I_a		14	mA
Mutual conductance	S		14.5	mA/V

DIMENSIONS AND CONNECTIONS Dimensions in mm

Envelope: Subminiature







Leads should not be soldered nearer than 5 mm to the seal.
Leads should not be bent nearer than 2 mm to the seal.
Method of shielding. See fig. 1.

CHARACTERISTICS

Column I Nominal value or setting of the tube
II Range values for equipment design: Initial spread
III Range values for equipment design: End of life

		I	II	III	
Heater voltage	V_f	6.3			V
Heater current	I_f	185	175- 195		mA
Anode voltage	V_a	80			V
Grid voltage	$-V_g$	2			V
Anode current	I_a	14			mA
Mutual conductance	S	14.5			mA/V
Amplification factor	μ	27.5			
Input resistance	r_g	300			Ω
Frequency = 250 MHz					
Input resonance frequency	f	400			MHz
Anode supply voltage	Vba	82			V
Cathode resistor	R_k	143			Ω
Anode current	I_a	14.0	11.2-16.8	min. 8.2	mA
Mutual conductance	S	14.5			mA/V
Anode supply voltage	Vba	90			V
Cathode resistor	R_k	680			Ω
Grid supply voltage	$+V_{bg}$	7.5			V
Anode current	I_a	14			mA
Mutual conductance	S	14.5	12.9-16.1	min. 9.2	mA/V
Negative grid current	$-I_g$		max. 0.01	max. 0.01	μA
Leakage current between cathode and heater	I_{kf}		max. 5	max. 10	μA

Voltage between cathode and heater = 55 V. Cath. positive

CHARACTERISTICS (continued)

		I	II	
Equivalent grid microphony voltage	V_g		max. 1.0	mV_{RMS}
Peak acceleration = 4 g				
Frequency = 50 Hz				
Equivalent grid hum voltage	V_g		max. 1.0	mV_{RMS}
Grid resistor = 0.5 MΩ				
Cathode resistor = 100 Ω				
Heater centre grounded				

CAPACITANCES

Grid to cathode	C_{gk}	3.5	2.9 - 4.1	pF
Anode to grid	C_{ag}	1.7	1.4 - 2.0	pF
Grid to heater	C_{gf}	33	23 - 43	mpF
Anode to cathode	C_{ak}	450	325 - 575	mpF
Anode to heater	C_{af}	270	185 - 355	mpF

SHOCK AND VIBRATION RESISTANCE

The following test conditions are applied to assess the mechanical quality of the tube. These conditions are not intended to be used as normal operating conditions.

Shock

The tube is subjected 5 times in each of 4 positions to an acceleration of 500 g supplied by an NRL shock machine with the hammer lifted over an angle of 30°.

Vibration

The tube is subjected during 32 hours in each of 3 positions to a vibration frequency of 50 Hz with an acceleration of 2.5 g.

LIFE

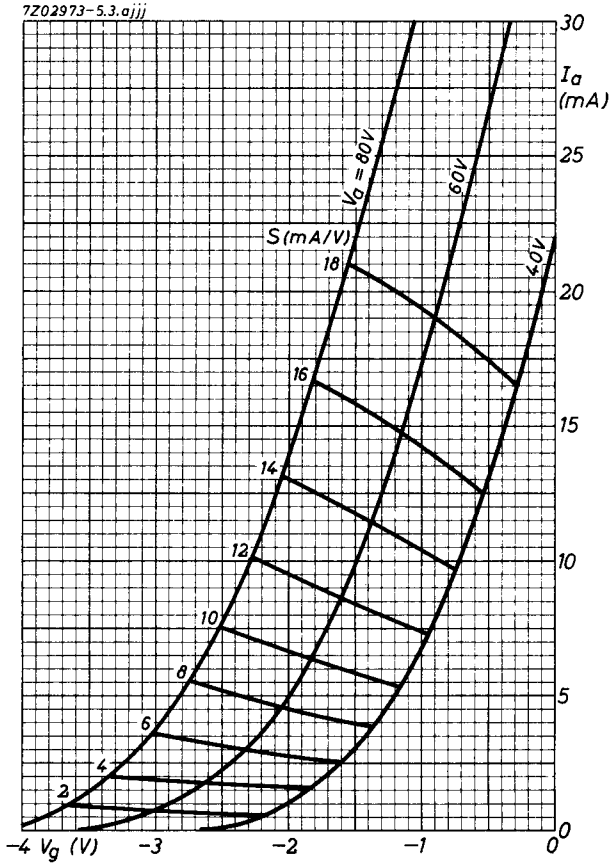
Production samples are tested to be within the end of life values during 1000 hours.

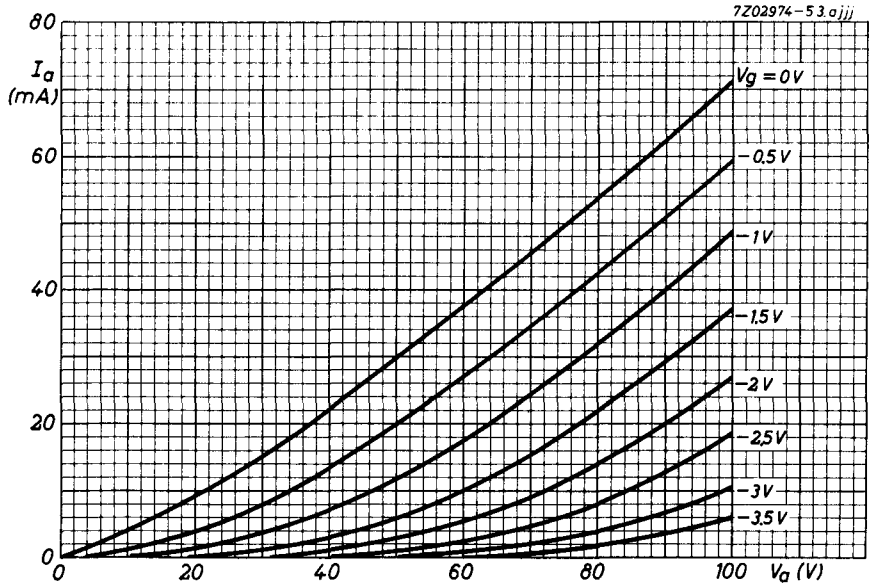
LIMITING VALUES (Absolute max. rating system)

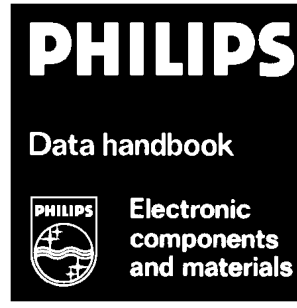
Anode voltage	V_{a_o}	max.	275	V
	V_a	max.	110	V
Anode dissipation	W_a	max.	1.5	W
Grid voltage	$-V_g$	max.	55	V
Cathode current	I_k	max.	22	mA
Voltage between cathode and heater	V_{kf}	max.	55	V
Bulb temperature	t_{bulb}	max.	170	^oC

Grid resistor: The grid resistance should be restricted to a value such that no limiting values are exceeded at $-I_g = 0.01\ \mu A$.
The D.C. feed back factor of the operating circuit may be taken into account.
The R_g value will also be limited by the required current stability and the permissible hum level.

Heater voltage: The average heater voltage should be 6.3 V.
Variations of the heater voltage exceeding the range of 6.0 V to 6.6 V will shorten the tube life.


7Z02973-5.3.ajjj
30
Ia
(mA)
25
20
15
10
5
0
Va = 80V
60V
40V
S(mA/V)
18
16
14
12
10
8
6
4
2
−4 Vg (V)
−3
−2
−1
0


7Z02974-53.ajj
80
I_a (mA)
60
40
20
0
0
20
40
60
80
100
V_a (V)
V_g = 0 V
−0.5 V
−1 V
−1.5 V
−2 V
−2.5 V
−3 V
−3.5 V



EC1000

page	sheet	date
1	1	1968.12
2	2	1968.12
3	3	1968.12
4	4	1968.12
5	5	1968.12
6	6	1968.12
7	FP	2001.04.13

DISC SEAL TRIODE for use as power amplifier in broad-band microwave grounded-grid circuits

TRIODE A DISQUES pour utilisation comme amplificatrice de puissance à large bande dans la gamme de micro-ondes dans des circuits avec la grille mise à la terre

SCHEIBENTRIODE zur Verwendung als Leistungsverstärker in Breitband-Gitterbasisschaltungen im Mikrowellenbereich

Heating : indirect by A.C. or D.C. parallel supply
Chauffage: indirect par C.A. ou C.C. alimentation parallèle
Heizung : indirekt durch Wechsel- oder Gleichstrom; Parallelspeisung

V_f = 6,3 V
I_f = 735 mA

Capacitances
Capacités
Kapazitäten

V_f = 6,3 V
I_k = 0 mA

C_{ag} = 1,4 pF
C_{ak} = 0,035 pF
C_{gk} = 3,0 pF

Characteristics
Caractéristiques
Kenndaten

	min.	nom.	max.	
V_a =	-	180	-	180 V
I_a =	-	60	-	30 mA
$-V_g$ =	0	1,25	2,5	2,8 V
S =	15	21	-	18 mA/V
μ =	33	43	52	43

---

[5]) Page 2; Seite 2

The tolerance of the eccentricity of the axis of the base flange is such, that this flange fits into a hole with a diameter of 33.5 mm, provided this hole is correctly centred with respect to the axis of the hole of fig. 2

La tolérance de l'excentricité de l'axe de la bride du culot est telle que la dernière s'adapte dans un trou d'un diamètre de 33,5 mm, à condition que ce trou soit correctement centré par rapport à l'axe du trou de la fig. 2

Die Exzentrizitätstoleranz der Achse des Sockelflansches ist derartig, dass der Flansch sicher passt in eine Bohrung von 33,5 mm Durchmesser, wenn diese Bohrung mit der Achse der Bohrung von Abb. 2 genau zentriert ist

Dimensions in mm
Dimensions en mm
Abmessungen in mm

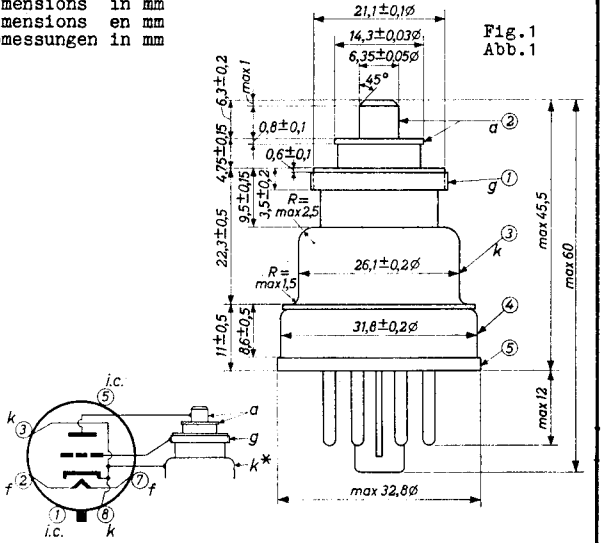


Fig.1
Abb.1

Base, culot, Sockel:
OCTAL

Mounting position: Any
Montage: à volonté
Einbau: beliebig

Fig.2 Recommended mount
Abb.2 Montage recommandé
Empfohlene Halterung

*) Cathode R.F. and D.C. connection. Pins 3 and 8 are connected internally to this terminal
Connexion de la cathode pour tension H.F. et continue. Les broches 3 et 8 sont reliées intérieurement à cette connexion H.F.
HF- und Gleichspannungskatodenanschluss. Stifte 3 und 8 sind im Innern der Röhre mit diesem HF-Anschluss verbunden

[1])...[4]) See page 3; voir page 3; siehe Seite 3

[5]) See page 1; voir page 1; siehe Seite 1

Data of thread of the grid disc and of recommended mount
Données du filet de la disque de grille et du montage recommandé
Daten des Gewindes der Gitterscheibe und der empfohlenen Halterung

32 turns per inch; 32 spires par pouce; 32 Windungen pro Zoll
Thread angle 60°; angle du filet 60°; Flankenwinkel 60°

	Minor diameter Diamètre intérieur Kerndurchmesser	Major diameter Diamètre exterieur Aussendurchmesser	Effektive diameter Diamètre réel Flankendurchmesser
g :	21,22 $^{+0}_{-0,15}$ mm	22,2 $^{+0}_{-0,15}$ mm	21,68 $^{+0}_{-0,09}$ mm
fig.2 Abb.2	21,51 $^{+0}_{-0,15}$ mm	min. 22,23 mm	21,83 $^{+0}_{-0,12}$ mm

[1] The eccentricities are given with respect to the axis of the threaded hole (see fig.2) in which the tube is screwed firmly against the flange, the inner diameter of which is 18 mm
Les excentricités sont données par rapport à l'axe du trou taraudé (voir fig.2) dans lequel le tube est bloqué contre la bride d'un diamètre intérieur de 18 mm
Die angegebenen Toleranzen beziehen sich auf die Achse der Flanschbohrung wenn die Röhre fest gegen den Flansch mit 18 mm Durchmesser geschraubt ist (Abb.2)

[2] Eccentricity of the axis of the anode max. 0.15 mm
Excentricité de l'axe de l'anode 0,15 mm au maximum
Exzentrizität der Achse der Anode max. 0,15 mm

[3] Eccentricity of the axis of the cathode max. 0,20 mm
Excentricité de l'axe de la cathode 0,20 mm au maximum
Exzentrizität der Achse der Katode max. 0,20 mm

[4] The tolerance of the eccentricity of the axis of the base is such, that this base fits into a hole with a diameter of 32,5 mm, provided this hole is correctly centred with respect to the axis of the hole of fig.2

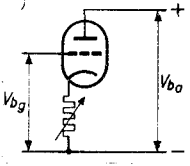
La tolérance de l'excentricité de l'axe du culot est telle que ce dernier s'adapte dans un trou d'un diamètre de 32,5 mm, à condition que ce trou soit correctement centré par rapport à l'axe du trou de la fig.2

Der Exzentrizitätstoleranz der Achse der Sockel ist derartig, dass der Sockel sicher passt in eine Bohrung von 32,5 mm Durchmesser, wenn diese Bohrung mit dem Flansch von Abb.2 genau zentriert ist

Operating characteristics as amplifier, f = 4000 Mc/s
Caractéristiques d'utilisation comme amplificatrice, f = 4000 MHz
Betriebsdaten als Verstärker, f = 4000 MHz

V_{ba}	= 200	200	V
V_{bg}	= +20	+20	V
R_k [1])	= -	-	
I_a	= 60	30	mA
B [2])	= 50	50	Mc/s
W_o (G = 8 dB)	= 1,8(min. 1,5)	-	W
W_o (G = 6 dB)	= -	0,5(min. 0,35)	W
G (W_i = 1 mW)	= 13(min. 10)	13(min. 10)	dB

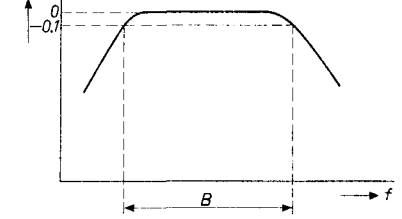
[1])



Recommended D.C. circuit
Circuit C.C. recommandé
Empfohlene Gleichstromschaltung

A variable resistor of max. 500 Ω (at Ia = 60 mA) or max. 1000 Ω (at Ia = 30 mA) is to be employed. It should be adjusted for the desired anode current
Il faut employer une résistance variable de 500 Ω au max. (à Ia = 60 mA) ou de 1000 Ω au max. (à Ia = 30 mA). Elle doit être réglée pour le courant anodique voulu
Es soll ein veränderlicher Widerstand von max. 500 Ω (bei Ia = 60 mA) oder max. 1000 Ω (bei Ia = 30 mA) vorgesehen werden, mit dem der gewünschte Anodenstrom eingestellt wird

[2])



The quoted value is the bandwidth between the 0,1 dB points of the flattened response curve
La valeur donnée est la largeur de bande entre les points de 0,1 dB de la courbe de réponse aplatie
Der gegebene Wert ist die Bandbreite zwischen den 0,1 dB Punkten der abgeplatteten Wiedergabekennlinie

Limiting values (Absolute limits)
Caractéristiques limites (Limites absolues)
Grenzdaten (Absolute Grenzwerte)

V_{ao} = max. 500 V	W_g	= max.	200 mW
V_a = max. 300 V	W_{ig}(f = 4000 Mc/s)	= max.	1 W [1]
→ W_a = max. 12,5 W	I_k	= max.	70 mA
$-V_g$ = max. 50 V	V_{kf}	= max.	50 V
$+V_g$ = max. 0 V	V_f	= max.	6,3 V ± 2%
I_g = max. 10 mA			

Seal temperatures
Températures des scellements
Temperaturen der Einschmelzungen

Anode	: max.	150 °C [2]
Grid, grille, Gitter	: max.	75 °C [2]
Cathode, Katode	: max.	75 °C [2]

Max. circuit values
Valeurs max. des éléments de montage
Max. Werte der Schaltungsteile

R_{kf}	= max.	20 kΩ
R_g	= max.	3 kΩ [3]

Remark: Special attention should be paid to the mounting of the tube in those cases where it is used in transportable equipment. Shocks, especially in a direction perpendicular to the axis of the tube should be avoided
Observation: L'on accordera une attention spéciale au montage du tube dans le cas d'utilisation dans un équipement transportable. Des chocs, surtout dans une direction perpendiculaire à l'axe du tube doivent être évités
Bemerkung: Besondere Aufmerksamkeit muss dem Einbau der Röhre geschenkt werden wenn die Röhre in transportabelen Geräten verwendet wird. Stösse, besonders in einer Richtung senkrecht zur Achse der Röhre sollen vermieden werden

[1]) In grounded grid circuit
En montage grille mise à la terre
In Gitterbasisschaltungen

[2]) A low velocity air flow may be necessary
Un léger courant d'air peut être nécessaire
Kühlung durch einen schwachen Luftstrom kann erforderlich sein

→ [3]) This value can be multiplied by the D.C. inverse feedback factor for the cathode current to a maximum of 25 kΩ
Cette valeur peut être multipliée par le facteur de contre-réaction du courant cathodique direct jusqu'à une valeur de 25 kΩ au max.
Dieser Wert kann mit dem Gegenkopplungsfaktor des Katodengleichstroms bis zu einem maximalen Wert von 25 kΩ multipliziert werden.

Limiting values (Absolute limits)
Caractéristiques limites (Limites absolues)
Grenzdaten (Absolute Grenzwerte)

V_{a_o}	= max. 500 V	I_g	= max. 10 mA
V_a	= max. 300 V	W_g	= max. 200 mW
W_a	= max. 12,5 W	W_{ig} (f = 4000 Mc/s)	= max. 1 W [1]
$-V_g$	= max. 50 V	I_k	= max. 70 mA
$-V_{g_p}$	= max. 100 V	V_{kf}	= max. 50 V
$+V_g$	= max. 5 V	V_f	= 6,3 V ± 2 %
$+V_{g_p}$	= max. 20 V		

Seal temperatures
Températures des scellements
Temperaturen der Einschmelzungen

Anode : max. 150 °C [2]
Grid, grille, Gitter: max. 75 °C [2]
Cathode, Katode : max. 75 °C [2]

Mounting torque
Moment de torsion à l'assemblage min. 10 kg cm
Drehmoment beim Einbau max. 15 kg cm

Max. circuit values
Valeurs max. des éléments de montage
Max. Werte der Schaltungsteile

R_{kf} = max. 20 kΩ
R_g = max. 3 kΩ [3]

[1]) In grounded grid circuit
En montage grille mise à la terre
In Gitterbasisschaltungen

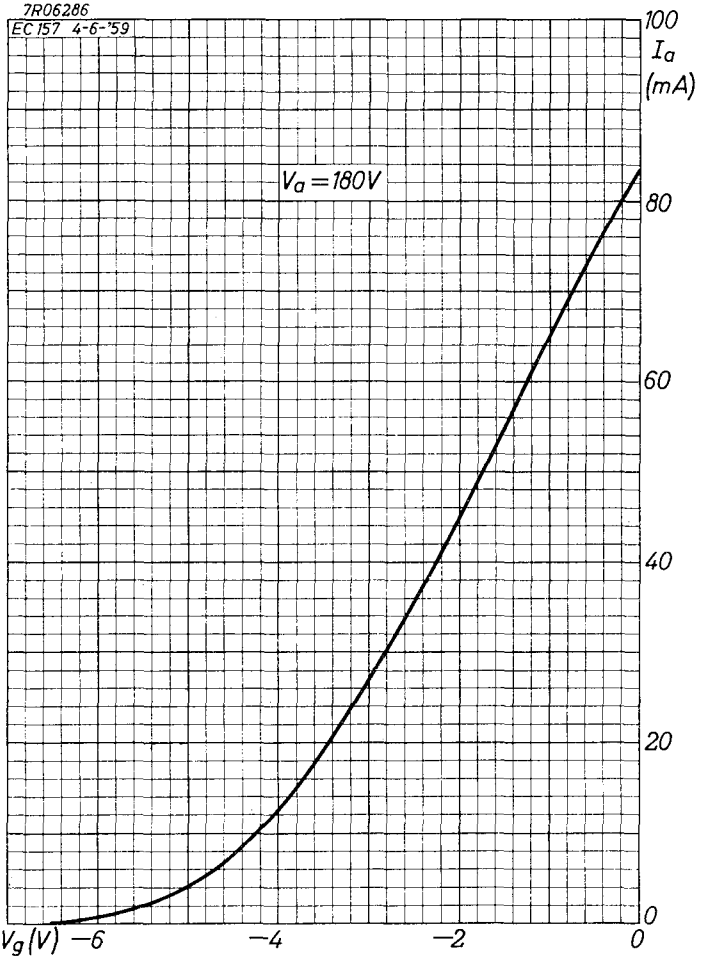
[2]) A low velocity air flow may be necessary
Un léger courant d'air peut être nécessaire
Kühlung durch einen schwachen Luftstrom kann erforderlich sein

[3]) This value may be multiplied by the D.C. inverse feedback factor for the cathode current to a maximum of 25 kΩ
Cette valeur peut être multipliée par le facteur de contre-réaction du courant cathodique continu jusqu'à une valeur de 25 kΩ au max.
Dieser Wert darf mit dem Gegenkopplungsfaktor des Katodengleichstroms bis zu einem maximalen Wert von 25 kΩ multipliziert werden

Remark: Special attention should be paid to the mounting of the tube in those cases where it is used in transportable equipment. Shocks, especially in a direction perpendicular to the axis of the tube should be avoided

Observation: L'on accordera une attention spéciale au montage du tube dans le cas d'utilisation dans un équipement transportable. Des chocs, surtout dans une direction perpendiculaire à l'axe du tube doivent être évités

Bemerkung: Besondere Aufmerksamkeit muss dem Einbau der Röhre geschenkt werden wenn die Röhre in transportabelen Geräten verwendet wird. Stösse, besonders in einer Richtung senkrecht zur Achse der Röhre sollen vermieden werden



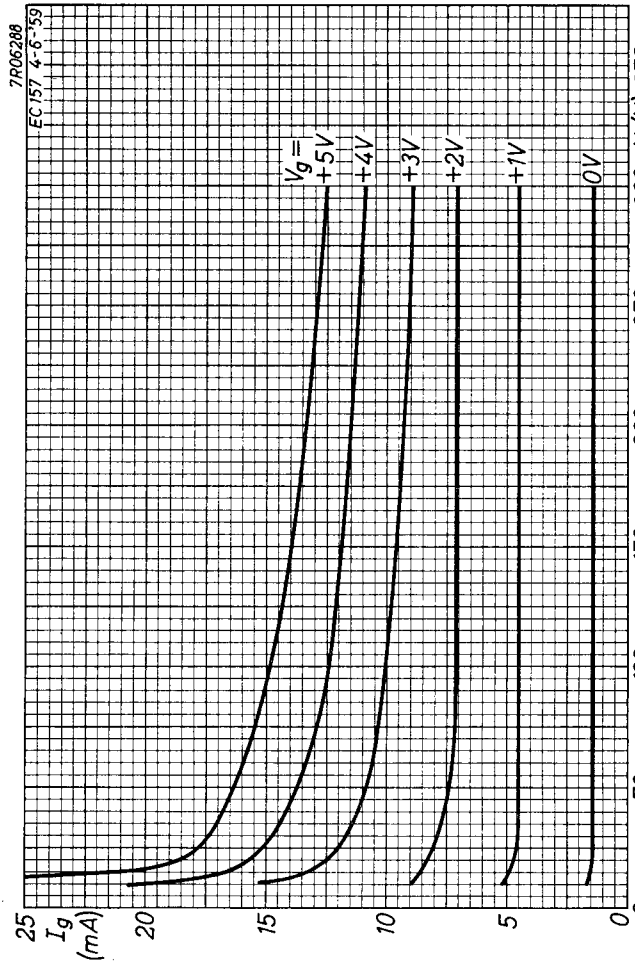
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EC157 PHILIPS

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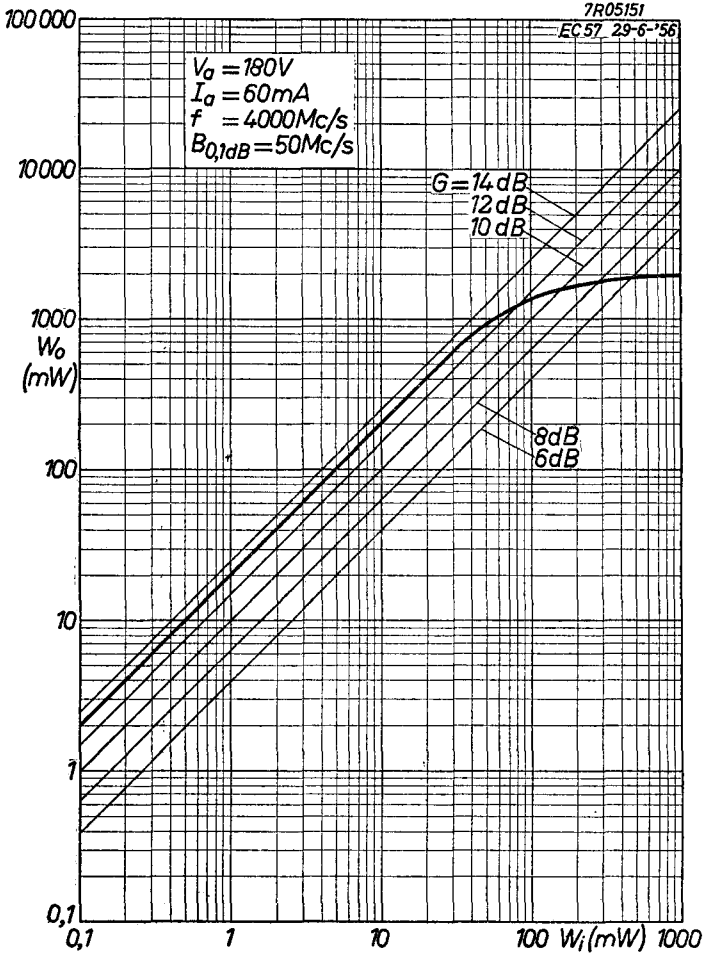
EC157



6.6.1959

C

PHILIPS


7R05151
EC57 29-6-'56
$V_a = 180V$
$I_a = 60mA$
$f = 4000Mc/s$
$B_{0,1dB} = 50Mc/s$
G = 14 dB
12 dB
10 dB
8dB
6dB
100 000
10000
1000
W_o (mW)
100
10
1
0,1
0,1
1
10
100 W_i (mW) 1000

D

PHILIPS

Electronic Tube

HANDBOOK

EC157

page	sheet	date
1	1	1960.06.06
2	2	1960.06.06
3	3	1959.06.06
4	4	1959.06.06
5	5	1960.06.06
6	5	1962.06.06
7	6	1962.06.06
8	A	1959.06.06
9	B	1959.06.06
10	C	1959.06.06
11	D	1959.06.06
12	FP	2005.05.06

DISC SEAL TRIODE with low operating voltages for use as broad-band amplifier or oscillator at frequencies up to 4000 Mc/s; the tube is capable of delivering an output power of 5.3 W at 4200 Mc/s with a power gain of 6 dB at a 0.1 dB band width of 50 Mc/s. The L cathode of the tube can withstand severe ionic and electronic bombardment and combines a high current density with a very long life.

HEATING

Indirect by A.C. or D.C.; parallel supply

Heater voltage	V_f = 6.3 V
Heater current	I_f = 900 mA

With due observance of the limiting values all supply voltages may be switched on at the same time and no pre-heating will be necessary.

CAPACITANCES

Measured at V_f = 6.3 V and I_k = 0 mA

Anode to grid	C_{ag} =	1.7 pF [1]
Anode to cathode	C_{ak} =	0.036 pF
Grid to cathode	C_{gk} =	3.5 pF [2]

TYPICAL CHARACTERISTICS

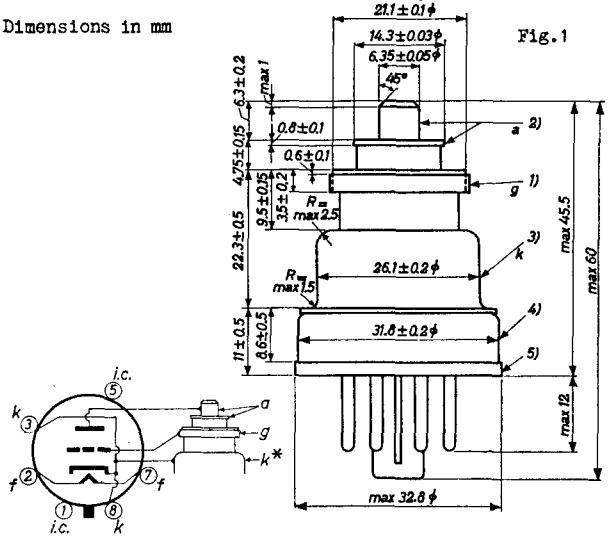
Anode voltage	V_a	=	180 V	
Anode current	I_a	=	140 mA	
Grid bias	V_g	=	0 V	> -2 V < +1.5 V
Anode voltage	V_a	=	180 V	
Anode current	I_a	=	60 mA	
Grid bias	V_g	=	-3.5 V	> -5.5 V < -1.5 V
Mutual conductance	S	=	22 mA/V	> 17 mA/V < 27 mA/V
Amplification factor	μ	=	30	> 20 < 40

[1]) Measured with a shield of 1 mm thick with a hole of 15 mm diameter

[2]) Measured with a shield of 1 mm thick with a hole of 23 mm diameter

Dimensions in mm

Fig.1



Base: Octal

*A.C. and D.C. connection of the cathode. Pins 3 and 8 are connected internally to this terminal

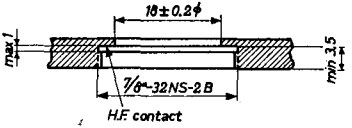


Fig.2
Recommended mount

Mounting position: any

Data of the thread of the grid disc and of the recommended mount. 32 turns per inch; thread angle 60 °

	Minor diameter	Major diameter	Effective diameter
grid disc	21.22 $^{+0}_{-0.15}$ mm	22.2 $^{+0}_{-0.15}$ mm	21.68 $^{+0}_{-0.09}$ mm
mount fig.2	21.51 $^{+0}_{-0.15}$ mm	min. 22.23 mm	21.83 $^{+0}_{-0.12}$ mm

1)2)3)4)5) See page 3

REMARKS

Special attention should be paid to the mounting of the tube in those cases where it is used in transportable equipment. Shocks especially in a direction perpendicular to the axis of the tube should be avoided

For screwing the tube into the cavity a key with a slip torque of max. 15 kg cm is recommended. This should be a key with studs which fit into the notches in the tube base. It is inadvisable to use a device which utilises the pins of the tube

[1]) The eccentricities are given with respect to the axis of the threaded hole (see fig.2) in which the tube is screwed firmly against the flange with inner diameter of 18 mm

[2]) Eccentricity of the axis of the anode max. 0.15 mm

[3]) Eccentricity of the axis of the cathode max. 0,20 mm

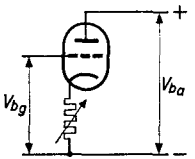
[4]) The tolerance of the eccentricity of the axis of the base is such, that this base fits into a hole with a diameter of 32.5 mm, provided this hole is correctly centred with respect to the axis of the threaded hole specified in fig.2

[5]) The tolerance of the eccentricity of the axis of the base flange is such, that this flange fits into a hole with a diameter of 33.5 mm, provided this hole is correctly centred with respect to the axis of the threaded hole specified in fig.2

OPERATING CHARACTERISTICS as an amplifier at a frequency of 4200 Mc/s

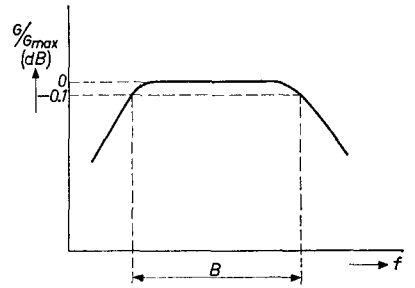
Anode supply voltage	V_{b_a}	=	200 V	
Grid supply voltage	V_{b_g}	=	+20 V	
Cathode resistor	R_k	=	[1])	
Anode current	I_a	=	140 mA	
Band width	B	=	50 Mc/s [2])	
Output power at a gain of 6 dB	W_o(G=6 dB)	=	5.3 W	> 4.5 W
Gain (driving power 10 mW)	G(W_{1_g}=10 mW)	=	11.5 dB	> 9.5 dB

[1]) Recommended D.C. circuit



A variable resistor of max. 200 Ω is to be employed. It should be adjusted for the desired anode current

[2]) The quoted value is the band width between the 0.1 dB points of the flattened response curve

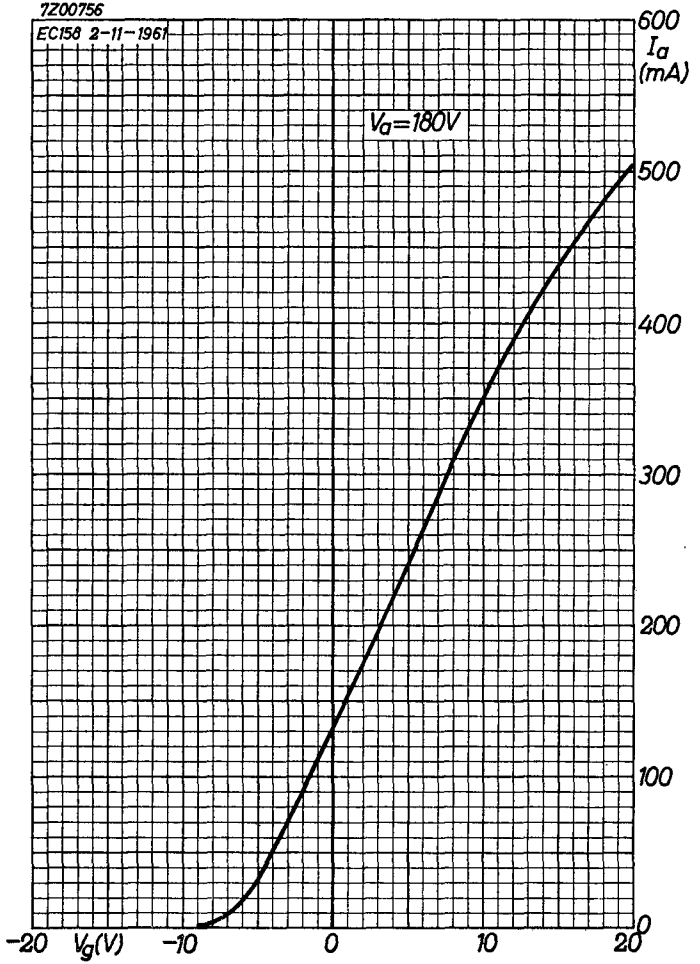


LIMITING VALUES (Absolute max. values)			
Anode voltage in cold condition	V_{ao}	= max.	500 V
Anode voltage	V_a	= max.	300 V
Anode dissipation	W_a	= max.	30 W [1]
Negative grid voltage	$-V_g$	= max.	50 V
Peak negative grid voltage	$-V_{gp}$	= max.	100 V
Positive grid voltage	$+V_g$	= max.	10 V
Peak positive grid voltage	$+V_{gp}$	= max.	30 V
Grid current	I_g	= max.	25 mA
Grid dissipation	W_g	= max.	350 mW
Driving power	W_{ig}	= max.	2.0 W [2]
Cathode current	I_k	= max.	170 mA
Voltage between cathode and heater	V_{kf}	= max.	50 V
Heater voltage	V_f	=	6.3 V ± 2%
Anode seal temperature		= max.	150 °C [1]
Grid seal temperature		= max.	75 °C [1]
Cathode seal temperature		= max.	75 °C [1]
Max. circuit values			
External resistance between heater and cathode	R_{kf}	= max.	20 kΩ
Grid resistor	R_g	= max.	3 kΩ [3]

[1]) Special attention must be paid with respect to the cooling

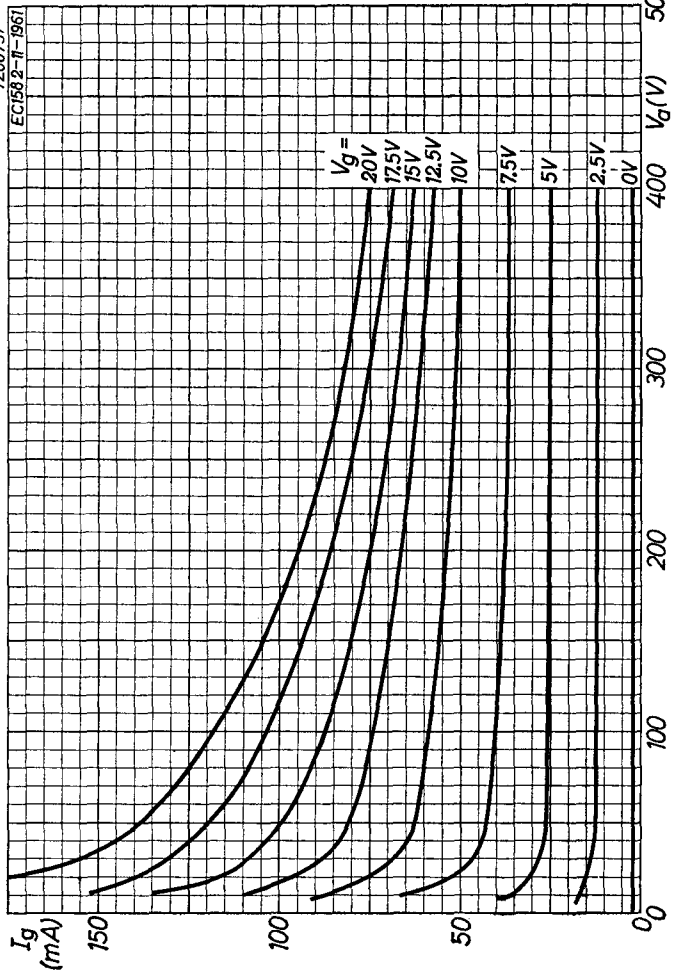
[2]) In a grounded grid circuit at a frequency of 4200 Mc/s

[3]) This value may be multiplied by the D.C. inverse feedback factor of the cathode current to a maximum of 25 kΩ


7Z00756
EC158 2-11-1961
V_a=180V
600
I_a
(mA)
500
400
300
200
100
0
−20
V_g(V)
−10
0
10
20

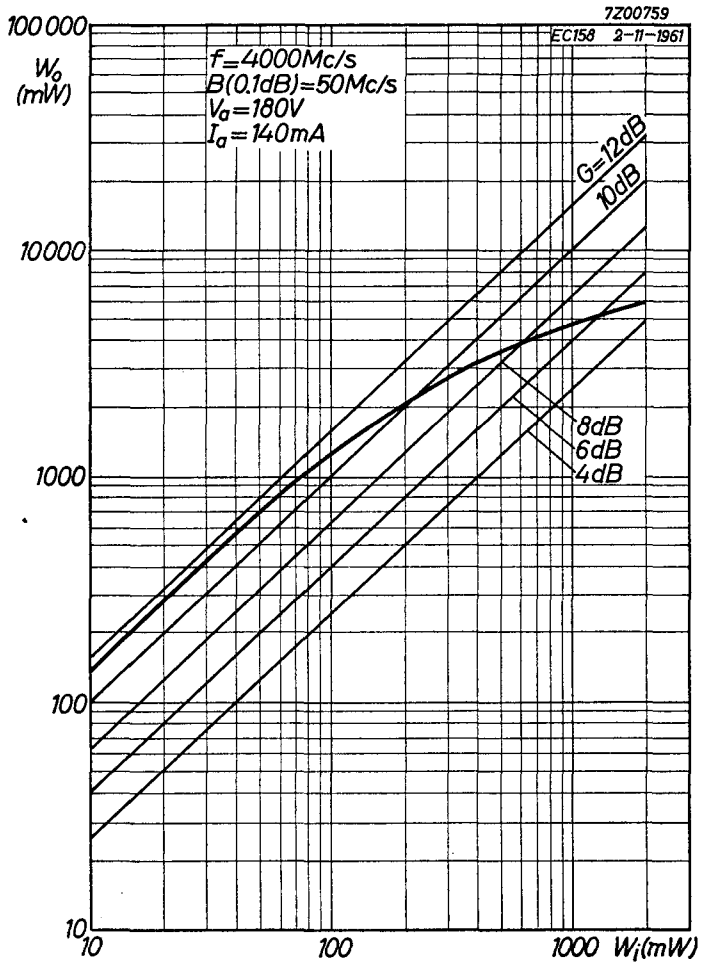
EC158

PHILIPS


7Z00757
EC158 2-11-1961
I_g (mA)
150
100
50
0
0
100
200
300
400
500
V_G(V)
V_g =
20V
17.5V
15V
12.5V
10V
7.5V
5V
2.5V
0V

EC158

PHILIPS



D

PHILIPS

Electronic Tube

HANDBOOK

EC158

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3	3	1962.06.06
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8	C	1962.06.06
9	D	1962.06.06
10	FP	1999.06.15

PHILIPS „MINIWATT"

EC 2

TRIODE

EC 2

Für weitere Daten und Kennlinien siehe Type AC 2.
Pour autres caractéristiques et données voir type AC2.
For other data and characteristic curves see type AC2.

Heizung ind. / Chauffage ind. / Heating ind.	Vf If	= 6,3 V = 0,4 A
Kapazitäten	Cag	= 1,7 $\mu\mu$F
Capacités	Cak	= 4,5 $\mu\mu$F
Capacities	Cgk	= 4,9 $\mu\mu$F

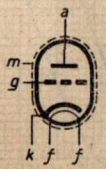
Betriebsdaten
Données relatives au fonctionnement
Operating conditions

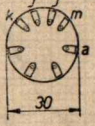
Va	= 250 V
Ia	= 6 mA
Vg	= -5,5 V
g	= 30
S max	= 3,5 mA/V
S (Ia = 6 mA)	= 2,5 mA/V
Ri (Ia = 6 mA)	= 12000 Ω

Grenzdaten
Données-limites
Limits

Vao max	= 550 V
VaR max	= 250 V
VaL max	= 200 V
Wa max	= 2 W
Ik max	= 10 mA
Vg (Ig = 0,3 μA) max	= -1,3 V
Rg1a max	= 1,5 MΩ
Rg1f max	= 1 MΩ
Vfk max	= 50 V
	= 20000 Ω*)

Elektrodenanordnung und Sockelschaltung.
Disposition des électrodes et connexion du culot.
Arrangement of electrodes and base connection.



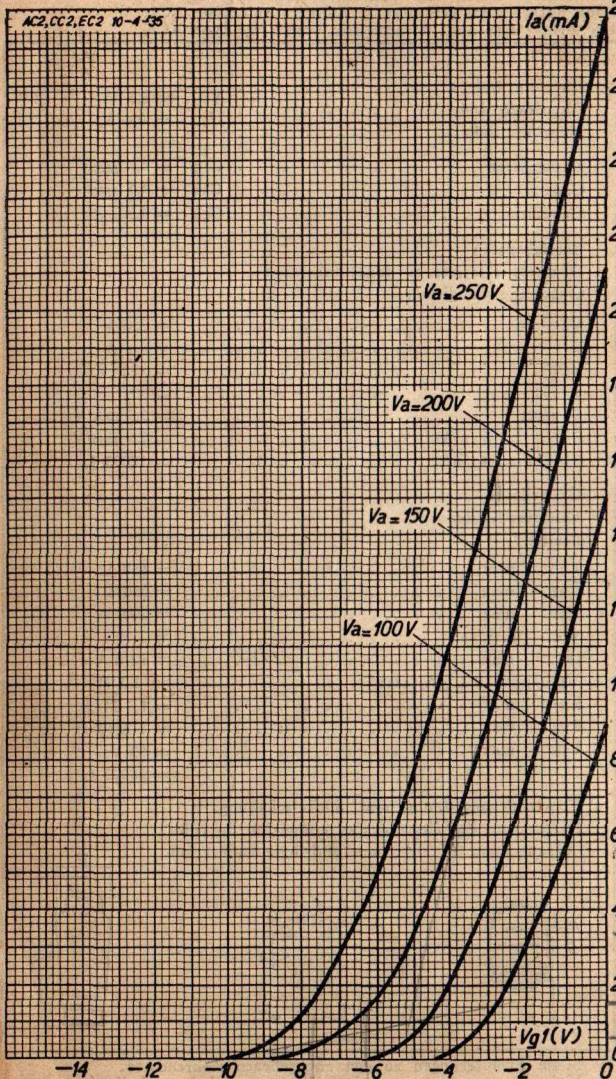




*) Siehe Erläuterungen zu den angegebenen Röhrendaten.
Voir les remarques concernant les caractéristiques indiquées.
See explanation of published data and characteristics.

EC 2

PHILIPS „MINIWATT"
EC 2
TRIODE



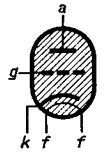
PHILIPS EC 50

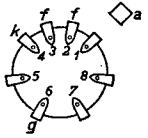
Helium-filled TRIODE
TRIODE à remplissage de hélium
TRIODE mit Heliumfüllung

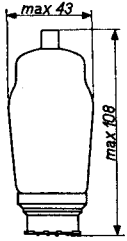
Heating : indirect
Chauffage: indirect
Heizung : indirekt

V_f = 6,3 V
I_f = 1,3 A

Dimensions in mm
Dimensions en mm
Abmessungen in mm







Base, culot, Sockel: P

Capacitances
Capacités
Kapazitäten

C_g = 6,7 pF
C_a = 4,2 pF
C_{ag} = 2,3 pF
C_{gf} = 1,5 pF

Typical characteristics
Caractéristiques types
Kenndaten

V_{arc} = 33 V
V_a/V_g = 35 [1]

Limiting values
Caractéristiques limites
Grenzdaten

V_{a_p}	= max.	1000 V
V_{ag_p}	= max.	1500 V
I_{a_p}	= max.	750 mA
I_a	= max.	10 mA
R_g/V_{g_p}	= min.	750 Ω/V
R_g	= max.	0,75 MΩ
V_{kf}	= max.	100 V
Freq.	= max.	150 kc/s

[1]) At striking point; à l'allumage; bei Zündung

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A

PHILIPS

Electronic Tube

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EF50

page	sheet	date
1	1	1953.11.11
2	2	1953.11.11
3	FP	1999.06.20

PHILIPS

EC 55

U.H.F. DISC-SEAL TRIODE (up to 3000 Mc/s)
TRIODE U.H.F. A DISQUES (jusqu'à 3000 Mc/s)
UHF-SCHEIBENTRIODE (bis 3000 MHz)

Heating : indirect by A.C. or D.C. parallel supply		
Chauffage: indirect par C.A. ou C.C. alimentation parallèle	V_f = 6,3 V ± 5%	
Heizung : indirekt durch Wechsel- oder Gleichstrom Parallelspeisung	I_f = 0,4 A	

Capacitances Capacités Kapazitäten	C_a	=	0,03 pF
	C_g	=	1,8 pF
	C_{ag}	<	1,3 pF

Typical characteristics
Caractéristiques types
Kenndaten

V_a	=	250 V
V_g	=	-3,5 V
I_a	=	20 mA
S	=	6 mA/V
μ	=	30

Limiting values (Absolute max. values)
Caractéristiques limites (Valeurs max. absolues)
Grenzdaten (Absolute Grenzwerte)

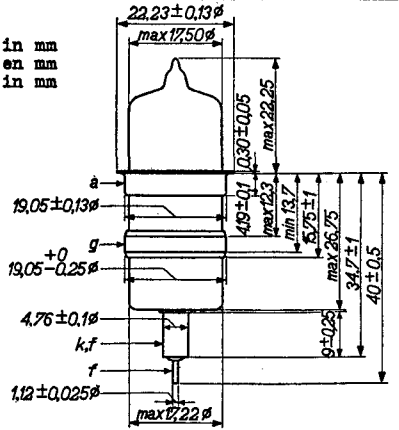
V_a	= max. 350 V
W_a	= max. 10 W
W_g	= max. 0,1 W
I_k	= max. 40 mA
$-V_g$	= max. 50 V

Anode seal temperature
Température du scellement de l'anode = max. 140 °C
Temperatur der Anodeneinschmelzung

For the dimensions see page 2
Pour les dimensions voir page 2
Für die Abmessungen siehe Seite 2

EC 55 PHILIPS

Dimensions in mm
Dimensions en mm
Abmessungen in mm

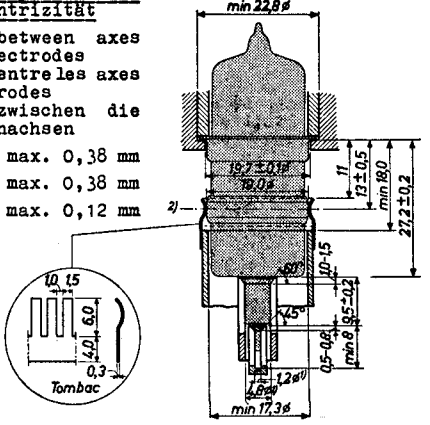




Eccentricity; Excentricité; Exzentrizität

Distance between axes of the electrodes
Distance entre les axes des électrodes
Abstand zwischen die Elektrodenachsen

g-a	max. 0,38 mm
k-a	max. 0,38 mm
f-k	max. 0,12 mm

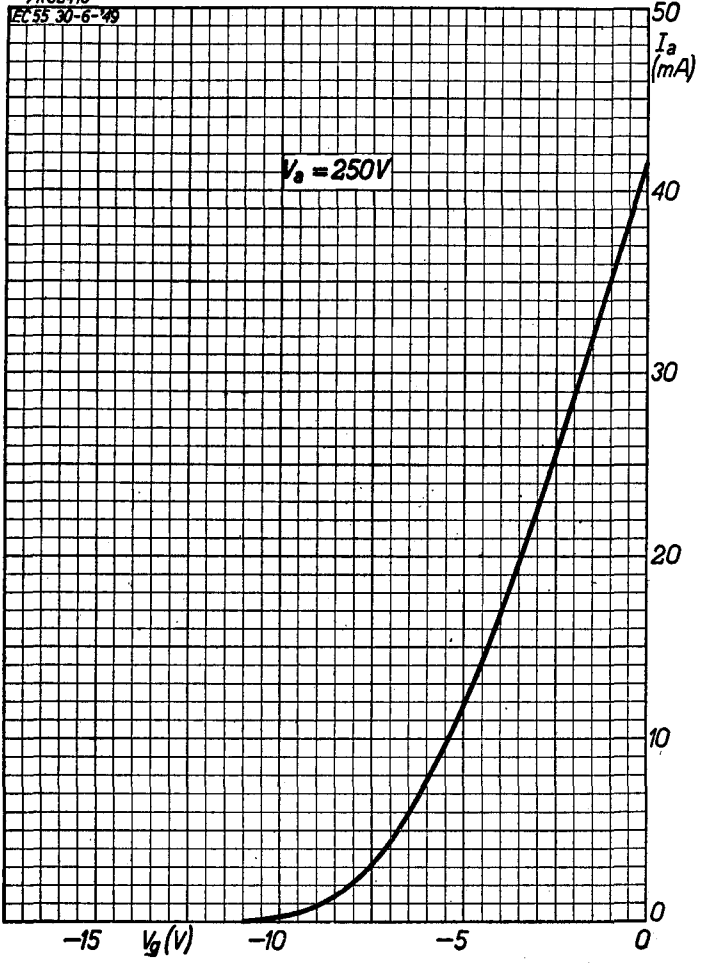


1) In order to make good contact these sockets should be split
Afin de faire bon contact ces douilles seront fendues
Zur guten Kontaktgebung sind diese Buchsen zu spleissen

2) Line of contact; ligne de contact; Kontaktlinie

PHILIPS

EC 55



8.8.1949

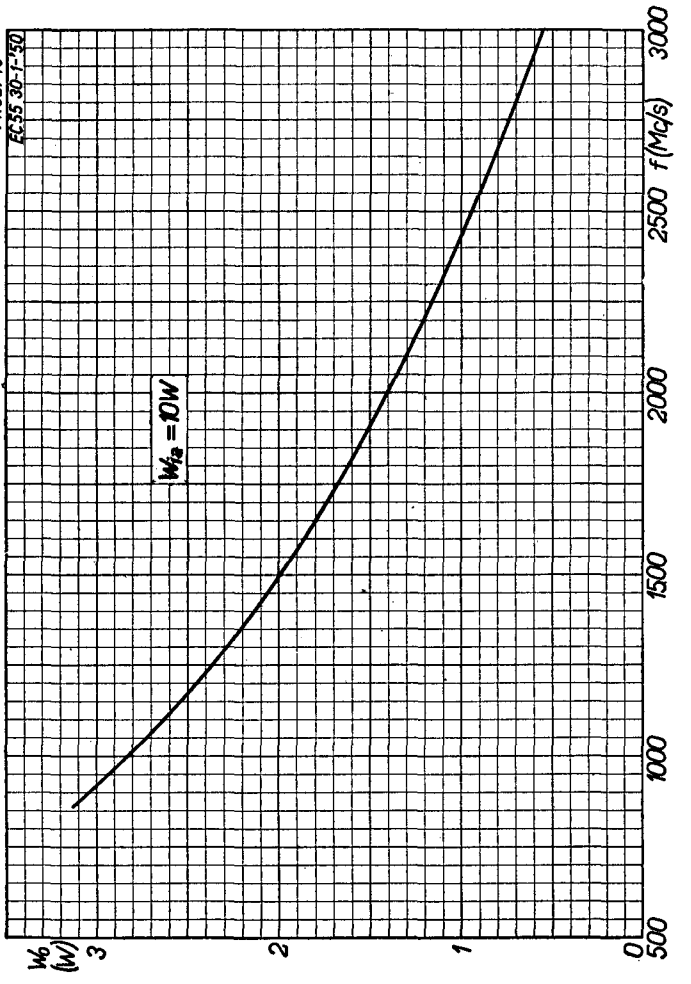
A

EC 55 PHILIPS

B

PHILIPS

EC55



5.5.1950

C

PHILIPS

Electronic Tube

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1	1	1954.05.05
2	2	1954.05.05
3	A	1949.08.08
4	B	1949.08.08
5	C	1950.05.05
6	FP	1999.06.20

DISC-SEAL TRIODE for use as general purpose low level amplifier, especially designed for use as broad-band microwave amplifier in grounded grid circuits

TRIODE A DISQUES pour utilisation comme amplificatrice à faible niveau pour emplois généraux, specialement conçue pour utilisation en amplificatrice à large bande dans la gamme à ondes courtes dans circuits avec la grille à la masse

SCHEIBENTRIODE zur Verwendung als Allzweck-Niederleistungsverstärker, speziell entworfen als Breitbandverstärker im Mikrowellenbereich in Gitterbasisschaltungen

Heating : indirect by A.C. or D.C.; parallel supply
Chauffage: indirect par C.A. ou C.C.; alimentation parallèle
Heizung : indirekt durch Wechsel- oder Gleichstrom; Parallelspeisung

$\frac{V_f = 6{,}3\ V\ ^{1})}{I_f = 650\ mA}$

Capacitances (Vf = 6,3 V ; Ik = 0 mA)
Capacités
Kapazitäten

$C_{ag} = 1{,}6\ pF$
$C_{ak} = 0{,}04\ pF$
$C_{gk} = 3{,}3\ pF$

Typical characteristics
Caractéristiques types
Kenndaten

		min.	nom.	max.	
V_a	=	–	180	– V	
V_g [4])	=	-1,8	-2,8	-4,0 V	←
I_a	=	–	30	– mA	
S	=	13,5	17	– mA/V	←
μ	=	33	43	52	

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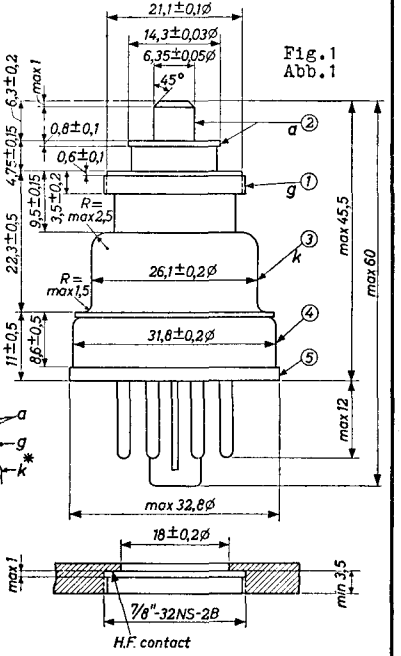
[1]) Max. allowed variation ± 2 % (absolute limits)
Variation admissible max. ± 2 % (limites absolues)
Max. zulässige Schwankung ± 2 % (absolute Grenzen)

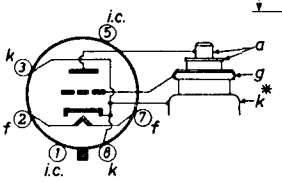
[4]) (See also page 4). The end point of life is reached when one or more of these characteristics have changed to the following values: ←
(Voir aussi page 4). Le tube est arrivé à la fin de sa durée si une ou quelques-unes de ces caractéristiques sont changées jusqu'aux valeurs suivantes:
(Siehe auch Seite 4). Das Ende der Lebensdauer ist erreicht, wenn eine oder mehrere dieser Kennwerte bis folgende Werte geändert sind:

$-V_g (I_a = 30\ mA) \leq 0{,}5\ V$
$G\ (W_o = 1\ mW) \leq 8\ dB$
$W_o \left\{ \begin{matrix} G = 4\ dB \\ V_f = 6{,}3\ V \end{matrix} \right\} \leq 0{,}25\ W$

Dimensions in mm
Dimensions en mm
Abmessungen in mm

Fig.1
Abb.1





Base, culot, Sockel:
OCTAL

Fig.2
Abb.2

Recommended mount
Montage recommandé
Empfohlene Halterung

Pins 3 and 8 are connected internally to the cathode R.F. connection
Les broches 3 et 8 ont été reliées à l'intérieur à la connexion de cathode H.F.
Stifte 3 und 8 sind im Innern der Röhre mit dem HF-Katodenanschluss verbunden

¥)Cathode R.F. connection
Connexion de cathode H.F.
HF-Katodenanschluss

1)2)3)4)See page 3; voir page 3; siehe Seite 3

5)See page 4; voir page 4; siehe Seite 4

Data of thread of the grid disc and of recommended mount
Données du filet de la disque de grille et du montage recommandé
Daten des Gewindes der Gitterscheibe und der empfohlenen Halterung

32 turns per inch; 32 spires par pouce; 32 Windungen pro Zoll
Thread angle 60°; angle du filet 60°; Flankenwinkel 60°

	Minor diameter Diamètre intérieur Kerndurchmesser	Major diameter Diamètre exterieur Aussendurchmesser	Effektive diameter Diamètre réel Flankendurchmesser
g :	21,22 $^{+0}_{-0,15}$ mm	22,2 $^{+0}_{-0,15}$ mm	21,68 $^{+0}_{-0,09}$ mm
fig.2 Abb.2	21,51 $^{+0}_{-0,15}$ mm	min. 22,23 mm	21,83 $^{+0}_{-0,12}$ mm

[1] The eccentricities are given with respect to the axis of the threaded hole (see fig.2) in which the tube is screwed firmly against the flange, the inner diameter of which is 18 mm
Les excentricités sont données par rapport à l'axe du trou taraudé (voir fig.2) dans lequel le tube est bloqué contre la bride d'un diamètre intérieur de 18 mm
Die angegebenen Toleranzen beziehen sich auf die Achse der Flanschbohrung wenn die Röhre fest gegen den Flansch mit 18 mm Durchmesser geschraubt ist (Abb.2)

[2] Eccentricity of the axis of the anode max. 0.15 mm
Excentricité de l'axe de l'anode 0,15 mm au maximum
Exzentrizität der Achse der Anode max. 0,15 mm

[3] Eccentricity of the axis of the cathode max. 0,20 mm
Excentricité de l'axe de la cathode 0,20 mm au maximum
Exzentrizität der Achse der Katode max. 0,20 mm

[4] The tolerance of the eccentricity of the axis of the base is such, that this base fits into a hole with a diameter of 32,5 mm, provided this hole is correctly centred with respect to the axis of the hole of fig.2

La tolérance de l'excentricité de l'axe du culot est telle que ce dernier s'adapte dans un trou d'un diamètre de 32,5 mm, à condition que ce trou soit correctement centré par rapport à l'axe du trou de la fig.2

Der Exzentrizitätstoleranz der Achse der Sockel ist derartig, dass der Sockel sicher passt in eine Bohrung von 32,5 mm Durchmesser, wenn diese Bohrung mit dem Flansch von Abb.2 genau zentriert ist

Note 5 from page 2; note 5 de la page 2;Note 5 von Seite 2

[5]) The tolerance of the eccentricity of the axis of the base flange is such, that this flange fits into a hole with a diameter of 33.5 mm, provided this hole is correctly centred with respect to the axis of the hole of fig. 2
La tolérance de l'excentricité de l'axe de la bride du culot est telle que ce dernier s'adapte dans un trou d'un diamètre de 33,5 mm, à condition que ce trou soit correctement centré par rapport à l'axe du trou de la fig. 2
Der Exzentrizitätstoleranz der Achse des Sockelflansches ist derartig, dass der Flansch sicher passt in eine Bohrung von 33,5 mm Durchmesser, wenn diese Bohrung mit dem Flansch von Abb. 2 genau zentriert ist

Operating characteristics as amplifier, f = 4000 Mc/s
Caractéristiques d'utilisation comme amplificatrice, f = 4000 MHz
Betriebsdaten als Verstärker, f = 4000 MHz

V_{ba}	=	200 V
V_{bg}	=	+20 V
R_k	=	[1])
I_a	=	30 mA
B	=	50 Mc/s [2])
G (W_o = 1 mW)	=	12 (min. 10) dB [4])
W_o {G = 6 dB; V_f = 6,3 V}	=	0,5 (min.0,35) W [4])

Limiting values (ABSOLUTE LIMITS)
Valeurs limites (LIMITES ABSOLUES)
Grenzdaten (ABSOLUTE WERTE)

V_{ao} (cold;froid;kalt)	=	max. 500 V
V_a	=	max. 300 V
W_a	=	max. 10 W
W_i (f = 4000 Mc/s)	=	max. 0,5 W [3])
I_k	=	max. 35 mA
I_g	=	max. 10 mA
$-V_g$	=	max. 50 V
$+V_g$	=	max. 0 V
V_{kf}	=	max. 50 V
R_{kf}	=	max. 20 kΩ
R_g	=	max. 25 kΩ

[1])[2])[3]) See page 5; voir page 5; siehe Seite 5
[4]) See page 1; voir page 1; siehe Seite 1

Max. seal temperatures:
Températures des scellements max.:
Max. Temperatur der Einschmelzungen:

Anode	: max.	150 °C	4)
Grid, grille, Gitter	: max.	75 °C	4)
Cathode, Katode	: max.	75 °C	4)
Insulation Isolement Isolation k-f (V_{kf} = 50 V, V_f = 6,3 V)	: max.	0,5 MΩ	

1) A variable resistor of max. 1 kΩ is to be employed. It should be adjusted for the desired anode current (see fig.3)
Il faut employer une résistance variable de 1 kΩ au max. Elle sera réglée pour le courant anodique voulu (voir fig.3)
Es soll ein veränderlicher Widerstand von max. 1 kΩ vorgesehen werden, mit dem der gewünschte Anodenstrom eingestellt wird (siehe Abb.3)

2) The quoted value is the bandwidth between the 0.1 dB points of the flattened response curve of fig.4
La valeur donnée est la largeur de bande entre les points de 0,1 dB de la courbe de réponse aplatie de la fig.4
Der gegebene Wert ist die Bandbreite zwischen den 0,1 dB Punkten der abgeplattete Wiedergabekennlinie von Abb.4

3) Grounded grid
Grille à la masse
Gitterbasisschaltung

4) A low velocity air flow may be required
Un léger courant d'air peut être nécessaire
Kühlung durch einen schwachen Luftstrom kann erforderlich sein

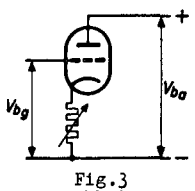


Fig.3
Abb.3

Recommended D.C. circuit
Circuit C.C. recommandé
Empfohlene Gleichstrom-schaltung

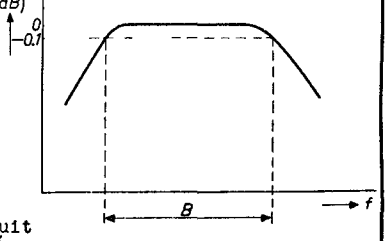


Fig.4
Abb.4

Remark

Special attention should be paid to the mounting of the tube in those cases where it is used in transportable equipment Shocks, especially in a direction perpendicular to the axis of the tube should be avoided

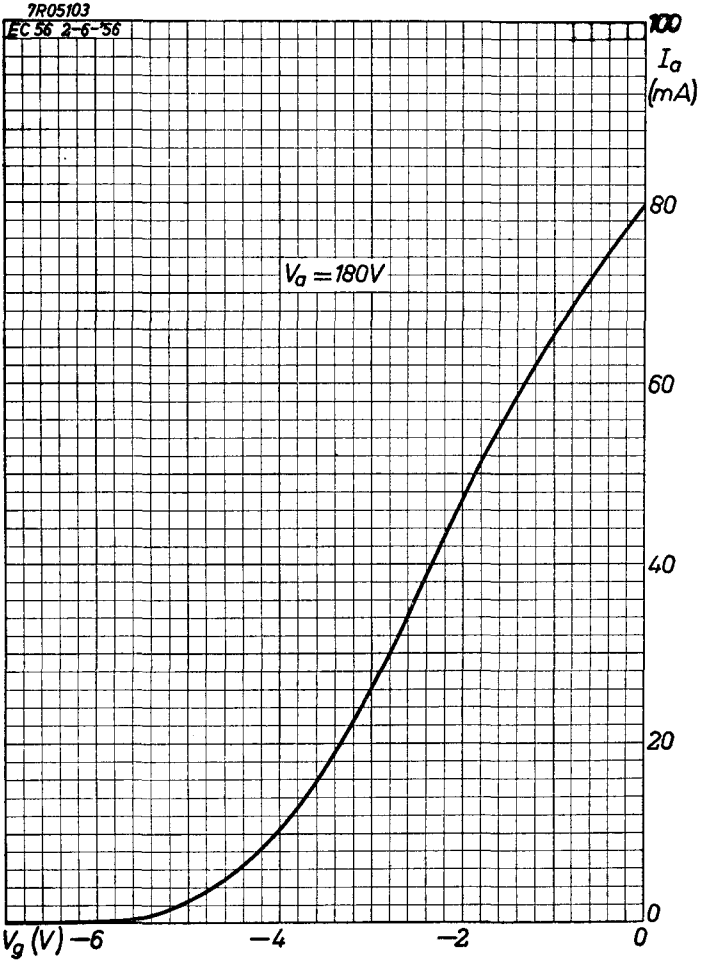
Observation

On doit apporter une attention particulière au montage du tube au cas où il est utilisé dans un équipement mobile Les chocs, en particulier dans un sens perpendiculaire à l'axe du tube doivent être évités .

Bemerkung

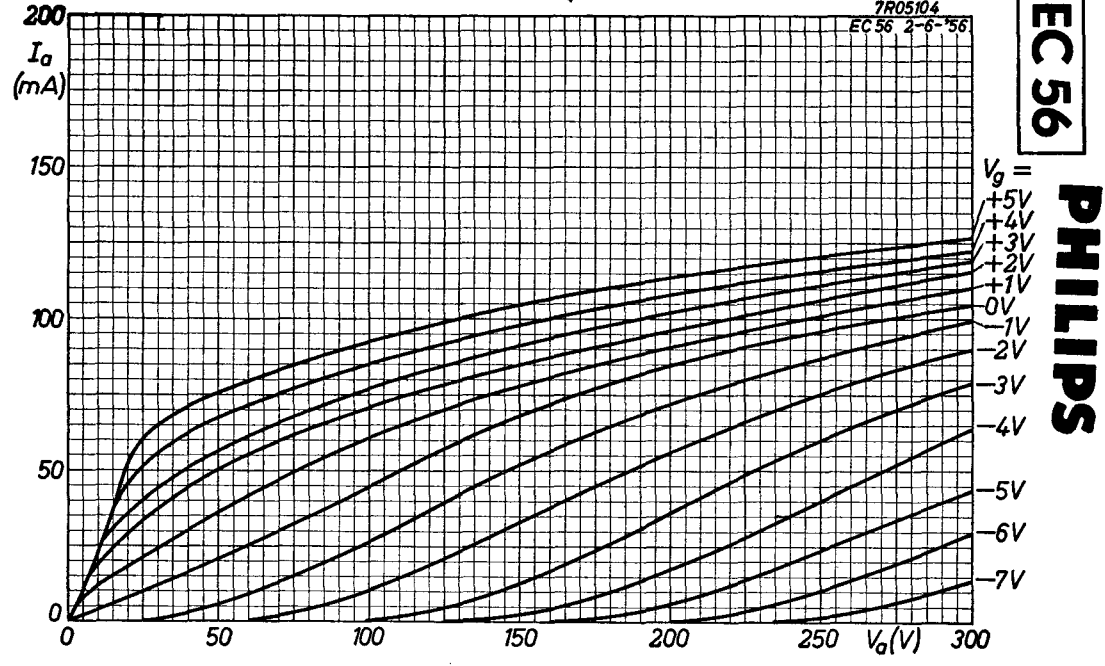
Bei Verwendung in transportablen Anlagen ist auf die Montage der Röhre besondere Sorgfalt zu verwenden. Erschütterungen, besonders senkrecht zur Röhrenachse, sind zu vermeiden

PHILIPS EC 56



6.6.1956

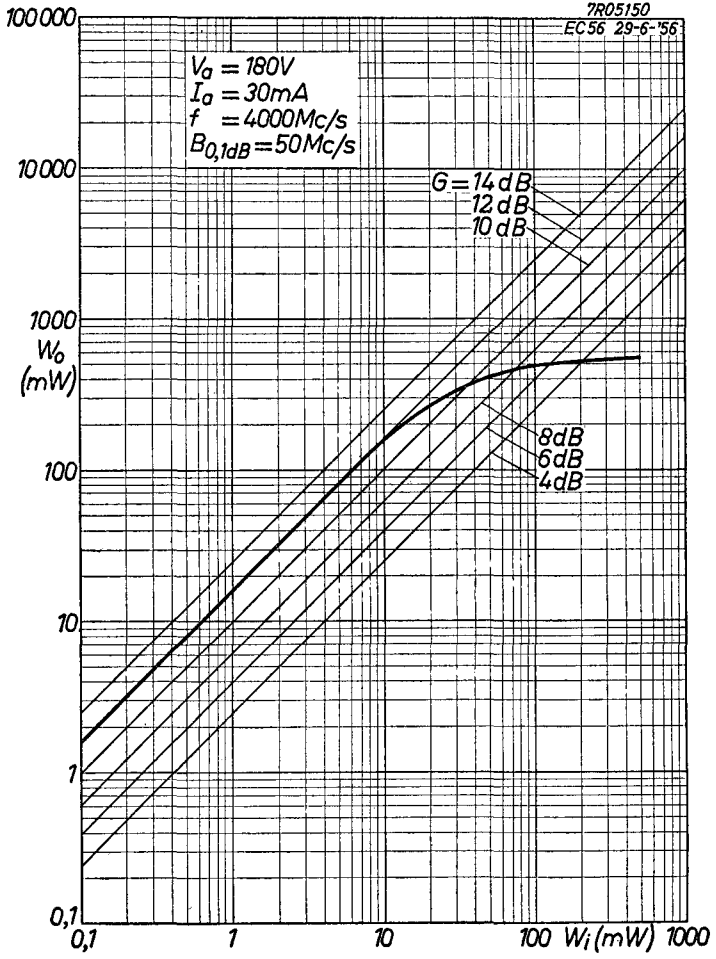
A



EC 56

PHILIPS

g


7R05150
EC56 29-6-'56
$V_a = 180V$
$I_a = 30mA$
$f = 4000Mc/s$
$B_{0,1dB} = 50Mc/s$
G = 14 dB
12 dB
10 dB
8dB
6dB
4dB
100000
10000
1000
W_o (mW)
100
10
1
0,1
0,1
1
10
100 W_i (mW) 1000



EC56

page	sheet	date
1	1	1958.12.12
2	2	1958.12.12
3	3	1958.12.12
4	4	1958.12.12
5	5	1957.03.03
6	6	1957.03.03
7	A	1956.06.06
8	B	1956.06.06
9	C	1956.07.07
10	FP	1999.06.20

DISC-SEAL TRIODE for use as power amplifier, especially designed as broad-band micro-wave amplifier in grounded grid circuits

TRIODE A DISQUES pour utilisation comme amplificatrice de puissance, particulièrement conçue comme amplificatrice à large bande dans la gamme à ondes courtes dans circuits avec la grille à la masse

SCHEIBENTRIODE zur Verwendung als Leistungsverstärker, speziell entworfen als Breitbandverstärker im Mikrowellenbereich in Gitterbasisschaltungen

Heating : indirect by A.C. or D.C.; parallel supply
Chauffage: indirect par C.A. ou C.C.; alimentation parallèle
Heizung : indirekt durch Wechsel- oder Gleichstrom; Parallelspeisung

$V_f = 6{,}3$ V [1]
$I_f = 650$ mA

Capacitances (Vf = 6,3 V ; Ik = 0 mA)
Capacités
Kapazitäten

$C_{ag} = 1{,}6$ pF
$C_{ak} = 0{,}04$ pF
$C_{gk} = 3{,}3$ pF

Typical characteristics
Caractéristiques types
Kenndaten

		min.	nom.	max.	
V_a	=	–	180	–	180 V
V_g [4])	=	-1,8	-2,8	-4,0	-1,6 V ←
I_a	=	–	30	–	60 mA
S	=	13,5	17	–	21 mA/V ←
μ	=	33	43	52	43

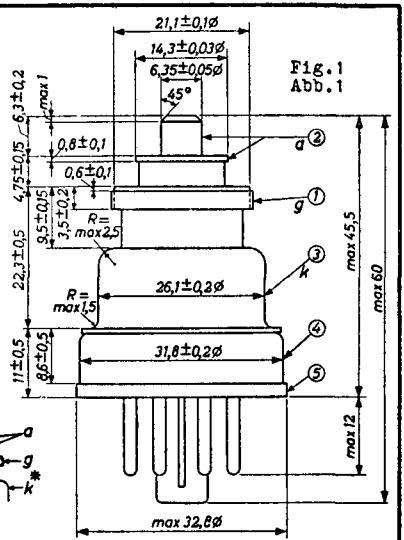
[1]) Max. allowed variation ± 2 % (absolute limits)
Variation admissible max. ± 2 % (limites absolues)
Max. zulässige Schwankung ± 2 % (absolute Grenzen)

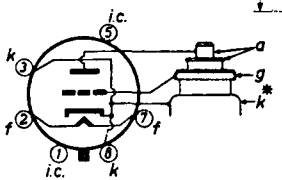
[4]) (See also page 4). The end point of life is reached ← when one or more of these characteristics have changed to the following values:
(Voir aussi page 4). Le tube est arrivé à la fin de sa durée si une ou quelques-unes de ces caractéristiques sont changées jusqu'aux valeurs suivantes:
(Siehe auch Seite 4). Das Ende der Lebensdauer ist erreicht, wenn eine oder mehrere dieser Kennwerte bis folgende Werte geändert sind:

$-V_g$ (I_a = 30 mA) ≦ 0,5 V
Wo {G = 6 dB, Vf = 6,3 V} ≦ 1 W

Dimensions in mm
Dimensions en mm
Abmessungen in mm

Fig.1
Abb.1





Base, culot, Sockel:
OCTAL

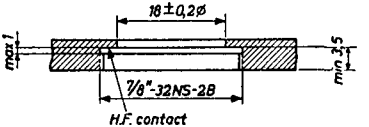


Fig.2
Abb.2

Recommended mount
Montage recommandé
Empfohlene Halterung

Pins 3 and 8 are connected internally to the cathode R.F. connection
Les broches 3 et 8 ont été reliées à l'intérieur à la connexion de cathode H.F.
Stifte 3 und 8 sind im Innern der Röhre mit dem HF-Katodenanschluss verbunden

*)Cathode R.F. connection
Connexion de cathode H.F.
HF-Katodenanschluss

1)2)3)4)See page 3; voir page 3; siehe Seite 3

5)See page 4; voir page 4; siehe Seite 4

Data of thread of the grid disc and of recommended mount
Données du filet de la disque de grille et du montage recommandé
Daten des Gewindes der Gitterscheibe und der empfohlenen Halterung

32 turns per inch; 32 spires par pouce; 32 Windungen pro Zoll
Thread angle 60°; angle du filet 60°; Flankenwinkel 60°

	Minor diameter Diamètre intérieur Kerndurchmesser	Major diameter Diamètre exterieur Aussendurchmesser	Effektive diameter Diamètre réel Flankendurchmesser
g :	21,22 $\pm^{0}_{0,15}$ mm	22,2 $\pm^{0}_{0,15}$ mm	21,68 $\pm^{0}_{0,09}$ mm
fig.2 Abb.2	21,51 $\pm^{0}_{0,15}$ mm	min. 22,23 mm	21,83 $\pm^{0}_{0,12}$ mm

[1])The eccentricities are given with respect to the axis of the threaded hole (see fig.2) in which the tube is screwed firmly against the flange, the inner diameter of which is 18 mm
Les excentricités sont données par rapport à l'axe du trou taraudé (voir fig.2) dans lequel le tube est bloqué contre la bride d'un diamètre intérieur de 18 mm
Die angegebenen Toleranzen beziehen sich auf die Achse der Flanschbohrung wenn die Röhre fest gegen den Flansch mit 18 mm Durchmesser geschraubt ist (Abb.2)

[2])Eccentricity of the axis of the anode max. 0.15 mm
Excentricité de l'axe de l'anode 0,15 mm au maximum
Exzentrizität der Achse der Anode max. 0,15 mm

[3])Eccentricity of the axis of the cathode max. 0,20 mm
Excentricité de l'axe de la cathode 0,20 mm au maximum
Exzentrizität der Achse der Katode max. 0,20 mm

[4])The tolerance of the eccentricity of the axis of the base is such, that this base fits into a hole with a diameter of 32,5 mm, provided this hole is correctly centred with respect to the axis of the hole of fig.2

La tolérance de l'excentricité de l'axe du culot est telle que ce dernier s'adapte dans un trou d'un diamètre de 32,5 mm, à condition que ce trou soit correctement centré par rapport à l'axe du trou de la fig.2

Der Exzentrizitätstoleranz der Achse der Sockel ist derartig, dass der Sockel sicher passt in eine Bohrung von 32,5 mm Durchmesser, wenn diese Bohrung mit dem Flansch von Abb.2 genau zentriert ist

Note 5 from p.2; note 5 de la p.2; Note 5 von Seite 2

5) The tolerance of the eccentricity of the axis of the base flange is such, that this flange fits into a hole with a diameter of 33.5 mm, provided this hole is correctly centred with respect to the axis of the hole of fig.2

La tolérance de l'excentricité de l'axe de la bride du culot est telle que ce dernier s'adapte dans un trou d'un diamètre de 33,5 mm, à condition que ce trou soit correctement centré par rapport à l'axe du trou de la fig2

Der Exzentrizitätstoleranz der Achse des Sockelflansches ist derartig, dass der Flansch sicher passt in eine Bohrung von 33,5 mm Durchmesser, wenn diese Bohrung mit dem Flansch von Abb.2 genau zentriert ist

Operating characteristics as amplifier, f = 4000 Mc/s
Caractéristiques d'utilisation comme amplificatrice, f = 4000 MHz
Betriebsdaten als Verstärker, f = 4000 MHz

V_{ba}	=	200 V
V_{bg}	=	+20 V
R_k	=	1)
I_a	=	60 mA
B	=	50 Mc/s^2)
→ W_o (G = 8 dB; V_f = 6,3 V)	=	1,8 (min. 1,5) W 4)

Limiting values (ABSOLUTE LIMITS)
Valeurs limites (LIMITES ABSOLUES)
Grenzdaten (ABSOLUTWERTE)

V_{a_o} (cold;froid;kalt)	=	max.	500 V
V_a	=	max.	300 V
W_a	=	max.	10 W
W_i (f = 4000 Mc/s)	=	max.	1 W^3)
I_k	=	max.	70 mA
I_g	=	max.	10 mA
$-V_g$	=	max.	50 V
$+V_g$	=	max.	0 V
→ V_{kf}	=	max.	50 V
R_{kf}	=	max.	20 kΩ
R_g	=	max.	25 kΩ

1)2)3) See page 5; voir page 5; siehe Seite 5

→ 4) See page 1; voir page 1; siehe Seite 1

Max. seal temperatures:
Températures des scellements max.:
Max. Temperature der Einschmelzungen:

	Anode	: max.	150 °C [4]
	Grid, grille, Gitter	: max.	75 °C [4]
	Cathode, Katode	: max.	75 °C [4]
Insulation Isolement Isolation	k-f (V_{kf} = 50 V, V_f = 6,3 V)	: max.	0,5 MΩ

[1] A variable resistor of max.0.5kΩ is to be employed. It should be adjusted for the desired anode current (see fig.3)
Il faut employer une résistance variable de0,5kΩ au max. Elle sera réglée pour le courant anodique voulu (voir fig.3)
Es soll ein veränderlicher Widerstand von max.0,5kΩ vorgesehen werden, mit dem der gewünschte Anodenstrom eingestellt wird (siehe Abb.3)

[2] The quoted value is the bandwidth between the 0.1 dB points of the flattened response curve of fig.4
La valeur donnée est la largeur de bande entre les points de 0,1 dB de la courbe de réponse aplatie de la fig.4
Der gegebene Wert ist die Bandbreite zwischen den 0,1 dB Punkten der abgeplattete Wiedergabekennlinie von Abb.4

[3] Grounded grid
Grille à la masse
Gitterbasisschaltung

[4] A low velocity air flow may be required
Un léger courant d'air peut être nécessaire
Kühlung durch einen schwachen Luftstrom kann erforderlich sein

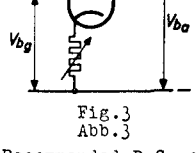


Fig.3
Abb.3

Recommended D.C. circuit
Circuit C.C. recommandé
Empfohlene Gleichstrom-schaltung

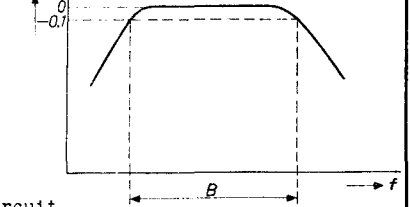


Fig.4
Abb.4

Remark

Special attention should be paid to the mounting of the tube in those cases where it is used in transportable equipment Shocks, especially in a direction perpendicular to the axis of the tube should be avoided

Observation

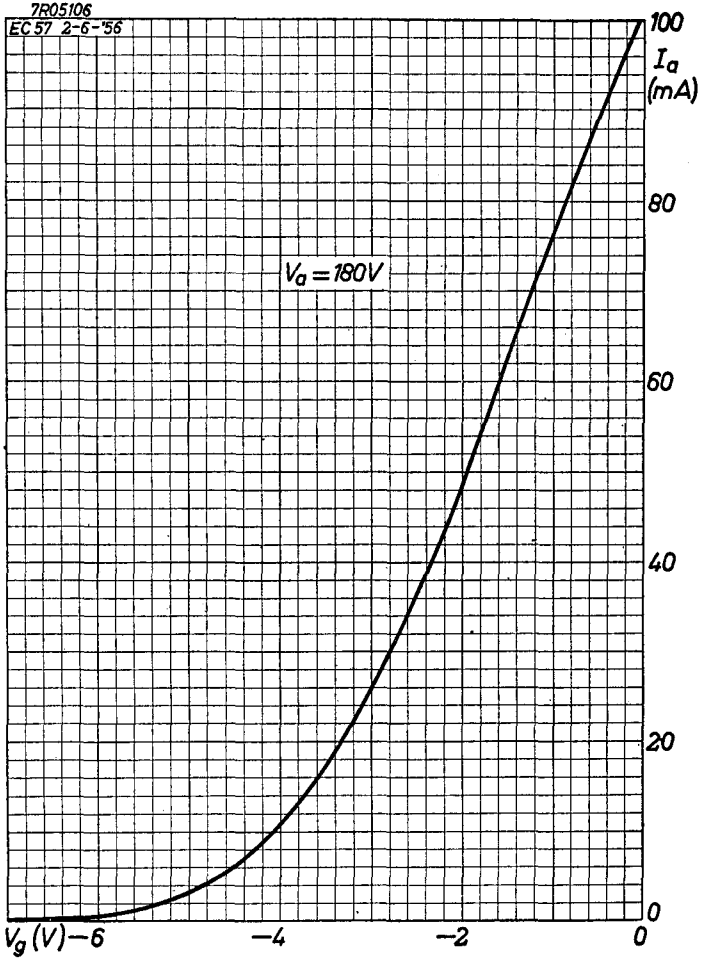
On doit apporter une attention particulière au montage du tube au cas où il est utilisé dans un équipement mobile Les chocs, en particulier dans un sens perpendiculaire à l'axe du tube doivent être évités

Bemerkung

Bei Verwendung in transportablen Anlagen ist auf die Montage der Röhre besondere Sorgfalt zu verwenden. Erschütterungen, besonders senkrecht zur Röhrenachse, sind zu vermeiden

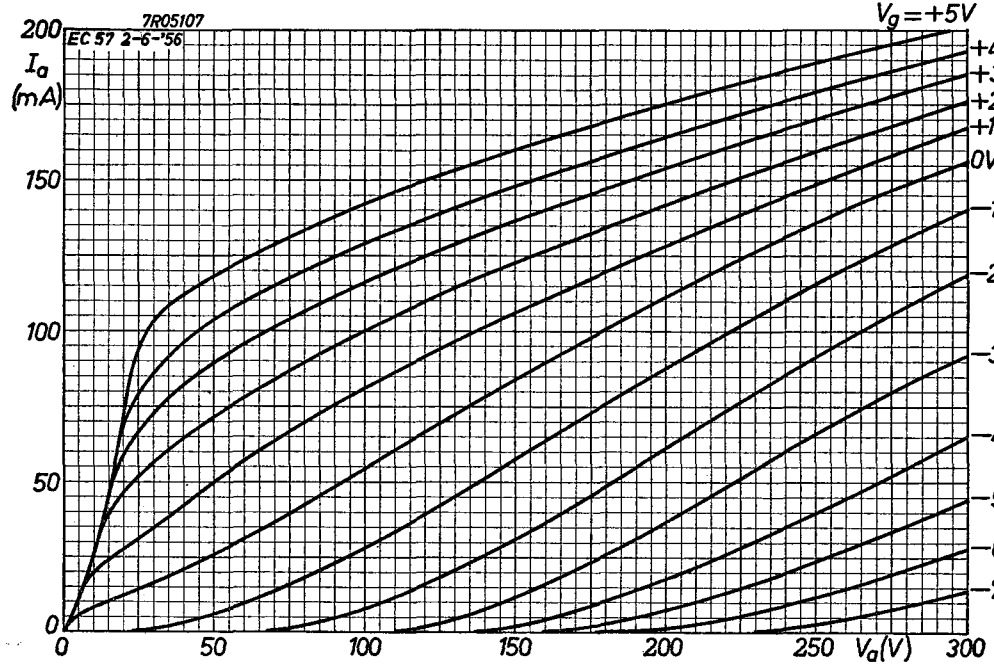
PHILIPS

EC 57



6.6.1956

A

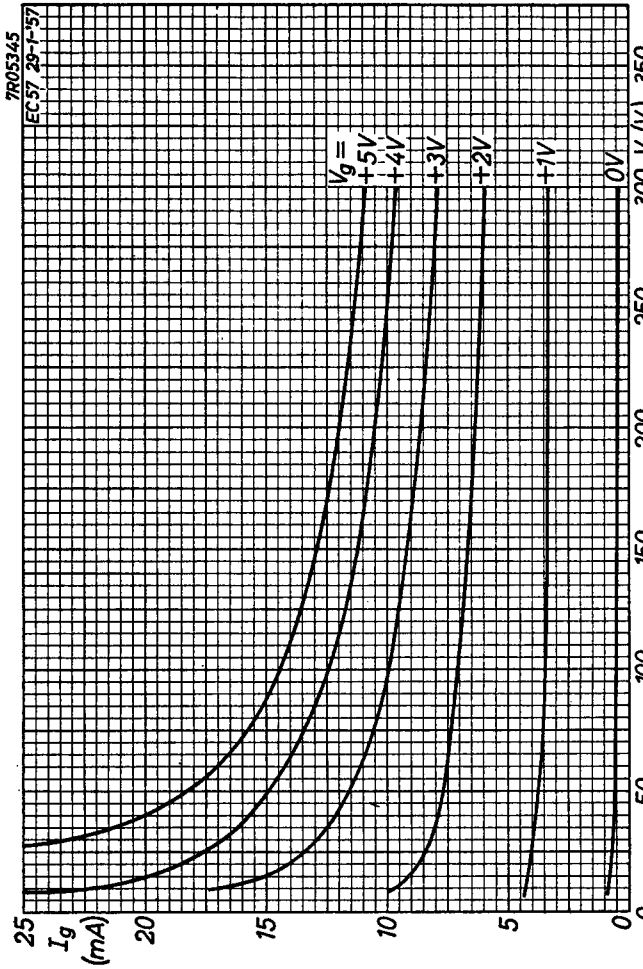


EC 57

PHILIPS

8

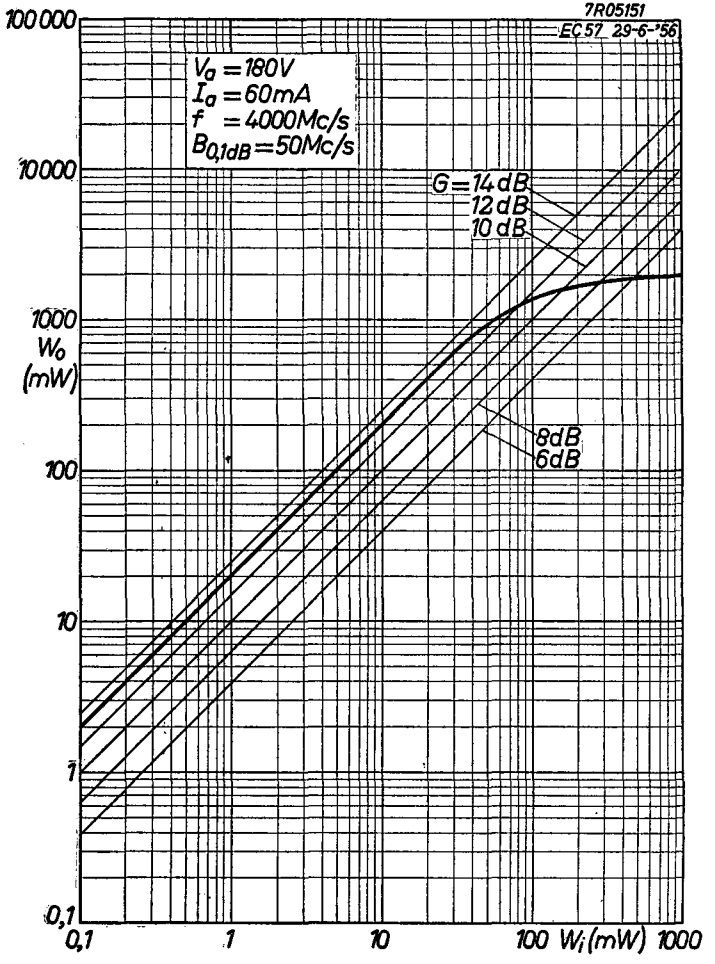
PHILIPS EC 57



2.2.1957

C

EC 57 PHILIPS



D

PHILIPS

Electronic Tube

HANDBOOK

EC57

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1	1	1958.12.12
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3	3	1958.12.12
4	4	1958.12.12
5	5	1957.03.03
6	6	1957.03.03
7	A	1956.06.06
8	B	1956.06.06
9	C	1957.02.02
10	D	1957.02.02
11	FP	1999.06.20

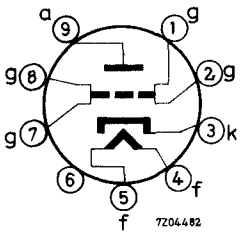
S.Q. TUBE

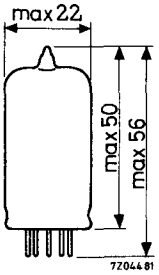
Triode designed for use as grounded grid U.H.F. amplifier for frequencies up to 500 MHz.

QUICK REFERENCE DATA			
Life test	500 hours		
Base	Noval. Gold plated pins		
Heating	Indirect A.C. or D.C.; parallel supply		
Heater voltage	V_f	6.3	V
Heater current	I_f	430	mA
Mutual conductance	S	12	mA/V

DIMENSIONS AND CONNECTIONS Dimensions in mm

Base: Noval





CHARACTERISTICS

Anode voltage	V_a	250	V
Grid voltage	$-V_g$	1.5	V
Anode current	I_a	15	mA
Mutual conductance	S	12	mA/V
Amplification factor	μ	80	

CAPACITANCES

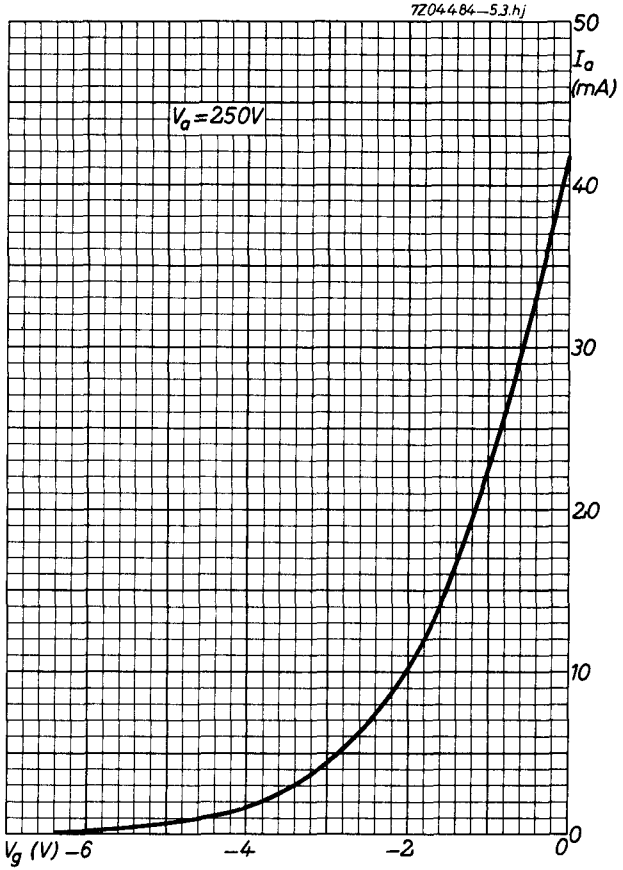
Grid and pin No.6 to cathode and heater	$C_{gp_6/kf}$	5.1	pF
Grid, heater and pin No.6 to cathode	$C_{gfp_6/k}$	9.3	pF
Anode to cathode	C_{ak}	max. 0.075	pF
Anode to cathode and heater	$C_{a/kf}$	max. 0.08	pF
Anode to grid and pin No.6	C_{a/gp_6}	3.4	pF
Anode to grid, heater and pin No.6	C_{a/gfp_6}	3.4	pF
Cathode to heater	C_{kf}	max. 8	pF

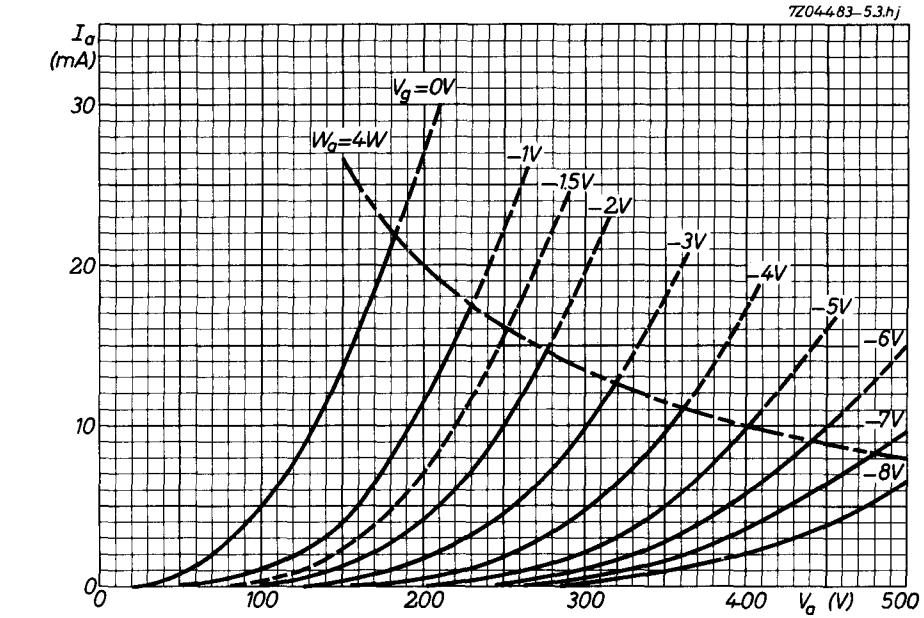
LIFE

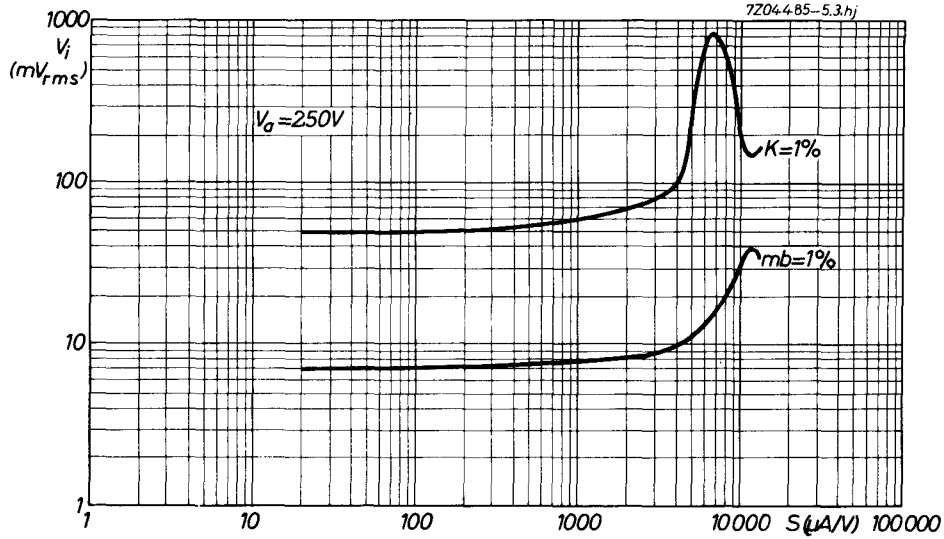
Production samples are tested during 500 hours.

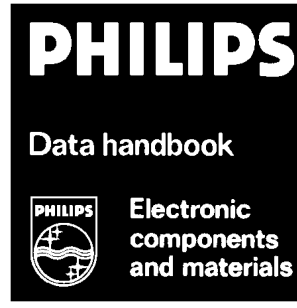
LIMITING VALUES (Design centre rating system)

Anode voltage	V_{a_o}	max.	550	V
	V_a	max.	300	V
Anode dissipation	W_a	max.	4	W
Cathode current	I_k	max.	15	mA
Voltage between cathode and heater	V_{kf}	max.	100	V
Grid resistor	R_g	max.	0.3	MΩ


7Z04484-5.3.hj
50
I_a
(mA)
V_a=250V
40
30
20
10
0
V_g (V) -6
-4
-2
0


7Z04483-5.3.hj
I_a (mA)
30
20
10
0
0
100
200
300
400
V_a (V)
500
V_g=0V
W_a=4W
-1V
-15V
-2V
-3V
-4V
-5V
-6V
-7V
-8V


7Z04485-5.3.hj
1000
V_i (mV_{rms})
100
10
1
1
10
100
1000
10000
S (μA/V)
100000
V_a=250V
K=1%
mb=1%



EC80

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5	FP	2001.04.13

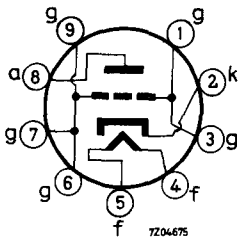
S.Q. TUBE

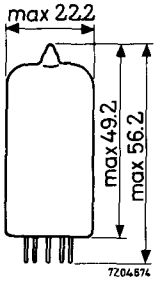
Special quality U.H.F. triode designed for use as R.F. amplifier and oscillator (max. frequency 1000 MHz).

QUICK REFERENCE DATA			
Life test	10 000 hours		
Low interface resistance			
Mechanical quality	Shock and vibration resistant		
Base	Noval		
Heating	Indirect A.C. or D.C.; parallel supply		
Heater voltage	V_f	6.3	V
Heater current	I_f	280	mA
Anode current	I_a	25	mA
Mutual conductance	S	28	mA/V

DIMENSIONS AND CONNECTIONS Dimensions in mm

Base: Noval





CHARACTERISTICS

Anode supply voltage	V_{ba}	200	V
Anode resistor	R_a	2.4	kΩ
Cathode resistor	R_k	47	Ω
Anode current	I_a	25	mA
Mutual conductance	S	28	mA/V
Amplification factor	μ	60	

CAPACITANCES

Without shield

Anode to cathode and heater	$C_{a/kf}$	0.1	pF
Grid to cathode and heater	$C_{g/kf}$	7	pF
Anode to grid	C_{ag}	1.4	pF

With external shield

Anode to cathode and heater	$C_{a/kf}$	0.09	pF
Grid and screen to cathode and heater	$C_{gs/kf}$	7.5	pF
Anode to grid and shield	$C_{a/gs}$	1.9	pF

SHOCK AND VIBRATION RESISTANCE

The following test conditions are applied to assess the mechanical quality of the tube. These conditions are not intended to be used as normal operating conditions.

Shock

The tube is subjected 5 times in each of 4 positions to an acceleration of 500 g supplied by an NRL shock machine with the hammer lifted over an angle of 30^{o}.

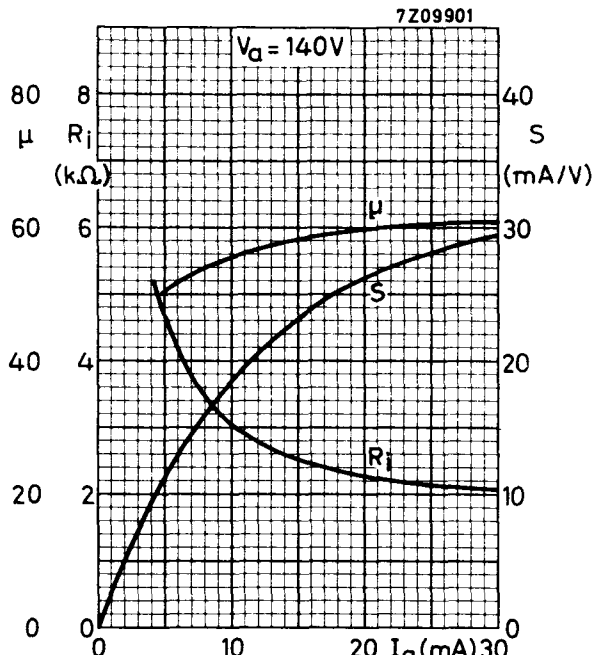
Vibration

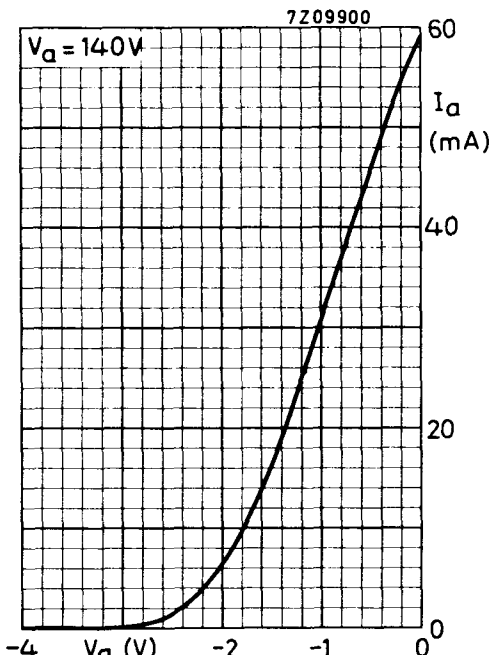
The tube is subjected during 32 hours in each of 3 positions to a vibration frequency of 50 Hz with an acceleration of 2.5 g.

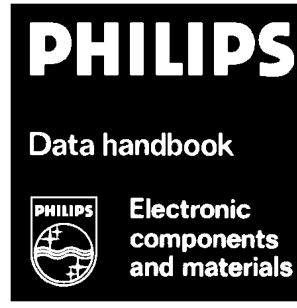
LIMITING VALUES (Absolute max. rating system)

Anode voltage	V_{a_o}	max. 400	V
	V_a	max. 200	V
Anode dissipation	W_a	max. 4.5	W
Grid voltage	$-V_g$	max. 20	V
Cathode current	I_k	max. 35	mA
Grid resistor	R_g	max. 500	kΩ
Voltage between cathode and heater	V_{kf}	max. 100	V

Heater voltage: The average heater voltage should be 6.3 V.
Variations of the heater voltage exceeding the range of 6.0 V to 6.6 V will shorten the tube life.


7Z09901
V_a = 140V
80
μ
60
40
20
0
8
R_i
(kΩ)
6
4
2
0
40
S
(mA/V)
30
20
10
0
μ
S
R_i
0
10
20
I_a(mA)
30


7Z09900
V_a = 140V
60
I_a
(mA)
40
20
0
-4
V_g (V)
-2
-1
0



EC8010

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S.Q. TUBE

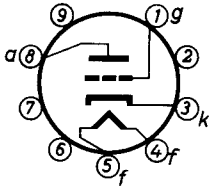
U.H.F. oscillator triode for frequencies up to 750 MHz.

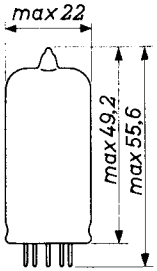
QUICK REFERENCE DATA			
Base	Noval. Gold plated pins		
Heating	Indirect A.C. or D.C.; parallel supply		
Heater voltage	V_f	6.3	V
Heater current	I_f	175	mA
Anode current	I_a	30	mA
Mutual conductance	S	5.5	mA/V

DIMENSIONS AND CONNECTIONS

Dimensions in mm

Base: Noval





CAPACITANCES

Grid to all except anode	$C_{g(a)}$	1.8	pF
Anode to all except grid	$C_{a(g)}$	0.7	pF
Anode to grid	C_{ag}	1.6	pF
Grid to heater	C_{gf}	max. 0.25	pF
Cathode to heater	C_{kf}	2.3	pF

CHARACTERISTICS

Heater voltage	V_f	6.3		V
Heater current	I_f	175		mA
Anode voltage	V_a	120	150	V
Grid voltage	$-V_g$	2	2	V
Anode current	I_a	20	30	mA
Mutual conductance	S	4	5.5	mA/V
Amplification factor	μ	16	16	

OPERATING CHARACTERISTICS AND LIMITING VALUES

Operation as U.H.F. oscillator

A) Heater supply voltage	V_f	6.3		V
Series resistor in heater circuit	R	3		Ω
Wave length	λ	40	80	cm
Anode voltage	V_a	220	275	V
Anode current	I_a	18.6	17.2	mA
Grid current	$+I_g$	1.5	2.8	mA
Output power	W_o	0.6	2.1	W

LIMITING VALUES Design centre rating system

Anode voltage	V_{a_o}	max.	550	V
Anode voltage	V_a	max.	275	V
Anode dissipation	W_a	max.	3.5	W
Cathode current	I_k	max.	20	mA
Grid current	I_g	max.	7.5	mA
Negative grid voltage	$-V_g$	max.	100	V
Voltage between cathode and heater	V_{kf}	max.	100	V
Grid resistor	R_g	max.	1	MΩ

B) Heater supply voltage	V_f	6.3		V
Series resistor in heater circuit	R	3		Ω
Wave length	λ	40	80	cm
Anode voltage	V_a	290	300	V
Anode current	I_a	19.6	18.6	mA
Grid current	$+I_g$	0.4	1.5	mA
Output power	W_o	0.7	2.2	W

With these operating conditions the following limiting values should be strictly adhered to

LIMITING VALUES Design centre rating system unless otherwise specified.

Anode voltage	V_{a_o}	max.	550	V
Anode voltage (stabilized ± 1%)	V_a	max.	300	V
Anode dissipation (Abs.max.)	W_a	max.	5	W
Cathode current	I_k	max.	20	mA
Grid current	I_g	max.	7.5	mA
Negative grid voltage	$-V_g$	max.	100	V
Voltage between cathode and heater	V_{kf}	max.	100	V
Grid resistor	R_g	max.	1	MΩ

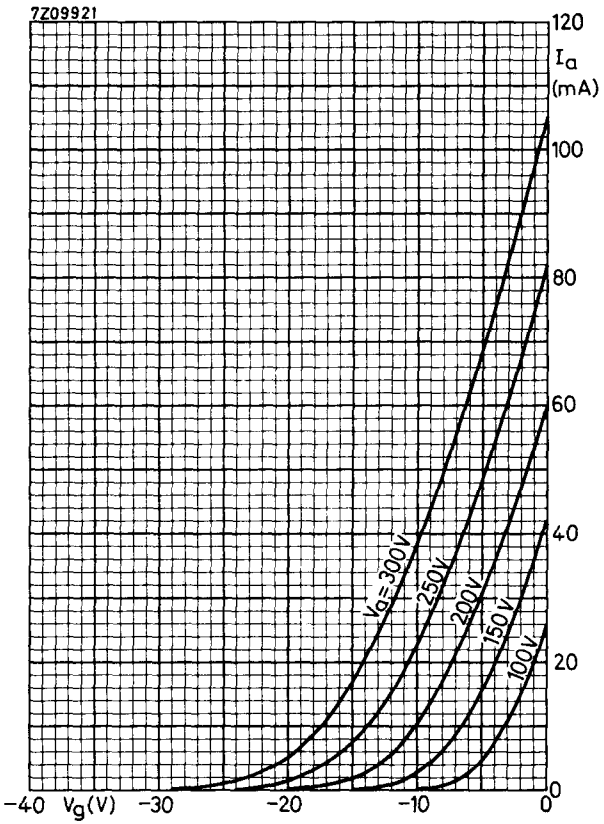
C) Heater voltage V_f 6.3 V

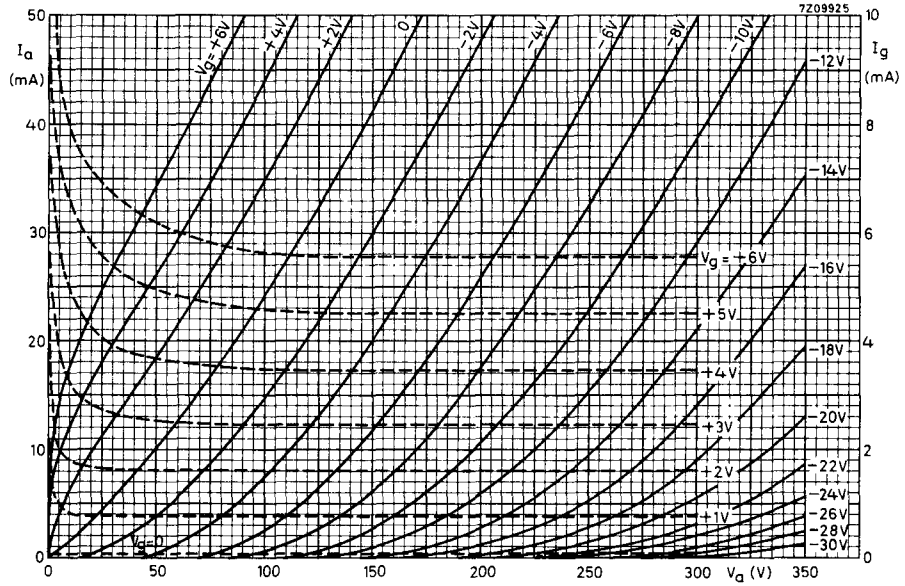
Wave length	λ	40	80	cm
Anode voltage	V_a	220	300	V
Anode current	I_a	27.7	26.3	mA
Grid current	I_g	2.3	4	mA
Output power	W_o	1.1	3.8	W

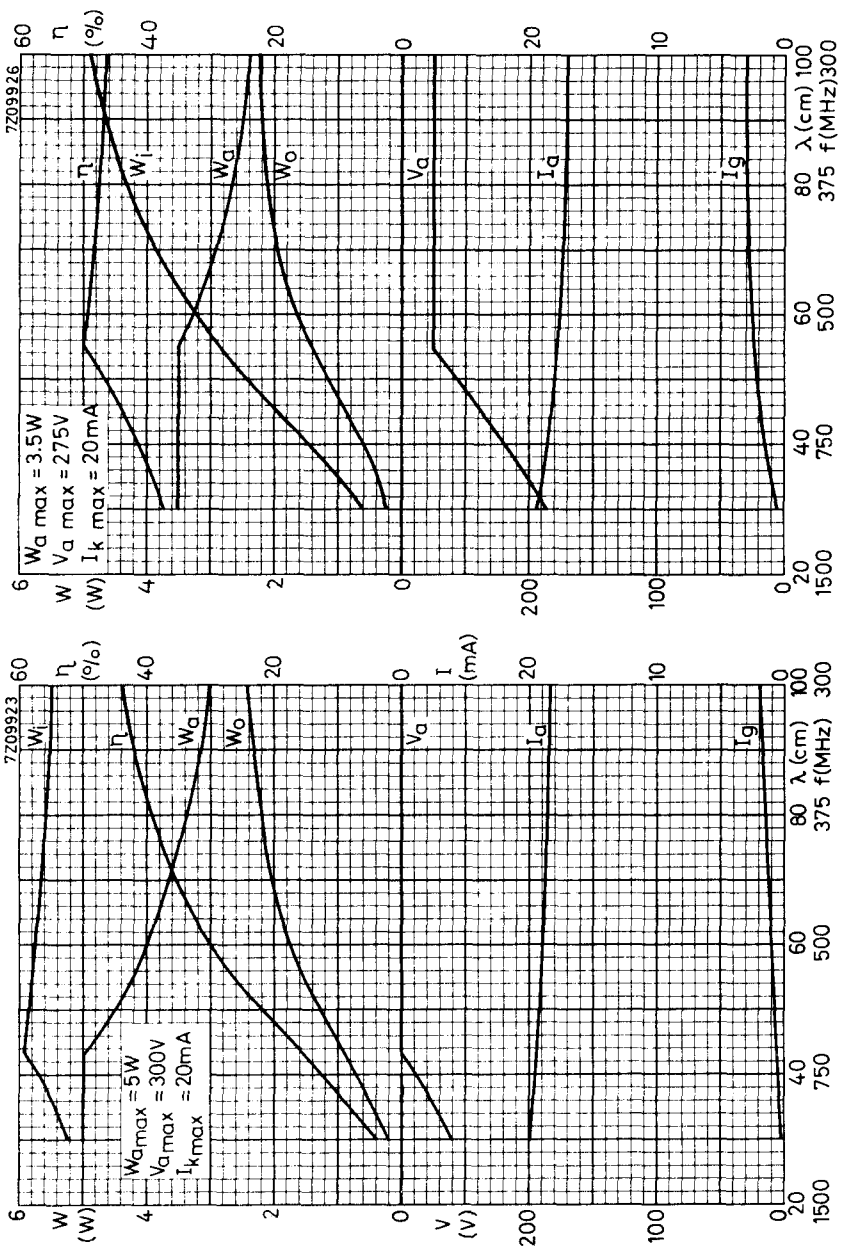
LIMITING VALUES Design centre rating system unless otherwise specified.

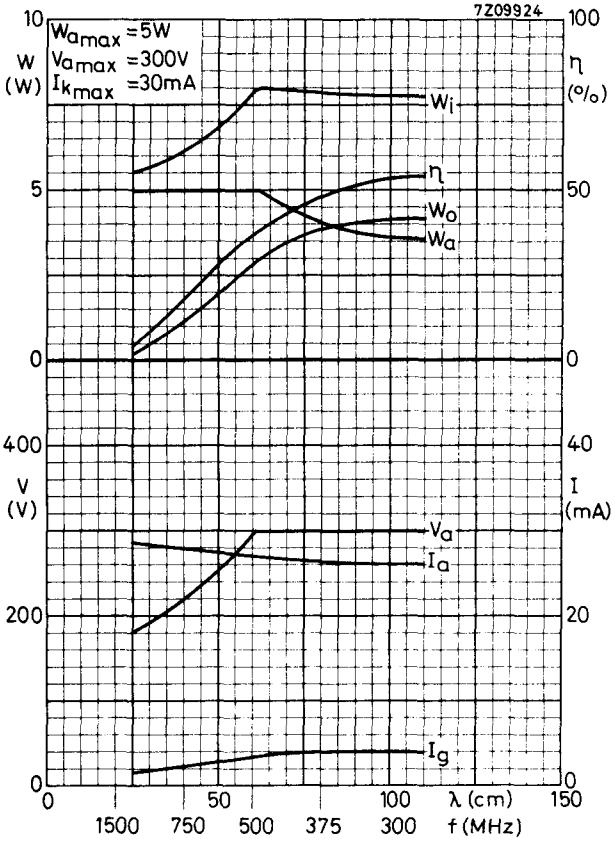
Anode voltage	V_{a_o}	max.	550	V
Anode voltage (stabilized ± 1%)	V_a	max.	300	V
Anode dissipation (Abs.max.)	W_a	max.	5	W
Cathode current (Abs.max.)	I_k	max.	30	mA
Grid current	$+I_g$	max.	7.5	mA
Grid voltage	$-V_g$	max.	100	V
Voltage between cathode and heater	V_{kf}	max.	100	V
Grid resistor	R_g	max.	1	MΩ

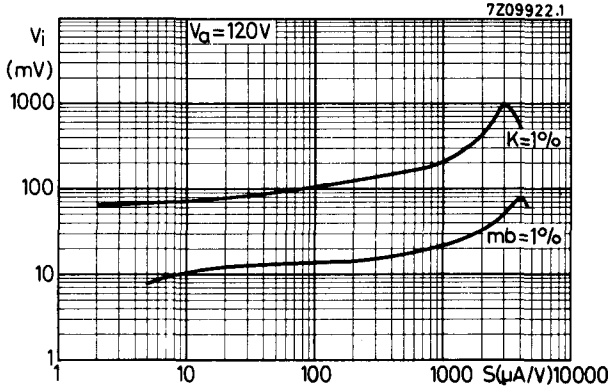
Heater voltage: The average heater voltage should be 6.3 V
Variation of the heater voltage should not exceed the range the range of 6.3 V ± 3%.

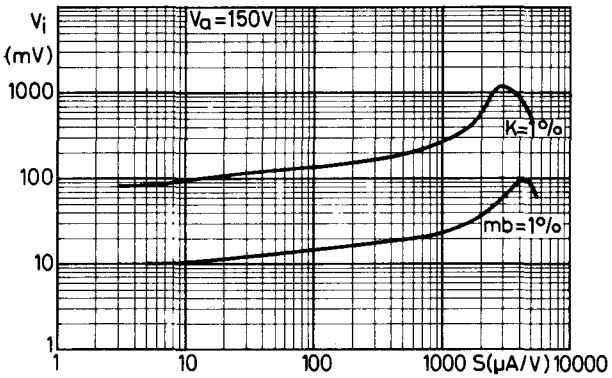

7Z09921
120
I_a
(mA)
100
80
60
40
20
0
V_a=300V
250V
200V
150V
100V
−40 V_g(V) −30
−20
−10
0


7Z09925
I_a (mA)
I_g (mA)
V_a (V)
V_g = +6V
+5V
+4V
+3V
+2V
+1V
0
-2V
-4V
-6V
-8V
-10V
-12V
-14V
-16V
-18V
-20V
-22V
-24V
-26V
-28V
-30V


7209926
W_a max = 3.5W
V_a max = 275V
I_k max = 20mA
η (%)
W (W)
V (V)
I (mA)
W_i
W_a
W_o
V_a
I_a
I_g
λ (cm) 100 80 60 40
f (MHz) 300 375 500 750
7209923
W_{amax} = 5W
V_{amax} = 300V
I_{kmax} = 20mA
λ (cm)
f (MHz)


7Z09924
W_{amax} =5W
V_{amax} =300V
I_{kmax} =30mA
W (W)
η (%)
V (V)
I (mA)
W_i
η
W_o
W_a
V_a
I_a
I_g
10
5
0
100
50
0
400
200
0
40
20
0
0
50
100
150
λ (cm)
1500
750
500
375
300
f (MHz)


7Z09922.1
Vi
(mV)
Va=120V
1000
100
10
1
K=1%
mb=1%
1
10
100
1000 S(μA/V)10000


Vi
(mV)
Va=150V
1000
100
10
1
K=1%
mb=1%
1
10
100
1000 S(μA/V)10000

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9	FP	2001.04.13

U.H.F. TRIODE

Triode intended for use as grounded grid U.H.F. amplifier, oscillator or mixer for bands IV and V.

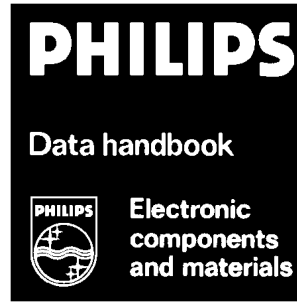
HEATING: Indirect by A.C. or D.C.; parallel supply

Heater voltage	V_f	6.3	V
Heater current	I_f	200	mA

LIMITING VALUES (Design centre rating system)

Cathode to heater voltage, (k pos)	$V_{kf\ (k\ pos)}$	max. 100	V
(k neg)	$V_{kf\ (k\ neg)}$	max. 50	V

For further data and curves of this type please refer to PC86



EC86

page	sheet	date
1	1	1969.01
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U.H.F. TRIODE

Triode intended for use as grounded grid U.H.F. amplifier for bands IV and V.

HEATING: Indirect by A.C. or D.C.; parallel supply

Heater voltage	V_f	6.3	V
Heater current	I_f	165	mA

For further data and curves of this type
please refer to PC88

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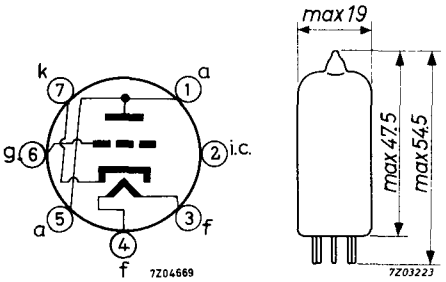
S.Q. TUBE

Triode designed for use as R.F. power amplifier or oscillator for frequencies up to 150 MHz.

QUICK REFERENCE DATA	
Life test	500 hours
Base	Miniature
Heating	Indirect A.C. or D.C.
Heater voltage	V_f 6.3 V
Heater current	I_f 150 mA
Output power f = 50 MHz	W_o 3.6 W
f = 100 MHz	W_o 3.3 W

DIMENSIONS AND CONNECTIONS Dimensions in mm

Base: Miniature



CHARACTERISTICS

Heater voltage	V_f		6.3	V
Heater current	I_f		150	mA
Anode voltage	V_a	100	250	V
Grid voltage	$-V_g$	0	8.5	V
Anode current	I_a	11.8	10.5	mA
Mutual conductance	S	3.25	2.2	mA/V
Amplification factor	μ	21.5	17	
Internal resistance	R_i	6.6	7.7	kΩ

CAPACITANCES

		Without shield	With shield	
Anode to grid	C_{ag}	1.4	1.3	pF
Grid to cathode and heater	$C_{a/kf}$	1.5	1.7	pF
Anode to cathode and heater	$C_{g/kf}$	1.2	2.6	pF

LIMITING VALUES (Design centre rating system)

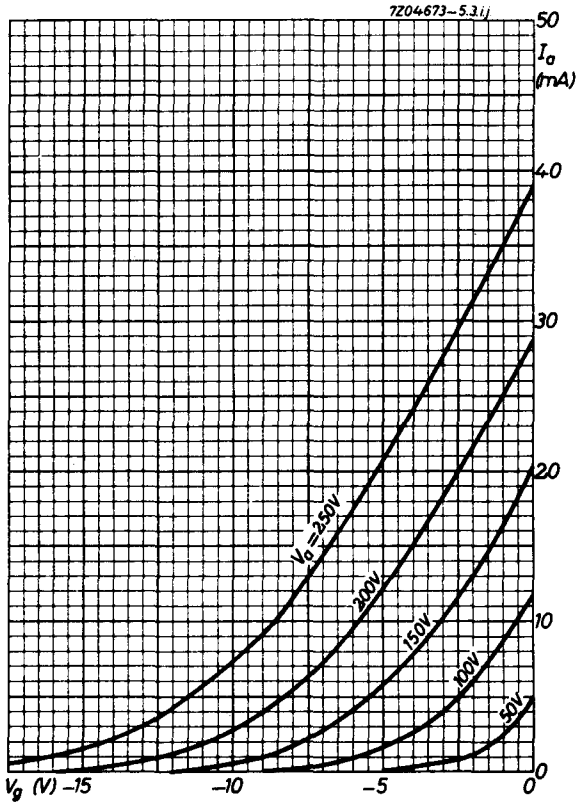
Anode voltage	V_{a_o}	max.	550	V
	V_a	max.	300	V
Anode dissipation	W_a	max.	3.5	W
Cathode current:				
(as R.F. oscillator or amplifier)	I_k	max.	30	mA
(as R.F. doubler or trebler)	I_k	max.	20	mA
Grid voltage	$-V_g$	max.	100	V
Grid current	$+I_g$	max.	5.0	mA
Grid resistor	R_g	max.	250	kΩ
Voltage between cathode and heater	V_{kf}	max.	150	V
Bulb temperature	t_{bulb}	max.	180	°C

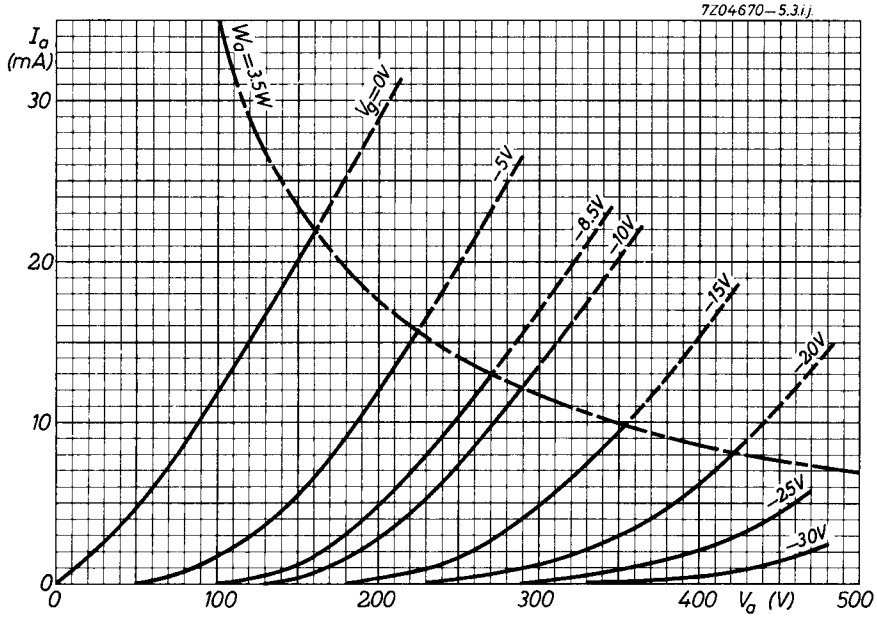
OPERATING CHARACTERISTICS

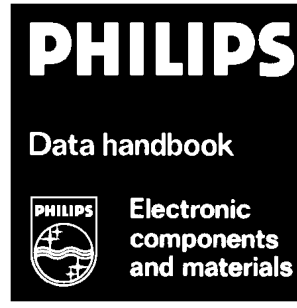
As R.F. amplifier or oscillator

Class C telegraphy or F.M.

Frequency	f	50	100	MHz
Anode voltage	V_a	300	300	V
Grid voltage	$-V_g$	27	27	V
Anode current	I_a	16.2	17.1	mA
Grid current	$+I_g$	3.8	2.9	mA
Output power	W_o	3.6	3.3	W
Efficiency	η	67	55	%




7Z04670—5.3.i.j.
I_a (mA)
W_a=3.5W
V_g=0V
-5V
-8.5V
-10V
-15V
-20V
-25V
-30V
0
10
20
30
0
100
200
300
400
500
V_a (V)



EC90

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V.H.F. TRIODE

Triode intended for use as R.F. amplifier in V.H.F. television tuners.

HEATING: Indirect by A.C. or D.C.; parallel supply

Heater voltage	V_f	6.3	V
Heater current	I_f	180	mA

For further data and curves of this type please refer to type PC900

PHILIPS

Data handbook

Electronic components and materials

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S.Q. TUBE

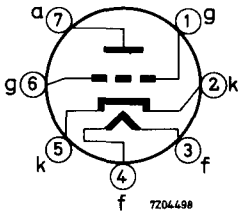
Triode designed for use as grounded grid U.H.F. amplifier for frequencies up to 250 MHz.

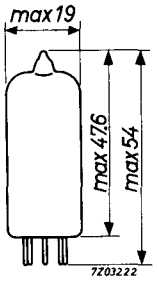
QUICK REFERENCE DATA			
Life test	500 hours		
Base	Miniature 7 pin		
Heating	Indirect A.C. or D.C. Series or parallel supply		
Heater voltage	V_f	6.3	V
Heater current	I_f	300	mA
Mutual conductance	S	8.5	mA/V

DIMENSIONS AND CONNECTIONS

Dimensions in mm

Base: Miniature 7 pin





CHARACTERISTICS

Anode voltage	V_a	250	V
Grid voltage	$-V_g$	1.5	V
Cathode resistor	R_k	150	Ω
Anode current	I_a	10	mA
Mutual conductance	S	8.5	mA/V
Amplification factor	μ	100	
Internal resistance	R_i	12	kΩ
Equivalent noise resistance	R_{eq}	400	Ω

CAPACITANCES

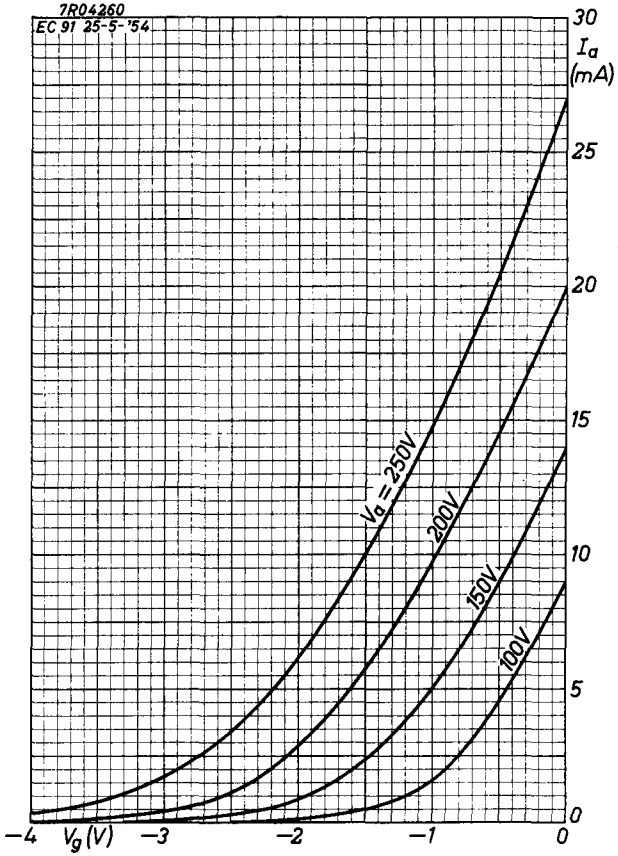
Grid to cathode and heater	$C_{g/kf}$	8.5	pF
Anode to cathode and heater	$C_{a/kf}$	max. 0.2	pF
Anode to grid	C_{ag}	2.5	pF

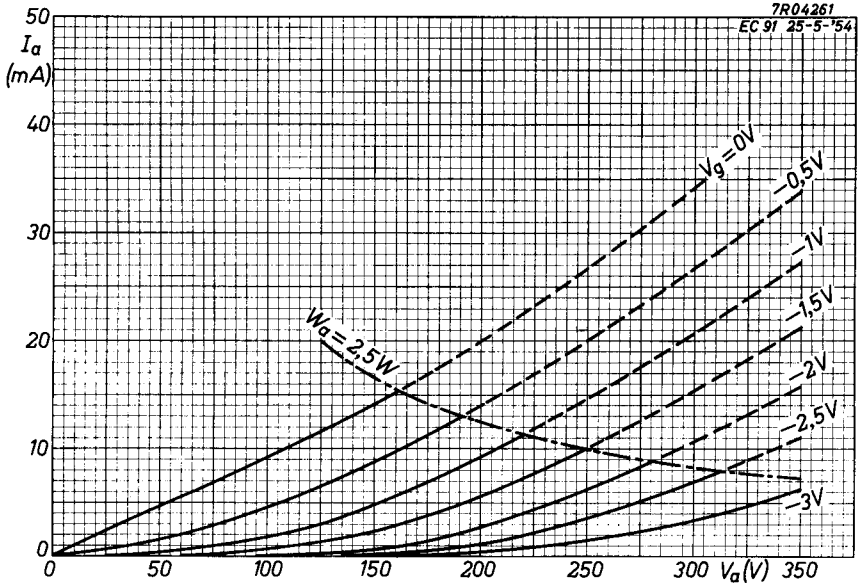
LIFE

Production samples are tested during 500 hours.

LIMITING VALUES (Absolute max. rating system)

Anode voltage	V_{a_o}	max. 550	V
	V_a	max. 250	V
Cathode current	I_k	max. 15	mA
Grid voltage	$-V_g$	max. 100	V
Voltage between cathode and heater	V_{kf}	max. 150	V
Anode dissipation	W_a	max. 2.5	W


7R04260
EC 91 25-5-'54
30
I_a
(mA)
25
20
15
10
5
0
V_a = 250V
200V
150V
100V
−4
V_g (V)
−3
−2
−1
0


7R04261
EC 91 25-5-'54
50
I_a
(mA)
40
30
20
10
0
0
50
100
150
200
250
300
V_a(V)
350
V_{g_1}=0V
−0,5V
−1V
−1,5V
−2V
−2,5V
−3V
W_a=2,5W

PHILIPS

Data handbook

Electronic components and materials

EC91

page	sheet	date
1	1	1968.12
2	2	1968.12
3	3	1968.12
4	4	1968.12
5	FP	2001.04.13

R.F. TRIODE

Triode intended for use as oscillator, mixer or amplifier in F.M.- and television receivers.

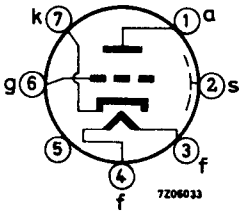
QUICK REFERENCE DATA			
Anode current	I_a	10	mA
Transconductance	S	5.5	mA/V
Amplification factor	μ	60	

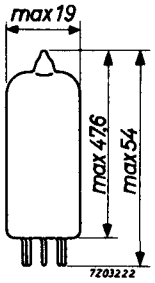
HEATING: Indirect by A.C. or D.C.; series or parallel supply

Heater voltage	V_f	6.3	V
Heater current	I_f	150	mA

DIMENSIONS AND CONNECTIONS Dimensions in mm

Base: Miniature





CAPACITANCES

Grid to all except anode	$C_{g(a)}$	2.6	pF
Anode to all except grid	$C_{a(g)}$	0.55	pF
Anode to grid	C_{ag}	1.6	pF
Anode to cathode	C_{ak}	0.24	pF
Cathode to heater	C_{kf}	2.2	pF
Grid to heater	C_{gf}	max. 0.15	pF
Anode to grid + heater	$C_{a/gf}$	1.8	pF
Cathode to grid + heater	$C_{k/gf}$	4.5	pF

TYPICAL CHARACTERISTICS AND OPERATING CONDITIONS

Anode voltage	V_a	100	170	200	250	V
Grid voltage	V_g	-1.0	-1.0	-1.0	-2.0	V
Anode current	I_a	3.0	8.5	11.5	10	mA
Transconductance	S	3.75	5.9	6.7	5.5	mA/V
Amplification factor	μ	62	66	70	60	
Internal resistance	R_i	16.5	11	10.5	11	kΩ

LIMITING VALUES (Design centre rating system)

Anode voltage	V_{a_o}	max.	550	V
	V_a	max.	300	V
Anode dissipation	W_a	max.	2.5	W
Cathode current	I_k	max.	15	mA
Grid voltage	$-V_g$	max.	50	V
Grid resistor (automatic bias)	R_g	max.	1	MΩ
Cathode to heater voltage	V_{kf}	max.	100	V

For curves please refer to type ECC81

PHILIPS

Data handbook

Electronic components and materials

EC92

page	sheet	date
1	1	1969.01
2	2	1969.01
3	FP	1999.08.10

PHILIPS

EC 95

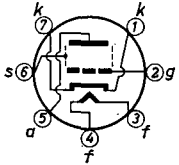
TRIODE with variable mutual conductance and low anode to grid capacitance for use in V.H.F. television tuners.
TRIODE à pente variable et à petite capacité anode-grille pour l'utilisation dans l'étage d'entrée de récepteurs de télévision pour très hautes fréquences
TRIODE mit veränderlicher Steilheit und niedriger Anoden-Gitter Kapazität zur Verwendung in Eingangsstufen von Fernsehempfängern für sehr hohe Frequenzen

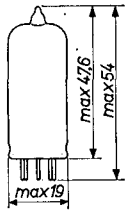
Heating : indirect by A.C. or D.C. parallel supply
Chauffage: indirect par C.A. ou C.C. alimentation parallele
Heizung : indirekt durch Wechsel- oder Gleichstrom; Parallelspeisung

$V_f = 6{,}3$ V

$I_f = 180$ mA

Dimensions in mm
Dimensions en mm
Abmessungen in mm





Base, culot, Sockel: Miniature

Capacitances
Capacités
Kapazitäten

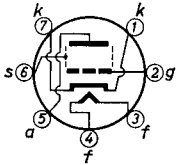
Without external screening Sans blindage extérieur Ohne äussere Abschirmung	With external screening Avec blindage extérieur Mit äusserer Abschirmung
$C_{ag} = 0{,}38$ pF	$C_{ag} = 0{,}36$ pF
$C_g = 4{,}4$ pF	$C_g = 4{,}4$ pF
$C_a = 3{,}0$ pF	$C_a = 4{,}0$ pF
$C_{ak} = 0{,}24$ pF	$C_{ak} = 0{,}20$ pF
$C_{gk} = 3{,}1$ pF	$C_{gk} = 3{,}1$ pF
$C_{gf} < 0{,}28$ pF	$C_{gf} < 0{,}28$ pF
$C_{kf} = 2{,}5$ pF	$C_{kf} = 2{,}5$ pF

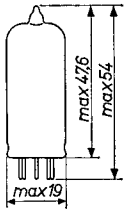
TRIODE with variable mutual conductance and low anode to grid capacitance for use in V.H.F. television tuners.
TRIODE à pente variable et à petite capacité anode-grille pour l'utilisation dans l'étage d'entrée de récepteurs de télévision pour très hautes fréquences
TRIODE mit veränderlicher Steilheit und niedriger Anoden-Gitter Kapazität zur Verwendung in Eingangsstufen von Fernsehempfängern für sehr hohe Frequenzen

Heating : indirect by A.C. or D.C. parallel supply
Chauffage: indirect par C.A. ou C.C. alimentation parallèle
Heizung : indirekt durch Wechsel- oder Gleichstrom; Parallelspeisung

$V_f = 6{,}3$ V
$I_f = 180$ mA

Dimensions in mm
Dimensions en mm
Abmessungen in mm





Base, culot, Sockel: Miniature

Capacitances
Capacités
Kapazitäten

Without external screening Sans blindage extérieur Ohne äussere Abschirmung	With external screening Avec blindage extérieur Mit äusserer Abschirmung
$C_{ag} = 0{,}38$ pF	$C_{ag} = 0{,}36$ pF
$C_g = 4{,}4$ pF	$C_g = 4{,}4$ pF
$C_a = 3{,}0$ pF	$C_a = 4{,}0$ pF
$C_{ak} = 0{,}24$ pF	$C_{ak} = 0{,}20$ pF
$C_{gk} = 3{,}1$ pF	$C_{gk} = 3{,}1$ pF
$C_{gf} < 0{,}28$ pF	$C_{gf} < 0{,}28$ pF
$C_{kf} = 2{,}5$ pF	$C_{kf} = 2{,}5$ pF

Typical characteristics
Caractéristiques types
Kenndaten

V_a	=	200	200	200 V
V_g	=	-1,2	-3,8	-5,6 V
I_a	=	10	—	— mA
S	=	10,5	0,5	0,1 mA/V
μ	=	80	—	—

Cross modulation
Transmodulation
Kreuzmodulation

V_i for / pour / für $K = 1\%$ at / à / bei: S = 10,5 mA/V > 100 mV; S = 0,5 mA/V > 100 mV; S = 0,1 mA/V > 100 mV

Limiting values
Caractéristiques limites
Grenzdaten

V_{a_o}	=	max.	550 V
V_a	=	max.	250 V
W_a	=	max.	2,2 W
I_k	=	max.	20 mA
$-V_g$	=	max.	50 V
R_g	=	max.	1 MΩ
V_{kf}	=	max.	100 V
R_{kf}	=	max.	20 kΩ

Typical characteristics
Caractéristiques types
Kenndaten

V_a	=	200		V
V_g	=	-1,2	-3,8	-5,6 V
I_a	=	10	-	- mA
S	=	10,5	0,5	0,1 mA/V
μ	=	80	-	-

Cross modulation
Transmodulation
Kreuzmodulation

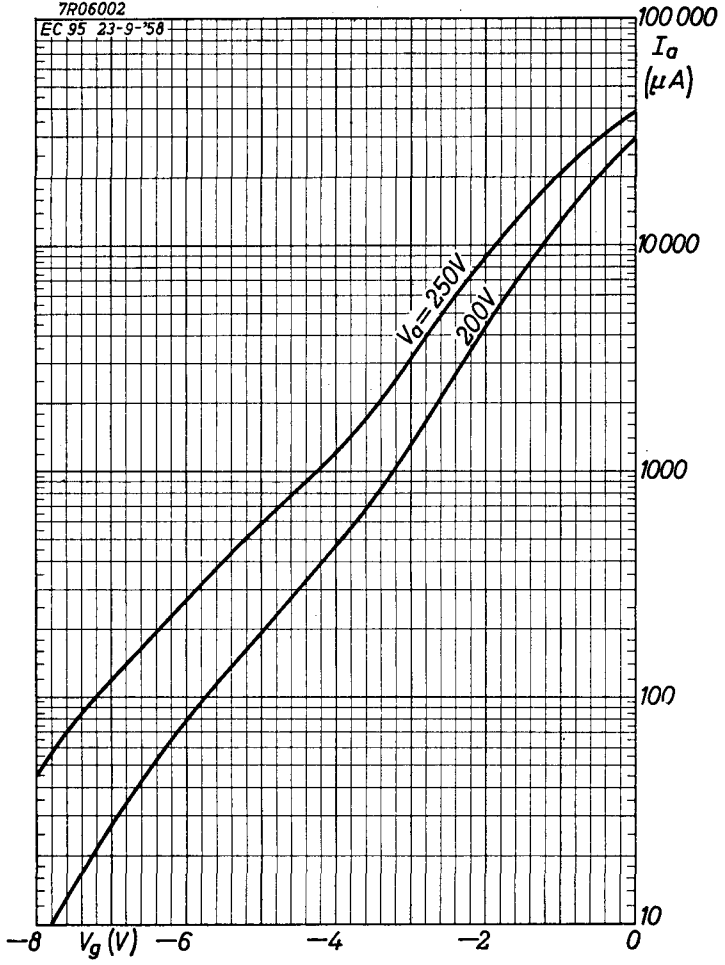
V_i for / pour / für $K = 1\%$ {
at S = 10,5 mA/V > 100 mV
à S = 0,5 mA/V 100 mV
bei S = 0,1 mA/V > 100 mV

Limiting values
Caractéristiques limites
Grenzdaten

V_{a_o}	= max.	550	V
V_a	= max.	250	V
W_a	= max.	2,2	W
I_k	= max.	20	mA
$-V_g$	= max.	50	V
R_g	= max.	1	MΩ
V_{kf}	= max.	100	V
R_{kf}	= max.	20	kΩ

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EC 95

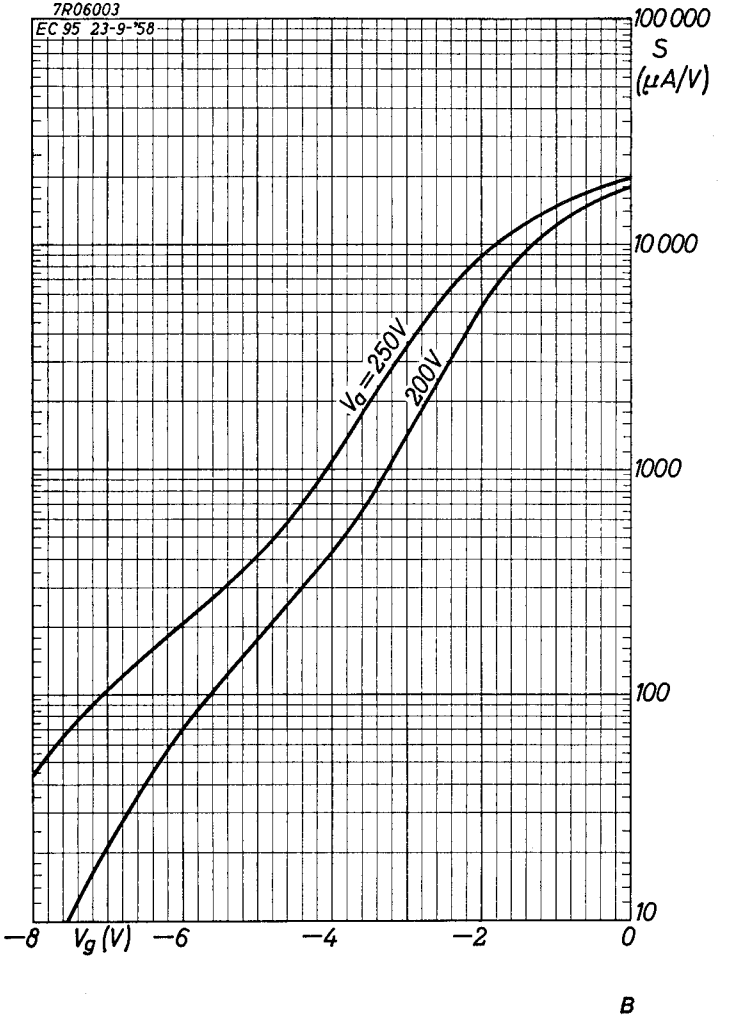


3.3.1959

A

EC 95

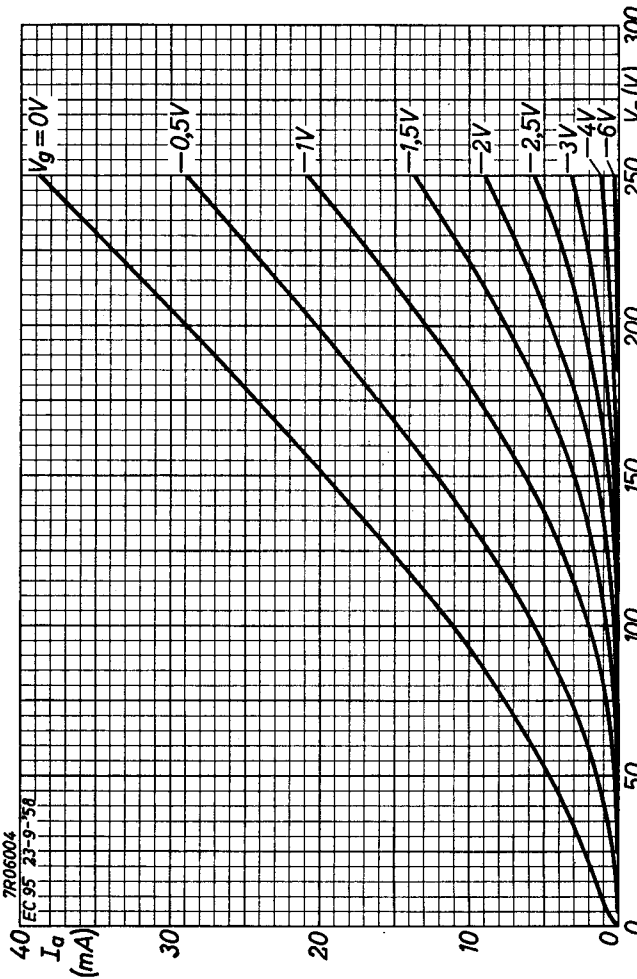
PHILIPS



B

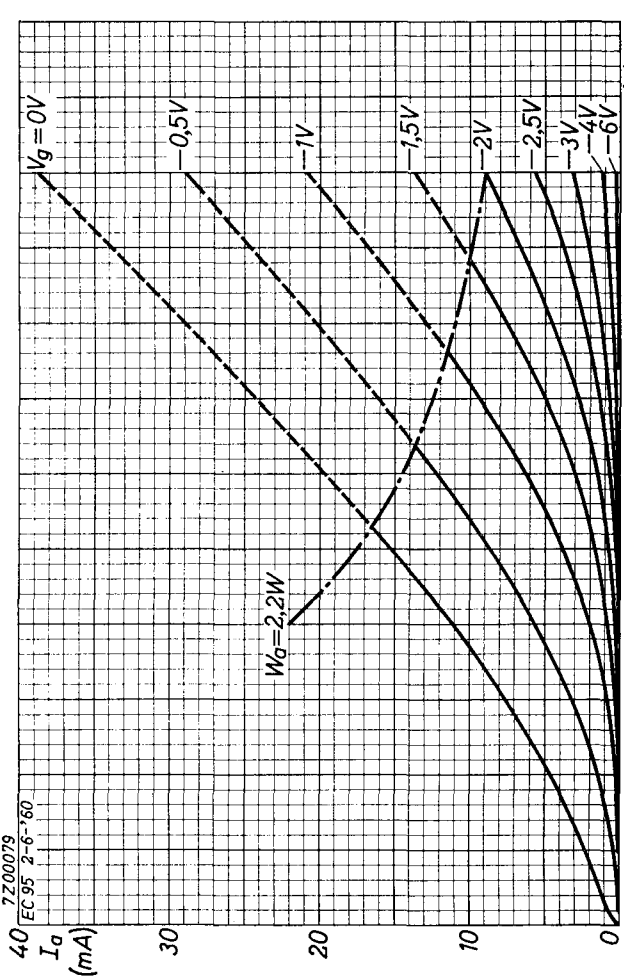
PHILIPS

EC 95



3.3.1959

C


Vg = 0V
−0,5V
−1V
−1,5V
−2V
−2,5V
−3V
−4V
−6V
Wa=2,2W
Ia (mA)
Va (V)
0
10
20
30
40
50
100
150
200
250
300
7Z00079
EC 95 2-6-'60

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Electronic Tube

HANDBOOK

EC95

page	sheet	date
1	1	1959.03.03
2	1	1960.06.06
3	2	1959.03.03
4	2	1960.06.06
5	A	1959.03.03
6	B	1959.03.03
7	C	1959.03.03
8	C	1960.06.06
9	FP	2000.01.06

PHILIPS

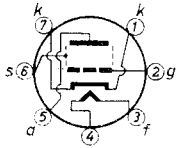
EC97

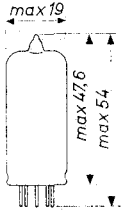
TRIODE for use as R.F. amplifier in V.H.F. television tuners
TRIODE pour utilisation en amplificatrice H.F. dans le pré-amplificateur V.H.F. des récepteurs de télévision
TRIODE zur Verwendung als HF-Verstärkerröhre in der VHF-Vorverstärker von Fernsehempfängern

Heating : indirect by A.C. or D.C. parallel supply
Chauffage: indirect par C.A. ou C.C. alimentation parallèle
Heizung : indirekt durch Gleich- oder Wechselstrom Parallelspeisung

$V_f = 6{,}3$ V
$I_f = 0{,}215$ A

Dimensions in mm
Dimensions en mm
Abmessungen in mm





Base, culot, Sockel: MINIATURE

Capacitances
Capacités
Kapazitäten

with external screening [1] avec blindage extérieur mit äusserer Abschirmung		without external screening sans blindage extérieur ohne äussere Abschirmung	
C_a	= 4,3 pF	C_a	= 3,3 pF
C_g	= 5,0 pF	C_g	= 5,0 pF
C_{ag}	= 0,48 pF	C_{ag}	= 0,5 pF
C_{ak}	= 0,21 pF	C_{ak}	= 0,25 pF
C_{gk}	= 3,2 pF	C_{gk}	= 3,2 pF
C_{gf}	< 0,28 pF	C_{gf}	< 0,28 pF
C_{kf}	= 2,5 pF	C_{kf}	= 2,5 pF

[1]) Inside diameter 19.1 mm
Diamètre intérieur 19,1 mm
Innerer Durchmesser 19,1 mm

Typical characteristics (pin 6 connected to cathode)
Caractéristiques types (broche 6 reliée à la cathode)
Kenndaten (Stift 6 mit der Katode verbunden)

V_a	=	135	V
V_g	=	-1	V
I_a	=	11	mA
S	=	13	mA/V
μ	=	65	
R_i	=	5	kΩ
V_g (S = 0,65 mA/V)	=	-3,1	V
V_g (S = 0,13 mA/V)	=	-5,0	V
V_g (I_a = 0,1 mA)	=	-5,0	V

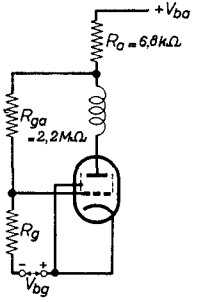
Operating characteristics (pin 6 connected to cathode)
Caractéristiques d'utilisation (broche 6 reliée à la cathode)
Kenndaten (Stift 6 mit der Katode verbunden)

V_{ba} =	200 [1]			200 [2]			V
R_a =	5,6			5,6			kΩ
R_k =	82			0			Ω
R_g =	0			1,0			MΩ
V_{bg} =	0	-4,4	-7,5	0	-4,2	-7,3	V
I_a =	12	-	-	13	-	-	mA
S =	14	0,7	0,14	15,5	0,78	0,155	mA/V

[1]) See curves 1 pages C and D
Voir les courbes 1 pages C et D
Siehe die Kurven 1 auf Seiten C und D

[2]) See curves 2 pages C and D
Voir les courbes 2 pages C et D
Siehe die Kurven 2 auf Seiten C und D

Operating characteristics (continued)
Caractéristiques d'utilisation (suite)
Betriebsdaten (Fortsetzung)



V_{ba} =	200 [3]			200 [4]			V
R_g =	0,22			0,56			MΩ
V_{bg} =	0	-5,9	-9,0	0	-9,2	-12,5	V
I_a =	14	-	-	14	-	-	mA
S =	16	0,80	0,16	16	0,80	0,16	mA/V

Limiting values (Design centre limites)
Caractéristiques limites (Limites moyennes)
Grenzdaten (Normalgrenzdaten)

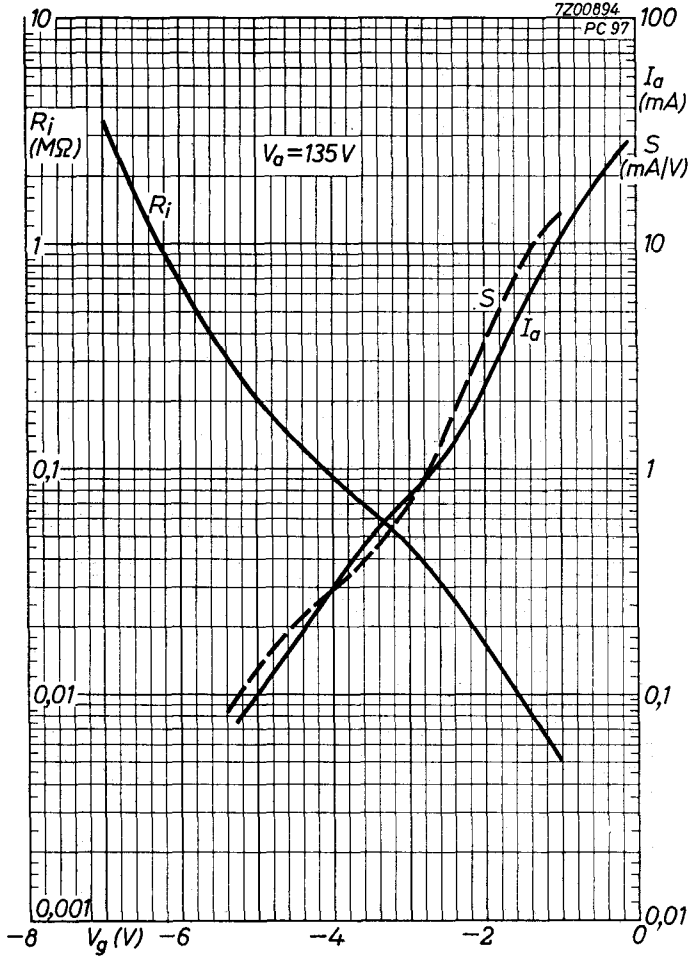
V_{ao}	= max.	550 V
V_a	= max.	200 V
W_a	= max.	2,2 W
I_k	= max.	20 mA
$-V_g$	= max.	50 V
R_g	= max.	1 MΩ
V_{kf}	= max.	100 V

[3]) See curves 3 pages C and D
Voir courbes 3 pages C et D
Siehe Kurven 3 auf Seiten C und D

[4]) See curves 4 pages C and D
Voir courbes 4 pages C et D
Siehe Kurven 4 auf Seiten C und D

PHILIPS

EC97

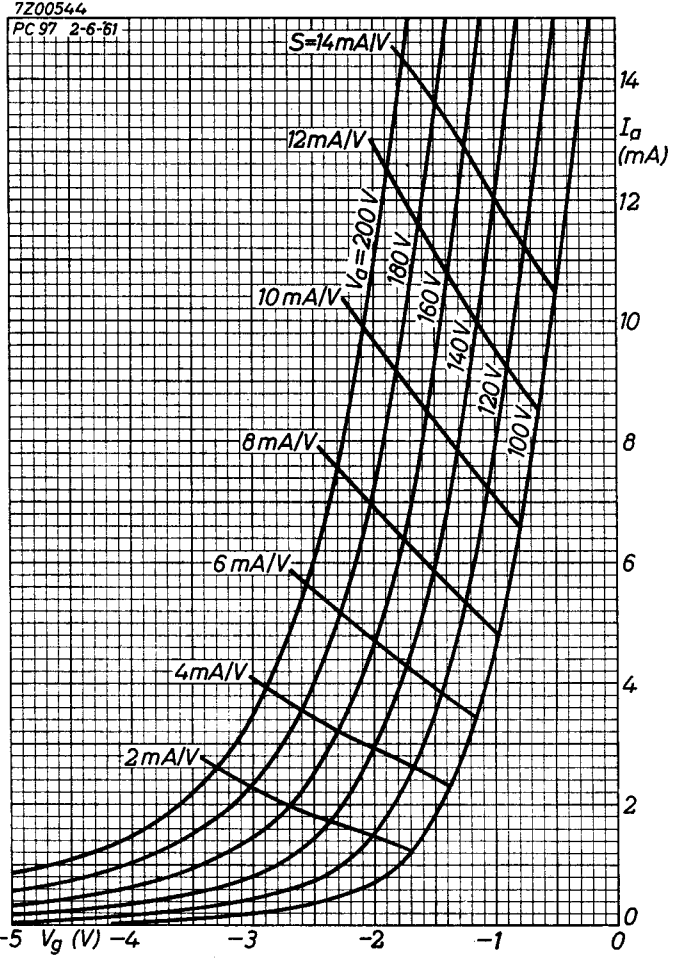


3.3.1962

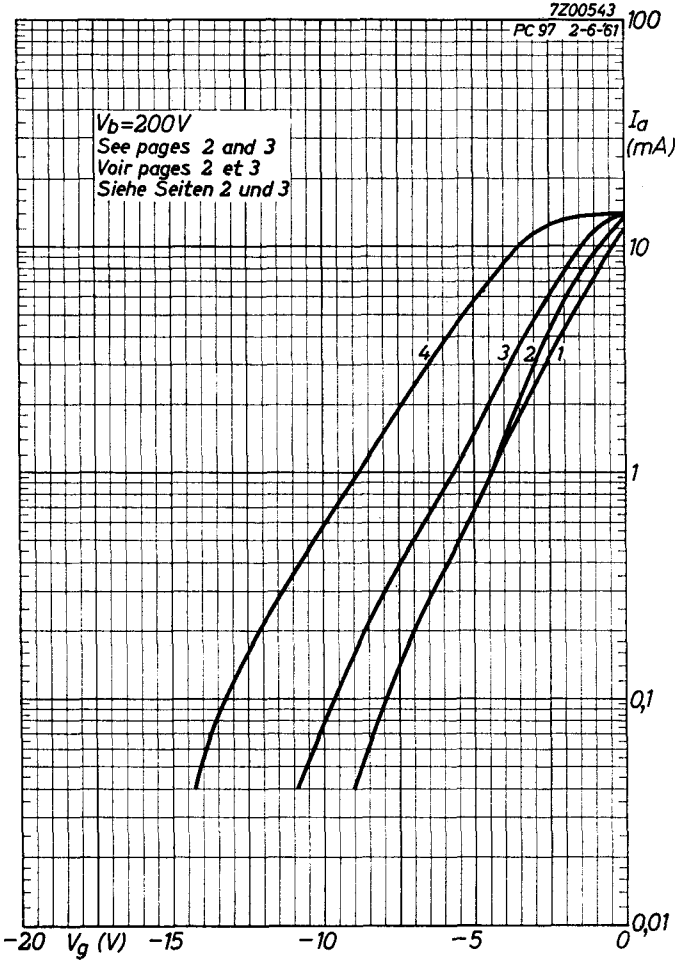
A

EC97

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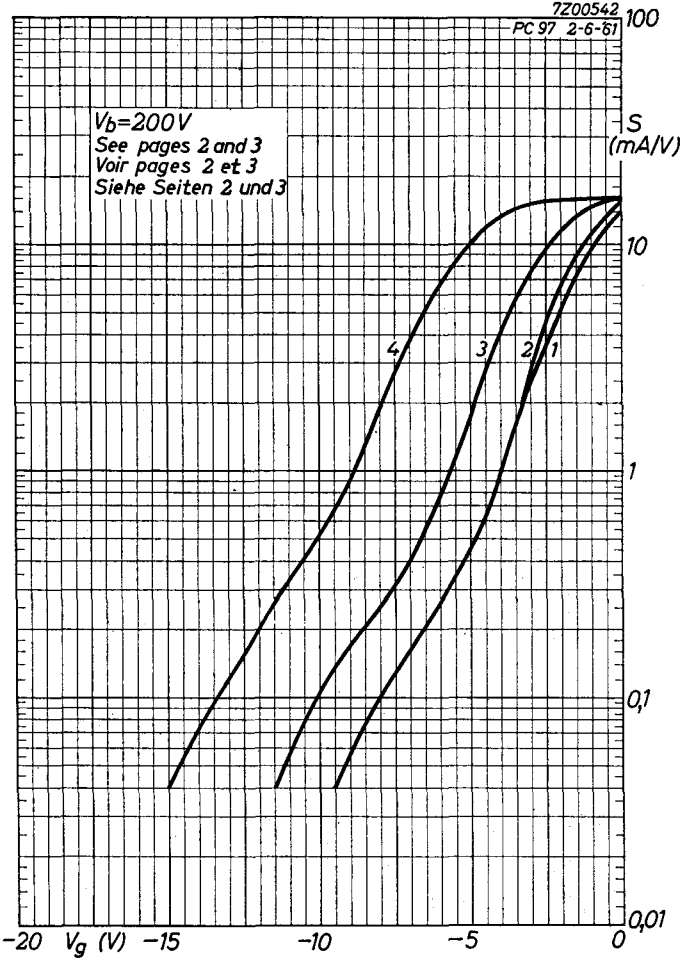


B


7Z00543
PC 97 2-6-61
100
I_a
(mA)
10
1
0,1
0,01
V_b=200V
See pages 2 and 3
Voir pages 2 et 3
Siehe Seiten 2 und 3
4
3
2
1
−20
V_g (V)
−15
−10
−5
0

EC97

PHILIPS



D

PHILIPS

Electronic Tube

HANDBOOK

EC97

page	sheet	date
1	1	1962.03.03
2	2	1962.03.03
3	3	1962.03.03
4	A	1962.03.03
5	B	1962.03.03
6	C	1962.03.03
7	D	1962.03.03
8	FP	2005.05.06

MEDIUM μ DOUBLE TRIODE for computer applications. The tube will maintain its emission capabilities after long periods of operation under cut-off conditions

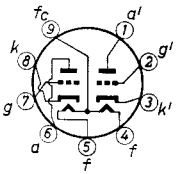
DOUBLE TRIODE AVEC COEFFICIENT D'AMPLIFICATION MOYEN pour application dans des machines à calculer. Le tube conservera son pouvoir d'émission après de longues périodes de fonctionnement dans la condition de cut-off

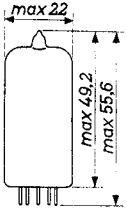
DOPPELTRIODE MIT MITTLEREM VERSTÄRKUNGSFAKTOR zur Verwendung in Rechenanlagen. Die Röhre behält ihre Emissionsfähigkeit auch nach langen Betriebsperioden in gesperrtem Zustand bei

Heating : Indirect by A.C. or D.C.; parallel supply
Chauffage: Indirect par C.A. ou C.C.; alimentation parallèle
Heizung : Indirekt durch Wechsel- oder Gleichstrom; Parallelspeisung

V_f	=	6,3 V	12,6 V
I_f	=	300 mA	150 mA
Pins Broches Stifte		9-(4+5)	4-5

Dimensions in mm
Dimensions en mm
Abmessungen in mm





Base, culot, Sockel: NOVAL

Capacitances (without external shield)
Capacités (sans blindage extérieur)
Kapazitäten (ohne äussere Abschirmung)

C_a	=	0,37 pF	$C_{a'}$	=	0,25 pF	$C_{aa'}$	<	1,1 pF
C_g	=	1,8 pF	$C_{g'}$	=	1,8 pF	$C_{gg'}$	<	0,01 pF
C_{ag}	=	1,5 pF	$C_{a'g'}$	=	1,5 pF	$C_{ag'}$	<	0,11 pF
C_{kf}	=	2,5 pF	$C_{k'f}$	=	2,5 pF	$C_{a'g}$	<	0,06 pF
C_{gf}	<	0,135 pF	$C_{g'f}$	<	0,135 pF			

Characteristics (each triode)
Caractéristiques (chaque triode)
Kenndaten (jede Triode)

Column I: Setting of the triode and typical (average) measuring results of new tubes
II: Characteristic range values for equipment design
Colonne I: Valeurs pour le réglage de la triode et les résultats moyens de mesures de tubes neufs
II: Gamme de valeurs caractéristiques pour l'étude d'équipements
Spalte I: Einstelldaten der Triode und mittlere Messergebnisse
II: Charakteristischer Wertbereich für Gerätentwurf

Heater current; courant de chauffage; Heizstrom

	I	II	
V_f	= 6,3		V
I_f	= 300	270-330	mA

Typical characteristics; caractéristiques types; Kenndaten

	I	II		I	II	
V_a	= 250	V [1]	V_a	= 100		V
V_g	= -8,5	V	V_g	= 0		V
R_g	= 0,1	MΩ	I_a	= 11,8		mA
I_a	= 10,5	6-15 mA [1]	S	= 3,1		mA/V
S	= 2,2	mA/V	μ	= 19,5		
μ	= 17		R_i	= 6,25		kΩ
R_i	= 7,7	kΩ				
$-I_g$	=	<0,1 μA	V_{ba}	= 250		V
			V_g	= -30		V
			R_a	= 1		MΩ
			I_a	=	< 30	μA

Insulation; isolement; Isolierung

	I	II		I	II	
V_{kf} [2])	= 180	V	V [4])	= 250		V
R [3])	= 1	MΩ	R_{isol} [4])	=	> 100	MΩ
I_{kf}	=	< 15 μA				

[1]) These conditions should not be interpreted as suitable operating conditions
Ces conditions ne doivent pas être interprétées comme des conditions de fonctionnement normales
Diese Bedingungen sind nicht als geeignete Betriebsbedingungen aufzufassen

[2])[3])[4]) See page 3; voir page 3; siehe Seite 3

Limiting values (Absolute limits)
Caractéristiques limites (Limites absolues)
Grenzdaten (Absolute Grenzwerte)

V_{ao}	= max.	550 V
V_a	= max.	300 V
W_a	= max.	2,75 W
$-V_g$	= max.	100 V
$-V_{gp}$ (T_{imp} = max. 10 µsec, δ = 1 %)	= max.	200 V
$+V_g$	= max.	0 V
I_k	= max.	20 mA
I_{kp} (T_{imp} = max. 10 µsec, δ = 1 %)	= max.	100 mA
V_{kf}	= max.	90 V
V_{kfp}	= max.	180 V
V_f	=	6,3 V ± 5 % 12,6 V ± 5 %
t_{bulb}	= max.	120 °C

Max. circuit values (Absolute limits)
Valeurs max. des éléments de montage (Limites absolues)
Max. Werte der Schaltungsteile (Absolute Grenzwerte)

R_g	automatic bias en polarisation automatique mit automatischer Gittervorspannung	= max. 1 MΩ
R_g	fixed bias en polarisation fixe mit fester Gittervorspannung	= max. 0,5 MΩ
R_{kf}		= max. 20 kΩ

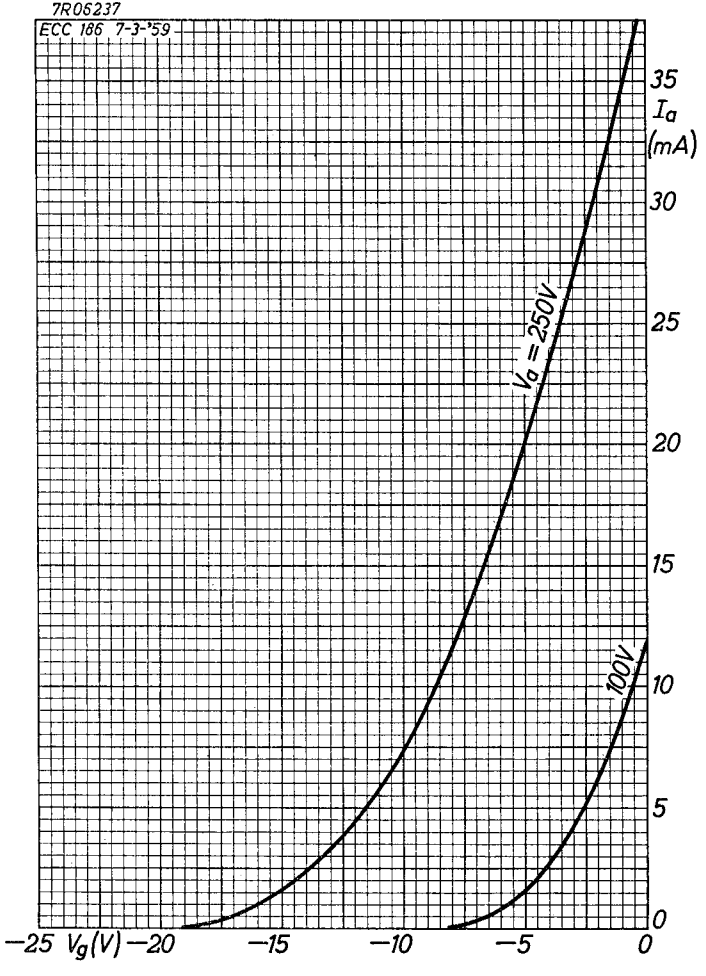
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[2]) Cathode positive with respect to the heater
Cathode positive par rapport au filament
Katode positiv in Bezug auf den Heizfaden

[3]) Series resistor; résistance série; Serienwiderstand

[4]) Voltage and insulation resistance between two arbitrary electrodes. When measured with respect to the cathode, the latter should be positive
Tension et résistance d'isolement entre deux électrodes quelconques. Quand mesuré par rapport à la cathode, celle-ci doit être positive
Spannung und Isolationswiderstand zwischen zwei willkürlichen Elektroden. Wenn in Bezug auf die Katode gemessen wird, soll diese positiv sein

PHILIPS **ECC186**



8.8.1959

A

7R06238
ECC186 7-3-59
−14 V
−16 V
−18 V
−20 V
−12
−10
−8
−6
−4
−2
0
Vg = 0 V
Wa = 2,75 W
0
50
100
150
200
250
300
350
Va (V)
25
20
15
10
5
0
Ia (mA)

PHILIPS

Electronic Tube

HANDBOOK

ECC186

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1	1	1959.10.10
2	2	1959.10.10
3	3	1959.10.10
4	A	1959.08.08
5	B	1959.08.08
6	FP	2005.05.06

R.F. DOUBLE TRIODE

Double triode with variable transconductance intended for use as V.H.F. cascode amplifier in television receivers.

HEATING: Indirect by A.C. or D.C.; parallel supply

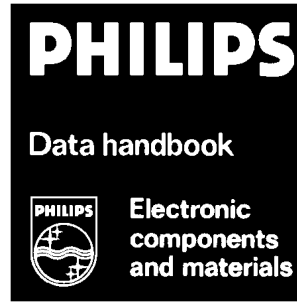
Heater voltage	V_f	6.3	V
Heater current	I_f	365	mA

LIMITING VALUES (Design centre rating system)

Cathode to heater voltage	V_{kf}	max.	50	V
	$V_{k'f(k\,pos)}$	max.	150	V [1])

For further data and curves of this type please refer to type PCC189

[1]) D.C. component max. 130 V.



ECC189

page	sheet	date
1	1	1969.01
2	FP	1999.08.10

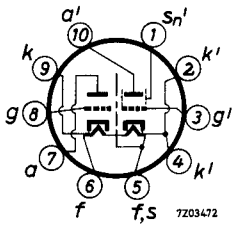
S.Q. TUBE

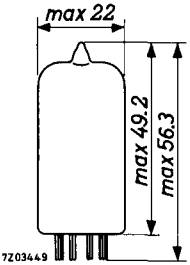
Special quality double triode with neutralisation screen, designed for use as V.H.F. amplifier (max. freq. 300 MHz) in a cascode circuit without external neutralisation, e.g. aerial amplifier for band III and frequency multiplier.

QUICK REFERENCE DATA					
Life test	10 000 hours				
Low interface resistance					
Mechanical quality	Shock and vibration resistant				
Base	10 pin miniature with gold plated pins				
Heating	Indirect A.C. or D.C.; parallel supply				
Heater voltage	V_f 6.3 V				
Heater current	I_f 335 mA				
	Input section		Output section		
Anode voltage	90	90	90	90	V
Anode current	15	27	15	27	mA
Mutual conductance	13	17.5	17	22	mA/V

DIMENSIONS AND CONNECTIONS Dimensions in mm

Base: 10 pin miniature





CHARACTERISTICS

Heater voltage		V_f	6.3		V
Heater current		I_f	335		mA
Input section (unit a', g', k')					
Anode voltage		$V_{a'}$	90	90	V
Neutralization screen voltage		$V_{Sn'}$	0	0	V
Grid voltage		$-V_{g'}$	2.1	1.4	V
Anode current		$I_{a'}$	15	27	mA
Mutual conductance		S	13	17.5	mA/V
Amplification factor		μ	27	27	
Equivalent noise resistance		R_{eq}	250	200	Ω
Output section (unit a,g,k)					
Anode voltage		V_a	90	90	V
Grid voltage		$-V_g$	2.0	1.4	V
Anode current		I_a	15	27	mA
Mutual conductance		S	17	22	mA/V
Amplification factor		μ	28	28	
Equivalent noise resistance		R_{eq}	200	150	Ω
Insulation resistance between electrodes	R_{ins}	Initial	min.	100	MΩ
		End of life	min.	20	MΩ
Leakage current between cathode and heater					
Voltage between cathode and heater V = 150 V					
Cathode positive	I_{kf}	Initial	max.	15	μA
		End of life	max.	20	μA
Voltage between cathode and heater V = 50 V					
Cathode negative	I_{kf}	Initial	max.	15	μA
		End of life	max.	20	μA

CAPACITANCES

Input system (unit a', g', k')

Grid to cathode, filament and neutralisation screen	$C_{g'/k'fsn'}$	5.1	pF
Anode to cathode, filament and neutralisation screen	$C_{a'/k'fsn'}$	5.0	pF
Grid to neutralisation screen	$C_{g'sn'}$	1.4	pF
Anode to grid	$C_{a'g'}$	0.45	pF
Anode to neutralisation screen	$C_{a'sn'}$	3.4	pF

Output system (unit a, g, k)

Cathode to grid and filament	$C_{k/gf}$	6.5	pF
Anode to grid and filament	$C_{a/gf}$	3.2	pF
Anode to cathode	C_{ak}	180	mpF
Anode to grid	C_{ag}	1.5	pF

SHOCK AND VIBRATION RESISTANCE

The following test conditions are applied to assess the mechanical quality of the tube. These conditions are not intended to be used as normal operating conditions.

Shock

The tube is subjected 5 times in each of 4 positions to an acceleration of 500 g supplied by an NRL shock machine with the hammer lifted over an angle of 30^{o}.

Vibration

The tube is subjected during 32 hours in each of 3 positions to a vibration frequency of 50 Hz with an acceleration of 2.5 g.

LIFE

Production samples are tested under the following conditions during 10 000 hours: (each unit)

Heater voltage	V_f	6.3	V
Anode supply voltage	V_{ba}	110	V
Grid supply voltage	V_{bg}	17	V
Cathode resistor	R_k	680	Ω

LIMITING VALUES (Absolute max. rating system)

(Each unit)

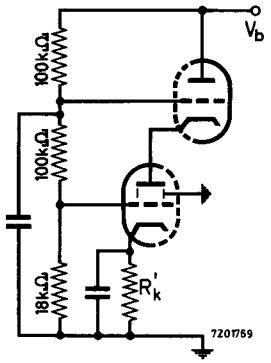
Anode voltage	V_{a_o}	max. 450	V
	V_a	max. 250	V
Anode dissipation	W_a	max. 2.7	W
Grid voltage	$-V_g$	max. 50	V
Grid peak voltage	$-V_{g_p}$	max. 150	V
Duty factor max. 1%			
Pulse duration max. 10 μs			
Cathode current	I_k	max. 40	mA
Cathode peak current	I_{k_p}	max. 400	mA
Duty factor max. 10%			
Pulse duration max. 200 μs			
Grid resistor	R_g	max. 1	MΩ
Automatic bias			
Voltage between cathode and heater			
Cathode positive	$V_{kf\ (k+)}$	max. 150	V
Cathode negative	$V_{kf\ (k-)}$	max. 50	V
Bulb temperature		max. 225	°C

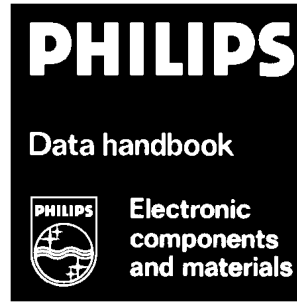
OPERATING CHARACTERISTICS

Cascode circuit, Frequency 200 MHz

Supply voltage	V_b	200	200	V
Cathode resistor	$R_{k'}$	1200	680	Ω
Anode current	I_a	15.5	26.5	mA
Input resistance	$r_{g'}$	910	670	Ω
Input capacitance	C_i	11	12	pF
Noise figure	F	2.5	2.5	kT_o

Adapted to minimum noise





ECC2000

page	sheet	date
1	1	1968.12
2	2	1968.12
3	3	1968.12
4	4	1968.12
5	5	1968.12
6	FP	2001.04.12

PHILIPS ECC 230

Low-mu DOUBLE TRIODE with separate cathodes intended for use as a series regulator tube in D.C. power supplies, for servo applications or as a booster triode

DOUBLE TRIODE à coefficient d'amplification bas avec cathodes séparées, destinée à l'utilisation comme tube régulateur série dans dispositifs d'alimentation C.C., pour applications de servo-réglage ou comme triode survoltеuse

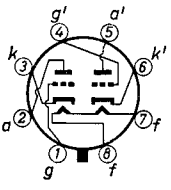
DOPPELTRIODE mit niedrigem Verstärkungsfaktor und getrennten Katoden bestimmt zur Verwendung als Serien-Regelröhre in Gleichstromspeisevorrichtungen, für Servoanwendungen oder als Zeilenschaltertriode

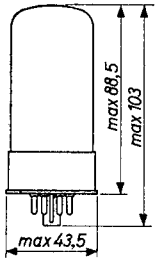
This type is interchangeable with type 6080
Ce type est interchangeable avec le type 6080
Dieser Typ ist auswechselbar mit dem Typ 6080

Heating : indirect by A.C. or D.C.; parallel supply
Chauffage: indirect par C.A. ou C.C.; alimentation parallèle
Heizung : indirekt durch Wechsel- oder Gleichstrom; Parallelspeisung

$V_f = 6{,}3$ V
$I_f = 2{,}5 \pm 0{,}24$ A

Dimensions in mm
Dimensions en mm
Abmessungen in mm





Capacitances
Capacités
Kapazitäten

$C_{ag} = 8{,}6$ pF $C_{a'g'} = 8{,}6$ pF
$C_a = 2{,}5$ pF $C_{a'} = 2{,}5$ pF
$C_g = 5{,}5$ pF $C_{g'} = 5{,}5$ pF
$C_{kf} = 7$ pF $C_{k'f} = 7$ pF
$C_{aa'} = 2{,}2$ pF
$C_{gg'} = 0{,}5$ pF

Typical characteristics (each section)
Caractéristiques types (chaque système)
Kenndaten (jedes System) [1]

V_{ba}	=	-	135	V
V_a	=	100	-	V
I_a	=	100	125	mA
R_k	=	300	250	Ω
S	=	6,5	7	mA/V
μ	=	2	2	
R_i	=	300	280	Ω

Characteristic range values for equipment design (For measuring purposes only; measuring time max. 1 sec)
Gamme des valeurs caractéristiques pour l'étude d'équipements (Pour buts de mesure seulement; temps de mesure max. 1 sec)
Charakteristischer Wertbereich für Geräteentwurf (Nur für Messzwecke; Messzeit max. 1 Sek)

V_f	=	6,3 V
V_{ba}	=	135 V
R_k	=	250 Ω
I_a	=	125 ± 25 mA
S	=	7 ±1,2 mA/V
μ	=	2 ±0,6
$-I_g$ (R_g= 1 MΩ)	=	4 μA [2]

Limiting values (absolute limits, each section)
Caractéristiques limites (limites absolues, chaque système)
Grenzdaten (Absolutwerte, jedes System)

V_{ao}	= max.	550 V
V_a	= max.	250 V
V_a invp	= max.	3 kV [3]
I_k	= max.	125 mA
$-V_{gp}$	= max.	2,3 kV [3]
W_a	= max.	13 W
V_{kfp}	= max.	300 V
R_g	= max.	1,0 MΩ [4][6]
R_g	= max.	0,1 MΩ [5][6]
t_{bulb}	= max.	200 °C

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[1] See page 3; voir page 3; siehe Seite 3
[2][3][4][5][6] See page 4; voir page 4; siehe Seite 4

Shock and vibration [7])

The tube can withstand vibrations of 2.5 g and 25 c/s during 32 hours and is proof against impact accelerations of 450 g (measured with the N.R.L. impact machine for electronic devices, lifting the hammer over an angle of 30°)

Output voltage caused by low-frequency vibrations:

V_o = max. 200 mV r.m.s.

Measured with both sections in parallel at V_f = 6.3 V, V_{ba} = 135 V, V_g = -7 V, R_a = 2 kΩ and vibrational accelerations of 2.5 g at 25 c/s

Chocs et vibrations [7])

Le tube peut resister à des vibrations de 2,5 g et de 25 Hz pendant 32 heures et à une accélération par choc de 450 g (Mesurée avec la machine N.R.L.à impact pour des dispositifs électroniques, en soulevant le marteau d'un angle de 30°

Tension de sortie par suite de vibrations à basse fréquence:

V_o = max. 200 mVeff

Mesurée avec les deux systemes en parallèle à V_f = 6,3 V, V_{ba} = 135 V, V_g = -7 V, R_a = 2 kΩ et des accélérations de vibration de 2,5 g à 25 Hz

Stösse und Schwingungen [7])

Die Röhre kann Schwingungen von 2,5 g bei 25 Hz während 32 Stunden aushalten und eine Stossbeschleunigung von 450 g vertragen (gemessen mit der N.R.L. Stossmaschine für elektronische Geräte, wobei der Hammer über einen Winkel von 30° gehoben wird)

Ausgangsspannung infolge Schwingungen niedriger Frequenz:

V_o = max. 200 mVeff

Gemessen mit den beiden Systemen parallelgeschaltet bei V_f = 6,3 V, V_{ba} = 135 V, V_g = -7 V, R_a = 2 kΩ und Schwingungsbeschleunigungen von 2,5 g bei 25 Hz

---

[1]) These values represent the setting of an average tube at the absolute limits of I_a and W_a
Ces valeurs représentent l'ajustage d'un tube moyen aux limites absolues de I_a et W_a
Diese Werte stellen die Einstellung einer mittleren Röhre dar bei den absoluten Grenzen von I_a und W_a

[7]) These test conditions are only given for evaluation of the ruggedness of the tube. They are by no means to be interpreted as suitable operating conditions
Ces conditions d'essai sont données seulement pour l'évaluation de la robustesse du tube. En aucune manière elles ne doivent être interprétées comme des conditions de fonctionnement normales
Diese Prüfbedingungen dienen lediglich zur Beurteilung der Robustheit der Röhre und sind keinesfalls als geeignete Betriebsbedingungen aufzufassen

[2]) Both sections in parallel
Les deux systèmes en parallèle
Beide Systeme parallelgeschaltet

[3]) In booster scanning service; max. pulse duration 15 % of a cycle with a maximum of 10 µsec
En service comme triode survolteuse; durée de l'impulsion max. 15 % d'un cycle avec un maximum de 10 µsec
Bei Verwendung als Zeilenschaltertriode; max. Impulsdauer 15 % einer Periode mit einem Maximum von 10 µSek

[4]) Automatic bias
Polarisation automatique
Automatische Gittervorspannung

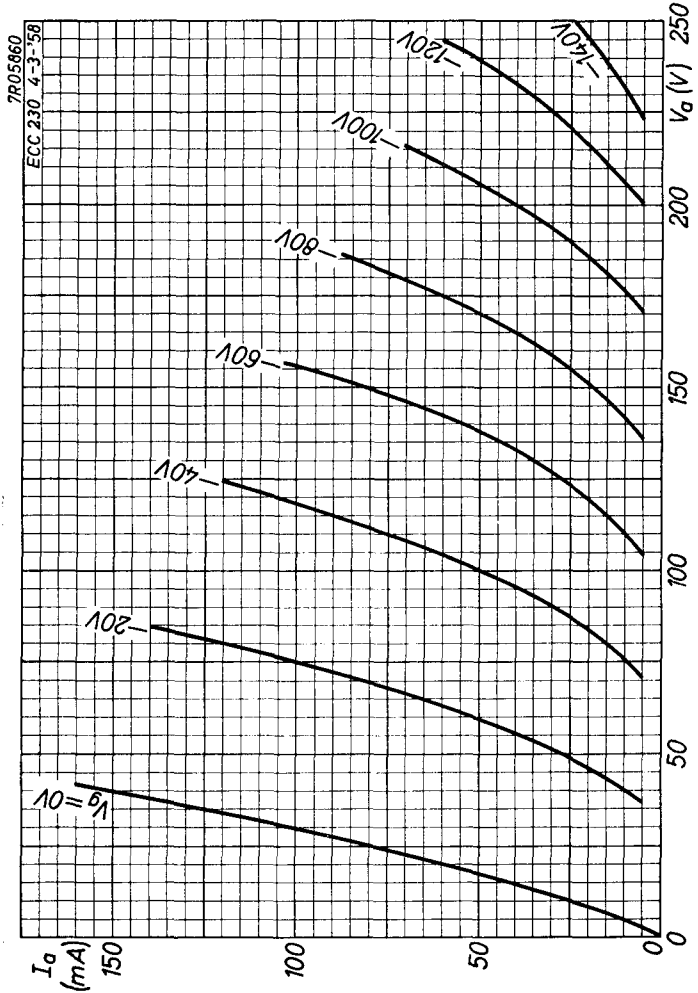
[5]) Fixed bias
Polarisation fixe
Feste Gittervorspannung

[6]) Automatic bias is recommended. With fixed bias the anode circuit should contain a protective resistance to provide a minimum voltage drop of 15 V D.C. at the normal operating conditions. When two or more sections are used in parallel at dissipations approaching the rated maximum, separate anode and cathode resistors must be used to advance load sharing. In the case combined fixed and automatic bias is used, the cathode bias portion should have a minimum value of 7.5 V D.C. at the normal operating conditions
R_g in this case is max. 0.1 MΩ

Polarisation automatique est recommandée. A polarisation fixe le circuit de l'anode doit contenir une résistance de protection pour obtenir une chute de la tension continue de 15 V au moins aux conditions de fonctionnement normales. Quand deux ou plus de systèmes sont utilisés en parallèle à des dissipations s'approchantes du maximum indiqué il faut utiliser des résistances anodiques et cathodiques séparées pour avancer la division de la charge. Dans le cas où une combination de polarisation fixe et polarisation automatique est utilisée la partie de polarisation automatique doit avoir une valeur de 7,5 V de tension continue au moins aux conditions de fonctionnement normales
La valeur de R_g dans ce cas est de 0,1 MΩ au max.

Automatische Gittervorspannung wird empfohlen. Bei fester Gittervorspannung muss in den Anodenkreis ein Schutzwiderstand aufgenommen werden zur Erhaltung eines minimalen Gleichspannungsabfalles von 15 V bei den normalen Betriebsverhältnissen. Wenn 2 oder mehrere Systeme parallel verwendet werden bei etwa der maximal zulässigen Anodenverlustleistung soll man getrennte Anoden- und Katodenwiderstände benützen zur Förderung der Belastungsteilung. Für den Fall eine Kombination von fester und automatischer Gittervorspannung verwendet wird soll die automatische Vorspannung einen Mindestwert von 7,5 V Gleichspannung haben bei den normalen Betriebsverhältnissen
R_g in diesem Fall ist max. 0,1 MΩ

PHILIPS ECC230



3.3.1958

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PHILIPS

Electronic Tube

HANDBOOK

ECC230

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1	1	1958.03.03
2	2	1958.03.03
3	3	1958.03.03
4	4	1958.03.03
5	A	1958.03.03
6	FP	1999.06.20

ECC33

TWIN TRIODE (Separate Cathodes)

HEATER (The heaters of the two cathodes are connected in series)

V_h	6.3	V
I_h	0.4	A

CAPACITANCES

$C_{a'-a"}$	0.75	$\mu\mu$F
C_{a-g} (each section)	2.5	$\mu\mu$F
C_{in} (each section)	3.5	$\mu\mu$F
C_{out}'	1.2	$\mu\mu$F
$C_{out}"$	1.5	$\mu\mu$F

CHARACTERISTICS (each section)

V_a	250	V
V_g	-4.0	V
I_a	9.0	mA
g_m	3.6	mA/V
μ	35	
r_a	9,700	Ω

LIMITING VALUES (each section)

$V_{a(b)}$ max.	300	V
V_a max.	550	V
p_a max.	2.5	W
I_k max.	20	mA
R_{g-k} max.	1.5	MΩ
V_{h-k} max.	100	V
R_{h-k} max.	20,000	Ω

OPERATING CONDITIONS AS R.C. COUPLED A.F. AMPLIFIER

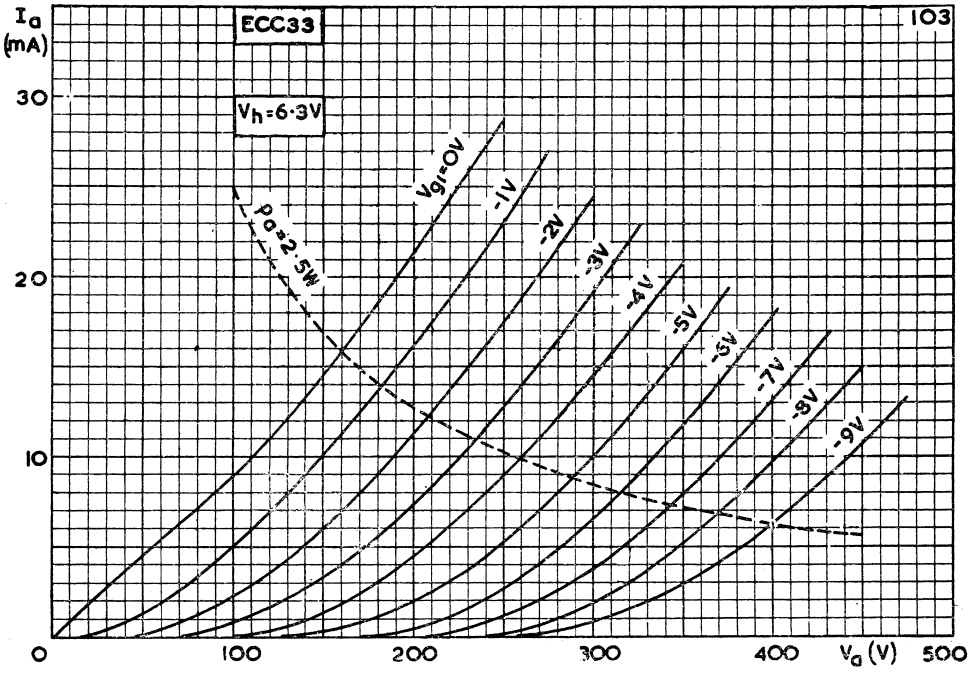
V_b (V)	R_a (Ω)	I_a (mA)	R_k (Ω)	V_{out} V_{in}	*V_{out} (V)	D_{tot} (%)	**R_{g1} (Ω)
400	47,000	4.0	1200	25.5	74	6.1	150,000
350	47,000	3.5	1200	25	62.5	5.9	150,000
300	47,000	3.0	1200	25	50	5.6	150,000
250	47,000	2.5	1200	25	41	5.6	150,000
200	47,000	2.0	1200	24.5	30.5	5.3	150,000
400	100,000	2.05	2200	28	78.5	5.7	330,000
350	100,000	1.8	2200	27.5	66.5	5.6	330,000
300	100,000	1.55	2200	27	54.5	5.6	330,000
250	100,000	1.3	2200	27	43	5.4	330,000
200	100,000	1.05	2200	26.5	43	5.2	330,000
400	220,000	1.1	3900	28	74.5	5.1	680,000
350	220,000	0.98	3900	28	63	5.0	680,000
300	220,000	0.83	3900	28	51	5.0	680,000
250	220,000	0.7	3900	27.5	41	4.8	680,000
200	220,000	0.53	3900	27	30.5	4.8	680,000

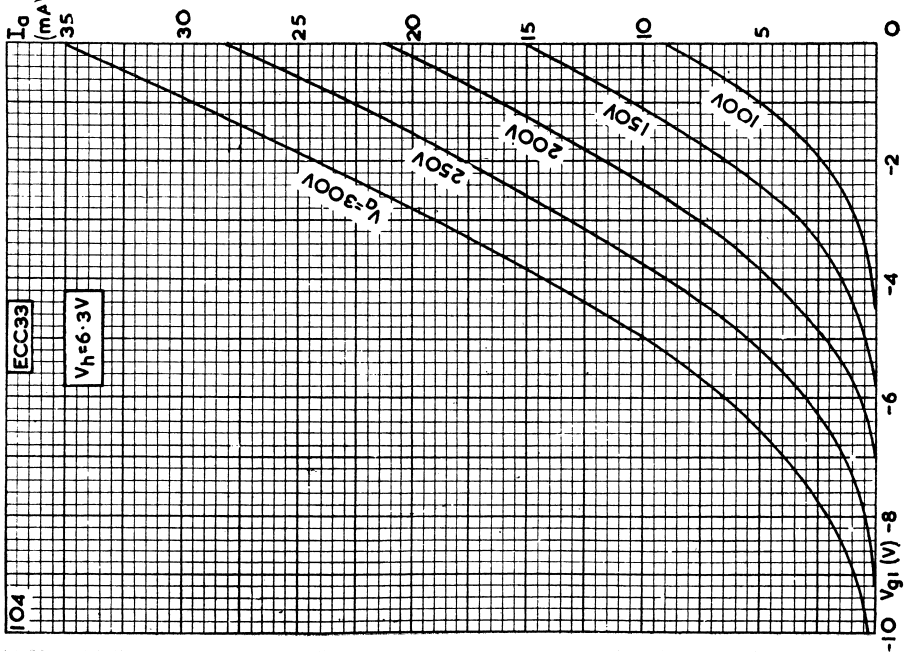
* Output voltage at the start of I_{g1}. At output voltages lower than those shown, the distortion is approximately proportional to voltage.

** Grid resistor of following valve.

ECC33

TWIN TRIODE (Separate Cathodes)





PHILIPS
RADIO and TELEVISION
MANUAL

Compiled by
E. G. BEARD, S.M.I.R.E., (Aust.)



PHILIPS ELECTRICAL INDUSTRIES OF AUSTRALIA PTY. LTD.
SYDNEY, AUSTRALIA

SECOND EDITION — JANUARY, 1952

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ECC34

TWIN TRIODE (Separate Cathodes)

HEATER

V_h	6.3	V
I_h	0.95	A

CAPACITANCES

c_{a-a}		0.48	μμF
Each Section	c_{a-g}	4.0	μμF
	c_{g-k}	3.5	μμF
	c_{a-k}	1.8	μμF

TYPICAL OPERATING CONDITIONS

V_a	250	V
I_a	10	mA
V_g	-1ℓ	V
g_m	2.2	mA/V
r_a	5,200	ohms
μ	11.5	

LIMITING VALUES

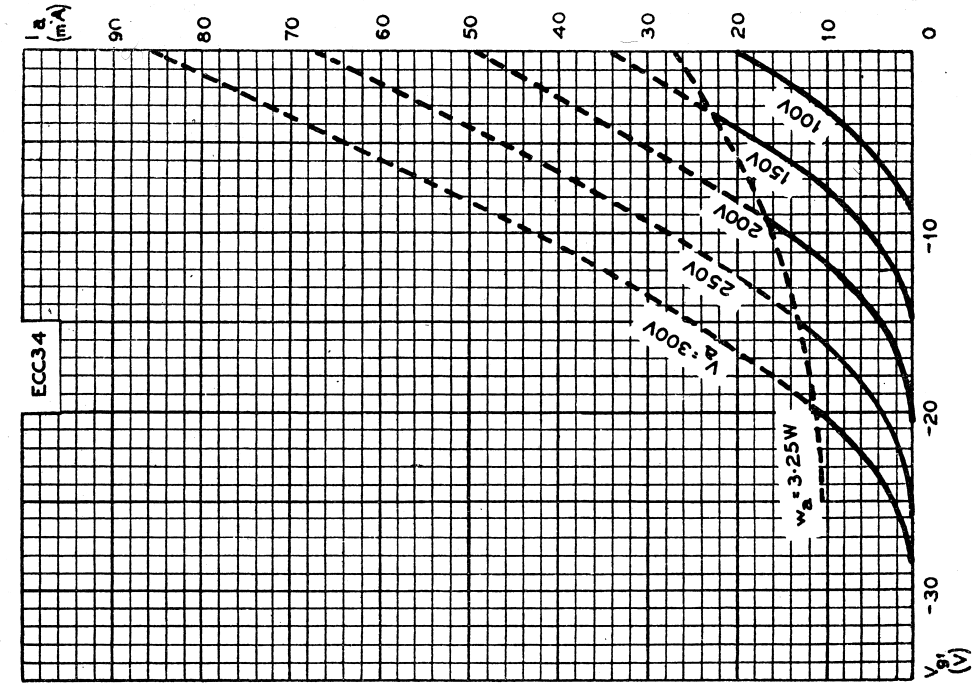
$V_{a(b)}$ max.	550	V
V_a max.	300	V
w_a max.	3.25	W
I_k max.	50	mA
V_{h-k} max.	50	V
R_{h-k} max.	20,000	ohms
R_{gl} max.	2.0	M. ohms

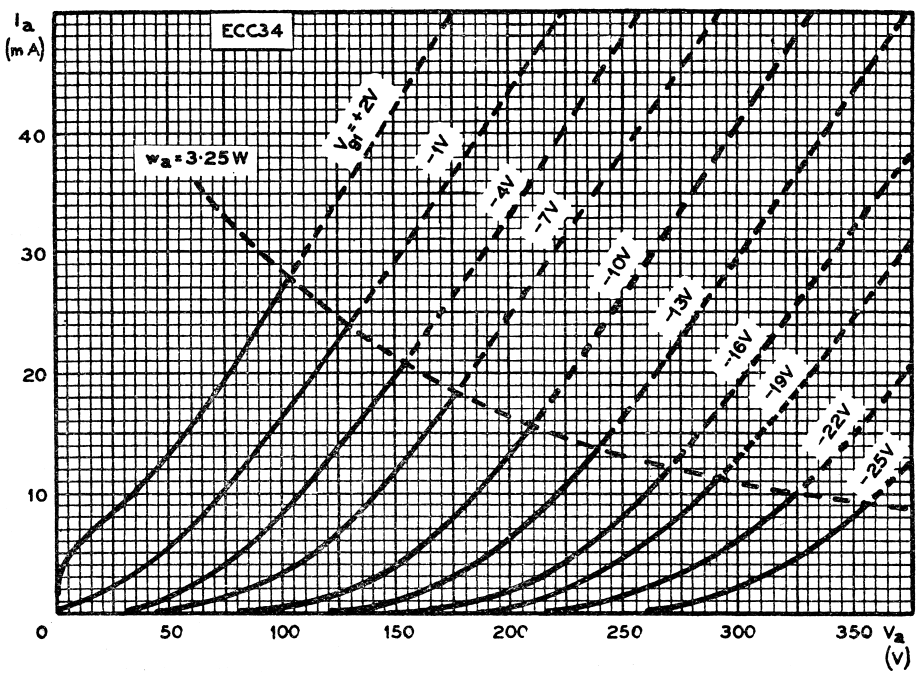
DIMENSIONS

ARRANGEMENT OF ELECTRODES AND BASE CONNECTIONS

ECC34

(Continued)





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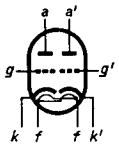
SECOND EDITION — JANUARY, 1952

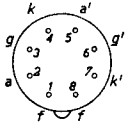
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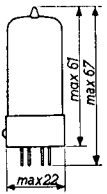
DOUBLE TRIODE for use as L.F. amplifier, phase inverter and output valve
DOUBLE TRIODE pour utilisation en amplificatrice B.F., tube inverseur de phase et tube de sortie
DOPPELTRIODE zur Verwendung als N.F.Verstärker, Phasenumkehrröhre und Endröhre

Heating:	indirect by A.C. or D.C.; parallel supply	
Chauffage:	indirect par C.A. ou C.C.; alimentation en parallèle	V_f = 6,3 V I_f = 0,6 A
Heizung:	indirekt durch Wechsel- oder Gleichstrom; Parallelspeisung	

Dimensions in mm
Dimensions en mm
Abmessungen in mm







Base, culot, Sockel: RIMLOCK

Capacitances Capacités Kapazitäten	C_a = 1,1 pF	$C_{a'}$ = 0,55 pF	$C_{aa'}$ <0,8 pF
	C_{ag} = 2,7 pF	$C_{a'g'}$ = 2,8 pF	$C_{gg'}$ <0,1 pF
	C_g = 2,8 pF	$C_{g'}$ = 2,6 pF	$C_{ag'}$ <0,1 pF
	C_{gf} < 0,1 pF	$C_{g'f}$ < 0,1 pF	$C_{a'g}$ <0,1 pF
	C_{kf} = 3,0 pF	$C_{k'f}$ = 3,0 pF	

This valve can be used without special precautions against microphonic effect in circuits in which the input voltage $V_i \geq$ 5 mV for an output of 50 mW of the output valve

Ce tube peut être utilisé sans précautions spéciales contre l'effet microphonique dans des circuits dont la tension d'entrée $V_i \geq$ 5 mV pour une puissance de 50 mW du tube de sortie

Diese Röhre darf ohne spezielle Massnahmen gegen Mikrophonie verwendet werden in Schaltungen die für eine Eingangsspannung $V_i \geq$ 5 mV eine Leistung von 50 mW der Endröhre ergeben

Operating conditions as output valve, class A (1 system)
Caractéristiques d'utilisation comme tube de sortie, classe A (1 système)
Betriebsdaten als Endröhre, Klasse A (1 System)

V_a	=	250 V
I_a	=	6 mA
V_g	=	-5,6 V
S	=	2,9 mA/V
μ	=	32
R_i	=	11 kΩ
R_a	=	15 kΩ
V_i	=	3,9 V_{eff}
W_o	=	280 mW
d_{tot}	=	8,5 %
$R_{eq\ lf}$	=	150 kΩ

Operating conditions as output valve, class A (2 systems in push-pull)
Caractéristiques d'utilisation comme tube de sortie, classe A (2 systèmes en push-pull)
Betriebsdaten als Endröhre, Klasse A (2 Systeme in Gegentaktschaltung)

V_a	=	250		V
R_k	=	560		Ω
$R_{aa'}$	=	30		kΩ
V_i	=	0	4,1	V_{eff}
I_a	=	2x5,2	2x5,6	mA
W_o	=	0	520	mW
d_{tot}	=	-	1,0	%

Operating conditions as L.F. amplifier (1 system)
Caractéristiques d'utilisation comme amplificatrice B.F. (1 système)
Betriebsdaten als N.F. Verstärker (1 System)

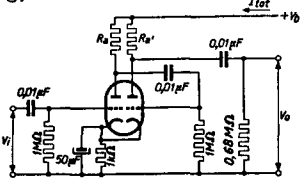
V_b (V)	R_a (kΩ)	R_g (MΩ)	R_g [2]) (MΩ)	R_k (Ω)	I_a (mA)	$\frac{V_o}{V_i}$	V_o [1]) (V_{eff})	d_{tot} (%)
400	47	1	0,15	1200	4,1	21	72	4,4
350	47	1	0,15	1200	3,6	20	60	4,1
300	47	1	0,15	1200	3,1	20	50	4,0
250	47	1	0,15	1200	2,6	20	40	3,8
200	47	1	0,15	1200	2,0	20	30	3,4

[1])[2]) See page 3; voir page 3; siehe Seite 3.

L.F. amplifier (1 system), continued
Amplificatrice B.F. (1 système), continuation
N.F. Verstärker (1 System), Fortsetzung

Vb (V)	Ra (kΩ)	Rg (MΩ)	Rg'[2] (MΩ)	Rk (Ω)	Ia (mA)	Vo/Vi	Vo[1] (Veff)	dtot (%)
400	100	1	0,33	2200	2,2	24	76	3,9
350	100	1	0,33	2200	1,9	24	65	3,9
300	100	1	0,33	2200	1,6	24	54	3,8
250	100	1	0,33	2200	1,4	24	44	3,7
200	100	1	0,33	2200	1,1	24	33	3,6
400	220	1	0,68	3900	1,1	25	72	3,8
350	220	1	0,68	3900	1,0	25	63	3,7
300	220	1	0,68	3900	0,87	25	53	3,7
250	220	1	0,68	3900	0,72	25	44	3,6
200	220	1	0,68	3900	0,58	24	32	3,5

Operating conditions as L.F.amplifier (2 systems in cascade connection)
Caractéristiques d'utilisation comme amplificatrice B.F. (2 systèmes en connexion en cascade)
Betriebsdaten als N.F. Verstärker (2 Systeme in Kaskadenschaltung)



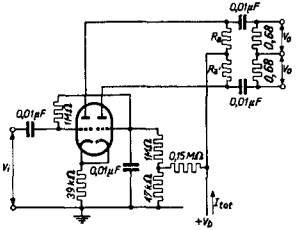
Vb (V)	Ra (MΩ)	Ra' (MΩ)	Itot (mA)	Vo/Vi	Vo (Veff)	dtot (%)
250	0,22	0,1	2,5	740	30	1,9
250	0,22	0,22	2,0	780	18	1,2

[1]) Output voltage at start of Ig1; the distortion is proportional to the output voltage
Tension de sortie au commencement de Ig1; la distorsion est proportionnel à la tension de sortie.
Ausgangsspannung beim Einsatz von Ig1; die Verzerrung ist proportional mit der Ausgangsspannung.

[2]) Grid circuit resistance of following valve
Résistance du circuit de grille du tube suivant
Gitterableitwiderstand der folgenden Röhre

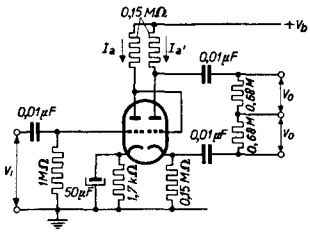
Operating characteristics as phase inverter
Caractéristiques d'utilisation comme tube inverseur de phase
Betriebsdaten als Phasenumkehrröhre

A.



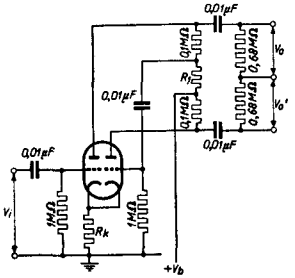
V_b (V)	R_a (MΩ)	$R_{a'}$ (MΩ)	I_{tot} (mA)	$\frac{Vo}{Vi}$	Vo (V_{eff})	d_{tot} (%)
350	0,11	0,12	4,5	12	30	0,4
250	0,11	0,12	3,0	11,5	30	0,6

B.



V_b (V)	I_a (mA)	$I_{a'}$ (mA)	$\frac{Vo}{Vi}$	Vo (V_{eff})	d_{tot} (%)
350	1,57	0,78	27	30	1,0
250	1,12	0,55	27	18	1,0

C.



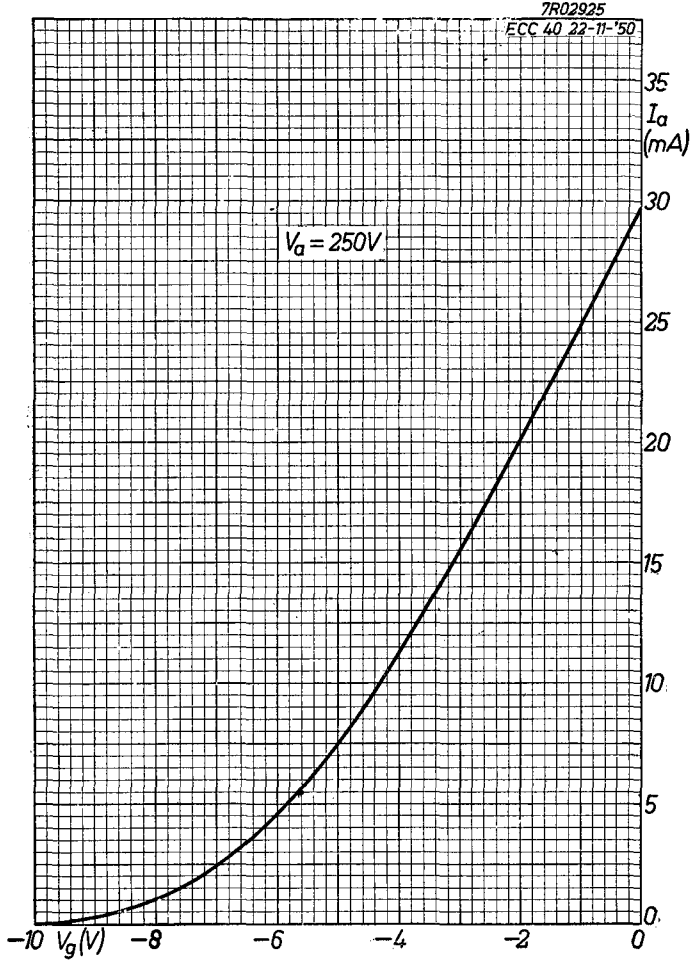
V_b (V)	R_1 (kΩ)	R_k (kΩ)	I_{tot} (mA)	$\frac{Vo}{Vi}$	$V_o=V_o'$ (V_{eff})	d_{tot} (%)	d'_{tot} (%)
350	3,8	0,75	4,3	27,5	30	1,1	0,3
250	3,9	1,0	3,0	26	30	1,5	0,5

Limiting values (per system)
Caractéristiques limites (par système)
Grenzdaten (pro System)

V_{a_o}	= max.	550 V
V_a	= max.	300 V
W_a	= max.	1,5 W
W_g	= max.	0,1 W
I_k	= max.	10 mA
V_g (I_g = +0,3 µA)	= max.	-1,3 V
R_g	= max.	1 MΩ
V_{kf}(k pos.,f neg.)	= max.	175 V
V_{kf}(k neg.,f pos.)	= max.	100 V
R_{kf}	= max.	0,15 MΩ
t_{bulb}	= max.	120 °C

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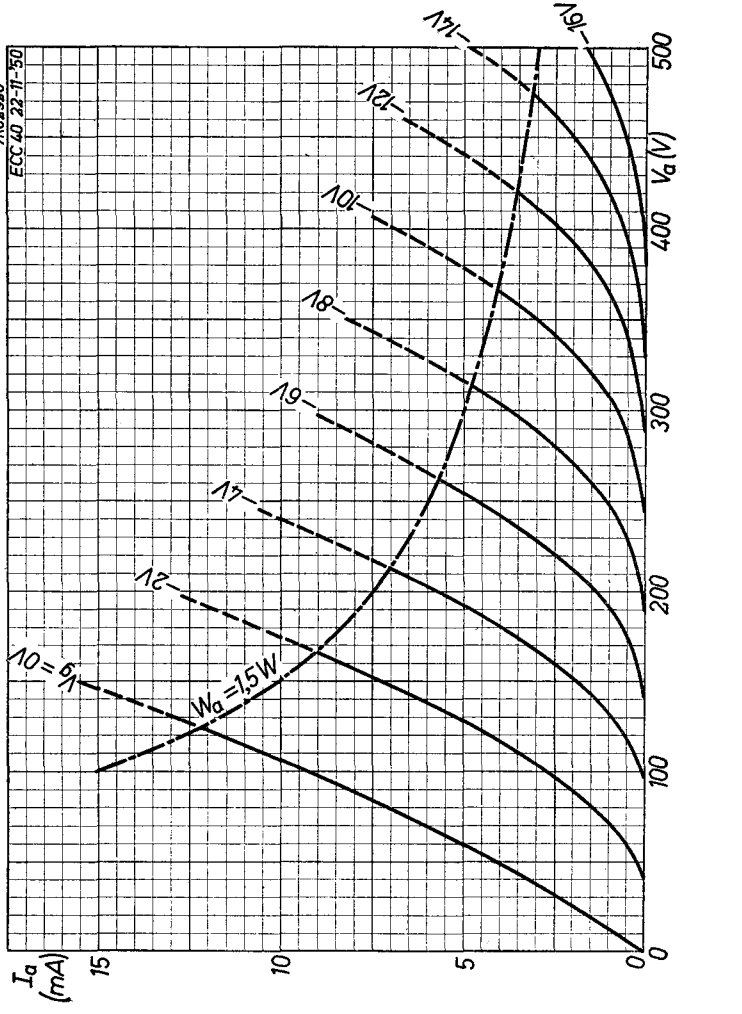
ECC 40



2.2.1951

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ECC 40 **PHILIPS**



PHILIPS

Electronic Tube

HANDBOOK

ECC40

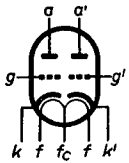
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2	2	1953.10.10
3	3	1951.06.06
4	4	1951.06.06
5	5	1953.10.10
6	A	1951.02.02
7	B	1951.02.02
8	FP	1999.04.19

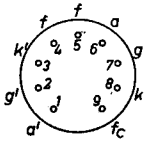
R.F.DOUBLE TRIODE for use as oscillator, mixer or amplifier in television receivers
DOUBLE TRIODE H.F. pour utilisation en oscillatrice, mélangeuse ou amplificatrice dans des récepteurs de télévision
HF-DOPPELTRIODE zur Verwendung als Oszillator, Mischröhre oder Verstärker in Fernsehempfängern

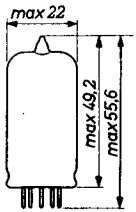
Heating : indirect by A.C. or D.C.; series or parallel supply
Cnauffage: indirect par C.A. ou C.C.; alimentation parallèle ou série
Heizung : indirekt durch Wechsel- oder Gleichstrom; Serien- oder Parallelspeisung

V_f = 6,3 V	V_f = 12,6 V
I_f = 300 mA[1])	I_f = 150 mA[1])
Pins Broches 9-(4+5) Stifte	Pins Broches 4-5 Stifte

Dimensions in mm
Dimensions en mm
Abmessungen in mm







Base, culot, Sockel: Noval

[1]) In case of series supply a current-limiting device must be inserted in the heater circuit for limiting the current when switching on.

En cas d'alimentation en série il faut utiliser un limiteur de courant pour limiter le courant près de la mise en circuit.

Bei Serienspeisung muss ein Strombegrenzer verwendet werden, damit der Heizstrom beim Einschalten begrenzt wird.

Capacitances
Capacités
Kapazitäten

C_g	= 2,3 pF	$C_{g'}$	= 2,3 pF
C_a	= 0,45 pF	$C_{a'}$	= 0,35 pF
C_{ag}	= 1,6 pF	$C_{a'g'}$	= 1,6 pF
C_{ak}	= 0,20 pF	$C_{a'k'}$	= 0,20 pF
C_{kf}	= 2,5 pF	$C_{k'f}$	= 2,5 pF
$C_{k/g+f}$	= 4,7 pF	$C_{k'/g'+f}$	= 4,7 pF
$C_{a/g+f}$	= 1,9 pF	$C_{a'/g'+f}$	= 1,8 pF
C_{gf}	< 0,17 pF	$C_{g'f}$	< 0,17 pF

$C_{aa'}$ < 0,4 pF
$C_{gg'}$ < 0,005 pF
$C_{ag'}$ < 0,07 pF
$C_{a'g}$ < 0,04 pF

Typical characteristics
Caractéristiques types
Kenndaten

V_B =	100	170	200	250 V
V_g =	-1,0	-1,0	-1,0	-2,0 V
I_a =	3,0	8,5	11,5	10 mA
S =	3,75	5,9	6,7	5,5 mA/V
μ =	62	66	70	60
R_i =	16,5	11	10,5	11 kΩ

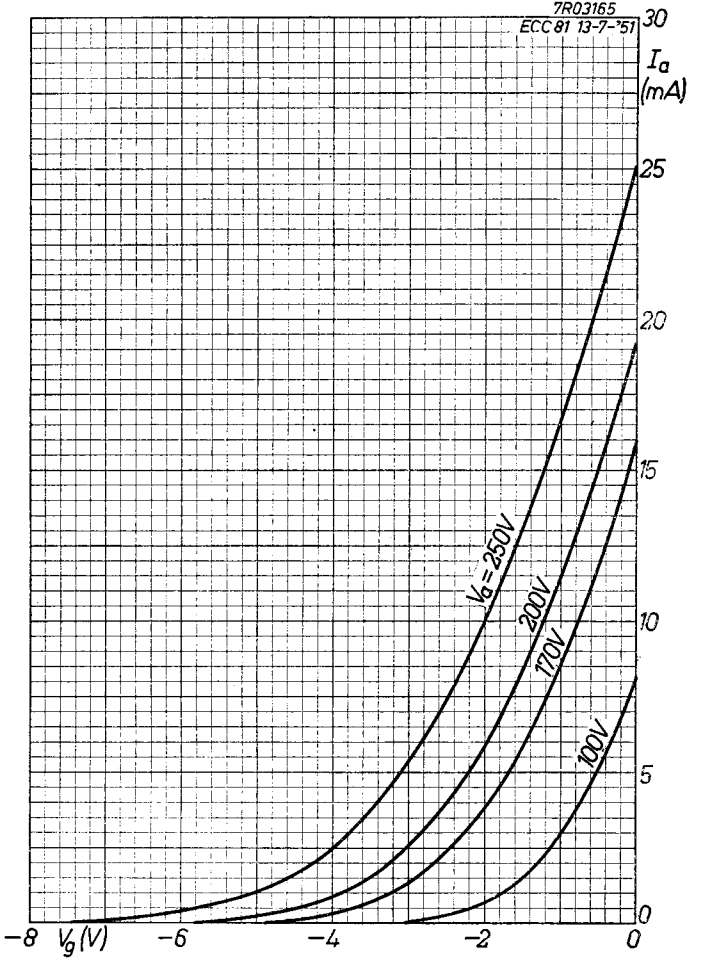
Limiting values (each section)
Caractéristiques limites (par système)
Grenzdaten (pro System)

V_{a_o}	= max. 550 V
V_a	= max. 300 V
W_a	= max. 2,5 W
I_k	= max. 15 mA
$-V_g$	= max. 50 V
R_g	= max. 1 MΩ[1])
V_g (I_g = +0,3 µA)	= max. -1,3 V
V_{kf}	= max. 90 V
R_{kf}	= max. 20 kΩ

[1]) With automatic grid bias
Avec polarisation de grille automatique
Mit automatischer Gittervorspannung

PHILIPS

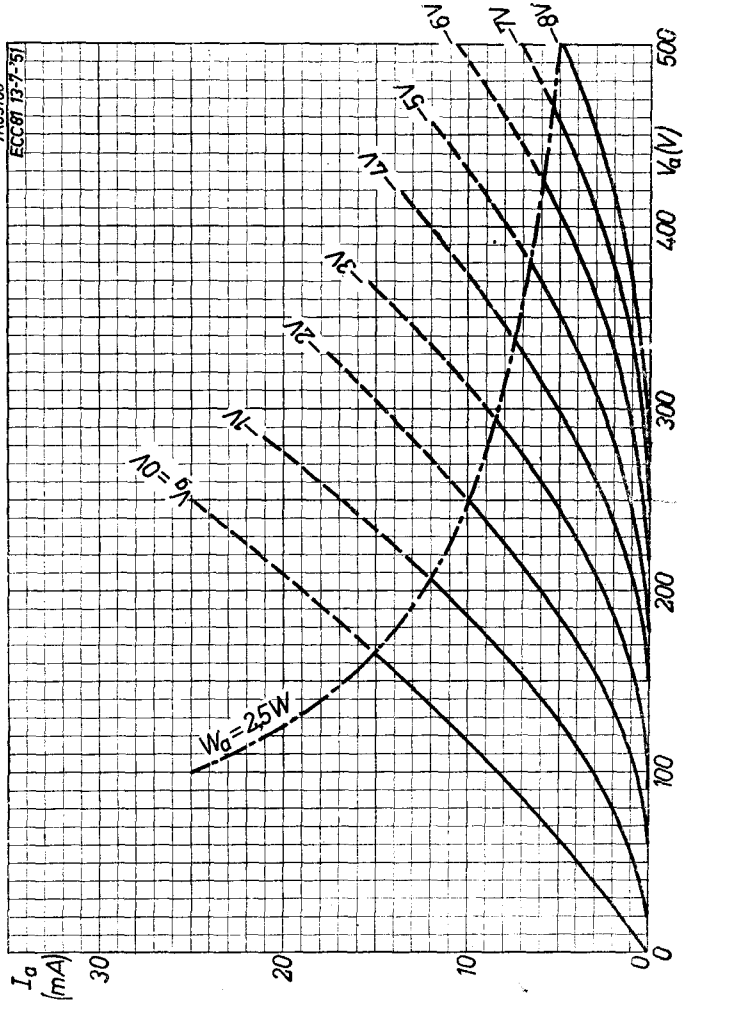
ECC 81



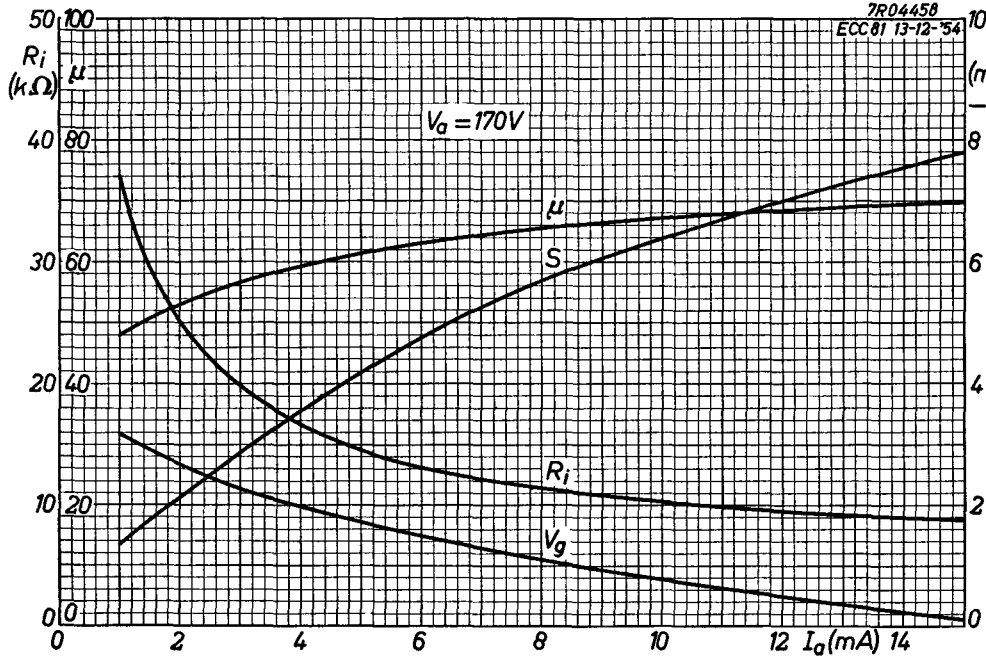
6.6.1951

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ECC 81 PHILIPS



7R04457
ECC 81 13-12-'54
S (mA/V)
−Vg (V)
Ri (kΩ)
μ
Ia (mA)
Va = 100V
μ
S
Ri
Vg

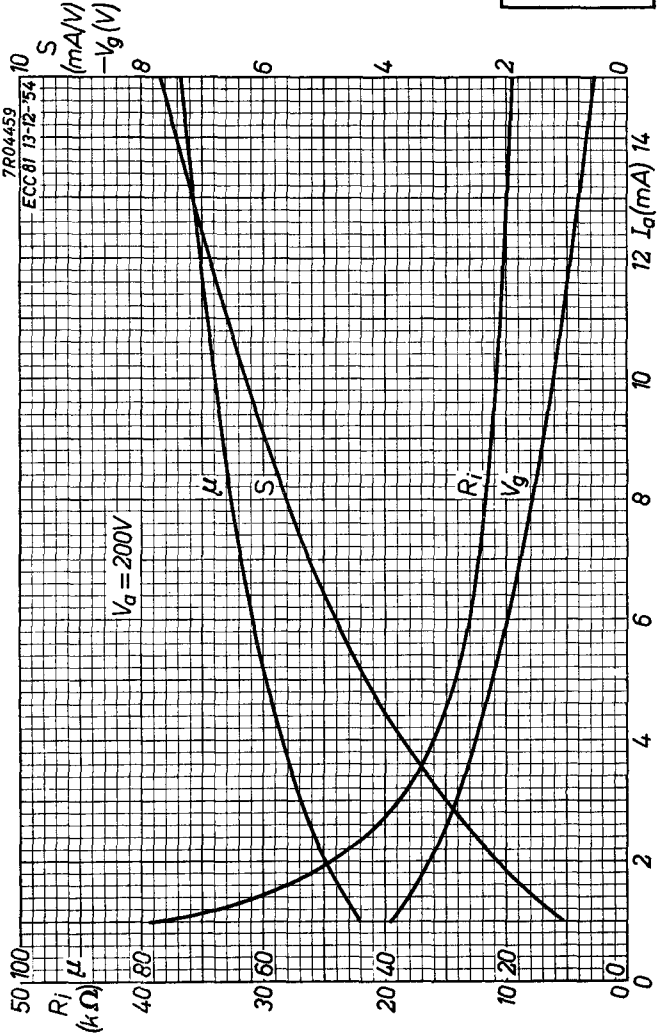


ECC 81

PHILIPS

PHILIPS

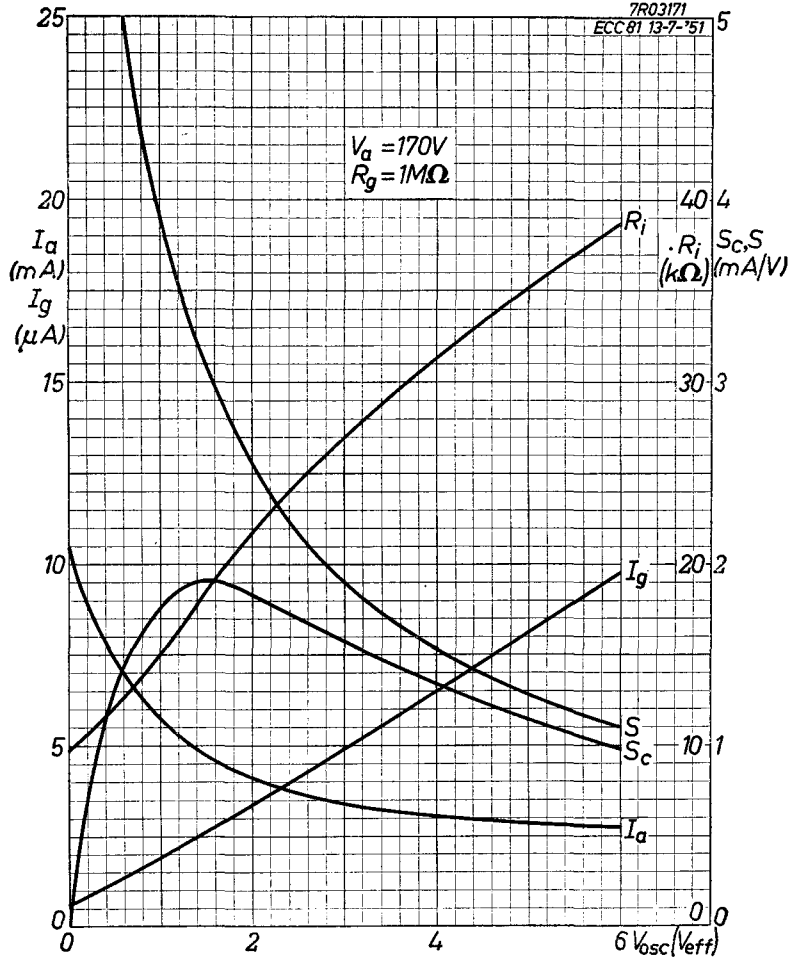
ECC 81



1.1.1955

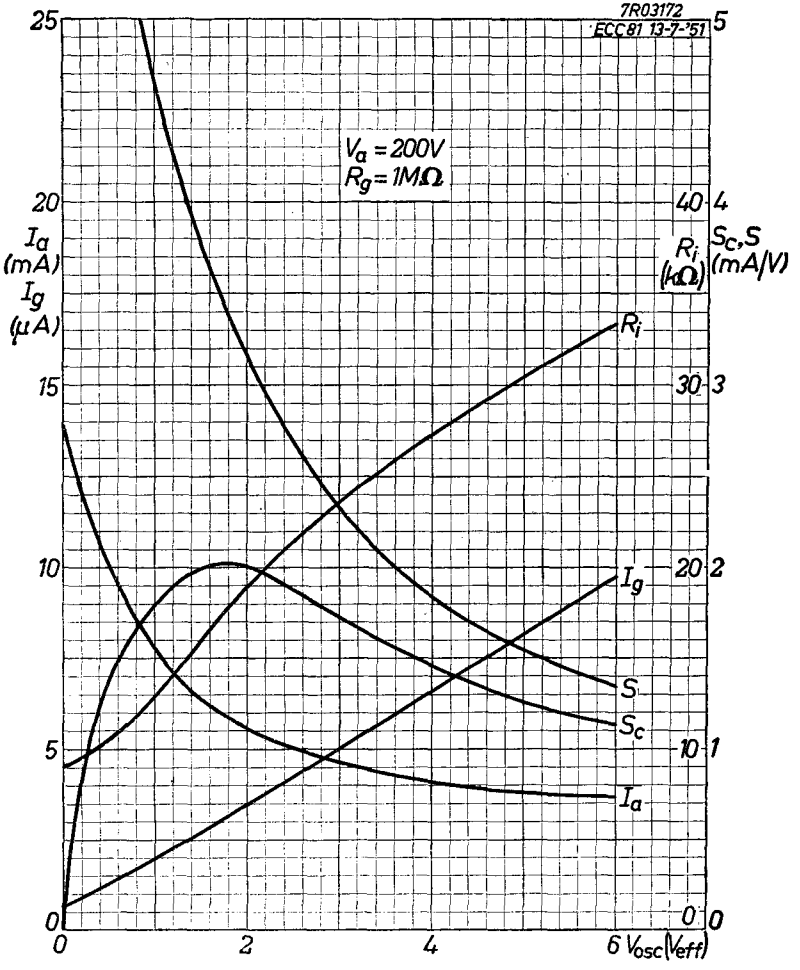
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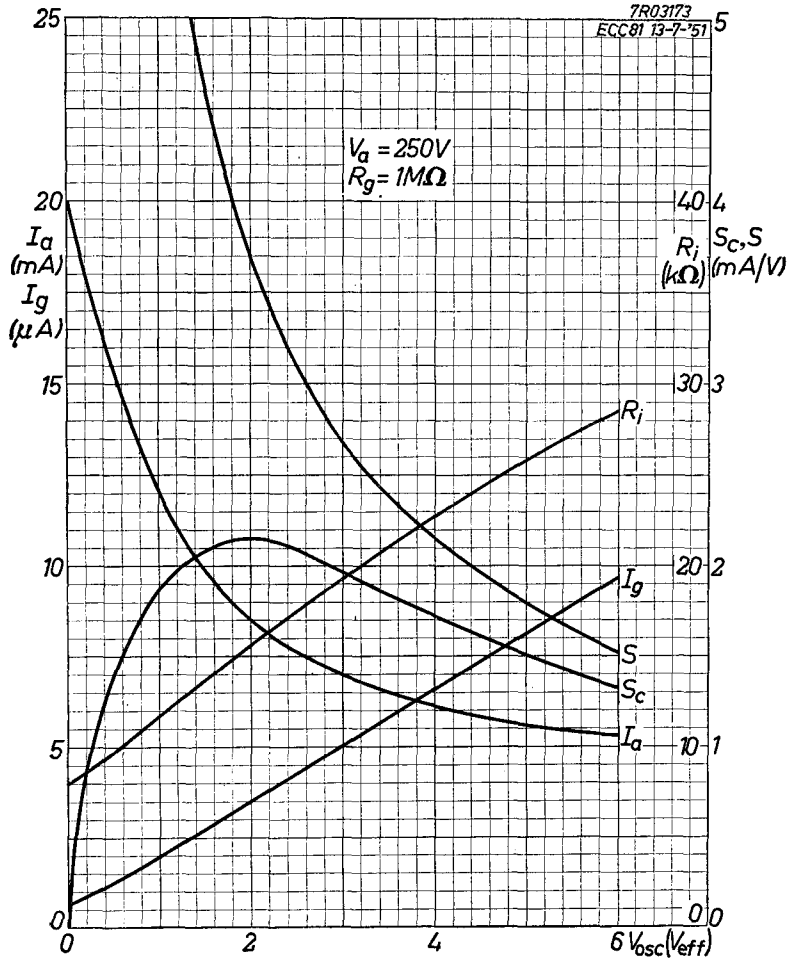
ECC 81 PHILIPS


7R03171
ECC 81 13-7-'51
V_a = 170V
R_g = 1MΩ
I_a (mA)
I_g (μA)
R_i
S_c, S (mA/V)
R_i (kΩ)
S
S_c
I_g
I_a
25
20
15
10
5
0
40
30
20
10
0
4
3
2
1
0
0
2
4
6
V_{osc} (V_{eff})

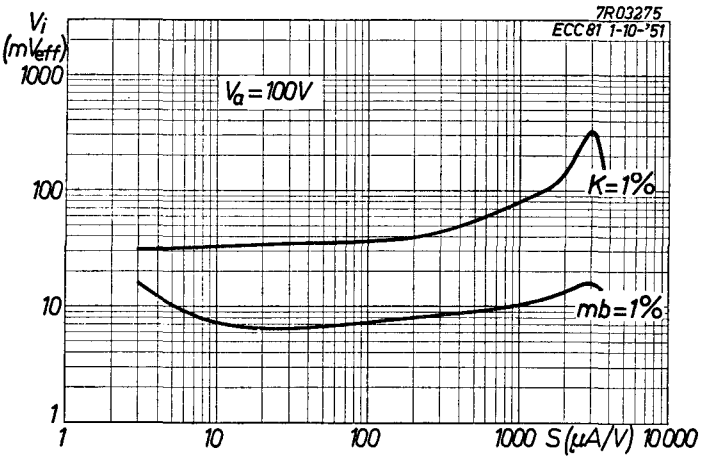
6.6.1951 G

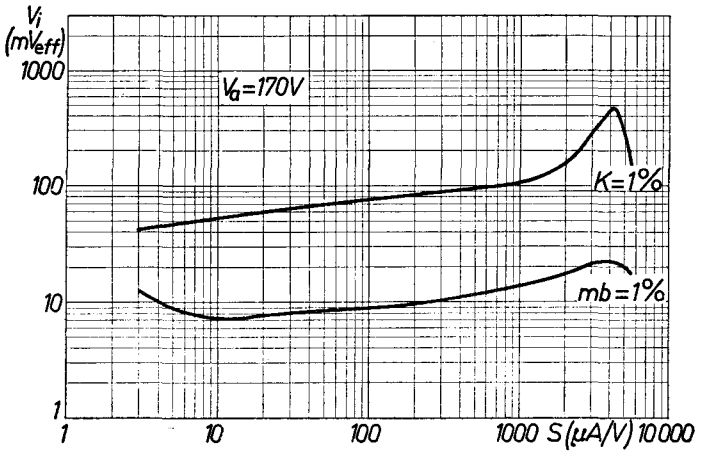
ECC 81 **PHILIPS**

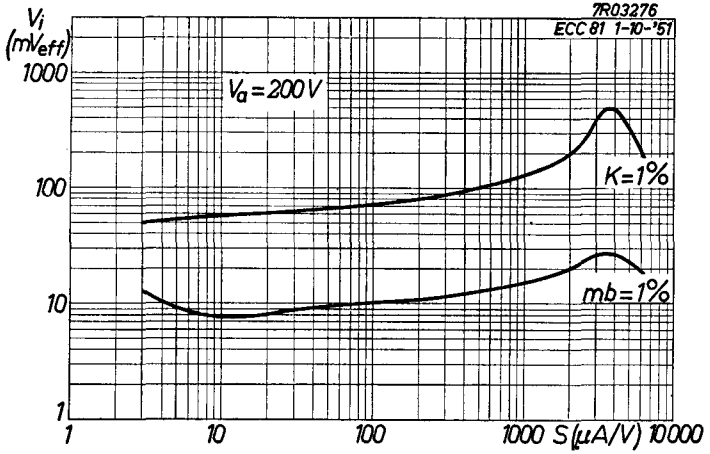


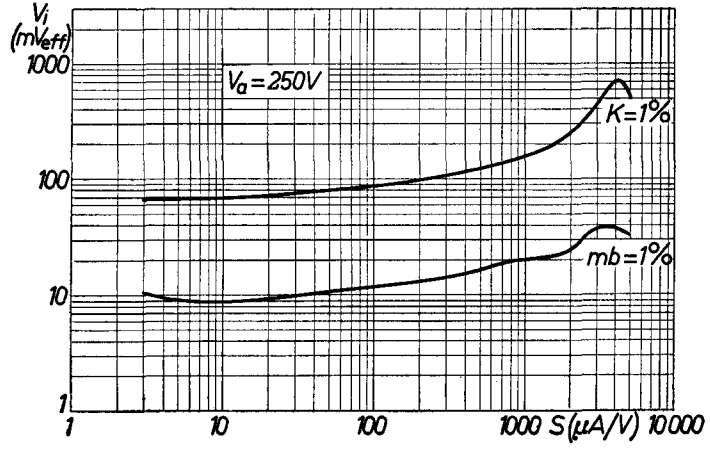

7R03173
ECC81 13-7-'51
V_a = 250V
R_g = 1MΩ
I_a (mA)
I_g (μA)
R_i (kΩ)
S_c, S (mA/V)
R_i
I_g
S
S_c
I_a
25
20
15
10
5
0
5
40
30
20
10
0
4
3
2
1
0
0
2
4
6 V_{osc} (V_{eff})

PHILIPS


7R03275
ECC 81 1-10-'51
Vi (mVeff)
1000
100
10
1
Va = 100V
K=1%
mb=1%
1
10
100
1000 S (μA/V) 10000


Vi (mVeff)
1000
100
10
1
Va = 170V
K=1%
mb=1%
1
10
100
1000 S (μA/V) 10000


7R03276
ECC 81 1-10-'51
V_i (mV_{eff})
1000
100
10
1
$V_a = 200V$
K=1%
mb=1%
1
10
100
1000 S(μA/V) 10000


V_i (mV_{eff})
1000
100
10
1
$V_a = 250V$
K=1%
mb=1%
1
10
100
1000 S(μA/V) 10000

PHILIPS

Electronic Tube

HANDBOOK

ECC81

page	sheet	date
1	1	1955.03.03
2	2	1955.03.03
3	A	1951.06.06
4	B	1951.06.06
5	C	1955.01.01
6	D	1955.01.01
7	E	1955.01.01
8	F	1955.01.01
9	G	1951.06.06
10	H	1951.06.06
11	I	1951.10.10
12	J	1951.10.10
13	K	1951.10.10
14	FP	1999.02.16

A.F. DOUBLE TRIODE

Double triode intended for use as A.F. amplifier.

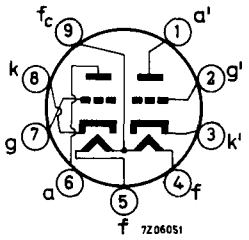
QUICK REFERENCE DATA (each unit)			
Anode current	I_a	10.5	mA
Transconductance	S	2.2	mA/V
Amplification factor	μ	17	-

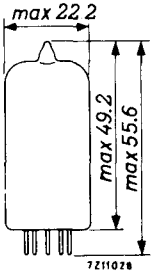
HEATING: Indirect by A.C. or D.C.; series or parallel supply

Heater voltage	V_f	6.3	12.6	V
Heater current	I_f	300	150	mA
		pins 9-(4+5)	pins 4-5	

DIMENSIONS AND CONNECTIONS Dimensions in mm

Base: Noval





REMARK

With V_f applied to pins 4+5 and 9 and the centre tap of the heater transformer connected to earth, the more favourable triode section of the tube with regard to hum is the section connected to pins 6, 7 and 8.

CAPACITANCES

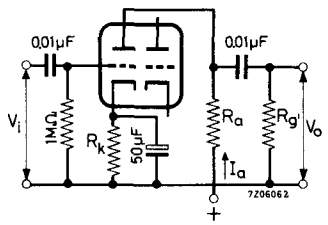
Grid to all except anode	$C_{g(a)}$		1.8	pF
	$C_{g'(a')}$		1.8	pF
Anode to all except grid	$C_{a(g)}$		0.37	pF
	$C_{a'(g')}$		0.25	pF
Anode to grid	C_{ag}		1.5	pF
	$C_{a'g'}$		1.5	pF
Grid to heater	C_{gf}	max.	0.135	pF
	$C_{g'f}$	max.	0.135	pF
Anode to anode	$C_{aa'}$	max.	1.1	pF
Anode to grid other unit	$C_{ag'}$	max.	0.11	pF
Grid to anode other unit	$C_{ga'}$	max.	0.06	pF
Grid to grid	$C_{gg'}$	max.	0.010	pF

TYPICAL CHARACTERISTICS

Anode voltage	V_a	100	250	V
Grid voltage	V_g	0	-8.5	V
Anode current	I_a	11.8	10.5	mA
Transconductance	S	3.1	2.2	mA/V
Amplification factor	μ	19.5	17	-
Internal resistance	R_i	6.25	7.7	kΩ

OPERATING CHARACTERISTICS

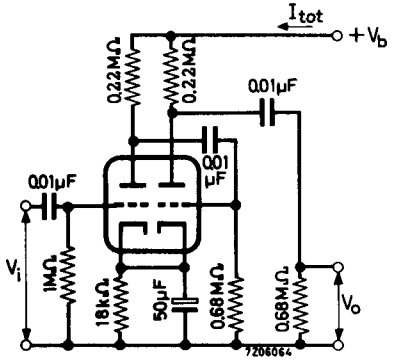
As A.F. amplifier, one unit



Supply voltage	V_b	100	150	200	250	300	350	400	V
Anode resistor	R_a	47	47	47	47	47	47	47	kΩ
Grid resistor next stage	R_g'	150	150	150	150	150	150	150	kΩ
Cathode resistor	R_k	1.2	1.2	1.2	1.2	1.2	1.2	1.2	kΩ
Anode current	I_a	1.20	1.82	2.41	3.02	3.65	4.30	5.00	mA
Voltage gain	V_o/V_i	13.5	13.5	13.5	13.5	13.5	13.5	13.5	–
Output voltage (I_g = 0.3 μA)	V_o	11	18	26	34	43	51	59	V_{RMS}
Total distortion	d_{tot}	5.6	6.1	6.3	6.4	6.5	6.6	6.7	%
Supply voltage	V_b	100	150	200	250	300	350	400	V
Anode resistor	R_a	100	100	100	100	100	100	100	kΩ
Grid resistor next stage	R_g'	330	330	330	330	330	330	330	kΩ
Cathode resistor	R_k	2.2	2.2	2.2	2.2	2.2	2.2	2.2	kΩ
Anode current	I_a	0.66	0.98	1.30	1.63	1.97	2.30	2.62	mA
Voltage gain	V_o/V_i	14	14	14	14	14	14	14	–
Output voltage (I_g = 0.3 μA)	V_o	10	17	25	32	41	49	57	V_{RMS}
Total distortion	d_{tot}	4.8	5.6	5.8	5.9	6.0	6.1	6.2	%
Supply voltage	V_b	100	150	200	250	300	350	400	V
Anode resistor	R_a	220	220	220	220	220	220	220	kΩ
Grid resistor next stage	R_g'	680	680	680	680	680	680	680	kΩ
Cathode resistor	R_k	3.9	3.9	3.9	3.9	3.9	3.9	3.9	kΩ
Anode current	I_a	0.33	0.50	0.66	0.82	0.98	1.16	1.31	mA
Voltage gain	V_o/V_i	14.5	14.5	14.5	14.5	14.5	14.5	14.5	–
Output voltage (I_g = 0.3 μA)	V_o	8	15	22	28	36	43	50	V_{RMS}
Total distortion	d_{tot}	4.0	4.4	4.7	4.8	4.9	5.0	5.1	%

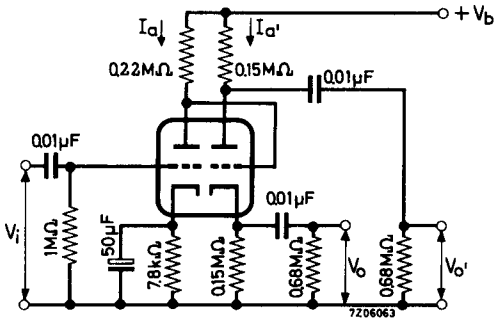
OPERATING CHARACTERISTICS (continued)

Two sections in cascade



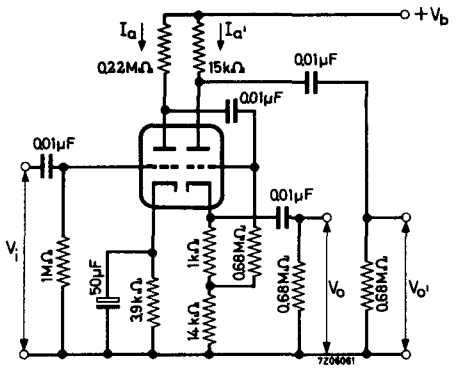
Supply voltage	V_b	250	350	V
Total current	I_{tot}	1.66	2.33	mA
Voltage gain	V_o/V_i	178	178	-
Output voltage (I_g = 0.3 μA)	V_o	15	25	V_{RMS}
Total distortion	d_{tot}	2	2	%

As phase inverter



Supply voltage	V_b	250	350	V
Anode current	I_a	0.70	1.00	mA
Anode current	I_a'	0.68	0.93	mA
Voltage gain	V_o/V_i	11	11	-
Output voltage (I_g = 0.3 μA)	V_o	15	24	V_{RMS}
Total distortion	d_{tot}	1	1	%

OPERATING CHARACTERISTICS (continued)



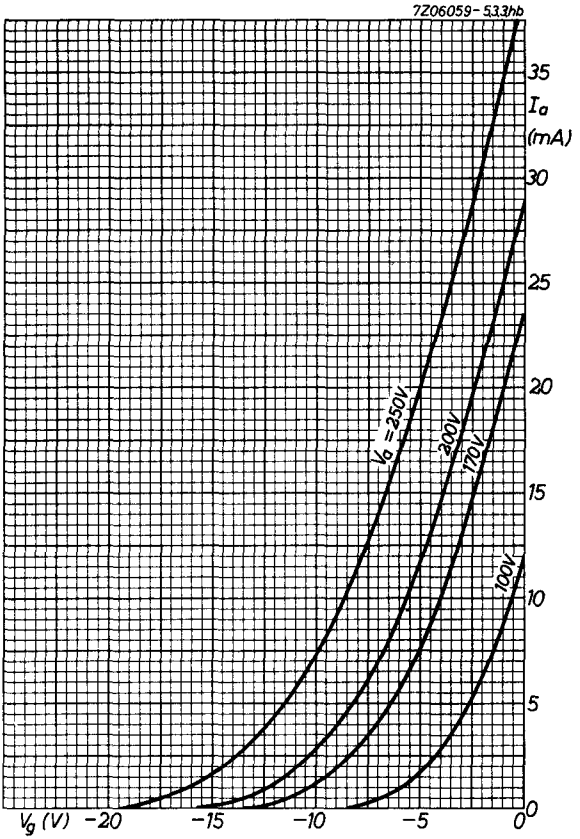
Supply voltage	V_b	250	350	V
Anode current	I_a	0.82	1.16	mA
Anode current	I_a'	4.5	6.3	mA
Voltage gain	V_o/V_i	11	11	-
Output voltage (I_g = 0.3 μA)	V_o	13	20	V_{RMS}
Total distortion	d_{tot}	1.5	1.5	%

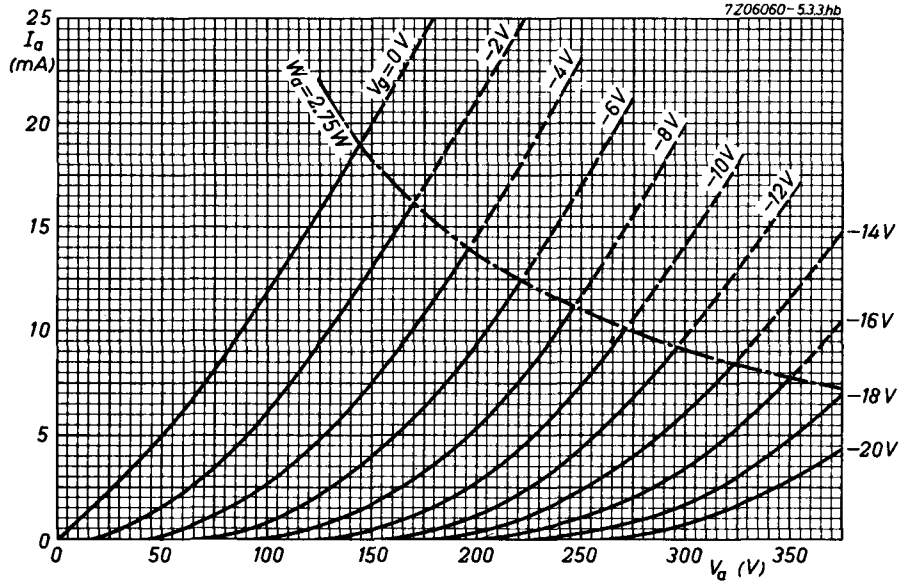
LIMITING VALUES (Design centre rating system) (each unit)

Anode voltage	V_{a_o}	max.	550	V
	V_a	max.	300	V
Anode dissipation	W_a	max.	2.75	W
Cathode current	I_k	max.	20	mA
Grid voltage	$-V_g$	max.	100	V
, peak	$-V_{gp}$	max.	250	V
Grid resistor (automatic bias)	R_g	max.	1	MΩ
Cathode to heater voltage	V_{kf}	max.	180	V
Cathode to heater circuit resistance in phase splitting circuits	R_{kf}	max.	150	kΩ

REMARK

This tube can be used without precautions against microphony in equipment in which $V_i \geqq 10$ mV for an output of 50 mW of the output tube (or $V_i \geqq 100$ mV for 5 W output) provided that the average acceleration of the tube is not greater than indicated in the section "Microphonic effect" of the "Application Directions". When the centre tap of the heater transformer has been earthed, $R_g \leqq 0.3$ MΩ and R_k is sufficiently decoupled, the disturbance level for hum and noise will then be better than 60 dB below 100 mV.


7Z06059-5333hb
35
I_a
(mA)
30
25
20
15
10
5
0
V_b = 250V
200V
170V
100V
V_g (V) -20
-15
-10
-5
0


7Z06060-533hb
25
I_a
(mA)
20
15
10
5
0
0
50
100
150
200
250
300
350
V_a (V)
W_a=2.75W
V_g=0V
-2V
-4V
-6V
-8V
-10V
-12V
-14V
-16V
-18V
-20V

PHILIPS

Data handbook

Electronic components and materials

ECC82

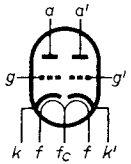
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2	2	1969.01
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6	6	1969.01
7	7	1969.01
8	8	1969.01
9	FP	1999.08.14

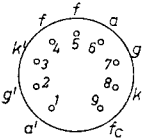
DOUBLE HIGH MU TRIODE
DOUBLE TRIODE à coefficient d'amplification élevé
DOPPELTRIODE mit grossem Verstärkungsfaktor

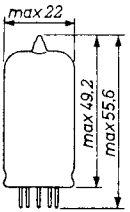
Heating : indirect by A.C. or D.C.; series or parallel supply
Chauffage: indirect par C.A. ou C.C.; alimentation série ou parallèle
Heizung : indirekt durch Wechsel-oder Gleichstrom; Serien- oder Parallelspeisung

V_f	= 6,3 V	= 12,6 V
I_f	= 300 mA[1])	= 150 mA[1])
Pins Broches Stifte	9-(4+5)	Pins Broches Stifte 4-5

Dimensions in mm
Dimensions en mm
Abmessungen in mm







Base, culot, Sockel: NOVAL

Capacitances
Capacités
Kapazitäten

C_g = 1,6 pF	$C_{aa'}$ < 1,2 pF	$C_{g'}$ = 1,6 pF
C_a = 0,46 pF	$C_{a'g}$ < 0,1 pF	$C_{a'}$ = 0,34 pF
C_{ag} = 1,7 pF	$C_{ag'}$ < 0,1 pF	$C_{a'g'}$ = 1,7 pF
C_{gf} < 0,15 pF	$C_{gg'}$ < 0,01 pF	$C_{g'f}$ < 0,15 pF

[1]) In case of series supply a current-limiting device must be inserted in the heater circuit for limiting the current when switching on.

En cas d'alimentation série il faut utiliser un limiteur de courant pour limiter le courant près de la mise en circuit.

Bei Serienspeisung muss ein Strombegrenzer verwendet werden, damit der Heizstrom beim Einschalten begrenzt wird.

PHILIPS

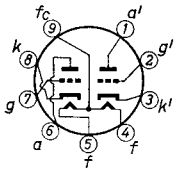
ECC 83

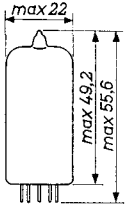
DOUBLE HIGH MU TRIODE
DOUBLE TRIODE à coefficient d'amplification élevé
DOPPELTRIODE mit grossem Verstärkungsfaktor

Heating : indirect by A.C. or D.C.; series or parallel supply
Chauffage: indirect par C.A. ou C.C.; alimentation série ou parallèle
Heizung : indirekt durch Wechsel- oder Gleichstrom; Serien- oder Parallelspeisung

V_f	= 6,3 V	V_f	= 12,6 V
I_f	= 300 mA	I_f	= 150 mA
Pins Broches Stifte	9-(4+5)	Pins Broches Stifte	4-5

Dimensions in mm
Dimensions en mm
Abmessungen in mm





Base, culot, Sockel: NOVAL

→ Capacitances
Capacités
Kapazitäten

C_g = 1,6 pF	$C_{aa'}$ < 1,2 pF	$C_{g'}$ = 1,6 pF
C_a = 0,33 pF	$C_{a'g}$ < 0,1 pF	$C_{a'}$ = 0,23 pF
C_{ag} = 1,6 pF	$C_{ag'}$ < 0,11 pF	$C_{a'g'}$ = 1,6 pF
C_{gf} < 0,15 pF	$C_{gg'}$ < 0,01 pF	$C_{g'f}$ < 0,15 pF

Typical characteristics
Caractéristiques types
Kenndaten

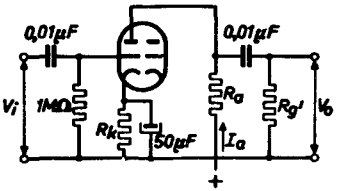
V_a	=	100	250 V
V_g	=	-1,0	-2,0 V
I_a	=	0,5	1,2 mA
S	=	1,25	1,6 mA/V
μ	=	100	100
R_i	=	80	62,5 kΩ

Typical characteristics
Caractéristiques types
Kenndaten

V_a	=	100	250 V
V_g	=	-1,0	-2,0 V
I_a	=	0,5	1,2 mA
S	=	1,25	1,6 mA/V
μ	=	100	100
R_i	=	80	62,5 kΩ

Operating characteristics as A.F. amplifier
Caractéristiques d'utilisation comme amplificateur B.F.
Betriebsdaten zur Verwendung als NF-Verstärker

A. One section; une section; ein System



a) R_a = 0,047 MΩ; R_g' = 0,15 MΩ

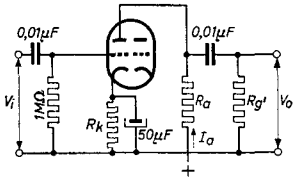
V_b (V)	R_k (Ω)	I_f (mA)	V_o (V_{eff})[1]	V_o/V_i	d_{tot} (%)[2]
200	1500	0,86	18	34	8,5
250	1200	1,18	23	37,5	7,0
300	1000	1,55	26	40	5,0
350	820	1,98	33	42,5	4,4
400	680	2,45	37	44	3,6

b) R_a = 0,1 MΩ; R_g' = 0,33 MΩ

V_b (V)	R_k (Ω)	I_a (mA)	V_o (V_{eff})[1]	V_o/V_i	d_{tot} (%)[2]
200	1800	0,65	20	50	4,8
250	1500	0,86	26	54,5	3,9
300	1200	1,11	30	57	2,7
350	1000	1,40	36	61	2,2
400	820	1,72	38	63	1,7

[1])[2]) See page 3; voir page 3; siehe Seite 3

Operating characteristics as A.F. amplifier
Caractéristiques d'utilisation comme amplificateur B.F.
Betriebsdaten zur Verwendung als NF-Verstärker



a) R_a = 0,047 MΩ; $R_{g'}$ = 0,15 MΩ

V_b (V)	R_K (Ω)	I_a (mA)	V_o (V_{eff})[1]	V_o/V_i	d_{tot} (%)[2]
200	1500	0,86	18	34	8,5
250	1200	1,18	23	37,5	7,0
300	1000	1,55	26	40	5,0
350	820	1,98	33	42,5	4,4
400	680	2,45	37	44	3,6

b) R_a = 0,1 MΩ; $R_{g'}$ = 0,33 MΩ

V_b (V)	R_K (Ω)	I_a (mA)	V_o (V_{eff})[1]	V_o/V_i	d_{tot} (%)[2]
200	1800	0,65	20	50	4,8
250	1500	0,86	26	54,5	3,9
300	1200	1,11	30	57	2,7
350	1000	1,40	36	61	2,2
400	820	1,72	38	63	1,7

c) R_a = 0,22 MΩ; $R_{g'}$ = 0,68 MΩ

V_b (V)	R_K (Ω)	I_a (mA)	V_o (V_{eff})[1]	V_o/V_i	d_{tot} (%)[2]
200	3300	0,36	24	56	4,6
250	2700	0,48	28	66,5	3,4
300	2200	0,63	36	72	2,6
350	1500	0,85	37	75,5	1,6
400	1200	1,02	38	76,5	1,1

[1]) See page 3; voir page 3; siehe Seite 3

[2]) The total harmonic distortion is about proportional to the output voltage
La distorsion non linéaire totale est environ proportionnelle à la tension de sortie
Die totale nichtlineare Verzerrung ist etwa proportional zu der Ausgangsspannung

c) R_a = 0,22 MΩ; R_g' = 0,68 MΩ

V_b (V)	R_k (Ω)	I_a (mA)	V_o (Veff)[1]	V_o/V_i	dtot (%)[2]
200	3300	0,36	24	56	4,6
250	2700	0,48	28	66,5	3,4
300	2200	0,63	36	72	2,6
350	1500	0,85	37	75,5	1,6
400	1200	1,02	38	76,5	1,1

This tube can be used without special precautions against microphonic effect in amplifiers in which the input voltage $V_i \geq 50$ mV for an output of 5 W of the output tube, the loudspeaker (η = 5%) being mounted in the near vicinity of the tube. In that case the disturbance level for hum and noise will be better than -60 dB, when the midtap of the heater has been earthed, $R_{g_1} \leq 0.5$ MΩ and the cathode resistor is sufficiently decoupled

Ce tube peut être utilisé sans precautions spéciales contre l'effet microphonique dans des amplificateurs où la tension d'entrée $V_i \geq 50$ mV pour une puissance de sortie de 5 W du tube de sortie, le haut-parleur (η = 5 %) étant monté près du tube. Dans ce cas le niveau de ronflement et de bruit sera meilleur à -60 dB, si le branchement du filament est mis à la terre, $R_{g_1} \leq 0,5$ MΩ et la résistance cathodique est découplée suffisamment

Diese Röhre darf ohne spezielle Massnahmen gegen Mikrophonie in Verstärker verwendet werden wenn die Eingangsspannung $V_i \geq 50$ mV für eine Ausgangsleistung von 5 W der Endröhre. Der Lautsprecher (η = 5%) ist hierbei in der unmittelbare Nähe der Röhre montiert. In diesem Falle wird das Brumm- und Störniveau besser sein als -60 dB, wenn die Mittelanzapfung des Heizfadens geerdet ist, $R_{g_1} \leq 0,5$ MΩ und der Katodenwiderstand genügend entkoppelt ist

---

[1]) V_o at grid current starting point
V_o au point de naissance du courant de grille
V_o beim Gitterstromeinsatzpunkt

[2]) The total harmonic distortion is about proportional to the output voltage

La distorsion non linéaire totale est environ proportionnelle à la tension de sortie

Die totale nichtlineare Verzerrung ist etwa proportional zu der Ausgangsspannung

→ Microphony and hum

This tube can be used without special precautions against microphony in equipment in which the input voltage $V_i \leq 5$ mV for an output of 50 mW (or 50 mV for an output of 5 W) provided the average acceleration of the tube is not greater than indicated in the section "Microphonic effect" of the "Application directions". In this case the disturbance level for hum and noise will be better than -60 dB when the centre tap of the heater has been earthed, $R_g \leq 0.5$ MΩ and the cathode resistor is sufficiently decoupled.

With V_f applied to pins 9 and 4+5 and the centre tap of the heater transformer connected to earth, the triode section connected to pins 6, 7 and 8 is the more favourable section of the tube with respect to hum.

→ Effet microphonique et ronflement

Ce tube peut être utilisé sans précautions spéciales contre l'effet microphonique dans tout équipement exigeant une tension d'entrée $V_i \leq 5$ mV pour fournir une puissance de 50 mW (ou 50 mV pour une puissance de 5 W), pourvue que l'accélération moyenne du tube ne soit pas plus grande que celle mentionnée dans la section "Effet microphonique" des "Indications d'application". Dans ce cas le niveau de brouillage du ronflement et du bruit sera meilleur à -60 dB, si la prise médiane du filament est reliée à la terre, $R_g \leq 0{,}5$ MΩ et la résistance cathodique est découplée satisfaisant.

Si V_f est appliquée aux broches 9 et 4+5 et la prise médiane du transformateur de chauffage est reliée à la terre, la triode reliée aux broches 6, 7 et 8 est la triode la plus favorable du tube au regard du ronflement.

→ Mikrophonie und Brumm

Diese Röhre darf ohne spezielle Massnahmen gegen Mikrophonie in Schaltungen verwendet werden, die bei einer Eingangsspannung $V_i \leq 5$ mV eine Ausgangsleistung der Endröhre von 50 mW ergeben (bezw. 50 mV für eine Leistung von 5 W), vorausgesetzt dass die mittlere Beschleunigung der Röhre nicht grösser ist als im Kapitel "Mikrophonieeffekt" der "Anwendungsrichtlinien" angegeben. In diesem Falle wird der Störpegel in Bezug auf Brumm und Rauschen besser als -60 dB sein, wenn die Mittelanzapfung des Heizfadens geerdet ist, $R_g \leq 0{,}5$ MΩ und der Katodenwiderstand genügend entkoppelt.

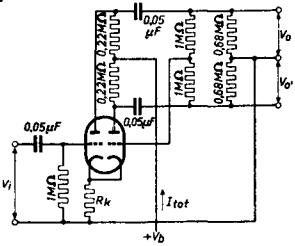
Wenn V_f an die Stifte 9 und 4+5 angelegt ist und die Mittelanzapfung des Heiztransformators mit Erde verbunden, ist die Triode die mit den Stiften 6, 7 und 8 verbunden ist mit Rücksicht auf Brumm am günstigsten.

---

[1]) V_o at grid current starting point
V_o au point de naissance du courant de grille
V_o beim Gitterstromeinsatzpunkt

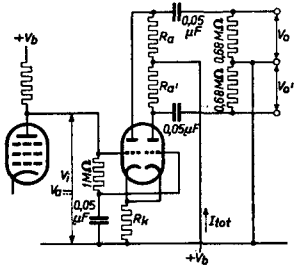
Operating characteristics as phase inverter
Caractéristiques d'utilisation comme tube inverseur de phase
Betriebsdaten als Phasenumkehrröhre

A.



V_b	=	250	350 V
R_k	=	1200	820 Ω
I_{tot}	=	1,08	1,70 mA
V_o [1]	=	35	45 Veff
V_o/V_i	=	58	62
d_{tot} [2]	=	5,5	3,5 %

B.



V_b	=	250	350 V
V_a	=	65	90 V
I_{tot}	=	1	1,2 mA
R_k	=	68	82 kΩ
R_a	=	0,1	0,15 MΩ
R_a'	=	0,1	0,15 MΩ
V_o [1]	=	20	35 Veff
V_o/V_i	=	25	27
d_{tot} [2]	=	1,8	1,8 %

Limiting values (each section)
Caractéristiques limites (chaque système)
Grenzdaten (jedes System)

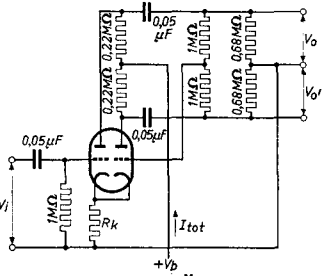
V_{ao}	= max.	550 V	$V_g(I_g=+0,3\mu A)$	= max.	−1,3 V
V_a	= max.	300 V	R_g	= max.	2 MΩ [3]
W_a	= max.	1 W	V_{kf}	= max.	180 V
I_k	= max.	8 mA	R_{kf}	= max.	20 kΩ
$-V_g$	= max.	50 V	R_{kf}	= max.	150 kΩ [4]

[1][2] See page 3; voir page 3; siehe Seite 3

[3] With automatic grid bias
Avec polarisation de grille automatique
Mit automatischer Gittervorspannung

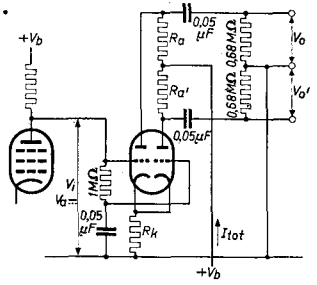
[4] In phase-inverting circuits
Dans des circuits inverseur de phase
In Phasenumkehrschaltungen

Operating characteristics as phase inverter
Caractéristiques d'utilisation comme tube inverseur de phase
Betriebsdaten als Phasenumkehrröhre



V_b	=	250	350 V
R_k	=	1200	820 Ω
I_{tot}	=	1,08	1,70 mA
V_o [1]	=	35	45 Veff
V_o/V_i	=	58	62
d_{tot} [2]	=	5,5	3,5 %

B.



V_b	=	250	350 V
V_a	=	65	90 V
I_{tot}	=	1	1,2 mA
R_k	=	68	82 kΩ
R_a	=	0,1	0,15 MΩ
R_a'	=	0,1	0,15 MΩ
V_o [1]	=	20	35 Veff
V_o/V_i	=	25	27
d_{tot} [2]	=	1,8	1,8 %

Limiting values (each section)
Caractéristiques limites (chaque système)
Grenzdaten (jedes System)

V_{ao}	= max.	550 V	$V_g(I_g=+0,3\mu A)$	= max.	-0,9 V
V_a	= max.	300 V	R_g	= max.	2 MΩ [3]
W_a	= max.	1 W	V_{kf}	= max.	180 V
I_k	= max.	8 mA	R_{kf}	= max.	20 kΩ
$-V_g$	= max.	50 V	R_{kf}	= max.	150 kΩ [4]

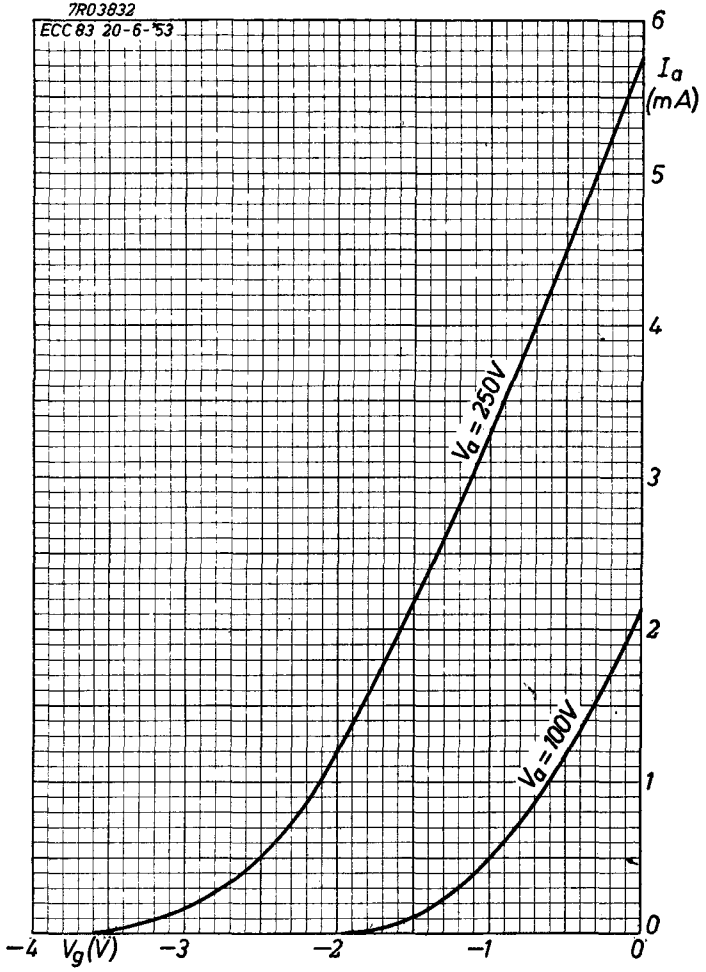
[1][2]) See pages 2 and 3; voir pages 2 et 3; siehe Seiten 2 und 3

[3]) With automatic grid bias
Avec polarisation de grille automatique
Mit automatischer Gittervorspannung

[4]) In phase-inverting circuits
Dans des circuits inverseurs de phase
In Phasenumkehrschaltungen

PHILIPS

ECC 83



6.6.1953

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ECC 83 PHILIPS

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Electronic Tube

HANDBOOK

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1	1	1954.11.11
2	1	1960.05.05
3	2	1954.11.11
4	2	1960.05.05
5	3	1955.02.02
6	3	1960.05.05
7	4	1955.02.02
8	4	1960.05.05
9	A	1953.06.06
10	B	1953.06.06
11	FP	2005.05.06

PHILIPS

ECC 84

DOUBLE TRIODE particularly designed for use as R.F. cascode amplifier in tuners for television receivers up to 220 Mc/s

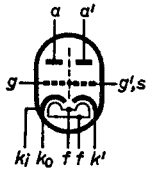
DOUBLE TRIODE conçue particulièrement pour être utilisée comme amplificatrice H.F. en montage cascode dans les étages d'entrée des récepteurs de télévision jusqu'à 220 Mc/s

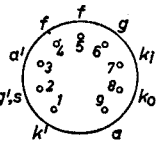
DOPPELTRIODE speziell entworfen zur Verwendung als HF-Verstärker in Kaskodenschaltung in Eingangsstufen von Fernsehempfängern bis zu 220 MHz

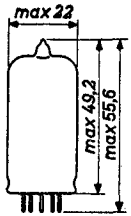
Heating : indirect by A.C. or D.C. parallel supply
Chauffage: indirect par C.A. ou C.C. alimentation parallèle
Heizung : indirekt durch Wechsel- oder Gleichstrom; Parallelspeisung

V_f = 6,3 V
I_f = 330 mA

Dimensions in mm
Dimensions en mm
Abmessungen in mm







Base, culot, Sockel: NOVAL

Capacitances (without external shield)
Capacités (sans blindage extérieur)
Kapazitäten (ohne äusserer Abschirmung)

C_{ag}	=	1,2 pF	$C_{a'k'}$	=	0,16 pF
C_g	=	2,1 pF	$C_{k'(g'+f)}$	=	4,7 pF
C_a	=	0,45 pF	$C_{a'(g'+f)}$	=	2,5 pF
C_{gf}	<	0,25 pF	$C_{k'f}$	=	2,7 pF
			$C_{a'g'}$	=	2,3 pF

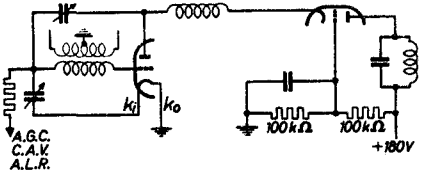
$C_{a-(k+f+g')}$ = 1,2 pF
$C_{aa'}$ < 0,035 pF
$C_{ga'}$ < 0,006 pF

Typical characteristics (each system)
Caractéristiques types (chaque système)
Kenndaten (jedes System)

V_a	=	90 V
V_g	=	-1,5 V
I_a	=	12 mA
S	=	6 mA/V
μ	=	24

Input conductance at 200 Mc/s
Conductance d'entrée à 200 Mc/s = 250 µA/V[1)]
Eingangsleitwert bei 200 MHz

Operating characteristics
Caractéristiques d'utilisation
Betriebsdaten



Noise figure
(bandwidth of input circuit 7-8 Mc/s) 6.5[1)]
Indice de souffle
(largeur de bande du circuit d'entrée 7-8 Mc/s) 6,5[1)]
Rauschzahl
(Bandbreite der Eingangsschaltung 7-8 MHz) 6,5[1)]

1) The quoted values of the input conductance and the noise figure are valid in the case that the cathode lead ki is connected to the input circuit and k_o to the chassis. The noise figure will be reduced to about 5 when the cathode leads are connected in parallel; the input conductance will increase, however, in this case to about 700 µA/V.
Les valeurs mentionnées de la conductance d'entrée et de l'indice de souffle s'appliquent au cas que la connection cathodique ki soit connectée au circuit d'entrée et k_o au châssis. L'indice de souffle sera diminuée à 5 si les connections cathodiques sont montées en parallèle; pourtant, la conductance d'entrée s'élèvera à 700 µA/V dans ce cas
Die genannten Werte des Eingangsleitwertes und der Rauschzahl gelten im Falle das die Katodenleitung ki mit dem Eingangskreis verbunden ist und k_o mit dem Chassis. Die Rauschzahl wird bis zu etwa 5 verringert wenn die Katodenleitungen parallel geschaltet sind; der Eingangsleitwert wird in diesem Falle aber bis zu etwa 700 µA/V erhöht werden

Remarks

1. The section a,g,k_1,k_o is the grounded cathode triode of the cascode amplifier and the section a',g',k' the grounded grid triode
2. The grounded cathode section has two cathode leads, of which k_1 should be connected to the input circuit and k_o to the chassis

Observations

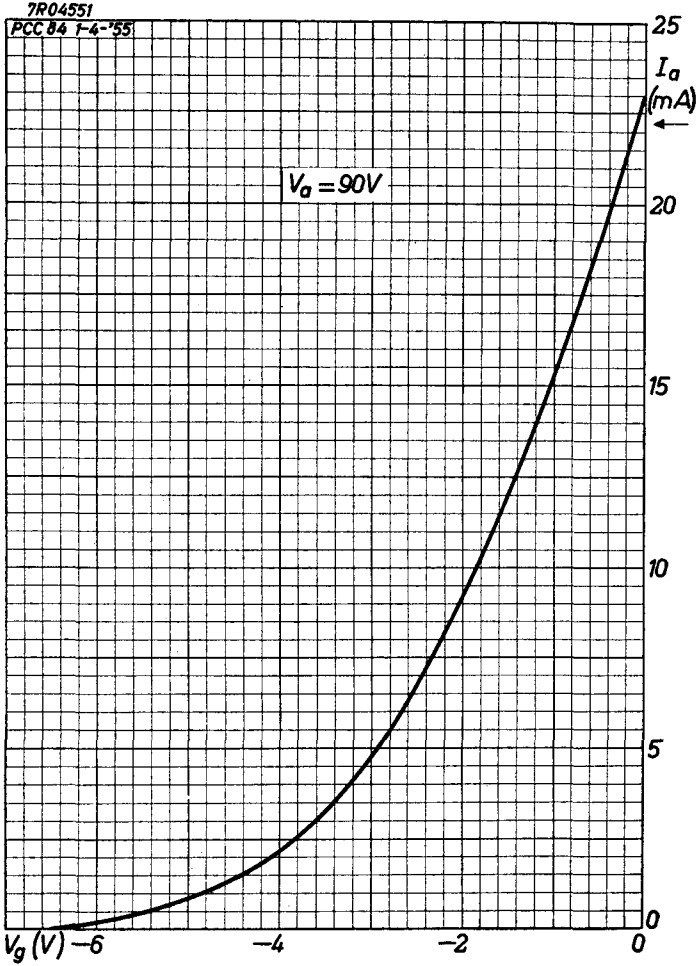
1. La section a,g,k_1,k_o est la triode à cathode à la terre de l'amplificateur cascode et la section a',g' k' la triode a grille à la terre
2. La triode à cathode à la terre a deux connections de la cathode, l'une (k_1) destinée d'être connectée au circuit d'entrée et l'autre (k_o) au châssis.

Bemerkungen

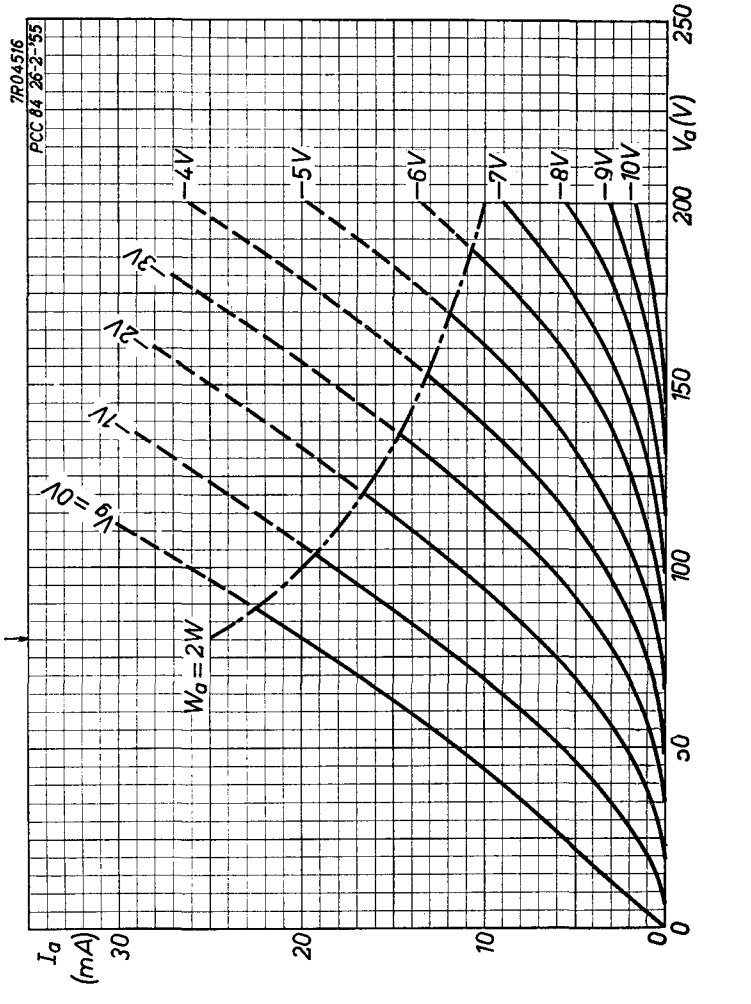
1. Das System a,g,k_1,k_o ist die Katodenbasistriode des Kaskodenverstärkers und das System a',g',k' die Gitterbasistriode
2. Die Katodenbasistriode hat zwei Katodenanschlüsse, der eine (k_1) zum Anschluss am Eingangskreis, der andere (k_o) zum Anschluss am Chassis.

Limiting values
Caractéristiques limites
Grenzdaten

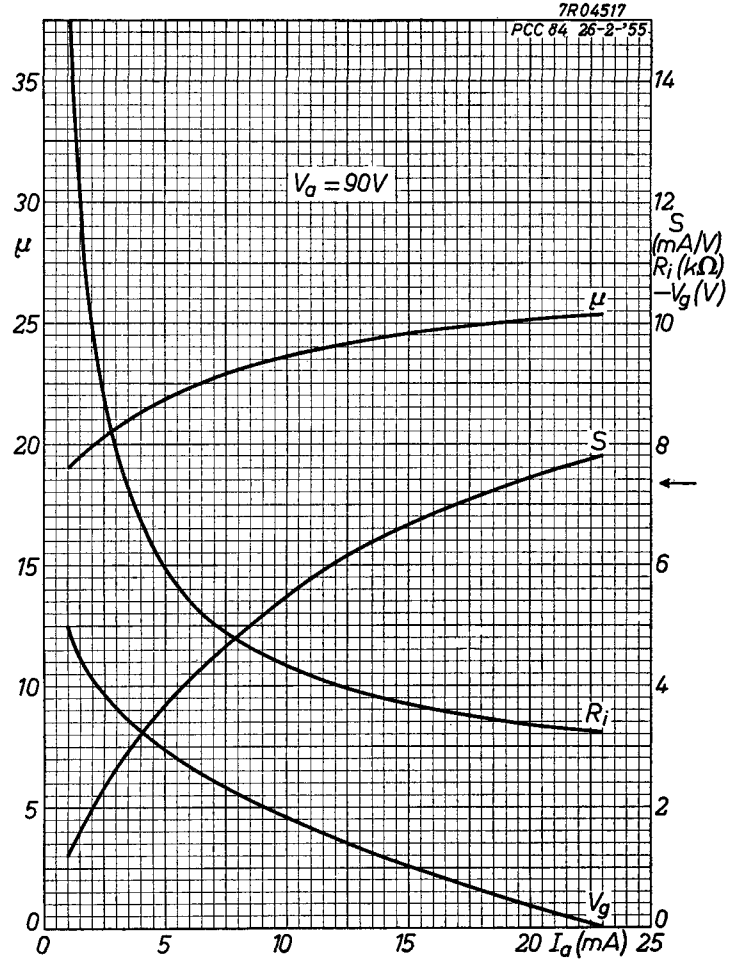
V_{b_o}	= max.	550	V
$V_a = V_a'$	= max.	180	V
$W_a = W_a'$	= max.	2	W
$I_k = I_k'$	= max.	22	mA
$-V_g = -V_g'$	= max.	50	V
R_g	= max.	1,5	MΩ
R_g'	= max.	0,5	MΩ
$V_k'f$ (k' pos., f neg.)	= max.	200	V
V_{kf}	= max.	100	V
R_{kf}	= max.	20	kΩ


7R04551
PCC 84 1-4-'55
$V_a = 90V$
I_a (mA)
25
20
15
10
5
0
V_g (V) −6
−4
−2
0

ECC 84 **PHILIPS**



B


7R04517
PCC 84 26-2-'55
$V_a = 90V$
μ
S
R_i
V_g
μ
S (mA/V)
R_i (kΩ)
$-V_g$ (V)
I_a (mA)
0
5
10
15
20
25
35
30
25
20
15
10
5
0
14
12
10
8
6
4
2
0

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1	1	1956.04.04
2	2	1956.04.04
3	3	1956.04.04
4	A	1955.02.02
5	B	1955.02.02
6	C	1955.02.02
7	FP	1999.06.25

R.F. DOUBLE TRIODE

Double triode intended for use as R.F. and A.F. amplifier and self oscillating mixer.

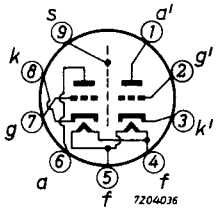
QUICK REFERENCE DATA (each unit)			
Anode current	I_a	10	mA
Transconductance	S	6.1	mA/V
Amplification factor	μ	55	-

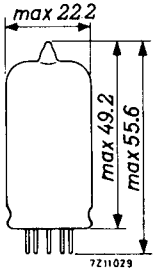
HEATING: Indirect by A.C. or D.C.; parallel supply

Heater voltage	V_f	6.3	V
Heater current	I_f	435	mA

DIMENSIONS AND CONNECTIONS Dimensions in mm

Base: Noval





CAPACITANCES

Anode to grid	C_{ag}	1.5	pF
	$C_{a'g'}$	1.5	pF
Anode to cathode	C_{ak}	0.17	pF
	$C_{a'k'}$	0.18	pF
Anode to cathode + heater + screen	$C_{a/kfs}$	1.2	pF
	$C_{a'/k'fs}$	1.2	pF
Grid to cathode + heater + screen	$C_{g/kfs}$	3.1	pF
	$C_{g'/k'fs}$	3.1	pF
Anode to cathode + heater + screen with external screen of 22.5 mm diam.	$C_{a/kfs}$	1.8	pF
	$C_{a'/k'fs}$	1.8	pF
Anode to anode	$C_{aa'}$	max. 0.04	pF
Grid to grid	$C_{gg'}$	max. 0.003	pF
Anode to grid other unit	$C_{ag'}$	max. 0.008	pF
Grid to anode other unit	$C_{ga'}$	max. 0.008	pF
Anode to anode with external screen of 22.5 mm diam.	$C_{aa'}$	max. 0.008	pF
Anode to cathode other unit	$C_{ak'}$	max. 0.008	pF
Grid to cathode other unit	$C_{gk'}$	max. 0.003	pF
Cathode to anode other unit	$C_{ka'}$	max. 0.008	pF
Cathode to grid other unit	$C_{kg'}$	max. 0.003	pF

TYPICAL CHARACTERISTICS

Anode voltage	V_a	250	V
Grid voltage	V_g	-2.7	V
Anode current	I_a	10	mA
Transconductance	S	6.1	mA/V
Amplification factor	μ	55	-

REMARK

Microphony

This tube can be used without special precautions against microphony in A.F. applications in which the input voltage $V_i \geq 5$ mV for an output of 50 mW (or 50 mV for an output of 5 W) provided the peak acceleration of the tube is not greater than indicated in the section "Microphony" of the "General Operational Recommendations".

OPERATING CHARACTERISTICS

As R.F. amplifier

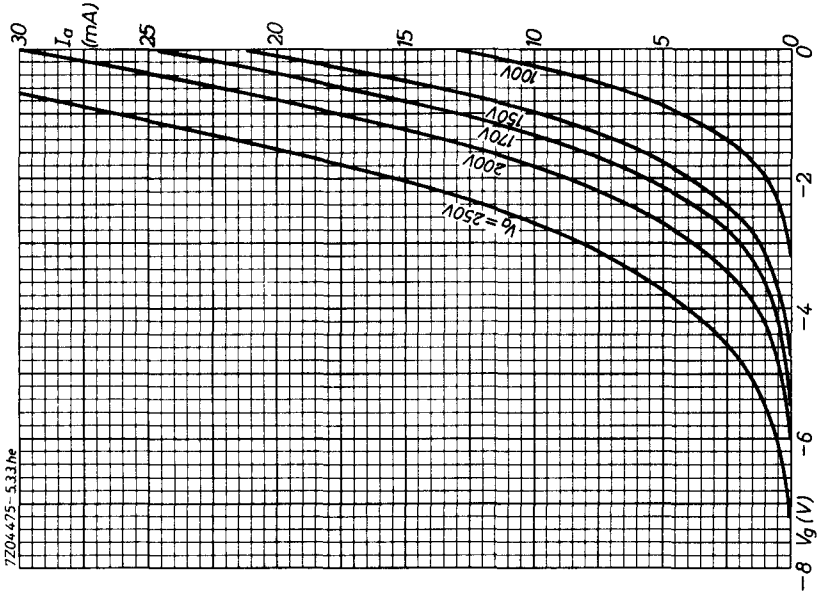
Supply voltage	V_b	250	V
Anode resistor	R_a	1.8	kΩ
Anode voltage	V_a	230	V
Cathode resistor	R_k	200	Ω
Grid voltage	V_g	-2.2	V
Anode current	I_a	10.8	mA
Transconductance	S	6.8	mA/V
Internal resistance	R_i	8.3	kΩ
Grid input resistance (f = 100 MHz)	r_g	4.7	kΩ
Equivalent noise resistance	R_{eq}	580	Ω

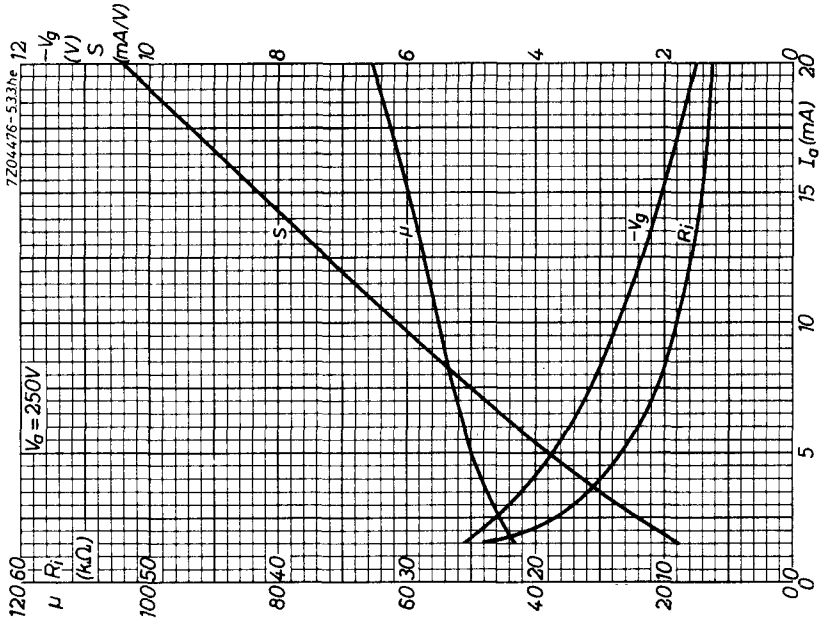
As self-oscillating mixer

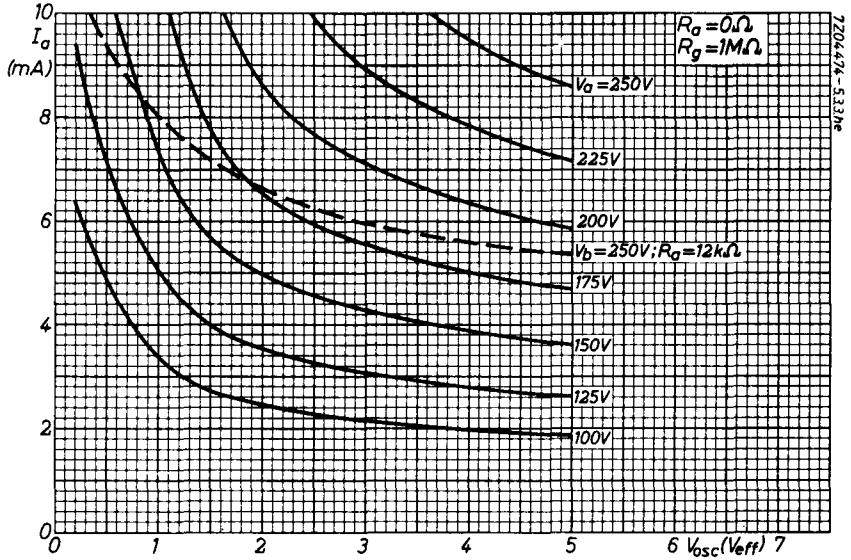
Supply voltage	V_b	250	V
Anode resistor	R_a	12	kΩ
Grid resistor	R_g	1	MΩ
Oscillator voltage	V_{osc}	3.0	V_{RMS}
Anode current	I_a	6	mA
Conversion conductance	S_c	3	mA/V
Internal resistance	R_i	18	kΩ
Grid input resistance (f = 100 MHz)	r_g	15	kΩ

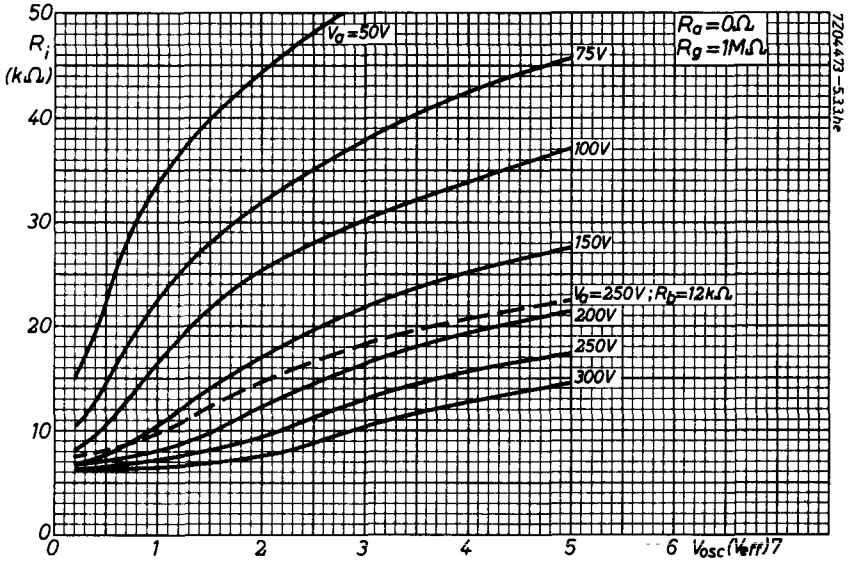
LIMITING VALUES (Design centre rating system) (Each unit unless otherwise stated)

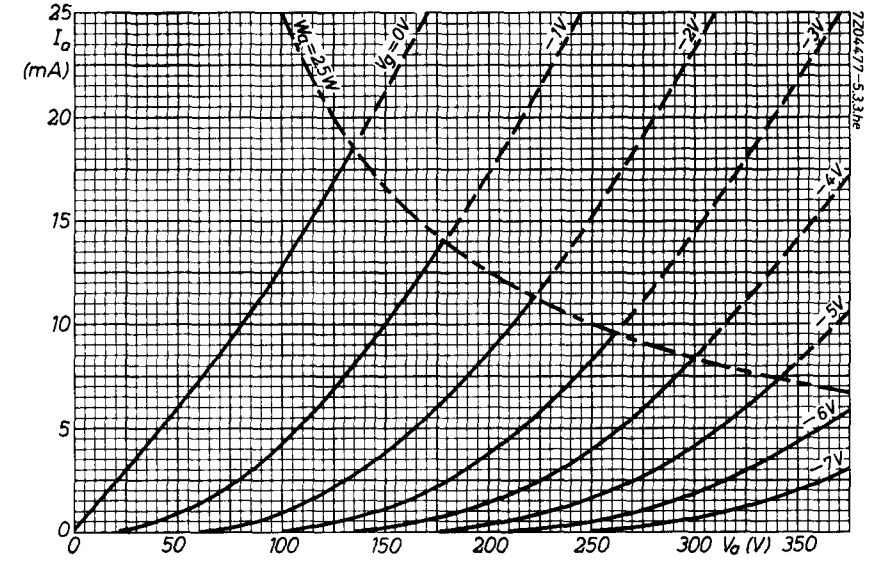
Anode voltage	V_{a_o}	max. 550	V
	V_a	max. 300	V
Anode dissipation	W_a	max. 2.5	W
Anode dissipation, total for both units	$W_a+W_{a'}$	max. 4.5	W
Cathode current	I_k	max. 15	mA
Grid voltage	$-V_g$	max. 100	V
Grid resistor	R_g	max. 1	MΩ
Cathode to heater voltage	V_{kf}	max. 90	V

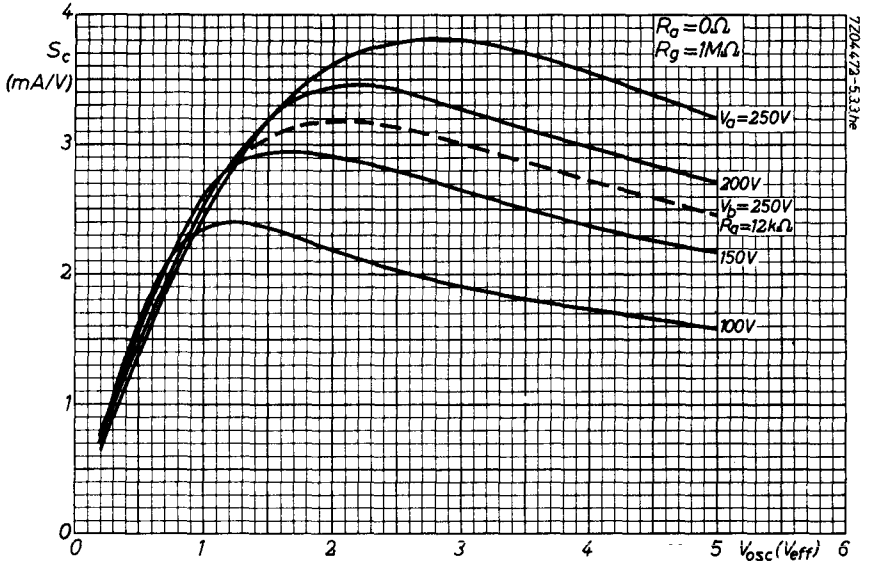

7Z04475-533he
I_a (mA)
V_g (V)
V_b = 250V
200V
175V
150V
100V


7Z04476-533he
V_b = 250V
$-V_g$ (V)
S (mA/V)
I_a (mA)
μ
R_i (kΩ)
S
μ
$-V_g$
R_i


10
I_a
(mA)
8
6
4
2
0
0
1
2
3
4
5
6 V_{osc} (V_{eff}) 7
R_a = 0Ω
R_g = 1MΩ
V_a = 250V
225V
200V
V_b = 250V; R_a = 12kΩ
175V
150V
125V
100V
7204474-533he


50
R_i
(kΩ)
40
30
20
10
0
0
1
2
3
4
5
6 V_{osc} (V_{eff}) 7
R_a = 0Ω
R_g = 1MΩ
V_a = 50V
75V
100V
150V
V_b = 250V; R_b = 12kΩ
200V
250V
300V
7204473-533he


25
I_a
(mA)
20
15
10
5
0
0
50
100
150
200
250
300
V_a (V)
350
W_a = 2,5 W
V_g = 0V
−1V
−2V
−3V
−4V
−5V
−6V
−7V
7204477-5.3.3.he


4
S_c
(mA/V)
3
2
1
0
0
1
2
3
4
5
V_{osc} (V_{eff})
6
R_a = 0Ω
R_g = 1MΩ
V_a = 250V
200V
V_b = 250V
R_d = 12kΩ
150V
100V
7204478-5.3.3.he

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Data handbook

Electronic components and materials

ECC85

page	sheet	date
1	1	1969.12
2	2	1969.01
3	3	1969.01
4	4	1969.01
5	5	1969.01
6	6	1969.01
7	FP	1999.08.14

PHILIPS ECC 86

DOUBLE TRIODE for use as R.F. amplifier and self-oscillating mixer in carradio sets. The tube can be directly operated from a storage battery

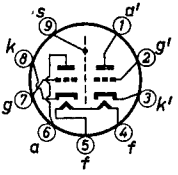
DOUBLE TRIODE pour l'utilisation comme amplificatrice H.F. et tube mélangeur auto-oscillateur dans récepteurs auto-radio. Le tube peut fonctionner directement d'un accumulateur

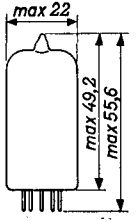
DOPPELTRIODE zur Verwendung als HF-Verstärker und selbstschwingende Mischröhre in Autoempfängern. Die Röhre kann direkt von einer Batterie betrieben werden

Heating : indirect by A.C. or D.C.; parallel supply
Chauffage: indirect par C.A. ou C.C.; alimentation parallèle
Heizung : indirekt durch Wechsel- oder Gleichstrom; Parallelspeisung

V_f = 6,3 V
I_f = 330 mA

Dimensions in mm
Dimensions en mm
Abmessungen in mm





Base, culot, Sockel: NOVAL

Capacitances
Capacités
Kapazitäten

C_a	= 1,8 pF	$C_{a'}$	= 1,8 pF
C_g	= 3 pF	$C_{g'}$	= 3 pF
C_{ag}	= 1,3 pF	$C_{a'g'}$	= 1,3 pF
		$C_{aa'}$	< 0,05 pF
		$C_{gg'}$	< 0,005 pF
		$C_{ag'}$	< 0,005 pF
		$C_{a'g}$	< 0,005 pF

Typical characteristics (each section)
Caractéristiques types (chaque système)
Kenndaten (jedes System)

V_a	=	6,3 V
V_g	=	-0,4 V
I_a	=	0,9 mA
S	=	2,6 mA/V
μ	=	14

PHILIPS ECC 86

DOUBLE TRIODE for use as R.F. amplifier and self-oscillating mixer in carradio sets. The tube can be directly operated from a storage battery

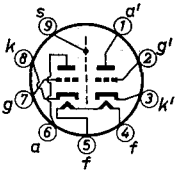
DOUBLE TRIODE pour l'utilisation comme amplificatrice H.F. et tube mélangeur auto-oscillateur dans récepteurs auto-radio. Le tube peut fonctionner directement d'un accumulateur

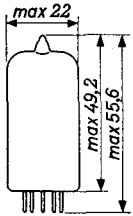
DOPPELTRIODE zur Verwendung als HF-Verstärker und selbstschwingende Mischröhre in Autoempfängern. Die Röhre kann direkt von einer Batterie betrieben werden

Heating : indirect by A.C. or D.C.; parallel supply
Chauffage: indirect par C.A. ou C.C.; alimentation parallèle
Heizung : indirekt durch Wechsel- oder Gleichstrom; Parallelspeisung

Vf = 6,3 V
If = 330 mA

Dimensions in mm
Dimensions en mm
Abmessungen in mm





Base, culot, Sockel: NOVAL

Capacitances
Capacités
Kapazitäten

C_a	= 1,8 pF	$C_{a'}$	= 1,8 pF
C_g	= 3 pF	$C_{g'}$	= 3 pF
C_{ag}	= 1,3 pF	$C_{a'g'}$	= 1,3 pF
		$C_{aa'}$	< 0,05 pF
		$C_{gg'}$	< 0,005 pF
		$C_{ag'}$	< 0,005 pF
		$C_{a'g}$	< 0,005 pF

Typical characteristics (each section)
Caractéristiques types (chaque système)
Kenndaten (jedes System)

V_a	=	6,3 V
V_g	=	-0,4 V
I_a	=	0,9 mA
S	=	2,6 mA/V
μ	=	14

PHILIPS

ECC86

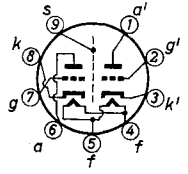
DOUBLE TRIODE for use as R.F. amplifier and self-oscillating mixer in carradio sets. The tube can be directly operated from a storage battery

HEATING

Indirect by A.C. or D.C.; parallel supply

Heater voltage	V_f = 6.3 V
Heater current	I_f = 330 mA

Dimensions in mm



Base: NOVAL

CAPACITANCES

Grid to all other elements except anode	$C_g = C_{g'}$ =	3.0 pF
Anode to all other elements except grid	$C_a = C_{a'}$ =	1.8 pF
Anode to grid	$C_{ag} = C_{a'g'}$ =	1.3 pF
Anode to anode of other section	$C_{aa'}$ <	0.05 pF
Grid to grid of other section	$C_{gg'}$ <	0.005 pF
Anode to grid of other section	$C_{ag'}$ <	0.005 pF
	$C_{a'g}$ <	0.005 pF

TYPICAL CHARACTERISTICS (each triode)

Anode voltage	V_a =	6.3 V
Anode current	I_a =	0.9 mA
Grid voltage	V_g =	-0.4 V
Mutual conductance	S =	2.6 mA/V
Amplification factor	μ =	14

Operating characteristics as R.F. amplifier
Caractéristiques d'utilisation comme amplificateur H.F.
Betriebsdaten als HF-Verstärker

V_a	= 6,3	12,6	V
V_{bg}	= 0	0	V
R_g	= 100	100	kΩ
I_a	= 0,9	2,5	mA
S	= 2,6	4,6	mA/V
R_i	= 5	3,4	kΩ

Operating characteristics as self-oscillating mixer
Caractéristiques d'utilisation comme tube mélangeur auto-oscillateur
Betriebsdaten als selbstschwingende Mischröhre

V_{ba}	= 6,3	12,6	V
R_a	= 500	500	Ω
R_g	= 220	220	kΩ
V_{osc}	= 0,7	1,0	V_{eff}
I_a	= 0,4	1,0	mA
S_c	= 0,8	1,3	mA/V
R_i	= 11	8	kΩ

Limiting values (each section)
Caractéristiques limites (chaque système)
Grenzdaten (jedes System)

V_a	= max.	30	V
W_a	= max.	0,6	W
I_k	= max.	20	mA
R_g	= max.	1	MΩ
V_{kf}	= max.	30	V
R_{kf}	= max.	20	kΩ

Operating characteristics as R.F. amplifier (one triode)
Caractéristiques d'utilisation en amplificatrice H.F. (une triode)
Betriebsdaten als HF-Verstärker (eine Triode)

V_a =	6,3	12,6	25	V
V_{bg} =	0	0	0	V
R_g =	100	100	100	kΩ
I_a =	0,9	2,5	7,5	mA
S =	2,6	4,6	7,8	mA/V
R_i =	5	3,4	2,1	kΩ
R_{eq} =	1	-	-	kΩ

Operating characteristics as self-oscillating mixer (one triode)
Caractéristiques d'utilisation en mélangeuse auto-oscillatrice (une triode)
Betriebsdaten als selbstschwingende Mischstufe (eine Triode)

V_{ba} =	6,3	12,6	25	V
R_a =	500	500	500	Ω
R_g =	220	220	220	kΩ
V_{osc} =	0,7	1,0	1,5	Veff
I_a =	0,4	1,0	2,6	mA
S_c =	0,8	1,3	2,0	mA/V
R_i =	11	8	5,3	kΩ

Limiting values (each system)
Caractéristiques limites (chaque système)
Grenzdaten (jedes System)

V_a	= max.	30	V
W_a	= max.	0,6	W
I_k	= max.	20	mA
V_{kf}	= max.	30	V

Max. circuit values
Valeurs max. des éléments de montage
Max. Werte der Schaltungsteile

R_g	= max.	1	MΩ
R_{kf}	= max.	20	kΩ

OPERATING CHARACTERISTICS for use as R.F. amplifier (each triode)

Anode voltage	V_a	= 6.3	12.6	25	V
Grid supply voltage	V_{bg}	= 0	0	0	V
Grid resistor	R_g	= 100	100	100	kΩ
Anode current	I_a	= 0.9	2.5	7.5	mA
Mutual conductance	S	= 2.6	4.6	7.8	mA/V
Internal resistance	R_i	= 5	3.4	2.1	kΩ
Equivalent noise resistance	R_{eq}	= 1	-	-	kΩ

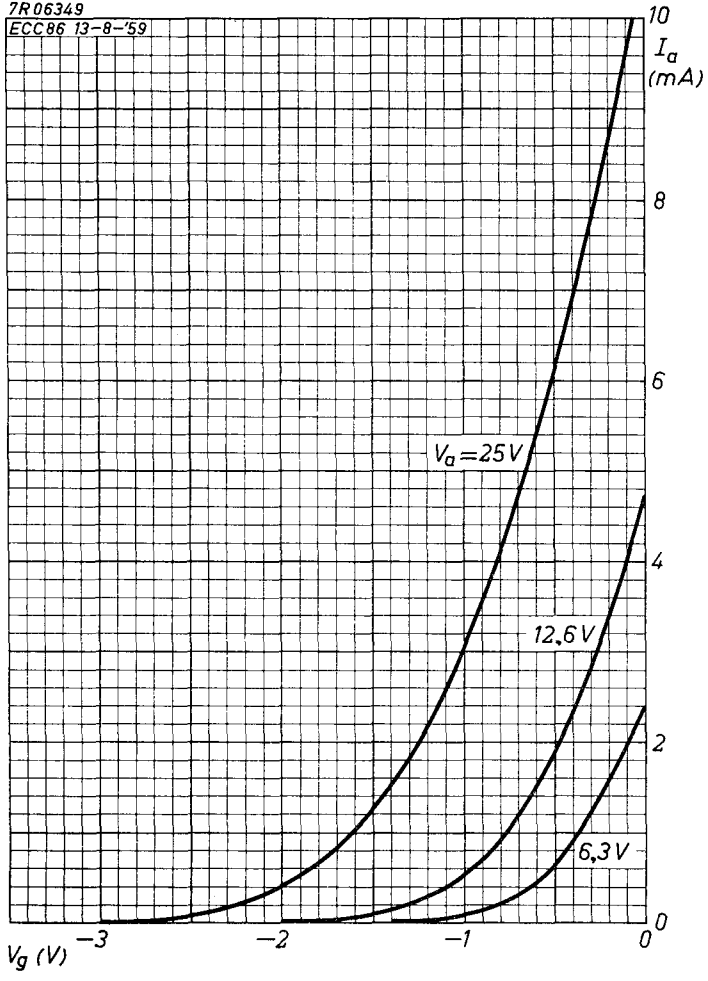
OPERATING CHARACTERISTICS for use as self-oscillating mixer (each triode)

Anode supply voltage	V_{ba}	= 6.3	12.6	25	V
Anode resistor	R_a	= 500	500	500	Ω
Grid resistor	R_g	= 220	220	220	kΩ
Oscillator voltage	V_{osc}	= 0.7	1.0	1.5	V(RMS)
Anode current	I_a	= 0.4	1.0	2.6	mA
Conversion conductance	S_c	= 0.8	1.3	2.0	mA/V
Internal resistance	R_i	= 11	8	5.3	kΩ

LIMITING VALUES (Design centre limits; each triode)

Anode voltage	V_a	= max.	30	V
Anode dissipation	W_a	= max.	0.6	W
Grid circuit resistance	R_g	= max.	1	MΩ
Cathode current	I_k	= max.	20	mA
Voltage between heater and cathode	V_{kf}	= max.	30	V
Circuit resistance between heater and cathode	R_{kf}	= max.	20	kΩ

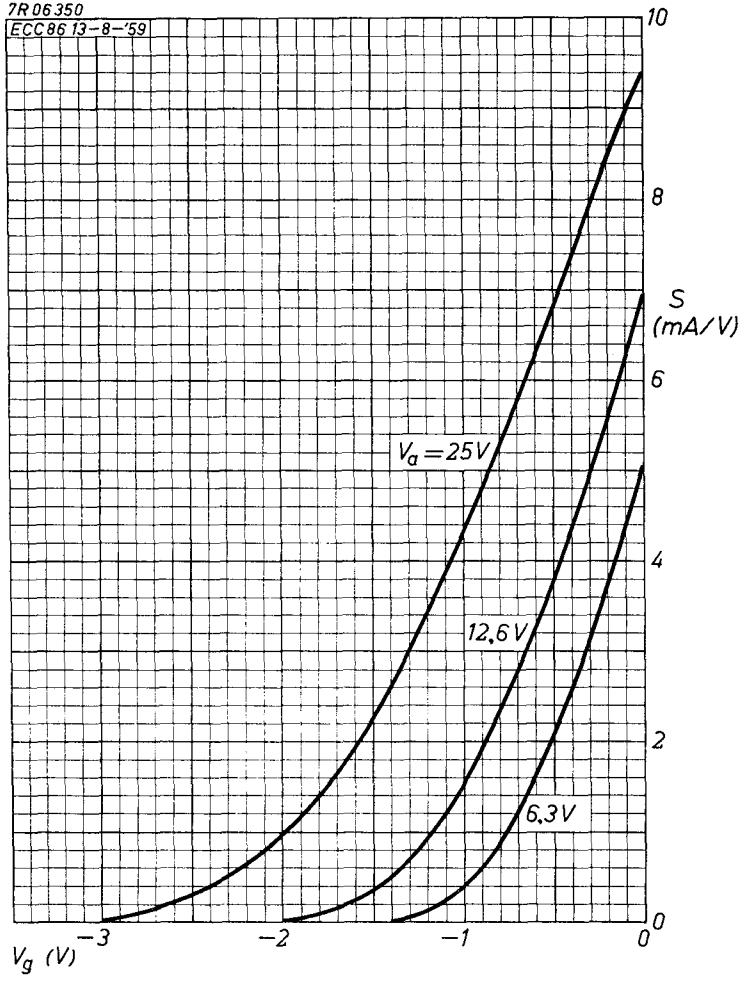
PHILIPS ECC 86



8.8.1959

A

ECC 86 PHILIPS

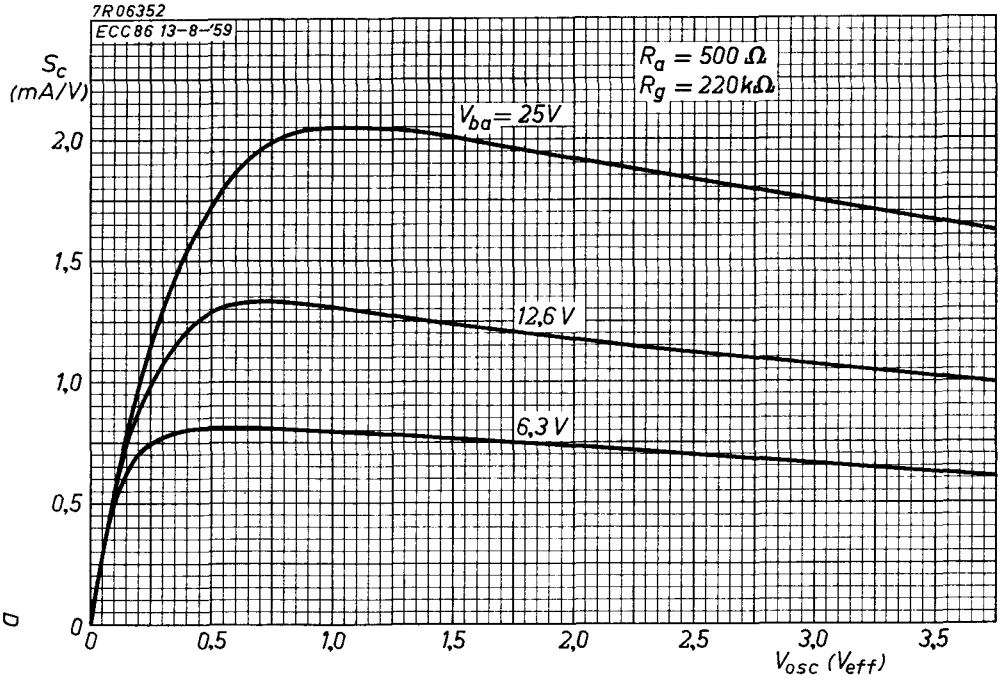


B

$V_g = 0\,V$
−0,25V
−0,5V
−0,75V
−1V
−1,25V
−1,5V
−1,75V
−2V
V_a (V)
0
5
10
15
20
25
30
35
I_a (mA)
0
2
4
6
8
10
7R06351
ECC86 13-8-'59

8.8.1959

C


7R06352
ECC86 13-8-'59
S_c (mA/V)
$R_a = 500\ \Omega$
$R_g = 220\ k\Omega$
$V_{ba} = 25V$
12,6 V
6,3 V
2,0
1,5
1,0
0,5
0
0
0,5
1,0
1,5
2,0
2,5
3,0
3,5
V_{osc} (V_{eff})

PHILIPS

Electronic Tube

HANDBOOK

ECC86

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1	1	1958.03.03
2	1	1959.08.08
3	1	1962.09.09
4	2	1958.03.03
5	2	1959.08.08
6	2	1962.09.09
7	A	1959.08.08
8	B	1959.08.08
9	C	1959.08.08
10	D	1959.08.08
11	FP	2005.05.06

R.F. DOUBLE TRIODE

Double triode intended for use as cascode amplifier in tuners for television receivers.

HEATING: Indirect by A.C. or D.C.; parallel supply

Heater voltage	V_f	6.3	V
Heater current	I_f	365	mA

For further data and curves please refer to PCC88

PHILIPS

Data handbook

Electronic components and materials

ECC88

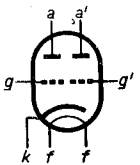
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1	1	1969.01
2	FP	1999.08.10

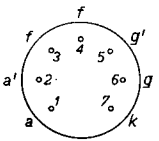
DOUBLE TRIODE for use as R.F. amplifier and oscillator
DOUBLE TRIODE pour utilisation en amplificatrice H.F. et oscillatrice
DOPPELTRIODE zur Verwendung als HF- Verstärker und Oszillator

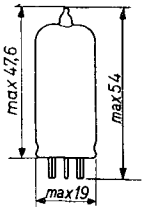
Heating : indirect by A.C.or D.C. parallel supply
Chauffage: indirect par C.A.ou C.C. alimentation parallèle
Heizung : indirekt durch Wechsel- oder Gleichstrom Parallelspeisung

V_f = 6,3 V
I_f = 0,45 A

Dimensions in mm
Dimensions en mm
Abmessungen in mm







Base, culot, Sockel: Miniature

Capacitances
Capacités
Kapazitäten

$C_g = C_{g'} = 2{,}0$ pF
$C_a = C_{a'} = 0{,}4$ pF
$C_{ag} = C_{a'g'} = 1{,}6$ pF
$C_{kf} = 5{,}4$ pF

Typical characteristics (per system)
Caractéristiques types (par système)
Kenndaten (pro System)

V_a = 100 V
I_a = 8,5 mA
R_k = 100 Ω
S = 5,3 mA/V
μ = 38
R_i = 7,1 kΩ

Operating characteristics as H.F. class C telegraphy push-pull amplifier and oscillator at 80 Mc/s
Caractéristiques d'utilisation en amplificatrice H.F. classe C télégraphie push-pull et oscillatrice à 80 Mc/s
Betriebsdaten zur Verwendung als HF- Klasse C telegrafie Gegentaktverstärker und Oszillator bei 80 MHz

V_a	=	150 V
V_g	=	-10 V
R_g	=	625 Ω
I_a	=	2 x 15 mA
I_g	=	2 x 8 mA
W_{ig}	=	0,35 W
W_o	=	3,5 W

Limiting values (per system)
Caractéristiques limites (par système)
Grenzdaten (pro System)

V_{a_o}	= max.	550 V
V_a	= max.	300 V
W_a	= max.	1,5 W
$-V_g$	= max.	40 V
I_k	= max.	25 mA
I_g	= max.	8 mA
R_g	= max.	0,5 MΩ[1])
V_{kf}	= max.	100 V
R_{kf}	= max.	20 kΩ

[1]) Automatic grid bias
Polarisation de grille automatique
Automatische Gittervorspannung

PHILIPS

Electronic Tube

HANDBOOK

ECC91

page	sheet	date
1	1	1954.06.06
2	2	1954.06.06
3	FP	1999.06.25

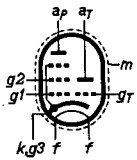
PHILIPS

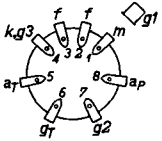
ECF 1

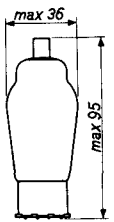
TRIODE-PENTODE for use as combined I.F. and L.F. amplifier
TRIODE-PENTHODE pour utilisation comme amplificatrice combinée M.F. et B.F.
TRIODE-PENTHODE zur Verwendung als kombinierten Z.F. und N.F. Verstärker

Heating: indirect by A.C. or D.C.; parallel or series supply
Chauffage: indirect par C.A. ou C.C.; alimentation en parallèle ou en série — Vf = 6,3 V, If = 0,200 A
Heizung: indirekt durch Wechsel- oder Gleichstrom; Parallel- oder Serienspeisung

Dimensions in mm
Dimensions en mm
Abmessungen in mm







Capacitances Capacités Kapazitäten	Pentode section Partie penthode Penthodenteil	Triode section Partie triode Triodenteil
	Ca = 6,7 pF	Ca = 3,2 pF
	Cag1 < 0,004 pF	Cag = 1,4 pF
	Cg1 = 4,6 pF	Cg = 3,3 pF
	Cg1f < 0,001 pF	

Between pentode and triode section
Entre les parties penthode et triode
Zwischen Penthoden- und Triodenteil

CaTg1 < 0,07 pF
CagT < 0,5 pF
Cg1gT < 0,06 pF

Operating characteristics of the pentode section as H.F. and I.F. amplifier
Caractéristiques d'utilisation de la partie penthode comme amplificatrice H.F. et M.F.
Betriebsdaten des Penthodenteiles als H.F. und Z.F. Verstärker

Va=Vb	=	250		V
Vg3	=	0		V
Rg2	=	75		kΩ
Vg1	=	-2	-40	V
Ia	=	5	-	mA
Ig2	=	2	-	mA
S	=	2	0,02	mA/V
Ri	=	1,6	>10	MΩ

Typical characteristics of the triode section
Caractéristiques typiques de la partie triode
Kenndaten des Triodenteiles

Va	= 150 V	S	= 2,2 mA/V
Vg	= -3 V	Ri	= 9 kΩ
Ia	= 8 mA	μ	= 20

Limiting values of the pentode section
Caractéristiques limites de la partie penthode
Grenzdaten des Penthodenteiles

Va_o	=max. 550 V	Vg2	=max. 550 V
Va	=max. 300 V	Vg2 (Ia = 5 mA)	=max. 125 V
Wa	=max. 2 W	Vg2 (Ia = 2,5 mA)	=max. 300 V
Rg1	=max. 3 MΩ	Wg2	=max. 0,3 W
Rfk	=max. 20 kΩ	Vg1 (Ig1=+0,3 μA)	=max. -1,3 V
Vfk	=max. 100 V		

Limiting values of the triode section
Caractéristiques limites de la partie triode
Grenzdaten des Triodenteiles

Va_o	=max. 550 V	Vg (Ig =+0,3 μA)	=max. -1,3 V
Va	=max. 200 V	Rg	=max. 3 MΩ
Wa	=max.0,25 W	Rfk	=max. 20 kΩ
		Vfk	=max. 100 V



ECF1

page	sheet	date
1	1	1948.09.24
2	2	1948.09.24
3	FP	1999.06.25

TRIODE-PENTODE

Triode-pentode intended for use in television receivers; triode section as limiter, noise detector, A.G.C. amplifier, sync. separator and pulse-amplifier; pentode section as sound I.F. amplifier and video I.F. amplifier.

HEATING: Indirect by A.C. or D.C.; parallel supply

Heater voltage	V_f	6.3	V
Heater current	I_f	410	mA

For further data and curves
please refer to type PCF200

PHILIPS

Data handbook

Electronic components and materials

ECF200

page	sheet	date
1	1	1969.01
2	FP	1999.08.10

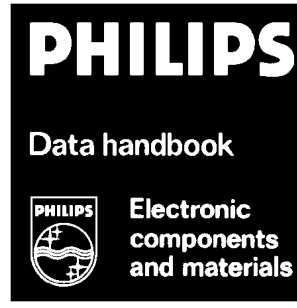
TRIODE-PENTODE

Triode-pentode intended for use in T.V. receivers; triode section as line-blocking oscillator, part of a multivibrator, sync separator, pulse amplifier or A.G.C. delay diode; pentode section with remote cut-off as video I.F. amplifier.

HEATING: Indirect by A.C. or D.C.; parallel supply

Heater voltage	V_f	6.3	V
Heater current	I_f	410	mA

For further data and curves of this type please refer to type PCF201



ECF201

page	sheet	date
1	1	1969.01
2	FP	1999.08.10

TRIODE-PENTODE

Triode-pentode with separate cathodes intended for use as frequency changer in television receivers.

HEATING: Indirect by A.C. or D.C.; parallel supply

Heater voltage	V_f	6.3	V
Heater current	I_f	430	mA

LIMITING VALUES (Design centre rating system)

Triode section

Cathode to heater voltage	V_{kf}	max. 100	V

Pentode section

Cathode to heater voltage	V_{kf}	max. 100	V

For further data and curves
please refer to PCF80

PHILIPS

Data handbook

Electronic components and materials

ECF80

page	sheet	date
1	1	1969.01
2	FP	1999.08.10

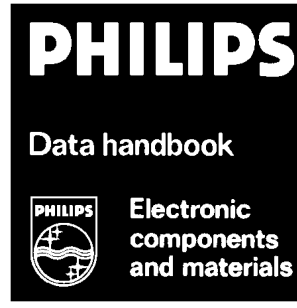
TRIODE-PENTODE

High transconductance triode and R.F. pentode intended for use as frequency changer in V.H.F. T.V. tuners.

HEATING: Indirect by A.C. or D.C.; parallel supply

Heater voltage	V_f	6.3	V
Heater current	I_f	0.41	A

For further data and curves of this type please refer to type PCF801



ECF801

page	sheet	date
1	1	1969.01
2	FP	1999.08.10

TRIODE-PENTODE

Triode-pentode; triode section intended for use as reactance tube, pentode section intended for use as sine wave oscillator or pulse shaper in television receivers.

HEATING: Indirect by A.C. or D.C.; parallel supply

Heater voltage	V_f	6.3	V
Heater current	I_f	430	mA

LIMITING VALUES

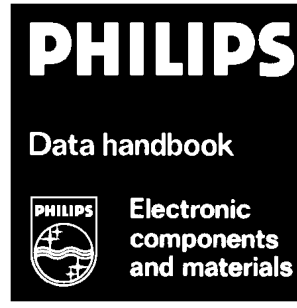
Pentode section

Cathode to heater voltage	V_{kf}	max. 100	V

Triode section

Cathode to heater voltage	V_{kf}	max. 100	V

For further data and curves
please refer to type PCF802



ECF802

page	sheet	date
1	1	1969.01
2	FP	1999.08.10

TRIODE-PENTODE

Triode-pentode intended for use as frequency changer in V.H.F. television tuners.

HEATING: Indirect by A.C. or D.C.; parallel supply

Heater voltage	V_f	6.3	V
Heater current	I_f	390	mA

LIMITING VALUES (Design centre rating system)

Triode section

Cathode to heater voltage	V_{kf}	max.	100	V

Pentode section

Cathode to heater voltage	V_{kf}	max.	100	V

For further data and curves
please refer to PCF86

PHILIPS

Data handbook

Electronic components and materials

ECF86

page	sheet	date
1	1	1969.01
2	FP	1999.08.10

PHILIPS

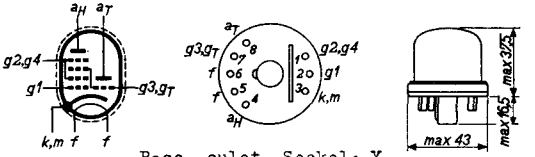
ECH 11

TRIODE-HEXODE

Heating: indirect by A.C. or D.C.; parallel or series supply
Chauffage: indirect par C.A. ou C.C.; alimentation en parallèle ou en série
Heizung: indirekt durch Wechsel- oder Gleichstrom; Serien- oder Parallelspeisung

V_f = 6,3 V
I_f = 0,2 A

Dimensions in mm
Dimensions en mm
Abmessungen in mm



Base, culot, Sockel: Y

Capacitances
Capacités
Kapazitäten

C_{aH}	= 9,1 pF	$C_{(gT+g3)-aT}$	< 1,6 pF
C_{aH-g1}	< 0,001 pF	$C_{(gT+g3)-f}$	< 0,3 pF
C_{g1}	= 5,3 pF	$C_{(gT+g3)-g1}$	< 0,25 pF
C_{g1f}	< 0,001 pF	$C_{(gT+g3)-aH}$	< 0,06 pF
C_{aT}	= 3,7 pF	C_{aT-aH}	< 0,0045 pF
C_{gT+g3}	= 8,3 pF	C_{aT-g1}	< 0,035 pF

Operating characteristics of the triode section as oscillator
Caractéristiques d'utilisation de la partie triode en oscillatrice
Betriebsdaten des Triodenteiles als Oszillator

V_b	=	100	200	250 V
R_a	=	30	30	30 kΩ
I_a	=	1,2	2,6	3,4 mA
V_a	=	64	122	148 V
R_{gT+g3}	=	30	30	30 kΩ
I_{gT+g3}	=	165	330	330 µA
V_{osc}	=	4	8,5	8,5 Veff

Operating characteristics of the hexode section
Caractéristiques d'utilisation de la partie hexode
Betriebsdaten des Hexodenteiles

Screen grid supply through a potentiometer (R_1, R_2)
Alimentation de la grille-écran à travers un potentiomètre (R_1, R_2)
Schirmgitterspeisung über einen Spannungsteiler(R_1,R_2)

V_a=V_b	=	100		200		250	V
R_1	=	35		35		35	kΩ
R_2	=	100		100		60	kΩ
R_k	=	300		300		230	Ω
R_{gT+g3}	=	30		30		30	kΩ
I_{gT+g3}	=	165		330		330	µA
V_{osc}	=	4		8,5		8,5	V_{eff}
V_{g1}	=	-1	-8,8	-2	-15,8	-2	-16 V
V_{g2+g4}	=	40	72	87	146	95	156 V
I_a	=	0,75	-	1,7	-	2,2	- mA
I_{g2+g4}	=	1,2	-	2,2	-	2,8	- mA
S_c	=	470	4,7	590	5,9	640	6,4 µA/V
R_i	=	>1	>5	>1	>2	>1	>7 MΩ

Limiting values of the hexode section
Caractéristiques limites de la partie hexode
Grenzdaten des Hexodenteiles

V_{ao}	= max.	550	V
V_a	= max.	300	V
W_a	= max.	1,8	W
$V_{(g2+g4)o}$	= max.	550	V
V_{g2+g4} (I_a < 1 mA)	= max.	300	V
V_{g2+g4} (I_a = 2,3 mA)	= max.	125	V
W_{g2+g4}	= max.	0,6	W
I_k	= max.	18	mA
V_{g1} (I_{g1} = +0,3 µA)	= max.	-1,3	V
V_{gT+g3} (I_{gT+g3}=+0,3 µA)	= max.	-1,3	V
R_{g1}	= max.	3	MΩ
Rfk	= max.	20	kΩ
Vfk	= max.	100	V

Limiting values of the triode section
Caractéristiques limites de la partie triode
Grenzdaten des Triodenteiles

V_{ao}	= max.	550	V
V_a	= max.	150	V
W_a	= max.	1	W
V_{gT+g3} (I_{gT+g3} =+0,3 µA)	= max.	-1,3	V
R_{gT+g3}	= max.	0,1	MΩ

PHILIPS

Electronic Tube

HANDBOOK

ECH11

page	sheet	date
1	1	1953.04.04
2	2	1953.04.04
3	3	1999.06.26

PHILIPS „MINIWATT"

ECH 2

ECH 2

Heizung ind., Wechselstrom, Parallelschaltung	Vf	6,3	V
Chauffage ind., CA, alimentation en parallele Heating ind., A.C., parallel filament supply	If	0,95	A
Kapazitäten zwischen Heptoden- und Triodenteil	CaT-g1H	<0,06	µµF
Capacités entre les parties heptode et triode	CaT-aH	0,9	µµF
Capacities between heptode and triode section	CgT-g1H	0,16	µµF
Kapazitäten des Heptodenteiles	CaH-g1H	<0,015	µµF
Capacités de la partie heptode	Cg1H	8,4	µµF
Capacities of the heptode section	CaH	13,8	µµF
Kapazitäten des Triodenteiles	CaT-gT	3,4	µµF
Capacités de la partie triode	CgT	17	µµF
Capacities of the triode section	CaTk	3,5	µµF

Betriebsdaten des Heptodenteiles als Mischröhre.
Caractéristiques de service de la partie heptode comme changeuse de fréquence.
Operating conditions for the heptode section as frequeney converter.

Va	250 V		
Vg2,4	100 V		
Rk	140 Ω		
Rg3	50000 Ω		
Vg3 (Vosc)	8 V(eff)		
Ig3	200 µA		
Vg1	-2,5 V[1])	-25 V[2])	-34 V[3])
Ia	3,25 mA	—	—
Ig2+Ig4	6 mA	—	—
Sc	750 µA/V	7 µA/V	2 µA/V
Ri	1,5 MΩ	>10 MΩ	>10 MΩ

Betriebsdaten des Triodenteiles als Oszillator.
Caractéristiques de service de la partie triode comme oscillatrice.
Operating conditions for the triode section for use as oscillator.

Va	100 V
Ia (Rg3 = 50.000 Ω, Vosc = 8 V(eff))	9,5 mA
Ia (Vg = 0 V, Vosc = 0 V)	24 mA
S (Vg = 0 V, Vosc = 0 V)	5,5 mA/V
µ (Vg = 0 V, Vosc = 0 V)	17,5

[1]) Im ungeregelten Zustand.
Tube non-réglé par le C.A.V.
Tube not regulated by A.V.C.

[2]) Für eine Regelung der Mischsteilheit von etwa 1 : 100.
Pour le réglage de la pente de conversion de 1 : 100 environ.
For a regulation of the conversion conductance of about 1 : 100.

[3]) Grenze des optimalen Regelbereiches.
Limite de la plage de réglage optimum.
Limit of the optimum regulation range.

ECH 2

PHILIPS „MINIWATT"

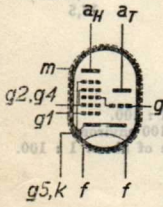
ECH 2

Grenzdaten.
Limites fixées pour les caractéristiques.
Limiting values.

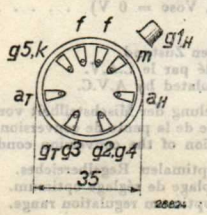
VaHo	max.	550	V
VaH	max.	300	V
WaH	max.	1	W
Vg2,4o	max.	550	V
Vg2,4	max.	125	V
Wg2,4	max.	0,6	W
Ig2 + Ig4 (Vg2,4 = 100 V, Vg1 = -2,5 V, Vg3(Vosc) = 8 V(eff), Rg3 = 50.000 Ω)	max.	7,5	mA
Ig2 + Ig4 (Vg2,4 = 100 V, Vg1 = -2,5 V, Vg3(Vosc) = 8 V(eff), Rg3 = 50.000 Ω)	min.	4,5	mA
Vg1 (Ig1 = +0,3 μA)	max.	-1,3	V
Vg3 (Ig3 = +0,3 μA)	max.	-1,3	V
Ik	max.	25	mA
Rg1H	max.	3	MΩ
Rfk	max.	20000	Ω
Vfk	max.	50	V[4])
VaTo	max.	550	V
VaT	max.	125	V
WaT	max.	1	W
VgT (IgT = +0,3 μA)	max.	-1,3	V

[4]) Gleichspannung oder Effektivwert der Wechselspannung.
Tension continue ou valeur efficace de la tension alternative.
D.C. voltage or R.M.S. value of the A.C. voltage.

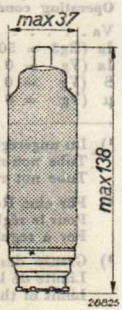
Elektrodenanordnung, Sockelanschlüsse und max. Abmessungen in mm.
Disposition des électrodes, connections du culot et dimensions max. en mm.
Electrode arrangement, base connections and max. dimensions in mm.



25823



25824

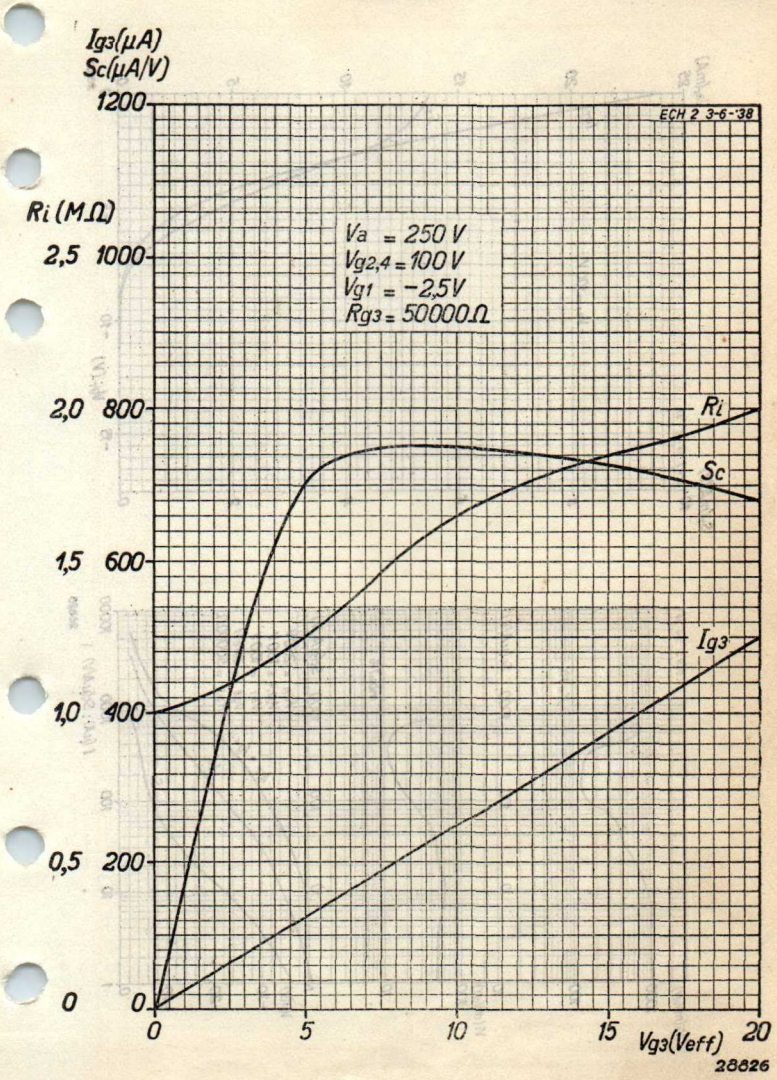


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PHILIPS „MINIWATT"

ECH 2

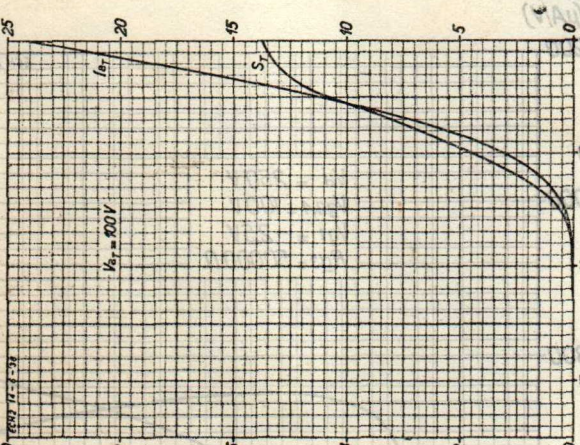
ECH 2

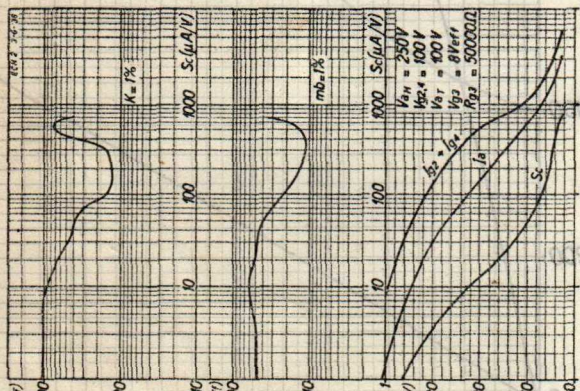


ECH 2

PHILIPS „MINIWATT"

ECH 2





TRIODE-HEPTODE

Triode-heptode; triode section intended for use as pulse amplifier and heptode section for use as noise gated sync. separator.

HEATING: Indirect by A.C. or D.C.; parallel supply

Heater voltage	V_f	6.3	V
Heater current	I_f	435	mA

LIMITING VALUES (Design centre rating system)

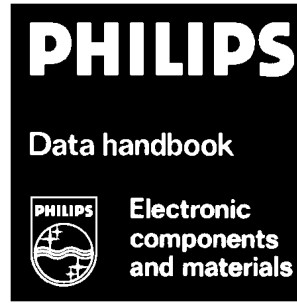
Triode section

Cathode to heater voltage	V_{kf}	max. 100	V

Heptode section

Cathode to heater voltage	V_{kf}	max. 100	V

For further data and curves of this type please refer to type PCH200



ECH200

page	sheet	date
1	1	1969.01
2	FP	1999.08.12

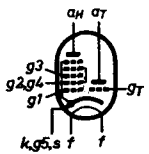
PHILIPS

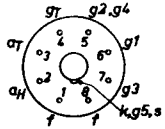
ECH 21

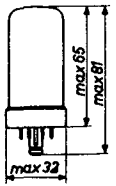
TRIODE-HEPTODE for use as frequency converter, H.F., I.F. and L.F. amplifier and phase inverter
TRIODE-HEPTODE pour utilisation comme changeuse de fréquence, amplificatrice H.F., M.F. et B.F. et comme tube inverseur de phase
TRIODE-HEPTODE zur Verwendung als Mischröhre, H.F.-, Z.F.- und N.F. Verstärker und als Phasenumkehrröhre

Heating:	indirect by A.C. or D.C.; parallel supply		
Chauffage:	indirect par C.A. ou C.C.; alimentation en parallèle	V_f =	6,3 V
Heizung:	indirekt durch Wechsel- oder Gleichstrom; Parallelspeisung	I_f =	0,33 A

Dimensions in mm
Dimensions en mm
Abmessungen in mm







Base, culot, Sockel: Loctal 8 p.

Capacitances Capacités Kapazitäten	Heptode section Partie heptode Heptodenteil		Triode section Partie triode Triodenteil	
	C_{g1} =	6,5 pF	C_g =	3,8 pF
	C_a =	8 pF	C_a =	3,1 pF
	C_{ag1} <	0,002 pF	C_{ag} =	1,1 pF
	C_{g3} =	8 pF	C_{gk} =	2,7 pF
	C_{g1g3} <	0,3 pF	C_{ak} =	1,6 pF
	C_{g1f} <	0,007 pF	C_{gf} <	0,1 pF

Between heptode and triode section
Entre les parties heptode et triode
Zwischen Heptoden- und Triodenteil

C_{gTg1H}	< 0,1 pF
C_{gT+g3}	= 12,3 pF
$C_{(gT+g3)g1H}$	< 0,35 pF
$C_{(gT+g3)aH}$	< 0,1 pF

Operating characteristics of the heptode section as frequency converter (g3 connected to gT)
Caractéristiques d'utilisation de la partie heptode comme changeuse de fréquence (g3 reliée à gT)
Betriebsdaten des Heptodenteiles als Mischröhre (g3 verbunden mit gT)

$V_a=V_b$	=	250		V
R_{g2+g4}	=	24		kΩ
R_k	=	150		Ω
R_{g3+gT}	=	50		kΩ
I_{g3+gT}	=	190		µA
V_{g1}	=	-2	-24,5	V
V_{g2+g4}	=	100	250	V
I_a	=	3	-	mA
I_{g2+g4}	=	6,2	-	mA
S_c	=	750	7,5	µA/V
R_i	=	1,4	> 3	MΩ
R_{eq}	=	55	-	kΩ

Operating characteristics of the heptode section as I.F. amplifier (g3 disconnected from gT)
Caractéristiques d'utilisation de la partie heptode comme amplificatrice M.F. (g3 non reliée à gT)
Betriebsdaten des Heptodenteiles als Z.F. Verstärker (g3 frei von gT)

$V_a=V_b$	=		250		V
V_{g3}	=		0		V
R_{g2+g4}	=		45		kΩ
V_{g1}	=	-2	-36	-44	V
V_{g2+g4}	=	90	-	250	V
I_a	=	5,3	-	-	mA
I_{g2+g4}	=	3,5	-	-	mA
S	=	2200	22	2,2	µA/V
R_i	=	0,9	>10	>10	MΩ
μ_{g2g1}	=	18	-	-	
R_{eq}	=	7,5	-	-	kΩ

Typical characteristics of the triode section
Caractéristiques types de la partie triode
Kenndaten des Triodenteiles

V_a	=	100 V
V_g	=	0 V
I_a	=	12 mA
S	=	3,2 mA/V
μ	=	22

Operating characteristics of the triode section as oscillator (g3 connected to gT)
Caractéristiques d'utilisation de la partie triode comme oscillatrice (g3 reliée à gT)
Betriebsdaten des Triodenteiles als Oszillator (g3 verbunden mit gT)

V_b	=	250 V
R_a	=	20 kΩ
R_{gT+g3}	=	50 kΩ
I_{gT+g3}	=	190 µA
I_a	=	4,5 mA
S_{eff}	=	0,55 mA/V

Operating characteristics of the triode section as L.F. amplifier with resistance coupling (gT disconnected from g3)
Caractéristiques d'utilisation de la partie triode comme amplificatrice B.F. avec couplage à resistances (gT non reliée à g3)
Betriebsdaten des Triodenteiles als N.F. Verstärker mit Widerstandskopplung (gT frei von g3)

V_b (V)	R_a (MΩ)	V_g (V)	I_a (mA)	V_o (V_{eff})	$\frac{V_o}{V_i}$	d_{tot} (%)
250	0,2	-2	1,0	7,5	13	2,5
250	0,2	-4	0,9	7,5	12	2,0
250	0,1	-2	2,0	7,5	14	2,1
250	0,1	-4	1,7	7,5	13	1,6
250	0,05	-2	3,5	7,5	14	2,1
250	0,05	-4	3,0	7,5	13	1,5

Limiting values of the heptode section
Caractéristiques limites de la partie heptode
Grenzdaten des Heptodenteiles

V_{ao}	= max.	550	V
V_a	= max.	300	V
W_a	= max.	1,5	W
$V_{(g2+g4)o}$	= max.	550	V
V_{g2+g4} (I_a = 3 mA)	= max.	100	V
V_{g2+g4} (I_a < .1 mA)	= max.	300	V
W_{g2+g4}	= max.	1	W
V_{g1} (I_{g1}=+0,3 µA)	= max.	-1,3	V
V_{g3} (I_{g3}=+0,3 µA)	= max.	-1,3	V
I_k	= max.	15	mA
R_{g1}	= max.	3	MΩ
R_{g3}	= max.	3	MΩ
R_{fk}	= max.	20	kΩ
V_{fk}	= max.	50	V

Limiting values of the triode section
Caractéristiques limites de la partie triode
Grenzdaten des Triodenteiles

V_{ao}	= max.	550	V
V_a	= max.	175	V
W_a	= max.	0,8	W
V_g (I_g=+0,3 µA)	= max.	-1,3	V
R_g	= max.	3	MΩ

PHILIPS

Electronic Tube

HANDBOOK

ECH21

page	sheet	date
1	1	1953.04.04
2	2	1953.04.04
3	3	1953.04.04
4	4	1953.04.04
5	FP	1999.06.26

ECH 3 Triode-Hexode

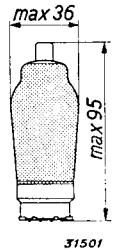


Abb. 1
Abmessungen in mm.

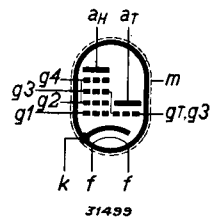
Die Röhre ECH 3 ist eine Mischröhre mit veränderlicher Steilheit nach dem Prinzip der Triode-Hexode. Sie besteht mithin aus der Kombination einer Hexode als der eigentlichen Mischröhre und einer Triode als Oszillatorröhre; beide Teile benutzen die gemeinschaftliche Kathode, deren Heizleistung 1,26 Watt beträgt. Der Heizstrom ist bei 6,3 V Spannung 200 mA. Durch diese Wahl der Heizdaten eignet sich die ECH 3 sowohl zur Verwendung als Mischröhre in Wechselstromgeräten mit Parallelspeisung der Röhrenfäden wie auch zur Verwendung in Gleichstrom/Wechselstromgeräten mit Serienspeisung bei 200 mA Heizstrom.

Das erste Gitter des Hexodenteiles hat eine veränderliche Steigung. An dieses Gitter werden das H.F.-Signal und die Regelspannung der automatischen Lautstärkeregelung gelegt. Gitter 2 und 4 sind Schirmgitter, während Gitter 3 in der Röhre direkt mit dem Steuergitter des Triodenteiles verbunden ist und mithin die Oszillatorwechselspannung führt.

Trotz der geringen Heizleistung gestattet die ECH 3 eine sehr große Mischverstärkung. Bei 250 V Anodenspannung und 100 V Schirmgitterspannung beträgt die Mischsteilheit im ungeregelten Zustand 650 μA/V und der Innenwiderstand 1,3 Megohm. Es ist daher eine sehr hohe Mischverstärkung möglich.

Die Röhre ECH 3 eignet sich vorzüglich für den Kurzwellenempfang. Dabei ist eine Regelung der Steilheit (automatische Lautstärkeregelung) durchaus möglich, ohne daß eine zu große Frequenzverwerfung auftritt. Auch bei Netzspannungsschwankungen bleibt die Frequenzverwerfung genügend klein. Ist der abgestimmte Kreis des Oszillators in die Anodenleitung und die Rückkopplungsspule in die Gitterzuleitung geschaltet, so beträgt die Frequenzverwerfung bei einer Netzspannungsschwankung von 10% und einer Wellenlänge von 15 m weniger als 1 kHz. Sie beträgt bei 15 m Wellenlänge und bei einer Abstimmkapazität des Schwingkreises von 50 $\mu\mu$F für völlige Herunterregelung weniger als 2 kHz.

Günstig für den Kurzwellenempfang sind weiter die verhältnismäßig geringen Ein- und Ausgangskapazitäten.



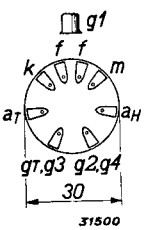


Abb. 2
Elektrodenanordnung und Sockelanschlüsse.

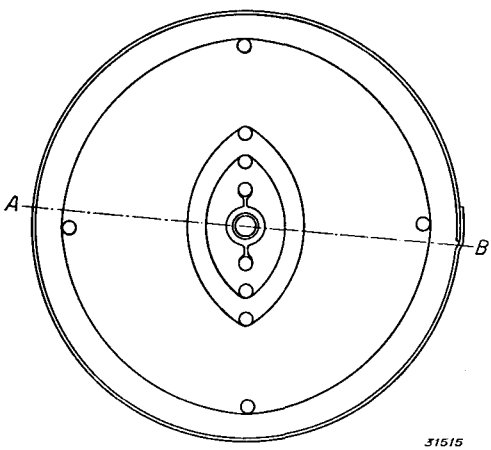


Abb. 3
Querschnitt durch das Elektrodensystem des Hexodenteiles.

Wegen des Hexodenprinzips besteht keine elektronische Kopplung zwischen Oszillatorgitter (Gitter 3) und Hochfrequenzgitter (Gitter 1). Wohl hat Gitter 3 eine Kapazität gegenüber Gitter 1, so daß bei sehr kurzen Wellen (13 m) noch eine Wechselspannung der Oszillatorfrequenz von etwa 0,5 V an Gitter 1 liegt. Diese Spannung hat aber praktisch nur wenig Einfluß auf die Mischsteilheit. Infolge der großen Steilheit des Hexodenteiles und des scharfen Steilheitsabfalles des ersten Gitters bei zunehmender negativer Spannung an Gitter 3 (siehe Abb. 21) wurde erstens die große Mischsteilheit im ungeregelten Zustand und zweitens ein geringer Oszillatorwechselspannungsbedarf erreicht. Die effektive Oszillatorwechselspannung für opti-

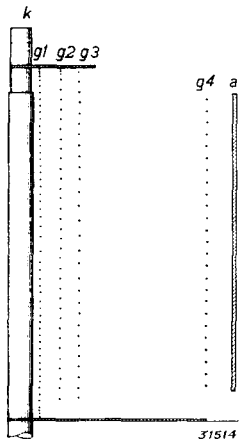


Abb. 4
Senkrechter Schnitt durch das Elektrodensystem des Hexodenteiles (Schnitt A-B der Abb. 3).

males Arbeiten beträgt nur 8 V. Sie kann ohne weiteres mit normalen Spulensätzen durch den Triodenteil erzeugt werden. Aber auch bei geringeren Oszillatorwechselspannungen ist die Mischsteilheit noch sehr hoch (bei 5 V etwa 580 µA/V, siehe z.B. Abb. 9), so daß auch im Kurzwellenbereich eine befriedigende Mischverstärkung erzielt werden kann. Auch bei viel größeren Oszillatorspannungen als 8 V weicht die Mischsteilheit nur wenig von der optimalen ab, so daß sogar bei beträchtlicher Änderung der Oszillatorspannung im Wellenbereich die Mischsteilheit und daher die Verstärkung nur wenig schwankt. Die Oszillatorspannung von 8 V (200 µA Strom durch den Gitterableitwiderstand von 50.000 Ohm) stellt einen günstigen Mittelwert dar und verbürgt das günstigste Kompromiß zwischen Rauschen, Pfeiftonstärke und Mischsteilheit.

Die ECH 3 wurde in Bezug auf Regelfähigkeit und Quermodulationseigenschaften zur Schirmgitterspeisung mit Hilfe eines Spannungsteilers entwickelt. Obwohl in Bezug auf Stromverbrauch die Speisung der Schirmgitter über einen Serienwiderstand vorteilhafter wäre, ist ein großer Nachteil damit verbunden. Bei Speisung des Schirmgitters über einen Serienwiderstand steigt nämlich beim Herunterregeln die Schirmgitterspannung und nähert sich dann der Anodenspannung. Bei hoher Schirmgitterspannung werden die aus der Anode ausgestoßenen Sekundärelektronen vom Schirmgitter angezogen, und dadurch sinkt der Innenwiderstand erheblich. Infolgedessen nimmt auch die Trennschärfe des in den Anoden-

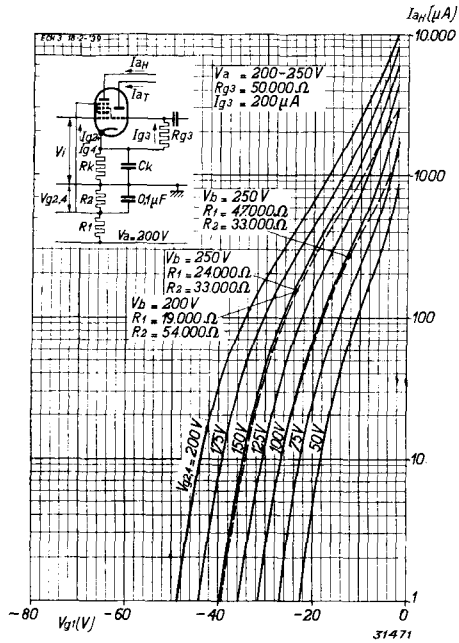


Abb. 5
Anodenstrom des Hexodenteiles als Funktion der negativen Gittervorspannung bei verschiedenen Schirmgitterspannungen und einer Anodenspannung von 200 bis 250 V.

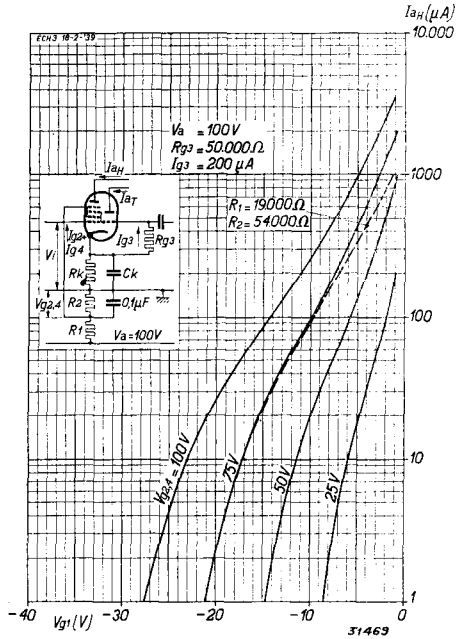


Abb. 6
Anodenstrom des Hexodenteiles als Funktion der negativen Gittervorspannung bei verschiedenen Schirmgitterspannungen und einer Anodenspannung von 100 V.

kreis geschalteten Bandfilters während der Regelung ab. Bei geeigneter Wahl der Potentiometerwiderstände kann die Steigung der Schirmgitterspannung beschränkt bleiben und wird der Abfall des Innenwiderstandes vermieden. Die Wahl der Potentiometerwiderstände gestattet es, eine mehr oder weniger scharfe Regelung der Verstärkung zu erzielen.
Die Regelung der Mischsteilheit ist verhältnismäßig scharf bei hervorragenden Quermodulationseigenschaften im ganzen Regelbereich (siehe Abb. 15 bis 20 einschließlich).

HEIZDATEN

Heizung: indirekt durch Gleich- oder Wechselstrom, Parallel- oder Serienspeisung
Heizspannung . . . . . V_f = 6,3 V
Heizstrom . . . . . I_f = 0,200 A.

KAPAZITÄTEN

a) Hexodenteil

C_{b1} = 4,9 µµF
C_a = 9,0 µµF
C_{ag1} < 0,003 µµF
C_{g1f} < 0,001 µµF

b) Triodenteil

C_g = 8,8 µµF
C_a = 4,4 µµF
C_{ag} = 1,4 µµF

c) Zwischen Hexoden- und Triodenteil

$C_{g_{Tg1_H}}$ < 0,3 µµF

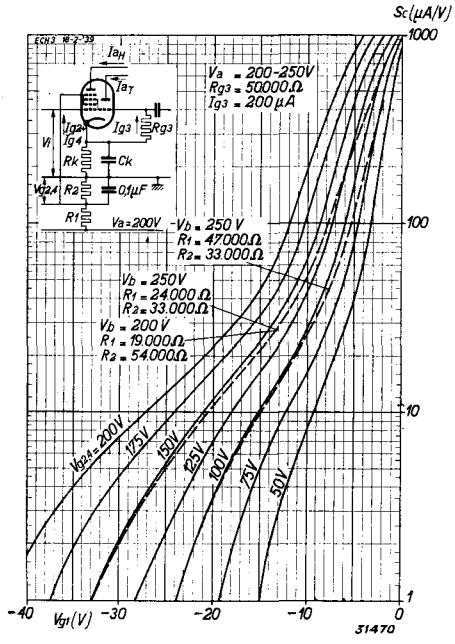


Abb. 7
Mischsteilheit *Sc* als Funktion der negativen Gittervorspannung Vg_1 bei verschiedenen Schirmgitterspannungen und einer Anodenspannung von 200 bis 250 V.

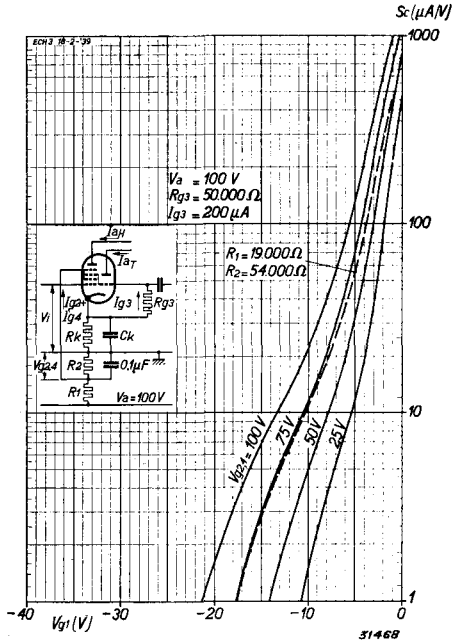


Abb. 8
Mischsteilheit *Sc* als Funktion der negativen Gittervorspannung Vg_1 bei verschiedenen Schirmgitterspannungen und einer Anodenspannung von 100 V.

ECH 3

BETRIEBSDATEN des Hexodenteiles als Mischröhre

a) FESTE SCHIRMGITTERSPANNUNG

Anodenspannung							
V_a	=	200 V			250 V		
Schirmgitterspannung							
$V_{g2,4}$	=	100 V			100 V		
Kathodenwiderstand							
R_k	=	215 Ω			215 Ω		
Ableitwiderst. d. Oszillatorgitters							
R_{g3}	=	50.000 Ω			50.000 Ω		
Strom des Oszillatorgitters							
I_{g3}	=	200 µA			200 µA		
Neg. Vorspannung an Gitter 1							
V_{g1}	=	—2 V [1]	—17 V [2]	—23 V [3]	—2 V [1]	—17 V [2]	—23 V [3]
Anodenstrom							
I_a	=	3 mA	—	—	3 mA	—	—
Schirmgitterstrom							
$I_{g2} + I_{g4}$	=	3 mA	—	—	3 mA	—	—
Mischsteilheit							
S_c	=	650 µA/V	6,5 µA/V	1,5 µA/V	650 µA/V	6,5 µA/V	1,5 µA/V
Innenwiderstand							
R_i	=	0,9 MΩ	>5 MΩ	>5 MΩ	1,3 MΩ	>5 MΩ	>6 MΩ

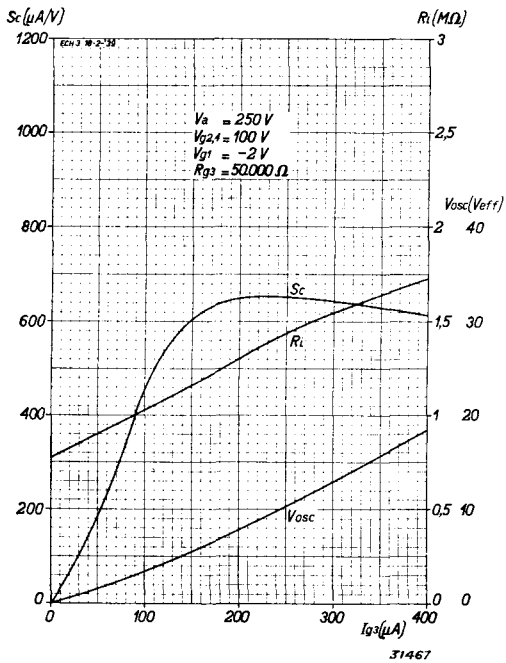


Abb. 9
Mischsteilheit *Sc*, Innenwiderstand *Ri* und effektive Oszillatorwechselspannung *Vosz* als Funktion des Oszillatorgitterstroms Ig_3 bei Rg_3 = 50.000 Ohm, Va = 250 V und einer festen Schirmgitterspannung von 100 V.

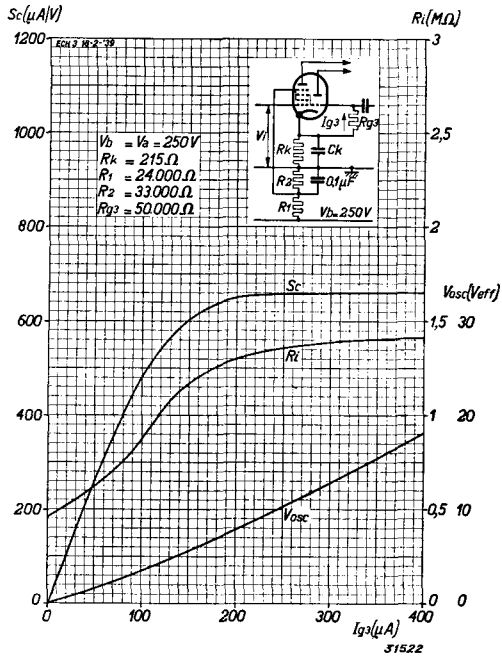


Abb. 10
Mischsteilheit *Sc*, Innenwiderstand *Ri* und effektive Oszillatorwechselspannung *Vosz* als Funktion des Oszillatorgitterstroms Ig_3 bei Rg_3 = 50.000 Ohm, Va = 250 V und Schirmgitterspeisung über einen Spannungsteiler von 24.000 + 33.000 Ohm (mittlere Einstellung).

b) SCHIRMGITTERSPEISUNG ÜBER EINEN SPANNUNGSTEILER (mittlere Verhältnisse) (Eigenverbrauch des Spannungsteilers 3 mA)

Anodenspannung bzw. Speisespannung	$V_b = V_a$	=		250 V	
Spannungsteilerwiderst. (s. Abb. 28)	R_1	=		24.000 Ω	
Spannungsteilerwiderst. (s. Abb. 28)	R_2	=		33.000 Ω	
Kathodenwiderstand	R_k	=		215 Ω	
Ableitwiderstand d. Oszillatorgitters	R_{g3}	=		50.000 Ω	
Strom des Oszillatorgitters	I_{g3}	=		200 µA	
Neg. Vorspannung an Gitter 1	V_{g1}	=	—2 V [1]	—23,5 V [2]	—31 V [3]
Schirmgitterspannung	V_{g2+4}	=	100 V	—	145 V
Anodenstrom	I_a	=	3 mA	—	—
Schirmgitterstrom	$I_{g2} + I_{g4}$	=	3 mA	—	—
Mischsteilheit	S_c	=	650 µA/V	6,5 µA/V	1,5 µA/V
Innenwiderstand	R_i	=	1,3 MΩ	>3 MΩ	> 4 MΩ

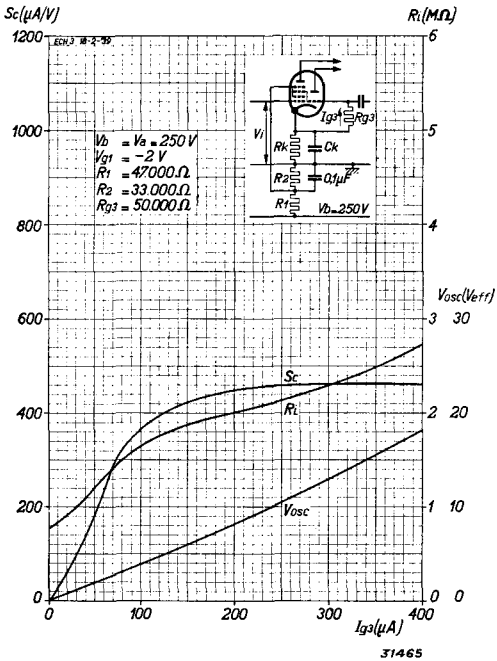


Abb. 11
Mischsteilheit *Sc*, Innenwiderstand *Ri* und efefektive Oszillatorwechselspannung *Vosz* als Funktion des Oszillatorgitterstroms Ig_3 bei Rg_3 = 50.000 Ohm, *Va* = 250 V und Schirmgitterspeisung über einen Spannungteiler von 47.000 + 33.000 Ohm (rauscharme Einstellung).

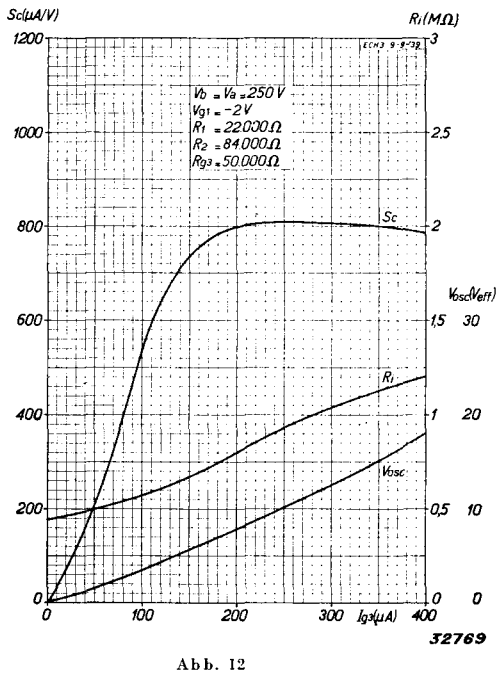


Abb. 12
Mischsteilheit *Sc*, Innenwiderstand *Ri* und effektive Oszillatorwechselspannung *Vosz* als Funktion des Oszillatorgitterstroms Ig_3 bei Rg_3 = 50.000 Ohm, *Va* = 250 V und Schirmgitterspeisung über einen Spannungsteiler von 22.000 + 84.000 Ohm (Einstellung mit besonderer Berücksichtigung der Quermodulation).

c) EINSTELLUNG ZUR ERREICHUNG EINES GUTEN RAUSCHVERHÄLTNISSES, SCHIRMGITTERSPEISUNG ÜBER EINEN SPANNUNGSTEILER. (Eigenverbrauch des Spannungsteilers 2,1 mA)

Anodenspannung bzw. Speisespannung	$V_b = V_a =$		250 V		
Spannungsteilerwiderst. (s. Abb. 28)	$R_1 =$		47.000 Ω		
Spannungsteilerwiderst. (s. Abb. 28)	$R_2 =$		33.000 Ω		
Kathodenwiderstand	$R_k =$		310 Ω		
Ableitwiderst. d. Oszillatorgitters	$R_{g3} =$		50.000 Ω		
Strom d. Oszillatorgitters	$I_{g3} =$		200 µA		
Neg. Vorspannung an Gitter 1	$V_{g1} =$	−2 V [1]	−19 V [2]	−23 V [3]	
Schirmgitterspannung	$V_{g2,4} =$	70 V	—	100 V	
Anodenstrom	$I_a =$	1,5 mA	—	—	
Schirmgitterstrom	$I_{g2} + I_{g4} =$	1,6 mA	—	—	
Mischsteilheit	$S_c =$	450 µA/V	4,5 µA/V	1,5 µA/V	
Innenwiderstand	$R_i =$	2 MΩ	> 5 MΩ	> 6 MΩ	

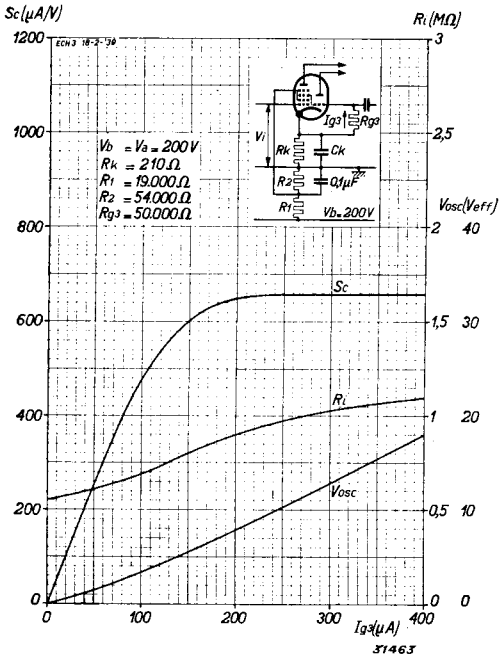


Abb. 13
Mischsteilheit *Sc*, Innenwiderstand *Ri* und effektive Oszillatorwechselspannung *Vosz* als Funktion des Oszillatorgitterstroms Ig_3 bei Rg_3 = 50.000 Ohm, *Va* = 200 V und Schirmgitterspeisung über einen Spannungsteiler von 19.000 + 54.000 Ohm (für umschaltbare G/W-Geräte).

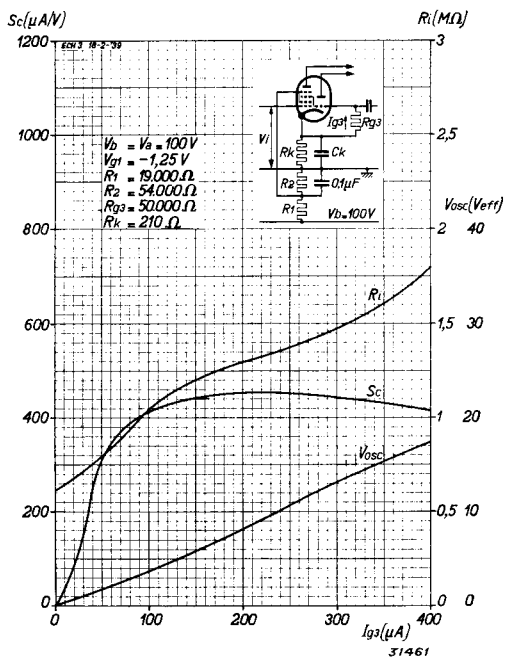


Abb. 14
Mischsteilheit *Sc*, Innenwiderstand *Ri* und effektive Oszillatorwechselspannung *Vosz* als Funktion des Oszillatorgitterstroms Ig_3 bei Rg_3 = 50.000 Ohm, *Va* = 100 V und Schirmgitterspeisung über einen Spannungsteiler von 19.000 + 54.000 Ohm (für umschaltbare G/W-Geräte).

d) GÜNSTIGSTE EINSTELLUNG MIT RÜCKSICHT AUF QUERMODULATION, SCHIRMGITTERSPEISUNG ÜBER EINEN SPANNUNGSTEILER.
(Eigenverbrauch des Spannungsteilers 1,5 mA)

Anodenspannung bzw. Speisespannung	$V_b = V_a =$		250 V	
Spannungsteilerwiderst. (s. Abb. 28)	$R_1 =$		22.000 Ω	
Spannungsteilerwiderst. (s. Abb. 28)	$R_2 =$		84.000 Ω	
Kathodenwiderstand	$R_k =$		165 Ω	
Ableitwiderst. d. Oszillatorgitters	$R_{g3} =$		50.000 Ω	
Strom d. Oszillatorgitters	$I_{g3} =$		200 µA	
Neg. Vorspannung an Gitter 1	$V_{g1} =$	—2 V [1]	—28,5 V [2]	—40 V [2]
Schirmgitterspannung	$V_{g2+4} =$	125 V	—	200 V
Anodenstrom	$I_a =$	4,5 mA	—	—
Schirmgitterstrom	$I_{g2} + I_{g4} =$	4,3 mA	—	—
Mischsteilheit	$S_c =$	800 µA/V	8 µA/V	1,5 µA/V
Innenwiderstand	$R_i =$	0,8 MΩ	>0,8 MΩ	>1,1 MΩ

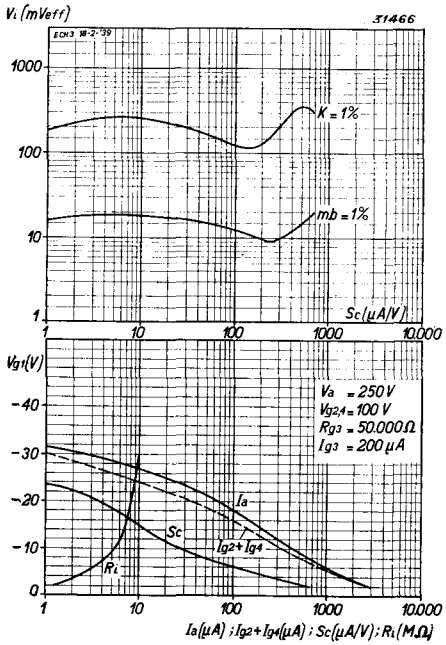


Abb. 15
Bei *Va* = 250 V und einer festen Schirmgitterspannung von 100 V.
Obere Kurven: Für 1% Quermodulation (*K* = 1%) zulässige effektive hochfrequente Wechselspannung und für 1% Modulationsbrummen (*mb* = 1%) zulässige Wechselspannung des Störsignals am Gitter als Funktion der Mischsteilheit.
Untere Kurven: Anodenstrom *Ia*, Schirmgitterstrom $Ig_2 + Ig_4$, Mischsteilheit Sc und Innenwiderstand *Ri* als Funktion der negativen Spannung an Gitter 1.

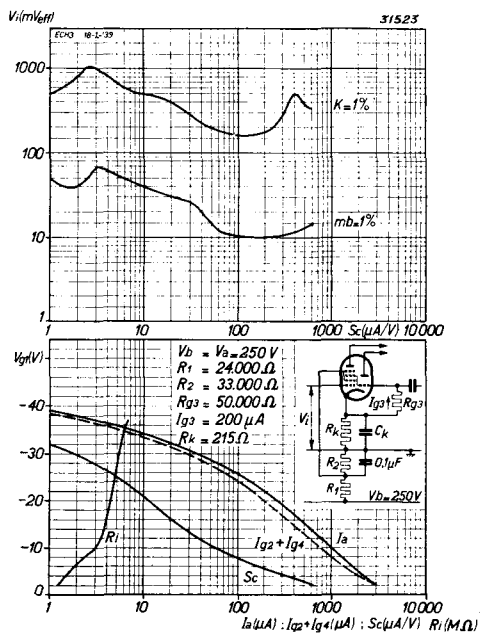


Abb. 16
Bei *Va* = 250 V und einer Schirmgitterspeisung über einen Spannungsteiler von 24.000 + 33.000 Ohm (mittlere Einstellung):
Obere Kurven: Für 1% Quermodulation (*K* = 1%) zulässige effektive hochfrequente Wechselspannung und für 1% Modulationsbrummen (*mb* = 1%) zulässige Wechselspannung des Störsignals am Gitter als Funktion der Mischsteilheit.
Untere Kurven: Anodenstrom *Ia*, Schirmgitterstrom $Ig_2 + Ig_4$, Mischsteilheit Sc und Innenwiderstand *Ri* als Funktion der negativen Spannung an Gitter 1.

e) EINSTELLUNG ZUR VERWENDUNG IN G/W-EMPFÄNGERN, SCHIRMGITTERSPEISUNG ÜBER EINEN SPANNUNGSTEILER.
(Eigenverbrauch des Spannungsteilers bei V_b = 200 V 1,85 mA und bei V_b = 100 V 1 mA).

Anodensp. bzw. Speisesp. $V_b = V_a$	=	100 V			200 V	
Spannungsteilerwiderst. (s. Abb. 28) R_1	=	19.000 Ω			19.000 Ω	
Spannungsteilerwiderst. (s. Abb. 28) R_2	=	54.000 Ω			54.000 Ω	
Kathodenwiderstand R_k	=	210 Ω			210 Ω	
Ableitwiderst. d. Oszillatorgitters R_{g3}	=	50.000 Ω			50.000 Ω	
Strom d. Oszillatorgitters I_{g3}	=	200 µA			200 µA	
Neg. Vorsp. an Gitter 1 V_{g1}	=	—1,25 V[1])	—13,5 V[2])	—16,5 V[2])	—2 V[1])	—23,5 V[2])	—31 V[3])
Schirmgitterspannung $V_{g2,4}$	=	55 V	—	75 V	100 V	—	145 V
Anodenstrom I_a	=	1 mA	—	—	3 mA	—	—
Schirmgitterstrom $I_{g2} + I_{g4}$	=	1,4 mA	—	—	3 mA	—	—
Mischsteilheit S_c	=	450 µA/V	4,5 µA/V	1,5 µA/V	650 µA/V	6,5 µA/V	1,5 µA/V
Innenwiderstand R_i	=	1,3 MΩ	> 4 MΩ	> 5 MΩ	0,9 MΩ	> 2 MΩ	>2,5 MΩ

[1]) Im ungeregelten Zustand
[2]) Für eine Regelung der Mischsteilheit 1 : 100
[3]) Grenze des optimalen Regelbereiches.

BETRIEBSDATEN des Triodenteiles als Oszillator

Anodenspannung	V_a	=	100 V	150 V	—
Speisespannung d. Anodenwiderst. . .	V_b	=	—	—	250 V
Anodenwiderstand	R_a	=	—	—	45.000 Ω
Anodenstrom in schwingendem Zust. (R_g = 50.000 Ω, I_g = 200 µA) . . .	I_a	=	3,3 mA	8 mA	3,3 mA
Anodenstrom b. Schwingungseinsatz (V_{osz} = 0 V)	I_a	=	10 mA	18 mA	6,3 mA
Steilheit b. Schwingungseinsatz (V_{osz} = 0 V)	S	=	2,8 mA/V	3,8 mA/V	2,8 mA/V
Verstärkungsfaktor (V_g = 0 V, V_{osz} = 0 V)	μ	=	24	24	24

GRENZDATEN für den Hexodenteil

Maximale Anodenkaltspannung	V_{ao}	= max.	550 V
Maximale Anodenspannung	V_a	= max.	300 V
Maximale Anodenbelastung	W_a	= max.	1,2 W
Maximale Schirmgitterkaltspannung	V_{g2o}	= max.	550 V
Maximale Schirmgitterspannung (I_a = 4,5 mA)	V_{g2}	= max.	125 V
Maximale Schirmgitterspannung (I_a < 0,5 mA)	V_{g2}	= max.	200 V
Maximale Schirmgitterbelastung	W_{g2}	= max.	0,6 W
Gitterstromeinsatzpunkt (I_{g1} = + 0,3 µA)	V_{g1}	= max.	—1,3 V
Gitterstromeinsatzpunkt (I_{g3} = + 0,3 µA)	V_{g1}	= max.	—1,3 V
Maximaler Kathodenstrom	I_k	= max.	15 mA
Maximaler Widerstand im Kreise von Gitter 1	R_{g1k}	= max.	3 MΩ
Maximaler Widerstand im Kreise von Gitter 3	R_{g3k}	= max.	100.000 Ω
Maximaler Widerstand zwischen Heizfaden und Kathode	R_{fk}	= max.	20.000 Ω
Maximale Spannung zwischen Heizfaden und Kathode (Gleichspannung oder Effektivwert der Wechselsp.)	V_{fk}	= max.	100 V

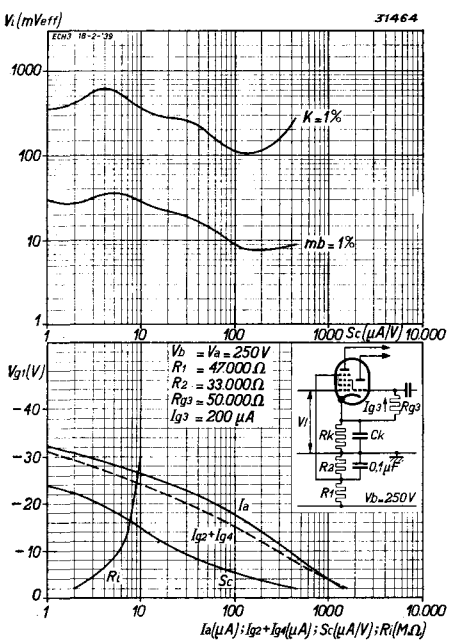


Abb. 17
Bei *Va* = 250 V und einer Schirmgitterspeisung über einen Spannungsteiler von 47.000 + 33.000 Ohm (rauscharme Einstellung).
Obere Kurven: Für 1% Quermodulation (*K* = 1%) zulässige effektive hochfrequente Wechselspannung und für 1% Modulationsbrummen (*mb* = 1%) zulässige Wechselspannung des Störsignals am Gitter als Funktion der Mischsteilheit.
Untere Kurven: Anodenstrom *Ia*, Schirmgitterstrom $Ig_2 + Ig_4$, Mischsteilheit *Sc* und Innenwiderstand *Ri* als Funktion der negativen Spannung an Gitter 1.

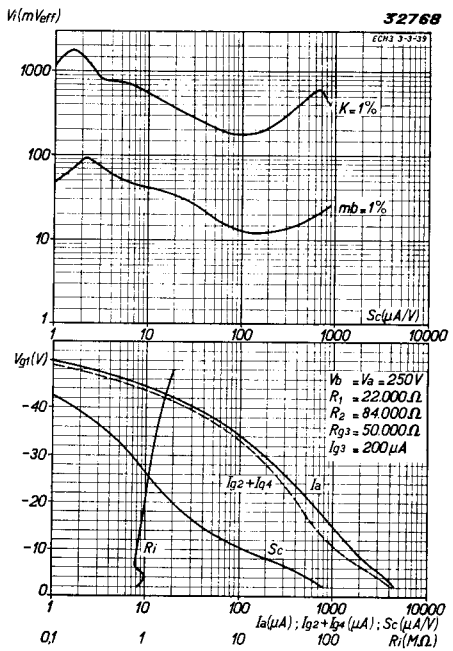


Abb. 18
Bei *Va* = 250 V und einer Schirmgitterspeisung über einen Spannungsteiler von 22.000 + 84.000 Ohm (Einstellung mit besonderer Berücksichtigung der Quermodulation).
Obere Kurven: Für 1% Quermodulation (*K* = 1%) zulässige effektive hochfrequente Wechselspannung und für 1% Modulationsbrummen (*mb* = 1%) zulässige Wechselspannung des Störsignals am Gitter als Funktion der Mischsteilheit.
Untere Kurven: Anodenstrom *Ia*, Schirmgitterstrom $Ig_2 + Ig_4$, Mischsteilheit *Sc* und Innenwiderstand *Ri* als Funktion der negativen Spannung an Gitter 1.

ECH 3

GRENZDATEN für den Triodenteil

Maximale Anodenkaltspannung	V_{ao}	=	max. 550 V
Maximale Anodenspannung	V_a	=	max. 150 V
Maximale Anodenbelastung	W_a	=	max. 1,5 W
Gitterstromeinsatzpunkt	V_g (I_g = + 0,3 µA)	=	max. —1,3 V
Maximaler Widerstand im Gitterkreis	R_g	=	max. 100.000 Ω

Infolge der großen Steilheit des Triodenteiles wird der Schwingungseinsatz und das Aufrechterhalten der Schwingung keine Schwierigkeiten bereiten. Durch den leichten Schwingungseinsatz wird vorteilhaft eine losere Rückkopplung angewendet werden können. Ein Gitterableitwiderstand von 50.000 Ω wird empfohlen. Der Gitterkondensator kann am besten einen Wert von 50 µµF erhalten. Diese Werte können für alle Wellenbereiche eingehalten werden. Es ist zu empfehlen, sowohl mit Rücksicht auf Frequenzverwerfung als auch im Hinblick auf das Mitziehen der Oszillatorabstimmung durch den Hochfrequenzkreis, den abgestimmten Oszillatorkreis in den Anodenkreis des Triodenteiles zu

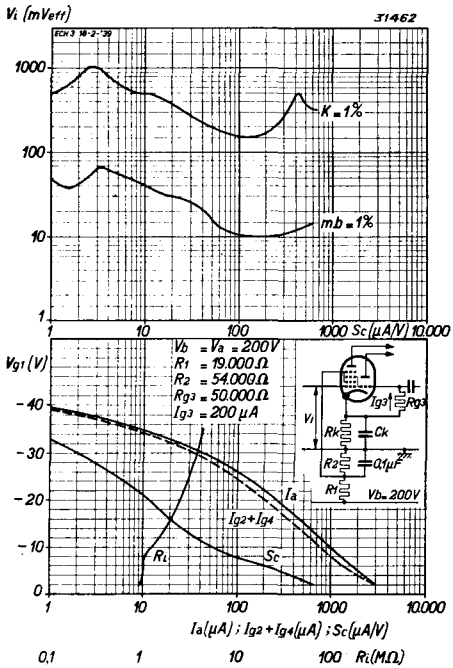


Abb. 19

Bei *Va* = 200 V und einer Schirmgitterspeisung über einen Spannungsteiler von 19.000 + 54.000 Ohm (für umschaltbare G/W-Geräte).
Obere Kurven: für 1% Quermodulation (*K* = 1%) zulässige effektive hochfrequente Wechselspannung und für 1% Modulationsbrummen (*mb* = 1%) zulässige Wechselspannung des Störsignals am Gitter als Funktion der Mischsteilheit.
Untere Kurven: Anodenstrom *Ia*, Schirmgitterstrom $Ig_2 + Ig_4$, Mischsteilheit *Sc* und Innenwiderstand *Ri* als Funktion der negativen Spannung an Gitter 1.

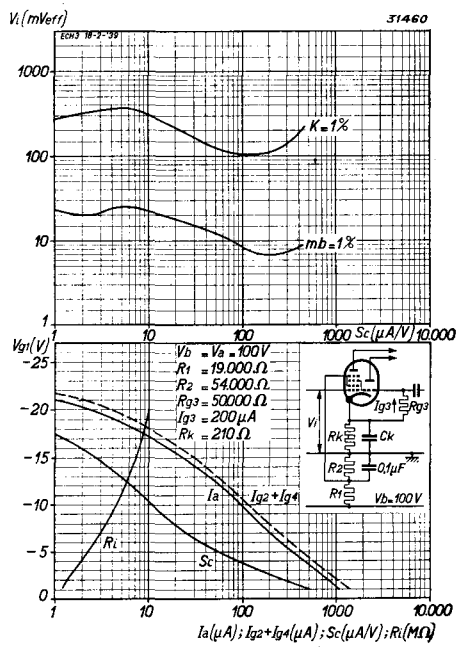


Abb. 20

Bei *Va* = 100 V und einer Schirmgitterspeisung über einen Spannungsteiler von 19.000 + 54.000 Ohm (für umschaltbare G/W-Geräte).
Obere Kurven: für 1% Quermodulation (*K* = 1%) zulässige effektive hochfrequente Wechselspannung und für 1% Modulationsbrummen (*mb* = 1%) zulässige Wechselspannung des Störsignals am Gitter als Funktion der Mischsteilheit.
Untere Kurven: Anodenstrom *Ia*, Schirmgitterstrom $Ig_2 + Ig_4$, Mischsteilheit *Sc* und Innenwiderstand *Ri* als Funktion der negativen Spannung an Gitter 1.

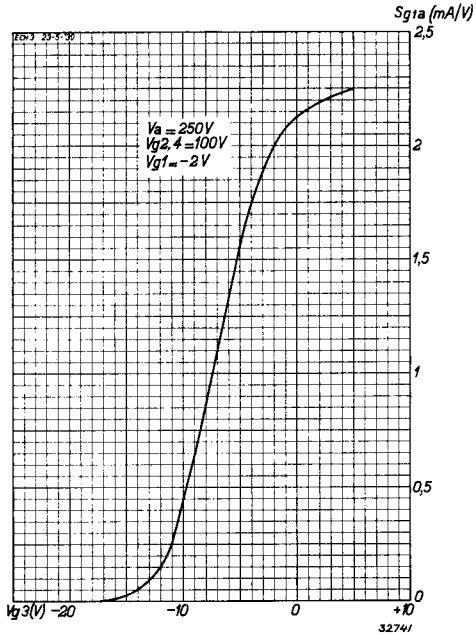


Abb. 21
Steilheit des ersten Gitters $S_{g_1 a}$ als Funktion der negativen Spannung an Gitter 3.

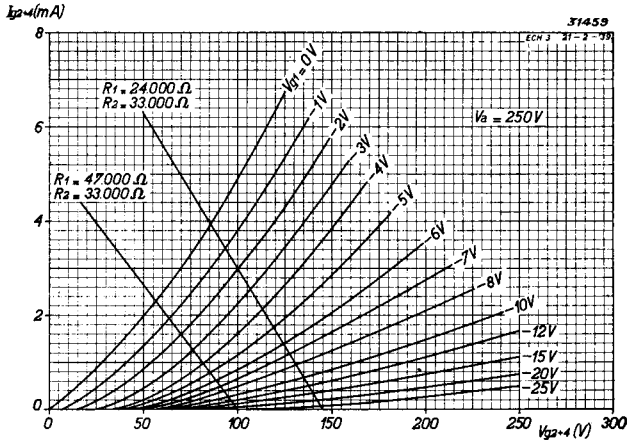


Abb. 22
Schirmgitterstrom $Ig_2 + Ig_4$ als Funktion der Schirmgitterspannung Ig_{2+4} bei verschiedenen negativen Gittervorspannungen V_{g_1}.

schalten. Wird der abgestimmte Kreis in die Gitterzuleitung geschaltet, so wird ungefähr der doppelte Wert für die Frequenzverwerfung erhalten.
Die über die Kapazität C_{g1g3} am Eingangskreis entstehende Wechselspannung von der Oszillatorfrequenz vergrößert oder verkleinert die Mischsteilheit, je nachdem die Oszillatorfrequenz höher oder niedriger als die Eingangsfrequenz ist. Es ist also im Kurzwellenbereich vorteilhafter, die Oszillatorfrequenz höher als die Eingangsfrequenz zu wählen, wie es im Mittel- oder Langwellenbereich üblich ist.
Abb. 28 zeigt eine grundsätzliche Schaltung für die Verwendung der ECH 3 als Mischröhre. Der Oszillatorkreis kann in normaler Weise parallel gespeist werden. Der Anodenserien- oder Speisewiderstand beträgt dann bei einer Betriebsspannung V_b von 250 V etwa 30.000 bis 45.000 Ohm, der Kopplungskondensator 50 bis 500 $\mu\mu$F. Für das Konstanthalten der Oszillatorwechselspannung auf Mittel- und Langwellen kann mit Vorteil die Rückkopplungsspule zum Paddingkondensator zurückgeführt werden. Der Verlauf des Oszillatorgitterstromes wird dann auf Mittel- und Langwellen 200-300-200 μA. Auf Kurzwellen kann die Oszillatorspannung durch einen Widerstand von etwa 75 Ohm in Serie mit der Rückkopplungsspule konstant gehalten werden. Dieser Widerstand wirkt zusammen mit der Eingangskapazität der Triode und liefert eine Dämpfung, die mit der Frequenz rasch zunimmt.
Bei Apparaten für Gleichstrom/Wechselstrombetrieb kann die oben angeführte Schaltung für den Betrieb bei 250 V auch angewendet werden, wenn die Betriebsspannung der Röhre nicht zu niedrig liegt (z.B. nicht unterhalb 200 V). Beim Betrieb mit 100 V wird infolge der Speisung der Triodenanode über einen Serienwiderstand von 30.000 Ohm die Spannung an der Anode zu niedrig sein. Wählt man einen kleineren Speisewiderstand, so wird der Oszillatorkreis zu sehr gedämpft, und außerdem erhält man dann eine schlechte Paddingkurve (größere Abweichungen von der richtigen Oszillatorfrequenz infolge von Verstimmung des Oszillatorkreises durch den Speisewiderstand). Da im allgemeinen an G/W-Empfänger zum Betrieb bei niedriger Netzspannung weniger strenge Anforderungen gestellt werden, wird in dem Falle am besten der abgestimmte Oszillatorkreis in den Gitterkreis geschaltet. Bei umschaltbaren Geräten, die sowohl an 220-V- wie an 110-V-Netzen arbeiten müssen, ist es einfacher, den abgestimmten Oszillatorkreis in der Anodenzuleitung zu lassen und auch bei niedriger Spannung eine Parallelspeisung über einen normalen Speisewiderstand vorzunehmen. Man erhält dann natürlich bei 110 V eine wesentlich niedrigere Oszillatorspannung als bei 220 V.

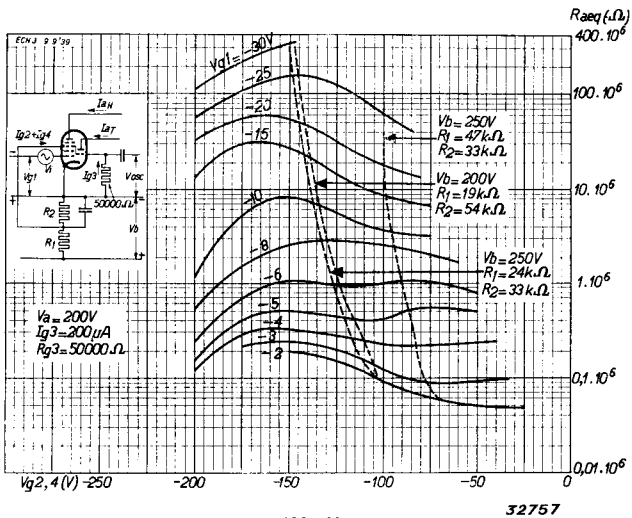


Abb. 23
Äquivalenter Rauschwiderstand *Raeq* als Funktion der Schirmgitterspannung Vg_{2+4} bei verschiedenen negativen Gittervorspannungen Vg_1.

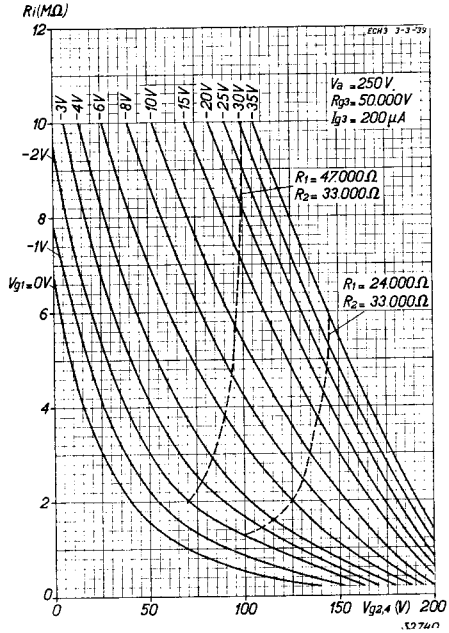


Abb. 24
Innenwiderstand *Ri* als Funktion der Schirmgitterspannung $Vg_{2,4}$ bei verschiedenen negativen Gittervorspannungen Vg_1 und bei Va = 250 V.

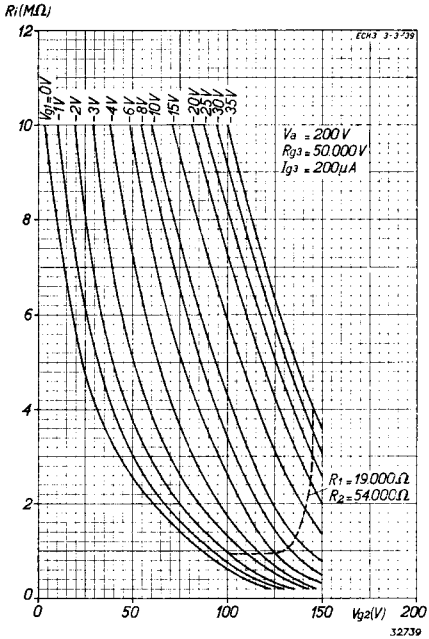


Abb. 25
Innenwiderstand *Ri* als Funktion der Schirmgitterspannung $Vg_{2,4}$ bei verschiedenen negativen Gittervorspannungen Vg_1 und bei Va = 200 V.

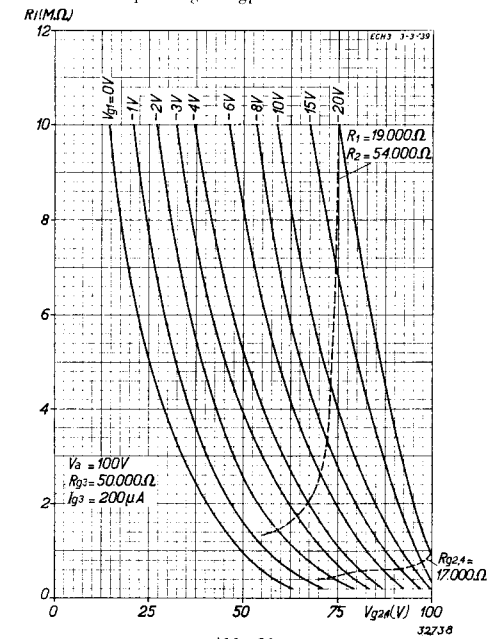


Abb. 26
Innenwiderstand *Ri* als Funktion der Schirmgitterspannung $Vg_{2,4}$ bei verschiedenen negativen Gittervorspannungen Vg_1 und bei Va = 100 V.

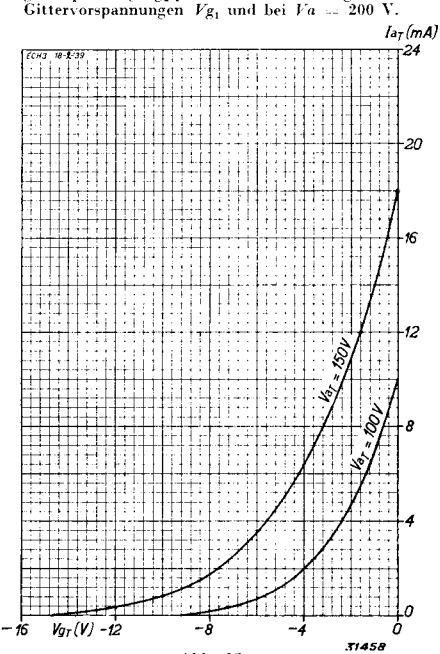


Abb. 27
Anodenstrom des Triodenteiles *IaT* als Funktion der negativen Gitterspannung *VgT* bei *VaT* = 150 und 100 V.

Durch die Wahl der Widerstände des Potentiometers zur Speisung der Schirmgitter des Hexodenteiles kann der Regelbereich stark beeinflußt werden. Hiermit können auch verschiedene Eigenschaften in Bezug auf Rausch/Signalverhältnis, Regelschärfe, Quermodulation usw. erzielt werden. Zu diesem Zweck sind auch in den Daten verschiedene Potentiometer zur Speisung des Schirmgitters vorgesehen, und zwar für den Fall einer durchschnittlichen Einstellung, für den Fall eines guten Rausch/Signalverhältnisses beim Herunterregeln und für den Fall einer besseren Quermodulationscharakteristik. Zur Verwendung in G/W-Geräten sind die Daten und Kurven so gewählt, daß sie sich für umschaltbare Geräten eignen, wobei dann das Schirmgitterpotentiometer und der Kathodenwiderstand sowohl für hohe wie für niedrige Netzspannungen dieselben bleiben. Bei einer Speisespannung von 100 V beträgt dann zwar die negative Gittervorspannung im ungeregelten Zustand nur −1,25 V, so daß Gitterstrom auftreten könnte, aber da man für den 100-V-Betrieb weniger strenge Anforderungen stellt, ist dieser Umstand als annehmbar zu bezeichnen.

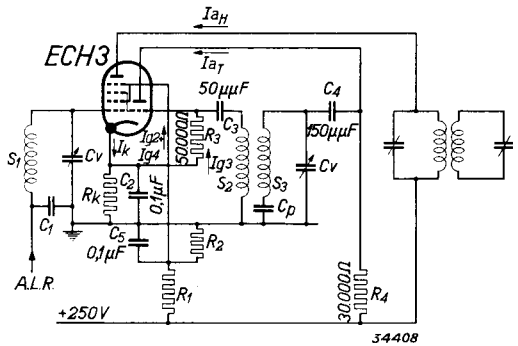


Abb. 28
Grundsätzliches Schaltbild für die Verwendung der ECH 3 als Mischröhre. Für den Kondensator C_4 kann unter Umständen ein Wert von 100 µµF eine im Wellenbereich gleichmässigere Oszillatorspannung erhalten werden.

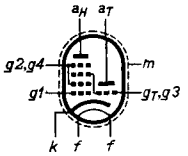
Abb. 23 zeigt die Kurven, die bei verschiedenen negativen Gittervorspannungen den äquivalenten Rauschwiderstand als Funktion der Schirmgitterspannung darstellen. Mit Hilfe des Kurvenblattes: Schirmgitterstrom als Funktion der Schirmgitterspannung (Abb. 22), kann für ein bestimmtes Potentiometer der Verlauf des Rauschwiderstandes eingezeichnet werden. Hieraus kann dann wieder mit Hilfe der berechneten Arbeitskurve der automatischen Lautstärkeregelung eines Gerätes der Verlauf des Rausch/Signalverhältnisses ermittelt werden. Abb. 24 bis 26 zeigen Kurvenblätter des Innenwiderstandes als Funktion der Schirmgitterspannung. Mit Hilfe dieser Kurvenblätter und des Kurvenblattes der Abb. 22 kann der Verlauf des Innenwiderstandes als Funktion der Regelspannung an Gitter 1 ermittelt werden. Dies ist oft wichtig, da bei manchen Spannungsteilern zur Speisung des Schirmgitters die Schirmgitterspannung während der Regelung zu rasch ansteigt und dadurch einen Abfall im Innenwiderstand verursacht.
Zur Vermeidung von Störschwingungen können in die Zuführungsleitungen zur Anode und zum ersten Gitter kleine Sperrwiderstände von beispielswiese 30 Ohm aufgenommen werden.

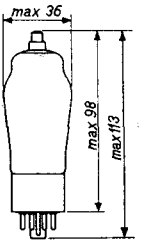
TRIODE-HEXODE

Heating: indirect by A.C. or D.C.; series or parallel supply
Chauffage: indirect par C.A. ou C.C.; alimentation en parallèle ou en série
Heizung: indirekt durch Wechsel- oder Gleichstrom; Serien- oder Parallelspeisung

V_f = 6,3 V
I_f = 0,2 A

Dimensions in mm
Dimensions en mm
Abmessungen in mm





Base, culot, Sockel: Octal

Capacitances
Capacités
Kapazitäten

C_{g1}	= 5,0 pF	C_{gT}	= 9,0 pF
C_{aH}	= 10 pF	C_{aT}	= 3,0 pF
C_{aH-g1}	< 0,003 pF	C_{aT-gT}	= 1,6 pF
C_{g1f}	< 0,001 pF	C_{gT-g1H}	< 0,3 pF

Operating characteristics of the triode section as oscillator
Caractéristiques d'utilisation de la partie triode comme oscillatrice
Betriebsdaten des Triodenteiles als Oszillator.

V_b	=	100	150	250	V
R_a	=	0	0	45	kΩ
R_{gT+g3}	=	50	50	50	kΩ
I_{gT+g3}	=	200	200	200	µA
I_a	=	3,3	8	3,3	mA
V_{osc}	=	8	8	8	V_{eff}

Operating characteristics of the hexode section as frequency changer
Caractéristiques d'utilisation de la partie hexode comme changeuse de fréquence
Betriebsdaten des Hexodenteiles als Mischröhre

Screen grid supply through a potentiometer (R_1,R_2)
Alimentation de la grille-écran à travers un potentiomètre (R_1, R_2)
Schirmgitterspeisung über einen Spannungsteiler(R_1,R_2)

V_a=V_b	=	100		200		250		V
R_1	=	19		19		24		kΩ
R_2	=	54		54		33		kΩ
R_k	=	210		210		215		Ω
R_{gT+g3}	=	50		50		50		kΩ
I_{gT+g3}	=	200		200		200		µA
V_{g1}	=	-1,25	-13,5	-2	-23,5	-2	-23,5	V
V_{g2+g4}	=	55	-	100	-	100	-	V
I_a	=	1,0	-	3,0	-	3,0	-	mA
I_{g2+g4}	=	1,4	-	3,0	-	3,0	-	mA
S_c	=	450	4,5	650	6,5	650	6,5	µA/V
R_i	=	1,3	> 4	0,9	> 2	1,3	> 3	MΩ

Limiting values of the hexode section
Caractéristiques limites de la partie hexode
Grenzdaten des Hexodenteiles

V_{ao}	= max.	550 V
V_a	= max.	300 V
W_a	= max.	1,2 W
$V_{(g2+g4)}$	= max.	550 V
V_{g2+g4}(I_a < 0,5 mA)	= max.	200 V
V_{g2+g4}(I_a < 4,5 mA)	= max.	125 V
W_{g2+g4}	= max.	0,6 W
V_{g1}(I_{g1} = +0,3 µA)	= max.	-1,3 V
V_{g3}(I_{g3} = +0,3 µA)	= max.	-1,3 V
I_k	= max.	15 mA
R_{g1}	= max.	3 MΩ
R_{g3}	= max.	100 kΩ
R_{kf}	= max.	20 kΩ
V_{kf}	= max.	100 V

Limiting values of the triode section
Caractéristiques limites de la partie triode
Grenzdaten des Triodenteiles

V_{ao}	= max.	550 V
V_a	= max.	150 V
V_g(I_g = +0,3 µA)	= max.	-1,3 V
W_a	= max.	1,5 V
R_g	= max.	100 kΩ

PHILIPS

Electronic Tube

HANDBOOK

ECH35

page	sheet	date
1	1	1953.04.04
2	2	1953.04.04
3	FP	1999.06.26

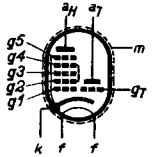
PHILIPS ECH 4

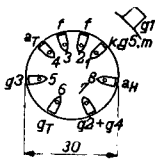
TRIODE-HEPTODE with variable mutual conductance for use as frequency converter, H.F., I.F. and L.F. amplifier and as phase inverter
TRIODE-HEPTODE à pente variable pour utilisation comme changeuse de fréquence, amplificatrice H.F., M.F. et B.F. et comme tube inverseur de phase
TRIODE-HEPTODE mit veränderlicher Steilheit zur Verwendung als Mischröhre, H.F., Z.F. und N.F. Verstärker und als Phasenumkehrröhre

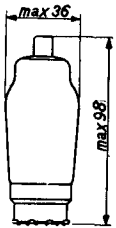
Heating: indirect by A.C.; parallel supply
Chauffage: indirect par C.A.; alimentation en parallèle
Heizung: indirekt durch Wechselstrom; Parallelspeisung

Vf = 6,3 V
If = 0,35 A

Dimensions in mm
Dimensions en mm
Abmessungen in mm







Capacities Capacités Kapazitäten	Heptode section Partie heptode Heptodenteil		Triode section Partie triode Triodenteil	
	Ca	= 9,2 pF	Ca	= 5,4 pF
	Cag1	< 0,002 pF	Cag	= 2,1 pF
	Cg1	= 5,0 pF	Cg	= 6,0 pF
	Cg3	= 8,9 pF	Cgf	< 0,3 pF
	Cg1g3	< 0,2 pF		
	Cg1f	< 0,001 pF		

ECH 4 PHILIPS

Capacities Capacités Kapazitäten	Between heptode and triode section Entre les parties heptode et triode Zwischen Heptoden- und Triodenteil		
		C_{gTglH}	< 0,1 pF
		C_{gT+g3}	= 14 pF
		$C_{(gT+g3)glH}$	<0,25 pF
		$C_{(gT+g3)aH}$	< 0,1 pF

For further technical data, refer to type ECH 21
Pour les autres détails techniques voir type ECH 21
Für übrige technischen Daten siehe Typ ECH 21



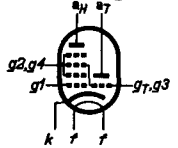
ECH4

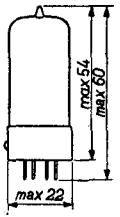
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2	2	1948.09.24
3	FP	1999.06.26

TRIODE-HEXODE for use as frequency changer
TRIODE-HEXODE pour l'utilisation comme changeuse de fréquence
TRIODE-HEXODE zur Verwendung als Mischröhre

Heating	Vf = 6,3 V
Chauffage	If = 0,225 A
Heizung	

Dimensions in mm
Dimensions en mm
Abmessungen in mm





Base, culot, Sockel: Rimlock

Capacitances Capacités Kapazitäten	Hexode section Partie hexode Hexodenteil	Triode section Partie triode Triodenteil
	C_a = 6,0 pF	C_a = 1,5 pF
	C_{g1} = 3,4 pF	C_{gT+g3} = 4,8 pF
	C_{ag1} < 0,1 pF	$C_{(gT+g3)a}$ = 1,2 pF
	C_{g1f} < 0,15 pF	

Between hexode and triode sections
Entre les parties hexode et triode
Zwischen Hexoden- und Triodenteil

$C_{(gT+g3)-g1H}$ < 0,35 pF
$C_{(gT+g3)-aH}$ < 0,2 pF

Operating characteristics of the triode section as oscillator
Caractéristiques d'utilisation de la partie triode en oscillatrice
Betriebsdaten des Triodenteiles als Oszillator

V_b	= 250 V
R_a	= 30 kΩ
I_a	= 4,9 mA
R_{gT+g3}	= 20 kΩ
I_{gT+g3}	= 350 µA
V_{osc}	= 8 V_{eff}
S_{eff}	= 0,55 mA/V

Operating characteristics of the hexode section as frequency changer (V_{g2+g4} through a potentiometer R_1, R_2)
Données caractéristiques de la partie hexode comme changeuse de fréquence (V_{g2+g4} par un potentiomètre R_1, R_2)
Betriebsdaten des Hexodenteiles als Mischröhre (V_{g2+g4} über einen Spannungsteiler R_1, R_2).

$V_a=V_b$	=	250		V
R_1	=	33		kΩ
R_2	=	47		kΩ
R_k	=	200		Ω
R_{gT+g3}	=	20		kΩ
I_{gT+g3}	=	350		µA
V_{g1}	=	−2	−28	V
V_{g2+g4}	=	105	147	V
I_a	=	3,0	-	mA
I_{g2+g4}	=	2,2	-	mA
Sc	=	500	5	µA/V
R_i	=	2,0	>5	MΩ
Req	=	170	-	kΩ

Limiting values of the hexode section
Caractéristiques limites de la partie hexode
Grenzdaten des Hexodenteiles

V_{ao} = max. 550 V	$V_{(g2+g4)o}$	= max.	550 V
V_a = max. 300 V	V_{g2+g4}	= max.	125 V
W_a = max. 0,8 W	W_{g2+g4}	= max.	0,3 W
I_k = max. 7 mA	V_{g1} (I_{g1}=+0,3µA)	= max.	-1,3 V
R_{g1} = max. 3 MΩ	Rkf	= max.	20 kΩ
R_{g3} = max. 3 MΩ	Vkf	= max.	100 V

Limiting values of the triode section
Caractéristiques limites de la partie triode
Grenzdaten des Triodenteiles

V_{ao} = max. 550 V	V_g(I_g = +0,3 µA)	= max.	-1,3 V
V_a = max. 175 V	R_g	= max.	3 MΩ
W_a = max. 0,9 W	Rkf	= max.	20 kΩ
I_k = max. 5,5 mA	Vkf	= max.	100 V

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HANDBOOK

ECH41

page	sheet	date
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2	2	1953.07.07
3	FP	1999.06.26

ECH 42 Triode-hexode frequency changer

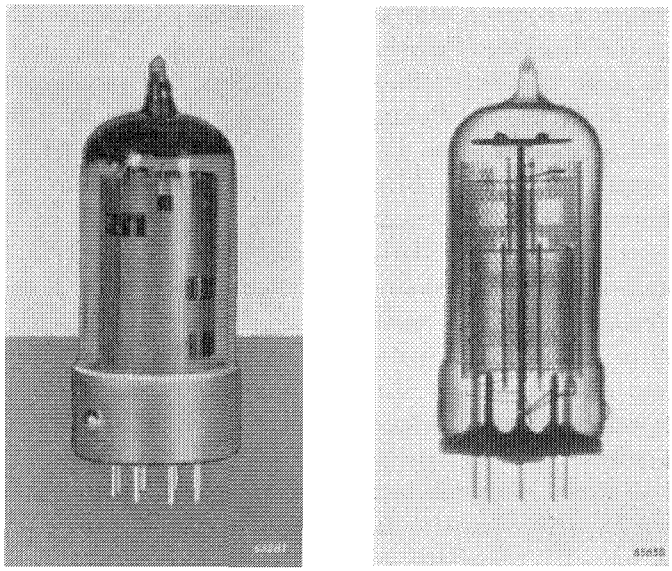


Fig. 1
Normal and X-ray photographs of the ECH 42 (approximately actual size).

The ECH 42 is a frequency changer which, like the ECH 41, is designed as a triode hexode, but various features, including a screen fitted round the entire system, have so improved the design that the properties of the ECH 42 are much superior to those of the ECH 41. The conversion slope of the ECH 42 is variable, being 750 μA/V at the working point.
The third grid of the hexode section and the grid of the triode section are internally connected, as in the earlier model ; hence this valve is also unsuitable for combined A.F. and I.F. amplification.
On the other hand, the ECH 42 can be employed as a combined A.F. amplifier-phase inverter, the triode system being then connected as the A.F. amplifier and the hexode system as the phase inverter. In view of the fact that the third grid of the hexode is connected to the grid of the triode, the voltage on the former will counteract the gain in the hexode, but, since no amplification is required in this case, the efficiency of the valve is not thereby adversely affected.
The initial slope of the triode system, i.e. the slope without oscillator voltage or grid bias, is 2.8 mA/V, so that, from the point of view of oscillatory properties, this valve is better than the ECH 41, the improvement being particularly noticeable on the short-wave range.
Frequency displacement attributable to gain control or mains fluctuations is so slight, even at the shortest wavelengths in the short-wave range, that

it may be disregarded ; moreover, the hexode principle ensures that induction effects are so small that they have no effect on the conversion gain.
As with the ECH 41, the screen grids must be fed by means of a potentiometer ; if a series resistor is employed, the screen voltage rises as soon as control is applied, resulting in secondary emission and a pronounced drop in internal resistance. With low internal resistance, the conversion gain decreases, but this is not generally detrimental, since the valve is controlled for the very purpose of reducing the gain ; however, another result of low internal resistance is that the I.F. transformer in the anode circuit of the hexode is heavily damped, to the detriment of the selectivity. In general, then, the use of a series resistor feed is not recommended.
If the EF 41, or EAF 42, is used as I.F. amplifier in conjunction with the ECH 42 as frequency changer, it is possible to feed the screen grids of both valves by means of a common potentiometer, resulting in a saving of various components.

TECHNICAL DATA OF THE TRIODE-HEXODE ECH 42

Heater data

Heating : indirect, A.C. or D.C., parallel feed

Heater voltage	V_f	=	6.3 V
Heater current	I_f	=	0.23 A

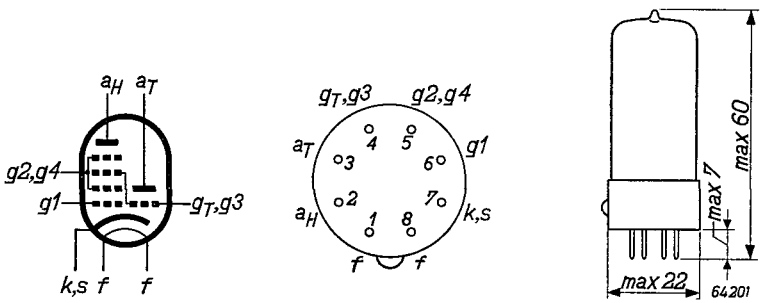


Fig. 2
Electrode arrangement, electrode connections and dimensions (in mm) of the ECH 42.

Capacitances (cold valve)

Hexode section

Input capacitance	C_{g1}	=	4.0 pF
Output capacitance	C_a	=	9.4 pF
Anode - control grid	C_{ag1}	<	0.1 pF
Control grid - heater . .	C_{g1f}	<	0.15 pF

Triode section

Input capacitance . . .	$C_{(gT+g3)}$	=	5.9 pF
Output capacitance	C_a	=	2.4 pF
Anode - grid	$C_{(gT+g3)a}$	=	1.3 pF

ECH 42

Between hexode system and triode system

Between the two control grids	$C_{(gT+g3)g1H}$	<	0.35 pF
Between hexode control grid and triode anode	C_{g1HaT}	<	0.06 pF
Between triode grid and hexode anode	$C_{(gT+g3)aH}$	<	0.2 pF
Between the two anodes . . .	C_{aHaT}	<	0.5 pF

Operating characteristics of the hexode system used as mixer (see Figs. 6 to 11 incl.)

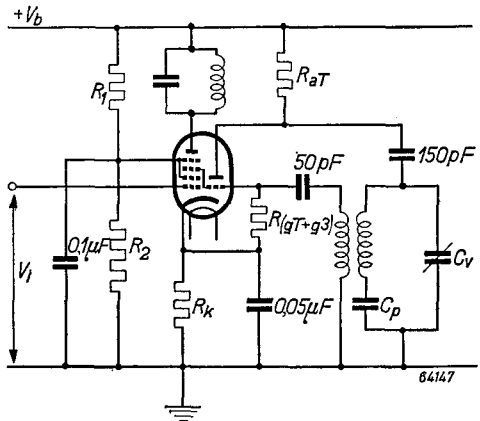


Fig. 3

Anode and supply voltage . .	$V_a = V_b$	=	250	V
Potentiometer for feeding screen grids (Fig. 3)	R_1	=	27	kΩ
	R_2	=	27	kΩ
Biasing resistor	R_k	=	180	Ω
Oscillator grid leak	R_{gT+g3}	=	22[1])	kΩ
Oscillator grid current . .	I_{gT+g3}	=	350[1])	µA
Grid bias	V_{g1}	=	—2	—29 V
Screen grid voltage	V_{g2+g4}	=	85	124 V
Anode current	I_a	=	3.0	— mA
Screen grid current . . .	I_{g2+g4}	=	3.0	— mA
Conversion conductance . . .	S_c	=	750	7.5 µA/V
Internal resistance	R_i	=	1.7	>5 MΩ
Equivalent noise resistance . .	R_{eq}	=	100	— kΩ

[1]) If the grid leak is 47 kΩ instead of 22 kΩ, an oscillator grid current of 200 µA is recommended ; none of the other values is affected.

Typical characteristics of the triode section (see Figs. 14 and 15)

Anode voltage	V_a	=	100 V
Grid voltage	V_g	=	0 V
Anode current	I_a	=	10 mA
Slope	S	=	2.8 mA/V
Amplification factor	μ	=	22

Operating characteristics of the triode section used as oscillator (see Figs. 12 and 13)

Supply voltage	V_b	= 250	250	V
Resistor in anode circuit	R_a	= 33	33	kΩ
Grid leak	R_{gT+g3}	= 47	22	kΩ
Grid current	I_{gT+g3}	= 200	350	µA
Anode current	I_a	= 4.8	5.1	mA
Oscillator voltage	V_{osc}	= 8	8	V_{RMS}
Effective slope	S_{eff}	= 0.55	0.6	mA/V

Operating characteristics of the ECH 42 used as phase inverter (see Fig. 4)

Supply voltage	V_b	= 250	350	V
Total current	I_b	= 3.6	5.1	mA
Amplification	V_0/V_i	= 11	11	
Distortion at output voltage of 5 V_{RMS}	d	= 1.2	1.1	%
Distortion at output voltage of 10 V_{RMS}	d	= 1.4	1.2	%
Distortion at output voltage of 15 V_{RMS}	d	= 1.7	1.4	%

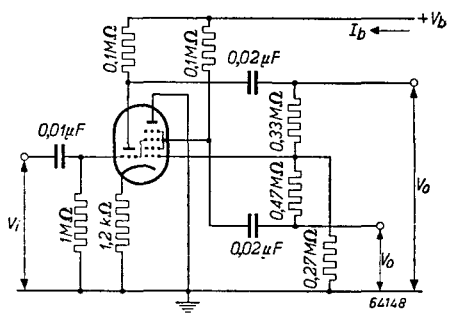


Fig. 4
Circuit diagram showing the ECH 42 used as phase inverter

ECH 42

Operating characteristics of the hexode section used as mixer; screen grids of the ECH 42 and I.F. amplifying valve EAF 42 fed by means of a common potentiometer (see Figs. 16 and 17).

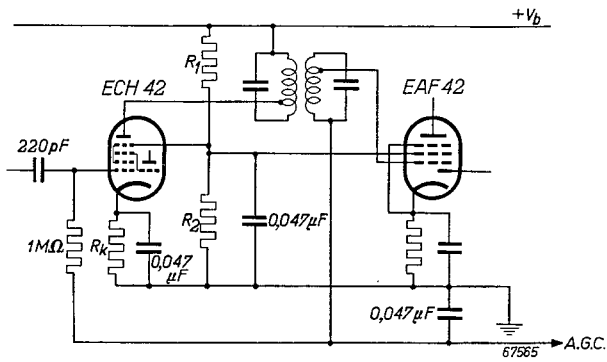


Fig. 5

Anode and supply voltage . .	$V_a = V_b$	=	250	V
Potentiometer for screen grid voltage	R_1	=	22	kΩ
	R_2	=	27	kΩ
Biasing resistor	R_k	=	180	Ω
Oscillator grid leak	R_{gT+g3}	=	22[1]	kΩ
Oscillator grid current . . .	I_{gT+g3}	=	350[1]	µA
Grid bias	V_{g1}	=	—2	—20.5 V
Screen grid voltage.	V_{g2+g4}	=	85	135 V
Anode current	I_a	=	3.0	— mA
Screen grid current	I_{g2+g4}	=	3.0	— mA
Conversion conductance . . .	S_c	=	750	24 µA/V
Internal resistance	R_i	=	1.7	>5 MΩ
Equivalent noise resistance	R_{eq}	=	100	— kΩ

[1]) If the oscillator grid leak is 47 kΩ, the recommended oscillator grid current is 200 µA. The operating conditions of the valve are not affected.

Operating characteristics of the hexode section used as mixer; (screen grid voltage derived from the same potentiometer as that for the I.F. amplifier EF 41 (see Figs. 18 and 19)

Anode and supply voltage	$V_a = V_b$	=	250		V
Potentiometer for screen grid voltage	R_1	=	22		kΩ
	R_2	=	27		kΩ
Biasing resistor	R_k	=	180		Ω
Oscillator grid leak	R_{gT+g3}	=	22[1]		kΩ
Oscillator grid current	I_{gT+g3}	=	350[1]		μA
Grid bias	V_{g1}	=	—2	—22	V
Screen grid voltage	V_{g2+g4}	=	85	135	V
Anode current	I_a	=	3.0	—	mA
Screen grid current	I_{g2+g4}	=	3.0	—	mA
Conversion conductance	S_c	=	750	20	μA/V
Internal resistance	R_i	=	1.7	>5	MΩ
Equivalent noise resistance	R_{eq}	=	100	—	kΩ

Limiting values of the hexode section

Anode voltage, valve biased to cut-off	V_{a_0}	= max.	550		V
Anode voltage	V_a	= max.	300		V
Anode dissipation	W_a	= max.	1.5		W
Screen grid voltage, valve biased to cut-off	$V_{(g2+g4)_0}$	= max.	550		V
Screen grid voltage with control applied to valve	$V_{g2+g4}(I_a<1\text{mA})$	= max.	300		V
Screen grid voltage with no control applied	$V_{g2+g4}(I_a=3\text{mA})$	= max.	125		V
Screen grid dissipation	W_{g2+g4}	= max.	0.3		W
Grid current starting point	$V_{g1}(I_{g1}=+0.3\mu\text{A})$	= max.	—1.3		V
Cathode current	I_k	= max.	10		mA
External resistance between first grid and cathode	R_{g1}	= max.	3		MΩ[2]
External resistance between third grid and cathode	R_{g3}	= max.	3		MΩ
External resistance between cathode and heater	R_{fk}	= max.	20		kΩ
Voltage between cathode and heater	V_{fk}	= max.	100		V

[1]) See footnote page 80.
[2]) This value is applicable when automatic grid bias is employed.

ECH 42

Limiting values of the triode section

Anode voltage, valve biased to cut-off	V_{a_o}	= max.	550	V
Anode voltage	V_a	= max.	175	V
Anode dissipation	W_a	= max.	0.8	W
Grid current starting point	$V_g(I_g = +0.3\mu A)$	= max.	−1.3	V
Cathode current	I_k	= max.	6	mA
External resistance between grid and cathode	R_g	= max.	3	MΩ
External resistance between cathode and heater	R_{fk}	= max.	20	kΩ
Voltage between cathode and heater	V_{fk}	= max.	100	V

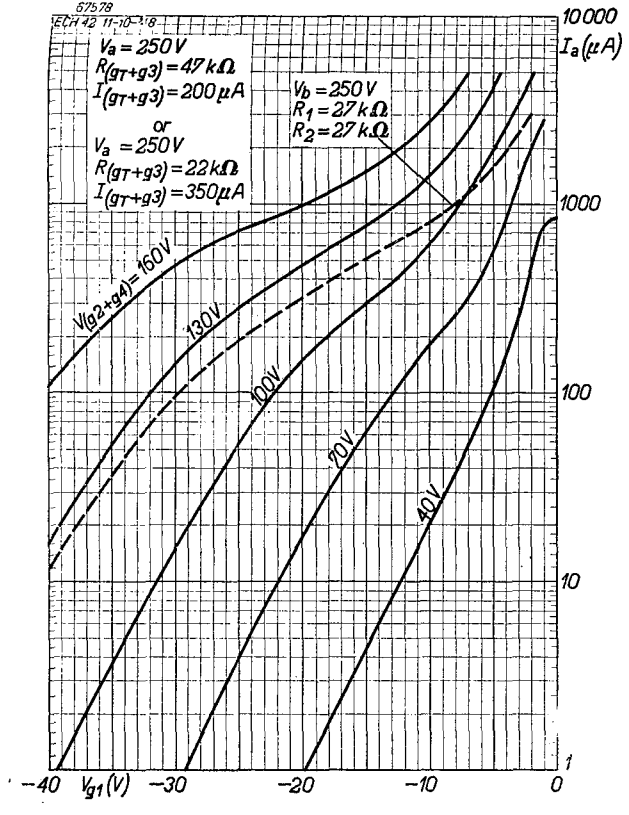


Fig. 6

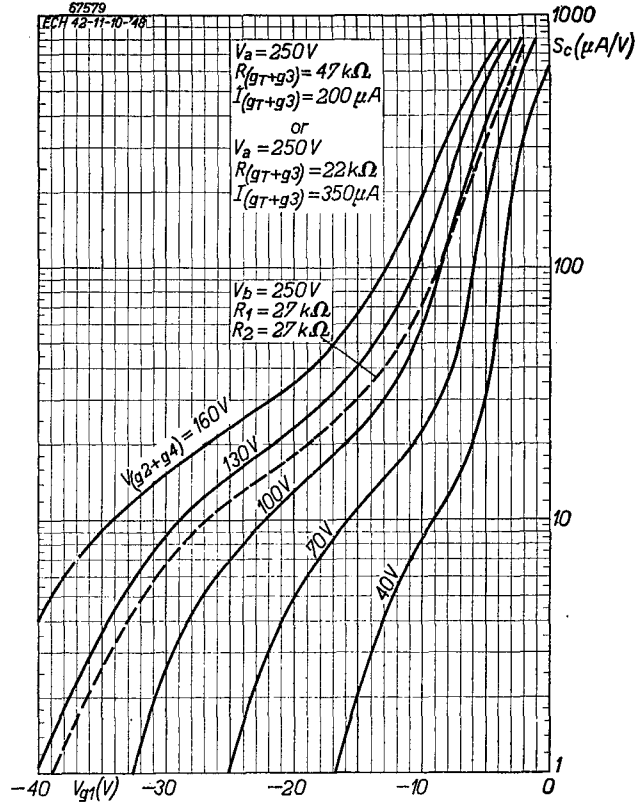


Fig. 7

Anode current (I_a, Fig. 6) and conversion conductance (S_c, Fig. 7) of the hexode section, as functions of the grid bias ($-V_{g1}$) with screen grid voltage (V_{g2+g4}) as parameter. The dotted lines indicate the anode current and conversion conductance when the screen grid voltage is derived from a potentiometer R_1, R_2 (see Fig. 3).

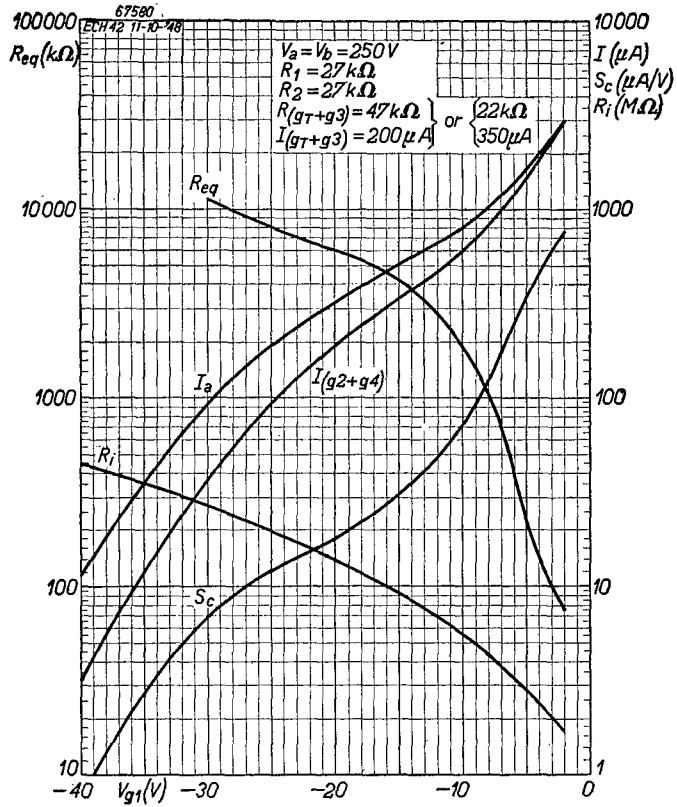


Fig. 8
Anode current (I_a), screen grid current (I_{g2+g4}), conversion conductance (S_c), internal resistance (R_i) and equivalent noise resistance (R_{eq}) as functions of the grid bias (V_{g1}). Measured in the circuit shown in Fig. 3.

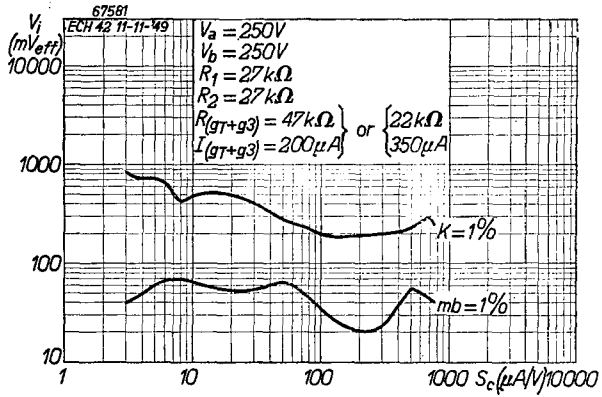


Fig. 9
1) The strength of an interfering signal on the control grid (V_i) producing 1% cross modulation (curve $K=1\%$), and
2) the strength of a hum signal on the control grid (V_i) producing 1% hum modulation (curve $m_b=1\%$), both as functions of the conversion conductance (S_c). Measured in the circuit shown in Fig. 3.

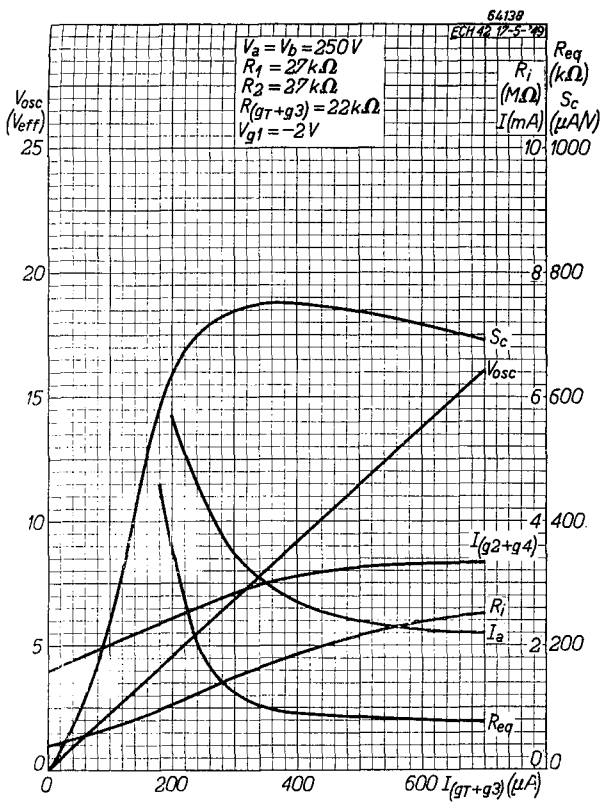


Fig. 10

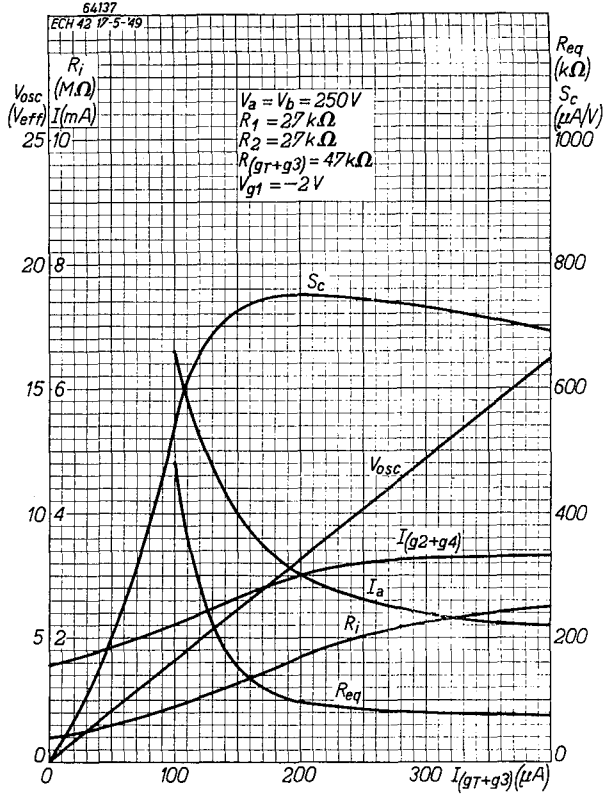


Fig. 11

Anode current (I_a), screen grid current (I_{g2+g4}), oscillator voltage (V_{osc}), conversion conductance (S_c), internal resistance (R_i) and equivalent noise resistance (R_{eq}) as functions of the oscillator grid current.
Fig. 10 : Oscillator grid leak $R_{gT+g3} = 22$ kΩ.
Fig. 11 : Oscillator grid leak $R_{gT+g3} = 47$ kΩ.

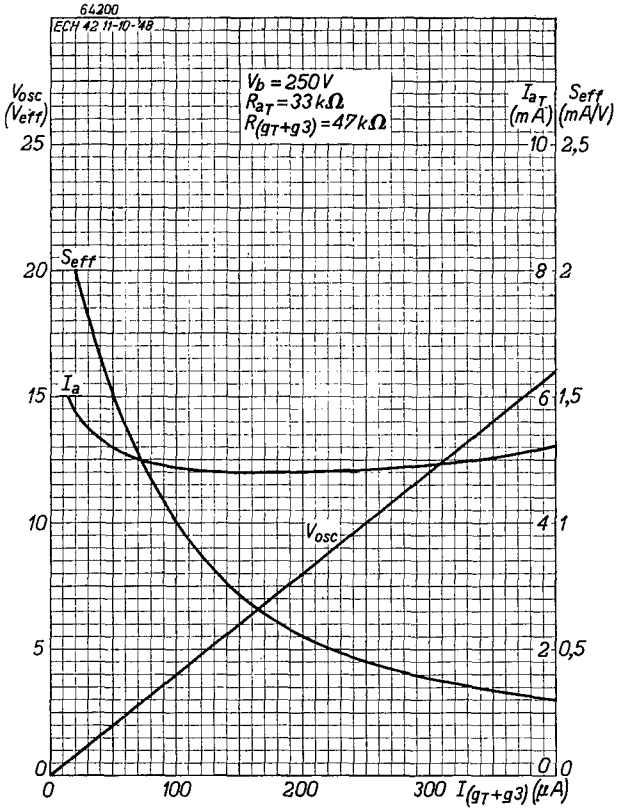


Fig. 12

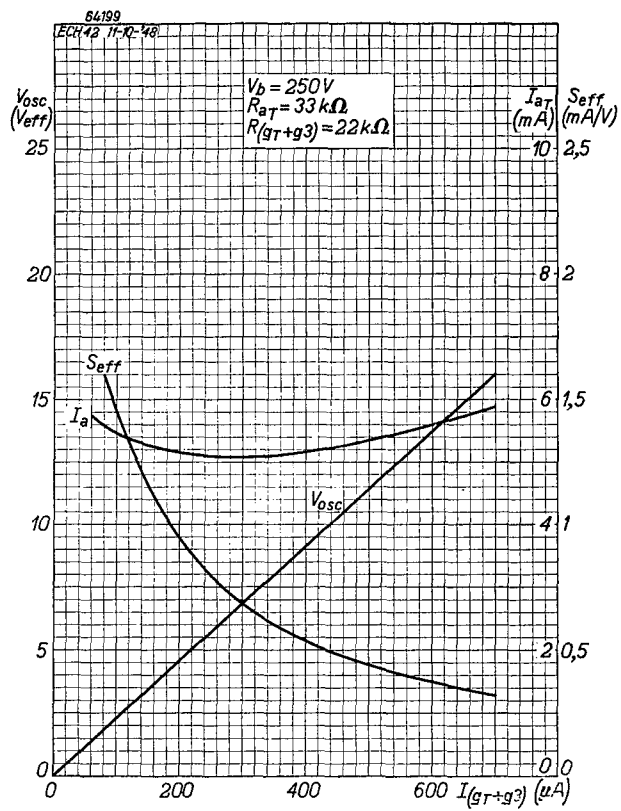


Fig. 13

Triode system : anode current (I_{aT}), oscillator voltage (V_{osc}) and effective slope (S_{eff}) as functions of the oscillator grid current (I_{gT+g3}).
Fig. 12 : Oscillator grid leak $R_{gT+g3} = 47$ kΩ.
Fig. 13 : Oscillator grid leak $R_{gT+g3} = 22$ kΩ.

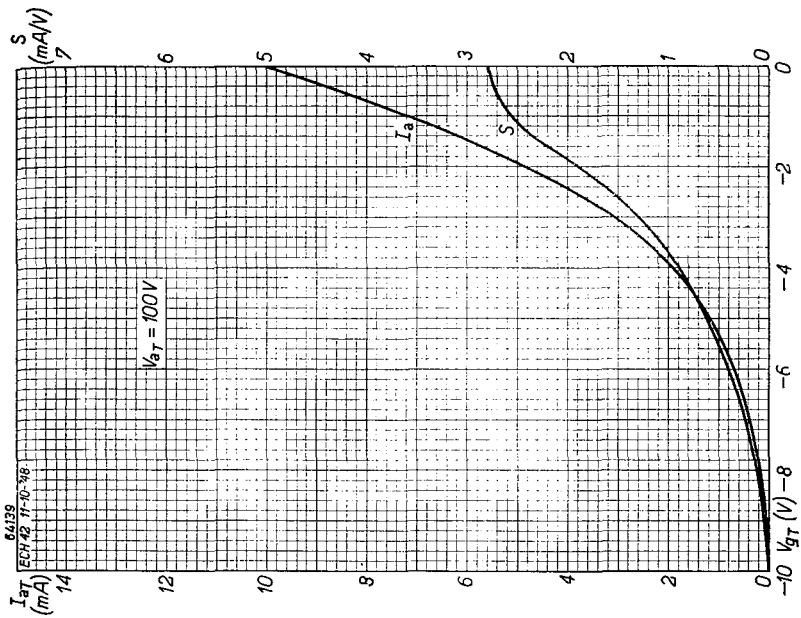


Fig. 14
Anode current (I_a) and slope (S) of the triode system as functions of the grid bias (V_{gT}). Measurements taken from non-oscillating valve at an anode voltage (V_{aT}) of 100 V.

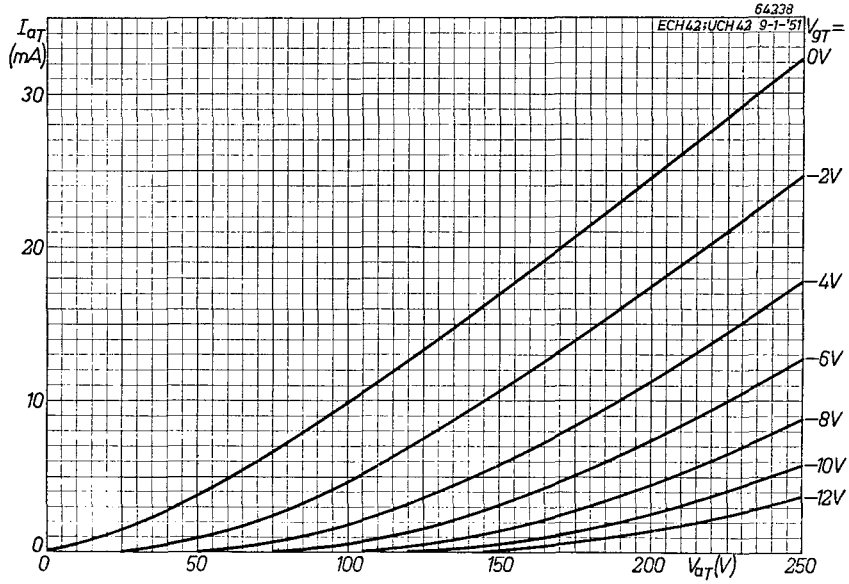


Fig. 15
I_a / V_a characteristics of the triode section of the ECH 42: static measurements.

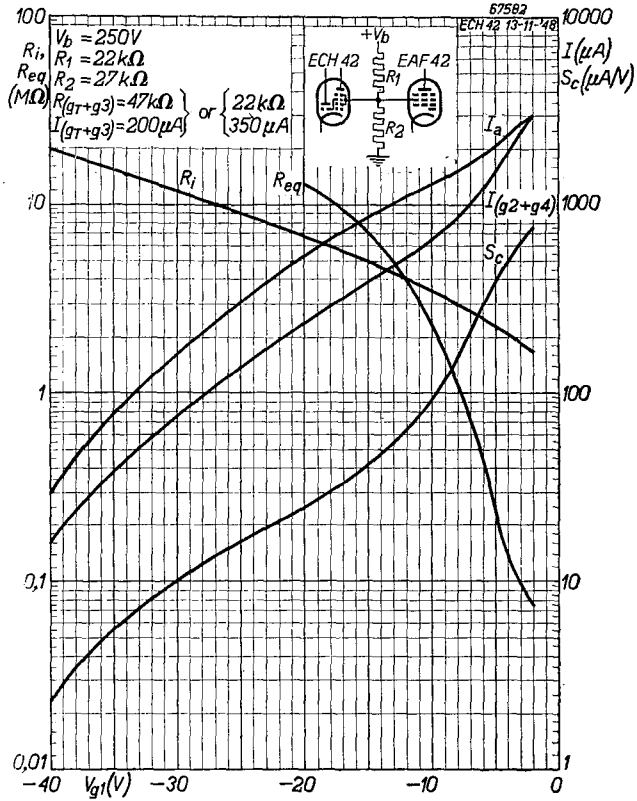


Fig. 16
As Fig. 8, but with screen grid voltage of the ECH 42 and I.F. amplifying valve EAF 42 derived from a common potentiometer R_1, R_2.

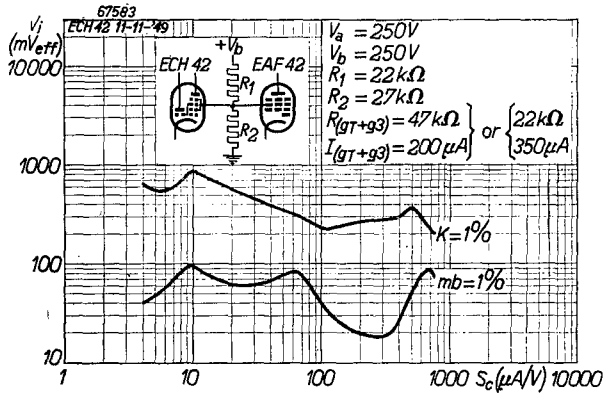


Fig. 17

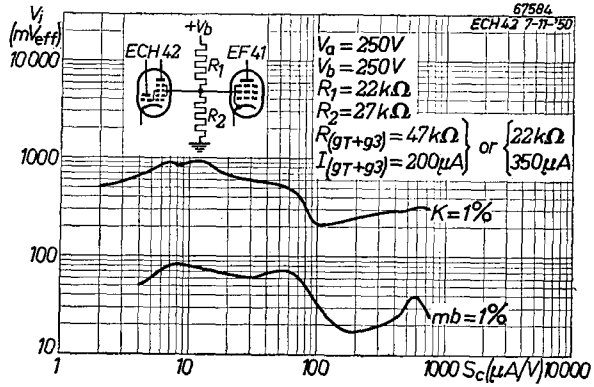


Fig. 18
As Fig. 9, but with screen grid voltage of the ECH 42 and I.F. amplifying valve supplied by means of a common potentiometer R_1, R_2.

Fig. 17 : I.F. amplifier EAF 42.
Fig. 18 : I.F. amplifier EF 41.

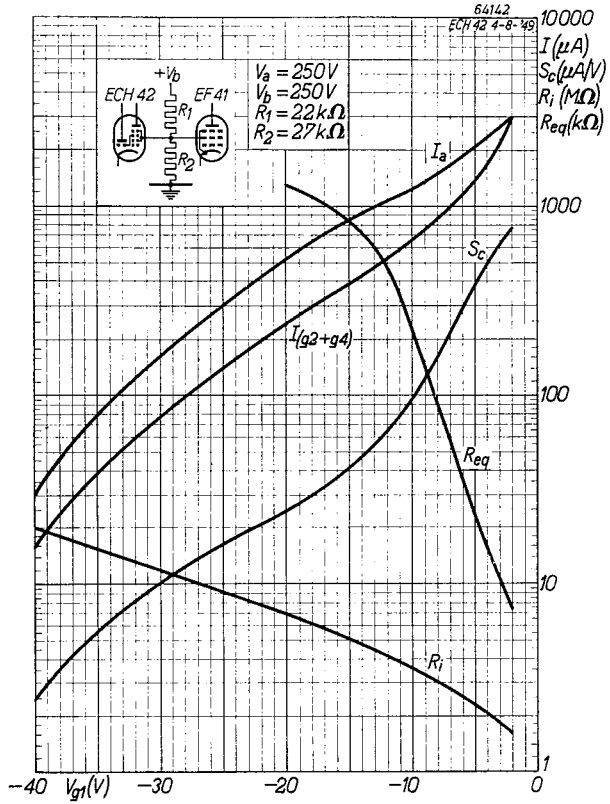


Fig. 19
As Fig. 8, but with screen grid voltage of the ECH 42 and that of the EF 41 obtained by means of a common potentiometer.

TRIODE-HEPTODE

Triode-heptode. Heptode section intended for use as mixer, R.F.- or I.F. amplifier. Triode section intented for use as oscillator in A.M./F.M. receivers.

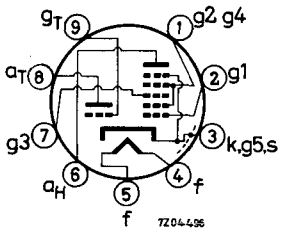
QUICK REFERENCE DATA			
Triode section			
Anode current	I_a	13.5	mA
Transconductance	S	3.7	mA/V
Amplification factor	μ	22	-
Heptode section			
Anode current	I_a	11	mA
Transconductance	S	4.5	mA/V
Amplification factor	$\mu_{g_2g_1}$	25	-

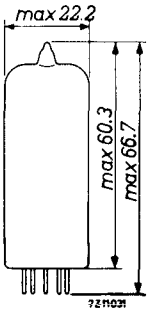
HEATING: Indirect by A.C. or D.C.; series or parallel supply

Heater voltage	V_f	6.3	V
Heater current	I_f	300	mA

DIMENSIONS AND CONNECTIONS Dimensions in mm

Base: Noval





CAPACITANCES

Triode section

Grid to all except anode	$C_{g(a)}$	2.6	pF
Anode to all except grid	$C_{a(g)}$	2.1	pF
Anode to grid	C_{ag}	1.0	pF
Grid to heater	C_{gf}	max. 0.02	pF

Heptode section

Grid No.1 to all except anode	$C_{g_1(a)}$	4.8	pF
Anode to all except grid No.1	$C_{a(g_1)}$	7.9	pF
Anode to grid No.1	C_{ag_1}	max.0.006	pF
Grid No.1 to heater	C_{g_1f}	max. 0.17	pF
Grid No.3 to all	C_{g_3}	6	pF
Grid No.1 to grid No.3	$C_{g_1g_3}$	max. 0.3	pF
Grid No.3 to heater	C_{g_3f}	max. 0.06	pF

Between heptode and triode sections

Anode heptode to anode triode	$C_{a_Ha_T}$	0.20	pF
Anode heptode to grid triode	$C_{a_Hg_T}$	max. 0.09	pF
Grid No.1 heptode to anode triode	$C_{g_1Ha_T}$	max. 0.06	pF
Grid No.1 heptode to grid triode	C_{g_1HgT}	max. 0.17	pF
Grid No.1 heptode to grid triode + grid No.3	C_{g_1H/gTg_3}	max. 0.45	pF
Anode heptode to grid triode + grid No.3	C_{a_H/g_Tg_3}	max. 0.35	pF

TYPICAL CHARACTERISTICS

Triode section

Anode voltage	V_a	100	V
Grid voltage	V_g	0	V
Anode current	I_a	13.5	mA
Transconductance	S	3.7	mA/V
Amplification factor	μ	22	-

Heptode section

Anode voltage	V_a	160	V
Grid No.3 voltage	V_{g_3}	0	V
Grids No.2 and 4 voltage	$V_{g_{2+4}}$	100	V
Grid No.1 current	I_{g_1}	0.5	μA
Grid No.1 voltage	V_{g_1}	-0.5	V
Anode current	I_a	11	mA
Grids No.2 and 4 current	$I_{g_{2+4}}$	7	mA
Transconductance	S	4.5	mA/V
Amplification factor	$\mu_{g_2g_1}$	25	-

OPERATING CHARACTERISTICS

Heptode section as mixer [1]

Supply voltage	V_b	250		V
Anode resistor	R_a	8.2		kΩ
Grids No.2 and 4 resistor	R_{g_2+4}	22		kΩ
Grid triode + grid No.3 resistor	$R_{g_T+g_3}$	47		kΩ
Grid triode + grid No.3 current	$I_{g_T+g_3}$	200		μA
Grid No.1 current	I_{g_1}	0.5	–	μA [2]
Grid No.1 voltage	V_{g_1}	–	-28	V
Anode voltage	V_a	225	240	V
Grids No.2 and 4 voltage	V_{g_2+4}	78	235	V
Anode current	I_a	3.3	–	mA
Grids No.2 and 4 current	I_{g_2+4}	7.8	–	mA
Conversion conductance	S_c	1100	11	μA/V
Internal resistance	R_i	0.8	min. 3	MΩ
Equivalent noise resistance	R_{eq}	30	–	kΩ

1) Triode operating with V_b = 250 V, R_a = 33 kΩ, V_{osc} = 8 V_{RMS}.

2) Grid current bias obtained with R_{g_1} = 1 MΩ and with zero volts a.g.c. voltage; resulting grid one voltage: -0.5 V.

OPERATING CHARACTERISTICS (continued)

Heptode section as R.F. or I.F. amplifier

Supply voltage	V_b	250		V
Anode resistor	R_a	8.2		kΩ
Grid No.3 voltage	V_{g_3}	0		V
Grids No.2 and 4 resistor	$R_{g_{2+4}}$	22		kΩ
Grid No.1 current	I_{g_1}	0.5	-	μA
Grid No.1 voltage	V_{g_1}	-	−35	V [1]
Anode voltage	V_a	160	248	V
Grids No.2 and 4 voltage	$V_{g_{2+4}}$	96	245	V
Anode current	I_a	11	-	mA
Grids No.2 and 4 current	$I_{g_{2+4}}$	7	-	mA
Transconductance	S	4500	45	μA/V
Internal resistance	R_i	0.24	min. 10	MΩ
Amplification factor	$\mu_{g_2g_1}$	25	-	-
Equivalent noise resistance	R_{eq}	4.5	-	kΩ

Triode section as oscillator

Supply voltage	V_b	250		V
Anode resistor	R_a	33		kΩ
Grid triode + grid No.3 resistor	R_{gT+g_3}	47		kΩ
Grid triode + grid No.3 current	I_{gT+g_3}	200		μA
Anode current	I_a	4.5		mA
Effective transconductance	S_{eff}	0.65		mA/V

[1]) Grid current bias obtained with R_{g_1} = 1 MΩ and with zero volts a.g.c. voltage; resulting grid No.1 voltage: −0.5 V.

LIMITING VALUES (Design centre rating system)

Heptode section

Anode voltage	V_{a_o}	max. 550	V
	V_a	max. 300	V
Anode dissipation	W_a	max. 2.0	W
Grids No.2 and 4 voltage	$V_{g_{2+4_o}}$	max. 550	V
	$V_{g_{2+4}}$	max. 125	V
Grids No.2 and 4 voltage (I_a max. 1 mA)	$V_{g_{2+4}}$	max. 300	V
Grids No.2 and 4 dissipation	$W_{g_{2+4}}$	max. 0.8	W
Cathode current	I_k	max. 18	mA
Grid No.1 resistor	R_{g_1}	max. 3	MΩ
Grid No.3 resistor	R_{g_3}	max. 20	kΩ
Grid No.3 resistor grid No.3 directly connected to grid triode	R_{g_3}	max. 3	MΩ
Cathode to heater voltage	V_{kf}	max. 100	V

Triode section

Anode voltage	V_{a_o}	max. 550	V
	V_a	max. 250	V
Anode dissipation	W_a	max. 0.8	W
Cathode current	I_k	max. 6.5	mA
Grid resistor	R_g	max. 3	MΩ
Cathode to heater voltage	V_{kf}	max. 100	V

PHILIPS

Data handbook

Electronic components and materials

ECH81

page	sheet	date
1	1	1969.12
2	2	1969.01
3	3	1969.01
4	4	1969.01
5	5	1969.01
6	6	1969.01
7	FP	1999.08.15

TRIODE-HEPTODE

Triode-heptode intended for use as mixer in car radio sets and as sync separator in TV receivers.

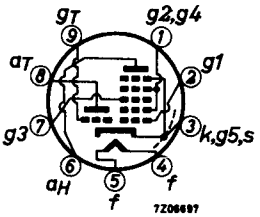
QUICK REFERENCE DATA					
Triode					
Anode voltage	V_a	25	12.6	6.3	V
Anode current	I_a	2	0.75	0.3	mA
Transconductance	S	2.2	1.4	0.8	mA/V
Amplification factor	μ	20	18.3	14.6	-
Heptode as mixer					
Anode voltage	V_a	25	12.6	6.3	V
Grids No.2 and 4 voltage	V_{g2+4}	25	12.6	6.3	V
Conversion conductance	S_c	450	220	90	μA/V
Heptode as R.F. or I.F. amplifier					
Anode voltage	V_a	25	12.6	6.3	V
Grids No.2 and 4 voltage	V_{g2+4}	25	12.6	6.3	V
Transconductance	S	1.5	0.75	0.35	mA/V

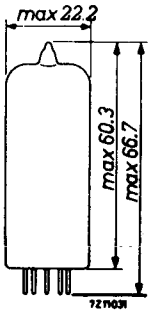
HEATING: Indirect by A.C. or D.C.; parallel or series supply

Heater voltage	V_f	6.3	V
Heater current	I_f	300	mA

DIMENSIONS AND CONNECTIONS Dimensions in mm

Base: Noval





CAPACITANCES

Triode section

Anode to all except grid	$C_{a(g)}$	2.1	pF
Grid to all except anode	$C_{g(a)}$	2.6	pF
Anode to grid	C_{ag}	1.0	pF

Heptode section

Anode to all	C_a	7.9	pF
Grid No.1 to all	C_{g_1}	4.8	pF
Anode to grid No.1	C_{ag_1}	max. 0.012	pF
Grid No.3 to all	C_{g_3}	6.0	pF
Grid No.1 to grid No.3	$C_{g_1g_3}$	max. 0.3	pF

Between heptode and triode sections

Anode heptode to anode triode	C_{aHaT}	0.20	pF
Anode heptode to grid triode	C_{aHgT}	max. 0.09	pF
Grid No.1 heptode to anode triode	C_{g_1HaT}	max. 0.06	pF
Grid No.1 heptode to grid triode	C_{g_1HgT}	max. 0.17	pF
Grid No.1 heptode to grid triode and grid No.3	C_{g_1H/gTg_3}	max. 0.45	pF
Anode heptode to grid triode and grid No.3	C_{aH/gTg_3}	max. 0.35	pF

TYPICAL CHARACTERISTICS

Triode section

Anode voltage	V_a	25	12.6	6.3	V
Grid voltage	V_g	1)	1)	1)	-
Anode current	I_a	2	0.75	0.3	mA
Transconductance	S	2.2	1.4	0.8	mA/V
Amplification factor	μ	20	18.3	14.6	-

1) Obtained by grid current biasing: R_g = 47 kΩ.

OPERATING CHARACTERISTICS

Heptode as mixer, circuit fig.1.

Anode voltage	V_a	25	12.6	6.3	V
Grids No.2 and 4 voltage	$V_{g_{2+4}}$	25	12.6	6.3	V
Grid No.1 voltage	V_{g_1}	1)	1)	1)	
Oscillator voltage	V_{osc}	3.5	1.7	1.1	V_{RMS}
Grid No.3 resistor	R_{g_3}	47	47	47	kΩ
Grid No.3 current	I_{g_3}	40	18	7	μA
Anode current	I_a	550	170	50	μA
Grids No.2 and 4 current	$I_{g_{2+4}}$	1000	300	80	μA
Conversion conductance	S_c	450	220	90	μA/V
Internal resistance	R_i	0.5	1.5	1.3	MΩ

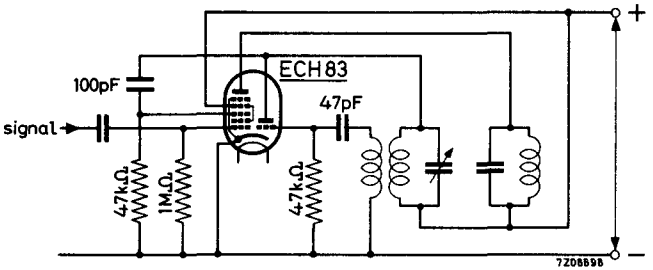


fig.1

Heptode as R.F. or I.F. amplifier

Anode voltage	V_a	25	12.6	6.3	V
Grids No.2, No.3 and No.4 voltage	$V_{g_{2+3+4}}$	25	12.6	6.3	V
Grid No.1 voltage	V_{g_1}	1)	1)	1)	
Anode current	I_a	1.25	0.4	0.11	mA
Grids No.2, No.3 and 4 current	$I_{g_{2+3+4}}$	0.85	0.25	0.08	mA
Transconductance	S	1.5	0.75	0.35	mA/V
Internal resistance	R_i	0.2	0.85	0.6	MΩ
Equivalent noise resistance	R_{eq}	5	6.5	8.5	kΩ

1) Obtained by grid current biasing: R_{g_1} = 1 MΩ.

LIMITING VALUES (*Design centre rating system*)

Triode section

Anode voltage	V_{a_o}	max.	550	V
	V_a	max.	250	V
Anode dissipation	W_a	max.	0.8	W
Cathode current	I_k	max.	6.5	mA
Grid resistor	R_g	max.	3	MΩ
Cathode to heater voltage	V_{kf}	max.	150	V
D.C. component		max.	100	V

Heptode section

Anode voltage	V_{a_o}	max.	550	V
	V_a	max.	50	V
Grids No.2 and 4 voltage	$V_{g_{2+4}}$	max.	50	V
Cathode current	I_k	max.	5	mA
Grid No.1 resistor	R_{g_1}	max.	3	MΩ
Grid No.3 resistor	R_{g_3}	max.	50	kΩ
Cathode to heater voltage	V_{kf}	max.	150	V
D.C. component		max.	100	V

PHILIPS

Data handbook

Electronic components and materials

ECH83

page	sheet	date
1	1	1969.12
2	2	1969.12
3	3	1969.01
4	4	1969.12
5	FP	1999.08.15

TRIODE-HEPTODE

Triode-heptode intended for use as pulse separator, noise inverter and sync. amplifier.

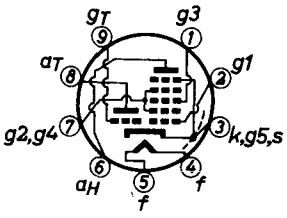
QUICK REFERENCE DATA			
Triode section			
Anode voltage	V_a	50	V
Anode current	I_a	3	mA
Transconductance	S	3.7	mA/V
Amplification factor	μ	50	-
Heptode section			
Anode voltage	V_a	135	V
Grids No.2 and 4 voltage	$V_{g_{2+4}}$	14	V
Anode current	I_a	1.7	mA
Grids No.2 and 4 current	$I_{g_{2+4}}$	0.9	mA
Transconductance	S	2.2	mA/V

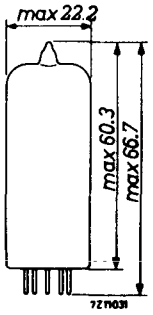
HEATING: Indirect by A.C. or D.C.; series or parallel supply

Heater voltage	V_f	6.3	V
Heater current	I_f	300	mA

DIMENSIONS AND CONNECTIONS Dimensions in mm

Base: Noval





CAPACITANCES

Triode section

Grid to all except anode	$C_{g(a)}$	3.0	pF
Anode to grid	C_{ag}	1.1	pF

Heptode section

Anode to grid No.1	C_{ag_1}	max. 0.009	pF

Between triode and heptode sections

Grid triode to grid No.1 heptode	$C_{g_Tg_{1H}}$	max. 0.10	pF
Anode triode to grid No.1 heptode	$C_{a_Tg_{1H}}$	max. 0.08	pF
Anode triode to grid No.3 heptode	$C_{a_Tg_{3H}}$	max. 0.13	pF
Grid triode to anode heptode	$C_{g_Ta_H}$	max. 0.09	pF
Anode triode to anode heptode	$C_{a_Ta_H}$	max. 0.25	pF

TYPICAL CHARACTERISTICS

Triode section

Anode voltage	V_a	50	V
Grid voltage	V_g	0	V
Anode current	I_a	3	mA
Transconductance	S	3.7	mA/V
Amplification factor	μ	50	-
Anode voltage	V_a	200	V
Grid voltage	V_g	-11	V
Anode current	I_a	max. 0.1	mA

TYPICAL CHARACTERISTICS (continued)

Heptode section

Anode voltage	V_a	135	V
Grid No.3 voltage	V_{g_3}	0	V
Grids No.2 and 4 voltage	$V_{g_{2+4}}$	14	V
Grid No.1 voltage	V_{g_1}	0	V
Anode current	I_a	1.7	mA
Grids No.2 and 4 current	$I_{g_{2+4}}$	0.9	mA
Transconductance	S	2.2	mA/V
Grid No.3 voltage	V_{g_3}	-2	V
Grid No.1 voltage	V_{g_1}	0	V
Anode current	I_a	20	μA
Grid No.1 voltage	V_{g_1}	-1.9	V
Grid No.3 voltage	V_{g_3}	0	V
Anode current	I_a	20	μA

LIMITING VALUES (Design centre rating system)

Heptode section

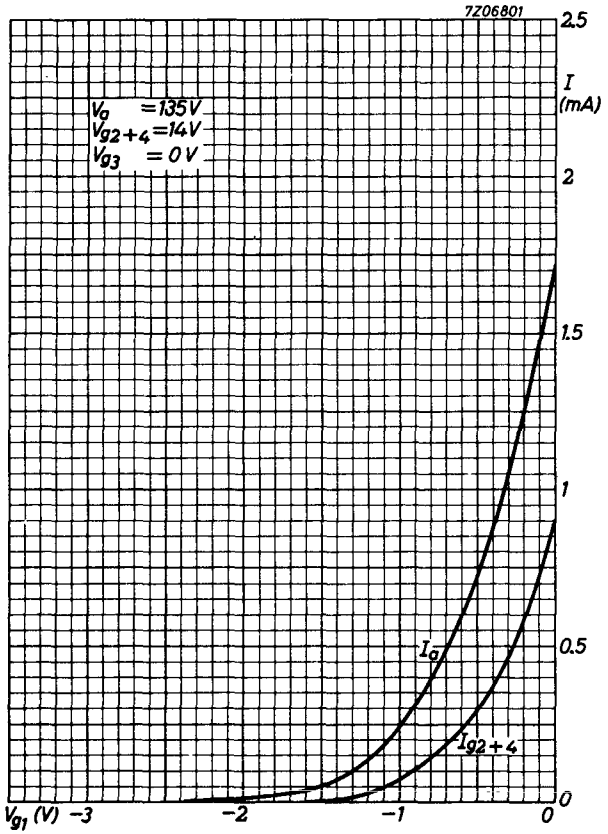
Anode voltage	V_{a_o}	max.	550	V
	V_a	max.	250	V
Anode dissipation	W_a	max.	1.7	W
Grids No.2 + 4 voltage	$V_{g_{2+4_o}}$	max.	550	V
	$V_{g_{2+4}}$	max.	250	V
		min.	10	V [1]
Grids No.2 + 4 dissipation	$W_{g_{2+4}}$	max.	0.8	W
Grid No.3 voltage, negative peak	$-V_{g_{3p}}$	max.	150	V
Grid No.3 resistor	R_{g_3}	max.	3	MΩ
Grid No.1 voltage, negative peak	$-V_{g_{1p}}$	max.	150	V
Grid No.1 resistor	R_{g_1}	max.	3	MΩ
Cathode current	I_k	max.	12.5	mA
Cathode to heater voltage	V_{kf}	max.	100	V

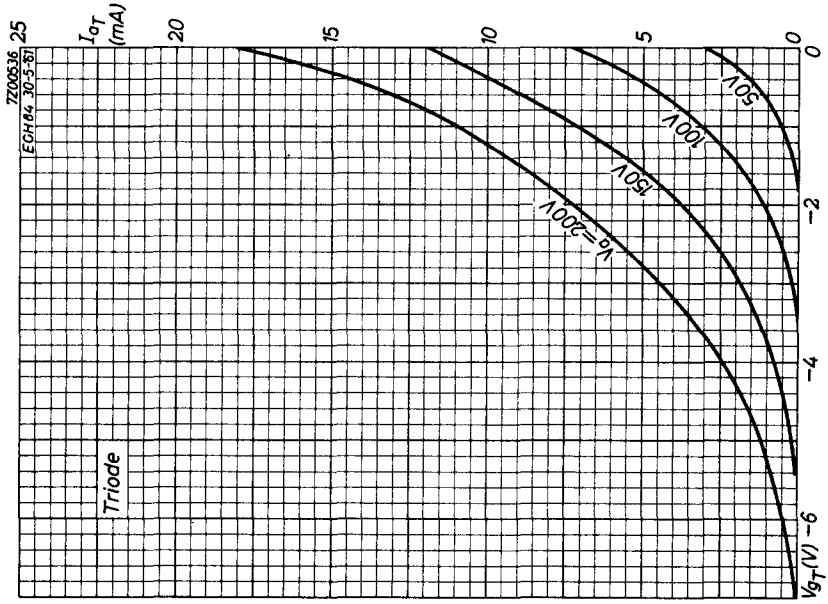
[1]) This value applies to an average tube operated under the worst probable conditions.

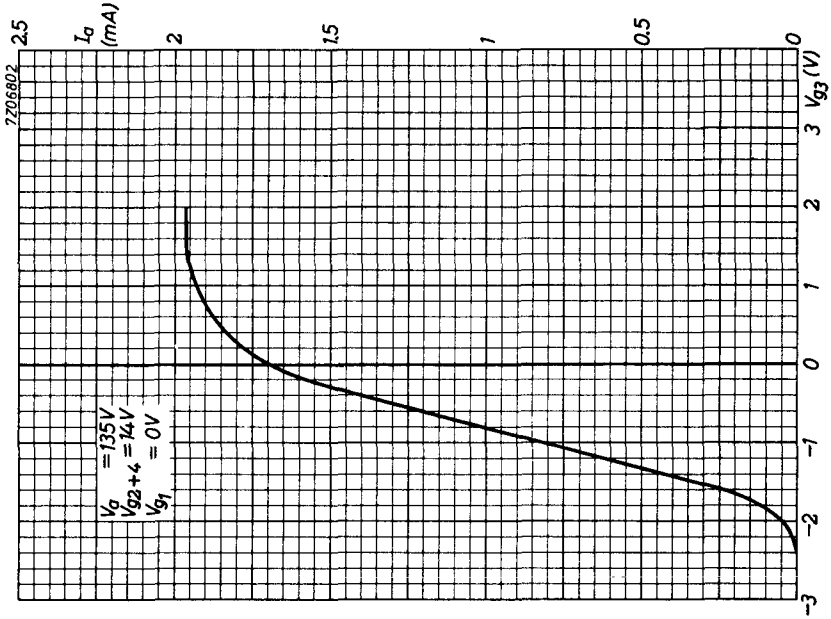
LIMITING VALUES (continued)

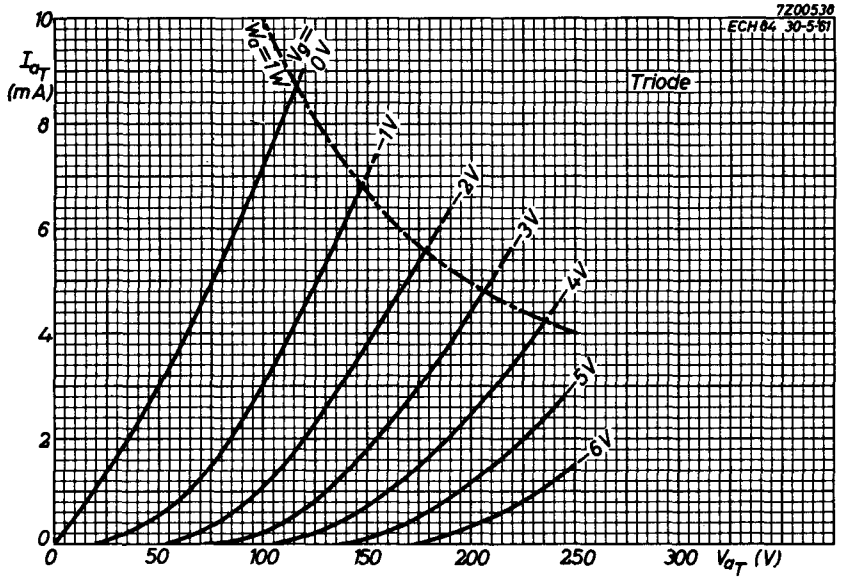
Triode section

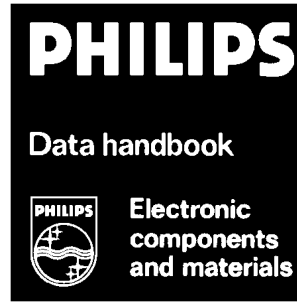
Anode voltage	V_{a_o}	max.	550	V
	V_a	max.	250	V
Anode dissipation	W_a	max.	1.3	W
Grid voltage, negative peak	$-V_{g_p}$	max.	200	V
Grid resistor	R_g	max.	3	MΩ
Cathode current	I_k	max.	10	mA
Cathode to heater voltage	V_{kf}	max.	100	V




7200536
ECH84 30-5-67
I_{aT} (mA)
25
20
15
10
5
0
Triode
V_a=200V
150V
100V
50V
V_{gT}(V)
0
−2
−4
−6


7206802
I_a (mA)
2.5
2
1.5
1
0.5
0
V_{g3} (V)
3
2
1
0
−1
−2
−3
V_a = 135V
V_{g2+4} = 14V
V_{g1} = 0V


7Z00538
ECH84 30-5-61
Triode
I_{aT} (mA)
V_{aT} (V)
0
2
4
6
8
10
0
50
100
150
200
250
300
V_{g1} = 0V
-1V
-2V
-3V
-4V
-5V
-6V



ECH84

page	sheet	date
1	1	1970.01
2	2	1970.01
3	3	1970.01
4	4	1970.01
5	5	1970.01
6	6	1970.01
7	FP	1999.08.10

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ECL 11

Röhrentype: N.F.-Verstärkertriode und Endtetrode.
Type de tube: Triode ampl. B.F. et tétrode de sortie.
Type of tube: L.F.amplifier triode and output tetrode.

Heizung indir., Gleich- oder Wechselstrom, Parallelspeisung.
Chauffage indir., CA ou CC, alimentation en parallèle.
Heating indir., A.C. or D.C., parallel heater supply

Vf 6,3 V
If 1 A

Kapazitäten
Capacités
Capacities

a) Triodenteil
Partie triode
Triode section

Cak 4,4 µµF
Cgk 5,3 µµF
Cag 1,5 µµF
Cgf < 0,02 µµF

b) Tetrodenteil
Partie tétrode
Tetrode section

Cag1 < 0,9 µµF

c) Zwischen Trioden- und Tetrodenteil
Entre les parties triode et tétrode
Between triode and tetrode section

CaT2gT2 < 0,25 µµF

Kenndaten des Triodenteiles
Caractéristiques typiques de la partie triode
Typical characteristics of the triode section

Va	250 V
Vg	-2,5 V
Ia	2 mA
S	2 mA/V
µ	70

Betriebsdaten des Tetrodenteiles als Endverstärker
Caractéristiques de service de la partie tétrode, utilisation comme tube de sortie
Operating conditions for use of the tetrode section as power amplifier

Va	250 V
Vg2	250 V
Vg1	-6 V
Ia	36 mA
Ig2	4 mA
S	9 mA/V
Ri	25000 Ω
µg2g1	25
Ra	7000 Ω
Wo	3,8 W
Vieff	4,2 V
dtot	10%
Vieff (Wo = 50 mW)	0,4 V

Grenzdaten des Triodenteiles.
Limites fixées pour l'utilisation de la partie triode.
Limiting values for operation of the triode section.

Vao	max. 550 V
Va	max. 300 V
Wa	max. 0,5 W
Rgk	max. 2 MΩ
Vg (Ig = +0,3 µA)	max. -1,3 V

Grenzdaten des Tetrodenteiles.
Limites fixées pour l'utilisation de la partie tétrode.
Limiting values for operation of the tetrode section.

Vao	max. 550 V
Va	max. 250 V
Wa	max. 9 W
Vg2o	max. 550 V
Vg2	max. 275 V
Wg2 (Vi = 0 V)	max. 1,2 W
Ik	max. 60 mA
Vg1 (Ig1 = +0,3 µA)	max. -1,3 V
Rg1k	max. 0,7 MΩ
Rfk	max. 5000 Ω
Vfk	max. 50 V[1]

1) Gleichspannung oder Effektivwert der Wechselspannung.
Tension continue ou valeur efficace de la tension alternative.
D.C. voltage or R.M.S. value of the A.C. voltage.

Bei halbautomatischer Vorspannung muss der Kathodenstrom der Röhre ECL 11 mehr als 50% des Gesamtstromes durch den Widerstand zur Erzeugung des Spannungsabfalles betragen. Der angegebene Maximalwert von Rgk muss nach der Formel:

$$\frac{\text{totaler Kathodenstrom der Röhre ECL 11}}{\text{Gesamtstr. durch den Widerst. zur Erzeugung des Spannungsabfalles}} \times \text{Rg1k}$$

erniedrigt werden. Zur Vermeidung von Störschwingungen ist es notwendig, in die Schirmgitterzuleitung des Tetrodenteiles Schutzwiderstände aufzunehmen (z.B. 100 Ω).

Dans le cas d'une polarisation semi-automatique le courant cathodique du tube ECL 11 doit être plus de 50% du courant traversant la résistance chutrice. La valeur maximum indiquée pour Rg1k doit être diminuée selon la formule:

$$\frac{\text{courant cathodique total du tube ECL 11}}{\text{courant total traversant la résist. qui produit la chute de tension requise}} \times \text{Rg1k}$$

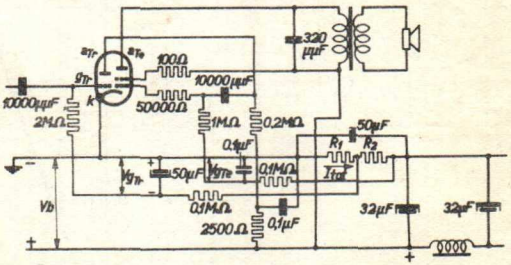
Afin d'éviter des oscillations parasitaires il est nécessaire de prevoir une résistance d'arrêt dans le conducteur de la grille-écran de la partie tétrode (100 Ω par exemple).

In case of semi-automatic bias the cathode current of tube ECL 11 must be more than 50% of the total current through the voltage dropping resistance. The maximum value indicated for Rglk must be reduced according to the formula:

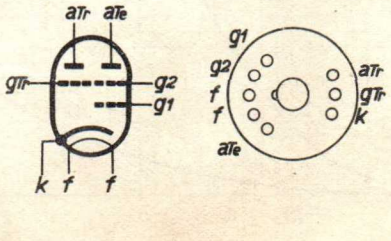
$$\frac{\text{total cathode current of tube ECL 11}}{\text{total current through the voltage dropping resistance}} \times \text{Rglk}$$

In order to avoid parasitic oscillations it is necessary to provide for a blocking resistance in the screen-grid lead of the tetrode section (100 Ω per example).

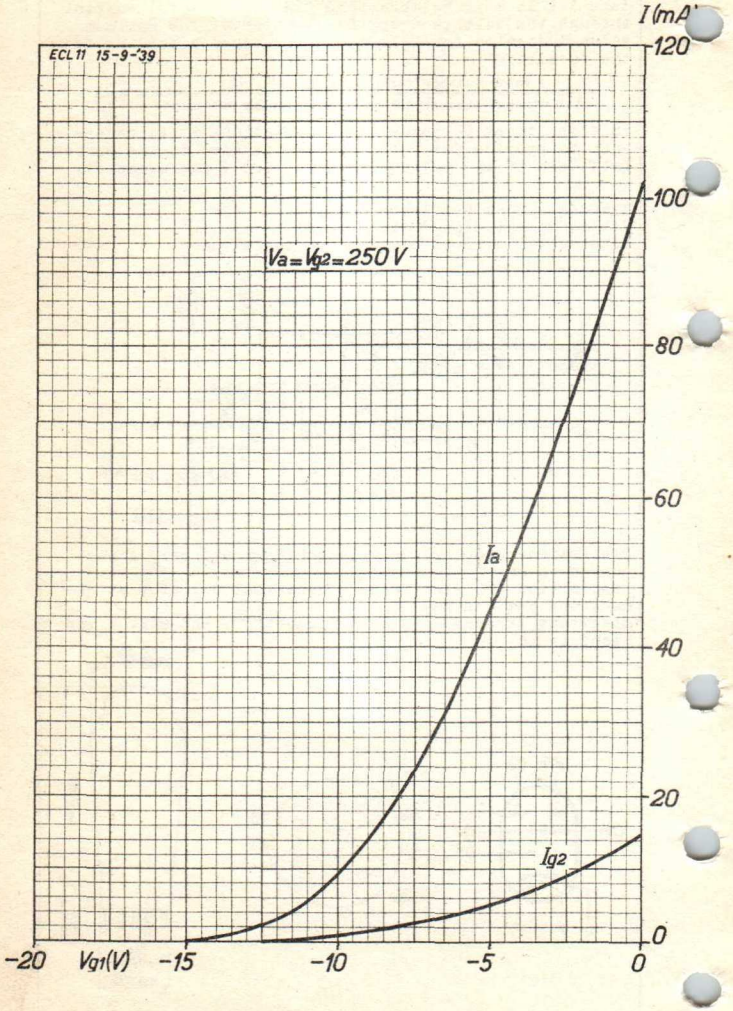
Grundsätzliche Betriebsschaltung
Schéma de principe d'utilisation
Fundamental circuit diagram for operation



Elektrodenanordnung, Sockelanschlüsse und max. Abmessungen in mm.
Disposition des électrodes, connexions du culot et dimensions max. en mm.
Electrode arrangement, base connections and max. dimensions in mm.

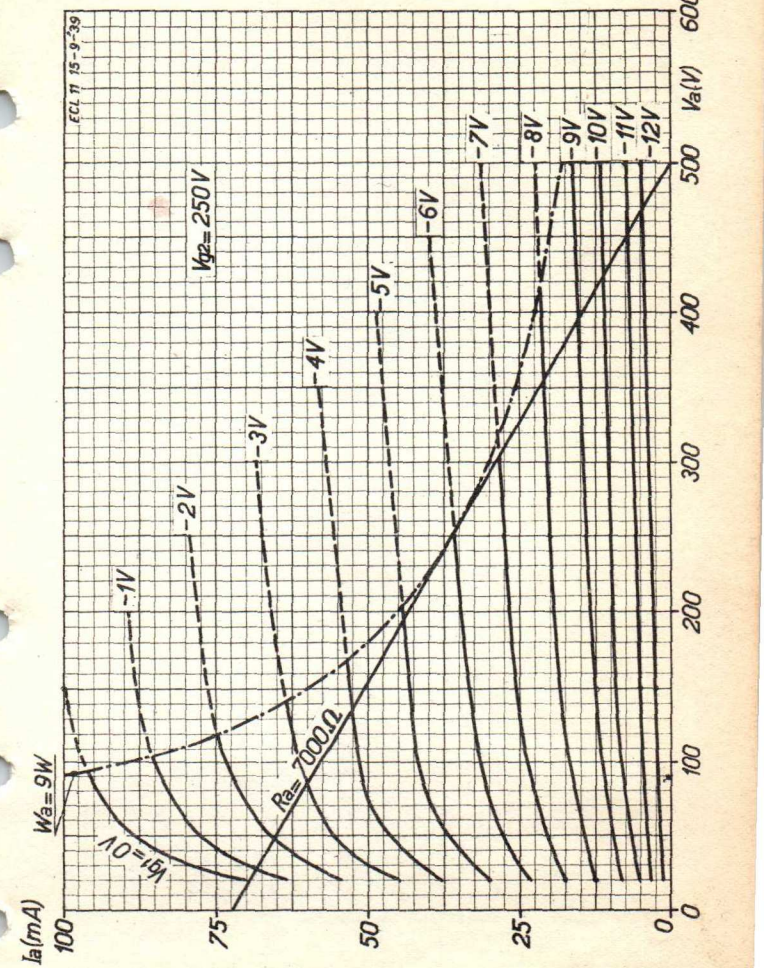


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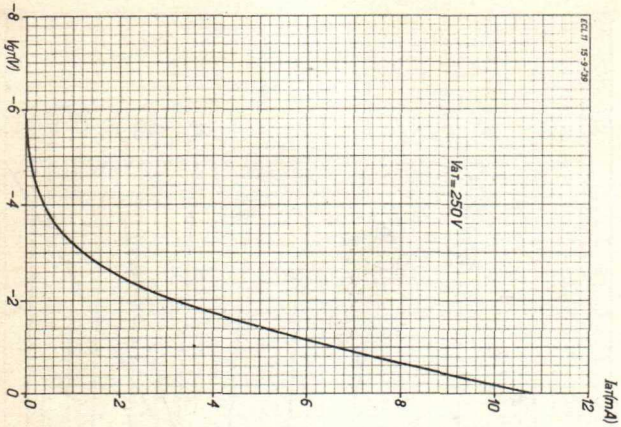


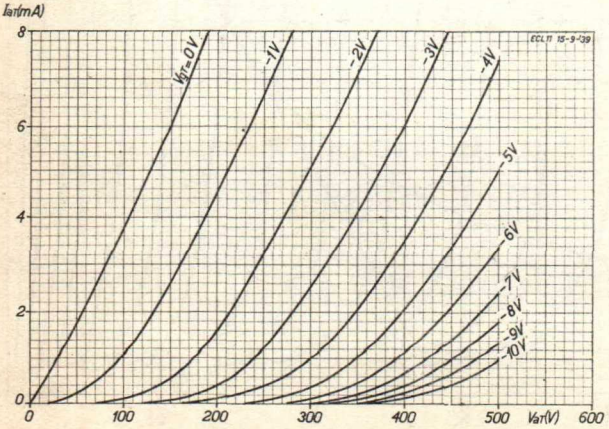
15/9'39

5312114


ECL 11 15-9-'39
Ia(mA)
Wa=9W
Vg=10V
Vg=250V
-1V
-2V
-3V
-4V
-5V
-6V
-7V
-8V
-9V
-10V
-11V
-12V
Ra=7000Ω
100
75
50
25
0
0
100
200
300
400
500
600
Va(V)

ECL11 PHILIPS „MINIWATT"





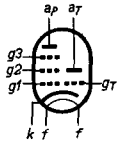
15/9'39

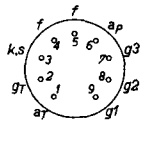
5312116

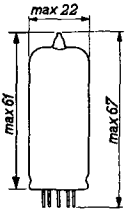
TRIODE-PENTODE; triode section for use as A.F. pre-amplifier and oscillator, pentode section for use as synchronizing pulse separator, frame output valve and audio output valve
TRIODE-PENTHODE; la triode pour utilisation en préamplificatrice B.F. et oscillatrice, la penthode en séparatrice des impulsions de synchronisation, amplificatrice de sortie du son et de base de temps image
TRIODE-PENTODE; Triode zur Verwendung als N.F.Vorverstärker und Oszillator, Pentode als Synchronisierungs-Trennungsröhre, Endröhre für die vertikale Ablenkung und für die Schallwiedergabe

Heating:	indirect by A.C. or D.C.; parallel or series supply	
Chauffage:	indirect par C.A. ou C.C.; alimentation en parallèle ou en série	V_f = 6,3 V I_f = 300 mA
Heizung:	indirekt durch Wechsel- oder Gleichstrom; Serien- oder Parallelspeisung	

Dimensions in mm
Dimensions en mm
Abmessungen in mm







Base, culot, Sockel: NOVAL

Capacitances Capacités Kapazitäten	Triode section Partie triode Triodenteil	Pentode section Partie penthode Pentodenteil
	C_g = 2,1 pF	C_{g1} = 4,3 pF ←
	C_a = 0,8 pF	C_a = 4,8 pF ←
	C_{ag} = 0,9 pF	C_{ag1} < 0,2 pF
	C_{gf} < 0,05 pF	C_{g1f} < 0,25 pF
	C_{kf} = 3,7 pF	

Between triode and pentode sections
Entre les parties triode et penthode
Zwischen Trioden- und Pentodenteilen

C_{aT-g1P}	<	0,2 pF
C_{gT-aP}	<	0,12 pF
C_{gT-g1P}	<	0,2 pF
C_{aT-aP}	<	1,2 pF

Operating characteristics of the pentode section as audio valve
Caractéristiques d'utilisation de la partie penthode comme tube de sortie du son
Betriebsdaten des Pentodenteiles als Endröhre für Schallwiedergabe

$V_a=V_b$	=	170	200	250	V
V_{g3}	=	0	0	0	V
V_{g2}	=	170	200	-	V
R_{g2}	=	0	0	4,7	kΩ
V_{g1}	=	-6,7	-8	-12,2	V
I_a	=	15	17,5	14	mA
I_{g2}	=	2,8	3,3	2,6	mA
S	=	3,2	3,3	2,6	mA/V
R_i	=	0,15	0,15	0,2	MΩ
μ_{g2g1}	=	14	14	14	
R_a	=	11	11	17,5	kΩ
W_o (d = 10%)	=	1,0	1,4	1,55	W
V_i (d = 10%)	=	3,7	4,1	5,3	V_{eff}
W_o (η = 50%)	=	1,27	1,75	1,75	W
V_i (η = 50%)	=	4,4	5,1	5,9	V_{eff}
V_i (W_o=50mW)	=	0,7	0,7	0,75	V_{eff}

Operating characteristics of the pentode section as synchronizing pulse separator
Caractéristiques d'utilisation de la partie penthode en séparatrice des impulsions de synchronisation
Betriebsdaten des Pentodenteiles als Synchronisierungs-Trennungsröhre

V_a	=	20		V
V_{g3}	=	0		V
V_{g2}	=	12		V
V_{g1}	=	0	-1,45	V
I_a	=	2	0,1	mA

Optimum peak anode current in frame output application

To allow for valve spread and for deterioration during life, the circuit should be designed around a peak anode current not exceeding

26 mA at V_a = 50 V, V_{g2} = 170 V
31 mA at V_a = 60 V, V_{g2} = 200 V
42 mA at V_a = 70 V, V_{g2} = 250 V.

The peak anode current of an average new valve is:
38 mA at V_a = 50 V, V_{g2} = 170 V, V_{g1} = -1 V
47 mA at V_a = 60 V, V_{g2} = 200 V, V_{g1} = -1 V
62 mA at V_a = 70 V, V_{g2} = 250 V, V_{g1} = -1 V.

Courant anodique de crête optimum en application comme tube final de base de temps image

Pour tenir compte des tolérances du tube et de la détérioration pendant la durée de vie, le circuit sera dessiné pour un courant anodique de crête ne dépassant pas une valeur de

26 mA à V_a = 50 V, V_{g2} = 170 V
31 mA à V_a = 60 V, V_{g2} = 200 V
42 mA à V_a = 70 V, V_{g2} = 250 V.

Le courant anodique de crête d'un tube nouveau moyen est de
38 mA à V_a = 50 V, V_{g2} = 170 V, V_{g1} = -1 V
47 mA à V_a = 60 V, V_{g2} = 200 V, V_{g1} = -1 V
62 mA à V_a = 70 V, V_{g2} = 250 V, V_{g1} = -1 V.

Höchstwert des Anodenspitzenstromes beim Gebrauch als Endröhre für die vertikale Ablenkung

Um den Röhrentoleranzen und der Verschlechterung der Röhre während der Lebensdauer Rechnung zu tragen, soll die Schaltung entworfen werden für einen Höchstwert des Anodenspitzenstromes von

26 mA bei V_a = 50 V, V_{g2} = 170 V
31 mA bei V_a = 60 V, V_{g2} = 200 V
42 mA bei V_a = 70 V, V_{g2} = 250 V

Der Anodenspitzenstrom einer durchschnittlichen neuen Röhre ist
38 mA bei V_a = 50 V, V_{g2} = 170 V, V_{g1} = -1 V
47 mA bei V_a = 60 V, V_{g2} = 200 V, V_{g1} = -1 V
62 mA bei V_a = 70 V, V_{g2} = 250 V, V_{g1} = -1 V.

Typical characteristics of the triode section
Caractéristiques types de la partie triode
Kenndaten des Triodenteiles

V_a	=	100 V
V_g	=	0 V
I_a	=	8 mA
S	=	1,9 mA/V
μ	=	20

Operating characteristics of the triode section as A.F. amplifier
Caractéristiques d'utilisation de la partie triode comme amplificatrice B.F.
Betriebsdaten des Triodenteiles als N.F.Verstärker

V_b (V)	V_g (V)	R_a (kΩ)	R_{g1} (kΩ)[1]	I_a (mA)	V_o[2] (V)	g	d_{tot} (%)
170	-3,5	47	150	1,8	22	9,5	8,7
170	-3,5	100	330	1,0	24	10	7,6
170	-3,5	220	680	0,5	24	11	6,5
200	-4,2	47	150	2,2	27	9,5	9,0
200	-4,2	100	330	1,2	29	10	8,0
200	-4,2	220	680	0,6	30	11	6,5
250	-5,5	47	150	2,8	36	9,5	9,2
250	-5,5	100	330	1,5	39	10	8,3
250	-5,5	220	680	0,75	40	11	7,0

The triode section can be used without special precautions against microphonic effect in circuits in which the input voltage $V_i \geqq 50$ mV for an output of 50 mW of the output valve.
La partie triode peut être utilisé sans précautions spéciales contre l'effet microphonique dans des circuitsdont la tension d'entrée $V_i \geqq 50$ mV pour une puissance de 50 mW du tube de sortie.
Der Triodenteil darf ohne spezielle Massnahmen gegen Mikrophonie verwendet werden in Schaltungen die für eine Eingangsspannung $V_i \geqq 50$ mV eine Leistung von 50 mW der Endröhre ergeben.

Limiting values of the pentode section
Caractéristiques limites de la partie penthode
Grenzdaten des Pentodenteiles

V_{a_o} = max. 550 V	I_k	= max. 25 mA	
→ V_{a_p} = max. 1200 V[3]	I_{k_p}	= max. 350 mA[3]	
$-V_{a_p}$ = max. 500 V	V_{g1} (I_{g1}=+0,3μA)	= max.-1,3 V	
V_a = max. 400 V	R_{g1}	= max. 2 MΩ[4]	
W_a = max. 3,5 W	R_{g1}	= max. 1 MΩ[5]	
V_{g2_o} = max. 550 V	R_{kf}	= max. 20 kΩ	
V_{g2} = max. 250 V	V_{kf}	= max. 150 V	
W_{g2} = max. 1,2 W			

[1],[2],[3],[4],[5], see page 5; voir page 5;siehe Seite 5.

Limiting values of the triode section
Caractéristiques limites de la partie triode
Grenzdaten des Triodenteiles

V_{a_o}	= max. 550 V
V_a	= max. 200 V
W_a	= max. 1 W
I_k	= max. 8 mA
I_{k_p}	= max. 200 mA[3])
V_g (I_g=+0,3µA)	= max.-1,3 V
R_g	= max. 3 MΩ[4])
R_g	= max. 1 MΩ[5])
R_{kf}	= max. 20 kΩ
V_{kf}	= max. 150 V

[1]) Grid leak of the output valve.
Résistance de grille du tube de sortie.
Gitterwiderstand der Endröhre.

[2]) Output voltage at start of I_g; at lower output voltages the distortion is reduced in proportion.

Tension de sortie au commencement de I_g; à des tensions de sortie plus basses la distortion est réduite proportionnellement.

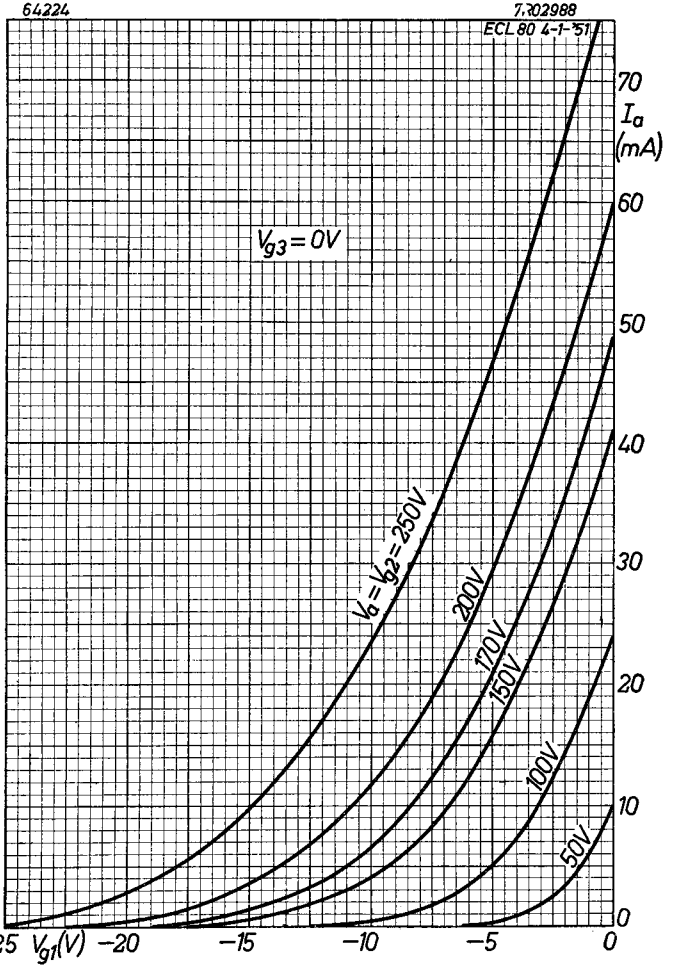
Ausgangsspannung beim Einsatzpunkt von I_g; bei niedrigerer Ausgangsspannung wird die Verzerrung proportional verringert.

[3]) Max. pulse duration 10% of a cycle with a maximum of 2 msec.
Durée de l'impulsion max. 10% d'un cycle avec un maximum de 2 msec.
Impulszeit max. 10% einer Periode mit einem Maximum von 2 mSek.

[4]) With automatic grid bias.
Avec polarisation négative automatique.
Mit automatischer negativer Gittervorspannung.

[5]) With fixed grid bias.
Avec polarisation négative fixe.
Mit fester negativer Gittervorspannung.

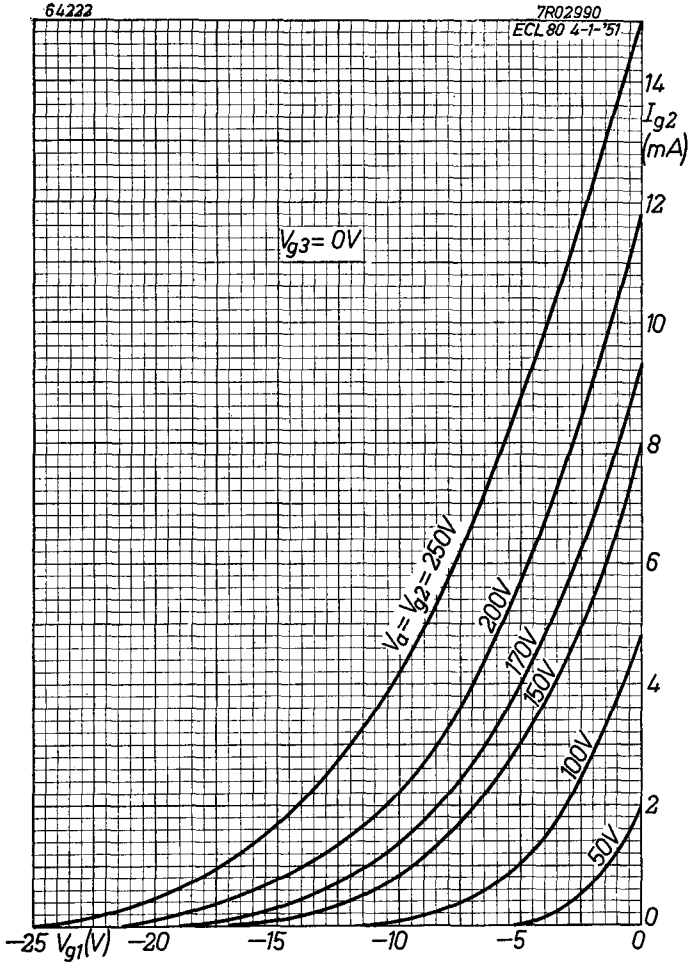
ECL 80 **PHILIPS**



A

PHILIPS

ECL 80

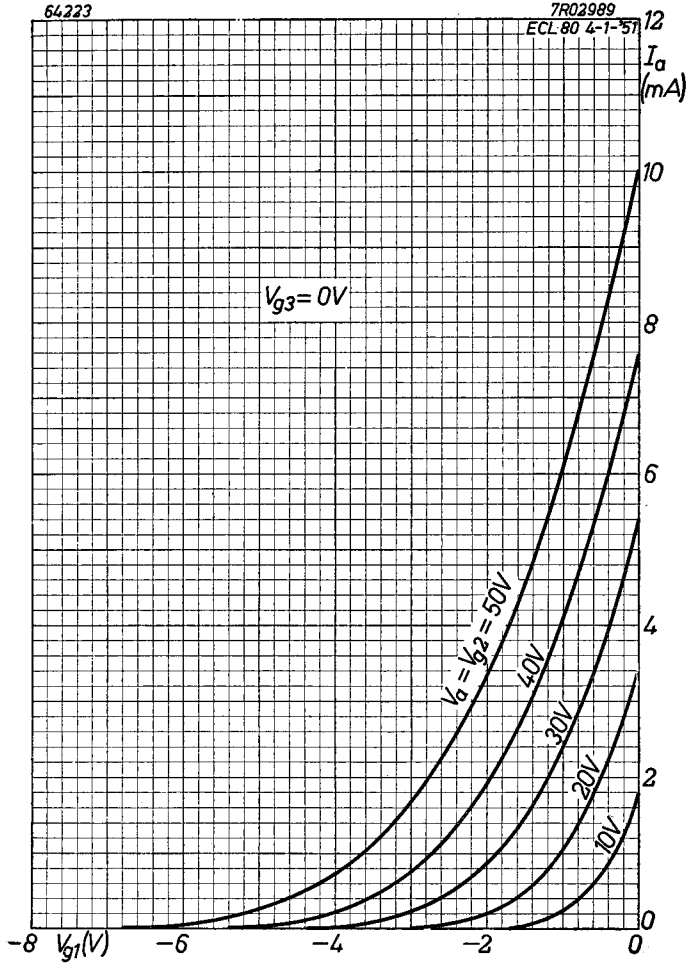


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B

ECL80

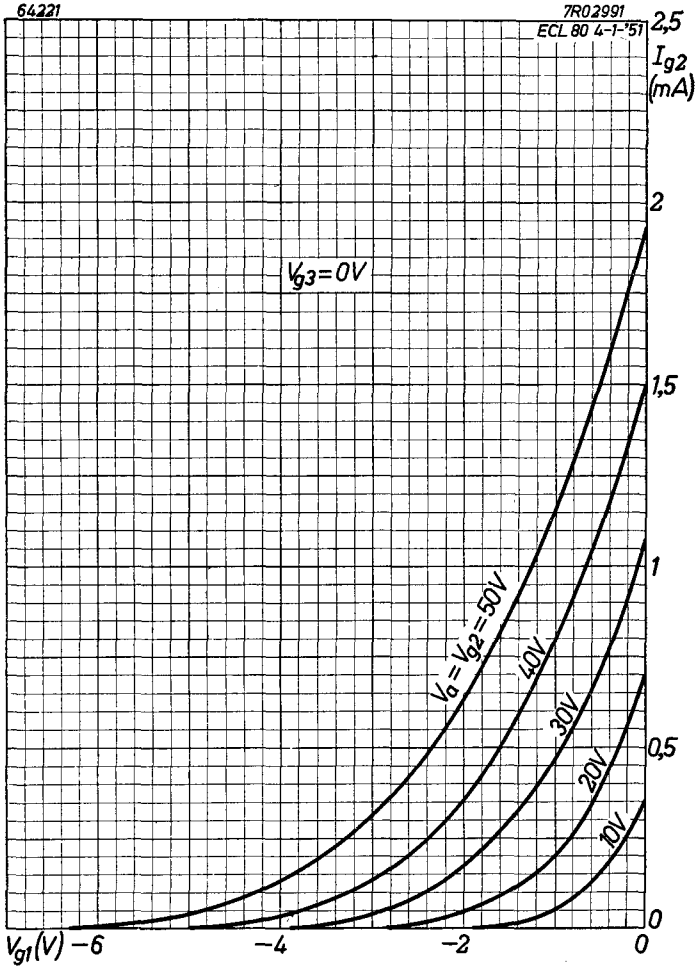
PHILIPS



C

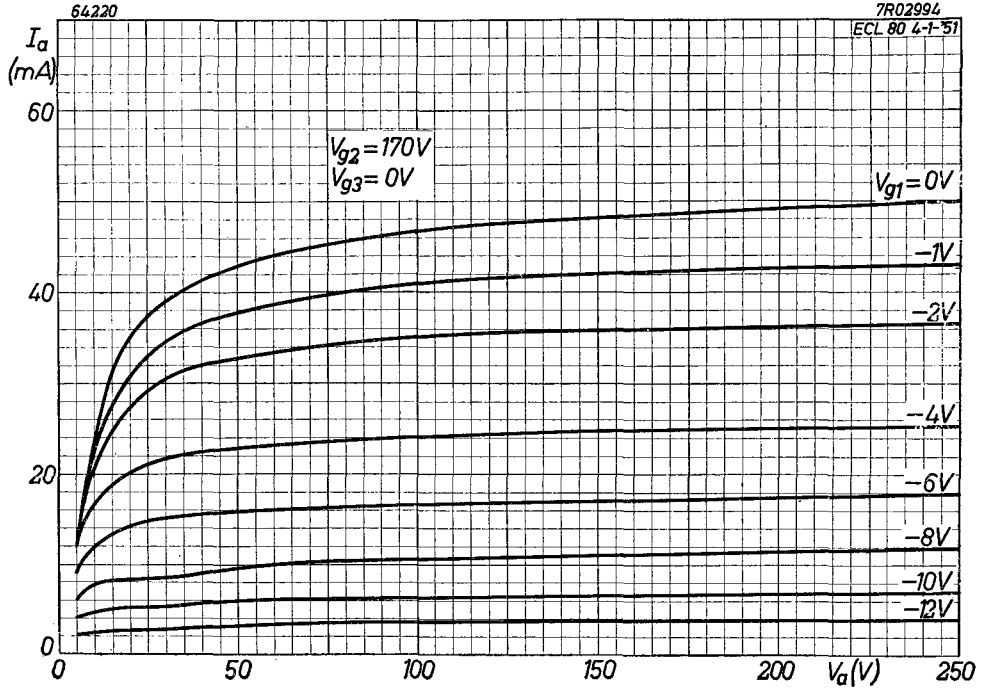
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ECL 80



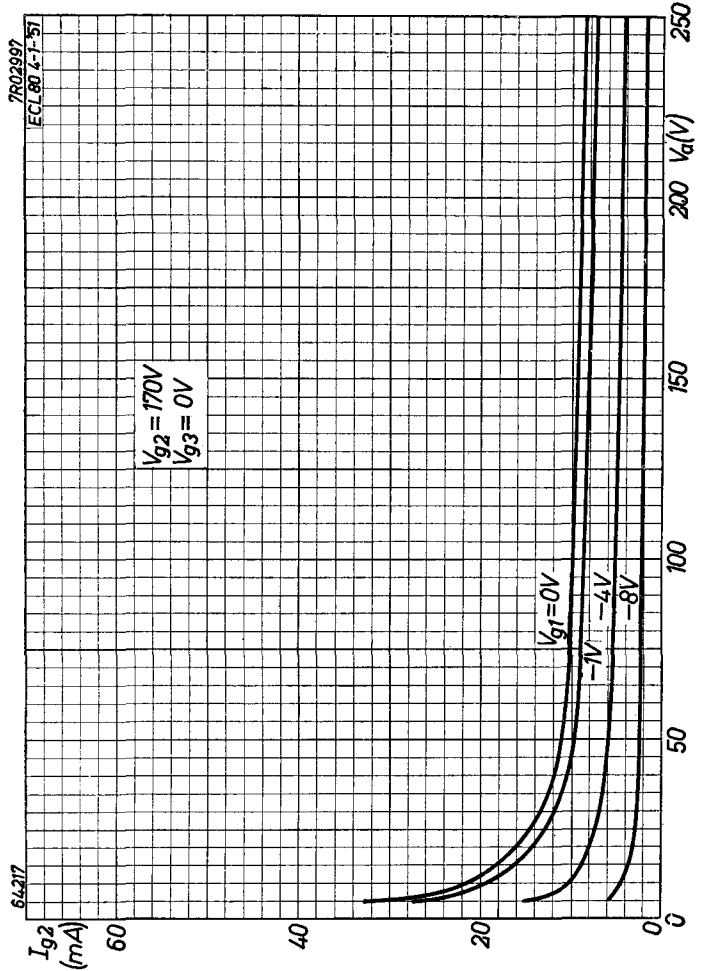
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D


64220
7R02994
ECL 80 4-1-51
I_a (mA)
60
40
20
0
0
50
100
150
200
250
V_a(V)
V_{g2}=170V
V_{g3}= 0V
V_{g1}= 0V
−1V
−2V
−4V
−6V
−8V
−10V
−12V

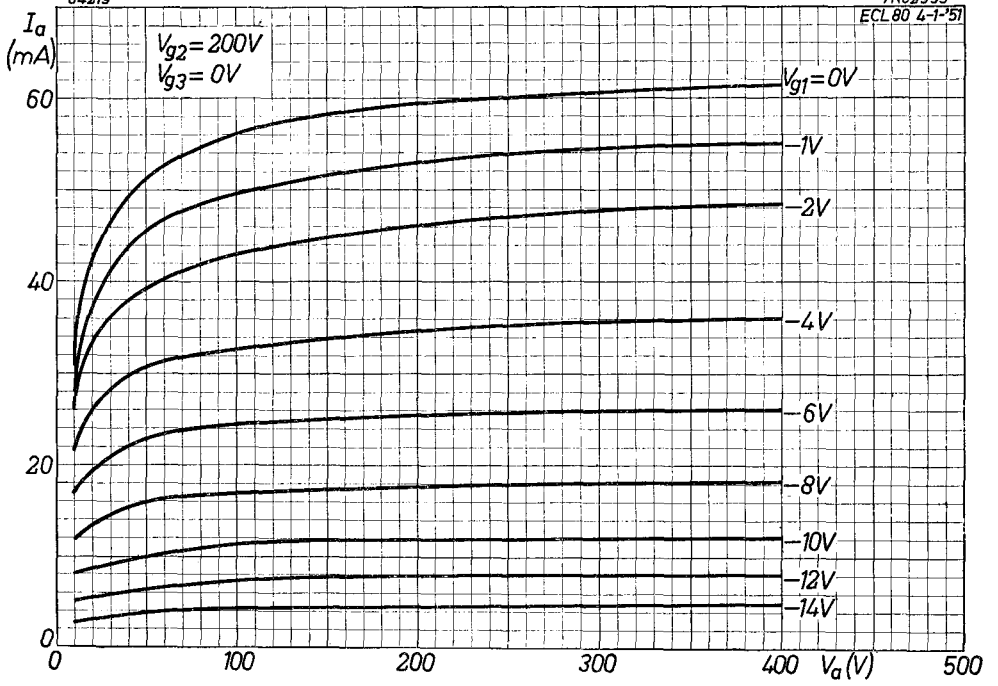
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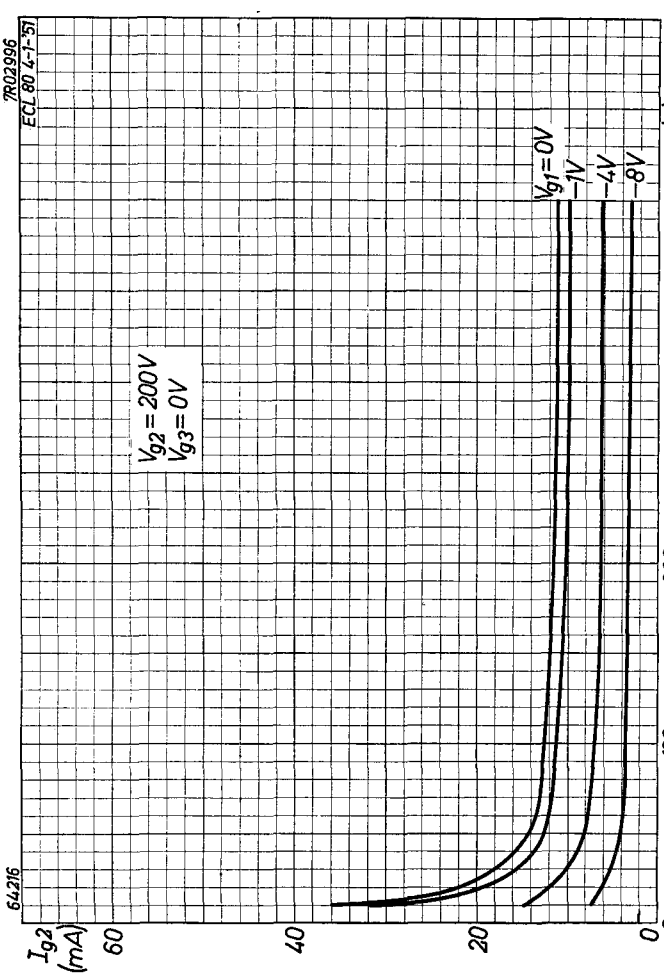
ECL 80

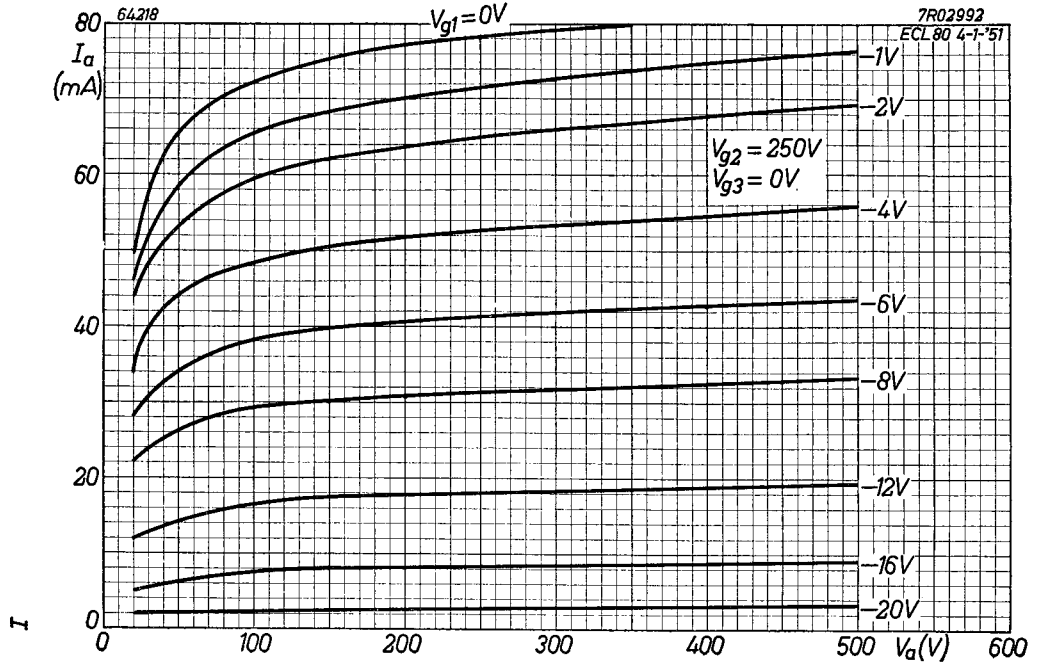


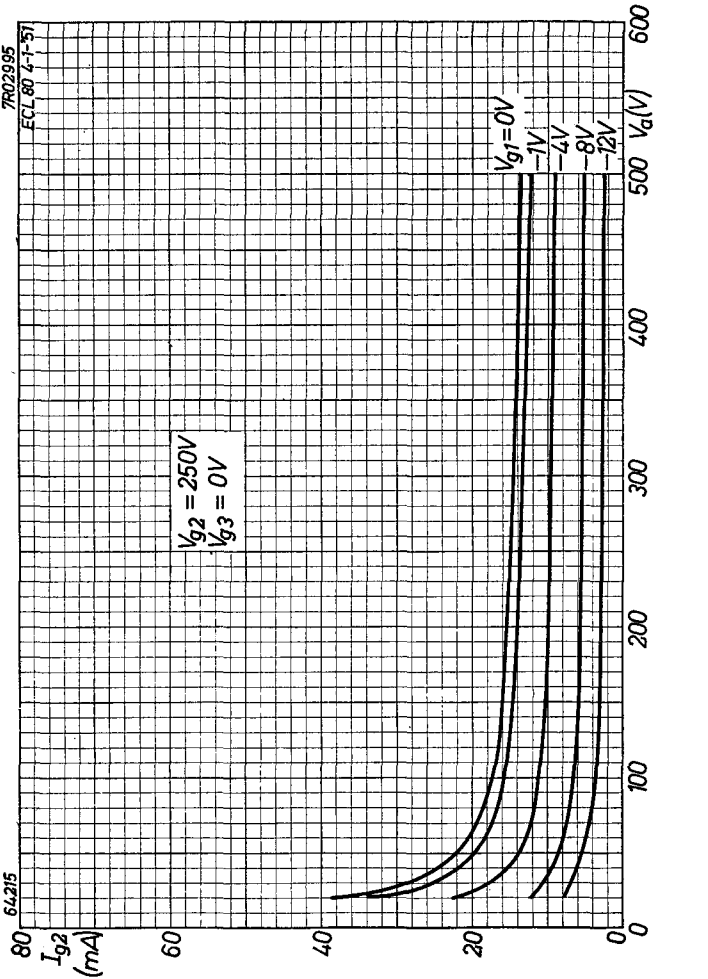
2.2.1951

F


64219
7R02993
ECL 80 4-1-'51
I_a (mA)
V_{g2} = 200V
V_{g3} = 0V
V_{g1} = 0V
-1V
-2V
-4V
-6V
-8V
-10V
-12V
-14V
60
40
20
0
0
100
200
300
400
V_a (V)
500


7R02996
ECL 80 4-1-51
64216
I_{g2} (mA)
60
40
20
0
0
100
200
300
400
500
V_a (V)
V_{g2} = 200 V
V_{g3} = 0 V
V_{g1} = 0 V
−1 V
−4 V
−8 V


64218
7R02992
ECL 80 4-1-'51
$V_{g1}=0V$
I_a (mA)
80
60
40
20
0
$V_{g2}=250V$
$V_{g3}=0V$
-1V
-2V
-4V
-6V
-8V
-12V
-16V
-20V
0
100
200
300
400
500
V_a(V)
600

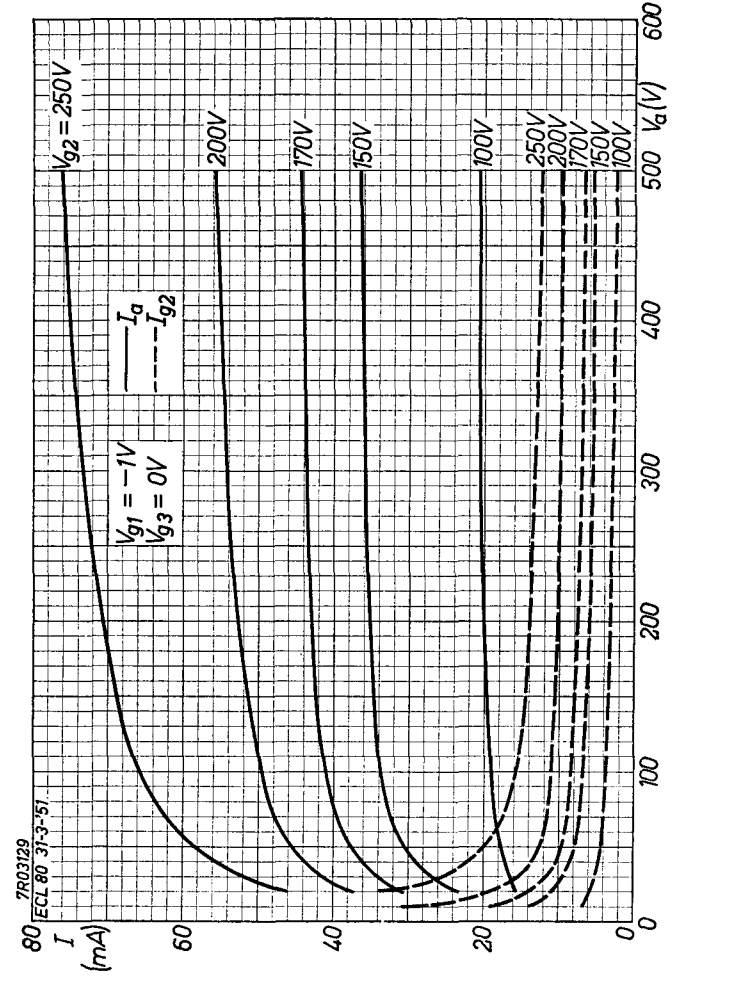

7R02995
ECL80 4-1-51
64215
I_{g2} (mA)
80
60
40
20
0
0
100
200
300
400
500
600
V_a(V)
V_{g2} = 250V
V_{g3} = 0V
V_{g1}=0V
−1V
−4V
−8V
−12V

1.1.1954

J

ECL 80

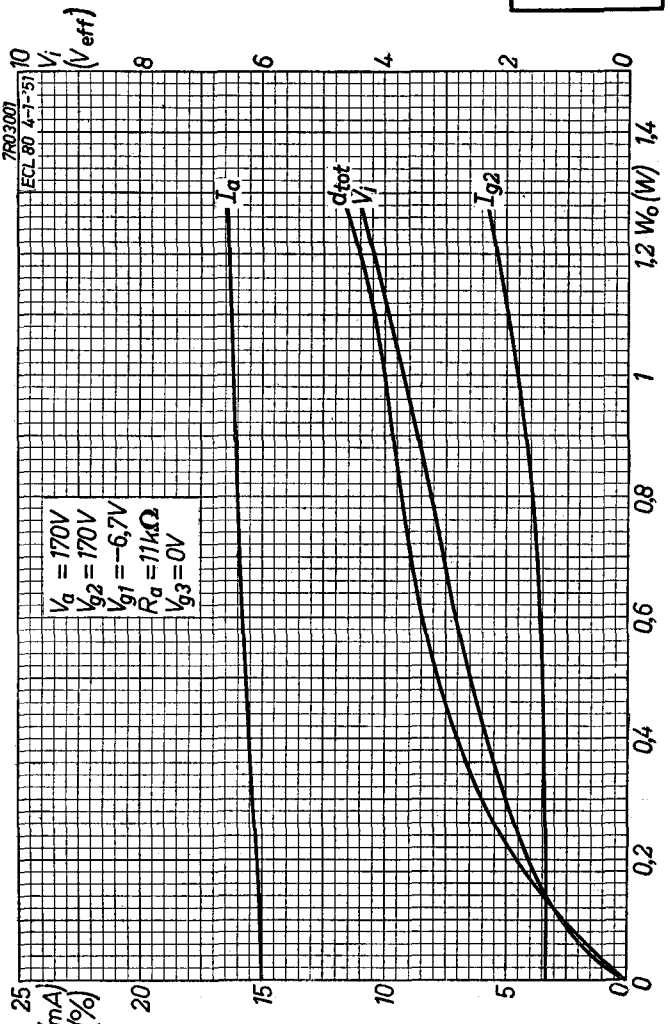
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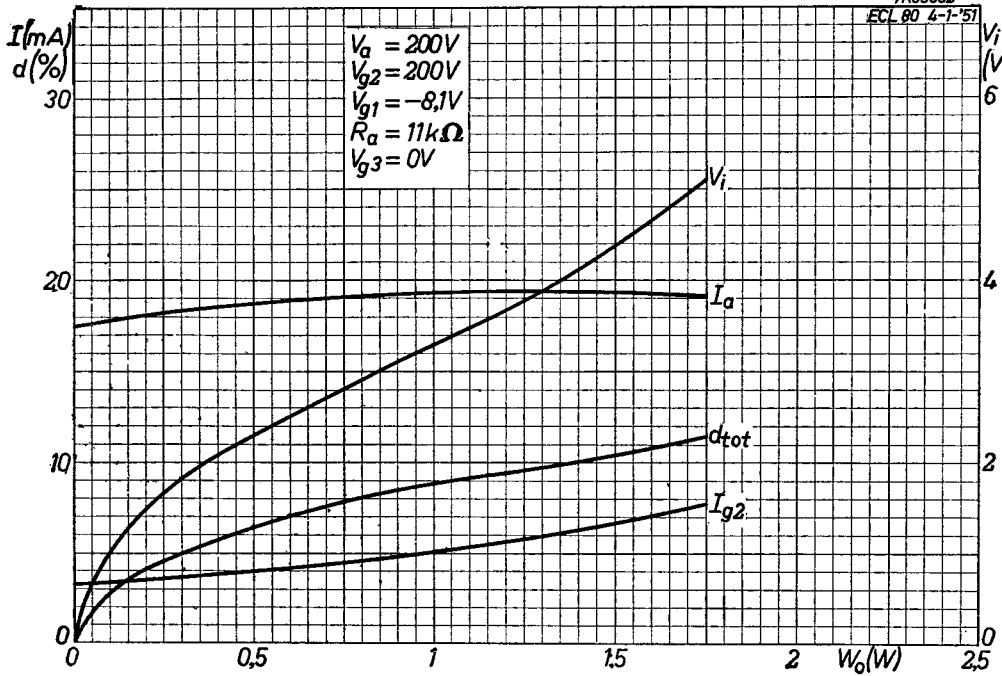


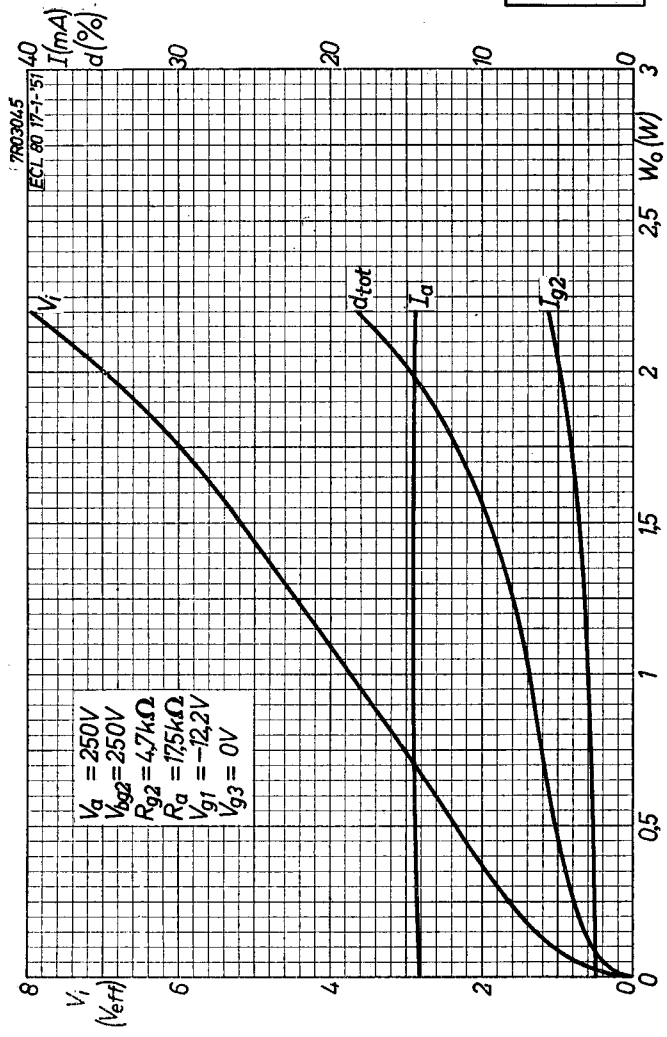
K

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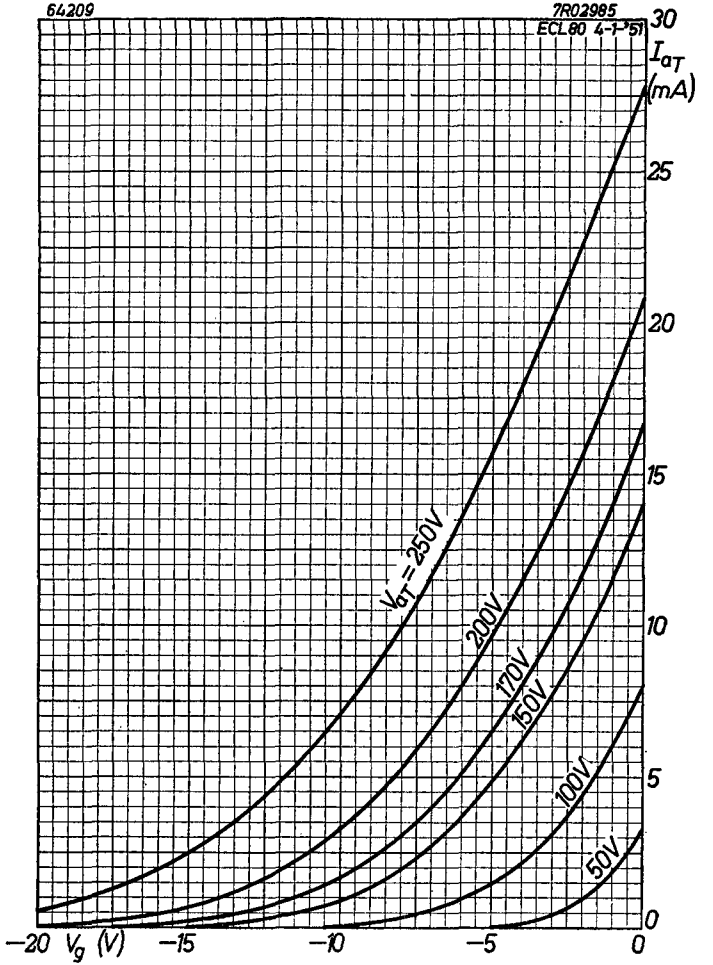
ECL 80




7R03002
ECL 80 4-1-'51
I(mA)
d(%)
Vi
(Veff)
Va = 200V
Vg2 = 200V
Vg1 = −8,1V
Ra = 11kΩ
Vg3 = 0V
Vi
Ia
dtot
Ig2
30
20
10
0
6
4
2
0
0
0,5
1
1,5
2
2,5
Wo(W)

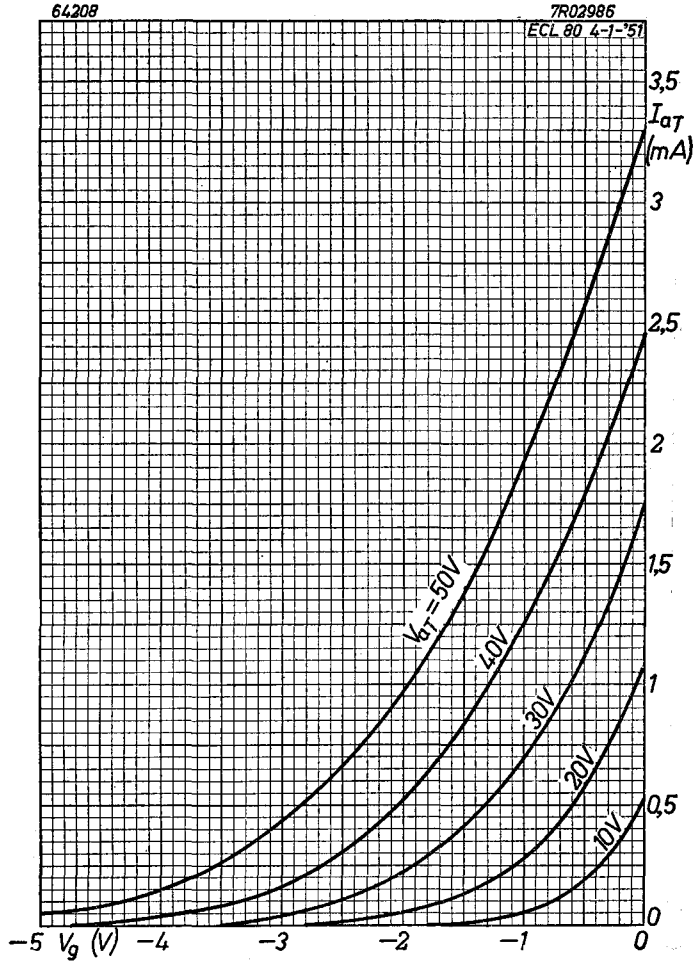

7803045
ECL 80 17-1-'51
I(mA)
d(%)
W₀(W)
Vi (Veff)
Va = 250V
Vg2 = 250V
Rg2 = 4,7kΩ
Ra = 17,5kΩ
Vg1 = −12,2V
Vg3 = 0V
Vi
dtot
Ia
Ig2
40
30
20
10
0
3
2,5
2
1,5
1
0,5
0
8
6
4
2
0

ECL 80 **PHILIPS**



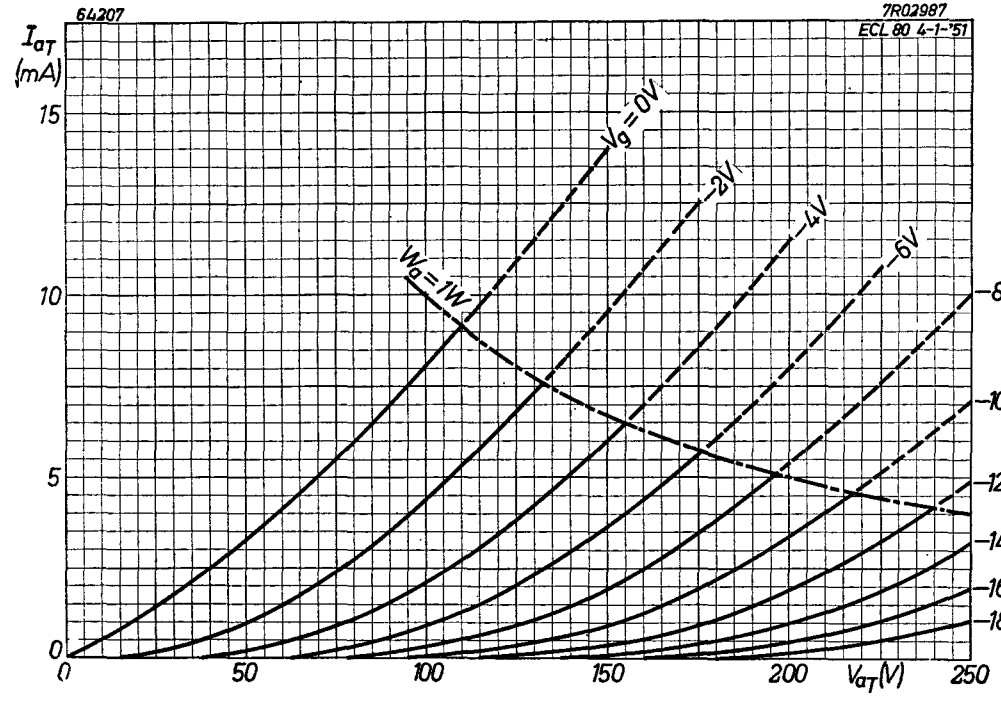
PHILIPS

ECL 80



10.10.1957

P



ECL 80

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ECL80

page	sheet	date
1	1	1952.12.12
2	2	1952.12.12
3	3	1952.12.12
4	4	1952.12.12
5	5	1951.12.12
6	A	1951.12.12
7	B	1951.02.02
8	C	1951.02.02
9	D	1951.02.02
10	E	1951.02.02
11	F	1951.02.02
12	G	1951.02.02
13	H	1951.02.02
14	I	1951.02.02
15	J	1954.01.01
16	K	1954.01.01
17	L	1957.10.10
18	M	1957.10.10
19	N	1957.10.10

20	O	1957.10.10
21	P	1957.10.10
22	Q	1957.10.10
23, 24	FP	1999.06.26

TRIODE-OUTPUT PENTODE

The triode section is intended for use as frame oscillator and A.F. amplifier. The pentode section is intended for use as frame output tube and A.F. power amplifier.

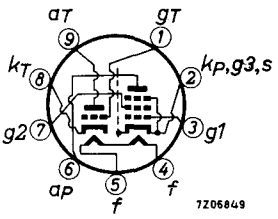
QUICK REFERENCE DATA			
Triode section			
Anode current	I_a	3.5	mA
Transconductance	S	2.2	mA/V
Amplification factor	μ	70	-
Pentode section			
Anode peak voltage	V_{a_p}	max. 2.5	kV
Anode current	I_a	41	mA
Transconductance	S	7.5	mA/V
Amplification factor	$\mu_{g_2g_1}$	9.5	-
Output power	W_o	3.5	W

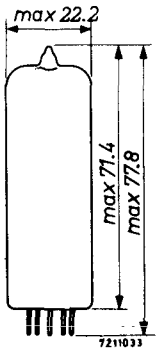
HEATING: Indirect by A.C. or D.C.; parallel supply

Heater voltage	V_f	6.3	V
Heater current	I_f	780	mA

DIMENSIONS AND CONNECTIONS Dimensions in mm

Base: Noval





CAPACITANCES

Triode section			
Anode to all except grid	$C_{a(g)}$	4.3	pF
Grid to all except anode	$C_{g(a)}$	2.7	pF
Anode to grid	C_{ag}	4.4	pF
Grid to heater	C_{gf}	max. 0.1	pF
Pentode section			
Anode to all except grid No.1	$C_{a(g_1)}$	8.0	pF
Grid No.1 to all except anode	$C_{g_1(a)}$	9.3	pF
Anode to grid No.1	C_{ag_1}	max. 0.3	pF
Grid No.1 to heater	C_{g_1f}	max. 0.3	pF
Between triode and pentode sections			
Anode triode to grid No.1 pentode	C_{aTg_1P}	max. 0.02	pF
Grid triode to anode pentode	C_{gTaP}	max. 0.02	pF
Grid triode to grid No.1 pentode	C_{gTg_1P}	max.0.025	pF
Anode triode to anode pentode	C_{aTaP}	max. 0.25	pF

TYPICAL CHARACTERISTICS

Triode section			
Anode voltage	V_a	100	V
Grid voltage	V_g	0	V
Anode current	I_a	3.5	mA
Transconductance	S	2.2	mA/V
Amplification factor	μ	70	-
Pentode section			
Anode voltage	V_a	170	V
Grid No.2 voltage	V_{g_2}	170	V
Grid No.1 voltage	V_{g_1}	-11.5	V
Anode current	I_a	41	mA
Grid No.2 current	I_{g_2}	9	mA
Transconductance	S	7.5	mA/V
Amplification factor	$\mu_{g_2g_1}$	9.5	-
Internal resistance	R_i	16	kΩ

OPERATING CHARACTERISTICS

Triode section as A.F. amplifier

A. Signal source resistance	R_s	0.22		MΩ
Grid resistor	R_g	3		MΩ
Grid resistor of next stage	R_g	0.68		MΩ
Supply voltage	V_b	200	170	V
Cathode resistor	R_k	2.2	2.7	kΩ
Anode resistor	R_a	220	220	kΩ
Anode current	I_a	0.52	0.43	mA
Voltage gain	V_o/V_i [1]	52	51	-
Max. output voltage	$V_{o\,max}$	26	25	V_{RMS}
Distortion	d_{tot} [2]	1.6	2.3	%

B. Signal source resistance	R_s	0.22				MΩ
Grid resistor	R_g	22				MΩ
Grid resistor of next stage	R_g'	0.68				MΩ
Supply voltage	V_b	200	200	170	170	V
Cathode resistor	R_k	0	0	0	0	Ω
Anode resistor	R_a	100	220	100	220	kΩ
Anode current	I_a	1.05	0.61	0.86	0.50	MΩ
Voltage gain	V_o/V_i [1]	50	55	49	53	-
Max. output voltage	$V_{o\,max}$	24	25	19	20	V_{RMS}
Distortion	d_{tot} [3]	1.5	1.4	1.4	1.4	%

MICROPHONY AND HUM

The triode section can be used without special precautions against microphony and hum in circuits in which an input voltage of minimum 10 mV_{RMS} is required for an output of 50 mW of the output stage. Z_g(50 Hz) = 0.25 MΩ.

1) Measured at small input voltage.
2) At lower output voltages the distortion is proportionnally lower.
3) At lower output voltages down to 5 V_{RMS} the distortion is approximately constant. At values below 5 V_{RMS} the distortion is approximately proportional to V_o.

OPERATING CHARACTERISTICS

Pentode section

A.F. power amplifier, class A (measured with V_k constant)

Supply voltage	$V_{ba} = V_{bg_2}$		200			272		V
Grid No.2 series resistor (non-decoupled)	R_{g_2}		470			2200		Ω
Cathode resistor	R_k		330			650		Ω
Load resistance	$R_{a\sim}$		4.5			8		kΩ
Grid No.1 driving voltage	V_i	0	0.66	6.7	0	0.9	9.5	V_{RMS}
Anode current	I_a	35		37	28		27	mA
Grid No.2 current	I_{g_2}	7.8		13.3	6.5		10.8	mA
Output power	W_o	0	0.05	3.3	0	0.05	3.5	W
Distortion	d_{tot}	-	-	10	-	-	10	%

A.F. power amplifier, class AB, two tubes in push-pull

Anode supply voltage	V_{ba}	200		250	V
Grid No.2 supply voltage	V_{bg_2}	200		200	V
Common cathode resistor	R_k	170		220	Ω
Load resistance	$R_{aa'\sim}$	4.5		10	kΩ
Grid No.1 driving voltage	V_i	0	14.2	0	12.5	V_{RMS}
Anode current	I_a	2x35	2x42.5	2x28	2x31	mA
Grid No.2 current	I_{g_2}	2x8	2x16.5	2x5.8	2x13	mA
Output power	W_o	0	9.3	0	10.5	W
Distortion	d_{tot}	-	6.3	-	4.8	%

Frame output application

The circuit should operate satisfactorily with a peak anode current I_{ap} = 85 mA at V_a = 50 V, V_{g_2} = 170 V, V_f = 6.3 V. The minimum available I_{ap} at end of life is;

70 mA at V_a = 50 V, V_{g_2} = 170 V, V_f = 5.5 V
80 mA at V_a = 50 V, V_{g_2} = 190 V. V_f = 5.5 V.

LIMITING VALUES (Design centre rating system)

Triode section

Anode voltage	V_{a_o}	max. 550	V
	V_a	max. 300	V
Anode peak voltage	V_{a_p}	max. 600	V [1]
Anode dissipation	W_a	max. 1	W
Cathode current, average	I_k	max. 15	mA
peak	I_{k_p}	max. 100	mA [1]
Grid resistor for fixed bias	R_g	max. 1	MΩ
for automatic bias	R_g	max. 3	MΩ
Grid impedance at 50 Hz	Z_g	max. 0.5	MΩ
Cathode to heater voltage	V_{kf}	max. 100	V

Pentode section

Anode voltage	V_{a_o}	max. 550	V
	V_a	max. 300	V
Anode peak voltage, positive	V_{a_p}	max. 2.5	kV [1]
negative	$-V_{a_p}$	max. 500	V
Anode dissipation for frame ouput application	W_a	max. 5	W
for A.F. output application	W_a	max. 7	W
Grid No.2 voltage	$V_{g_{2o}}$	max. 550	V
	V_{g_2}	max. 300	V
Grid No.2 dissipation, average	W_{g_2}	max. 2	W
peak	$W_{g_{2p}}$	max. 3.2	W
Cathode current	I_k	max. 50	mA
Grid No.1 resistor for fixed bias	R_{g_1}	max. 1	MΩ
for automatic bias	R_{g_1}	max. 2	MΩ
Cathode to heater voltage	V_{kf}	max. 150	V

For curves of the ECL82 please refer to PCL82

1) Max. pulse duration 4% of a cycle with a maximum of 0.8 msec.

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Data handbook

Electronic components and materials

ECL82

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1	1	1969.12
2	2	1969.12
3	3	1969.01
4	4	1969.12
5	5	1969.01
6	FP	1999.08.15

TRIODE-OUTPUT PENTODE

Triode-pentode with separate cathodes
The triode section is intended for use in circuits for keyed AGC, sync separation, sync amplification and noise suppression.
The pentode section is intended for use as video output tube.

HEATING: Indirect by A.C. or D.C.; parallel supply

Heater voltage	V_f	6.3	V
Heater current	I_f	720	mA

LIMITING VALUES (Design centre rating system)

Triode section

Cathode to heater voltage	V_{kf}	max.	200	V

For further data and curves
please refer to PCL84

PHILIPS

Data handbook

Electronic components and materials

ECL84

page	sheet	date
1	1	1969.01
2	FP	1999.08.12

TRIODE-OUTPUT PENTODE

Triode pentode with separate cathodes.
Triode intended for use as frame oscillator or pulse amplifier.
Pentode intended for use as frame output tube.

HEATING: Indirect by A.C. or D.C.; parallel supply

Heater voltage	V_f	6.3	V
Heater current	I_f	875	mA

OPERATING CHARACTERISTICS OF THE PENTODE SECTION

Hum

The equivalent pentode grid hum voltage without negative feedback and without A.C. voltage between heater and cathode is max. 10 mV_{RMS} when Z_{g_1} (at f = 50 Hz) ≦ 0.5 MΩ and C_{g_1-f} = 0.2 pF.

LIMITING VALUES (Design centre rating system)

Triode section

Cathode to heater voltage	V_{kf}	max. 100	V
D.C. component during warming up	V_{kf} (k pos)	max. 315	V

Pentode section

Cathode to heater voltage	V_{kf}	max. 100	V

For further data and curves
please refer to PCL85/PCL805

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Data handbook

Electronic components and materials

ECL85 ECL805

page	sheet	date
1	1	1969.01
2	FP	1999.08.12

TRIODE-OUTPUT PENTODE

Triode pentode with separate cathodes.
The triode section is intended for use as A.F. amplifier.
The pentode section is intended for use as A.F. power amplifier.

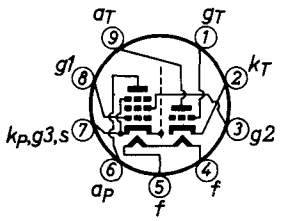
QUICK REFERENCE DATA			
Triode section			
Anode current	I_a	1.2	mA
Transconductance	S	1.6	mA/V
Amplification factor	μ	100	-
Pentode section			
Anode current	I_a	36	mA
Transconductance	S	10	mA/V
Amplification factor	$\mu_{g_2g_1}$	21	-
Output power	W_o	4.0	W

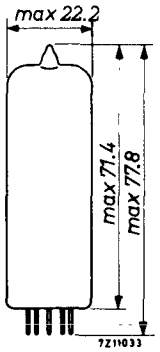
HEATING: Indirect by A.C. or D.C.; parallel supply

Heater voltage	V_f	6.3	V
Heater current	I_f	660	mA

DIMENSIONS AND CONNECTIONS Dimensions in mm

Base: Noval





CAPACITANCES

Triode section			
Anode to all except grid	$C_{a(g)}$	2.5	pF
Grid to all except anode	$C_{g(a)}$	2.3	pF
Anode to grid	C_{ag}	1.4	pF
Grid to heater	C_{gf}	max. 0.006	pF
Pentode section			
Grid No.1 to all except anode	$C_{g_1(a)}$	10	pF
Anode to grid No.1	C_{ag_1}	max. 0.4	pF
Grid No.1 to heater	C_{g_1f}	max. 0.24	pF
Between triode and pentode sections			
Anode triode to grid No.1 pentode	C_{aTg_1P}	max. 0.2	pF
Grid triode to grid No.1 pentode	C_{gTg_1P}	max. 0.02	pF
Anode triode to anode pentode	C_{aTaP}	max. 0.15	pF
Grid triode to anode pentode	C_{gTaP}	max. 0.006	pF [1]

TYPICAL CHARACTERISTICS

Triode section			
Anode voltage	V_a	250	V
Grid voltage	V_g	-1.9	V
Anode current	I_a	1.2	mA
Transconductance	S	1.6	mA/V
Amplification factor	μ	100	-
Pentode section			
Anode voltage	V_a	250	V
Grid No.2 voltage	V_{g_2}	250	V
Grid No.1 voltage	V_{g_1}	-7	V
Anode current	I_a	36	mA
Grid No.2 current	I_{g_2}	6	mA
Transconductance	S	10	mA/V
Amplification factor	$\mu_{g_2g_1}$	21	-
Internal resistance	R_i	48	kΩ

[1]) The capacitance between triode grid and pentode anode (C_{gT-aP}) can be reduced to a value of less than 0.002 pF by using a shielding ring with a diameter of 22.5 mm and a height of 15 mm with respect to the tube base.

OPERATING CHARACTERISTICS

Triode section

as A.F. amplifier

Supply voltage	V_b	200	250	250	300	V
Cathode resistor	R_k	2.6	1.75	1.75	1.2	kΩ
Anode resistor	R_a	220	220	220	220	kΩ
Grid resistor of following stage	$R_{g'}$	0.68	0.68	10	10	MΩ
Anode current	I_a	0.42	0.6	0.6	0.8	mA
Output voltage	V_o	3.2	3.2	5	9	V_{RMS}
Voltage gain	V_o/V_i	66	70	75	80	-
Distortion	d_{tot}	0.6	0.4	0.4	0.4	%

A.F. amplifier with grid current biasing

Supply voltage	V_b	200	250	250	300	V
Cathode resistor	R_k	0	0	0	0	Ω
Anode resistor	R_a	220	220	220	220	kΩ
Grid resistor	R_g	10	10	10	10	MΩ
Grid resistor of following stage	$R_{g'}$	0.68	0.68	10	10	MΩ
Signal source resistance	R_s	47	47	47	47	kΩ
Anode current	I_a	0.42	0.6	0.6	0.8	mA
Output voltage	V_o	3.2	3.2	5	9	V_{RMS}
Voltage gain	V_o/V_i	66	70	75	80	-
Distortion	d_{tot}	0.6	0.4	0.4	0.4	%

MICROPHONY

The triode section can be used without special precautions against microphonic effect in circuits in which an output of 50 mW is obtained at an input voltage of not less than 4 mV_{RMS}.

HUM

The hum level will be better than 60 dB under the following conditions:
Input voltage minimum 10 mV_{RMS} for 50 mW output.
Grid circuit impedance max. 0.5 MΩ at 50 Hz.
Cathode decoupling capacitor minimum 100 μF.
Pin 4 connected to earth.

OPERATING CHARACTERISTICS (continued)

Pentode section

Class A (Measured with V_k constant)

Anode voltage	V_a		250			250		V
Grid No.2 voltage	V_{g_2}		250			250		V
Cathode resistor	R_k		170			270		Ω
Load resistance	$R_{a\sim}$		7			10		kΩ
Grid No.1 driving voltage	V_i	0	0.3	3.2	0	0.28	2.7	V_{RMS}
Anode current	I_a	36	–	37	26	–	27	mA
Grid No.2 current	I_{g_2}	6	–	10.2	4.4	–	8.0	mA
Output power	W_o	0	0.05	4.0	0	0.05	2.8	W
Distortion	d_{tot}	–	0.95	10	–	1.1	10	%

Class AB, two tubes in push-pull

Supply voltage	V_b		250			300		V
Common cathode resistor	R_k		90			130		Ω
Load resistance	$R_{aa\sim}$		8.2			9.1		kΩ
Grid No.1 driving voltage	V_i	0	0.24	5.5	0	0.26	8.4	V_{RMS}
Anode current	I_a	2x32.5	–	2x35.5	2x31	–	2x36.5	mA
Grid No.2 current	I_{g_2}	2x5.6	–	2x8.9	2x5.5	–	2x11	mA
Output power	W_o	0	0.05	10	0	0.05	13.6	W
Distortion	d_{tot}	–	<0.4	5.0	–	<0.4	4.0	%

LIMITING VALUES (Design centre rating system)

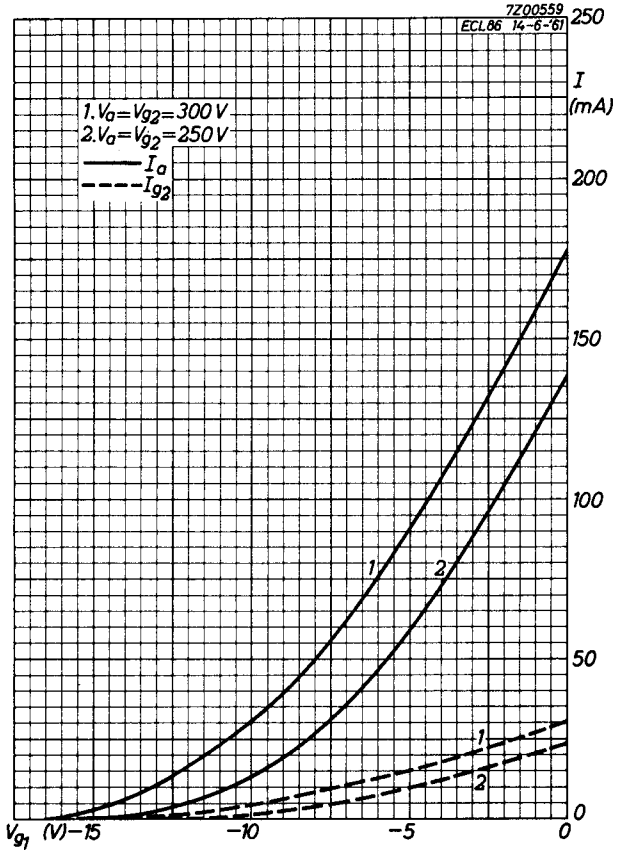
Triode section

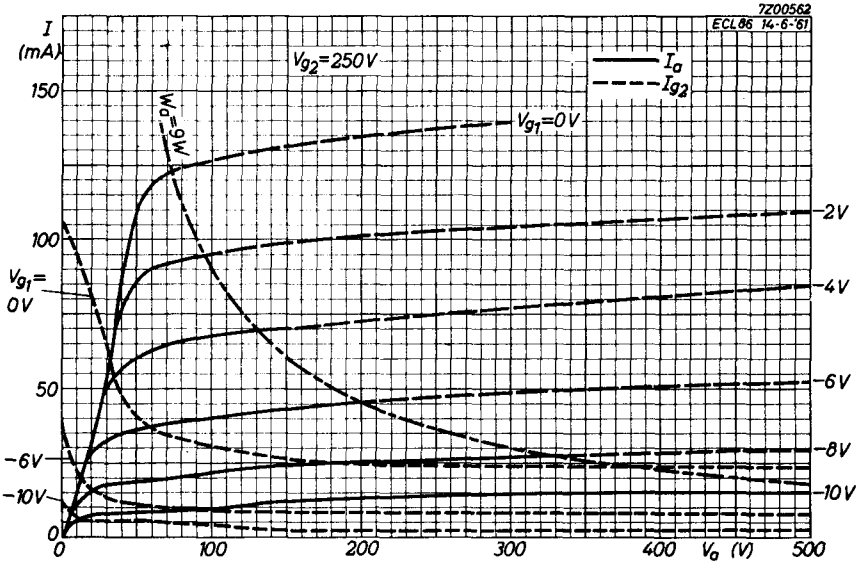
Anode voltage	V_{a_o}	max.	550	V
	V_a	max.	300	V
Anode dissipation	W_a	max.	0.5	W
Cathode current	I_k	max.	4	mA
Grid resistor	R_g	max.	1	MΩ [1])
Cathode to heater voltage	V_{kf}	max.	100	V

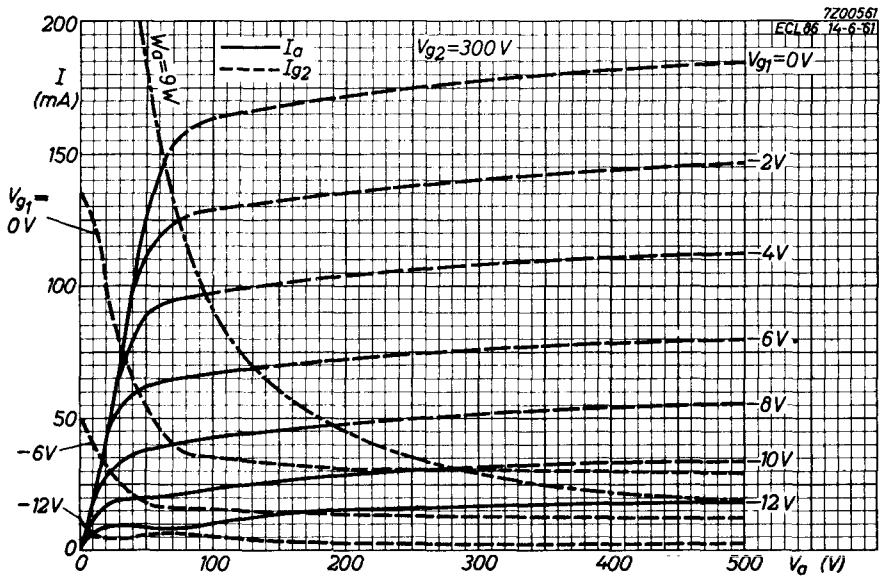
Pentode section

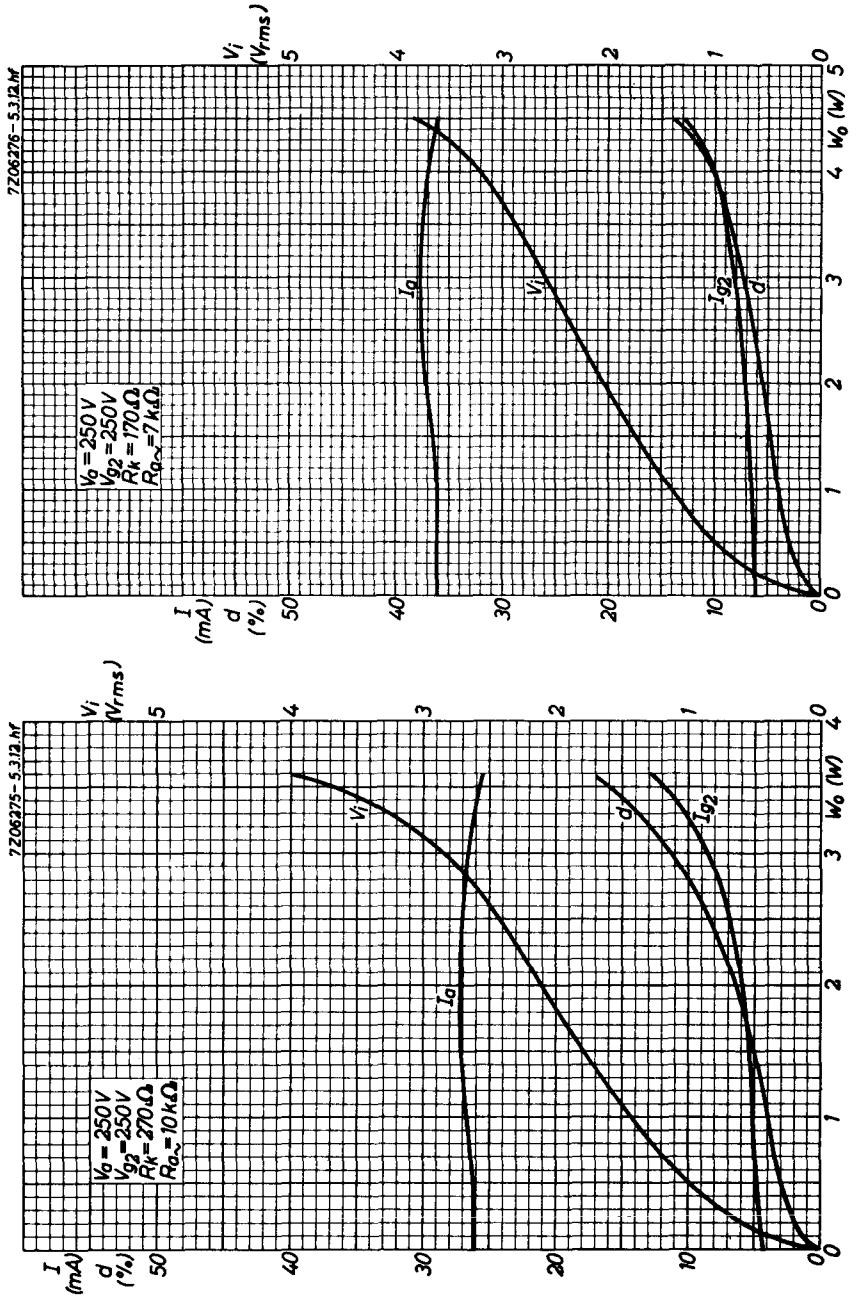
Anode voltage	V_{a_o}	max.	550	V
	V_a	max.	300	V
Grid No.2 voltage	V_{g2_o}	max.	550	V
	V_{g_2}	max.	300	V
Anode dissipation	W_a	max.	9	W
Grid No.2 dissipation				
average	W_{g_2}	max.	1.8	W
peak	$W_{g_{2p}}$	max.	3.25	W
Cathode current	I_k	max.	55	mA
Grid No.1 resistor	R_{g_1}	max.	0.5	MΩ [1])
Cathode to heater voltage	V_{kf}	max.	100	V

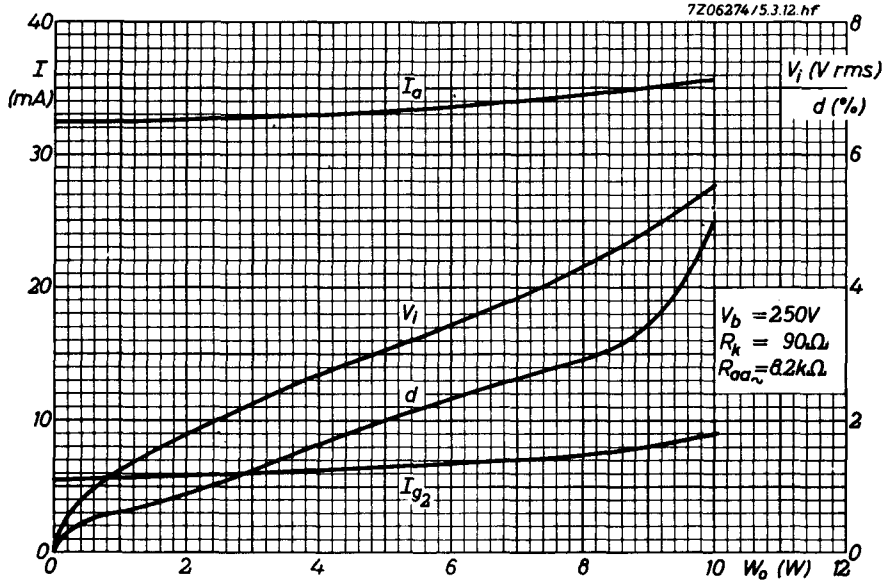
[1]) This value applies to operation with fixed bias. It may be multiplied by the D.C. inverse feedback factor resulting from e.g. cathode, screen grid or anode resistors, to a maximum of 10 MΩ.

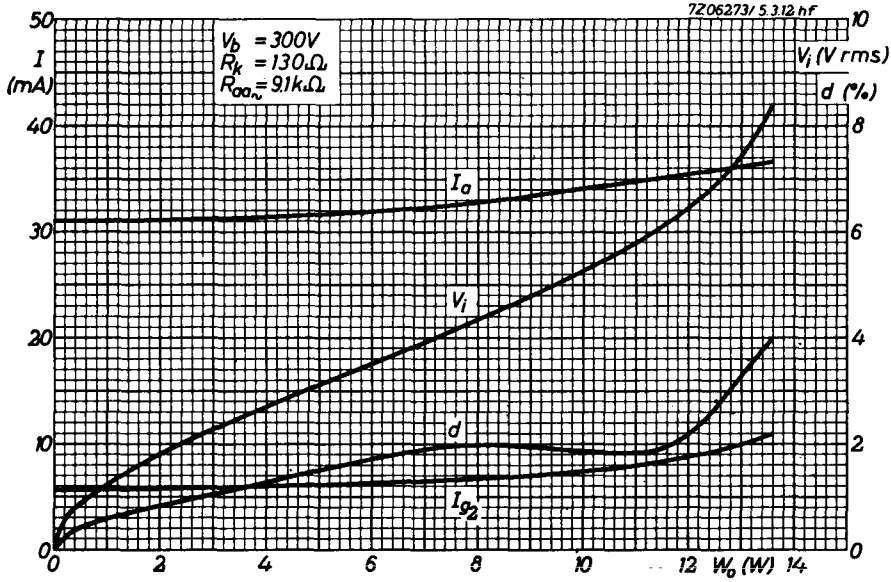

7Z00559
ECL86 14-6-61
1. $V_a = V_{g2} = 300\,V$
2. $V_a = V_{g2} = 250\,V$
I_a
I_{g2}
I (mA)
250
200
150
100
50
0
1
2
1
2
V_{g1} (V) −15
−10
−5
0

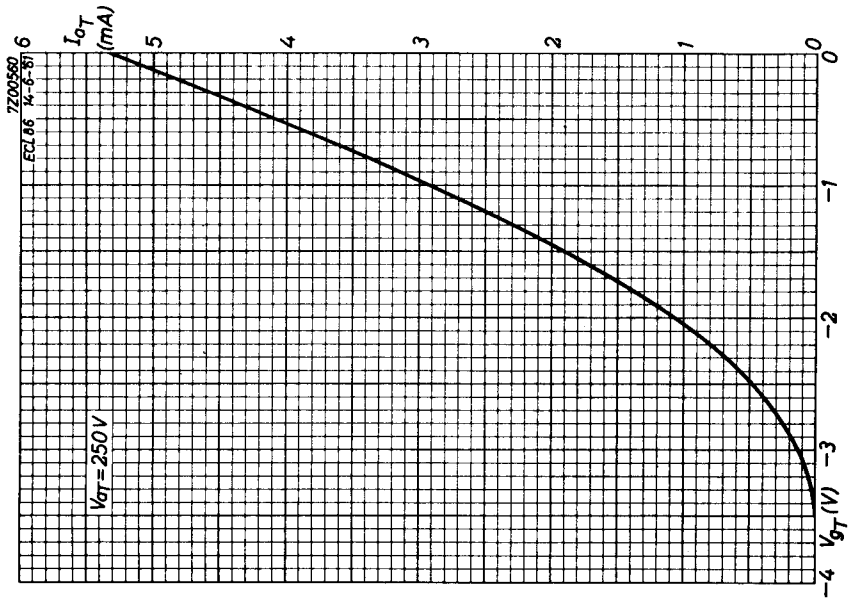

7Z00562
ECL86 14-6-61
I (mA)
V_{g2}=250V
I_a
I_{g2}
W_a=9W
V_{g1}=0V
-2V
-4V
-6V
-8V
-10V
V_{g1}= 0V
-6V
-10V
150
100
50
0
0
100
200
300
400
500
V_a (V)

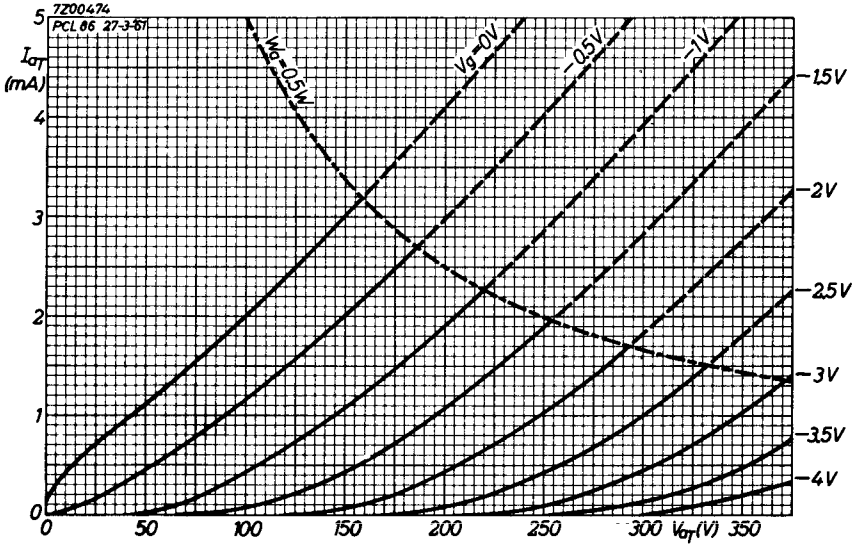

7Z00561
ECL86 14-6-61
200
I (mA)
W_a=9W
I_a
I_{g2}
V_{g2}=300V
V_{g1}=0V
-2V
-4V
-6V
-8V
-10V
-12V
V_{g1}= 0V
-6V
-12V
150
100
50
0
0
100
200
300
400
500
V_a (V)


7206275-5.312.hf
$V_a = 250\,V$
$V_{g2} = 250\,V$
$R_k = 170\,\Omega$
$R_{a\sim} = 7\,k\Omega$
V_i (V_{rms})
W_o (W)
I_a
V_i
I_{g2}
d
I (mA)
d (%)
7206275-5.312.hf
$V_a = 250\,V$
$V_{g2} = 250\,V$
$R_k = 270\,\Omega$
$R_{a\sim} = 10\,k\Omega$
V_i (V_{rms})
W_o (W)
V_i
I_a
d
I_{g2}
I (mA)
d (%)


7Z06274/5.3.12.hf
I (mA)
I_a
V_i
d
I_{g_2}
V_b = 250V
R_k = 90Ω
$R_{aa\sim}$ = 8.2kΩ
V_i (V rms)
d (%)
W_o (W)


7Z06273/5.3.12.hf
I (mA)
V_b = 300V
R_k = 130Ω
$R_{aa\sim}$ = 9.1kΩ
I_a
V_i
d
I_{g_2}
V_i (V rms)
d (%)
W_o (W)


7Z00580
ECL86 14-6-67
I_{GT} (mA)
6
5
4
3
2
1
0
V_{GT} = 250 V
0
−1
−2
−3
−4
V_{gT} (V)


7Z00474
PCL86 27-3-67
I_{GT} (mA)
5
4
3
2
1
0
W_g = 0,5 W
V_g = 0 V
−0,5 V
−1 V
−1,5 V
−2 V
−2,5 V
−3 V
−3,5 V
−4 V
0
50
100
150
200
250
300
V_{GT} (V)
350

PHILIPS

Data handbook

PHILIPS Electronic components and materials

ECL86

page	sheet	date
1	1	1970.01
2	2	1970.01
3	3	1970.01
4	4	1970.01
5	5	1970.01
6	6	1970.01
7	7	1970.01
8	8	1970.01
9	9	1970.01
10	10	1970.01
11	FP	1999.08.10

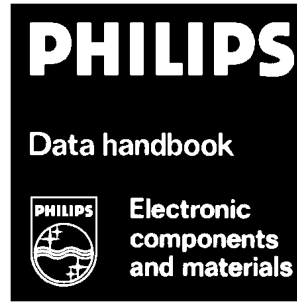
SHUNT STABILIZER TRIODE

Shunt stabilizer triode intended for use as in colour TV receivers.

HEATING: Indirect by A.C. or D.C.; parallel supply

Heater voltage	V_f	6.3	V
Heater current	I_f	350	mA

For further data and curve of this type please refer to type PD500



ED500

page	sheet	date
1	1	1970.01
2	FP	1999.08.12

Vorläufige Daten.
Caractéristiques provisoires.
Tentative data.

PHILIPS „MINIWATT"
EDD11

EDD11

Heizung ind., Parallelspeisung durch Autobatterie.
Chauffage ind., alimentation en parallèle par accumulateur de voiture.
Heating ind., parallel filament supply by car battery.

Vf	6,3 V
If	0,4 A

Betriebsdaten als Klasse-B-Gegentaktverstärker mit der EBC 11 als Treiberröhre.
Caractéristiques de service comme amplificatrice de sortie push-pull classe B utilisant la EBC 11 comme lampe préamplificatrice.
Operating conditions for use as class B push-pull power amplifier with valve EBC 11 as driver.

Va (EDD 11 & EBC 11)	200 V	250 V
Vg (EDD 11)	-6,3 V	-6,3 V
Vg (EDD 11)	-6,3 V	-8 V
Rk (EBC 11)	1600 Ω	1600 Ω
u[1]	3:(1+1)	3:(1+1)
Iao (EDD 11)	2x1,6 mA	2x3,5 mA
Ia max (EDD 11)	2x17,5 mA	2x17,5 mA
Ra	12000 Ω	16000 Ω
Vi (EBC 11)	4,5 V(eff)	4,5 V(eff)
Wo (EDD 11)	4,5 W	5,5 W
d_{tot}	10 %	10 %
Vi (Wo = 50 mW)	0,15V(eff)	0,15 V(eff)
Wi (EDD 11)(Wo = max)[2]	0,1 W	0,1 W

1) Übersetzungsverhältnis des Steuertransformators.
Rapport de transformation du transformateur de commande.
Driver transformer ratio (primary to secundary turns).

2) Gitterleistungsaufnahme der EDD 11 bei voller Aussteuerung.
Puissance requise par les grilles de la EDD 11 pour la modulation complète.
Grid power requirement of the EDD 11 for full modulation.

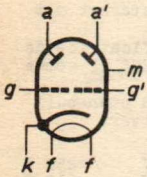
Grenzdaten.
Limites fixées pour les caractéristiques.
Limiting values.

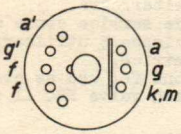
Vao	max. 550 V
Va	max. 250 V
Wa	max. 2x3 W
Ik	max. 2x25 mA
Rfk	max. 5000 Ω
Vfk	max. 50 V

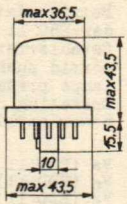
EDD 11

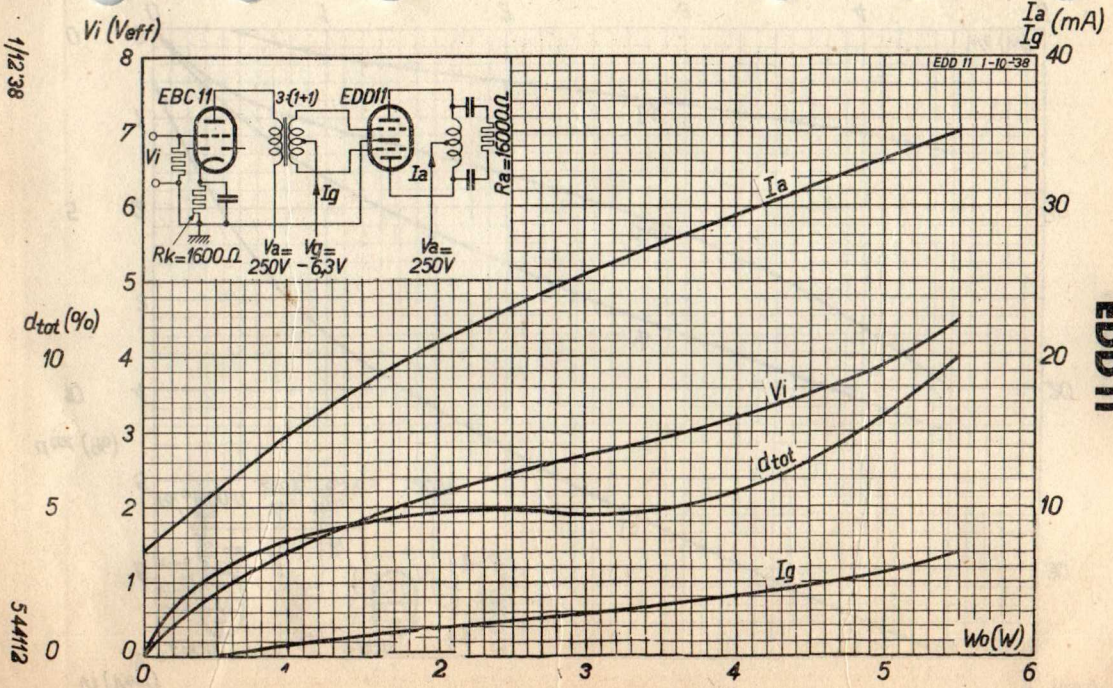
PHILIPS „MINIWATT"
EDD 11

Elektrodenanordnung, Sockelanschlüsse und max. Abmessungen in mm.
Disposition des électrodes, connexions du culot et dimensions max. en mm.
Electrode arrangement, base connections and max.dimensions in mm.









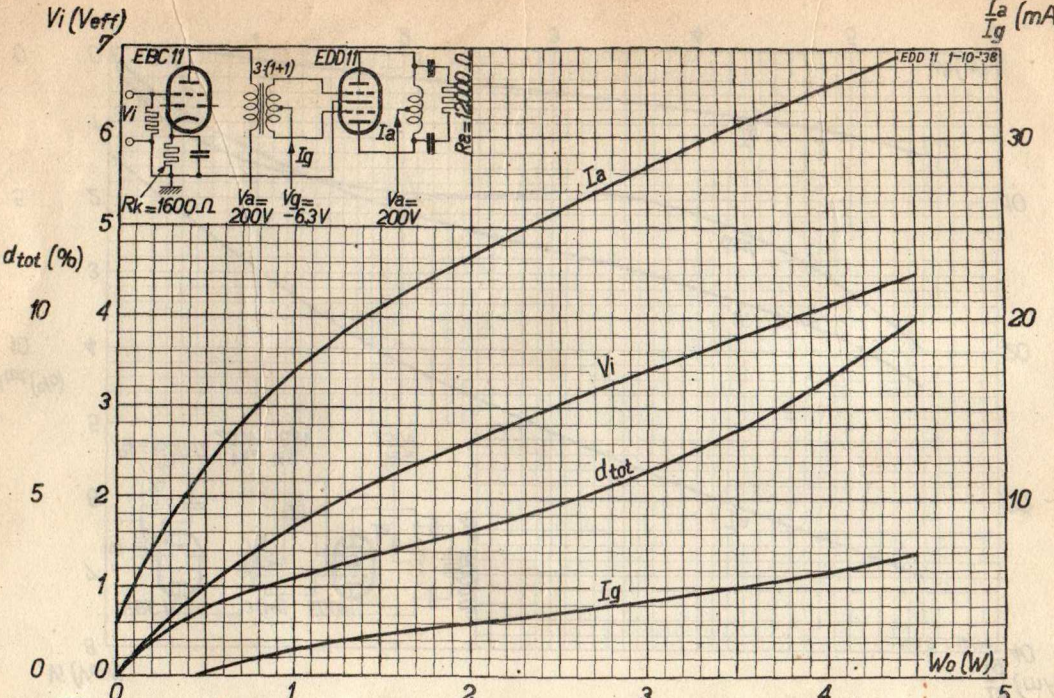
PHILIPS „MINIWATT"

EDD 11

EDD 11

1/12.38

544112



EDD 11

PHILIPS „MINIWATT"

EDD 11

EE 1 Sekundäremissionsröhre

Die Röhre EE 1 ist eine Verstärkerröhre mit einer Sekundäremissionskathode. Obwohl ursprünglich für Breitbandverstärkung in Fernsehempfängern entwickelt, wird sie in Rundfunkempfängern und Kraftverstärkern als transformatorlose Steuerröhre für Gegentaktstufen Verwendung finden. Nicht nur wird dabei der Transformator zur Erzielung der beiden in Gegenphase liegenden Wechselspannungen gespart, sondern die Sekundäremissionsröhre wird gleichzeitig eine sehr hohe Verstärkung gestatten, was besonders für Kraftverstärker seine Bedeutung hat, da sie entweder zu einer Beschränkung der Röhrenzahl führt oder eine Gegenkopplungsschaltung ohne erheblichen Verlust an Verstärkung ermöglicht.
Im Folgenden wird zunächst die Wirkungsweise der Sekundäremission und der prinzipielle Aufbau der Sekundäremissionsröhre erläutert und sodann die Anwendung als Vorverstärker von Gegentaktendstufen besprochen.

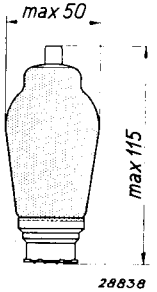
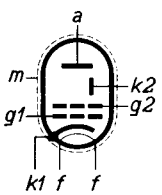


Abb. 1
Abmessungen in mm.

Sekundäremission und Aufbau der Sekundäremissionsröhre

Treffen Elektronen mit bestimmter Geschwindigkeit auf eine Metalloberfläche, so wird ein kleiner Teil dieser Elektronen reflektiert. Der größte Teil dringt in die Oberflächenschicht ein und löst Elektronen aus den dort befindlichen Atomen. Diese Elektronen erhalten durch den Aufprall der Primärelektronen große Geschwindigkeiten und können, falls ihre Bewegungsrichtung günstig ist, die beschossene Oberfläche verlassen. Die Elektronen, die durch die Primärelektronen aus der Metalloberfläche ausgestoßen werden, werden als Sekundärelektronen bezeichnet. Das Vermögen zur Aussendung sekundärer Elektronen wird durch den Sekundäremissionsfaktor δ ausgedrückt, d.h. durch die durchschnittliche Anzahl der von einem Primärelektron frei gemachten Sekundärelektronen.



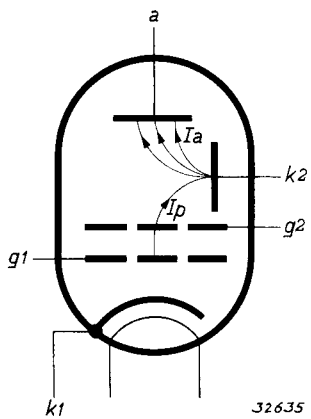


Abb. 3
Schematische Darstellung des Elektrodensystemes der Sekundäremissionsröhre. Die Primärelektronen, die die Kathode k_1 verlassen, werden auf die Sekundäremissionskathode k_2 gelenkt. Die hieraus ausgelösten Sekundärelektronen wandern zur Anode. Die Pfeilrichtung gibt die Bewegung der Elektronen an und ist dem konventionellen Strom entgegengesetzt.

Menge und Lauf der Sekundärelektronen hängen vom Aufbau der Röhre, von den Spannungen der verschiedenen Elektroden und von den physikalischen Eigenschaften des Stoffes der bombardierten Oberfläche ab. Bei einer Nickeloberfläche z.B. beträgt der Sekundäremissionsfaktor für einen Potentialunterschied von 150 V nur 0,94, so daß nicht mehr Sekundärelektronen als Primärelektronen erhalten werden und keine Elektronenvervielfachung auftritt.

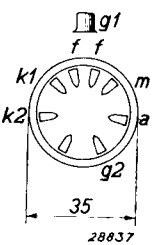


Abb. 2
Elektrodenanordnung und Sockelanschlüsse.

Elektronenvervielfachung wird erzielt bei Verwendung eines Materials mit $\delta > 1$. Abb. 3 zeigt schematisch das Prinzip der Sekundäremissionsröhre. Die Wirkungsweise der Sekundäremissionsröhre EE 1 ist kurz folgende:
Von einer primären indirekt geheizten Kathode werden die Elektronen durch eine auf positive Spannung (150 V) gebrachte Sekundäremissionskathode abgesaugt. Zwischen der Kathode und der Sekundäremissionskathode befindet sich ein Steuergitter und ein Schirmgitter. Jedes auf die Sekundäremissionskathode auftreffende Elektron löst aus dieser eine größere Menge von

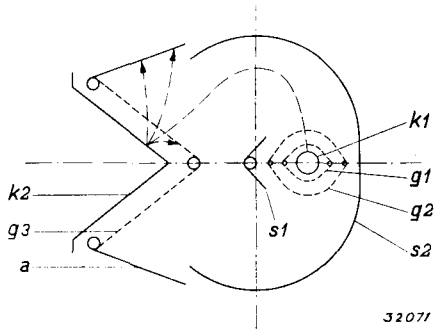


Abb. 4
Querschnitt der Sekundäremissionsröhre mit Bahn eines Primärelektrons und Bahnen der aus der Kathode k_2 gelösten Sekundärelektronen.
k_1 = Primärkathode
g_1 = Steuergitter
g_2 = Schirmgitter (150 V)
s_1 = Schirm zum Schutz der Sekundärkathode (0 V)
s_2 = Ablenkschirm (0 V)
k_2 = Sekundäremissionskathode (150 V)
g_3 = Anodengitter (250 V)
a = Anodenbleche (250 V)

Steilheit der Sekundäremissionsröhre $\delta^{1/k}$ mal so groß wie die der Röhre ohne Sekundäremission, wo k ein Faktor ist, der mit der Röhrenkonstruktion und mit der Anodenspannung zusammenhängt. Für einen nicht zu kleinen Primärkathodenstrom wird der Faktor

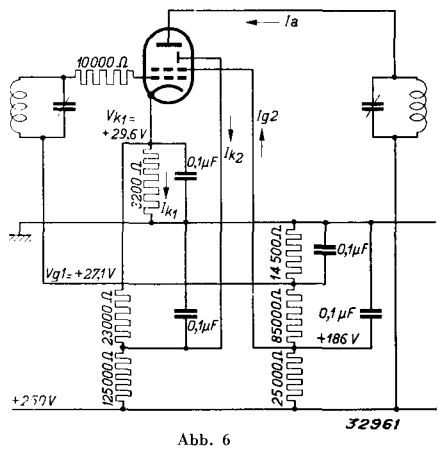


Abb. 6
Grundsätzliches Schaltbild für die Verwendung der Röhre EE 1. Der Kathodenwiderstand ist, um Anodenstromstreuungen zu beschränken, wesentlich größer als der, der für die negative Vorspannung erforderlich ist. Um die richtige negative Vorspannung des Gitters in Bezug auf die Kathode zu erzielen, erhält das Gitter eine positive Vorspannung.

Sekundärelektronen aus, die von der auf höherer Spannung (250 V) liegenden Anode angezogen werden. Es ist nun klar, daß jede Stromänderung zur Sekundäremissionskathode durch Änderung der Spannung am Steuergitter g_1 eine viel größere Änderung in dem Strom von der Sekundäremissionskathode zur Anode hervorruft und infolgedessen die Sekundäremission eine beträchtliche Steilheitserhöhung herbeiführt, ohne daß eine anormal große Kathode und ein sehr kleiner Kathoden-Gitterabstand erforderlich sind.

Bei einem Vergleich zwischen zwei Röhren, die dieselbe Kathode, dasselbe Steuergitter und dieselbe Anode besitzen und von denen die eine mit, die andere ohne Sekundäremissionsverstärkung arbeitet, stellt sich heraus, daß bei gleichem Anodenstrom die Steilheit der Röhre mit Sekundäremission viel größer ist. Bei gleichem Anodenstrom ist die

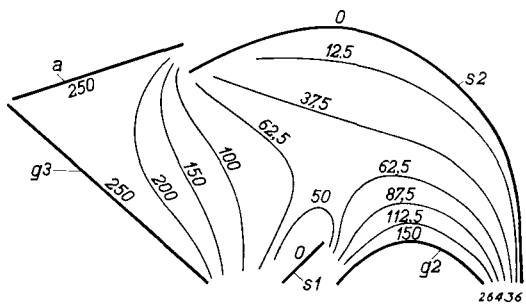


Abb. 5
Verlauf der Äquipotentialflächen in der Sekundäremissionsröhre. Wegen der Bezeichnung der Elektroden siehe Unterschrift von Abb. 4.

k einen konstanten Wert von etwa 1,6 haben, so daß unter diesen Umständen die Steilheit der Sekundäremissionsröhre $\delta^{0,6}$ mal so groß ist. Ist δ z.B. gleich 5, so wird $\delta^{0,6}$ gleich 2,6 sein.

Werden Primärkathode (indirekt geheizte Kathode mit Oxydschicht) und Sekundäremissionsoberfläche ohne besondere Vorsorgsmaßnahmen im Röhrenkolben aufgestellt, so bedeckt sich auf die Dauer die Sekundäremissionsoberfläche mit einem Niederschlag von Stoffen, die aus der Kathode verdampfen (z.B. Barium und Bariumoxyd). Die Konstanz der Sekundäremission wird hierdurch stark beeinflußt. Durch die Anwendung einer Elektronenoptik und genaue Anordnung der Elektronenbahnen ist es gelungen, den Niederschlag auf der Sekundäremissionskathode zu verhüten.

Die Schwierigkeiten durch den Niederschlag des Primärkathodenmaterials sind in der

Sekundäremissionsröhre EE 1 durch die Elektronenablenkung vermieden. Es wurde davon ausgegangen, daß sich die von der Primärkathode gelösten Moleküle im Hochvakuum praktisch geradlinig bewegen. Durch eine zweckmäßige Aufstellung der Elektroden konnte erzielt werden, daß das gelöste Material der Primärkathode die Sekundäremissionskathode nicht erreichen wird, wohl aber die Elektronen aus der Primärkathode. Die Wirkungsweise der Sekundäremissionsröhre kann am besten mit Hilfe der Abb. 4 erläutert werden. Diese Abbildung zeigt einen Querschnitt durch das Elektrodensystem der Röhre EE 1. Die Primärkathode (indirekt geheizte Oxydkathode) k_1, das konzentrisch darum angebrachte Steuergitter g_1 und das Schirmgitter g_2 (mit positiver Spannung von etwa 150 V gegen k_1) bilden zusammen die drei ersten Elektroden einer normalen Schirmgitterröhre. k_2 ist die Sekundäremissionskathode; sie erhält normalerweise auch eine Spannung von rund 150 V. Zwischen dem erstgenannten Dreielektrodensystem und der Sekundäremissionskathode ist ein Schirmblech s_1 angebracht. Dieser Schirm verhütet den Niederschlag des von der Primärkathode gelösten Materials auf die Sekundärkathode und ist im Röhreninneren direkt mit der Kathode verbunden. Um das zuerst erwähnte Dreielektrodensystem ist ein zweiter Schirm s_2 angebracht, der auch auf Kathodenpotential liegt und eine für die Elektronenablenkung sorgfältig gewählte Form hat. Schließlich besteht das Röhrensystem noch aus zwei Anodenblechen a, die in der Nähe der Sekundäremissionskathode aufgestellt sind, und einem besonderen Gitter g_3, das vor der Sekundäremissionskathode ausgespannt und mit den Anodenblechen verbunden ist. Durch die sinngemäße Wahl der Form des Schirmes s_2 ist ein solches Feld zwischen Primär- und Sekundärkathode erzielt, daß die Elektronen längs gekrümmter Bahnen um den Schirm s_1 herum zur Sekundärkathode k_2 gelangen (siehe Abb. 4). Abb. 5 zeigt die Äquipotentialflächen in einer Hälfte des Röhrensystems. Die Elektronen durchlaufen zwischen Schirmgitter g_2 und Sekundäremissionskathode zwei konzentrierende Potentialfelder, während eine Ablenkung in dem durch den gebogenen Schirm s_2 verursachten Gebiet mit niedrigem Potential stattfindet. Abb. 5 veranschaulicht besonders klar die erreichte Elektronenoptik. Ein auf die Sekundäremissionskathode auftreffendes Elektron löst hieraus mehrere Primärelektronen (Sekundäremissionsfaktor = etwa 5). Diese werden zu einem kleinen Teil von dem in etwa 1,5 mm Abstand vor der Sekundäremissionskathode angebrachten und mit der Anode verbundenen Gitter g_3 aufgefangen. Der größte Teil dieser Elektronen gelangt aber durch das Gitter auf die Anodenbleche a, die eine um 100 Volt höhere Spannung als die Sekundäremissionskathode haben. Der Zweck des Anodengitters g_3 ist nun der folgende: Weil in der Röhre Ströme von einigen Milliampere vorkommen, besteht die Möglichkeit, daß beträchtliche Raumladungen auftreten, die sowohl den Verlauf des Potentialfeldes in der Umgebung des Schirmes s_2 wie auch an der Oberfläche der Sekundäremissionskathode beeinflussen. Hierdurch würde ein Teil der Sekundärelektronen nicht auf die Anode auftreffen. Das Gitter 3 vor der Sekundäremissionskathode mit dem Anodenpotential beseitigt diese Erscheinung. Ohne Gitter würde der Anodenstrom stark von der Anodenspannung abhängig, d.h. der Innenwiderstand würde sehr niedrig sein.

Durch Anwendung des beschriebenen Prinzips ist es gelungen, eine Verstärkerröhre zu bauen, die bei einem Anodenstrom von nur 8 mA eine Steilheit von 14 mA/V besitzt. Dabei beträgt der Innenwiderstand 75.000 Ohm, was z.B. für Breitbandverstärker vollkommen ausreicht.

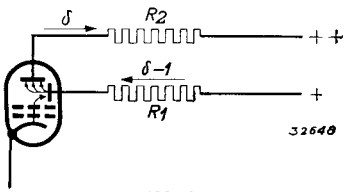


Abb. 7
Grundsätzliche Darstellung der Wirkung der Sekundäremissionsröhre als Steuerröhre für Gegentaktstufen. Die eingezeichneten Pfeile geben die Richtung der Elektronenbewegung an. Die konventionellen Stromrichtungen sind den Pfeilrichtungen entgegengesetzt.

Interessant ist zu erwähnen, daß die aus der Sekundäremissionskathode ausgestoßenen Elektronen einen negativen Strom zu dieser Kathode verursachen. Während einer normalen positiven Elektrode der konventionelle Strom von außen zufließt, geht der Strom von der Sekundäremissionskathode weg und verfolgt seinen Weg über die Spannungsquelle zur Primärkathode. Gleichzeitig fließt aber zur Sekundäremissionskathode der positive Primärstrom, um den sich der Sekundäremissionsstrom verringert.

Die Sekundäremissionsröhre als Vorverstärker für transformatorlose Gegentaktstufen

Zur Steuerung von Gegentaktendstufen mittels der Sekundäremissionsröhre EE 1 wird von dem

Umstand Gebrauch gemacht, daß der Sekundäremissionstrom (im positiven Sinne) der Anode von außen zugeführt und von der Sekundäremissionskathode abgeführt wird. Zu berücksichtigen ist hierbei, daß der Strom von der Sekundäremissionskathode um den in entgegengesetzter Richtung fließenden Primärelektronenstrom verringert wird. Die Phasen der Ströme zu den beiden Elektroden sind also um 180° gegeneinander verschoben, und wenn diese über Widerstände zu den Elektroden bzw. von ihnen weggeführt werden, entstehen hierüber Spannungen mit einem Phasenunterschied von 180° (siehe auch Abb. 7.)

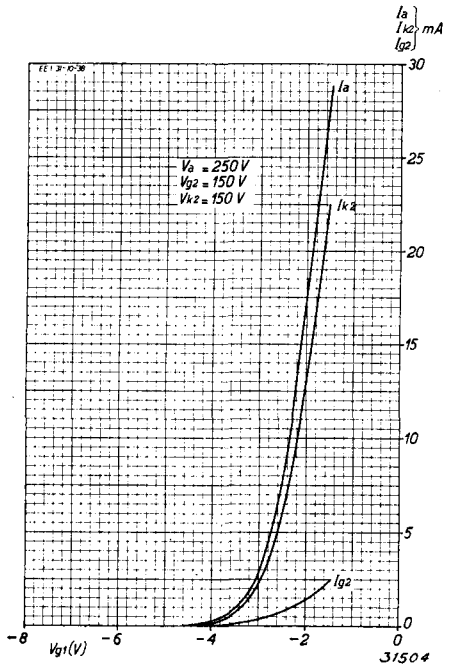


Abb. 8
Anodenstrom, Schirmgitterstrom und Strom von der Sekundäremissionskathode als Funktion der negativen Gitterspannung.

Die beiden in Gegenphase liegenden Wechselspannungen können über Kopplungskondensatoren mit Ableitwiderständen den Gittern von zwei in Gegentakt geschalteten Endröhren zugeführt werden. Die Werte der Widerstände im Anoden- und Sekundäremissionskathodenkreis müssen natürlich so gewählt werden, daß die beiden in Gegenphase liegenden Spannungen genau gleich groß sind.

Wie bereits erwähnt wurde, beruht die Wirkung der Sekundäremissionsröhre darauf, daß für 1 auf die Sekundärkathode treffendes Elektron δ Elektronen die Anode erreichen. Der Elektronenbestand an der Sekundäremissionskathode muß mithin um $(\delta-1)$ Elektronen, die durch R_1 [1]) zur Sekundäremissionskathode gehen, ergänzt werden, während sich dafür δ Elektronen durch R_2 von der Anode entfernen. Wird die Steuerung der Sekundäremissionskathode auf den Anodenstrom vernachlässigt, so muß zur Erzielung gleicher Spannungen folgende Gleichung erfüllt sein:

$$(\delta-1)\,R_1 = \delta\,R_2 \quad \text{oder} \quad R_2 = \frac{\delta-1}{\delta}\,R_1$$

R_2 wird in der Praxis etwas kleiner als dieser Wert sein müssen, da die Wechselspannung

[1]) In Abb. 17 wird R_1 durch die Parallelschaltung von R_2 und R_3 gebildet.

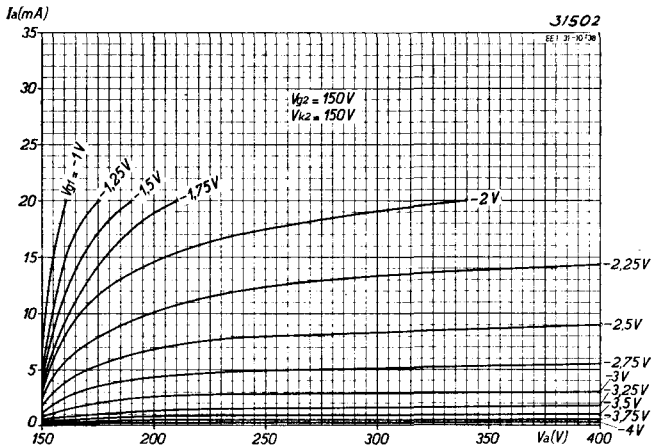


Abb. 9
Anodenstrom als Funktion der Anodenspannung bei verschiedenen negativen Gitterspannungen.

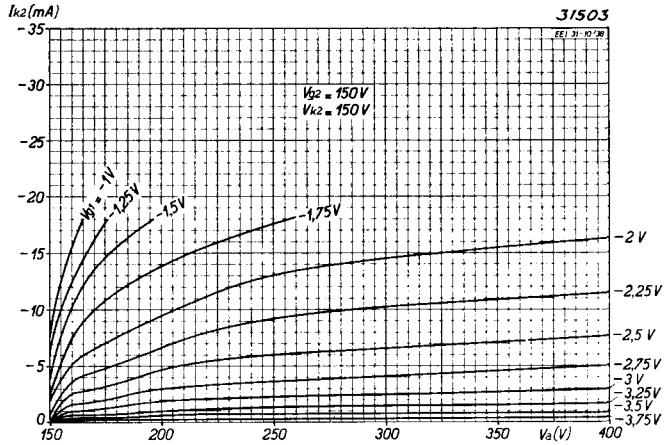


Abb. 10
Strom von der Sekundäremissionskathode als Funktion der Anodenspannung bei verschiedenen negativen Gitterspannungen.

an der Sekundäremissionskathode den Anodenstrom auch einigermaßen steuert. Abb. 17 zeigt die grundsätzliche Schaltung der Röhre EE 1 zur Steuerung von zwei in Gegentakt geschalteten Endröhren. Da das Verhältnis δ von der Vorspannung am ersten Gitter der EE 1 abhängig ist, wird zur Festhaltung der Vorspannung ein Kompensationsverfahren angewandt. Die Kathode wird etwa 23 Volt positiv in Bezug auf den Nulleiter vorgespannt, während das erste Gitter und das Schirmgitter über einen Spannungsteiler gespeist werden. Das erste Gitter erhält dadurch eine positive Vorspannung von etwa 20 Volt. Eine Gegenkopplung kann in der Kathodenleitung auf die in der Abb. 18 angegebene Weise erfolgen. Über dem Lautsprecher liegt ein Spannungsteiler $R_9 R_8$. Der Widerstand R_8 befindet sich auch in der Kathodenleitung der EE 1, und die geteilte Lautsprecherwechselspannung über R_8 befindet sich also zwischen Kathode und Gitter dieser Röhre. Die Summe der Widerstände R_7 und R_8 muß dem erforderlichen Kathodenwiderstand der EE 1 entsprechen (Wert von R_7 in Abb. 17, siehe auch die untenstehenden Daten).

HEIZDATEN

Heizung: indirekt durch Gleich- oder Wechselstrom, Parallelspeisung.

Heizspannung	V_f	= 6,3 V
Heizstrom	I_f	= 0,6 A

KAPAZITÄTEN

C_{ag1}	<	0,006 µµF	C_a	=	9,2 µµF
C_{g1}	=	10,6 µµF	C_{g1f}	<	0,025 µµF

KENNDATEN

Anodenspannung	V_a	= 250 V
Schirmgitterspannung	V_{g2}	= 150 V
Spannung an der Sekundäremissionskathode	V_{k_2}	= 150 V
Negative Gittervorspannung	V_{g1}	= −2,5 V
Anodenstrom	I_a	= 8 mA
Schirmgitterstrom	I_{g2}	= 0,7 mA
Strom von der Sekundäremissionskathode	I_{k_2}	= −6 mA
Steilheit	S	= 14 mA/V
Innenwiderstand	R_i	= 75.000 Ω

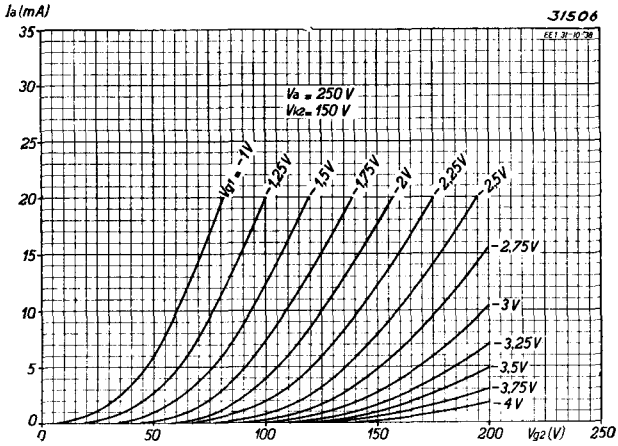


Abb. 11
Anodenstrom als Funktion der Schirmgitterspannung bei verschiedenen negativen Gitterspannungen.

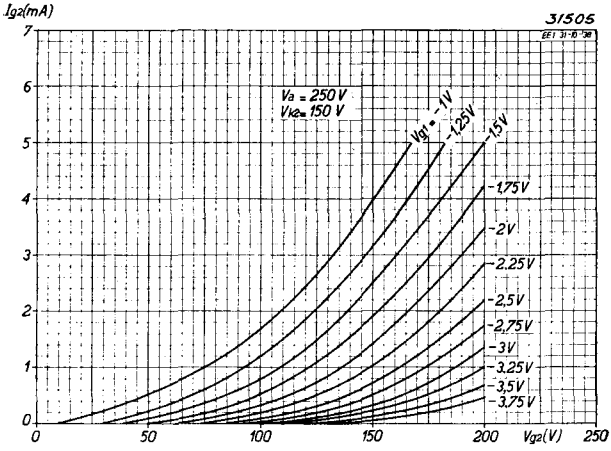


Abb. 12
Schirmgitterstrom als Funktion der Schirmgitterspannung bei verschiedenen negativen Gitterspannungen.

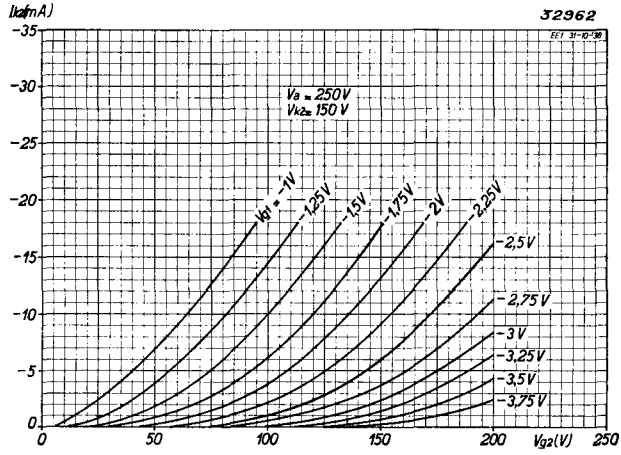


Abb. 13
Strom von der Sekundäremissionskathode als Funktion der Schirmgitterspannung bei verschiedenen negativen Gitterspannungen

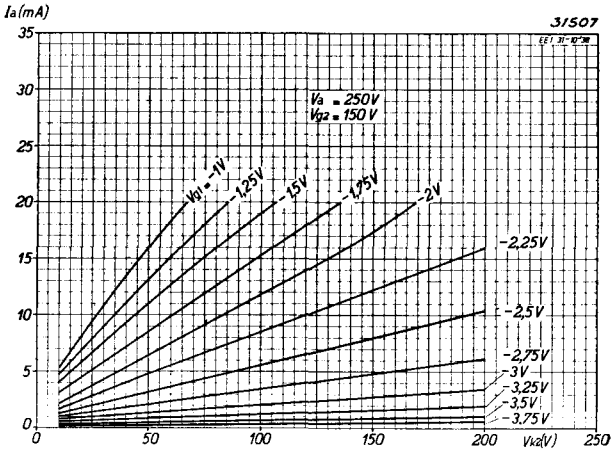


Abb. 14
Anodenstrom als Funktion der Spannung an der Sekundäremissionskathode bei verschiedenen negativen Gitterspannungen.

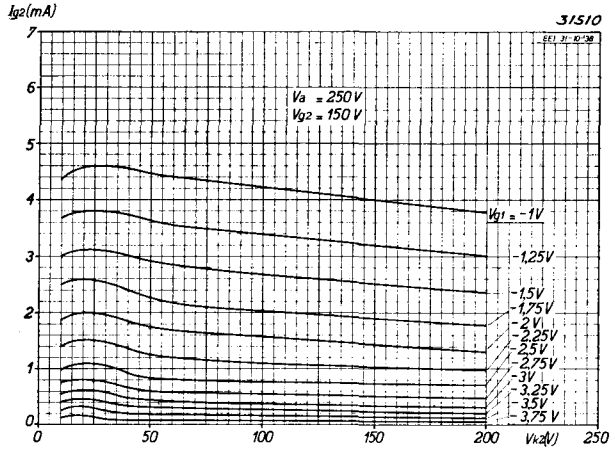


Abb. 15
Schirmgitterstrom als Funktion der Spannung an der Sekundäremissionskathode bei verschiedenen negativen Gitterspannungen.

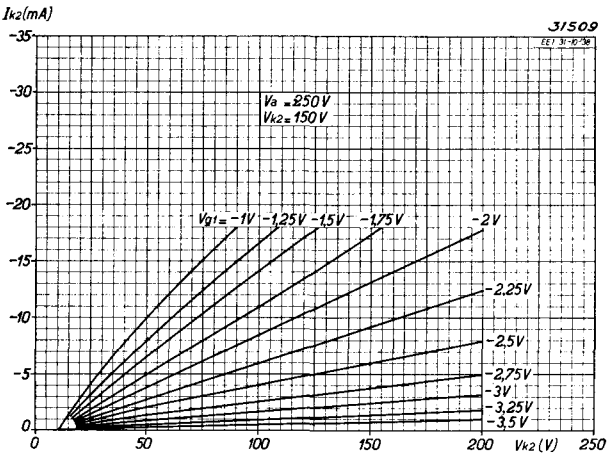


Abb. 16
Strom von der Sekundäremissionskathode als Funktion der Spannung an der Sekundäremissionskathode bei verschiedenen negativen Gitterspannungen.

EE 1

BETRIEBSDATEN zur Verwendung als Steuerröhre von Gegentaktstufen

(Über die Bedeutung der Widerstände, Spannungen, Ströme usw. siehe Schaltbild der Abb. 17).

Speisespannung	V_o	=	275 V		300 V	
Widerstand	R_1	=	8000 Ω		8000 Ω	
Widerstand	R_2	=	25000 Ω		25000 Ω	
Widerstand	R_3	=	16000 Ω		16000 Ω	
Widerstand	R_4	=	80000 Ω		100000 Ω	
Widerstand	R_5	=	150000 Ω		136000 Ω	
Widerstand	R_6	=	20000 Ω		18000 Ω	
Kathodenwiderstand	R_7	=	2250 Ω		2150 Ω	
Anodenstrom	I_a	=	3,6 mA		3 mA	
Strom von der Sekundäremissionskathode	I_{k_2}	=	—2,75 mA		—2,25 mA	
Schirmgitterstrom	I_{g_2}	=	0,3 mA		0,2 mA	
Ausgangswechselspannung pro Gitter der Endstufe	$V_{o(eff)}$	=	3 V	5 V	3 V	5 V
Verstärkung vom Gitter der EE 1 auf das Gitter der Endstufe	V_o/V_i	=	70	70	75	75
Gesamtverzerrung	d_{tot}	=	2,2%	3,6%	3%	5%

GRENZDATEN

Max. Anodenkaltspannung	V_{ao}	= max. 550 V
Max. Anodenspannung	V_a	= max. 250 V
Max. Anodendauerleistung	W_a	= max. 2 W
Max. Schirmgitterkaltspannung	V_{g20}	= max. 550 V
Max. Schirmgitterspannung	V_{g2}	= max. 150 V
Max. Schirmgitterdauerbelastung	W_{g2}	= max. 0,1 W
Max. Kaltspannung an der Sekundäremissionskathode	V_{k20}	= max. 550 V
Max. Spannung an der Sekundäremissionskathode	V_{k_2}	= max. 150 V
Max. Dauerbelastung der Sekundäremissionskathode	W_{k_2}	= max. 2,5 W
Max. Primärkathodenstrom	I_{k_1}	= max. 10 mA
Grenzwert des Gitterstromeinsatzpunktes	V_{g1} (I_{g1} + 0,3 µA)	= max. —1,3 V
Max. Widerstand zwischen Gitter und Kathode	R_{g1k}	= max. 0,7 MΩ
Max. Widerstand zwischen Heizfaden und Kathode	R_{fk}	= max. 20.000 Ω
Max. Spannung zwischen Heizfaden und Kathode (Gleichspannung oder Effektivwert der Wechselspannung)	V_{fk}	= max. 50 V

ANWENDUNG

Im Anschluß an das anfangs Erwähnte ist noch folgendes zu beachten. Angesichts der hohen Steilheit ist die größere Schwingneigung zu berücksichtigen. Man kann diese durch einen vor das Steuergitter geschalteten Widerstand von z.B. 10.000 Ohm beherrschen. Die Röhre EE 1 darf nur mit automatischer Gittervorspannung betrieben werden. Normalerweise wird die automatische Gittervorspannung durch einen Kathodenwiderstand erzeugt. Der Wert dieses Widerstandes wird dann so gewählt, daß der Spannungsabfall in ihm gerade der erforderlichen Gittervorspannung entspricht. Der Arbeitspunkt A stellt sich dann auf den Schnittpunkt der Linie OA mit der Kennlinie ein (siehe Abb. 19). Eine kleine Verschiebung der Kennlinie hat in dem Falle bei normalen Röhren nur eine geringe Zu- oder Abnahme des Anodenstromes zur Folge. Bei der EE 1 hätten aber Verschiebungen der Kennlinie eine viel größere Anodenstromänderung zur Folge. Da der normale Kathodenwiderstand ziemlich klein wäre und daher nur in geringem Maße ausgleichend wirken würde, sind besondere Maßnahmen erforderlich. Eine bessere Selbstregelung des Kathodenstromes wäre möglich, wenn in Abb. 19 die Linie OA weniger steil verliefe. Das ist dadurch zu erreichen, daß

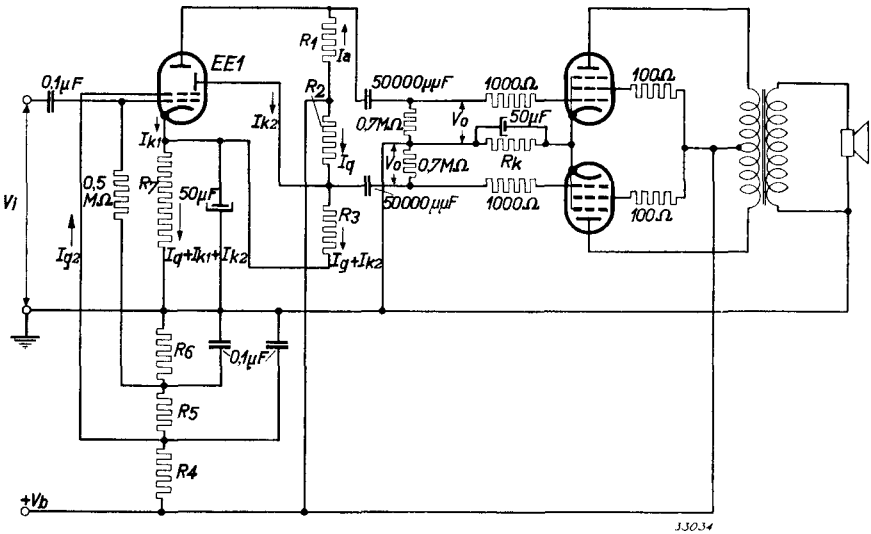


Abb. 17

Schaltung zur Verwendung der Röhre EE1 als Steuerröhre von Gegentaktendstufen ohne Gegenkopplung. Die Werte der Widerstände R1 bis R7 sind der Datenaufstellung zu entnehmen.

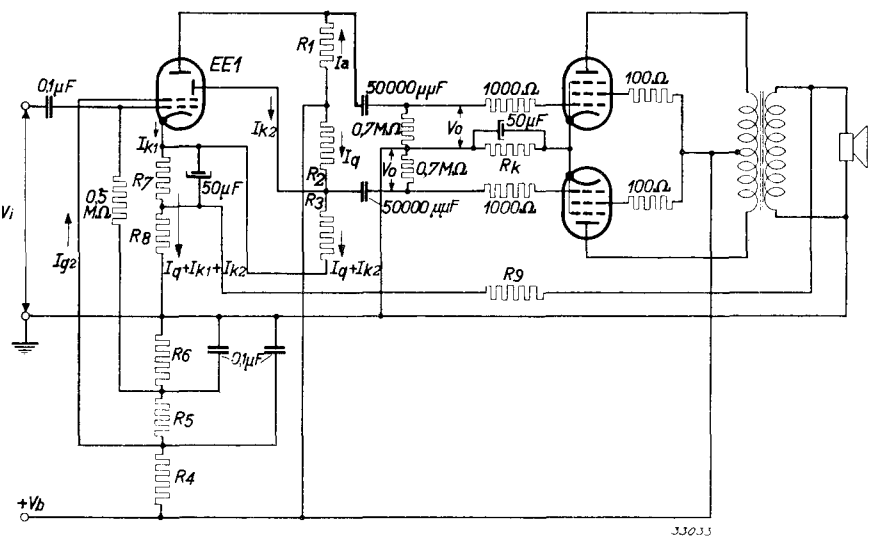


Abb. 18

Schaltung zur Verwendung der Röhre EE1 als Steuerröhre von Gegentaktstufen mit Gegenkopplung. Diese Schaltung entspricht der Schaltung der Abb. 17 bis auf die Einfügung der Widerstände R8 und R9. Die Werte dieser Widerstände sind von dem gewünschten Gegenkopplungsgrad abhängig, die Summe der Widerstände R7 und R8 muß dem Werte des Widerstandes R7 der Abb. 17 gleich sein.

der Kathodenwiderstand höher gewählt wird, da die Neigung der Linie dem Quotienten der Kathodenspannung und des Kathodenstromes entspricht. Da nun die negative Vorspannung zu hoch werden würde, ist dem Gitter gleichzeitig eine positive Spannung zuzuführen. Diese Spannung ist in Abb. 19 durch OB dargestellt. Wird vom Punkte B aus die neue Linie gezogen, so ergibt diese tatsächlich wieder die gesamte Gittervorspannung als Funktion des Kathodenstromes, und es ist ersichtlich, daß der nun eingestellte Kathodenstrom, der durch den Schnittpunkt mit der Kennlinie angegeben wird, nicht viel von dem mittleren Betrag abweichen kann. Abb. 6 zeigt eine prinzipielle Schaltung, die für die EE 1 als einfache Verstärkerröhre maßgebend ist. Bei Verwendung der EE 1 als Steuerröhre für Gegentaktendstufen wird empfohlen, die Speisespannung V_b nicht niedriger als 275 V zu wählen, da sonst keine befriedigenden Resultate erzielt werden.

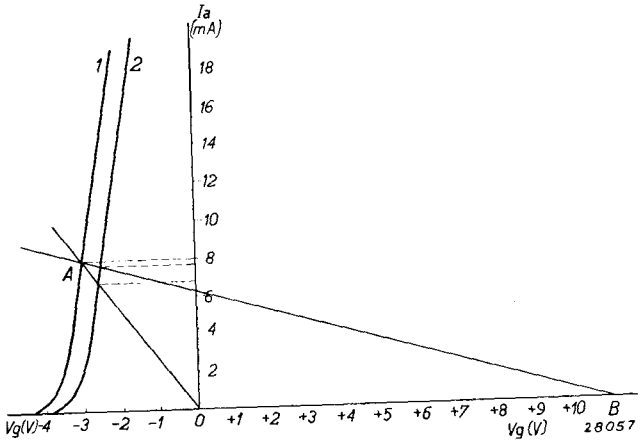


Abb. 19
Zeichnerische Darstellung des Einflusses des Kathodenwiderstandes auf die Konstanz des Kathodenstromes. Je flacher die Widerstandslinie OA verläuft, desto besser wird die Selbstregelung des Kathodenstromes sein.

PHILIPS „MINIWATT"

EE 50

Röhrentype: Sekundäremissionsröhre für Breitbandverstärker (Fernsehempfänger).
Type de tube: Tube à émission secondaire pour amplificateurs à large bande passante (récepteurs de télévision).
Type of tube: Secondary emission valve for wide-band amplifiers (television receivers).

Heizung indir., Gleich- oder Wechselstrom, Parallelspeisung
Chauffage ind., courant continu ou alternatif, alimentation en parallèle
Heating indir., A.C. or D.C., parallel heater supply

	Vf	6,3 V
	If	0,3 A

Kapazitäten in kaltem Zustand
Capacités à l'état froid
Capacities in cold condition

Cag1	<0,003	µµF
Cg1	7,7	µµF
Ca	7,7	µµF
Cg1f	< 0,01	µµF

Kapazitäten in warmem Zustand (Ia = 10 mA)
Capacités à l'état chaud (Ia = 10 mA)
Capacities in hot condition (Ia = 10 mA)

Cg1	9,1	µµF
Ca	7,7	µµF

Gitterdämpfung
Amortissement de grille
Grid damping

Rg1	(λ = 5 m)	3500 Ω
Rg1	(λ = 7,5m)	8000 Ω

Der Wert der Gitterdämpfung ist umgekehrt proportional dem Quadrate der Frequenz.
La valeur de l'amortissement de grille est inversement proportionnellement au carré de la fréquence.
The value of grid damping is inversely proportional to the square of the frequency

Betriebsdaten als H.F.- oder Z.F.-Verstärker
Caractéristiques de service, utilisation comme amplificateur H.F. ou M.F.
Operating conditions for use as H.F. or I.F.amplifier

Va	250 V
Vg2	250 V
Vk2	150 V
Vg1	-3 V
Ia	10 mA
Ig2	0,6 mA
Ik2	-8 mA
Sg1a	14 mA/V
Ri	0,25 MΩ
Raeq[1]	3000 Ω
Vieff (K = 1%)[2]	140 mV
Vieff (mb = 1%)[3]	14 mV

1) Äquivalenter Rauschwiderstand im Arbeitspunkt.
Résistance équivalente au bruit de fond (souffle).
Equivalent noise resistance.

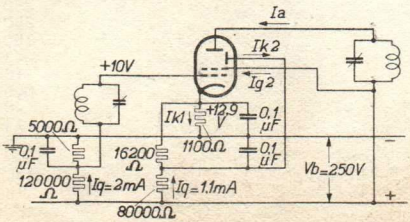
2) Zulässige Wechselspannung des Störsignals für 1% Quermodulation.
Tension alternative admissible du signal interférant pour une transmodulation de 1%.
Admissible A.C. voltage of the interfering signal for 1% cross modulation.

3) Zulässige Wechselspannung des Störsignals für 1% Modulationsbrummen.
Tension alternative admissible du signal interférant pour un ronflement de modulation de 1%.
Admissible A.C. voltage of the interfering signal for 1% modulation hum.

Diese Röhre darf nur mit automatischer Vorspannung betrieben werden. Zum Ausgleich von grossen Anodenstromschwankungen infolge der hohen Steilheit muss der Wert des Kathodenwiderstandes grösser als der für die negative Vorspannung erforderliche sein. Das Gitter wird dann an eine solche positive Vorspannung angeschlossen, dass die richtige negative Vorspannung wieder erzielt wird. Die untenstehende Schaltung ist deswegen zu verwenden.

Ce tube ne sera utilisé qu'avec polarisation de grille automatique. Afin d'éviter de grandes divergences du courant anodique par suite de la pente très élevée, la valeur de la résistance cathodique sera plus élevée que celle nécessaire pour la polarisation. La grille sera réunie à une source de tension positive telle que la polarisation correcte sera obtenue. Le schéma indiqué ci-dessous est à utiliser pour cette raison

This tube only must be used with self-bias. In order to compensate large anode current divergences due to the high transconductance the value of the cathode resistance must be higher than the one required for obtaining the correct bias. The control grid should then be connected to such a positive voltage source that the correct bias value is reestablished. The circuit diagram given below is to be used for this reason.



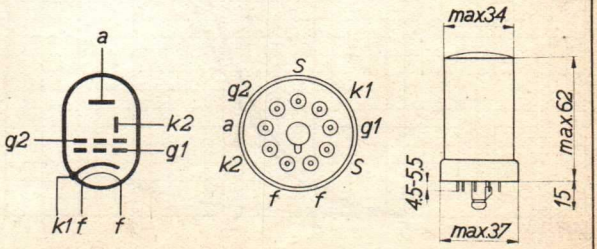
Grenzdaten
Limites fixées pour l'utilisation
Limiting values for operation

Vao	max.	550 V
Va	max.	250 V
Wa	max.	2,5 W
Vg2o	max.	550 V
Vg2	max.	250 V
Wg2	max.	0,2 W
Vk2o	max.	550 V
Vk2	max.	150 V
Wk2	max.	1,5 W
Ik1	max.	5 mA
Vg1 (Ig1 = +0,3 µA)	max.	-1,3 V
Rg1k	max.	0,7 MΩ
Rfk	max.	20000 Ω
Vfk	max.	50 V4)

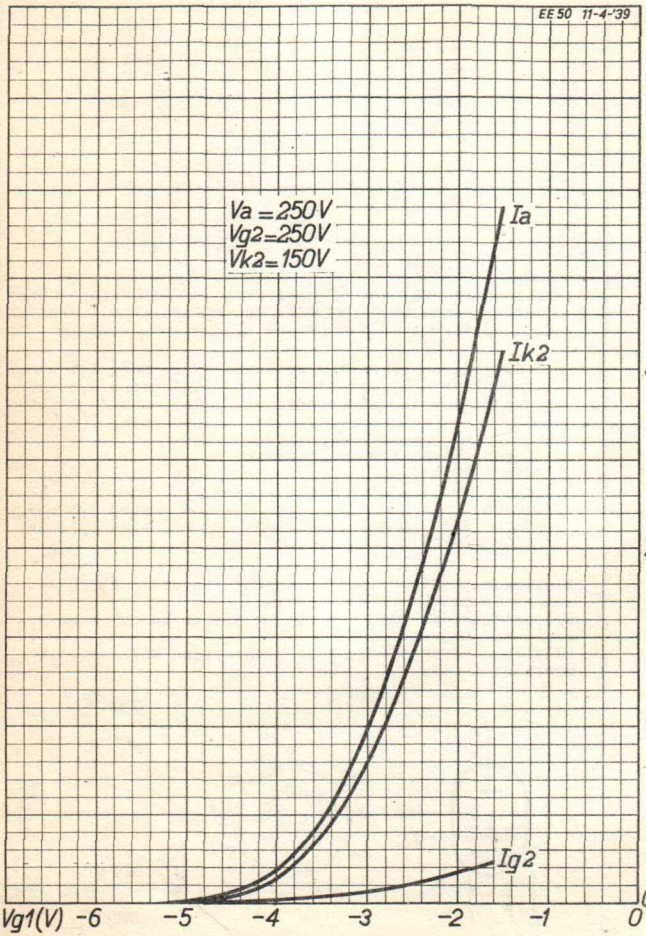
4) Gleichspannung oder Effektivwert der Wechselspannung.
Tension cont.ou valeur eff. de la tension alternative
D.C. voltage or R.M.S. value of the A.C. voltage.

Kapazitäten in kaltem Zustand	Cg1	max. 8,1 µµF
Capacités à l'état froid	Cg1	min. 7,3 µµF
Capacities in cold condition	Ca	max. 8,1 µµF
	Ca	min. 7,3 µµF
Kapazitäten in warmem Zustand (Ia = 10 mA)	Cg1	max. 9,7 µµF
Capacités à l'état chaud (Ia = 10 mA)	Cg1	min. 8,5 µµF
	Ca	max. 8,3 µµF
Capacities in hot condition (Ia = 10 mA)	Ca	min. 7,1 µµF

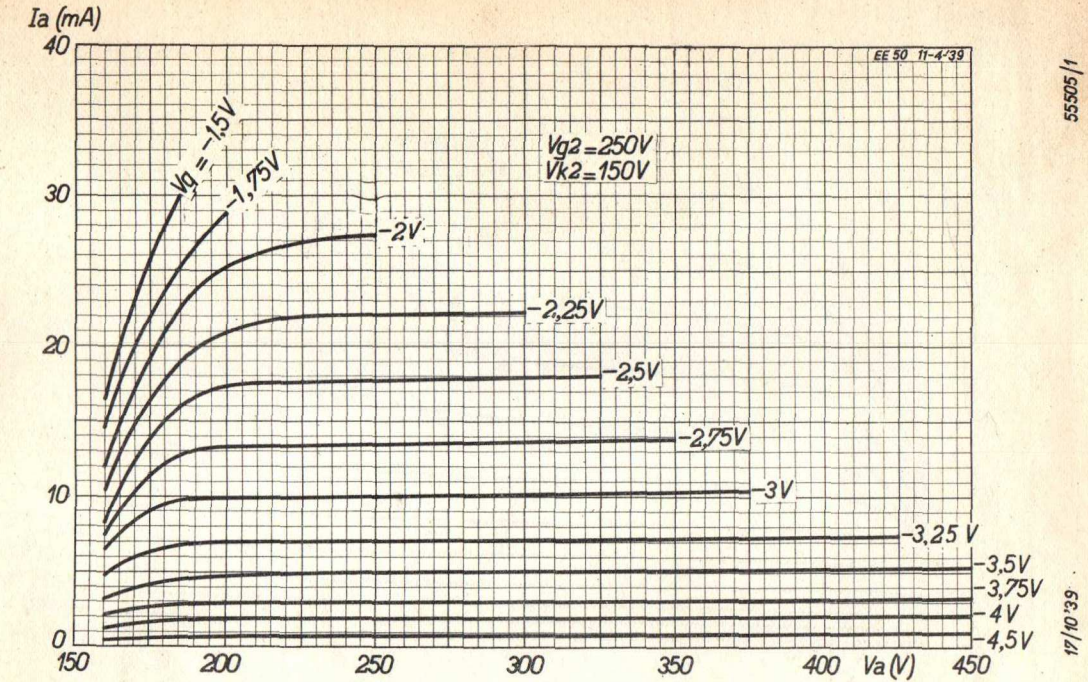
Elektrodenanordnung, Sockelanschlüsse und max. Abmessungen in mm.
Disposition des électrodes, connexions du culot et dimensions max. en mm.
Electrode arrangement, base connections and max. dimensions in mm.



EE 50 PHILIPS „MINIWATT"

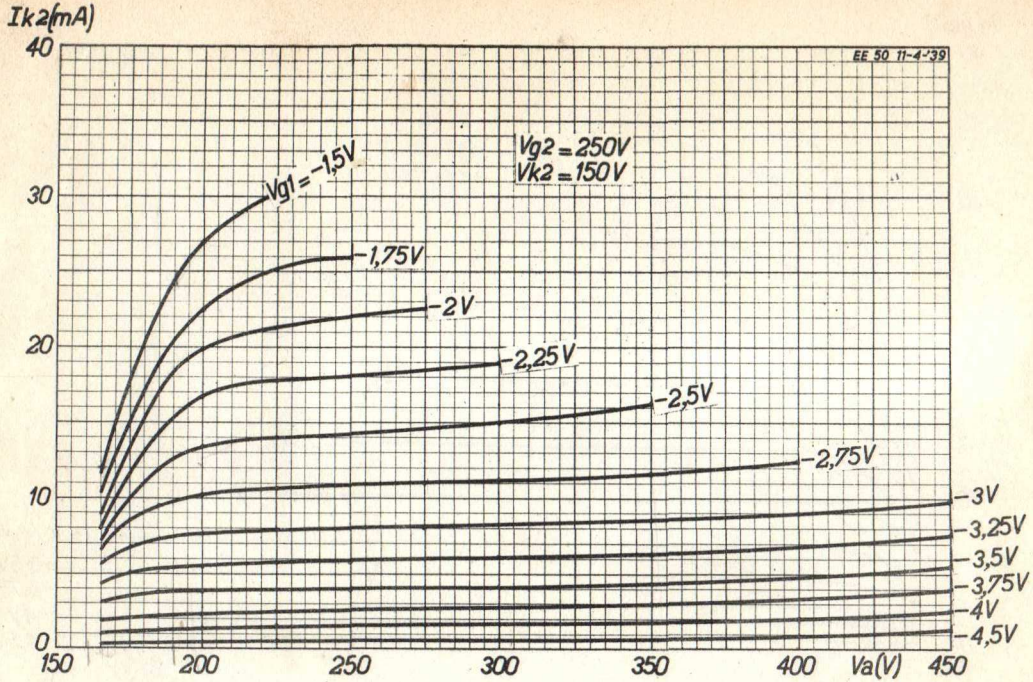


PHILIPS „MINIWATT" EE 50

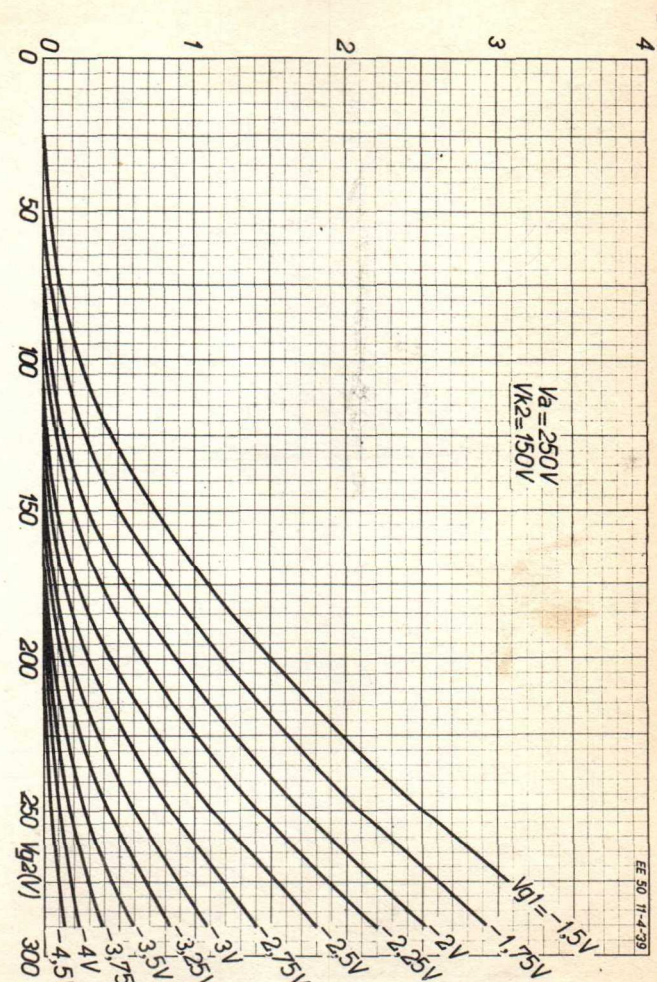


55505/1

17/10'39

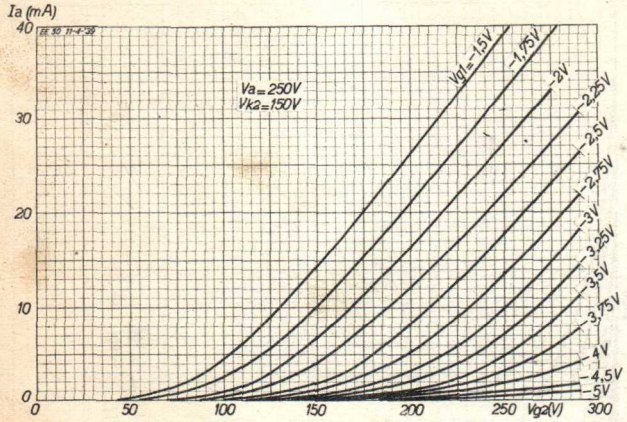


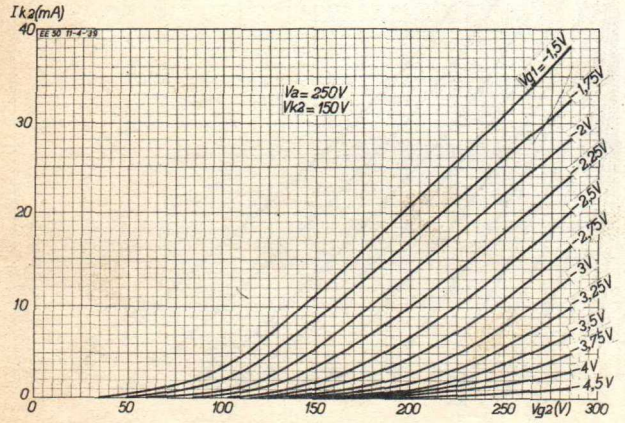
6E.04/4
SSSO6/1


Ig2(mA)
0
1
2
3
4
0
50
100
150
200
250
300
Vg2(V)
Va = 250V
Vk2 = 150V
Vg1 = −1,5V
−1,75V
−2V
−2,25V
−2,5V
−2,75V
−3V
−3,25V
−3,5V
−3,75V
−4V
−4,5V
EE 50 11-4-39

EE 50

PHILIPS „MINIWATT"





17/10'39

55508/1

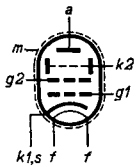
PHILIPS

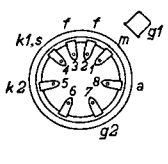
EEP 1

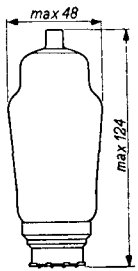
SECONDARY EMISSION TETRODE for use as wide band amplifier and phase inverter
TETRODE A EMISSION SECUNDAIRE pour utilisation comme amplificatrice à large bande et tube inverseur de phase
SEKUNDÄREMISSIONSTETRODE zur Verwendung als Breitbandverstärker und Phasenumkehrröhre

Heating:	indirect by A.C. or D.C.; parallel supply	
Chauffage:	indirect par C.A. ou C.C.; alimentation en parallèle	Vf = 6,3 V If = 0,6 A
Heizung:	indirekt durch Wechsel- oder Gleichstrom; Parallelspeisung	

Dimensions in mm
Dimensions en mm
Abmessungen in mm







Capacitances
Capacités
Kapazitäten

Ca	=	7,5 pF
Cg1	=	10,6 pF
Cag1	<	0,006 pF
Ck2g1	<	0,001 pF
Cg1f	<	0,05 pF

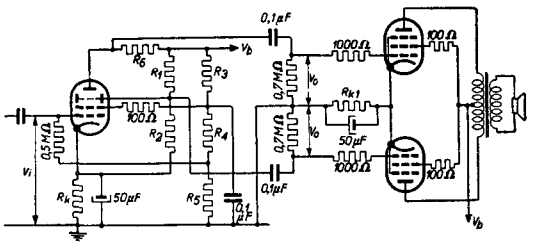
PHILIPS

Typical characteristics
Caractéristiques typiques
Kenndaten

Va	=	250 V
Vk2	=	150 V
Vg2	=	150 V
Vg1	=	-2,5 V
Ia	=	8 mA
Ik2	=	-6,5 mA
Ig2	=	0,45 mA
S	=	17 mA/V
μg2g1	=	65 -
Ri	=	50 kΩ

Operating conditions for use as a driver of push-pull stages
Caractéristiques d'utilisation comme tube de commande d'étages push-pull
Betriebsdaten zur Verwendung als Steuerröhre von Gegentaktstufen

Vb	=	400		500		V
R1	=	208		208		kΩ
R2	=	29		29		kΩ
R3	=	85		105		kΩ
R4	=	30		30		kΩ
R5	=	9		9		kΩ
R6	=	26		26		kΩ
Rk	=	6,9		6		kΩ
Vo	=	10	30	10	30	V_{eff}
Vi	=	34	114	31	96	mV_{eff}
d_{tot}	=	1,4	4,6	0,9	3,2	%



Limiting values
Caractéristiques limites
Grenzdaten

Va_o	= max.	700	V
Va	= max.	400	V
Wa	= max.	2	W
$Vk2_o$	= max.	400	V
Vk2	= max.	200	V
Wk2	= max.	2	W
$Vg2_o$	= max.	400	V
Vg2	= max.	150	V
Wg2	= max.	0,1	W
Ik1	= max.	10	mA
Vg1 (Ig1 = +0,3 µA)	= max.	-1,3	V
Rg1	= max.	0,7	MΩ
Vfk1	= max.	50	V
Rfk1	= max.	20	kΩ



EEP1

page	sheet	date
1	1	1949.01.05
2	2	1949.01.05
3	3	1948.09.14
4	FP	1999.06.26

PHILIPS „MINIWATT"
EF 1
PENTHODE (H.F.)

EF 1

Heizung ind.	Vf = 6,3 V
Chauffage ind.	If = ca. env. appr. 0,4 A
Heating ind.	

Kapazitäten	Cag1	≤ 0,0018
Capacités	Cg1	= 7,1 $\mu\mu$F
Capacities	Ca	= 7,7 $\mu\mu$F

Betriebsdaten als HF- und ZF-Verstärker.
Données relatives au fonctionnement comme amplificateur HF et MF.
Operating conditions as HF and IF amplifier

Va	= 250 V
Vg2	= 100 V
Ia	= 3 mA
Vg1	= -2 V
Ig2	= 0,9 mA
g (k)	= 4000
S max	= 3,2 mA/V
S (Ia = 3 mA)	= 2,3 mA/V
Ri (Ia = 3 mA)	= 1,7 Megohm

Betriebsdaten als Anodengleichrichter
Données relatives au fonctionnement comme détecteur plaque
Operating conditions as biased detector

Va	= 250 V
Ra	= 0,3 Megohm
Rk	= 10000 Ohm
Vg2	= 100 V
Va max (m = 0,3)	= 67 V
Verstärkung, Amplification	= 9

Betriebsdaten als NF. Verstärker
Données relatives au fonctionnement comme amplificateur B.F.
Operating conditions as L.F. amplifier.

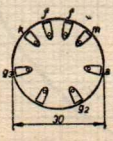
Va	= 250 V
Ra	= 0,3 Megohm
Rk	= 6400 Ohm
Vg2	= 100 V
Va max (m = 0,3)	= 70 V
Verstärkung, Amplification	= 250

Grenzdaten
Dates limits
Limits

Vao	max	= 400 V	Vg2	max	= 150 V
VaR	max	= 250 V	Ig2	max	= 1,2 mA
VaL	max	= 200 V	Ig2	min	= 0,6 mA
Wa	max	= 1 W	Wg2	max	= 0,3 W
Ik	max	= 6 mA	Rg1a	max	= 1,5 Megohm
Vgi (Ig1 = 0,3 μA)		= -1,3 V	Rg1f	max	= 1 Megohm
Vg2o	max	= 400 V	Vfk	max	= 50 Volt
			Rfk	max	= 20000 Ohm

Elektrodenanordnung und Sockelschaltung
Disposition des electrodes et connexion du culot.
Arrangement of electrodes and base connection.

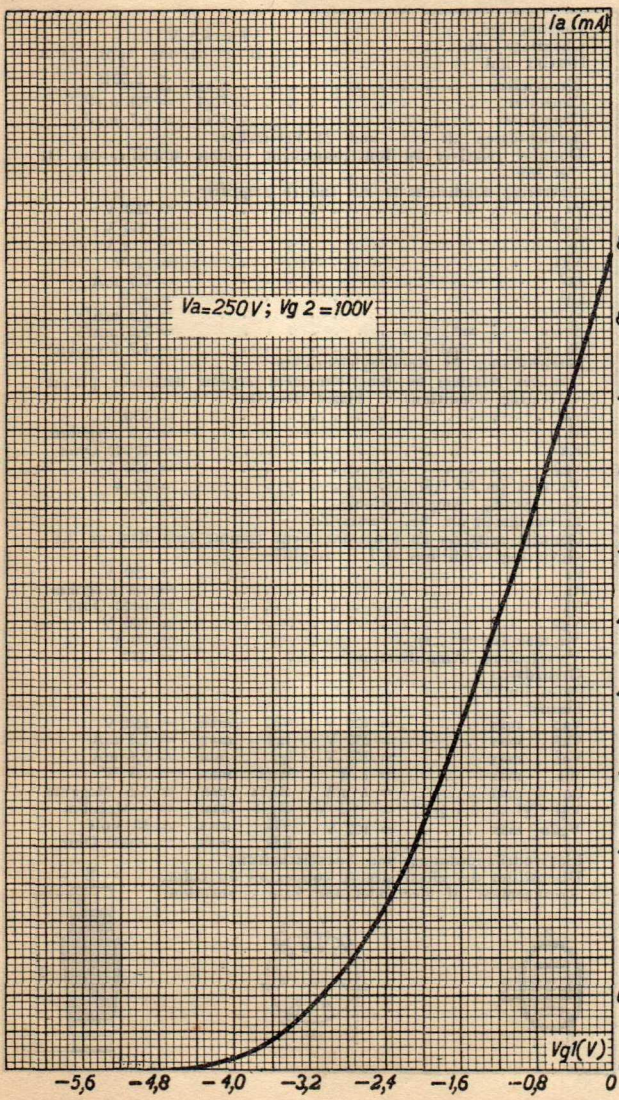






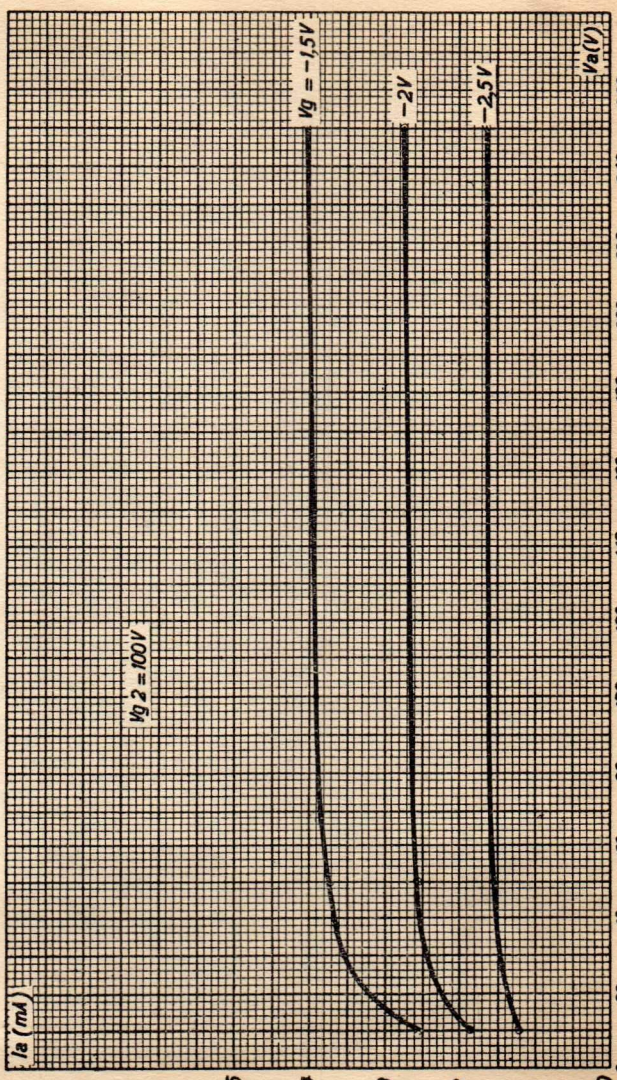
EF 1

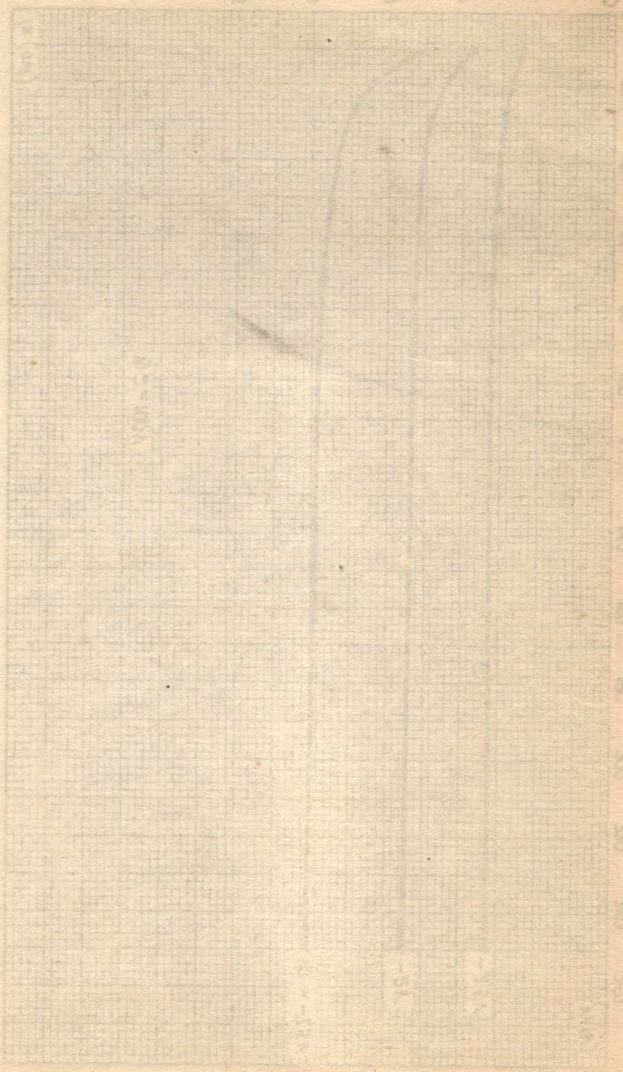
PHILIPS „MINIWATT"
EF 1
PENTHODE (H.F.)



PHILIPS „MINIWATT"
EF 1
PENTHODE (H.F.)

EF 1

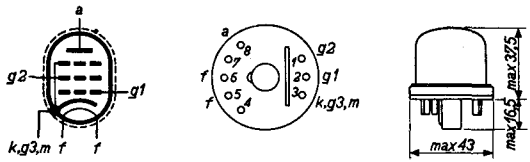




PENTODE with variable mutual conductance for use as R.F., I.F. or A.F. amplifier
PENTHODE à pente variable pour utilisation en amplificatrice H.F., M.F. ou B.F.
PENTODE mit veränderlicher Steilheit zur Verwendung als HF-, ZF- oder NF-Verstärker

Heating : indirect; parallel or series supply
Chauffage: indirect; alimentation - parallèle ou série — V_f = 6,3 V, I_f = 0,2 A
Heizung : indirekt; Parallel- oder Serienspeisung

Dimensions in mm Dimensions en mm
Abmessungen in mm



Base, culot, Sockel: Y

Capacitances Capacités Kapazitäten	C_a =	6,5 pF
	C_{g1} =	6,1 pF
	C_{ag1} <	0,002 pF
	C_{g1f} <	0,03 pF

Operating characteristics as R.F. or I.F. amplifier
Caractéristiques d'utilisation en amplificatrice H.F. ou M.F.
Betriebsdaten als HF- oder ZF-Verstärker

V_a	=	100		200		250	V
R_{g2}	=	50		50		75	kΩ
R_k	=	300		300		250	Ω
μ_{g2g1}	=	19		19		19	
V_{g1}	=	-1	-22	-2,25	-42	-2	-53 V
V_{g2}	=	55	100	103	200	100	250 V
I_a	=	2,5	-	5,7	-	6	- mA
I_{g2}	=	0,9	-	1,95	-	2	- mA
S	=	1300	4,4	2200	5,5	2200	4,4 µA/V
R_i	=	0,4	>10	2	>10	2	>10

Operating characteristics as A.F. amplifier
Caractéristiques d'utilisation en amplificatrice B.F.
Betriebsdaten als NF-Verstärker

A. V_b = 250 V; R_a = 0,2 MΩ; R_{g2} = 0,6 MΩ; R_k = 1,5 kΩ

$-V_R$ (V)	I_a (mA)	I_{g2} (mA)	$\frac{V_o}{V_i}$	d_{tot} (%) (V_o=3 Veff)	d_{tot} (%) (V_o=5 Veff)
0	1,0	0,35	98	0,85	1,4
5	0,9	0,28	41	0,35	0,6
10	0,78	0,24	27,5	0,65	1,1
18	0,62	0,17	17	0,65	1,1
25	0,49	0,12	12,5	0,85	1,4

B. V_b = 200 V; R_a = 0,2 MΩ; R_{g2} = 0,6 MΩ; R_k = 2 kΩ

$-V_R$ (V)	I_a (mA)	I_{g2} (mA)	$\frac{V_o}{V_i}$	d_{tot} (%) (V_o=3 Veff)	d_{tot} (%) (V_o=5 Veff)
0	0,76	0,26	77	1,0	1,7
5	0,66	0,21	33	0,65	1,1
10	0,56	0,17	21	0,80	1,3
18	0,42	0,12	14	1,10	1,8
25	0,27	0,07	8,1	2,10	3,5

C. V_b = 100 V; R_a = 0,2 MΩ; R_{g2} = 0,6 MΩ; R_k = 2 kΩ

$-V_R$ (V)	I_a (mA)	I_{g2} (mA)	$\frac{V_o}{V_i}$	d_{tot} (%) (V_o=3 Veff)	d_{tot} (%) (V_o=5 Veff)
0	0,37	0,12	66	2,4	4,0
2,5	0,31	0,10	30	1,1	1,8
5	0,26	0,09	18	2,0	3,3
9	0,20	0,06	11	2,4	4,0
12,5	0,13	0,03	6,9	3,6	6,0

Limiting values
Caractéristiques limites
Grenzdaten

V_{a_o} = max. 550 V
V_a = max. 300 V
W_a = max. 2 W
R_{g1} = max. 3 MΩ
R_{kf} = max. 20 kΩ
V_{kf} = max. 100 V

V_{g2_o} = max. 550 V
V_{g2} (I_a< 3 mA) = max. 300 V
V_{g2} (I_a =6 mA) = max. 125 V
W_{g2} = max. 0,3 W
I_k = max. 10 mA
V_{g1}(I_{g1}=+0,3μA) = max. -1,3 V

PHILIPS

Electronic Tube

HANDBOOK

EF11

page	sheet	date
1	1	1953.10.10
2	2	1953.10.10
3	FP	1999.06.28

PHILIPS

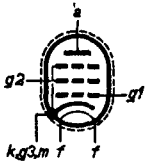
EF 12

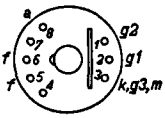
PENTODE for use as R.F., or A.F. amplifier
PENTHODE pour utilisation en amplificatrice H.F.,M.F. ou B.F.
PENTODE zur Verwendung als HF-, ZF- oder NF-Verstärker

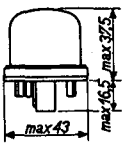
Heating : indirect by A.C. or D.C. series or parallel supply
Chauffage: indirect par C.A. ou C.C. alimentation-série ou parallèle
Heizung : indirekt durch Wechsel- oder Gleichstrom; Parallel- oder Serienspeisung

V_f = 6,3 V
I_f = 0,2 A

Dimensions in mm
Dimensions en mm
Abmessungen in mm







Base, culot, Sockel: Y

Capacitances
Capacités
Kapazitäten

C_a	=	6,5 pF
C_{g1}	=	6,5 pF
C_{ag1}	<	0,002 pF
C_{g1f}	<	0,03 pF

Operating characteristics as R.F. or I.F. amplifier
Caractéristiques d'utilisation en amplificatrice H.F. ou M.F.
Betriebsdaten als HF- oder ZF-Verstärker

V_a	= 100	200	250	V
V_{g2}	= 100	100	100	V
R_k	= 500	500	500	Ω
V_{g1}	= -2	-2	-2	V
I_a	= 3	3	3	mA
I_{g2}	= 1	1	1	mA
S	= 2,1	2,1	2,1	mA/V
R_i	= 0,4	1,5	2	MΩ
μ_{g2g1}	= 25	25	25	

Operating characteristics as A.F. amplifier
Caractéristiques d'utilisation en amplificatrice B.F.
Betriebsdaten als NF-Verstärker

V_b (V)	R_a (MΩ)	R_{g2} (MΩ)	I_a (mA)	I_{g2} (mA)	R_k (Ω)	$\frac{V_o}{V_i}$	d_{tot} (%) (V_o=3Veff)	d_{tot} (%) (V_o=5Veff)
250	0,2	0,5	0,90	0,37	1600	181	0,12	0,20
250	0,1	0,25	1,70	0,68	850	137	0,09	0,15
250	0,05	0,2	2,15	0,82	700	90	0,27	0,45
200	0,2	0,5	0,67	0,27	2200	166	0,15	0,25
200	0,1	0,25	1,24	0,50	1200	125	0,12	0,20
200	0,05	0,15	1,88	0,75	800	83	0,27	0,45
100	0,2	0,5	0,32	0,14	2200	128	0,42	0,70
100	0,1	0,25	0,60	0,25	1200	100	0,24	0,40
100	0,05	0,15	0,92	0,48	800	70	0,42	0,70

Limiting values
Caractéristiques limites
Grenzdaten

V_{a_o}	= max.	550 V
V_a	= max.	300 V
V_a	= max.	200 V[1])
W_a	= max.	1,5 W
V_{g2_o}	= max.	550 V
V_{g2}	= max.	125 V
W_{g2}	= max.	0,4 W
I_k	= max.	10 mA
V_{g1} (I_{g1}=+0,3μA)	= max.	-1,3 V
R_{g1}	= max.	3 MΩ
R_{kf}	= max.	20 kΩ
V_{kf}	= max.	100 V

[1])In triode connection; screen grid connected to anode
En montage triode; grille-écran reliée à l'anode
Triodenschaltung; Schirmgitter an Anode

PHILIPS

Electronic Tube

HANDBOOK

EF12

page	sheet	date
1	1	1953.10.10
2	2	1953.10.10
3	FP	1999.06.28

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EF13

Heizung ind., Gleich- oder Wechselstrom, Parallel- oder Serienspeisung,
Chauffage ind., courant continu ou alternatif, alimentation en parallèle ou en série.
Heating ind., A.C. or D.C., parallel or series filament supply.

Vf 6,3 V
If 0,200 A

Kapazitäten	Cagl	<0,005 µµF
Capacités	Cgl	6,3 µµF
Capacities	Ca	7,8 µµF

Betriebsdaten als H.F.-Verstärker.
Caractéristiques de service comme amplificatrice H.F.
Operating conditions as H.F. amplifier.

a) Feste Schirmgitterspannung, Gitter 3 an Kathode.
Tension de grille-écran fixe, grille 3 connectée à la cathode.
Fixed screen-grid voltage, grid 3 connected to the cathode.

Va		250 V	
Vg2		100 V	
Vg3		0 V	
Rk		400 Ω	
Vg1	-2 V[1]	-17 V[2]	-18,5 V[3]
Ia	4,5 mA	-	-
Ig2	0,6 mA	-	-
S	2300 µA/V	23 µA/V	15 µA/V
Ri	>0,5 MΩ	>10 MΩ	>10 MΩ
Raeq[4]	2500 Ω	-	-

b) Schirmgitterspeisung über einen Spannungsteiler, Gitter 3 an Kathode.
Alimentation de la grille-écran par un potentiomètre, grille 3 connectée à la cathode.
Screen-grid supply via a voltage divider, grid 3 connected to the cathode.

Va = Vb[5]		250 V	
Vg3		0 V	
R1[6]		80000 Ω	
R2[7]		80000 Ω	
Rk		400 Ω	
Vg1	-2 V[1]	-21 V[2]	-23 V[3]
Vg2	100 V	-	125 V
Ia	4,5 mA	-	-
Ig2	0,6	-	-
S	2300 µA/V	23 µA/V	15 µA/V
Ri	>0,5 MΩ	>10 MΩ	>10 MΩ
Raeq[4]	2500 Ω	-	-

Va = Vb[2]		250 V	
Vg3		0 V	
R1[6]		140.000 Ω	
R2[7]		210.000 Ω	
Rk		400 Ω	
Vg1	-2 V[1]	-24,5 V[2]	-28 V[3]
Vg2	100	-	150 V
Ia	4,5 mA	-	-

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Ig2	0,6 mA	-	-
S	2300 µA/V	23 µA/V	15 µA/V
Ri	>0,5 MΩ	>10 MΩ	>10 MΩ
Raeq[4]	2500 Ω	-	-

c) Schirmgitterspeisung über einen Spannungsteiler, Gitter 3 an der Regelspannungsquelle von Gitter 1.
Alimentation de la grille-écran par un potentiomètre grille 3 connectée à la source de la tension de réglage de la grille 1.
Screen-grid supply via a voltage divider, grid 3 connected to the regulation voltage source of grid 1.

Va = Vb[5]		250 V	
R1[6]		80000 Ω	
R2[7]		80000 Ω	
Rk		400 Ω	
Vg1 = Vg3	-2 V[1]	-18,5 V[2]	-20 V[3]
Vg2	100 V	-	125 V
Ia	4,5 mA	-	-
Ig2	0,6 mA	-	-
S	2300 µA/V	23 µA/V	1,5 µA/V
Ri	>0,5 MΩ	>10 MΩ	>10 MΩ
Raeq[4]	2500 Ω	-	-

Va = Vb[5]		250 V	
R1[6]		140000 Ω	
R2[7]		210000 Ω	
Rk		400 Ω	
Vg1 = Vg3	-2 V[1]	-21,5 V[2]	-24 V[3]
Vg2	100 V	-	150 V
Ia	4,5 mA	-	-
Ig2	0,6 mA	-	-
S	2300 µA/V	23 µA/V	15 µA/V
Ri	>0,5 MΩ	>10 MΩ	>10 MΩ
Raeq[4]	2500 Ω	-	-

1) Im ungeregelten Zustand.
Tube non réglé par le C.A.V.
Tube not regulated by A.V.C.

2) Für eine Regelung der Steilheit 1:100.
Pour le réglage de la pente de 1:100.
For a regulation of the conductance of 1:100.

3) Grenze des optimalen Regelbereiches.
Limite de la plage de réglage optimum.
Limite of the optimum regulation range.

4) Äquivalenter Rauschwiderstand.
Résistance équivalente du bruit de fond (soufle).
Equivalent noise resistance (back ground noise).

5) Spannung am Schirmgitterspannungsteiler.
Tension sur le potentiomètre d'alimentation de la grille-écran.
Voltage on the screen-grid voltage divider.

6) **Widerstand** des Spannungsteilers angeschlossen an die Hochspannungsseite.
Résistance du potentiomètre connectée à la borne haute tension.
Voltage-divider resistance connected to the high-tension terminal.

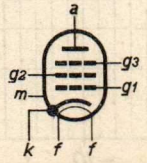
7) Geerdeter Widerstand des Spannungsteilers.
Résistance du potentiomètre mise à la terre.
Voltage-divider resistance connected to earth.

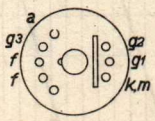
Grenzdaten.
Limites fixées pour les caractéristiques.
Limiting values.

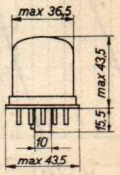
Vao	max. 550 V
Va	max. 300 V
Wa	max. 2 W
Vg2o	max. 550 V
Vg2 (Ia = 4,5 mA)	max. 125 V
Vg2 (Ia < 1,5 mA)	max. 200 V
Ig2 (Va = 250 V, Vg2 = 100 V, Ia = 4,5 mA)	max. 0,8 mA
Ig2 (Va = 250 V, Vg2 = 100 V, Ia = 4,5 mA)	min. 0,4 mA
Wg2	max. 0,3 W
Vg1 (Ig1 = +0,3 µA)	max. -1,3 V
Vg3 (Ig3 = +0,3 µA)	max. -1,3 V
Ik	max. 10 mA
Rg1k	max. 3 MΩ
Rg3k	max. 3 MΩ
Rfk	max. 20000 Ω
Vfk	max. 100 V 8)

8) Gleichspannung oder Effektivwert der Wechselspannung.
Tension continue ou valeur efficace de la tension alternative.
D.C.voltage or R.M.S. value of the alternating voltage.

Elektrodenanordnung, Sockelanschlüsse und max. Abmessungen in mm.
Disposition des électrodes, connexions du culot et dimensions max. en mm.
Electrode arrangement, base connections and max. dimensions in mm.



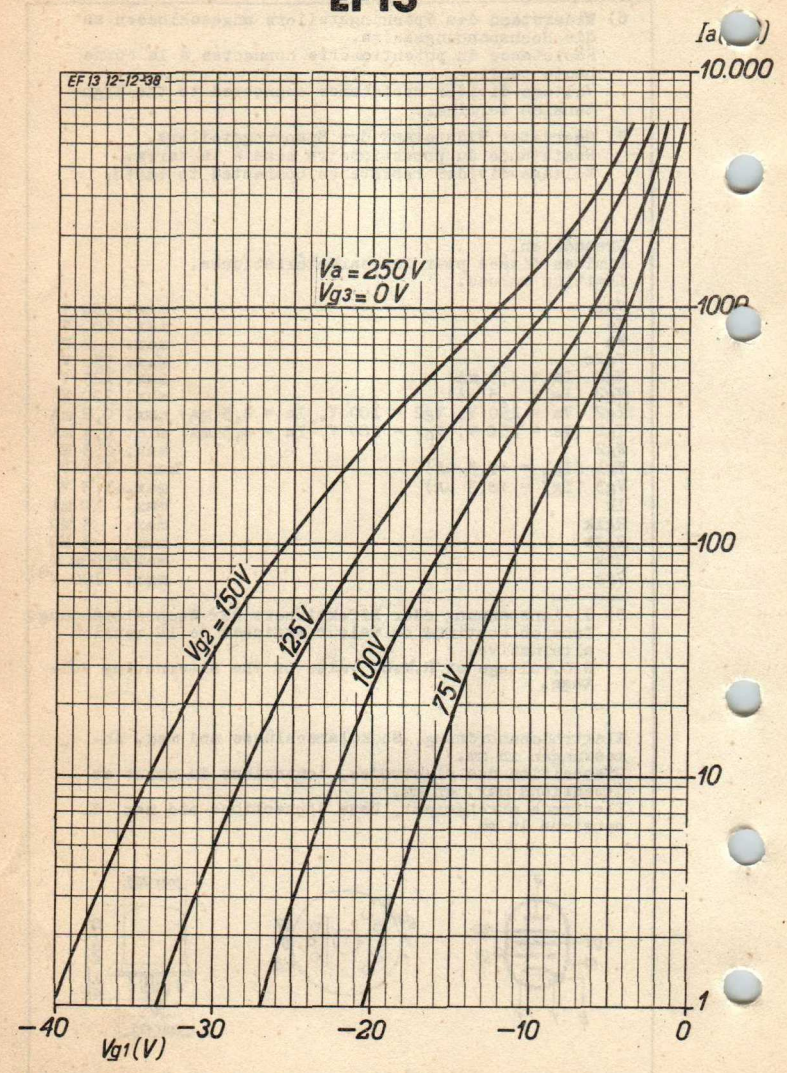




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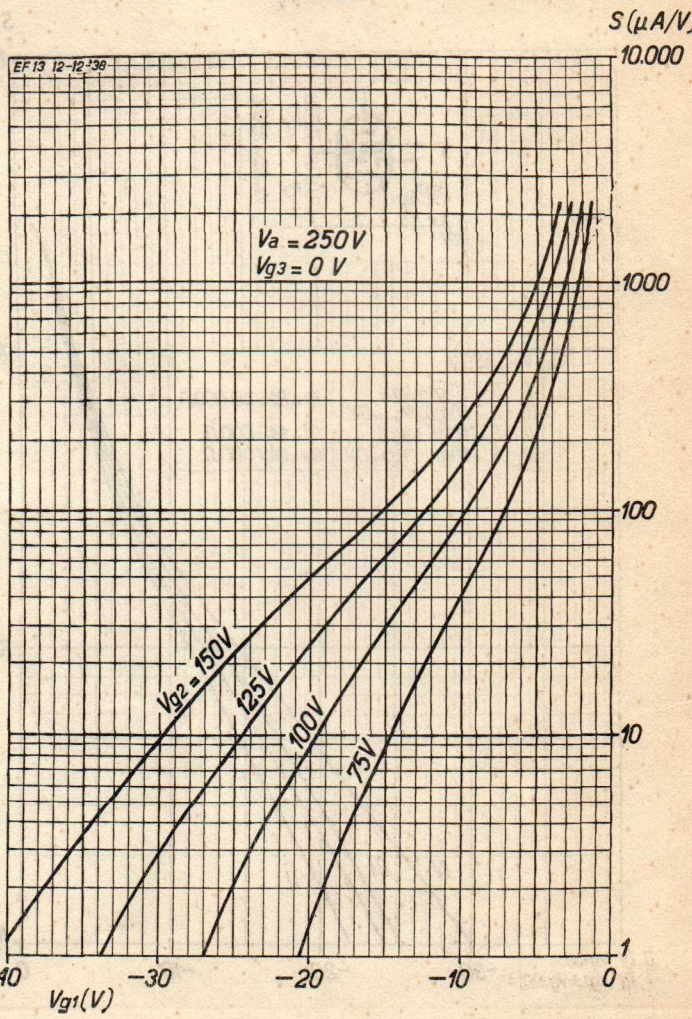
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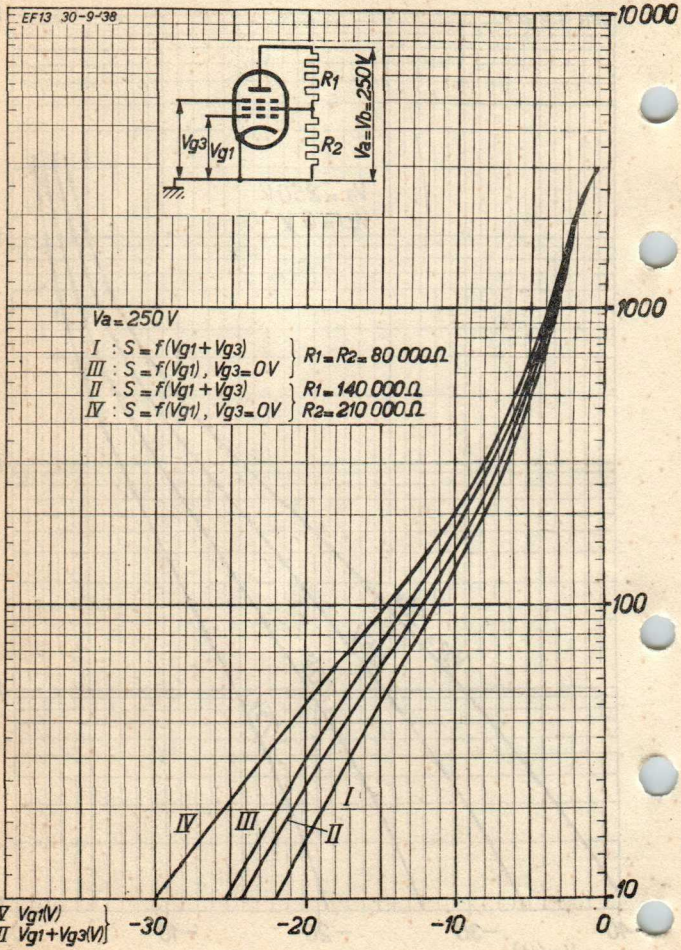
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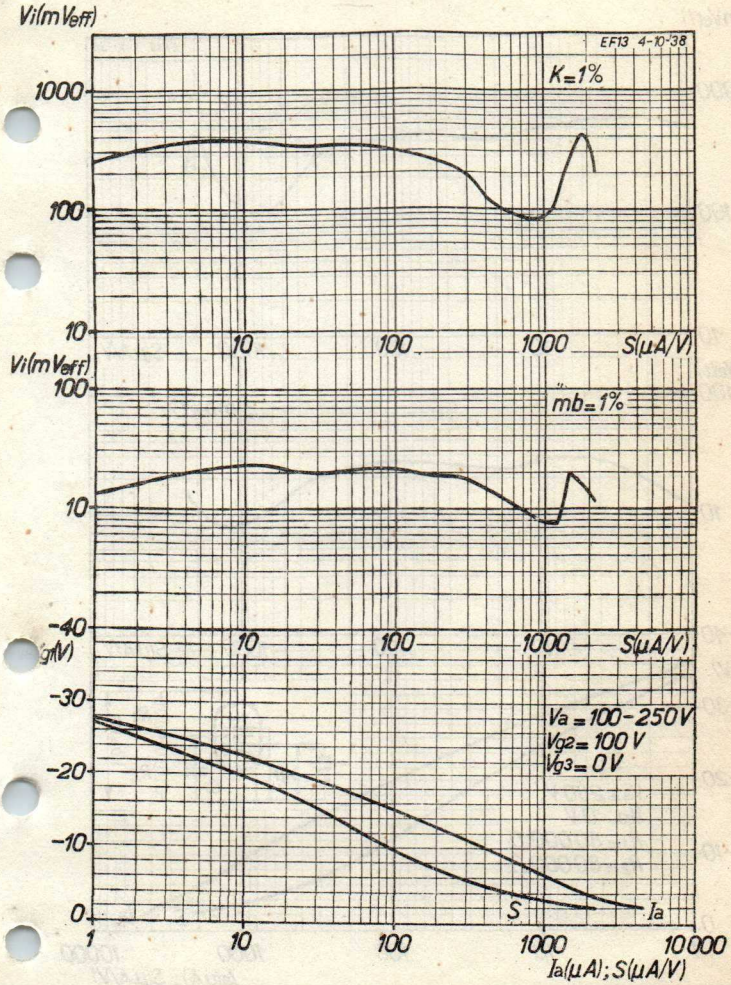
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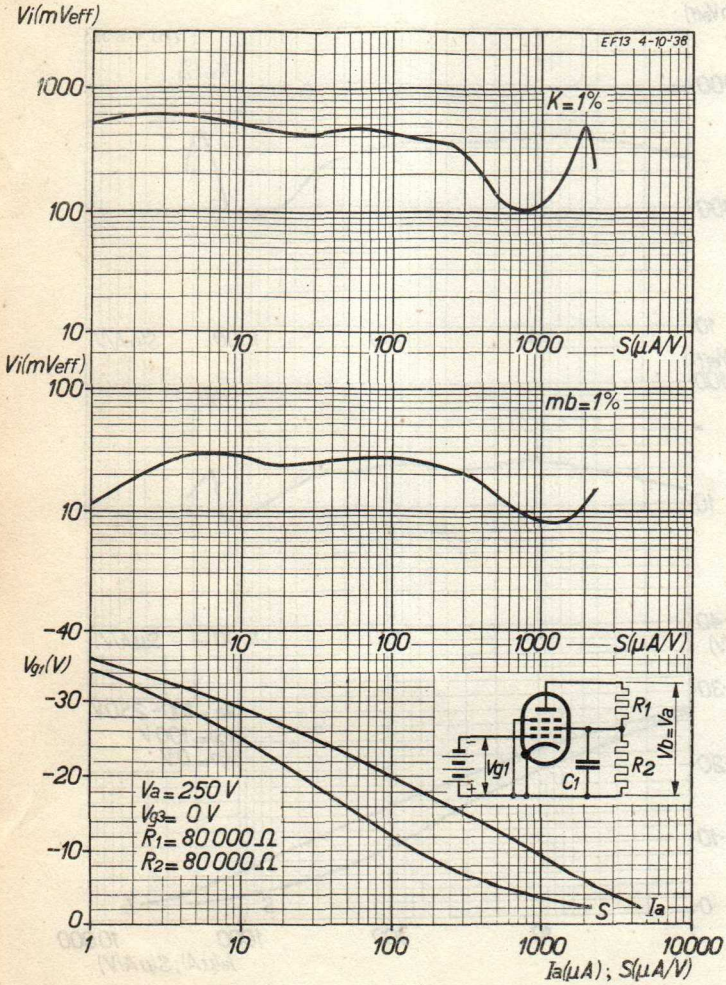
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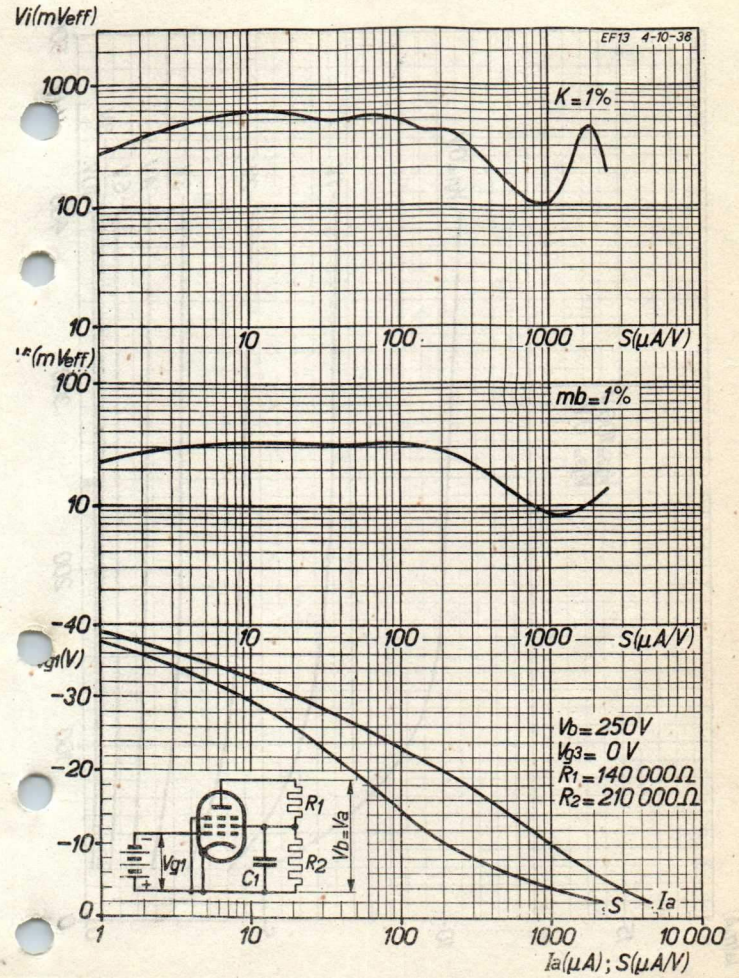
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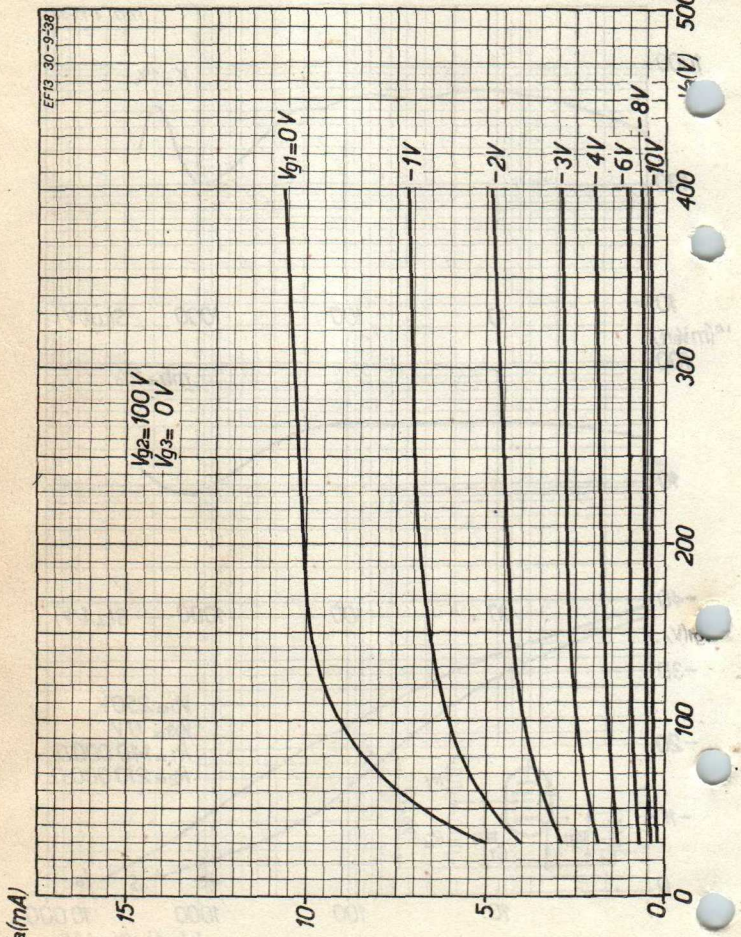
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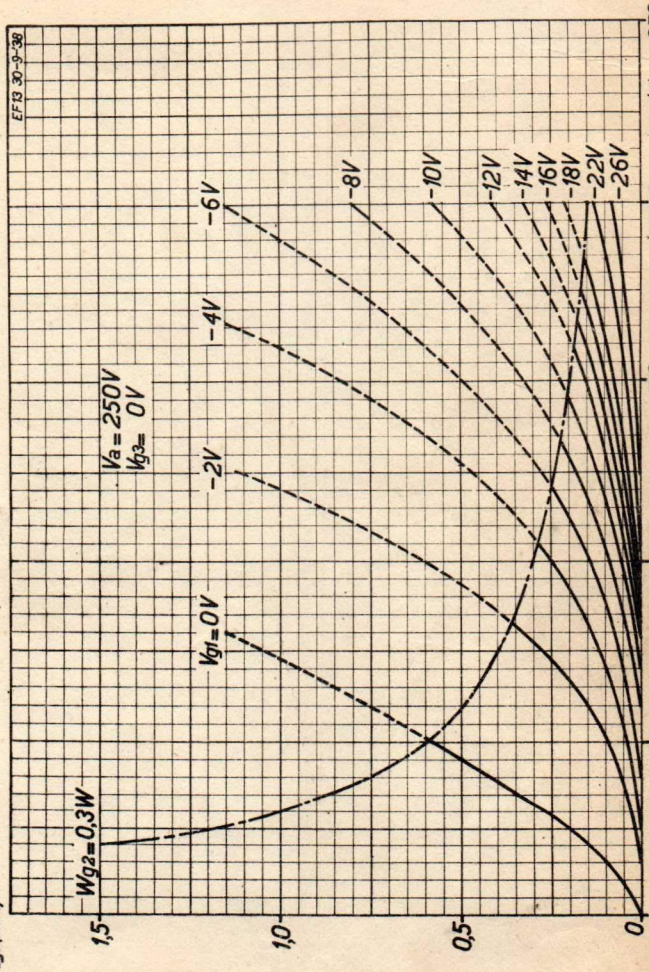
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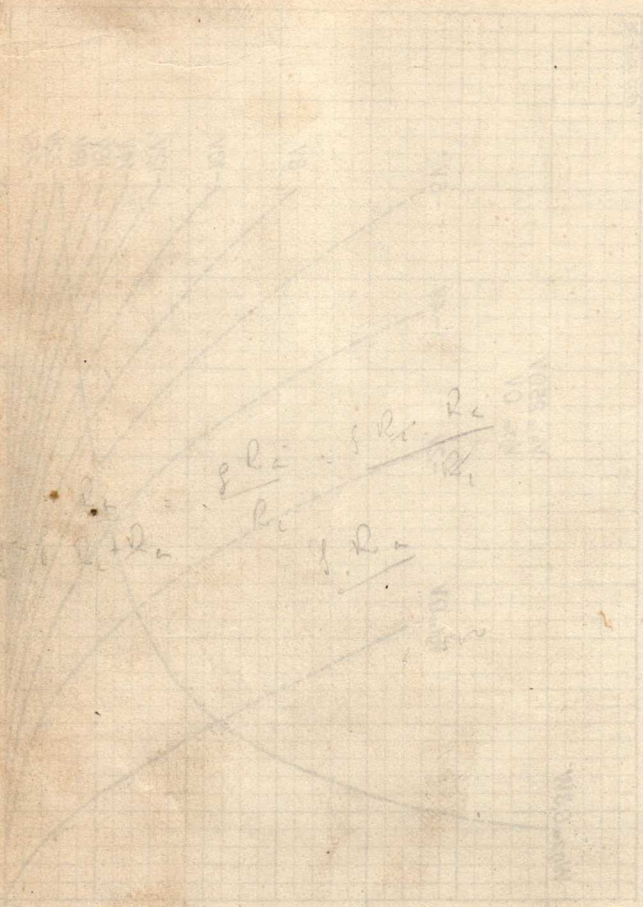
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I.F. PENTODE

Pentode with variable transconductance intended for use as I.F. amplifier in television receivers.

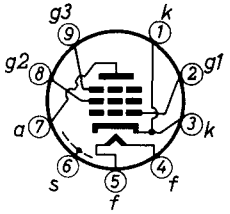
QUICK REFERENCE DATA			
Anode current	I_a	12	mA
Transconductance	S	12.5	mA/V
Internal resistance	R_i	500	kΩ

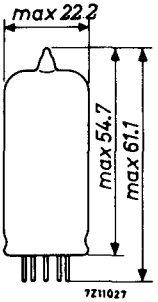
HEATING: Indirect by A.C. or D.C.; parallel or series supply

Heater voltage	V_f	6.3	V
Heater current	I_f	300	mA

DIMENSIONS AND CONNECTIONS Dimensions in mm

Base: Noval





CAPACITANCES

Anode to all except grid No.1	$C_{a(g_1)}$	3	pF
Grid No.1 to all except anode	$C_{g_1(a)}$	9.5	pF
Anode to grid No.1	C_{ag_1}	max. 0.005	pF
Grid No.1 to grid No.2	$C_{g_1g_2}$	2.8	pF

TYPICAL CHARACTERISTICS

Anode voltage	V_a	200	V
Grid No.3 voltage	V_{g_3}	0	V
Grid No.2 voltage	V_{g_2}	90	V
Grid No.1 voltage	V_{g_1}	-2	V
Anode current	I_a	12	mA
Grid No.2 current	I_{g_2}	4.5	mA
Transconductance	S	12.5	mA/V
Internal resistance	R_i	500	kΩ
Input resistance grid No.1 (f = 40 MHz)	r_{g_1}	13	kΩ
Equivalent noise resistance (f = 40 MHz)	R_{eq}	490	Ω

OPERATING CHARACTERISTICS

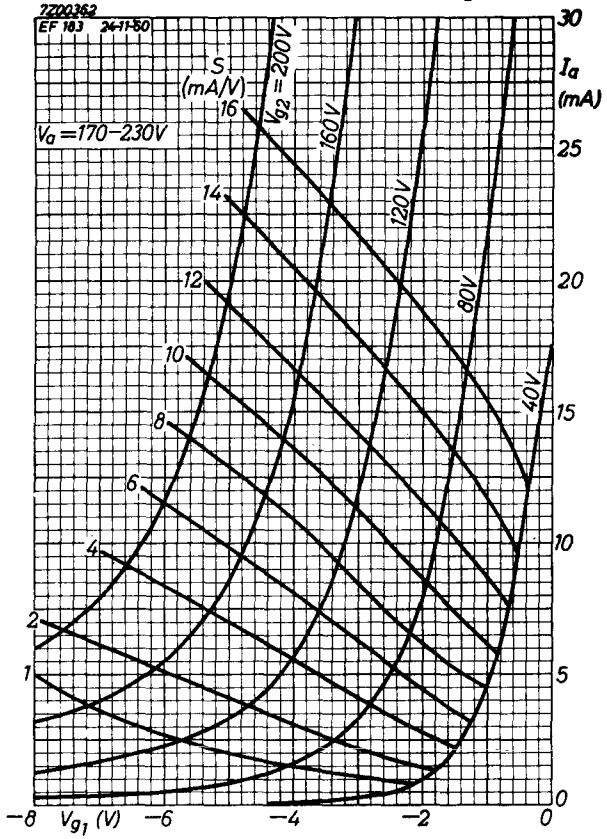
Anode voltage	V_a	170		200		230		V
Grid No.3 voltage	V_{g_3}	0		0		0		V
Grid No.2 supply voltage	V_{bg_2}	170		200		230		V
Grid No.2 resistor	R_{g_2}	15		24		39		kΩ
Grid No.1 voltage	V_{g_1}	-1.8	-7.5	-2.0	-9.5	-2.1	-12	V
Anode current	I_a	14	2.7	12	2.7	10.5	2.4	mA
Transconductance	S	14	0.7	12.5	0.62	10.6	0.5	mA/V

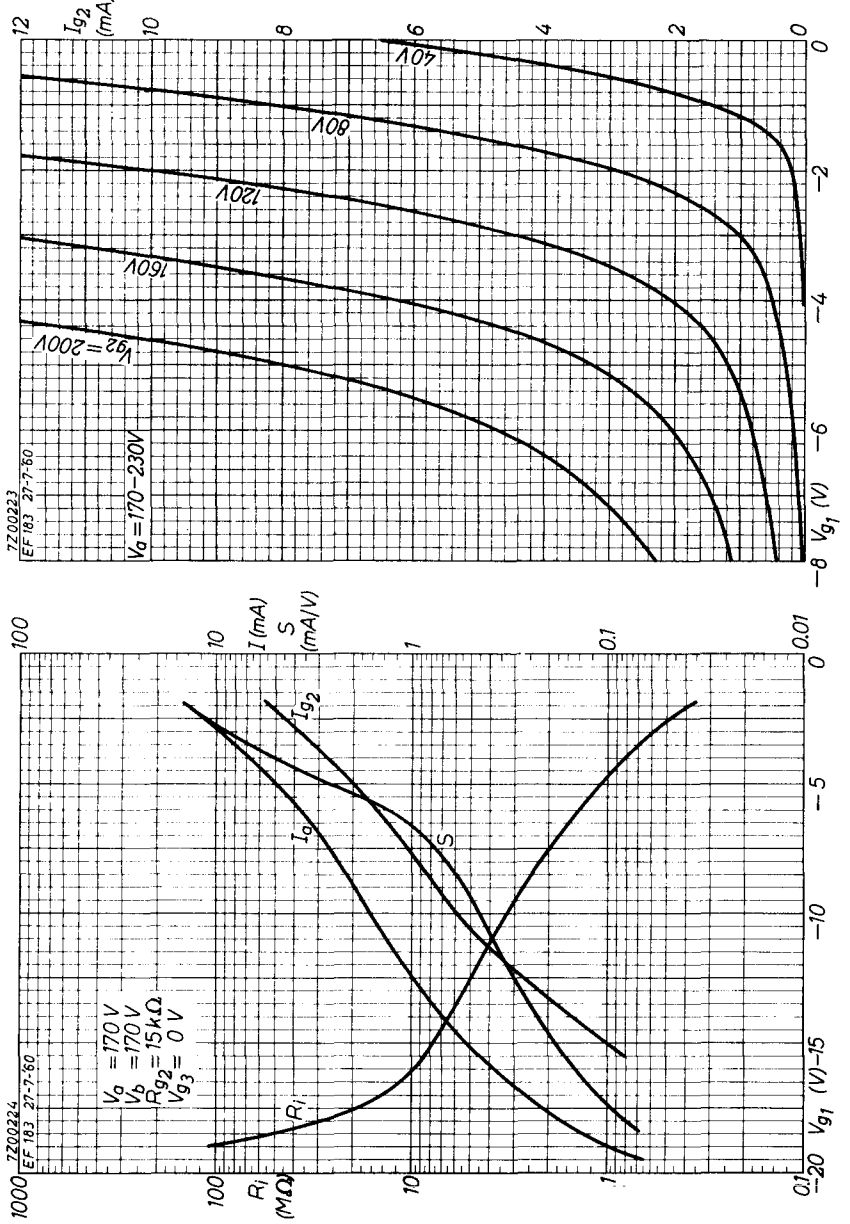
REMARK

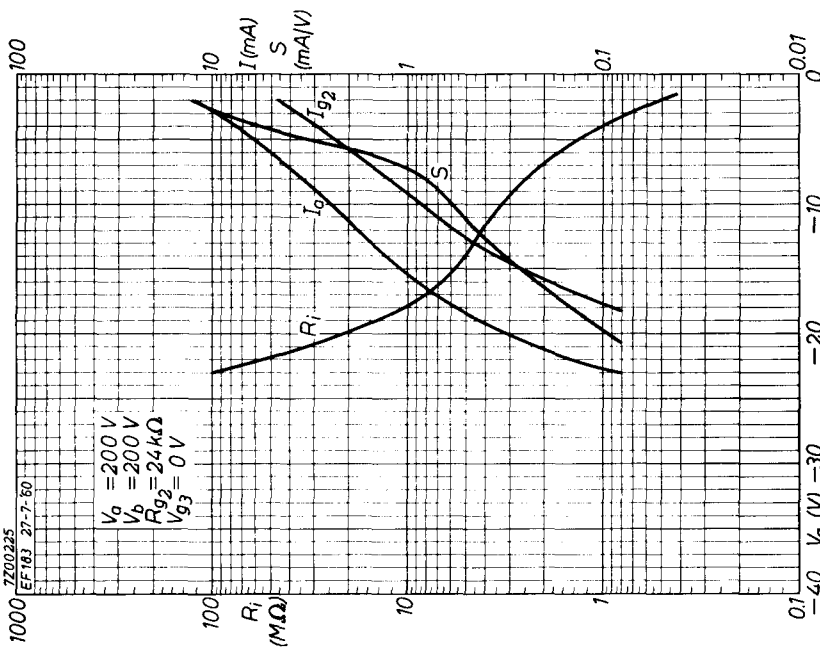
Operation with cathode bias resistor and/or screen grid resistor is recommended.

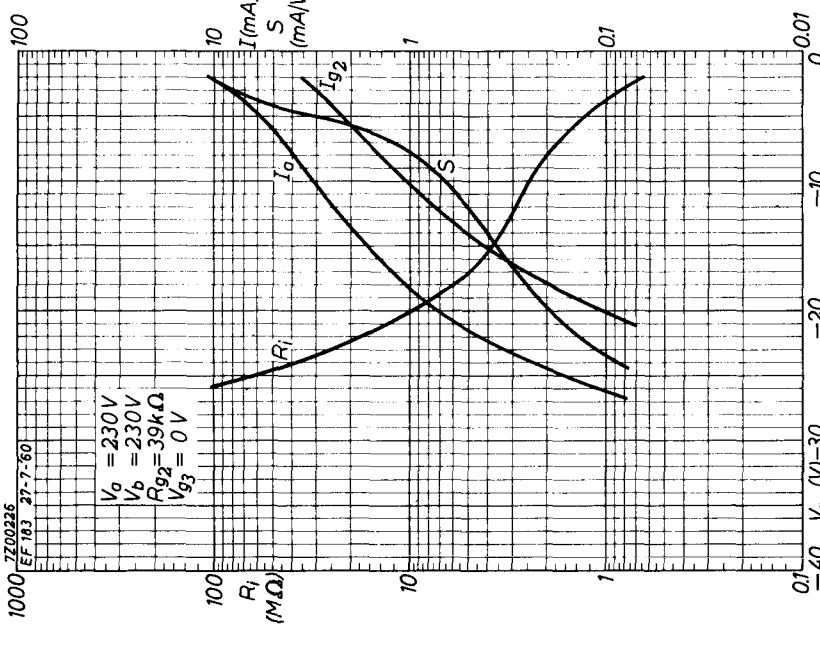
LIMITING VALUES (Design centre rating system)

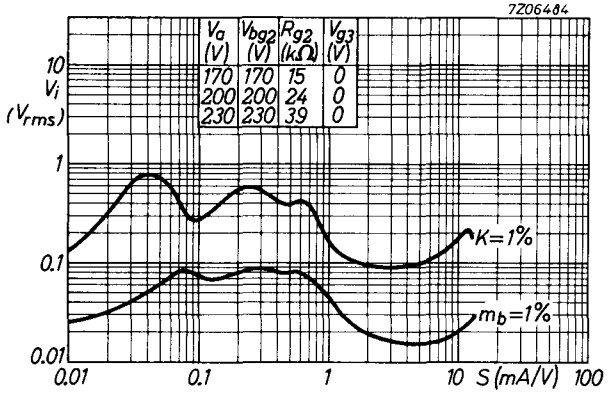
Anode voltage	V_{a_o}	max.	550	V
	V_a	max.	250	V
Anode dissipation	W_a	max.	2.5	W
Grid No.2 voltage	V_{g2_o}	max.	550	V
	V_{g2}	max.	250	V
Grid No.2 dissipation	W_{g_2}	max.	0.65	W
Grid No.1 voltage, negative peak	$-V_{g1p}$	max.	50	V
Cathode current	I_k	max.	20	mA
Cathode to heater voltage	V_{kf}	max.	150	V
Grid No.3 resistor	R_{g_3}	max.	50	kΩ
Grid No.1 resistor	R_{g_1}	max.	1	MΩ

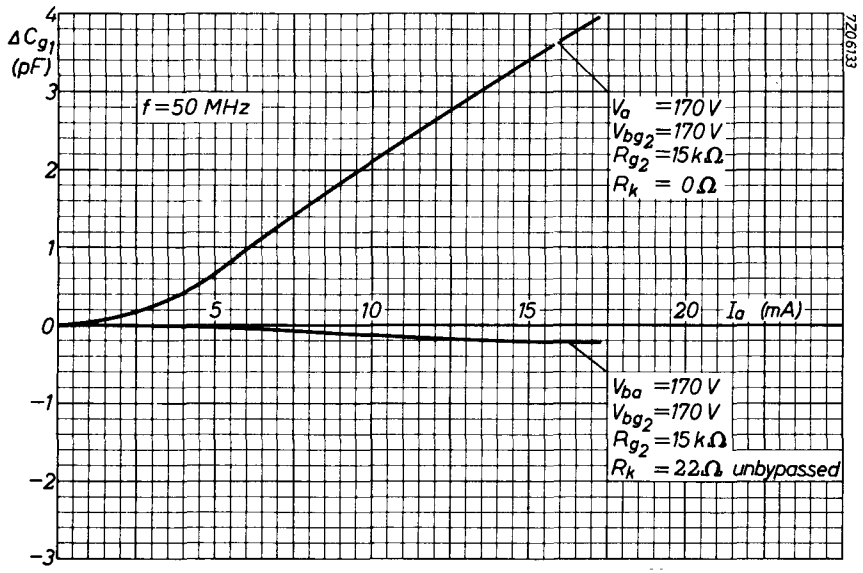


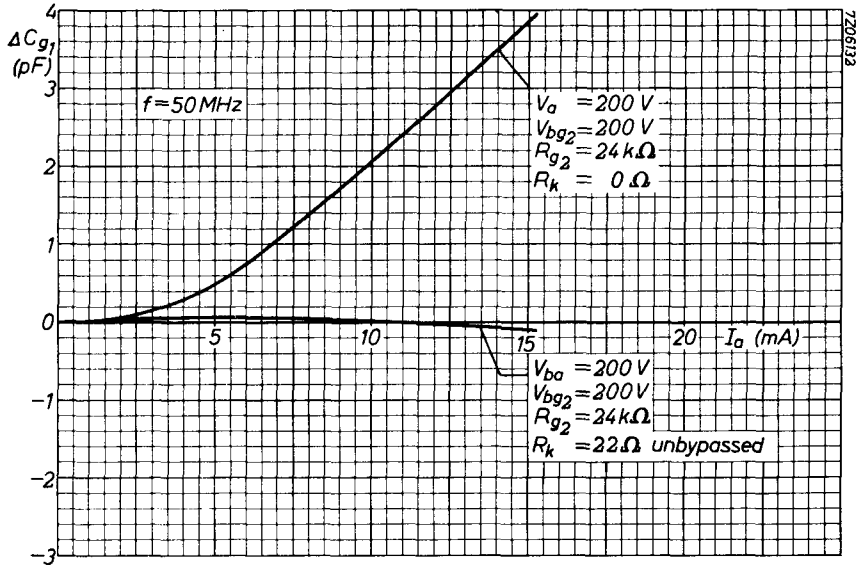

I_{g_2} (mA)
12
10
8
6
4
2
0
40V
80V
120V
160V
V_{g2} = 200V
V_a = 170–230V
EF183 27-7-60
7Z00223
V_{g_1} (V)
−8
−6
−4
−2
0
I (mA)
S (mA/V)
100
10
1
0.1
0.01
I_{g_2}
I_a
S
R_i
V_a = 170 V
V_b = 170 V
R_{g_2} = 15 kΩ
V_{g_3} = 0 V
EF183 27-7-60
7Z00224
R_i (MΩ)
1000
100
10
1
0.1
0
−5
−10
−15
−20
V_{g_1} (V)


V_a = 200 V
V_b = 200 V
R_{g_2} = 24 kΩ
V_{g_3} = 0 V
EF183 27-7-60
ZE00225
R_i (MΩ)
I (mA)
S (mA/V)
I_{g_2}
I_a
S
R_i
V_{g_1} (V)


V_a = 230 V
V_b = 230 V
R_{g_2} = 39 kΩ
V_{g_3} = 0 V
EF183 27-7-60
ZE00226
R_i (MΩ)
I (mA)
S (mA/V)
I_{g_2}
I_a
S
R_i
V_{g_1} (V)


7Z06484
V_a (V) | V_{bg2} (V) | R_{g2} (kΩ) | V_{g3} (V)
170 | 170 | 15 | 0
200 | 200 | 24 | 0
230 | 230 | 39 | 0
10
V_i (V_{rms})
1
0.1
0.01
K=1%
m_b=1%
0.01
0.1
1
10
S (mA/V)
100


7Z06133
ΔC_{g1} (pF)
4
3
2
1
0
−1
−2
−3
f=50 MHz
V_a =170 V
V_{bg2}=170 V
R_{g2}=15 kΩ
R_k = 0 Ω
5
10
15
20
I_a (mA)
V_{ba} =170 V
V_{bg2}=170 V
R_{g2}=15 kΩ
R_k =22 Ω unbypassed


ΔC_{g_1} (pF)
4
3
2
1
0
−1
−2
−3
f=50MHz
5
10
15
20
I_a (mA)
V_a =200 V
V_{bg_2}=200 V
R_{g_2}=24 kΩ
R_k = 0 Ω
V_{ba} =200 V
V_{bg_2}=200 V
R_{g_2}=24 kΩ
R_k =22 Ω unbypassed
7206132

PHILIPS

Data handbook

Electronic components and materials

EF183

page	sheet	date
1	1	1970.01
2	2	1970.01
3	3	1970.01
4	4	1970.01
5	5	1970.01
6	6	1970.01
7	7	1970.01
8	FP	1999.08.16

I.F. PENTODE

Pentode intended for use as I.F. amplifier in television receivers.

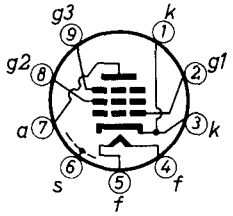
QUICK REFERENCE DATA			
Anode current	I_a	10	mA
Transconductance	S	15	mA/V
Amplification factor	$\mu_{g_2g_1}$	60	-
Internal resistance	R_i	380	kΩ

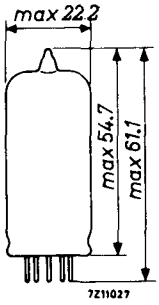
HEATING: Indirect by A.C. or D.C.; parallel or series supply

Heater voltage	V_f	6.3	V
Heater current	I_f	300	mA

DIMENSIONS AND CONNECTIONS Dimensions in mm

Base: Noval





CAPACITANCES

Anode to all except grid No.1	$C_{a(g_1)}$	3	pF
Grid No.1 to all except anode	$C_{g_1(a)}$	10	pF
Anode to grid No.1	C_{ag_1}	max. 0.0055	pF
Grid No.1 to grid No.2	$C_{g_1g_2}$	2.8	pF

TYPICAL CHARACTERISTICS

Anode voltage	V_a	200	V
Grid No.3 voltage	V_{g_3}	0	V
Grid No.2 voltage	V_{g_2}	200	V
Grid No.1 voltage	V_{g_1}	-2.5	V
Anode current	I_a	10	mA
Grid No.2 current	I_{g_2}	4.1	mA
Transconductance	S	15	mA/V
Internal resistance	R_i	380	kΩ
Amplification factor	$\mu_{g_2g_1}$	60	-
Input resistance grid No.1 (f = 40 MHz)	r_{g_1}	11	kΩ
Equivalent noise resistance (f = 40 MHz)	R_{eq}	330	Ω

OPERATING CHARACTERISTICS

Anode supply coltage	V_{ba}	170	200	230	V
Grid No.3 voltage	V_{g_3}	0	0	0	V
Grid No.2 supply voltage	V_{bg_2}	170	200	230	V
Grid No.2 resistor	R_{g_2}	0	7.5	15	kΩ
Cathode resistor	R_k	140	140	140	Ω
Anode current	I_a	10	10	10	mA
Grid No.2 current	I_{g_2}	4.1	4.1	4.1	mA
Transconductance	S	15.6	15.6	15.6	mA/V
Internal resistance	R_i	330	510	680	kΩ
Input resistance grid No.1 f = 40 MHz	r_{g_1}	10	10	10	kΩ
Equivalent noise resistance f = 40 MHz	R_{eq}	300	300	300	Ω

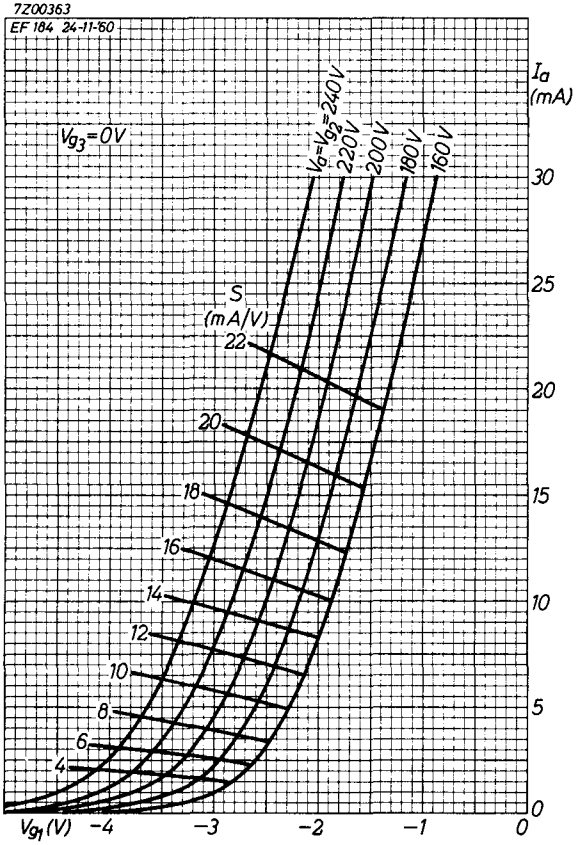
REMARKS

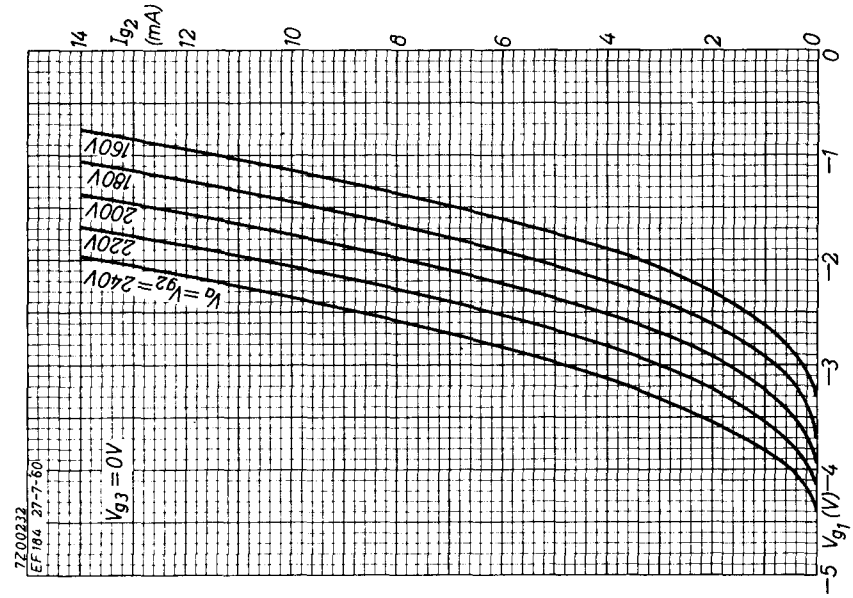
1. Operation with cathode bias resistor is recommended.
2. In order to ensure a good performance with respect to cross-modulation and microphony this tube should not be used in circuits with automatic gain control. For such applications a tube with variable transconductance is recommended.

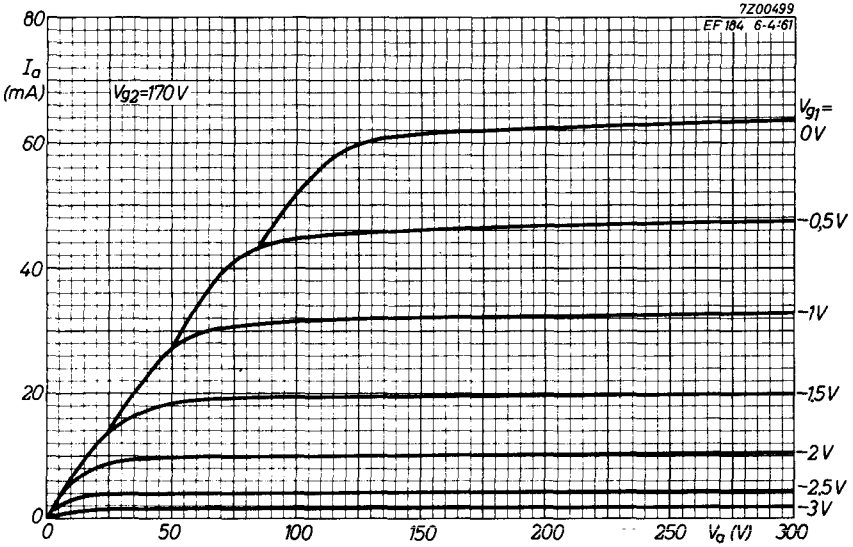
LIMITING VALUES (Design centre rating system)

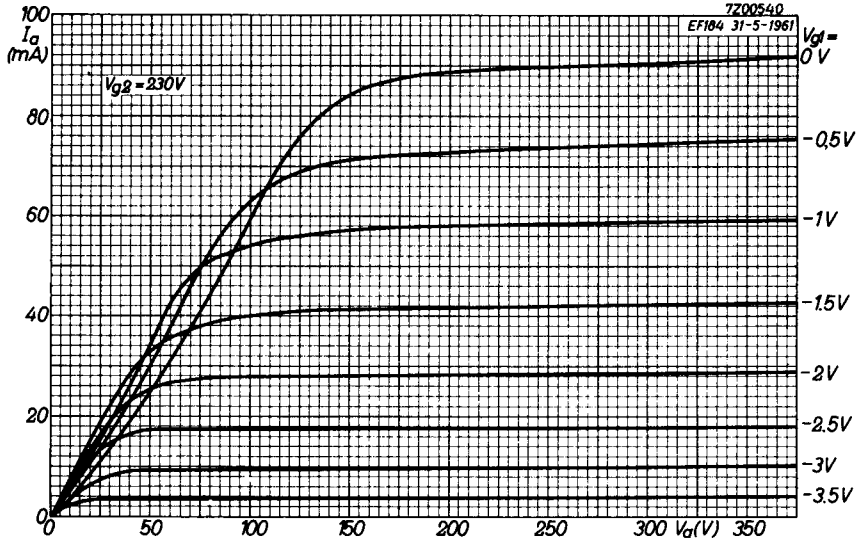
Anode voltage	V_{a_o}	max.	550	V
	V_a	max.	250	V
Anode dissipation	W_a	max.	2.5	W
Grid No.2 voltage	$V_{g_{2_o}}$	max.	550	V
	V_{g_2}	max.	250	V
Grid No.2 dissipation	W_{g_2}	max.	0.9	W [1]
Grid No.1 voltage, negative peak	$-V_{g_{1p}}$	max.	50	V
Cathode current	I_k	max.	25	mA
Cathode to heater voltage	V_{kf}	max.	150	V
Grid No.1 resistor	R_{g_1}	max.	1	MΩ

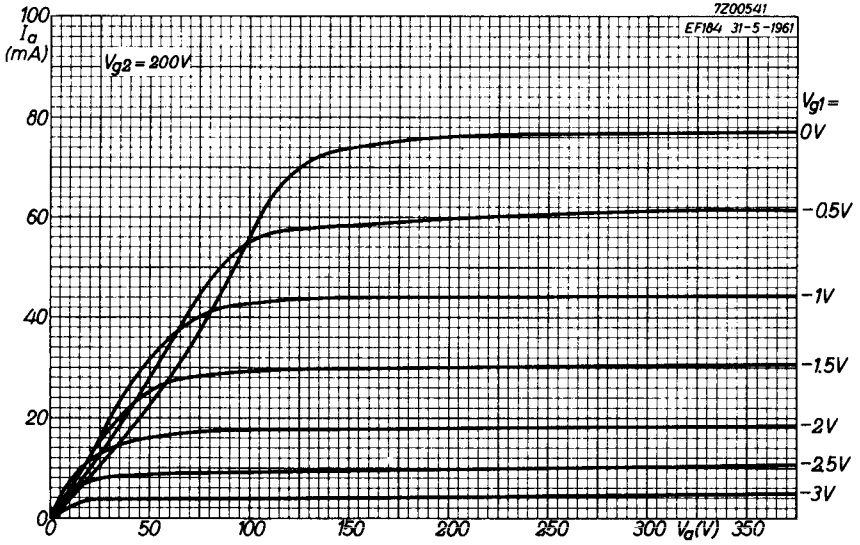
[1]) During a heating-up period not exceeding 15 seconds this value may be max. 1.5 W. At the values of R_{g_2} specified under "Operating characteristics" there will be no risk of exceeding the maximum permissible value of W_{g_2}.


7Z00363
EF 184 24-11-60
$V_{g3}=0V$
$V_a=V_{g2}=240V$
220V
200V
180V
160V
S
(mA/V)
22
20
18
16
14
12
10
8
6
4
I_a
(mA)
30
25
20
15
10
5
0
V_{g1}(V) −4 −3 −2 −1 0


I_{g2} (mA)
14
12
10
8
6
4
2
0
160V
180V
200V
220V
$V_a = V_{g2} = 240V$
$V_{g3} = 0V$
0
−1
−2
−3
−4
−5
V_{g1} (V)
7Z00232
EF184 27-7-60


7Z00499
EF184 6-4-61
I_a (mA)
V_{g2}=170V
80
60
40
20
0
V_{g1} = 0V
−0,5V
−1V
−1,5V
−2V
−2,5V
−3V
0
50
100
150
200
250
V_a (V)
300


7Z00540
EF184 31-5-1961
I_a (mA)
V_{g2} = 230V
V_{g1} =
0 V
-0.5V
-1V
-1.5V
-2V
-2.5V
-3V
-3.5V
0
20
40
60
80
100
0
50
100
150
200
250
300
V_a(V)
350


7Z00541
EF184 31-5-1961
I_a (mA)
V_{g2} = 200V
V_{g1} =
0V
-0.5V
-1V
-1.5V
-2V
-2.5V
-3V
0
20
40
60
80
100
0
50
100
150
200
250
300
V_a(V)
350

PHILIPS

Data handbook

Electronic components and materials

EF184

page	sheet	date
1	1	1970.01
2	2	1970.01
3	3	1970.01
4	4	1970.01
5	5	1970.01
6	6	1970.01
7	FP	1999.08.16

PHILIPS „MINIWATT"
EF 2
PENTHODE (H.F.)

EF 2

Heizung ind.	Vf	= 6,3 V
Chauffage ind.	If	= ca. env. appr. 0,4 A
Heating ind.		

Kapazitäten	Cag1	< 0,0018 $\mu\mu$F
Capacités	Cg	= 7,1 $\mu\mu$F
Capacities	Ca	= 7,7 $\mu\mu$F

Betriebsdaten als HF- und ZF-Verstärker.
Données rélatives au fonctionnement comme amplificateur HF et MF.
Operating conditions as HF and IF amplifier.

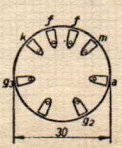
Va	= 250 V
Vg2	= 100 V
Ia (Vg1 = ca. -2 V)	= 4,5 mA
Ig2 (Ia = 4,5 mA)	= 1,4 mA
g (k)	= 3000
S max	= 2,8 mA/V
S (Ia = 4,5 mA)	= 2,2 mA/V
S (Vg1 = -22 V)	< 0,002 mA/V
Ri (Ia = 4,5 mA)	= 1,4 Megohm
Ri (Vg1 = ca. env. appr. -22 V)	> 10 Megohm

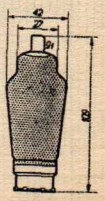
Grenzdaten.
Données limites.
Limits.

Va_0	max	= 400 V
VaR	max	= 250 V
VaL	max	= 200 V
Wa	max	= 1,5 W
Ik	max	= 8 mA
Vg1 (Ig1 = 0,3 μA)		= -1,3 V
$Vg2_0$	max	= 400 V
Vg2	max	= Va max 125 V
Ig2	max	= 1,8 mA
Ig2	min	= 1 mA
Wg2	max	= 0,3 W
Rg1f	max	= 2 Megohm
Vfk	max	= 80 V
Rfk	max	= 20000 Ohm

Elektrodenanordnung und Sockelschaltung.
Disposition des electrodes et connexion du culot.
Arrangement of electrodes and base connection.

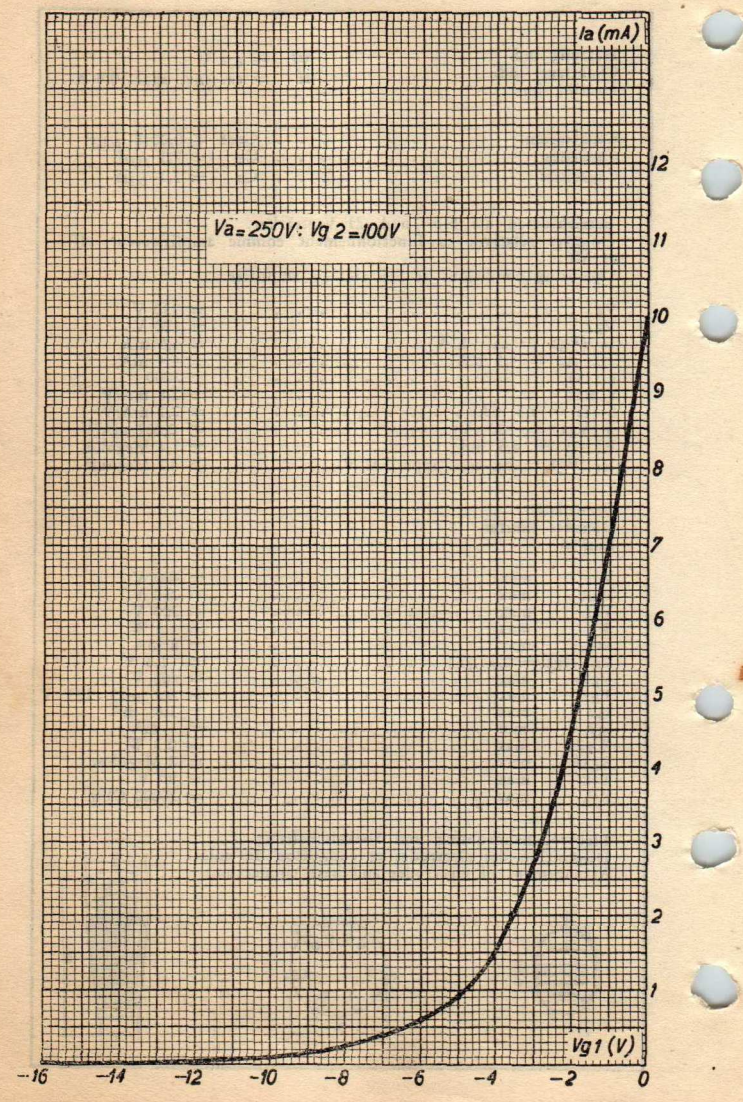






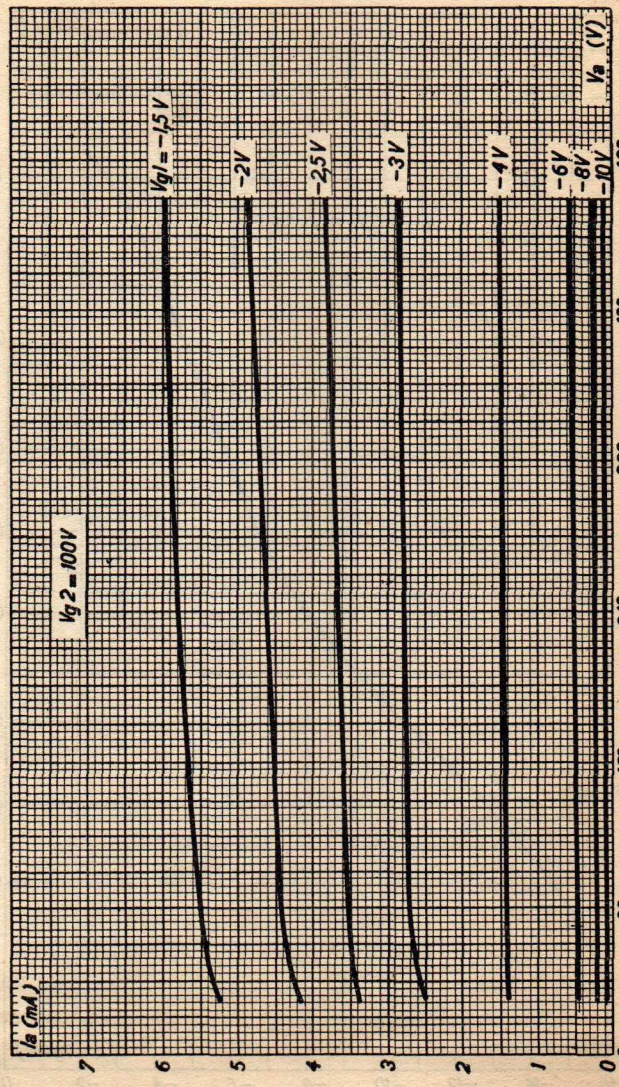
EF 2

PHILIPS „MINIWATT"
EF 2
PENTHODE (H.F.)



PHILIPS „MINIWATT"
EF 2
PENTHODE (H.F.)

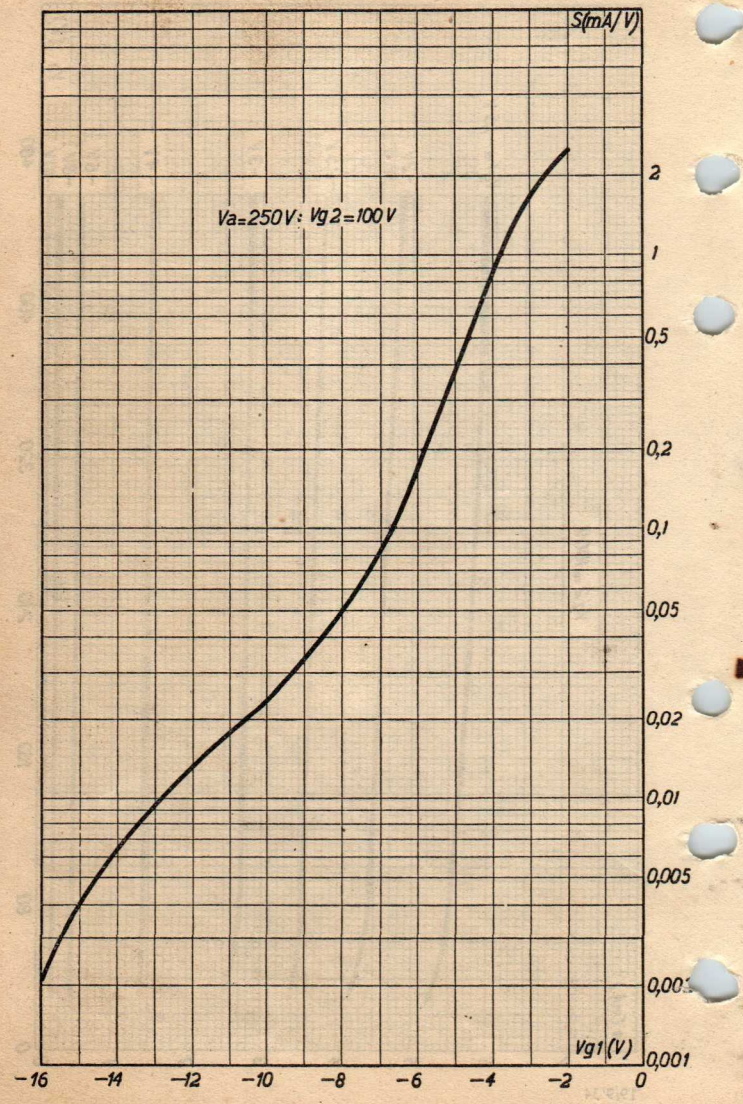
EF 2



19/9'34

EF 2

PHILIPS „MINIWATT"
EF 2
PENTHODE (H.F.)



EF 22 H.F. penthode-selectode

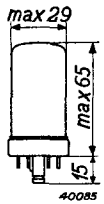


Fig. 1
Afmetingen in mm.

De penthode EF 22 is een H.F. of M.F. versterkerbuis met regelbare steilheid, die ook als L.F. versterker met weerstandkoppeling kan worden gebruikt, waarbij de versterking al dan niet kan worden geregeld.
De EF 22 komt electrisch ongeveer overeen met de buis EF 9 van de roode E serie; bij de EF 22 wordt de schermroosterspanning eveneens meeloopend uitgevoerd, zoodat de gunstige eigenschappen met betrekking tot kruismodulatie enz., ook indien de buis wordt geregeld, behouden blijven. Hoewel de EF 22, in tegenstelling met de EF 8, niet van een extra rooster is voorzien, heeft de equivalente ruischweerstand de gunstige waarde van ca. 6200 Ω. De EF 22 is dan ook bij uitstek geschikt voor toepassing in zeer gevoelige toestellen met H.F. versterking.

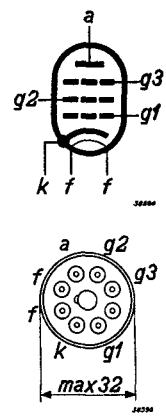


Fig. 2
Rangschikking en aansluitingen van de electroden.

GLOEIDRAADGEGEVENS

Gloeidraadvoeding: indirect met wissel- of gelijkstroom; parallel- of serievoeding.

Gloeispanning	V_f	= 6,3 V
Gloeistroom	I_f	= 0,2 A

CAPACITEITEN

C_{ag1}	< 0,002 pF
C_a	= 6,1 pF
C_{g1}	= 5,5 pF
C_{g1f}	< 0,004 pF

DYNAMISCHE GEGEVENS voor toepassing als H.F. en M.F. versterker

Anodespanning	V_a	=		250 V	
Vangroosterspanning	V_{g3}	=		0 V	
Schermrooster-serieweerstand	R_{g2}	=		90 000 Ω	
Kathodeweerstand	R_k	=		325 Ω	
Neg. roosterspanning	V_{g1}	=	—2,5 V[1])	—46 V[2])	—58 V[3])
Schermroosterspanning	V_{g2}	=	100 V	—	250 V
Anodestroom	I_a	=	6 mA	—	—
Schermroosterstroom	I_{g2}	=	1,7 mA	—	—
Steilheid	S	=	2200 µA/V	22 µA/V	5,5 µA/V
Inwendige weerstand	R_i	=	1,2 MΩ	>10 MΩ	>10 MΩ
Versterkingsfactor t.o.v. het scherm-rooster	μ_{g2g1}	=	17	—	—
Equivalente ruischweerstand	R_{aeq}	=	6200 Ω	—	—

[1]) Bij niet geregelde buis.
[2]) Bij een regeling van de steilheid op $^1/_{100}$.
[3]) Uiterste grens van het regelingsbereik.

EF 22

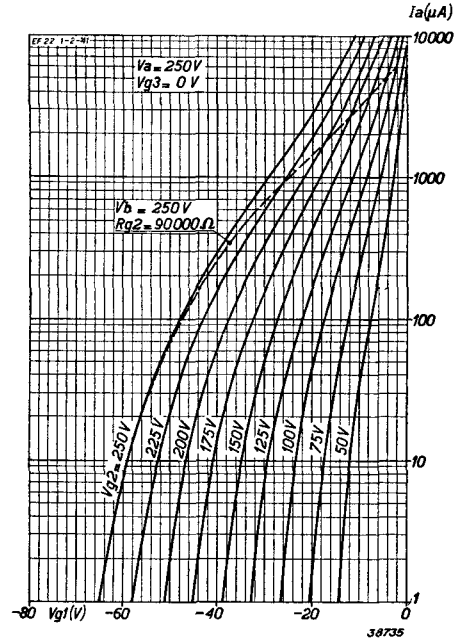


Fig. 3
Anodestroom als functie van de negatieve roosterspanning bij $Va = 250$ V en $Vg_3 = 0$ V, met de schermroosterspanning als parameter.

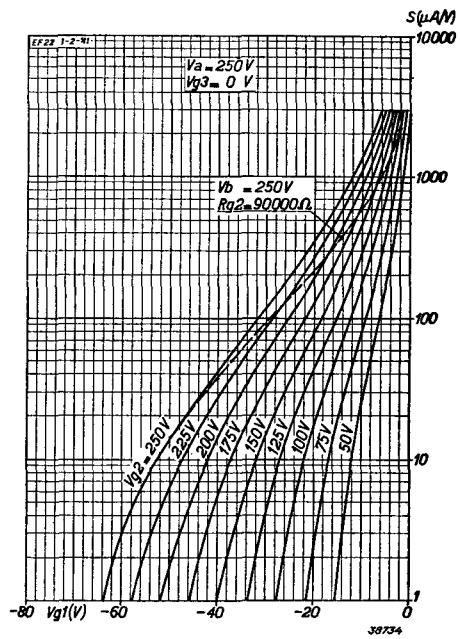


Fig. 4
Steilheid als functie van de negatieve roosterspanning bij $Va = 250$ V en $Vg_3 = 0$ V, met de schermroosterspanning als parameter.

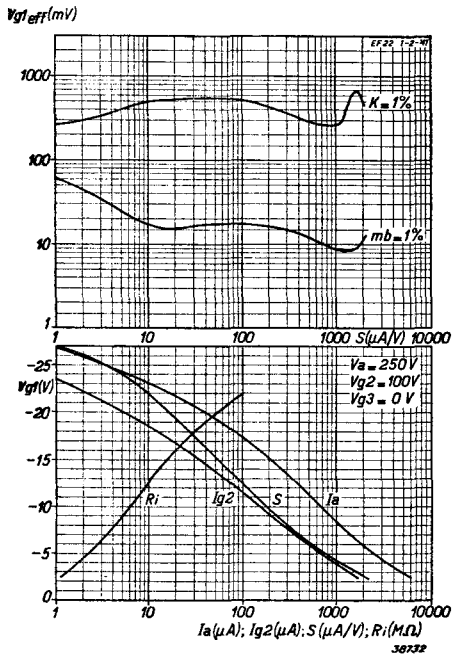


Fig. 5
Bij $Va = 250$ V, $Vg_3 = 100$ V (vaste schermroosterspanning) en $Vg_3 = 0$ V.
Bovenste krommen: De hoogst toelaatbare effectieve waarde van de H.F. wisselspanning voor 1% kruismodulatie ($K = 1\%$) en de hoogst toelaatbare wisselspanning voor 1% modulatiebrom ($mb = 1\%$), beide van het storende signaal op het stuurrooster, als functie van de steilheid.
Onderste krommen: Anodestroom Ia, schermroosterstroom Ig_2, steilheid S en inwendige weerstand Ri als functie van de negatieve roosterspanning Vg_1.

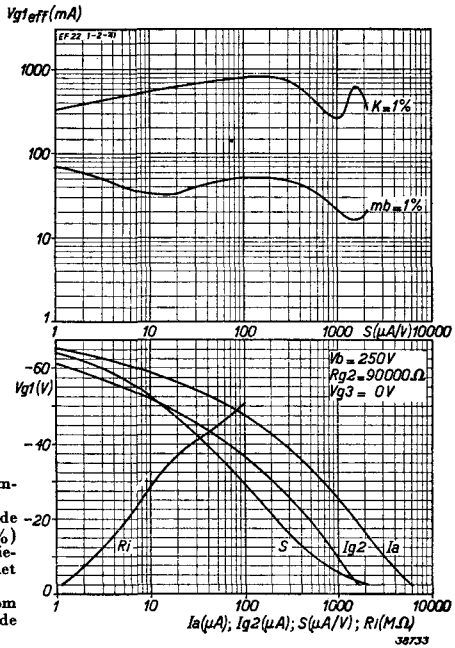


Fig. 6
Bij Vb = 250 V, Rg_2 = 90 000 Ω (voeding van het schermrooster via een weerstand) en Vg_3 = 0 V.
Bovenste krommen: De hoogst toelaatbare effectieve waarde van de H.F. wisselspanning voor 1% kruismodulatie (K = 1%) en de hoogst toelaatbare wisselspanning voor 1% modulatiebrom (mb = 1%), beide van het storende signaal op het stuurrooster, als functie van de steilheid.
Onderste krommen: Anodestroom Ia, schermroosterstroom Ig_2, steilheid S en inwendige weerstand Ri als functie van de negatieve roosterspanning Vg_1.

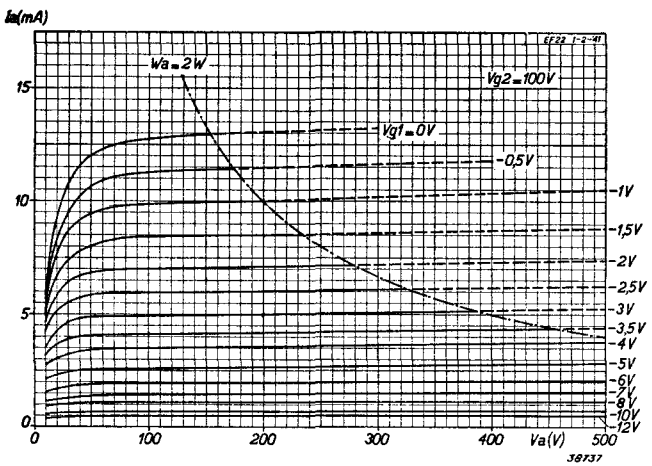


Fig. 7
Anodestroom als functie van de anodespanning bij Vg_2 = 100 V met de negatieve roosterspanning als parameter.

DYNAMISCHE GEGEVENS voor toepassing als L.F. versterker met weerstandkoppeling en regeling van de versterking d.m.v. het stuurrooster.

Voedingsspanning	Anodekoppelweerstand	Schermroosterserieweerstand	Anodestroom	Schermroosterstroom	Kathodeweerstand	Regelspanning aan rooster 1	Versterking	Vereischte roosterwisselspanning en totale vervorming ter verkrijging van een uitgangswisselspanning van:					
								Vo_{eff} = 3 V		Vo_{eff} = 5 V		Vo_{eff} = 10 V	
V_b (V)	R_a (MΩ)	R_{g2} (MΩ)	I_a (mA)	I_{g2} (mA)	R_k (Ω)	$-VR$ (V)	$\frac{Vo_{eff}}{V_{g1eff}}$	V_{g1eff} (V)	d_{tot} (%)	V_{g1eff} (V)	d_{tot} (%)	V_{g1eff} (V)	d_{tot} (%)
250	0,2	0,8	0,87	0,26	1750	0	106	0,028	0,8	0,047	2,4	0,094	2,7
250	0,2	0,8	0,69	0,21	1750	−5	40	0,075	0,8	0,125	2,4	0,25	2,7
250	0,2	0,8	0,55	0,17	1750	−10	23	0,13	1,1	0,22	1,9	0,43	3,7
250	0,2	0,8	0,37	0,11	1750	−18	11,6	0,27	1,5	0,42	2,4	0,86	4,8
250	0,2	0,8	0,17	0,05	1750	−25	6,7	0,45	2,7	0,75	4,4	1,46	8,8
250	0,1	0,4	1,6	0,45	1000	0	85	0,035	0,8	0,059	1,3	0,118	2,5
250	0,1	0,4	1,22	0,36	1000	−5	36	0,083	0,8	0,14	1,4	0,28	2,7
250	0,1	0,4	0,92	0,28	1000	−10	20	0,15	1,2	0,25	2,1	0,49	4,1
250	0,1	0,4	0,57	0,18	1000	−18	9,2	0,33	1,8	0,55	3,1	1,08	6,1
250	0,1	0,4	0,36	0,11	1000	−25	5,5	0,55	2,8	0,91	4,8	1,83	9,5

GRENSWAARDEN

Anodespanning in kouden toestand	V_{ao}	= max.	550 V
Anodespanning	V_a	= max.	300 V
Anodedissipatie	W_a	= max.	2 W
Schermroosterspanning in kouden toestand	V_{g2o}	= max.	550 V
Schermroosterspanning bij $I_a < 3$ mA	V_{g2}	= max.	300 V
Schermroosterspanning bij $I_a = 6$ mA	V_{g2}	= max.	125 V
Schermroosterdissipatie	W_{g2}	= max.	0,3 W
Kathodestroom	I_k	= max.	10 mA
Beginpunt van roosterstroom ($I_{g1} = +3$ µA)	V_{g1}	= max.	—1,3 V
Max. uitwendige weerstand tusschen rooster en kathode	R_{g1k}	= max.	3 MΩ
Max. uitwendige weerstand tusschen gloeidraad en kathode	R_{fk}	= max.	20 000 Ω
Max. spanning tusschen gloeidraad en kathode	V_{fk}	= max.	50 V

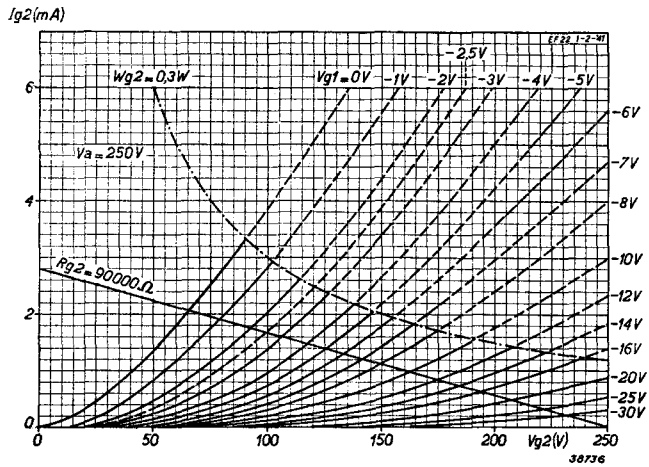


Fig. 8
Schermroosterstroom als functie van de schermroosterspanning bij $Va = 250$ V met de negatieve roosterspanning als parameter. In de kromme is tevens de belastinglijn voor den schermrooster-serieweerstand $Rg_2 = 90\,000\ \Omega$ geteekend.

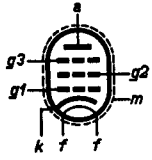
PHILIPS

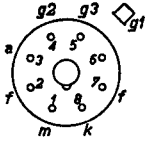
EF 39

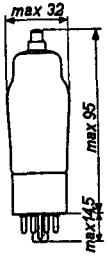
PENTODE with variable mutual conductance for use as R.F., I.F. and A.F. amplifier
PENTHODE à pente variable pour utilisation en amplificatrice H.F., M.F. et B.F.
PENTODE mit veränderlicher Steilheit zur Verwendung als HF-, ZF- und NF-Verstärker

Heating : indirect; series or parallel supply
Chauffage: indirect; alimentation-parallèle ou série — V_f = 6,3 V, I_f = 0,2 A
Heizung : indirekt; Serien- oder Parallelspeisung

Dimensions in mm
Dimensions en mm
Abmessungen in mm







Base, culot, Sockel: Octal

Capacitances
Capacités
Kapazitäten

C_{g1} = 5,5 pF
C_a = 7,2 pF
C_{ag1} < 0,003 pF

Operating characteristics as R.F. or I.F. amplifier
Caractéristiques d'utilisation en amplificatrice H.F. ou M.F.
Betriebsdaten als HF- oder ZF-Verstärker

V_a =	100		200		250		V
V_{g3} =	0		0		0		V
R_{g2} =	0		60		90		kΩ
R_k =	325		325		325		Ω
V_{g1} =	-2,5	19	-2,5	-39	-2,5	-49	V
V_{g2} =	100	100	100	200	100	250	V
I_a =	6	-	6	-	6	-	mA
I_{g2} =	1,7	-	1,7	-	1,7	-	mA
S =	2200	7	2200	5,5	2200	4,5	µA/V
R_i =	0,4	>10	0,9	>10	1,2	>10	MΩ

Operating characteristics for use as A.F. amplifier with resistance coupling and with control of amplification on grid 1
Caractéristiques d'utilisation en amplificatrice B.F. avec couplage à résistances avec réglage de l'amplification sur la grille 1
Betriebsdaten zur Verwendung als NF-Verstärker mit Widerstandskopplung und Regelung auf Gitter 1

A. V_b = 250 V; R_a = 0,2 MΩ; R_{g2} = 0,8 MΩ; R_k = 1750 Ω

$-V_R$ (V)	I_a (mA)	I_{g2} (mA)	$\frac{V_o}{V_i}$	d_{tot} (%) (V_o=3Veff)	d_{tot} (%) (V_o=5Veff)	d_{tot} (%) (V_o=10Veff)
0	0,87	0,26	106	0,8	2,4	2,7
5	0,69	0,21	40	0,8	2,4	2,7
10	0,55	0,17	23	1,1	1,9	3,7
18	0,37	0,11	12	1,5	2,4	4,8
25	0,17	0,05	6,7	2,7	4,4	8,8

B. V_b = 250 V; R_a = 0,1 MΩ; R_{g2} = 0,4 MΩ; R_k = 1000 Ω

$-V_R$ (V)	I_a (mA)	I_{g2} (mA)	$\frac{V_o}{V_i}$	d_{tot} (%) (V_o=3Veff)	d_{tot} (%) (V_o=5Veff)	d_{tot} (%) (V_o=10Veff)
0	1,60	0,45	85	0,8	1,3	2,5
5	1,22	0,36	36	0,8	1,4	2,7
10	0,92	0,28	20	1,2	2,1	4,1
18	0,57	0,18	9,2	1,8	3,1	6,1
25	0,36	0,11	5,5	2,8	4,8	9,5

This tube can be used without special precautions against microphonic effect in circuits in which the input voltage $V_i \geq 10$ mV for an output of 50 mW of the output tube
Ce tube peut être utilisé sans précautions spéciales contre l'effet microphonique dans des circuits dont la tension d'entrée $V_i \geq 10$ mV pour une puissance de 50 mW du tube de sortie
Diese Röhre darf ohne spezielle Massnahmen gegen Mikrophonie verwendet werden in Schaltungen die für eine Eingangsspannung $V_i \geq 10$ mV eine Leistung von 50 mW der Endröhre ergeben

Limiting values
Caractéristiques limites
Grenzdaten

V_{a_o}	= max. 550 V	I_k	= max. 10 mA
V_a	= max. 300 V	V_{g2_o}	= max. 550 V
W_a	= max. 2 W	V_{g2}(I_a=6mA)	= max. 125 V
R_{g1}	= max. 3 MΩ	V_{g2}(I_a<3mA)	= max. 300 V
V_{kf}	= max. 100 V	W_{g2}	= max. 0,3 W
R_{kf}	= max. 20 kΩ	V_{g1}(I_{g1}=+0,3μA)	= max. -1,3 V

PHILIPS

Electronic Tube

HANDBOOK

EF39

page	sheet	date
1	1	1953.11.11
2	2	1953.11.11
3	FP	1999.06.28

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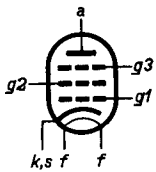
EF 40

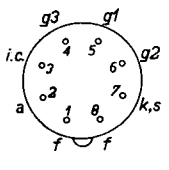
PENTODE for use as A.F. amplifier
PENTHODE pour utilisation en amplificatrice B.F.
PENTODE zur Verwendung als NF-Verstärker

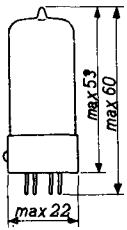
Heating : indirect by A.C. or D.C.; series or parallel supply
Chauffage: indirect par C.A. ou C.C.; alimentation- parallèle ou série
Heizung : indirekt durch Wechsel-oder Gleichstrom; Serien- oder Parallelspeisung

V_f = 6,3 V
I_f = 0,2 A

Dimensions in mm
Dimensions en mm
Abmessungen in mm







Base, culot, Sockel: Rimlock

Capacitances
Capacités
Kapazitäten

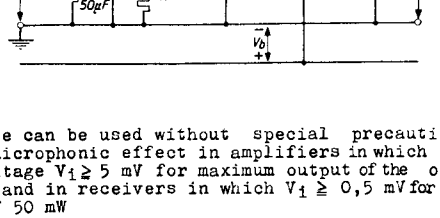
C_{g1}	=	4,5 pF
C_a	=	5,2 pF
C_{ag1}	<	0,04 pF
C_{g1f}	<	0,002 pF

Typical characteristics
Caractéristiques types
Kenndaten

V_a	=	250 V
V_{g3}	=	0 V
V_{g2}	=	140 V
V_{g1}	=	-2 V
I_a	=	3,0 mA
I_{g2}	=	0 55 mA
S	=	1,85 mA/V
μ_{g2g1}	=	38
R_i	=	2,5 MΩ
R_{eq} {A.F. / B.F. / NF}	=	40 kΩ

Operating characteristics as R.C. coupled pentode A.F. amplifier
Caractéristiques d'utilisation en amplificatrice B.F. à couplage par résistances en montage penthode
Betriebsdaten als Widerstandsgekoppelter NF-Verstärker in Pentodenschaltung

V_b		=	250	250	250	100 V
R_a		=	0,1	0,22	0,22	0,22 MΩ
R_{g2}		=	0,39	1,0	1,2	1,2 MΩ
R_{g1}		=	1	1	10	10 MΩ
R_{g1}'		=	0,33	0,68	0,68	0,68 MΩ
R_k		=	1000	2200	0	0 Ω
I_k		=	2,05	0,95	1,07	0,36 mA
g		=	112	180	200	130
d_{tot}	(V_o= 4Veff)	=	0,3	0,5	<1	1,2 %
	(V_o= 8Veff)	=	0,6	1,0	<1	1,8 %
	(V_o=12Veff)	=	0,8	1,4	<1	3,0 %



This tube can be used without special precautions against microphonic effect in amplifiers in which the input voltage $V_i \geq 5$ mV for maximum output of the output tube and in receivers in which $V_i \geq 0,5$ mV for an output of 50 mW

Ce tube peut être utilisé sans précautions spéciales contre l'effet microphonique dans des amplificateurs dont la tension d'entrée $V_i \geq 5$mV pour la puissance maximum du tube de sortie et dans des récepteurs dont $V_i \geq 0,5$ mV pour une puissance de 50 mW

Diese Röhre darf ohne spezielle Massnahmen gegen Mikrophonie verwendet werden in Kraftverstärker die maximale Leistung der Endröhre ergeben für eine Eingangsspannung $V_i \geq 5$ mV und in Empfängern die eine Ausgangsleistung von 50 mW ergeben für $V_i \geq 0,5$ mV

Operating characteristics as triode connected R.C. coupled A.F. amplifier (g2 connected to anode)
Caractéristiques d'utilisation en amplificatrice B.F. à couplage par résistances en montage triode (g2 reliée à l'anode)
Betriebsdaten als Widerstandsgekoppelter NF-Verstärker in Triodenschaltung (g2 verbunden mit anode)

A. R_a = 0,047 MΩ; R_{g1}' = 0,15 MΩ; R_k = 1200 Ω

V_b (V)	400	350	300	250	200
I_a (mA)	3,7	3,2	2,7	2,3	1,85
g	24,5	24,5	24	23,5	23,5
V_o (V_{eff})[1])	64	53	43	32	22
d_{tot}(%) [1])	4,5	4,0	3,8	3,5	3,1

B. R_a = 0,1 MΩ; R_{g1}' = 0,33 MΩ; R_k = 2200 Ω

V_b (V)	400	350	300	250	200
I_a (mA)	2,0	1,7	1,5	1,25	1,0
g	28,5	28,5	28,5	28	27,5
V_o (V_{eff})[1])	73	62	50	39	27,5
d_{tot}(%)[1])	4,0	4,0	3,8	3,7	3,3

C. R_a = 0,22 MΩ; R_{g1}' = 0,68 MΩ; R_k = 3900 Ω

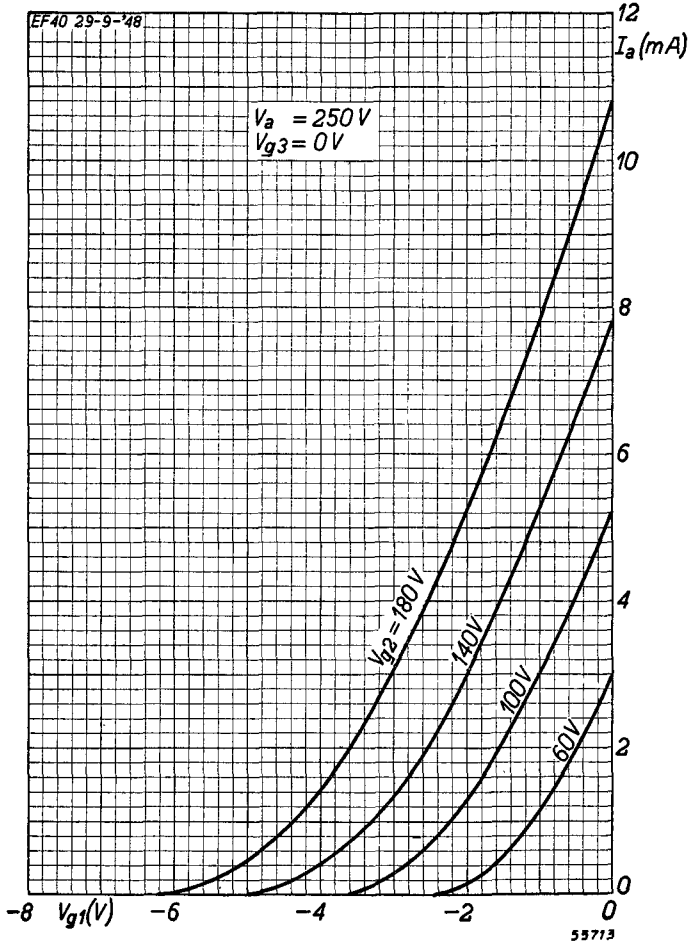
V_b (V)	400	350	300	250	200
I_a (mA)	1,05	0,9	0,8	0,65	0,5
g	32	31,5	31	30,5	30,5
V_o (V_{eff})[1])	74	62	51	39	28
d_{tot}(%)[1])	3,8	3,7	3,7	3,5	3,1

[1]) Output voltage at start of I_{g1} ; the distortion is approximately proportional to the output voltage
Tension de sortie au commencement de I_{g1}; la distorsion est environ proportionnelle à la tension de sortie
Ausgangsspannung beim Einsatz von I_{g1}; die Verzerrung ist etwa proportional zu der Ausgangsspannung

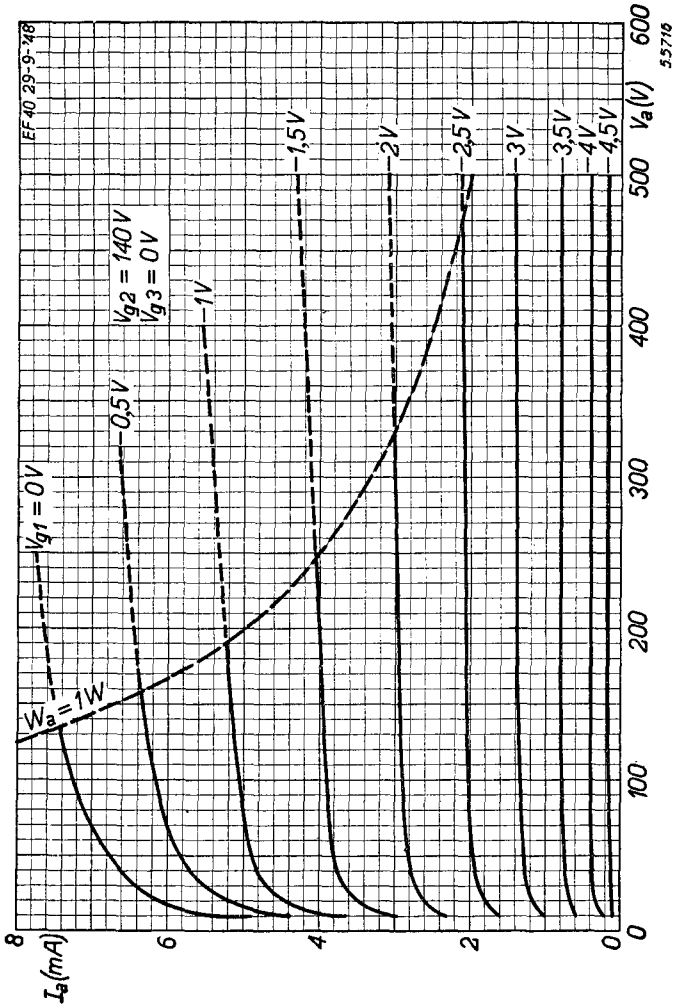
Limiting values
Caractéristiques limites
Grenzdaten

V_{a_o}	= max.	550	V
V_a	= max.	300	V
W_a	= max.	1	W
V_{g2_o}	= max.	550	V
V_{g2}	= max.	200	V
W_{g2}	= max.	0,2	W
I_k	= max.	6	mA
$V_{g1}(I_{g1}=+0,3\mu A)$	= max.	-1,3	V
$R_{g1}(W_a < 0,2\ W)$	= max.	10	MΩ
$R_{g1}(W_a > 0,2\ W)$	= max.	3	MΩ[1])
V_{kf}	= max.	100	V
R_{kf}	= max.	20	kΩ

[1]) Max. 22 MΩ with grid biasing
Max. 22 MΩ si la polarisation négative de grille est abtenue seulement par moyen de R_{g1}
Max. 22 MΩ wenn die negative Vorspannung nur mittels R_{g1} erhalten wird


EF40 29-9-'48
V_a = 250 V
V_{g3} = 0 V
I_a (mA)
12
10
8
6
4
2
0
V_{g2} = 180 V
140 V
100 V
60 V
−8
V_{g1}(V)
−6
−4
−2
0
55713

EF 40 PHILIPS





EF40

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1	1	1954.06.06
2	2	1954.06.06
3	3	1953.11.11
4	4	1953.11.11
5	A	1948.10.22
6	B	1948.10.22
7	FP	1999.06.28

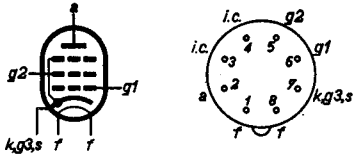
PHILIPS

EF 41

PENTODE with variable mutual conductance for use as R.F. and I.F. amplifier
PENTHODE à pente variable pour l'utilisation comme amplificatrice H.F. et M.F.
PENTODE mit veränderlicher Steilheit zur Verwendung als HF- und ZF-Verstärker

Heating:	indirect by A.C. or D.C.; parallel supply	
Chauffage:	indirect par C.A. ou C.C.; alimentation en parallèle	Vf = 6,3 V
Heizung:	indirekt durch Wechsel- oder Gleichstrom; Parallelspeisung	If = 0,2 A

Dimensions in mm
Dimensions en mm
Abmessungen in mm



Base, culot, Sockel: Rimlock

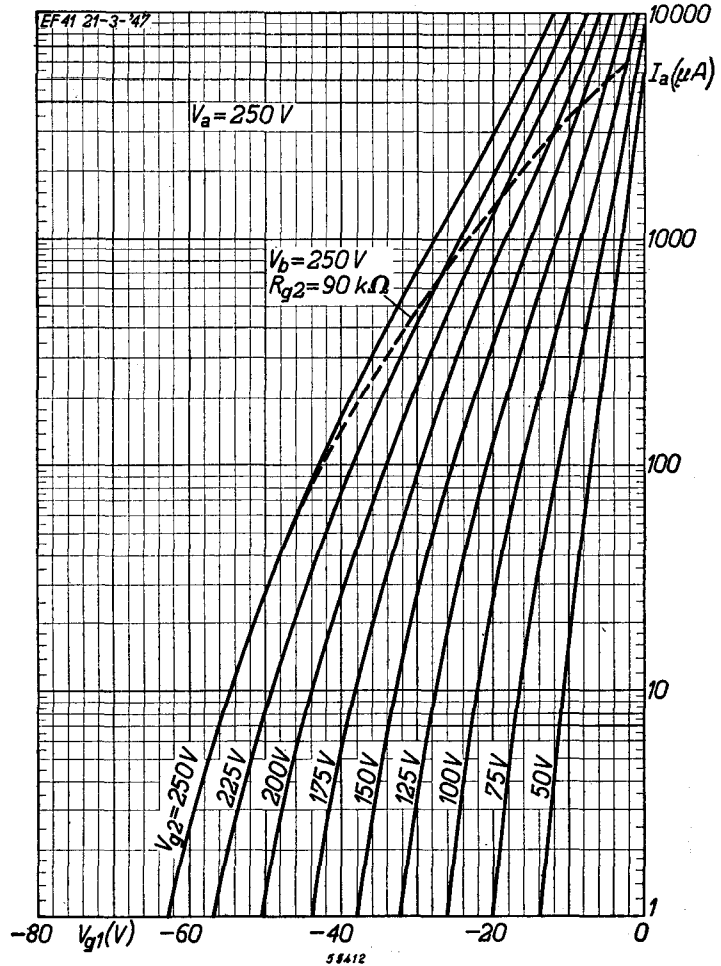
Capacitances Capacités Kapazitäten	C_a	=	5,9 pF
	C_{g1}	=	5,3 pF
	C_{ag1}	<	0,002 pF
	C_{g1f}	<	0,05 pF

Operating characteristics
Caractéristiques d'utilisation
Betriebsdaten

V_a=V_b	=	250		V
R_{g2}	=	90		kΩ
R_k	=	325		Ω
V_{g1}	=	-2,5	-39	V
I_a	=	6,0	-	mA
I_{g2}	=	1,7	-	mA
S	=	2200	22	µA/V
R_i	=	1,1	>10	MΩ
μ_{g2g1}	=	18	-	
R_{eq}	=	6,5	-	kΩ

Limiting values
Caractéristiques limites
Grenzdaten

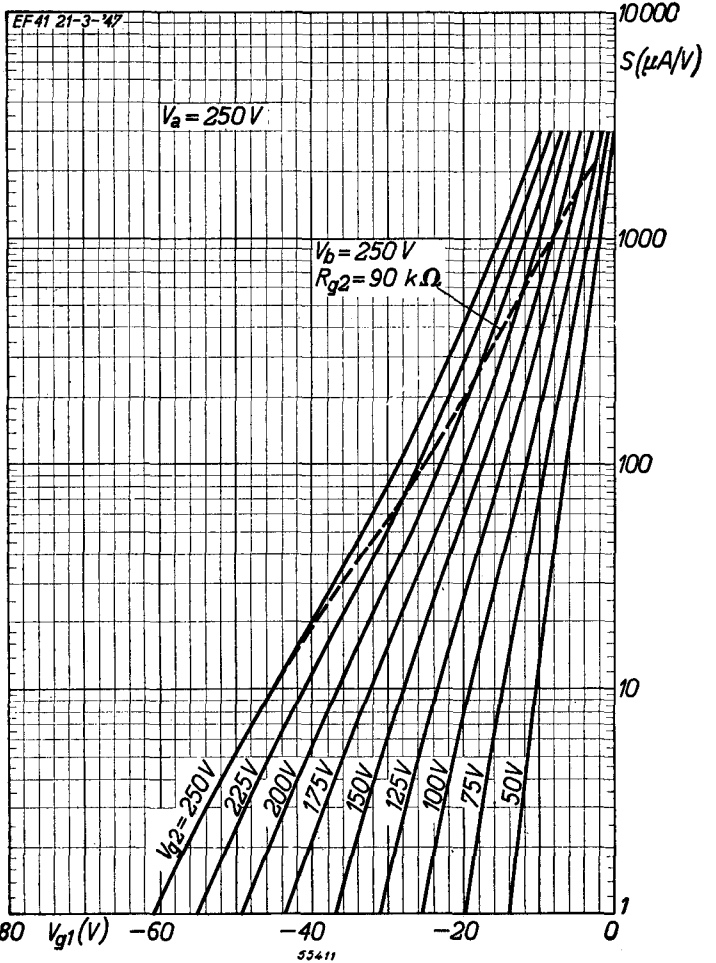
V_{a_o}	= max.	550	V
V_a	= max.	300	V
W_a	= max.	2	W
V_{g2_o}	= max.	550	V
V_{g2} (I_a < 3 mA)	= max.	300	V
V_{g2} (I_a = 6 mA)	= max.	125	V
W_{g2}	= max.	0,3	W
I_k	= max.	10	mA
V_{g1} (I_{g1}= +0,3 µA)	= max.	-1,3	V
R_{g1}	= max.	3	MΩ
R_{kf}	= max.	20	kΩ
V_{kf}	= max.	100	V


EF41 21-3-'47
V_a=250 V
V_b=250 V
R_{g2}=90 kΩ
I_a(μA)
10000
1000
100
10
1
V_{g2}=250V
225V
200V
175V
150V
125V
100V
75V
50V
−80
V_{g1}(V)
−60
−40
−20
0
5841.2

1.9.1948

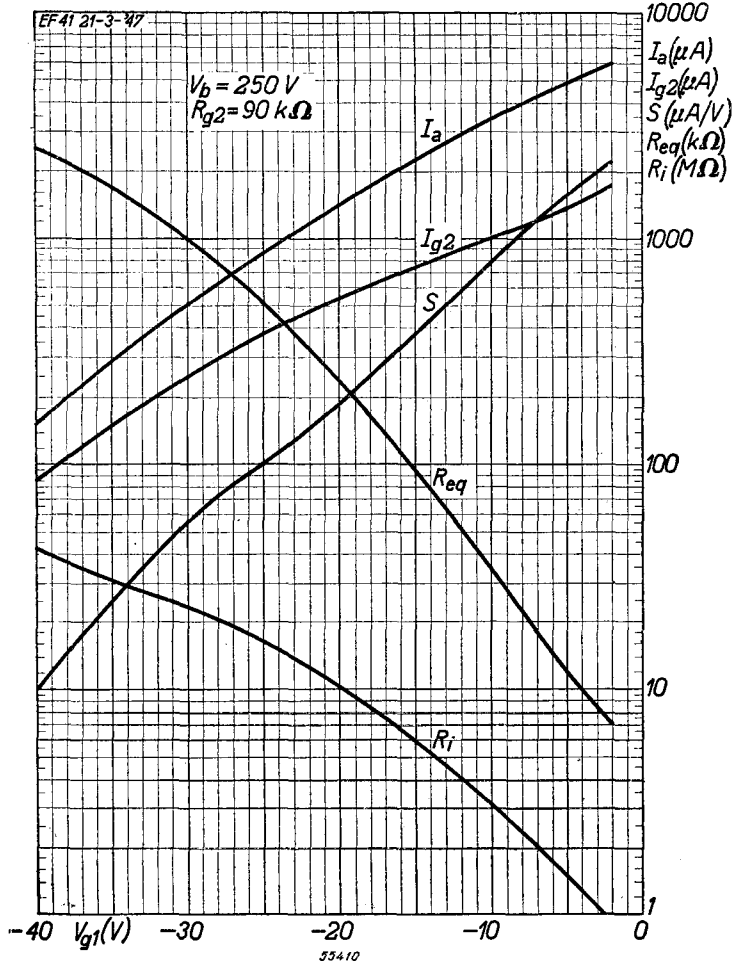
A

EF 41 PHILIPS



1.9.1948

B

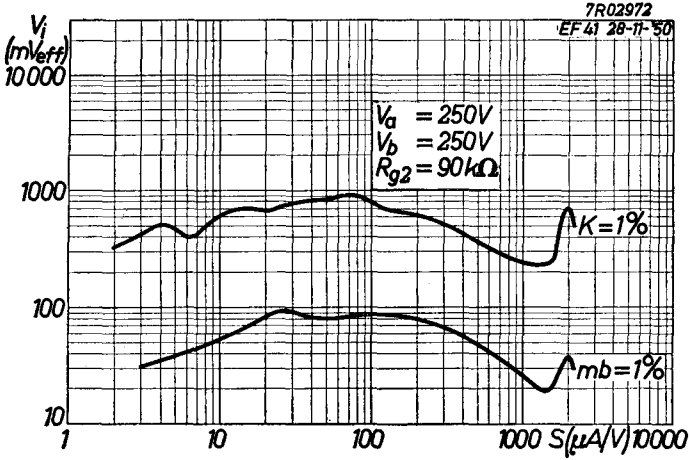

EF 41 21-3-47
V_b = 250 V
R_{g2} = 90 kΩ
I_a
I_{g2}
S
R_{eq}
R_i
10000
I_a(μA)
I_{g2}(μA)
S (μA/V)
R_{eq}(kΩ)
R_i (MΩ)
1000
100
10
1
−40
V_{g1}(V)
−30
−20
−10
0
55410

12.12.1950

C

EF 41 **PHILIPS**

D


7R02972
EF 41 28-11-50
V_i (mV_{eff})
10000
1000
100
10
1
10
100
1000 S(μA/V) 10000
V_a = 250V
V_b = 250V
R_{g2} = 90kΩ
K=1%
mb=1%

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Electronic Tube

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EF41

page	sheet	date
1	1	1953.10.10
2	2	1953.10.10
3	A	1948.09.01
4	B	1948.09.01
5	C	1950.12.12
6	D	1950.12.12
7	E	1957.10.10
8	FP	1999.06.28

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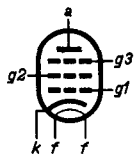
EF42

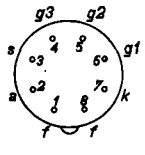
R.F. PENTODE for use as wide-band amplifier
PENTHODE H.F. pour utilisation en amplificatrice à large bande
H.F. PENTODE zur Verwendung als Breitbandverstärker

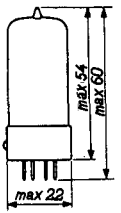
Heating: indirect by A.C. or D.C.; parallel supply
Chauffage: indirect par C.A. ou C.C.; alimentation en parallèle
Heizung: indirekt durch Wechsel- oder Gleichstrom; Parallelspeisung

V_f = 6,3 V
I_f = 0,33 A

Dimensions in mm
Dimensions en mm
Abmessungen in mm







Base, culot, Sockel: RIMLOCK

Capacitances
Capacités
Kapazitäten

C_a	=	4,3 pF
C_{g1}	=	8,5 pF
C_{ag1}	<	0,006 pF
C_{g1f}	<	0,2 pF

Typical characteristics
Caractéristiques types
Kenndaten

V_a	=	250 V
V_{g3}	=	0 V
V_{g2}	=	250 V
V_{g1}	=	-2 V
I_a	=	10 mA
I_{g2}	=	2,4 mA
S	=	9 mA/V
μ_{g2g1}	=	83
R_i	=	0,5 MΩ
R_{eq}	=	840 Ω

Operating characteristics
Caractéristiques d'utilisation
Betriebsdaten

V_a	=	250 V
V_{g3}	=	0 V
V_{g2}	=	250 V
I_a	=	10 mA
f	=	100 Mc/s
Bandwidth Largeur de bande Bandbreite	=	0,8 Mc/s
G	=	1100

Limiting values
Caractéristiques limites
Grenzdaten

V_{a_o}	= max.	550	V
V_a	= max.	300	V
W_a	= max.	3,5	W
V_{g2_o}	= max.	550	V
V_{g2}	= max.	300	V
W_{g2}	= max.	0,7	W
I_k	= max.	25	mA
$-V_{g1}$	= max.	100	V
V_{g1} (I_{g1}=+0,3µA)	= max.	-1,3	V
R_{g1}	= max.	1	MΩ[1])
V_{kf}	= max.	100	V
R_{kf}	= max.	20	kΩ

[1]) With automatic grid bias
A polarisation négative automatique
Mit automatischer negativer Gittervorspannung



EF42

page	sheet	date
1	1	1952.12.12
2	2	1952.12.12
3	FP	1999.06.28

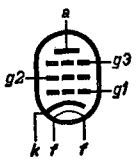
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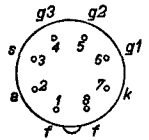
EF 43

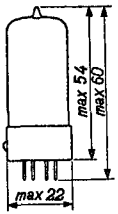
R.F. PENTODE with variable mutual conductance for use as wide-band amplifier
PENTHODE H.F. à pente variable pour utilisation en amplificatrice à large bande
H.F. PENTODE mit veränderlicher Steilheit zur Verwendung als Breitbandverstärker

Heating:	indirect by A.C. or D.C.; parallel supply			
Chauffage:	indirect par C.A. ou C.C.; alimentation en parallèle	V_f	=	6,3 V
Heizung:	indirekt durch Wechsel- oder Gleichstrom; Parallelspeisung	I_f	=	0,33 A

Dimensions in mm
Dimensions en mm
Abmessungen in mm







Base, culot, Sockel: RIMLOCK

Capacitances
Capacités
Kapazitäten

C_a	=	4,5 pF
C_{g1}	=	9,5 pF
C_{ag1}	<	0,006 pF
C_{g1f}	<	0,2 pF

Operating characteristics for use as R.F. or I.F. amplifier
Caractéristiques d'utilisation en amplificatrice H.F. ou M.F.
Betriebsdaten als H.F.- oder Z.F.-Verstärker

V_a=V_b	=	250		V
V_{g3}	=	0		V
R_{g2}	=	33		kΩ
R_k	=	105		Ω
V_{g1}	=	-2	-28	V
V_{g2}	=	135	-	V
I_a	=	15	-	mA
I_{g2}	=	3,5	-	mA
S	=	6,4	0,064	mA/V
R_i	=	0,5	-	MΩ
R_{eq}	=	1,7	-	kΩ

Limiting values
Caractéristiques limites
Grenzdaten

V_{a_o}	= max.	550	V
V_a	= max.	300	V
W_a	= max.	3,75	W
V_{g2_o}	= max.	550	V
V_{g2}	= max.	250	V
W_{g2}	= max.	0,7	W
I_k	= max.	20	mA
V_{g1}(I_g = 0,3μA)	= max.	-1,3	V
R_{g1}	= max.	1	MΩ
R_{kf}	= max.	20	kΩ
V_{kf}	= max.	100	V

PHILIPS

Electronic Tube

HANDBOOK

EF43

page	sheet	date
1	1	1951.04.04
2	2	1951.04.04
3	FP	1999.06.28

EF 5 Variable MU R.F. pentode

The EF 5 is a variable-mu R. F. or I.F. pentode. Special care has been devoted in the design of this valve to the greatest possible reduction in cross-modulation and modulation hum. At a screen-grid voltage of 100 V the anode current of the EF 5 is 8 mA, when the mutual conductance is 1.7 mA/V, the control range being from —3 to —46.5 V. The control range is capable of modification by means of the screen voltage; at lower screen potentials, for the same grid bias, the mutual conductance drops sharply, but the cross-modulation conditions are then not so very good. With a screen voltage of 85 V the control range extends from —2 to —39 V only. Obviously, a lower screen potential will result in a lower screen current as well as a lower anode current and it is thus possible to reduce the bias at the working point from —3 to —2 V to increase the slope; the working value of the mutual conductance is then 1.85 mA/V.

With 60 V screen potential the conductance is still further reduced, to —2/—29 V.

The very greatly diminished modulation hum in this valve is of first importance in A.C./D.C. receivers, where alternating voltages at mains frequency can easily occur between heater and grid. The EF 5 is notable for its low inter-electrode capacitances and high internal resistance; excellent results are obtained on the short-wave range. Although on short waves the circuit magnification is usually only fair, the excellent properties of the EF 5 make it possible to achieve extremely good amplification in this range. On short waves, too, the mutual conductance is the same as on the other ranges (e.g. 200 m). The high impedance of anode and grid with respect to earth in the 12 to 60 metre band, as compared with the impedance values of practical tuned circuits, enables the EF 5 to produce in that range amplification values equal to the product of mutual conductance and impedance. On the short-wave bands the (feed-back) impedance, which takes the place of the anode-to-grid capacitance on the long waves, is unusually high and there is therefore no risk of parasitic oscillation, even with the maximum permissible amount of gain.

A factor contributing in no small degree towards the high properties of this valve is the use of side contacts (P-type

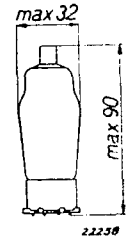
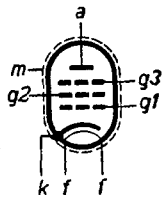


Fig. 1
Dimensions in mm.



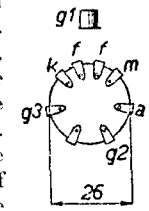


Fig. 2
Arrangement of electrodes and base connections.

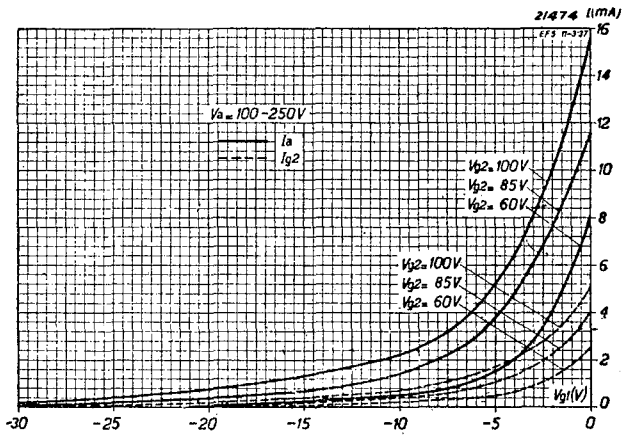


Fig. 3
Anode current and screen current as a function of the grid bias, for different values of screen potential, at 250 V anode. The curves also apply as an approximation to anode voltages of 100–250 V.

base). The suppressor grid and metallizing, each with their own individual contacts, can be connected direct to earth to give the best possible results with short-wave reception.

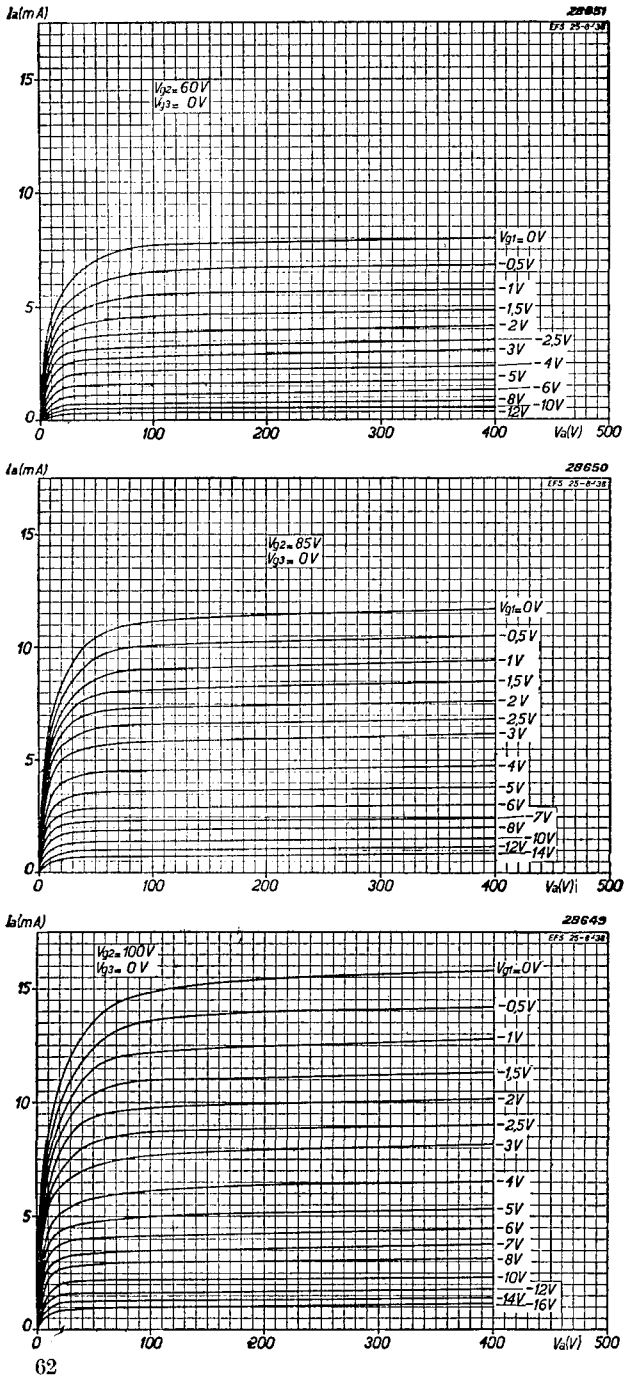


Fig. 4
Anode current as a function of the anode voltage, for different values of screen potential and grid bias.

HEATER RATINGS

Heating: indirect, A.C. or D.C., series or parallel supply

Heater voltage	$V_f = 6.3$ V
Heater current	$I_f = 0.200$ A

CAPACITANCES

$C_{ag_1} < 0.003$ $\mu\mu$F
$C_{g_1} = 5.4$ $\mu\mu$F
$C_a = 6.9$ $\mu\mu$F

OPERATING DATA: valve employed as R.F. or I.F. amplifier

Anode voltage									
V_a (V)		100			200			250	
Screen-grid voltage									
V_{g_2} (V)		100			100			100	
Suppressor-grid voltage									
V_{g_3} (V)		0			0			0	
Cathode resistor									
R_k (ohms)		170			180			180	
Grid bias									
V_{g_1} (V)	-2.85[1]	-34[2]	-46.5[3]	-2.95[1]	-34[2]	-46.5[3]	-3[1]	-34[2]	-46.5[3]
Anode current									
I_a (A)	8	—	—	8	—	—	8	—	—
Screen current									
I_{g_2} (mA)	2.6	—	—	2.6	—	—	2.6	—	—
Mutual conductance									
S (μA/V)	1700	17	2	1700	17	2	1700	17	2
Amplification factor									
μ	500	—	—	1600	—	—	2000	—	—
Internal resistance									
R_i (M ohms)	0.3	> 10	> 10	0.95	> 10	> 10	1.2	> 10	> 10

Anode voltage									
V_a (V)		100			200			250	
Screen-grid voltage									
V_{g_2} (V)		85			85			85	
Suppressor-grid voltage									
V_{g_3} (V)		0			0			0	
Cathode resistor									
R_k (ohms)		190			195			200	
Grid bias									
V_{g_1} (V)	-1.9[1]	-29[2]	-39[3]	-1.95[1]	-29[2]	-39[3]	-2[1]	-29[2]	-39[3]
Anode current									
I_a (mA)	7.5	—	—	7.5	—	—	7.5	—	—
Screen current									
I_{g_2} (mA)	2.45	—	—	2.45	—	—	2.45	—	—
Mutual conductance									
S (μA/V)	1850	18	2	1850	18	2	1850	18	2
Amplification factor									
μ	550	—	—	1750	—	—	2200	—	—
Internal resistance									
R_i (M ohms)	0.3	> 10	> 10	0.95	> 10	> 10	1.2	> 10	> 10

Anode voltage									
V_a (V)		100			200			250	
Screen-grid voltage									
V_{g2} (V)		60			60			60	
Supressor-grid voltage									
V_{g3} (V)		0			0			0	
Cathode resistor									
R_k (ohms)		360			370			380	
Grid bias									
V_{g1} (V)	-1.9[1]	-22[2]	-29[3]	-2.95[1]	-22[2]	-29[3]	-2[1]	-22[2]	29[3]
Anode current									
I_a (mA)	4	—	—	4	—	—	4	—	—
Screen-grid current									
I_{g2} (mA)	1.3	—	—	1.3	—	—	1.3	—	—
Mutual conductance									
S (μA/V)	1400	14	2	1400	14	2	1400	14	2
Amplification factor									
μ	1200	—	—	1900	—	—	2000	—	—
Internal resistance									
R_i (M ohms)	0.85	> 10	> 10	1.35	> 10	> 10	1.4	> 10	> 10

[1]) Without control
[2]) Mutual conductance reduced to one-hundredth of uncontrolled value.
[3]) Extreme limit of control.

MAXIMUM RATINGS

V_{ao}	= max. 550 V
V_a	= max. 250 V
W_a	= max. 2 W
V_{g2o}	= max. 400 V
V_{g2}	= max. 125 V
W_{g2}	= max. 0.4 W
I_k	= max. 15 mA
V_{g1} (I_{g1} = +0.3 μA)	= max. —1.3 V
R_{g1}	= max. 2.5 M ohms
R_{fk}	max. 20,000 ohms
V_{fk}	= max. 100 V [1])

[1]) Direct voltage or effective value of alternating voltage.

Due to the curvature of the characteristic, the uses of the EF 5 are restricted to R.F. and I.F. amplification. It can be employed as amplifier with either automatic or manual control. It is preferable to feed the screen through a potential divider; in many cases it would be found when using a series resistor that the screen voltage would become too high on full control and that the amplification control would be far too tardy.

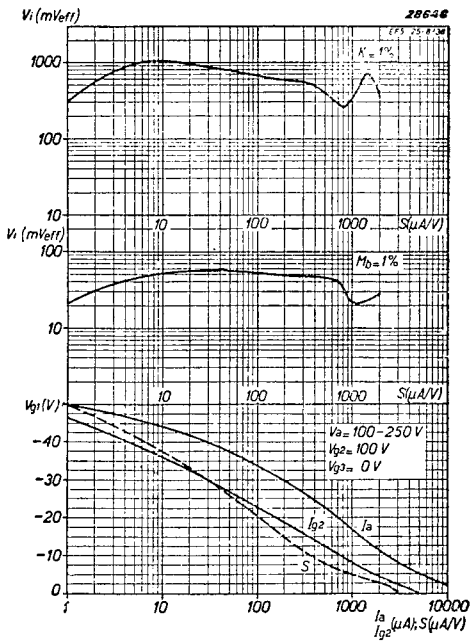


Fig. 5
At 100–250 V anode and 100 V screen;
Upper diagram. Alternating grid voltage as a function of the mutual conductance, with 1 % cross modulation.
Centre diagram. Alternating grid voltage as a function of the mutual conductance, with 1 % modulation hum.
Lower diagram. Mutual conductance S, anode current Ia and screen current Ig_2 as a function of the voltage on the first grid.

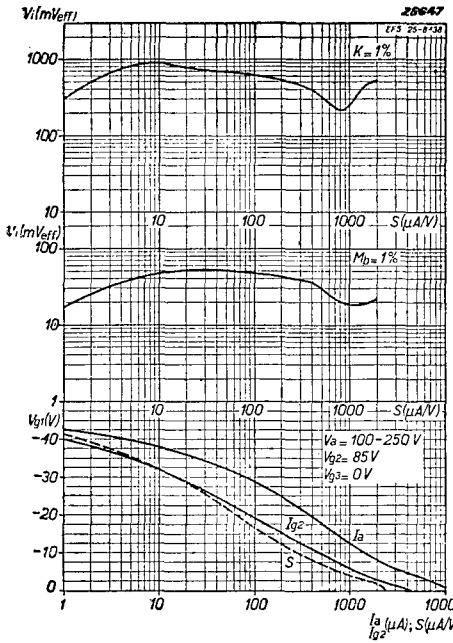


Fig. 6
At 100–250 V anode and 85 V screen;
Upper diagram. Effective alternating grid voltage as a function of the mutual conductance, with 1 % cross modulation.
Centre diagram. Effective alternating grid voltage as a function of the mutual conductance, with 1 % modulation hum.
Lower diagram. Mutual conductance S, anode current Ia and screen current Ig_2 as a function of the grid bias.

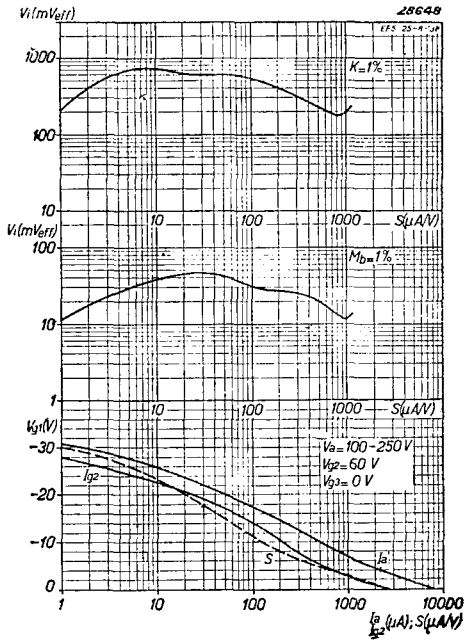


Fig. 7
At 100–250 V anode and 60 V screen:
Upper diagram. Effective alternating grid voltage as a function of the mutual conductance, with 1 % cross-modulation.
Centre diagram. Effective alternating grid voltage as a function of the mutual conductance, with 1 % modulation hum.
Lower diagram. Mutual conductance S, anode current Ia and screen current Ig_2 as a function of the grid bias.

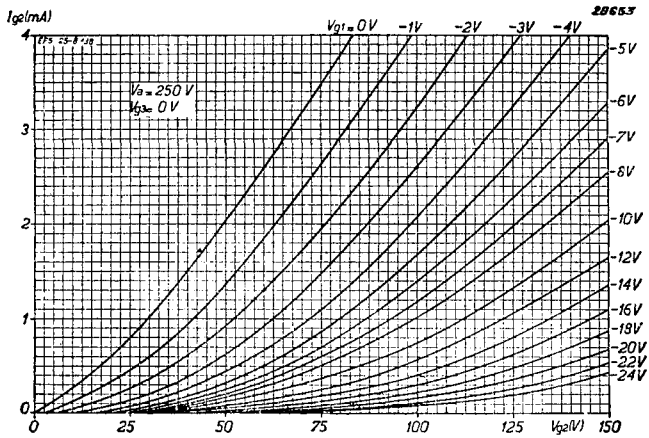


Fig. 8
Screen-grid current as a function of the screen voltage, for different values of grid bias.

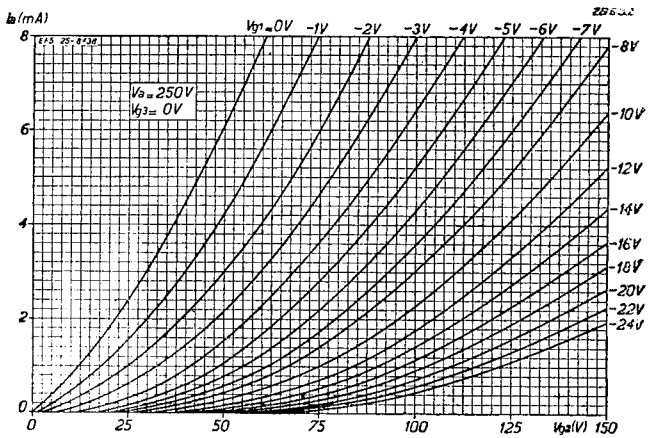


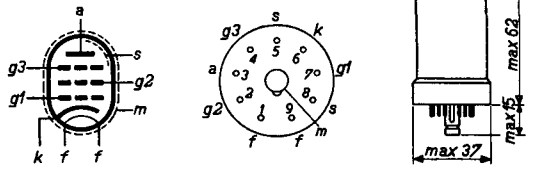
Fig. 9
Anode current as a function of the screen-grid voltage, for different values of grid bias.

PENTODE for use as wide band and measuring amplifier
PENTHODE pour utilisation comme amplificatrice à large bande et de mesure
PENTODE zur Verwendung als Breitband- und Messverstärker

Heating: indirect by A.C. or D.C.; parallel supply
Chauffage: indirect par C.A. ou C.C.; alimentation en parallèle
Heizung: indirekt durch Wechsel- oder Gleichstrom; Parallelspeisung

V_f = 6,3 V
I_f = 0,3 A

Dimensions in mm
Dimensions en mm
Abmessungen in mm



Base, culot, Sockel: Loctal 9 p.(B9G)

Capacitances
Capacités
Kapazitäten

C_a = 5,2 pF
C_{g1} = 8,3 pF
C_{ag1} < 0,007 pF
C_{g1f} < 0,01 pF

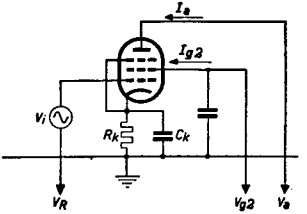
Damping resistances
Résistances d'amortissement
Dämpfungswiderstände
(λ = 6 m ; I_a=10 mA)

r_{g1} = 4 kΩ
r_a = 50 kΩ

The grid damping rg1 is inversely proportional to the square of the frequency
L'amortissement de grille rg1 est inversement proportionnel au carré de la fréquence
Die Gitterdämpfung rg1 ist umgekehrt proportional dem Quadrate der Frequenz

Operating characteristics
Caractéristiques d'utilisation
Betriebsdaten

$V_a=V_{g2}$	=	250		V
V_{g3}	=	0		V
R_k	=	32		Ω
C_k	=	50		pF
V_R	=	-1,55	- 4,5	V
I_a	=	10	-	mA
I_{g2}	=	3	-	mA
S	=	6,5	0,65	mA/V
R_i	=	1	-	MΩ



Limiting values
Caractéristiques limites
Grenzdaten

V_{ao}	= max.	550	V
V_a	= max.	300	V
W_a	= max.	3	W
V_{g2o}	= max.	550	V
V_{g2}	= max.	300	V
W_{g2}	= max.	1,7	W
I_k	= max.	15	mA
V_{g1} (I_{g1} = +0,3 µA)	= max.	-1,3	V
V_{g3} (I_{g3} = +0,3 µA)	= max.	-1,3	V
R_{g1}	= max.	3	MΩ
R_{g3}	= max.	3	MΩ
V_{fk}	= max.	100	V
R_{fk}	= max.	20	kΩ

PHILIPS

Electronic Tube

HANDBOOK

EF50

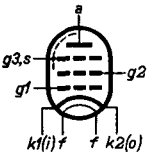
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1	1	1953.04.04
2	2	1953.04.04
3	FP	1999.06.28

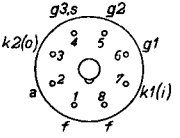
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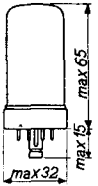
EF 51

H.F. PENTODE FOR ULTRA SHORT WAVE AMPLIFICATION
PENTHODE H.F. POUR L'AMPLIFICATION EN ONDES ULTRA COURTES
H.F. PENTHODE FÜR ULTRAKURZWELLENVERSTÄRKUNG

Heating Chauffage par. Heizung	Vf If	6,3 0,35	V A







Capacities Capacités Kapazitäten	Cag1	< 0,007	pF
	Ca	4	pF
	Cg1	10	pF
	Cg1f	< 0,02	pF

Damping resistances Résistances d'amortissement Dämpfungswiderstände	(Vg2 = 250 V, Ia = 14 mA, λ = 3 m)		
Input Entrée Eingang	Rg1	15	kΩ
Output Sortie Ausgang	Ra	100	kΩ

General information
Information générale
Allgemeine Auskunft

Va	250		V
Vg2	250		V
Vg3	0		V
Vg1	-2	-8	V
Ia	14	-	mA
Ig2	2,6	-	mA
S	9,5	0,1	mA/V
Ri	0,5	> 5	MΩ
μg2g1	65	-	
Raeq	1000	-	Ω

Max. ratings
Limites fixées
Grenzdaten

Vao	550	V
Va	300	V
Wa	4,5	W
Vg2o	550	V
Vg2	300	V
Wg2	1	W
Ik	20	mA
Vg1(Ig1=+0,3μA)	-1,3	V
Rg1k	1,0	MΩ
Rfk	20	kΩ
Vfk	50	V

1) These data vary somewhat with the used circuit.
K1 (input) is to be earthed via the cathode resistance
K2 (output) is to be connected to the earthside of the output-circuit via a condenser.
Ces données varient légèrement avec le montage utilisé. K1 (entrée) doit être mis à la terre par l'intermédiaire de la résistance-cathodique; K2 (sortie) doit être connecté avec la terre du circuit de sortie par l'intermédiaire d'un condensateur.
Diese Daten sind einigermassen von der verwendeten Schaltung abhängig. K1 (Eingang) ist mittels eines Kathodenwiderstandes zu erden; K2 (Ausgang) mittels eines Kondensators mit der geerdeten Seite des Ausgangskreises zu verbinden.



EF51

page	sheet	date
1	1	1948.05.01
2	2	1948.05.01
3	FP	1999.06.28

PHILIPS

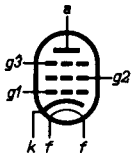
EF55

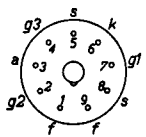
PENTODE for use as video amplifier
PENTHODE pour utilisation comme amplificatrice vidéo
PENTHODE zur Verwendung als Bildverstärker

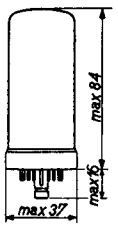
Heating: indirect by A.C. or D.C.; parallel supply
Chauffage: indirect par C.A. ou C.C.; alimentation en parallèle
Heizung: indirekt durch Wechsel- oder Gleichstrom; Parallelspeisung

Vf = 6,3 V
If = 1,0 A

Dimensions in mm
Dimensions en mm
Abmessungen in mm







Base, culot, Fuss: B9G

Mounting position: If the valve is mounted horizontally, pins 4 and 8 must be in a vertical plane
Montage: Si le tube est monté horizontalement, il faut que les broches 4 et 8 se trouvent dans le même plan vertical
Aufstellung: Wenn die Röhre waagerecht aufgestellt ist, müssen sich die Stifte 4 und 8 in derselben senkrechten Ebene befinden

Capacitances
Capacités
Kapazitäten

C_{ag1} = 0,15 pF
C_a = 12 pF
C_{g1} = 15 pF

Typical characteristics
Caractéristiques typiques
Kenndaten

V_a	=	250	250	V
V_{g2}	=	250	150	V
V_{g1}	=	-4,5	-4,0	V
V_{g3}	=	0	0	V
I_a	=	40	10	mA
I_{g2}	=	5,5	1	mA
R_k	=	100	360	Ω
S	=	12	7	mA/V
μ_{g2g1}	=	28	27	
R_i		55	100	kΩ

Limiting values
Caractéristiques limites
Grenzdaten

V_{a_o}	= max.	500	V
V_a	= max.	300	V
W_a	= max.	10	W
V_{g2_o}	= max.	300	V
V_{g2}	= max.	250	V
W_{g2}	= max.	2	W
I_{k_p}	= max.	1,5	A[1])
R_{g1}	= max.	0,7	MΩ
V_{kf}	= max.	150	V

[1]) With 500 pulses of 50 µsec each per second
Avec 500 impulsions de 50 µsec par seconde
Mit 500 Impulsen von je 50µSek je Sekunde



EF55

page	sheet	date
1	1	1950.03.03
2	2	1950.03.03
3	FP	1999.06.28

EF 6 Pentode

This valve is particularly suitable for A.F. amplification and either anode-bend or grid detection. The EF 6 works only on a fixed bias and therefore finds no application in practice as an R.F. or I.F. amplifier. The degree of A.F. amplification, however, is very high indeed, the ultimate signal voltage on the anode being so great that practically distortionless modulation is possible in any kind of output stage. Used as a grid detector, this valve has many advantages when good reception of local stations is required.

It is also a very useful valve in special circuits, for instance as an amplifier for the control voltage in an automatic gain control circuit and so on. The EF 6 will also give very good results on the short-wave ranges, where the mutual conductance is the same as in the broadcast wave-bands.

As the R.F. impedance of anode and grid in the 12 to 60 m range, with respect to the impedance of normal tuned circuits, is extremely high, the gain obtainable from this valve is equal to the product of mutual conductance and impedance. In the short-wave range, the impedance, which replaces the anode-to-grid capacitance on long waves (anode feed-back), is also very high, so that the maximum permissible amplification may be obtained without risk of parasitic oscillation.

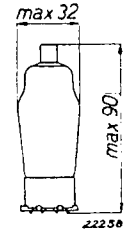
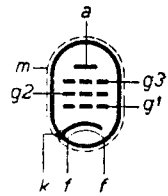


Fig. 1
Dimensions in mm.



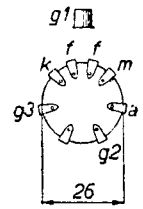


Fig. 2
Arrangement of electrodes and base connections.

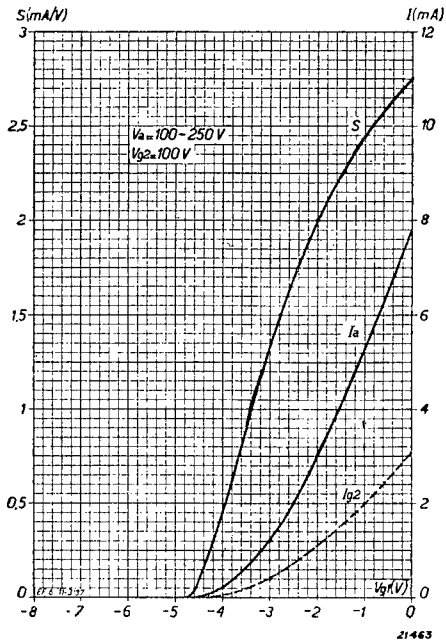


Fig. 3
Anode current, screen-grid current and mutual conductance as a function of the grid bias at $V_{g_2} = 100$ V. The curves also apply as an approximation at all anode voltages from 100 V upwards.

In part, the excellent short-wave qualities of the EF 6 are due to the use of the P-type side-contact base and separate suppressor-grid connection. Cross-modulation and modulation hum are both very slight indeed, especially at the maximum permissible screen-grid voltage and, for this reason, the valve gives good results in A.C./D.C. receivers; in view of the high alternating voltages occurring between the heater and earth, and induced on the grid, in this type of receiver it is important that modulation hum should be as low as possible.

HEATER RATINGS

Heating, indirect, A.C. or D.C., parallel supply.

Heater voltage	V_f	= 6.3 V
Heater current	I_f	= 0.200 A

CAPACITANCES

C_{ag_1}	< 0.003	$\mu\mu$F
C_{g_1}	= 5.2	$\mu\mu$F
C_a	= 6.9	$\mu\mu$F

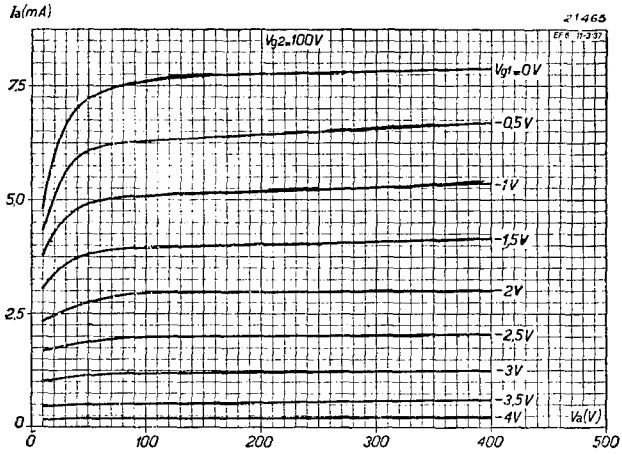


Fig. 4
Anode current as a function of the anode voltage at V_{g_2} = 100 V, for different values of grid bias.

OPERATING DATA

Anode voltage	V_a =	100 V	200 V	250 V
Screen-grid voltage	V_{g_2} =	100 V	100 V	100 V
Suppressor-grid voltage	V_{g_3}	0 V	0 V	0 V
Grid bias	V_{g_1} =	—2 V	—2 V	—2 V
Anode current	I_a =	3 mA	3 mA	3 mA
Screen grid current	I_{g_2} =	0.8 mA	0.8 mA	0.8 mA
Amplification factor	μ =	1800	3600	4500
Mutual conductance	S =	1.8 mA/V	1.8 mA/V	1.8 mA/V
Internal resistance	R_i =	1.0 M ohm	2.0 M ohms	2.5 M ohms

MAXIMUM RATINGS

V_{ao}	= max. 550 V
V_a	= max. 300 V
W_a	= max. 1 W
$V_{g_{2o}}$	= max. 550 V
V_{g_2}	= max. 125 V
W_{g_2}	= max. 0.3 W
I_k	= max. 6 mA
V_{g_1} (I_{g_1} = + 0.3 μA)	= max. —1.3 V
R_{g_1k} (auto. grid bias)	= max. 1.5 M ohms
R_{g_1k} (fixed bias)	= max. 1 M ohm
R_{fk}	= max. 20,000 ohms
V_{fk}	= max. 75 V [1]

[1]) Direct voltage or effective value of alternating voltage.

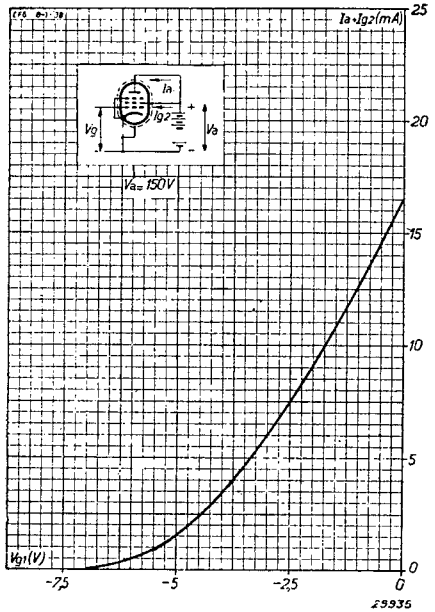


Fig. 5
EF 6 employed as triode. Anode current as a function of the grid bias for V_a = 150 V.

The valve is metallized and no additional screening is necessary, but the separate base contact to which the metallizing is connected internally must be effectively connected to the chassis. If in special circuits the cathode is negative with respect to the chassis, the metallizing should be connected to the cathode. The suppressor grid also has its own separate base contact for direct connection to earth.

Care must be taken when using the EF 6 as detector or A.F. amplifier in A.C./D.C. receivers, however, to see that the heater of the valve, in the heater circuit, is connected as closely as possible to the chassis end, in order to avoid hum.

1) GRID DETECTOR WITH RESISTANCE COUPLING

For grid detection it is advisable to feed the screen from a resistor and not from a potential divider, since in that case the grid swing will increase with signal strength. In A.C./D.C. receivers for use on 110 V mains the EF 6 is not generally satisfactory, as the output voltage is usually insufficient to load the output valve fully at low modulation depths. Table I gives the results to be obtained with the EF 6 when employed as grid detector.

2) A.F. AMPLIFIER WITH RESISTANCE COUPLING

The EF 6 is eminently suitable for A. F. amplification since it provides considerable gain with only very moderate distortion; the screen should preferably be fed through a resistor, for which a suitable value is indicated in tables II and III.

The A.F. signal applied to the grid must not be too strong, as this tends towards microphony when the loudspeaker used is of a sensitive type. This valve can be used only in circuits having not more than one stage of A.F. amplification and must therefore in every case be followed immediately by the output valve.

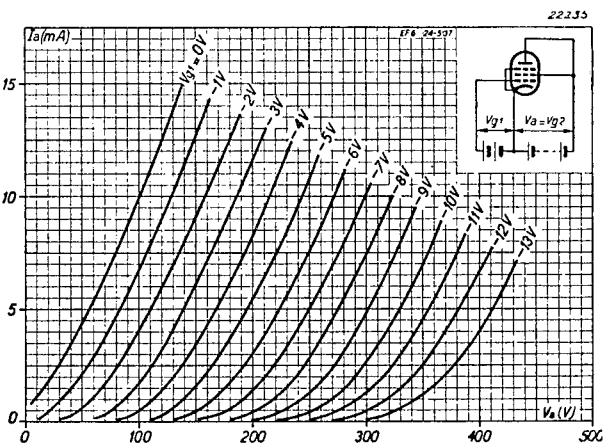


Fig. 6
EF 6 employed as triode. Anode current as a function of the anode voltage, for different values of grid bias.

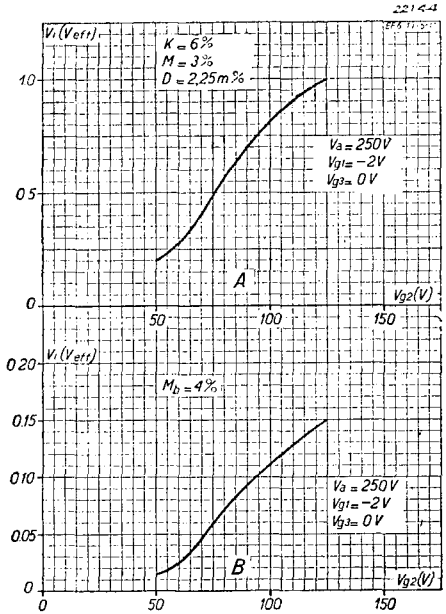


Fig. 7
Curve A: Effective alternating grid voltage as a function of the screen-grid voltage of the EF 6, with 6 % cross-modulation (3 % increase in modulation depth + 2.25 m % modulation distortion, m = modulation depth). 6 % cross-modulation corresponds to 0.5 % third harmonic.
Curve B. Effective value of the alternating grid voltage as a function of the screen-grid voltage with 4 % modulation hum (corresponding to 1 % second harmonic).

Generally speaking, the A.F. sensitivity at the grid of the EF 6 should not be less than 5 mV.

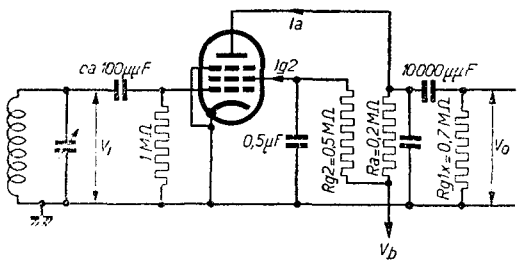


Fig. 8
Circuit driagram of the EF 6 employed as grid detector with resistance coupling.

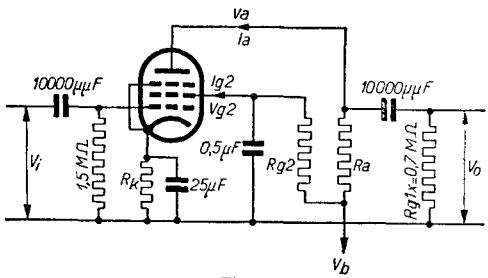


Fig. 9
Circuit diagram of the EF 6 employed as A. F. amplifier with resistance coupling.

TABLE I

EF 6 employed as grid detector with resistance coupling in A.C. receivers.

Heaters fed in parallel in A.C. receivers; detector grid leak = 1 megohm; grid capacitor = 100 $\mu\mu$F. Grid leak of next (output) valve Rg_1x = 0.7 megohm. Modulation depth m = 0.3 (30 %). Screen fed through series resistor; Ia and Ig_2 measured without signal.

Supply voltage	Anode Coupling res.	Anode current	Screen-grid series resistor	Screen current	Max. alternating output	Used with EL 2 as next (output) valve. $Va = Vg_2 = 250$ V				Used with EL 3 as next (output) valve. $Va = Vg_2 = 250$ V				Used with EL 5 as next (output) valve. $Va = 250$ V; $Vg_2 = 275$ V			
						For 50 mW output		For full excitation		For 50 mW output		For full excitation		For 50 mW output		For full excitation	
						Output volts	Input volts	Output volts	Input volts	Output volts	Input volts	Output volts	Input volts	Output volts	Input volts	Output volts	Input volts
Vb (V)	Ra (M ohm)	Ia (mA)	Rg_2 (M ohm)	Ig_2 (mA)	Vomax[1] ($Veff$)	Vo ($Veff$)	Vi (m$Veff$)	Vo ($Veff$)	Vi ($Veff$)	Vo ($Veff$)	Vi (m$Veff$)	Vo ($Veff$)	Vi ($Veff$)	Vo ($Veff$)	Vi (m$Veff$)	Vo ($Veff$)	Vi ($Veff$)
300	0.2	1.35	0.6	0.45	19	0.9	63	11.2	0.35	0.33	35	3.7	0.14	0.5	43	8.5	0.27
300	0.2	1.15	0.8	0.35	17	0.9	58	11.2	0.35	0.33	33	3.7	0.13	0.5	41	8.5	0.26
300	0.2	1.0	1.0	0.30	15	0.9	58	11.2	0.42	0.33	33	3.7	0.14	0.5	41	8.5	0.28
250	0.2	1.15	0.6	0.35	16	0.9	60	11.2	0.35	0.33	33	3.7	0.14	0.5	40	8.5	0.27
250	0.2	0.95	0.8	0.28	14	0.9	60	11.2	0.35	0.33	33	3.7	0.13	0.5	40	8.5	0.26
250	0.2	0.8	1.0	0.23	11.5	0.9	65	11.2	0.42	0.33	33	3.7	0.14	0.5	40	8.5	0.28
300	0.1	2.6	0.3	0.85	23	0.9	58	11.2	0.43	0.33	38	3.7	0.14	0.5	50	8.5	0.35
300	0.1	2.2	0.4	0.65	20	0.9	58	11.2	0.43	0.33	38	3.7	0.14	0.5	50	8.5	0.35
300	0.1	1.8	0.5	0.55	17	0.9	58	11.2	0.48	0.33	38	3.7	0.15	0.5	50	8.5	0.35
250	0.1	2.1	0.3	0.7	19	0.9	70	11.2	0.43	0.33	38	3.7	0.14	0.5	50	8.5	0.35
250	0.1	1.8	0.4	0.55	16	0.9	70	11.2	0.43	0.33	38	3.7	0.14	0.5	50	8.5	0.35
250	0.1	1.5	0.5	0.45	14	0.9	70	11.2	0.48	0.33	38	3.7	0.15	0.5	50	8.5	0.35
300	0.05	4.6	0.15	1.5	24	0.9	77	11.2	0.6	0.33	44	3.7	0.25	0.5	56	8.5	0.45
300	0.05	3.9	0.2	1.2	20	0.9	77	11.2	0.6	0.33	44	3.7	0.25	0.5	56	8.5	0.45
300	0.05	2.9	0.3	0.9	15	0.9	79	11.2	0.7	0.33	46	3.7	0.25	0.5	59	8.5	0.60
250	0.05	3.7	0.15	1.3	18	0.9	80	11.2	0.6	0.33	42	3.7	0.25	0.5	55	8.5	0.45
250	0.05	3.1	0.2	1.0	16	0.9	80	11.2	0.6	0.33	42	3.7	0.25	0.5	55	8.5	0.45
250	0.05	2.4	0.3	0.65	12	0.9	84	11.2	0.7	0.33	45	3.7	0.25	0.5	60	8.5	0.60

[1]) In these values for the alternating output the distortion in the detector is less than 5 %.

TABLE II

The EF 6 as resistance-coupled A.F. amplifier in A.C. mains receivers

For use in A.C. mains receivers with heaters in parallel; grid leak of the following (output) valve Rg_1x = 0.7 megohm; cathode decoupling capacitor = 50 μF. Screen grid fed through a resistor; Ia and Ig_2 measured without signal.

Supply voltage	Anode coupling resistor	Anode current	Screen-grid series resistor	Screen-grid current	Cathode resistor	Voltage gain	Used with EL 3 as output valve $Va = Vg_2 = 250$ V		Used with EL 5 as output valve $Va = 250$ V; $Vg_2 = 275$ V		Used with EL 2 as output valve $Va = Vg_2 = 250$ V		Used with AD 1 as output valve $Va = 250$ V	
							Output voltage	Total distortion	Output voltage	Total distortion	Output voltage	Total distortion	Output voltage	Total distortion
Vb (V)	Ra (megohm)	Ia (mA)	Rg_2 (megohm)	Ig_2 (mA)	Rk (ohms)	$\frac{Vo}{Vi}$	Vo [1]) (Veff)	$d$tot [2]) (%)	Vo [1]) (Veff)	$d$tot [2]) (%)	Vo [1]) (Veff)	$d$tot [2]) (%)	Vo [1]) (Veff)	$d$tot [2]) (%)
300	0.3	0.7	0.8	0.25	4,000	175	3.7	< 1.0	8.5	1.0	11.2	1.4	31	4.4
250	0.3	0.6	0.8	0.20	4,000	165	3.7	< 1.0	8.5	1.6	11.2	2.2	31	5.0
300	0.2	1.1	0.4	0.40	3,000	150	3.7	< 1.0	8.5	1.0	11.2	< 1.0	31	2.7
250	0.2	0.9	0.4	0.35	3,000	140	3.7	< 1.0	8.5	1.3	11.2	1.8	31	2.4
300	0.1	1.9	0.25	0.65	1,600	115	3.7	< 1.0	8.5	1.0	11.2	1.0	31	2.0
250	0.1	1.6	0.25	0.30	1,600	110	3.7	< 1.0	8.5	1.0	11.2	1.0	31	2.7

[1]) For the A.F. amplifier with fully loaded output valve.

[2]) In the A.F. amplifier with fully loaded output valve.

TABLE III

The EF 6 used as resistance-coupled A. F. amplifier in A.C./D.C. mains receivers

Used in A.C./D.C. receivers with heaters in series (heater current 200 mA); grid leak of the next (output) valve Rg_{1x} = 0.7 megohm. Cathode decoupling capacitor = 50 μF; screen fed through a resistor. Ia and Ig_2 measured without signal.

Supply voltage	Anode coupling resistor	Anode current	Screen-grid series resistor	Screen current	Cathode resistor	Voltage gain	Used with CL 1 as output valve $Va = Vg_2 =$ supply voltage		Used with CL 2 as output valve $Va =$ supply voltage; $Vg_2 = 100$ V		Used with CL 4 as output valve $Va = Vg_2 =$ supply voltage	
							Output voltage	Total distortion	Output voltage	Total distortion	Output voltage	Total distortion
Vb (V)	Ra (Mohm)	Ia (mA)	Rg_2 (M ohm)	Ig_2 (mA)	Rk (ohm)	$\frac{Vo}{Vi}$	Vo [1]) (Veff)	$d$tot [2]) (%)	Vo [1]) (Veff)	$d$tot [2]) (%)	Vo [1]) (Veff)	$d$tot [2]) (%)
200	0.3	0.45	0.6	0.17	6,400	130	9.6	2.8	10	3.0	5.0	1.8
150	0.3	0.35	0.6	0.13	6,400	120	—	—	10	2.5	4.0	1.3
100	0.3	0.22	0.6	0.08	6,400	105	—	—	10	3.5	2.4	< 1.0
200	0.2	0.60	0.4	0.23	5,000	115	9.6	2.0	10	2.1	5.0	1.0
150	0.2	0.45	0.4	0.17	5,000	110	—	—	10	2.6	4.0	0.9
100	0.2	0.30	0.4	0.12	5,000	100	—	—	10	4.2	2.4	0.9
200	0.1	1.2	0.2	0.4	3,000	95	9.6	1.5	10	1.6	5.0	< 1.0
150	0.1	0.85	0.2	0.3	3,000	90	—	—	10	2.1	4.0	1.1
100	0.1	0.60	0.2	0.2	3,000	85	—	—	10	3.3	2.4	< 1.0

[1]) For the A.F. amplifier with fully loaded output valve.

[2]) In the A.F. amplifier with fully loaded output valve.

EF 8 Rauscharme H.F.-Verstärkerröhre-Selektode

Die Röhre EF 8 ist eine H.F.-Verstärkerröhre mit veränderlicher Steilheit, die sich durch besonders geringes Rauschen kennzeichnet. Da das Rauschen von Schirmgitterröhren und Penthoden hauptsächlich durch die Stromverteilung zwischen Schirmgitter und Anode verursacht wird und ein geringer Schirmgitterstrom in diesem Sinne günstig ist, wurde ein möglichst kleiner Schirmgitterstrom angestrebt. Der Aufbau der EF 8 ist ähnlich wie bei einer Penthode, d.h. die Röhre hat ein Steuergitter, ein Schirmgitter und ein Fanggitter. Zwischen dem Steuergitter und dem Schirmgitter befindet sich jedoch noch ein zusätzliches Gitter, das meistens mit der Kathode verbunden wird und genau dieselbe Steigung hat wie das Schirmgitter. Die Gitterwindungen dieses Zusatzgitters sind genau vor die Windungen des Schirmgitters gelagert. Durch das Zusatzgitter werden die Elektronen auf ihrem Wege zur Anode abgestoßen und in Bündeln vereinigt, die genau durch die Öffnungen im Schirmgitter hindurchgeleitet werden. Es werden auf diese Weise wesentlich weniger Elektronen auf das Schirmgitter auftreffen, als wenn das Zusatzgitter nicht vorhanden wäre. Abb. 3 zeigt den Verlauf der Elektronenbahnen durch die verschiedenen Gitter. Gitter 3 hat die Aufgabe, durch zwei Gitter mit niedrigem Potential (Gitter 1 und 2) genügend Elektronen von der Kathode anzuziehen. Dies kann nur erreicht werden, wenn der Durchgriff von g_3 durch g_2 hindurch groß ist, was eine große Steigung des Gitters 2 und 3 bedeutet. Außerdem ist es aus demselben Grunde erforderlich, die Schirmgitterspannung zu erhöhen. Diese wurde von dem üblichen Wert von 100 Volt auf 250 Volt hinaufgesetzt.

Ein Nachteil besteht allerdings darin, daß die Steigungen so groß sein müssen, daß auch die Anode noch einem beträchtlichen Durchgriff durch g_4, g_3 und g_2 hindurch nach g_1 hat.

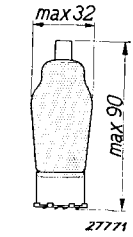
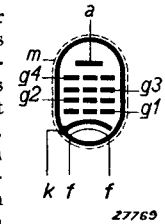


Abb. 1
Abmessungen in mm.



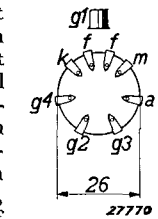


Abb. 2.
Elektrodenanordnung und Sockelanschlüsse.

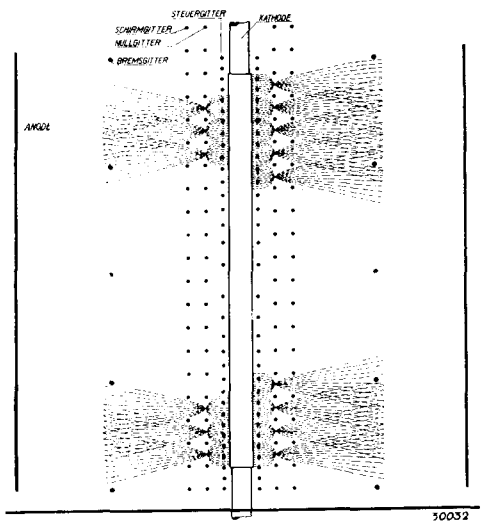


Abb. 3

Verlauf der Elektronenbahnen von der Kathode bis zum Raum zwischen Schirmgitter und Anode. Das zweite Gitter bildet mit dem dritten eine Elektronenoptik, deren Brennpunkt etwa vor Gitter 2 liegt.
Diese Optik bewirkt, daß die Elektronen genau durch die Maschen des dritten Gitters hindurchgehen, und daher ist der Schirmgitterstrom nur sehr gering.

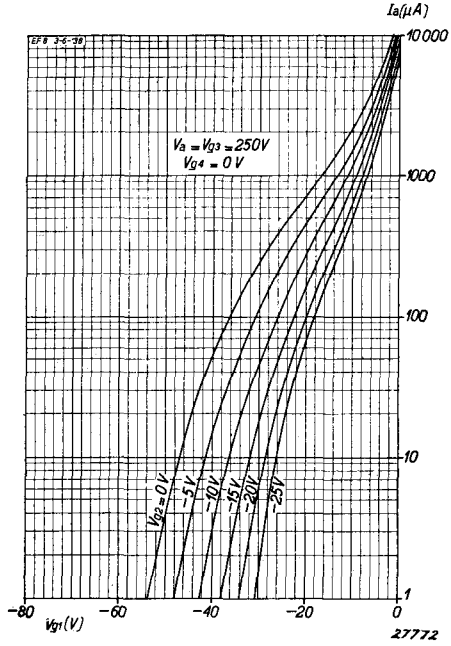


Abb. 4
Anodenstrom als Funktion der Gitterspannung bei verschiedenen negativen Spannungen an Gitter 2.

Hieraus ergibt sich eine größere Gitteranodenkapazität, als sie normalerweise bei Penthoden, wie der EF 5 und EF 9, vorhanden ist. Sie beträgt bei der EF 8 maximal 0,007 µµF, bei der EF 5 dagegen maximal 0,003 µµF. Aus demselben Grunde ist der Innenwiderstand niedriger, und zwar beträgt er 0,45 Megohm. Da die EF 8 nur als Hochfrequenzverstärker, d.h. als Eingangsröhre des Empfängers, Sinn hat, erschweren die größere C_{ag1} und der kleinere Innenwiderstand nicht die Verwendung dieser Röhre. Im Kurzwellenbereich sind die Kreisimpedanzen sowieso niedrig, und in den normalen Rundfunkbereichen wird die volle Verstärkungsmöglichkeit dieser Röhre meistens nicht ausgenützt, da sonst zu große Signale am Eingangsgitter der Mischröhre auftreten.

Auf die Eingangsröhre eines Empfängers folgt die größte Verstärkung, die Verstärkung hinter den anderen Röhren ist bereits viel kleiner, so daß diese sich nur unwesentlich am Gesamtrauschen des Empfängers beteiligen. Durchweg wird als Eingangsröhre eine Mischröhre verwendet.

Die Mischröhre ergibt bekanntlich ein erhebliches Rauschen, und bessere Empfänger, in denen bereits nach Erniedrigung der Rauschstörung gesucht wurde, werden aus diesem Grunde mit einer Hochfrequenzvorröhre ausgestattet.

Die Anwendung der EF 8 als Hochfrequenzverstärker bedingt, daß diese Röhre sehr günstige Quermodulationseigenschaften haben muß. Da sie meistens ebenfalls durch die automatische Lautstärkeregelung beeinflußt wird, müssen die günstigen Quermodulationseigenschaften insbesondere bei sehr starken Signalen, wenn die Röhre heruntergeregelt ist, beibehalten bleiben. Eine sehr günstige Quermodulationscharakteristik wurde bei einem Anodenstrom von 8 mA im ungeregelten Zustand erreicht. Die besondere Konstruktion hat es ermöglicht, bei diesem für das Rauschen ungünstigen Wert des Anodenstromes ein sehr geringes Röhrenrauschen zu erzielen.

Durch die obenerwähnten Maßnahmen wurde der Schirmgitterstrom auf 0,2

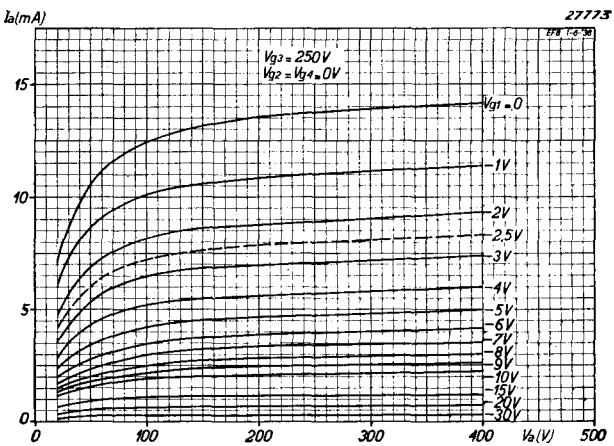


Abb. 5
Anodenstrom als Funktion der Anodenspannung bei verschiedenen negativen Spannungen an Gitter 1, Gitter 2 an die Kathode angeschlossen.

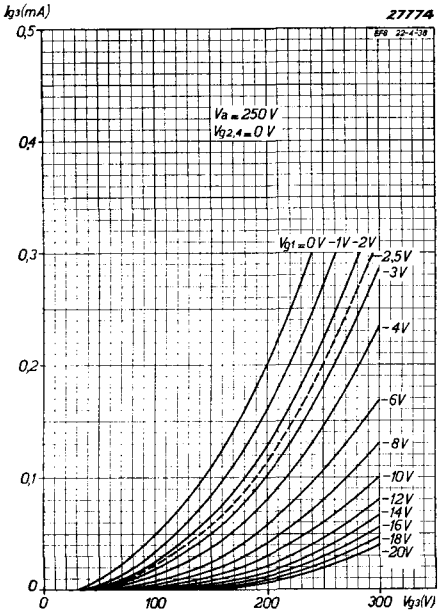


Abb. 6
Schirmgitterstrom als Funktion der Schirmgitterspannung bei verschiedenen Gittervorspannungen, wenn Gitter 2 an die Kathode angeschlossen ist.

durch Anwendung der EF 8 um einen Faktor $\sqrt{\frac{25000}{13000}} \simeq 1{,}4$ gebessert hat. Am Ende des Kurzwellenbereiches, z.B. bei 50 m, ist die Kreisimpedanz meistens viel niedriger, nämlich von der Größenordnung von 3000 Ohm. Hier hat die Verbesserung durch die Anwendung der EF 8 eine größere Bedeutung, da bei der EF 8 der gesamte Rauschwiderstand dann 6000 Ohm und bei der EF 5 18000 Ohm betragen würde. Hieraus ergibt sich eine Verbesserung des Rauschens um einen Faktor $\sqrt{\frac{18000}{6000}} = 1{,}73$.

Im Mittel- und Langwellenbereich sind die Kreisimpedanzen durchweg viel höher. Sie sind von der Größenordnung 100.000 Ohm. Hier überwiegt also sowohl bei der EF 8 wie bei der EF 5 das Kreisrauschen gegen das Röhrenrauschen. In diesen Bereichen kann also normalerweise die EF 8 keine Verbesserung bringen.
Wenn aber aus anderen Gründen die Kreisimpedanzen in diesen Wellenbereichen auch mA heruntergebracht. Zum Vergleich sei erwähnt, daß der Schirmgitterstrom der EF 5 2,6 mA beträgt. Infolge dieser Verringerung des Schirmgitterstroms wurde ein äquivalenter Rauschwiderstand von nur 3200 Ohm erreicht. Der äquivalente Rauschwiderstand der EF 5 beträgt dagegen rund 15000 Ohm, so daß die EF 8 in Bezug auf Röhrenrauschen eine nahezu 5fache Verbesserung darstellt.
Da nicht nur die Röhre allein als Rauschquelle zu betrachten ist, sondern die an das Gitter angeschlossenen Kreise und Widerstände ebenfalls zum Rauschen beitragen, wird normalerweise keine so hohe Verbesserung des Rauschens erzielt. Beträgt z.B. die Impedanz des an das Gitter angeschlossenen Abstimmkreises bei 15 m Wellenlänge 10.000 Ohm, so kann das Rauschen aus der ersten Stufe als von einem Widerstand von 10.000 + 3.000 = 13.000 Ohm erzeugt gedacht werden. Mit einer EF 5 würde der gesamte Rauschwiderstand 10.000 + 15.000 = 25.000 Ohm betragen. Nun ist die Rauschspannung an einem Widerstand proportional der Wurzel des Widerstandswertes, so daß sich das Rauschen

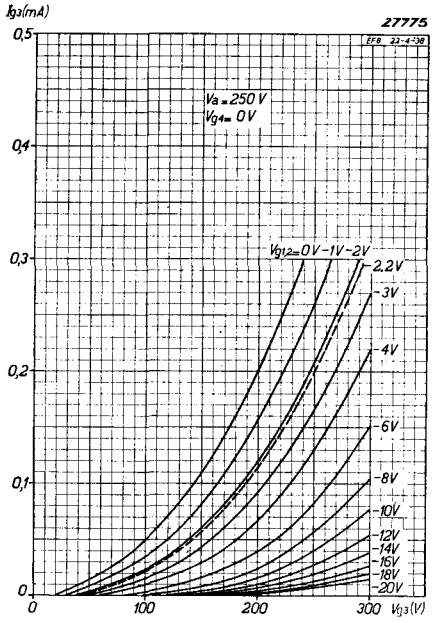


Abb. 7
Schirmgitterstrom als Funktion der Schirmgitterspannung bei verschiedenen Gittervorspannungen, wenn Gitter 2 an die Vorspannung von Gitter 1 angeschlossen ist.

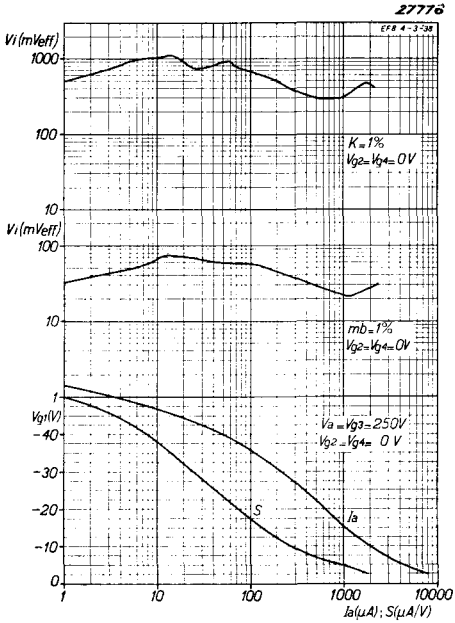


Abb. 8
Obere Kurve: Effektive Gitterwechselspannung als Funktion der Steilheit für 1 % Quermodulation, Gitter 2 an Kathode.
Mittlere Kurve: Effektive Gitterwechselspannung als Funktion der Steilheit für 1% Modulationsbrummen.
Untere Kurve: Steilheit S und Anodenstrom *Ia* als Funktion der negativen Gitterspannung.

aber eine größere Regelspannung der automatischen Lautstärkeregelung einem stärkeren Signal entspricht, wird das Verhältnis zwischen Signal und Rauschen günstiger.
Die EF 8 hat für den Kurzwellenbereich sehr günstige Impedanzwerte, die die Erzielung einer sehr guten Verstärkung in diesem Gebiet gestatten. Da der H.F.-Widerstand von Anode und Gitter gegen Erde im Kurzwellenbereich gegen die Impedanzwerte der praktisch ausführbaren abgestimmten Kreise sehr hoch ist, lassen sich mit der EF 8 in diesem Bereich Verstärkungen gleich dem Produkt aus Steilheit und Anodenimpedanz erzielen.
Gitter 2 kann entweder direkt an die Kathode angeschlossen oder wie Gitter 1 durch die Regelspannung der automatischen Lautstärkeregelung beeinflußt werden. Im letzteren Falle wird eine schärfere Regelung erzielt. Die Quermodulationskurve ist dann etwas weniger günstig, als wenn Gitter 1 an der Kathode liegt. In Bezug auf Rauschen sind beide Schaltungen gleichwertig. Die EF 8 bietet also die Möglichkeit, eine mehr oder weniger scharfe Regelung zu wählen.

niedrig sind, so kann die EF 8 Vorteile bieten. Um in Geräten mit Hochfrequenzverstärkung zu große Signale an der Mischröhre zu vermeiden, wird die Hochfrequenzverstärkung nicht zu groß gewählt (z.B. 10mal). Bei Röhren mit starkem Rauschen wurde die H.F.-Verstärkung hinter der Röhre unterdrückt, um das Rauschen zu beschränken. Dies wurde durch eine Anzapfung am zweiten Hochfrequenzkreis erzielt. Ist aber das Röhrenrauschen gering, so kann die Verstärkung vor dieser Röhre herabgesetzt werden. Dadurch wird erreicht, daß auch die H.F.-Röhre schwächere Signale zu verarbeiten hat, was im Zusammenhang mit Quermodulation und Modulationsverzerrung günstig ist. Das Signal an der H.F.-Röhre wird dann abgeschwächt, indem das Gitter an eine Anzapfung angeschlossen und dadurch das Kreisrauschen proportional herabgesetzt wird.
Der Rauschwiderstand dieser Röhre nimmt bei zunehmender Gittervorspannung zu. Da

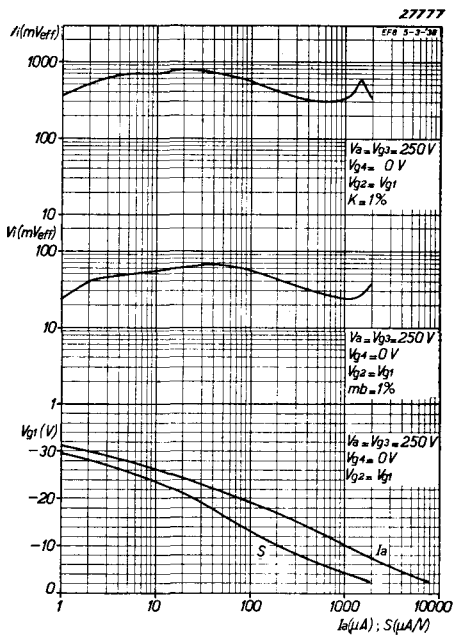


Abb. 9
Obere Kurve: Effektive Gitterwechselspannung als Funktion der Steilheit für 1% Quermodulation, Gitter 2 an der Regelspannung von Gitter 1.
Mittlere Kurve: Effektive Gitterwechselspannung als Funktion der Steilheit für 1% Modulationsbrummen.
Untere Kurve: Steilheit S und Anodenstrom *Ia* als Funktion der negativen Gitterspannung.

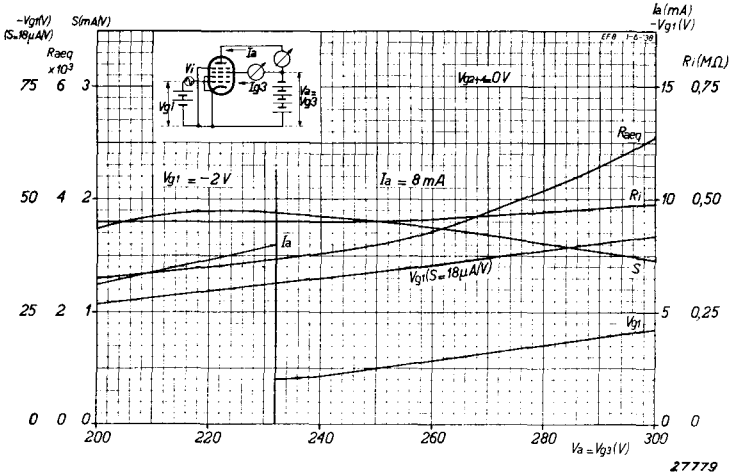


Abb. 10
Verschiedene Betriebswerte als Funktion der Anoden- und Schirmgitterspannung, wenn Gitter 2 an der Kathode liegt. Links vom Strich bei $Vg_1 = -2$ V, rechts bei $Ia = 8$ mA.

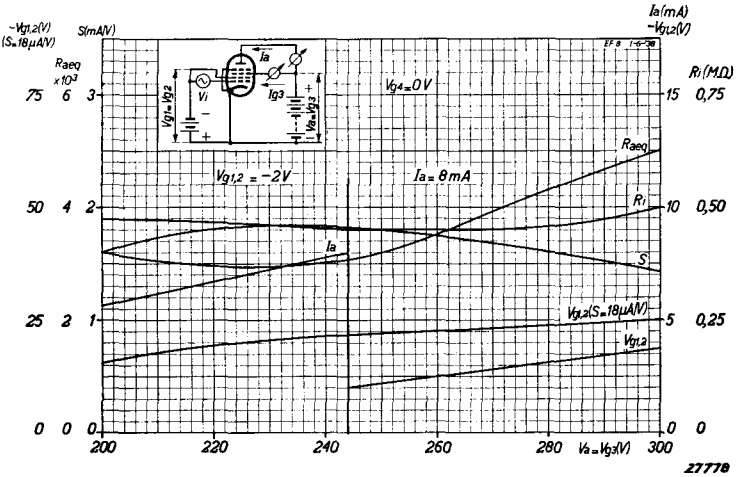


Abb. 11
Verschiedene Betriebswerte als Funktion der Anoden- und Schirmgitterspannung, wenn Gitter 2 an die Regelspannung von Gitter 1 angeschlossen ist. Links vom Strich bei $Vg_1 = Vg_2 = -2$ V, rechts bei $Ia = 8$ mA.

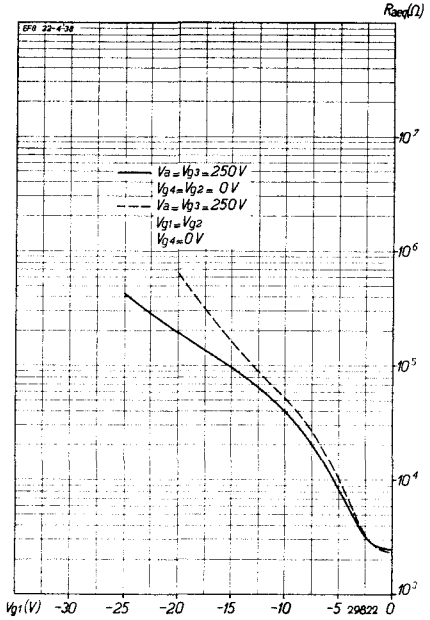


Abb. 12
Äquivalenter Rauschwiderstand als Funktion der negativen Gittervorspannung. Gestrichelt für Gitter 2 an der Regelspannung von Gitter 1, voll ausgezogen für Gitter 2 an Kathode.

HEIZDATEN

Heizung: indirekt durch Gleich- oder Wechselstrom, Serien- oder Parallelspeisung:

Heizspannung	V_f	= 6,3 V
Heizstrom	I_f	= 0,200 A

KAPAZITÄTEN

C_{ag1}	<	0,007 µµF
C_{g1}	=	4,6 µµF
C_a	=	7,8 µµF

BETRIEBSDATEN ALS H.F.-VERSTÄRKER

(g2 und g4 an Kathode)

Anodenspannung	V_a	=	250 V		
Spannung an Gitter 2	V_{g2}	=	0 V		
Schirmgitterspannung	V_{g3}	=	250 V		
Spannung an Gitter 4	V_{g4}	=	0 V		
Kathodenwiderstand	R_k	=	305 Ω		
Neg. Gittervorspannung	V_{g1}	=	— 2,5 V [1]	— 34 V [2]	— 50 V [3]
Anodenstrom	I_a	=	8 mA	—	—
Schirmgitterstrom	I_{g3}	=	0,2 mA	—	—
Steilheit	S	=	1800 µA/V	18 µA/V	1 µA/V
Innenwiderstand	R_i	=	0,45 MΩ	> 10 MΩ	> 10 MΩ
Äquivalenter Rauschwiderstand	R_{aeq}	=	3200 Ω	—	—

BETRIEBSDATEN ALS H.F.-VERSTÄRKER

(g2 an der Regelspannung von g1, g4 an Kathode)

Anodenspannung	V_a	=	250 V		
Schirmgitterspannung	V_{g3}	=	250 V		
Spannung an Gitter 4	V_{g4}	=	0 V		
Kathodenwiderstand	R_k	=	265 Ω		
Neg. Vorspannung an Gitter 1 und Gitter 2	V_{g1} = V_{g2}	=	— 2,2 V [1]	— 22 V [2]	— 28 V [3]
Anodenstrom	I_a	=	8 mA	—	—
Schirmgitterstrom	I_{g3}	=	0,2 mA	—	—
Steilheit	S	=	1800 µA/V	18 µA/V	2,5 µA/V
Innenwiderstand	R_i	=	0,45 MΩ	> 10 MΩ	> 10 MΩ
Äquivalenter Rauschwiderstand	R_{aeq}	=	3200 Ω	—	—

[1]) Im ungeregelten Zustand.
[2]) Für eine Regelung der Steilheit von 1 : 100.
[3]) Grenze des optimalen Regelbereiches.

EF 8

GRENZDATEN

Max. Anodenkaltspannung	V_{ao}	= max. 550 V
Max. Anodenspannung	V_a	= max. 300 V
Max. Anodenbelastung	W_a	= max. 2,5 W
Max. Schirmgitterkaltspannung	V_{g3o}	= max. 550 V
Max. Schirmgitterspannung	V_{g3}	= max. 300 V
Max. Schirmgitterbelastung	W_{g3}	= max. 0,08 W
Max. Schirmgitterstrom (bei $V_{g1} = -2{,}5$ V, $V_{g2} = 0$ V, $V_{g3} = 250$ V)	I_{g3}	= max. 0,24 mA
Min. Schirmgitterstrom (bei $V_{g1} = -2{,}5$ V, $V_{g2} = 0$ V, $V_{g3} = 250$ V)	I_{g3}	= min. 0,16 mA
Max. Kathodenstrom	I_k	= max. 12 mA
Grenzwert des Gitterstromeinsatzpunktes für Gitter 1 ($I_{g1} = +0{,}3$ µA)	V_{g1}	= max. −1,3 V
Grenzwert des Gitterstromeinsatzpunktes für Gitter 2 ($I_{g2} = +0{,}3$ µA)	V_{g2}	= max. −1,3 V
Höchstwert des Widerstandes zwischen Gitter 1 und Kathode	R_{g1k}	= max. 3 MΩ
Höchstwert des Widerstandes zwischen Gitter 2 und Kathode	R_{g2k}	= max. 3 MΩ
Höchstwert des Widerst. zwischen Heizfaden und Kathode	R_{fk}	= max. 20.000 Ω
Max. Spannung zwischen Heizfaden und Kathode (Gleichspannung oder Effektivwert der Wechselspannung)	V_{fk}	= max. 100 V

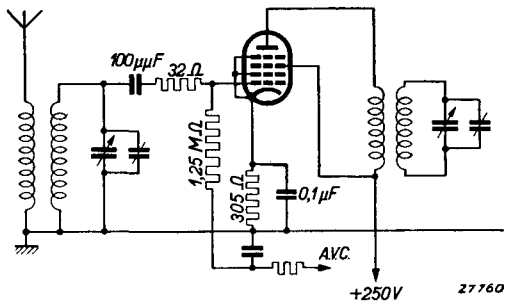


Abb. 13
Prinzip der Schaltung der EF 8 als H.F.-Röhre eines Superhets mit Regelspannung der automatischen Lautstärkeregelung nur an Gitter 1.

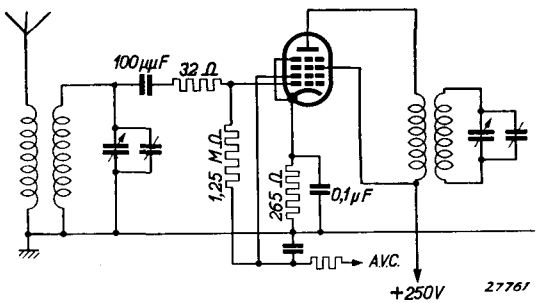


Abb. 14
Prinzip der Schaltung der EF 8 als H.F.-Röhre eines Superhets mit Regelspannung der automatischen Lautstärkeregelung an Gitter 1 und Gitter 2.

Die Anwendung dieser Röhre beschränkt sich auf die erste Hochfrequenzstufe des Empfängers. Sie bietet sowohl für die Kurzwellenbereiche wie auch für den Mittelwellen- und Langwellenbereich in Bezug auf Rauschen Vorteile. Die günstige Quermodulationscharakteristik spielt dabei naturgemäß eine wichtige Rolle. Gitter 3 kann entweder direkt oder besser noch über einen kleinen Widerstand mit Entkopplungskondensator an die Hochspannungsspeisung angeschlossen werden. Bei höheren Spannungen als 250 Volt muß die negative Vorspannung erhöht werden, um die maximale Anodendauerleistung nicht zu überschreiten. Dadurch nimmt die Steilheit etwas ab. Abb. 10 und 11 zeigen einige Betriebswerte dieser Röhre bei verschiedenen Schirmgitter- und Anodenspannungen.

R.F. PENTODE

Pentode intended for use as R.F., I.F. or video amplifying tube or as mixing tube in television receivers.

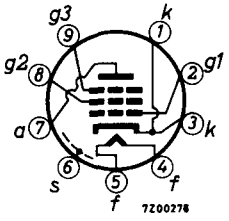
QUICK REFERENCE DATA			
Anode current	I_a	10	mA
Transconductance	S	7.4	mA/V
Amplification factor	$\mu_{g_2g_1}$	50	-
Internal resistance	R_i	500	kΩ

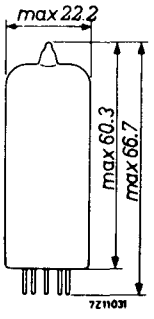
HEATING: Indirect by A.C. or D.C.; series or parallel supply

Heater voltage	V_f	6.3	V
Heater current	I_f	300	mA

DIMENSIONS AND CONNECTIONS Dimensions in mm

Base: Noval





CAPACITANCES

Grid No.1 to all except anode	$C_{g_1(a)}$	6.9	pF
Anode to all except grid No.1	$C_{a(g_1)}$	3.1	pF
Anode to grid No.1	C_{ag_1}	max. 0.007	pF
Anode to cathode	C_{ak}	max. 0.012	pF
Grid No.2 to all	C_{g_2}	5.4	pF
Grid No.1 to grid No.2	$C_{g_1g_2}$	2.6	pF
Grid No.1 to heater	C_{g_1f}	max. 0.15	pF
Cathode to heater	C_{kf}	5.0	pF

REMARK

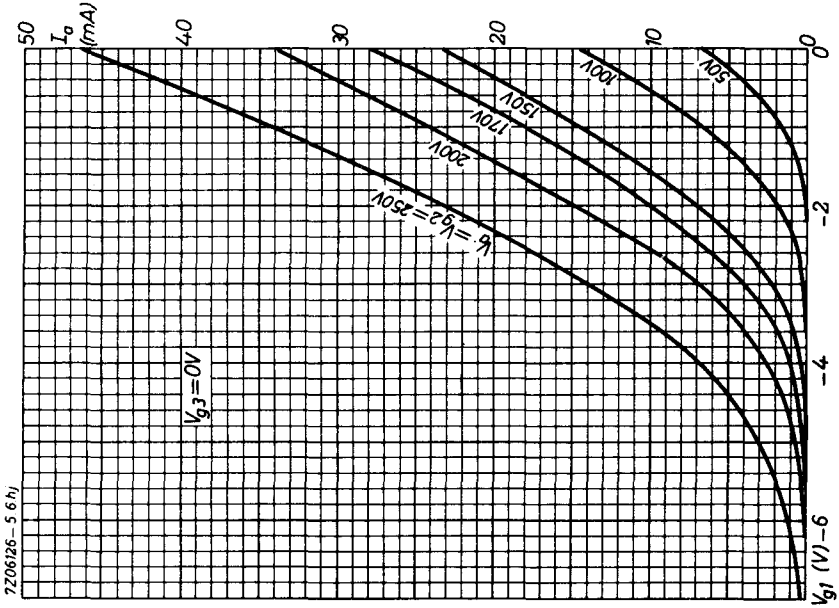
When using the EF80 as video amplifier the amplification between the input grid of the EF80 and the input of the cathode ray tube should not exceed a value of 25, in order to prevent microphonic effect.

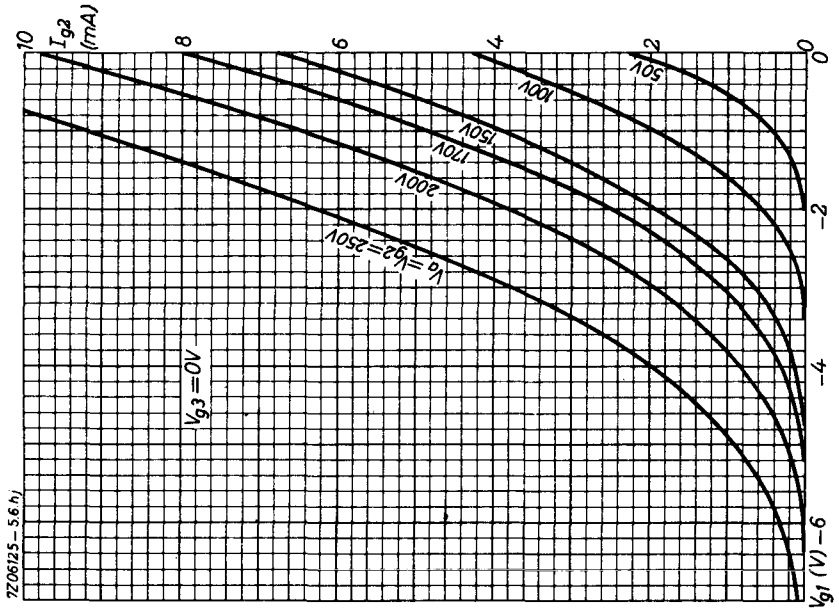
TYPICAL CHARACTERISTICS AND OPERATING CHARACTERISTICS

Anode voltage	V_a	170	200	250	V
Grid No.3 voltage	V_{g_3}	0	0	0	V
Grid No.2 voltage	V_{g_2}	170	200	250	V
Grid No.1 voltage	V_{g_1}	-2.0	-2.55	-3.5	V
Anode current	I_a	10	10	10	mA
Grid No.2 current	I_{g_2}	2.5	2.6	2.8	mA
Transconductance	S	7.4	7.1	6.8	mA/V
Internal resistance	R_i	0.5	0.55	0.65	MΩ
Amplification factor	$\mu_{g_2g_1}$	50	50	50	-
Equivalent noise resistance	R_{eq}	1000	1100	1200	Ω
Grid No.1 input resistance f = 50 MHz, pin 1 connected to pin 3	r_{g_1}	10	12	15	kΩ

LIMITING VALUES (Design centre rating system)

Anode voltage	V_{a_o}	max. 550	V
	V_a	max. 300	V
Anode dissipation	W_a	max. 2.5	W
Grid No.2 voltage	$V_{g_{2o}}$	max. 550	V
	V_{g_2}	max. 300	V
Grid No.2 dissipation	W_{g_2}	max. 0.7	W
Grid No.2 dissipation (W_a < 1.8 W)	W_{g_2}	max. 0.9	W
Grid No.1 resistor	R_{g_1}	max. 1	MΩ
Cathode current	I_k	max. 15	mA
Heater to cathode voltage	V_{kf}	max. 150	V


I_a (mA)
50
40
30
20
10
0
$V_{g3}=0V$
$I_a=V_{g2}=250V$
200V
175V
150V
100V
50V
-2
-4
-6
V_{g1} (V)
7Z06126-5.6 h)


I_{g2} (mA)
10
8
6
4
2
0
$V_{g3}=0V$
$I_a=V_{g2}=250V$
200V
175V
150V
100V
50V
-2
-4
-6
V_{g1} (V)
7Z06125-5.6 h)

PHILIPS

Data handbook

Electronic components and materials

EF80

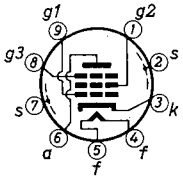
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3	3	1970.01
4	4	1970.01
5	FP	1999.08.16

PENTODE with variable mutual conductance for use as A.F. preamplifier.
PENTHODE à pente variable pour utilisation comme pré-amplificatrice B.F.
REGELPENTODE zur Verwendung als NF-Vorverstärker

Heating : indirect by A.C. or D.C. series or parallel supply
Chauffage: indirect par C.A. ou C.C. alimentation série ou parallèle
Heizung : indirekt durch Wechsel- oder Gleichstrom; Serien- oder Parallelspeisung

V_f = 6,3 V
I_f = 200 mA

Dimensions in mm
Dimensions en mm
Abmessungen in mm



Base, culot, Sockel: NOVAL

Capacitances
Capacités
Kapazitäten

C_{g_1}	=	4 pF
C_a	=	5 pF
C_{ag_1}	<	0,05 pF
C_{g_1f}	<	0,0025 pF

Typical characteristics
Caractéristiques types
Kenndaten

V_a	=	250 V
V_{g_2}	=	50 V
V_{g_3}	=	0 V
V_{g_1}	=	-1,6 V
I_a	=	4 mA
I_{g_2}	=	1,15 mA
S	=	1,6 mA/V
R_i	=	1,25 MΩ ←
$\mu_{g_2g_1}$	=	10
$-V_{g_1}$ (I_{g_1} = +0,3 µA)	=	max. 1,3 V

Operating characteristics
Caractéristiques d'utilisation
Betriebsdaten

V_b	=	250	V
R_a	=	100	kΩ
V_{g3}	=	0	V
R_{g2}	=	390	kΩ
R_{g1}	=	3	MΩ
R_{g1}'	=	1	MΩ [1]
R_{Gen}	≤	220	kΩ [2]
V_o	=	8	Veff
V_R	=	-1 / -20	V
I_a	=	1,80 / 1,65	mA
I_{g2}	=	0,55 / 0,25	mA
V_o/V_i	=	105 / 16	
d_{tot}	=	1,5 / 2,3	%

V_b = 250 V
R_a = 100 kΩ
R_{g2} = 390 kΩ
R_{g1} = 3 MΩ
R_{g1}' = 1 MΩ [1]

V_o =	3	5	8	15	V
d_{tot} ($-V_R$ = 1-3 V) =	0,8	1,0	1,5	2,5	% [3]
d_{tot} ($-V_R$ = 3-20 V) =	1,0	1,5	2,3	3,5	% [3]

Limiting values
Caractéristiques limites
Grenzdaten

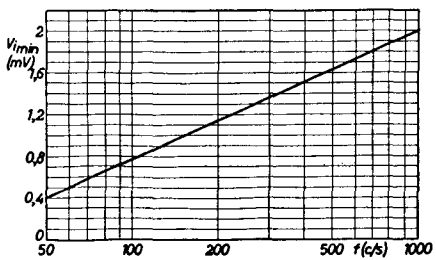
V_{a_o}	= max.	550 V
V_a	= max.	300 V
W_a	= max.	1 W
V_{g2_o}	= max.	550 V
V_{g2}	= max.	300 V
W_{g2}	= max.	0,2 W
I_k	= max.	6 mA
R_{g1}	= max.	3 MΩ
R_{g3}	= max.	10 kΩ
V_{kf} (k pos.)	= max.	100 V
V_{kf} (k neg.)	= max.	50 V
R_{kf}	= max.	20 kΩ

1)2)3)See page 4; voir page 4; siehe Seite 4

This tube can be used without special precautions against microphonic effect and hum in circuits in which the input voltage $V_1 \geq 2$ mV ($f = 1000$ c/s; $-V_R \leq 1$ V) for an output of 50 mW of the output tube. Z_{g1} ($f = 50$ c/s) ≤ 0.5 MΩ. For other values of $-V_R$ the admissible input voltage is inversely proportional to the amplification. For frequencies between 50 and 1000 c/s the sensitivity may be increased according to the figure below

Ce tube peut être utilisé sans précautions spéciales contre l'effet microphonique et le ronflement dans des circuits dont la tension d'entrée $V_1 \geq 2$ mV ($f = 1000$ Hz; $-V_R \leq 1$ V) pour une puissance de 50 mW du tube de sortie Z_{g1} ($f = 50$ Hz) $\leq 0,5$ MΩ. Pour autres valeurs de $-V_R$ la tension d'entrée admissible est inversement proportionnelle à l'amplification. Pour des fréquences entre 50 et 1000 Hz la sensibilité peut être augmentée suivant la figure ci-dessous

Diese Röhre darf ohne spezielle Massnahmen gegen Mikrophonie und Brumm in Schaltungen verwendet werden die für eine Spannung $V_1 \geq 2$ mV ($f = 1000$ Hz; $-V_R \leq 1$ V) eine Lautsprecherleistung von 50 mW ergeben. Z_{g1} ($f = 50$ Hz) $\leq 0,5$ MΩ. Für andere Werte von $-V_R$ ist der zulässige Eingangsspannung der Verstärkung umgekehrt proportional. Für Frequenzwerte zwischen 50 und 1000 Hz kann die Empfindlichkeit nach untenstehender Abbildung vergrössert werden



[1])Grid leak of the following tube
Résistance de fuite du tube suivant
Ableitwiderstand der folgenden Röhre

[2])Signal source resistance
Résistance interne de la source du signal
Generator-Innenwiderstand

[3])d_{tot} is the maximum value of the distortion occurring within the indicated control range, averaged over a great number of tubes

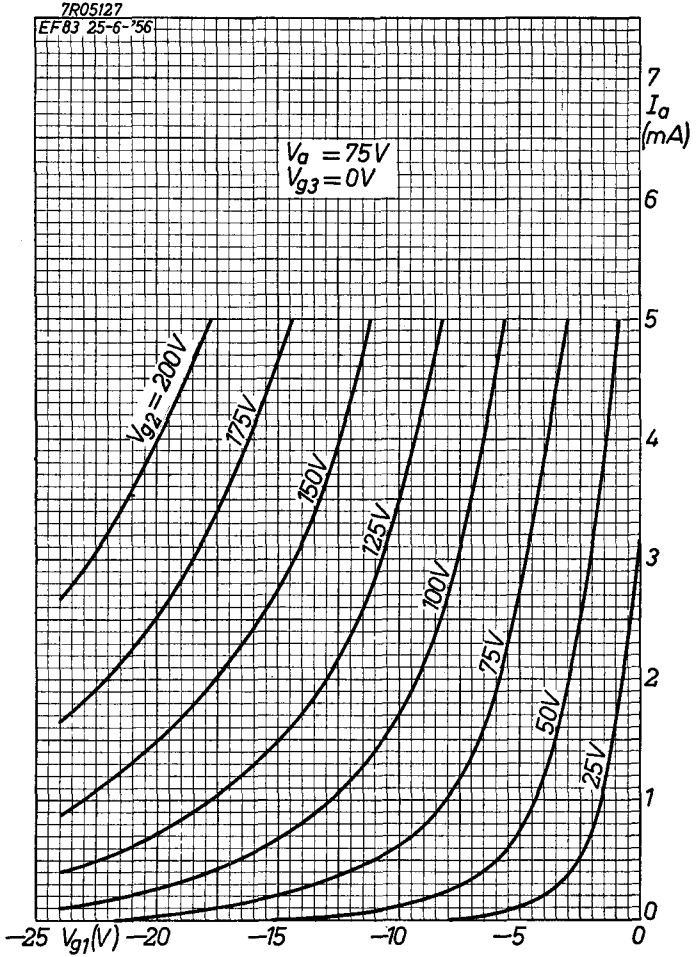
d_{tot} est la valeur maximum de la distorsion se produisant dans la gamme de réglage indiquée. C'est la valeur moyenne pour un grand nombres de tubes

d_{tot} ist der maximal auftretende Klirrfaktor im angegebenen Regelbereich gemittelt über eine grosse Anzahl Röhren

→

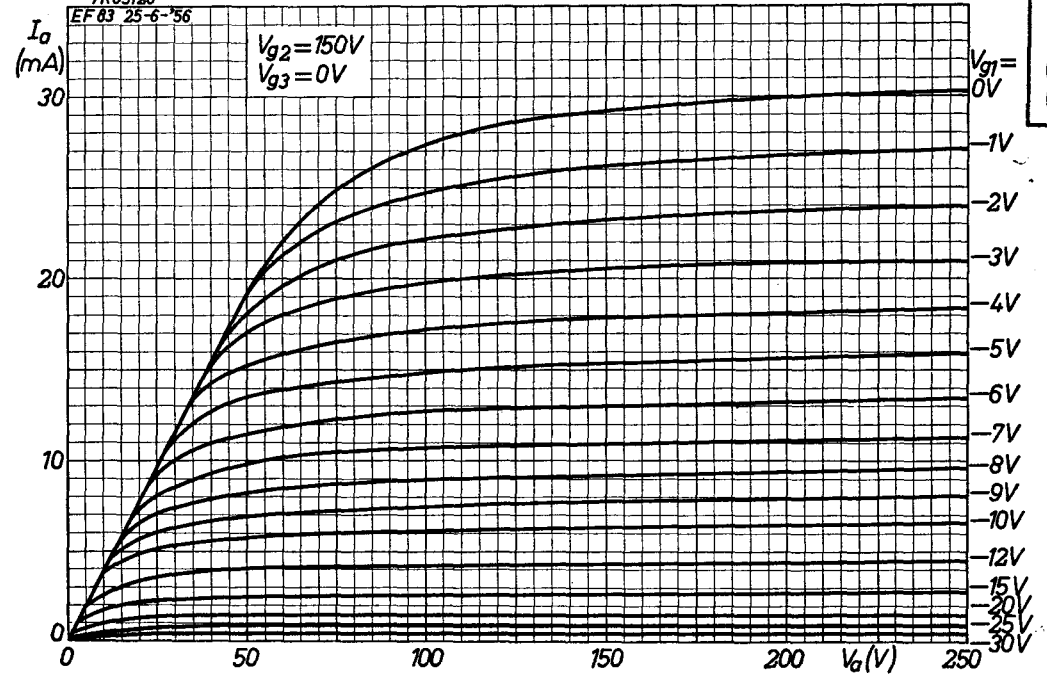
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EF 83



7.7.1956

A

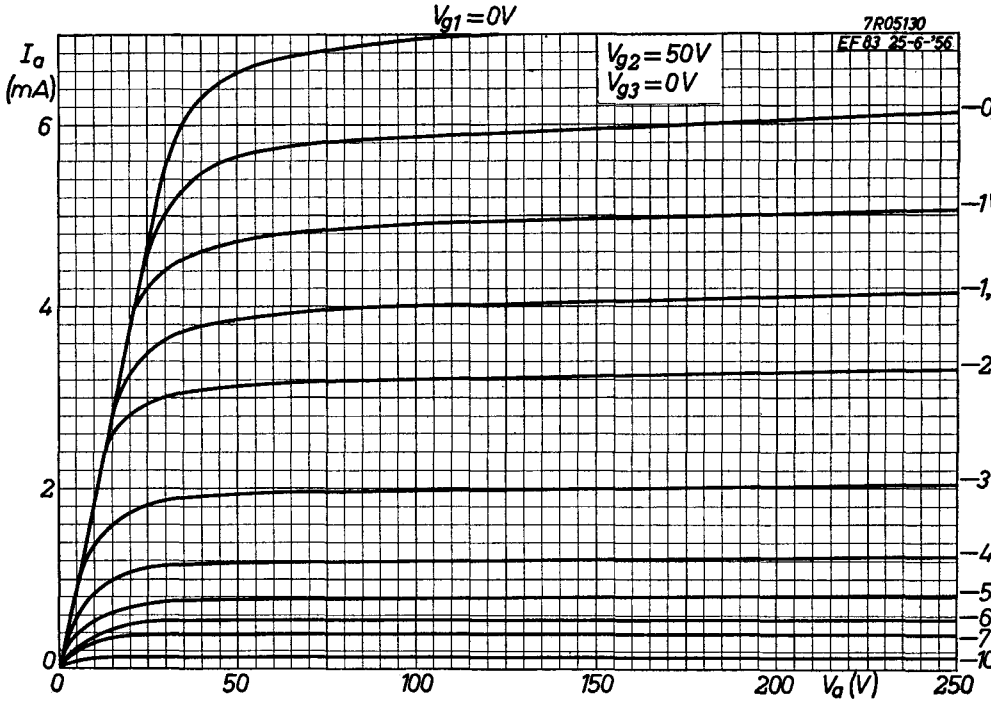


EF 83

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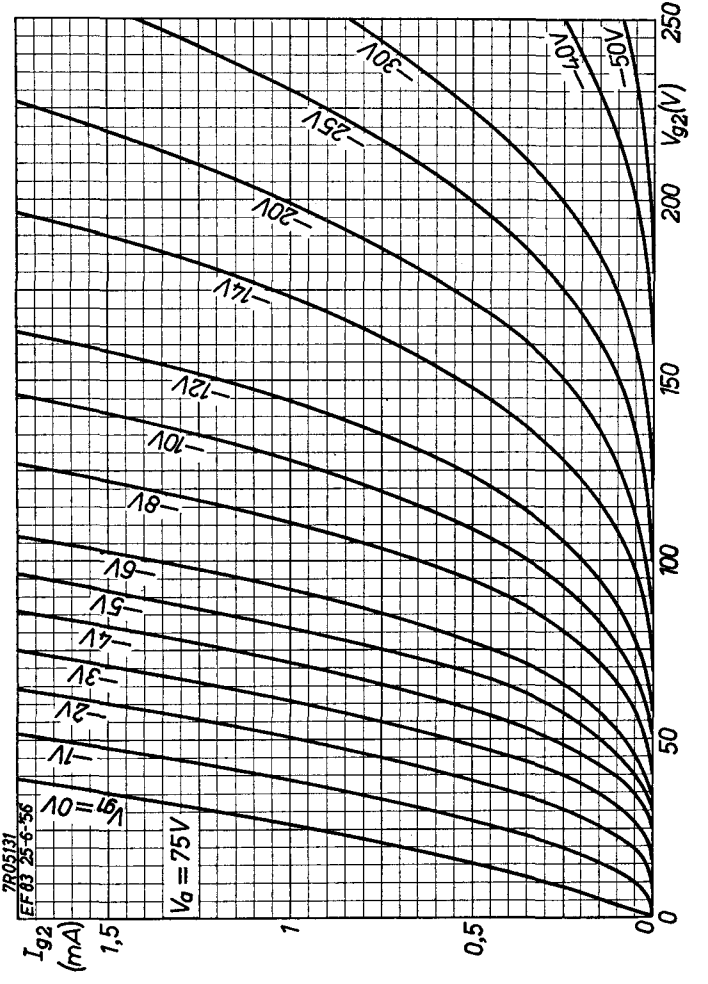
B

$V_{g1}=0V$
-1V
-2V
-3V
-4V
-5V
-6V
-7V
-8V
-9V
-10V
-12V
-15V
-20V
I_a (mA)
15
10
5
0
0
50
100
150
200
250
V_a(V)
$V_{g2}=100V$
$V_{g3}=0V$
7R05129
EF 83 25-6-'56



EF 83

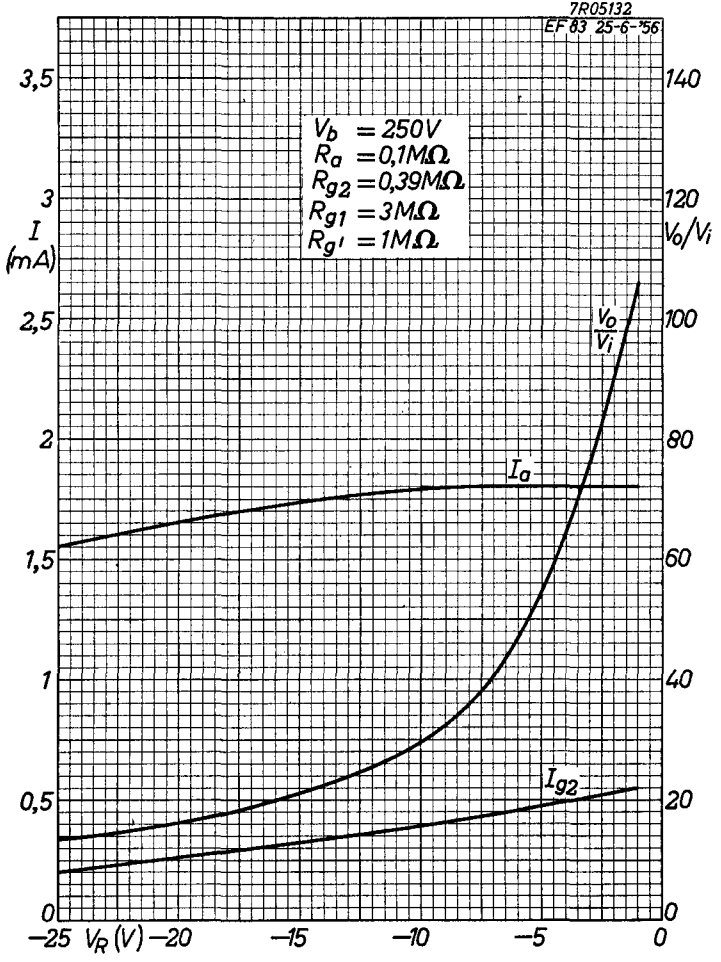
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7R05131
EF 83 25-6-56
$V_a = 75\,V$
$V_{g1} = 0V$
−1V
−2V
−3V
−4V
−5V
−6V
−8V
−10V
−12V
−14V
−20V
−25V
−30V
−40V
−50V
I_{g2} (mA)
1,5
1
0,5
0
V_{g2}(V)
250
200
150
100
50
0

7. 7. 1956

E

EF 83 **PHILIPS**



F



EF83

page	sheet	date
1	1	1959.02.02
2	2	1959.02.02
3	3	1958.01.01
4	4	1958.01.01
5	A	1956.07.07
6	B	1956.07.07
7	C	1956.07.07
8	D	1956.07.07
9	E	1956.07.07
10	F	1956.07.07
11	FP	1999.06.29

R.F. PENTODE

R.F. pentode with variable transconductance intended for use as wide-band amplifier.

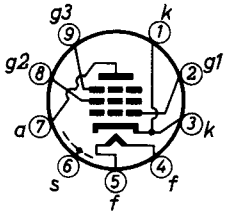
QUICK REFERENCE DATA			
Anode current	I_a	10	mA
Transconductance	S	6.0	mA/V
Amplification factor	$\mu_{g_2g_1}$	26	-
Internal resistance	R_i	600	kΩ

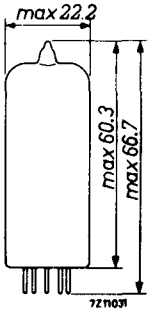
HEATING: Indirect by A.C. or D.C.; series or parallel supply

Heater voltage	V_f	6.3	V
Heater current	I_f	300	mA

DIMENSIONS AND CONNECTIONS Dimensions in mm

Base: Noval





CAPACITANCES

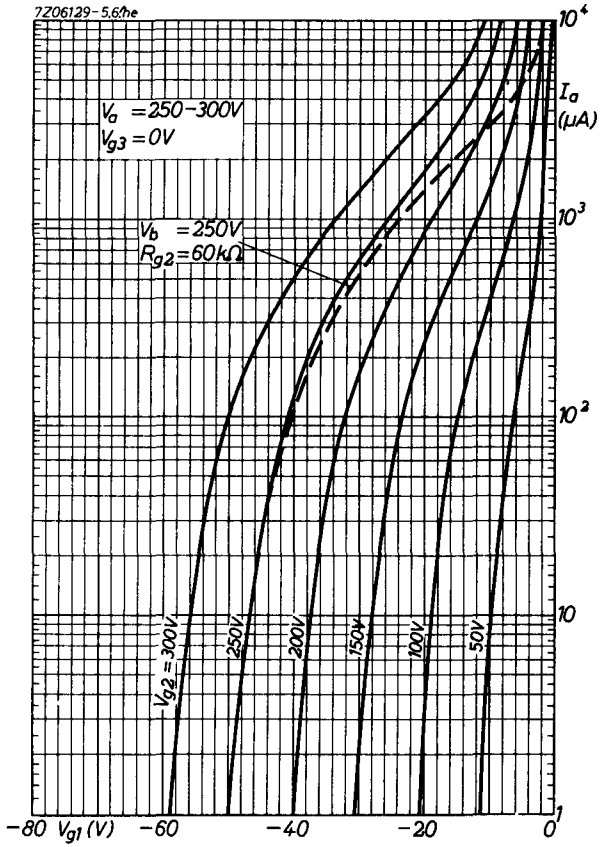
Anode to all except grid No.1	$C_{a(g_1)}$	3.2	pF
Grid No.1 to all except anode	$C_{g_1(a)}$	6.9	pF
Anode to grid No.1	C_{ag_1}	max. 0.007	pF
Grid No.1 to heater	C_{g_1f}	max. 0.15	pF

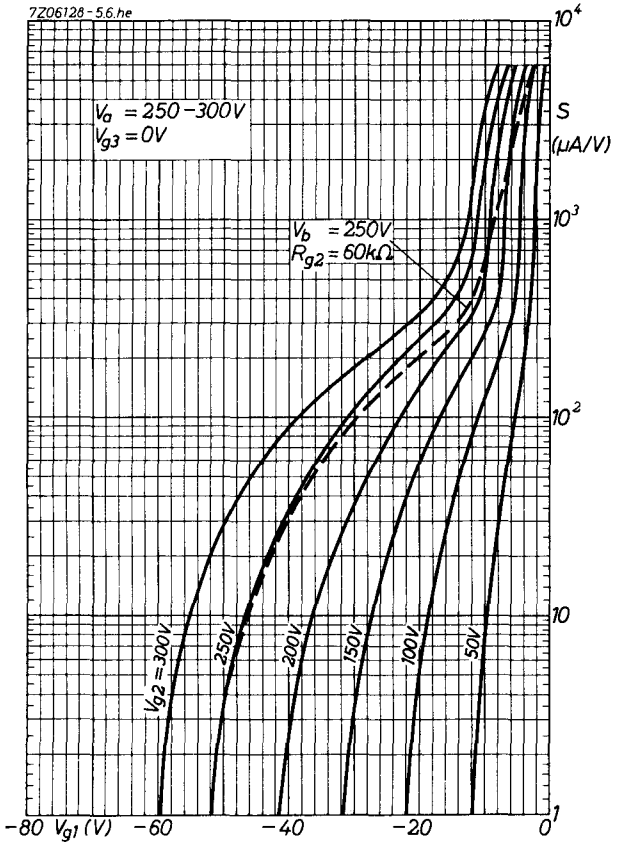
TYPICAL CHARACTERISTICS AND OPERATING CHARACTERISTICS

Anode and supply voltage	$V_a = V_b$	250		V
Grid No.3 voltage	V_{g_3}	0		V
Grid No.2 resistor	R_{g_2}	60		kΩ
Grid No.1 voltage	V_{g_1}	-2	-35	V
Grid No.2 voltage	V_{g_2}	100	-	V
Anode current	I_a	10	-	mA
Grid No.2 current	I_{g_2}	2.5	-	mA
Transconductance	S	6.0	0.06	mA/V
Internal resistance	R_i	0.6	>5	MΩ
Amplification factor	$\mu_{g_2g_1}$	26	-	
Equivalent noise resistance	R_{eq}	1.4	-	kΩ
Grid No.1 input resistance, f = 50 MHz	r_{g_1}	9	-	kΩ

LIMITING VALUES (Design centre rating system)

Anode voltage	V_{a_o}	max.	550	V
	V_a	max.	250	V
Anode dissipation	W_a	max.	2.5	W
Grid No.2 voltage	$V_{g_{2o}}$	max.	550	V
	V_{g_2}	max.	250	V
Grid No.2 dissipation	W_{g_2}	max.	0.65	W
Grid No.1 resistor	R_{g_1}	max.	3	MΩ
Cathode current	I_k	max.	15	mA
Heater to cathode voltage	V_{kf}	max.	150	V


7Z06129-5.6/he
V_a =250-300V
V_{g3} =0V
V_b =250V
R_{g2}=60kΩ
I_a (μA)
10^4
10^3
10^2
10
1
V_{g2}=300V
250V
200V
150V
100V
50V
−80 V_{g1} (V)
−60
−40
−20
0


7Z06128-5.6.he
V_a = 250 – 300V
V_{g3} = 0V
V_b = 250V
R_{g2} = 60kΩ
V_{g2} = 300V
250V
200V
150V
100V
50V
S
(μA/V)
10^4
10^3
10^2
10
1
–80 V_{g1} (V)
–60
–40
–20
0

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Data handbook

Electronic components and materials

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page	sheet	date
1	1	1969.12
2	2	1969.01
3	3	1969.01
4	4	1969.01
5	FP	1999.08.16

A.F. PENTODE

Pentode intended for use as A.F. amplifier

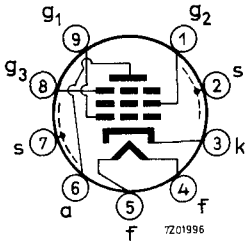
QUICK REFERENCE DATA			
Anode current	I_a	3.0	mA
Transconductance	S	2.2	mA/V
Amplification factor	$\mu_{g_2g_1}$	38	-
Internal resistance	R_i	2.5	MΩ

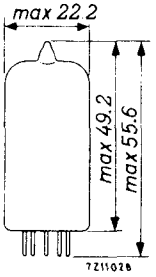
HEATING: Indirect by A.C. or D.C.; series or parallel supply

Heater voltage	V_f	6.3	V
Heater current	I_f	200	mA

DIMENSIONS AND CONNECTIONS Dimensions in mm

Base: Noval





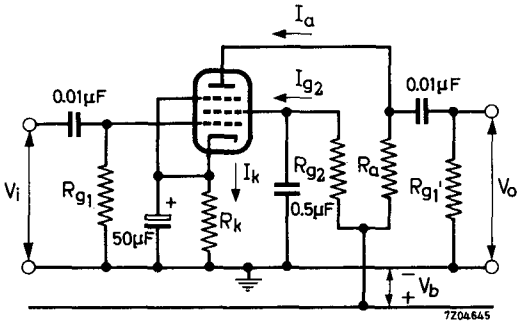
CAPACITANCES

Grid No.1 to all except anode	$C_{g_1(a)}$		3.8	pF
Anode to all except grid No.1	$C_{a(g_1)}$		5.1	pF
Anode to grid No.1	C_{ag_1}	max.	0.05	pF
Grid No.1 to heater	C_{g_1f}	max.	0.0025	pF

TYPICAL CHARACTERISTICS

Anode voltage	V_a	250	V
Grid No.3 voltage	V_{g_3}	0	V
Grid No.2 voltage	V_{g_2}	140	V
Grid No.1 voltage	V_{g_1}	-2.2	V
Anode current	I_a	3.0	mA
Grid No.2 current	I_{g_2}	0.6	mA
Transconductance	S	2.2	mA/V
Amplification factor	$\mu_{g_2g_1}$	38	-
Internal resistance	R_i	2.5	MΩ

OPERATING CHARACTERISTICS as A.F. amplifier



Supply voltage	V_b	400	350	300	250	200	150	V
Anode resistor	R_a	100	100	100	100	100	100	kΩ
Grid No.2 resistor	R_{g_2}	390	390	390	390	390	390	kΩ
Cathode resistor	R_k	1000	1000	1000	1000	1000	1000	Ω
Grid resistor next stage	R_{g_1}'	330	330	330	330	330	330	kΩ
Cathode current	I_k	3.2	2.75	2.4	2.0	1.55	1.05	mA
Voltage gain 1)	V_o/V_i	140	134	129	123	117	110	-
Output voltage	V_o	85	74	62	50	38	27	V_{RMS}
Total distortion	d_{tot}	5	5	5	5	5	5	%

1) Measured at small input voltages

OPERATING CHARACTERISTICS (continued)

Supply voltage	V_b	400	350	300	250	200	150	V
Anode resistor	R_a	220	220	220	220	220	220	kΩ
Grid No.2 resistor	R_{g_2}	1	1	1	1	1	1	MΩ
Cathode resistor	R_k	2200	2200	2200	2200	2200	2200	Ω
Grid resistor next stage	$R_{g'_1}$	680	680	680	680	680	680	kΩ
Cathode current	I_k	1.45	1.3	1.1	0.9	0.75	0.5	mA
Voltage gain [1])	V_o/V_i	210	205	194	185	173	147	-
Output voltage	V_o	72	62	53	44	35	22	V_{RMS}
Total distortion	d_{tot}	5	5	5	5	5	5	%

As triode connected A.F. amplifier (g_2 connected to anode, g_3 to cathode)

Supply voltage	V_b	400	350	300	250	200	V
Anode resistor	R_a	47	47	47	47	47	kΩ
Cathode resistor	R_k	1200	1200	1200	1200	1200	Ω
Grid resistor next stage	$R_{g'_1}$	150	150	150	150	150	kΩ
Anode current	I_a	3.6	3.15	2.7	2.25	1.8	mA
Voltage gain	V_o/V_i	26	25	25	25	24	-
Output voltage ($I_g = 0.3\mu A$)	V_o	68	58	46	36	24	V_{RMS}
Total distortion	d_{tot}	5	5	5	5	5	%

Supply voltage	V_b	400	350	300	250	200	V
Anode resistor	R_a	100	100	100	100	100	kΩ
Cathode resistor	R_k	2200	2200	2200	2200	2200	Ω
Grid resistor next stage	$R_{g'_1}$	330	330	330	330	330	kΩ
Anode current	I_a	2.0	1.8	1.5	1.25	1.0	mA
Voltage gain	V_o/V_i	28	28	27.5	27.5	27	-
Output voltage ($I_g = 0.3\mu A$)	V_o	75	63	51	42	30	V_{RMS}
Total distortion	d_{tot}	5	5	5	5	5	%

Supply voltage	V_b	400	350	300	250	200	V
Anode resistor	R_a	220	220	220	220	220	kΩ
Cathode resistor	R_k	3900	3900	3900	3900	3900	Ω
Grid resistor next stage	R_{g_1}'	680	680	680	680	680	kΩ
Anode current	I_a	1.1	0.95	0.8	0.7	0.55	mA
Voltage gain	V_o/V_i	29	29	29	28	28	-
Output voltage ($I_g = 0.3\mu A$)	V_o	71	60	52	42	30	V_{RMS}
Total distortion	d_{tot}	5	5	5	5	5	%

OPERATING CHARACTERISTICS (continued)

Microphonic effect

A sensitivity of 0.5 mV for an output of 50 mW (or 5 mV for an output of 5 W) is permissible in those equipments where an output of 50 mW in the loudspeaker does not produce an average acceleration on the tube higher than 0.015 g at any frequency higher than 500 Hz or higher than 0.06 g at any frequency lower than 500 Hz.

Hum level

The hum disturbance level will be 3 μV (max. 5 μV) when Z_{g_1} is smaller than 0.5 MΩ at f = 50 Hz, the cathode resistor is decoupled by a capacitor of at least 100 μF and pin 4 is earthed. With the centre tap of the heater supply earthed this value will be 1 μV (max. 2 μV).

Noise voltage

The equivalent noise voltage on g_1 is approximately 2 μV for the frequency range from 25 to 10 000 Hz at V_b = 250 V and R_a = 100 kΩ.

LIMITING VALUES (Design centre rating system)

Anode voltage	V_{a_o}	max.	550	V
	V_a	max.	300	V
Anode dissipation	W_a	max.	1.0	W
Grid No.2 voltage	$V_{g_{2o}}$	max.	550	V
	V_{g_2}	max.	200	V
Grid No.2 dissipation	W_{g_2}	max.	0.2	W
Grid No.1 circuit resistor				
if $W_a < 0.2$ W	R_{g_1}	max.	10	MΩ
if $W_a > 0.2$ W	R_{g_1}	max.	3	MΩ
with grid current biasing	R_{g_1}	max.	22	MΩ
Cathode current	I_k	max.	6	mA
Cathode to heater voltage				
cathode positive	V_{kf}	max.	100	V
cathode negative	V_{kf}	max.	50	V

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Data handbook

Electronic components and materials

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page	sheet	date
1	1	1970.01
2	2	1970.01
3	3	1970.01
4	4	1970.01
5	FP	1999.08.16

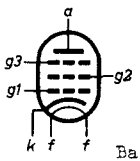
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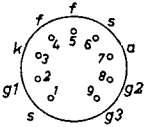
EF 89

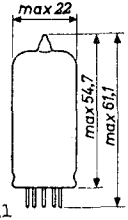
PENTODE with variable mutual conductance for use as R.F. or I.F. amplifier
PENTHODE à pente variable pour utilisation comme amplificatrice H.F. ou M.F.
PENTODE mit veränderlicher Steilheit zur Verwendung als HF- oder ZF-Verstärker

Heating : indirect by A.C. or D.C.; parallel supply
Chauffage: indirect par C.A. ou C.C.; alimentation parallèle — Vf = 6,3 V, If = 0,2 A
Heizung : indirekt durch Wechsel- oder Gleichstrom; Parallelspeisung

Dimensions in mm
Dimensions en mm
Abmessungen in mm







Base, culot, Sockel: Noval

Capacitances Capacités Kapazitäten	C_a = 5,1 pF	C_{ag1}	< 0,002 pF
	C_{g1} = 5,5 pF	C_{g1f}	= 0,05 pF

Typical characteristics
Caractéristiques types
Kenndaten

V_a	=	250	250	170 V
V_{g2}	=	100	85	100 V
V_{g3}	=	0	0	0 V
I_a	=	9	9	12 mA
V_{g1}	=	-2	-1,2[1])	-1,2[1])V
I_{g2}	=	3	3,2	4,4 mA
S	=	3,6	4,0	4,4 mA/V
R_i	=	0,9	0,75	0,4 MΩ
μ_{g2g1}	=	-	21	-

[1]) In this case control grid current may occur. If this is not permissible, the negative grid bias should be increased to a value of 1.5 V at least.
Dans ce cas il peut se présenter de courant de grille. Si celui-ci n'est pas permis, il faut augmenter la polarisation négative jusqu'à une valeur de 1,5 V au moins
Bei dieser Einstellung kann Gitterstrom fliessen; wenn das unzulässig ist, muss man eine Einstellung mit -1,5 V Gittervorspannung wählen.

Operating characteristics as R.F. or I.F. amplifier
Caractéristiques d'utilisation en amplificatrice H.F. ou M.F.
Betriebsdaten als HF- oder ZF-Verstärker

$V_a=V_b$	=	250		200		V
V_{g3}	=	0		0		V
R_{g2}	=	51		24		kΩ
R_k	=	160		130		Ω
V_{g1}	=	-1,95	-20	-1,95	-20	V
I_a	=	9	-	11,1	-	mA
I_{g2}	=	3	-	3,8	-	mA
S	=	3,5	0,24	3,85	0,16	mA/V
R_i	=	0,9	-	0,55	-	MΩ
R_{eq}	=	4,2	-	4,2	-	kΩ
$g^{1})$	=	95	-	102	-	μA/V

$V_a=V_b$	=	250[2])		200[2])		V
V_{g3}	=	0		0		V
R_{g2}	=	62		33		kΩ
R_k	=	0		0		Ω
R_{g1}	=	10		10		MΩ
$V_{R(g1)}$	=	0	-20	0	-20	V
I_a	=	9	-	11,25	-	mA
I_{g2}	=	2,9	-	3,9	-	mA
S	=	4,7	0,22	5,15	0,15	mA/V
R_i	=	825	-	550	-	kΩ
R_{eq}	=	2,4	-	2,5	-	kΩ

[1]) Input conductance at f = 50 Mc/s
Conductance d'entrée à f = 50 MHz
Eingangsleitwert bei f = 50 MHz

[2]) See page 1
Voire page 1
Siehe Seite 1

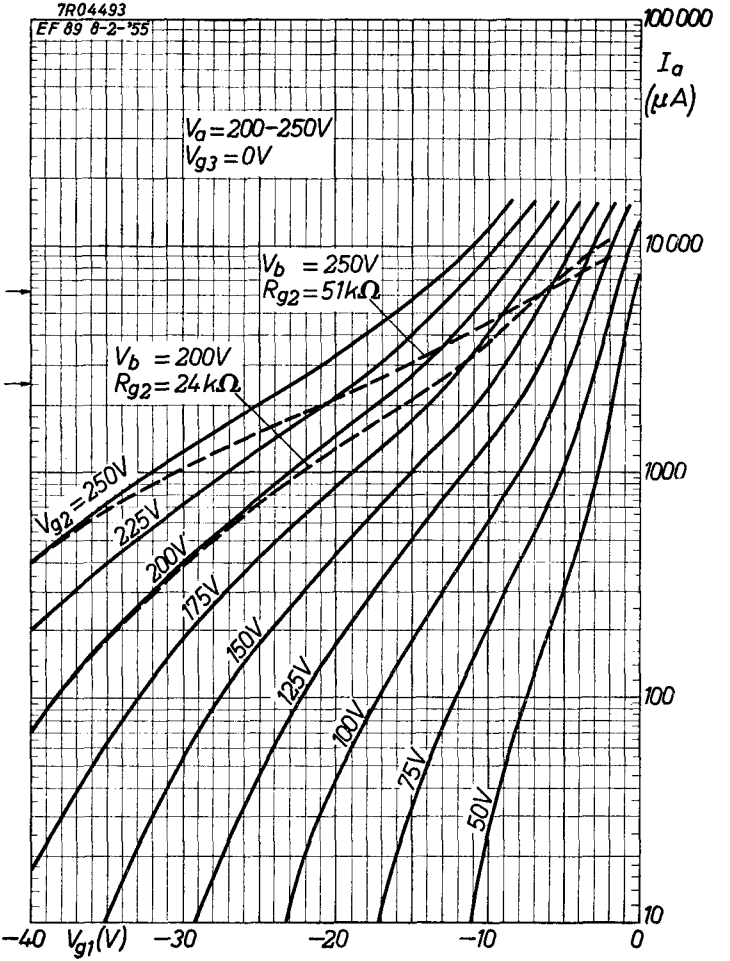
Limiting values
Caractéristiques limites
Grenzdaten

V_{a_o}	= max.	550	V
V_a	= max.	300	V
W_a	= max.	2,25	W
V_{g2_o}	= max.	550	V
V_{g2}	= max.	300	V
W_{g2}	= max.	0,45	W
I_k	= max.	16,5	mA
R_{g1}	= max.	3	MΩ[1])
R_{g3}	= max.	10	kΩ
R_{kf}	= max.	20	kΩ
V_{kf}	= max.	100	V

---

[1])With grid current biasing R_{g1} = max. 22 MΩ
Si V_{g1} est obtenue seulement par moyen de R_{g1}, R_{g1} = max. 22 MΩ
Wenn V_{g1} nur mittels R_{g1} erhalten wird ist R_{g1} = max. 22 MΩ

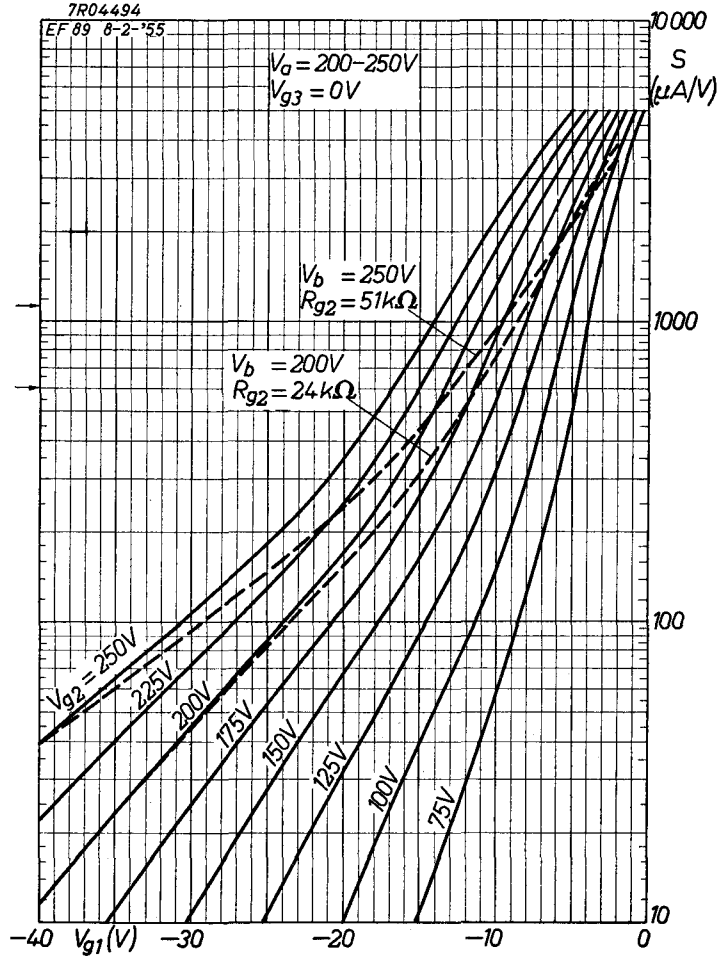
EF 89 PHILIPS



A

PHILIPS

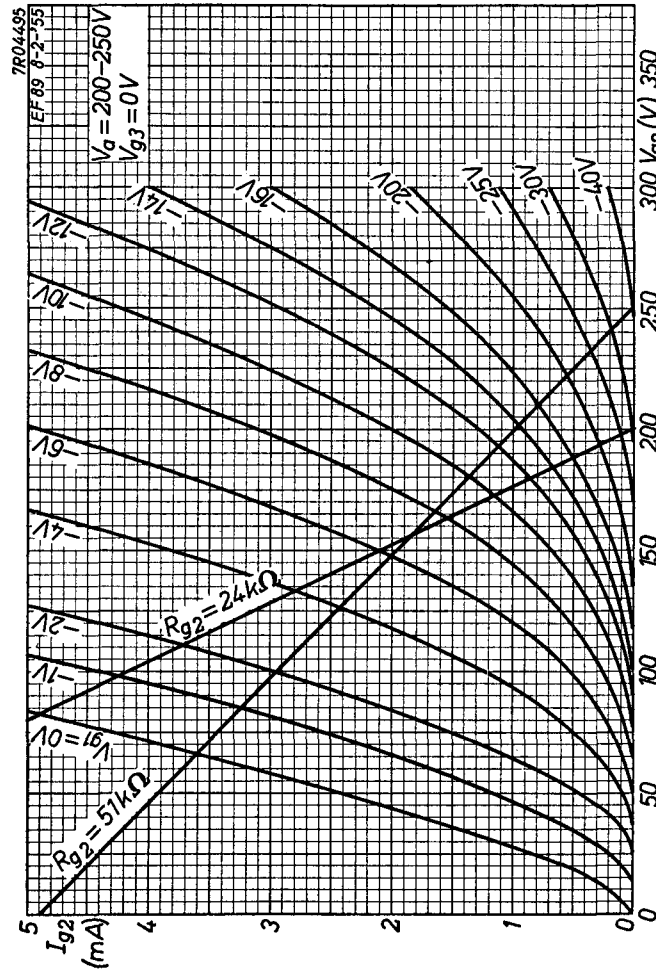
EF 89



3.3.1955

B

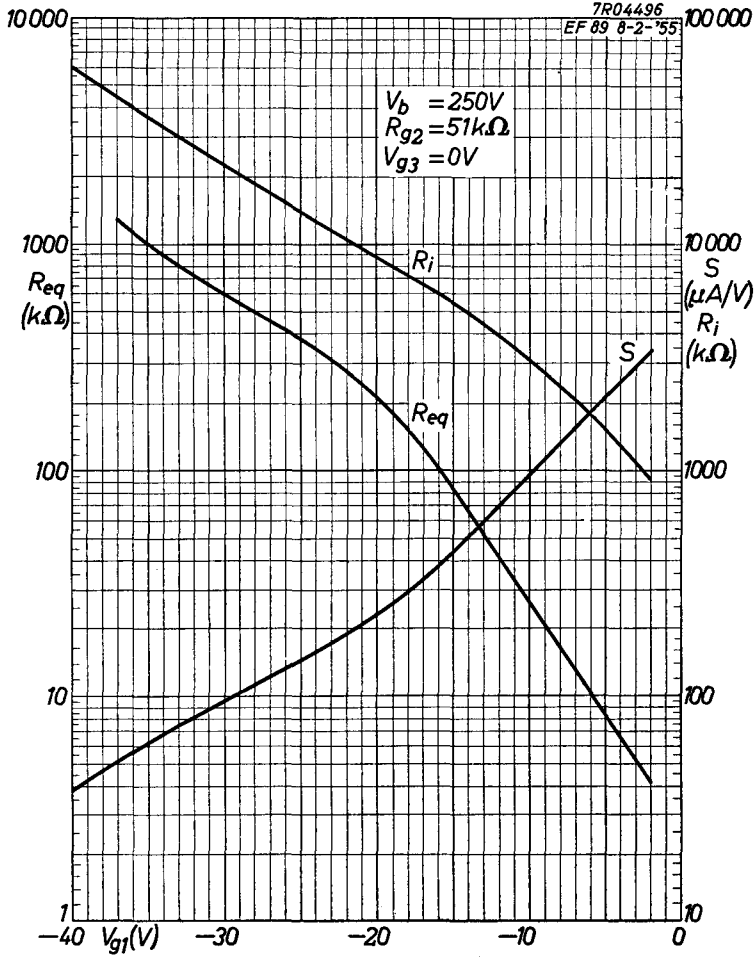
EF 89 **PHILIPS**



C

PHILIPS

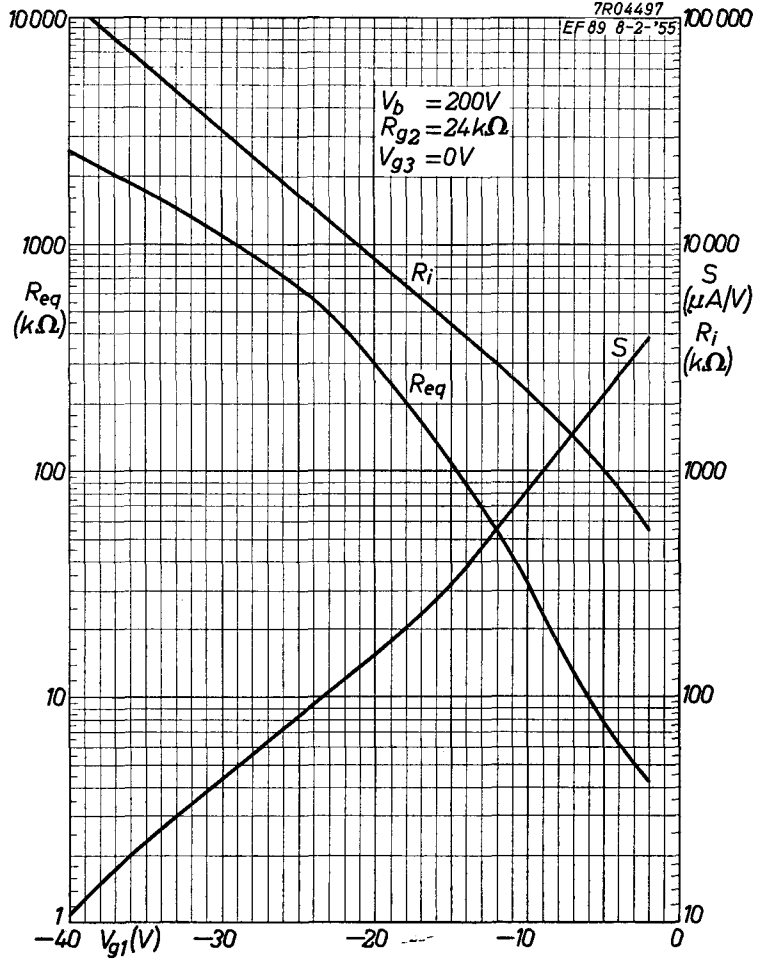
EF 89



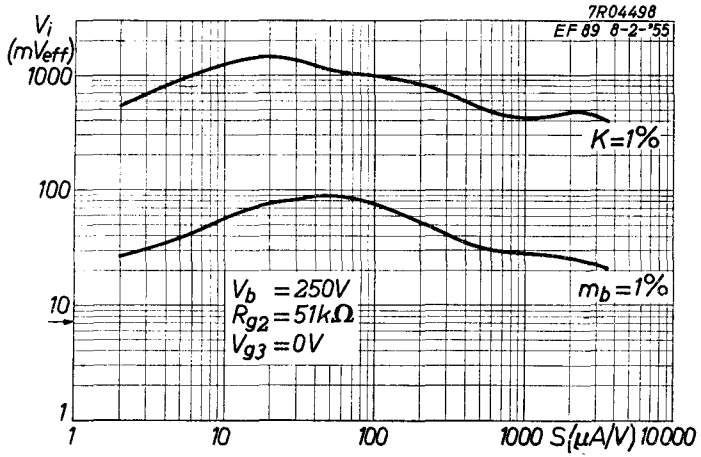
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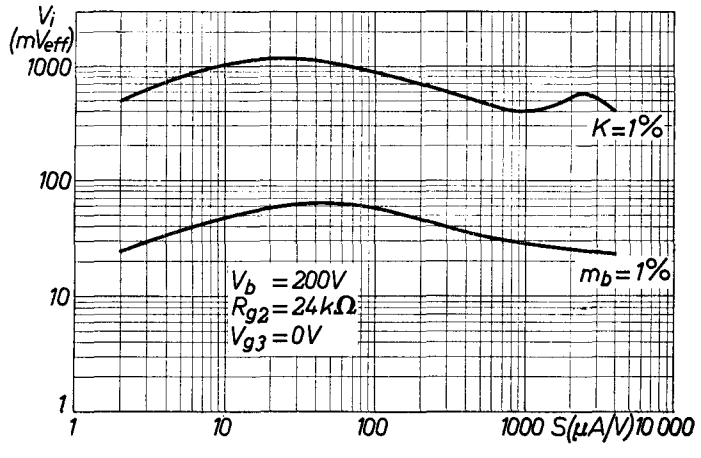
EF 89

PHILIPS



E


7R04498
EF 89 8-2-'55
V_i (mV$_{eff}$)
1000
100
10
1
K=1%
m_b=1%
V_b =250V
R_{g2}=51kΩ
V_{g3}=0V
1
10
100
1000 S(μA/V) 10000


V_i (mV$_{eff}$)
1000
100
10
1
K=1%
m_b=1%
V_b =200V
R_{g2}=24kΩ
V_{g3}=0V
1
10
100
1000 S(μA/V) 10 000

EF 89 PHILIPS

PHILIPS

Electronic Tube

HANDBOOK

EF89

page	sheet	date
1	1	1955.12.12
2	2	1955.12.12
3	3	1955.04.04
4	A	1955.04.04
5	B	1955.03.03
6	C	1955.03.03
7	D	1955.03.03
8	E	1955.03.03
9	F	1955.03.03
10	G	1955.03.03
11	FP	1999.06.29

EF 9 H.F.-Penthode-Selektode

Die Penthode EF 9 ist eine Hoch- oder Zwischenfrequenzröhre mit veränderlicher Steilheit, die auch als N.F.-Verstärker mit Widerstandskopplung verwendet werden kann, und zwar mit oder ohne Regelung der Verstärkung (automatische Lautstärkeregelung, die auch die N.F.-stufe beeinflußt). Der Entwurf dieser Röhre unterscheidet sich von dem der EF 5 dadurch, daß an Stelle einer festen Schirmgitterspannung eine bei zunehmender Gittervorspannung veränderliche Schirmgitterspannung vorgesehen wurde. Anstatt der Speisung durch einen Spannungsteiler kann das Schirmgitter der EF 9 durch einen Serienwiderstand gespeist werden. Die Schirmgitterspannung stellt sich im ungeregelten Zustand durch den Spannungsabfall im Schirmgittervorwiderstand auf beispielsweise 100 Volt ein. Beim Herunterregeln der Röhre sinkt der Schirmgitterstrom und verringert sich der Spannungsabfall über dem Serienwiderstand, so daß die Schirmgitterspannung steigt, bis sie sich im vollkommen heruntergeregelten Zustand dem Wert der Speisespannung nähert. Man bezeichnet diese veränderliche Spannung des Schirmgitters als gleitende Schirmgitterspannung.

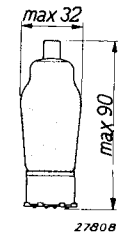
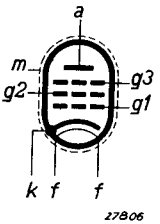


Abb. 1
Abmessungen in mm.



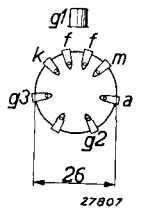


Abb. 2
Elektrodenanordnung und Sockelanschlüsse.

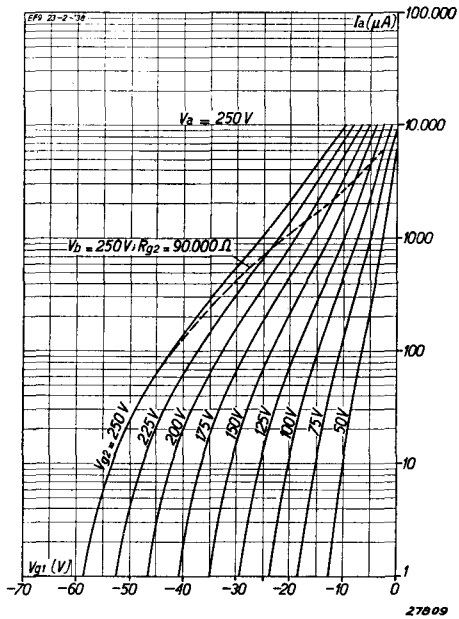


Abb. 3
Ia/Vg_1-Kurvenschar mit Vg_2 als Parameter. Die gestrichelte Kurve gibt den Verlauf des Anodenstromes bei Regelung der Röhre für den Fall der Schirmgitterspeisung über 90.000 Ohm von 250 Volt aus.

Der Vorteil der Speisung des Schirmgitters über einen Vorwiderstand liegt darin, daß bei ungefähr gleichen Quermodulationseigenschaften der Anodenstrom im ungeregelten Zustand niedriger und die Steilheit höher sein kann, als es bei einer Röhre mit fester Schirmgitterspannung der Fall ist. So hat die EF 9 bei —2,5 Volt Vorspannung und 100 Volt Schirmgitterspannung im ungeregelten Zustand einen Anodenstrom von 6 mA und eine Steilheit von 2,2 mA/V, die EF 5 dagegen bei $V_{g1} = -3$ V und $V_{g2} = 100$ V einen Anodenstrom von 8 mA und eine Steilheit von 1,7 mA/V.

Bei steigender Schirmgitterspannung verschiebt sich die Ia/Vg_1-Kennlinie nach links, und wenn die Kennlinie im ungeregelten Zustand einen kurzen Auslauf hat, so wird dieser bei zunehmender Schirmgitterspannung immer größer. Die in Abb. 3 dargestellten logarithmischen Ia/Vg_1-Kurven für verschiedene Schirmgitterspannungen bestätigen dies. Diese Tatsache führt dazu, daß, obschon die Ia/Vg_1-Kennlinie im ungeregelten Zustand einen kurzen Auslauf hat, die Quermodulationseigenschaften bei der Regelung wesentlich besser werden, als wenn die Schirmgitterspannung konstant bliebe.

Bei 250 Volt Speisespannung muß der Schirmgittervorwiderstand 90.000 Ohm

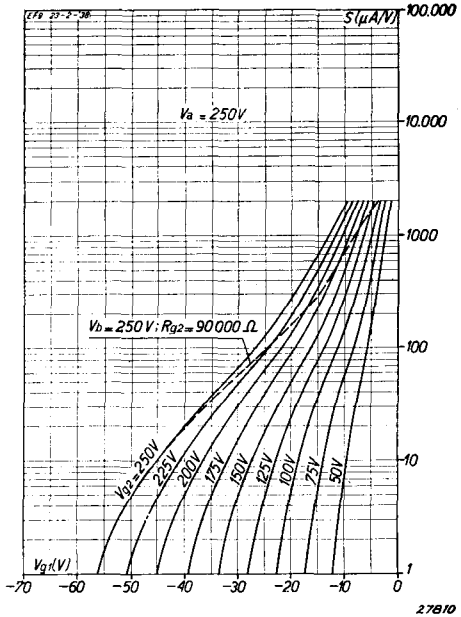


Abb. 4
Steilheit als Funktion der Gittervorspannung mit V_{g_2} als Parameter. Die gestrichelte Kurve gibt den Verlauf der Steilheit bei Regelung der Röhre für den Fall der Schirmgitterspeisung über 90.000 Ohm von 250 Volt aus.

betragen, um im ungeregelten Zustand eine Schirmgitterspannung von 100 Volt zu erhalten. Da jeder Gittervorspannung eine andere Schirmgitterspannung zugeordnet ist, wird der Anodenstromverlauf als Funktion der Gitterspannung durch die gestrichelte Kurve dargestellt. Eine Gitterwechselspannung hat aber keine Schirmgitterspannungsänderung zur Folge, da das Schirmgitter durch einen Kondensator entkoppelt wird, so daß sich in dem Falle der Anodenstrom gemäß der I_a/V_{g1}-Kurve ändert, die zu der betreffenden Gittervorspannung gehört. Nach Abb. 3 beträgt bei —12,5 Volt Gittervorspannung die Schirmgitterspannung 175 Volt, so daß für diese Vorspannung die I_a/V_{g1}-Kennlinie für V_{g2} = 175 V gilt.

Bei anderen Werten der Speisespannung muß der Schirmgittervorwiderstand dementsprechend anders gewählt werden, und es ergibt sich dann auch ein anderer Regelverlauf. So wird bei 200 Volt Speisespannung (z.B. für G/W-Geräte) ein Wert von 60.000 Ohm erforderlich sein, um im ungeregelten Zustand eine Schirmgitterspannung von 100 Volt zu erhalten. Der Anodenstrom wird dadurch rascher heruntergeregelt. Bei 100 Volt Speisespannung wird das Prinzip der gleitenden Schirmgitterspannung nicht mehr zur Anwendung gelangen und die Röhre dann mit fester Schirmgitterspannung betrieben.

Für diesen Fall gilt die I_a/V_{g1}-Kurve für V_{g2} = 100 V der Abb. 3. Wenn zur Speisung des Schirmgitters Spannungsteiler verwendet werden, kann durch geeignete Wahl der Widerstandswerte eine raschere Regelung erzielt werden als bei Speisung durch einen Vorwiderstand. Zu berücksichtigen ist aber immer, daß eine raschere Regelung mit einer weniger günstigen Quermodulationscharakteristik gleichbedeutend ist. Mit Hilfe der in Abb. 10 dargestellten I_{g2}/V_{g2}-Kurven können für jeden Fall die verschiedenen Betriebsbedingungen im voraus bestimmt werden. Die Modulationsbrummeigenschaften sind bei günstiger Wahl der Regelkennlinie hervorragend. Dies ist für die Anwendung in G/W-Geräten von Bedeutung.

Die EF 9 zeichnet sich insbesondere durch niedrige Kapazitätswerte aus. Bemerkenswert ist die Gitter-Anodenkapazität, die bei dieser Röhre kleiner als 0,002 μμF ist. Auf Kurzwellen ermöglicht diese Röhre beachtliche Leistungen. Obschon für Kurzwellen nur Kreise mäßiger Güte hergestellt werden können, gestatten die vorzüglichen Eigenschaften der Röhre EF 9 die Erzielung einer für diesen Bereich sehr hohen Verstärkung

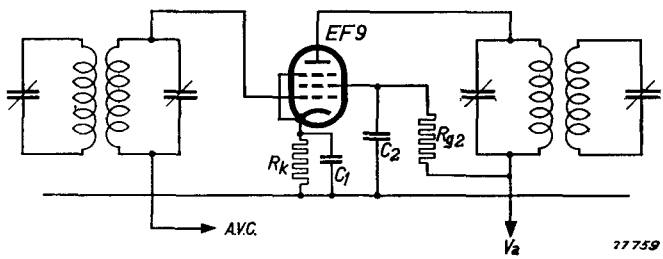


Abb. 5
Prinzip der Schaltung einer Z.F.-Verstärkerröhre mit gleitender Schirmgitterspannung.

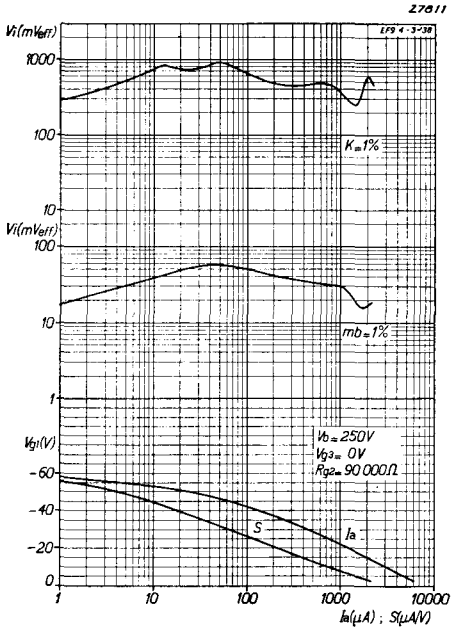


Abb. 6
Obere Kurve: Effektive Gitterwechselspannung als Funktion der Steilheit für 1% Quermodulation bei Speisung des Schirmgitters über einen Widerstand von 90.000 Ohm von 250 V aus.
Mittlere Kurve: Effektive Gitterwechselspannung als Funktion der Steilheit für 1% Modulationsbrummen.
Untere Kurve: Steilheit *S* und Anodenstrom *Ia* als Funktion der negativen Gitterspannung.

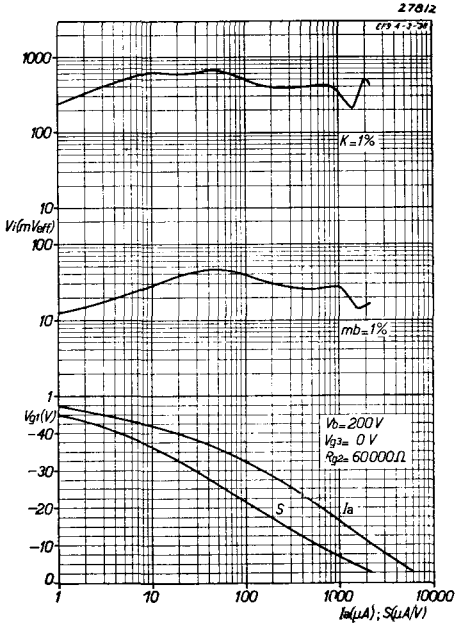


Abb. 7
Obere Kurve: Effektive Gitterwechselspannung als Funktion der Steilheit für 1% Quermodulation bei Speisung des Schirmgitters über einen Widerstand von 60.000 Ohm von 200 Volt aus.
Mittlere Kurve: Effektive Gitterwechselspannung als Funktion der Steilheit für 1% Modulationsbrummen.
Untere Kurve: Steilheit *S* und Anodenstrom *Ia* als Funktion der negativen Gitterspannung.

Die Röhre EF 9 kann, wie erwähnt, auch als N.F.-Verstärker mit Widerstandskopplung verwendet werden. Hierbei ist es möglich, durch Zuführung einer Regelspannung zum ersten Gitter die Verstärkung zu regeln, so daß die automatische Lautstärkeregelung im N.F.-Verstärker unterstützt werden kann. Die Daten als N.F.-Verstärker sind in der Tabelle auf Seite 272 untergebracht.

HEIZDATEN

Heizung: indirekt durch Gleich- oder Wechselstrom, Parallel- oder Serienspeisung.
Heizspannung . . . . . $V_f = 6{,}3$ A
Heizstrom . . . . . $I_f = 0{,}200$ A

KAPAZITÄTEN

$C_{ag1} < 0{,}002$ μμF
$C_{g1} = 5{,}5$ μμF
$C_a = 7{,}2$ μμF

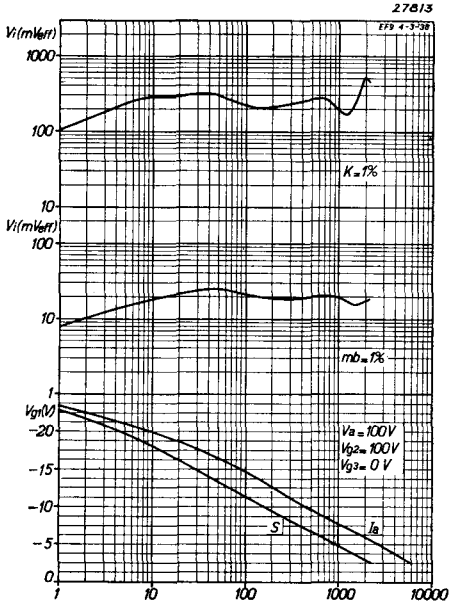


Abb. 8
Obere Kurve: Effektive Gitterwechselspannung als Funktion der Steilheit für 1% Quermodulation bei Va = 100 V und $Vg2$ = 100 V (feste Schirmgitterspannung).
Mittlere Kurve: Effektive Gitterwechselspannung als Funktion der Steilheit für 1% Modulationsbrummen.
Untere Kurve: Steilheit S und Anodenstrom Ia als Funktion der negativen Gitterspannung.

BETRIEBSDATEN FÜR DIE VERWENDUNG ALS H.F.- ODER Z.F.-VERSTÄRKER

Anodenspannung	V_a	= 250 V		
Fanggitterspannung	V_{g3}	= 0 V		
Schirmgittervorwiderstand	R_{g2}	= 90.000 Ω		
Kathodenwiderstand	R_k	= 325 Ω		
Neg. Gittervorspannung	V_{g1}	= — 2,5 V [1]	— 39 V [2]	— 49 V [3]
Schirmgitterspannung	V_{g2}	= 100 V	—	250 V
Anodenstrom	I_a	= 6 mA	—	—
Schirmgitterstrom	I_{g2}	= 1,7 mA	—	—
Steilheit	S	= 2200 µA/V	22 µA/V	4,5 µA/V
Innenwiderstand	R_i	= 1,25 MΩ	> 10 MΩ	> 10 MΩ
Anodenspannung	V_a	= 200 V		
Fanggitterspannung	V_{g3}	= 0 V		
Schirmgittervorwiderstand	R_{g2}	= 60.000 Ω		
Kathodenwiderstand	R_k	= 325 Ω		
Neg. Gittervorspannung	V_{g1}	= — 2,5 V [1]	— 32 V [2]	— 39 V [3]
Schirmgitterspannung	V_{g2}	= 100 V	—	200 V
Anodenstrom	I_a	= 6 mA	—	—
Schirmgitterstrom	I_{g2}	= 1,7 mA	—	—
Steilheit	S	= 2200 µA/V	22 µA/V	5,5 µA/V
Innenwiderstand	R_i	= 0,9 MΩ	> 10 MΩ	> 10 MΩ
Anodenspannung	V_a	= 100 V		
Fanggitterspannung	V_{g3}	= 0 V		
Schirmgitterspannung	V_{g2}	= 100 V		
Kathodenwiderstand	R_k	= 325 Ω		
Neg. Gittervorspannung	V_{g1}	= — 2,5 V [1]	— 16 V [2]	— 19 V [3]
Anodenstrom	I_a	= 6 mA	—	—
Schirmgitterstrom	I_{g2}	= 1,7 mA	—	—
Steilheit	S	= 2200 µA/V	22 µA/V	7 µA/V
Innenwiderstand	R_i	= 0,4 MΩ	> 10 MΩ	> 10 MΩ

[1]) Im ungeregelten Zustand.
[2]) Für eine Regelung der Steilheit auf 1 : 100.
[3]) Grenze des optimalen Regelbereiches.

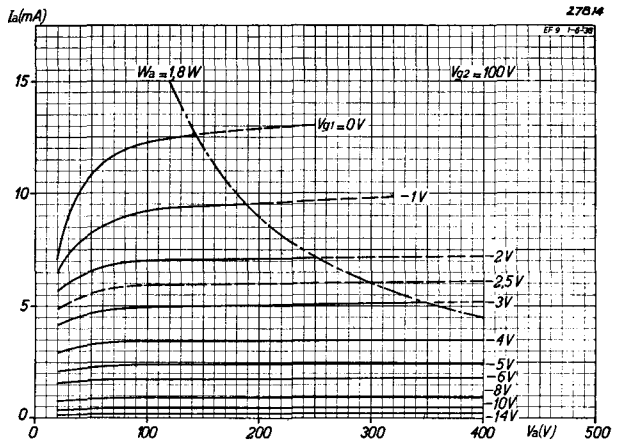


Abb. 9
Anodenstrom als Funktion der Anodenspannung bei verschiedenen negativen Gitterspannungen und einer festen Schirmgitterspannung von 100 Volt.

GRENZDATEN

Max. Anodenkaltspannung	V_{ao}	= max. 550 V
Max. Anodenspannung	V_a	= max. 300 V
Max. Anodenbelastung	W_a	= max. 1,8 W
Max. Schirmgitterkaltspannung	V_{g2o}	= max. 550 V
Max. Schirmgitterspannung bei $I_a = 6$ mA	V_{g2}	= max. 125 V
Max. Schirmgitterspannung bei $I_a \leqq 3$ mA	V_{g2}	= max. 300 V
Max. Schirmgitterbelastung	W_{g2}	= max. 0,3 W
Obere Grenze des Schirmgitterstromes ($I_a = 6$ mA, $V_{g2} = 100$ V)	I_{g2}	= max. 2,0 mA
Untere Grenze des Schirmgitterstromes ($I_a = 6$ mA, $V_{g2} = 100$ V)	I_{g2}	= min. 1,2 mA
Max. Kathodenstrom	I_k	= max. 10 mA
Grenzwert des Gitterstromeinsatzpunktes V_{g1} ($I_{g1} = +0{,}3$ µA)		= max. — 1,3 V
Höchstwert des Widerstandes zwischen Gitter und Kathode	R_{g1k}	= max. 3 MΩ
Höchstwert des Widerst. zwischen Heizfaden und Kathode	R_{fk}	= max. 20.000 Ω
Max. Spannung zwischen Heizfaden und Kathode (Gleichspannung oder Effektivwert der Wechselspannung)	V_{fk}	= max. 100 V

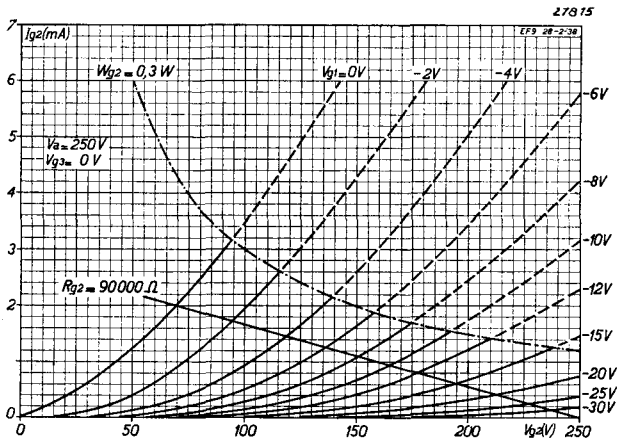


Abb. 10
Schirmgitterstrom als Funktion der Schirmgitterspannung bei verschiedenen Steuergitterspannungen. Die Kurven gelten näherungsweise für alle Anodenspannungen zwischen 100 und 250 Volt.

Wegen der Daten als widerstand gekoppelter N.F.-Verstärker wird auf die Tabelle auf Seite 272 verwiesen.

Die Röhre EF 9 kann als hand- oder automatisch geregelte Verstärkerröhre benutzt werden. Die Röhre hat eine kurze Anheizzeit. Die Kathodenisolierung ist für Spannungen bis zu 100 Volt Gleichspannung oder Effektivwert der Wechselspannung bemessen. Diese Spannung darf unter keinen Umständen überschritten werden.

BETRIEBSDATEN der Penthode EF 9 als widerstandgekoppelter N.F.-Verstärker mit regelbare Verstärkung

(Für Verwendung in Wechselstromempfängern oder Kraftverstärkern)

Spannung der Speisungsquelle Vb (Volt)	Anodenkopplungswiderst. Ra (MΩ)	Schirmgitterserienwiderst. Rg_2 (MΩ)	Kathodenwiderst. Rk (Ω)	Regelspannung am Steuergitter V_R (Volt)	Anodenstrom Ia (mA)	Schirmgitterstrom Ig_2 (mA)	Ausgangswechselspannung Vo_{eff} (Volt)	Gitterwechselspann. bei der angegebenen Ausgangswechselspann. Vi_{eff} (Volt)	Spannungsverstärkung $\frac{Vo}{Vi}$	Gesamtverzerrung dtot (%)
250	0,2	0,8	1750	0	0,87	0,26	3	0,028	106	0,8
250	0,2	0,8	1750	—5	0,69	0,21	3	0,075	40	0,8
250	0,2	0,8	1750	—10	0,55	0,17	3	0,13	23	1,1
250	0,2	0,8	1750	—18	0,37	0,11	3	0,27	11,6	1,5
250	0,2	0,8	1750	—25	0,17	0,05	3	0,45	6,7	2,7
250	0,2	0,8	1750	0	0,87	0,26	5	0,047	106	2,4
250	0,2	0,8	1750	—5	0,69	0,21	5	0,125	40	2,4
250	0,2	0,8	1750	—10	0,55	0,17	5	0,22	23	1,9
250	0,2	0,8	1750	—18	0,37	0,11	5	0,42	11,6	2,4
250	0,2	0,8	1750	—25	0,17	0,05	5	0,75	6,7	4,4
250	0,2	0,8	1750	0	0,87	0,26	10	0,094	106	2,7
250	0,2	0,8	1750	—5	0,69	0,21	10	0,25	40	2,7
250	0,2	0,8	1750	—10	0,55	0,17	10	0,43	23	3,7
250	0,2	0,8	1750	—18	0,37	0,11	10	0,86	11,6	4,8
250	0,2	0,8	1750	—25	0,17	0,05	10	1,46	6,7	8,8
250	0,1	0,4	1000	0	1,6	0,45	3	0,035	85	0,8
250	0,1	0,4	1000	—5	1,22	0,36	3	0,083	36	0,8
250	0,1	0,4	1000	—10	0,92	0,28	3	0,15	20	1,2
250	0,1	0,4	1000	—18	0,57	0,18	3	0,33	9,2	1,8
250	0,1	0,4	1000	—25	0,36	0,11	3	0,55	5,5	2,8
250	0,1	0,4	1000	0	1,6	0,45	5	0,059	85	1,3
250	0,1	0,4	1000	—5	1,22	0,36	5	0,14	36	1,4
250	0,1	0,4	1000	—10	0,92	0,28	5	0,25	20	2,1
250	0,1	0,4	1000	—18	0,57	0,18	5	0,55	9,2	3,1
250	0,1	0,4	1000	—25	0,36	0,11	5	0,91	5,5	4,8
250	0,1	0,4	1000	0	1,6	0,45	10	0,118	85	2,5
250	0,1	0,4	1000	—5	1,22	0,36	10	0,28	36	2,7
250	0,1	0,4	1000	—10	0,92	0,28	10	0,49	20	4,1
250	0,1	0,4	1000	—18	0,57	0,18	10	1,08	9,2	6,1
250	0,1	0,4	1000	—25	0,36	0,11	10	1,83	5,5	9,5

Erläuterungen:

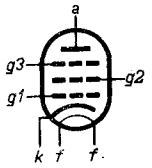
Die Verstärkungszahlen sind für einen Gitterableitwiderstand der nachfolgenden Röhre von 0,7 MΩ angegeben. Die Regelspannung am Steuergitter ist nicht mit der Gittervorspannung zu verwechseln; die letztere setzt sich zusammen aus Regelspannung plus Spannungsabfall über den Kathodenwiderstand.

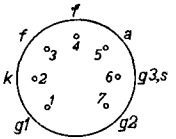
PENTODE for use as R.F. amplifier
PENTHODE pour utilisation en amplificatrice H.F.
PENTODE zur Verwendung als HF-Verstärker

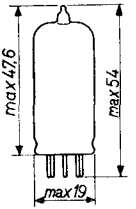
Heating : indirect by A.C. or D.C.; series or parallel supply
Chauffage: indirect par C.A. ou C.C.; alimentation parallèle ou série
Heizung : indirekt durch Wechsel- oder Gleichstrom; Serien- oder Parallelspeisung

V_f = 6,3 V
I_f = 0,3 A

Dimensions in mm
Dimensions en mm
Abmessungen in mm







Base, culot, Sockel: Miniature

Capacitances (with external screening)
Capacités (avec blindage extérieur)
Kapazitäten (mit äusserer Abschirmung)

C_{g1}	=	7,3 pF
C_a	=	3,4 pF
C_{ag1}	<	0,01 pF

Typical characteristics
Caractéristiques types
Kenndaten

V_a	=	250 V
V_{g2}	=	250 V
V_{g3}	=	0 V
V_{g1}	=	-2,0 V
I_a	=	10 mA
I_{g2}	=	2,55 mA
S	=	7,65 mA/V
R_i	=	1 MΩ
μ_{g2g1}	=	70
R_{eq}	=	1200 Ω
r_{g1}(50Mc/s)	=	7500 Ω

Limiting values
Caractéristiques limites
Grenzdaten

V_{a_o}	= max.	550	V
V_a	= max.	300	V
W_a	= max.	2,5	W
V_{g2_o}	= max.	550	V
V_{g2}	= max.	300	V
W_{g2}	= max.	0,65	W
I_k	= max.	15	mA
V_{g1} (I_{g1}=+0,3µA)	= max.	-1,3	V
V_{g3} (I_{g3}=+0,3µA)	= max.	-1,3	V
R_{g1}	= max.	1	MΩ
V_{kf}	= max.	150	V

PHILIPS

Electronic Tube

HANDBOOK

EF91

page	sheet	date
1	1	1955.02.02
2	2	1955.02.02
3	FP	1999.06.29

PHILIPS

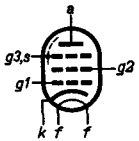
EF 92

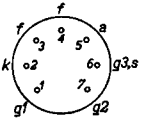
PENTODE for use as R.F. amplifier (up to 160 Mc/s)
PENTHODE pour utilisation en amplificatrice H.F. (jusqu'à 160 Mc/s)
PENTODE zur Verwendung als HF-Verstärker (bis 160 MHz)

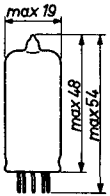
Heating : indirect by A.C. or D.C.; parallel supply
Chauffage: indirect par C.A. ou C.C.; alimentation- parallèle
Heizung : indirekt durch Wechsel- oder Gleichstrom; Parallelspeisung

V_f = 6,3 V
I_f = 0,2 A

Dimensions in mm
Dimensions en mm
Abmessungen in mm







Base, culot, Sockel: Miniature

Capacitances
Capacités
Kapazitäten

C_{g1} = 4,5 pF
C_a = 6,5 pF
C_{ag1} = 0,007 pF

Typical characteristics
Caractéristiques types
Kenndaten

V_a	=	250	250	V
V_{g2}	=	150	200	V
V_{g3}	=	0	0	V
V_{g1}	=	-0,65	-2,5	-28 V
I_a	=	8,0	8,0	- mA
I_{g2}	=	2,0	2,1	- mA
S	=	2,5	2,5	0,005 mA/V
μ_{g2g1}	=	30	30	-

Limiting values
Caractéristiques limites
Grenzdaten

V_{ao}	= max.	300	V
V_a	= max.	250	V
W_a	= max.	2,5	W
V_{g2o}	= max.	300	V
V_{g2}	= max.	250	V
W_{g2}	= max.	0,6	W
I_k	= max.	12	mA
R_{g1}	= max.	1	MΩ
V_{kf}	= max.	100	V
R_{kf}	= max.	20	kΩ

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Electronic Tube

HANDBOOK

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page	sheet	date
1	1	1953.11.11
2	2	1953.11.11
3	FP	1999.06.29

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EF 95

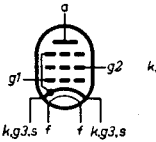
PENTODE for use as H.F. amplifier
PENTHODE pour utilisation en amplificatrice H.F.
PENTHODE zur Verwendung als H.F.Verstärker

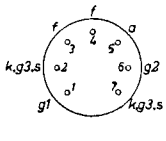
Heating:	indirect by A.C. or D.C.; parallel supply	
Chauffage:	indirect par C.A. ou C.C.; alimentation en parallèle	V_f = 6,3 V
Heizung:	indirekt durch Wechsel- oder Gleichstrom; Parallelspeisung	I_f = 0,175 A

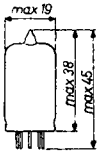
Dimensions in mm
Dimensions en mm
Abmessungen in mm

Base
Culot
Sockel

Miniature







Capacitances (with external shield)	C_{ag1}	< 0,02 pF
Capacités (avec blindage extérieur)	C_a	= 2,8 pF
Kapazitäten (mit äusserer Abschirmung)	C_{g1}	= 4,0 pF

Typical characteristics
Caractéristiques types
Kenndaten

V_a	=	120	180 V
V_{g2}	=	120	120 V
R_k	=	200	200 Ω
I_a	=	7,5	7,7 mA
I_{g2}	=	2,5	2,4 mA
S	=	5,0	5,1 mA/V
R_i	=	0,34	0,69 MΩ
R_{eq}	=	2	2 kΩ
r_{g1} (50 Mc/s)	=	25	25 kΩ

Limiting values
Caractéristiques limites
Grenzdaten

V_{ao}	= max.	300	V
V_a	= max.	180	V
W_a	= max.	1,7	W
V_{g2o}	= max.	300	V
V_{g2}	= max.	140	V
W_{g2}	= max.	0,5	W
I_k	= max.	18	mA
V_{kf}	= max.	90	V



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page	sheet	date
1	1	1952.12.12
2	2	1952.12.12
3	FP	1999.06.29

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PENTODE with variable mutual conductance for use as R.F. amplifier, I.F. amplifier and mixer in carradio sets. The tube can directly be operated from a 6 V or 12 V storage battery

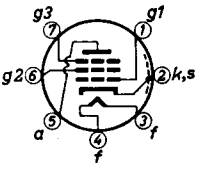
PENTHODE à pente variable pour l'utilisation comme amplificatrice H.F., amplificatrice M.F. et comme tube mélangeur dans récepteurs autoradio. On peut faire fonctionner le tube directement d'un accumulateur de 6 V ou de 12 V

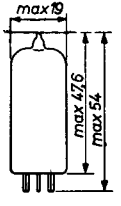
PENTODE mit veränderlicher Steilheit zur Verwendung als HF-Verstärker, ZF-Verstärker und als Mischröhre in Autoempfängern. Die Röhre kann direkt von einer 6 V oder 12 V Batterie betrieben werden

Heating : indirect. Parallel or series supply
Chauffage: indirect. Alimentation série ou parallèle
Heizung : indirekt. Serien- oder Parallelspeisung

V_f = 6,3 V
I_f = 300 mA

Dimensions in mm
Dimensions en mm
Abmessungen in mm





Base, culot, Sockel: MINIATURE

Capacitances
Capacités
Kapazitäten

C_a	=	4 pF
C_{g1}	=	6,5 pF
C_{ag1}	=	0,015 pF
C_{g1g2}	=	3 pF

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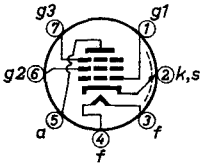
PENTODE with variable mutual conductance for use as R.F. or I.F. amplifier in carradio sets. The tube can be operated directly from a storage battery

HEATING

Indirect; series or parallel supply

Heater voltage	Vf = 6.3 V
Heater current	If = 0.3 A

Dimensions in mm



Base: MINIATURE

CAPACITANCES

Grid No.1 to all other elements except anode	C_{g_1}	= 6.2 pF
Anode to all other elements except grid No.1	C_a	= 3.8 pF
Anode to grid No.1	C_{ag_1}	= 0.015 pF
Grid No.1 to grid No.2	$C_{g_1g_2}$	= 3.0 pF

OPERATING CHARACTERISTICS for use as R.F. or I.F. amplifier

Anode voltage	V_a	=	25	12.6	6.3 V
Grid No.3 voltage	V_{g3}	=	0	0	0 V
Grid No.2 voltage	V_{g2}	=	6.3	6.3	3.2 V
Grid No.1 voltage	V_{g1}	=	-0.85	-0.85	-0.85 V
Anode current	I_a	=	2.7	2.5	0.8 mA
Grid No.2 current	I_{g2}	=	0.8	0.9	0.3 mA
Mutual conductance	S	=	1.9	1.8	0.9 mA/V
Internal resistance	Ri	=	60	120	60 kΩ
Equivalent noise resistance	R_{eq}	=	5	5.5	8 kΩ
Grid No.1 voltage	V_{g1}	=	-3.3	-3.3	-2.6 V
Mutual conductance	S	=	0.19	0.18	0.09 mA/V
Grid No.1 voltage	V_{g1}	=	-5	-5	-4 V
Mutual conductance	S	=	0.095	0.09	0.045 mA/V

Operating characteristics as R.F. or I.F. amplifier
Caractéristiques d'utilisation comme amplificateur H.F. ou M.F.
Betriebsdaten als HF- oder ZF-Verstärker

V_a =	25			12,6			V
V_{g2} =	6,3			6,3			V
V_{g3} =	connected to 0			connected to 0			V
V_{g1} =	-0,7[1])	-3,5	-5	-0,7[1])	-3,5	-5	V
I_a =	3,3	-	-	3	-	-	mA
I_{g2} =	0,95	-	-	1,1	-	-	mA
S =	2100	210	105	1900	190	95	µA/V
R_i =	50	-	-	150	-	-	kΩ
R_{eq} =	5	-	-	5,5	-	-	kΩ

V_a =	12,6			6,3			V
V_{g2} =	3,2			3,2			V
V_{g3} =	connected to 0			connected to 0			V
V_{g1} =	-0,7[1])	-2,5	-4	-0,7[1])	-2,5	-4	V
I_a =	1	-	-	1	-	-	mA
I_{g2} =	0,35	-	-	0,4	-	-	mA
S =	1100	110	55	1000	100	50	µA/V
R_i =	200	-	-	70	-	-	kΩ
R_{eq} =	7	-	-	8	-	-	kΩ

V_a =	6,3			V
V_{g2} =	1,6			V
V_{g3} =	connected to 0			V
V_{g1} =	-0,7[1])	-2,5	-3,5	V
I_a =	0,4	-	-	mA
I_{g2} =	0,15	-	-	mA
S =	500	50	25	µA/V
R_i =	200	-	-	kΩ
R_{eq} =	15	-	-	kΩ

[1]) Obtained by grid current biasing; R_{g1} = 10 MΩ
Obtenu par moyen de R_{g1} = 10 MΩ
Erhalten mittels R_{g1} = 10 MΩ

→

OPERATING CHARACTERISTICS for use as R.F. or I.F. amplifier (continued)

Anode voltage	V_a	= 12.6	6.3	V
Grid No.3 voltage	V_{g3}	= 0	0	V
Grid No.2 voltage	V_{g2}	= 3.2	1.6	V
Grid No.1 voltage	V_{g1}	= -0.85	-0.85	V
Anode current	I_a	= 0.85	0.3	mA
Grid No.2 current	I_{g2}	= 0.28	0.12	mA
Mutual conductance	S	= 0.95	0.45	mA/V
Internal resistance	R_i	= 180	180	kΩ
Equivalent noise resistance	R_{eq}	= 7	15	kΩ
Grid No.1 voltage	V_{g1}	= -2.6	-2.3	V
Mutual conductance	S	= 0.095	0.045	mA/V
Grid No.1 voltage	V_{g1}	= -4	-3.5	V
Mutual conductance	S	= 0.047	0.022	mA/V

LIMITING VALUES (Design centre limits)

Anode voltage	V_a	= max.	50	V
Anode dissipation	W_a	= max.	0.5	W
Grid No.3 voltage	V_{g3}	= max.	50	V
Grid No.3 circuit resistance	R_{g3}	= max.	5	MΩ
Grid No.2 voltage	V_{g2}	= max.	50	V
Grid No.2 dissipation	W_{g2}	= max.	0.5	W
Grid No.1 circuit resistance	R_{g1}	= max.	22	MΩ
Cathode current	I_k	= max.	15	mA
Voltage between heater and cathode	V_{kf}	= max.	50	V

Operating characteristics as mixer (R.F. voltage on g1, oscillator voltage on g3)
Caractéristiques d'utilisation comme tube mélangeur (tension H.F. à g1, tension d'oscillateur à g3)
Betriebsdaten als Mischröhre (HF-Spannung an g1, Oszillatorspannung an g3)

Va	=	25			12,6			V
Vg2	=	6,3			6,3			V
Rg3	=	0,1			0,1			MΩ
Vosc	=	10			10			Veff
Vg1	=	[1]	-3	-4	[1]	-3,5	-5	V
Ia	=	1,8	-	-	1,3	-	-	mA
Ig2	=	1,5	-	-	1,7	-	-	mA
Sc	=	600	60	30	550	55	27,5	µA/V
Ri	=	50	-	-	25	-	-	kΩ
Req	=	40	-	-	40	-	-	kΩ

Va	=	6,3			V
Vg2	=	3,2			V
Rg3	=	0,1			MΩ
Vosc	=	5			Veff
Vg1	=	[1]	-2,5	-3,5	V
Ia	=	0,45	-	-	mA
Ig2	=	0,6	-	-	mA
Sc	=	300	30	15	µA/V
Ri	=	30	-	-	kΩ
Req	=	55	-	-	kΩ

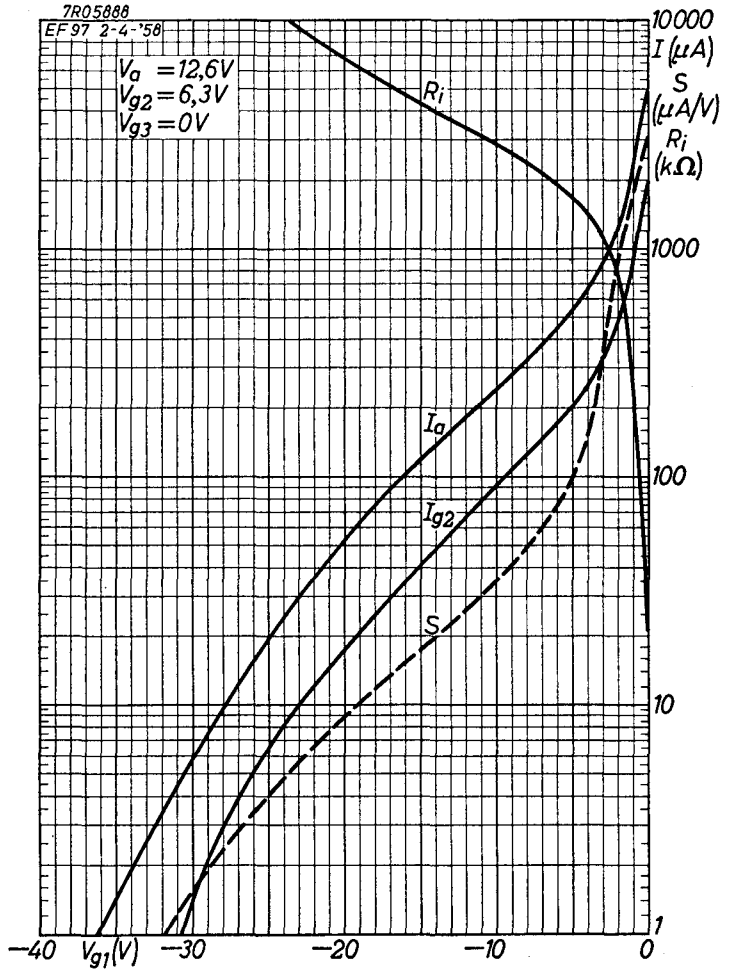
Limiting values
Caractéristiques limites
Grenzdaten

Va	= max.	50	V
Wa	= max.	0,5	W
Vg2	= max.	50	V
Wg2	= max.	0,5	W
Vg3	= max.	50	V
Ik	= max.	15	mA
Rg1	= max.	22	MΩ
Rg3	= max.	5	MΩ
Vkf	= max.	50	V

[1]) See page 2; voir page 2; siehe Seite 2

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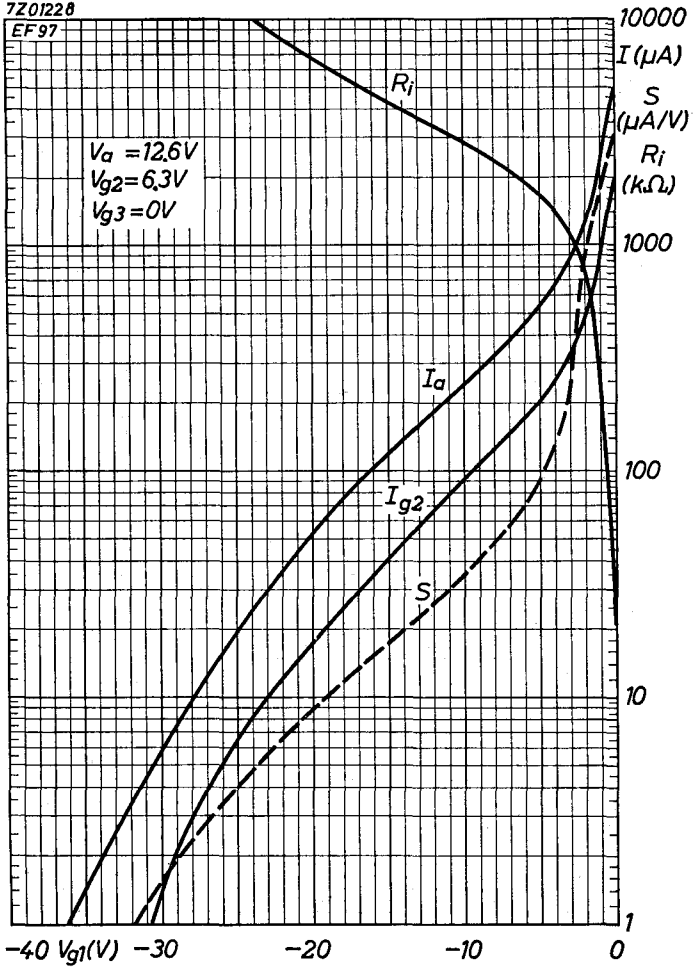


3. 3. 1958

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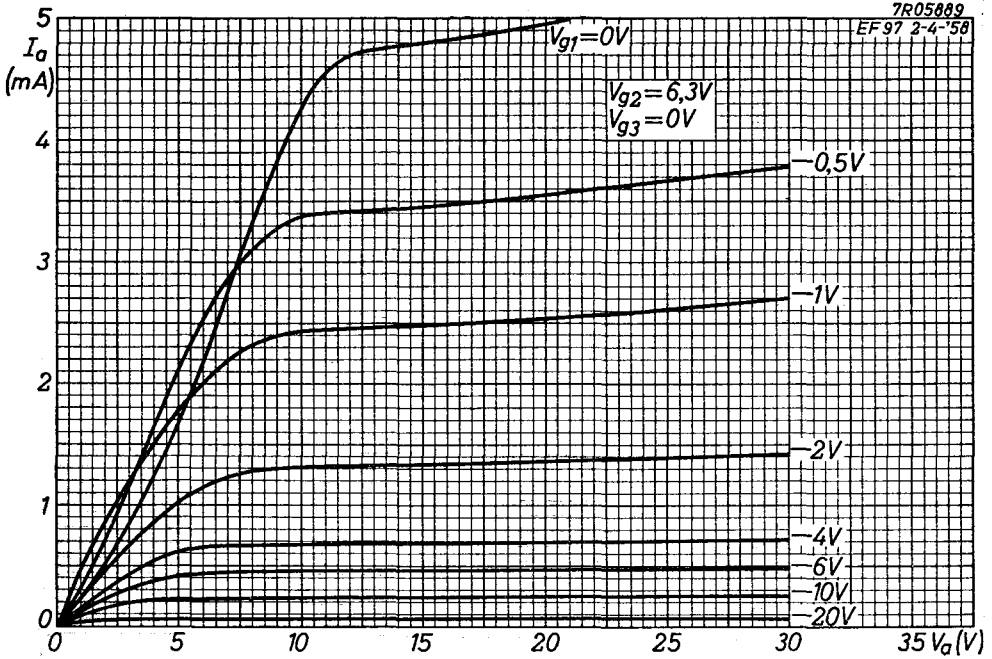
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9.9.1962

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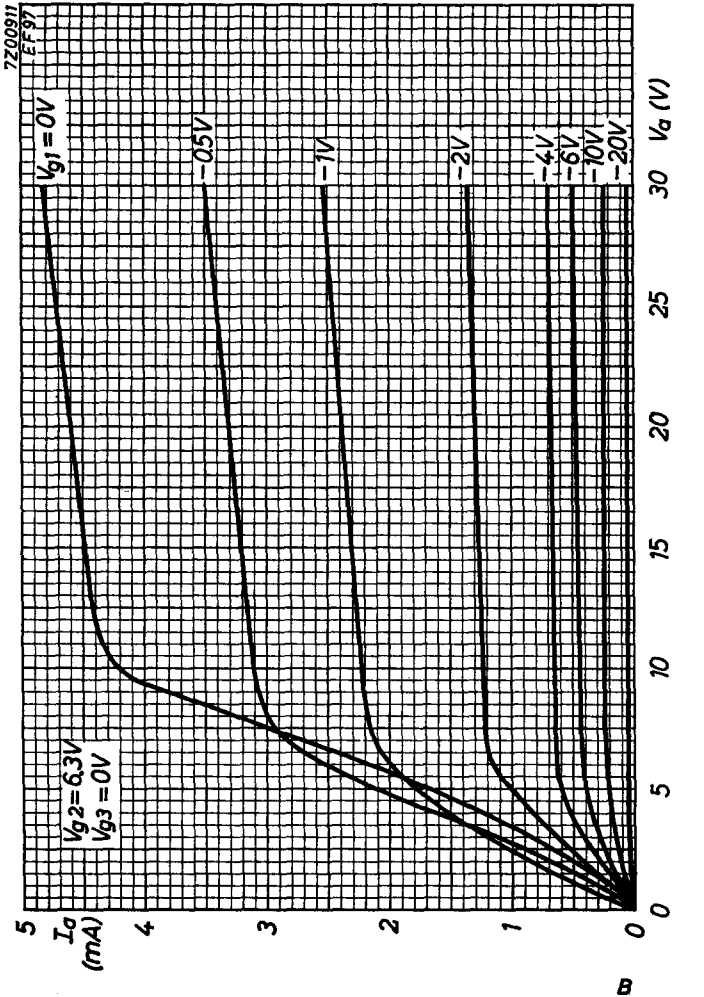


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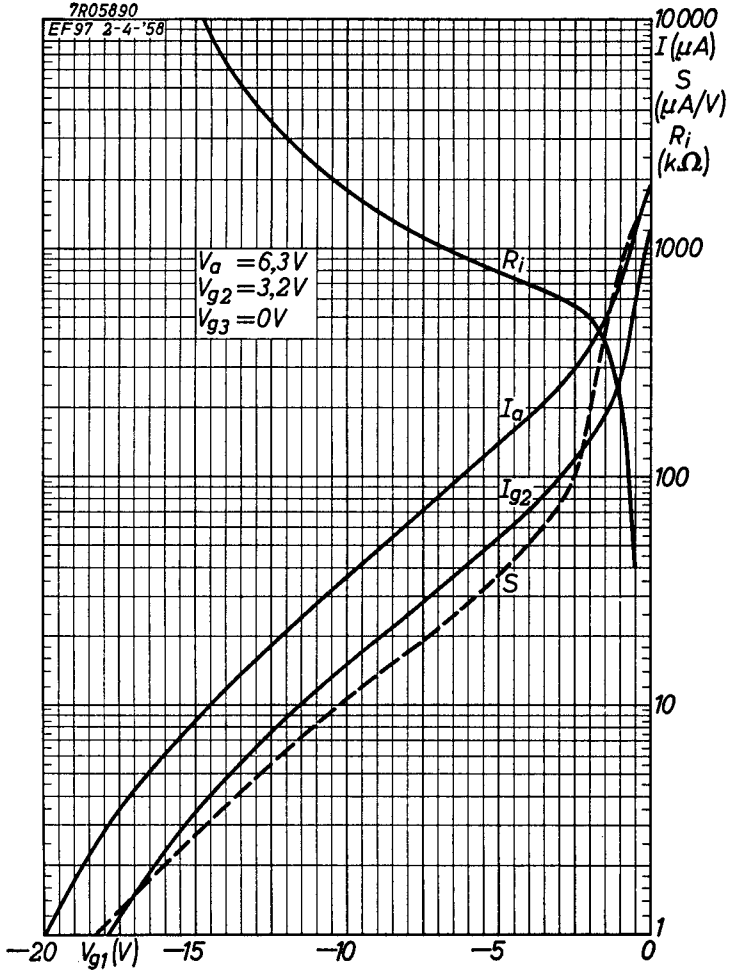
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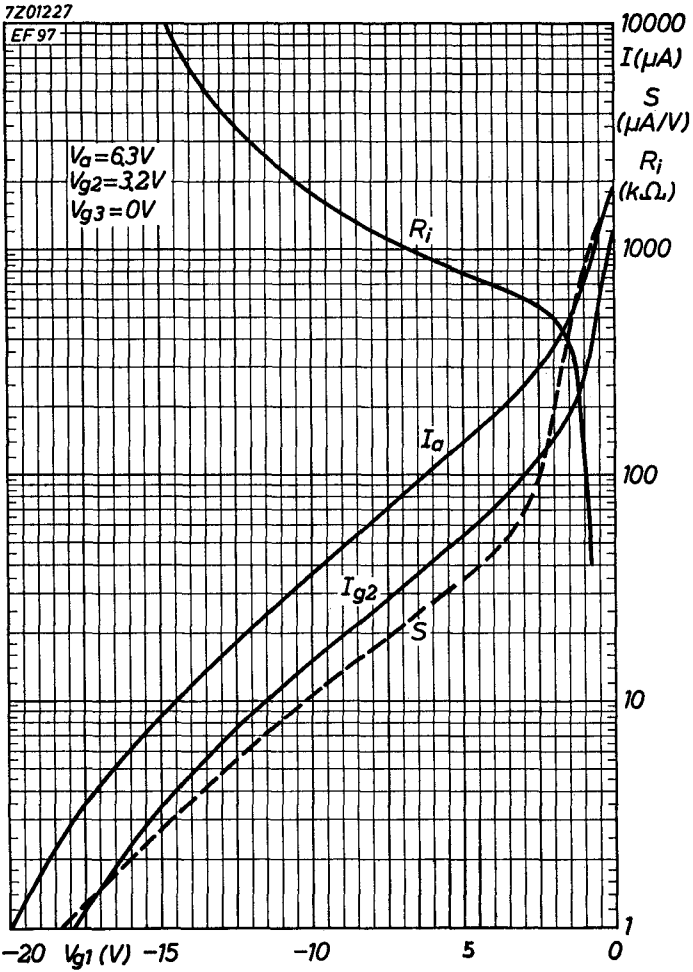
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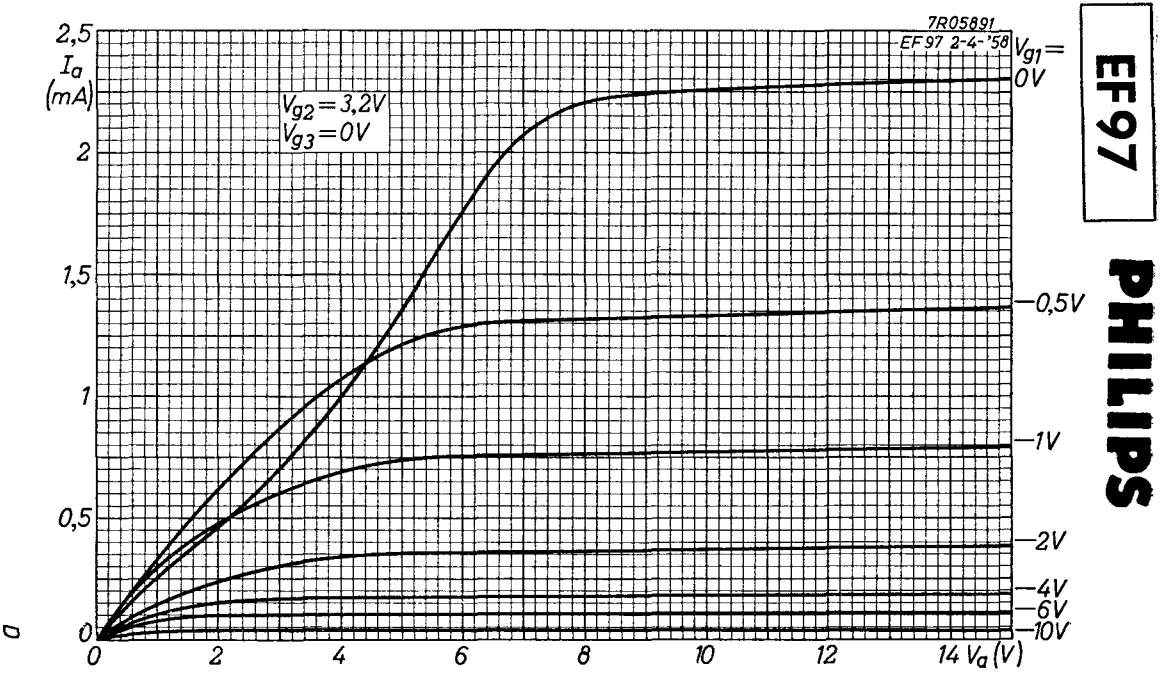
3.3.1958

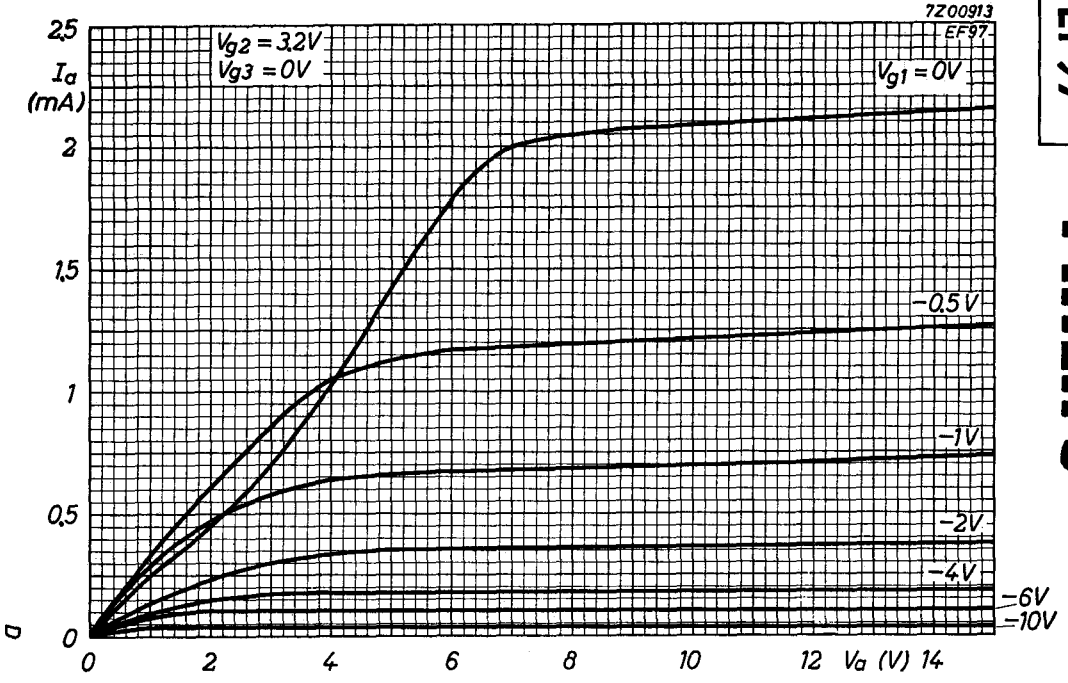
C

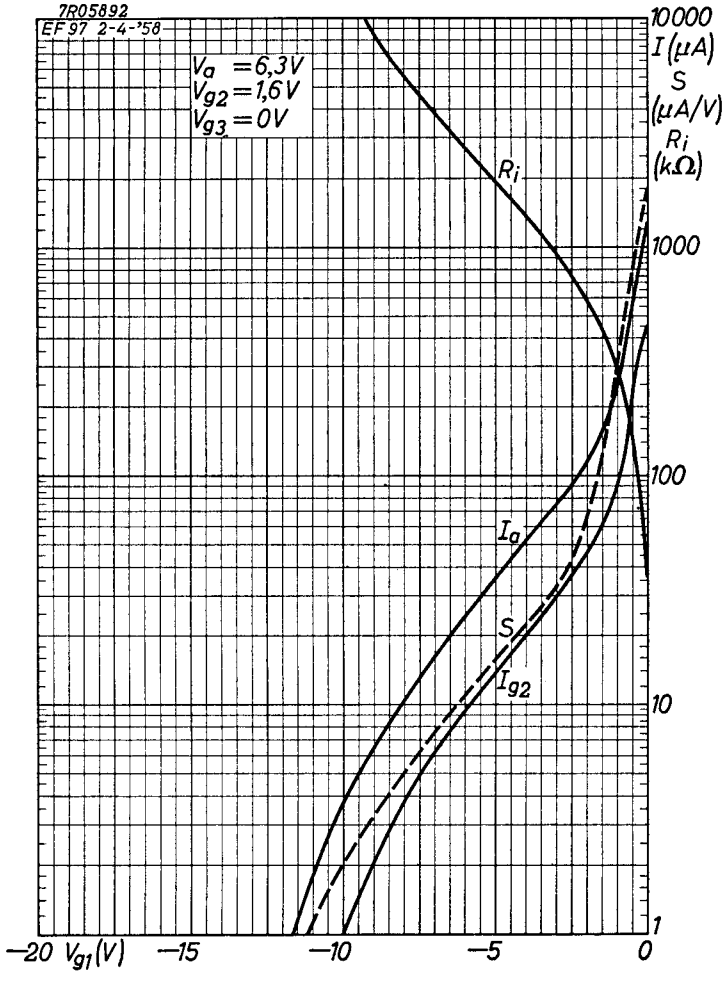

7Z01227
EF97
10000
I(μA)
S
(μA/V)
Ri
(kΩ)
1000
100
10
1
Va=6,3V
Vg2=3,2V
Vg3=0V
Ri
Ia
Ig2
S
−20
Vg1 (V)
−15
−10
5
0

9.9.1962

C

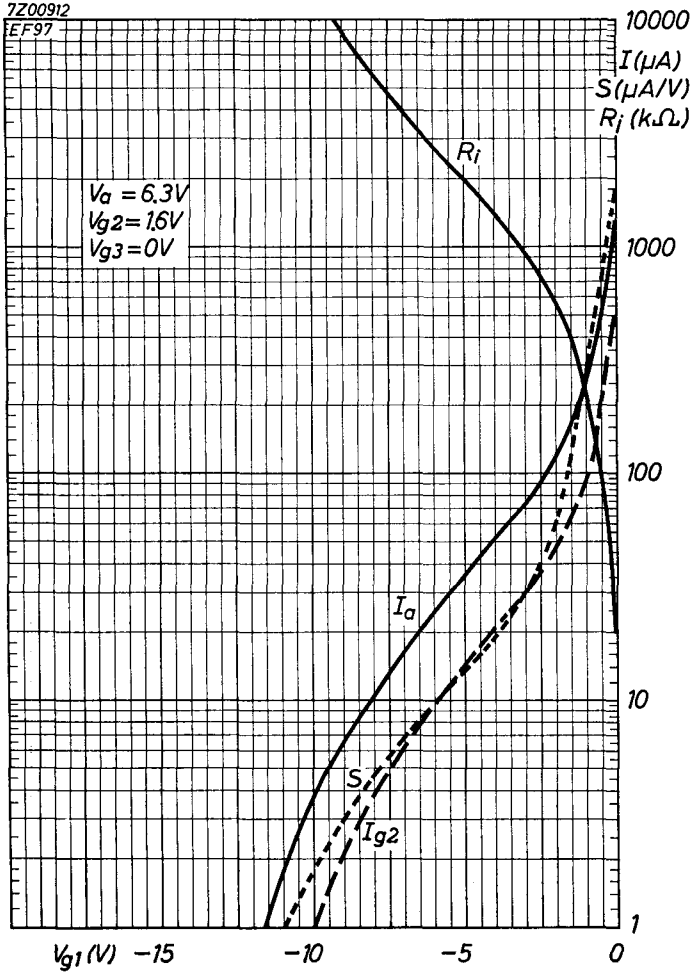

7R05891
EF97 2-4-'58
EF97
PHILIPS
I_a (mA)
2,5
2
1,5
1
0,5
0
$V_{g2}=3,2V$
$V_{g3}=0V$
$V_{g1}=$
0V
−0,5V
−1V
−2V
−4V
−6V
−10V
0
2
4
6
8
10
12
14 V_a (V)


7Z00913
EF97
$V_{g2} = 3.2V$
$V_{g3} = 0V$
$V_{g1} = 0V$
-0.5 V
-1V
-2V
-4V
-6V
-10V
I_a (mA)
2.5
2
1.5
1
0.5
0
0
2
4
6
8
10
12
V_a (V)
14


7R05892
EF97 2-4-'58
V_a = 6,3V
V_{g2} = 1,6V
V_{g3} = 0V
R_i
I_a
S
I_{g2}
10000
I (μA)
S
(μA/V)
R_i
(kΩ)
1000
100
10
1
−20 V_{g1} (V)
−15
−10
−5
0

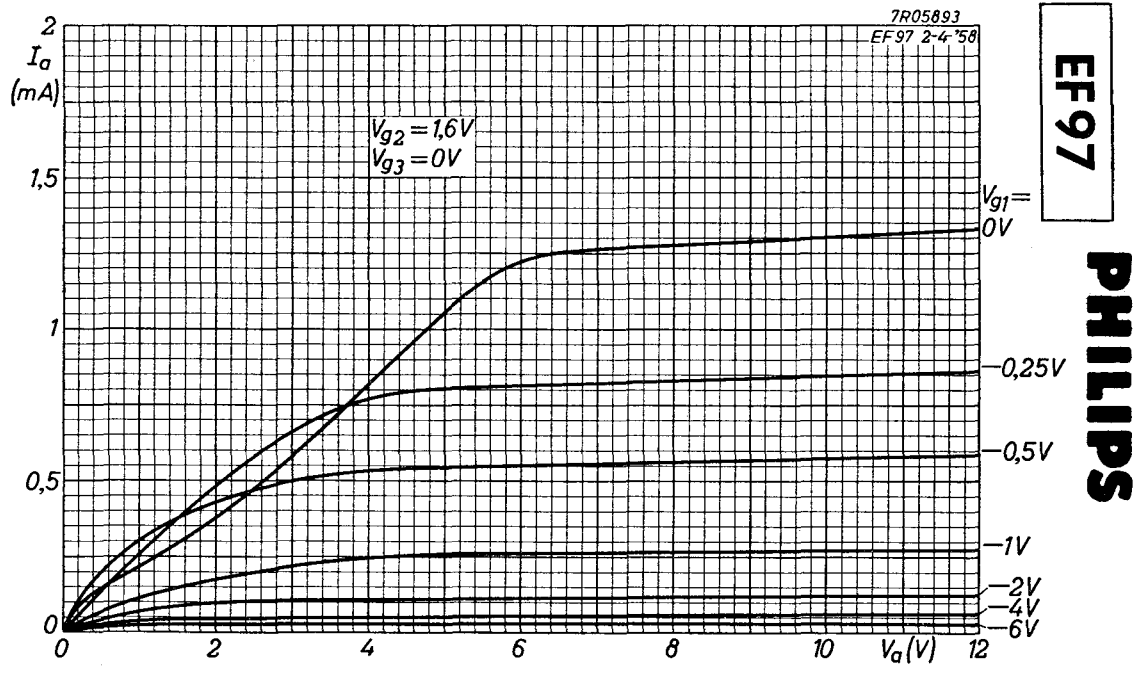
3.3.1958

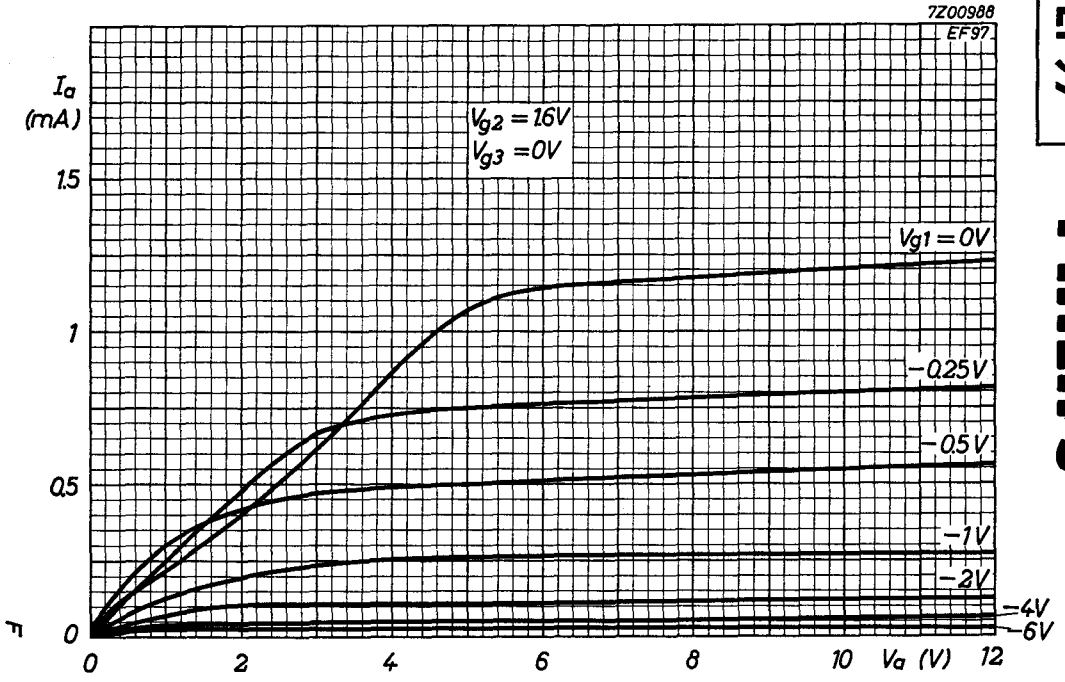
E

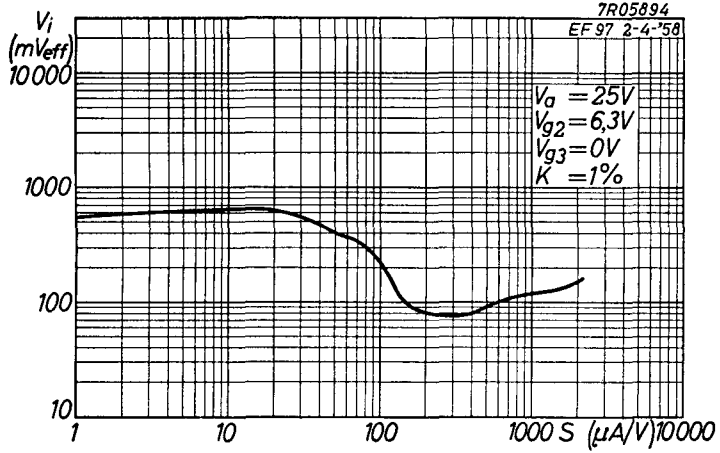

7Z00912
EF97
10000
I(μA)
S(μA/V)
Ri (kΩ)
Ri
Va = 6.3V
Vg2 = 1.6V
Vg3 = 0V
1000
100
Ia
10
S
Ig2
1
Vg1 (V) −15
−10
−5
0

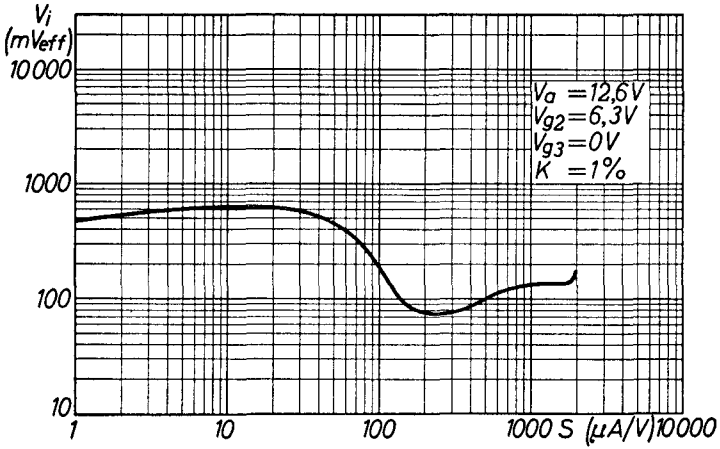
9.9.1962

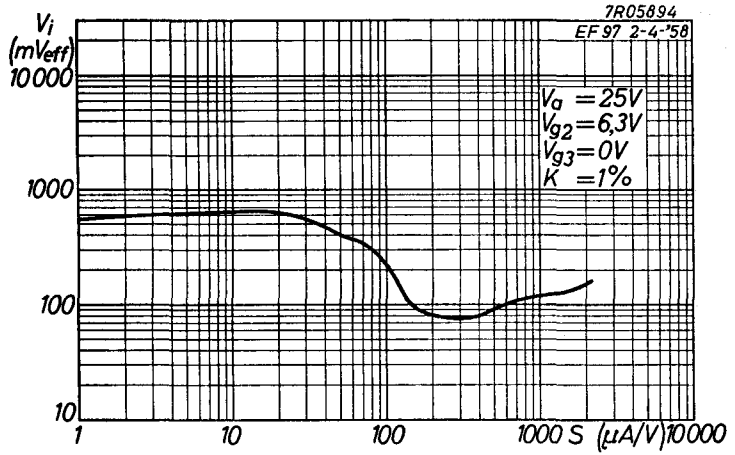
E

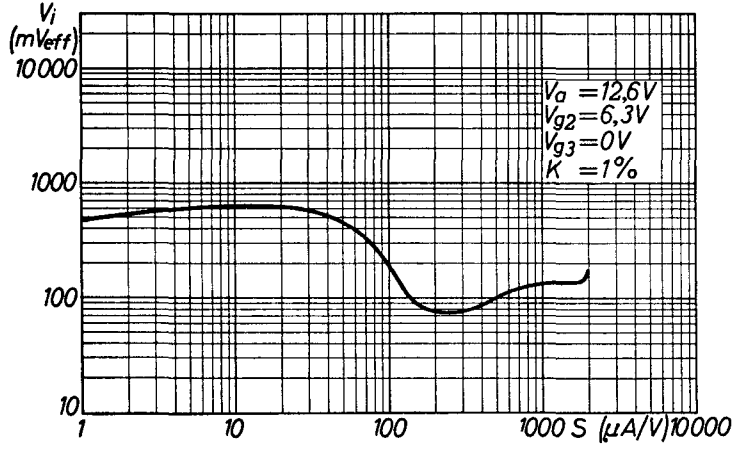

7R05893
EF97 2-4-'58
EF97
PHILIPS
I_a (mA)
2
1,5
1
0,5
0
$V_{g2} = 1{,}6V$
$V_{g3} = 0V$
V_{g1} =
0V
−0,25V
−0,5V
−1V
−2V
−4V
−6V
0
2
4
6
8
10
12
V_a(V)


7Z00988
EF97
I_a (mA)
$V_{g2} = 16V$
$V_{g3} = 0V$
$V_{g1} = 0V$
−0.25V
−0.5V
−1V
−2V
−4V
−6V
1.5
1
0.5
0
0
2
4
6
8
10
12
V_a (V)

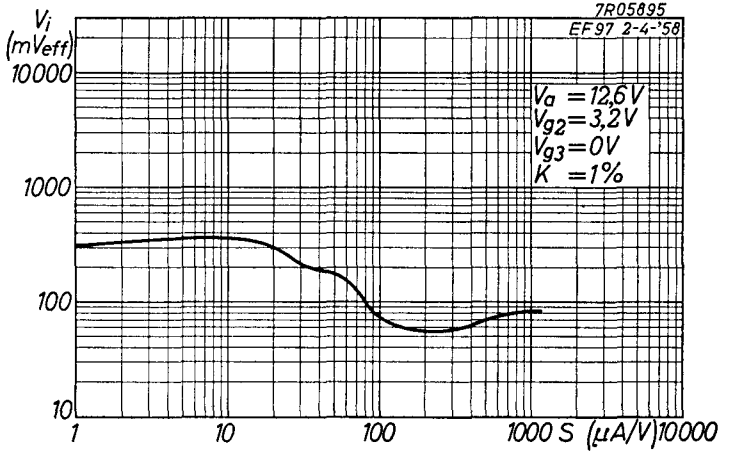

7R05894
EF 97 2-4-'58
Vi (mVeff)
10000
1000
100
10
1
10
100
1000 S (µA/V)10000
Va = 25V
Vg2 = 6,3V
Vg3 = 0V
K = 1%

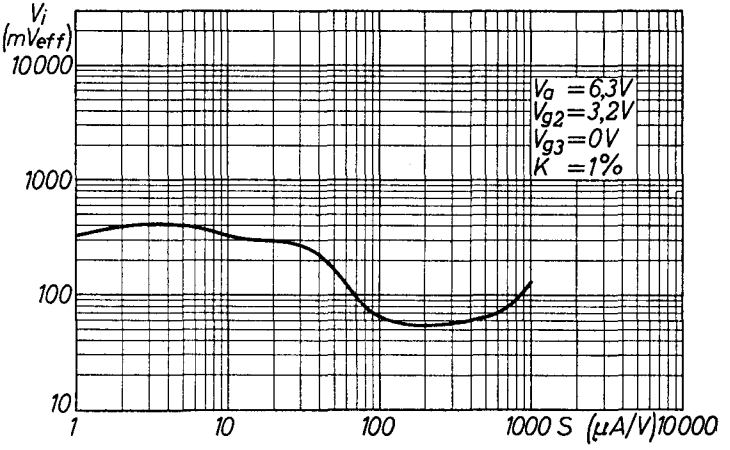

Vi (mVeff)
10000
1000
100
10
1
10
100
1000 S (µA/V)10000
Va = 12,6V
Vg2 = 6,3V
Vg3 = 0V
K = 1%


7R05894
EF 97 2-4-'58
Vi (mVeff)
10000
1000
100
10
1
10
100
1000 S (µA/V)10000
Va =25V
Vg2=6,3V
Vg3=0V
K =1%


Vi (mVeff)
10000
1000
100
10
1
10
100
1000 S (µA/V)10000
Va =12,6V
Vg2=6,3V
Vg3=0V
K =1%

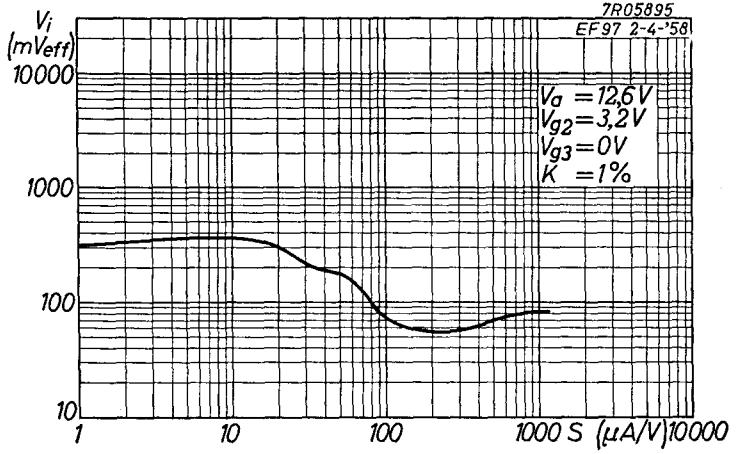
EF97 PHILIPS

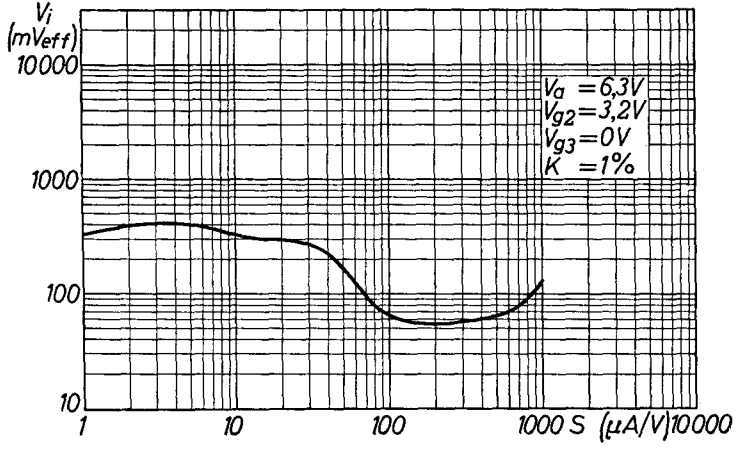




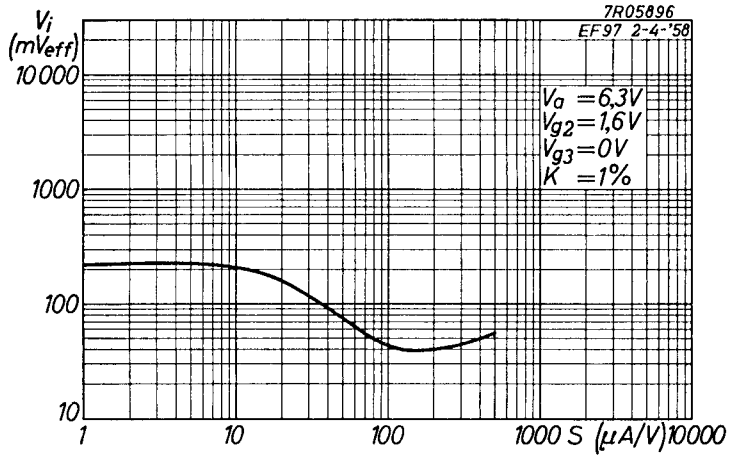
EF97

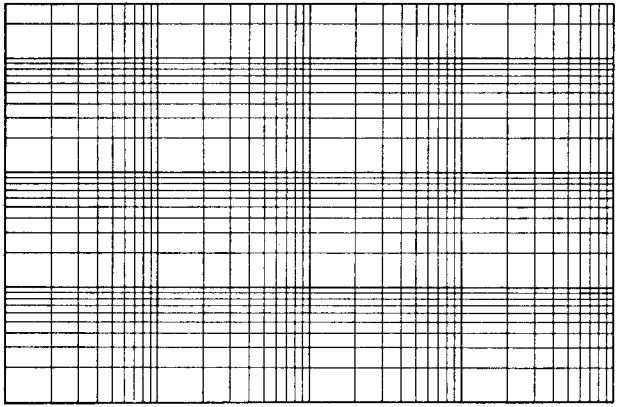
PHILIPS



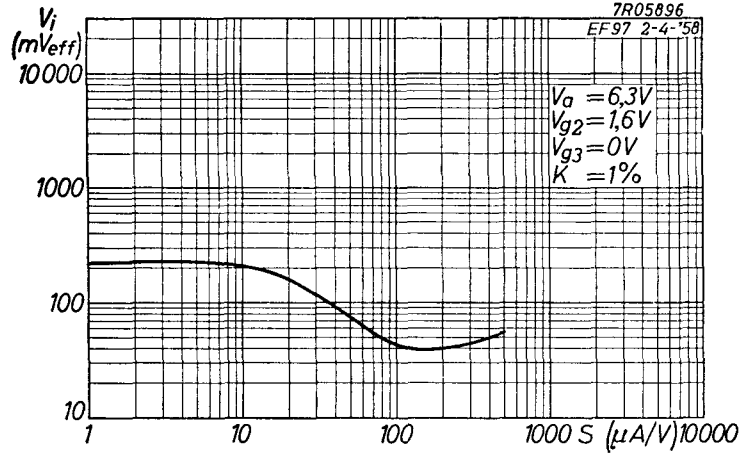


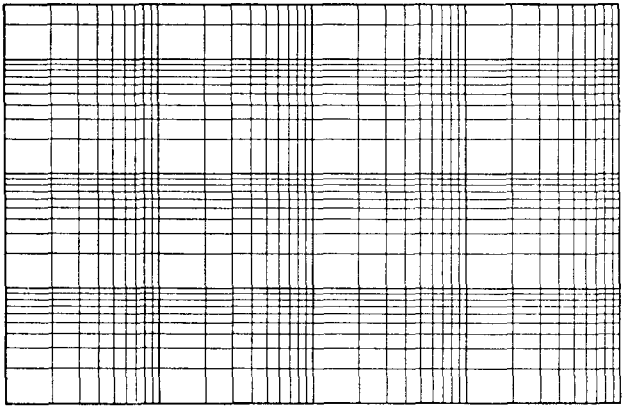
H


7R05896
EF97 2-4-'58
V_i (mV_{eff})
10000
1000
100
10
1
10
100
1000 S ($\mu A/V$) 10000
V_a = 6,3V
V_{g2} = 1,6V
V_{g3} = 0V
K = 1%



3.3.1958


7R05896
EF97 2-4-'58
Vi (mVeff)
10000
1000
100
10
1
10
100
1000 S (μA/V) 10000
Va = 6,3V
Vg2 = 1,6V
Vg3 = 0V
K = 1%



PHILIPS

Electronic Tube

HANDBOOK

EF97

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1	1	1959.04.04
2	1	1962.09.09
3	2	1959.04.04
4	2	1962.09.09
5	3	1959.04.04
6	A	1958.03.03
7	A	1962.09.09
8	B	1958.03.03
9	B	1962.09.09
10	C	1958.03.03
11	C	1962.09.09
12	D	1958.03.03
13	D	1962.09.09
14	E	1958.03.03
15	E	1962.09.09
16	F	1958.03.03
17	F	1962.09.09
18	G	1958.03.03
19	G	1962.09.09

20	H	1958.03.03
21	H	1962.09.09
22	I	1958.03.03
23	I	1962.09.09
24, 25	FP	2005.05.06

PHILIPS EF 98

PENTODE for use as I.F. amplifier, oscillator and A.F. amplifier in carradio sets. The tube can be directly operated from a 6 V or 12 V storage battery

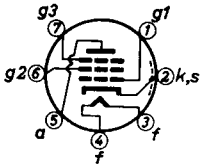
PENTHODE pour utilisation comme amplificatrice M.F., oscillatrice et comme amplificatrice B.F. dans récepteurs autoradio. On peut faire fonctionner le tube directement d'un accumulateur de 6 V ou de 12 V

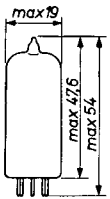
PENTODE zur Verwendung als ZF-Verstärker, Oszillator und NF-Verstärker in Autoempfängern. Die Röhre kann direkt von einer 6 V- oder 12 V-Batterie betrieben werden

Heating : indirect. Parallel or series supply
Chauffage: indirect. Alimentation parallèle ou série
Heizung : indirekt. Parallel- oder Serienspeisung

V_f = 6,3 V
I_f = 300 mA

Dimensions in mm
Dimensions en mm
Abmessungen in mm





Base, culot, Sockel: MINIATURE

Capacitances
Capacités
Kapazitäten

C_a	=	4 pF
C_{g1}	=	6,7 pF
C_{ag1}	=	0,015 pF
C_{g1g2}	=	3 pF

Operating characteristics as I.F. amplifier
Caractéristiques d'utilisation comme amplificatrice M.F.
Betriebsdaten als ZF-Verstärker

V_a	=	25	12,6	6,3	V
V_{g2}	=	6,3	6,3	3,2	V
V_{g3}	=	0	0	0	V
V_{g1} [1])	=	-0,75	-0,75	-0,8	V
I_a	=	2,2	2	0,6	mA
I_{g2}	=	0,6	0,7	0,2	mA
S	=	2,1	2	1	mA/V
R_i	=	90	200	100	kΩ
μ_{g2g1}	=	4,1	4,1	3,2	

Operating characteristics as A.F. driver (g3 connected to anode)
Caractéristiques d'utilisation comme tube d'attaque B.F. (g3 reliée à l'anode)
Betriebsdaten als NF-Treiberröhre (g3 mit Anode verbunden)

V_a	=	25	12,6	14[2])	6,3	7[2])	V
V_{g2}	=	12,6	12,6	14	6,3	7	V
V_{g3}	=	25	12,6	14	6,3	7	V
V_{g1} [1])	=	-2	-2,3	-2,4	-1,2	-1,3	V
I_a+I_{g3}	=	3	2,1	2,5	1,1	1,2	mA
$R_{a\sim}$	=	8	6	6	5,8	5,8	kΩ
V_i	=	1,2	1	1	0,4	0,4	V_{eff}
W_o	=	30	11	14	1,2	1,6	mW
d_{tot}	=	10	10	10	10	10	%

Limiting values
Caractéristiques limites
Grenzdaten

V_a	= max.	50	V
W_a	= max.	0,5	W
V_{g2}	= max.	50	V
W_{g2}	= max.	0,5	W
V_{g3}	= max.	50	V
I_k	= max.	15	mA
R_{g1}	= max.	22	MΩ
R_{g3}	= max.	0,1	MΩ
V_{kf}	= max.	50	V

[1])[2]) See page 3; voir page 3; siehe Seite 3

→

[1])Nearly the same results can be obtained when the neg. control-grid voltage is obtained by means of grid current biasing with R_{g1} = 10 MΩ

On peut obtenir presque les mêmes resultats quand la polarisation négative de la grille de commande est obtenue par R_{g1} = 10 MΩ

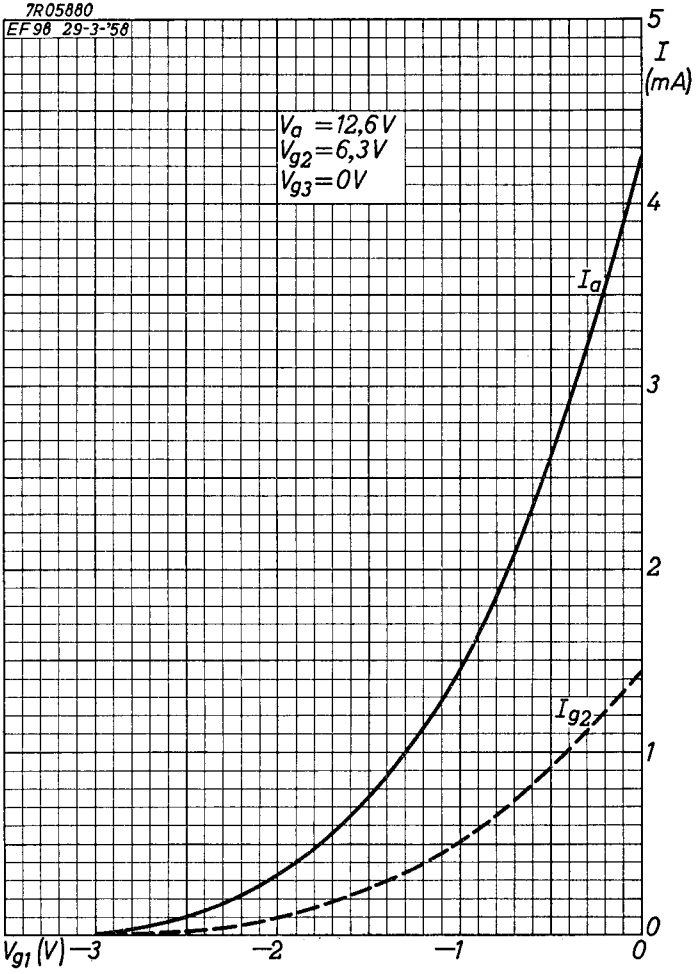
Fast dieselben Ergebnisse können erreicht werden wenn die negatieve Steuergittervorspannung mittels R_{g1} = 10 MΩ erhalten wird

[2])The output figures at a supply voltage of 7 V and 14 V have been added, because these values are normal praxis, when the car is running

Les caractéristiques de sortie à une tension d'alimentation de 7 V et de 14 V ont été données, ces valeurs étant normales en pratique quand l'automobile marche

Die Ausgangsdaten bei einer Speisespannung von 7 V und 14 V wurden hinzugefügt weil diese Daten normal in der Praxis vorkommen wenn der Wagen fährt

PHILIPS EF 98

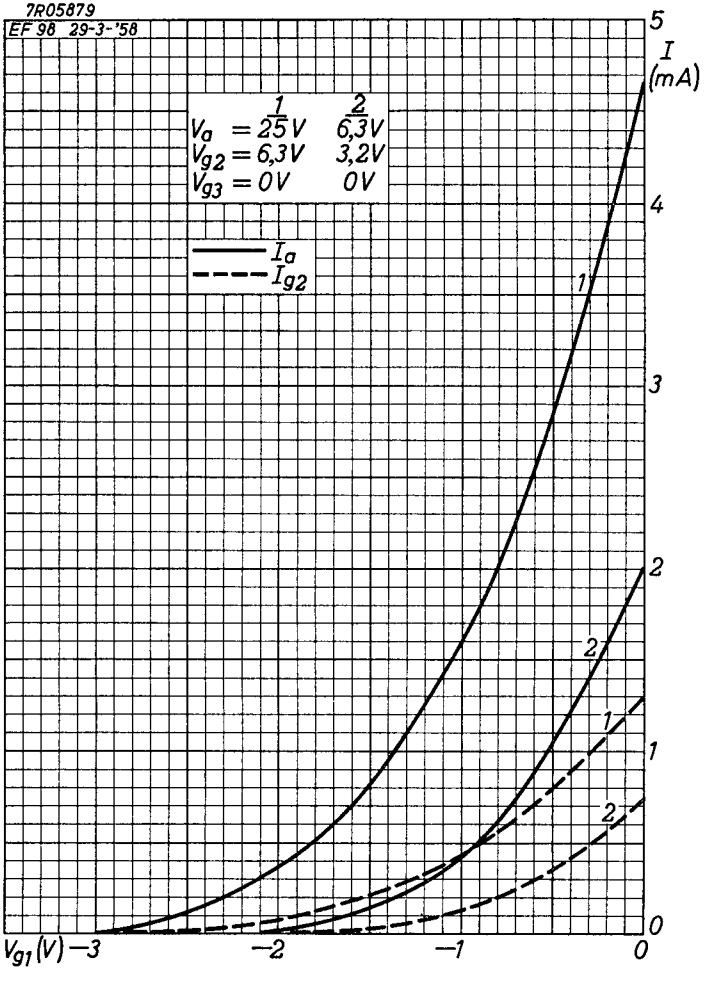


3.3.1958

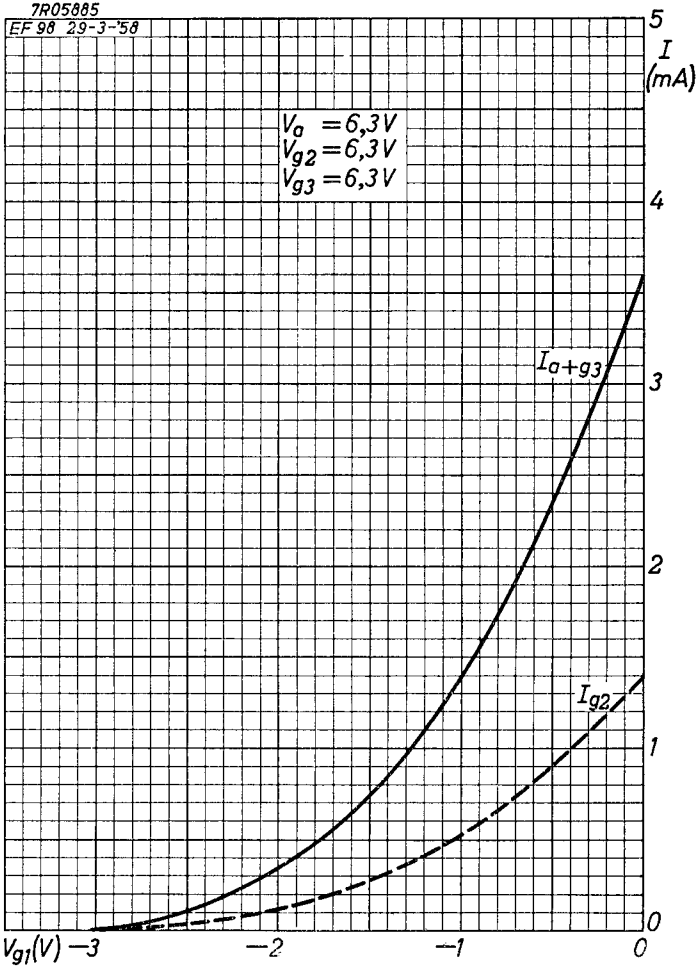
A

EF 98

PHILIPS



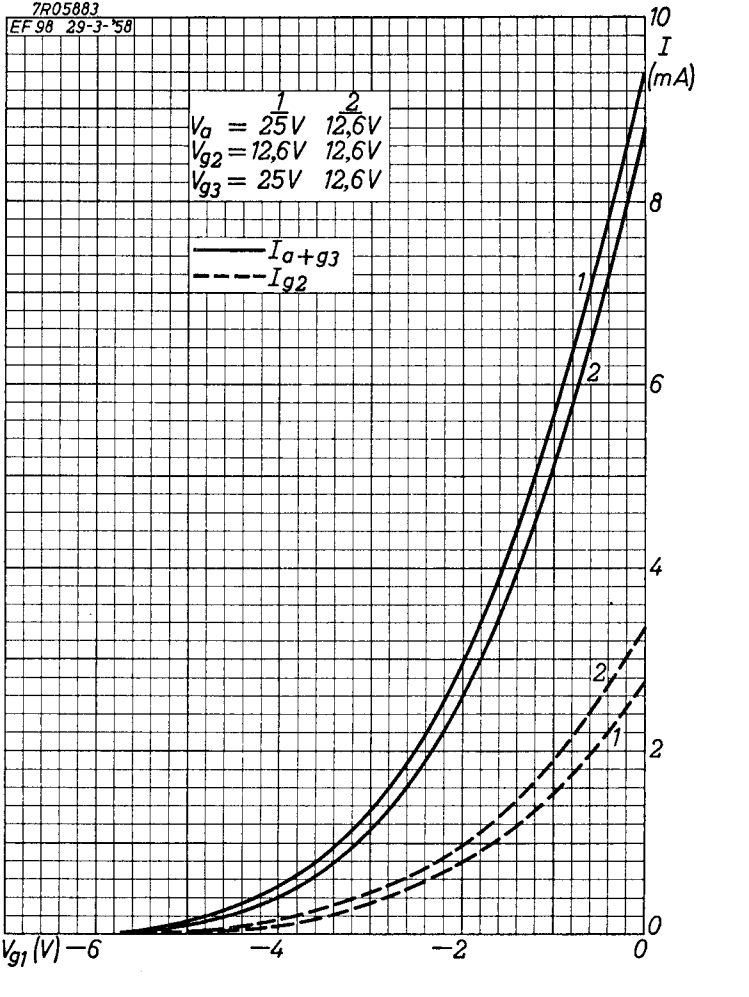
B


7R05885
EF 98 29-3-'58
V_a = 6,3 V
V_{g2} = 6,3 V
V_{g3} = 6,3 V
I_{a+g3}
I_{g2}
I (mA)
5
4
3
2
1
0
V_{g1}(V) −3
−2
−1
0

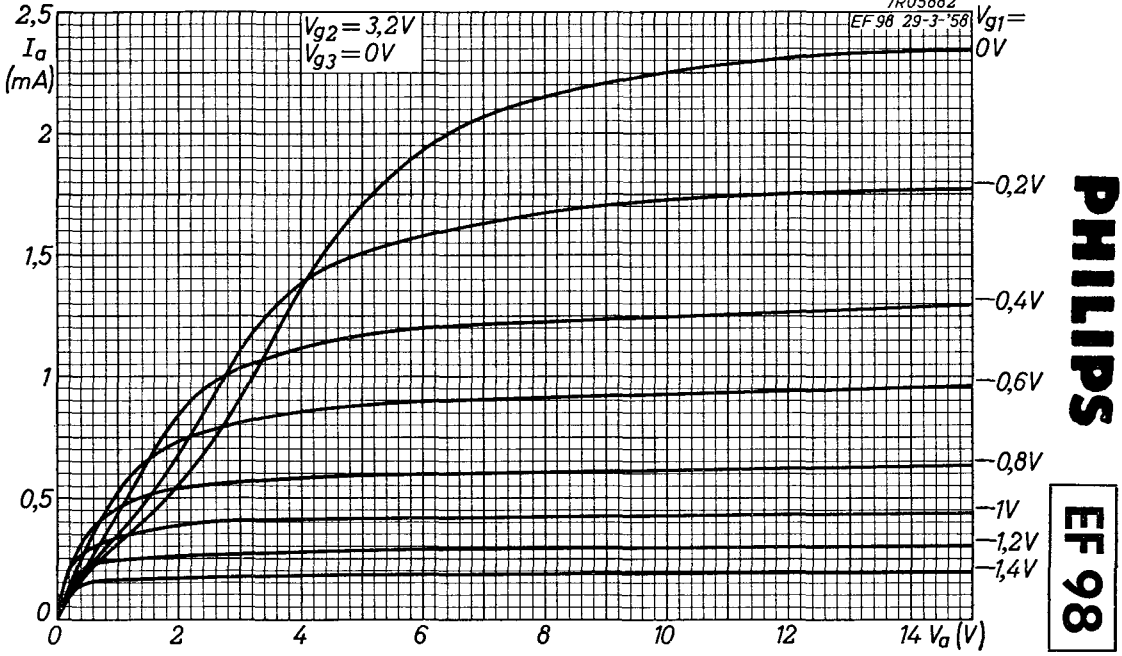
3.3.1958

C

EF 98 PHILIPS



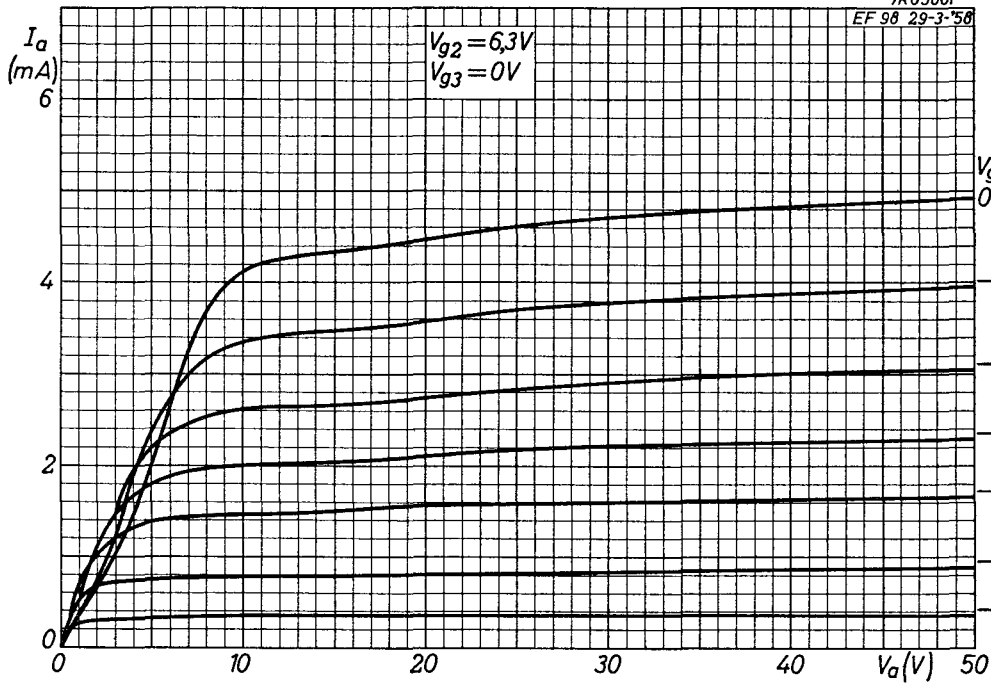
D



PHILIPS

EF 98

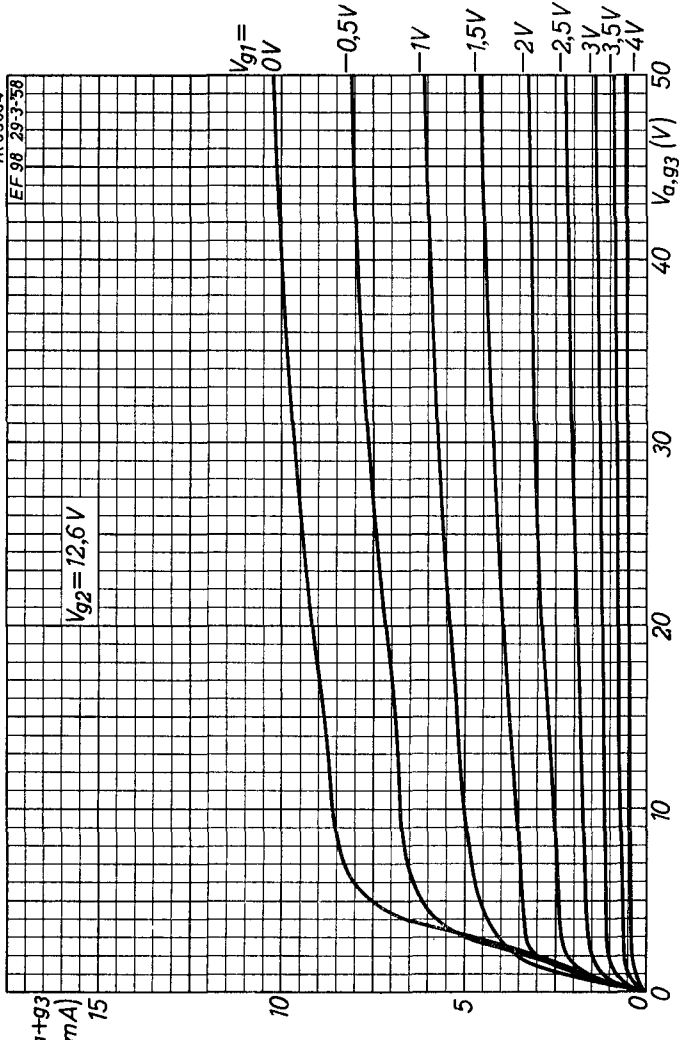
E

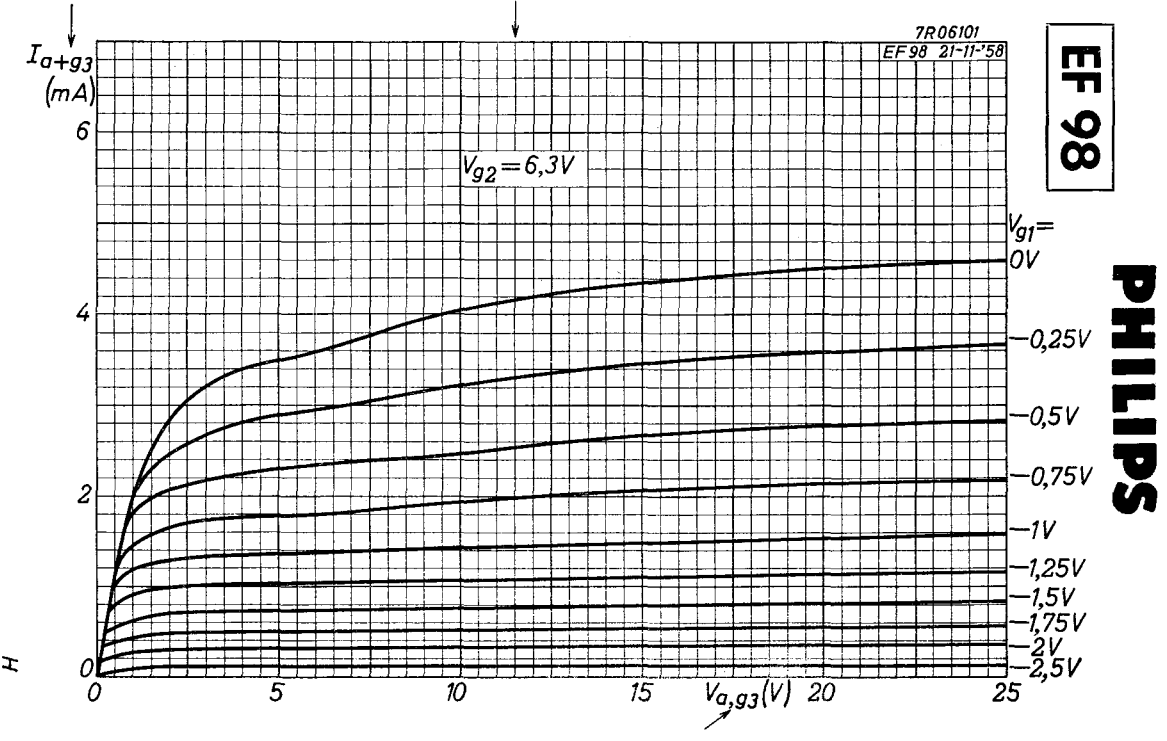


EF 98

PHILIPS

F


7R05884
EF 98 29-3-58
V_{g1} = 0V
−0,5V
−1V
−1,5V
−2V
−2,5V
−3V
−3,5V
−4V
V_{g2} = 12,6 V
I_{a+g3} (mA)
15
10
5
0
0
10
20
30
40
50
$V_{a,g3}$ (V)


7R06101
EF98 21-11-'58
EF 98
PHILIPS
I_{a+g3} (mA)
6
4
2
0
$V_{g2}=6,3V$
$V_{g1}=$
0V
-0,25V
-0,5V
-0,75V
-1V
-1,25V
-1,5V
-1,75V
-2V
-2,5V
H
0
5
10
15
$V_{a,g3}$(V)
20
25



EF98

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1	1	1959.04.04
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3	3	1959.04.04
4	A	1958.03.03
5	B	1958.03.03
6	C	1958.03.03
7	D	1958.03.03
8	E	1958.03.03
9	F	1958.03.03
10	G	1958.12.12
11	H	1958.12.12
12	FP	1999.06.28

Röhrentype: Doppel-H.F.-Penthode für Ultrakurzwellenverstärkung (Gegentaktschaltung) und für Breitbandverstärkung (Parallelschaltung).

Type de tube: Penthode H.F. double pour l'amplification en ondes ultra courtes (montage push-pull) et pour l'amplification à bande passante très large (montage en parallèle).

Type of tube: Twin H.F.pentode for ultra shortwave amplification (push-pull connection) and wideband amplification (parallel connection).

Heizung indir., durch Gleich- oder Wechselstrom, Parallelschaltung
Chauffage indir., par courant continu ou alternatif, alimentation en parallèle
Heating indir., by D.C. or A.C., parallel heater supply

Vf 6,3 V
If 0,6 A

Kapazitäten in kaltem Zustand
Capacités à l'état froid
Capacities in cold condition

Cag1	< 0,04 µµF	Ca'g1'	< 0,04 µµF
Ca	5,5 µµF	Ca'	5,5 µµF
Cg1	9,4 µµF	Cg1'	9,4 µµF
Cg1f	< 0,1 µµF	Cg1'f	< 0,1 µµF

Dämpfungswiderstände (λ = 1,5 m, Vg2 = 225 V, Ia = 10 mA)
Resistances d'amortissement (λ = 1,5 m, Vg2 = 225 V, Ia = 10 mA)
Damping resistances (λ = 1,5 m, Vg2 = 225 V, Ia = 10 mA)

Rg1'g1 750 Ω
Raa' 4700 Ω

Kenndaten jedes Penthodenteiles
Caractéristiques typiques de chaque partie penthode
Typical characteristics of each pentode section

Va	250	300 V
Rg2 [1]	62.000	50.000 Ω
Vg2	200	225 V
Vg1	-2	-2 V
Ia	6	10 mA
Ig2	0,8	1,5 mA
S	8	10 mA/V
Ri	0,35	0,25 MΩ
Raeq [2]	600	600 Ω

Die H.F.-Verstärkung ist bei einer Wellenlänge von 1,5 m und bei Gegentaktschaltung etwa 25fach bei einer Wellenlänge von 0,50 m etwa 8fach
L'amplification H.F. à une longueur d'onde de 1,5 m et en utilisant le montage push-pull est 25 fois environ, à une longueur d'onde de 0,50 m 8 fois environ.
The H.F. amplification amounts to 25 times at a wavelength of 1.5 m and with push-pull connection and to 8 times at a wavelength of 0.50m.

1) Um Ungleichheiten zwischen den beiden Systemen auszugleichen, soll bei der Gegentaktschaltung jedes

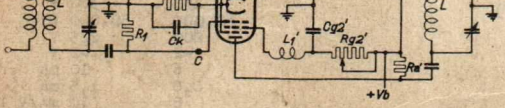
Schirmgitter über einen besonderen Vorwiderstand gespeist werden. Eine wesentliche Verringerung der Gitterdämpfung wird erhalten durch die Einschaltung einer kleinen Selbstinduktion (etwa 0,1 µH) in jede Schirmgitterzuleitung (siehe Schaltbild).

Avec le montage push-pull il faut prévoir pour chaque grille-écran une résistance chutrice spéciale afin de compenser des inégalités entre les deux systèmes. On obtient une amélioration importante de l'amortissement de grille en insérant dans chaque conducteur de grille-écran une petite self-induction (voir le schéma) de 0,1 µH environ.

With push-pull operation a separate dropping resistance should be used for each screen-grid in order to compensate inegalities between both systems. An important improvement of grid damping is achieved by inserting in each screen-grid lead a small self-induction of appropriate value (approx. 0,1 µH, see circuit diagram).

2) Äquivalenter Rauschwiderstand für jedes Gitter
Résistance équivalente au bruit de fond (souffle) pour chaque grille
Equivalent noise resistance for each grid

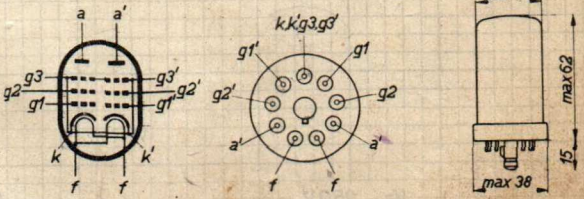
Grundsätzliches Schaltbild für den Gegentaktbetrieb
Schéma de principe pour le montage push-pull
Fundamental circuit diagram for push-pull operation



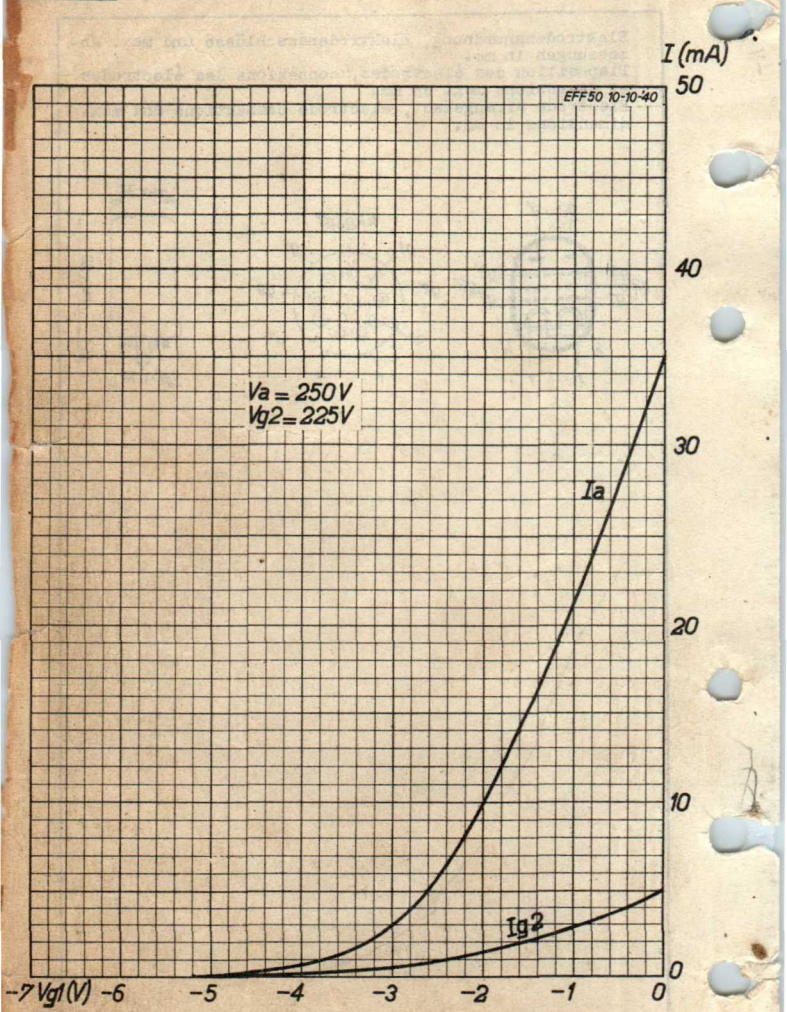
Grenzwerte für den Betrieb jedes Penthodenteiles
Limites fixées pour l'utilisation de chaque partie penthode
Limit ratings for operation of each pentode section

Vao	max.	550 V
Va	max.	300 V
Wa	max.	3 W
Vg2o	max.	550 V
Vg2	max.	225 V
Wg2	max.	0,5 W
Ik	max.	15 mA
Vg1 (Ig1 = +0,3 µA)	max.	-1,3 V
Rglk	max.	1 MΩ
Rfk	max.	20000 Ω
Vfk	max.	50 V

Elektrodenanordnung, Elektrodenanschlüsse und max. Abmessungen in mm.
Disposition des électrodes, connexions des électrodes et dimensions max. en mm.
Electrode arrangement, electrode connections and max. dimensions in mm.

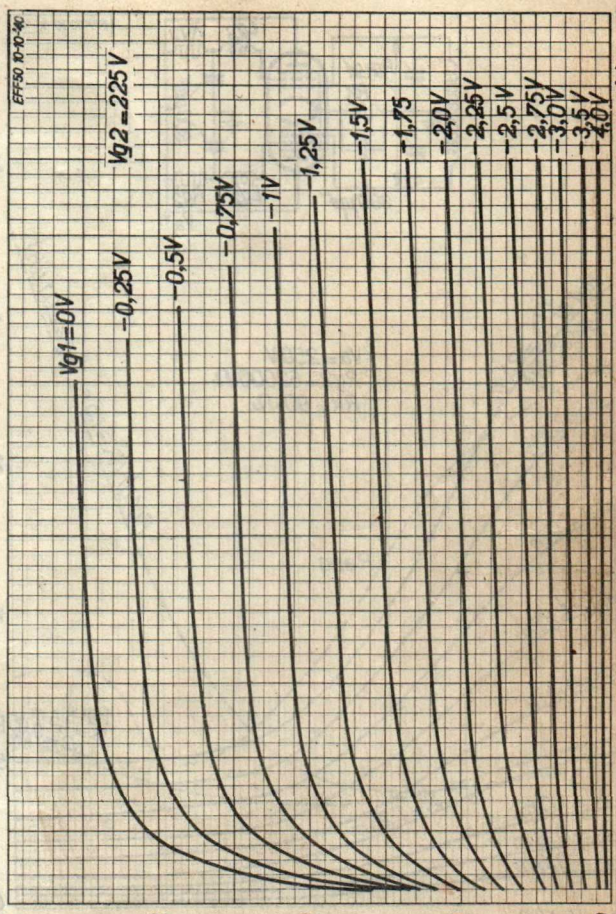


EFF 50 PHILIPS „MINIWATT"

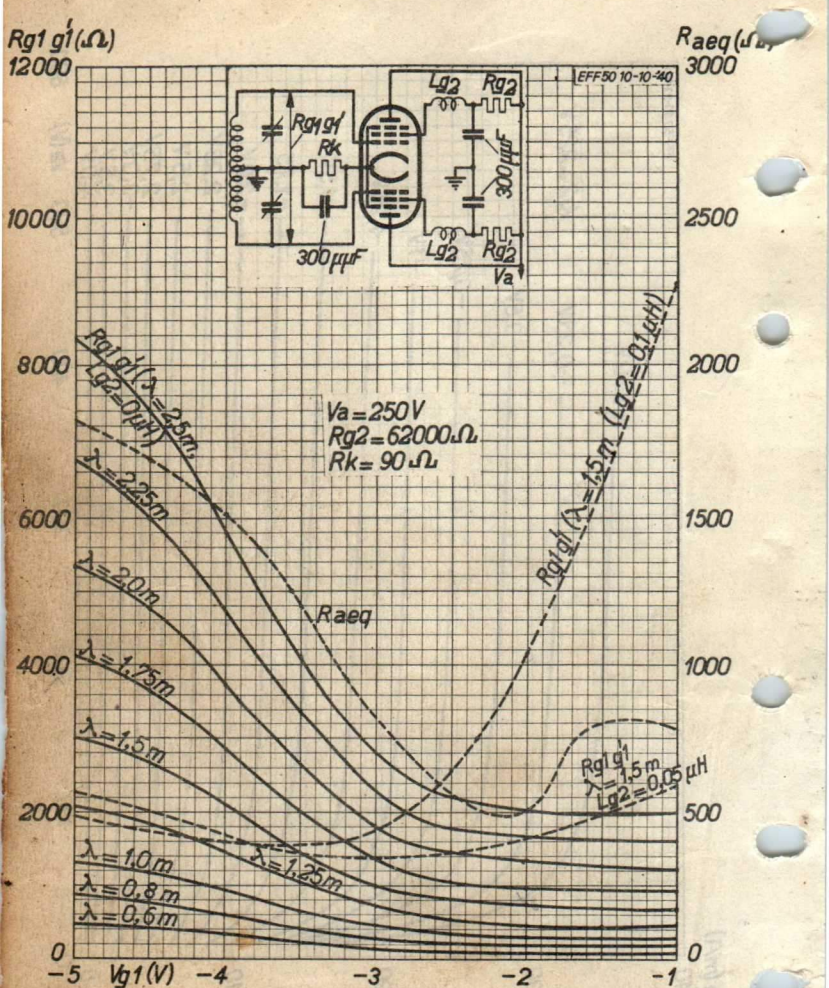


5/11 '40

566504


EFF50 10-10-40
Vg2 = 225 V
Vg1 = 0V
-0,25V
-0,5V
-0,75V
-1V
-1,25V
-1,5V
-1,75
-2,0V
-2,25V
-2,5V
-2,75V
-3,0V
-3,5V
-4,0V
Ia (mA)
40
30
20
10
0
0
100
200
300
400
500
600
Va (V)

EFF 50 PHILIPS „MINIWATT"



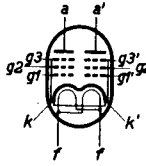
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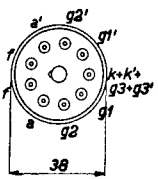
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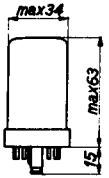
TWIN H.F.PENTODE FOR U.S.W.AMPLIFICATION
(PUSH-PULL CONNECTION) UP TILL 500 Mc/s
PENTHODE H.F.DOUBLE POUR AMPLIFICATION EN O.U.C.
(MONTAGE PUSH-PULL) JUSQU'À 500 MHz.
DOPPEL H.F.PENTHODE FÜR U.K.W.VERSTÄRKUNG
(GEGENTAKTSCHALTUNG) BIS ZUM 500 MHz.

Heating Chauffage Heizung	Vf If	6,3 0,75	V A

Dimensions in mm.
Dimensions en mm.
Abmessungen in mm.







Capacities Capacités Kapazitäten		
Cag1	< 0,04	pF
Ca	4,5	pF
Cg1	9,6	pF
Cg1f	< 0,1	pF
Ca'g1'	< 0,04	pF
Ca'	4,5	pF
CgI'	9,6	pF
Cg1'f	< 0,1	pF

Damping resistance Résistance d'amortissement Dämpfungswiderstand	Vg2 Ia λ	225 V 10 mA 1,5 m	Rg1g1' Raa'	750 Ω 4700 Ω

Gain (both systems in push-pull)
Amplification (deux sytèmes en push-pull)
Betriebsverstärkung (beide Systeme in Gegentakt)

Va	300 V	λ = 1 m.	2,7 x
Vg2	225 V		
Ia	2x10 mA	λ = 1,5 m.	4,7 x

Operating conditions (per system)
Caractéristiques de service (par système)
Betriebsdaten (pro System)

Va	250	300	V
Rg2	42	42	kΩ
Vg2	200	225	V
Vg1	-2	-2	V
Ia	6	10	mA
Ig2	1,2	1,8	mA
S	7,5	9	mA/V
Ri	0,35	0,25	MΩ
Req.	800	750	Ω

Max. ratings
Limites fixées
Grenzdaten

Vao	550	V
Va	300	V
Wa	3	W
Vg2o	550	V
Vg2	225	V
Wg2	0,5	W
Wg1	0,05	W
Ik	15	mA
Ikp	50	mA
Vg1 (Ig1=+0,3 μA)	-1,3	V
Rg1k	1	MΩ
Rfk	20	kΩ
Vfk	50	V

PHILIPS

Electronic Tube

HANDBOOK

EFF51

page	sheet	date
1	1	1948.05.01
2	2	1948.05.01
3	FP	1999.07.04

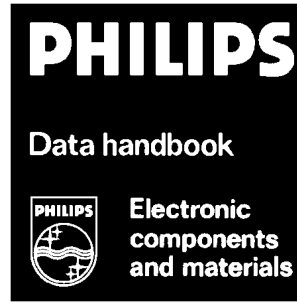
DOUBLE PENTODE

Double pentode intended for use as video output tube and as sync separator, A.G.C. amplifier or I.F. sound amplifier.

HEATING: Indirect by A.C. or D.C.; parallel supply

Heater voltage	V_f	6.3	V
Heater current	I_f	810	mA

For further data and curves of this type please refer to type PFL200



EFL200

page	sheet	date
1	1	1968.09
2	FP	1999.08.12

EFM 1 N.F.-Verstärkerpenthode und Abstimmanzeiger

Die EFM 1 ist eine Kombination einer N.F.-Verstärkerpenthode veränderlicher Steilheit mit einem Elektronenstrahlabstimmanzeiger. Der untere Teil des Innensystemes wird durch die Penthode gebildet. Über diesem Penthodenteil ist, wie bei der EM 1, ein konischer Fluoreszenzschirm angeordnet, der vom Kopfende der Röhre aus sichtbar ist. Die Kathode ist bis in den durch den Fluoreszenzschirm abgeschlossenen Raum verlängert. Sie ist durch eine Abschirmung abgedeckt, so daß das Kathodenlicht nicht von außen sichtbar ist. Dieser Schirm wird von zwei Trägerstegen gehalten, die von außen unsichtbar angebracht sind.

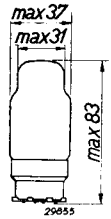
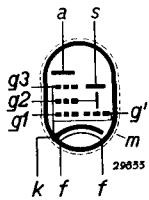


Abb. 1
Abmessungen in mm.

Zwischen der Kathode und dem Schirm befinden sich der Reihe nach ein Gitter und zwei Ablenkstäbe. Das Gitter ist ohne Stege gewickelt und nur an den beiden Enden befestigt. Dieses Gitter soll durch die Raumladung, die sich vor dem Gitter bildet, einen gleichmäßigeren Elektronenübertritt zum Fluoreszenzschirm bewirken und bei sehr schwachen Signalen, wenn die Fluoreszenzflecke schmal sind, den Elektronenstrom auf die dann relativ kleine wirksame Fläche des Fluoreszenzschirmes beschränken. Die beiden Ablenkstäbe sind mit dem Schirmgitter des Penthodenteiles verbunden. Es bilden sich auf dem Schirm zwei Fluoreszenzflecke.



Der Penthodenteil ist für den Betrieb mit gleitender Schirmgitterspannung konstruiert. Das Schirmgitter wird über einen Serienwiderstand gespeist. Wenn die Regelspannung der automatischen Lautstärkeregelung dem Gitter zugeführt wird, sinkt der Schirmgitterstrom, und mithin steigt die Spannung am Schirmgitter und an den Ablenkstäben. Der Fluoreszenzschirm ist direkt mit der Speisespannung verbunden, so daß der Unterschied zwischen der Spannung an den Ablenkstäbchen und der am Fluoreszenzschirm abnimmt. Dadurch nimmt auch die ablenkende Wirkung der beiden Stäbe ab, wodurch die Schatten schmäler und die Fluoreszenzflecke breiter werden. Da das Schirmgitter durch einen Kondensator abgeflacht wird, können dem Gitter zu gleicher Zeit N.F.-Wechselspannungen

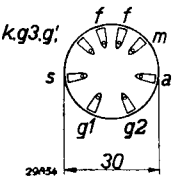


Abb. 2
Elektrodenanordnung und Sockelanschlüsse.

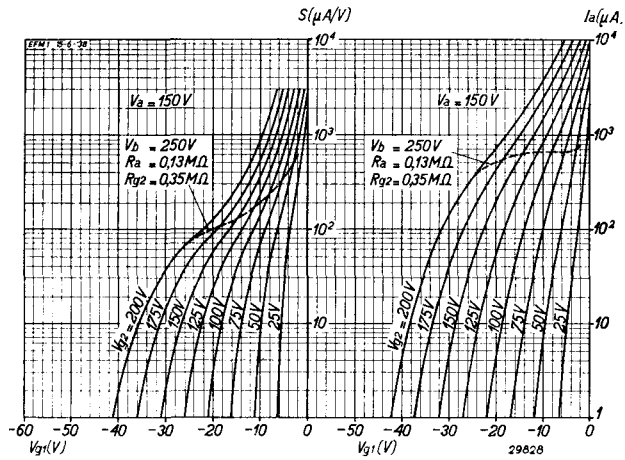


Abb. 3

Rechts: Anodenstrom als Funktion der negativen Gitterspannung mit der Schirmgitterspannung als Parameter. Diese Kurven gelten für eine Anodenspannung von 150 V. Die gestrichelte Linie zeigt die Arbeitspunktkurve für Vb = 250 V, Rg_2 = 0,35 MΩ und Ra = 0,13 MΩ. **Links:** Steilheit als Funktion der negativen Gitterspannung mit der Schirmgitterspannung als Parameter. Diese Kurven gelten für eine Anodenspannung von 150 V. Die gestrichelte Kurve zeigt den Verlauf der Steilheit als Funktion der Gitterspannung bei Verwendung eines Schirmgitterwiderstandes von 0,35 MΩ und eines Anodenwiderstandes von 0,13 MΩ, beide von 250 V aus gespeist.

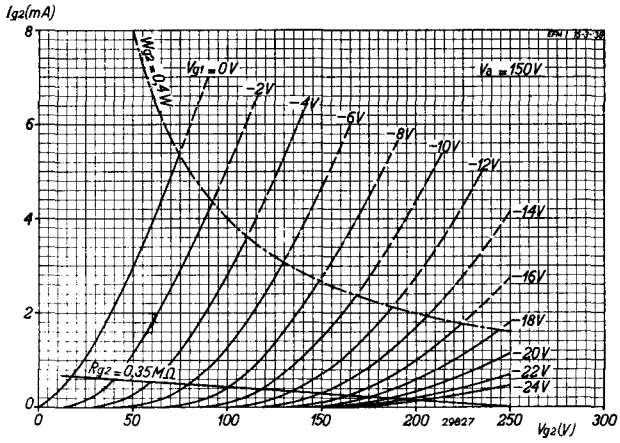


Abb. 4
Schirmgitterstrom als Funktion der Schirmgitterspannung mit der Gitterspannung als Parameter, Widerstandsgerade für Rg_2 = 350.000 Ohm.

zugeführt werden, ohne daß eine Beeinflussung der Fluoreszenzflecke erfolgt. Der Anodenkreis kann durch Widerstandskopplung an die folgende Röhre angekoppelt werden, um die Wechselspannungen weiter zu verstärken. Zur Erzielung der gewünschten Abstimmanzeigung wird das Gitter, wie erwähnt, mit der vom Detektor erzeugten Gleichspannung oder mit der automatischen Lautstärkeregelung gekoppelt. Daraus ergibt sich bei einem starken H.F.-Signal an der Diode am Gitter der EFM 1 eine große negative Gleichspannung, und die Verstärkung wird infolgedessen heruntergeregelt. Dies hat zur Folge, daß der N.F.-Verstärker sich an der automatischen Lautstärkeregelung beteiligt.

Die Kombination des Abstimmanzeigers mit einer N.F.-Verstärkerpenthode hat also gleichzeitig zu einer N.F.-Verstärkerröhre veränderlicher Steilheit geführt. An eine solche Penthode müssen besondere Anforderungen gestellt werden, da im ganzen Regelbereich die Verzerrung klein bleiben muß.

Der Penthodenteil der EFM 1 ist so gebaut, daß er bei einem Anodenwiderstand von 130.000 Ohm und einem Schirmgitterwiderstand von 350.000 Ohm bei —2 V Vorspannung eine etwa 60fache Verstärkung ergibt. Durch Änderung der negativen Gitterspannung von —2 bis —20 V wird die Verstärkung von 60 auf etwa 13 heruntergebracht, also eine Regelung von 1 : 4,5 erzielt. Diese Regelmöglichkeit kann zu einer wirksamen Lautstärkeregelung beitragen. Bei dieser Gitterspannungsänderung erfolgt auch der volle Ausschlag der Schatten des Fluoreszenzschirmes. Durch richtige Konstruktion des Schirmgitters wurde erreicht, daß der Anodenstrom im ganzen Regelbereich praktisch konstant bleibt. Dabei wurde ebenfalls eine im Regelbereich nahezu konstante Verzerrung erzielt, die innerhalb zulässiger Grenzen gehalten werden konnte.

Der Verstärkerteil braucht mit Rücksicht auf Verzerrung eine ziemlich große Regelspannung, so daß pro Grad des Ausschlages der Fluoreszenzflecke eine größere Spannungsänderung am Gitter der

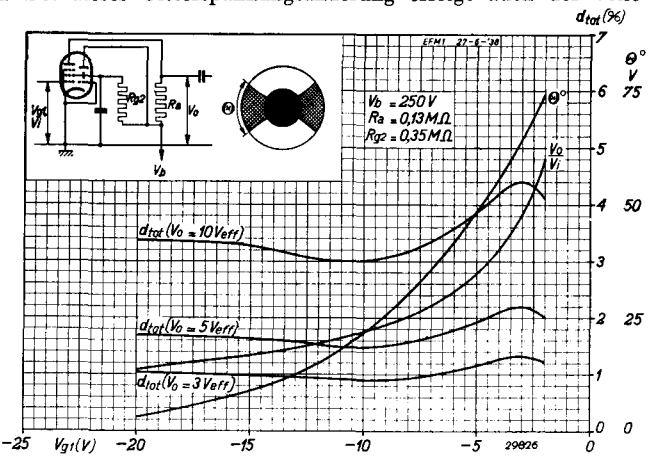


Abb. 5
Verzerrung als Funktion der Gittervorspannung mit der Ausgangswechselspannung als Parameter bei Rg_2 = 350.000 Ohm, Ra = 130.000 Ohm und Vb = 250 V und Schattenwinkel Θ als Funktion der Gittervorspannung.

EFM 1

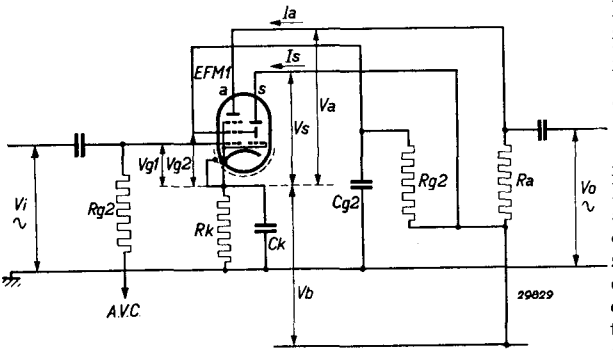


Abb. 6
Schaltung zur Erläuterung der in den Daten angegebenen Größen.

EFM 1 notwendig ist als z.B. mit der EM 1. Die Kombination einer Verstärkerpenthode mit einem Abstimmanzeiger gestattet es, die Anzahl der Röhren in manchen Empfängertypen zu beschränken, ohne auf die Abstimmanzeigung zu verzichten oder die Empfindlichkeit zu beeinträchtigen. Sie bildet einen Kompromiß, und es ist daher nicht zu erwarten, daß man dieselben optimalen Verhältnisse antrifft wie bei Verwendung einer getrennten N.F.-Verstärkerröhre und einer Abstimmröhre.

Da die EFM 1 keine Dioden zur Gleichrichtung enthält, wird sie in Kombination mit der Duodiode-Z.F.-Penthode EBF 2 häufig verwendet werden. Auch kann die EFM 1 in Kombination mit einer getrennten Diode, z.B. der EAB 1 oder der EB 4, verwendet werden.

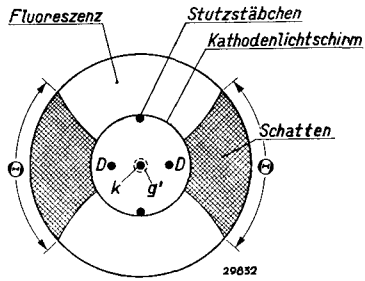


Abb. 7
Ansicht des Fluoreszenzschirmes mit den Fluoreszenzflecken und Schatten.

HEIZDATEN

Heizung: indirekt, Gleich- oder Wechselstrom, Serien- oder Parallelspeisung.

Heizspannung	V_f	= 6,3
Heizstrom	I_f	= 0,200 A

BETRIEBSDATEN

Spannung der Anoden- und Schirmgitterspeisung sowie des Fluoreszenzschirmes	$V_b = V_s$	= 250 V		
Anodenaußenwiderstand	R_a	= 130.000 Ω		
Schirmgittervorwiderstand	R_{g2}	= 350.000 Ω		
Kathodenwiderstand	R_k	= 980 Ω		
Negative Gittervorspannung im ungeregelten Zustand	V_{g1}	= —2 V	—	
Negative Gittervorspannung im heruntergeregelten Zustand	—		V_{g1}	= —20 V
Anodenstrom	I_a	= 0,8 mA	I_a	= 0,5 mA
Schirmgitterstrom	I_{g2}	= 0,6 mA	I_{g2}	= 0,2 mA
Strom zum Fluoreszenzschirm	I_s	= 0,65 mA	I_s	= 0,8 mA
Anodenspannung	V_a	= 146 V	V_a	= 185 V
Schirmgitterspannung	V_{g2}	= 40 V	V_{g2}	= 180 V
Verstärkung	G	= 60	G	= 13
Verzerrung bei 5 $V_{(eff)}$ Anodenwechselspannung	d_{tot}	= 2%	d_{tot}	= 1,7%
Schattenwinkel eines Sektors, gemessen am Rande des Schirmes	Θ	> 70°	Θ	< 5°

GRENZDATEN

Max. Anodenkaltspannung	V_{ao}	= max. 550 V
Max. Anodenspannung	V_a	= max. 300 V
Max. Anodenbelastung	W_a	= max. 0,4 W
Max. Schirmgitterkaltspannung	V_{g2o}	= max. 550 V
Max. Schirmgitterspannung	V_{g2}	= max. 300 V
Max. Schirmgitterbelastung	W_{g2}	= max. 0,4 W
Max. Kaltspannung am Fluoreszenzschirm	V_{so}	= max. 550 V
Max. Spannung am Fluoreszenzschirm	V_s	= max. 300 V
Min. Spannung am Fluoreszenzschirm	V_s	= min. 200 V
Max. Kathodenstrom	I_k	= max. 5 mA
Grenzwert des Gitterstromeinsatzpunktes	V_{g1}	(I_{g1} = + 0,3 µA) = —1,3 V
Oberer Grenzwert des Schirmgitterstromes bei V_b = 250 V, I_a = 0,8 mA, R_a = 130.000 Ω, R_{g2} = 350.000 Ω	I_{g2}	= max. 0,67 mA
Unterer Grenzwert des Schirmgitterstromes bei V_b = 250 V, I_a = 0,8 mA, R_a = 130.000 Ω, R_{g2} = 350.000 Ω	I_{g2}	= min. 0,53 mA
Max. Widerstand zwischen Gitter und Kathode	R_{glk}	= max. 3 MΩ
Max. Widerstand zwischen Heizfaden und Kathode	R_{fk}	= max. 20.000 Ω
Max. Spannung (Gleichspannung oder Effektivwert der Wechselspannung) zwischen Heizfaden und Kathode	V_{fk}	= max. 100 V

ANWENDUNG

Die Anwendung der EFM 1 beschränkt sich auf N.F.-Verstärkung mit gleichzeitiger Abstimmungsanzeigung. Abb. 8 zeigt die Prinzipschaltung dieser Röhre mit einer vorgeschalteten Diode Das N.F.-Signal wird dem Diodenwiderstand R_2 entnommen und über einen Kondensator dem Gitter der EFM 1 zugeführt. Die negative Gleichspannung, die am Ableitwiderstand entsteht, wird dem Punkt A entnommen und gelangt über die Widerstände R_1 und R_3 an das Gitter der EFM 1. Der Widerstand R_1 bildet mit dem Kondensator C_5 ein Abflachfilter für die am Diodenwiderstand befindliche N.F.-Spannung, so daß über diesen Weg nur Gleichspannung an das Gitter der EFM 1 gelangt. R_3 ist der Ableitwiderstand des Gitters.

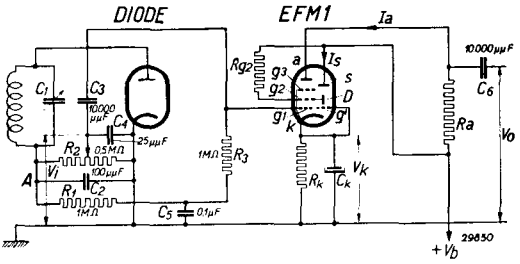


Abb. 8
Prinzip der Schaltung der EFM 1 als regelbarer N.F.-Verstärker und Abstimmanzeiger mit einer vorgeschalteten Diode als Detektor.

Die negative Gleichspannung zur Regelung der EFM 1 wird meistens der Detektordiode entnommen. Sie kann auch von der A.L.R.-Diode geliefert werden, aber bei verzögerter automatischer Lautstärkeregelung wird die Abstimmanzeigung für kleine Signale, die zum Regelungseinsatz nicht ausreichen, nicht arbeiten.

Mit Rücksicht auf Mikrophoneffekt ist dafür zu sorgen, daß die N.F.-Empfindlichkeit am Gitter der EFM 1 nicht zu groß gewählt wird und daß die Aufstellung der Röhre keine zu starken akustischen Rückkopplungen herbeiführt. Wird ein steile Endröhre wie die EL 3 hinter die EFM 1 geschaltet, so wird empfohlen, mit Hilfe einer ausreichenden Gegenkopplung die Empfindlichkeit zu reduzieren.

Um Brummschwierigkeiten zu vermeiden, muß die dem Anodenkopplungswiderstand zugeführte Gleichspannung immer durch ein geeignetes R.C.-Filter gesäubert werden. In den Daten und Kurven wurde der Säuberungswiderstand nicht berücksichtigt, da er von Fall zu Fall und bei verschiedenen Speisespannungen anders gewählt werden wird. Für die praktische Anwendung der EFM 1 kann zwischen zwei Möglichkeiten eine Wahl getroffen werden.

Zunächst besteht die Möglichkeit einer Verbesserung der automatischen Lautstärkeregelung, da die dem Gitter zugeführte Regelspannung die Verstärkung der EFM 1 beeinflußt. Wie bereits oben erwähnt, ist bei Verwendung einer steilen Endröhre die N.F.-Verstärkung durch Gegenkopplung herabzusetzen. Wird der Kathodenkondensator der EL 3 weggelassen, so wird eine etwa $2^1/_2$fache Gegenkopplung erzielt; hiermit wird aber die Empfindlichkeit noch nicht ausreichend herabgesetzt, so daß dann entweder ein größerer Kathodenwiderstand der Endröhre oder eine kleinere Verstärkung der EFM 1 im ungeregelten Zustand gewählt werden muß. Das Gitter der EL 3 wird im ersten Falle, um die richtige Vorspannung zu erhalten, an eine Anzapfung am Kathodenwiderstand angeschlossen. Bei Verwendung eines Kathodenwiderstandes von 500 Ohm wird eine etwa 4,5fache Gegenkopplung erzielt, womit eine genügende Empfindlichkeitsabnahme gewährleistet ist. Diese stärkere Gegenkopplung wird aber auf Kosten einer Abnahme der maximalen Ausgangsleistung erhalten; bei R_k = 500 Ohm beträgt die maximale Ausgangsleistung nur noch rund 3,3 Watt. Deswegen wird es meistens vorgezogen werden, die maximale Verstärkung der EFM 1 herunterzusetzen. Dies kann durch die Wahl eines größeren Kathodenwiderstandes erzielt werden, wobei dann die Winkeländerung des Anzeigeteiles etwas verringert wird (siehe auch Abb. 5). Bei einem Kathodenwiderstand von 2000 Ohm z.B. wird eine negative Vorspannung von etwa —4 Volt erzielt, und hierbei ist die Verstärkung 40 anstatt 60 und der Winkeländerungsbereich der Schatten des Anzeigeteiles von 5 bis 75° auf 5 bis 65° zurückgegangen.

Eine andere Möglichkeit besteht in der Verwendung eines kleineren Anodenkopplungswiderstandes als 130.000 Ohm. Es kann dann in Serie mit dem Kopplungswiderstand ein Abflachwiderstand geschaltet werden, der den Gesamtanodenwiderstand wieder auf 130.000 Ohm bzw. bei höheren Speisespannungen auf den entsprechend höheren Wert bringt.

Die beschränkte Gegenkopplung bei Verwendung von steilen Endröhren (EL 3 und EL 6) hat zur Folge, daß die Niederfrequenzempfindlichkeit noch ziemlich groß ist. Bekanntlich bestimmt die Größe der N.F.-Verstärkung das am Detektor erforderliche Z.F.-Signal und mithin auch die Verzögerungsspannung der automatischen Lautstärkeregelung. Bei großer N.F.-Empfindlichkeit sind die am Detektor auftretenden Signale klein, so daß nur kleine Regelspannungen zur Steuerung der EFM 1 zur Verfügung stehen. Dies bedeutet, daß erst bei sehr starken Signalen die Schatten schmal sind und daß also der Abstimmanzeiger ziemlich unempfindlich ist.

Eine größere Verringerung der N.F.-Empfindlichkeit als durch Gegenkopplung einer steilen Endröhre kann durch Verwendung einer Endröhre mit sehr geringer N.F.-Empfindlichkeit erzielt werden, wobei dann eine größere Anzeigeempfindlichkeit erhalten wird, z.B. durch Verwendung der Endtriode AD 1.

Trotz der größeren Ausgangswechselspannung der EFM 1, die zur Steuerung der AD 1 erforderlich ist, zeigt sich, daß die Verzerrung noch sehr gering ist. Im Mittel ist die Verzerrung der Kombination EFM 1 + AD 1 geringer als die einer AD 1 allein, was auf die Kompensation der zweiten Harmonischen zurückzuführen ist.

Die zweite Möglichkeit, die für die Verwendung der EFM 1 zu wählen ist, besteht in der Verlegung des Schwerpunktes auf die Empfindlichkeit des Anzeigeteiles bei Vernachlässigung des Beitrages der Röhe zu der automatischen Lautstärkeregelung. In diesem Falle braucht man eine größere Gleichspannung am Detektor und mithin ein größeres Z.F.-Signal und eine geringere N.F.-Verstärkung. Man wird die N.F.-Verstärkung durch eine starke Gegenkopplung herabsetzen müssen. Da eine starke Gegenkopplung beim Weglassen des Kathodenkondensators der Endröhre zu einem erheblichen Verlust an Ausgangsleistung führt, wird die Rückkopplung vom Lautsprecher auf die EFM 1 verwendet werden müssen.

Die Spannungsgegenkopplung auf die EFM 1 hat den Vorteil, daß die N.F.-Verstärkung durch entsprechend stärkere Gegenkopplung beliebig herabgesetzt werden kann. Außerdem wird der Innenwiderstand der Endstufe erniedrigt anstatt erhöht, wie es bei der Stromrückkopplung durch Weglassung des Kathodenkondensators der Fall ist. Bei dieser Art der Gegenkopplung können frequenzabhängige Glieder in der Gegenkopplungsschaltung aufgenommen werden, so daß die Frequenzcharakteristik günstig beeinflußt werden kann.

Die Spannungsrückkopplung auf die EFM 1 hat natürlich das Bestreben, die Verstärkung konstant zu halten. Dadurch geht die N.F.-Regelung größtenteils verloren. Bei starker Trägerwelle ist die EFM 1 heruntergeregelt, so daß in dem Falle die Verstärkung kleiner und mithin die negative Rückkopplung schwächer ist. Die Verringerung der Verzerrung ist dann also geringer.

DIE KOMBINATION DER EFM 1 UND EBF 2

Zu der EFM 1 als N.F.-Verstärker wird die EBF 2 als Z.F.-Verstärker und Detektor häufig verwendet werden.
Es sind zwei Verwendungsmöglichkeiten dieser Kombination vorhanden:

1) Die EFM 1 wird als N. F.-Verstärker mit nur schwacher Gegenkopplung auf die Endröhre allein benutzt. Die Abstimmanzeigung ist dann nicht sehr empfindlich.
2) Die EFM 1 wird als N.F.-Verstärker mit starker Gegenkopplung vom Lautsprecher auf die EFM 1 benutzt.
   Im vorhergehenden wurde bereits darauf hingewiesen, daß, wenn auf eine bessere Abstimmanzeigung Wert gelegt wird, die N.F.-Verstärkung ziemlich niedrig gewählt werden muß. In diesem Fall soll die Verzögerungsspannung größer gewählt werden (5 bis 6 Volt).

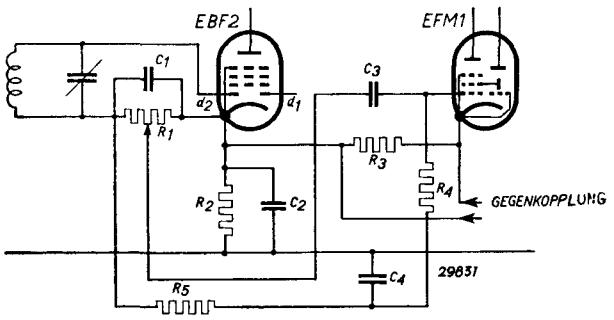


Abb. 9
Prinzipschaltung der Kombination der Röhren EBF 2 und EFM 1 mit Gegenkopplung auf die EFM 1.

Die nächstliegende Schaltung ist in Abb. 9 dargestellt. Die Kathodenspannung der EBF 2 beträgt 5 bis 6 Volt. Die Kathode der EFM 1 ist über den Widerstand R_3 mit der Kathode der EBF 2 verbunden. Der Spannungsabfall in R_3 ergibt also die negative Vorspannung der EFM 1. Der Widerstand R_3 ist nicht kapazitiv überbrückt und bildet gleichzeitig einen Teil des Spannungsteilers der Gegenkopplung.
Bei Verwendung der EFM 1 mit Gegenkopplung muß die Verzögerungsspannung der A.L.R. nicht nur wegen der Möglichkeit der vollen Endröhrenaussteuerung größer sein als die normale Kathodenspannung der EBF 2 (2 V), sondern auch, damit der Ausschlag des Abstimmanzeigers für schwächere Signale nicht beschränkt wird. Würde nämlich die A.L.R. bereits vor der vollen Aussteuerung der Endröhre arbeiten, so würde für die entsprechenden Signale schon die Gleichspannung am Detektor beschränkt, was zu der geringeren Empfindlichkeit der Abstimmanzeigung führt. Eine Verzögerung von 5 bis 6 V zeigt sich für die meisten Fälle als ausreichend.
Eine Komplikation, auf die noch hingewiesen werden muß, ist die folgende:
Wenn eine geringe N.F.-Verstärkung angestrebt wird, und zwar nicht durch Anwendung von Gegenkopplung, sondern durch Verwendung einer Ausgangsstufe mit geringer Empfindlichkeit (z.B. AD 1), wird durch die stärkere Regelung auf die Röhre EFM 1 die gesamte N.F.-Verstärkung bei zunehmendem Signal mehr abnehmen. Die Folge hiervon ist, daß bei großen Signalen ein viel größeres Detektorsignal erforderlich ist, um die Endröhre voll auzusteuern, als wenn die N.F.-Regelung durch die Gegenkopplung ausgeglichen wird. Dies bringt mit sich, daß die Verzögerungsspannung der A.L.R. größer gewählt werden muß, als zunächst vorausgesetzt war. Hierdurch ergeben sich größere Schwierigkeiten mit der Regelung auf die EBF 2. Hieraus geht wohl hervor, daß die Anwendung von Gegenkopplung den Vorzug verdient, wenn man die N.F.-Verstärkung hinter dem Detektor verringern will.

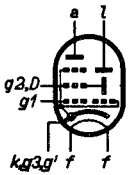
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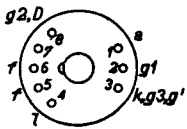
EFM 11

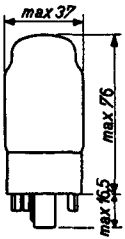
PENTODE for use as L.F. amplifier and tuning indicator
PENTHODE pour utilisation comme amplificatrice B.F. et indicatrice d'accord
PENTHODE zur Verwendung als N.F. Verstärker mit Abstimmanzeiger

Heating: indirect by A.C. or D.C.; parallel or series supply
Chauffage: indirect par C.A. ou C.C.; alimentation en parallèle ou en série; Vf = 6,3 V If = 0,200 A
Heizung: indirekt durch Gleich- oder Wechselstrom; Parallel- oder Serienspeisung

Dimensions in mm
Dimensions en mm
Abmessungen in mm







Capacities
Capacités
Kapazitäten

Ca	=	6,6 pF
Cg1	=	6,4 pF
Cag1	<	0,7 pF
Cg1f	<	0,12 pF

Operating characteristics
Caractéristiques d'utilisation
Betriebsdaten

Vb=Vℓ	=	250		V
Ra	=	130		kΩ
Rg2	=	350		kΩ
Rk	=	650		Ω
Va	=	120	172	V
Vg2	=	30	166	V
Vg1	=	-1,5	-20	V
Ia	=	1,0	0,58	mA
Ig2	=	0,63	0,26	mA
Iℓ	=	0,65	1	mA
Ri	=	0,7	>3	MΩ
Vo/Vi	=	80	12	
d_{tot} (Vo=5V_{eff})	=	1,5	2	%
d_{tot} (Vo=3V_{eff})	=	1	1	%
β		70°	3°	

Limiting values
Caractéristiques limites
Grenzdaten

Va_o	= max.	550	V
Va	= max.	300	V
Wa	= max.	0,4	W
$Vg2_o$	= max.	550	V
Vg2	= max.	300	V
Wg2	= max.	0,2	W
$Vℓ_o$	= max.	550	V
Vℓ	= max.	300	V
Vℓ	= min.	150	V
Ik	= max.	4	mA
Vg1 (Ig1=+0,3 μA)	= max.	-1,3	V
Rg1	= max.	3	MΩ
Rfk	= max.	20	kΩ
Vfk	= max.	100	V

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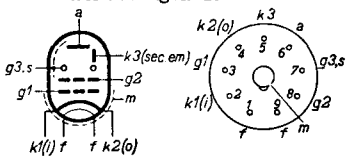
EFP 60

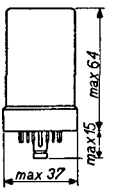
SECONDARY EMISSION PENTODE for television purposes
PENTHODE À EMISSION SECUNDAIRE pour la télévision
SEKUNDAREMISSIONSPENTHODE für Fernsehzwecke

Heating: indirect by A.C. or D.C.; parallel supply
Chauffage: indirect par C.A. ou C.C.; alimentation en parallèle
Heizung: indirekt durch Wechsel- oder Gleichstrom; Parallelspeisung

Vf = 6,3 V
If = 0,37 A

Dimensions in mm
Dimensions en mm
Abmessungen in mm





Capacities
Capacités
Kapazitäten

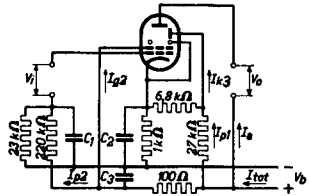
Ca	=	6 pF
Cg1	=	9,2 pF
Cag1	<	0,004 pF

Typical characteristics
Caractéristiques typiques
Kenndaten

Va	=	250 V
Vk3	=	150 V
Vg3	=	0 V
Vg2	=	250 V
Vg1	=	-2 V
Ia	=	20 mA
Ik3	=	-15,6 mA
Ig2	=	1,5 mA
S	=	25 mA/V
μg2g1	=	110 -
Ri	=	70 kΩ

Operating conditions for use as stabilised amplifier
Caractéristiques d'utilisation comme amplificatrice stabilisée
Betriebsdaten zur Verwendung als stabilisierter Verstärker

Vb	=	250 V
Vg3	=	0 V
Ia	=	20 mA
Ik3	=	-15,6 mA
Ig2	=	1,5 mA
Ip1	=	3,5 mA
Ip2	=	1,0 mA
I_{tot}	=	26 mA

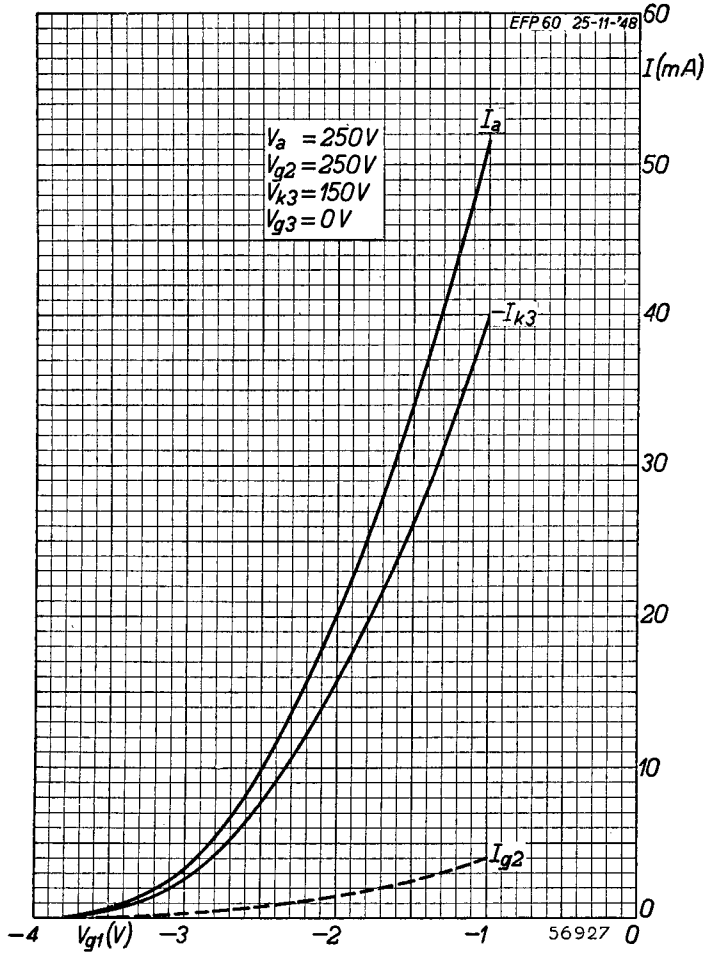


Limiting values
Caractéristiques limites
Grenzdaten

Va_o	= max.	550	V
Va	= max.	300	V
Wa	= max.	2	W
$Vk3_o$	= max.	550	V
Vk3	= max.	150	V
Wk3	= max.	1	W
$Vg2_o$	= max.	550	V
Vg2	= max.	300	V
Wg2	= max.	0,4	W
Ik1	= max.	8	mA
Vg1 (Ig1 = + 0,3 µA)	= max.	-1,3	V
Rg1	= max.	0,7	MΩ
Vfk1	= max.	50	V
Rfk1	= max.	20	kΩ

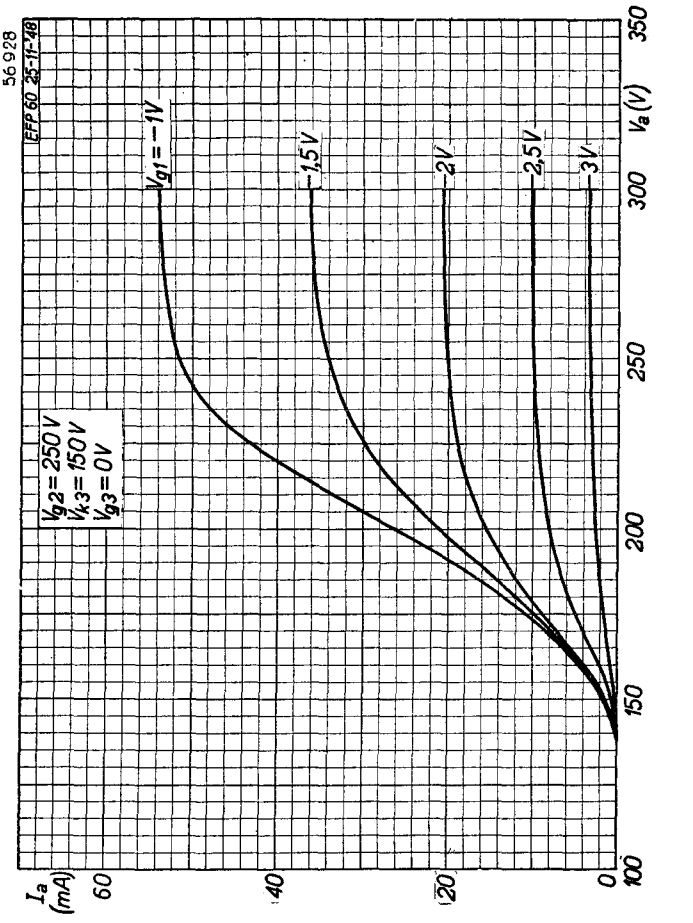
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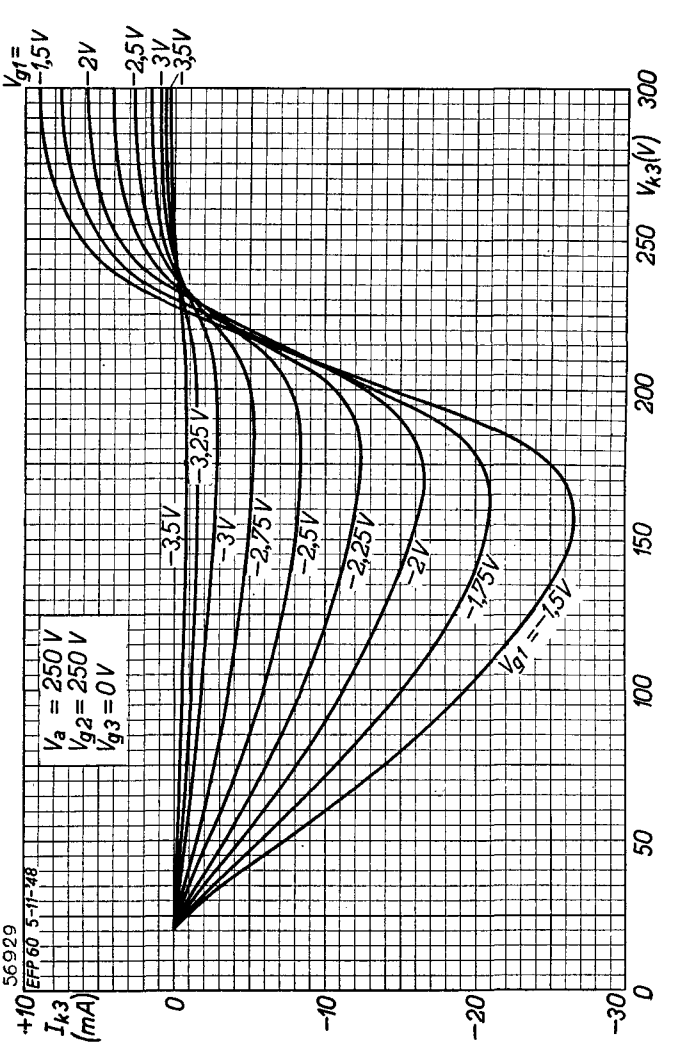
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V_{g2}= 250 V
V_{k3}= 150 V
V_{g3}= 0 V
V_{g1} = −1V
−1,5 V
−2V
−2,5V
−3V
I_a (mA)
60
40
20
0
100
150
200
250
300
350
V_a (V)


V_{g1} = -1,5 V
-2 V
-2,5 V
-3 V
-3,5 V
V_a = 250 V
V_{g2} = 250 V
V_{g3} = 0 V
-3,5V
-3,25 V
-3V
-2,75 V
-2,5V
-2,25V
-2V
-1,75V
V_{g1} = -1,5V
+10
0
-10
-20
-30
I_{k3} (mA)
0
50
100
150
200
250
300
V_{k3}(V)
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EFP 60 5-11-48

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4	B	1949.01.25
5	C	1949.01.25
6	FP	1999.07.04

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EH 1

Heizung ind. / Chauffage ind. / Heating ind.	Vf 6,3 V If 0,4 A
Kapazitäten / Capacités / Capacities	Cg1 6,9 µµF Ca 15.3 µµF Cg1g3 < 0.25 µµF Cg1a < 0,003 µµF

Betriebsdaten als Modulatorröhre.
Données relatives au fonctionnement comme lampe modulatrice.
Operating conditions as first detector.

Va	250 V
Vg2	80 V
Vg4	80 V
Ia (Vg1 = -2 V, Vg3 = -12 V, Vosc. = 9 Veff)	1,7 mA
Ia (Vg1 = -24 V, Vg3 = -12 V, Vosc = 9 Veff)	< 0,15 mA
Ig2 + 4 (Vg1 = -2 V, Vg3 = -12 V, Vosc = 9 Veff)	2,6 mA
Sc (Vg1 = -2 V, Vg3 = -12 V, Vosc = 9 Veff)	0,55 mA/V
Sc (Vg1 = -24 V, Vg3 = -12 V, Vosc = 9 Veff)	< 0,002 mA/V
Ri (Vg1 = -2 V, Vg3 = -12 V, Vosc = 9 Veff)	2 MOhm
Ri (Vg1 = -24 V, Vg3 = -12 V, Vosc = 9 Veff)	> 10 MOhm

Betriebsdaten als H.F.- und Zwischenfrequenzverstärker.
Données relatives au fonctionnement comme H.F. et M.F.
Operating conditions as H.F. and I.F. amplifier.

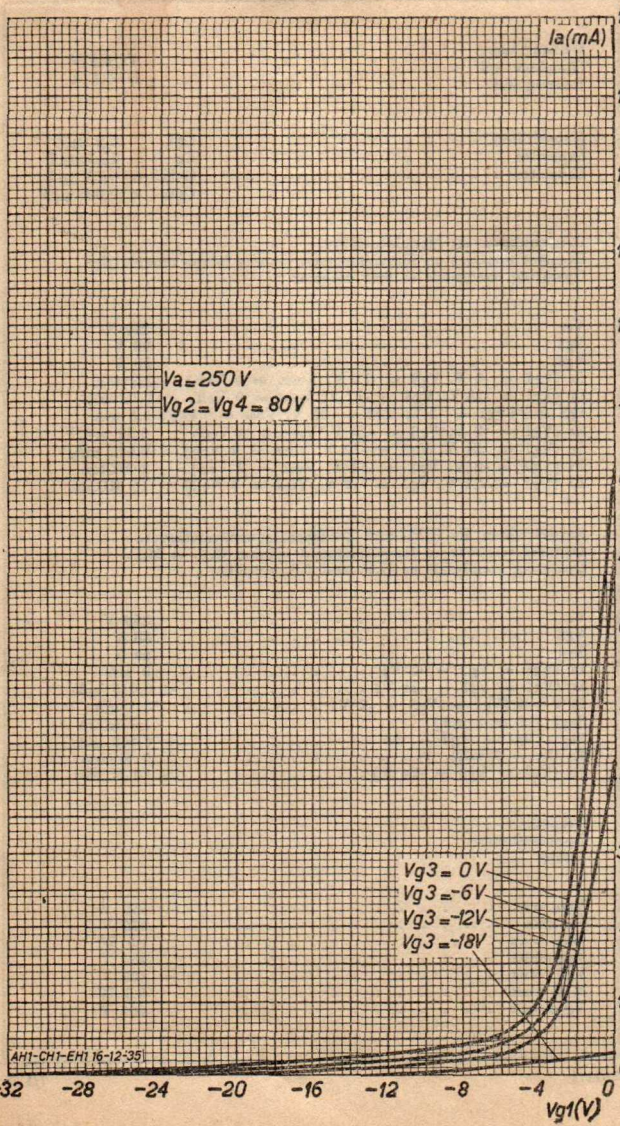
Va	250 V
Vg2	80 V
Vg4	80 V
Ia (Vg1 = Vg3 = -2 V)	3 mA
Ia (Vg1 = Vg3 = -24 V)	< 0,015 mA
Ig 2 + 4 (Vg1 = Vg3 = -2 V)	1,1 mA
Sag1 (Ia = 3 mA)	1,8 mA/V
Sag1 (Vg1 = Vg3 = -24 V)	< 0,002 mA/V
Ri (Ia = 3 mA)	2 MOhm
Ri (Vg1 = Vg3 = -24 V)	> 10 MOhm

Grenzdaten
Données-limites
Limits

Vao max	550 V
Va max	250 V
Wa max	1,5 W
Vg2o max	400 V
Vg2 max	125 V
Wg2 max	0,5 W
Vg4o max	400 V

EH 1

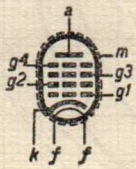
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EH 1
HEXODE

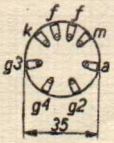


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EH 1

Vg4 max	125 V
Wg4 max	0,5 W
Vg1 (Ig. = 0,3 μA) max.	-1,3 V
Vg3 (Ig3 = 0,3 μA) max.	-1,3 V
Ig 2 + 4 min	0,3 mA
Ig 2 + 4 max	1,7 mA
Ik max	10 mA
Rg1 max	2,5 MOhm
Rg3 max	2,5 MOhm
Rfk max	5000 Ohm
Vfk max	50 V

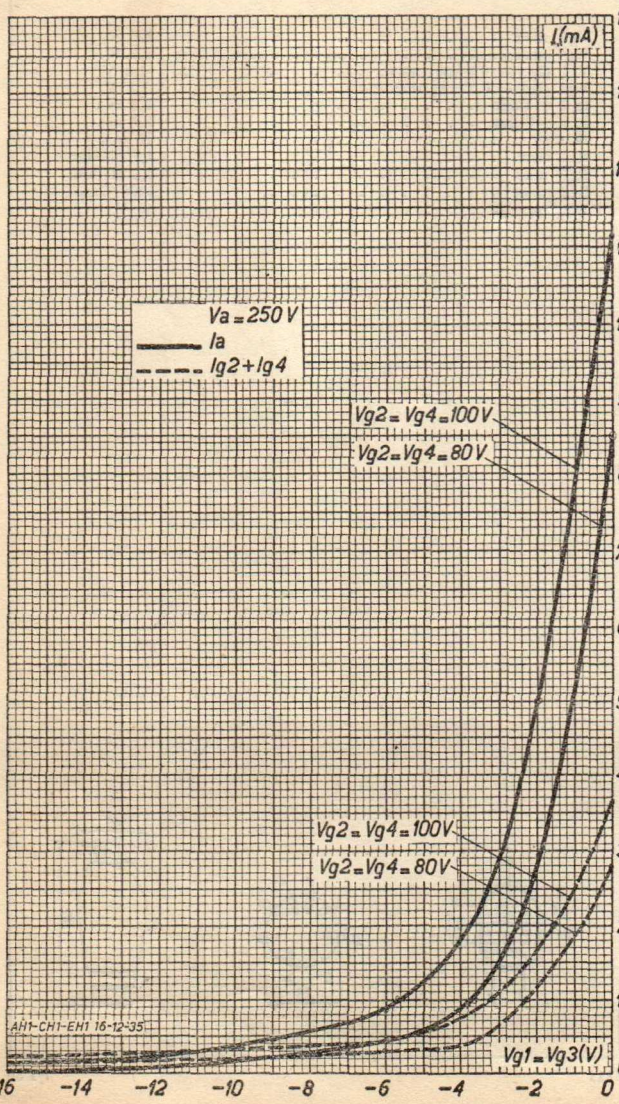






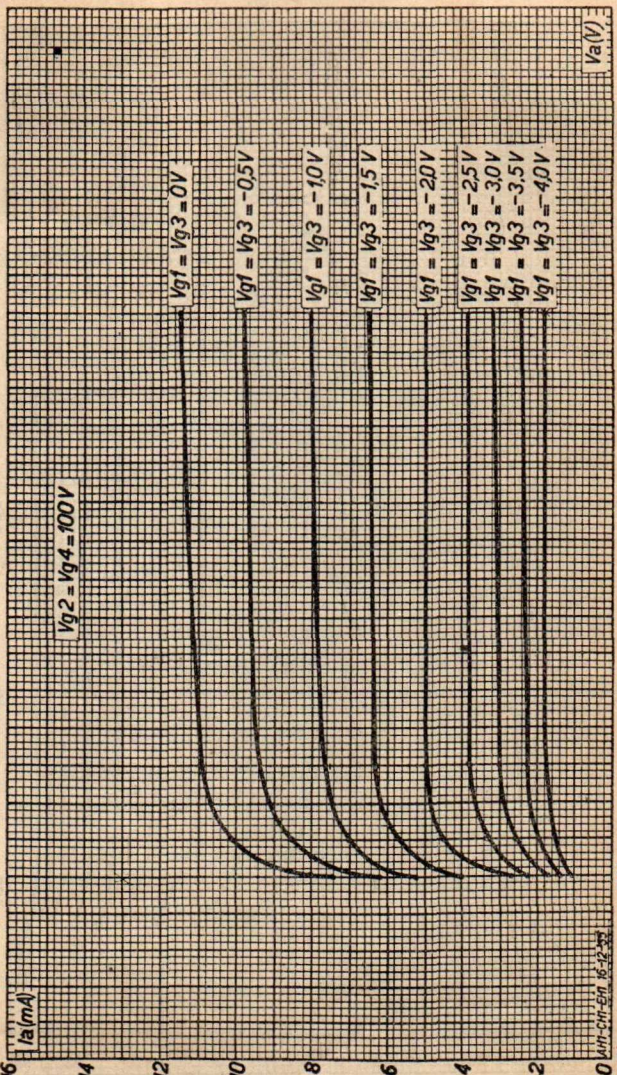
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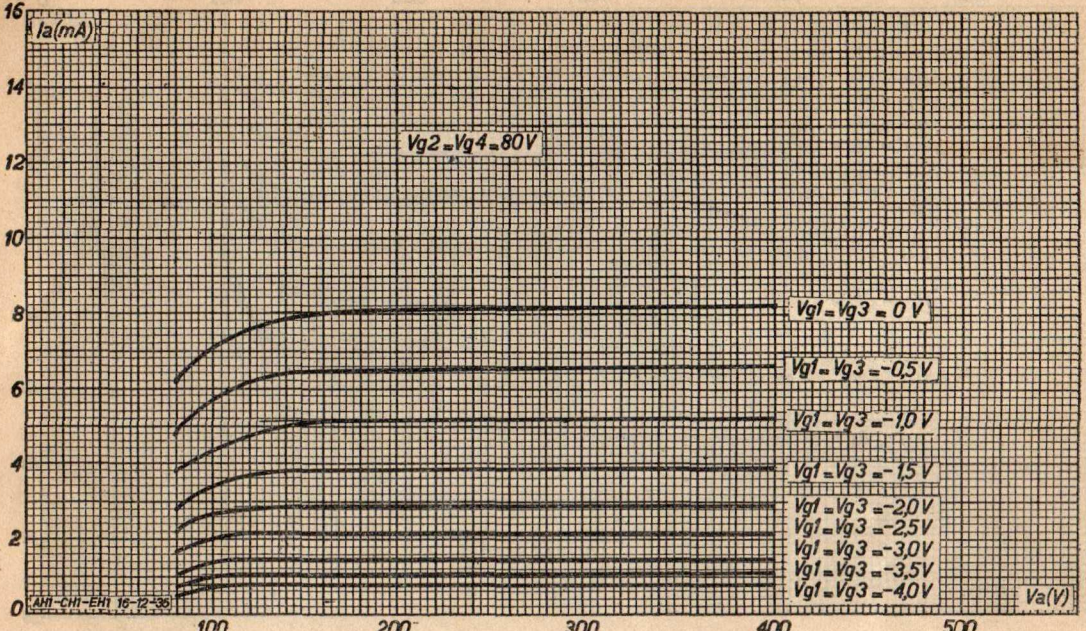
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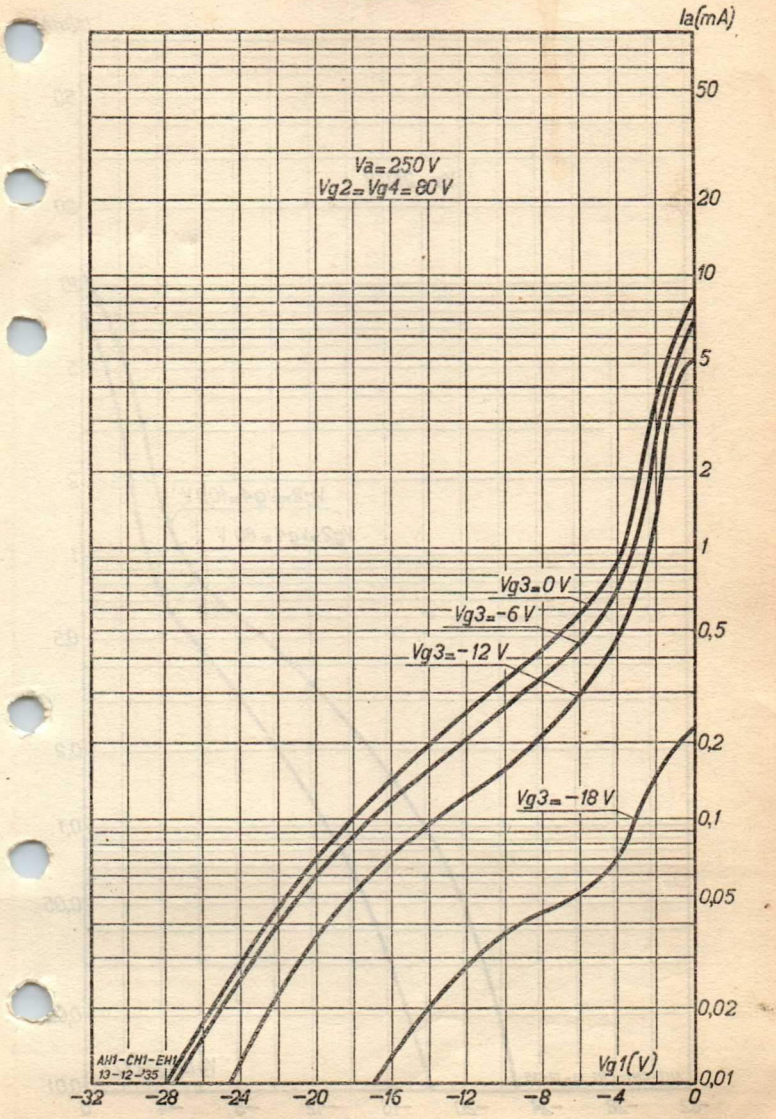
EH 1

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EH 1
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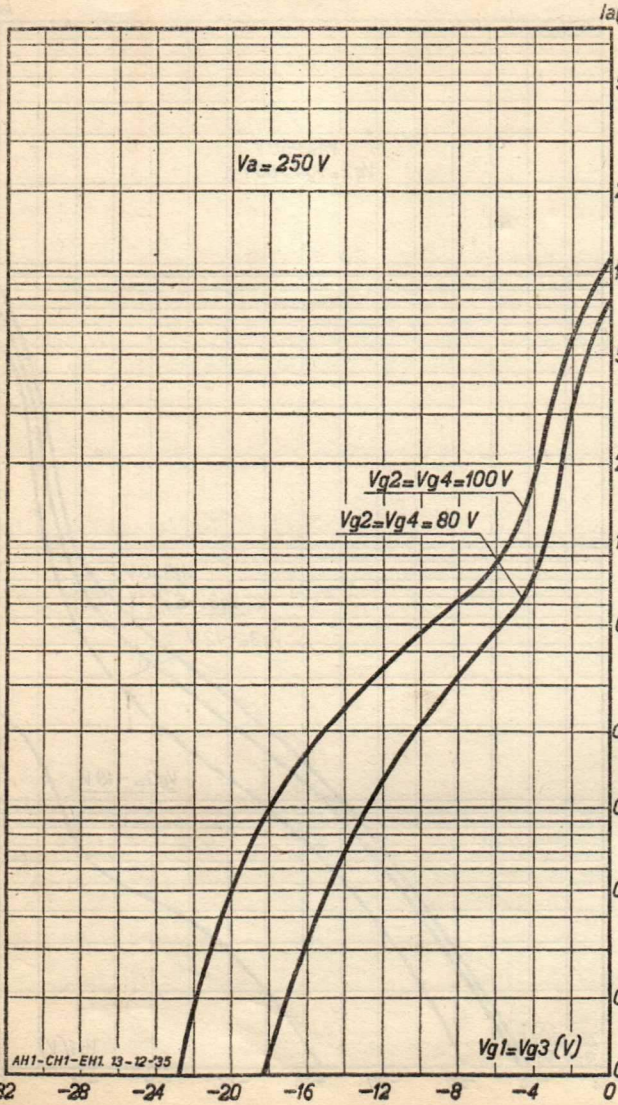
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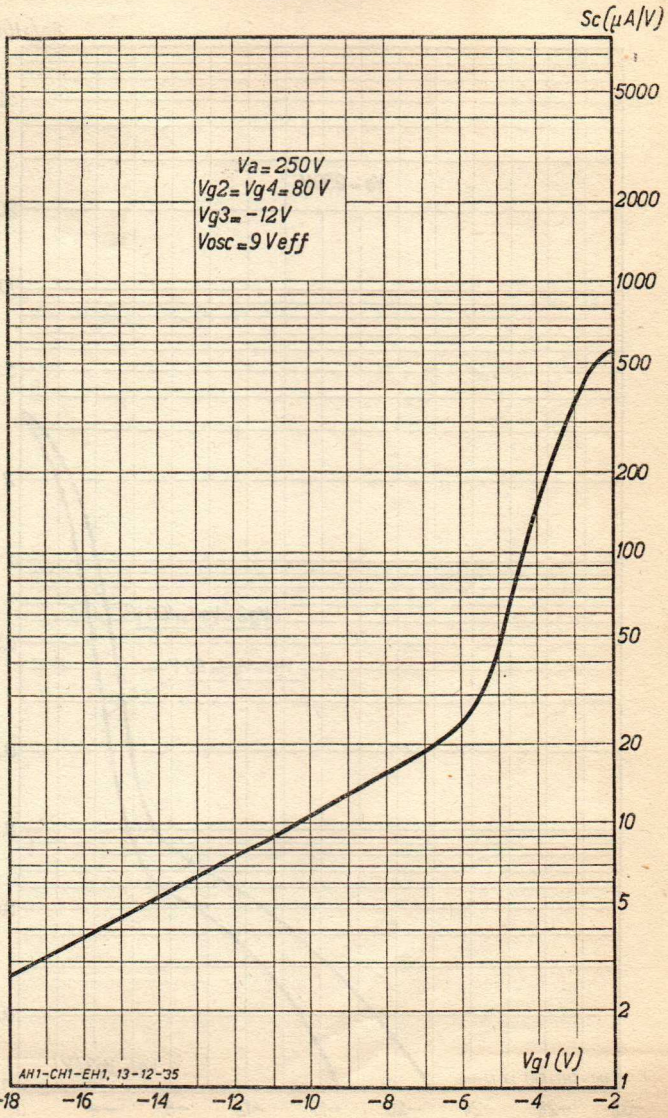
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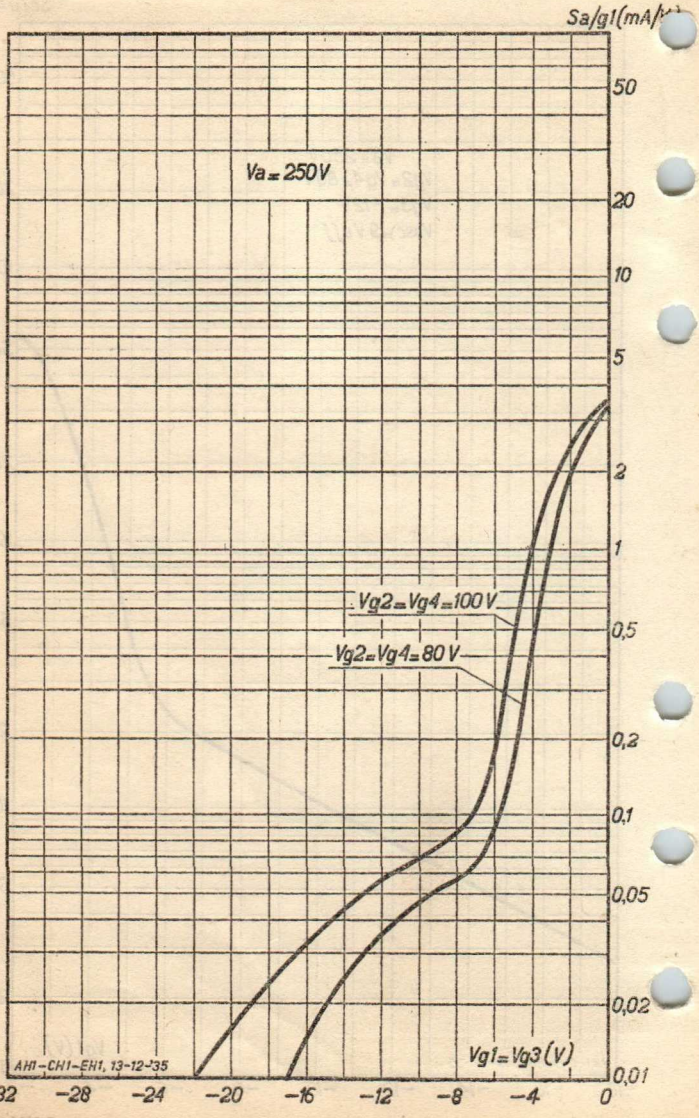
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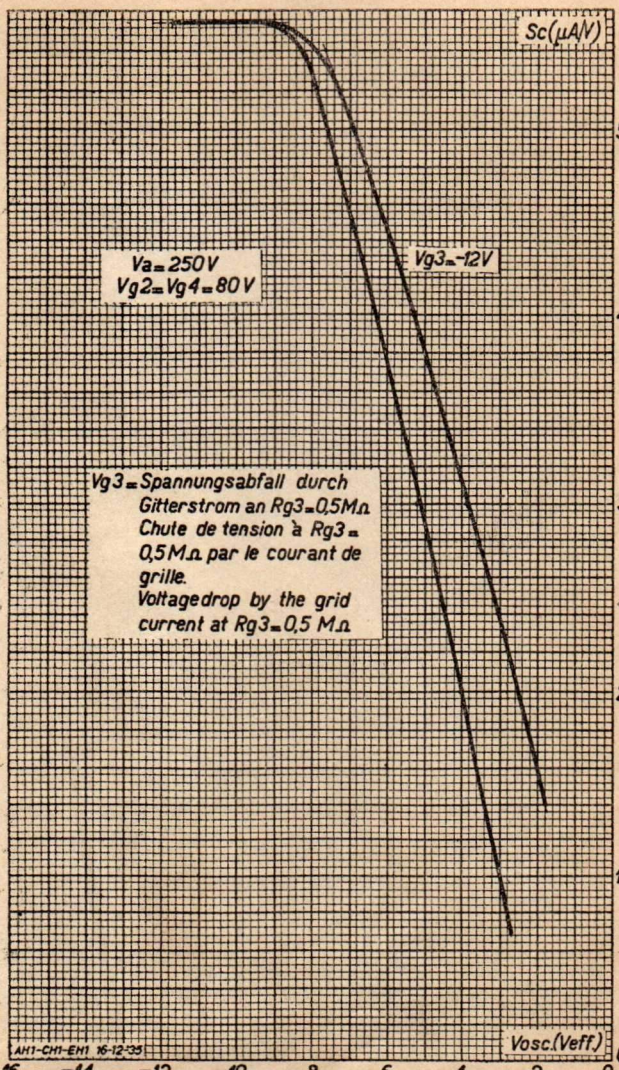
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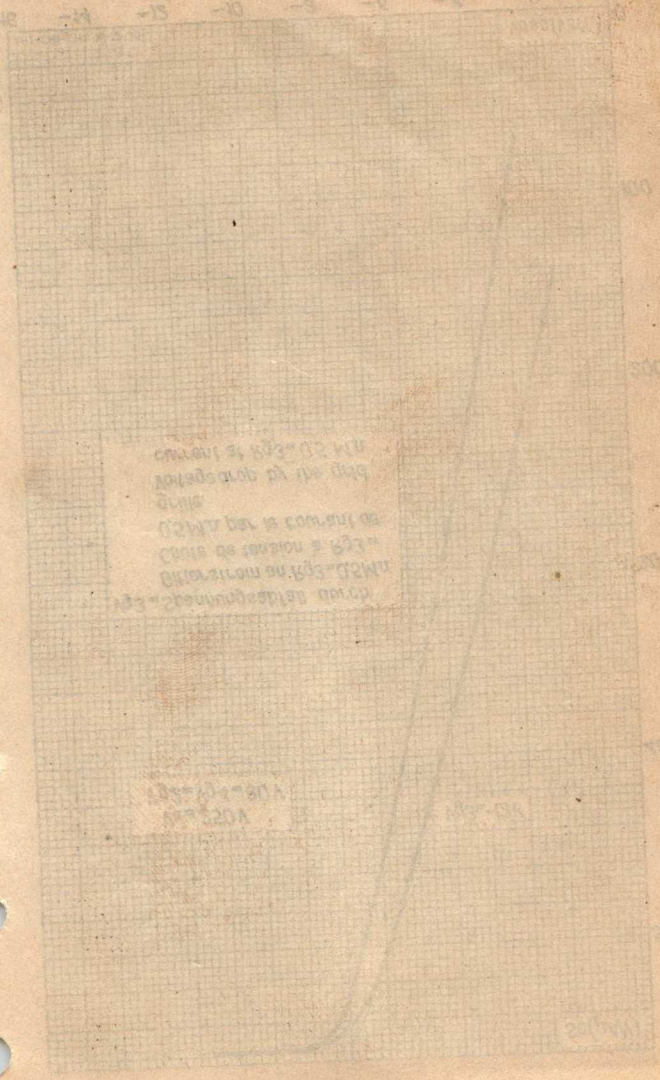
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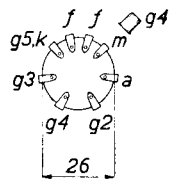
EH 2 Heptode

Die EH 2 ist eine Fünfgitterröhre, die als geregelte Modulatorröhre mit einer getrennten Oszillatorröhre bis zu sehr kurzen Wellen und als geregelter Hoch- oder Zwischenfrequenzverstärker mit kurzem Regelbereich vorteilhaft benutzt werden kann.
Sie arbeitet nach demselben Prinzip wie die Hexode; bei Verwendung als Modulatorröhre wird also das Eingangssignal dem ersten und das Oszillatorsignal dem dritten Gitter zugeführt. Das zweite und vierte Gitter sind Schirmgitter, die getrennt nach außen geführt sind. Das fünfte Gitter, das, oberflächlich betrachtet, den eigentlichen Unterschied gegen die früheren Hexoden darstellt, ist ein Fanggitter, das eingeführt wurde, um den Innenwiderstand zu verbessern und das richtige Arbeiten bei 100 V Anodenspannung in G/W-Empfängern zu gewährleisten. Bei der Verwendung als Mischröhre bietet der getrennte Oszillator große Vorteile. Eine Triode wie die EBC 3 hat eine Anschwingsteilheit (bei $V_g = 0$, $S = 3{,}0$ mA/V), die auch im Kurzwellengebiet ohne jegliche Schwierigkeit ein sicheres Schwingen verbürgt.
An eine Modulatorröhre mit veränderlicher Mischverstärkung sind folgende Anforderungen zu stellen:

1.) sie soll eine genügende Mischsteilheit besitzen;
2.) die Oszillatorspannung soll möglichst klein sein;
3.) es sollen keine Laufzeitströme auftreten;
4.) der Eingangsparallelwiderstand soll bis auf sehr kurzen Wellen noch möglichst groß bleiben;



Abb. 1
Abmessungen in mm.



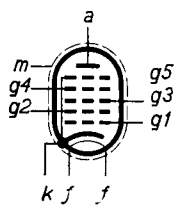


Abb. 2
Elektrodenanordnung und Sockelanschlüsse.

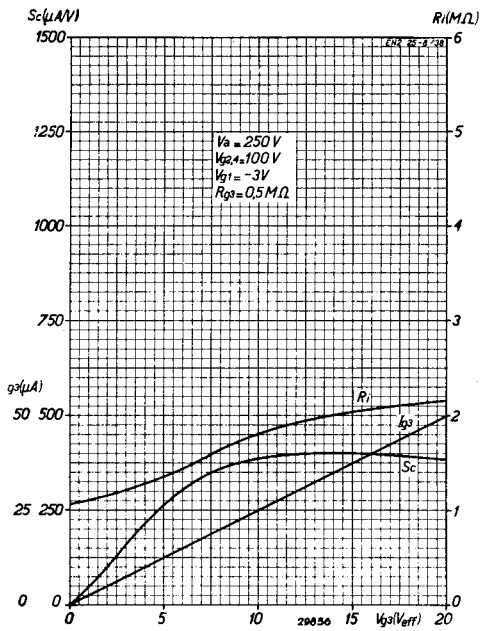


Abb. 3
Mischsteilheit, Innenwiderstand und Oszillatorgitterstrom als Funktion der Oszillatorspannung am Gitter 3 bei einer Anodenspannung von 250 V, einer Schirmgitterspannung von 100 V und einer negativen Vorspannung des Gitters 1 von −3 V.

5.) sie soll ein Kompromiß zwischen einem möglichst geringen Rauschen, einem möglichst geringen Gitterspannungsbereich zum Herunterregeln und einer möglichst geringen Quermodulation bilden;
6.) sie soll eine geringe Frequenzverwerfung beim Regeln und bei Netzspannungsschwankungen hervorrufen;
7.) es soll eine geringe Kopplung zwischen Eingangskreis und Oszillatorkreis (Induktionseffekt) bestehen.

1.) Bei der EH 2 wurde die gewünschte Mischsteilheit durch die große Steilheit des ersten Gitters mit Bezug auf

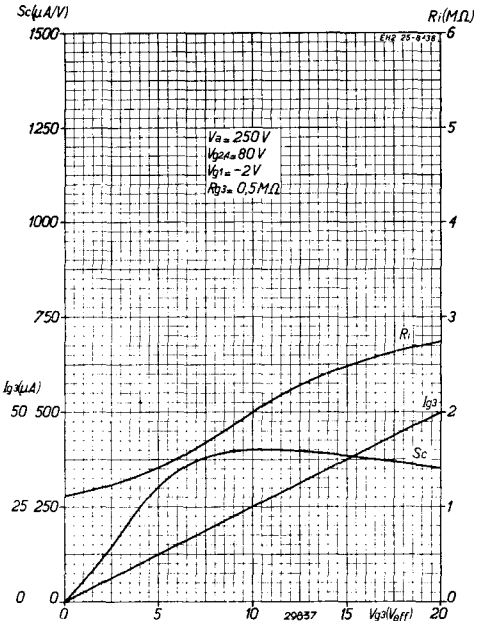


Abb. 4
Mischsteilheit, Innenwiderstand und Oszillatorgitterstrom als Funktion der Oszillatorspannung am Gitter 3 bei einer Anodenspannung von 250 V, einer Schirmgitterspannung von 80 V und einer negativen Vorspannung des Gitters 1 von —2 V.

nung, und daraus folgt, daß auch bei bedeutend kleineren Werten als 14 V_{eff} Oszillatorspannung eine noch befriedigende Mischsteilheit erzielt wird. Dies ist insbesondere im Zusammenhang mit dem Kurzwellenempfang von Bedeutung.

3.) Auch in Bezug auf Laufzeitstrom bietet die EH 2 eine günstige Lösung. Die Elektronen werden zwischen Gitter 2 und 3 verzögert, und einige von diesen können bei sehr hohen Frequenzen infolge des wechselnden Feldes der Oszillatorspannung an Gitter 3 eine solche kinetische Energie erhalten, daß sie gegen die negative Spannung des

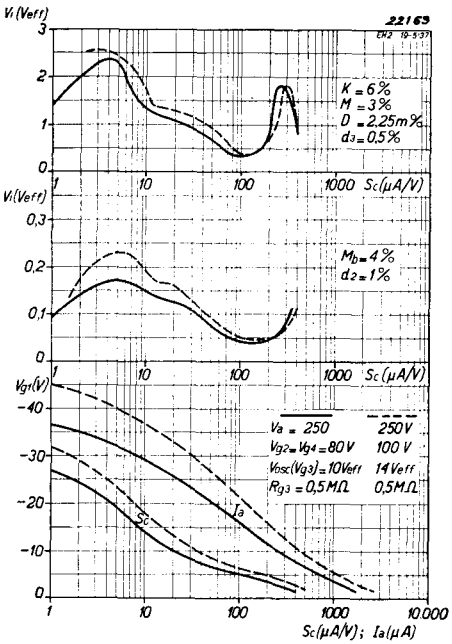


Abb. 5
Für Verwendung als Mischröhre:
Obere Kurven: Eingangswechselspannung als Funktion der durch die negative Spannung des Gitters 1 geänderten Mischsteilheit bei 6 % Quermodulation.
Mittlere Kurven: Eingangswechselspannung als Funktion der durch die negative Spannung des Gitters 1 geänderten Mischsteilheit bei 4 % Modulationsbrummen.
Untere Kurven: Mischsteilheit und Anodenstrom als Funktion der negativen Spannung am Gitter 1.

den Anodenstrom bei Verwendung dieser Röhre als direkter Verstärker und bei $V_{g3} = 0$ erreicht. Diese Steilheit beträgt etwa 1,8 mA/V.

2.) Für den Oszillatorspannungsbedarf ist die Kennlinie der Steilheit des ersten Gitters in Bezug auf den Anodenstrom als Funktion der Spannung am dritten Gitter maßgebend. Je steiler diese Kurve bei größerer negativer Spannung am dritten Gitter (V_{g3}) abfällt, desto kleiner ist die am Gitter benötigte Oszillatorspannung. Diese Steilheit ist durch die günstige Dimensionierung des Gitters so groß, daß bei einer Spannung von 100 Volt an den Gittern 2 und 4 die für die normale Mischsteilheit benötigte Oszillatorspannung etwa 14 V_{eff} beträgt. Diese Oszillatorspannung kann ohne weiteres mit einem gewöhnlichen Oszillator erreicht werden. Abb. 3 und 4 zeigen den Verlauf der Mischsteilheit als Funktion der Oszillatorspan-

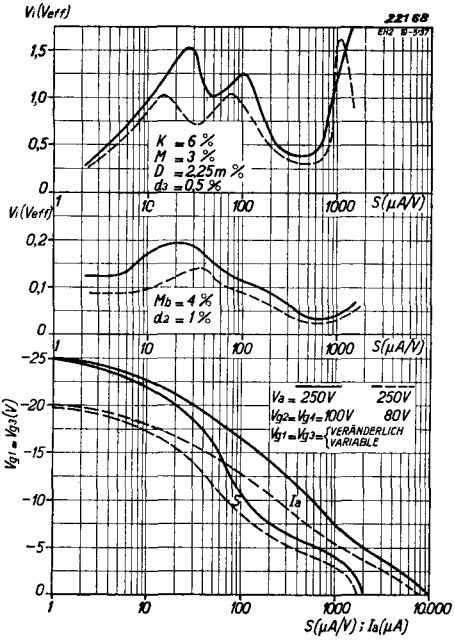


Abb. 6
Für Verwendung als direkter H.F.- oder Z.F.-Verstärker:
Obere Kurven: Eingangswechselspannung als Funktion der durch dieselbe negative Spannung am Gitter 1 und 3 geänderten Steilheit bei 6 % Quermodulation.
Mittlere Kurven: Eingangswechselspannung als Funktion der durch die negative Spannung an Gitter 1 und 3 geänderten Steilheit bei 4 % Modulationsbrummen.
Untere Kurven: Steilheit und Anodenstrom als Funktion derselben negativen Spannung am Gitter 1 und Gitter 3.

verwerfung durch Regelung der Steilheit ist sehr klein, weil sie nur durch die Kapazitätsänderung des Gitters 3 bedingt wird, die unwesentlich ist.

7.) Die Heptode EH 2 zeigt nicht den Effekt der elektronischen Kopplung zwischen Oszillatorgitter und Eingangs-Gitters 1 anlaufen, nämlich wenn die Periode des Wechselfeldes von der Größenordnung der vom Elektron zwischen diesen Gittern benötigten Laufzeit wird. Man kann den Laufzeitstrom durch einen kleinen Abstand zwischen g_3 und g_2 verringern, aber dadurch werden andere Eigenschaften der Heptode ungünstig beeinflußt. In diesem Sinne wurde bei der EH 2 das günstigste Kompromiß erzielt.

4.) Der Eingangsparallelwiderstand auf kurzen Wellen ist durch die kleinen Abstände g_1 - k und g_2 - g_1 bedeutend verbessert. Bei 15 m Wellenlänge und bei einer gegen die Signalfrequenz um 500 kHz höheren Oszillatorfrequenz ($f_{osz.} = f_i + 500$ kHz) wurden für die Heptode EH 2 die folgende Werte für den Eingangsparallelwiderstand und die Eingangskapazität gemessen:
$R_{Eingang} = 30.000\ \Omega$
$C_{Eingang} = 6{,}3\ \mu\mu F$

5.) Die EH 2 ist auch unter Berücksichtigung eines möglichst geringen Rauschens, sowohl bei Verwendung als Mischröhre wie auch als H.F.-Röhre, entwickelt worden. Wie die Kurven der Abbildungen 5 und 6 zeigen, sinkt die Eingangswechselspannung für 6 % Quermodulation, sowohl bei Verwendung als Mischröhre wie auch als direkter H.F.-Verstärker, während des Regelvorganges nirgends unter 0,3 V_{eff}.

6.) Dank der Verwendung einer getrennten Oszillatorröhre ist die Frequenzverwerfung infolge von Netzspannungsschwankungen äußerst gering. Die Frequenz-

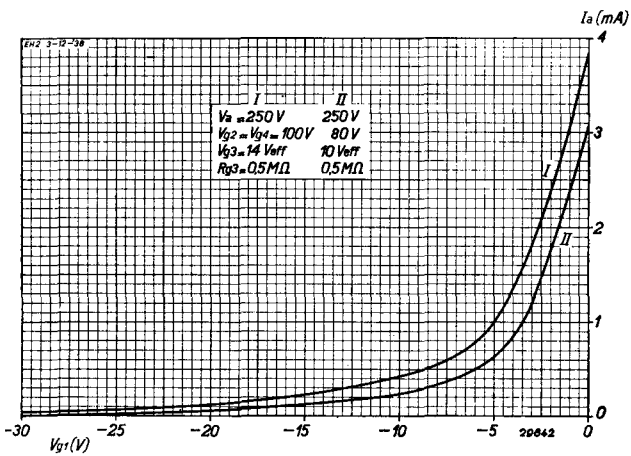


Abb. 7
Anodenstrom als Funktion der Spannung am Gitter 1 bei Verwendung der EH 2 als Mischröhre.

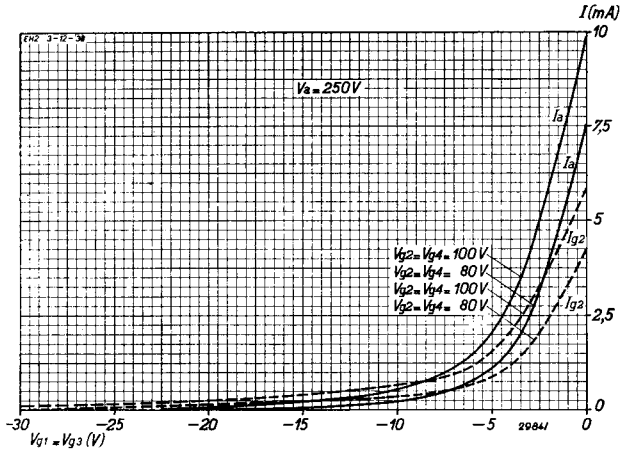


Abb. 8
Anodenstrom und Schirmgitterstrom als Funktion der Spannung an Gitter 1 und 3 bei Verwendung der EH 2 als direkter H.F.- oder Z.F.-Verstärker.

gitter, weil das Gitter 3 auf die Elektronen um das Gitter 1 keine Einwirkung hat. Es besteht somit keine negative Kapazität zwischen Gitter 1 und Gitter 3. Wohl ist eine normale positive Interelektrodenkapazität vorhanden, die etwa 0,2 μμF beträgt und bei sehr kurzen Wellen eine Oszillatorspannung über den Eingangskreis zur Folge hat; aber wenn die Oszillatorfrequenz höher als die Eingangsfrequenz gewählt wird, hat sie keine nachteiligen Folgen.

HEIZDATEN

Heizung: indirekt durch Gleich- oder Wechselstrom, Serien- oder Parallelspeisung.

Heizspannung	$V_f = 6{,}3$ V
Heizstrom	$I_f = 0{,}200$ A

KAPAZITÄTEN

C_{ag1}	$< 0{,}0015$ μμF
C_{g1}	$= 5$ μμF
C_a	$= 11$ μμF
C_{g1g3}	$= 0{,}2$ μμF

BETRIEBSDATEN FÜR DIE VERWENDUNG ALS MISCHRÖHRE

Anodenspannung				
V_a =	250 V		250 V	
Schirmgitterspannung				
$V_{g\,2,4}$ =	100 V		80 V	
Ableitwiderstand des Oszillatorgitters				
R_{g3} =	0,5 MΩ		0,5 MΩ	
Oszillatorspannung am 3. Gitter				
V_{osz} =	14 $V_{(eff)}$		10 $V_{(eff)}$	
Kathodenwiderstand				
R_k =	530 Ω		380 Ω	
Neg. Gittervorspannung				
V_{g1} =	−3 V	−25 V	−2 V	−20 V
Anodenstrom				
I_a =	1,85 mA	—	1,8 mA	—
Schirmgitterstrom				
$I_{g2} + I_{g4}$ =	3,8 mA	—	3,5 mA	—
Mischsteilheit				
S_c =	400 μA/V	<10 μA/V	400 μA/V	<10 μA/V
Innenwiderstand				
R_i =	2 MΩ	>10 MΩ	2 MΩ	>10 MΩ

EH 2

BETRIEBSDATEN FÜR VERWENDUNG ALS H.F.- ODER Z.F.-VERSTÄRKER

Anodenspannung				
V_a =	250 V		250 V	
Schirmgitterspannung				
$V_{g2} = V_{g4}$ =	100 V		80 V	
Kathodenwiderstand				
R_k =	430 Ω		310 Ω	
Neg. Gittervorspannung				
$V_{g1} = V_{g3}$ =	−3 V	−25 V	−2 V	−20 V
Anodenstrom				
I_a =	4,2 mA	—	4 mA	—
Schirmgitterstrom				
$I_{g2} + I_{g4}$ =	2,8 mA	—	2,5 mA	—
Steilheit				
S =	1400 µA/V	<2 µA/V	1400 µA/V	<2 µA/V
Innenwiderstand				
R_i =	1 MΩ	>10 MΩ	1 MΩ	>10 MΩ

GRENZDATEN

V_{ao}	= max. 550 V	V_{g1} (I_{g1} = 0,3 µA)	= max. −1,3 V
V_a	= max. 300 V	V_{g3} (I_{g3} = 0,3 µA)	= max. −1,3 V
W_a	= max. 1,5 W	$R_{g1} = R_{g3}$	= max. 3 MΩ
$V_{g2o} = V_{g4o}$	= max. 400 V	I_k	= max. 10 mA
$V_{g2} = V_{g4}$	= max. 125 V	V_{fk}	= max. 5000 Ω
$W_{g2} = W_{g4}$	= max. 0,5 W	R_{fk}	= max. 100 V [1]

[1]) Gleichsp. oder Effektivwert der Wechselsp.

ANWENDUNG

A. H.F.- oder Z.F.-VERSTÄRKER MIT VERÄNDERLICHER STEILHEIT.

Für die Speisung der Schirmgitter (Gitter 2 und 4) soll vorzugsweise ein Potentiometer verwendet werden. Die Regelung der Steilheit kann am besten mittels gleichzeitiger Steuerung der Gitter 1 und 3 durch dieselbe Regelspannung erfolgen. Wenn mittels eines Abschwächers (Spannungsteilers) das dritte Gitter durch eine kleinere Spannung gesteuert wird als das erste Gitter, wird der Regelbereich länger, aber die Quermodulation bleibt dieselbe, so daß diese Schaltung keine Vorteile bietet.

Die Metallisierung ist gesondert nach außen geführt und muß im allgemeinen mit dem Chassis verbunden werden. Die üblichen Vorkehrungen bezüglich Abschirmung der Zuleitungen und Verlegung der Bedrahtung müssen berücksichtigt und die Speisungszuleitungen durch Filter entkop-

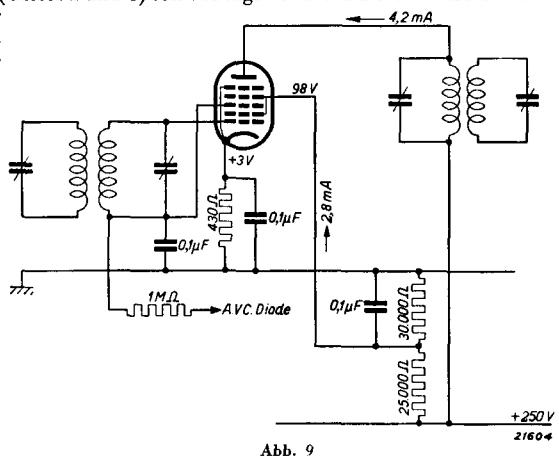


Abb. 9
Prinzipschaltung für die Verwendung der EH 2 als Zwischenfrequenzverstärker, wenn dieselbe Regelspannung den Gittern 1 und 3 zugeführt wird.

pelt werden. Abb. 9 gibt die Prinzipschaltung für die Verwendung der EH 2 als geregelter Z.F.-Verstärker.

B. MODULATORRÖHRE MIT VERÄNDERLICHER MISCHSTEILHEIT.

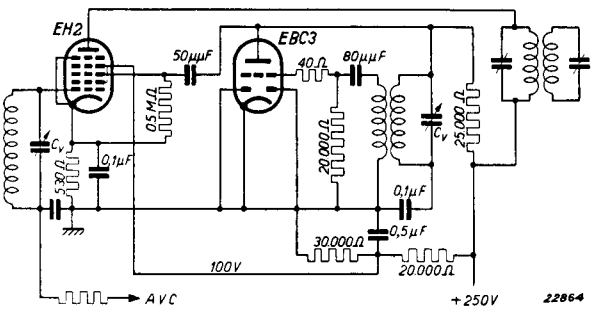


Abb. 10
Prinzipschaltung für die Verwendung der Röhre EH 2 als Mischröhre mit der EBC 3 als Oszillator.

Abbildung 10 zeigt die Prinzipschaltung der Röhre EH 2 als Modulatorröhre mit der EBC 3 als Oszillatorröhre. Die EF 6, als Triode geschaltet, kann eventuell auch als Oszillator benutzt werden.
Diese Schaltung ermöglicht es, bis zu sehr kurzen Wellen (5 m) herunterzugehen. Der abgestimmte Oszillatorkreis wird am besten an die Anode der Oszillatorröhre angeschlossen. Die Kopplung mit dem Gitter 3 der Heptode EH 2 findet über einen kleinen Kondensator von 20 bis 50 µµF statt (der letztere Wert ist für alle Wellenlängen am besten geeignet). Für den Wellenbereich 5—12 m kann die Oszillatorspule aus 2 mm dickem Emailledraht (Kupfer), ca. 4,5 Windungen von etwa 10 mm Innendurchmesser, dicht gewickelt ohne Kern, bestehen. Es ist wichtig, dafür keinen verzinnten Montagedraht zu verwenden und die Verbindungen der Kreisspule mit dem Abstimmkondensator möglichst kurz zu halten. Die Rückkopplungsspule soll ebenfalls aus 4,5 Windungen von seideisoliertem Draht, ca. 0,1 mm dick und direkt auf die Kreisspule gewickelt, bestehen. Der Serienwiderstand von 40 Ω in der Gitterzuleitung der Oszillatorröhre dient dazu, das Überschwingen am kurzwelligen Ende des Bereiches zu verhüten.
Bei Verwendung der EF 6 als Oszillator ist die Oszillatorspannung etwas größer. Im Kurzwellenbereich soll, im Gegensatz zu den Verhältnissen bei der Oktode (z.B. EK 2), die Oszillatorfrequenz höher als die Eingangsfrequenz gewählt werden, also genau wie in den Mittel- und Langwellenbereichen üblich. Die übriggebliebene Kopplung durch die Kapazität zwischen g_1 und g_3 hat dann eine Spannung von der Oszillatorfrequenz über den Eingangskreis zur Folge, die eine solche Phase hat, daß sie die Tendenz hat, die Mischverstärkung zu vergrößern. Im nicht geregelten Zustand muß das Gitter 1 eine negative Gittervorspannung von —2 Volt bei einer Spannung von 80 V an den Schirmgittern 2 und 4 und eine solche von —3 Volt bei einer Schirmgitterspannung von 100 Volt erhalten. Die Regelspannung der automatischen Lautstärkeregelung wird in dem Falle nur dem ersten Gitter zugeführt. Die beiden Schirmgitter 2 und 4 müssen über ein reichlich bemessenes Potentiometer gespeist werden.

PHILIPS

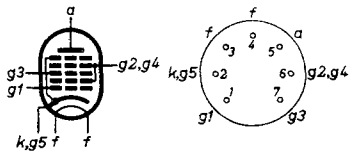
EH 90

DUAL CONTROL HEPTODE for television service
HEPTODE A DOUBLE COMMANDE pour le service de télévision
DOPPELGESTEUERTE HEPTODE für Fernsehbetrieb

Heating : indirect by A.C. or D.C. series or parallel supply
Chauffage: indirect par C.A. ou C.C. alimentation série ou parallèle
Heizung : indirekt durch Wechsel- oder Gleichstrom; Serien- oder Parallelspeisung

V_f = 6,3 V
I_f = 300 mA

Dimensions in mm
Dimensions en mm
Abmessungen in mm



Base, culot, Sockel: MINIATURE

Capacitances
Capacités
Kapazitäten

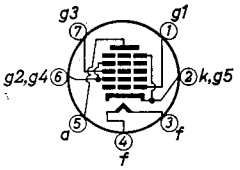
C_{ag1}	<	0,07 pF
C_{ag3}	<	0,36 pF
$C_{g1-(k+f+g2+g3+g4+g5)}$	=	5,5 pF
$C_{g3-(k+f+g1+g2+g4+g5)}$	=	7,0 pF
$C_{a-(k+f+g1+g2+g3+g4+g5)}$	=	7,5 pF
C_{g1g3}	<	0,22 pF

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V_f = 6,3 V
I_f = 300 mA

Dimensions in mm
Dimensions en mm
Abmessungen in mm



Base, culot, Sockel: MINIATURE

Capacitances
Capacités
Kapazitäten

C_{ag_1}	< 0,07 pF
C_{ag_3}	< 0,36 pF
C_{g_1} - (k+f+g2+g3+g4+g5)	= 5,5 pF
C_{g_3} - (k+f+g1+g2+g4+g5)	= 7,0 pF
C_a - (k+f+g1+g2+g3+g4+g5)	= 7,5 pF
$C_{g_1g_3}$	< 0,22 pF

Operating characteristics
Caractéristiques d'utilisation
Betriebsdaten

V_a	=	10	100	100 V
V_{g2+g4}	=	30	30	30 V
V_{g1}	=	0	0	-1 V
V_{g3}	=	0	-1	0 V
I_a	=	1,2	0,8	0,75 mA
I_{g2+g4}	=	4,1	4,0	1,1 mA
S_{g1}	=	-	-	0,95 mA/V
S_{g3}	=	-	1,25	- mA/V
R_i	=	-	0,7	1,0 MΩ
V_{g1} (I_a=50 µA)	=	-	-	-2,5 V
V_{g3} (I_a=50 µA)	=	-	-2,2	- V

Limiting values
Caractéristiques limites
Grenzdaten

V_{a_o}	= max.	550 V
V_a	= max.	300 V
W_a	= max.	1,0 W
$V_{(g2+g4)_o}$	= max.	550 V
$V_{b(g2+g4)}$	= max.	300 V
V_{g2+g4}	= max.	100 V
W_{g2+g4}	= max.	1,0 W
I_k	= max.	14 mA
R_{g1}	= max.	0,47 MΩ
R_{g3}	= max.	2,2 MΩ
R_{g3} ($V_{g2+g4} \leq 30$ V)	= max.	5 MΩ
V_{kf} (k pos.; f neg.)	= max.	200 V
V_{kf} (k neg.; f pos.)	= max.	200 V[1])

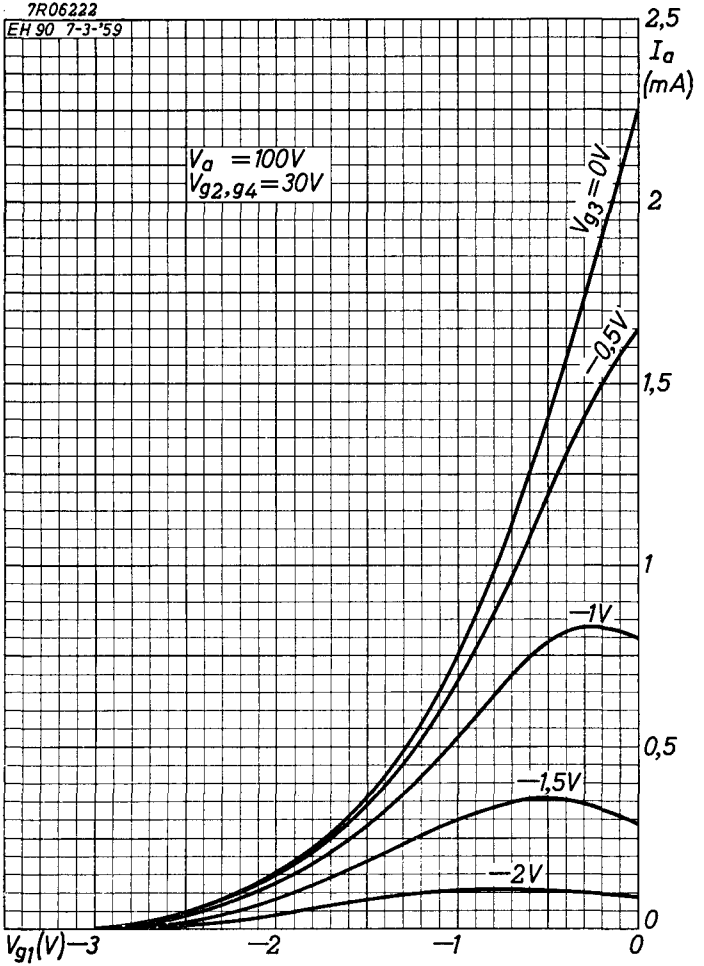
[1])D.C. component max. 100 V
Composante C.C. 100 V au max.
Gleichspannungsanteil max. 100 V

Operating characteristics
Caractéristiques d'utilisation
Betriebsdaten

V_a	=	10	100	100 V
V_{g2+g4}	=	30	30	30 V
V_{g1}	=	0	0	-1 V
V_{g3}	=	0	-1	0 V
I_a	=	2	0,8	0,75 mA
I_{g2+g4}	=	3,5	4,0	1,1 mA
S_{g1}	=	-	-	1,2 mA/V
S_{g3}	=	-	1,55	- mA/V
R_i	=	-	0,4	0,9 MΩ
V_{g1} (I_a=50 µA)	=	-	-	-2,5 V
V_{g3} (I_a=50 µA)	=	-	-2,2	- V

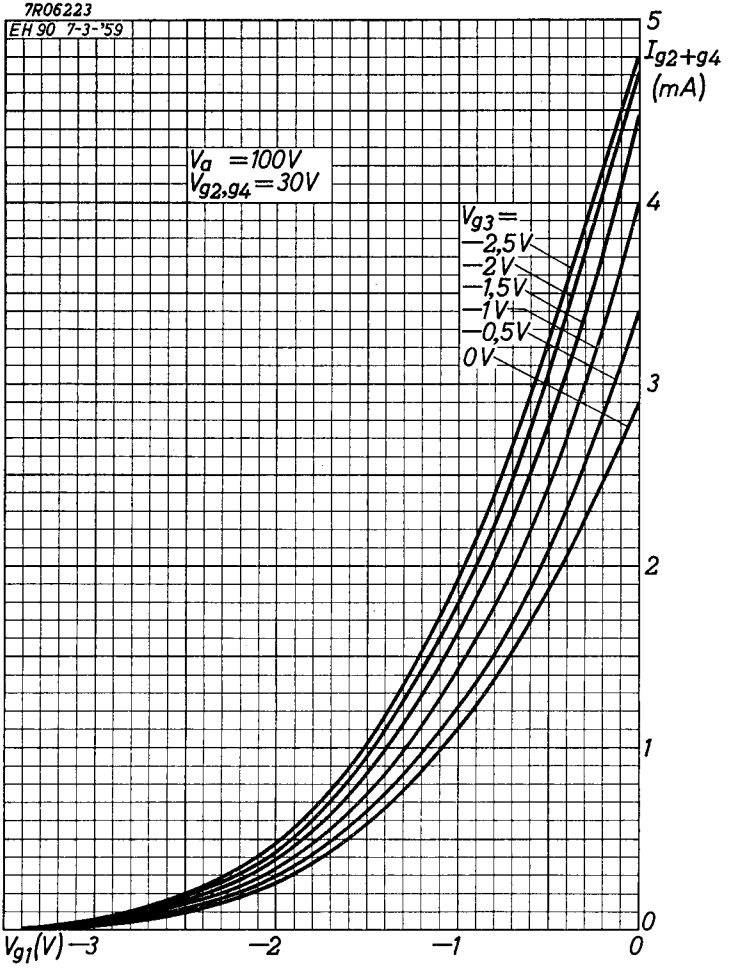
Limiting values
Caractéristiques limites
Grenzdaten

V_{a_o}	=	max.	550 V
V_a	=	max.	300 V
W_a	=	max.	1,0 W
$V_{(g2+g4)_o}$	=	max.	550 V
$V_{b(g2+g4)}$	=	max.	300 V
V_{g2+g4}	=	max.	100 V
W_{g2+g4}	=	max.	1,0 W
I_k	=	max.	14 mA
R_{g1}	=	max.	0,47 MΩ
R_{g3}	=	max.	2,2 MΩ
R_{g3} ($V_{g2+g4} \leqq 30$ V)	=	max.	5 MΩ
V_{kf} (k pos.; f neg.)	=	max.	200 V
V_{kf} (k neg.; f pos.)	=	max.	100 V

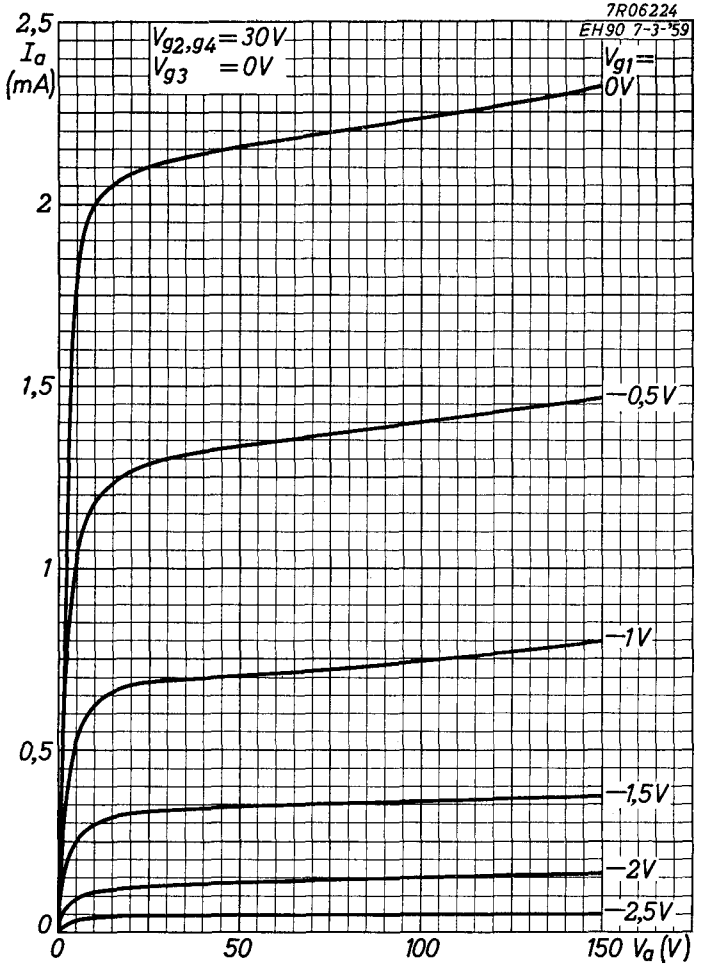

7R06222
EH 90 7-3-'59
V_a =100V
$V_{g2,g4}$=30V
V_{g3}=0V
−0,5V
−1V
−1,5V
−2V
I_a (mA)
2,5
2
1,5
1
0,5
0
V_{g1}(V)
−3
−2
−1
0

3.3.1959 A

EH 90 PHILIPS



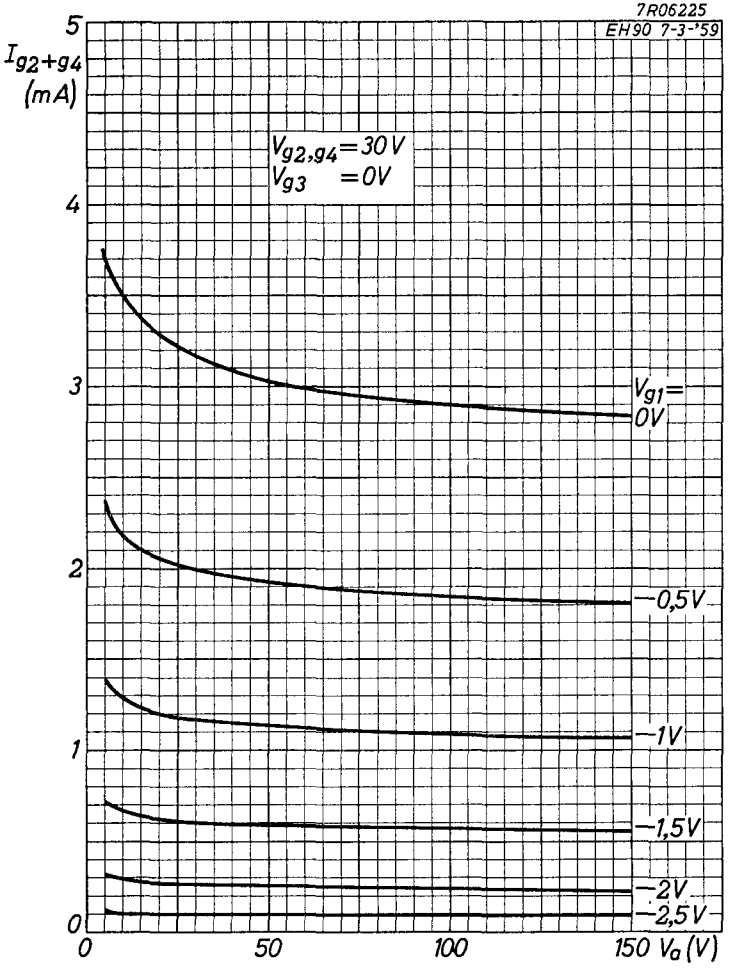
B


7R06224
EH90 7-3-59
$V_{g2,g4}$ = 30V
V_{g3} = 0V
V_{g1} =
0V
−0,5V
−1V
−1,5V
−2V
−2,5V
I_a (mA)
2,5
2
1,5
1
0,5
0
0
50
100
150 V_a (V)

3.3.1959

C

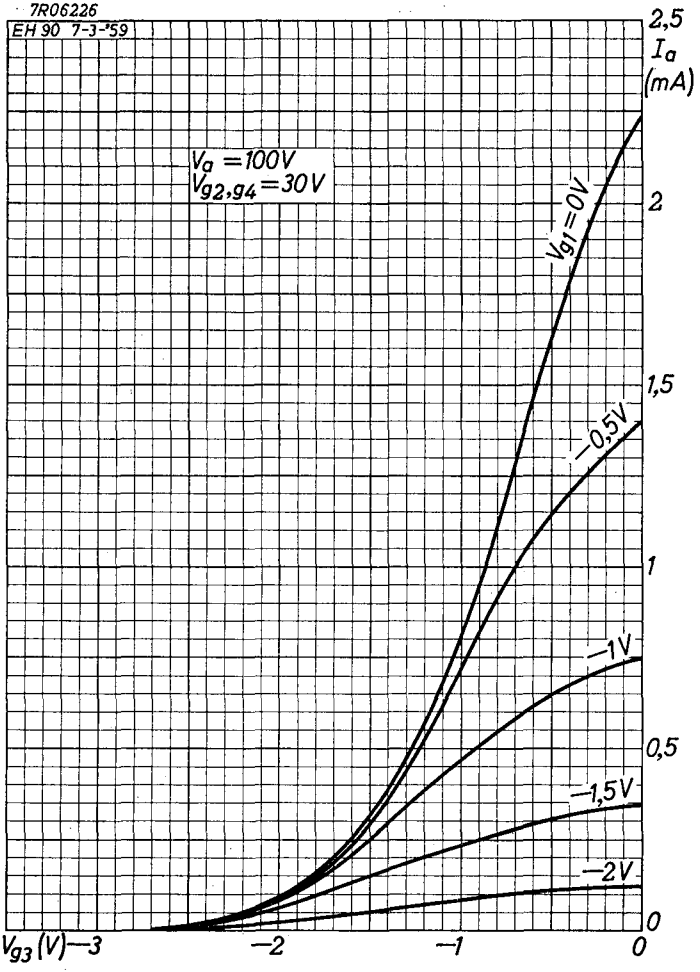
EH90 PHILIPS



D

PHILIPS

EH90

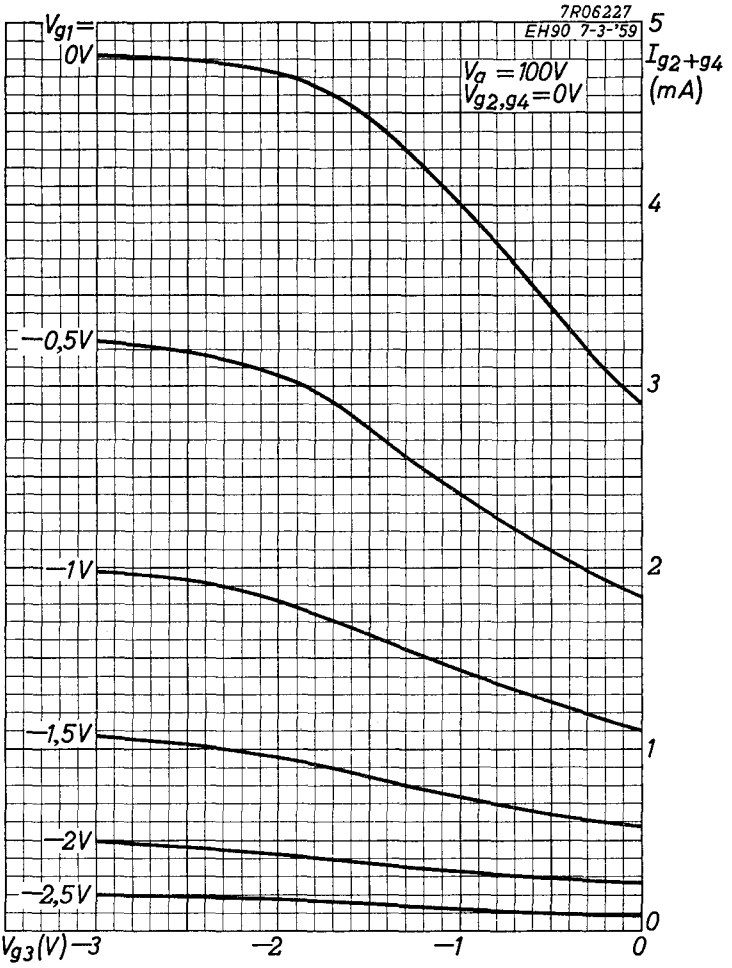


3.3.1959

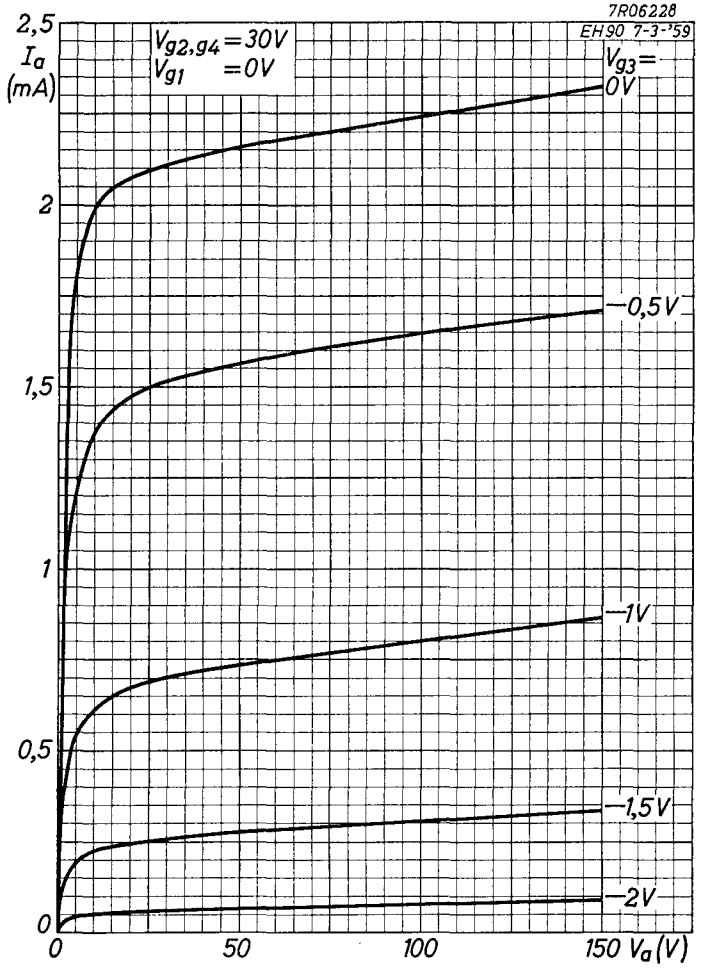
E

EH90

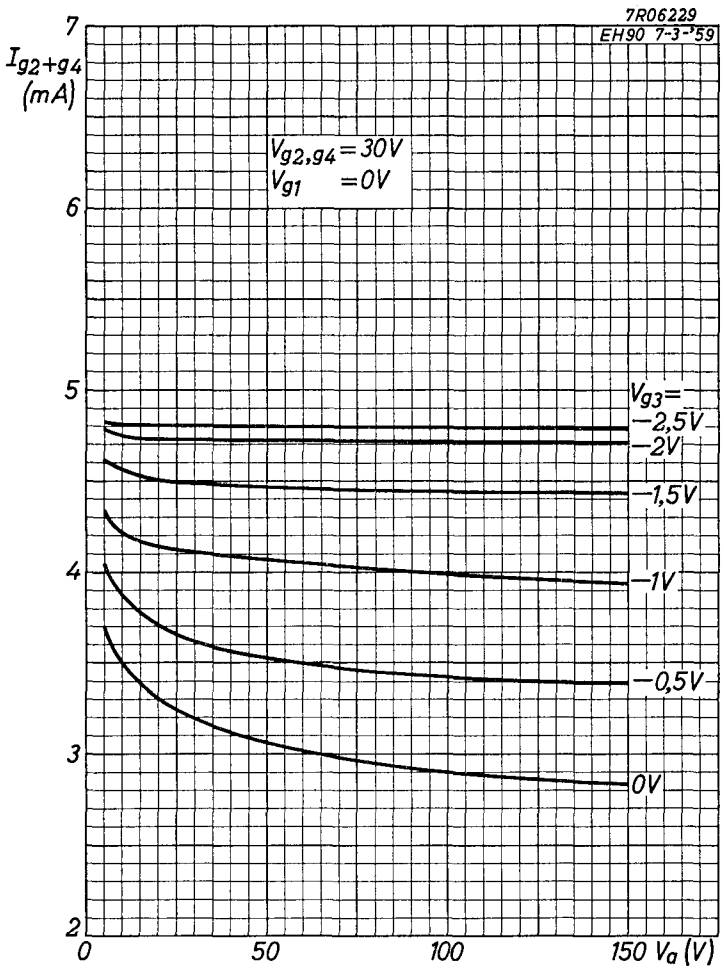
PHILIPS



F


7R06228
EH90 7-3-'59
$V_{g2,g4}$ = 30V
V_{g1} = 0V
V_{g3} =
0V
−0,5V
−1V
−1,5V
−2V
I_a (mA)
2,5
2
1,5
1
0,5
0
0
50
100
150 V_a (V)

EH90 PHILIPS



H

PHILIPS

Electronic Tube

HANDBOOK

EH90

page	sheet	date
1	1	1956.04.04
2	1	1959.03.03
3	2	1956.04.04
4	2	1959.03.03
5	A	1959.03.03
6	B	1959.03.03
7	C	1959.03.03
8	D	1959.03.03
9	E	1959.03.03
10	F	1959.03.03
11	G	1959.03.03
12	H	1959.03.03
13	FP	1999.07.04

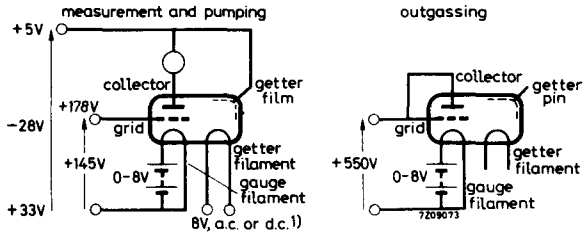
EVAPORATION ION PUMP

One-shot evaporation ion pump, consisting of a Bayard-Alpert gauge with the addition of a zirconium getter filament. The getter is evaporated from the getter filament, the pumping speed being enhanced by the ionising action of the gauge.
The Bayard-Alpert gauge can be used independently for measuring purposes.

CHARACTERISTICS

Pressure range, pumping		10^{-3} to 10^{-11}	torr
measurement		10^{-3} *to* 10^{-10}	*torr*
Pumping speed average (for nitrogen) at 10 mA emission current		0.4	l/s
Gauge sensitivity (for nitrogen)		approx. 12	per torr
Gauge filament characteristics		see page 3	
Gauge emission current range		1 μA to 75	mA
Insulation resistance before pumping			
Collector to other electrodes	min.	10^{14}	Ω
Grid to other electrodes	min.	10^{12}	Ω

TYPICAL OPERATING CONDITIONS



potentials are given with respect to earth

Gauge emission current (see also page 2)		
measurement	100 μA, 1 mA or 10	mA
outgassing	75	mA

[1]) Getter filament current at the given supply voltage 8 A

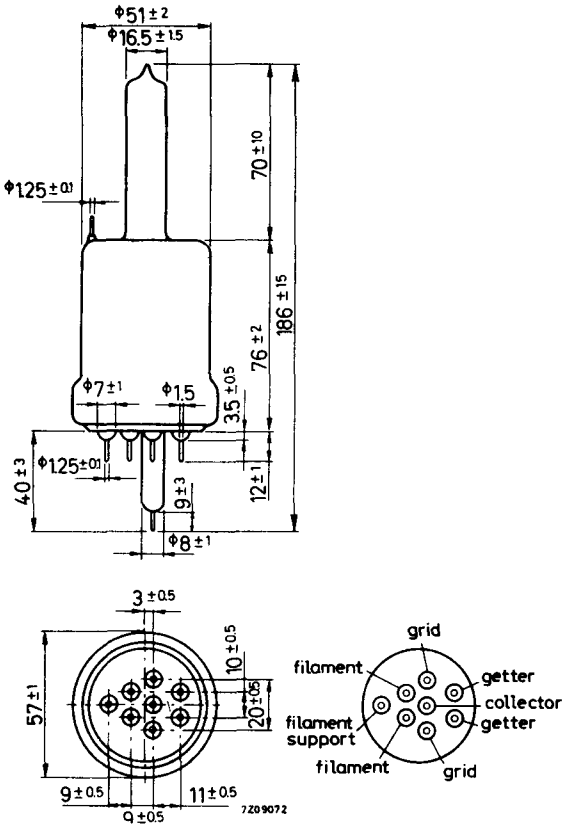
LIMITING VALUES

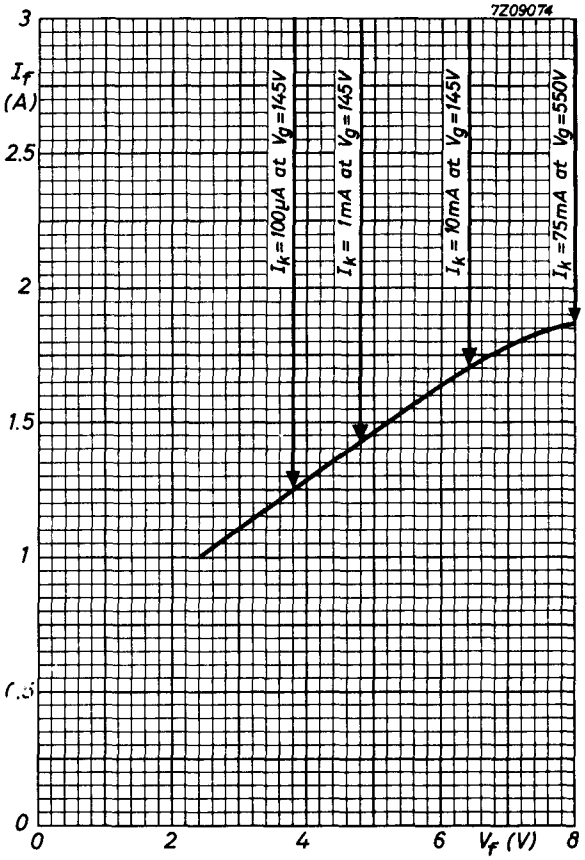
Gauge filament voltage	max.	8	V
Gauge emission current	max.	75	mA
Getter filament current	max.	10	A
Grid wattage	max.	40	W
Bulb temperature during operation	max.	100	°C
Bake-out temperature	max.	450	°C

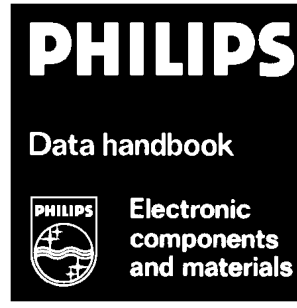
MECHANICAL DATA

Dimensions in mm

Material W1 glass




7Z09074
3
I_f (A)
2.5
2
1.5
1
0.5
0
0
2
4
6
8
V_f (V)
I_k = 100μA at V_g = 145V
I_k = 1mA at V_g = 145V
I_k = 10mA at V_g = 145V
I_k = 75mA at V_g = 550V



EIP12

page	sheet	date
1	1	1968.03
2	2	1970.01
3	3	1970.01
4	FP	2001.05.17

PHILIPS „MINIWATT"
EK 1
OKTODE

EK 1

Heizung ind. / Chauffage ind. / Heating ind.	Vf = 6,3 V If = ca. env. appr. 0,4 A

Kapazitäten / Capacités / Capacities	Cg1 = 9 $\mu\mu$F Cg4 = 8,7 $\mu\mu$F Ca = 12,5 $\mu\mu$F Cg2 = 6 $\mu\mu$F Cg1g4 < 0.35 $\mu\mu$F Cg2g4 < 0,25 $\mu\mu$F Cag4 < 0,06 $\mu\mu$F

Betriebsdaten
Données relatives au fonctionnement
Operating conditions

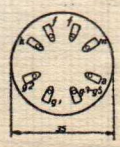
Va	= 250 V
Vg2	= 90 V
Vg3 + 5	= 70 V
Vg1	= -1,5 V
Ia (Vg4 = -1,5 V)	= 1,6 mA
Sc (Ia = 1,6 mA)	= 0 6 mA/V*)
Sc (Vg4 = -25 V)	< 0 001 mA/V
Ri (Ia = 1.6 mA)	= 1,5 Megohm
Ri (Vg4 = -25 V)	> 10 Megohm
Verstärkung, Amplification.	= 225**)

Grenzdaten.
Données limites.
Limits.

V_{a_0}	max = 400 V	$Vg2_0$	max	= 400 V
VaR	max = 250 V	Vg2	max	= 90 V
VaL	max = 250 V	Ig2	. . .	= 2 mA
Wa	max = 0,5 W	Ig2	min	= 1,3 mA
Vg (3 + 5)0	max = 400 V	Ig2	max	= 3 mA
Vg (3 + 5) R	max = 70 V	Wg2	max	= 0,3 W
Ig (3 + 5)	= 2,8 mA	Rg1	max	= 100000 Ohm
Ig (3 + 5)	min = 2,3 mA	Ik	max	= 10 mA
Ig (3 + 5)	max = 5,2 mA	Rfk	max	= 20000 Ohm
Wg (3 + 5)	max = 0 5 W	Vfk	max	= 50 V
Rg4	max = 2 Megohm			
Vg4 (Ig4 = 0,3 μA)	max			= -1,3 V

Elektrodenanordnung und Sockelschaltung.
Disposition des électrodes et connexion du culot.
Arrangement of electrodes and base connection.





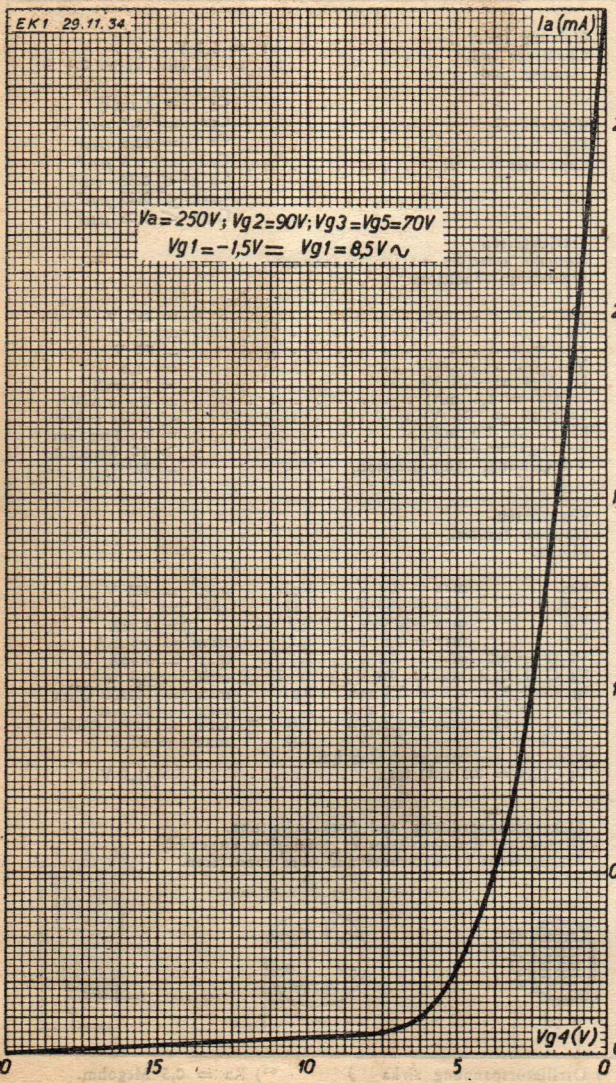


*) Oszillatorspannung zirka / Tension d'oscillateur env. / Oscillator voltage appr. } 8,5 V

**) Ra = 0,5 Megohm.

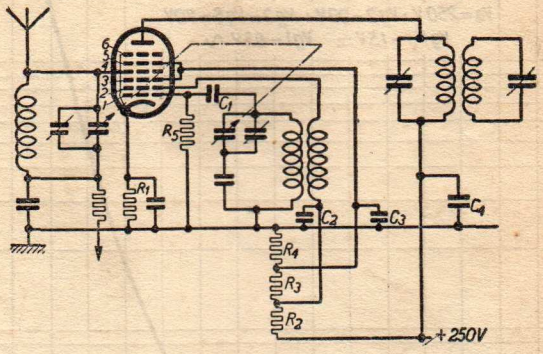
EK 1

PHILIPS „MINIWATT"
EK 1
OCTODE



PHILIPS „MINIWATT"
EK 1
OCTODE

EK 1



R1 = 250 Ω
R2 = 16000 Ω
R3= 2000 Ω
R4 = 12500 Ω
R5 = 50000 Ω
C1 = 100 μμF

Für die richtige Oszillatorspannung muss der Strom durch R5 190 μA sein.

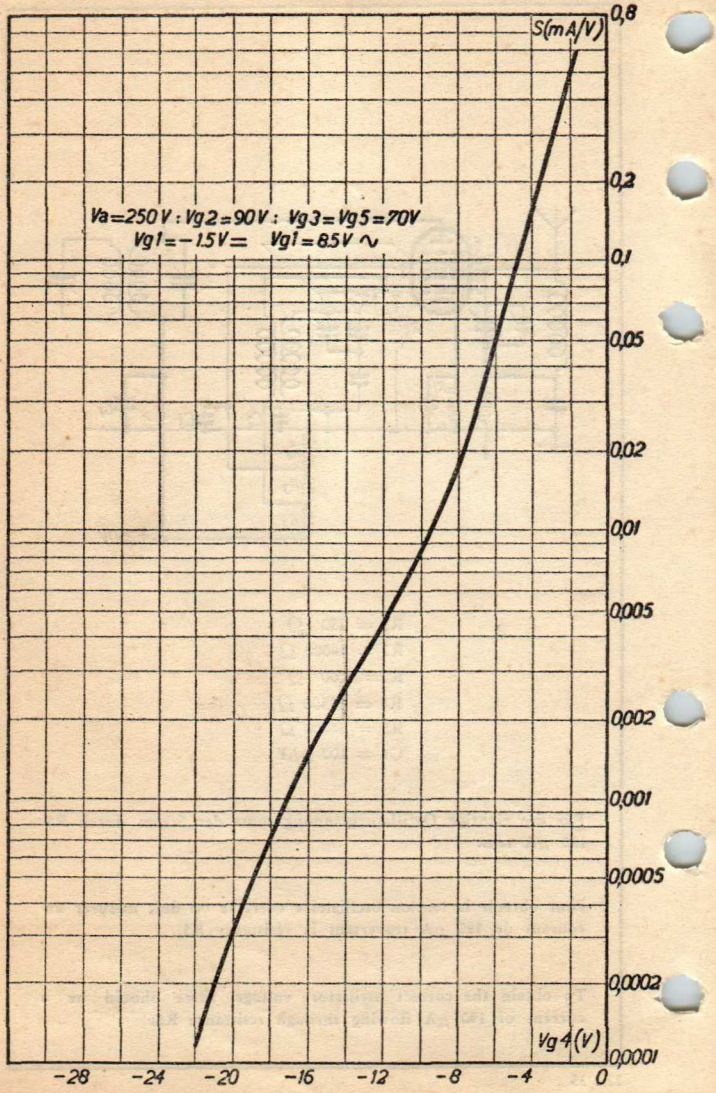
Pour obtenir la tension oscillatrice correcte on doit mesurer un courant de 190 μA traversant la résistance R5.

To obtain the correct oscillator voltage there should be a current of 190 μA flowing through resistance R5.

22/1'35

EK 1

PHILIPS „MINIWATT"
EK 1
OCTODE



EK 2 Oktode

Die Oktode EK 2 ist eine Sechsgittermischröhre, die nach dem bekannten Prinzip der elektronischen Mischung arbeitet. Die kleinen Abmessungen und gewisse Maßnahmen im Aufbau der Röhre haben nennenswerte Vorteile mit sich gebracht.

1) Die Erscheinung der elektronischen Kopplung (Induktionseffekt), die sich besonders auf Kurzwellen offenbart, ist durch Einfügung eines kompensierenden Kondensators zwischen dem ersten und vierten Gitter größtenteils unterdrückt. Die Aufgabe dieses Kondensators besteht darin, die durch die elektronische Kopplung hervorgerufene scheinbare negative Kapazität zwischen Gitter 4 und Gitter 1 durch eine positive Kapazität auszugleichen.
2) Die geringen Abmessungen haben infolge der sich daraus ergebenden kleineren Abstände auch den Laufzeiteffekt auf sehr kurzen Wellen praktisch beseitigt.
3) Der Eingangsparallelwiderstand zwischen Steuergitter und Kathode ist auf sehr kurzen Wellen noch sehr groß und beeinträchtigt praktisch nicht die Verstärkung.
4) Das Rauschen, das bekanntlich von der Quadratwurzel des Anodenstromes, dividiert durch die Mischsteilheit, abhängig ist, ist bei dieser Röhre schon sehr gering.
5) In Bezug auf Schwäche der Pfeifstörungen ist diese Röhre besonders günstig.
6) Diese Röhre ergibt beim Herunterregeln nur wenig Störung durch Quermodulation oder Modulationsverzerrung.
7) Der Innenwiderstand ist hoch; er beträgt mehr als 1 Megohm und ermöglicht daher die Verwendung von Z.F.-Kreisen sehr guter Qualität, die eine große Verstärkung gewährleisten.
8) Der Mikrophoneffekt ist so klein, daß er beim Entwurf eines Empfangsapparates außer acht gelassen werden kann.

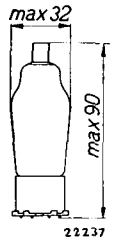
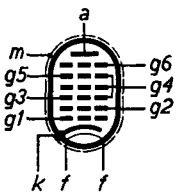


Abb. 1
Abmessungen in mm der Röhre EK 2.



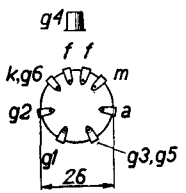


Abb. 2
Elektrodenanordnung und Sockelanschlüsse.

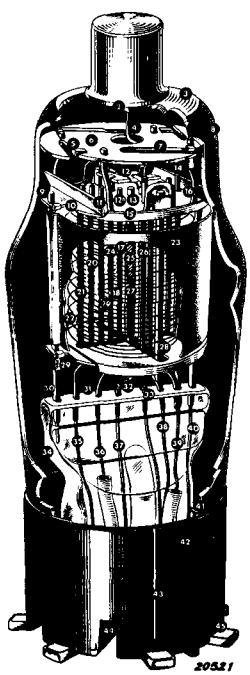


Abb. 3
Aufbau der neuen Oktode EK 2. Der Ausgleichskondensator gegen Induktionseffekt ist mit 12 bezeichnet.

HEIZDATEN

Heizung: indirekt durch Gleich- oder Wechselstrom, Serien- oder Parallelspeisung.

Heizspannung	V_f	= 6,3 V
Heizstrom	I_f	= 0,200 A

KAPAZITÄTEN

C_{ag4}	<	0,07 µµF	C_{g2}	=	4,5 µµF
C_a	=	10 µµF	C_{g2g4}	<	0,25 µµF
C_{g1}	=	6,0 µµF	C_{g4}	=	8,8 µµF
C_{g1g4}	=	1,1 µµF			

BETRIEBSDATEN (ZUR VERWENDUNG AUF LANG- UND MITTELWELLEN)

Anodenspannung							
V_a	=	100 V			200—250 V		
Schirmgitterspannung							
$V_{g\,3,5}$	=	50 V			50 V		
Oszillatoranodenspannung							
V_{g2}	=	100 V			200 V		
Ableitwiderstand des Oszillatorgitters							
R_{g1}	=	50.000 Ω			50.000 Ω		
Oszillatorwechselspannung an Gitter 1							
V_{osz}	=	9 $V_{(eff)}$			9 $V_{(eff)}$		
Oszillatorgitterstrom							
I_{g1}	=	200 µA			200 µA		
Kathodenwiderstand							
R_k	=	570 Ω			490 Ω		
Neg. Vorspannung an Gitter 4							
V_{g4}	=	—2 V[1])	—15 V[2])	—20 V[3])	—2 V[1])	—15 V[2])	—20 V[3])
Anodenstrom							
I_a	=	1 mA	—	—	1 mA	—	—
Schirmgitterstrom							
$I_{g3} + I_{g5}$	=	1 mA	—	—	1 mA	—	—
Oszillatoranodenstrom							
I_{g2}	=	1,5 mA	—	—	2,1 mA	—	—
Mischsteilheit							
S_c	=	550 µA/V	5,5 µA/V	2 µA/V	550 µA/V	5,5 µA/V	2 µA/V
Innenwiderstand							
R_i	=	1,2 MΩ	>10 MΩ	>10 MΩ	1,5 MΩ	>10 MΩ	>10 MΩ
Steilheit von Gitter 1 nach Gitter 2 ($V_{osz} = 0$)							
S_{g1g2}	=	0,3 mA/V	—	—	0,4 mA/V	—	—
Oszillatoranodengleichstrom beim Schwingungseinsatz ($V_{osz} = 0$)							
I_{g2}	=	3,2 mA	—	—	5,5 mA	—	—

[1]) Im ungeregelten Zustand.
[2]) Für eine Regelung der Steilheit 1 : 100.
[3]) Grenze des optimalen Regelbereiches.

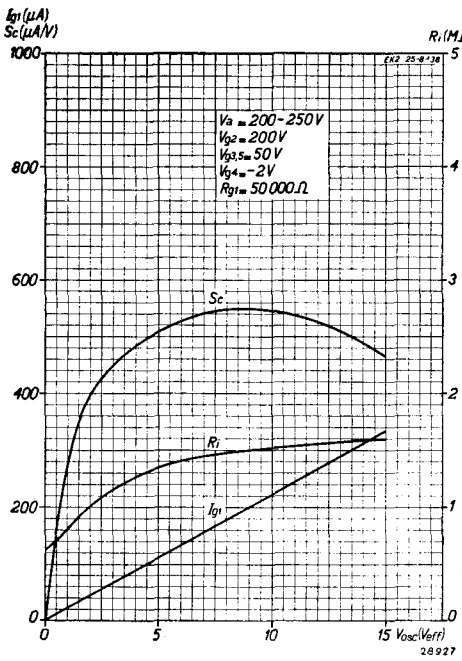


Abb. 4
Mischsteilheit *Sc*, Innenwiderstand *Ri* und Oszillatorgitterstrom Ig_1 als Funktion der Oszillatorspannung bei $Vg_2 = 200$ V und $Vg_{3,5} = 50$ V.

EK 2

BETRIEBSDATEN (ZUR VERWENDUNG IN ALLWELLENEMPFÄNGERN) [4]

Anodenspannung							
V_a	=	100 V			200—250 V		
Schirmgitterspannung							
$V_{g\ 3,5}$	=	80 V			80 V		
Oszillatoranodenspannung							
V_{g2}	=	100 V			200 V		
Ableitwiderstand des Oszillatorgitters							
R_{g1}	=	16000 Ω			50.000 Ω		
Oszillatoranodenwechselspannung an Gitter 1							
V_{osz}	=	6 $V_{(eff)}$			6 $V_{(eff)}$		
Oszillatorgitterstrom							
I_{g1}	=	300 µA			150 µA		
Kathodenwiderstand							
R_k	=	395 Ω			525 Ω		
Neg. Vorspannung an Gitter 4							
V_{g4}	=	—3 V[1]	—26 V[2]	—40 V[3]	—4 V[1]	—26 V[2]	—40 V[3]
Anodenstrom							
I_a	=	2,5 mA	—	—	2,1 mA	—	—
Schirmgitterstrom							
$I_{g3} + I_{g5}$	=	2,8 mA	—	—	1,5 mA	—	—
Oszillatoranodenstrom							
I_{g2}	=	2,3 mA	—	—	4 mA	—	—
Mischsteilheit							
S_c	=	550 µA/V	5,5 µA/V	1 µA/V	550 µA/V	5,5 µA/V	1 µA/V
Innenwiderstand							
R_i	=	0,65 MΩ	>10 MΩ	>10 MΩ	0,9 MΩ	>10 MΩ	>10 MΩ
Steilheit von Gitter 1 nach Gitter 2 ($V_{osz} = 0$)							
S_{g1g2}	=	0,35 mA/V	—	—	0,9 mA/V	—	—
Oszillatoranodengleichstrom beim Schwingungseinsatz ($V_{osz} = 0$)							
I_{g2}	=	4 mA	—	—	9 mA	—	—

[1]) Im ungeregelten Zustand.
[2]) Für eine Regelung der Steilheit 1 : 100.
[3]) Grenze des optimalen Regelbereiches.
[4]) Im Kurzwellenbereich soll die Röhre mit Rücksicht auf Frequenzverwerfung nicht geregelt werden.

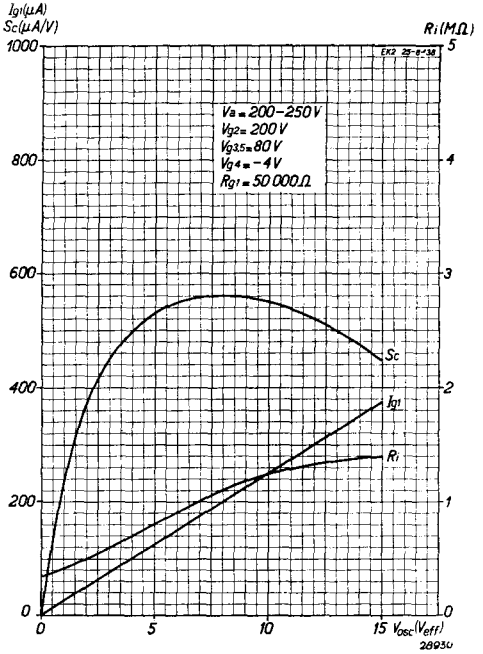


Abb. 5
Mischsteilheit *Sc*, Innenwiderstand *Ri* und Oszillatorgitterstrom Ig_1 als Funktion der Oszillatorspannung bei $Vg_2 = 200$ V und $Vg_{3,5} = 80$ V.

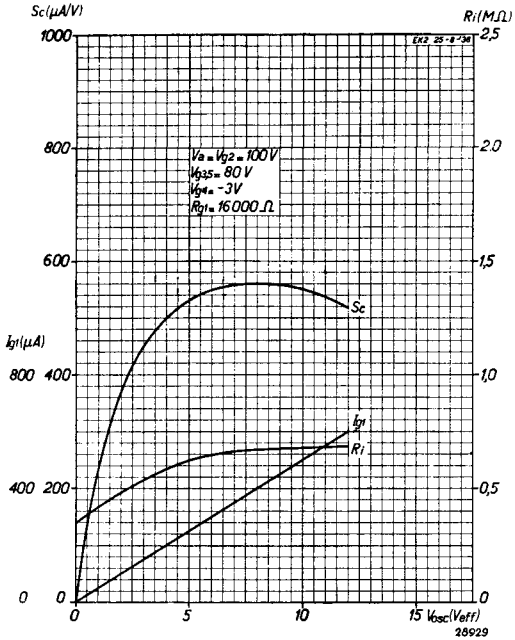


Abb. 6
Mischsteilheit Sc, Innenwiderstand Ri und Oszillatorgitterstrom Ig_1 als Funktion der Oszillatorspannung bei $Vg_2 = 100$ V und $Vg_{3,5} = 80$ V.

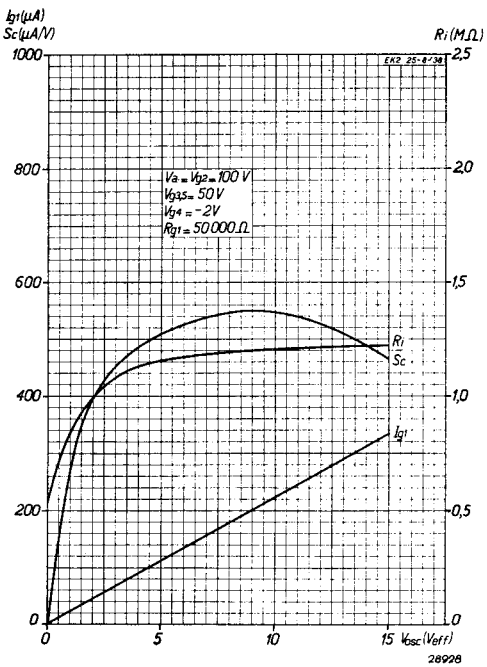


Abb. 7
Mischsteilheit Sc, Innenwiderstand Ri und Oszillatorgitterstrom Ig_1 als Funktion der Oszillatorspannung bei $Vg_2 = 100$ V und $Vg_{3,5} = 50$ V.

EK 2

GRENZDATEN

V_{ao}	= max. 550 V	W_{g2}	= maz. 1,3 W
V_a	= max. 300 V	I_k	= max. 12 mA
W_a	= max. 1,0 W	V_{g4} (I_{g4} = 0,3 µA)	= max. −1,3 V
$V_{g3,5o}$	= max. 550 V	R_{g4k}	= max. 3 MΩ
$V_{g3,5}$	= max. 125 V	R_{g1k}	= max. 100.000 Ω
$W_{g3,5}$	= max. 0,3 W	R_{fk}	= max. 5000 Ω
V_{g2o}	= max. 550 V	V_{fk}	= max. 100 V [1])
V_{g2}	= max. 225 V		

[1]) Gleichsp. od. Effektivwert der Wechsels

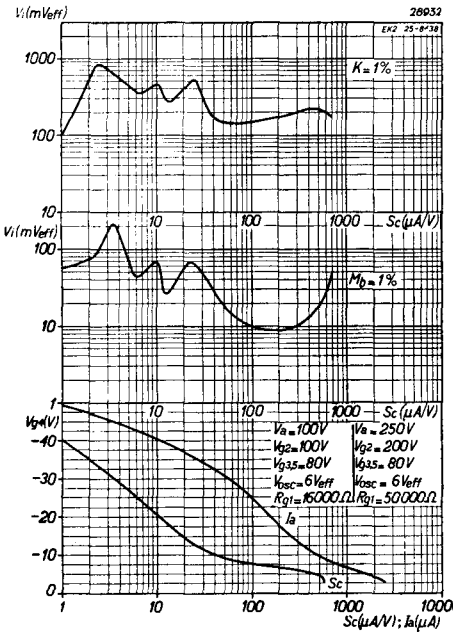


Abb. 8

Obere Kurve: Eingangswechselspannung als Funktion der durch die negative Vorspannung des Gitters 4 geänderten Mischsteilheit bei 1% Quermodulation.
Mittlere Kurve: Eingangswechselspannung als Funktion der Mischsteilheit für 1% Modulationsbrummen.
Untere Kurven: Anodenstrom und Mischsteilheit als Funktion der negativen Vorspannung an Gitter 4.

Die Spannungen der verschiedenen Elektroden sollen vorzugsweise über einen reichlich bemessenen Spannungsteiler zugeführt werden, obwohl es natürlich auch möglich ist, sie über hohe Serienwiderstände zuzuführen. Weil der Oszillatorteil auch ohne Vorspannung (also bei V_{g1} = 0 V) leicht ins Schwingen gebracht wird, kann bei der EK 2 der Ableitwiderstand des ersten Gitters direkt an die Kathode angeschlossen werden. Der Wert von 15 V(eff) für die Oszillatorspannung gewährleistet ein möglichst rauschfreies Arbeiten. Diese Spannung ist in den Lang- und Mittelwellenbereichen meistens ohne Mühe zu erzielen. Es kann aber vorkommen, daß man bei 600 m Wellenlänge die Rückkopplung so stark wählen muß, daß bei 200 m die Oszillatorspannung z.B. zweimal so hoch wird. Dies kann zu Schwierigkeiten durch periodisches Abreißen der Schwingungen (Überschwingen) Veranlassung geben. Es handelt sich um eine bei sehr einfachen Empfängern mit Rückkopplung bereits bekannte Erscheinung, die sich durch sehr starkes Rauschen oder durch Auftreten einer großen Anzahl Pfeiftöne beim Abstimmen auf bestimmte Stationen bemerkbar macht. Diese Erscheinung ist auf ein sehr schnell wechselndes Aus- und Einsetzen der Schwingungen zurückzuführen. Ein Mittel zur Bekämpfung des Überschwingens ist die Verringerung der Anzahl der Rückkopplungswindungen. Zwar nimmt dann oben im Wellenbereich die Oszillatorspannung etwas ab, aber aus der Kurve der Transponierungssteilheit als Funktion der Oszillatorspannung (s. Abb. 4) geht hervor, daß bei Spannungen von 9 bis 10 V(eff) die Steilheit sogar noch günstiger ist als bei 15 V(eff). Das Konstanthalten der Oszillatorspannung im ganzen Wellenbereich gelingt manchmal durch Parallelschalten eines geeigneten Dämpfungswiderstandes zur Rückkopplungsspule.

Ein anderes Mittel gegen Überschwingen ist die Wahl von kleineren Werten des Gitterkondensators und des Gitterableitwiderstandes des Oszillatorteiles. Insbesondere im Kurzwellenbereich kann dies viel Erfolg haben, und man kann z.B. 50 µµF für den Kondensator und 50.000 Ω für den Ableitwiderstand wählen. Weil 50 µµF für Langwellen zu klein ist — normalerweise wird ein Wert von 200 bis 1000 µµF

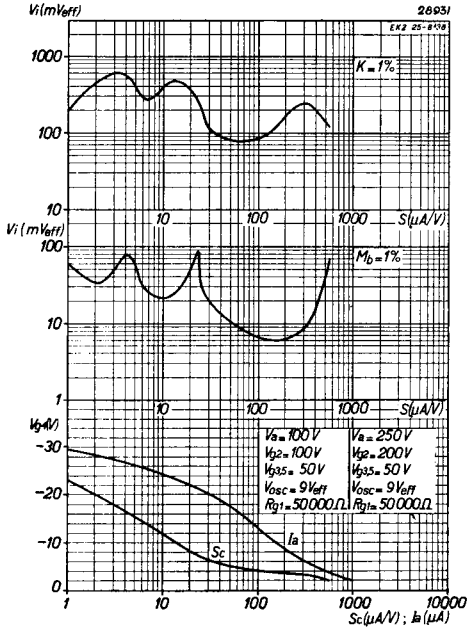


Abb. 9

Obere Kennlinie: Eingangswechselspannung als Funktion der durch die negative Spannung des Gitters 4 geänderten Mischsteilheit bei 1 % Quermodulation.

Mittlere Kennlinie: Eingangswechselspannung als Funktion der Mischsteilheit für 1 % Modulationsbrummen.

Untere Kennlinien: Anodenstrom als Funktion der negativen Spannung des Gitters 4.

genommen — kann man für Allwellenempfänger anstatt des Gitterkondensators den Ableitwiderstand kleiner wählen, z.B. 10.000 oder 16.000 Ω (siehe auch die Daten für den letzteren Wert).

Man muß dann aber dies Oszillatorstand nicht parallel zum en Widerkreis schalten, weil dieser dadurch zu sehr gedämpft wäre. Es empfiehlt sich dann, diese Schaltung gemäß Abb. 11 durchzuführen. Abb. 12 zeigt eine Schaltung mit einem kleineren Ableitwiderstand, wenn man den Paddingkondensator zu gleicher Zeit als Gitterkondensator verwendet. Auch in diesem Fall wird die Oszillatorspule weniger gedämpft. Hat jedoch der Paddingkondensator C_p einen zu kleinen Wert, so wird der Kreis doch gedämpft, und für Allwellenempfänger empfiehlt sich dann die Schaltung der Abb. 13, in der für Rundfunkwellen der Ableitwiderstand von 50.000 Ω maßgebend ist und für Kurzwellen der Widerstand von 10.000 Ω. Der Paddingkondensator C_p für Kurzwellen hat, wenn ein vorgesehen wird, im allgemeinen einen sehr großen Wert und bildet eine für Kurzwellen ausreichende Erdung des Kreises.

Im Kurzwellenbereich ist eine hohe Oszillatorspannung nicht so bequem zu erreichen, und man wähle deswegen die folgenden Spannungen:

$$V_{g2} = 200\ \text{V}$$
$$V_{g3,5} = 80\ \text{V}$$

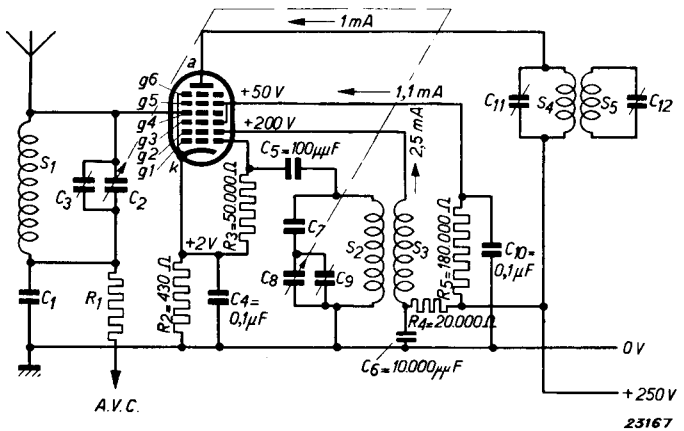


Abb. 10
Prinzipschaltung der Oktode EK 2.

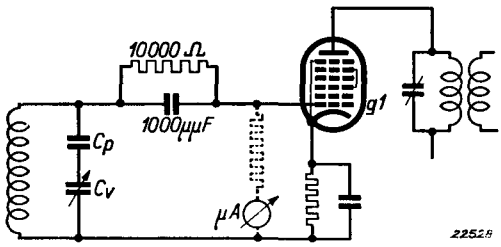


Abb. 11
Schaltung bei Verwendung eines kleineren Ableitwiderstandes (10.000 Ω). Es ist auch angegeben, wie man die Oszillatoramplitude durch Gitterstrom messen kann.

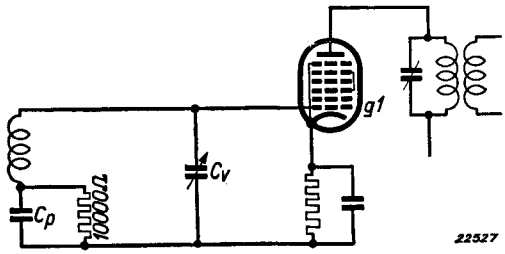


Abb. 12
Schaltung bei Verwendung eines kleineren Ableitwiderstandes, wenn sich der Paddingkondensator in Serie mit der Spule befindet.

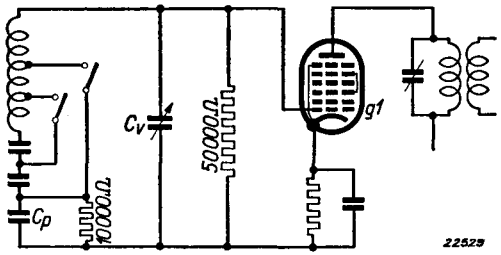


Abb. 13
Schaltung des Oszillatorkreises bei Verwendung eines kleineren Ableitwiderstandes unter Berücksichtigung des kleinen Wertes des Paddingkondensators auf Lang- und Mittelwellen.

Man erzielt dann meistens eine Oszillatorspannung von 5 bis 6 $V_{(eff)}$ und mit sehr guten Kreisen auch höhere Spannungen. Es ist aber nicht empfehlenswert, im Kurzwellenbereich hohe Oszillatorspannungen anzustreben, da bei einer zu hohen Oszillatorspannung der abgestimmte Eingangskreis vor der Oktode Neigung zum Selbstschwingen hat. Da die Transponierungssteilheit bei 5 bis 6 V Oszillatorspannung noch sehr gut ist, empfiehlt es sich, diese Spannung zwischen den erwähnten Werten festzulegen.

Die Frequenzverwerfung macht sich im Kurzwellenbereich besonders unangenehm bemerkbar.

Im Rundfunkbereich ist diese Frequenzverwerfung, die theoretisch auch hier auftritt, verschwindend klein, aber im Kurzwellenbereich muß sie berücksichtigt werden.

Die Frequenzverwerfung infolge von Netzspannungsschwankungen spielt sogar auf Kurzwellen noch keine wesentliche Rolle. Sie beträgt z.B. bei 13 m Wellenlänge nur etwa 5 kHz.

Die Frequenzverwerfung infolge der Regelung der Vorspannung des 4. Gitters ist im Bereich von 13 bis 50 m so groß, daß die Röhre in diesem Bereich nicht geregelt werden soll. Wünscht man unbedingt mit dieser Mischröhre auch im Kurzwellenbereich zu regeln, so muß man als Oszillator eine getrennte Triode verwenden. Besser ist es aber, nicht mit der Mischröhre zu regeln, sondern eine Penthode mit veränderlicher Steilheit als H.F.-Verstärker vor die Oktode zu schalten und mit dieser Röhre zu regeln.

Ist keine H.F.-Röhre vorgesehen, so ist die Empfindlichkeit im Kurzwellenbereich nicht so groß, und man kommt mit einer Regelung auf die Z.F.-Röhre allein in diesem Bereich aus.

Weil das Unterdrücken der sogenannten Spiegelfrequenz im Kurzwellenbereich (infolge der schlechteren Qualität der H.F.-Kreise in diesem Gebiet) schwieriger als auf Lang- und Mittelwellen ist, wähle man für Apparate mit Kurzwellenbereich vorzugsweise eine hohe Zwischenfrequenz (450-475 kHz). Diese Wahl ist auch günstig in Bezug auf Verringerung der elektronischen Kopplung. Bei niedriger Zwischenfrequenz empfehlen wir zur Erleichterung des Abgleichens der Kreise, unten im Wellenbereich von 13-50 m den Eingangskreis absichtlich z.B. um 500 kHz in diesem Sinne zu verstimmen (d.h. die Differenz zwischen Oszillatorfrequenz und Eingangsfrequenz um 500 kHz zu vergrößern). Dies hat auf die Empfindlichkeit nicht viel Einfluß und erleichtert das Abgleichen bedeutend.

Im Rundfunkbereich wähle man die Oszillatorfrequenz höher als die Eingangsfrequenz, denn sonst könnte man nicht den gewünschten Wellenbereich bestreichen. Im Kurzwellen-

bereich ist es vorteilhaft, die Oszillatorfrequenz mit Rücksicht auf die elektronische Kopplung niedriger zu wählen. Der Induktionseffekt ist zwar durch das Einbauen eines kleinen Ausgleichskondensators bedeutend heruntergesetzt, aber nicht vollkommen, weil ein übermäßiger Ausgleich die Gefahr eines Selbstschwingens des Eingangskreises in sich birgt.

Im Kurzwellenbereich (13-50 m) wird oft kein Paddingkondensator eingebaut, und die gegenseitige Verstimmung der Kreise wird dann mittels des Selbstinduktionsunterschiedes und des Trimmerkondensators erreicht, so daß die Oszillatorfrequenz in diesem Bereich ebenso einfach niedriger als die Eingangsfrequenz gewählt werden kann.

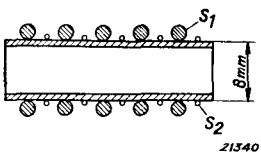


Abb. 14
Oszillatorspule für den Betrieb auf sehr kurzen Wellen (6 bis 8 m).
S_1 = 5 Windungen von 2 mm blankem Kupferdraht (nicht verzinnt).
S_2 = 5 Windungen von 0,1 bis 0,2 mm emailliertem Kupferdraht.

Der abgestimmte Oszillatorkreis muß an das erste Gitter gekoppelt und die Rückkopplungsspule in die Zuleitung des 2. Gitters aufgenommen werden.

Die EK 2 ist auch im Kurzwellenbereich von 5 bis 13 m als selbstschwingende Mischröhre sehr gut brauchbar. Man kann aber den obengenannten Bereich nicht in einem Zug bestreichen. Der Oszillator kann nur in einem kleinen willkürlichen Teil dieses Spektrums im Schwingen gehalten werden, z.B. im Bereiche 6—8 m. Man würde übrigens beim Abstimmen Schwierigkeiten begegnen, wenn der große Frequenzbereich zwischen 5 und 13 m auf einer Skala untergebracht wäre. Abb. 14 zeigt eine Spulenkonstruktion, die für den Bereich 6—8 m zu verwenden ist. Eine sehr sorgfältig ausgeführte und einfache Bedrahtung ist für diesen Bereich wesentlich.

EK 3 Oktode

Die Röhre EK 3 ist eine Mischröhre nach dem Oktodenprinzip mit wesentlich verbesserten Eigenschaften. Durch die Bündelung der Elektronenbahnen sind einige nachteilige Effekte auf ein Mindestmaß herabgesetzt worden. Die EK 3 gestattet im Kurzwellenbereich eine ebenso hohe Mischverstärkung wie in den üblichen Rundfunkbereichen und hat gegen die bestehenden Mischrohrtypen sehr wesentliche Vorteile.

Das Prinzip der Elektronenbündelung gestattete es, den Oszillatorteil vollkommen vom Mischteil zu trennen, wie es bei Verwendung von zwei getrennten Röhren für die beiden Funktionen der Fall ist. Es sind vier Elektronenbündel gebildet, von denen zwei der Schwingungserzeugung und zwei der Mischwirkung zugeteilt und die paarweise so weit voneinander unabhängig sind, daß nachteilige Rückwirkungen praktisch nicht bestehen. Abb. 3 zeigt einen Querschnitt durch das Elektrodensystem mit Elektronenbahnen. Durch das Vierbündelprinzip sind folgende Vorteile erreicht:

1) Geringe Frequenzverwerfung durch Netzspannungsänderungen und durch Regelung der Vorspannung am vierten Gitter.
2) Konstante Oszillatorsteilheit bis zu sehr kurzen Wellen.

Die fast vollkommene Einkapselung des Oszillatorteiles der EK 3 hat zur Folge, daß die infolge der Regelung auf das vierte Gitter zurückgedrängten Elektronen keinen Einfluß mehr auf die Raumladung und die Steilheit im Oszillatorteil ausüben können. Hierdurch wird die Frequenzverwerfung durch Regelung vermieden; die EK 3 kann auch im Kurzwellenbereich zur automatischen Lautstärkeregelung herangezogen werden.

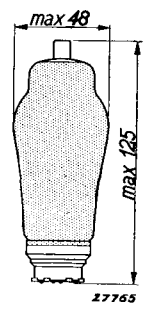
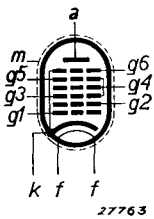


Abb. 1
Abmessungen in mm.



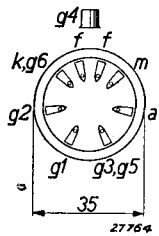


Abb. 2
Elektrodenanordnung und Sockelanschlüsse.

Durch die Einkapselung des Oszillatorteiles sind folgende Vorteile erhalten:

a) Die Raumladung zwischen Gitter 1 und Kathode sowie zwischen Gitter 2 und Gitter 1 ändert sich beim Regeln der Vorspannung von Gitter 4 nicht.
b) Die Steilheit von Gitter 1 zum Gitter 2 wird durch die Vorspannung von Gitter 4 nicht beeinflußt.
c) Die Steilheit von Gitter 4 zum Gitter 2 ist völlig verschwunden. Hierdurch sind unangenehme Kopplungserscheinungen des Eingangskreises mit dem Oszillatorteil beseitigt, die manchmal zum Schwingen der Röhre auf dem Eingangskreis

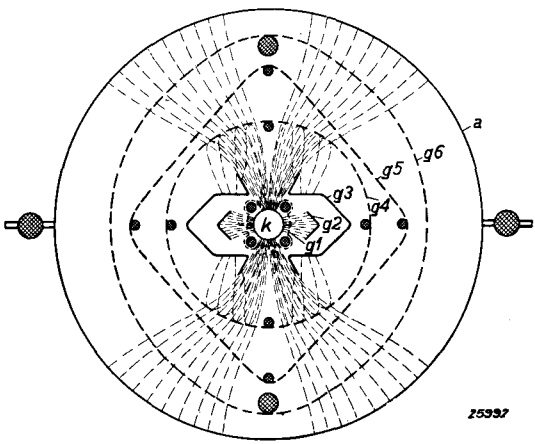


Abb. 3
Querschnitt durch das Elektrodensystem der EK 3 mit Elektronenbahnen. Die beiden Elektronenbündel nach links und rechts dienen für die Schwingungserzeugung. An Gitter 1 befindet sich dadurch eine Schwingspannung, die die beiden Bündel, die nach oben und nach unten verlaufen, moduliert. Der Oszillatorteil ist durch eine Blechkapselung umschlossen, die zwei Schlitzöffnungen besitzt, wodurch die beiden Bündel gerichtet sind. Diese Blechkapselung ist auf eine positive Spannung gebracht und wirkt wie ein drittes Oktodengitter. Die Elektronen, die den Oszillatorraum verlassen haben, werden auf ihren Bahnen vor dem vierten Gitter mehr oder weniger abgebogen. Etwaige zurückgestoßene Elektronen können nicht mehr in den Oszillatorraum gelangen, sondern treffen die Blechkapselung.

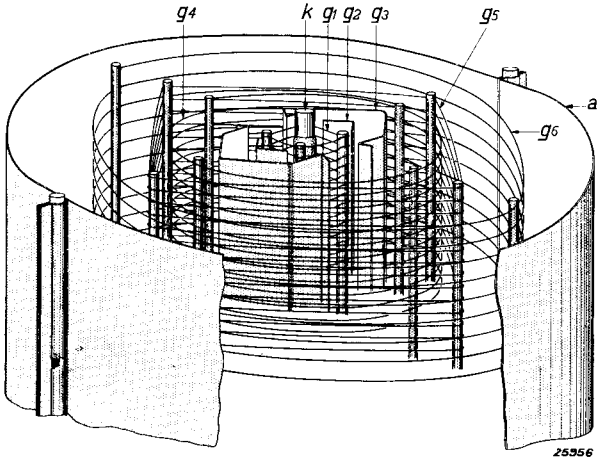


Abb. 4
Zeichnerische Darstellung der Konstruktion der Vierbündeloktode.

und im Zusammenhang mit der Frequenzverwerfung zu Kippschwingungen Anlaß geben.
Die Hilfsanode besteht aus zwei V-förmig gebogenen Plättchen. Infolgedessen werden die gesamten auf diese Elektroden gerichteten Elektronenströme von diesen Plättchen aufgefangen und ist eine Beeinflussung des Oszillatorteiles durch etwaige Gleichspannungsschwankungen an der Elektrode g_3 vermieden.
Durch die kurzen Elektronenbahnen von der Kathode bis zu den Hilfsanodenplättchen sind die Elektronenlaufzeiten im Oszillatorteil äußerst klein. Dadurch ist die Oszillatorsteilheit bis zu sehr kurzen Wellen gleich der statisch gemessenen Steilheit.
Die statische Steilheit von Gitter 1 zum Gitter 2 ist bei der EK 3 sehr hoch. Sie beträgt beim Schwingungseinsatz 4 mA/V. Durch die hohe Steilheit können die Schwingkreiselemente lose an die Röhre gekoppelt werden, wodurch Kapazitätsschwankungen der Röhre nur zu einem Bruchteil zur Verstimmung der Oszillatorfrequenz beitragen können. Gegen den Induktionseffekt (elektronische Kopplung zwischen Gitter 1 und Gitter 4) sind Maßnahmen getroffen, die diesen Effekt auf ein Mindestmaß beschränken. Zwischen Gitter 1 und Gitter 4 ist ein Kondensator in Serie mit einem Widerstand geschaltet. Der Widerstand dient dazu, den Phasenwinkel der über den Kondensator dem Gitter 4 zugeführten Wechselspannung genau so groß zu machen wie den Phasenwinkel der Induktionsspannung, der durch die Laufzeit der Elektronen auf dem Weg Gitter 1—Gitter 4 entsteht. Die Mischverstärkung wird am kurzwelligen Ende der verschiedenen Wellenbereiche praktisch nicht durch diesen Effekt beeinflußt.
Die Eingangsimpedanz der EK 3 ist im Kurzwellenbereich im Vergleich zu den Impedanzen der praktisch verwendbaren Kreise sehr hoch. Sie beeinträchtigt daher die Verstärkung praktisch nicht. Bei 14 m Wellenlänge beträgt sie etwa 60.000 Ohm. Bei jeder Röhre ändert sich die Eingangskapazität, wenn das Steuergitter durch eine Regelspannung beeinflußt wird, da dabei Änderungen in der Raumladungsdichte vor diesem Gitter eintreten. Die Folge dieser Kapazitätsänderung ist eine Ver-

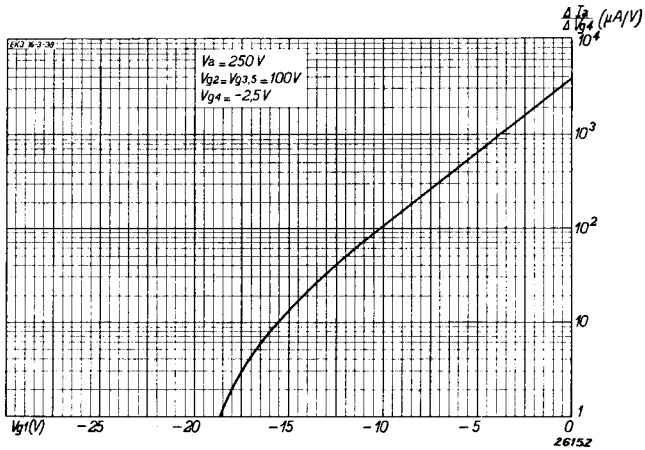


Abb. 5
Steilheit des vierten Gitters als Funktion der Gleichspannung an Gitter 1.

EK 3

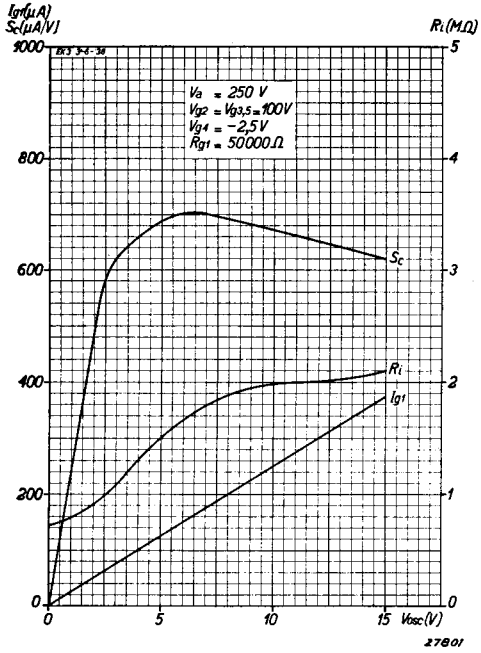


Abb. 6
Innenwiderstand, Mischsteilheit und Oszillatorgitterstrom als Funktion der Oszillatorspannung bei einem Ableitwiderstand von 50.000 Ohm.

Die wesentlich höhere Steilheit des Oszillatorteiles und die höhere Mischsteilheit bedingen eine größere, leistungsfähigere Kathode. Deshalb hat die EK 3 einen größeren Heizstrom als 200 mA. Er beträgt 0,6 Ampere, so daß für G/W-Geräte diese Röhre nicht verwendet werden kann. Hierfür wurde eine besondere Röhre mit einem Heizfaden für 200-mA-Serienspeisung entwickelt.

HEIZDATEN

Heizung: indirekt durch Wechselstrom, Parallelspeisung
Heizspannung . . . . . V_f = 6,3 V
Heizstrom . . . . . I_f = 0,6 A

KAPAZITÄTEN

C_{ag4} < 0,07 µµF
C_a = 16,5 µµF
C_{g1} = 14 µµF
C_{g1g4} = 1,1 µµF
C_{g2} = 8,6 µµF
C_{g4} = 15,2 µµF

stimmung des in den Gitterkreis geschalteten Abstimmkreises, und dadurch wird die Trennschärfe des Gerätes schlechter. Außerdem liegt dann das Hochfrequenzsignal nicht mehr in der Mitte der Resonanzkurve und werden die Seitenbänder ungleichmäßig verstärkt. Diese Unsymmetrie der Seitenbänder ruft im Detektor eine ziemlich wesentliche Verzerrung hervor.
Bei der EK3 ist diese Kapazitätsänderung nur sehr gering. Sie beträgt nur 0,2 µµF, so daß nur kleine Verstimmungen die Folge hiervon sind, die jedenfalls in den normalen Rundfunkbereichen innerhalb zulässiger Grenzen bleiben.
Um eine bessere Quermodulationscharakteristik zu erhalten, sinkt die Steilheit der EK 3 weniger rasch, wenn dem vierten Gitter eine Regelspannung zugeführt wird.

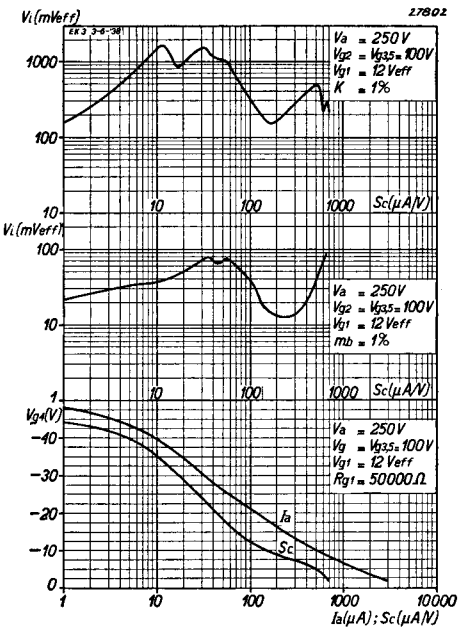


Abb. 7
Obere Kurve: Eingangswechselspannung als Funktion der durch die negative Spannung des Gitters 4 geänderten Mischsteilheit bei 1% Quermodulation.
Mittlere Kurve: Eingangswechselspannung als Funktion der durch die negative Vorspannung des Gitters 4 geänderten Mischsteilheit bei 1% Modulationsbrummen.
Untere Kurve: Anodenstrom und Mischsteilheit als Funktion der negativen Spannung am Gitter 4.

BETRIEBSDATEN ALS MISCHRÖHRE IN ALLEN WELLENBEREICHEN

Anodenspannung	V_a	= 250 V		
Schirmgitterspannung	$V_{g3,5}$	= 100 V		
Oszillatoranodenspannung	V_{g2}	= 100 V		
Ableitwiderstand des Oszillatorgitters	R_{g1}	= 50.000 Ω		
Oszillatorwechselspannung an Gitter 1	$V_{(osz)}$	= 12 $V_{(eff)}$		
Oszillatorgitterstrom	I_{g1}	= 300 μA		
Kathodenwiderstand	R_k	= 190 Ω		
Neg. Vorspannung an Gitter 4	V_{g4}	= — 2,5 V [1])	— 38 V [2])	— 42 V [3])
Anodenstrom	I_a	= 2,5 mA	—	—
Schirmgitterstrom	$I_{g3,5}$	= 5,5 mA	—	—
Oszillatoranodenstrom	I_{g2}	= 5 mA	—	—
Mischsteilheit	S_c	= 650 μA/V	6,5 μA/V	3 μA/V
Innenwiderstand	R_i	= 2 MΩ	> 10 MΩ	> 10 MΩ
Steilheit von Gitter 1 nach Gitter 2 (V_{osz} = 0)	S_{g1g2}	= 4 mA/V	—	—
Oszillatoranodengleichstrom beim Schwingungseinsatz (V_{osz} = 0 V)	I_{g2}	= 18 mA	—	—

[1]) Im ungerelten Zustand.
[2]) Für eine Regelung der Mischsteilheit 1 : 100.
[3]) Grenze des optimalen Regelbereiches.

GRENZDATEN

Maximale Anodenkaltspannung	V_{ao}	= max. 550 V
Maximale Anodenspannung	V_a	= max. 300 V
Maximale Anodenbelastung	W_a	= max. 1 W
Maximale Schirmgitterkaltspannung	$V_{g3,5o}$	= max. 550 V
Maximale Schirmgitterspannung	$V_{g3,5}$	= max. 150 V
Maximale Schirmgitterbelastung	$W_{g3,5}$	= max. 1 W
Maximale Oszillatoranodenkaltspannung	V_{g2o}	= max. 550 V
Maximale Oszillatoranodenspannung	V_{g2}	= max. 150 V
Maximale Oszillatoranodenbelastung	W_{g2}	= max. 1 W
Oberer Grenzwert des Schirmgitterstroms	$I_{g3} + I_{g5}$	= max. 6,6 mA
Unterer Grenzwert des Schirmgitterstroms	$I_{g3} + I_{g5}$	= min. 4,4 mA
Oberer Grenzwert des Oszillatoranodenstroms	I_{g2}	= max. 6 mA
Unterer Grenzwert des Oszillatoranodenstroms	I_{g2}	= min. 4 mA
Maximaler Kathodenstrom	I_k	= max. 23 mA
Gitterstromeinsatzpunkt des Gitters 4	V_{g4} (I_{g4} = + 0,3 μA)	= max. — 1,3 V
Maximaler Widerstand im Kreise von Gitter 4	R_{g4k}	= max. 3 MΩ
Maximaler Widerstand im Kreise von Gitter 1	R_{g1k}	= max. 100.000 Ω
Maximaler Widerstand zwischen Heizfaden und Kathode	R_{fk}	= max. 20.000 Ω
Maximale Spannung zwischen Heizfaden und Kathode (Gleichspannung oder Effektivwert der Wechselsp.)	V_{fk}	= max. 50 V

Infolge der großen Steilheit des Oszillatorteiles wird der Schwingungseinsatz und das Aufrechterhalten der Schwingung keine Schwierigkeiten bereiten. Der Gitterableitwiderstand kann denn auch an die Kathode gelegt werden. Durch den leichten Schwingungseinsatz des Triodenteiles kann nun vorteilhaft eine losere Rückkopplung angewendet werden, wodurch erfahrungsgemäß auch nicht mehr das störende „Überschwingen" auftritt. Es wird empfohlen, bei dieser Röhre einen Gitterableitwiderstand von 50000 Ω und einen Gitterkondensator von 50 μμF zu verwenden. Diese Werte können für alle Wellenbereiche eingehalten werden.

EK 3

Bei der EK3 ist der Induktionseffekt durch eine Kompensation zwischen den Gittern 1 und 4 behoben. Um die Kompensationsmöglichkeit auszunützen, muß dafür gesorgt werden, daß unten am Kurzwellenbereich die Oszillatorspannung 12 Volt (effektiv) beträgt (300 μA Gitterstrom durch den Gitterableitwiderstand von 50000 Ω). Daß die Oszillatorspannung bei anderen Wellenlängen einen anderen Wert haben wird und die Kompensation also hier nicht vollkommen ist, ist unwesentlich, da der Effekt verschwindend klein wird, sobald man sich vom kurzwelligen Ende entfernt.
Durch das Vierbündelprinzip ist die Frequenzverwerfung auf einen sehr geringen Betrag zurückgebracht worden. Die Spannung des 3. Gitters hat aber auf die Kapazität des 1. Gitters noch einen geringen Einfluß. Das ist einleuchtend, weil das 1. Gitter vom 3. Gitter umhüllt wird. Soll die Frequenzverwerfung möglichst beschränkt werden, so muß die Spannung an den Schirmgittern ($V_{g\,3,5}$) mittels eines Potentiometers mit hohem Querstrom konstant gehalten werden. Aus praktischen Gründen ist dieser Konstanz der Schirmgitterspannung eine Grenze gesetzt. Durch Speisung der Schirmgitter über ein Potentiometer kann die noch vorhandene Frequenzverwerfung eingeschränkt werden.
Ein wirksames Mittel, um die übrigbleibende Frequenzverwerfung weiter zu beseitigen, besteht darin, den Oszillatorkreis in den Anodenkreis des Triodenteiles zu schalten. Die Kapazitätsschwankung des ersten Gitters hat dann einen geringeren Einfluß auf die Abstimmung, sofern die Rückkopplung nicht zu fest gewählt wird, denn die Gitterkapazität wird über die Rückkopplungsspule in den Oszillatorkreis transformiert.
In dieser Hinsicht zeigt sich der wesentliche Vorteil der großen Triodensteilheit, da eine schwächere Rückkopplung ausreicht.

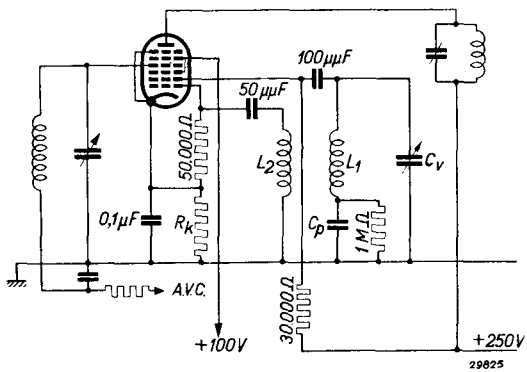


Abb. 8
Schaltung des Schwingkreises in den Oszillatoranodenkreis der EK 3 und Speisung der Anode über einen Widerstand von 30.000 Ohm. Der Schwingkreis ist spannungsfrei.

Das Schaltbild, das sich mit Rücksicht auf Frequenzverwerfung empfiehlt, ist in Abb. 8 dargestellt. Der Oszillatorkreis ist nicht direkt in den Anodenkreis aufgenommen, sondern über einen Kopplungskondensator von 100 $\mu\mu$F. Auf diese Weise wird vermieden, daß die Gleichspannung von 100 Volt an den Platten des Abstimmkondensators liegt. Die Schaltung ist einfach, hat aber den Nachteil, daß der Kreis durch den Speisungswiderstand von 30000 Ω gedämpft wird. Die Dämpfung dieses Kreises muß aus zwei Gründen vermieden werden:

1) Weil im Kurzwellenbereich eine möglichst lose Rückkopplung zwecks Beschränkung der Frequenzverwerfung gesucht wird.
2) Weil manchmal auf langer Welle eine zusätzliche Dämpfung in Serie mit dem Mittelwellenpaddingkondensator geschaltet wird, um störende Selbstschwingungen zu vermeiden. Die Gesamtdämpfung wäre zu groß. In den meisten Fällen ergibt aber die Schaltung nach Abb. 8 keine Schwierigkeiten.

Wenn sich ein Paddingkondensator C_p in Serie mit der Oszillatorspule befindet (im Mittel- und Langwellenbereich), muß dieser eigentlich durch einen hohen Widerstand überbrückt werden, weil sich sonst eine Gleichspannung über dem Abstimmkondensator C_p entwickeln kann.
Eine andere Möglichkeit der Speisung der Oszillatoranode ist in Abb. 9 angegeben. Nach dieser Schaltung wird über die Oszillatorspule gespeist, und der Paddingkondensator dient zu gleicher Zeit als Schutz für den veränderlichen Kondensator C_v. Der Nachteil dieser Schaltung ist, daß sie für das Umschalten des Paddingkondensators C_p Schaltkontakte erfordert. Dagegen wird der Oszillatorkreis weniger gedämpft als mit der Schaltung der Abb. 8.
Mit der Schaltung der Abb. 8, in welcher fünf Rückkopplungswindungen verwendet und

Gitter 3 und 5 über einen Serienwiderstand gespeist werden, wurde eine Frequenzverwerfung von 4,5 kHz gemessen. Die Messung erfolgte bei einer Wellenlänge von 15 m und bei Regelung der negativen Vorspannung am Gitter 4 von —2 bis —20 Volt.
Es handelt sich dabei um die ungünstigsten Umstände. Wird die Spannung am Schirmgitter $V_{g\,3,5}$ von einem Spannungsteiler abgenommen, so wird ein kleinerer Wert gefunden.

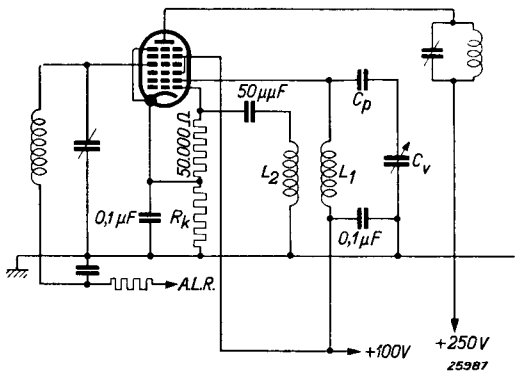


Abb. 9
Schaltung des Schwingkreises in den Oszillatoranodenkreis, bei welcher die Oszillatoranode über die Spule gespeist wird. Der Paddingkondensator dient zu gleicher Zeit als Schutz für den veränderlichen Kondensator C_v.

PHILIPS „MINIWATT"
EL 1
PENTHODE (5 W)

EL 1

Heizung ind. / Chauffage ind. / Heating ind.	Vf	= 6,3 V
	If	= ca. env. appr. 0,4 A
Kapazitäten / Capacités / Capacities	Cag	= 1,1 $\mu\mu$F
	Cak	= 5,1 $\mu\mu$F
	Cgk	= 4,3 $\mu\mu$F

Betriebsdaten
Dates d'opération
Operating conditions

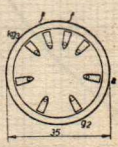
Va	= 250 V
Vg2	= 250 V
Ia	= 20 mA
Vg1	= -23 V
Ig2	= ca. env. appr. 2 mA
g (k)	= 150
S max	= 3,5 mA/V
S (Ia = 20 mA)	= 1,9 mA/V
Ri (Ia = 20 mA)	= 80000 Ω
Ra (5%)	= 14000 Ω
Ra (10%)	= 12500 Ω
Vg1eff (5%)	= 5,3 V
Vg1eff (10%)	= 9,6 V
Wo (5%)	= 0,75 W
Wo (10%)	= 1,7 W

Grenzdaten.
Dates limites.
Limits.

Va_0	max	= 400 V
VaL	max	= 250 V
Wa	max	= 5 W
Ik	max	= 32 mA
$Vg2_0$	max	= 400 V
Vg2	max	= 250 V
Ig2	min	= 1 mA
Ig2	max	= 3 mA
Wg2	max	= 1,2 W
Vg1 (Ig1 = 0,3 μA)		= -1,3 V
Rg1a	max	= 1 Megohm
Rg1f	max	= 0,6 Megohm
Vfk	max	= 50 V

Elektrodenanordnung und Sockelschaltung.
Disposition des electrodes et connexion du culot.
Arrangement of electrodes and base connection.

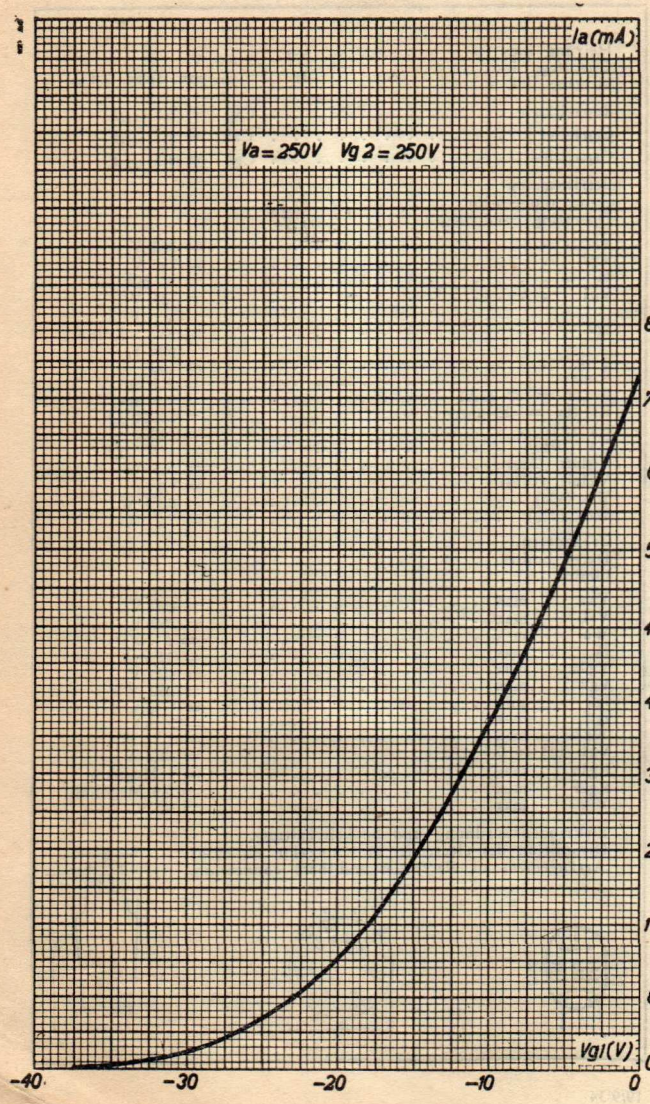






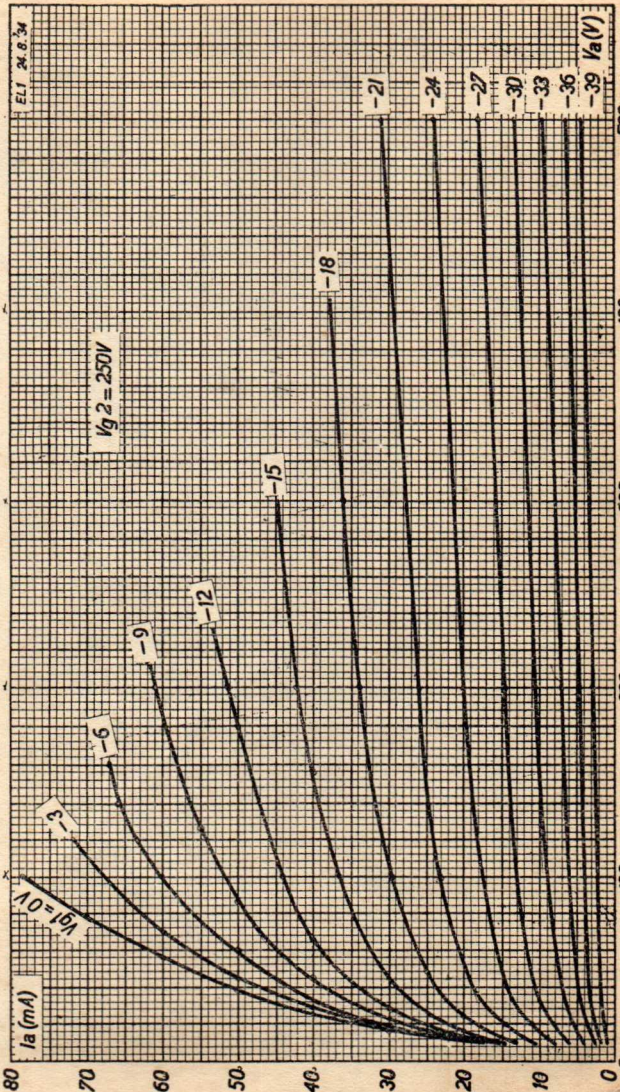
EL 1

PHILIPS „MINIWATT"
EL 1
PENTHODE (5 W)



PHILIPS „MINIWATT"
EL 1
PENTHODE (5 W)

EL 1



EL 1

PHILIPS

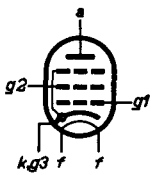
EL 11

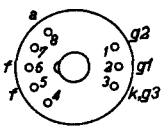
OUTPUT PENTODE
PENTHODE DE SORTIE
ENDPENTHODE

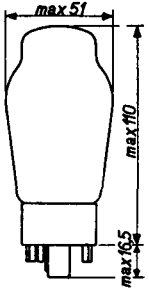
Heating: indirect by A.C.; parallel supply
Chauffage: indirect par C.A.; alimentation en parallèle
Heizung: indirekt durch Wechselstrom; Parallelspeisung

Vf = 6,3 V
If = 0,9 A

Dimensions in mm
Dimensions en mm
Abmessungen in mm







Capacities
Capacités
Kapazitäten

Cag1 < 0,8 pF

Operating characteristics class A
Caracteristiques d'utilisation classe A
Betriebsdaten Klasse A

Va	=	250 V
Vg2	=	250 V
Vg1	=	-6 V
Rk	=	150 Ω
Ia	=	36 mA
Ig2	=	4 mA
S	=	9 mA/V
Ri	=	50 kΩ
Ra	=	7 kΩ
μg2g1	=	25
Wo (d_{tot} = 10%)	=	4,5 W
Vi (d_{tot} = 10%)	=	4,2 V_{eff}
Vi (Wo = 50 mW)	=	0,33 V_{eff}

Operating characteristics class AB
Caractéristiques d'utilisation classe AB
Betriebsdaten Klasse AB

Va	=	250	V
Vg2	=	250	V
Rk	=	140	Ω
Raa	=	10	kΩ
Vi	=	0 ⟷ 6,7	V_{eff}
Ia	=	2x24 ⟷ 2x28,5	mA
Ig2	=	2x2,8 ⟷ 2x4,6	mA
Wo	=	0 ⟷ 8,2	W
d_{tot}	=	- ⟷ 3,1	%

Limiting values
Caractéristiques limites
Grenzdaten

Va_o	=max. 550 V	Wg2 (Vi = 0 V)	=max. 1,2 W
Va	=max. 250 V	Wg2 (Wo = max.)	=max. 2,5 W
Wa	=max. 9 W	Vg1 (Ig1=+0,3 μA)	=max.-1,3 V
$Vg2_o$	=max. 550 V	Rg1	=max. 1 MΩ
Vg2	=max. 275 V	Rfk	=max. 5 kΩ
Ik	=max. 55 mA	Vfk	=max. 50 V

PHILIPS

Electronic Tube

HANDBOOK

EL11

page	sheet	date
1	1	1948.09.16
2	2	1948.09.16
3	FP	1999.07.02

PHILIPS „MINIWATT"
EL11N/EL11

EL11N
EL11

Röhrentype: Endpenthode.
Type de tube: penthode de sortie
Type of tube: Power output pentode.

Heizung ind., Wechselstrom, Parallelspeisung.
Chauffage ind., courant alternatif, alimentation en parallèle. Vf 6,3 V If 0,9 A
Heating ind., A.C., parallel filament supply.

Kapazitäten.
Capacités.
Capacities.

Cagl <0,8 µµF

Betriebsdaten als einfacher Endverstärker.
Caracteristiques de service pour l'utilisation comme tube de sortie simple.
Operating conditions for use as single tube output amplifier.

Va	250 V
Vg2	250 V
Rk	150 Ω
Vg1	-6 V
Ia	36 mA
Ig2	4 mA
S	9 mA/V
Ri	50000 Ω
Ra	7000 Ω
Wo (dtot = 10%)	4,5 W
Vi (dtot = 10%)	4,2 V(eff)
Vi (Wo = 50 mW)	0,33 V(eff)
µg2g1	23

Grenzdaten.
Limites fixées pour les caractéristiques.
Limiting values.

Vao	max. 550 V
Va	max. 250 V
Wa	max. 9 W
Vg2o	max. 550 V
Vg2	max. 275 V
Wg2 (Vi ≐ 0)	max. 1,2 W
Wg2 (Wo max)	max. 2,5 W
Ik	max. 55 mA
Vg1 (Igl = +0,3 µA)	max. -1,3 V
Rglk	max. 1 MΩ
Vfk	max. 50 V[1]
Rfk	max. 5000 Ω

1) Gleichspannung oder Effektivwert der Wechselspannung.
Tension continue ou valeur efficace de la tension alternative.
D.C. voltage or R.M.S. value of the A.C. voltage.

Die Röhren EL 11N und EL 11 sind elektrisch vollkommen gleichwertig mit der Röhre EL 3. Für die Daten als Gegentaktverstärker und die besondere Vorschriften siehe Röhre EL 3.

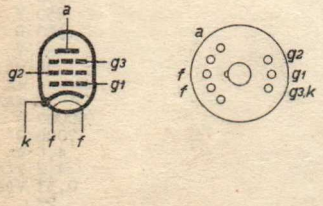
EL 11 N
EL 11

PHILIPS „MINIWATT"
EL 11 N / EL 11

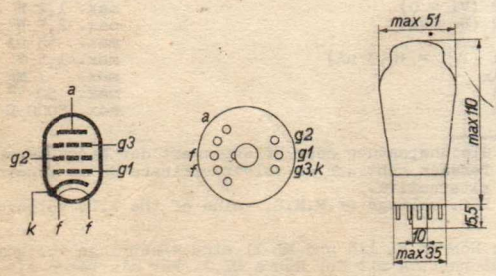
Les tubes EL 11N et EL 11 sont au point de vue caractéristiques électriques tout à fait identiques avec le tube EL 3. En ce qui concerne les caractéristiques comme amplificateur push-pull et les prescriptions spéciales prière de référer au tube EL 3.

Tubes EL 11N and EL 11 are electrically indentical with tube EL 3. For data as push-pull output amplifier and special prescriptions refer to type EL 3.

Elektrodenanordnung, Sockelanschlüsse und max. Abmessungen in mm. der Röhre EL 11N.
Disposition des électrodes, connexions du culot et dimensions max. en mm du tube EL 11N.
Electrode arrangement, base connections and max. dimensions in mm. of tube EL 11N.



Elektrodenanordnung, Sockelanschlüsse und max. Abmessungen in mm. der Röhre EL 11.
Disposition des électrodes, connexions du culot et dimensions max. en mm. du tube EL 11.
Electrode arrangement, base connections and max. dimensions in mm. of tube EL 11.

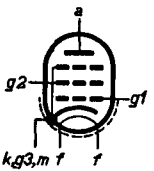


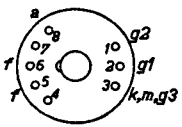
OUTPUT PENTODE
PENTHODE DE SORTIE
ENDPENTHODE

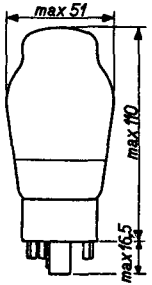
Heating: indirect by A.C.; parallel supply
Chauffage: indirect par C.A.; alimentation en parallèle
Heizung: indirekt durch Wechselstrom; Parallelspeisung

Vf = 6,3 V
If = 1,2 A

Dimensions in mm
Dimensions en mm
Abmessungen in mm







Capacities
Capacités
Kapazitäten

Cagl < 0,7 pF

Operating characteristics class A
Caractéristiques d'utilisation classe A
Betriebsdaten Klasse A

Va	= 250 V
Vg2	= 250 V
Vg1	= -7 V
Rk	= 90 Ω
Ia	= 72 mA
Ig2	= 8 mA
S	= 15 mA/V
Ri	= 25 kΩ
Ra	= 3,5 kΩ
μg2g1	= 18
Wo (d_{tot} = 10%)	= 8 W
Vi (d_{tot} = 10%)	= 4,5 V
Vi (Wo = 50 mW)	= 0,3 V

Operating characteristics classe AB
Caractéristiques d'utilisation classe AB
Betriebsdaten Klasse AB

Va	=	250		V
Vg2	=	250		V
Rk	=	90		Ω
Raa	=	5		kΩ
Vi	=	0	7,3	V_{eff}
Ia	=	2x45	2x53	mA
Ig2	=	2x5,1	2x8,5	mA
Wo	=	0	14,5	W
d_{tot}	=	-	2,2	%

Limiting values
Caractéristiques limites
Grenzdaten

Va_o	=max. 550 V	Wg2 (Vi = 0 V)	=max. 2,5 W
Va	=max. 250 V	Wg2 (Wo = max.)	=max. 5 W
Wa	=max. 18 W	Vg1 (Ig1=+0,3 μA)	=max.-1,3 V
$Vg2_o$	=max. 550 V	Rg1	=max. 1 MΩ
Vg2	=max. 275 V	Rfk	=max. 5 kΩ
Ik	=max. 90 mA	Vfk	=max. 50 V

55398



EL12

page	sheet	date
1	1	1948.09.16
2	2	1948.09.16
3	FP	1999.07.04

EL 2 Endpenthode

Die Röhre EL 2 ist eine indirekt geheizte 8-Watt-Endpenthode für Autoempfänger. Ihre niedrige Heizleistung und geringen Abmessungen sind für diese Empfänger besonders günstig. Die Steilheit der Röhre beträgt 2,8 mA/V im Arbeitspunkt bei einer Anoden- und Schirmgitterspannung von 250 Volt. Die Kathode ist als Schnellheizkathode ausgeführt; die Anheizzeit beträgt 18 Sekunden. Das Steuergitter der Röhre ist an die Kuppe des Röhrenkolbens angeschlossen.

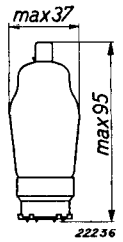
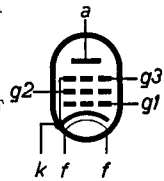


Abb. 1
Abmessungen in mm.

HEIZDATEN

Heizung: indirekt durch Gleichstrom, Wechselstrom oder Batteriestrom, Parallel- oder Serienspeisung.

Heizspannung . . . . . V_f = 6,3 V
Heizstrom . . . . . I_f = 0,2 A



KAPAZITÄTEN

Grenzwert der Gitteranodenkapazität . . . . C_{ag1} = max. 0,6 µµF

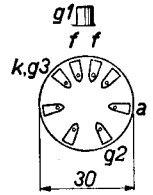


Abb. 2
Elektrodenanordnung und Sockelanschlüsse.

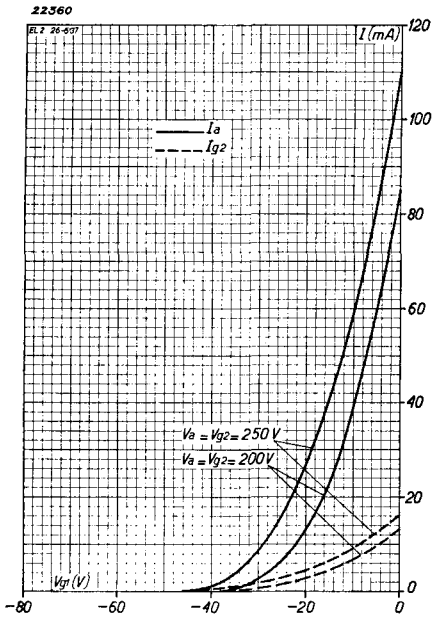


Abb. 3
Anodenstrom und Schirmgitterstrom als Funktion der negativen Gitterspannung bei einer Schirmgitterspannung von 200 und 250 V.

BETRIEBSDATEN ALS EINFACHER ENDVERSTÄRKER (EINE RÖHRE).

Anodenspannung	V_a	= 250 V
Schirmgitterspannung	V_{g2}	= 250 V
Negative Gittervorspannung	V_{g1}	= −18 V
Anodenstrom	I_a	= 32 mA
Schirmgitterstrom	I_{g2}	= 5 mA
Steilheit im Arbeitspunkt	S	= 2,8 mA/V
Innerer Widerstand im Arbeitspunkt	R_i	= 70.000 Ω
Günstigste Anpassungsimpedanz	R_a	= 8000 Ω
Ausgangsleistung für 10 % Verzerrung	W_o	= 3,6 W
Gitterwechselspannung für 10 % Verzerrung	V_i	= 10 $V_{(eff)}$
Gitterwechselspannung für 50 mW Ausgangsleistung	$V_{i\,(50\,mW)}$	= 0,9 $V_{(eff)}$

BETRIEBSDATEN ALS GEGENTAKT-ENDVERSTÄRKER (ZWEI RÖHREN).

		Automatische Vorspannung
Anodenspannung	V_a	= 250 V
Schirmgitterspannung	V_{g2}	= 250 V
Gemeinsamer Kathodenwiderstand	R_k	= 310 Ω
Anodenstrom	I_{ao}	= 2 × 27,5 mA
Anodenstrom bei voller Aussteuerung	$I_{a\,max}$	= 2 × 32 mA
Schirmgitterruhestrom	I_{g2o}	= 2 × 4,4 mA
Schirmgitterstrom bei voller Aussteuerung	$I_{g2\,max}$	= 2 × 8,0 mA
Günstigste Anpassungsimpedanz zwischen den beiden Anoden	R_a	= 8000 Ω
Größte Ausgangsleistung	$W_{o\,max}$	= 8,1 W
Gesamtverzerrung bei voller Aussteuerung	d_{tot}	= 1,4 %

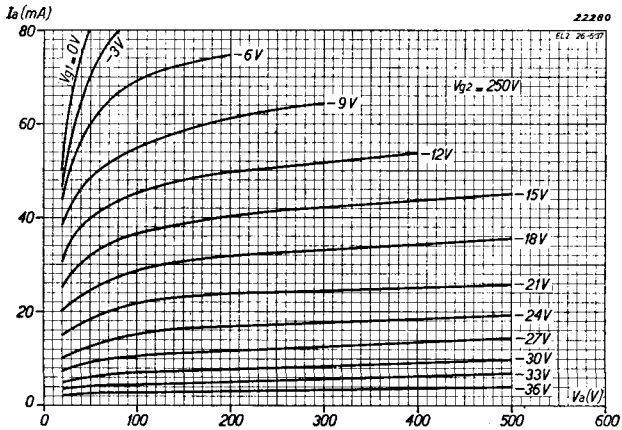


Abb. 4
Anodenstrom als Funktion der Anodenspannung mit Vg_1 als Parameter für Vg_2 = 250 V.

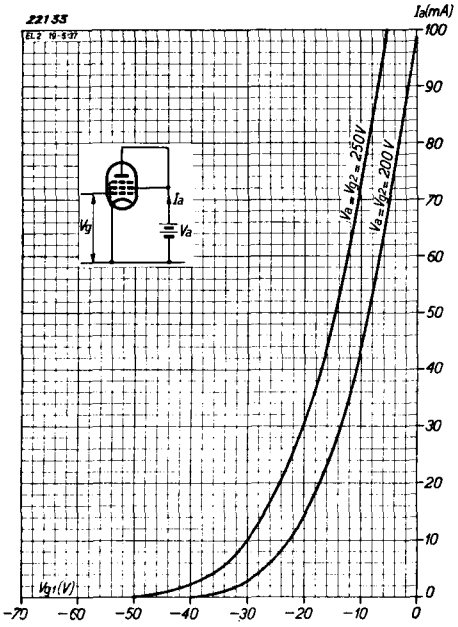


Abb. 5
Anodenstrom als Funktion der negativen Gitterspannung bei Va = 200 und 250 V, wenn die EL 2 als Triode verwendet wird.

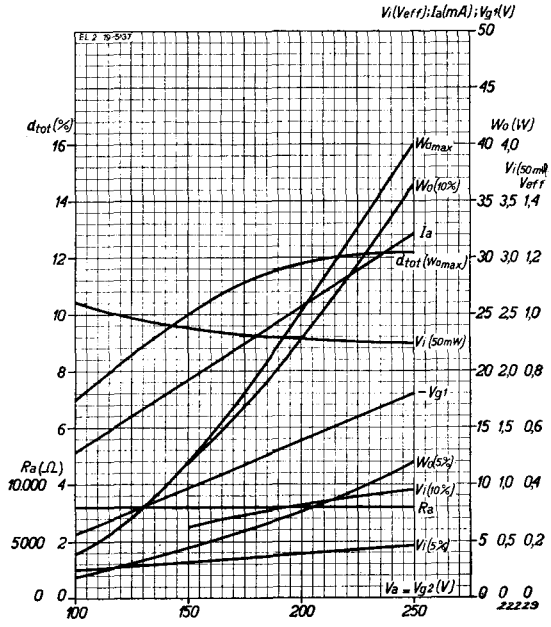


Abb. 7
Verschiedene Größen und Leistungen als Funktion der Anoden- und Schirmgitterspannung der EL 2.

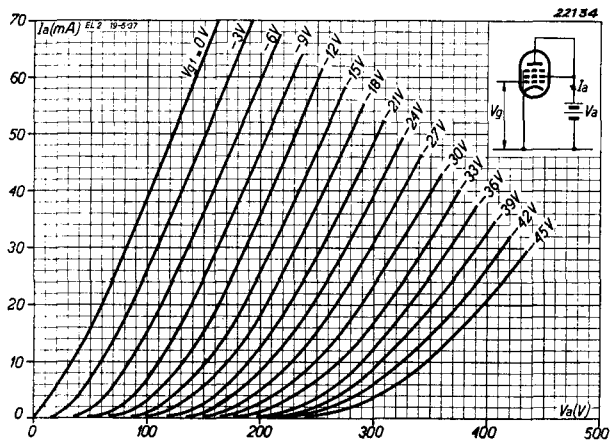


Abb. 6
Anodenstrom als Funktion der Anodenspannung bei verschiedenen negativen Gitterspannungen, wenn die EL 2 als Triode verwendet wird.

BETRIEBSDATEN BEI VERWENDUNG ALS TRIODE

Anoden- und Schirmgitterspannung	V_a	= 250 V	250 V
Negative Gittervorspannung	V_{g1}	= −27 V	−20 V
Anodenstrom	I_a	= 15 mA	30 mA
Steilheit im Arbeitspunkt	S	= 1,7 mA/V	2,6 mA/V
Innenwiderstand	R_i	= 4100 Ω	3100 Ω
Verstärkungsfaktor	μ	= 7	8

GRENZDATEN

Maximale Anodenkaltspannung	V_{ao}	= max. 550 V
Maximale Anodenspannung	V_a	= max. 250 V
Maximale Anodendauerbelastung	W_a	= max. 8 W
Maximale Schirmgitterkaltspannung	V_{g20}	= max. 550 V
Maximale Schirmgitterspannung	V_{g2}	= max. 250 V
Maximale Schirmgitterdauerbelastung	W_{g2}	= max. 1,6 W
Maximaler Kathodenstrom	I_k	= max. 45 mA
Grenzwert des Gitterstromeinsatzpunktes V_{g1} (I_{g1} = + 0,3 µA)		= max. −1,3 V
Maximaler Widerstand zwischen Gitter und Kathode bei autom. Vorspannung	R_{g1k}	= max. 1 MΩ
Maximaler Widerstand zwischen Gitter und Kathode bei fester Vorspannung	R_{g1k}	= max. 0,6 MΩ
Maximaler Widerstand zwischen Heizfaden und Kathode	R_{fk}	= max. 5000 Ω
Maximale Spannung zwischen Heizfaden und Kathode (Gleichsp. oder Effektivwert der Wechselsp.)	V_{fk}	= max. 100 V

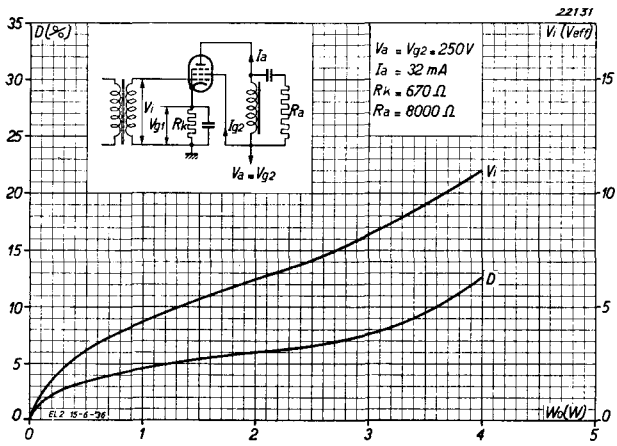


Abb. 8
Gitterwechselspannung und Gesamtverzerrung als Funktion der Ausgangsleistung bei Verwendung der EL 2 als einfacher Endverstärker und $Va = Vg_2 = 250$ V.

Die Röhre kann als einfacher oder Gegentakt-Endverstärker in Autoempfängern verwendet werden. Bei 12-Volt-Autobatterien können die Heizfäden von zwei Röhren EL 2 in Serie geschaltet werden oder auch eine Röhre EL 2 in Serie mit einer 200-mA-Röhre dieser Röhrenserie, z.B. mit der EBC 3 oder EF 6. Die Kathode soll durch eine Kapazität von mindestens 2 µF in Bezug auf den Nulleiter entkoppelt werden. Es verdient aber den Vorzug, hierfür eine größere Kapazität, beispielsweise von 25 oder 50 µF, zu wählen.

Bei Verwendung als Gegentakt-Endverstärker (zwei Röhren) wähle man vor-

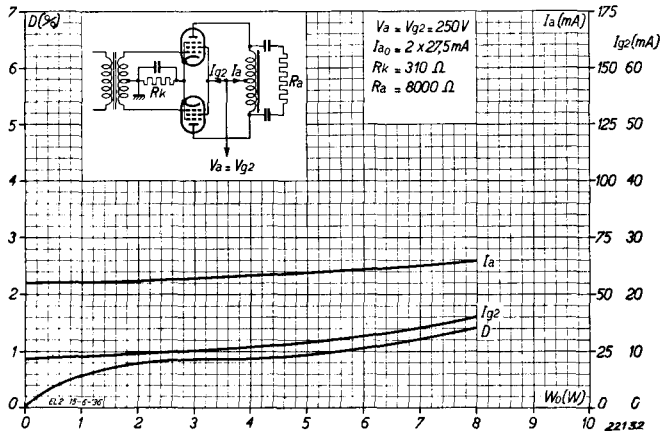


Abb. 9
Anodenstrom, Schirmgitterstrom und Gesamtverzerrung als Funktion der Ausgangsleistung bei Verwendung von zwei Röhren EL 2 in einer Gegentakt-Endstufe mit automatischer Vorspannung und $Va = Vg_2 = 250$ V.

zugsweise automatische Vorspannung. Als Vorverstärkerröhre der Gegentaktstufe kann man die EBC 3 oder die EL 2, als Triode geschaltet, benutzen. Im Zusammenhang mit dem Preis des Zwischentransformators und der Wiedergabe der tiefen Töne ist für die Vorröhre ein Übersetzungsverhältnis von 1 : (2 + 2) ein geeigneter Wert. Mit der als Triode geschalteten EL 2 als Vorröhre kann ein höheres Übersetzungsverhältnis gewählt werden.

Die Tabellen I und II geben über die Anwendung der EL 2 als einfacher Endverstärker unter Berücksichtigung des Spannungsabfalles im Ausgangstransformator Aufschluß. Die in den Tabellen gegebenen Zahlen für die Ausgangsleistung entsprechen der Nutzleistung am Ausgang der Röhre. Man muß also die Verluste im Ausgangstransformator hiervon noch abziehen.

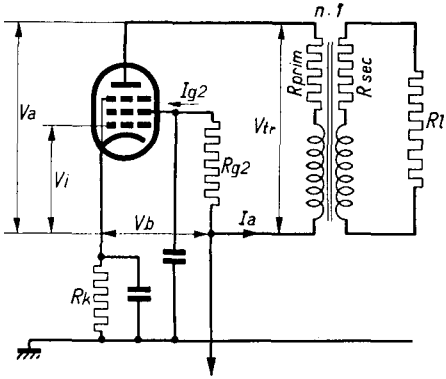


Abb. 10
Schaltung der Röhre EL 2, mit der die Messungen der Tabelle I durchgeführt wurden.
Belastungswiderstand $Ra = Rprim + n^2 Rscc + n^2 Rl = Rtr + n^2 Rl$.
Ausgangsleistung $Wo = ia^2 (Rprim + n^2 Rsec + n^2 Rl) = ia^2 (Rtr + n^2 Rl) = ia^2 Ra$.
Gleichspannung an der Anode $Va = Vb - Ia\ Rprim$.
Leistungsverlust im Ausgangstransformator

$$= ia^2 (Rprim + n^2 Rsec) = ia^2 Rtr = Wo \frac{Rtr}{Ra}$$

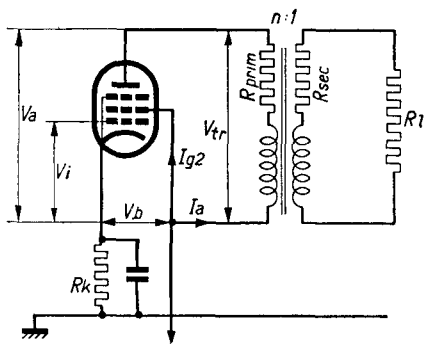


Abb. 11
Schaltung der Röhre EL 2, mit der die Messungen der Tabelle II durchgeführt wurden. Wegen der verschiedenen Bezeichnungen und Formeln siehe die Unterschrift der Abb. 10.

TABELLE I

EL 2 - Ausgangsleistung und Gitterwechselspannungsbedarf als Funktion des Spannungsverlustes im Ausgangstransformator, wenn die Gleichspannung an der Anode gleich 250 Volt ist.

I_a = 32 mA.

Gleichspannung an der Anode Va (V)	Spannung der Speisungsquelle Vb (V)	Schirmgitter-Widerstand Rg_2 (Ω)	Spannungsabfall im Ausgangstransformator Vtr (V)	Bei 10 % Verzerrung: Anoden-außenwiderstand Ra (Ω)	Bei 10 % Verzerrung: Gitterwechselspannung Vi (Veff)	Bei 10 % Verzerrung: Ausgangsleistung Wo (W)	Bei 5 % Verzerrung: Anoden-außenwiderstand Ra (Ω)	Bei 5 % Verzerrung: Gitterwechselspannung Vi (Veff)	Bei 5 % Verzerrung: Ausgangsleistung Wo (W)	Leistungsverlust im Ausgangstransformator $\frac{Wtr}{Wo}$ 100 %
250	250	0	0	8000	9,4	3,65	8000	4,7	1,3	—
250	260	1600	10	8000	9,4	3,5	8000	4,5	1,1	8
250	270	3300	20	8000	9,3	3,3	8000	4,4	1,1	16
250	280	4900	30	8000	9,0	3,2	8000	4,4	1,1	24
250	300	8400	50	8000	8,5	2,95	8000	4,3	1,0	40

TABELLE II

EL 2 - Ausgangsleistung und Gitterwechselspannungsbedarf als Funktion des Spannungsverlustes im Ausgangstransformator, wenn die Gleichspannung der Speisungsquelle und am Schirmgitter gleich 250 Volt ist.

I_a = 32 mA.

Gleichspannung an der Anode Va (V)	Spannung der Speisungsquelle Vb (V)	Schirmgitterspannung Vg_2 (V)	Spannungsabfall im Ausgangstransformator Vtr (V)	Bei 10 % Verzerrung: Anoden-außenwiderstand Ra (Ω)	Bei 10 % Verzerrung: Gitterwechselspannung Vi (Veff)	Bei 10 % Verzerrung: Ausgangsleistung Wo (W)	Bei 5 % Verzerrung: Anoden-außenwiderstand Ra (Ω)	Bei 5 % Verzerrung: Gitterwechselspannung Vi (Veff)	Bei 5 % Verzerrung: Ausgangsleistung Wo (W)	Leistungsverlust im Ausgangstransformator $\frac{Wtr}{Wo}$ 100 %
250	250	250	0	8000	9,4	3,65	8000	4,7	1,3	—
240	250	250	10	7500	9,6	3,55	7500	4,7	1,2	8
230	250	250	20	7000	9,6	3,35	7000	4,7	1,1	18
220	250	250	30	7000	9,5	3,15	7000	5,2	1,3	27
200	250	250	50	6000	9,8	2,9	6000	5,1	1,1	52

Bemerkung: Der Leistungsverlust durch den Kupferwiderstand des Ausgangstransformators wurde unter der Annahme gleicher Kupferverluste in der primären und sekundären Wicklung berechnet.

EL 3 Endpenthode

Die EL 3 ist eine indirekt geheizte 9-Watt-Endpenthode mit großer Steilheit, die durch äußerst sorgfältige Konstruktion imstande ist, bei 10% Verzerrung eine Ausgangsleistung von 4,5 Watt (Wirkungsgrad 50%) abzugeben. Sie hat eine Steilheit von 9 mA/V und ist zur Verwendung in Empfängern mit niederfrequenter Gegenkopplung sehr geeignet. Ihr Gitterwechselspannungsbedarf beträgt bei 4,5 Watt Ausgangsleistung nur 4,2 Volt. In Gegentaktstufen ermöglicht diese Röhre bei $V_a = V_{g2} = 250$ Volt eine Ausgangsleistung von 8,2 Watt bei einem Klirrfaktor von 3,1% und einem Gitterwechselspannungsbedarf von nur 6,7 Volt (pro Hälfte der Sekundärwicklung des Steuertransformators). Bei einer Schirmgitterspannung von 265 Volt und einer Anodenspannung von 250 Volt, wobei ein Spannungsabfall im Ausgangstransformator von 15 Volt berücksichtigt wird, wird eine Ausgangsleistung von 9 Watt erzielt, bei 6,8% Verzerrung und einem Gitterwechselspannungsbedarf von 5,6 Volt (Effektivwert). Durch die besondere Form der Kathode wird die große Steilheit dieser Röhre bei einer verhältnismäßig niedrigen Heizleistung erzielt. Bei 6,3 Volt Heizspannung beträgt der Heizstrom nur 0,9 Ampere.

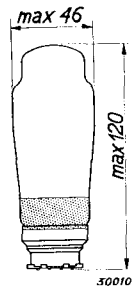
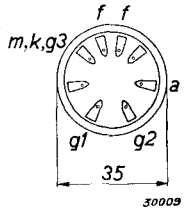


Abb. 1
Abmessungen in mm.



HEIZDATEN

Heizung: indirekt durch Wechselstrom, Parallelspeisung.

Heizspannung	V_f	= 6,3 V
Heizstrom	I_f	= 0,9 A

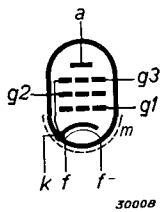


Abb. 2
Elektrodenanordnung und Sockelanschlüsse.

KAPAZITÄTEN

Grenzwert der Gitter-Anodenkapazität	C_{ag1}	= max. 0,8 µµF

BETRIEBSDATEN ALS EINFACHER ENDVERSTÄRKER (1 RÖHRE)

Anodenspannung	V_a	= 250 V
Schirmgitterspannung	V_{g2}	= 250 V
Neg. Gittervorspannung	V_{g1}	= — 6 V
Kathodenwiderstand	R_k	= 150 Ω
Anodenstrom	I_a	= 36 mA
Schirmgitterstrom	I_{g2}	= 4 mA
Steilheit	S	= 9 mA/V
Innenwiderstand	R_i	= 50.000 Ω
Günstigster Anpassungswiderstand	R_a	= 7.000 Ω
Ausgangsleistung bei 10% Verzerrung	$W_{o(10\%)}$	= 4,5 W
Gitterwechselspannungsbedarf für $W_o = 4{,}5$ W	V_i	= 4,2 V
Empfindlichkeit	$V_{i(50mW)}$	= 0,33 $V_{(eff)}$
Verstärkungsfaktor von Gitter 2 in Bezug auf Gitter 1	μ_{g2g1}	= 23

BETRIEBSDATEN ALS GEGENTAKT-ENDVERSTÄRKER (2 RÖHREN)

(automatische Vorspannung)

Anodenspannung	V_a	= 250 V	250 V
Schirmgitterspannung	V_{g2}	= 250 V	265 V
Kathodenwiderstand	R_k	= 140 Ω	190 Ω [1])
Anodenruhestrom	I_{ao}	= 2×24 mA	2×31 mA
Anodenstrom bei voller Aussteuerung	$I_{a\,max}$	= 2×28,5 mA	2×34 mA
Schirmgitterruhestrom	I_{g2o}	= 2×2,8 mA	2×3,6 mA
Schirmgitterstrom bei voller Aussteuerung	$I_{g2\,max}$	= 2×4,6 mA	2×5,8 mA
Günstigster Anpassungswiderstand zwischen den beiden Anoden	R_a	= 10.000 Ω	10.000 Ω
Max. Ausgangsleistung	W_o	= 8,2 W	9 W
Verzerrung bei max. Ausgangsleistung	d_{tot}	= 3,1 %	6,8 %
Gitterwechselspannungsbedarf pro Gitter	V_i	= 6,7 $V_{(eff)}$	5,6 $V_{(eff)}$

[1]) Je Röhre ein besonderer Kathodenwiderstand.

BETRIEBSDATEN ALS TRIODE (GITTER 2 AN ANODE)

Anodenspannung	V_a	= 250 V
Gittervorspannung	V_{g1}	= — 8,5 V
Kathodenwiderstand	R_k	= 425 Ω
Anodenstrom	I_a	= 20 mA
Verstärkungsfaktor	μ	= 20
Steilheit	S	= 6,5 mA/V
Innenwiderstand	R_i	= 3000 Ω
Günstigster Anpassungswiderstand	R_a	= 7000 Ω
Ausgangsleistung bei 5 % Verzerrung	W_o	= 1,1 W
Gitterwechselspannungsbedarf bei W_o = 1,1 W	V_i	= 5,9 $V_{(eff)}$
Empfindlichkeit	$V_{i(50mW)}$	= 1,1 $V_{(eff)}$

GRENZDATEN

Max. Anodenkaltspannung	V_{ao}	= max. 550 V
Max. Anodenspannung	V_a	= max. 250 V
Max. Anodendauerbelastung	W_a	= max. 9 W
Max. Schirmgitterkaltspannung	V_{g2o}	= max. 550 V
Max. Schirmgitterspannung	V_{g2}	= max. 275 V
Max. Schirmgitterdauerbelastung im ungesteuerten Zustand	W_{g2}	= max. 1,2 W
Max. Schirmgitterdauerbelastung bei voller Aussteuerung	W_{g2}	= max. 2,5 W
Max. Kathodenstrom	I_k	= max. 55 mA
Grenzwert des Gitterstromeinsatzpunktes (I_{g1} = 0,3 µA)	V_{g1}	= max. — 1,3 V
Max. Widerstand zwischen Gitter und Kathode	R_{g1k}	= max. 1 MΩ
Max. Widerstand zwischen Heizfaden und Kathode	R_{fk}	= 5000 Ω
Max. Spannung zwischen Heizfaden und Kathode (Gleichspannung oder Effektivwert der Wechselspannung)	V_{fk}	= max. 50 V

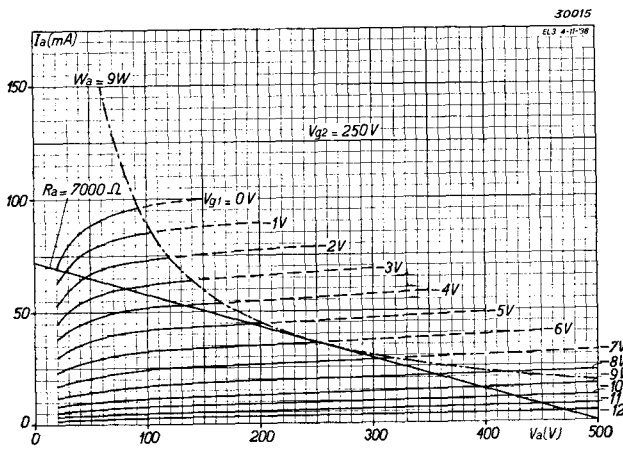


Abb. 3
Anodenstrom als Funktion der Anodenspannung bei verschiedenen negativen Gitterspannungen und bei $Vg_3 = 250$ V.

Da im allgemeinen über den Ausgangstransformator ein Spannungsabfall entsteht, soll die Speisespannung dementsprechend höher gewählt werden, um aus der Röhre die volle Leistung herauszuholen. Das Schirmgitter wird durchweg direkt von der Speiseleitung aus gespeist, so daß dann eine höhere Schirmgitterspannung zugelassen werden muß, damit der Anode die richtige Spannung von 250 Volt zugeführt wird. Deswegen wurde die maximale Schirmgitterspannung(siehe unter Grenzdaten) auf 275 Volt festgesetzt. Abb. 7 stellt einige wichtige Daten der EL 3 in Abhängigkeit von der Schirmgitterspannung in einem Bereiche von 250 bis 275 Volt dar, wenn die Anodenspannung 250 Volt beträgt. Für jeden Spannungsabfall im Ausgangstransformator zwischen 0 und 25 Volt sind also diesem Kurvenblatt die wichtigsten Daten zu entnehmen.

Abb. 8 stellt noch einige Betriebswerte der EL 3 dar für den Fall, daß im Gerät nicht die erforderliche Betriebsspannung vorhanden ist, und zwar als Funktion der Schirmgitterspannung, wobei die Anodenspannung um 15 Volt niedriger als die Schirmgitterspannung ist. Dieses Kurvenblatt wurde auf Grund eines mittleren Spannungsabfalles von 15 Volt über dem Ausgangstransformator aufgestellt.

Die negative Gitterspannung darf nur durch einen Kathodenwiderstand (automatische Vorspannung) erzeugt werden. Eine halbautomatische Vorspannung ist zulässig, wenn der Kathodenstrom der EL 3 mehr als 50 % von dem durch den spannungserzeugenden Widerstand fließenden Gesamtstrom beträgt. Der maximale unter Grenzdaten angegebene Gitterableitwiderstand ist dann nach der Formel (Kathodenstrom der Endröhre/Gesamtstrom durch den Widerstand zur Erzeugung des Spannungsabfalles) $\times$ R_{g1k} zu erniedrigen. In dem Falle muß noch berücksichtigt werden, daß der Strom der geregelten Röhren die negative Gitterspannung der Endröhre beeinflußt, so daß beim Herunterregeln die negative Gittervorspannung leicht zu niedrig und mithin der Anodenstrom der Endröhre zu hoch wird.

Bei der Schaltung ist die große Steilheit dieser Röhre zu beachten, die zu hochfrequenten Rückkopplungen und Selbstschwingen Anlaß geben kann. Die Leitungen zu den Elektroden sind möglichst kurz zu halten. Die Einschaltung eines Widerstandes von beispielsweise 1000 Ohm in die Steuergitterleitung und von 100 Ohm in die Schirmgitterleitung ist erforderlich.

Bei der Verwendung dieser Röhre in Gegentaktstufen ist noch zu berücksichtigen, daß, wenn der Anodenruhestrom pro Röhre höher als 25 mA ist, für jede Röhre ein besonderer Kathodenwiderstand verwendet werden muß. Infolge von Streuungen in den Anodenströmen könnte es nämlich vorkommen, daß eine Röhre mit verhältnismäßig hohem Strom durch eine andere Röhre mit zu geringem Strom eine zu niedrige Vorspannung erhält und daher überlastet wird. Diese Maßnahme empfiehlt sich überall, wo man vermeiden möchte, daß das Herausziehen einer Röhre zur Zerstörung der anderen Röhre führt.

Die Daten für die Verwendung als Triode sollen über das Verhalten der Röhre als Vorverstärker von Gegentaktendstufen Aufschluß geben. Um Selbstschwingungen zu vermeiden, wird empfohlen, das Schirmgitter nicht direkt mit der Anode zu verbinden, sondern über einen Widerstand von 100 Ohm, der nicht entkoppelt wird. Weiter werden dieselben Maßnahmen empfohlen wie bei der Penthodenschaltung, d.h. kurze Verbindungen. Die Triodenschaltung kann auch für die Verwendung als Treiber von Gegentaktendstufen mit Gitterstrom dienen.

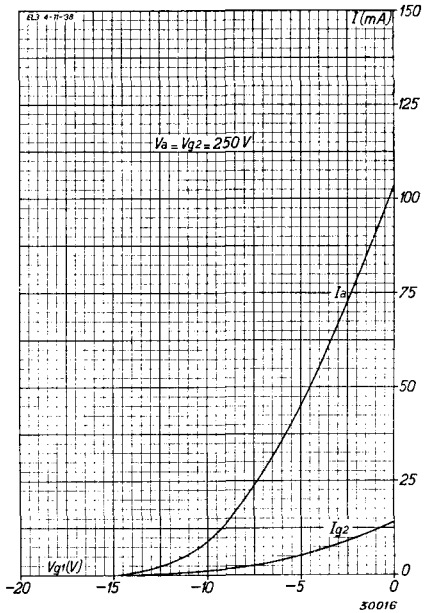


Abb. 4
Anodenstrom als Funktion der negativen Gitterspannung bei $Va = Vg_2 = 250$ V.

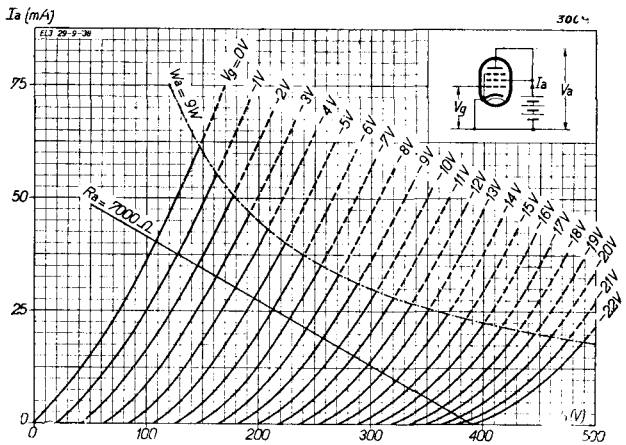


Abb. 5
Anoden- + Schirmgitterstrom als Funktion der Anodenspannung mit Vg_1 als Parameter bei Verwendung der EL 3 als Triode.

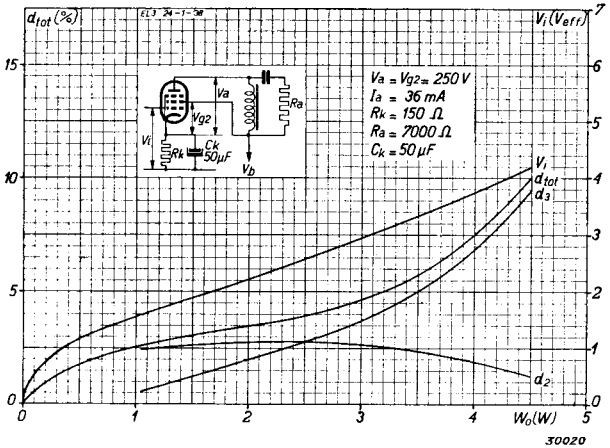


Abb. 6
Gesamtverzerrung, Verzerrung durch die 2. und 3. Harmonische und Gitterwechselspannungsbedarf bei Verwendung der EL 3 als einfache Endpenthode mit automatischer Vorspannung ($Va = Vg_2 = 250$ V).

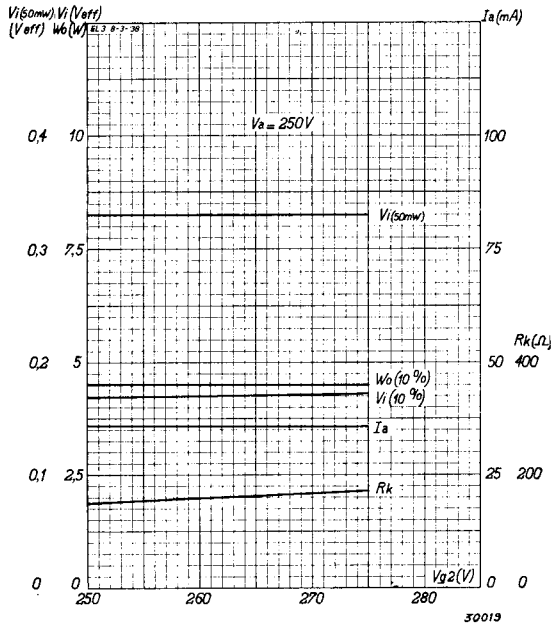


Abb. 7

Ausgangsleistung bei 10 % Verzerrung . . .	Wo(10 %)	als Funktion der Schirmgitterspannung (in einem Bereiche von 250 bis 275 V) bei konstanter Anodenspannung (Va = 250 V).
Gitterwechselspannungsbedarf bei 10 % Verzerrung . . .	Vi (10 %)	
Empfindlichkeit	Vi (50 mW)	
Kathodenwiderstand	Rk	
Anodenstrom	Ia	

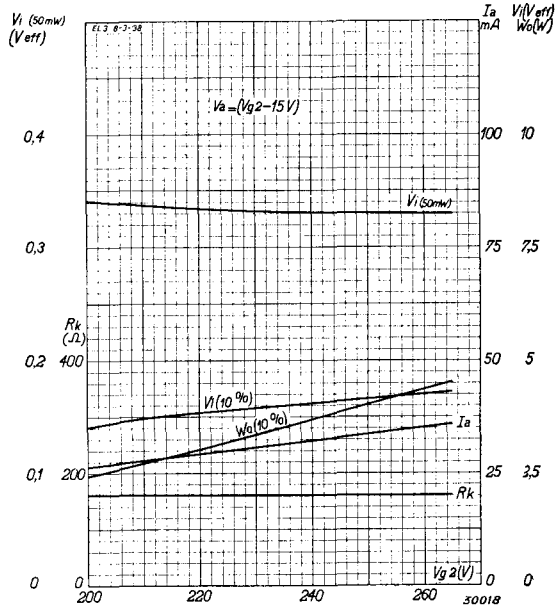


Abb. 8

Ausgangsleistung
bei 10 % Verzerrung . . . Wo (10 %)
Gitterwechselspannungsbedarf
bei 10 % Verzerrung . . . Vi (10 %)
Empfindlichkeit . . . . . Vi (50 mW)
Kathodenwiderstand . . . . . Rk
Anodenstrom . . . . . Ia

} als Funktion der Schirmgitterspannung (in einem Bereiche von 200 bis 265 V) bei einer gegen die Schirmgitterspannung um 15 Volt niedrigeren Anodenspannung

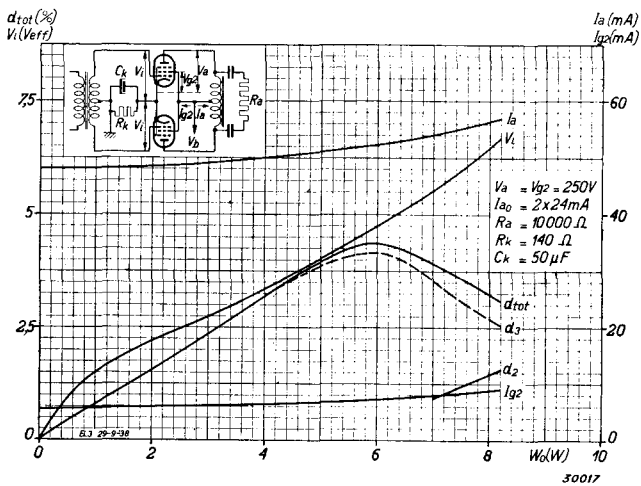
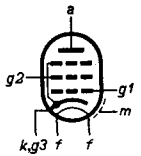


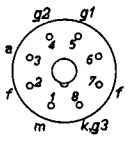
Abb. 9
Anodenstrom Ia, Schirmgitterstrom Ig_2, Gesamtverzerrung $d$tot, Verzerrung durch die 2. und 3. Harmonische und Gitterwechselspannungsbedarf Vi als Funktion der Ausgangsleistung Wo bei Verwendung von zwei Röhren EL 3 in Gegentakt mit $Va = Vg_2 = 250$ V.

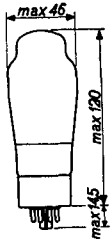
OUTPUT PENTODE
PENTHODE DE SORTIE
ENDPENTODE

Heating:	indirect by A.C. or D.C.; parallel supply	
Chauffage:	indirect par C.A. ou C.C.; alimentation en parallèle	V_f = 6,3 V I_f = 0,9 A
Heizung:	indirekt durch Wechsel- oder Gleichstrom; Parallelspeisung	

Dimensions in mm
Dimensions en mm
Abmessungen in mm







Base, culot, Sockel: Octal

Operating characteristics class A
Caractéristiques d'utilisation classe A
Betriebsdaten Klasse A

V_a	=	250 V
V_{g2}	=	250 V
V_{g1}	=	-6 V
I_a	=	36 mA
I_{g2}	=	4 mA
S	=	9 mA/V
R_i	=	50 kΩ
$R_{a\sim}$	=	7 kΩ
W_o (dtot= 10%)	=	4,5 W
V_i (dtot= 10%)	=	4,2 V_{eff}
V_i (W_o = 50mW)	=	0,35 V_{eff}
μ_{g2g1}	=	23

Operating characteristics classe AB
Caractéristiques d'utilisation classe AB
Betriebsdaten Klasse AB

V_a	=	250		V
V_{g2}	=	250		V
R_k	=	140		Ω
$R_{aa\sim}$	=	10		kΩ
V_i	=	0	6,7	V_{eff}
I_a	=	2x24	2x28,5	mA
I_{g2}	=	2x2,8	2x4,6	mA
W_o	=	0	8,2	W
d_{tot}	=	-	3,1	%

Limiting values
Caractéristiques limites
Grenzdaten

V_{a_o}	= max.	550	V
V_a	= max.	300	V
W_a	= max.	9	W
V_{g2_o}	= max.	550	V
V_{g2}	= max.	300	V
W_{g2} (V_i=0)	= max.	1,2	W
W_{g2} (W_o=max.)	= max.	2,5	W
I_k	= max.	55	mA
V_{g1}(I_{g1}=+0,3μA)	= max.	-1,3	V
R_{g1}	= max.	1	MΩ
V_{kf}	= max.	100	V
R_{kf}	= max.	5	kΩ

PHILIPS

Electronic Tube

HANDBOOK

EL33

page	sheet	date
1	1	1953.10.10
2	2	1953.10.10
3	FP	1999.07.04

A.F. OUTPUT PENTODE

Pentode intended for use as A.F. power amplifier.

QUICK REFERENCE DATA			
Anode current	I_a	100	mA
Transconductance	S	12.5	mA/V
Amplification factor	$\mu_{g_2g_1}$	11	
Output power, class B		100	W

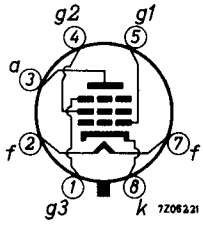
HEATING: Indirect by A.C. or D.C.; parallel supply

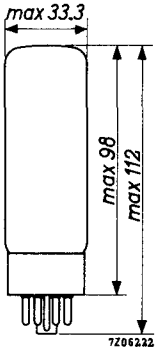
Heater voltage	V_f	6.3	V
Heater current	I_f	1.5	A

DIMENSIONS AND CONNECTIONS Dimensions in mm

Base: Octal

Socket: 5903/13





CAPACITANCES

Anode to all except grid No.1	$C_{a(g_1)}$	8.4	pF
Grid No.1 to all except anode	$C_{g_1(a)}$	15.2	pF
Anode to grid No.1	C_{ag_1}	max. 1.1	pF
Grid No.1 to heater	C_{g_1f}	max. 1.0	pF
Cathode to heater	C_{kf}	10	pF

OPERATING CHARACTERISTICS

Class A

Supply voltage	V_b	265	265	V
Anode voltage	V_a	250	250	V
Grid No.2 series resistor	R_{g_2}	2	0	kΩ
Grid No.3 voltage	V_{g_3}	0	0	V
Grid No.1 voltage	V_{g_1}	−14.5	−13.5	V
Anode current	I_a	70	100	mA
Grid No.2 current	I_{g_2}	10	14.9	mA
Transconductance	S	11	12.5	mA/V
Amplification factor	$\mu_{g_2g_1}$	11	11	
Internal resistance	R_i	20	17	kΩ
Load resistance	$R_{a\sim}$	3.0	2.0	kΩ
Grid No.1 driving voltage	V_i	9.3	8.7	V_{RMS}
Output power	W_o	8	11	W
Distortion	d_{tot}	10	10	%
Grid No.1 driving voltage for W_o = 50 mW	V_i	0.65	0.5	V_{RMS}

OPERATING CHARACTERISTICS

Class B, two tubes in push-pull

Common grid No.2 series resistor (non decoupled)	R_{g_2}		1000			470		Ω
Grid No.1 voltage	V_{g_1}		−38			−32		V
Grid No.3 voltage	V_{g_3}		0			0		V
Grid No.1 driving voltage	V_i	0	27	27	0	22.7	22.7	V_{RMS}
Load resistance	$R_{aa\sim}$	–	3.4	4.0	–	2.8	3.8	kΩ
Supply voltage	V_b	425	425	400	375	375	350	V
Anode voltage	V_a	420	400	375	370	350	325	V
Anode current	I_a	2x30	2x120	2x100	2x35	2x120	2x93	mA
Grid No.2 current	I_{g_2}	2x4.4	2x25	2x25	2x4.7	2x25	2x25	mA
Output power	W_o	0	55	45	0	44	36	W
Distortion	d_{tot}	–	5	6	–	5	6	%

Common grid No.2 series resistor (non decoupled)	R_{g_2}		750			750		Ω
Grid No.1 voltage	V_{g_1}		−36			−39		V
Grid No.3 voltage	V_{g_3}		0			0		V
Grid No.1 driving voltage	V_i	0	25.8	25.8	0	23.4	23.4	V_{RMS}
Load resistance	$R_{aa\sim}$	–	4	5	–	11	11	kΩ
Anode supply voltage	V_{ba}	500	500	475	800	800	750	V
Anode voltage	V_a	495	475	450	795	775	725	V
Grid No.2 supply voltage	V_{bg_2}	400	400	375	400	400	375	V
Anode current	I_a	2x30	2x125	2x102	2x25	2x91	2x84	mA
Grid No.2 current	I_{g_2}	2x4	2x25	2x25	2x3	2x19	2x19	mA
Output power	W_o	0	70	58	0	100	90	W
Distortion	d_{tot}	–	5	6	–	5	6	%

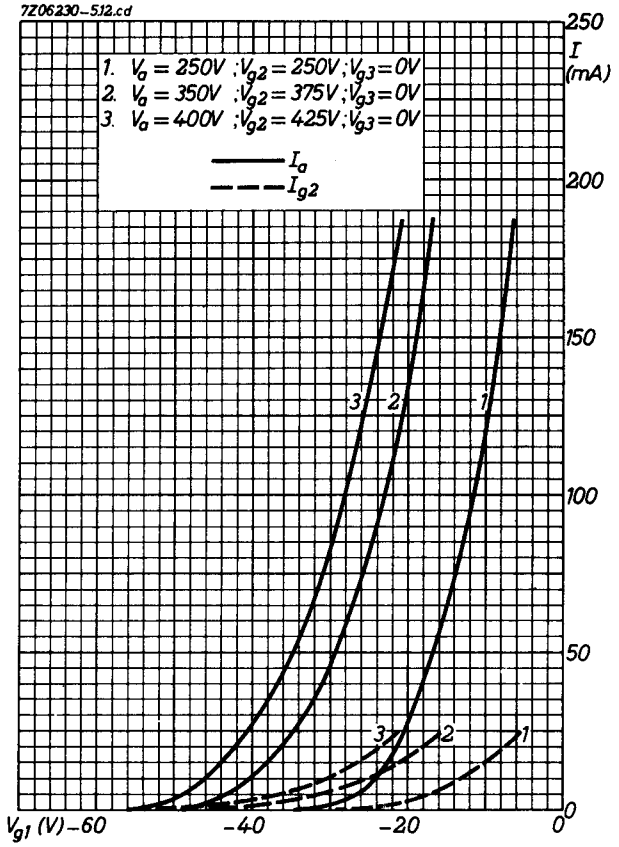
OPERATING CHARACTERISTICS

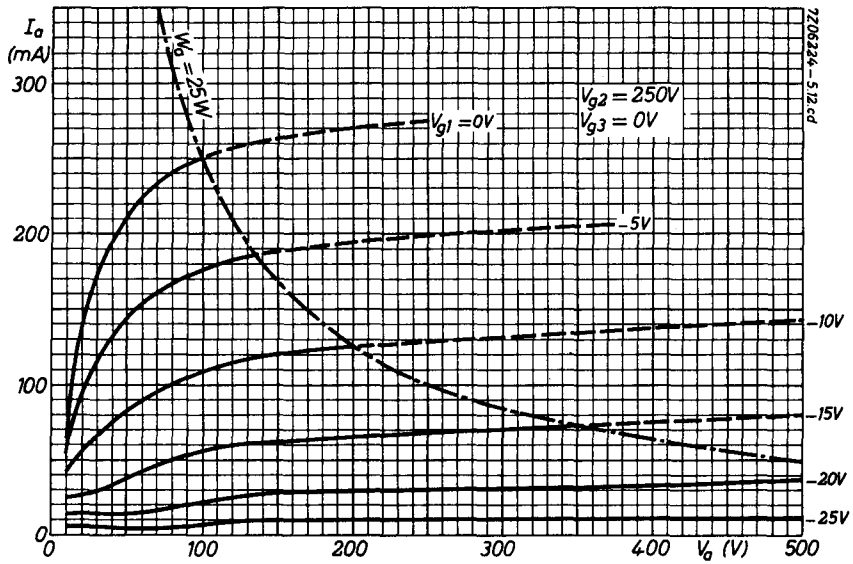
Class AB, two tubes in push-pull

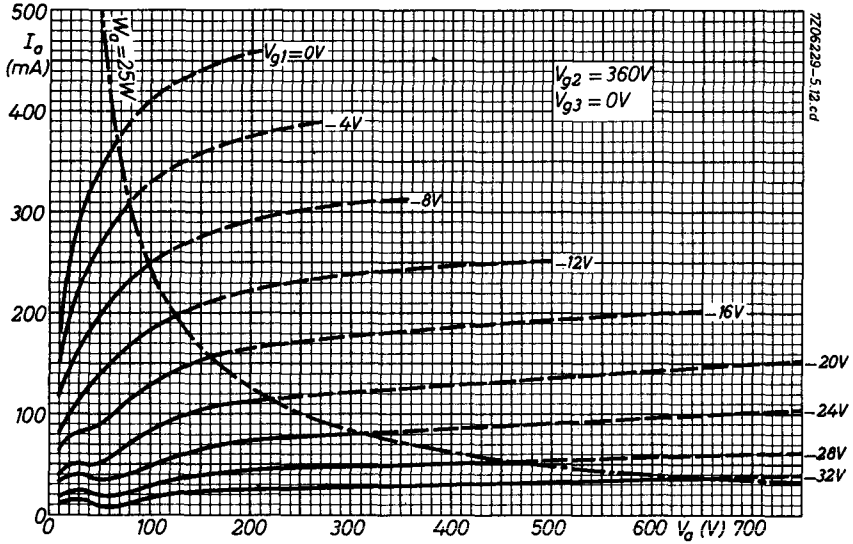
Load resistance	$R_{aa\sim}$	3.4		kΩ
Common grid No.2 series resistor (non decoupled)	R_{g_2}	470		Ω
Common cathode resistor	R_k	130		Ω
Grid No.3 voltage	V_{g_3}	0		V
Grid No.1 driving voltage	V_i	0	21	V_{RMS}
Supply voltage	V_b	375	375	V
Anode to earth voltage	V_a+V_{Rk}	355	350	V
Anode current	I_a	2x75	2x95	mA
Grid No.2 current	I_{g_2}	2x11.5	2x22.5	mA
Output power	W_o	0	35	W
Distortion	d_{tot}	-	5	%

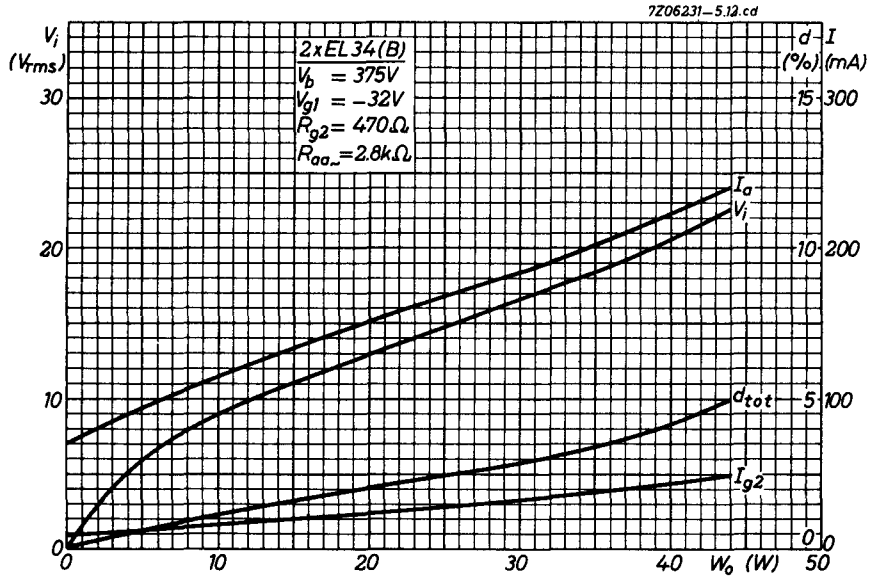
LIMITING VALUES (Design centre rating system)

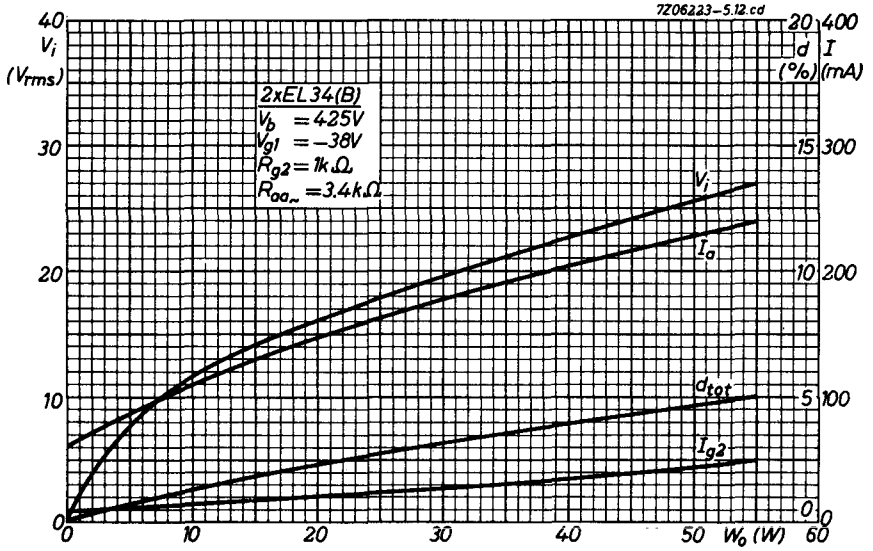
Anode voltage	V_{a_o}	max.	2000	V
	V_a	max.	800	V
Grid No.2 voltage	V_{g2_o}	max.	800	V
	V_{g_2}	max.	500	V
Anode dissipation				
at $V_i = 0$	W_a	max.	25	W
at $V_i > 0$	W_a	max.	27.5	W
Grid No.2 dissipation	W_{g_2}	max.	8	W
Cathode current	I_k	max.	150	mA
Grid No.1 resistor				
for class A and AB	R_{g_1}	max.	0.7	MΩ
for class B	R_{g_1}	max.	0.5	MΩ
Cathode to heater voltage	V_{kf}	max.	100	V

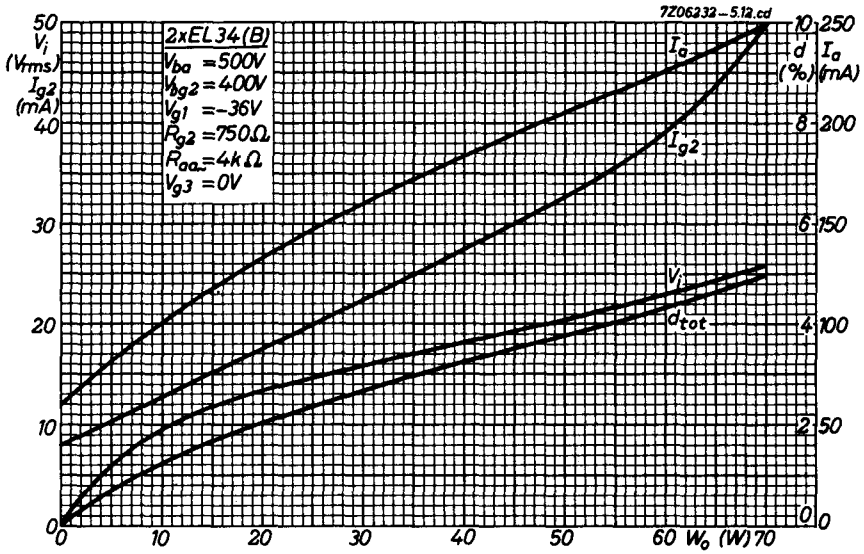

7Z06230-512.cd
1. V_a = 250V ; V_{g2} = 250V ; V_{g3} = 0V
2. V_a = 350V ; V_{g2} = 375V ; V_{g3} = 0V
3. V_a = 400V ; V_{g2} = 425V ; V_{g3} = 0V
I_a
I_{g2}
I (mA)
250
200
150
100
50
0
3
2
1
3
2
1
V_{g1} (V) -60
-40
-20
0

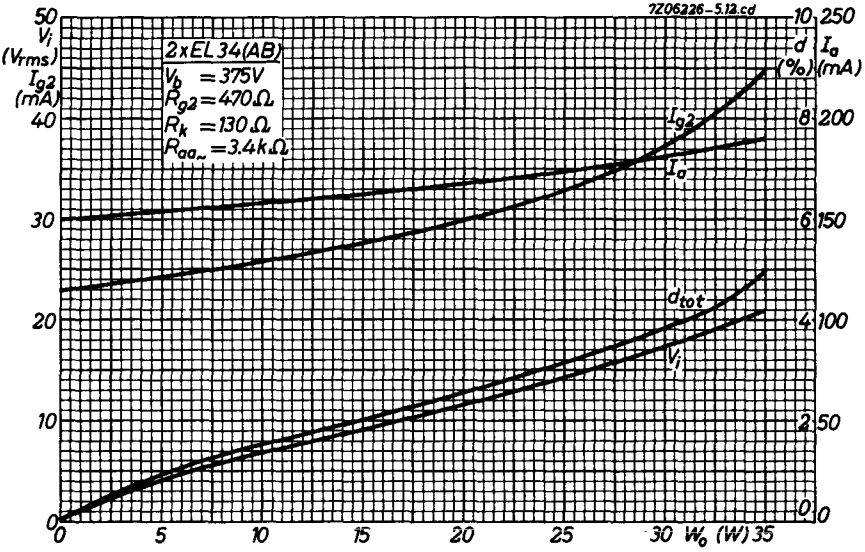

I_a (mA)
300
200
100
0
0
100
200
300
400
V_a (V)
500
W_a = 25W
V_{g1} = 0V
-5V
-10V
-15V
-20V
-25V
V_{g2} = 250V
V_{g3} = 0V
7Z06224-5.12.cd


500
I_a (mA)
400
300
200
100
0
0
100
200
300
400
500
600
V_a (V)
700
W_a = 25W
V_{g1} = 0V
-4V
-8V
-12V
-16V
-20V
-24V
-28V
-32V
V_{g2} = 360V
V_{g3} = 0V
7Z06229-5.12.cd


7Z06231–5.12.cd
2xEL34(B)
V_b = 375V
V_{g1} = −32V
R_{g2} = 470Ω
$R_{aa\sim}$ = 2.8kΩ
V_i (V_{rms})
d (%)
I (mA)
I_a
V_i
d_{tot}
I_{g2}
W_o (W)


7Z06223–5.12.cd
2xEL34(B)
V_b = 425V
V_{g1} = −38V
R_{g2} = 1kΩ
$R_{aa\sim}$ = 3.4kΩ
V_i (V_{rms})
d (%)
I (mA)
V_i
I_a
d_{tot}
I_{g2}
W_o (W)


7Z06232-5.12.cd
2xEL34(B)
V_{ba} =500V
V_{bg2}=400V
V_{g1} =-36V
R_{g2} =750Ω
$R_{aa\sim}$=4kΩ
V_{g3} =0V
I_a
I_{g2}
V_i
d_{tot}
V_i (V_{rms})
I_{g2} (mA)
d (%)
I_a (mA)
W_o (W)


7Z06226-5.12.cd
2xEL34(AB)
V_b =375V
R_{g2}=470Ω
R_k =130Ω
$R_{aa\sim}$=3.4kΩ
I_{g2}
I_a
d_{tot}
V_i
V_i (V_{rms})
I_{g2} (mA)
d (%)
I_a (mA)
W_o (W)

PHILIPS

Data handbook

Electronic components and materials

EL34

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1	1	1969.01
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4	4	1969.01
5	5	1969.01
6	6	1969.01
7	7	1969.01
8	8	1969.01
9	FP	19990319

LINE AND A.F. OUTPUT PENTODE

Pentode intended for use as line output tube in television receivers and as A.F. power amplifier.

HEATING: Indirectly by A.C. or D.C.; parallel supply

Heater voltage	V_f	6.3	V
Heater current	I_f	1.25	A

OPERATING CHARACTERISTICS

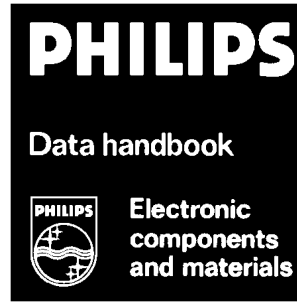
A.F. amplifier, Class B, two tubes in push pull

Anode voltage	V_a	300		V
Grid No.2 voltage	V_{g_2}	150		V
Grid No.1 voltage	V_{g_1}	-29		V
Load resistance	$R_{aa\sim}$	3.5		kΩ
Grid No.1 driving voltage	V_i	0	20	V_{RMS}
Anode current	I_a	2x18	2x100	mA
Grid No.2 current	I_{g_2}	2x0.5	2x19	mA
Output power	W_o	0	44.5	W
Distortion	d_{tot}	-	7.2	%

LIMITING VALUES (Design centre rating system)

Anode voltage	V_a	max.	250	V
Anode voltage for class B operation	V_a	max.	300	V
Cathode to heater voltage	V_{kf}	max.	100	V

For further data and curves of this type please refer to PL36



EL36

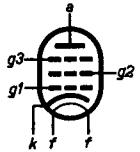
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2	FP	1999.03.19

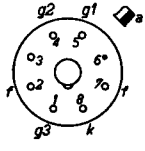
PHILIPS EL 38

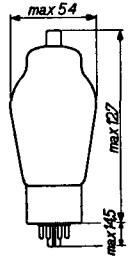
PENTODE for use as line time base output valve
PENTHODE pour l'utilisation comme tube de sortie de base de temps lignes
PENTHODE zur Verwendung als Zeilenzeitbasisendröhre

Heating:	indirect by A.C. parallel supply		
Chauffage:	indirect par C.A. alimentation en parallèle	V_f =	6,3 V
		I_f =	1,4 A
Heizung:	indirekt durch Wechselstrom Parallelspeisung		

Dimensions in mm
Dimensions en mm
Abmessungen in mm







Base, culot, Fuss: Octal

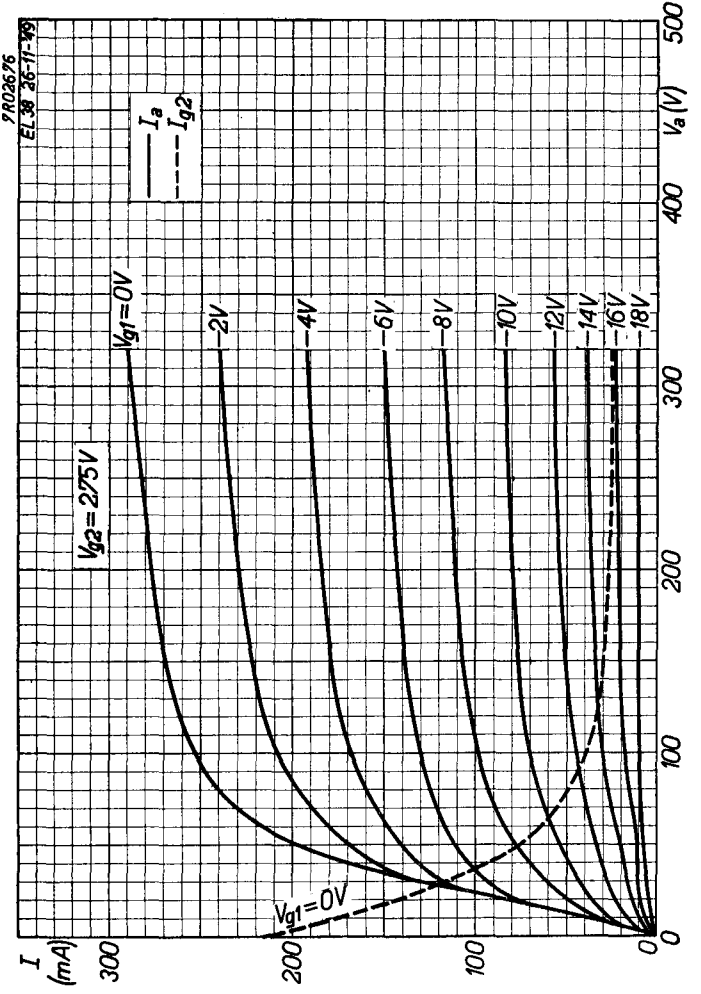
Capacitances Capacités Kapazitäten	C_{g1} =	17,5 pF
	C_a =	6,5 pF
	C_{ag1} =	1,2 pF

Typical characteristics
Caractéristiques typiques
Kenndaten

V_a	=	250	600 V
V_{g3}	=	0	0 V
V_{g2}	=	250	400 V
V_{g1}	=	-7	-22 V
I_a	=	100	42 mA
I_{g2}	=	13	5 mA
S	=	14,3	7,0 mA/V
R_i	=	21	43 kΩ
μ_{g2g1}	=	16,5	

Limiting values
Caractéristiques limites
Grenzdaten

V_a	= max.	800	V
V_{a_p}	= max.	4	kV
W_a	= max.	25	W
V_{g2}	= max.	400	V
W_{g2}	= max.	8	W
I_k	= max.	200	mA
V_{g1} (I_{g1} = +0,3 µA)	= max.	-1,3	V
R_{g1} (W_a < 9 W)	= max.	0,8	MΩ
R_{g1} (W_a > 9 W)	= max.	0,5	MΩ
V_{kf}	= max.	100	V
R_{kf}	= max.	20	kΩ


7R026.76
EL 38 26-11-49
I_a
I_{g2}
V_{g2}= 275V
V_{g1}=0V
-2V
-4V
-6V
-8V
-10V
-12V
-14V
-16V
-18V
V_{g1}=0V
I (mA)
300
200
100
0
0
100
200
300
400
500
V_a (V)

PHILIPS

Electronic Tube

HANDBOOK

EL38

page	sheet	date
1	1	1950.05.05
2	2	1950.05.05
3	A	1950.02.02
4	FP	2000.01.06

PHILIPS

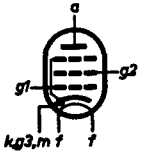
EL 3 N

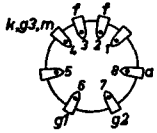
OUTPUT PENTODE
PENTHODE DE SORTIE
ENDPENTHODE

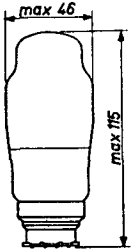
Heating : indirect; parallel supply
Chauffage: indirect; alimentation-parallèle
Heizung : indirekt;Parallelspeisung

V_f = 6,3 V
I_f = 0,9 A

Dimensions in mm
Dimensions en mm
Abmessungen in mm







Base, culot, Sockel: P

Operating characteristics class A
Caractéristiques d'utilisation classe A
Betriebsdaten Klasse A

V_a	=	250 V
V_{g2}	=	250 V
R_k	=	150 Ω
V_{g1}	=	-6 V
I_a	=	36 mA
I_{g2}	=	4 mA
S	=	9 mA/V
R_i	=	50 kΩ
R_a	=	7 kΩ
W_o (d_{tot} = 10%)	=	4,5 W
V_i (d_{tot} = 10%)	=	4,2 V_{eff}
V_i (W_o = 50 mW)	=	0,35 V_{eff}
μ_{g2g1}	=	23

Operating characteristics class AB
Caractéristiques d'utilisation classe AB
Betriebsdaten Klasse AB

V_a	=	250		V
V_{g2}	=	250		V
R_k	=	140		Ω
R_{aa}	=	10		kΩ
V_i	=	0	6,7	V_{eff}
I_a	=	2x24	2x28,5	mA
I_{g2}	=	2x2,8	2x4,6	mA
W_o	=	0	8,2	W
d_{tot}	=	0	3,1	%

Limiting values
Caractéristiques limites
Grenzdaten

V_{ao}	= max.	550	V
V_a	= max.	250	V
W_a	= max.	9	W
V_{g2o}	= max.	550	V
V_{g2}	= max.	275	V
W_{g2} (V_i = 0)	= max.	1,2	W
W_{g2} (W_o = max)	= max.	2,5	W
I_k	= max.	55	mA
V_{g1} (I_{g1} = +0,3 µA)	= max.	-1,3	V
R_{g1}	= max.	1	MΩ
V_{kf}	= max.	100	V
R_{kf}	= max.	5	kΩ

Remark, Observation, Bemerkung

The tube should only be used with automatic or semi-automatic bias

Le tube ne sera utilisé qu'avec polarisation automatique ou semi-automatique

Die Röhre soll nur mit automatischer oder mit halbautomatischer Gittervorspannung verwendet werden

PHILIPS

Electronic Tube

HANDBOOK

EL3N

page	sheet	date
1	1	1953.08.08
2	2	1953.08.08
3	FP	1999.07.04

EL 41 9 W output pentode

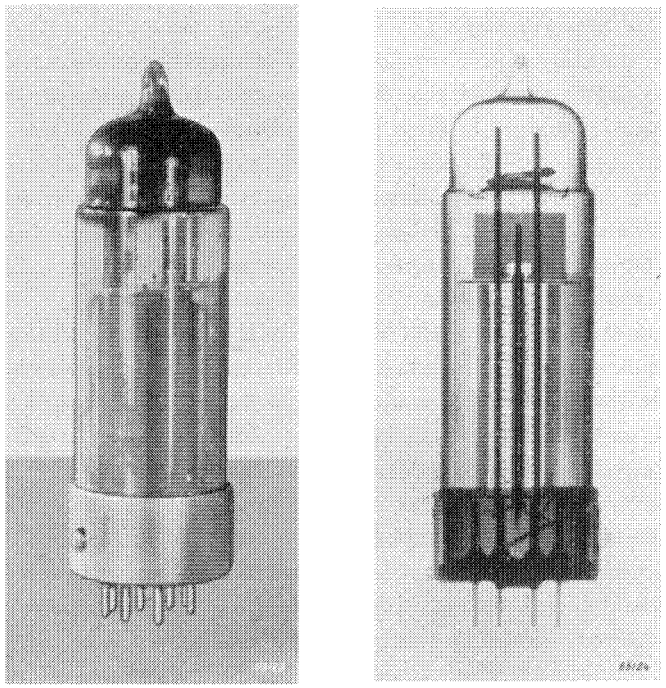


Fig. 1
Normal and X-ray photographs of the EL 41 (approximately actual size).

The EL 41 is an indirectly heated output pentode having a slope of 10 mA/V. The maximum permissible anode dissipation of this valve is 9 W and, for an A.C. grid voltage of only 3.8 V_{RMS}, the output power is 3.9 W, with 10% distortion. Owing to the fact that no current flows to the control grid at an A.C. voltage of this value (the grid bias is 7 V without input signal), the output can be raised considerably without very much increase in the distortion. Grid current does not commence to flow until the output reaches 4.8 W, at which point the distortion is 14.5 %, the required input signal being 5.1 V_{RMS}.
In a class A push-pull amplifier, with $V_a = V_{g2} = 250$ V, an output of 9.4 W with 4.6% distortion can be obtained for an alternating grid voltage of 5.6 V_{RMS}.
Connected as a triode (screen grid connected to anode), the EL 41 will deliver 1.55 W with 8% distortion on an anode voltage of 250 V. In either of these circuits, however, care should be taken that the leads to the various electrodes be kept short in order to avoid undesirable coupling and so ensure that no parasitic oscillation can occur in view of the high mutual conductance

of the valve. If oscillation does occur, owing to imperfect wiring, it can be suppressed by including in the control grid and/or screen grid circuits resistors of 1000 and 100 Ω respectively, without decoupling capacitor. These resistors should be connected as closely as possible to the valveholder.
Grid bias for the EL 41 should be only of the automatic or semi-automatic kind, i.e. as provided by a resistor in the cathode circuit, or by a resistor in the common negative line of the receiver. In the latter case the cathode current of the EL 41 should constitute at least 50% of the total current flowing through the resistor.
With automatic bias, the external resistance between control grid and cathode must not exceed 1 MΩ; with semi-automatic bias this resistance should be lower, the maximum value being obtained from the formula :

$$Rg_1 = \text{max.} \frac{\text{cathode current of the EL 41}}{\text{total current flowing through the resistor}} R'g_1,$$

where $R'g_1$ is the maximum permissible external resistance between grid and cathode for automatic bias.
As previously stated, the maximum anode dissipation of the EL 41 is 9 W; to illustrate the full significance of this, certain points should be explained: As a rule, when the set is in operation, the anode dissipation in the output valve of a receiver is not constant, and among sets of the same type the anode dissipation of the output valve will be found to vary considerably. Several factors contribute to these differences, the most important of these being the tolerances on the various components and valves in the circuit, fluctuations in the mains voltage and, in some circuits, the effects of the A.G.C. If the grid bias of the output valve is of the semi-automatic kind (see previous paragraph), the bias will drop when the A.G.C. comes into operation because the currents flowing through the R.F. and I.F. valves are then reduced. In consequence, the anode dissipation in the output valve increases.
For a better understanding of the significance of "a maximum permissible anode dissipation of 9 W[22] the following factors have been established :
If the anode dissipation of an average EL 41 valve in a receiver does not exeed 9 W when :
1) the valve is operating on nominal voltages,
2) the components of the circuit are of nominal value, and
3) no input signal is applied,
it is permissible :
a) to use any EL 41 valve in the set in question,
b) to allow the anode dissipation to exceed the specified 9 W by a maximum of 15%, by reason of deviating values of the components and the effects of the A.G.C.,
c) to allow fluctuations of at most +or—10% in the mains voltage.
As will be seen from the above, it is intended that the average anode dissipation of the EL 41 in a receiver shall be 9 W when no input signal is applied. There is then sufficient reserve: (a) to allow for the customary tolerances on components, voltages and valves without risk of the valve being overloaded, and (b) to avoid any difficulties when the A.G.C. comes into operation. If

abnormal deviations in voltages or values of components are anticipated, the average anode dissipation without input signal should be re-adjusted accordingly.

When the EL 41 is to be used as the output valve in a vibrator-driven set, the above condition no longer applies as far as the line voltage is concerned, since the voltage is then obtained from an accumulator, not from the mains, and large fluctuations are likely to occur. In such cases the average anode dissipation should be adjusted to 9 W (without input signal) for an accumulator voltage of 7 V. The voltage may then safely rise to 8 V without overloading the valve. In addition, an increase in the dissipation of 15% beyond the limit can be allowed as a maximum, to meet deviations of the components of the circuit, as well as the effects of the A.G.C.

The lower limit specified for the accumulator voltage should be 5.5 V: if the voltage is allowed to drop any further, the heater will be under-heated, which, in the long run, will impair the emissive properties of the cathode.

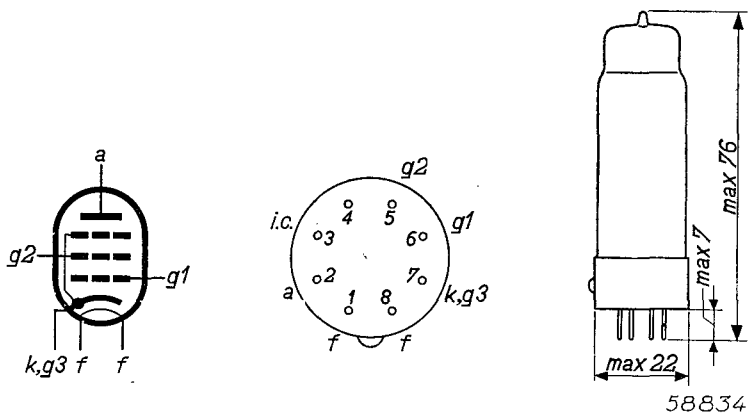


Fig. 2
Electrode arrangement, electrode connections and maximum dimensions in mm of the EL 41.

EL 41

TECHNICAL DATA OF THE OUTPUT PENTODE EL 41

Heater data

Heating : indirect by A.C. or D.C. ; parallel feed

Heater voltage	V_f	=	6.3 V
Heater current	I_f	=	0.71 A

Capacitances (measured at the cold tube)

Input capacitance	C_{g1}	=	10.2 pF
Output capacitance	C_a	=	7.8 pF
Anode-control grid	C_{ag1}	<	1 pF
Control grid-heater	C_{g1f}	<	0.15 pF

Operating characteristics as Class A output amplifier (see Fig. 7)

Anode voltage	V_a	=	250 V
Screen grid voltage	V_{g2}	=	250 V
Cathode resistor	R_k	=	170 Ω
Control grid bias	V_{g1}	=	—7 V
Anode current	I_a	=	36 mA
Screen grid current	I_{g2}	=	5.2 mA
Mutual conductance	S	=	10 mA/V
Internal resistance	R_i	=	40 kΩ
Amplification factor of the 2nd grid with respect to the 1st grid	μ_{g2g1}	=	22
Matching resistance	R_a	=	7 kΩ
Output power at 10% distortion	$W_o(d_{tot}=10\%)$	=	3.9 W
A.C. input voltage at 10% distortion	$V_i(d_{tot}=10\%)$	=	3.8 V_{RMS}
Output power at grid current starting point	$W_o(I_{g1}=+0.3\mu A)$	=	4.8 W
Sensitivity	$V_i(W_o=50$ mW)	=	0.32 V_{RMS}

Operating characteristics of 2 valves as Class A push-pull amplifier (without grid current) (see Fig. 8)

Anode voltage	V_a	=	250	V
Screen grid voltage	V_{g2}	=	250	V
Common cathode resistor	R_k	=	85	Ω
Matching resistance	R_{aa}	=	7	kΩ
A.C. input voltage	V_i	=	0 | 5.6	V_{RMS}
Anode current	I_a	=	2×36 | 2×39.5	mA
Screen grid current	I_{g2}	=	2×5.2 | 2×8	mA
Output power	W_o	=	0 | 9.4	W
Total distortion	d_{tot}	=	— | 4.6	%

Operating characteristics of one valve as Class A output amplifier in triode connection (screen grid connected to anode) (see Fig. 9)

Anode voltage	V_a	=	250 V
Cathode resistor	R_k	=	250 Ω
Anode current	I_a+I_{g2}	=	33 mA
Matching resistance	R_a	=	3.5 kΩ
Output power	W_o	=	1.55 W
A.C. input voltage	V_i	=	6 V_{RMS}
Total distortion	d_{tot}	=	8 %

Limiting values

Anode voltage in cut-off condition	V_{a_o}	= max.	550 V
Anode voltage	V_a	= max.	300 V
Anode dissipation	W_a	= max.	9 W
Screen grid voltage in cut-off condition	V_{g2_o}	= max.	550 V
Screen grid voltage	V_{g2}	= max.	300 V
Screen grid dissipation without input signal	$W_{g2}(V_i=0)$	= max.	1.4 W
Screen grid dissipation at full modulation	$W_{g2}(W_o=\text{max.})$	= max.	3.3 W
Cathode current	I_k	= max.	55 mA
Grid current starting point	$V_{g1}(I_{g1}=+0.3\mu A)$	= max.	−1.3 V
External resistance between control grid and cathode	R_{g1}	= max.	1 MΩ[1])
External resistance between cathode and heater	R_{fk}	= max.	20 kΩ
Voltage between cathode and heater	V_{fk}	= max.	100 V

[1]) With automatic grid bias, see page 9[illegible].

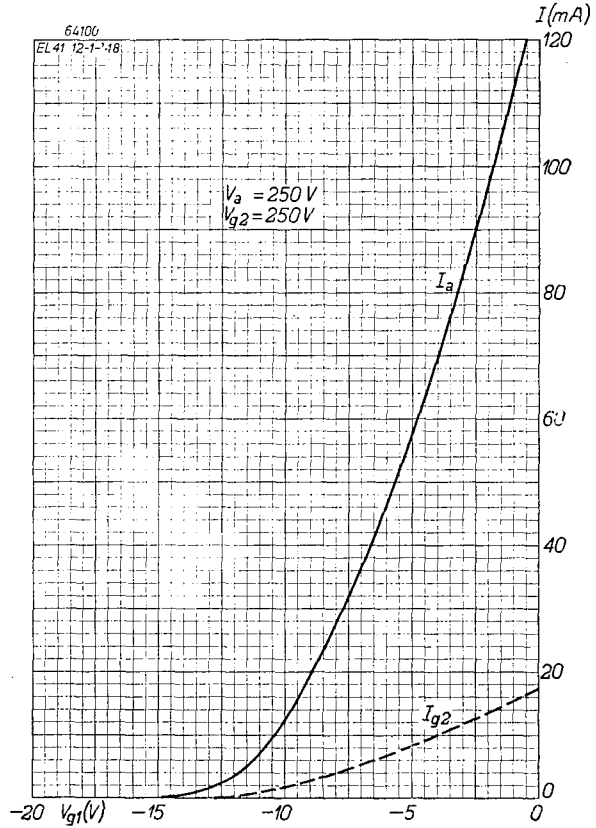


Fig. 3
Anode current I_a and screen grid current I_{g2} as functions of the grid bias V_{g1} at anode voltage V_a and screen grid voltage V_{g2} = 250 V.

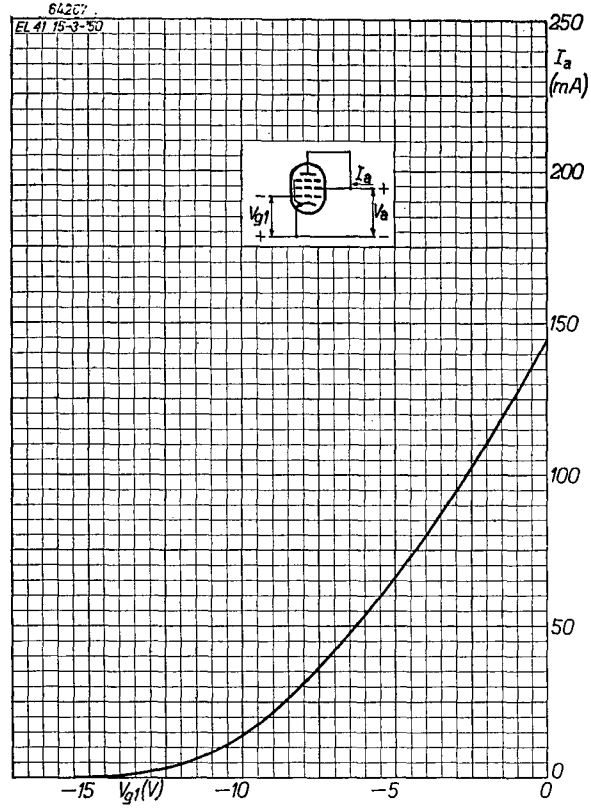


Fig. 4
EL 41 connected as triode (screen grid connected to anode). Anode current I_a (including screen grid current) as a function of the grid bias V_{g1}, for an anode voltage V_a of 250 V.

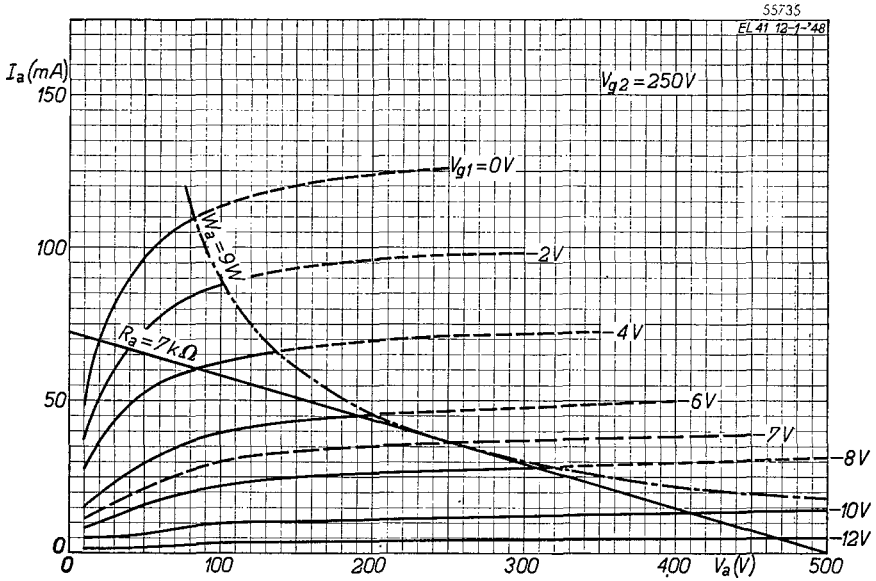


Fig. 5
Anode current I_a as a function of the anode voltage V_a with the grid bias V_{g1} as parameter. Screen grid voltage $V_{g2}=250$ V. The straight characteristic is the load line for an anode resistance R_a of 7 kΩ. The dot-dash curve indicates the maximum permissible anode dissipation ($W_a=9$ W).

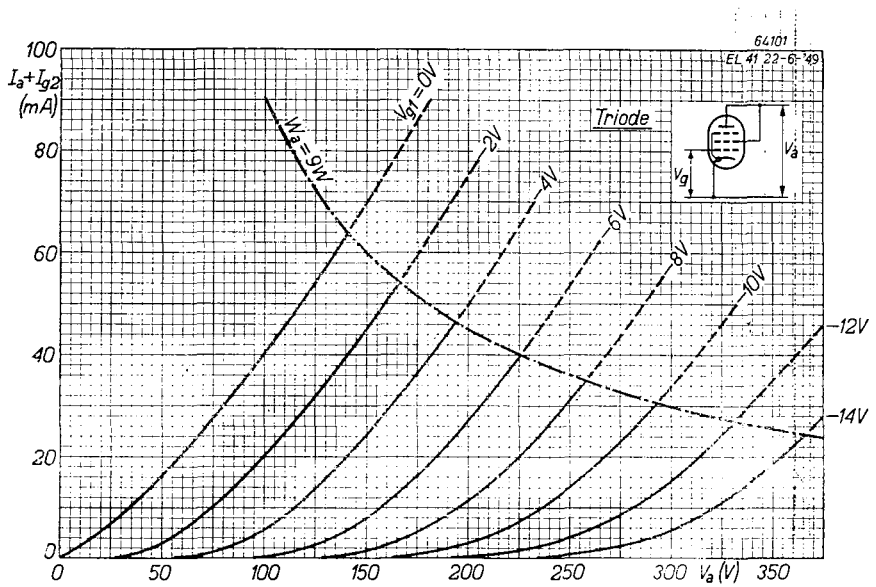


Fig. 6
EL 41 connected as triode (screen grid connected to anode). Anode current I_a (including screen grid current) as function of the anode voltage. The dot-dash curve indicates the maximum per-

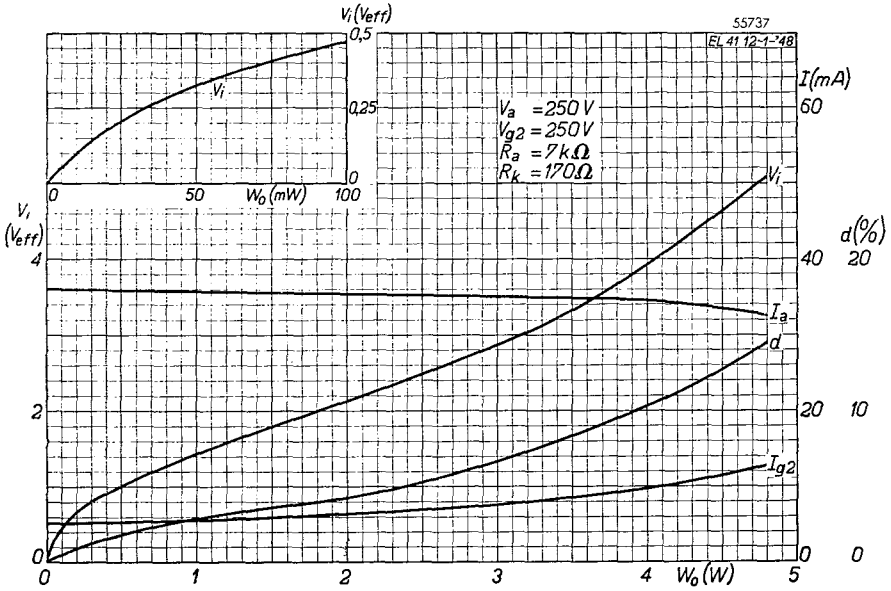


Fig. 7
Anode current I_a, screen grid current I_{g2}, distortion d and required input voltage V_i as functions of the output W_o. Upper-left inset : A.C. input voltage V_i as a function of the power output W_o for low values of W_o.

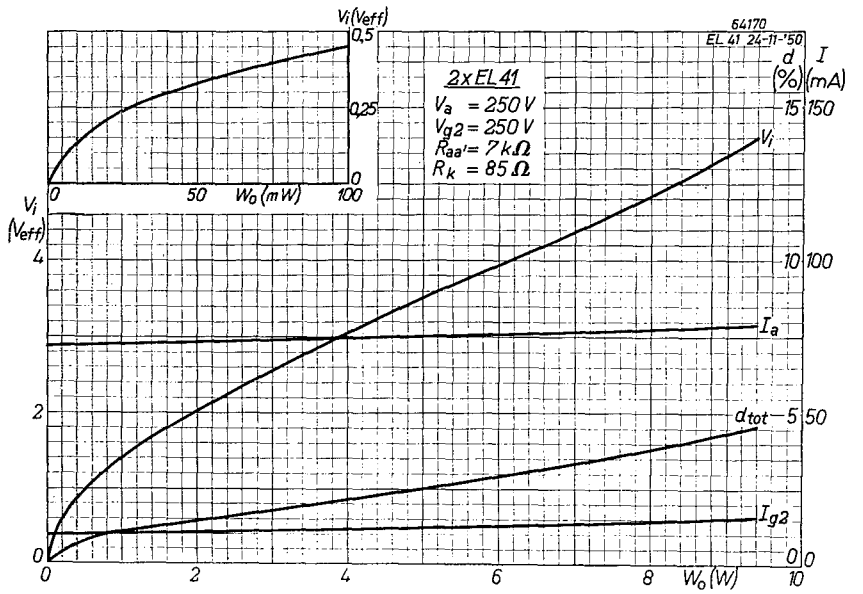


Fig. 8
As Fig. 7, for two EL 41 valves in Class A push-pull. I_a = total anode current, I_{g2} = total screen grid current, V_i = A.C. input voltage.

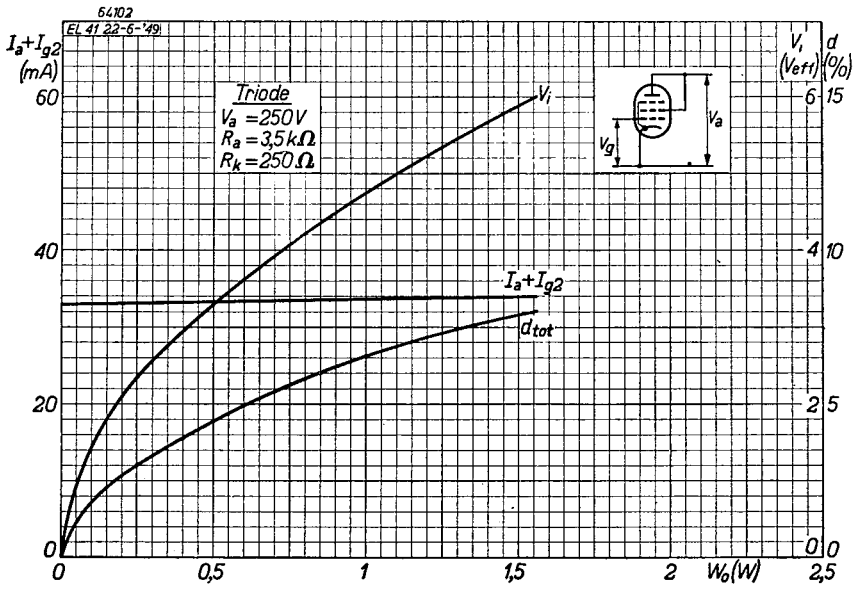


Fig. 9
As Fig. 7, for an EL 41 connected as a triode (screen grid connected to anode).

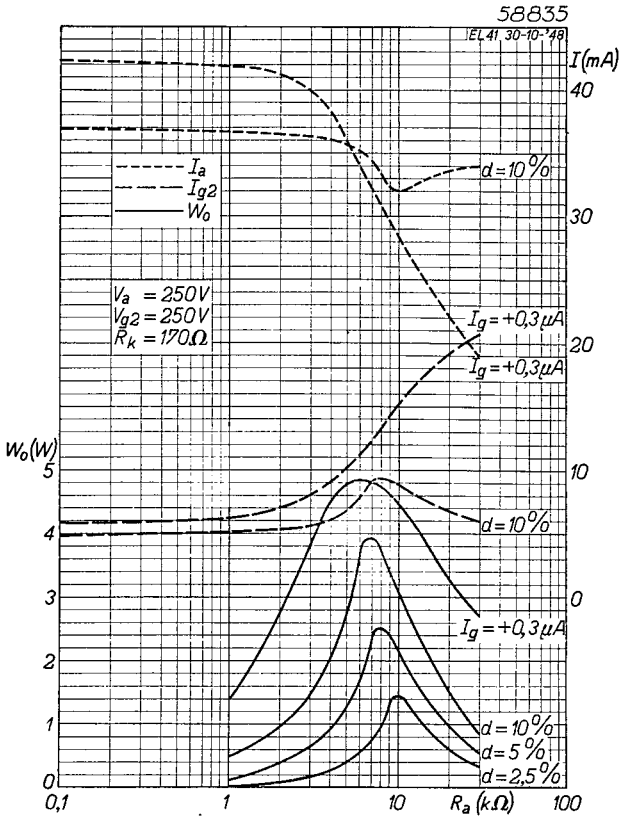


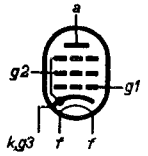
Fig. 10
Output power W_o of the EL 41 with $2\frac{1}{2}$, 5 and 10% distortion and at the grid current starting point (I_{g1} = +0.3 μA), as a function of the anode load resistance (continuous curves). Also the anode current I_a (dotted lines) and screen grid current I_{g2} (long dashes) with 10% distortion and at the grid current starting point (I_{g1} = +0.3 μA), as function of the anode-load resistance R_a.

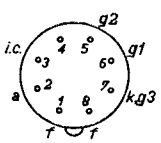
OUTPUT PENTODE for car radio sets
PENTHODE DE SORTIE pour récepteurs autoradio
ENDPENTHODE für Autoempfänger

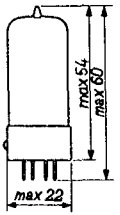
Heating : indirect by D.C. parallel supply
Chauffage: indirect par C.C. alimentation- parallèle
Heizung : indirekt durch Gleichstrom;Parallelspeisung

V_f = 6,3 V
I_f = 0,2 A

Dimensions in mm
Dimensions en mm
Abmessungen in mm







Base, culot, Sockel: Rimlock

Capacitances
Capacités
Kapazitäten

C_{g1} = 4,3 pF
C_a = 6,2 pF
C_{ag1} < 0,2 pF
C_{g1f} < 0,2 pF

Operating characteristics class A
Caractéristiques d'utilisation classe A
Betriebsdaten Klasse A

V_a	=	200	225 V
V_{g2}	=	200	225 V
R_k	=	360	360 Ω
I_a	=	22,5	26 mA
I_{g2}	=	3,5	4,1 mA
S	=	3,2	3,2 mA/V
R_i	=	90	90 kΩ
μ_{g2g1}	=	11	11
$R_{a\sim}$	=	9	9 kΩ
V_i	=	6,8	8 Veff
W_o	=	2,1	2,8 W
d_{tot}	=	11	12 %
$V_i(W_o=50mW)$	=	0,8	0,75 Veff

Operating characteristics class AB
Caractéristiques d'utilisation classe AB
Betriebsdaten-Klasse AB

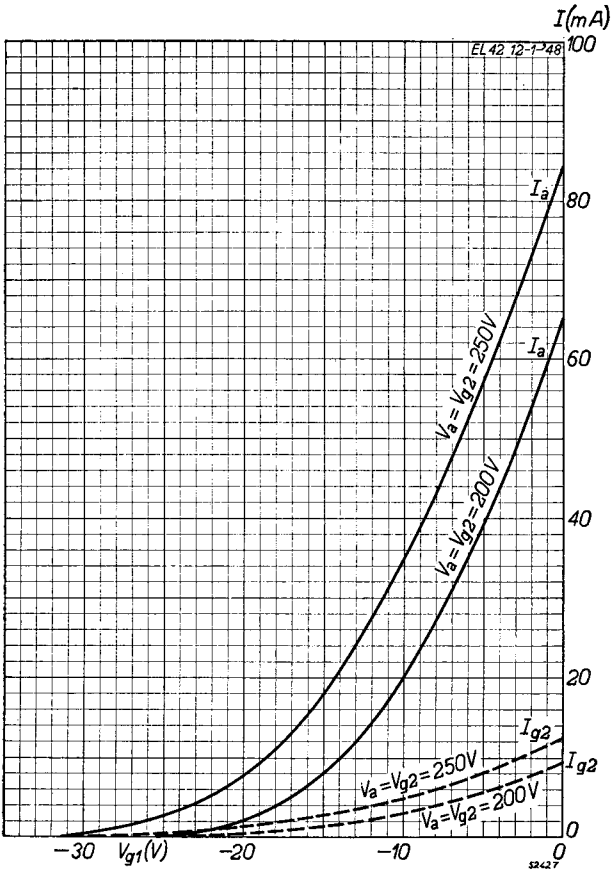
V_a	=		200			250		V
V_{g2}	=		200			250		V
R_k	=		310			310		Ω
$R_{aa\sim}$	=		15			15		kΩ
V_i	=	0	0,75	9,6	0	0,7	12,5	V_{eff}
I_a	=	2x16	-	2x17	2x20	-	2x21,5	mA
I_{g2}	=	2x2,6	-	2x5,6	2x3,2	-	2x6,7	mA
W_o	=	0	0,05	4,1	0	0,05	7	W
d_{tot}	=	-	-	5,5	-	-	5,5	%

Operating characteristics class B
Caractéristiques d'utilisation classe B
Betriebsdaten Klasse B

V_a	=		200			250		V
V_{g2}	=		200			250		V
V_{g1}	=		-17			-22,5		V
$R_{aa\sim}$	=		16			16		kΩ
V_i	=	0	1,5	12	0	1,7	16	V_{eff}
I_a	=	2x5	-	2x16	2x5	-	2x20	mA
I_{g2}	=	2x0,8	-	2x4,6	2x0,8	-	2x6,5	mA
W_o	=	0	0,05	4	0	0,05	6,5	W
d_{tot}	=	-	-	3,5		-	5	%

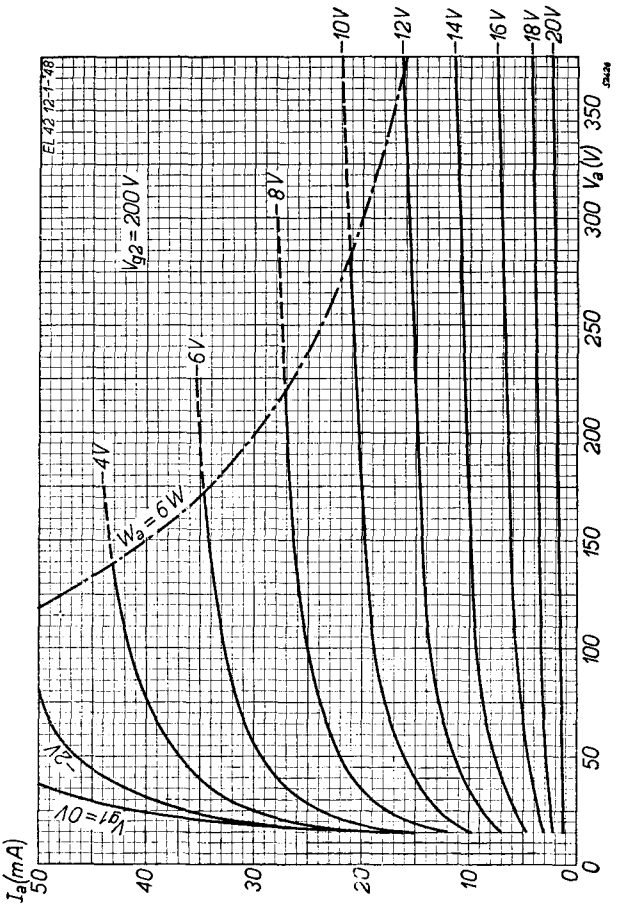
Limiting values
Caractéristiques limites
Grenzdaten

V_{a_o}	= max.	550	V
V_a	= max.	300	V
W_a	= max.	6	W
V_{g2_o}	= max.	550	V
V_{g2}	= max.	300	V
$W_{g2}(V_i=0)$	= max.	1	W
$W_{g2}(W_o=max.)$	= max.	2	W
I_k	= max.	35	mA
$V_{g1}(I_{g1}=+0,3\mu A)$	= max.	-1,3	V
R_{g1}	= max.	2	MΩ
R_{kf}	= max.	20	kΩ
V_{kf}	= max.	100	V


I(mA)
EL42 12-1-48
100
80
60
40
20
0
I_a
I_a
$V_a = V_{g2} = 250V$
$V_a = V_{g2} = 200V$
I_{g2}
I_{g2}
$V_a = V_{g2} = 250V$
$V_a = V_{g2} = 200V$
−30
$V_{g1}(V)$
−20
−10
0
S2427

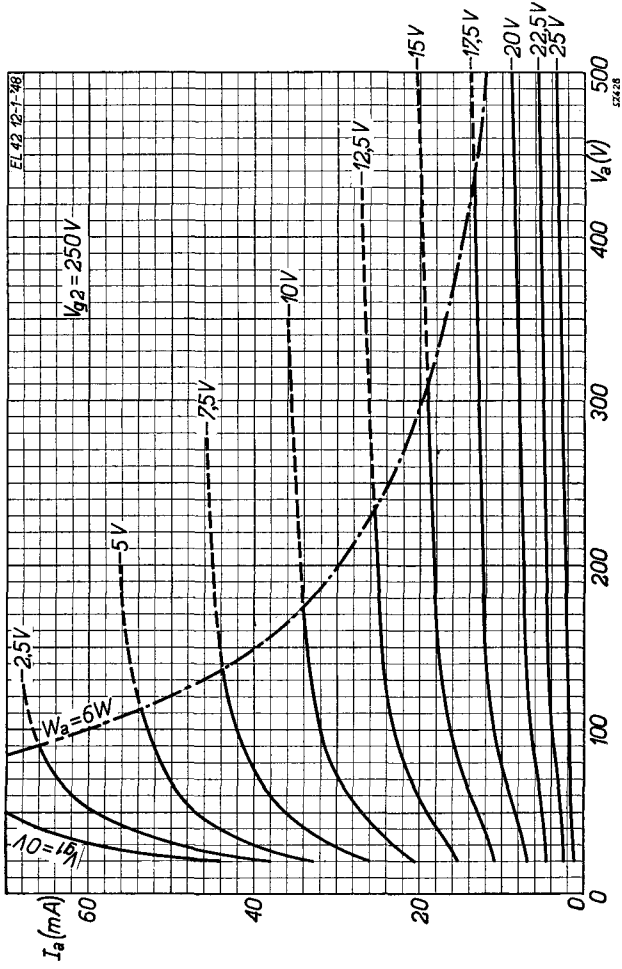
EL 42

PHILIPS

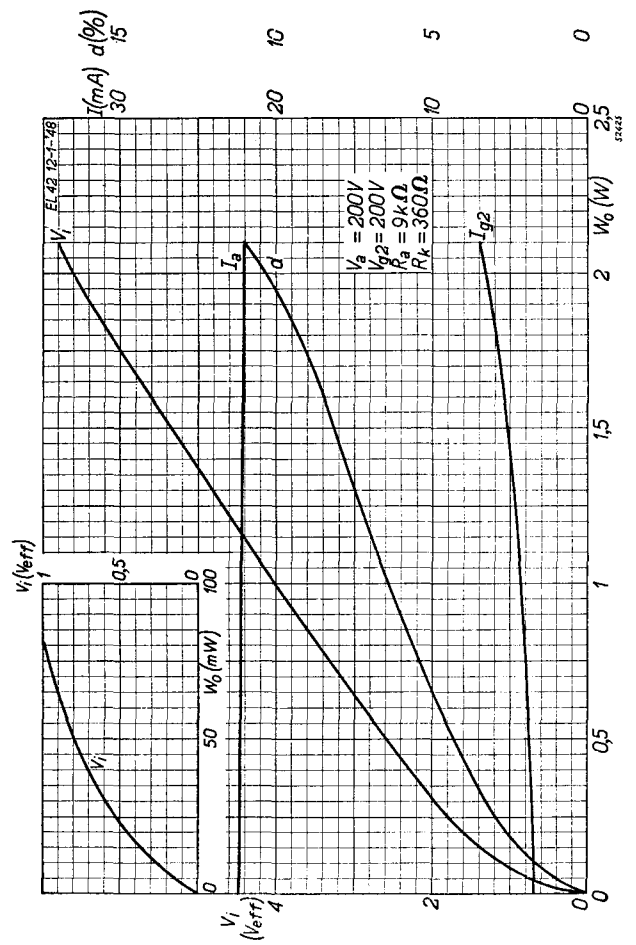


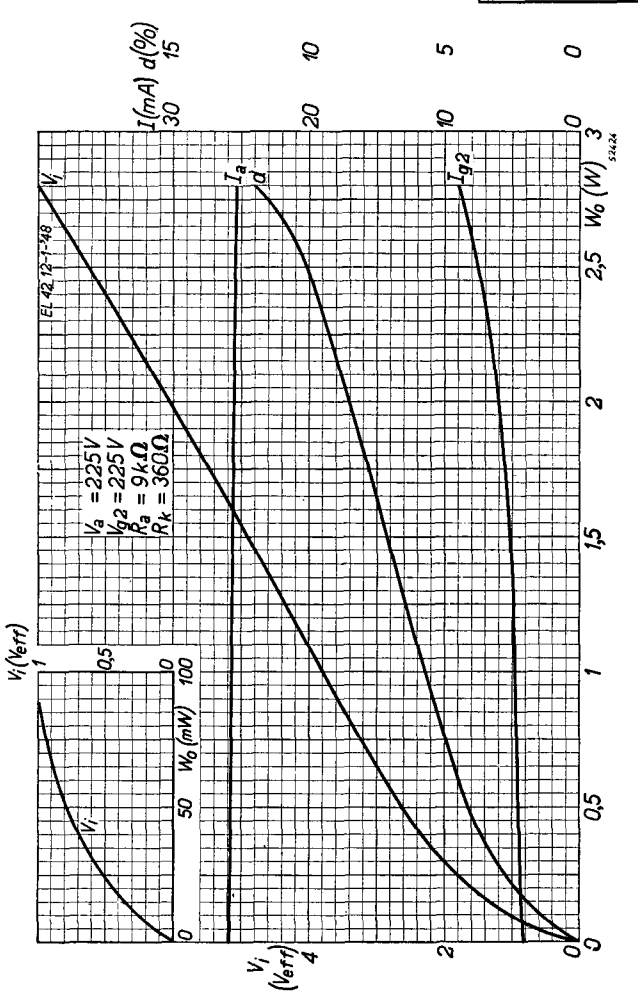
PHILIPS

EL 42



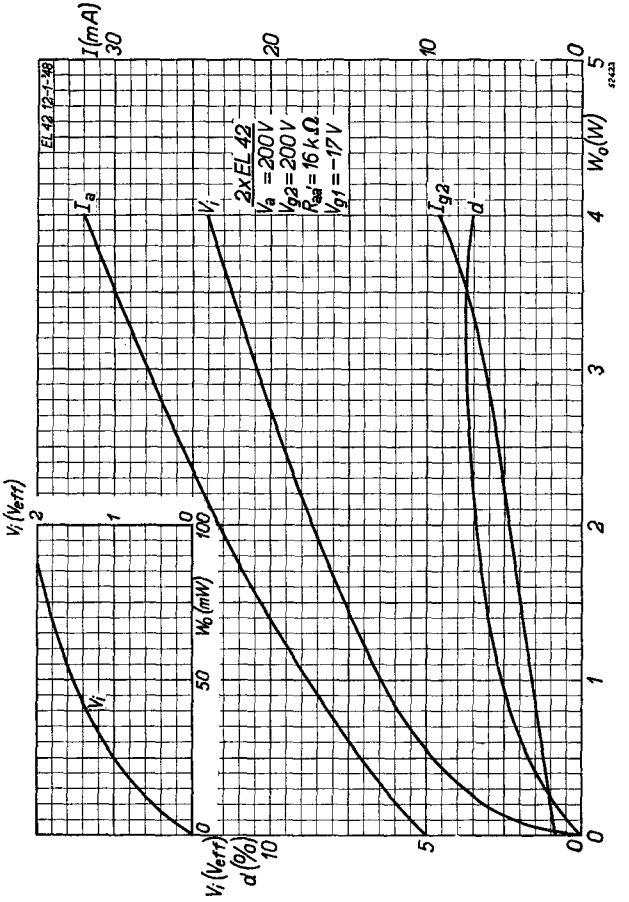
EL 42 PHILIPS




EL 42, 12-1-48
V_a = 225V
V_{g2} = 225V
R_a = 9kΩ
R_K = 360Ω
V_i (Veff)
I_a
d
I_{g2}
W_o (W)
W_o (mW)
51424

EL 42

PHILIPS

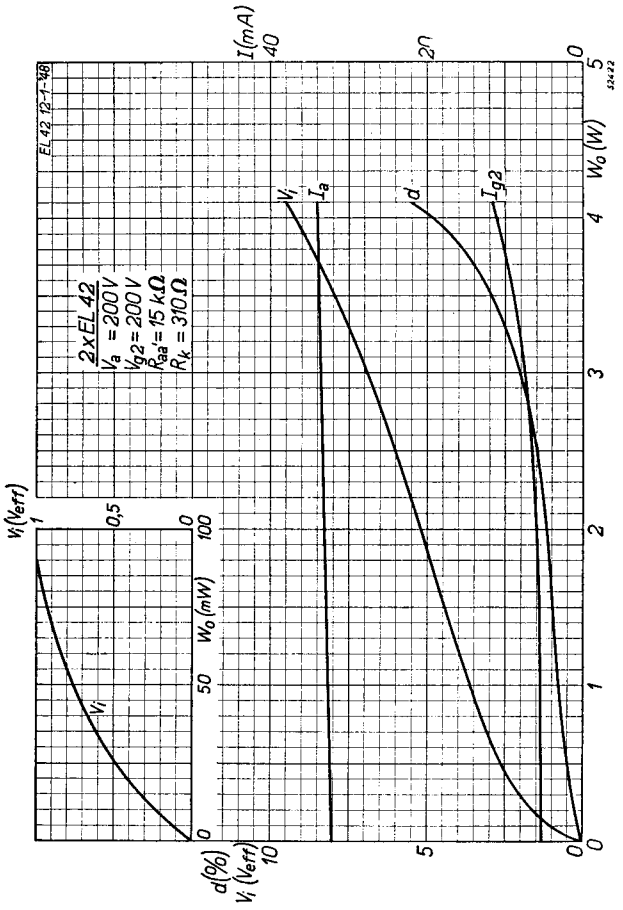


1.3.1948

F

PHILIPS

EL 42

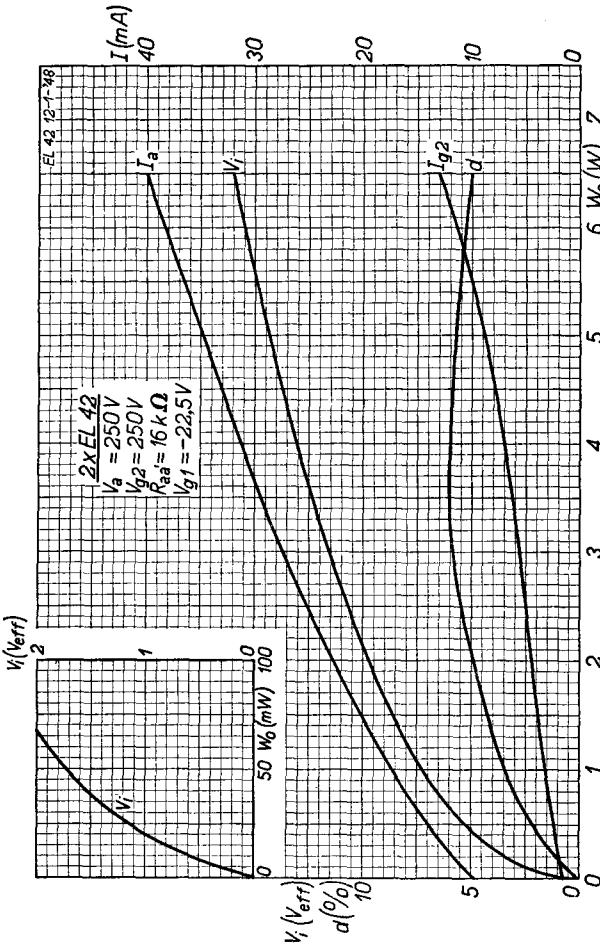


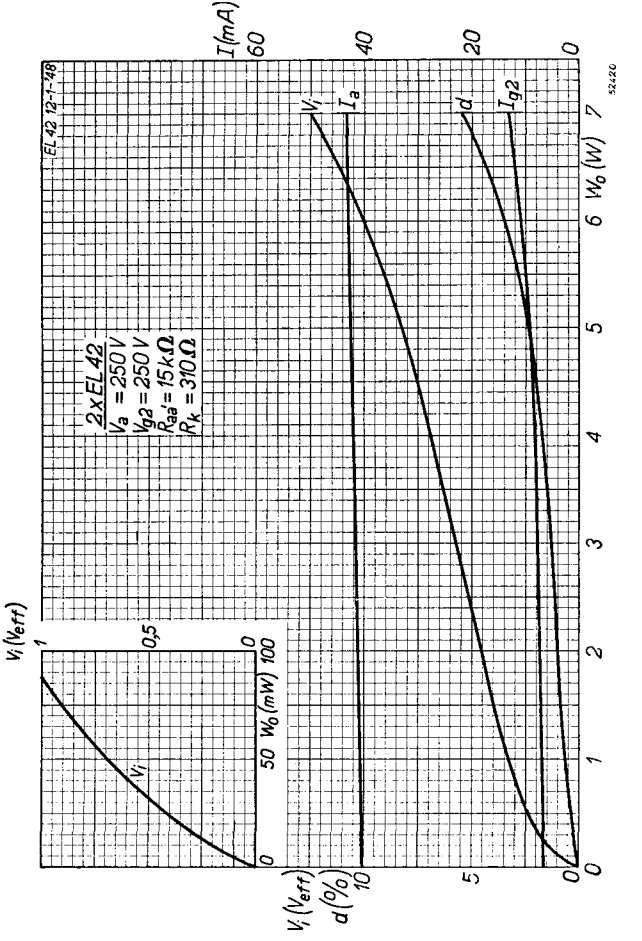
1.3.1948

G

EL 42

PHILIPS




EL 42 12-1-48
2xEL42
V_a = 250 V
V_{g2} = 250 V
R_{aa} = 15 kΩ
R_k = 310 Ω
I(mA)
60
40
20
0
V_i
I_a
d
I_{g2}
W_o (W)
0
1
2
3
4
5
6
7
V_i (V_{eff})
1
0,5
0
V_i
0
50
W_o (mW)
100
V_i (V_{eff})
d (%)
10
5
0
52420

PHILIPS

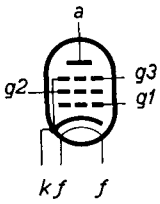
Electronic Tube

HANDBOOK

EL42

page	sheet	date
1	1	1953.11.11
2	2	1953.11.11
3	A	1948.03.01
4	B	1948.03.01
5	C	1948.03.01
6	D	1948.03.01
7	E	1948.03.01
8	F	1948.03.01
9	G	1948.03.01
10	H	1948.03.01
11	I	1948.03.01
12	FP	1999.07.04

EL 5 Endpenthode



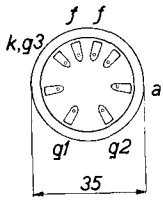


Abb. 2
Elektrodenanordnung und Sockelanschlüsse.

Die Endpenthode EL 5 ist eine 18-Watt-Endröhre mit großer Steilheit. Interessant ist eine 18-Watt-Endpenthode vor allem, weil sie die Möglichkeit bietet, auf billigerem Wege als mit zwei 9-Watt-Penthoden in Gegentakt eine größere Ausgangsleistung zu erreichen. Durch Anwendung einer niederfrequenten Gegenkopplung können die linearen und nichtlinearen Verzerrungen wesentlich verbessert werden.

Zwei 18-Watt-Endpenthoden in Gegentakt gestatten eine Ausgangsleistung von 20 Watt, so daß die Möglichkeit vorliegt, Dynamikexpansion erfolgreich anzuwenden.

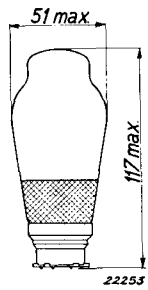


Abb. 1
Abmessungen in mm.

Die mit Sorgfalt gewählte Form und die Abmessungen des dritten Gitters haben zur Folge, daß die obere Krümmung der dynamischen I_a/V_{g1}-Kennlinie sehr günstig ist; die Anodenspannung kann bei Aussteuerung bis auf sehr niedrige Werte sinken. Dies hat zur Folge, daß die Verzerrung bei 9 Watt Ausgangsleistung sehr günstig ist, nämlich bei automatischer Gittervorspannung etwa 10 %, während die Verzerrung bei kleinerer Ausgangsleistung sehr wenig dritte Harmonische enthält. Auf diese Weise werden dieselben Vorteile wie mit einer Tetrode erzielt, ohne dafür den Nachteil der meisten Tetroden aufzuweisen, daß die abgegebene Leistung bei einer bestimmten Verzerrung bei größeren Werten des Belastungswiderstandes als dem normalen sehr rasch abnimmt.

Weil die Röhre eine Schirmgitterspannung von 275 Volt zuläßt, kann bei 250 Volt Anodenspannung und 275 Volt Schirmgitterspannung ein Spannungsverlust von z.B. 25 Volt im Ausgangstransformator durch eine höhere Spannung der Speisungsquelle kompensiert werden, ohne daß es notwendig ist, das Schirmgitter über einen Serienwiderstand zu speisen. Hierdurch kann die maximale Ausgangsleistung von 9 W praktisch verwirklicht werden.

HEIZDATEN

Heizung: indirekt durch Wechselstrom, Parallelspeisung.

Heizspannung . . . . . V_f = 6,3 V
Heizstrom . . . . . I_f = 1,3 A

KAPAZITÄTEN

Grenzwert der Gitteranodenkapazität
C_{ag1} = max. 0,8 µµF

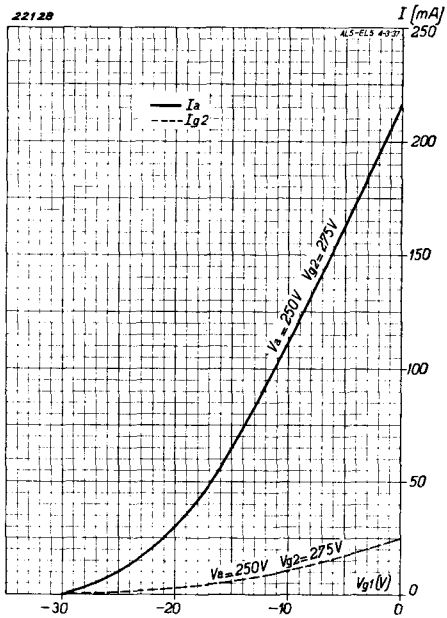


Abb. 3
Anodenstrom und Schirmgitterstrom als Funktion der negativen Gitterspannung bei V_a = 250 V und V_{g_2} = 275 V.

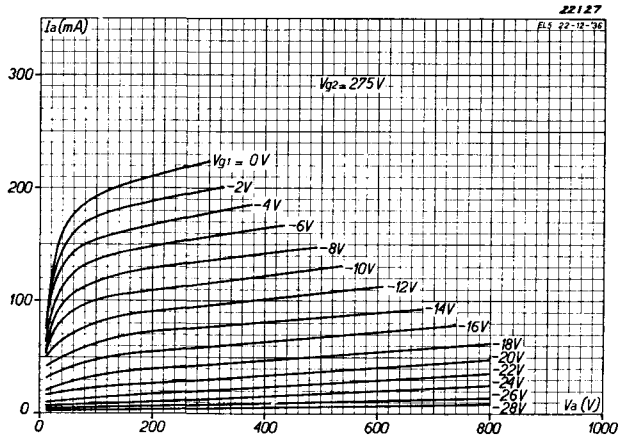


Abb. 4
Anodenstrom als Funktion der Anodenspannung bei V_{g_2} = 275 Volt und bei verschiedenen negativen Gitterspannungen.

BETRIEBSDATEN

ANWENDUNG ALS ENDVERSTÄRKER (EINE RÖHRE)

Anodenspannung	V_a	= 250 V
Schirmgitterspannung	V_{g2}	= 275 V
Kathodenwiderstand	R_k	= 175 Ω
Neg. Gittervorspannung	V_{g1}	= −14 V
Anodenstrom	I_a	= 72 mA
Schirmgitterstrom	I_{g2}	= 7 mA
Normale Steilheit	S	= 8,5 mA/V
Normaler Innenwiderstand	R_i	= 22.000 Ω
Günstigster Anpassungswiderstand	R_a	= 3500 Ω
Ausgangsleistung	W_o	= 8,8 W
Gitterwechselsp. bei 10 % Verzerrung	V_i	= 8,2 $V_{(eff)}$
Empfindlichkeit	$V_{i(50\ mW)}$	= 0,5 $V_{(eff)}$

ANWENDUNG ALS GEGENTAKT-ENDVERSTÄRKER (ZWEI RÖHREN) MIT AUTOMATISCHER GITTERVORSPANNUNG.

Anodenspannung	V_a	= 250 V
Schirmgitterspannung	V_{g2}	= 275 V
Kathodenwiderstand	R_k	= 120 Ω
Anodenruhestrom	I_{ao}	= 2 × 58 mA
Anodenstrom bei voller Aussteuerung bis zum Gitterstrom	$I_{a\ max}$	= 2 × 65 mA
Schirmgitterruhestrom	I_{g2o}	= 2 × 6,25 mA
Schirmgitterstrom bei voller Aussteuerung	$I_{g2\ max}$	= 2 × 10,5 mA
Günstigster Anpassungswiderstand zwischen den beiden Anoden	R_a	= 4500 Ω
Maximale Ausgangsleistung	$W_{o\ max}$	= 19,5 W
Gesamtverzerrung	d_{tot}	= 5,1 %

GRENZDATEN

V_{ao}	= max. 550 V	I_k	= max. 90 mA
V_a	= max. 250 V	V_{g1} (I_{g1} = 0,3 µA)	= max. −1,3 V
W_a	= max. 18 W	R_{g1k} (aut. Vorsp.)	= max. 0,7 MΩ
V_{g2o}	= max. 550 V	R_{fk}	= max. 5000 Ω
V_{g2}	= max. 275 V	V_{fk}	= max. 50 V
W_{g2}	= max. 3 W		

EL 5

A. EINFACHE ENDVERSTÄRKUNG (EINE RÖHRE).

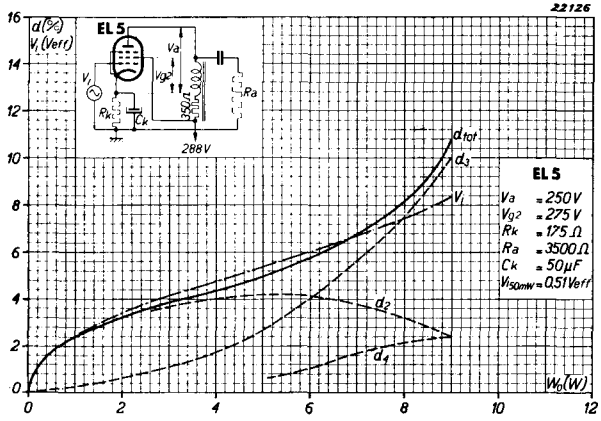


Abb. 5
Gitterwechselspannungsbedarf, Gesamtverzerrung und in ihre Komponenten zerlegte Verzerrung als Funktion der Ausgangsleistung bei Verwendung der EL 5 als einfacher Endverstärker mit normaler Anodenspannung, einer Anpassung von 3500 Ω und überbrücktem Kathodenwiderstand.

Im allgemeinen ist es nicht zu empfehlen, die EL 5 direkt hinter eine Diode zu schalten.
In den Abbildungen 5 und 6 sind die Gitterwechselspannung und die Verzerrung für die EL 5 bei Va = 250 Volt, $Vg2$ = 275 Volt und Rk = 175 Ohm entsprechend einem Anodenstrom von 72 mA als Funktion der Ausgangsleistung aufgetragen. Abbildung 5 gilt für einen Belastungswiderstand von 3500 Ohm, und Abbildung 6 stellt die genannte Funktion bei einem Belastungswiderstand von 2500 Ohm dar.
Aus diesen Abbildungen folgt, daß bei 2500 Ohm Belastung die dritte Harmonische bedeutend geringer als bei 3500 Ohm ist, so daß in Fällen, wo dies von Bedeutung ist, die Anwendung eines Belastungswiderstandes von 2500 Ohm den Vorzug verdient.
Als Vorverstärker für die EL 5 kommen die EF 6 und die EBC 3 in Betracht. Die Kombination EF 6 + EL 5 ergibt praktisch dieselbe Verzerrungskurve wie die EL 5 allein. Für die Kombination EBC 3 + EL 5 liegt die Verzerrungskurve für eine kleinere Ausgangsleistung als $^3/_4$ der maximalen Leistung etwa 10 % niedriger. Diese geringere Verzerrung ist eine Folge der teilweisen Kompensation der zweiten Harmonischen der EL 5 durch diejenige der EBC 3.
Infolge ihrer großen Steilheit ist die EL 5 besonders für niederfrequente Rückkopplung zur Verringerung der Verzerrung geeignet.
Für die Anwendung einer etwa 10fachen Rückkopplung ist das Resultat in Abbildung 7 dargestellt. Hier wurde die EF 6 als Vorverstärkerröhre benutzt, während die Rückkopplung über beide Röhren erfolgt.

B. GEGENTAKT-ENDVERSTÄRKUNG (ZWEI RÖHREN)

Wenn eine größere Ausgangsleistung oder eine kleinere Verzerrung erwünscht ist, können vorteilhaft zwei Röhren EL 5 in Gegentakt benutzt werden. Bei einer Anodenspannung von 250 Volt und einer Schirmgitterspannung von 275 V muß der gemeinschaftliche

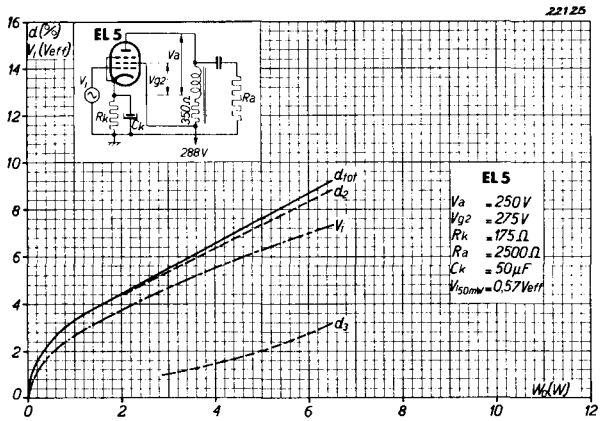


Abb. 6
Gitterwechselspannungsbedarf, Gesamtverzerrung und in ihre Komponenten zerlegte Verzerrung als Funktion der Ausgangsleistung bei Verwendung der EL 5 mit normaler Anodenspannung, einer Anpassung von 2500 Ω und überbrücktem Kathodenwiderstand.

Kathodenwiderstand 120 Ω betragen. Zur Vermeidung einer großen Verzerrung muß dieser Widerstand durch einen ausreichenden Kondensator (25 bis 50 μF) für N.F. überbrückt werden. Die voll ausgezogene Linie der Abbildung 8 zeigt für diese Anwendung und einen Belastungswiderstand von 4500 Ω (zwischen den beiden Anoden gerechnet) die Verzerrung als Funktion der Ausgangsleistung. Die Verzerrung besteht nur aus der dritten Harmonischen.

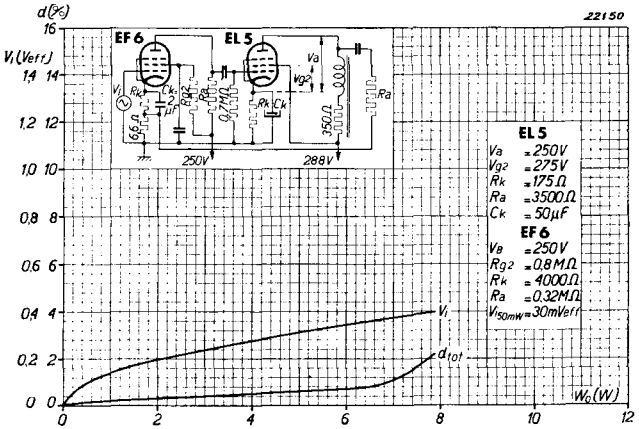


Abb. 7
Gitterwechselspannungsbedarf *Vi* und Gesamtverzerrung d_{tot} als Funktion der Ausgangsleistung bei Verwendung der EL 5 mit dem Vorverstärker EF 6 und mit niederfrequenter Rückkopplung auf die Vorverstärkerröhre.

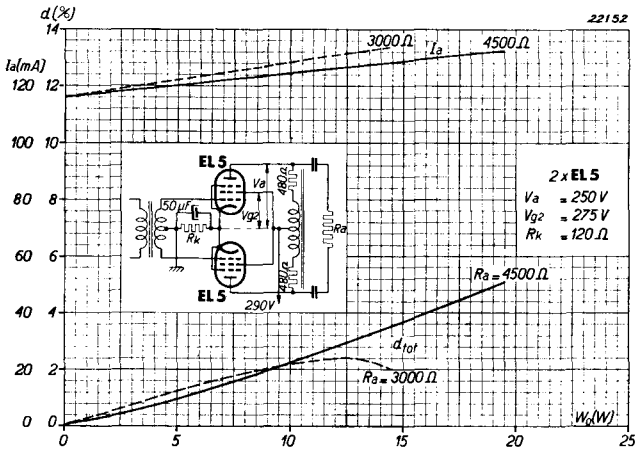
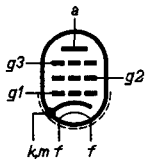


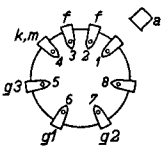
Abb. 8
Anodenstrom und Gesamtverzerrung als Funktion der Ausgangsleistung bei Verwendung von zwei Röhren EL 5 in Gegentakt ohne Gitterstrom mit normaler Anodenspannung und bei einer Anpassungsimpedanz von 3000 und 4500 Ω zwischen den Anoden.

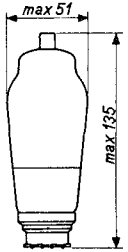
OUTPUT PENTODE
PENTHODE DE SORTIE
ENDPENTHODE

Heating : indirect by A.C.; parallel supply
Chauffage: indirect par C.A.; alimentation en parallèle — Vf = 6,3 V, If = 1,35 A
Heizung : indirekt durch Wechselstrom; Parallelspeisung

Dimensions in mm
Dimensions en mm
Abmessungen in mm







Capacities
Capacités
Kapazitäten

Cagl < 0,8 pF

Operating conditions class B
Caractéristiques d'utilisation classe B
Betriebsdaten Klasse B

Raa'	=		18		kΩ
Rg2	=		0,5		kΩ
Vgl	=		-40		V
Vg3	=		0		V
Vi	=	0	28	28	V_{eff}
Vb_a	=	800	800	750	V
Va	=	795	775	725	V
Vb_{g2}	=	400	400	375	V
Ia	=	2x15	2x70	2x64	mA
Ig2	=	2x1	2x24	2x21	mA
Wo	=	0	80	68	W
d_{tot}	=	-	10	8	%

Limiting values
Caractéristiques limites
Grenzdaten

Va_o	= max.	1600	V
Va	= max.	800	V
Wa	= max.	18	W
$Vg2_o$	= max.	1000	V
Vg2	= max.	425	V
Wg2 (Vi = 0)	= max.	3	W
Wg2 (Wo = max.)	= max.	10	W
Ik	= max.	120	mA
Vgl (Igl = +0,3 µA)	= max.	-1,3	V
Rgl (B)	= max.	0,5	MΩ
Vfk	= max.	50	V
Rfk	= max.	20	kΩ

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Electronic Tube

HANDBOOK

EL50

page	sheet	date
1	1	1958.09.15
2	2	1958.09.15
3	FP	1999.07.04

LINE OUTPUT PENTODE

Beam pentode intended for use as line output tube in television receivers.

HEATING: Indirect by A.C. or D.C.; parallel supply

Heater voltage	V_f	6.3 V
Heater current	I_f	1.38 A

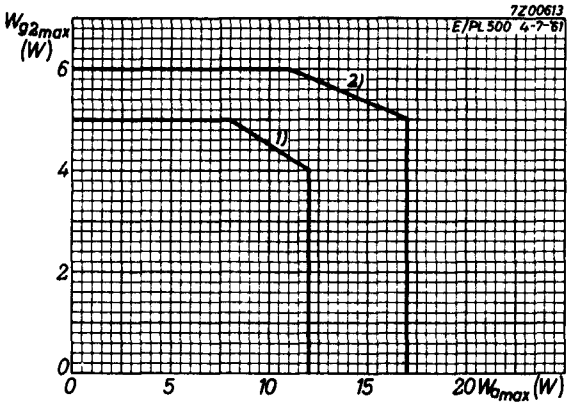
LIMITING VALUES (Design centre rating system)

Cathode to heater voltage

DC + peak, k positive	V_{kf}	max. 200	V
k negative	$-V_{kf}$	max. 200	V [3]

Anode dissipation

Grid No.2 dissipation — See graph below



1) Design centre limits for W_a and W_{g_2}.
2) These limits for W_a and W_{g_2} should not be exceeded with a nominal tube operating in a normal line deflection circuit under the worst probable conditions.
3) D.C. component max. 100 V.

For further data and curves of this type please refer to type PL 504

PHILIPS

Data handbook

Electronic components and materials

EL500

page	sheet	date
1	1	1969.01
2	FP	1999.03.19

A.F. OUTPUT PENTODE

Beam pentode intended for use as A.F. power amplifier.

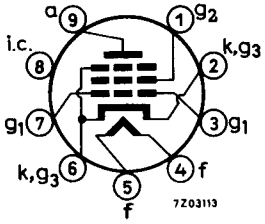
QUICK REFERENCE DATA			
Anode current	I_a	110	mA
Transconductance	S	23	mA/V
Amplification factor	$\mu_{g_2g_1}$	13	
Output power (class AB)	W_o	40	W

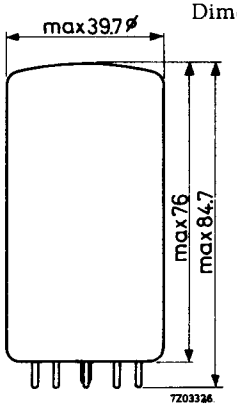
HEATING: Indirect by A.C. or D.C.; parallel supply

Heater voltage	V_f	6.3 V
Heater current	I_f	1.05 A

DIMENSIONS AND CONNECTIONS Dimensions in mm

Base: Magnoval





CAPACITANCES

Anode to all except grid No.1	$C_{a(g_1)}$	13.5	pF
Grid No.1 to all except anode	$C_{g_1(a)}$	22.5	pF
Anode to grid No.1	C_{ag_1}	1.7	pF
Grid No.1 to heater	C_{g_1f}	0.325	pF

TYPICAL CHARACTERISTICS

Anode voltage	V_a	250	V
Grid No.2 voltage	V_{g_2}	250	V
Grid No.1 voltage	V_{g_1}	14.0	V
Anode current	I_a	110	mA
Grid No.2 current	I_{g_2}	7.0	mA
Transconductance	S	23	mA/V
Amplification factor	$\mu_{g_2g_1}$	13	
Internal resistance	R_i	5.4	kΩ

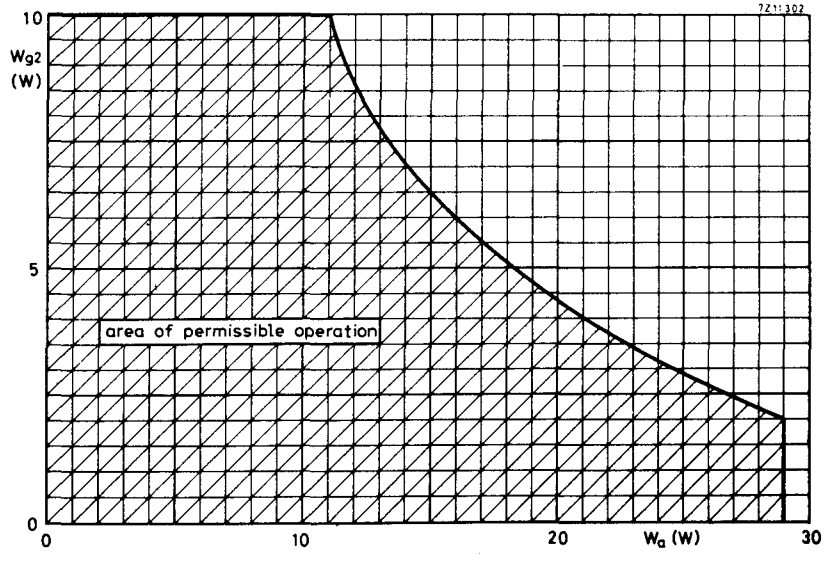
OPERATING CHARACTERISTICS

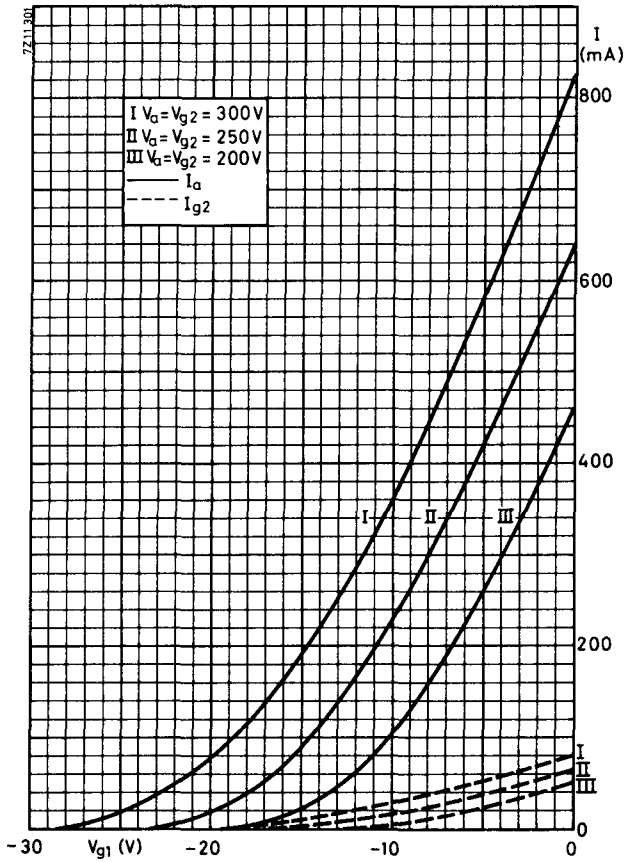
Class AB, two tubes in push-pull

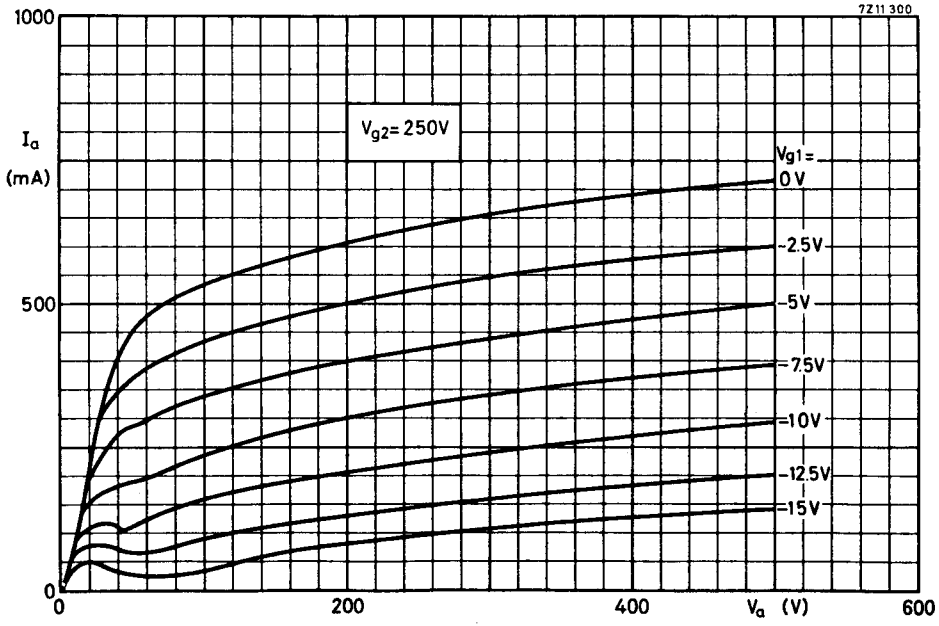
Anode supply voltage	V_{ba}	265		V
Grid No.2 supply voltage	V_{bg_2}	265		V
Common cathode resistor	R_k	56		Ω
Load resistance	$R_{aa\sim}$	2.4		kΩ
Grid No.1 driving voltage	V_i	0	12.2	V_{RMS}
Anode current	I_a	2x115	2x125	mA
Grid No.2 current	I_{g_2}	2x7.5	2x35.0	mA
Output power	W_o	0	40	W
Distortion	d_{tot}	-	5	%

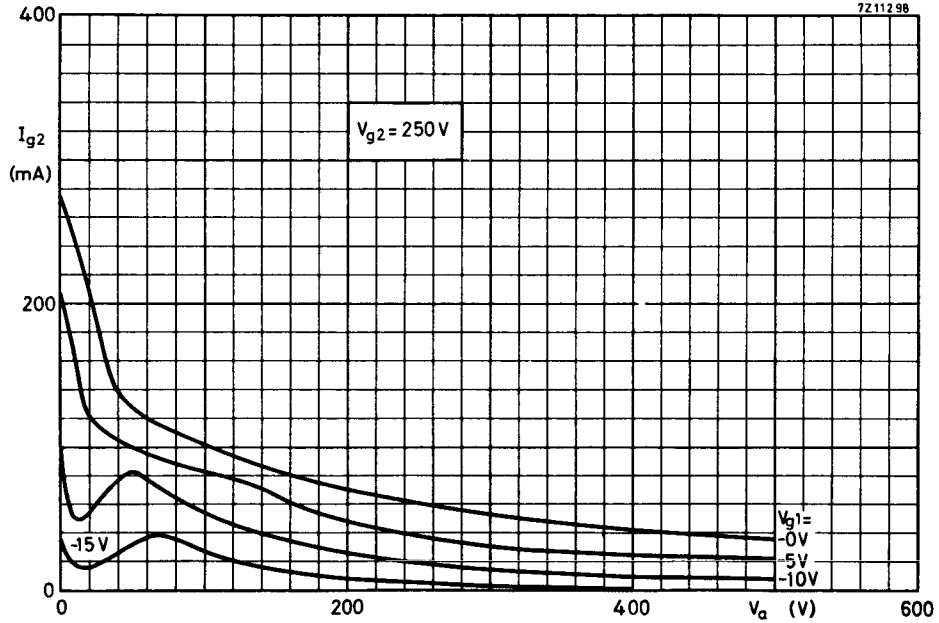
LIMITING VALUES (Design centre rating system)

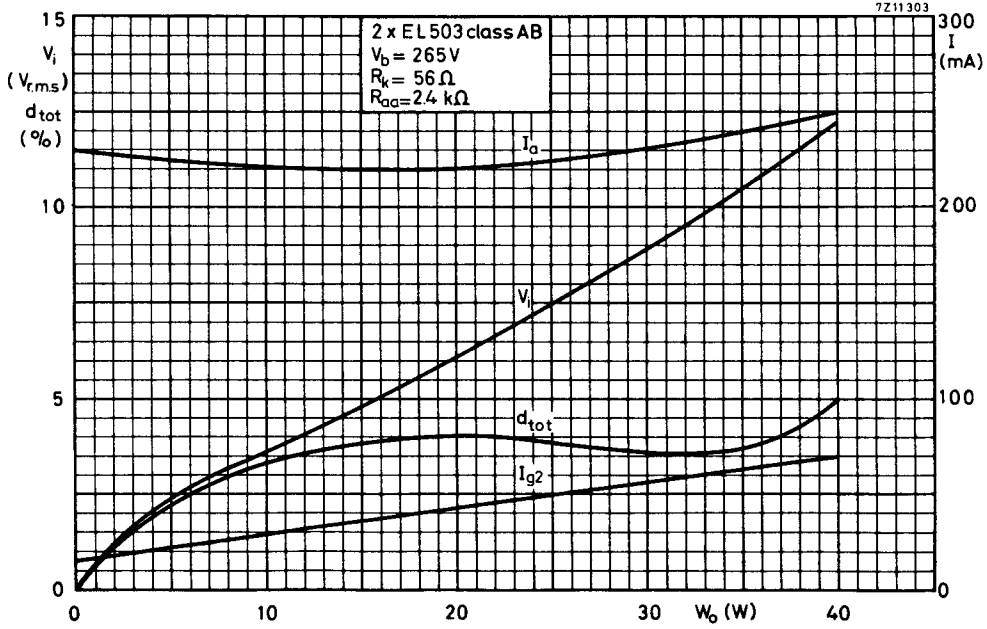
Anode voltage	V_{a_o}	max. 550	V
	V_a	max. 300	V
Grid No.2 voltage	$V_{g_{2o}}$	max. 550	V
	V_{g_2}	max. 300	V
Anode dissipation	W_a	see below	
Grid No.2 dissipation			
average	W_{g_2}	see below	
peak	$W_{g_{2p}}$	see below	
Cathode current	I_k	max. 200	mA
Grid No.1 resistor, automatic bias	R_{g_1}	max. 0.5	MΩ
Cathode to heater voltage	V_{kf}	max. 100	V




7Z11301
I
(mA)
800
600
400
200
0
I Va=Vg2 = 300V
II Va=Vg2 = 250V
III Va=Vg2 = 200V
Ia
Ig2
I
II
III
-30
Vg1 (V)
-20
-10
0


7Z11300
1000
500
0
I_a
(mA)
V_{g2}= 250V
V_{g1}=
0V
-2.5V
-5V
-7.5V
-10V
-12.5V
-15V
0
200
400
V_a (V)
600


7Z11298
400
200
0
I_{g2}
(mA)
V_{g2} = 250V
-15V
V_{g1}=
-0V
-5V
-10V
0
200
400
V_a (V)
600


7Z11303
2 x EL503 class AB
V_b = 265 V
R_k = 56 Ω
R_{aa} = 2.4 kΩ
15
V_i
($V_{r.m.s.}$)
d_{tot}
(%)
10
5
0
300
I
(mA)
200
100
0
I_a
V_i
d_{tot}
I_{g2}
0
10
20
30
W_o (W)
40

PHILIPS

Data handbook

Electronic components and materials

EL503

page	sheet	date
1	1	1970.08
2	2	1970.08
3	3	1970.08
4	4	1970.08
5	5	1972.01
6	6	1972.01
7	FP	1999.02.20

LINE OUTPUT PENTODE

Beam pentode intended for use as line output tube in television receivers.

HEATING: Indirect by A.C. or D.C.; parallel supply

Heater voltage	V_f	6.3	V
Heater current	I_f	1.38	A

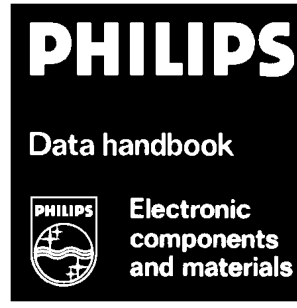
LIMITING VALUES (Design centre rating system)

Cathode to heater voltage,

DC + peak, k positive	V_{kf}	max.	200	V
k negative	$-V_{kf}$		200	V [1])

For further data and curves of this type please refer to type PL 504

[1]) DC component max. 100 V.



EL504

page	sheet	date
1	1	1969.01
2	FP	1999.03.19

FRAME OUTPUT PENTODE

Pentode intended for use as frame output amplifier in colour television receivers.

HEATING: Indirect by A.C. or D.C.; parallel supply

Heater voltage	V_f	6.3	V
Heater current	I_f	825	mA

LIMITING VALUES (Design centre rating system)

Cathode to heater voltage	V_{kf}	max.	100	V

For further data of this type please refer to type PL508

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Data handbook

Electronic components and materials

EL508

page	sheet	date
1	1	1970.01
2	FP	1999.06.06

LINE OUTPUT PENTODE

Output pentode intended for colour TV line deflection circuits.

HEATING: Indirect by A.C. or D.C.; parallel supply

Heater voltage	V_f	6.3	V
Heater voltage	I_f	2	A

LIMITING VALUES (Design centre rating system)

Cathode to heater voltage,

DC + peak, k positive	V_{kf}	max. 200	V
k negative	$-V_{kf}$	max. 200	V [1])

For further data and curves of this type please refer to type PL 509

[1]) DC component max. 100 V.

PHILIPS

Data handbook

Electronic components and materials

EL509

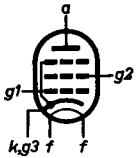
page	sheet	date
1	1	1969.01
2	FP	1999.03.19

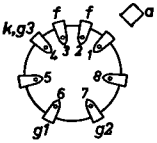
OUTPUT PENTODE
PENTHODE DE SORTIE
ENDPENTODE

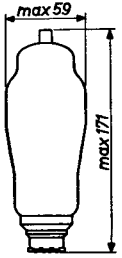
Heating: indirect by A.C. or D.C.; parallel supply
Chauffage: indirect par C.A. ou C.C.; alimentation en parallèle
Heizung: indirekt durch Wechsel- oder Gleichstrom; Parallelspeisung

V_f = 6,3 V
I_f = 1,9 A

Dimensions in mm
Dimensions en mm
Abmessungen in mm







Base, culot, Sockel: P

Capacitances
Capacités
Kapazitäten

C_{ag1} < 1,5 pF

Typical characteristics
Caractéristiques types
Kenndaten

V_a	=	500	750	V
V_{g2}	=	500	750	V
V_{g1}	=	-20	-37,5	V
I_a	=	87	60	mA
I_{g2}	=	13	10	mA
S	=	11	8	mA/V
μ_{g2g1}	=	16,5	16,5	-
R_i	=	33	50	kΩ

Operating characteristics
Caractéristiques d'utilisation
Betriebsdaten

		class B classe B Klasse B		class AB classe AB Klasse AB		
V_a	=	750		500		V
V_{g2}	=	750		500		V
V_{g1}	=	-40		-		V
R_k	=	-		100		Ω
R_{aa}	=	6		4,8		kΩ
R_{g2}	=	[1]		-		-
V_i	=	0	28,5	0	19	V_{eff}
I_a	=	2x40	2x145	2x87	2x110	mA
I_{g2}	=	2x7,5	2x30	2x13	2x23	mA
W_o	=	0	140	0	67,5	W
d_{tot}	=	-	5	-	5	%

Limiting values
Caractéristiques limites
Grenzdaten

V_{ao}	= max.	1500	V
V_a	= max.	750	V
W_a	= max.	45	W
V_{g2o}	= max.	1500	V
V_{g2}	= max.	750	V
W_{g2} (V_i = 0)	= max.	7	W
W_{g2} (W_o = max.)	= max.	25	W
I_k	= max.	200	mA
V_{g1} (I_{g1}=+0,3 µA)	= max.	-1,3	V
R_{g1} (A, B)	= max.	0,35	MΩ
R_{g1} (AB)	= max.	0,7	MΩ
V_{fk}	= max.	50	V
R_{fk}	= max.	20	kΩ

---

[1]) Incandescent lamp of 550 V/68 W
Lampe à incandescence de 550 V/68 W
Glühlampe von 550 V/68 W

PHILIPS

Electronic Tube

HANDBOOK

EL51

page	sheet	date
1	1	1953.04.04
2	2	1953.04.04
3	FP	1999.07.04

LINE OUTPUT PENTODE

Output pentode intended for colour TV line deflection circuits.

HEATING: Indirect by A.C. or D.C.; parallel supply

Heater voltage	V_f	6.3	V
Heater voltage	I_f	2	A

LIMITING VALUES (Design centre rating system)

Cathode to heater voltage,

DC + peak, k positive	V_{kf}	max.	200	V
k negative	$-V_{kf}$	max.	200	V [1]

For further data and curves of this type please refer to type PL519

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[1]) DC component max. 100 V.

PHILIPS

Data handbook

Electronic components and materials

EL519

page	sheet	date
1	1	1972.01
2	FP	1999.02.24

EL 6 Endpenthode

Die EL 6 ist eine indirekt geheizte 18-Watt-Endpenthode mit sehr großer Steilheit. Sie entstand aus dem Bedürfnis nach einer größeren Endröhre, die bei voller Aussteuerung ungefähr denselben Gitterwechselspannungsbedarf wie die EL 3 hat. Hierdurch wird der Vorteil geboten, daß Geräte mit 9- oder 18-Watt-Endstufen, mit Ausnahme des Gleichrichters, auf dieselbe Weise entwickelt werden können. Die EL 6 hat im Arbeitspunkt die außerordentlich hohe Steilheit von 14,5 mA/V. Sie ergibt bei 10 % Verzerrung eine Ausgangsleistung von 8,2 Watt. Der Gitterwechselspannungsbedarf beträgt bei dieser Ausgangsleistung nur 4,8 $V_{(eff)}$, und die Empfindlichkeit (bei 50 Milliwatt Ausgangsleistung) ist 0,3 $V_{(eff)}$.

In Gegentaktstufen kann diese Röhre ebenfalls Verwendung finden, obwohl die maximale Ausgangsleistung nicht so groß ist wie bei Verwendung von zwei Röhren EL 5. Die EL 6 bietet aber dafür den Vorteil einer viel größeren Steilheit. Die maximale Ausgangsleistung ist 14,5 Watt bei 2,2 % Verzerrung und einem Gitterwechselspannungsbedarf von 7,3 $V_{(eff)}$ pro Gitter. Unter Berücksichtigung eines mittleren Spannungsabfalles von 15 Volt im Ausgangstransformator ist bei $V_a =$ 250 V und $V_{g2} =$ 265 V die Ausgangsleistung etwas günstiger, nämlich 16 Watt bei 1,4 % Verzerrung und einem Gitterwechselspannungsbedarf von 8,5 $V_{(eff)}$. Die maximale Verzerrung beträgt etwa 3 % und tritt bei rund 10 Watt Ausgangsleistung auf.

Durch die besondere Form der Kathode wird die große Steilheit bei verhältnismäßig niedriger Heizleistung erzielt. Bei 6,3 Volt Heizspannung beträgt der Heizstrom nur 1,2 Ampere.

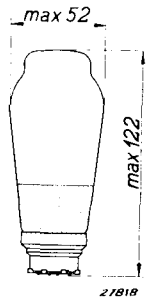
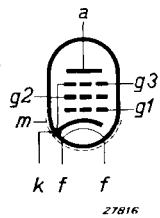


Abb. 1
Abmessungen in mm.



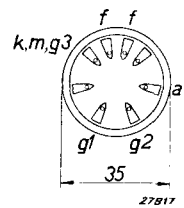


Abb. 2
Elektrodenanordnung und Sockelanschlüsse.

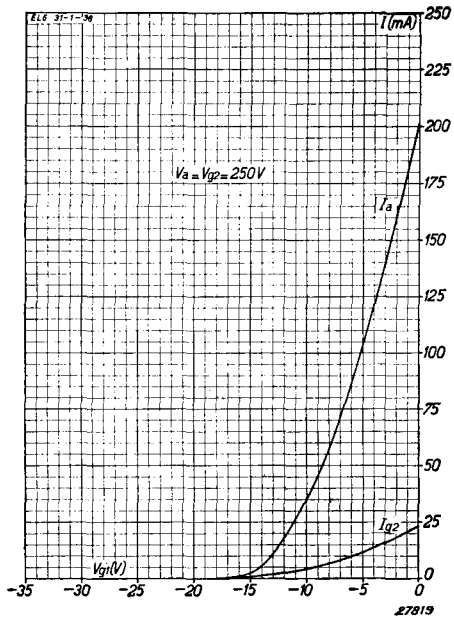


Abb. 3
Anodenstrom und Schirmgitterstrom als Funktion der negativen Gitterspannung bei $Va = V_{g_2} =$ 250 V.

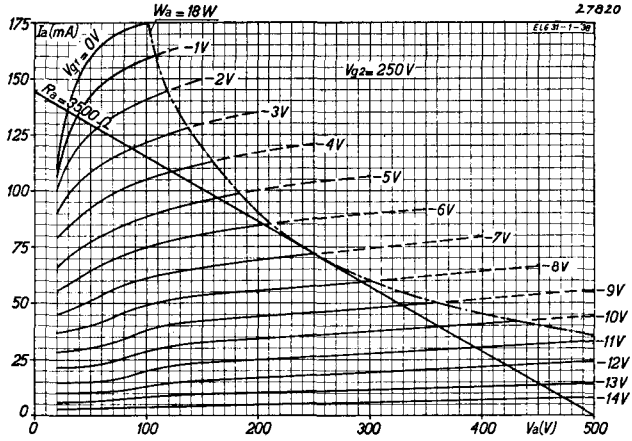


Abb. 4
Anodenstrom als Funktion der Anodenspannung bei $V_{g_2} = 250$ V mit V_{g_1} als Parameter.

HEIZDATEN

Heizung: indirekt durch Wechselstrom, Parallelspeisung.

Heizspannung	V_f	= 6,3 V
Heizstrom	I_f	= 1,2 A

KAPAZITÄTEN

Grenzwert der Gitter-Anodenkapazität	C_{agl}	= max. 0,7 $\mu\mu$F

BETRIEBSDATEN ALS EINFACHER ENDVERSTÄRKER (1 RÖHRE)

Anodenspannung	V_a	= 250 V
Schirmgitterspannung	V_{g2}	= 250 V
Neg. Gittervorspannung	V_{gl}	= — 7 V
Kathodenwiderstand	R_k	= 90 Ω
Anodenstrom	I_a	= 72 mA
Schirmgitterstrom	I_{g2}	= 8,0 mA
Steilheit	S	= 14,5 mA/V
Innenwiderstand	R_i	= 20.000 Ω
Günstigster Anpassungswiderstand	R_a	= 3.500 Ω
Ausgangsleistung bei 10 % Verzerrung	$W_{o(10\%)}$	= 8,2 W
Gitterwechselspannungsbedarf für W_o = 8,2 W	V_i	= 4,8 $V_{(eff)}$
Empfindlichkeit	$V_{i(50mW)}$	= 0,3 $V_{(eff)}$
Verstärkungsfaktor des Schirmgitters in Bezug auf Gitter 1	μ_{g2gl}	= 20

EL 6

BETRIEBSDATEN ALS GEGENTAKT-ENDVERSTÄRKER (2 RÖHREN)

(automatische Vorspannung)

Anodenspannung	V_a	= 250 V	250 V
Schirmgitterspannung	V_{g2}	= 250 V	265 V
Kathodenwiderstand	R_k	= 90 Ω	97 Ω
Anodenruhestrom	I_{ao}	= 2×45 mA	2×45 mA
Anodenstrom bei voller Aussteuerung	$I_{a\,max}$	= 2×53 mA	2×54 mA
Schirmgitterruhestrom	I_{g2o}	= 2×5,1 mA	2×5,1 mA
Schirmgitterstrom bei voller Aussteuerung	$I_{g2\,max}$	= 2×8,5 mA	2×9,9 mA
Günstigster Anpassungswiderstand zwischen den beiden Anoden	R_a	= 5000 Ω	5000 Ω
Max. Ausgangsleistung	W_o	= 14,5 W	16 W
Verzerrung bei max. Ausgangsleistung	d_{tot}	= 2,2 %	1,7 %
Gitterwechselspannungsbedarf pro Gitter	V_i	= 7,3 $V_{(eff)}$	8,2 $V_{(eff)}$

GRENZDATEN

Max. Anodenkaltspannung	V_{ao}	= max. 550 V
Max. Anodenspannung	V_a	= max. 250 V
Max. Anodendauerbelastung	W_a	= max. 18 W
Max. Schirmgitterkaltspannung	V_{g2o}	= max. 550 V
Max. Schirmgitterspannung	V_{g2}	= max. 275 V
Max. Schirmgitterdauerbelastung ohne Aussteuerung	W_{g2}	= max. 2 W
Max. Schirmgitterdauerbelastung bei voller Aussteuerung	$W_{g2}(W_{o\,max})$	= max. 3 W
Max. Kathodenstrom	I_k	= max. 90 mA
Grenzwert des Gitterstromeinsatzpunktes	V_{g1} (I_{g1} = + 0,3 µA)	= max. — 1,3 V
Max. Widerstand zwischen Gitter und Kathode	R_{g1k}	= max. 0,7 MΩ
Max. Widerstand zwischen Heizfaden und Kathode	R_{fk}	= max. 5000 Ω
Max. Spannung zwischen Heizfaden und Kathode (Gleichspannung oder Effektivwert der Wechselspannung)	V_{fk}	= max. 50 V

Abb. 6 stellt einige wichtige Daten der EL 6 in Abhängigkeit von der Schirmgitterspannung in einem Bereiche von 250 bis 275 Volt dar, wenn die Anodenspannung konstant auf 250 Volt eingestellt bleibt. Diese Kurven ermöglichen es, jeden Spannungsabfall im Ausgangstransformator von 0 bis 25 Volt zu berücksichtigen. Abb. 8 stellt noch einige Betriebswerte der EL 6 dar für den Fall, daß im Gerät die erforderliche Spannung für V_a = 250 V nicht vorhanden ist, und zwar als Funktion der Schirmgitterspannung, wobei die Anodenspannung um 15 Volt niedriger ist als die Schirmgitterspannung. Hierbei wurde also ein mittlerer Spannungsabfall von 15 Volt über den Ausgangstransformator angenommen.

Die negative Gitterspannung darf sowohl für A-Verstärkung wie auch für A/B-Verstärkung nur durch einen Kathodenwiderstand (automatische Vorspannung) erzeugt werden. Eine halbautomatische Vorspannung ist zulässig, wenn der Kathodenstrom der EL 6 mehr als 50 % von dem durch den spannungserzeugenden Widerstand fließenden Gesamtstrom beträgt. Der maximale unter den Grenzdaten angegebene Gitterableitwiderstand ist dann nach der Formel

$$\frac{\text{Kathodenstrom der Endröhre}}{\text{Gesamtstrom durch den Widerstand zur Erzeugung des Spannungsabfalles}} \times R_{g1k}$$

zu erniedrigen. In dem Falle muß noch berücksichtigt werden, daß der Strom der geregelten Röhren die negative Gitterspannung der Endröhre beeinflußt, so daß beim Herunterregeln die negative Gittervorspannung leicht zu niedrig und mithin der Anodenstrom der Endröhre zu hoch wird.

Bei der Schaltung ist die große Steilheit dieser Röhre zu berücksichtigen, die leicht zu hochfrequenten Rückkopplungen und Selbstschwingen Anlaß geben kann. Die Leitungen zu den Elektroden sind möglichst kurz zu halten, und die Einschaltung eines Widerstandes von beispielsweise 1000 Ohm in die Steuergitterleitung und von 100 Ohm in die Schirmgitterleitung ist notwendig.

Für die Verwendung der EL 6 in Gegentaktstufen mit automatischer Gittervorspannung sind in den Daten und Kurven der Abb. 7 und 9 die nötigen Angaben zu finden. Abb. 7 gibt die Verzerrung und den Gitterwechselspannungsbedarf bei $V_a = 250$ V und $V_{g2} = 250$ V. Abb. 9 zeigt verschiedene Größen, wie Kathodenwiderstand, Ausgangsleistung usw., als Funktion der Schirmgitterspannung, wenn der Anodenstrom auf 2×45 mA und die Anodenspannung auf 250 V konstant gehalten wird. Dieses Kurvenblatt bietet also die Möglichkeit, für jeden Spannungsabfall über den Ausgangstransformator die sich dafür ergebenden Betriebsverhältnisse abzulesen.

Bei Verwendung der EL 6 in Gegentaktstufen ist noch zu berücksichtigen, daß bei einem Anodenruhestrom von mehr als 45 mA pro Röhre für jede Röhre ein besonderer Kathodenwiderstand vorgesehen werden muß. Diese Maßnahme empfiehlt sich jedenfalls, wenn die Möglichkeit vorliegt, daß eine Röhre während des Betriebes des Apparates entfernt wird, da dies unvermeidlich zur Zerstörung der anderen Röhre führen würde.

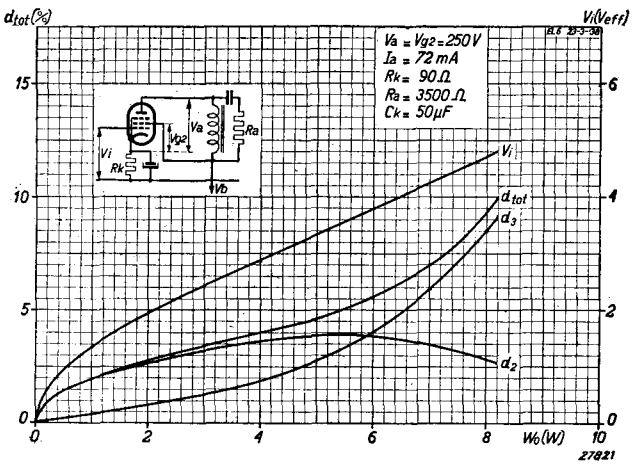


Abb. 5
Gesamtverzerrung, Verzerrung durch die 2. und 3. Harmonische und Gitterwechselspannungsbedarf bei Verwendung der EL 6 als einfache Endpenthode mit automatischer Vorspannung und Kathodenkondensator ($Va = Vg_2 = 250$ V).

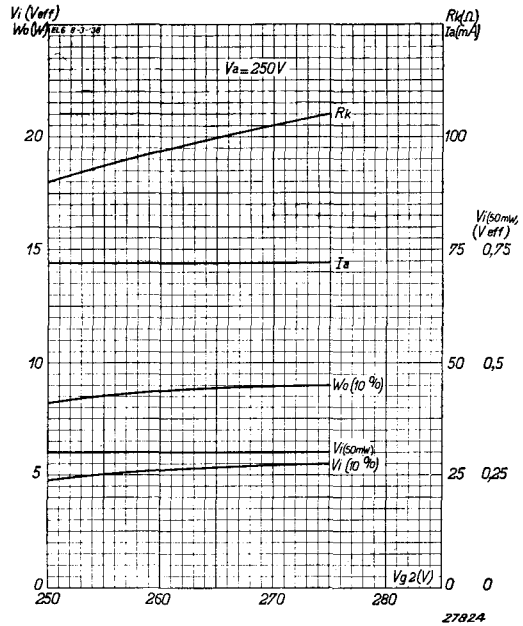


Abb. 6

Ausgangsleistung bei 10 % Verzerrung . . .	Wo (10 %)	als Funktion der Schirmgitterspannung (in einem Bereiche von 250 bis 275 V) bei konstanter Anodenspannung (Va = 250 V).
Gitterwechselspannungsbedarf bei 10 % Verzerrung . . .	Vi (10 %)	
Empfindlichkeit	Vi (50 mW)	
Kathodenwiderstand	Rk	
Anodenstrom	Ia	

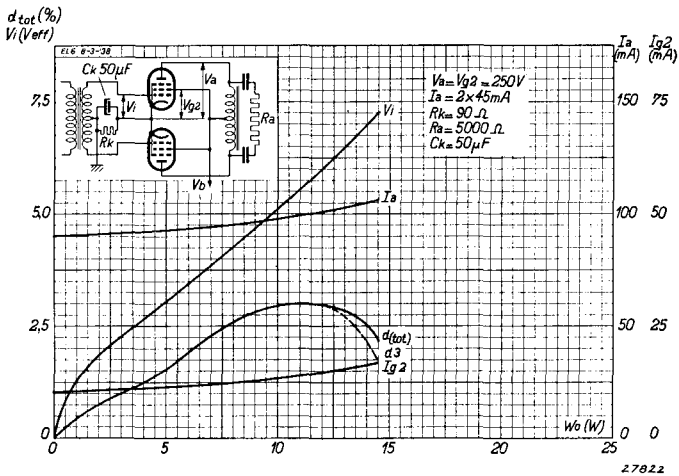


Abb. 7

Anodenstrom Ia, Schirmgitterstrom Ig_2, Gesamtverzerrung dtot, Verzerrung durch die dritte Harmonische d_3 und Gitterwechselspannungsbedarf pro Gitter Vi als Funktion der Ausgangsleistung Wo, bei Verwendung von zwei Röhren EL 6 in Gegentakt mit $Va = Vg_2 = 250$ V.

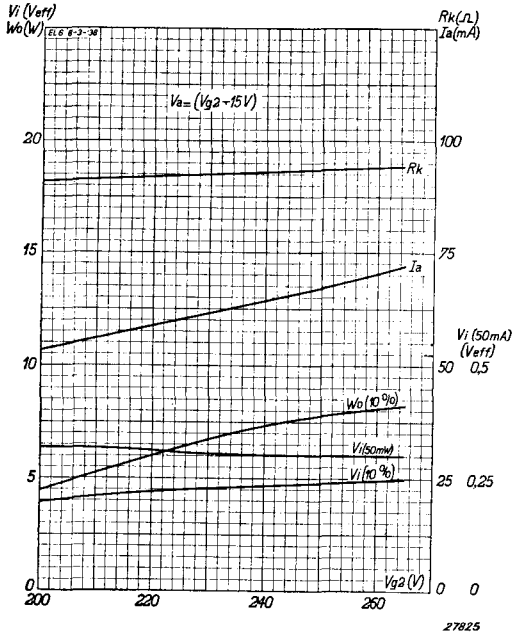


Abb. 8

Ausgangsleistung bei 10 % Verzerrung . . . Wo (10 %)
Gitterwechselspannungsbedarf bei 10 % Verzerrung . . . Vi (10 %)
Empfindlichkeit . . . . . Vi (50 mW)
Kathodenwiderstand . . . . . Rk
Anodenstrom . . . . . Ia

als Funktion der Schirmgitterspannung (in einem Bereiche von 200 bis 265 V) bei einer gegen die Schirmgitterspannung um 15 Volt niedrigeren Anodenspannung.

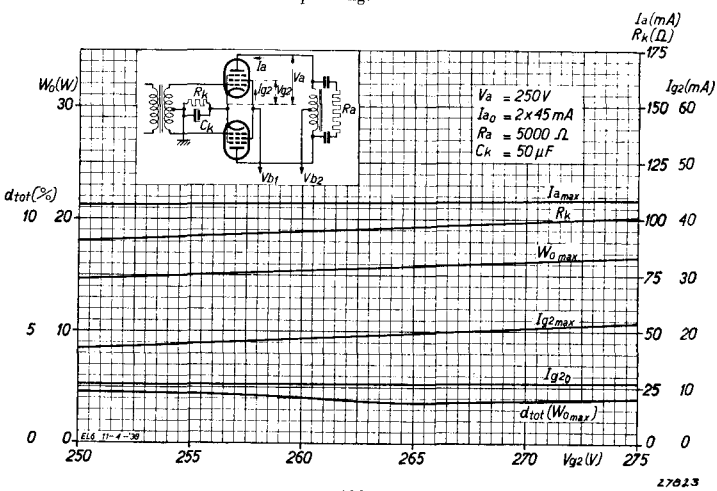


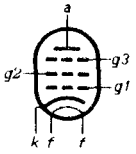
Abb. 9

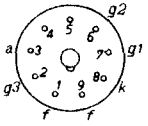
Ausgangsleistung bei voller Aussteuerung Wo max)
Verzerrung bei voller Aussteuerung . . . . $dtot(Wo max)$
Anodenstrom bei voller Aussteuerung . . . Ia max
Schirmgitterruhestrom . . . . . Ig_{20}
Schirmgitterstrom bei voller Aussteuerung . Ig_2 max
Kathodenwiderstand für einen Anodenruhestrom von 45 mA pro Röhre . . . . . Rk

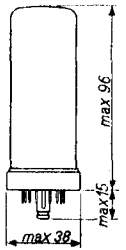
als Funktion der Schirmgitterspannung (in einem Bereiche von 250 bis 275 V) bei konstanter Anodenspannung (Va = 250 V).

OUTPUT PENTODE
PENTHODE DE SORTIE
ENDPENTHODE

Dimensions in mm
Dimensions en mm
Abmessungen in mm







Base, culot, Fuss: Enne-a1

Capacitances Capacités Kapazitäten		
	Cg1	= 16,6 pF
	Ca	= 11 pF
	Cag1	= 1,1 pF
	Cg1f	< 0,6 pF
	Ckf	= 10 pF

For further data and curves refer to type EL 34
Pour les autres caractéristiques et courbes voir type EL 34
Für die übrigen Daten und Kurven siehe Typ EL 34

PHILIPS

Electronic Tube

HANDBOOK

EL60

page	sheet	date
1	1	1949.11.11
2	FP	1999.07.04

VIDEO OUTPUT PENTODE

Luminance output tube in colour TV receivers

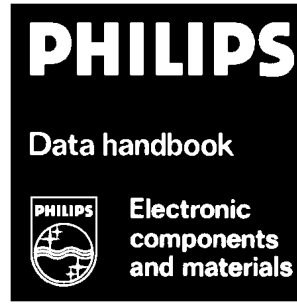
HEATING: Indirect by A.C. or D.C.; parallel supply

Heater voltage	V_f	6.3	V
Heater current	I_f	800	mA

LIMITING VALUES (Design centre rating system)

Cathode to heater voltage	Vkf	max.	100	V

For further data of this type please refer to type PL802



EL802

page	sheet	date
1	1	1970.08
2	FP	1999.06.06

OUTPUT PENTODE FOR LINE DEFLECTION AND A.F. OUTPUT PENTODE

Output pentode intended for use as horizontal deflection amplifier in small screen television receivers and as A. F. power amplifier.

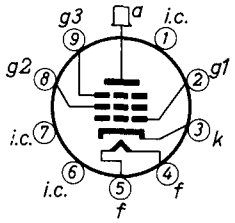
QUICK REFERENCE DATA				
Anode peak voltage	V_{ap}	max.	7	kV
Cathode current	I_k	max.	180	mA
Output power, class B two tubes	W_o		20	W

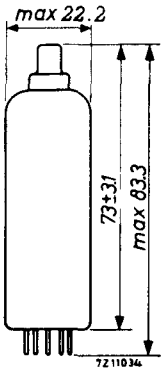
HEATING : Indirect by A.C. ot D.C. ; parallel supply

Heater voltage	V_f	6.3	V
Heater current	I_f	1.05	A

DIMENSIONS AND CONNECTIONS Dimensions in mm

Base: Noval





CAPACITANCES

Anode to all except grid No. 1	$C_{a(g_1)}$		6	pF
Grid No. 1 to all except anode	$C_{g_1(a)}$		14	pF
Anode to grid No. 1	C_{ag_1}	max.	0.8	pF
Anode to cathode	C_{ak}	max.	0.1	pF
Grid No. 1 to heater	C_{g_1f}	max.	0.2	pF

TYPICAL CHARACTERISTICS

A)

Anode voltage	V_a	170	V
Grid No. 3 voltage	V_{g_3}	0	V
Grid No. 2 voltage	V_{g_2}	170	V
Grid No. 1 voltage	V_{g_1}	-24	V
Anode current	I_a	45	mA
Grid No. 2 current	I_{g_2}	2.4	mA
Transconductance	S	6.3	mA/V
Internal resistance	R_i	11	kΩ
Amplification factor	$\mu_{g_2g_1}$	5.0	

B) (Measured under pulse conditions)

Anode voltage	V_a	40	V
Grid No. 3 voltage	V_{g_3}	0	V
Grid No. 2 supply voltage	V_{bg_2}	190	V
Grid No. 2 series resistor	R_{g2}	4.7	kΩ
Grid No. 1 voltage	V_{g_1}	0	V
Anode current	I_a	180	mA
Grid No. 2 current	I_{g2}	18	mA

OPERATING CONDITIONS

Stabilized circuits (D.C. feedback)

Cut-off voltage

The minimum required cut-off voltage ($-V_{g1}$) during flyback is 120 V at V_a = 6000 V, V_{g2} = 190 V, and Z_{g1} = 1 kΩ at line-frequency.

Supply-voltage: See page 5

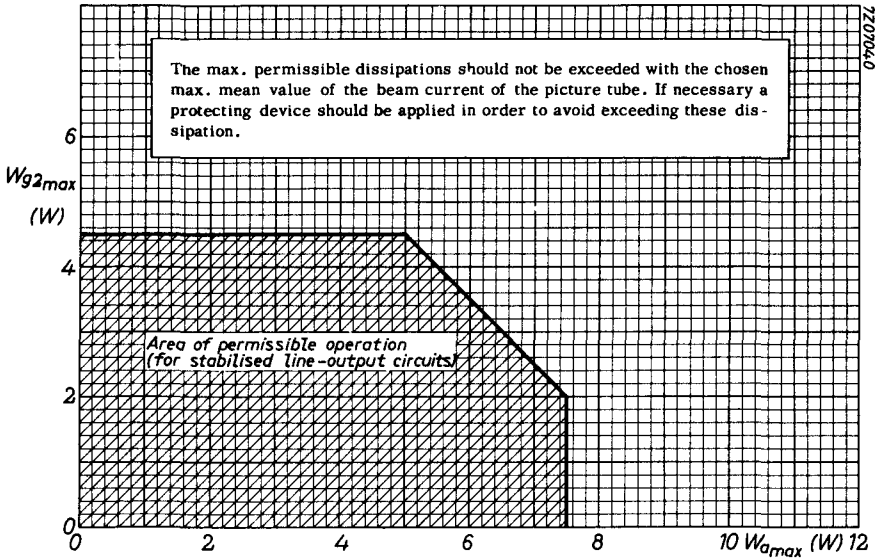
Minimum required value of the screengrid voltage and of the anode voltage, when the tube is used in a line output stage.
The graphs refer to nominal mains voltage provided the specified values of I_a at V_a min, will be available throughout life of the tube at supply voltage values 10% below nominal.
In order to prevent Barkhausen interferences and less of stabilisation, care should be taken that the anode voltage never drops below the specified V_a min. during the scanning period.

OPERATING CHARACTERISTICS as class B push-pull A.F. power amplifier, two tubes.

Anode voltage	V_a	170		200		V
Grid No. 3 voltage	V_{g3}	0		0		V
Grid No. 2 supply voltage	V_{bg2}	170		200		V
Common Grid No. 2 series resistor	R_{g2}	1		1		kΩ
Grid No. 1 voltage	V_{g1}	−27		−31.5		V
Load resistance	$R_{aa\sim}$	2.5		2.5		kΩ
Grid No. 1 driving voltage	V_i	0	16.5	0	21.5	V_{RMS}
Anode current	I_a	2x25	2x72	2x27	2x84	mA
Grid No. 2 current	I_{g2}	2x1.5	2x10	2x2.0	2x11.0	mA
Output power	W_o	0	13.0	0	20	W
Distortion	d_{tot}	-	5.2	-	6.5	%

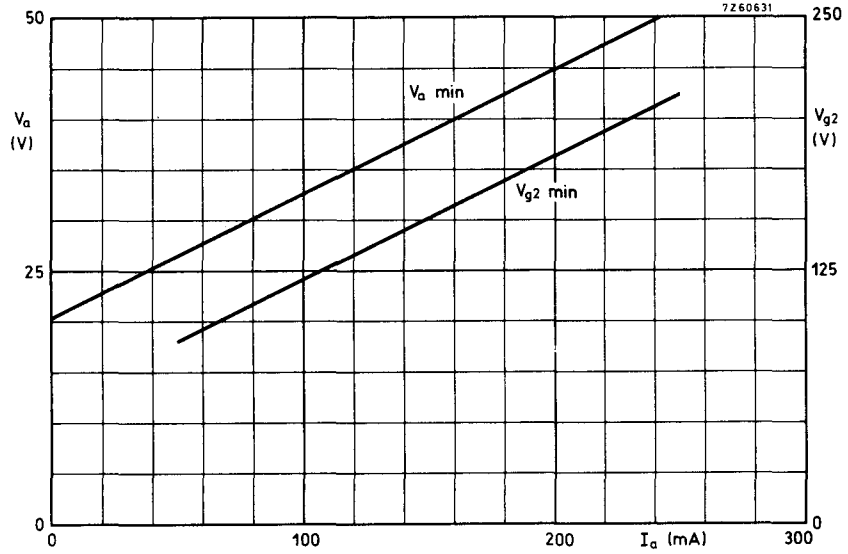
LIMITING VALUES (Design centre rating system)

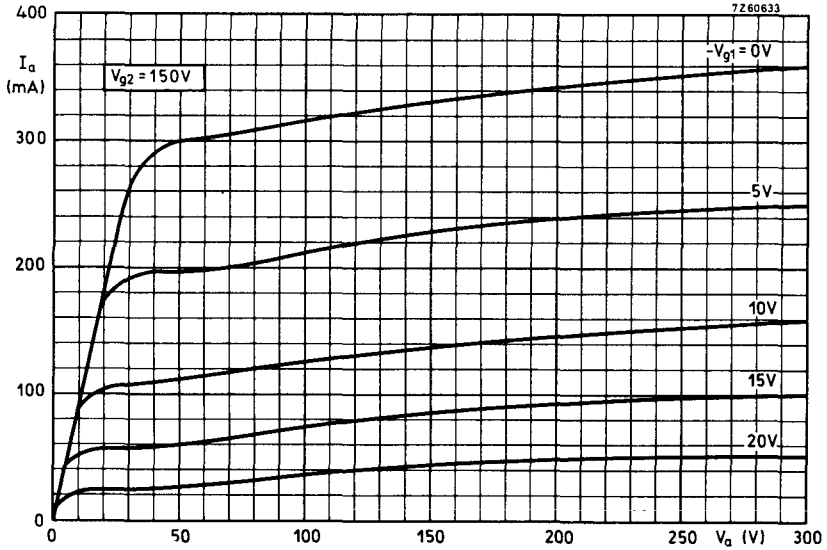
Anode voltage	V_{a_o}	max. 550	V
	V_a	max. 250	V
Anode voltage, peak	V_{a_p}	max. 7	kV [1]
negative peak	$-V_{a_p}$	max. 7	kV [1]
Anode dissipation	W_a	See figure below	
Grid No. 2 dissipation	W_{g2} [2]		
Anode + grid No. 2 dissipation	$W_a + W_{g2}$		
Grid No. 2 voltage	V_{g2_o}	max. 550	V
	V_{g2}	max. 250	V
Cathode current	I_k	max. 180	mA
Cathode to heater voltage	V_{kf}	max. 100	V
Grid No. 1 resistor	R_{g_1}	max. 0.5	MΩ

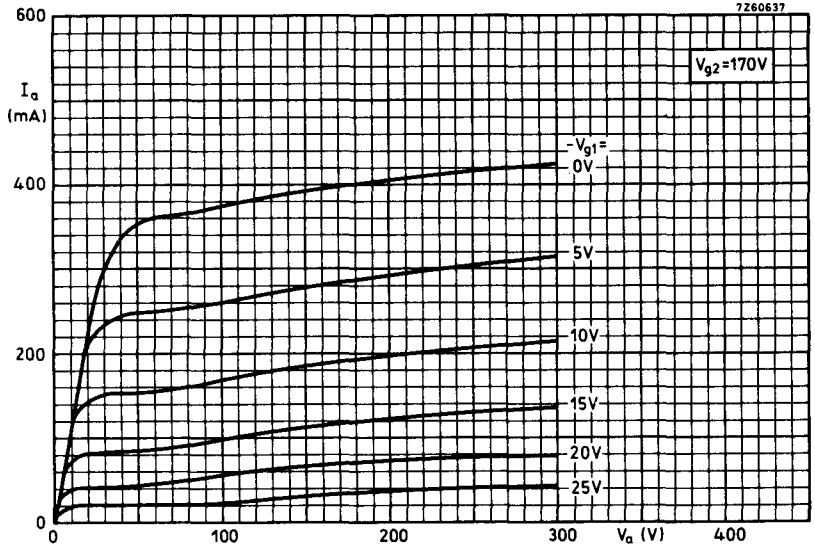


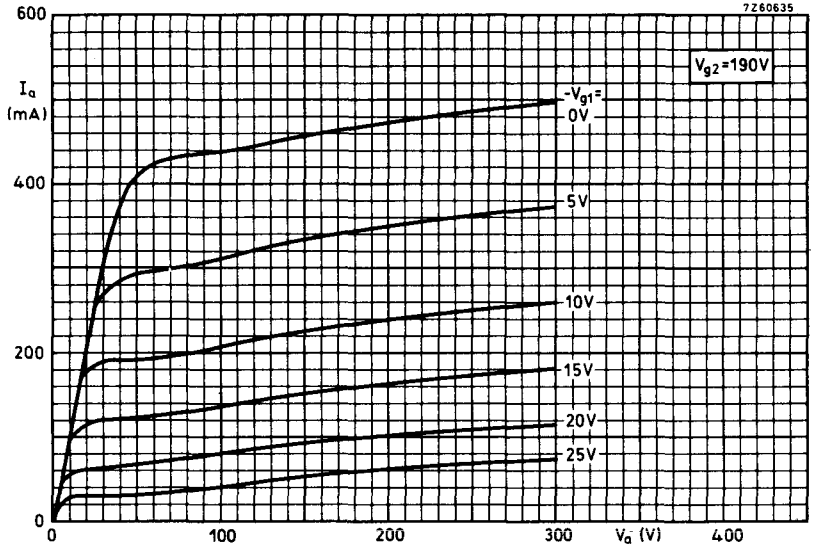
[1]) Maximum pulse duration 22 % of a cycle but maximum 18 μs.

[2]) During the heating-up of the cathode W_{g2} = max. 6 W.


7Z60631
50
250
V_a (V)
V_{g2} (V)
V_a min
V_{g2} min
25
125
0
0
100
200
I_a (mA)
300


7Z60633
400
I_a (mA)
V_{g2} = 150V
$-V_{g1}$ = 0V
-5V
10V
15V
20V
300
200
100
0
0
50
100
150
200
250
V_a (V)
300


7Z60637
600
400
200
0
I_a (mA)
V_{g2}=170V
-V_{g1}=
0V
5V
10V
15V
20V
25V
0
100
200
300
V_a (V)
400


7Z60635
600
400
200
0
I_a (mA)
V_{g2}=190V
-V_{g1}=
0V
5V
10V
15V
20V
25V
0
100
200
300
V_a (V)
400

PHILIPS

Data handbook

Electronic components and materials

EL81

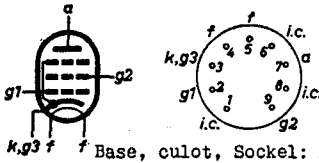
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6	6	1972.01
7	FP	1999.03.18

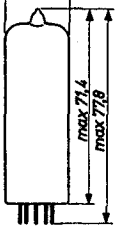
PENTODE for use as frame and sound output tube
PENTHODE pour utilisation comme tube de sortie de déviation verticale et de son
PENTODE zur Verwendung als Endröhre für die vertikale Ablenkung und für die Schallwiedergabe

Heating : indirect by A.C. or D.C. parallel supply
Chauffage: indirect par C.A. ou C.C. alimentation parallèle
Heizung : indirekt durch Wechsel- oder Gleichstrom; Parallelspeisung

V_f = 6,3 V
I_f = 800 mA

Dimensions in mm
Dimensions en mm
Abmessungen in mm





Base, culot, Sockel: NOVAL

Capacitances
Capacités
Kapazitäten

C_a	=	5,9 pF
C_{g_1}	=	11 pF
C_{ag_1}	<	1 pF
$C_{g_1 f}$	<	0,15 pF

Optimum peak anode current in frame output application
To allow for tube spread and for deterioration during life in frame output application the circuit should be designed around a peak anode current not exceeding

90 mA at V_a = 50 V, V_{g_2} = 170 V
120 mA at V_a = 60 V, V_{g_2} = 200 V

Courant anodique de crête optimum en application comme tube de sortie pour la déviation verticale
Pour tenir compte des tolérances du tube et de la dégradation en service, le circuit devra être conçu pour un courant anodique de crête ne dépassant pas une valeur de

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120 mA à V_a = 60 V, V_{g_2} = 200 V

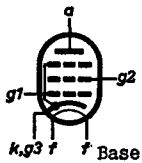
PHILIPS EL 82

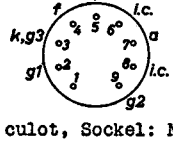
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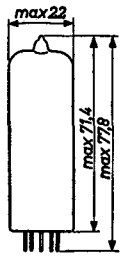
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I_f = 800 mA

Dimensions in mm
Dimensions en mm
Abmessungen in mm





Base, culot, Sockel: NOVAL



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Capacités
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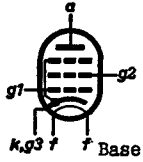
EL 82

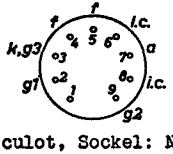
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PENTODE zur Verwendung als Endröhre für die vertikale Ablenkung und für die Schallwiedergabe

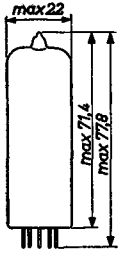
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Heizung : indirekt durch Wechsel- oder Gleichstrom; Parallelspeisung

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I_f = 800 mA

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Dimensions en mm
Abmessungen in mm







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Kapazitäten

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120 mA à V_a = 60 V, V_{g_2} = 200 V

Höchstwert des Anodenspitzenstromes beim Gebrauch als Endröhre für die vertikale Ablenkung
Um den Röhrentoleranzen und der Verschlechterung während der Lebensdauer Rechnung zu tragen, soll die Schaltung entworfen werden für einen Höchstwert des Anodenspitzenstromes von

90 mA bei V_a = 50 V, V_{g_2} = 170 V
120 mA bei V_a = 60 V, V_{g_2} = 200 V

Operating characteristics as sound output tube, class A
Caractéristiques d'utilisation comme tube de sortie de son, classe A
Betriebsdaten als Endröhre für Schallwiedergabe, Klasse A

$V_a = V_b$	=	170	200 V
V_{g_2}	=	170	- V
R_{g_2}	=	-	680 Ω
V_{g_1}	=	-10,4	-13,9 V
I_a	=	53	45 mA
I_{g_2}	=	10	8,5 mA
S	=	9	7,6 mA/V
R_i	=	20	24 kΩ
$\mu_{g_2 g_1}$	=	10	10
R_a	=	3	4 kΩ
W_o (d = 10 %)	=	4,0	4,2 W
V_i (d = 10 %)	=	6	7 Veff
V_i (W_o =50 mW)	=	0,5	0,55 Veff

Höchstwert des Anodenspitzenstromes beim Gebrauch als Endröhre für die vertikale Ablenkung
Um den Röhrentoleranzen und der Verschlechterung während der Lebensdauer Rechnung zu tragen, soll die Schaltung entworfen werden für einen Höchstwert des Anodenspitzenstromes von

90 mA bei V_a = 50 V, V_{g_2} = 170 V
120 mA bei V_a = 60 V, V_{g_2} = 200 V

Operating characteristics as sound output tube, class A
Caractéristiques d'utilisation comme tube de sortie de son, classe A
Betriebsdaten als Endröhre für Schallwiedergabe, Klasse A

$V_a = V_b$	=	170	200 V
V_{g_2}	=	170	- V
R_{g_2}	=	-	680 Ω
V_{g_1}	=	-10,4	-13,9 V
I_a	=	53	45 mA
I_{g_2}	=	10	8,5 mA
S	=	9	7,6 mA/V
R_i	=	20	24 kΩ
$\mu_{g_2 g_1}$	=	10	10
R_a	=	3	4 kΩ
W_o (d = 10 %)	=	4,0	4,2 W
V_i (d = 10 %)	=	6	7 V_{eff}
V_i (W_o =50 mW)	=	0,5	0,55 V_{eff}

Höchstwert des Anodenspitzenstromes beim Gebrauch als Endröhre für die vertikale Ablenkung
Um den Röhrentoleranzen und der Verschlechterung während der Lebensdauer Rechnung zu tragen, soll die Schaltung entworfen werden für einen Höchstwert des Anodenspitzenstromes von

90 mA bei V_a = 50 V, V_{g_2} = 170 V
120 mA bei V_a = 60 V, V_{g_2} = 200 V

Operating characteristics as sound output tube, class A
Caractéristiques d'utilisation comme tube de sortie de son, classe A
Betriebsdaten als Endröhre für Schallwiedergabe, Klasse A

$V_a = V_b$	=	170	200 V
V_{g_2}	=	170	- V
R_{g_2}	=	-	680 Ω
V_{g_1}	=	-10,4	-13,9 V
I_a	=	53	45 mA
I_{g_2}	=	10	8,5 mA
S	=	10,2	8,6 mA/V ←
R_i	=	20	24 kΩ
$\mu_{g_2 g_1}$	=	10	10
R_a	=	3	4 kΩ
W_o (d = 10 %)	=	4,0	4,2 W
V_1 (d = 10 %)	=	6	7 V_{eff}
V_1 (W_o =50 mW)	=	0,5	0,55 V_{eff}

Operating characteristics as sound output tube, class A push-pull (two tubes)
Caractéristiques d'utilisation comme tube de sortie de son, classe A push-pull (deux tubes)
Betriebsdaten als Endröhre für Schallwiedergabe, Klasse A Gegentakt (zwei Röhren)

V_a	=	170		200		V
V_{g2}	=	170		200		V
R_k	=	100		135		Ω
R_{aa}	=	4		4		kΩ
V_i	=	0	2x9,3	0	2x13,5	V_{eff}
I_a	=	2x46	2x50	2x45	2x52	mA
I_{g2}	=	2x8,7	2x17	2x8,5	2x19	mA
W_o	=	0	9	0	12	W
d_{tot}	=	-	5	-	5	%

Limiting values
Caractéristiques limites
Grenzdaten

V_{a_o}	= max. 550 V	W_{g_2p}	= max.	4	W
V_{ap}	= max. 2500 V [1]	I_k	= max.	75	mA
$-V_{a_p}$	= max. 500 V	V_{g_1} (I_{g_1}=+0,3µA)	= max.	-1,3	V
V_a	= max. 250 V [4]	R_{g_1}	= max.	1	MΩ [2]
W_a	= max. 9 W	R_{g_1}	= max.	0,4	MΩ [3]
$V_{g_{2o}}$	= max. 550 V	R_{kf}	= max.	20	kΩ
V_{g2}	= max. 250 V	V_{kf}	= max.	100	V
W_{g2}	= max. 2,5 W				

[1] Max. pulse duration 10% of a cycle, with a maximum of 2 msec
Durée de l'impulsion max. 10% d'un cycle, avec un maximum de 2 msec
Impulszeit max. 10% einer Periode, mit einem Maximum von 2 mSek

[2] With automatic grid bias
Avec polarisation négative fixe
Mit automatischer negativer Gittervorspannung

[3] With fixed grid bias
Avec polarisation négative fixe
Mit fester negativer Gittervorspannung

[4] When used as frame output tube with $W_a \leq 4,5$ W, V_a = max. 450 V
En utilisation comme tube de sortie de déviation verticale avec $W_a \leq 4,5$ W, V_a = 450 V au max.
Beim Gebrauch als Endröhre für die vertikale Ablenkung mit $W_a \leq 4,5$ W, ist V_a = max. 450 V

Operating characteristics as sound output tube, class A push-pull (two tubes)
Caractéristiques d'utilisation comme tube de sortie de son, classe A push-pull (deux tubes)
Betriebsdaten als Endröhre für Schallwiedergabe, Klasse A Gegentakt (zwei Röhren)

V_a	=	170		200	V
V_{g2}	=	170		200	V
R_k	=	100		135	Ω
R_{aa}	=	4		4	kΩ
V_i	=	0	2x9,3	0	2x13,5 Veff
I_a	=	2x46	2x50	2x45	2x52 mA
I_{g2}	=	2x8,7	2x17	2x8,5	2x19 mA
W_o	=	0	9	0	12 W
d_{tot}	=	-	5	-	5 %

Limiting values
Caractéristiques limites
Grenzdaten

V_{a_o}	= max.	550 V	$W_{g2\,p}$	= max.	4 W
V_{a_p}	= max.	2500 V [1]	I_k	= max.	75 mA
$-V_{a_p}$	= max.	500 V	V_{g1} (I_{g1}=+0,3µA)	= max.	-1,3 V
V_a	= max.	250 V [4]	R_{g1}	= max.	1 MΩ [2]
W_a	= max.	9 W	R_{g1}	= max.	0,4 MΩ [3]
$V_{g2\,o}$	= max.	550 V	R_{kf}	= max.	20 kΩ
V_{g2}	= max.	250 V	V_{kf}	= max.	100 V
W_{g2}	= max.	2,5 W			

---

[1] Max. pulse duration 10% of a cycle, with a maximum of 2 msec
Durée de l'impulsion max. 10% d'un cycle, avec un maximum de 2 msec
Impulszeit max. 10% einer Periode, mit einem Maximum von 2 mSek

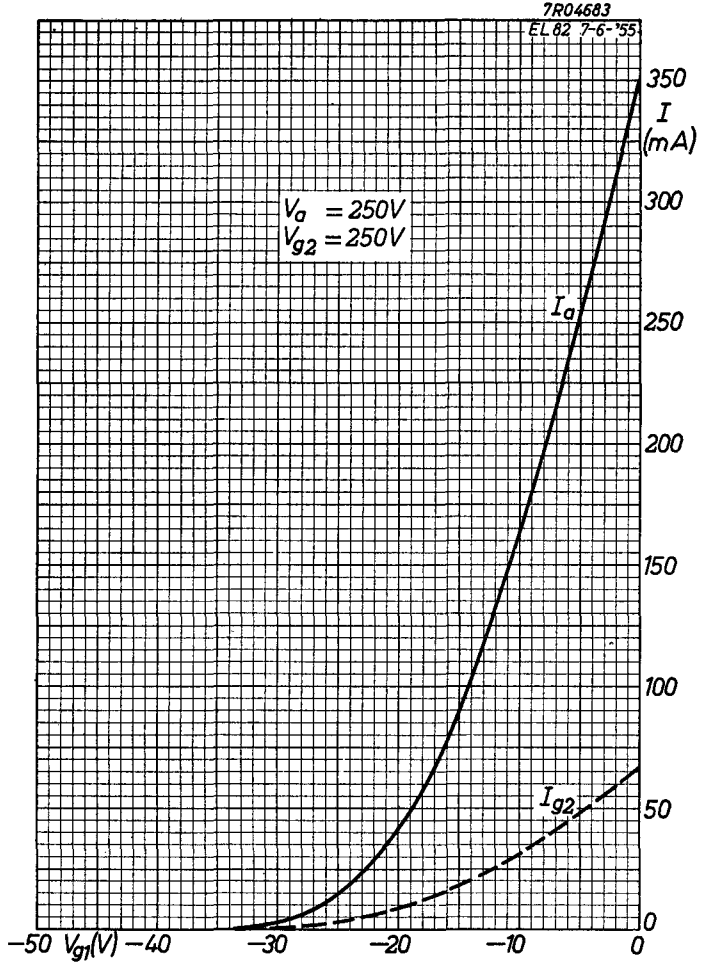
[2] With automatic grid bias
Avec polarisation négative automatique
Mit automatischer negativer Gittervorspannung

[3] With fixed grid bias
Avec polarisation négative fixe
Mit fester negativer Gittervorspannung

[4] When used as frame output tube with $W_a \leq 4{,}5$ W, V_a = max. 450 V
En utilisation comme tube de sortie de déviation verticale avec $W_a \leq 4{,}5$ W, V_a = 450 V au max.
Beim Gebrauch als Endröhre für die vertikale Ablenkung mit $W_a \leq 4{,}5$ W, ist V_a = max. 450 V

PHILIPS

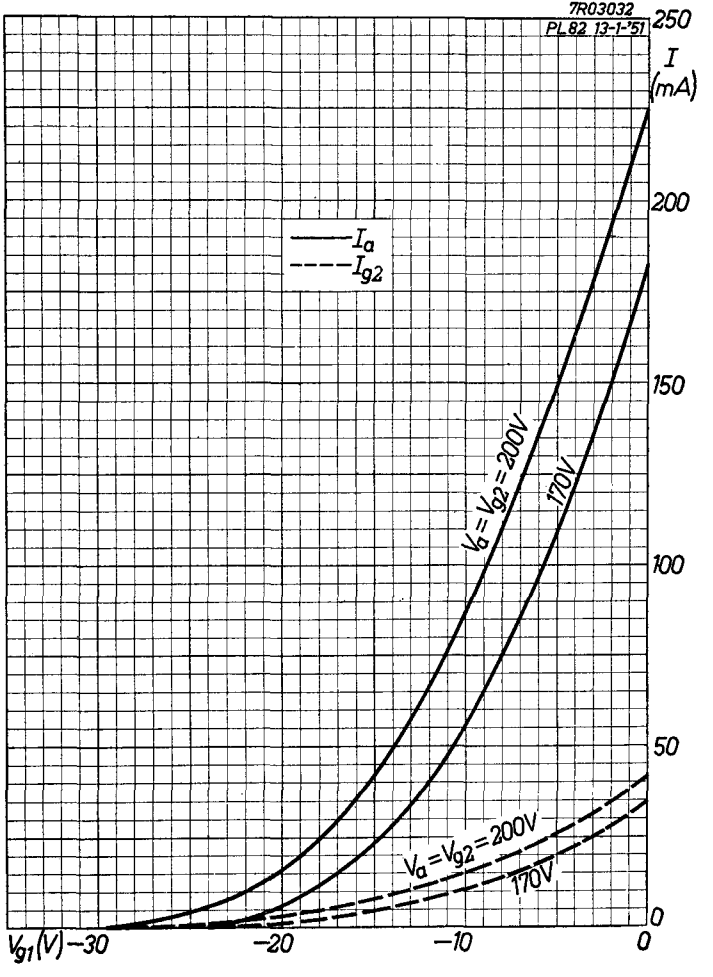
EL 82



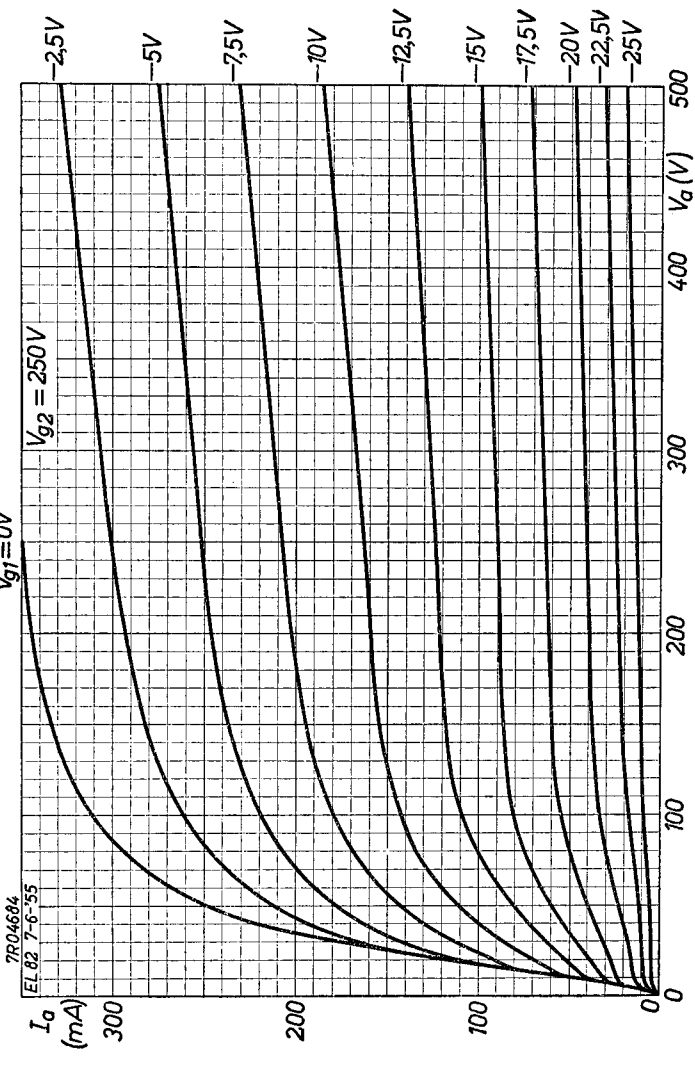
7.7.1955

A

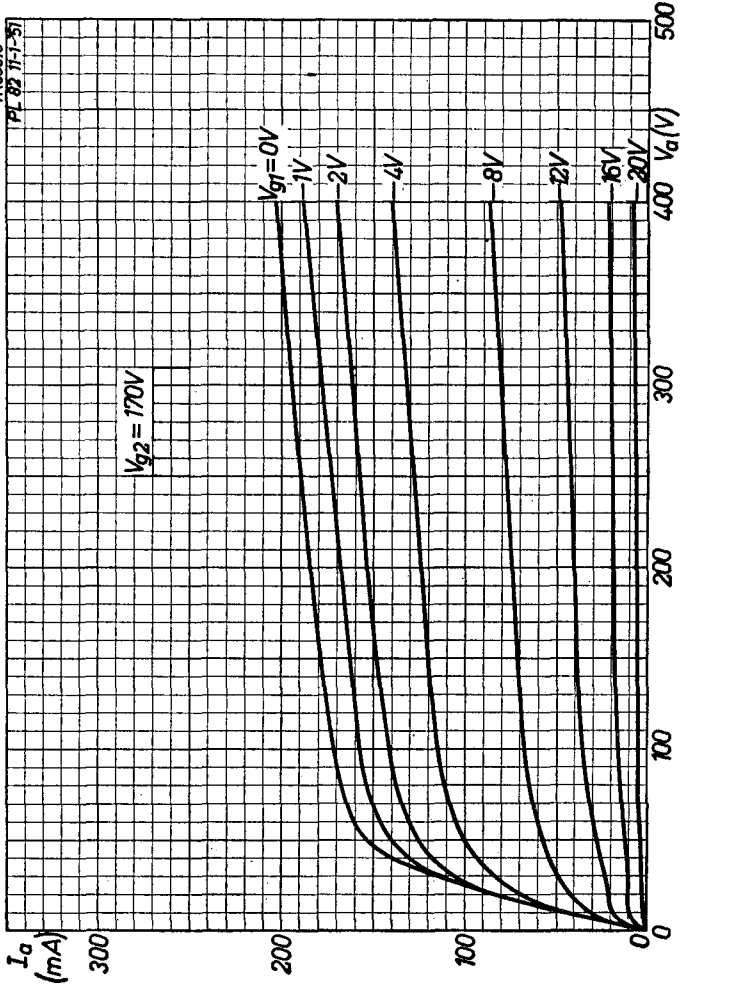
EL 82 PHILIPS



B

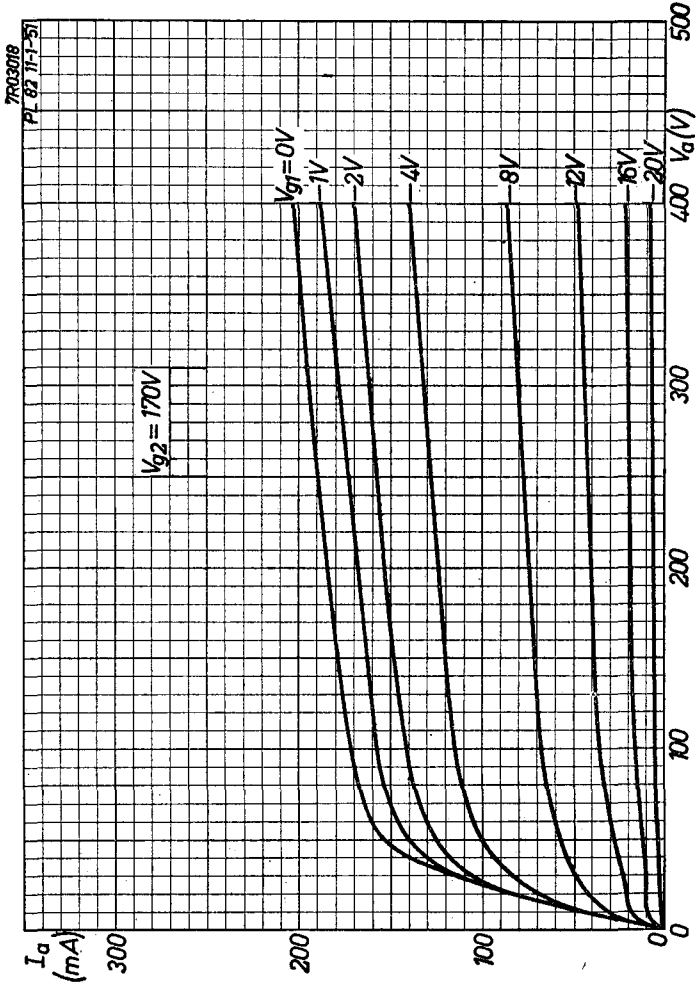

$V_{g1}=0V$
$V_{g2}=250V$
−2,5V
−5V
−7,5V
−10V
−12,5V
−15V
−17,5V
−20V
−22,5V
−25V
I_a (mA)
300
200
100
0
100
200
300
400
500
V_a (V)
7R04684
EL 82 7-6-'55

PHILIPS


7R03018
(PL 82 11-1-57)
V_{g1}=0V
1V
2V
4V
8V
12V
16V
20V
V_{g2}=170V
I_a (mA)
300
200
100
0
0
100
200
300
400
500
V_a(V)

PHILIPS

EL 82

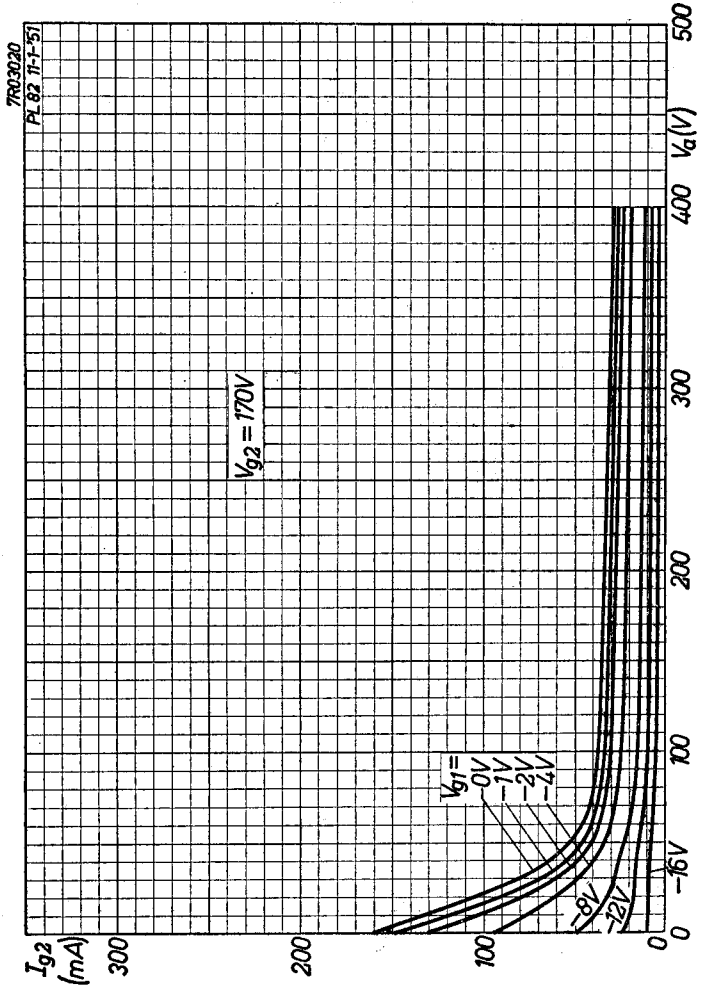


7.7.1955

E

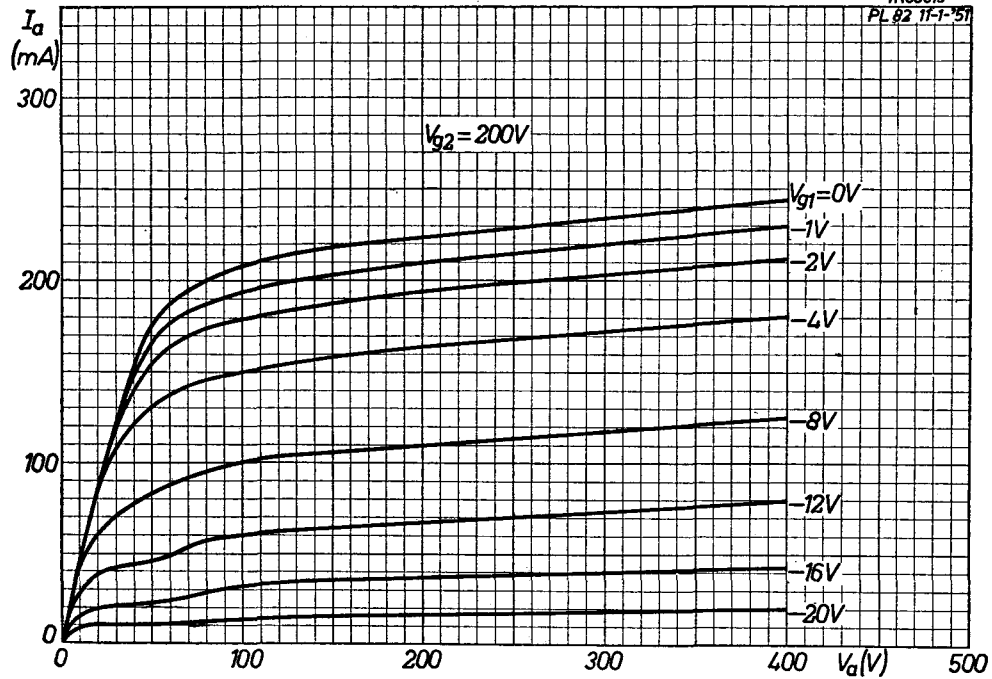
PHILIPS

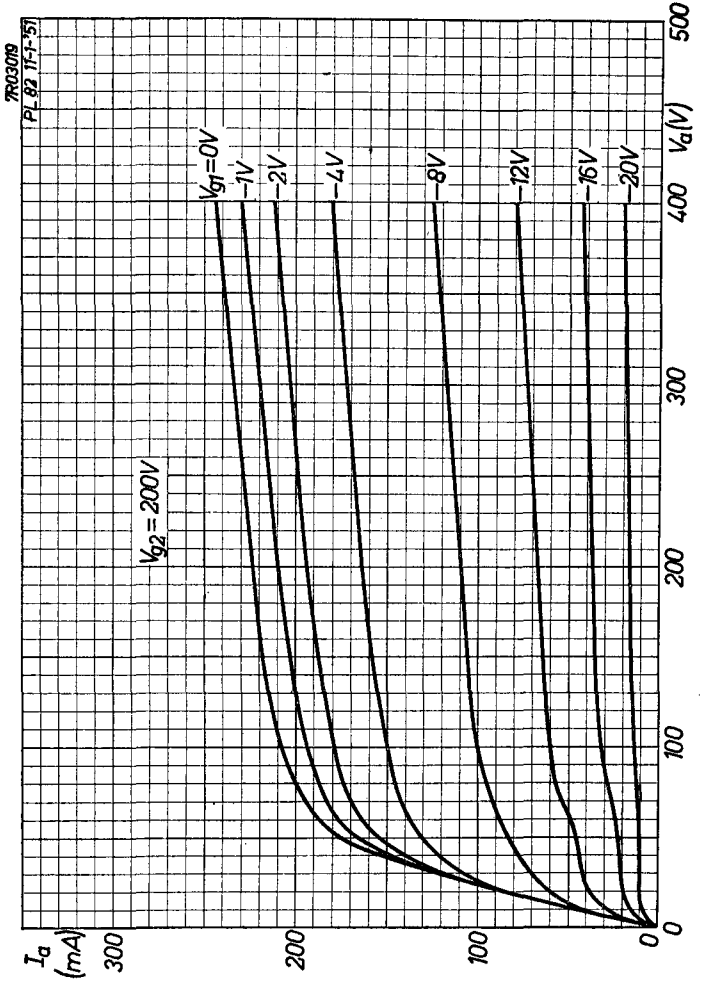
EL 82



EL 82 PHILIPS

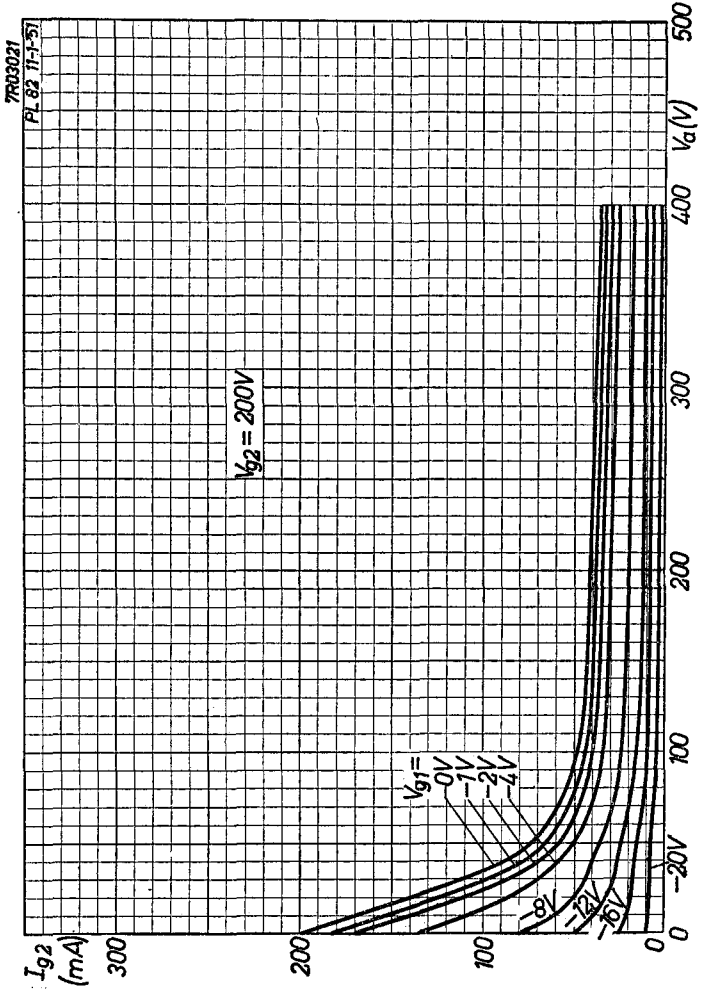
F


7R03019
PL 82 11-1-'51
I_a (mA)
300
200
100
0
V_{g2} = 200V
V_{g1} = 0V
-1V
-2V
-4V
-8V
-12V
-16V
-20V
0
100
200
300
400
V_a (V)
500


7R03019
PL 82 115-1-151
V_{g1}=0V
-1V
-2V
-4V
-8V
-12V
-16V
-20V
V_{g2} = 200V
I_a (mA)
V_a(V)
0
100
200
300
400
500

PHILIPS

EL 82



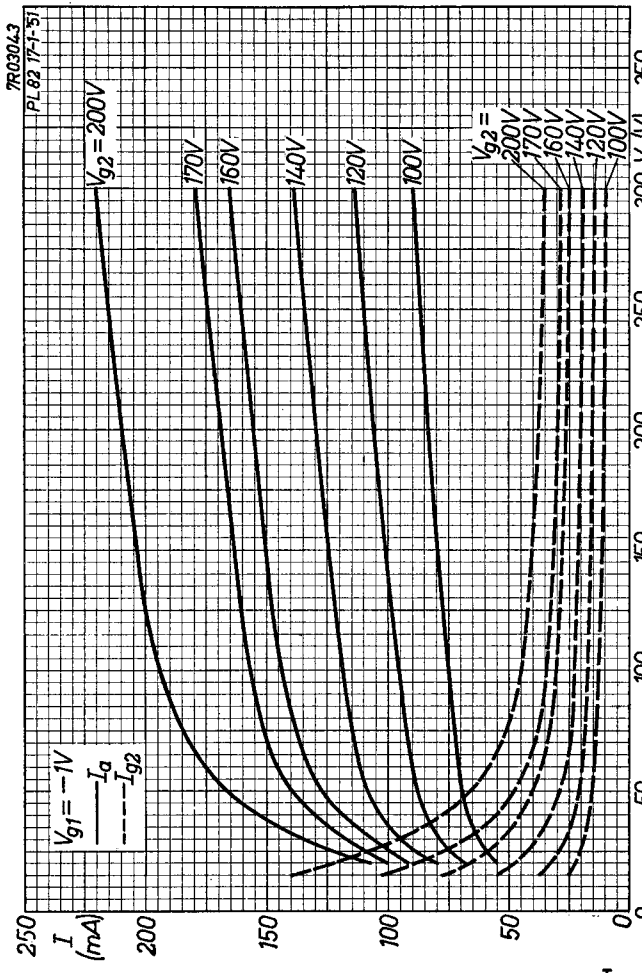
EL 82 **PHILIPS**

H

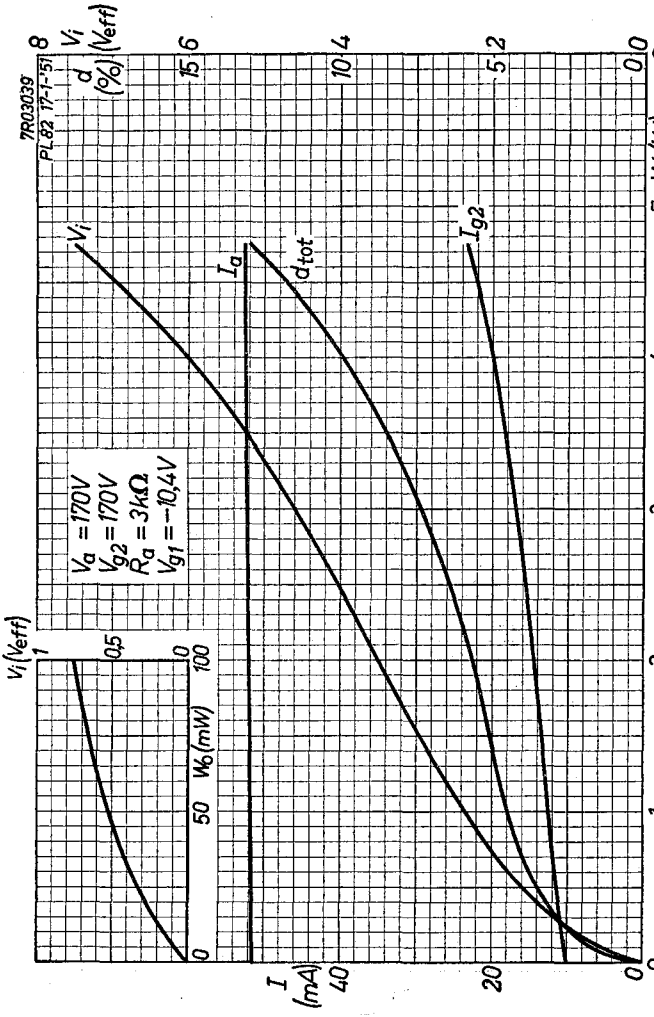
EL 82

PHILIPS

H


7R03043
PL 82 17-1-51
V_{g2} = 200V
170V
160V
140V
120V
100V
V_{g2} =
200V
170V
160V
140V
120V
100V
V_{g1} = −1V
I_a
I_{g2}
I (mA)
250
200
150
100
50
0
0
50
100
150
200
250
300
350
V_a (V)

7.7.1955


7R03039
PL82 17-1-57
V_i (Veff)
d (%)
W_o (W)
I_a
d_{tot}
$-I_{g2}$
I (mA)
V_i (Veff)
W_o (mW)
V_a = 170V
V_{g2} = 170V
R_a = 3kΩ
V_{g1} = −10,4V

EL 82 **PHILIPS**

EL 82

PHILIPS

PHILIPS

EL 82

9.9.1955

K

EL 82 PHILIPS

PHILIPS **EL 82**

9.9.1955

M

PHILIPS

Electronic Tube

HANDBOOK

EL82

page	sheet	date
1	1	1956.04.04
2	1	1960.05.05
3	1	1962.05.05
4	2	1956.04.04
5	2	1960.05.05
6	2	1962.05.05
7	3	1956.04.04
8	3	1962.05.05
9	A	1955.07.07
10	B	1955.07.07
11	C	1957.10.10
12	D	1957.10.10
13	E	1955.07.07
14	E	1957.10.10
15	F	1955.07.07
16	F	1957.10.10
17	G	1955.07.07
18	G	1957.10.10
19	H	1955.07.07

20	H	1957.10.10
21	I	1955.07.07
22	I	1957.10.10
23	J	1955.07.07
24	J	1957.10.10
25	K	1955.09.09
26	L	1955.09.09
27	M	1955.09.09
28, 29	FP	2005.05.06

PHILIPS

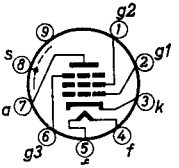
EL83

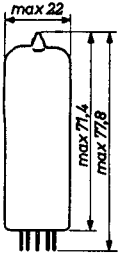
PENTODE for use as video output tube
PENTHODE pour utilisation comme tube de sortie vidéo
PENTODE zur Verwendung als Video-Endröhre

Heating : indirect by A.C. or D.C. parallel supply
Chauffage: indirect par C.A. ou C.C. alimentation parallèle
Heizung : indirekt durch Wechsel- oder Gleichstrom; Parallelspeisung

V_f = 6,3 V
I_f = 710 mA

Dimensions in mm
Dimensions en mm
Abmessungen in mm





Base, culot, Sockel: NOVAL

Capacitances Capacités Kapazitäten	C_{g1}	=	10,8 pF
	C_a	=	6,6 pF
	C_{ag1}	<	0,1 pF
	C_{g1g2}	=	3,2 pF
	C_{g1f}	<	0,15 pF

Typical characteristics Caractéristiques types Kenndaten	V_a	=	250 V
	V_{g3}	=	0 V
	V_{g2}	=	250 V
	V_{g1}	=	-5,5 V
	I_a	=	36 mA
	I_{g2}	=	5 mA
	S	=	10 mA/V
	μ_{g2g1}	=	24
	R_i	=	0,13 MΩ

Limiting values
Caractéristiques limites
Grenzdaten

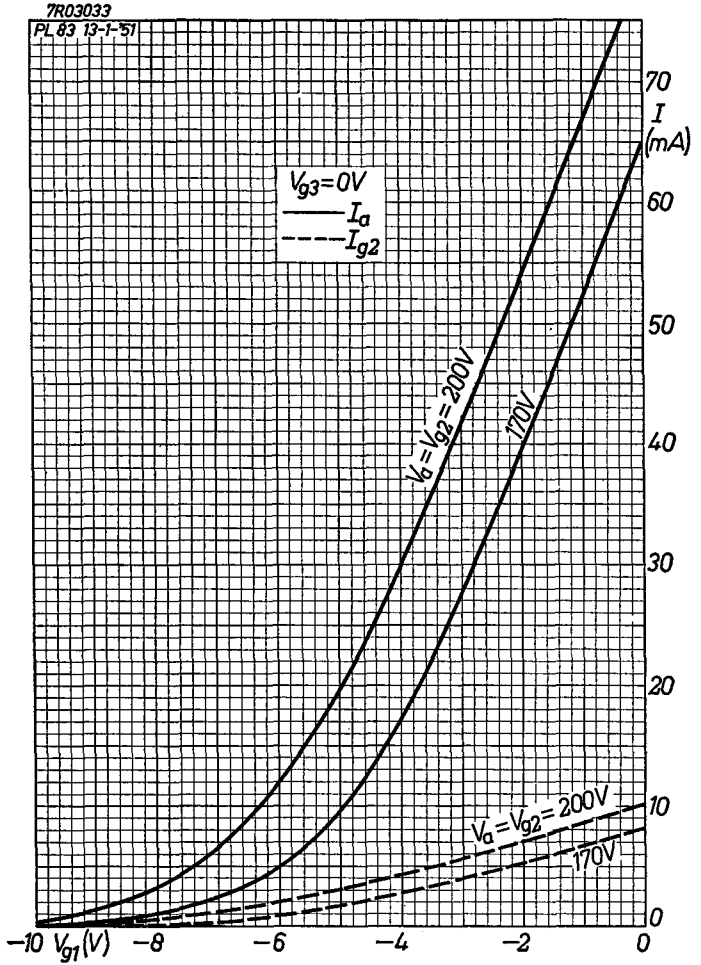
V_{a_o}	= max.	550	V
V_a	= max.	300	V
W_a	= max.	9	W
V_{g2_o}	= max.	550	V
V_{g2}	= max.	300	V
W_{g2}	= max.	2	W
I_k	= max.	70	mA
V_{g1} (I_{g1} = +0,3 µA)	= max.	-1,3	V
R_{g1}	= max.	1	MΩ [1]
R_{g1}	= max.	0,5	MΩ [2]
R_{kf}	= max.	20	kΩ
V_{kf}	= max.	100	V

[1] With automatic bias
Avec polarisation automatique
Mit automatischer Gittervorspannung

[2] With fixed bias
Avec polarisation fixe
Mit fester Gittervorspannung

PHILIPS

EL 83

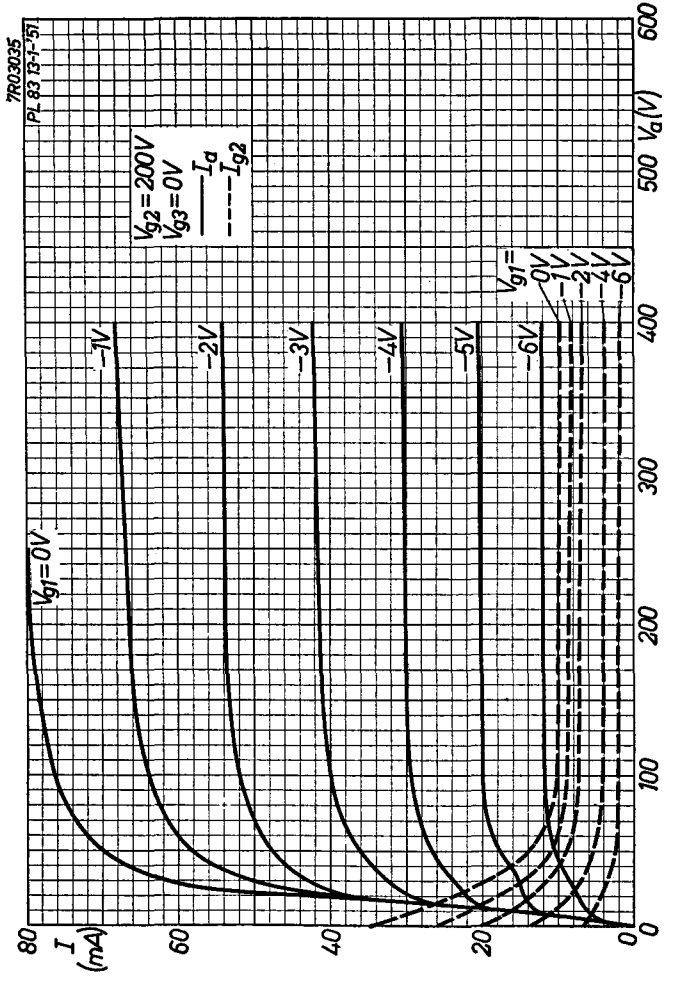


7.7.1960

A

EL83

PHILIPS


7R03035
PL 83 13-1-'51
V_{g2} = 200V
V_{g3} = 0V
I_a
I_{g2}
V_{g1} = 0V
−1V
−2V
−3V
−4V
−5V
−6V
V_{g1} =
0V
−1V
−2V
−4V
−6V
I (mA)
80
60
40
20
0
0
100
200
300
400
500
600
V_a (V)

7.7.1960

C

7R03044
PL83 17-1-51
$R_{a\,min}$ (Ω)
1500
1000
500
0
260
240
220
200
180
160
$V_b = V_{g2}$ (V)

PHILIPS

Electronic Tube

HANDBOOK

EL83

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1	1	1957.03.03
2	2	1957.03.03
3	A	1960.07.07
4	B	1960.07.07
5	C	1960.07.07
6	D	1960.07.07
7	FP	2005.05.06

A.F. OUTPUT PENTODE

Pentode intended for use as A.F. power amplifier.

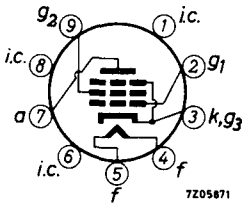
QUICK REFERENCE DATA			
Anode current	I_a	48	mA
Transconductance	S	11.3	mA/V
Amplification factor	$\mu_{g_2g_1}$	19	
Output power	W_o	6.0	W

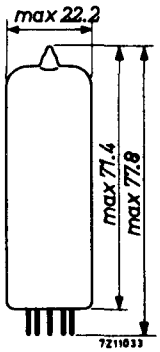
HEATING: Indirect by A.C. or D.C.; parallel supply

Heater voltage	V_f	6.3	V
Heater current	I_f	760	mA

DIMENSIONS AND CONNECTIONS Dimensions in mm

Base: Noval





CAPACITANCES

Anode to all except grid No.1	$C_{a(g_1)}$	6.5	pF
Grid No.1 to all except anode	$C_{g_1(a)}$	10.8	pF
Anode to grid No.1	C_{ag_1}	max. 0.5	pF
Grid No.1 to heater	C_{g_1f}	max. 0.25	pF

OPERATING CHARACTERISTICS

Class A

Anode voltage	V_a			250			V
Grid No.2 voltage	V_{g_2}			250			V
Grid No.1 voltage	V_{g_1}			-7.3			V
Cathode resistor	R_k			135			Ω
Load resistance	$R_{a\sim}$			5.2			kΩ
Grid No.1 driving voltage	V_i	0	0.3	3.4	4.3	4.7 [2]	V_{RMS}
Anode current	I_a	48	–	–	49.5	49.2	mA
Grid No.2 current	I_{g_2}	5.5	–	–	10.8	11.6	mA
Transconductance	S	11.3	–	–	–	–	mA/V
Amplification factor	$\mu_{g_2g_1}$	19	–	–	–	–	
Internal resistance	R_i	38	–	–	–	–	kΩ
Output power	W_o [1]	0	0.05	4.5	5.7	6.0	W
Distortion, total	d_{tot} [1]	–	–	6.8	10	–	%
second harmonic	d_2 [1]	–	–	3.0	2.0	–	%
third harmonic	d_3 [1]	–	–	5.8	9.5	–	%

Anode voltage	V_a			250			V
Grid No.2 voltage	V_{g_2}			250			V
Grid No.1 voltage	V_{g_1}			-7.3			V
Cathode resistor	R_k			135			Ω
Load resistance	$R_{a\sim}$			4.5			kΩ
Grid No.1 driving voltage	V_i	0	0.3	3.5	4.4	4.8 [2]	V_{RMS}
Anode current	I_a	48	–	–	50.6	50.5	mA
Grid No.2 current	I_{g_2}	5.5	–	–	10	11	mA
Transconductance	S	11.3	–	–	–	–	mA/V
Amplification factor	$\mu_{g_2g_1}$	19	–	–	–	–	
Internal resistance	R_i	38	–	–	–	–	kΩ
Output power	W_o [1]	0	0.05	4.5	5.7	6.0	W
Distortion, total	d_{tot} [1]	–	–	7.5	10	–	%
second harmonic	d_2 [1]	–	–	5.7	5.0	–	%
third harmonic	d_3 [1]	–	–	4.5	8	–	%

[1]) Measured with fixed bias
[2]) At $I_{g_1} = +0.3\ \mu A$

OPERATING CHARACTERISTICS (continued)

Class A (continued)

Anode voltage	V_a			250		V
Grid No.2 voltage	V_{g_2}			250		V
Grid No.1 voltage	V_{g_1}			-8.4		V
Cathode resistor	R_k			210		Ω
Load resistance	$R_{a\sim}$			7		kΩ
Grid No.1 driving voltage	V_i	0	0.3	3.5	5.5 [2]	V_{RMS}
Anode current	I_a	36	–	36.8	36	mA
Grid No.2 current	I_{g_2}	4.1	–	8.5	14.6	mA
Transconductance	S	10	–	–	–	mA/V
Amplification factor	$\mu_{g_2g_1}$	19	–	–	–	
Internal resistance	R_i	40	–	–	–	kΩ
Output power	W_o [1]	0	0.05	4.2	5.6	W
Distortion, total	d_{tot} [1]	–	–	10	–	%
second harmonic	d_2 [1]	–	–	1.7	–	%
third harmonic	d_3 [1]	–	–	8.7	–	%

Anode voltage	V_a			250		V
Grid No.2 voltage	V_{g_2}			210		V
Grid No.1 voltage	V_{g_1}			-6.4		V
Cathode resistor	R_k			160		Ω
Load resistance	$R_{a\sim}$			7		kΩ
Grid No.1 driving voltage	V_i	0	0.3	3.4	3.8 [2]	V_{RMS}
Anode current	I_a	36	–	36.6	36.5	mA
Grid No.2 current	I_{g_2}	3.9	–	7.3	8.0	mA
Transconductance	S	10.4	–	–	–	mA/V
Amplification factor	$\mu_{g_2g_1}$	19	–	–	–	
Internal resistance	R_i	40	–	–	–	kΩ
Output power	W_o [1]	0	0.05	4.3	4.7	W
Distortion, total	d_{tot} [1]	–	–	10	–	%
second harmonic	d_2 [1]	–	–	1.8	–	%
third harmonic	d_3 [1]	–	–	9.3	–	%

1) Measured with fixed bias
2) At $I_{g_1} = +0.3\ \mu A$

OPERATING CHARACTERISTICS (continued)

Class B, two tubes in push-pull

Anode voltage	V_a	250		300		V
Grid No.2 voltage	V_{g_2}	250		300		V
Grid No.1 voltage	V_{g_1}	-11.6		-14.7		V
Load resistance	$R_{aa\sim}$	8		8		kΩ
Grid No.1 driving voltage	V_i	0	8	0	10	V_{RMS}
Anode current	I_a	2x10	2x37.5	2x7.5	2x46	mA
Grid No.2 current	I_{g_2}	2x1.1	2x7.5	2x0.8	2x11	mA
Output power	W_o	0	11	0	17	W
Distortion	d_{tot}	-	3	-	4	%

Class AB, two tubes in push-pull

Anode voltage	V_a	250		300		V
Grid No.2 voltage	V_{g_2}	250		300		V
Common cathode resistor	R_k	130		130		Ω
Load resistance	$R_{aa\sim}$	8		8		kΩ
Grid No.1 driving voltage	V_i	0	8	0	10	V_{RMS}
Anode current	I_a	2x31	2x37.5	2x36	2x46	mA
Grid No.2 current	I_{g_2}	2x3.5	2x7.5	2x4	2x11	mA
Output power	W_o	0	11	0	17	W
Distortion	d_{tot}	-	3	-	4	%

OPERATING CHARACTERISTICS IN TRIODE CONNECTION

(g_2 connected to a)

Class A

Anode voltage	V_a	250			V
Cathode resistor	R_k	270			Ω
Load resistance	$R_{a\sim}$	3.5			kΩ
Grid No.1 driving voltage	V_i	0	1.0	6.7	V_{RMS}
Anode current	I_a	34	–	36	mA
Output power	W_o	–	0.05	1.95	W
Distortion	d_{tot}	–	–	9	%

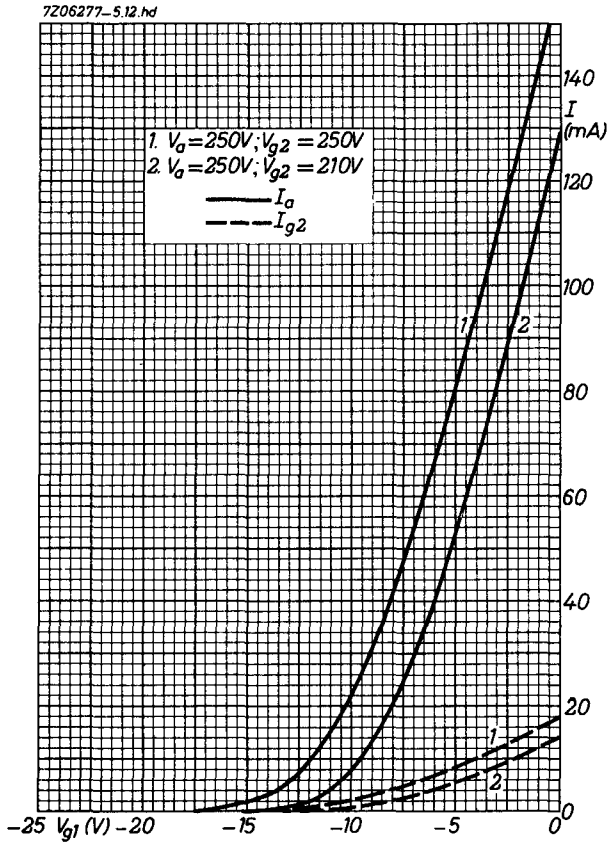
Class AB, two tubes in push-pull

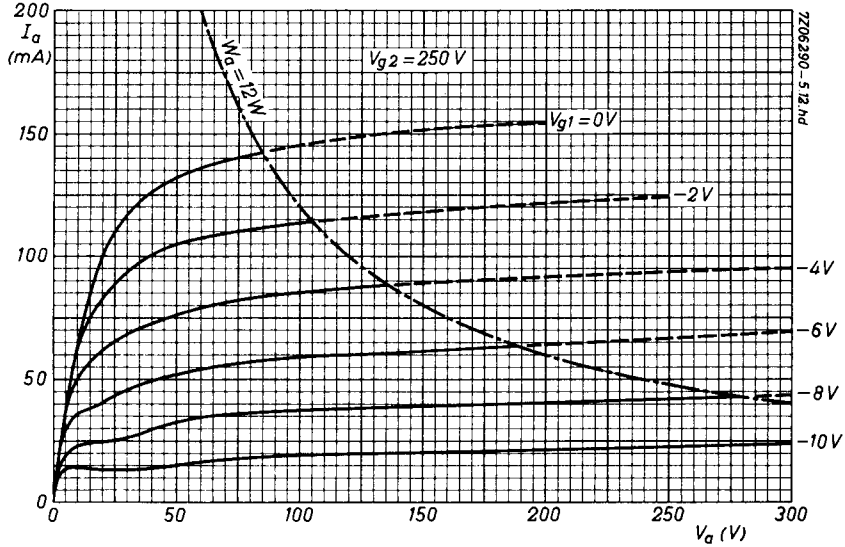
Anode voltage	V_a	250		300		V
Common cathode resistor	R_k	270		270		Ω
Load resistance	$R_{aa\sim}$	10		10		kΩ
Grid No.1 driving voltage	V_i	0	8.3	0	10	V_{RMS}
Anode current	I_a	2x20	2x21.7	2x24	2x26	mA
Output power	W_o	0	3.4	0	5.2	W
Distortion	d_{tot}	–	2.5	–	2.5	%
Grid No.1 driving voltage for W_o = 50 mW	V_i	0.95		0.9		V_{RMS}

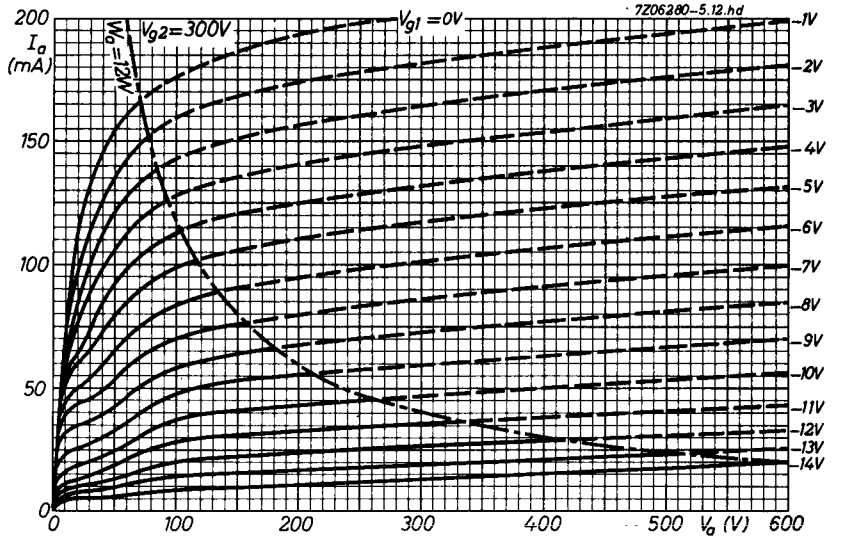
LIMITING VALUES (Design centre rating system)

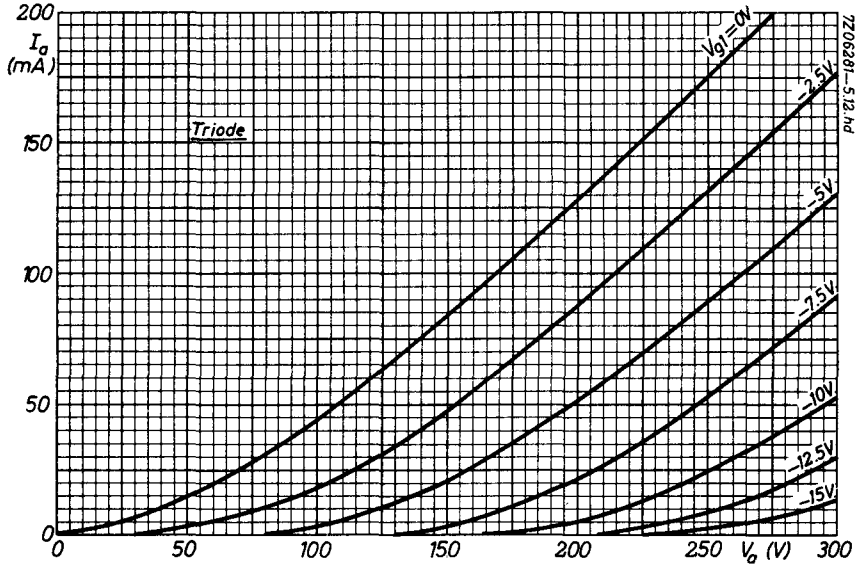
Anode voltage	V_{a_o}	max.	550	V
	V_a	max.	300	V [1]
Anode dissipation	W_a	max.	12	W [1]
Grid No.2 voltage	$V_{g_{2o}}$	max.	550	V
	V_{g_2}	max.	300	V [1]
Grid No.2 dissipation	W_{g_2}	max.	2	W
	$W_{g_{2p}}$	max.	4	W
Grid No.1 voltage	$-V_{g_1}$	max.	100	V
Cathode current	I_k	max.	65	mA
Grid No.1 resistor				
for automatic bias	R_{g_1}	max.	1	MΩ
for fixed bias	R_{g_1}	max.	0.3	MΩ
Cathode to heater voltage	V_{kf}	max.	100	V

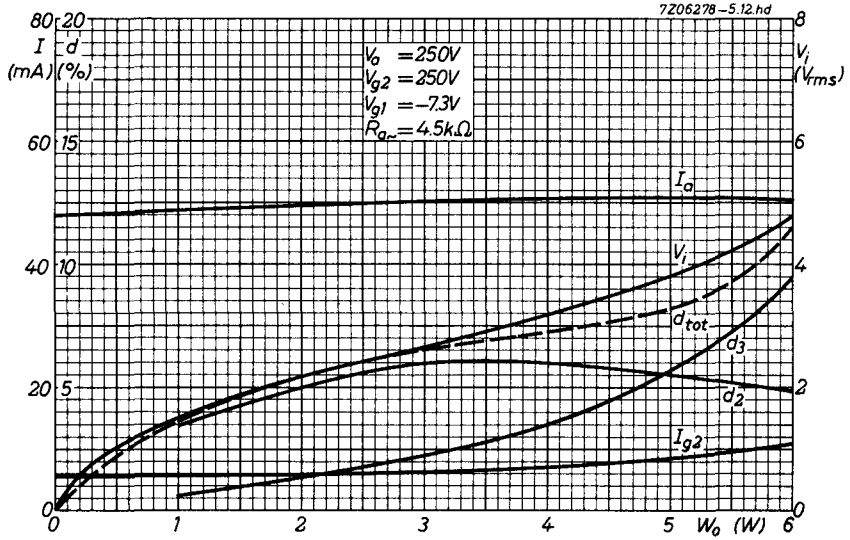
[1]) When the heater and positive voltages are obtained from a storage battery by means of a vibrator, the max. values of V_a and V_{g_2} are 250 V and that of W_a is 9 W.

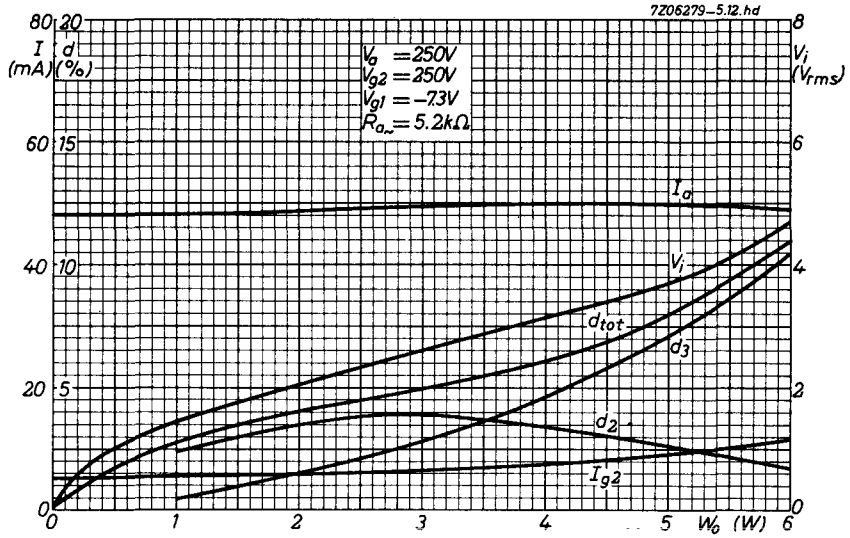

7Z06277-5.12.hd
1. V_a=250V; V_{g2} = 250V
2. V_a=250V; V_{g2} = 210V
I_a
I_{g2}
I (mA)
140
120
100
80
60
40
20
0
1
2
1
2
−25 V_{g1} (V) −20
−15
−10
−5
0

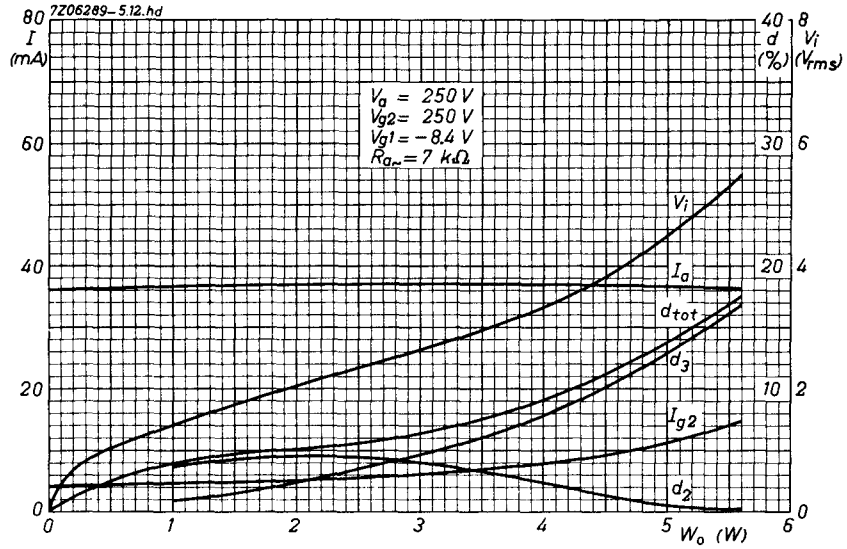

200
I_a
(mA)
150
100
50
0
0
50
100
150
200
250
300
V_a (V)
W_a = 12W
V_{g2} = 250 V
V_{g1} = 0V
−2V
−4V
−6V
−8V
−10V
7Z06290-5.12.hd

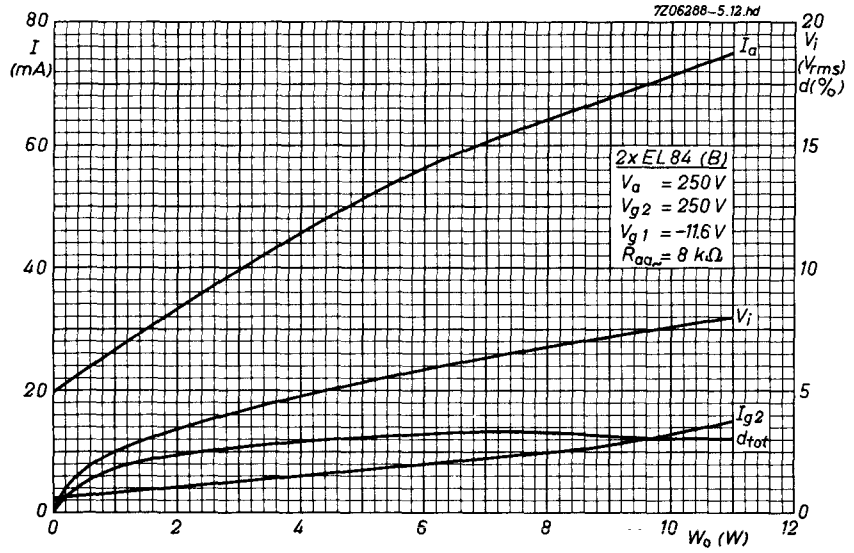

200
I_a
(mA)
150
100
50
0
0
100
200
300
400
500
V_a (V)
600
W_a = 12W
V_{g2} = 300V
V_{g1} = 0V
−1V
−2V
−3V
−4V
−5V
−6V
−7V
−8V
−9V
−10V
−11V
−12V
−13V
−14V
7Z06280-5.12.hd

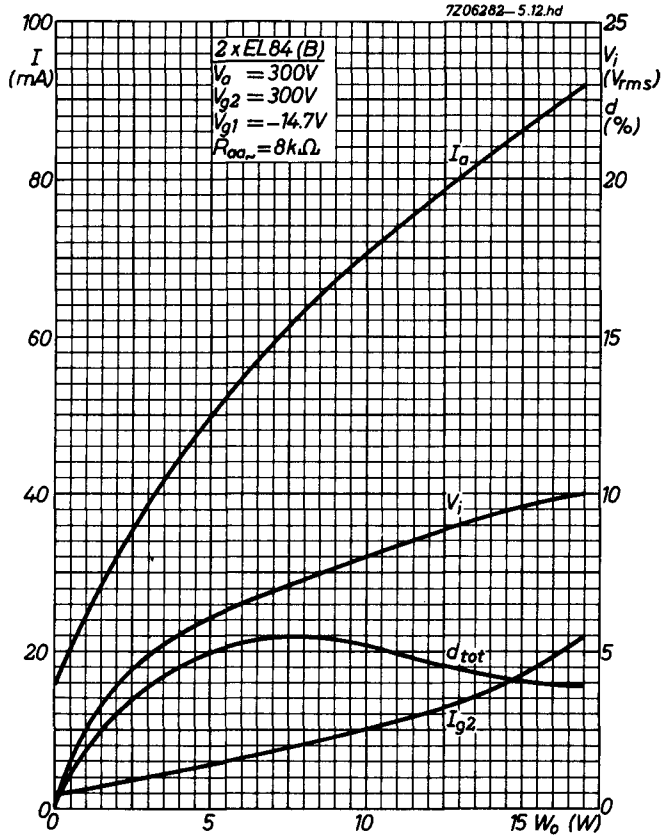

200
I_a (mA)
150
100
50
0
Triode
V_{g1}=0V
-2.5V
-5V
-7.5V
-10V
-12.5V
-15V
0
50
100
150
200
250
V_a (V)
300
ZZ06281-5.12.hd

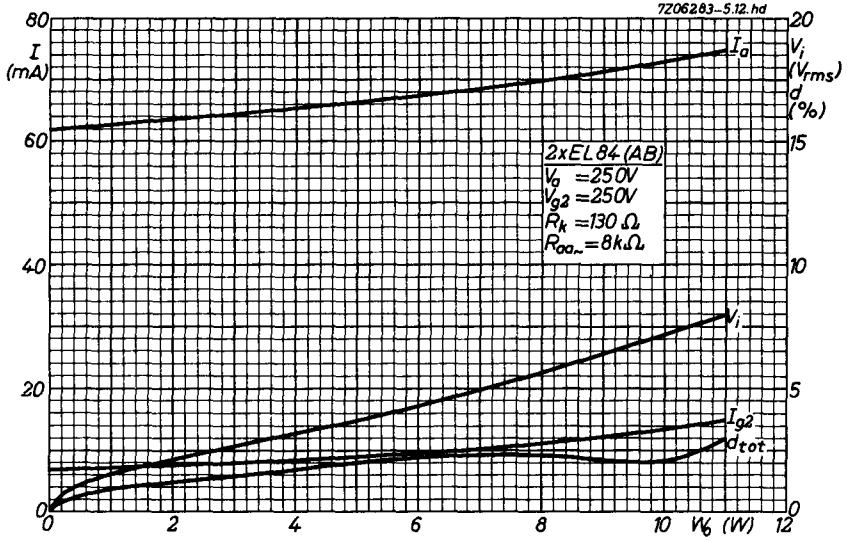

7Z06278-5.12.hd
I (mA)
d (%)
V_i (V_{rms})
V_a =250V
V_{g2} =250V
V_{g1} =-7.3V
$R_{a\sim}$=4.5kΩ
I_a
V_i
d_{tot}
d_3
d_2
I_{g2}
W_o (W)

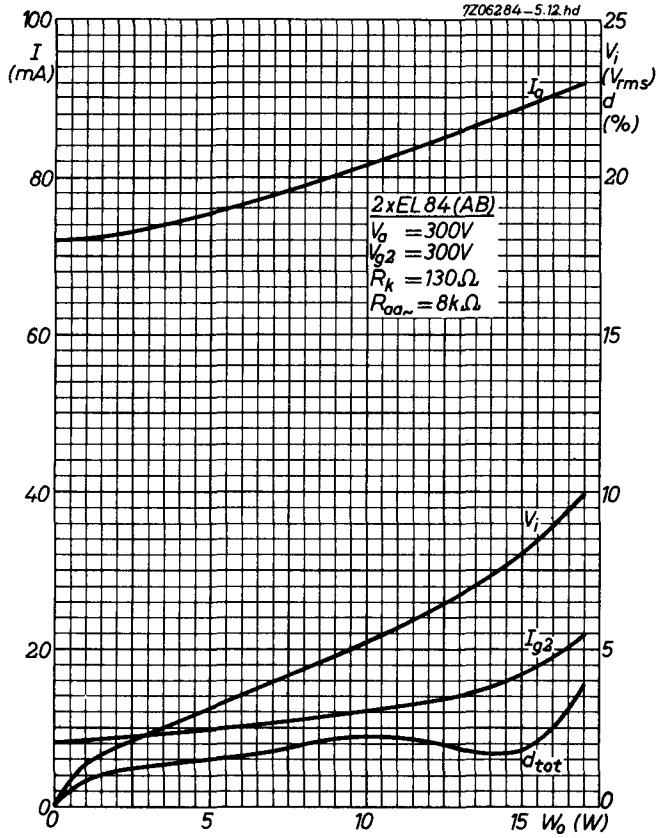

7Z06279-5.12.hd
I (mA)
d (%)
V_i (V_{rms})
V_a =250V
V_{g2} =250V
V_{g1} =-7.3V
$R_{a\sim}$=5.2kΩ
I_a
V_i
d_{tot}
d_3
d_2
I_{g2}
W_o (W)


7Z06289-5.12.hd
I (mA)
d (%)
Vi (Vrms)
Va = 250 V
Vg2 = 250 V
Vg1 = −8.4 V
Ra~ = 7 kΩ
Vi
Ia
dtot
d3
Ig2
d2
Wo (W)


7Z06288-5.12.hd
I (mA)
Vi (Vrms) d(%)
Ia
2x EL 84 (B)
Va = 250 V
Vg2 = 250 V
Vg1 = −11.6 V
Raa~ = 8 kΩ
Vi
Ig2
dtot
Wo (W)


7Z06282–5.12.hd
2 x EL84 (B)
V_a = 300V
V_{g2} = 300V
V_{g1} = −14.7V
$R_{aa\sim}$ = 8kΩ
I (mA)
V_i (V_{rms})
d (%)
I_a
V_i
d_{tot}
I_{g2}
100
80
60
40
20
0
25
20
15
10
5
0
0
5
10
15 W_o (W)


7Z06283-5.12.hd
I (mA)
80
60
40
20
0
I_a
V_i (V_{rms})
d (%)
20
15
10
5
0
2xEL84 (AB)
V_g =250V
V_{g2} =250V
R_k =130 Ω
$R_{aa\sim}$=8kΩ
V_i
I_{g2}
d_{tot}
0
2
4
6
8
10
V_G (W)
12


7Z06284-5.12.hd
100
I
(mA)
80
60
40
20
0
25
V_i
(V_{rms})
d
(%)
20
15
10
5
0
I_a
2xEL84(AB)
V_a =300V
V_{g2} =300V
R_k =130Ω
$R_{aa\sim}$ =8kΩ
V_i
I_{g2}
d_{tot}
0
5
10
15
W_o (W)

PHILIPS

Data handbook

PHILIPS Electronic components and materials

EL84

page	sheet	date
1	1	1969.12
2	2	1969.01
3	3	1969.01
4	4	1969.01
5	5	1969.01
6	6	1969.01
7	7	1969.01
8	8	1969.01
9	9	1969.01
10	10	1969.01
11	11	1969.01
12	12	1969.01
13	13	1969.01
14	14	1969.01
15	FP	1999.03.20

FRAME AND A.F. OUTPUT PENTODE

Pentode intended for use as frame output tube in television receivers and as A.F. power amplifier.

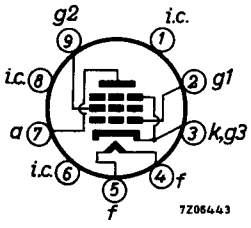
QUICK REFERENCE DATA				
Anode peak voltage	V_{a_p}	max.	2	kV
Cathode current	I_k	max.	100	mA
Output power	W_o		5.3	W

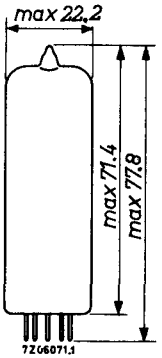
HEATING: Indirect by A.C. or D.C.; parallel supply

Heater voltage	V_f	6.3	V
Heater current	I_f	760	mA

DIMENSIONS AND CONNECTIONS Dimensions in mm

Base: Noval





CAPACITANCES

Anode to all except grid No.1	$C_{a(g_1)}$		6.8	pF
Grid No.1 to all except anode	$C_{g_1(a)}$		13	pF
Anode to grid No.1	C_{ag_1}	max.	0.6	pF
Grid No.1 to heater	C_{g_1f}	max.	0.25	pF

OPTIMUM PEAK ANODE CURRENT IN FRAME OUTPUT OPERATION

The circuit should be designed so that the peak anode current does not exceed:

145 mA at V_a = 60 V, V_{g_2} = 170 V, V_f = 6.3 V
190 mA at V_a = 70 V, V_{g_2} = 200 V, V_f = 6.3 V
220 mA at V_a = 80 V, V_{g_2} = 220 V, V_f = 6.3 V

The minimum available value of the peak anode current at end of life and V_f = 5.7 V is:

125 mA at V_a = 60 V, V_{g_2} = 170 V
160 mA at V_a = 70 V, V_{g_2} = 200 V
185 mA at V_a = 80 V, V_{g_2} = 220 V

OPERATING CHARACTERISTICS

A.F. power amplifier, class A (Measured with V_k constant)

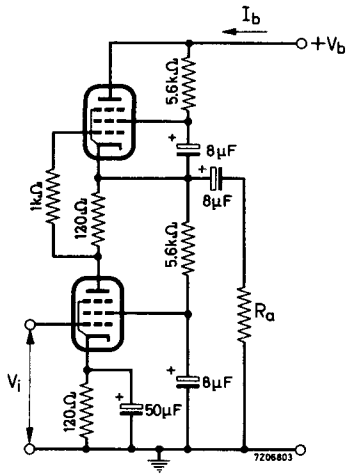
Supply voltage	V_b		200		V
Grid No.2 series resistor (non decoupled)	R_{g_2}		470		Ω
Cathode resistor	R_k		215		Ω
Load resistance	$R_{a\sim}$		2.5		kΩ
Grid No.1 driving voltage	V_i	0	0.52	7.0	V_{RMS}
Anode current	I_a	65	–	64	mA
Grid No.2 current	I_{g_2}	3.2	–	11.4	mA
Output power	W_o	0	0.05	5.3	W
Distortion	d_{tot}	–	–	10	%

A.F. power amplifier, class AB, two tubes in push-pull

Anode supply voltage	V_{ba}		250		V
Grid No.2 supply voltage	V_{bg_2}		200		V
Common cathode resistor	R_k		150		Ω
Load resistance	$R_{aa\sim}$		5.5		kΩ
Grid No.1 driving voltage	V_i	0	0.37	13.0	V_{RMS}
Anode current	I_a	2x50	–	2x55	mA
Grid No.2 current	I_{g_2}	2x2.0	–	2x13	mA
Output power	W_o	0	0.05	18.5	W
Distortion	d_{tot}	–	–	4.5	%

OPERATING CHARACTERISTICS (continued)

A.F. power amplifier, single ended push-pull



a) Single tone input signal

Supply voltage	V_b		300		V
Load resistance	$R_{a\sim}$		1		kΩ
Grid No.1 driving voltage	V_i	0	0.41	5.4	V_{RMS}
Supply current	I_b	66	–	64	mA
Output power	W_o	0	0.05	4.5	W
Distortion	d_{tot}	–	–	9.3	%

b) Double tone input signal

Supply voltage	V_b		300		V
Load resistance	$R_{a\sim}$		1		kΩ
Grid No.1 driving voltage	V_i	0		2.7	V_{RMS} [1)]
Supply current	I_b	66		64	mA
Output power	W_o	0		5.5	W
Distortion	d_{tot}	–		8.5	%

[1)] Value of each tone separately.

REMARK

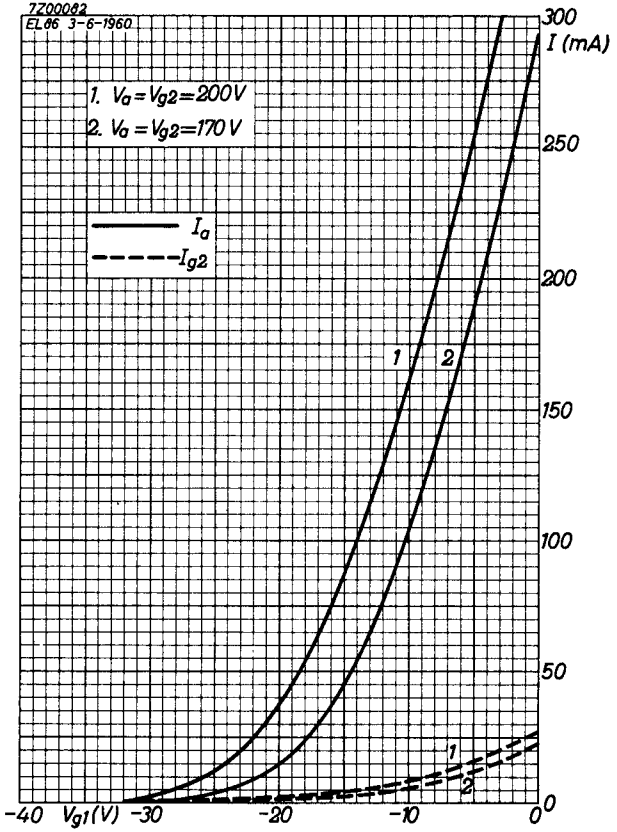
Single tone data are obtained with a pure sinusoidal input voltage. However such an input voltage is in general not representative for the reproduction of music and speech, since a purely sinusoidal tone seldom occurs.
The double tone data are obtained with two sinusoidal signals of different frequencies but of the same amplitude. This appears to be far better in agreement with practice. In the case of full drive with two sinusoidal signals different in frequency but having the same amplitude, the output power is half the value obtained at full drive with a single sinusoidal input voltage of twice this amplitude. To make comparison possible the obtained output power with double tone has therefore been multiplied by 2.

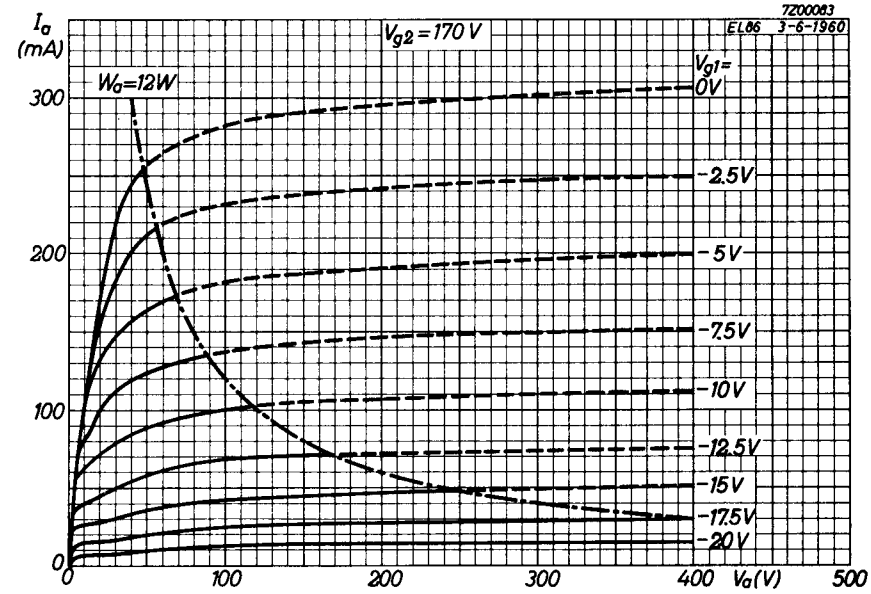
LIMITING VALUES (Design centre rating system)

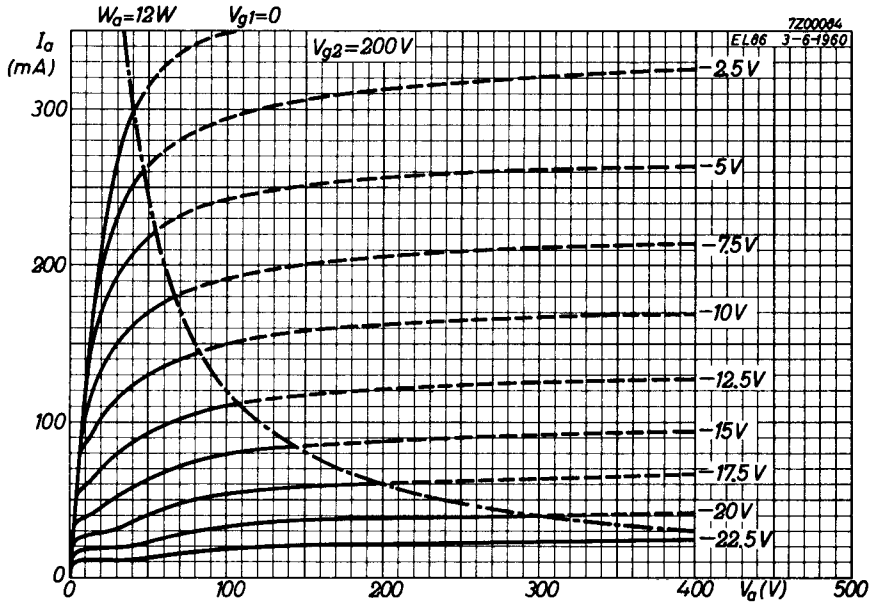
Anode voltage	V_{a_o}	max.	550	V
	V_a	max.	250	V
Anode peak voltage	V_{a_p}	max.	2	kV [1]
Grid No.2 voltage	V_{g2_o}	max.	550	V
	V_{g_2}	max.	250	V
Anode dissipation	W_a	max.	12	W [2]
Grid No.2 dissipation:				
average	W_{g_2}	max.	1.75	W
peak	$W_{g_{2p}}$	max.	6	W
Cathode current	I_k	max.	100	mA
Grid No.1 resistor:				
automatic bias	R_{g_1}	max.	1	MΩ
frame output application with automatic bias	R_{g_1}	max.	2	MΩ
Cathode to heater voltage	V_{kf}	max.	200	V

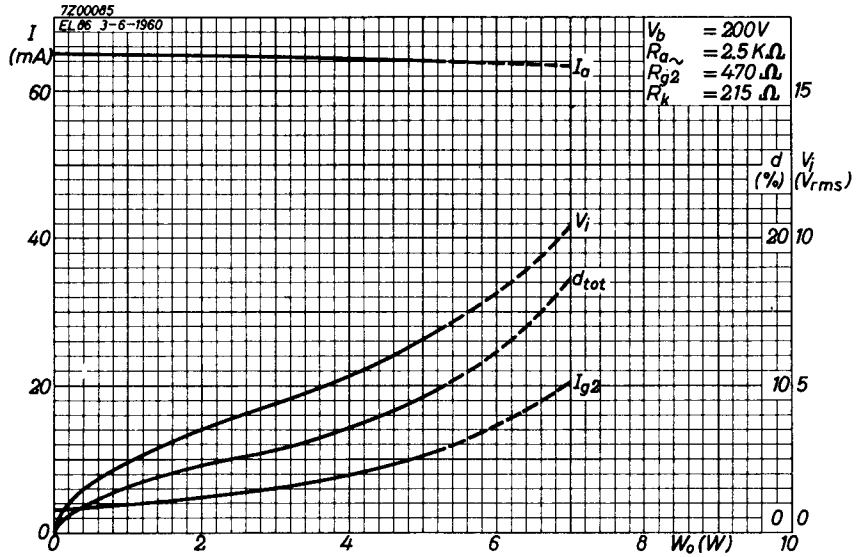
[1] Valid for application in frame output circuits where the max. pulse duration is 4% of a cyele with a max. of 0.8 ms.

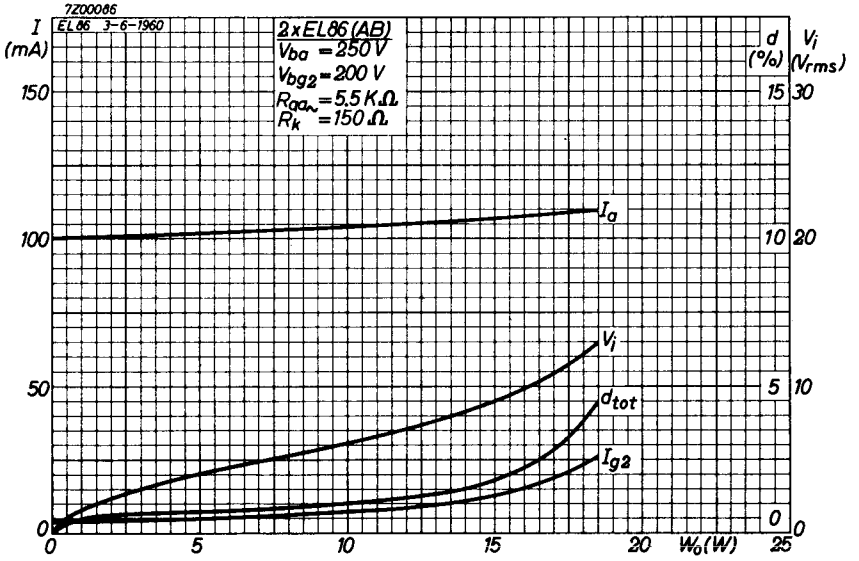
[2] For frame output application W_a = max. 10 W.

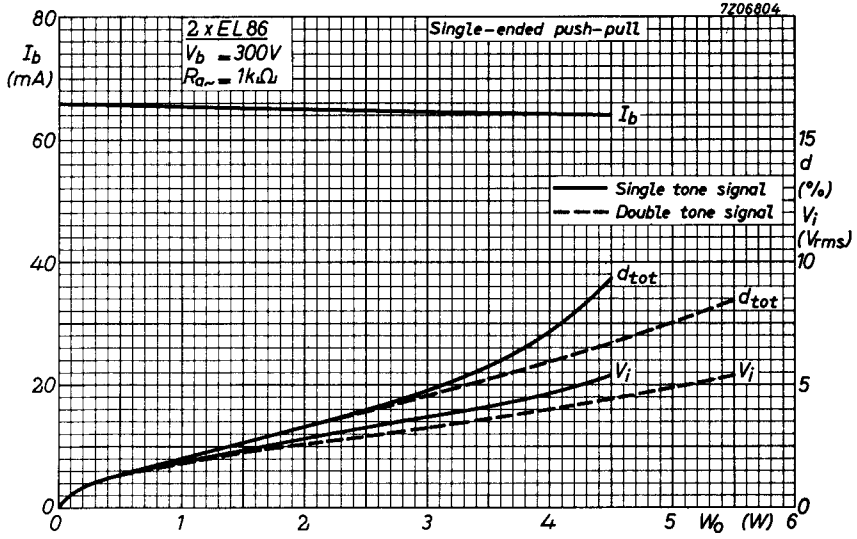

7Z00082
EL86 3-6-1960
1. $V_a = V_{g2} = 200V$
2. $V_a = V_{g2} = 170V$
I_a
I_{g2}
300
I (mA)
250
200
150
100
50
0
1
2
1
2
-40
V_{g1}(V)
-30
-20
-10
0

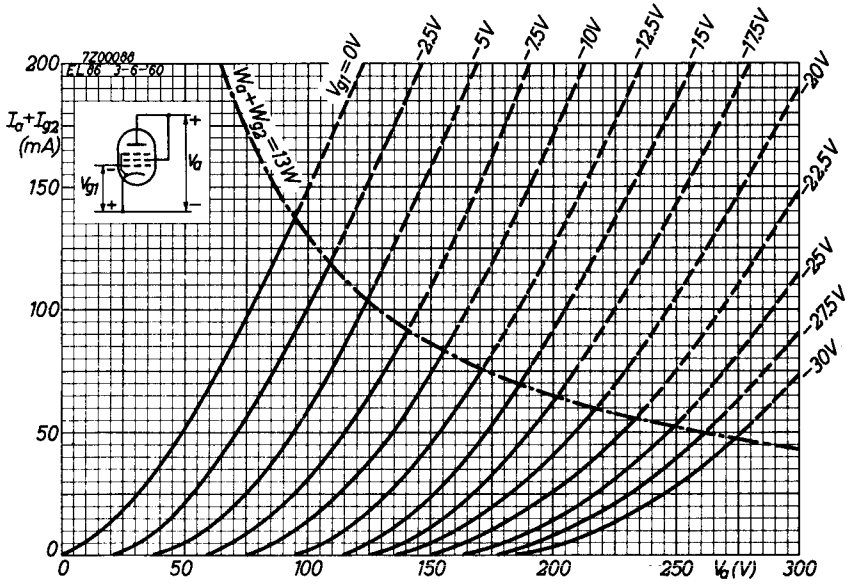

7Z00083
EL86 3-6-1960
I_a (mA)
V_{g2} = 170 V
W_a=12W
V_{g1}=
0V
-2.5V
-5V
-7.5V
-10V
-12.5V
-15V
-17.5V
-20V
300
200
100
0
0
100
200
300
400
V_a(V)
500


W_a=12W
V_{g1}=0
7Z00084
EL86 3-6-1960
I_a (mA)
V_{g2}=200V
-2.5V
-5V
-7.5V
-10V
-12.5V
-15V
-17.5V
-20V
-22.5V
300
200
100
0
0
100
200
300
400
V_a(V)
500


7Z00085
EL86 3-6-1960
I (mA)
60
40
20
0
0
2
4
6
8
W₀ (W)
10
I_a
V_i
d_{tot}
I_{g2}
V_b = 200V
$R_{a\sim}$ = 2.5 KΩ
R_{g2} = 470 Ω
R_k = 215 Ω
d (%)
15
10
5
0
V_i (V_{rms})
20
10
0


7Z00086
EL86 3-6-1960
I (mA)
150
100
50
0
0
5
10
15
20
25
W₀ (W)
2 x EL86 (AB)
V_{ba} = 250 V
V_{bg2} = 200 V
$R_{aa\sim}$ = 5.5 KΩ
R_k = 150 Ω
I_a
V_i
d_{tot}
I_{g2}
d (%)
15
10
5
0
V_i (V_{rms})
30
20
10
0


7206804
2 x EL86
V_b = 300V
$R_{a\sim}$ = 1kΩ
Single-ended push-pull
I_b (mA)
I_b
d (%)
V_i (V_{rms})
Single tone signal
Double tone signal
d_{tot}
d_{tot}
V_i
V_i
W_o (W)
0
1
2
3
4
5
6
20
40
60
80
10
15


7200088
EL86 3-6-60
I_a+I_{g2} (mA)
W_a+W_{g2}=13W
V_{g1}=0V
-2.5V
-5V
-7.5V
-10V
-12.5V
-15V
-17.5V
-20V
-22.5V
-25V
-27.5V
-30V
V_{g1}
V_b
V_b (V)
0
50
100
150
200
250
300

PHILIPS

Data handbook

Electronic components and materials

EL86

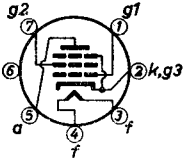
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2	2	1969.01
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6	6	1969.01
7	7	1969.01
8	8	1969.01
9	FP	1999.03.19

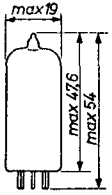
OUTPUT PENTODE
PENTHODE DE SORTIE
ENDPENTODE

Heating : indirect by A.C. or D.C. parallel supply
Chauffage: indirect par C.A. ou C.C. alimentation parallèle
Heizung : indirekt durch Wechsel- oder Gleichstrom; Parallelspeisung

V_f = 6,3 V
I_f = 200 mA
T_h = 12 sec

Dimensions in mm
Dimensions en mm
Abmessungen in mm





Base, culot, Sockel: MINIATURE

Capacitances
Capacités
Kapazitäten

		[1]	[2]	
C_{g1}	=	4,0	6,6	pF
C_a	=	3,75	4,0	pF
C_{ag1}	<	0,25	0,25	pF

Typical characteristics
Caractéristiques types
Kenndaten

V_a	=	250	V
V_{g2}	=	250	V
I_a	=	16	mA
I_{g2}	=	2,4	mA
S	=	2,6	mA/V
μ_{g2g1}	=	12	
R_i	=	130	

[1] Without external shield
Sans blindage extérieur
Ohne äussere Abschirmung

[2] With external shield
Avec blindage extérieur
Mit äusserer Abschirmung

Operating characteristics, class A
Caractéristiques d'utilisation, classe A
Betriebsdaten, Klasse A

V_a	=	250 V
V_{g2}	=	250 V
R_k	=	740 Ω
I_a	=	16 mA
I_{g2}	=	2,4 mA
R_a	=	16 kΩ
V_i (d_{tot} = 10%)	=	5,3 V_{eff}
W_o (d_{tot} = 10%)	=	1,4 W

Operating characteristics class AB, two tubes
Caractéristiques d'utilisation classe AB, deux tubes
Betriebsdaten Klasse AB, zwei Röhren

V_a	=	250		V
V_{g2}	=	250		V
R_k	=	600		Ω[1]
R_{aa}	=	24		kΩ
V_i	=	0	12	V_{eff}
I_a	=	2x11	2x12,8	mA
I_{g2}	=	2x1,6	2x4,1	mA
W_o	=	0	4	W
d_{tot}	=	-	3,2	%

Operating characteristics class B, two tubes
Caractéristiques d'utilisation classe B, deux tubes
Betriebsdaten Klasse B, zwei Röhren

V_a	=	250		V
V_{g2}	=	250		V
V_{g1}	=	-19		V
R_{aa}	=	20		kΩ
V_i	=	0	13	V_{eff}
I_a	=	2x5	2x16	mA
I_{g2}	=	2x0,65	2x4,5	mA
W_o	=	0	4,8	W
d_{tot}	=	-	3,3	%

[1])See page 3; voir page 3; siehe Seite 3

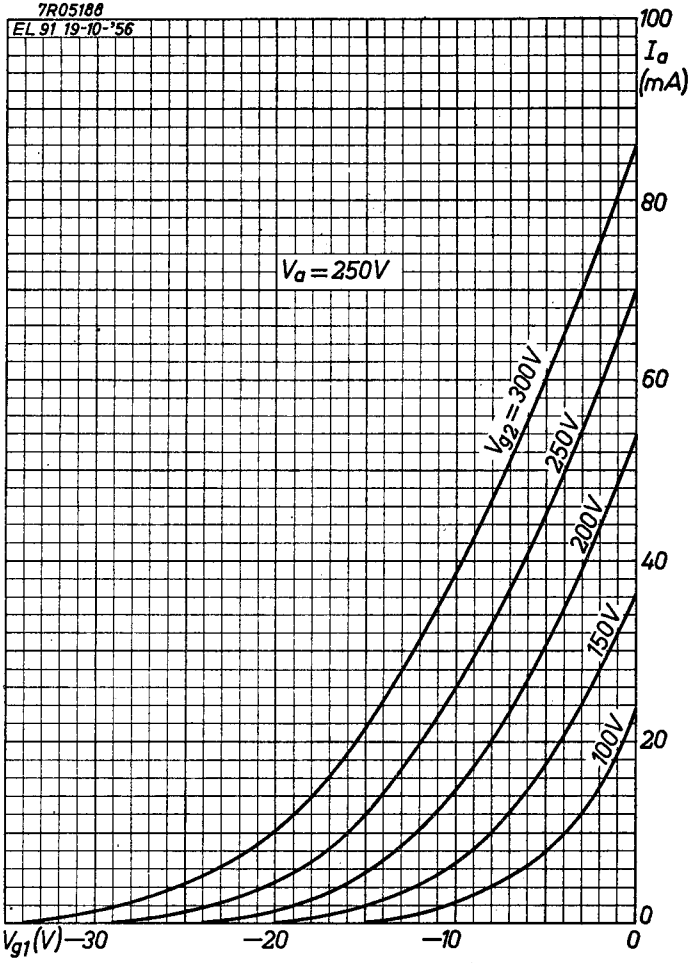
Limiting values
Caractéristiques limites
Grenzdaten

V_{ba}	= max.	550 V
V_a	= max.	250 V
W_a	= max.	4 W
V_{bg2}	= max.	550 V
V_{g2}	= max.	250 V
W_{g2}	= max.	0,6 W
I_k	= max.	25 mA
V_{kf} (k pos.; f neg.)	= max.	150 V
R_{g1}	= max.	0,7 MΩ[2])

[1])Common cathode bias resistor
Résistance cathodique commune
Gemeinsamer Katodenwiderstand

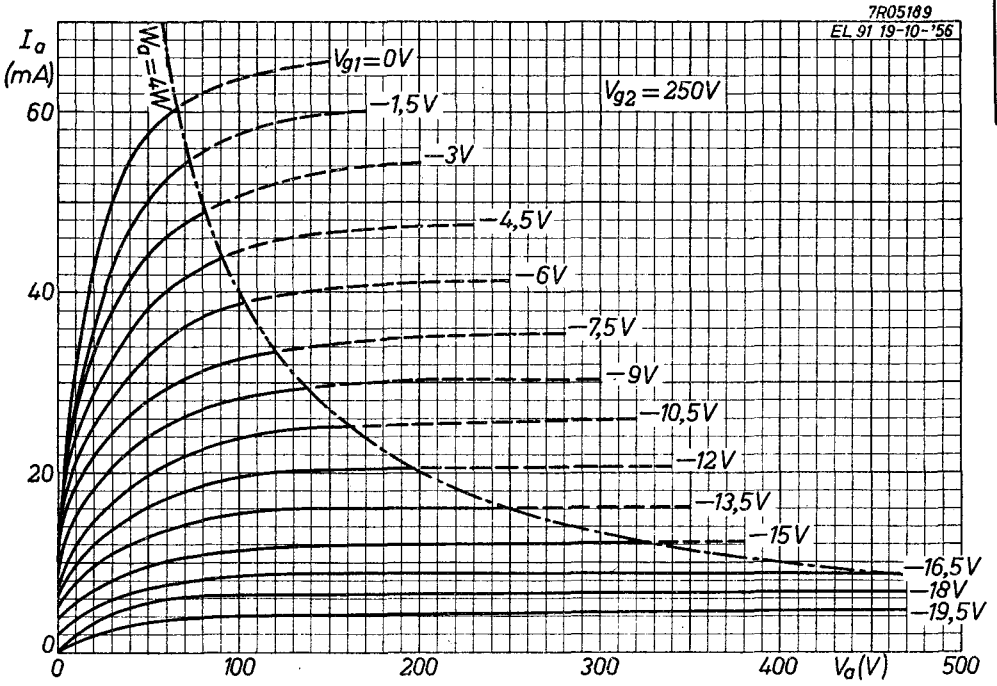
[2])With automatic grid bias
Avec polarisation automatique
Mit automatischer Gittervorspannung

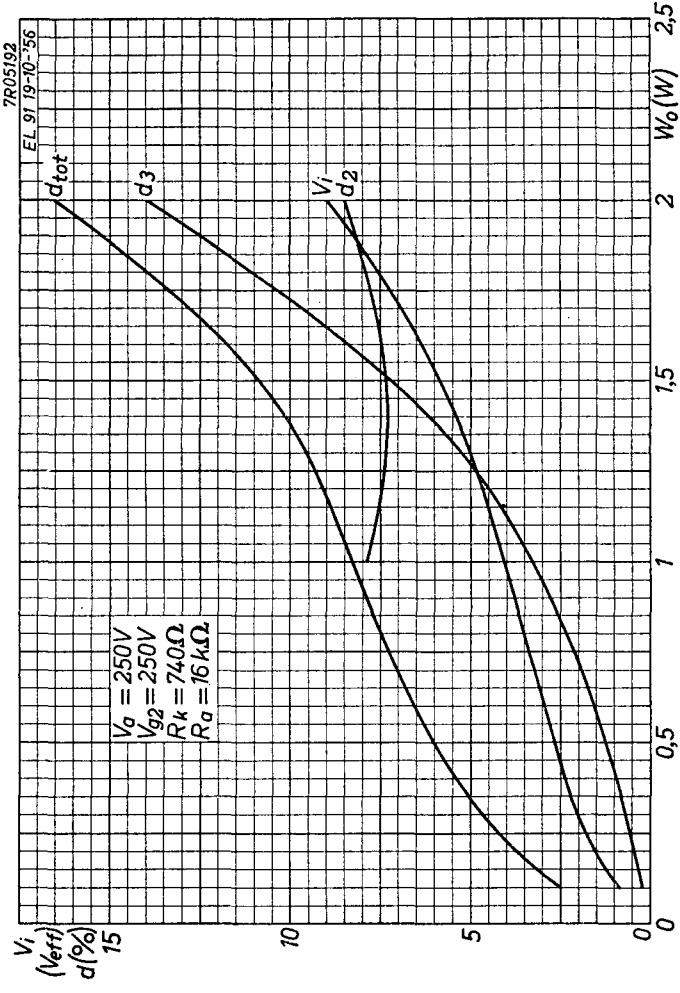
PHILIPS EL 91



10.10.1956

A


7R05189
EL 91 19-10-'56
I_a (mA)
$W_a = 14W$
$V_{g1} = 0V$
$-1,5V$
$-3V$
$-4,5V$
$-6V$
$-7,5V$
$-9V$
$-10,5V$
$-12V$
$-13,5V$
$-15V$
$-16,5V$
$-18V$
$-19,5V$
$V_{g2} = 250V$
60
40
20
0
0
100
200
300
400
V_a(V)
500


7R05192
EL 91 19-10-'56
d_{tot}
d_3
V_i
d_2
$V_a = 250V$
$V_{g2} = 250V$
$R_k = 740\Omega$
$R_a = 16k\Omega$
V_i (Veff)
d (%)
15
10
5
0
0
0,5
1
1,5
2
2,5
W_o (W)

EL 91

PHILIPS

D



EL91

page	sheet	date
1	1	1957.03.03
2	2	1957.03.03
3	3	1957.03.03
4	A	1956.10.10
5	B	1956.10.10
6	C	1957.10.10
7	D	1957.10.10
8	FP	1999.07.10

A.F. OUTPUT PENTODE

Pentode intended for use as A.F. power amplifier.

HEATING : Indirect by A.C. or D.C.; parallel supply

Heater voltage	V_f	6.3 V
Heater current	I_f	200 mA

LIMITING VALUES (Design centre rating system)

Cathode to heater voltage	V_{kf}	max.	100 V

For further data and curves of this type please refer to type PL95

PHILIPS

Data handbook

Electronic components and materials

EL95

page	sheet	date
1	1	1972.01
2	FP	1999.03.19

ELL 1 Doppelendpenthode

Die ELL 1 ist eine Endröhre für Autoempfänger. Sie besteht aus zwei in einem Kolben zusammengebauten Endpenthodensystemen für je 4,5 W Anodenverlustleistung. Mit Rücksicht auf die Anwendung in Autoempfängern wurde auf große Wirtschaftlichkeit des Betriebes geachtet, so daß ein niedriger Heiz- und Anodenstromverbrauch angestrebt wurde. Deswegen ist die Steilheit der beiden Systeme dieser Röhre verhältnismäßig gering. Sie beträgt 1,8 mA/V. Um eine bessere Ausnützung der zugeführten Anodenleistung zu erzielen, wurden zwei Penthodensysteme in einem Kolben zusammengebaut, die in Gegentakt betrieben werden sollen. Bei 3,7 % Verzerrung kann eine Ausgangsleistung von 5,4 Watt erzielt werden.
Bei der ELL 1 sind die beiden Kathoden, das Schirmgitter und das Fanggitter in der Röhre selbst miteinander verbunden.

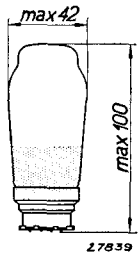


Abb. 1
Abmessungen in mm.

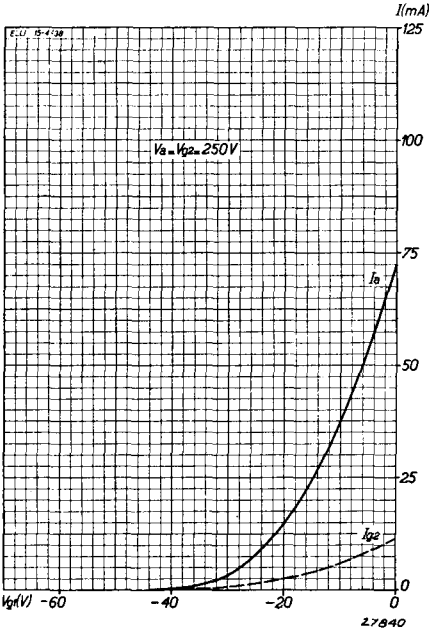


Abb. 3
Anodenstrom und Schirmgitterstrom eines Penthodenteiles der ELL 1 als Funktion der negativen Gitterspannung bei $Va = Vg_2 = 250$ V.

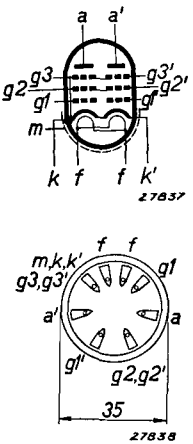


Abb. 2
Elektrodenanordnung und Sockelanschlüsse.

HEIZDATEN

Heizung: indirekt durch Autobatterie.
Heizspannung . . . . . V_f = 6,3 V
Heizstrom . . . . . I_f = 0,45 A

KAPAZITÄTEN

Grenzwert der Gitteranodenkapazität für System 1 . . . . . C_{ag1} = max. 2 µµF
Grenzwert der Gitteranodenkapazität für System 2 . . . . . C_{ag1} = max. 2 µµF

KENNDATEN EINES PENTHODENSYSTEMES

Anodenspannung	V_a	= 250 V
Schirmgitterspannung	V_{g2}	= 250 V
Neg. Gittervorspannung	V_{g1}	= −20 V
Anodenstrom	I_a	= 15 mA
Schirmgitterstrom	I_{g2}	= 2,5 mA
Steilheit	S	= 1,8 mA/V
Innenwiderstand	R_i	= 14.000 Ω

BETRIEBSDATEN FÜR DIE GEGENTAKTSCHALTUNG

Anodenspannung	V_a	= 250 V
Schirmgitterspannung	V_{g2}	= 250 V
Gemeinsamer Kathodenwiderstand	R_k	= 500 Ω
Neg. Gittervorspannung	V_{g1}	= — 20 V
Anodenruhestrom	I_{ao}	= 2×15 mA
Anodenstrom bei voller Aussteuerung	$I_{a\,max}$	= 2×17,5 mA
Schirmgitterruhestrom	I_{g2o}	= 2×2.5 mA
Schirmgitterstrom bei voller Aussteuerung	$I_{g2\,max}$	= 2×5,8 mA
Anpassungswiderstand zwischen den beiden Anoden	R_a	= 16.000 Ω
Max. Ausgangsleistung	W_o	= 5,4 W
Verzerrung bei max. Ausgangsleistung	d_{tot}	= 3,7 %
Gitterwechselspannungsbedarf pro Gitter	V_i	= 19 $V_{(eff)}$

GRENZDATEN

Max. Anodenkaltspannung	V_{ao}	= max. 550 V
Max. Anodenspannung	V_a	= max. 250 V
Max. Anodendauerbelastung (pro System)	W_a	= max. 4,5 V
Max. Schirmgitterkaltspannung	V_{g2o}	= max. 550 V
Max. Schirmgitterspannung	V_{g2}	= max. 275 V
Max. Schirmgitterbelastung im Ruhezustand pro System	W_{g2}	= max. 0,7 W
Max. Schirmgitterbelastung bei voller Aussteuerung pro System	W_{g2}	= max. 1,5 W
Max. Kathodenstrom pro System	I_k	= max. 30 mA
Grenzwert des Gitterstromeinsatzpunktes	V_{g1} ($I_{g1} = +0{,}3\ \mu A$)	= max. — 1,3 V
Max. Gitterkathodenwiderstand	R_{g1k}	= max. 1 MΩ
Max. Widerstand zwischen Kathode und Heizfaden	R_{fk}	= max. 5000 Ω
Max. Spannung zwischen Kathode und Heizfaden	V_{fk}	= max. 50 V

Die für diese Röhre gegebenen Daten und Kurven gelten für den Betrieb mit einer Spannungsquelle ohne Innenwiderstand. Im allgemeinen werden Autoempfänger durch einen Zerhacker gespeist. Der Zerhacker mit Transformator und Siebkreis hat meistens einen ziemlich hohen Innenwiderstand, der die maximal erzielbare Ausgangsleistung der Endstufe ungünstig beeinflußt. Es wird daher empfohlen, für einen möglichst niedrigen Innenwiderstand zu sorgen. Bei einem Innenwiderstand des Speisungsteiles von 1600 Ohm und einem Stromverbrauch der Vorröhren von 20 mA werden nach der untenstehenden Einstellung 4,75 Watt Ausgangsleistung bei 3 % Verzerrung erzielt.

Innenwiderstand der Anodenstromquelle	R_b	= 1600 Ω
Stromverbrauch der Vorröhren	I_q	= 20 mA
Anodenspannung	V_a	= 250 V
Schirmgitterspannung	V_{g2}	= 250 V

Kathodenwiderstand	R_k	= 600 Ω
Anodenruhestrom	I_{ao}	= 2×15 mA
Anodenstrom bei voller Aussteuerung	$I_{a\,max}$	= 2×16,5 mA
Schirmgitterruhestrom	I_{g2o}	= 2×2,5 mA
Schirmgitterstrom bei voller Aussteuerung	$I_{g2\,max}$	= 2×4,7 mA
Anpassungswiderstand zwischen den beiden Anoden	R_a	= 16.000 Ω
Maximale Ausgangsleistung	W_o	= 4,75 W
Verzerrung bei max. Ausgangsleistung	d_{tot}	= 3 %
Gitterwechselspannungsbedarf pro Gitter	V_i	= 18 $V_{(eff)}$

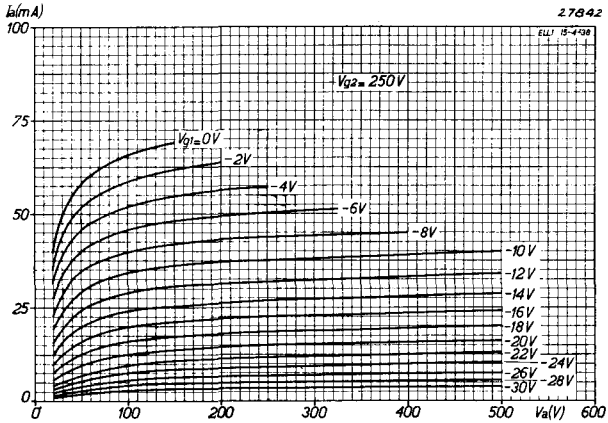


Abb. 4
Anodenstrom eines Penthodenteiles der ELL 1 als Funktion der Anodenspannung bei verschiedenen negativen Gitterspannungen und Vg_2 = 250 V.

Diese Angaben ermöglichen es, für andere Fälle die mögliche Leistung abzuschätzen.
Die maximale Spannung an der Anode beträgt 250 Volt. Sie soll bei der mittleren Batteriespannung von 6,3 Volt nicht überschritten werden. Der Betrieb mit Wagenbatterien führt zu wesentlich größeren Überspannungen als die Speisung mit Netzstrom; während der Aufladung der Batterie kommen manchmal Spannungen von 8 bis 9 Volt vor, so daß die Lebensdauer der Empfängerröhren hierdurch gefährdet wird. Überspannungen an der Anode und am Schirmgitter bis 20 % sind bei automatischer Vorspannung noch zulässig. Da die maximale Schirmgitterspannung dieser Röhre 275 V beträgt, besteht die Möglichkeit, den Spannungsabfall über den Ausgangstransformator zu berücksichtigen, ohne die Anodenspannung zu erniedrigen.

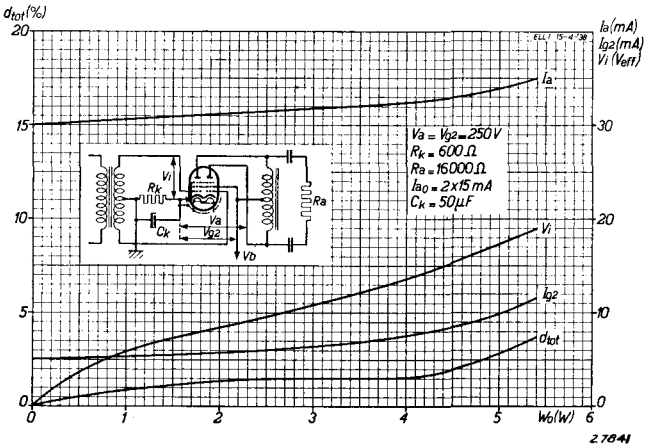


Abb. 5
Gesamtverzerrung dtot, Gitterwechselspannungsbedarf pro Gitter Vi, Gesamtanodenstrom Ia und Gesamtschirmgitterstrom Ig_2 als Funktion der Ausgangsleistung bei Verwendung der ELL 1 als Gegentaktverstärker mit automatischer Vorspannung.

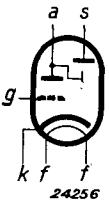
EM 1 Abstimmkreuz

Der Abstimmanzeiger EM 1 beruht auf dem Prinzip der Hochvakuumelektronenröhre und arbeitet folglich völlig trägheitslos. Er besteht zunächst aus dem eigentlichen Anzeigerteil, der nur eine Kathode, eine Anode (Schirm) und 4 Ablenkplatten hat. Die Anode ist konisch und auf der Innenseite mit einer fluoreszierenden Substanz bedeckt. Das Aufleuchten des Schirmes durch das Auftreffen der angezogenen Elektronen kann vom Kopfende beobachtet werden. Zwischen der Kathode und dem Schirm befinden sich radial 4 Ablenkplättchen, die eine ablenkende Wirkung auf die zum Schirm fliegenden Elektronen ausüben. Durch die ablenkende Wirkung der 4 Plättchen entstehen hinter diesen auf dem Leuchtschirm, der direkt an die Spannungsquelle der Anodenspeisung angeschlossen wird, 4 Schatten, deren Breite veränderlich ist.



Abb. 1
Abmessungen in mm

Bei normaler Schaltung in einem Empfänger wird die Abstimmung auf den gewünschten Sender auf größte Breite der Leuchtsektoren eingestellt. Der untere Teil dieses Abstimmanzeigers besteht aus einer Triode, die die veränderliche Regelspannung der automatischen Lautstärkeregelung verstärkt. Die Anode dieser Triode ist im Inneren der Röhre mit den Ablenkstegen verbunden und sie wird über einem Widerstand von 2 MΩ an die Spannung der Anodenspeisung des Gerätes angeschlossen. Die veränderliche Regelspannung am Gitter erzeugt Spannungsschwankungen an der Anode und folglich auch an den Ablenkplatten; hieraus entsteht die veränderliche Breite der Leuchtsektoren, auf die man die Abstimmung des Empfängers einstellen kann. Die EM 1 kann sowohl für 6,3-Volt-Wechselstromgeräte und Autoempfänger wie auch in Gleichstrom/Wechselstromempfängern mit Serienspeisung der Heizfäden verwendet werden. Weil jedoch die Gleichspannung am Fluoreszenzschirm nicht unter 200 Volt sinken darf, ist die Anwendung in G/W-Empfängern beschränkt auf solche, die an Gleichstromnetzen von 220 V, ohne Spannungsverdopplung an Wechselstromnetzen von 220 Volt und mit Spannungsverdopplung an 110-Volt-Wechselstromnetzen arbeiten.



Richtung des Trägers der Abschirmkappe

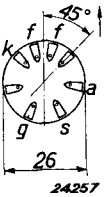


Abb. 2
Elektrodenanordnung und Sockelanschlüsse.

HEIZDATEN

Heizung: indirekt durch Gleich- oder Wechselstrom, Serien- oder Parallelspeisung.

Heizspannung	V_f	= 6,3 V
Heizstrom	I_f	= 0,200 A

BETRIEBSDATEN

Spannung an Schirm und Anodenwiderstand	V_b	=	200 V	250 V
Serienwiderstand der Triodenanode	R_a	=	2 MΩ	2 MΩ
Neg. Gittersp. für die kleinste Breite der Lichtstreifen	V_g	=	0 V	0 V
Neg. Gittersp. für die größte Breite der Lichtstreifen	V_g	=	−4 V	−5 V
Anodenstrom für V_g = 0 V	I_a	=	75 µA	95 µA
Anodenstrom für V_g = −4 bzw. −5 Volt	I_a	=	20 µA	21 µA
Schirmstrom für V_g = 0 Volt	I_s	=	0,13 mA	0,13 mA
Schirmstrom für V_g = −4 bzw. −5 Volt	I_s	=	0,14 mA	0,14 mA
Lichtwinkel am Rande des Schirmes, gemessen bei V_g = 0 Volt	Θ	=	20°	16°
Lichtwinkel am Rande des Schirmes, gemessen bei V_g = −4 bzw. −5 Volt	Θ	=	90°	90°

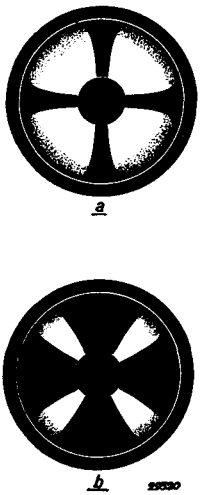


Abb. 4
a) Lichtbedeckung des Fluoreszenzschirmes bei großer negativer Spannung *am Gitter des* Triodenteiles.
b) Lichtbedeckung des Fluoreszenzschirmes bei kleiner negativer Spannung am Gitter des Triodenteiles.

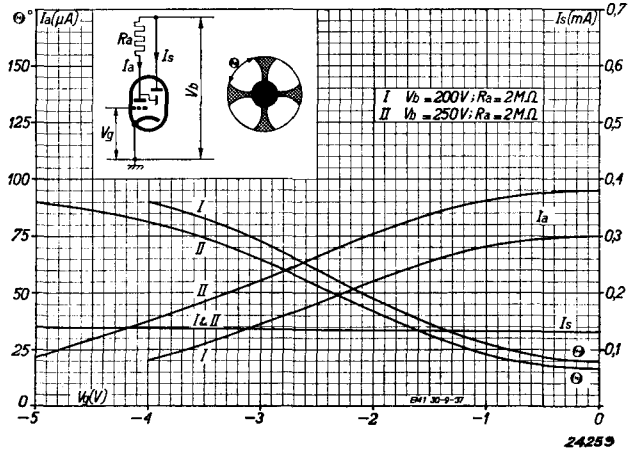


Abb. 3
Anodenstrom des Triodenteiles Ia, Strom zum Fluoreszenzschirm Is und Lichtwinkel Θ, gemessen am Rande des Schirmes als Funktion der negativen Gitterspannung bei Vb = 200 V (Kurve I) und Vb = 250 V (Kurve II).

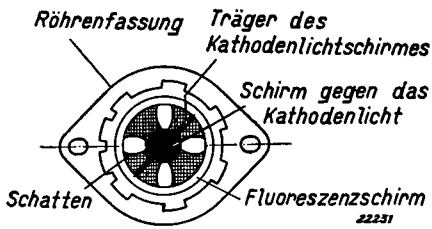


Abb. 5
Kopfansicht des Abstimmkreuzes mit Röhrenfassung. Die Trägerstange des Kathodenlichtschirmes gibt die Richtung des Kreuzes an.

GRENZDATEN

V_{ao}	=	max. 550 V
V_a	=	max. 250 V
V_{so}	=	max. 550 V
V_s	=	max. 250 V [1]
R_{fk}	=	max. 5000 Ω
R_{gk}	=	max. 2,5 MΩ
V_{fk}	=	max. 100 V [2]

[1]) Hierbei wurden 10 % Überspannung des Netzes berücksichtigt. Die absolute max. Spannung ist 275 Volt.
[2]) Gleichspannung oder Effektivwert der Wechselspannung.

PHILIPS „MINIWATT"

EM 3

EM 3

Röhrentype: Abstimmanzeigeröhre mit Fluoreszenzschirm.
Type de tube: Indicateur d'accord avec écran fluorescent.
Type of tube: Tuning indicator with fluorescent screen.

Heizung ind., Gleich- oder Wechselstrom, Parallel- oder Serienschaltung.
Chauffage ind., CC ou CA, alimentation en parallèle ou en série.
Heating ind., A.C. or D.C., parallel or series filament supply.

Vf 6,3 V
If 0,200 A

Betriebsdaten als Abstimmanzeigeröhre.
Caractéristiques de service, utilisation comme indicateur d'accord.
Operating conditions for use as tuning indicator.

Vb	200 V	250 V
Ra	1,0 MΩ	1,0 MΩ
Is (Vg = 0 V)	0,25 mA	0,3 mA
Ia (Vg = 0 V)	175 µA	220 µA
Vg (φ = 9°)1)	-	0 V
Vg (φ = 12°)1)	0 V	-
Vg (φ = 90°)1)	-18 V	-21 V

1) Winkel jedes Lichtstreifens gemessen am Rande des Schirmes.
Angle de chaque tache fluorescente mesuré au bord de l'écran.
Angle of each fluorescent patch measured on the edge of the screen.

Grenzdaten.
Limites fixées pour les caractéristiques.
Limiting values.

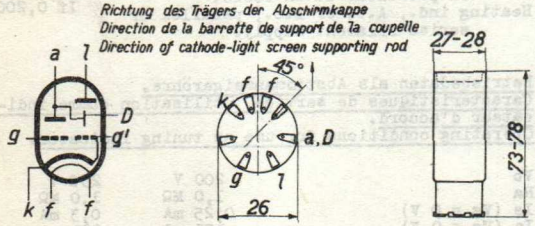
Vao	max. 550 V
Va	max. 275 V
Vso	max. 550 V
Vs	max. 275 V
Vg (Ig = +0,3 µA)	max. -1,3 V
Rgk	max. 3 MΩ
Rfk	max. 5000 Ω
Vfk	max. 100 V2)

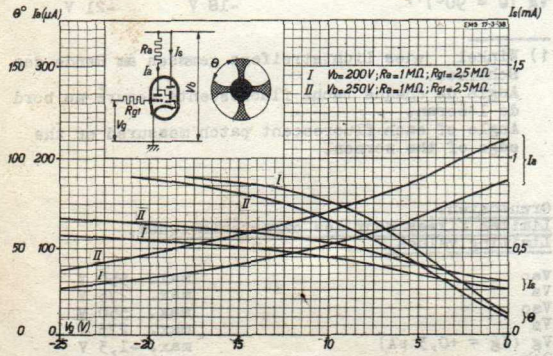
2) Gleichspannung oder Effektivwert der Wechselspannung.
Tension continue ou valeur efficace de la tension alternative.
D.C. voltage or R.M.S. value of the A.C. voltage.

EM 3

PHILIPS „MINIWATT"
EM 3

Elektrodenanordnung, Sockelanschlüsse und max. Abmessungen in mm.
Disposition des électrodes, connexions du culot et dimensions max. en mm.
Electrode arrangement, base connections and max. dimensions in mm.



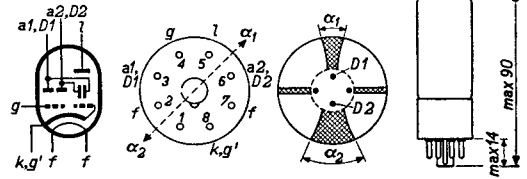


TUNING INDICATOR with two systems of different sensitivity
INDICATEUR D'ACCORD avec deux systèmes de sensibilité différente
ABSTIMMANZEIGERÖHRE mit zwei Systemen verschiedener Empfindlichkeit

Heating : indirect by A.C. or D.C. series or parallel supply
Chauffage: indirect par C.A. ou C.C. alimentation parallèle ou série
Heizung : indirekt durch Wechsel- oder Gleichstrom; Serien- oder Parallelspeisung

V_f = 6,3 V
I_f = 200 mA

Dimensions in mm
Dimensions en mm
Abmessungen in mm



Base, culot, Sockel: OCTAL

Operating characteristics
Caractéristiques d'utilisation
Betriebsdaten

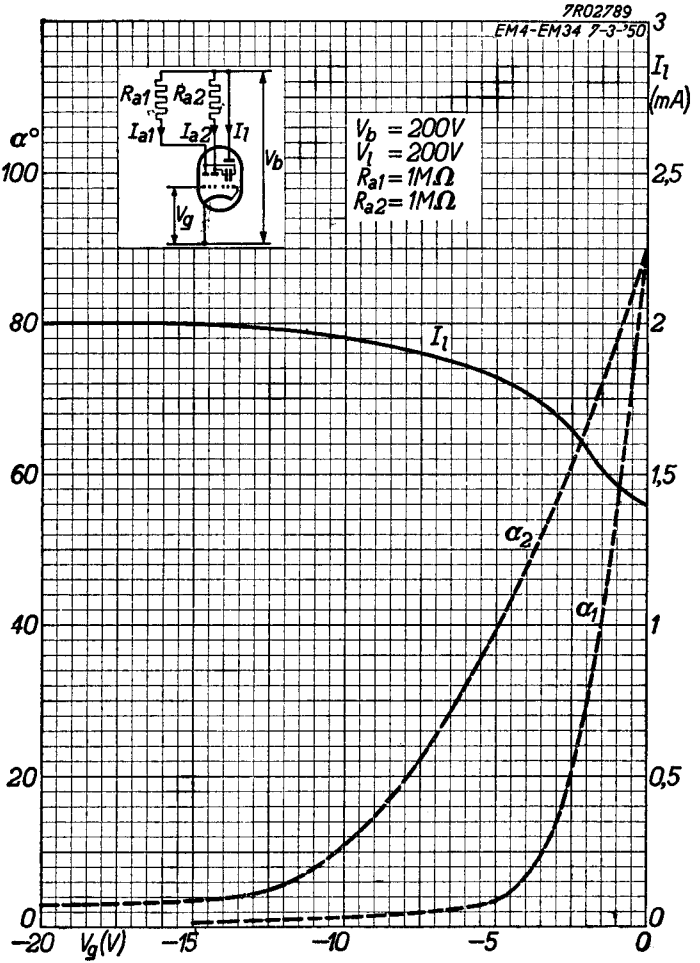
$V_b = V_l$	=	200	250 V
$R_{a1} = R_{a2}$	=	1,0	1,0 MΩ
I_l (V_g = 0 V)	=	1,4	2,0 mA
V_g ($\alpha_1 = \alpha_2 = 90^o$)	=	0	0 V
V_g (α_1 = min.)	=	-4,2	-5 V
V_g (α_2 = min.)	=	-12,5	-16 V

Limiting values
Caractéristiques limites
Grenzdaten

V_{a1_o}	= max.	550 V	
V_{a1}	= max.	300 V	
V_{a2_o}	= max.	550 V	
V_{a2}	= max.	300 V	
V_{l_o}	= max.	550 V	
V_l	= max.	300 V	
$-V_g$ (I_g =+0,3μA)	= max.	1,3 V	
R_g	= max.	3 MΩ	
R_{kf}	= max.	20 kΩ	
V_{kf}	= max.	100 V	

PHILIPS

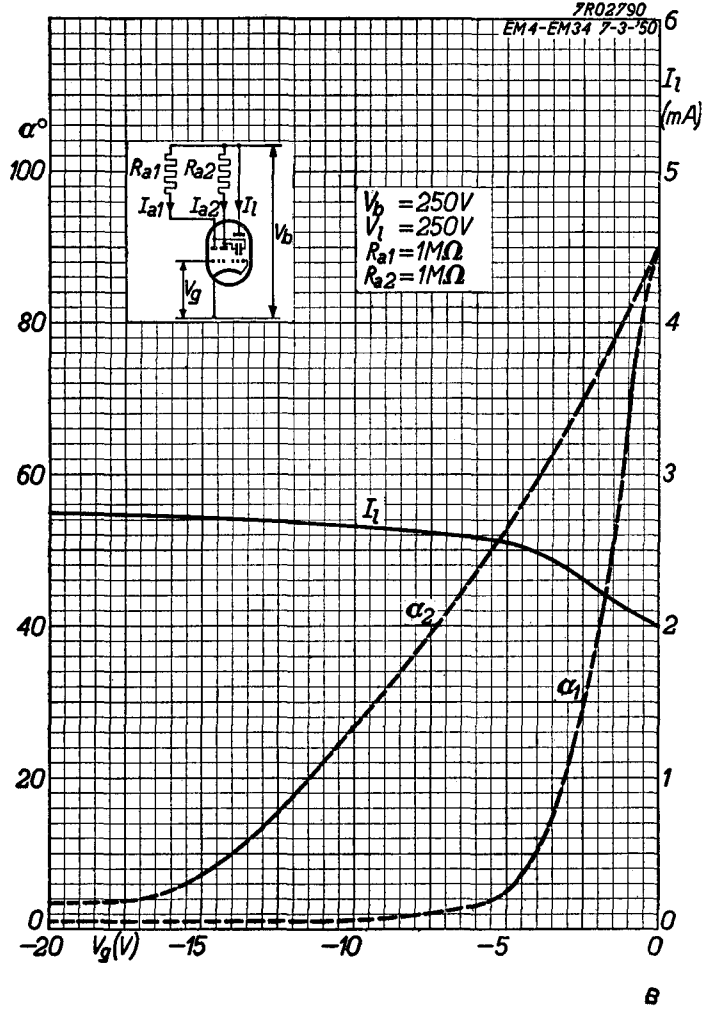
EM34



1.1.1956

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EM34 **PHILIPS**



PHILIPS

Electronic Tube

HANDBOOK

EM34

page	sheet	date
1	1	1956.01.01
2	A	1956.01.01
3	B	1956.01.01
4	FP	1999.07.10

EM 4 Abstimmanzeiger mit zwei Empfindlichkeiten

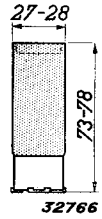
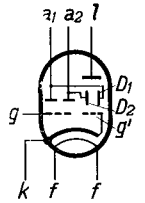


Abb. 1
Abmessungen in mm.

Die Röhre EM 4 ist eine Elektronenstrahlabstimmanzeigeröhre mit zwei verschiedenen Empfindlichkeiten, die es gestattet, sowohl die am Empfangsorte sehr schwachen wie auch sehr starken Sender mit größter Genauigkeit einzustellen.
Die EM 4 ist äußerlich kaum von der Röhre EM 1 zu unterscheiden. Sie arbeitet nach demselben Prinzip; sie besitzt einen konischen Fluoreszenzschirm, auf dem sich infolge der Ablenkung der Elektronenbahnen Schatten veränderlicher Breite bilden. Der Fluoreszenzschirm wird vom Kopfende der Röhre aus beobachtet. Auf dem Fluoreszenzschirm bilden sich anstatt vier nur zwei Fluoreszenzflecke. Es bleiben mithin auch nur zwei Schatten übrig. Die Abstimmung wird bei der EM 4 eher mit Hilfe der veränderlichen Schattensektoren als mit Hilfe der Leuchtsektoren erfolgen. Jeder Schattensektor ändert sich bei der Abstimmung jedoch in der Breite nicht in derselben Weise. Der eine Schattensektor besitzt nämlich eine viel größere Empfindlichkeit als der andere, d.h. die Winkeländerung des einen Sektors geht viel rascher vor sich als die des anderen.
Es lag bei der Entwicklung dieser Röhre folgende Überlegung vor. Bei der Schaltung der Röhre EM 1 zeigte sich häufig, daß eine befriedigende Abstimmanzeigung sowohl für schwache wie auch für starke Sender schwierig zu erreichen war. Will man nämlich mit dieser Röhre für schwache Stationen eine empfindliche Abstimmanzeigung erhalten, so ist man gezwungen, das Gitter der EM 1 direkt durch die Gleichspannung am Ableitwiderstand der Empfangsdiode zu steuern oder diese Spannung nur in geringem Maße durch einen Spannungsteiler herabzusetzen. Bei starken Sendern entwickelt sich dann eine so hohe Gleichspannung am Gitter der EM 1, daß die Fluoreszenzflecke schon lange, bevor die Mitte der Resonanzkurve erreicht wird, sich überlappen. Sollte man andererseits die Abstimmöglichkeit der starken Sender bevorzugen und deswegen das Teilverhältnis des Spannungsteilers dementsprechend wählen, so wird von einer Abstimmanzeigung der schwachen Stationen kaum mehr die Rede sein. Die Gleichspannungsänderung am Gitter bei der Abstimmung wird so schwach sein, daß kaum eine Verschiebung der Ränder der Fluoreszenzflecke zu bemerken ist. Um eine gute Abstimmanzeigung sowohl für schwache wie für starke Stationen zu erhalten, müßte man zwei Abstimmanzeigeröhren einbauen, von denen die eine direkt und die andere über einen Spannungsteiler mit dem Ableitwiderstand der Empfangsdiode



Richtung der permanenten Schattenstriche

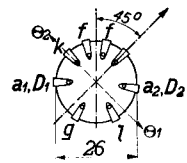


Abb. 2
Elektrodenanordnung und Sockelanschlüsse.
1 = Fluoreszenzschirm.

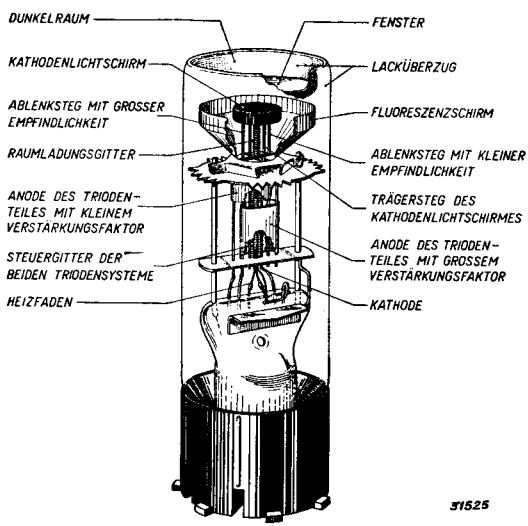


Abb. 3
Konstruktion des Philips Abstimmanzeigers EM 4.

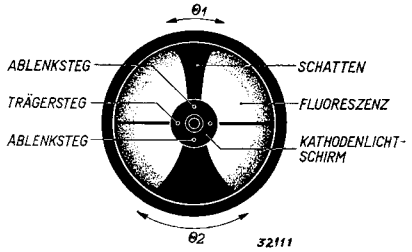


Abb. 4
Anordnung der Teile im Anzeigeteil der EM 4.

gekoppelt werden müßte. Besser wäre es noch, wenn beide Abstimmanzeiger in derselben Weise direkt mit dem Ableitwiderstand gekoppelt werden könnten, z.B. durch Verwendung eines Abstimmanzeigers mit großer und eines anderen mit kleiner Empfindlichkeit. Unter Empfindlichkeit des Abstimmanzeigers ist dann die Winkeländerung der Fluoreszenzflecke bzw. der Schatten pro Volt Gitterspannungsänderung zu verstehen. Da die Verwendung von zwei Röhren für die Abstimmanzeigung sogar in Luxusempfängern wegen der damit zusammenhängenden Kosten und des Platzbedarfs als ausgeschlossen zu betrachten ist, besteht das Bedürfnis nach einer Röhre, die die beiden Empfindlichkeiten in sich vereinigt.

Auf Grund dieses Bedürfnisses entstand die Röhre EM 4. Sie ist als eine Kombination von zwei in einem Kolben zusammengebauten Abstimmanzeigeröhren mit verschiedenen Empfindlichkeiten zu betrachten; sie ist aber im Aufbau kaum komplizierter als die EM 1. Die beiden Systeme benutzen gemeinsam den Fluoreszenzschirm und die Kathode. Dabei dient eine Hälfte des Fluoreszenzschirmes für das eine und die andere für das zweite System.

Der Aufbau der EM 4 folgt aus Abb. 3. Der konische Fluoreszenzschirm befindet sich oben. In diesen ragt das Ende der Kathode hinein, und zwischen Kathode und Schirm befinden sich der Reihe nach von innen nach außen ein Raumladungsgitter, das mit der Kathode verbunden ist, und zwei einander diametral gegenüberliegende Ablenkstege. Die Kathode ist oben durch einen kleinen Deckel abgedeckt, so daß das Kathodenlicht bei der Abstimmung nicht stört. Dieser Deckel ruht auf zwei Stegen, die senkrecht auf dem Fluoreszenzschirm angebracht sind, so daß der querliegende Trägersteg der EM 1 wegfällt. Diese Stege befinden sich auf einer Achse, die 90° gegen die Achse der beiden Ablenkstege verdreht ist (siehe Abb. 4), und besitzen das Potential des Schirmes. Der Verstärkerteil befindet sich unten. Er besteht aus zwei Verstärkertrioden mit verschiedenem Verstärkungsfaktor. Beide Trioden sind übereinander um die Kathode angeordnet. Sie haben ein gemeinsames Gitter, das jedoch für jedes System eine andere Steigung hat. Die beiden Anoden sind elektrisch voneinander getrennt, die obere, schmälere Anode gehört zur Triode mit dem kleinen Verstärkungsfaktor, die untere, breitere Anode zur Triode mit dem großen Verstärkungsfaktor. Jede Anode ist mit einem Ablenksteg des Anzeigeteiles verbunden und außerdem am Röhrensockel nach außen geführt.

In der Röhrenschaltung (siehe auch Abb. 9) werden diese Anoden über Serienwiderstände von je einem Megohm mit der positiven Gleichspannung des Empfangsgerätes verbunden. Der Fluoreszenzschirm liegt ebenfalls an dieser Spannung. Beide Trioden werden gleichzeitig durch die negative Gleichspannung am Gitter gesteuert (Regelspannung von der Detektordiode). Sie arbeiten als Gleichspannungsverstärker, und eine Änderung der negativen Gleichspannung ist gleichbedeutend mit einer Änderung des Spannungsabfalles über die Anodenwiderstände und mithin mit einer Änderung der Schattenbreiten hinter den Ablenkstegen. Das Triodensystem mit dem größeren Verstärkungsfaktor wird für eine bestimmte Gitterspannungsänderung eine größere Änderung des Schattenwinkels hinter dem betreffenden Ablenksteg hervorrufen als das andere System. Die EM 4 ist so entworfen, daß bei 0 Volt Gitterspannung (für 250 V Speisespannung) die Schattenwinkel hinter beiden Stegen 90° betragen. Bei —5 Volt

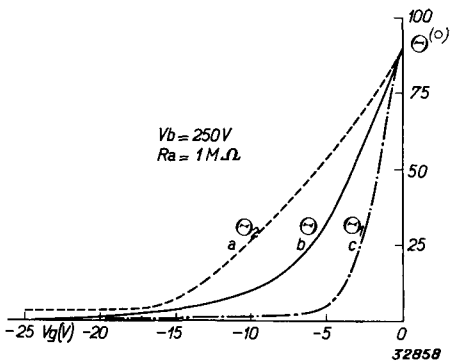


Abb. 5
Einige Kurven, die den Schattenwinkel als Funktion der Gitterspannung darstellen.
Kurve a: Kennlinie des unempfindlichen Teiles der EM 4.
Kurve b: Kennlinie einer Röhre, deren Gitter eine veränderliche Steigung besitzt.
Kurve c: Kennlinie des empfindlichen Teiles der EM 4.

Gitterspannung ist der Schattenwinkel des „empfindlichen" Steges auf 5° gesunken, während der Schattenwinkel des „unempfindlichen" Steges erst bei —16 Volt diesen Winkel erreicht.

Abb. 6 zeigt die Kurven für die beiden Systeme, und hieraus geht die Wirkungsweise deutlich hervor.

Die beiden Empfindlichkeiten sind bei der EM 4 also durch den Einbau von zwei Verstärkertrioden mit verschiedenem Verstärkungsfaktor erreicht worden. Ursprünglich wurde die Lösung des Problems der Abstimmanzeigung für schwache und starke Signale in einer besonderen Form der Charakteristik des Triodenverstärkerteiles gesucht. Man hatte z.B. versucht, dem Gitter der Triode eine veränderliche Steigung zu geben, damit die I_a/V_g-Kurve einen langen Auslauf bekam. Eine solche Kurve bringt aber keine befriedigende Lösung, wie aus Abb. 5 hervorgeht. In Abb. 5 stellt die Kurve *b* den Schattenwinkel als Funktion der negativen Gitterspannung einer Röhre mit langem Auslauf in der Kennlinie dar. Bei kleinen Gitterspannungen ist die Steilheit verhältnismäßig groß, so daß für kleine Signale eine ziemlich gute Empfindlichkeit vorhanden ist. Sie ist aber noch nicht so groß wie bei der Kurve *c*, die die Charakteristik des empfindlichen Teiles der EM 4 darstellt. Bei großen Vorspannungen liegt man im Auslauf der Kurve und ist die Steilheit klein. Hierbei ist auch die Empfindlichkeit gering. Aus Abb. 5 ist aber direkt ersichtlich, daß auch bei großen Signalen die Abstimmanzeigung unbefriedigend ist; denn wird z.B. angenommen, daß sich bei der Abstimmung auf eine starke Station die Gleichspannung von —10 bis —15 Volt ändert, so findet man für Kurve *a* eine Winkeländerung von etwa 18° und für Kurve *b* eine solche von nur etwa 6°. Die Anzeigung wird also für starke Signale zu unempfindlich, wenn man eine noch gute Anzeigung für schwache Signale wünscht. Tatsächlich ergeben Röhren mit einem Gitter mit veränderlicher Steigung eine Charakteristik ähnlich der Kurve *b* und deswegen eine einigermaßen befriedigende Lösung nur für die Abstimmung von schwachen Signalen. Aus diesem Grunde ist eine gute Abstimmanzeigung sowohl für schwache wie auch für starke Stationen nur mit einer Röhre der Type EM 4 mit zwei Empfindlichkeits-

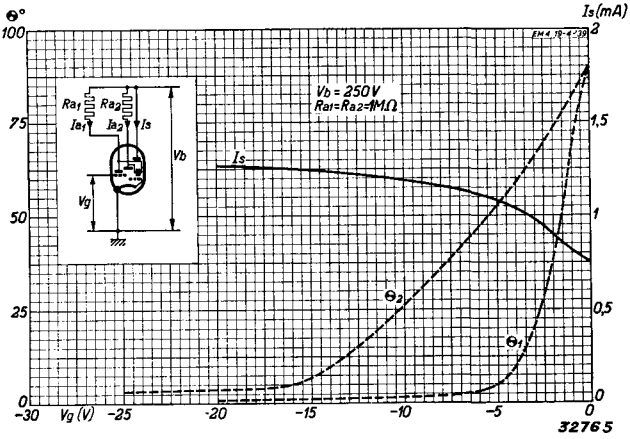


Abb. 6
Schattenwinkel Θ_1 und Θ_2, gemessen am Rande des Schirmes, und Schirmstrom *Is* als Funktion der Gitterspannung bei einer Speisespannung von 250 V.

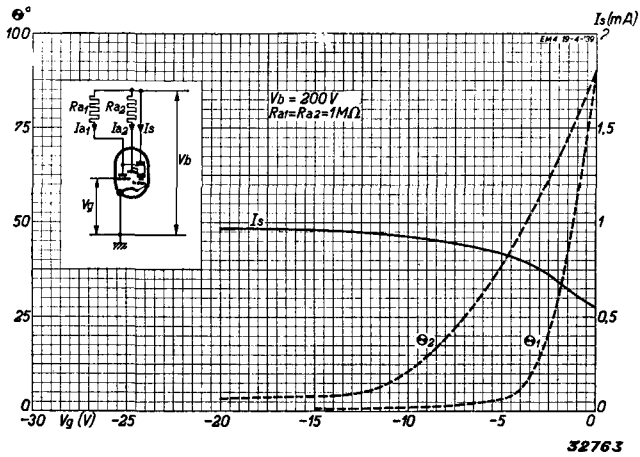


Abb. 7
Schattenwinkel Θ_1 und Θ_2, gemessen am Rande des Schirmes, und Schirmstrom *Is* als Funktion der Gitterspannung bei einer Speisespannung von 200 V.

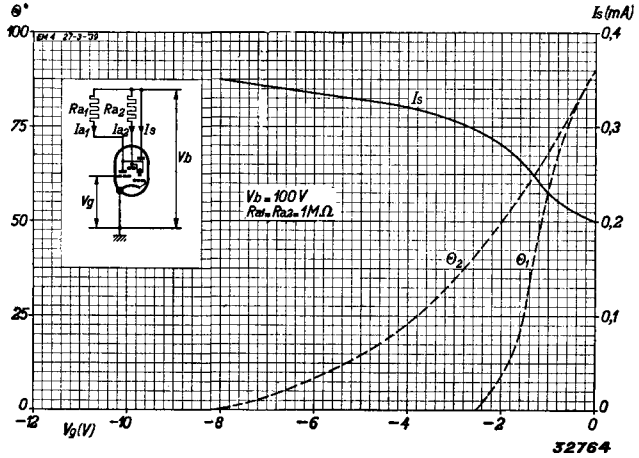


Abb. 8
Schattenwinkel Θ_1 und Θ_2, gemessen am Rande des Schirmes, und Schirmstrom I_s als Funktion der Gitterspannung bei einer Speisespannung von 100 V.

bereichen möglich. Zu erwähnen ist noch, daß, um ein deutliches Bild auf dem Schirm zu bekommen, anstatt vier nur zwei Fluoreszenzflecke vorgesehen sind. Dadurch ist zunächst die Winkeländerung jedes Schattensektors größer. Weiter hat sich praktisch erwiesen, daß der durchschnittliche Empfängerbesitzer mit zwei Schattensektoren leichter arbeitet. Bei vier Fluoreszenzflecken hat man nämlich gefunden, daß der Laie das Bestreben hat, zu versuchen, ein symmetrisches Bild auf dem Schirm zu erhalten und dadurch falsche Abstimmungen erhält. Bei zwei Schattensektoren ist das Bild übersichtlicher und besteht für den Laien kein Anlaß zu falschen Abstimmungen. Infolge der beiden Trägerstege des Kathodenlichtschirmes sind die Fluoreszenzflecke durch zwei schmale Schattenstreifen in zwei Hälften geteilt. Aus den Kurven der Abb. 6 geht hervor, daß die Kurven bei —16 bzw. —5 V Gitterspannung sehr flach zu verlaufen anfangen. Es bleiben restliche Schattenwinkel übrig, die darauf zurückzuführen sind, daß die Ablenkstege Strom aufnehmen. Dieser Strom verursacht einen solchen restlichen Spannungsabfall in den Kopplungswiderständen, daß die Stege eine bestimmte positive Spannung nicht überschreiten können. Dieser Umstand verhütet, daß die Fluoreszenzflecke sich überlappen, was öfters als ein Nachteil angesehen wurde. Abb. 4 zeigt schematisch die Anordnung der Elektroden und Stege im Anzeigeteil.

Zuletzt verdient noch die besondere Form des Kolbens am Kopfende Beachtung. Der Kolben ist eingestülpt, so daß sich vor dem Fenster durch den Glasrand mit Lacküberzug ein Dunkelraum bildet. Dadurch ist der Kontrast zwischen der Fluoreszenz und dem dunklen Hintergrund größer und wird die Verfolgung des Abstimmvorganges auf dem Leuchtschirm erleichtert.

Die Heizdaten sind so gewählt, daß diese Röhre sowohl bei Parallelspeisung mit einer Heizspannung von 6,3 V wie bei Serienspeisung mit einem Heizstrom von 200 mA verwendet werden kann. In G/W-Geräten mit einer Spannung von 100 V ist die Helligkeit der Fluoreszenzflecke geringer als bei z.B. 250 Volt Schirmspannung.

HEIZDATEN

Heizung: indirekt durch Gleich- oder Wechselspannung, Serien- oder Parallelspeisung.

Heizspannung	V_f	= 6,3 V
Heizstrom	I_f	= 0,200 A

EM 4

BETRIEBSDATEN als Abstimmanzeigeröhre

Spannung am Schirm und Anodenserienwiderständen	V_b	= 100 V	200 V	250 V
Anodenkopplungswiderstand des empfindlichen Anzeigeteiles	R_{a_1}	= 1 MΩ	1 MΩ	1 MΩ
Anodenkopplungswiderstand des unempfindlichen Anzeigeteiles	R_{a_2}	= 1 MΩ	1 MΩ	1 MΩ
Schirmstrom bei $V_g = 0$ V	$I_s\ (V_g = 0\ V)$	= 0,2 mA	0,55 mA	0,75 mA
Gitterspannung für die Schattenbreite von 90° des empfindlichen Anzeigeteiles	$V_g\ (\Theta_1 = 90°)$	= 0 V	0 V	0 V
Gitterspannung für die Schattenbreite von 90° des unempfindlichen Anteiles	$V_g\ (\Theta_2 = 90°)$	= 0 V	0 V	0 V
Gitterspannung für die Schattenbreite von 0° des empfindlichen Anzeigeteiles	$V_g\ (\Theta_1 = 0°)$	= —2,5 V	—	—
Gitterspannung für die Schattenbreite von 0° des unempfindlichen Anzeigeteiles	$V_g\ (\Theta_2 = 0°)$	= —8 V	—	—
Gitterspannung für die Schattenbreite von 5° des empfindlichen Anzeigeteiles	$V_g\ (\Theta_1 = 5°)$	= —	— 4,2 V	— 5 V
Gitterspannung für die Schattenbreite von 5° des unempfindlichen Anzeigeteiles	$V_g\ (\Theta_2 = 5°)$	= —	—12,5 V	—16 V

Θ_1 = Schattenwinkel für den Ablenksteg D_1, gemessen am Rande des Schirmes.
Θ_2 = Schattenwinkel für den Ablenksteg D_2, gemessen am Rande des Schirmes.

GRENZDATEN

$V_{a_{1o}}$	= max. 550 V	V_s	= max. 275 V
V_{a_1}	= max. 275 V	$V_g\ (I_g = +\ 0{,}3\ \mu A)$	= max. —1,3 V
$V_{a_{2o}}$	= max. 550 V	R_{gk}	= max. 3 MΩ
V_{a_2}	= max. 275 V	R_{fk}	= max. 20.000 Ω
V_{so}	= max. 550 V	V_{fk}	= max. 100 V[1])

[1]) Gleichspannung oder Effektivwert der Wechselspannung.

ANWENDUNG

Der Abstimmanzeiger EM 4 kann in allen Wechselstrom- oder G/W-Geräten mit Diodengleichrichtung verwendet werden, sofern die Signalstärken am Diodendetektor ausreichend groß sind (Überlagerungsempfänger). Vorzuziehen ist der Anschluß des Abstimmanzeigers an den Ableitwiderstand der Detektordiode. Der Anschluß an die Diode für automatische Lautstärkeregelung hat bei verzögerter automatischer Lautstärkeregelung den Nachteil, daß der Abstimmanzeiger bei schwachen Signalen, die unter dem Verzögerungspegel liegen, nicht anspricht. Da der empfindliche Teil des Abstimmanzeigers EM 4 gerade die Möglichkeit bietet, auch auf schwache Signale genau abzustimmen, sogar auf diejenigen, die unter dem Verzögerungspegel liegen (Kurzwellenempfang), empfiehlt es sich, das Gitter der EM 4 mit der Detektordiode zu koppeln. Außerdem erreicht man dann beim Abstimmen ein schärferes Ansteigen der Regelspannung, da die Signalspannung für die Detektordiode vom zweiten Abstimmkreis des Zwischenfrequenzbandfilters und diejenige für die Diode der A.L.R. im allgemeinen vom ersten Abstimmkreis abgenommen wird. Die scheinbare Trennschärfe ist dann an der Detektordiode größer als an der A.L.R.-Diode.
Abb. 9 zeigt ein Beispiel einer Schaltung der EM 4 in einem Überlagerungsempfänger. In dieser Schaltung wird das Gitter durch die *volle* Regelspannung am Ableitwiderstand

der Detektordiode gesteuert. Ein *RC*-Siebkreis ist vorgesehen, um die Niederfrequenz am Ableitwiderstand auszusieben.

In vielen Fällen wird man aber zu große Signale an der Detektordiode vorfinden und deswegen die Gleichspannung am Ableitwiderstand durch einen Spannungsteiler heruntersetzen. Dabei ist zu beachten, daß der Wechselstromwiderstand (R_w) der Diodenschaltung nicht zu sehr heruntergesetzt wird. Sonst würde ein ungünstiges Verhältnis $\frac{R_w}{R_g}$ entstehen, und die maximale Modulationstiefe für verzerrungsarme Gleichrichtung wäre kleiner. Deswegen sind für den Spannungsteiler hochohmige Widerstände zu wählen. Dasselbe gilt übrigens auch für den Widerstand des *RC*-Siebkreises der Schaltung von Abb. 9. Im allgemeinen wird darauf geachtet werden müssen, daß die Gleichspannung am Gitter der EM 4 bei dem größten zu erwartenden Signal in der Antenne gerade so groß ist, daß die Schattenbreite Θ_2 des unempfindlichen Anzeigeteiles minimal geworden ist. Auf diese Weise ist auch für die stärksten Signale eine Abstimmanzeigung vorhanden. Die Empfindlichkeiten der beiden Anzeigeteile wurden für mittlere Verhältnisse bestimmt, so daß dabei im allgemeinen auch eine genaue Abstimmung auf die schwächsten Signale möglich sein wird. Wird aber eine überaus große Empfindlichkeit der Anzeigung für schwächere Signale gewünscht, so wird die Anzeigung für die allerstärksten Signale vernachlässigt werden müssen. Es sei noch darauf hingewiesen, daß, wenn die Resonanzkurve des Apparates zwei Schultern zeigt, die Möglichkeit einer Abstimmung mit Hilfe des Abstimmanzeigers auf eine Seitenwelle bestehen wird. Es muß also darauf geachtet werden, daß die Resonanzkurve von der Mitte aus nach beiden Seiten herunterfällt und nirgends wieder ansteigt.

Bei Verwendung in G/W-Geräten mit niedriger Spannung ist dafür zu sorgen, daß der Schirm eine möglichst hohe Spannung erhält, da sonst die Helligkeit der Fluoreszenzflecke zu gering sein wird. Man wird dann aber gleichzeitig feststellen, daß bei z.B. einer Speisespannung von 100 Volt der empfindliche Teil fast kaum mehr für die Abstimmanzeigung dienen kann. Der Grund ist der folgende.

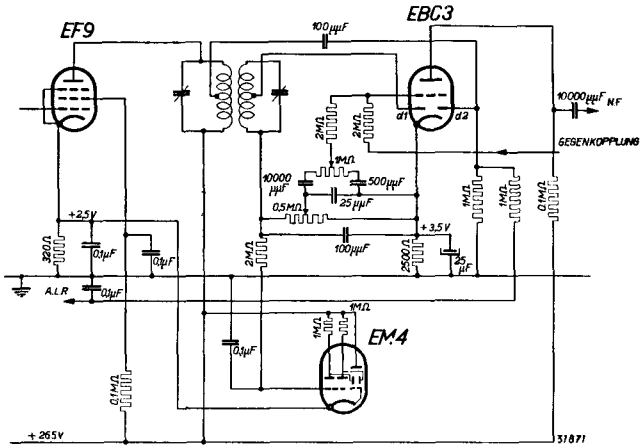


Abb. 9.
Prinzip der Schaltung der EM 4 in einem Überlagerungsempfänger. Diese Abbildung zeigt den Z.F.- und N.F.-Teil eines solchen Empfängers.

Im Gitterkreis der EM 4 wird man zwangsläufig in Kombination mit einem Kondensator einen Widerstand von 1 bis 2,5 MΩ schalten müssen, um die Modulation, die am Ableitwiderstand der Detektordiode liegt, auszusieben (siehe auch Abb. 9). Ohne Signal fließt Gitterstrom, und dieser verursacht über den Vorschaltwiderstand eine negative Spannung von etwa 1 Volt. Da bei einer Speisespannung von 100 Volt der Gitterbereich des empfindlichen Teiles nur 2,5 Volt beträgt, wird die negative Restspannung von 1 Volt den Schattenwinkelbereich wesentlich herabsetzen. Abb. 10 zeigt den Einfluß des Gittervorschaltwiderstandes für den Fall, daß dieser 1 bzw. 2,5 MΩ beträgt (strichpunktierte und gestrichelte Kurven).

Bei höherer Speisespannung macht sich diese Erscheinung weniger bemerkbar, weil der Gitterbereich des empfindlichen Teiles dann wesentlich größer ist, aber der Einfluß des Gitterstroms läßt sich dabei auch noch feststellen.

Bei einer Speisespannung von 100 Volt wird man also nur wenig mit dem empfindlichen Teil regeln können. Da der unempfindliche Teil dann aber wesentlich empfindlicher als bei 250 Volt ist, und seine Charakteristik sich der der Röhre EM 1 bei 250 Volt nähert, hat

dieser Teil bei 100 Volt Speisespannung für durchschnittliche Verhältnisse einen günstigen Regelbereich, und man kann in dem Falle mit der Abstimmung mittels dieses Teiles allein auskommen.
Für G/W-Geräte, die ausschließlich bei 100 Volt arbeiten, besteht noch die Möglichkeit, beide Anoden des Triodenteiles zusammenzuschalten und über einen gemeinsamen Widerstand von 1 Megohm zu speisen. Abb. 11 zeigt kurvenmäßig die Betriebsverhältnisse, die

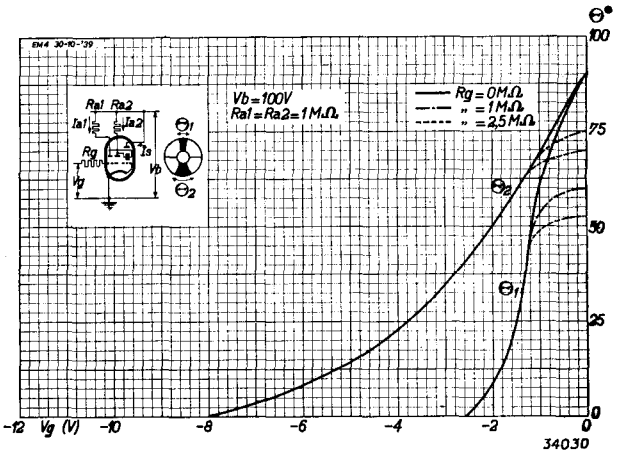


Abb. 10
Voll ausgezogene Kurven: Schattenwinkel Θ_1 und Θ_2, gemessen am Rande des Schirmes als Funktion der Gitterspannung bei einer Speisespannung von 100 V, wenn dem Gitter keinen Siebwiderstand vorgeschaltet ist.
Strichpunktierte Kurven: Schattenwinkel Θ_1 und Θ_2 als Funktion der Gitterspannung bei einem Siebwiderstand von 1 MΩ.
Gestrichelte Kurven: Schattenwinkel Θ_1 und Θ_2 als Funktion der Gitterspannung bei einem Siebwiderstand von 2,5 MΩ.
Ab —1,2 Volt fallen die gestrichelten, die strichpunktierten und vollausgezogenen Kurven zusammen.

sich dann ergeben. Dadurch wird erreicht, daß auch bei kleineren Werten der Regelspannung eine Spannungsänderung am Gitter eine deutliche Schattenwinkeländerung hervorruft. Die Kurve des Schattenwinkels als Funktion der Regelspannung liegt dann ungefähr zwischen den Kurven der Röhre EM 4 für den empfindlichen und den unempfindlichen Teil bei einer Speisespannung von 250 Volt. In Abb. 11 wurde die Kurve des Schattenwinkels Θ mit einem Gittervorwiderstand von 2,5 Megohm aufgenommen. Bei kleineren Regelspannungswerten stellt man zwar noch die Abbiegung der Kurve des Schattenwinkels fest, die durch den Gitterstrom hervorgerufen wird, aber sie ist lange nicht so ausgesprochen wie im Falle der Abb. 10, Kurve für Θ_1 und bei einer Gitterspannung von 0 V ist die Steilheit größer woraus sich auch eine größere Anzeigeempfindlichkeit ergibt. Es kann mit dieser Schaltung ein maximaler Schattenwinkelbereich von etwa 70° erzielt werden, der für die Abstimmung vollkommen ausreicht. Beide Schattenwinkel der Röhre EM 4 haben dann denselben Wert und es ergibt sich für beide Schattensektoren dieselbe Winkeländerung.

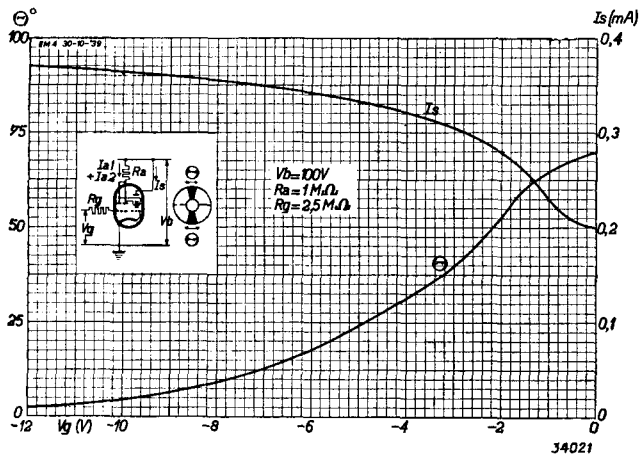


Abb. 11
Schaltenwinkel Θ der beiden Schattensektoren und Schirmstrom *Is* als Funktion der Gitterspannung bei einer Speisespannung von 100 V, wenn die beiden zusammengeschalteten Triodenanoden über einen Widerstand von 1 MΩ gespeist werden. Hierbei ist in die Gitterzuleitung ein Widerstand von 2,5 MΩ geschaltet.

PHILIPS

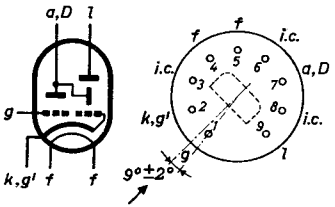
EM 80

TUNING INDICATOR for A.M. receivers
INDICATEUR D'ACCORD pour des récepteurs A.M.
ABSTIMMANZEIGERÖHRE für AM-Empfänger

Heating : indirect by A.C. or D.C. parallel supply
Chauffage: indirect par C.A. ou C.C. alimentation- Parallèle
Heizung : indirekt durch Wechsel- oder Gleichstrom; Parallelspeisung

V_f = 6,3 V
I_f = 0,3 A

Dimensions in mm
Dimensions en mm
Abmessungen in mm



Base, culot, Sockel: NOVAL

Operating characteristics
Caractéristiques d'utilisation
Betriebsdaten

V_b	=	250	V
V_l	=	250	V
R_a	=	0,5	MΩ
R_g	=	3	MΩ
V_g	=	−1	−14 V
β	=	5	50 °
I_a	=	0,37	0,01 mA
I_l	=	2	2,3 mA

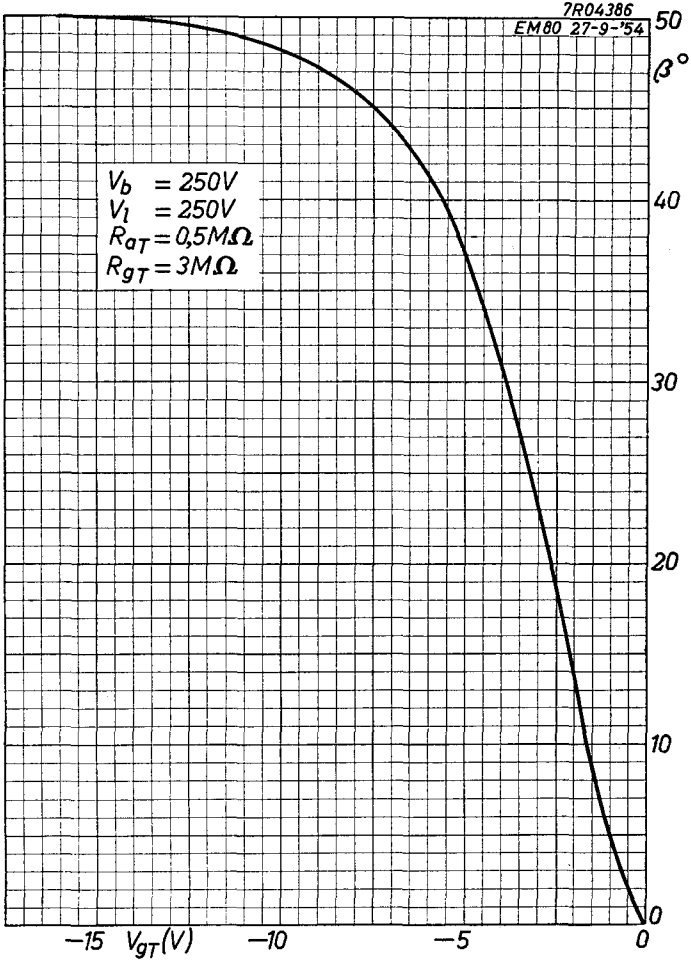
Limiting values
Caractéristiques limites
Grenzdaten

V_{a_o}	= max.	550 V
V_a	= max.	300 V
W_a	= max.	0,2 W
V_{ℓ_o}	= max.	550 V
V_ℓ	= max.	300 V
V_ℓ	= min.	165 V
$-V_g$ (I_g=+0,3µA)	= max.	1,3 V
I_k	= max.	3 mA
R_g	= max.	3 MΩ
V_{kf}	= max.	100 V
R_{kf}	= max.	20 kΩ

Remark : The tube is to be mounted in such a tube-holder that the frontside of the tube can be placed against the station name dial.

Observation: Le tube sera placé dans tel support que la face du tube peut être montée contre le cadran d'accord

Bemerkung : Die Röhre soll mit einer derartigen Fassung gebraucht werden dass die Vorderseite der Röhre gegen die Abstimmskala montiert werden kann.


7R04386
EM80 27-9-'54
50
β°
40
30
20
10
0
V_b = 250V
V_l = 250V
R_{aT} = 0,5MΩ
R_{gT} = 3MΩ
−15 V_{gT}(V) −10 −5 0

11.11.1954

A

PHILIPS

Electronic Tube

HANDBOOK

EM80

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1	1	1954.11.11
2	2	1954.11.11
3	A	1954.11.11
4	FP	1999.07.10

PHILIPS

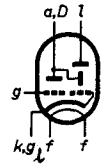
EM 81

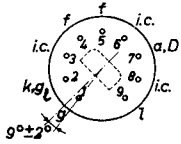
TUNING INDICATOR
INDICATEUR DE SYNTONISATION
ABSTIMMANZEIGERÖHRE

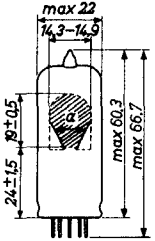
Heating : indirect by A.C. or D.C. series or parallel supply
Chauffage: indirect par C.A. ou C.C. alimentation série ou parallèle
Heizung : indirekt durch Wechsel- oder Gleichstrom; Serien- oder Parallelspeisung

V_f = 6,3 V
I_f = 300 mA

Dimensions in mm
Dimensions en mm
Abmessungen in mm







Base, culot, Sockel: NOVAL

Operating characteristics
Caractéristiques d'utilisation
Betriebsdaten

V_b	=	250	V
V_l	=	250	V
R_a	=	0,5	MΩ
R_g	=	3	MΩ
V_g	=	-1	-10,5 V
α	=	65	5 °
I_a	=	0,37	0,02 mA
I_l	=	2,0	2,3 mA

939 1015
4.4.1956

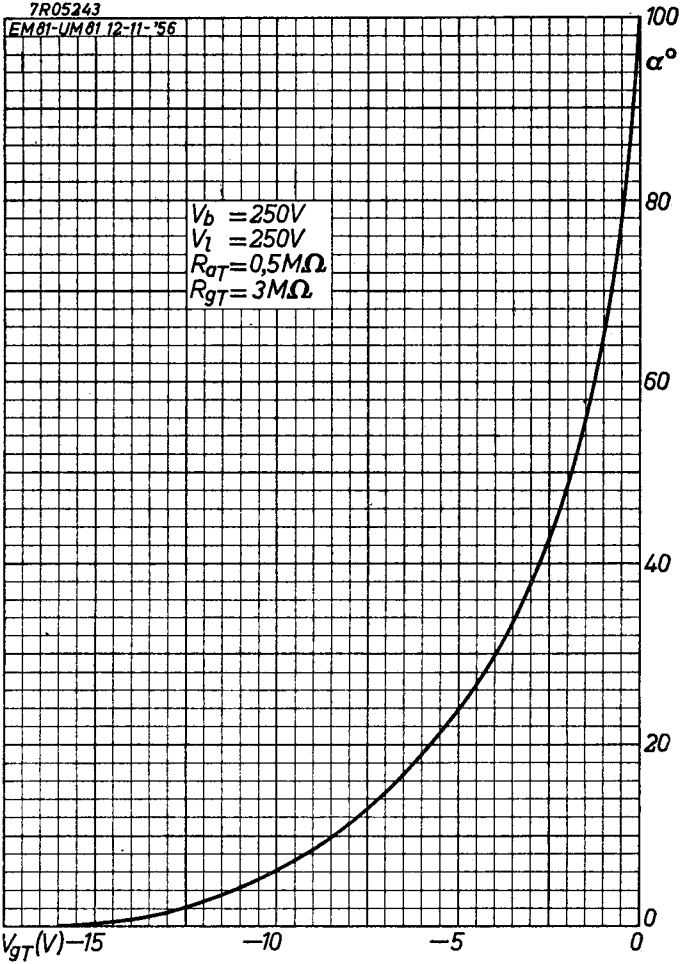
Limiting values
Caractéristiques limites
Grenzdaten

Va_o	= max.	550	V
V_a	= max.	300	V
W_a	= max.	0,2	W
$V_{l\,o}$	= max.	550	V
V_l	= max.	300	V
V_l	= min.	165	V
I_k	= max.	3	mA
V_{kf}	= max.	100	V
$-V_g(I_g = +0,3\mu A)$	= max.	1,3	V
R_g	= max.	3	MΩ
R_{kf}	= max.	20	kΩ

Remark : The tube is to be mounted in such a tubeholder that the frontside of the tube can be placed against the station name dial

Observation: Le tube sera placé dans un support tel que la face du tube peut être montée contre le cadran d'accord

Bemerkung : Die Röhre soll mit einer derartigen Fassung gebraucht werden dass die Vorderseite der Röhre gegen die Abstimmskala montiert werden kann


7R05243
EM81-UM81 12-11-'56
V_b = 250V
V_1 = 250V
R_{gT} = 0,5MΩ
R_{gT} = 3MΩ
100
α°
80
60
40
20
0
V_{gT}(V) −15
−10
−5
0

3.3.1957

A

PHILIPS

Electronic Tube

HANDBOOK

EM81

page	sheet	date
1	1	1956.04.04
2	2	1956.04.04
3	A	1957.03.03
4	FP	1999.07.10

TUNING INDICATOR

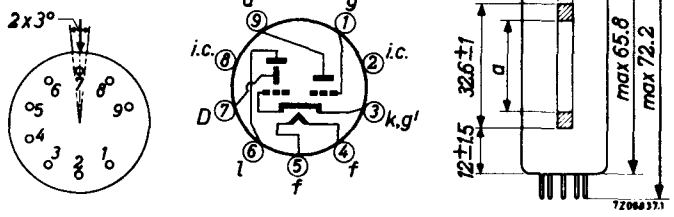
Indicator tube with triode amplifier intended for use as tuning indicator or for modulation control.

HEATING: Indirect by A.C. or D.C.; parallel supply

Heater voltage	V_f	6.3	V
Heater current	I_f	210	mA

DIMENSIONS AND CONNECTIONS Dimensions in mm

Base: Noval



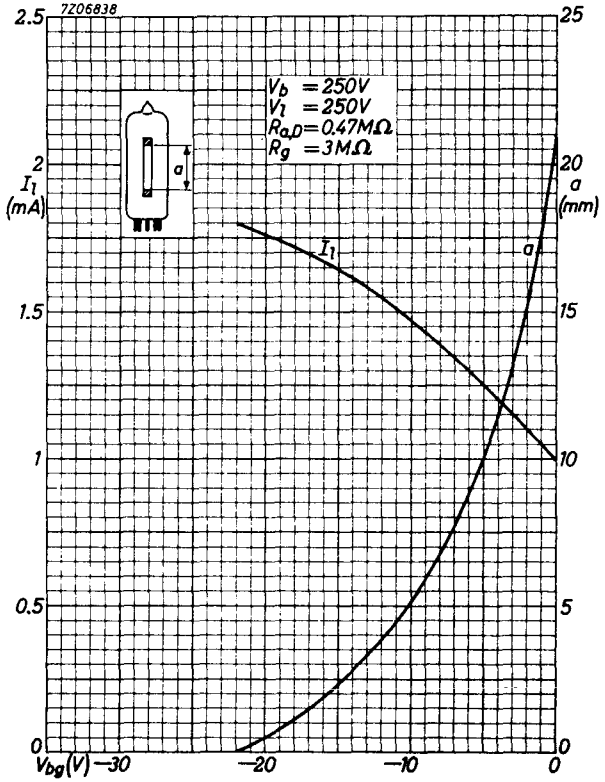
The arrow near pin 7 indicates the viewing direction.

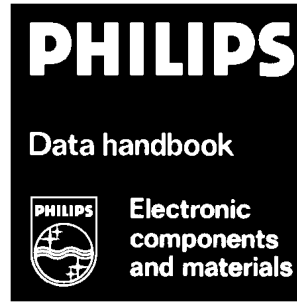
OPERATING CHARACTERISTICS (D connected to a)

Supply voltage	V_b	250		V
Luminescent screen voltage	V_ℓ	250		V
Anode and deflection electrode resistor	$R_{a,D}$	470		kΩ
Grid resistor	R_g	3		MΩ
Grid supply voltage	V_{bg}	0	−22	V
Anode and deflection electrode current	I_{a+D}	0.45	0.06	mA
Luminescent screen current	I_ℓ	1.0	1.8	mA
Shadow length	a	21±5	0	mm

LIMITING VALUES (Design centre rating system)

Anode voltage	V_{a_o}	max. 550	V
	V_a	max. 300	V
Anode dissipation	W_a	max. 0.5	W
Deflection electrode voltage	V_{D_o}	max. 550	V
	V_D	max. 300	V
Luminescent screen voltage	V_{ℓ_o}	max. 550	V
	V_ℓ	max. 300	V
	V_ℓ	min. 170	V
Cathode current	I_k	max. 3	mA
Grid resistor	R_g	max. 3	MΩ
Cathode to heater voltage	V_{kf}	max. 100	V
Bulb temperature	t_{bulb}	max. 120	°C





EM84

page	sheet	date
1	1	1970.01
2	2	1970.01
3	FP	1999.08.10

TUNING INDICATOR

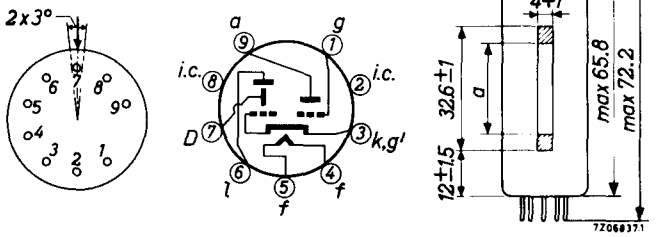
Tuning indicator tube.

HEATING: Indirect by A.C. or D.C.; series or parallel supply

Heater voltage	V_f	6.3 V
Heater current	I_f	300 mA

DIMENSIONS AND CONNECTIONS Dimensions in mm

Base: Noval



The arrow near pin 7 indicates the viewing direction.

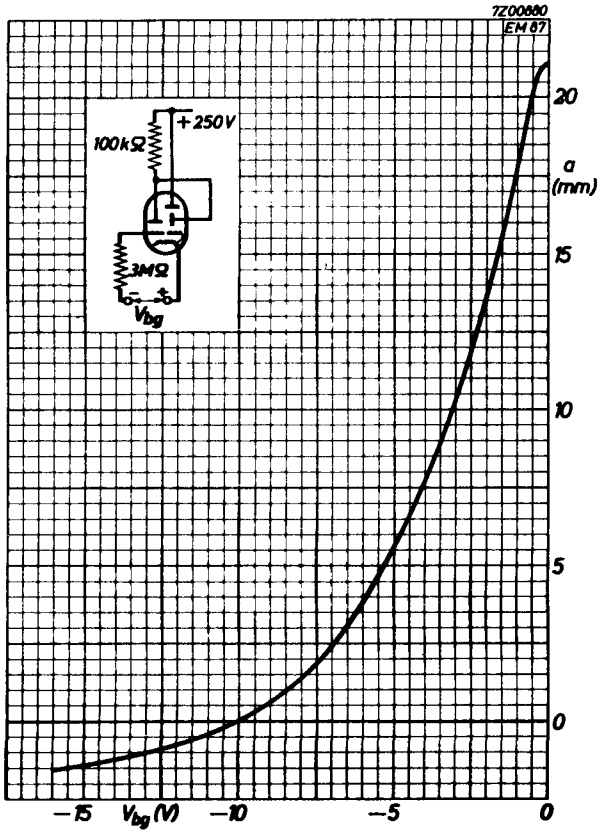
OPERATING CHARACTERISTICS (D connected to a)

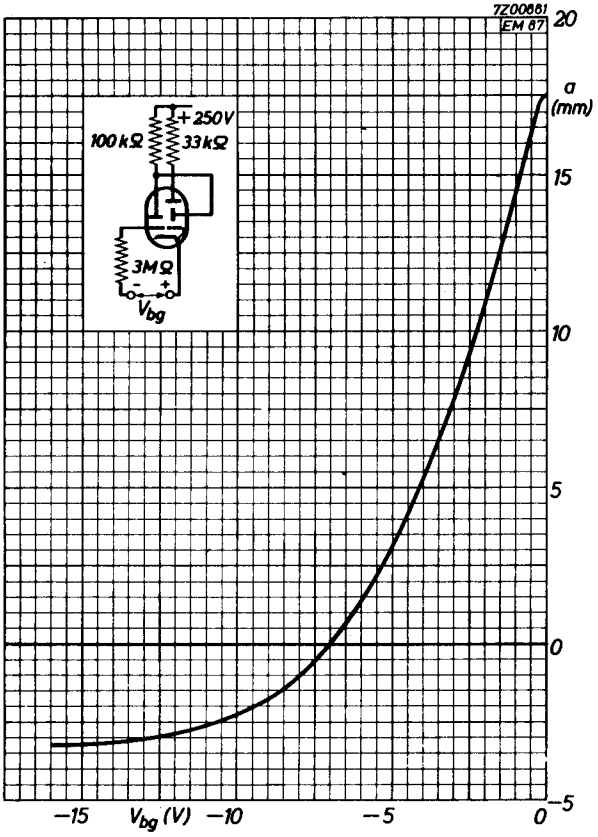
Supply voltage	V_b		250		V
Luminescent screen voltage	V_ℓ		250		V
Anode and deflection electrode resistor	$R_{a,D}$		100		kΩ
Grid resistor	R_g		3		MΩ
Grid supply voltage	V_{bg}	0	−10	−15	V
Anode and deflection electrode current	I_{a+D}	2.0	0.5	0.2	mA
Luminescent screen current	I_ℓ	1.0	1.8	2.0	mA
Shadow length	a	21	0	−1.5	mm[1])

[1]) A negative value of "a" means overlapping:
The grid bias for a = o is reduced by decreasing V_ℓ.
The measure of overlapping at V_g = −15 V will then increase (see page 4).

LIMITING VALUES (Design centre rating system)

Anode voltage	V_{a_o}	max. 550	V
	V_a	max. 300	V
Anode dissipation	W_a	max. 0.6	W
Deflection electrode voltage	V_{D_o}	max. 550	V
	V_D	max. 300	V
Luminescent screen voltage	V_{ℓ_o}	max. 550	V
	V_ℓ	max. 300	V
	V_ℓ	min. 170	V
Grid resistor	R_g	max. 3	MΩ
Cathode current	I_k	max. 5	mA
Cathode to heater voltage	V_{kf}	max. 250	V
Bulb temperature	t_{bulb}	max. 120	°C


7Z00880
EM87
+250V
100kΩ
3MΩ
V_{bg}
20
a
(mm)
15
10
5
0
−15
V_{bg} (V)
−10
−5
0


7Z00881
EM 87
+250V
100kΩ
33kΩ
3MΩ
V_{bg}
a
(mm)
20
15
10
5
0
−5
−15
V_{bg} (V)
−10
−5
0

PHILIPS

Data handbook

Electronic components and materials

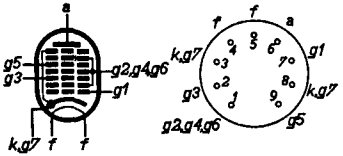
EM87

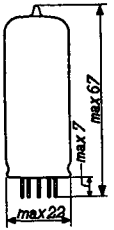
page	sheet	date
1	1	1969.12
2	2	1869.01
3	3	1869.01
4	4	1869.01
5	FP	1999.08.10

ENNEODE for use as F.M. detector and limiter and as A.F. amplifier
ENNEODE pour l'utilisation comme détectrice F.M. et limitrice et comme amplificatrice B.F.
ENNEODE zur Verwendung als F.M. Detektor und Begrenzer und als N.F. Verstärker

Heating:	indirect by A.C. or D.C.; parallel supply	
Chauffage:	indirect par C.A. ou C.C.; alimentation en parallèle	V_f = 6,3 V I_f = 0,2 A
Heizung:	indirekt durch Wechsel- oder Gleichstrom; Parallelspeisung	

Dimensions in mm
Dimensions en mm
Abmessungen in mm



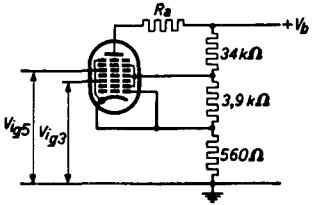


Base, culot, Fuss: Noval

Capacitances
Capacités
Kapazitäten

C_{g1}	=	4,5 pF
C_{g3}	=	6,3 pF
C_{g5}	=	8,7 pF
C_a	=	8,3 pF
C_{ag1}	<	0,4 pF
C_{ag3}	<	0,15 pF
C_{ag5}	<	0,35 pF
C_{g3g5}	<	0,4 pF
C_{g1f}	<	0,2 pF
C_{g3f}	<	0,15 pF
C_{g5f}	<	0,15 pF

Operating characteristics as F.M.detector and limiter
Caractéristiques d'utilisation comme détectrice F.M. et limitrice
Betriebsdaten als F.M. Detektor und Begrenzer



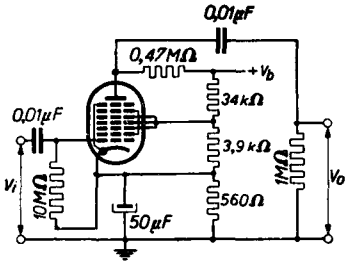
V_b	=	250 V
$V_{g2+g4+g6}$	=	20 V
V_{g3}	=	-4 V
V_{ig3}	=	12 V_{eff}
V_{g5}	=	-4 V
V_{ig5}	=	12 V_{eff}
$\varphi(V_{ig3}-V_{ig5})$	=	90°
R_a	=	0,47 MΩ
I_a	=	0,28 mA
$I_{g2+g4+g6}$	=	1,5 mA
I_{g3}	=	0,09 mA
I_{g5}	=	0,03 mA
R_i	=	5 MΩ

This valve can be used without special precautions against microphonic effect in F.M. detector circuits if the input voltage of the next stage V_i is ≧ 1,0 V for an output of 50 mW of the output stage

Ce tube peut être utilisé sans précautions spéciales contre l'effet microphonique dans des circuits détecteur F.M., si la tension d'entrée de l'étage suivant V_i est ≧ 1,0 V pour une puissance de 50 mW du tube de sortie

Diese Röhre darf ohne spezielle Massnahmen gegen Mikrophonie verwendet werden in F.M.Detektorschaltungen wenn eine Eingangsspannung der nächsten Stufe V_i ≧ 1,0 V eine Leistung von 50 mW der Endröhre ergibt

Operating characteristics as A.F. amplifier
Caractéristiques d'utilisation comme amplificatrice B.F.
Betriebsdaten als N.F. Verstärker



V_b	= 250 V
Ia	= 0,28 mA
g	= 150
d_{tot} (V_o = 15 V_{eff})	= 2,8 %

This valve can be used without special precautions against microphonic effect in A.F.amplifier circuits if the input voltage V_i is ≧ 25 mV for an output of 50 mW of the output stage

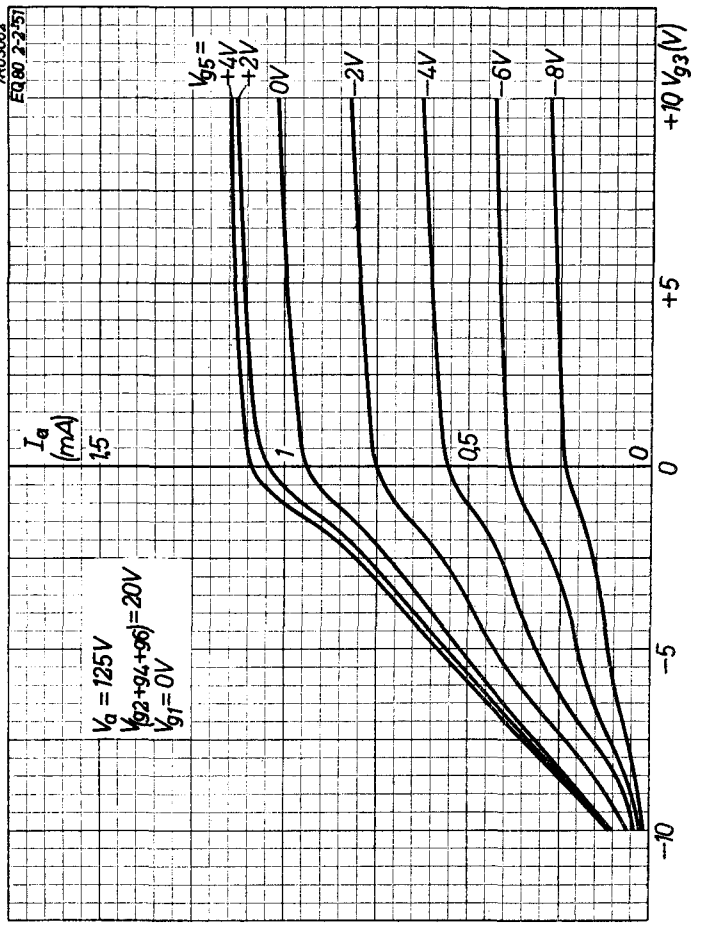
Ce tube peut être utilisé sans précautions spéciales contre l'effet microphonique dans des circuits amplificateur B.F. si la tension d'entrée V_i est ≧ 25mV pour une puissance de 50 mW du tube de sortie

Diese Röhre darf ohne spezielle Massnahmen gegen Mikrophonie verwendet werden in N.F. Verstärkerschaltungen wenn eine Eingangsspannung V_i ≧ 25 mV eine Leistung von 50 mW der Endröhre ergibt

Limiting values
Caractéristiques limites
Grenzdaten

V_{a_o}	= max.	550 V
V_a	= max.	300 V
W_a	= max.	0,1 W
$V_{(g2+g4+g6)_o}$	= max.	250 V
$V_{g2+g4+g6}$	= max.	100 V
$W_{g2+g4+g6}$	= max.	0,1 W
I_k	= max.	3 mA
V_{g1} (I_{g1} = +0,3 µA)	= max.	-1,3 V
V_{g3} (I_{g3} = +0,3 µA)	= max.	-1,3 V
V_{g5} (I_{g5} = +0,3 µA)	= max.	-1,3 V
R_{g1}	= max.	1 MΩ [1]
R_{g3}	= max.	3 MΩ
R_{g5}	= max.	3 MΩ
R_{kf}	= max.	20 kΩ
V_{kf}	= max.	100 V

[1]) With grid biasing R_{g1} = max. 22 MΩ.
Si V_{g1} est obtenue seulement par moyen de R_{g1}, R_{g1} = max. 22 MΩ.
Wenn V_{g1} nur mittels R_{g1} erhalten wird, ist R_{g1} = max. 22 MΩ.


7R03062
EQ80 2-2-51
I_a (mA)
1,5
1
0,5
0
V_{g5} =
+4V
+2V
0V
−2V
−4V
−6V
−8V
V_a = 125V
$V_{g2+g4+g6}$ = 20V
V_{g1} = 0V
+10 V_{g3} (V)
+5
0
−5
−10

EQ80

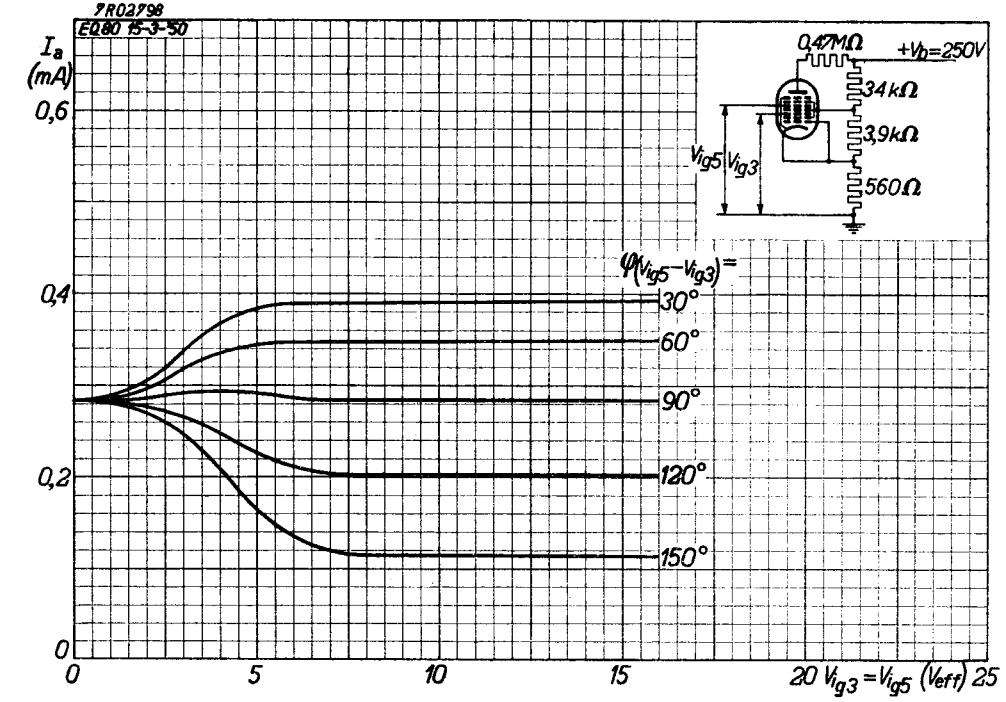
PHILIPS

PHILIPS

EQ80

2.2.1951

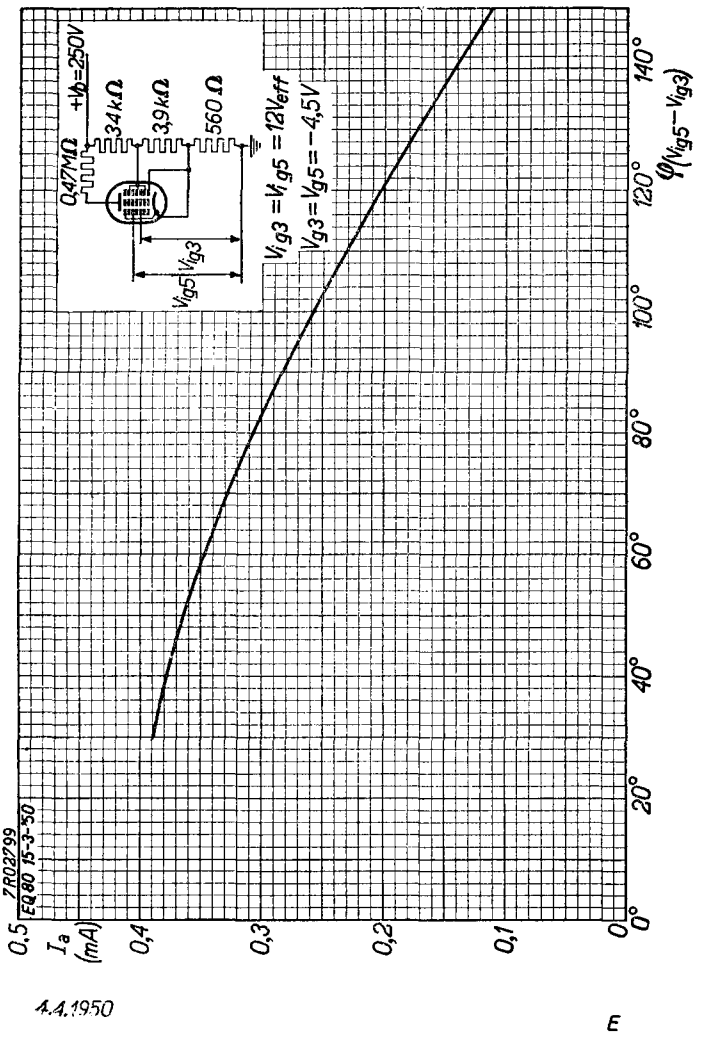
C


7R02798
EQ80 15-3-50
I_a (mA)
0,6
0,4
0,2
0
0
5
10
15
20 $V_{ig3} = V_{ig5}$ (V_{eff}) 25
$\varphi(V_{ig5} - V_{ig3}) =$
30°
60°
90°
120°
150°
0,47MΩ
+V_b=250V
34kΩ
3,9kΩ
560Ω
V_{ig5} V_{ig3}

a

PHILIPS

EQ80



4.4.1950

E



EQ80

page	sheet	date
1	1	1952.10.10
2	2	1952.10.10
3	3	1950.03.03
4	4	1950.03.03
5	A	1951.02.02
6	B	1951.02.02
7	C	1951.02.02
8	D	1951.02.02
9	E	1950.04.04
10	FP	2000.01.06

BOOSTER DIODE

Booster diode intended for use in time base circuits of colour television receivers.

HEATING: Indirect by A.C. or D.C.; parallel supply

Heater voltage	V_f	6.3	V
Heater current	I_f	2.1	A

For further data and curves of this type please refer to type PY500

PHILIPS

Data handbook

Electronic components and materials

EY500

page	sheet	date
1	1	1969.12
2	FP	1999.02.24

BOOSTER DIODE

Booster diode intended for use in time base circuits of colour television receivers.

HEATING: Indirect by A.C. or D.C.; parallel supply

Heater voltage	V_f	6.3	V
Heater current	I_f	2.1	A

For further data and curves of this type please refer to type PY500A

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Data handbook

Electronic components and materials

EY500A

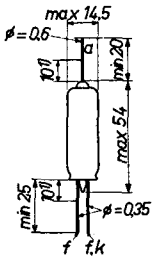
page	sheet	date
1	1	1970.08
2	FP	1999.02.24

High vacuum single anode RECTIFYING VALVE for E.H.T. supply
TUBE REDRESSEUR monoplaque à vide poussé pour haute tension
Einanodige hochvakuum GLEICHRICHTERRÖHRE für Hochspannungsbetrieb

Heating:	indirect by A.C. or D.C.; parallel supply	
Chauffage:	indirect par C.A. ou C.C.; alimentation en parallèle	V_f = 6,3 V
Heizung:	indirekt durch Wechsel- oder Gleichstrom; Parallelspeisung	I_f = 90 mA

Dimensions in mm
Dimensions en mm
Abmessungen in mm





Capacitance
Capacité
Kapazität

C_{ak} = 0,8 pF

Remark — The anode lead must not be bent near its seal

Observation — Le fil de connexion de l'anode ne sera pas pliée près du scellement

Bemerkung — Der Anodenanschlussdraht muss nicht in der Nähe der Einschmelzung gebogen werden

[1]) This part of the leads should not be soldered
Cette partie des fils ne sera pas soudée
Dieser Teil der Drähte soll nicht gelötet werden

Limiting values for operation at 50 c/s with sinusoidal input voltage
Caractéristiques limites pour l'utilisation à 50 c/s avec tension d'entrée sinusoïdale
Grenzdaten für Gebrauch bei 50 Hz mit sinusformiger Eingangsspannung

V_{tr}	= max.	5 kV_{eff}
I_o	= max.	3 mA
C_{filt}	= max.	0,1 µF
R_t	= min.	0,1 MΩ

Limiting values for operation at 10 to 500 kc/s with sinusoidal input voltage
Caractéristiques limites pour l'utilisation à 10-500 kc/s avec tension d'entrée sinusoïdale
Grenzdaten für den Gebrauch bei 10-500 kHz mit sinusförmiger Eingangsspannung

$V_{a\ inv_p}$	= max.	17 kV
I_o	= max.	3 mA
C_{filt}	= max.	0,01 µF
R_t	= min.	0,1 MΩ

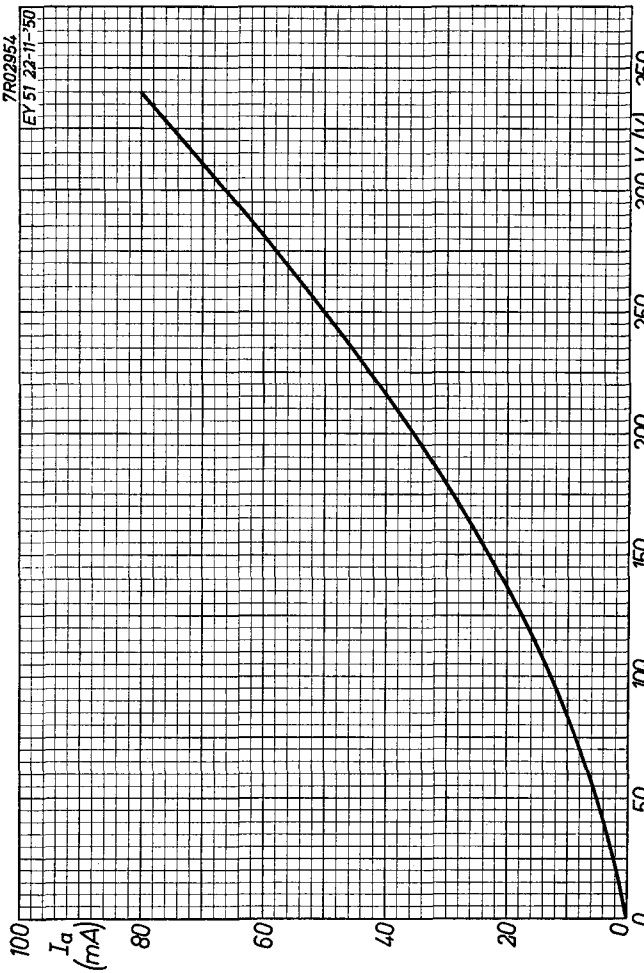
Limiting values for use as pulse type E.H.T. supply
Caractéristiques limites pour l'utilisation comme redresseur haute tension d'impulsions
Grenzdaten für Verwendung als Hochspannungsgleichrichterröhre mit Impulsbetrieb

$V_{a\ inv_p}$	= max.	17 kV
I_o	= max.	0,35 mA
I_{o_p}	= max.	80 mA [1]
C_{filt}	= max.	5000 pF

[1]) Maximum pulse duration ½ % of the time between 2 pulses, with a maximum of 5 µsec
Durée de l'impulsion max. ½ % du temps entre 2 impulsions, avec un maximum de 5 µsec
Impulszeit max. ½ % der Zeit zwischen 2 Impulsen mit einem Maximum von 5 µsec

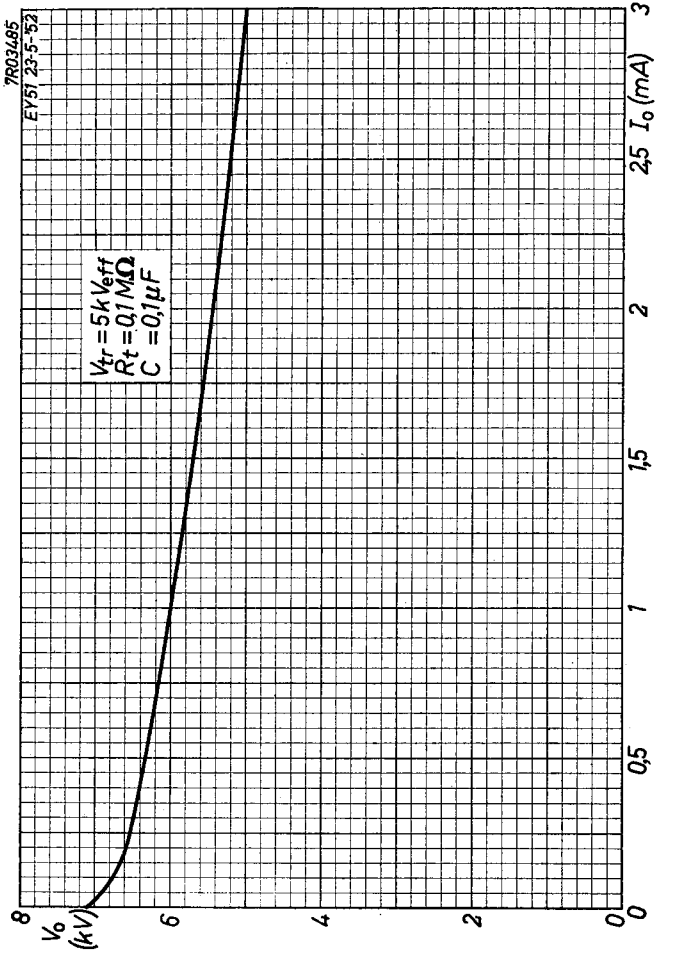
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EY 51



A

6.6.1952


7R034.85
EY51 23-5-52
V_{tr} = 5 kV eff
R_t = 0,1 MΩ
C = 0,1 μF
V_o (kV)
8
6
4
2
0
0
0,5
1
1,5
2
2,5
3
I_o (mA)

PHILIPS

Electronic Tube

HANDBOOK

EY51

page	sheet	date
1	1	1954.01.01
2	2	1954.01.01
3	A	1952.06.06
4	B	1952.06.06
5	FP	1999.07.10

PHILIPS EY80

DIODE for use as booster
DIODE pour l'utilisation comme survolteuse
DIODE zur Verwendung als Spannungserhöher

Heating: indirect by A.C.; parallel supply
Chauffage: indirect par C.A.; alimentation en parallèle
Heizung: indirekt durch Wechselstrom; Parallelspeisung

V_f = 6,3 V
I_f = 0,9 A

For further data and curves please refer to type PY 80
Pour les autres caractéristiques et courbes voir type PY 80
Für die übrigen Daten und Kurven siehe Typ PY 80

939 3453
4.4.1956

PHILIPS

Electronic Tube

HANDBOOK

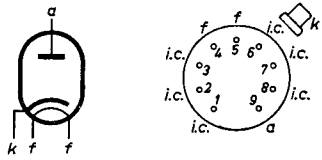
EY80

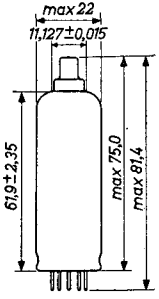
page	sheet	date
1	1	1956.04.04
2	FP	1999.07.10

BOOSTER DIODE for time base circuits in television receivers
DIODE SURVOLTEUSE pour les circuits base de temps de récepteurs de télévision
SPANNUNGSERHÖHERDIODE (BOOSTER) für Zeitbasisstromkreise in Fernsehempfängern

Heating : indirect; parallel supply — $V_f = 6{,}3$ V
Chauffage: indirect; alimentation parallèle — $I_f = 810$ mA
Heizung : indirekt; Parallelspeisung

Dimensions in mm
Dimensions en mm
Abmessungen in mm





Base, culot, Sockel: NOVAL

Capacitances Capacités Kapazitäten	C_a	=	6,4 pF
	C_{kf}	=	2,5 pF

Limiting values
Caractéristiques limites
Grenzdaten

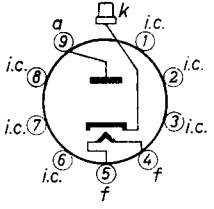
	I_a	= max.	150 mA
	I_{ap}	= max.	450 mA
	$C_{b_{cast}}$	= max.	4 µF
	V_{kf}	= max.	600 V [1]
During the flyback [2] Pendant le retour Während des Rücklaufes			
	V_{kf_p}	= max.	5000 V [3]
	V_{kf_p}	= max.	5600 V [3][4]
	V_{ak_p}	= max.	5000 V [5]
	V_{ak_p}	= max.	5600 V [4][5]
	V_{af_p}	= max.	3000 V [6]
	V_{af_p}	= max.	3800 V [4][6]

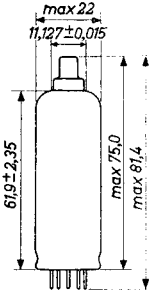
[1])....[6])See page 2; voir page 2; siehe Seite 2

BOOSTER DIODE for line time-base circuits in television receivers
DIODE SURVOLTEUSE pour les circuits base de temps lignes de récepteurs de télévision
SPANNUNGSERHÖHERDIODE (BOOSTER) für Zeilenzeitbasisstromkreise in Fernsehempfängern

Heating : indirect; parallel supply — $V_f = 6{,}3$ V
Chauffage: indirect; alimentation parallèle — $I_f = 810$ mA
Heizung : indirekt; Parallelspeisung

Dimensions in mm
Dimensions en mm
Abmessungen in mm





Base, culot, Sockel: NOVAL

Capacitances Capacités Kapazitäten	C_a	=	6,4 pF
	C_{kf}	=	2,5 pF

Limiting values (design centre values)
Caractéristiques limites (valeurs moyennes)
Grenzdaten (mittlere Entwicklungsdaten)

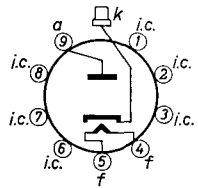
V_{bo}	= max.	550 V
V_b	= max.	250 V
W_a	= max.	3,5 W
I_a	= max.	150 mA
I_{ap}	= max.	450 mA
V_{akp}	= max.	5000 V [1][2]
V_{akp}	= max.	5600 V [1][2][3]
V_{kfp}	= max.	5000 V [1]
V { heater to earth entre filament et terre Heizfaden zu Erde	= max.	220 V_{eff}

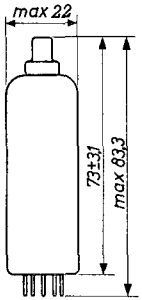
[1],[2],[3] See page 2; voir page 2; siehe Seite 2

BOOSTER DIODE for line time-base circuits in television receivers
DIODE SURVOLTEUSE pour les circuits base de temps lignes de récepteurs de télévision
SPANNUNGSERHÖHERDIODE (BOOSTER) für Zeilenzeitbasisstromkreise in Fernsehempfängern

Heating : indirect; parallel supply — $V_f = 6{,}3$ V / $I_f = 810$ mA
Chauffage: indirect; alimentation parallèle
Heizung : indirekt; Parallelspeisung

Dimensions in mm
Dimensions en mm
Abmessungen in mm





Base, culot, Sockel: NOVAL

Capacitances
Capacités
Kapazitäten

C_a	=	6,4 pF
C_{kf}	=	2,5 pF

Limiting values (design centre values)
Caractéristiques limites (valeurs moyennes)
Grenzdaten (Normalgrenzdaten)

V_{bo}	= max.	550 V
V_b	= max.	250 V
W_a	= max.	3,5 W
I_a	= max.	150 mA
I_{ap}	= max.	450 mA
V_{akp}	= max.	5000 V [1][2]
V_{akp}	= max.	5600 V [1][2][3]
V_{kfp}	= max.	5000 V [1]
V (heater to earth / entre filament et terre / Heizfaden zu Erde)	= max.	220 V_{eff}

[1],[2],[3]) See page 2; voir page 2; siehe Seite 2

Remark : In general it will be necessary to take measures in order to prevent W_{g2} max. of the tubes, which obtain their V_a from the EY 81, from being exceeded during the heating time of the EY 81

Observation: Il faut prendre des mesures de manière que W_{g2} max. des tubes, qui dérivent leur V_a du EY 81, n'est pas surpassée pendant le temps de chauffage du EY 81

Bemerkung : Im allgemeinen müssen Massnahmen getroffen werden damit W_{g2} max. der Röhren, die ihre V_a von der EY 81 erhalten, nicht überschritten wird während der Anheizzeit der EY 81

---

[1])T_{av} = 1 cycle. Cathode positive with respect to the heater

T_{av} = 1 cycle. Cathode positive par rapport au filament

T_{av} = 1 Periode. Katode positiv in Bezug auf den Heizfaden

[2])Max. pulse duration 22% of a cycle with a maximum of 18 µsec.

Durée de l'impulsion max. 22% d'un cycle avec un maximum de 18 µsec.

Impulszeit max. 22% einer Periode mit einem Maximum von 18 µSek.

[3])Cathode positive with respect to the heater
Cathode positive par rapport au filament
Katode positiv in Bezug auf den Heizfaden

[4])Absolute value
Valeur absolue
Absolutwert

[5])Anode negative with respect to the cathode
Anode négative par rapport à la cathode
Anode negativ in Bezug auf die Katode

[6])Anode negative with respect to the heater
Anode négative par rapport au filament
Anode negativ in Bezug auf den Heizfaden

Remark: In general it will be necessary to take measures in order to prevent the maximum permissible screen-grid dissipation of the tubes that derive their anode voltage from the EY 81, from being exceeded during the heating-up time of the EY 81

Observation: Il faut prendre des mesures de manière que la dissipation grille-écran maximum admissible des tubes, qui dérivent leur tension anodique du EY 81, ne soit pas surpassée pendant le temps de chauffage du EY 81

Bemerkung: Im allgemeinen müssen Massnahmen getroffen werden damit die maximal zulässige Schirmgitterleistung der Röhren die ihre Anodenspannung von der EY 81 erhalten, während der Anheizzeit der EY 81 nicht überschritten wird

---

[1]) Max. pulse duration 22 % of a cycle with a maximum of 18 µsec

Durée de l'impulsion max. 22 % d'un cycle avec un maximum de 18 µsec

Impulszeit max. 22 % einer Periode mit einem Maximum von 18 µSek

[2]) Cathode positive with respect to the anode
Cathode positive par rapport à l'anode
Katode positiv in Bezug auf die Anode

[3]) Absolute maximum value
Valeur maximum absolue
Absoluter Maximalwert

Remark: In general it will be necessary to take measures in order to prevent the maximum permissible screen-grid dissipation of the tubes that derive their anode voltage from the EY 81, from being exceeded during the heating-up time of the EY 81

Observation: Il faut prendre des mesures de manière que la dissipation grille-écran maximum admissible des tubes, qui dérivent leur tension anodique du EY 81, ne soit pas surpassée pendant le temps de chauffage du EY 81

Bemerkung: Im allgemeinen müssen Massnahmen getroffen werden damit die maximal zulässige Schirmgitterleistung der Röhren die ihre Anodenspannung von der EY 81 erhalten, während der Anheizzeit der EY 81 nicht überschritten wird

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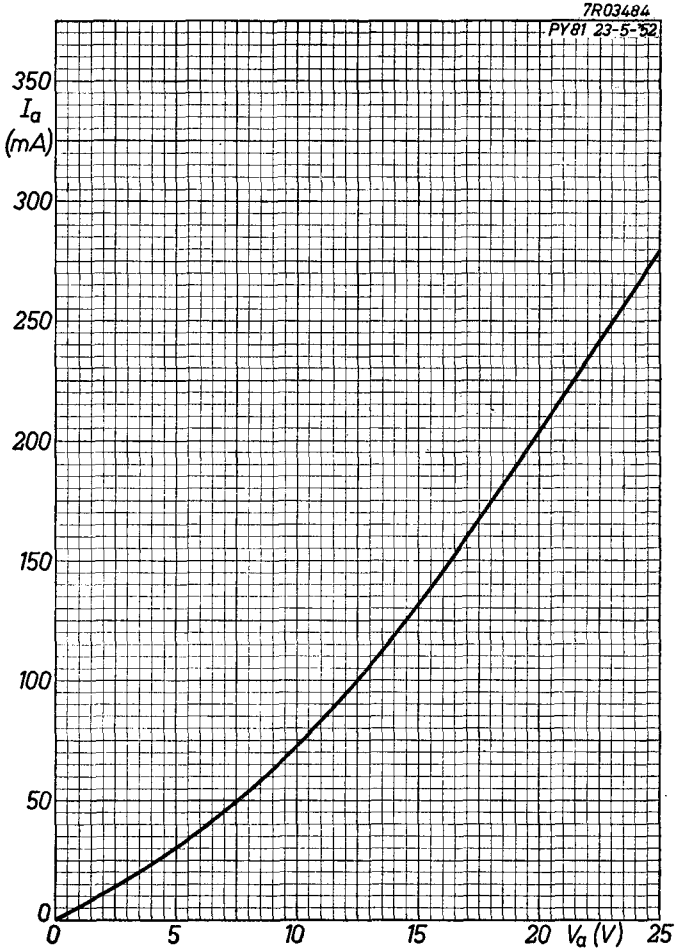
[1]) Max. pulse duration 22 % of a cycle with a maximum of 18 µsec

Durée de l'impulsion max. 22 % d'un cycle avec un maximum de 18 µsec

Impulszeit max. 22 % einer Periode mit einem Maximum von 18 µSek

[2]) Cathode positive with respect to the anode
Cathode positive par rapport à l'anode
Katode positiv in Bezug auf die Anode

[3]) Absolute maximum value
Valeur maximum absolue
Absoluter Maximalwert


7R03484
PY81 23-5-52
350
I_a
(mA)
300
250
200
150
100
50
0
0
5
10
15
20
V_a (V)
25

3.3.1955

A



EY81

page	sheet	date
1	1	1958.01.01
2	1	1958.09.09
3	1	1960.11.11
4	2	1958.01.01
5	2	1958.09.09
6	2	1960.11.11
7	A	1955.03.03
8	FP	2005.05.06

PHILIPS

EY 82

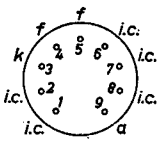
High-vacuum single-anode RECTIFYING TUBE
TUBE REDRESSEUR monoplaque à vide poussée
Einanodige hochvakuum GLEICHRICHTERRÖHRE

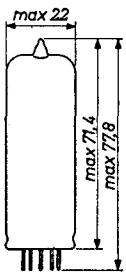
Heating : indirect by A.C. or D.C. parallel supply
Chauffage: indirect par C.A. ou C.C. alimentation parallèle
Heizung : indirekt durch Wechsel- oder Gleichstrom; Parallelspeisung

V_f = 6,3 V
I_f = 900 mA

Dimensions in mm
Dimensions en mm
Abmessungen in mm







Base, culot, Sockel: NOVAL

Operating characteristics(two tubes in a full-wave circuit)
Caractéristiques d'utilisation (deux tubes dans un circuit biplaque)
Betriebsdaten (zwei Röhren in einem Doppelwegstromkreis)

V_{tr}	=	2x250	2x280	2x300	V_{eff}
V_o	=	225	250	268	V
I_o	=	360	360	360	mA
R_t	=	2x75	2x95	2x110	Ω
Cfilt	=	60	60	60	µF

Limiting values (two tubes in a full-wave circuit)
Caractéristiques limites (deux tubes dans un circuit bi-plaque)
Grenzdaten (zwei Röhren in einem Doppelwegstromkreis)

V_{tr}	=	max.	2x300	Veff
$V_{a\ inv\,p}$	=	max.	850	V
I_o	=	max.	360	mA
I_{ap} [1])	=	max.	1,1	A
$V_{kf\,p}$	=	max.	450	V
→ C_{filt}	=	max.	60	µF [2])

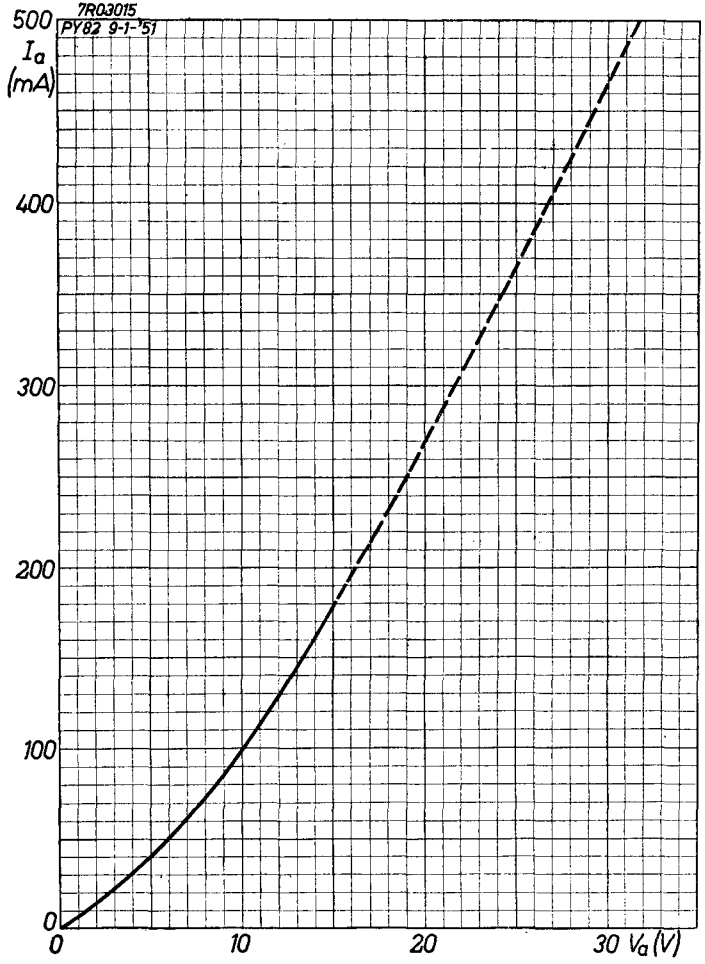
R_t	= min.	2x75	2x95	2x110 Ω
(V_{tr}	=	2x250	2x280	2x300 V_{eff})

[1]) Each diode
Chaque diode
Jede Diode

[2]) When R_t is increased by 10 Ω, C_{filt} = max. 100 µF
Si R_t est augmenté de 10 Ω, C_{filt} = max. 100 µF
Wenn R_t um 10 Ω erhöht wird, ist C_{filt} = max. 100 µF

PHILIPS

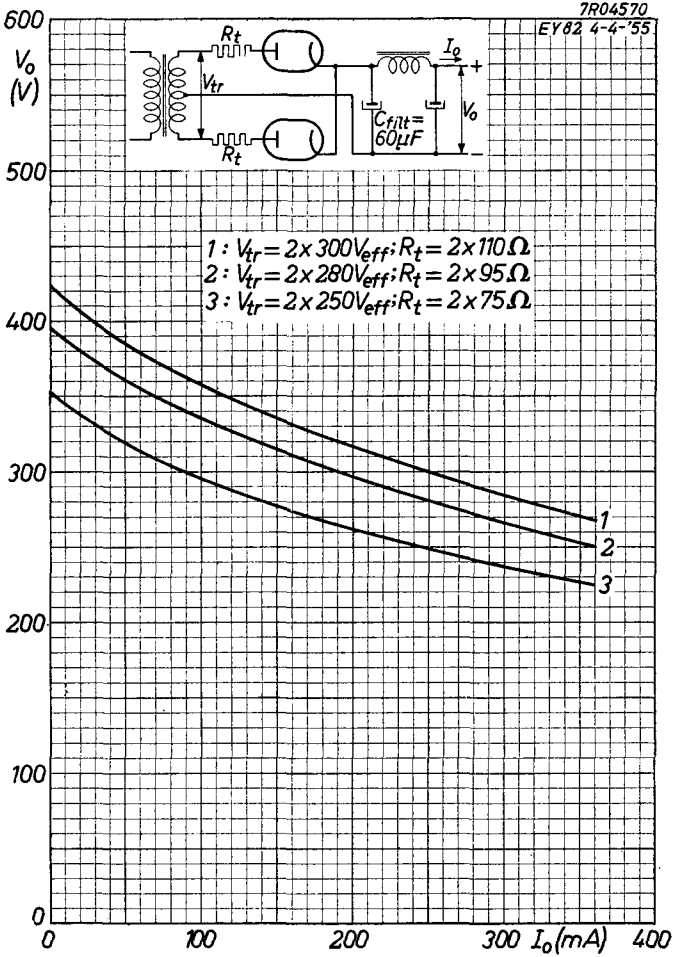
EY 82



4.4.1955

A

EY 82 PHILIPS



PHILIPS

Electronic Tube

HANDBOOK

EY82

page	sheet	date
1	1	1958.06.06
2	2	1958.06.06
3	A	1955.04.04
4	B	1955.04.04
5	FP	1999.07.10

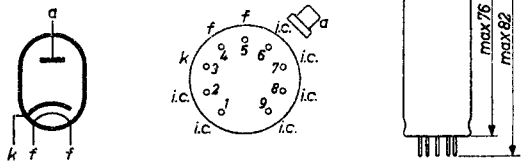
PHILIPS EY84

HALF-WAVE RECTIFIER primarily intended for operation at high altitudes
TUBE REDRESSEUR MONOPLAQUE conçue particulièrement pour être utilisé à grande altitude
EINWEGGLEICHRICHTERRÖHRE speziell entworfen zur Verwendung auf grosser Höhe

Heating: indirect by A.C. or D.C.; parallel supply
Chauffage: indirect par C.A. ou C.C.; alimentation en parallèle
Heizung: indirekt durch Wechsel- oder Gleichstrom; Parallelspeisung

V_f = 6,3 V
I_f = 1,0 A

Dimensions in mm
Dimensions en mm
Abmessungen in mm



Base, culot, Sockel: Noval

Operating characteristics - 2 tubes as two-phase half-wave rectifier
Caractéristiques d'utilisation - 2 tubes comme rédresseur biphasé à une alternance
Betriebsdaten - 2 Röhren als zweiphasiger Einweggleichrichter

V_{tr}	=	2x500	2x625 Veff
R_t	=	2x150	2x250 Ω
C_{filt} (f = 50 c/s)	=	16	16 µF
C_{filt} (f = 1600 c/s)	=	0,5	0,5 µF
I_o	= max.	300	250 mA
V_o	=	500	635 V

939 4541
4.4.1956

Limiting values
Caractéristiques limites
Grenzdaten

$V_{inv.p.}$		=	max.	2000 V
I_o	(V_i = 500 V_{eff})	=	max.	150 mA
	(V_i = 625 V_{eff})	=	max.	125 mA
I_{ap}		=	max.	0,9 A
C_{filt}		=	max.	24 µF
R_t	($V_i \leq$ 500 V_{eff})	=	min.	150 Ω
	(V_i > 500 V_{eff})	=	min.	250 Ω
V_{kf}	(k pos.; f neg.)	=	max.	500 V



EY84

page	sheet	date
1	1	1956.04.04
2	2	1956.04.04
3	FP	1999.07.10

This tube is equivalent to type EY 87, except for the envelope, not being chemically treated

Ce tube est équivalent au type EY 87, à l'exception de l'ampoule, qui n'a pas été traîtée chimiquement

Diese Röhre ist äquivalent mit Typ EY 87, mit Ausnahme des Glaskolbens, welche nicht chemisch behandelt worden ist

PHILIPS

Electronic Tube

HANDBOOK

EY86

page	sheet	date
1	1	1956.04.04
2	FP	1999.07.10

PHILIPS EY 87

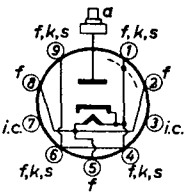
High-vacuum single-anode RECTIFYING TUBE for high tension in television receivers (E.H.T. supply from the line time base)
TUBE REDRESSEUR MONOPLAQUE à vide poussé pour la haute tension de récepteurs de télévision (alimentation très haute tension de la base de temps lignes)
Einanodige hochvakuum GLEICHRICHTERRÖHRE für Hochspannungsbetrieb in Fernsehempfängern (Hochspannungsspeisung von der Zeilenzeitbasis)

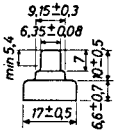
The tube has a chemically treated envelope which avoids flash-over under conditions of high humidity and low atmospheric pressure (45 cm Hg)
L'ampoule du tube est traitée d'une façon chimique qui empêche une décharge disruptive en cas d'une humidité élevée et d'une pression atmosphérique basse (45 cm Hg)
Die Röhre hat einen chemisch behandelten Glaskolben, wodurch Überschlag bei hoher Feuchtigkeit und niedrigem atmosphärischem Druck (45 cm Hg) vermieden wird

Heating : indirect by A.C. or D.C. parallel supply
Chauffage: indirect par C.A. ou C.C. alimentation parallèle
Heizung : indirekt durch Wechsel- oder Gleichstrom; Parallelspeisung

$V_f = 6{,}3\ V^{1)2)}$
$I_f = 90\ mA$

Dimensions in mm
Dimensions en mm
Abmessungen in mm







Base, culot, Sockel: NOVAL

Pins 1,4,6,9 can be used for fixing an anti-corona ring
Broches 1,4,6,9 peuvent être utilisées pour le montage d'un anneau anticouronne
Stifte 1,4,6 und 9 können für die Befestigung eines Antikoronaringes gebraucht werden

[1])See page 3; voir page 3; siehe Seite 3
[2])See page 4; voir page 4; siehe Seite 4

PHILIPS EY 87

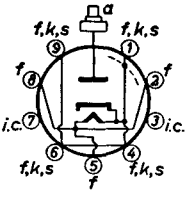
High-vacuum single-anode RECTIFYING TUBE for high tension in television receivers (E.H.T. supply from the line time base)
TUBE REDRESSEUR MONOPLAQUE à vide poussé pour la haute tension de récepteurs de télévision (alimentation très haute tension de la base de temps lignes)
Einanodige hochvakuum GLEICHRICHTERRÖHRE für Hochspannungsbetrieb in Fernsehempfängern (Hochspannungsspeisung von der Zeilenzeitbasis)

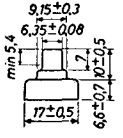
The tube has a chemically treated envelope which avoids flash-over under conditions of high humidity and low atmospheric pressure (45 cm Hg)
L'ampoule du tube est traîtée d'une façon chimique qui empêche une décharge disruptive en cas d'une humidité élevée et d'une pression atmosphérique basse (45 cm Hg)
Die Röhre hat einen chemisch behandelten Glaskolben, wodurch Überschlag bei hoher Feuchtigkeit und niedrigem atmosphärischem Druck (45 cm Hg) vermieden wird

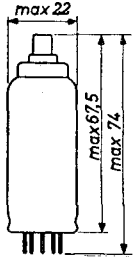
Heating : indirect by A.C. or D.C. parallel supply
Chauffage: indirect par C.A. ou C.C. alimentation parallèle
Heizung : indirekt durch Wechsel- oder Gleichstrom; Parallelspeisung

$V_f = 6{,}3$ V [1)] [2)]
$I_f = 90$ mA

Dimensions in mm
Dimensions en mm
Abmessungen in mm







Base, culot, Sockel: NOVAL

Pins 1,4,6,9 can be used for fixing an anti-corona ring
Broches 1,4,6,9 peuvent être utilisées pour le montage d'un anneau anticouronne
Stifte 1,4,6 und 9 können für die Befestigung eines Antikoronaringes gebraucht werden

[1)] See page 3; voir page 3; siehe Seite 3
[2)] See page 4; voir page 4; siehe Seite 4

Remarks

a. Circuit elements having the same potential as the heater (e.g. a series resistor) may be connected to pins 3 and 7. These pins must never be earthed

b. If the tube operates at high values of $V_{a\ invp}$ and/or under conditions of high relative humidity or low pressure the metal top-cap should get an insulating cover to avoid corona phenomena

Observations

a. Elements du montage avec la même potentielle que le filament (p.e. une résistance série) peuvent être connectés aux broches 3 et 7. Ces broches ne seront jamais être mises à la terre

b. Si le tube fonctionne avec des valeurs élevées de $V_{a\ invp}$ et/ou dans des conditions de forte humidité relative ou de basse pression, le téton métallique devra recevoir un capot isolant pour éviter les phénomènes coronaires

Bemerkungen

a. Schaltungsteile mit dem gleichen Potential als der Glühfaden (z.B. ein Serienwiderstand) können mit den Stiften 3 und 7 verbunden werden. Diese Stifte sollen keinenfalls geerdet werden

b. Wird die Röhre mit hohen $V_{a\ invp}$ - Werten und/oder bei hoher Feuchtigkeit bzw. niedrigem Druck betrieben, so ist die Metallkappe zur Vermeidung von Koronaerscheinungen mit einem Isolationsüberzug zu versehen

Capacitance (without external shield)
Capacité (sans blindage extérieur) C_a = 1,8 pF
Kapazität (ohne äusserer Abschirmung)

Typical characteristics
Caractéristiques types R_1 (I_o = 1 mA) = 20 kΩ
Kenndaten

Operating characteristics for use as pulse type E.H.T.supply
Caractéristiques d'utilisation pour application comme redresseur haute tension d'impulsions
Betriebsdaten bei Verwendung als Hochspannungsgleichrichterröhre mit Impulsbetrieb

I_o = 0,15 mA
V_o = 18 kV

Remarks

a. Circuit elements having the same potential as the heater (e.g. a series resistor) may be connected to pins 3 and 7. These pins must never be earthed

b. If the tube operates at high values of $V_{a\ invp}$ and/or under conditions of high relative humidity or low pressure the metal top-cap should get an insulating cover to avoid corona phenomena

Observations

a. Eléments du montage avec le même potentiel que le filament (p.e. une résistance série) peuvent être reliés aux broches 3 et 7. Ces broches ne seront jamais mises à la terre

b. Si le tube fonctionne avec des valeurs élevées de $V_{a\ invp}$ et/ou dans des conditions de forte humidité relative ou de basse pression, le téton métallique devra recevoir une couche isolante pour éviter les phénomènes coronaires

Bemerkungen

a. Schaltungsteile mit dem gleichen Potential als der Glühfaden (z.B. ein Serienwiderstand) können mit den Stiften 3 und 7 verbunden werden. Diese Stifte sollen keinenfalls geerdet werden

b. Wird die Röhre mit hohen $V_{a\ invp}$ - Werten und/oder bei hoher Feuchtigkeit bzw. niedrigem Druck betrieben, so ist die Metallkappe zur Vermeidung von Koronaerscheinungen mit einem Isolationsüberzug zu versehen

Capacitance (without external shield)
Capacité (sans blindage extérieur) C_a = 1,55 pF ←
Kapazität (ohne äusserer Abschirmung)

Typical characteristics
Caractéristiques types R_i (I_o = 1 mA) = 20 kΩ
Kenndaten

Operating characteristics for use as pulse type E.H.T. supply
Caractéristiques d'utilisation pour application comme redresseur haute tension d'impulsions
Betriebsdaten bei Verwendung als Hochspannungsgleichrichterröhre mit Impulsbetrieb

I_o = 0,15 mA
V_o = 18 kV

Limiting values for use as pulse type E.H.T. supply (design centre values)
Valeurs limites pour application comme redresseur haute tension d'impulsions (valeur moyennes)
Grenzdaten bei Verwendung als Hochspannungsgleichrichterröhre mit Impulsbetrieb (mittlere Entwicklungsdaten)

$V_{a\ inv_p}$	= max.	22 kV [3)4)]
$V_{a\ inv_p}$ ($I_o = 0$)	= max.	24 kV [3)4)]
$V_{a\ inv_p}$	= max.	27 kV [4)5)]
I_o	= max.	0,8 mA
I_{ap}	= max.	40 mA [6)]
C_{filt}	= max.	2000 pF

Limiting values for operation at 50 c/s with sinusoidal input voltage
Caractéristiques limites pour utilisation à 50 Hz avec tension d'entrée sinusoïdale
Grenzdaten für Gebrauch bei 50 Hz mit sinusförmiger Eingangsspannung

V_{tr}	= max.	5 kV_{eff}
I_o	= max.	3 mA
C_{filt}	= max.	0,2 µF
R_t	= min.	0,1 MΩ

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[1]) When the heater is to be operated on R.F. or flyback pulses, the heater voltage can be adjusted to 6.3 V e.g. by measurement with a thermocouple

Lorsque le filament est alimenté par des impulsions H.F. ou par des impulsions de retour, la tension de chauffage peut être réglée à 6,3 V par example par une mesure avec un couple thermoélectrique

Wenn die Katode mittels Hochfrequenz oder Rücklaufimpulsen geheizt wird, so kann die Heizspannung z.B. mittels Messung mit einem Thermoelement auf 6,3 V eingestellt werden

[3)4)5)6)] See page 5; voir page 5; siehe Seite 5

Limiting values for use as pulse type E.H.T. supply (design centre values)
Valeurs limites pour application comme redresseur haute tension d'impulsions (valeurs moyennes)
Grenzdaten bei Verwendung als Hochspannungsgleichrichterröhre mit Impulsbetrieb (Normalgrenzdaten)

$V_{a\ inv_p}$	= max.	22 kV [3)4)]
$V_{a\ inv_p}$ ($I_o = 0$)	= max.	24 kV [3)4)]
$V_{a\ inv_p}$	= max.	27 kV [4)5)]
I_o	= max.	0,5 mA [6)]
I_{ap}	= max.	40 mA [7)]
C_{filt}	= max.	2000 pF

Limiting values for operation at 50 c/s with sinusoidal input voltage
Caractéristiques limites pour utilisation à 50 Hz avec tension d'entrée sinusoïdale
Grenzdaten für Gebrauch bei 50 Hz mit sinusförmiger Eingangsspannung

V_{tr}	= max.	5 kV_{eff}
I_o	= max.	3 mA
C_{filt}	= max.	0,2 µF
R_t	= min.	0,1 MΩ

---

[1]) When the heater is to be operated on R.F. or flyback pulses, the heater voltage can be adjusted to 6.3 V e.g. by measurement with a thermocouple

Lorsque le filament est alimenté par des impulsions H.F. ou par des impulsions de retour, la tension de chauffage peut être réglée à 6,3 V par example par une mesure avec un couple thermoélectrique

Wenn die Katode mittels Hochfrequenz- oder Rücklaufimpulsen geheizt wird, so kann die Heizspannung z.B. mittels Messung mit einem Thermoelement auf 6,3 V eingestellt werden

[3)4)5)6)7)] See page 5; voir page 5; siehe Seite 5

2) Tolerances of Vf; Tolérances de Vf; Heizspannungsschwankungen

a. As E.H.T. rectifier in television receivers

The heater voltage should be adjusted to its nominal value at a D.C. output current of 200 µA. At an increase of the D.C. output current to 400 à 600 µA which can incidentically occur during operation the decrease of the heater voltage may amount to max. 15%. These requirements hold for nominal mains voltage and full horizontal scanning of the picture tube. If the picture width control is such that also the heater voltage of the E.H.T. diode is influenced, the influence of this control must be kept within the 15% limit indicated above

b. For all other applications the limits for the heater voltage are as given in the application directions in front of this section

a. Utilisation comme redresseur T.H.T. dans les récepteurs de télévision

La tension de chauffage devra être réglée à sa valeur nominale pour une intensité continue de sortie de 200 µA. Pour une augmentation de l'intensité continue de sortie allant jusqu'à 400 à 600 µA, accroissement pouvant se produire par instants en cours de fonctionnement, la diminuation de la tension de chauffage peut se monter au maximum à 15%. Ces exigences sont valables pour la tension nominale du secteur et l'exploration totale horizontale du tube image. Si la commande de la largeur d'image est telle que la tension de chauffage de la diode T.H.T. est également influencée, l'influence de cette commande doit être maintenue au-dessous de la limite de 15% indiquée ci-dessus

b. Pour toutes les autres applications, les limites de la tension de chauffage ont été données dans l'indications d'application en tête de ce chapitre

a. Zur Verwendung als Hochspannungsgleichrichter in Fernsehempfängern

Die Einstellung der Heizspannung auf den Nennwert soll bei einem Ausgangsstrom von 200 µA erfolgen. Bei Ansteigen des Ausgangsgleichstroms auf 400 - 600 µA, wie dies im praktischen Betrieb gelegentlich vorkommen kann, darf die Verringerung der Heizspannung maximal 15% betragen. Diese Forderung gilt für nominale Netzspannung und volle Horizontalablenkung. Ist die Bildbreiteregelung derart, dass auch die Heizspannung der Hochspannungsdiode beeinflusst wird, so ist der Einfluss dieser Regelung auf die obenerwähnte 15%-Grenze zu beschränken

b. Für alle sonstigen Anwendungen sind die Grenzwerte der Heizspannung die gleichen wie in den Anwendungsrichtlinien am Anfang dieses Abschnitts angegeben

[2] Tolerances of Vf; Tolérances de Vf; Heizspannungsschwankungen

a. As E.H.T. rectifier in television receivers

The heater voltage should be adjusted to its nominal value at a D.C. output current of 200 µA. At an increase of the D.C. output current to 400 à 600 µA which can incidentically occur during operation the decrease of the heater voltage may amount to max. 15%. These requirements hold for nominal mains voltage and full horizontal scanning of the picture tube. If the picture width control is such that also the heater voltage of the E.H.T. diode is influenced, the influence of this control must be kept within the 15% limit indicated above

b. For all other applications the limits for the heater voltage are as given in the application directions in front of this section

a. Utilisation comme redresseur T.H.T. dans les récepteurs de télévision

La tension de chauffage devra être réglée à sa valeur nominale pour une intensité continue de sortie de 200 µA. Pour une augmentation de l'intensité continue de sortie allant jusqu'à 400 à 600 µA, accroissement pouvant se produire par instants en cours de fonctionnement, la diminuation de la tension de chauffage peut se monter au maximum à 15%. Ces exigences sont valables pour la tension nominale du secteur et l'exploration totale horizontale du tube image. Si la commande de la largeur d'image est telle que la tension de chauffage de la diode T.H.T. est également influencée, l'influence de cette commande doit être maintenue au-dessous de la limite de 15% indiquée ci-dessus

b. Pour toutes les autres applications, les limites de la tension de chauffage ont été données dans l'indications d'application en tête de ce chapitre

a Zur Verwendung als Hochspannungsgleichrichter in Fernsehempfängern

Die Einstellung der Heizspannung auf den Nennwert soll bei einem Ausgangsstrom von 200 µA erfolgen. Bei Ansteigen des Ausgangsgleichstroms auf 400 - 600 µA, wie dies im praktischen Betrieb gelegentlich vorkommen kann, darf die Verringerung der Heizspannung maximal 15% betragen. Diese Forderung gilt für nominale Netzspannung und volle Horizontalablenkung. Ist die Bildbreiteregelung derart, dass auch die Heizspannung der Hochspannungsdiode beeinflusst wird, so ist der Einfluss dieser Regelung auf die obenerwähnte 15%-Grenze zu beschränken

b. Für alle sonstigen Anwendungen sind die Grenzwerte der Heizspannung die gleichen wie in den Anwendungsrichtlinien am Anfang dieses Abschnitts angegeben

---

3) The negative peak anode voltage due to ringing in the line output transformer must be taken into account. The ratio between this negative peak and the positive D.C. voltage can be about 1 to 4,5
La tension anodique de crête négative par suite d'oscillations transitoires du transformateur de sortie lignes doit être prise en considération. Le rapport entre cette tension de crête négative et la tension continue positive peut être d'environ 1 à 4,5
Die negative Anodenspitzenspannung infolge des Nachschwingens des Horizontalausgangstransformators muss berücksichtigt werden. Das Verhältnis zwischen dieser negativen Spitzenspannung und der positiven Gleichspannung darf etwa 1 zu 4,5 betragen

4) Maximum pulse duration 22 % of a line scanning cycle with a maximum of 18 µsec
Durée maximum d'une impulsion 22 % d'une période de balayage de lignes avec un maximum de 18 µsec
Max. Impulsdauer 22 % einer Zeilendauer, maximal 18 µSek

5) Absolute value
Valeur absolue
Absolutwert

6) Maximum pulse duration 10 % of a line scanning cycle with a maximum of 10 µsec
Durée maximum d'une impulsion 10 % d'une période de balayage de lignesavec un maximum de 10 µsec
Max. Impulsdauer 10 % einer Zeilendauer, maximal 10 µSek

[3]) The negative peak anode voltage due to ringing in the line output transformer must be taken into account. The ratio between this negative peak and the positive D.C. voltage can be about 1 to 4.5
La tension anodique de crête négative par suite d'oscillations transitoires du transformateur de sortie lignes doit être prise en considération. Le rapport entre cette tension de crête négative et la tension continue positive peut être d'environ 1 à 4,5
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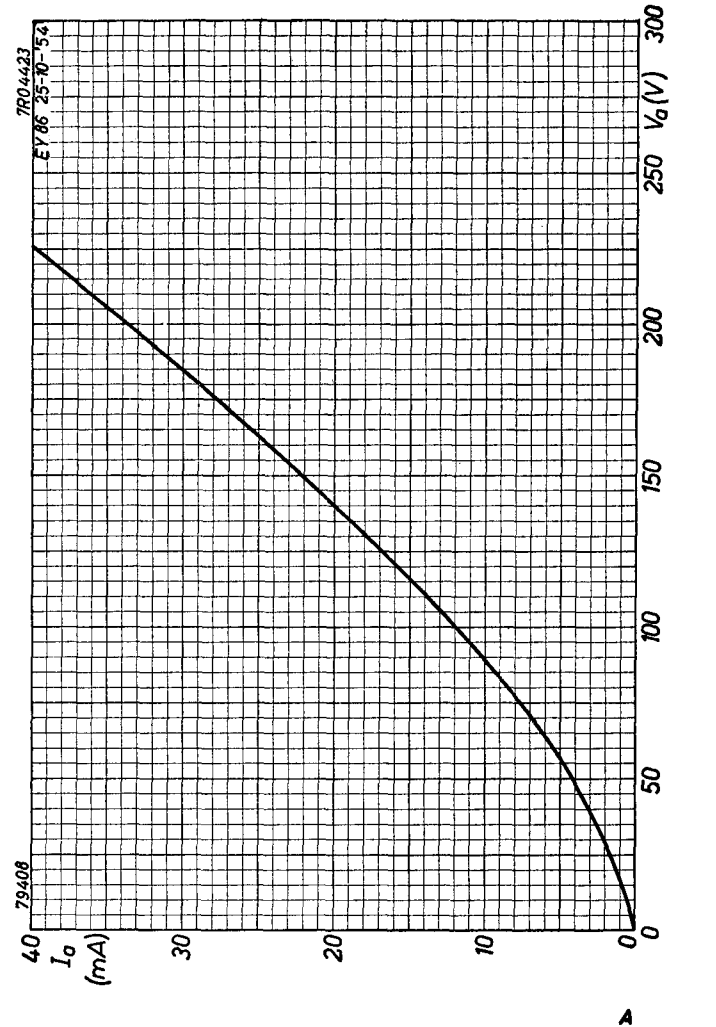
[4]) Maximum pulse duration 22 % of a line scanning cycle with a maximum of 18 µsec
Durée maximum d'une impulsion 22 % d'une période de balayage de lignes avec un maximum de 18 µsec
Max. Impulsdauer 22 % einer Zeilendauer, maximal 18 µSek

[5]) Absolute value
Valeur absolue
Absolutwert

[6]) During short periods as in television service I_o = max. 0.8 mA
Pendant des périodes courtes comme en service de télévision I_o = max. 0,8 mA
Während kurzer Perioden wie bei Fernsehbetrieb ist I_o = max. 0,8 mA

[7]) Maximum pulse duration 10 % of a line scanning cycle with a maximum of 10 µsec
Durée maximum d'une impulsion 10 % d'une période de balayage de lignes avec un maximum de 10 µsec
Max. Impulsdauer 10 % einer Zeilendauer, maximal 10 µSek

EY 87 **PHILIPS**



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Electronic Tube

HANDBOOK

EY87

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2	1	1960.11.11
3	2	1956.11.11
4	2	1960.11.11
5	3	1958.07.07
6	3	1960.11.11
7	4	1958.07.07
8	4	1960.11.11
9	5	1958.07.07
10	5	1960.11.11
11	A	1958.07.07
12	A	1960.11.11
13	FP	2005.05.06

BOOSTER DIODE

Booster diode intended for use in line time base circuits of television receivers.

HEATING: Indirect by A.C. or D.C.; parallel supply

Heater voltage	V_f	6.3	V
Heater current	I_f	1.55	A

For further data and curves of this type please refer to type PY88

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Data handbook

Electronic components and materials

EY88

page	sheet	date
1	1	1969.01
2	FP	1999.08.12

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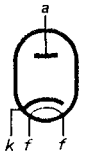
EY 91

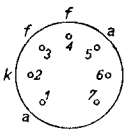
High-vacuum HALF-WAVE RECTIFIER
REDRESSEUR MONOPLAQUE à vide poussé
Hochvakuum EINWEGGLEICHRICHTER

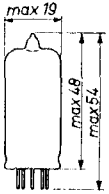
Heating : indirect by A.C. parallel supply
Chauffage: indirect par C.A. alimentation-parallèle
Heizung : indirekt durch Wechselstrom;Parallelspeisung

V_f = 6,3 V
I_f = 0,42 A

Dimensions in mm
Dimensions en mm
Abmessungen in mm







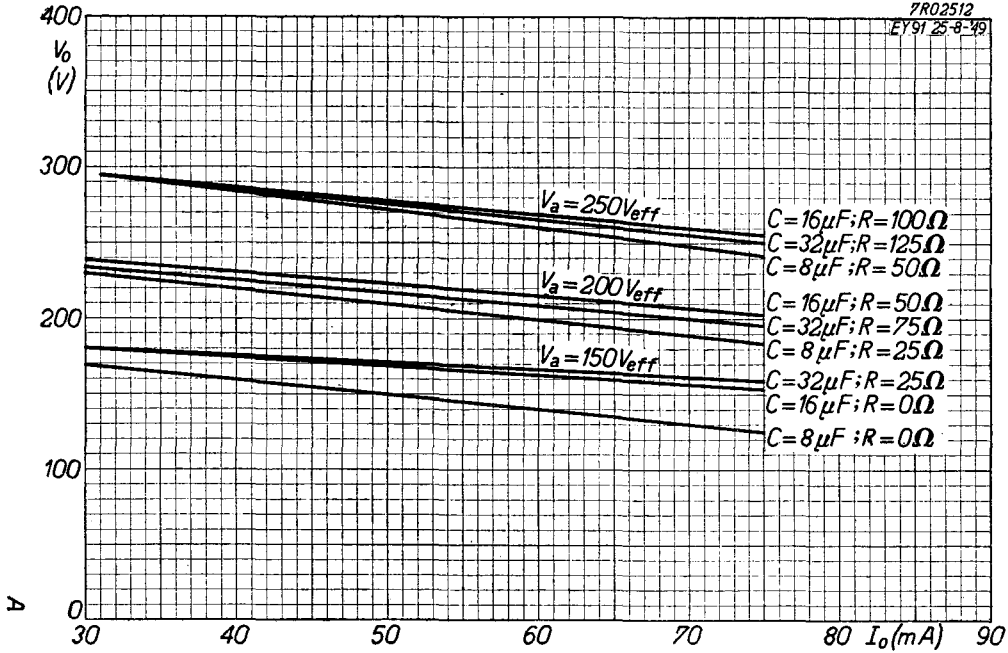
Base, culot, Sockel: Miniature

Operating characteristics
Caractéristiques d'utilisation
Betriebsdaten

V_i (V_{eff})	C_{filt} (μF)	R_t (Ω)
250	32	min. 100
	16	min. 50
	8	0
200	32	min. 70
	16	min. 30
	8	0

Limiting values
Caractéristiques limites
Grenzdaten

V_i = max. 250 V_{eff}
I_o = max. 75 mA
C_{filt} = max. 32 μF
V_{kf} = max. 300 V


7R02512
EY91 25-8-49
400
V_o
(V)
300
200
100
0
30
40
50
60
70
80
I_o(mA)
90
$V_a = 250 V_{eff}$
$V_a = 200 V_{eff}$
$V_a = 150 V_{eff}$
C = 16µF; R = 100Ω
C = 32µF; R = 125Ω
C = 8µF ; R = 50Ω
C = 16µF; R = 50Ω
C = 32µF; R = 75Ω
C = 8µF; R = 25Ω
C = 32µF; R = 25Ω
C = 16µF; R = 0Ω
C = 8µF ; R = 0Ω
A



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3	FP	1999.07.10

EZ 2 Gleichrichter



Die EZ 2 ist eine Zweiphasengleichrichterröhre mit indirekter Heizung und besonders für Automobilempfänger entworfen. Der Heizfaden der Röhre ist mit dem Strom der Wagenbatterie bei einer Spannung von 6,3 Volt zu speisen. Zur Schonung der Batterie bei Verwendung der Röhre EZ 2 in Automobilempfängern ist der Heizstromverbrauch weitgehend herabgesetzt.
Die größte Gleichstromabgabe ist so gewählt, daß sie zur Speisung eines normalen Automobilempfängers ohne Fremderregung für den Lautsprecher genügt.

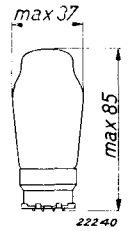


Abb. 1
Abmessungen in mm der Röhre EZ 2.

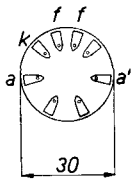


Abb. 2
Elektrodenanordnung und Sockelanschlüsse.

HEIZDATEN

Heizung: indirekt durch Batteriestrom.

Heizspannung	V_f	= 6,3 V
Heizstrom	I_f	= 0,4 A

GRENZDATEN

Größte Leerlaufwechselspannung an der Sekundärwicklung des Speisungstransformators	V_{tr}	= max. 2×350 $V_{(eff)}$
Größte Gleichstromabgabe	I_a	= max. 60 mA
Größte Spannung zwischen Faden und Kathode (absoluter Scheitelwert)	V_{fk}	= max. 500 V
Minimaler Innenwiderstand des Speisungstransformators (pro Anode)	R_{tot}	= min. 600 Ω
Größte Kapazität des ersten Abflachkondensators bei $V_{tr} = 2\times350$ $V_{(eff)}$	C	= max. 16 µF
Größte Kapazität des ersten Abflachkondensators bei $V_{tr} = 2\times300$ $V_{(eff)}$	C	= max. 32 µF

Infolge der Schaltung als Gleichrichter eines Autoempfängers ist man gezwungen, die Gleichspannung mit überlagerter Welligkeit zwischen dem Heizfaden, der über die Batterie an die Masse angeschlossen ist, und der in unmittelbarer Verbindung mit der Hochspannungsseite des ersten Abflachkondensators stehenden Kathode zuzulassen. Bei Leerlauf des Gleichrichters entsteht dadurch zwischen diesen Teilen eine Spannung gleich dem Scheitelwert der an den Gleichrichter angelegten Spannung. Die maximal zulässige Spannung zwischen Heizfaden und Kathode wurde zu 500 Volt gewählt, d.i. der Scheitelwert der höchstzulässigen Anodenwechselspannung. Der Höchstwert der Gleichstromabgabe von 60 mA gilt absolut und daher auch für Wechselspannungen von 2×300 Volt$_{(eff)}$.

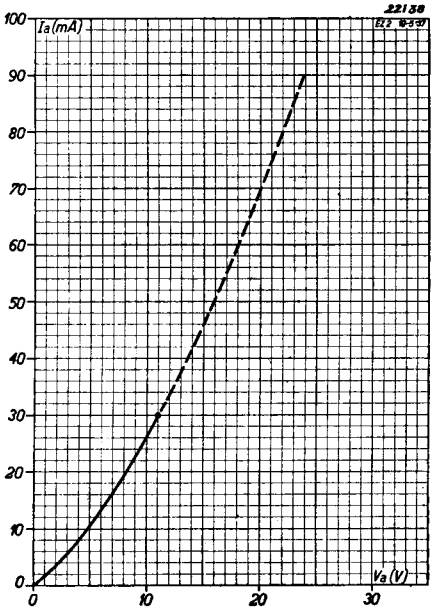


Abb. 3
Strom je Anode als Funktion der angelegten Gleichspannung.

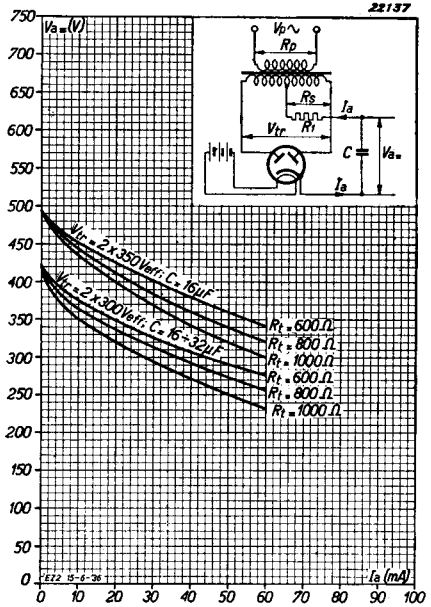
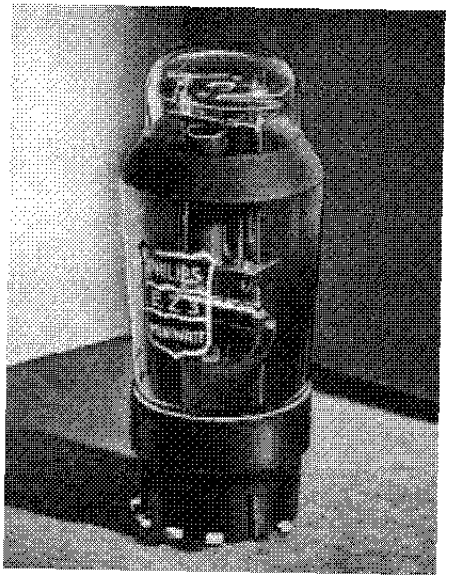


Abb. 4
Belastungskurven des Gleichrichters EZ 2 bei Leerlaufspannungen von 2×300 und 2×350 V an der Sekundärwicklung des Speisungstransformators und verschiedenen Werten seines Innenwiderstandes. Die Eingangskapazität des Filters C beträgt maximal 16 µF bei 2×350 Volt und 32 µF bei 2×300 Volt. Wenn der Innenwiderstand des Speisungstransformators niedriger ist als der Mindestwert von 600 Ohm, ist er durch einen entsprechenden Ergänzungswiderstand R_1 in Reihe mit der halben Sekundärwicklung auf 600 Ohm zu erhöhen.

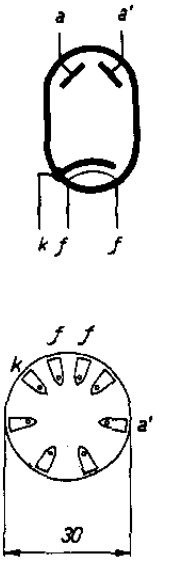
$Rtot$ = $Rs + R_1 + u^2 Rp$.
Rp = Widerstand der Primärwicklung.
Rs = Widerstand der halben Sekundärwicklung.
u = Übersetzungsverhältnis Primärwicklung: halbe Sekundärwicklung.
R_1 = etwaiger Ergänzungswiderstand zur Erhöhung eines zu niedrigen Gesamtwiderstandes.

Le tube redresseur EZ 3



Le tube redresseur EZ 3 pour récepteurs de puissance moyenne.
Fig. 1

Le tube EZ 3 est un tube redresseur biplaque à chauffage indirect, étudié pour les récepteurs de puissance moyenne alimentés par le secteur alternatif. Le débit maximum de ce tube a été choisi suffisamment grand pour pouvoir alimenter, avec facilité, tout appareil normal, et fournir l'excitation du haut-parleur. Le filament sera chauffé par un enroulement de chauffage séparé de 6,3 volts. Le temps de chauffage est de 24 secondes environ. Il a été choisi plus long que celui de la lampe finale d'un appareil récepteur; ainsi la tension continue de l'appareil ne dépassera pas après l'enclanchement la tension de service normale, car le redresseur ne fournira pas de tension à vide.



Disposition des électrodes et connexions sur le culot du tube EZ 3.
Fig. 2

Caractéristiques de chauffage

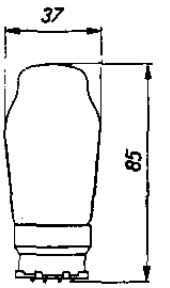
Chauffage indirect par courant alternatif.

Tension de chauffage ..... $V_f = 6{,}3$ V

Courant de chauffage ..... $I_f = 0{,}65$ A

Limites fixées pour les caractéristiques

Tension alternative à vide max au secondaire du transformateur d'alimentation	V_{trmax}	$= 2\times400$ V_{eff}
Débit max. en courant redressé	I_{amax}	$= 100$ mA
Tension max. entre filament et cathode	V_{fkmax}	$= 0$ V [1])
Résistance interne minimum du transformateur d'alimentation pour $V_{tr} = 2\times300$ et 2×350 V_{eff}	$R_{tot\ min}$	$= 250\ \Omega$
Résistance interne minimum du transformateur d'alimentation pour $V_{tr} = 2\times400$ V_{eff}	$R_{tot\ min}$	$= 300\ \Omega$
Capacité maximum du premier condensateur de filtrage à 2×300 V_{eff} de tension du transf. ...	C_{max}	$= 32\ \mu$F
Capacité maximum du premier condensateur de filtrage à 2×350 V_{eff} et 2×400 V_{eff} de tension du transformateur	C_{max}	$= 16\ \mu$F

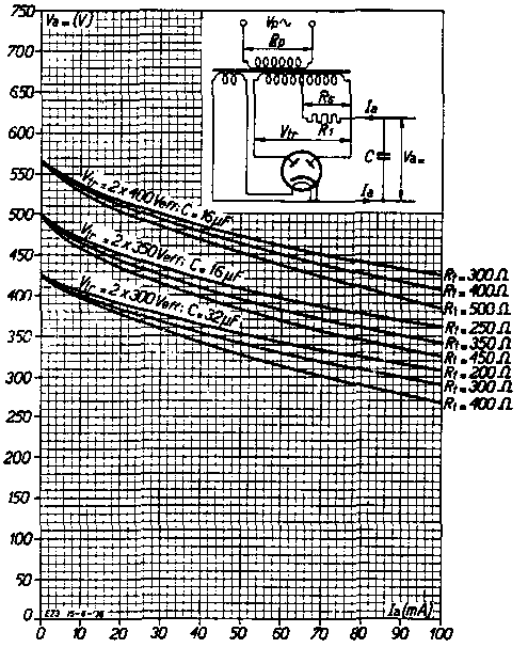


Encombrement du tube EZ 3.
Fig. 3

Utilisation

Ce tube sera utilisé dans les récepteurs alimentés sur secteur alternatif où l'enroulement de chauffage du tube redresseur est prévu pour 6,3 volts. Il n'est pas admissible de brancher le filament de ce tube sur le circuit de chauffage des tubes récepteurs. Il faudra donc prévoir

[1]) *La cathode sera toujours réunie à une extrémité du filament.*



Courbes de charge du redresseur EZ 3 pour des tensions de 2×300, de 2×350 et de 2×400 volts$_{eff}$ au secondaire du transformateur d'alimentation et pour différentes valeurs de sa résistance interne. La capacité d'entrée du filtre C est de 32 μF au maximum pour une tension d'anode de 2×300 V_{eff} et de 16 μF pour une tension d'anode jusqu'à 2×400 V_{eff}. Si la résistance au secondaire du transformateur d'alimentation est inférieure à la valeur minimum indiquée il faut la compléter par une résistance R_1 en série avec le secondaire, jusqu'à ce que R_{tot} soit à nouveau égale à cette valeur minimum.

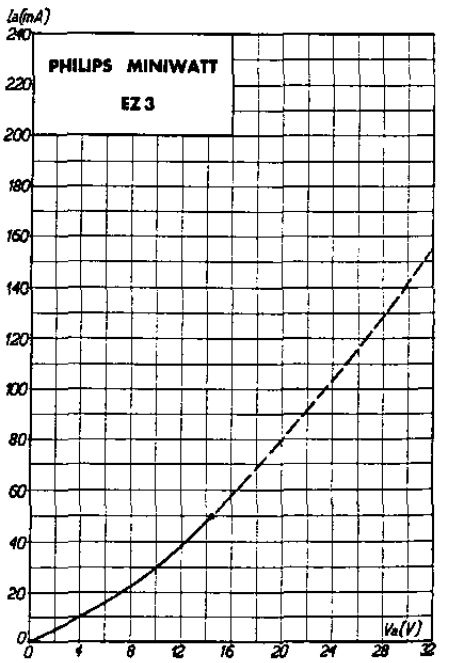
$R_{tot} = R_s + R_1 + n^2 R_p$.
R_p = résistance de l'enroulement primaire.
R_s = résistance de l'enroulement secondaire.
n = rapport de transformation enroulement primaire/moitié de l'enroulement secondaire.
R_1 = résistance éventuelle à intercaler en série pour compléter une résistance totale trop faible.

Fig. 4

un enroulement de chauffage séparé pour ce tube et on réunira la cathode directement à un côté du filament.

Il faudra veiller à ce que les valeurs maxima et minima admissibles ne soient pas dépassées. La valeur maximum de 100 mA pour le débit anodique est absolue, elle est donc aussi valable pour des tensions plus faibles. La figure 4 représente les courbes de charge de la EZ 3 pour V_{tr} = 2×300 volts$_{eff}$, V_{tr} = 2×350 volts$_{eff}$, et V_{tr} = 2×400 volts$_{eff}$ et pour des valeurs différentes de la résistance interne du transformateur d'alimentation. La résistance minimum admissible est de 200 ohms pour une tension jusqu'à 2×300 V_{eff}, de 250 ohms pour une tension jusqu'à 2×350 V_{eff} et de 300 ohms pour une tension jusqu'à 2×400 V_{eff}.

Si le transformateur d'alimentation utilisé présente une résistance interne qui n'atteint pas la valeur minimum indiquée il faut brancher en série avec le secondaire de ce transformateur une résistance R_1 complémentaire (voir fig. 4) jusqu'à atteindre la valeur minimum.



Courant par anode en fonction de la tension continue appliquée.

Fig. 5

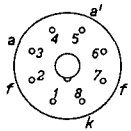
PHILIPS EZ 35

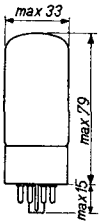
HIGH VACUUM FULL WAVE RECTIFYING VALVE
TUBE REDRESSEUR BIPLAQUE A VIDE POUSSE
HOCHVAKUUM VOLLWEGGLEICHRICHTERROHRE

Heating:	indirect by A.C. parallel supply	
Chauffage:	indirect par C.A. alimentation en parallèle	Vf = 6,3 V If = 0,6 A
Heizung:	indirekt durch Wechselstrom Parallelspeisung	

Dimensions in mm
Dimensions en mm
Abmessungen in mm





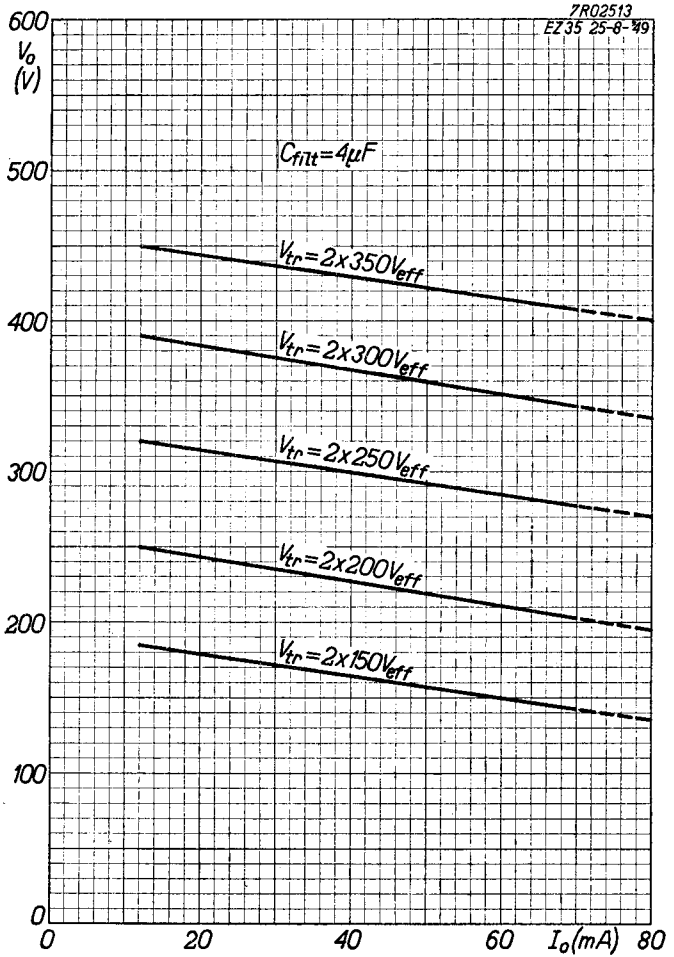


Base, culot, Fuss: Octal

Operating characteristics and limiting values
Caractéristiques d'utilisation et caractéristiques limites
Betriebs- und Grenzdaten

V_{tr}	= max.	2x325	V_{eff}
Io	= max.	70	mA
C_{filt}	= max.	16	µF
Rt	= min.	2x350	Ω
Vfk	= max.	350	V[1])

[1]) Peak value; valeur de crête; Scheitelwert


7R02513
EZ35 25-8-'49
600
V_o
(V)
500
400
300
200
100
0
$C_{filt}=4\mu F$
$V_{tr}=2x350V_{eff}$
$V_{tr}=2x300V_{eff}$
$V_{tr}=2x250V_{eff}$
$V_{tr}=2x200V_{eff}$
$V_{tr}=2x150V_{eff}$
0
20
40
60
I_o(mA)
80

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Electronic Tube

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EZ 4 Gleichrichter



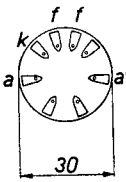


Abb. 2
Elektrodenanordnung und Sockelanschlüsse der Röhre EZ 4.

Die EZ 4 ist eine indirekt geheizte zweiphasige Gleichrichterröhre für Empfänger großer Leistung und kleine Verstärker. Wenn beide Anoden miteinander verbunden werden, eignet sich die Röhre auch als Einphasengleichrichter. Zwei derart geschaltete Röhren bilden einen Zweiphasengleichrichter, der die Hochspannung bei beträchtlicher Leistung liefern kann, und zwar beträgt sie das Doppelte der einer einzigen EZ 4. Ein solcher Gleichrichter mit zwei Röhren EZ 4 kann 350 mA bei einer Wechselspannung von 2×400 Volt an der Sekundärwicklung des Speisungstransformators abgeben.

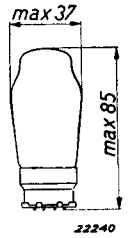


Abb. 1
Abmessungen in mm.

Die Abmessungen der Röhre EZ 4 sind äußerst klein, und ihre Leistungsfähigkeit ist daher besonders bemerkenswert, vor allem bei dem geringen Heizleistungsaufwand.

HEIZDATEN

Heizung: indirekt durch Wechselstrom.

Heizspannung	V_f	= 6,3 V
Heizstrom	I_f	= 0,9 A

GRENZDATEN

Größte Leerlaufwechselspannung an der Sekundärwicklung des Speisungstransformators	V_{tr}	= max. 2×400 $V_{(eff)}$
Größte Gleichstromabgabe	I_a	= max. 175 mA
Größte Spannung zwischen Faden und Kathode	V_{fk}	= 0 V [1]
Minimaler Innenwiderstand des Speisungstransformators bei V_{tr} = 2×300 $V_{(eff)}$ (pro Anode)	R_{tot}	= min. 200 Ω
Minimaler Innenwiderstand des Speisungstransformators bei V_{tr} = 2×350 $V_{(eff)}$ (pro Anode)	R_{tot}	= min. 250 Ω
Minimaler Innenwiderstand des Speisungstransformators bei V_{tr} = 2×400 $V_{(eff)}$ (pro Anode)	R_{tot}	= min. 300 Ω
Größte Kapazität des ersten Abflachkondensators bei V_{tr} = 2×350 $V_{(eff)}$ und 2×400 $V_{(eff)}$	C	= max. 16 µF
Größte Kapazität des ersten Abflachkondensators bei V_{tr} = 2×300 $V_{(eff)}$	C	= max. 32 µF

Der Heizfaden der Gleichrichterröhre darf nicht in den Heizstromkreis der Empfangsröhren geschaltet werden. Es ist daher eine besondere Heizwicklung vorzusehen und die Kathode unmittelbar mit einem Heizfadenende zu verbinden.
Die Kapazität des ersten Abflachkondensators kann von 16 auf 32 µF erhöht werden, wenn die Wechselspannung auf 2×300 $V_{(eff)}$ herabgesetzt wird. Wegen des sehr niedrigen Innenwiderstandes dieser Gleichrichterröhre ist die Wärmeentwicklung nur gering. Besondere Maßnahmen zur Ventilierung des Gerätes oder bei der Aufstellung der Röhre erübrigen sich daher.

[1]) Die Kathode ist stets mit einem Heizfadenende zu verbinden.

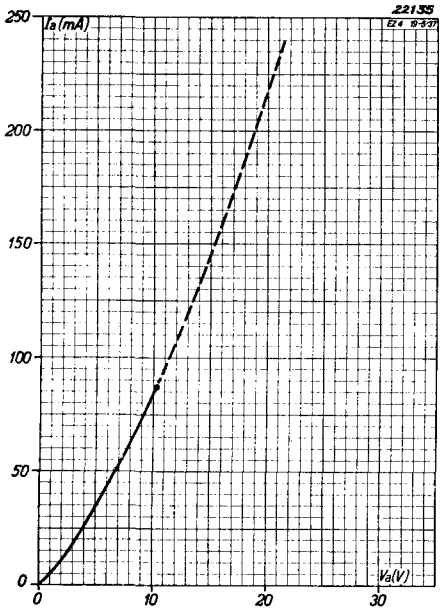


Abb. 3
Strom e Anode als Funktion der angelegten Gleichspannung.

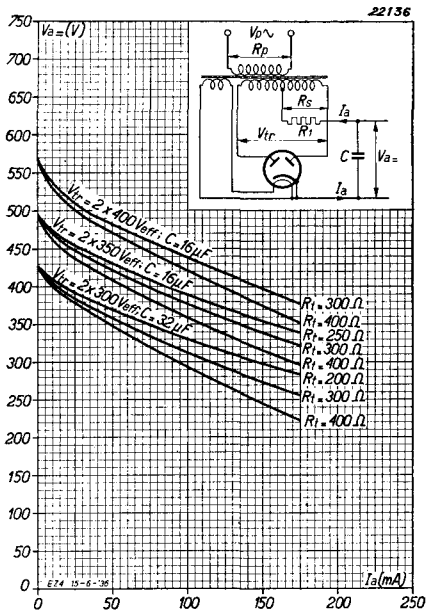


Abb. 4
Belastungskurven des Gleichrichters EZ 4 bei Spannungen von 2×300, 2×350 und 2×400 $V_{(eff)}$ an der Sekundärwicklung des Speisungstransformators und verschiedenen Werten seines Innenwiderstandes. Die Eingangskapazität C des Filters beträgt maximal 32 µF bei 2×300 $V_{(eff)}$ und 16 µF bei 2×350 und 2×400 $V_{(eff)}$. Wenn der Innenwiderstand des Speisungstransformators unter dem Mindestwert bleibt, ist er durch einen entsprechenden Ergänzungswiderstand R_1 in Reihe mit der halben Sekundärwicklung auf den Mindestwert zu erhöhen.

$Rtot$ = $Rs + R_1 + u^2 Rp$.
Rp = Widerstand der Primärwicklung.
Rs = Widerstand der halben Sekundärwicklung.
u = Übersetzungsverhältnis Primärwicklung: halbe Sekundärwicklung.
R_1 = etwaiger Ergänzungswiderstand in Reihe zur Erhöhung eines zu niedrigen Gesamtwiderstandes.

PHILIPS EZ 40

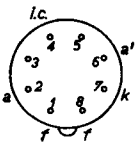
High-vacuum FULL-WAVE RECTIFIER
REDRESSEUR BIPLAQUE à vide poussé
Hochvakuum VOLLWEGGLEICHRICHTER

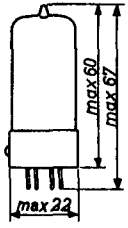
Heating : indirect by A.C.; parallel supply
Chauffage: indirect par C.A.; alimentation parallèle
Heizung : indirekt durch Wechselstrom; Parallelspeisung

V_f = 6,3 V
I_f = 0,6 A

Dimensions in mm
Dimensions en mm
Abmessungen in mm







Base, culot, Sockel: Rimlock

Operating characteristics and limiting values
Caractéristiques d'utilisation et caractéristiques limites
Betriebs- und Grenzdaten

V_{tr} (Veff)	I_o (mA) max.	Rt (Ω) min.	Cfilt (µF) max.	V_{kf_o} (V) max.
2x250	90	2x125	50	500
2x275	90	2x175	50	500
2x300	90	2x215	50	500
2x350	90	2x300	50	500

EZ 40 PHILIPS

PHILIPS

Electronic Tube

HANDBOOK

EZ40

page	sheet	date
1	1	1954.12.12
2	A	1954.12.12
3	FP	1999.07.10

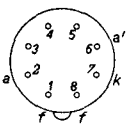
PHILIPS EZ 41

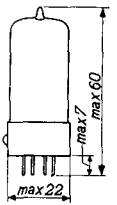
High vacuum FULL WAVE RECTIFYING VALVE for use in car radio receivers
TUBE REDRESSEUR BIPLAQUE à vide poussé pour postes auto-radio
Hochvakuum VOLLWEGGLEICHRICHTERRÖHRE für Autoempfänger

Heating:	indirect by A.C. parallel supply	
Chauffage:	indirect par C.A. alimentation en parallèle	Vf = 6,3 V If = 0,4 A
Heizung:	indirekt durch Wechselstrom; Parallelspeisung	

Dimensions in mm
Dimensions en mm
Abmessungen in mm



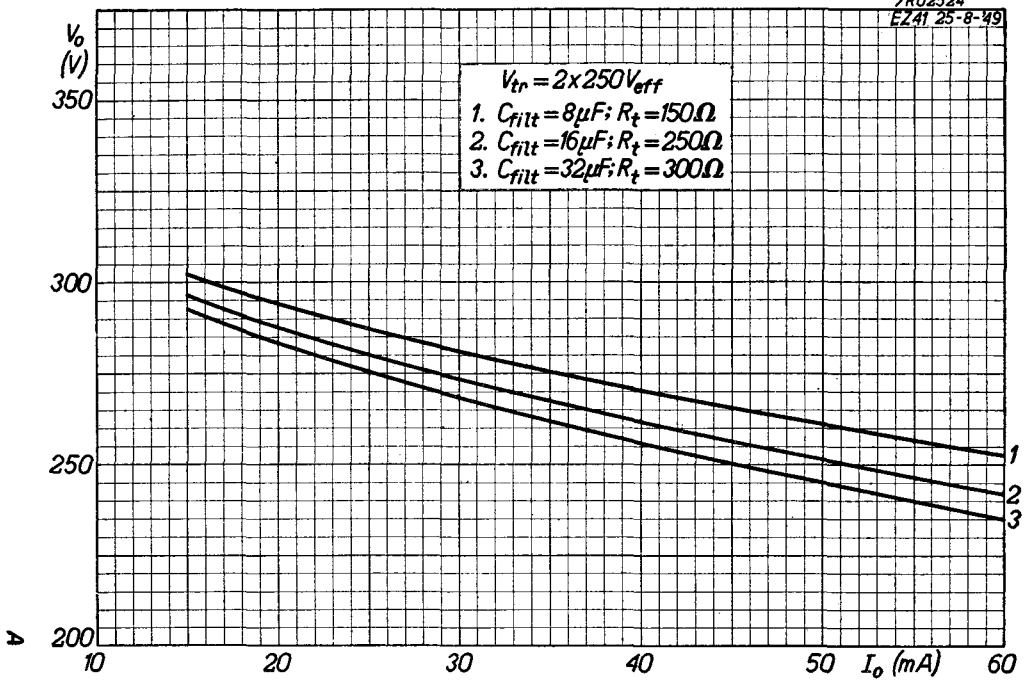




Operating characteristics and limiting values
Caractéristiques d'utilisation et caractéristiques limites
Betriebs- und Grenzdaten

V_{tr}	= max. 2 x 250 V_{eff}
Io	= max. 60 mA
Vfk	= max. 350 V

C_{filt} =	8	16	32	µF
Rt =	min. 2x150	2x250	2x300	Ω


7R02524
EZ41 25-8-'49
V_o (V)
$V_{tr} = 2 \times 250 V_{eff}$
1. $C_{filt} = 8 \mu F$; $R_t = 150 \Omega$
2. $C_{filt} = 16 \mu F$; $R_t = 250 \Omega$
3. $C_{filt} = 32 \mu F$; $R_t = 300 \Omega$
350
300
250
200
10
20
30
40
50
60
I_o (mA)
1
2
3

A

PHILIPS

Electronic Tube

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EZ41

page	sheet	date
1	1	1949.09.09
2	A	1949.09.09
3	FP	1999.07.10

DOUBLE ANODE RECTIFYING TUBE

Double anode high vacuum rectifying tube

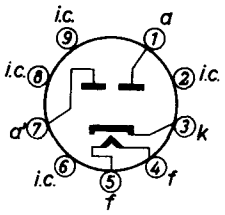
QUICK REFERENCE DATA			
Transformer voltage	V_{tr}	2x350	V_{RMS}
D.C. current	I_o	90	mA

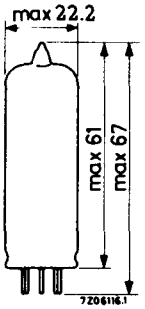
HEATING: Indirèct by A.C.; parallel supply

Heater voltage	V_f	6.3	V
Heater current	I_f	600	mA

DIMENSIONS AND CONNECTIONS Dimensions in mm

Base: Noval





OPERATING CHARACTERISTICS as two-phase half-wave rectifier

Transformer voltage	V_{tr}	2x250	2x275	2x300	2x350	V_{RMS}
D.C. output voltage	V_o	260	285	310	360	V
D.C. current	I_o	90	90	90	90	mA
Protecting resistance	R_t	2x125	2x175	2x215	2x300	Ω
Input capacitor of smoothing filter	C_{filt}	50	50	50	50	μF

LIMITING VALUES (Design centre rating system)

Transformer voltage	V_{tr}	max.	2x350	V_{RMS}		
D.C. current	I_o	max.	90	mA		
Cathode to heater voltage, peak, k pos	V_{kf_p}	max.	500	V		
Input capacitor of smoothing filter	C_{filt}	max.	50	μF		
Protecting resistance	R_t min.	2x125	2x175	2x215	2x300	Ω
at transformer voltage	V_{tr}	2x250	2x275	2x300	2x350	V_{RMS}

PHILIPS

Data handbook

Electronic components and materials

EZ80

page	sheet	date
1	1	1969.12
2	2	1969.01
3	FP	1999.03.19

DOUBLE ANODE RECTIFYING TUBE

Double anode high vacuum rectifying tube.

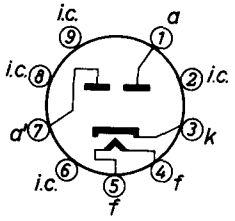
QUICK REFERENCE DATA			
Transformer voltage	V_{tr}	2x450	V_{RMS}
D.C. current	I_o	100	mA

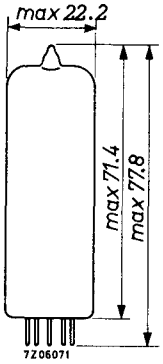
HEATING: Indirect by A.C.; parallel supply

Heater voltage	V_f	6.3 V
Heater current	I_f	1 A

DIMENSIONS AND CONNECTIONS Dimensions in mm

Base: Noval





OPERATING CHARACTERISTICS

As two-phase half-wave rectifier with capacitor input filter See page 4 upper fig.

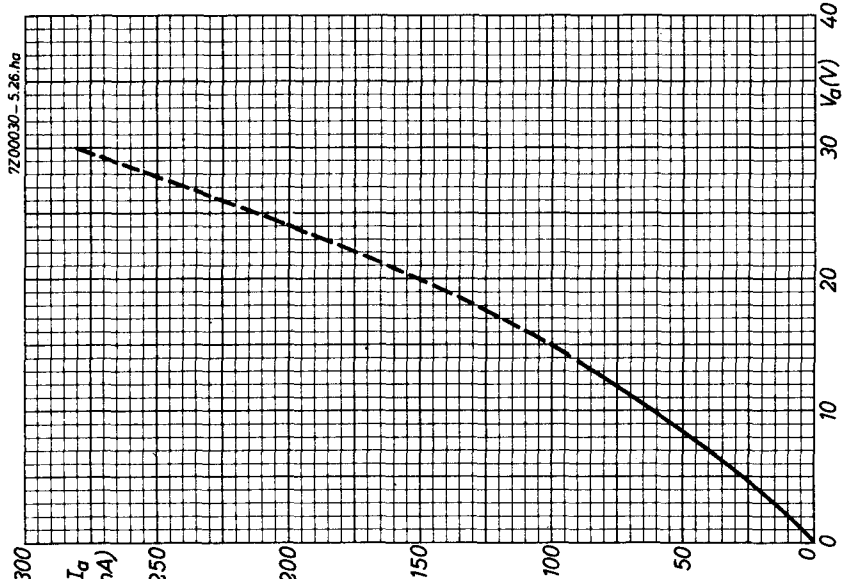
Transformer voltage	V_{tr}	2x250	2x350	2x450	V_{RMS}
D.C. output voltage	V_o	245	352	497	V
D.C. current	I_o	160	150	100	mA
Protecting resistance	R_t	2x150	2x230	2x310	Ω
Input capacitor of smoothing filter	C_{filt}	50	50	50	μF

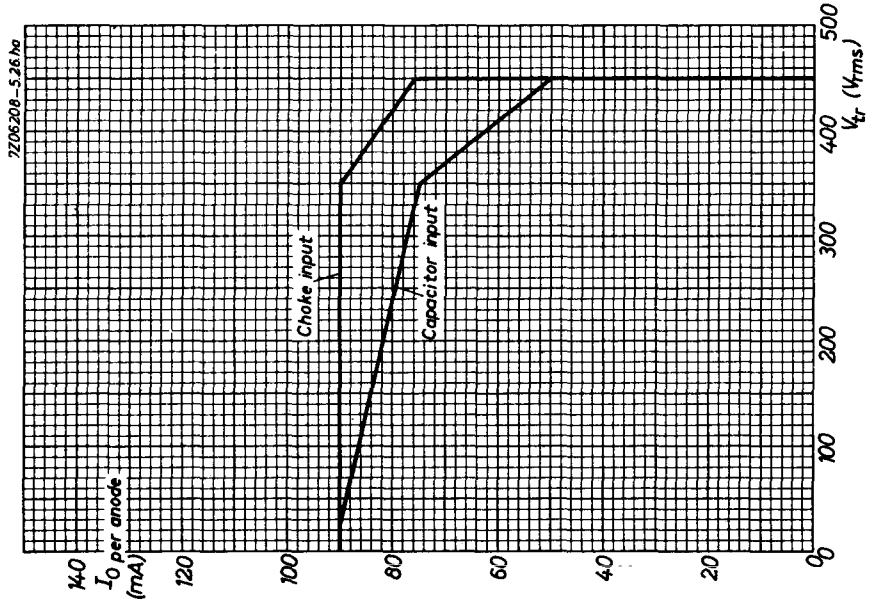
As two-phase half-wave rectifier with choke input filter See page 4 lower fig.

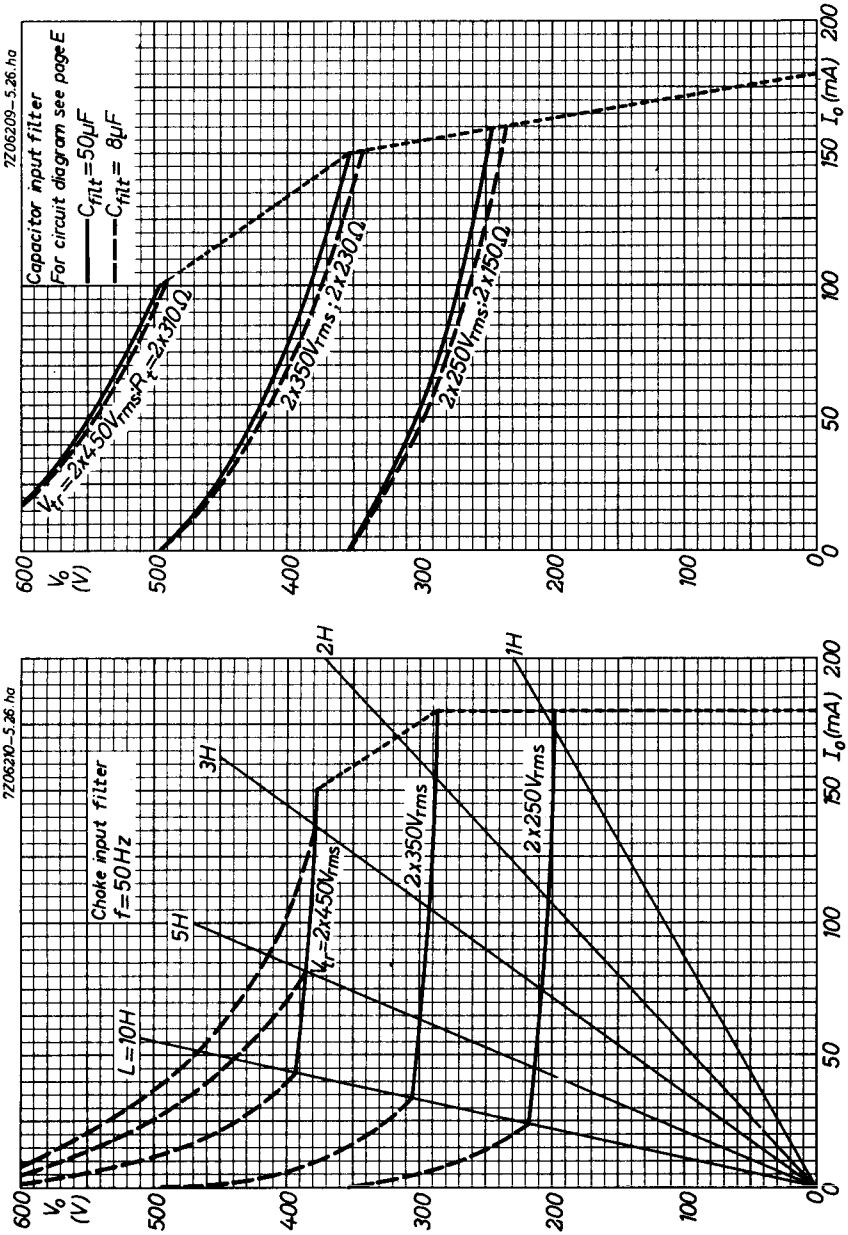
Transformer voltage	V_{tr}	2x250	2x350	2x450	V_{RMS}
D.C. output voltage	V_o	199	288	378	V
D.C. current	I_o	180	180	150	mA
Choke	L	10	10	10	H

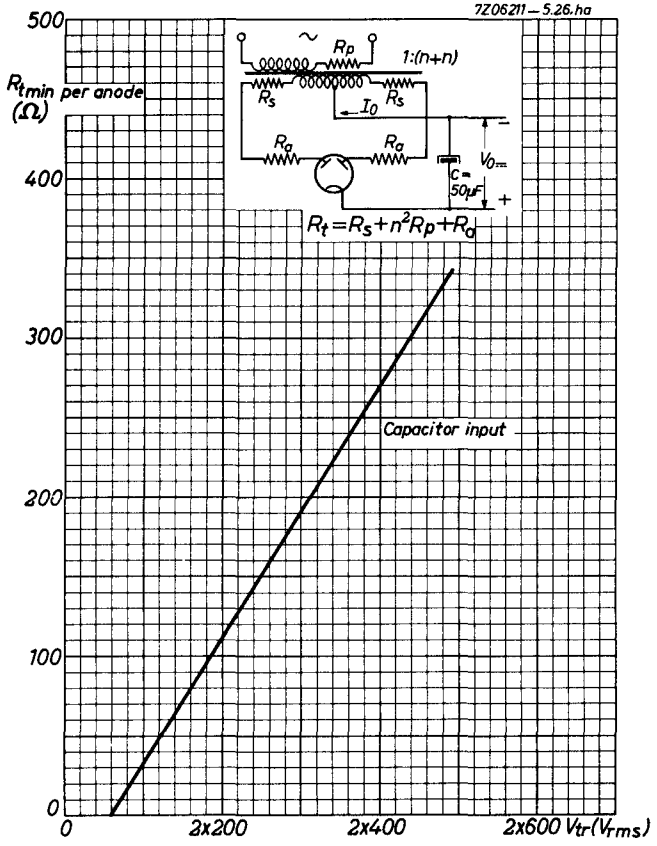
LIMITING VALUES (Design centre rating system)

Anode voltage, peak inverse	$V_{a_{invp}}$	max.	1300	V
D.C. current	I_o	See page 3 lower figure		
Transformer voltage	V_{tr}			
Anode current, peak	I_{a_p}	max.	500	mA
surge	$I_{a_{surge}}$	max.	1.8	A
Cathode to heater voltage, k pos	V_{kf}	max.	500	V
Input capacitor of smoothing filter	C_{filt}	max.	50	μF
Protecting resistance	R_t min.	See page 5		
Choke	L min.	See page 4 lower fig.		


7Z00030-5.26.ha
I_a (mA)
300
250
200
150
100
50
0
V_a(V)
0
10
20
30
40


7Z06208-5.26.ha
I_o per anode (mA)
140
120
100
80
60
40
20
0
Choke input
Capacitor input
V_{tr} (V_{rms})
0
100
200
300
400
500


7Z06209-5.26.ha
Capacitor input filter
For circuit diagram see page E
C_{filt}=50µF
C_{filt}= 8µF
V_{tr}=2x450Vrms;R_t=2x310Ω
2x350Vrms;2x230Ω
2x250Vrms;2x150Ω
V_o (V)
I_o (mA)
7Z06210-5.26.ha
Choke input filter
f=50Hz
L=10H
5H
3H
2H
1H
V_{tr}=2x450Vrms
2x350Vrms
2x250Vrms
V_o (V)
I_o (mA)


7Z06211—5.26.ha
500
400
300
200
100
0
$R_{tmin\ per\ anode}$ (Ω)
R_p
1:(n+n)
R_s
R_s
I_0
R_a
R_a
V_{0rms}
C = 50µF
+
−
$R_t = R_s + n^2R_p + R_a$
Capacitor input
0
2x200
2x400
2x600 $V_{tr}(V_{rms})$

PHILIPS

Data handbook

Electronic components and materials

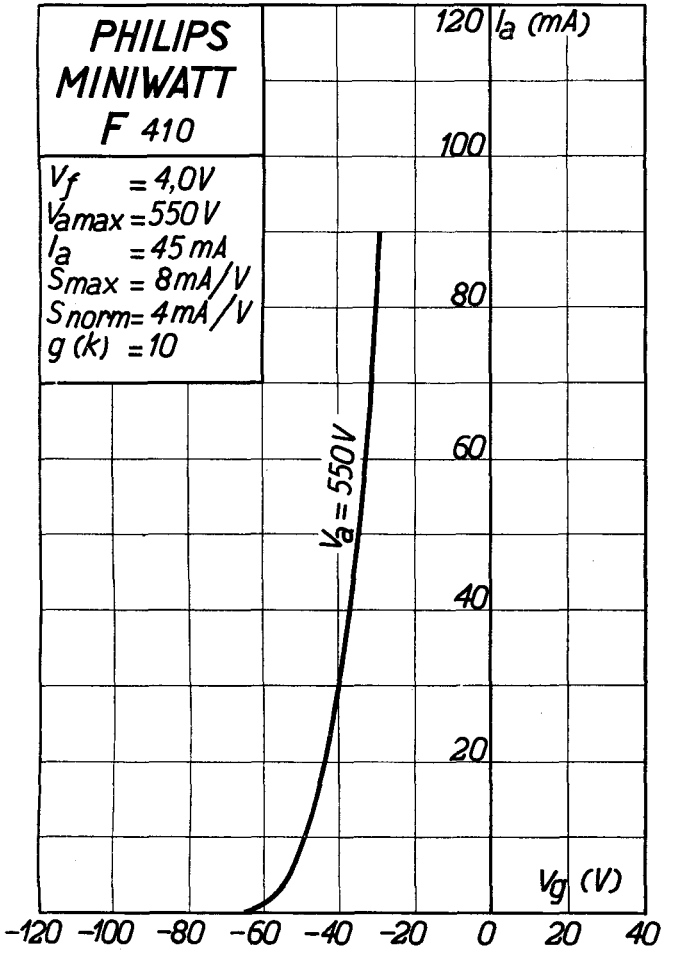
EZ81

page	sheet	date
1	1	1970.01
2	2	1970.01
3	3	1970.01
4	4	1970.01
5	5	1970.01
6	FP	1999.03.19

PHILIPS „MINIWATT"

Heizspannung Tension de chauffage Filament voltage	v_f	=	4,0 V
Heizstrom Courant de chauffage Filament current	i_f	=	ca. env. 2,0 A appr.
Anodenspannung Tension anodique Anode voltage	$v_{a\,max.}$	=	550 V
Normaler Anodenstrom Courant anodique normal Normal anode current	i_a	=	45 mA
Neg. Gittervorspannung Polarisation négative de grille Negative grid bias	v_g	=	ca. env. 36 V appr.
Verstärkungsfaktor Coefficient d'amplification Amplification factor	$g\,(k)$	=	10
Steilheit (max.) Inclinaison (max.) Slope (max.)	$S_{\,max.}$	=	8 mA/V
Steilheit (norm.) Inclinaison (norm.) Slope (norm.)	$S_{\,norm.}$	=	4 mA/V
Innerer Widerstand (norm.) Résistance intérieure (norm.) Internal resistance (norm.)	R_i	=	2500 Ohm
Anodenverlustleistung Dissipation anodique Anode dissipation	$w_{a\ max.}$	=	25 W
Max. Länge Longueur max. Overall length	l	=	140 mm
Grösster Durchmesser Diamètre max. Max. diameter	d	=	67 mm
Sockel Culot Base		=	A 40
Sockelschaltung Connexion du culot Base connection		=	S 1

Anwendung:	Endstufe
Applications:	Tube final
Function:	Power valve


PHILIPS
MINIWATT
F 410
V_f = 4,0V
V_{amax} = 550V
I_a = 45 mA
S_{max} = 8mA/V
S_{norm} = 4mA/V
g (k) = 10
120
100
80
60
40
20
I_a (mA)
V_a = 550V
V_g (V)
-120
-100
-80
-60
-40
-20
0
20
40

PHILIPS „MINIWATT"

Max. Anodenspannung	V_{ao}	= 900 V
Tension anodique max.		
Max. anode voltage	V_{a_L}	= 550 V

Max. Anodenbelastung		
Dissipation anodique max.	W_a	= 25 W
Max. anode dissipation		

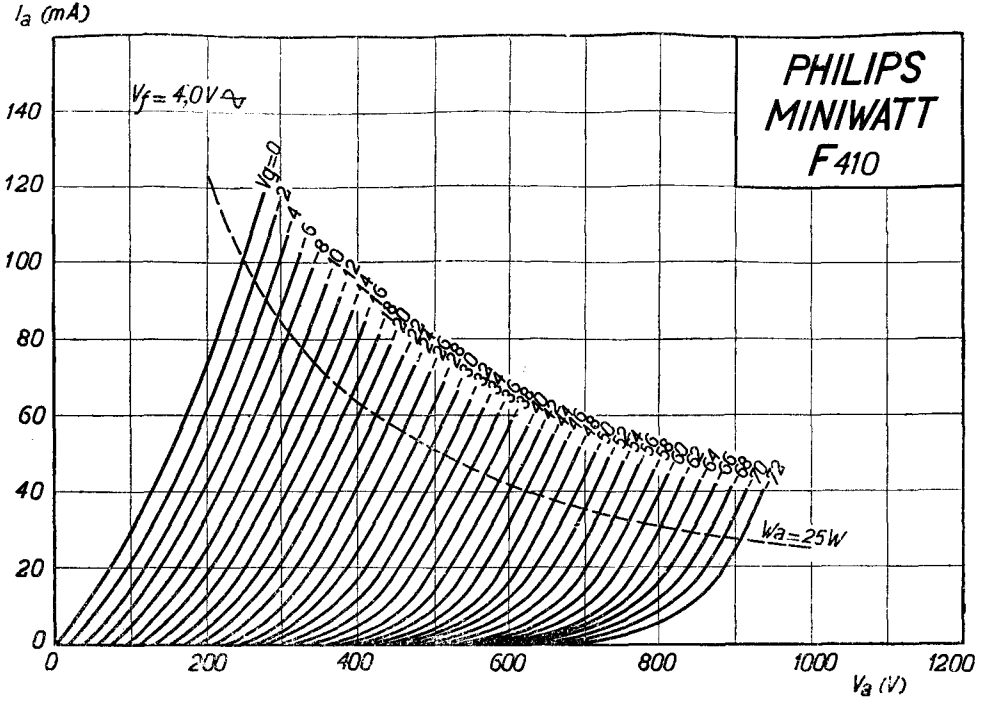
Max. Kathodenstrom		
Courant cathodique max.	I_c	= 60 mA
Max. cathode current		

Gitterstrom-Einsatzpunkt		
Point de commenc. du courant de grille	V_{gi}	= —2 V
Starting point of grid current		

Max. Widerstand im Gitterkreis	R_{g1}	= 0,3 M.Ohm
Résistance max. dans le circuit de grille		
Max. resistance in grid circuit	R_{g2}	= 0,1 M.Ohm

Nutzleistung		
Puissance utile	W_o ($V_{g\ eff}$ = 24,5 V) (R_a = 7000 Ω)	= 5,9 W
Output		

	C_{ag}	= 6 μμF
Kapazitäten		
Capacités	C_{ak}	= 4,4 μμF
Capacities		
	C_{gk}	= 7,1 μμF


I_a (mA)
PHILIPS
MINIWATT
F410
$V_f = 4{,}0V$
$V_g = 0$
$W_a = 25W$
0
20
40
60
80
100
120
140
0
200
400
600
800
1000
1200
V_a (V)

Philips „Miniwatt" F 443



½ nat. Gr.

Die F 443 is nach denselben Grundsätzen ausgeführt wie die B 443, die C 443 und die E 443 N. Die höchstzulässige Anodenspannung beträgt 550 V; der Anodenverlust beläuft sich bei dieser Anodenspannung auf 25 Watt.

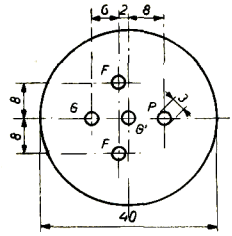
Diese Röhre eignet sich zur Verwendung als Endverstärkerröhre in Verstärkern zum Betriebe von 3—12 elektromagnetischen oder einem oder mehreren elektrodynamischen Lautsprechern für Restaurants, kleine Säle (höchstens 1250 cbm) usw.

Für die Wechselstromheizung wird der PHILIPS Heiztransformator Nr. 4009 empfohlen. Ein Heizwiderstand ist überflussig.

Die PHILIPS Gleichrichterröhre 1562 ist zur Lieferung der Anodenspannung geeignet.

Die F 443 wird normalerweise mit dem Sockel O 40 geliefert.

F = Heizfaden
G = Steuergitter
G′ = Schirmgitter
P = Anode



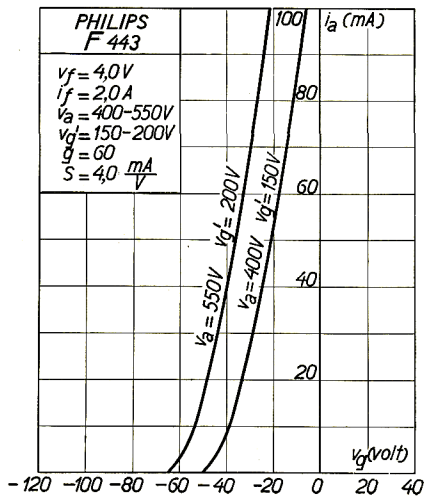
0 40

Philips „Miniwatt" F 443

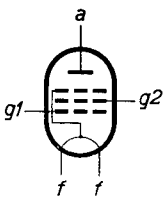
Heizspannung	v_f	= 4,0 V
Heizstrom	i_f	= 2,0 A
Anodenspannung	v_a	= 400-550 V
Schirmgitterspannung	v_g'	= 150-200 V
Verstärkungsfaktor	g	= 60
Steilheit	S	= 4,0 mA/V
Innerer Widerstand	R_i	= 15000 Ω
Negative Steuergitterspannung (bei v_g' = 200 V)	v_g	= 39 V
Normaler Anodenstrom (bei v_g' = 200 V)	i_a	= 45 mA
Länge (ohne Stifte)	l	= 155 mm
Grösster Durchmesser	d	= 68 mm

Um Überlastung der Anode und Verzerrung zu vermeiden, ist folgende negative Steuergitterspannung erforderlich:

29 V bei 150 V Schirmgitterspannung (v_a = 400 V),
39 V „ 200 V „ (v_a = 550 V).



F 443 N Penthode



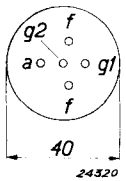


Abb. 2
Elektrodenanordnung und Sockelanschlüsse.

Die Röhre F 443 N ist eine direkt geheizte 25-Watt-Endverstärkerpenthode, die mit einem Fünfstiftsockel ausgestattet ist und eine maximale Anodenspannung von 550 Volt gestattet. Die maximale Schirmgitterspannung beträgt 300 V, aber bei automatischer Vorspannung ist eine Schirmgitterspannung van 250 V für Gegentaktstufen die günstigste. Bei 300 Volt Anodenspannung kann die Schirmgitterspannung ebenfalls bis auf 300 Volt gebracht werden, so daß dann die Schwierigkeiten in Bezug auf Schirmgitterspeisung (Potentiometer mit eventueller Stabilisierung) fortfallen. Die maximal erzielbare Ausgangsleistung ist bei Gegentaktstufen dann aber bedeutend geringer als bei 550/250 V. Bei 550 V Anoden- und 250 V Schirmgitterspannung erzielt man mit zwei Röhren F 443 N in Gegentakt Klasse A/B mit automatischer Vorspannung eine Ausgangsleistung von 41 W bei 4,3 % Verzerrung.

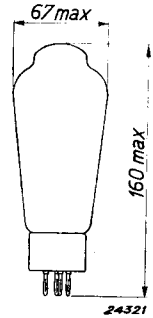


Abb. 1
Abmessungen in mm.

HEIZDATEN

Heizung: direkt durch Wechselstrom, Parallelspeisung.

Heizspannung	V_f	= 4 V
Heizstrom	I_f	= 2 A

KAPAZITÄTEN

C_{ag}	=	1,6 µµF
C_a	=	17 µµF
C_{g1}	=	16 µµF

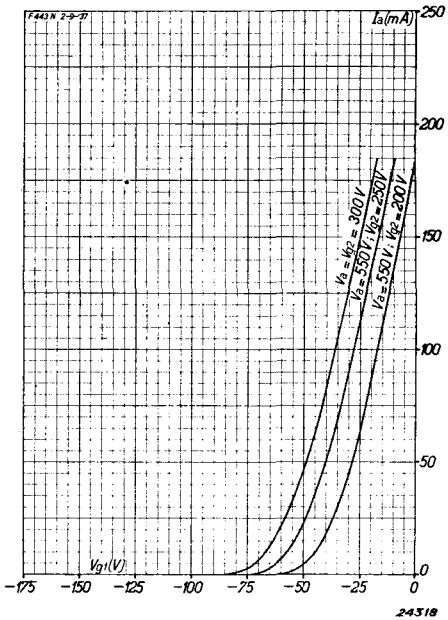


Abb. 3
Anodenstrom als Funktion der negativen Gitterspannung bei Va = 550 V, Vg_2 = 250 V, bei Va = 550 V, Vg_2 = 200 V und bei $Va = Vg_2$ = 300 V.

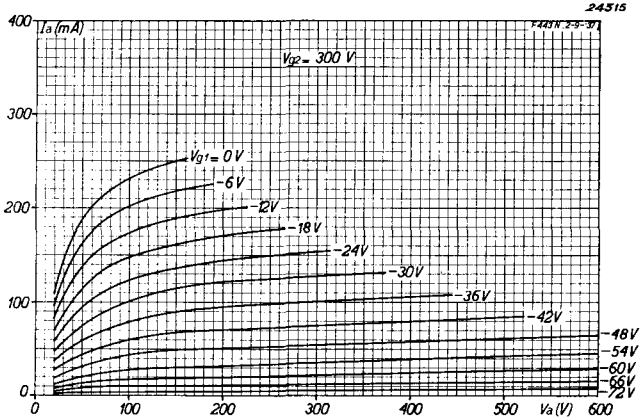


Abb. 4
Anodenstrom als Funktion der Anodenspannung bei V_{g_2} = 300 V mit der negativen Gitterspannung als Parameter.

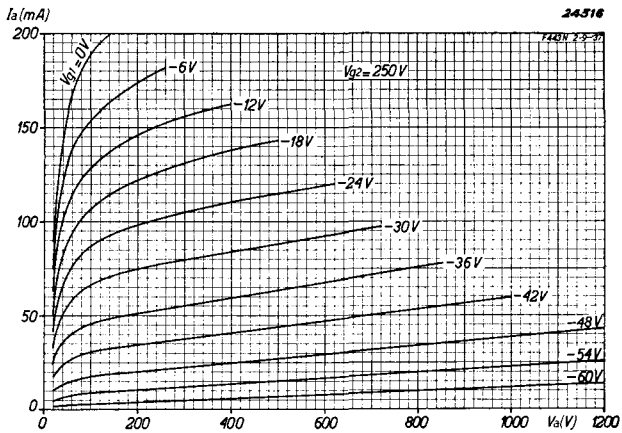


Abb. 5
Anodenstrom als Funktion der Anodenspannung bei V_{g_2} = 250 V mit der negativen Gitterspannung als Parameter.

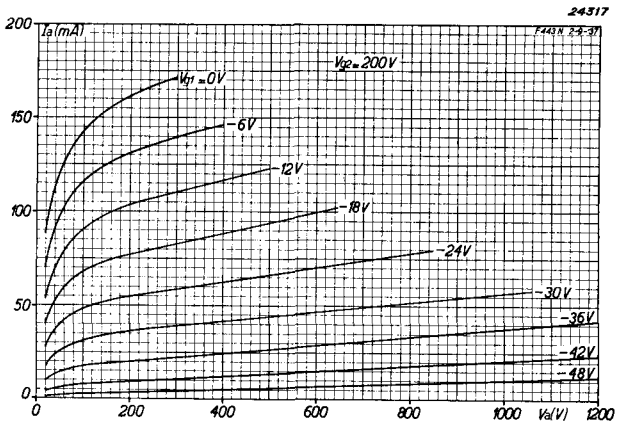


Abb. 6
Anodenstrom als Funktion der Anodenspannung bei V_{g_2} = 200 V mit der negativen Gitterspannung als Parameter.

F 443 N

BETRIEBSDATEN

		Einfacher Endverstärker Klasse A	Einfacher Endverstärker Klasse A	Gegentakt-Endverstärker Klasse A/B autom. Vorspannung (2 Röhren)	Gegentakt-Endverstärker Klasse A/B feste Vorspannung (2 Röhren)	Gegentakt-Endverstärker Klasse A/B autom. Vorspannung (2 Röhren)
Anodenspannung	V_a (V)	550	300	550	300	300
Schirmgitterspannung	V_{g2} (V)	200	300	250	300	300
Neg. Gittervorsp. bei fester Vorspannung	V_{g1} (V)	— 30	— 40	—	—63	—
Gemeinsamer Kathodenwiderst. bei automatischer Vorspannung	R_k (Ω)	647	457	455	—	340
Anodenruhestrom	I_{ao}(mA)	45	83	2×45	2×15	2×64
Anodenstrom bei voller Aussteuerung	$I_{a\,max}$ (mA)	—	—	2×53	2×72,5	2×72,5
Schirmgitterruhestrom	I_{g2o} (mA)	1,4	4,6	2×0,8	2×0,4	2×2,0
Schirmgitterstrom bei voller Aussteuerung	$I_{g2\,max}$ (mA)	—	—	2×7,4	2×14,3	2×11,9
Steilheit im Arbeitspunkt . . .	S (mA/V)	3,2	3,9	—	—	—
Innenwiderst. im Arbeitspunkt	R_i (Ω)	30000	20000	—	—	—
Günst. Anpassungsimpedanz (zwischen den beiden Anoden)	R_a (Ω)	12000	3500	12000	4500	4000
Max. Ausgangsleistung	W_o (W)	12	10,3	41	26,5	24
Verzerrung bei maximaler Ausgangsleistung	d_{tot} (%)	10	10	4,3	3,4	2,9
Gitterwechselspannung bei voller Aussteuerung	$V_{i\,max}$ (V_{eff})	12,5	20	37[1])	46[1])	39[1])

[1]) Pro Gitter.

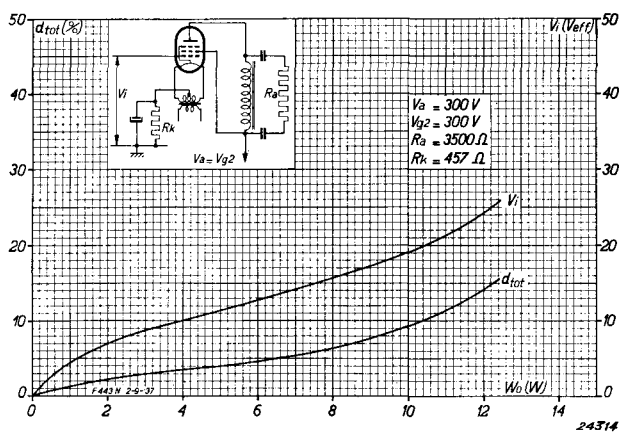


Abb. 7
Gesamtverzerrung und Gitterwechselspannungsbedarf als Funktion der Ausgangsleistung bei $Va = Vg_2 = 300$ V und bei Verwendung der Röhre F 443 N als einfache Endröhre.

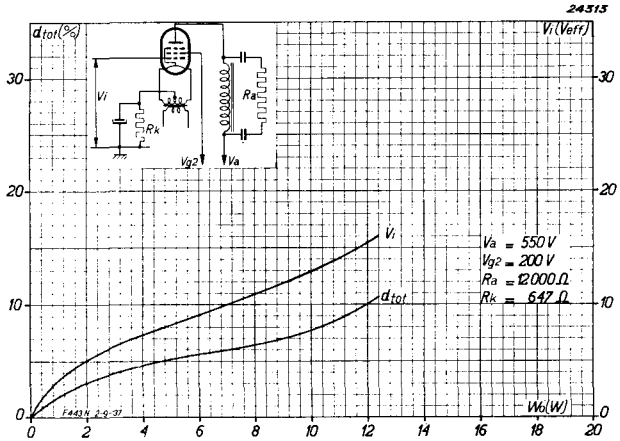


Abb. 8
Gesamtverzerrung und Gitterwechselspannungsbedarf als Funktion der Ausgangsleistung bei Va = 550 V und Vg_2 = 200 V und bei Verwendung der Röhre F 443 N als einfache Endröhre.

GRENZDATEN

V_{ao}	= max. 900 V	I_k	= max. 100 mA
V_a	= max. 550 V	V_{g1} (I_{g1} = + 0,3 µA)	= max. —2 V
W_a	= max. 25 W	R_{g1k} (*aut. Vorsp.*)	= max. 0,3 MΩ
V_{g2o}	= max. 500 V	R_{g1k} (*feste Vorsp.*)	= max. 0,1 MΩ
V_{g2}	= max. 300 V		
W_{g2}	= max. 2 W		

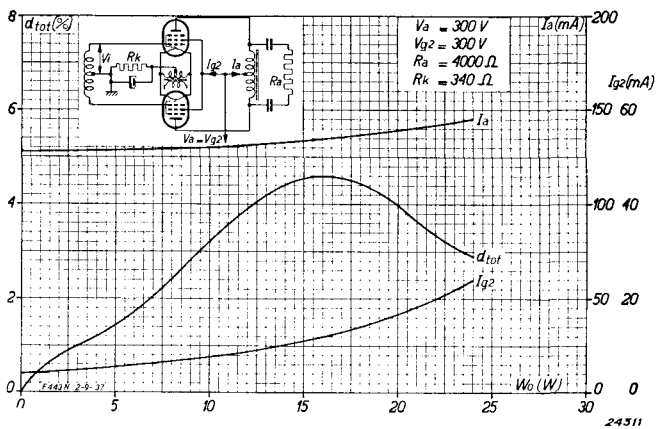


Abb. 9
Gesamtverzerrung, Gesamtanodenstrom und Gesamtschirmgitterstrom als Funktion der Ausgangsleistung bei Verwendung von zwei Röhren F 443 N in Gegentakt mit automatischer Vorspannung und bei Va = Vg_1 = 300 V.

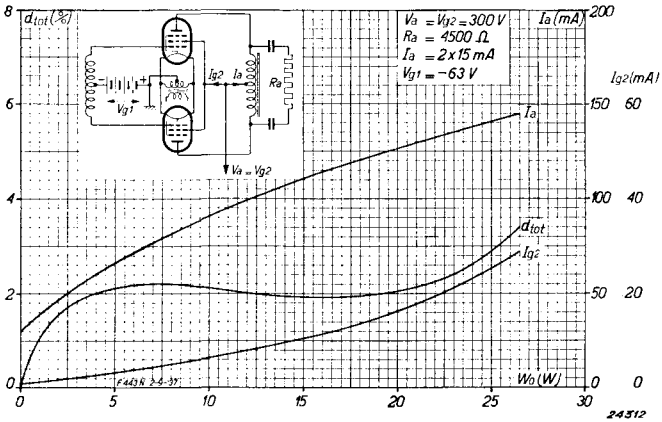


Abb. 10
Gesamtverzerrung, Gesamtanodenstrom und Gesamtschirmgitterstrom als Funktion der Ausgangsleistung bei Verwendung von zwei Röhren F 443 N in Gegentakt mit fester Gittervorspannung und bei $Va = V_{g_2} = 300$ V.

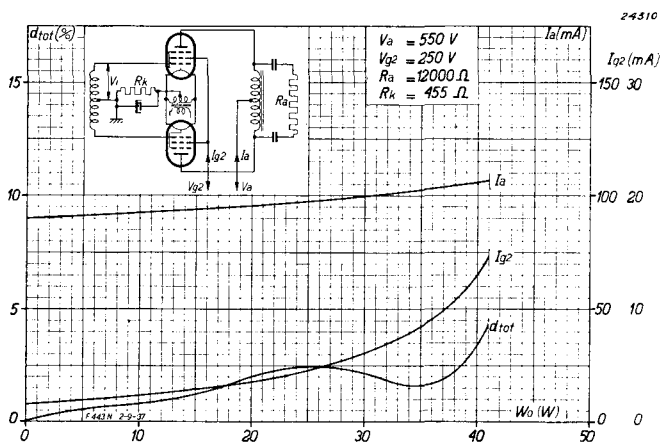


Abb. 11
Gesamtverzerrung, Gesamtanodenstrom und Gesamtschirmgitterstrom als Funktion der Ausgangsleistung bei Verwendung von zwei Röhren F 443 N in Gegentakt mit automatischer Gittervorspannung und bei $Va = 550$ V, $V_{g_2} = 250$ V.

PHILIPS MODULATORLAMP



Schaal 2 : 3

F 704

Deze eindversterkerlamp kan gebruikt worden als modulatorlamp voor anodespannings-(Heising) modulatie.

De maximale anodedissipatie van 25 W mag niet worden overschreden.

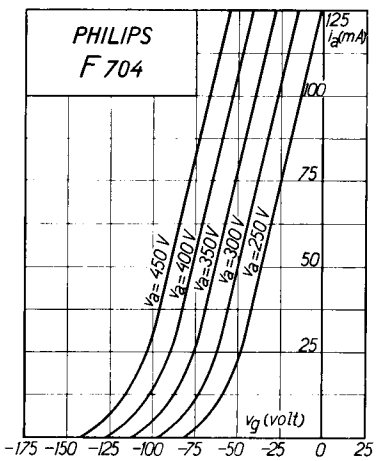
Bij de normale anodespanning van 450 V mag dus de anodestroom hoogstens 55 mA bedragen, hetgeen bij een negatieve roosterspanning van ca. 84 V het geval is.

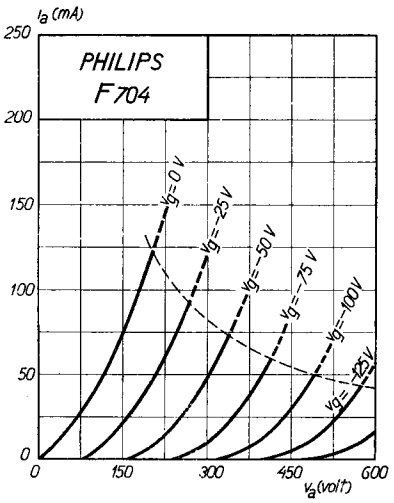
Indien smoorspoelkoppeling wordt toegepast zijn er voor het moduleeren van één TC 04/10 één of twee F 704 noodig.

In dit geval krijgt de F 704 evenals de TC 04/10 een anodespanning van 400 Volt, waarbij de anodestroom dus 60 mA mag bedragen hetgeen bij een negatieve roosterspanning van ongeveer 75 V het geval is.

PHILIPS MODULATORLAMP

F 704





Gloeispanning	v_f	=	7,5 V
Gloeistroom	i_f	=	ca. 1,25 A
Verzadigingsstroom	i_s	=	ca. 900 mA
Anodespanning	v_a	=	250—450 V
Maximale anodedissipatie	w_a	=	25 W
Anodedissipatie beproefd op	w_{at}	=	35 W
Versterkingsfactor	g	=	ca. 3,8
Steilheid	S	=	ca. 2,1 mA/V
Inwendige weerstand	R_i	=	ca. 1800 Ω
Grootste diameter	d	=	58 mm
Grootste lengte	l	=	152 mm

PHILIPS

TUBE MODULATEUR

F 708



Le tube a été construit spécialement pour l'emploi comme modulateur dans le système de modulation par tension plaque dans un petit émetteur ou comme tube de sortie d'un faible amplificateur de puissance. Pour ces applications il peut parfaitement remplacer le tube émetteur Philips TB 04/10 qui n'est plus fabriqué actuellement.

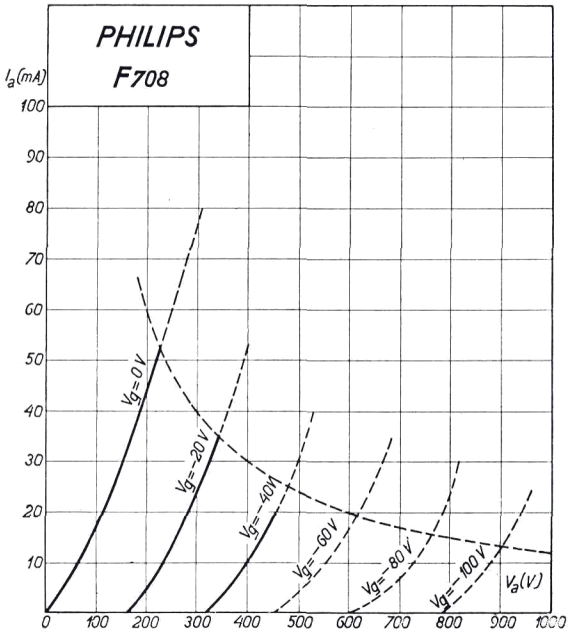
Comme dans les deux applications citées la dissipation anodique admissible de 12 W ne doit pas être dépassée, il faut que le courant anodique ne soit pas supérieur à 26 mA pour une tension anodique de 450 V, le filament étant chauffé en alternatif.

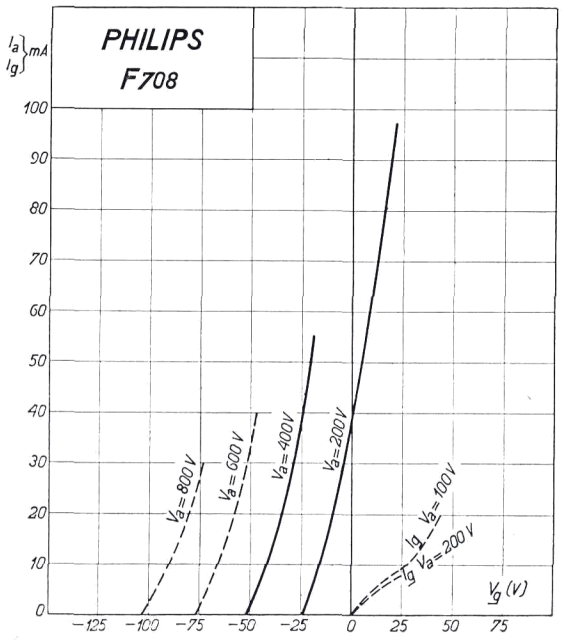
Dans un montage utilisant la modulation par tension plaque, deux tubes F 708 suffisent pour la modulation d'un tube émetteur Philips TC 04/10.

Les tubes redresseurs Philips 1805 ou 1561 sont recommandés pour fournir la tension anodique du F 708.

PHILIPS

TUBE MODULATEUR F 708





Tension de chauffage	V_f	= 7,5 V
Courant de chauffage	I_f	= 1,1 A env.
Courant de saturation	I_s	= 800 mA env.
Tension anodique	V_a	= 400—450 V
Dissipation anod. admissible..	W_a	= 12 W
Coefficient d'amplification ..	k	= 8 env.
Inclinaison pour V_a =		
400 V, I_a = 20 mA	S_{norm}	= 1,8 mA/V env.
Inclinaison maximum	S_{max}	= 3 mA/V env.
Résistance intérieure pour		
V_a = 400 V, I_a = 20 mA	R_i	= 4500 Ω env.
Diamètre maximum	d	= 55 mm
Longueur totale	l	= 140 mm

SINGLE ANODE E.H.T. RECTIFYING TUBE

Single anode E.H.T. rectifying tube intended for use in colour television receivers.
The GY501 has a chemically treated envelope to avoid flash-over under conditions of high humidity and low atmospheric pressure (45 cm Hg).

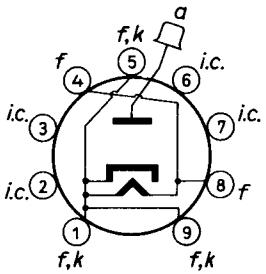
QUICK REFERENCE DATA			
D.C. output voltage	V_o	25	kV
Anode current	I_a	1.5	mA

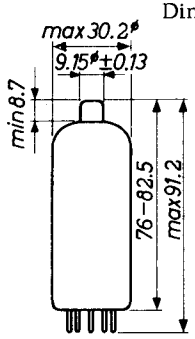
HEATING: Indirect by A.C. or D.C.; parallel supply

Heater voltage	V_f	3.15	V [1])
Heater current	I_f	400	mA

DIMENSIONS AND CONNECTIONS Dimensions in mm

Base: Magnoval





Pins 1, 5 and 9 may be used to connect an anti-corona ring.

Circuit elements having the same potential as the heater (e.g. a series resistor) may be connected to pins 3 and 7. These pins must never be earthed.

Precaution: X-ray shielding may be required to give protection against excessive radiation.

[1]) Under nominal operating conditions and with the longterm average value of I_a to be expected in practice, V_{fRMS} should be 3.15 V.
The heater voltage deviation resulting from spread or variation of operating conditions should be limited to the values indicated by the diagram in fig.A.

CAPACITANCES

Anode to cathode	C_{ak}		1.2	pF

OPERATING CHARACTERISTICS

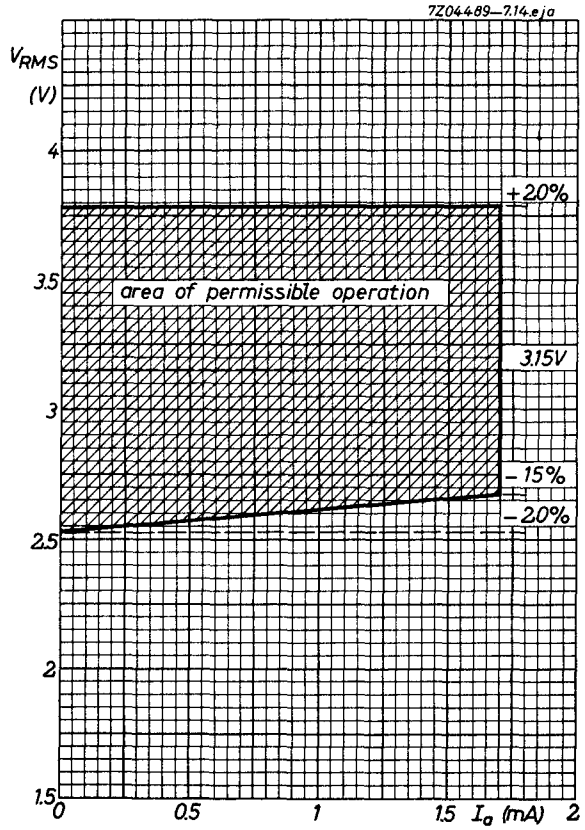
Output voltage	V_o		25	kV
Anode current	I_a		1.5	mA

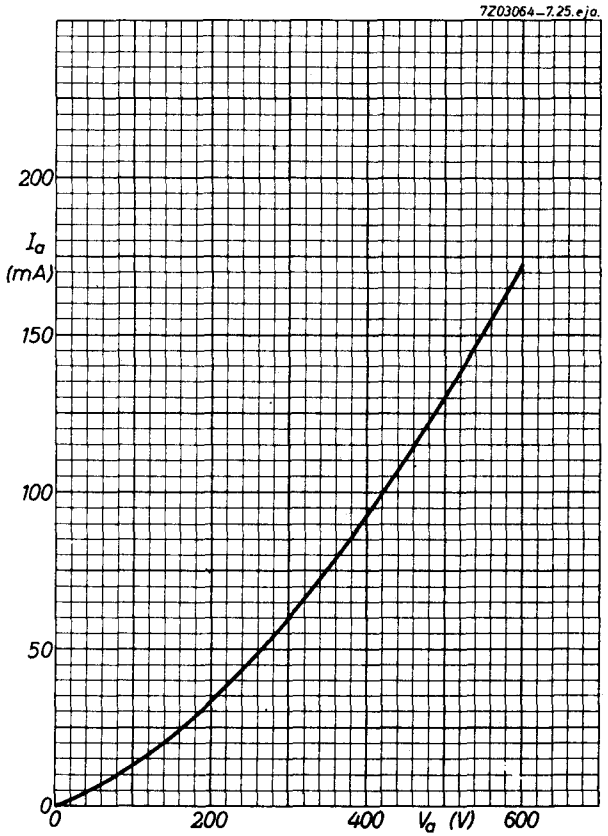
LIMITING VALUES (Design centre rating system)

Peak inverse voltage (absolute max.)	V_{ainv_p}	max.	35	kV [1]
Output voltage (absolute max.)	V_o	max.	27.5	kV
Output current, average	I_o	max.	1.7	mA
peak	I_{op}	max.	100	mA [2]

[1]) The negative peak due to ringing in the line output transformer should be taken into account.
Max. pulse duration 22% of a cycle and 18 μs.

[2]) Design max. rating system
Max. pulse duration 10% of a line scanning cycle with a max. of 10 μs.


7Z04489—7.14.eja
V_{RMS}
(V)
4
3.5
3
2.5
2
1.5
+20%
area of permissible operation
3.15V
−15%
−20%
0
0.5
1
1.5
I_a (mA)
2


7Z03064-7.25.ejo.
200
I_a
(mA)
150
100
50
0
0
200
400
V_a (V)
600

PHILIPS

Data handbook

Electronic components and materials

GY501

page	sheet	date
1	1	1969.12
2	2	1969.12
3	3	1969.12
4	4	1969.12
5	FP	1999.08.07

PHILIPS

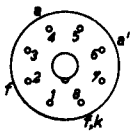
GZ 32

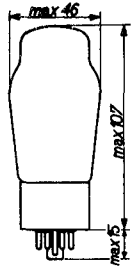
High vacuum FULL WAVE RECTIFIER
REDRESSEUR BIPLAQUE à vide poussé
Hochvakuum VOLLWEGGLEICHRICHTER

Heating:	indirect parallel supply		
Chauffage:	indirect alimentation en parallèle	Vf =	5,0 V 2,0 A
Heizung:	indirekt Parallelspeisung	If =	

Dimensions in mm
Dimensions en mm
Abmessungen in mm







Operating conditions and limiting values
Caractéristiques d'utilisation et limites
Betriebs- und Grenzdaten

A. **Condenser input of the filter**
Un condensateur à l'entrée du filtre
Kondensatoreingang des Filters

V_{tr} =	max. 2x300	max. 2x350	max. 2x500	V_{eff}
I_o =	max. 300	max. 250	max. 125	mA

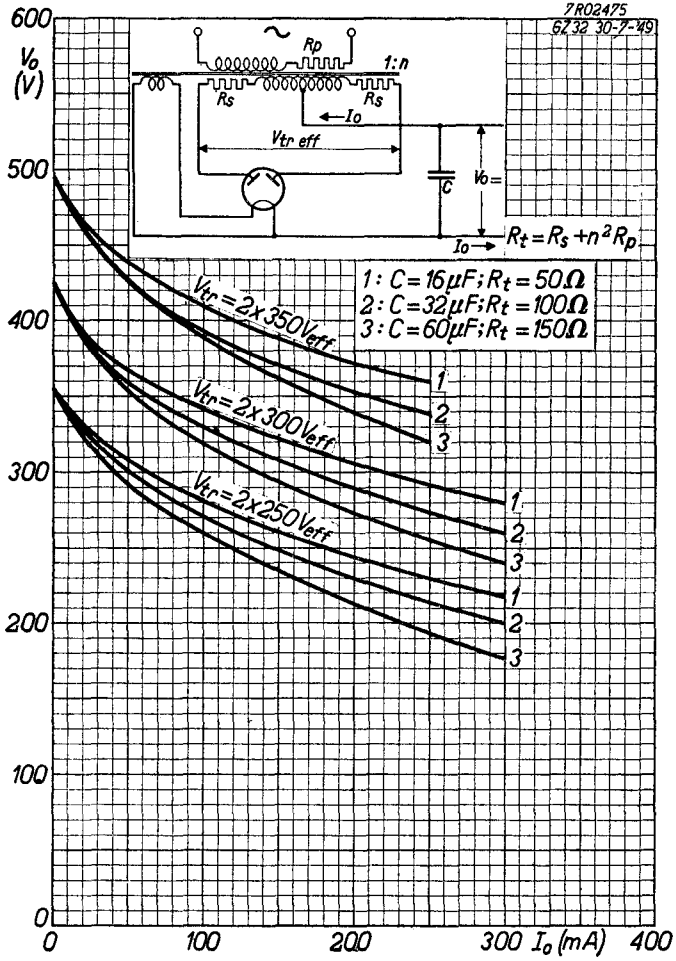
C (µF)	Rt (Ω)
60	min.150
32	min.100
16	min. 50

B. Choke input of the filter
Un self à l'entrée du filtre
Drosseleingang des Filters

V_{tr} =	max. 2x400	max. 2x500	V_{eff}
I_o =	max. 300	max. 250	mA

PHILIPS

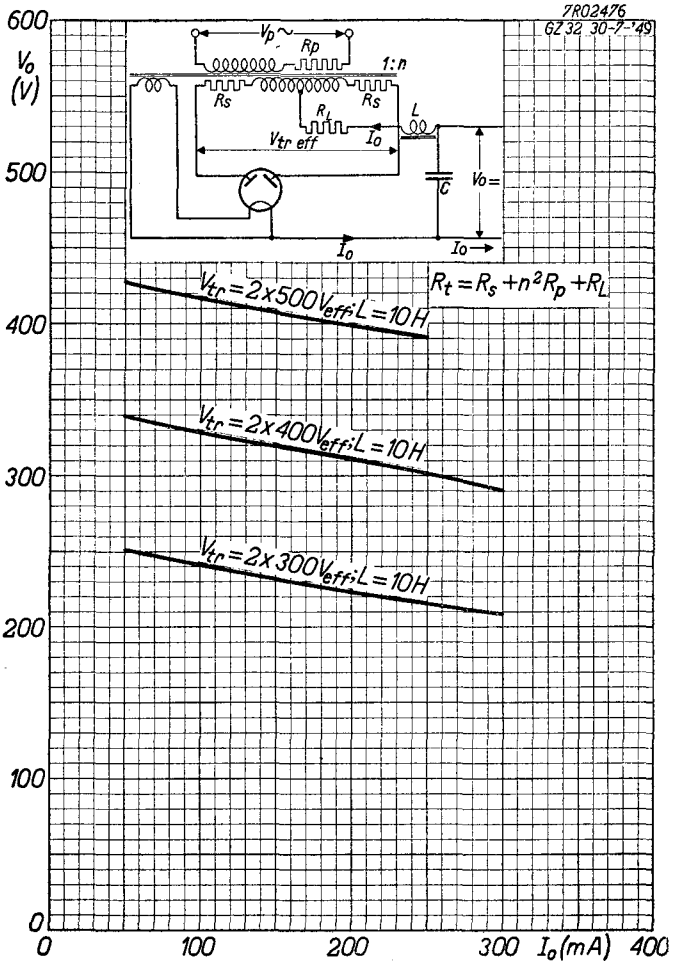
GZ32



9.9.1949

A

GZ32 PHILIPS



B

PHILIPS

Electronic Tube

HANDBOOK

GZ32

page	sheet	date
1	1	1949.10.10
2	A	1949.09.09
3	B	1949.09.09
4	FP	1999.06.05

DOUBLE ANODE RECTIFYING TUBE

Double anode high vacuum rectifying tube.

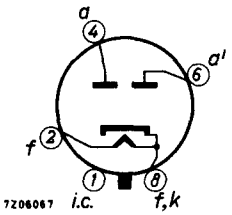
QUICK REFERENCE DATA			
Transformer voltage	V_{tr}	2x450	V_{RMS}
D.C. current	I_o	250	mA

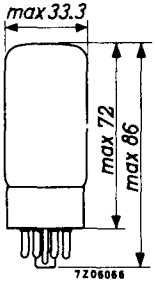
HEATING: Indirect by A.C.; parallel supply

Heater voltage	V_f	5	V
Heater current	I_f	1.9	A

DIMENSIONS AND CONNECTIONS Dimensions in mm

Base: Octal





OPERATING CHARACTERISTICS

As two-phase half-wave rectifier with capacitor input

Transformer voltage	V_{tr}	2x300	2x350	2x400	V_{RMS}
D.C. output voltage	V_o	330	380	430	V
D.C. current	I_o	250	250	250	mA
Protecting resistance	R_t	2x75	2x100	2x125	Ω
Input capacitor of smoothing filter	C_{filt}	60	60	60	μF
Transformer voltage	V_{tr}	2x450	2x500	2x550	V_{RMS}
D.C. output voltage	V_o	480	560	640	V
D.C. current	I_o	250	200	160	mA
Protecting resistance	R_t	2x150	2x175	2x200	Ω
Input capacitor of smoothing filter	C_{filt}	60	60	60	μF

As two-phase half-wave rectifier with choke input

Transformer voltage	V_{tr}	2x300	2x350	2x400	V_{RMS}
D.C. output voltage	V_o	250	290	330	V
D.C. current	I_o	250	250	250	mA
Protecting resistor	R_t	0	0	0	Ω
Choke	L	10	10	10	H
Transformer voltage	V_{tr}	2x450	2x500	2x550	V_{RMS}
D.C. output voltage	V_o	375	420	465	V
D.C. current	I_o	250	250	225	mA
Protecting resistor	R_t	0	0	0	Ω
Choke	L	10	10	10	H

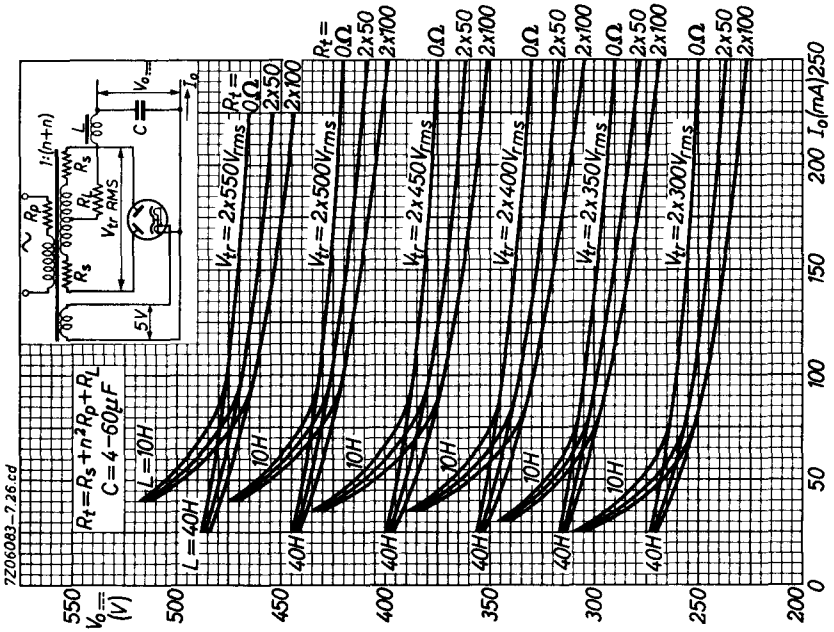
LIMITING VALUES (Design centre rating system)
See also page 4

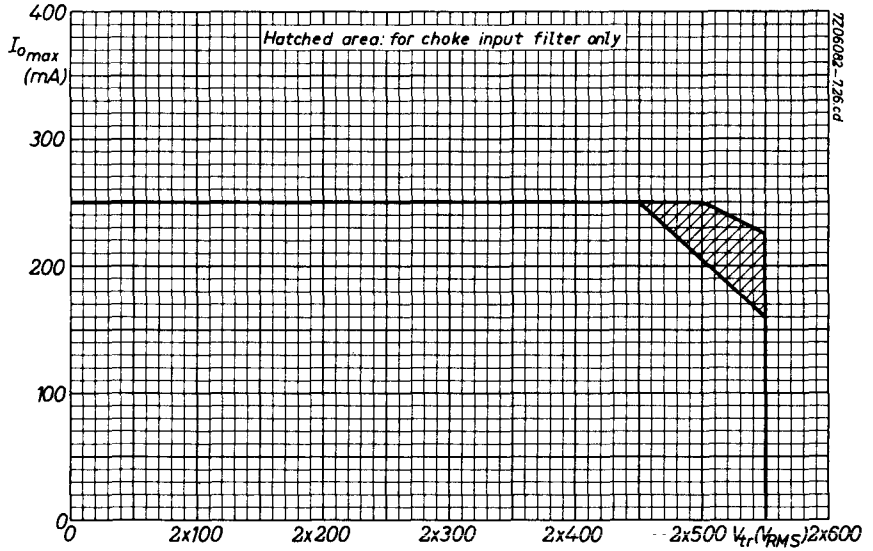
Capacitor input

Anode voltage, peak inverse	$V_{a\,inv_p}$	max. 1500 V						
D.C. current	I_o	max. See page 4						
Anode peak current	I_{a_p}	max. 750 mA						
Input capacitor of smoothing filter	C_{filt}	max. 60 μF						
Protecting resistance at transformer	$R_{t\,min.}$	2x50	2x75	2x100	2x125	2x150	2x175	Ω
voltage	V_{tr}	2x300	2x350	2x400	2x450	2x500	2x550	V_{RMS}

Choke input

Anode voltage, peak inverse	$V_{a\,inv_p}$	max. 1500 V
D.C. current	I_o	max. See page 4
Anode peak current	I_{a_p}	max. 750 mA


Rt = 0Ω 2x50 2x100
Vtr = 2x550Vrms
Vtr = 2x500Vrms
Vtr = 2x450Vrms
Vtr = 2x400Vrms
Vtr = 2x350Vrms
Vtr = 2x300Vrms
L = 10H
L = 40H
Rt = Rs + n²Rp + RL
C = 4 - 60µF
Vo⎓ (V)
Io (mA)
5V
Vtr RMS
1:(n+n)
Rp
Rs
RL
C
Vo⎓
Io
2ZO6083-726.cd


Hatched area: for choke input filter only
Io max (mA)
Vtr (VRMS)
2ZO6082-726.cd

PHILIPS

Data handbook

Electronic components and materials

GZ34

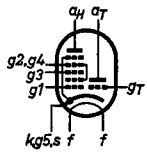
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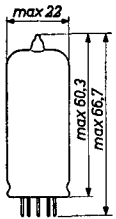
PHILIPS HCH 81

TRIODE-HEPTODE for use in A.M.,F.M. and AM/FM receivers
TRIODE-HEPTODE pour applications dans des récepteurs A.M., F.M. et AM/FM
TRIODE-HEPTODE zur Verwendung in AM-, FM- und AM/FM Empfängern

Heating : indirect; series or parallel supply — V_f = 12,6 V
Chauffage: indirect; alimentation série ou parallèle — I_f = 150 mA
Heizung : indirekt; Serien- oder Parallelspeisung

Dimensions in mm
Dimensions en mm
Abmessungen in mm





Base, culot, Sockel: NOVAL

Capacitances
Capacités
Kapazitäten

Triode section Partie triode Triodenteil		Heptode section Partie heptode Heptodenteil	
C_g = 2,6 pF	C_{g_1} = 4,8 pF	$C_{g_1 g_3}$ < 0,3 pF	
C_a = 2,1 pF	C_a = 7,9 pF	$C_{g_1 f}$ < 0,17 pF	
C_{ag} = 1,0 pF	C_{ag_1} < 0,006 pF	$C_{g_3 f}$ < 0,06 pF	←
C_{gf} < 0,02 pF	C_{g_3} = 6,0 pF		

Between triode and heptode sections
Entre les parties triode et heptode
Zwischen Trioden- und Heptodenteil

C_{aH-aT}	= 0.20 pF[1)]	$C_{g_1 H-gT}$	< 0,170 pF
C_{aH-gT}	< 0,090 pF	$C_{g_1 H-(gT+g_3)}$	< 0.450 pF
$C_{g_1 H-aT}$	< 0,060 pF	$C_{aH-(gT+g_3)}$	< 0,350 pF

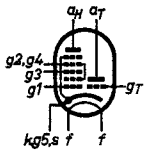
1) See page 6; voir page 6; siehe Seite 6

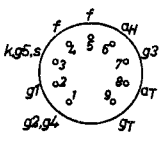
TRIODE-HEPTODE for use in A.M..F.M. and AM/FM receivers
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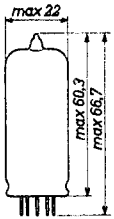
Heating : indirect; series or parallel supply
Chauffage: indirect; alimentation série ou parallèle
Heizung : indirekt; Serien- oder Parallelspeisung

V_f = 12,6 V
I_f = 150 mA

Dimensions in mm
Dimensions en mm
Abmessungen in mm







Base, culot, Sockel: NOVAL

Capacitances
Capacités
Kapazitäten

Triode section Partie triode Triodenteil		Heptode section Partie heptode Heptodenteil	
C_g = 2,6 pF	C_{g_1} = 4,8 pF	$C_{g_1 g_3}$ < 0,3 pF	
C_a = 2,1 pF	C_a = 7,9 pF	$C_{g_1 f}$ < 0,17 pF	
C_{ag} = 1,0 pF	C_{ag_1} < 0,006 pF	$C_{g_3 f}$ < 0,06 pF	
C_{gf} < 0,02 pF	C_{g_3} = 6,0 pF		

Between triode and heptode sections
Entre les parties triode et heptode
Zwischen Trioden- und Heptodenteil

C_{aH-aT}	= 0.20 pF[1)]	$C_{g_1 H-gT}$	< 0,170 pF
C_{aH-gT}	< 0,090 pF	$C_{g_1 H-(gT+g_3)}$	< 0,450 pF
$C_{g_1 H-aT}$	< 0,060 pF	$C_{aH-(gT+g_3)}$	< 0,350 pF

1) See page 6; voir page 6; siehe Seite 6

Operating characteristics of the heptode section for use as mixer
Caractéristiques d'utilisation de la partie heptode comme tube mélangeur
Betriebsdaten des Heptodenteiles als Mischröhre

$V_a = V_b$	=	200		V
$R_{(g_2+g_4)}$	=	10		kΩ
$R_{(gT+g_3)}$	=	47		kΩ
$I_{(gT+g_3)}$	=	230		µA
V_{g_1}	=	-2,3	-28	V
$V_{(g_2+g_4)}$	=	119	-	V
I_a	=	3,7	-	mA
$I_{(g_2+g_4)}$	=	8,1	-	mA
S_c	=	775	7,75	µA/V
R_i	=	1	>3	MΩ
R_{eq}	=	75	-	kΩ

$V_a = V_b$	=	170		100	V
$R_{(g_2+g_4)}$	=	10		10	kΩ
$R_{(gT+g_3)}$	=	47		47	kΩ
$I_{(gT+g_3)}$	=	200		115	µA
V_{g_1}	=	-2,0	-24	-1,1	-14,5 V
$V_{(g_2+g_4)}$	=	103	-	63	- V
I_a	=	3,2	-	1,7	- mA
$I_{(g_2+g_4)}$		6,7	-	3,7	- mA
S_c	=	750	7,5	620	6,2 µA/V
R_i	=	0,9	>3	0,8	>3 MΩ
R_{eq}	=	70	-	62	- kΩ

Operating characteristics of the heptode section for use as mixer
Caractéristiques d'utilisation de la partie heptode comme tube mélangeur
Betriebsdaten des Heptodenteiles als Mischröhre

$V_a = V_b$	=	200		V
$R(g_2+g_4)$	=	10		kΩ
$R(gT+g_3)$	=	47		kΩ
$I(gT+g_3)$	=	230		μA
V_{g_1}	=	-2,3	-28	V
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$I(g_2+g_4)$	=	8,1	-	mA
S_c	=	775	7,75	μA/V
R_1	=	1	>3	MΩ
R_{eq}	=	75	-	kΩ

$V_a = V_b$	=	170		100		V
$R(g_2+g_4)$	=	10		10		kΩ
$R(gT+g_3)$	=	47		47		kΩ
$I(gT+g_3)$	=	200		115		μA
V_{g_1}	=	-2,0	-24	-1,1	-14,5	V
$V(g_2+g_4)$	=	103	-	63	-	V
I_a	=	3,2	-	1,7	-	mA
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S_c	=	750	7,5	620	6,2	μA/V
R_1	=	0,9	>3	0,8	>3	MΩ
R_{eq}	=	70	-	62	-	kΩ

Operating characteristics of the heptode section as R.F. or I.F. amplifier
Caractéristiques d'utilisation de la partie heptode en amplificatrice H.F. ou M.F.
Betriebsdaten des Heptodenteiles als HF- oder ZF- Verstärker

$V_a = V_b$	=	200			V
V_{g_3}	=	0			V
$R_{(g_2+g_4)}$	=	18			kΩ
V_{g_1}	=	-2,3		-33	V
$V_{(g_2+g_4)}$	=	117		-	V
I_a	=	7,4		-	mA
$I_{(g_2+g_4)}$	=	4,6		-	mA
S	=	2,4		0,024	mA/V
R_i	=	0,5		>10	MΩ
$\mu_{g_2 g_1}$	=	20		-	
R_{eq}	=	9,7		-	kΩ
r_{g_1} [2]	=	2,1		-	kΩ

$V_a = V_b$	=	170		100		V
V_{g_3}	=	0		0		V
$R_{(g_2+g_4)}$	=	18		18		kΩ
V_{g_1}	=	-2,0	-28	-1,1	-16,5	V
$V_{(g_2+g_4)}$	=	102	-	60	-	V
I_a	=	6,25	-	3,4	-	mA
$I_{(g_2+g_4)}$	=	3,8	-	2,2	-	mA
S	=	2,3	0,023	2,0	0,020	mA/V
R_i	=	0,5	>10	0,45	>10	MΩ
$\mu_{g_2 g_1}$	=	20	-	20	-	
R_{eq}	=	8,8	-	5,8	-	kΩ
r_{g_1} [2]	=	2,0	-	1,4	-	kΩ

[2] Input resistance at 100 Mc/s
Résistance d'entrée à 100 Mc/s
Eingangswiderstand bei 100 MHz

Operating characteristics of the heptode section as R.F. or I.F. amplifier
Caractéristiques d'utilisation de la partie heptode en amplificatrice H.F. ou M.F.
Betriebsdaten des Heptodenteiles als HF- oder ZF- Verstärker

$V_a = V_b$	=	200		V
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$\mu_{g_2 g_1}$	=	20	-	
R_{eq}	=	9,7	-	kΩ
r_{g_1} [2]	=	2,1	-	kΩ

$V_a = V_b$	=	170		100		V
V_{g_3}	=	0		0		V
$R_{(g_2+g_4)}$	=	18		18		kΩ
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$V_{(g_2+g_4)}$	=	102	-	60	-	V
I_a	=	6,25	-	3,4	-	mA
$I_{(g_2+g_4)}$	=	3,8	-	2,2	-	mA
S	=	2,3	0,023	2,0	0,020	mA/V
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$\mu_{g_2 g_1}$	=	20	-	20	-	
R_{eq}	=	8,8	-	5,8	-	kΩ
r_{g_1} [2]	=	2,0	-	1,4	-	kΩ

[2] Input resistance at 100 Mc/s
Résistance d'entrée à 100 Mc/s
Eingangswiderstand bei 100 MHz

Typical characteristics of the triode section
Caractéristiques types de la partie triode
Kenndaten des Triodenteiles

V_a	=	100 V
V_g	=	0 V
I_a	=	13,5 mA
S	=	3,7 mA/V
μ	=	22

Operating characteristics of the triode section as oscillator
Caractéristiques d'utilisation de la partie triode en oscillatrice
Betriebsdaten des Triodenteiles als Oszillator

V_b	=	200	170	100 V
R_a	=	15	15	15 kΩ
$R_{(gT+g_3)}$	=	47	47	47 kΩ
$I_{(gT+g_3)}$	=	230	200	115 µA
I_a	=	5,4	4,5	2,5 mA
S_{eff}	=	0,65	0,65	0,58 mA/V

Operating characteristics for use as A.F. amplifier
Caractéristiques d'utilisation en amplificatrice B.F.
Betriebsdaten als NF- Verstärker

The heptode section of this tube can be used without special precautions against microphonic effect in circuits in which the input voltage V_i > 50 mV for an output of 50 mW of the output tube. For the triode section the corresponding value is 25 mV.

La partie heptode de ce tube peut être utilisée sans précautions spéciales contre l'effet microphonique dans des circuits dont la tension d'entrée V_i > 50 mV pour une puissance de 50 mW du tube de sortie. La valeur correspondante pour la partie triode est de 25 mV

Der Heptodenteil dieser Röhre darf ohne spezielle Massnahmen gegen Mikrophonie verwendet werden in Schaltungen die für eine Eingangsspannung V_i > 50 mV eine Leistung von 50 mW ergeben. Der entsprechende Wert für den Triodenteil ist 25 mV

Typical characteristics of the triode section
Caractéristiques types de la partie triode
Kenndaten des Triodenteiles

V_a	=	100	V
V_g	=	0	V
I_a	=	13,5	mA
S	=	3,7	mA/V
μ	=	22	

Operating characteristics of the triode section as oscillator
Caractéristiques d'utilisation de la partie triode en oscillatrice
Betriebsdaten des Triodenteiles als Oszillator

V_b	=	200	170	100	V
R_a	=	15	15	15	kΩ
$R_{(gT+g_3)}$	=	47	47	47	kΩ
$I_{(gT+g_3)}$	=	230	200	115	µA
I_a	=	5,4	4,5	2,5	mA
S_{eff}	=	0,65	0,65	0,58	mA/V

Operating characteristics for use as A.F. amplifier
Caractéristiques d'utilisation en amplificatrice B.F.
Betriebsdaten als NF- Verstärker

The heptode section of this tube can be used without special precautions against microphonic effect in circuits in which the input voltage V_i › 50 mV for an output of 50 mW of the output tube. For the triode section the corresponding value is 25 mV.

La partie heptode de ce tube peut être utilisée sans précautions spéciales contre l'effet microphonique dans des circuits dont la tension d'entrée V_i › 50 mV pour une puissance de 50 mW du tube de sortie. La valeur correspondante pour la partie triode est de 25 mV

Der Heptodenteil dieser Röhre darf ohne spezielle Massnahmen gegen Mikrophonie verwendet werden in Schaltungen die für eine Eingangsspannung V_i › 50 mV eine Leistung von 50 mW ergeben. Der entsprechende Wert für den Triodenteil ist 25 mV

Limiting values of the triode section
Caractéristiques limites de la partie triode
Grenzdaten des Triodenteiles

V_{ao}	=	max.	550 V
V_a	=	max.	250 V
W_a	=	max.	0,8 W
I_k	=	max.	6,5 mA
R_g	=	max.	3 MΩ
R_{kf}	=	max.	20 kΩ
V_{kf}	=	max.	100 V
$-V_g(I_g = +0,3\ \mu A)$	=	max.	1,3 V

Limiting values of the heptode section
Caractéristiques limites de la partie heptode
Grenzdaten des Heptodenteiles

V_{a_o}	=	max.	550 V
V_a	=	max.	250 V
W_a	=	max.	1,7 W
$V_{(g_2+g_4)_o}$	=	max.	550 V
$V_{(g_2+g_4)}$	=	max.	125 V
$V_{(g_2+g_4)}(I_a < 1\ mA)$	=	max.	250 V
$W_{(g_2+g_4)}$	=	max.	1 W
I_k	=	max.	12,5 mA
R_{g_1}	=	max.	3 MΩ
R_{g_3}	=	max.	3 MΩ [3]
R_{kf}	=	max.	20 kΩ
V_{kf}	=	max.	100 V
$-V_{g_1}(I_{g_1}=+0,3\ \mu A)$	=	max.	1,3 V
$-V_{g_3}(I_{g_3}=+0,3\ \mu A)$	=	max.	1,3 V

[3] See page 6; voir page 6; siehe Seite 6

Limiting values of the triode section
Caractéristiques limites de la partie triode
Grenzdaten des Triodenteiles

V_{ao}	= max.	550 V
V_a	= max.	250 V
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I_k	= max.	6,5 mA
R_g	= max.	3 MΩ
R_{kf}	= max.	20 kΩ
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$-V_g (I_g = +0,3\ \mu A)$	= max.	1,3 V

Limiting values of the heptode section
Caractéristiques limites de la partie heptode
Grenzdaten des Heptodenteiles

V_{a_o}	= max.	550 V
V_a	= max.	250 V
W_a	= max.	1,7 W
$V_{(g_2+g_4)_o}$	= max.	550 V
$V_{(g_2+g_4)}$	= max.	125 V
$V_{(g_2+g_4)} (I_a < 1\ mA)$	= max.	250 V
$W_{(g_2+g_4)}$	= max.	1 W
I_k	= max.	12,5 mA
R_{g_1}	= max.	3 MΩ
R_{g_3}	= max.	3 MΩ [3]
R_{kf}	= max.	20 kΩ
V_{kf}	= max.	100 V
$-V_{g_1} (I_{g_1} = +0,3\ \mu A)$	= max.	1,3 V
$-V_{g_3} (I_{g_3} = +0,3\ \mu A)$	= max.	1,3 V

[3]) See page 6; voir page 6; siehe Seite 6

For curves of this tube please refer to type UCH 81
Pour les courbes de ce tube voir le type UCH 81
Für die Kennlinien dieser Röhre siehe Type UCH 81

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[1] σ = 0.015 pF, which means
that for 68% of a great number of tubes
0.20 - 0.015 pF < CaH-aT < 0.20 + 0.015 pF
and for 94% of a great number of tubes
0.20 - 0.03 pF < CaH-aT < 0.20 + 0.03 pF

σ = 0,015 pF, cequi signifie que
0,20 - 0,015 pF < CaH-aT < 0,20 + 0,015 pF
pour 68% d'un grand nombre de tubes et
0,20 - 0,03 pF < CaH-aT < 0,20 + 0,03 pF
pour 94% d'un grand nombre de tubes

σ = 0,015 pF, das heisst
dass für 68% einer grossen Anzahl Röhren
0,20 - 0,015 pF < CaH-aT < 0,20 + 0,015 pF
und für 94% einer grossen Anzahl Röhren
0,20 - 0,03 pF < CaH-aT < 0,20 + 0,03 pF

[3] When in AM/FM receivers the connections to the tube are switched over during operation and g_3 and gT have not been connected by ohmic resistance, R_{g_3} = max. 20 kΩ

En cas que dans des appareils AM/FM les connexions au tube soient commutées pendant l'opération et g_3 n'ait pas été connecté à gT par l'intermédiaire d'une résistance ohmique, R_{g_3} = max. 20 kΩ

Wenn in AM/FM-Empfängern die Verbindungen zu der Röhre während des Betriebs umgeschaltet werden und g_3 nicht mittels eines ohmischen Widerstandes mit gT verbunden ist, ist R_{g_3} = max. 20 kΩ

For curves of this tube please refer to type UCH 81
Pour les courbes de ce tube voir le type UCH 81
Für die Kennlinien dieser Röhre siehe Type UCH 81

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[1] σ = 0.015 pF, which means
that for 68% of a great number of tubes
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σ = 0,015 pF, cequi signifie que
0,20 - 0,015 pF < CaH-aT < 0,20 + 0,015 pF
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σ = 0,015 pF, das heisst
dass für 68% einer grossen Anzahl Röhren
0,20 - 0,015 pF < CaH-aT < 0,20 + 0,015 pF
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PHILIPS

Electronic Tube

HANDBOOK

HCH81

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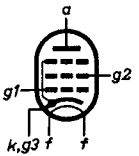
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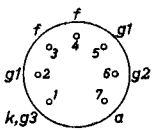
OUTPUT PENTODE for use in receivers for low mains voltages
PENTHODE DE SORTIE pour l'utilisation dans des récepteurs pour tension de secteur basse
ENDPENTODE zur Verwendung in Empfangsgeräten für niedrige Netzspannung

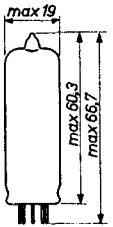
Heating : indirect by A.C. or D.C. series supply
Chauffage: indirect par C.A. ou C.C. alimentation série
Heizung : indirekt durch Wechsel- oder Gleichstrom; Serien-speisung

V_f = 30 V
I_f = 150 mA

Dimensions in mm
Dimensions en mm
Abmessungen in mm







Base, culot, Sockel: MINIATURE

Capacitances Capacités Kapazitäten	C_a	= 5.8 pF
	C_{g_1}	= 12 pF
	C_{ag_1}	= 0,3 pF
	$C_{g_1 f}$	= 0,4 pF
Typical characteristics Caractéristiques types Kenndaten	V_a	= 100 V
	V_{g_2}	= 100 V
	V_{g_1}	= -6,7 V
	I_a	= 43 mA
	I_{g_2}	= 3 mA
	S	= 9,2 mA/V
	μ	= 7,8
	R_1	= 22 kΩ

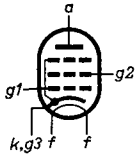
PHILIPS HL 94

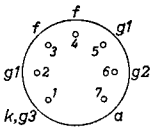
OUTPUT PENTODE for use in receivers for low mains voltages
PENTHODE DE SORTIE pour l'utilisation dans des récepteurs pour tension de secteur basse
ENDPENTODE zur Verwendung in Empfangsgeräten für niedrige Netzspannung

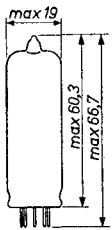
Heating : indirect by A.C. or D.C. series supply
Chauffage: indirect par C.A. ou C.C. alimentation série
Heizung : indirekt durch Wechsel- oder Gleichstrom; Serien-speisung

V_f = 30 V
I_f = 150 mA

Dimensions in mm
Dimensions en mm
Abmessungen in mm







Base, culot, Sockel: MINIATURE

Capacitances
Capacités
Kapazitäten

C_a	=	5.8 pF
C_{g_1}	=	12 pF
C_{ag_1}	=	0,3 pF
$C_{g_1 f}$	=	0,4 pF

Typical characteristics
Caractéristiques types
Kenndaten

V_a	=	100 V
V_{g2}	=	100 V
V_{g_1}	=	-6,7 V
I_a	=	43 mA
I_{g2}	=	3 mA
S	=	9,2 mA/V
μ_{g2g1}	=	7,8
R_i	=	22 kΩ

Operating characteristics
Caractéristiques d'utilisation
Betriebsdaten

V_a	=		100		V
V_{g2}	=		100		V
V_{g1}	=		-6,7		V
$R_{a\sim}$	=		2,4		kΩ
V_i	=	0	0,55	4,3	Veff
I_a	=	43	-	43,0	mA
I_{g2}	=	3	-	11	mA
W_o	=	-	0,05	1,9	W
d_t	=	-	-	10	%

Limiting values
Caractéristiques limites
Grenzdaten

V_{a_o}	= max.	550	V
V_a	= max.	150	V
W_a	= max.	7,5	W
V_{g2_o}	= max.	550	V
V_{g2}	= max.	150	V
W_{g2}	= max.	1,5	W
W_{g2_p}	= max.	2,5	W
I_k	= max.	100	mA
Vkf	= max.	150	V
R_{g_1}	= max.	1	MΩ [1]

[1] With automatic bias
Avec polarisation automatique
Mit automatischer Gittervorspannung

Operating characteristics
Caractéristiques d'utilisation
Betriebsdaten

V_a	=		100		V
V_{g2}	=		100		V
V_{g1}	=		-6,7		V
$R_{a\sim}$	=		2,4		kΩ
V_i	=	0	0,55	4,3	Veff
I_a	=	43	-	43,0	mA
I_{g2}	=	3	-	11	mA
W_o	=	-	0,05	1,9	W
d_t	=	-	-	10	%

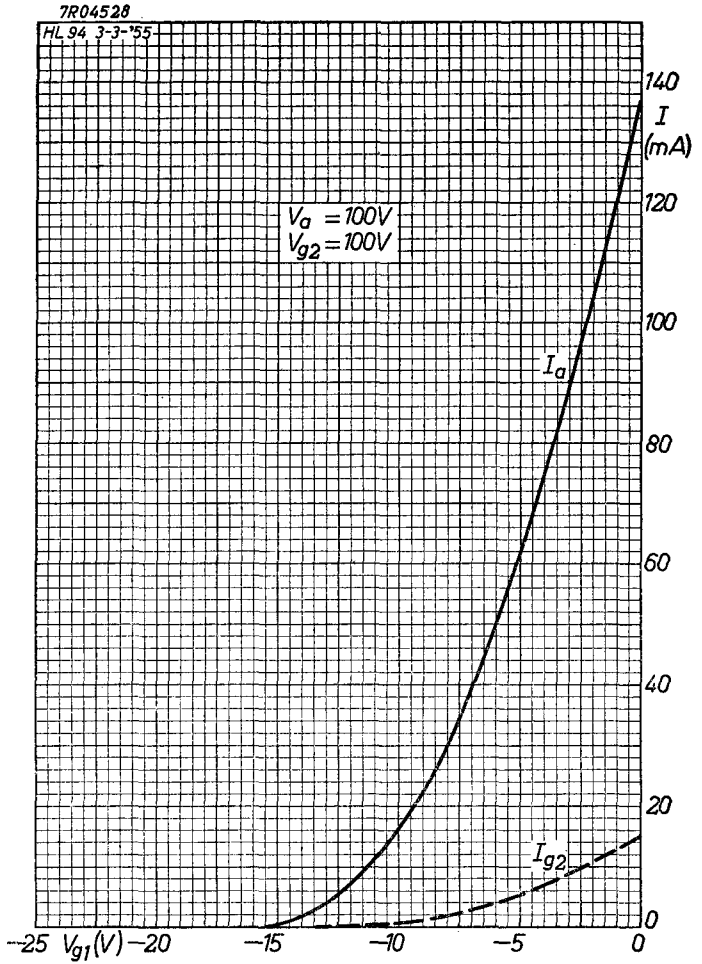
Limiting values
Caractéristiques limites
Grenzdaten

V_{a_o}	= max.	550	V
V_a	= max.	150	V
W_a	= max.	7,5	W
$V_{g2\,o}$	= max.	550	V
V_{g2}	= max.	150	V
W_{g2}	= max.	1,5	W
$W_{g2\,p}$	= max.	2,5	W
I_k	= max.	100	mA
V_{kf}	= max.	150	V
R_{g_i}	= max.	1	MΩ [1]

[1] With automatic bias
Avec polarisation automatique
Mit automatischer Gittervorspannung

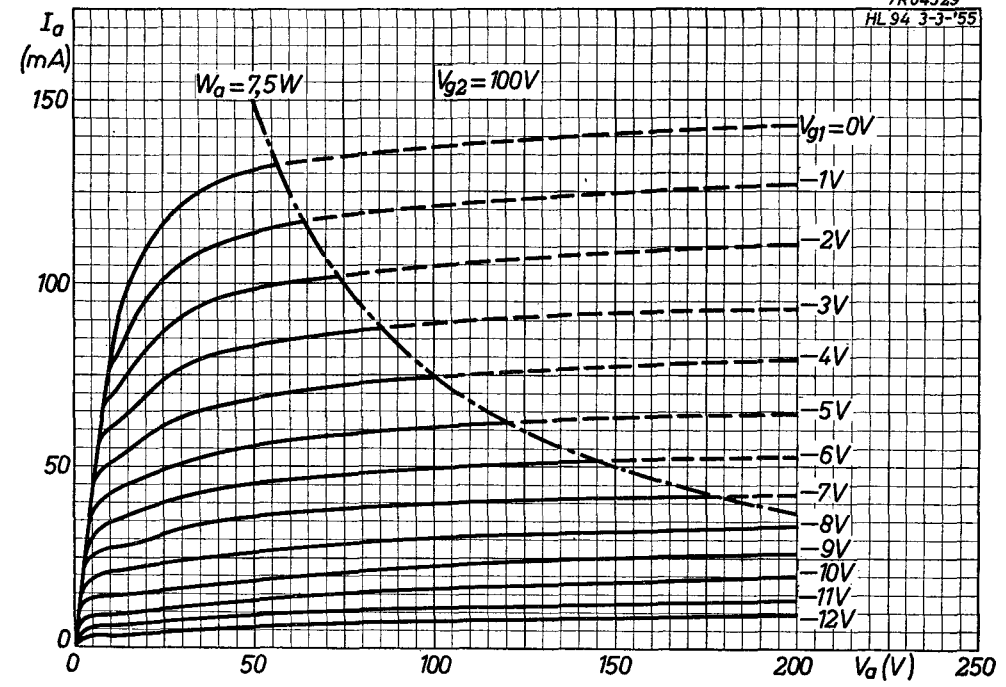
PHILIPS

HL 94



4.4.1955

A



HL 94

PHILIPS

B

PHILIPS

HL 94

4.4.1955

C

PHILIPS

Electronic Tube

HANDBOOK

HL94

page	sheet	date
1	1	1956.04.04
2	1	1957.09.09
3	2	1956.04.04
4	2	1957.09.09
5	A	1955.04.04
6	B	1955.04.04
7	C	1955.04.04
8	FP	1999.07.16

VACUUM GAUGE HEAD , BAYARD-ALPERT TYPE

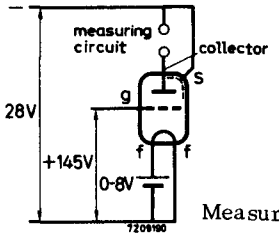
Glass envelope, ultra-high vacuum gauge head of the Bayard-Alpert type. Measuring range 10^{-3} torr to 10^{-10} torr; sensitivity approx. 12 per torr.

The gauge head is provided with an electrically conductive layer deposited on the inside of the glass envelope. By applying a fixed potential to the layer, excess primary electrons are attracted directly to the envelope rather than oscillating around the collector thereby leading to very stable measurements of low pressure.
Moreover the gauge head features a low thermal inertia and a low filament power consumption.

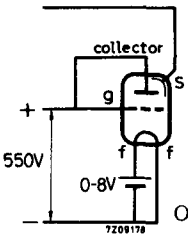
CHARACTERISTICS

Pressure range	10^{-3} to 10^{-10}	torr
Sensitivity (for nitrogen)	approx. 12 per	torr
Emission current range	1 μA to 75	mA
Filament characteristics	see page 3	
Insulation resistance		
Collector to other electrodes	min. 10^{14}	Ω
Grid to other electrodes	min. 10^{12}	Ω

TYPICAL OPERATING CONDITIONS



Measurement



Outgassing

Emission current (see also page 3)

measurement	100 μA, 1 mA or 10	mA
outgassing	75	mA

LIMITING VALUES

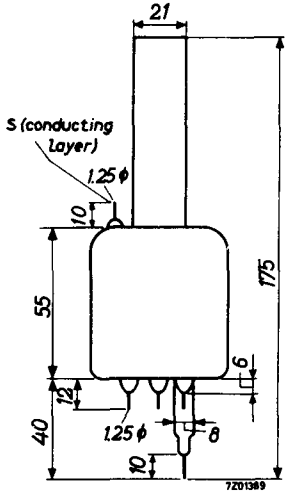
Pressure (filament litt)	max.	10^{-3}	torr
Filament voltage	max.	8	V
Emission current	max.	75	mA
Grid input power	max.	40	W
Bulb temperature during operation	max.	100	°C
Bake-out temperature	max.	450	°C

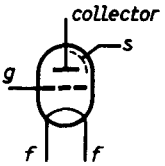
MECHANICAL DATA

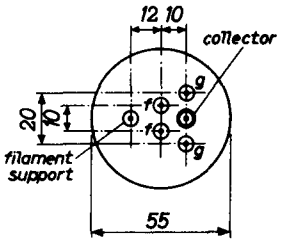
Dimensions in mm

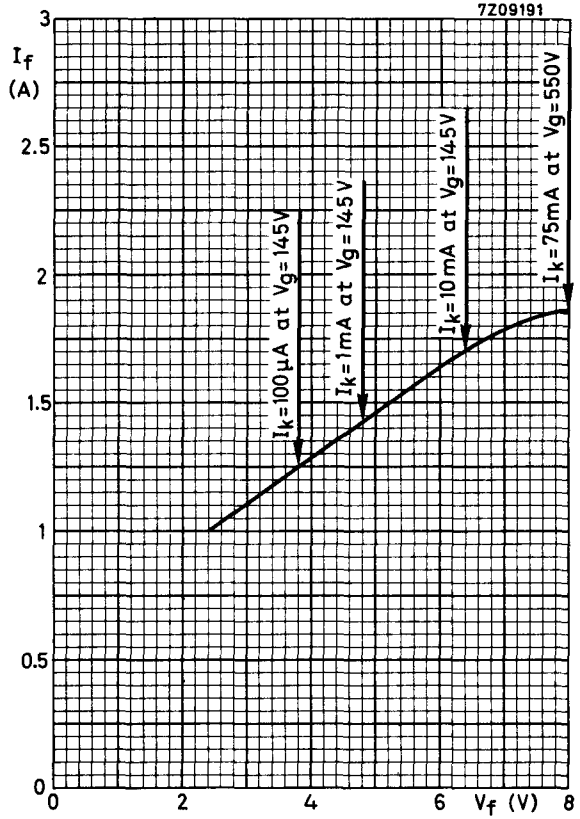
Material tubulation G28 glass

Filament Tungsten








7Z09191
I_f (A)
3
2.5
2
1.5
1
0.5
0
0
2
4
6
V_f (V)
8
I_k=100µA at Vg=145V
I_k=1mA at Vg=145V
I_k=10mA at Vg=145V
I_k=75mA at Vg=550V

PHILIPS

Data handbook

Electronic components and materials

IOG12

page	sheet	date
1	1	1969.01
2	2	1970.01
3	3	1969.01
4	FP	2001.05.17

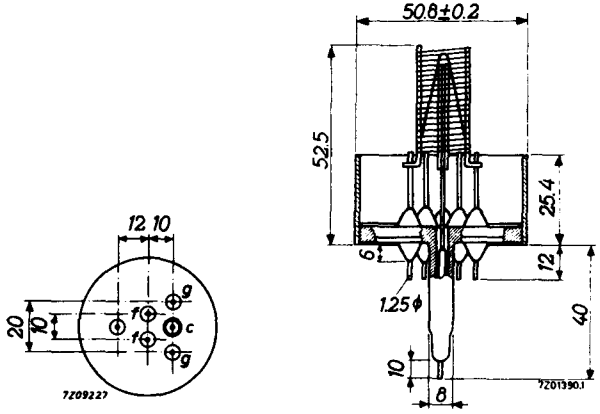
VACUUM GAUGE HEAD, BAYARD-ALPERT TYPE

Nude, ultra-high vacuum gauge head of the Bayard-Alpert type.
Measuring range 10^{-3} torr to 10^{-10} torr; sensitivity approx. 12 per torr.
Type IOG-13T has a fernico skirt, prepared for easy welding.
The gauge head features a low thermal inertia and a low filament power consumption.

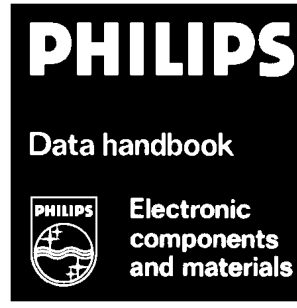
FOR THE ELECTRICAL DATA SEE TYPE IOG-12

MECHANICAL DATA Dimensions in mm

Material	
Filament	Tungsten
Skirt	Fernico



Mounting position: any



IOG13T

page	sheet	date
1	1	1970.01
2	FP	2001.05.17

VACUUM GAUGE HEAD , BAYARD-ALPERT TYPE

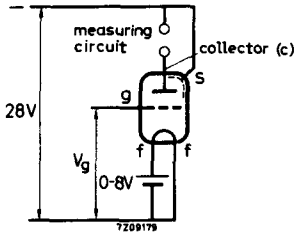
Glass envelope, ultra-high vacuum gauge head of the Bayard-Alpert type. Measuring range 10^{-3} torr to 10^{-10} torr; sensitivity approx. 12 per torr.

The gauge head is provided with two filaments, one of tungsten and one of lanthanum hexaboride.

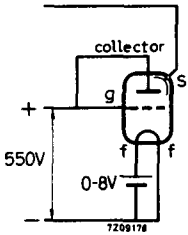
CHARACTERISTICS

Pressure range	10^{-3} to 10^{-10}		torr
Sensitivity (for nitrogen)	approx.	12	per torr
Emission current range	1 μA to 75		mA
Filament characteristics	see page 3		
Insulation resistance			
collector to other electrodes	min.	10^{14}	Ω
grid to other electrodes	min.	10^{12}	Ω

TYPICAL OPERATING CONDITIONS



Measurement



Outgassing

Grid voltage, in combination with fil. 1	V_g	+145	V
in combination with fil. 2		+178	V
Emission current (see also page 3)			
measurement	100 μA, 1 mA or 10		mA
outgassing		75	mA

LIMITING VALUES

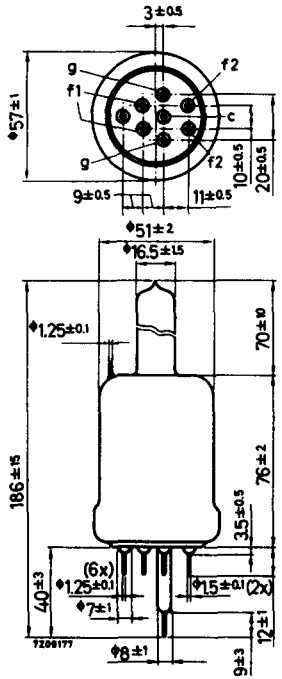
Pressure (filament litt)	max.	10^{-3}	torr
Filament voltage	max.	8	V
Emisssion current	max.	75	mA
Grid input power	max.	40	W
Bulb temperature during operation	max.	100	°C
Bake-out temperature	max.	450	°C

MECHANICAL DATA

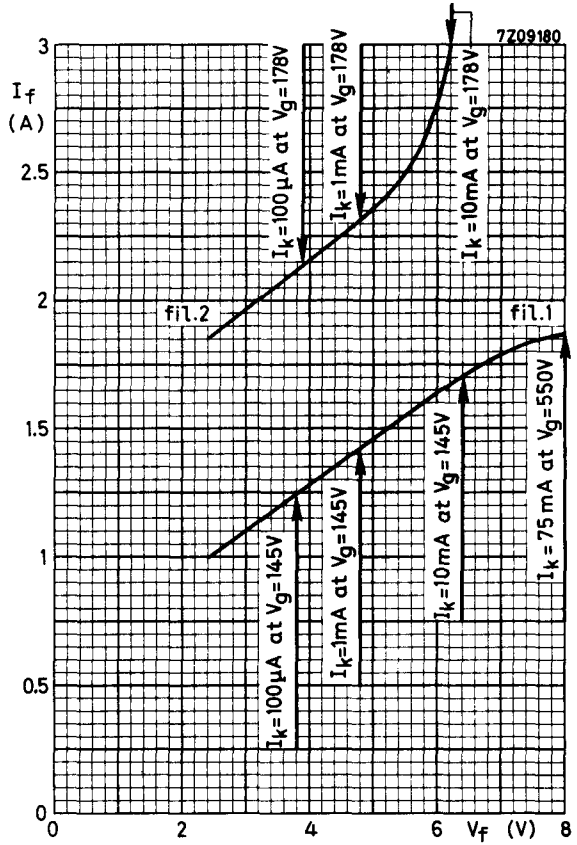
Dimensions in mm

Material

Tubulation	W1 glass
Filament 1	Tungsten
Filament 2	Lanthanum hexaboride (La Br 6)



Mounting position: any


7Z09180
I_f (A)
3
2.5
2
1.5
1
0.5
0
0
2
4
6
8
V_f (V)
fil.2
fil.1
I_k=100 µA at V_g=178V
I_k=1mA at V_g=178V
I_k=10mA at V_g=178V
I_k=100µA at V_g=145V
I_k=1mA at V_g=145V
I_k=10mA at V_g=145V
I_k= 75 mA at V_g=550V

PHILIPS

Data handbook

Electronic components and materials

IOG17

page	sheet	date
1	1	1968.03
2	2	1968.03
3	3	1968.03
4	FP	2001.05.17

VACUUM GAUGE HEAD, BAYARD-ALPERT TYPE

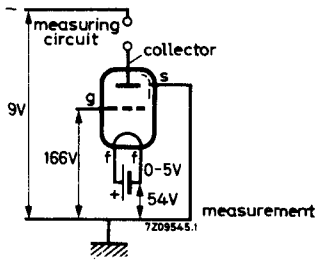
Ultra-high vacuum gauge head of the Bayard-Alpert type. Measuring range 10^{-3} torr to 4 x 10^{-11} torr; sensitivity approx. 12 per torr.
Type IOG-18 has a glass envelope.
Type IOG-18N has a fernico skirt, prepared for easy welding.

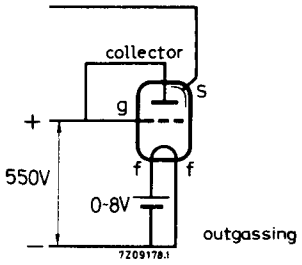
The heads with a glass envelope are provided with an electrically conductive layer on the inside of the envelope. By applying a fixed potential to the layer, excess primary electrons are attracted directly to the envelope rather than oscillating around the collector thereby leading to very stable measurements of low pressure.
Moreover the gauge head features a low thermal inertia and a low filament power consumption.

CHARACTERISTICS

Pressure range	10^{-3} to 4×10^{-11}	torr
Sensitivity (for nitrogen)	approx. 12	per torr
Emission current range, type IOG-18	1 μA to 50	mA
type IOG-18N	1 μA to 30	mA
Filament characteristics	see page 4	
Insulation resistance		
Collector to other electrodes	min. 10^{14}	Ω
Grid to other electrodes	min. 10^{12}	Ω

TYPICAL OPERATING CONDITIONS





Emission current (see also page 4)		
measurement	100 μA, 1 mA or 10	mA
outgassing, type IOG-18	50	mA
type IOG-18N	30	mA

LIMITING VALUES

Pressure (filament litt)	max.	10^{-3}	torr
Filament voltage	max.	8	V
Emission current	max.	50	mA
Grid input power, type IOG-18	max.	30	W
type IOG-18N	max.	20	W
Bulb temperature during operation	max.	100	°C
Bake-out temperature	max.	450	°C

MECHANICAL DATA

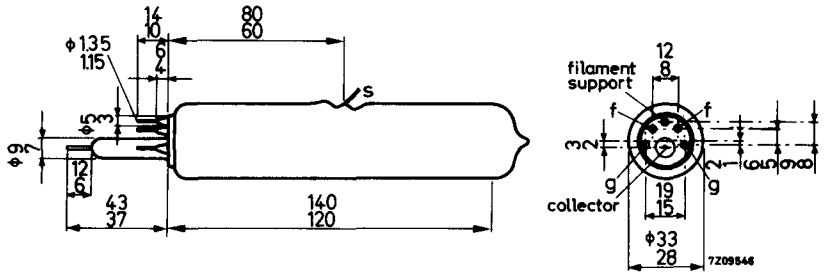
Dimensions in mm

Material

Filament	Tungsten
Tubulation (with type IOG-18)	Kodial
Skirt (with type IOG-18N)	Fernico

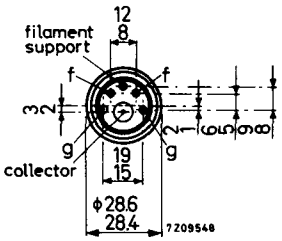
Mounting position: any

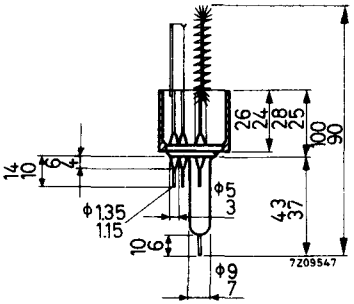
IOG-18

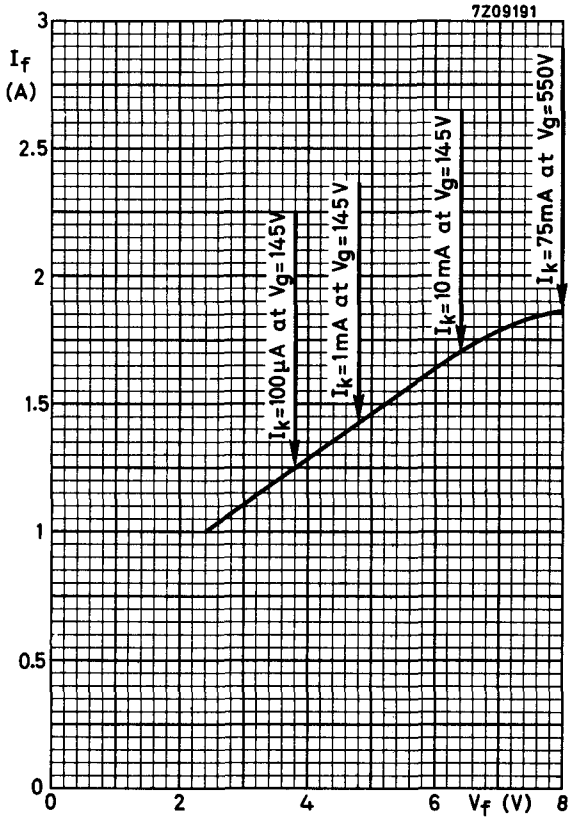


MECHANICAL DATA (continued)

IOG-18N






7Z09191
I_f (A)
3
2.5
2
1.5
1
0.5
0
0
2
4
6
8
V_f (V)
I_k=100µA at V_g=145V
I_k=1mA at V_g=145V
I_k=10mA at V_g=145V
I_k=75mA at V_g=550V

PHILIPS

Data handbook

Electronic components and materials

IOG18 IOG18N

page	sheet	date
1	1	1970.01
2	2	1970.01
3	3	1970.01
4	4	1970.01
	FP	2001.05.17

VACUUM GAUGE HEAD, BAYARD-ALPERT TYPE

Ultra-high vacuum gauge head of the Bayard-Alpert type. Measuring range 10^{-3} torr to 4 x 10^{-11} torr; sensitivity approx. 12 per torr.

Type IOG-19N has a fernico skirt, prepared for easy welding.
The gauge head features a low thermal inertia and a low filament power consumption.

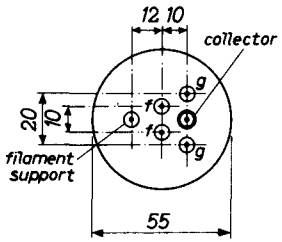
FOR THE ELECTRICAL DATA SEE TYPE IOG-18

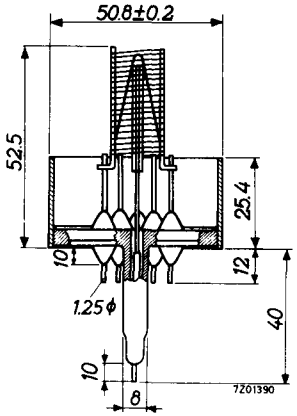
MECHANICAL DATA

Material

Filament	Tungsten
Skirt	Fernico

Mounting position: any





PHILIPS

Data handbook

Electronic components and materials

IOG19N

page	sheet	date
1	1	1970.01
2	FP	2001.05.17

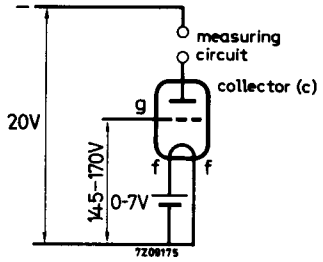
VACUUM GAUGE HEAD, TRIODE TYPE

Glass envelope, high vacuum gauge head of the triode type (hot-cathode, ionization type). Measuring range 10^{-3} to 5 x 10^{-8} torr, sensitivity 20 per torr.

CHARACTERISTICS

Pressure range	10^{-3} to 5 x 10^{-8}	torr
Sensitivity (for dry air)	20 per torr	

TYPICAL OPERATING CONDITIONS



Grid current

above 10^{-4} torr	5	mA
below 10^{-4} torr	10	mA

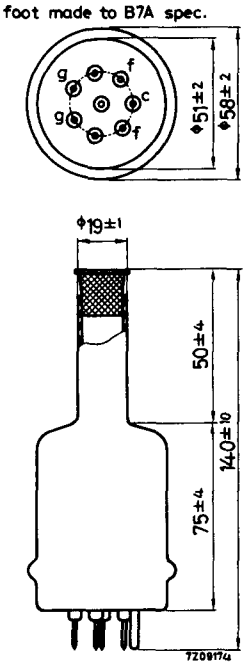
LIMITING VALUES

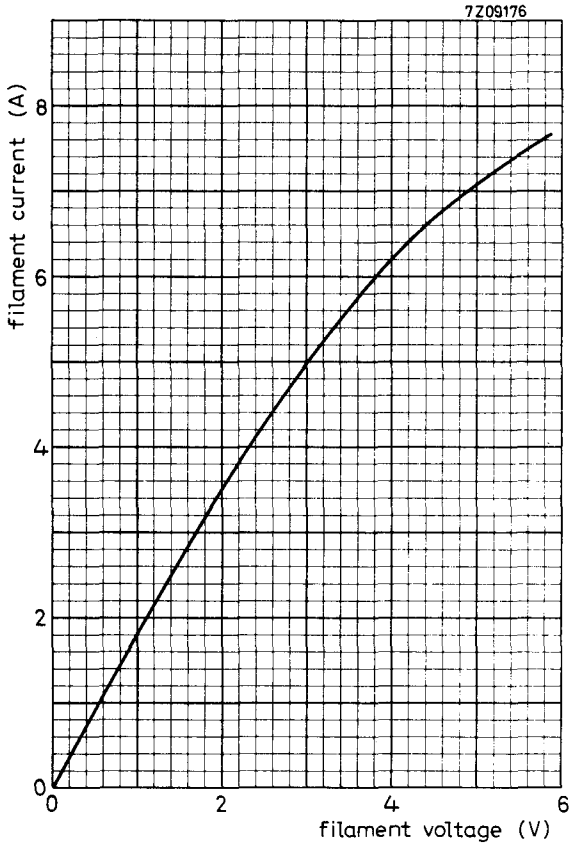
Pressure (filament litted)	max.	5 x 10^{-3}	torr
Filament voltage	max.	10	V
Bake-out temperature	max.	450	°C

MECHANICAL DATA

Dimensions in mm

Material: W1 glass




7Z09176
filament current (A)
0
2
4
6
8
0
2
4
6
filament voltage (V)

PHILIPS

Data handbook

Electronic components and materials

IOG71

page	sheet	date
1	1	1970.01
2	2	1968.03
3	3	1968.03
4	FP	2001.05.17

Forced-air cooled packaged MAGNETRON for pulsed service at a fixed frequency within the range 9345-9405 Mc/s, capable of delivering a peak output power W_{op} > 15 kW(T_{imp} = 0.1µsec)
MAGNETRON refroidi par air forcé, avec aimant incorporé, pour service d'impulsions à une fréquence fixe dans la gamme 9345-9405 MHz, capable de fournir une puissance de sortie de crête W_{op} > 15 kW à T_{imp} = 0,1 µsec
Druckluftgekühltes MAGNETRON für Impulsbetrieb auf einer festen Frequenz im Bereich 9345-9405 MHz, mit einer Impulsspitzenleistung W_{op} > 15 kW bei T_{imp} = 0,1 µSek. Magnetron und Magnet bilden eine Baueinheit

Heating : indirect Chauffage: indirect Heizung : indirekt	V_{fo}		=	6,3 V ±5%
	I_f	(V_{fo} = 6,3 V)	=	600 mA
	T_w	(t_{amb} < 0 °C)	= min.	3 min
	T_w	(t_{amb} > 0 °C)	= min.	2 min

Limiting values
Caractéristiques limites
Grenzdaten [1])

T_{imp}	= max.	2,5	µsec
δ	= max.	0,001	
I_{ap}	= max.	7,0	A
I_{ap}	= min.	5,0	A
I_a	= max.	7,0	mA
W_{ip}	= max.	56	kW
W_i	= max.	56	W
$\frac{\Delta V}{\Delta T_{rv}}$	= max.	100	kV/µsec
V.S.W.R.	= max.	1,5	
t_a	= max.	120	°C

[1]) Each limiting value should be regarded independently of other values, so that under no circumstances it is permitted to exceed a limiting value whichsoever

Chaque valeur limite doit être considérée indépendamment des autres valeurs, de sorte qu'en aucun cas il est permis de dépasser une valeur limite quelconque

Jeder Grenzwert gilt unabhängig von anderen Werten, so dass er unter keinen Umständen überschritten werden darf

Typical characteristics
Caractéristiques types
Kenndaten

V_{ap} (I_{ap} = 6,5 A)	= max.	8,0	kV
V_{ap} (I_{ap} = 6,5 A)	= min.	6,5	kV
A[2])	=	16,5 - 22	mm
Δfp (V.S.W.R.=1,5)	= max.	18	Mc/s

Operating characteristics
Caractéristiques d'utilisation
Betriebsdaten

V_f	= 6,3	4,5[3])	V
T_{imp}	= 0,1	2,0	µsec
f_{imp}	= 2000	500	c/s
I_{ap}	= 6,5	6,5	A
I_a	= 1,3	6,5	mA
W_o	= 3,9	19,5	W
W_{op}	= 19,5	19,5	kW
Δfp (V.S.W.R.= 1,5)	= 15	15	Mc/s

Magnetron output: Designed for coupling to standard rectangular waveguide RG-52/U. For drawing of this waveguide see front of this section

Sortie de magnétron Prévue pour un couplage avec le guide d'ondes rectangulaire standard RG-52/U. Pour le croquis de ce guide d'ondes voir en tête de ce chapitre

Magnetron-Ausgang Passend für Kupplung mit Standard Hohlleiter RG-52/U mit rechteckigem Querschnitt. Für die Massskizze dieses Hohlleiters siehe am Anfang dieses Abschnitts

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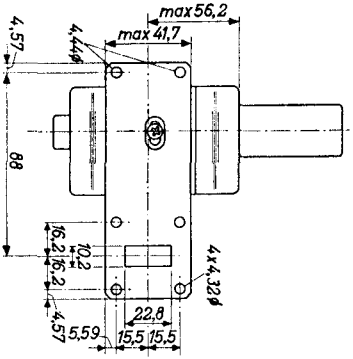
[2])Distance of voltage standing wave minimum from mounting plate inwards

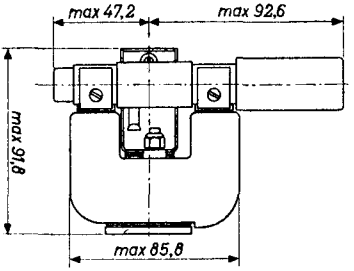
Distance entre le minimum de l'onde stationnaire de la tension (dans le guide d'ondes du magnétron) et la plaque de montage

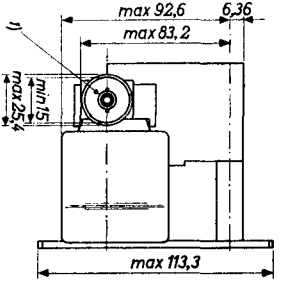
Entfernung zwischen dem Stehwellenminimum der Spannung (innerhalb des Hohlleiters des Magnetrons) und der Montierungsplatte

[3])The heater voltage must be reduced from 6.3 V to 4.5 V immediately after applying the anode voltage
Il est nécessaire de réduire la tension de chauffage de 6,3 V à 4,5 V immédiatement après application de la tension anodique
Es ist erforderlich die Heizspannung sofort nach Anlegen der Anodenspannung von 6,3 V auf 4,5 V zu reduzieren

Dimensions in mm; Dimensions en mm; Abmessungen in mm







1) See page 4; voir page 4; siehe Seite 4

Mounting position: any
Montage : à volonté
Einbau : beliebig

Net weight
Poids net 1700 g
Nettogewicht

Shipping weight
Poids brut 3100 g
Bruttogewicht

[1])Miniature bayonet cap, 9.16 mm diameter
The common heater-cathode terminal is the sleeve of the bayonet cap, the other heater terminal is the centre contact

Culot à baïonnette miniature, 9,16 mm diamètre
La borne commune filament-cathode est la douille du culot à baïonnette, l'autre borne du filament est le contact central

Miniatur-Bajonetthülse, 9,16 mm Durchmesser
Der gemeinsame Heizfaden-Katodenanschluss liegt an der Bajonetthülse, der zweite Fadenanschluss am Mittelkontakt.

PHILIPS

Electronic Tube

HANDBOOK

JP9-15

page	sheet	date
1	1	1957.05.05
2	2	1957.05.05
3	3	1957.05.05
4	4	1957.05.05
5	FP	1999.08.29

PHILIPS JP9-7A

Forced-air cooled packaged MAGNETRON for pulsed service at a fixed frequency within the range 9210-9270 Mc/s , capable of delivering a peak output power W_{op} › 7 kW

MAGNETRON refroidi par air forcé, avec aimant incorporé, pour service d'impulsions à une fréquence fixe dans la gamme 9210-9270 MHz, capable de fournir une puissance de sortie de crête W_{op} › 7 kW

Druckluftgekühltes MAGNETRON für Impulsbetrieb auf einer festen Frequenz im Bereich 9210-9270 MHz, mit einer Impulsspitzenleistung W_{op} › 7 kW. Magnetron und Magnet bilden eine Baueinheit

Except for the operating frequency this magnetron is equivalent to type 2J42. For details please refer to this type

A l'exception de la fréquence de service ce magnétron est équivalent au type 2J42. Pour les données voir ce type

Mit Ausnahme der Betriebsfrequenz ist dieses Magnetron äquivalent mit Typ 2J42. Für Daten siehe dieser Typ

PHILIPS

Electronic Tube

HANDBOOK

JP9-7A

page	sheet	date
1	1	1957.05.05
2	FP	1999.08.29

Forced-air cooled packaged MAGNETRON for pulsed service at a fixed frequency within the range 9345-9405 Mc/s, capable of delivering a peak output power W_{op} > 7 kW (T_{imp} = 0.1 µsec)
MAGNETRON refroidi par air forcé, avec aimant incorporé, pour service d'impulsions à une fréquence fixe dans la gamme 9345-9405 MHz, capable de fournir une puissance de sortie de crête W_{op} > 7 kW à T_{imp} = 0,1 µsec.
Druckluftgekühltes MAGNETRON für Impulsbetrieb auf einer festen Frequenz im Bereich 9345-9405 MHz, mit einer Impulsspitzenleistung W_{op} > 7 kW bei T_{imp} = 0,1 µSek. Magnetron und Magnet bilden eine Baueinheit

Heating : indirect
Chauffage: indirect
Heizung : indirekt

V_{fo}	=	6,3 V ±5%
I_f (V_{fo} = 6,3 V)	=	600 mA
T_w (t_{amb} < 0 °C)	=	min.3 min
T_w (t_{amb} > 0 °C)	=	min.2 min

Limiting values
Caractéristiques limites
Grenzdaten [1])

T_{imp}	= max.	1,0 µsec
T_{imp}	= min.	0,05 µsec
δ	= max.	0,002
I_{ap}	= max.	6,0 A
I_{ap}	= min.	4,5 A
I_a	= max.	12 mA
W_{ip}	= max.	36 kW
W_i	= max.	72 W
$\frac{\Delta V}{\Delta T_{rv}}$	= max.	100 kV/µsec
V.S.W.R.	= max.	1,5
t_a	= max.	120 °C

[1])Each limiting value should be regarded independently of other values, so that under no circumstances it is permitted to exceed a limiting value whichsoever

Chaque valeur limite doit être considérée indépendamment des autres valeurs, de sorte qu'en aucun cas il est permis de dépasser une valeur limite quelconque

Jeder Grenzwert gilt unabhängig von anderen Werten, so dass er unter keinen Umständen überschritten werden darf

Air cooled packaged MAGNETRON for pulsed service at a fixed frequency within the range 9345-9405 Mc/s, capable of delivering a peak output power of minimum 8 kW.
MAGNETRON refroidi par air, avec aimant incorporé, pour service d'impulsions à une fréquence fixe dans la gamme de 9345-9405 MHz, capable de fournir une puissance de sortie de crête de 8 kW au minimum
Luftgekühltes MAGNETRON für Impulsbetrieb auf einer festen Frequenz im Bereich 9345-9405 MHz, mit einer Ausgangsspitzenleistung von mindestens 8 kW. Magnetron und Magnet bilden eine Baueinheit

Heating : indirect
Chauffage: indirect
Heizung : indirekt

V_{fo} = 6,3 V ± 5 %
I_f (V_{fo} = 6,3 V) = 600 mA
T_w (t_{amb} < 0 °C) = min. 3 min
T_w (t_{amb} > 0 °C) = min. 2 min

For W_i > 25 W it is necessary to reduce V_f immediately after the application of the high tension in accordance with page C.
Pour W_i > 25 W il est nécessaire de diminuer V_f immédiatement après l'application de la haute tension en rapport avec page C.
Für W_i > 25 W muss V_f sofort nach dem Anlegen der Hochspannung in Übereinstimmung mit Seite C verringert werden

Limiting values (absolute limits)
Caractéristiques limites (Limites absolues)
Grenzdaten (Absolute Grenzwerte)

I_{ap} (T_{imp} < 1,0 µsec)	= min.	4,5 A
	= max.	6,0 A
I_{ap} (T_{imp} < 0,1 µsec	= min.	4,5 A
	= max.	7,0 A
V_{ap}	= min.	5,2 kV
	= max.	6,2 kV
T_{imp}	= min.	0,05 µsec
	= max.	1,0 µsec
δ	= max.	0,002
W_i	= max.	83 W
$\frac{\Delta V}{\Delta T_{rv}}$	= max.	120 kV/µsec
V.S.W.R.	= max.	1,5
t_a	= max.	100 °C

Typical characteristics
Caractéristiques types
Kenndaten

V_{ap}	= max.	6,0	kV
V_{ap}	= min.	5,0	kV
A[2])	=	16,5-21,5	mm
Δfp (V.S.W.R.= 1,5)	= max.	15	Mc/s

Operating characteristics
Caractéristiques d'utilisation
Betriebsdaten

V_f	=	6,3	V
T_{imp}	=	0,1	µsec
δ	=	0,0001	
I_{ap}	=	5,5	A
I_a	=	0,55	mA
W_o	= min.	0,8	W
W_{op}	= min.	8	kW
Δfp (V.S.W.R.= 1,5)	= max.	15	Mc/s

Magnetron output: Designed for coupling to standard rectangular waveguide RG-52/U. For drawing of this waveguide see front of this section

Sortie de magnétron: Prévue pour un couplage avec le guide d'ondes rectangulaire standard RG-52/U. Pour le croquis de ce guide d'ondes voir en tête de ce chapitre

Magnetron-Ausgang: Passend für Kupplung mit Standard Hohlleiter RG-52/U mit rechteckigem Querschnitt. Für die Massskizze dieses Hohlleiters siehe am Anfang dieses Abschnitts

Mounting position: any
Montage : à volonté
Einbau : beliebig

Net weight Poids net Nettogewicht	1350 g	Shipping weight Poids brut Bruttogewicht	2700 g

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2) Distance of voltage standing wave minimum from mounting plate inwards

Distance entre le minimum de l'onde stationnaire de la tension (dans le guide d'ondes du magnétron) et la plaque de montage

Entfernung zwischen dem Stehwellenminimum der Spannung (innerhalb des Hohlleiters des Magnetrons) und der Montierungsplatte

Typical characteristics
Caractéristiques types
Kenndaten

f	(t_a = 45 °C)	=	9345-9405 Mc/s [1]
V_{ap}	(I_{ap} = 5,5 A)	=	5,4-5,9 kV
W_{op}	(I_{ap} = 5,5 A)	>	8 kW
Δf_p	(V.S.W.R.=1,5)	<	15 Mc/s
d		=	16,5-21,5 mm [2]
C_{ak}		<	8 pF

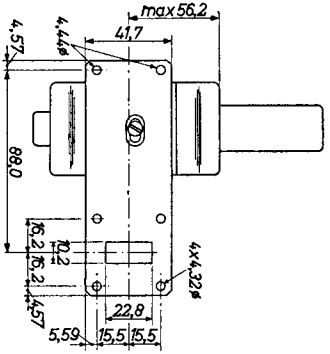
Operating characteristics
Caractéristiques d'utilisation
Betriebsdaten

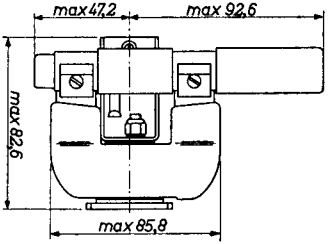
V_f	=	6,3	6,3	5,8 V
T_{imp}	=	0,05	0,1	1,0 µsec
f_{imp}	=	4000	1000	1000 c/s
δ	=	0,0002	0,0001	0,001
I_{ap}	=	7,0	6,0	5,5 A
I_a	=	1,4	0,6	5,5 mA
V_{ap}	=	5,9	5,7	5,6 kV
$\frac{\Delta V_a}{\Delta T_{rv}}$	=	110	110	80 kV/µsec
W_{ip}	=	41,3	34,2	30,8 kW
W_i	=	8,3	3,4	31 W
W_{op}	=	10,5	9,5	9,0 kW
W_o	=	2,1	0,95	9,0 W
Δf_p (V.S.W.R.=1,5)	=	14	14	14 Mc/s

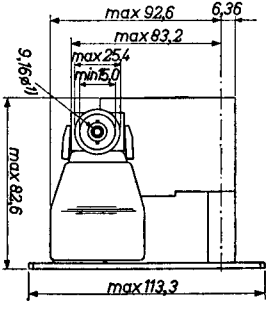
[1]) Fixed frequency within this band
Fréquence fixe dans cette gamme
Feste Frequenz in diesem Bereich

[2]) Distance of voltage standing wave minimum from mounting plate into the tube
Distance du minimum d'ondes stationnaires à partie de la plaque de montage vers la tube
Entfernung des Spannungsminimums von der Montageplatte in Richtung der Röhre

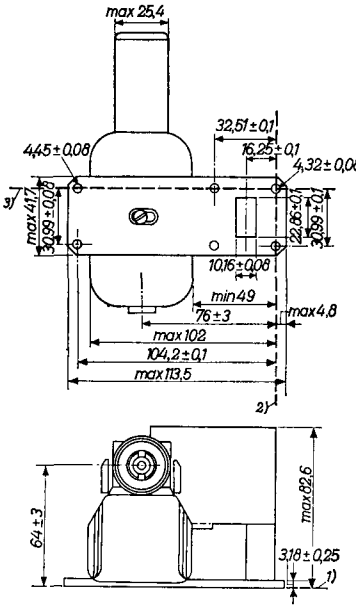
Dimensions in mm
Dimensions en mm
Abmessungen in mm







1) See page 4; voir page 4; siehe Seite 4



Dimensions in mm
Dimensions en mm
Abmessungen in mm

Net weight
Poids net 1,4 kg
Nettogewicht

Weight in carton
Poids dans le carton 2,5 kg
Gewicht in Karton

To fasten the magnetron output to the RG-52/U waveguide, a choke flange type I.S. Z830051 should be inserted between these parts

Pour fixer la sortie du magnétron au guide d'ondes RG-52/U une bride de piège type Z830051 doit être insérée entre ces deux sections

Zur Befestigung des Magnetronausgangs am Hohlleiter RG-52/U muss ein Drosselflansch Type Z830051 zwischen diesen Teilen eingefügt werden

1) Reference plane A
Plan de référence A
Bezugsebene A

2) Reference plane B
Plan de référence B
Bezugsebene B

3) Reference plane C
Plan de référence C
Bezugsebene C

[1])Miniature bayonet cap, 9,16 mm diameter
The common heater-cathode terminal is the sleeve of the bayonet cap, the other heater terminal is the centre contact

Culot à baïonnette miniature, 9,16 mm diamètre
La borne commune filament-cathode est la douille du culot à baïonnette, l'autre borne du filament est le contact central

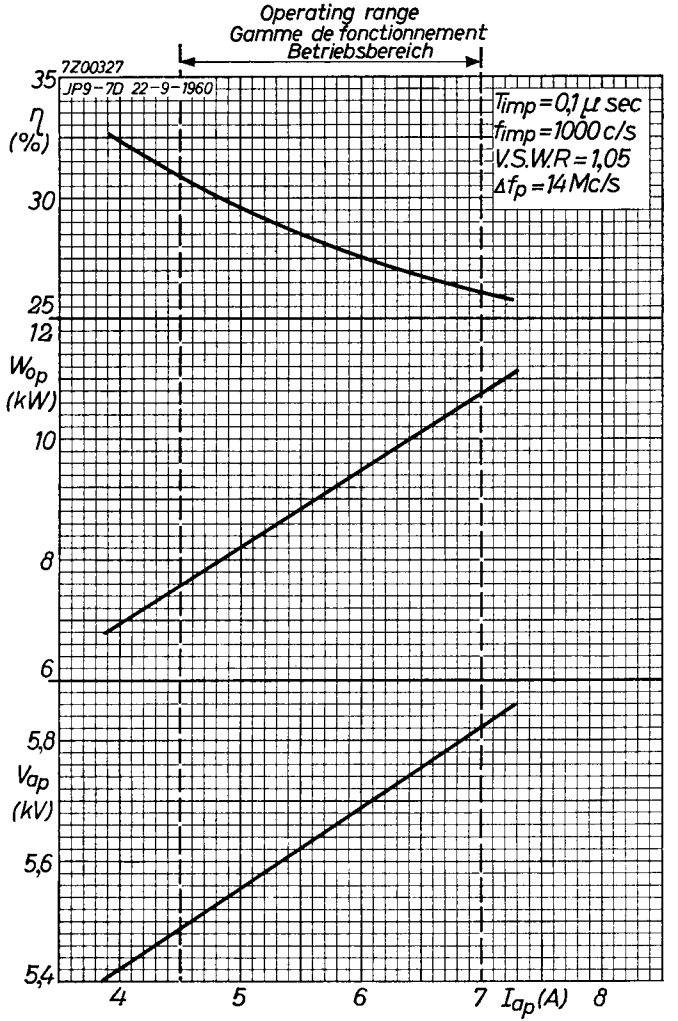
Miniatur-Bajonetthülse, 9,16 mm Durchmesser
Der gemeinsame Heizfaden-Katodenanschluss liegt an der Bajonetthülse, der zweite Fadenanschluss am Mittelkontakt.

COOLING: In normal circumstances natural cooling is adequate, but where the ambient temperature is abnormally high a flow of cooling air between the radiator fins may be necessary to keep the block temperature below the permitted maximum.

REFROIDISSEMENT. Dans les circonstances normales le refroidissement naturel est suffisant; si la température de l'ambiance est exceptionnellement élevée un courant d'air entre les ailettes du radiateur est nécessaire pour maintenir la température du bloc au-dessous de la température admissible au max.

KÜHLUNG: Unter normalen Umständen genügt die natürliche Kühlung; wenn die Umgebungstemperatur aussergewöhnlich hoch ist, muss ein Luftstrom durch den Radiator geschickt werden, damit die Temperatur des Anodenblocks den max. zulässigen Wert nicht überschreitet.

PHILIPS JP 9-7 D

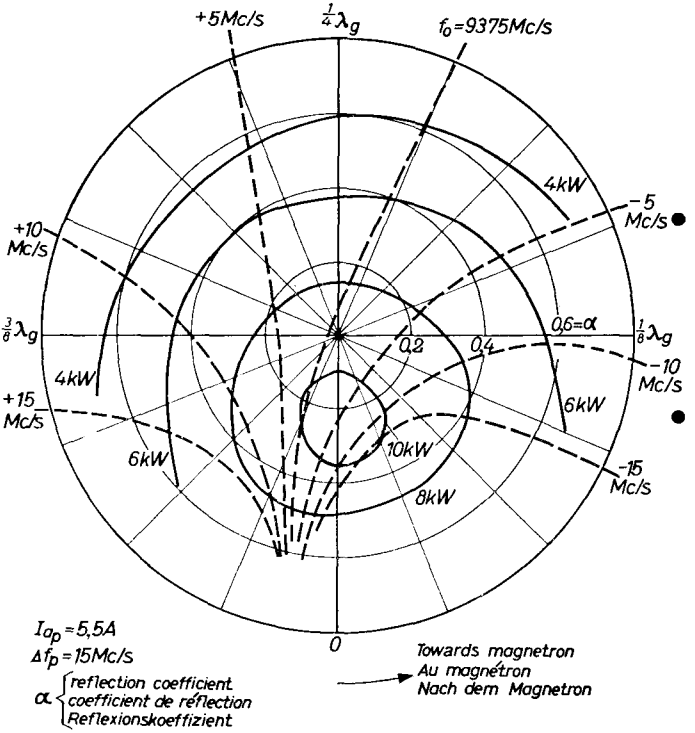


9.9.1960

A

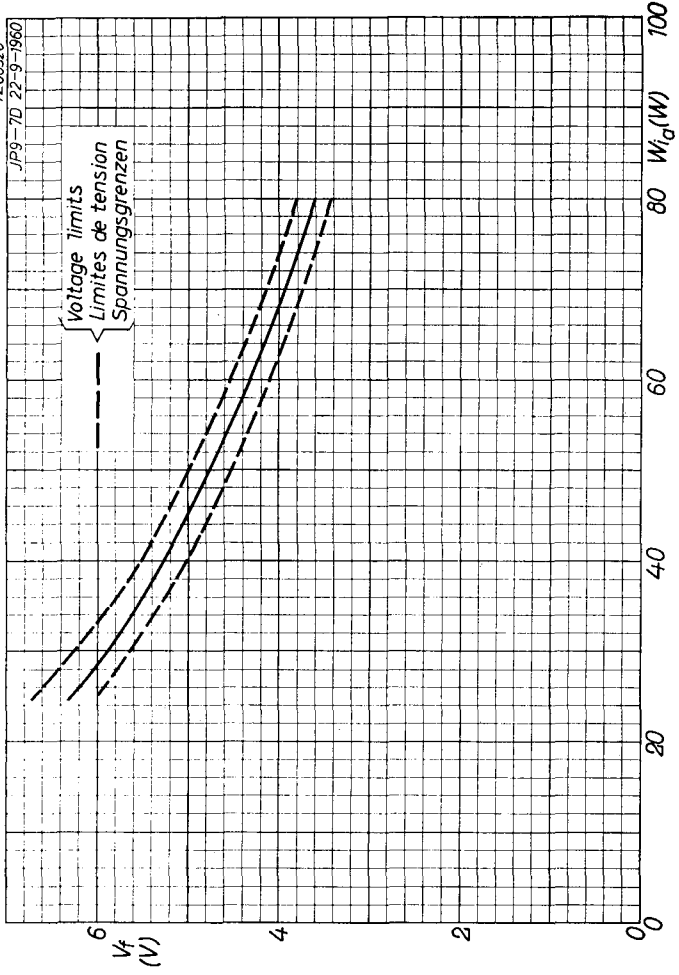
JP 9-7D **PHILIPS**

7Z00329



B

PHILIPS JP9-7D



9.9.1960

C

PHILIPS

Electronic Tube

HANDBOOK

JP9-7D

page	sheet	date
1	1	1957.05.05
2	1	1960.09.09
3	2	1957.05.05
4	2	1960.09.09
5	3	1957.05.05
6	3	1960.09.09
7	4	1957.05.05
8	4	1960.09.09
9	A	1960.09.09
10	B	1960.09.09
11	C	1960.09.09
12	FP	1999.08.29

Forced-air cooled packaged tunable MAGNETRON for continuous wave operation in the frequency range 9150 to 9600 Mc/s and suitable for amplitude modulation.

MAGNÉTRON syntonisable, refroidi par air forcé, avec aimant incorporé, pour fonctionnement à onde continue dans la gamme de 9150 - 9600 MHz; propre à modulation d'amplitude.

Druckluftgekühltes, abstimmbares MAGNETRON für Dauerwellenbetrieb im Frequenzbereich von 9150 bis 9600 MHz; geeignet zur Amplitudenmodulation. Magnetron und Magnet bilden eine Baueinheit.

Heating : indirect
Chauffage: indirect
Heizung : indirekt

V_{f_o} = 6,3 V
I_f = 1,1 A
T_w = min. 2 min.

V_f must be reduced immediately upon application of the H.T. power, the operating voltage being as low as possible consistent with stable operation. For maximum life individual adjustment of each tube is recommended.

V_f doit être diminué immédiatement après l'application de la haute tension. La tension de fonctionnement doit être la plus basse possible en vue de fonctionnement stable. Pour obtenir la durée maximum il estrecommandé de régler chaque tube individuellement.

V_f muss sofort nach dem Anlegen der Hochspannung verringert werden. Die Betriebsspannung soll so niedrig sein als mit Rücksicht auf einen stabilen Betrieb möglich ist. Zur Erhaltung der maximalen Lebensdauer wird empfohlen jede Röhre einzeln einzustellen

Limiting values (Absolute limits)
Caractéristiques limites (Limites absolues)
Grenzdaten (Absolute Grenzwerte)

I_a = max. 60 mA
I_a = min. 20 mA
I_{ap} = max. 100 mA[1])
W_{ia} = max. 60 W

[1]) Modulated continuous wave
Modulé, à onde continue
Moduliert, Dauerwellenbetrieb

Forced-air cooled packaged tunable MAGNETRON for continuous wave operation in the frequency range 9150 to 9600 Mc/s and suitable for amplitude modulation.
MAGNÉTRON syntonisable, refroidi par air forcé, avec aimant incorporé, pour fonctionnement à onde continue dans la gamme de 9150 - 9600 MHz; propre à modulation d'amplitude.
Druckluftgekühltes, abstimmbares MAGNETRON für Dauerwellenbetrieb im Frequenzbereich von 9150 bis 9600 MHz; geeignet zur Amplitudenmodulation. Magnetron und Magnet bilden eine Baueinheit.

Heating : indirect
Chauffage: indirect
Heizung : indirekt

V_{fo} = 6,3 V
I_f = 1,1 A
T_w = min. 2 min.

V_f must be reduced immediately upon application of the H.T. power, the operating voltage being as low as possible consistent with stable operation. For maximum life individual adjustment of each tube is recommended.
V_f doit être diminué immédiatement après l'application de la haute tension. La tension de fonctionnement doit être la plus basse possible en vue de fonctionnement stable. Pour obtenir la durée maximum il est recommandé de régler chaque tube individuellement.
V_f muss sofort nach dem Anlegen der Hochspannung verringert werden. Die Betriebsspannung soll so niedrig sein als mit Rücksicht auf einen stabilen Betrieb möglich ist. Zur Erhaltung der maximalen Lebensdauer wird empfohlen jede Röhre einzeln einzustellen

Limiting values (Absolute limits)
Caractéristiques limites (Limites absolues)
Grenzdaten (Absolute Grenzwerte)

I_a = max. 60 mA
I_a = min. 20 mA
I_{ap} = max. 100 mA[1])
W_{ia} = max. 60 W

[1]) Modulated continuous wave
Modulé, à onde continue
Moduliert, Dauerwellenbetrieb

Typical characteristics
Caractéristiques types
Kenndaten

V_a (I_a = 50 mA)	= 900 - 1100	V
Δf_p (V.S.W.R. = 1,5)	< 20	Mc/s
Frequency pushing Désaccord par le courant Stromverstimmungsmass	< 1	Mc/s/mA
W_o (f = 9150-9600 Mc/s)	> 5	W

Operating characteristics
Caractéristiques d'utilisation
Betriebsdaten

V_f	=	9200	9400	9550	Mc/s
I_a	=	50	50	50	mA
V_a	=	920	930	930	V
W_o	=	10	10	10	W

Series resistance of the voltage supply
Résistance série de la source d'alimentation
Serienwiderstand der Speisungsquelle
= min 6 kΩ

Net weight Poids net Nettogewicht	0,71 kg	Shipping weight Poids brut Bruttogewicht	1,16 kg

Cooling, refroidissement, Kühlung

Temperature of anode block Température du bloc anodique Temperatur des Anodenblocks	= max.	140 °C
Air flow required for cooling Courant d'air requis pour le refroidissement Zur Kühlung erforderlicher Luftstrom	= min.	150 l/min.

Typical characteristics
Caractéristiques types
Kenndaten

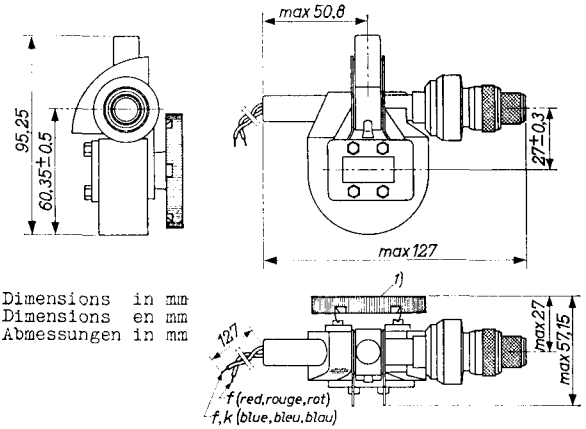
V_a (I_a = 50 mA)	=	900 - 1100 V
Δf_p (V.S.W.R. = 1,5)	<	20 Mc/s
Frequency pushing Désaccord par le courant Stromverstimmungsmass	<	1 Mc/s/mA
W_o (f = 9150-9600 Mc/s)	>	5 W

Operating characteristics
Caractéristiques d'utilisation
Betriebsdaten

f =	9200	9400	9500	Mc/s
I_a =	50	50	50	mA
V_a =	920	930	930	V
W_o =	10	10	10	W

Series resistance of the voltage supply
Résistance série de la source d'alimentation
Serienwiderstand der Speisungsquelle
= min. 6 kΩ

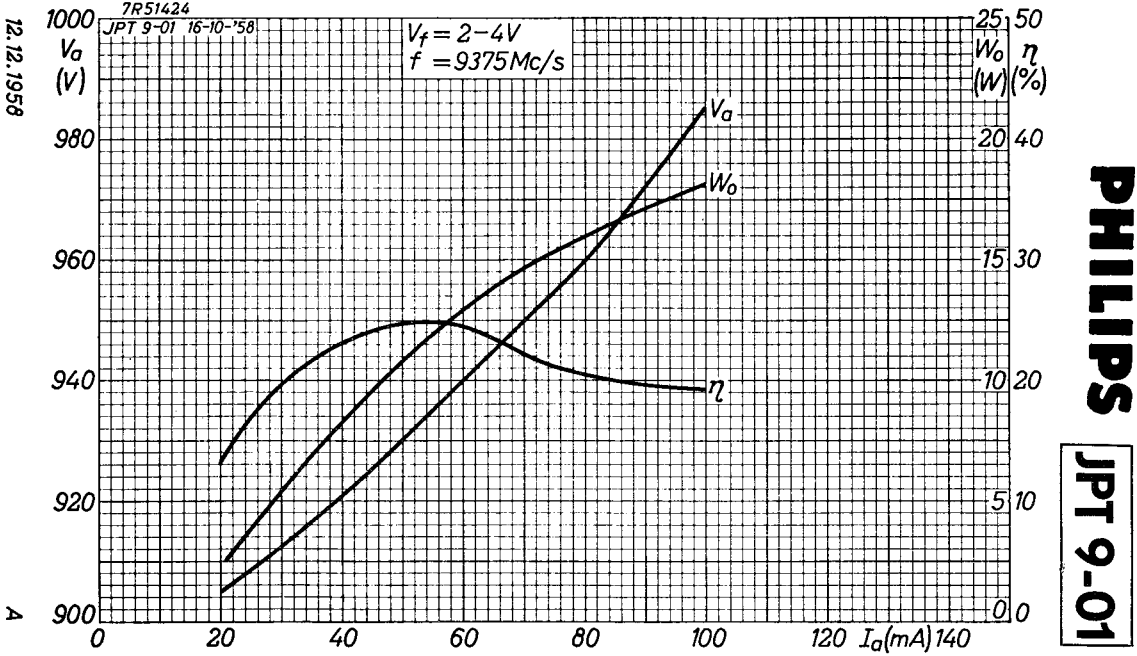
Net weight Poids net Nettogewicht	0,71 kg	Shipping weight Poids brut Bruttogewicht	1,16 kg



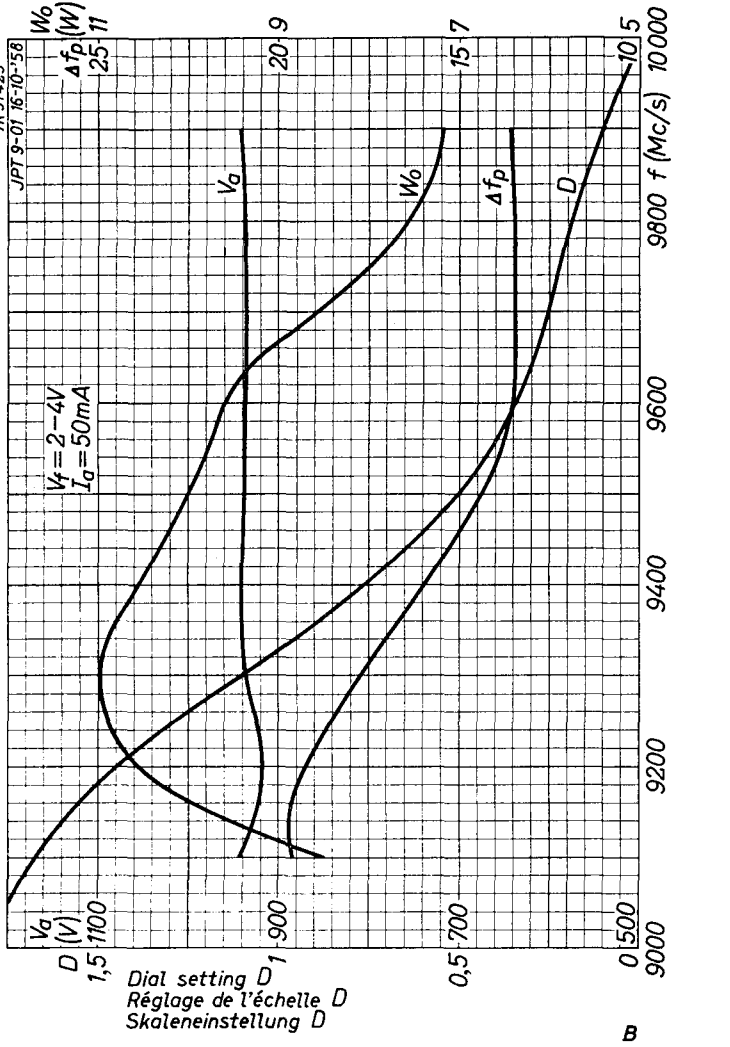
Dimensions in mm
Dimensions en mm
Abmessungen in mm

1) Wave guide output system
Système de sortie à guide d'ondes RG - 52/U
Hohlleiterausgangssystem

Wave guide coupling system
Système de couplage du guide d'ondes Z 83 000 3
Hohlleiterkupplungssystem


7R51424
JPT 9-01 16-10-'58
$V_f = 2-4V$
$f = 9375 Mc/s$
V_a
W_o
η
1000
980
960
940
920
900
V_a (V)
25
20
15
10
5
0
W_o (W)
50
40
30
20
10
0
η (%)
0
20
40
60
80
100
120
140
I_a(mA)
12.12.1958
A
PHILIPS
JPT 9-01

JPT 9-01 PHILIPS



Dial setting D
Réglage de l'échelle D
Skaleneinstellung D

B

PHILIPS

Electronic Tube

HANDBOOK

JPT9-01

page	sheet	date
1	1	1959.03.03
2	1	1959.09.09
3	2	1959.03.03
4	2	1959.09.09
5	3	1959.03.03
6	A	1958.12.12
7	B	1958.12.12
8	FP	1999.08.29

NOISE DIODE

Rare gas filled noise diode for use in waveguide systems in the 3 cm wave band

QUICK REFERENCE DATA				
Noise level above 290 ^{o}K	F	=	18.75	dB
Ignition voltage	V_{ign}	>	6000	V
Anode current	I_a	= max.	150	mA

HEATING: direct, parallel supply

Filament voltage	V_f	=	2	V ± 10%
Filament current	I_f	=	2	A
Heating time	T_w	= min.	15	sec

TYPICAL CHARACTERISTICS

Anode voltage	V_a	=	165	V
Anode current	I_a	=	125	mA
Noise temperature	t_F	=	21700	^{o}K ± 5%
Noise level above 290 ^{o}K [1]	F	=	18.75	± 0.2 dB
Ignition voltage [2]	V_{ign}	>	6000	V

LIMITING VALUES (Absolute limits)

Anode current	I_a	= max.	150	mA
		= min.	50	mA
Ambient temperature	t_{amb}	= −55 to +75		^{o}C

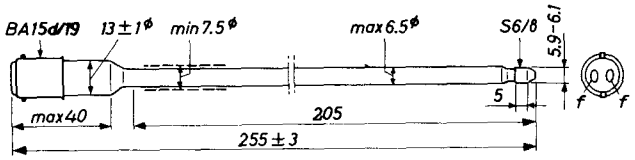
REMARKS

It is recommended that the noise diode and the microwave part of the mount are not touching (min. diameter of pipe 7.5 mm).
The V.S.W.R. in the test mount with the noise diode in operation should not be more than 1.1

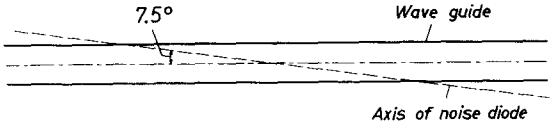
1) Change in noise level over 200 hours of operation is negligible.
2) For recommended ignition circuit see page 2.

MECHANICAL DATA

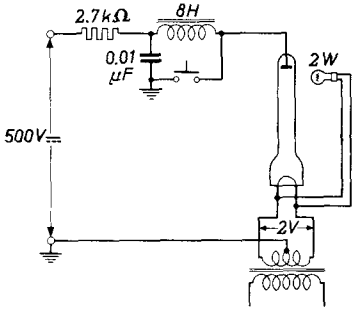
Dimensions in mm



MOUNTING POSITION: Cathode at receiver side

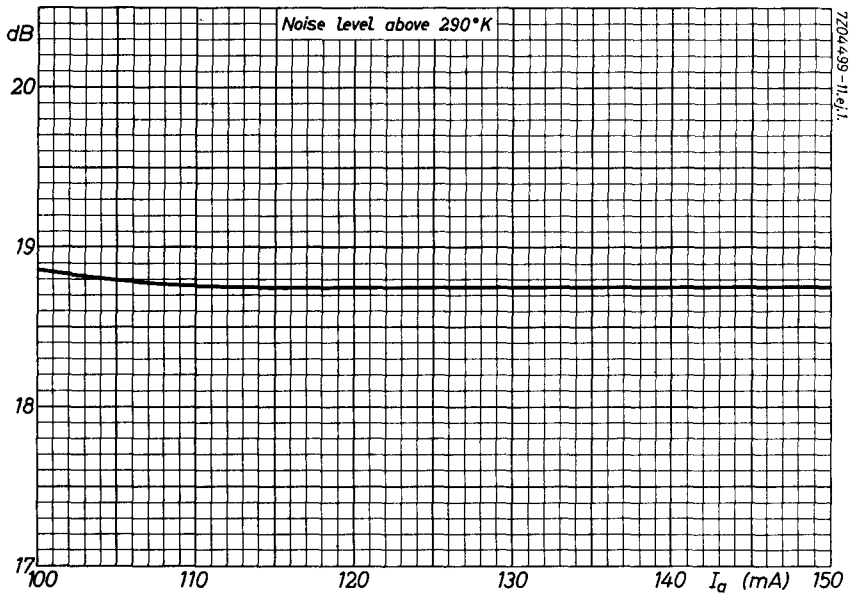


RECOMMENDED IGNITION CIRCUIT



The minimum value if V_{ign} is only valid if some ambient illumination is present. Hence in darkness the presence of a small light-source (about 2W) is necessary.

The inductance of 8H should be of proper construction in order to be able to produce the minimum value of V_{ign}.


Noise level above 290°K
dB
20
19
18
17
100
110
120
130
140
I_a (mA)
150
7204499 - 11.1.1.

PHILIPS

Data handbook

Electronic components and materials

K50A

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1	1	1968.12
2	2	1968.12
3	3	1968.12
4	FP	2001.05.18

NOISE DIODE

Rare gas filled noise diode for use in waveguide systems in the 10 cm wave band

QUICK REFERENCE DATA				
Noise level above 290 °K	F	=	17.58	dB
Ignition voltage	V_{ign}	>	6000	V
Anode current	I_a	= max.	300	mA

HEATING: direct, parallel supply

Filament voltage	V_f	=	2	V ± 10%
Filament current	I_f	=	3.5	A
Heating time	T_w	= min.	15	sec

TYPICAL CHARACTERISTICS

Anode voltage	V_a	=	140	V
Anode current	I_a	=	200	mA
Noise temperature	t_F	=	16600	°K ± 5%
Noise level above 290 °K [1]	F	=	17.58	± 0.2 dB
Ignition voltage [2]	V_{ign}	>	6000	V

LIMITING VALUES (Absolute limits)

Anode current	I_a	= max.	300	mA
		= min.	100	mA
Ambient temperature	t_{amb}	=	−55 to +75	°C

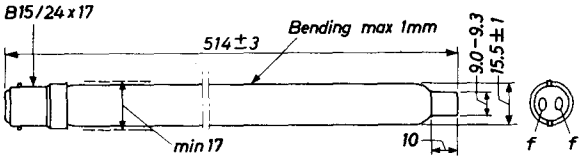
REMARKS

It is recommended that the noise diode and the microwave part of the mount are not touching (min. diameter of pipe 17 mm).
The V.S.W.R. in the test mount with the noise diode in operation should not be more than 1.1

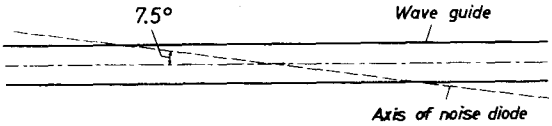
1) Change in noise level over 200 hours of operation is negligible.
2) For recommended ignition circuit see page 2.

MECHANICAL DATA

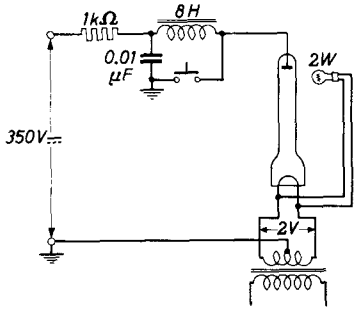
Dimensions in mm
Small top cap



MOUNTING POSITION: Cathode at receiver side

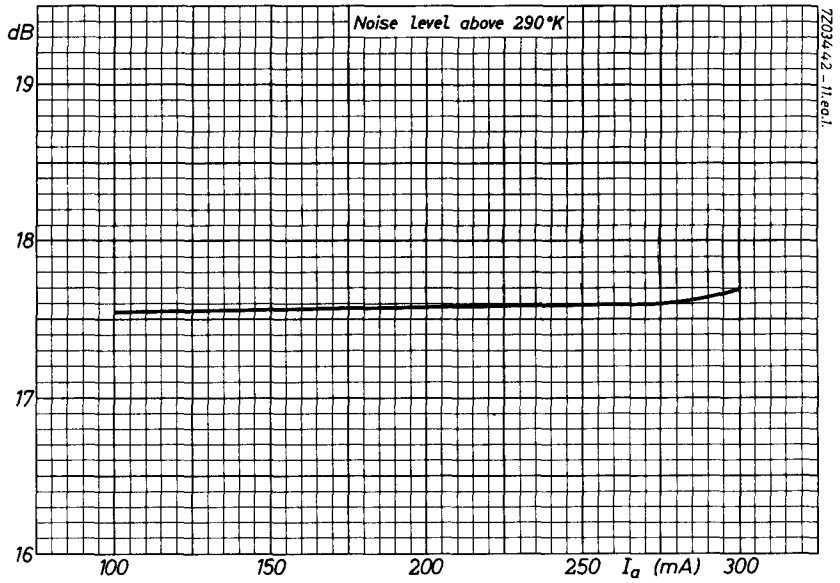


RECOMMENDED IGNITION CIRCUIT



The minimum value of V_{ign} is only valid if some ambient illumination is present. Hence in darkness the presence of a small light-source (about 2 W) is necessary.

The inductance of 8H should be of proper construction in order to be able to produce the minimum value of V_{ign}.


Noise level above 290°K
dB
19
18
17
16
100
150
200
250
I_a (mA)
300
7Z70442 - 11.eal.

PHILIPS

Data handbook

Electronic components and materials

K51A

page	sheet	date
1	1	1968.12
2	2	1968.12
3	3	1968.12
4	FP	2001.05.18

STANDARD NOISE SOURCES K 81A, K 50A and K 51A

In the performance of short wave apparatus, such as television and radar equipment, noise plays an important part. This is attributable to the inherent noise of the receivers and amplifiers used. An important property of amplifiers and receivers is the 'noise factor', which defines their noise properties under given conditions.

There are two main methods of determining the noise factor. The first is the one employing a standard signal generator. This method is rather time-consuming and inaccurate, since it necessitates absolute measurements of power and effective bandwidth. The other method is to employ a standard noise source, such as hot resistors, saturated diodes and gas discharge tubes. Since it would be necessary to heat resistors to 29000 °K for measuring a noise factor of 100, which may often be required, their use is, however, restricted.

Saturated diodes are only available for measurements at frequencies up to about 1000 Mc/s. However, at such frequencies it is hardly possible to effect good matching between the diode and its circuit. The K 81 A noise diode is designed for use at frequencies up to 300 Mc/s.

Specially designed gas discharge tubes have proved to possess properties that make them very suitable for use as standard noise sources at microwaves. The K 50 A and K 51 A are intended for use in the 3 cm and the 10 cm band respectively.

NOISE

Noise originates from the arbitrary motion of electrons in solids, liquids and gases. The electron motion may be due to temperature (thermal agitation- or Johnson noise) or to phenomena occurring in gas discharges (collisions of the electrons and the ions) or in vacuum tubes (shot noise, partition noise, induced grid noise).

It can be proved that the mean square noise voltage v_n^2 at the terminals of a resistor equals $4kTBR$, where k is Bolzmann's constant (1.38×10^{-23} Joule/°C), T the absolute temperature of the resistor, B the effective bandwidth of the frequency range considered and R the resistance of the resistor.

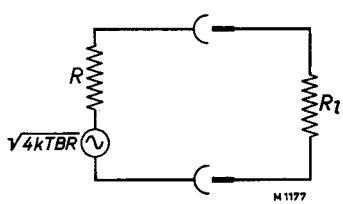


Fig. 58. Representation of a resistor as a noise source.

Accordingly, a resistor may be considered as a noise source of which the e.m.f. is $\sqrt{4kTBR}$ and whose internal resistance is R, which is assumed to be noise-free (fig. 58).

The maximum obtainable power from this

noise source is dissipated in a load resistor R_l, which is equal to R. This so-called 'available noise power' is thus:

$$W_{na} = \frac{v_n^{-2}}{4R} = \frac{4kTBR}{4R} = kTB \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

The available noise power is therefore directly proportional to the absolute temperature T. Analogous to the noise from a resistor, the noise originating from a non-thermal noise source may be expressed in terms of the 'noise temperature', i.e. the temperature of a resistor that would deliver the same amount of noise as the non-thermal noise source.

THE NOISE FACTOR OF A POWER AMPLIFIER

For the sake of simplicity only the noise factor of a power amplifier will be discussed. The discussion is, however, also valid for any other four-terminal network.

Fig. 59 shows the block diagram of a power amplifier and the adjacent circuits. The input of the amplifier is matched to the driver, which has an internal resistance $'R$ and is thus equal to the input resistance of the amplifier.



Fig. 59. Block diagram of a power amplifier and adjacent circuits.

The available noise power at the input is kT_0B, T_0 being the noise temperature of the driver.

The term 'available gain' is introduced, being the ratio of the available output power and the available power at the input of the amplifier.

If the available signal power at the input of the amplifier is assumed to be S, and the available gain of the amplifier to be G, the available signal power at the output is GS and the available noise power

$$W_n = GkT_0B + W_i , \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

where W_i is the inherent noise power of the amplifier available at the output.

The noise factor of the amplifier is defined as the ratio of the available signal-to-noise ratio at the input and the available signal-to-noise ratio at the output of the amplifier, hence:

$$N = \frac{S/kT_0B}{GS/W_n} = \frac{W_n}{GkT_0B} , \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3)$$

or:

$$N = \frac{GkT_0B + W_i}{GkT_0B} .$$

The last expression shows that the noise factor may also be defined as the ratio of the noise power actually available at the output to the noise power that would be available at the output if the amplifier were noiseless.

From (3) it follows that:

$$W_n = NGkT_0B\ ; \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ (4)$$

since:

$$W_n = GkT_0B + W_i = NGkT_0B\ ,$$

$$W_i = (N - 1)\ GkT_0B\ . \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ (5)$$

THE SATURATED DIODE AS A STANDARD NOISE SOURCE

The operation of a diode as a noise source is based on the following principle. When the diode is saturated, all electrons emitted by the cathode will reach the anode. The number of electrons emitted during a time interval Δt, i.e. the charge transferred during this time interval, is not constant but fluctuates around a statistical average value due to the thermal movement of the electrons in the cathode. The charge transmitted per unit time corresponds to the direct anode current I_a, and on this average value a fluctuating current is superimposed. This effect is termed the shot effect. The mean square of the noise current within a frequency band B is given by:

$$i_n^{-2} = 2e \cdot I_a \cdot B\ , \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ (6)$$

in which e denotes the charge of an electron, i.e. 1.6×10^{-19} C.

Since the individual electrons do not influence each other, this expression is applicable to the entire frequency spectrum, but at extremely high frequencies the influence of the transit time effect becomes more and more noticeable and reduces the shot effect.

When a current $I_a + i_n$ passes through a resistance R_a included in the anode circuit of the diode, a noise voltage drop $v_n^2\ i_n \cdot R_a$ will be produced in addition to the voltage drop caused by the direct anode current. So long as the influence of the internal resistance of the diode is negligible compared with that of R_a, i.e. when $R_i \gg R_a$ (which will always be the case when the diode is saturated, since $\partial\ v_a / \partial\ i_a = \infty$), the resistance R_a may be considered as a noise source with an e.m.f. v_n and an internal resistance R_a. The noise voltage source may be represented by the equivalent diagram shown in fig. 60.

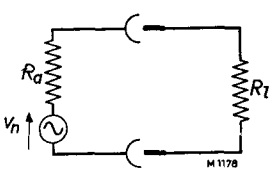


Fig. 60. Equivalent diagram of a saturated diode as a noise source.

The available noise power of this noise source is given by:

$$W_{na} = \frac{i_n^{-2} \cdot R_a}{4} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (7)$$

From (6) and (7) it follows that:

$$W_{na} = \frac{e \cdot I_a \cdot B \cdot R_a}{2} = 8\, I_a \cdot B \cdot R_a \cdot 10^{-20}. \quad \ldots\ldots\ldots\ldots\ldots (8)$$

The essential formulae having been given, we will now investigate the way in which the noise generator should be set up in order to be used as a standard noise source, and the requirements to be satisfied in order to obtain reliable results.

The requirement is imposed on the circuit that the internal resistance of the generator should be real and that no appreciable attenuation should be caused by the circuit at high frequencies. In order to ensure that the internal resistance of the generator is real, the capacitance introduced by the tube and the circuit may be neutralized by an inductance shunted across the tube. In this way a parallel tuned resonant circuit is obtained, which is heavily damped by the anode load resistance R_a (usually 60 Ω or 300 Ω).

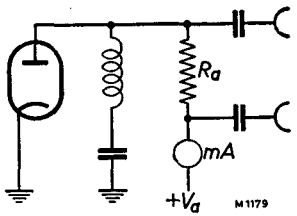


Fig. 61. Basic circuit of a noise generator equipped with a noise diode.

Fig. 61 shows the basic circuit of a noise generator equipped with a noise diode. The noise factor is measured in the following way.

As shown in fig. 62, the amplifier to be tested is connected to the noise generator. The anode load resistance R_a of the generator should be equal to the input resistance of the amplifier.



Fig. 62. Block diagram of the measuring set-up.

First the heater current of the diode remains switched off and a meter indicating the relative power output is connected to the output terminals of the amplifier. After a record has been made of the reading of this meter, which indicates a value corresponding to a power output $W_n = NGkT_0B$ (according to eq. (4)), the heater current of the diode is switched on and carefully adjusted to the value at which the output meter indicates twice the original power. The additional noise output power due to the energized diode is GW_{na} and exactly equal to the initial power $NGkT_0B$.

Hence:

$$GW_{na} = NGkT_0B\,, \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (9)$$

which gives:

$$N = \frac{W_{na}}{kT_0B} = \frac{8 \cdot I_a B R_a \cdot 10^{-20}}{kT_0B}.$$

When T_0 is 288 °K:

$$N = 20\, I_a R_a\,, \qquad \text{.....(10)}$$

where I_a is expressed in mA and R_a in kΩ.

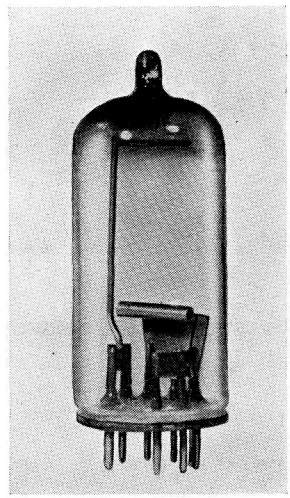
When the milliammeter incorporated in the anode circuit has been calibrated accordingly, the noise factor can be read directly, or it can be calculated by means of eq. (10).

STANDARD NOISE DIODE K 81 A

The K 81 A is a directly heated diode equipped with a noval base, intended for use as a standard noise source at frequencies up to 300 Mc/s. Owing to the small distance between the filament and the anode, the transit time is reduced to a large extent. In order to realize small self-inductances of the electrode leads, both the extremities of the filament and the anode are each connected to three pins of the base.

The filament is fairly thick, so that it can be fed from a 2 volts battery. The thermal inertia consequent upon this thickness is sufficient to prevent fluctuations in the saturation current when an a.c. supply is used. In this case the filament voltage should be very well stabilized. As a result of the diode's high internal resistance, the anode voltage need not be stabilized.

When a load resistor of 50 ohms is employed, a noise factor of 20 (13 dB) can be measured without exceeding the maximum admissible anode current and anode dissipation. When the load resistor is enlarged, it is possible to measure higher noise factors.



89515

Fig. 63. Photograph of the K81A (actual size).

TECHNICAL DATA

Heating: direct by a.c. or d.c.

CAPACITANCES

Capacitance between filament and anode . . . . . $C_{af} = 2.2$ pF

MOUNTING POSITION: any
ELECTRODE ARRANGEMENT

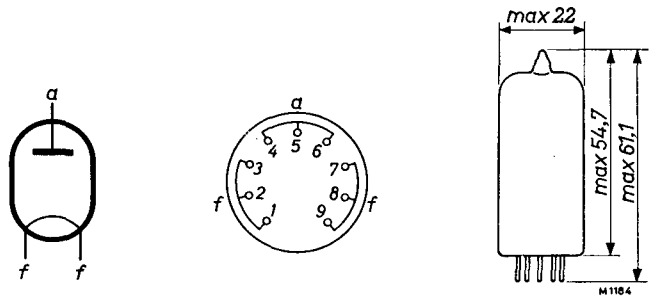


Fig 64. Electrode arrangement, electrode connections and maximum dimensions in mm (noval base).

TYPICAL CHARACTERISTICS

Filament voltage	V_f	=	1.85 V
Filament current	I_f	=	2.5 A
Anode voltage	V_a	=	100 V
Anode current	I_a	=	15 mA

LIMITING VALUES

Filament voltage	V_f	= max.	2 V
Anode voltage	V_a	= max.	150 V
Anode current	I_a	= max.	20 mA
Anode dissipation	W_a	= max.	3 W

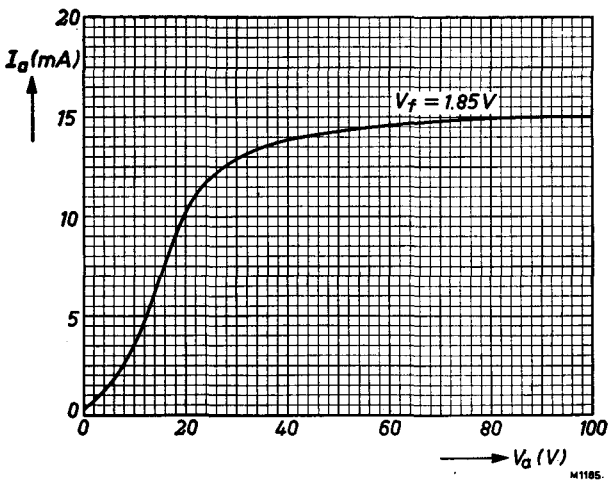


Fig. 65. I_a/V_a characteristic of the K81A at a heater voltage of 1.85 V.

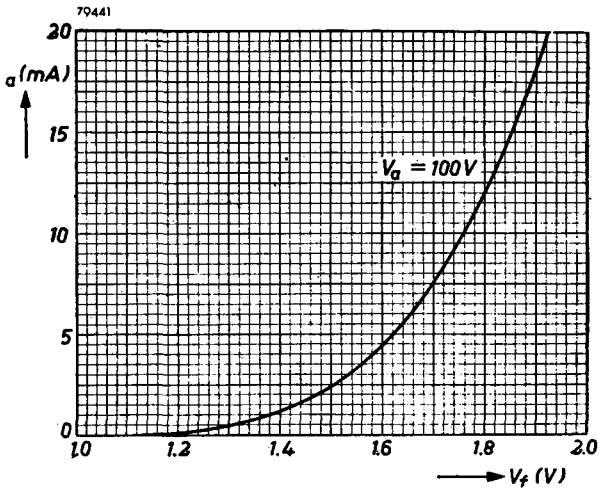


Fig. 66. I_a/V_f characteristic of the K81A at an anode voltage of 100 V.

PRACTICAL CIRCUIT

Fig. 67 shows the circuit diagram of a typical set-up for noise measurements with the K 81 A at 50 Mc/s. The h.f. section is mounted in a closed metal box. The filament and anode voltages are applied via low-pass filters, which prevent the noise originating in the power supply from entering the circuit.

The anode-filament capacitance and the parasitic capacitances are compensated by the self-inductance *L*.

P represents a coaxial output plug to which a coaxial cable with a characteristic impedance of 50 or 75 ohms should be connected, depending on the load resistor used.

CHARACTERISTIC DATA

L = 3 H (approx.)
C = 5000 pF
C' = 1000 pF
R_a = 50 or 75 Ω
V_a = 90 - 150 V

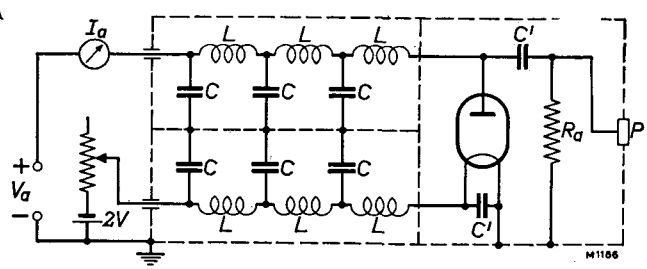


Fig. 67. Practical set-up for noise measurements at 50 Mc/s with the K81A.

GAS-DISCHARGE NOISE TUBES

The collisions between electrons and atoms and the mutual collisions of the electrons in a gas discharge give rise to an arbitrary motion of these electrons, the mean square velocity of which is of such a magnitude that an appreciable

amount of noise is produced. It is possible to determine the noise temperature (or electron temperature), which may amount to a few tens of thousands of degrees Kelvin, depending on the type of gas, its pressure, etc.

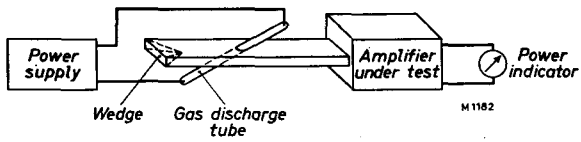


Fig. 68. Outline of a microwave set-up for noise measurements.

In fig. 68 an outline is shown of a typical microwave set-up for measuring the noise factor of an amplifier. In order to achieve wide-band matching, the gas-discharge tube penetrates the broad faces of the waveguide at an inclination of about 10°. The dissipating wedge, situated at the rear of the tube, provides a reflection-free termination when the tube is not ignited, damping then being small. The input of the amplifier is matched to the waveguide: the output terminals of the amplifier, which has an available gain G, are connected to a measuring instrument, indicating the relative output power $a \cdot W$, a generally being unknown.

A method of measuring the noise factor is as follows:

First the gas-discharge tube remains unenergized. The available noise power at the input of the amplifier is now kT_0B, where T_0 is the temperature of the wedge, which is mostly assumed to be at room temperature. The available noise output of the amplifier is $W_n = GkT_0B + W_i$, according to (2). The reading of the power indicator, being $a(GkT_0B + W_i)$, is recorded.

Then the gas-discharge tube is switched on. The available noise power at the input of the amplifier now amounts to kT_nB, T_n being the noise temperature of the tube. At the output of the amplifier a noise power of $GkT_nB + W_i$ is available. The corresponding reading on the power indicator, being $a(GkT_nB + W_i)$, is divided by the actual reading. This ratio, which is called Y, thus becomes:

$$Y = \frac{a(GkT_nB + W_i)}{a(GkT_0B + W_i)} = \frac{GkT_nB + W_i}{GkT_0B + W_i}.$$

Since, according to eq. (5):

$$W_i = (N - 1)\, GkT_0B\,.$$

$$Y = \frac{GkT_nB + (N - 1)\, GkT_0B}{GkT_0B + (N - 1)\, GkT_0B},$$

or:

$$Y = \frac{T_n + (N - 1)T_0}{T_0 + (N - 1)T_0},$$

whence:

$$N = \frac{T_n/T_0 - 1}{Y - 1} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (11)$$

Since Y and T_n are known quantities, the noise factor N can be calculated from eq. (11).

As can be seen, the bandwidth B of the amplifier does not appear in (11), which makes this method more attractive than that using a standard signal generator, in which this is the case.

TUBES K 50 A and K 51 A

The K 50 A and the K 51 A are directly heated, neon-filled gas-discharge tubes for use as standard noise sources in the 3 cm and 10 cm wave bands respectively. They have been designed to be inserted in corresponding waveguides. In fig. 69 an outline of the recommended test mounts is drawn, in which the tubes, when adjusted as specified, are properly matched.

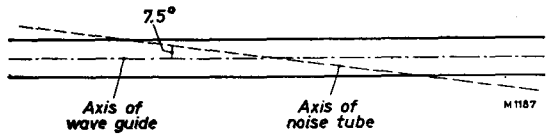


Fig. 69. Outline of the recommended test mount.

High stability is obtained owing to the rare-gas filling of the tubes; within wide limits the noise level is independent of the ambient temperature.

The ignition voltage of the tubes is about 6000 V, and the arc voltages amount to 165 and 140 V respectively. If a special starting device is used, it is not necessary to have a high-tension power supply. The recommended circuit is shown on page 59. The resistor R is designed so as to obtain the desired anode current.

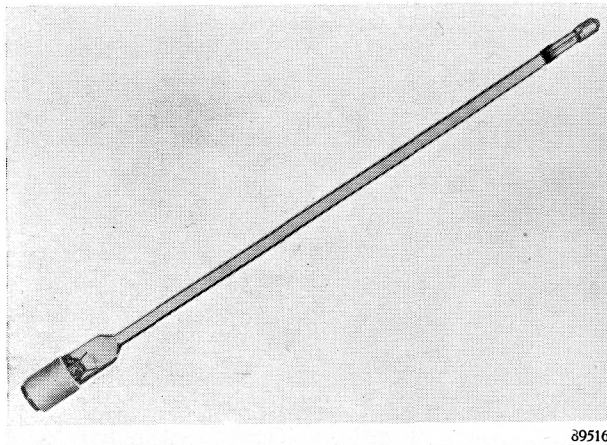
In order to ignite the tube, the switch S is closed, which causes a rather large current to flow through the coil. When this current is interrupted by the switch being opened, a high voltage is induced in the coil, which is sufficient to ignite the tube.

For the tubes to function reliably, the following precautions should be taken:

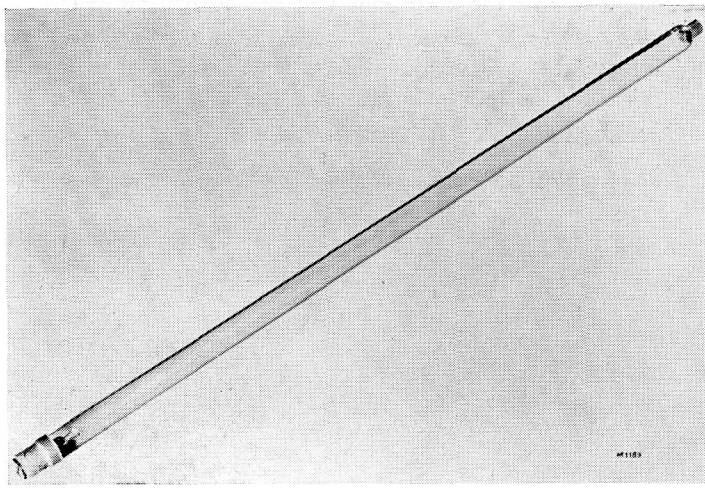
a. The anode side of the tube should point in the direction of the device under test.

b. The tube should not touch the microwave part of the mount.

c. When using the tube in on-off conditions, it should be remembered that the tube represents a small damping when not ignited. In this condition the waveguide at the rear of the tube should be terminated in a matched load, or a dissipative attenuator of at least 30 dB should be inserted in the waveguide between the tube and the device under test.



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Figs 70 and 71. Photographs of the K50A (above) and K51A (below).

TECHNICAL DATA of the K 50 A

Heating: directly by a.c.: parallel supply

Heater voltage		2 V
Heater current		2 A
Heating time	min.	15 sec

DESIGN VALUE

Ignition voltage	approx.	6000 V [1])

[1]) For recommended circuit, see fig. 74.

The inductance of 8 H should be capable of producing the minimum value of the ignition voltage. This value is only valid if some ambient illumination is present. Hence, in darkness, the presence of a small light source (about 2 W) is necessary.

TYPICAL CHARACTERISTICS

Anode voltage	approx.	165 V
Anode current		125 mA
Noise level in test mount (see fig. 69)		19.3 dB [2])

LIMITING VALUES

Anode current	min.	50 mA
	max.	150 mA
Ambient temperature	min.	—55 °C
	max.	+75 °C

The K 50 A is intended to be used in a waveguide RG-52U or equivalent. The VSWR introduced by the tube in operation is less than 1.1 [3]).

It is recommended that the noise tube and the microwave part of the mount are not touching (minimum diameter of pipe: 7.5 mm).

TECHNICAL DATA of the K 51 A

Heating: directly by a.c.; parallel supply		
Heater voltage		2 V ± 7.5%
Heater current		3.5 A
Heating time	min.	15 sec

DESIGN VALUE

Ignition voltage	min.	6000 V [1])

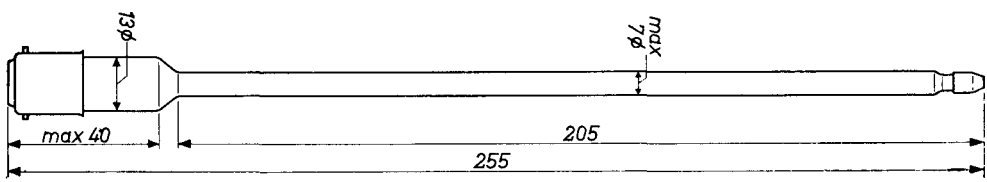


Fig. 72. Dimensions in mm of the K50A.

[1]) For recommended circuit, see fig. 74.

The inductance of 8 H should be capable of producing the minimum value of the ignition voltage. This value is only valid if some ambient illumination is present. Hence, in darkness, the presence of a small light source (about 2 W) is necessary.

[2]) With respect to 300 °K. Change in noise level over 200 hours of operation is negligible.

[3]) The tube can also be used in other types of waveguides. Care should then be taken not to exceed the minimum VSWR of 1.1. For this reason a matching transformer may be required.

TYPICAL CHARACTERISTICS

Anode voltage	approx.	140 V
Anode current		200 mA
Noise level in test mount (see fig. 69)		19.1 dB [1])

LIMITING VALUES

Anode current	min.	100 mA
	max.	300 mA
Ambient temperature	min.	—55 °C
	max.	+75 °C

The K 51 A is intended to be used in a waveguide RG-48U or equivalent. The VSWR introduced by the tube in operation in less than 1.1 [2]).

It is recommended that the noise tube and the microwave part of the mount are not touching (minimum diameter of pipe: 17 mm).

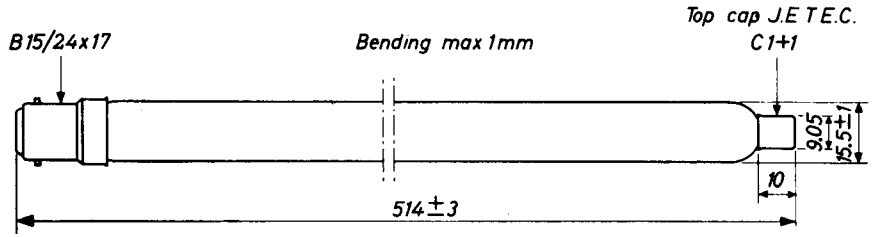


Fig. 73. Dimensions in mm of the K51A.

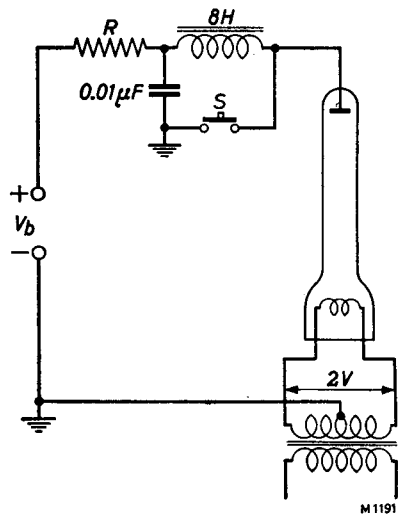


Fig. 74. Recommended ignition circuit for the K 50 A and K 51 A.
K 50 A V_b = 500 V, R = 2700 Ω.
K 51 A V_b = 350 V, R = 1000 Ω.

[1]) With respect to 300 °K. Change in noise level over 200 hours of operation is negligible.

[2]) The tube can also be used in other types of waveguides. Care should then be taken not to exceed the minimum VSWR of 1.1. For this reason a matching transformer may be required.

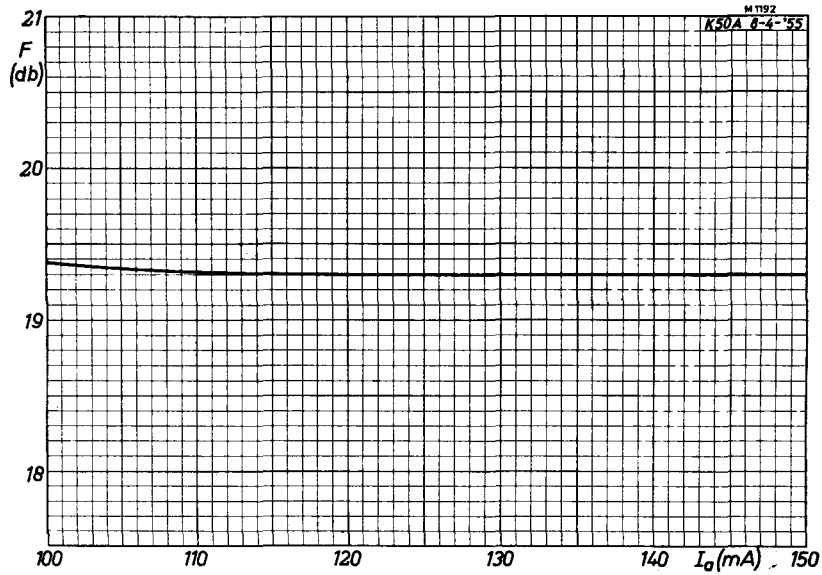


Fig. 75. Noise level (F) of the K50A with respect to 300 °K as a function of the anode current.

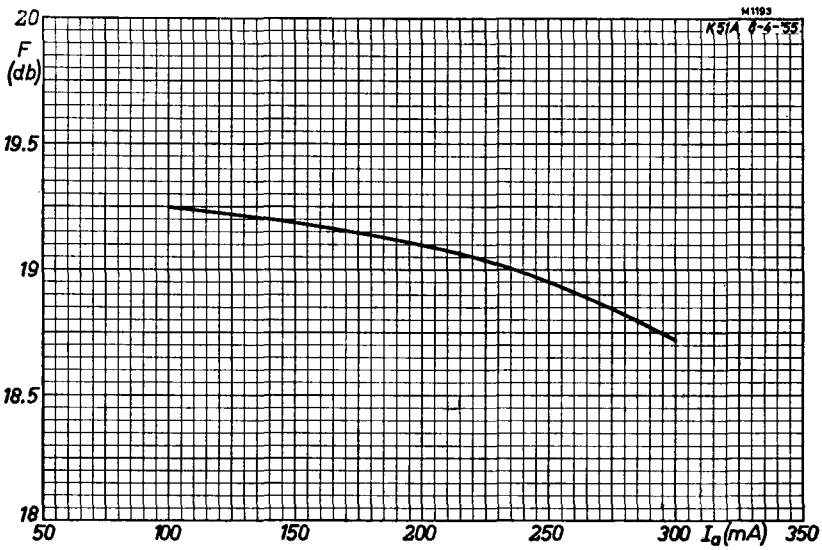


Fig. 76. Noise level (F) of the K51A with respect to 300 °K as a function of the anode current.

KB 2 Indirectly-heated double-diode

The KB 2 is an indirectly-heated double-diode valve for battery receivers. The current consumption is very low indeed, being only about 95 mA on 2 V.

As the cathode is indirectly heated, sets in which this valve is used may be equipped with delayed automatic gain control; the delay may be regulated as desired by applying a positive potential from the H. T. battery to the cathode. The KB 2 can be employed as a detector preceding a stage of A.F. amplification using a valve such as the KF 4, or a driver, e.g. the KC 3, or it can be coupled directly to a pentode output valve.

The strong signals which in the latter case would inevitably occur on the KB 2 can be quite easily handled by this diode.

The capacitance between the two diodes has been kept as low as possible, as this is of importance when the second anode is used for the delayed A.G.C., and is accordingly connected to the primary side of the preceding band-pass filter. The characteristics of the D.C. voltage gain ($\triangle V$) across the load resistor as a function of the unmodulated R.F. signal, as well as that of the A.F. voltage (V_{LF}) across the resistor of 0.5 megohm as plotted against the 30 % modulated R.F. voltage on one of the diodes, are identical with those relating to the EB 4, to which reference may be made for details.

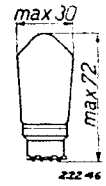


Fig. 1
Dimensions in mm.

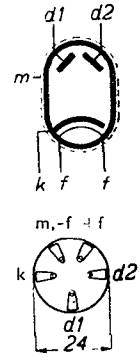


Fig. 2
Arrangement of electrodes and base connections.

HEATER RATINGS

Heating: indirect by battery, parallel supply.

Heater voltage	V_f	= 2.0 V
Heater current	I_f	= 0.095 A

CAPACITANCES

$C_{d_1d_2} < 0.25$ $\mu\mu$F
$C_{kd_1} = 2.1$ $\mu\mu$F
$C_{kd_2} = 1.7$ $\mu\mu$F

MAXIMUM RATINGS

Voltage on diode (peak value)	$V_{d_1} = V_{d_2}$	= max. 125 V
Diode current	$I_{d_1} = I_{d_2}$	= max. 0.5 mA
Voltage between heater and cathode	V_{fk}	= max. 50 V
External resistance between heater and cathode	R_{fk}	= max. 20,000 ohms

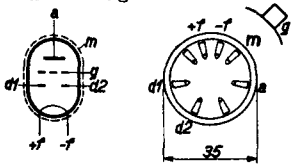
PHILIPS

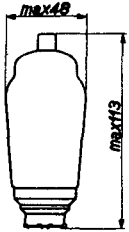
KBC 1

DUODIODE-TRIODE for use as L.F. amplifier
DUODIODE-TRIODE pour utilisation comme amplificatrice B.F.
DUODIODE-TRIODE zur Verwendung als N.F. Verstärker

Heating: direct by battery; parallel supply
Chauffage: direct par batterie; alimentation en parallèle — Vf = 2,0 V, If = 0,115 A
Heizung: direkt durch Batteriestrom; Parallelspeisung

Dimensions in mm
Dimensions en mm
Abmessungen in mm





Capacities Capacités Kapazitäten	Triode section Partie triode Triodenteil	Diode section Partie diode Diodenteil
	Ca = 6,5 pF	Cd1 = 2,7 pF
	Cg = 3,0 pF	Cd2 = 2,5 pF
	Cag = 3,1 pF	Cd1d2 < 0,5 pF

Between triode and diode sections
Entre les parties triode et diode
Zwischen Trioden- und Diodenteil

Cd1g < 0,003 pF
Cd2g < 0,003 pF

Typical characteristics of the triode section
Caractéristiques typiques de la partie triode
Kenndaten des Triodenteiles

Va =	90	135	V
Ia =	1	2,5	mA
Vg =	-3,4	-4,5	V
μ =	16	16	
S =	0,7	1	mA/V
Ri =	23	16	kΩ

Operating characteristics of the triode section
Caractéristiques d'utilisation de la partie triode
Betriebsdaten des Triodenteiles

Vb (V)	Ra (MΩ)	Vg (V)	Ia (mA)	Vo (Veff)	$\frac{Vo}{Vi}$	d_{tot} (%)
135	0,2	-2	0,35	5	12,5	0,7
135	0,2	-2	0,35	8	12,5	1,2
135	0,1	-2	0,69	5	12	0,7
135	0,1	-2	0,69	8	12	1,2
135	0,05	-2	1,25	5	11	0,8
135	0,05	-2	1,25	8	11	1,3
90	0,2	-2	0,19	3	11	0,8
90	0,2	-2	0,19	5	11	1,3
90	0,1	-2	0,36	3	11	0,8
90	0,1	-2	0,36	5	11	1,3
90	0,05	-2	0,60	3	10	1,0
90	0,05	-2	0,60	5	10	1,6

Limiting values of the triode section
Caractéristiques limites de la partie triode
Grenzdaten des Triodenteiles

Va	= max.	150 V
Wa	= max.	0,6 W
Ik	= max.	6 mA
Vg (Ig = +0,3 μA)	= max.	-0,2 V
Rg	= max.	3 MΩ

Limiting values of the diode section
Caractéristiques limites de la partie diode
Grenzdaten des Diodenteiles

Vd1[1)]	= max.	125 V
Id1	= max.	0,2 mA
Vd2[1)]	= max.	125 V
Id2	= max.	0,2 mA
Vd2(Id2= +0,3 μA)	= max.	-0,4 V

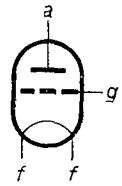
1) Peak value; Valeur de crête; Scheitelwert



KBC1

page	sheet	date
1	1	1948.09.08
2	2	1948.09.08
3	FP	1999.07.16

KC 1 Triode



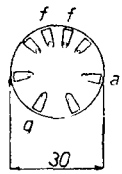


Fig. 2
Arrangement of electrodes and base connections.

This triode is useful as an A.F. amplifier valve, anode-bend detector, or oscillator in battery receivers. Its use as a grid detector is not recommended, since the maximum alternating output voltage is then usually insufficient for the output stage. In the case of A.F. amplification, care must be taken that the A.F. gain following the grid of this valve is not made too great, as this is liable to set up microphony.

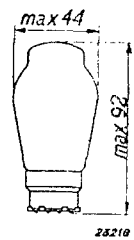


Fig. 1
Dimensions in mm.

FILAMENT RATINGS

Heating: direct by battery; parallel supply.

Filament voltage	$V_f = 2.0$ V
Filament current	$I_f = 0.065$ A

CAPACITANCES

$C_{ag} = 3.5\ \mu\mu F$
$C_a = 2.0\ \mu\mu F$
$C_g = 3.0\ \mu\mu F$

STATIC DATA

Anode voltage		
V_a	= 90 V	135 V
Anode current		
I_a	= 0.3 mA	1.2 mA
Grid bias		
V_g	= —1.5 V	—1.5 V
Internal resistance		
R_i	= 60,000 ohms	40,000 ohms
Amplification factor		
μ	= 25	25

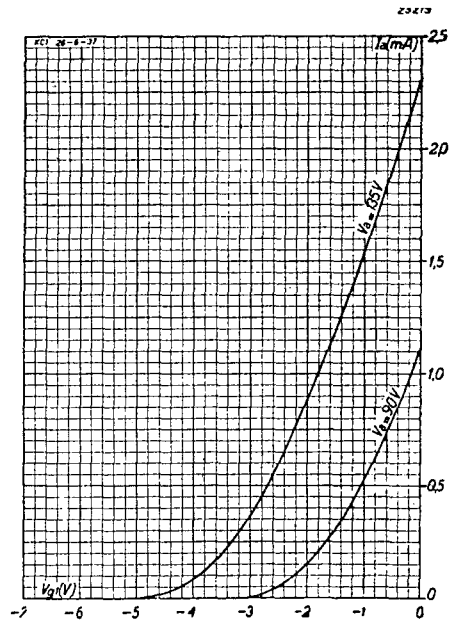


Fig. 3
Anode current as a function of the grid bias, with V_a = 90 V and 135 V.

MAXIMUM RATINGS

V_a	= max. 150 V
W_a	= max. 0.5 W
I_k	= max. 4 mA
V_g (I_g = + 0.3 μA)	= max. —0.2 V
R_{gf}	= max. 3 M ohms

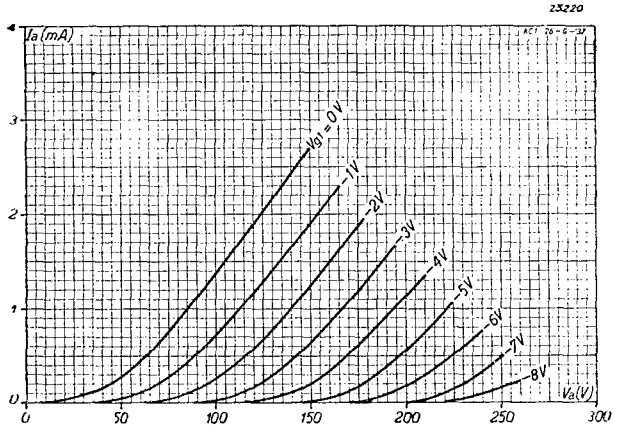


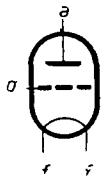
Fig. 4
Anode current as a function of the anode voltage with grid bias as parameter.

TABLE

KC 1 used as a resistance-coupled A.F. amplifier

Battery voltage	Coupling resistor	Anode current	Grid bias	For an alternating output voltage of 7 Veff		For an alternating output voltage of 10 Veff	
				Gain	Distortion	Gain	Distortion
Vb (V)	Ra (megohms)	Ia (mA)	Vg (V)	$\frac{Vo}{Vi}$	$d$tot (%)	$\frac{Vo}{Vi}$	$d$tot %
90	0.32	0.08	—1.5	14.6	2.7	—	—
90	0.32	0.13	—0.75	16.7	1.6	—	—
135	0.32	0.18	—1.5	—	—	19	1.0
135	0.32	0.23	—0.75	—	—	20	0.8
90	0.2	0.11	—1.5	14.3	4	—	—
90	0.2	0.17	—0.75	16.2	1.5	—	—
135	0.2	0.26	—1.5	—	—	18	1.0
135	0.2	0.32	—0.75	—	—	18.5	0.8

KC 3 Triode



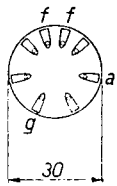


Fig. 2
Arrangement of electrodes and base connections.

This triode is a driver valve for Class B output stages in which the grid of the output valve passes a certain amount of current. In view of the high power required for the excitation of a Class B output circuit in which grid current flows, the filament consumption is on the high side.
The KC 3 should be employed only in conjunction with the Class B output valve KDD 1, using a driver transformer having a ratio of 2 : (1 + 1).
The sensitivity of the combination of KC 3 and KDD 1 valves is so high that the KF 4, connected as A.F. amplifier or detector, may precede it only when operating below its maximum amplification; otherwise the receiver becomes microphonic.

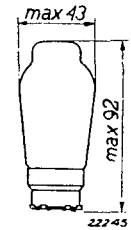


Fig. 1
Dimensions in mm

FILAMENT RATINGS

Heating: direct by battery; parallel supply.

Filament voltage	V_f = 2.0 V
Filament current	I_f = 0.21 A

CAPACITANCES

C_{ag} = max. 6.3 $\mu\mu$F

STATIC DATA

Anode voltage	V_a = 90	135 V
Grid bias	V_g = —1.6	—2.8 V
Anode current	I_a = 2	3 mA
Mutual conductance	S = 2.2	2.5 mA/V
Internal resistance	R_i = 14,000	12,000 ohms
Amplification factor	μ = 25	25

MAXIMUM RATINGS

V_a	= max. 150 V
W_a	= max. 1 W
I_k	= max. 7 mA
V_g (I_g = + 0.3 μA)	= max. —0.4 V
R_{gf}	= max. 3 M ohms

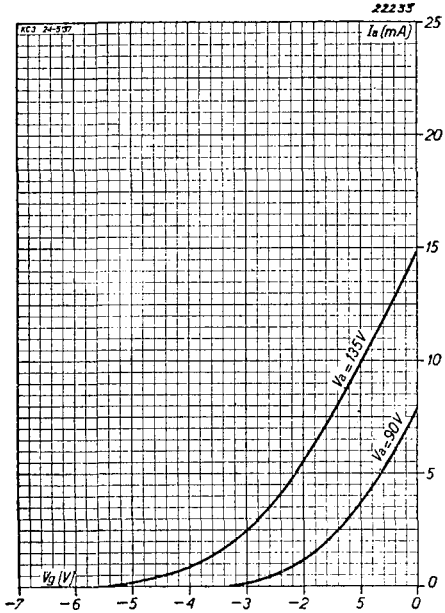


Fig. 3
Anode current as a function of the grid bias.

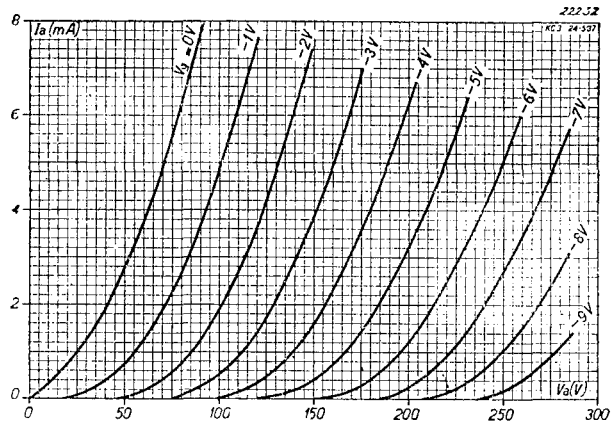


Fig. 4
Anode current as a function of the anode voltage for different values of grid bias.

KC 4 Triode

The triode KC 4 can be used either as oscillator valve for the frequency-changer KH 1, or as A.F. amplifier. In the last-mentioned case the total A.F. gain, as from the grid of the valve, should not be too high, as this may result in microphony.

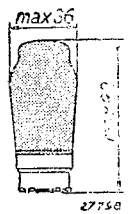


Fig. 1
Dimensions in mm

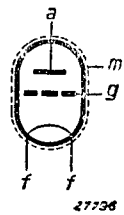
FILAMENT RATINGS

Heating: direct by battery; parallel supply.

Filament voltage	V_f	= 2.0 V
Filament current	I_f	= 0.1 A

CAPACITANCES

C_{ag} = 2.9 $\mu\mu$F
C_{gf} = 2.1 $\mu\mu$F
C_{af} = 5 $\mu\mu$F



STATIC DATA

Anode voltage	V_a	= 90	135 V
Grid bias	V_g	= —1.5	—1.5 V
Anode current	I_a	= 0.5	2.2 mA
Amplification factor	μ	= 30	30
Internal resistance	R_i	= 37,500	21,500 ohms
Mutual conductance	S	= 0.8	1.4 mA/V

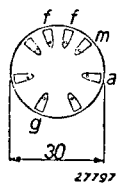


Fig. 2
Arrangement of electrodes and base connections

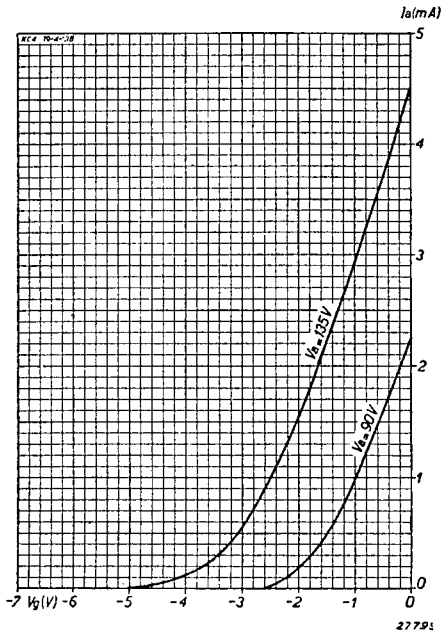


Fig. 3
Anode current as a function of the grid bias, with Va = 90 and 135 V.

OPERATING DATA: KC 4 used as resistance-coupled A.F. amplifier

Battery voltage Vb (V)	Coupling resistor (M ohms)	Grid bias V_g (V)	Anode current Ia (mA)	Stage gain $\frac{Vo}{Vi}$	For valve KL 1 $Va = Vb$		For valve KL 2 $Va = Vb$		For valve KL 4 $Va = Vb$	
					Vo (Veff)	$d$tot (%)	Vo (Veff)	$d$tot (%)	Vo (Veff)	$d$tot (%)
135	0.2	—1.5	0.32	21.5	4.2	< 1	8	1.2	5	< 1
90	0.2	—1.5	0.15	18.5	3	1.5	5	2.3	3.3	1
135	0.1	—1.5	0.52	20	4.2	< 1	8	1.3	5	< 1
90	0.1	—1.5	0.23	16.5	3	1.7	5	2.9	3.3	1.1
135	0.05	—1.5	0.8	17.5	4.2	< 1	8	1.6	5	< 1
90	0.05	—1.5	0.32	13.5	3	2.8	5	4	3.3	1.5

MAXIMUM RATINGS

Anode voltage . . . . . V_a = max. 150 V
Anode dissipation . . . . . W_a = max. 0.5 W
Cathode current . . . . . I_k = max. 5 mA
Grid voltage at grid current start . . (I_g = + 0.3 μA) V_g = max. —0.2 V
External resistance between grid and filament . . . . . R_{gf} = max 3 M ohms

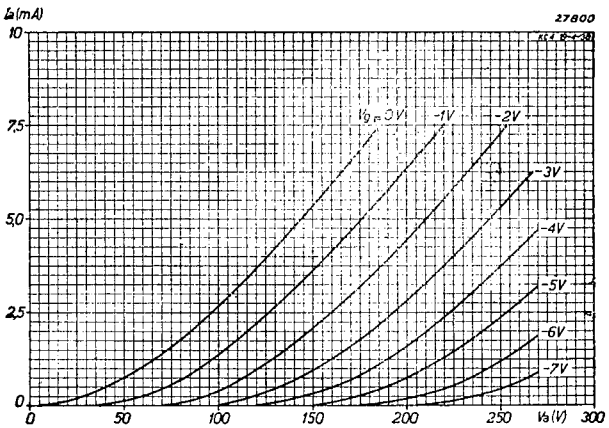


Fig. 4
Anode current as a function of the anode voltage for various values of grid bias.

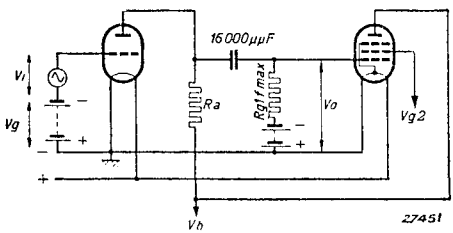


Fig. 5
Theoretical diagram of circuit employing resistance-coupled amplification and illustrating the symbols used in the data.

KC 50

Heizung dir., batterie, Parallelschaltung	Vf	2,0	V
Chauffage dir., battérie alimentation en parallèle	If	0,05	A
Heatung dir., Battery, parallel filament supply . .			

Kapazitäten	Cag	1,6	µµF
Capacités	Cg	3,8	µµF
Capacities	Ca	5,4	µµF

Betriebsdaten
Caractéristiques de service.
Operating conditions.

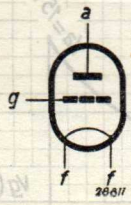
Va	20	40	V
Ia	100	250	µA
Vg	-0,15	-0,25	V
S	0,2	0,4	mA/V
Ri	150,000	80,000	Ω
µ	30	32	

Grenzdaten.
Limites fixées pour les caractéristiques.
Limiting values.

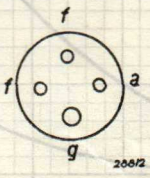
Va	max.	100	V
Rg	max.	1	MΩ
Vg (Ig = ± 0,3 µA)	max.	0	V

Die KC 50 ist eine Triode met sehr kleinen Abmessungen für Verwendung in kompakten Geräten z.B. Geräte für Schwerhörigen.
La KC 50 est une triode avec des dimensions très reduites pour l'emploi dans des appareils très compactes comme p.e. des amplificateurs pour les sourdes.
The KC 50 is a triode with very small dimensions for use in compact equipment such as e.g. deaf aid apparatus.

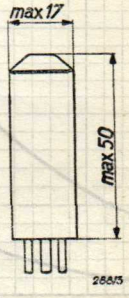
Elektrodenanordnung, Sockelanschlüsse und max. Abmessungen in mm.
Disposition des électrodes, connexions du culot et dimensions max. en mm.
Electrode arrangement, base connections and max. dimensions in mm.



2661/1



2661/2

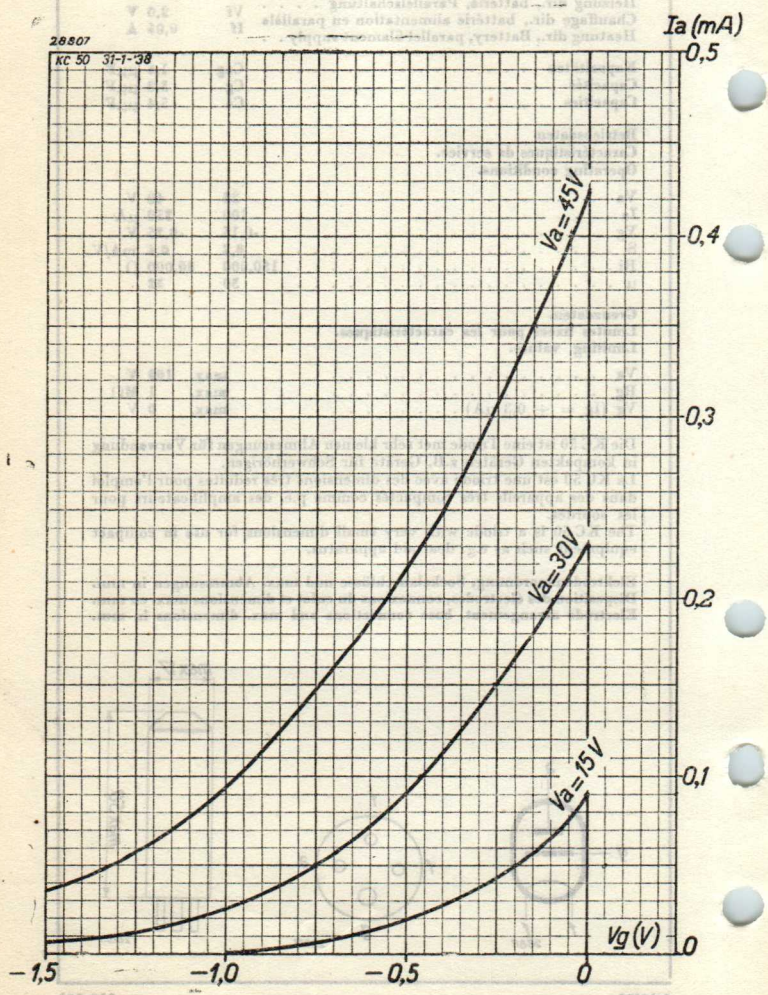


2661/3

KC 50

PHILIPS „MINIWATT"

KC 50



PHILIPS „MINIWATT"

KC 51

KC 51

Heizung dir., Batterie, Parallelschaltung	Vf	2,0	V
Chauffage dir., battérie, alimentation en parallèle	If	0,05	A
Heating dir., battery, parallel filament supply .			

Kapazitäten	Cag	1,4	µµF
Capacités	Cg	3,4	µµF
Capacities	Ca	5,4	µµF

Betriebsdaten.
Caractéristiques de service.
Operating conditions.

Va	20	40	V
Ia	0,5	1,25	mA
Vg	-0,9	-2,15	V
S	0,35	0,5	mA/V
Ri	18900	13600	Ω
µ	6,6	6,9	

Grenzdaten.
Limites fixées pour les caractéristiques.
Limiting values.

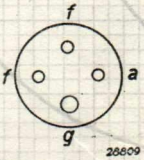
Va	max. 100	V
Rg	max. 1	MΩ
Vg (Ig = ±0,3 µA)	max. 0,3	V

Die KC 51 ist eine Triode mit sehr kleinen Abmessungen für Verwendung in kompakten Geräten z.B. Geräte für Schwerhörigen.
La KC 51 est une triode avec des dimensions très réduites pour l'emploi dans des appareils très compactes comme p.e. des amplificateurs pour les sourdes.
The KC 51 is a triode with very small dimensions for use in compact equipment such as e.g. deaf aid apparatus.

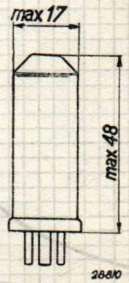
Elektrodenanordnung, Sockelanschlüsse und max. Abmessungen in mm.
Disposition des électrodes, connexions du culot et dimensions max. en mm.
Electrode arrangement, base connections and max. dimensions in mm.



28808



28809

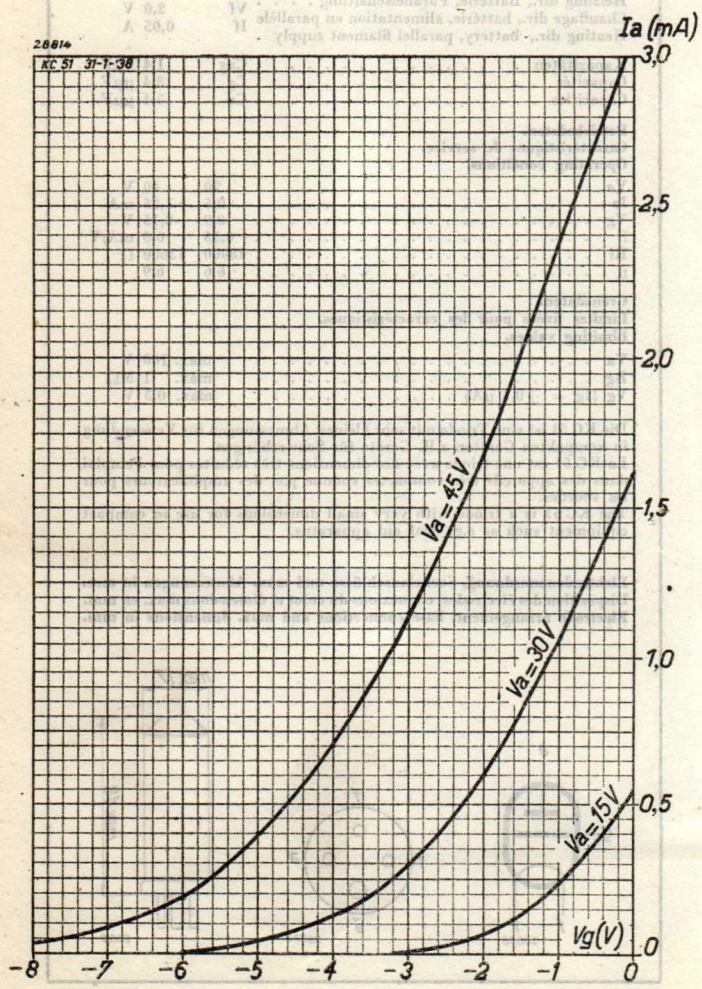


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KC 51

PHILIPS „MINIWATT"

KC 51



KCH 1 Triode-hexode

The KCH 1 is a frequency-changer for battery superheterodyne receivers. It consists of a combination of hexode for mixing the input signal with the signal generated by the oscillator, and a triode for use as the latter.

Every effort has been made in the development of this valve to attain the highest possible conversion conductance, with a low filament current consumption. The main object was to produce a mixer valve for battery receivers that would give a reliable performance on short waves and also permit of automatic gain control on that wave range, with a minimum of interference due to frequency drift and so on.

Because of the rapid control required in battery receivers, great care has been taken to ensure good characteristics from the aspect of cross-modulation. A variation in the grid bias of from —0.5 to —17 V, with an anode potential of 135 V and "sliding" screen voltage, is sufficient to reduce the conversion conductance to one-hundredth. Without control the conversion conductance is 325 μA/V.

The screen-grid voltage of the hexode section of the KCH 1 may be arranged so as to be self-adjusting; this saves the current that would otherwise pass through the potential divider and operates the valve as economically as possible. On a battery voltage of 135 V, with a resistor of 67,000 ohms in series with the screen, the total load on the anode battery is only 5 mA. With a fixed screen potential, control of the conversion conductance is considerably more rapid, but the cross-modulation characteristics are not so favourable.

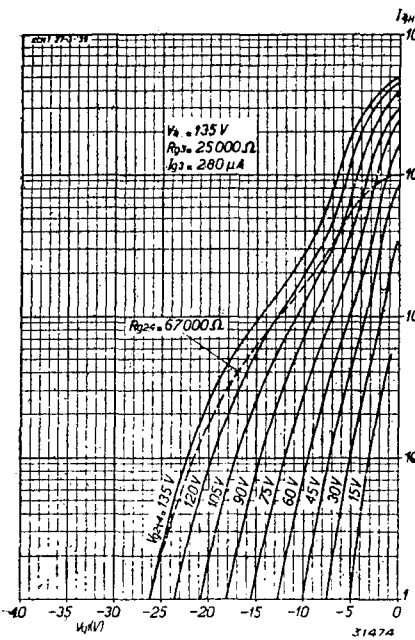


Fig. 3
Anode current of the hexode unit as a function of the grid bias, with the screen-grid voltage as parameter. The broken lines show the anode current in the case of the controlled valve, with the screen fed from the 135 V battery through a resistor of 67,000 ohms.

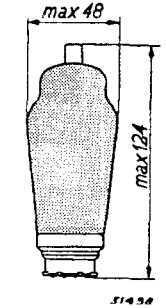
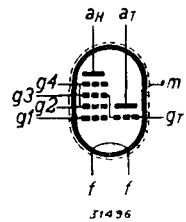


Fig. 1
Dimensions in mm.



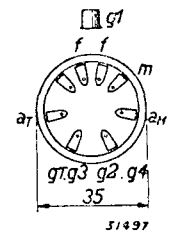


Fig. 2
Arrangement of electrodes and base connections.

Further, when the valve is operated on a fixed screen voltage the internal resistance during the control period, even on a low battery voltage, increases rapidly, whereas if a screen series resistor is used the internal resistance commences to decrease. This is explained by the fact that the screen voltage, when self-adjusting, closely approaches the same value as the anode voltage when control is applied; due to secondary emission the internal resistance drops, until the anode voltage has decreased so far in response to

the control that the internal resistance again rises. The curve relating to the internal resistance of the valve when under control, as a function of the grid bias, shows a decrease at —5 V. At V_a = 135 V and $R_{g2,4}$ = 67,000 ohms, the internal resistance diminishes to 0.5 megohm, whilst on V_a = 90 V and $V_{g2,4}$ = 29,000 ohms the minimum is 0.1 megohm. Although a value of 0.5 megohm is still quite serviceable, 0.1 megohm must be regarded as too low, as the selectivity of the associated I.F. circuit is then reduced too much. On a low battery voltage, therefore, a fixed screen voltage will normally be preferred, or alternatively, potential-divider feed; the latter need take only a very small amount of current, viz. 0.5—1 mA.

Much attention has been given to the oscillator section of this valve to ensure reliable oscillation when the valve is to be used in conjunction with ordinary standard coils and circuits. Every effort has also been made to procure the highest possible conductance in the triode section at the threshold of oscillation; this is 1.3 mA/V at an anode potential of 70 V, and constant oscillation is thus guaranteed.

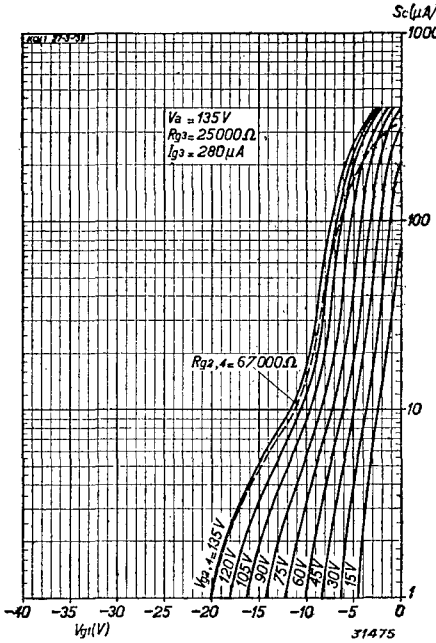


Fig. 4
Conversion conductance as a function of the grid bias, with the screen voltage as parameter. The broken line refers to the conductance when control is applied to the valve, with the screen fed from the 135 V battery through a resistor of 67,000 ohms.

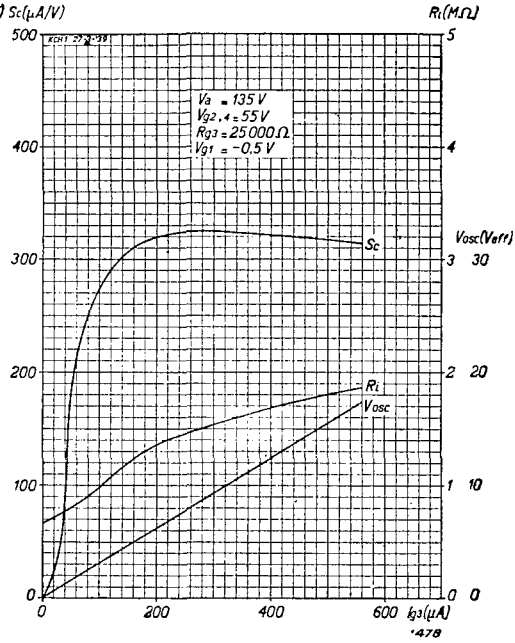


Fig. 5
Conversion conductance *Sc*, internal resistance *Ri* and effective oscillator voltage *Vosc* as functions of the oscillator-grid current I_{g_3} (grid leak of oscillator, R_{g_3} = 25,000 ohms), at V_a = 135 V and a fixed screen voltage of 55 V.

FILAMENT RATINGS

Heating: direct by battery; parallel supply.

Filament voltage	V_f = 2.0 V
Filament current	I_f = 0.18 A

CAPACITANCES

a. Hexode section.	b. Triode section.	Between hexode and triode.
$C_{g1} = 7$ $\mu\mu$F	$C_{gf} = 13.5$ $\mu\mu$F	$C_{gTg1H} < 0.4$ $\mu\mu$F
$C_a = 16$ $\mu\mu$F	$C_{af} = 3.6$ $\mu\mu$F	
$C_{ag1} < 0.05$ $\mu\mu$F	$C_{ag} = 3.5$ $\mu\mu$F	

OPERATING DATA: Hexode section

a) FIXED SCREEN-GRID VOLTAGE

Anode voltage .	V_a	=	90 V			135 V		
Screen-grid voltage. . . .	$V_{g2,4}$	=	55 V			55 V		
Grid leak. . . .	R_{g3}	=	25,000 ohms			25,000 ohms		
Oscillator-grid current. . . .	I_{g3}	=	280 μA			280 μA		
Grid bias. . . .	V_{g1}	=	—0.5 [1]	—8 [2]	—9.5 [3]	—0.5 [1]	—8 [2]	—9.5 [3]
Anode current .	I_a	=	1 mA	—	—	1 mA	—	—
Screen current .	$I_{g2,g1}$	=	1.2 mA	—	—	1.2 mA	—	—
Conversion conductance .	S_c	=	320	3	1	325	3	1 μA/V
Internal resistance . .	R_i	=	0.7	> 4	> 5	1.5	> 10	> 10 M ohms

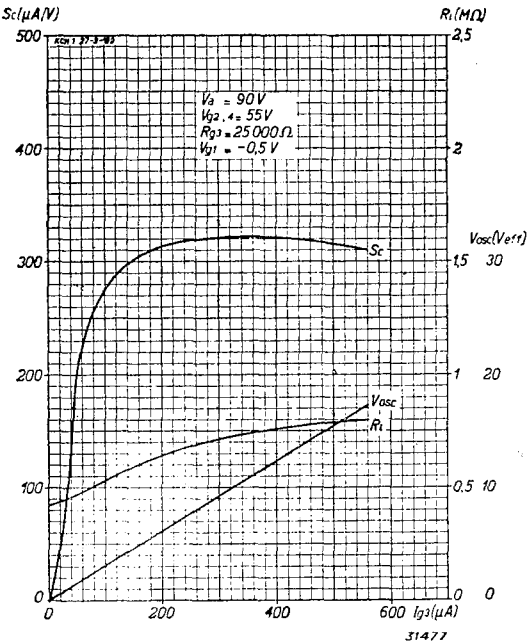


Fig. 6
Conversion conductance *Sc*, internal resistance *Ri* and effective oscillator voltage *Vosc* as functions of the oscillator-grid current Ig_3 (oscillator grid leak Rg_3 = 25,000 ohms), with Va = 90 V and fixed screen voltage of 55 V.

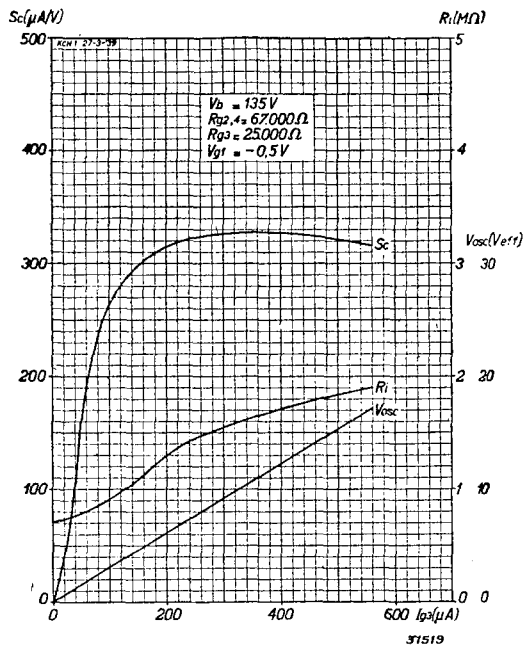


Fig. 7
Conversion conductance *Sc*, internal resistance *Ri* and effective oscillator voltage *Vosc* as functions of the oscillator-grid current Ig_3 (oscillator grid leak Rg_3 = 25,000 ohms), with Va = 135V and screen fed from 135 V battery through a resistor of 67,000 ohms.

b) WITH SCREEN SERIES RESISTOR

Anode voltage .	V_a	=	90 V			135 V		
Screen series resistor	$R_{g2,4}$	=	29,000 ohms			67,000 ohms		
Grid leak	R_{g3}	=	25,000 ohms			25,000 ohms		
Oscillator grid current	I_{g3}	=	280 μA			280 μA		
Grid bias	V_{g1}	=	−0.5 [1]	−12 [2]	−15 [3]	−0.5 [1]	−17 [2]	−20 V [3]
Screen-grid voltage	$V_{g2,4}$	=	55	—	90	55	—	135 V
Anode current .	I_a	=	1	—	—	1	—	— mA
Screen-grid current	$I_{g2,g4}$	=	1.2	—	—	1.2	—	— mA
Conversion conductance .	S_c	=	320	3	1	325	3	1 μA/V
Internal resistance . .	R_i	=	0.7 [4]	> 0.9	> 1	1.5 [5]	> 1	> 1.5 M ohms

For footnotes see next page.

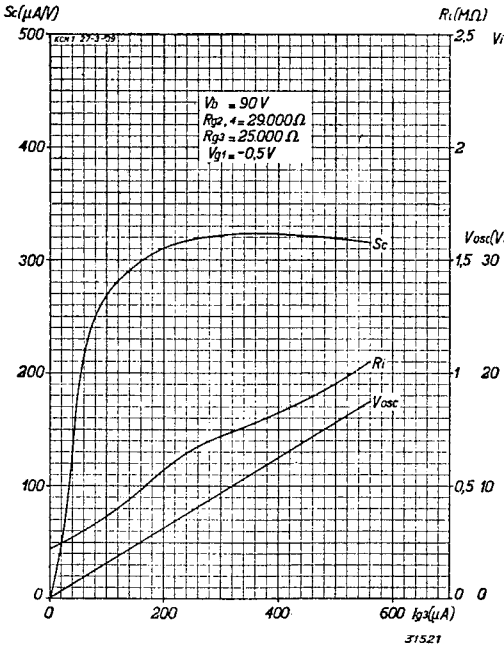


Fig. 8
Conversion conductance *Sc*, internal resistance *Ri* and effective oscillator voltage *Vosc* as functions of the oscillator-grid current Ig_3 (oscillator grid leak Rg_3 = 25,000 ohms), with Va = 90 V and screen fed from 90 V battery through a resistor of 29,000 ohms.

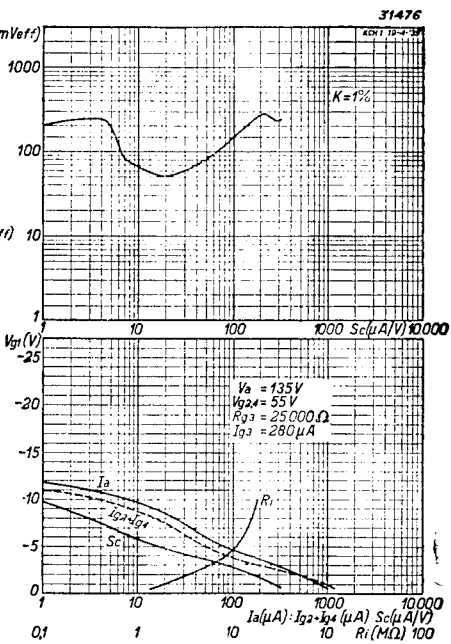


Fig. 9
With 135 V anode voltage and fixed screen voltage 55 V;
Upper diagram. Alternating grid voltage of interfering signal (effective value) as a function of the conversion conductance, with 1 % cross-modulation.
Lower diagram. Conversion conductance *Sc*, anode current *Ia*, screen current $Ig_2 + Ig_4$ and internal resistance *Ri* as functions of the grid bias Vg_1.

c) SCREEN FED FROM A POTENTIAL DIVIDER

Anode voltage	V_a	=	90 V			90 V		
Potential divider resistor	R_1 [6])	=	16,000 ohms			22,000 ohms		
Potential divider resistor	R_2 [6])	=	55,000 ohms			110,000 ohms		
Potentiometer current	I_p	=	1 mA			0.5 mA		
Grid leak	R_{g3}	=	25,000 ohms			25,000 ohms		
Oscillator-grid current	I_{g3}	=	280 μA			280 μA		
Grid bias	V_{g1}	=	—0.5 [1])	—9.5 [2])	—11 V [3])	—0.5 [1])	—10 [2])	—12 [3]) V
Screen-grid voltage	$V_{g2,1}$	=	55	—	70 V	55	—	75 V
Anode current	I_a	=	1	—	— mA	1	—	— mA
Screen current	$I_{g2,g1}$	=	1.2	—	— mA	1.2	—	— mA
Conversion conductance	S_c	=	320	3	1	325	3	1 μA/V
Internal resistance	R_i	=	0.7	> 2	> 3	0.7	> 1.5	> 2.5 M ohms

[1]) Without control
[2]) Conversion conductance controlled to 1 : 100
[3]) Limit of control
[4]) With a grid bias of –5 V the internal resistance is approx. 0.1 megohm
[5]) With a grid bias of –6 V the internal resistance is approx. 0.4 megohm
[6]) See circuit diagram, Fig. 16.

OPERATING DATA: triode section used as oscillator

Anode voltage	V_a	=	70	—	— V
Battery voltage	V_b	=	—	90	135 V
Anode series resistor	R_a	=	—	22,000	22,000 ohms
Anode current with I_g = 280 μA and R_{g1} = 25,000 ohms	I_a	=	3	2	3 mA
Anode current ($V_g = 0$, $I_g = 0$)	I_a	=	2.4	—	— mA
Mutual conductance at threshold of oscillation ($V_g = 0$, $I_g = 0$)	S_o	=	1.3	1.1	1.3 mA/V
Amplification factor, with $V_g = 0$, $I_g = 0$	μ	=	28	28	28

MAXIMUM RATINGS: Hexode section

Anode voltage	V_a	= max. 135 V
Anode dissipation	W_a	= max. 1.5 W
Screen-grid voltage without control on the valve (I_a = 1 mA)	$V_{g2,1}$	= max. 60 V
Screen voltage, valve under control (I_a < 0.2 mA)	$V_{g2,4}$	= max. 135 V
Screen-grid dissipation	$W_{g2,4}$	= max. 1 W
Cathode current	I_k	= max. 8 mA
External resistance between control grid and cathode	R_{g1k}	= max. 3 M ohms
Grid voltage at grid current start (I_{g1} = + 0.3 μA)	V_{g1}	= max. —0.2 V

MAXIMUM RATINGS: Triode section

Anode voltage	V_a	= max. 80 V
Anode dissipation	W_a	= max. 0.5 W
Grid voltage at grid current start (I_g = + 0.3 μA)	V_g	= max. — 0.2 V
External resistance between grid and cathode . . .	R_{gk}	= max. 50,000 ohms

APPLICATIONS

A few further remarks may be added to the above. In order to limit frequency drift as much as possible, the oscillator circuit should be connected to the anode of the triode unit of the KCH 1; the reaction coil is therefore connected to the grid. At a wavelength of 15 metres, the drift will then be 3 kc/s with a grid voltage variation of from —2 to —15 V, which means that this valve is quite suitable for automatic gain control in the short-wave range. For the medium and long waves, the "bottom" end of the reaction coil should be connected to the "top" of the padding capacitor; the inductive coupling will then be assisted by the capacitive reaction through the

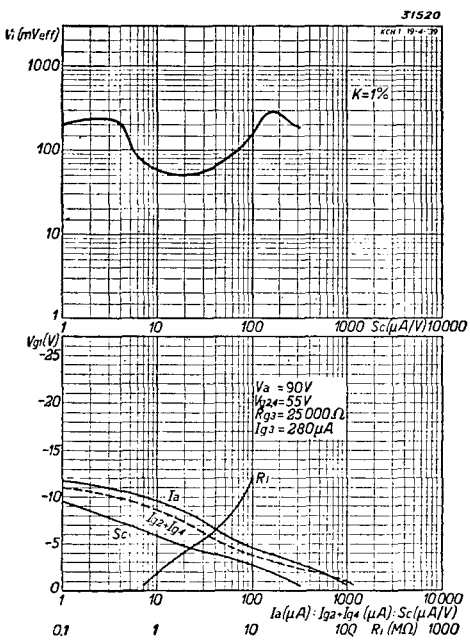


Fig. 10
With 90 V anode voltage and fixed-screen voltage of 55 V:
Upper diagram. Alternating grid voltage of the interfering signal (effective value) as a function of the conversion conductance, with 1 % cross-modulation.
Lower diagram. Conversion conductance *Sc*, anode current *Ia*, screen-grid current $Ig_2 + Ig_4$ and internal resistance *Ri*, as functions of the grid bias Vg_1.

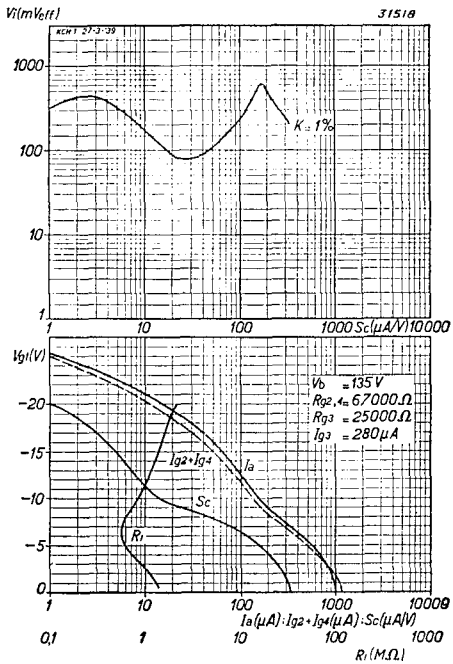


Fig. 11
With 135 V anode voltage and screen fed through a resistor of 67,000 ohms from a 135 V battery:
Upper diagram. Alternating grid voltage of the interfering signal (effective value) as a function of the conversion conductance with 1 % cross-modulation.
Lower diagram. Conversion conductance *Sc*, anode current *Ia*, screen-grid current $Ig_2 + Ig_4$ and internal resistance *Ri* as functions of the grid bias Vg_1.

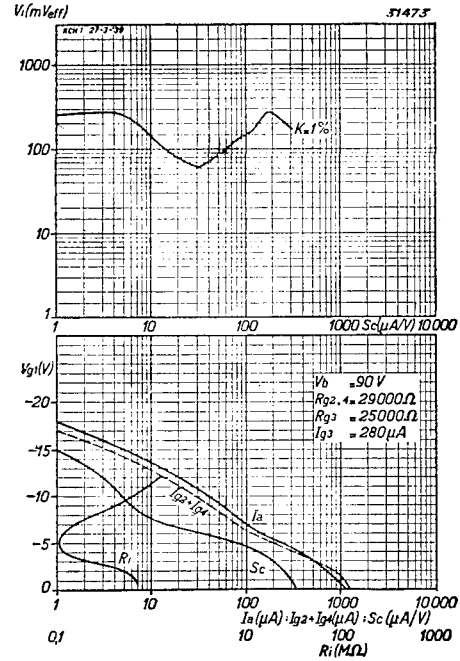


Fig. 12

With 90 V anode voltage and screen fed through a resistor of 29,000 ohms from a 90 V battery: *Upper diagram.* Alternating grid voltage of the interfering signal (effective value) as a function of the conversion conductance, with 1 % cross-modulation.

Lower diagram. Conversion conductance *Sc*, anode current *Ia*, screen-grid current $Ig_2 + Ig_4$ and internal resistance *Ri* as functions of the grid bias Vg_1.

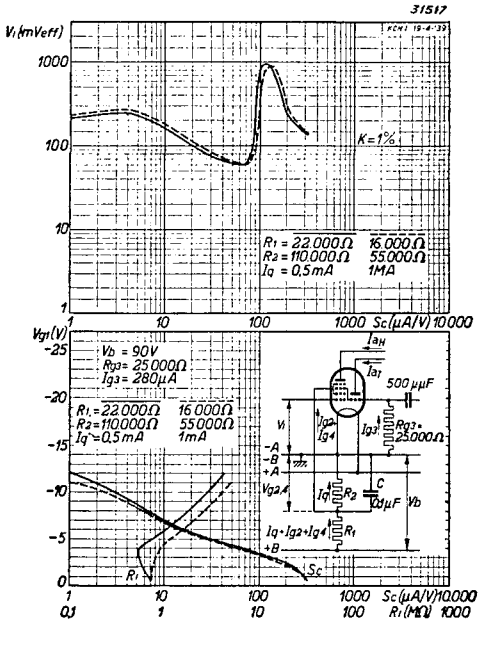


Fig. 13

With 90 V anode voltage and screen fed from a potential divider carrying a current of 0.5 mA (full line), or 1 mA (broken line):

Upper diagram. Alternating grid voltage of interfering signal (effective value), as a function of the conversion conductance, with 1 % cross-modulation.

Lower diagram. Conversion conductance *Sc*, and internal resistance *Ri*, as functions of the grid bias Vg_1.

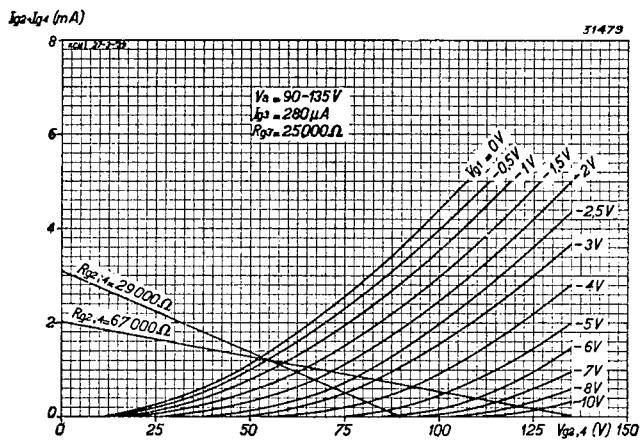


Fig. 14

Screen-grid current $Ig_2 + Ig_4$ as a function of the screen voltage $Vg_{2,4}$ with grid bias Vg_1 as parameter. The resistance lines for $Rg_{2,4}$ = 67,000 ohms for a battery voltage of 135 V, and for $Vg_{2,4}$ with reference to a 90 V battery are also given.

latter. This ensures more uniform oscillation throughout the whole wave-range. For short waves a padding capacitor is not usually employed. A grid capacitor of some 50 to 70 $\mu\mu$F will give reliable oscillation on long waves, with very little frequency drift on the short waves. A value of 25,000 ohms is recommended for the grid-leak resistor as this will prevent over-oscillation and will at the same time not damp the oscillator circuit too heavily. When a 135 V battery is used, it is advisable to feed the anode through a resistor of 22,000 ohms; this resistor is in parallel with the oscillator circuit for the high frequencies, thus slightly damping the circuit. Fig. 16 shows the circuit diagram of the KCH 1 when used on a 90 V or 135 V battery. If on a 90 V battery supply the resistor in series with the anode is any lower than 7,000 ohms, the damping of the oscillator circuit is considerably increased, but, on the other hand, if the 22,000 ohms resistor is used, the conductance at the threshold of oscillation will be reduced. With the last mentioned value, however, oscillation is more reliable, which is, of course, the more preferable result. To avoid any possibility of parasitic oscillation, a small resistor of 30 to 50 ohms can be included in the first grid circuit.

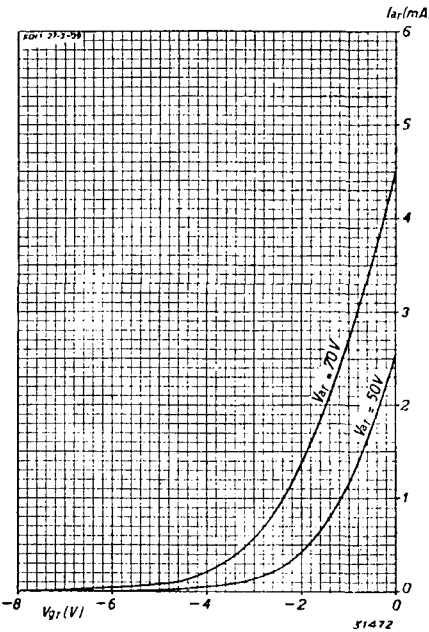


Fig. 15
Anode current of the triode section, IaT, as a function of the grid bias VgT, with VaT = 50 and 70 V.

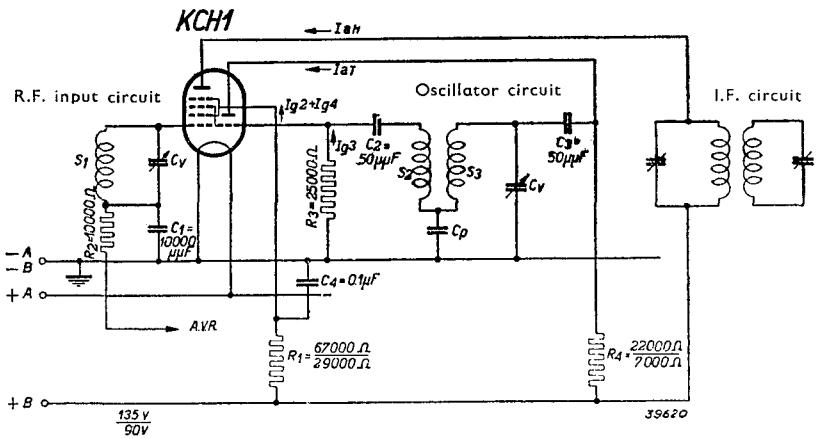


Fig. 16
Circuit diagram showing the KCH 1 employed as a frequency-changer in a battery receiver operated from a 135 V or 90 V battery.

PHILIPS „MINIWATT"

KD 50

KD 50

Heizung, dir., Batterie, Parallelschaltung . . .	Vf	2,0 V
Chauffage dir., battérie, alimentation en parallèle	If	0,055 A
Heating dir., battery, parallel filament supply . .		

Betriebsdaten.
Caractéristiques de service.
Operating conditions.

Va	20	40 V
Ia	0,5	1,8 mA
Vg1	1,0	2,8 V
S	0,35	0,63 mA/V
Ri	13500	7600 Ω
v	4,7	4,7

Grenzdaten.
Limites fixées pour les caractéristiques.
Limiting values.

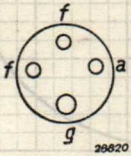
Va	max.	100 V
Rg1	max.	1,0 MΩ

Die KD 50 ist eine Triode mit sehr kleinen Abmessungen für Verwendung in kompakten Geräten z.B. Geräte für Schwerhörigen.
La KD 50 est une triode avec des dimensions très réduites pour l'emploi dans des appareils très compactes comme p.e. des amplificateurs pour les sourdes.
The KD 50 is a triode with very small dimensions for use in compact equipment such as e.g. deaf aid apparatus.

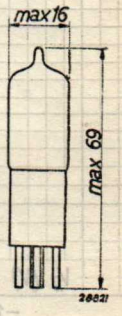
Elektrodenanordnung, Sockelanschlüsse and max. Abmessungen in mm.
Disposition des électrodes, connexions du culot et dimensions max. en mm.
Electrode arrangement, base connections and max. dimensions in mm,



28570



28620

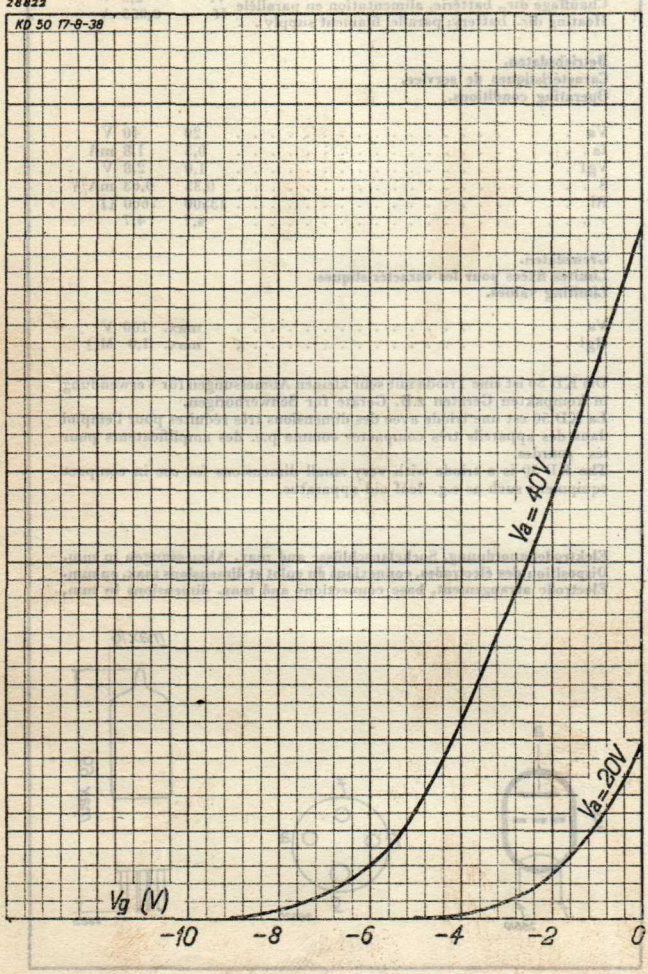


28621

KD 50

PHILIPS „MINIWATT"

KD 50



KDD 1 Class B output valve

The KDD 1 is, in effect, two triodes housed in a single envelope: it is intended for use in Class B output circuits operating with grid current and, in conjunction with a suitable driver valve, it will deliver 2.2 W without too much drain on the H.T. battery. The valve is of a type that requires no grid bias; without bias, grid current flows during almost the whole of the cycle of grid signal, thus avoiding any sudden surges of grid current in the secondary winding of the transformer, which would produce severe distortion of a very unpleasant character by reason of the clearly audible higher harmonics.

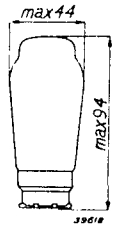


Fig. 1
Dimensions in mm

When there is no signal on the grid the anode current is extremely low, being only about 3 mA for the two anodes together, on 135 V; the current becomes appreciable only when the signal is applied. Consumption of anode current is roughly proportional to the alternating grid voltage, which means that a considerable saving may be effected, since the average current is much less than with maximum excitation. It is also possible to relieve the drain on the H.T. battery somewhat by turning down the receiver volume control to a low level. With a signal present on the grid, grid current flows in both of the triodes, and the driver valve must be capable of supplying the input required to load the valve fully.

The construction of the grid is such that grid current is limited to a minimum, whilst ensuring the greatest economy and sensitivity in the driver stage.

A suitable driver transformer, of ratio 2 : (1 + 1), should be used with the KDD 1 and the optimum matching impedance between anodes will in this case be 10,000 ohms.

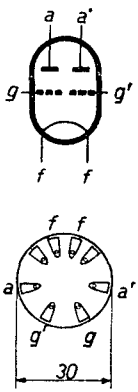


Fig. 2
Arrangement of electrodes and base connections.

FILAMENT RATINGS

Heating: direct by battery; parallel supply.

Filament voltage	V_f	= 2.0 V
Filament current	I_f	= 0.22 A

OPERATING DATA

Anode voltage	V_a	= 90 V	135 V
Grid voltage	V_g	= 0	0 V
Anode current (without signal)	I_{a0}	= 2 × 0.8	2 × 1.5 mA
Anode current at max. modulation	$I_{a\,max}$	= 2 × 8.5	2 × 14 mA
Output power at max. modulation	W_o	= 0.72 [1]	2.0 W [1]
Load resistor between anodes	R_{aa}	= 10,000	10,000 ohms
Alternating grid voltage of the driver valve	V_i	= 1.5 [1]	1.9 V_{eff} [1]
Total distortion	d_{tot}	= 6 [1]	10 % [1]

[1]) Measured with KC 3 as driver; transformation ratio 2 : (1 + 1).

MAXIMUM RATINGS PER SYSTEM

Anode voltage	V_a	= max. 150 V
Anode dissipation ($V_i = 0$)	W_a	= max. 0.35 W
Anode dissipation (W_o = max.)	W_a	= max. 1.5 W
Direct current per anode (average value)	I_a	= max. 20 mA

TABLE
VALVES KC 3 + KDD 1

Ratio of driver transformer $\frac{\text{prim. wdg.}}{\text{½ sec. wdg.}}$	$\frac{5}{3} = \frac{1.67}{1}$					$\frac{2}{1}$					$\frac{7}{3} = \frac{2.33}{1}$				
Load resistor between anodes R_{aa} (ohms)	5,000	7,500	10,000	15,000	20,000	5,000	7,500	10,000	15,000	20,000	5,000	7,500	10,000	15,000	20,000
Max. output power (limited by grid current of KC 3) (W)	1.8	2.2	2.2	2.2	1.9	1.6	2.0	2.2	2.1	1.8	1.5	1.8	2.0	2.0	1.8
Distortion with that output (%)	10	11	13	19	22	7.2	8.2	10	15	20	5	5.7	8.0	13	18
Combined anode current of both anodes with that output (mA)	35	32	32	24	20	33	30	28	23	19	31	29	27	22	19
Alternating grid voltage V_i for 50 mW output (sensitivity) (V_{eff})	0.31	0.26	0.22	0.19	0.17	0.35	0.29	0.25	0.22	0.20	0.39	0.32	0.29	0.25	0.22

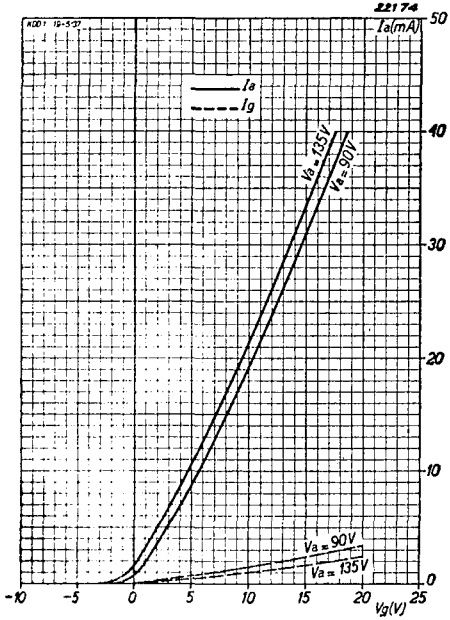


Fig. 3
Anode current and grid current as functions of the grid voltage.

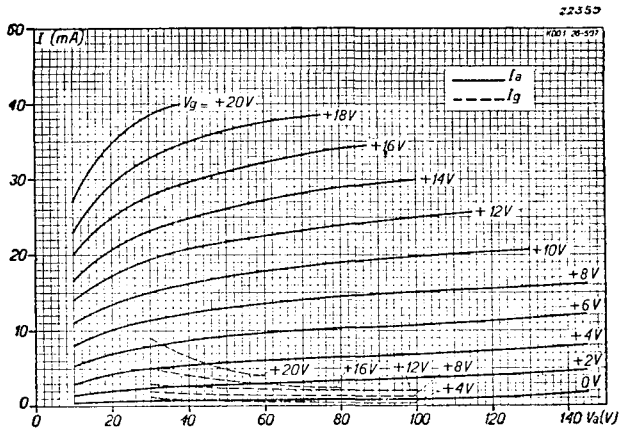


Fig. 4
Anode current and grid current as functions of the anode voltage, with grid voltage as parameter.

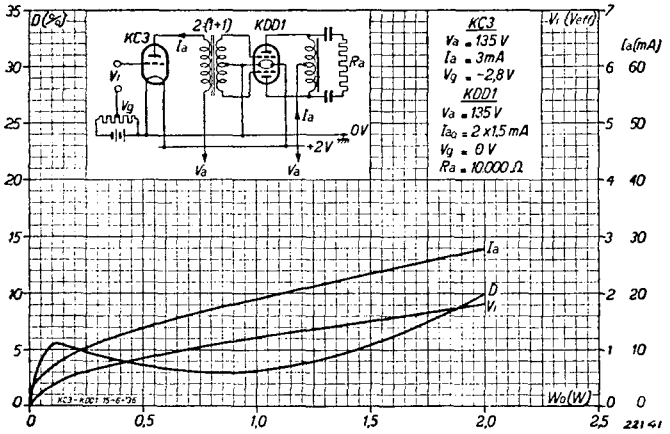


Fig. 5
Anode current, alternating grid voltage and total distortion d_{tot} as functions of the output power of the KDD 1 for an anode voltage of 135 V, using the KC 3 as driver valve.

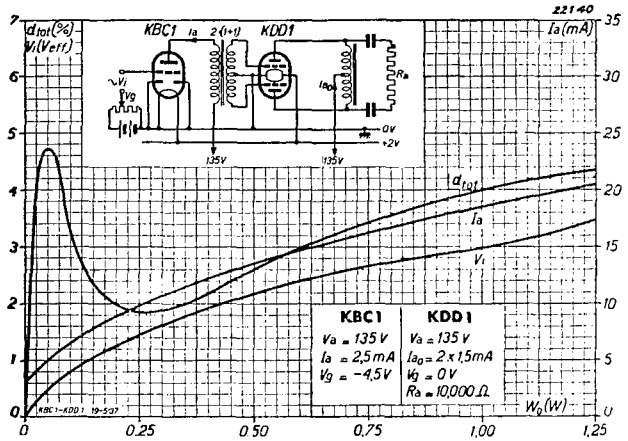


Fig. 6
Anode current, alternating grid voltage and total distortion d_{tot} as functions of the output power of the KDD 1 for an anode voltage of 135 V, using the KBC 1 as driver valve.

KE 50

Heizung dir., Batterie, Parallelschaltung	Vf	2,0 V
Chauffage dir., batterie, alimentation en parellèle	If	0,06 A
Heating dir., battery, parallel filament supply		
Kapazitäten	Cag1	0,07 μμF
Capacités	Cg1	5,7 μμF
Capacities	Ca	3,4 μμF

Betriebsdaten
Caractéristiques de service.
Operating conditions.

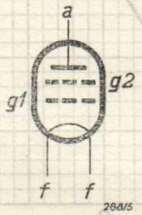
Va	120	120 V
Vg2	45	60 V
Ia	0,8	1,5 mA
Vg1	-2,0	-2,7 V
S	0,43	0,58 mA/V
Ri	0,65	0,5 MΩ

Grenzdaten.
Limites fixées pour les caractéristiques.
Limiting values.

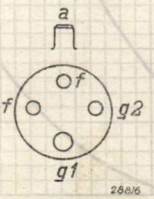
Va	max.	120 V
Vg2	max.	60 V
Rg1	max.	2,0 MΩ

Die KE 50 ist eine Tetrode mit sehr kleinen Abmessungen für Verwendung in kompakten Geräten z.B. Geräte für Schwehörigen.
La KE 50 est une tétrode avec des dimensions très réduites pour l'emploi dans des appareils très compactes comme p.e. des amplificateurs pour les sourdes.
The KE 40 is a tetrode with very small dimensions for use in compact equipment such as e.g. deaf aid apparatus.

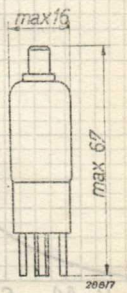
Elektrodenanordnung, Sockelanschlüsse und max. Abmessungen in mm.
Disposition des électrodes, connexions du culot et dimensions max. en mm.
Electrode arrangement base connections and max. dimensions in mm.



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268/6

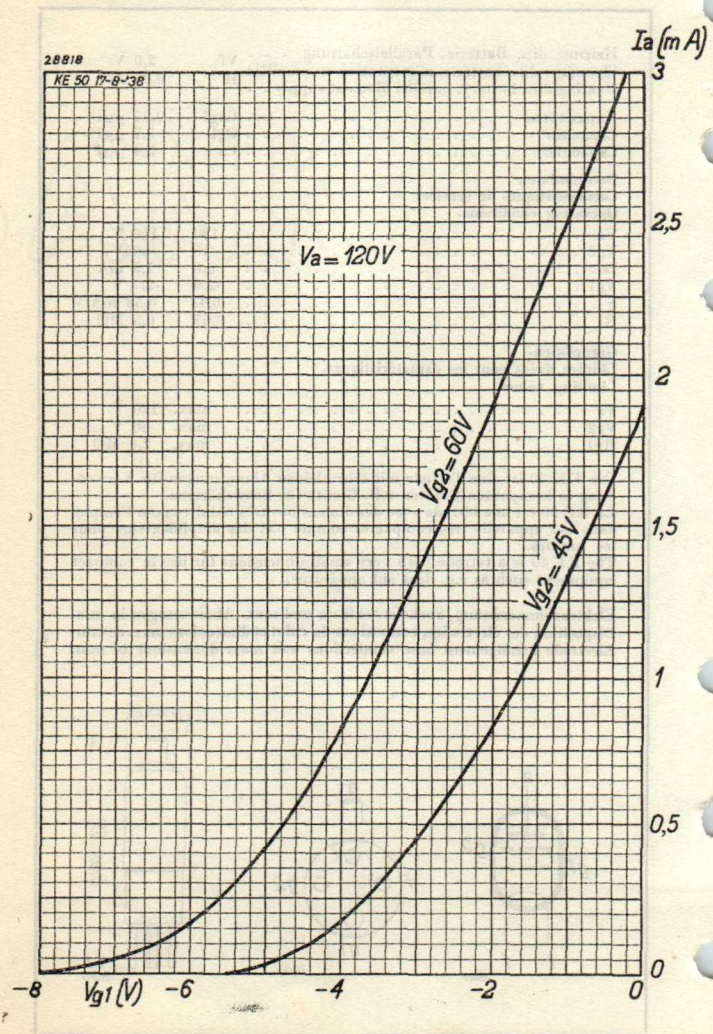


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KE 50

PHILIPS „MINIWATT"

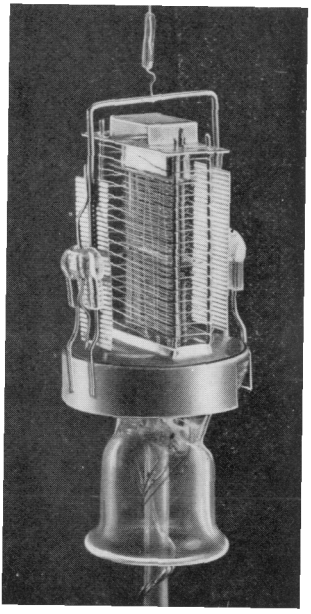
KE 50



KF 1 H.F.-Penthode

Diese H.F.-Penthode wurde entwickelt für folgende Zwecke:
Als H.F.- und Z.F.-Verstärker: Für diese Verwendung ergibt die KF 1 auch bei niedrigen Spannungen von z.B. 100 Volt eine sehr grosse Verstärkung. Die Anoden-Gitterkapazität wurde weitgehendst reduziert, so dass ein störendes Selbstschwingen bei entsprechendem Aufbau der Schaltung nicht zu befürchten ist. Die günstigsten Resultate werden bei einer Anoden- und Schirmgitterspannung von 135 Volt und einer negativen Gittervorspannung von 0 Volt erzielt.

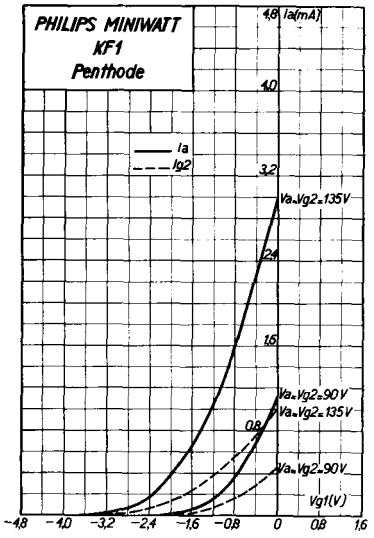
Die Anwendung der KF 1 als Audion und N.F.-Verstärker ist im allgemeinen nur zu empfehlen, wenn der Lautsprecher nicht im Apparat eingebaut ist, weil sonst Mikrophoneffekt auftreten könnte.



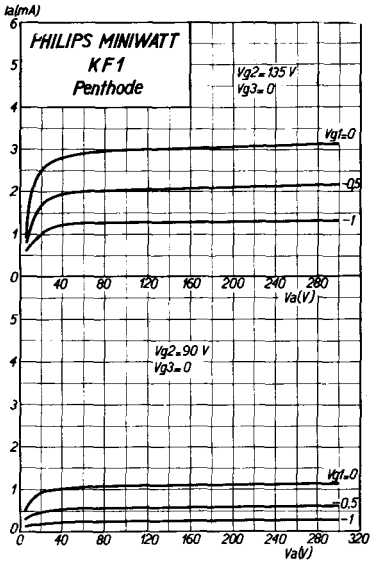
Innenkonstruktion der Batterie-H.F.-Penthoden KF 1 und KF 2.

Betriebsdaten

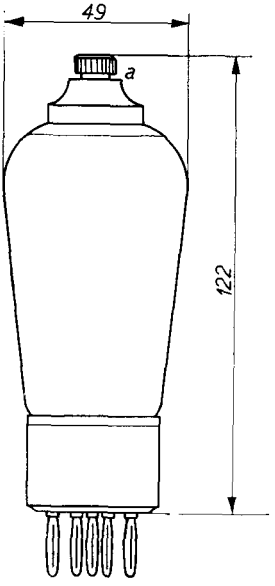
Heizspannung	Vf	=	2	2 V
Heizstrom	If	=	ca. 0,2	ca. 0,2 A
Anodenspannung	Va	=	135	90 V
Schirmgitterspannung	$Vg2$	=	135	90 V
Normaler Anodenstrom	Ia	=	3,0	1,1 A
Neg. Gittervorspannung	$Vg1$	=	0	0 V
Verstärkungsfaktor	g	=	1600	1500
Max. Steilheit	S_{max}	=	1,8	mA/V
Norm. Steilheit	S_{norm}	=	1,8	1,0 mA/V
Norm. innerer Widerstand	Ri_{norm}	=	0,9	1,5 Megohm
Bremsgitterspannung	$Vg3$	=	0	0 V
Gitter-Anodenkapazität	$Cag1$	$\leq$	0,01	$\leq$ 0,01 $\mu\mu$F



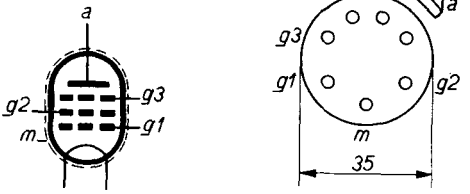
Anodenstrom und Schirmgitterstrom als Funktion der neg. Gitterspannung.



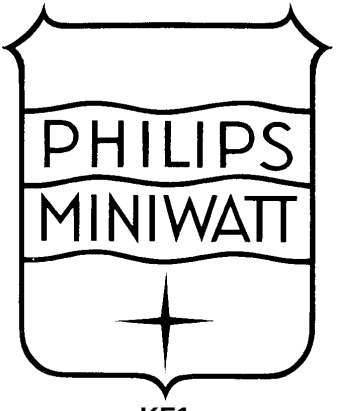
Anodenstrom als Funktion der Anodenspannung bei verschiedenen neg. Gitterspannungen.



Abmessungen der Röhren KF 1 und KF 2.



Sockelschaltung der Röhren KF 1 und KF 2.



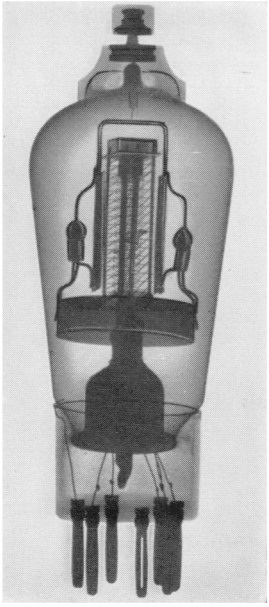
KF1

page	sheet	date
1	84	1935
2	85	1935
3	FP	2000.02.04

KF 2 H. F.-Penthode-Selektode

Die Röhre KF 2 ist eine H.F.-Penthode mit veränderlicher Steilheit. Dadurch ist es möglich, Batterie-Empfänger mit automatischer Lautstärkeregelung zu bauen.

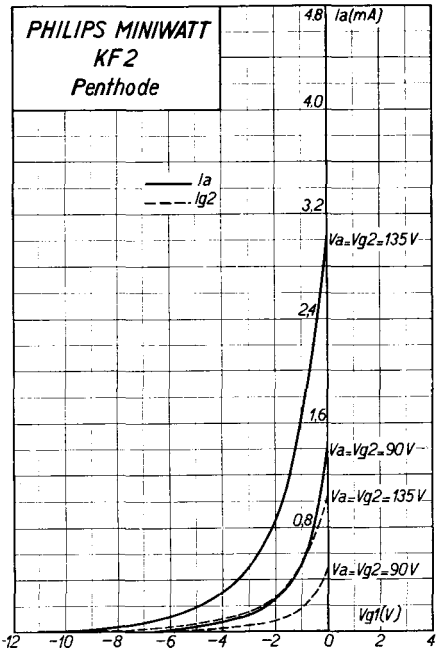
Diese Röhre kommt hauptsächlich für die Verwendung als Hoch- oder Zwischenfrequenzverstärker in Frage. Ihre Penthodeneigenschaften ermöglichen eine sehr ausgiebige Verstärkung auch bei niedrigen Anodenspannungen, was die Verwendung dieser Röhre mit billigen Anodenbatterien sehr vorteilhaft macht.



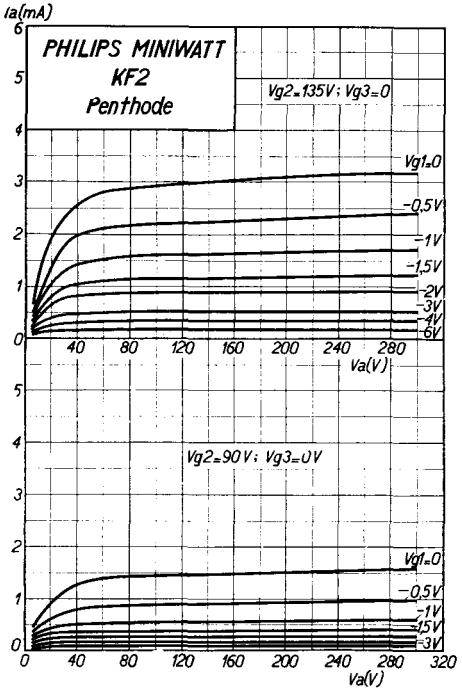
Die Röhre KF 2 im Röntgenbild.

Betriebsdaten

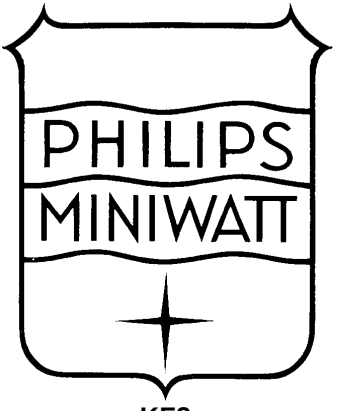
Heizspann.	Vf	= 2 V	Vf	= 2 V
Heizstrom	If	= ca. 0,2 A	If	= ca. 0,2 A
Anodensp.	Va	= 135 V	Va	= 90 V
Schirmgitterspannung	$Vg2$	= 135 V	$Vg2$	= 90 V
Neg. Gittervorsp.	$Vg1$	= 0 bis —16 V	$Vg1$	= 0 bis —11 V
Anodenstr.	$Ia\ (Vg1 = 0\ V)$	= 3,0 mA	$Ia\ (Vg1 = 0V)$	= 1,4 mA
Anodenstr.	$Ia\ (Vg1 = -16V)$	= ca. 0,01 mA	$Ia(Vg1 = -11V)$	= ca. 0,01 mA
Max. Steilh.	S_{max}	= 1,3 mA/V		
Norm. Steilh.	S_{norm}	= 1,3 mA/V	S_{norm}	= 0 8 mA/V
Min. Steilh.	$S\ (Vg1 = -16V)$	≦ 0,002 mA/V	$S\ (Vg1 = -11V)$	≦ 0,002 mA/V
Verstärkungsfaktor	g	= 1400	g	= 1500
Norm. inner. Widerst.	Ri_{norm}	= 1,1 Megohm	Ri_{norm}	= 1,9 Megohm
Bremsgitterspannung	$Vg3$	= 0 V	$Vg3$	= 0 V
Gitter-An.-Kapazität	$Cag1$	≦ 0,01 $\mu\mu$F	$Cag1$	≦ 0,01 $\mu\mu$F



Anodenstrom und Schirmgitterstrom als Funktion der neg. Gitterspannung.



Anodenstrom als Funktion der Anodenspannung bei verschiedenen neg. Gitterspannungen.



KF2

page	sheet	date
1	86	1935
2	87	1935
3	FP	2000.02.04

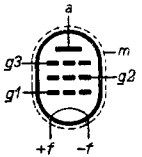
PHILIPS

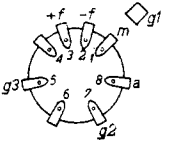
KF 3

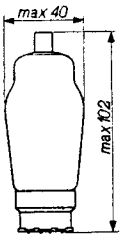
PENTODE with variable mu for use as H.F. and I.F. amplifier
PENTHODE à pente variable pour utilisation comme amplificatrice H.F. et M.F.
PENTHODE mit veränderlicher Steilheit zur Verwendung als H.F. und Z.F. Verstärker

Heating:	direct by battery; parallel supply	
Chauffage:	direct par batterie; alimentation en parallèle	Vf = 2,0 V If = 0,045 A
Heizung:	direkt durch Batteriestrom; Parallelspeisung	

Dimensions in mm
Dimensions en mm
Abmessungen in mm







Capacitances Capacités Kapazitäten		
	Cagl	< 0,006 pF
	Cgl	6,2 pF
	Ca	5,2 pF

PHILIPS

Operating characteristics
Caractéristiques d'utilisation
Betriebsdaten

Va	=	90		135		V
Vg2	=	90		135		V
Vg3	=	0		0		V
μglg2	=	28		26		
Vgl	=	-0,5	-9	-0,5	-13,5	V
Ia	=	1	-	2	-	mA
Ig2	=	0,2	-	0,6	-	mA
μ	=	1000	-	850	-	
S	=	500	5	650	6,5	μA/V
Ri	=	2	>10	1,3	>10	MΩ

Limiting values
Caractéristiques limites
Grenzdaten

Va	= max.	135	V
Wa	= max.	0,5	W
Ik	= max.	5	mA
Vg2	= max.	135	V
Wg2	= max.	0,2	W
Vg1 (Ig1 = 0,3 μA)	= max.	-2,0	V
Rg1	= max.	3	MΩ

PHILIPS

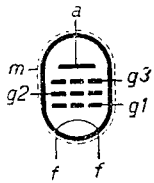
Electronic Tube

HANDBOOK

KF3

page	sheet	date
1	1	1948.08.08
2	2	1948.08.08
3	FP	1999.07.16

KF 4 R.F. pentode



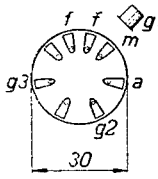


Fig. 2
Arrangement of base connections and electrodes.

The R.F. pentode KF 4 has no control characteristic; it can be employed for R.F. or I.F. amplification, anode-bend or grid detection, and as resistance-coupled A.F. amplifier.

When used for the last-mentioned function it should follow the indirectly-heated double-diode KB 2 for driving a Class A output stage using the pentode KL 4 or, with the necessary driver transformer, a Class B stage comprising two valves of the latter type.

The KF 4 gives excellent results on short waves; this is mainly due to the use of the P-type base with which it is fitted, and a separate contact for the suppressor grid connection. In the design of this valve output capacitances have been kept as low as possible.

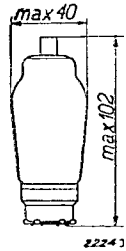


Fig. 1
Dimensions in mm.

FILAMENT RATINGS

Heating: direct by battery; parallel supply.

Filament voltage	V_f = 2.0 V
Filament current	I_f = 0.065 A

CAPACITANCES

C_{ag_1}	< 0.008 $\mu\mu$F
C_{g_1}	= 6.0 $\mu\mu$F
C_a	= 5.0 $\mu\mu$F

MAXIMUM RATINGS

V_a	= max. 135 V
W_a	= max. 0.5 W
V_{g_2}	= max. 135 V
W_{g_2}	= max. 0.25 W
I_k	= max. 5 mA
V_{g_1} (I_{g_1} = + 0.3 μA)	= max. —0.2 V
R_{g_1k}	= max. 3 M ohms

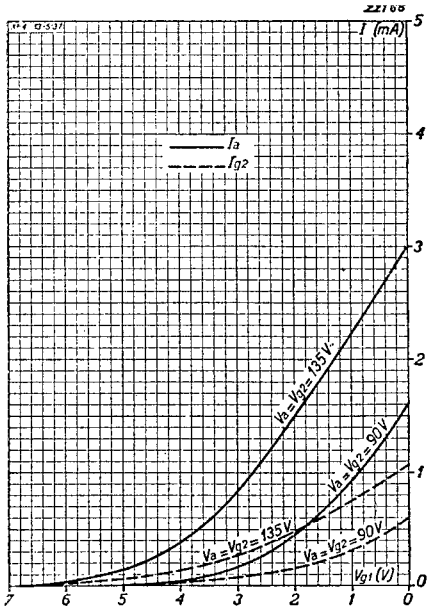


Fig. 3
Anode and screen-grid current as functions of the grid bias.

STATIC DATA

Anode voltage	V_a	= 90 V	135 V
Screen-grid voltage	V_{g2}	= 90 V	135 V
Suppressor-grid voltage	V_{g3}	= 0	0 V
Grid bias	V_{g1}	= —0.5 V	—0.5 V
Anode current	I_a	= 1.2 mA	2.6 mA
Screen-grid current	I_{g2}	= 0.4 mA	1.0 mA
Amplification factor	μ	= 800	700
Mutual conductance	S	= 0.7 mA/V	0.8 mA/V
Internal resistance	R_i	= 0.9 M ohms	0.8 M ohms

TABLE I

KF 4 used as grid detector with resistance coupling (connected as pentode); grid leak of following valve = 1 megohm.

Battery voltage	Coupling resistor	Anode current	Screen-series resistor	Screen-grid current	Detector amplification; modulation depth 30 %		Alternating output voltage; modulation depth 30 %	
					Altern. output voltage	Stage gain	Altern. output voltage	Altern. grid voltage
Vb (V)	Ra (M ohm)	Ia (mA)	Rg_2 (M ohm)	Ig_2 (mA)	Vo (Veff)		Vo (Veff)	Vi (Veff)
135	0.32	0.37	0.64	0.15	2	6.6	4.8	0.64
90	0.32	0.24	0.5	0.11	2	4.8	2.6	0.56
135	0.10	1.05	0.5	0.16	2	7.3	6.4	1.0
90	0.04	2.1	0.032	1.05	2	4.4	5.1	1.6
135	0.10	0.71	0.10	0.41	2	4.9	4.5	1.0
90	0.04	1.5	0.016	0.75	2	3.9	3.8	1.1

TABLE II

KF 4 used as grid detector with reaction and resistance coupling (connected as triode).

Battery voltage	Coupling resistor	Anode current	Detector amplification at m = 0.3		Alternating output voltage at m = 0.3			Alternating output voltage at m = 0.1		
			Altern. output volts	Stage gain	Altern. output volts	Altern. grid volts	Distor-tion	Altern. output volts	Altern. grid volts	Distor-tion
Vb (V)	Ra (Ohms)	Ia (mA)	Vo (Veff)		Vo (Veff)	Vi (Veff)	%	Vo (Veff)	Vi (Veff)	%
135	20,000	2.6	0.5	1.9	2.2 [1]	1.1	2	0.85	1.5	0.9
135	40,000	1.8	0.5	2.2	2.2 [1]	1.0	3.6	0.86	1.5	2
90	20,000	1.5	0.5	1.6	1.4 [2]	0.95	5 [3]	—	—	—
90	40,000	1.1	0.5	2.0	1.4 [2]	0.8	4	—	—	—

[1]) Max. excitation of the stage KC 3 + KDD 1 at Va = 135 V is reached at an alternating grid voltage of 2.2V(*eff*)

[2]) Max. excitation of the stage KC 3 + KDD 1 at Va = 90 V is reached at an alternating grid voltage of 1.4 V(*eff*).

[3]) Maximum alternating output voltage.

TABLE III

KF 4 used as A.F. amplifier (connected as pentode). Grid leak of following valve 1 megohm.

Battery voltage	Coupling resistor	Anode current	Screen series resistor	Screen-grid current	Grid bias	With an alternating output voltage of 10 V_{eff}:		With an alternating output voltage of 14 V_{eff}:	
V_b (V)	R_a (M ohm)	I_a (mA)	R_{g_2} (M ohm)	I_{g_2} (mA)	V_{g_1} (V)	Gain factor	Distortion d (%)	Gain factor	Distortion d (%)
135	0.32	0.30	0.64	0.11	—1.5	72	0.5	72	0.7
90	0.32	0.18	0.4	0.10	—1.5	52	1.5	52	1.8
135	0.20	0.41	0.4	0.15	—1.5	62	0.8	62	1.0
90	0.20	0.24	0.25	0.10	—1.5	48	1.2	48	1.9
135	0.10	0.64	0.2	0.23	—1.5	47	0.9	47	1.6
90	0.10	0.50	0.05	0.20	—1.5	37	0.9	37	1.8

TABLE IV

KF 4 used as A.F amplifier (connected as triode). Grid leak of the following valve 1 megohm.

Battery voltage	Coupling resistor	Anode current	Grid bias	With an alternating output voltage of 7 V_{eff}: [1]			With an alternating output voltage of 10 V_{eff}: [2]		
				Altern. grid volts	Stage gain	Distortion	Altern. grid volts	Stage gain	Distortion
V_b (V)	R_a (M ohm)	I_a (mA)	V_{g_1} (V)	V_i (V_{eff})		d (%)	V_i (V_{eff})		d (%)
135	0.32	0.25	—1.5	0.39	18	0.8	0.56	18	0.8
135	0.32	0.15	—3.0	0.43	16.2	1.5	0.62	16.2	2.8
90	0.32	0.13	—1.5	0.43	16.2	2	—	—	—
90	0.32	0.05	—3.0	0.62	11.5	10	—	—	—
135	0.20	0.35	—1.5	0.39	18	0.8	0.56	18	0.8
135	0.20	0.21	—3.0	0.45	16	1.7	0.63	16	3.0
90	0.20	0.17	—1.5	0.43	16.2	2	—	—	—
90	0.20	0.07	—3.0	0.65	10.5	13	—	—	—
135	0.10	0.56	—1.5	0.42	16.6	0.8	0.60	16.6	1.0
135	0.10	0.33	—3.0	0.48	14.5	2.4	0.70	14.5	4.0
90	0.10	0.28	—1.5	0.48	14.5	1.5	—	—	—
90	0.10	0.09	—3.0	0.76	9.5	18	—	—	—

[1]) Max. excitation of the KL 2 at $V_a = V_{g_2} =$ 90 V is reached at an alternating input of 7 V_{eff}.
Max. excitation of the KL 4 at $V_a = V_{g_2} =$ 90 V is reached at an alternating input of 2 V_{eff}.
[2]) Max. excitation of the KL 2 at $V_a = V_{g_2} =$ 135 V is reached at an alternating input of 10 V_{eff}.
Max. excitation of the KL 4 at $V_a = V_{g_2} =$ 135 V is reached at an alternating input of 3.5 V_{eff}.

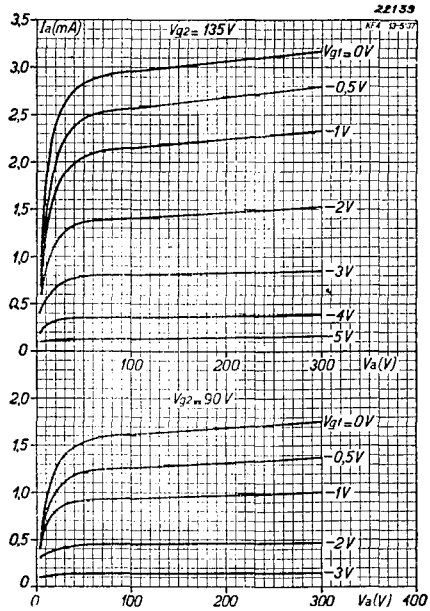


Fig. 4
Anode current as a function of the anode voltage, with grid bias as parameter, at $Vg_2 = 90$ V and 135 V.

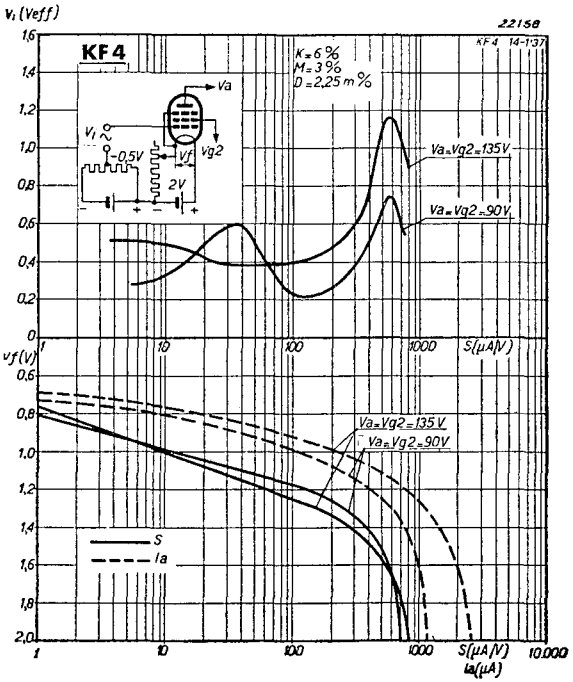


Fig. 5
Upper diagram. Maximum permissible effective value of the alternating grid voltage with 6 % cross-modulation (0.5 % 3rd harmonic), as a function of the mutual conductance controlled by varying the filament voltage.
Lower diagram. Mutual conductance and anode current as functions of the filament voltage.

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KH 1

KH 1

Heizung dir., Batteriestrom, Parallelschaltung		
Chauffage dir., courant batterie, alimentation en parallèle	Vf	2,0 V
	If	0,135 A
Heating dir., battery current, parallel filament supply		
	Cg1	7,8 µµF
Kapazitäten	Cg3	12,5 µµF
Capacités	Ca	16,3 µµF
Capacities	Cg1g3	0,17 µµF
	Cg1a	< 0,002 µµF

Betriebsdaten als Mischröhre.
Caractéristiques de service comme changeur de fréquence.
Operating conditions for use as frequency changer.

Va	135 V		
Vg2	60 V		
Vg3 (Vosc, Rg3 = 0,5 MΩ)	10 V(eff)		
Vg4	60 V		
Vg1	— 1,5 V [1]	— 8 V [2]	— 9,5 V [3]
Ia	1 mA	—	—
Ig2+Ig4	1,1 mA	—	—
Sc	450 µA/V	4,5 µA/V	1 µA/V
Ri	1 MΩ	> 10 MΩ	> 10 MΩ

Betriebsdaten als Penthode (H.F.- oder Z.F.-Verstärker).
Caractéristiques de service comme penthode (amplificatrice H.F. ou M.F.).
Operating conditions for use as pentode (H.F. or I.F. amplifier).

Va	135 V		
Vg2	60 V		
Vg3	60 V		
Vg4	0 V		
Vg1	— 1,5 V [1]	— 7,5 V [2]	— 9,3 V [3]
Ia	2 mA	—	—
Ig2+Ig3	0,95 mA	—	—
S	1400 µA/V	14 µA/V	1 µA/V
Ri	1,3 MΩ	> 10 MΩ	> 10 MΩ

Betriebsdaten als Tetrode (H.F.- oder Z.F.-Verstärker).
Caractéristiques de service comme tétrode (amplificatrice H.F. ou M.F.).
Operating conditions for use as tetrode (H.F. or I.F. amplifier).

Va	135 V		
Vg2	60 V		
Vg3	0 V		
Vg4	60 V		
Vg1	— 1,5 V [1]	— 8,5 V [2]	— 11 V [3]
Ia	2,2 mA	—	—
Ig2+Ig4	0,7 mA	—	—
S	1500 µA/V	15 µA/V	1 µA/V
Ri	0,7 MΩ	> 10 MΩ	> 10 MΩ

[1]) Im ungeregelten Zustand.
Tube non-réglé par le C.A.V.
Tube not regulated by A.V.C.

[2]) Für eine Regelung der Steilheit 1 : 100.
Pour le réglage de la pente de 1 : 100.
For a regulation of the conductance of 1 : 100.

[3]) Grenze des optimalen Regelbereiches.
Limite de la plage de réglage optimum.
Limit of the optimum regulation range.

KH 1

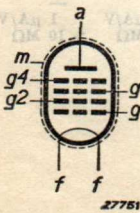
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KH 1

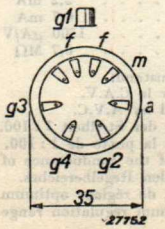
Grenzdaten.
Limites fixées pour les caractéristiques.
Limiting values.

Va	max.	150	V
Wa	max.	0,4	W
Vg2	max.	60	V
Wg2	max.	0,1	W
Vg3	max.	60	V
Wg3	max.	0,1	W
Vg4	max.	60	V
Wg4	max.	0,1	W
Vg1 (Ig1 = + 0,3 µA)	max.	— 0,2	V
Vg3 (Ig3 = + 0,3 µA)	max.	— 0,2	V
Ig2+Ig4 (Va = 135 V, Vg2 = Vg4 = 60 V, Vg3 = 10 V(eff), Vg1 = — 1,5 V, Verwendung als Hexode, Utilisation comme hexode, hexode connection)	min.	0,75	mA
Ig2+Ig4 (Va = 135 V, Vg2 = Vg4 = 60 V, Vg3 = 10 V(eff), Vg1 = — 1,5 V, Verwendung als Hexode, Utilisation comme hexode, hexode connection)	max.	1,45	mA
Ig2+Ig3 (Va = 135 V, Vg2 = Vg3 = 60 V, Vg4 = 0 V, Vg1 = — 1,5 V, Verwendung als Penthode, utilisation comme penthode, pentode connection)	min.	0,70	mA
Ig2+Ig3 (Va = 135 V, Vg2 = Vg3 = 60 V, Vg4 = 0 V, Vg1 = — 1,5 V, Verwendung als Penthode, utilisation comme penthode, pentode connection)	max.	1,30	mA
Ig2+Ig4 (Va = 135 V, Vg2 = Vg4 = 60 V, Vg3 = 0 V, Vg1 = — 1,5 V, Verwendung als Tetrode, utilisation comme tétrode, tetrode connection)	min.	0,5	mA
Ig2+Ig4 (Va = 135 V, Vg2 = Vg4 = 60 V, Vg3 = 0 V, Vg1 = — 1,5 V, Verwendung als Tetrode, utilisation comme tétrode, tetrode connection)	max.	0,9	mA
Ik	max.	10	mA
Rg1	max.	1	MΩ
Rg3	max.	1	MΩ

Elektrodenanordnung, Sockelanschlüsse und max. Abmessungen in mm.
Disposition des électrodes, connexions du culot et dimensions max. en mm.
Electrode arrangement, base connections and max. dimensions in mm.



Z7751



Z7752

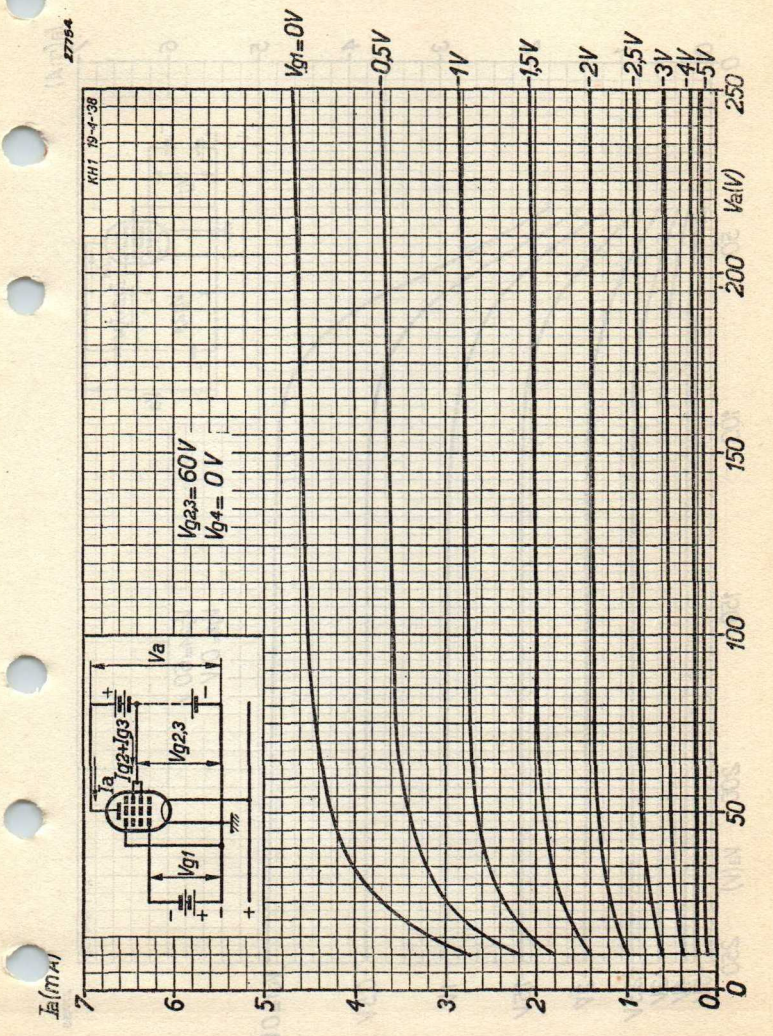


Z7753

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KH 1

KH 1

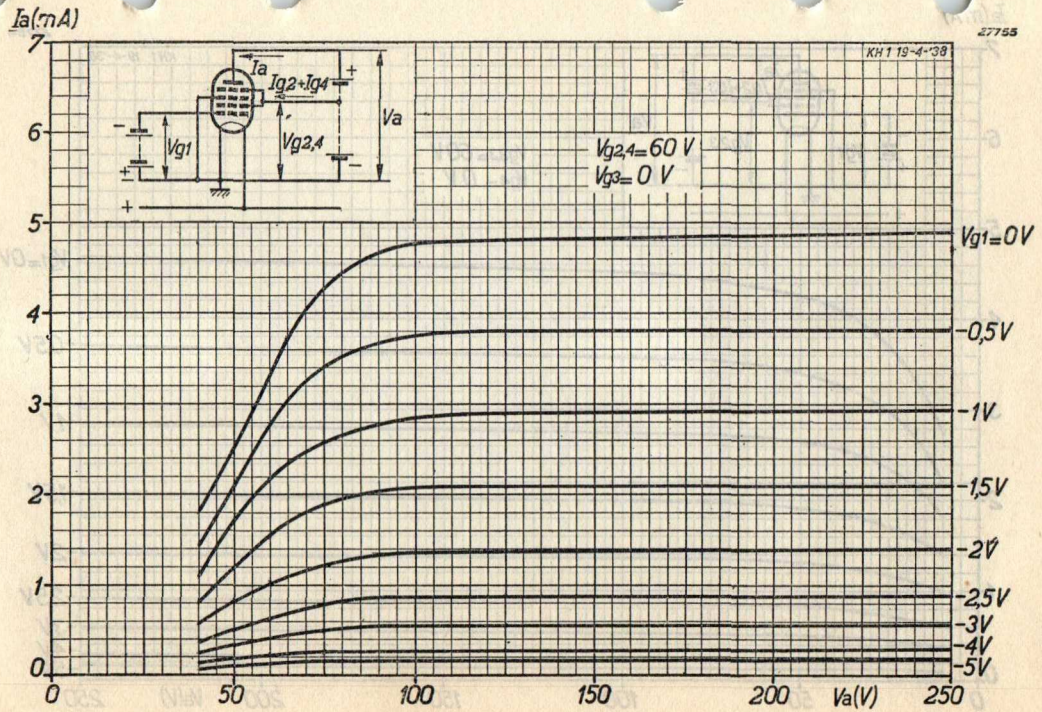


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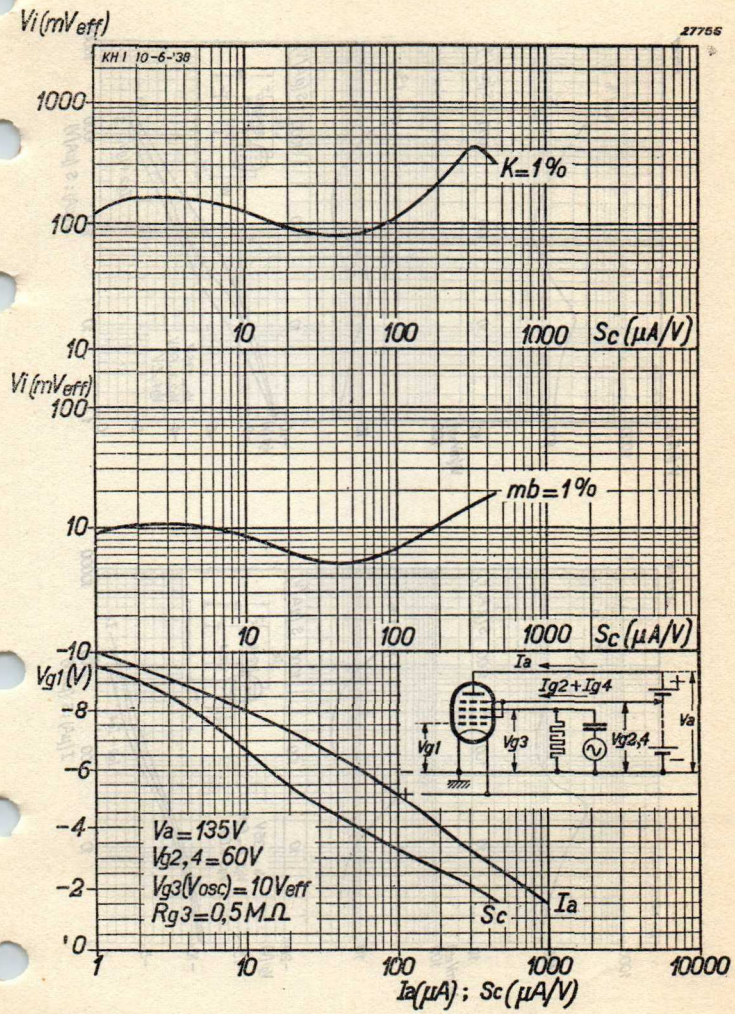
KH 1



KH 1

KH 1

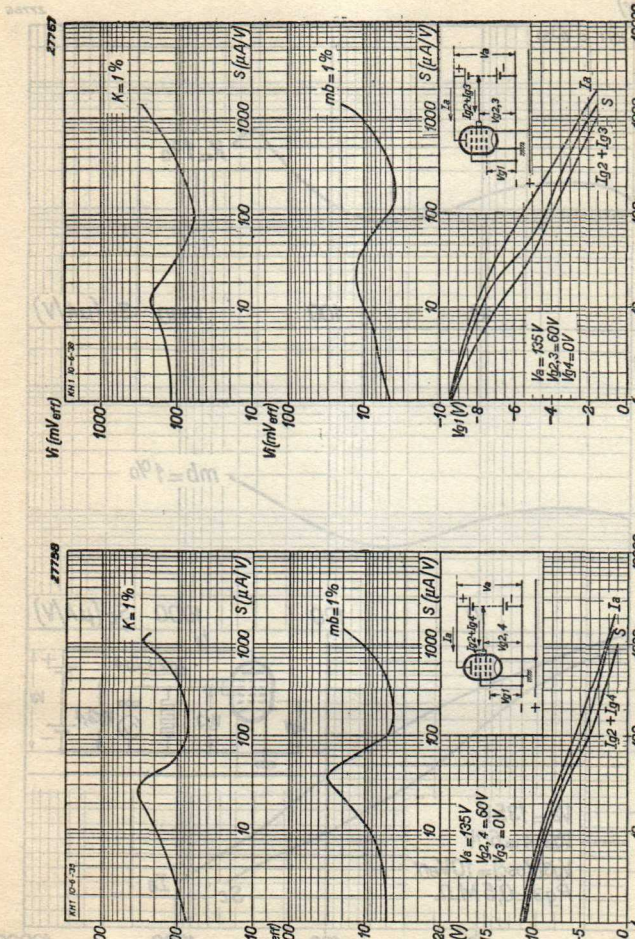
KH 1


Vi (mVeff)
27755
KH 1 10-6-'38
1000
100
K=1%
10
100
1000
Sc (µA/V)
10
Vi (mVeff)
100
mb=1%
10
10
100
1000
Sc (µA/V)
-10
Vg1 (V)
-8
-6
-4
-2
0
Ia
Ig2+Ig4
Va
Vg1
Vg3
Vg2,4
Va=135V
Vg2,4=60V
Vg3(Vosc)=10Veff
Rg3=0,5 MΩ
Sc
Ia
1
10
100
1000
10000
Ia(µA) ; Sc (µA/V)

KH 1

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KH 1



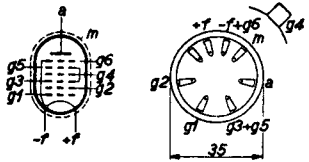
PHILIPS

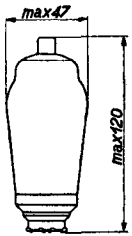
KK 2

OCTODE for use as frequency changer in battery receivers
OCTODE pour l'utilisation comme changeuse de fréquence dans des appareils batterie
OKTODE zur Verwendung als Mischröhre in Batteriegeräten

Heating:	direct by battery; parallel supply	
Chauffage:	direct par batterie; alimentation en parallèle	Vf = 2,0 V If = 0,13 A
Heizung:	direkt durch Batteriestrom; Parallelspeisung	

Dimensions in mm
Dimensions en mm
Abmessungen in mm





Capacities
Capacités
Kapazitäten

Ca	=	14 pF
Cg1	=	6,4 pF
Cg2	=	8 pF
Cg4	=	10 pF
Cag4	<	0,07 pF
Cg1g4	<	0,2 pF
Cg2g4	<	0,4 pF

Operating characteristics
Caractéristiques d'utilisation
Betriebsdaten

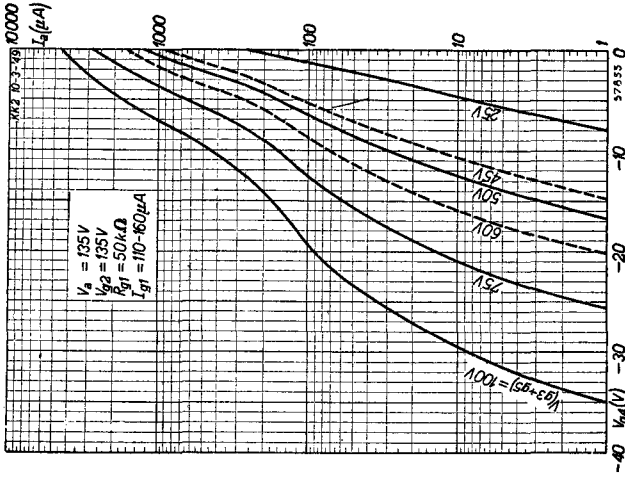
Va	=	90		135		V
Vg2	=	90		135		V
Vg3+g5	=	45		45		V
Ig1	=	160		160		µA
Rg1	=	50		50		kΩ
Vosc	=	8,5		8,5		V_{eff}
Vg4	=	-0,5	-11	-0,5	-11	V
Ia	=	0,7	-	0,7	-	mA
Ig2	=	1,6	-	2,2	-	mA
Ig3+g5	=	1,0	-	1,0	-	mA
Sc	=	270	2,7	270	2,7	µA/V
Ri	=	2	>10	2,5	>10	MΩ

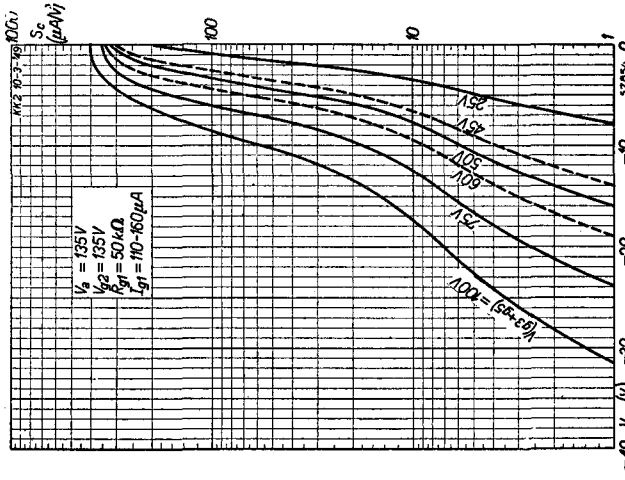
Operating conditions for use on short waves
Caractéristiques d'utilisation pour ondes courtes
Betriebsdaten für Kurzwellen

Va	=	135		V
Vg2	=	135		V
Vg3+g5	=	60		V
Ig1	=	110		µA
Rg1	=	50		kΩ
Vosc	=	6		Veff
Vg4	=	-1,5	-15	V
Ia	=	1	-	mA
Ig2	=	3	-	mA
Ig3+g5	=	1,4	-	mA
Sc	=	300	3	µA/V
Ri	=	1,7	>10	MΩ

Limiting values
Caractéristiques limites
Grenzdaten

Va	= max.	135	V
Wa	= max.	0,5	W
Vg2	= max.	135	V
Wg2	= max.	0,6	W
Vg3+g5	= max.	100	V
Wg3+g5	= max.	0,4	W
Ik	= max.	10	mA
Vg4 (Ig4 = +0,3 µA)	= max.	−0,2	V
Rg1	= max.	0,1	MΩ
Rg4	= max.	3	MΩ


KK2 10-3-49
I_a(μA)
10000
1000
100
10
1
V_a = 135V
V_{g2} = 135V
R_{g1} = 50kΩ
I_{g1} = 110-160μA
25V
45V
50V
60V
75V
100V = (93+93)V
0
−10
−20
−30
−40
V_{g4}(V)
57855


KK2 10-3-49
S_c (μA/V)
100
10
1
V_a = 135V
V_{g2} = 135V
R_{g1} = 50kΩ
I_{g1} = 110-160μA
25V
45V
50V
60V
75V
100V = (93+93)V
0
−10
−20
−30
−40
V_{g4}(V)
57854

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KK2

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KL 1
PENTHODE

KL 1

Heizung dir. Batterie Chauffage dir. batterie Heating dir. battery	Vf If	2,0 V 0,15 A

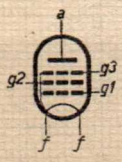
Betriebsdaten
Données relatives au fonctionnement
Operating conditions

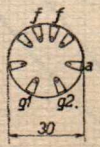
Va	90	135 V
Vg2	90	100 V
Vg1	-4,5	-6 V
Ia	8	8 mA
Ig2	1,2	1,2 mA
S (Vg1 = -6,4)		1,7 mA/V
S (Vg1 = -4,5 V)	1,7	mA/V
Ri (Vg1 = -6 V)		100000 Ohm
Ri (Vg1 = -4,5 V)	80000	Ohm

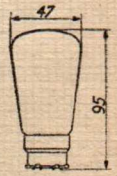
Grenzdaten
Données-limites
Limits.

Va max		135 V
Wa max		1,5 W
Ik max		12 mA
Vg2o max		135 V
Vg2 max		100 V
Wg2 max		0,3 W
Vg1 max (Ig1 = 0,3 µA)		-0,2 V
Rg1f max		1,5 MOhm
Wo	0,2	0,4 W
Ra	14000	14000 Ohm
Vg1 eff	3	4,2 V

Elektrodenanordnung und Sockelschaltung
Disposition des électrodes et connexion du culot
Arrangement of electrodes and base connection

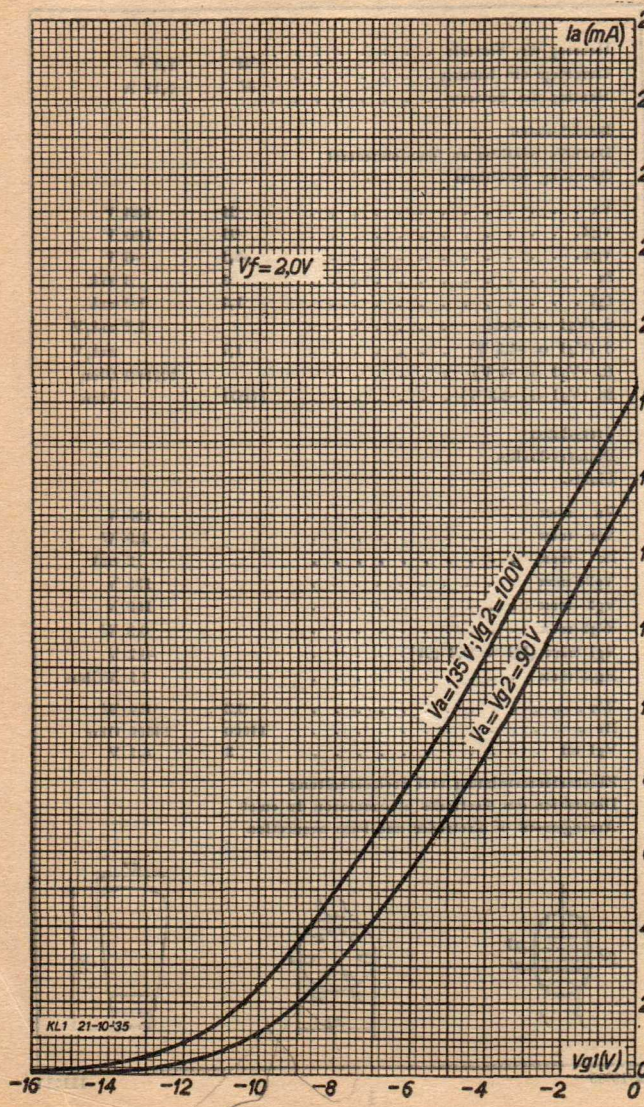






KL 1

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KL 1
PENTHODE

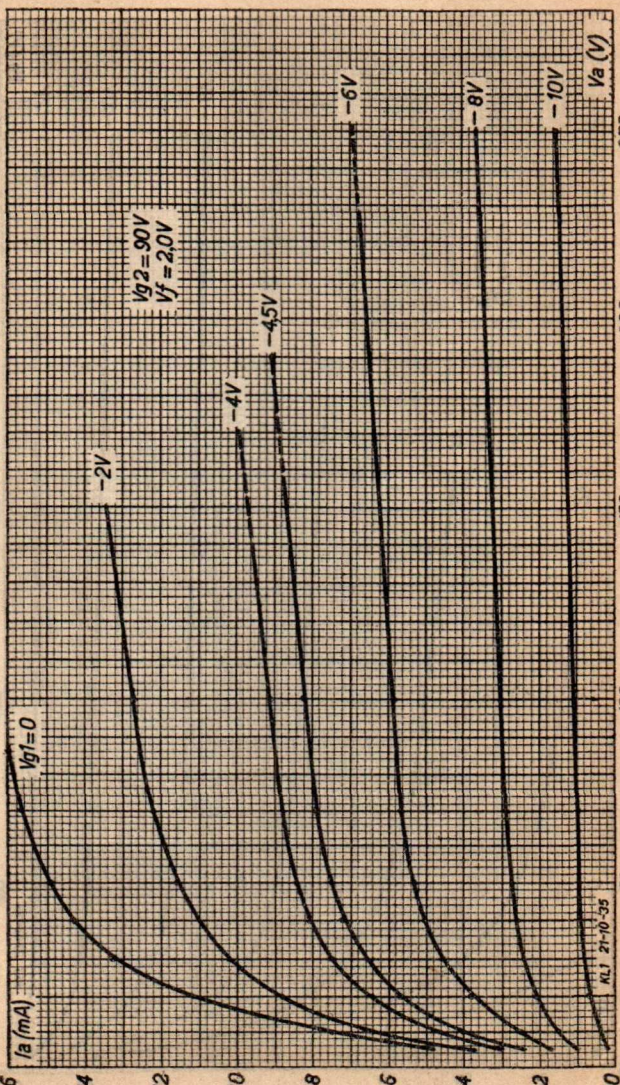


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KL 1

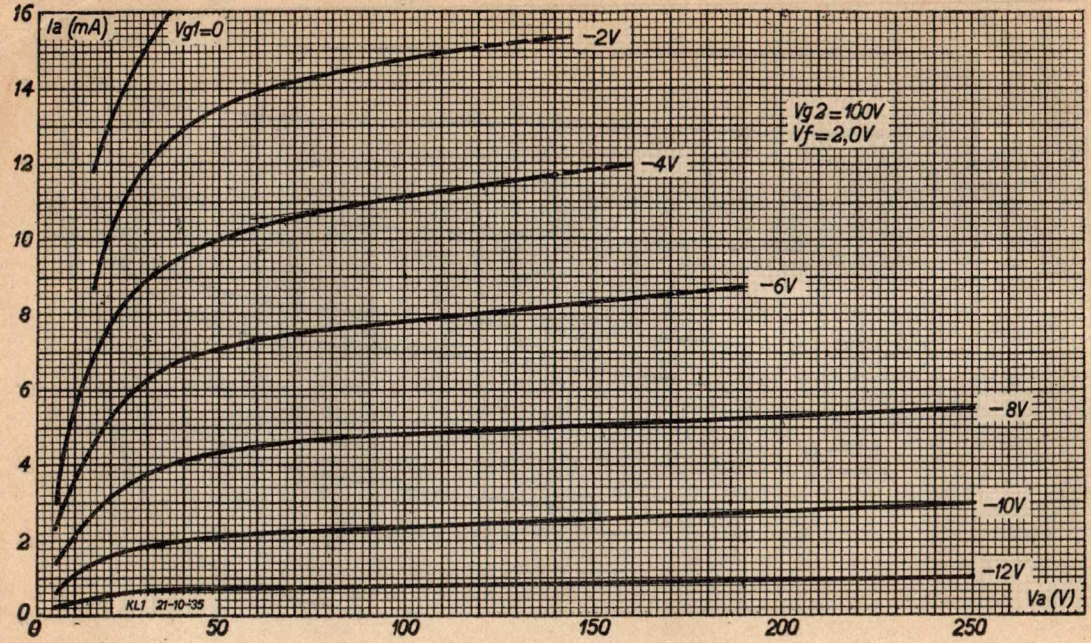
PENTHODE

KL 1



KL 1

PHILIPS „MINIWATT"
KL 1
PENTHODE



PHILIPS „MINIWATT"
KL 2
PENTHODE

KL 2

Heizung dir. Batterie	Vf	2,0 V
Chauffage dir. batterie	If	0,265 A
Heating dir. batterij		

Betriebsdaten
Données relatives au fonctionnement
Operating conditions

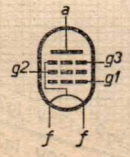
Va	**90**	**135** V
Vg2	**90**	**135** V
Ia	11	18 mA
Vg1	**-7,5**	**-12** V
Ig2	0,9	2 mA
S (Vg1 = -12 V)		2,0 mA/V
S (Vg1 = -7,5 V)	1,8	mA/V
Ri (Vg1 = -12 V)		30000 Ohm
Ri (Vg1 = -7,5 V)	30000	Ohm

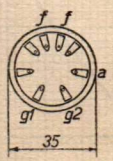
Grenzdaten
Données-limites
Limits

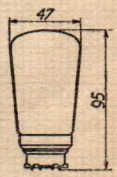
Va max		135 V
Wa max		2,5 W
Ik max		25 mA
Vg2 max		135 V
Wg2 max		0,5 W
Vg1 max (Ig1 = 0,3 μA)		-0,2 V
Rg1a max		1,5 MOhm
Rg1f max		1 MOhm

Wo	0,35	0,8 W
Ra	6000	6000 Ohm
Vg1 eff	5,0	8,0 V

Elektrodenanordnung und Sockelschaltung
Disposition des électrodes et connexion du culot
Arrangement of electrodes and base connection

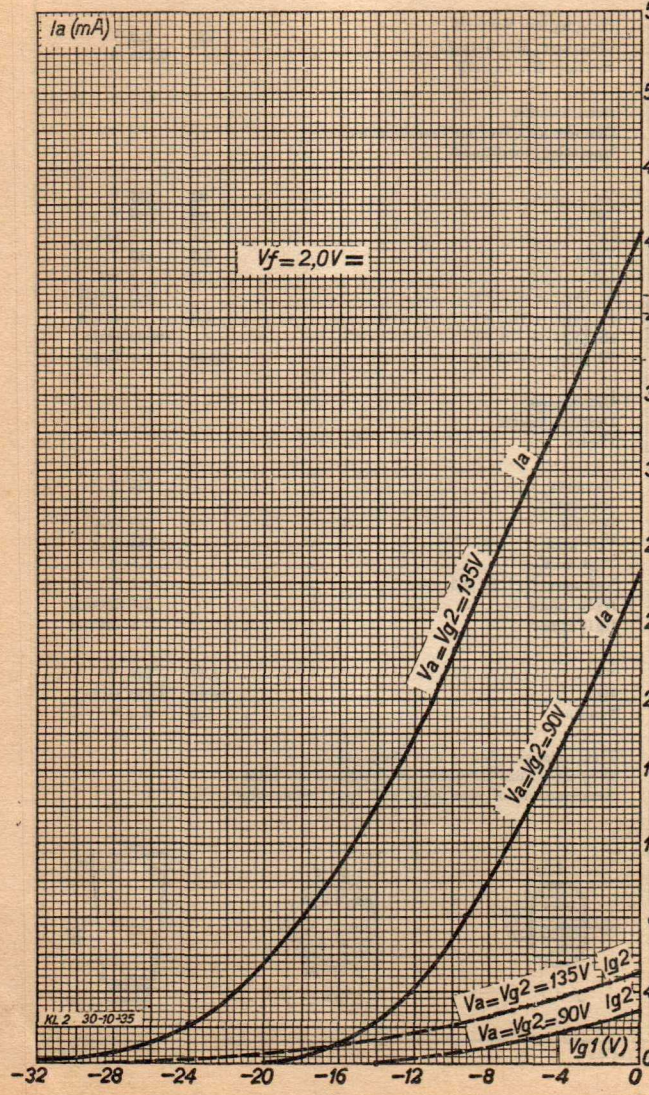






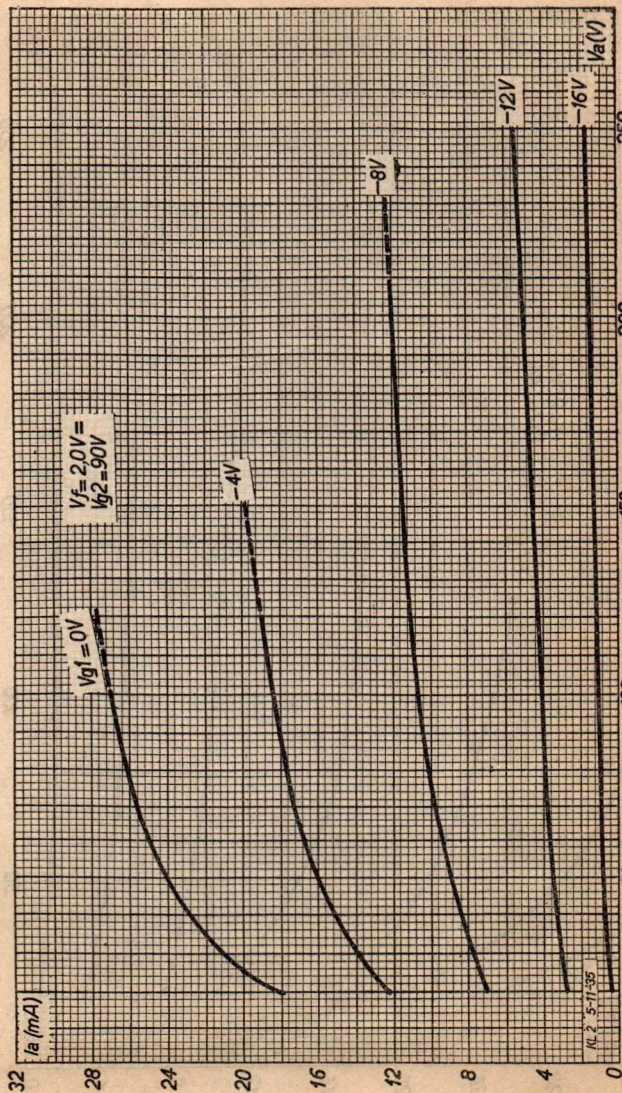
KL 2

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KL 2
PENTHODE



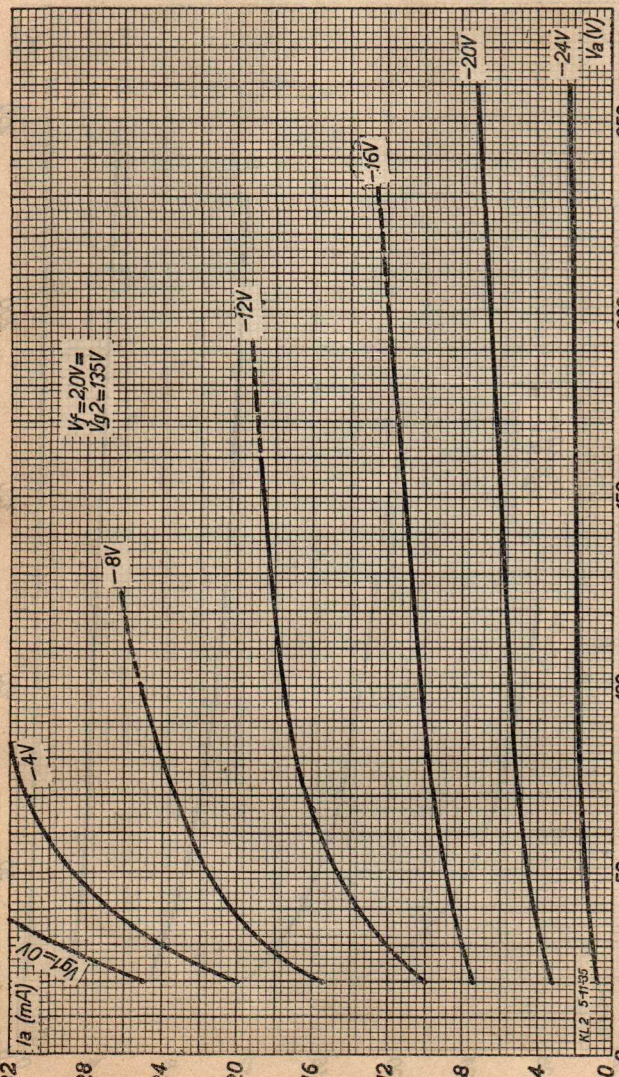
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KL 2
PENTHODE

KL 2



KL 2

PHILIPS „MINIWATT"
KL 2
PENTHODE



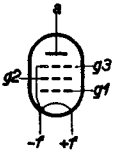
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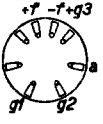
KL4

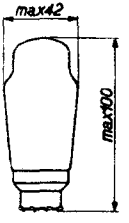
OUTPUT PENTODE
PENTHODE DE SORTIE
ENDPENTHODE

Heating:	direct by battery; parallel supply	
Chauffage:	direct par batterie; alimentation en parallèle	Vf= 2,0 V If=0,150 A
Heizung:	direkt durch Batteriestrom; Parallelspeisung	

Dimensions in mm
Dimensions en mm
Abmessungen in mm







Capacities Capacités Kapazitäten	Cag1 <	1 pF

Operating characteristics class A
Caractéristiques d'utilisation classe A
Betriebsdaten Klasse A

Va	=	90	135	V
Vg2	=	90	135	V
Vg1	=	-2,6	-5	V
Ia	=	4,7	7	mA
Ig2	=	0,8	1,1	mA
S	=	1,8	2,1	mA/V
$\mu g2g1$	=	13	13	
Ri	=	150	130	kΩ
Ra	=	19	19	kΩ
Wo (d=10%)	=	0,16	0,44	W
Vi (d=10%)	=	1,9	3,3	Veff
Vi (Wo=50mW)	=	1	0,9	Veff

Operating characteristics class B
Caractéristiques d'utilisation classe B
Betriebsdaten Klasse B

Va =	90		135		V
Vg2 =	90		135		V
Vg1 =	-5		-8		V
Ra =	40		35		kΩ
Vi =	0	3,9	0	6,2	Veff
Ia =	2x1,0	2x2,7	2x1,5	2x4,9	mA
Ig2 =	2x0,2	2x0,5	2x0,3	2x0,8	mA
Wo =	0	0,37	0	0,8	W
d_{tot} =	-	6,4	-	7,8	%

Limiting values
Caractéristiques limites
Grenzdaten

Vg2	= max. 135 V	Va	= max. 135 V
Wg2 (Vi = 0 V)	= max. 0,15 W	Wa	= max. 1 W
Wg2 (Wo = max.)	= max. 0,30 W	Ik	= max. 10 mA
Vg1 (Ig1=+0,3μA)	= max. -0,2 V	Rg1	= max. 1 MΩ

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3	FP	1999.07.16

KL 5 Output pentode

This is a directly-heated output valve for 2 V battery receivers, delivering a reasonably high output on a very low current consumption; with 135 V on the anode, passing a current of 8.5 mA, the output is 0.52 W with 10 % distortion.
In this valve an improvement has been introduced in the form of mica dampers on the filament, which greatly reduce any tendency towards microphony; in this respect, too, therefore, the KL 5 is an extremely reliable valve. Two of these valves in a balanced circuit will deliver an output which for battery receivers is quite high, with relatively little distortion. The low filament consumption in such circuits is another important feature; with an anode potential of 135 V, two KL 5 valves will give slightly more than 1 W, with about 7 % distortion, the combined filament current being only 0.2 A. The sensitivity is such that the valve can be fully excited with any normal A.F. valve, or with a pentode functioning as grid detector.

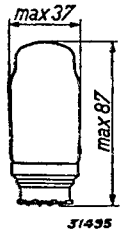


Fig. 1
Dimensions in mm.

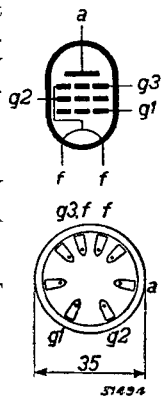


Fig. 2
Arrangement of electrodes and base connections.

FILAMENT RATINGS

Heating: direct by battery; parallel supply.
Filament voltage . . . . . $V_f = 2.0$ V
Filament current . . . . . $I_f = 0.1$ A

CAPACITANCES

Anode-grid . . . . . $C_{ag1} < 0.6$ $\mu\mu$F

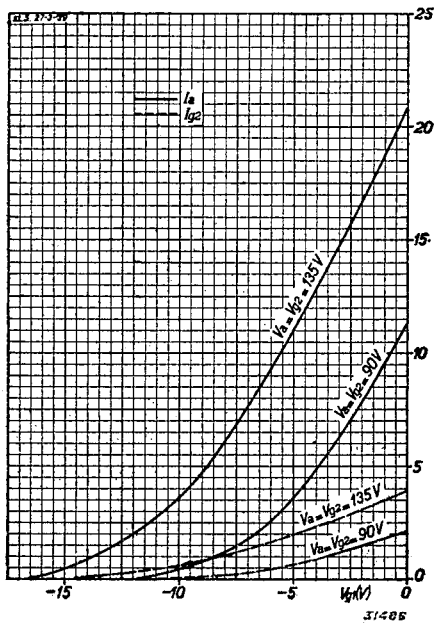


Fig. 3
Anode and screen-grid current as functions of the grid bias, with $Va = Vg_2 = 135$ and 90 V.

OPERATING DATA: KL 5 used as a single output valve

Anode voltage	V_a	= 90 V	135 V
Screen-grid voltage	V_{g2}	= 90 V	135 V
Grid bias	V_{g1}	= —4 V	—6.5 V
Anode current	I_a	= 4.8 mA	8.5 mA
Screen-grid current	I_{g2}	= 0.9 mA	1.5 mA
Mutual conductance	S	= 1.4 mA/V	1.7 mA/V
Internal resistance	R_i	= 180,000 ohms	135,000 ohms
Load resistor	R_a	= 19,000 ohms	16,000 ohms
Output power (10 % distortion)	W_o	= 0.2 W	0.53 W
Alternating grid voltage (10 % distortion)	V_i	= 2.6 V_{eff}	4.8 V_{eff}
Sensitivity (W_o = 50 mW)	V_i	= 0.7 V_{eff}	0.8 V_{eff}

OPERATING DATA: KL 5 used in a balanced output stage (2 valves)

Anode voltage	V_a	= 90 V	135 V
Screen-grid voltage	V_{g2}	= 90 V	135 V
Grid bias	V_{g1}	= —8.5 V	—12 V
Anode current (without signal)	I_{ao}	= 2 × 1 mA	2 × 2 mA
Anode current at max. modulation	$I_{a\,max}$	= 2 × 3.6 mA	2 × 6.25 mA
Screen-grid current (without signal)	I_{g2o}	= 2 × 0.1 mA	2 × 0.35 mA
Screen-grid current at max. modulation	$I_{g2\,max}$	= 2 × 1.0 mA	2 × 2.4 mA
Load resistor between anodes	R_{aa}	= 25,000 ohms	25,000 ohms
Output power at max. modulation	W_o	= 3.5 W	1.05 W
Alternating grid voltage at maximum modulation	V_i	= 6.5 V_{eff}	8.7 V_{eff}
Total distortion at maximum modulation	d_{tot}	= 3.8 %	7 %

MAXIMUM RATINGS

Anode voltage	V_a	= max. 200 V
Anode dissipation	W_a	= max. 2.0 W
Screen-grid voltage	V_{g2}	= max. 200 V
Screen-grid dissipation (V_i = 0 V)	W_{g2}	= max. 0.5 W
Screen-grid dissipation (W_o = max.)	W_{g2}	= max. 1.0 W
Cathode current	I_k	= max. 12 mA
Grid voltage at grid current start (I_{g1} = + 0.3 μA)	V_{g1}	= max. —0.2 V
External resistance between grid and cathode	R_{g1k}	= max. 1 M ohm

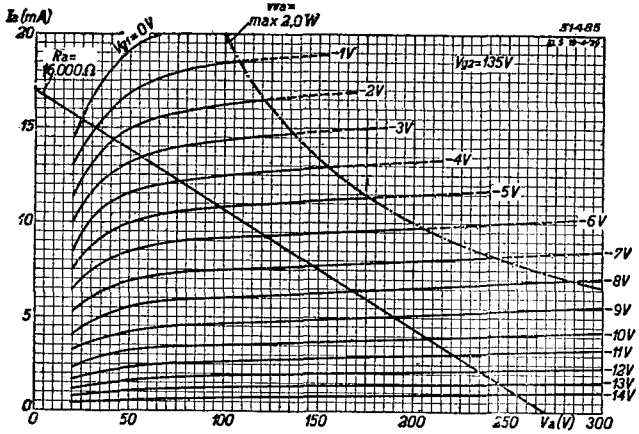


Fig. 4
Anode current as a function of the anode voltage, with grid bias as parameter, for a screen voltage of 135 V.

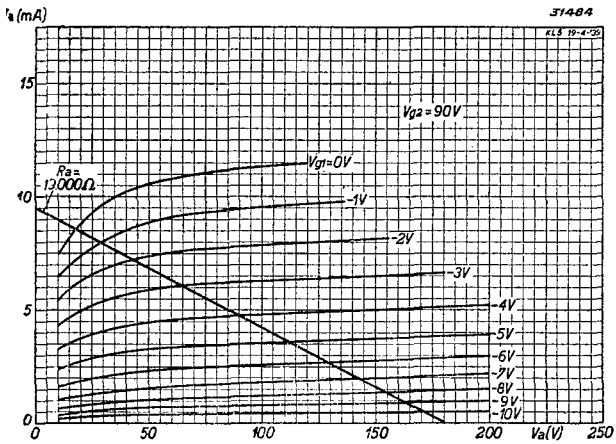


Fig. 5
Anode current as a function of the anode voltage, with grid bias as parameter, for a screen voltage of 90 V.

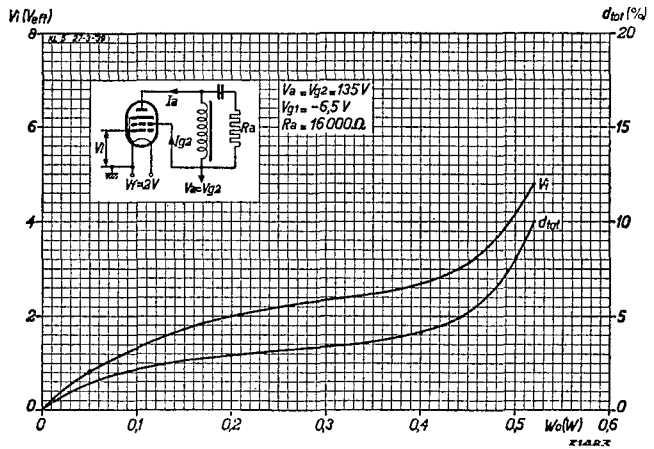


Fig. 6
Alternating grid voltage Vi and total distortion d_{tot} of the KL 5 as functions of the output power ($Va = Vg_2 = 135$ V).

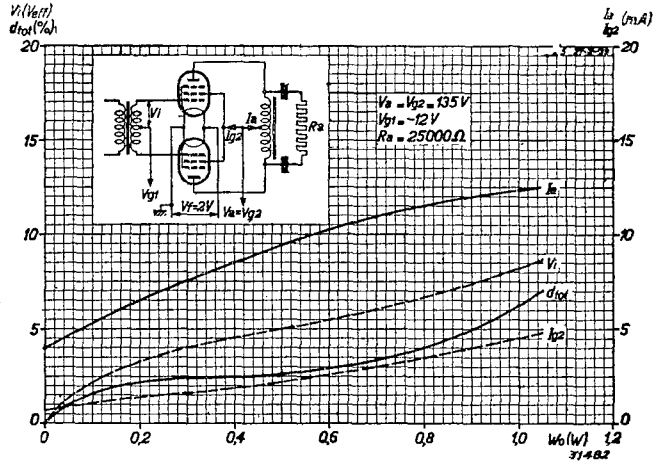


Fig. 7
Alternating grid voltage Vi, total distortion d_{tot}, combined anode current Ia and combined screen-grid current Ig_2 as functions of the output power, for two KL 5 valves in a Class B output circuit without grid current ($Va = Vg_2 = 135$ V).

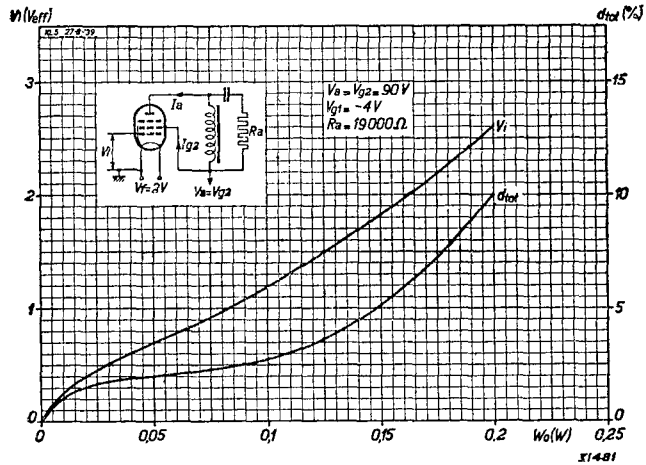


Fig. 8
Alternating grid voltage Vi and total distortion d_{tot} of the KL 5 as functions of the output power. $Va = Vg_2 = 90$ V.

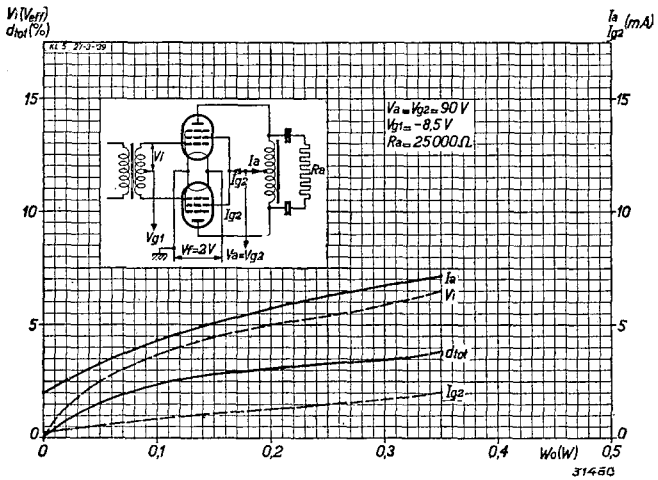


Fig. 9
Alternating grid voltage Vi, total distortion d_{tot}, combined anode current Ia and combined screen-grid current Ig_2 as functions of the output power of two KL 5 valves in a Class B output circuit without grid current. $Va = Vg_2 = 90$ V.

INSTRUMENT CATHODE-RAY TUBE

14 cm diagonal, rectangular flat-faced direct-view storage tube with variable persistence and internal graticule, intended for oscilloscope applications.

QUICK REFERENCE DATA

Final accelerator voltage	$V_{g10(\ell)}$	8,5	kV
Display area (10 x 8 divisions of 9 mm)		90 x 72	mm^2
Deflection coefficient			
horizontal	M_x	9,5	V/div
vertical	M_y	4,1	V/div
Writing speed		2,5	div/μs

OPTICAL DATA

Screen		metal backed phosphor	
type		GH, colour green	
persistence, non-store mode		medium-short	
persistence, store mode		variable	
Useful screen dimensions		min. 90 x 72	mm
Useful scan			
horizontal		min. 90	mm
vertical		min. 72	mm
Spot eccentricity in horizontal and vertical directions		max. 6	mm

The scanned raster can be shifted and aligned with the internal graticule by means of correction coils fitted around the tube by the manufacturer.

HEATING

Writing section

Indirect by a.c. or d.c.; parallel supply

Heater voltage	V_f	6,3	V
Heater current	I_f	300	mA

Viewing section

Indirect by d.c.; parallel supply

Heater voltage	$V_{f'}$	6,3	V
Heater current	$I_{f'}$	300	mA
Heater voltage	$V_{f''}$	6,3	V
Heater current	$I_{f''}$	300	mA

MECHANICAL DATA

Mounting position any

The tube should not be supported by the base alone and under no circumstances should the socket be allowed to support the tube. The tags near the screen should not be subjected to mechanical stress.

Net mass	approx.	1,1	kg
Base	14 pin, all glass		
Dimensions and connections			
See also outline drawing			
Overall length (socket included)	max.	445	mm
Face dimensions	max.	100 x 120	mm
Accessories			
Socket (supplied with tube)	type	55566	
Side contact connector (14 required)	type	55561	
Small ball contact connector (3 required)	type	4022 102 21590	
FOCUSING	electrostatic		
DEFLECTION	double electrostatic		
x-plates	symmetrical		
y-plates	symmetrical		
Angle between x and y-traces		90^{o}	
Angle between x-trace and x-axis of the internal graticule		0^{o}	
See also Correction coils			

CAPACITANCES

x_1 to all other elements except x_2	$C_{x1(x2)}$	6,5	pF
x_2 to all other elements except x_1	$C_{x2(x1)}$	6,5	pF
y_1 to all other elements except y_2	$C_{y1(y2)}$	3	pF
y_2 to all other elements except y_1	$C_{y2(y1)}$	3	pF
x_1 to x_2	C_{x1x2}	2,5	pF
y_1 to y_2	C_{y1y2}	2	pF
g_1 to all other elements	C_{g1}	5,5	pF
$g_{1'}$ to all other elements	$C_{g1'}$	5,5	pF
$g_{1''}$ to all other elements	$C_{g1''}$	5,5	pF
k to all other elements	C_k	4,5	pF
k' to all other elements	$C_{k'}$	5	pF
k'' to all other elements	$C_{k''}$	5	pF
g_7 to all other elements	C_{g7}	40	pF
g_9 to all other elements	C_{g9}	75	pF

DIMENSIONS AND CONNECTIONS

Dimensions in mm

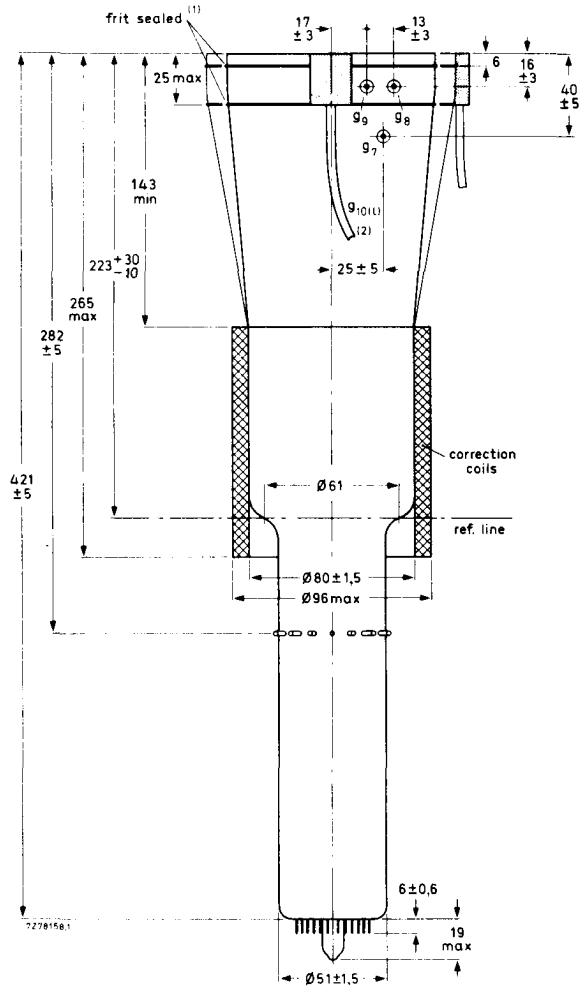


Fig. 1 Outlines.

(1) The bulge at the frit seal may increase the indicated maximum dimensions by not more than 3 mm.

(2) Minimum length of cable: 420 mm.

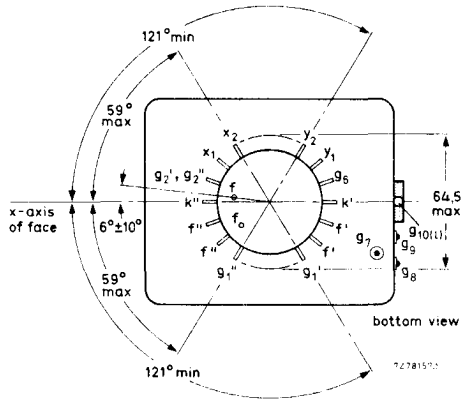


Fig. 2 Bottom view and side-contact arrangement.

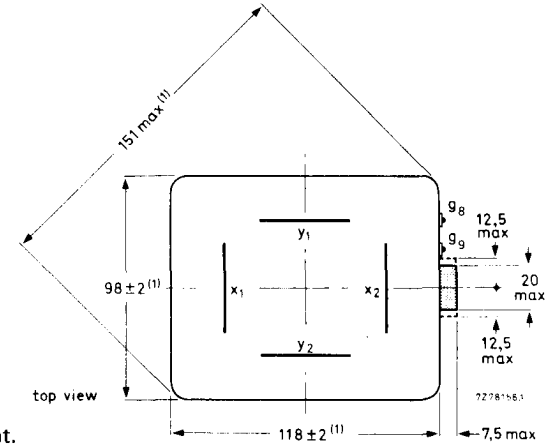


Fig. 3 Top view.

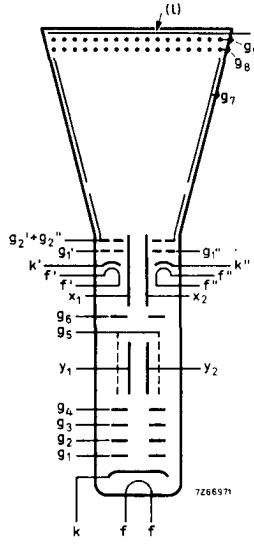


Fig. 4 Electrode configuration.

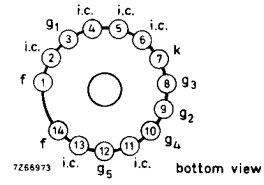


Fig. 5 Pin arrangement; bottom view.

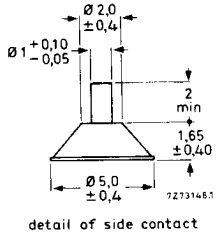


Fig. 6 Detail of side contact

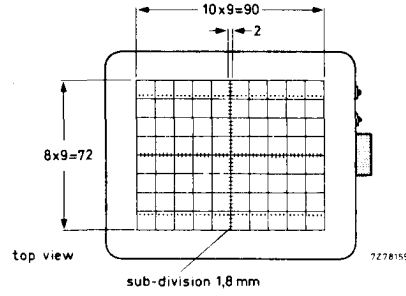


Fig. 7 Internal graticule
colour of graticule: brown-black;
line width : 0,15 mm;
dot diameter : 0,3 mm.

TYPICAL OPERATION (for notes see page 284)

Conditions

Writing section (voltages with respect to writing gun cathode k)

Final accelerator voltage	$V_{g10(\ell)}$	8500	V	note 1
Geometry control electrode voltage	V_{g6}	1500 ± 100	V	
Deflection plate shield voltage	V_{g5}	1500	V	note 2
Astigmatism control electrode voltage	V_{g4}	1500 ± 50	V	
Focusing electrode voltage	V_{g3}	400 to 600	V	
First accelerator voltage	V_{g2}	1500	V	
Control grid voltage for visual extinction of focused spot	V_{g1}	−40 to −80	V	

Viewing section (voltages with respect to viewing gun cathodes k′ and k″)

Final accelerator voltage	$V_{g10(\ell)}$	7050	V	note 1
Backing electrode voltage,				
storage operation	V_{g9}	0 to 5	V	
non-storage operation	V_{g9}	−35	V	
Collector voltage	V_{g8}	150	V	
Collimator voltage	V_{g7}	30 to 120	V	note 3
First accelerator voltage	V_{g2}', V_{g2}''	50	V	note 4
Control grid voltage for cut-off	V_{g1}', V_{g1}''	−30 to −70	V	
Cathode current (each viewing gun)	I_k', I_k''	0,4	mA	

Performance

Useful scan				
horizontal		min. 90	mm	
vertical		min. 72	mm	
Deflection coefficient				
horizontal	M_x	9,5	V/div	
		max. 10,5	V/div	
vertical	M_y	4,1	V/div	
		max. 4,4	V/div	
Line width at the centre of the screen	l.w.	0,35	mm	note 5
Writing speed in store mode		greater than 250	div/ms	note 6
Storage time		greater than 1,5	min	note 7
Deviation of linearity of deflection		max. 2	%	note 8
Geometry distortion		see note 9		
Grid drive for 10 μA beam current		≈ 25	V	

LIMITING VALUES (Absolute maximum rating system)

Writing section (voltages with respect to writing gun cathode k)

Final accelerator voltage	$V_{g10(\ell)}$	max.	9500	V
		min.	7000	V
Geometry control electrode voltage	V_{g6}	max.	2100	V
Deflection plate shield voltage	V_{g5}	max.	2000	V
Astigmatism control electrode voltage	V_{g4}	max.	2100	V
		min.	1200	V
Focusing electrode voltage	V_{g3}	max.	1000	V
First accelerator voltage	V_{g2}	max.	2000	V
		min.	1250	V
Control grid voltage				
positive	V_{g1}	max.	0	V
negative	$-V_{g1}$	max.	200	V
Cathode to heater voltage				
positive	V_{kf}	max.	125	V
negative	$-V_{kf}$	max.	125	V
Voltage between astigmatism control electrode and any deflection plate	$V_{g4/x}$	max.	500	V
	$V_{g4/y}$	max.	500	V
Average grid drive		max.	30	V

Viewing section (voltages with respect to viewing gun cathodes k′ and k″ unless otherwise specified)

Final accelerator voltage	$V_{g10(\ell)}$	max.	8000	V
		min.	5500	V
Backing electrode voltage, storage operation	V_{g9}	max.	5	V
		min.	0	V
non-storage operation	$-V_{g9}$	max.	50	V
		min.	25	V
Collector voltage	V_{g8}	max.	180	V
		min.	120	V
Collimator voltage	V_{g7}	max.	200	V
		min.	0	V
First accelerator voltage	$V_{g2'}, V_{g2''}$	max.	60	V
		min.	40	V
Cathode to heater voltage				
positive	$V_{k'f'}, V_{k''f''}$	max.	125	V
negative	$-V_{k'f'}, -V_{k''f''}$	max.	125	V
Control grid voltage				
positive	$V_{g1'}, V_{g1''}$	max.	0	V
negative	$-V_{g1'}, -V_{g1''}$	max.	200	V

NOTES

1. These values are valid at cut-off of both flood guns and the writing gun. The H.T. unit must be capable of supplying 0,5 mA. To protect the tube against excessive surge current during erasure, an adequately dimensioned RC-network must be connected in series with the screen terminal lead (Fig. 8).

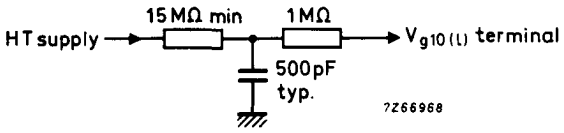


Fig. 8.

2. This voltage should be equal to the mean y-plate potential. The mean x and y-plate potentials should be equal for optimum spot quality.
3. The collimator electrode voltage should be adjusted for optimum uniformity of background illumination.
4. The voltage V_{g2}', V_{g2}'' should be equal to the mean x-plate potential.
5. Measured with the shrinking raster method in the centre of the screen under typical operating conditions, adjusted for optimum spot size at a beam current I_b = 10 μA (measured against x-plates).
6. The writing speed is defined as the maximum speed at which a written trace is just visible, starting from a background which is just black. The indicated value is guaranteed for the total graticule area, with the exception of maximum 5% in each corner. The writing speed can be increased to approx. 2,5 div/μs if some background is tolerated.
7. The storage time is defined as the time required for the brightness of the unwritten background to rise from just zero brightness (viewing-beam cut-off) to 10% of saturated brightness. At reduced intensity (by pulsing the flood beams) the storage time can be increased.
8. The sensitivity at a deflection less than 75% of the useful scan will not differ from the sensitivity at a deflection of 25% of the useful scan by more than the indicated value.
9. A graticule, consisting of concentric rectangles of 88 mm x 70 mm and 86 mm x 68,5 mm is aligned with the electrical x-axis of the tube. With optimum corrections applied, a raster will fall between these rectangles.

CORRECTION COILS

General

The L14-111GH/55 is provided with a coil unit (see Fig. 9) consisting of:

- a pair of coils L3 and L4 which enable the angle between the x and y-traces at the centre of the screen to the made exactly 90° (orthogonality correction);
- a pair of coils L1 and L2 for image rotation which enable the alignment of the x-trace with the x-lines of the graticule.

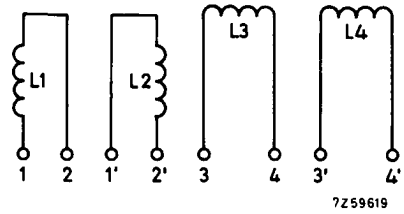


Fig. 9 Diagram of coil unit.

Orthogonality (coils L3 and L4)

The current required under typical operating conditions without a mu-metal shield being used is max. 20 mA for complete correction of orthogonality. It will be 30% to 50% lower with shield, depending on the shield diameter. The resistance of the coil is approx. 225 Ω.

Image rotation (coils L1 and L2)

The image rotation coils are wound concentrically around the tube neck. Under typical operating conditions 22 ampere-turns are required for maximum rotation of 5°. Both coils have 850 turns. This means that a current of max. 12,5 mA per coil is required which can be obtained by using a 12 V supply when the coils are connected in series or a 6 V supply when they are in parallel.

Connecting the coils

The coils have been connected to 8 solder tags according to Fig. 10.

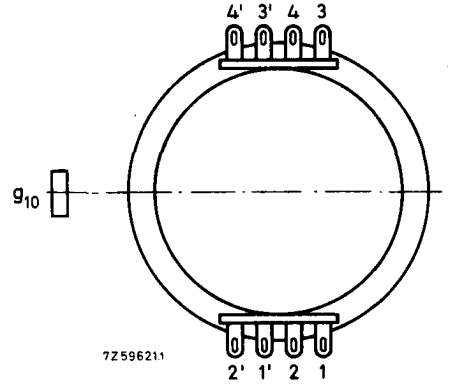


Fig. 10 Bottom view.

With L3 and L4 connected in series according to Fig. 11 a current in the direction indicated will produce a clockwise rotation of the vertical trace and an anti-clockwise rotation of the horizontal trace.

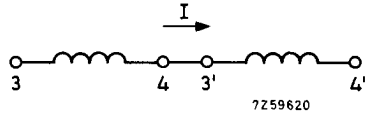


Fig. 11.

OPERATING NOTES

Modes of operation

Store mode

a. Dynamic erasure (variable persistence)

Dynamic erasure can be achieved by applying erasing pulses of positive polarity to the backing electrode. The pulse amplitude required is approximately 9V (< 15 V) and the persistence of a stored display can be controlled by varying the duty factor of these pulses.

b. Static erasure.

If no dynamic erasing pulses are applied, the storage time is limited by the potential shift of the storage layer due to landing of positive ions. In order to erase a stored display, the backing electrode should first be connected to the collector electrode voltage and then returned to its original potential for about 100 ms; after that, an erasing pulse of positive polarity and a duration of not less than 300 ms should be applied. For the adjustment of the amplitude of this pulse see Procedure of adjustment.

Non-store mode

For non-store operation, it is sufficient to make the backing electrode about 35 V negative with respect to the viewing gun cathodes. The viewing guns should not be switched off in this mode of operation since slight variations in raster geometry and deflection sensitivity might otherwise be caused. Care should be taken, especially when switching from store mode to non-store mode, that excessive writing beam current is avoided, as otherwise the storage layer may be damaged.

Procedure of adjustment

a. Adjust the cathode current of each viewing gun to 0,4 mA by means of its control grid voltage.

b. Adjustment of the erasing pulse amplitude (static erasure)

The pulse amplitude should be just sufficient to suppress any background illumination at the centre of the display area (this adjustment should be done under low ambient light conditions). Data on storage time and maximum writing speed are based on erasure to "just black". A larger pulse amplitude (erasure to "blacker than black") yields a longer storage time at the expense of maximum writing speed. On the other hand, writing speed can be increased if some background illumination is tolerated. To erase to "just black" the amplitude of this pulse is approximately 9 V.

c. Adjustment of the collimator voltage

With dynamic erasing pulses applied and a persistence control setting that yields a convenient background illumination intensity, the collimator voltage is adjusted for optimum background uniformity. This voltage will be approximately 80 V with respect to the viewing gun cathode potential. If this voltage is too high or too low, there is a decrease of intensity at the four corners or at the centres of the vertical edges of the display area respectively. For a good erasure of the display, the collimator voltage should be as low as possible.

INSTRUMENT CATHODE-RAY TUBE

14 cm-diagonal rectangular flat-faced direct-view storage tube with split-beam writing gun, variable persistence and internal graticule, intended for oscilloscope applications.

QUICK REFERENCE DATA

Final accelerator voltage	V_{g10} (ℓ)	8,5 kV
Useful scan (10 x 8 divisions of 9 mm)		90 x 72 mm
Deflection coefficient		
horizontal	M_x	9,5 V/div
vertical, system 1	M_y'	8,5 V/div
vertical, system 2	M_y''	8,5 V/div
Overlap of the systems		100 %
Writing speed		1,25 div/μs

OPTICAL DATA

Screen	metal-backed phosphor	
type	GH, colour green	
persistence, non-store mode	medium short	
persistence, store mode	variable	
Useful screen dimensions	min.	90 x 72 mm
Useful scan		
horizontal	min.	90 mm
vertical (each system)	min.	72 mm
overlap		100 %
Spot eccentricity		
in horizontal direction	max.	6 mm
in vertical direction	max.	9 mm

The scanned raster can be aligned with the internal graticule by means of correction coils fitted around the tube by the manufacturer.

HEATING

Writing section

Indirect by AC or DC; parallel supply		
Heater voltage	V_f	6,3 V
Heater current	I_f	300 mA

Viewing section

Indirect by DC; parallel supply		
Heater voltage	V_f'	6,3 V
Heater current	I_f'	300 mA
Heater voltage	V_f''	6,3 V
Heater current	I_f''	300 mA

MECHANICAL DATA

Mounting position

The tube should not be supported by the base alone and under no circumstances should the socket be allowed to support the tube. The tags near the screen should not be subjected to mechanical stress.

Net mass	approx.	1,1 kg
Base	14 pin, all glass	
Dimensions and connections		
See also outline drawing		
Overall length (socket included)	max.	445 mm
Face dimensions	max.	100 x 120 mm
Accessories		
Socket (supplied with tube)	type	55566
Side contact connector (16 required)	type	55561
Small ball contact connector (3 required)	type	4022 102 21590
FOCUSING	electrostatic	
DEFLECTION	double electrostatic	
x-plates	symmetrical	
y-plates	symmetrical	

If use is made of the full deflection capabilities of the tube, the deflection plates will block part of the electron beams, hence a low impedance deflection plate drive is desirable.

Angle between x and y traces, each beam	90°	
Angle between x-trace and x-axis of the internal graticule	0°	
Angle between corresponding y-traces at the centre of the screen	max.	45′

CAPACITANCES

Writing section

x_1 to all other elements except x_2	$C_{x1(x2)}$	6,5 pF
x_2 to all other elements except x_1	$C_{x2(x1)}$	6,5 pF
y_1' to all other elements except y_2'	$C_{y1'(y2')}$	5 pF
y_2' to all other elements except y_1''	$C_{y2'(y1')}$	6 pF
y_1'' to all other elements except y_2''	$C_{y1''(y2'')}$	6 pF
y_2'' to all other elements except y_1''	$C_{y2''(y1'')}$	5 pF
x_1 to x_2	$C_{x1\,x2}$	2,5 pF
y_1' to y_2'	$C_{y1'y2'}$	0,6 pF
y_1'' to y_2''	$C_{y1''y2''}$	0,6 pF
g_1 to all other elements	C_{g1}	5,5 pF
k to all other elements	C_k	4,5 pF

Viewing section

g_1' to all other elements	$C_{g1'}$	5,5 pF
g_1'' to all other elements	$C_{g1''}$	5,5 pF
k' to all other elements	$C_{k'}$	5 pF
k'' to all other elements	$C_{k''}$	5 pF
g_7 to all other elements	C_{g7}	45 pF
g_9 to all other elements	C_{g9}	75 pF

DIMENSIONS AND CONNECTIONS

Dimensions in mm

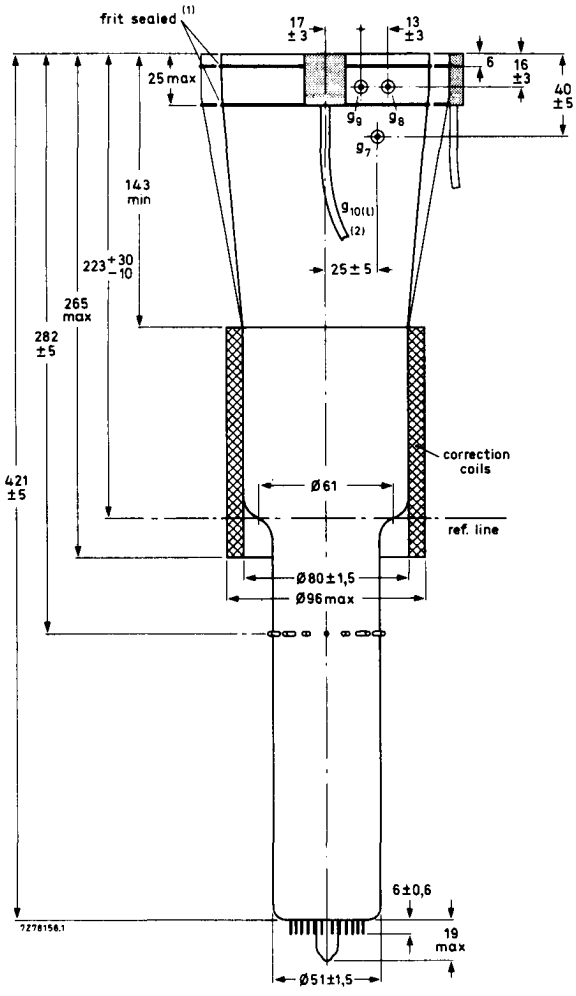


Fig. 1 Outlines.

(1) The bulge at the frit seal may increase the indicated maximum dimensions (Fig. 3) by not more than 3 mm.

(2) Minimum length of cable: 420 mm.

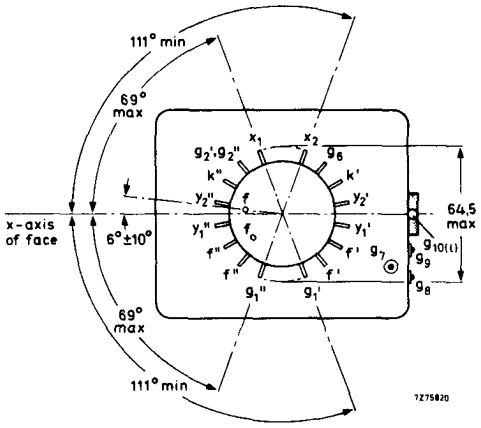


Fig. 2 Bottom view and side-contact arrangement.

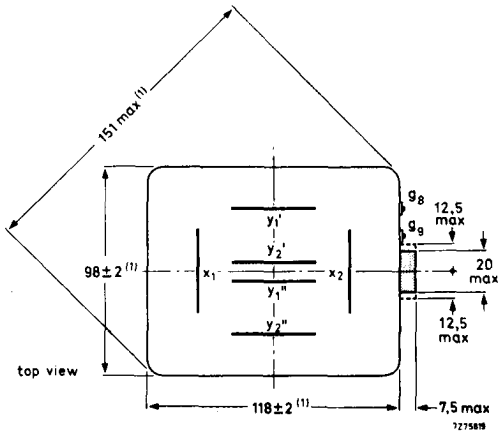


Fig. 3 Top view.

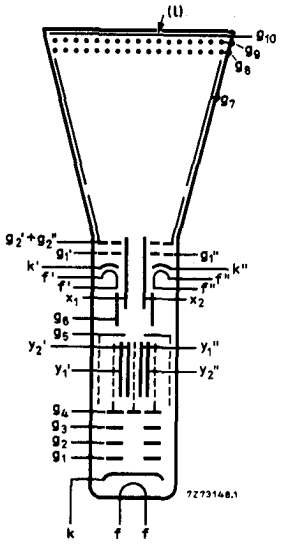


Fig. 4 Electrode configuration.

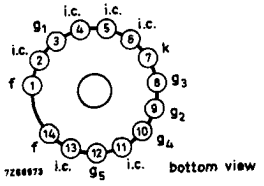


Fig. 5 Pin arrangement; bottom view.

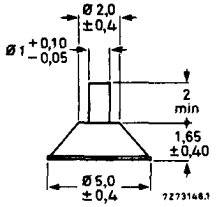


Fig. 6 Detail of side contact.

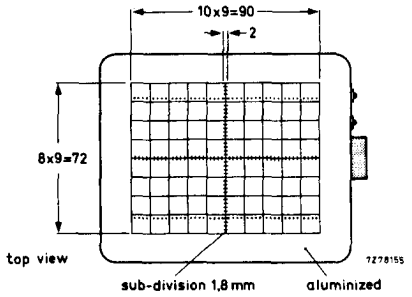


Fig. 7 Internal graticule.
Colour: brown-black;
line width: 0,15 mm;
dot diameter: 0,3 mm.

TYPICAL OPERATION

Conditions

Writing section (voltages with respect to writing gun cathode k)

Final accelerator voltage	$V_{g10(\ell)}$	8500	V	note 1
Geometry control electrode voltage	V_{g6}	1500 ± 100	V	
Deflection plate shield voltage	V_{g5}	1500	V	note 2
Astignatism control electrode voltage	V_{g4}	1500 ± 75	V	
Focusing electrode voltage	V_{g3}	400 to 650	V	
First accelerator voltage	V_{g2}	1500	V	
Control grid voltage for visual extinction of focused spot	V_{g1}	−40 to −80	V	

Viewing section (voltages with respect to viewing gun cathode k' and k'')

Final accelerator voltage	$V_{g10(\ell)}$	7050	V	note 1
Backing electrode voltage,				
storage operation	V_{g9}	1	V	
non-storage operation	V_{g9}	−35	V	
Collector voltage	V_{g8}	150	V	
Collimator voltage	V_{g7}	30 to 120	V	note 3
First accelerator voltage	$V_{g2'}$, $V_{g2''}$	50	V	note 4
Control grid voltage for cut-off	$V_{g1'}$, $V_{g1''}$	−30 to −70	V	
Cathode current (each viewing gun)	$I_{k'}$, $I_{k''}$	0,4	mA	

Performance

Useful scan					
horizontal		min.	90	mm	
vertical		min.	72	mm	
Deflection coefficient					
horizontal	M_x		9,5	V/div	
		max.	10,5	V/div	
vertical, system 1	$M_{y'}$		8,5	V/div	
		max.	9,5	V/div	
vertical, system 2	$M_{y''}$		8,5	V/div	
		max.	9,5	V/div	
Line width at the centre of the screen	l.w.		0,40	mm	note 5
Writing speed in store mode		greater than	125	div/ms	note 6
Storage time		greater than	1,5	min	note 7
Deviation of linearity of deflection		max.	2	%	note 8
Geometry distortion		see note 9			
Grid drive for 5 μA beam current, per system		approx.	30	V	

LIMITING VALUES (Absolute maximum rating system)

Writing section (voltages with respect to writing gun cathode k)

Final accelerator voltage	$V_{g10(\ell)}$	max.	9500 V
		min.	7000 V
Geometry control electrode voltage	V_{g6}	max.	2100 V
Deflection plate shield voltage	V_{g5}	max.	2000 V
Astigmatism control electrode voltage	V_{g4}	max.	2100 V
		min.	1200 V
Focusing electrode voltage	V_{g3}	max.	1000 V
First accelerator voltage	V_{g2}	max.	2000 V
		min.	1250 V
Control grid voltage			
positive	V_{g1}	max.	0 V
negative	$-V_{g1}$	max.	200 V
Cathode to heater voltage			
positive	V_{kf}	max.	125 V
negative	$-V_{kf}$	max.	125 V
Voltage between astigmatism control electrode and any deflection plate	$V_{g4/x}$	max.	500 V
	$V_{g4/y}$	max.	500 V
Average grid drive		max.	30 V

Viewing section (voltages with respect to viewing gun cathodes k' and k'' unless otherwise specified)

Final accelerator voltage	$V_{g10(\ell)}$	max.	8000 V
		min.	5500 V
Backing electrode voltage, storage operation	V_{g9}	max.	5 V
		min.	0 V
non-storage operation	$-V_{g9}$	max.	50 V
		min.	25 V
Collector voltage	V_{g8}	max.	180 V
		min.	120 V
Collimator voltage	V_{g7}	max.	200 V
		min.	0 V
First accelerator voltage	$V_{g2'}$, $V_{g2''}$	max.	60 V
		min.	40 V
Cathode to heater voltage			
positive	$V_{k'f'}$, $V_{k''f''}$	max.	125 V
negative	$-V_{k'f'}$, $-V_{k''f''}$	max.	125 V
Control grid voltage			
positive	$V_{g1'}$, $V_{g1''}$	max.	0 V
negative	$-V_{g1'}$, $-V_{g1''}$	max.	200 V

NOTES

1. These values are valid at cut-off of both viewing (flood) guns and the writing gun. The H.T. unit must be capable of supplying 0,5 mA. To protect the tube against excessive surge current during erasure, an adequately dimensioned RC-network must be connected in series with the screen terminal lead (Fig. 8).

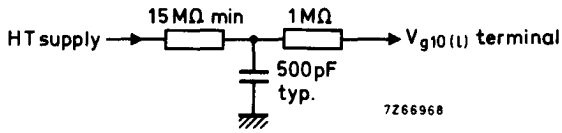


Fig. 8.

2. This voltage should be equal to the mean y-plate potential. The mean x and y-plate potentials should be equal for optimum spot quality.
3. The collimator electrode voltage should be adjusted for optimum uniformity of background illumination.
4. The voltage $V_{g2'}$, $V_{g2''}$ should be equal to the mean x-plate potential.
5. Measured with the shrinking raster method in the centre of the screen under typical operating conditions, adjusted for optimum spot size at a beam current I_b = 5 μA per system (measured against x-plates).
6. The writing speed is defined as the maximum speed at which a written trace is just visible, starting from a background which is just black. The indicated value is guaranteed for the total graticule area, with the exception of maximum 5% in each corner. The writing speed can be increased to approx. 1,25 div/μs if some background is tolerated.
7. The storage time is defined as the time required for the brightness of the unwritten background to rise from just zero brightness (viewing-beam cut-off) to 10% of saturated brightness. At reduced intensity (by pulsing the flood beams) the storage time can be increased.
8. The sensitivity at a deflection less than 75% of the useful scan will not differ from the sensitivity at a deflection of 25% of the useful scan by more than the indicated value.
9. A graticule, consisting of concentric rectangles of 88 mm x 70 mm and 84,8 mm x 67,6 mm is aligned with the electrical x-axis of the tube. With optimum corrections applied, a raster will fall between these rectangles.

CORRECTION COILS

General

The L14-131GH/55 is provided with a coil unit (see Fig. 9) consisting of:

1. A pair of coils L3 and L4 which enable the angle between the x and y-traces at the centre of the screen to be made exactly 90° (orthogonality correction).
2. A pair of coils L1 and L2 for image rotation which enable the alignment of the x-trace with the x-lines of the graticule.

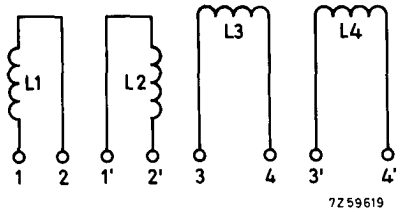


Fig. 9 Diagram of coil unit.

Orthogonality (coils L3 and L4)

The current required under typical operating conditions without a mu-metal shield being used is max. 20 mA for complete correction of orthogonality. It will be 30% to 50% lower with shield, depending on the shield diameter. The resistance of the coil is approx. 225 Ω.

Image rotation (coils L1 and L2)

The image rotation coils are wound concentrically around to the tube neck. Under typical operating conditions 22 ampere-turns are required for maximum rotation of 5°. Both coils have 850 turns. This means that a current of max. 12,5 mA per coil is required which can be obtained by using a 12 V supply when the coils are connected in series or a 6 V supply when they are in parallel.

Connecting the coils

The coils have been connected to 8 solder tags according to Fig. 10.

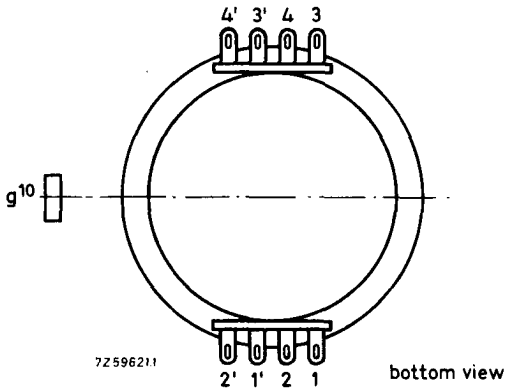


Fig. 10 Bottom view.

With L3 and L4 connected in series according to Fig. 11 a current in the direction indicated will produce a clockwise rotation of the vertical trace and an anti-clockwise rotation of the horizontal trace.

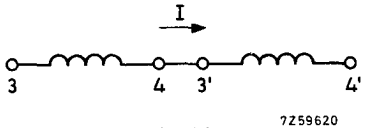


Fig. 11.

BEAM CENTRING MAGNET

Inherent to the split-beam system a slight difference between the two beam currents can occur after splitting, resulting in different intensities of the two traces. In order to equalize the beam currents, a beam centring magnet should be mounted near the base of the gun and adjusted for the required field direction and field strength.

OPERATING NOTES

Modes of operation

Store mode

a. Dynamic erasure (variable persistence).

Dynamic erasure can be achieved by applying erasing pulses of positive polarity to the backing electrode. The pulse amplitude required is approximately 9 V (< 15 V) and the persistence of a stored display can be controlled by varying the duty factor of these pulses.

b. Static erasure.

If no dynamic erasing pulses are applied, the storage time is limited by the potential shift of the storage layer due to landing of positive ions. In order to erase a stored display, the backing electrode should first be connected to the collector electrode voltage and then returned to its original potential for about 100 ms; after that, an erasing pulse of positive polarity and a duration of not less than 300 ms should be applied. For the adjustment of the amplitude of this pulse see Procedure of adjustment.

Non-store mode

For non-store operation, it is sufficient to make the backing electrode about 35 V negative with respect to the viewing gun cathodes. The viewing guns should not be switched off in this mode of operation since slight variations in raster geometry and deflection sensitivity might otherwise be caused. Care should be taken, especially when switching from store mode to non-store mode, that excessive writing beam current is avoided, as otherwise the storage layer may be damaged.

Procedure of adjustment

a. Adjust the cathode current of each viewing gun to 0,4 mA by means of its control grid voltage.

b. Adjustment of the erasing pulse amplitude (static erasure)

The pulse amplitude should be just sufficient to suppress any background illumination at the centre of the display area (this adjustment should be done under low ambient light conditions). Data on storage time and maximum writing speed are based on erasure to "just black". A larger pulse amplitude (erasure to "blacker than black") yields a longer storage time at the expense of maximum writing speed. On the other hand, writing speed can be increased if some background illumination is tolerated. To erase to "just black" the amplitude of this pulse is approximately 9 V.

c. Adjustment of the collimator voltage.

With dynamic erasing pulses applied and a persistence control setting that yields a convenient background illumination intensity, the collimator voltage is adjusted for optimum background uniformity. This voltage will be approximately 80 V with respect to the viewing gun cathode potential. If this voltage will be approximately 80 V with respect to the viewing gun cathode potential. If this voltage is too high or too low, there is a decrease of intensity at the four corners or at the centres of the vertical edges of the display area respectively.

INSTRUMENT CATHODE-RAY TUBE

14 cm diagonal, rectangular flat-faced direct-view charge transfer storage tube with internal graticule. The tube has vertical scan-magnification with 3 quadrupole lenses and is for wide-band (100 MHz) oscilloscopy with fast store mode and variable persistence.

QUICK REFERENCE DATA

Final accelerator voltage	$V_{g13(\ell)}$	10 kV
Minimum useful scan area		90 mm x 72 mm
Deflection coefficient		
horizontal	M_x	18,5 V/div
vertical	M_y	4,8 V/div
Writing speed		1 div/ns

OPTICAL DATA

Screen	metal backed phosphor	
type	GH, colour green	
persistence, non-store mode	medium-short	
persistence, store mode	variable	
Useful screen area	min.	90 mm x 72 mm
Useful scan area	*min.*	*90 mm x 72 mm*
Spot eccentricity		
in horizontal direction	max.	6 mm
in vertical direction	max.	8 mm
Internal graticule	type 95; see Fig. 6	

HEATING

Writing section

Indirect by a.c. or d.c.*

Heater voltage	V_f	6,3 V
Heater current	I_f	240 mA
Heating time to attain 10% of the cathode current at equilibrium conditions		approx. 5 s

Viewing section

Indirect by d.c.*

Heater voltage	V_{FGf}	12,6 V
Heater current	I_{FGf}	240 mA
Heating time to attain 10% of the cathode current at equilibrium conditions		approx. 5 s

* Not to be connected in series with other tubes.

MECHANICAL DATA

Mounting position

The tube can be mounted in any position. It should not be supported by the base alone or near the base region, and under no circumstances should the socket be allowed to support the tube. The tags near the screen should not be subjected to mechanical stress. Avoid any force on the side contacts.

Net mass	approx.	1,3	kg
Base	14 pin, all glass		
Dimensions and connections (see also outline drawing)			
Overall length (socket included)	max.	454	mm
Faceplate dimensions	118 ± 0,5 mm x 98 ± 0,5		mm
Accessories			
Socket (supplied with tube)	type	55572	
Side contact connector (8 required)	type	55561	
Small ball contact connected (6 required)	type	4022 102 21590	
FOCUSING	electrostatic		note 1
DEFLECTION	double electrostatic		
x-plates	symmetrical		
y-plates	symmetrical		
Angle between x and y-traces	90 ± 1°		
Angle between y-trace and y-axis of the internal graticule	⩽ 5°		note 2

NOTES

1. Because of the use of a quadrupole lens for the magnification of the vertical deflection, two more quadrupole lenses are used for focusing. Therefore, controls for two voltages have to be provided.
2. The tube has a rotation coil, concentrically wound around the tube neck, to allow alignment of the y-trace with the mechanical y-axis of the screen. The coil has 2000 turns and a maximum resistance of 650 Ω. Under typical operating conditions, a maximum of 30 ampere-turns is required for the maximum rotation of 5°. This means the required supply is 15 mA maximum at 12 V maximum.

CAPACITANCES

x_1 to all other elements except x_2	$C_{x1(x2)}$	5,5 pF
x_2 to all other elements except x_1	$C_{x2(x1)}$	5,5 pF
y_1 to all other elements except y_2	$C_{y1(y2)}$	2,7 pF
y_2 to all other elements except y_1	$C_{y2(y1)}$	2,7 pF
x_1 to x_2	C_{x1x2}	3 pF
y_1 to y_2	C_{y1y2}	1,7 pF
g_1 to all other elements	C_{g1}	7 pF
k to all other elements	C_k	5 pF
g_{11} to all other elements	C_{g11}	80 pF
g_{12} to all other elements	C_{g12}	70 pF
g_{13} to all other elements	C_{g13}	85 pF
g_3 to all other elements	C_{g3}	17 pF
g_5 to all other elements	C_{g5}	17 pF
$g_{9\text{-}1}$ to all other elements	$C_{g9\text{-}1}$	30 pF
$g_{9\text{-}2}$ to all other elements	$C_{g9\text{-}2}$	70 pF
$g_{9\text{-}3}$ to all other elements	$C_{g9\text{-}3}$	60 pF
FGA to all other elements	C_{FGA}	20 pF
k', k'' to all other elements	$C_{k', k''}$	12 pF

DIMENSIONS AND CONNECTIONS

Dimensions in mm

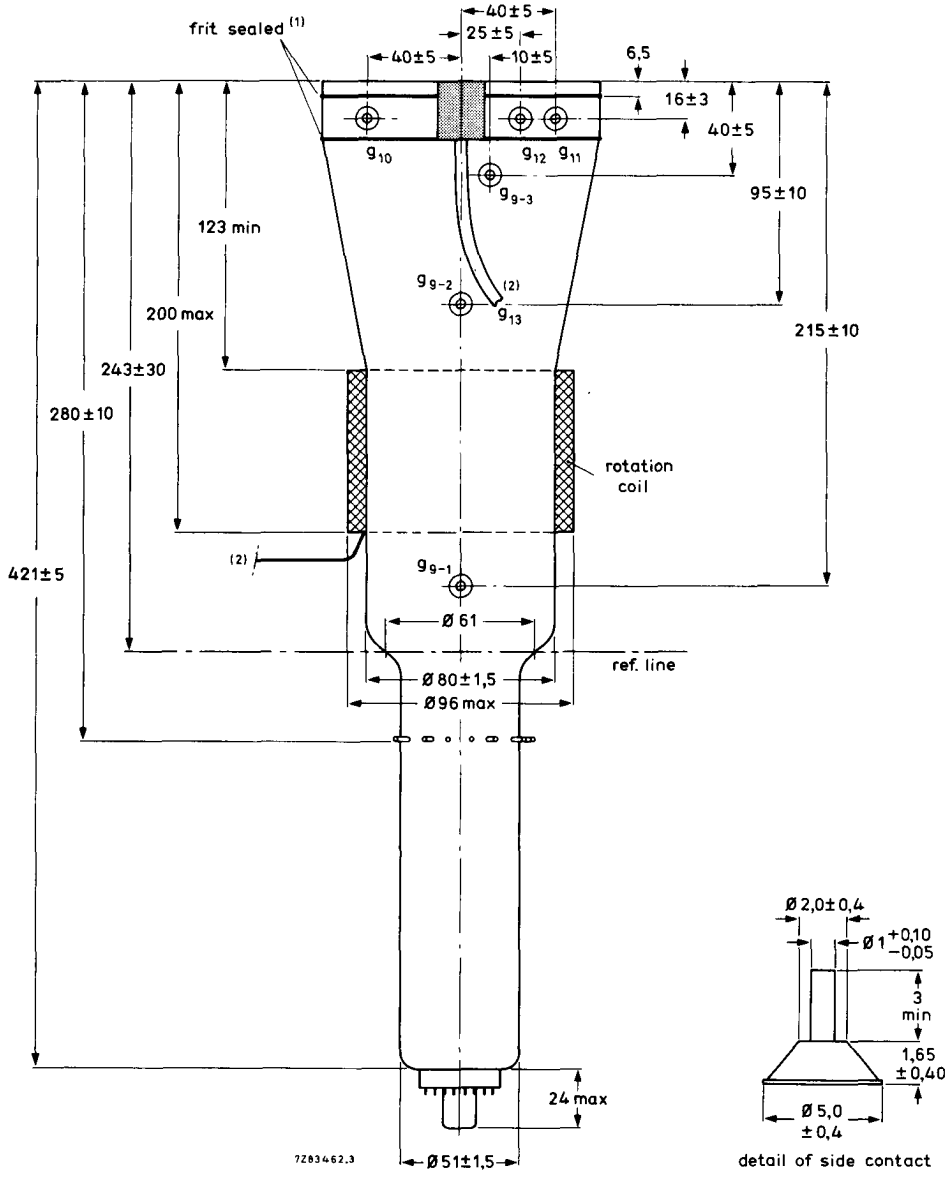


Fig. 1 Outlines

(1) Dimensions of faceplate only. The bulge at the frit seal may increase the indicated maximum dimensions by not more than 3 mm.
(2) Minimum length of cable: 350 mm.

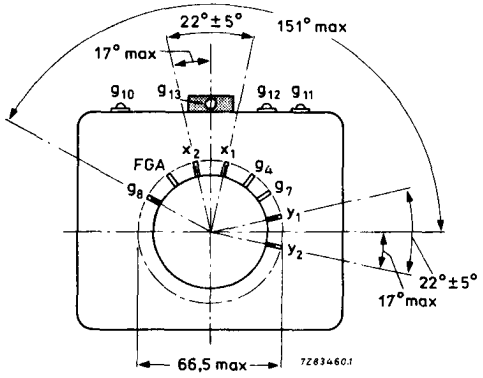


Fig. 2 Bottom view and side-contact arrangement.

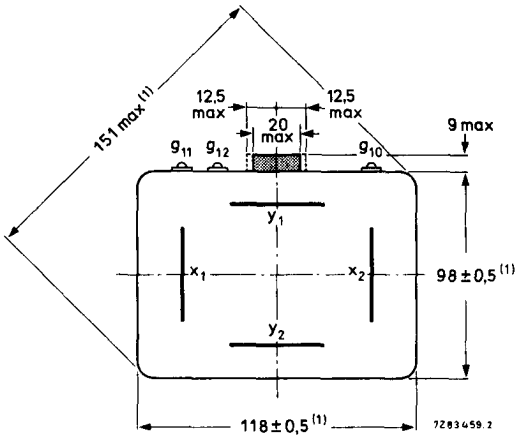


Fig. 3 Top view. For note (1) see opposite page.

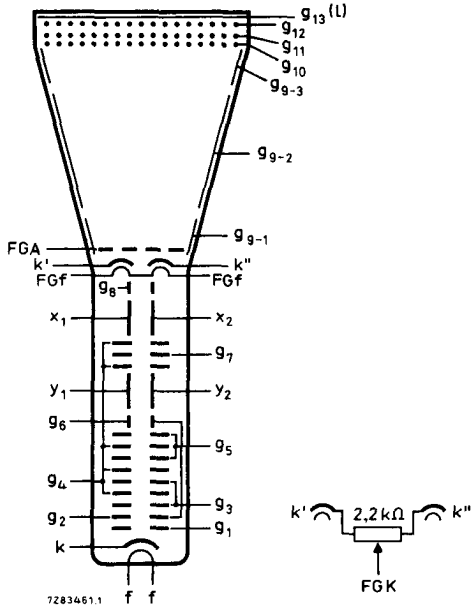


Fig. 4 Electrode configuration.

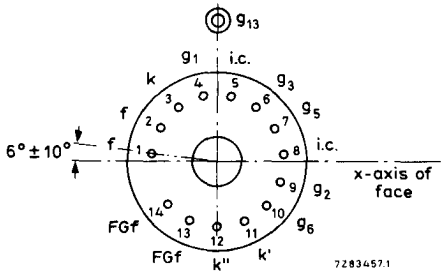


Fig. 5 Pin arrangement; bottom view.

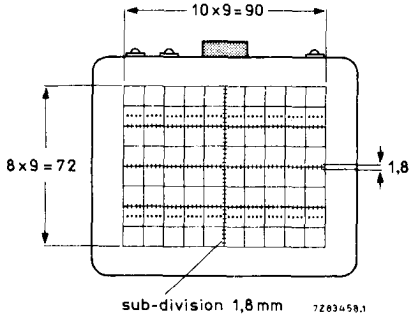


Fig. 6 Internal graticule
colour of graticule: brown-black;
line width : 0,2 mm;
dot diameter : 0,4 mm.

TYPICAL OPERATION (for notes see next pages)

Conditions

Writing section (voltages with respect to writing gun cathode k, unless otherwise stated for optimum scan magnification ≈ 1,8).

Final accelerator voltage	$V_{g13(I)}$	10 000 V	note 1
Geometry control voltage	V_{g8}	3000 ± 100 V	
Scan magnifier electrode voltage (with respect to g_2)	V_{g7}	−600 V	
Horizontal alignment electrode voltage (with respect to g_2)	V_{g6}	± 100 V	note 2
Vertical focusing electrode voltage (with respect to g_2)	V_{g5}	−860 to −1100 V	
Correction electrode voltage (with respect to g_2)	V_{g4}	200 V	note 3
Horizontal focusing electrode voltage (with respect to g_2)	V_{g3}	−1300 to −1650 V	
First accelerator voltage	V_{g2}	3000 V	
Cut-off voltage for visual extinction of focused spot	$-V_{g1}$	75 to 130 V	

Viewing section (voltages with respect to viewing gun cathode FGK, Fig. 4)

		non-store mode	variable persistance mode	fast-store mode	
Final accelerator voltage (with respect to first accelerator FGA)	$V_{g13(I)}$	7000 V	7000 V	7000 V	note 1
Backing electrode voltages (d.c.)					
front mesh	V_{g12}	−50 V			note 4
fast mesh	V_{g11}	140 V	140 V	140 V	
Collector mesh voltage (d.c.)	V_{g10}	130 V	130 V	130 V	
Collimator voltage (d.c.)					
C3	V_{g9-3}	65 V	65 V	65 V	
C2	V_{g9-2}	≈ 65 V	65 V	65 V	
C1	V_{g9-1}	30 V	30 V	30 V	
First accelerator voltage (d.c.)	V_{FGA}	20 V	20 V	20 V	
Flood gun cathode voltage (d.c.)	V_{FGK}	0 V	0 V	0 V	

The first accelerator voltage should be equal to the mean x-plate potential.

Performance

Useful scan area		min. 90 mm x 72	mm
Deflection coefficient			
horizontal	M_x	typ. 18,5	V/div
		max. 20,5	V/div
vertical	M_y	typ. 4,8	V/div
		max. 5,5	V/div

Deviation of deflection linearity		max.	2 %	note 5
Geometry distortion		see note 6		
Grid drive for 10 μA beam current	V_d	approx.	20 V	
Grid drive for specified writing speed	V_d	max.	80 V	
Line width at the centre of the screen	l.w.		0,4 mm	note 7

Writing speed (note 8)

Variable persistence mode
just black: $\geqslant$ 250 div/ms
max. write: $\geqslant$ 2,5 div/μs

Fast-store mode
max. write: $\geqslant$ 1 div/ns

Storage viewing time (note 9)

Variable persistence mode
just black: $\geqslant$ 60 s
max. write: $\geqslant$ 15 s

Fast-store mode
max. write: $\geqslant$ 15 s

NOTES

1. These values are valid at cut-off of both flood guns and the writing gun. The H.T. unit must be capable of supplying 0,5 mA. To protect the tube against excessive surge current during erasure, an RC-network as shown in Fig. 7 must be connected in series with the screen terminal lead; the resistance of 15 to 20 MΩ includes the internal resistance of the H.T. supply.

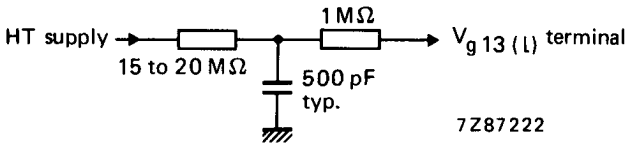


Fig. 7.

2. This voltage should be adjusted for equal brightness in the x-direction with respect to the electrical centre of the tube.
3. For minimum defocusing of vertical lines near the upper and lower edges of the scanned area this voltage should be the value indicated.
4. The indicated values concern the d.c. levels; during the erasing, preparing and transfering operation these electrodes are pulsed.
5. The sensitivity at a deflection less than 75% of the useful scan will not differ from the sensitivity at a deflection of 25% of the useful scan by more than the indicated value.
6. A graticule, consisting of concentric rectangles of 90 mm x 72 mm and 87,8 mm x 70,5 mm is aligned with the electrical x-axis of the tube. With optimum corrections applied, a raster will fall between these rectangles.
7. Measured with the shrinking raster method in the centre of the screen under typical operating conditions, adjusted for optimum spot size at a beam current I_b = 10 μA (measured against x-plates).

NOTES (continued)

8. The writing speed is defined as the maximum speed at which a written trace is just visible starting from a background which is just black. The indicated value is guaranteed for the central 80% of the minimum screen area, except the outmost 3 mm of the screen. However, in any corner not more than 4 square divisions fall outside the guaranteed area. The writing speed can be increased, if some background is tolerated. Within the same area, a trace, written with the indicated value of max. write, remains just visible within the indicated storage time of max. write.

   The writing speed in max. write, with background, is defined as the maximum speed at which the written trace remains just visible within the indicated storage time.

9. The storage time in just black mode is defined as the time required for the brightness of the unwritten background to rise from zero brightness (viewing beam cut-off) to 10% of saturated brightness. At reduced intensity (by pulsing the flood beams) the storage time can be increased.

   The storage time in max. write and fast is related to the writing speed.

LIMITING VALUES (absolute maximum rating system)

Writing section (Voltages with respect to writing gun cathode k, unless otherwise stated)

Final accelerator voltage	$V_{g13(I)}$	max.	10500 V
		min.	8500 V
Geometry control voltage (with respect to g_2)	V_{g8}	max.	500 V
		min.	−500 V
Scan magnifier electrode voltage (with respect to g_2)	V_{g7}	max.	550 V
		min.	−700 V
Horizontal alignment electrode voltage (with respect to g_2)	V_{g6}	max.	500 V
		min.	−500 V
Vertical focusing electrode voltage (with respect to g_2)	V_{g5}	max.	−750 V
		min.	−1200 V
Correction electrode voltage (with respect to g_2)	V_{g4}	max.	500 V
		min.	0 V
Horizontal focusing electrode voltage (with respect to g_2)	V_{g3}	max.	−1200 V
		min.	−1800 V
First accelerator voltage	V_{g2}	max.	3500 V
		min.	2500 V
Control grid voltage			
positive	V_{g1}	max.	0 V
negative	$-V_{g1}$	max.	200 V
Cathode to heater voltage			
positive	V_{kf}	max.	125 V
negative	$-V_{kf}$	max.	125 V
Voltage between correction electrode and any deflection plate	$V_{g4/x}$	max.	500 V
	$V_{g4/y}$	max.	500 V
Grid drive, averaged over 1 ms	V_d	max.	30 V

Viewing section (voltages with respect to viewing gun cathode FGK)

Screen voltage	$V_{g13(I)}$	max.	7500 V
		min.	5500 V
Backing electrode voltage (d.c.) front mesh	V_{g12}	max.	600 V
		min.	−50 V
fast mesh	V_{g11}	max.	200 V
		min.	−50 V
Collector mesh voltage (d.c./a.c.)	V_{g10}	max.	200 V
		min.	100 V
Collimator voltages (d.c./a.c.)	$V_{g9\text{-}1;\ 9\text{-}2;\ 9\text{-}3}$	max.	150 V
		min.	0 V
First accelerator voltage	V_{FGA}	max.	100 V
		min.	0 V
Cathode to heater voltage	$V_{k'FGf}$, $V_{k''FGf}$	max.	125 V
	$-V_{k'FGf}$, $-V_{k''FGf}$	max.	125 V

OPERATING NOTES

Scan magnifier

A scan magnification $M_{sc} \approx 1{,}8$ is the best compromise between line width and sensitivity. This is obtained with $V_{g7} = -600$ V and $V_{g4} = 200$ V. Performance is tested and specified under this condition and no adjustment will be necessary for individual tubes.

Focusing is separate for horizontal and vertical directions with V_{g3} and V_{g5} respectively. Both focus settings may depend on beam current with different steepness. Although both electrodes are positive with respect to cathode, reverse current may result from secondary electrons leaving grid 3 (max. 5 μA) and grid 5 (max. 50 μA).

Normal current direction from beam interception is to be expected on the horizontal correction electrode g_6 (up to 500 μA) and, as usual, on g_2 and deflection plates.

Modes of operations

Non-store mode

For non-store operation the front mesh V_{g12} is set to -50 V with respect to FGK.

The viewing guns should not be switched off in this mode of operation since slight variations in raster geometry and deflection sensitivity might otherwise be caused. Care should be taken, especially when switching from store mode to non-store mode, that excessive writing beam current is avoided, as otherwise the storage layer may be damaged.

Variable persistence mode

The fast mesh is switched off for this operation and used as collector by setting $V_{g11} = 140$ V.

a. Static erasure

If no dynamic erasing pulses are applied the storage time is limited by the potential shift of the storage layer due to landing of positive ions.

In order to erase a stored display, V_{g12} is increased to 500 V for 100 ms and than returned to its original potential for about 500 ms; after that, an erasing pulse of positive polarity (max. 20 V) and a duration of 600 ms should be applied.

While the erasing pulse amplitude is to be adjusted with zero d.c. level for "just black", the background illumination can be changed – even with a stored signal – by varying the d.c. level for optimum contrast or maximum writing speed.

Background egality can be optimized by balancing the viewing gun cathodes by means of a potentiometer of 2,2 kΩ, proper collimator adjustment, and by increasing V_{FGA}. $V_{g9\text{-}1}$ and $V_{g9\text{-}3}$ in positive direction during erasure.

Before first installation, depending on transport conditions, demagnetization of the tube face region may be necessary.

b. Dynamic erasure

Dynamic erasure can be achieved by applying extra erasing pulses of positive polarity to the backing electrode of the front mesh (g_{12}). The amplitude of these extra pulses is equal to that of the original erasing pulse, the frequency is 120 Hz and the persistence of the display can be controlled by varying the duty factor.

Fast-store mode

For erasure in the fast mode the front mesh has to be erased first in the same way as in the variable persistence mode but separate adjustments should be foreseen.

The fast mesh is to be prepared by reducing V_{g11} from 140 V to the stabilizing level (0 to max. 20 V) during the erasing pulse on the front mesh.

After writing, at the end of the unblanking pulse, a transfer pulse (500 V, 100 ms) is to be applied on the front mesh.

During the transfer pulse, V_{g11} is further reduced about 1 V for enhanced transmission during transfer. This reduction has to be carefully adjusted for optimum contrast and writing speed.

During the whole cycle, FGA, V_g9-1 and V_g9-3 may be increased for more viewing gun current. Details on the adjustment procedure and the voltage range to be provided for can be made available.

INSTRUMENT CATHODE-RAY TUBE

- 14 cm diagonal rectangular flat face
- direct - view storage tube
- internal graticule
- for oscilloscope applications

QUICK REFERENCE DATA

Final accelerator voltage	$V_{g10(\ell)}$	8,5 kV
Minimum useful scan area		90 mm x 72 mm
Deflection coefficient		
horizontal	M_x	9,5 V/div
vertical	M_y	4,1 V/div
Writing speed		2,5 div/μs

OPTICAL DATA

Screen	metal-backed phosphor
type	GH, colour green
persistence, non-store mode	medium-short
persistence, store mode	variable
Useful screen area	min. 90 mm x 72 mm
Useful scan area	min. 90 mm x 72 mm
Spot eccentricity in horizontal and vertical directions	max. 6 mm
Internal graticule	typ. 95; see Fig. 6

HEATING

Writing section

Indirect by AC or DC*

Heater voltage	V_f	6,3 V
Heater current	I_f	240 mA
Heating time to attain 10% of the cathode current at equilibrium conditions		approx. 5 s

Viewing section

Indirect by DC*

Heater voltage	V_{FGf}	12,6 V
Heater current	I_{FGf}	240 mA
Heating time to attain 10% of the cathode current at equilibrium conditions		approx. 5 s

* Not to be connected in series with other tubes.

MECHANICAL DATA

Dimensions and connections (see also outline drawings)

Overall length (socket included)	⩽ 452 mm
Faceplate dimensions (final accelerator contact excluded)	118 ± 0,5 mm x 98 ± 0,5 mm
Net mass	approx. 1,3 kg
Mase	14 pin, all glass

Mounting position

The tube can be mounted in any position. It should not be supported by the base alone or near the base region, and under no circumstances should the socket be allowed to support the tube. The tags near the screen should not be subjected to mechanical stress. Avoid any force on the side contacts.

Accessories

Socket (supplied with tube)	type 55566
Side contact connector (7 required)	type 55561
Small ball contact connector (5 required)	type 4022 102 21590

FOCUSING	electrostatic
DEFLECTION	double electrostatic
x-plates	symmetrical
y-plates	symmetrical
Angle between x and y-traces	90 ± 1°
Angle between x-trace and x-axis of the internal graticule	⩽ 5°*

CAPACITANCES

x_1 to all other elements except x_2	$C_{x1(x2)}$	5,5 pF
x_2 to all other elements except x_1	$C_{x2(x1)}$	5,5 pF
y_1 to all other elements except y_2	$C_{y1(y2)}$	3,5 pF
y_2 to all other elements except y_1	$C_{y2(y1)}$	3,5 pF
x_1 to x_2	C_{x1x2}	2,5 pF
y_1 to y_2	C_{y1y2}	2 pF
g_1 to all other elements	C_{g1}	6 pF
k to all other elements	C_k	3,5 pF
g_3 to all other elements	C_{g3}	4,5 pF
g_{7-1} to all other elements	C_{g7-1}	30 pF
g_{7-2} to all other elements	C_{g7-2}	65 pF
g_{7-3} to all other elements	C_{g7-3}	60 pF
g_9 to all other elements	C_{g9}	60 pF
g_{10} to all other elements	C_{g10}	80 pF
FGA to all other elements	C_{FGA}	15 pF
FGK' to all other elements	$C_{FGK'}$	8 pF
FGK'' to all other elements	$C_{FGK''}$	8 pF

Dimensions in mm

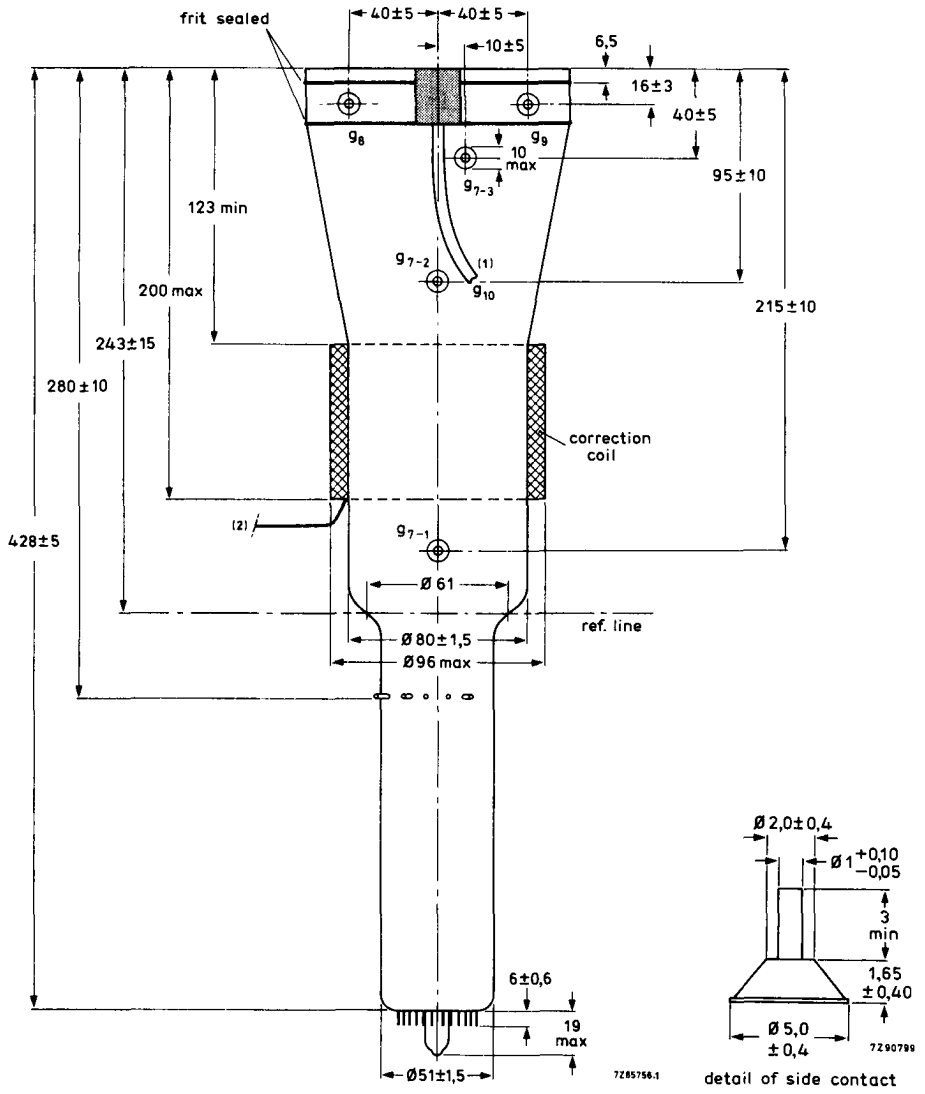


Fig. 1 Outlines.

(1) Minimum cable length is 420 mm.
(2) Minimum length of connecting leads is 350 mm.

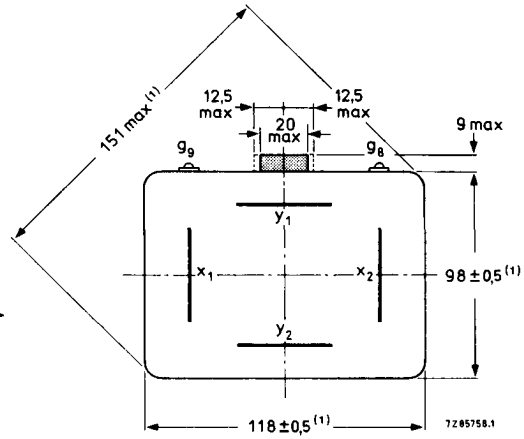


Fig. 2 Top view.

(1) The bulge at the frit seal may increase the indicated maximum dimensions by not more than 3 mm.

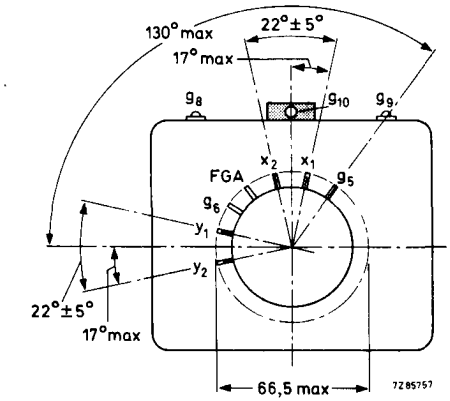


Fig. 3 Bottom view and side-contact arrangement.

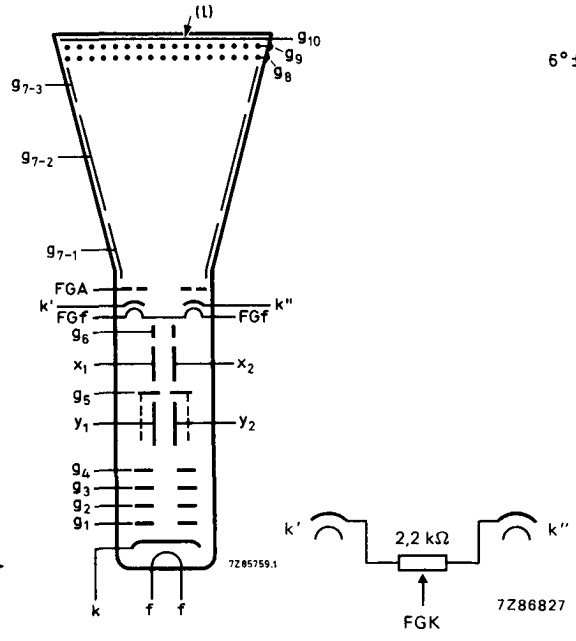


Fig. 4 Electrode configuration.

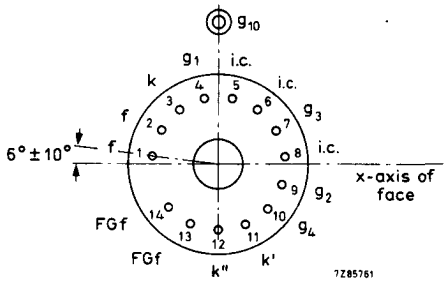


Fig. 5 Pin arrangement; bottom view.

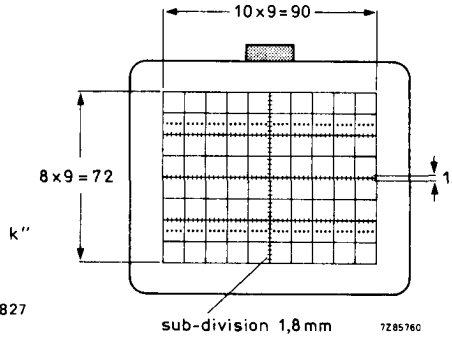


Fig. 6 Internal graticule
colour of graticule: black;
line width: 0,2 mm;
dot diameter: 0,4 mm.

INTERNAL GRATICULE ALIGNMENT

The internal graticule is aligned with the faceplate by using the faceplate reference points A1, A2 and A3, see Fig. 7.

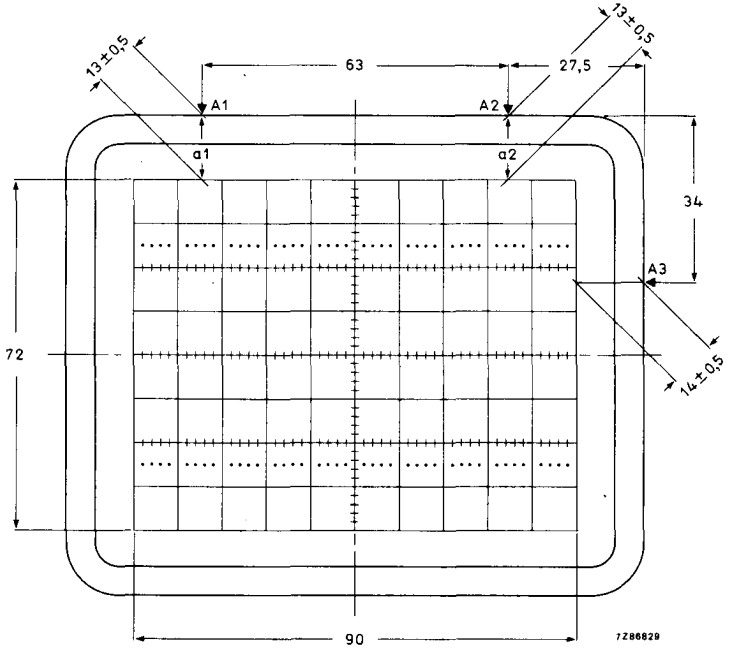


Fig. 7 Front view of tube with internal graticule. $|a1 - a2| \leqslant 0{,}3$ mm.

TYPICAL OPERATION

Conditions

Writing section *

Final accelerator voltage	$V_{g10(\ell)}$	8500 V	see note 1
Geometry control electrode voltage	V_{g6}	1500 ± 100 V	
Deflection plate shield voltage	V_{g5}	1500 V	see note 2
Astigmatism control electrode voltage	V_{g4}	1500 ± 50 V	see note 3
Focusing electrode voltage	V_{g3}	400 to 600 V	
First accelerator voltage	V_{g2}	1500 V	
Cut-off voltage for visual extinction of focused spot	$-V_{g1}$	45 to 85 V	

* Above voltages are with respect to writing gun cathode k.

Viewing section

Refer to Fig. 8 for typical operating values.

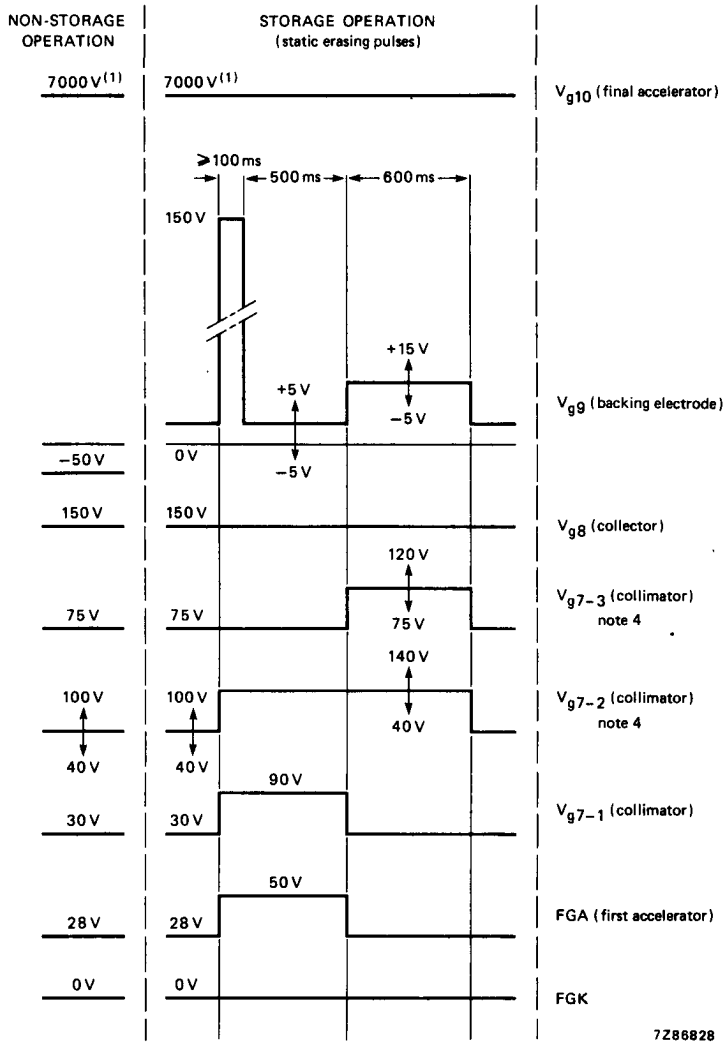


Fig. 8 Diagram of non-storage and storage operation.

(1) With respect to FGA, all other voltages with respect to viewing gun cathode FGK (see Fig. 4 and note 11).

Performance

Useful scan					
horizontal		min.	90	mm	
vertical		min.	72	mm	
Deflection coefficient					
horizontal	M_x		9,5	V/div	
		max.	10,5	V/div	
vertical	M_y		4,1	V/div	
		max.	4,4	V/div	
Line width at the centre of the screen	l.w.		0,35	mm	see note 5
Writing speed in storage operation					
just black		⩾	250	div/ms	see note 6
max. write		⩾	2,5	div/μs	
Storage viewing time					
just black		⩾	90	s	see note 7
max. write		⩾	15	s	
Deviation of deflection linearity		max.	2	%	see note 8
Geometry distortion		see note 9			
Grid drive for 10 μA beam current	V_d	approx.	25	V	
Grid drive for specified writing speed	V_d	max.	45	V	
Total cathode current of both viewing guns					
at FGA = 28 V		approx.	1	mA	
at FGA = 50 V		approx.	2	mA	

LIMITING VALUES (Absolute maximum rating system)

Writing section (voltages with respect to writing gun cathode k)

Final accelerator voltage	$V_{g10(\ell)}$	max.	9000	V
		min.	7000	V
Geometry control electrode voltage	V_{g6}	max.	2100	V
Deflection plate shield voltage	V_{g5}	max.	2000	V
Astigmatism control electrode voltage	V_{g4}	max.	2100	V
		min.	1200	V
Focusing electrode voltage	V_{g3}	max.	1000	V
First accelerator voltage	V_{g2}	max.	2000	V
		min.	1250	V
Control grid voltage				
positive	V_{g1}	max.	0	V
negative	$-V_{g1}$	max.	200	V
Cathode to heater voltage				
positive	V_{kf}	max.	125	V
negative	$-V_{kf}$	max.	125	V
Voltage between astigmatism control electrode and any deflection plate	$V_{g4/x}$	max.	500	V
	$V_{g4/y}$	max.	500	V
Grid drive, averaged over 1 ms	V_d	max.	30	V
Screen dissipation	W_ℓ	max.	8	mW/cm²

Viewing section (voltages with respect to viewing gun cathode FGK)

Final accelerator voltage	$V_{g10(\ell)}$	max.	7500	V
		min.	5500	V
Backing electrode voltage				
storage operation	V_{g9}	max.	+150	V
		min.	−5	V
non-storage operation	$-V_{g9}$	max.	50	V
		min.	25	V
Collector voltage	V_{g8}	max.	180	V
		min.	120	V
Collimator voltage	$V_{g7\text{-}1}$, $V_{g7\text{-}2}$, $V_{g7\text{-}3}$	max.	200	V
		min.	0	V
First accelerator voltage	V_{FGA}	max.	60	V
		min.	0	V
Cathode to heater voltage				
positive	$V_{k'FGf}$, $V_{k''FGf}$	max.	125	V
negative	$-V_{k'FGf}$, $-V_{k''FGf}$	max.	125	V

OPERATING NOTES

Modes of operations

Non-storage mode

For non-storage operation the front mesh V_{g9} is set to −50 V with respect to FGK.

The viewing guns should not be switched off in this mode of operation since slight variations in raster geometry and deflection sensitivity might otherwise be caused.

Variable persistence mode

a. Dynamic erasure

Dynamic erasure can be achieved by applying extra erasing pulses of positive polarity to the backing electrode V_{g9}. The amplitude of these extra pulses is equal to that of the original erasing pulse, the frequency is 120 Hz and the persistence of the display can be controlled by varying the duty factor.

b. Static erasure (Fig. 8)

If no dynamic erasing pulses are applied the storage time is limited by the potential shift of the storage layer due to landing of positive ions.

In order to erase a stored display, V_{g9} is increased to 150 V for 100 ms and than returned to its original potential for about 500 ms; after that, an erasing pulse of positive polarity (max. 15 V) and a duration of 600 ms should be applied.

While the erasing pulse amplitude is to be adjusted with zero d.c. level for "just black", the background illumination can be changed – even with a stored signal – by varying the d.c. level for optimum contrast or maximum writing speed.

Back ground egality can be optimized by balancing the viewing gun cathodes by means of a potentiometer of 2,2 kΩ, proper collimator adjustment, and by increasing V_{FGA}. $V_{g7\text{-}1}$, $V_{g7\text{-}2}$ and $V_{g7\text{-}3}$ in positive direction during erasure.

Before first installation, depending on transport conditions, demagnetization of the tube face region may be necessary.

NOTES

1. These values are valid at cut-off of both flood guns and the writing gun. The HT unit must be capable of supplying 0,5 mA. To protect the tube against excessive surge current during erasure, an RC network as shown in Fig. 9 must be connected in series with the screen terminal lead; the resistance of 15 to 20 MΩ includes the internal resistance of the HT supply.

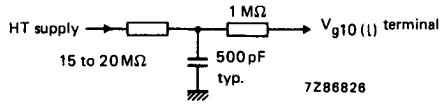


Fig. 9 RC network.

2. This voltage should be equal to the mean y-plate potential. The mean x and y-plate potentials should be equal for optimum spot quality.
3. When putting the tube into operation, the astigmatism control voltage should be adjusted only once for optimum spot size in the screen centre. The control voltage will be within the stated range, provided the conditions of note 2 are adhered to.
4. The collimator electrode voltage $V_{g7\text{-}2}$ and $V_{g7\text{-}3}$ should be adjusted for optimum uniformity of background illumination.
5. Measured with the shrinking raster method in the centre of the screen under typical operating conditions, adjusted for optimum spot size at a beam current I_b = 10 μA (measured on x-plates).
6. The writing speed is defined as the maximum speed at which a written trace is just visible starting from a background which is just black. The indicated value is guaranteed for the central 75% of the minimum screen area, except the outmost 4 mm of the screen. However, in any corner not more than 4 square divisions fall outside the guaranteed area. The writing speed can be increased, if some background is tolerated. Within the same area, a trace, written with the indicated value of max. write, remains just visible within the indicated storage time of max. write.

   The writing speed in max. write, with background, is defined as the maximum speed at which the written trace remains just visible within the indicated storage time.
7. The storage time in just black mode is defined as the time required for the brightness of the unwritten background to rise from zero brightness to 10% of saturated brightness. At reduced intensity (by pulsing the flood beams) the storage time can be increased.

   The storage time in max. write is related to the writing speed.
8. The sensitivity at a deflection less than 75% of the useful scan will not differ from the sensitivity at a deflection of 25% of the useful scan by more than the indicated value.
9. A graticule, consisting of concentric rectangles of 72 mm x 54 mm and 69,8 mm x 52,5 mm is aligned with the electrical x-axis of the tube. With optimum corrections applied, a raster will fall between these rectangles.
10. The tube has a rotation coil, concentrically wound around the tube neck, to allow alignment of the x-trace with the mechanical x-axis of the screen. The coil has 2000 turns and a maximum resistance of 650 Ω. Under typical operating conditions, a maximum of 20 ampere-turns is required for the maximum rotation of 5°. This means the required supply is 10 mA maximum at 8 V maximum.
11. The d.c. voltage on the first accelerator of the flood guns (FGA) should be equal to the mean x-plate potential.

MONITOR TUBE

17 cm diagonal rectangular flat face monitor tube primarily for use as a viewfinder in television cameras. This tube has been replaced by type M17-142WE, which features a 1,5 W cathode (6,3 V/240 mA) with short warm-up time (quick-heating cathode), and an improved phosphor, type WE.

The data of M17-140W are equivalent to those of type M17-142WE, except for the following.

HEATING

Indirect by a.c. or d.c.*

Heater voltage	V_f	6,3 V
Heater current	I_f	300 mA

SCREEN

Phosphor type	W
fluorescent colour	white

* Not to be connected in series with other tubes.

MONITOR TUBE

17 cm diagonal rectangular flat face monitor tube primarily for use as a viewfinder in television cameras. It has a bonded face plate and a metal mounting band. This tube has been replaced by type M17-143WE, which features a 1,5 W cathode (6,3 V/240 mA) with short warm-up time (quick-heating cathode), and an improved phosphor, type WE.

The data of M17-141W are equivalent to those of type M17-143WE, *except for the following.*

HEATING

Indirect by a.c. or d.c.*

Heater voltage	V_f	6,3 V
Heater current	I_f	300 mA

SCREEN

Phosphor type	W
fluorescent colour	white

* Not to be connected in series with other tubes.

MONITOR TUBES

- 17 cm diagonal rectangular flat face
- 70° deflection angle
- high resolution
- quick heating cathode
- M17-142WE: for use in precision monitors and as a viewfinder in television cameras
  M17-144WE: for use in photographic equipment (see Optical Data)

QUICK REFERENCE DATA

Deflection angle, diagonal	70 °
Face diagonal	17 cm
Neck diameter	28 mm
Overall length	max. 234 mm
Screen dimensions	min. 124 mm x 93 mm
Resolution	min. 1050 TV lines

ELECTRICAL DATA

Capacitances		
final accelerator to external conductive coating	$C_{g3,g5(\ell)/m}$	300 pF
cathode to all other elements	C_k	3,6 pF
grid 1 to all other elements	C_{g1}	7 pF
Focusing method	electrostatic	
Deflection method	magnetic*	
Deflection angle, diagonal	70°	
Heating	indirect by AC or DC **	
heater voltage	V_f	6,3 V
heater current	I_f	240 mA
Heating time to attain 10% of the cathode current at equilibrium conditions	approx.	5 s

OPTICAL DATA

Screen	metal-backed phosphor
Phosphor type	WE ▲
fluorescent colour	white
persistence	medium short
Useful screen dimensions	
diagonal	min. 155 mm
horizontal axis	min. 124 mm
vertical axis	min. 93 mm
Light transmission of screen	approx. 92%

Note: The M17-144WE has an improved screen blemish specification, to meet the extreme requirements of photographic recording equipment.

* To obtain the best tube performance, use either the AT1071/05 or the AT1071/07 deflection unit.
** Not to be connected in series with other tubes.
▲ Other phosphors available to special order.

MECHANICAL DATA (see also the figures on the next page)

Overall length	227 ± 7 mm
Neck diameter	min. 27,8 mm
Base	neo eightar, B8H; IEC67-I-31a
Final accelerator contact	cavity contact, CT8; IEC67-III-2
Net mass	approx. 0,7 kg

Mounting

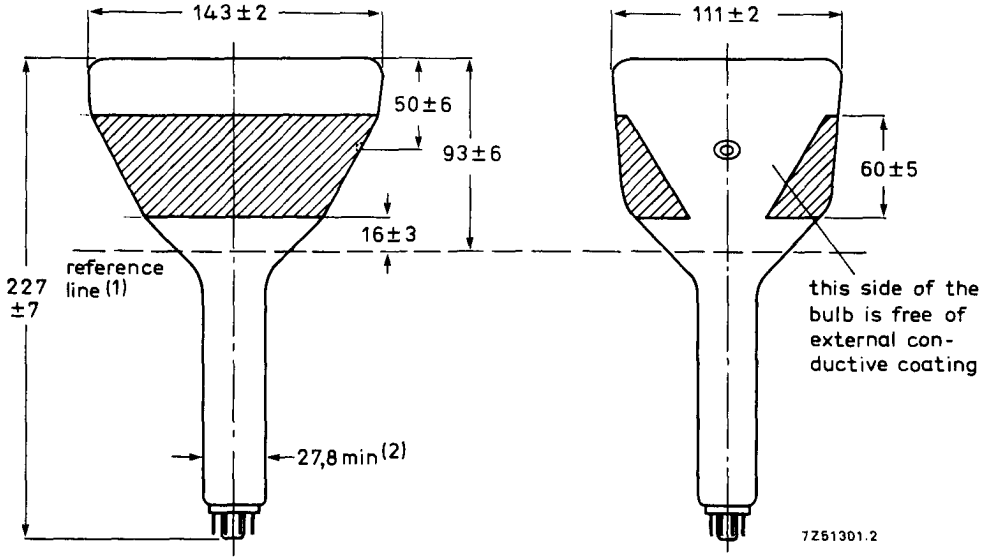
The tube can be mounted in any position. It must not be supported by the socket and not by the base region alone.

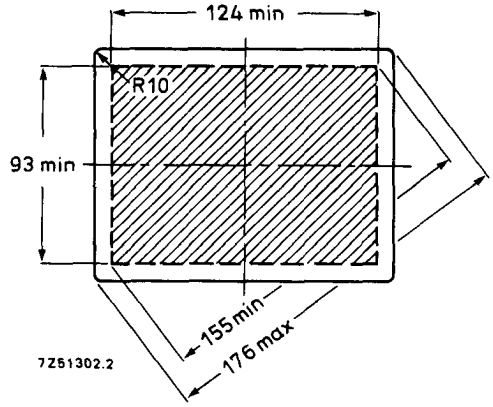
Accessories

Final accelerator contact connector	55563A

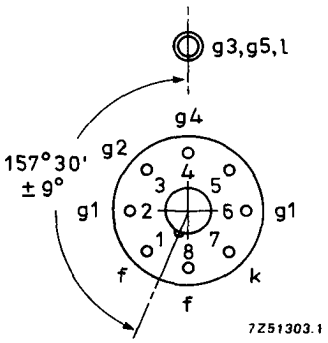
MECHANICAL DATA

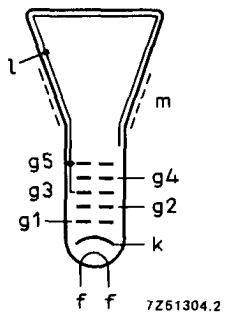
Dimensions in mm



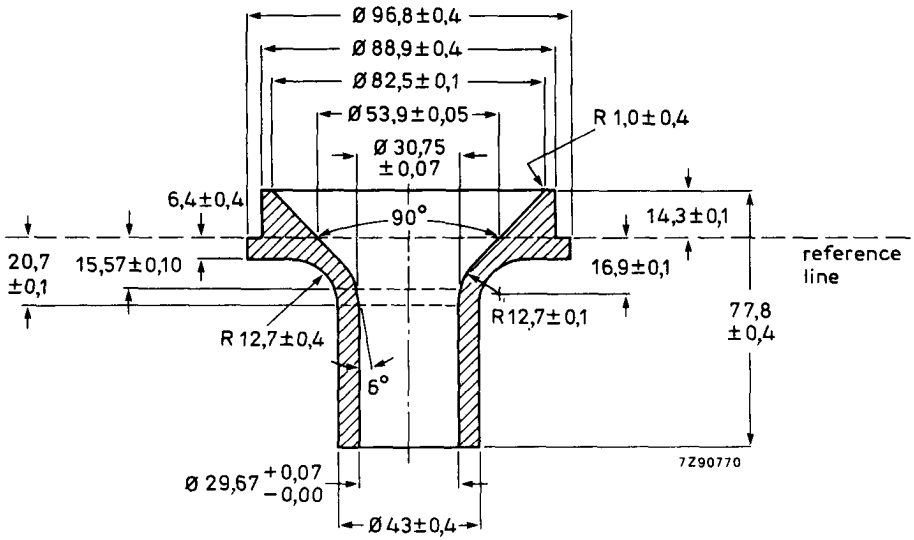


(1) Reference line, determined by the plane of the upper edge of the flange of the reference line gauge when the gauge is resting on the cone.
(2) The maximum dimension is determined by the reference line gauge.





Reference line gauge



RECOMMENDED OPERATING CONDITIONS

Final accelerator voltage	$V_{g3,g5(\ell)}$	14 kV
Focusing electrode voltage	V_{g4}	0 to 400 V*
First accelerator voltage	V_{g2}	400 V
Cut-off voltage for visual extinction of focused spot	$-V_{g1}$	30 to 62 V

RESOLUTION

Resolution at screen centre, measured with beam centring magnet** at $V_{g3,g5(\ell)}$ = 14 kV, V_{g2} = 400 V, I_ℓ = 20 μA, luminance = 400 cd/m² ▲		min.	1050 TV lines

LIMITING VALUES

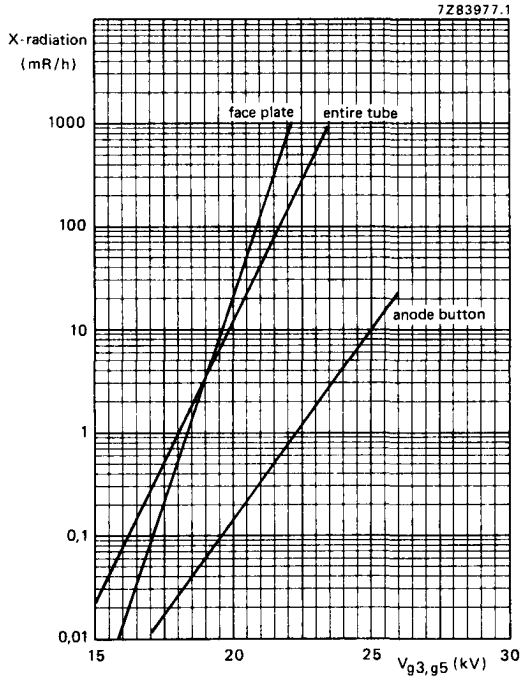
Final accelerator voltage	$V_{g3,g5(\ell)}$	max. min.	16 kV 12 kV
Focusing electrode voltage	V_{g4} $-V_{g4}$	max. max.	1 kV 0,5 kV
First accelerator voltage	V_{g2}	max. min.	800 V 300 V
Control grid voltage			
negative	$-V_{g1}$	max.	150 V
positive	V_{g1}	max.	0 V
positive peak	V_{g1p}	max.	2 V
Cathode to heater voltage			
positive	V_{kf}	max.	125 V
negative	$-V_{kf}$	max.	125 V

* For optimum focus at a beam-current of 50 μA.

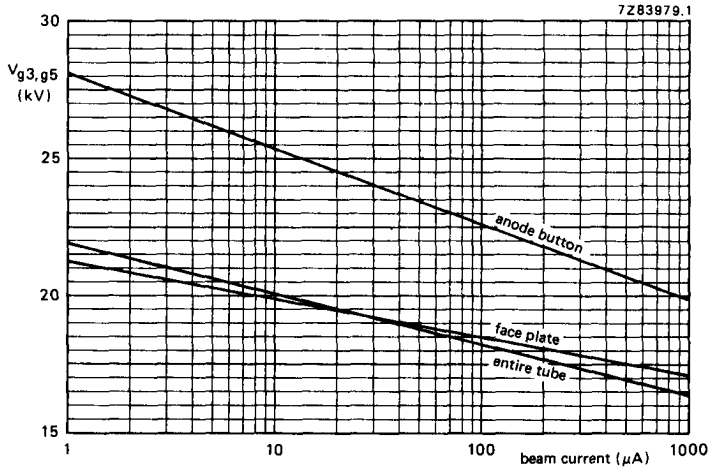
** Catalogue number 3322 142 11401; supplied with directions for use with each tube.

▲ Luminance is measured with a photocell, of which the spectral response curve is identical to that of the human eye, on a 312-lines raster with dimensions 70 mm x 70 mm.

X-RADIATION LIMIT



X-radiation limit curves, at a constant anode current of 250 μA, measured according to TEPAC103A.



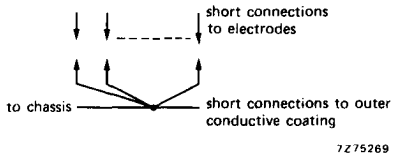
0,5 mR/h isoexposure-rate limit curves, measured according to TEPAC103A.

Product safety

X-ray shielding of the cone is advisable to give protection against possible danger of personal injury arising from prolonged exposure at close range to this tube when operated above 14 kV.

FLASHOVER PROTECTION

With the high voltage used with this tube internal flashovers may occur. These may destroy the cathode of the tube. Therefore it is necessary to provide protective circuits, using spark gaps. The spark gaps must be connected as follows:



No other connections between the outer conductive coating and the chassis are permissible.

MONITOR TUBES

- 17 cm diagonal rectangular flat face
- 70° deflection angle
- high resolution
- quick heating cathode
- bonded face plate
- metal band for mounting
- M17-143WE: for use in precision monitors and as a viewfinder in television cameras
  M17-145WE: for use in photographic equipment (see Optical Data)

QUICK REFERENCE DATA

Deflection angle, diagonal	70 °
Face diagonal	17 cm
Neck diameter	28 mm
Overall length	max. 240 mm
Screen dimensions	min. 124 mm x 93 mm
Resolution at V_a = 16 kV	min. 1250 TV lines

ELECTRICAL DATA

Capacitances		
final accelerator to metal band	$C_{g3,g5(\ell)/m'}$	135 pF
final accelerator to external conductive coating	$G_{g3,g5(\ell)/m}$	240 pF
cathode to all other elements	C_k	3,6 pF
grid 1 to all other elements	C_{g1}	7 pF
Focusing method	electrostatic	
Deflection method	magnetic*	
Deflection angle, diagonal	70°	
Heating	indirect by AC or DC **	
heater voltage	V_f	6,3 V
heater current	I_f	240 mA
Heating time to attain 10% of the cathode current at equilibrium conditions	approx.	5 s

OPTICAL DATA

Screen	metal-backed phosphor
Phosphor type	WE ▲
fluorescent colour	white
persistence	medium short
Useful screen dimensions	
diagonal	min. 155 min.
horizontal axis	min. 124 min.
vertical axis	min. 93 min.
Light transmission of screen	approx. 88%

Note: The M17-145WE has an improved screen blemish specification, to meet the extreme requirements of photographic recording equipment.

* To obtain the best tube performance, deflection unit AT1071/05 should be used.
** Not to be connected in series with other tubes.
▲ Other phosphors available to special order.

MECHANICAL DATA (see also the figures on the next page)

Overall length	232 ± 8 mm
Neck diameter	min. 27,8 mm
Base	*neo eightar*, B8H; IEC 67-I-31a
Final accelerator contact	cavity contact, CT8; IEC 67-III-2
Implosion protection	bonded face plate
Net mass	approx. 1 kg

Mounting

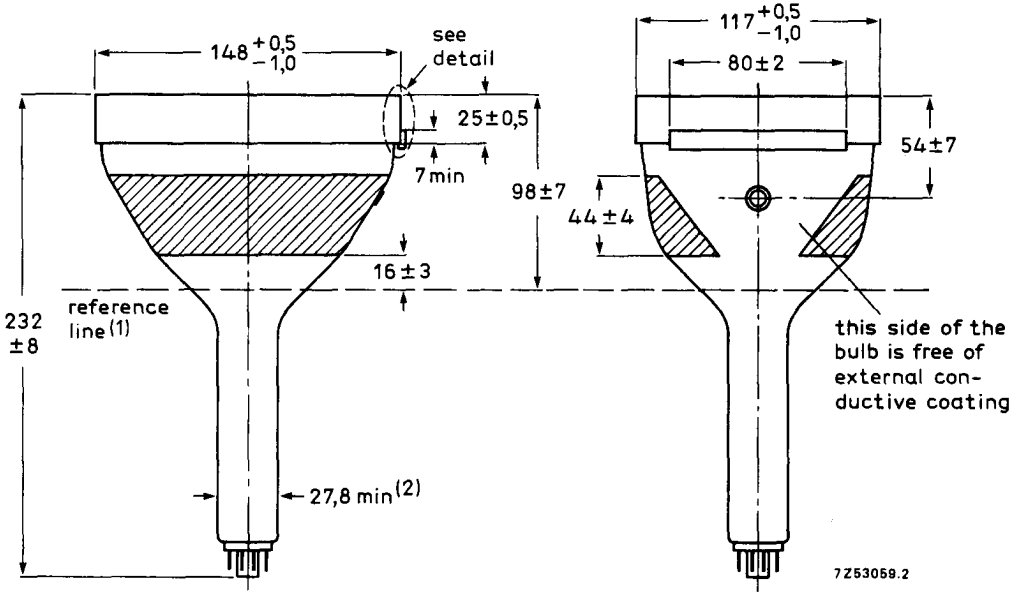
The tube can be mounted in any position. It must not be supported by the socket and not by the base region alone.

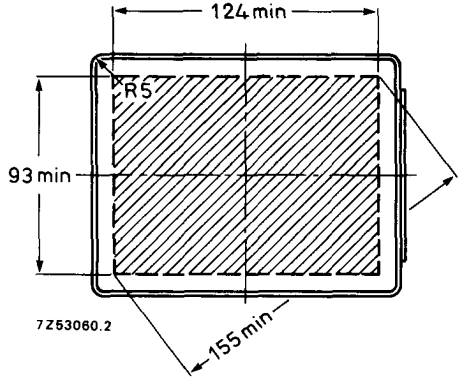
Accessories

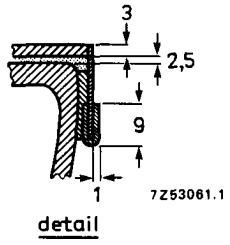
Final accelerator contact connector	55563 A

MECHANICAL DATA

Dimensions in mm

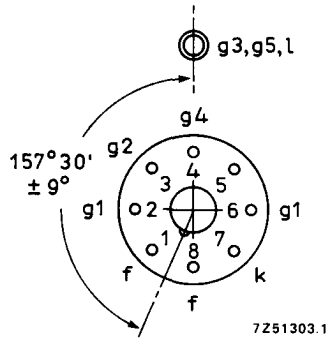


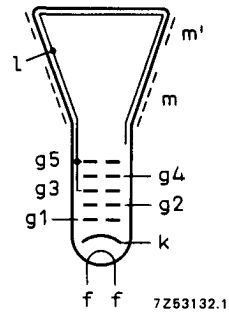




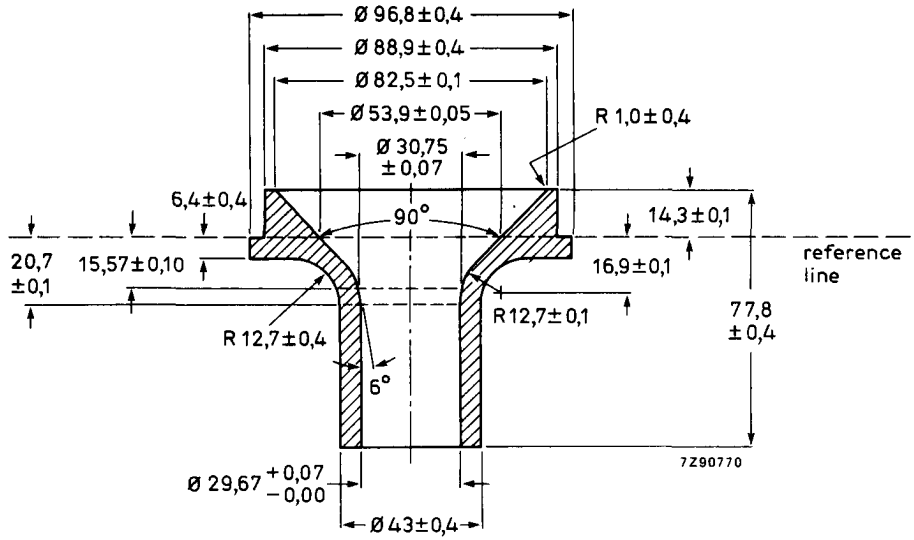
(1) Reference line, determined by the plane of the upper edge of the flange of the reference line gauge when the gauge is resting on the cone.

(2) The maximum dimension is determined by the reference line gauge.





Reference line gauge



RECOMMENDED OPERATING CONDITIONS

Final accelerator voltage	$V_{g3,g5(\ell)}$	14	16 kV
Focusing electrode voltage	V_{g4}	0 to 400*	0 to 400 V*
First accelerator voltage	V_{g2}	400	600 V
Cut-off voltage for visual extinction of focused spot	$-V_{g1}$	30 to 62	40 to 90 V

RESOLUTION

Resolution at screen centre, measured with beam centring magnet**

at $V_{g3,g5(\ell)}$ = 14 kV, V_{g2} = 400 V, I_ℓ = 20 μA, luminance = 400 cd//m² ▲		min.	1050 TV lines ←
at $V_{g3,g5(\ell)}$ = 16 kV, V_{g2} = 600 V, I_ℓ = 20 μA, luminance = 500 cd/m² ▲		min.	1250 TV lines ←

LIMITING VALUES

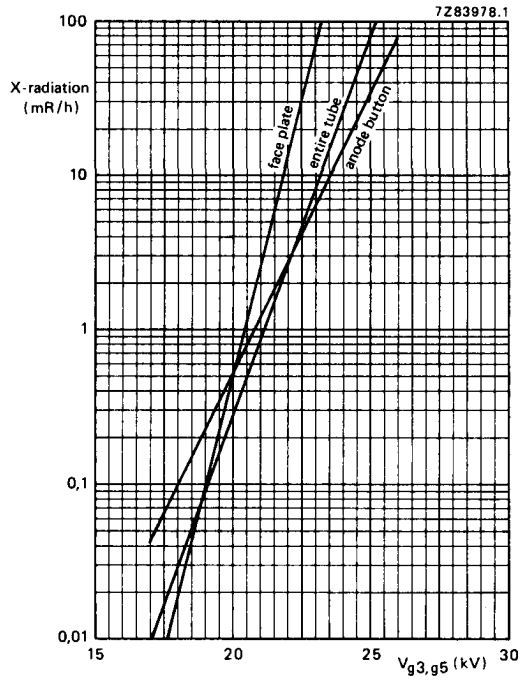
Final accelerator voltage	$V_{g3,g5(\ell)}$	max.	18 kV
		min.	12 kV
Focusing electrode voltage	V_{g4}	max.	1 kV
	$-V_{g4}$	max.	0,5 kV
First accelerator voltage	V_{g2}	max.	800 V
		min.	300 V
Control grid voltage			
negative	$-V_{g1}$	max.	150 V
positive	V_{g1}	max.	0 V
positive peak	V_{g1p}	max.	2 V
Cathode to heater voltage			
positive	V_{kf}	max.	125 V
negative	$-V_{kf}$	max.	125 V

* For optimum focus at a beam current of 50 μA.

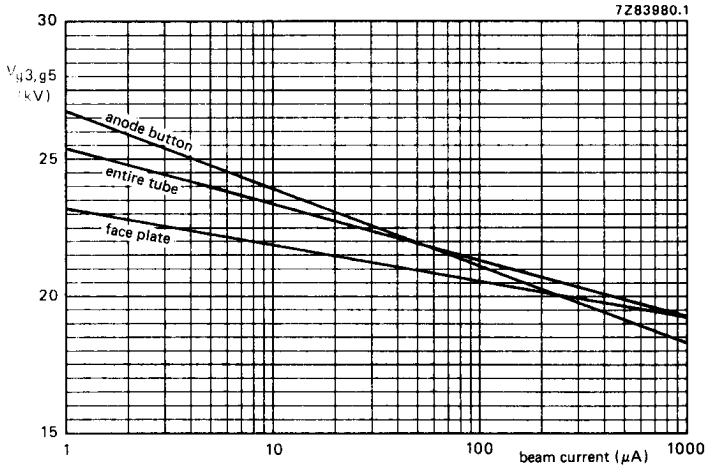
** Catalogue number 3322 142 11401; supplied with directions for use with each tube.

▲ Luminance is measured with a photocell, of which the spectral response curve is identical to that of the human eye, on a 312-lines raster with dimensions 70 mm x 70 mm.

X-RADIATION LIMIT



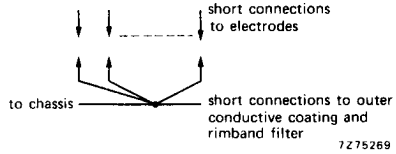
X-radiation limit curves, at a constant anode current of 250 μA, measured according to TEPAC103A.



0,5 mR/h isoexposure-rate limit curves, measured according to TEPAC103A.

FLASHOVER PROTECTION

When the high voltage used with this tube internal flashovers may occur. These may destroy the cathode of the tube. Therefore it is necessary to provide protective circuits, using spark gaps.
The spark gaps must be connected as follows:



No other connections between the outer conductive coating and the chassis are permissible.

VERY HIGH RESOLUTION FLAT CATHODE-RAY TUBE

- 17 cm diagonal rectangular flat face
- 70° deflection angle
- very high resolution
- quick heating cathode

QUICK REFERENCE DATA

Deflection angle, diagonal	70 °
Face diagonal	17 cm
Neck diameter	28 mm
Overall length	max. 269 mm
Screen dimensions	min. 124 mm x 93 mm
Resolution	approx 2500 TV lines 1800 lines (shrinking raster)

APPLICATION *

This tube has been designed for use in photographic applications where screen current is generally limited to a maximum of 20 μA. At these relatively low screen currents, the extremely good resolution together with the excellent screen quality, makes this tube ideal for use in photographic equipment.

* Application support is available on request.

ELECTRICAL DATA

Capacitances		
final accelerator to external conductive coating	$C_{g4(\ell)/m}$	310 pF
cathode to all other elements	C_k	2,8 pF
grid 1 to all other elements	C_{g1}	6 pF
Focusing method	electrostatic	
Deflection method	magnetic	
Deflection angle, diagonal	70°	
Heating	indirect by AC or DC	
heater voltage	V_f	6,3 V
heater current	I_f	240 mA
Heating time to attain 10% of the cathode current at equilibrium conditions	approx.	5 s

OPTICAL DATA

Screen	metal-backed phosphor
Phosphor type	WE *
fluorescent colour	white
persistence	medium short
Useful screen dimensions	
diagonal	min. 155 mm
horizontal axis	min. 124 mm
vertical axis	min. 93 mm
Light transmission of screen glass	approx. 92%

The M17-220WE has an improved screen blemish and uniformity specification, to meet the extreme requirements of photographic recording equipment.

* Other phosphors available to special order.

MECHANICAL DATA

Overall length	262 ± 7 mm
Neck diameter	min. 27,8 mm
Base	JEDEC B10-277
Final accelerator contact	cavity contact, CT8; IEC67-III-2
Net mass	approx. 0,8 kg

Mounting

The tube should not be mounted in a vertical position, screen downwards, such that its longitudinal axis makes an angle of less that 20° with the vertical. This is the only restriction on mounting.

Accessories

Final accelerator contact connector	55563A
Deflection coils*	Syntronic type deflection coils are highly recommended. e.g. 15330/1

Options

- customer designed suspension system
- implosion protection
- other phosphors

* The tube has internal magnetic correction for astigmatism. To avoid changing this correction, the coil must be at zero potential, before being moved on the tube neck.

MECHANICAL DATA

Dimensions in mm

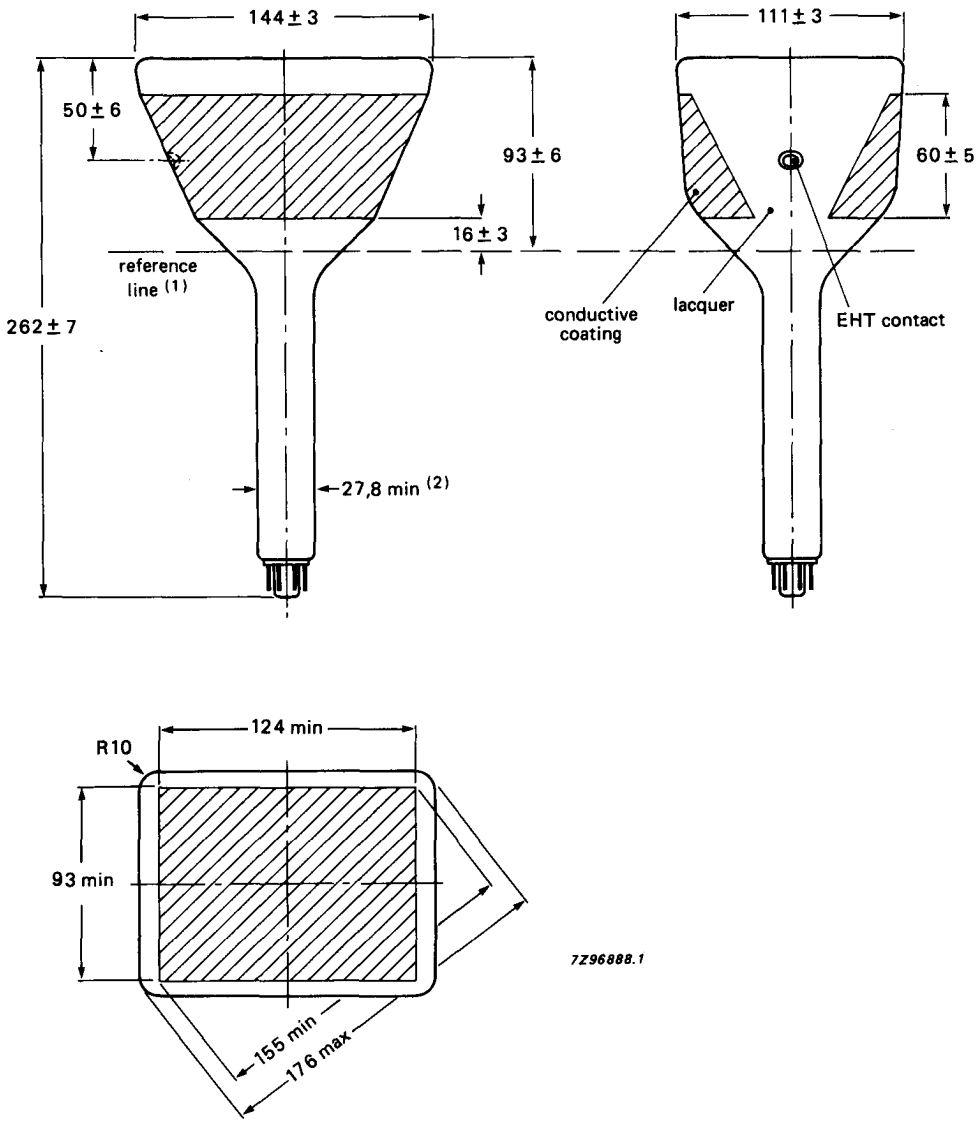


Fig. 1.

(1) Reference line, determined by the plane of the upper edge of the flange of the reference line gauge when the gauge is resting on the cone.
(2) The maximum dimension is determined by the reference line gauge.

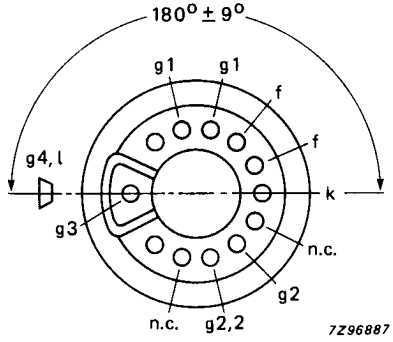


Fig. 2.

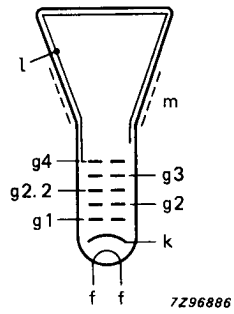


Fig. 3.

Reference line gauge

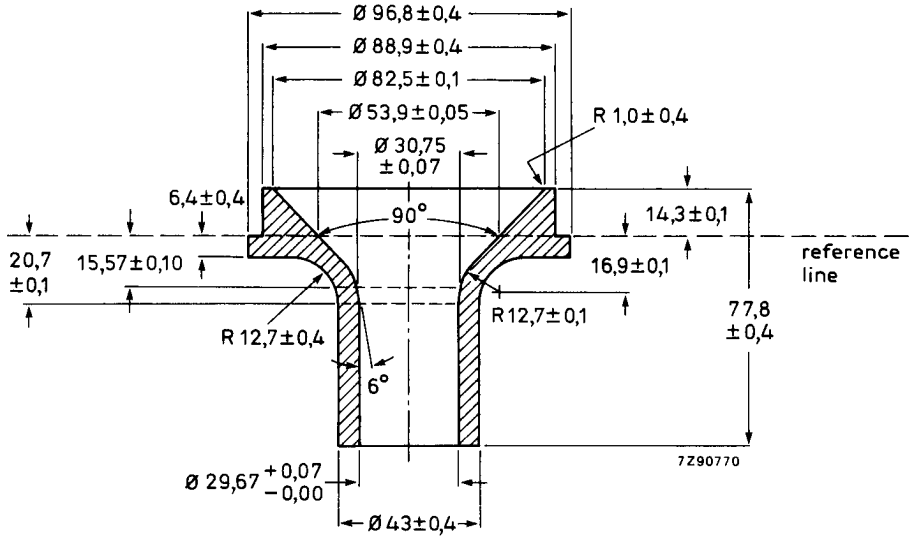


Fig. 4.

RECOMMENDED OPERATING CONDITIONS

Final accelerator voltage	$V_{g4(\ell)}$	15 kV
Focusing electrode voltage	V_{g3}	3,05 kV
Dynamic focusing	ΔV_{g3}	400 V
First accelerator voltage	V_{g2}	800 V
Second accelerator voltage	$V_{g2.2}$	3,05 kV
Cut-off voltage for visual extinction of focused spot	$-V_{g1}$	50 to 80 V

RESOLUTION

Resolution at screen centre, measured with shrinking raster method (non-interlaced raster)

at $V_{g4(\ell)}$ = 15 kV; V_{g2} = 800 V; $V_{g2.2}$ = 3,05 kV — approx 2500 TV lines

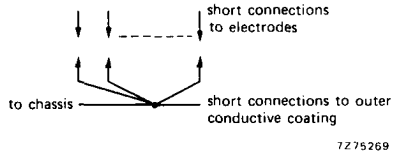
I_ℓ = 10 μA; luminance = 200 cd/m^2 (see Fig. 6) — 1800 lines (shrinking raster)

LIMITING VALUES

Final accelerator voltage	V_{g4}	max.	17 kV
		min.	13 kV
Focusing electrode voltage	V_{g3}	max.	3,2 kV
		min.	2,9 kV
First accelerator voltage	V_{g2}	max.	1,2 kV
		min.	0,6 kV
Second accelerator voltage	$V_{g2.2}$	max.	3,2 kV
		min.	2,0 kV
Screen current	$I_{g4(\ell)}$	max.	20 μA
Grid G2.2 maximum interception of cathode current at screen current = 20 μA			50 %
Control grid voltage			
negative	$-V_{g1}$	max.	150 V
positive	V_{g1}	max.	0 V
positive peak	V_{g1p}	max.	2 V
Cathode to heater voltage			
positive	V_{kf}	max.	125 V
negative	$-V_{kf}$	max.	125 V

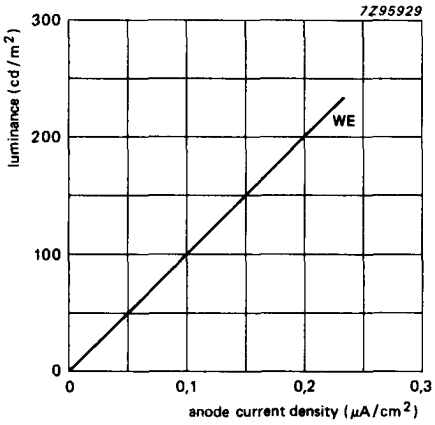
FLASHOVER PROTECTION

With the high voltage used with this tube internal flashovers may occur. These may destroy the cathode of the tube. Therefore it is necessary to provide protective circuits, using spark gaps.
The spark gaps must be connected as follows:



No other connections between the outer conductive coating and the chassis are permissible.

Fig. 5.



Luminance is measured with a photo-cell, the spectral response of which is identical to that of the human eye, on a 312-lines non-interlaced raster with screen dimensions 70 mm x 70 mm, frame frequency 50 Hz and V_{g4} = 15 kV.

Fig. 6 Luminance.

X-RADIATION LIMIT

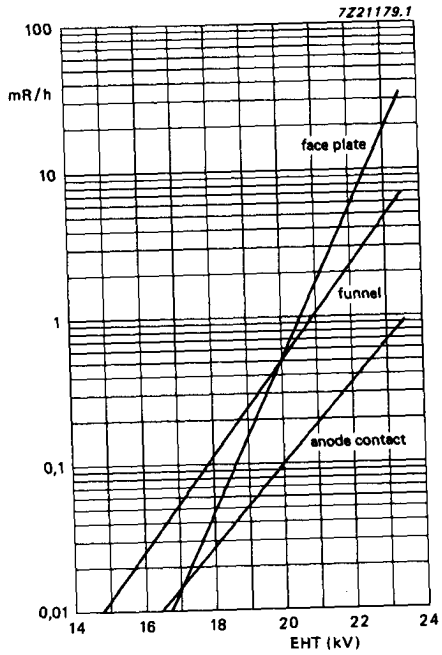


Fig. 7 X-radiation limit curves, at a constant anode current of 50 μA, measured in accordance with TEPAC164.

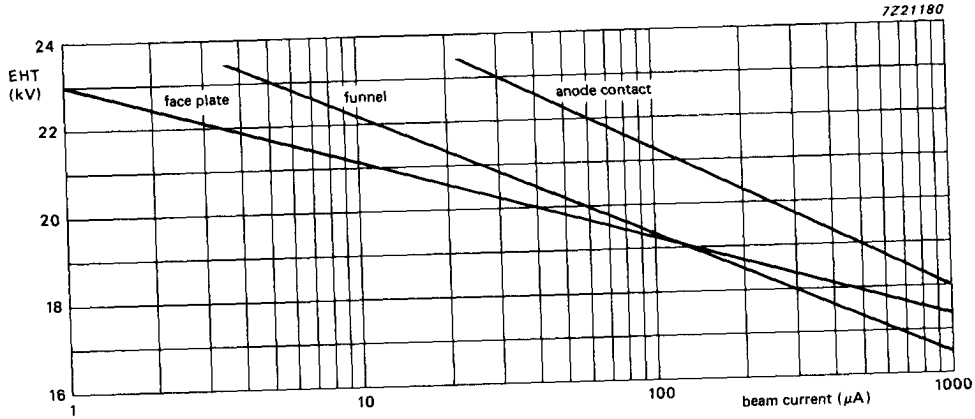


Fig. 8 0,5 mR/h isoexposure-rate limit curves, measured in accordance with TEPAC164.

MONITOR TUBE

The M24-100W is a 24 cm-diagonal rectangular television tube with metal-backed screen primarily intended for use as a monitor or display tube.

QUICK REFERENCE DATA		
Deflection angle		90 °
Focusing		electrostatic
Resolution		900 lines
Overall length	max.	260 mm

SCREEN

Metal-backed phosphor			
Luminescence		white	
Light transmission of face glass		52	%
Useful diagonal	min.	225	mm
Useful width	min.	190	mm
Useful height	min.	140	mm

HEATING

Indirect by a.c. or d.c.; parallel supply

Heater voltage	V_f	6,3	V
Heater current	I_f	300	mA

CAPACITANCES

Final accelerator to external conductive coating	$C_{g_3, g_5(\ell)/m}$	420	pF
Cathode to all other elements	C_k	5	pF
Control grid to all other elements	C_{g_1}	7	pF

FOCUSING

electrostatic

For focusing voltage providing optimum focus at a beam current of 100 μA see under "Typical operating conditions".

DEFLECTION [3]

magnetic

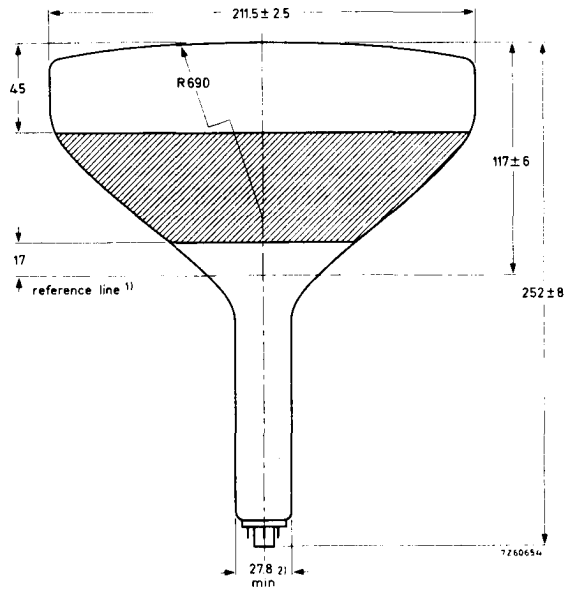
Diagonal deflection angle

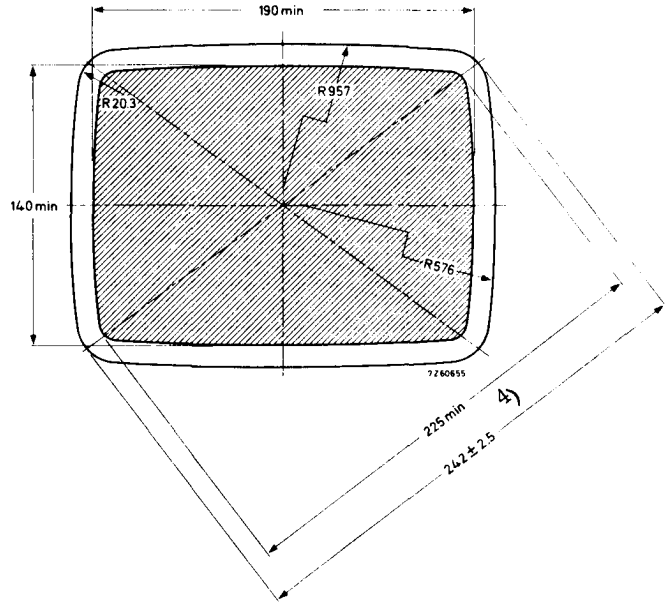
90^{o}

MECHANICAL DATA

Dimensions in mm

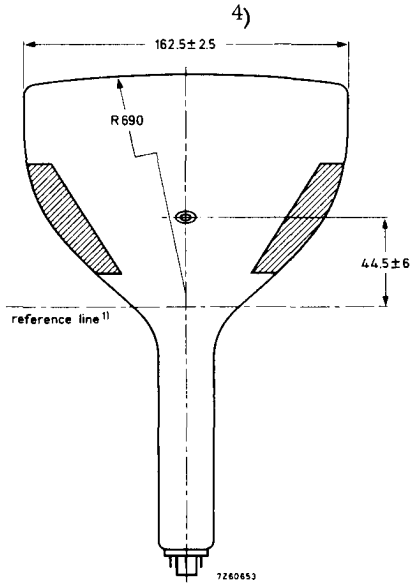
[4]

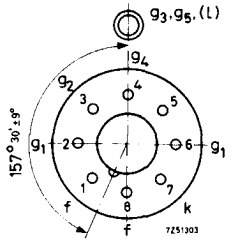


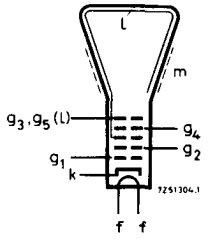


Notes see **next page.**

MECHANICAL DATA (continued)







Mounting position : any, except vertical with the screen downward and the axis of the tube making an angle of less than 20° with the vertical.

Base	Neo eightar (B8H)
Cavity contact	CT8
Accessories	
Socket	2422 501 06001
Final accelerator contact connector	type 55563A

PICTURE CENTRING MAGNET

Field intensity perpendicular to the tube axis adjustable from 0 to 800 A/m (0 to 10 Oe). Adjustment of the centring magnet should not be such that a general reduction in brightness or shading of the raster occurs.

NOTES

1) The reference line is determined by the plane of the upper edge of the of the flange of reference line gauge when the gauge is resting on the cone.

2) The maximum dimension is determined by the reference line gauge.

3) Deflection coil AT1071/03 is recommended. If another coil is considered, it is advisable to contact the local tube supplier.

4) The bulge at the spliceline seal may increase the indicated maximum values for envelope width, diagonal and height by not more than 6,4 mm, but at any point around the seal the bulge will not protrude more than 3,2 mm beyond the envelope surface.

TYPICAL OPERATING CONDITIONS

Final accelerator voltage	$V_{g_3,g_5(\ell)}$			16	kV
Focusing electrode voltage	V_{g_4}	0	to	400	V
First accelerator voltage	V_{g_2}			600	V
Grid no.1 voltage for extinction of focused raster	V_{g_1}	-32	to	-85	V

RESOLUTION

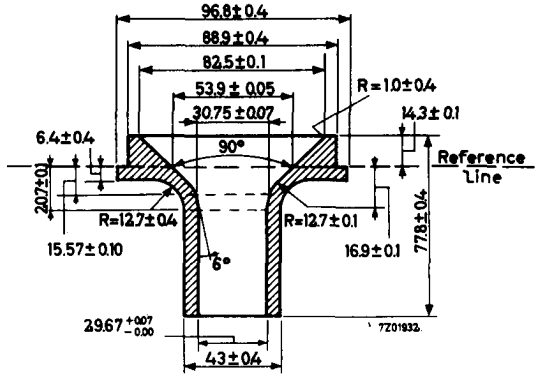
Resolution at screen centre measured with the shrinking raster method (non-interlaced raster), under typical operating conditions, at a beam current of 50 μA (200cd/m^2 = 200 nit)
The resolution can be improved by the use of beam centring magnet catalogue number 3322 142 11401, supplied on request.

900 lines

LIMITING VALUES (Absolute max. rating system)

Final accelerator voltage	$V_{g_3,g_5(\ell)}$	max.	18	kV
		min.	10	kV
Focusing electrode voltage	V_{g_4}	max.	1	kV
	$-V_{g_4}$	max.	0,5	kV
First accelerator voltage	V_{g_2}	max.	800	V
		min.	300	V
Grid no.1 voltage, negative	$-V_{g_1}$	max.	150	V
positive	V_{g_1}	max.	0	V
positive peak	$V_{g_{1p}}$	max.	2	V
Cathode to heater voltage, positive	V_{kf}	max.	250	V
positive peak	V_{kf_p}	max.	300	V [1]
negative	$-V_{kf}$	max.	135	V
negative peak	$-V_{kf_p}$	max.	180	V

REFERENCE LINE GAUGE



[1] During a warm-up period not exceeding 15 s the heater may be 410 V negative with respect to the cathode.

MONITOR TUBE

The M24-101W is a 24 cm-diagonal rectangular television tube with integral protection primarily intended for use as a monitor or display tube.

QUICK REFERENCE DATA			
Deflection angle		90 °	
Focusing		electrostatic	
Resolution		900	lines
Overall length	≤	260	mm

SCREEN

Metal backed phosphor

Luminescence		white	
Light transmission of face glass		52	%
Useful diagonal	≥	225	mm
Useful width	≥	190	mm
Useful height	≥	140	mm

HEATING

Indirect by a.c. or d.c.; parallel supply

Heater voltage	V_f	6,3	V
Heater current	I_f	300	mA

FOCUSING

electrostatic

For focusing voltage providing optimum focus at a beam current of 100 μA see under "Typical operating conditions".

DEFLECTION

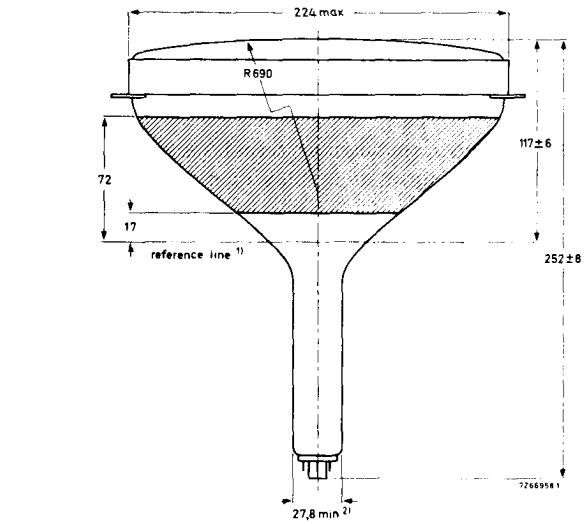
magnetic

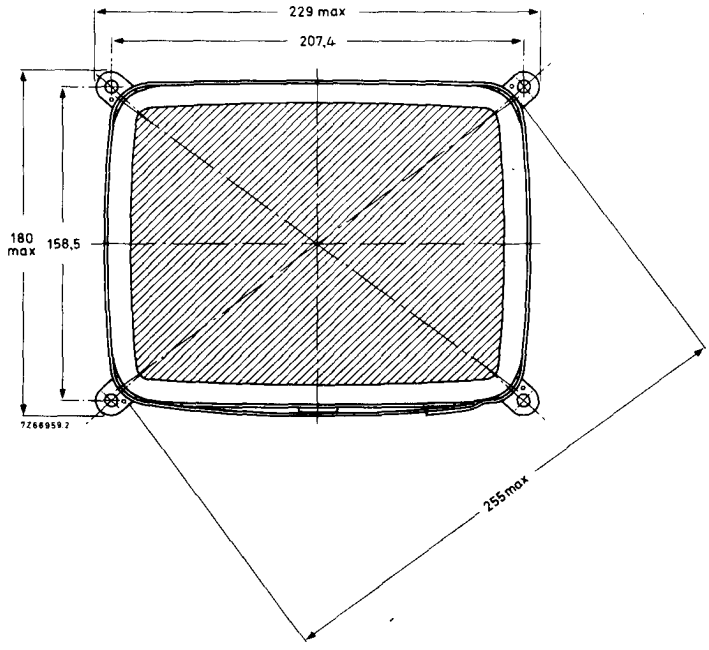
Diagonal deflection angle	90 °
Horizontal deflection angle	80 °
Vertical deflection angle	65 °

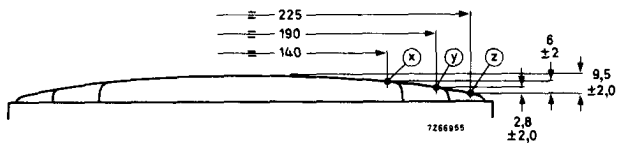
Deflection coil AT1071/03 is recommended.

MECHANICAL DATA

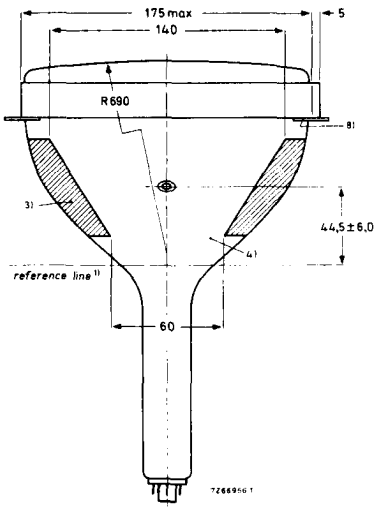
Dimensions in mm

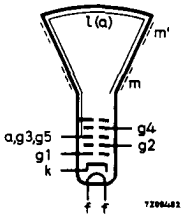


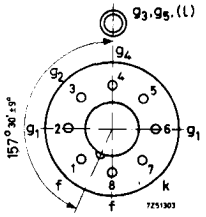


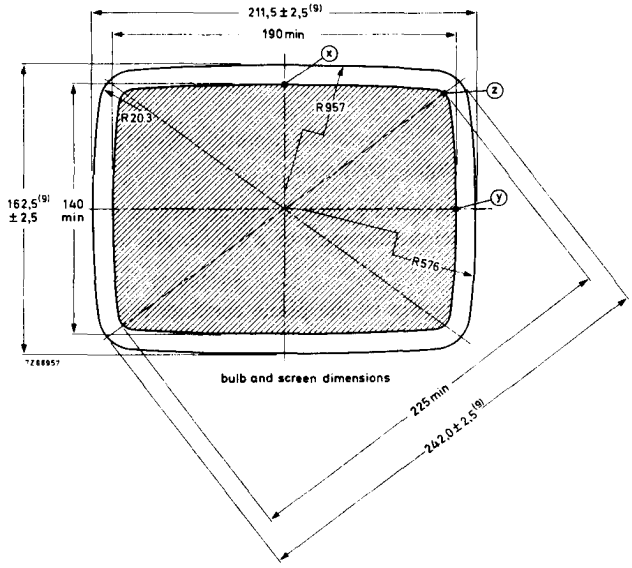


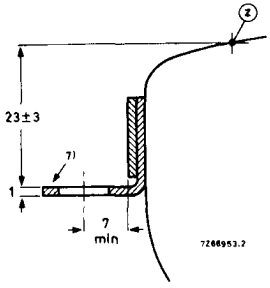
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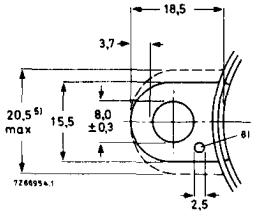












Notes see next page.

MECHANICAL DATA (continued)

Mounting position : any

Base	Neo eightar (B8H), IEC 67-I-31a
Cavity contact	CT8, IEC67-III-2
Accessories	
Socket	2422 501 06001
Final accelerator contact connector	

PICTURE CENTRING MAGNET

Field intensity perpendicular to the tube axis adjustable from 0 to 800 A/m (0 to 10 Oe). Adjustment of the centring magnet should not cause a general reduction in brightness or shading of the raster.

NOTES TO OUTLINE DRAWINGS

1) The reference line is determined by the plane of the upper edge of the flange of the reference line gauge with the gauge resting on the cone.

2) The maximum dimension is determined by the reference line gauge.

3) This tube has an external conductive coating (m), which must be earthed. The capacitance of this coating to the final accelerator is used for smoothing the EHT. The tube marking and warning labels are on the side of the cone opposite the final accelerator contact, and this side should not be used for making contact to the conductive coating.

4) This area must be kept clean.

5) Minimum space to be reserved for mounting lugs.

6) The mounting screws in the cabinet must be situated within a circle with a diameter of 4 mm drawn around the true geometrical position (corners of a rectangle of 207,4 mm x 158,5 mm).

7) The maximum displacement of any lug with respect to the plane through the other three lugs is 2 mm.

8) The metal rim-band must be earthed. The hole of 2,5 mm diameter in each lug is provided for this purpose.

9) The bulge at the spliceline seal may increase the indicated maximum values for envelope width, diagonal and height by not more than 6,4 mm, but at any point around the seal the bulge will not protrude more than 3,2 mm beyond the envelope surface.

CAPACITANCES

Final accelerator to external conductive coating	$C_{g_3,\ g_5(\ell)/m}$		420	pF
Final accelerator to metal band	$C_{g_3,\ g_5(\ell)/m'}$		200	pF
Cathode to all other elements	C_k		5	pF
Control grid to all other elements	C_{g1}		7	pF

TYPICAL OPERATING CONDITIONS

Final accelerator voltage	$V_{g_3,\ g_5(\ell)}$			16	kV
Focusing electrode voltage	V_{g4}	0	to	400	V
First accelerator voltage	V_{g2}			600	V
Grid 1 voltage for extinction of focused raster	V_{g1}	-32	to	-85	V

RESOLUTION

Resolution at screen centre measured with the shrinking raster method (non-interlaced raster), under typical operating conditions, and at a beam current of 50 μA: 900 lines (luminance ≈ 200 cd/m^2).

If necessary, the picture quality can be improved by using a beam centring magnet. This magnet, catalogue number 3322 142 11401, can be supplied on request.

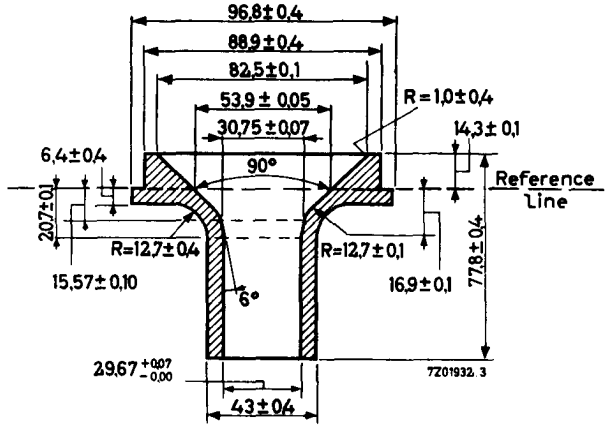
LIMITING VALUES (Absolute max. rating system)

Final accelerator voltage		$V_{g_3,\ g_5(\ell)}$	max.	18	kV
			min.	10	kV
Focusing electrode voltage, positive		V_{g4}	max.	1000	V
	negative	$-V_{g4}$	max.	500	V
First accelerator voltage		V_{g2}	max.	800	V
			min.	300	V
Grid 1 voltage, negative		$-V_{g1}$	max.	150	V
	positive	V_{g1}	max.	0	V
	positive peak	V_{g1p}	max.	2	V
Cathode to heater voltage, positive		V_{kf}	max.	250	V
	positive peak	V_{kfp}	max.	300	V [1]
	negative	$-V_{kf}$	max.	135	V
	negative peak	$-V_{kfp}$	max.	180	V

1) During a warm-up period not exceeding 15 s the heater may be 410 V negative with respect to the cathode.

REFERENCE LINE GAUGE

Dimensions in mm



MONITOR TUBE

The M31-130W is a 31 cm-diagonal rectangular television tube with metal-backed screen primarily intended for use as a monitor or display tube.

QUICK REFERENCE DATA			
Deflection angle		90°	
Focusing		electrostatic	
Resolution		900	lines
Overall length	max.	310	mm

SCREEN

Metal-backed phosphor

Luminescence		white	
Light transmission of face glass	approx.	50	%
Useful diagonal	min.	295	mm
Useful width	min.	257	mm
Useful height	min.	195	mm

HEATING

Indirect by a.c. or d.c.; parallel supply

Heater voltage	V_f	6,3	V
Heater current	I_f	300	mA

FOCUSING electrostatic

For focusing voltage providing optimum focus at a beam current of 100 μA see under "Typical operating conditions".

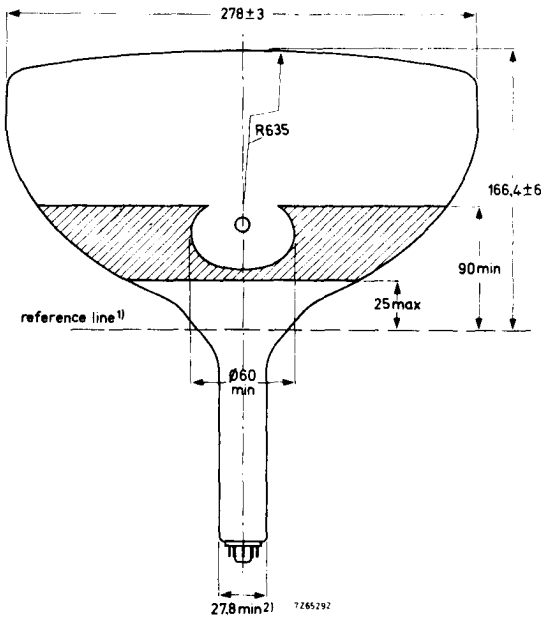
DEFLECTION magnetic

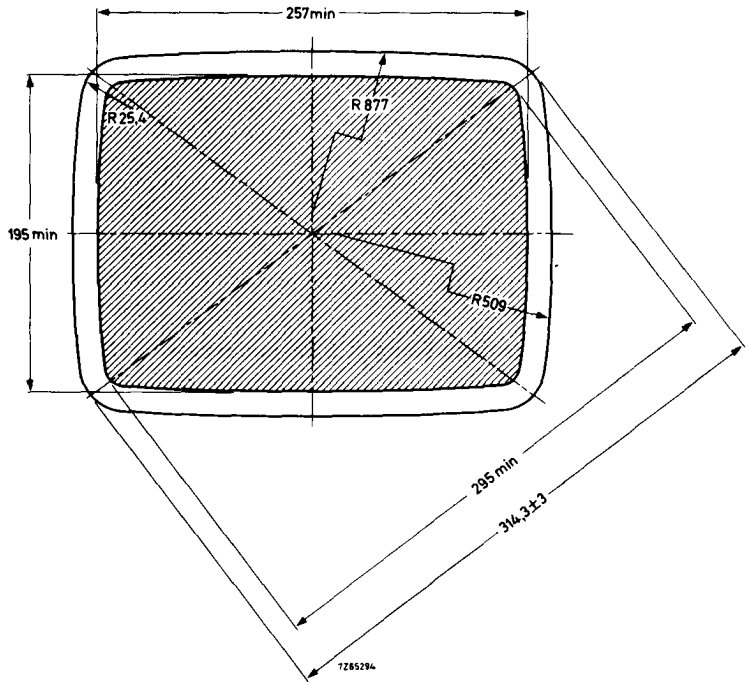
Diagonal deflection angle 90°

Deflection coil AT1071/03 is recommended.

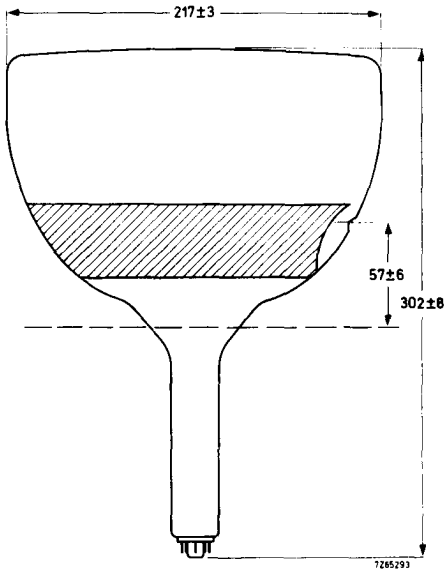
MECHANICAL DATA

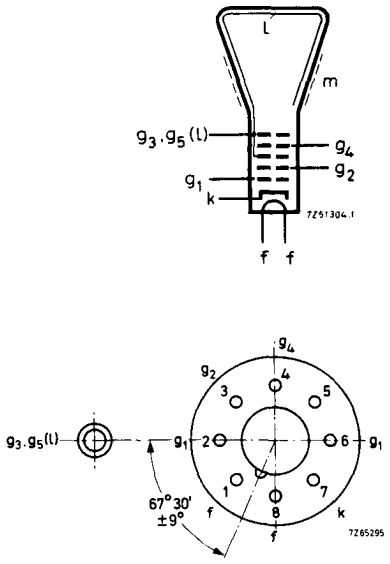
Dimensions in mm





MECHANICAL DATA (continued)





Mounting position: any, except vertical with the screen down and the axis of the tube making an angle of less than 20° with the vertical.

Base	Neo eightar (B8H), IEC67-I-31a
Cavity contact	CT8, IEC67-III-2
Accessories	
Socket	2422 501 06001
Final accelerator contact connector	type 55563A

CAPACITANCES

Final accelerator to external conductive coating	$C_{g3,\ g5(\ell)/m}$	1100	pF
Cathode to all other elements	C_k	5	pF
Control grid to all other elements	C_{g1}	7	pF

[1]) The reference line is determined by the plane of the upper edge of the flange of the reference line gauge with the gauge resting on the cone.

[2]) The maximum dimension is determined by the reference line gauge.

TYPICAL OPERATING CONDITIONS

Final accelerator voltage	$V_{g3,\,g5(\ell)}$	16	kV
Focusing electrode voltage	V_{g4}	0 to 400	V
First accelerator voltage	V_{g2}	600	V
Grid no. 1 voltage for extinction of focused raster	V_{g1}	−32 to −85	V

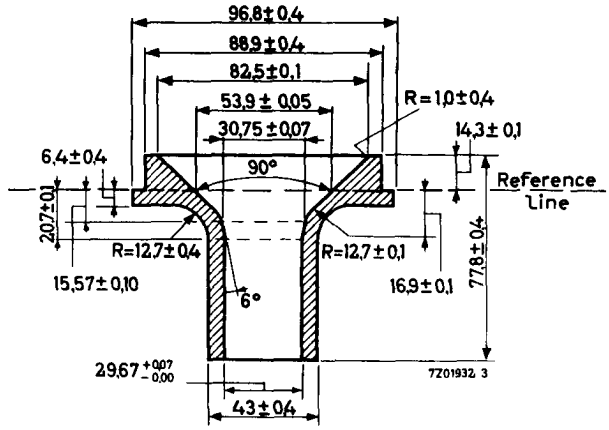
RESOLUTION

Resolution at screen centre measured with the shrinking raster method (non-interlaced raster), under typical operating conditions, and at a beam current of 50 μA: 900 lines
The resolution can be improved by the use of beam centring magnet, catalogue number 3322 142 11401, supplied on request.

LIMITING VALUES (Absolute max. rating system)

Final accelerator voltage	$V_{g3,\,g5(\ell)}$	max.	18	kV
		min.	10	kV
Focusing electrode voltage, positive	V_{g4}	max.	1000	V
	$-V_{g4}$	max.	500	V
First accelerator voltage	V_{g2}	max.	800	V
		min.	300	V
Grid no. 1 voltage, negative	$-V_{g1}$	max.	150	V
positive	V_{g1}	max.	0	V
positive peak	V_{g1_p}	max.	2	V
Cathode to heater voltage, positive	V_{kf}	max.	250	V
positive peak	V_{kf_p}	max.	300	V 1)
negative	$-V_{kf}$	max.	135	V
negative peak	$-V_{kf_p}$	max.	180	V

REFERENCE LINE GAUGE



1) During a warm-up period not exceeding 15 s the heater may be 410 V negative with respect to the cathode.

MONITOR TUBE

The M31-131W is a 31 cm-diagonal rectangular television tube with integral protection primarily intended for use as a monitor or display tube.

QUICK REFERENCE DATA			
Deflection angle		90 °	
Focusing		electrostatic	
Resolution		900	lines
Overall length	≤	310	mm

SCREEN

Metal backed phosphor

Luminescence		white	
Light transmission of face glass		approx. 50	%
Useful diagonal	≥	295	mm
Useful width	≥	257	mm
Useful height	≥	195	mm

HEATING

Indirect by a.c. or d.c.; parallel supply

Heater voltage	V_f	6,3	V
Heater current	I_f	300	mA

FOCUSING *electrostatic*

For focusing voltage providing optimum focus at a beam current of 100 μA see under "Typical operating conditions".

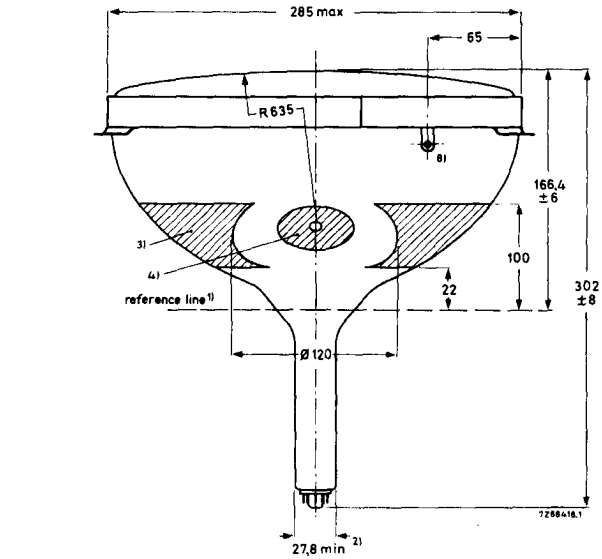
DEFLECTION magnetic

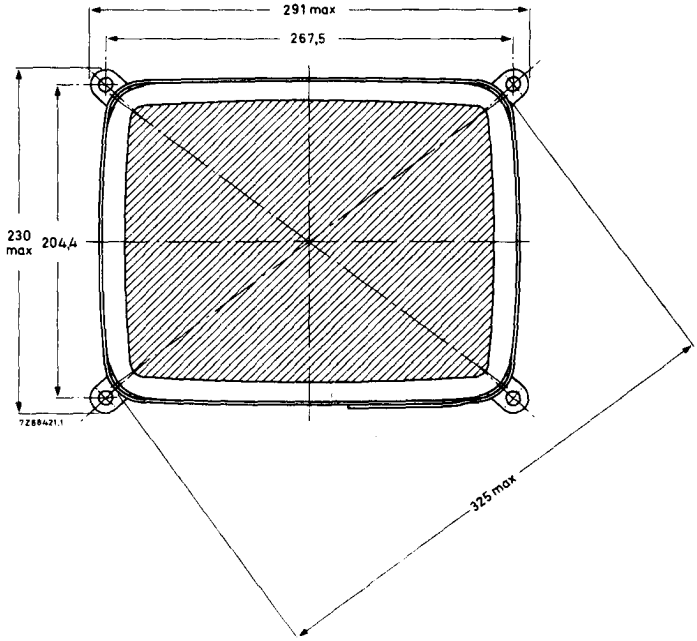
Diagonal deflection angle 90 °

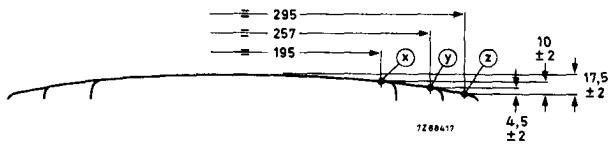
Deflection coil AT1071/03 is recommended.

MECHANICAL DATA

Dimensions in mm

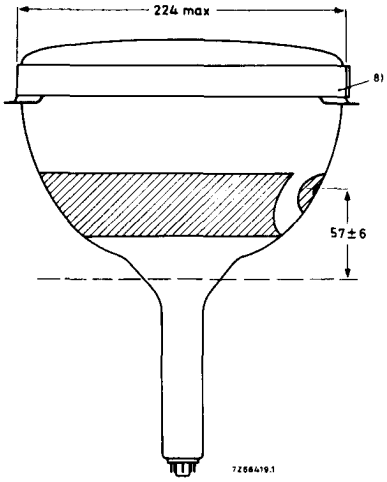


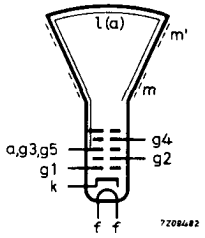


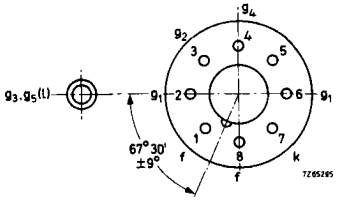


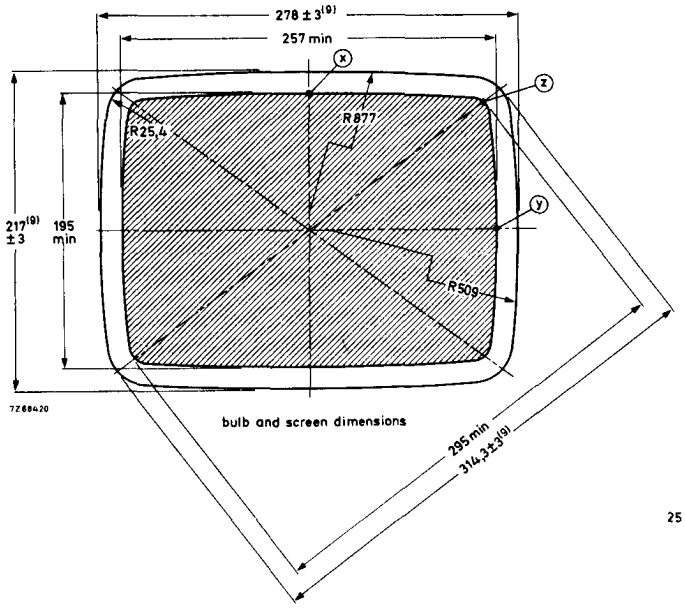
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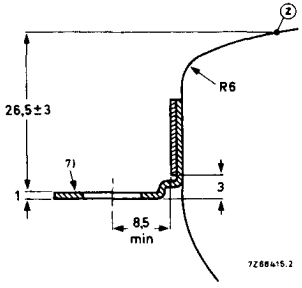
Dimensions in mm

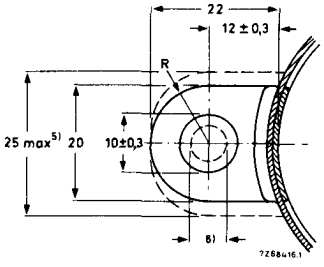












See "Notes to outline drawings".

MECHANICAL DATA (continued)

Mounting position : any	
Base	Neo eightar (B8H), IEC 67-I-31a
Cavity contact	CT8, IEC 67-III-2
Accessories	
Socket	2422 501 06001
Final accelerator contact connector	type 55563A

PICTURE CENTRING MAGNET

Field intensity perpendicular to the tube axis adjustable from 0 to 800 A/m (0 to 10 Oe). Adjustment of the centring magnet should not cause a general reduction in brightness or shading the raster.

NOTES TO OUTLINE DRAWINGS

1) The reference line is determined by the plane of the upper edge of the flange of the reference line gauge with the gauge resting on the cone.
2) The maximum dimension is determined by the reference line gauge.
3) This tube has a external conductive coating (m), which must be earthed. The capacitance of this coating to the final accelerator is used for smoothing the EHT. The tube marking and warning labels are on the side of the cone opposite the final accelerator contact, and this side should not be used for making contact to the conductive coating.
4) This area must be kept clean.
5) Minimum space to be reserved for mounting lugs.
6) The mounting screws in the cabinet must be situated within a circle with a diameter of 6 mm drawn around the true geometrical position (corners of a rectangle of 267,5 mm x 204,4 mm).
7) The maximum displacement of any lug, with respect to the plane through the other three lugs is 2 mm.
8) The metal rim-band must be earthed. For this purpose the band is provided with a tag.
9) The bulge of the spliceline seal may increase the indicated maximum values for envelope width, diagonal, and height by not more than 6,4 mm, but at any point around the seal the bulge will not protrude more than 3,2 mm beyond the envelope surface.

CAPACITANCES

Final accelerator to external conductive coating	$C_{g3,\ g5(\ell)/m}$	1200	pF
Final accelerator to metal band	$C_{g3,\ g5(\ell)/m}$	150	pF
Cathode to all other elements	C_k	5	pF
Control grid to all other elements	C_{g1}	7	pF

TYPICAL OPERATING CONDITIONS

Final accelerator voltage	$V_{g3,\ g5(\ell)}$			16	kV
Focusing electrode voltage	V_{g4}	0	to	400	V
First accelerator voltage	V_{g2}			600	V
Grid 1 voltage for extinction of focused raster	V_{g1}	-32	to	-85	V

RESOLUTION

Resolution at screen centre measured with the shrinking raster method (non-interlaced raster), under typical operating conditions, and at a beam current of 50 μA: 900 lines

If necessary, the picture quality can be improved by using a beam centring magnet. This magnet, catalogue number 3322 142 11401, can be supplied on request.

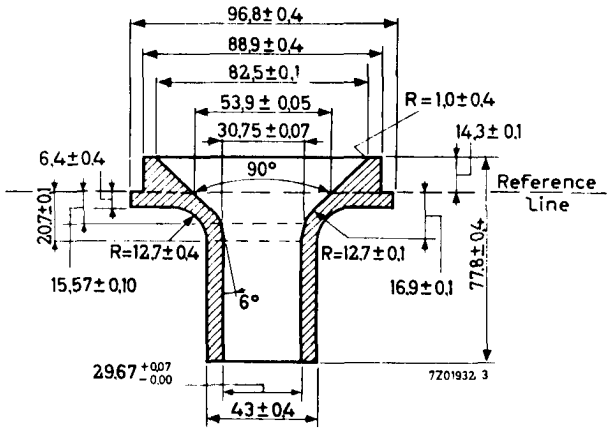
LIMITING VALUES (Absolute max. rating system)

Final accelerator voltage	$V_{g3,\ g5(\ell)}$	max.		18	kV
		min.		10	kV
Focusing electrode voltage, positive	V_{g4}	max.		1000	V
negative	$-V_{g4}$	max.		500	V
First accelerator voltage	V_{g2}	max.		800	V
		min.		300	V
Grid voltage, negative	$-V_{g1}$	max.		150	V
positive	V_{g1}	max.		0	V
positive peak	V_{g1p}	max.		2	V
Cathode to heater voltage, positive	V_{kf}	max.		250	V
positive peak	V_{kfp}	max.		300	V
negative	$-V_{kf}$	max.		135	V [1]
negative peak	$-V_{kfp}$	max.		180	V

1) During a warm-up period not exceeding 15 s the heater may be 410 V negative with respect to the cathode.

REFERENCE LINE GAUGE

Dimensions in mm



MONITOR TUBE

The M38-120W is a 38 cm-diagonal rectangular television tube with metal backed screen and integral protection primarily intended for use as a monitor tube.
On request this tube can also be supplied with a WA screen phosphor.

QUICK REFERENCE DATA		
Deflection angle	110 ^{o}	
Focusing	electrostatic	
Resolution	min. 650	lines
Overall length	max. 279,5	mm

SCREEN

Metal backed phosphor		
Luminescence	white	
Light transmission of face glass	50	%
Useful diagonal	min. 350	mm
Useful width	min. 290	mm
Useful height	min. 226	mm

HEATING

Indirect by a.c. or d.c.; parallel or series supply

Heater voltage	V_f	6,3	V
Heater current	I_f	300	mA

FOCUSING electrostatic

For focusing voltage providing optimum focus at screen centre at a beam current of 100 μA see under "Typical operating conditions".

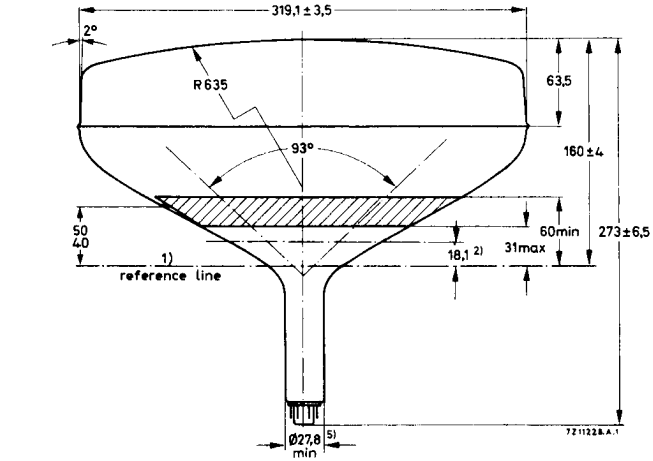
DEFLECTION magnetic

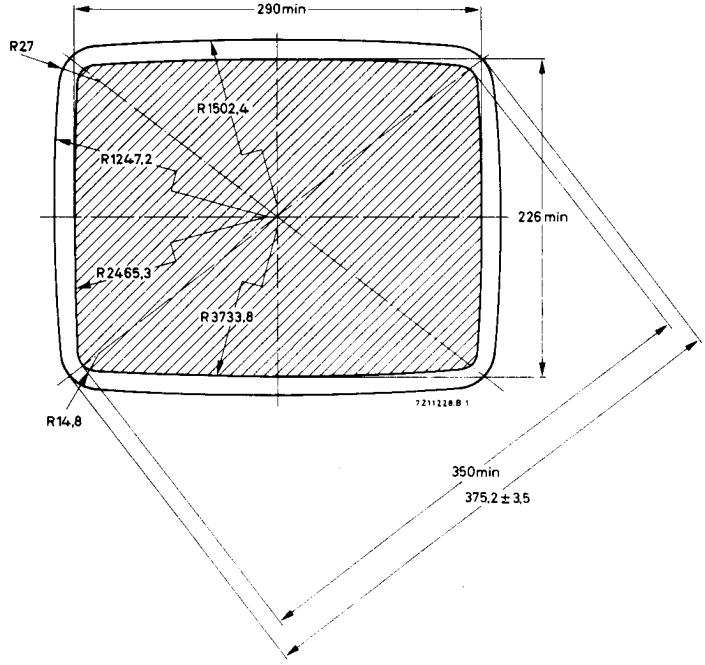
Diagonal deflection angle	110 ^{o}
Horizontal deflection angle	93 ^{o}
Vertical deflection angle	76 ^{o}

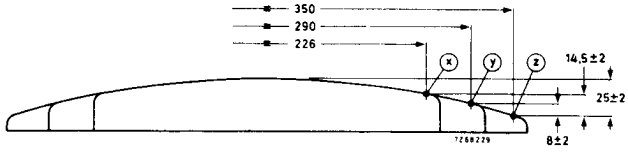
Deflection coil AT1038/40A or AT1039/.. is recommended.

MECHANICAL DATA

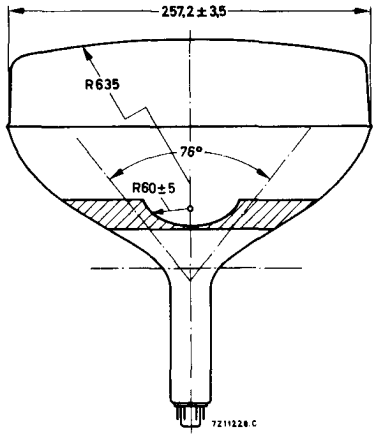
Dimensions in mm

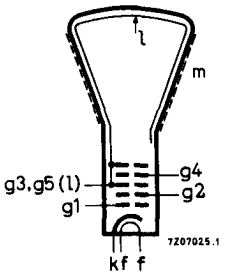


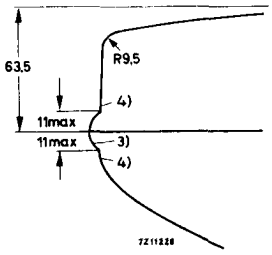


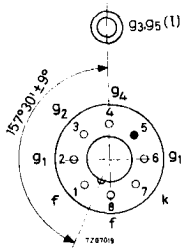


MECHANICAL DATA (continued)









Mounting position: any

Base	Neo eightar (B8H), IEC67-I-31a
Cavity contact	CT8, IEC67-III-2
Accessories	
Final accelerator contact connector	type 55563A
Socket	2422 501 06001

NOTES TO OUTLINE DRAWING

1) The reference line is determined by the plane of the upper edge of the flange of reference line gauge, (JEDEC126) when the gauge is resting on the cone.

2) End of guaranteed contour. The maximum neck and cone contour is given by the Reference line gauge.

3) Bulge at splice-line seal may increase the indicated maximum value for envelope width, diagonal and height by not more than 6,4 mm, but at any point around the seal, the bulge will not protrude more than 3,2 mm beyond the envelope surface at the location specified for dimensioning the envelope width, diagonal and height.

4) The tube should be supported on both sides of the bulge. The mechanism used should provide clearance for the maximum dimensions of the bulge.

5) The maximum dimension is determined by the reference line gauge

PICTURE CENTRING MAGNET

Field intensity perpendicular to the tube axis adjustable from 0 to 800 A/m (0 to 10 oersted). Adjustment of the centring magnet should not be such that a general reduction in brightness or shading of the raster occurs.

CAPACITANCE

Control grid to all other elements	C_{g1}	6,0	pF
Cathode to all other elements	C_k	5,0	pF
Final accelerator to external conductive coating	$C_{g3,g5(\ell)}$/m	600	pF

TYPICAL OPERATING CONDITIONS

Final accelerator voltage	$V_{g3,g5(\ell)}$	16	kV
Focusing electrode voltage	V_{g4}	0 to 400	V [1]
First accelerator voltage	V_{g2}	400	V
Grid No. 1 voltage for visual extinction of a focused raster	$-V_{g1}$	40 to 85	V

RESOLUTION

Resolution at screen centre, measured with the shrinking raster method (non-interlaced raster), under typical operating conditions, a beam current of 100 μA, and focusing voltage adjusted for optimum spot size — min. 650 lines

LIMITING VALUES (Absolute max. rating system)

Voltages are specified with respect to cathode unless otherwise stated.

Final accelerator voltage	$V_{g3,g5(\ell)}$	max.	18	kV
		min.	13	kV
Focusing electrode voltage	V_{g4}	max.	1	kV
	$-V_{g4}$	max.	0,5	kV
First accelerator voltage	V_{g2}	max.	550	V
		min.	350	V
Control grid voltage, negative	$-V_{g1}$	max.	150	V
positive	V_{g1}	max.	0	V
positive peak	V_{g1_p}	max.	2	V
Cathode to heater voltage, positive	V_{kf}	max.	250	V
positive peak	V_{kf_p}	max.	300	V
negative	$-V_{kf}$	max.	135	V
negative peak	$-V_{kf_p}$	max.	180	V

[1]) With the small change in focus spot size with variation of focus voltage the limit of 0 to 400 V is such that an acceptable focus quality is obtained within this range. If it is required to pass through the point of focus, a voltage of at least −100 V to +500 V will be required.

CIRCUIT DESIGN VALUES

Focusing electrode current, positive	I_{g_4}	max.	25	μA
negative	$-I_{g_4}$	max.	25	μA
Grid no. 2 current, positive	I_{g_2}	max.	5	μA
negative	$-I_{g_2}$	max.	5	μA

MAXIMUM CIRCUIT VALUES

Resistance between cathode and heater	R_{kf}	max.	1	MΩ
Impedance between cathode and heater (f = 50 Hz)	Z_{kf}	max.	500	kΩ
Resistance between grid no. 1 and earth	R_{g_1}	max.	1,5	MΩ
Impedance between cathode and earth (f = 50 Hz)	Z_k	max.	100	kΩ

WARNING

X-ray shielding is advisable to give protection against possible danger of personal injury arising from prolonged exposure at close range to this tube when operated above 16 kV.

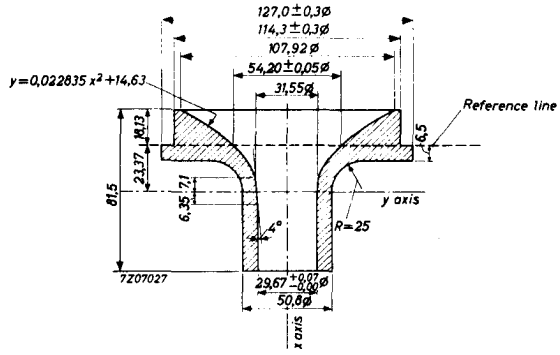
EXTERNAL CONDUCTIVE COATING

This tube has an external conductive coating (m), which must be earthed and capacitance of this to the final electrode is used to provide smoothing for the EHT supply. The tube marking and warning labels are on the side of the cone opposite the final electrode connector and this side should not be used for making contact to the external conductive coating.

REFERENCE LINE GAUGE

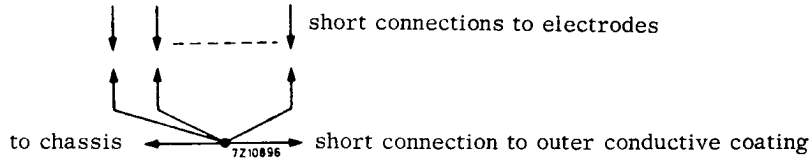
Dimensions in mm

JEDEC126



REMARK

With the high voltage used with this tube internal flash-overs may occur. These may destroy the cathode of the tube. Therefore it is necessary to provide protective circuits, using spark gaps.
The spark gaps must be connected as follows:



No other connections between the outer conductive coating and the chassis are permissible.

On request the tube can be supplied with spark traps mounted in the base (ring trap base).

MONITOR TUBE

The M38-121 is a 38 cm-diagonal rectangular television tube with metal backed screen and integral protection primarily intended for use as a monitor or display tube.

QUICK REFERENCE DATA			
Deflection angle		110 °	
Focusing		electrostatic	
Resolution	min.	650	lines
Overall length	max.	279,5	mm

SCREEN

Metal backed phosphor

Luminescence		white	
Light transmission of face glass		50	%
Useful diagonal	min.	350	mm
Useful width	min.	290	mm
Useful height	min.	226	mm

HEATING

Indirect by a.c. or d.c.; parallel or series supply

Heater voltage	V_f	6,3	V
Heater current	I_f	300	mA

FOCUSING

electrostatic

For focusing voltage providing optimum focus at screen centre at a beam current of 100 μA see under "Typical operating conditions".

DEFLECTION

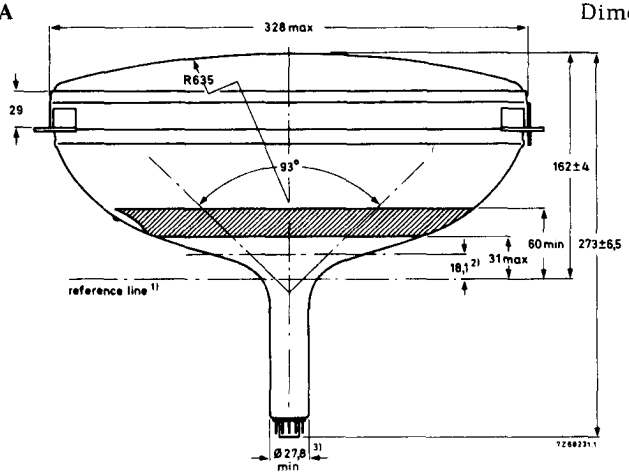
magnetic

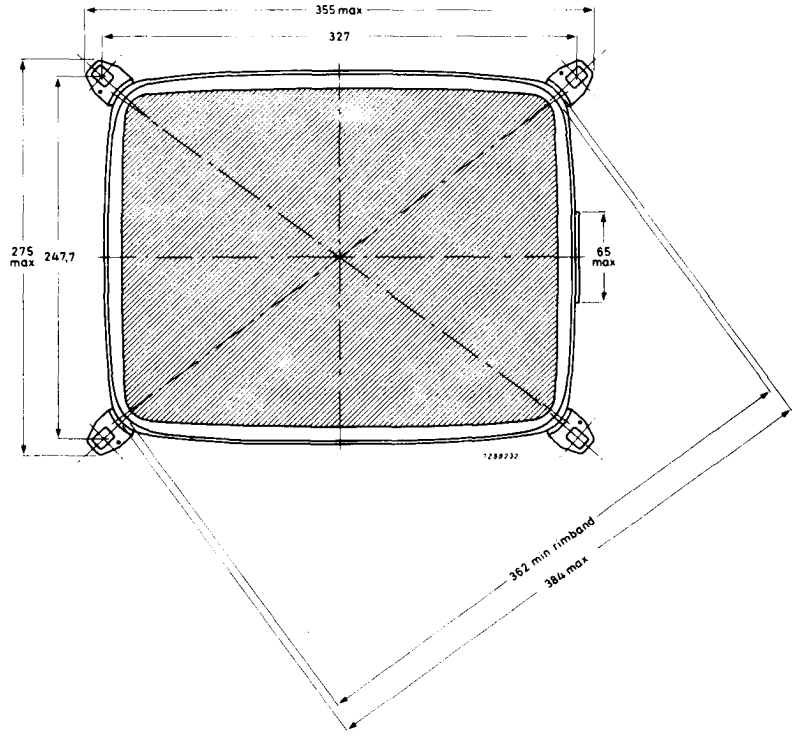
Diagonal deflection angle	110 °
Horizontal deflection angle	93°
Vertical deflection angle	76°

Deflection coil AT1038/40A or AT1039/.. is recommended.

MECHANICAL DATA

Dimensions in mm

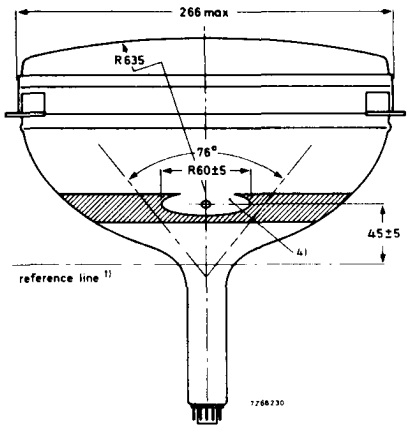


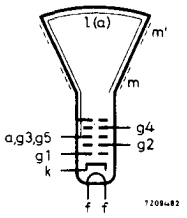


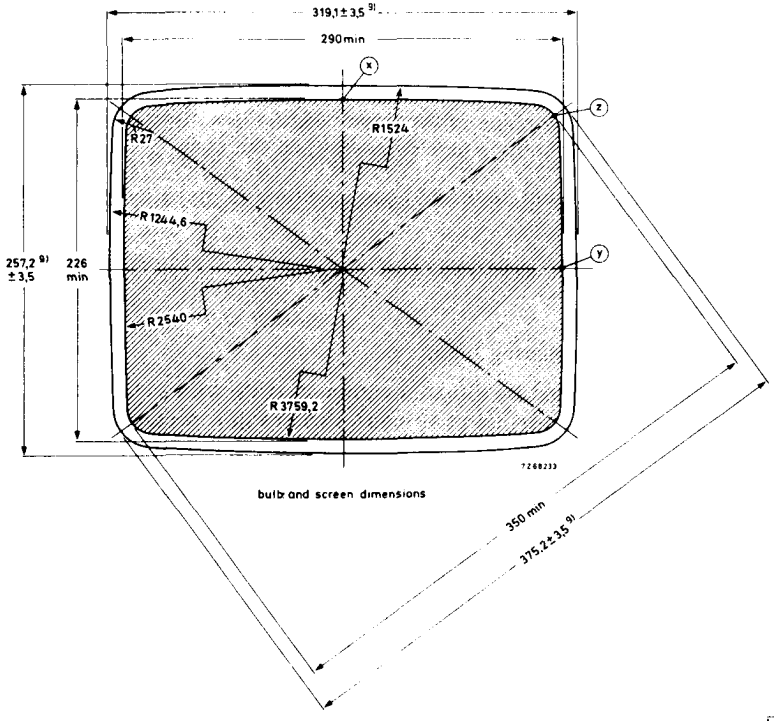


MECHANICAL DATA (continued)

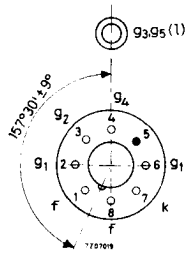
Dimensions in mm

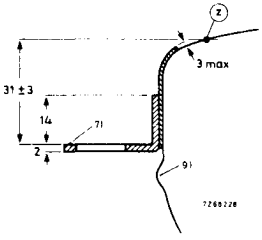


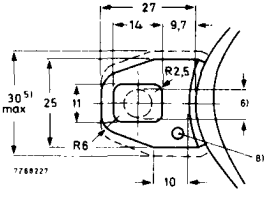




bulb and screen dimensions







MECHANICAL DATA (continued)

Mounting position: any

Base	Neo eightar (B8H), IEC67-I-31a
Cavity contact	CT8, IEC67-III-2
Accessories	
Socket	2422 501 06001
Final accelerator contact connector	type 55563

PICTURE CENTRING MAGNET

Field intensity perpendicular to the tube axis from 0 to 800 A/m (0 to 10 Oe). Adjustment of the centring magnet should not cause a general reduction in brightness or shading of the raster.

NOTES TO OUTLINE DRAWING

1) The reference line is determined by the plane of the upper edge of the flange of the reference line gauge, (JEDEC 126) when the gauge is resting on the cone.

2) End of guaranteed contour. The maximum neck and cone countour is given by the reference line gauge.

3) The maximum dimension is given by the reference line gauge.

4) This area must be kept clean.

5) Minimum space to the reserved for mounting lugs.

6) The mounting screws in the cabinet must be situated within a circle with a diameter of 7,5 mm drawn around the true geometrical positions(corners of a rectangle of 327 mm x 247,7 mm).

7) The maximum displacement of any lug with respect to the plane trough the other three lugs is 2 mm.

8) The metal rimband must be earthed. Holes of 3 mm diameter in each lug are provided for this purpose.

9) The bulge at the pliceline seal may increase the indicated maximum value for envelope width, diagonal and height by not more than 6,4 mm, but at any point around the seal the bulge will not protrude more than 3,2 mm beyond the envelope surface.

CAPACITANCES

Final accelerator to external conductive coating	$C_{g3,g5(\ell)/m}$	450 to 650	pF
Final accelerator to metal band	$C_{g3,g58\ell 9/m'}$	240	pF
Cathode to all other elements	C_k	5	pF
Control grid to all other elements	C_{g1}	6	pF

TYPICAL OPERATING CONDITIONS

Final accelerator voltage	$V_{g3,g5(\ell)}$	16	kV
Focusing electrode voltage	V_{g4}	0 to 400	V [1]
First accelerator voltage	V_{g2}	400	V
Grid No. 1 voltage for visual extinction of a focused raster	$-V_{g1}$	40 to 85	V

RESOLUTION

Resolution at screen centre, measured with the shrinking raster method (non-interlaced raster), under typical operating conditions, a beam current of 100 μA, and focusing voltage adjusted for optimum spot size min. 650 lines

LIMITING VALUES (Absolute max. rating system)

Voltages are specified with respect to cathode unless otherwise stated.

Final accelerator voltage	$V_{g3,g5(\ell)}$	max. 18 min. 13	kV kV
Focusing electrode voltage	V_{g4} $-V_{g4}$	max.1000 max. 500	V V
First accelerator voltage	V_{g2}	max. 550 min. 350	V V
Control grid voltage, negative	$-V_{g1}$	max. 150	V
positive	V_{g1}	max. 0	V
positive peak	V_{g1p}	max. 2	V
Cathode to heater voltage, positive	V_{kf}	max. 250	V
positive peak	V_{kfp}	max. 300	V
negative	$-V_{kf}$	max. 135	V
negative peak	$-V_{kfp}$	max. 180	V

[1]) With the small change in focus spot size with variation of focus voltage the limit of 0 to 400 V is such that an acceptable focus quality is obtained within this range. If it is required to pass through the point of focus, a voltage range of at least -100 to +500 V will be required.

CIRCUIT DESIGN VALUES

Focusing electrode current, positive	I_{g4}	max.	25	µA
negative	$-I_{g4}$	max.	25	µA
Grid No.2 current, positive	I_{g2}	max.	5	µA
negative	$-I_{g2}$	max.	5	µA

MAXIMUM CIRCUIT VALUES

Resistance between cathode and heater	R_{kf}	max.	1	MΩ
Impedance between cathode and heater (f = 50 Hz)	Z_{kf}	max.	500	kΩ
Resistance between grid no. 1 and earth	R_{g1}	max.	1,5	MΩ
Impedance between cathode and earth (f = 50 Hz)	Z_k	max.	100	kΩ

WARNING

X-ray shielding is advisable to give protection against possible danger of personal injury arising from prolonged exposure at close range to this tube when operated above 16 kV.

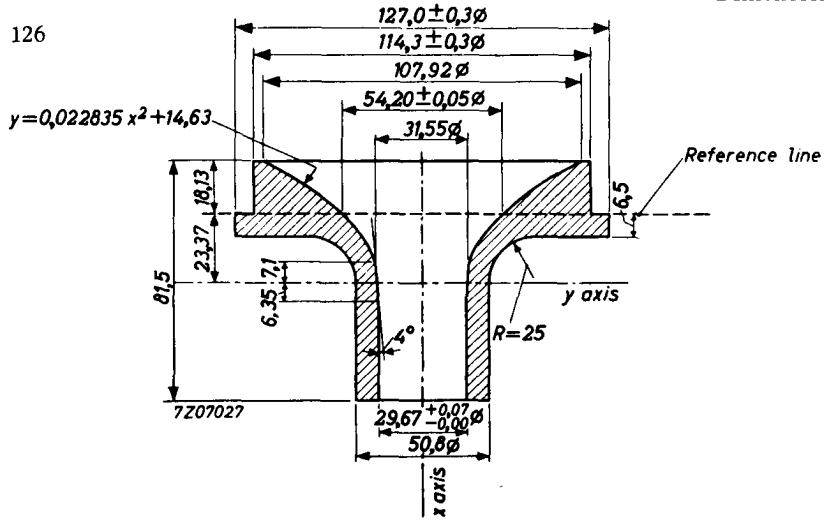
EXTERNAL CONDUCTIVE COATING

This tube has an external conductive coating (m), wich must be earthed and capacitance of this to the final electrode is used to provide smoothing for the EHT supply. The tube marking and warning labels are on the side of the cone opposite the final electrode connector and this side should not be used for making contact to the external conductive coating.

REFERENCE LINE GAUGE

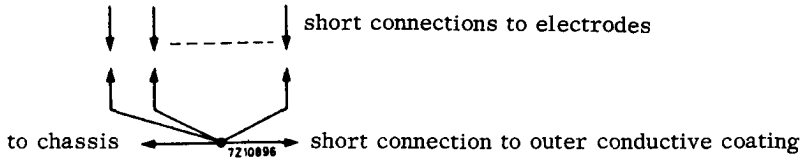
Dimensions in mm

JEDEC 126



REMARK

With the high voltage used with this tube internal flash-overs may occur. These may destroy the cathode of the tube. Therefore it is necessary to provide protective circuits, using spark gaps.
The spark gaps must be connected as follows:



No other connections between the outer conductive coating and the chassis are permissible.

On request the tube can be supplied with spark traps mounted in the base (ring trap base).

VERY HIGH RESOLUTION CATHODE-RAY TUBE

The M38-200 is a 38 cm, 70° data graphic display tube with a resolution of more than 6,6 line pairs per mm (corresponding to 3000 TV lines). Used in conjunction with deflection unit AT1991 it is eminently suitable for full page document display.
The resolution easily meets the stringent requirements of the CCITT recommendations for digital group III, high resolution facsimile transmission, and those of graphic displays for computer-aided design.

Tubes with white (WA and WE) or green (GH) screen phosphors are standard; the WE phosphor is recommended for photographic applications. Other phosphors are available to special order. The tubes have a metal-backed screen and rim band for implosion protection.

QUICK REFERENCE DATA

Deflection angle	70°
Face diagonal	38 cm
Overall length	478 mm
Neck diameter	36,8 mm
Screen dimensions	226 mm x 291 mm
Resolution	3000 TV lines* ← 1800 lines* ← (shrinking raster)

* Landscape format.

ELECTRICAL DATA

Capacitances		
cathode to all other electrodes	C_k	4 pF
grid 1 to all other electrodes	C_{g1}	12 pF
final accelerator to external conductive coating	$C_{g3,\ g5(I)/m}$	1000 pF
final accelerator to tension band	$C_{g3,\ g5(I)/m'}$	220 pF
Focusing method		electrostatic
Deflection method		magnetic*
Deflection angle		approx. 70°
Heating		indirect by AC or DC
heater voltage	V_f	6,3 V ± 5 %
heater current	I_f	190 mA**

OPTICAL DATA

Screen	metal-backed phosphor		
Phosphor type	GH	WA	WE
fluorescent colour	green	white	white
persistence	medium	medium	medium
	short		short
Screen dimensions	226 mm x 291 mm		
Minimum useful screen diagonal	352 mm		
Preferable useful scanning area	200 mm x 270 mm		
Reduction for A4 size (297 mm x 210 mm)	9%		
Reduction for 11" x 8½" size (279 mm x 216 mm)	7,4%		
Light transmission of screen	approx. 50%		

* To obtain the best tube performance, deflection unit AT1991 should be used.

** Liable to be modified into 240 mA.

MECHANICAL DATA

Overall length	478 ± 6,5 mm
Neck diameter	36,8 ± 0,8 mm
Base	JEDEC B12-246
Final accelerator contact	cavity contact, CT8; IEC 67-III-2
Mounting position	any
Implosion protection	rim band
Net mass	approx. 6 kg
Accessories	
socket	type 55589
final accelerator contact connector	type 55563A
deflection unit	type AT1991

MECHANICAL DATA (continued)

Dimensions in mm

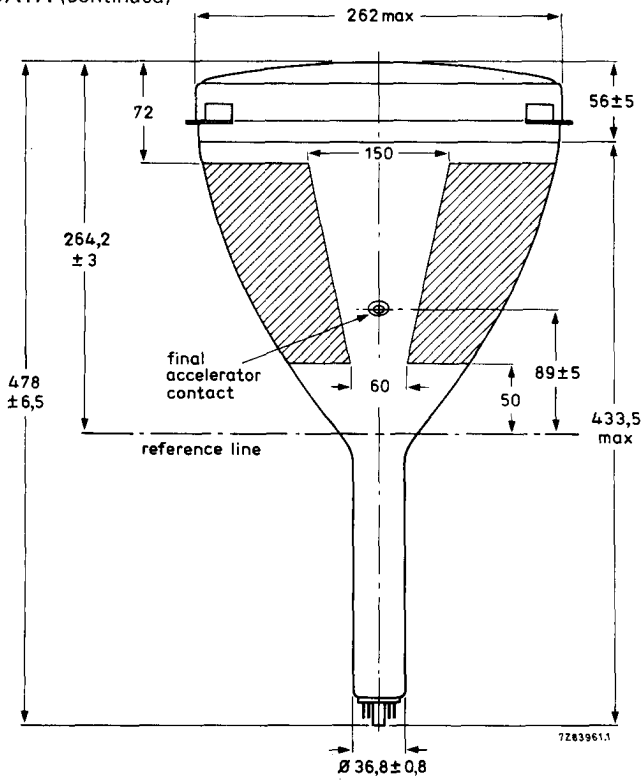


Fig. 1a.

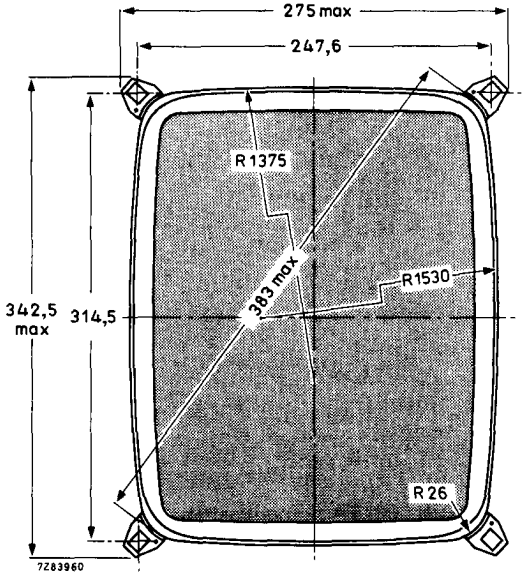


Fig. 1b.

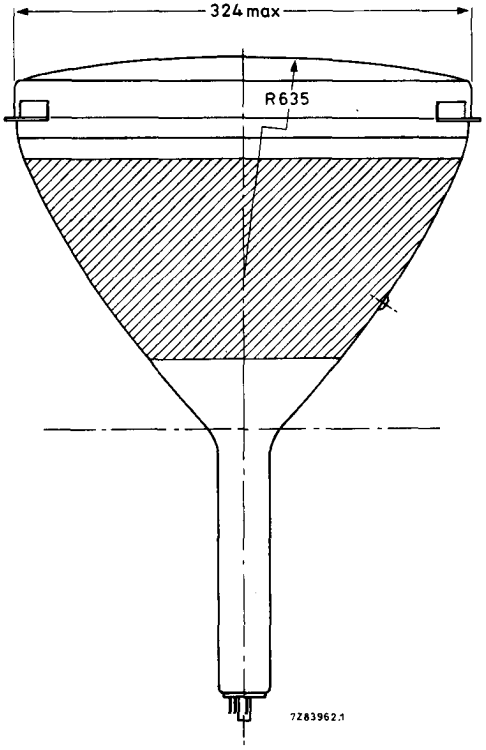


Fig. 1c.

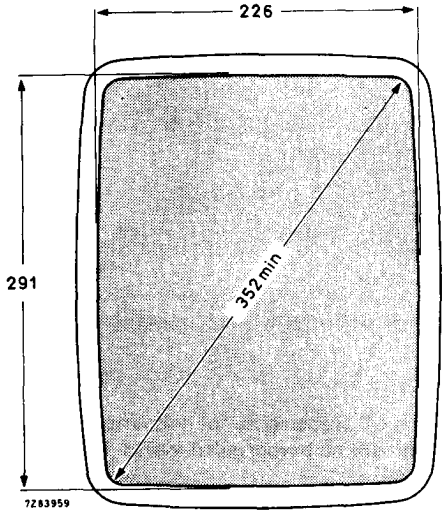


Fig. 2.

MECHANICAL DATA (continued)

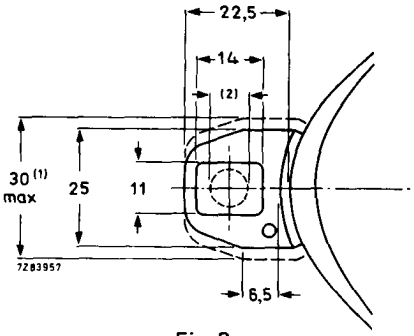


Fig. 3.

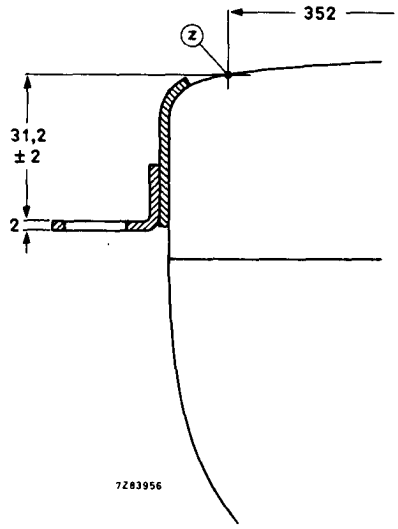


Fig. 4.

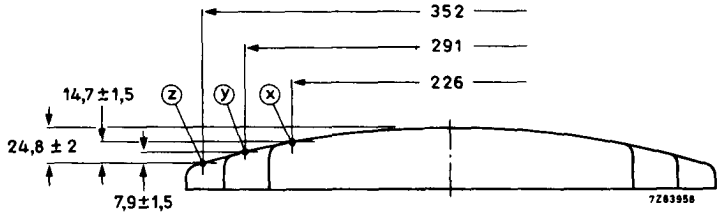


Fig. 5.

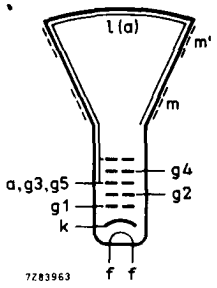


Fig. 6.

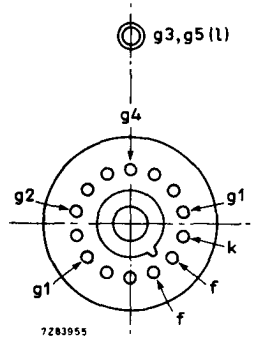


Fig. 7.

Notes

1. Minimum space to be reserved for mounting lugs.
2. The mounting screws in the cabinet must be situated within a circle with a diameter 7,5 mm drawn around the true geometrical positions (corners of a rectangle of 314,5 mm x 247,6 mm).

Reference line gauge, JEDEC 110

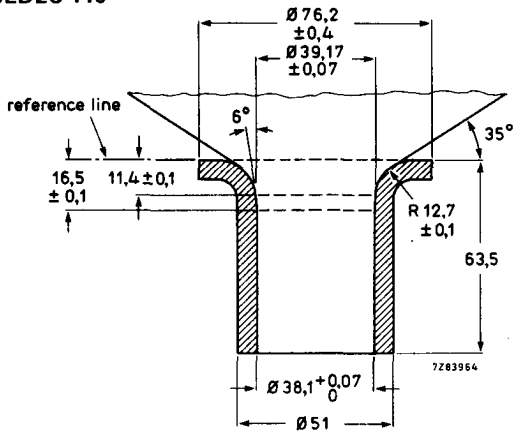


Fig. 8.

RECOMMENDED OPERATING CONDITIONS; voltages with respect to cathode* ←

Final accelerator voltage	$V_{g3, g5}$	18	kV
Focusing electrode voltage	V_{g4}	5 to 7	kV**
Dynamic focusing	ΔV_{g4}	200 to 300	V▲
First accelerator voltage	V_{g2}	800	V
Cut-off voltage for visual extinction of focused spot	$-V_{g1}$	50 to 110	V
Grid drive for 30 μA screen current	V_d	approx. 20	V

RESOLUTION

With a beam current (I_a) of 30 μA, the spot diameter at a brightness level of 50% is approx. 120 μm (see Fig. 9).

CIRCUIT DESIGN VALUES

Grid 4 current				
positive	I_{g4}	max.	6 μA	←
negative	$-I_{g4}$	max.	6 μA	←
Grid 2 current				
positive	I_{g2}	max.	5 μA	
negative	$-I_{g2}$	max.	5 μA	

* The tube has internal magnetic correction for astigmatism. To avoid changing this correction, the coil must be at zero potential, before being moved on the tube neck.

** For optimum focus at screen centre.

▲ To obtain optimum focus over the whole useful screen area, dynamic correction voltages should be applied in N-S and E-W directions; these voltages should be adjustable separately within the indicated range.

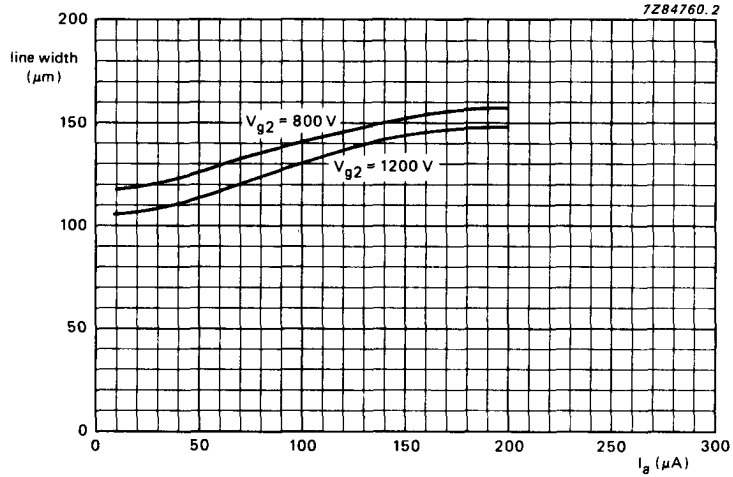
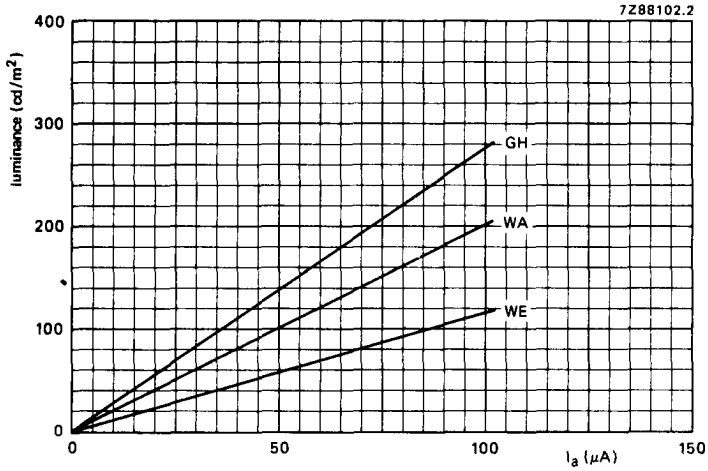
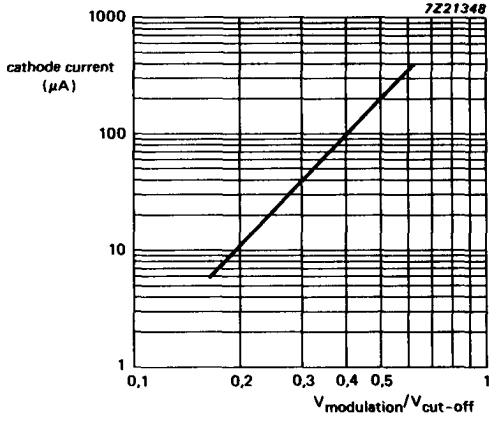


Fig. 9 Resolution.



Luminance is measured with a photo-cell, the spectral response of which is identical to that of the human eye, on a 312 lines non-interlaced raster, screen dimensions 226 mm x 291 mm, frame frequency 50 Hz.

Fig. 10 Luminance.



V_{co} = 74,5 V, V_{g2} = 800 V, $V_{g3,g5}$ = 18 kV.

Fig. 11 Grid drive.

LIMITING VALUES (Absolute maximum rating system)

Voltages are specified with respect to cathode unless otherwise stated.

Final accelerator voltage	$V_{g3,\ g5(\ell)}$	max.	20	kV
Focusing electrode voltage	V_{g4}	max.	8	kV
		min.	4	kV
First accelerator voltage	V_{g2}	max.	1,2	kV
Control grid voltage				
negative	$-V_{g1}$	max.	140	V
positive, non-repetitive	V_{g1}	max.	0	V
Cathode to heater voltage				
positive	V_{kf}	max.	250	V
positive peak	V_{kfp}	max.	300	V
negative	$-V_{kf}$	max.	135	V
negative peak	$-V_{kfp}$	max.	180	V

LIMITING CIRCUIT VALUES

Resistance between cathode and heater	R_{kf}	max.	1	MΩ
Impedance between cathode and heater (f = 50 Hz)	Z_{kf}	max.	500	kΩ
Grid 1 circuit resistance	R_{g1}	max.	1,5	MΩ
Impedance between cathode and earth	Z_k	max.	100	kΩ

X-RADIATION

→ See Figs 13 and 14.

FLASHOVER PROTECTION

With the high voltage used with this tube internal flashovers may occur. These may destroy the cathode of the tube. Therefore it is necessary to provide protective circuits, using spark gaps. The spark gaps must be connected as follows:

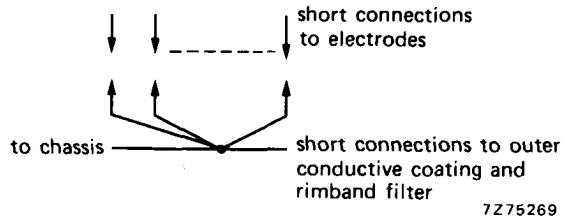
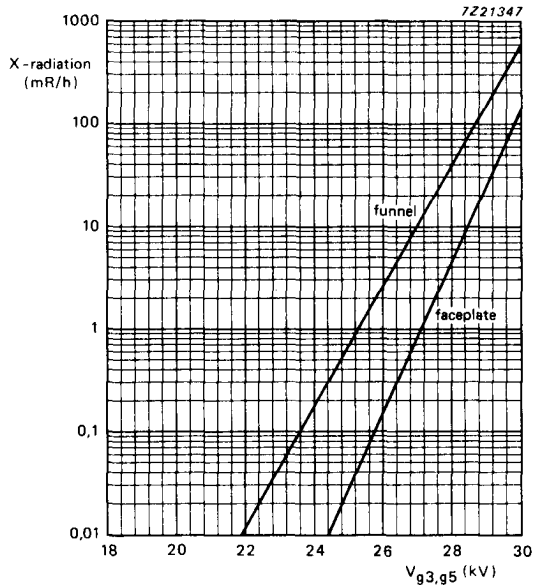


Fig. 12.

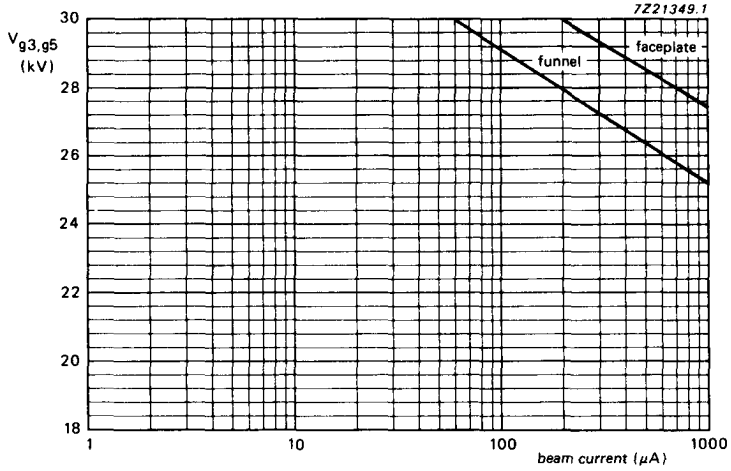
No other connections between the outer conductive coating and the chassis are permissible.

X-RADIATION LIMIT



Anode button has no measureable radiation up to 30 kV.

Fig. 13 X-radiation limit curves, at a constant anode current of 250 μA, measured in accordance with TEPAC164.



Anode button has no measureable radiation up to 30 kV and 1500 μA.

Fig. 14 0,5 mR/h isoexposure-rate limit curves, measured according to TEPAC164.

VERY HIGH RESOLUTION CATHODE-RAY TUBE/COIL ASSEMBLY

This tube/coil assembly consists of the very high resolution tube M38-200 and the deflection unit AT1991. The assembly is adjusted for astigmatism correction of the spot, over the entire screen. For further information see the data sheets of M38-200 and AT1991.

QUICK REFERENCE DATA

Deflection angle	70°
Face diagonal	38 cm
Overall length	478 mm
Neck diameter	36,8 mm
Screen dimensions	226 mm x 291 mm
Resolution	3000 TV lines* 1800 lines* (shrinking raster)

MECHANICAL DATA Dimensions in mm

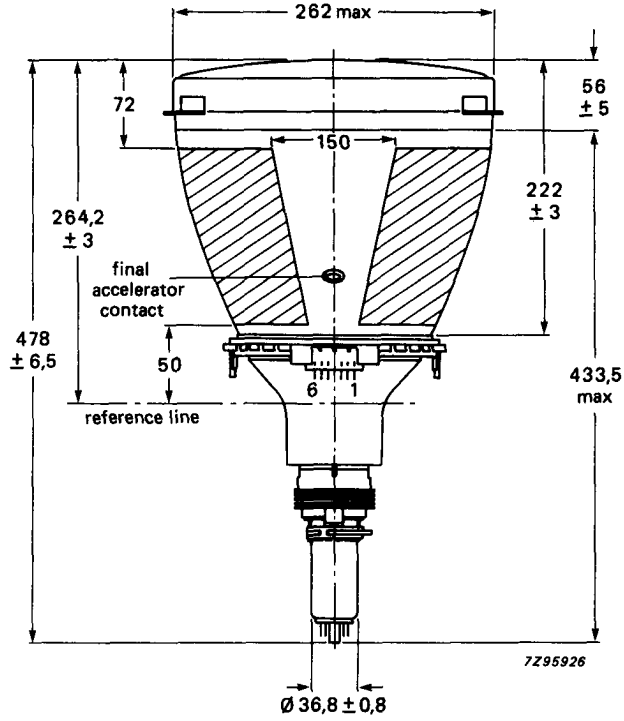


Fig. 1 M38-201 tube assembly.

MECHANICAL DATA (continued)

Dimensions in mm

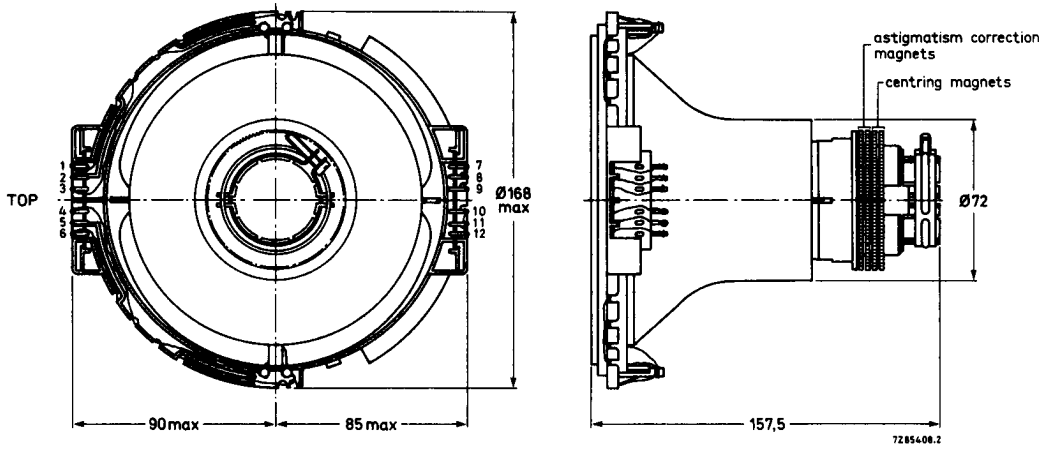


Fig. 2 AT1991 deflection unit.

ELECTRICAL DATA (for landscape format: 290 mm x 225 mm scan)

Line deflection coils, parallel connected; (see Fig. 3)	
inductance (at 1 kHz)	140 μH
resistance (DC)	0,23 Ω
Line deflection current, for 290 mm scan, at 18 kV	7,6 A
Field deflection coils, parallel connected; (see Fig. 3)	
inductance (at 1 kHz)	5 mH
resistance (DC)	5,6 Ω
Field deflection current, for 225 mm scan, at 18 kV	940 mA
Maximum voltage between line and field coils	2500 V (DC)

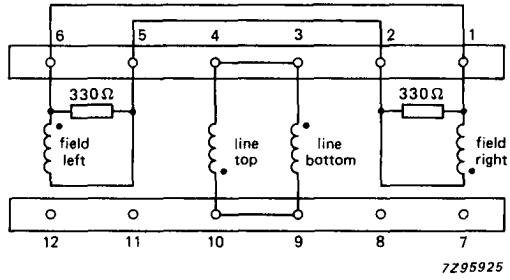
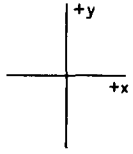


Fig. 3 Diagram of the coils. The beginning of the windings are indicated with ●.

Geometric distortion measured without centring magnets.



$Fy: +1{,}0^{+1{,}5}_{-1{,}0}$ $Fx: -1{,}0^{+1{,}0}_{-1{,}5}$

$Gy: +1{,}0^{+1{,}5}_{-1{,}0}$ $Gx: +1{,}0^{+1{,}5}_{-1{,}0}$

$Jy: -1{,}0^{+1{,}0}_{-1{,}5}$ $Jx: +1{,}0^{+1{,}5}_{-1{,}0}$

$Hy: -1{,}0^{+1{,}0}_{-1{,}5}$ $Hx: -1{,}0^{+1{,}0}_{-1{,}5}$

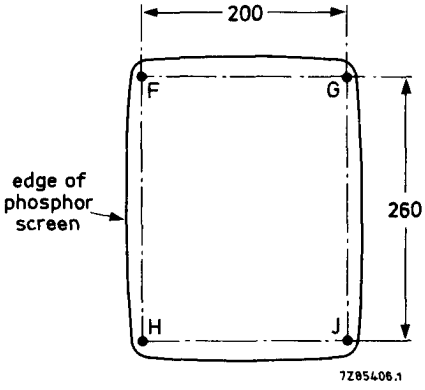


Fig. 4.

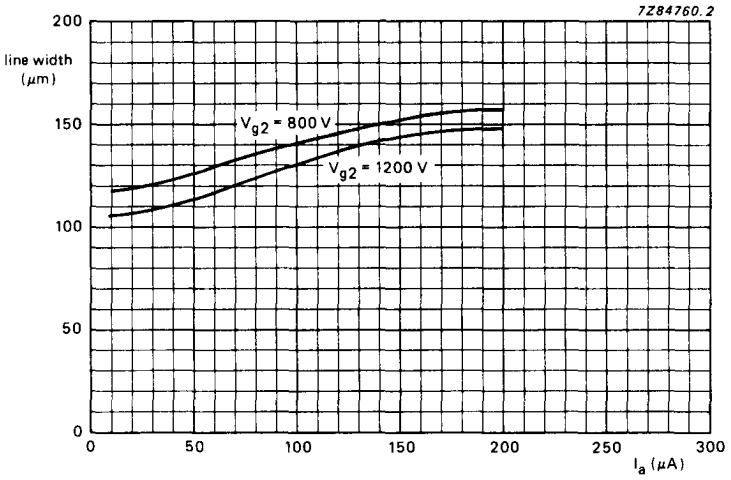


Fig. 5 Resolution.

CENTRING CORRECTION *

The eccentricity of the CRT and the deflection unit can be corrected by two independently movable centring magnets, which are magnetized diametrically (see Fig. 2). By turning the magnets with respect to each other the resulting field strength is varied. The direction of the resulting magnetic field is adjusted by turning the magnets simultaneously. The magnets must be adjusted so that the curvature of the horizontal and vertical axes disappears; in general the picture will be centred at the same time, otherwise this should be corrected electronically.

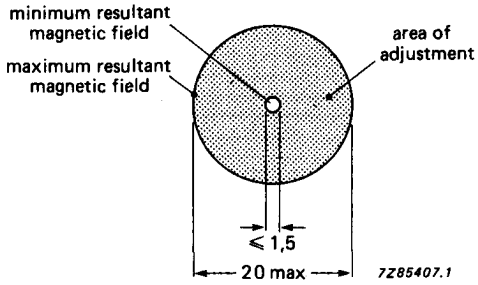


Fig. 6.

ASTIGMATISM CORRECTION *

The astigmatism of the undeflected beam can be corrected by two independently movable quadripole magnets, which are placed next to the centring magnets (see Fig. 2). By turning the quadripole magnets with respect to each other the resulting four-pole field strength varies. The direction of the resulting four-pole field is adjusted by turning the quadripole magnets simultaneously. The astigmatism of the undeflected beam is examined during a slow variation of the focusing voltage; the beam is free of astigmatism when the size, and not the shape, of the beam changes when the focusing voltage is varied around its optimum (Figs 7 and 8).



Fig. 7 Beam with astigmatism.



Fig. 8 Beam free of astigmatism.

a. Focusing voltage < optimum value.
b. Focusing voltage at optimum value.
c. Focusing voltage > optimum value.

* See "Precautions for use" overleaf.

PRECAUTIONS FOR USE

To avoid possible deterioration of the astigmatism correction quality of the assembly, the recommendations listed below should be adhered to:*

- To avoid changing the tube's internal magnetic correction, the coil must be at zero potential before being moved on the tube neck.
- If centring correction is necessary, adjust the coil dipole magnets so that the spot shift at the screen centre does not exceed 1 cm from its original position.
- For picture geometric distortion correction, an electrical correction is preferable to magnetic adjustment.
- When used in portrait format it may be necessary to adjust the position of the coil quadripole magnets, in order to achieve optimum astigmatism correction.
- When used in landscape format no adjustment for astigmatism correction is necessary as optimum astigmatism correction is set in the factory.

* The spot astigmatism correction quality is guaranteed for beam currents up to 250 μA, provided these recommendations are followed.

PHILIPS MODULATORRÖHRE MA 12/15

Die MA 12/15 ist eine wassergekühlte Triode zum Gebrauch als Modulator-, N.F.- oder H.F.-Verstärkerröhre. Sie wurde besonders für die Anodenspannungsmodulation (System Heising) der Philips wassergekühlten Senderröhre TA 12/20 entworfen. Die Anode ist durch einen Wasserkühler umgeben; der Anodenverlust darf 15 kW betragen.

Die Nutzleistung der MA 12/15 in einem N.F.-Verstärker Klasse A beträgt 1,95 kW[1]) bei einer Anodenspannung von 12 kV und 2,7 kW[1]) bei einer Anodenspannung von 10,6 kV. Der Wirkungsgrad ist 16 bzw. 22%, während die Verzerrung in beiden Fällen 5% nicht überschreitet.

Zwei in Gegentakt geschaltete Röhren MA 12/15 (Klasse-B Einstellung) ergeben zusammen eine Nutzleistung von



PHILIPS EMISSION

42 kW[1]) bei einem Wirkungsgrad von ca. 65% und einer Anodenspannung von 12 kV.

Die Nutzleistung und der entsprechende Wirkungsgrad, die eine MA 12/15 in einem H.F.-Verstärker bei Wellenlängen bis zu 15 m herab ergibt, sind in untenstehender Tabelle angegeben:

Einstellung	Anodenspannung	Nutzleistung	Wirkungsgrad
H.F.-Klasse C (Telegraphie)	12 kV 10 kV	20 kW[1]) 16 kW[1])	67% 64%
H.F.-Klasse B (Telephonie)	12 kV 10 kV	4,5 kW[1])[2]) 3,7 kW[1])[2])	25% 24%
H.F.-Klasse C (Anodenspannungsmodulation)	10 kV 8 kV	9,5 kW[1])[2]) 7,5 kW[1])[2])	68% 67%

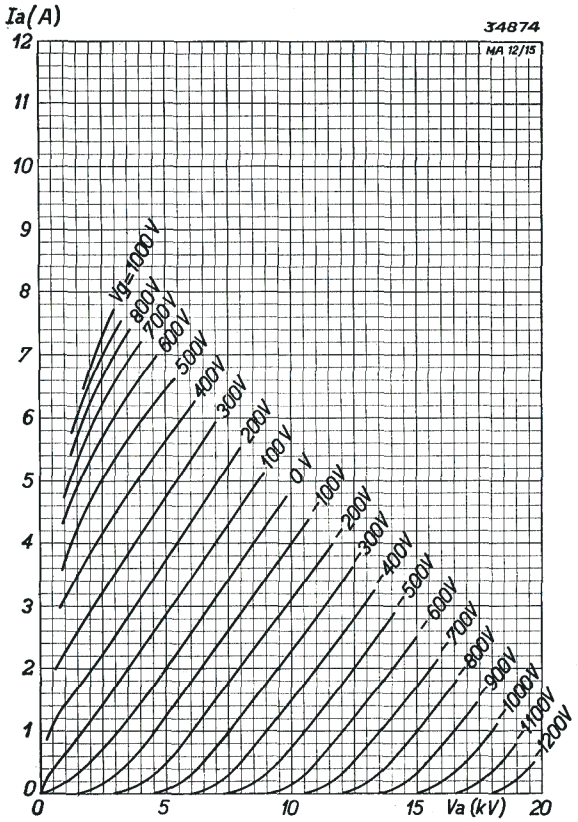
[1]) Kreisverluste sind abzuziehen.

[2]) Nutzleistung in der Trägerwelle (max. Modulationstiefe 100%).

7/40

B 1621/1

PHILIPS MODULATORRÖHRE MA 12/15



Heizspannung	V_f	=	21,5 V
Heizstrom	I_f	=	ca. 79 A
Sättigungsstrom	I_s	=	ca. 11 A
Anodenspannung	V_a	=	max. 12 kV
Höchstzulässiger Anodenverlust	W_a	=	max. 15 kW
Geprüfter Anodenverlust	W_{at}	=	18 kW
Verstärkungsfaktor	μ	=	ca. 14
Steilheit bei V_a = 12 kV, I_a = 1,5 A	S	=	ca. 7,5 mA/V
Anoden/Kathodenkapazität	C_{ak}	=	ca. 2,5 pF
Gitter/Kathodenkapazität	C_{gk}	=	ca. 21,2 pF
Anoden/Gitterkapazität	C_{ag}	=	ca. 30,5 pF
Maximale Gesamtlänge ohne Kühler	l	=	741 mm
Maximale Gesamtlänge mit Kühler	l'	=	811 mm
Maximaler Kolbendurchmesser	d	=	104 mm
Maximaler Gesamtdurchmesser	d'	=	226 mm

PHILIPS

MODULATORRÖHRE

MA 12/15000

Die MA 12/15000 ist eine wassergekühlte Modulatorröhre, die besonders für die Anodenspannungsmodulation (Heising) von wassergekühlten Philips Senderöhren konstruiert wurde. Die Anode ist von einem Wasserbehälter umgeben, so dass sie mit fliessendem Wasser gekühlt werden kann. Dadurch wird die an der Anode entwickelte Wärme sehr rasch abgeleitet, und kann der Anodenverlust bis zu 12 kW betragen. Nebenstehende Tabelle



gibt für die MA 12/15000 bei Benutzung als Modulatorröhre den höchstzulässigen Anodenstrom als Funktion der Anodenspannung an.

Anodenspannung V_a	12000	10000	9000	V
Anodenstrom . I_a	1	1,2	1,3	A
Anodenverlust . W_a	12	12	12	kW

Die Röhre eignet sich auch als Verstärker von modulierter H.F.-Energie auf Wellenlängen von mehr als 150 m. Die Anodenspannung darf in diesem Falle bis zu 15000 V betragen. Die Röhre kann wie folgt eingestellt werden:

ANODENSPANNUNG 15000 V

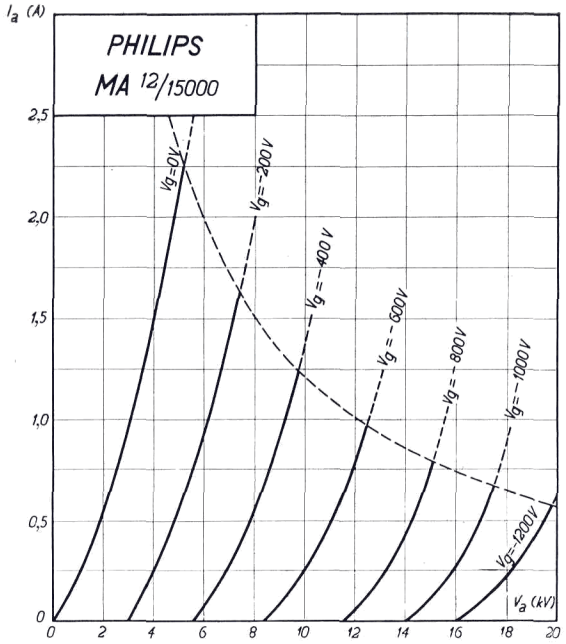
Modulationstiefe	Anodenstrom	Energie der Trägerwelle	Spitzenleistung
100%	1,2 A	5,4 kW	21,6 kW
80%	1,2 A	6 kW	19,4 kW
60%	1,3 A	7,3 kW	18,3 kW

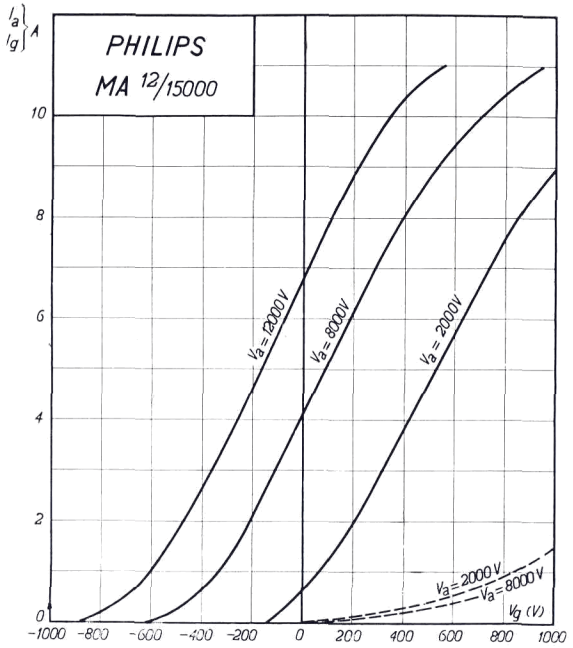
ANODENSPANNUNG 12000 V

Modulationstiefe	Anodenstrom	Energie der Trägerwelle	Spitzenleistung
100%	1,25 A	4,9 kW	19,6 kW
80%	1,35 A	5,4 kW	17,5 kW
60%	1,45 A	6,6 kW	16,9 kW

PHILIPS

MODULATORRÖHRE MA 12/15000





Heizspannung	V_f	=	21,5 V
Heizstrom	I_f	=	ca. 79 A
Sättigungsstrom	I_s	=	ca. 11 A
Anodenspannung	V_a	=	6000—15000 V
Zulässiger Anodenverlust	W_a	=	12 kW
Geprüfter Anodenverlust	W_{at}	=	15 kW
Verstärkungsfaktor	g	=	ca. 14
Durchgriff	D	=	ca. 7 %
Steilheit bei V_a = 9000 V, I_a = 1,5 A	S_{norm}	=	ca. 7,5 mA/V
Grösste Steilheit	S_{max}	=	ca. 10 mA/V
Innerer Widerstand bei V_a = 9000 V, I_a = 1,5 A	R_i	=	ca. 1900 Ω
Grösster Kolbendurchmesser	d	=	100 mm
Grösster Gesamtdurchmesser	d'	=	ca. 225 mm
Gesamtlänge ohne Kühlmantel	l	=	785 mm
Gesamtlänge mit Kühlmantel	l'	=	ca. 800 mm

PHILIPS WATERGEKOELDE MODULATORLAMP



Schaal 1 : 6

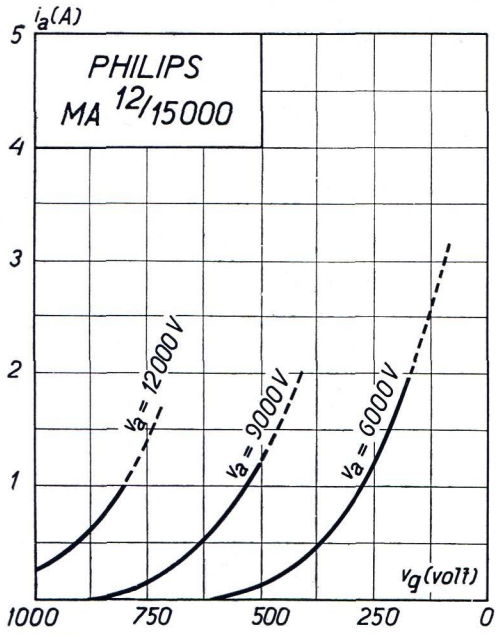
MA 12/15000

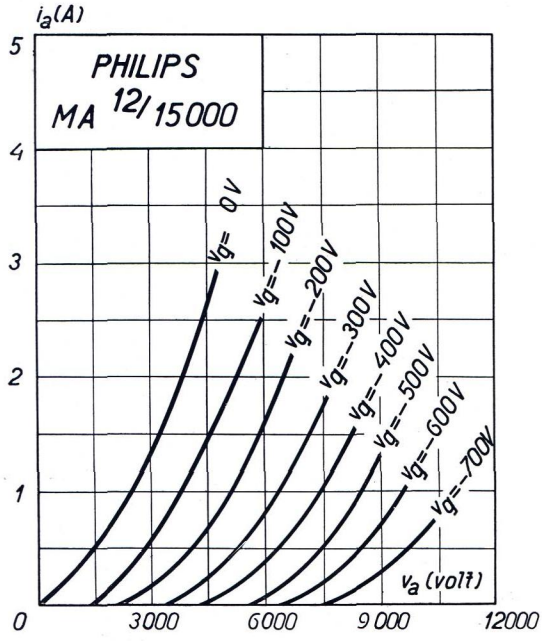
De MA 12/15000 is een watergekoelde modulatorlamp, behoorende bij de Philips watergekoelde zendlampen en speciaal geconstrueerd voor anodespanningsmodulatie. De anode kan met een koelmantel omgeven en door stroomend water gekoeld worden, zodat de op de anode ontwikkelde warmte snel kan worden afgevoerd en waardoor de anodedissipatie tot 12 kW mag bedragen.
Per zendlamp zijn, afhankelijk van de kwaliteit der modulatie, die verlangd wordt, 1 à 2 modulatorlampen noodig. De lamp kan met 12 kW ongemoduleerde anodeenergie belast worden. In onderstaande tabel wordt de toelaatbare anodestroom als functie van de anodespanning aangegeven.

Anodespanning	12000	10000	9000	V
Anodestroom	1	1,2	1,3	A
Anodedissipatie	12	12	12	kW

PHILIPS WATERGEKOELDE MODULATORLAMP

MA 12/15000





Gloeispanning v_f =
ca. **22** V

Gloeistroom i_f =
ca. **77** A

Verzadigingsstroom i_s =
ca. **10** A

Anodespanning v_a =
6000—12000 V

Anodedissipatie w_a =
12000 W

Anodedissipatie beproefd
op w_{at} = **15000** W

Versterkingsfactor g =
ca. **12**

Steilheid S =
ca. **9** mA/V

Inwendige weerstand R_i =
ca. **1400** Ω

Grootste diameter zonder
koeler d = **100** mm

Grootste lengte zonder
koeler l = **800** mm

PHILIPS

MA 4/500

TRIODE for use as modulator, L.F. amplifier
TRIODE pour utilisation comme modulatrice, amplificatrice B.F.
TRIODE zur Verwendung als Modulator, N.F. Verstärker

Filament : tungsten
Filament : tungstène
Heizfaden: Wolfram

Heating : direct
Chauffage: direct
Heizung : direkt

Vf = 17,0 V
If = 9,6 A

Capacitances
Capacités
Kapazitäten

Ca = 1,2 pF
Cg = 11,3 pF
Cag = 12 pF

Typical characteristics
Caractéristiques typiques
Kenndaten

μ = 7,5
S (Ia=175 mA) = 1,5 mA/V
Isat = 0,6 A

A mod.		B mod.[1]	
Va (V)	Wo (W)	Va (V)	Wo (W)
4000	152	4000	950

1) two valves
deux tubes
zwei Röhren

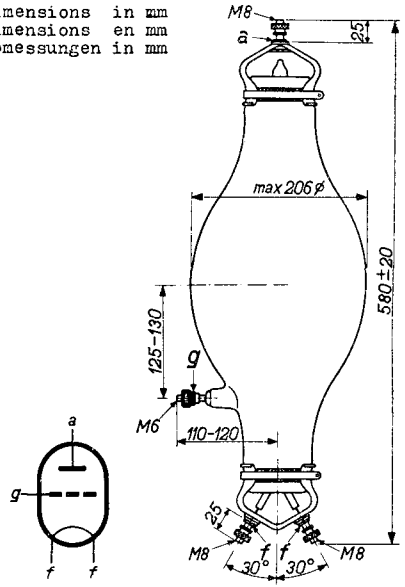
Limiting values
Caractéristiques limites
Grenzdaten

Va = max. 4000 V
Wa = max. 500 W
Wg = max. 50 W
Rg = max. 50 kΩ

7.7.1954

PHILIPS

Dimensions in mm
Dimensions en mm
Abmessungen in mm



Mounting position: vertical
Montage : vertical
Aufstellung : senkrecht

Net weight
Poids net
Nettogewicht

1,8 kg

Shipping weight
Poids brut
Bruttogewicht

7 kg

PHILIPS

Electronic Tube

HANDBOOK

MA4-500

page	sheet	date
1	1	1954.07.07
2	2	1954.07.07
3	FP	1999.09.04

PHILIPS

MODULATORRÖHRE MA 4/600



Die MA 4/600 eignet sich sehr gut als Modulatorröhre auch in solchen Fällen, wenn nur eine verhältnismässig niedrige Anodenspannung zur Verfügung steht. Sie kann ferner vorteilhaft als Klasse-B-Verstärker oder als Endröhre in Kraftverstärkern Verwendung finden.

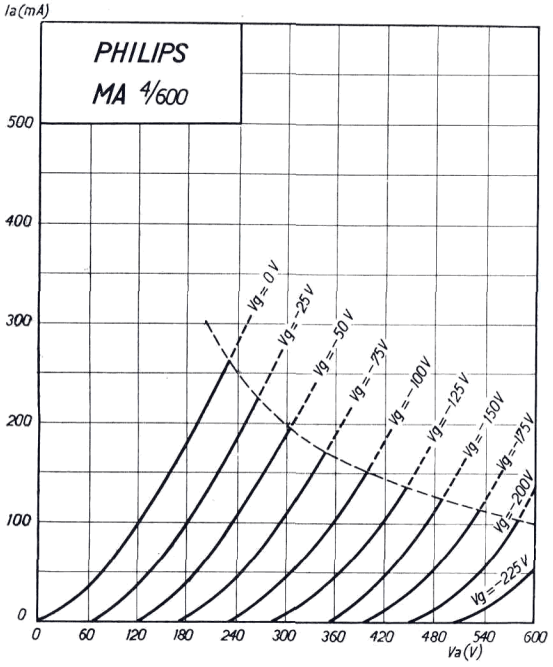
Es ist darauf zu achten, dass der höchstzulässige Anodenverlust von 600 W nicht überschritten wird, zu welchem Zweck eine genügend hohe negative Gittervorspannung angelegt werden muss.

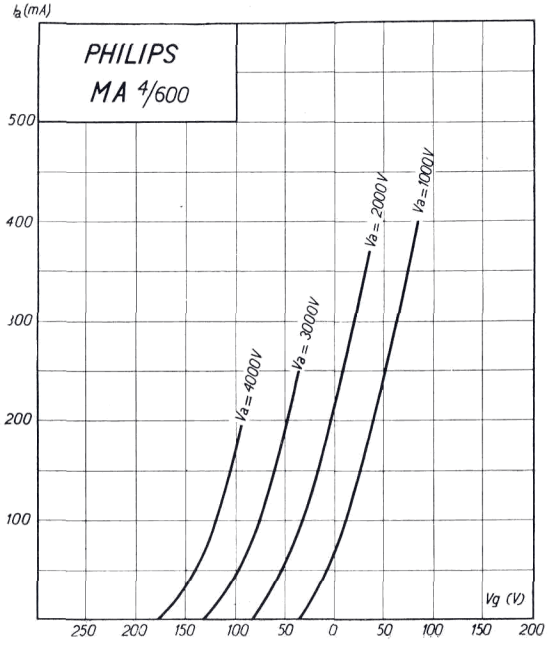
Bei Anodenspannungsmodulation können eine oder zwei Philips Senderöhren TB 2/250 oder TC 2/250 oder eine Röhre TA 3/500 bzw. TA 3/500K mit einer MA 4/600 bei einer Anodenspannung von 3000 V moduliert werden.

Bei einer Anodenspannung von 4000 V und bei Verwendung von Anodenspannungsmodulation kann diese Röhre eine Philips Senderöhre TA 4/1500 oder TA 4/1500K modulieren.

PHILIPS

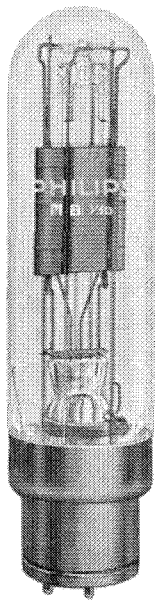
MODULATORRÖHRE
MA 4/600





Heizspannung	V_f	= 16,0 V
Heizstrom	I_f	= ca. 16 A
Sättigungsstrom	I_s	= ca. 1,5 A
Anodenspannung	V_a	= 3000-4000 V
Höchstzulässiger Anodenverlust	W_a	= 600 W
Geprüfter Anodenverlust	W_{at}	= 750 W
Verstärkungsfaktor	g	= ca. 25
Durchgriff	D	= ca. 4%
Steilheit bei V_a = 4000 V, I_a = 150 mA	S_{norm}	= ca. 4,5 mA/V
Grösste Steilheit	S_{max}	= ca. 5 mA/V
Innerer Widerstand bei V_a = 4000 V, I_a = 150 mA	R_i	= 5500 Ω
Grösster Kolbendurchmesser	d	= 120 mm
Grösster Gesamtdurchmesser	d'	= ca. 200 mm
Gesamtlänge	l	= ca. 450 mm

PHILIPS 50 WATT AMATEUR-ZEND- EN MODULATOR-LAMP MB 1/50 MET LAGEN INWENDIGEN WEERSTAND



Philips MB 1/50 is geschikt voor dezelfde toepassingen als de TB 1/50, d.w.z. als oscillator, als energieversterker, als modulator voor groot vermogen en als gelijkrichter.

Bij zeer los gekoppelden antennekring of wanneer de attennekring niet in resonantie is met den zenderkring, zal de anodestroom klein zijn, daarentegen de roosterstroom vrij groot.

Door de antennekoppeling vaster te maken en (of) den antennekring op den zenderkring af te stemmen, zal de roosterstroom afnemen en de anodestroom toenemen tot b.v. 100 à 125 mA, hetgeen een goede waarde is voor een veilig en continu bedrijf(telefonie). Voor onderbroken bedrijf (telegrafie) en bij lage anodespanning, kan de anodestroom opgevoerd worden tot 150 mA, *echter nimmer meer.*

Bij een juiste instelling zal de roosterstroom 15 tot 25% van den anodestroom bedragen.

Bij 1000 V anodespanning kan de lekweerstand een waarde hebben van 2500 à 10.000 ohm. Bij verhooging van deze waarde wordt het rendement gewoonlijk grooter, echter daalt daarbij de opgenomen energie tevens. Bij lagere anodespanning wordt meer energie aan de antenne afgegeven met een kleinere waarde van den lekweerstand. Soms kan de lekweerstand zelfs wel geheel weggelaten worden, echter niet de hoogfrequentsmoorspoel in fig. 1 (blz. 8), die in dat geval direct tusschen het rooster en een der gloeidraadpolen geschakeld wordt in serie met een milliampèremeter en de roosterbatterij.

Gebruik als energieversterker

Bij gebruik als energieversterker in een zender, waarbij de roosterexcitatie met behulp van een stuurlamp verkregen wordt, kan een TB 04/10 (anodespanning 400 V) voor de roosterexcitatie van een MB 1/50 dienen.

Toepassing als modulator of eindversterker

Bij toepassing als modulator mag de anodedissipatie 50 Watt bedragen. Bij een anodespanning van 1000 V is een roosterspanning van ca 60 V noodig om den maximalen anode stroom van 50 mA in te stellen. Bij 2 of meer lampen parallel moet de roosterspanning voor elke lamp afzonderlijk regelbaar zijn.

Voor elke verandering van de roosterspanning moet de anodespanning uitgeschakeld worden.

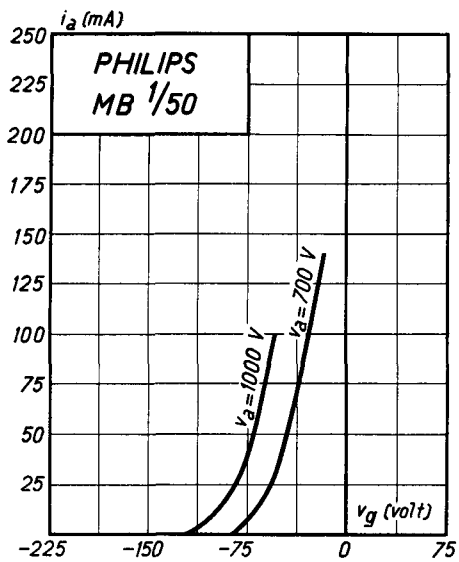
Een TB 04/10 kan als submodulator voor de roosterexcitatie van 1 tot 4 MB 1/50 versterkerlampen gebruikt worden.

Toepassing als gelijkrichter (diode)

(Zie bij de TB 1/50)

Huls

(Zie eveneens bij de TB 1/50).



Gloeispanning	v_f	= 10 V
Gloeistroom	i_f	= ca. 3,25A
Verzadigingsstroom	i_s	= ca. 1500 mA
Anodespanning	v_a	= 1000 V
Anodedissipatie	W_a	= 50 W
Anodedissipatie beproefd op . .	W_{at}	= 100 W
Versterkingsfactor	g	= ca. 12
Steilheid	S	= ca. 3 mA/V
Inwendige Weerstand	R_i	= ca. 4000 ohm
Grootste Lengte	d	= 60 mm
Grootste Diameter	l	= 250 mm

Philips MB 2/200



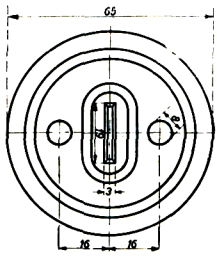
¼ nat. Gr.

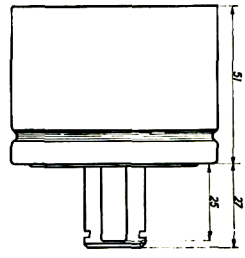
Die MB 2/200 hat einen höchstzulässigen Anodenverlust von 200 Watt. Sie dient als Endröhre in Verstärkern zum Betriebe von 20—100 elektromagnetischen oder 4 oder mehr elektrodynamischen Lautsprechern Nr. 2060 bei Tonfilmen, Freiluftaufführungen usw.
Diese Röhre eignet sich auch zur Verwendung in Verstärkern zum Betriebe von 2000 Lautsprechern in Hotels, Krankenhäusern und ähnlichen Einrichtungen.

Es wird empfohlen, die MB 2/200 in vertikaler Lage aufzustellen. Sollte dies nicht möglich sein, so ist auch horizontale Anbringung zulässig; es muss dann aber dafür gesorgt werden, dass die ebene Fläche der Anode vertikal steht.

Zur Lieferung der Anodenspannung für die MB 2/200 wird die PHILIPS Gleichrichterröhre 1200 empfohlen.

Die MB 2/200 ist an der Unterseite mit einem besonderen Sockel versehen, zu dem die Heizfaden- und Gitteranschlüsse geführt sind; der Anodenanschluss ist an der Oberseite der Röhre nach aussen geführt.





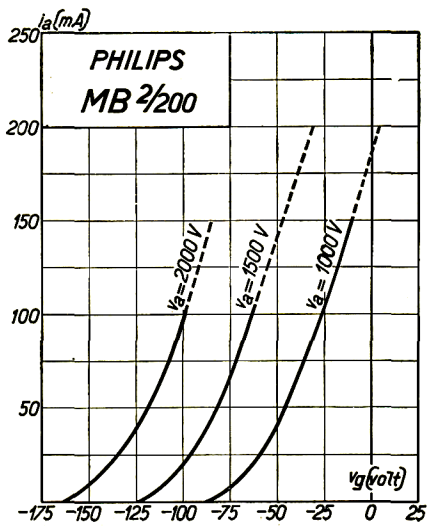
Zur MB 2/200 werden auf Bestellung 2 Fassungen Nr. 4112 geliefert, eine für die Heizfaden- und Gitteranschlüsse und eine für den Anodenanschluss.

Philips MB 2/200

Heizspannung	v_f	= 11 V
Heizstrom	i_f	= ca. 3,8 A
Anodenspannung	v_a	= 1500–2000 V
Höchstzulässiger Anodenverlust	w_a	= 200 W
Verstärkungsfaktor	g	= ca. 14
Steilheit	S	= ca. 3 mA/V
Innerer Widerstand	R_i	= ca. 4700 Ω
Negative Gittervorspannung (bei v_a = 2000 V)	v_g	= ca. 100 V
Anodenstrom (bei v_a = 2000 V)	i_a	= 100 mA
Grösste Länge	l	= 400 mm
Grösster Durchmesser	d	= 100 mm

Um Überlastung der Anode und Verzerrung zu vermeiden, ist eine genügend grosse negative Gittervorspannung anzulegen.

Diese erforderliche Spannung kann aus dem Packzettel ersehen werden.



PHILIPS

MC 13-16

FLYING SPOT SCANNER with metal-backed screen
TUBE ANALYSEUR CATHODIQUE AU SPOT VOLANT avec écran aluminisé
LICHTPUNKTABTASTUNGSKATODENSTRAHLRÖHRE mit metallhinterlegtem Schirm

Heating : indirect by A.C. or D.C. series or parallel supply Chauffage: indirect par C.A. ou C.C. alimentation série ou parallèle Heizung : indirekt durch Wechsel- oder Gleichstrom; Serien- oder Parallelspeisung	V_f = 6,3 V[1] I_f = 0,3 A	
Capacitances Capacités Kapazitäten	C_{g1}	= 6,5 pF
	C_k	= 6,5 pF
	C_{am}[2]	= 250 - 450 pF
Screen Ecran Schirm	Colour Couleur Farbe	bleu violet violet bleuâtre blau violett
	Persistence Persistance Nachleuchtung	very short très courte[3] sehr kurz
	Useful diameter Diamètre utile Nützlicher Durchmesser	min. 108 mm

[1] When the tube is used in a series heater chain, the heater voltage must not exceed 9.5 V when the supply is switched on. If necessary a current limiting device must be used for this purpose
Si le tube est monté dans une chaîne série de filaments, la tension de chauffage ne doit pas dépasser 9,5 V à la mise en circuit. En cas de besoin il faut utiliser un limiteur de courant pour ce but
Wenn die Röhre in einer Heizfadenkette verwendet wird, darf die Heizspannung beim Einschalten 9,5 V nicht überschreiten. Nötigenfalls ist zu diesem Zweck ein Strombegrenzer zu verwenden

[2] m = conducting outer coating
m = couche conductive extérieure
m = leitender Aussenbelag

[3] The brightness is reduced to 37% of the initial peak value within 0.1 µs after excitation is removed
La brillance est réduite à 37% de la valeur de pointe initiale dans un délai de 0,1 µs après que l'excitation a été coupée
Die Helligkeit nimmt ab bis 37% des Anfangsspitzenwertes innerhalb 0,1 µs nachdem die Steuerung ausgeschaltet wird

FLYING SPOT SCANNER with metal-backed screen
TUBE ANALYSEUR CATHODIQUE AU SPOT VOLANT avec écran aluminisé
LICHTPUNKTABTASTUNGSKATODENSTRAHLRÖHRE mit metallhinterlegtem Schirm

Heating : indirect by A.C. or D.C. series or parallel supply		
Chauffage: indirect par C.A. ou C.C. alimentation série ou parallèle	V_f = 6,3 V[1]	
Heizung : indirekt durch Wechsel- oder Gleichstrom; Serien- oder Parallelspeisung	I_f = 0,3 A	
Capacitances Capacités Kapazitäten	C_{g1} =	6,5 pF
	C_k =	6,5 pF
	C_{am}[2] =	250 - 450 pF
Screen Ecran Schirm — Colour Couleur Farbe	bleu violet violet bleuâtre blau violett	
Persistence Persistance Nachleuchtung	very short très courte[3] sehr kurz	
Useful diameter Diamètre utile Nützlicher Durchmesser	min.	108 mm

[1] When the tube is used in a series heater chain, the heater voltage must not exceed 9.5 V when the supply is switched on. If necessary a current limiting device must be used for this purpose
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FLYING SPOT SCANNER with metal-backed screen
TUBE ANALYSEUR CATHODIQUE AU SPOT VOLANT avec écran aluminisé
LICHTPUNKTABTASTUNGSKATODENSTRAHLRÖHRE mit metallhinterlegtem Schirm

Heating : indirect by A.C. or D.C. series or parallel supply		
Chauffage: indirect par C.A. ou C.C. alimentation série ou parallèle	V_f = 6,3 V[1]	I_f = 0,3 A
Heizung : indirekt durch Wechsel- oder Gleichstrom; Serien- oder Parallelspeisung		
Capacitances	C_{g1} =	6,5 pF
Capacités	C_k =	6,5 pF
Kapazitäten	C_{am}[2] =	250 - 450 pF
Screen Colour	bleu violet	
Ecran Couleur	violet bleuâtre	
Schirm Farbe	blau violett	
Persistence	very short	
Persistance	très courte[3]	
Nachleuchtung	sehr kurz	
Useful diameter		
Diamètre utile	min.	108 mm
Nützlicher Durchmesser		

[1] When the tube is used in a series heater chain, the heater voltage must not exceed 9.5 V when the supply is switched on. If necessary a current limiting device must be used for this purpose
Si le tube est monté dans une chaîne série de filaments, la tension de chauffage ne doit pas dépasser 9,5 V à la mise en circuit. En cas de besoin il faut utiliser un limiteur de courant pour ce but
Wenn die Röhre in einer Heizfadenkette verwendet wird, darf die Heizspannung beim Einschalten 9,5 V nicht überschreiten. Nötigenfalls ist zu diesem Zweck ein Strombegrenzer zu verwenden

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La brillance est réduite à 37% de la valeur de pointe initiale dans un délai de 0,1 µs après que l'excitation a été coupée
Die Helligkeit nimmt ab bis 37% des Anfangsspitzenwertes innerhalb 0,1 µs nachdem die Steuerung ausgeschaltet wird

FLYING SPOT SCANNER with metal-backed screen
TUBE ANALYSEUR CATHODIQUE AU SPOT VOLANT avec écran aluminisé
LICHTPUNKTABTASTUNGSKATODENSTRAHLRÖHRE mit metallhinterlegtem Schirm

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Capacitances Capacités Kapazitäten	C_{g1} = 6,5 pF C_k = 6,5 pF C_{am}[2] = 250 - 450 pF	
Screen Ecran Schirm	Colour Couleur Farbe	bleu violet violet bleuâtre blau violett
	Persistence Persistance Nachleuchtung	very short très courte[3] sehr kurz
	Useful diameter Diamètre utile Nützlicher Durchmesser	min. 108 mm

[1] When the tube is used in a series heater chain, the heater voltage must not exceed 9.5 V when the supply is switched on. If necessary a current limiting device must be used for this purpose
Si le tube est monté dans une chaîne série de filaments, la tension de chauffage ne doit pas dépasser 9,5 V à la mise en circuit. En cas de besoin il faut utiliser un limiteur de courant pour ce but
Wenn die Röhre in einer Heizfadenkette verwendet wird, darf die Heizspannung beim Einschalten 9,5 V nicht überschreiten. Nötigenfalls ist zu diesem Zweck ein Strombegrenzer zu verwenden

[2] m = conducting outer coating
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[3] The brightness is reduced to 37% of the initial peak value within 0.1 µs after excitation is removed
La brillance est réduite à 37% de la valeur de pointe initiale dans un délai de 0,1 µs après que l'excitation a été coupée
Die Helligkeit nimmt ab bis 37% des Anfangsspitzenwertes innerhalb 0,1 µs nachdem die Steuerung ausgeschaltet wird

FLYING SPOT SCANNER TUBES with metal-backed screen

SCREEN

For screen properties please refer to front of this section

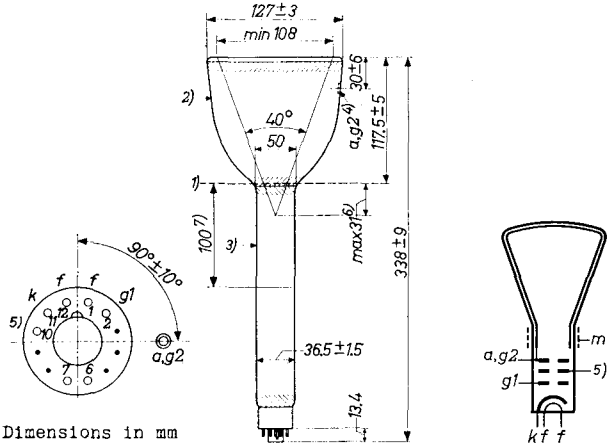
Useful screen diameter min. 108 mm

HEATING

Indirect by A.C. or D.C.; series or parallel supply

Heater voltage Vf = 6.3 V

Heater current If = 300 mA



Dimensions in mm

Base: DUODECAL 7 p.

1) Reference line, determined by the plane of the upper edge of the reference line gauge when the gauge is resting on the cone

2) Insulating outer coating; should not be in close proximity to any metal part

3) Conductive outer coating; to be grounded

4) Recessed cavity contact

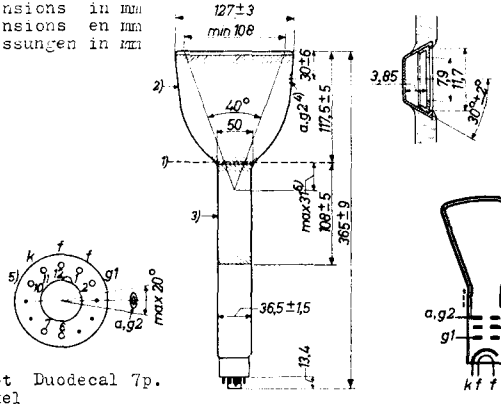
5) Spark trap; to be grounded

6) The distance between the deflection centre and the reference line should not exceed 31 mm

7) Distance between the centre of the magnetic length of the focusing unit and the reference line

For the relative spectral energy distribution curve see front of this section
Pour la courbe de la distribution relative de l'énergie spectrale voir en tête de ce chapitre
Für die relative spektrale Energieverteilungskurve siehe am Anfang diese Abschnitts

Dimensions in mm
Dimensions en mm
Abmessungen in mm



Base
Culot Duodecal 7p.
Sockel

1) Reference line, determined by the plane of the upper edge of the reference line gauge when the gauge is resting on the cone
Ligne de référence, déterminée par le plan du bord supérieur du calibre de la ligne de référence, si celui-ci pose sur le cône
Bezugslinie, bestimmt durch die Ebene des oberen Randes der Bezugslinienlehre wenn diese auf dem Konus ruht

2) Insulating outer coating; couche isolante extérieure; isolierender Aussenbelag

3) Conducting outer coating, to be grounded; couche conductive extérieure, doit être mise à la terre; leitender Aussenbelag, muss geerdet werden

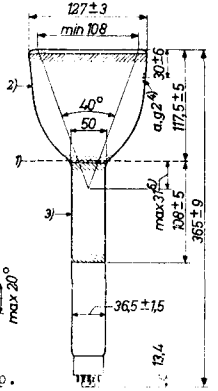
4) Recessed cavity contact; contact à cavité enfoncé; versenkter Druckknopfkontakt

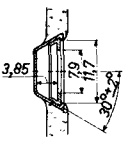
5) Spark trap, to be grounded; Attrape d'étincelles, doit être mise à la terre; Funkenfänger, muss geerdet werden

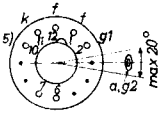
6) The distance from deflection centre to reference line should not exceed 31 mm
La distance du centre de déviation au ligne de référence ne dépassera pas 31 mm
Der Abstand des Ablenkungsmittelpunktes bis zur Bezugslinie soll 31 mm nicht überschreiten

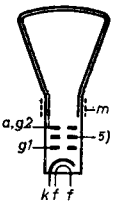
For the relative spectral energy distribution curve see front of this section
Pour la courbe de la distribution relative de l'énergie spectrale voir en tête de ce chapitre
Für die relative spektrale Energieverteilungskurve siehe am Anfang diese Abschnitts

Dimensions in mm
Dimensions en mm
Abmessungen in mm









Base
Culot Duodecal 7p.
Sockel

1) Reference line, determined by the plane of the upper edge of the reference line gauge when the gauge is resting on the cone
Ligne de référence, déterminée par le plan du bord supérieur du calibre de la ligne de référence, si celui-ci pose sur le cône
Bezugslinie, bestimmt durch die Ebene des oberen Randes der Bezugslinienlehre wenn diese auf dem Konus ruht

2) Insulating outer coating; couche isolante extérieure; isolierender Aussenbelag

3) Conducting outer coating, to be grounded; couche conductive extérieure, doit être mise à la terre; leitender Aussenbelag, muss geerdet werden

4) Recessed cavity contact; contact à cavité enfoncé; versenkter Druckknopfkontakt

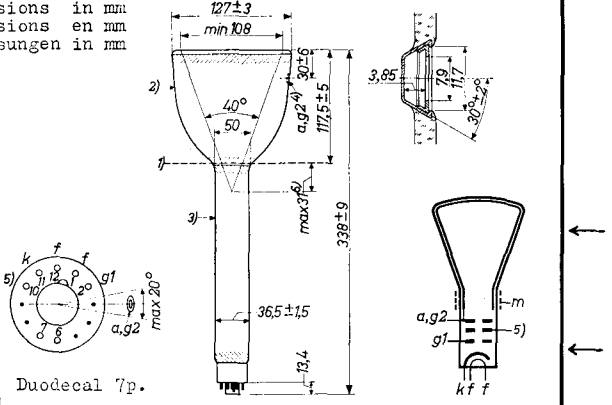
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Der Abstand des Ablenkungsmittelpunktes bis zur Bezugslinie soll 31 mm nicht überschreiten

PHILIPS

For the relative spectral energy distribution curve see front of this section
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Für die relative spektrale Energieverteilungskurve siehe am Anfang diese Abschnitts

Dimensions in mm
Dimensions en mm
Abmessungen in mm



Base
Culot Duodecal 7p.
Sockel

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1) Reference line, determined by the plane of the upper edge of the reference line gauge when the gauge is resting on the cone
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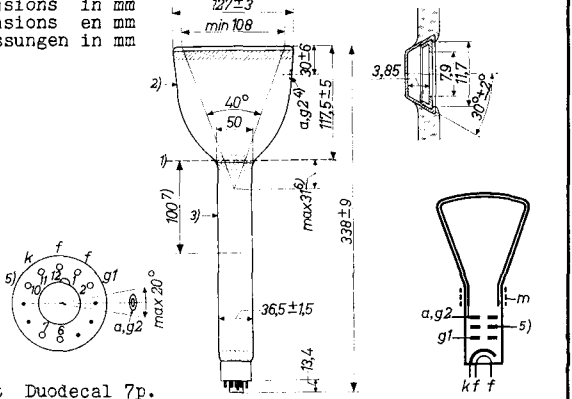
4) Recessed cavity contact; contact à cavité enfoncé; versenkter Druckknopfkontakt

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Für die relative spektrale Energieverteilungskurve siehe am Anfang dieses Abschnitts

Dimensions in mm
Dimensions en mm
Abmessungen in mm



Base
Culot Duodecal 7p.
Sockel

1) Reference line, determined by the plane of the upper edge of the reference line gauge when the gauge is resting on the cone
Ligne de référence, déterminée par le plan du bord supérieur du calibre de la ligne de référence, si celui-ci repose sur le cône
Bezugslinie, bestimmt durch die Ebene des oberen Randes der Bezugslinienlehre wenn diese auf dem Konus ruht

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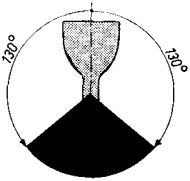
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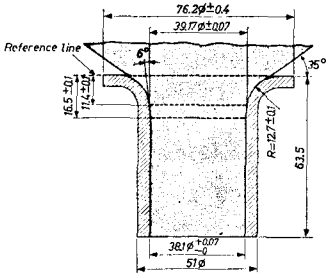
7) See page 5; voir page 5; siehe Seite 5

PHILIPS

MOUNTING POSITION. Any, except with screen downwards and the axis of the tube making an angle of less than 50° with the vertical



REFERENCE LINE GAUGE



Dimensions in mm

CAPACITANCES

Grid No.1 to all other electrodes	C_{g_1} =	6.5 pF
Cathode to all other electrodes	C_k =	6.5 pF
Anode and grid No.2 to outer conductive coating	C_{a-m} =	250 to 450 pF

FOCUSING AND DEFLECTION Magnetic

Focusing coil Type AT 1997

OPERATING CHARACTERISTICS

Anode and grid No.2 voltage	V_{a,g_2} =	25 kV
Beam current	I_ℓ =	50 to 150 µA ←
Negative grid No.1 cut-off voltage	$-V_{g_1}(I_\ell=0)$ =	50 to 100 V

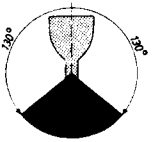
Resolution at centre of screen better than 1000 lines [1]

REMARKS

Measures should be taken for the beam current to be switched off immediately when one of the time-base circuits becomes defective. An X-ray radiation shielding with an equivalent lead thickness of 0.5 mm is required to protect the observer

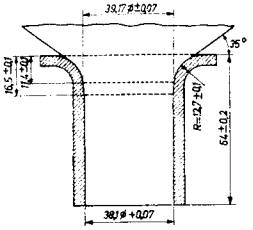
[1]) With focusing coil AT1997

Mounting position
Montage
Aufstellung



Reference line gauge
Calibre de la ligne de référence
Bezugslinienlehre

Dimensions in mm
Dimensions en mm
Abmessungen in mm



Deflection and focusing — magnetic
Déviation et concentration — magnétique
Ablenkung und Fokussierung — magnetisch

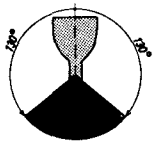
Focusing coil
Bobine de concentration Type AT 1997
Fokussierungsspule

Operating characteristics
Caractéristiques d'utilisation
Betriebsdaten

V_a	=	25 kV
$-V_{g1}$ (I_a = 0)	=	50-100 V
I_a	=	50-100 µA
Focusing current Courant pour concentration Fokussierungsstrom	=	35 mA[1]
Resolution at the centre of the screen Résolution au centre de l'écran Auflösungsgüte in der Mitte des Schirmes	>	1000 lines[1] lignes[1] Linien

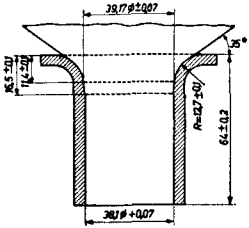
[1] With focusing coil type AT 1997
Avec bobine de concentration type AT 1997
Mit Fokussierungsspule Type AT 1997

Mounting position
Montage
Aufstellung



Reference line gauge
Calibre de la ligne de référence
Bezugslinienlehre

Dimensions in mm
Dimensions en mm
Abmessungen in mm



Deflection and focusing — magnetic
Déviation et concentration — magnétique
Ablenkung und Fokussierung — magnetisch

Focusing coil
Bobine de concentration Type AT 1997
Fokussierungsspule

Operating characteristics
Caractéristiques d'utilisation
Betriebsdaten

V_a	=	25 kV
$-V_{g1}$ (I_a = 0)	=	50–100 V
I_a	=	50–100 µA
Focusing current Courant pour concentration Fokussierungsstrom	=	35 mA[1])
Resolution at the centre of the screen Résolution au centre de l'écran Auflösungsgüte in der Mitte des Schirmes	>	1000 lines 1000 lignes[1]) 1000 Linien

[1])With focusing coil type AT 1997
Avec bobine de concentration type AT 1997
Mit Fokussierungsspule Type AT 1997

939 4938
9.9.1955

LIMITING VALUES (Design centre limits)

Anode and grid No.2 voltage	$V_{a,g2}$	= max. 27 kV = min. 20 kV
Grid No.1 voltage		
negative value	$-V_{g1}$	= max. 200 V
positive value	$+V_{g1}$	= max. 0 V
peak positive value	$+V_{g1\ p}$	= max. 2 V
Cathode current	I_k	= max. 150 µA
Voltage between heater and cathode [1]		
cathode negative	V_{kf} (k neg.)	= max. 125 V
cathode positive	V_{kf} (k pos.)	= max. 200 V
peak value, cathode positive	V_{kfp}(k pos.)	= max. 410 V [2]

MAX. CIRCUIT VALUES

External resistance between heater and cathode	R_{kf}	= max. 1 MΩ ←
External grid No.1 resistance	R_{g1}	= max. 1.5 MΩ
External grid No.1 impedance at a frequency of 50 c/s	Z_{g1}(f=50 c/s)	= max. 0.5 MΩ

[1]) In order to avoid excessive hum, the A.C.component of the heater to cathode voltage should be as low as possible and should not exceed 20 V R.M.S.

[2]) During a heating-up period not exceeding 45 sec.

Limiting values (design center value)
Caractéristiques limites (valeurs moyennes de développement)
Grenzdaten (mittlere Entwicklungsdaten)

V_a	= max.	27 kV
V_a	= min.	20 kV
V_{g1}	= max.	0 V
$-V_{g1}$	= max.	200 V
V_{g1_p}	= max.	2 V
I_a	= max.	150 µA
V_{kf} (k pos.; f neg.)	= max.	200 V[1][2]
V_{kf} (k neg.; f pos.)	= max.	125 V[1]

Maximum circuit values
Valeurs max. des éléments du montage
Max. Werte der Schaltungsteile

R_{kf}	= 20 kΩ
R_{g1}	= 1,5 MΩ
Z_{g1} (f=50 c/s)	= 0,5 MΩ

Net weight Poids net Nettogewicht	800 g	Shipping weight Poids brut Bruttogewicht	1500 g

[1] In order to avoid excessive hum, the A.C.component of V_{kf} should be as low as possible and must not exceed 20 V

Pour éviter le ronflement excessif, la composante alternative de V_{kf} sera la plus petite possible et ne dépassera pas 20 V

Zur Vermeidung von Brummstörungen muss die Wechselspannungskomponente von V_{kf} so klein wie möglich sein und jedenfalls 20 V nicht überschreiten

[2] During a warm-up period not exceeding 45 seconds the heater may be 410 V negative with respect to the cathode
Pendant une période d'échauffement ne dépassant pas 45 secondes, le filament peut être porté à un potentiel négatif de 410 V par rapport à la cathode
Während einer Anheizzeit von max. 45 Sekunden darf der Heizfaden 410 V negativ sein in Bezug auf der Katode

Limiting values (design center value)
Caractéristiques limites (valeurs moyennes de développement)
Grenzdaten (mittlere Entwicklungsdaten)

V_a	= max.	27 kV
V_a	= min.	20 kV
V_{g1}	= max.	0 V
$-V_{g1}$	= max.	200 V
V_{g1_p}	= max.	2 V
I_a	= max.	150 µA
V_{kf} (k pos.; f neg.)	= max.	200 V[1])[2])
V_{kf} (k neg.; f pos.)	= max.	125 V[1])

Maximum circuit values
Valeurs max. des éléments du montage
Max. Werte der Schaltungsteile

R_{kf}	= 20 kΩ
R_{g1}	= 1,5 MΩ
Z_{g1} (f=50 c/s)	= 0,5 MΩ

Net weight Poids net Nettogewicht	800 g	Shipping weight Poids brut Bruttogewicht	1500 g

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Pour éviter le ronflement excessif, la composante alternative de Vkf sera la plus petite possible et ne dépassera pas 20 V

Zur Vermeidung von Brummstörungen muss die Wechselspannungskomponente von Vkf so klein wie möglich sein und jedenfalls 20 V nicht überschreiten

[2]) During a warm-up period not exceeding 45 seconds the heater may be 410 V negative with respect to the cathode
Pendant une période d'échauffement ne dépassant pas 45 secondes, le filament peut être porté à un potentiel négatif de 410 V par rapport à la cathode
Während einer Anheizzeit von max. 45 Sekunden darf der Heizfaden 410 V negativ sein in Bezug auf der Katode

General observations

Measures should be taken for the anode current to be switched off immediately when one of the time-base circuits becomes defective.
An X-ray radiation shielding with an equivalent lead thickness of 0.5 mm is required to protect the observer.

Observations générales

Il faut prendre des mesures pour interrompre le courant anodique immédiatement après un dérangement d'une des bases de temps.
Pour la protection de l'observateur il faut incorporer un blindage contre des rayons X d'une épaisseur équivalente de plomb de 0,5 mm.

Allgemeine Bemerkungen

Es sind besondere Massnahmen notwendig, damit der Anodenstrom unmittelbar nach dem Ausfallen einer der Zeitbasisschaltungen ausgeschaltet wird.
Um den Beobachter gegen Röntgenstrahlen zu schützen ist es notwendig eine Abschirmung mit einer Bleiäquivalenz von 0,5 mm an zu bringen.

General observations

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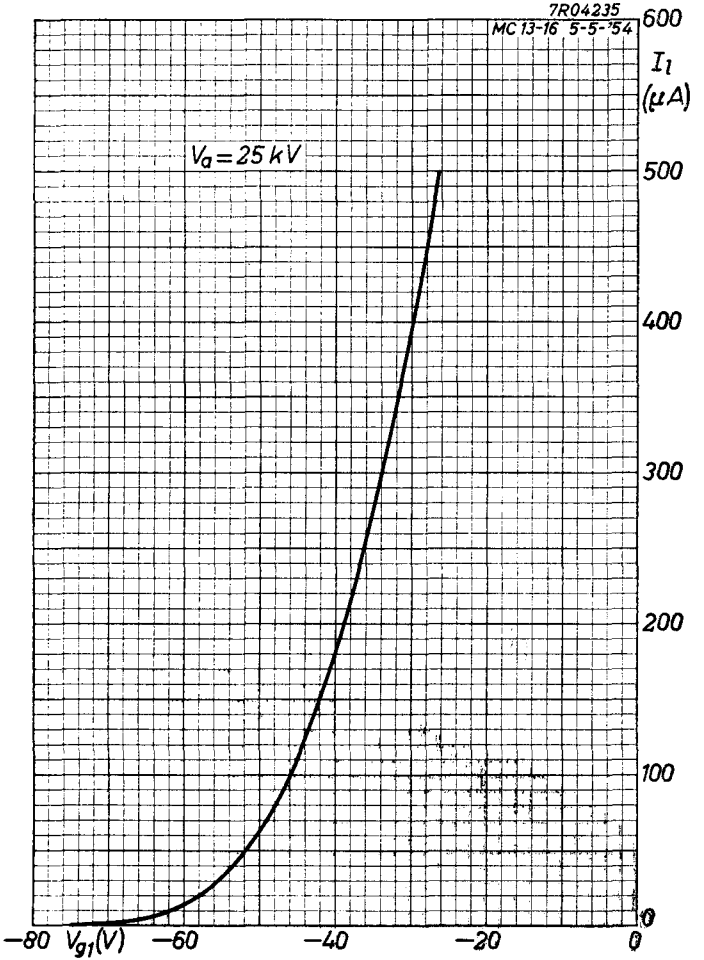
Allgemeine Bemerkungen

Es sind besondere Massnahmen notwendig, damit der Anodenstrom unmittelbar nach dem Ausfallen einer der Zeitbasisschaltungen ausgeschaltet wird
Um den Beobachter gegen Röntgenstrahlen zu schützen ist es notwendig eine Abschirmung mit einer Bleiäquivalenz von 0,5 mm an zu bringen

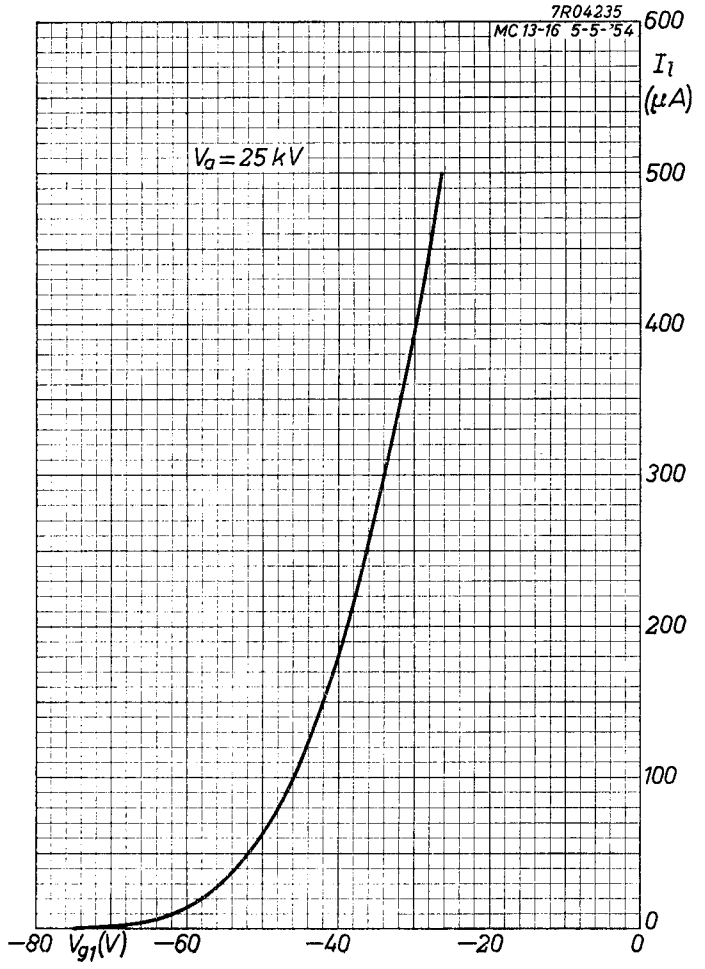
→ 7) Page 2, Seite 2

The centre of the magnetic length of the focusing unit is at a distance of 100 mm from the reference line.
Le centre de la longueur magnétique de l'unité de focalisation se trouve à une distance de 100 mm de la ligne de référence
Die Mitte der magnetischen Länge des Fokussierungssystems befindet sich in einem Abstand von 100 mm von der Bezugslinie

PHILIPS **MC 13-16**



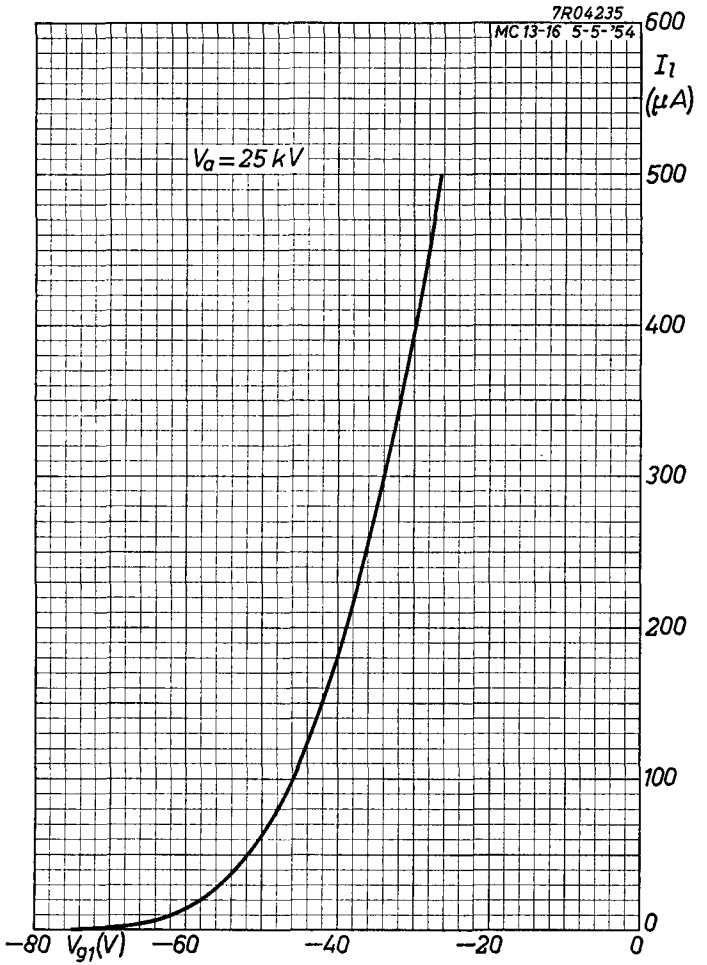
5.5.1954 A


7R04235
MC 13-16 5-5-'54
I_l (μA)
600
500
400
300
200
100
0
$V_a = 25$ kV
−80
V_{g1}(V)
−60
−40
−20
0

A

MC13-16
MK13-16

PHILIPS



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Electronic Tube HANDBOOK

MC13-16 MK13-16

page	sheet	date
1	1	1954.05.05
2	1	1955.09.09
3	1	1959.04.04
4	1	1959.09.09
5	1	1963.03.03
6	2	1954.05.05
7	2	1955.09.09
8	2	1959.04.04
9	2	1959.09.09
10	2	1963.03.03
11	3	1954.05.05
12	3	1955.09.09
13	3	1963.03.03
14	4	1954.05.05
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16	5	1954.05.05
17	5	1955.09.09
18	5	1959.09.09
19	A	1954.05.05

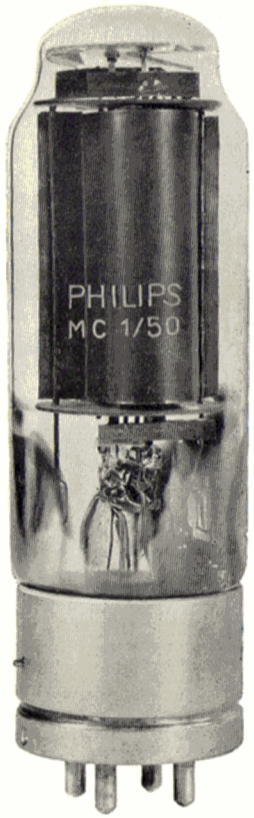
20	A	1955.09.09
21	A	1963.03.03
22, 23	FP	2000.07.16

PHILIPS MODULATORRÖHRE MC 1/50

Diese Röhre ist mit einem Oxydheizfaden versehen, wodurch sich eine sehr hohe Elektronenemission sowie eine große mechanische Stärke ergibt. Die MC 1/50 eignet sich besonders für Anodenspannungsmodulation und N.F.-Verstärkung. Sie kann jedoch auch als H.F.-Verstärkerröhre oder als Oszillatorröhre verwendet werden.

Die Nutzleistung der MC 1/50 beträgt in einem N.F.-Verstärker 22 W[1]) bei einem Wirkungsgrad von 28,5% und einer Verzerrung von maximal 5%.

Die gesamte Nutzleistung von zwei in Gegentakt geschalteten Röhren MC 1/50 in einem N.F.-Verstärker Klasse B ist 196 W[1]) bei einem Wirkungsgrad von ca. 63%.



Die Nutzleistung und der Wirkungsgrad der MC 1/50 in einem H.F.-Verstärker wird in nachstehender Tabelle für verschiedene Schaltungen angegeben. Die Werte gelten für eine Anodenspannung von 1000 V und Wellenlängen bis zu 150 m abwärts.

Einstellung	Nutzleistung	Wirkungsgrad
H.F.-Klasse C (Telegraphie)	97 W[1])	62%
H.F.-Klasse B (Telephonie)	29 W[1])[2])	28%
H.F.-Klasse C (Anodenspannungsmodulation)	80 W[1])[2]) 95 W[1])[2])	64% 60%

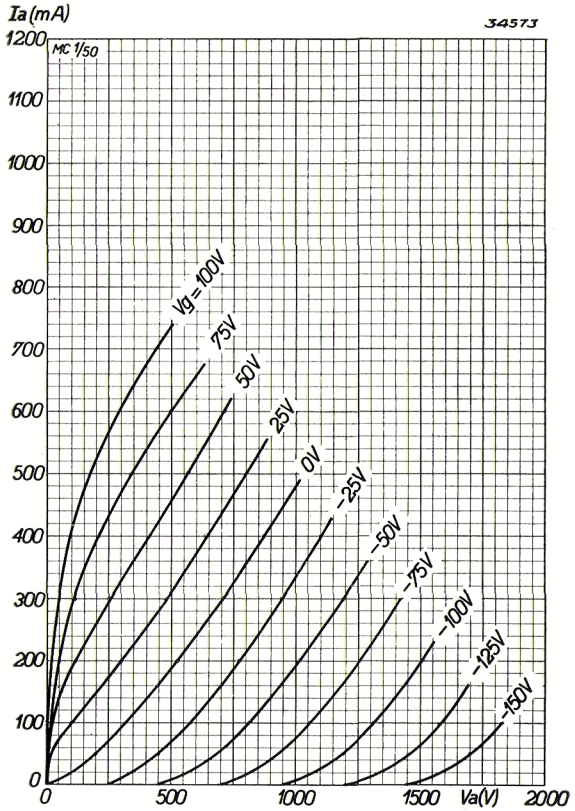
[1]) Kreisverluste sind abzuziehen.
[2]) Nutzleistung in der Trägerwelle (max. Modulationstiefe 100%).

PHILIPS EMISSION

6/40

B 1371/1

PHILIPS MODULATORRÖHRE MC 1/50



Heizspannung	V_f	=	10,0 V
Heizstrom	I_f	=	ca. 1,1 A
Sättigungsstrom	I_s	=	ca. 1,1 A
Anodenspannung	V_a	=	max. 1000 V
Höchstzulässiger Anodenverlust	W_a	=	max. 75 W
Geprüfter Anodenverlust	W_{at}	=	100 W
Verstärkungsfaktor	μ	=	ca. 10
Steilheit bei V_a = 1000 V, I_a = 75 mA	S	=	ca. 4,0 mA/V
Höchstzulässiger Kathodenstrom	I_k	=	max. 175 mA
Anoden/Kathodenkapazität	C_{ak}	=	ca. 5,4 pF
Gitter/Kathodenkapazität	C_{gk}	=	ca. 9,2 pF
Anoden/Gitterkapazität	C_{ag}	=	ca. 9,6 pF
Maximale Gesamtlänge	l	=	177,5 mm
Maximaler Durchmesser	d	=	56 mm

PHILIPS MODULATORLAMP



Schaal 1 : 3

MC 1/50

Deze lamp is voorzien van een oxyde gloeidraad met een hooge, specifieke emissie.

Zij kan gebruikt worden als modulatorlamp voor anodespannings- (Heising) modulatie en als laagfrequent versterker lamp.

De maximale anodedissipatie bedraagt 50 W en de normale anodespanning 1000 V waarbij dus de anodestroom hoogstens 50 mA mag bedragen en waarvoor een negatieve roosterspanning van ongeveer 80 V vereischt wordt.

Zelfs met een anodespanning van slechts 700 V kan een behoorlijk nuttig effect bereikt worden.

De anodestroom mag dan 75 mA bedragen, hetgeen met een negatieve roosterspanning van ca. 45 V overeenkomt.

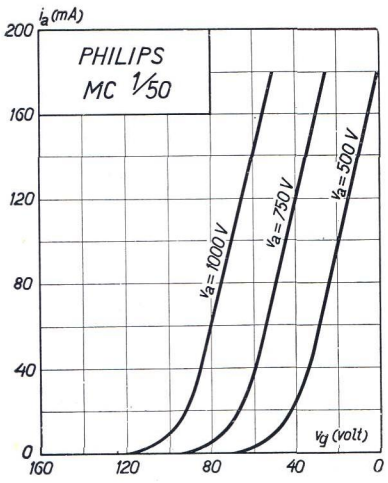
Indien smoorspoelkoppeling wordt toegepast kan 1 TB 1/50 gemoduleerd worden met twee MC 1/50, terwijl voor het moduleeren van een TA 1,5/75 één MC 1/50 gebruikt kan worden.

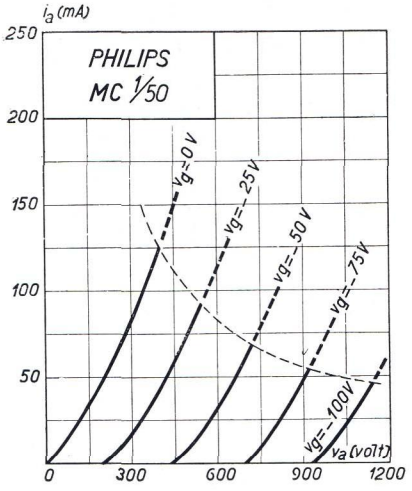
Voor de roosterexcitatie van 1 tot 4 als modulator geschakelde MC 1/50 kan een E 408 worden toegepast, terwijl een MC 1/50 kan worden gebezigd voor de roosterexcitatie van een modulatorlamp MA 12/15000.

Als gelijkrichtlamp voor de MC 1/50 wordt de Philips dubbelphasige gelijkrichtlamp 2769 (2×1000 V, 75 mA) aanbevolen.

PHILIPS MODULATORLAMP

MC 1/50





Gloeispanning	v_f =	10,0 V
Gloeistroom	i_f =	ca. 1,5 A
Verzadigingsstroom	i_s =	ca. 1500 mA
Anodespanning	v_a =	700—1000 V
Maximale anodedissipatie	w_a =	50 W
Anodedissipatie beproefd op	w_{at} =	80 W
Versterkingsfactor	g =	ca. 10
Steilheid	S =	ca. 4 mA/V
Inwendige weerstand	R_i =	ca. 2500 Ω
Grootste diameter	d =	85 mm
Grootste lengte	l =	250 mm

PHILIPS

MC 1/60

TRIODE for use as modulator, L.F. amplifier
TRIODE pour utilisation comme modulatrice, amplificatrice B.F.
TRIODE zur Verwendung als Modulator, N.F.Verstärker

Filament : oxide-coated
Filament : oxyde
Heizfaden: Oxyd

Heating : direct
Chauffage: direct
Heizung : direkt

Vf = 4,0 V
If = 3,3 A

Capacitances
Capacités
Kapazitäten

Ca = 4,3 pF
Cg = 11 pF
Cag = 15,3 pF

Typical characteristics
Caractéristiques typiques
Kenndaten

μ = 12,5
S (Ia=75 mA) = 6 mA/V

A mod.		B mod.[1]	
Va (V)	Wo (W)	Va (V)	Wo (W)
1000	22,3	1000	204

[1] two valves
deux tubes
zwei Röhren

Limiting values
Caractéristiques limites
Grenzdaten

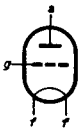
Va = max. 1000 V
Wa = max. 75 W
Wg = max. 5 W
Rg { = max. 20 kΩ [2]
Rg { = max. 50 kΩ [3]
Ik = max. 200 mA
Ikp = max. 800 mA

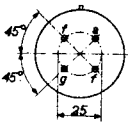
[2] With fixed grid bias; à polarisation fixe; mit fester Gittervorspannung

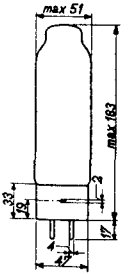
[3] With automatic grid bias; à polarisation automatique; mit automatischer Gittervorspannung

PHILIPS

Dimensions in mm
Dimensions en mm
Abmessungen in mm







Socket Support Fassung	40400
Net weight poids net Nettogewicht	180 g
Shipping weight Poids brut Bruttogewicht	390 g

Mounting position: vertical with base up or down horizontal with plane of filament vertical.

Montage : vertical avec culot en haut ou en bas horizontal avec plan du filament vertical

Einbau : senkrecht mit Sockel oben oder unten waagerecht mit der Heizfadenfläche senkrecht

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HANDBOOK

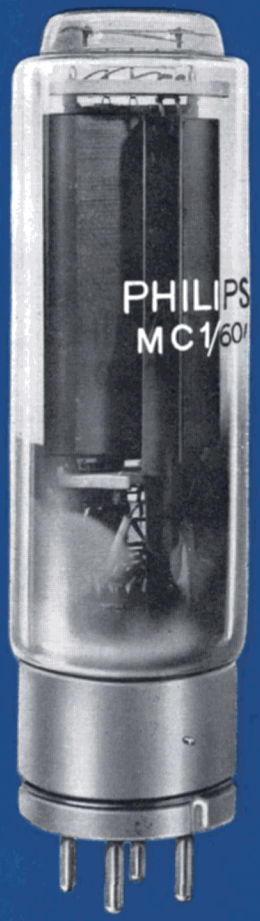
MC1-60

page	sheet	date
1	1	1954.07.07
2	2	1954.07.07
3	FP	1999.09.04

PHILIPS

MODULATORLAMP

MC 1/60-I



Deze lamp heeft een oxyd-kathode met een groote electronenemissie, in verhouding tot het lage stroomverbruik. De gloeidraad is zeer stevig, zoodat de lamp ook in verplaatsbare zenders kan worden gebruikt.

De MC 1/60-I kan als modulatorlamp of als L.F.-versterker worden gebruikt. Bij klasse A versterking kan het afgegeven vermogen 22 W bereiken. Twee in klasse B geschakelde lampen MC 1/60-I geven gezamenlijk een vermogen af van ca. 200 W. In het laatstgenoemde geval mag de roosterstroom een gemiddelde waarde van 26 mA niet overschrijden. Deze waarde wordt bereikt bij een negatieve roosterspanning van 80 V en een topwaarde van de roosterwisselspanning van 140 V per lamp.

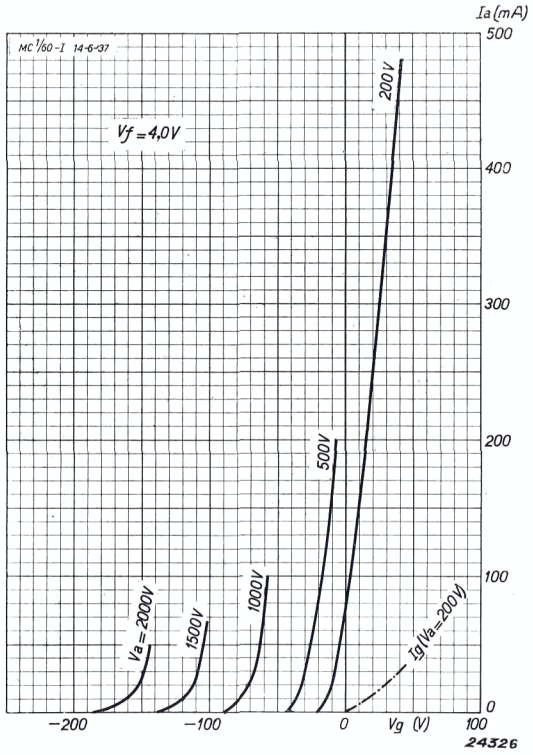
Twee in klasse A geschakelde lampen MC 1/60-I kunnen worden gebruikt voor de anodespanningmodulatie van een Philips zendlamp TC 1/75 of PC 1,5/100.

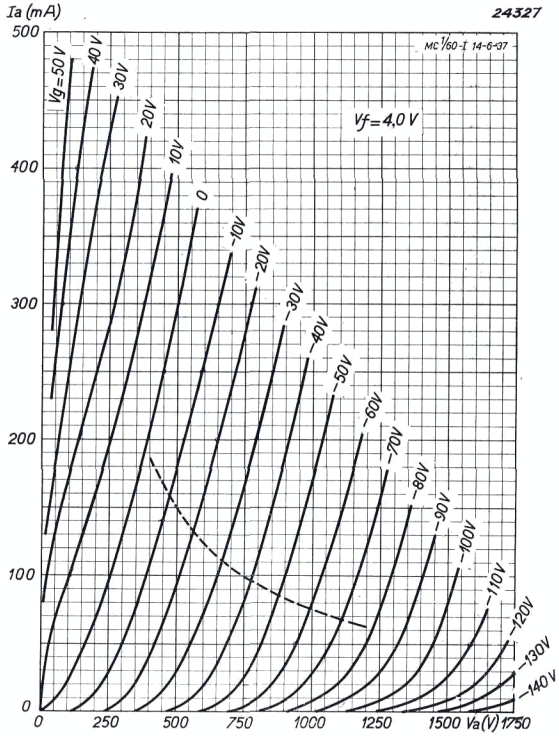
Voor het versterken van L.F. spanningen kunnen 1 tot 4 lampen MC 1/60-I door een Philips „Miniwatt" lamp E 408 N worden gestuurd. Eén lamp MC 1/60-I kan een Philips watergekoelde modulatorlamp MA 12/15 in het rooster sturen.

De voor de MC 1/60-I noodige anodespanning kan door een Philips dubbelfasige hoogvacuum gelijkrichtlamp DC 1/50-I of DC 1/60-I worden geleverd.

PHILIPS

MODULATORLAMP MC 1/60-I





Gloeispanning	V_f	=	4,0 V
Gloeistroom	I_f	=	ca. 3,3 A
Verzadigingsstroom	I_s	=	ca. 1,3 A
Anodespanning	V_a	=	1000 V
Toelaatbare anodedissipatie	W_a	=	75 W
Anodedissipatie tijdens meting	W_{at}	=	100 W
Versterkingsfactor	μ	=	ca. 12,5
Steilheid bij V_a = 1000 V, I_a = 75 mA	S	=	ca. 6,0 mA/V
Grootste steilheid	S_{max}	=	ca. 11,0 mA/V
Inwendige weerstand bij V_a = 1000 V, I_a = 75 mA	R_i	=	ca. 2100 Ω
Max. kathodestroom	I_k	=	max. 200 mA
Anode/kathode capaciteit	C_{af}	=	ca. 6,8 $\mu\mu$F
Rooster/kathode capaciteit	C_{gf}	=	ca. 10,9 $\mu\mu$F
Anode/rooster capaciteit	C_{ag}	=	ca. 15,6 $\mu\mu$F
Grootste diameter	d	=	51 mm
Totale lengte	l	=	200 mm

PHILIPS

MC 2/200

TRIODE for use as modulator, H.F. and L.F. amplifier
TRIODE pour utilisation comme modulatrice, amplificatrice H.F. et B.F.
TRIODE zur Verwendung als Modulator, H.F. und N.F. Verstärker

Filament : oxide-coated
Filament : oxyde
Heizfaden: Oxyd

Heating : direct
Chauffage: direct
Heizung : direkt

Vf = 11,0 V
If = 2,35 A

Capacitances
Capacités
Kapazitäten

Ca = 3,5 pF
Cg = 26,5 pF
Cag = 15,5 pF

Typical characteristics
Caractéristiques typiques
Kenndaten

μ = 15
S (Ia=100 mA) = 6 mA/V

λ	Freq.	C telegr.		B teleph.		Can.mod.	
m	Mc/s	Va (V)	Wo (W)	Va (V)	Wo (W)	Va (V)	Wo (W)
>15	<20	2000	500	2000	130	2000	290
		1500	350	1500	110	1500	200

A mod.		B mod.[1]	
Va (V)	Wo (W)	Va (V)	Wo (W)
2000	74	2000	776

1) two valves
deux tubes
zwei Röhren

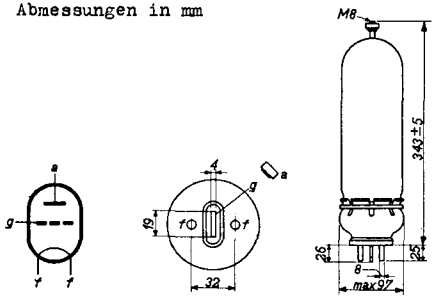
Limiting values
Caractéristiques limites
Grenzdaten

Va = max. 2000 V
Wa = max. 250 W
Wg = max. 25 W
Rg = max. 6 kΩ[2]
Ik = max. 400 mA
Ikp = max. 1600 mA

2) With fixed grid bias; à polarisation fixe; mit fester Gittervorspannung

PHILIPS

Dimensions in mm
Dimensions en mm
Abmessungen in mm



Socket **Support** **Fassung**	40209
Cap Capot Haube	40620
Net weight **Poids net** **Nettogewicht**	**1 kg**
Shipping weight **Poids brut** **Bruttogewicht**	**3,4 kg**

Mounting position: vertical with base up or down
horizontal with plane of filament vertical

Montage : vertical avec culot en haut ou en bas
horizontal avec plan du filament vertical

Aufstellung : senkrecht mit Fuss oben oder unten
wagerecht mit der Heizfadenfläche senkrecht

PHILIPS

Electronic Tube

HANDBOOK

MC2/200

page	sheet	date
1	1	1954.07.07
2	2	1954.07.07
3	FP	2000.01.06

FLYING SPOT SCANNER with metal-backed screen
TUBE ANALYSEUR A SPOT MOBILE avec écran aluminisé
LICHTPUNKTABTASTRÖHRE mit metall-hinterlegtem Schirm

Heating : indirect by A.C. or D.C. series or parallel supply Chauffage: indirect par C.A. ou C.C. alimentation série ou parallèle Heizung : indirekt durch Wechsel- oder Gleichstrom; Serien- oder Parallelspeisung	V_f = 6,3 V I_f = 0,3 A	
Capacitances Capacités Kapazitäten	C_{g1} =	6,3 pF
	C_k =	6,3 pF
	$C_{(a,g2)m}$ >	300 pF
	<	500 pF
Screen Ecran Schirm — Colour Couleur Farbe	blue violet bleu violet blau violett	
Persistence Persistance Nachleuchtung	very short très courte [1]) sehr kurz	
Useful diameter Diamètre utile Nützlicher Durchmesser	min. 57,5 mm	

For the relative spectral energy distribution curve see front of this section

Pour la courbe de la distribution relative de l'énergie spectrale voir en tête de ce chapitre

Für die relative spektrale Energieverteilungskurve siehe am Anfang dieses Abschnitts

---

[1])The brightness is reduced to 36% of the initial peak value within 0.1 µs after excitation is removed

La brillance est réduite à 36% de la valeur de pointe initiale dans un délai de 0,1 µs après que l'excitation a été coupée

Die Helligkeit nimmt ab bis 36% des Anfangsspitzenwertes innerhalb 0,1 µs nachdem die Steuerung ausgeschaltet wird

FLYING SPOT SCANNER with metal-backed screen
TUBE ANALYSEUR A SPOT MOBILE avec écran aluminisé
LICHTPUNKTABTASTRÖHRE mit metall-hinterlegtem Schirm

Heating : indirect by A.C. or D.C. series or parallel supply Chauffage: indirect par C.A. ou C.C. alimentation série ou parallèle Heizung : indirekt durch Wechsel- oder Gleichstrom; Serien- oder Parallelspeisung	V_f = 6,3 V I_f = 0,3 A	
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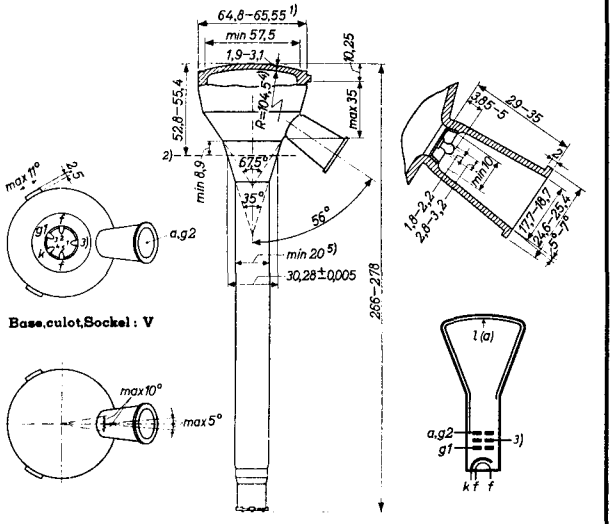
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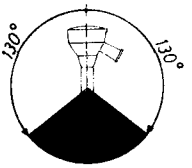
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Dimensions in mm
Dimensions en mm
Abmessungen in mm



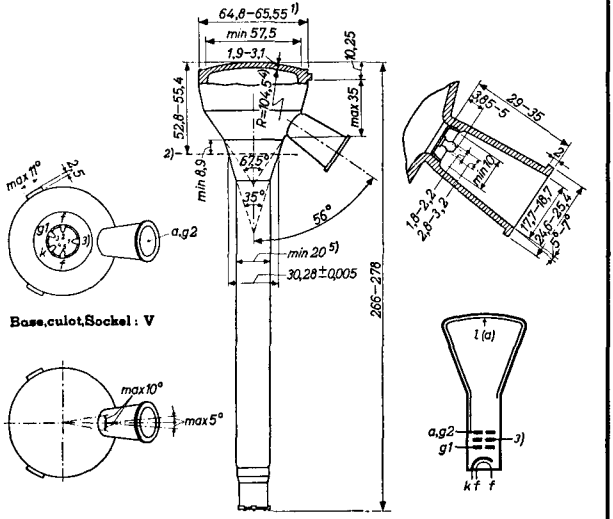
The tolerance of the position of the base with respect to the tube is ± 10°
La tolérance de la position du culot au regard du tube est de ± 10°
Die Toleranz der Lage des Sockels in bezug auf die Röhre ist ± 10°

Mounting position
Montage
Einbau



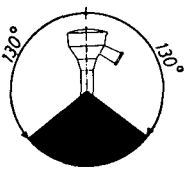
PHILIPS

Dimensions in mm
Dimensions en mm
Abmessungen in mm



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Mounting position
Montage
Einbau



→

---

[1] Eccentricity of the face plate with respect to the centre line of the neck max. 0.9 mm

Excentricité du front au regard de l'axe du col 0,9 mm max

Exzentrizität der Vorderplatte in bezug auf die Achse des Röhrenhalses max. 0,9 mm

[2] Reference line, determined by the diameter of 30.28 ± 0.005 mm

Ligne de référence, déterminée par le diamètre de 30,28 ± 0,005 mm

Bezugslinie, bestimmt durch den Durchmesser von 30,28 ± 0,005 mm

[3] Spark trap and outer coating. This connection must be earthed

Trappe à étincelles et couche extérieure. Cette connexion doit être mise à la terre

Funkenfänger und Aussenbelag. Dieser Anschluss muss geerdet werden

[4] Inner radius of curvature of the face plate
The deviation of the centre of the outer radius of curvature with respect to the centre line of the neck is max. 2 mm

Rayon de courbure intérieur du front
La déviation du centre du rayon de courbure extérieur au regard de l'axe du col est de 2 mm au max.

Innerer Krümmungsradius der Vorderplatte
Die Abweichung des Mittelpunktes des äusseren Krümmungsradius in bezug auf die Achse des Röhrenhalses ist max. 2 mm

[5] Neck fits in gauge of 22 ± 0.005 mm internal diameter and 130 mm long

Le col du tube s'adapte dans une calibre d'un diamètre extérieur de 22 ± 0,005 mm; longueur 130 mm

Der Röhrenhals passt in einer Lehre mit Innen-Durchmesser von 22 ± 0,005 mm; Höhe 130 mm

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Focusing and deflection Concentration et déviation Fokussierung und Ablenkung	magnetic magnétique magnetisch
Deflection angle Angle de déviation Ablenkungswinkel	approx. 40° environ 40° ungefähr 40°

Operating characteristics
Caractéristiques d'utilisation
Betriebsdaten

$V_{a,g2}$	=	25 kV
$-V_g$ (I_l = 0 µA)	=	40-90 V
Number of ampere-turns for focusing Nombres d'ampère-tours pour concentration Amperewindungszahl für Fokussierung	=	855
I_l	=	15-30 µA

Limiting values (design centre values)
Caractéristiques limites (valeurs moyennes pour projets)
Grenzdaten(mittlere Entwicklungsdaten)

$V_{a,g2}$	= max.	25 kV
$V_{a,g2}$	= min.	20 kV
$-V_{g1}$	= max.	200 V
$+V_{g1}$	= max.	0 V
$+V_{g1_p}$	= max.	2 V
V_{kf} (k pos.; f neg.)	= max.	200 V[1])[2])
V_{kf} (k neg.; f pos.)	= max.	125 V[1])
I_l	= max.	50 µA

Max. circuit values
Valeurs max. des éléments du montage
Max. Werte der Schaltungsteile

R_{kf}	= max.	20 kΩ
R_{g1}	= max.	1,5 MΩ
Z_{g1} (f = 50 c/s)	= max.	0,5 MΩ

[1])[2])See page 5; voir page 5; siehe Seite 5

Focusing and deflection Concentration et déviation Fokussierung und Ablenkung	magnetic magnétique magnetisch
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[1])[2])See page 5; voir page 5; siehe Seite 5

Remarks

Measures should be taken for the anode current to be switched off immediately when one of the time-base circuits becomes defective

An X-ray radiation shielding with an equivalent lead thickness of 0.5 mm is required to protect the observer.

Observations

Il faut prendre des mesures pour couper le courant anodique immédiatement après un dérangement d'une des bases de temps

Pour la protection de l'observateur il faut incorporer un blindage contre les rayons X d'une épaisseur de plomb équivalente de 0,5 mm

Bemerkungen

Es sind besondere Massnahmen notwendig, damit der Anodenstrom unmittelbar nach dem Ausfallen einer der Zeitbasisschaltungen ausgeschaltet wird

Um den Beobachter gegen Röntgenstrahlen zu schützen ist es notwendig eine Abschirmung mit einer Bleiäquivalenz von 0,5 mm an zu bringen

---

[1])In order to avoid excessive hum, the A.C. component of V_{kf} should be as low as possible and must not exceed 20 Veff

Pour éviter le ronflement excessif, la composante alternative de V_{kf} sera la plus petite possible et ne doit pas dépasser 20 Veff

Zur Vermeidung von Brummstörungen muss die Wechselspannungskomponente von V_{kf} so klein wie möglich sein und jedenfalls 20 Veff nicht überschreiten

[2])During a warm-up period not exceeding 45 seconds the heater may be 410 V negative with respect to the cathode

Pendant une période d'échauffement ne dépassant pas 45 secondes, le filament peut être porté à un potentiel négatif de 410 V par rapport à la cathode

Während einer Anheizzeit von max. 45 Sekunden darf der Heizfaden 410 V negativ sein in bezug auf die Katode

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PHILIPS

Electronic Tube

HANDBOOK

MC6-16

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1	1	1957.03.03
2	1	1959.04.04
3	2	1957.03.03
4	2	1959.04.04
5	3	1957.03.03
6	3	1959.04.04
7	4	1957.03.03
8	4	1959.04.04
9	5	1957.03.03
10	5	1959.04.04
11	FP	1999.09.04

RADAR TUBE with metal-backed screen
TUBE RADAR avec écran aluminisé
RADARROHRE mit metallhinterlegtem Schirm

Heating :	indirect by A.C. or D.C. series or parallel supply	
Chauffage:	indirect par C.A. ou C.C. alimentation série ou parallèle	V_f = 6,3 V[1]) I_f = 0,3 A
Heizung :	indirekt durch Wechsel- oder Gleichstrom; Serien- oder Parallelspeisung	

Capacitances Capacités Kapazitäten	C_{g1}	< 10 pF
	C_k	< 10 pF

Screen Ecran Schirm	Colour Couleur Farbe	orange
	Useful diameter Diamètre utile Nützlicher Durchmesser	min.108 mm

For curves of the screen properties see front of this section
Pour les courbes des propriétés de l'écran voir en tête de ce chapitre
Für die Kurven der Schirmeigenschaften siehe am Anfang dieses Abschnitts

---

[1])When the tube is used in a series heater chain, the heater voltage must not exceed 9.5 V when the supply is switched on. If necessary a current limiting device must be used for this purpose

Si le tube est monté dans une chaîne série de filaments, la tension de chauffage ne doit pas dépasser 9,5 V à la mise en circuit. En cas de besoin il faut utiliser un limiteur de courant pour ce but

Wenn die Röhre in einer Heizfadenkette verwendet wird, darf die Heizspannung beim Einschalten 9,5 V nicht überschreiten. Nötigenfalls ist zu diesem Zweck ein Strombegrenzer zu verwenden

RADAR C.R. TUBE with round metal-backed 13 cm (5") screen, magnetic focusing and double magnetic deflection
TUBE RADAR A RAYONS CATHODIQUES avec écran aluminisé rond d'un diamètre de 13 cm (5"), concentration magnétique et déflection magnétique double
RADAR-KATODENSTRAHLRÖHRE mit einem ronden metall-hinterlegten Schirm mit einem Durchmesser von 13 cm (5"), magnetischer Fokussierung und doppelmagnetischer Ablenkung

Heating : indirect by A.C. or D.C. series or parallel supply		
Chauffage : indirect par C.A. ou C.C. alimentation série ou parallèle	V_f = 6,3 V	I_f = 300 mA
Heizung : indirekt durch Wechsel- oder Gleichstrom; Serien- oder Parallelspeisung		

Capacitances Capacités Kapazitäten	C_g	< 10 pF
	C_k	< 10 pF

Screen	F-phosphor, metal-backed, clear glass
Ecran	Phosphore F, aluminisé, verre claire
Schirm	F-Phosphor, metallhinterlegt, Klarglas

Fluorescence: orange with orange afterglow
Fluorescence: orange avec phosphorescence orange
Fluoreszenz : orange mit orangefarbiger Nachleuchtung

Persistence : long
Persistance : longue
Nachleuchtdauer: lang

Useful diameter
diamètre utile 108 mm
Nutzbarer Durchmesser

For curves of the screen properties see front of this section
Pour les courbes caracteristiques de l'écran voir en tête de ce chapitre
Für die Kennlinien der Schirmeigenschaften siehe am Anfang dieses Abschnitts

PHILIPS

MF 13-1

RADAR C.R. TUBE with round metal-backed 13 cm (5") screen, magnetic focusing and double magnetic deflection
TUBE RADAR A RAYONS CATHODIQUES avec écran aluminisé rond d'un diamètre de 13 cm (5"), concentration magnétique et déflection magnétique double
RADAR-KATODENSTRAHLRÖHRE mit einem ronden metall-hinterlegten Schirm mit einem Durchmesser von 13 cm (5"), magnetischer Fokussierung und doppelmagnetischer Ablenkung

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Capacitances Capacités Kapazitäten	C_g	< 10 pF
	C_k	< 10 pF

Screen / Ecran / Schirm: F-phosphor, metal-backed, clear glass
Phosphore F, aluminisé, verre claire
F-Phosphor, metallhinterlegt, Klarglas

Fluorescence: orange with orange afterglow
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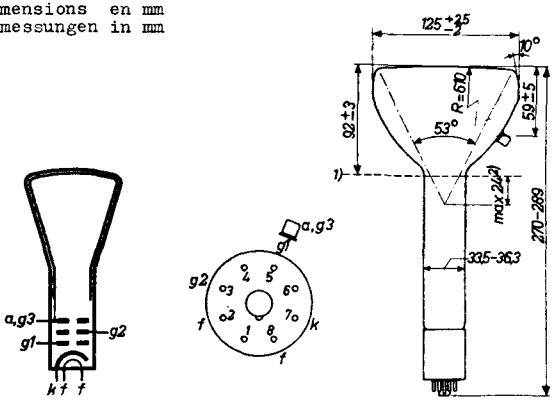
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Useful diameter
diamètre utile 108 mm
Nutzbarer Durchmesser

For curves of the screen properties see front of this section
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Für die Kennlinien der Schirmeigenschaften siehe am Anfang dieses Abschnitts

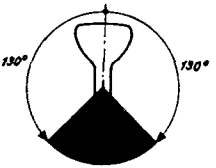
PHILIPS

Dimensions in mm
Dimensions en mm
Abmessungen in mm



Base, culot, Sockel: Octal 8p.

Mounting position
Montage
Aufstellung

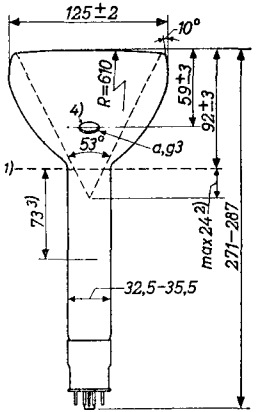


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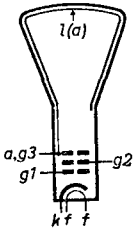
[1])Reference line, determined by the diameter of 36,4 mm.
Ligne de référence, déterminée par le diamètre de 36,4 mm
Bezugslinie, bestimmt durch den Durchmesser von 36,4 mm

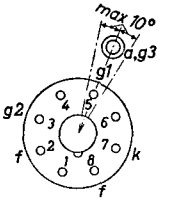
[2])The distance from deflection centre to reference line should not exceed 24 mm
La distance du centre de déviation au ligne de référence ne dépassera pas 24 mm
Der Abstand des Ablenkungsmittelpunktes bis zur Bezugslinie soll 24 mm nicht überschreiten

Dimensions in mm
Dimensions en mm
Abmessungen in mm



Base,culot,Sockel : OCTAL

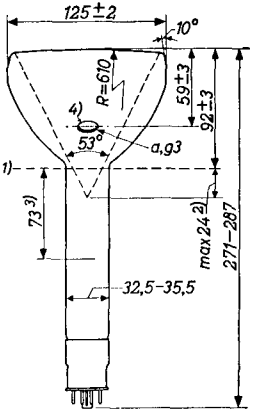




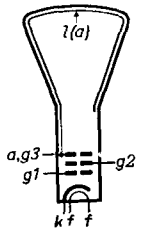
1)2)3)4)See page 3, voir page 3; siehe Seite 3

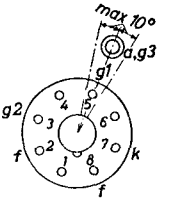
PHILIPS

Dimensions in mm
Dimensions en mm
Abmessungen in mm



Base,culot,Sockel: **OCTAL**





1)2)3)4) See page 3, voir page 3; siehe Seite 3

Deflection and focusing — magnetic
Déviation et concentration — magnétique
Ablenkung und Fokussierung — magnetisch

Focusing ampere-turns
Nombre d'ampère-tours pour concentration $300 \cdot \sqrt{V_a\ (kV)}$
Amperewindungszahl zur Fokussierung

Operating characteristics
Caractéristiques d'utilisation
Betriebsdaten

V_a	=	7 kV
V_{g2}	=	250 V
$-V_{g1}$ (I_a=0)	=	28-63 V

Focusing ampere turns
Ampère-tours pour concentration = 300
Amperewindungen zur Fokussierung

Limiting values (absolute limites)
Caractéristiques limites (limites absolues)
Grenzdaten (absolute Grenzen)

V_a	= max.	11 kV	$-V_{g1}$	= max.	200 V
V_a	= min.	5,5 kV	V_{g1_p}	= max.	2 V
V_{g2}	= max.	450 V	V_{kf}	= max.	150 V
V_{g2}	= min.	200 V	R_{kf}	= max.	20 kΩ
V_{g1}	= max.	0 V	R_{g1}	= max.	1,5 MΩ

Remark:
The tube has a screen which is liable to burn if a stationary or slowly moving spot is used even with low values of mean beam current

Observation:
Le tube comporte un écran qui risque d'être endommagé lorsque le spot reste immobile ou se meuve à petite vitesse, même dans le cas d'un courant de faisceau moyen faible

Bemerkung:
Es wird dafür gewarnt dass der Schirm der Röhre einbrennen kann wenn der Punkt still steht oder sich nur langsam bewegt, sogar bei einem schwachen mittleren Strahlstrom

Mounting position
Montage
Einbau

Net weight
Poids net 500 g
Nettogewicht

Deflection Déviation Ablenkung	double magnetic magnétique double doppel-magnetisch
Focusing Concentration Fokussierung	magnetic magnétique magnetisch

Operating characteristics
Caractéristiques d'utilisation
Betriebsdaten

$V_{a,g3}$	=	7 kV
V_{g2}	=	250 V
V_{g1}	=	-28/-63 V [5]
A [3]	=	73 mm

[1] Reference line, determined by the point at which a ring gauge of 36 mm diameter is stopped

Ligne de référence, déterminée par le point ou une calibre cylindrique d'un diamètre de 36 mm bûte contre le cône

Bezugslinie, bestimmt durch den Berührungspunkt einer zylindrischen Lehre mit einem Durchmesser von 36 mm und dem Konus

[2] Distance from reference line to effective centre of deflection
Distance de la ligne de référence au centre de déviation effectif
Abstand der Bezugslinie bis zum effektiven Mittelpunkt der Ablenkung

[3] Recommended distance from reference line to centre of magnetic lengths of focus unit
Distance recommandée de la ligne de référence au centre du longueur magnétique du dispositif de concentration
Empfohlener Abstand der Bezugslinie bis zur Mitte der magnetischen Länge der Fokussiervorrichtung

[4] Recessed ball contact CT7
Contact à bille enfoncée CT7
Versenkter Kugelkontakt CT7

[5] See page 4; voir page 4; siehe Seite 4

Mounting position
Montage
Einbau

Net weight
Poids net 500 g
Nettogewicht

Deflection Déviation Ablenkung	double magnetic magnétique double doppel-magnetisch
Focusing Concentration Fokussierung	magnetic magnétique magnetisch

Operating characteristics
Caractéristiques d'utilisation
Betriebsdaten

$V_{a,g3}$	=	7 kV
V_{g2}	=	250 V
V_{g1}	=	-28/-63 V [5]
A [3]	=	73 mm

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Ligne de référence, déterminée par le point où une calibre cylindrique d'un diamètre de 36 mm bûte contre le cône

Bezugslinie, bestimmt durch den Berührungspunkt einer zylindrischen Lehre mit einem Durchmesser von 36 mm und dem Konus

[2] Distance from reference line to effective centre of deflection
Distance de la ligne de référence au centre de déviation effectif
Abstand der Bezugslinie bis zum effektiven Mittelpunkt der Ablenkung

[3] Recommended distance from reference line to centre of magnetic lengths of focus unit
Distance recommandée de la ligne de référence au centre du longueur magnétique du dispositif de concentration
Empfohlener Abstand der Bezugslinie bis zur Mitte der magnetischen Länge der Fokussiervorrichtung

[4] Recessed ball contact CT7
Contact à bille enfoncée CT7
Versenkter Kugelkontakt CT7

[5] See page 4; voir page 4; siehe Seite 4

Limiting values (ABSOLUTE LIMITS)
Caractéristiques limites (VALEURS ABSOLUES)
Grenzdaten (ABSOLUTE WERTE)

$V_{a,g3}$	= max.	11 kV
	= min.	5,5 kV
V_{g2}	= max.	500 V
	= min.	200 V
$-V_g$	= max.	200 V
I_k	= max.	150 µA[6]
V_{kf} (k pos.; f neg.)	= max.	150 V
V_{kf} (k neg.; f pos.)	= max.	150 V

Max. circuit values
Valeurs maximum des éléments du montage
Max. Werte der Schaltungsteile

R_{kf}	= max.	1 MΩ
R_{g1}	= max.	1,5 MΩ

---

[5])Limits of negative grid No.1 voltage for visual extinction of the undeflected focused spot. Please refer also to page B

Limites de la tension de la grille 1 pour l'extinction visuelle du spot lumineux concentré non-dévié. Voir aussi page B

Grenzwerte der negativen Spannung am Gitter 1 für optische Löschung des nicht abgelenkten fokussierten Leuchtpunktes Siehe auch Seite B

[6])The tube has a screen which is liable to burn if a stationary or slowly moving spot is used even with low values of mean beam current

Le tube comparte un écran qui risque d'être endommagé lorsque le spot reste immobile ou se meuve à petite vitesse, même dans le cas d'un courant de faiseau moyen faible

Es wird dafür gewarnt dass der Schirm der Röhre einbrennen kann wenn der Punkt still steht oder sich nur langsam bewegt, sogar bei einem schwachen mittleren Strahlstrom

Limiting values (ABSOLUTE LIMITS)
Caractéristiques limites (VALEURS ABSOLUES)
Grenzdaten (ABSOLUTE WERTE)

$V_{a,g3}$	= max. 11 kV = min. 5,5 kV
V_{g2}	= max. 500 V = min. 200 V
$-V_g$	= max. 200 V
I_k	= max. 150 µA[6]
V_{kf} (k pos.; f neg.)	= max. 150 V
V_{kf} (k neg.; f pos.)	= max. 150 V

Max. circuit values
Valeurs maximum des éléments du montage
Max. Werte der Schaltungsteile

R_{kf}	= max. 1 MΩ
R_{g1}	= max. 1,5 MΩ

---

[5] Limits of negative grid No.1 voltage for visual extinction of the undeflected focused spot. Please refer also to page B

Limites de la tension de la grille 1 pour l'extinction visuelle du spot lumineux concentré non-dévié. Voir aussi page B

Grenzwerte der negativen Spannung am Gitter 1 für optische Löschung des nicht abgelenkten fokussierten Leuchtpunktes Siehe auch Seite B

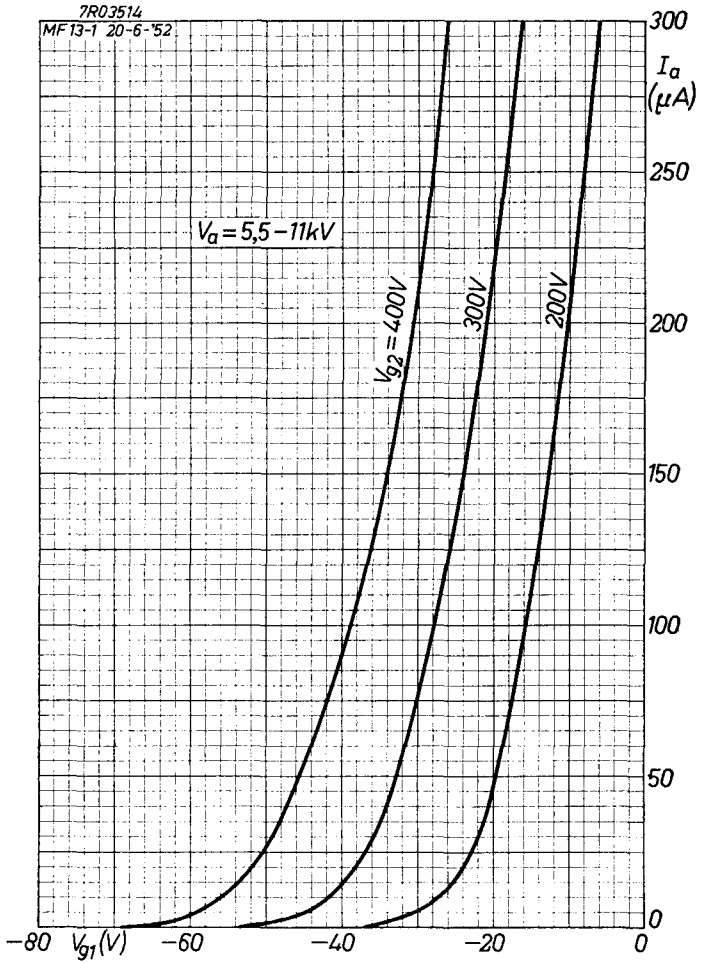
[6] The tube has a screen which is liable to burn if a stationary or slowly moving spot is used even with low values of mean beam current

Le tube comparte un écran qui risque d'être endommagé lorsque le spot reste immobile ou se meuve à petite vitesse, même dans le cas d'un courant de faiseau moyen faible

Es wird dafür gewarnt dass der Schirm der Röhre einbrennen kann wenn der Punkt still steht oder sich nur langsam bewegt, sogar bei einem schwachen mittleren Strahlstrom

PHILIPS

MF 13-1

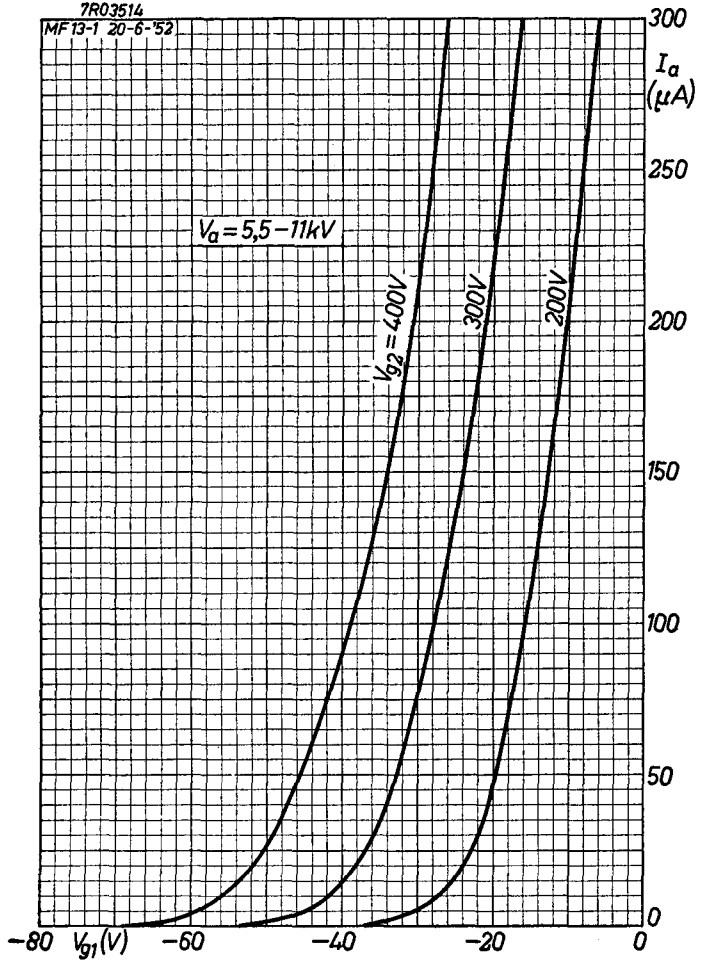


2.2.1953

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PHILIPS

MF 13-1

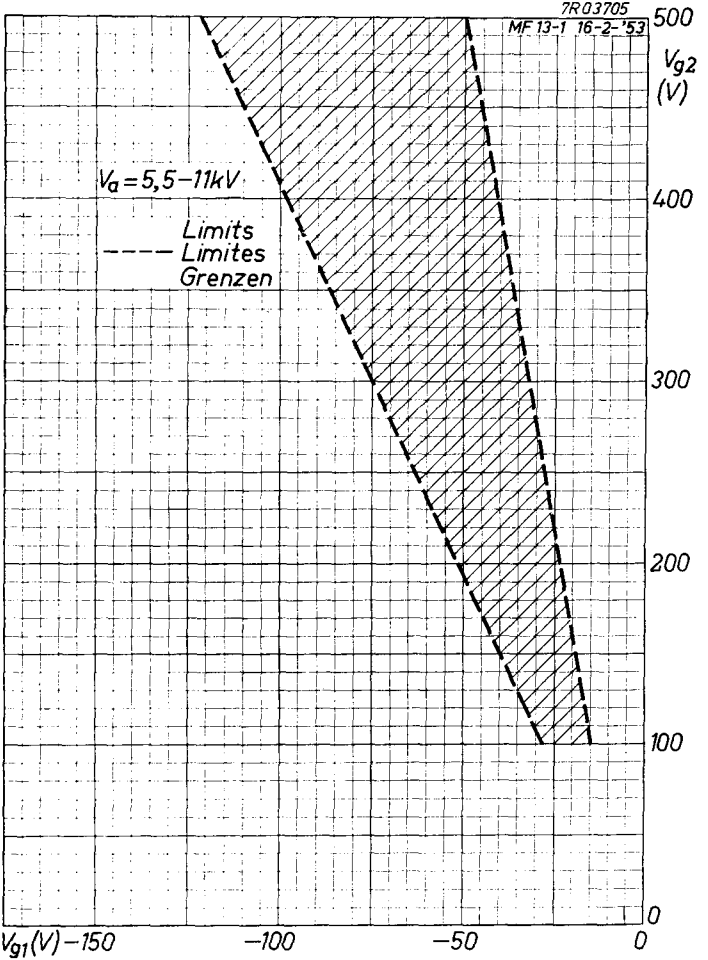


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MF 13-1

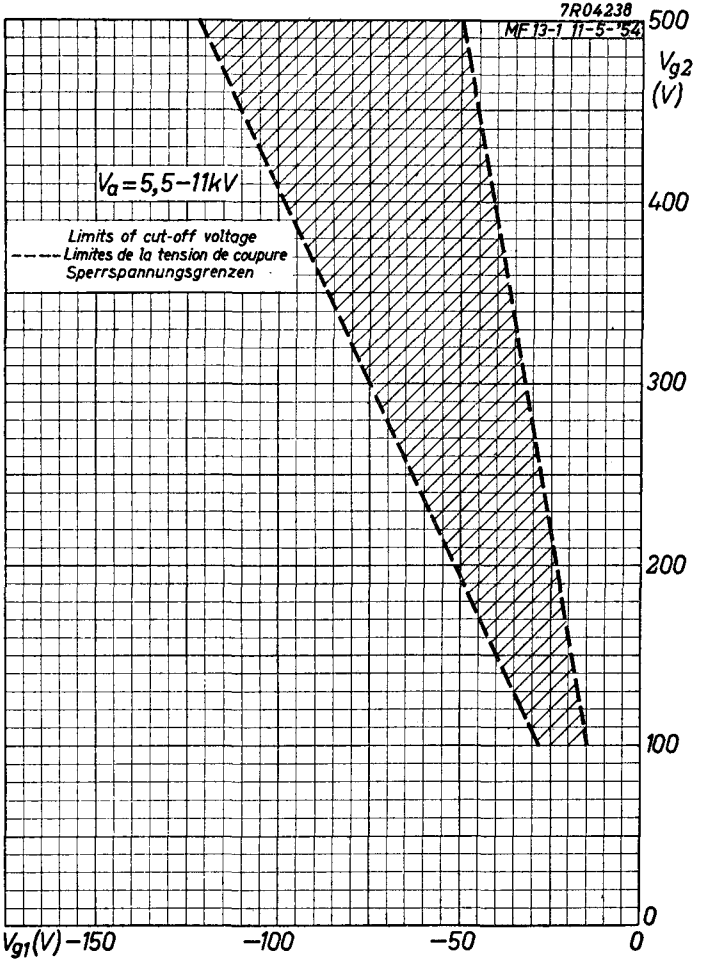
PHILIPS



Cut off voltage
Tension de coupure
Sperrspannung

B

PHILIPS


7R04238
MF 13-1 11-5-'54
V_{g2} (V)
500
400
300
200
100
0
$V_a = 5,5-11kV$
Limits of cut-off voltage
Limites de la tension de coupure
Sperrspannungsgrenzen
V_{g1}(V) −150
−100
−50
0

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Electronic Tube

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5	2	1957.03.03
6	2	1959.04.04
7	3	1954.04.04
8	3	1957.03.03
9	3	1959.04.04
10	4	1957.03.03
11	4	1959.04.04
12	A	1953.02.02
13	A	1954.05.05
14	B	1953.02.02
15	B	1954.05.05
16	FP	2000.07.16

RADAR TUBE with metal-backed screen
TUBE RADAR avec écran aluminisé
RADARRÖHRE mit metallhinterlegtem Schirm

Heating : indirect by A.C. or D.C. series or parallel supply Chauffage: indirect par C.A. ou C.C. alimentation série ou parallèle Heizung : indirekt durch Wechsel- oder Gleichstrom; Serien- oder Parallelspeisung	V_f = 6,3 V[1]) I_f = 0,3 A	
Capacitances Capacités Kapazitäten	C_{g1}	< 10 pF
	C_k	< 10 pF
Screen Ecran Schirm — Colour Couleur Farbe		orange
Useful diameter Diamètre utile Nützlicher Durchmesser		min. 287 mm

For curves of the screen properties see front of this section
Pour les courbes des propriétés de l'écran voir en tête de ce chapitre
Für die Kurven der Schirmeigenschaften siehe am Anfang dieses Abschnitts

---

[1])When the tube is used in a series heater chain, the heater voltage must not exceed 9.5 V when the supply is switched on. If necessary a current limiting device must be used for this purpose

Si le tube est monté dans une chaîne série de filaments, la tension de chauffage ne doit pas dépasser 9,5 V à la mise en circuit. En cas de besoin il faut utiliser un limiteur de courant pour ce but

Wenn die Röhre in einer Heizfadenkette verwendet wird, darf die Heizspannung beim Einschalten 9,5 V nicht überschreiten. Nötigenfalls ist zu diesem Zweck ein Strombegrenzer zu verwenden

RADAR TUBE with metal-backed screen
TUBE RADAR avec écran aluminisé
RADARRÖHRE mit metallhinterlegtem Schirm

Heating : indirect by A.C. or D.C. series or parallel supply Chauffage: indirect par C.A. ou C.C. alimentation série ou parallèle Heizung : indirekt durch Wechsel- oder Gleichstrom; Serien- oder Parallelspeisung	V_f = 6,3 V [1] I_f = 0,3 A	
Capacitances Capacités Kapazitäten	C_{g1}	< 10 pF
	C_k	< 10 pF
Screen Colour Ecran Couleur Schirm Farbe		orange
Useful diameter Diamètre utile Nützlicher Durchmesser		min. 287 mm

For curves of the screen properties see front of this section
Pour les courbes des propriétés de l'écran voir en tête de ce chapitre
Für die Kurven der Schirmeigenschaften siehe am Anfang dieses Abschnitts

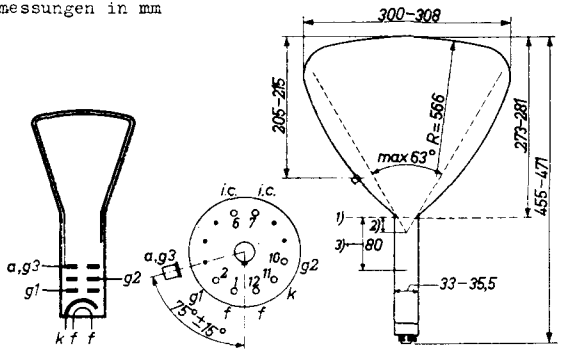
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[1]) When the tube is used in a series heater chain, the heater voltage must not exceed 9.5 V when the supply is switched on. If necessary a current limiting device must be used for this purpose

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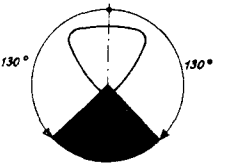
Wenn die Röhre in einer Heizfadenkette verwendet wird, darf die Heizspannung beim Einschalten 9,5 V nicht überschreiten. Nötigenfalls ist zu diesem Zweck ein Strombegrenzer zu verwenden

Dimensions in mm
Dimensions en mm
Abmessungen in mm



Base, culot, Sockel: Duodecal 7p.

Mounting position
Montage
Aufstellung



---

[1])Reference line, determined by the diameter of 36 mm
Ligne de référence, déterminée par le diamètre de 36 mm
Bezugslinie, bestimmt durch den Durchmesser von 36 mm

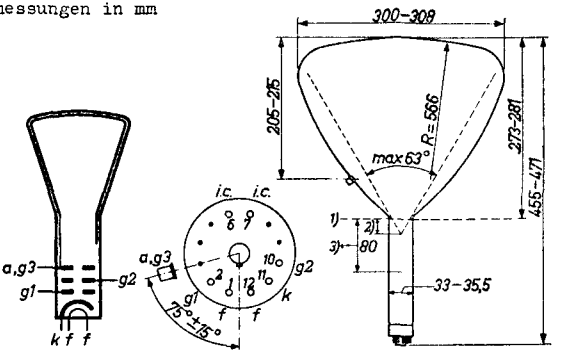
[2])The distance from deflection centre to reference line should not exceed 16 mm

La distance du centre de déviation au ligne de référence ne dépassera pas 16 mm

Der Abstand des Ablenkungsmittelpunktes bis zur Bezugslinie soll 16 mm nicht überschreiten

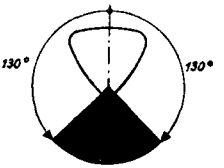
[3])Distance from focusing centre to reference line
Distance du centre de concentration au ligne de référence
Abstand des Fokussierungsmittelpunktes bis zur Bezugslinie

Dimensions in mm
Dimensions en mm
Abmessungen in mm



Base, culot, Sockel: Duodecal 7p.

Mounting position
Montage
Aufstellung



---

[1])Reference line, determined by the diameter of 36 mm
Ligne de référence, déterminée par le diamètre de 36 mm
Bezugslinie, bestimmt durch den Durchmesser von 36 mm

[2])The distance from deflection centre to reference line should not exceed 16 mm

La distance du centre de déviation au ligne de référence ne dépassera pas 16 mm

Der Abstand des Ablenkungsmittelpunktes bis zur Bezugslinie soll 16 mm nicht überschreiten

[3])Distance from focusing centre to reference line
Distance du centre de concentration au ligne de référence
Abstand des Fokussierungsmittelpunktes bis zur Bezugslinie

Deflection and focusing Déviation et concentration Ablenkung und Fokussierung	magnetic magnétique magnetisch

Focusing ampere-turns
Nombre d'ampère-tours pour concentration
Amperewindungszahl zur Fokussierung

$250 \cdot \sqrt{V_a\ (kV)}$

Operating characteristics
Caractéristiques d'utilisation
Betriebsdaten

V_a	=	9 kV
V_{g2}	=	300 V
$-V_{g1}(I_a = 0)$	=	32-81 V

Focusing ampere-turns
Ampère-tours pour concentration
Amperewindungen zur Fokussierung = 750

Limiting values (absolute limits)
Caractéristiques limites (limites absolues)
Grenzdaten (absolute Grenzen)

V_a	= max.	12 kV	$-V_{g1}$	= max.	200 V
V_a	= min.	6 kV	V_{g1_p}	= max.	2 V
V_{g2}	= max.	450 V	V_{kf}	= max.	150 V
V_{g2}	= min.	200 V	R_{kf}	= max.	20 kΩ
V_{g1}	= max.	0 V	R_{g1}	= max.	1,5 MΩ

Remark:

The tube has a screen which is liable to burn if a stationary or slowly moving spot is used even with low values of mean beam current

Observation:

Le tube comporte un écran qui risque d'être endommagé lorsque le spot reste immobile ou se meuve à petite vitesse, même dans le cas d'un courant de faisceau moyen faible

Bemerkung:

Es wird dafür gewarnt dass der Schirm der Röhre einbrennen kann wenn der Punkt still steht oder sich nur langsam bewegt, sogar bei einem schwachen mittleren Strahlstrom

Deflection and focusing Déviation et concentration Ablenkung und Fokussierung	magnetic magnétique magnetisch
Focusing ampere-turns Nombre d'ampère-tours pour concentration Amperewindungszahl zur Fokussierung	$250 \cdot \sqrt{V_a\ (kV)}$

Operating characteristics
Caractéristiques d'utilisation
Betriebsdaten

V_a	=	9 kV
V_{g2}	=	300 V
$-V_{g1}(I_a = 0)$	=	32-81 V

Focusing ampere-turns
Ampère-tours pour concentration = 750
Amperewindungen zur Fokussierung

Limiting values (absolute limits)
Caractéristiques limites (limites absolues)
Grenzdaten (absolute Grenzen)

V_a	= max. 12 kV	$-V_{g1}$	= max. 200 V
V_a	= min. 6 kV	V_{g1_p}	= max. 2 V
V_{g2}	= max. 450 V	V_{kf}	= max. 150 V
V_{g2}	= min. 200 V	R_{kf}	= max. 20 kΩ
V_{g1}	= max. 0 V	R_{g1}	= max. 1,5 MΩ

Remark:

The tube has a screen which is liable to burn if a stationary or slowly moving spot is used even with low values of mean beam current

Observation:

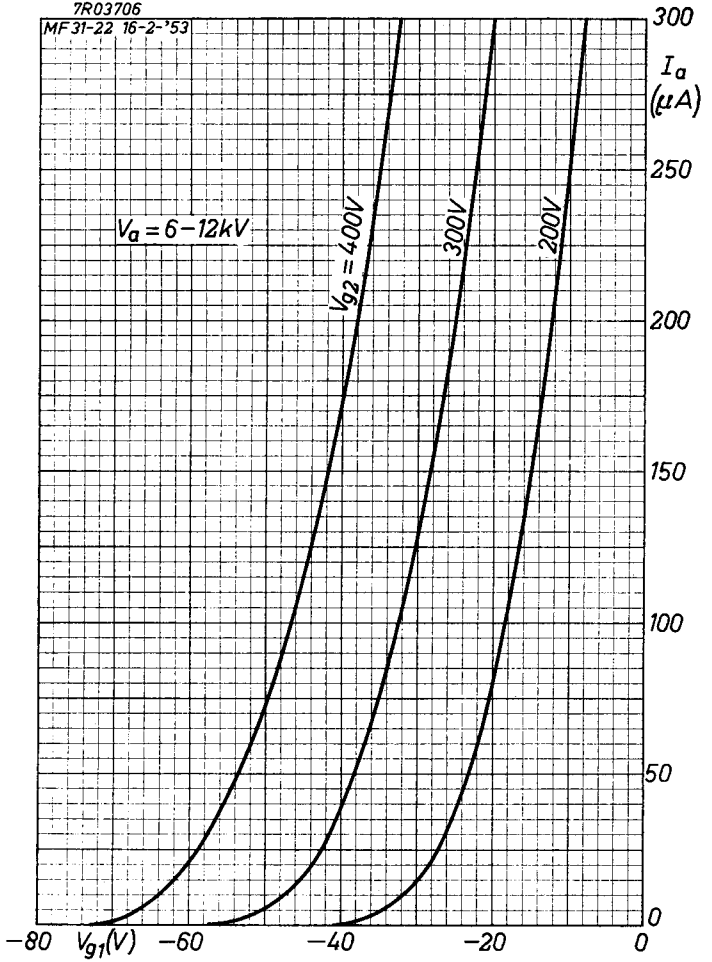
Le tube comporte un écran qui risque d'être endommagé lorsque le spot reste immobile ou se meuve à petite vitesse, même dans le cas d'un courant de faisceau moyen faible

Bemerkung:

Es wird dafür gewarnt dass der Schirm der Röhre einbrennen kann wenn der Punkt still steht oder sich nur langsam bewegt, sogar bei einem schwachen mittleren Strahlstrom

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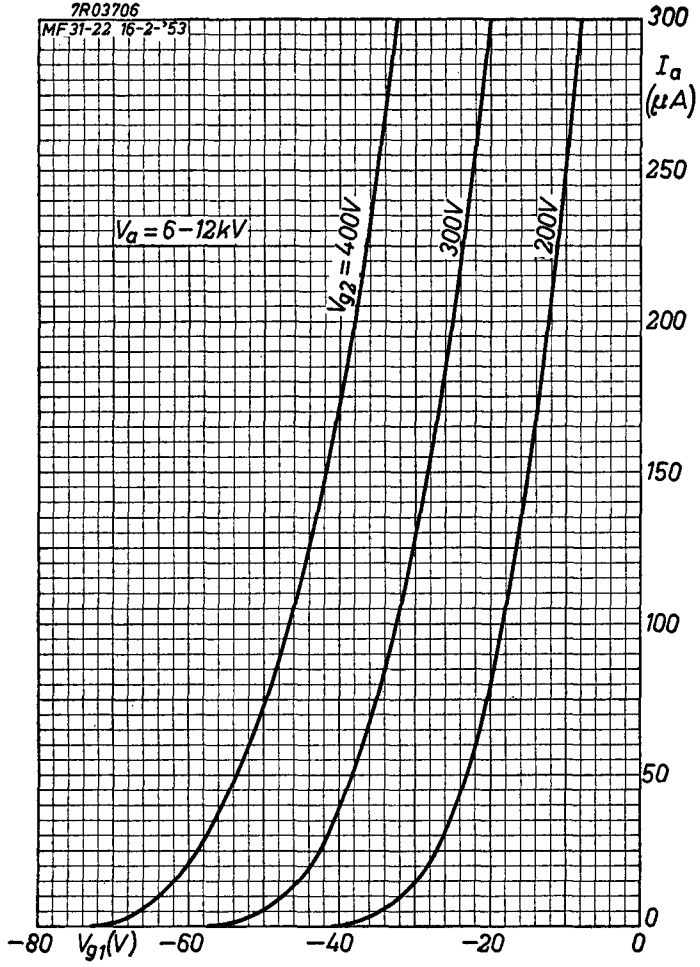


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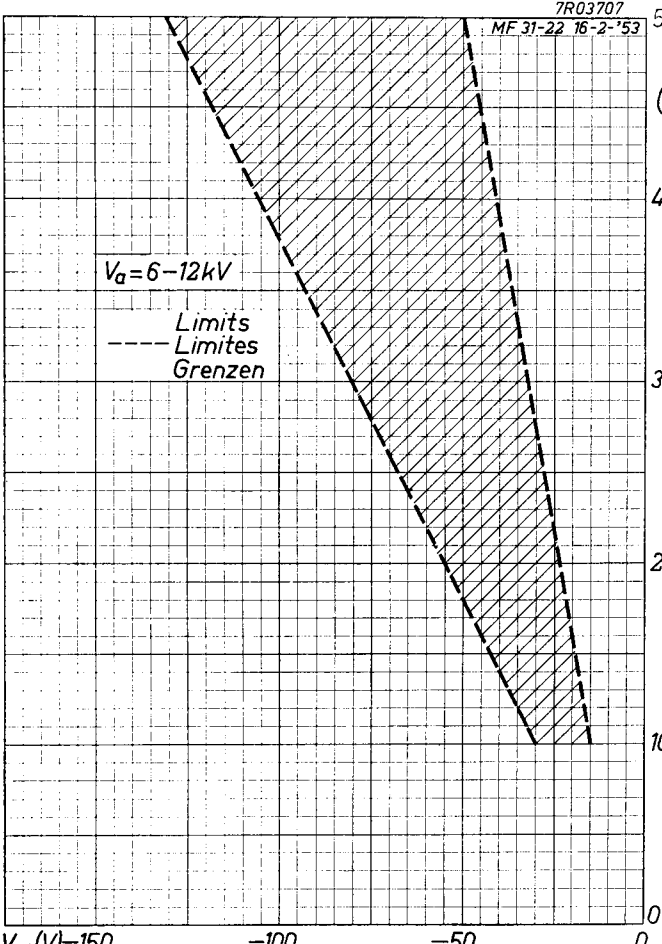


5.5.1954

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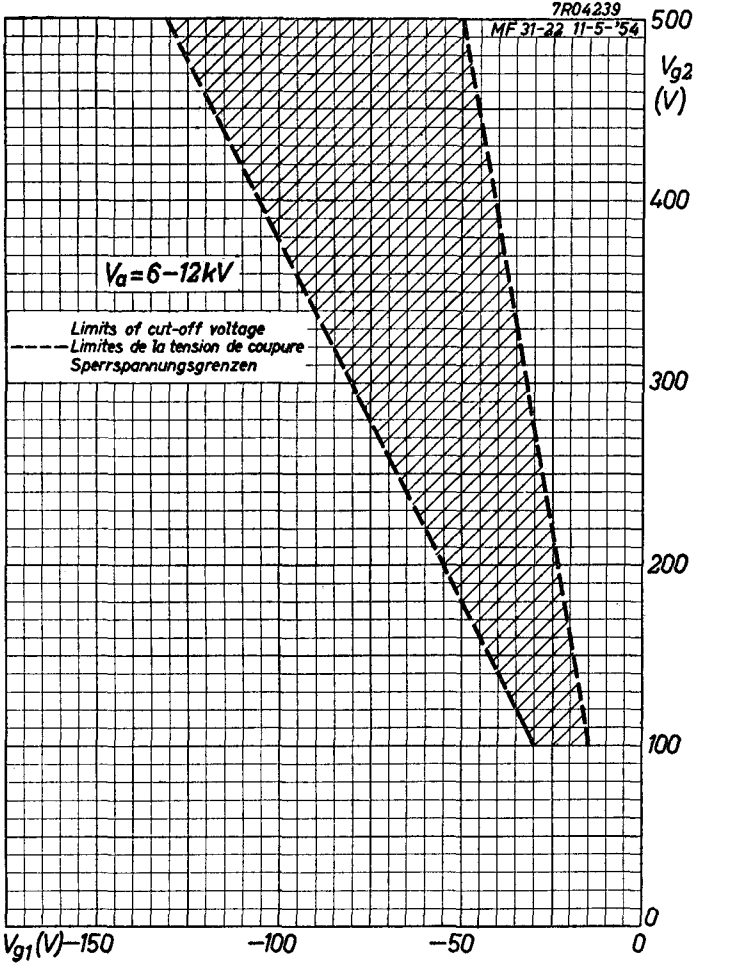
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B

MF 31-22 **PHILIPS**



B

PHILIPS

Electronic Tube

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4	2	1957.05.05
5	3	1954.04.04
6	3	1957.05.05
7	A	1953.02.02
8	A	1954.05.05
9	B	1953.02.02
10	B	1954.05.05
11	FP	1999.09.07

RADAR C.R. TUBE with round metal-backed 31 cm (12") screen, magnetic focusing and double magnetic deflection

TUBE RADAR A RAYONS CATHODIQUES avec écran aluminisé rond d'un diamètre de 31 cm (12"), concentration magnétique et déflection magnétique double

RADAR-KATODENSTRAHLRÖHRE mit einem ronden metall-hinterlegten Schirm mit einem Durchmesser von 31 cm (12"), magnetischer Fokussierung und doppelmagnetischer Ablenkung

Heating	: indirect by A.C. or D.C. series or parallel supply	
Chauffage	: indirect par C.A. ou C.C. alimentation série ou parallèle	V_f = 6,3 V I_f = 300 mA
Heizung	: indirekt durch Wechsel- oder Gleichstrom; Serien- oder Parallelspeisung	

Capacitances Capacités Kapazitäten	C_g < 8 pF C_k < 8 pF

Screen Ecran Schirm	F-phosphor, metal-backed, clear glas Phosphore F, aluminisé, verre claire F-Phosphor, metallhinterlegt, Klarglas

Fluorescence: orange with orange afterglow
Fluorescence: orange avec phosphorescence orange
Fluoreszenz : orange mit orangefarbiger Nachleuchtung

Persistence : long
Persistance : longue
Nachleuchtdauer: lang

Useful diameter
Diamètre utile 265 mm
Nutzbarer Durchmesser

For curves of the screen properties see front of this section
Pour les courbes caractéristiques de l'écran voir en tête de ce chapitre
Für die Kennlinien der Schirmeigenschaften siehe am Anfang dieses Abschnitts

RADAR C.R. TUBE with round metal-backed 31 cm (12") screen, magnetic focusing and double magnetic deflection

TUBE RADAR A RAYONS CATHODIQUES avec écran aluminisé rond d'un diamètre de 31 cm (12"), concentration magnétique et déflection magnétique double

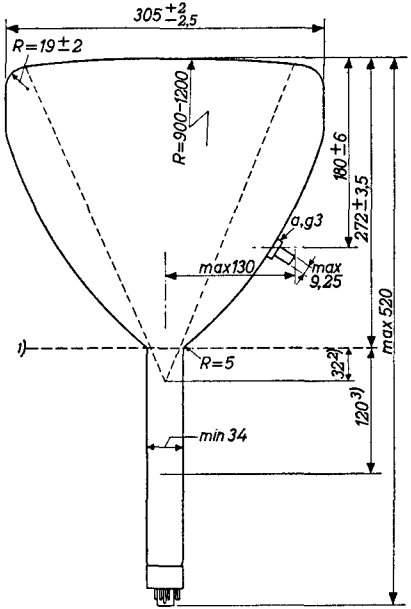
RADAR-KATODENSTRAHLRÖHRE mit einem ronden metall-hinterlegten Schirm mit einem Durchmesser von 31 cm (12"), magnetischer Fokussierung und doppelmagnetischer Ablenkung

Heating : indirect by A.C. or D.C. series or parallel supply		
Chauffage: indirect par C.A. ou C.C. alimentation série ou parallèle	V_f = 6,3 V I_f = 300 mA	
Heizung : indirekt durch Wechsel- oder Gleichstrom; Serien- oder Parallelspeisung		
Capacitances Capacités Kapazitäten	C_g	< 8 pF
	C_k	< 8 pF

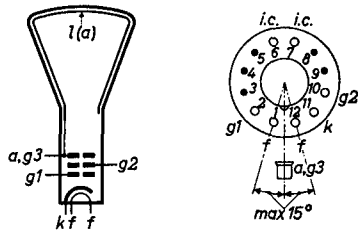
Screen Écran Schirm	F-phosphor, metal-backed, clear glas Phosphore F, aluminisé, verre claire F-Phosphor, metallhinterlegt, Klarglas
	Fluorescence: orange with orange afterglow Fluorescence: orange avec phosphorescence orange Fluoreszenz : orange mit orangefarbiger Nachleuchtung
	Persistence : long Persistance : longue Nachleuchtdauer: lang
	Useful diameter Diamètre utile 265 mm Nutzbarer Durchmesser

For curves of the screen properties see front of this section
Pour les courbes caractéristiques de l'écran voir en tête de ce chapitre
Für die Kennlinien der Schirmeigenschaften siehe am Anfang dieses Abschnitts

Dimensions in mm
Dimensions en mm
Abmessungen in mm

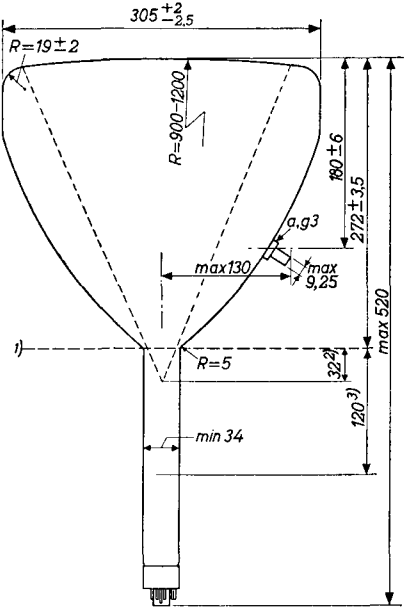


Base,culot,Sockel: DUODECAL 7-p

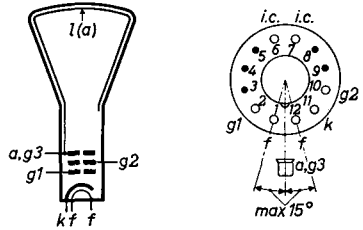


1)2)3) See page 3; voir page 3; siehe Seite 3

Dimensions in mm
Dimensions en mm
Abmessungen in mm



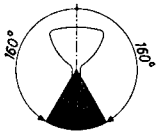
Base,culot,Sockel: DUODECAL 7-p



1)2)3) See page 3; voir page 3; siehe Seite 3

→

Mounting position
Montage
Einbau



Deflection Déviation Ablenkung	double magnetic magnétique double doppel-magnetisch
Focusing Concentration Fokussierung	magnetic magnétique magnetisch

Operating characteristics
Caractéristiques d'utilisation
Betriebsdaten

Va,g3	=	15 kV
Vg2	=	300 V
Vg1	=	-30/-90 V[4])
A[3])	=	120 mm

---

[1])Reference line, determined by the point at which a ring gauge of 36 mm diameter is stopped

Ligne de référence, déterminée par le point où une calibre cylindrique d'un diamètre de 36 mm bûte contre le cône

Bezugslinie, bestimmt durch den Berührungspunkt einer zylindrischen Lehre mit einem Durchmesser von 36 mm und dem Konus

[2])Distance from reference line to effective centre of deflection

Distance de la ligne de référence au centre de déviation effectif

Abstand der Bezugslinie bis zum effektiven Mittelpunkt der Ablenkung

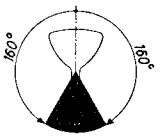
[3])Recommended distance from reference line to centre of magnetic lengths of focus unit

Distance recommandée de la ligne de référence au centre du longueur magnétique du dispositif de concentration

Empfohlener Abstand der Bezugslinie bis zur Mitte der magnetischen Länge der Fokussiervorrichtung

[4])See page 4, voir page 4; siehe Seite 4

Mounting position
Montage
Einbau



Deflection Déviation Ablenkung	double magnetic magnétique double doppel-magnetisch
Focusing Concentration Fokussierung	magnetic magnétique magnetisch

Operating characteristics
Caractéristiques d'utilisation
Betriebsdaten

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Ligne de référence, déterminée par le point où une calibre cylindrique d'un diamètre de 36 mm bûte contre le cône

Bezugslinie, bestimmt durch den Berührungspunkt einer zylindrischen Lehre mit einem Durchmesser von 36 mm und dem Konus

[2])Distance from reference line to effective centre of deflection

Distance de la ligne de référence au centre de déviation effectif

Abstand der Bezugslinie bis zum effektiven Mittelpunkt der Ablenkung

[3])Recommended distance from reference line to centre of magnetic lengths of focus unit

Distance recommandée de la ligne de référence au centre du longueur magnétique du dispositif de concentration

Empfohlener Abstand der Bezugslinie bis zur Mitte der magnetischen Länge der Fokussiervorrichtung

[4])See page 4, voir page 4; siehe Seite 4

Limiting values (ABSOLUTE LIMITS)
Caractéristiques limites (VALEURS ABSOLUES)
Grenzdaten (ABSOLUTWERTE)

$V_{a,g3}$	= max.	15,5	kV
$V_{a,g3}$	= min.	9	kV
V_{g2}	= max.	600	V
V_{g2}	= min.	250	V
$-V_{g1}$	= max.	250	V
I_k	= max.	150	µA[5]
V_{kf} (k pos.; f neg.)	= max.	150	V
V_{kf} (k neg., f pos.)	= max.	150	V

Max. circuit values
Valeurs maximum des éléments du montage
Max. Werte der Schaltungsteile

R_{kf}	=	1 MΩ
R_{g1}	=	1,5 MΩ

[4] Limits of negative grid No.1 voltage for visual extinction of the undeflected focused spot. Please refer also to p.B

Limites de la tension de la grille 1 pour l'extinction visuelle du spot lumineux concentré non-dévié. Voir aussi page B

Grenzwerte der negativen Spannung am Gitter 1 für optische Löschung des nicht abgelenkten fokussierten Leuchtpunktes Siehe auch Seite B

[5] The tube has a screen which is liable to burn if a stationary or slowly moving spot is used even with low values of mean beam current

Le tube comporte un écran qui risque d'être endommagé lorsque le spot reste immobile ou se meuve à petite vitesse, même dans le cas d'un courant de faisceau moyen faible

Es wird dafür gewarnt dass der Schirm der Röhre einbrennen kann wenn der Punkt still steht oder sich nur langsam bewegt, sogar bei einem schwachen mittleren Strahlstrom

Limiting values (ABSOLUTE LIMITS)
Caractéristiques limites (VALEURS ABSOLUES)
Grenzdaten (ABSOLUTWERTE)

$V_{a,g3}$	= max.	15,5	kV
$V_{a,g3}$	= min.	9	kV
V_{g2}	= max.	600	V
V_{g2}	= min.	250	V
$-V_{g1}$	= max.	250	V
I_k	= max.	150	µA [5]
V_{kf} (k pos.; f neg.)	= max.	150	V
V_{kf} (k neg., f pos.)	= max.	150	V

Max. circuit values
Valeurs maximum des éléments du montage
Max. Werte der Schaltungsteile

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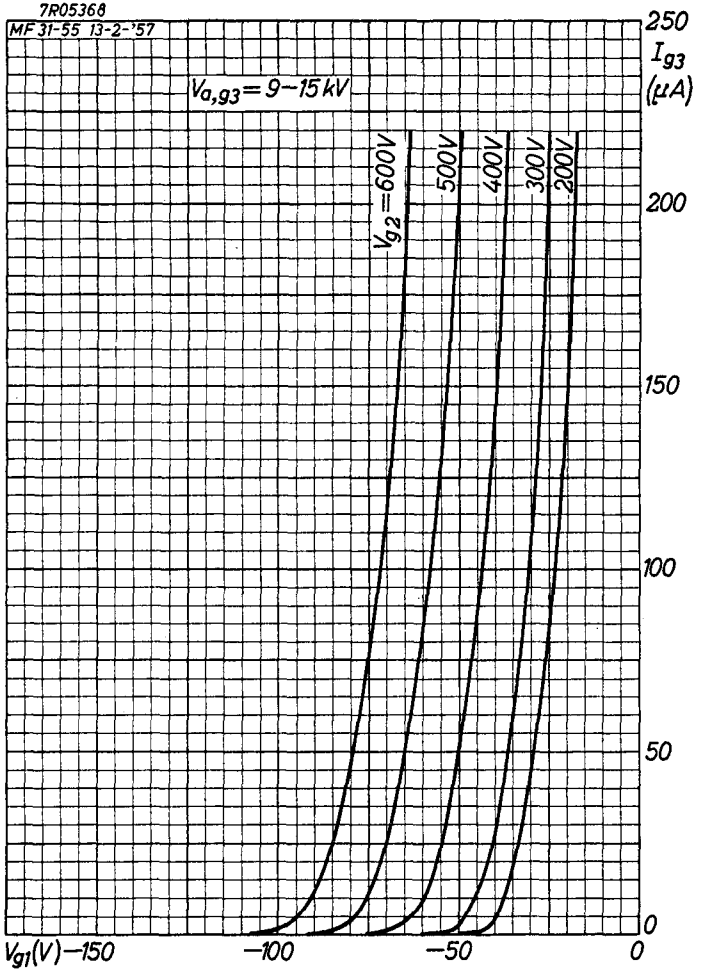
Le tube comparte un écran qui risque d'être endommagé lorsque le spot reste immobile ou se meuve à petite vitesse, même dans le cas d'un courant de faisceau moyen faible

Es wird dafür gewarnt dass der Schirm der Röhre einbrennen kann wenn der Punkt still steht oder sich nur langsam bewegt, sogar bei einem schwachen mittleren Strahlstrom

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PHILIPS

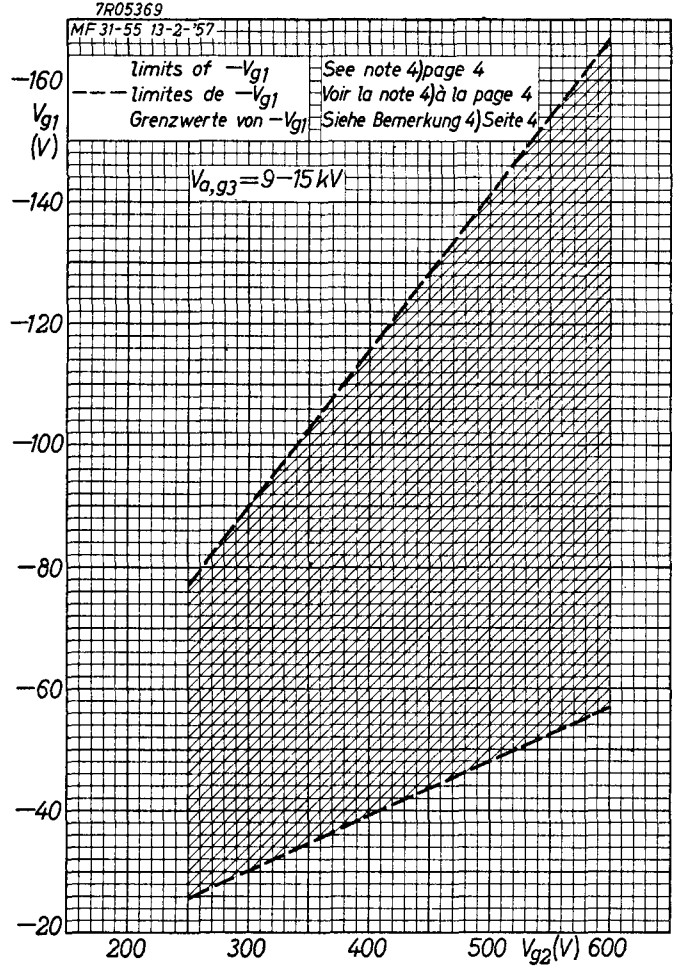
MF 31-55



3.3.1957

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PHILIPS


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MF 31-55 13-2-'57
limits of $-V_{g1}$
limites de $-V_{g1}$
Grenzwerte von $-V_{g1}$
See note 4) page 4
Voir la note 4) à la page 4
Siehe Bemerkung 4) Seite 4
$V_{a,g3}$ = 9–15 kV
$-V_{g1}$ (V)
−160
−140
−120
−100
−80
−60
−40
−20
200
300
400
500
V_{g2} (V)
600

PHILIPS

Electronic Tube

HANDBOOK

MF31-55

page	sheet	date
1	1	1957.03.03
2	1	1959.04.04
3	2	1957.03.03
4	2	1959.04.04
5	3	1957.03.03
6	3	1959.04.04
7	4	1957.03.03
8	4	1959.04.04
9	A	1957.03.03
10	B	1957.03.03
11	FP	1999.09.07

RADAR C.R. TUBE with round metal-backed 41 cm (16") screen, magnetic deflection and magnetic focusing

TUBE RADAR A RAYONS CATHODIQUES avec écran aluminisé rond d'un diamètre de 41 cm (16"), concentration magnétique et déflection magnétique

RADAR-KATODENSTRAHLRÖHRE mit einem runden metall-hinterlegten Schirm mit einem Durchmesser von 41 cm (16"), magnetischer Ablenkung und magnetischer Fokussierung

Heating : indirect by A.C. or D.C. series or parallel supply
Chauffage: indirect par C.A. ou C.C. alimentation série ou parallèle
Heizung : indirekt durch Wechsel- oder Gleichstrom; Serien- oder Parallelspeisung

V_f = 6,3 V
I_f = 300 mA

Capacitances
Capacités
Kapazitäten

C_g < 8 pF
C_k < 8 pF

Screen — F-phosphor, metal-backed, clear glas
Ecran — Phosphore F, aluminisé, verre claire
Schirm — F-Phosphor, metallhinterlegt, Klarglas

Fluorescence: orange with orange afterglow
Fluorescence: orange avec phosphorescence orange
Fluoreszenz : orange mit orangefarbiger Nachleuchtung

Persistence : very long
Persistance : tres longue
Nachleuchtdauer: sehr lang

Useful diameter
Diamètre utile 368 mm
Nutzbarer Durchmesser

For curves of the screen properties see front of this section
Pour les courbes caractéristiques de l'écran voir en tête de ce chapitre
Für die Kennlinien der Schirmeigenschaften siehe am Anfang dieses Abschnitts

RADAR C.R. TUBE with round metal-backed 41 cm (16") screen, magnetic deflection and magnetic focusing

TUBE RADAR A RAYONS CATHODIQUES avec écran aluminisé rond d'un diamètre de 41 cm (16"), concentration magnétique et déflection magnétique

RADAR-KATODENSTRAHLRÖHRE mit einem runden metall-hinterlegten Schirm mit einem Durchmesser von 41 cm (16"), magnetischer Ablenkung und magnetischer Fokussierung

Heating : indirect by A.C. or D.C. series or parallel supply
Chauffage: indirect par C.A. ou C.C. alimentation série ou parallèle
Heizung : indirekt durch Wechsel- oder Gleichstrom; Serien- oder Parallelspeisung

V_f = 6,3 V
I_f = 300 mA

Capacitances
Capacités
Kapazitäten

C_g < 8 pF
C_k < 8 pF

Screen / Ecran / Schirm: F-phosphor, metal-backed, clear glas / Phosphore F, aluminisé, verre claire / F-Phosphor, metallhinterlegt, Klarglas

Fluorescence: orange with orange afterglow
Fluorescence: orange avec phosphorescence orange
Fluoreszenz : orange mit orangefarbiger Nachleuchtung

Persistence : very long
Persistance : tres longue
Nachleuchtdauer: sehr lang

Useful diameter
Diamètre utile 368 mm
Nutzbarer Durchmesser

For curves of the screen properties see front of this section
Pour les courbes caractéristiques de l'écran voir en tête de ce chapitre
Für die Kennlinien der Schirmeigenschaften siehe am Anfang dieses Abschnitts

RADAR CATHODE RAY TUBES with round metal-backed 41 cm (16") screen, magnetic deflection and magnetic focusing

HEATING

Indirect by A.C. or D.C.; series or parallel supply

Heater voltage	V_f = 6.3 V
Heater current	I_f = 300 mA

CAPACITANCES

Grid No.1 to all other elements	C_{g_1} < 8 pF
Cathode to all other elements	C_k < 8 pF

SCREEN: metal-backed, clear glass

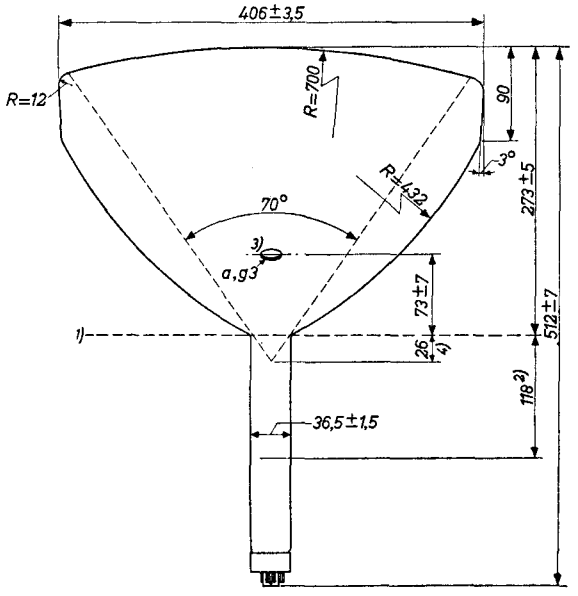
Colour	orange with orange afterglow
Persistance	very long
Useful diameter	368 mm

For curves of the screen properties please refer to front of this section

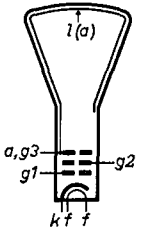
FOCUSING: magnetic

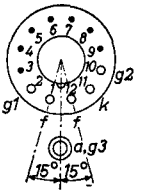
DEFLECTION: double magnetic

Dimensions in mm
Dimensions en mm
Abmessungen in mm



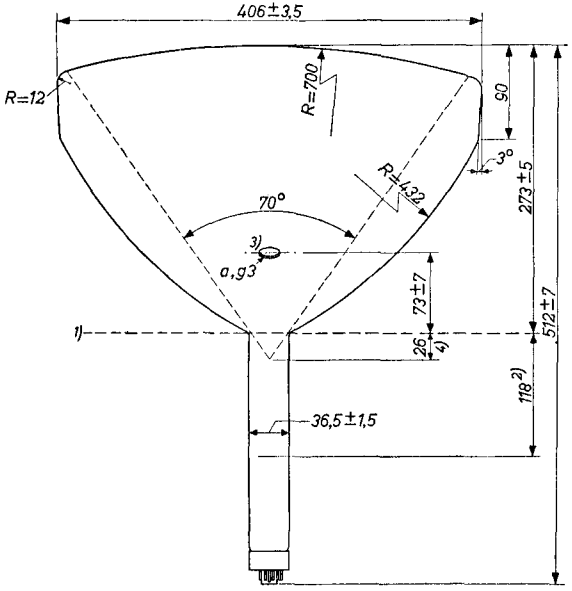
Base,culot,Sockel: DUODECAL 5-p



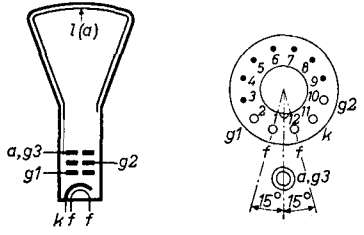


1)2)3)4)See page 3; voir page 3; siehe Seite 3

Dimensions in mm
Dimensions en mm
Abmessungen in mm



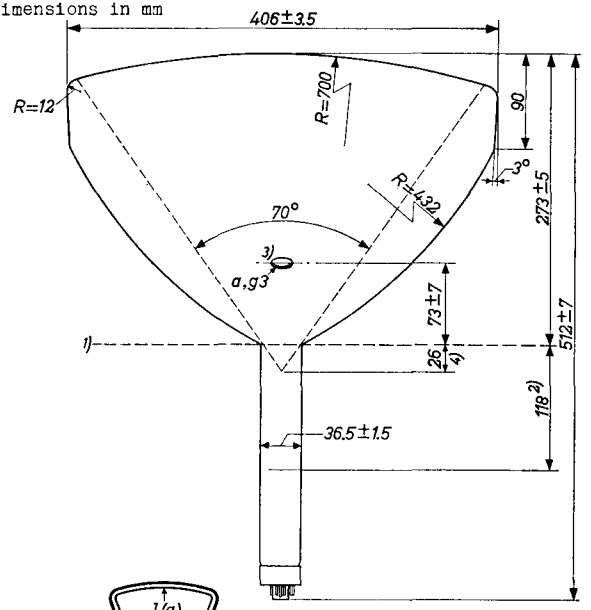
Base,culot,Sockel: DUODECAL 5-p

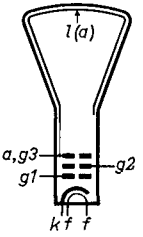


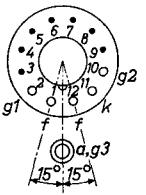
1)2)3)4)See page 3; voir page 3; siehe Seite 3

PHILIPS

Dimensions in mm







Base: DUODECAL 5 p

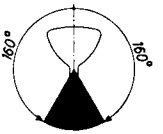
1) Reference line, see page 3

2) Recommended distance from reference line to centre of magnetic length of focusing unit

3) Recessed cavity contact

4) Distance from reference line to effective centre of deflection

Mounting position
Montage
Einbau



Deflection Déviation Ablenkung	double magnetic magnétique double doppel-magnetisch
Focusing Concentration Fokussierung	magnetic magnétique magnetisch

Operating characteristics
Caractéristiques d'utilisation
Betriebsdaten

$V_{a,g3}$	=	15 kV
V_{g2}	=	300 V
V_{g1}	=	-30/-70 V[5])
A[2])	=	118 mm

[1])Reference line, determined by the plane of the upper edge of the reference line gauge of page 5 when the gauge is resting on the cone

Ligne de référence, déterminée par le plan de la partie supérieure du calibre représenté à la page 5, lorsque celui-ci est appliqué contre le cône

Bezugslinie, bestimmt durch die Ebene des oberen Randes der Bezugslinielehre auf Seite 5 wenn diese auf dem Konus aufsitzt

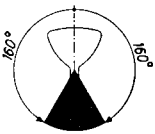
[2])Recommended distance from reference line to centre of magnetic length of focus unit
Distance recommandée de la ligne de référence au centre du longueur magnétique du dispositif de concentration
Empfohlener Abstand der Bezugslinie bis zur Mitte der magnetische Länge der Fokussiervorrichtung

[3])Recessed cavity contact, Contact à cavité enfoncé, Versenkter Druckknopfkontakt: Type CT8

[4])Distance from reference line to effective centre of deflection
Distance de la ligne de référence au centre de déviation effectif
Abstand der Bezugslinie bis zum effektiven Mittelpunkt der Ablenkung

[5])See page 4; voir page 4; siehe Seite 4

Mounting position
Montage
Einbau



Deflection Déviation Ablenkung	double magnetic magnétique double doppel-magnetisch
Focusing Concentration Fokussierung	magnetic magnétique magnetisch

Operating characteristics
Caractéristiques d'utilisation
Betriebsdaten

$V_{a,g3}$	=	15 kV
V_{g2}	=	300 V
V_{g1}	=	-30/-70 V [5]
A [2]	=	118 mm

[1] Reference line, determined by the plane of the upper edge of the reference line gauge of page 5 when the gauge is resting on the cone

Ligne de référence, déterminée par le plan de la partie supérieure du calibre représenté à la page 5, lorsque celui-ci est appliqué contre le cône

Bezugslinie, bestimmt durch die Ebene des oberen Randes der Bezugslinielehre auf Seite 5 wenn diese auf dem Konus aufsitzt

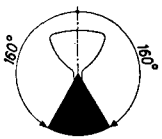
[2] Recommended distance from reference line to centre of magnetic length of focus unit
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Empfohlener Abstand der Bezugslinie bis zur Mitte der magnetische Länge der Fokussiervorrichtung

[3] Recessed cavity contact, Contact à cavité enfoncé, Versenkter Druckknopfkontakt: Type CT8

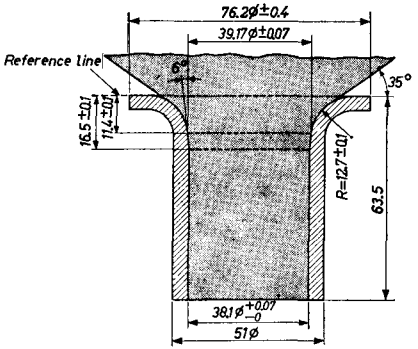
[4] Distance from reference line to effective centre of deflection
Distance de la ligne de référence au centre de déviation effectif
Abstand der Bezugslinie bis zum effektiven Mittelpunkt der Ablenkung

[5] See page 4; voir page 4; siehe Seite 4

MOUNTING POSITION



REFERENCE LINE GAUGE



The reference line is determined by the plane of the upper edge of the reference line gauge when the gauge is resting on the cone.

OPERATING CHARACTERISTICS

Grid No.3 voltage	V_{g3} =	15 kV
Grid No.2 voltage	V_{g2} =	300 V
Grid NO.1 voltage for visual cut-off	V_{g1} =	-30 to -70 V [1]
Location of focusing unit	A =	118 mm [2]

[1]) Grid No.1 voltage for visual extinction of undeflected focused spot. See also page B.

[2]) Recommended distance from reference line to centre of magnetic length of focusing unit

Limiting values (ABSOLUTE LIMITS)
Caractéristiques limites (LIMITES ABSOLUES)
Grenzdaten (ABSOLUTE WERTE)

$V_{a,g3}$	= max.	16 kV
$V_{a,g3}$	= min.	8 kV
V_{g2}	= max.	500 V
V_{g2}	= min.	200 V
$-V_{g1}$	= max.	200 V
$-V_{g1}$	= min.	1 V
V_{kf} (k pos.; f neg.)	= max.	150 V
V_{kf} (k neg.; f pos.)	= max.	150 V

Max. circuit values
Valeurs maximum des éléments du montage
Max. Werte der Schaltungsteile

R_{kf}	=	[6]
R_{g1}	=	1,5 MΩ
Z_{g1} (f = 50 c/s)	=	0,5 MΩ

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[5] Limits of negative grid No.1 voltage for visual extinction of the undeflected focused spot. Please refer also to p.B

Limites de la tension de la grille 1 pour l'extinction visuelle du spot lumineux concentré non-dévié. Voir aussi page B

Grenzwerte der negativen Spannung am Gitter 1 für optische Löschung des nicht-abgelenkten fokussierten Leuchtpunktes Siehe auch Seite B

[6] When the heater is supplied from a separate transformer R_{kf} = max. 1 MΩ. When the heater is in a series chain or earthed, Z_k (f = 50 c/s) = max. 0,1 MΩ

Quand le filament est alimenté par un transformateur séparé R_{kf} = max. 1 MΩ. Quand le filament est connecté dans une chaine série ou est mis à la terre, Z_k (f=50Hz)= max.0,1 MΩ

Wenn der Heizfaden von einem separaten Transformator gespeist wird, ist R_{kf} = max. 1 MΩ. Wenn der Heizfaden in einer Serienkette aufgenommen oder geerdet ist, ist Z_k (f = 50 Hz) = max. 0,1 MΩ

Limiting values (ABSOLUTE LIMITS)
Caractéristiques limites (LIMITES ABSOLUES)
Grenzdaten (ABSOLUTE WERTE)

$V_{a,g3}$	= max.	16 kV
$V_{a,g3}$	= min.	8 kV
V_{g2}	= max.	500 V
V_{g2}	= min.	200 V
$-V_{g1}$	= max.	200 V
$-V_{g1}$	= min.	1 V
V_{kf} (k pos.; f neg.)	= max.	150 V
V_{kf} (k neg.; f pos.)	= max.	150 V

Max. circuit values
Valeurs maximum des éléments du montage
Max. Werte der Schaltungsteile

R_{kf}	=	[6]
R_{g1}	=	1,5 MΩ
Z_{g1} (f = 50 c/s)	=	0,5 MΩ

---

[5] Limits of negative grid No.1 voltage for visual extinction of the undeflected focused spot. Please refer also to p.B

Limites de la tension de la grille 1 pour l'extinction visuelle du spot lumineux concentré non-dévié. Voir aussi page B

Grenzwerte der negativen Spannung am Gitter 1 für optische Löschung des nicht-abgelenkten fokussierten Leuchtpunktes Siehe auch Seite B

[6] When the heater is supplied from a separate transformer R_{kf} = max. 1 MΩ. When the heater is in a series chain or earthed, Z_k (f = 50 c/s) = max. 0,1 MΩ

Quand le filament est alimenté par un transformateur séparé R_{kf} = max. 1 MΩ. Quand le filament est connecté dans une chaine série ou est mis à la terre, Z_k (f=50Hz)= max.0,1 MΩ

Wenn der Heizfaden von einem separaten Transformator gespeist wird, ist R_{kf} = max. 1 MΩ. Wenn der Heizfaden in einer Serienkette aufgenommen oder geerdet ist, ist Z_k (f = 50 Hz) = max. 0,1 MΩ

PHILIPS

LIMITING VALUES (Absolute limits)

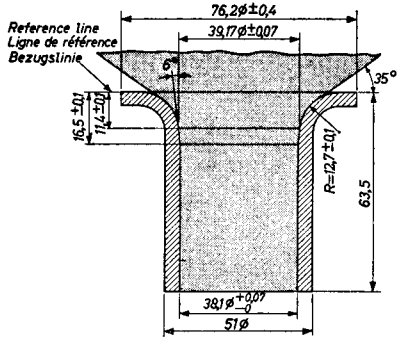
Grid No.3 voltage	V_{g_3}	= max. 16 kV = min. 8 kV
Grid No.2 voltage	V_{g_2}	= max. 500 V = min. 200 V
Negative grid No.1 voltage	$-V_{g_1}$	= max. 200 V = min. 1 V
Voltage between heater and cathode		
cathode negative	V_{kf}	= max. 150 V
cathode positive	V_{kf}	= max. 150 V

MAXIMUM CIRCUIT VALUES

Grid No.1 circuit resistance	R_{g_1}	= max. 1.5 MΩ
Grid No.1 circuit impedance at 50 c/s	Z_{g_1}	= max. 0.5 MΩ
Circuit resistance between heater and cathode	R_{kf}	= max. [1]

[1]) When the heater is supplied from a separate transformer R_{kf} = max. 1 MΩ. When the heater is in a series chain or earthed, Z_k = max. 0.1 MΩ, where Z_k is the 50 c/s impedance between earth and cathode

Reference line gauge
Calibre de la ligne de référence
Bezugslinienlehre

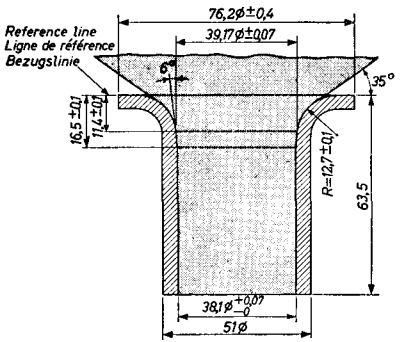


The inner surface of the coils must not extend into the shaded region

La surface intérieure des bobines ne doit pas saillir dans la region estompée

Die innere Oberfläche der Spulen darf nicht ins schattierte Gebiet ragen

Reference line gauge
Calibre de la ligne de référence
Bezugslinielehre



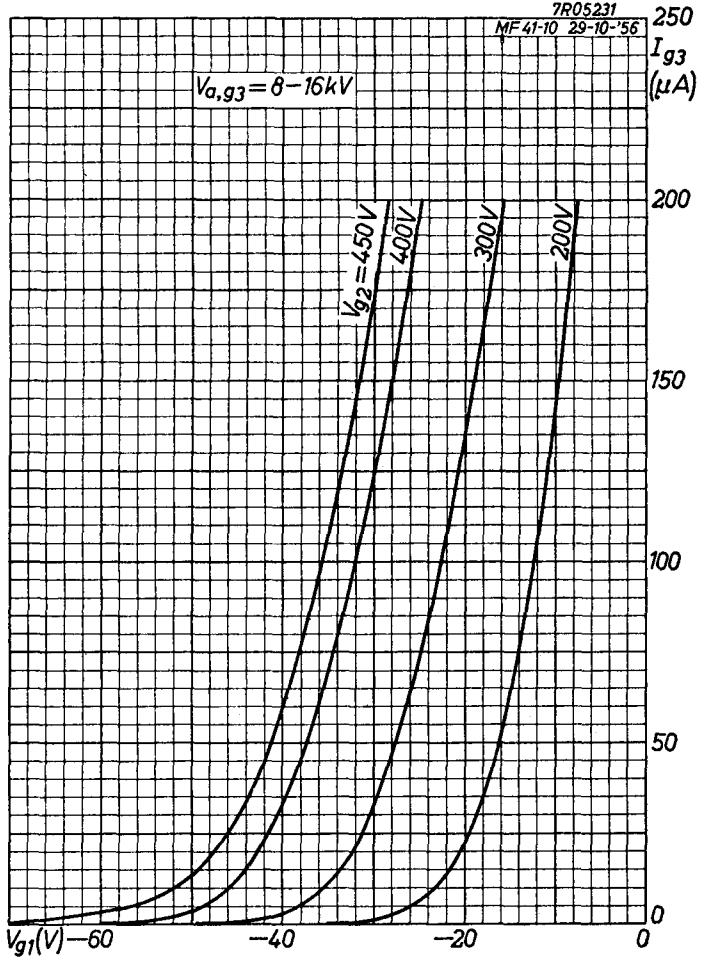
The inner surface of the coils must not extend into the shaded region

La surface intérieure des bobines ne doit pas saillir dans la region estompée

Die innere Oberfläche der Spulen darf nicht ins schattierte Gebiet ragen

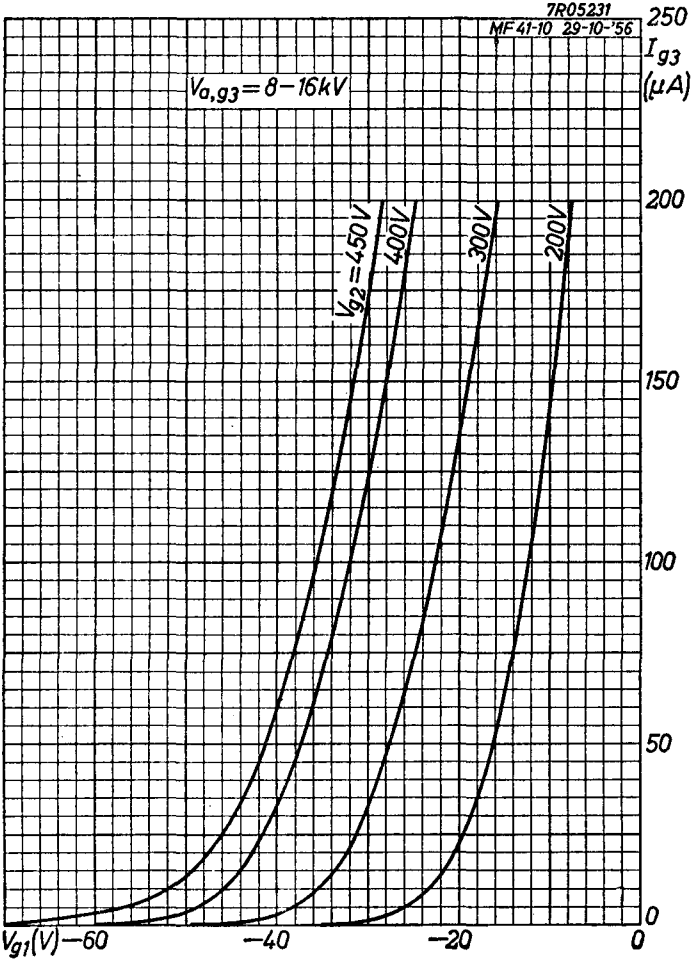
PHILIPS

MF 41-10



3.3.1957

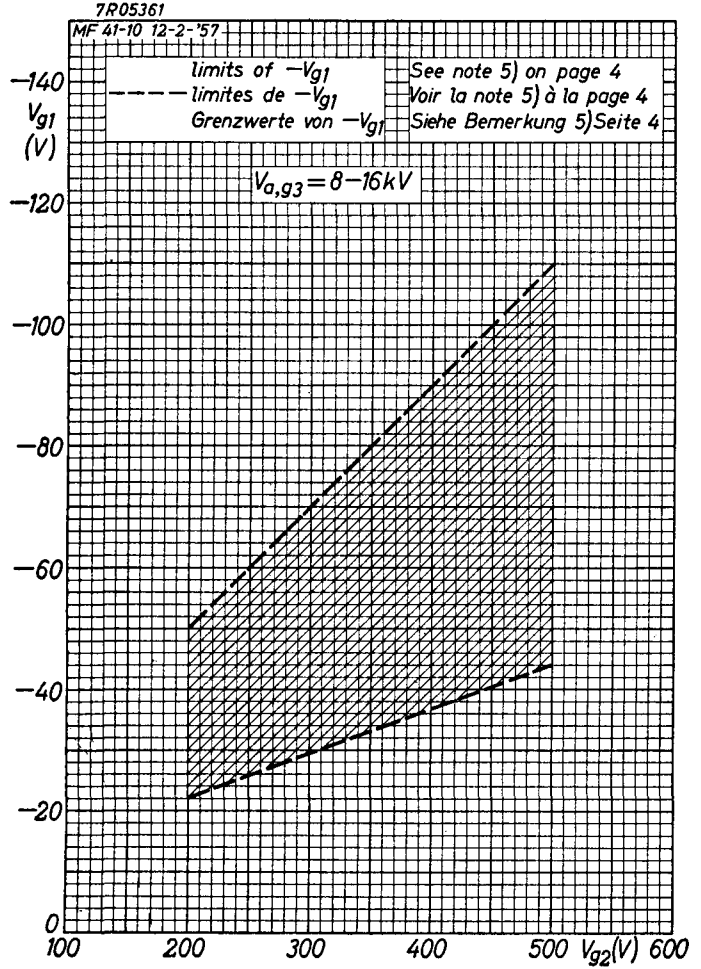
A


7R05231
MF41-10 29-10-'56
$V_{a,g3}$ = 8 – 16kV
V_{g2} = 450V
400V
300V
200V
I_{g3} (μA)
250
200
150
100
50
0
V_{g1}(V) –60
–40
–20
0

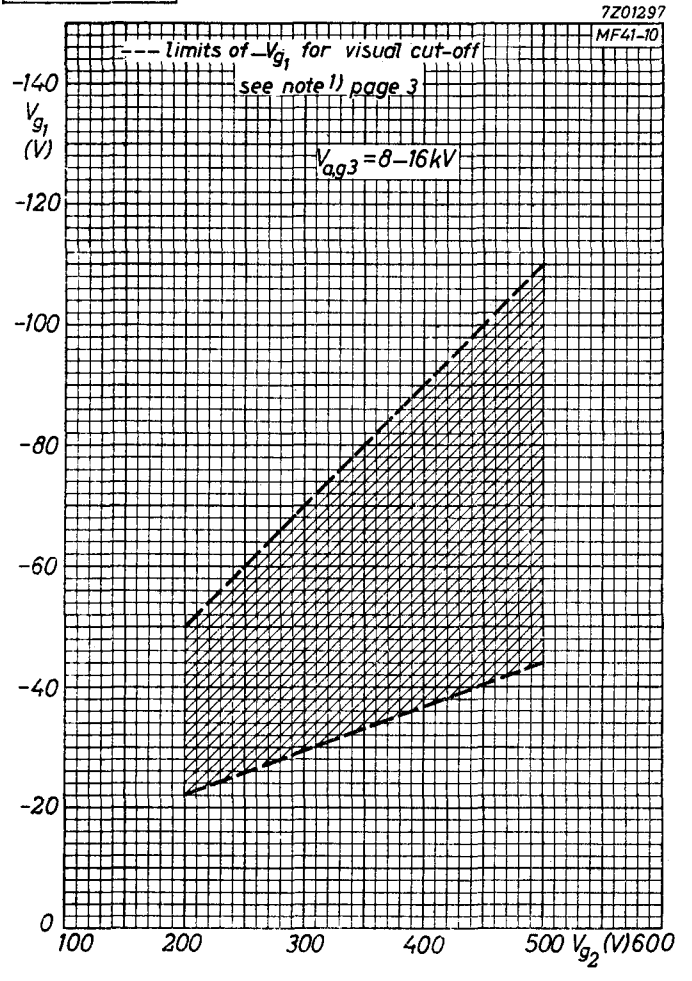
12.12.1962

A

PHILIPS


7R05361
MF 41-10 12-2-'57
limits of $-V_{g1}$
limites de $-V_{g1}$
Grenzwerte von $-V_{g1}$
See note 5) on page 4
Voir la note 5) à la page 4
Siehe Bemerkung 5) Seite 4
$V_{a,g3} = 8-16\,kV$
$-V_{g1}$ (V)
−140
−120
−100
−80
−60
−40
−20
0
100
200
300
400
500
V_{g2}(V)
600

PHILIPS


7Z01297
MF41-10
--- limits of $-V_{g_1}$ for visual cut-off
see note 1) page 3
$V_{a,g3}$ = 8–16 kV
$-V_{g_1}$ (V)
-140
-120
-100
-80
-60
-40
-20
0
100
200
300
400
500
600
V_{g_2} (V)

B

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Electronic Tube

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page	sheet	date
1	1	1957.03.03
2	1	1959.04.04
3	1	1962.12.12
4	2	1957.03.03
5	2	1959.04.04
6	2	1962.12.12
7	3	1957.03.03
8	3	1959.04.04
9	3	1962.12.12
10	4	1957.03.03
11	4	1959.04.04
12	4	1962.12.12
13	5	1957.03.03
14	5	1959.04.04
15	A	1957.03.03
16	A	1962.12.12
17	B	1957.03.03
18	B	1962.12.12
19	FP	1999.09.11

RADAR TUBE with metal-backed screen and metal cone
TUBE RADAR avec écran aluminisé et cône métallique
RADARRÖHRE mit metallhinterlegtem Schirm und Metallkonus

Heating : indirect by A.C. or D.C. series or parallel supply Chauffage: indirect par C.A. ou C.C. alimentation série ou parallèle Heizung : indirekt durch Wechsel- oder Gleichstrom; Serien- oder Parallelspeisung	V_f = 6,3 V[1] I_f = 0,3 A	
Capacitances Capacités Kapazitäten	C_{g1} < 8 pF C_k < 8 pF	
Screen Ecran Schirm	Colour Couleur Farbe	orange
	Useful diameter Diamètre utile Nützlicher Durchmesser	min. 360 mm

For curves of the screen properties see front of this section
Pour les courbes des propriétés de l'écran voir en tête de ce chapitre
Für die Kurven der Schirmeigenschaften siehe am Anfang dieses Abschnitts

[1]) When the tube is used in a series heater chain, the heater voltage must not exceed 9.5 V when the supply is switched on. If necessary a current limiting device must be used for this purpose

Si le tube est monté dans une chaîne série de filaments, la tension de chauffage ne doit pas dépasser 9,5 V à la mise en circuit. En cas de besoin il faut utiliser un limiteur de courant pour ce but

Wenn die Röhre in einer Heizfadenkette verwendet wird, darf die Heizspannung beim Einschalten 9,5 V nicht überschreiten. Nötigenfalls ist zu diesem Zweck ein Strombegrenzer zu verwenden

RADAR TUBE with metal-backed screen and metal cone
TUBE RADAR avec écran aluminisé et cône métallique
RADARRÖHRE mit metallhinterlegtem Schirm und Metallkonus

Heating : indirect by A.C. or D.C. series or parallel supply Chauffage: indirect par C.A. ou C.C. alimentation série ou parallèle Heizung : indirekt durch Wechsel- oder Gleichstrom; Serien- oder Parallelspeisung	V_f = 6,3 V I_f = 0,3 A	
Capacitances Capacités Kapazitäten	C_{g1}	< 8 pF
	C_k	< 8 pF
Screen Colour Ecran Couleur Schirm Farbe	orange	
Useful diameter Diamètre utile Nützlicher Durchmesser	min. 360 mm	

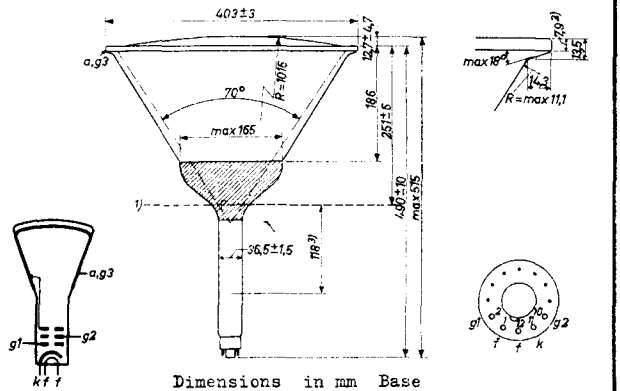
Operating characteristics
Caractéristiques d'utilisation
Betriebsdaten

$V_{a,g3}$	= 12 kV
V_{g2}	= 300 V
$-V_{g1}$ (I_l = 0 µA)	= 30-70 V

Limiting values (ABSOLUTE LIMITS)
Caractéristiques limites (LIMITES ABSOLUES)
Grenzdaten (ABSOLUTE WERTE)

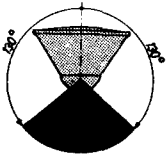
$V_{a,g3}$	= max.	16 kV
	= min.	8 kV
V_{g2}	= max.	500 V
	= min.	200 V
V_{g1}	= max.	0 V
$-V_{g1}$	= max.	200 V
V_{g1_p}	= max.	2 V
I_{k_p}	= max.	150 µA
V_{kf}	= max.	150 V
R_{kf}	= max.	1 MΩ
R_{g1}	= max.	1,5 MΩ

PHILIPS



Dimensions in mm Base
Dimensions en mm Culot Duodecal 5p.
Abmessungen in mm Sockel

Mounting position
Montage
Aufstellung



The tube socket should not be rigidly mounted but should be allowed to move freely and have flexible leads
Le support du tube ne peut être monté d'une manière rigide mais il doit pouvoir se mouvoir librement et doit être connecté par des conducteurs flexibles
Die Röhrenfassung ist nicht starr zu befestigen aber soll frei beweglich sein und flexible Zuleitungen haben

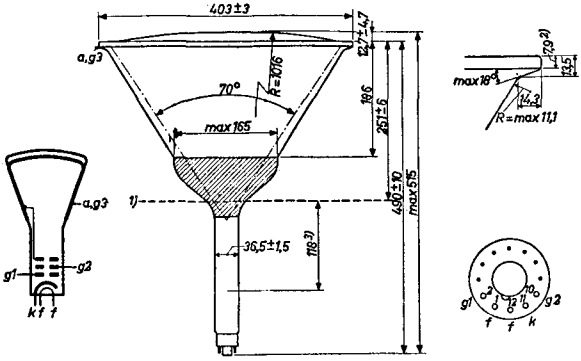
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1) Reference line, determined by the plane of the upper edge of the reference line gauge when the gauge is resting on the cone
Ligne de référence, déterminée par le plan du bord supérieur du calibre de la ligne de référence, si celui-ci pose sur le cône
Bezugslinie, bestimmt durch die Ebene des oberen Randes der Bezugslinienlehre wenn diese auf dem Konus ruht

2) Min. contact area
Surface de contact min.
Min. Kontaktfläche

3) Distance from focusing centre to reference line
Distance du centre de concentration au ligne de référence
Abstand des Fokussierungsmittelpunktes bis zur Bezugslinie

PHILIPS

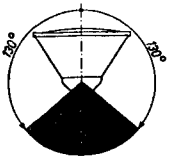


Dimensions in mm
Dimensions en mm
Abmessungen in mm

Base
Culot
Sockel

DUODECAL 5-p

Mounting position
Montage
Einbau



Deflection and focusing
Déviation et concentration
Ablenkung und Fokussierung

Magnetic
Magnétique
Magnetisch

---

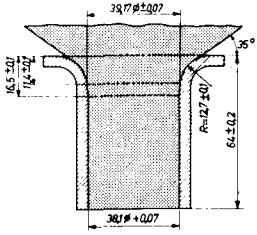
1) Reference line, determined by the plane of the upper edge of the reference line gauge when the gauge is resting on the cone

Ligne de référence, déterminée par le plan du bord supérieur du calibre de référence, lorsque celui-ci vient au contact du cône

Bezugslinie, bestimmt durch die Ebene des oberen Randes der Bezugslinienlehre wenn diese auf dem Konus aufsitzt

2) Min. contact area; Surface de contact min.
Min. Kontaktfläche

3) Distance from focusing centre to reference line
Distance du centre de concentration à la ligne de référence
Abstand des Fokussierungsmittelpunktes bis zur Bezugslinie



Reference line gauge. The inner surface of the coils must not extend into the shaded region.

Calibre de la ligne de référence. La surface intérieure des bobines ne doit pas saillir dans la région estompée.

Bezugslinienlehre. Die innere Oberfläche der Spulen muss nicht im schattierten Gebiet ausragen.

Remark Any material in contact with the cone or the face must have insulating properties adequate for 17 kV.

Observation Les matériaux en contact avec le cône ou la face doivent avoir des propriétés d'isolement pour 17 kV.

Bemerkung Material in Kontakt mit dem Konus oder der Vorderseite muss Isolationseigenschaften für 17 kV haben.

Deflection and focusing magnetic
Déviation et concentration magnétique
Ablenkung und Fokussierung magnetisch

Operating conditions
Caractéristiques d'utilisation
Betriebsdaten

V_a	=	12 kV
V_{g2}	=	300 V
$-V_{g1}(I_a=0)$	=	30-70 V

Limiting values (absolute limits)
Caractéristiques limites (limites absolues)
Grenzdaten (absolute Grenzen)

V_a	= max.	16 kV
V_a	= min.	6 kV
V_{g2}	= max.	450 V
V_{g2}	= min.	200 V
$-V_{g1}$	= max.	200 V
$-V_{g1}$	= min.	0 V
V_{g1p}	= max.	2 V
V_{kf}	= max.	125 V
I_{kp}	= max.	150 µA
R_{g1}	= max.	0,5 MΩ
R_{fk}	= max.	20 kΩ

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page	sheet	date
1	1	1954.04.04
2	1	1957.05.05
3	2	1954.04.04
4	2	1957.05.05
5	3	1953.02.02
6	FP	1999.09.11

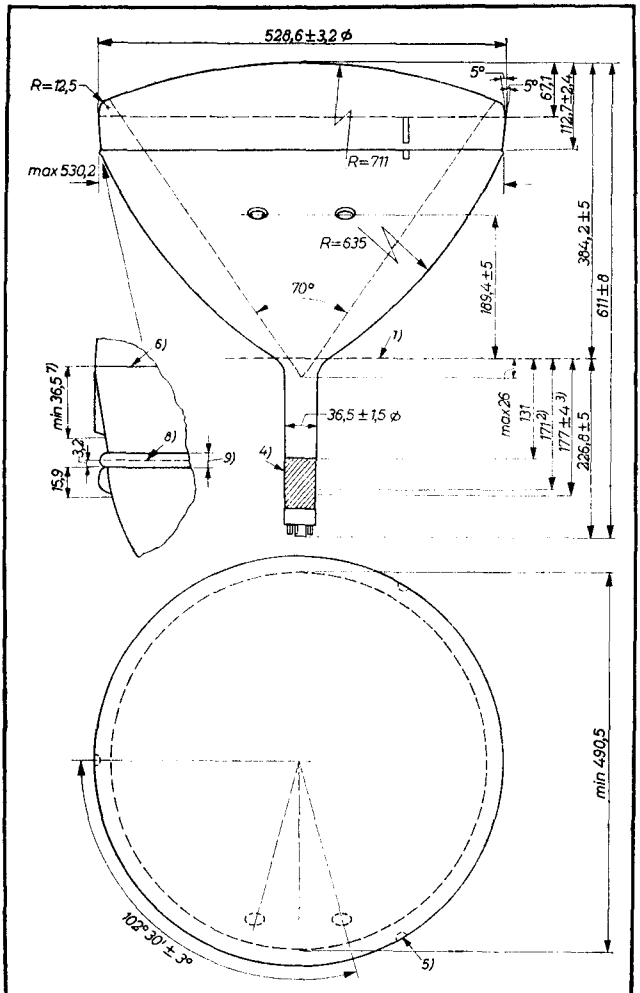
RADAR CATHODE-RAY TUBES with round metal-backed screen and magnetic deflection and focusing
TUBES A RAYONS CATHODIQUES RADAR avec écran aluminisé rond et concentration et déflection magnétiques
RADAR-KATODENSTRAHLRÖHREN mit rundem, metallhinterlegtem Schirm und magnetischer Fokussierung und Ablenkung

Heating : indirect by A.C. or D.C. parallel supply		
Chauffage: indirect par C.A. ou C.C. alimentation parallèle	V_f = 6,3 V	
Heizung : indirekt durch Wechsel- oder Gleichstrom Parallelspeisung	I_f = 300 mA	
Capacitances	C_{g1} = 5 pF	
Capacités	C_k = 5 pF	
Kapazitäten		
Screen	Metal backed	
Ecran	Aluminisé	
Schirm	Metallhinterlegt	
Colour	orange	
Couleur	orange	
Farbe	orange	
Light transmission		
Transmission de lumière	72%	
Lichtdurchlässigkeit		
Useful diameter		
Diamètre utile	min. 490,5 mm	
Nutzbarer Durchmesser		

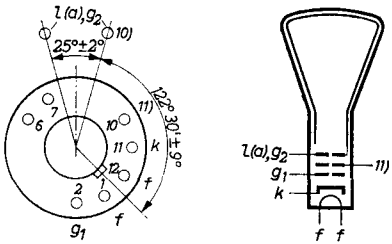
For curves of the screen properties please refer to front of this section
Pour les courbes caractéristiques de l'écran voir en tête de ce chapitre
Für die Kurven der Schirmeigenschaften siehe am Anfang dieses Abschnitts

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Dimensions in mm. Dimensions en mm. Abmessungen in mm.



Base, culot, Sockel: DUODECAL 7 p

Mounting position: any
Montage: à volonté
Einbau: beliebig

1) Reference line, determined by the plane of the upper edge of the flange of the reference line gauge when the gauge is resting on the cone
Ligne de référence, déterminée par le plan du bord supérieur de la bride du calibre de la ligne de référence, si celui-si repose sur le cône
Bezugslinie, bestimmt durch die Ebene des oberen Flanschrandes der Bezugslinienlehre, wenn diese auf dem Konus ruht

2) This space should be kept clear for deflection yoke and focusing coil
Emplacement des bobines de déviation et de concentration
Raum für die Ablenk- und Fokussierungsspulen

3) Distance from reference line to top centre of grid
Distance entre la ligne de référence et le centre de la surface supérieure de la grille
Abstand zwischen Bezugslinie und Mittelpunkt der Oberseite des Gitters

4) The external conductive coating should be earthed
La couche conductive extérieure doit être mise à la terre
Der leitende Aussenschicht soll geerdet werden

5) 3 pairs of funnel pads, spaced 120°. The effective width of a funnel pad is max. 16 mm
3 paires de cames de guidage, espacées de 120°. La largeur d'une came de guidage est de 16 mm au max.
3 Paare Führungszapfen, 120° von einander entfernt. Die Breite eines Führungszapfens ist max. 16 mm

6) Mold match line; ligne de jonction du moule
Anschlussnaht der Giessform

7) Undisturbed area excluding pads
Surface sans perturbations, sauf les cames de guidage
Störfreie Fläche, mit Ausnahme der Führungszapfen

8)9)10)11) See page 6; voir page 6; siehe Seite 6.

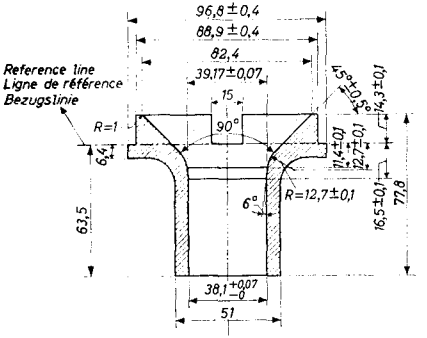
PHILIPS

The socket for the base should not be rigidly mounted; it should have flexible leads and be allowed to move freely. The bottom circumference of the base shell will fall within a circle concentric with the bulb axis and having a diameter of 55 mm

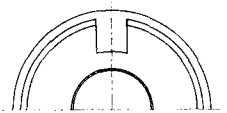
Le support du tube ne pouvra être monté rigidement; il devra être connecté par des conducteurs flexibles lui permettant de se mouvoir librement. La circonférence du support sera dans un cercle concentrique avec l'axe de l'ampoule et ayant un diamètre de 55 mm

Die Röhrenfassung ist nicht starr zu befestigen aber soll frei beweglich sein und flexible Zuleitungen haben. Der Umfang der Fassung fällt innerhalb eines Kreises der konzentrisch mit der Kolbenachse ist und einen Durchmesser von 55 mm hat

Reference line gauge
Calibre de la ligne de référence
Bezugslinienlehre



Dimensions in mm
Dimensions en mm
Abmessungen in mm



Deflection Déviation Ablenkung	magnetic magnétique magnetisch
Deflection angle Angle de déviation Ablenkungswinkel	70°

Focusing Concentration Fokussierung	magnetic magnétique magnetisch	
Focusing coil Bobine de concentration Fokussierungsspule	AT1997	
Typical characteristics Caractéristiques types Kenndaten		
	V_a =	25 kV
$-V_{g1}$ for visual extinction of focused raster $-V_{g1}$ pour l'extinction visuelle d'une trame concentrée $-V_{g1}$ für optische Löschung eines fokussierten Rasters	=	60-120 V
Drive voltage for I_a = 100 µA Tension de commande pour I_a = 100 µA Steuerspannung für I_a = 100 µA	= max.	45 V
Light output at I_a = 50 µA with close raster of convenient size Intensité lumineuse à I_a = 50 µA avec trame serrée de dimensions convenable Lichtstärke bei I_a = 50 µA mit einem dichten Raster geeigneter Abmessungen	=	3,5 candela
Diameter of undeflected, unfocused spot at I_a = 100 µA Diamètre de la tache lumineuse non-déviée et non-concentrée à I_a = 100 µA Durchmesser des nicht abgelenkten und nicht-fokussierten Leuchtflecks bei I_a = 100 µA	= max.	18 mm
Deviation from screen centre of undeflected, unfocused spot Déviation du centre de l'écran de la tache lumineuse non-déviée et non-concentrée Abweichung des nicht-abgelenkten, nicht-fokussierten Leuchtfleckes vom Schirmmittelpunkt	= max.	20 mm
Line width at I_a = 100 µA Epaisseur de la ligne à I_a = 100 µA Linienbreite bei I_a = 100 µA	= max.	0,6 mm [1]

[1]) See page 6; voir page 6; siehe Seite 6.

Limiting values (Absolute limits)
Caractéristiques limites (Limites absolues)
Grenzdaten (Absolute Grenzwerte)

V_a	= max.	27 kV
$-V_{g1}$	= max.	200 V
$+V_{g1}$	= max.	0 V
$+V_{g1p}$	= max.	2 V
V_{kf} (k pos., f neg.)	= max.	200 V
V_{kf} (k neg., f pos.)	= max.	125 V

Pages 2,3; Seiten 2,3.

[8]) Seal line
Ligne de scellement
Anschmelzlinie

[9]) Seal area
Surface de scellement
Anschmelzfläche

[10]) Small cavity contacts
Petits contacts en creux
Kleine Druckknopfkontakte

[11]) Spark trap, to be earthed
Piège à étincelles, devant être mis à la terre
Funkenfänger, soll geerdet werden

---

[1]) Page 5; Seite 5.

Measured at the centre of the screen with a normal interlaced 625 lines television raster with a width of 490 mm. Distance between top centre of grid and focusing centre 55 mm.
Mésuré au centre de l'écran avec une trame de télévision entrelacée de 625 lignes d'une largeur de 490 mm. Distance entre le centre de la surface supérieure de la grille et le centre de focalisation de 55 mm
Gemessen in der Schirmmitte mit einem normalen Fernsehraster von 625 Zeilen mit Zwischenzeilenabtastung. Breite des Rasters 490 mm. Abstand zwischen dem Mittelpunkt der Oberseite des Gitters und Fokussierungszentrum 55 mm

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Electronic Tube

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MF53-10 ML53-10

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1	1	1961.10.10
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5	5	1961.10.10
6	6	1961.10.10
7	FP	1999.09.11

COLOUR TELEVISION PROJECTION TUBES

SCREEN

For screen properties please refer to front of this section

Useful screen diameter = min. 55 mm

HEATING

Indirect by A.C. or D.C.

Heater voltage V_f = 6.3 V

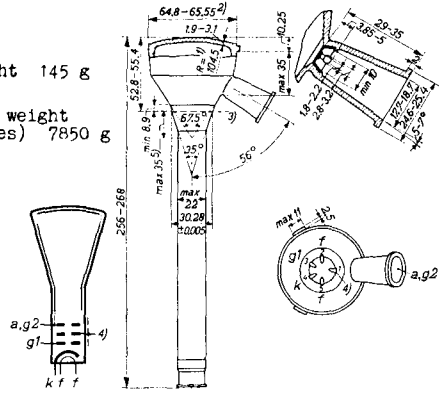
Heater current I_f = 0.3 A

Dimensions in mm

Base: V

Net weight 145 g

Shipping weight (10 pieces) 7850 g



The tolerance of the position of the base with respect to the tube is ± 10°

---

1) Inner radius of curvature of the face plate
The deviation of the centre of the outer radius of curvature with respect to the centre line of the neck is max. 2 mm

2) Eccentricity of the face plate with respect to the centre line of the neck is max. 0.9 mm

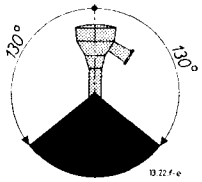
3) Reference line, determined by the diameter of 30.28 ± 0.005 mm

4) Spark trap and outer coating. This connection must be earthed

5) The distance from the deflection centre to the reference line should not exceed 35 mm

PHILIPS

MOUNTING POSITION



CAPACITANCES

Grid No.1 to all other electrodes	C_{g_1}	=	6.3 pF
Cathode to all other electrodes	C_k	=	6.3 pF
Anode and grid No.2 to outer conductive coating	$C_{a,g2-m}$	=	450 pF

FOCUSING Magnetic

Focusing coil with iron casing

Number of ampere-turns at an anode and grid No.2 voltage of 25 kV	920 [1]
Air gap	11 to 13 mm
Distance from the centre of the air gap to the reference line	83 to 87 mm
Inner diameter of the inner bush	27.5 mm

For centring it is necessary that the focusing coil can be tilted over 3° to either side

DEFLECTION Magnetic

OPERATING CHARACTERISTICS

Anode and grid No.2 voltage	$-V_{a,g_2}$	=	25 kV
Negative grid No.1 voltage for cut-off	$-V_{g_1}(I_\ell=0)$	=	40 to 90 V

[1]) Without saturation of the iron casing
In order to reduce the influence of voltage fluctuations it is, however, advisable to saturate the iron to such an extent that the required number of ampere-turns becomes about 10 % higher

REMARKS

Measures should be taken for the beam current to be switched off immediately when one of the time-base circuits becomes defective

An X-ray radiation shielding with an equivalent lead thickness of 0.5 mm is required to protect the observer. When the tube is used in an optical box, the screening by the box will in general be sufficient

LIMITING VALUES (Design centre limits)

Anode and grid No.2 voltage	$V_{a,g2}$	= max. 25 kV[1])
Negative grid No.1 voltage	$-V_{g1}$	= max. 200 V [2])
External grid No.1 resistance	R_{g1}	= max. 1.5 MΩ
External resistance between heater and cathode	R_{kf}	= max. 20 kΩ
Voltage between heater and cathode	V_{kf}	= max. 125 V [2])

[1]) At nominal mains voltage and with a raster area of at least 14 cm^2 and a spot velocity of at least 450 m/s the load curve of the E.H.T. unit should not at any point go beyond the curve I on page B. It is desirable that under these conditions the design load curve is in accordance with curve II

The total charge of the filter capacitors in the supply unit should not exceed 130 μC

The curves on page B refer to application in normal colour television receivers. In case of other applications the average current should be limited to 200 μA

[2]) During the operation of the security circuit

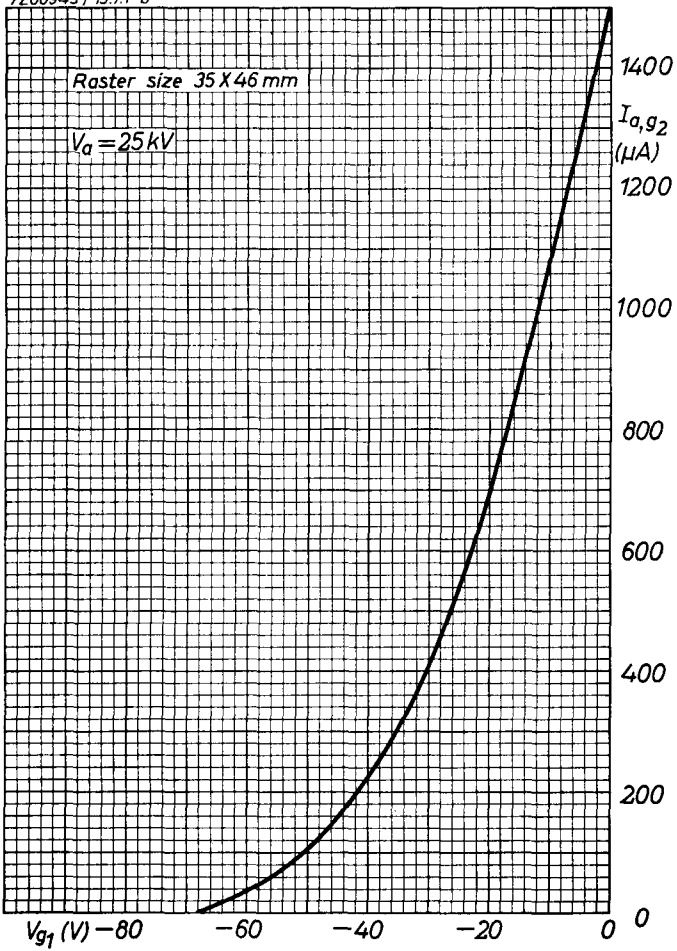
$-V_{g1}$ = max. 300 V

V_{kf} = max. 250 V

PHILIPS

MG6-2
MU6-2
MY6-2

7Z00943 / 13.7.f-b



3.3.1963

A

PHILIPS

7Z01613/13.23.5.b
See note 1) page 3
I
II
V_{a,g_2} (kV)
28
26
24
22
20
0
100
200
300
400
500
600
I_L (μA)

PHILIPS

Electronic Tube

HANDBOOK

MG6-2 MU6-2 MY6-2

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5	B	1963.03.03
6	FP	1999.09.11

RADAR CATHODE-RAY PROJECTION TUBE

SCREEN

For screen properties please refer to front of this section

Useful screen diameter = min. 55 mm

HEATING

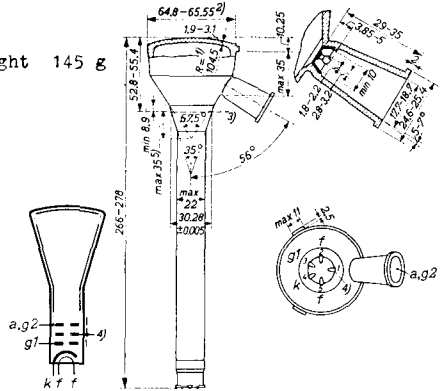
Indirect by A.C. or D.C. Heater voltage V_f = 6.3 V

Heater current I_f = 0.3 A

Dimensions in mm

Base: V

Net weight 145 g



The tolerance of the position of the base with respect to the tube is ± 10°

1) Inner radius of curvature of the face plate
The deviation of the centre of the outer radius of curvature with respect to the centre line of the neck is max. 2 mm

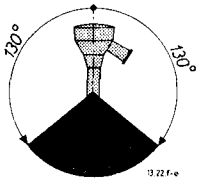
2) Eccentricity of the face plate with respect to the centre line of the neck is max. 0.9 mm

3) Reference line, determined by the diameter of 30.28 ± 0.005 mm

4) Spark trap and outer coating. This connection must be earthed

5) The distance from the deflection centre to the reference line should not exceed 35 mm

MOUNTING POSITION



CAPACITANCES

Grid No.1 to all other electrodes	C_{g_1}	=	6.3 pF
Cathode to all other electrodes	C_k	=	6.3 pF
Anode and grid No.2 to outer conductive coating	$C_{a,g_{2-m}}$	=	450 pF

FOCUSING Magnetic

Focusing coil with iron casing

Number of ampere-turns at an anode and grid No.2 voltage of 25 kV	865 [1]
Air gap	11 to 13 mm
Distance from the centre of the the air gap to the reference line	83 to 87 mm
Inner diameter of the inner bush	27.5 mm

For centring it is necessary that the focusing coil can be tilted over 3° to either side

DEFLECTION Magnetic

UNDEFLECTED SPOT ECCENTRICITY max. 5 mm

OPERATING CHARACTERISTICS

Anode and grid No.2 voltage	V_{a,g_2}	= 25 kV
Negative grid No.1 voltage for cut-off	$-V_{g_1}(I_\ell=0)$	= 50 to 90 V
Peak beam current (max. duration 10 µsec)	I_ℓ (T=max.10 µsec)	= 1000 µA

[1]) Without saturation of the iron casing
In order to reduce the influence of voltage fluctuations it is, however, advisable to saturate the iron to such an extent that the required number of ampere-turns becomes about 10 % higher

REMARKS

Measures should be taken for the beam current to be switched off immediately when one of the time-base circuits becomes defective

An X-ray radiation shielding with an equivalent lead thickness of 0.5 mm is required to protect the observer. When the tube is used in an optical box, the screening by the box will in general be sufficient

LIMITING VALUES (Design centre limits, unless otherwise specified)

Anode and grid No.2 voltage (absolute limit)	V_a	= max. 27 kV [1]
Grid No.1 voltage		
negative value	$-V_{g_1}$	= max. 200 V [2]
positive value	$+V_{g_1}$	= max. 0 V
peak positive value	$+V_{g_1\,p}$	= max. 2 V
External grid No.1 resistance	R_{g_1}	= max. 1.5 MΩ
External resistance between heater and cathode	R_{kf}	= max. 20 kΩ
Voltage between heater and cathode	V_{kf}	= max. 125 V [2]
Current	I_{a,g_2}	= max. 200 μA

[1]) The total charge of the filter capacitors in the supply unit should not exceed 130 μC

[2]) During the operation of the security circuit

$-V_{g_1}$ = max. 300 V

V_{kf} = max. 250 V

PHILIPS

Electronic Tube

HANDBOOK

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3	3	1963.03.03
4	FP	1999.09.11

TELEVISION VIEWFINDER TUBE with metal-backed screen
TUBE VISEUR DE TELEVISION avec écran aluminisé
FERNSEHSUCHERROHRE mit metallhinterlegtem Schirm

Heating : indirect by A.C. or D.C. series or parallel supply Chauffage: indirect par C.A. ou C.C. alimentation série ou parallèle Heizung : indirekt durch Wechsel- oder Gleichstrom; Serien- oder Parallelspeisung	V_f = 6,3 V[1]) I_f = 0,3 A	
Capacitances Capacités Kapazitäten	C_{g1} < 10 pF C_K < 10 pF	
Screen Ecran Schirm	Colour Couleur Farbe	white blanche weiss
	Useful diameter Diamètre utile Nützlicher Durchmesser	min. 108 mm

For curves of the screen properties see front of this section
Pour les courbes des propriétés de l'écran. voir en tête de ce chapitre
Für die Kurven der Schirmeigenschaften siehe am Anfang dieses Abschnitts

---

[1])When the tube is used in a series heater chain, the heater voltage must not exceed 9.5 V when the supply is switched on. If necessary a current limiting device must be used for this purpose

Si le tube est monté dans une chaîne série de filaments, la tension de chauffage ne doit pas dépasser 9,5 V à la mise en circuit. En cas de besoin il faut utiliser un limiteur de courant pour ce but

Wenn die Röhre in einer Heizfadenkette verwendet wird, darf die Heizspannung beim Einschalten 9,5 V nicht überschreiten. Nötigenfalls ist zu diesem Zweck ein Strombegrenzer zu verwenden

TELEVISION VIEWFINDER TUBE with metal-backed screen
TUBE VISEUR DE TELEVISION avec écran aluminisé
FERNSEHSUCHERROHRE mit metallhinterlegtem Schirm

Heating : indirect by A.C. or D.C. series or parallel supply Chauffage: indirect par C.A. ou C.C. alimentation série ou parallèle Heizung : indirekt durch Wechsel- oder Gleichstrom; Serien- oder Parallelspeisung	V_f = 6,3 V[1] I_f = 0,3 A	
Capacitances Capacités Kapazitäten	C_{g1} < 10 pF C_k < 10 pF	
Screen Ecran Schirm	Colour Couleur Farbe	white blanche weiss
	Useful diameter Diamètre utile Nützlicher Durchmesser	min. 108 mm

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[1])When the tube is used in a series heater chain, the heater voltage must not exceed 9.5 V when the supply is switched on. If necessary a current limiting device must be used for this purpose

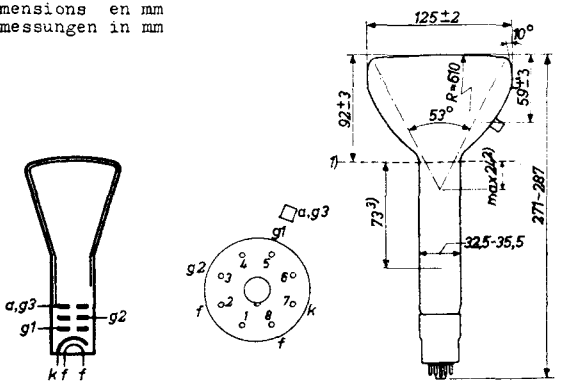
Si le tube est monté dans une chaîne série de filaments, la tension de chauffage ne doit pas dépasser 9,5 V à la mise en circuit. En cas de besoin il faut utiliser un limiteur de courant pour ce but

Wenn die Röhre in einer Heizfadenkette verwendet wird, darf die Heizspannung beim Einschalten 9,5 V nicht überschreiten. Nötigenfalls ist zu diesem Zweck ein Strombegrenzer zu verwenden

9398 1926
4.4.1959

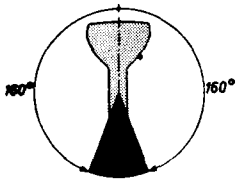
PHILIPS

Dimensions in mm
Dimensions en mm
Abmessungen in mm



Base, culot, Sockel: Octal 8p.

Mounting position
Montage
Aufstellung



---

1) Reference line, determined by the diameter of 36 mm
Ligne de référence, déterminée pas le diamètre de 36 mm
Bezugslinie, bestimmt durch den Durchmesser von 36 mm

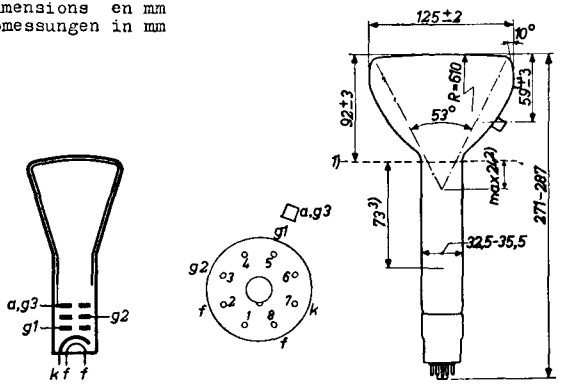
2) The distance from deflection centre to reference line should not exceed 24 mm

La distance du centre de déviation au ligne de référence ne dépassera pas 24 mm

Der Abstand des Ablenkungsmittelpunktes bis zur Bezugslinie soll 24 mm nicht überschreiten

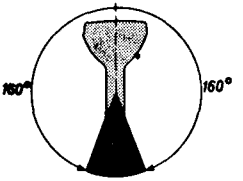
3) Distance from focusing centre to reference line
Distance du centre de concentration au ligne de référence
Abstand des Fokussierungsmittelpunktes bis zur Bezugslinie

Dimensions in mm
Dimensions en mm
Abmessungen in mm



Base, culot, Sockel: Octal 8p.

Mounting position
Montage
Aufstellung



---

1) Reference line, determined by the diameter of 36 mm
Ligne de référence, déterminée par le diamètre de 36 mm
Bezugslinie, bestimmt durch den Durchmesser von 36 mm

2) The distance from deflection centre to reference line should not exceed 24 mm

La distance du centre de déviation au ligne de référence ne dépassera pas 24 mm

Der Abstand des Ablenkungsmittelpunktes bis zur Bezugslinie soll 24 mm nicht überschreiten

3) Distance from focusing centre to reference line
Distance du centre de concentration au ligne de référence
Abstand des Fokussierungsmittelpunktes bis zur Bezugslinie

→

Deflection and focusing Déviation et concentration Ablenkung und Fokussierung	magnetic magnétique magnetisch

Net weight
Poids net 500 g
Nettogewicht

Operating characteristics
Caractéristiques d'utilisation
Betriebsdaten

V_a	=	7 kV
V_{g2}	=	300 V
$-V_{g1}(I_a=0)$	=	30 - 70 V

Limiting values (absolute limits)
Caractéristiques limites (limites absolues)
Grenzdaten (absolute Grenzen)

V_a	= max.	11 kV
V_a	= min.	5,5 kV
V_{g2}	= max.	500 V
V_{g2}	= min.	200 V
V_{g1}	= max.	0 V
$-V_{g1}$	= max.	200 V
V_{g1_p}	= max.	2 V
V_{kf} (k pos.;f neg.)	= max.	200 V
V_{kf} (k neg.;f pos.)	= max.	125 V

Max. circuit values
Valeurs max. des éléments du montage
Max. Werte der Schaltungsteile

R_{kf}	=	1 MΩ[1]
R_{g1}	=	1,5 MΩ
Z_{g1}(f =50 c/s)	=	0,5 MΩ

[1] When the heater is supplied from a separate transformer. When the heater is in a series chain, or earthed to A.C., Z_k (f =50 c/s)= max. 0.1 MΩ

Quand le filament est alimenté par un transformateur séparé.
Quand le filament est connecté dans une chaîne série, ou est mise à la terre pour C.A., Z_k (f = 50 c/s)= max. 0,1 MΩ

Wenn der Heizfaden von einem separaten Transformator gespeist wird.
Wenn der Heizfaden in einer Serienkette aufgenommen oder für Wechselstrom geeerdet ist, Z_k(f=50Hz)=max.0,1MΩ

Deflection and focusing — magnetic
Déviation et concentration — magnétique
Ablenkung und Fokussierung — magnetisch

Net weight
Poids net 500 g
Nettogewicht

Operating characteristics
Caractéristiques d'utilisation
Betriebsdaten

V_a	= 7	kV
V_{g2}	= 300	V
$-V_{g1}(I_a=0)$	= 30 - 70	V

Limiting values (absolute limits)
Caractéristiques limites (limites absolues)
Grenzdaten (absolute Grenzen)

V_a	= max. 11	kV
V_a	= min. 5,5	kV
V_{g2}	= max. 500	V
V_{g2}	= min. 200	V
V_{g1}	= max. 0	V
$-V_{g1}$	= max. 200	V
V_{g1_p}	= max. 2	V
V_{kf} (k pos.;f neg.)	= max. 200	V
V_{kf} (k neg.;f pos.)	= max. 125	V

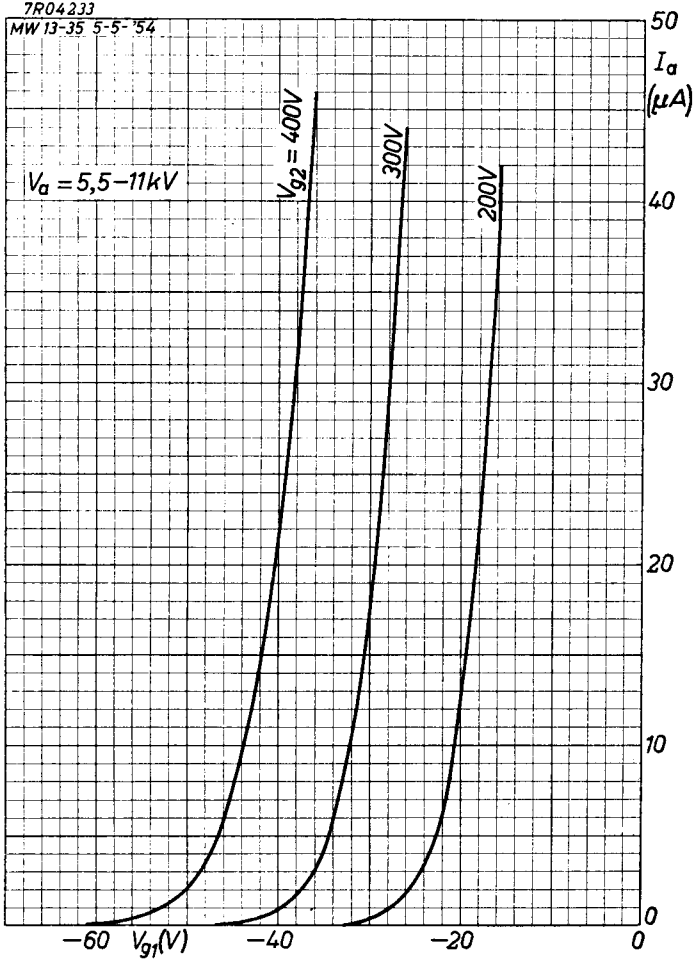
Max. circuit values
Valeurs max. des éléments du montage
Max. Werte der Schaltungsteile

R_{kf}	= 1	MΩ [1]
γ_{g1}	= 1,5	MΩ
$\angle_{g1}$(f =50 c/s)	= 0,5	MΩ

[1] When the heater is supplied from a separate transformer
When the heater is in a series chain, or earthed to A.C., Z_k (f =50 c/s)= max. 0.1 MΩ

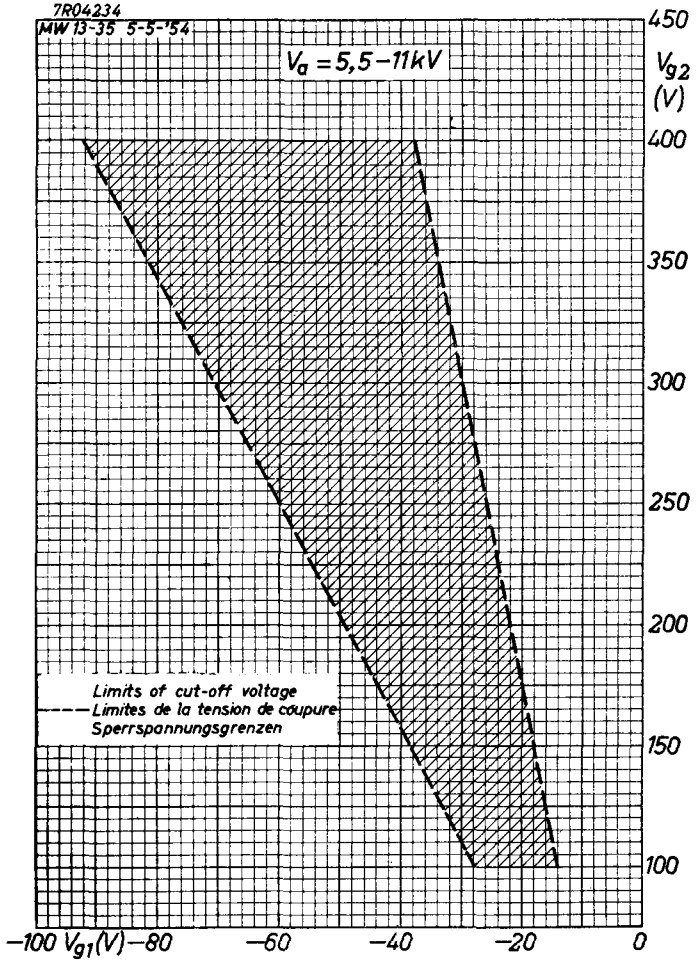
Quand le filament est alimenté par un transformateur séparé
Quand le filament est connecté dans une chafne série, ou est mise à la terre pour C.A., Z_k (f = 50 c/s)= max. 0,1 MΩ

Wenn der Heizfaden von einem separaten Transformator gespeist wird.
Wenn der Heizfaden in einer Serienkette aufgenommen oder für Wechselstrom geeerdet ist, Z_k(f=50Hz)=max.0,1MΩ


7R04233
MW 13-35 5-5-'54
$V_a = 5,5-11kV$
$V_{g2} = 400V$
300V
200V
50
I_a
(μA)
40
30
20
10
0
−60
V_{g1}(V)
−40
−20
0

MW 13-35

PHILIPS



PHILIPS

Electronic Tube

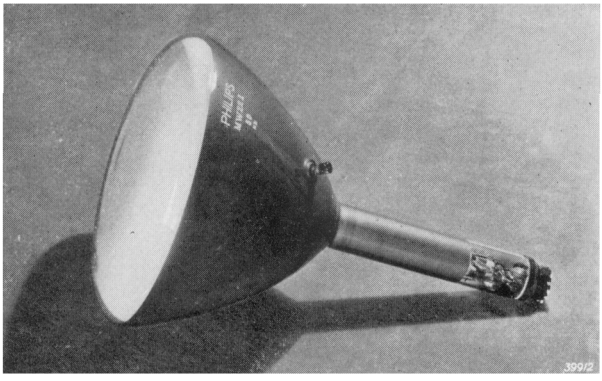
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4	2	1959.04.04
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6	3	1959.04.04
7	A	1954.05.05
8	B	1954.05.05
9	FP	2000.03.07

PHILIPS "Miniwatt" SPECIAL VALVES

TELEVISION ELECTRON RAY TUBE **MW 22-1**



CHARACTERISTICS

Heater voltage	V_f	= 4.0		V
Heater current	I_f	= 1.0		A
Anode voltage	V_{a_2}	= 5000	5000	V
Auxiliary anode voltage	V_{a_1}	= 250	125	V
Grid bias	V_g	= 0 to -100	0 to -50	V
Grid to cathode capacity	C_g	=	13	pF
Deflection			magnetic	
Focusing			magnetic	
Colour of spot			white	

SPECIAL ADVANTAGES

1. Very bright picture
2. Small dimensions
3. Great clarity, right up to the edges of the screen
4. Hexode system; in consequence a small input to the grid suffices for full modulation

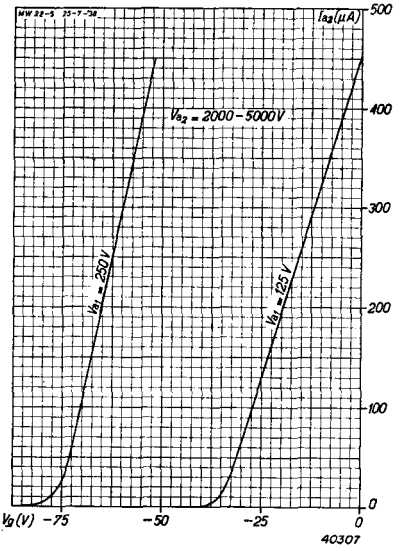
DESCRIPTION

The MW 22-1 is a television electron ray tube with a screen about 22 cm in diameter; it is for magnetic deflection. In relation to the size of the screen the tube is very short, and it is therefore practicable to mount it in a small, relatively inexpensive cabinet.

The beam is concentrated to a certain extent by the electrode system, but focusing proper is effected with the aid of a coil placed round the neck of the tube. The current necessary for focusing depends on the shape, and position of the coil; with the middle of the spool 8 cm from the end of the neck, the number of ampère-turns should be above 500-700 if the anode voltage is 5000 V. By this means, excellent focusing of the beam is achieved, and the picture is very sharp, right to the edges of the screen. The beam is also deflected magnetically. If the axis of the deflecting coils is 203 mm from the screen, the deflection of the beam is given by:

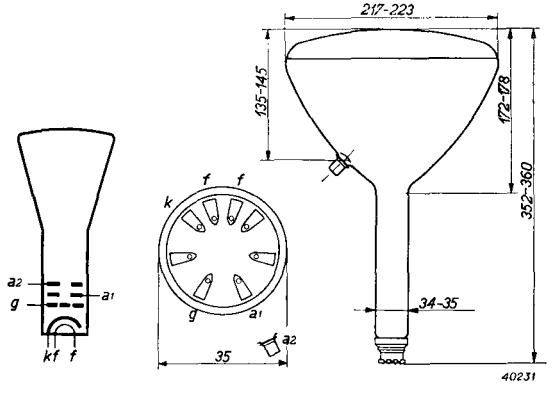
$$D \text{ (mm)} = 0{,}09 \text{ LH}$$

where L is the length in millimetres of the path of an electron through the magnetic field of deflection, and H is the intensity of the magnetic field in gauss. In order to deflect the lightspot 90 mm, the product L x H will be about 1000, so that with a coil 50 mm long, a maximum intensity of field of 20 gauss is required.



Anode current shown against negative grid bias.

The electrode system is of the hexode type, and the Ia/Vg characteristic has a high slope; in consequence a comparatively small voltage from the associated wide-band amplifier sufficies for complete control of the brightness of the spot. The amplifier may in consequence be of quite simple design.



Arrangement of electrodes, connections and maximum dimensions in millimetres.

DIRECT VIEWING TELEVISION CATHODE RAY TUBE with ion trap
TUBE A RAYONS CATHODIQUES DE TELEVISION A VUE DIRECTE avec trappe à ions
FERNSEHKATHODENSTRAHLRÖHRE FÜR DIREKTEN SICHT mit Ionenfalle

Heating:	indirect by A.C. or D.C.; series or parallel supply	
Chauffage:	indirect par C.A. ou C.C.; alimentation en parallèle ou en série	V_f = 6,3 V [1]
Heizung:	indirekt durch Wechsel- oder Gleichstrom; Serien- oder Parallelspeisung	I_f = 0,3 A

Capacitances Capacités Kapazitäten	C_g	= 8 pF
	C_k	= 5 pF
	C_{a2m} [2]	= 800-1500 pF

Screen Ecran Schirm	Colour Couleur Farbe	white blanche weiss
	Colour temperature Température de couleur Farbtemperatur	7500 °K
	Useful screen diameter Diamètre utile de l'écran Nützlicher Schirmdurchmesser	214 mm

[1]) When the tube is used in a series heater chain, the heater voltage must not exceed 8,5 V when the supply is switched on. If necessary a current limiting device must be used for this purpose.

Si le tube est monté dans une chaîne série de filaments, la tension de chauffage ne doit pas dépasser 8,5 V à la mise en circuit. En cas de besoin il faut utiliser un limiteur de courant pour ce but.

Wenn die Röhre in einer Heizfadenkette verwendet wird, darf die Heizspannung beim Einschalten 8,5 V nicht überschreiten. Nötigenfalls muss zu diesem Zweck ein Strombegrenzer verwendet werden.

[2]) m = outer coating; couche extérieure; äussere Schicht.

TELEVISION PICTURE TUBE with ion trap
TUBE IMAGE DE TELEVISION avec trappe à ions
FERNSEHBILDRÖHRE mit Ionenfalle

Heating :	indirect by A.C. or D.C. series or parallel supply	
Chauffage:	indirect par C.A. ou C.C. alimentation série ou parallèle	V_f = 6,3 V[1]) I_f = 0,3 A
Heizung :	indirekt durch Wechsel- oder Gleichstrom; Serien- oder Parallelspeisung	

Capacitances Capacités Kapazitäten	C_{g1}	= 8 pF
	C_k	= 5 pF
	C_{g3m}[2])	= 900 pF

Screen Ecran Schirm	Colour Couleur Farbe	white blanche weiss
	Colour temperature Température de couleur Farbtemperatur	7500 °K
	Useful diameter Diamètre utile Nützlicher Durchmesser	min. 214 mm

For curves of the screen properties see front of this section
Pour les courbes des propriétés de l'écran voir en tête de ce chapitre
Für die Kurven der Schirmeigenschaften siehe am Anfang dieses Abschnitts

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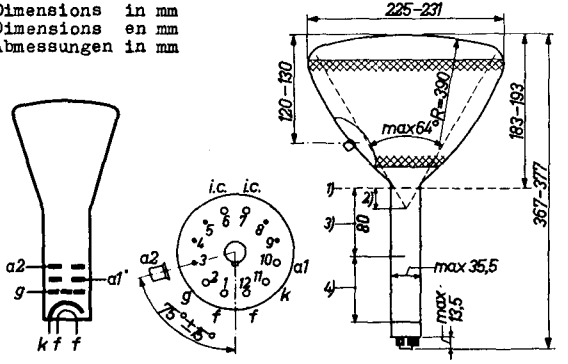
[1]) When the tube is used in a series heater chain, the heater voltage must not exceed 8.5 V when the supply is switched on. If necessary a current limiting device must be used for this purpose

Si le tube est monté dans une chaîne série de filaments, la tension de chauffage ne doit pas dépasser 8,5 V à la mise en circuit. En cas de besoin il faut utiliser un limiteur de courant pour ce but

Wenn die Röhre in einer Heizfadenkette verwendet wird, darf die Heizspannung beim Einschalten 8,5 V nicht überschreiten. Nötigenfalls ist zu diesem Zweck ein Strombegrenzer zu verwenden

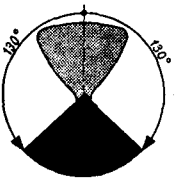
[2]) m = outer coating; couche extérieure; Aussenbelag

Dimensions in mm
Dimensions en mm
Abmessungen in mm



Base, culot, Fuss: Duodecal

Mounting position: The anode connection must be in the vertical plane through the axis of the tube.
Montage: La connexion de l'anode doit être située dans le plan vertical mené par l'axe du tube
Aufstellung: Der Anodenanschluss muss in der senkrechten Ebene durch die Achse liegen.



---

1) Reference line, determined by diameter of 36 mm.
Ligne de référence, déterminée par le diamètre de 36 mm.
Bezugslinie, bestimmt durch den Durchmesser von 36 mm.

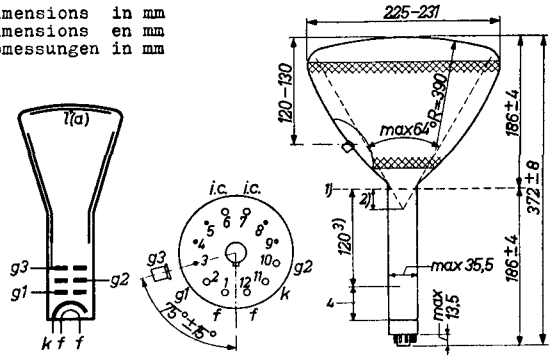
2) The distance from deflection centre to reference line is 16 mm max.
La distance du centre de déviation au ligne de référence est de 16 mm au max.
Der Abstand des Ablenkungamittelpunktes bis zur Bezugslinie ist max. 16 mm.

3) Space for deflection and focusing coils.
Place pour les bobines de déviation et de concentration.
Platz für Ablenk- und Fokussierungsspulen.

4) Space for the ion trap magnet.
Place pour l'aimant de la trappe à ions.
Platz für den Magnet der Ionenfalle.

PHILIPS

Dimensions in mm
Dimensions en mm
Abmessungen in mm



Base, culot, Sockel: Duodecal 7p.

Mounting position: The anode connection must be in the vertical plane through the axis of the tube
Montage: La connexion de l'anode doit être située dans le plan vertical mené par l'axe du tube
Aufstellung: Der Anodenanschluss muss in der senkrechten Ebene durch die Achse der Röhre liegen

---

1) Reference line, determined by the diameter of 36 mm
Ligne de référence, déterminée par le diamètre de 36 mm
Bezugslinie, bestimmt durch den Durchmesser von 36 mm

2) The distance from the deflection centre to the reference line should not exceed 16 mm
La distance du centre de déviation au ligne de référence ne dépassera pas 16 mm
Der Abstand des Ablenkungsmittelpunktes bis zur Bezugslinie soll 16 mm nicht überschreiten

3) Space for deflection and focusing coils
Place pour les bobines de déviation et de concentration
Platz für Ablenk- und Fokussierungsspulen

4) Space for the ion trap magnet
Place pour l'aimant de la trappe à ions
Platz für den Magnet der Ionenfalle

Deflection (double magnetic) $N = \frac{0.3 \times P \times H \times cL}{\sqrt{V_{a2}}}$ cm, where

N = the deflection on the screen in cm
P = the distance between the deflection centre and the screen in cm
H = the max. magnetic field strength in gauss
c = a correction factor, in most cases = $\frac{1}{2}$
L = the length of the coil windings in cm.

The deflection centre can be assumed to coincide with the max. magnetic field strength. In order to prevent the electron beam from being blocked by the end of the tube neck at maximum deflection, the distance from the deflection centre to the reference line should not exceed 16 mm.

The deflection angle is maximum 64°.

Déviation (magnétique double) $N = \frac{0,3 \times P \times H \times cL}{\sqrt{V_{a2}}}$ cm, où

N = la déviation sur l'écran en cm
P = la distance entre le centre de déviation et l'écran en cm
H = l'intensité max. du champ magnétique en gauss
c = un facteur de correction, en général = $\frac{1}{2}$
L = la longueur des enroulements de bobine en cm.

Le centre de déviation peut être supposé coïncidant avec le maximum de l'intensité du champ magnétique. Pour prévenir le faisceau électronique d'être intercepté à la deviation maximum par l'extrémité du col du tube, la distance entre le centre de déviation et la ligne de référence ne dépassera pas 16 mm.

L'angle de déviation est de 64° au maximum.

Ablenkung (doppelmagnetisch) $N = \frac{0,3 \times P \times H \times cL}{\sqrt{V_{a2}}}$ cm, wo

N = die Ablenkung auf dem Schirm in cm
P = der Abstand zwischen dem Ablenkungsmittelpunkt und dem Schirm in cm
H = die max. magnetische Feldstärke in Gauss
c = ein Korrektionsfaktor, im allgemeinen = $\frac{1}{2}$
L = die Länge der Spulenwindungen in cm.

Der Ablenkungsmittelpunkt fällt gewöhnlich mit dem Höchstwert der magnetischen Feldstärke zusammen. Um zu verhüten, dass der Elektronenstrahl während der grössten Ablenkung am Ende des Röhrenhalses unterbrochen wird, darf der Abstand vom Ablenkungsmittelpunkt bis zur Bezugslinie 16 mm nicht überschreiten.

Der Ablenkungswinkel ist maximum 64°.

Deflection and focusing Déviation et concentration Ablenkung und Fokussierung	magnetic magnétique magnetisch
Deflection angle L'angle de déviation Ablenkungswinkel	max. 64°

Focusing coil: without ferromagnetic material

Number of ampere-turns: (V_{g3} = 7000 V)	605-745
(V_{g3} = 9000 V)	665-815
Distance between centre of field and reference line :	80 mm

Bobine de concentration: sans matière ferromagnétique

Nombre d'ampère- tours: (V_{g3} = 7000 V)	605-745
(V_{g3} = 9000 V)	665-815
Distance entre le centre du champ et la ligne de référence:	80 mm

Fokussierungsspule: ohne ferromagnetisches Material

Amperewindungszahl: (V_{g3} = 7000 V)	605-745
(V_{g3} = 9000 V)	665-815
Abstand des Zentrums des Feldes bis zur Bezugslinie:	80 mm

Ion trap magnet: Single magnet, field strength 52-60 gausses, Type number 55400. For the procedure of setting up see MW 31-74 page 6

Aimant de la trappe à ions: Aimant simple, intensité du champ 52-60 gauss. Numéro de type 55400. Pour le réglage voir MW 31-74 page 6

Magnet der Ionenfalle: Einfacher Magnet, Feldstärke 52-60 Gauss. Typennummer 55400. Für die Einstellung siehe MW 31-74 Seite 7

Net weight Poids net Nettogewicht	1500 g	Shipping weight Poids brut Bruttogewicht	3100 g

Operating characteristics
Caractéristiques d'utilisation
Betriebsdaten

V_{g3}	=	7000	9000 V
V_{g2}	=	250	250 V
$-V_{g1}(I_{g3}=0)$	=	32-71	32-71 V

Focusing Magnetic
The number of ampere-turns necessary for focusing at V_{a2} = 7000 V is 605-745 and at V_{a2} = 9000 V 665-815.

Concentration Magnétique
Le nombre d'ampère-tours nécessaire pour la concentration à V_{a2} = 7000 V est de 605-745 et à V_{a2} = 9000 V 665-815.

Fokussierung Magnetisch
Die erforderliche Amperewindungszahl für Fokussierung beträgt bei V_{a2} = 7000 V 605-745 und bei V_{a2} = 9000 V 665-815.

Ion trap magnet: Single magnet, field strength about 40 Gauss. Type number 55400.
Aimant de la trappe à ions: Aimant simple, intensité du champ environ 40 Gauss. Numéro de type 55400.
Magnet der Ionenfalle: Einfacher Magnet, Feldstärke etwa 40 Gauss. Typennummer 55400.

Net weight
Poids net
Nettogewicht 1900 g

Shipping weight
Poids brut
Bruttogewicht 3100 g

Operating characteristics
Caractéristiques d'utilisation
Betriebsdaten

V_{a2}	=	7000	7000	9000	9000 V
V_{a1}	=	160	200	160	200 V
$-V_g$ (I_a = 0)	=	20-50	25-60	20-50	25-60 V

Limiting values
Caractéristiques limites
Grenzdaten

V_{a2} = max.	11000 V	$-V_g$ = max.	200 V
V_{a2} = min.	6000 V	W_ℓ = max.	2,5 mW/cm^2 [1]
V_{a1} = max.	400 V	W_ℓ = max.	5 mW/cm^2 [2]
V_g = max.	0 V	V_{kf} = max.	150 V [3]

[1], [2], [3] see page 5, voir page 5, siehe Seite 5.

Limiting values (design centre values)
Caractéristiques limites (valeurs moyennes de développement)
Grenzdaten (mittlere Entwicklungsdaten)

V_{g3}	= max.	11000 V
V_{g3}	= min.	6000 V
V_{g2}	= max.	410 V
V_{g1}	= max.	0 V
$-V_{g1}$	= max.	200 V
V_{g1_p}	= max.	2 V
W_ℓ	= max.	2,5 mW/cm^2 [1]
W_ℓ	= max.	5 mW/cm^2 [2]
V_{kf} (k pos.;f neg.)	= max.	200 V [3][4]
V_{kf} (k neg.;f pos.)	= max.	125 V [4]

Max. circuit values
Valeurs max. des éléments du montage
Max. Werte der Schaltungsteile

R_{kf}	=	1 MΩ [5]
R_{g1}	=	1,5 MΩ
Z_{g1}(f =50 c/s)	=	0,5 MΩ

The power supply should be of the limited-energy type with inherent regulation to limit the continuous short-circuit current to 5 mA.

Le circuit d'alimentation ne doit être capable de fournir qu'une puissance limitée de sorte que le courant de court-circuit permanent ne dépasse pas 5 mA.

Der Speiseteil soll nur eine begrenzte Leistung liefern können, damit der Strom bei Dauerkurzschluss nicht mehr als 5 mA beträgt.

---

[1] Fixed pattern
Mire fix
Feste Patrone

[2] Moving picture
Image mouvante
Bewegendes Bild

3)4)5) See page 5;voir page 5;siehe Seite 5

The power supply should be of the limited-energy type with inherent regulation to limit the continuous short-circuit current to 5 mA

Le circuit d'alimentation ne doit être capable de fournir qu'une puissance limitée de sorte que le courant de court-circuit permanent ne dépasse pas 5 mA.

Der Speiseteil soll nur eine begrenzte Leistung liefern können, damit der Strom bei Dauerkurzschluss nicht mehr als 5 mA beträgt.

---

[1]) Fixed pattern
Patron fix
Feste Patrone

[2]) Moving pattern
Patron mouvant
Bewegende Patrone

[3]) If the heater is negative with respect to the cathode, V_{kf} is permitted to rise to 410 V during an equipment warm-up period not exceeding 15 sec.

Si le filament est négatif par rapport à la cathode, V_{kf} est permis de monter jusqu'à 410 V pendant une période de chauffage ne dépassant pas 15 sec.

Wenn der Heizfaden negativ ist in bezug auf der Kathode, darf V_{kf} während einer Anheizzeit von max. 15 Sek. steigen bis 410 V.

[3]) During a warm-up period not exceeding 45 seconds the heater may be 410 V negative with respect to the cathode

Pendant une période d'échauffement ne dépassant pas 45 secondes, le filament peut être porté à un potentiel négatif de 410 V par rapport à la cathode

Während einer Anheizzeit von max. 45 Sekunden darf der Heizfaden 410 V negativ sein in bezug auf der Katode

[4]) In order to avoid excessive hum, the A.C. component of V_{kf} should be as low as possible and must not exceed 20 V

Pour éviter le ronflement excessif la composante alternative de V_{kf} sera la plus petite possible et ne dépassera pas 20 V

Zur Vermeidung von Brummstörungen muss die Wechselspannungskomponente von V_{kf} so klein wie möglich sein und jedenfalls 20 V nicht überschreiten

[5]) When the heater is supplied from a separate transformer.
When the heater is in a series chain, or earthed to A.C., Z_k(f =50 c/s)= max. 0.1 MΩ

Quand le filament est alimenté par un transformateur séparé.
Quand le filament est connecté dans une chaîne série, ou est mise à la terre pour C.A., Z_k(f = 50 c/s) = max. 0,1 MΩ

Wenn der Heizfaden von einem separaten Transformator gespeist wird.
Wenn der Heizfaden in einer Serienkette aufgenommen oder für Wechselstrom geerdet ist, Z_k(f = 50 Hz) = max. 0,1 MΩ

PROCEDURE FOR SETTING UP MW 22-16 ION TRAP TUBES

1) This adjustment is best carried out on a stationary test pattern, or a raster with no signal applied.
2) Push the magnet over the base, with the arrow pointing towards the screen and over the line on the tube neck. Push magnet just beyond the base.
3) Fit base connections, switch on, and turn up brightness control.
4) Move the magnet up the neck of the tube keeping the arrow over the line on the neck until the focused raster is at its brightest. Now increase the brightness to give a brilliance equivalent to peak white in a picture, and, if necessary, re-adjust the position of the magnet for maximum brilliance. Centre the raster by adjusting the position of the focus field. If this cannot be done, the magnet may be moved, either along the neck or by rotating it a little, so that centrality is obtained by adjusting the focus field position. The brilliance must not decrease during this operation.
5) Lock the magnet in position by tightening the thumb screw. Check that the tube is now set up for optimum picture quality.

WARNING

The magnet must be handled carefully, it should not be placed in a strong magnetic field.

If a raster of inadequate brilliance is obtained, a new magnet should be tried.

REGLAGE DES TUBES AVEC TRAPPE A IONS MW 22-16

1) Il est préférable d'effectuer ce réglage sur une mire d'essai stationnaire, ou un réseau sans signal appliqué.
2) Enfoncer l'aimant sur la base, la flèche pointée en direction de l'écran, et sur la ligne sur le col du tube. Pousser l'aimant juste au-delà de la base.
3) Etablir les connexions de la base, commuter, et tourner le bouton de luminosité.
4) Déplacer l'aimant sur le col du tube en maintenant la flèche sur la ligne sur le col, jusqu'à ce que le réseau focalisé atteigne sa brillance maximum. Augmenter alors la brillance pour obtenir une brillance équivalente au blanc maximum de l'image et, au besoin, réajuster la position de l'aimant pour la brillance maximum. Centrer le réseau en réglant la position du champ focal. Si c'est impossible, on peut déplacer l'aimant, soit le long du col ou en le faisant tourner légèrement, de telle sorte que la centralisation soit obtenue en

ajustant la position du champ focal. La brillance ne doit pas diminuer pendant l'opération.

5) Bloquer l'aimant dans sa position au moyen de la vis moletée. Vérifier que le tube est alors réglé pour la qualité optimum de l'image.

ATTENTION

L'aimant doit être traité avec précaution,il ne doit pas être placé dans un champ magnétique intense.

Si on obtient un réseau d'une brillance qui ne convient pas, il faut essayer un nouvel aimant.

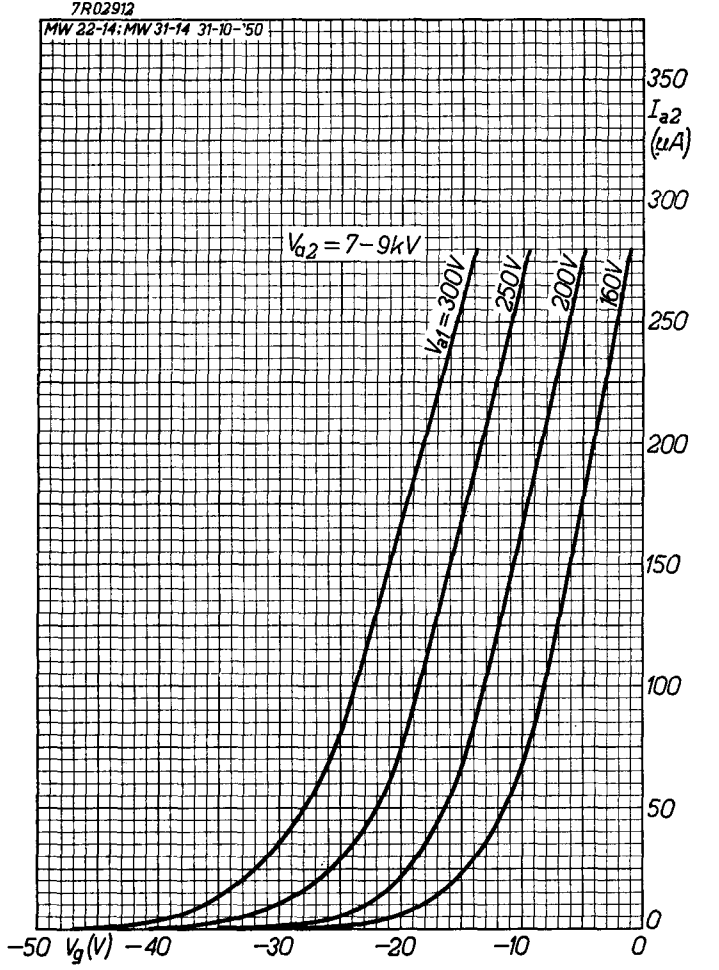
EINSTELLUNG DER RÖHREN MW 22-16 MIT IONENFALLE

1) Die Einstellung wird am besten an einem festen Kontrollmuster vorgenommen, oder an Hand eines Rasters ohne Signalzuführung.
2) Man schiebe den Magnetring über den Sockel, mit dem Pfeil in Schirmrichtung weisend und über den Strich auf dem Röhrenhals,derart, dass der Magnet gerade oberhalb des Sockels liegt.
3) Die Sockelanschlüsse herstellen, einschalten und den Helligkeitsregler aufdrehen.
4) Man verstelle den Magnet, wobei jedoch der Pfeil immer über den Strich liegen muss, so weit, bis das fokussierte Raster die stärkste Helligkeit aufweist. Alsdann steigere man die Helligkeit auf intensivstes Weiss und stelle, falls nötig, den Magnet auf maximale Helligkeit nach. Zur Zentrierung des Rasters regle man hiernach die Lage des Fokussierungsfeldes. Ist das nicht möglich, so verstelle oder verdrehe man den Magnet ein wenig, so dass Zentrierung mittels Regelung des Fokussierungsfeldes erreicht werden kann.
   Während dieses Vorganges darf jedoch die Helligkeit nicht abnehmen.
5) Durch Anspannen der Rändelschraube den Magnet alsdann fixieren und untersuchen, ob die Röhre nunmehr für optimale Bildgüte eingestellt ist.

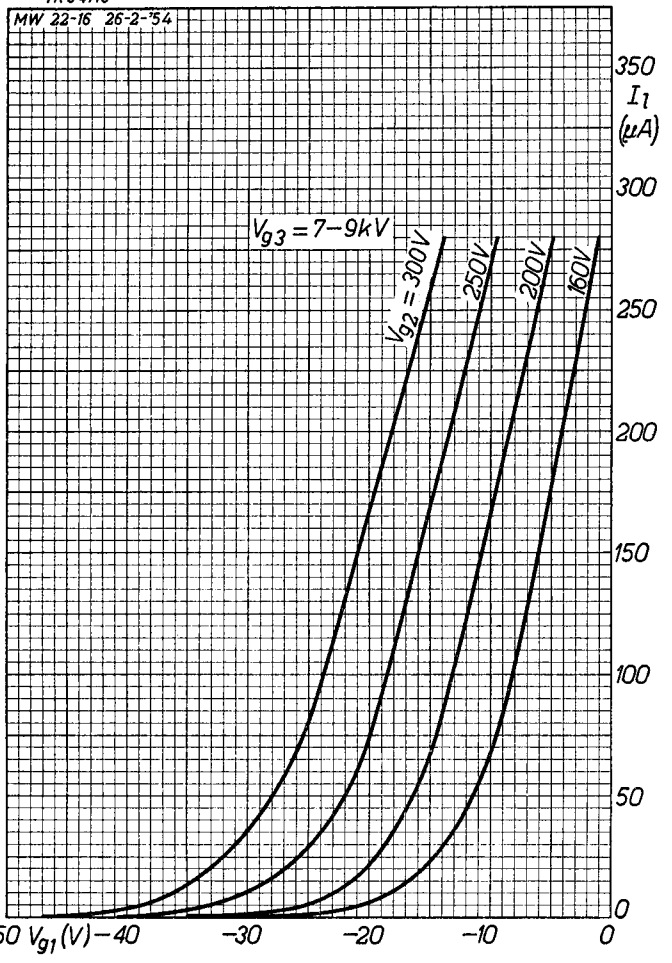
ZUR BEACHTUNG

Der Magnet erfordert sorgfältige Behandlung,und darf niemals in ein starkes magnetisches Feld gebracht werden.

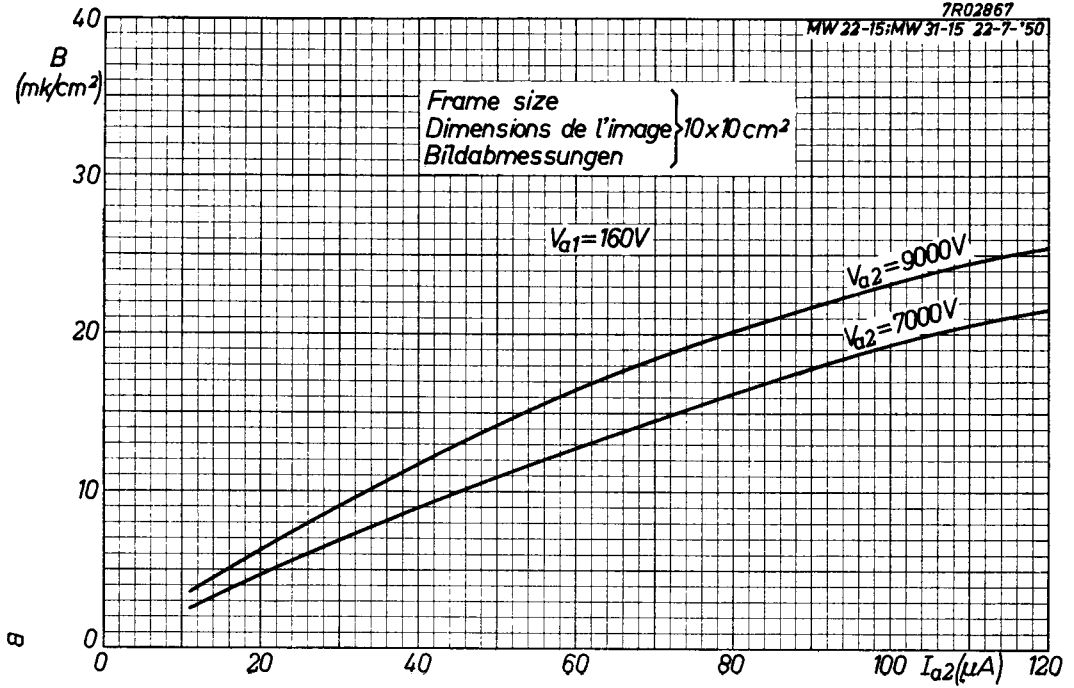
Ist die Helligkeit des Rasters unzulänglich, so muss ein neuer Magnet benutzt werden.


7R02912
MW 22-14; MW 31-14 31-10-'50
$V_{a2} = 7-9kV$
$V_{a1} = 300V$
250V
200V
160V
I_{a2} (μA)
350
300
250
200
150
100
50
0
−50 V_g(V) −40
−30
−20
−10
0

PHILIPS


7R04110
MW 22-16 26-2-'54
$V_{g3} = 7-9kV$
$V_{g2} = 300V$
250V
200V
160V
350
300
250
200
150
100
50
0
I_1 (μA)
−50 V_{g1} (V) −40
−30
−20
−10
0

A

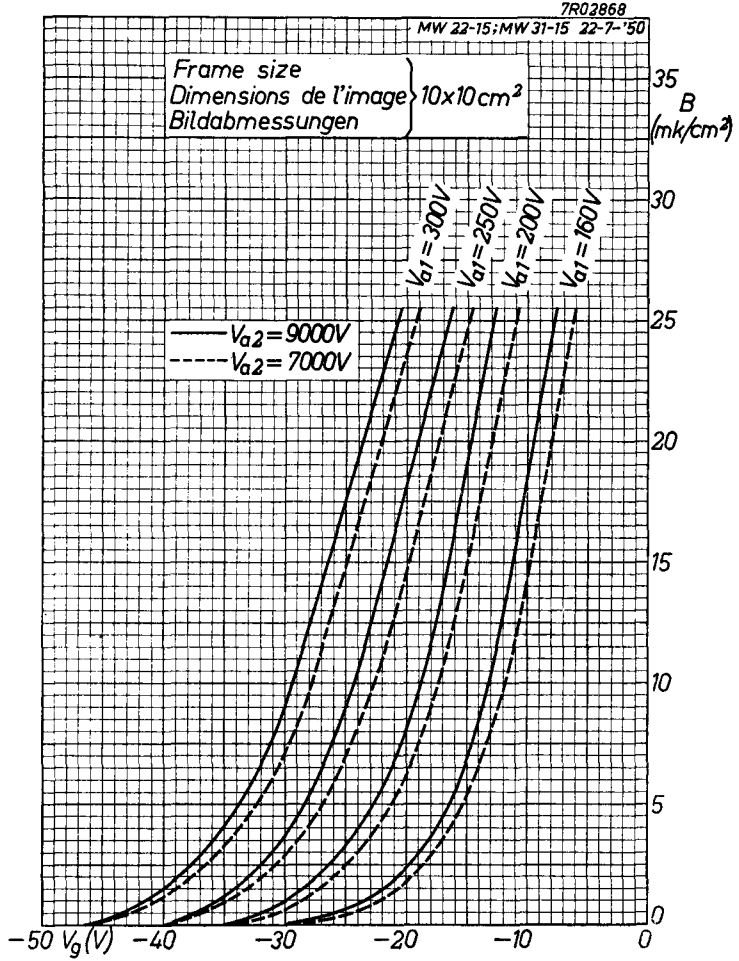

B
(mk/cm²)
40
30
20
10
0
Frame size
Dimensions de l'image
Bildabmessungen
10x10 cm²
Va1=160V
Va2=9000V
Va2=7000V
0
20
40
60
80
100
Ia2(µA)
120

B

PHILIPS

PHILIPS

MW 22-16



11.11.1950

C

PHILIPS

Electronic Tube

HANDBOOK

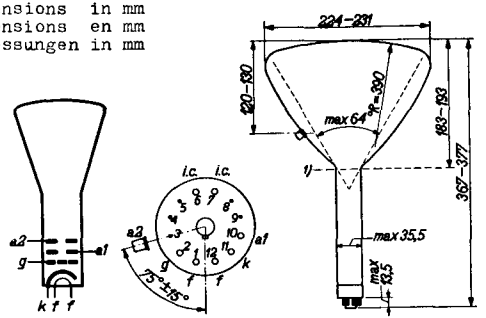
MW22-16

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2	1	1954.03.03
3	2	1950.10.10
4	2	1954.03.03
5	3	1950.10.10
6	3	1954.03.03
7	4	1950.10.10
8	4	1954.03.03
9	5	1950.10.10
10	5	1954.03.03
11	6	1950.10.10
12	7	1950.10.10
13	A	1950.11.11
14	A	1954.03.03
15	B	1950.11.11
16	C	1950.11.11
17	FP	2000.03.07

DIRECT VIEWING TELEVISION CATHODE RAY TUBE
TUBE A RAYONS CATHODIQUES DE TELEVISION A VUE DIRECTE
FERNSEHKATHODENSTRAHL**RÖHRE FÜR DIREKTEN SICHT**

Heating:	indirect by A.C. or D.C.; series or parallel supply	
Chauffage:	indirect par C.A. ou C.C.; alimentation en parallèle ou en série	V_f = 6,3 V I_f = 0,3 A
Heizung:	indirekt durch Wechsel- oder Gleichstrom; Serien- oder Parallelspeisung	
Capacitances Capacités Kapazitäten		C_g = 6 pF C_k = 5 pF

Dimensions in mm
Dimensions en mm
Abmessungen in mm



Base, culot, Fuss: Duodecal

Screen Ecran Schirm	Colour Couleur Farbe	white blanche weiss
	Colour temperature Température de couleur Farbtemperatur	9000 °K
	Useful screen diameter Diamètre utile de l'écran Nützlicher Schirmdurchmesser	214 mm

[1]) Reference line, determined by the diameter of
Ligne de référence, déterminée par le diamètre de
Bezugslinie, bestimmt durch den Durchmesser von 36 mm

PHILIPS

MW 22-17
MW 22-18

TELEVISION PICTURE TUBES
TUBES IMAGE DE TELEVISION
FERNSEHBILDRÖHREN

MW 22-17=MW 22-16 { without ion trap and outer coating / sans trappe à ions et couche extérieure / ohne Ionenfalle und Aussenbelag

MW 22-18=MW 22-16 { without ion trap / sans trappe à ions / ohne Ionenfalle

Focusing — Magnetic
The number of ampere-turns necessary for focusing at Va2 = 7000 V is 580-720, at a distance of about 27 cm from the coil centre to the screen.

Focalisation — Magnétique
Le nombre d'ampère-tours nécessaire pour la focalisation à Va2 = 7000 V est de 580-720, à une distance d'environ 27 cm du centre de la bobine jusqu'à l'écran.

Fokussierung — Magnetisch
Die erforderliche Amperewindungszahl für Fokussierung beträgt bei Va2 = 7000 V 580-720, bei einem Abstand von ungefähr 27 cm vom Mittelpunkt der Spule bis zum Schirm.

Deflection (double magnetic) $N = \frac{0,3 \times P \times H \times cL}{\sqrt{Va2}}$ cm, where

N = the deflection on the screen in cm
P = the distance between the deflection centre and the screen in cm
H = the max. magnetic field strength in gauss
c = a correction factor, in most cases = $\frac{1}{2}$
L = the length of the coil windings in cm

The deflection centre can be assumed to coincide with the max. magnetic field strength. In order to prevent the electron beam from being blocked by the end of the tube neck at maximum deflection, the distance from the deflection centre to the reference line should not exceed 18.5 mm.

The symmetrical plane of the magnetic field must pass between the deflection centre and the screen.

Déviation (magnétique double) $N = \frac{0,3 \times P \times H \times cL}{\sqrt{Va2}}$ cm, où

N = la déviation sur l'écran en cm
P = la distance entre le centre de déviation et l'écran en cm
H = l'intensité max. du champ magnétique en gauss
c = un facteur de correction, en général = $\frac{1}{2}$
L = la longueur des enroulements de bobine en cm

Le centre de déviation peut être supposé coincidant avec le maximum de l'intensité du champ magnétique. Pour prévenir le faisceau électronique d'être intercepté à la déviation maximum par l'extrémité du col du tube, la distance entre le centre de déviation et la ligne de référence ne dépassera pas 18,5 mm.

Le plan symétrique du champ magnétique doit passer entre le centre de déviation et l'écran.

Ablenkung (doppelmagnetisch) $N = \frac{0{,}3 \times P \times H \times cL}{\sqrt{Va2}}$ cm, wo

N = die Ablenkung auf dem Schirm in cm
P = der Abstand zwischen dem Ablenkungsmittelpunkt und dem Schirm in cm
H = die max. magnetische Feldstärke in Gauss
c = ein Korrektionsfaktor, im allgemeinen = $\frac{1}{3}$
L = die Länge der Spulenwindungen in cm

Der Ablenkungsmittelpunkt fällt gewöhnlich mit dem Höchstwert der magnetischen Feldstärke zusammen. Um zu verhüten, dass der Elektronenstrahl während der grössten Ablenkung am Ende des Röhrenhalses unterbrochen wird, darf der Abstand vom Ablenkungsmittelpunkt bis zur Bezugslinie 18,5 mm nicht überschreiten.

Die Symmetriefläche des magnetischen Feldes muss zwischen dem Ablenkungsmittelpunkt und dem Schirm liegen.

Net weight, poids net, Nettogewicht	1900 g
Shipping weight, poids brut, Bruttogewicht	3100 g

Operating characteristics
Caractéristiques d'utilisation
Betriebsdaten

V_{a2}	=	7000	7000 V
V_{a1}	=	160	200 V
$-V_g$ (I_a = 0)	=	20-50	25-60 V
I_{a2}	=	80	80 µA
W_ℓ	=	2	2 mW/cm^2
$W_{\ell p}$	=	10	10 mW/cm^2
Max. raster size Dimensions max. du trame Max. Rasterabmessungen	=	15,8 x 19,8 cm^2 [1]	

Limiting values
Caractéristiques limites
Grenzdaten

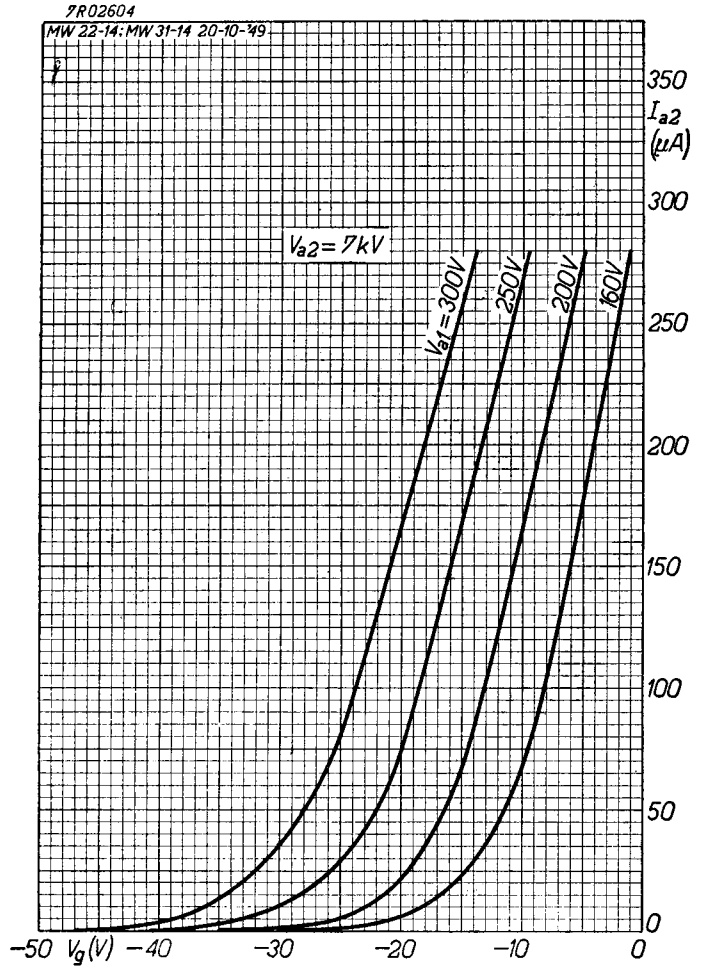
V_{a2} = max. 9000 V
V_{a1} = max. 400 V
I_{a2} = max. 100 µA
$-V_g$ = max. 200 V
V_{kf} = max. 150 V [2] (k pos., f neg.)
V_{kf} = max. 0 V (k neg., f pos.)

1) With rounded angles; avec angles arondis; mit abgerundeten Ecken

2) This value must not be exceeded when switching on
Cette valeur ne doit pas être dépassée pendant la mise en circuit
Dieser Wert muss beim Einschalten nicht überschritten werden

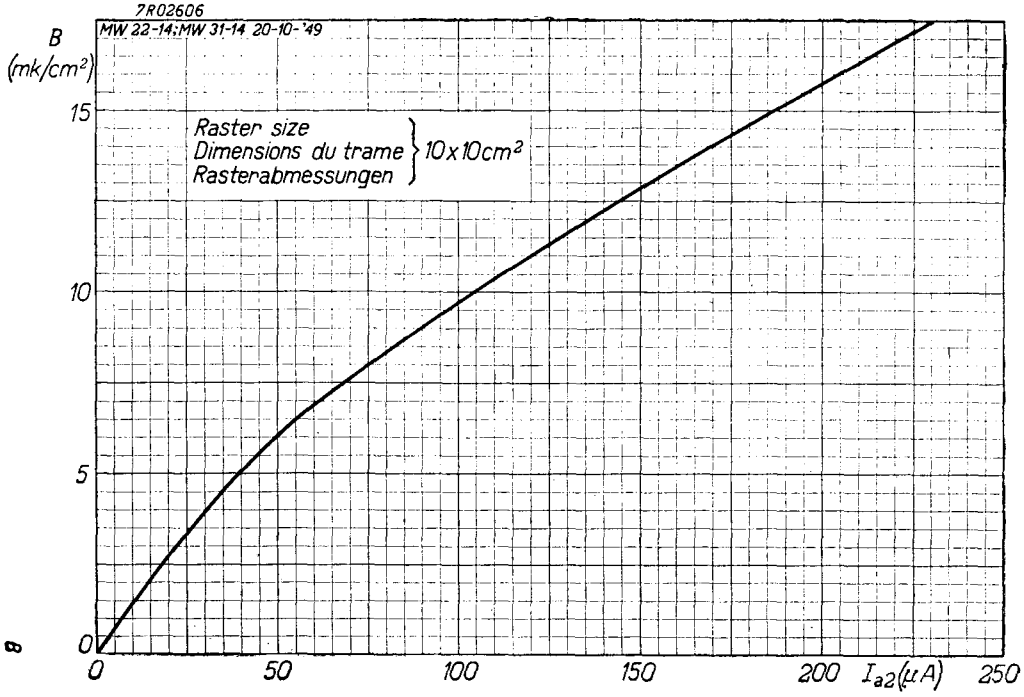
PHILIPS

MW 22-17



11.11.1949

A

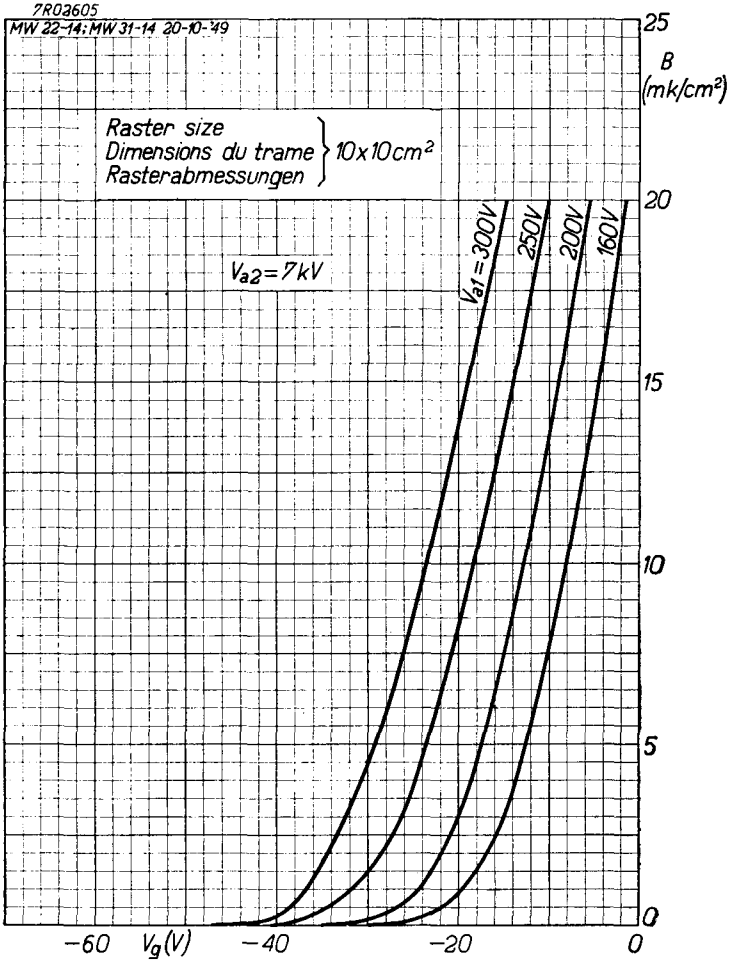


MW22-17

PHILIPS

PHILIPS

MW 22-17



11.11.1949

C

PHILIPS

Electronic Tube

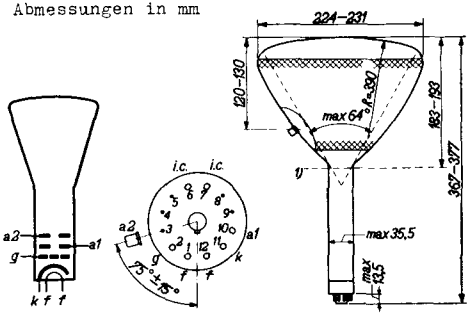
HANDBOOK

MW22-17

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1	1	1950.04.04
2	1	1954.03.03
3	2	1950.04.04
4	3	1950.04.04
5	A	1949.11.11
6	B	1949.11.11
7	C	1949.11.11
8	FP	2000.03.07

DIRECT VIEWING TELEVISION CATHODE RAY TUBE
TUBE A RAYONS CATHODIQUES DE TELEVISION A VUE DIRECTE
FERNSEHKATHODENSTRAHL**RÖHRE FÜR DIREKTEN SICHT**

Dimensions in mm
Dimensions en mm
Abmessungen in mm



Base, culot, Fuss: Duodecal

For further technical data, refer to type MW 22-17
Pour les autres détails techniques voir type MW 22-17
Für die übrigen technischen Daten siehe Typ MW 22-17

PHILIPS

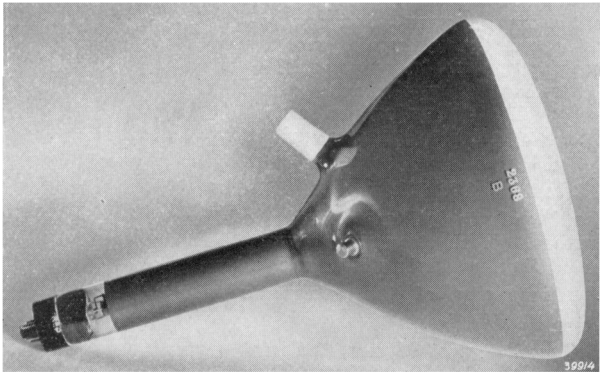
Electronic Tube

HANDBOOK

MW22-18

page	sheet	date
1	1	1950.04.04
2	FP	2000.03.07

TELEVISION ELECTRON-RAY TUBE **MW 22-3**



CHARACTERISTICS

Heater voltage	V_f	= 2·0	V
Heater current	I_f	= 1·2	A
Anode voltage	V_a	= 5000	V
Grid voltage	V_g	= 0 to -55	V
Grid to cathode capacity	C_g	= 6	pF
Deflection		magnetic	
Focusing		magnetic	
Colour of spot		white	

SPECIAL ADVANTAGES

1. Very bright picture
2. Small size
3. Great clarity, right up to the edge of the screen

DESCRIPTION

The MW 22-3 is a television electron-ray tube with a screen of about 22 cm in diameter; it is for magnetic deflection. In relation to the size of the screen the tube is very short, and it is therefore practicable to mount it in a small, relatively inexpensive cabinet.

The beam is concentrated to a certain extent by the electrode system, but

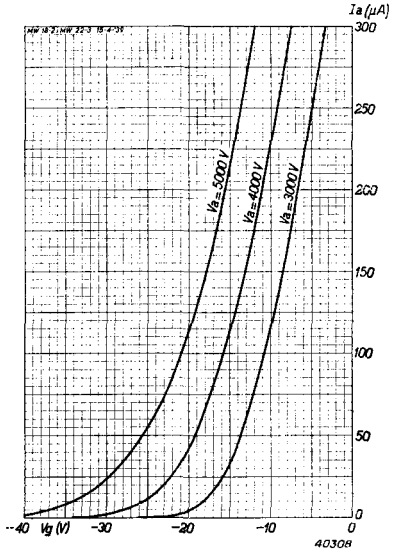
focusing proper is effected with the aid of a coil placed round the neck of the tube. The current necessary for focusing depends on the shape and position of the coil; with the middle of the spool 8 cm from the end of the neck, the number of ampère-turns should be about 500-700 if the anode voltage is 5000 V. By this means, very good concentration of the beam is achieved, and the picture is very sharp, right to its edges. The jet of electrons is also deflected magnetically. If the centres of the deflection coils are 203 mm from the screen, the deflection of the beam is given by:

$$D(mm) = 0{\cdot}09\ LH,$$

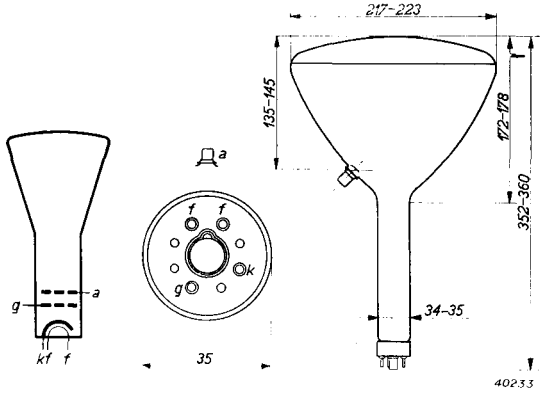
where L = the length in millimetres of the path of an electron in the magnetic field of deflection, and

H = the intensity of the magnetic field in gauss.

In order to deflect the spot 90 mm, the product L x H will be about 1000, so that with a coil 50 mm long, a maximum intensity of field of about 20 gauss is required.
The electrode system being of the triode type, pictures of high contrast are readily obtained.



Anode current shown against negative grid bias.



Arrangement of electrodes, connections and maximum dimensions in millimetres.

PHILIPS

MW 22-7
MW 22-14

DIRECT VIEWING TELEVISION CATHODE RAY TUBE
TUBE A RAYONS CATHODIQUES DE TELEVISION A VUE DIRECTE
FERNSEHKATHODENSTRAHLRÖHRE FÜR DIREKTEN SICHT

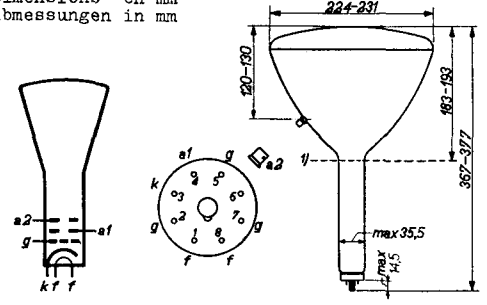
Heating: indirect by A.C. parallel supply
Chauffage: indirect par C.A. alimentation en parallèle
Heizung: indirekt durch Wechselstrom Parallelspeisung

MW 22-7
V_f = 6,3 V
I_f = 0,6 A

Heating: indirect by A.C. or D.C.; series or parallel supply
Chauffage: indirect par C.A. ou C.C.; alimentation en parallèle ou en série
Heizung: indirekt durch Wechsel- oder Gleichstrom; Serien- oder Parallelspeisung

MW 22-14
V_f = 6,3 V
I_f = 0,3 A

Dimensions in mm
Dimensions en mm
Abmessungen in mm



MW 22-7 **MW 22-14**

Base, culot, Fuss: Loctal

For further technical data, refer to type MW 22-17
Pour les autres détails techniques voir type MW 22-17
Für die übrigen technischen Daten siehe Typ MW 22-17

PHILIPS

MW 22-7
MW 22-14

TELEVISION PICTURE TUBES
TUBES IMAGE DE TELEVISION
FERNSEHBILDRÖHREN

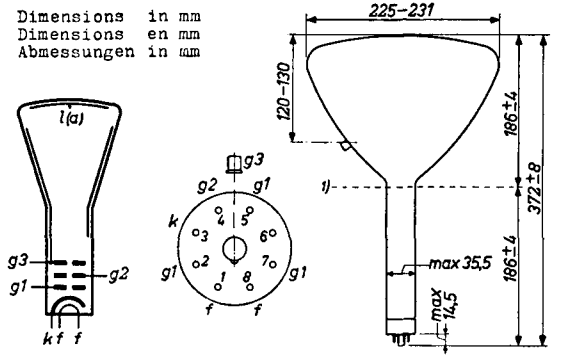
Heating : indirect by A.C. parallel supply
Chauffage: indirect par C.A. alimentation parallèle
Heizung : indirekt durch Wechselstrom; Parallelspeisung

MW 22-7
V_f = 6,3 V
I_f = 0,6 A

Heating : indirect by A.C. or D.C. series or parallel supply
Chauffage: indirect par C.A. ou C.C. alimentation série ou parallèle
Heizung : indirekt durch Wechsel- oder Gleichstrom; Serien- oder Parallelspeisung

MW 22-14
V_f = 6,3 V
I_f = 0,3 A

Dimensions in mm
Dimensions en mm
Abmessungen in mm



Base, culot, Sockel: Loctal 8p.

For further data and curves refer to type MW 22-17
Pour les autres caractéristiques et courbes voir type MW 22-17
Für die übrigen Daten und Kurven siehe Typ MW 22-17

PHILIPS

Electronic Tube

HANDBOOK

MW22-7 MW22-14

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3	FP	2000.03.07

DIRECT VIEWING TELEVISION CATHODE RAY TUBE with ion trap
TUBE A RAYONS CATHODIQUES DE TELEVISION A VUE DIRECTE avec trappe à ions
FERNSEHKATHODENSTRAHLRÖHRE FUR DIREKTEN SICHT mit Ionenfalle

Heating:	indirect by A.C. or D.C.; series or parallel supply	
Chauffage:	indirect par C.A. ou C.C.; alimentation en parallèle ou en série	V_f = 6,3 V[1])
Heizung:	indirekt durch Wechsel- oder Gleichstrom; Serien- oder Parallelspeisung	I_f = 0,3 A

Capacitances Capacités Kapazitäten	C_g	= 8 pF
	C_k	= 5 pF
	C_{a_2m}[2])	= 1500-2500 pF

Screen Ecran Schirm	Colour Couleur Farbe	white blanche weiss
	Colour temperature Température de couleur Farbtemperatur	7500 °K
	Useful screen diameter Diamètre utile de l'écran Nützlicher Schirmdurchmesser	287 mm

[1]) When the tube is used in a series heater chain, the heater voltage must not exceed 8,5 V when the supply is switched on. If necessary a current limiting device must be used for this purpose.

Si le tube est monté dans une chaîne série de filaments, la tension de chauffage ne doit pas dépasser 8,5 V à la mise en circuit. En cas de besoin il faut utiliser un limiteur de courant pour ce but.

Wenn die Röhre in einer Heizfadenkette verwendet wird, darf die Heizspannung beim Einschalten 8,5 V nicht überschreiten. Nötigenfalls muss zu diesem Zweck ein Strombegrenzer verwendet werden.

[2]) m = outer coating; couche extérieure; äussere Schicht.

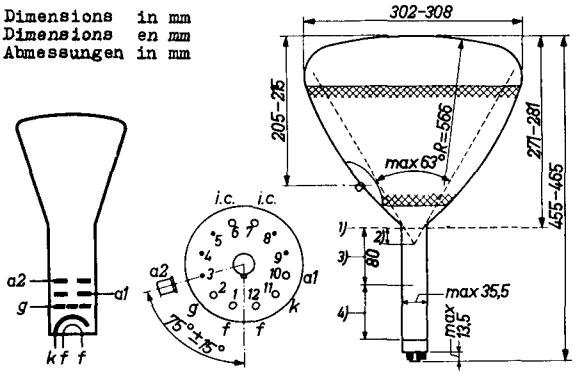
PHILIPS

MW 31-16
MW 31-17
MW 31-18

TELEVISION PICTURE TUBES
TUBES IMAGE DE TELEVISION
FERNSEHBILDRÖHREN

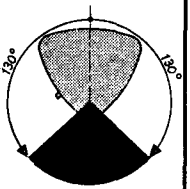
MW31-16 = MW31-74	With a clear face plate Avec une plaque de face claire Mit einem Klarglasschirm
MW31-17 = MW31-74	With a clear face plate, but without ion trap and outer coating Avec une plaque de face claire, cependant sans trappe à ions et couche extérieure Mit einem Klarglasschirm, aber ohne Ionenfalle und Aussenbelag
MW31-18 = MW31-74	With a clear face plate, but without ion trap Avec une plaque de face claire, cependant sans trappe à ions Mit einem Klarglasschirm, aber ohne Ionenfalle

Dimensions in mm
Dimensions en mm
Abmessungen in mm



Base, culot, Fuss: Duodecal

Mounting position: The anode connection must be in the vertical plane through the axis of the tube.
Montage: La connexion de l'anode doit être située dans le plan vertical mené par l'axe du tube
Aufstellung: Der Anodenanschluss muss in der senkrechten Ebene durch die Achse liegen.



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1) Reference line, determined by diameter of 36 mm.
Ligne de référence, déterminée par le diamètre de 36 mm.
Bezugslinie, bestimmt durch den Durchmesser von 36 mm.

2) The distance from deflection centre to reference line is 16 mm max.
La distance du centre de déviation au ligne de référence est de 16 mm au max.
Der Abstand des Ablenkungsmittelpunktes bis zur Bezugslinie ist max. 16 mm.

3) Space for deflection and focusing coils.
Place pour les bobines de déviation et de concentration.
Platz für Ablenk- und Fokussierungsspulen.

4) Space for the ion trap magnet.
Place pour l'aimant de la trappe à ions.
Platz für den Magnet der Ionenfalle.

Deflection (double magnetic) $N = \frac{0,3 \times P \times H \times cL}{\sqrt{V_{a2}}}$ cm, where

N = the deflection on the screen in cm
P = the distance between the deflection centre and the screen in cm
H = the max. magnetic field strength in gauss
c = a correction factor, in most cases = $\frac{1}{2}$
L = the length of the coil windings in cm.

The deflection centre can be assumed to coincide with the max. magnetic field strength. In order to prevent the electron beam from being blocked by the end of the tube neck at maximum deflection, the distance from the deflection centre to the reference line should not exceed 16 mm.

The deflection angle is maximum 63°.

Déviation (magnétique, double) $N = \frac{0,3 \times P \times H \times cL}{\sqrt{V_{a2}}}$ cm, où

N = la déviation sur l'écran en cm
P = la distance entre le centre de déviation et l'écran en cm
H = l'intensité max. du champ magnétique en gauss
c = un facteur de correction, en général = $\frac{1}{2}$
L = la longueur des enroulements de bobine en cm.

Le centre de déviation peut être supposé coincidant avec le maximum de l'intensité du champ magnétique. Pour prévenir le faisceau électronique d'être intercepté à la déviation maximum par l'extrémité du col du tube, la distance entre le centre de déviation et la ligne de référence ne dépassera pas 16 mm.

L'angle de déviation est de 63° au maximum.

Ablenkung (doppelmagnetisch) $N = \frac{0,3 \times P \times H \times cL}{\sqrt{V_{a2}}}$ cm, wo

N = die Ablenkung auf dem Schirm in cm
P = der Abstand zwischen dem Ablenkungsmittelpunkt und dem Schirm in cm
H = die max. magnetische Feldstärke in Gauss
c = ein Korrektionsfaktor, im allgemeinen = $\frac{1}{2}$
L = die Länge der Spulenwindungen in cm.

Der Ablenkungsmittelpunkt fällt gewöhnlich mit dem Höchstwert der magnetischen Feldstärke zusammen. Um zu verhüten, dass der Elektronenstrahl während der grössten Ablenkung am Ende des Röhrenhalses unterbrochen wird, darf der Abstand vom Ablenkungsmittelpunkt bis zur Bezugslinie 16 mm nicht überschreiten.

Der Ablenkungswinkel ist maximum 63°.

Focusing — Magnetic
The number of ampere-turns necessary for focusing at V_{a2} = 7000 V is 605-745 and at V_{a2} = 9000 V 665-815.

Concentration — Magnétique
Le nombre d'ampère-tours nécessaire pour la concentration à V_{a2} = 7000 V est de 605-745 et à V_{a2} = 9000 V 665-815.

Fokussierung — Magnetisch
Die erforderliche Amperewindungszahl für Fokussierung beträgt bei V_{a2} = 7000 V 605-745 und bei V_{a2} = 9000 V 665-815.

Ion trap magnet: Single magnet, field strength about 40 Gauss. Type number 55400.
Aimant de la trappe à ions. Aimant simple, intensité du champ environ 40 Gauss. Numéro de type 55400.
Magnet der Ionenfalle. Einfacher Magnet, Feldstärke etwa 40 Gauss. Typennummer 55400.

Net weight
Poids net
Nettogewicht — 3000 g

Shipping weight
Poids brut
Bruttogewicht — 5400 g

Operating characteristis
Caractéristiques d'utilisation
Betriebsdaten

V_{a2}	=	7000	7000	9000	9000	V
V_{a1}	=	160	200	160	200	V
$-V_g$ (I_a = 0)	=	20-50	25-60	20-50	25-60	V

Limiting values
Caractéristiques limites
Grenzdaten

V_{a2}	= max.	11000 V	$-V_g$	= max.	200 V
V_{a2}	= min.	6000 V	W_l	= max.	2,5 mW/cm^2 [1]
V_{a1}	= max.	400 V	W_l	= max.	5 mW/cm^2 [2]
V_g	= max.	0 V	V_{kf}	= max.	150 V [3]

[1], [2], [3] see page 5, voir page 5, siehe Seite 5.

The power supply should be of the limited-energy type with inherent regulation tc limit the continuous short-circuit current to 5 mA.

Le circuit d'alimentation ne doit être capable de fournir qu'une puissance limitée de sorte que le courant de court-circuit permanent ne dépasse pas 5 mA.

Der Speiseteil soll nur eine begrenzte Leistung liefern können, damit der Strom bei Dauerkurzschluss nicht mehr als 5 mA beträgt.

---

1) Fixed pattern
Patron fix
Feste Patrone

2) Moving pattern
Patron mouvant
Bewegende Patrone

3) If the heater is negative with respect to the cathode, V_{kf} is permitted to rise to 410 V during an equipment warm-up period not exceeding 15 sec.

Si le filament est négatif par rapport à la cathode, V_{kf} est permis de monter jusqu'à 410 V pendant une période de chauffage ne dépassant pas 15 sec.

Wenn der Heizfaden negativ ist in bezug auf der Kathode, darf V_{kf} während einer Anheizzeit von max. 15 Sek. steigen bis 410 V.

PROCEDURE FOR SETTING UP MW 31-16 ION TRAP TUBES

1) This adjustment is best carried out on a stationary test pattern, or a raster with no signal applied.
2) Push the magnet over the base, with the arrow pointing towards the screen and over the line on the tube neck. Push magnet just beyond the base.
3) Fit base connections, switch on, and turn up brightness control.
4) Move the magnet up the neck of the tube keeping the arrow over the line on the neck until the focused raster is at its brightest. Now increase the brightness to give a brilliance equivalent to peak white in a picture, and, if necessary, re-adjust the position of the magnet for maximum brilliance. Centre the raster by adjusting the position of the focus field. If this cannot be done, the magnet may be moved, either along the neck or by rotating it a little, so that centrality is obtained by adjusting the focus field position. The brilliance must not decrease during this operation.
5) Lock the magnet in position by tightening the thumb screw. Check that the tube is now set up for optimum picture quality.

WARNING

The magnet must be handled carefully, it should not be placed in a strong magnetic field.

If a raster of inadequate brilliance is obtained, a new magnet should be tried.

REGLAGE DES TUBES AVEC TRAPPE A IONS MW 31-16

1) Il est préférable d'effectuer ce réglage sur une mire d'essai stationnaire, ou un réseau sans signal appliqué.
2) Enfoncer l'aimant sur la base, la flèche pointée en direction de l'écran, et sur la ligne sur le col du tube. Pousser l'aimant juste au-delà de la base.
3) Etablir les connexions de la base, commuter, et tourner le bouton de luminosité.
4) Déplacer l'aimant sur le col du tube en maintenant la flèche sur la ligne sur le col, jusqu'à ce que le réseau focalisé atteigne sa brillance maximum. Augmenter alors la brillance pour obtenir une brillance équivalente au blanc maximum de l'image et, au besoin, réajuster la position de l'aimant pour la brillance maximum. Centrer le réseau en réglant la position du champ focal. Si c'est impossible, on peut déplacer l'aimant, soit le long du col ou en le faisant tourner légèrement, de telle sorte que la centralisation soit obtenue en

ajustant la position du champ focal. La brillance ne doit pas diminuer pendant l'opération.

5) Bloquer l'aimant dans sa position au moyen de la vis moletée. Vérifier que le tube est alors réglé pour la qualité optimum de l'image.

ATTENTION

L'aimant doit être traité avec précaution, il ne doit pas être placé dans un champ magnétique intense.

Si on obtient un réseau d'une brillance qui ne convient pas, il faut essayer un nouvel aimant.

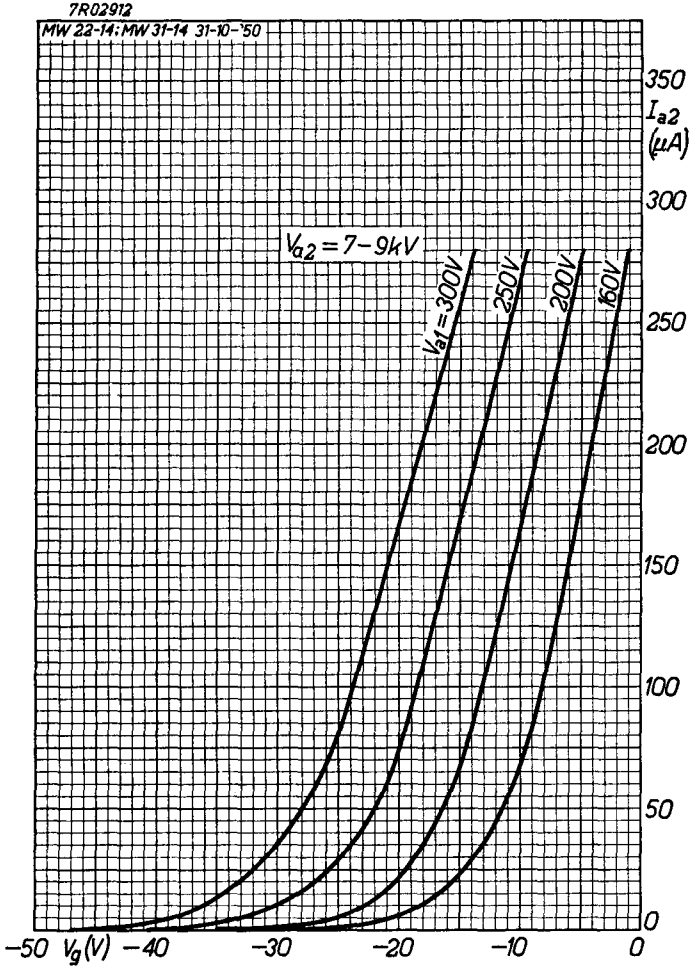
EINSTELLUNG DER RÖHREN MW 31-16 MIT IONENFALLE

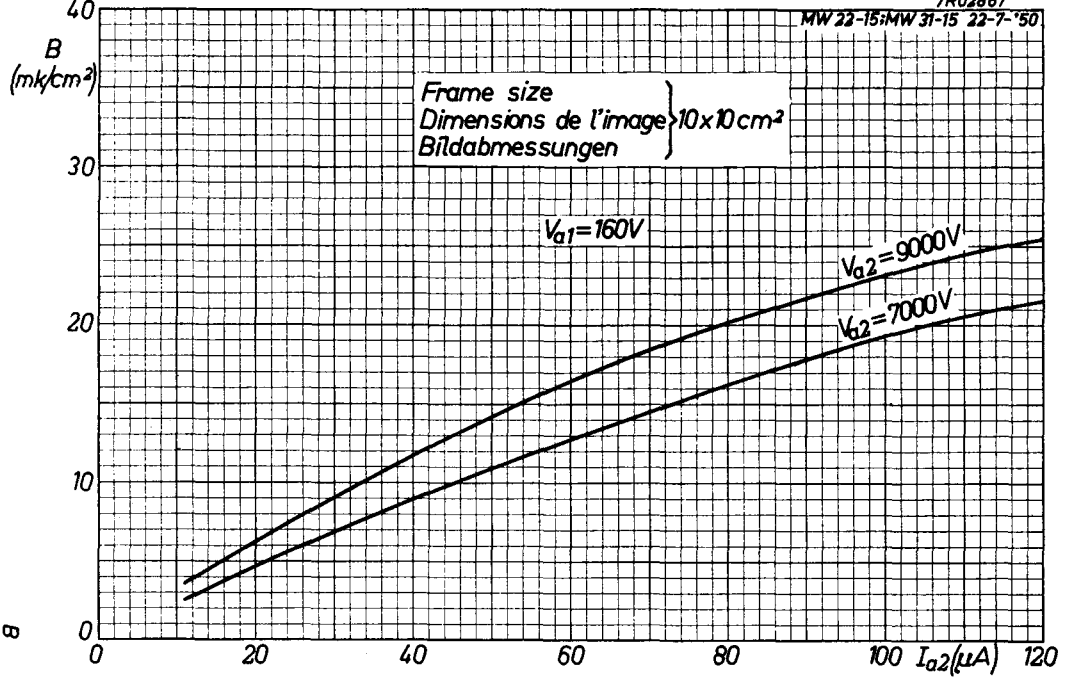
1) Die Einstellung wird am besten an einem festen Kontrollmuster vorgenommen, oder an Hand eines Rasters ohne Signalzuführung.
2) Man schiebe den Magnetring über den Sockel, mit dem Pfeil in Schirmrichtung weisend und über den Strich auf dem Röhrenhals, derart, dass der Magnet gerade oberhalb des Sockels liegt.
3) Die Sockelanschlüsse herstellen, einschalten und den Helligkeitsregler aufdrehen.
4) Man verstelle den Magnet, wobei jedoch der Pfeil immer über den Strich liegen muss, so weit, bis das fokussierte Raster die stärkste Helligkeit aufweist. Alsdann steigere man die Helligkeit auf intensivstes Weiss und stelle, falls nötig, den Magnet auf maximale Helligkeit nach. Zur Zentrierung des Rasters regle man hiernach die Lage des Fokussierungsfeldes. Ist das nicht möglich, so verstelle oder verdrehe man den Magnet ein wenig, so dass Zentrierung mittels Regelung des Fokussierungsfeldes erreicht werden kann.
   Während dieses Vorganges darf jedoch die Helligkeit nicht abnehmen.
5) Durch Anspannen der Rändelschraube den Magnet alsdann fixieren und untersuchen, ob die Röhre nunmehr für optimale Bildgüte eingestellt ist.

ZUR BEACHTUNG

Der Magnet erfordert sorgfältige Behandlung, und darf niemals in ein starkes magnetisches Feld gebracht werden.

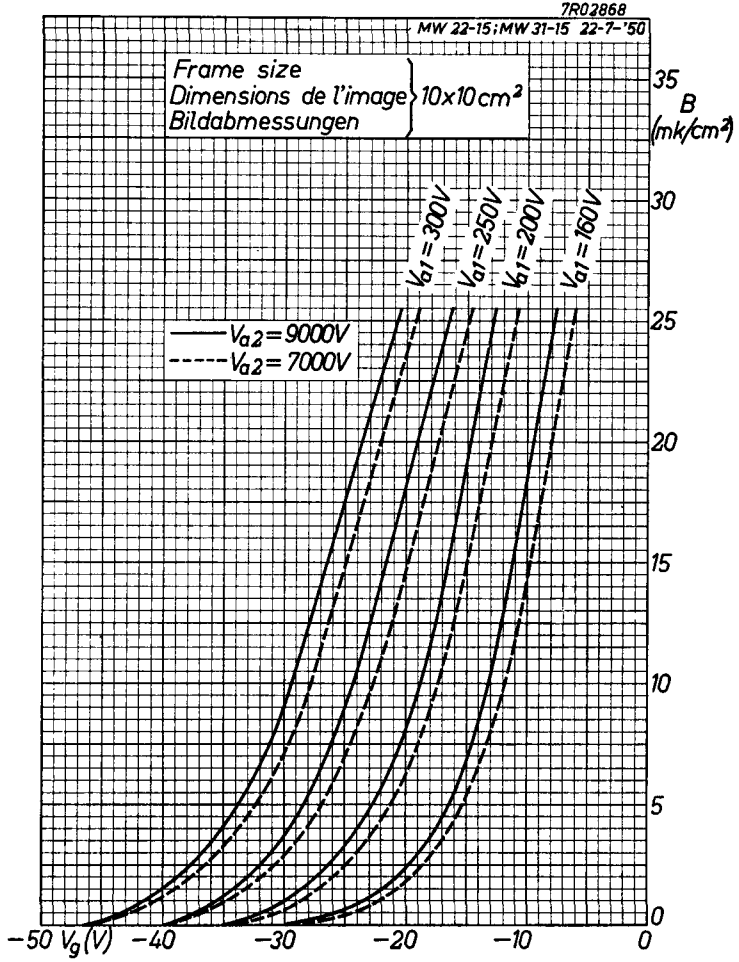
Ist die Helligkeit des Rasters unzulänglich, so muss ein neuer Magnet benutzt werden.


7R02912
MW 22-14; MW 31-14 31-10-'50
350
I_{a2} (μA)
300
V_{a2} = 7–9kV
V_{a1} = 300V
250V
200V
160V
250
200
150
100
50
0
−50 V_g(V) −40
−30
−20
−10
0


B
(mk/cm²)
40
30
20
10
0
Frame size
Dimensions de l'image
Bildabmessungen
10x10 cm²
V_{a1}=160V
V_{a2}=9000V
V_{a2}=7000V
0
20
40
60
80
100
I_{a2}(μA)
120

PHILIPS

B


7R02868
MW 22-15; MW 31-15 22-7-'50
Frame size
Dimensions de l'image
Bildabmessungen
10x10 cm²
B
(mk/cm²)
35
30
25
20
15
10
5
0
Va1 = 300V
Va1 = 250V
Va1 = 200V
Va1 = 160V
Va2 = 9000V
Va2 = 7000V
−50 Vg (V)
−40
−30
−20
−10
0

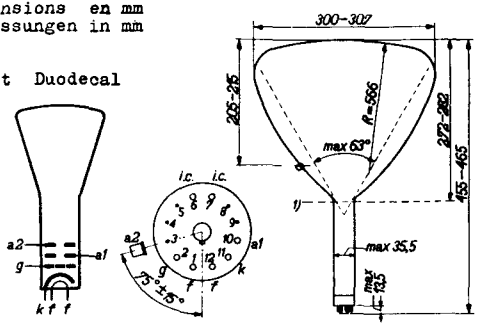
DIRECT VIEWING TELEVISION CATHODE RAY TUBE
TUBE A RAYONS CATHODIQUES DE TELEVISION A VUE DIRECTE
FERNSEHKATHODENSTRAHLRÖHRE FÜR DIREKTEN SICHT

Heating:	indirect by A.C. or D.C.; series or parallel supply	
Chauffage:	indirect par C.A. ou C.C.; alimentation en parallèle ou en série	V_f = 6,3 V I_f = 0,3 A
Heizung:	indirekt durch Wechsel- oder Gleichstrom; Serien- oder Parallelspeisung	

Capacitances Capacités Kapazitäten	C_g = 6 pF C_{ha} = 5 pF

Dimensions in mm
Dimensions en mm
Abmessungen in mm

Base
Culot Duodecal
Fuss



Screen Ecran Schirm	Colour Couleur Farbe	white blanche weiss
	Colour temperature Température de couleur Farbtemperatur	9000 °K
	Useful screen diameter Diamètre utile de l'écran Nützlicher Schirmdurchmesser	287 mm

1) Reference line, determined by the diameter of
Ligne de référence, déterminée par le diamètre de
Bezugslinie, bestimmt durch den Durchmesser von 36 mm

Focusing — Magnetic
The number of ampere-turns necessary for focusing at Va2 = 7000 V is 580-720, at a distance of about 36 cm from the coil centre to the screen.

Focalisation — Magnétique
Le nombre d'ampère-tours nécessaire pour la focalisation à Va2 = 7000 V est de 580-720, à une distance d'environ 36 cm du centre de la bobine jusqu'à l'écran.

Fokussierung — Magnetisch
Die erforderliche Amperewindungszahl für Fokussierung beträgt bei Va2 = 7000 V 580-720, bei einem Abstand von ungefähr 36 cm vom Mittelpunkt der Spule bis zum Schirm.

Deflection (double magnetic) $N = \frac{0.3 \times P \times H \times cL}{\sqrt{Va2}}$ cm, where

N = the deflection on the screen in cm
P = the distance between the deflection centre and the screen in cm
H = the max. magnetic field strength in gauss
c = a correction factor, in most cases = $\frac{1}{2}$
L = the length of the coil windings in cm

The deflection centre can be assumed to coincide with the max. magnetic field strength. In order to prevent the electron beam from being blocked by the end of the tube neck at maximum deflection, the distance from the deflection centre to the reference line should not exceed 21 mm.

The symmetrical plane of the magnetic field must pass between the deflection centre and the screen.

Déviation (magnétique double) $N = \frac{0,3 \times P \times H \times cL}{\sqrt{Va2}}$ cm, où

N = la déviation sur l'écran en cm
P = la distance entre le centre de déviation et l'écran en cm
H = l'intensité max. du champ magnétique en gauss
c = un facteur de correction, en général = $\frac{1}{2}$
L = la longueur des enroulements de bobine en cm

Le centre de déviation peut être supposé coincidant avec le maximum de l'intensité du champ magnétique. Pour prévenir le faisceau électronique d'être intercepté à la déviation maximum par l'extrémité du col du tube, la distance entre le centre de déviation et la ligne de référence ne dépassera pas 21 mm.

Le plan symétrique du champ magnétique doit passer entre le centre de déviation et l'écran.

Ablenkung (doppelmagnetisch) $N = \frac{0{,}3 \times P \times H \times cL}{\sqrt{Va2}}$ cm, wo

N = die Ablenkung auf dem Schirm in cm
P = der Abstand zwischen dem Ablenkungsmittelpunkt und dem Schirm in cm
H = die max. magnetische Feldstärke in Gauss
c = ein Korrektionsfaktor, im allgemeinen = ½
L = die Länge der Spulenwindungen in cm

Der Ablenkungsmittelpunkt fällt gewöhnlich mit dem Höchstwert der magnetischen Feldstärke zusammen. Um zu verhüten, dass der Elektronenstrahl während der grössten Ablenkung am Ende des Röhrenhalses unterbrochen wird, darf der Abstand vom Ablenkungsmittelpunkt bis zur Bezugslinie 21 mm nicht überschreiten.

Die Symmetriefläche des magnetischen Feldes muss zwischen dem Ablenkungsmittelpunkt und dem Schirm liegen.

Net weight, poids net, Nettogewicht	3000 g
Shipping weight, poids brut, Bruttogewicht	5400 g

Operating characteristics
Caractéristiques d'utilisation
Betriebsdaten

V_{a2}	=	7000	7000 V
V_{a1}	=	160	200 V
$-V_g$ (I_a = 0)	=	20-50	25-60 V
I_{a2}	=	140	140 µA
W_l	=	2	2 mW/cm^2
W_{l_p}	=	10	10 mW/cm^2

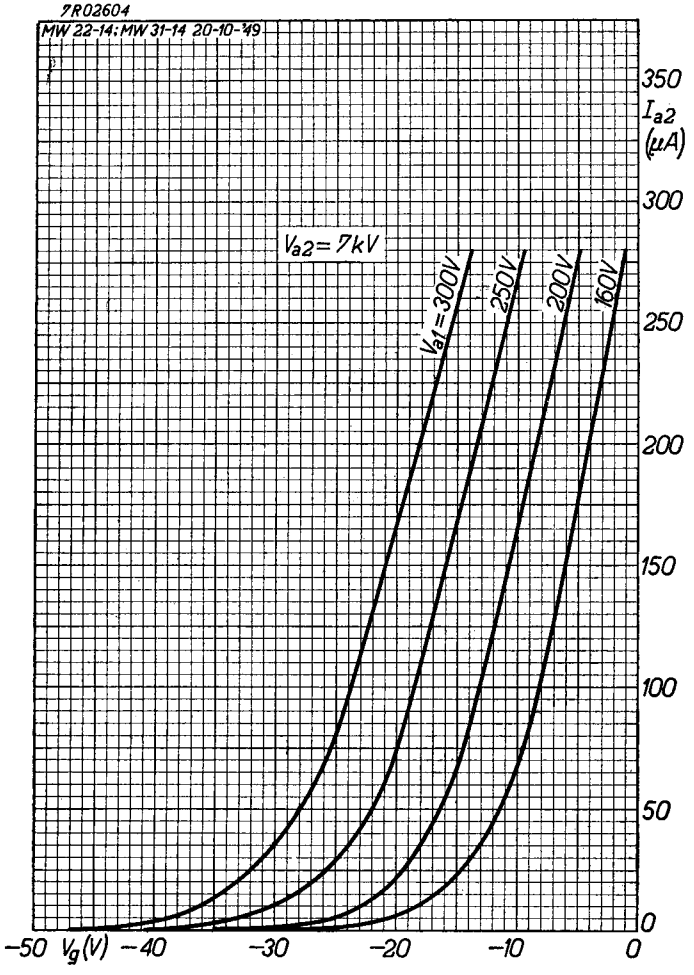
Max. raster size
Dimensions max. du trame = 21 x 26,5 cm^2 1)
Max. Rasterabmessungen

Limiting values
Caractéristiques limites
Grenzdaten

V_{a2} = max.	9000 V
V_{a1} = max.	400 V
I_{a2} = max.	175 µA
$-V_g$ = max.	200 V
V_{kf} = max.	150 V 2) (k pos., f neg.)
V_{kf} = max.	0 V (k neg., f pos.)

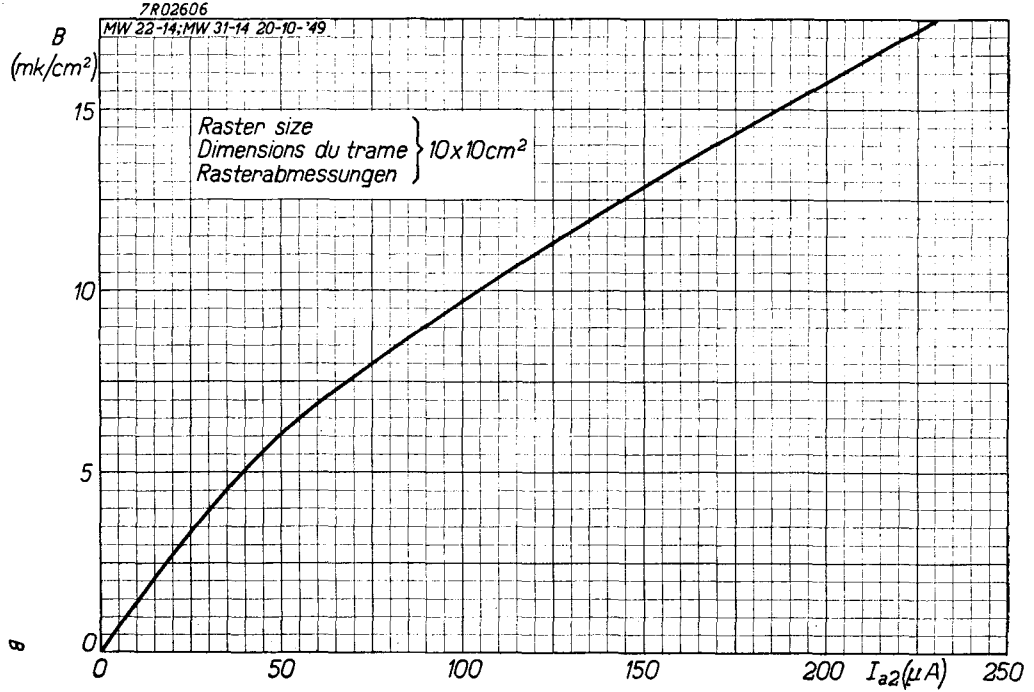
1) With rounded angles; avec angles arondis; mit abgerundeten Ecken.

2) This valve must not be exceeded when switching on. Cette valeur ne doit pas être dépassée pendant la mise en circuit. Dieser Wert muss beim Einschalten nicht überschritten werden.


7R02604
MW 22-14; MW 31-14 20-10-49
V_{a2}= 7kV
V_{a1}= 300V
250V
200V
160V
I_{a2} (μA)
350
300
250
200
150
100
50
0
−50 V_g(V) −40
−30
−20
−10
0

11.11.1949

A

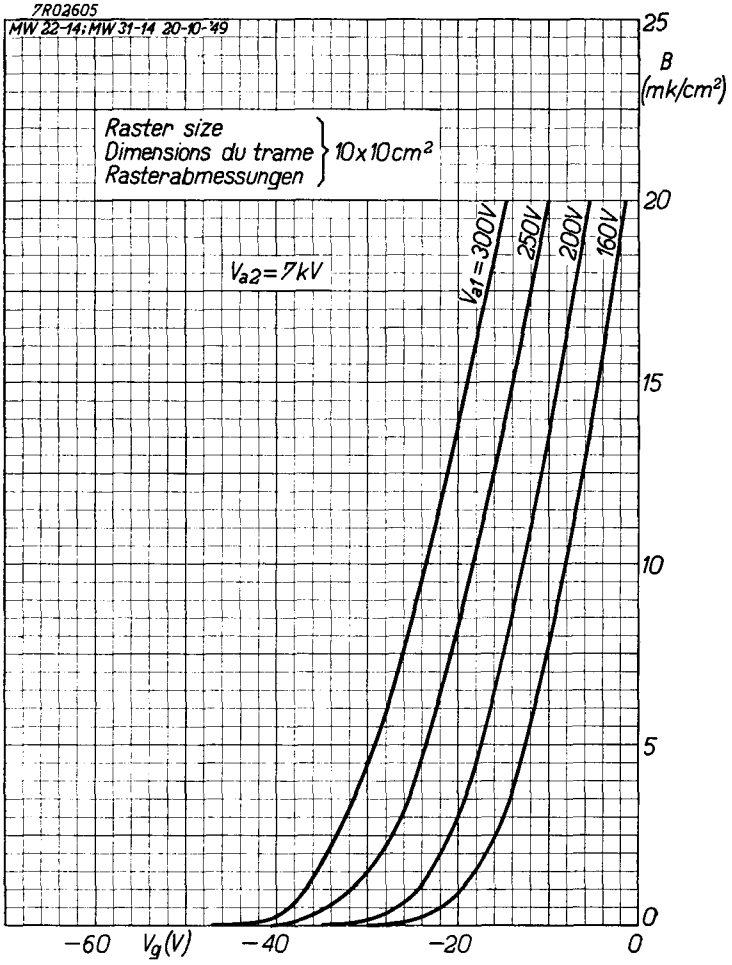


MW31-17

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MW 31-17



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C

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Electronic Tube

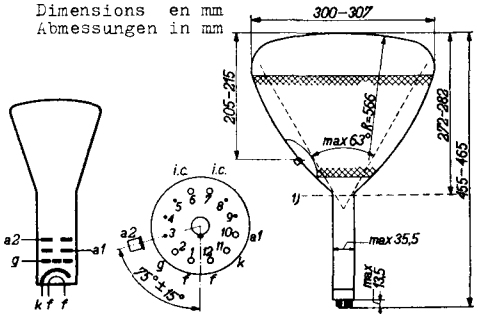
HANDBOOK

MW31-17

page	sheet	date
1	1	1950.04.04
2	2	1950.04.04
3	3	1950.04.04
4	A	1949.11.11
5	B	1949.11.11
6	C	1949.11.11
7	FP	2000.03.14

DIRECT VIEWING TELEVISION CATHODE RAY TUBE
TUBE A RAYONS CATHODIQUES DE TELEVISION A VUE DIRECTE
FERNSEHKATHODENSTRAHLRÖHRE FÜR DIREKTEN SICHT

Dimensions in mm
Dimensions en mm
Abmessungen in mm



Base, culot, Fuss: Duodecal

For further technical data, refer to type MW 31-17
Pour les autres détails techniques voir type MW 31-17
Für die übrigen technischen Daten siehe Typ MW 31-17

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Electronic Tube

HANDBOOK

MW31-18

page	sheet	date
1	1	1950.04.04
2	FP	2000.03.14

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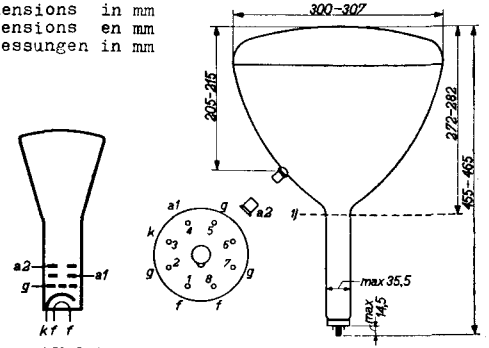
MW 31-7
MW 31-14

DIRECT VIEWING TELEVISION CATHODE RAY TUBE
TUBE A RAYONS CATHODIQUES DE TELEVISION A VUE DIRECTE
FERNSEHKATHODENSTRAHLRÖHRE FÜR DIREKTEN SICHT

Heating:	indirect by A.C. parallel supply	**MW 31-7**
Chauffage:	indirect par C.A alimentation en parallèle	Vf = 6,3 V If = 0,6 A
Heizung:	indirekt durch Wechselstrom Parallelspeisung	

Heating:	indirect by A.C. or D.C.; series or parallel supply	**MW 31-14**
Chauffage:	indirect par C.A. ou C.C.; alimentation en parallèle ou en série	Vf = 6,3 V If = 0,3 A
Heizung:	indirekt durch Wechsel- oder Gleichstrom; Serien- oder Parallelspeisung	

Dimensions in mm
Dimensions en mm
Abmessungen in mm



MW 31-7 **MW 31-14**

Base, culot, Fuss: Loctal

For further technical data, refer to type MW 31-17
Pour les autres détails techniques voir type MW 31-17
Für die übrigen technischen Daten siehe Typ MW 31-17

PHILIPS

MW 31-7
MW 31-14

TELEVISION PICTURE TUBES
TUBES IMAGE DE TELEVISION
FERNSEHBILDRÖHREN

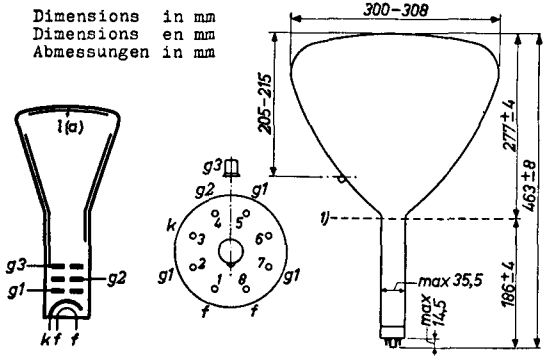
Heating : indirect by A.C. parallel supply
Chauffage: indirect par C.A. alimentation parallèle
Heizung : indirekt durch Wechsel- oder Gleichstrom; Serien- oder Parallelspeisung

MW 31-7
V_f = 6,3 V
I_f = 0,6 A

Heating : indirect by A.C. or D.C. series or parallel supply
Chauffage: indirect par C.A. ou C.C. alimentation série ou parallèle
Heizung : indirekt durch Wechsel- oder Gleichstrom; Serien- oder Parallelspeisung

MW 31-14
V_f = 6,3 V
I_f = 0,3 A

Dimensions in mm
Dimensions en mm
Abmessungen in mm



Base, culot, Sockel: Loctal 8p.

For further data and curves refer to type MW 31-17
Pour les autres caractéristiques et courbes voir type MW 31-17
Für die übrigen Daten und Kurven siehe Typ MW 31-17

PHILIPS

Electronic Tube

HANDBOOK

MW31-7 MW31-14

page	sheet	date
1	1	1950.04.04
2	1	1954.03.03
3	FP	2000.03.14

PHILIPS

MW 31-74

DIRECT VIEWING TELEVISION CATHODE RAY TUBE with ion trap and filterglass
TUBE A RAYONS CATHODIQUES DE TELEVISION A VISION DIRECT avec piège à ions et verre filtre
FERNSEHKATHODENSTRAHLRÖHRE FÜR DIREKTEN SICHT mit Ionenfalle und Filterglas

Type MW 31-74 is identical to type MW 31-16, except for having the filterglass face plate
Le type MW 31-74 est identique au type MW 31-16, sauf que la plaque de face est en verre filtre
Type MW 31-74 ist identisch mit Type MW 31-16, ausgenommen dass die Frontplatte aus Filterglas besteht

TELEVISION PICTURE TUBE with ion trap and filterglass
TUBE IMAGE DE TELEVISION avec trappe à ions et verre filtre
FERNSEHBILDRÖHRE mit Ionenfalle und Filterglas

Heating : indirect by A.C. or D.C. series or parallel supply		
Chauffage: indirect par C.A. ou C.C. alimentation série ou parallèle	V_f = 6,3 V[1])	I_f = 0,3 A
Heizung : indirekt durch Wechsel- oder Gleichstrom; Serien- oder Parallelspeisung		

Capacitances Capacités Kapazitäten	C_{g1} =	8 pF
	C_k =	5 pF
	C_{g3m}[2]) =	1200 pF

Screen Ecran Schirm	colour couleur Farbe	white blanche weiss
	Colour temperature Température de couleur Farbtemperatur	7500 °K
	Light transmission Transmission de lumière Lichtdurchlässigkeit	70 %
	Useful diameter Diamètre utile Nützlicher Durchmesser	min. 287 mm

For curves of the screen properties see front of this section
Pour les courbes des propriétés de l'écran voir en tête de ce chapitre
Für die Kurven der Schirmeigenschaften siehe am Anfang dieses Abschnitts

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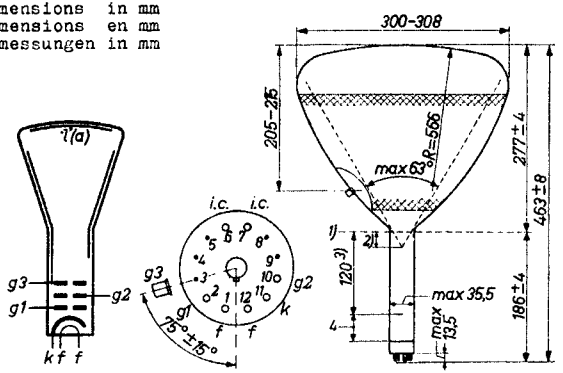
[1]) When the tube is used in a series heater chain, the heater voltage must not exceed 8.5 V when the supply is switched on. If necessary a current limiting device must be used for this purpose

Si le tube est monté dans une chaîne série de filaments, la tension de chauffage ne doit pas dépasser 8,5 V à la mise en circuit. En cas de besoin il faut utiliser un limiteur de courant pour ce but

Wenn die Röhre in einer Heizfadenkette verwendet wird, darf die Heizspannung beim Einschalten 8,5 V nicht überschreiten. Nötigenfalls ist zu diesem Zweck ein Strombegrenzer zu verwenden

)m = outer coating; couche extérieure; Aussenbelag

Dimensions in mm
Dimensions en mm
Abmessungen in mm



Base, culot, Sockel: Duodecal 7p.

Mounting position: The anode connection must be in the vertical plane through the axis of the tube
Montage: La connexion de l'anode doit être située dans le plan vertical mené par l'axe du tube
Aufstellung: Der Anodenanschluss muss in der senkrechten Ebene durch die Achse der Röhre liegen

---

1) Reference line, determined by the diameter of 36 mm
Ligne de référence, déterminée par le diamètre de 36 mm
Bezugslinie, bestimmt durch den Durchmesser von 36 mm

2) The distance from the deflection centre to the reference line should not exceed 16 mm
La distance du centre de déviation au ligne de référence ne dépassera pas 16 mm
Der Abstand des Ablenkungsmittelpunktes bis zur Bezugslinie soll 16 mm nicht überschreiten

3) Space for deflection and focusing coils
Place pour les bobines de déviation et de concentration
Platz für Ablenk- und Fokussierungsspulen

4) Space for the ion trap magnet
Place pour l'aimant de la trappe à ions
Platz für den Magnet der Ionenfalle

Deflection and focusing Déviation et concentration Ablenkung und Fokussierung	magnetic magnétique magnetisch
Deflection angle l'angle de déviation Ablenkungswinkel	max. 63°
Focusing coil: without ferromagnetic material Number of ampere-turns: (V_{g3} = 7000 V) 605-745 (V_{g3} = 9000 V) 665-815	
Distance between centre of field and reference line:	80 mm
Bobine de concentration: sans matière ferromagnétique Nombre d'ampère -tours : (V_{g3} = 7000 V) 605-745 (V_{g3} = 9000 V) 665-815	
Distance entre le centre du champ et la ligne de référence:	80 mm
Fokussierungsspule: ohne ferromagnetischen Material Amperewindungszahl: (V_{g3} = 7000 V) 605-745 (V_{g3} = 9000 V) 665-815	
Abstand des Zentrums des Feldes bis zur Bezugslinie:	80 mm

Ion trap magnet: Single magnet, field strength 52-60 gausses. Type number 55400. For the procedure of setting up see page 6

Aimant de la trappe à ions: Aimant simple, intensité du champ 52-60 gauss. Numéro de type 55400. Pour le réglage voir page 6

Magnet der Ionenfalle: Einfacher Magnet, Feldstärke 52-60 Gauss. Typennummer 55400. Für die Einstellung siehe Seite 7

Net weight Poids net Nettogewicht	3000 g
Shipping weight Poids brut Bruttogewicht	5400 g

Operating characteristics
Caractéristiques d'utilisation
Betriebsdaten

V_{g3}	=	7000	9000 V
V_{g2}	=	250	250 V
$-V_{g1}(I_g=0)$	=	32-71	32-71 V

Limiting values (design centre values)
Caractéristiques limites (valeurs moyennes de développement)
Grenzdaten (mittlere Entwicklungsdaten)

V_{g3}	= max.	11000	V
V_{g3}	= min.	6000	V
V_{g2}	= max.	410	V
V_{g1}	= max.	0	V
$-V_{g1}$	= max.	200	V
V_{g1_p}	= max.	2	V
W_ℓ	= max.	2,5	mW/cm^2 [1]
W_ℓ	= max.	5	mW/cm^2 [2]
V_{kf}(k pos.;f neg.)	= max.	200	V [3][4]
V_{kf}(k neg.;f pos.)	= max.	125	V [4]

Max. circuit values
Valeurs max. des éléments du montage
Max. Werte der Schaltungsteile

R_{kf}	=	1 MΩ [5]
R_{g1}	=	1,5 MΩ
Z_{g1}(f= 50c/s)	=	0,5 MΩ

The power supply should be of the limited-energy type with inherent regulation to limit the continuous short-circuit current to 5 mA.

Le circuit d'alimentation ne doit être capable de fournir qu'une puissance limitée de sorte que le courant de court-circuit permanent ne dépasse pas 5 mA.

Der Speiseteil soll nur eine begrenzte Leistung liefern können, damit der Strom bei Dauerkurzschluss nicht mehr als 5 mA beträgt.

---

[1] Fixed pattern
Mire fix
Feste Patrone

[2] Moving picture
Image mouvante
Bewegendes Bild

[3][4][5] See page 5; voir page 5; siehe Seite 5

3) During a warm-up period not exceeding 45 seconds the heater may be 410 V negative with respect to the cathode

Pendant une période d'échauffement ne dépassant pas 45 secondes, le filament peut être porté à un potentiel négatif de 410 V par rapport à la cathode

Während einer Anheizzeit von max. 45 Sekunden darf der Heizfaden 410 V negativ sein in bezug auf der Katode

4) In order to avoid excessive hum, the A.C. component of V_{kf} should be as low as possible and must not exceed 20 V

Pour éviter le ronflement excessif la composante alternative de V_{kf} sera la plus petite possible et ne dépassera pas 20 V

Zur Vermeidung von Brummstörungen muss die Wechselspannungskomponente von V_{kf} so klein wie möglich sein und jedenfalls 20 V nicht überschreiten

5) When the heater is supplied from a separate transformer.
When the heater is in a series chain, or earthed to A.C., Z_k(f =50 c/s)= max. 0.1 MΩ

Quand le filament est alimenté par un transformateur séparé.
Quand le filament est connecté dans une chaîne série, ou est mise à la terre pour C.A., Z_k(f = 50 c/s) = max. 0,1 MΩ

Wenn der Heizfaden von einem separaten Transformator gespeist wird.
Wenn der Heizfaden in einer Serienkette aufgenommen oder für Wechselstrom geerdet ist, Z_k(f = 50 Hz) = max. 0,1 MΩ

ADJUSTMENT OF ION-TRAP MAGNET 55400

1. This adjustment is best carried out on a stationary test pattern, or a raster with no signal applied.
2. Push the magnet over the base, with the arrow pointing towards the screen and over the line on the tube neck. Push magnet just beyond the base.
3. Fit base connections, switch on, and turn up brightness control.
4. Move the magnet up the neck of the tube keeping the arrow over the line on the neck until the focused raster is at its brightest. Now increase the brightness to give a brilliance equivalent to peak white in a picture, and, if necessary, re-adjust the position of the magnet for maximum brilliance. Centre the raster by adjusting the position of the focus field. If this cannot be done. the magnet may be moved, either along the neck or by rotating it a little, so that centrality is obtained by adjusting the focus field position. The brilliance must not decrease during this operation.
5. Lock the magnet in position by tightening the thumb screw. Check that the tube is now set up for optimum picture quality.

WARNING

The magnet must be handled carefully, it should not be placed in a strong magnetic field.

If a raster of inadequate brilliance is obtained, a new magnet should be tried.

REGLAGE DE L'AIMANT DE TRAPPE A IONS 55400

1. Il est préférable d'effectuer ce réglage sur une mire d'essai stationnaire, ou un réseau sans signal appliqué.
2. Enfoncer l'aimant sur la base, la flèche pointée en direction de l'écran, et sur la ligne sur le col du tube. Pousser l'aimant juste au-delà de la base.
3. Etablir les connexions de la base, commuter, et tourner le bouton de luminosité.
4. Déplacer l'aimant sur le col du tube en maintenant la flèche sur la ligne sur le col, jusqu'à ce que le réseau focalisé atteigne sa brillance maximum. Augmenter alors la brillance pour obtenir une brillance équivalente au blanc maximum de l'image et, au besoin, réajuster la position de l'aimant pour la brillance maximum. Centrer le réseau en réglant la position du champ focal. Si c'est impossible, on peut déplacer l'aimant, soit le long du col ou en le faisant tourner légèrement, de telle sorte que la centralisation soit obtenue en ajustant la position du champ focal. La brillance ne doit pas diminuer pendant l'opération.

5. Bloquer l'aimant dans sa position au moyen de la vis moletée. Vérifier que le tube est alors réglé pour la qualité optimum de l'image.

ATTENTION

L'aimant doit être traité avec précaution, il ne doit pas être placé dans un champ magnétique intense.

Si on obtient un réseau d'une brillance qui ne convient pas, il faut essayer un nouvel aimant.

EINSTELLUNG DES MAGNETS DER IONENFALLE 55400

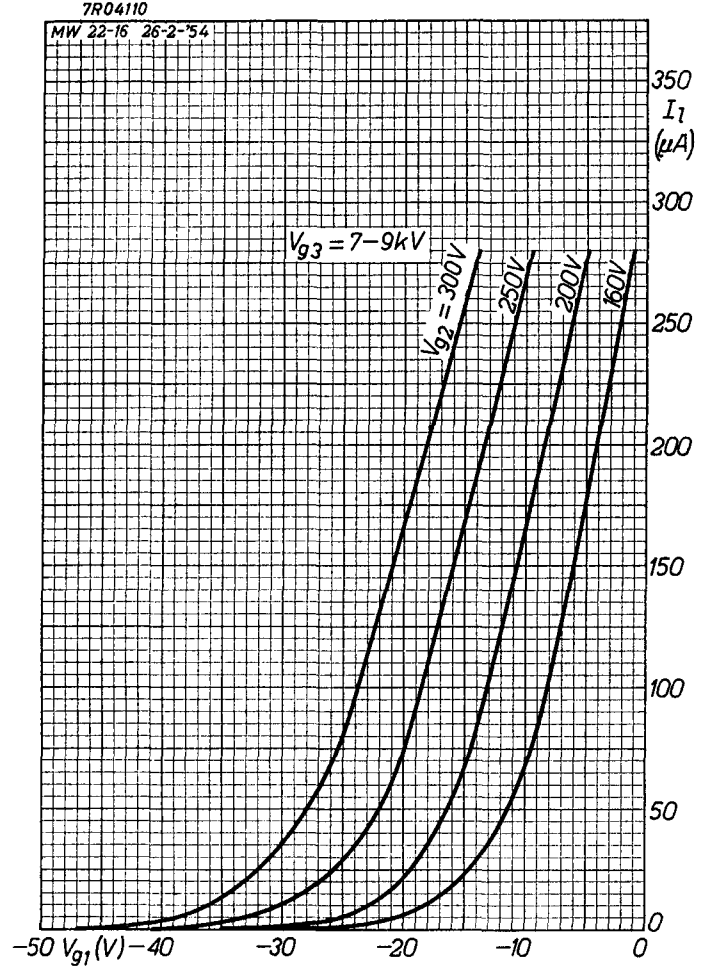
1. Die Einstellung wird am besten an einem festen Kontrollmuster vorgenommen, oder an Hand eines Rasters ohne Signalzuführung.
2. Man schiebe den Magnetring über den Sockel, mit dem Pfeil in Schirmrichtung weisend und über den Strich auf dem Röhrenhals, derart, dass der Magnet gerade oberhalb des Sockels liegt.
3. Die Sockelanschlüsse herstellen, einschalten und den Helligkeitsregler aufdrehen.
4. Man verstelle den Magnet, wobei jedoch der Pfeil immer über den Strich liegen muss, so weit, bis das fokussierte Raster die stärkste Helligkeit aufweist. Alsdann steigere man die Helligkeit auf intensivstes Weiss und stelle, falls nötig, den Magnet auf maximale Helligkeit nach. Zur Zentrierung des Rasters regle man hiernach die Lage des Fokussierungsfeldes. Ist das nicht möglich, so verstelle oder verdrehe man den Magnet ein wenig, so dass Zentrierung mittels Regelung des Fokussierungsfeldes erreicht werden kann.
   Während dieses Vorganges darf jedoch die Helligkeit nicht abnehmen.
5. Durch Anspannen der Rändelschraube den Magnet alsdann fixieren und untersuchen, ob die Röhre nunmehr für optimale Bildgüte eingestellt ist.

ZUR BEACHTUNG

Der Magnet erfordert sorfältige Behandlung, und darf niemals in ein starkes magnetisches Feld gebracht werden.

Ist die Helligkeit des Rasters unzulänglich, so muss ein neuer Magnet benutzt werden.

PHILIPS


7R04110
MW 22-16 26-2-'54
$V_{g3} = 7-9kV$
$V_{g2} = 300V$
250V
200V
160V
350
300
250
200
150
100
50
0
I_1 (μA)
−50 V_{g1}(V) −40
−30
−20
−10
0

A



MW31-74

page	sheet	date
1	1	1953.02.02
2	1	1954.03.03
3	2	1954.03.03
4	3	1954.03.03
5	4	1954.03.03
6	5	1954.03.03
7	6	1954.03.03
8	7	1954.03.03
9	A	1954.03.03
10	FP	2000.03.14

TELEVISION CATHODE RAY TUBE with rectangular screen and ion trap
TUBE A RAYONS CATHODIQUES DE TELEVISION avec écran rectangulaire et trappe à ions
FERNSEHKATHODENSTRAHLRÖHRE mit rechteckigem Schirm und Ionenfalle

Heating:	indirect by A.C. or D.C.; series or parallel supply		
Chauffage:	indirect par C.A. ou C.C.; alimentation en parallèle ou en série	Vf =	6,3 V[1])
Heizung:	indirekt durch Wechsel- oder Gleichstrom; Serien- oder Parallelspeisung	If =	0,3 A

Capacitances Capacités Kapazitäten	C_g	=	6 pF
	C_k	=	4 pF
	$C_{a_{2m}}$[2])	>	1500 pF

Screen Ecran Schirm	Colour Couleur Farbe	white blanche weiss
	Colour temperature Température de couleur Farbtemperatur	7500 °K
	Useful screen diagonal Diagonale utile de l'écran Nützliche Schirmdiagonale	min. 324 mm
	Useful screen width Largeur utile de l'écran Nützliche Schirmbreite	min. 294 mm

[1]) When the tube is used in a series heater chain, the heater voltage must not exceed 9,5 V when the supply is switched on. If necessary a current limiting device must be used for this purpose.

Si le tube est monté dans une chaîne série de filaments, la tension de chauffage ne doit pas dépasser 9,5 V à la mise en circuit. En cas de besoin il faut utiliser un limiteur de courant pour ce but.

Wenn die Röhre in einer Heizfadenkette verwendet wird, darf die Heizspannung beim Einschalten 9,5 V nicht überschreiten. Nötigenfalls muss zu diesem Zweck ein Strombegrenzer verwendet werden.

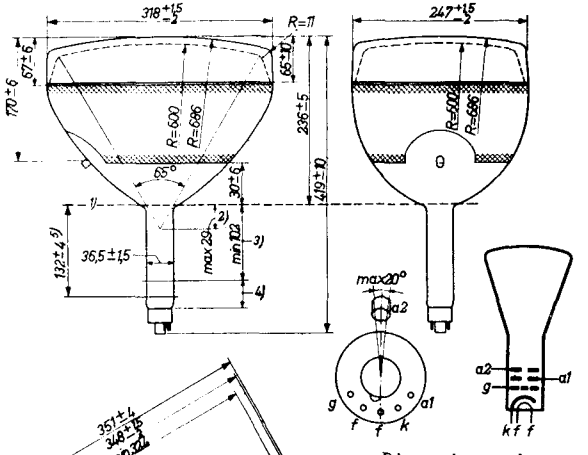
[2]) m = outer coating; m = couche extérieure; m = äussere Schicht.

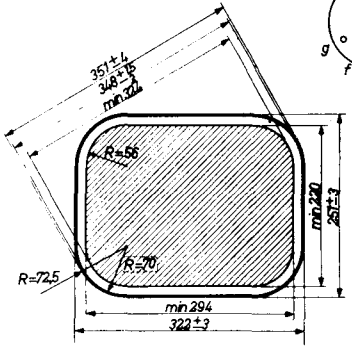
PHILIPS

MW 36-22

RECTANGULAR TELEVISION CATHODE RAY TUBE with ion trap
TUBE À RAYONS CATHODIQUES DE TÉLÉVISION RECTANGULAIRE avec piège à ions
RECHTECKIGE FERNSEHKATHODENSTRAHLRÖHRE mit Ionenfalle

Type MW36-22 is identical to type MW36-24 except for having a clear face plate.
Le type MW36-22 est identique au type MW36-24, sauf que la face est claire.
Type MW36-22 ist identisch mit Type36-24, ausgenommen dass der Schirm aus Klarglas besteht.

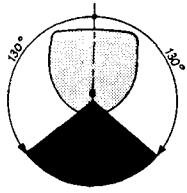




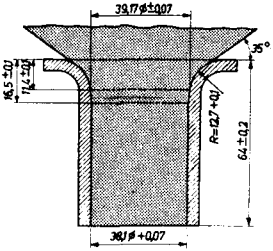
Dimensions in mm
Dimensions en mm
Abmessungen in mm

Base 5-pin
Culot Duodecal
Sockel

Mounting position
Montage
Aufstellung



1), 2), .., 5), see page 3, voir page 3, siehe Seite 3.



Reference line gauge. The inner surface of the coils must not extend into the shaded region.

Calibre de la ligne de référence. La surface intérieure des bobines ne doit pas saillir dans la région estompée.

Bezugslinienlehre. Die innere Oberfläche der Spulen muss nicht im schattierten Gebiet ausragen.

---

1) Reference line, determined by the plane of the upper edge of the reference line gauge when the gauge is resting on the cone.

Ligne de référence, déterminée par le plan du bord supérieur du calibre de la ligne de référence, si celui-ci pose sur le cône.

Bezugslinie, bestimmt durch die Ebene des oberen Randes der Bezugslinienlehre wenn diese auf dem Konus ruht.

2) The distance from the deflection centre to the reference line should not exceed 29 mm.

La distance entre le centre de déviation et la ligne de référence ne dépassera pas 29 mm.

Der Abstand des Ablenkungsmittelpunktes bis zur Bezugslinie soll 29 mm nicht überschreiten.

3) Space for deflection and focusing coils.
Place pour les bobines de déviation et de concentration.
Platz für Ablenk- und Fokussierungsspulen.

4) Space for the ion trap magnet.
Place pour l'aimant de la trappe à ions.
Platz für den Magnet der Ionenfalle.

5) Distance from reference line to top centre of grid
Distance de la ligne de référence jusqu'au centre de la surface supérieure de la grille.
Abstand der Bezugslinie bis zum Mittelpunkt der Oberseite des Gitters.

Deflection (double magnetic) $N = \frac{0.3 \times P \times H \times cL}{\sqrt{V_{a2}}}$ cm, where

N = the deflection on the screen in cm
P = the distance between the deflection centre and the screen in cm.
H = the max. magnetic field strength in gauss
c = a correction factor, in most cases = $\frac{1}{2}$
L = the length of the coil windings in cm.

The deflection centre can be assumed to coincide with the max. magnetic field strength.

The deflection angle is max. 65°.

The diagonal deflection angle is max. 70°.

Déviation (magnétique double) $N = \frac{0,3 \times P \times H \times cL}{\sqrt{V_{a2}}}$ cm, où

N = la déviation sur l'écran en cm
P = la distance entre le centre de déviation et l'écran en cm
H = l'intensité max. du champ magnétique en gauss
c = un facteur de correction, en général = $\frac{1}{2}$
L = la longueur des enroulements de bobine en cm.

Le centre de déviation peut être supposé coïncidant avec le maximum de l'intensité du champ magnétique.

L'angle de déviation est de 65° au max.

L'angle de déviation diagonal est de 70° au max.

Ablenkung (doppelmagnetisch) $N = \frac{0,3 \times P \times H \times cL}{\sqrt{V_{a2}}}$ cm, wo

N = die Ablenkung auf dem Schirm in cm
P = der Abstand zwischen dem Ablenkungsmittelpunkt und dem Schirm in cm
H = die max. magnetische Feldstärke in Gauss
c = ein Korrektionsfaktor, im allgemeinen = $\frac{1}{2}$
L = die Länge der Spulenwindungen in cm.

Der Ablenkungsmittelpunkt fällt gewöhnlich mit dem Höchstwert der magnetischen Feldstärke zusammen.

Der Ablenkungswinkel ist max. 65°.

Der Diagonalablenkungswinkel ist max. 70°.

Focusing — Magnetic
The number of ampere-turns necessary for focusing is about $320/\sqrt{V_{a2(kV)}}$ when a coil without ferromagnetic material is used and the distance of the centre of the focusing field to the reference line is 78 mm.

Concentration — Magnétique
Le nombre d'ampère-tours nécessaire pour la concentration est environ $320/\sqrt{V_{a2(kV)}}$, si une bobine sans matière ferromagnétique est utilisée et si la distance entre le centre du champ de concentration et la ligne de référence est de 78 mm.

Fokussierung — Magnetisch
Die erforderliche Amperewindungszahl für Fokussierung beträgt etwa $320/\sqrt{V_{a2(kV)}}$, wenn eine Spule ohne ferromagnetisches Material verwendet wird und der Abstand des Zentrums des Fokussierungsfeldes bis zur Bezugslinie 78 mm beträgt.

Ion trap magnet: Single magnet, field strength about 60 gausses. Type number 55402.
Aimant de la trappe à ions: Aimant simple, intensité du champ environ 60 gauss. Numéro de type 55402.
Magnet der Ionenfalle: Einfacher Magnet, Feldstärke etwa 60 Gauss. Typennummer 55402.

Net weight
Poids net
Nettogewicht — 4800 g

Operating characteristics
Caractéristiques d'utilisation
Betriebsdaten

V_{a2}	=	10 kV
V_{a1}	=	250 V
$-V_g$ (I_a = 0)	=	33 - 72 V

Limiting values
Caractéristiques limites
Grenzdaten

V_{a2}	= max.	14 kV	[1]
V_{a2}	= min.	7 kV	
V_{a1}	= max.	410 V	
V_{a1}	= min.	160 V	
V_g	= max.	0 V	
$-V_g$	= max.	150 V	
$+V_{g_p}$	= max.	2 V	
V_{kf}	= max.	125 V	[2][3]
V_{kf}	= max.	200 V	[2][4]
R_{g1}	= max.	0,5 MΩ	

[1]) The product of V_{a2} and I_ℓ (average value for the whole screen) must not exceed 6 W.
Le produit de V_{a2} et I_ℓ (valeur moyenne pour tout l'écran) ne dépassera pas 6 W.
Das Produkt von V_{a2} und I_ℓ (Mittelwert für den ganzen Schirm) muss einen Wert von 6 W **nicht** überschreiten.

[2]) In order to avoid excessive hum, the A.C.component of V_{kf} should be as low as possible and must not exceed 20 V.
Pour éviter le ronflement excessif la composante alternative de V_{kf} sera la plus petite possible et ne dépassera pas 20 V.

[3]) Cathode negative with respect to the filament.
Cathode négative par rapport au filament.
Kathode negativ in bezug auf dem Heizfaden.

[4]) Cathode positive with respect to the filament.
During a warming-up period not exceeding 15 sec V_{kf_p} is permitted to rise to 410 V.

Cathode positive par rapport au filament.
Pendant une période de chauffage ne dépassant pas 15 sec V_{kf_p} est permis de monter jusqu'à 410 V.

Kathode positiv in bezug auf dem Heizfaden.
Während einer Anheizzeit von max. 15 Sek. darf V_{kf_p} steigen bis 410 V.

The power supply should be of the limited-energy type with inherent regulation to limit the continuous short-circuit current to 5 mA. If the supply permits the instantaneous short-circuit current to exceed 1 A, or is capable of storing more than 250 µcoulombs, the effective resistance in the circuit between the indicated electrode and the output capacitor should be as follows:

R_g = min. 150 Ω; R_{a1} = min. 470 Ω; R_{a2} = min. 16 kΩ

The resistance R_{a2} can not be applied when the outer valve coating constitutes the output capacitor.

PROCEDURE FOR SETTING UP MW 36-22 ION TRAP TUBES

1. This adjustment is best carried out on a stationary test pattern, or a raster with no signal applied.
2. Push the magnet over the base, with the arrow pointing towards the screen and over the line on the tube neck. Push maghet just beyond the base.
3. Fit base connections, switch on and adjust brightness control for low intensity.
4. Move the magnet up the neck of the tube keeping the arrow over the line on the neck until the focused raster is at its brightest. Now increase the brightness to give a brilliance equivalent to peak white in a picture, and, if necessary, re-adjust the position of the magnet for maximum brilliance. Centre the raster by adjusting the position of the focus coil. If this cannot be done, the magnet may be moved, either along the neck or by rotating it a little, so that centrality is obtained by adjusting the focus coil position. The brilliance must not decrease during this operation.
5. Lock the magnet in position by tightening the thumb screw. Check that the tube is now set up for optimum picture quality.

WARNING

The magnet must be handled carefully, it should not be placed in a strong magnetic field.

If a raster of inadequate brilliance is obtained, a new magnet should be tried.

Le circuit d'alimentation ne doit être capable de fournir qu'une puissance limitée de sorte que le courant de court-circuit permanent ne dépasse pas 5 mA. Si le courant instantané de court-circuit dépasse 1 A, ou si le circuit d'alimentation est capable d'accumuler plus de 250 μ coulomb, les résistances efficaces entre les diverses électrodes et la capacité de sortie doivent avoir les valeurs min. suivantes:

R_g = min. 150 Ω; R_{a1} = min. 470 Ω; R_{a2} = min. 16 kΩ

La résistance R_{a2} ne peut pas être appliquée si le condensateur de sortie est constitué par la couche extérieure du tube.

REGLAGE DES TUBES AVEC TRAPPE A IONS MW 36-22

1. Il est préférable d'effectuer ce réglage sur une mire d'essai stationnaire, ou un réseau sans signal appliqué.
2. Enfoncer l'aimant sur la base, la flèche pointée en direction de l'écran, et sur la ligne sur le col du tube. Pousser l'aimant juste au-delà de la base.
3. Etablir les connexions de la base, commuter, et tourner le bouton de luminosité pour intensité basse.
4. Déplacer l'aimant sur le col du tube en maintenant la flèche sur la ligne sur le col, jusqu'à ce que le réseau focalisé atteigne sa brillance maximum. Augmenter alors la brillance pour obtenir une brillance équivalente au blanc maximum de l'image et, au besoin, réajuster la position de l'aimant pour la brillance maximum. Centrer le réseau en réglant la position de la bobine de concentration. Si c'est impossible, on peut déplacer l'aimant, soit le long du col ou en le faisant tourner légèrement, de telle sorte que la centralisation soit obtenue en ajustant la position de la bobine de concentration. La brillance ne doit pas diminuer pendant l'opération.
5. Bloquer l'aimant dans sa position au moyen de la vis moletée. Vérifier que le tube est alors réglé pour la qualité optimum de l'image.

ATTENTION

L'aimant doit être traité avec précaution, il ne doit pas être placé dans un champ magnétique intense.

Si on obtient un réseau d'une brillance que ne convient pas, il faut essayer un nouvel aimant.

Der Speiseteil soll nur eine begrenzte Leistung liefern können, damit der Strom bei Dauerkurzschluss nicht mehr als 5 mA beträgt. Wenn der Momentanwert des Kurzschlussstromes 1 A überschreitet oder wenn der Speiseteil mehr als 250 µ coulomb speichern kann, müssen die effektiven Widerstände zwischen den verschiedenen Elektroden und dem Ausgangskondensator die folgenden Minimalwerte aufweisen:

R_g = min. 150 Ω; R_{a1} = min. 470 Ω; R_{a2} = min. 16 kΩ

Der Widerstand R_{a2} kann nicht angebracht werden wenn der Ausgangskondensator von der äusseren Schicht der Röhre gebildet wird.

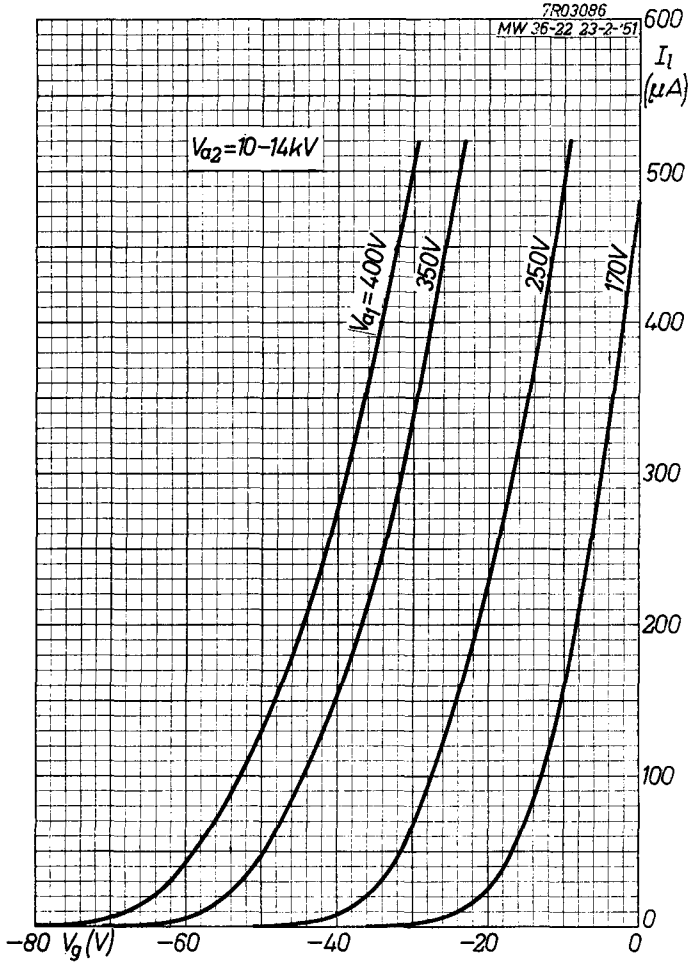
EINSTELLUNG DER RÖHREN MW 36-22 MIT IONENFALLE

1. Die Einstellung wird am besten an einem festen Kontrollmuster vorgenommen, oder an Hand eines Rasters ohne Signalzuführung.
2. Man schiebe den Magnetring über den Sockel, mit dem Pfeil in Schirmrichtung weisend und über den Strich auf dem Röhrenhals, derart, dass der Magnet gerade oberhalb des Sockels liegt.
3. Die Sockelanschlüsse herstellen, einschalten und den Helligkeitsregler aufdrehen bis niedrige Intensität.
4. Man verstelle den Magnet, wobei jedoch der Pfeil immer über den Strich liegen muss, so weit, bis das fokussierte Raster die stärkste Helligkeit aufweist. Alsdann steigere man die Helligkeit auf intensivstes Weiss und stelle, falls nötig, den Magnet auf maximale Helligkeit nach. Zur Zentrierung des Rasters regle man hiernach die Lage der Fokussierungsspule. Ist das nicht möglich, so verstelle oder verdrehe man den Magnet ein wenig, so dass Zentrierung mittels Regelung der Fokussierungsspule erreicht werden kann.
5. Durch Anspannen der Rändelschraube den Magnet alsdann fixieren und untersuchen, ob die Röhre nunmehr für optimale Bildgüte eingestellt ist.

ZUR BEACHTUNG

Der Magnet erfordert sorgfältige Behandlung, und darf niemals in ein starkes magnetisches Feld gebracht werden.

Ist die Helligkeit des Rasters unzulänglich, so muss ein neuer Magnet benutzt werden.


7R03086
MW 36-22 23-2-'51
I_l (μA)
600
500
400
300
200
100
0
V_{a2}=10–14kV
V_{a1}=400V
350V
250V
170V
−80 V_g(V)
−60
−40
−20
0

3.3.1951

A

PHILIPS

Electronic Tube

HANDBOOK

MW36-22

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1	1	1951.02.02
2	1	1952.12.12
3	2	1951.02.02
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5	4	1951.02.02
6	5	1950.02.02
7	6	1950.02.02
8	7	1950.02.02
9	8	1950.02.02
10	9	1951.02.02
11	A	1951.03.03
12	FP	2000.03.14

RECTANGULAR TELEVISION PICTURE TUBE with ion trap and filterglass
TUBE IMAGE DE TELEVISION RECTANGULAIR avec trappe à ions et verre filtre
RECHTECKIGE FERNSEHBILDRÖHRE mit Ionenfalle und Filterglas

Heating : indirect by A.C. or D.C. series or parallel supply Chauffage: indirect par C.A. ou C.C. alimentation série ou parallèle Heizung : indirekt durch Wechsel- oder Gleichstrom; Serien- oder Parallelspeisung	V_f = 6,3 V[1] I_f = 0,3 A	
Capacitances Capacités Kapazitäten	C_{g1} =	6 pF
	C_k =	4 pF
	C_{g3m}[2] =	1100 pF
Screen Ecran Schirm — Colour Couleur Farbe		white blanche weiss
Colour temperature Température de couleur Farbtemperatur		7500 °K
Light transmission Transmission de lumière Lichtdurchlässigkeit		66 %
Useful diagonal Diagonale utile Nützlicher Diagonale		min. 318 mm
Useful width Largeur utile Nützliche Breite		min. 288 mm
Useful height Hauteur utile Nützliche Höhe		min. 217 mm

[1])When the tube is used in a series heater chain, the heater voltage must not exceed 9.5 V when the supply is switched on. If necessary a current limiting device must be used for this purpose.
Si le tube est monté dans une chaîne série de filaments, la tension de chauffage ne doit pas dépasser 9,5 V à la mise en circuit. En cas de besoin il faut utiliser un limiteur de courant pour ce but.
Wenn die Röhre in einer Heizfadenkette verwendet wird, darf die Heizspannung beim Einschalten 9,5 V nicht überschreiten. Nötigenfalls ist zu diesem Zweck ein Strombegrenzer zu verwenden.

[2])m = outer coating; couche extérieure; Aussenbelag.

PHILIPS MW 36-24

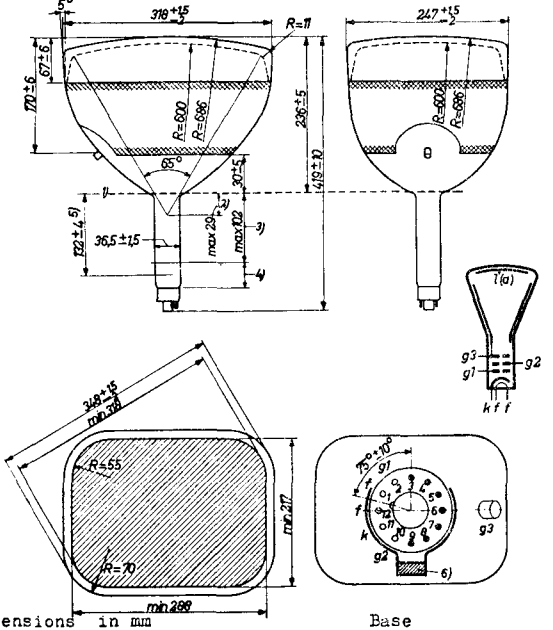
RECTANGULAR TELEVISION PICTURE TUBE with ion trap and filterglass
TUBE IMAGE DE TELEVISION RECTANGULAIR avec trappe à ions et verre filtre
RECHTECKIGE FERNSEHBILDRÖHRE mit Ionenfalle und Filterglas

Heating : indirect by A.C. or D.C. series or parallel supply Chauffage: indirect par C.A. ou C.C. alimentation série ou parallèle Heizung : indirekt durch Wechsel- oder Gleichstrom; Serien- oder Parallelspeisung	V_f = 6,3 V[1] I_f = 0,3 A	
Capacitances Capacités Kapazitäten	C_{g1} =	6 pF
	C_k =	4 pF
	C_{g3m}[2] =	1100 pF
Screen Ecran Schirm — Colour Couleur Farbe		white blanche weiss
Colour temperature Température de couleur Farbtemperatur		7500 °K
Light transmission Transmission de lumière Lichtdurchlässigkeit		66 %
Useful diagonal Diagonale utile Nützlicher Diagonale		min. 318 mm
Useful width Largeur utile Nützliche Breite		min. 288 mm
Useful height Hauteur utile Nützliche Höhe		min. 217 mm

[1])When the tube is used in a series heater chain, the heater voltage must not exceed 9.5 V when the supply is switched on. If necessary a current limiting device must be used for this purpose.
Si le tube est monté dans une chaîne série de filaments, la tension de chauffage ne doit pas dépasser 9,5 V à la mise en circuit. En cas de besoin il faut utiliser un limiteur de courant pour ce but.
Wenn die Röhre in einer Heizfadenkette verwendet wird, darf die Heizspannung beim Einschalten 9,5 V nicht überschreiten. Nötigenfalls ist zu diesem Zweck ein Strombegrenzer zu verwenden.

[2])m = outer coating; couche extérieure; Aussenbelag.

For curves of the screen properties see front of this section
Pour les courbes des propriétés de l'écran voir en tête de ce chapitre
Für die Kurven der Schirmeigenschaften siehe am Anfang dieses Abschnitts



Dimensions in mm
Dimensions en mm
Abmessungen in mm

Base
Culot Duodecal 5p
Sockel

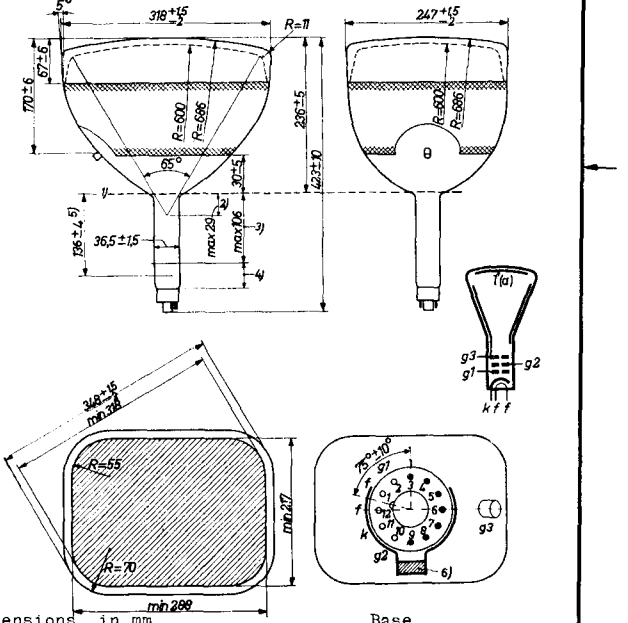
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1) Reference line, determined by the plane of the upper edge of the reference line gauge when the gauge is resting on the cone.

Ligne de référence, déterminée par le plan du bord supérieur du calibre de la ligne de référence, si celui-ci pose sur le cône.

Bezugslinie, bestimmt durch die Ebene des oberen Randes der Bezugslinienlehre wenn diese auf dem Konus ruht.

For curves of the screen properties see front of this section
Pour les courbes des propriétés de l'écran voir en tête de ce chapitre
Für die Kurven der Schirmeigenschaften siehe am Anfang dieses Abschnitts



Dimensions in mm
Dimensions en mm
Abmessungen in mm

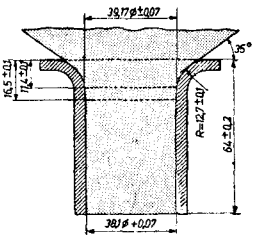
Base
Culot Duodecal 5p
Sockel

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1) Reference line, determined by the plane of the upper edge of the reference line gauge when the gauge is resting on the cone.

Ligne de référence, déterminée par le plan du bord supérieur du calibre de la ligne de référence, si celui-ci pose sur le cône.

Bezugslinie, bestimmt durch die Ebene des oberen Randes der Bezugslinienlehre wenn diese auf dem Konus ruht.



Reference line gauge. The inner surface of the coils must not extend into the shaded region.

Calibre de la ligne de référence. La surface intérieure des bobines ne doit pas saillir dans la région estompée.

Bezugslinienlehre. Die innere Oberfläche der Spulen muss nicht im schattierten Gebiet ausragen.

Mounting position:	Any
Montage:	Arbitrairement
Aufstellung:	Willkürlich

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[2]) The distance from the deflection centre to the reference line should not exceed 29 mm.

La distance entre le centre de déviation et la ligne de référence ne dépassera pas 29 mm.

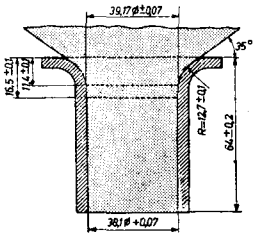
Der Abstand des Ablenkungsmittelpunktes bis zur Bezugslinie soll 29 mm nicht überschreiten.

[3]) Space for deflection and focusing coils.
Place pour les bobines de déviation et de concentration.
Platz für Ablenk- und Fokussierungsspulen.

[4]) Space for the ion trap magnet.
Place pour l'aimant de la trappe à ions.
Platz für den Magnet der Ionenfalle.

[5]) Distance from reference line to top centre of grid.
Distance de la ligne de référence jusqu'au centre de la surface supérieure de la grille.
Abstand der Bezugslinie bis zum Mittelpunkt der Oberseite des Gitters.

[6]) Ion trap magnet
L'aimant de la trappe à ions
Magnet der Ionenfalle



Reference line gauge. The inner surface of the coils must not extend into the shaded region.

Calibre de la ligne de référence. La surface intérieure des bobines ne doit pas saillir dans la région estompée.

Bezugslinienlehre. Die innere Oberfläche der Spulen muss nicht im schattierten Gebiet ausragen.

Mounting position:	Any
Montage:	Arbitrairement
Aufstellung:	Willkürlich

---

[2]) The distance from the deflection centre to the reference line should not exceed 29 mm.

La distance entre le centre de déviation et la ligne de référence ne dépassera pas 29 mm.

Der Abstand des Ablenkungsmittelpunktes bis zur Bezugslinie soll 29 mm nicht überschreiten.

[3]) Space for deflection and focusing coils.
Place pour les bobines de déviation et de concentration.
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Place pour l'aimant de la trappe à ions.
Platz für den Magnet der Ionenfalle.

[5]) Distance from reference line to top centre of grid.
Distance de la ligne de référence jusqu'au centre de la surface supérieure de la grille.
Abstand der Bezugslinie bis zum Mittelpunkt der Oberseite des Gitters.

[6]) Ion trap magnet
L'aimant de la trappe à ions
Magnet der Ionenfalle

Deflection and focusing Déviation et concentration Ablenkung und Fokussierung	magnetic magnétique magnetisch
Vertical deflection angle L'angle de déviation verticale Vertikaler Ablenkungswinkel	max. 52°
Horizontal deflection angle L'angle de déviation horizontale Horizontaler Ablenkungswinkel	max. 65°
Focusing coil: without ferromagnetic material Number of ampere-turns:	$290\cdot\sqrt{V_{g3}(kV)}$
Distance between centre of field and reference line:	78 mm
Bobine de concentration: sans matière ferromagnétique Nombre d'ampère-tours :	$290\cdot\sqrt{V_{g3}(kV)}$
Distance entre le centre du champ et la ligne de référence:	78 mm
Fokussierungsspule: ohne ferromagnetisches Material Amperewindungszahl:	$290\cdot\sqrt{V_{g3}(kV)}$
Abstand des Zentrums des Feldes bis zur Bezugslinie:	78 mm

Ion trap magnet: Single magnet, field strength about 60 gausses. Type number 55402. For the procedure of setting up see MW 43-64 page 7

Aimant de la trappe à ions: Aimant simple, intensité du champ environ 60 gauss. Numéro de type 55402. Pour le réglage voir MW 43-64 page 8

Magnet der Ionenfalle: Einfacher Magnet, Feldstärke etwa 60 Gauss. Typennummer 55402. Für die Einstellung siehe MW 43-64 Seite 9

Net weight Poids net Nettogewicht	4000 g	Shipping weight Poids brut Bruttogewicht	6500 g

Operating characteristics
Caractéristiques d'utilisation
Betriebsdaten

V_{g3}	=	10 kV
V_{g2}	=	250 V
$-V_{g1}(I_{g3} = 0)$	=	33-72 V

Deflection and focusing Déviation et concentration Ablenkung und Fokussierung	magnetic magnétique magnetisch
Vertical deflection angle Angle de déviation verticale Vertikaler Ablenkungswinkel	max. 52°
Horizontal deflection angle Angle de déviation horizontale Horizontaler Ablenkungswinkel	max. 65°
Focusing coil: without ferromagnetic material Number of ampere-turns:	$290 \cdot \sqrt{V_{g3}\ (kV)}$
Distance between centre of field and reference line:	78 mm
Bobine de concentration: sans matière ferromagnétique Nombre d'ampère-tours :	$290 \cdot \sqrt{V_{g3}\ (kV)}$
Distance entre le centre du champ et la ligne de référence:	78 mm
Fokussierungsspule: ohne ferromagnetisches Material Amperewindungszahl:	$290 \cdot \sqrt{V_{g3}\ (kV)}$
Abstand des Zentrums des Feldes bis zur Bezugslinie:	78 mm

Ion trap magnet: Single magnet; field strength about 50 gausses. Type number 55402. For the procedure of setting up please refer to "Application directions" (page C107), in front of this section

Aimant du piège à ions: Aimant simple; intensité du champ environ 50 gauss. Numéro de type 55402. Pour le réglage voir "Indications d'application" (page C107), en tête de ce chapitre

Ionenfallenmagnet: Einfacher Magnet; Feldstärke etwa 50 Gauss. Typennummer 55402. Für die Einstellung siehe "Anwendungsrichtlinien" (Seite C107), am Anfang dieses Abschnitts

Net weight Poids net Nettogewicht	4000 g	Shipping weight Poids brut Bruttogewicht	6500 g

Operating characteristics
Caractéristiques d'utilisation
Betriebsdaten

V_{g3}	=	10 kV
V_{g2}	=	250 V
$-V_{g1}$ (I_{g3} = 0 μA)	=	33-72 V

Ion trap magnet: Single magnet, field strength about 60 gausses. Type number 55402. For the procedure of setting up see MW 43-43 page 7.

Aimant de la trappe à ions: Aimant simple, intensité du champ environ 60 gauss. Numéro de type 55402. Pour le réglage voir MW 43-43 page 8.

Magnet der Ionenfalle: Einfacher Magnet, Feldstärke etwa 60 Gauss. Typenummer 55402. Für die Einstellung siehe MW 43-43 Seite 9.

Operating characteristics
Caractéristiques d'utilisation
Betriebsdaten

V_a	= 10 kV
V_{g2}	= 250 V
$-V_{g1}(I_a = 0)$	= 33 - 72 V

Limiting values
Caractéristiques limites
Grenzdaten

V_a	= max. 14 kV[1]	V_{g1}	= max. 0 V
V_a	= min. 7 kV	$-V_{g1}$	= max. 150 V
V_{g2}	= max. 410 V	$+V_{g1p}$	= max. 2 V
V_{g2}	= min. 160 V	R_{g1}	= max. 1,5 MΩ
		$Z_{g1}(f=50\ c/s)$	= max. 0,5 MΩ

V_{kf}(k pos.;f neg.) = max. 200 V [2)3)]
V_{kf}(k neg.;f pos.) = max. 125 V [2)]

[1]) The product of V_a and I_ℓ (average value for the whole screen) must not exceed 6 W.
Le produit de V_a et I_ℓ (valeur moyenne pour tout l'écran) ne dépassera pas 6 W.
Das Produkt von V_a und I_ℓ (Mittelwert für den ganzen Schirm) muss einen Wert von 6 W nicht überschreiten.

[2]) In order to avoid excessive hum, the A.C.component of V_{kf} should be as low as possible and must not exceed 20 V.
Pour éviter le ronflement excessif la composante alternative de V_{kf} sera la plus petite possible et ne dépassera pas 20 V.
Zur Vermeidung von Brummstörungen muss die Wechselspannungskomponente von V_{kf} so klein wie möglich sein und jedenfalls 20 V nicht überschreiten.

[3]) During a warming-up period not exceeding 45 sec. V_{kfp} is permitted to rise to 410 V.
Pendant une période de chauffage ne dépassant pas 45 sec., V_{kfp} est permis de monter jusqu'à 410 V.
Während einer Anheizzeit von max. 45 Sek. darf V_{kfp} steigen bis 410 V.

Limiting values (design centre values)
Caractéristiques limites(valeurs moyennes de développement)
Grenzdaten (mittlere Entwicklungsdaten)

V_{g3}	= max.	14	kV
V_{g3}	= min.	7	kV
V_{g2}	= max.	410	V
V_{g2}	= min.	200	V
V_{g1}	= max.	0	V
$-V_{g1}$	= max.	150	V
$+V_{g1_p}$	= max.	2	V
W_g	= max.	6	W
V_{kf} (k pos.;f neg.)	= max.	200	V [1] [2]
V_{kf} (k neg.;f pos.)	= max.	125	V [2]

Max. circuit values
Valeurs max. des éléments du montage
Max. Werte der Schaltungsteile

R_{kf}	=	1 MΩ [3]
R_{g1}	=	1,5 MΩ
Z_{g1}(f=50 c/s)	=	0,5 MΩ

---

[1] During a warm-up period not exceeding 45 seconds the heater may be 410 V negative with respect to the cathode
Pendant une période d'échauffement ne dépassant pas 45 secondes, le filament peut être porté à un potentiel négatif de 410 V par rapport à la cathode
Während einer Anheizzeit von max. 45 Sekunden darf der Heizfaden 410 V negativ sein in bezug auf der Katode

[2] In order to avoid excessive hum, the A.C. component of V_{kf} should be as low as possible and must not exceed 20 V
Pour éviter le ronflement excessif la composante alternative de V_{kf} sera la plus petite possible et ne dépassera pas 20 V
Zur Vermeidung von Brummstörungen muss die Wechselspannungskomponente von V_{kf} so klein wie möglich sein und jedenfalls 20 V nicht überschreiten.

[3] When the heater is supplied from a separate transformer. When the heater is in a series chain, or earthed to A.C., Z_k(f = 50 c/s)= max. 0.1 MΩ
Quand le filament est alimenté par un transformateur séparé.
Quand le filament est connecté dans une chaîne série, ou est mise à la terre pour C.A., Z_k(f = 50 c/s) = max. 0,1 MΩ
Wenn der Heizfaden von einem separaten Transformator gespeist wird.
Wenn der Heizfaden in einer Serienkette aufgenommen oder für Wechselstrom geerdet ist, Z_k(f=50 Hz)=max.0,1MΩ

Min.circuit values;

The power supply should be of the limited-energy type with inherent regulation to limit the continuous short-circuit current to 5 mA. If the supply permits the instantaneous short-circuit current to exceed 1A, or is capable of storing more than 250 μcoulombs, the effective resistance in the circuit between the indicated electrode and the output capacitor should be as follows:

R_{g1} = min. 150 Ω; R_{g2} = min. 470 Ω; R_a = min.16 kΩ

The resistance R_a can not be applied when the outer tube coating constitutes the output capacitor.

Valeurs min. du circuit:

Le circuit d'alimentation ne doit être capable de fournir qu'une puissance limitée de sorte que le courant de court-circuit permanent ne dépasse pas 5 mA. Si le courant instantané de court-circuit dépasse 1 A, ou si le circuit d'alimentation est capable d'accumuler plus de 250 μ coulomb, les résistances efficaces entre les diverses électrodes et la capacité de sortie doivent avoir les valeurs min. suivante:

R_{g1} = min. 150 Ω; R_{g2} = min. 470 Ω; R_a = min.16 kΩ

La résistance R_a ne peut pas être appliquée si le condensateur de sortie est constitué par la couche extérieure du tube.

Min. Schaltungswerte:

Der Speiseteil soll nur eine begrenzte Leistung liefern können, damit der Strom bei Dauerkurzschluss nicht mehr als 5 mA beträgt. Wenn der Momentanwert des Kurzschlussstromes 1 A überschreitet oder wenn der Speiseteil mehr als 250 μ coulomb speichern kann, müssen die effektiven Widerstände zwischen den verschiedenen Elektroden und dem Ausgangskondensator die folgenden Minimalwerte aufweisen:

R_{g1} = min. 150 Ω; R_{g2} = min. 470 Ω; R_a = min.16 kΩ

Der Widerstand R_a kann nicht angebracht werden wenn der Aussenbelag der Röhre als Ausgangskondensator verwendet wird.

Net weight Poids net Nettogewicht	4000 g	Shipping weight Poids brut Bruttogewicht	6500 g

Min. circuit values;

The power supply should be of the limited-energy type with inherent regulation to limit the continuous short-circuit current to 5mA. If the supply permits the instantaneous short-circuit current to exceed 1A, or is capable of storing more than 250 µcoulombs, the effective resistance in the circuit between the indicated electrode and the output capacitor should be as follows:

R_{g1} = min.150 Ω; R_{g2} = min. 470 Ω; R_{g3} = min.16000Ω

Valeurs min. des éléments du montage:

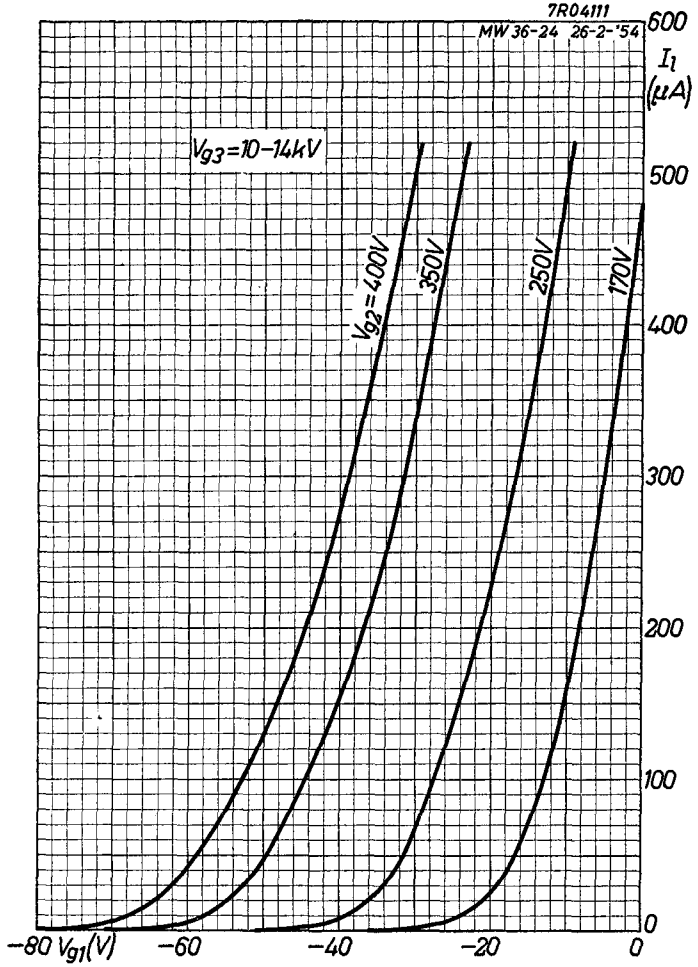
Le circuit d'alimentation ne doit être capable de fournir qu'une puissance limitée de sorte que le courant de court-circuit permanent ne dépasse pas 5 mA. Si le courant instantané de court-circuit dépasse 1 A, ou si le circuit d'alimentation est capable d'accumuler plus de 250 µcoulomb, les résistances efficaces entre les diverses électrodes et la capacité de sortie doivent avoir les valeurs min. suivantes:

R_{g1} = min.150 Ω; R_{g2} = min.470 Ω;R_{g3} = min.16000 Ω

Min. Werte der Schaltungsteile:

Der Speiseteil soll nur eine begrenzte Leistung liefern können, damit der Strom bei Dauerkurzschluss nicht mehr als 5 mA beträgt. Wenn der Momentanwert des Kurzschlussstromes 1 A überschreitet oder wenn der Speiseteil mehr als 250 µcoulomb speichern kann, müssen die effektiven Widerstände zwischen den verschiedenen Elektroden und dem Ausgangskondensator die folgenden Minimalwerte aufweisen:

R_{g1} = min.150 Ω; R_{g2} = min.470 Ω;R_{g3} = min.16000 Ω


7R04111
MW 36-24 26-2-'54
I_1 (μA)
600
500
400
300
200
100
0
V_{g3}=10–14kV
V_{g2}=400V
350V
250V
170V
–80 V_{g1}(V)
–60
–40
–20
0

PHILIPS

Electronic Tube

HANDBOOK

MW36-24

page	sheet	date
1	1	1954.03.03
2	1	1955.03.03
3	2	1954.03.03
4	2	1955.03.03
5	3	1954.03.03
6	3	1957.12.12
7	4	1954.03.03
8	4	1957.12.12
9	5	1952.12.12
10	5	1954.03.03
11	6	1952.12.12
12	6	1954.03.03
13	A	1954.02.02
14	FP	2000.03.20

RECTANGULAR TELEVISION PICTURE TUBE with ion trap and filterglass
TUBE IMAGE DE TELEVISION RECTANGULAIR avec trappe à ions et verre filtre
RECHTECKIGE FERNSEHBILDRÖHRE mit Ionenfalle und Filterglas

Heating : indirect by A.C. or D.C. series or parallel supply Chauffage: indirect par C.A. ou C.C. alimentation série ou parallèle Heizung : indirekt durch Wechsel- oder Gleichstrom; Serien- oder Parallelspeisung	V_f = 6,3 V [1] If = 0,3 A	
Capacitances Capacités Kapazitäten	C_{g1} = 7 pF C_k = 5 pF	C_{k+g3} = 8 pF C_{g4m} [2] = 1100 pF

Screen Ecran Schirm	Colour Couleur Farbe	white blanche weiss
	Colour temperature Température de couleur Farbtemperatur	7500 °C
	Light transmission Transmission de lumière Lichtdurchlässigkeit	66 %
	Useful diagonal Diagonale utile Nützlicher Diagonale	min. 318 mm
	Useful width Largeur utile Nützliche Breite	min. 288 mm
	Useful height Hauteur utile Nützliche Höhe	min. 217 mm

1) When the tube is used in a series heater chain, the heater voltage must not exceed 9.5 V when the supply is switched on. If neccesary a current limiting device must be used for this purpose.
Si le tube est monté dans une chaîne série de filaments, la tension de chauffage ne doit pas dépasser 9,5 V à la mise en circuit. En cas de besoin il faut utiliser un limiteur de courant pour ce but.
Wenn die Röhre in einer Heizfadenkette verwendet wird, darf die Heizspannung beim Einschalten 9,5 V nicht überschreiten. Nötigenfalls ist zu diesem Zweck ein Strombegrenzer zu verwenden.

2) m = outer coating, couche extérieure, Aussenbelag.

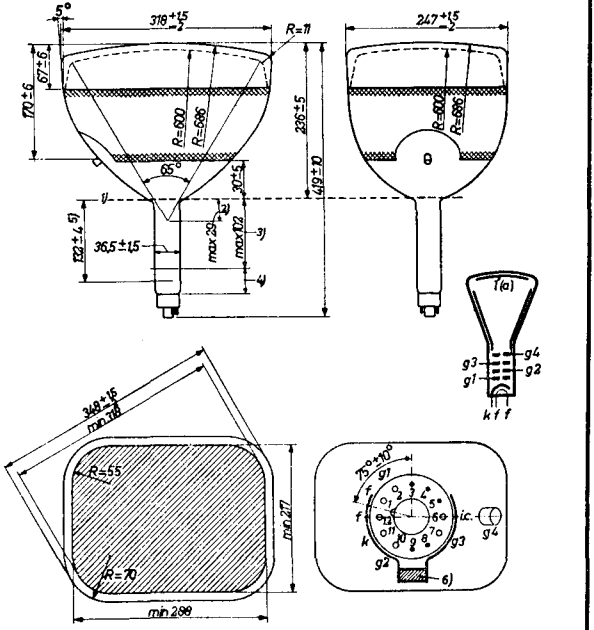
RECTANGULAR TELEVISION PICTURE TUBE with ion trap and filterglass
TUBE IMAGE DE TELEVISION RECTANGULAIR avec trappe à ions et verre filtre
RECHTECKIGE FERNSEHBILDRÖHRE mit Ionenfalle und Filterglas

Heating : indirect by A.C. or D.C. series or parallel supply Chauffage: indirect par C.A. ou C.C. alimentation série ou parallèle Heizung : indirekt durch Wechsel- oder Gleichstrom; Serien- oder Parallelspeisung	V_f = 6,3 V[1] I_f = 0,3 A	
Capacitances Capacités Kapazitäten	C_{g1} = 7 pF C_k = 5 pF	C_{k+g3} = 8 pF C_{g4m}[2] = 1100 pF
Screen Ecran Schirm	Colour Couleur Farbe	white blanche weiss
	Colour temperature Température de couleur Farbtemperatur	7500 °C
	Light transmission Transmission de lumière Lichtdurchlässigkeit	66 %
	Useful diagonal Diagonale utile Nützlicher Diagonale	min. 318 mm
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Wenn die Röhre in einer Heizfadenkette verwendet wird, darf die Heizspannung beim Einschalten 9,5 V nicht überschreiten. Nötigenfalls ist zu diesem Zweck ein Strombegrenzer zu verwenden.

2) m = outer coating, couche extérieure, Aussenbelag.

For curves of the screen properties see front of this section
Pour les courbes des propriétés de l'écran voir en tête de ce chapitre
Für die Kurven der Schirmeigenschaften siehe am Anfang dieses Abschnitts

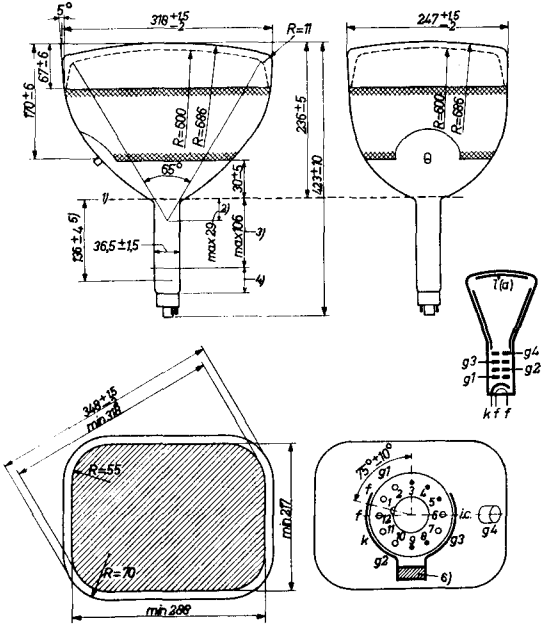


Dimensions in mm	Base
Dimensions en mm	Culot Duodecal 7p.
Abmessungen in mm	Sockel

---

1) Reference line, determined by the plane of the upper edge of the reference line gauge, when the gauge is resting on the cone.
Ligne de référence, déterminée par le plan du bord supérieur du calibre de la ligne de référence, si celui-ci pose sur le cône.
Bezugslinie, bestimmt durch die Ebene des oberen Randes der Bezugslinienlehre wenn diese auf dem Konus ruht.

For curves of the screen properties see front of this section
Pour les courbes des propriétés de l'écran voir en tête de ce chapitre
Für die Kurven der Schirmeigenschaften siehe am Anfang dieses Abschnitts



Dimensions in mm
Dimensions en mm
Abmessungen in mm

Base
Culot Duodecal 7p.
Sockel

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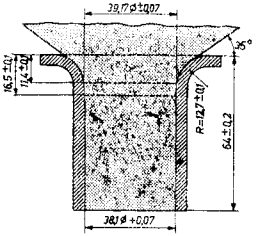
1) Reference line, determined by the plane of the upper edge of the reference line gauge, when the gauge is resting on the cone.
Ligne de référence, déterminée par le plan du bord supérieur du calibre de la ligne de référence, si celui-ci pose sur le cône.
Bezugslinie, bestimmt durch die Ebene des oberen Randes der Bezugslinienlehre wenn diese auf dem Konus ruht.

Mounting position:	Any
Montage:	Arbitrairement
Aufstellung:	Willkürlich

Reference line gauge. The inner surface of the coils must not extend into the shaded region.

Calibre de la ligne de référence. La surface intérieure des bobines ne doit pas saillir dans la région estompée.

Bezugslinienlehre. Die innere Oberfläche der Spulen muss nicht im schattierten Gebiet ausragen.



---

2) The distance from deflection centre to reference line should not exceed 29 mm

La distance du centre de déviation au ligne de référence ne dépassera pas 29 mm

Der Abstand des Ablenkungsmittelpunktes bis zur Bezugslinie soll 29 mm nicht überschreiten

3) Space for deflection and focusing coils
Place pour les bobines de déviation et de concentration
Platz für Ablenk- und Fokussierungsspulen

4) Space for the ion trap magnet
Place pour l'aimant de la trappe à ions
Platz für den Magnet der Ionenfalle

5) Distance from reference line to top centre of grid
Distance de la ligne de référence jusqu'au centre de la surface supérieure de la grille
Abstand der Bezugslinie bis zum Mittelpunkt der Oberseite des Gitters

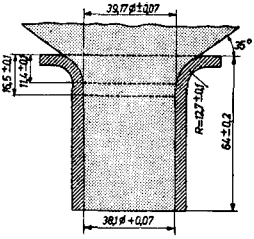
6) Ion trap magnet; l'aimant de la trappe à ions; Magnet der Ionenfalle

Mounting position:	Any
Montage:	Arbitrairement
Aufstellung:	Willkürlich

Reference line gauge. The inner surface of the coils must not extend into the shaded region.

Calibre de la ligne de référence. La surface intérieure des bobines ne doit pas saillir dans la région estompée.

Bezugslinienlehre. Die innere Oberfläche der Spulen muss nicht im schattierten Gebiet ausragen.



---

2) The distance from deflection centre to reference line should not exceed 29 mm

La distance du centre de déviation au ligne de référence ne dépassera pas 29 mm

Der Abstand des Ablenkungsmittelpunktes bis zur Bezugslinie soll 29 mm nicht überschreiten

3) Space for deflection and focusing coils
Place pour les bobines de déviation et de concentration
Platz für Ablenk- und Fokussierungsspulen

4) Space for the ion trap magnet
Place pour l'aimant de la trappe à ions
Platz für den Magnet der Ionenfalle

5) Distance from reference line to top centre of grid
Distance de la ligne de référence jusqu'au centre de la surface supérieure de la grille
Abstand der Bezugslinie bis zum Mittelpunkt der Oberseite des Gitters

6) Ion trap magnet; l'aimant de la trappe à ions; Magnet der Ionenfalle

Deflection and focusing Déviation et concentration Ablenkung und Fokussierung	magnetic magnétique magnetisch
Vertical deflection angle L'angle de déviation verticale Vertikaler Ablenkungswinkel	max. 52°
Horizontal deflection angle L'angle de déviation horizontale Horizontaler Ablenkungswinkel	max. 65°
Focusing coil: without ferromagnetic material Number of ampere-turns: see pages B and C Distance between centre of field and reference line:	78 mm
Bobine de concentration: sans matière ferromagnétique Nombre d'ampère-tours : voir pages B et C Distance entre le centre du champ et la ligne de référence:	78 mm
Fokussierungsspule: ohne ferromagnetisches material Amperewindungszahl: siehe Seite B und C Abstand des Zentrums des Feldes bis zur Bezugslinie:	78 mm

Ion trap magnet: Single magnet, field strength about 60 gausses. Type number 55402. For the procedure of setting up see MW 43-64 page 7

Aimant de la trappe à ions: Aimant simple, intensité du champ environ 60 gauss. Numéro de type 55402. Pour le réglage voir MW 43-64 page 8

Magnet der Ionenfalle: Einfacher Magnet, Feldstärke etwa 60 Gauss. Typennummer 55402. Für die Einstellung siehe MW 43-64 Seite 9

Net weight Poids net Nettogewicht	Shipping weight Poids brut Bruttogewicht
4200 g	6500 g

Operating characteristics
Caractéristiques d'utilisation
Betriebsdaten

V_{g4}	=	12	kV
V_{g2}	=	250	V
$-V_{g1}(I_{g4}=0)$	=	33/72	V
V_{g3}	=	0 250	V

Focusing ampere-turns Ampère-tours pour concentration Amperewindungen zur Fokussierung	960	1015

Deflection and focusing Déviation et concentration Ablenkung und Fokussierung	magnetic magnétique magnetisch
Vertical deflection angle Angle de déviation verticale Vertikaler Ablenkungswinkel	max. 52°
Horizontal deflection angle Angle de déviation horizontale Horizontaler Ablenkungswinkel	max. 65°
Focusing coil: without ferromagnetic material Number of ampere-turns: see pages B and C Distance between centre of field and reference line:	78 mm
Bobine de concentration: sans matière ferromagnétique Nombre d'ampère-tours: voir pages B et C Distance entre le centre du champ et la ligne de référence:	78 mm
Fokussierungsspule: ohne ferromagnetisches Material Amperewindungszahl: siehe Seite B und C Abstand des Zentrums des Feldes bis zur Bezugslinie:	78 mm

Ion trap magnet: Single magnet; field strength about 50 gausses. Type number 55402. For the procedure of setting up please refer to "Application directions" (page C107), in front of this section

Aimant du piège à ions: Aimant simple; intensité du champ environ 50 gauss. Numéro de type 55402. Pour le réglage voir "Indications d'application" (page C107), en tête de ce chapitre

Ionenfallenmagnet: Einfacher Magnet; Feldstärke etwa 50 Gauss. Typennummer 55402. Für die Einstellung siehe "Anwendungsrichtlinien" (Seite C107), am Anfang dieses Abschnitts

Net weight Poids net Nettogewicht	4200 g	Shipping weight Poids brut Bruttogewicht	6500 g

Operating characteristics
Caractéristiques d'utilisation
Betriebsdaten

V_{g4}	=	12 kV
V_{g2}	=	250 V
$-V_{g1}$ (I_{g4} = 0 µA)	=	33/72 V
V_{g3}	=	0 250 V

Focusing ampere-turns
Ampère-tours pour concentration 960 1015
Amperewindungen zur Fokussierung

Limiting values (design center values)
Caractéristiques limites (valeurs moyennes de développement)
Grenzdaten (mittlere Entwicklungsdaten)

V_a	= max.	14 kV
V_a	= min.	9 kV
V_{g2}	= max.	410 V
V_{g2}	= min.	200 V
V_{g3}	= max.	410 V
$-V_{g3}$	= max.	100 V
$-V_{g1}$	= max.	150 V
$+V_{g1}$	= max.	0 V
V_{g1p}	= max.	2 V
V_{kf} (k pos.; f neg.)	= max.	200 V [1][2]
V_{kf} (k neg.; f pos.)	= max.	125 V [1]
W_ℓ	= max.	6 W

---

1) In order to avoid interference due to hum, the A.C. component of V_{kf} should be as low as possible and must not exceed 20 V.

Pour éviter des perturbations par le ronflement, la composante alternative de V_{kf} sera la plus petite possible et ne dépassera pas 20 V.

Zur Vermeidung von Brummstörungen muss die Wechselspannungskomponente von V_{kf} so klein wie möglich sein und jedenfalls 20 V nicht überschreiten.

2) During a warming-up period not exceeding 45 sec. V_{kfp} is permitted to rise to 410 V.

Pendant une période de chauffage ne dépassant pas 45 sec. V_{kfp} est permis de monter jusqu'à 410 V.

Während einer Anheizzeit von max. 45 Sek. darf V_{kfp} steigen bis 410 V.

Limiting values (design centre values)
Caractéristiques limites(valeurs moyennes de développement)
Grenzdaten (mittlere Entwicklungsdaten)

V_{g4}	= max.	14	kV
V_{g4}	= min.	9	kV
V_{g3}	= max.	410	V
$-V_{g3}$	= max.	100	V
V_{g2}	= max.	410	V
V_{g2}	= min.	200	V
V_{g1}	= max.	0	V
$-V_{g1}$	= max.	150	V
V_{g1_p}	= max.	2	V
W_ℓ	= max.	6	W
V_{kf}(k pos.;f neg.)	= max.	200	V [1] [2]
V_{kf}(k neg.;f pos.)	= max.	125	V [2]

Max. circuit values
Valeurs max. des éléments du montage
Max. Werte der Schaltungsteile

R_{kf}	=	1 MΩ [3]
R_{g1}	=	1,5 MΩ
Z_{g1}(f =50 c/s)	=	0,5 MΩ

---

[1]) During a warm-up period not exceeding 45 seconds the heater may be 410 V negative with respect to the cathode

Pendant une période d'échauffement ne dépassant pas 45 secondes, le filament peut être porté à un potentiel négatif de 410 V par rapport à la cathode

Während einer Anheizzeit von max. 45 Sekunden darf der Heizfaden 410 V negativ sein in bezug auf der Katode

[2]) In order to avoid excessive hum, the A.C. component of V_{kf} should be as low as possible and must not exceed 20 V

Pour éviter le ronflement excessif la composante alternative de V_{kf} sera la plus petite possible et ne dépassera pas 20 V

Zur Vermeidung von Brummstörungen muss die Wechselspannungskomponente von V_{kf} so klein wie möglich sein und jedenfalls 20 V nicht überschreiten

[3]) See page 6; voir page 6; siehe Seite 6

Max. circuit values
Valeurs max. des éléments du montage
Max. Werte der Schaltungsteile

R_{kf} = 20 kΩ
R_{g1} = 1,5 MΩ
Z_{g1} (f = 50 c/s) = 0,5 MΩ

Min. circuit values:

The power supply should be of the limited-energy type with inherent regulation to limit the continuous short-circuit current to 5 mA. If the supply permits the instantaneous short-circuit current to exceed 1 A, or is capable of storing more than 250 μ coulombs, the effective resistance in the indicated electrode and the output capacitor should be as follows:

R_{g1} = min. 150 Ω; R_{g2} = min. 470 Ω
R_{g3} = min. 470 Ω; R_a = min. 16000 Ω

Valeurs min. des éléments du montage:

Le circuit d'alimentation ne doit être capable de fournir qu'une puissance limitée de sorte que le courant de court-circuit permanent ne dépasse pas 5 mA. Si le courant instantané de court-circuit dépasse 1 A, ou si le circuit d'alimentation est capable d'accumuler plus de 250 μ coulomb, les résistances efficaces entre les diverses électrodes et la capacité de sortie doivent avoir les valeurs min. suivantes:

R_{g1} = min. 150 Ω; R_{g2} = min. 470 Ω
R_{g3} = min. 470 Ω; R_a = min. 16000 Ω

Min. Werte der Schaltungsteile:

Der Speiseteil soll nur eine begrenzte Leistung liefern können, damit der Strom bei Dauerkurzschluss nicht mehr als 5 mA beträgt. Wenn der Momentanwert des Kurzschlussstromes 1 A überschreitet oder wenn der Speiseteil mehr als 250 μ coulomb speichern kann, müssen die effektiven Widerstände zwischen den verschiedenen Elektroden und dem Ausgangskondensator die folgenden Minimalwerte aufweisen:

R_{g1} = min. 150 Ω; R_{g2} = min. 470 Ω
R_{g3} = min. 470 Ω; R_a = min. 16000 Ω

Min. circuit values:

The power supply should be of the limited-energy type with inherent regulation to limit the continuous short-circuit current to 5 mA. If the supply permits the instantaneous short-circuit current to exceed 1 A, or is capable of storing more than 250 µcoulombs, the effective resistance in the circuit between the indicated electrode and the output capacitor should be as follows:

R_{g1}	= min. 150 Ω	R_{g2}	= min. 470 Ω
R_{g3}	= min. 470 Ω	R_{g4}	= min. 16000 Ω

Valeurs min. des éléments du montage:

Le circuit d'alimentation ne doit être capable de fournir qu'une puissance limitée de sorte que le courant de court-circuit permanent ne dépasse pas 5 mA. Si le courant instantané de court-circuit dépasse 1 A, ou si le circuit d'alimentation est capable d'accumuler plus de 250 µcoulomb, les résistances efficaces entre les diverses électrodes et la capacité de sortie doivent avoir les valeurs min. suivantes:

R_{g1}	= min. 150 Ω	R_{g2}	= min. 470 Ω
R_{g3}	= min. 470 Ω	R_{g4}	= min. 16000 Ω

Min. Werte der Schaltungsteile:

Der Speiseteil soll nur eine begrenzte Leistung liefern können, damit der Strom bei Dauerkurzschluss nicht mehr als 5 mA beträgt. Wenn der Momentanwert des Kurzschlussstromes 1 A überschreitet oder wenn der Speiseteil mehr als 250 µcoulomb speichern kann, müssen die effektiven Widerstände zwischen den verschiedenen Elektroden und dem Ausgangskondensator die folgenden Minimalwerte aufweisen:

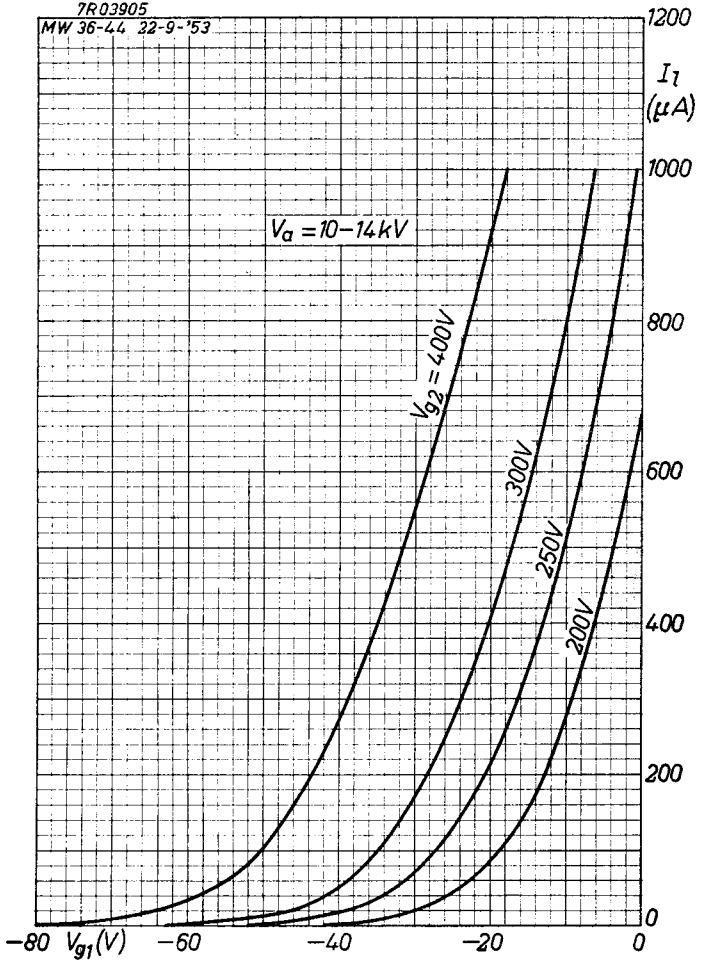
R_{g1}	= min. 150 Ω	R_{g2}	= min. 470 Ω
R_{g3}	= min. 470 Ω	R_{g4}	= min. 16000 Ω

---

[3]) When the heater is supplied from a separate transformer.
When the heater is in a series chain, or earthed to A.C., Z_k(f =50 c/s)= max. 0.1 MΩ
Quand le filament est alimenté par un transformateur séparé
Quand le filament est connecté dans une chaîne série, ou est mise à la terre pour C.A., Z_k(f=50c/s)= max. 0,1 MΩ
Wenn der Heizfaden von einem separaten Transformator gespeist wird. Wenn der Heizfaden in einer Serienkette aufgenommen oder für Wechselstrom geerdet ist, Z_k(f =50 Hz) = max. 0,1 MΩ

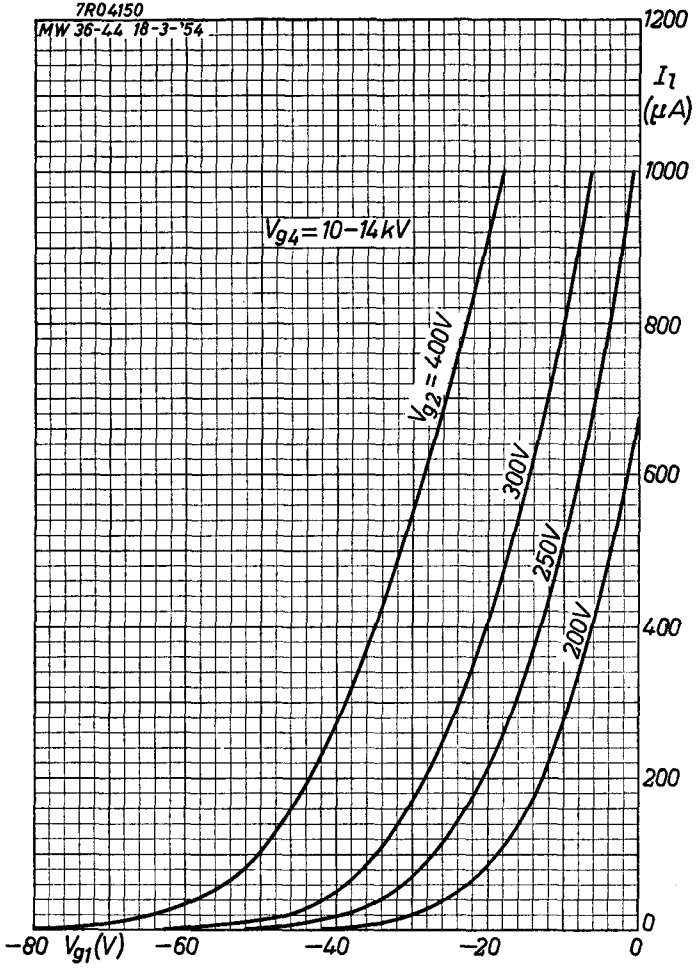
PHILIPS

MW 36-44



8.8.1953

A


7R04150
MW 36-44 18-3-'54
1200
I_1 (μA)
1000
800
600
400
200
0
V_{g4} = 10–14 kV
V_{g2} = 400V
300V
250V
200V
−80 V_{g1}(V) −60 −40 −20 0

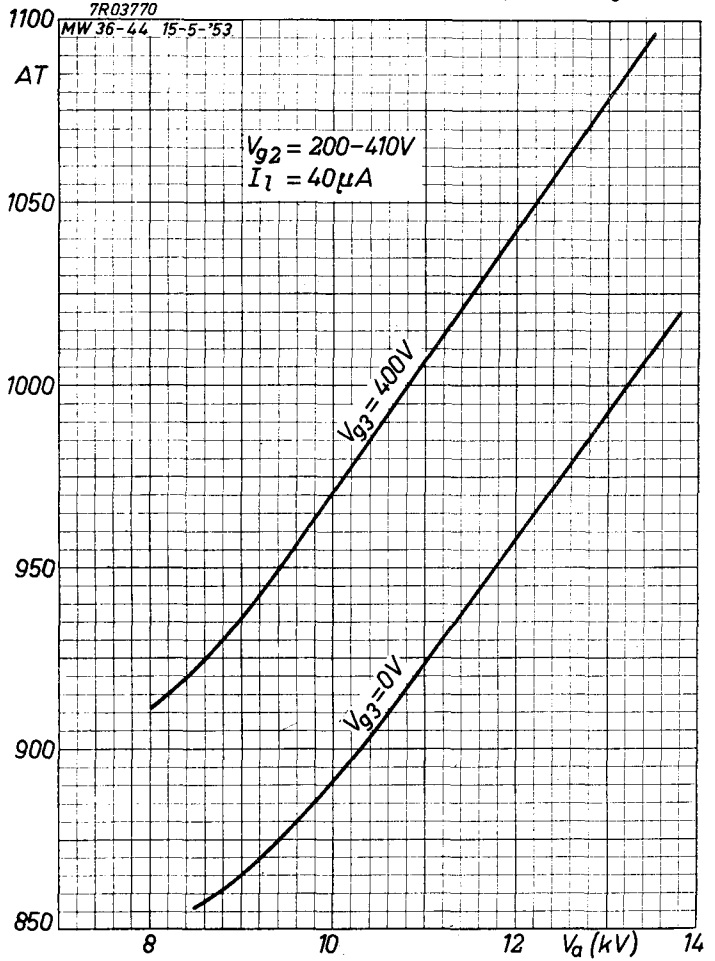
3.3.1954

A

MW 36-44

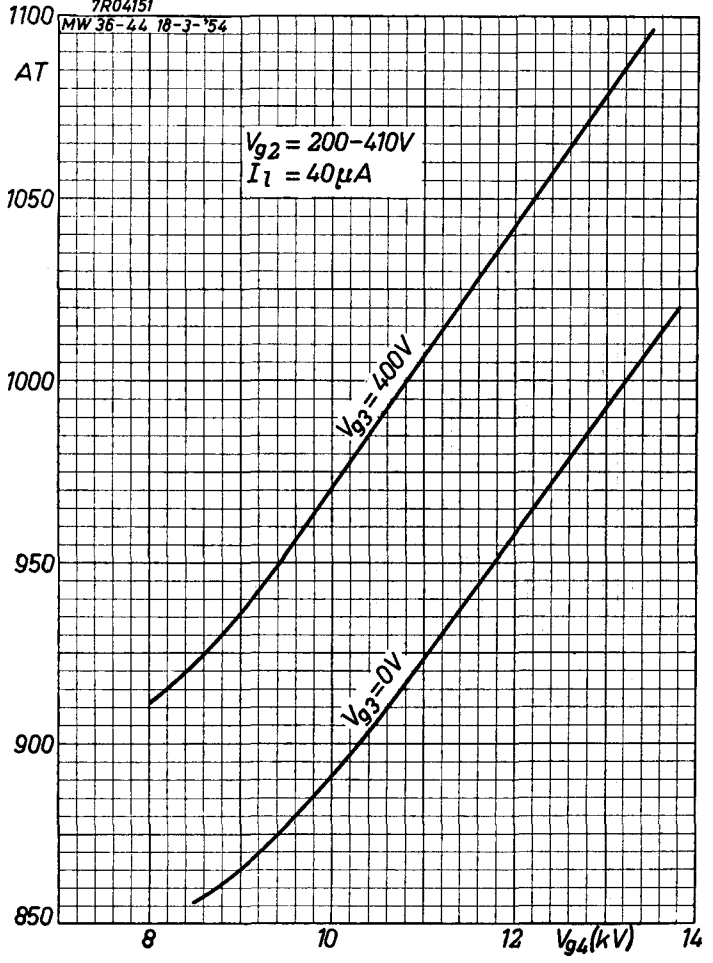
PHILIPS

AT = Number of ampere turns necessary for focusing
AT = Nombre d'ampère-tours nécessaire pour la concentration
AT = Die zur Fokussierung erforderliche Amperewindungszahl



MW 36-44 **PHILIPS**

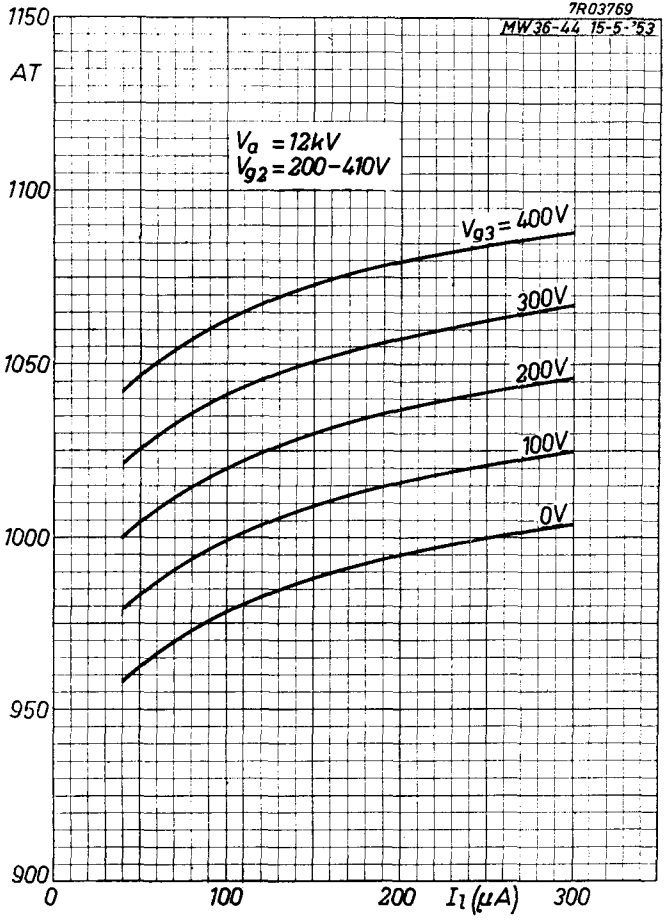
AT = Number of ampere turns necessary for focusing
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PHILIPS

MW 36-44

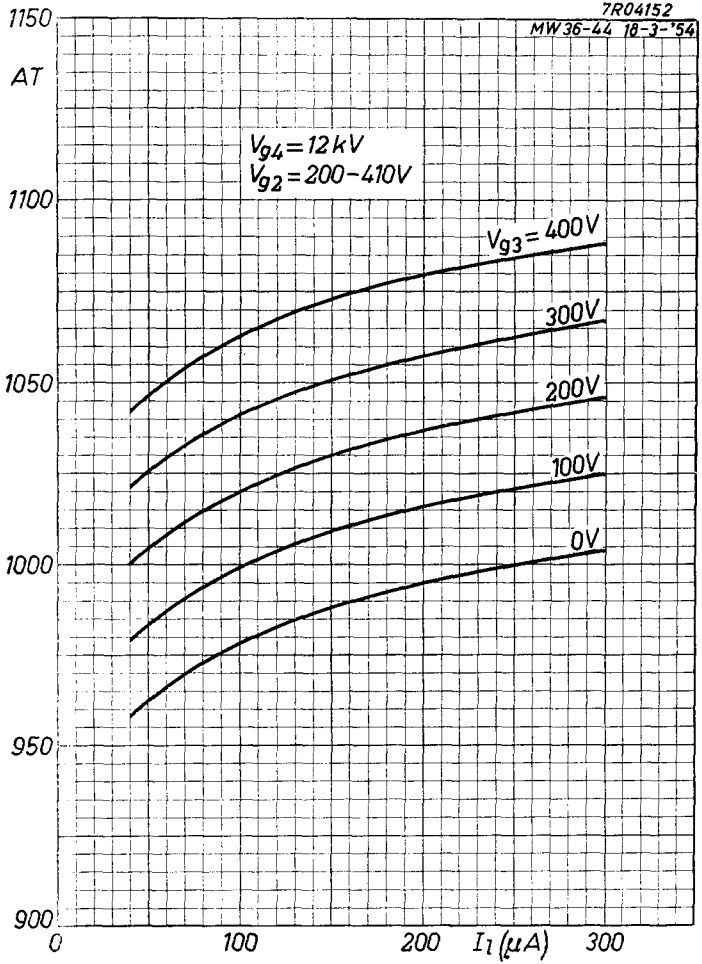
AT = Number of ampere turns necessary for focusing
AT = Nombre d'ampère-tours nécessaire pour la concentration
AT = Die zur Fokussierung erforderliche Amperewindungszahl



8.8.1953

C

ΔT = Number of ampere turns necessary for focusing
ΔT = Nombre d'ampère-tours nécessaire pour la concentration
ΔT = Die zur Fokussierung erforderliche Amperewindungszahl



PHILIPS

Electronic Tube

HANDBOOK

MW36-44

page	sheet	date
1	1	1954.03.03
2	1	1955.03.03
3	2	1954.03.03
4	2	1955.03.03
5	3	1954.03.03
6	3	1957.12.12
7	4	1954.03.03
8	4	1957.12.12
9	5	1953.08.08
10	5	1954.03.03
11	6	1953.08.08
12	6	1954.03.03
13	A	1953.08.08
14	A	1954.03.03
15	B	1953.08.08
16	B	1954.03.03
17	C	1953.08.08
18	C	1954.03.03
19	FP	2000.03.14

RECTANGULAR TELEVISION MONITOR TUBE in all glass construction with filter glass, metal-backed screen, magnetic focusing and double magnetic deflection
TUBE MONITEUR DE TELEVISION RECTANGULAIRE de construction toute verre avec verre filtrant, écran aluminisé, concentration magnétique et déflection magnétique double
RECHTECKIGE FERNSEH-MONITORRÖHRE in Allglastechnik mit Filterglas, metallhinterlegtem Schirm, magnetischer Fokussierung und doppel- magnetischer Ablenkung

Heating :	indirect by A.C. or D.C. series or parallel supply	
Chauffage:	indirect par C.A. ou C.C. alimentation série ou parallèle	V_f = 6,3 V[1])
Heizung :	indirect durch Wechsel- oder Gleichstrom; Serien- oder Parallelspeisung	I_f = 300 mA

Capacitances Capacités Kapazitäten		
	C_{g1} <	8 pF
	C_k <	8 pF
	$C_{(a,g3)m}$ =	1100 pF

Screen Ecran Schirm	Filterglass, metal-backed, spherical Verre filtrant, aluminisé, sphérique Filterglas, metallhinterlegt, sphärisch	
	Colour Couleur Farbe	white blanche weiss
	Useful diagonal Diagonale utile Nützliche Diagonale	min. 318 mm
	Useful width Largeur utile Nützliche Breite	min. 288 mm
	Useful height Hauteur utile Nützliche Höhe	min. 217 mm

For curves of the screen properties see front of this section
Pour les courbes caractéristiques de l'écran voir en tête de ce chapitre
Für die Kurven der Schirmeigenschaften siehe am Anfang dieses Abschnitts

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[1])See page 4; voir page 4; siehe Seite 4

RECTANGULAR TELEVISION MONITOR TUBE in all glass construction with filter glass, metal-backed screen, magnetic focusing and double magnetic deflection
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V_f = 6,3 V [1]
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Capacitances
Capacités
Kapazitäten

C_{g1} ≤ 8 pF
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Verre filtrant, aluminisé, sphérique
Filterglas, metallhinterlegt, sphärisch

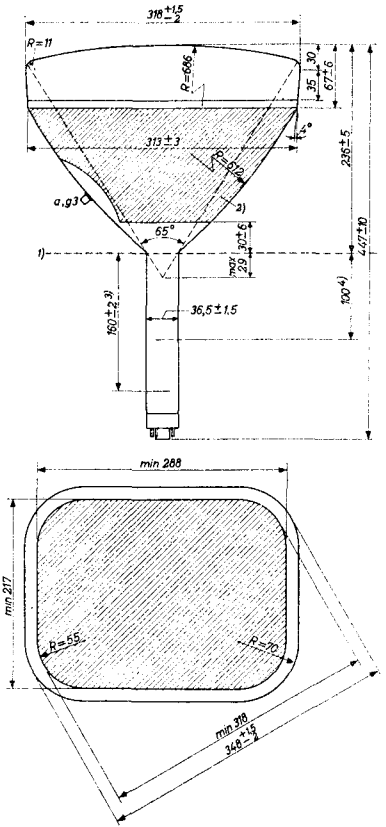
Light transmission Transmission de lumière Lichtdurchlässigkeit	66 %
Colour Couleur Farbe	white blanche weiss
Useful diagonal Diagonale utile **Nutzbare** Diagonale	min. 318 mm
Useful width Largeur utile **Nutzbare** Breite	min. 288 mm
Useful height Hauteur utile **Nutzbare** Höhe	min. 217 mm

For curves of the screen properties see front of this section
Pour les courbes caractéristiques de l'écran voir en tête de ce chapitre
Für die Kurven der Schirmeigenschaften siehe am Anfang dieses Abschnitts

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[1])See page 4; voir page 4; siehe Seite 4

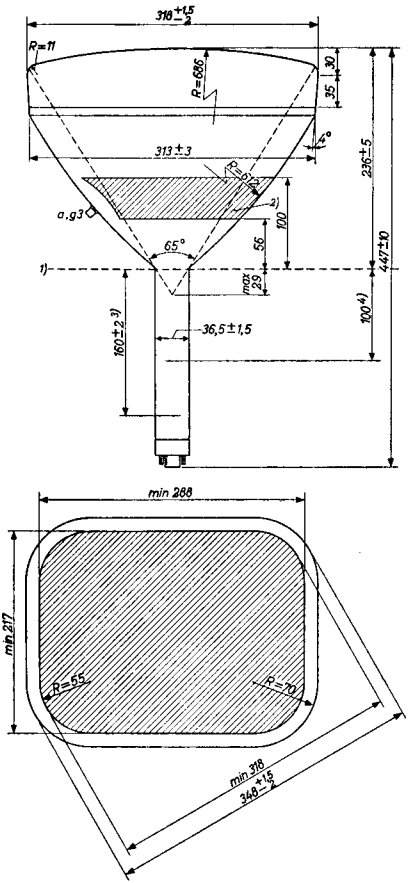
Dimensions in mm; Dimensions en mm; Abmessungen in mm



1)2)3)4) See page 4; voir page 4; siehe Seite 4

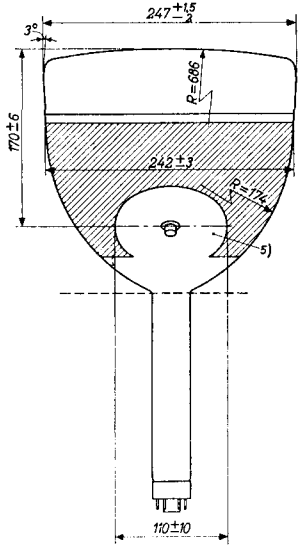
PHILIPS

Dimensions in mm; Dimensions en mm; Abmessungen in mm

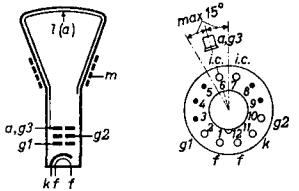


1)2)3)4) See page 4; voir page 4; siehe Seite 4

Dimensions in mm; Dimensions en mm; Abmessungen in mm

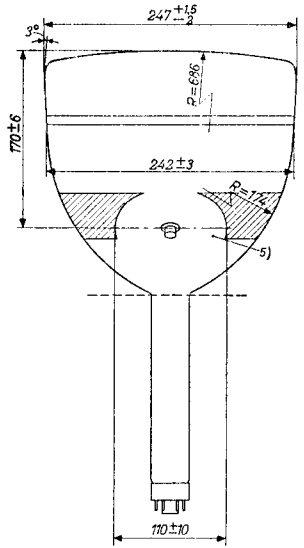


Base,culot,Sockel: DUODECAL 7-p

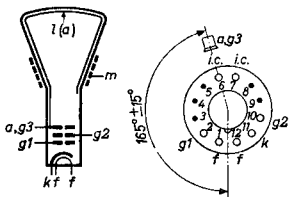


5) See page 4; voir page 4; siehe Seite 4

Dimensions in mm; Dimensions en mm; Abmessungen in mm



Base,culot,Sockel: DUODECAL 7-p



5)See page 4; voir page 4; siehe Seite 4

Note from page 1; note de la page 1; Note von Seite 1

[1])When the tube is used in a series heater chain, the heater voltage must not exceed 9.5 V when the supply is switched on. If necessary a current limiting device must be used for this purpose

Si le tube est monté dans une chaine de filaments en série, la tension de chauffage ne doit pas dépasser 9,5 V à la mise en circuit. En cas de besoin il faut utiliser dans ce but un limiteur de courant

Wenn die Röhre in einer Heizfadenkette verwendet wird, darf die Heizspannung beim Einschalten 9,5 V nicht überschreiten. Nötigenfalls ist zu diesem Zweck ein Strombegrenzer zu verwenden

Notes from page 2.3; Notes des pages 2.3; Noten von Seite 2.3

[1])Reference line, determined by the plane of the upper edge of the reference line gauge when the gauge is resting on the cone

Ligne de référence, déterminée par le plan du bord supérieur du calibre de la ligne de référence, si celui-ci repose sur le cône

Bezugslinie, bestimmt durch die Ebene des oberen Randes der Bezugslinienlehre, wenn diese auf dem Konus ruht

[2])Allowable contact area
Surface de contact admissible
Zulässige Kontaktfläche

[3])Distance from reference line to top centre of grid
Distance de la ligne de référence au centre de la surface supérieure de la grille
Abstand der Bezugslinie bis zum Mittelpunkt der Oberseite des Gitters

[4])Distance from reference line to centre of magnetic length of focus unit
Distance de la ligne de référence au centre du longueur magnétique du dispositif de concentration
Abstand der Bezugslinie bis zum Mittelpunkt der magnetischen Länge der Fokussiervorrichtung

[5])This area must be kept clean
Cette surface sera maintenue propre
Diese Fläche muss unbedeckt bleiben

Note from page 1; note de la page 1; Note von Seite 1

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Mounting position
Montage
Einbau

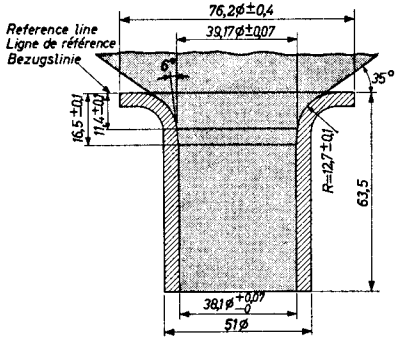
Net weight
Poids net 4500 g
Nettogewicht

The socket for the base should not be rigidly mounted; it should have flexible leads and be allowed to move freely. The bottom circumference of the base shell will fall within a circle which is concentric with the perpendicular from the centre of the face and which has a diameter of 55 mm

Le support du tube ne pourra pas être monté rigidement; il devra être connecté par des conducteurs flexibles lui permettant de se mouvoir librement. La circonférence du fond de la chemise sera incluse dans un cercle qui est concentrique à la perpendiculaire du centre de l'écran et qui a un diamètre de 55 mm

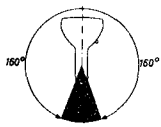
Die Röhrenfassung ist nicht starr zu befestigen sondern soll frei beweglich sein und flexible Zuleitungen haben. Der Bodenumfang der Sockelhülse fällt innerhalb eines Kreises, der konzentrisch mit der Senkrechte des Schirmmittelpunktes ist und einen Durchmesser von 55 mm hat

Reference line gauge
Calibre de la ligne de référence
Bezugslinielehre



The inner surface de the coils must not extend into the shaded region
La surface intérieure des bobines ne doit pas saillir dans la région estompée
Die innere Oberfläche der Spulen muss nicht ins schattierte Gebiet ragen

Mounting position
Montage
Einbau



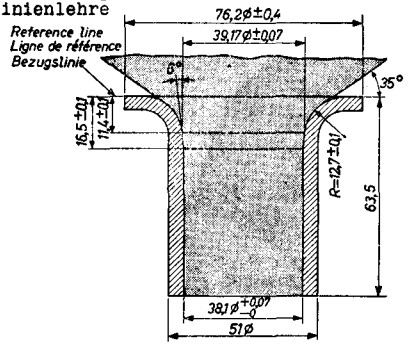
Net weight
Poids net 4500 g
Nettogewicht

The socket for the base should not be rigidly mounted; it should have flexible leads and be allowed to move freely. The outer circumference of the base will fall within a circle which is concentric with the perpendicular from the centre of the face and which has a diameter of 55 mm

Le support du tube ne pourra pas être monté rigidement; il devra être connecté par des conducteurs flexibles lui permettant de se mouvoir librement. La circonférence extérieure du culot est incluse dans un cercle qui est concentrique à la perpendiculaire du centre de l'écran et qui a un diamètre de 55 mm

Die Röhrenfassung ist nicht starr zu befestigen sondern soll frei beweglich sein und flexible Zuleitungen haben. Der Aussenumfang des Sockels fällt innerhalb eines Kreises, der konzentrisch mit der Senkrechte des Schirmmittelpunktes ist und einen Durchmesser von 55 mm hat

Reference line gauge
Calibre de la ligne de référence
Bezugslinienlehre



The inner surface of the coils must not extend into the shaded region
La surface intérieure des bobines ne doit pas saillir dans la région estompée
Die innere Oberfläche der Spulen muss nicht ins schattierte Gebiet ragen

PHILIPS

Deflection Déviation Ablenkung	double magnetic magnétique double doppel-magnetisch
Focusing Concentration Fokussierung	magnetic magnétique magnetisch

Operating characteristics
Caractéristiques d'utilisation
Betriebsdaten

$V_{a,g3}$	=	14 kV
V_{g2}	=	300 V
V_{g1}	=	-30/-70 V[1]
A[2]	=	100 mm

Limiting values (ABSOLUTE LIMITS)
Caractéristiques limites (LIMITES ABSOLUES)
Grenzdaten (ABSOLUTE WERTE)

$V_{a,g3}$	= max.	15 kV
$V_{a,g3}$	= min.	9 kV
V_{g2}	= max.	500 V
V_{g2}	= min.	250 V
V_{g1}	= max.	0 V
$-V_{g1}$	= max.	150 V
V_{g1p}	= max.	2 V
W_l	= max.	6 W
V_{kf} (k pos.; f neg.)	= max.	200 V[3][4]
V_{kf} (k neg.; f pos.)	= max.	125 V[4]

Max. circuit values
Valeurs max. des éléments du montage
Max. Werte der Schaltungsteile

R_{kf}	=	[5]
R_{g1}	=	0,5 MΩ
Z_{g2} (f = 50 c/s)	=	1 MΩ

[1] Limits of negative grid No.1 voltage for visual extinction of the undeflected focused spot. See page B
Limites de la tension de la grille 1 pour l'extinction visuelle du spot lumineux concentré non-dévié. Voir la page B
Grenzwerte der negativen Spannung am Gitter 1 für optische Löschung des nicht-abgelenkten fokussierten Leuchtpunktes Siehe Seite B

[2][3][4][5] See page 7; voir page 7; siehe Seite 7

Deflection Déviation Ablenkung	double magnetic magnétique double doppelt-magnetisch
Focusing Concentration Fokussierung	magnetic magnétique magnetisch

Operating characteristics
Caractéristiques d'utilisation
Betriebsdaten

$V_{a,g3}$	=	14 kV
V_{g2}	=	300 V
V_{g1}	=	-30/-70 V[1]
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Limiting values (ABSOLUTE LIMITS)
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Grenzdaten (ABSOLUTE WERTE)

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V_{g1}	= max.	0 V
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V_{kf} (k pos.; f neg.)	= max.	200 V [3)4)]
V_{kf} (k neg.; f pos.)	= max.	125 V [4)]

Max. circuit values
Valeurs max. des éléments du montage
Max. Werte der Schaltungsteile

R_{kf}	= max.	[5)]
R_{g1k}	= max.	1,5 MΩ
Z_{g1k} (f = 50 c/s)	= max.	0,5 MΩ
Z_{g2}	= max.	1,5 MΩ

[1])Limits of negative grid No.1 voltage for visual extinction of the undeflected focused spot. See page B

Limites de la tension de la grille 1 pour l'extinction visuelle du spot lumineux concentré non-dévié. Voir la page B

Grenzwerte der negativen Spannung am Gitter 1 für optische Löschung des nicht-abgelenkten fokussierten Leuchtpunktes Siehe Seite B

[2])[3])[4])[5]) See page 7; voir page 7; siehe Seite 7

[2]) Recommended distance from reference line to centre of magnetic length of focus unit

Distance recommandée de la ligne de référence au centre du longueur magnétique du dispositif de concentration

Empfohlener Abstand der Bezugslinie bis zur Mitte der magnetischen Länge der Fokussiervorrichtung

[3]) During a warm-up period not exceeding 45 seconds the heater may be 410 V negative with respect to the cathode

Pendant une période d'échauffement ne dépassant pas 45 secondes, le filament peut être porté à un potentiel négatif de 410 V par rapport à la cathode

Während einer Anheizzeit von max. 45 Sekunden darf der Heizfaden 410 V negativ sein in bezug auf die Katode

[4]) In order to avoid excessive hum, the A.C. component of V_{kf} should be as low as possible and must not exceed 20 Veff

Pour éviter un ronflement excessif la composante alternative de V_{kf} sera la plus petite possible et ne dépassera pas 20 Veff

Zur Vermeidung von Brummstörungen muss die Wechselspannungskomponente von V_{kf} so klein wie möglich sein und darf sie jedenfalls 20 Veff nicht überschreiten

[5]) When the heater is supplied from a separate transformer R_{kf} = max. 1 MΩ. When the heater is in a series chain or earthed, Z_k (f = 50 c/s) = max. 0.1 MΩ

Quand le filament est alimenté par un transformateur séparé R_{kf} = max. 1 MΩ. Quand le filament est connecté dans une chaine série ou est mis à la terre, Z_k (f=50Hz) = max. 0,1MΩ

Wenn der Heizfaden von einem separaten Transformator gespeist wird, ist R_{kf} = max. 1 MΩ. Wenn der Heizfaden in einer Serienkette aufgenommen oder geerdet ist, ist Z_k (f = 50 Hz) = max. 0,1 MΩ

[2]) Recommended distance from reference line to centre of magnetic length of focus unit

Distance recommandée de la ligne de référence au centre du longueur magnétique du dispositif de concentration

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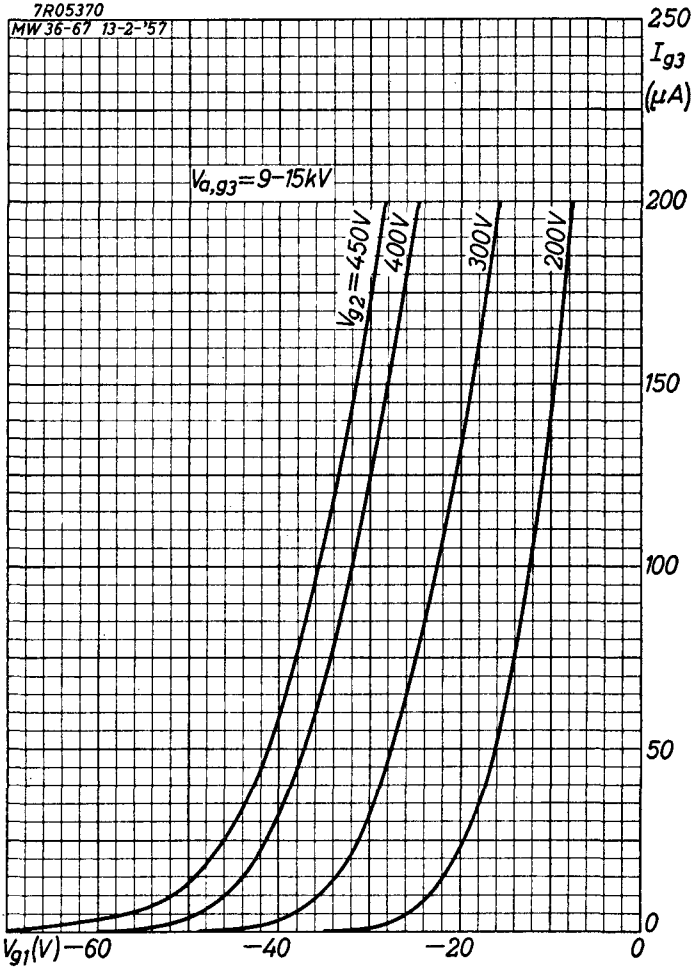
[5]) When the heater is supplied from a separate transformer R_{kf} = max. 1 MΩ. When the heater is in a series chain or earthed, Z_k (f = 50 c/s) = max. 0.1 MΩ

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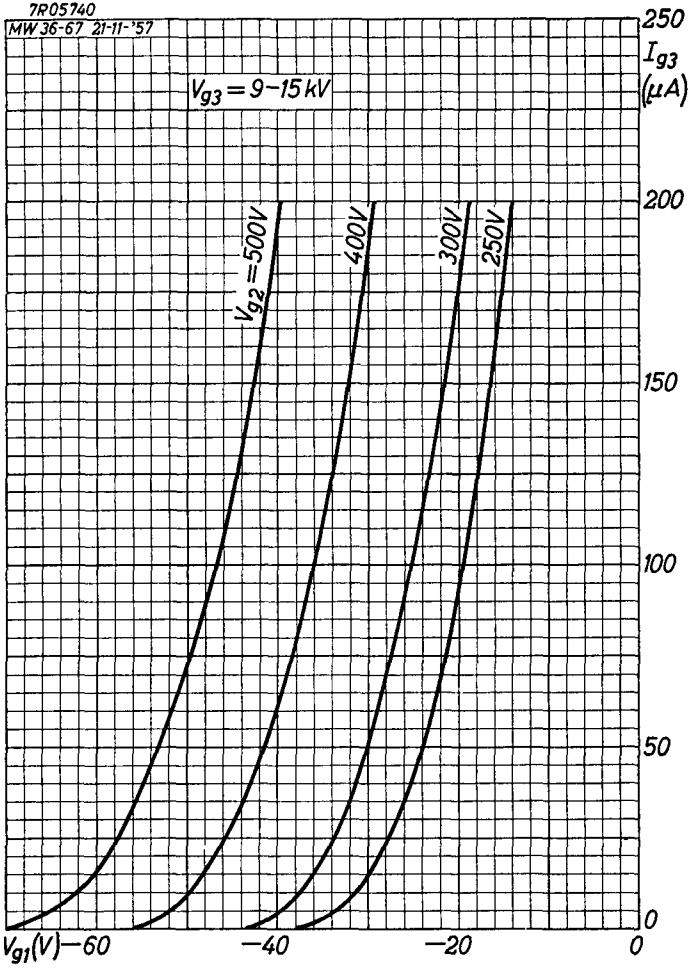
PHILIPS

MW 36-67



3.3.1957

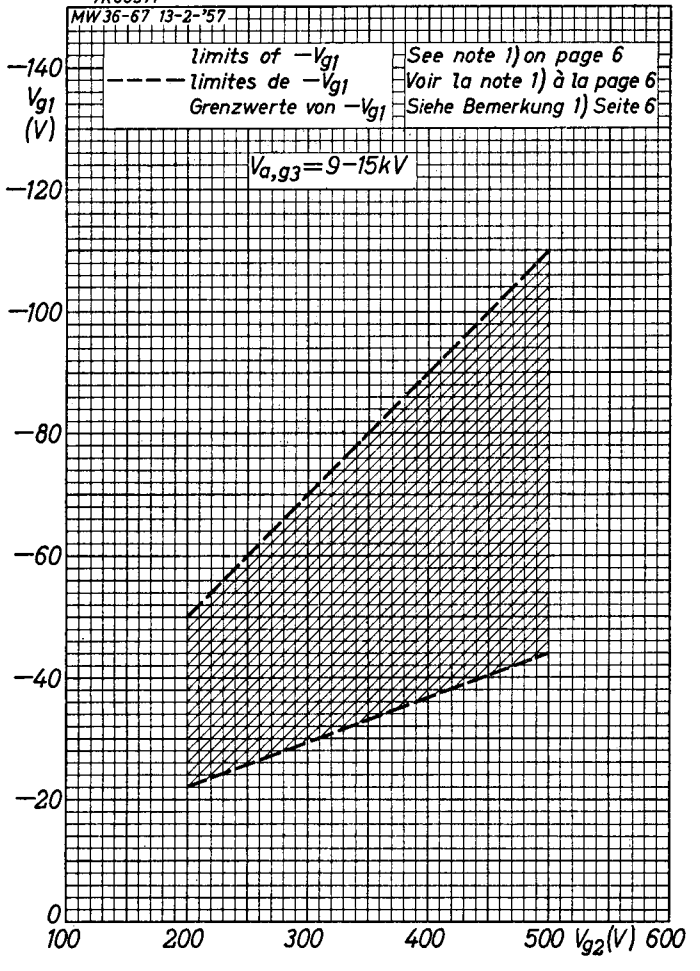
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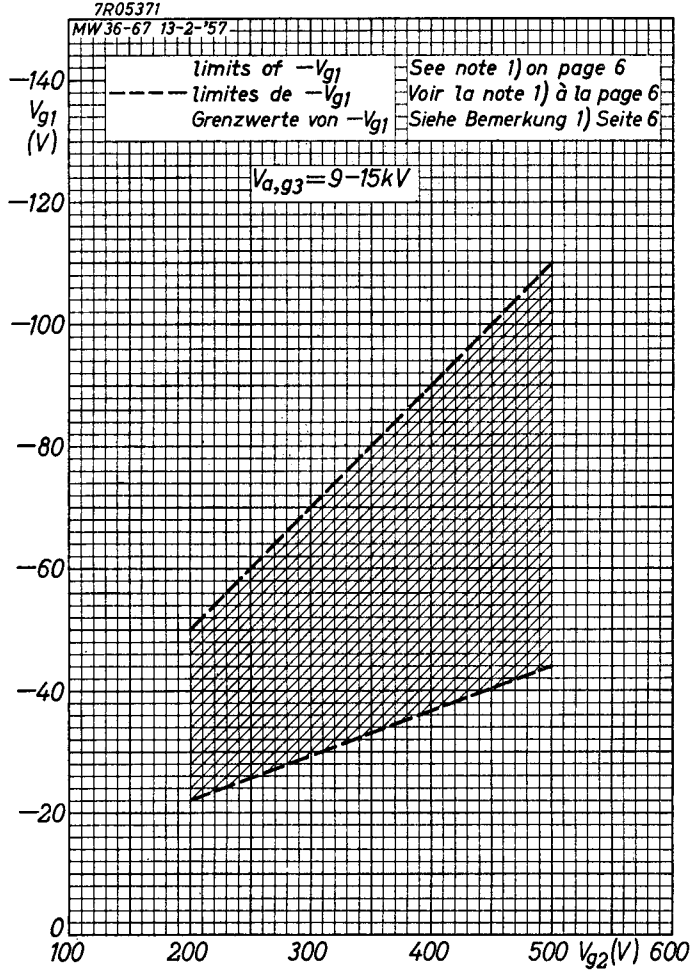

7R05740
MW 36-67 21-11-'57
$V_{g3} = 9-15\,kV$
$V_{g2} = 500V$
400V
300V
250V
I_{g3} (μA)
250
200
150
100
50
0
$V_{g1}(V)$ −60
−40
−20
0

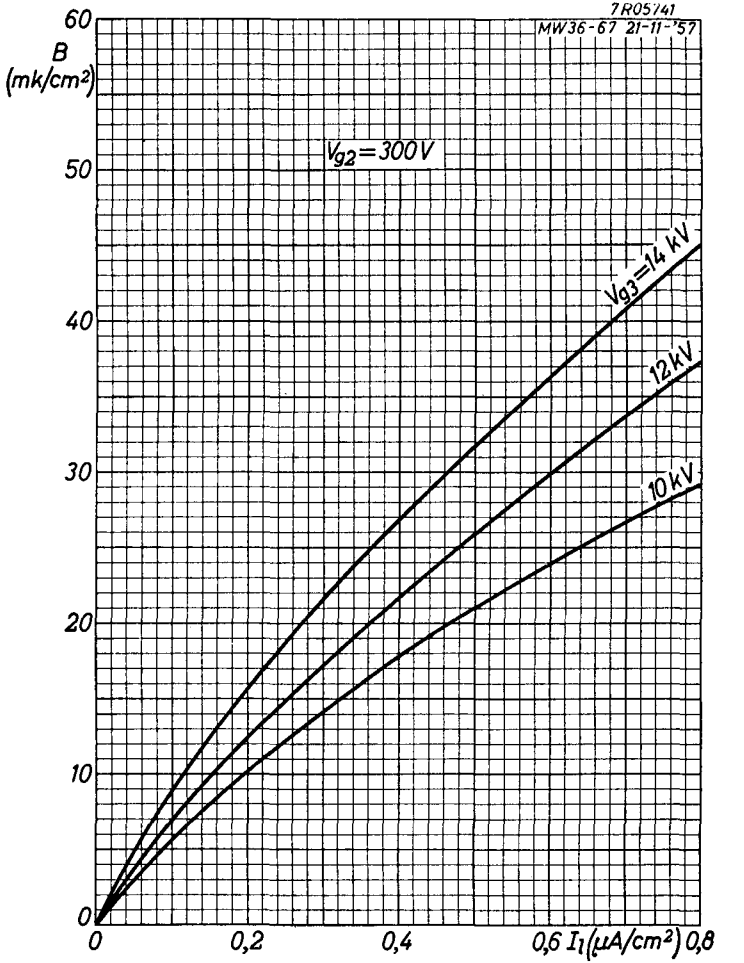
8.8.1957

A

PHILIPS


7R05371
MW 36-67 13-2-'57
limits of $-V_{g1}$
limites de $-V_{g1}$
Grenzwerte von $-V_{g1}$
See note 1) on page 6
Voir la note 1) à la page 6
Siehe Bemerkung 1) Seite 6
$V_{a,g3}$=9–15kV
$-V_{g1}$ (V)
−140
−120
−100
−80
−60
−40
−20
0
100
200
300
400
500
600
V_{g2}(V)


7R05371
MW36-67 13-2-'57
limits of $-V_{g1}$
limites de $-V_{g1}$
Grenzwerte von $-V_{g1}$
See note 1) on page 6
Voir la note 1) à la page 6
Siehe Bemerkung 1) Seite 6
$V_{a,g3}=9-15kV$
$-V_{g1}$ (V)
-140
-120
-100
-80
-60
-40
-20
0
100
200
300
400
500
V_{g2}(V)
600


7R05741
MW36-67 21-11-'57
B (mk/cm²)
60
50
40
30
20
10
0
V_{g2}=300V
V_{g3}=14 kV
12kV
10kV
0
0,2
0,4
0,6 I_1(μA/cm²) 0,8

8.8.1957

C

PHILIPS

Electronic Tube

HANDBOOK

MW36-67

page	sheet	date
1	1	1957.03.03
2	1	1957.08.08
3	2	1957.03.03
4	2	1957.08.08
5	3	1957.03.03
6	3	1957.08.08
7	4	1957.03.03
8	4	1957.08.08
9	5	1957.03.03
10	5	1957.08.08
11	6	1957.03.03
12	6	1957.08.08
13	7	1957.03.03
14	7	1957.08.08
15	A	1957.03.03
16	A	1957.08.08
17	B	1957.03.03
18	B	1957.08.08
19	C	1957.08.08

DIRECT VIEWING TELEVISION CATHODE RAY TUBE with metal cone and ion trap
TUBE A RAYONS CATHODIQUES DE TELEVISION A VUE DIRECTE avec cône métallique et trappe à ions
FERNSEHKATHODENSTRAHLRÖHRE FÜR DIREKTEN SICHT mit Metallkonus und Ionenfalle

Heating:	indirect by A.C. or D.C.; series or parallel supply	
Chauffage:	indirect par C.A. ou C.C.; alimentation en parallèle ou en série	V_f = 6,3 V [1])
Heizung:	indirekt durch Wechsel- oder Gleichstrom; Serien- oder Parallelspeisung	If = 0,3 A

Capacitances Capacités Kapazitäten	C_g = 6 pF C_k = 4 pF

Screen **Ecran** **Schirm**	Colour Couleur Farbe	white blanche weiss
	Colour temperature Température de couleur Farbtemperatur	7500 °K
	Useful screen diameter Diamètre utile de l'écran Nützliche Schirmdurchmesser	min. 365 mm

For curves of the screen properties see front of this **section.**
Pour les courbes des propriétés de l'écran voir en tête de ce chapitre.
Für die Kurven der Schirmeigenschaften siehe am Anfang dieses Abschnitts.

---

[1]) When the tube is used in a series heater chain, the heater voltage must not exceed 9,5 V when the supply is switched on. If necessary a current limiting device must be used for this purpose.

Si le tube est monté dans une chaîne série de filaments, la tension de chauffage ne doit pas dépasser 9,5 V à la mise en circuit. En cas de besoin il faut utiliser un limiteur de courant pour ce but.

Wenn die Röhre in einer Heizfadenkette verwendet wird, darf die Heizspannung beim Einschalten 9,5 V nicht überschreiten. Nötigenfalls muss zu diesem Zweck ein Strombegrenzer verwendet werden.

TELEVISION PICTURE TUBE with metal cone and ion trap
TUBE IMAGE DE TELEVISION avec cône métallique et trappe à ions
FERNSEHBILDRÖHRE mit Metallkonus und Ionenfalle

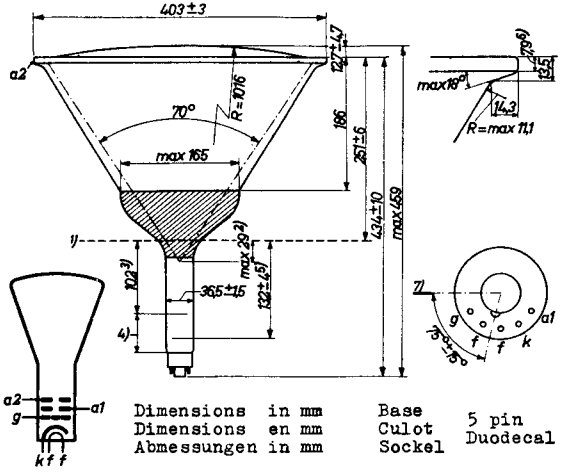
Heating : indirect by A.C. or D.C. series or parallel supply		
Chauffage: indirect par C.A. ou C.C. alimentation série ou parallèle	V_f = 6,3 V[1]	
Heizung : indirekt durch Wechsel- oder Gleichstrom; Serien- oder Parallelspeisung	I_f = 0,3 A	
Capacitances Capacités Kapazitäten	C_{g1} =	6 pF
	C_k =	4 pF
Screen Ecran Schirm — Colour Couleur Farbe		white blanche weiss
Colour temperature Température de couleur Farbtemperatur		7500 °K
Useful diameter Diamètre utile Nützlicher Durchmesser		min. 365 mm

For curves of the screen properties see front of this section
Pour les courbes des propriétés de l'écran voir en tête de ce chapitre
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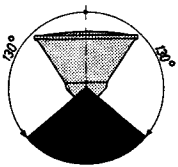
Si le tube est monté dans une chaîne série de filaments, la tension de chauffage ne doit pas dépasser 9,5 V à la mise en circuit. En cas de besoin il faut utiliser un limiteur de courant pour ce but

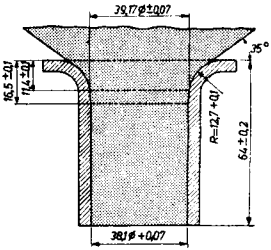
Wenn die Röhre in einer Heizfadenkette verwendet wird, darf die Heizspannung beim Einschalten 9,5 V nicht überschreiten. Nötigenfalls ist zu diesem Zweck ein Strombegrenzer zu verwenden.



Dimensions in mm — Base 5 pin
Dimensions en mm — Culot Duodecal
Abmessungen in mm — Sockel

Mounting position
Montage
Aufstellung





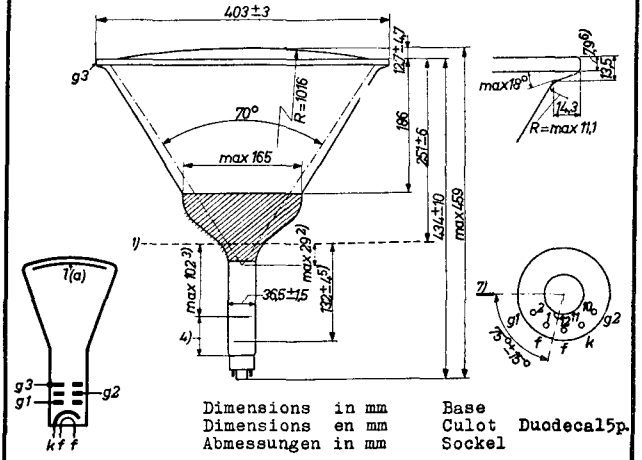
Reference line gauge. The inner surface of the coils must not extend into the shaded region.

Calibre de la ligne de référence. La surface intérieure des bobines ne doit pas saillir dans la région estompée.

Bezugslinienlehre. Die innere Oberfläche der Spulen muss nicht im schattierten Gebiet ausragen

1), 2).., 7), see page 3, voir page 3, siehe Seite 3

PHILIPS



Dimensions in mm
Dimensions en mm
Abmessungen in mm

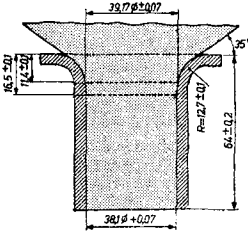
Base
Culot **Duodecal5p.**
Sockel

Mounting position: Any
Montage: Arbitrairement
Aufstellung: Willkürlich

Reference line gauge. The inner surface of the coils must not extend into the shaded region.

Calibre de la ligne de référence. La surface intérieure des bobines ne doit pas saillir dans la région estompée.

Bezugslinienlehre. Die innere Oberfläche der Spulen muss nicht im schattierten Gebiet ausragen



1), 2)....7), See page 3, voir page 3, siehe Seite 3

Remark — Any material in contact with the cone or the face must have insulating properties adequate for 16 kV.

Observation — Les matériaux en contact avec le cône ou la face doivent avoir des propriétés d'isolement pour 16 kV.

Bemerkung — Material in Kontakt mit dem Konus oder der Vorderseite muss Isolationseigenschaften für 16 kV haben.

---

1) Reference line, determined by the plane of the upper edge of the reference line gauge when the gauge is resting on the cone.

Ligne de référence, déterminée par le plan du bord supérieur du calibre de la ligne de référence, si celui-ci pose sur le cône.

Bezugslinie, bestimmt durch die Ebene des oberen Randes der Bezugslinienlehre wenn diese auf dem Konus ruht.

2) The distance from the deflection centre to the reference line should not exceed 29 mm.

La distance entre le centre de déviation et la ligne de référence ne dépassera pas 29 mm.

Der Abstand des Ablenkungsmittelpunktes bis zur Bezugslinie soll 29 mm nicht überschreiten.

3) Space for deflection and focusing coils.
Place pour les bobines de déviation et de concentration.
Platz für Ablenk- und Fokussierungsspulen.

4) Space for the ion trap magnet.
Place pour l'aimant de la trappe à ions.
Platz für den Magnet der Ionenfalle.

5) Distance from reference line to top centre of grid
Distance de la ligne de référence jusqu'au centre de la surface supérieure de la grille.
Abstand der Bezugslinie bis zum Mittelpunkt der Oberseite des Gitters.

6) Min. contact area
Surface de contact min.
Min. Kontaktfläche

7) Red line for ion trap magnet
Ligne rouge pour l'aimant de la trappe à ions
Rote Linie für Magnet der Ionenfalle

Remark : Any material in contact with the cone or the face must have insulating properties adequate for 16 kV.

Observation: Les matériaux en contact avec le cône ou la face doivent avoir des propriétés d'isolement pour 16 kV.

Bemerkung : Material in Kontakt mit dem Konus oder der Vorderseite muss Isolationseigenschaften für 16 kV haben.

---

[1]) Reference line, determined by the plane of the upper edge of the reference line gauge when the gauge is resting on the cone.

Ligne de référence , déterminée par le plan du bord supérieur du calibre de la ligne de référence, si celui-ci pose sur le cône.

Bezugslinie, bestimmt durch die Ebene des oberen Randes der Bezugslinienlehre wenn diese auf dem Konus ruht.

[2]) The distance from deflection centre to reference line should not exceed 29 mm.

La distance du centre de déviation au ligne de référence ne dépassera pas 29 mm.

Der Abstand des Ablenkungsmittelpunktes bis zur Bezugslinie soll 29 mm nicht überschreiten.

[3]) Space for deflection and focusing coils.
Place pour les bobines de déviation et de concentration.
Platz für Ablenk- und Fokussierungsspulen.

[4]) Space for the ion trap magnet.
Place pour l'aimant de la trappe à ions.
Platz für den Magnet der Ionenfalle.

[5]) Distance from reference line to top centre of grid
Distance de la ligne de référence jusqu'au centre de la surface supérieure de la grille.
Abstand der Bezugslinie bis zum Mittelpunkt der Oberseite des Gitters.

[6]) Min. contact area
Surface de contact min.
Min. Kontaktfläche

[7]) Red line for ion trap magnet
Ligne rouge pour l'aimant de la trappe à ions
Rote Linie für Magnet der Ionenfalle

Remark : Any material in contact with the cone or the face must have insulating properties adequate for 16 kV.

Observation: Les matériaux en contact avec le cône ou la face doivent avoir des propriétés d'isolement pour 16 kV.

Bemerkung : Material in Kontakt mit dem Konus oder der Vorderseite muss Isolationseigenschaften für 16 kV haben.

---

1) Reference line, determined by the plane of the upper edge of the reference line gauge when the gauge is resting on the cone.

Ligne de référence , déterminée par le plan du bord supérieur du calibre de la ligne de référence, si celui-ci pose sur le cône.

Bezugslinie, bestimmt durch die Ebene des oberen Randes der Bezugslinienlehre wenn diese auf dem Konus ruht.

2) The distance from deflection centre to reference line should not exceed 29 mm.

La distance du centre de déviation au ligne de référence ne dépassera pas 29 mm.

Der Abstand des Ablenkungsmittelpunktes bis zur Bezugslinie soll 29 mm nicht überschreiten.

3) Space for deflection and focusing coils.
Place pour les bobines de déviation et de concentration.
Platz für Ablenk- und Fokussierungsspulen.

4) Space for the ion trap magnet.
Place pour l'aimant de la trappe à ions.
Platz für den Magnet der Ionenfalle.

5) Distance from reference line to top centre of grid
Distance de la ligne de référence jusqu'au centre de la surface supérieure de la grille.
Abstand der Bezugslinie bis zum Mittelpunkt der Oberseite des Gitters.

6) Min. contact area
Surface de contact min.
Min. Kontaktfläche

7) Red line for ion trap magnet
Ligne rouge pour l'aimant de la trappe à ions
Rote Linie für Magnet der Ionenfalle

Deflection (double magnetic) $N = \frac{0.3 \times P \times H \times cL}{\sqrt{V_{a2}}}$ cm, where

N = the deflection on the screen in cm
P = the distance between the deflection centre and the screen in cm
H = the max. magnetic field strength in gauss
c = a correction factor, in most cases = $\frac{1}{2}$
L = the length of the coil windings in cm.

The deflection centre can be assumed to coincide with the max. magnetic field strength.

The deflection angle is max. 70°

Déviation (magnétique double) $N = \frac{0,3 \times P \times H \times cL}{\sqrt{V_{a2}}}$ cm, où

N = la déviation sur l'écran en cm
P = la distance entre le centre de déviation et l'écran en cm
H = l'intensité max. du champ magnétique en gauss
c = un facteur de correction, en général = $\frac{1}{2}$
L = la longueur des enroulements de bobine en cm.

Le centre de déviation peut être supposé coïncidant avec le maximum de l'intensité du champ magnétique.

L'angle de déviation est de 70° au max.

Ablenkung (doppelmagnetisch) $N = \frac{0,3 \times P \times H \times cL}{\sqrt{V_{a2}}}$ cm, wo

N = die Ablenkung auf dem Schirm in cm
P = der Abstand zwischen dem Ablenkungsmittelpunkt und dem Schirm in cm
H = die max. magnetische Feldstärke in Gauss
c = ein Korrektionsfaktor, im allgemeinen = $\frac{1}{2}$
L = die Länge der Spulenwindungen in cm.

Der Ablenkungsmittelpunkt fällt gewöhnlich mit dem Höchstwert der magnetischen Feldstärke zusammen.

Der Ablenkungswinkel ist max. 70°.

Deflection and focusing Déviation et concentration Ablenkung und Fokussierung	magnetic magnétique magnetisch
Deflection angle L'angle de déviation Ablenkungswinkel	max. 70°
Focusing coil: without ferromagnetic material Number of ampere-turns:	$290 \cdot \sqrt{V_{g3(kV)}}$
Distance between centre of field and reference line:	78 mm
Bobine de concentration: sans matière ferromagnétique Nombre d'ampère tours :	$290 \cdot \sqrt{V_{g3(kV)}}$
Distance entre le centre du champ et la ligne de référence:	78 mm
Fokussierungsspule: ohne ferromagnetisches Material Amperewindungszahl:	$290 \cdot \sqrt{V_{g3(kV)}}$
Abstand des Zentrums des Feldes bis zur Bezugslinie:	78 mm

Ion trap magnet: Single magnet, field strength about 60 gausses. Type number 55402. For the procedure of setting up see MW 43-64 page 7

Aimant de la trappe à ions: Aimant simple, intensité du champ environ 60 gauss. Numéro de type 55402. Pour le réglage voir MW 43-64 page 8

Magnet der Ionenfalle: Einfacher Magnet, Feldstärke etwa 60 Gauss. Typennummer 55402. Für die Einstellung siehe MW 43-64 Seite 9

Net weight Poids net Nettogewicht	4800 g
Shipping weight Poids brut Bruttogewicht	7500 g

Operating characteristics
Caractéristiques d'utilisation
Betriebsdaten

V_{g3}	= 12 kV
V_{g2}	= 250 V
$-V_{g1}(I_{g3} = 0)$	= 33-72 V

Deflection and focusing Déviation et concentration Ablenkung und Fokussierung	magnetic magnétique magnetisch
Deflection angle Angle de déviation Ablenkungswinkel	max. 70°
Focusing coil: without ferromagnetic material Number of ampere-turns:	$290\cdot\sqrt{V_{g3}\ (kV)}$
Distance between centre of field and reference line :	78 mm
Bobine de concentration: sans matière ferromagnétique Nombre d'ampère tours :	$290\cdot\sqrt{V_{g3}\ (kV)}$
Distance entre le centre du champ et la ligne de référence:	78 mm
Fokussierungsspule: ohne ferromagnetisches Material Amperewindungszahl:	$290\cdot\sqrt{V_{g3}\ (kV)}$
Abstand des Zentrums des Feldes bis zur Bezugslinie:	78 mm

Ion trap magnet: Single magnet; field strength about 50 gausses. Type number 55402. For the procedure of setting up please refer to "Application directions" (page C107), in front of this section

Aimant du piège à ions: Aimant simple; intensité du champ environ 50 gauss. Numéro de type 55402. Pour le réglage voir "Indications d'application" (page C107), en tête de ce chapitre

Ionenfallenmagnet: Einfacher Magnet; Feldstärke etwa 50 Gauss. Typennummer 55402. Für die Einstellung siehe "Anwendungsrichtlinien" (Seite C107), am Anfang dieses Abschnitts

Net weight Poids net Nettogewicht	4800 g	Shipping weight Poids brut Bruttogewicht	7500 g

Operating characteristics
Caractéristiques d'utilisation
Betriebsdaten

V_{g3}	= 12 kV
V_{g2}	= 250 V
$-V_{g1}$ (I_{g3} = 0 µA)	= 33-72 V

Focusing — Magnetic
The number of ampere turns necessary for focusing is about 290 $\sqrt{V_{a2(kV)}}$ when a coil without ferromagnetic material is used and the distance of the centre of the focusing field to the reference line is 78 mm.

Concentration — Magnétique
Le nombre d'ampère-tours nécessaire pour la concentration est environ 290 $\sqrt{V_{a2(kV)}}$, si une bobine sans matière ferromagnétique est utilisée et si la distance entre le centre du champ de concentration et la ligne de référence est de 78 mm.

Fokussierung — Magnetisch
Die erforderliche Amperewindungszahl für Fokussierung beträgt etwa 290 $\sqrt{V_{a2(kV)}}$, wenn eine Spule ohne ferromagnetisches Material verwendet wird und der Abstand des Zemtrums des Fokussierungsfeldes bis zur Bezugslinie 78 mm beträgt.

Ion trap magnet: Single magnet, field strength about 60 gausses. Type number 55402.
Aimant de la trappe à ions: Aimant simple, intensité du champ environ 60 gauss. Numéro de type 55402.
Magnet der Ionenfalle: Einfacher Magnet, Feldstärke etwa 60 Gauss. Typennummer 55402.

Net weight
Poids net
Nettogewicht — 4800 g

Operating characteristics
Caractéristiques d'utilisation
Betriebsdaten

V_{a2}	=	12 kV
V_{a1}	=	250 V
$-V_g$ (I_a = 0)	=	33 - 72 V

Limiting values (design centre values)
Caractéristiques limites(valeurs moyennes de développement)
Grenzdaten (mittlere Entwicklungsdaten)

V_{g3}	= max.	14	kV
V_{g3}	= min.	7	kV
V_{g2}	= max.	410	V
V_{g2}	= min.	200	V
V_{g1}	= max.	0	V
$-V_{g1}$	= max.	150	V
$+V_{g1_p}$	= max.	2	V
W_ℓ	= max.	6	W
V_{kf}(k pos.;f neg.)	= max.	200	V [1] [2]
V_{kf}(k neg.;f pos.)	= max.	125	V [2]

Max. circuit values
Valeurs max. des éléments du montage
Max. Werte der Schaltungsteile

R_{kf}	=	1 MΩ [3]
R_{g1}	=	1,5 MΩ
Z_{g1}(f=50 c/s)	=	0,5 MΩ

---

[1]) During a warm-up period not exceeding 45 seconds the heater may be 410 V negative with respect to the cathode
Pendant une période d'échauffement ne dépassant pas 45 seconds, le filament peut être porté à un potentiel négatif de 410 V par rapport à la cathode
Während einer Anheizzeit von max. 45 Sekunden darf der Heizfaden 410 V negativ sein in bezug auf der Katode

[2]) In order to avoid excessive hum, the A.C. component of V_{kf} should be as low as possible and must not exceed 20 V
Pour éviter le ronflement excessif la composante alternative de V_{kf} sera la plus petite possible et ne dépassera pas 20 V
Zur Vermeidung von Brummstörungen muss die Wechselspannungskomponente von V_{kf} so klein wie möglich sein und jedenfalls 20 V nicht überschreiten

[3]) See page 6; voir page 6; siehe Seite 6

Limiting values
Caractéristiques limites
Grenzdaten

V_{a2}	= max.	14 kV	
V_{a2}	= min.	7 kV	
W_{ℓ}	= max.	6 W	
V_{a1}	= max.	410 V	
V_{a1}	= min.	160 V	
V_g	= max.	0 V	
$-V_g$	= max.	150 V	
$+V_{gp}$	= max.	2 V	
R_{g1}	= max.	0,5 MΩ	
V_{kf}	= max.	125 V	[1] [2]
V_{kf}	= max.	200 V	[1] [3]
R_{kf}	= max.	20 kΩ	

[1] In order to avoid interference due to hum, the A.C. component of V_{kf} should be as low as possible and must not exceed 20 V.
Pour éviter des perturbations par le ronflement la composante alternative de V_{kf} sera la plus petite possible et ne dépassera pas 20 V.
Zur Vermeidung von Brummstörungen muss die Wechselspannungskomponente von V_{kf} so klein wie möglich sein und jedenfalls 20 V nicht überschreiten

[2] Cathode negative with respect to the filament.
Cathode négative par rapport au filament.
Kathode negativ in bezug auf dem Heizfaden.

[3] Cathode positive with respect to the filament.
During a warming-up period not exceeding 15 sec V_{kf_p} is permitted to rise to 410 V.

Cathode positive par rapport au filament.
Pendant une période de chauffage ne dépassant pas 15 sec V_{kf_p} est permis de monter jusqu'à 410 V.

Kathode positiv in bezug auf dem Heizfaden.
Während einer Anheizzeit von max. 15 Sek. darf V_{kf_p} steigen bis 410 V.

Min. circuit values:

The power supply should be of the limited-energy type with inherent regulation to limit the continuous short-circuit current to 5 mA. If the supply permits the instantaneous short-circuit current to exceed 1A, or is capable of storing more than 250 μcoulombs, the effective resistance in the circuit between the indicated electrode and the output capacitor should be as follows:

R_{g1} = min.150 Ω; R_{g2} = min.470 Ω; R_{g3} = min.16000 Ω

Valeurs min. des éléments du montage:

Le circuit d'alimentation ne doit être capable de fournir qu'une puissance limitée de sorte que le courant de court-circuit permanent ne dépasse pas 5 mA. Si le courant instantané de court-circuit dépasse 1 A, ou si le circuit d'alimentation est capable d'accumuler plus de 250 μcoulomb, les résistances efficaces entre les diverses électrodes et la capacité de sortie doivent avoir les valeurs min. suivantes:

R_{g1} = min.150 Ω; R_{g2} = min.470 Ω; R_{g3} = min.16000 Ω

Min. Werte der Schaltungsteile:

Der Speiseteil soll nur eine begrenzte Leistung liefern können, damit der Strom bei Dauerkurzschluss nicht mehr als 5 mA beträgt. Wenn der Momentanwert des Kurzschlussstromes 1 A überschreitet oder wenn der Speiseteil mehr als 250 μcoulomb speichern kann, müssen die effektiven Widerstände zwischen den verschiedenen Elektroden und dem Ausgangskondensator die folgenden Minimalwerte aufweisen:

R_{g1} = min.150 Ω; R_{g2} = min.470 Ω; R_{g3} = min.16000 Ω

---

3) When the heater is supplied from a separate transformer.
When the heater is in a series chain, or earthed to A.C., Z_k(f =50 c/s)= max. 0.1 MΩ

Quand le filament est alimenté par un transformateur séparé.
Quand le filament est connecté dans une chaîne série, ou est mise à la terre pour C.A., Z_k(f=50c/s)= max. 0,1 MΩ

Wenn der Heizfaden von einem separaten Transformator gespeist wird.
Wenn der Heizfaden in einer Serienkette aufgenommen oder für Wechselstrom geerdet ist, Z_k(f =50 Hz) = max. 0,1 MΩ

The power supply should be of the limited-energy type with inherent regulation to limit the continuous short-circuit current to 5 mA. If the supply permits the instantaneous short-circuit current to exceed 1 A, or is capable of storing more than 250 µcoulombs, the effective resistance in the circuit between the indicated electrode and the output capacitor should be as follows:

R_g = min. 150 Ω; R_{a1} = min. 470 Ω; R_{a2} = min. 16kΩ

Le circuit d'alimentation ne doit être capable de fournir qu'une puissance limitée de sorte que le courant de court-circuit permanent ne dépasse pas 5 mA. Si le courant instantané de court-circuit dépasse 1 A, ou si le circuit d'alimentation est capable d'accumuler plus de 250 µ coulomb, les résistances efficaces entre les diverses électrodes et la capacité de sortie doivent avoir les valeurs min. suivantes:

R_g = min. 150 Ω; R_{a1} = min. 470 Ω; R_{a2} = min. 16kΩ

Der Speiseteil soll nur eine begrenzte Leistung liefern können, damit der Strom bei Dauerkurzschluss nicht mehr als 5 mA beträgt. Wenn der Momentanwert des Kurzschlussstromes 1 A überschreitet oder wenn der Speiseteil mehr als 250 µ coulomb speichern kann, müssen die effektiven Widerstände zwischen den verschiedenen Elektroden und dem Ausgangskondensator die folgenden Minimalwerte aufweisen:

R_g = min. 150 Ω; R_{a1} = min. 470 Ω; R_{a2} = min. 16kΩ

For the procedure of setting up the ion trap magnet see type MW 36-22.

Pour le réglage de l'aimant de la trappe à ions voir le type MW 36-22.

Für die Einstellung des Magnetes der Ionenfalle siehe MW 36-22.

PHILIPS

Electronic Tube

HANDBOOK

MW41-1

page	sheet	date
1	1	1951.04.04
2	1	1954.03.03
3	2	1951.04.04
4	2	1954.03.03
5	3	1951.04.04
6	3	1954.03.03
7	3	1957.12.12
8	4	1951.04.04
9	4	1954.03.03
10	4	1957.12.12
11	5	1951.04.04
12	5	1954.03.03
13	6	1951.04.04
14	6	1954.03.03
15	7	1951.04.04
16	FP	2000.01.16

RECTANGULAR TELEVISION CATHODE RAY TUBE with metal cone, ion trap and filterglass.
TUBE A RAYONS CATHODIQUES DE TELEVISION RECTANGULAIR avec cône métallique, trappe à ions et verre filtre.
RECHTECKIGE FERNSEHKATHODENSTRAHLRÖHRE mit Metallkonus, Ionenfalle und Filterglas.

Heating:	indirect by A.C. or D.C.; series or parallel supply		
Chauffage:	indirect par C.A. ou C.C.; alimentation en parallèle ou en série	V_f =	6,3 V[1]
		I_f =	0,3 A
Heizung:	indirekt durch Wechsel- oder Gleichstrom; Serien- oder Parallelspeisung		

Capacitances Capacités Kapazitäten	C_{g1} =	7 pF
	C_k =	5 pF

Screen Colour Ecran Couleur Schirm Farbe	white blanche weiss
Colour temperature Température de couleur Farbtemperatur	7500 °K ←
Light transmission of the filterglass Transmission de la lumière par le verre filtre Lichtdurchlassigkeit des Filterglases	66 %
Useful screen diagonal Diagonale utile de l'écran Nützliche Schirmdiagonale	min. 388 mm

For curves of the screen properties see front of this section.
Pour les courbes des propriétés de l'écran voir en tête de ce chapitre.
Für die Kurven der Schirmeigenschaften siehe am Anfang dieses Abschnitts.

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[1]) When the tube is used in a series heater chain, the heater voltage must not exceed 9.5 V when the supply is switched on. If necessary a current limiting device must be used for this purpose.
Si le tube est monté dans une chaîne série de filaments, la tension de chauffage ne doit pas dépasser 9,5 V à la mise en circuit. En cas de besoin il faut utiliser un limiteur de courant pour ce but.
Wenn die Röhre in einer Heizfadenkette verwendet wird, darf die Heizspannung beim Einschalten 9,5 V nicht überschreiten. Nötigenfalls muss zu diesem Zweck ein Strombegrenzer verwendet werden.

RECTANGULAR TELEVISION PICTURE TUBE with metal cone, ion trap and filterglass
TUBE IMAGE DE TELEVISION RECTANGULAIR avec cône métallique, trappe à ions et verre filtre
RECHTECKIGE FERNSEHBILDRÖHRE mit Metallkonus, Ionenfalle und Filterglas

Heating : indirect by A.C. or D.C. series or parallel supply Chauffage: indirect par C.A. ou C.C. alimentation série ou parallèle Heizung : indirekt durch Wechsel- oder Gleichstrom; Serien- oder Parallelspeisung	V_f = 6,3 V[1]) I_f = 0,3 A	
Capacitances Capacités Kapazitäten	C_{g1} = 7 pF C_k = 5 pF C_{k+g3} = 8 pF	
Screen Ecran Schirm	Colour Couleur Farbe	white blanche weiss
	Colour temperature Température de couleur Farbtemperatur	7500 °K
	Light transmission Transmission de lumière Lichtdurchlässigkeit	66 %
	Useful diagonal Diagonale utile Nützlicher Diagonale	min. 388 mm
	Useful width Largeur utile Nützliche Breite	min. 365 mm
	Useful height Hauteur utile Nützliche Höhe	min. 272 mm

For curves of the screen properties see front of this section.
Pour les courbes des propriétés de l'écran voir en tête de ce chapitre.
Für die Kurven der Schirmeigenschaften siehe am Anfang dieses Abschnitts.

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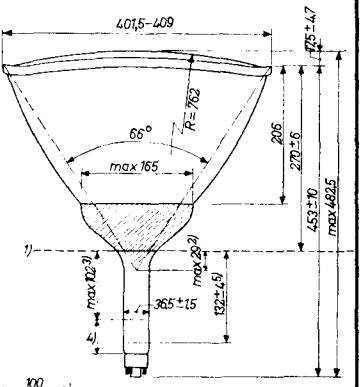
[1]) See page 6 ; voir page 6 ; siehe Seite 6

PHILIPS

1) Reference line, determined by the plane of the upper edge of the reference line gauge when the gauge is resting on the cone.

Ligne de réference, déterminée par le plan du bord supérieur du calibre de la ligne de référence, si celui-ci pose sur le cône.

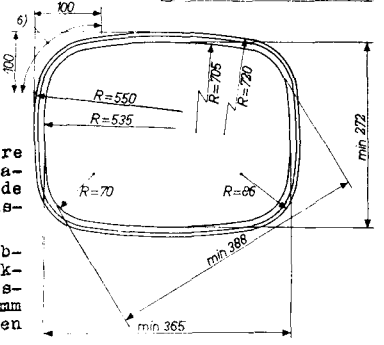
Bezugslinie, bestimmt durch die Ebene des oberen Randes der Bezugslinienlehre wenn diese auf dem Konus ruht.



2) The distance from the deflection centre to the reference line should not exceed 29 mm.

La distance entre le centre de déviation et la ligne de référence ne dépassera pas 29 mm.

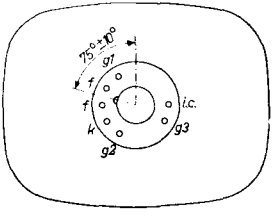
Der Abstand des Ablenkungsmittelpunktes bis zur Bezugslinie soll 29 mm nicht überschreiten



3) Space for deflection and focusing coils.

Place pour les bobines de déviation et de concentration

Platz für Ablenk- und Fokussierungsspulen.



4) Space for the ion trap
Place pour l'aimant de la trappe à ions
Platz für den Magnet der Ionenfalle.

Dimensione in mm
Dimensions en mm
Abmessungen in mm

[1])Reference line, determined by the plane of the upper edge of the reference line gauge when the gauge is resting on the cone.

Ligne de référence, déterminée par le plan du bord supérieur du calibre de la ligne de référence, si celui-ci pose sur le cône.

Bezugslinie, bestimmt durch die Ebene des oberen Randes der Bezugslinienlehre wenn diese auf dem Konus ruht.

[2])The distance from the deflection centre to the reference line should not exceed 29 mm.

La distance entre le centre de déviation et la ligne de référence ne dépasera pas 29 mm

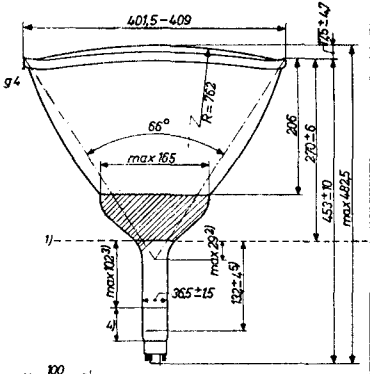
Der Abstand des Ablenkungsmittelpunktes bis zur Bezugslinie soll 29 mm nicht überschreiten

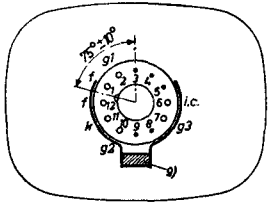
[3])Space for deflection and focusing coils.

Place pour les bobines de déviation et de concentration

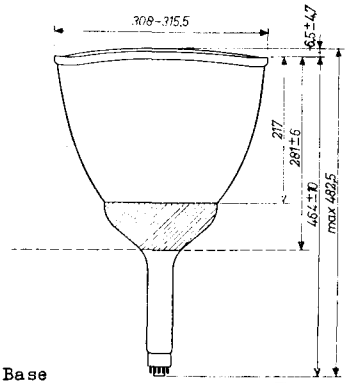
Platz für Ablenk- und Fokussierungsspulen.

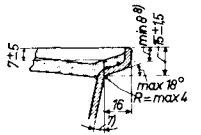
[4])Space for the ion trap
Place pour l'aimant de la trappe à ions
Platz für den Magnet der Ionenfalle.





[9])Ion trap magnet
L'aimant de la trappe à ions
Magnet der Ionenfalle





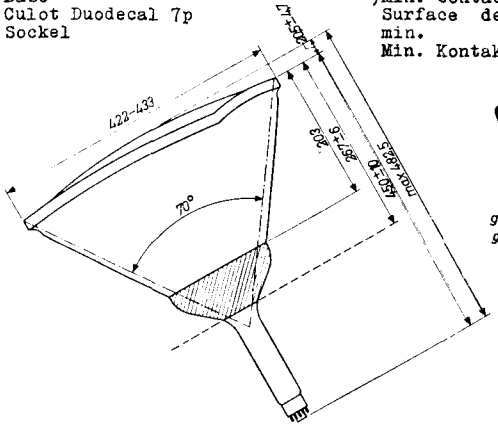
7) Angular variation around periphery of shell is 0° to 25°.

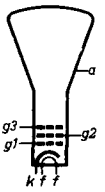
La variation angulaire autour de la périphérie du cône métallique est de 0° jusqu'à 25°.

Die Schwankung dieses Winkels am Umfang des Metallkonus beträgt 0° bis 25°.

Base
Culot Duodecal 7p
Sockel

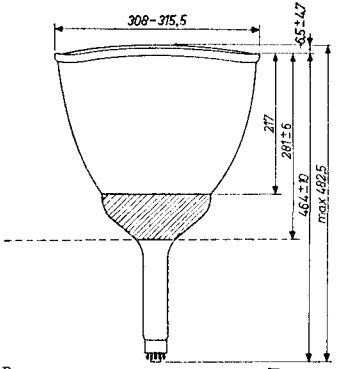
8) Min. contact area. Surface de contact min. Min. Kontaktfläche.

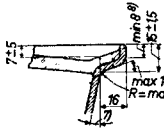




5) Distance from reference line to top centre of grid
Distance de la ligne de référence jusqu'au centre de la surface supérieure de la grille.
Abstand der Bezugslinie bis zum Mittelpunkt der Oberseite des Gitters.

6) Support tube by lip only at corners within this space
Le tube sera supporter seulement à cette partie des coins du bord.
Die Röhre soll nur an diesen Teilen der Ecken des Randes gestützt werden.





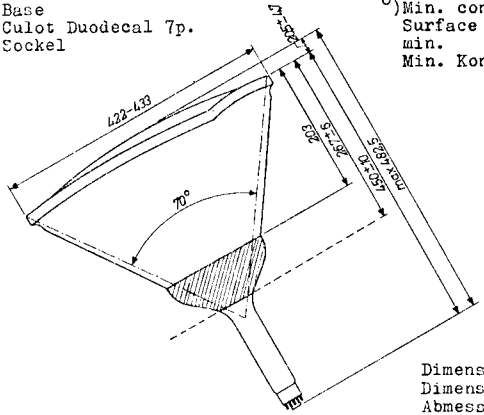
7) Angular variation around periphery of shell is 0° to 25°.

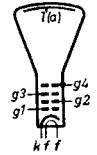
La variation angulaire autour de la périphérie du cône métallique est de 0° jusqu'à 25°.

Die Schwankung dieses Winkels am Umfang des Metallkonus beträgt 0° bis 25°.

8) Min. contact area. Surface de contact min. Min. Kontaktfläche.

Base
Culot Duodecal 7p.
Sockel



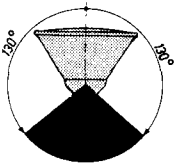


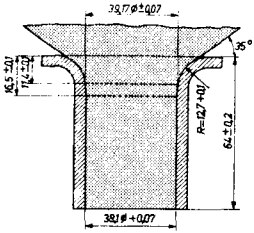
Dimensions in mm
Dimensions en mm
Abmessungen in mm

5) Distance from reference line to top centre of grid.
Distance de la ligne de référence jusqu'au centre de la surface supérieure de la grille.
Abstand der Bezugslinie bis zum Mittelpunkt der Oberseite des Gitters.

6) Support tube by lip only at corners within this space
Le tube sera supporter seulement à cette partie des coins du bord.
Die Röhre soll nur an diesen Teilen der Ecken des Randes gestützt werden.

Mounting position
Montage
Aufstellung





Reference line gauge. The inner surface of the coils must not extend into the shaded region.

Calibre de la ligne de référence. La surface intérieure des bobines ne doit pas saillir dans la région estompée.

Bezugslinienlehre. Die innere Oberfläche der Spulen muss nicht im schattierten Gebiet ausragen.

Remark; Observation; Bemerkung

Any material in contact with the cone or the face must have insulating properties adequate for 16 kV
Les matériaux en contact avec le cône ou la face doivent avoir des propriétés d'isolement pour 16 kV
Material in Kontakt mit dem Konus oder der Vorderseite muss Isolationseigenschaften für 16 kV haben

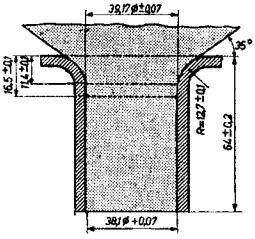
Deflection and focusing Déviation et concentration Ablenkung und Fokussierung	magnetic magnétique magnetisch
Vertical deflection angle L'angle de déviation verticale Vertikaler Ablenkungswinkel	53°
Horizontal deflection angle L'angle de déviation horizontale Horizontaler Ablenkungswinkel	66°
Focusing coil: without ferromagnetic material Number of ampere turns: see pages B and C Distance between centre of field and reference line:	78 mm
Bobine de concentration: sans matière ferromagnétique Nombre d'ampère-tours: voir pages B et C Distance entre le centre du champ et la ligne de référence:	78 mm
Fokussierungsspule: ohne ferromagnetisches Material Amperewindungszahl: siehe Seite B und C Abstand des Zentrums des Feldes bis zur Bezugslinie:	78 mm

Mounting position:	Any
Montage:	Arbitrairement
Aufstellung:	Willkürlich

Reference line gauge. The inner surface of the coils must not extend into the shaded region.

Calibre de la ligne de référence. La surface intérieure des bobines ne doit pas saillir dans la région estompée.

Bezugslinienlehre. Die innere Oberfläche der Spulen muss nicht im schattierten Gebiet ausragen.



Remark: Any material in contact with the cone or the face must have insulating properties adequate for 16 kV

Observation: Les matériaux en contact avec le cône ou la face doivent avoir des propriétés d'isolement pour 16 kV

Bemerkung: Material in Kontakt mit dem Konus oder der Vorderseite muss Isolationseigenschaften für 16 kV haben.

Deflection and focusing Déviation et concentration Ablenkung und Fokussierung	magnetic magnétique magnetisch
Vertical deflection angle L'angle de déviation verticale Vertikaler Ablenkungswinkel	max. 53°
Horizontal deflection angle L'angle de déviation horizontale Horizontaler Ablenkungswinkel	max. 66°
Focusing coil: Number of ampere-turns: Distance between centre of field and reference line :	without ferromagnetic material see pages B and C 78 mm
Bobine de concentration: Nombre d'ampère-tours: Distance entre le centre du champ et la ligne de référence:	sans matière ferromagnétique voir pages B et C 78 mm
Fokussierungsspule: Amperewindungszahl: Abstand des Zentrums des Feldes bis zur Bezugslinie:	ohne ferromagnetisches Material siehe Seite B und C 78 mm

Ion trap magnet: Single magnet, field strength about 60 gausses. Type number 55402. For the procedure of setting up see MW 43-64 page 7

Aimant de la trappe à ions: Aimant simple, intensité du champ environ 60 gauss. Numéro de type 55402. Pour le réglage voir MW 43-64 page 8

Magnet der Ionenfalle: Einfacher Magnet, Feldstärke etwa 60 Gauss. Typennummer 55402. Für die Einstellung siehe MW 43-64 Seite 9

Net weight
Poids net 4500 g
Nettogewicht

Shipping weight
Poids brut 7500 g
Bruttogewicht

Operating characteristics
Caractéristiques d'utilisation
Betriebsdaten

V_{g4}	=	14	kV
V_{g2}	=	300	V
$-V_{g1}(I_{g4}=0)$	=	-40/-86	V
V_{g3}	=	0 250	V

Focusing ampere-turns
Ampère-tours pour concentration 1015 1065
Amperewindungen zur Fokussierung

Limiting values (design centre values)
Caractéristiques limites (valeurs moyennes de développement)
Grenzdaten(mittlere Entwicklungsdaten)

V_{g4}	= max.	16	kV
V_{g4}	= min.	10	kV
V_{g3}	= max.	410	V
$-V_{g3}$	= max.	100	V
V_{g2}	= max.	410	V
V_{g2}	= min.	200	V
V_{g1}	= max.	0	V
$-V_{g1}$	= max.	150	V
$+V_{g1_p}$	= max.	2	V
W_{ℓ}	= max.	6	W
V_{kf}(k pos.;f neg.)	= max.	200	V [2) 3)]
V_{kf}(k neg.;f pos.)	= max.	125	V [3)]

[2)3)] See page 6; voir page 6; siehe Seite 6

Ion trap magnet: Single magnet; field strength about 50 gausses. Type number 55402. For the procedure of setting up please refer to "Application directions" (page C107), in front of this section

Aimant du piège à ions: Aimant simple; intensité du champ environ 50 gauss. Numéro de type 55402. Pour le réglage voir "Indications d'application" (page C107), en tête de ce chapitre

Ionenfallenmagnet: Einfacher Magnet; Feldstärke etwa 50 Gauss. Typennummer 55402. Für die Einstellung siehe "Anwendungsrichtlinien" (Seite C107), am Anfang dieses Abschnitts

Net weight Poids net Nettogewicht	4500 g	Shipping weight Poids brut Bruttogewicht	7500 g

Operating characteristics
Caractéristiques d'utilisation
Betriebsdaten

V_{g4}	=	14	kV
V_{g2}	=	300	V
$-V_{g1}$ (I_{g4} = 0 µA)	=	-40 / -86	V
V_{g3}	=	0 / 250	V
Focusing ampere-turns Ampère-tours pour concentration Amperewindungen zur Fokussierung		1015 / 1065	

Limiting values (design centre values)
Caractéristiques limites (valeurs moyennes pour projets)
Grenzdaten (mittlere Entwicklungsdaten)

V_{g4}	= max.	16	kV
V_{g4}	= min.	10	kV
V_{g3}	= max.	410	V
$-V_{g3}$	= max.	100	V
V_{g2}	= max.	410	V
V_{g2}	= min.	200	V
V_{g1}	= max.	0	V
$-V_{g1}$	= max.	150	V
$+V_{g1p}$	= max.	2	V
W_l	= max.	6	W
V_{kf} (k pos.; f neg.)	= max.	200	V [2)3)]
V_{kf} (k neg.; f pos.)	= max.	125	V [3)]

[2)3)] See page 6; voir page 6; siehe Seite 6

---

[1]) When the tube is used in a series heater chain, the heater voltage must not exceed 9.5 V when the supply is switched on. If necessary a current limiting device must be used for this purpose

Si le tube est monté dans une chaîne série de filaments, la tension de chauffage ne doit pas dépasser 9,5 V à la mise en circuit. En cas de besoin il faut utiliser un limiteur de courant pour ce but

Wenn die Röhre in einer Heizfadenkette verwendet wird darf die Heizspannung beim Einschalten 9,5 V nicht überschreiten. Nötigenfalls ist zu diesem Zweck ein Strombegrenzer zu verwenden.

[2]) During a warm-up period not exceeding 45 seconds the heater may be 410 V negative with respect to the cathode

Pendant une période d'échauffement ne dépassant pas 45 secondes, le filament peut être porté à un potentiel négatif de 410 V par rapport à la cathode

Während einer Anheizzeit von max. 45 Sekunden darf der Heizfaden 410 V negativ sein in bezug auf der Katode

[3]) In order to avoid excessive hum, the A.C. component of V_{kf} should be as low as possible and must not exceed 20 V

Pour éviter le ronflement excessif la composante alternative de V_{kf} sera la plus petite possible et ne dépassera pas 20 V

Zur Vermeidung von Brummstörungen muss die Wechselspannungskomponente von V_{kf} so klein wie möglich sein und jedenfalls 20 V nicht überschreiten

[4]) When the heater is supplied from a separate transformer.
When the heater is in a series chain, or earthed to A.C., Z_k(f =50 c/s)= max. 0.1 MΩ

Quand le filament est alimenté par un transformateur séparé.
Quand le filament est connecté dans une chaîne série, ou est mise à la terre pour C.A., Z_k(f =50 c/s) = max. 0,1 MΩ

Wenn der Heizfaden von einem separaten Transformator gespeist wird.
Wenn der Heizfaden in einer Serienkette aufgenommen oder für Wechselstrom geeerdet ist, Z_k(f = 50 Hz) = max. 0,1 MΩ

1) When the tube is used in a series heater chain, the heater voltage must not exceed 9.5 V when the supply is switched on. If necessary a current limiting device must be used for this purpose

Si le tube est monté dans une chaîne série de filaments, la tension de chauffage ne doit pas dépasser 9,5 V à la mise en circuit. En cas de besoin il faut utiliser un limiteur de courant pour ce but

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2) During a warm-up period not exceeding 45 seconds the heater may be 410 V negative with respect to the cathode

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4) When the heater is supplied from a separate transformer.
When the heater is in a series chain, or earthed to A.C., Z_k(f =50 c/s)= max. 0.1 MΩ

Quand le filament est alimenté par un transformateur séparé.
Quand le filament est connecté dans une chaîne série, ou est mise à la terre pour C.A., Z_k(f =50 c/s) = max. 0,1 MΩ

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Wenn der Heizfaden in einer Serienkette aufgenommen oder für Wechselstrom geeerdet ist, Z_k(f = 50 Hz) = max. 0,1 MΩ

ADJUSTMENT OF ION-TRAP MAGNET 55402

The ion-trap magnet is fitted to a clamping ring so that it may be fixed to the neck of the tube. The following procedure should be adopted for adjusting the position of the magnet:

1. Switch off the voltage supplies and remove the socket. Slip the magnet over the base with the arrow pointing away from the screen. The position of the magnet must be approximately in line with the position reserved for pin No.9 on the base (see fig.below). Adjust the magnet slightly in advance of the base.
2. Fit the socket to the tube and switch on the voltage supplies. Adjust the brightness control and, if necessary, the position of the magnet until the raster is just visible. The adjustment is best carried out with a stationary test pattern.
3. Move the magnet towards the screen, without rotating it, until the focused raster attains maximum brightness. The brightness may now be adjusted to give the correct level for the peak white portions of the image and, if necessary, the position of the magnet should be readjusted to obtain maximum brilliance.
4. If the raster cannot be centered by adjusting the position of the focus field, the magnet should be rotated slightly in order to assist in centering, provided that this does not cause any decrease in brilliance.
5. When optimum conditions are obtained, the magnet should be clamped in position by means of the screw, taking care not to alter the position of the magnet.
6. If a position of adequate brilliance can not be obtained, another magnet should be tried.

The magnet should never be adjusted to remove a shadow from the raster if by doing so the brightness of the image is decreased. In such cases the shadow should be eliminated by adjusting the position of the focus coil and/or deflection coils.

It is essential that the magnet should be handled with care and not subjected to very strong magnetic fields or mechanical shocks.



Max. circuit values
Valeurs max. des éléments du montage
Max. Werte der Schaltungsteile

R_{kf} = 1 MΩ[4])
R_{g1} = 1,5 MΩ
Z_{g1}(f =50 c/s)= 0,5 MΩ

Min. circuit values:

The power supply should be of the limited-energy type with inherent regulation to limit the continuous short-circuit current to 5 mA. If the supply permits the instantaneous short-circuit current to exceed 1 A, or is capable of storing more than 250 µcoulombs, the effective resistance in the circuit between the indicated electrode and the output capacitor should be as follows:

R_{g1} = min. 150 Ω R_{g2} = min. 470 Ω
R_{g3} = min. 470 Ω R_{g4} = min. 16000 Ω

Valeurs min. des éléments du montage:

Le circuit d'alimentation ne doit être capable de fournir qu'une puissance limitée de sorte que le courant de court-circuit permanent ne dépasse pas 5 mA. Si le courant instantané de court-circuit dépasse 1 A, ou si le circuit d'alimentation est capable d'accumuler plus de 250 µcoulomb, les résistances efficaces entre les diverses électrodes et la capacité de sortie doivent avoir les valeurs min. suivantes:

R_{g1} = min. 150 Ω R_{g2} = min. 470 Ω
R_{g3} = min. 470 Ω R_{g4} = min. 16000 Ω

Min. Werte der Schaltungsteile:

Der Speiseteil soll nur eine begrenzte Leistung liefern können, damit der Strom bei Dauerkurzschluss nicht mehr als 5 mA beträgt. Wenn der Momentanwert des Kurzschlussstromes 1 A überschreitet oder wenn der Speiseteil mehr als 250 µcoulomb speichern kann, müssen die effektiven Widerstände zwischen den verschiedenen Elektroden und dem Ausgangskondensator die folgenden Minimalwerte aufweisen:

R_{g1} = min. 150 Ω R_{g2} = min. 470 Ω
R_{g3} = min. 470 Ω R_{g4} = min. 16000 Ω

[4])See page 6; voir page 6; siehe Seite 6

REGLAGE DE L'AIMANT DE TRAPPE A IONS 55402

L'aimant de trappe à ions est monté sur un collier de serrage qui permet de le fixer au col du tube. Pour regler la position de l'aimant, procéder de la manière suivante:

1. Les tensions d'alimentation étant coupées et le support étant enlevé, glisser l'aimant au-dessus du culot, la flèche pointée dans le sens opposé à celui de l'écran. La position de l'aimant doit concorder avec la position réservée à la broche No. 9 sur le culot (voir la figure ci-dessous). Glisser l'aimant de façon qu'il se trouve tout juste au-delà du culot.
2. Fixer le support au tube et appliquer les tensions d'alimentation. Ajuster le bouton de luminosité et, en cas de besoin, déplacer l'aimant jusqu'à ce que la trame soit tout juste visible. Le réglage s'effectue au mieux à l'aide d'une mire stationnaire d'essai sur l'écran
3. Rapprocher l'aimant sans le tournant de l'écran jusqu'au moment où la brillance de la trame concentrée soit maximum. Ajuster le bouton de luminosité de façon à obtenir le niveau équivalent au blanc maximum de l'image et, en cas de besoin, déplacer légèrement l'aimant de façon à obtenir la brillance maximum.
4. Si le réglage de la position du champ de concentration ne permet pas d'obtenir le centrage de la trame, tourner légèrement l'aimant de façon à faciliter le centrage, pour autant que cette opération ne provoque pas une diminution de la brillance.
5. Les conditions optima étant obtenues, bloquer l'aimant au moyen de la vis, en veillant à ne pas modifier la position de l'aimant.
6. S'il est impossible d'obtenir une position pour laquelle la brillance est satisfaisante, essayer un autre aimant.

Ne jamais déplacer l'aimant pour enlever une ombre de la trame, si ce déplacement provoque une diminution de la brillance de l'image. Dans un tel cas, supprimer l'ombre parfaisant le réglage de la position de la bobine de concentration et ou des bobines de déviation.

Toujours manipuler l'aimant avec précaution et veiller à le soustraire aux champs magnétiques de forte intensité et aux chocs mécaniques.



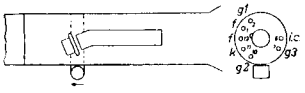
EINSTELLUNG DES MAGNETS DER IONENFALLE 55402

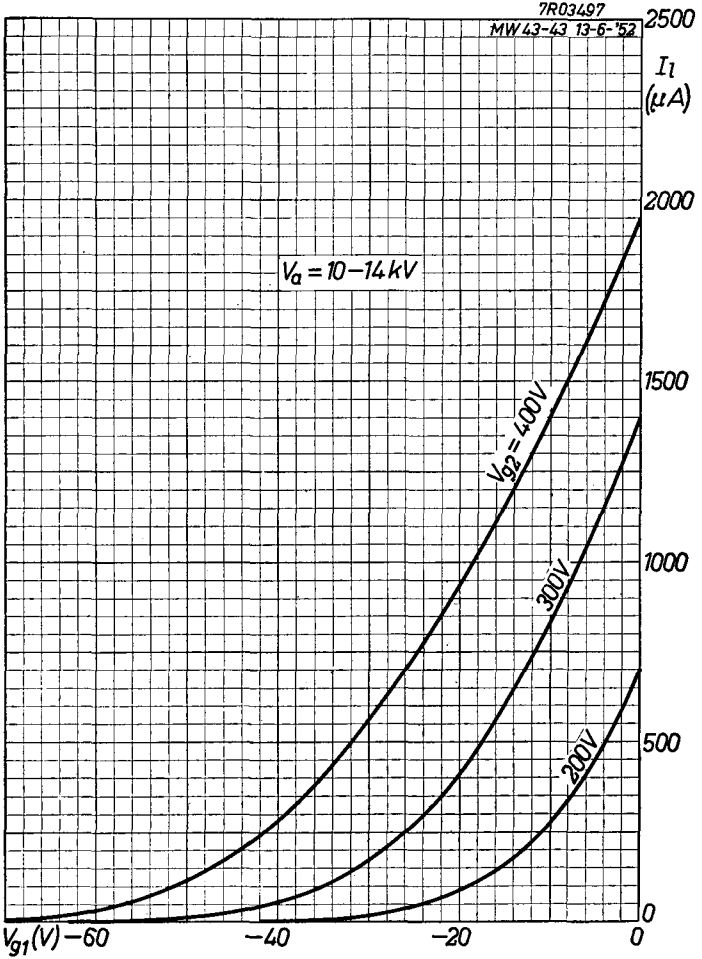
Der Magnet der Ionenfalle hat einen Halterungsring, mit dem er am Hals des Rohrenkolbens befestigt werden kann. Die Einstellung des Magnets geschieht in folgender Weise:

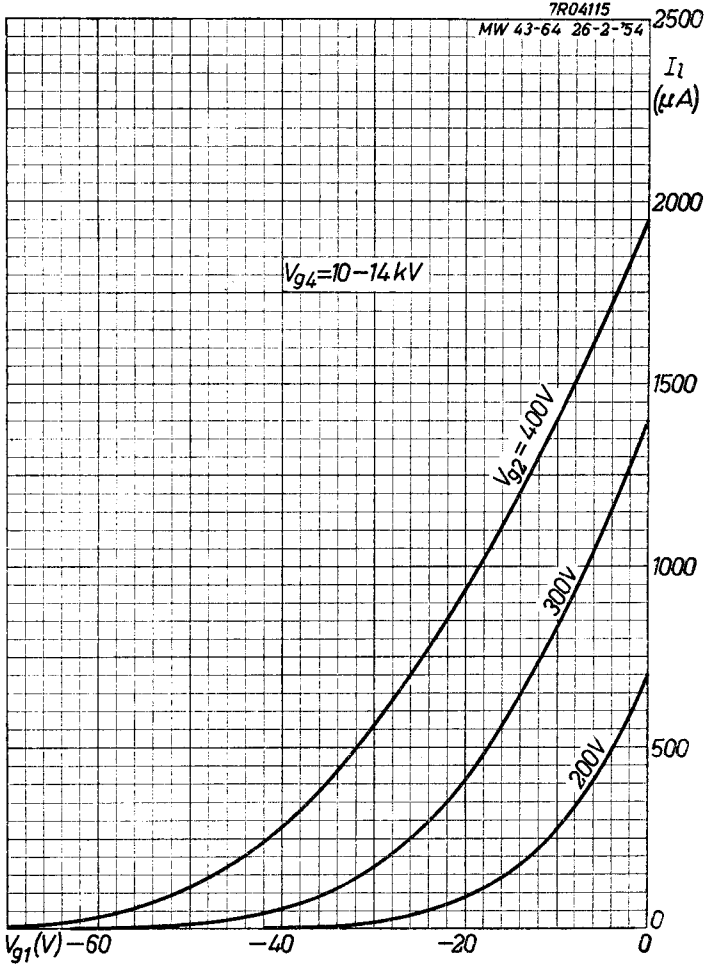
1. Die Spannungsquellen ausschalten und den Röhrenhalter abnehmen. Sodann schiebe man den Magnetring über den Sockel mit dem Pfeil vom Schirm wegweisend. Die Lage des Magnets muss ungefähr zusammenfallen mit der fur Stift No. 9 vorgesehenen Lage am Sockel (Siehe untenstehender Abbildung). Der Ring wird so angeordnet dass er ein wenig über den Sockel ragt.
2. Den Röhrenhalter wieder anbringen und die Spannungsquellen einschalten. Man regle nun die Helligkeit, und, falls nötig, die Lage des Magnets so, dass das Raster gerade sichtbar ist. Am besten wird diese Einstellung an einem festen Kontrolmuster vorgenommen.
3. Man verstelle den Magnet, ohne Drehung, soweit in Richtung des Schirmes, bis das fokussierte Raster die stärkste Helligkeit aufweist. Alsdann steigere man die Helligkeit auf intensivstes Weiss und stelle, falls nötig, den Magnet auf maximale Helligkeit nach.
4. Gelingt es nicht das Raster durch einstellen des Fokussierungsfeldes zu zentrieren, so suche man dies durch leichtes Drehen des Magnets zu erreichen, vorausgesetzt dass hierdurch die Helligkeit nicht vermindert wird.
5. Nachdem der optimale Punkt erreicht ist, setze man den Magnet mit Hilfe der Schraube fest, wobei an der Stellung des Magnets nichts mehr geändert werden darf.
6. Ist die Helligkeit des Rasters unzulänglich, so muss ein neuer Magnet verwendet werden.

In keinem Falle darf man sich des Magnets zur Beseitigung eines Schattens im Raster bedienen, wenn die Bildhelligkeit dadurch beeinträchtigt würde. Man beseitige dann den Schatten durch entsprechendes Nachstellen der Fokussierungspule und/oder der Ablenkspulen.

Bei der Verwendung des Magnets ist grösste Sorgfalt zu beachten; er darf keinen starken magnetischen Feldern une keinen mechanischen Erschütterungen ausgesetzt sein.




7R03497
MW43-43 13-6-'52
2500
I_l
(μA)
2000
1500
1000
500
0
$V_a = 10-14\,kV$
$V_{g2} = 400V$
300V
200V
V_{g1}(V) −60
−40
−20
0

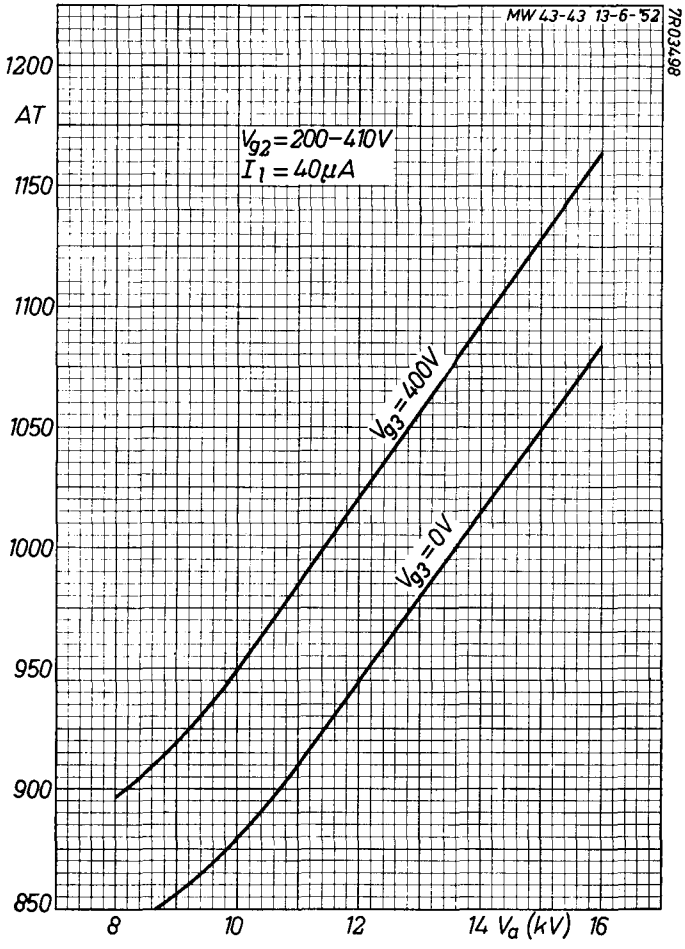

7R04115
MW 43-64 26-2-'54
2500
I_l
(μA)
2000
1500
1000
500
0
V_{g4}=10–14 kV
V_{g2} = 400V
300V
200V
V_{g1}(V) –60
–40
–20
0

2.2.1954

A

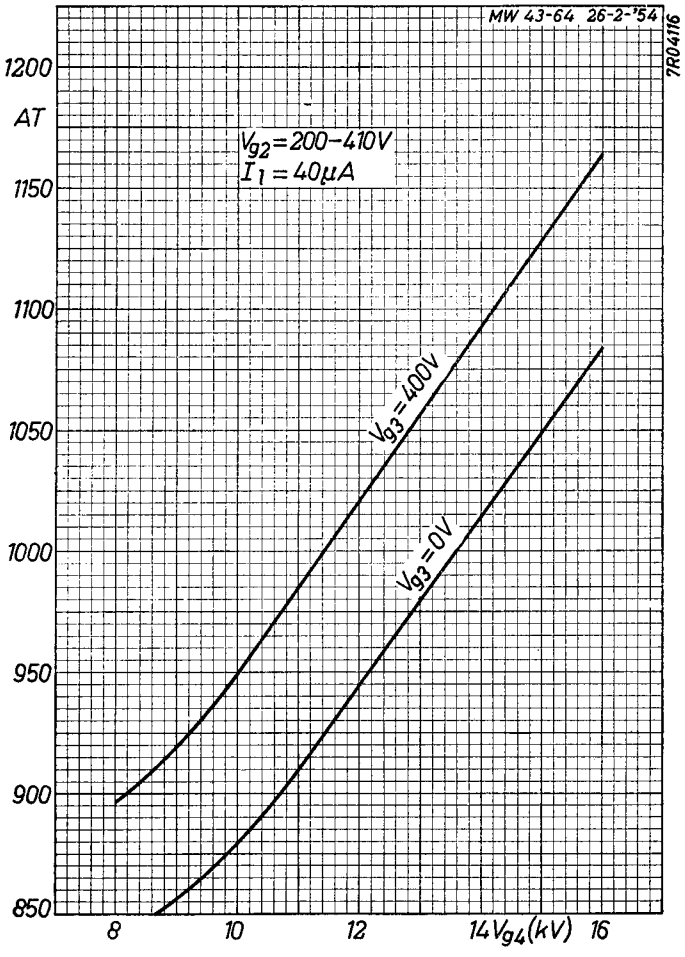
MW 43-43 **PHILIPS**

AT = Number of ampere turns necessary for focusing
AT = Nombre d'ampère-tours nécessaire pour la concentration
AT = Die zur Fokussierung erforderliche Amperewindungszahl



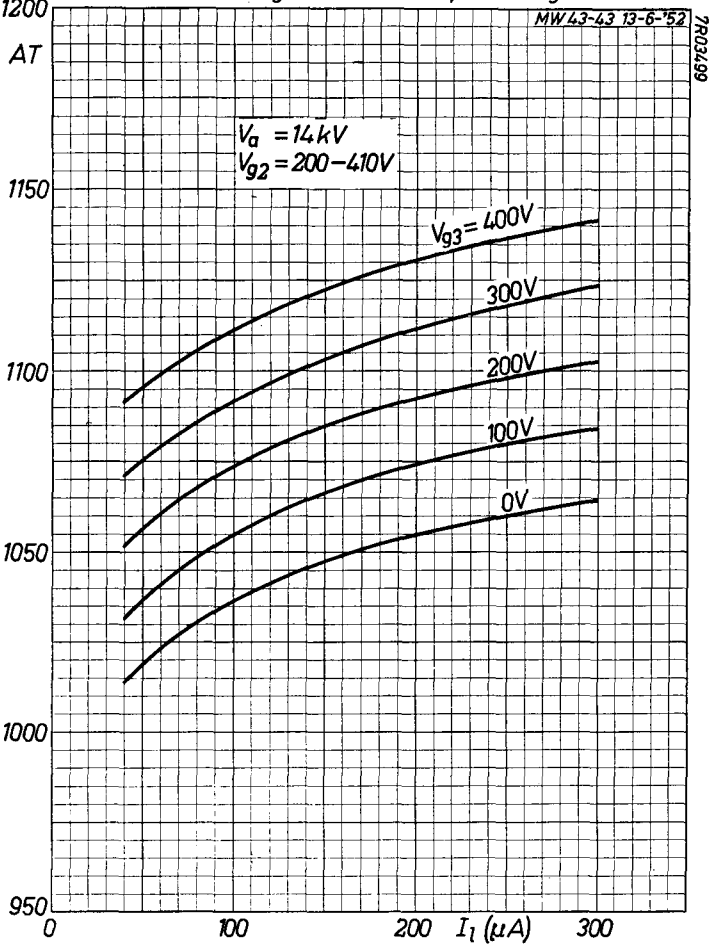
MW 43-43 **PHILIPS**

AT= Number of ampere turns necessary for focusing
AT= Nombre d'ampère-tours nécessaire pour la concentration
AT= Die zur Fokussierung erforderliche Amperewindungszahl

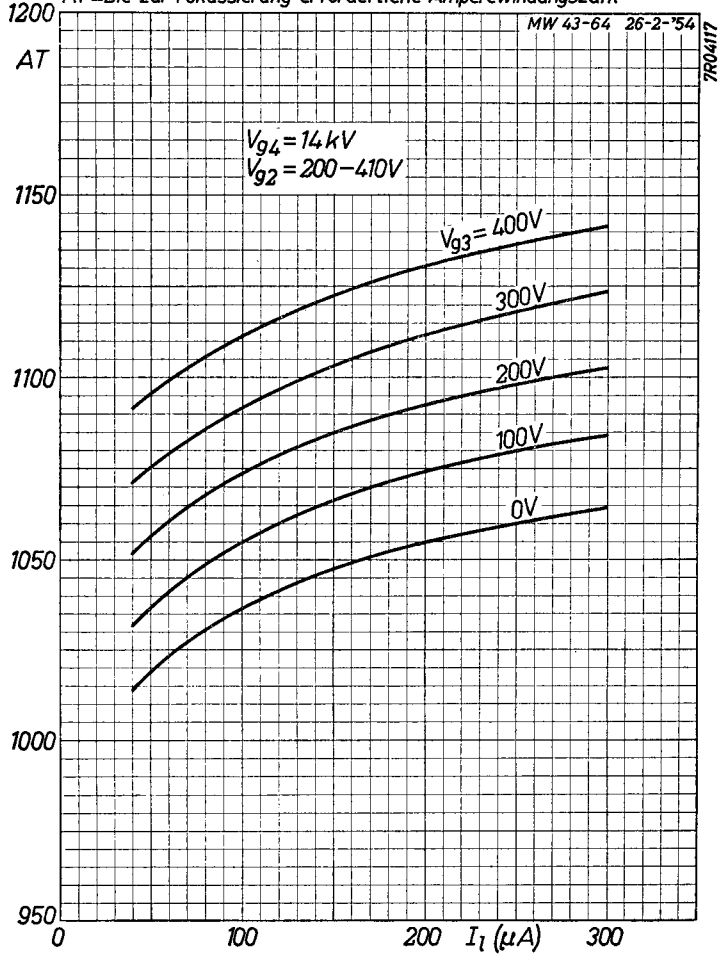


B.

AT=Number of ampere turns necessary for focusing
AT=Nombre d'ampère-tours nécessaire pour la concentration
AT=Die zur Fokussierung erforderliche Amperewindungszahl



AT=Number of ampere turns necessary for focusing
AT=Nombre d'ampère-tours nécessaire pour la concentration
AT=Die zur Fokussierung erforderliche Amperewindungszahl



2.2.1954

C

PHILIPS

Electronic Tube

HANDBOOK

MW43-43

page	sheet	date
1	1	1952.12.12
2	1	1954.03.03
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4	2	1954.03.03
5	3	1952.12.12
6	3	1954.03.03
7	4	1952.12.12
8	4	1954.03.03
9	5	1954.03.03
10	5	1957.12.12
11	6	1954.03.03
12	6	1957.12.12
13	7	1952.12.12
14	7	1954.03.03
15	8	1952.12.12
16	9	1952.12.12
17	A	1952.10.10
18	A	1954.02.02
19	B	1952.10.10

20	B	1954.02.02
21	C	1952.10.10
22	C	1954.02.02
23, 24	FP	2000.01.07

RECTANGULAR TELEVISION CATHODE RAY TUBE with metal cone, ion trap and filterglass.
TUBE A RAYONS CATHODIQUES DE TELEVISION RECTANGULAIR avec cône métallique, trappe à ions et verre filtre.
RECHTECKIGE FERNSEHKATHODENSTRAHLROHRE mit Metallkonus, Ionenfalle und Filterglas.

Heating :	indirect by A.C. or D.C.; series or parallel supply		
Chauffage:	indirect par C.A. ou C.C.; alimentation en parallèle ou en série	V_f	= 6,3 V
		I_f	= 0,6 A
Heizung :	indirekt durch Wechsel- oder Gleichstrom; Serien- oder Parallelspeisung		

Capacitances	C_{g1}	=	7 pF
Capacités	C_k	=	5 pF
Kapazitäten			

Screen Colour Ecran Couleur Schirm Farbe	white blanche weiss
Colour temperature *Température de couleur* Farbtemperatur	7500 °K
Light transmission of the filterglass Transmission de la lumière par le verre filtre Lichtdurchlässigkeit des Filterglases	66 %
Useful screen diagonal Diagonale utile de l'écran Nützliche Schirmdiagonale	min. 388 mm

For curves of the screen properties see front of this section.
Pour les courbes des propriétés de l'écran voir en tête de ce chapitre.
Für die Kurven der Schirmeigenschaften siehe am Anfang dieses Abschnitts.

PHILIPS

MW 43-43/02

RECTANGULAR TELEVISION PICTURE TUBE with metal cone, ion trap and filterglass
TUBE IMAGE DE TELEVISION RECTANGULAIR avec cône métallique, trappe à ions et verre filtre
RECHTECKIGE FERNSEHBILDRÖHRE mit Metallkonus, Ionenfalle und Filterglas

Heating : indirect by A.C. or D.C. series or parallel supply		
Chauffage: indirect par C.A. ou C.C. alimentation série ou parallèle	V_f = 6,3 V I_f = 0,6 A	
Heizung : indirekt durch Wechsel- oder Gleichstrom; Serien- oder Parallelspeisung		
Capacitances Capacités Kapazitäten	C_{g1} = 7 pF C_k = 5 pF	
Screen Ecran Schirm	Colour Couleur Farbe	white blanche weiss
	Colour temperature Température de couleur Farbtemperatur	7500 °K
	Light transmission Transmission de lumière Lichtdurchlässigkeit	66 %
	Useful diagonal Diagonale utile Nützlicher Diagonale	min. 387 mm
	Useful width Largeur utile Nützliche Breite	min. 365 mm
	Useful height Hauteur utile Nützliche Höhe	min. 272 mm

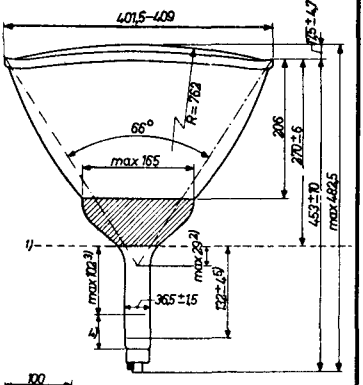
For curves of the screen properties see front of this section.
Pour les courbes des propriétés de l'écran voir en tête de ce chapitre.
Für die Kurven der Schirmeigenschaften siehe am Anfang dieses Abschnitts

PHILIPS

1) Reference line, determined by the plane of the upper edge of the reference line gauge when the gauge is resting on the cone.

Ligne de référence, déterminée par le plan du bord supérieur du calibre de la ligne de référence, si celui-ci pose sur le cône.

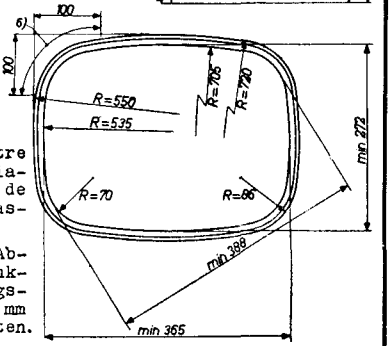
Bezugslinie, bestimmt durch die Ebene des oberen Randes der Bezugslinienlehre wenn diese auf dem Konus ruht.



2) The distance from the deflection centre to the reference line should not exceed 29 mm.

La distance entre le centre de déviation et la ligne de référence ne dépassera pas 29 mm.

Der Abstand des Ablenkungsmittelpunktes bis zur Bezugslinie soll 29 mm nicht überschreiten.

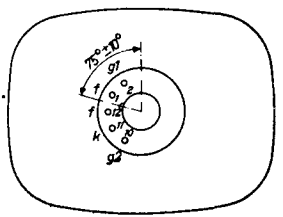


3) Space for deflection and focusing coils.

Place pour les bobines de déviation et de concentration.

Platz für Ablenk- und Fokussierungsspulen.

4) Space for the ion trap.
Place pour l'aimant de la trappe à ions.
Platz für den Magnet der Ionenfalle.



Dimensions in mm
Dimensions en mm
Abmessungen in mm

PHILIPS

[1])Reference line, determined by the plane of the upper edge of the reference line gauge when the gauge is resting on the cone.

Ligne de référence, déterminée par le plan du bord supérieur du calibre de la ligne de référence, si celui-ci pose sur le cône.

Bezugslinie, bestimmt durch die Ebene des oberen Randes der Bezugslinienlehre wenn diese auf dem Konus ruht.

[2])The distance from deflection centre to reference line should not exceed 29 mm.

La distance du centre de déviation au ligne de référence ne dépassera pas 29 mm.

Der Abstand des Ablenkungsmittelpunktes bis zur Bezugslinie soll 22 mm nicht überschreiten.

[3])Space for deflection and focusing coils.

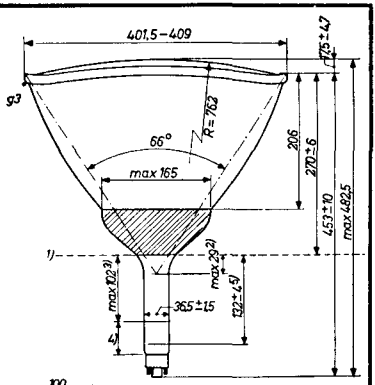
Place pour les bobines de déviation et de concentration.

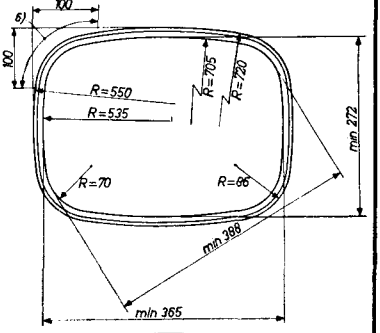
Platz für Ablenk- und Fokussierungsspulen.

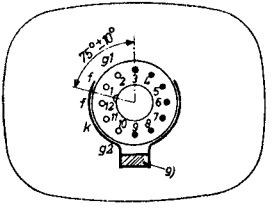
[4])Space for the ion trap.

Place pour l'aimant de la trappe à ions.

Platz für den Magnet der Ionenfalle.

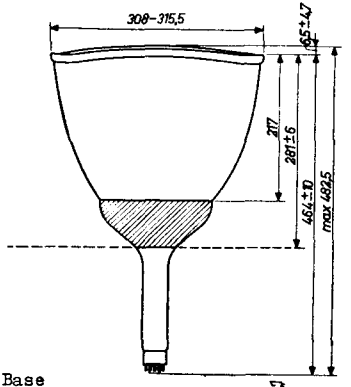


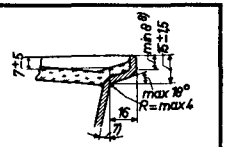




[9])Ion trap magnet
L'aimant de la trappe à ions
Magnet der Ionenfalle

Dimensions in mm
Dimensions en mm
Abmessungen in mm



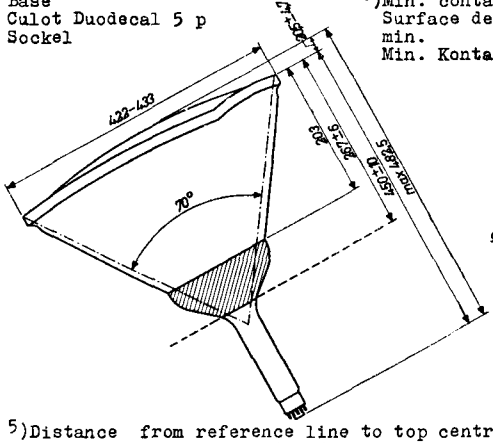


7) Angular variation around periphery of shell is 0° to 25°.

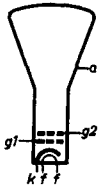
La variation angulaire autour de la périphérie du cône métallique est de 0° jusqu'à 25°.

Die Schwankung dieses Winkels am Umfang des Metallkonus beträgt 0° bis 25°.

Base
Culot Duodecal 5 p
Sockel

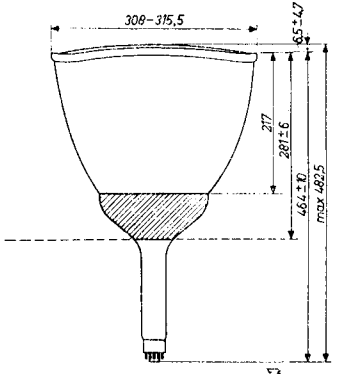


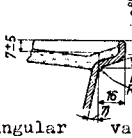
8) Min. contact area. Surface de contact min. Min. Kontaktfläche.



5) Distance from reference line to top centre of grid.
Distance de la ligne de référence jusqu'au centre de la surface supérieure de la grille.
Abstand der Bezugslinie bis zum Mittelpunkt der Oberseite des Gitters.

6) Support tube by lip only at corners within this space
Le tube sera supporter seulement à cette partie des coins du bord.
Die Röhre soll nur an diesen Teilen der Ecken des Randes gestützt werden.





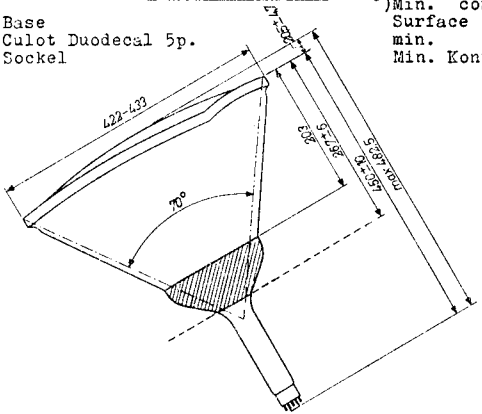
7) Angular variation around periphery of shell is 0° to 25°

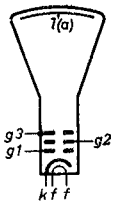
La variation angulaire autour de la périphérie du cône métallique est de 0° jusqu'à 25°

Die Schwankung dieses Winkels am Umfang des Metallkonus beträgt 0° bis 25°

8) Min. contact area. Surface de contact min.
Min. Kontaktfläche

Base
Culot Duodecal 5p.
Sockel

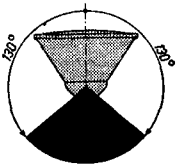


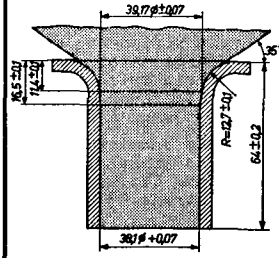


5) Distance from reference line to top centre of grid.
Distance de la ligne de référence jusqu'au centre de la surface supérieure de la grille.
Abstand der Bezugslinie bis zum Mittelpunkt der Oberseite des Gitters

6) Support tube by lip only at corners within this space
Le tube sera supporter seulement à cette partie des coins du bord
Die Röhre soll nur an diesen Teilen der Ecken des Randes gestützt werden.

Mounting position
Montage
Aufstellung





Reference line gauge. The inner surface of the coils must not extend into the shaded region.

Calibre de la ligne de référence. La surface intérieure des bobines ne doit pas saillir dans la région estompée.

Bezugslinienlehre. Die innere Oberfläche der Spulen muss nicht im schattierten Gebiet ausragen.

Remark; Observation; Bemerkung
Any material in contact with the cone or the face must have insulating properties adequate for 16 kV
Les matériaux en contact avec le cône ou la face doivent avoir des propriétés d'isolement pour 16 kV
Material in Kontakt mit dem Konus oder der Vorderseite muss Isolationseigenschaften für 16 kV haben

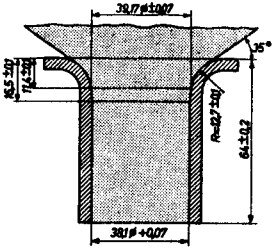
Deflection and focusing Déviation et concentration Ablenkung und Fokussierung	magnetic magnetique magnetisch
Vertical deflection angle L'angle de déviation verticale Vertikaler Ablenkungswinkel	53°
Horizontal deflection angle L'angle de déviation horizontale Horizontaler Ablenkungswinkel	66°
Focusing coil: without ferromagnetic material Number of ampere turns: see pages B and C Distance between centre of field and reference line:	78 mm
Bobine de concentration: sans matière ferromagnétique Nombre d'ampère-tours: voir pages B et C Distance entre le centre du champ et la ligne de référence:	78 mm
Fokussierungsspule: ohne ferromagnetisches Material Amperewindungszahl: siehe Seite B und C Abstand des Zentrums des Feldes bis zur Bezugslinie:	78 mm

Mounting position:	Any
Montage:	Arbitrairement
Aufstellung:	Willkürlich

Reference line gauge. The inner surface of the coils must not extend into the shaded region.

Calibre de la ligne de référence. La surface intérieure des bobines ne doit pas saillir dans la région estompée.

Bezugslinienlehre. Die innere Oberfläche der Spulen muss nicht im schattierten Gebiet ausragen.



Remark: Any material in contact with the cone or the face must have insulating properties adequate for 16 kV
Observation: Les matériaux en contact avec le cône ou la face doivent avoir des propriétés d'isolement pour 16 kV
Bemerkung: Material in Kontakt mit dem Konus oder der Vorderseite muss Isolationseigenschaften für 16 kV haben

Deflection and focusing Déviation et concentration Ablenkung und Fokussierung	magnetic magnétique magnetisch
Vertical deflection angle L'angle de déviation verticale Vertikaler Ablenkungswinkel	max. 53°
Horizontal deflection angle L'angle de déviation horizontale Horizontaler Ablenkungswinkel	max. 66°
Focusing coil: without ferromagnetic material Number of ampere-turns: see pages B and C Distance between centre of field and reference line:	78 mm
Bobine de concentration: sans matière ferromagnétique Nombre d'ampère-tours: voir pages B et C Distance entre le centre du champ et la ligne de référence:	78 mm
Fokussierungsspule: ohne ferromagnetisches Material Amperewindungszahl: siehe Seite B und C Abstand des Zentrums des Feldes bis zur Bezugslinie:	78 mm

Ion trap magnet: Single magnet, field strength about 60 gausses. Type number 55402. For the procedure of setting up see page 7.

Aimant de la trappe à ions: Aimant simple, intensité du champ environ 60 gauss. Numéro de type 55402. Pour le réglage voir page 8

Magnet der Ionenfalle: Einfacher Magnet, Feldstärke etwa 60 Gauss. Typennummer 55402. Für die Einstellung siehe Seite 9.

Net weight		Shipping weight	
Poids net	4500 g.	Poids brut	7500 g
Nettogewicht		Bruttogewicht	

Operating characteristics
Caractéristiques d'utilisation
Betriebsdaten

V_{g3}	=	14	kV
V_{g2}	=	300	V
$-V_{g1}(I_{g3}=0)$	=	33/77	V

Focusing ampere-turns
Ampère-tours pour concentration 1020
Amperewindungen zur Fokussierung

Limiting values (design centre values)
Caractéristiques limites(valeurs moyennes de développement)
Grenzdaten (mittlere Entwicklungsdaten)

V_{g3}	= max.	16	kV
V_{g3}	= min.	10	kV
V_{g2}	= max.	410	V
V_{g2}	= min.	200	V
V_{g1}	= max.	0	V
$-V_{g1}$	= max.	125	V
V_{g1_p}	= max.	2	V
W_g	= max.	6	W
V_{kf} (k pos.;f neg.)	= max.	180	V[1])
V_{kf} (k neg.;f pos.)	= max.	180	V

1)During a warm-up period not exceeding 15 seconds the heater may be 410 V negative with respect to the cathode
Pendant une période d'échauffement ne dépassant pas 15 seconder, le filament peut être porté à un potentiel négatif de 410 V par rapport à la cathode.
Während einer Anheizzeit von max. 15 Sekunden darf der Heizfaden 410 V negativ sein in bezug auf der Katode

Ion trap magnet: Single magnet; field strength about 50 gausses. Type number 55402. For the procedure of setting up please refer to "Application directions" (page C107), in front of this section

Aimant du piège à ions: Aimant simple; intensité du champ environ 50 gauss. Numéro de type 55402. Pour le réglage voir "Indications d'application" (page C107), en tête de ce chapitre

Ionenfallenmagnet: Einfacher Magnet; Feldstärke etwa 50 Gauss. Typennummer 55402. Für die Einstellung siehe "Anwendungsrichtlinien" (Seite C107), am Anfang dieses Abschnitts

Net weight Poids net Nettogewicht	4500 g	Shipping weight Poids brut Bruttogewicht	7500 g

Operating characteristics
Caractéristiques d'utilisation
Betriebsdaten

V_{g3}	=	14 kV
V_{g2}	=	300 V
$-V_{g1}$ (I_{g3} = 0)	=	33/77 V

Focusing ampere-turns
Ampère-tours pour concentration 1020
Amperewindungen zur Fokussierung

Limiting values (design centre values)
Caractéristiques limites (valeurs moyennes pour projets)
Grenzdaten (mittlere Entwicklungsdaten)

V_{g3}	= max.	16 kV
V_{g3}	= min.	10 kV
V_{g2}	= max.	410 V
V_{g2}	= min.	200 V
V_{g1}	= max.	0 V
$-V_{g1}$	= max.	125 V
V_{g1p}	= max.	2 V
W_l	= max.	6 W
V_{kf} (k pos.; f neg.)	= max.	180 V[1])
V_{kf} (k neg.; f pos.)	= max.	180 V

[1]) During a warm-up period not exceeding 15 seconds the heater may be 410 V negative with respect to the cathode
Pendant une période d'échauffement ne dépassant pas 15 secondes, le filament peut être porté à un potentiel négatif de 410 V par rapport à la cathode
Während einer Anheizzeit von max. 15 Sekunden darf der Heizfaden 410 V negativ sein in Bezug auf die Katode

Max. circuit values
Valeurs max. des éléments du montage
Max. Werte der Schaltungsteile

R_{kf}	= 1	MΩ [1])
R_{g1}	= 1,5	MΩ
Z_{g1}(f =50 c/s)	= 0,5	MΩ

Min. circuit values:
The power supply should be of the limited-energy type with inherent regulation to limit the continuous short-circuit current to 5 mA. If the supply permits the instantaneous short-circuit current to exceed 1 A, or is capable of storing more than 250 μcoulombs, the effective resistance in the circuit between the indicated electrode and the output capacitor should be as follows:

R_{g1} = min. 150 Ω; R_{g2} = min. 470 Ω; R_{g3} = min.18000 Ω

Valeurs min. des éléments du montage:
Le circuit d'alimentation ne doit être capable de fournir qu'une puissance limitée de sorte que le courant de court-circuit permanent ne dépasse pas 5 mA. Si le courant instantané de court-circuit dépasse 1 A, ou si le circuit d'alimentation est capable d'accumuler plus de 250 μcoulomb, les résistances efficaces entre les diverses électrodes et la capacité de sortie doivent avoir les valeurs min. suivantes:

R_{g1} = min. 150 Ω; R_{g2} = min. 470 Ω; R_{g3} = min.18000 Ω

Min.Werte der Schaltungsteile:
Der Speiseteil soll nur eine begrenzte Leistung liefern können, damit der Strom bei Dauerkurzschluss nicht mehr als 5 mA beträgt. Wenn der Momentanwert des Kurzschlussstromes 1 A überschreitet oder wenn der Speiseteil mehr als 250 μcoulomb speichern kann, müssen die effektiven Widerstände zwischen den verschiedenen Elektroden und dem Ausgangskondensator die folgenden Minimalwerte aufweisen:

R_{g1} = min. 150 Ω; R_{g2} = min. 470 Ω; R_{g3} = min.18000 Ω

1) When the heater is supplied from a separate transformer. When the heater is in a series chain, or earthed to A.C., Z_k(f =50 c/s)= max. 0.1 MΩ
Quand le filament est alimenté par un transformateur séparé. Quand le filament est connecté dans une chaîne série, ou est mise à la terre pour C.A., Z_k(f =50 c/s)= max. 0,1 MΩ
Wenn der Heizfaden von einem separaten Transformator gespeist wird. Wenn der Heizfaden in einer Serienkette aufgenommen oder für Wechselstrom geerdet ist, Z_k(f =50 Hz) = max. 0,1 MΩ

Max. circuit values
Valeurs max. des éléments du montage
Max. Werte der Schaltungsteile

R_{kf}	= 1	MΩ [1])
R_{g1}	= 1,5	MΩ
Z_{g1}(f =50 c/s)	= 0,5	MΩ

Min. circuit values:
The power supply should be of the limited-energy type with inherent regulation to limit the continuous short-circuit current to 5 mA. If the supply permits the instantaneous short-circuit current to exceed 1 A, or is capable of storing more than 250 μcoulombs, the effective resistance in the circuit between the indicated electrode and the output capacitor should be as follows:

R_{g1} = min. 150 Ω; R_{g2} = min. 470 Ω; R_{g3} = min.18000 Ω

Valeurs min. des éléments du montage:
Le circuit d'alimentation ne doit être capable de fournir qu'une puissance limitée de sorte que le courant de court-circuit permanent ne dépasse pas 5 mA. Si le courant instantané de court-circuit dépasse 1 A, ou si le circuit d'alimentation est capable d'accumuler plus de 250 μcoulomb, les résistances efficaces entre les diverses électrodes et la capacité de sortie doivent avoir les valeurs min. suivantes:

R_{g1} = min. 150 Ω; R_{g2} = min. 470 Ω; R_{g3} = min.18000 Ω

Min.Werte der Schaltungsteile:
Der Speiseteil soll nur eine begrenzte Leistung liefern können, damit der Strom bei Dauerkurzschluss nicht mehr als 5 mA beträgt. Wenn der Momentanwert des Kurzschlussstromes 1 A überschreitet oder wenn der Speiseteil mehr als 250 μcoulomb speichern kann, müssen die effektiven Widerstände zwischen den verschiedenen Elektroden und dem Ausgangskondensator die folgenden Minimalwerte aufweisen:

R_{g1} = min. 150 Ω; R_{g2} = min. 470 Ω; R_{g3} = min.18000 Ω

1) When the heater is supplied from a separate transformer. When the heater is in a series chain, or earthed to A.C., Z_k(f =50 c/s)= max. 0.1 MΩ
Quand le filament est alimenté par un transformateur séparé. Quand le filament est connecté dans une chaîne série, ou est mise à la terre pour C.A., Z_k(f =50 c/s)= max. 0,1 MΩ
Wenn der Heizfaden von einem separaten Transformator gespeist wird. Wenn der Heizfaden in einer Serienkette aufgenommen oder für Wechselstrom geerdet ist, Z_k(f =50 Hz) = max. 0,1 MΩ

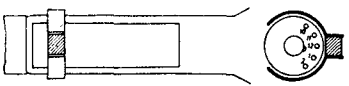
ADJUSTMENT OF ION-TRAP MAGNET 55402

The ion-trap magnet is fitted to a clamping ring so that it may be fixed to the neck of the tube. The following procedure should be adopted for adjusting the position of the magnet:

1. Switch off the voltage supplies and remove the socket. Slip the magnet over the base with the arrow pointing away from the screen. The position of the magnet must be approximately in line with the position of pin No.12 on the base (see figure below). Adjust the magnet slightly in advance of the base.
2. Fit the socket to the tube and switch on the voltage supplies. Adjust the brightness control and, if necessary, the position of the magnet until the raster is just visible. The adjustment is best carried out with a stationary test pattern.
3. Move the magnet towards the screen, without rotating it, until the focused raster attains maximum brightness. The brightness may now be adjusted to give the correct level for the peak white portions of the image and, if necessary, the position of the magnet should be readjusted to obtain maximum brilliance.
4. If the raster cannot be centered by adjusting the position of the focus field, the magnet should be rotated slightly in order to assist in centering, provided that this does not cause any decrease in brilliance.
5. When optimum conditions are obtained, the magnet should be clamped in position by means of the screw, taking care not to alter the position of the magnet.
6. If a position of adequate brilliance can not be obtained, another magnet should be tried.

The magnet should never be adjusted to remove a shadow from the raster if by doing so the brightness of the image is decreased. In such cases the shadow should be eliminated by adjusting the position of the focus coil and/or deflection coils.

It is essential that the magnet should be handled with care and not subjected to very strong magnetic fields or mechanical shocks.



REGLAGE DE L'AIMANT DE TRAPPE A IONS 55402

L'aimant de trappe à ions est monté sur un collier de serrage qui permet de le fixer au col du tube. Pour regler la position de l'aimant, procéder de la manière suivante:

1. Les tensions d'alimentation étant coupées et le support étant enlevé, glisser l'aimant au-dessus du culot, la flèche pointée dans le sens opposé à celui de l'écran. La position de l'aimant doit concorder avec la position de la broche No.12 sur le culot (voir la figure ci-dessous). Glisser l'aimant de facon qu'il se trouve tout juste au-delà du culot.
2. Fixer le support au tube et appliquer les tensions d'alimentation. Ajuster le bouton de luminosité et, en cas de besoin, déplacer l'aimant jusqu'à ce que la trame soit tout juste visible. Le réglage s'effectue au mieux à l'aide d'une mire stationnaire d'essai sur l'écran.
3. Rapprocher l'aimant sans le tournant de l'écran jusqu'au moment où la brillance de la trame concentrée soit maximum. Ajuster le bouton de luminosité de façon à obtenir le niveau équivalent au blanc maximum de l'image et, en cas de besoin, déplacer légèrement l'aimant de façon à obtenir la brillance maximum.
4. Si le réglage de la position du champ de concentration ne permet pas d'obtenir le centrage de la trame, tourner légèrement l'aimant de façon à faciliter le centrage, pour autant que cette opération ne provoque pas une diminution de la brillance.
5. Les conditions optima étant obtenues, bloquer l'aimant au moyen de la vis, en veillant à ne pas modifier la position de l'aimant.
6. S'il est impossible d'obtenir une position pour laquelle la brillance est satisfaisante, essayer un autre aimant.

Ne jamais déplacer l'aimant pour enlever une ombre de la trame, si ce déplacement provoque une diminution de la brillance de l'image. Dans un tel cas, supprimer l'ombre parfaisant le réglage de la position de la bobine de concentration et ou des bobines de déviation.

Toujours manipuler l'aimant avec précaution et veiller à le soustraire aux champs magnétiques de forte intensité et aux chocs mécaniques.



EINSTELLUNG DES MAGNETS DER IONENFALLE 55402

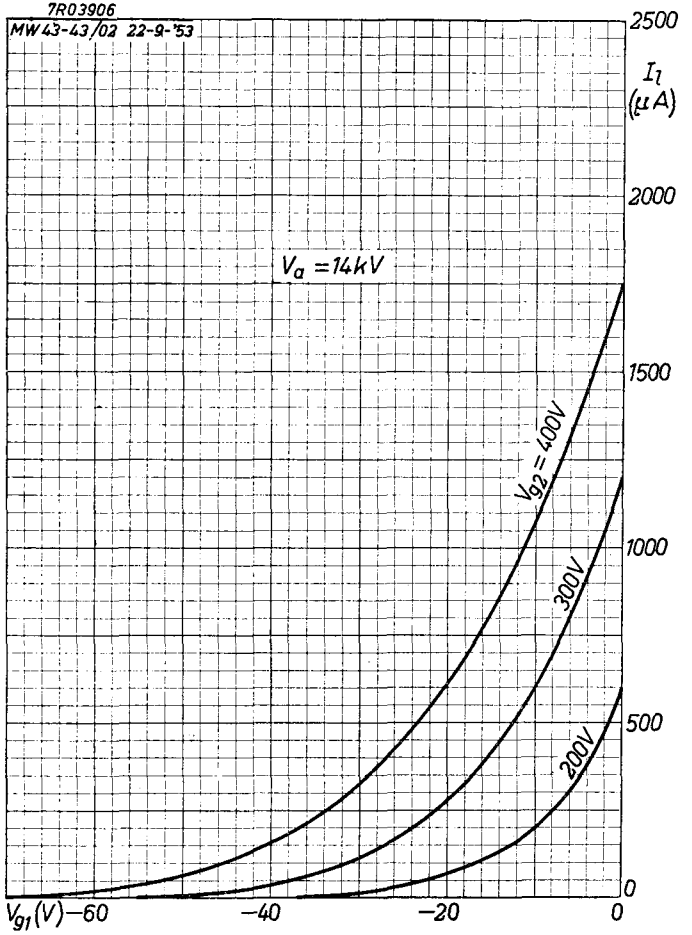
Der Magnet der Ionenfalle hat einen Halterungsring, mit dem er am Hals des Röhrenkolbens befestigt werden kann. Die Einstellung des Magnets geschieht in folgender Weise:

1. Die Spannungsquellen ausschalten und den Röhrenhalter abnehmen. Sodann schiebe man den Magnetring über den Sockel mit dem Pfeil vom Schirm wegweisend. Die Lage des Magnets muss ungefähr zusammenfallen mit der Lage von Stift No.12 am Sockel (siehe untenstehender Abbildung). Der Ring wird so angeordnet dass er ein wenig über den Sockel ragt.
2. Den Röhrenhalter wieder anbringen und die Spannungsquellen einschalten. Man regle nun die Helligkeit, und, falls nötig, die Lage des Magnets so, dass das Raster gerade sichtbar ist. Am besten wird diese Einstellung an einem festen Kontrolmuster vorgenommen.
3. Man verstelle den Magnet, ohne Drehung, soweit in Richtung des Schirmes, bis das fokussierte Raster die stärkste Helligkeit aufweist. Alsdann steigere man die Helligkeit auf intensivstes Weiss und stelle, falls nötig, den Magnet auf maximale Helligkeit nach
4. Gelingt es nicht das Raster durch einstellen des Fokussierungsfeldes zu zentrieren, so suche man dies durch leichtes Drehen des Magnets zu erreichen, vorausgesetzt dass hierdurch die Helligkeit nicht vermindert wird.
5. Nachdem der optimale Punkt erreicht ist, setze man den Magnet mit Hilfe der Schraube fest, wobei an der Stellung des Magnets nichts mehr geändert werden darf.
6. Ist die Helligkeit des Rasters unzulänglich, so muss ein neuer Magnet verwendet werden.

In keinem Falle darf man sich des Magnets zur Beseitigung eines Schattens im Raster bedienen, wenn die Bildhelligkeit dadurch beeinträchtigt würde. Man beseitige dann den Schatten durch entsprechendes Nachstellen der Fokussierungspule und/oder der Ablenkspulen.

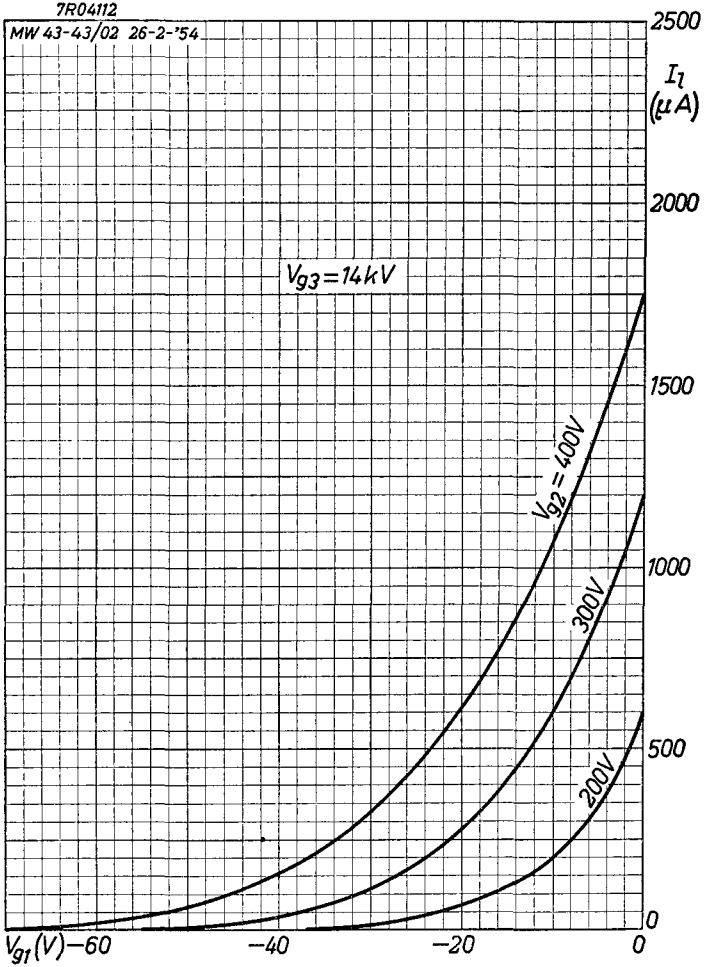
Bei der Verwendung des Magnets ist grösste Sorgfalt zu beachten; er darf keinen starken magnetischen Feldern und keinen mechanischen Erschütterungen ausgesetzt sein




7R03906
MW43-43/02 22-9-'53
2500
I_1
(μA)
2000
V_a = 14kV
1500
V_{g2} = 400V
1000
300V
500
200V
0
V_{g1}(V) −60
−40
−20
0

9.9.1953

A

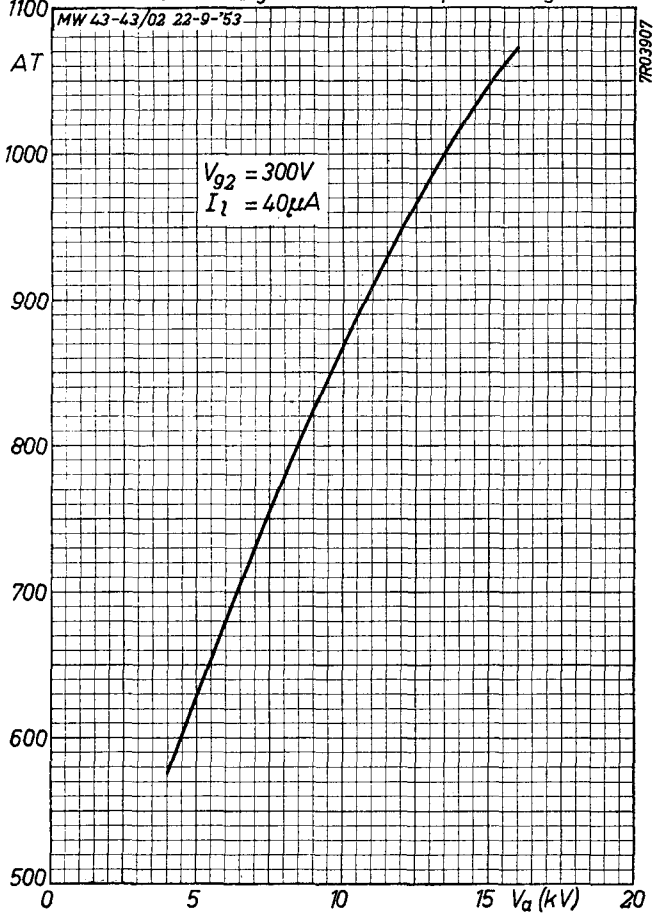

7R04112
MW 43-43/02 26-2-'54
2500
I_1 (μA)
2000
V_{g3} = 14 kV
1500
V_{g2} = 400V
1000
300V
500
200V
0
V_{g1} (V) −60
−40
−20
0

2.2.1954

A

MW 43-43/02 **PHILIPS**

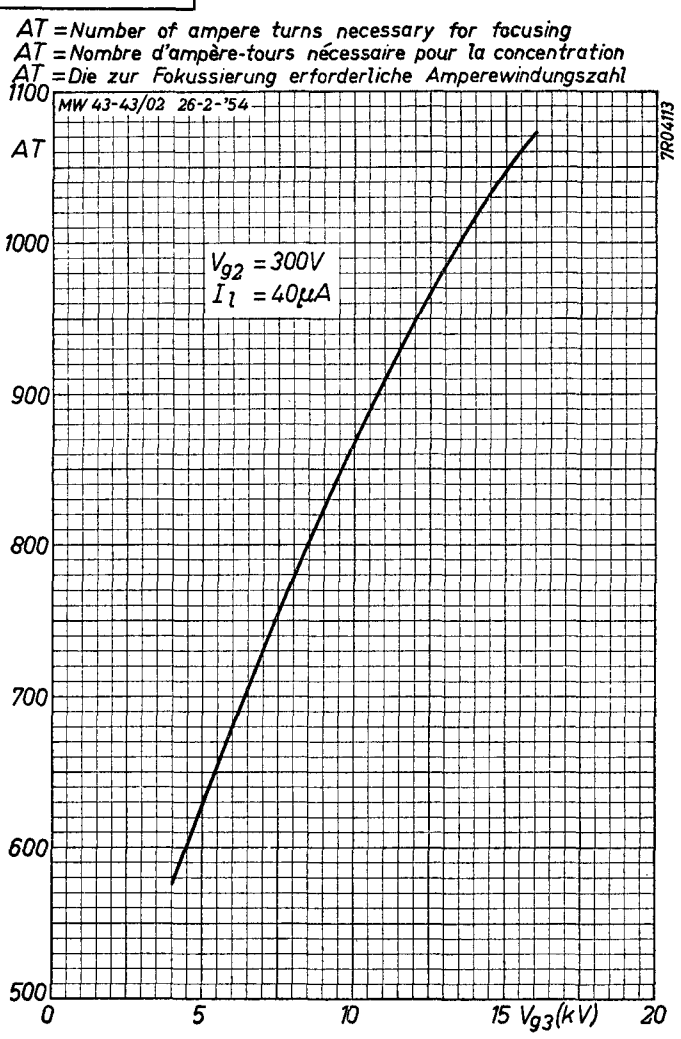
AT = Number of ampere turns necessary for focusing
AT = Nombre d'ampère-tours nécessaire pour la concentration
AT = Die zur Fokussierung erforderliche Amperewindungszahl



B

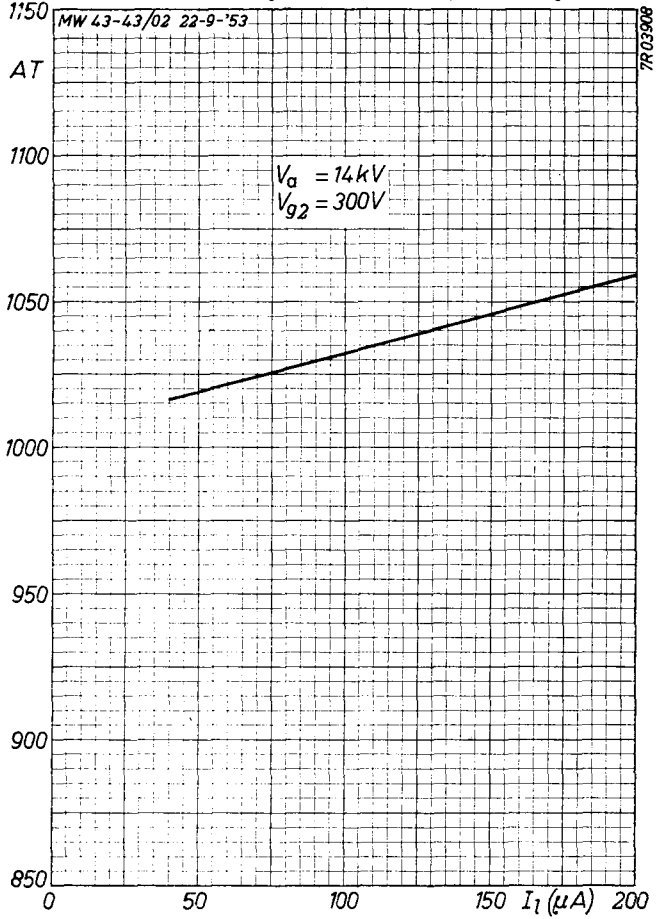
MW 43-43/02 **PHILIPS**

AT = Number of ampere turns necessary for focusing
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B

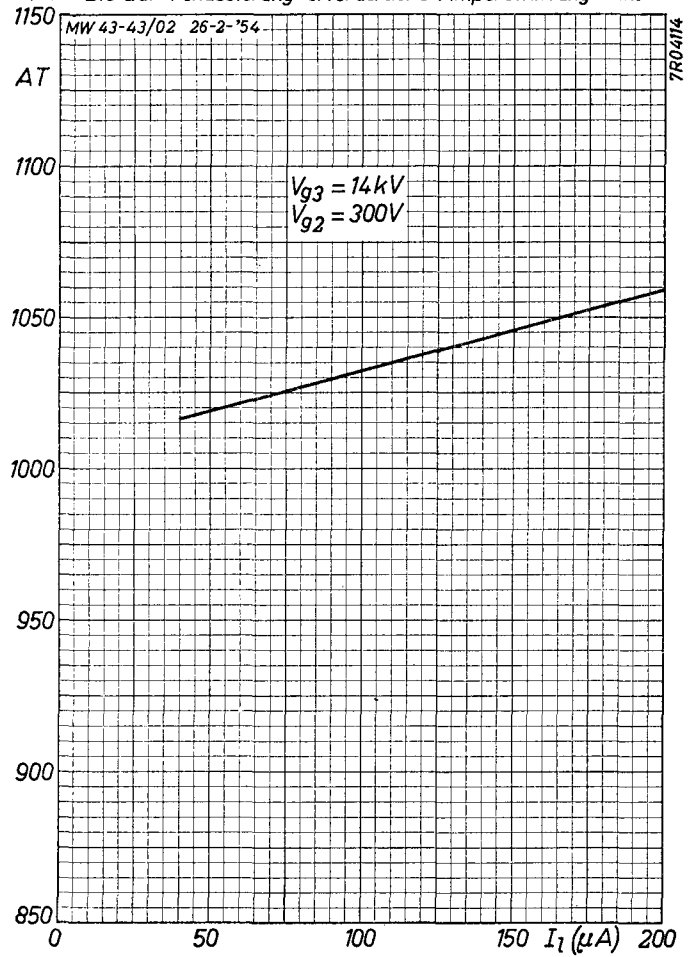
ΔT = Number of ampere turns necessary for focusing
ΔT = Nombre d'ampère-tours nécessaire pour la concentration
ΔT = Die zur Fokussierung erforderliche Amperewindungszahl



PHILIPS

MW 43-43/02

AT = Number of ampere turns necessary for focusing
AT = Nombre d'ampère-tours nécessaire pour la concentration
AT = Die zur Fokussierung erforderliche Amperewindungszahl



2.2.1954

C

PHILIPS

Electronic Tube

HANDBOOK

MW43-43/02

page	sheet	date
1	1	1953.09.09
2	1	1954.03.03
3	2	1953.09.09
4	2	1954.03.03
5	3	1953.09.09
6	3	1954.03.03
7	4	1953.09.09
8	4	1954.03.03
9	5	1954.03.03
10	5	1957.12.12
11	6	1954.03.03
12	6	1957.12.12
13	7	1953.09.09
14	8	1953.09.09
15	9	1953.09.09
16	A	1953.09.09
17	A	1954.02.02
18	B	1953.09.09
19	B	1954.02.02

20	C	1953.09.09
21	C	1954.02.02
22, 23	FP	2000.01.07

PHILIPS MW 43-64

RECTANGULAR TELEVISION PICTURE TUBE with ion trap and filterglass
TUBE IMAGE DE TELEVISION RECTANGULAIR avec trappe à ions et verre filtre
RECHTECKIGE FERNSEHBILDRÖHRE mit Ionenfalle und Filterglas

Heating : indirect by A.C. or D.C. series or parallel supply Chauffage: indirect par C.A. ou C.C. alimentation série ou parallèle Heizung : indirekt durch Wechsel- oder Gleichstrom; Serien- oder Parallelspeisung	V_f = 6,3 V[1]) I_f = 0,3 A	
Capacitances Capacités Kapazitäten	C_{g1} = 7 pF C_k = 5 pF C_{k+g3} = 8 pF C_{g4m}[2]) = 1100 pF	
Screen Ecran Schirm	Colour Couleur Farbe	white blanche weiss
	Colour temperature Température de couleur Farbtemperatur	7500 °K
	Light transmission Transmission de lumière Lichtdurchlässigkeit	66 %
	Useful diagonal Diagonale utile Nützlicher Diagonale	min. 390 mm
	Useful width Largeur utile Nützliche Breit	min. 362 mm
	Useful height Hauteur utile Nützliche Höhe	min. 273 mm

[1]) When the tube is used in a series heater chain, the heater voltage must not exceed 9.5 V when the supply is switched on. If necessary a current limiting device must be used.
Si le tube est monté dans une châine série de filaments, la tension de chauffage ne doit pas dépasser 9,5 V à la mise en circuit. En cas de besoin il faut utiliser un limiteur de courant.
Wenn die Röhre in einer Heizfadenkette verwendet wird darf die Heizspannung beim Einschalten 9,5 V nicht überschreiten. Nötigenfalls muss ein Strombegrenzer verwendet werden.

[2]) m = outer coating; couche extérieure; Aussenbelag

PHILIPS

MW 43-64

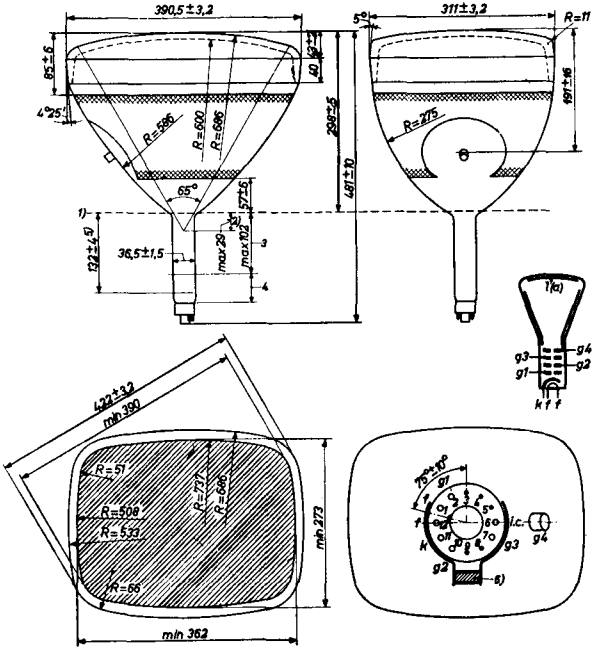
RECTANGULAR TELEVISION PICTURE TUBE with ion trap and filterglass
TUBE IMAGE DE TELEVISION RECTANGULAIR avec trappe à ions et verre filtre
RECHTECKIGE FERNSEHBILDRÖHRE mit Ionenfalle und Filterglas

Heating : indirect by A.C. or D.C. series or parallel supply Chauffage: indirect par C.A. ou C.C. alimentation série ou parallèle Heizung : indirekt durch Wechsel- oder Gleichstrom; Serien- oder Parallelspeisung	V_f = 6,3 V[1]) I_f = 0,3 A	
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For curves of the screen properties see front of this section
Pour les courbes des propriétés de l'écran voir en tête de ce chapitre
Für die Kurven der Schirmeigenschaften siehe am Anfang dieses Abschnitts



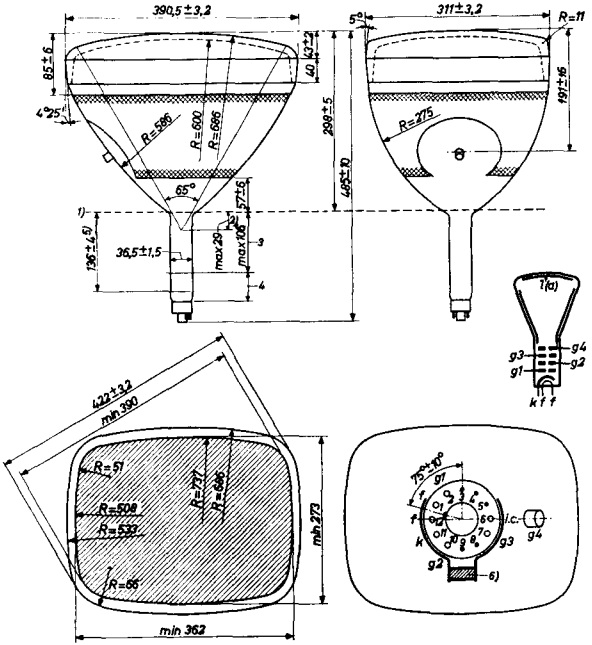
Dimensions in mm
Dimensions en mm
Abmessungen in mm

Base
Culot Duodecal 7p.
Sockel

1) Reference line, determined by the plane of the upper edge of the reference line gauge when the gauge is resting on the cone
Ligne de référence, déterminée par le plan du bord supérieur du calibre de la ligne de référence, si celui-ci pose sur le cône
Bezugslinie, bestimmt durch die Ebene des oberen Randes der Bezugslinienlehre wenn diese auf dem Konus ruht

PHILIPS

For curves of the screen properties see front of this section
Pour les courbes des propriétés de l'écran voir en tête de ce chapitre
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Dimensions in mm	Base
Dimensions en mm	Culot Duodecal 7p.
Abmessungen in mm	Sockel

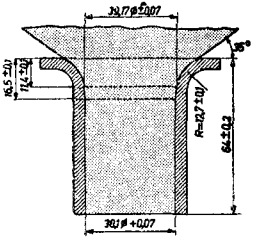
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Ligne de référence, déterminée par le plan du bord supérieur du calibre de la ligne de référence, si celui-ci pose sur le cône
Bezugslinie, bestimmt durch die Ebene des oberen Randes der Bezugslinienlehre wenn diese auf dem Konus ruht

Mounting position:	**Any**
Montage:	**Arbitrairement**
Aufstellung:	**Willkürlich**

Reference line gauge. The inner surface of the coils must not extend into the shaded region.

Calibre de la ligne de référence. La surface intérieure des bobines ne doit pas saillir dans la région estompée.

Bezugslinienlehre. Die innere Oberfläche der Spulen muss nicht im schattierten Gebiet ausragen.



---

2) The distance from deflection centre to reference line should not exceed 29 mm.

La distance du centre de déviation au ligne de référence ne dépassera pas 29 mm.

Der Abstand des Ablenkungsmittelpunktes bis zur Bezugslinie soll 29 mm nicht überschreiten.

3) Space for deflection and focusing coils
Place pour les bobines de déviation et de concentration.
Platz für Ablenk- und Fokussierungsspulen

4) Space for the ion trap magnet
Place pour l'aimant de la trappe à ions
Platz für den Magnet der Ionenfalle

5) Distance from reference line to top centre of grid.
Distance de la ligne de référence jusqu'au centre de la surface supérieure de la grille.
Abstand der Bezugslinie bis zum Mittelpunkt der Oberseite des Gitters.

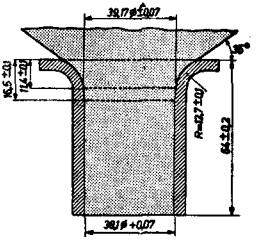
6) Ion trap magnet
L'aimant de la trappe à ions
Magnet der Ionenfalle

Mounting position:	**Any**
Montage:	**Arbitrairement**
Aufstellung:	**Willkürlich**

Reference line gauge. The inner surface of the coils must not extend into the shaded region.

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Abstand der Bezugslinie bis zum Mittelpunkt der Oberseite des Gitters.

6) Ion trap magnet
L'aimant de la trappe à ions
Magnet der Ionenfalle

Deflection and focusing Déviation et concentration Ablenkung und Fokussierung	magnetic magnétique magnetisch
Vertical deflection angle L'angle de déviation verticale Vertikaler Ablenkungswinkel	max. 52°
Horizontal deflection angle L'angle de déviation horizontale Horizontaler Ablenkungswinkel	max. 65°
Focusing coil: Number of ampere-turns: Distance between centre of field and reference line:	without ferromagnetic material see pages B and C 78 mm
Bobine de concentration: Nombre d'ampère - tours : Distance entre le centre du champ et la ligne de référence:	sans matière ferromagnétique voir pages B et C 78 mm
Fokussierungsspule: Amperewindungszahl: Abstand des Zentrums des Feldes bis zur Bezugslinie:	ohne ferromagnetisches Material siehe Seite B und C 78 mm

Ion trap magnet: Single magnet, field strength about 60 gausses. Type number 55402. For the procedure of setting up see page 7

Aimant de la trappe à ions: Aimant simple, intensité du champ environ 60 gauss. Numéro de type 55402. Pour le réglage voir page 8

Magnet der Ionenfalle: Einfacher Magnet, Feldstärke etwa 60 Gauss. Typennummer 55402. Für die Einstellung siehe Seite 9

Net weight Poids net Nettogewicht	8200 g
Shipping weight Poids brut Bruttogewicht	10600 g

Operating characteristics
Caractéristiques d'utilisation
Betriebsdaten

V_{g4}	=	14	kV
V_{g2}	=	300	V
$-V_{g1}(I_{g4}=0)$	=	-40/-86	V
V_{g3}	=	0 250	V

Focusing ampere-turns Ampère-tours pour concentration Amperewindungen zur Fokussierung	1015	1065

Deflection and focusing Déviation et concentration Ablenkung und Fokussierung	magnetic magnétique magnetisch
Vertical deflection angle Angle de déviation verticale Vertikaler Ablenkungswinkel	max. 52°
Horizontal deflection angle Angle de déviation horizontale Horizontaler Ablenkungswinkel	max. 65°
Focusing coil:	without ferromagnetic material
Number of ampere-turns:	see pages B and C
Distance between centre of field and reference line:	78 mm
Bobine de concentration:	sans matière ferromagnétique
Nombre d'ampère - tours:	voir pages B et C
Distance entre le centre du champ et la ligne de référence:	78 mm
Fokussierungsspule:	ohne ferromagnetisches Material
Amperewindungszahl:	siehe Seite B und C
Abstand des Zentrums des Feldes bis zur Bezugslinie:	78 mm

→ Ion trap magnet: Single magnet; field strength about 50 gausses. Type number 55402. For the procedure of setting up please refer to "Application directions" (page C107), in front of this section

Aimant du piège à ions: Aimant simple; intensité du champ environ 50 gauss. Numéro de type 55402. Pour le réglage voir "Indications d'application" (page C107), en tête de ce chapitre

Ionenfallenmagnet: Einfacher Magnet; Feldstärke etwa 50 Gauss. Typennummer 55402. Für die Einstellung siehe "Anwendungsrichtlinien" (Seite C107), am Anfang dieses Abschnitts

Net weight Poids net Nettogewicht	8200 g	Shipping weight Poids brut Bruttogewicht	10600 g

Operating characteristics
Caractéristiques d'utilisation
Betriebsdaten

V_{g4}		=	14	kV
V_{g2}		=	300	V
V_{g1}	(I_{g4} = 0 µA)	=	-40/-86	V
V_{g3}		=	0 / 250	V

Focusing ampere-turns Ampère-tours pour concentration Amperewindungen zur Fokussierung	1015	1065

Limiting values (design centre values)
Caractéristiques limites(valeurs moyennes de développement)
Grenzdaten (mittlere Entwicklungsdaten)

V_{g4}	= max.	16 kV
V_{g4}	= min.	10 kV
V_{g3}	= max.	410 V
$-V_{g3}$	= max.	100 V
V_{g2}	= max.	410 V
V_{g2}	= min.	200 V
V_{g1}	= max.	0 V
$-V_{g1}$	= max.	150 V
V_{g1_p}	= max.	2 V
W_ℓ	= max.	6 W
V_{kf}(k pos.;f neg.)	= max.	200 V[1])[2])
V_{kf}(k neg.;f pos.)	= max.	125 V[2])

Max. circuit values
Valeurs max. des éléments du montage
Max. Werte der Schaltungsteile

R_{kf}	=	1 MΩ[3])
R_{g1}	=	1,5 MΩ
Z_{g1}(f= 50 c/s)	=	0,5 MΩ

---

[1]) During a warm-up period not exceeding 45 seconds the heater may be 410 V negative with respect to the cathode
Pendant une période d'échauffement ne dépassant pas 45 secondes, le filament peut être porté à un potentiel négatif de 410 V par rapport à la cathode
Während einer Anheizzeit von max. 45 Sekunden darf der Heizfaden 410 V negativ sein in bezug auf der Katode

[2]) In order to avoid excessive hum, the A.C. component of Vkf should be as low as possible and must not exceed 20 V
Pour éviter le ronflement excessif la composante alternative de Vkf sera la plus petite possible et ne dépassera pas 20 V
Zur Vermeidung von Brummstörungen muss die Wechselspannungskomponente von Vkf so klein wie möglich sein und jedenfalls 20 V nicht überschreiten.

[3]) See page 6;voir page 6;siehe Seite 6

Min. circuit values:

The power supply should be of the limited-energy type with inherent regulation to limit the continuous short-circuit current to 5 mA. If the supply permits the instantaneous short-circuit current to exceed 1 A, or is capable of storing more than 250 μcoulombs, the effective resistance in the circuit between the indicated electrode and the output capacitor should be as follows:

R_{g1}	= min. 150 Ω	R_{g2}	= min. 470 Ω
R_{g3}	= min. 470 Ω	R_{g4}	= min. 16000 Ω

Valeurs min. des éléments du montage:

Le circuit d'alimentation ne doit être capable de fournir qu'une puissance limitée de sorte que le courant de court-circuit permanent ne dépasse pas 5 mA. Si le courant instantané de court-circuit dépasse 1 A, ou si le circuit d'alimentation est capable d'accumuler plus de 250 μcoulomb, les résistances efficaces entre les diverses électrodes et la capacité de sortie doivent avoir les valeurs min. suivantes:

R_{g1}	= min. 150 Ω	R_{g2}	= min. 470 Ω
R_{g3}	= min. 470 Ω	R_{g4}	= min. 16000 Ω

Min. Werte der Schaltungsteile:

Der Speiseteil soll nur eine begrenzte Leistung liefern können, damit der Strom bei Dauerkurzschluss nicht mehr als 5 mA beträgt. Wenn der Momentanwert des Kurzschlussstromes 1 A überschreitet oder wenn der Speiseteil mehr als 250 μcoulomb speichern kann, müssen die effektiven Widerstände zwischen den verschiedenen Elektroden und dem Ausgangskondensator die Folgenden Minimalwerte aufweisen:

R_{g1}	= min. 150 Ω	R_{g2}	= min. 470 Ω
R_{g3}	= min. 470 Ω	R_{g4}	= min. 16000 Ω

---

3) When the heater is supplied from a separate transformer.
When the heater is in a series chain, or earthed to A.C., Z_k(f =50 c/s)= max. 0.1 MΩ

Quand le filament est alimenté par un transformateur séparé.
Quand le filament est connecté dans une chaîne série, ou est mise à la terre pour C.A., Z_k(f =50c/s)= max. 0,1 MΩ

Wenn der Heizfaden von einem separaten Transformator gespeist wird.
Wenn der Heizfaden in einer Serienkette aufgenommen oder für Wechselstrom geerdet ist, Z_k(f = 50 Hz) = max. 0,1 MΩ

ADJUSTMENT OF ION-TRAP MAGNET 55402

The ion-trap magnet is fitted to a clamping ring so that it may be fixed to the neck of the tube. The following procedure should be adopted for adjusting the position of the magnet:

1. Switch off the voltage supplies and remove the socket. Slip the magnet over the base with the arrow pointing away from the screen. The position of the magnet must be approximately in line with the position reserved for pin No.9 on the base (see fig.below). Adjust the magnet slightly in advance of the base.
2. Fit the socket to the tube and switch on the voltage supplies. Adjust the brightness control and, if necessary, the position of the magnet until the raster is just visible. The adjustment is best carried out with a stationary test pattern.
3. Move the magnet towards the screen, without rotating it, until the focused raster attains maximum brightness. The brightness may now be adjusted to give the correct level for the peak white portions of the image and, if necessary, the position of the magnet should be readjusted to obtain maximum brilliance.
4. If the raster cannot be centered by adjusting the position of the focus field, the magnet should be rotated slightly in order to assist in centering, provided that this does not cause any decrease in brilliance.
5. When optimum conditions are obtained, the magnet should be clamped in position by means of the screw, taking care not to alter the position of the magnet.
6. If a position of adequate brilliance can not be obtained, another magnet should be tried.

The magnet should never be adjusted to remove a shadow from the raster if by doing so the brightness of the image is decreased. In such cases the shadow should be eliminated by adjusting the position of the focus coil and/or deflection coils.

It is essential that the magnet should be handled with care and not subjected to very strong magnetic fields or mechanical shocks.



PHILIPS

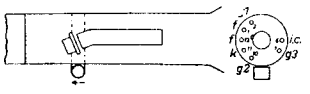
REGLAGE DE L'AIMANT DE TRAPPE A IONS 55402

L'aimant de trappe à ions est monté sur un collier de serrage qui permet de le fixer au col du tube. Pour regler la position de l'aimant, procéder de la manière suivante:

1. Les tensions d'alimentation étant coupées et le support étant enlevé, glisser l'aimant au-dessus du culot, la flèche pointée dans le sens opposé à celui de l'écran. La position de l'aimant doit concorder avec la position réservée à la broche No. 9 sur le culot (voir la figure ci-dessous). Glisser l'aimant de façon qu'il se trouve tout juste au-delà du culot.
2. Fixer le support au tube et appliquer les tensions d'alimentation. Ajuster le bouton de luminosité et, en cas de besoin, déplacer l'aimant jusqu'à ce que la trame soit tout juste visible. Le réglage s'effectue au mieux à l'aide d'une mire stationnaire d'essai sur l'écran
3. Rapprocher l'aimant sans le tournant de l'écran jusqu'au moment où la brillance de la trame concentrée soit maximum. Ajuster le bouton de luminosité de façon à obtenir le niveau équivalent au blanc maximum de l'image et, en cas de besoin, déplacer légèrement l'aimant de façon à obtenir la brillance maximum.
4. Si le réglage de la position du champ de concentration ne permet pas d'obtenir le centrage de la trame, tourner légèrement l'aimant de façon à faciliter le centrage, pour autant que cette opération ne provoque pas une diminution de la brillance.
5. Les conditions optima étant obtenues, bloquer l'aimant au moyen de la vis, en veillant à ne pas modifier la position de l'aimant.
6. S'il est impossible d'obtenir une position pour laquelle la brillance est satisfaisante, essayer un autre aimant.

Ne jamais déplacer l'aimant pour enlever une ombre de la trame, si ce déplacement provoque une diminution de la brillance de l'image. Dans un tel cas, supprimer l'ombre parfaisant le réglage de la position de la bobine de concentration et ou des bobines de déviation.

Toujours manipuler l'aimant avec précaution et veiller à le soustraire aux champs magnétiques de forte intensité et aux chocs mécaniques.



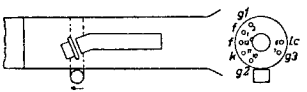
EINSTELLUNG DES MAGNETS DER IONENFALLE 55402

Der Magnet der Ionenfalle hat einen Halterungsring, mit dem er am Hals des Rohrenkolbens befestigt werden kann. Die Einstellung des Magnets geschieht in folgender Weise:

1. Die Spannungsquellen ausschalten und den Röhrenhalter abnehmen. Sodann schiebe man den Magnetring über den Sockel mit dem Pfeil vom Schirm wegweisend. Die Lage des Magnets muss ungefähr zusammenfallen mit der fur Stift No.9 vorgesehenen Lage am Sockel (Siehe untenstehender Abbildung). Der Ring wird so angeordnet dass er ein wenig über den Sockel ragt.
2. Den Röhrenhalter wieder anbringen und die Spannungsquellen einschalten. Man regle nun die Helligkeit, und, falls nötig, die Lage des Magnets so, dass das Raster gerade sichtbar ist. Am besten wird diese Einstellung an einem festen Kontrolmuster vorgenommen.
3. Man verstelle den Magnet, ohne Drehung, soweit in Richtung des Schirmes, bis das fokussierte Raster die stärkste Helligkeit aufweist. Alsdann steigere man die Helligkeit auf intensivstes Weiss und stelle, falls nötig, den Magnet auf maximale Helligkeit nach.
4. Gelingt es nicht das Raster durch einstellen des Fokussierungsfeldes zu zentrieren, so suche man dies durch leichtes Drehen des Magnets zu erreichen, vorausgesetzt dass hierdurch die Helligkeit nicht vermindert wird.
5. Nachdem der optimale Punkt erreicht ist, setze man den Magnet mit Hilfe der Schraube fest, wobei an der Stellung des Magnets nichts mehr geändert werden darf.
6. Ist die Helligkeit des Rasters unzulänglich, so muss ein neuer Magnet verwendet werden.

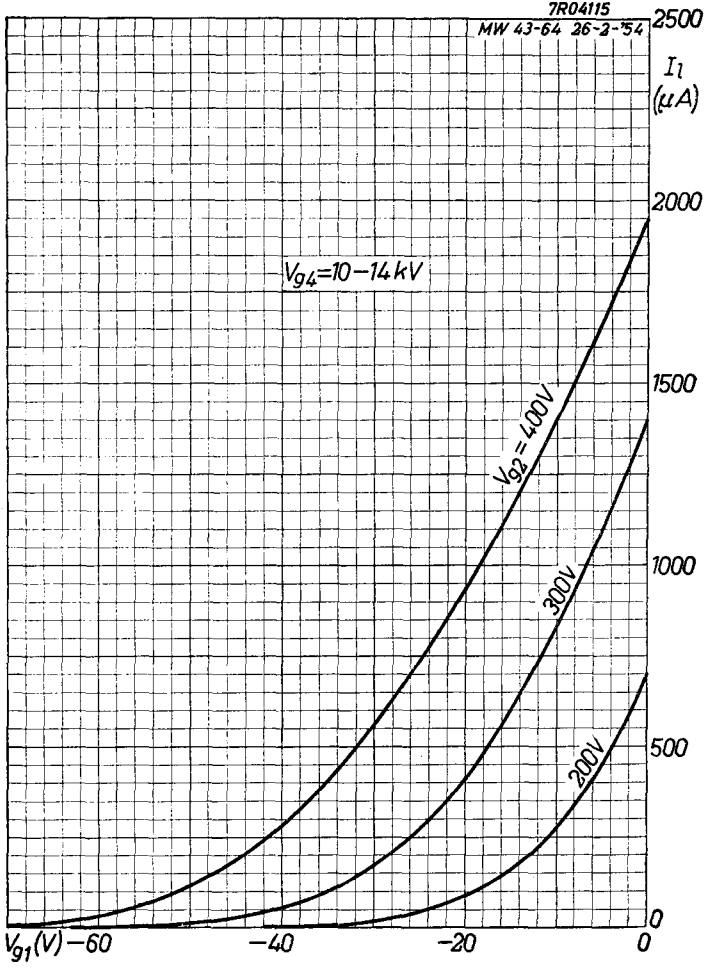
In keinem Falle darf man sich des Magnets zur Beseitigung eines Schattens im Raster bedienen, wenn die Bildhelligkeit dadurch beeinträchtigt würde. Man beseitige dann den Schatten durch entsprechendes Nachstellen der Fokussierungspule und/oder der Ablenkspulen.

Bei der Verwendung des Magnets ist grösste Sorgfalt zu beachten; er darf keinen starken magnetischen Feldern une keinen mechanischen Erschütterungen ausgesetzt sein.



PHILIPS

MW 43-64

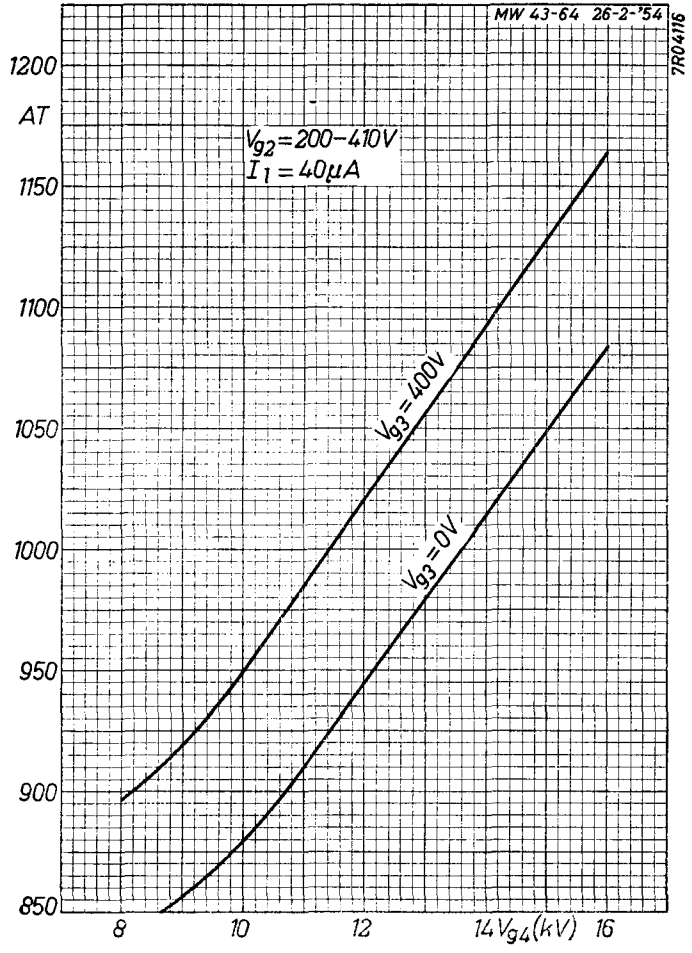


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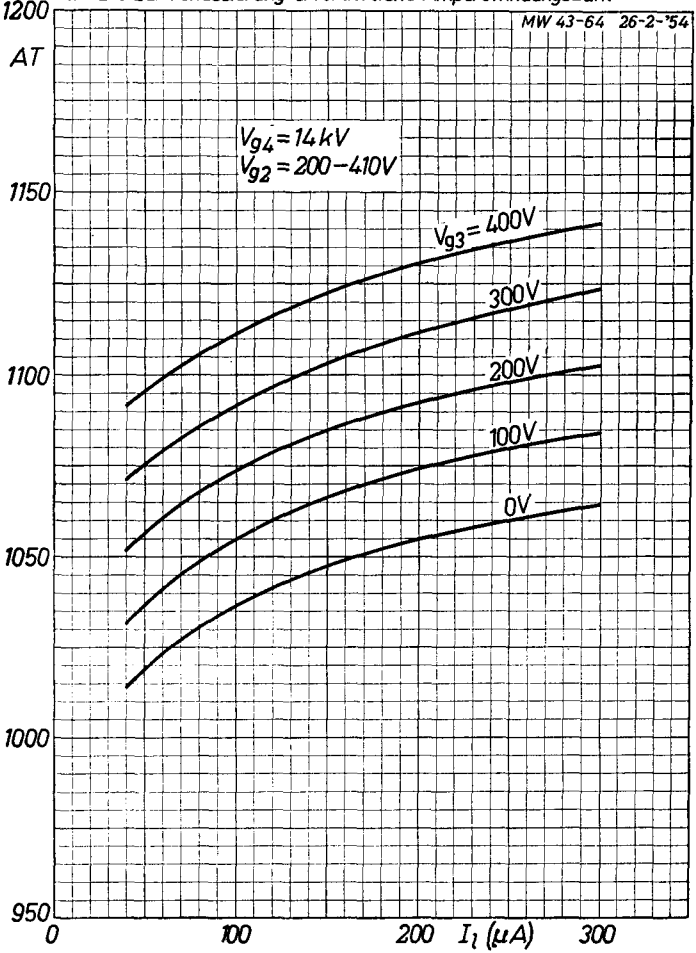
A

MW 43-64 **PHILIPS**

AT = Number of ampere turns necessary for focusing
AT = Nombre d'ampère-tours nécessaire pour la concentration
AT = Die zur Fokussierung erforderliche Amperewindungszahl



AT=Number of ampere turns necessary for focusing
AT=Nombre d'ampère-tours nécessaire pour la concentration
AT=Die zur Fokussierung erforderliche Amperewindungszahl



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C

PHILIPS

Electronic Tube

HANDBOOK

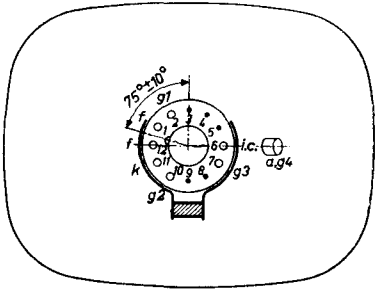
MW43-64

page	sheet	date
1	1	1955.03.03
2	1	1955.05.05
3	2	1955.03.03
4	2	1955.05.05
5	3	1954.03.03
6	3	1957.12.12
7	4	1954.03.03
8	4	1957.12.12
9	5	1954.03.03
10	6	1954.03.03
11	7	1952.12.12
12	8	1952.12.12
13	9	1952.12.12
14	A	1954.02.02
15	B	1954.02.02
16	C	1954.02.02
17	FP	2000.03.16

PHILIPS

MW 43-69

RECTANGULAR TELEVISION PICTURE TUBE in all glass construction with filter glass, metal-backed screen, ion trap, magnetic focusing and 70° magnetic deflection
TUBE IMAGE DE TELEVISION RECTANGULAIRE de construction tout verre avec verre filtrant, écran aluminisé, piège à ions, concentration magnétique et déflection magnétique de 70°
RECHTECKIGE FERNSEHBILDRÖHRE in Allglastechnik mit Filterglas, metallhinterlegtem Schirm, Ionenfalle, magnetischer Fokussierung und 70° magnetischer Ablenkung



Except for the metal backing this tube is equivalent to type MW43-64
A l'exception de l'écran aluminisé ce tube est équivalent au type MW43-64
Mit Ausnahme des metallhinterlegten Schirmes ist diese Röhre äquivalent mit Typ MW43-64

PHILIPS

Electronic Tube

HANDBOOK

MW43-69

page	sheet	date
1	1	1956.04.04
2	FP	2000.03.16

MONITOR TUBE with round metal-backed screen and magnetic deflection and focusing
TUBE MONITEUR avec écran rond aluminisé et concentration et déviation magnétiques
MONITORRÖHRE mit rundem, metallhinterlegtem Schirm und magnetischer Ablenkung und Fokussierung

For screen properties please refer to front of this section
Pour les propriétés de l'écran voir en tête de ce chapitre
Für die Eigenschaften des Schirmes siehe am Anfang dieses Abschnitts

Typical characteristics
Caractéristiques types
Kenndaten

	V_{a,g_2}	= 25 kV
Light output at I_a = 50 µA with close raster of convenient size Intensité lumineuse à I_a = 50 µA avec trame serrée de dimensions convenable Lichtstärke bei I_a = 50 µA mit einem dichten Raster geeigneter Abmessungen	=	8 candela

For further data please refer to MF53-10, ML53-10
Pour les autres données voir MF53-10, ML53-10
Für die übrigen Daten siehe MF53-10, ML53-10

PHILIPS

Electronic Tube

HANDBOOK

MW53-10

page	sheet	date
1	1	1962.03.03
2	FP	2000.03.16

RECTANGULAR TELEVISION PICTURE TUBE with ion trap, filter-glass and metal-backed screen
TUBE IMAGE DE TELEVISION RECTANGULAIR avec trappe à ions, verre filtre et écran aluminisé
RECHTECKIGE FERNSEHBILDRÖHRE mit Ionenfalle, Filterglas und metallhinterlegtem Schirm

Heating : indirect by A.C. or D.C. series or parallel supply Chauffage: indirect par C.A. ou C.C. alimentation série ou parallèle Heizung : indirekt durch Wechsel- oder Gleichstrom; Serien- oder Parallelspeisung	V_f = 6,3 V [1] I_f = 0,3 A	
Capacitances Capacités Kapazitäten	C_{g1} =	7 pF
	C_{gk} =	5 pF
	C_{k+g3} =	8 pF
	C_{am} [2] =	700-1100 pF
Screen Ecran Schirm	Filterglass, metal-backed, spherical Verre filtre, aluminisé, sphérique Filterglas, metallhinterlegt, sphärisch	
	Colour Couleur Farbe	white blanche weiss
	Light transmission Transmission de lumière Lichtdurchlässigkeit	70 %
	Useful diagonal Diagonale utile Nützlicher Diagonale	min. 506 mm ←
	Useful width Largeur utile Nützliche Breite	min. 485 mm
	Useful height Hauteur utile Nützliche Höhe	min. 360 mm

For curves of the screen properties see front of this section
Pour les courbes des propriétés de l'écran voir en tête de ce chapitre
Für die Kurven der Schirmeigenschaften siehe am Anfang dieses Abschnitts

[1][2]) See page 4; voir page 4; siehe Seite 4

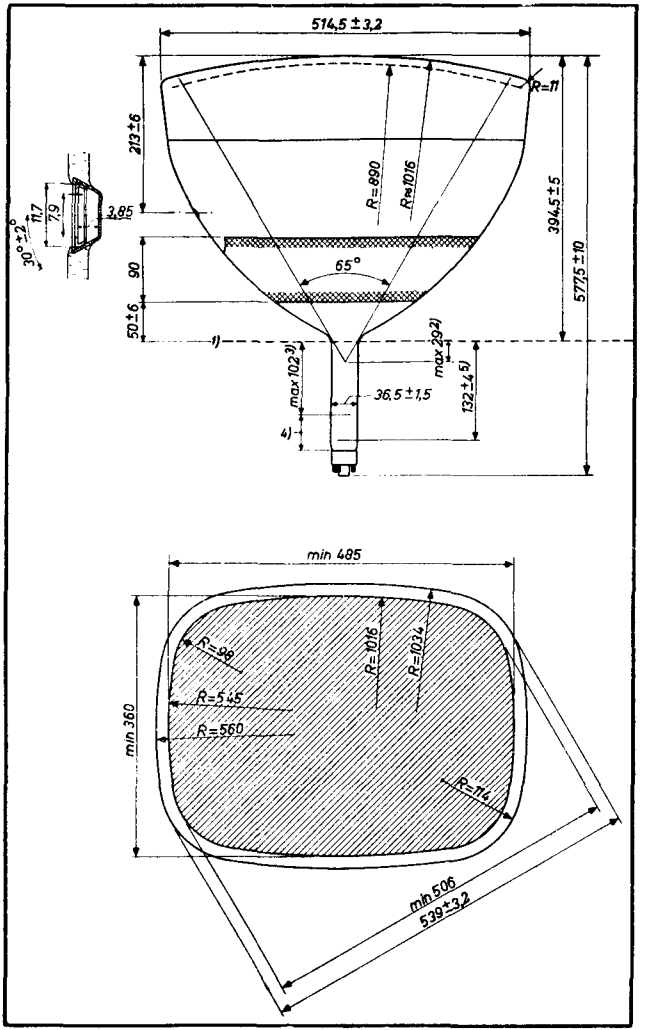
RECTANGULAR TELEVISION PICTURE TUBE with ion trap, filter-glass and metal-backed screen
TUBE IMAGE DE TELEVISION RECTANGULAIR avec trappe à ions, verre filtre et écran aluminisé
RECHTECKIGE FERNSEHBILDRÖHRE mit Ionenfalle, Filterglas und metallhinterlegtem Schirm

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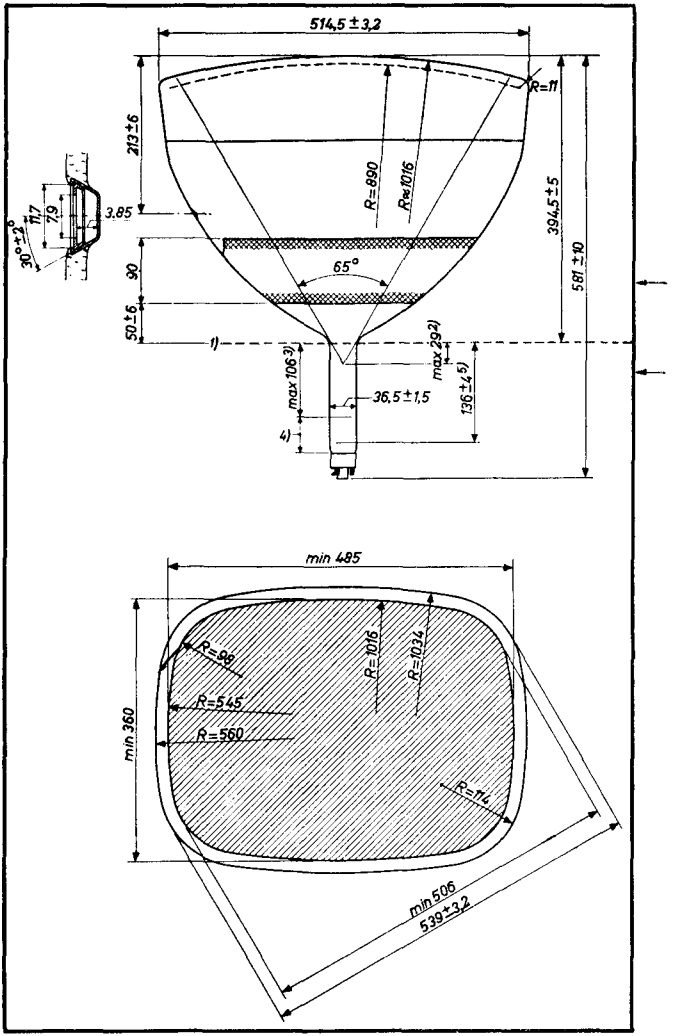
For curves of the screen properties see front of this section
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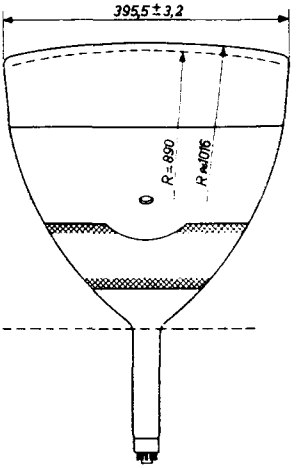
[1] [2]) See page 4; voir page 4; siehe Seite 4

MW 53-20 **PHILIPS**

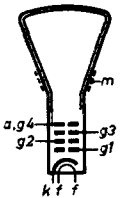


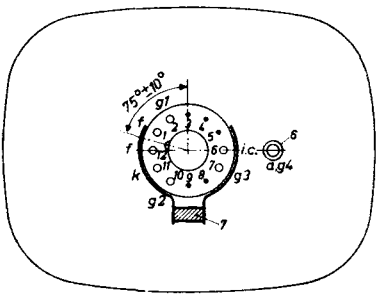
MW 53-20 **PHILIPS**





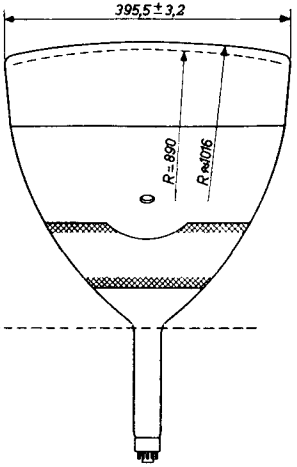
Dimensions in mm
Dimensions en mm
Abmessungen in mm



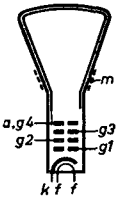


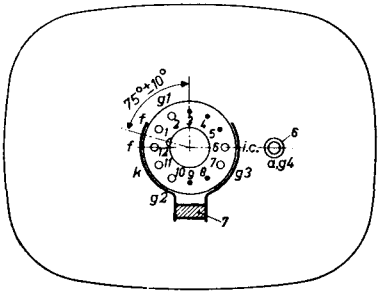
Base Duodecal
Culot 7p
Sockel

[1])....[7])See page 4; voir page 4; siehe Seite 4



Dimensions in mm
Dimensions en mm
Abmessungen in mm





Base Duodecal
Culot 7p
Sockel

[1])....[7])See page 4; voir page 4; siehe Seite 4

939 4964
11.11.1954

Notes from page 1;notes de la page 1;Noten von Seite 1

1) When the tube is used in a series heater chain, the heater voltage must not exceed 9.5 V when the supply is switched on. If necessary a current limiting device must be used for this purpose.
Si le tube est monté dans une chaîne série de filaments, la tension de chauffage ne doit pas dépasser 9,5 V à la mise en circuit. En cas de besoin il faut utiliser un limiteur de courant pour ce but.
Wenn die Röhre in einer Heizfadenkette verwendet wird, darf die Heizspannung beim Einschalten 9,5 V nicht überschreiten. Nötigenfalls ist zu diesem Zweck ein Strombegrenzer zu verwenden.

2) m = outer coating; couche extérieure; Aussenbelag.

Notes from pages 2,3;Notes des pages 2,3;Noten von Seiten 2,3

1) Reference line, determined by the plane of the upper edge of the reference line gauge when the gauge is resting on the cone
Ligne de référence, déterminée par le plan du bord supérieur du calibre de la ligne de référence, si celui-ci pose sur le cône
Bezugslinie, bestimmt durch die Ebene des oberen Randes der Bezugslinienlehre wenn diese auf dem Konus ruht

2) The distance from deflection centre to reference line should not exceed 29 mm
La distance du centre de déviation au ligne de référence ne dépassera pas 29 mm
Der Abstand des Ablenkungsmittelpunktes bis zur Bezugslinie soll 29 mm nicht überschreiten

3) Space for deflection coils and focusing device
Place pour les bobines de déviation et le dispositif de concentration.
Platz für Ablenkspulen und Fokussierungsvorrichtung

4) Space for the ion trap magnet
Place pour l'aimant de la trappe à ions
Platz für den Magnet der Ionenfalle

5) Distance from reference line to top centre of grid
Distance de la ligne de référence jusqu'au centre de la surface supérieure de la grille
Abstand der Bezugslinie bis zum Mittelpunkt der Oberseite des Gitters

6) Recessed cavity contact
Contact à cavité enfoncé
Versenkter Druckknopfkontakt

7) Ion trap magnet
L'aimant de la trappe à ions
Magnet der Ionenfalle

Notes from page 1;notes de la page 1;Noten von Seite 1

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Ligne de référence, déterminée par le plan du bord supérieur du calibre de la ligne de référence, si celui-ci pose sur le cône
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Abstand der Bezugslinie bis zum Mittelpunkt der Oberseite des Gitters

6) Recessed cavity contact
Contact à cavité enfoncé
Versenkter Druckknopfkontakt

7) Ion trap magnet
L'aimant de la trappe à ions
Magnet der Ionenfalle

Mounting position Montage Einbau	Any Arbitrairement Willkürlich

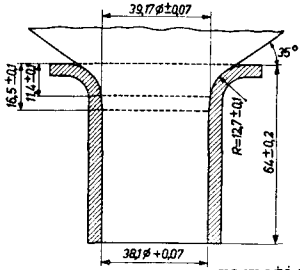
The socket for the base should not be rigidly mounted; it should have flexible leads and be allowed to move freely. The bottom circumference of the base shell will fall within a circle which is concentric with the cone axis and has a diameter of 55 mm

Le support du tube ne pouvra pas être monté rigidement; il devra être connecté par des conducteurs flexibles lui permettant de se mouvoir librement
La circonférence du fond de la chemise sera dans un cercle qui est concentrique avec l'axe du cône et a un diamètre de 55 mm

Die Röhrenfassung ist nicht starr zu befestigen aber soll frei beweglich sein und flexible Zuleitungen haben
Der Bodenumfang der Sockelhülse fällt innerhalb eines Kreises der konzentrisch mit der Konusachse ist und einen Durchmesser von 55 mm hat

Reference line gauge
Calibre de la ligne de référence
Bezugslinienlehre

Dimensions in mm
Dimensions en mm
Abmessungen in mm



Deflection Déviation Ablenkung	magnetic magnétique magnetisch
Vertical deflection angle L'angle de déviation verticale Vertikaler Ablenkungswinkel	50°
Horizontal deflection angle L'angle de déviation horizontale Horizontaler Ablenkungswinkel	65°
Diagonal deflection angle L'angle de déviation diagonale Diagonaler Ablenkungswinkel	70°

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11.11.1954

Mounting position Montage Einbau	Any Arbitrairement Willkürlich

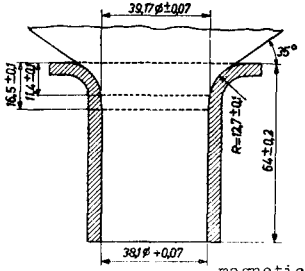
The socket for the base should not be rigidly mounted; it should have flexible leads and be allowed to move freely. The bottom circumference of the base shell will fall within a circle which is concentric with the cone axis and has a diameter of 55 mm

Le support du tube ne pouvra pas être monté rigidement;il devra être connecté par des conducteurs flexibles lui permettant de se mouvoir librement
La circonférence du fond de la chemise sera dans un cercle qui est concentrique avec l'axe du cône et a un diamètre de 55 mm

Die Röhrenfassung ist nicht starr zu befestigen aber soll frei beweglich sein und flexible Zuleitungen haben
Der Bodenumfang der Sockelhülse fällt innerhalb eines Kreises der konzentrisch mit der Konusachse ist und einen Durchmesser von 55 mm hat

Reference line gauge
Calibre de la ligne de référence
Bezugslinienlehre

Dimensions in mm
Dimensions en mm
Abmessungen in mm



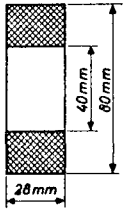
Deflection Déviation Ablenkung	magnetic magnétique magnetisch
Vertical deflection angle L'angle de déviation verticale Vertikaler Ablenkungswinkel	50°
Horizontal deflection angle L'angle de déviation horizontale Horizontaler Ablenkungswinkel	65°
Diagonal deflection angle L'angle de déviation diagonale Diagonaler Ablenkungswinkel	70°

Focusing	magnetic
Concentration	magnétique
Fokussierung	magnetisch

The focusing device used should have a focal distance corresponding to that of a coil, the data of which are given below

Le dispositif de concentration utilisé doit avoir une distance focale correspondant à celle d'une bobine dont les caractéristiques se trouvent ci-dessous

Die Brennweite der verwendete Fokussierungsvorrichtung muss übereinstimmen mit der Brennweite einer Spule deren Daten unten angegeben sind



Number of turns Nombre de tours Windungszahl	18000
Number of ampere-turns Nombre d'ampère-tours Amperewindungszahl	See p. B and C Voir p. B et C Siehe S. B und C

Additional centering magnet
Aimant à centrer additionnel
Zusätzlicher Zentriermagnet

Fieldstrength adjustable between 0 and 8 g
Intensité du champ réglable entre 0 et 8 g
Feldstärke einstellbar zwischen 0 und 8 G

Ion trap magnet: Single magnet, field strength about 60 gausses. Type number 55402. For the procedure of setting up see page 9

Aimant de la trappe à ions: Aimant simple, intensité du champ environ 60 gauss. Numéro de type 55402. Pour le réglage voir page 10

Magnet der Ionenfalle: Einfacher Magnet, Feldstärke etwa 60 Gauss. Typennummer 55402. Für die Einstellung siehe Seite 11

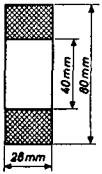
Operating characteristics
Caractéristiques d'utilisation
Betriebsdaten

V_a	=	14	16 kV
V_{g2}	=	300	300 V
$-V_{g1}$ (Ia= 0)	=	40-80	40-80 V
V_{g3}	=	0 300	0 300 V

Focusing ampere-turns
Ampère-tours pour concentration
Amperewindungen zur Fokussierung 910 964 978 1040

Focusing	magnetic
Concentration	magnétique
Fokussierung	magnetisch

The focusing device used should have a focal distance corresponding to that of a coil, the data of which are given below
Le dispositif de concentration utilisé doit avoir une distance focale correspondant à celle d'une bobine dont les caractéristiques se trouvent ci-dessous
Die Brennweite der verwendeten Fokussierungsvorrichtung muss übereinstimmen mit der Brennweite einer Spule deren Daten unten angegeben sind



Number of turns	
Nombre de tours	18 000
Windungszahl	
Number of ampere-turns	See p. B and C
Nombre d'ampère-tours	Voir p. B et C
Amperewindungszahl	Siehe S.B und C

Field intensity perpendicular to the tube axis for centering of the beam: 0 - 8 gausses

L'intensité de champ perpendiculaire à l'axe du tube pour centrer le faisceau est de 0 - 8 gauss

Feldstärke senkrecht zu der Röhrenachse zur Zentrierung des Elektronenstrahles: 0 - 8 Gauss

→ Ion trap magnet: Single magnet; field strength about 50 gausses. Type number 55402. For the procedure of setting up please refer to "Application directions" (page C107), in front of this section
Aimant du piège à ions: Aimant simple; intensité du champ environ 50 gauss. Numéro de type 55402. Pour le réglage voir "Indications d'application" (page C107), en tête de ce chapitre
Ionenfallenmagnet: Einfacher Magnet; Feldstärke etwa 50 Gauss. Typennummer 55402. Für die Einstellung siehe "Anwendungsrichtlinien" (Seite C107), am Anfang dieses Abschnitts

Operating characteristics
Caractéristiques d'utilisation
Betriebsdaten

$V_{a,g4}$	=	14	16 kV
V_{g2}	=	300	300 V
$-V_{g1}$ (I_{ℓ} = 0 µA)	=	40~80	40~80 V
V_{g3}	=	0 300	0 300 V
Focusing ampere-turns			
Ampère-tours pour concentration		910 964	978 1040
Amperewindungen zur Fokussierung			

Net weight Poids net Nettogewicht	11 kg	Shipping weight Poids brut Bruttogewicht	15 kg

Limiting values (design centre values)
Caractéristiques limites (valeurs moyennes de développement)
Grenzdaten (mittlere Entwicklungsdaten)

V_a	= max.	18 kV
V_a	= min.	12 kV
V_{g3}	= max.	500 V
$-V_{g3}$	= max.	100 V
V_{g2}	= max.	500 V
V_{g2}	= min.	200 V
V_{g1}	= max.	0 V
$-V_{g1}$	= max.	150 V
V_{g1p}	= max.	2 V
Vkf (k pos.;f neg.)	= max.	200 V[1)][2)]
Vkf (k neg.;f pos)	= max.	125 V[2)]

Max. circuit values
Valeurs max. des éléments du montage
Max. Werte der Schaltungsteile

R_{kf}	=	1 MΩ[3)]
R_{g1}	=	1,5 MΩ
Z_{g1}(f =50 c/s)	=	0,5 MΩ

[1)] During a warm-up period not exceeding 45 seconds the heater may be 410 V negative with respect to the cathode
Pendant une période d'échauffement ne dépassant pas 45 secondes, le filament peut être porté à un potentiel négatif de 410 V par rapport à la cathode
Während einer Anheizzeit von max. 45 Sekunden darf der Heizfaden 410 V negativ sein in Bezug auf der Katode

[2)] In order to avoid excessive hum, the A.C. component of Vkf should be as low as possible and must not exceed 20 V
Pour éviter le ronflement excessif la composante alternative de Vkf sera la plus petite possible et ne dépassera pas 20 V
Zur Vermeidung von Brummstörungen muss die Wechselspannungskomponente von Vkf so klein wie möglich sein und jedenfalls 20 V nicht überschreiten

[3)] See page 8; voir page 8; siehe Seite 8

Net weight / Poids net / Nettogewicht	11 kg	Shipping weight / Poids brut / Bruttogewicht	15 kg

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V_{kf} (k pos.;f neg.)	= max.	200 V[1])[2])
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Valeurs max. des éléments du montage
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[3])See page 8; voir page 8; siehe Seite 8

Min. circuit values:

The power supply should be of the limited-energy type with inherent regulation to limit the continuous short-circuit current to 5 mA. If the supply permits the instantaneous short-circuit current to exceed 1A, or is capable of storing more than 250 µcoulombs, the effective resistance in the circuit between the indicated electrode and the output capacitor should be as follows:

R_{g1}	= min. 150 Ω	R_{g2}	= min. 500 Ω
R_{g3}	= min. 500 Ω	R_a	= min. 18000 Ω

Valeurs min. des éléments du montage:

Le circuit d'alimentation ne doit être capable de fournir qu'une puissance limitée de sorte que le courant de court-circuit permanent ne dépasse pas 5 mA. Si le courant instantané de court-circuit dépasse 1 A, ou si le circuit d'alimentation est capable d'accumuler plus de 250 µcoulomb, les résistances efficaces entre les diverses électrodes et la capacité de sortie doivent avoir les valeurs min. suivantes:

R_{g1}	= min. 150 Ω	R_{g2}	= min. 500 Ω
R_{g3}	= min. 500 Ω	R_a	= min. 18000 Ω

Min. Werte der Schaltungsteile:

Der Speiseteil soll nur eine begrenzte Leistung liefern können, damit der Strom bei Dauerkurzschluss nicht mehr als 5 mA beträgt. Wenn der Momentanwert des Kurzschlussstromes 1 A überschreitet oder wenn der Speiseteil mehr als 250 µcoulomb speichern kann, müssen die effektiven Widerstände zwischen den verschiedenen Elektroden und dem Ausgangskondensator die folgenden Minimalwerte aufweisen:

R_{g1}	= min. 150 Ω	R_{g2}	= min. 500 Ω
R_{g3}	= min. 500 Ω	R_a	= min. 18000 Ω

---

[3]) When the heater is supplied from a separate transformer.
When the heater is in a series chain, or earthed to A.C., Z_k (f =50 c/s) = max. 0,1 MΩ
Quand le filament est alimenté par un transformateur séparé.
Quand le filament est connecté dans une chaîne série, ou est mise à la terre pour C.A., Z_k(f=50c/s) = max. 0,1 MΩ
Wenn der Heizfaden von einem separaten Transformator gespeist wird. Wenn der Heizfaden in einer Serienkette aufgenommen oder für Wechselstrom geerdet ist, Z_k (f =50 Hz) = max. 0,1 MΩ

Min. circuit values:

The power supply should be of the limited-energy type with inherent regulation to limit the continuous short-circuit current to 5 mA. If the supply permits the instantaneous short-circuit current to exceed 1A, or is capable of storing more than 250 µcoulombs, the effective resistance in the circuit between the indicated electrode and the output capacitor should be as follows:

R_{g1}	= min. 150 Ω	R_{g2}	= min. 500 Ω
R_{g3}	= min. 500 Ω	R_a	= min. 18000 Ω

Valeurs min. des éléments du montage:

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Min. Werte der Schaltungsteile:

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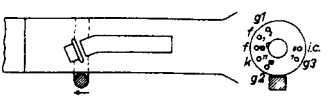
ADJUSTMENT OF ION-TRAP MAGNET 55402

The ion-trap magnet is fitted to a clamping ring so that it may be fixed to the neck of the tube. The following procedure should be adopted for adjusting the position of the magnet:

1. Switch off the voltage supplies and remove the socket. Slip the magnet over the base with the arrow pointing away from the screen. The position of the magnet must be approximately in line with the position of pin No.12 on the base (see figure below). Adjust the magnet slightly in advance of the base.
2. Fit the socket to the tube and switch on the voltage supplies. Adjust the brightness control and, if necessary, the position of the magnet until the raster is just visible. The adjustment is best carried out with a stationary test pattern.
3. Move the magnet towards the screen, without rotating it, until the focused raster attains maximum brightness. The brightness may now be adjusted to give the correct level for the peak white portions of the image and, if necessary, the position of the magnet should be readjusted to obtain maximum brilliance.
4. If the raster cannot be centered by adjusting the position of the focus field, the magnet should be rotated slightly in order to assist in centering, provided that this does not cause any decrease in brilliance.
5. When optimum conditions are obtained, the magnet should be clamped in position by means of the screw, taking care not to alter the position of the magnet.
6. If a position of adequate brilliance can not be obtained, another magnet should be tried.

The magnet should never be adjusted to remove a shadow from the raster if by doing so the brightness of the image is decreased. In such cases the shadow should be eliminated by adjusting The focusing device and/or the position of the deflection coils

It is essential that the magnet should be handled with care and not subjected to very strong magnetic fields or mechanical shocks.



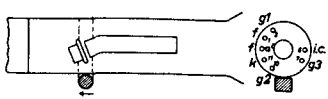
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1. Switch off the voltage supplies and remove the socket. Slip the magnet over the base with the arrow pointing away from the screen. The position of the magnet must be approximately in line with position No. 9 on the base (see figure below). Adjust the magnet slightly in advance of the base.
2. Fit the socket to the tube and switch on the voltage supplies. Adjust the brightness control and, if necessary, the position of the magnet until the raster is just visible. The adjustment is best carried out with a stationary test pattern.
3. Move the magnet towards the screen, without rotating it, until the focused raster attains maximum brightness. The brightness may now be adjusted to give the correct level for the peak white portions of the image and, if necessary, the position of the magnet should be readjusted to obtain maximum brilliance.
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It is essential that the magnet should be handled with care and not subjected to very strong magnetic fields or mechanical shocks.



REGLAGE DE L'AIMANT DE TRAPPE A IONS 55402

L'aimant de trappe à ions est monté sur un collier de serrage qui permet de le fixer au col du tube. Pour regler la position de l'aimant, procéder de la manière suivante:

1. Les tensions d'alimentation étant coupées et le support étant enlevé, glisser l'aimant au-dessus du culot, la flèche pointée dans le sens opposé à celui de l'écran. La position de l'aimant doit concorder avec la position de la broche No.12 sur le culot (voir la figure ci-dessous). Glisser l'aimant de façon qu'il se trouve tout juste au-delà du culot.
2. Fixer le support au tube et appliquer les tensions d'alimentation. Ajuster le bouton de luminosité et, en cas de besoin, déplacer l'aimant jusqu'à ce que la trame soit tout juste visible. Le réglage s'effectue au mieux à l'aide d'une mire stationnaire d'essai sur l'écran.
3. Rapprocher l'aimant sans le tournant de l'écran jusqu'au moment où la brillance de la trame concentrée soit maximum. Ajuster le bouton de luminosité de facon à obtenir le niveau équivalent au blanc maximum de l'image et, en cas de besoin, déplacer légèrement l'aimant de façon à obtenir la brillance maximum.
4. Si le réglage de la position du champ de concentration ne permet pas d'obtenir le centrage de la trame, tourner légèrement l'aimant de facon à faciliter le centrage, pour autant que cette opération ne provoque pas une diminution de la brillance.
5. Les conditions optima étant obtenues, bloquer l'aimant au moyen de la vis, en veillant à ne pas modifier la position de l'aimant.
6. S'il est impossible d'obtenir une position pour laquelle la brillance est satisfaisante, essayer un autre aimant.

Ne jamais déplacer l'aimant pour enlever une ombre de la trame, si ce déplacement provoque une diminution de la brillance de l'image. Dans un tel cas, supprimer l'ombre parfaisant le réglage du dispositif de concentration et ou de la position des bobines de déviation

Toujours manipuler l'aimant avec précaution et veiller à le soustraire aux champs magnétiques de forte intensité et aux chocs mécaniques.



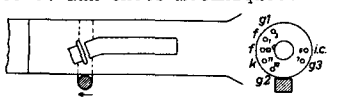
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1. Les tensions d'alimentation étant coupées et le support étant enlevé, glisser l'aimant au-dessus du culot, la flèche pointée dans le sens opposé à celui de l'écran. La position de l'aimant doit concorder avec la position de broche No.9 sur le culot (voir la figure ci-dessous). Glisser l'aimant de façon qu'il se trouve tout juste au-delà du culot. ←
2. Fixer le support au tube et appliquer les tensions d'alimentation. Ajuster le bouton de luminosité et, en cas de besoin, déplacer l'aimant jusqu'à ce que la trame soit tout juste visible. Le réglage s'effectue au mieux à l'aide d'une mire stationnaire d'essai sur l'écran.
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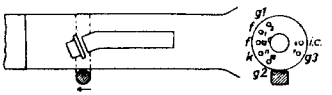
EINSTELLUNG DES MAGNETS DER IONENFALLE 55402

Der Magnet der Ionenfalle hat einen Halterungsring, mit dem er am Hals des Röhrenkolbens befestigt werden kann. Die Einstellung des Magnets geschieht in folgender Weise:

1. Die Spannungsquellen ausschalten und den Röhrenhalter abnehmen. Sodann schiebe man den Magnetring über den Sockel mit dem Pfeil vom Schirm wegweisend. Die Lage des Magnets muss ungefähr zusammenfallen mit der Lage von Stift No. 12 am Sockel (siehe untenstehender Abbildung). Der Ring wird so angeordnet dass er ein wenig über den Sockel ragt
2. Den Röhrenhalter wieder anbringen und die Spannungsquellen einschalten. Man regle nun die Helligkeit, und, falls nötig, die Lage des Magnets so, dass das Raster gerade sichtbar ist. Am besten wird diese Einstellung an einem festen Kontrolmuster vorgenommen.
3. Man verstelle den Magnet, ohne Drehung, soweit in Richtung des Schirmes, bis das fokussierte Raster die stärkste Helligkeit aufweist. Alsdann steigere man die Helligkeit auf intensivstes Weiss und stelle, falls nötig, den Magnet auf maximale Helligkeit nach.
4. Gelingt es nicht das Raster durch einstellen des Fokussierungsfeldes zu zentrieren, so suche man dies durch leichtes Drehen des Magnets zu erreichen, vorausgesetzt dass hierdurch die Helligkeit nicht vermindert wird.
5. Nachdem der optimale Punkt erreicht ist, setze man den Magnet mit Hilfe der Schraube fest, wobei an der Stellung des Magnets nichts mehr geändert werden darf.
6. Ist die Helligkeit des Rasters unzulänglich, so muss ein neuer Magnet verwendet werden.

In keinem Falle darf man sich Gps Magnets zur Beseitigung eines Schattens im Raster bedienen, wenn die Bildhelligkeit dadurch beeinträchtigt würde. Man beseitige dann den Schatten durch entsprechendes Nachstellen der Fokussierungsvorrichtung und/oder der Ablenk-Spulen.

Bei der Verwendung des Magnets ist grösste Sorgfalt zu beachten; er darf keinen starken magnetischen Feldern und keinen mechanischen Erschütterungen ausgesetzt sein.



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Der Magnet der Ionenfalle hat einen Halterungsring, mit dem er am Hals des Röhrenkolbens befestigt werden kann. Die Einstellung des Magnets geschieht in folgender Weise:

1 Die Spannungsquellen ausschalten und den Röhrenhalter abnehmen. Sodann schiebe man den Magnetring über den Sockel mit dem Pfeil vom Schirm wegweisend. Die Lage des Magnets muss ungefähr zusammenfallen mit der Stiftlage No.9 am Sockel (siehe untenstehender Abbildung). Der Ring wird so angeordnet dass er ein wenig über den Sockel ragt. ←

2. Den Röhrenhalter wieder anbringen und die Spannungsquellen einschalten. Man regle nun die Helligkeit, und, falls nötig, die Lage des Magnets so, dass das Raster gerade sichtbar ist. Am besten wird diese Einstellung an einem festen Kontrolmuster vorgenommen.

3. Man verstelle den Magnet, ohne Drehung, soweit in Richtung des Schirmes, bis das fokussierte Raster die stärkste Helligkeit aufweist. Alsdann steigere man die Helligkeit auf intensivstes Weiss und stelle, falls nötig, den Magnet auf maximale Helligkeit nach.

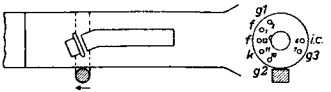
4. Gelingt es nicht das Raster durch einstellen des Fokussierungsfeldes zu zentrieren, so suche man dies durch leichtes Drehen des Magnets zu erreichen, vorausgesetzt dass hierdurch die Helligkeit nicht vermindert wird.

5. Nachdem der optimale Punkt erreicht ist, setze man den Magnet mit Hilfe der Schraube fest, wobei an der Stellung des Magnets nichts mehr geändert werden darf.

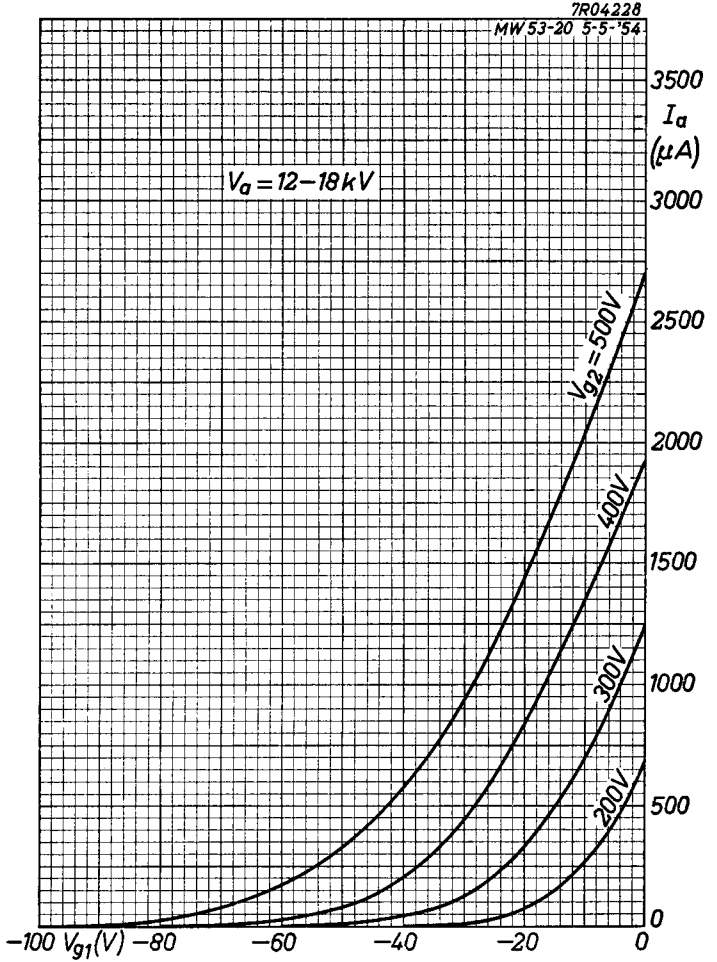
6. Ist die Helligkeit des Rasters unzulänglich, so muss ein neuer Magnet verwendet werden.

In keinem Falle darf man sich des Magnets zur Beseitigung eines Schattens im Raster bedienen, wenn die Bildhelligkeit dadurch beeinträchtigt würde. Man beseitige dann den Schatten durch entsprechendes Nachstellen der Fokussierungsvorrichtung und/oder der Ablenk-Spulen.

Bei der Verwendung des Magnets ist grösste Sorgfalt zu beachten; er darf keinen starken magnetischen Feldern und keinen mechanischen Erschütterungen ausgesetzt sein.



939 0116
11.11.1954


7R04228
MW 53-20 5-5-'54
$V_a = 12-18\,kV$
$V_{g2} = 500V$
400V
300V
200V
3500
I_a
(μA)
3000
2500
2000
1500
1000
500
0
−100 V_{g1}(V) −80
−60
−40
−20
0

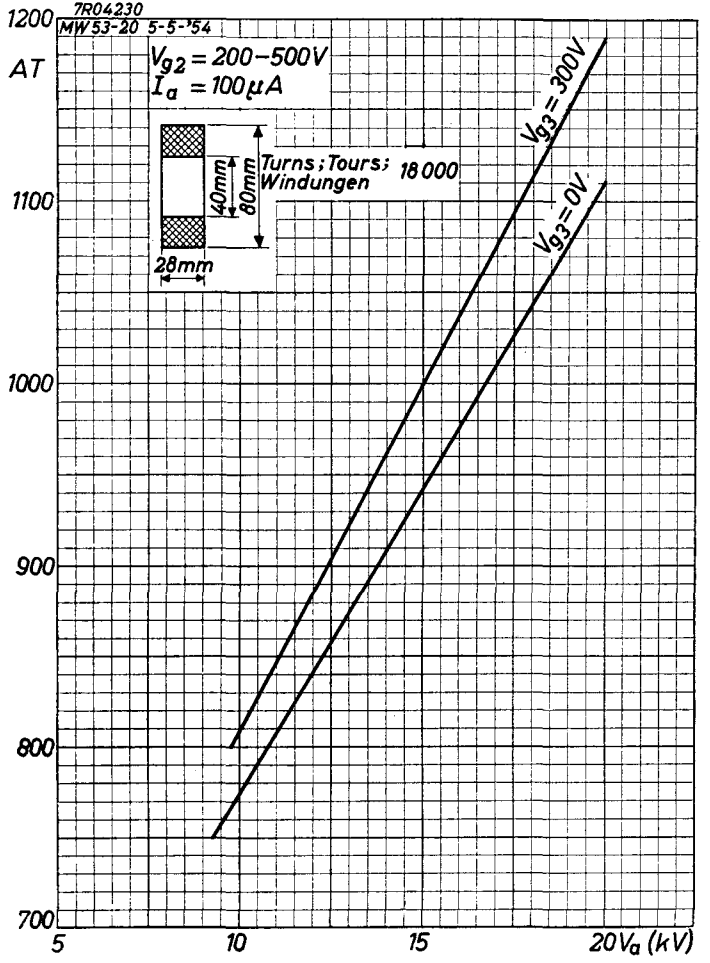
5.5.1954

A

MW 53-20

PHILIPS

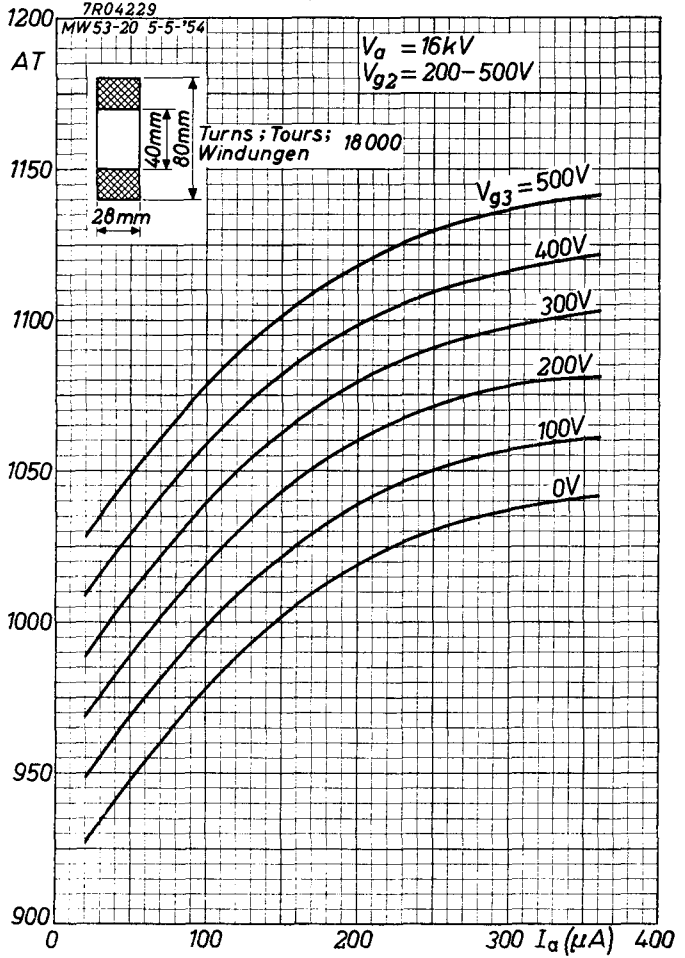
AT = Number of ampere turns necessary for focusing
AT = Nombre d'ampère-tours nécessaire pour la concentration
AT = Die zur Fokussierung erforderliche Amperewindungszahl



PHILIPS

MW 53-20

AT = Number of ampere turns necessary for focusing
AT = Nombre d'ampère-tours nécessaire pour la concentration
AT = Die zur Fokussierung erforderliche Amperewindungszahl



5.5.1954

C

PHILIPS

Electronic Tube

HANDBOOK

MW53-20

page	sheet	date
1	1	1955.02.02
2	1	1955.05.05
3	2	1955.02.02
4	2	1955.05.05
5	3	1954.05.05
6	3	1954.11.11
7	4	1954.05.05
8	4	1954.11.11
9	5	1954.11.11
10	5	1957.12.12
11	6	1954.11.11
12	6	1957.12.12
13	7	1954.05.05
14	7	1954.11.11
15	8	1954.05.05
16	8	1954.11.11
17	9	1954.05.05
18	9	1954.11.11
19	10	1954.05.05

20	10	1954.11.11
21	11	1954.05.05
22	11	1954.11.11
23	A	1954.05.05
24	B	1954.05.05
25	C	1954.05.05
26, 27	FP	2000.03.25

RECTANGULAR TELEVISION PICTURE TUBE with ion trap, filterglass and metal-backed screen
TUBE IMAGE DE TELEVISION RECTANGULAR avec piège à ions, verre filtre et écran aluminisé
RECHTECKIGE FERNSEHBILDRÖHRE mit Ionenfalle, Filterglas und metalhinterlegtem Schirm

Heating : indirect by A.C. or D.C. series or parallel supply
Chauffage: indirect par C.A. ou C.C. alimentation série ou parallèle
Heizung : indirekt durch Wechsel- oder Gleichstrom; Serien- oder Parallelspeisung

V_f = 6,3 V [1)]
I_f = 300 mA

Capacitances
Capacités
Kapazitäten

C_{g_1}	=	7 pF
C_{gk}	=	5 pF
C_{k+g_3}	=	8 pF
C_{am} [2)]	=	700-1100 pF

Screen
Ecran
Schirm

Filterglass, metal-backed, spherical
Verre filtre, aluminisé, sphérique
Filterglas, metallhinterlegt, sphärisch

Colour Couleur Farbe	white blanche weiss
Light transmission Transmission de lumière Lichtdurchlässigkeit	70 %
Useful diagonal Diagonale utile Nützlicher Diagonale	min. 511 mm
Useful width Largeur utile Nützliche Breite	min. 482 mm
Useful height Hauteur utile Nützliche Höhe	min. 378 mm

For curves of the screen properties see front of this section
Pour les courbes des propriétés de l'écran voir en tête de ce chapitre
Für die Kurven der Schirmeigenschaften siehe am Anfang dieses Abschnitts

1)2) see page 4; voir page 4; siehe Seite 4

RECTANGULAR TELEVISION PICTURE TUBE in all glass construction with filter glass, metal-backed screen, ion trap, magnetic focusing and 90° magnetic deflection
TUBE IMAGE DE TELEVISION RECTANGULAIRE de construction tout verre avec verre filtrant, écran aluminisé, piège à ions, concentration magnétique et déflection magnétique de 90°
RECHTECKIGE FERNSEHBILDRÖHRE in Allglastechnik mit Filterglas, metallhinterlegtem Schirm, Ionenfalle, magnetischer Fokussierung und 90° magnetischer Ablenkung

Heating :	indirect by A.C. or D.C. series or parallel supply	
Chauffage:	indirect par C.A. ou C.C. alimentation série ou parallèle	V_f = 6,3 V[1]) I_f = 300 mA
Heizung :	indirect durch Wechsel- oder Gleichstrom; Serien- oder Parallelspeisung	

Capacitances Capacités Kapazitäten	C_{g1}	=	7 pF
	C_k	=	5 pF
	C_{k+g3}	=	9 pF
	$C_{(a,g4)m}$	=	min.1250 pF
	$C_{(a,g4)m}$	=	max.1750 pF

Screen Ecran Schirm	Filterglass, metal-backed, spherical Verre filtrant, aluminisé, sphérique Filterglas, metallhinterlegt, sphärisch	
	Colour Couleur Farbe	white blanche weiss
	Light transmission Transmission de lumière Lichtdurchlässigkeit	70%
	Useful diagonal Diagonale utile Nützliche Diagonale	min. 511 mm
	Useful width Largeur utile Nützliche Breite	min. 482 mm
	Useful height Hauteur utile Nützliche Höhe	min. 378 mm

For curves of the screen properties see front of this section
Pour les courbes caractéristiques de l'écran voir en tête de ce chapitre
Für die Kurven der Schirmeigenschaften siehe am Anfang dieses Abschnitts

1)See page 4; voir page 4; siehe Seite 4

RECTANGULAR TELEVISION PICTURE TUBE in all glass construction with filter glass, metal-backed screen, ion trap, magnetic focusing and 90° magnetic deflection
TUBE IMAGE DE TÉLÉVISION RECTANGULAIRE de construction tout verre avec verre filtrant, écran aluminisé, piège à ions, concentration magnétique et déviation magnétique de 90°
RECHTECKIGE FERNSEHBILDRÖHRE in Allglastechnik mit Filterglas, metallhinterlegtem Schirm, Ionenfalle, magnetischer Fokussierung und 90° magnetischer Ablenkung

Heating :	indirect by A.C. or D.C. series or parallel supply	
Chauffage:	indirect par C.A. ou C.C. alimentation série ou parallèle	$V_f = 6{,}3\ V^{1)}$ / $I_f = 300\ mA$
Heizung :	indirect durch Wechsel- oder Gleichstrom; Serien- oder Parallelspeisung	

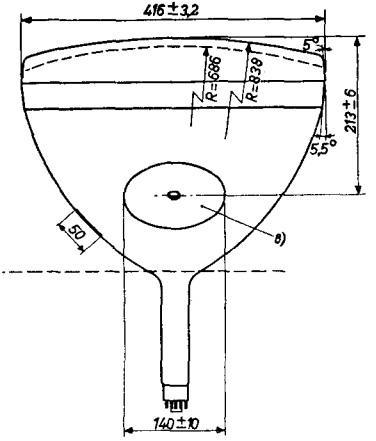
Capacitances Capacités Kapazitäten	C_{g1}	=	7 pF
	C_k	=	4 pF ←
	C_{k+g3}	=	9 pF
	$C_{(a,g4)m}$	=	min. 1250 pF
	$C_{(a,g4)m}$	=	max. 1750 pF

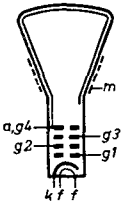
Screen Écran Schirm	Filterglass, metal-backed, spherical Verre filtrant, aluminisé, sphérique Filterglas, metallhinterlegt, sphärisch	
	Colour Couleur Farbe	white blanche weiss
	Light transmission Transmission de lumière Lichtdurchlässigkeit	75% ←
	Useful diagonal Diagonale utile Nutzbare Diagonale	min. 511 mm
	Useful width Largeur utile Nutzbare Breite	min. 482 mm
	Useful height Hauteur utile Nutzbare Höhe	min. 378 mm

For curves of the screen properties see front of this section
Pour les courbes caractéristiques de l'écran voir en tête de ce chapitre
Für die Kurven der Schirmeigenschaften siehe am Anfang dieses Abschnitts

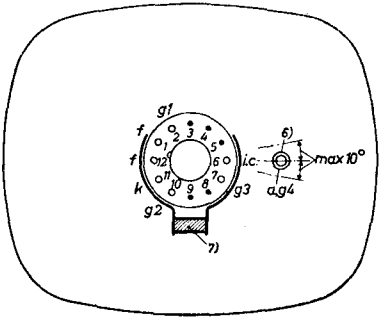
1) See page 4; voir page 4; siehe Seite 4

Dimensions in mm
Dimensions en mm
Abmessungen in mm



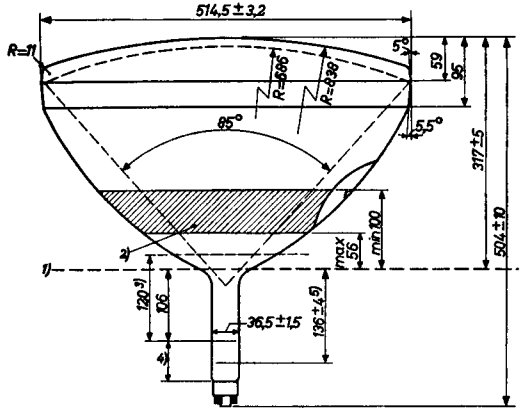


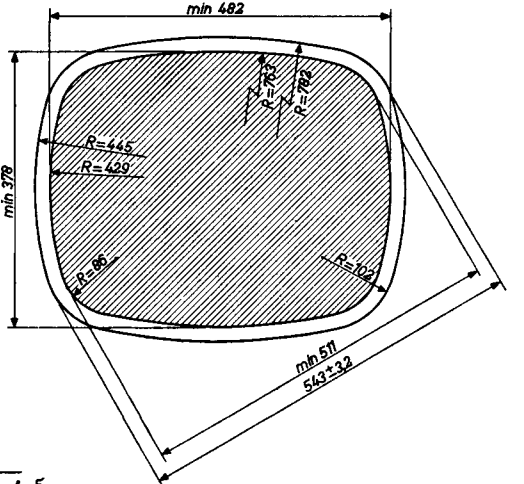
Base, culot, Sockel: DUODECAL 12-p



6) 7) 8) See page 4; voir page 4; siehe Seite 4

Dimensions in mm; Dimensions en mm; Abmessungen in mm

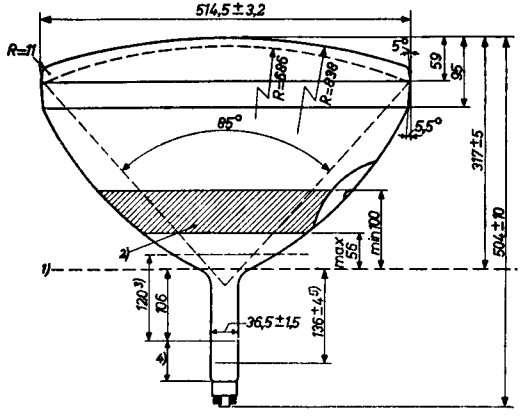


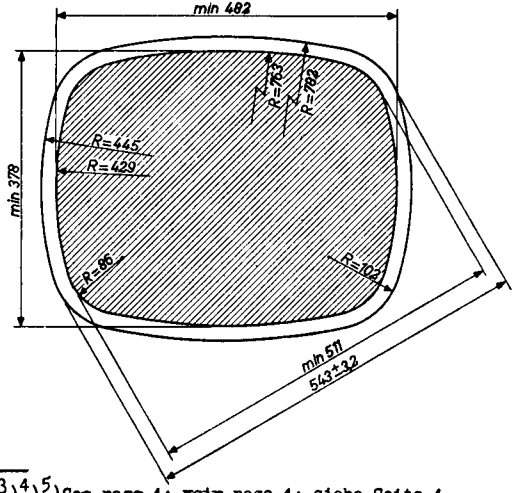


1)2)3)4)5) See page 4; voir page 4; siehe Seite 4

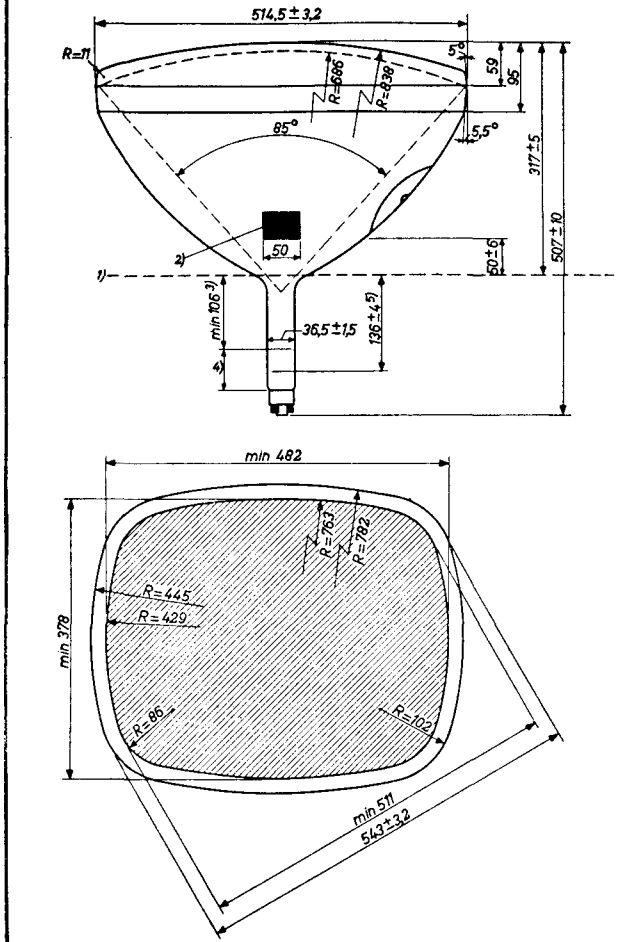
PHILIPS

Dimensions in mm; Dimensions en mm; Abmessungen in mm

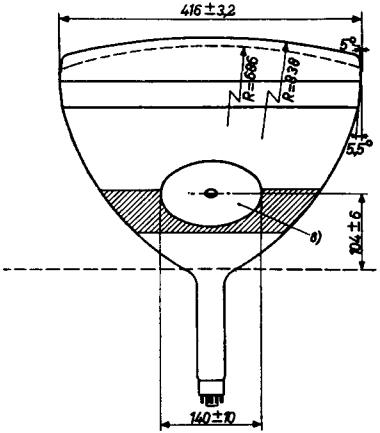


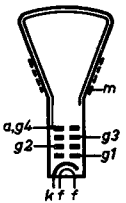


1)2)3)4)5) See page 4; voir page 4; siehe Seite 4

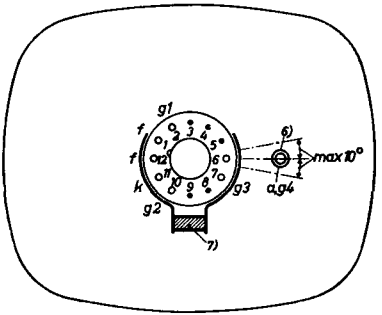


1)...5) See page 4; voir page 4; siehe Seite 4





Base, culot, Sockel: DUODECAL 7-p



6)7)8)See page 4; voir page 4; siehe Seite 4

Notes from page 1; notes de la page 1; Noten von Seite 1

1) When the tube is used in a series heater chain, the heater voltage must not exceed 9.5 V when the supply is switched on. If necessary a current limiting device must be used for this purpose.
Si le tube est monté dans une chaîne de filaments en série la tension de chauffage ne doit pas dépasser 9,5 V à la mise en circuit. En cas de besoin il faut utiliser un limiteur de courant dans ce but.
Wenn die Röhre in einer Heizfadenkette verwendet wird, darf die Heizspannung beim Einschalten 9,5 V nicht überschreiten. Nötigenfalls ist zu diesem Zweck ein Strombegrenzer zu verwenden.

2) m = outer coating; couche extérieure; Aussenbelag

Notes from page 2,3;Notes des pages 2,3; Noten von Seite 2,3

1) Reference line, determined by the plane of the upper edge of the flange of the reference line gauge when the gauge is resting on the cone
Ligne de référence, déterminée par le plan du bord supérieur de la bride du calibre de la ligne de référence, si celui-ci repose sur le cône
Bezugslinie, bestimmt durch die Ebene des oberen Flanschrandes der Bezugslinienlehre wenn diese auf dem Konus ruht

2) The external coating should be earthed within this area
La couche extérieure sera mise à la terre dans cette surface
Der Aussenbelag soll innerhalb dieser Fläche geerdet werden

3) Space for deflection coils and focusing device
Place pour les bobines de déviation et le dispositif de concentration
Platz für Ablenkspulen und Fokussierungsvorrichtung

4) Space for the ion trap magnet
Place pour l'aimant du piège à ions
Platz für den Ionenfallenmagnet

5) Distance from reference line to top centre of grid
Distance de la ligne de référence jusqu'au centre de la surface supérieure de la grille
Abstand der Bezugslinie bis zum Mittelpunkt der Oberseite des Gitters

6) Recessed cavity contact
Contact à cavité enfoncé
Versenkter Druckknopfkontakt

7) Ion trap magnet
L'aimant du piège à ions
Ionenfallenmagnet

8) This area must be kept clean
Cette surface sera maintenue propre
Diese Fläche muss unbedeckt bleiben

Note from page 1; note de la page 1; Note von Seite 1

1) When the tube is used in a series heater chain, the heater voltage must not exceed 9.5 V when the supply is switched on. If necessary a current limiting device must be used for this purpose
Si le tube est monté dans une chaîne de filaments en série, la tension de chauffage ne doit pas dépasser 9,5 V à la mise en circuit. En cas de besoin il faut utiliser un limiteur de courant dans ce but
Wenn die Röhre in einer Heizfadenkette verwendet wird, darf die Heizspannung beim Einschalten 9,5 V nicht überschreiten. Nötigenfalls ist zu diesem Zweck ein Strombegrenzer zu verwenden

Notes from page 2.3; Notes des pages 2.3; Noten von Seite 2.3

1) Reference line, determined by the plane of the upper edge of the flange of the reference line gauge when the gauge is resting on the cone
Ligne de référence, déterminée par le plan du bord supérieur de la bride du calibre de la ligne de référence, si celui-ci repose sur le cône
Bezugslinie, bestimmt durch die Ebene des oberen Flanschrandes der Bezugslinienlehre, wenn diese auf dem Konus ruht

2) Allowable contact area
Surface de contact admissible
Zulässige Kontaktfläche

3) Space for deflection coils and focusing device
Place pour les bobines de déviation et le dispositif de concentration
Platz für Ablenkspulen und Fokussierungsvorrichtung

4) Space for the ion trap magnet
Place pour l'aimant du piège à ions
Platz für den Ionenfallenmagnet

5) Distance from reference line to top centre of grid
Distance de la ligne de référence au centre de la surface supérieure de la grille
Abstand der Bezugslinie bis zum Mittelpunkt der Oberseite des Gitters

6) Recessed cavity contact
Contact à cavité enfoncé
Versenkter Druckknopfkontakt

7) Ion trap magnet
Aimant du piège à ions
Ionenfallenmagnet

8) This area must be kept clean
Cette surface sera maintenue propre
Diese Fläche muss unbedeckt bleiben

Mounting position Montage Einbau	Any A volonté Willkürlich
Net weight Poids net Nettogewicht	13000 g

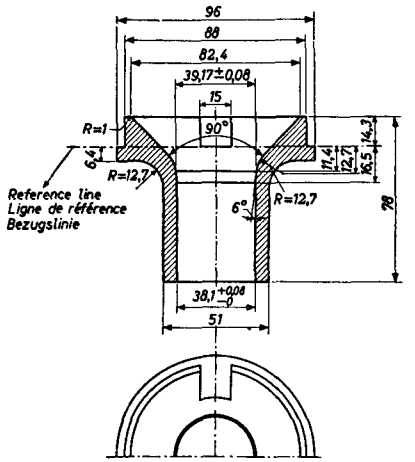
The socket for the base should not be rigidly mounted; it should have flexible leads and be allowed to move freely. The bottom circumference of the base shell will fall within a circle which is concentric with the cone axis and has a diameter of 55 mm

Le support du tube ne pouvra pas être monté rigidement; il devra être connecté par des conducteurs flexibles lui permettant de se mouvoir librement
La circonférence du fond de la chemise sera dans un cercle qui est concentrique avec l'axe du cône et a un diamètre de 55 mm

Die Röhrenfassung ist nicht starr zu befestigen aber soll frei beweglich sein und flexible Zuleitungen haben
Der Bodenumfang der Sockelhülse fällt innerhalb eines Kreises der Konzentrisch mit der Konusachse ist und einen Durchmesser von 55 mm hat

Reference line gauge
Calibre de la ligne de référence
Bezugslinienlehre

Dimensions in mm
Dimensions en mm
Abmessungen in mm



Mounting position Montage Einbau	Any A volonté Willkürlich

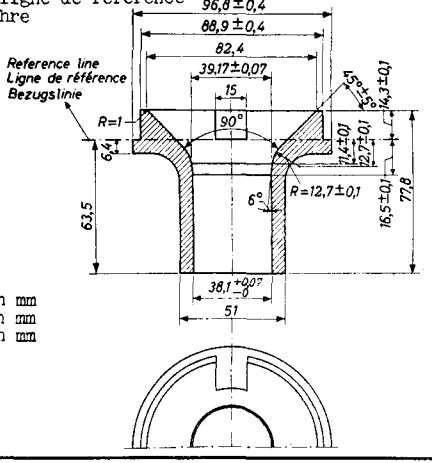
Net weight
Poids net 13 000 g
Nettogewicht

The socket for the base should not be rigidly mounted; it should have flexible leads and be allowed to move freely. The bottom circumference of the base shell will fall within a circle which is concentric with the perpendicular from the centre of the face and which has a diameter of 55 mm

Le support du tube ne pourra pas être monté rigidement; il devra être connecté par des conducteurs flexibles lui permettant de se mouvoir librement. La circonférence du fond de la chemise sera incluse dans un cercle qui est concentrique à la perpendiculaire du centre de l'écran et qui a un diamètre de 55 mm

Die Röhrenfassung ist nicht starr zu befestigen sondern soll frei beweglich sein und flexible Zuleitungen haben. Der Bodenumfang der Sockelhülse fällt innerhalb eines Kreises, der konzentrisch mit der Senkrechte des Schirmmittelpunktes ist und einen Durchmesser von 55 mm hat

→ Reference line gauge
Calibre de la ligne de référence
Bezugslinienlehre



Dimensions in mm
Dimensions en mm
Abmessungen in mm

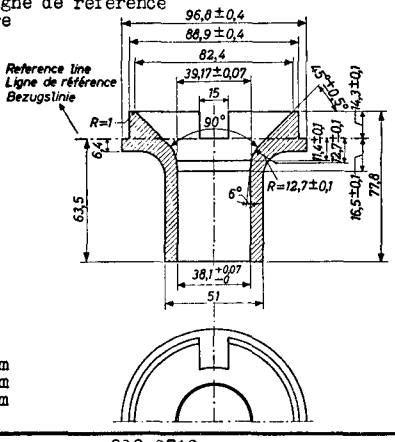
Mounting position Montage Einbau	Any A volonté Beliebig
Net weight Poids net 13 kg Nettogewicht	Shipping weight Poids brut 17,5 kg Bruttogewicht

The socket for the base should not be rigidly mounted; it should have flexible leads and be allowed to move freely. The outer circumference of the base will fall within a circle which is concentric with the perpendicular from the centre of the face and which has a diameter of 55 mm

Le support du tube ne pourra pas être monté rigidement; il devra être connecté par des conducteurs flexibles lui permettant de se mouvoir librement. La circonférence extérieure du culot est incluse dans un cercle qui est concentrique à la perpendiculaire du centre de l'écran et qui a un diamètre de 55 mm

Die Röhrenfassung ist nicht starr zu befestigen sondern soll frei beweglich sein und flexible Zuleitungen haben. Der Aussenumfang des Sockels fällt innerhalb eines Kreises, der konzentrisch mit der Senkrechte des Schirmmittelpunktes ist und einen Durchmesser von 55 mm hat

Reference line gauge
Calibre de la ligne de référence
Bezugslinienlehre



Dimensions in mm
Dimensions en mm
Abmessungen in mm

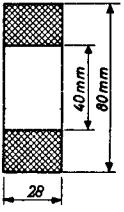
Deflection Déviation Ablenkung	magnetic magnétique magnetisch
Vertical deflection angle L'angle de déviation verticale Vertikaler Ablenkungswinkel	65 °
Horizontal deflection angle L'angle de déviation horizontale Horizontaler Ablenkswinkel	85 °
Diagonal deflection angle L'angle de déviation diagonale Diagonaler Ablenkungswinkel	90 °

Focusing Concentration Fokussierung	magnetic magnetique magnetisch

The focusing device used should have a focal distance corresponding to that of a coil, the data of which are given below. Distance between centre of field of this coil and reference line is 78 mm

Le dispositif de concentration utilisé doit avoir une distance focale correspondant à celle d'une bobine dont les caractéristiques se trouvent ci-dessous. La distance entre le centre du champ de cette bobine et la ligne de référence est 78 mm

Die Brennweite der verwendete Fokussierungsvorrichtung muss übereinstimmen mit der Brennweite einer Spule deren Daten unten angegeben sind. Der Abstand zwischen dem Feldmittelpunkt dieser Spule und der Bezugslinie ist 78 mm



Number of turns Nombre de tours Windungszahl	18 000
Number of ampere-turns Nombre d'ampere-tours Amperewindungszahl	See p. B and C Voir p. B et C Siehe S.B und C

Additional centering magnet
Aimant a centrer additionnel
Zusätzlicher Zentriermagnet

Fieldstrength adjustable between Intensité du champ réglage entre Feldstärke einstellbar zwischen	0 and 8 g 0 et 8 g 0 und 8 g

Deflection Déviation Ablenkung	magnetic magnétique magnetisch

Deflection angle; Angle de déviation; Ablenkungswinkel:

vertical	65°
horizontal	85°
diagonal	90°

Focusing Concentration Fokussierung	magnetic magnétique magnetisch

For focusing coil please refer to page 8
Pour la bobine de concentration voir page 8
Fokussierungsspule siehe Seite 8

Field intensity perpendicular to the tube axis for centering of the beam: 0 - 8 gausses

L'intensité de champ perpendiculaire à l'axe du tube pour centrer le faisceau est de 0 - 8 gauss

Feldstärke senkrecht zu der Röhrenachse zur Zentrierung des Elektronenstrahles: 0 - 8 Gauss

Ion trap magnet: Single magnet; field strength about 60 gausses. Type number 55402. For the procedure of setting up please refer to "Application directions" (page C107), in front of this section
Aimant du piège à ions: Aimant simple; intensité du champ environ 60 gauss. Numéro de type 55402. Pour le réglage voir "Indications d'application" (page C107), en tête de ce chapitre
Ionenfallenmagnet: Einfacher Magnet; Feldstärke etwa 60 Gauss. Typennummer 55402. Für die Einstellung siehe "Anwendungsrichtlinien" (Seite C107), am Anfang dieses Abschnitts

Operating characteristics
Caractéristiques d'utilisation
Betriebsdaten

$V_{a,g4}$	=	14	16 kV
V_{g2}	=	300	300 V
$-V_{g1}(I_l = 0\ \mu A)$	=	40-80	40-80 V
V_{g3}	=	0 300	0 300 V
Focusing coil current (at I_l = 100 µA) Intensité de courant de la bobine de concentration (à I_l = 100 µA) Strom durch die Fokussierungsspule (bei I_l = 100 µA)	=	103 112	108 118 mA
		(see pages B and C) (voir pages B et C) (siehe Seite B und C)	

Deflection Déviation Ablenkung	magnetic magnétique magnetisch

Deflection angle; Angle de déviation; Ablenkungswinkel:

vertical	65°
horizontal	85°
diagonal	90°

Focusing Concentration Fokussierung	magnetic magnétique magnetisch

For focusing coil please refer to page 8
Pour la bobine de concentration voir page 8
Fokussierungsspule siehe Seite 8

Field intensity perpendicular to the tube axis for centering of the beam: 0 - 8 gausses

L'intensité de champ perpendiculaire à l'axe du tube pour centrer le faisceau est de 0 - 8 gauss

Feldstärke senkrecht zu der Röhrenachse zur Zentrierung des Elektronenstrahles: 0 - 8 Gauss

Ion trap magnet: Single magnet; field strength about 50 gausses. Type number 55402. For the procedure of setting up please refer to "Application directions" (page C107), in front of this section
Aimant du piège à ions: Aimant simple; intensité du champ environ 50 gauss. Numéro de type 55402. Pour le réglage voir "Indications d'application" (page C107), en tête de ce chapitre
Ionenfallenmagnet: Einfacher Magnet; Feldstärke etwa 50 Gauss. Typennummer 55402. Für die Einstellung siehe "Anwendungsrichtlinien" (Seite C107), am Anfang dieses Abschnitts

Operating characteristics
Caractéristiques d'utilisation
Betriebsdaten

$V_{a,g4}$	=	14 16	kV
V_{g2}	=	300 300	V
$-V_{g1}$ (I_ℓ = 0 µA)	=	40-80 40-80	V
V_{g3}	=	0 300 0 300	V
Focusing coil current (at I_ℓ = 100µA) Intensité de courant de la bobine de concentration (à I_ℓ = 100 µA) Strom durch die Fokussierungsspule (bei I_ℓ = 100 µA)	=	103 112 108 118	mA (see pages B and C) (voir pages B et C) (siehe Seite B und C)

Ion trap magnet: Single magnet, field strength about 60 gausses. Type number 55402. For the procedure of setting up see MW53-20 page 9
Aimant du piège à ions: Aimant simple, intensité du champ environ 60 gauss. Numéro de type 55402. Pour le réglage voir MW53-20 page 10
Ionenfallenmagnet: Einfacher Magnet, Feldstärke etwa 60 Gauss Typennummer 55402. Für die Einstellung siehe MW 53-20 Seite 11

Operating characteristics
Caractéristiques d'utilisation
Betriebsdaten

$V_{(a,g_4)}$	=	14	16	kV
V_{g_2}	=	300	300	V
$-V_{g_1}$ (I_a =0)	=	40-80	40-80	V
V_{g_3}	=	0 300	0 300	V

Focusing ampere-turns
Ampère-tours pour concentration 920 965 960 1010
Amperewindungen zur Fokussierung

Limiting values (design centre values)
Caractéristiques limites (valeurs moyennes de développement)
Grenzdaten (mittlere Entwicklungsdaten)

$V_{(a,g_4)}$	= max. 18 kV	[1]
$V_{(a,g_4)}$	= min. 12 kV	
V_{g_3}	= max. 500 V	
$-V_{g_3}$	= max. 100 V	
V_{g_2}	= max. 500 V	
V_{g_2}	= min. 200 V	
V_{g_1}	= max. 0 V	
$-V_{g_1}$	= max. 150 V	
V_{g_1p}	= max. 2 V	
V_{kf} (k pos.;f neg.)	= max. 200 V	[2] [3]
V_{kf} (k neg.;f pos.)	= max. 125 V	[3]

Max. circuit values
Valeurs max. des éléments du montage
Max. Werte der Schaltungsteile

R_{kf}	=	1 MΩ	[4]
R_{g_1}	=	1,5 MΩ	
Z_{g_1} (f =50 c/s)	=	0,5 MΩ	

[1] [2] [3] [4] See page 9; voir page 9; siehe Seite 9

Limiting values (design centre values)
Caractéristiques limites(valeurs moyennes pour projets)
Grenzdaten (mittlere Entwicklungsdaten)

$V_{a,g4}$	= max.	18	kV[1]
$V_{a,g4}$	= min.	12	kV
V_{g3}	= max.	500	V
$-V_{g3}$	= max.	100	V
V_{g2}	= max.	500	V
V_{g2}	= min.	200	V
V_{g1}	= max.	0	V
$-V_{g1}$	= max.	150	V
V_{g1p}	= max.	2	V
V_{kf} (k pos.; f neg.)	= max.	200	V[2)3)]
V_{kf} (k neg.; f pos.)	= max.	125	V[3)]

Max. circuit values
Valeurs max. des éléments du montage
Max. Werte der Schaltungsteile

R_{kf}	=	1 MΩ[4)]
R_{g1}	=	1,5 MΩ
Z_{g1} (f = 50 c/s)	=	0,5 MΩ

[1]) This maximum value of $V_{a,g4}$ is also valid at I_l = 0 µA. When the time base is not synchronised, $V_{a,g4}$ may amount up to maximum 19,8 kV
Cette valeur maximum de $V_{a,g4}$ est aussi valable à I_l = 0 µA. Si la base de temps n'est pas synchronisée, $V_{a,g4}$ peut s'augmenter jusqu'à 19,8 kV au maximum
Dieser maximale Wert von $V_{a,g4}$ ist auch gültig bei I_l = 0 µA. Wenn die Zeitbasis nicht synchronisiert ist, darf $V_{a,g4}$ maximal 19,8 kV betragen

[2]) During a warm-up period not exceeding 45 seconds the heater may be 410 V negative with respect to the cathode
Pendant une période d'échauffement ne dépassant pas 45 secondes, le filament peut être porté à un potentiel négatif de 410 V par rapport à la cathode
Während einer Anheizzeit von max. 45 Sekunden darf der Heizfaden 410 V negativ sein in bezug auf die Katode

[3])[4]) See page 9; voir page 9; siehe Seite 9

Min. circuit values:

The power supply should be of the limited-energy type with inherent regulation to limit the continuous surge current to 5 mA. If the supply permits the instantaneous surge current to exceed 1 A, or is capable of storing more than 250 µcoulombs, the effective resistances in the circuit between the indicated electrodes and the output capacitor should be as follows:

R_{g_1}	= min. 150 Ω	R_{g_2}	= min. 500 Ω
R_{g_3}	= min. 500 Ω	R_a	= min. 18000 Ω

Valeurs min. des éléments du montage:

Le circuit d'alimentation ne doit être capable de fournir qu'une puissance limitée de sorte que le courant de court-circuit permanent ne dépasse pas 5 mA. Si le courant instantané de court-circuit dépasse 1 A, ou si le circuit d'alimentation est capable d'accumuler plus de 250 µcoulomb, les résistances efficases entre les diverses électrodes et la capacité de sortie doivent avoir les valeurs min. suivantes:

R_{g_1}	= min. 150 Ω	R_{g_2}	= min. 500 Ω
R_{g_3}	= min. 500 Ω	R_a	= min. 18000 Ω

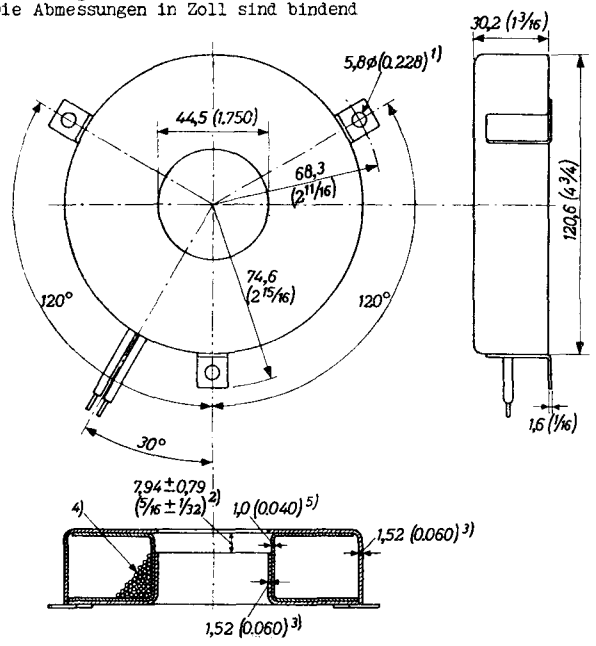
Min. Werte der Schaltungsteile:

Der Speiseteil soll nur eine begrenzte Leistung liefern können, damit der Strom bei Dauerkurzschluss nicht mehr als 5 mA beträgt. Wenn der Momentanwert des Kurzschluss-stromes 1 A überschreitet oder wenn der Speiseteil mehr als 250 µcoulomb speichern kann, müssen die effektiven Widerstände zwischen den verschiedenen Electroden und dem Ausgangskondensator die folgenden Minimalwerte aufweisen:

R_{g_1}	= min. 150 Ω	R_{g_2}	= min. 500 Ω
R_{g_3}	= min. 500 Ω	R_a	= min. 18000 Ω

Focusing coil
Bobine de concentration
Fokussierungsspule

Dimensions in mm and in inches (between brackets)
The dimensions in inches are holding
Dimensions en mm et en pouces (entre parenthèses)
Les dimensions en pouches sont de rigueur
Abmessungen in mm und in Zoll (in Klammern)
Die Abmessungen in Zoll sind bindend



1)2)3)4)5)See page 9; voir page 9; siehe Seite 9

Remark : The beamwidth as shown on page D has been measured on the screen, without focusing and deflection fields being applied.
The relative spot diameter has been measured on the centre of the screen with focusing field applied

Remarque : La largeur du faisceau exposee sur page D est mesurée sur l'écran, sans application des champs de concentration et de déflection.
Le diamètre relatief du spot est mesuré au centre de l'écran avec l'application du champ de concentration

Bemerkung: Seite D gibt die Bündelbreite welche gemessen ist auf dem Schirm ohne Anwendung von Fokussierungs-und Ablenkungsfeldern.
Der relative Leuchtfleckdurchmesser ist gemessen auf dem Schirmmittelpunkt mit Anwendung des Fokussierungsfeldes

---

1) This max. value of V_a is also valid at I = 0 µA
Absolute value 22 kV
Cette valeur maximum de V_a est aussi valable à I = 0 µA
Valeur absolue 22 kV
Dieser maximalen Wert von V_a ist auch gültig bei I = 0 µA
Absolutwert 22 kV

2) During a warm-up period not exceeding 45 seconds the heater may be 410 V negative with respect to the cathode
Pendant une période d'échauffement ne dépassant pas 45 secondes, le filament peut être porté à un potentiel négatif de 410 V par rapport à la cathode
Während einer Anheizzeit von max. 45 Sekunden darf der Heizfaden 410 V negativ sein in Bezug auf der Katode

3) In order to avoid excessive hum, the A.C. component of V_{kf} should be as low as possible and must not exceed 20 V
Pour éviter le ronflement excessif la composante alternative de V_{kf} sera la plus petite possible et ne dépassera pas 20 V
Zur Vermeidung von Brummstörungen muss die Wechselspannungskomponente von V_{kf} so klein wie möglich sein und jedenfalls 20 V nicht überschreiten

4) When the heater is supplied from a separate transformer When the heater is in a series chain, or earthed to A.C., Z_k (f = 50 c/s) = max. 0.1 MΩ

Quand le filament est alimenté par un transformateur séparé Quand le filament est connecté dans une chaîne série, ou est mise à la terre pour C.A., Z_k (f= 50 c/s) = max.0,1 MΩ

Wenn der Heizfaden von einem separaten Transformator gespeist wird. Wenn der Heizfaden in einer Serienkette aufgenommen oder für Wechselstrom geerdet ist, Z_k (f = 50 Hz) = max. 0,1 MΩ

Notes 3,4 from p.7; Notes 3,4 de la p.7; Noten 3,4 von S 7

3) In order to avoid excessive hum, the A.C. component of V_{kf} should be as low as possible and must not exceed 20 V_{eff}

Pour éviter un ronflement excessif la composante alternative de V_{kf} sera la plus petite possible et ne dépassera pas 20 V_{eff}

Zur Vermeidung von Brummstörungen muss die Wechselspannungskomponente von V_{kf} so klein wie möglich sein und darf sie jedenfalls 20 V_{eff} nicht überschreiten

4) When the heater is supplied from a separate transformer. When the heater is in a series chain, or earthed to A.C., Z_{kf}(f = 50 c/s) = max. 0.1 MΩ

Quand le filament est alimenté par un transformateur séparé Quand le filament est connecté dans une chaine série, ou est mis à la terre pour C.A., Z_{kf}(f = 50 Hz) = max. 0,1 MΩ

Wenn der Heizfaden von einem separaten Transformator gespeist wird. Wenn der Heizfaden in einer Serienkette aufgenommen oder für Wechselstrom geerdet ist, Z_{kf}(f = 50 Hz) = max. 0,1 MΩ

Notes from page 8; Notes de la page 8; Noten von Seite 8

1) 3 holes; 3 trous; 3 Löcher

2) Air gap; Entrefer; Luftspalt

3) Cold rolled steel. After forming not less than 1.2 mm (0.047") thick
Acier laminé à froid. Après la formation, l'épaisseur sera de 1,2 mm (0.047") au minimum
Kaltgewalzter Stahl. Nach Formung soll die Dicke nicht weniger als 1,2 mm (0.047") betragen

4) 6800 turns enamelled copper wire; diameter 0.01126" (AWG no.29); 470 Ω D.C. resistance
6800 spires fil de cuivre émaillé d'un diamètre de 0.01126" (AWG no.29); résistance en C.C. 470 Ω
6800 Windungen emaillierter Kupferdraht; Durchmesser 0.01126" (AWG No.29); Gleichstromwiderstand 470 Ω

5) Impregnated fiber; fibre imprégnée; Imprägnierte Fiber

Remark 1 from pages B and C
Ifoc is the current of the focusing coil as specified on page 8. This coil must be positioned with the air-gap toward the screen and center line of air-gap at a distance of 76 mm from reference line

Observation 1 des pages B et C
Ifoc est le courant de la bobine de concentration comme spécifiée à la page 8. Cette bobine doit être placée en position telle que l'entrefer soit dirigé vers l'écran, la ligne centrale de l'entrefer se trouvant à 76 mm de la ligne de référence

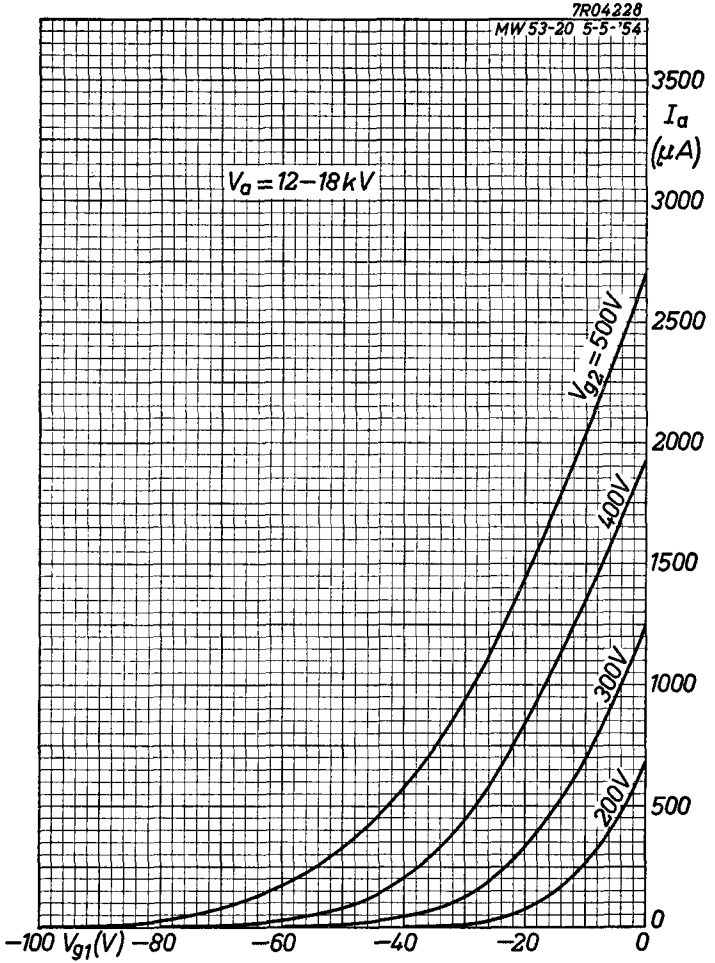
Bemerkung 1 von Seite B und C
Ifoc ist der Strom der auf Seite 8 beschriebene Fokussierungsspule. Die Spule muss so aufgesetzt werden, dass der Luftspalt zum Schirm hin weist und die Mittellinie des Luftspaltes einen Abstand von 76 mm zur Bezugslinie besitzt

Remark 2
The beamwidth as shown on page D has been measured on the screen, without focusing and deflection fields being applied The relative spot diameter has been measured on the centre of the screen with focusing field applied

Observation 2
La largeur du faisceau exposée sur page D est mesurée sur l'écran, sans application des champs de concentration et de deflection.Le diamètre relatief du spot est mesuré au centre de l'écran avec application du champ de concentration.

Bemerkung 2
Seite D gibt die Bündelbreite welche gemessen ist auf dem Schirm ohne Anwendung von Fokussierungs- und Ablenkungsfeldern. Der relative Leuchtfleckdurchmesser ist gemessen auf dem Schirmmittelpunkt mit Anwendung des Fokussierungsfeldes

PHILIPS MW 53-80

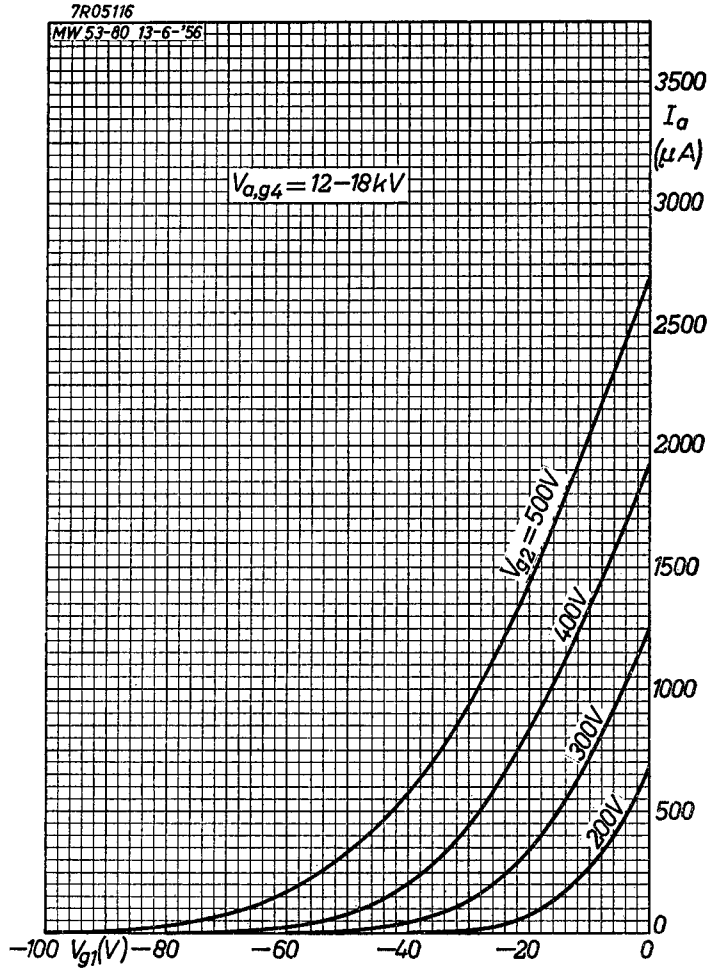


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A

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MW 53-80



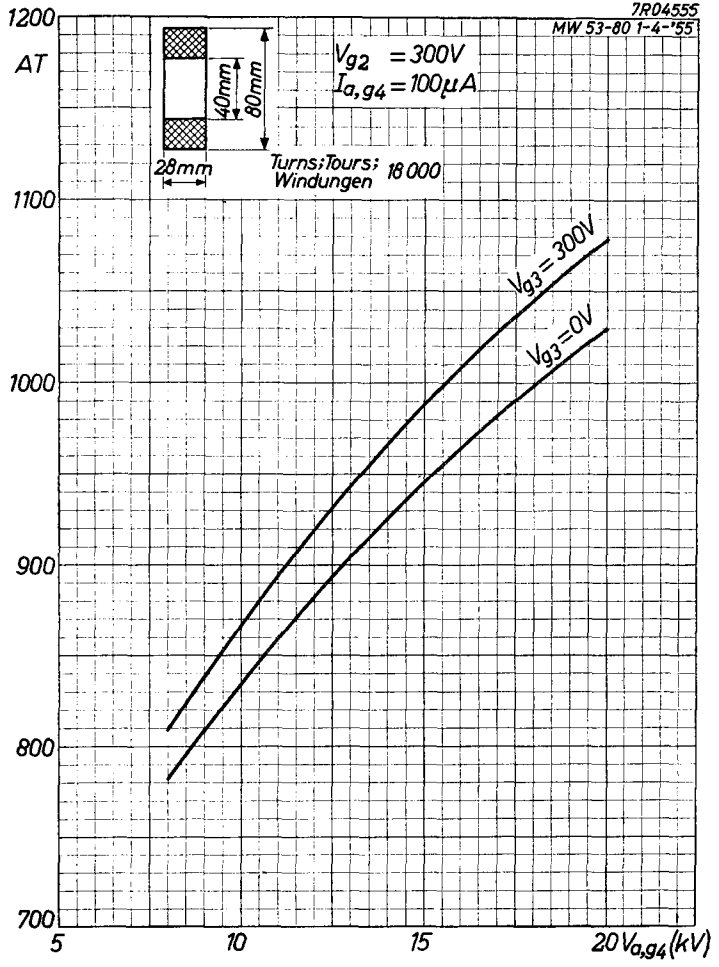
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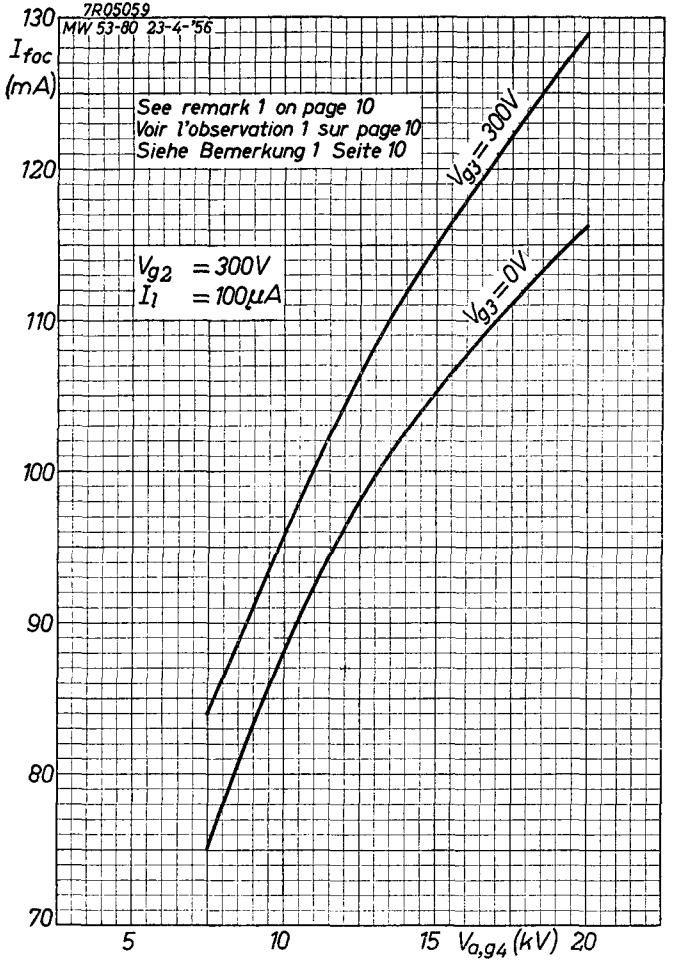
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MW 53-80

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AT = Number of ampere turns necessary for focusing
AT = Nombre d'ampère-tours nécessaire pour la concentration
AT = Die zur Fokussierung erforderliche Amperewindungzahl



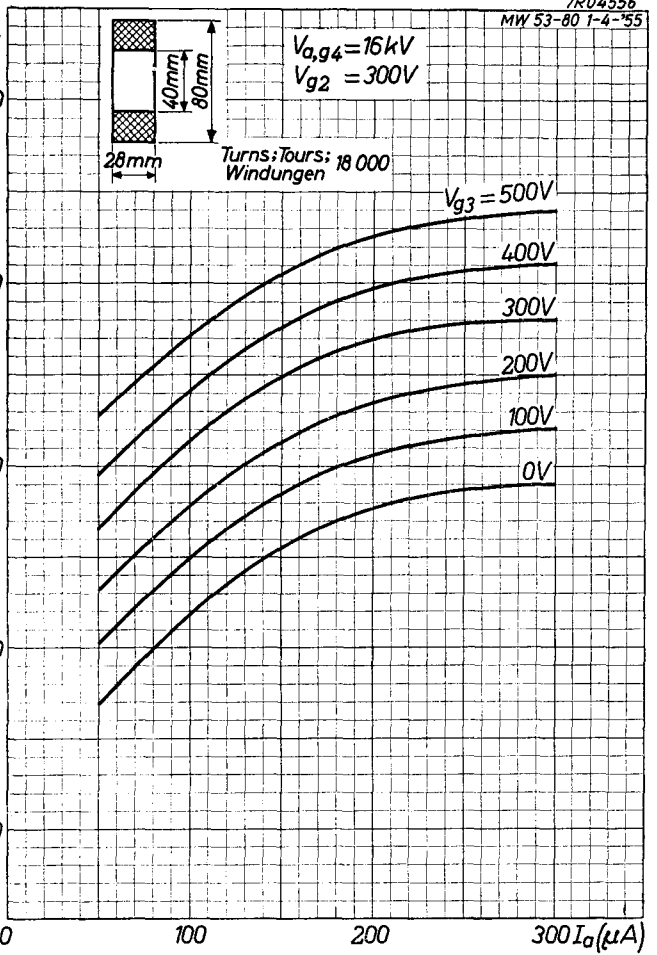

7R05059
MW 53-80 23-4-'56
130
120
110
100
90
80
70
I_{foc} (mA)
See remark 1 on page 10
Voir l'observation 1 sur page 10
Siehe Bemerkung 1 Seite 10
V_{g2} = 300V
I_1 = 100µA
V_{g3} = 300V
V_{g3} = 0V
5
10
15
$V_{a,g4}$ (kV)
20

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MW 53-80

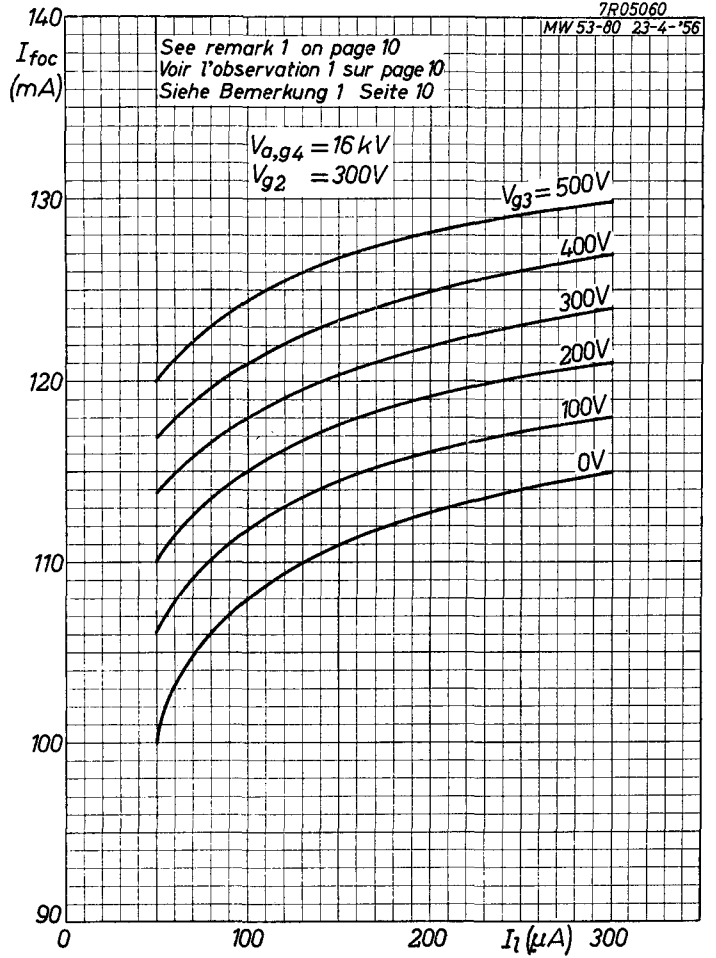
AT = Number of ampere turns necessary for focusing
AT = Nombre d'ampère-tours nécessaire pour la concentration
AT = Die zur Fokussierung erforderliche Amperewindungszahl

7R04556
MW 53-80 1-4-'55

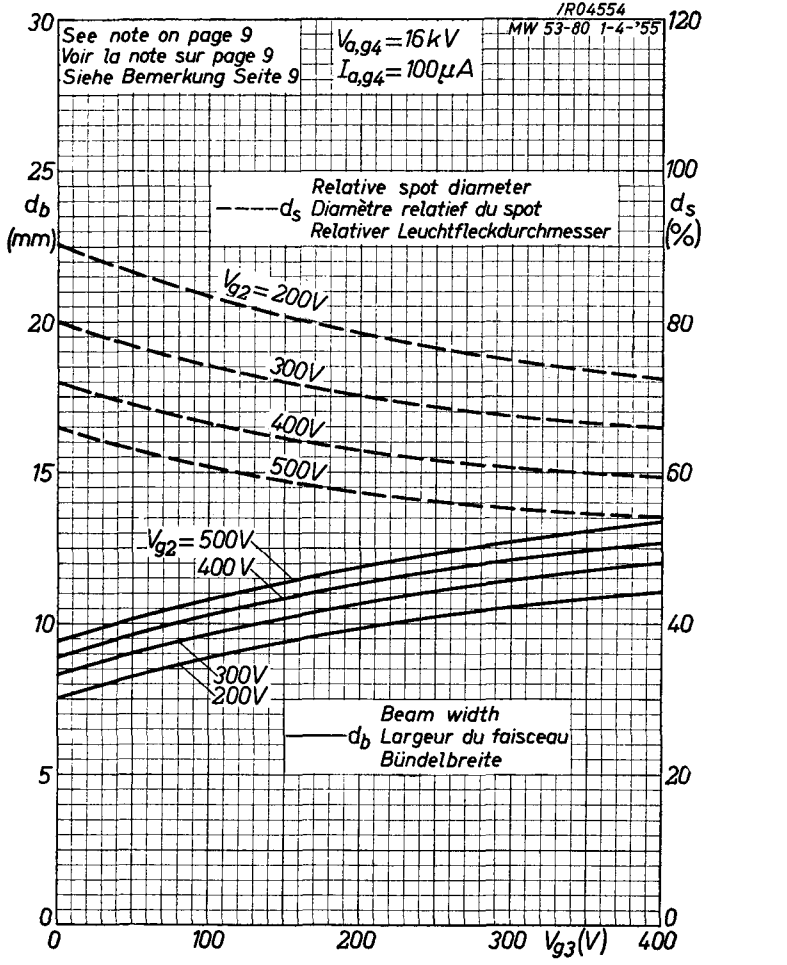


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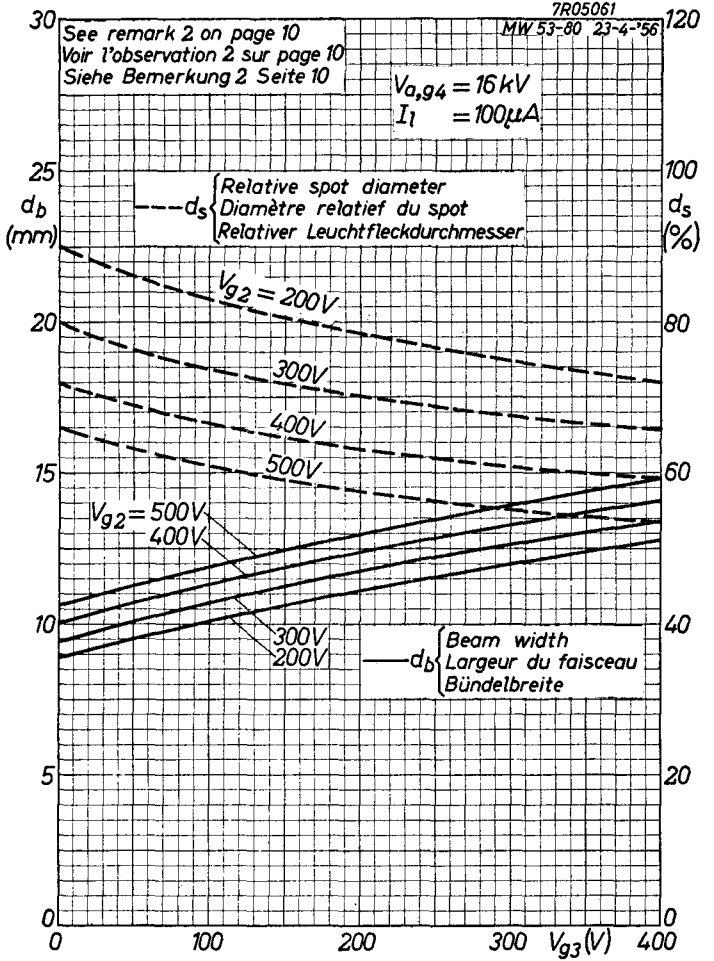
C


7R05060
MW 53-80 23-4-'56
See remark 1 on page 10
Voir l'observation 1 sur page 10
Siehe Bemerkung 1 Seite 10
$V_{a,g4} = 16\,kV$
$V_{g2} = 300V$
$V_{g3} = 500V$
400V
300V
200V
100V
0V
I_{foc} (mA)
140
130
120
110
100
90
0
100
200
300
I_1 (μA)

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/R04554
MW 53-80 1-4-'55
See note on page 9
Voir la note sur page 9
Siehe Bemerkung Seite 9
$V_{a,g4}$ = 16 kV
$I_{a,g4}$ = 100 µA
Relative spot diameter
d_s Diamètre relatief du spot
Relativer Leuchtfleckdurchmesser
V_{g2} = 200V
300V
400V
500V
V_{g2} = 500V
400 V
300V
200V
Beam width
d_b Largeur du faisceau
Bündelbreite
d_b (mm)
d_s (%)
V_{g3} (V)
0
5
10
15
20
25
30
40
60
80
100
120
200
300
400

PHILIPS


7R05061
MW 53-80 23-4-'56
See remark 2 on page 10
Voir l'observation 2 sur page 10
Siehe Bemerkung 2 Seite 10
$V_{a,g4} = 16\,kV$
$I_1 = 100\,\mu A$
d_s Relative spot diameter
Diamètre relatief du spot
Relativer Leuchtfleckdurchmesser
d_b (mm)
d_s (%)
$V_{g2} = 200V$
300V
400V
500V
$V_{g2} = 500V$
400V
300V
200V
d_b Beam width
Largeur du faisceau
Bündelbreite
30
25
20
15
10
5
0
120
100
80
60
40
20
0
0
100
200
300
V_{g3} (V)
400

PHILIPS

Electronic Tube

HANDBOOK

MW53-80

page	sheet	date
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2	1	1956.08.08
3	1	1957.11.11
4	2	1955.04.04
5	2	1956.08.08
6	2	1957.11.11
7	3	1955.04.04
8	3	1956.08.08
9	4	1955.04.04
10	4	1956.08.08
11	5	1955.04.04
12	5	1956.08.08
13	5	1957.11.11
14	6	1955.04.04
15	6	1956.08.08
16	6	1957.11.11
17	7	1955.04.04
18	7	1956.08.08
19	8	1955.04.04

20	8	1956.08.08
21	9	1955.04.04
22	9	1956.08.08
23	10	1956.08.08
24	A	1955.04.04
25	A	1956.06.06
26	B	1955.04.04
27	B	1956.06.06
28	C	1955.04.04
29	C	1956.05.05
30	D	1955.04.04
31	D	1956.05.05
32, 33	FP	2000.07.16

RECTANGULAR TELEVISION PICTURE TUBE in all glass construction with filter glass, metal-backed screen, ion trap, magnetic focusing and 90° magnetic deflection
TUBE IMAGE DE TÉLÉVISION RECTANGULAIRE de construction tout verre avec verre filtrant, écran aluminisé, piège à ions, concentration magnétique et déviation magnétique de 90°
RECHTECKIGE FERNSEHBILDRÖHRE in Allglastechnik mit Filterglas, metallhinterlegtem Schirm, Ionenfalle, magnetischer Fokussierung und 90° magnetischer Ablenkung

Heating : indirect by A.C. or D.C. series or parallel supply
Chauffage: indirect par C.A. ou C.C. alimentation série ou parallèle
Heizung : indirect durch Wechsel- oder Gleichstrom; Serien- oder Parallelspeisung

$V_f = 6{,}3$ V[1])
$I_f = 300$ mA

Capacitances Capacités Kapazitäten			
	C_{g1}	=	7 pF
	C_k	=	4 pF
	C_{k+g3}	=	9 pF
	$C_{(a,g4)m}$	= min.	1250 pF
	$C_{(a,g4)m}$	= max.	1750 pF

Screen / **Écran** / **Schirm**: Filterglass, metal-backed, spherical
Verre filtrant, aluminisé, sphérique
Filterglas, metallhinterlegt, sphärisch

Colour Couleur Farbe	white blanche weiss
Light transmission Transmission de lumière Lichtdurchlässigkeit	75 % ←
Useful diagonal Diagonale utile Nutzbare Diagonale	min. 576,5 mm
Useful width Largeur utile Nutzbare Breite	min. 544,5 mm
Useful height Hauteur utile Nutzbare Höhe	min. 428,5 mm

For curves of the screen properties see front of this section
Pour les courbes caractéristiques de l'écran voir en tête de ce chapitre
Für die Kurven der Schirmeigenschaften siehe am Anfang dieses Abschnitts

[1])See page 4; voir page 4; siehe Seite 4

RECTANGULAR TELEVISION PICTURE TUBE in all glass construction with filter glass, metal-backed screen, ion trap, magnetic focusing and 90° magnetic deflection
TUBE IMAGE DE TÉLÉVISION RECTANGULAIRE de construction tout verre avec verre filtrant, écran aluminisé, piège à ions, concentration magnétique et déviation magnétique de 90°
RECHTECKIGE FERNSEHBILDRÖHRE in Allglastechnik mit Filterglas, metallhinterlegtem Schirm, Ionenfalle, magnetischer Fokussierung und 90° magnetischer Ablenkung

Heating : indirect by A.C. or D.C. series or parallel supply
Chauffage: indirect par C.A. ou C.C. alimentation série ou parallèle
Heizung : indirect durch Wechsel- oder Gleichstrom; Serien- oder Parallelspeisung

V_f = 6,3 V[1])
I_f = 300 mA

Capacitances / Capacités / Kapazitäten			
	C_{g1}	=	7 pF
	C_k	=	4 pF
	C_{k+g3}	=	9 pF
	$C_{(a,g4)m}$	= min.	1250 pF
	$C_{(a,g4)m}$	= max.	1750 pF

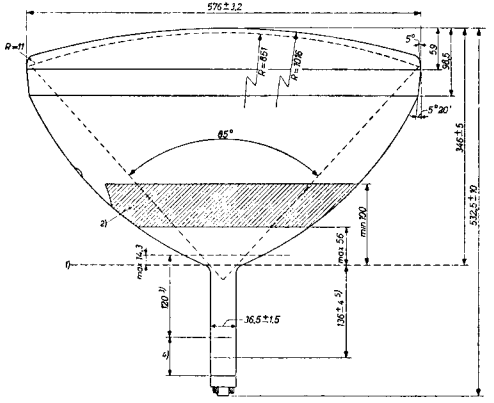
Screen / Écran / Schirm	Filterglass, metal-backed, spherical Verre filtrant, aluminisé, sphérique Filterglas, metallhinterlegt, sphärisch	
	Colour Couleur Farbe	white blanche weiss
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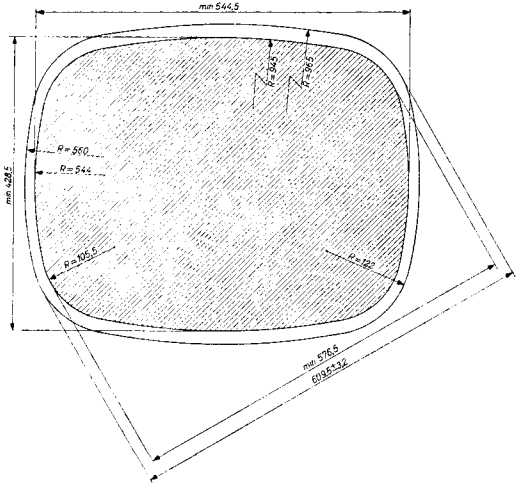
For curves of the screen properties see front of this section
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Für die Kurven der Schirmeigenschaften siehe am Anfang dieses Abschnitts

[1])See page 4; voir page 4; siehe Seite 4

PHILIPS

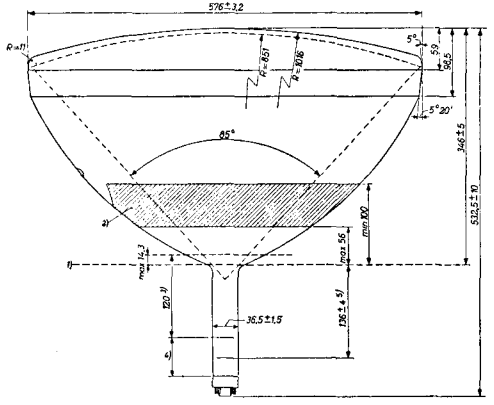
Dimensions in mm; Dimensions en mm; Abmessungen in mm

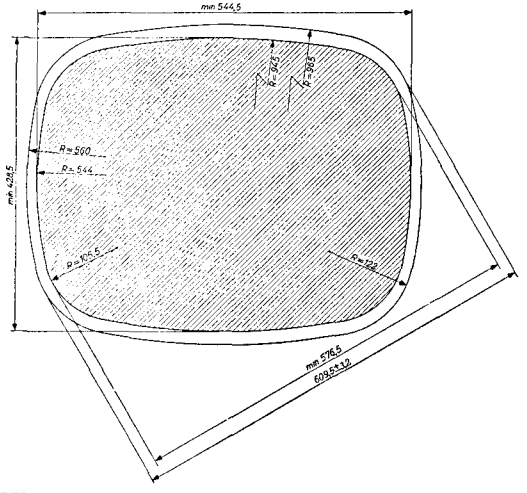




1)2)3)4)5) See page 4; voir page 4; siehe Seite 4

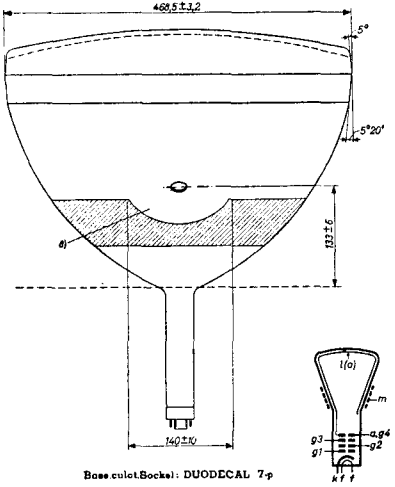
Dimensions in mm; Dimensions en mm; Abmessungen in mm

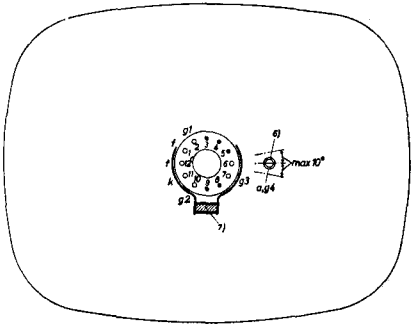




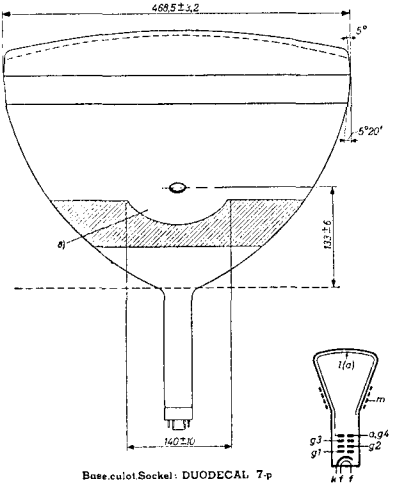
1)2)3)4)5) See page 4; voir page 4; siehe Seite 4

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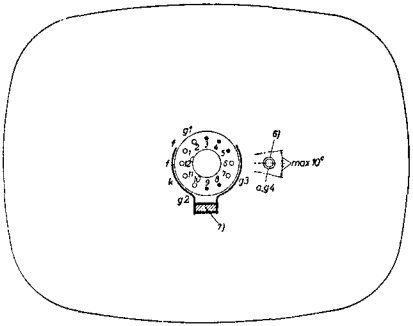




6)7)8) See page 4; voir page 4; siehe Seite 4



Base culot Sockel: DUODECAL 7-p



6)7)8) See page 4; voir page 4; siehe Seite 4

Note from page 1; note de la page 1; Note von Seite 1

1)When the tube is used in a series heater chain, the heater voltage must not exceed 9.5 V when the supply is switched on. If necessary a current limiting device must be used for this purpose
Si le tube est monté dans une chaîne de filaments en série, la tension de chauffage ne doit pas dépasser 9,5 V à la mise en circuit. En cas de besoin il faut utiliser un limiteur de courant dans ce but
Wenn die Röhre in einer Heizfadenkette verwendet wird, darf die Heizspannung beim Einschalten 9,5 V nicht überschreiten. Nötigenfalls ist zu diesem Zweck ein Strombegrenzer zu verwenden

Notes from page 2,3;Notes des pages 2,3; Noten von Seite 2,3

1)Reference line, determined by the plane of the upper edge of the flange of the reference line gauge when the gauge is resting on the cone
Ligne de référence, déterminée par le plan du bord supérieur de la bride du calibre de la ligne de référence, si celui-ci repose sur le cône
Bezugslinie, bestimmt durch die Ebene des oberen Flanschrandes der Bezugslinienlehre, wenn diese auf dem Konus ruht

2)Allowable contact area
Surface de contact admissible
Zulässige Kontaktfläche

3)Space for deflection coils and focusing device
Place pour les bobines de déviation et le dispositif de concentration
Platz für Ablenkspulen und Fokussierungsvorrichtung

4)Space for the ion trap magnet
Place pour l'aimant du piège à ions
Platz für den Ionenfallenmagnet

5)Distance from reference line to top centre of grid
Distance de la ligne de référence au centre de la surface supérieure de la grille
Abstand der Bezugslinie bis zum Mittelpunkt der Oberseite des Gitters

6)Recessed cavity contact
Contact à cavité enfoncé
Versenkter Druckknopfkontakt

7)Ion trap magnet
Aimant du piège à ions
Ionenfallenmagnet

8)This area must be kept clean
Cette surface sera maintenue propre
Diese Fläche muss unbedeckt bleiben

Note from page 1; note de la page 1; Note von Seite 1

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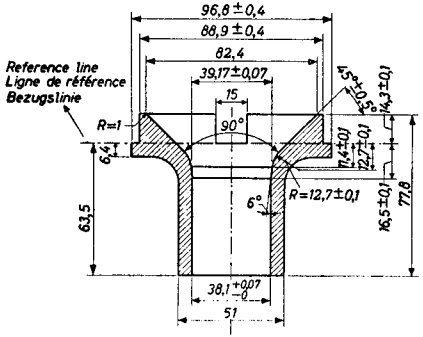
Mounting position Montage Einbau	Any A volonté Beliebig

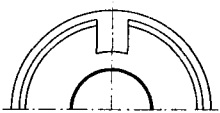
The socket for the base should not be rigidly mounted; it should have flexible leads and be allowed to move freely. The outer circumference of the base will fall within a circle which is concentric with the perpendicular from the centre of the face and which has a diameter of 63.5 mm

Le support du tube ne pourra pas être monté rigidement; il devra être connecté par des conducteurs flexibles lui permettant de se mouvoir librement. La circonférence extérieure du culot **est** incluse dans un cercle qui est concentrique à la perpendiculaire du centre de l'écran et qui a un diamètre de 63,5 mm

Die Röhrenfassung ist nicht starr zu befestigen sondern soll frei beweglich sein und flexible Zuleitungen haben. Der Aussenumfang des Sockels fällt innerhalb eines Kreises, der konzentrisch mit der Senkrechte des Schirmmittelpunktes ist und einen Durchmesser von 63,5 mm hat

Reference lir gauge
Calibre de la ligne de référence
Bezugslinienlehre





Dimensions in mm
Dimensions en mm
Abmessungen in mm

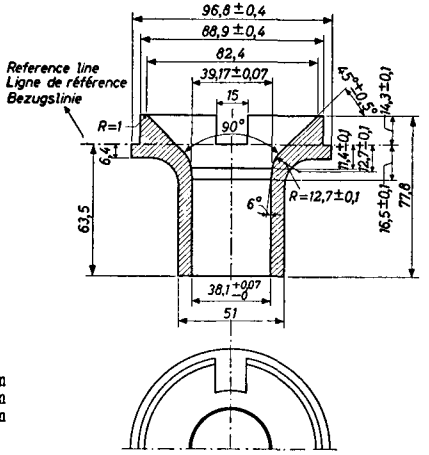
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Reference lir gauge
Calibre de la ligne de référence
Bezugslinienlehre



Dimensions in mm
Dimensions en mm
Abmessungen in mm

Deflection	magnetic
Déviation	magnétique
Ablenkung	magnetisch

Deflection angle; Angle de déviation; Ablenkungswinkel

Vertical	65°
Horizontal	85°
Diagonal	90°

Focusing	magnetic
Concentration	magnétique
Fokussierung	magnetisch

For focusing coil please refer to page 8
Pour la bobine de concentration voir page 8
Fokussierungsspule siehe Seite 8

Field intensity perpendicular to the tube axis for centering of the beam: 0 - 8 gausses

L'intensité de champ perpendiculaire à l'axe du tube pour centrer le faisceau est de 0 - 8 gauss

Feldstärke senkrecht zu der Röhrenachse zur Zentrierung des Elektronenstrahles: 0 - 8 Gauss

Ion trap magnet: Single magnet; field strength about 50 gausses. Type number 55402. For the procedure of setting up please refer to "Application directions" (page C107), in front of this section

Aimant du piège à ions: Aimant simple; intensité du champ environ 50 gauss. Numéro de type 55402. Pour le réglage voir "Indications d'application" (page C107), en tête de ce chapitre

Ionenfallenmagnet: Einfacher Magnet; Feldstärke etwa 50 Gauss. Typennummer 55402. Für die Einstellung siehe "Anwendungsrichtlinien" (Seite C107), am Anfang dieses Abschnitts

Operating characteristics
Caractéristiques d'utilisation
Betriebsdaten

$V_{a,g4}$	=	14	16 kV
V_{g2}	=	300	300 V
$-V_{g1}$ (I_l = 0 μA)	=	40-80	40-80 V
V_{g3}	=	0 300	0 300 V
Focusing coil current (at I_l = 100 μA) Intensité de courant de la bobine de concentration (à I_l = 100 μA) Strom durch die Fokussierungsspule (bei I_l = 100 μA)	=	100 107	105 113 mA

Deflection Déviation Ablenkung	magnetic magnétique magnetisch

Deflection angle; Angle de déviation; Ablenkungswinkel

Vertical	65°
Horizontal	85°
Diagonal	90°

Focusing Concentration Fokussierung	magnetic magnétique magnetisch

For focusing coil please refer to page 8
Pour la bobine de concentration voir page 8
Fokussierungsspule siehe Seite 8

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→

Limiting values (design centre values)
Caractéristiques limites (valeurs moyennes pour projets)
Grenzdaten (mittlere Entwicklungsdaten)

$V_{a,g4}$ (I_l = 0 µA)	= max.	18 kV
	= min.	12 kV
V_{g3}	= max.	500 V
$-V_{g3}$	= max.	100 V
V_{g2}	= max.	500 V
V_{g2}	= min.	200 V
V_{g1}	= max.	0 V
$-V_{g1}$	= max.	150 V
V_{g1_p}	= max.	2 V
V_{kf} (k pos.; f neg.)	= max.	200 V [1)] [2)]
V_{kf} (k neg.; f pos.)	= max.	125 V [2)]

Max. circuit values
Valeurs max. des éléments du montage
Max. Werte der Schaltungsteile

R_{kf}	=	[3)]
R_{g1}	=	1,5 MΩ
Z_{g1} (f = 50 c/s)	=	0,5 MΩ

1) During a warm-up period not exceeding 45 seconds the heater may be 410 V negative with respect to the cathode
Pendant une période d'échauffement ne dépassant pas 45 secondes, le filament peut être porté à un potentiel négatif de 410 V par rapport à la cathode
Während einer Anheizzeit von max. 45 Sekunden darf der Heizfaden 410 V negativ sein in bezug auf die Katode

2) In order to avoid excessive hum, the A.C. component of V_{kf} should be as low as possible and must not exceed 20 Veff
Pour éviter un ronflement excessif la composante alternative de V_{kf} sera la plus petite possible et ne dépassera pas 20 Veff
Zur Vermeidung von Brummstörungen muss die Wechselspannungskomponente von V_{kf} so klein wie möglich sein und darf sie jedenfalls 20 Veff nicht überschreiten

3) When the heater is supplied from a separate transformer R_{kf} = 1 MΩ. When the heater is in a series chain, or earthed Z_k (f = 50 c/s) = max. 0.1 MΩ
Quand le filament est alimenté par un transformateur séparé R_{kf} = 1 MΩ. Quand le filament est connecté dans une chaine série, ou est mis à la terre, Z_k(f =50 Hz) = max. 0,1 MΩ
Wenn der Heizfaden von einem separaten Transformator gespeist wird ist R_{kf} = 1 MΩ. Wenn der Heizfaden in einer Serienkette aufgenommen oder geerdet ist, Z_k (f = 50 Hz) = max. 0,1 MΩ

Limiting values (design centre values)
Caractéristiques limites (valeurs moyennes pour projets)
Grenzdaten (mittlere Entwicklungsdaten)

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$-V_{g3}$	= max.	100 V
V_{g2}	= max.	500 V
V_{g2}	= min.	200 V
V_{g1}	= max.	0 V
$-V_{g1}$	= max.	150 V
V_{g1_p}	= max.	2 V
V_{kf} (k pos.; f neg.)	= max.	200 V[1)2)]
V_{kf} (k neg.; f pos.)	= max.	125 V[2)]

Max. circuit values
Valeurs max. des éléments du montage
Max. Werte der Schaltungsteile

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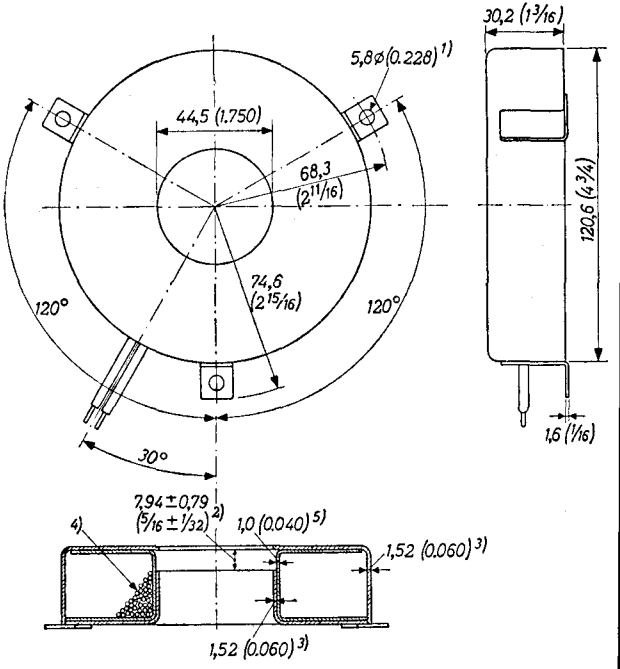
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Focusing coil
Bobine de concentration
Fokussierungsspule

Dimensions in mm and in inches (between brackets)
The dimensions in inches are holding

Dimensions en mm et en pouces (entre parenthèses)
Les dimensions en pouces sont de rigueur

Abmessungen in mm und Zoll (in Klammern)
Die Abmessungen in Zoll sind bindend



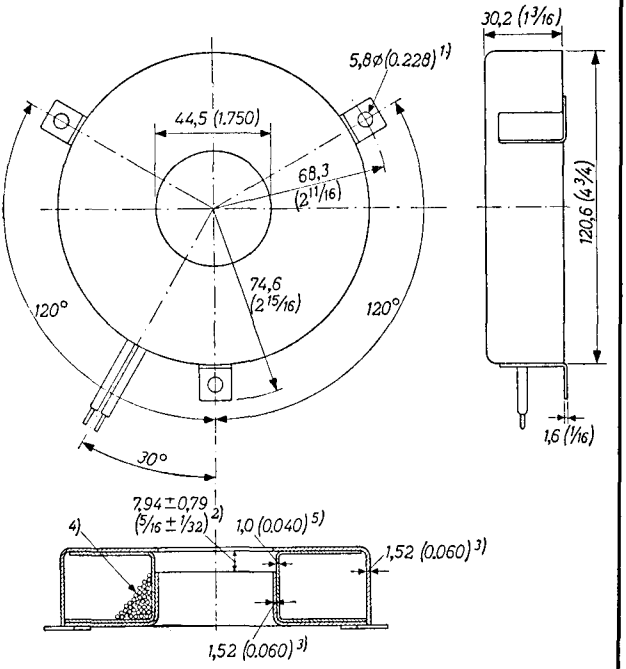
1)2)3)4)5) See page 9; voir page 9; siehe Seite 9

Focusing coil
Bobine de concentration
Fokussierungsspule

Dimensions in mm and in inches (between brackets)
The dimensions in inches are holding

Dimensions en mm et en pouces (entre parenthèses)
Les dimensions en pouces sont de rigueur

Abmessungen in mm und Zoll (in Klammern)
Die Abmessungen in Zoll sind bindend



1)2)3)4)5) See page 9; voir page 9; siehe Seite 9

→

Notes from page 8; Notes de la page 8; Noten von Seite 8

[1])3 holes; 3 trous; 3 Löcher

[2])Air gap; Entrefer; Luftspalt

[3])Cold rolled steel. After forming not less than 1.2 mm (0.047") thick
Acier laminé à froid. Après la formation, l'épaisseur sera de 1,2 mm (0.047") au minimum
Kaltgewalzter Stahl. Nach Formung soll die Dicke nicht weniger als 1,2 mm (0.047") betragen

[4])6800 turns enamelled copper wire; diameter 0.01126" (AWG no.29); 470 Ω D.C. resistance
6800 spires fil de cuivre émaillé d'un diamètre de 0.01126" (AWG no.29); résistance en C.C. 470 Ω
6800 Windungen emaillierter Kupferdraht; Durchmesser 0.01126" (AWG No.29); Gleichstromwiderstand 470 Ω

[5])Impregnated fiber; fibre imprégnée; Imprägnierte Fiber

Notes from page 8; Notes de la page 8; Noten von Seite 8

[1])3 holes; 3 trous; 3 Löcher

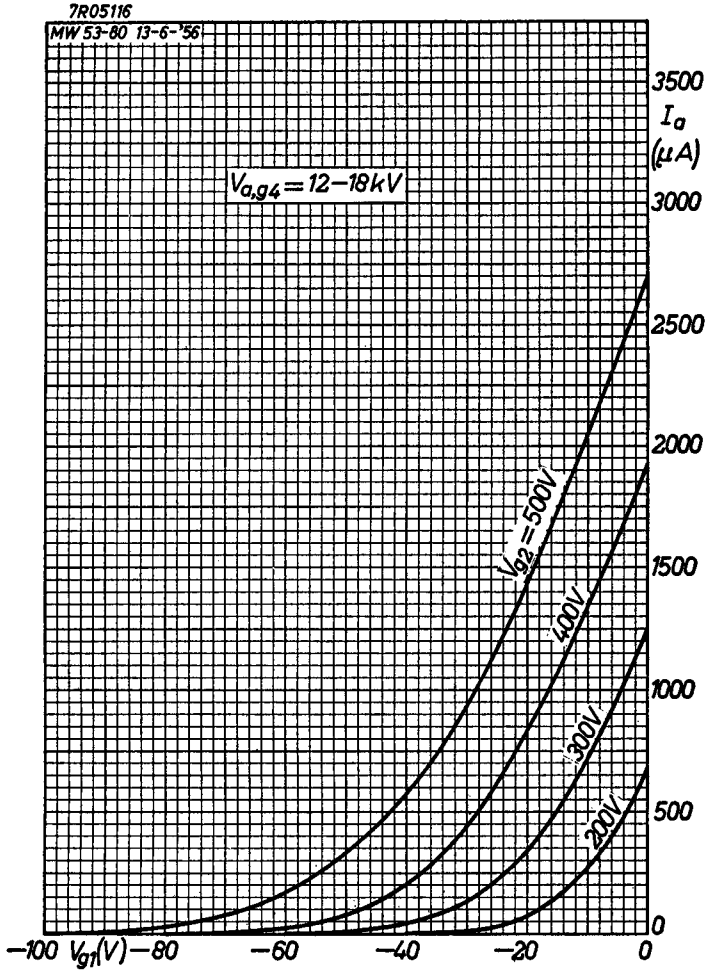
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[4])6800 turns enamelled copper wire; diameter 0.01126" (AWG no.29); 470 Ω D.C. resistance
6800 spires fil de cuivre émaillé d'un diamètre de 0.01126" (AWG no.29); résistance en C.C. 470 Ω
6800 Windungen emaillierter Kupferdraht; Durchmesser 0.01126" (AWG No.29); Gleichstromwiderstand 470 Ω

[5])Impregnated fiber; fibre imprégnée; Imprägnierte Fiber

PHILIPS **MW 61-80**



7.7.1957

A

PHILIPS

Electronic Tube

HANDBOOK

MW61-80

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8	4	1959.04.04
9	5	1957.11.11
10	5	1959.04.04
11	6	1957.11.11
12	6	1959.04.04
13	7	1957.07.07
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MW 6-2

TELEVISION PROJECTION TUBE
TUBE DE TELEVISION pour projection
PROJEKTIONSFERNSEHRÖHRE

Heating :	indirect by A.C. or D.C. series or parallel supply	
Chauffage:	indirect par C.A. ou C.C. alimentation série ou parallèle	V_f = 6,3 V[1])
Heizung	indirekt durch Wechsel- oder Gleichstrom; Serien- oder Parallelspeisung	I_f = 0,3 A

Capacitances Capacités Kapazitäten	C_{g1}	= 6,3 pF
	C_k	= 6,3 pF
	C_{am} [2])	= 450 pF

Screen Ecran Schirm	Colour Couleur Farbe	white blanche weiss
	Colour temperature Température de couleur Farbtemperatur	6500 °C
	Useful diameter Diamètre utile Nützlicher Durchmesser	min. 55 mm

[1]) When the tube is used in a series heater chain, the heater voltage must not exceed 9.5 V when the supply is switched on. If necessary a current limiting device must be used for this purpose.

Si le tube est monté dans une chaîne série de filaments, la tension de chauffage ne doit pas dépasser 9,5 V à la mise en circuit. En cas de besoin il faut utiliser un limiteur de courant pour ce but.

Wenn die Röhre in einer Heizfadenkette verwendet wird, darf die Heizspannung beim Einschalten 9,5 V nicht überschreiten. Nötigenfalls ist zu diesem Zweck ein Strombegrenzer zu verwenden.

[2]) m = outer coating; couche extérieure; Aussenbelag

TELEVISION PROJECTION TUBE
TUBE DE TELEVISION pour projection
PROJEKTIONSFERNSEHRÖHRE

Heating :	indirect by A.C. or D.C. series or parallel supply	
Chauffage:	indirect par C.A. ou C.C. alimentation série ou parallèle	V_f = 6,3 V [1]
Heizung	indirekt durch Wechsel- oder Gleichstrom; Serien- oder Parallelspeisung	I_f = 0,3 A

Capacitances Capacités Kapazitäten	C_{g1}	= 6,3 pF
	C_k	= 6,3 pF
	C_{am} [2]	= 450 pF

Screen Ecran Schirm	Colour Couleur Farbe	white blanche weiss
	Colour temperature Température de couleur Farbtemperatur	6500 °C
	Useful diameter Diamètre utile Nützlicher Durchmesser	min. 55 mm

[1] When the tube is used in a series heater chain, the heater voltage must not exceed 9.5 V when the supply is switched on. If necessary a current limiting device must be used for this purpose.

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TELEVISION PROJECTION TUBE
TUBE DE TELEVISION pour projection
PROJEKTIONSFERNSEHRÖHRE

Heating : indirect by A.C. or D.C. series or parallel supply Chauffage : indirect par C.A. ou C.C. alimentation série ou parallèle Heizung : indirekt durch Wechsel- oder Gleichstrom; Serien- oder Parallelspeisung	V_f = 6,3 V[1] I_f = 0,3 A	
Capacitances Capacités Kapazitäten	C_{g_1} =	6,3 pF
	C_k =	6,3 pF
	C_{am}[2] =	450 pF
Screen Ecran Schirm — Colour Couleur Farbe		white blanche weiss
Colour temperature Température de couleur Farbtemperatur		6500 °C
Useful diameter Diamètre utile Nützlicher Durchmesser	min.	55 mm

For curves of the screen properties see front of this section
Pour les courbes des propriétés de l'écran voir en tête de ce chapitre
Für die Kurven der Schirmeigenschaften siehe am Anfang dieses Abschnitts

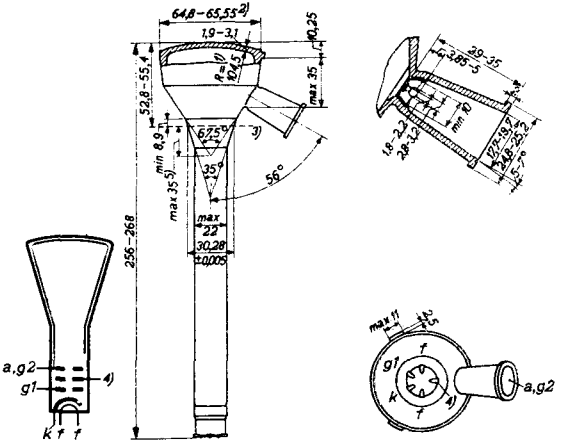
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Dimensions in mm
Dimensions en mm
Abmessungen in mm

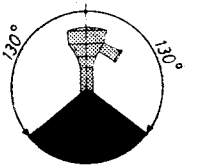
Base
Culot V
Sockel

The tolerance of the position of the base with respect to the tube is ± 10°

La tolérance de la position du culot au regard du tube est de ± 10°

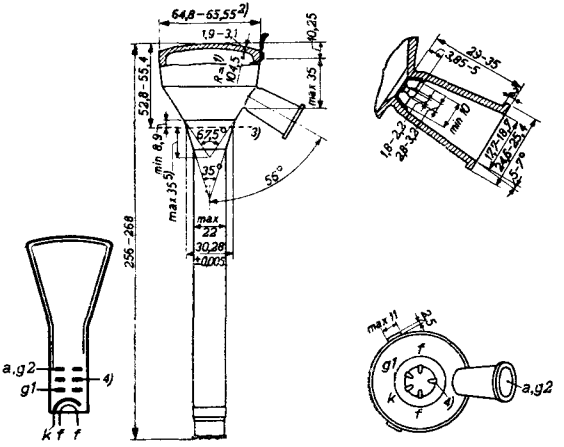
Die Toleranz der Lage des Fusses in bezug auf die Röhre ist ± 10°

Mounting position
Montage
Aufstellung



MW 6-2

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Dimensions in mm
Dimensions en mm
Abmessungen in mm

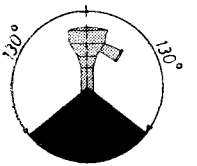
Base
Culot V
Sockel

The tolerance of the position of the base with respect to the tube is ± 10°

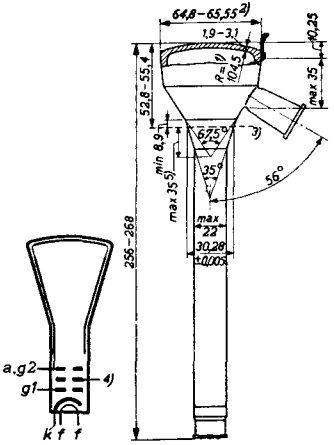
La tolérance de la position du culot au regard du tube est de ± 10°

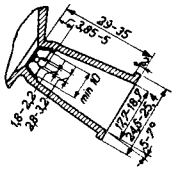
Die Toleranz der Lage des Fusses in bezug auf die Röhre ist ± 10°

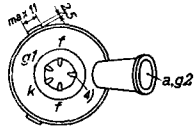
Mounting position
Montage
Aufstellung



PHILIPS







Dimensions in mm
Dimensions en mm
Abmessungen in mm

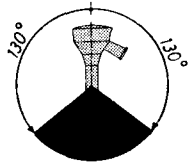
Base
Culot V
Sockel

The tolerance of the position of the base with respect to the tube is ± 10°

La tolérance de la position du culot au regard du tube est de ± 10°

Die Toleranz der Lage des Fusses in bezug auf die Röhre ist ± 10°

Mounting position
Montage
Aufstellung



Operating characteristics Données d'opération Betriebsdaten	V_a	= 25 kV
	$-V_g(I_a = 0)$	= 40-90 V
Limiting values Caractéristiques limites Grenzdaten	V_a	= max. 25 kV [6]
	$-V_g$	= max. 200 V [5]
	R_g	= max. 1,5 MΩ
	R_{kf}	= max. 20 kΩ
	V_{kf}	= max. 125 V [5]

[3] Reference line, determined by the diameter of 30.28 ± 0.005 mm

Ligne de référence, déterminée par le diamètre de 30,28 ± 0,005 mm

Bezugslinie, bestimmt durch den Durchmesser von 30,28 ± 0,005 mm

[4] Spark trap and outer coating. This connection must be connected to earth.

Trappe à étincelles et couche extérieure. Cette connexion doit être mise à la terre.

Funkenfänger und äussere Schicht. Dieser Anschluss muss geerdet werden.

[5] $-V_g$ = max. 300 V and V_{kf} = max. 250 V during the operation of a security circuit, preventing the light screen from being damaged when the deflection circuits fail.

$-V_g$ = max. 300 V et V_{kf} = max. 250 V pendant le temps de fonctionnement d'un circuit de protection, prévenant l'écran luminescent d'être endommagé si les circuits de déviation sont défauts.

$-V_g$ = max. 300 V und V_{kf} = max. 250 V während der Wirkung einer Schutzschaltung zur Verhütung einer Beschädigung des Leuchtschirmes wenn die Ablenkschaltungen defekt werden.

[6] At nominal mains voltage and with a raster area of at least 14 cm^2 and a spot velocity of at least 450 m/s the load curve of the E.H.T. unit should not at any point go beyond the curve I on page C. It is desirable that under these conditions the design load curve is in accordance with curve II. The product $V_o \times I_o$ must never exceed 7 W. The total charge of the filter capacitors in the supply unit should not exceed 130 μC. The curves on page C refer to application of the MW 6-2 in normal television receivers. In case of ←

See further page 4; voir page 4; siehe Seite 4.

Net weight Poids net Nettogewicht	145 g
Shipping weight (10 pieces) Poids brut (10 pièces) Bruttogewicht (10 Stück)	7850 g

---

1) Inner radius of curvature of the face plate
The deviation of the centre of the outer radius of curvature with respect to the centre line of the neck is max. 2 mm

Rayon de courbure intérieure du front
La déviation du centre du rayon de courbure extérieure au regard de l'axe du col est de 2 mm au max.

Innerer Krümmungsradius der Vorderplatte
Die Abweichung des Mittelpunktes des äusseren Krümmungsradius in bezug auf die Achse des Röhrenhalses ist max. 2 mm

2) Eccentricity of the face plate with respect to the centre line of the neck max.0.9 mm

Excentricité du front au regard de l'axe du col 0,9 mm max.

Exzentrizität der Vorderplatte in bezug auf die Achse des Röhrenhalses max. 0,9 mm

3) Reference line, determined by the diameter of 30.28 ± 0.005 mm

Ligne de référence, déterminée par le diamètre de 30,28 ± 0,005 mm

Bezugslinie, bestimmt durch den Durchmesser von 30,28 ± 0,005 mm

4) Spark trap and outer coating. This connection must be earthed

Trappe à étincelles et couche extérieure. Cette connexion doit être mise à la terre

Funkenfanger und Aussenbelag. Dieser Anschluss muss geerdet werden

5) The distance from deflection centre to reference line should not exceed 35 mm

La distance du centre de déviation au ligne de référence ne dépassera pas 35 mm

Der Abstand des Ablenkungsmittelpunktes bis zur Bezugslinie soll 35 mm nicht überschreiten

other applications the average current, consumed by the MW 6-2, should be limited to 200 µA.

A la tension de réseau nominale et avec une surface de l'image de 14 cm^2 au moins et une vitesse de la tâche de 450 m/s au moins la courbe de charge du dispositif de haute tension ne dépassera pas en quelque point la courbe I page C. Dans ces conditions il est désirable que la courbe de charge projetée corresponde à la courbe II. La produit V_o x I_o ne dépassera jamais la valeur de 7 W.
La charge totale des condensateurs du filtre du dispositif de haute tension ne dépassera pas 130 µC.
Les courbes sur page C se rapportent à l'application du MW 6-2 dans des récepteurs de télévision normaux. En cas d'autres applications le courant moyen consommé par le MW 6-2 sera limité à 200 µA. ←

Beim Nennwert der Netzspannung und mit einer Bildoberfläche von mindestens 14 cm^2 und einer Fleckgeschwindigkeit von mindestens 450 m/s darf die Belastungskurve des Hochspannungsgerätes die auf Seite C angegebene Kurve I nirgends überschreiten. Unter diesen Bedingungen ist es erwünscht dass die geplante Belastungskurve übereinstimmt mit der Kurve II. Das Produkt V_o x I_o soll einen Wert von 7 W niemals übersteigen.
Die Gesamtladung der Filterkondensatoren des Hochspannungsgerätes darf einen Wert von 130 µC nicht überschreiten.
Die Kurven auf Seite C beziehen sich auf die Anwendung der MW 6-2 in normalen Fernsehempfängern. ← Bei anderen Anwendungen soll der Mittlere Stromverbrauch der MW 6-2 begrenzt werden auf 200 µA.

Deflection and focusing Déviation et concentration Ablenkung und Fokussierung	magnetic magnétique magnetisch
Deflection angle L'angle de déviation Ablenkungswinkel	max. 67,5°
Focusing coil:	with iron casing
Number of ampere-turns (V_a = 25 kV)	920[1])
Air gap	11 - 13 mm
Distance from the centre of the air gap to the reference line	83 - 87 mm
Inner diameter of the inner bush	27.5 mm
For centering it is necessary that the focusing coil can be tilted over 2.5-3° to either side	
Bobine de concentration:	avec boîte de fer
Nombre d'ampère-tours (V_a=25 kV)	920[1])
Entrefer	11 - 13 mm
Distance du milieu de l'entrefer à la ligne de référence	83 - 87 mm
Diamètre interne de la boîte	27,5 mm
Pour le centrage il faut que l'on puisse incliner la bobine de 2,5-3° de toutes côtés	
Fokussierungsspule:	mit eisernem Gehäuse
Amperewindungszahl (V_a = 25 kV)	920[1])
Luftspalt	11 - 13 mm
Abstand von der Lufspaltmitte bis zur Bezugslinie	83 - 87 mm
Innendurchmesser der inneren Buchse	27,5 mm
Zur Zentrierung muss die Spule nach allen Seiten über 2,5-3° geneigt werden können	

Operating characteristics
Caractéristiques d'utilisation
Betriebsdaten

V_a	= 25 kV
$-V_{g1}(I_a=0)$	= 40-90 V

---

[1])See page 5; voir page 5; siehe Seite 5

Focusing (magnetic)

Number of ampere-turns necessary for focusing at Va = 25 kV	920[1])
Air gap in the magnetic circuit	11 - 13 mm
Distance from the centre of the air gap to the reference line	83 - 87 mm
Inner diameter of the inner bush of the focusing coil	27.5 mm

For centering the picture on the screen it is necessary that the focusing coil can be tilted over 2.5-3° to either side.

Deflection (double magnetic) $N = \frac{0.3 \times P \times H \times cL}{\sqrt{Va}}$ cm, where

N = the deflection on the screen in cm

P = the distance between the deflection centre and the screen in cm

H = the max. magnetic field strength in gauss

c = a correction factor, in most cases = $\frac{1}{2}$

L = the length of the coil windings in cm

The deflection centre can be assumed to coincide with the max. magnetic field strength. In order to prevent the electron beam from being blocked by the outer end of the tube neck at maximum deflection, the distance from the deflection centre to the reference line should not exceed 35 mm.

General observations

Measures should be taken for the anode current to be switched off immediately when one of the time-base circuits becomes defective.
Bombardment of the face plate of the tube by a 25 kV electron beam produces soft X-rays against which the observer should be protected. It is therefore necessary to incorporate a screening with an equivalent lead thickness of 0.5 mm. When the tube is used in an optical box, the screening by the box will in general be sufficient.

[1]) This figure applies for the case where the iron casing of the focusing coil is of such a thickness that there is no saturation. It is, however, advisable that the iron should be saturated to such an extent that the required number of ampere turns becomes about 10% higher, thereby greatly reducing the influence of voltage fluctuations on focusing.

Limiting values
Caractéristiques limites
Grenzdaten

V_a	= max.	25 kV[2]
$-V_{g1}$	= max.	200 V[3]
R_{g1}	= max.	1,5 MΩ
R_{kf}	= max.	20 kΩ
V_{kf}	= max.	125 V[3]

General observations

Measures should be taken for the anode current to be switched off immediately when one of the time-base circuits becomes defective.
An X-ray radiation shielding with an equivalent lead thickness of 0.5 mm is required to protect the observer. When the tube is used in an optical box, the screening by the box will in general be sufficient.

Observations générales

Il faut prendre des mesures pour interrompre le courant anodique immédiatement après un dérangement d'une des bases de temps.
Pour la protection de l'observateur il faut incorporer un blindage contre des rayons X d'une épaisseur équivalente de plomb de 0,5 mm. Si le tube est utilisé dans une boîte optique, le blindage fourni par la boîte est généralement suffisant.

Allgemeine Bemerkungen

Es sind besondere Massnahmen notwendig, damit der Anodenstrom unmittelbar nach dem Ausfallen einer der Zeitbasisschaltungen ausgeschaltet wird.
Um den Beobachter gegen Röntgenstrahlen zu schützen ist es notwendig eine Abschirmung mit einer Bleiäquivalenz von 0,5 mm an zu bringen. Wird die Röhre in einem optischen Gehäuse verwendet, so wird dieses im allgemeinen zur Abschirmung genügen.

---

1) Without saturation of the iron casing.
In order to reduce the influence of voltage fluctuations it is, however, advisable to saturate the iron to such an extend that the required number of ampere-turns becomes about 10% higher

Sans saturation de la boîte de fer.
Pour diminuer l'influence des variations de la tension il est, cependant, recommandé de saturer le fer de telle sorte que le nombre d'ampère-tours soit augmenté d'environ 10%

Ohne Sättigung des eisernen Gehäuses.
Um die Einfluss von Spannungsschwankungen zu verringern empfiehlt es sich jedoch das Eisen so weit zu sättigen dass die benötigte Amperewindungszahl um etwa 10% erhöht wird.

2),3) See page 6; voir page 6; siehe Seite 6

Limiting values
Caractéristiques limites
Grenzdaten

V_a	= max.	25 kV[2])
$-V_{g1}$	= max.	200 V[3])
R_{g1}	= max.	1,5 MΩ
R_{kf}	= max.	20 kΩ
V_{kf}	= max.	125 V[3])

General observations

Measures should be taken for the anode current to be switched off immediately when one of the time-base circuits becomes defective.
An X-ray radiation shielding with an equivalent lead thickness of 0.5 mm is required to protect the observer. When the tube is used in an optical box, the screening by the box will in general be sufficient.

Observations générales

Il faut prendre des mesures pour interrompre le courant anodique immédiatement après un dérangement d'une des bases de temps.
Pour la protection de l'observateur il faut incorporer un blindage contre des rayons X d'une épaisseur équivalente de plomb de 0,5 mm. Si le tube est utilisé dans une boîte optique, le blindage fourni par la boîte est généralement suffisant.

Allgemeine Bemerkungen

Es sind besondere Massnahmen notwendig, damit der Anodenstrom unmittelbar nach dem Ausfallen einer der Zeitbasisschaltungen ausgeschaltet wird.
Um den Beobachter gegen Röntgenstrahlen zu schützen ist es notwendig eine Abschirmung mit einer Bleiäquivalenz von 0,5 mm an zu bringen. Wird die Röhre in einem optischen Gehäuse verwendet, so wird dieses im allgemeinen zur Abschirmung genügen.

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Pour diminuer l'influence des variations de la tension il est, cependant, recommandé de saturer le fer de telle sorte que le nombre d'ampère-tours soit augmenté d'environ 10%

Ohne Sättigung des eisernen Gehäuses.
Um die Einfluss von Spannungsschwankungen zu verringern empfiehlt es sich jedoch das Eisen so weit zu sättigen dass die benötigte Amperewindungszahl um etwa 10% erhöht wird.

2),3)See page6; voir page 6; siehe Seite 6

Focalisation (magnétique)

Nombre d'ampère-tours nécessaires pour la focalisation à Va = 25 kV	920[1])
Entrefer dans le circuit magnétique	11 - 13 mm
Distance du milieu de l'entrefer à la ligne de référence	83 - 87 mm
Diamètre interne de la boîte de la bobine de focalisation	27,5 mm

Pour le centrage de l'image sur l'écran il faut que l'on puisse incliner la bobine de focalisation de 2,5 - 3° de toutes côtés.

Déviation (magnétique double) $N = \frac{0{,}3 \times P \times H \times cL}{\sqrt{Va}}$ cm, ou

N = la déviation sur l'écran en cm

P = la distance entre le centre de déviation et l'écran en cm

H = l'intensité max. du champ magnétique en gauss

c = un facteur de correction, en général = $\frac{1}{2}$

L = la longueur des enroulements de bobine en cm

Le centre de déviation peut être supposé coincidant avec le maximum de l'intensité du champ magnétique. Pour prévenir le faisceau électronique d'être intercepté à la déviation maximum par l'extrémité du col du tube, la distance entre le centre de déviation et la ligne de référence ne dépassera pas 35 mm.

Observations générales

Il faut prendre des mesures pour interrompre le courant anodique immédiatement après un dérangement d'une des bases de temps.
Le bombardement de l'écran par le faisceau électronique de 25 kV produit des rayons X doux, contre les quels l'observateur doit être protégé. Pour cette raison il faut incorporer un blindage d'une épaisseur équivalente de plomb de 0,5 mm. Si le tube est utilisé dans une boîte optique, le blindage fourni par la boîte est généralement suffisant.

[1]) Ce nombre s'applique au cas où l'épaisseur de paroi de la boîte de la bobine de focalisation est suffisante pour prévenir la saturation. Il est cependant recommandé de saturer le fer de telle sorte que le nombre d'ampère-tours soit augmenté d'environ 10%. Par cette mesure l'influence des variations de la tension sur la focalisation est diminuée fortement.

[2]) At nominal mains voltage and with a raster area of at least 14 cm^2 and a spot velocity of at least 450 m/s the load curve of the E.H.T. unit should not at any point go beyond the curve I on page C. It is desirable that under these conditions the design load curve is in accordance with curve II. The product V_ℓ x I_ℓ must never exceed 7 W.
The total charge of the filter capacitors in the supply unit should not exceed 130 μC
The curves on page C refer to application of the MW 6-2 in normal television receivers. In case of other applications the average current, consumed by the MW 6-2, should be limited to 200 μA

A la tension de réseau nominale et avec une surface de l'image de 14 cm^2 au moins et une vitesse de la tâche de 450 m/s au moins la courbe de charge du dispositif de haute tension ne dépassera pas en quelque point la courbe I page C. Dans ces conditions il est désirable que la courbe de charge projetée corresponde à la courbe II. La produit V_ℓ x I_ℓ ne dépassera jamais la valeur de 7 W.
La charge totale des condensateurs du filtre du dispositif de haute tension ne dépassera pas 130 μC.
Les courbes sur page C se rapportent à l'application du MW6-2 dans des récepteurs de télévision normaux. En cas d'autres applications le courant moyen consommé par le MW 6-2 sera limité à 200 μA.

Beim Nennwert der Netzspannung und mit einer Bildoberfläche von mindestens 14 cm^2 und einer Fleckgeschwindigkeit von mindestens 450 m/s darf die Belastungskurve des Hochspannungsgerätes die auf Seite C angegebene Kurve I nirgends überschreiten. Unter diesen Bedingungen ist es erwünscht dass die geplante Belastungskurve übereinstimmt mit der Kurve II. Das Produkt V_ℓ xI_ℓ soll einen Wert von 7 W niemals übersteigen.
Die Gesamtladung der Filterkondensatoren des Hochspannungsgerätes darf einen Wert von 130μC nicht überschreiten.
Die Kurven auf Seite C beziehen sich auf die Anwendung der MW 6-2 in normalen Fernsehempfängern. Bei anderen Anwendungen soll der Mittlere Stromverbrauch der MW6-2 begrenzt werden auf 200 μA.

[3]) During the operation of the security circuit — $-V_\ell$ = max. 300 V
Pendant le fonctionnement du circuit de protection — V_{kf} = max. 250 V
Während der Wirkung der Schutzschaltung

[2]) At nominal mains voltage and with a raster area of at least 14 cm² and a spot velocity of at least 450 m/s the load curve of the E.H.T. unit should not at any point go beyond the curve I on page C. It is desirable that under these conditions the design load curve is in accordance with curve II

The total charge of the filter capacitors in the supply unit should not exceed 130 µC
The curves on page C refer to application of the MW6-2 in normal television receivers. In case of other applications the average current, consumed by the MW6-2, should be limited to 200 µA

A la tension de réseau nominale et avec une surface de l'image de 14 cm² au moins et une vitesse de la tâche de 450 m/s au moins la courbe de charge du dispositif de haute tension ne dépassera pas en quelque point la courbe I page C. Dans ces conditions il est désirable que la courbe de charge projetée corresponde à la courbe II

La charge totale des condensateurs du filtre du dispositif de haute tension ne dépassera pas 130 µC
Les courbes sur page C se rapportent à l'application du MW6-2 dans des récepteurs de télévision normaux, En cas d'autres applications le courant moyen consommé par le MW6-2 sera limité à 200 µA

Beim Nennwert der Netzspannung und mit einer Bildoberfläche von mindestens 14 cm² und einer Fleckgeschwindigkeit von mindestens 450 m/s darf die Belastungskurve des Hochspannungsgerätes die auf Seite C angegebene Kurve I nirgends überschreiten. Unter diesen Bedingungen ist es erwünscht dass die geplante Belastungskurve übereinstimmt mit der Kurve II

Die Gesamtladung der Filterkondensatoren des Hochspannungsgerätes darf einen Wert von 130 µC nicht überschreiten
Die Kurven auf Seite C beziehen sich auf die Anwendung der MW6-2 in normalen Fernsehempfängern. Bei anderen Anwendungen soll der mittlere Stromverbrauch der MW6-2 begrenzt werden auf 200 µA

[3]) During the operation of the security circuit
Pendant le fonctionnement du circuit de protection
Während der Wirkung der Schutzschaltung

$-V_g$ = max. 300 V
V_{kf} = max. 250 V

Fokussierung (magnetisch)

Amperewindungszahl zur Fokussierung bei Va = 25 kV	920[1])
Luftspalt im magnetischen Kreis	11 - 13 mm
Abstand von der Luftspaltmitte bis zur Bezugslinie	83 - 87 mm
Innendurchmesser der inneren Buchse der Fokussierungsspule	27,5 mm

Zur Zentrierung des Bildes auf dem Schirm muss die Fokussierungsspule nach allen Seiten über 2,5 - 3° geneigt werden können.

Ablenkung (doppelmagnetisch)

$$N = \frac{0{,}3 \times P \times H \times cL}{\sqrt{Va}} \text{ cm}, \quad \text{wo}$$

N = die Ablenkung auf dem Schirm in cm

P = der Abstand zwischen dem Ablenkungsmittelpunkt und dem Schirm in cm

H = die max. magnetische Feldstärke in Gauss

c = ein Korrektionsfaktor, im allgemeinen = $\frac{1}{2}$

L = die Länge der Spulenwindungen in cm

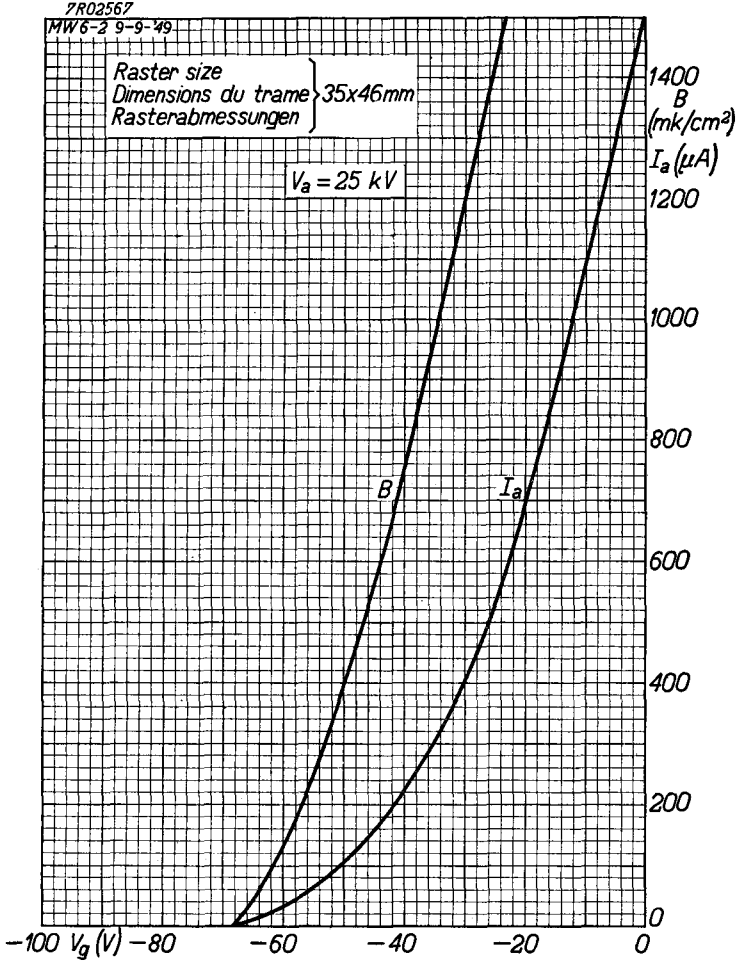
Der Ablenkungsmittelpunkt fällt gewöhnlich mit dem Höchstwert der magnetischen Feldstärke zusammen. Um zu verhüten, dass der Elektronenstrahl während der grössten Ablenkung am äusseren Ende des Röhrenhalses unterbrochen wird, darf der Abstand vom Ablenkungsmittelpunkt bis zur Bezugslinie 35 mm nicht überschreiten.

Allgemeine Bemerkungen

Es sind besondere Massnahmen notwendig, damit der Anodenstrom unmittelbar nach dem Ausfallen einer der Zeitbasisschaltungen ausgeschaltet wird.
Das Bombardieren des Schirmes durch einen 25kV Elektronenstrahl verursacht weiche Röntgenstrahlen, vor denen der Beobachter geschützt werden muss. Es ist deshalb eine Abschirmung mit einer Bleiäquivalenz von 0,5 mm notwendig. Wird die Röhre in einem optischen Gehäuse verwendet, so wird dieses im allgemeinen zur Abschirmung genügen.

---

[1]) Diese Zahl bezieht sich auf den Fall, wo die Wandstärke des eisernen Gehäuses der Fokussierungsspule genügt zur Vermeidung der Sättigung. Es empfiehlt sich jedoch, das Eisen so weit zu sättigen dass die benötigte Amperewindungszahl um etwa 10% erhöht wird. Bei dieser Massnahme wird der Einfluss von Spannungsschwankungen auf die Fokussierung stark verringert.

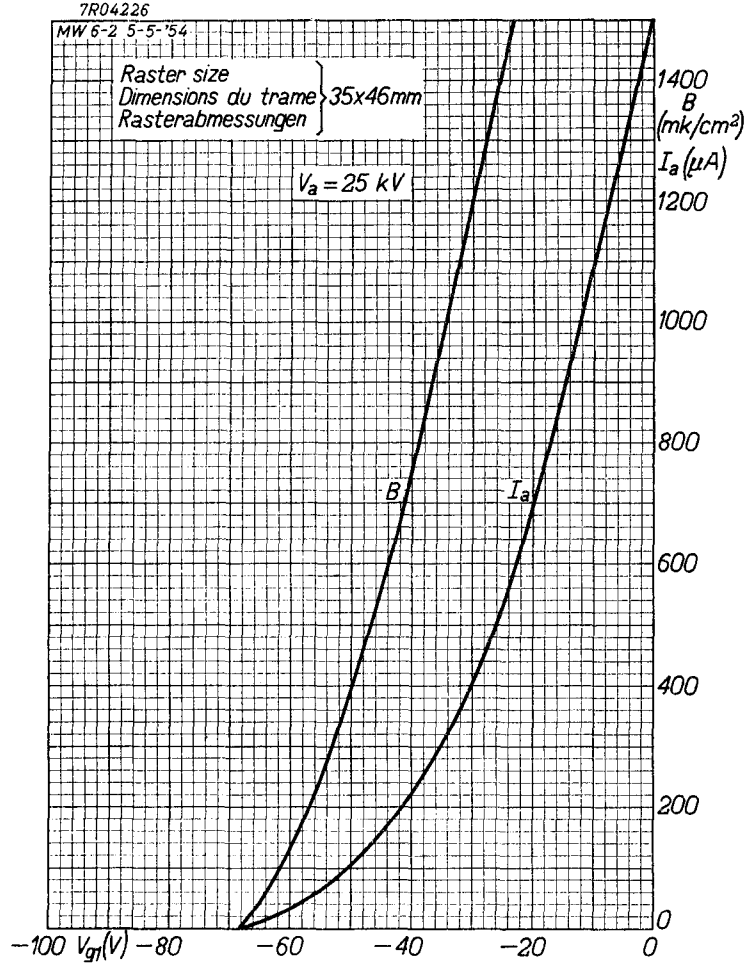

7R02567
MW6-2 9-9-49
Raster size
Dimensions du trame
Rasterabmessungen
35x46mm
$V_a = 25$ kV
B
I_a
1400
1200
1000
800
600
400
200
0
B (mk/cm²)
I_a (μA)
−100 V_g (V) −80
−60
−40
−20
0

10.10.1949

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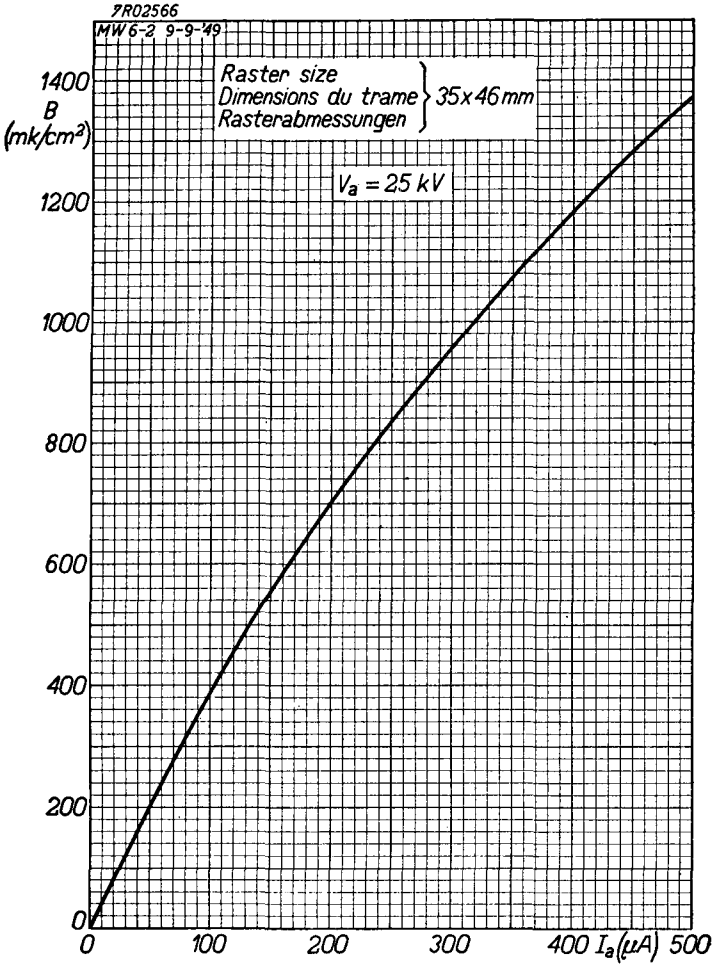
MW6-2



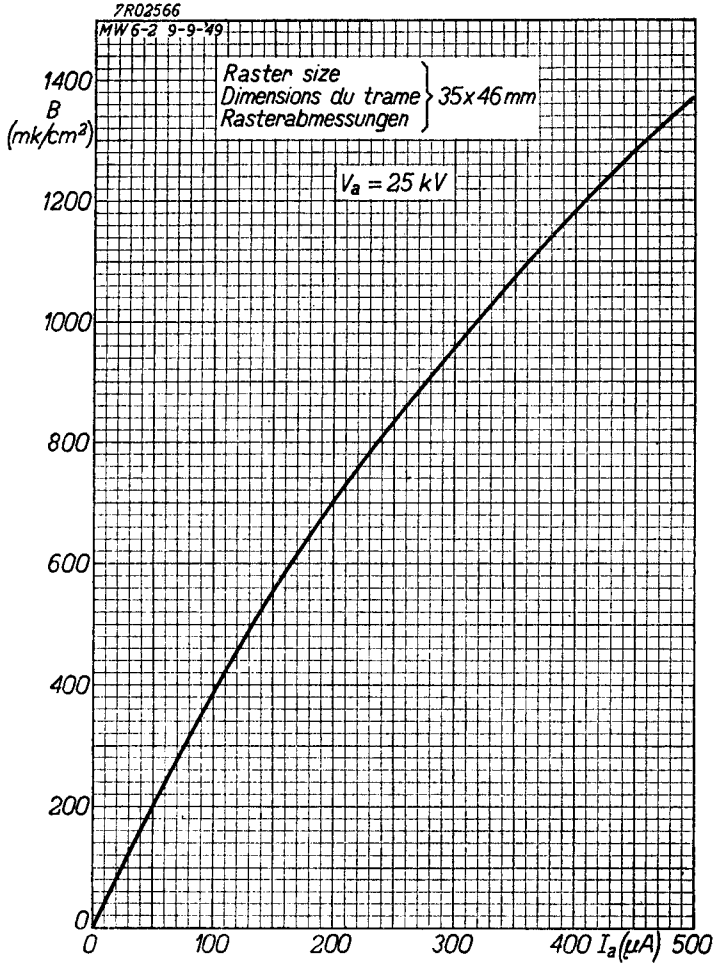
5.5.1954

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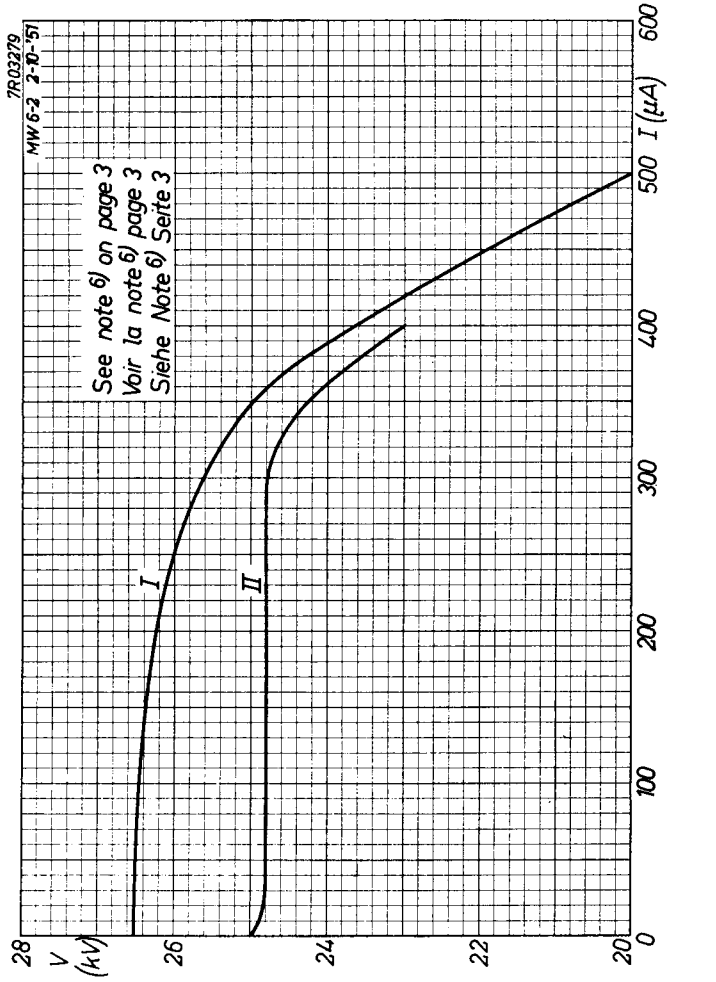

7R02566
MW6-2 9-9-49
Raster size
Dimensions du trame
Rasterabmessungen
35x46mm
$V_a = 25$ kV
B (mk/cm²)
1400
1200
1000
800
600
400
200
0
0
100
200
300
400
I_a(μA)
500

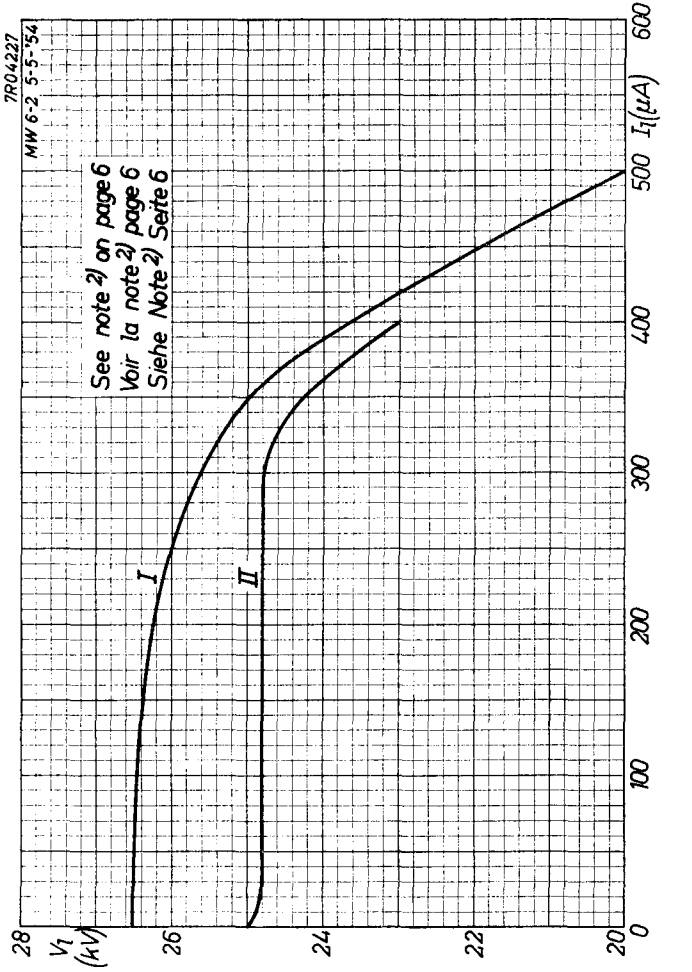
MW6-2 **PHILIPS**



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MW6-2




7R04227
MW 6-2 5-5-'54
See note 2) on page 6
Voir la note 2) page 6
Siehe Note 2) Seite 6
I
II
V1 (kV)
28
26
24
22
20
0
100
200
300
400
500
600
I1(μA)

PHILIPS

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1	1	1954.03.03
2	1	1954.06.06
3	1	1956.04.04
4	2	1954.03.03
5	2	1954.06.06
6	2	1956.04.04
7	3	1951.11.11
8	3	1954.03.03
9	4	1951.11.11
10	4	1954.03.03
11	5	1950.11.11
12	5	1954.03.03
13	5	1955.10.10
14	6	1950.11.11
15	6	1954.03.03
16	6	1955.10.10
17	7	1950.11.11
18	A	1949.10.10
19	A	1954.05.05

20	B	1949.10.10
21	B	1954.05.05
22	C	1951.10.10
23	C	1954.05.05
24, 25	FP	2000.07.16

CADMIUM SULFIDE PHOTOCONDUCTIVE CELL with top sensitivity
CELLULE PHOTOCONDUCTRICE A SULFURE DE CADMIUM avec la surface sensible du côté supérieur
KADMIUMSULFID PHOTOLEITER für frontalen Lichteinfall

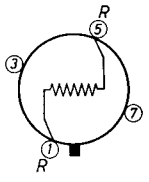
Application: Flame control, smoke detection, industrial on-off switching
Application: Contrôle de flammes, détection de fumées, commutation industrielle "en circuit-hors circuit"
Anwendung : Flammenüberwachung, Rauchmeldung, industrielle Ein-Ausschalter

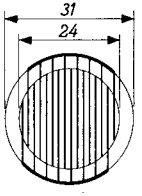
The symbols used in these data are those normally used for semiconductors. See List of Symbols for Semi-Conductors, pages Sem 501-505

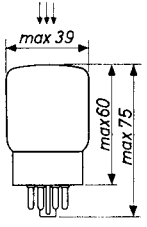
Les symboles utilisés pour les données suivantes sont ceux utilisés normalement pour les semi-conducteurs. Voir la Liste de Symboles pour Semi-Conducteurs, pages Sem 501-505

Die für diesen Daten verwendeten Symbole sind die für die Halbleiter üblichen. Siehe die Symbolenliste für Halbleiter, Seite Sem 501-505

Dimensions in mm
Dimensions en mm
Abmessungen in mm







Base, culot, Sockel: OCTAL

The arrows indicate the direction of the incident light
Les flèches indiquent la direction de la lumière incidente
Die Pfeile zeigen die Richtung des einfallenden Lichtes

Total area to be illuminated	7.5 cm^2
Sensitive part of this area	4.5 cm^2
Surface totale à être éclairée	7,5 cm^2
Partie sensible de cette surface	4,5 cm^2
Zu beleuchtende Fläche	7,5 cm^2
Empfindlicher Teil dieser Fläche	4,5 cm^2

Characteristics
Caractéristiques
Kenndaten

V	=	10	10	V
Illumination Éclairement Beleuchtungsstärke	=	50	53,8	lux
Colour temperature Température de couleur Farbtemperatur	=	1500	2700	°K
I	>	24	12	mA
	=	60	30	mA
	<	96	48	mA
V	=		300	V
T_{amb}	=		25	°C
Dark current Courant d'obscurité Dunkelstrom	=	max. 5		µA [1]

Limiting values (Absolute limits)
Caractéristiques limites (Limites absolues)
Grenzdaten (Absolute Grenzen)

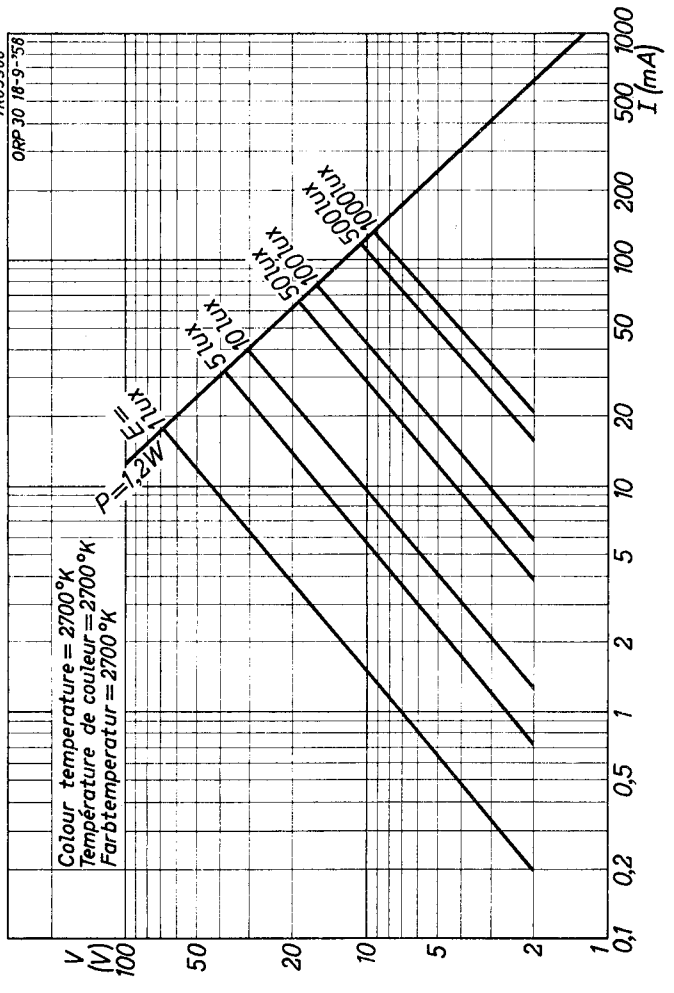
$V_{=}$	= max. 350	V
$V_{\sim}$	= max. 250	V
P (T_{amb} = 25 °C)	= max. 1,2	W
P (T_{amb} = 70 °C)	= max.0,35	W
T_{amb}	= -40°C/+70°C	

Remark : It is recommended that the photocell be stored in the dark
Observation: Il est recommandé d'emmagasiner le cellule dans l'obscurité
Bemerkung : Es wird empfohlen der Photoleiter im Dunkeln zu lagern

---

[1]) The current falls after the light has been removed, but there will be some delay before the value of 5 µA is reached
Le courant diminue après que la lumière à été éloignée mais il y aura quelque délai avant que la valeur de 5 µA soit atteinte
Nachdem das Licht entfernt ist, wird der Strom abnehmen aber der Wert von 5 µA wird erst nach einiger Verzögerung erreicht werden

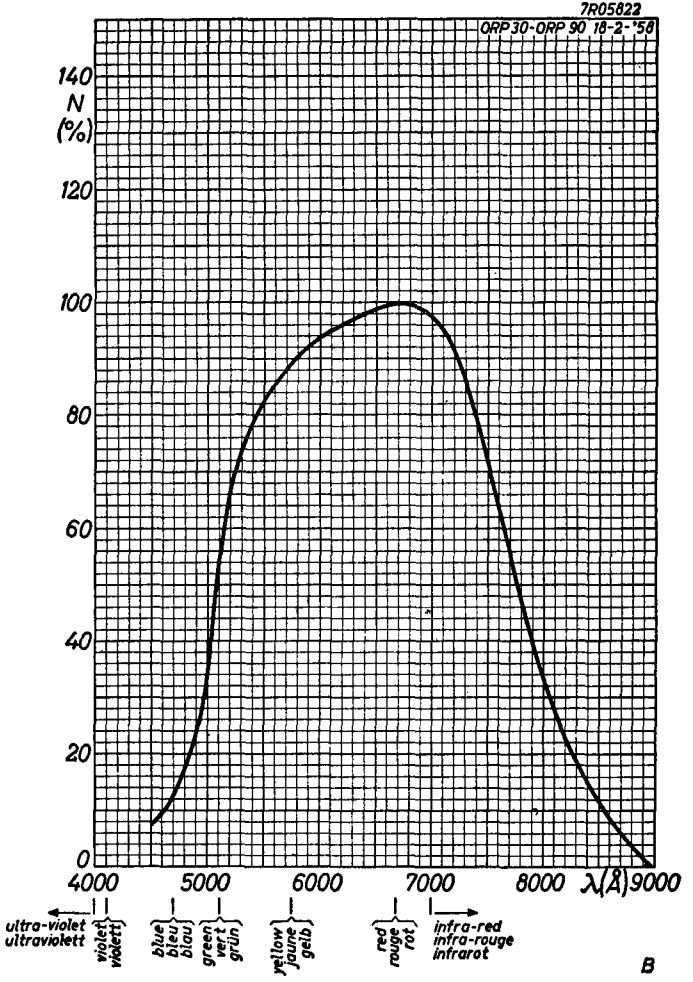
PHILIPS ORP 30



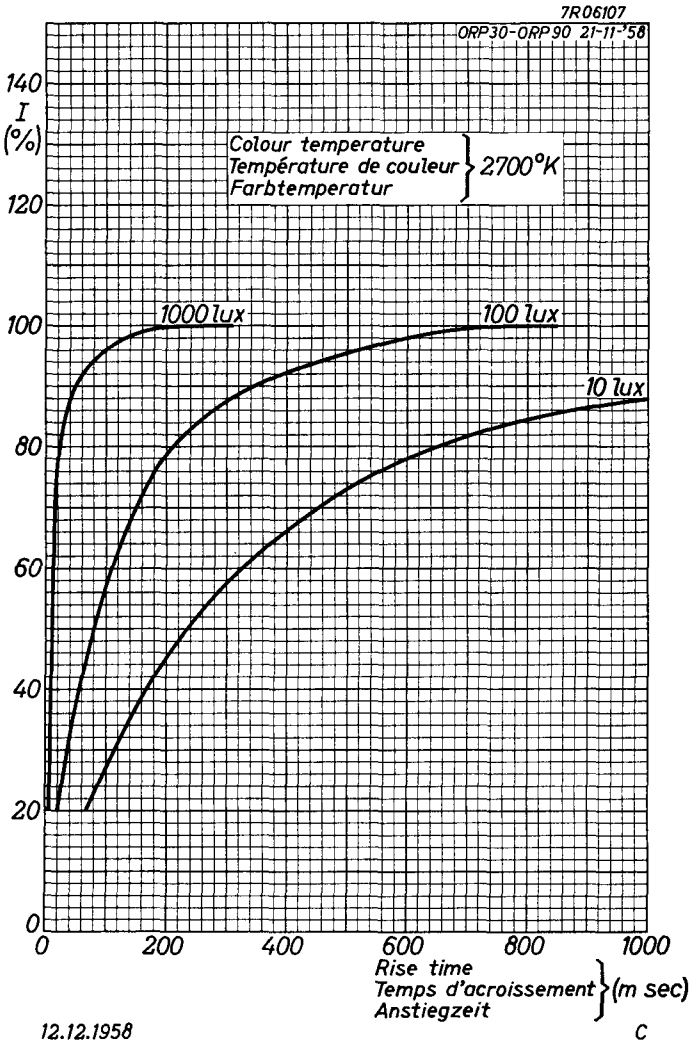
9.9.1958

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ORP 30 PHILIPS



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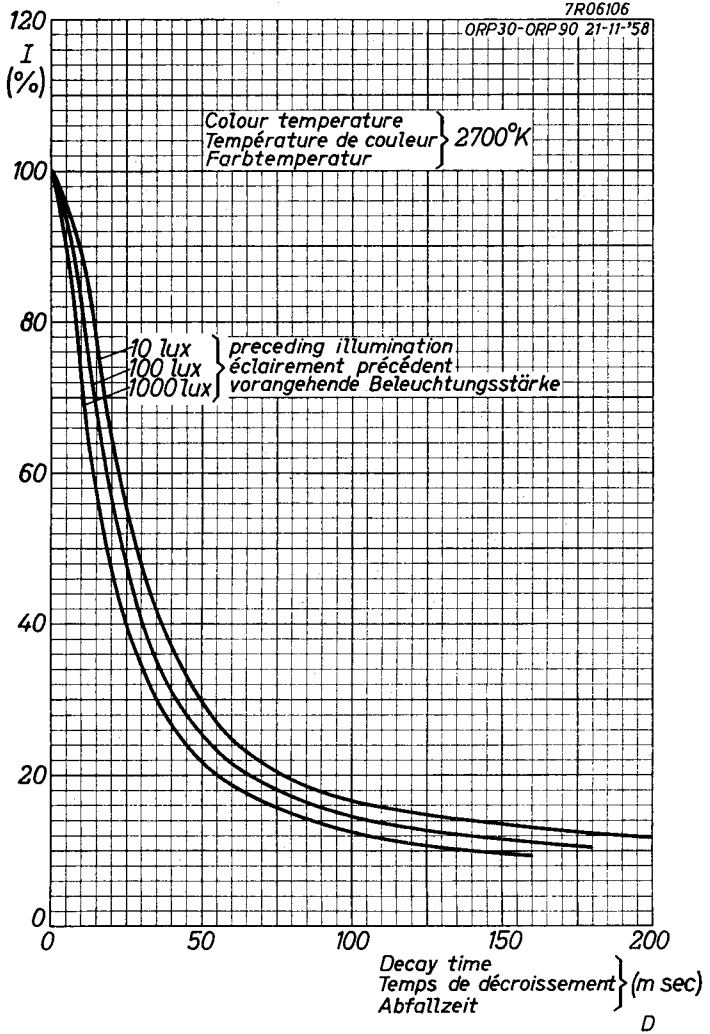


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D

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Electronic Tube

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3	A	1958.09.09
4	B	1958.09.09
5	C	1958.12.12
6	D	1958.12.12
7	FP	2002.10.13

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CADMIUM SULPHIDE PHOTOCONDUCTIVE CELL with top sensitivity
CELLULE PHOTOCONDUCTRICE A SULFURE DE CADMIUM avec la surface sensible du côté supérieur
KADMIUMSULFID PHOTOLEITER für frontalen Lichteinfall

Application: Flame control, smoke detection, industrial on-off switching
Application: Contrôle de flammes, détection de fumées, commutation industrielle "en circuit-hors circuit"
Anwendung : Flammenüberwachung, Rauchmeldung, industrielle Ein-Ausschalter

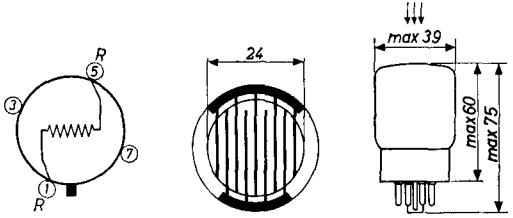
The symbols used in these data are those normally used for semiconductors. See List of Symbols for Semi-Conductors, pages Sem 501-507

Les symboles utilisés pour les données suivantes sont ceux utilisés normalement pour les semi-conducteurs. Voir la Liste de symboles pour Semi-Conducteurs, pages Sem 501-507

Die für diesen Daten verwendeten Symbole sind die für die Halbleiter üblichen. Siehe die Symbolenliste für Halbleiter, Seite Sem 501-507

For spectral response please refer to front of this section
Pour la réponse spectrale voir en tête de ce chapitre
Für die spektrale Empfindlichkeit siehe am Anfang dieses Abschnitts.

Dimensions in mm
Dimensions en mm
Abmessungen in mm



Base, culot, Sockel: OCTAL

The arrows indicate the direction of the incident light
Les flèches indiquent la direction de la lumière incidente
Die Pfeile zeigen die Richtung des einfallenden Lichtes

Total area to be illuminated	7,5 cm^2
Sensitive part of this area	4.5 cm^2
Surface totale à être éclairée	7,5 cm^2
Partie sensible de cette surface	4,5 cm^2
Zu beleuchtender Fläche	7,5 cm^2
Empfindlicher Teil dieser Fläche	4,5 cm^2

Characteristics
Caractéristiques
Kenndaten

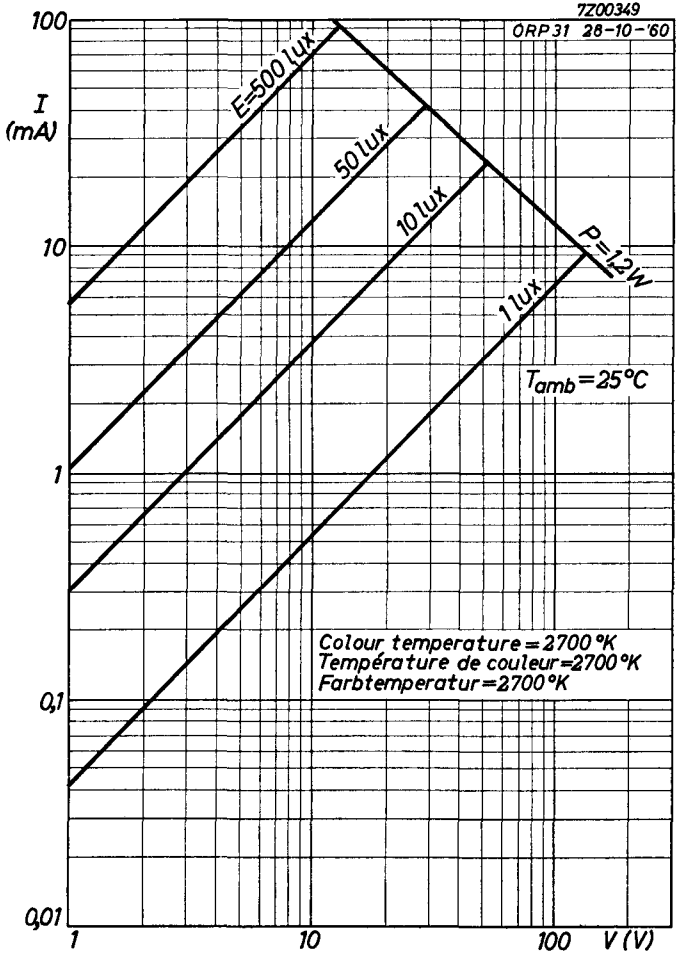
V	=	10 V
Illumination Eclairement Beleuchtungsstärke	=	54 lux
Colour temperature Température de couleur Farbtemperatur	=	2700 °K
T_{amb}	=	25 °C
I	>	7,5 mA
	=	14,5 mA
	<	22 mA
V	=	300 V
T_{amb}	=	25 °C
Dark current Courant d'obscurité Dunkelstrom	= max.	2,5 µA [1]

Limiting values (Absolute limits)
Caractéristiques limites (Limites absolues)
Grenzdaten (Absolute Grenzen)

$V_{\overline{\ldots}}$	= max. 350 V
$V_{\sim}$	= max. 250 V
P (T_{amb} = 25 °C)	= max. 1,2 W
P (T_{amb} = 70 °C)	= max. 0,35 W
T_{amb}	= -40°C/+70°C

Remark : It is recommended that the photocell be stored in the dark
Observation: Il est recommandé d'emmagasiner la cellule dans l'obscurité
Bemerkung : Es wird empfohlen der Photoleiter im Dunkeln zu lagern

[1]) After 15 minutes in complete darkness
Après 15 minutes dans l'obscurité complète
Nach 15 Minuten im völligen Dunkeln


7Z00349
ORP31 28-10-'60
100
I (mA)
10
1
0,1
0,01
E=500 lux
50 lux
10 lux
1 lux
P=1,2 W
T_{amb}=25°C
Colour temperature=2700°K
Température de couleur=2700°K
Farbtemperatur=2700°K
1
10
100
V (V)

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1	1	1961.03.03
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3	A	1961.03.03
4	FP	2002.10.13

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CADMIUM SULFIDE PHOTOCONDUCTIVE CELL with side sensitivity
CELLULE PHOTOCONDUCTRICE A SULFURE DE CADMIUM avec la surface sensible du côté latéral
KADMIUMSULFID PHOTOLEITER für Lichteinfall von der Seite

Application: Flame control, smoke detection, industrial on-off switching

Application: Contrôle de flammes, détection de fumées, commutation industrielle "en circuit-hors circuit"

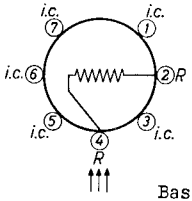
Anwendung : Flammenüberwachung, Rauchmeldung, industrielle Ein-Ausschalter

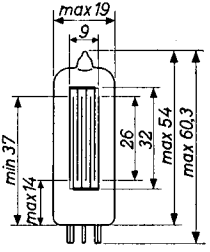
The symbols used in these data are those normally used for semiconductors. See List of Symbols for Semi-Conductors, pages Sem 501-505

Les symboles utilisés pour les données suivantes sont ceux utilisés normalement pour les semi-conducteurs. Voir la Liste de Symboles pour Semi-Conducteurs, pages Sem 501-505

Die für diese Daten verwendeten Symbole sind die für die Halbleiter üblichen. Siehe die Symbolenliste für Halbleiter, Seite Sem 501-505

Dimensions in mm
Dimensions en mm
Abmessungen in mm





Base, culot, Sockel: MINIATURE 7 P

The arrows indicate the direction of the incident light
Les flèches indiquent la direction de la lumière incidente
Die Pfeile zeigen die Richtung des einfallenden Lichtes

Total area to be illuminated	2.9 cm^2
Sensitive part of this area	1.8 cm^2
Surface totale à être éclairée	2,9 cm^2
Partie sensible de cette surface	1,8 cm^2
Zu beleuchtende Fläche	2,9 cm^2
Empfindlicher Teil dieser Fläche	1,8 cm^2

PHILIPS ORP 90

CADMIUM SULFIDE PHOTOCONDUCTIVE CELL with side sensitivity
CELLULE PHOTOCONDUCTRICE A SULFURE DE CADMIUM avec la surface sensible du côté latéral
KADMIUMSULFID PHOTOLEITER für Lichteinfall von der Seite

Application: Flame control, smoke detection, industrial on-off switching

Application: Contrôle de flammes, détection de fumées, commutation industrielle "en circuit-hors circuit"

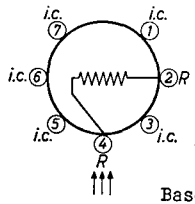
Anwendung : Flammenüberwachung, Rauchmeldung, industrielle Ein-Ausschalter

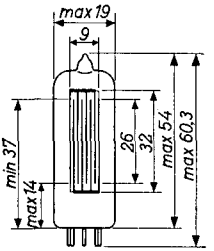
The symbols used in these data are those normally used for semiconductors. See List of Symbols for Semi-Conductors, pages Sem 501-505

Les symboles utilisés pour les données suivantes sont ceux utilisés normalement pour les semi-conducteurs. Voir la Liste de Symboles pour Semi-Conducteurs, pages Sem 501-505

Die für diese Daten verwendeten Symbole sind die für die Halbleiter üblichen. Siehe die Symbolenliste für Halbleiter, Seite Sem 501-505

Dimensions in mm
Dimensions en mm
Abmessungen in mm





Base, culot, Sockel: MINIATURE 7 P

The arrows indicate the direction of the incident light
Les flèches indiquent la direction de la lumière incidente
Die Pfeile zeigen die Richtung des einfallenden Lichtes

Total area to be illuminated	2.9 cm^2
Sensitive part of this area	1.8 cm^2
Surface totale à être éclairée	2,9 cm^2
Partie sensible de cette surface	1,8 cm^2
Zu beleuchtende Fläche	2,9 cm^2
Empfindlicher Teil dieser Fläche	1,8 cm^2

Characteristics
Caractéristiques
Kenndaten

V	=	10	10	V
Illumination Eclairement Beleuchtungsstärke	=	50	53,8	lux
Colour temperature Température de couleur Farbtemperatur	=	1500	2700	^{o}K
I	>	6	3	mA
	=	20	10	mA
	<	31	16	mA
V	=		300	V
T_{amb}	=		25	^{o}C
Dark current Courant d'obscurité Dunkelstrom	=	max. 2,5		µA [1]

Limiting values (Absolute limits)
Caractéristiques limites (Limites absolues)
Grenzdaten (Absolute Grenzen)

$V_{\overline{\sim}}$	= max. 350 V
$V_{\sim}$	= max. 250 V
P (T_{amb} = 25 ^{o}C)	= max. 1 W
P (T_{amb} = 70 ^{o}C)	= max. 0,3 W
T_{amb}	= -40°C/+70°C

Remark : It is recommended that the photocell be stored in the dark
Observation: Il est recommandé d'emmagasiner le cellule dans l'obscurité
Bemerkung : Es wird empfohlen der Photoleiter im Dunkeln zu lagern

---

[1]) The current falls after the light has been removed, but there will be some delay before the value of 2.5 µA is reached
Le courant diminue après que la lumière à été éloignée mais il y aura quelque délai avant que la valeur de 2,5 µA soit atteinte
Nachdem das Licht entfernt ist, wird der Strom abnehmen, aber der Wert von 2,5 µA wird erst nach einiger Verzögerung erreicht werden

Characteristics
Caractéristiques
Kenndaten

V	=	10	10	V
Illumination Eclairement Beleuchtungsstärke	=	50	53,8	lux
Colour temperature Température de couleur Farbtemperatur	=	1500	2700	^{o}K
I	>	6	3	mA
	=	20	10	mA
	<	31	16	mA
V	=		300	V
T_{amb}	=		25	^{o}C
Dark current Courant d'obscurité Dunkelstrom	=	max. 2,5		µA [1]

Limiting values (Absolute limits)
Caractéristiques limites (Limites absolues)
Grenzdaten (Absolute Grenzen)

$V_{\overline{}}$	= max. 350 V
$V_{\sim}$	= max. 250 V
P (T_{amb} = 25 ^{o}C)	= max. 1 W
P (T_{amb} = 70 ^{o}C)	= max. 0,3 W
T_{amb}	= -40^{o}C/+70^{o}C

Remark : It is recommended that the photocell be stored in the dark
Observation: Il est recommandé d'emmagasiner le cellule dans l'obscurité
Bemerkung : Es wird empfohlen der Photoleiter im Dunkeln zu lagern

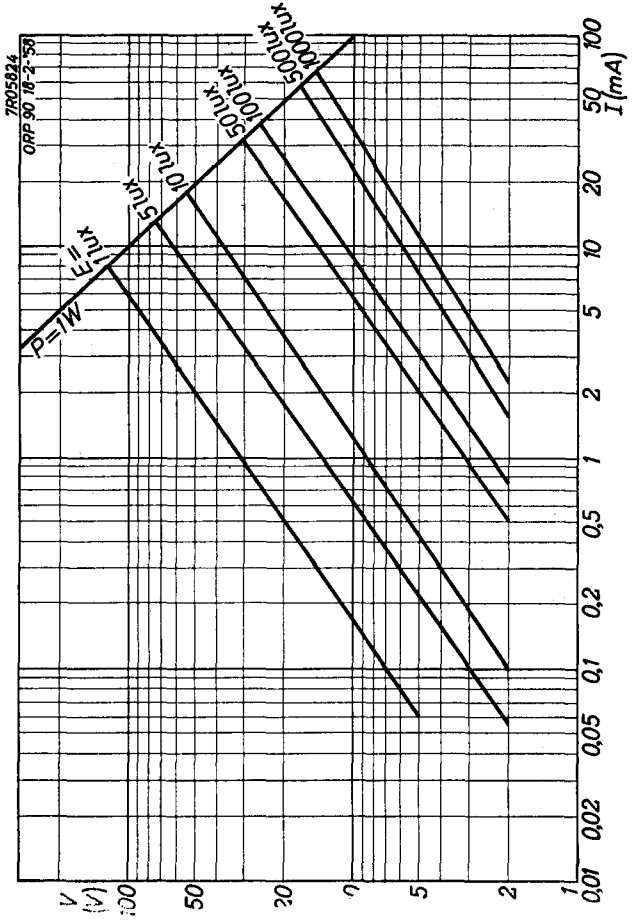
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[1]) The current falls after the light has been removed, but there will be some delay before the value of 2.5 µA is reached
Le courant diminue après que la lumière à été éloignée mais il y aura quelque délai avant que la valeur de 2,5 µA soit atteinte
Nachdem das Licht entfernt ist, wird der Strom abnehmen, aber der Wert von 2,5 µA wird erst nach einiger Verzögerung erreicht werden

→

PHILIPS

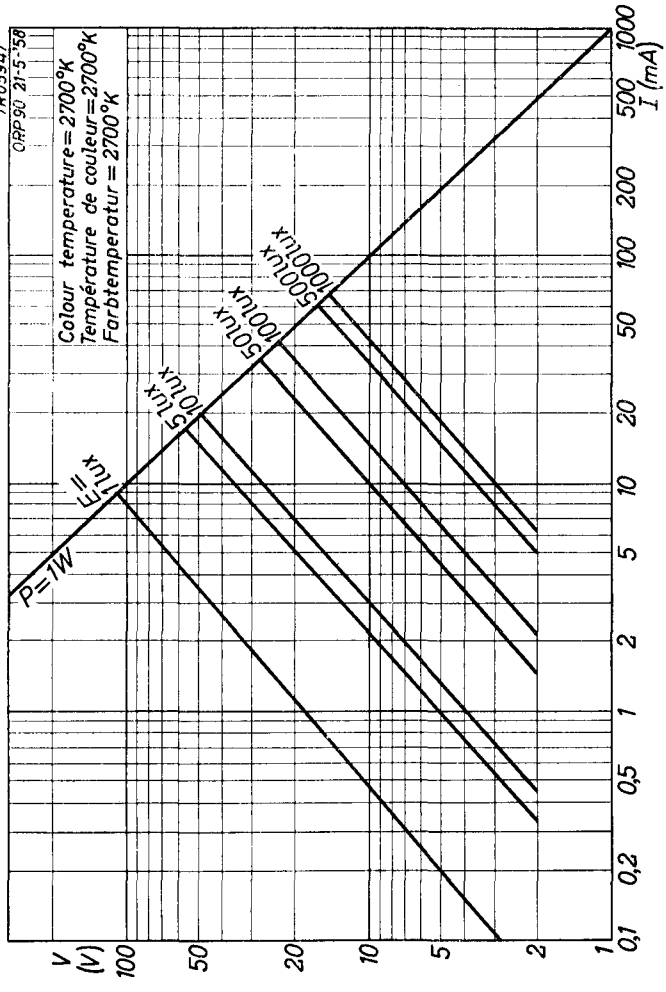
ORP 90



3.3.1958

A

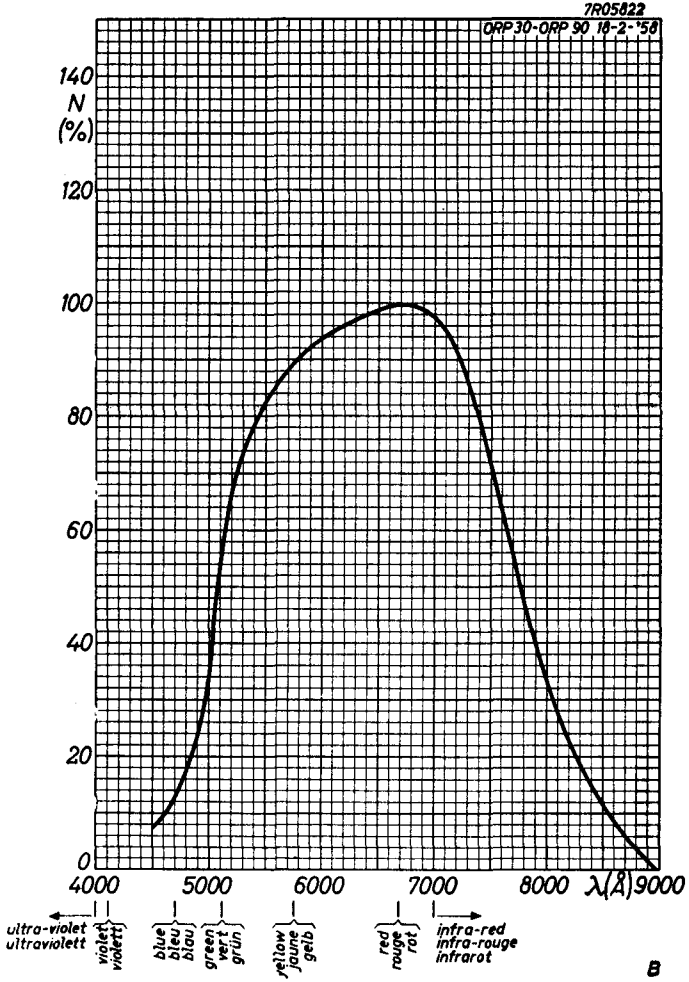
PHILIPS ORP90



6.6.1958

A

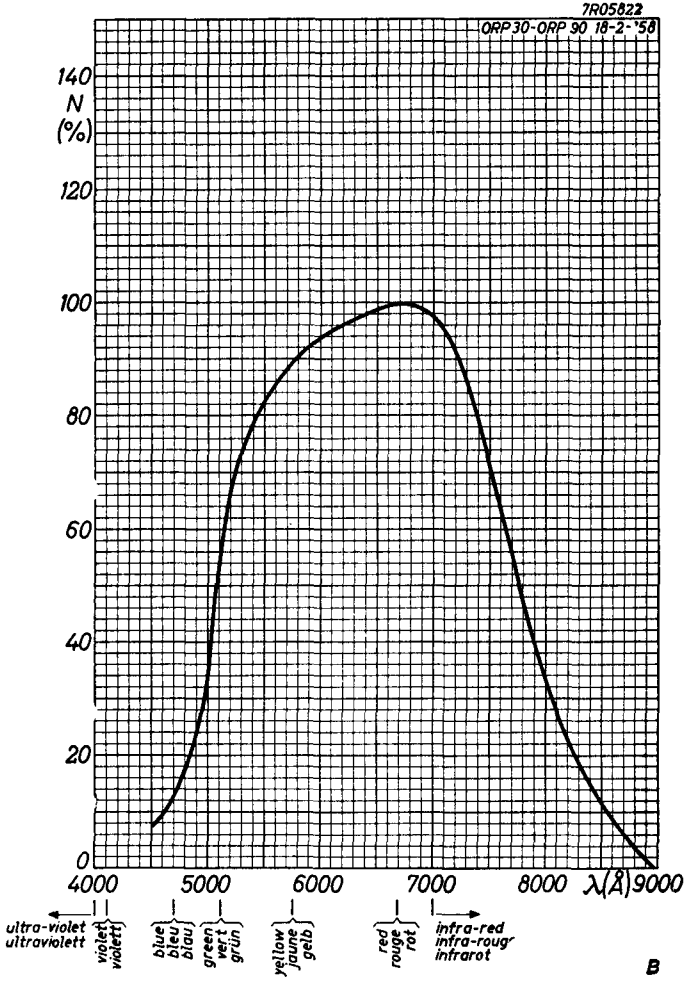
ORP 90 PHILIPS



B

ORP 90 **PHILIPS**

7R05822

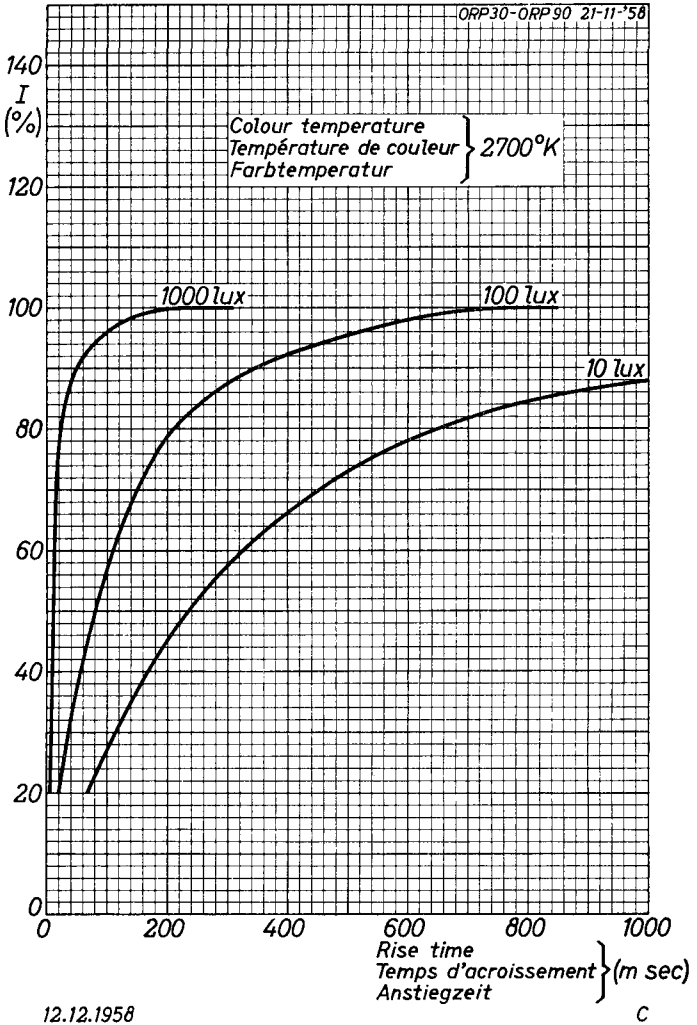


PHILIPS

ORP 90

7R06107

ORP30-ORP90 21-11-'58

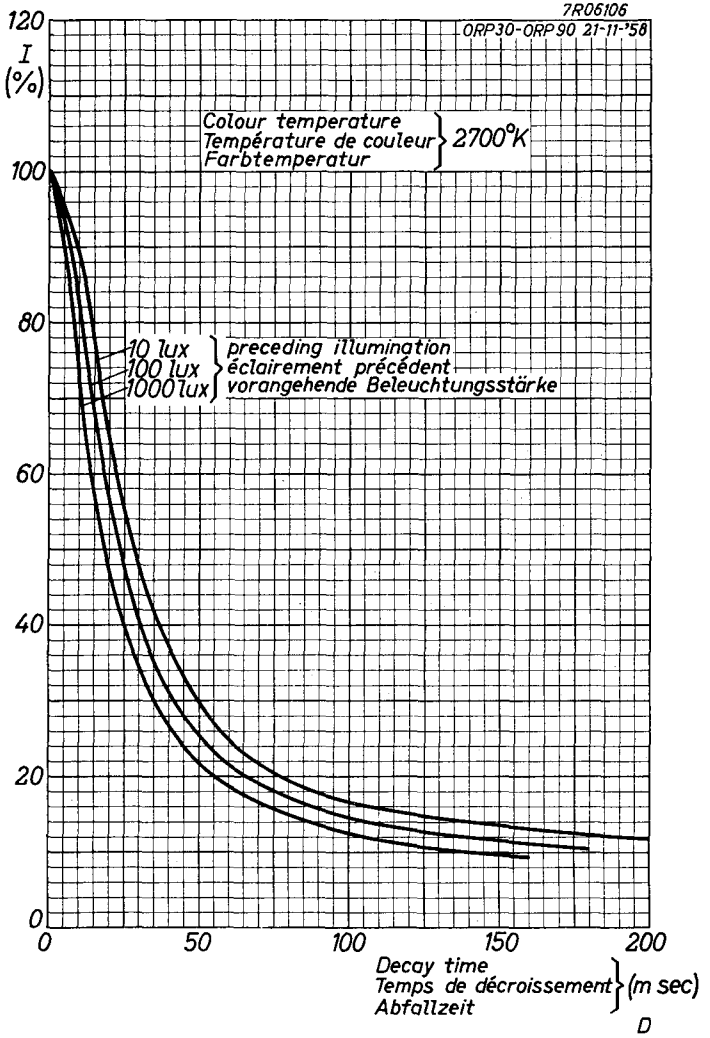


12.12.1958

C

ORP 90

PHILIPS





ORP90

page	sheet	date
1	1	1958.06.06
2	1	1959.04.04
3	2	1958.06.06
4	2	1959.04.04
5	A	1958.03.03
6	A	1958.06.06
7	B	1958.03.03
8	B	1958.06.06
9	C	1958.12.12
10	D	1958.12.12
11	FP	2002.10.13

PHILIPS

ZENDLAMP PA 12/15

De Philips watergekoelde zendpenthode PA 12/15 werd speciaal ontworpen voor gebruik in de versterkertrappen of in den eindtrap van groote zenders. Aldus kan ook bij den bouw van dergelijke zenders gebruik worden gemaakt van de bijzondere eigenschappen van penthoden en zal het mogelijk zijn de constructie belangrijk te vereenvoudigen. Een verder voordeel van deze lamp zijn de betrekkelijk geringe afmetingen.

De lamp kan bij een anodespanning van 12 kV op golflengten van 15 m en hooger worden gebruikt. Bij een golflengte van 6 m mag de anodespanning 8000 V bedragen; in het laatstgenoemde geval mag de stuurroosteramplitude 400 V niet overschrijden.

Het is noodig een positieve spanning aan het vangrooster te leggen om het maximum afgegeven vermogen te bereiken; bij normaal bedrijf worden vangrooster en schermrooster aan dezelfde spanningsbron gelegd.

Speciaal met het oog op de mogelijkheid deze lamp in moderne televisiezenders te gebruiken, wordt



erop gewezen, dat twee lampen in push-pull schakeling en klasse C versterking op een golflengte van 6 m tezamen een vermogen van 14,5 kW[1]) kunnen afgeven (bij V_a = 8000 V, $V_{g2} = V_{g3}$ = 2000 V, I_a = 4,0 A en een stuurroosterstroom van circa 5 mA).

Wordt de PA 12/15 op een golflengte van 150 m voor versterking van gemoduleerde H.F.-energie gebruikt, dan kan deze lamp een vermogen afgeven van 14 kW[2]) in den modulatietop, bij een modulatiediepte van 100% (bij V_a = 12 kV, $V_{g2} = V_{g3}$ = 1500 V, I_a = 0,9 mA en een stuurroosterstroom van ca. 5 mA).

Dit beteekent, dat met één versterkertrap een energieversterking wordt bereikt, welke met het oog op de grootte-orde van het afgegeven vermogen, bijzonder groot is.

Wordt de PA 12/15 op een golflengte van 150 m als klasse C versterker in een telegrafiezender gebruikt, dan kan deze lamp een vermogen van 14,4 kW afgeven (bij V_a = 12 kV, $V_{g2} = V_{g3}$ = 1500 V, I_a = 2,0 A en een stuurroosterstroom van ca. 210 mA).

Het is niet mogelijk deze lamp, zooals kleinere zendpenthoden, rechtstreeks in het vangrooster te moduleeren. Het schermrooster zou in dat geval zwaar worden overbelast. Wenscht men de lamp op deze wijze te moduleeren, dan moeten scherm- en vangrooster onderling worden verbonden. De op deze wijze verkregen modulatie komt vrijwel overeen met normale schermroostermodulatie.

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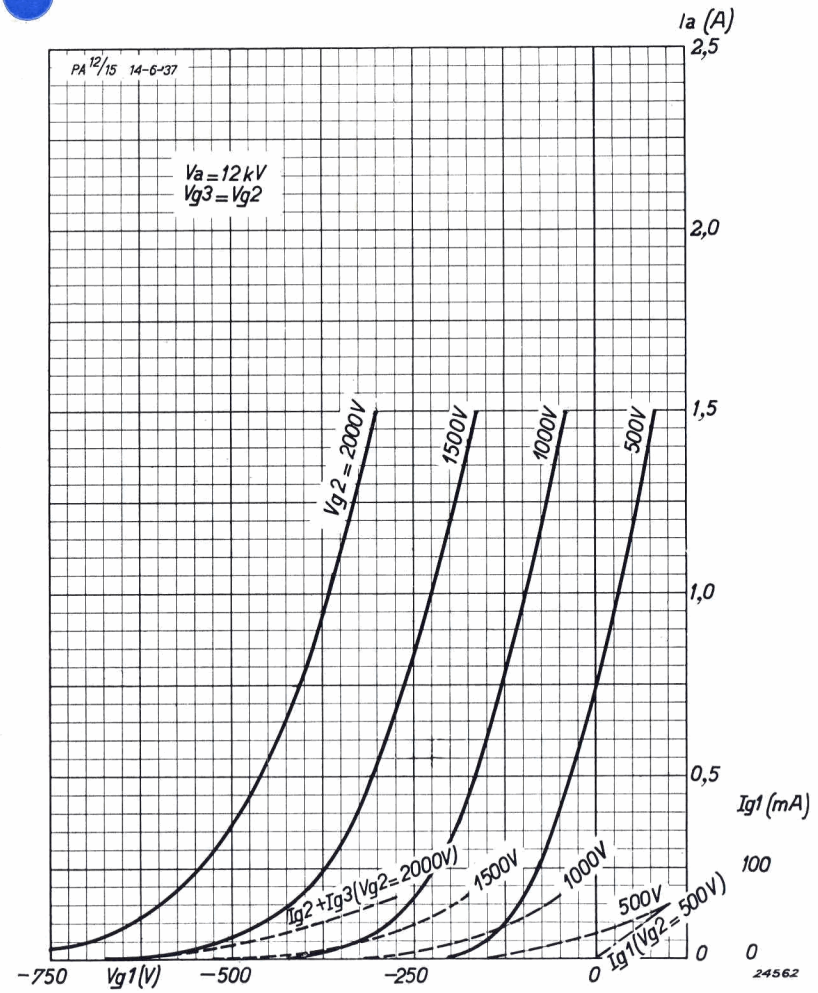
[1]) Kringverliezen (welke ca. 10% bedragen) moeten hierbij in mindering worden gebracht.

[2]) Kringverliezen (welke ca. 5% bedragen) moeten hierbij in mindering worden gebracht.

PHILIPS

ZENDLAMP

PA 12/15



Gloeispanning	V_f	=	22,0 V
Gloeistroom	I_f	=	ca. 80 A
Verzadigingsstroom	I_s	=	ca. 11 A
Anodespanning	V_a	=	12 kV
Schermroosterspanning	V_{g2}	=	2000 V
Maximum toelaatbare anodedissipatie	W_a	=	12 kW
Anodedissipatie tijdens meting	W_{at}	=	15 kW
Maximum toelaatbare schermrooster-dissipatie	W_{g2}	=	1,5 kW[1])
Versterkingsfactor t.o.v. schermrooster	μ_{g1g2}	=	ca. 4,0
Steilheid bij V_a = 12 kV, V_{g2} = 1500 V, I_a = 1 A	S	=	ca. 6,0 mA/V
Grootste steilheid	S_{max}	=	ca. 10,0 mA/V
Maximum kathodestroom	I_k	=	max. 3,5 A
Anode/kathodecapaciteit	C_{af}	=	ca. 30,5 $\mu\mu$F[2])
Stuurrooster/kathodecapaciteit	C_{g1f}	=	ca. 58 $\mu\mu$F[2])
Anode/stuurroostercapaciteit	C_{ag1}	=	ca. 0,05 $\mu\mu$F[2])
Grootste diameter van den ballon	d	=	ca. 126 mm
Grootste totale diameter	d'	=	ca. 255 mm
Totale lengte zonder koeler	l	=	ca. 256 mm
Totale lengte met koeler	l'	=	ca. 614 mm

[1]) Deze waarde verkrijgt men door vermenigvuldiging van de schermroosterspanning in volt met den schermroosterstroom in ampère.

[2]) Deze waarde geldt, indien schermrooster en vangrooster met de kathode zijn verbonden.

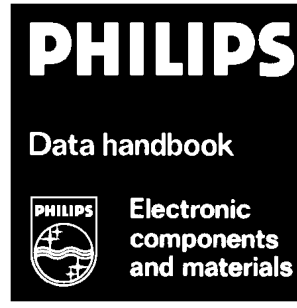
TRIPLE DIODE-TRIODE

Triple diode-triode, intended for video and FM and AM audio signal detection and A.F. signal amplification.

HEATING: Indirect by A.C. or D.C.; series supply

Heater current	I_f	300	mA
Heater voltage	V_f	9.5	V

For further data and curves please refer to UABC80



PABC80

page	sheet	date
1	1	1969.01
2	FP	1999.07.30

PHILIPS PENTODE PAL 12/15

Die Innenkonstruktion der Sendepentode PAL 12/15 gleicht jener der wassergekühlten Pentode PAW 12/15. Die Anode der PAL 12/15 wird jedoch mit Luft statt mit Wasser gekühlt und ist hierzu von einem festen Kühlmantel mit Kühlflanschen umgeben. Auf diese Weise kann man mit der PAL 12/15 eine beträchtliche Nutzleistung erzielen, ohne zur Verwendung von Wasserkühlung gezwungen zu sein. Bei ausreichender Luftkühlung darf der Anodenverlust dieser Röhre 8 kW betragen.

Die forcierte Luftkühlung wird durch einen mit dem Kühlmantel zu verbindenden Ventilator bewirkt, dessen erforderliche Leistung von der Eingangstemperatur der Luft und von dem Anodenverlust abhängt. In der Gebrauchsanweisung dieser Röhre sind die für die Errechnung dieser Leistung erforderlichen Kurven aufgenommen.

Zur Erzielung einer großen Ausgangsleistung ist an das Fanggitter eine gleiche Spannung zu legen wie an das Schirmgitter. Die statische Abschirmung zwischen Steuergitter und Anode wird äußerst zufriedenstellend sein, da die zwischen diesen Elektroden angebrachten Schirm- und Fanggitter eine Kopplung zwischen Steuergitter und Anode verhüten.

Bei Verwendung der Röhre als H.F.-Verstärker Klasse C in einem Telegraphiesender, in einem H.F.-Verstärker Klasse B, in einem Telephoniesender, oder bei Modulation der Röhre in dem Schirm- und dem Fanggitter, beträgt die höchst zulässige Anodenspannung, bei Wellenlängen bis auf 150 m herab 12 000 V, bei Wellenlängen bis



PHILIPS EMISSION

auf 15 m herab 10 000 V und bei Wellenlängen bis auf 6 m herab 8000 V. Wird die Röhre hingegen in der Anode oder in der Anode und in dem Schirm- und Fanggitter zugleich moduliert, so betragen die höchst zulässigen Anodenspannungen für die erwähnten Wellenlängen 10 000 V, bzw. 8000 V und 6500 V.

Die bei einer Wellenlänge von 150 m und einer Anodenspannung von 12 000 V erreichbare Nutzleistung und der entsprechende Wirkungsgrad sind in nachstehender Tabelle angegeben:

Einstellung	Schirm- und Fanggitterspannung	Nutzleistung	Wirkungsgrad
H.F.-Klasse C (Telegraphie)	1500 V	14,8 kW[1])	65%
H.F.-Klasse B (Telephonie)	1500 V	4 kW[1])[2])	33%
H.F.-Klasse C (Modulation in dem Schirm- und Fanggitter)	900 V	3,6 kW[1])[2])	34%

Die Nutzleistung und der entsprechende Wirkungsgrad, die bei einer Wellenlänge von 15 m bei höchst zulässiger Anodenspannung erreicht werden können, sind aus der folgenden Tabelle ersichtlich.

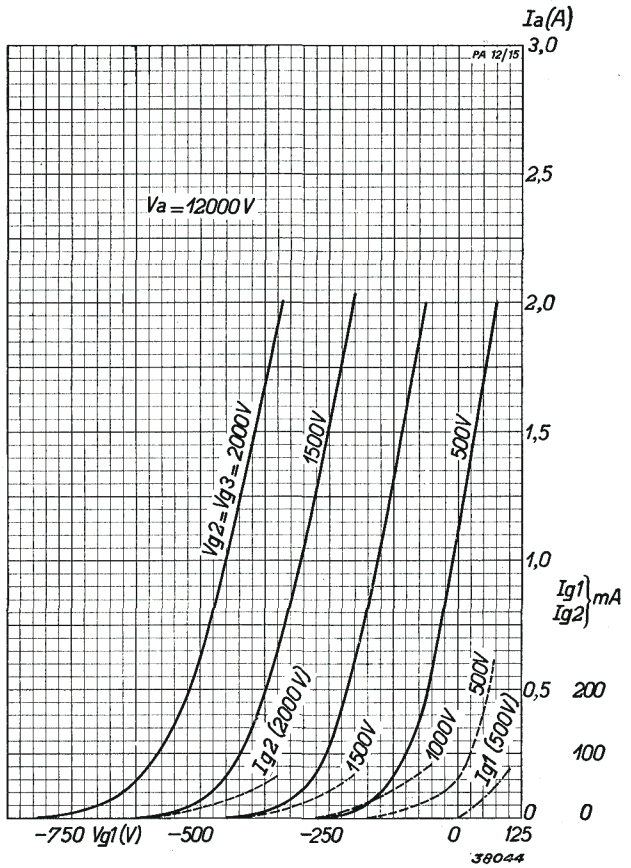
Einstellung	Schirm- und Fanggitterspannung	Nutzleistung	Wirkungsgrad
H.F.-Klasse C (Telegraphie)	1500 V	13 kW[1])	62 %
H.F.-Klasse C (Modulation in der Anode)	1200 V	5,8 kW[1])[2])	60,5%
H.F.-Klasse C (Modulation in dem Schirm- und Fanggitter	900 V	2,9 kW[1])[2])	37 %
H.F.-Klasse C (Modulation in der Anode, dem Schirm- und Fanggitter)	800 V	7,5 kW[1])[2])	70,5%

[1]) Kreisverluste sind abzuziehen.
[2]) Nutzleistung in der Trägerwelle (größte Modulationstiefe 100%).

B 5622/1

4/42 - K 333

PHILIPS PENTODE PAL 12/15



Heizspannung	V_f	= 22,0 V
Heizstrom	I_f	= ca. 80 A
Sättigungsstrom	I_s	= ca. 11 A
Anodenspannung	V_a	= max. 12 000 V
Schirmgitterspannung	V_{g2}	= max. 2000 V
Höchst zulässiger Anodenverlust	W_a	= max. 8 kW
Geprüfter Anodenverlust	W_{at}	= 10 kW
Höchst zulässiger Schirmgitterverlust	W_{g2}	= max. 1,5 kW[1])
Verstärkungsfaktor gegen Schirmgitter	μ_{g1g2}	= ca. 4
Steilheit bei V_a = 12 000 V, V_{g2} = 1500 V, I_a = 1 A	S	= ca. 8 mA/V
Anoden-Kathodenkapazität	C_{ak}	= ca. 30,5 pF [2])
Steuergitter-Kathodenkapazität	C_{g1k}	= ca. 58 pF [2])
Anoden-Steuergitterkapazität	C_{ag_1}	= ca. 0,05 pF [2])
Maximale Gesamtlänge mit Kühler	l	= 609 mm
Maximaler Kühlerdurchmesser	d	= 234 mm

[1]) Dieser Wert wird durch Multiplikation der Schirmgitterspannung in Volt mit dem Schirmgitterstrom in Ampere bestimmt.

[2]) Dieser Wert gilt bei Verbindung des Schirm- und des Fanggitters mit der Kathode.

PHILIPS PENTODE PAW 12/15

Die Anode der Philips Sendepentode PAW 12/15 ist wassergekühlt; zusätzliche Luftkühlung der Kolbenanschlüsse erübrigt sich. Die Röhre kann unter der Benennung PAL 12/15 geliefert werden, wobei der Wasserkühler für die Anode durch einen besonderen Luftkühler ersetzt ist. Die PAW 12/15 eignet sich besonders zur Verwendung in großen Sendern; sie ermöglicht es somit, in den Verstärker- oder Endstufen derartiger Sender die Vorteile von Pentoden auszunutzen.

Zur Erzielung einer großen Ausgangsleistung ist an das Fanggitter eine gleiche Spannung wie an das Schirmgitter zu legen. Die statische Abschirmung zwischen dem Steuergitter und der Anode wird dessenungeachtet äußerst zufriedenstellend sein, da das zwischen diesen Elektroden angebrachte Schirm- und Fanggitter eine Kopplung zwischen Steuergitter und Anode verhütet.

Bei Verwendung der Röhre als H.F.-Verstärker Klasse C in einem Telegraphiesender, in einem H.F.-Verstärker Klasse B in einem Telephoniesender oder bei Modulation der Röhre in dem Schirm- und Fanggitter beträgt die höchst zulässige Anodenspannung bei Wellenlängen bis zu 150 m herab 12000 V, bei Wellenlängen bis zu 15 m herab 10000 V und bei Wellenlängen bis zu 6 m herab 8000 V. Wird die Röhre hingegen in der Anode oder in der Anode und in dem Schirm- und Fanggitter zugleich moduliert, so betragen die höchst zulässigen Anodenspannungen für die erwähnten Wellenlängen je nachdem 10000 V, 8000 V oder 6500 V.

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PHILIPS EMISSION

Die Nutzleistung und der Wirkungsgrad, die bei einer Wellenlänge von 150 m und einer Anodenspannung von 12000 V erreicht werden können, sind in nachstehender Tabelle angegeben.

Einstellung	Schirm- und Fanggitter-spannung	Nutz-leistung	Wirkungs-grad
H.F.-Klasse C (Telegraphie)	1500 V	21 kW[1])	63,5%
H.F.-Klasse B (Telephonie)	1500 V	4,6 kW[1])[2])	34 %
H.F.-Klasse C (Modulation in dem Schirm- und Fanggitter)	900 V	3,6 kW[1])[2])	34 %

Die bei einer Wellenlänge von 15 m bei höchst zulässiger Anodenspannung erreichbare Nutzleistung und der entsprechende Wirkungsgrad sind aus untenstehender Tabelle ersichtlich.

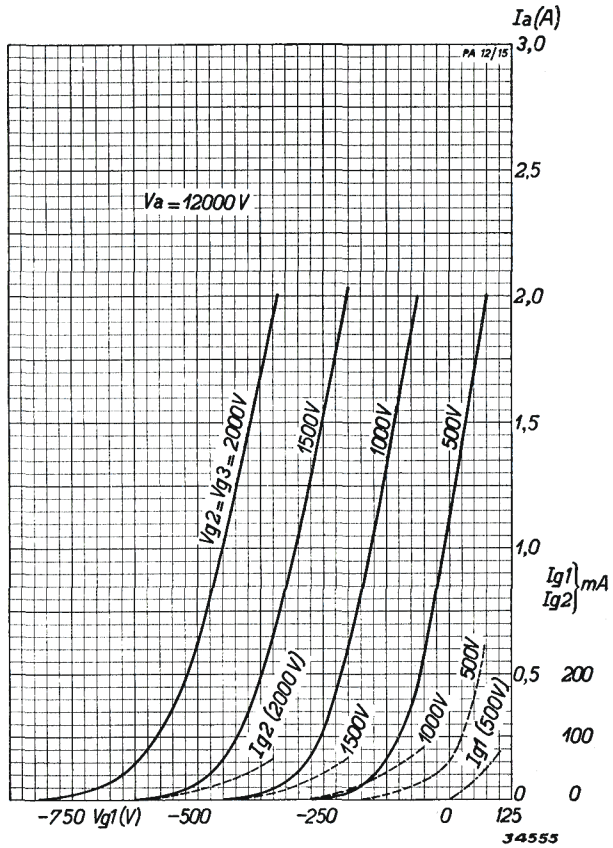
Einstellung	Schirm- und Fanggitter-spannung	Nutz-leistung	Wirkungs-grad
H.F.-Klasse C (Telegraphie)	1500 V	15,9 kW[1])	61 %
H.F.-Klasse B (Telephonie)	1500 V	3,5 kW[1])[2])	33 %
H.F.-Klasse C (Modulation in der Anode)	1200 V	5,8 kW[1])[2])	60,5%
H.F.-Klasse C (Modulation in dem Schirm- und Fanggitter)	900 V	2,9 kW[1])[2])	37 %
H.F.-Klasse C (Modulation in der Anode, dem Schirm- und Fanggitter)	800 V	7,5 kW[1])[2])	70,5%

[1]) Kreisverluste sind abzuziehen.

[2]) Nutzleistung in der Trägerwelle (max. Modulationstiefe 100%).

B 5621/1

PHILIPS PENTODE PAW 12/15



Heizspannung	V_f	=	22,0 V
Heizstrom	I_f	=	ca. 80 A
Sättigungsstrom	I_s	=	ca. 11 A
Anodenspannung	V_a	=	max. 12000 V
Schirmgitterspannung	V_{g_2}	=	max. 2000 V
Höchst zulässiger Anodenverlust	W_a	=	max. 12 kW
Geprüfter Anodenverlust	W_{at}	=	15 kW
Höchst zulässiger Schirmgitterverlust	W_{g_2}	=	max. 1,5 kW[1])
Verstärkungsfaktor gegen Schirmgitter	$\mu_{g_1g_2}$	=	ca. 4
Steilheit bei V_a = 12000 V, V_{g_1} = 1500 V, I_a = 1 A	S	=	ca. 8 mA/V
Anoden/Kathodenkapazität	C_{ak}	=	ca. 30,5 pF[2])
Steuergitter/Kathodenkapazität	C_{g_1k}	=	ca. 58 pF[2])
Anoden/Steuergitterkapazität	C_{ag_1}	=	ca. 0,05 pF[2])
Maximale Gesamtlänge ohne Kühler	l	=	541 mm
Maximale Gesamtlänge mit Kühler	l'	=	614 mm
Maximaler Kolbendurchmesser	d	=	126 mm
Maximaler Gesamtdurchmesser	d'	=	245 mm

[1]) Dieser Wert wird durch Multiplikation der Schirmgitterspannung in Volt mit dem Schirmgitterstrom in Ampere bestimmt.

[2]) Dieser Wert gilt bei Verbindung des Schirm- und Fanggitters mit der Kathode.

PENTODE for use as H.F. amplifier
PENTHODE pour utilisation en amplificatrice H.F.
PENTODE zur Verwendung als HF-Verstärker

Filament : thoriated tungsten
Filament : tungstène thorié
Heizfaden: thoriertes Wolfram

Heating : direct
Chauffage: direct
Heizung : direkt

Vf = 12 V
If = 3,35 A

Capacitances
Capacités
Kapazitäten

Ca = 14 pF
Cg1 = 13,7 pF
Cag1 = 0,15 pF

Typical characteristics
Caractéristiques types
Kenndaten

μg2g1 = 5,9
S (Ia=55 mA)= 3,3 mA/V

λ	Freq.	C telegr.		B teleph.		Can.mod.	
m	Mc/s	Va (V)	Wo (W)	Va (V)	Wo (W)	Va (V)	Wo (W)
>15	<20	2000	270	2000	45	1800	124
		1500	175	1500	37	1200	60
5[1])	60 [1])	1500	305	1500	70	1200	149
		Cag2 mod.		Cg3 mod.			
>15	<20	1800	147	2000	43		
		1200	76	1500	35		
5[1])	60 [1])	1200	155	1500	65		

[1]) two valves
deux tubes
zwei Röhren

Limiting values
Caractéristiques limites
Grenzdaten

Va	= max. 2000 V	Wg1	= max. 12 W
Wa	= max. 110 W	Ik	= max. 285 mA
Vg2	= max. 400 V	Ikp	= max. 1400 mA
Wg2	= max. 25 W	R_{g3}	= max. 80 kΩ ←

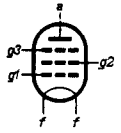
Rg1 { with fixed grid bias / à polarisation fixe / mit fester Gittervorspannung = max. 40 kΩ

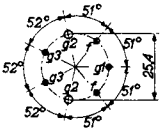
Rg1 { with automatic grid bias / à polarisation automatique / mit autom. Gittervorspannung = max. 80 kΩ

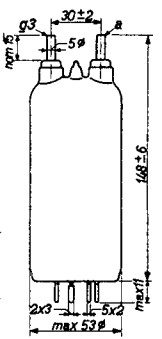
temperature of pins
température des broches
Stiftentemperatur = max. 180 °C

PHILIPS

Dimensions in mm
Dimensions en mm
Abmessungen in mm







Socket
Support
Fassung 40207

Clips
Bornes de connexion
Anschlussklemmen 40600

Mounting position: vertical with base up[1]) or down
Montage : vertical avec pied en haut [1]) ou en bas
Einbau : senkrecht mit Sockel oben [1]) oder unten

Net weight
Poids net
Nettogewicht 150 g

Shipping weight
Poids brut
Bruttogewicht 375 g

[1]) In that case it is recommended to support the tube
Dans ce cas il est recommendé de supporter le tube
In diesem Fall empfiehlt es sich die Röhre zu stützen

Operating conditions H.F. class C telegraphy
Caractéristiques d'utilisation H.F. classe C télégraphie
Betriebsdaten H.F. Klasse C Telegraphie

λ	=	>15	>15	5[1])	m
Va	=	2000	1500	1500	V
Vg1	=	-150	-150	-150	V
Vg2	=	300	400	200	V
Vg3	=	300	0	200	V
Ia	=	190	170	350	mA
Ig1	=	7,5	1	8	mA
Ig2(+g3)	=	60	60	60	mA
Vg1p	=	260	240	220	V
Wig1	=	2	0,24	1,7	W
Wg2	=	24	24	12	W
Wia	=	360	255	525	W
Wa	=	110	80	220	W
Wo	=	270	175	305	W
η	=	71	68,5	58	%

Operating conditions H.F. class B telephony
Caractéristiques d'utilisation H.F. classe B téléphonie
Betriebsdaten H.F. Klasse B Telephonie

λ	=	>15	>15	5[1])	m
Va	=	2000	1500	1500	V
Vg1	=	-65	-44	-45	V
Vg2	=	400	300	300	V
Vg3	=	0	0	0	V
Ia	=	77,5	98	190	mA
Ig2	=	6,5	10	12	mA
Vg1p	=	50	65	65	V
Wg2	=	2,6	3	3,6	W
Wia	=	155	147	285	W
Wa	=	110	110	215	W
Wo	=	45	37	70	W
η	=	29	25	25	%
m	=	100	100	100	%
Ig1	=	2,5	4	8	mA
Wig1	=	0,25	0,5	1	W

[1]) Two valves, deux tubes; zwei Röhren

PHILIPS

Operating conditions H.F. class C
Caractéristiques d'utilisation H.F. classe C
Betriebsdaten H.F. Klasse C

	anode modulation modulation d'anode Anodenmodulation			anode- and screen grid modulation modulation d'anode et de grille-écran Anoden- und Schirmgitter-modulation			
λ =	>15	>15	5[1])	>15	>15	5[1])	m
Va =	1800	1200	1200	1800	1200	1200	V
Vg1 =	-150	-150	-200	-150	-150	-200	V
Vg2 =	300	300	300	300	300	400	V
Vg3 =	0	0	0	0	0	0	V
Ia =	100	72	245	114	92	250	mA
Ig1 =	7,5	7	5	6	5	3	mA
Ig2 =	83	83	100	60	55	40	mA
Vg1p =	250	240	240	235	230	210	V
Wig1 =	1,9	1,7	1,2	1,4	1,2	0,6	W
Wg2 =	25	25	30	18	16,5	16	W
Wia =	180	87	294	205	110	300	W
Wa =	56	27	145	58	34	145	W
Wo =	124	60	149	147	76	155	W
η =	69	69	50	72	69	51	%
m =	100	100	100	100	100	100	%
Vg2p =				300	300	400	V
Wmod =	90	43	147	115	63	160	W

[1]) Two valves; deux tubes; zwei Röhren

Operating conditions H.F. class C suppressor grid modulation
Caractéristiques d'utilisation H.F. classe C modulation de grille d'arrêt
Betriebsdaten H.F. Klasse C Fanggittermodulation

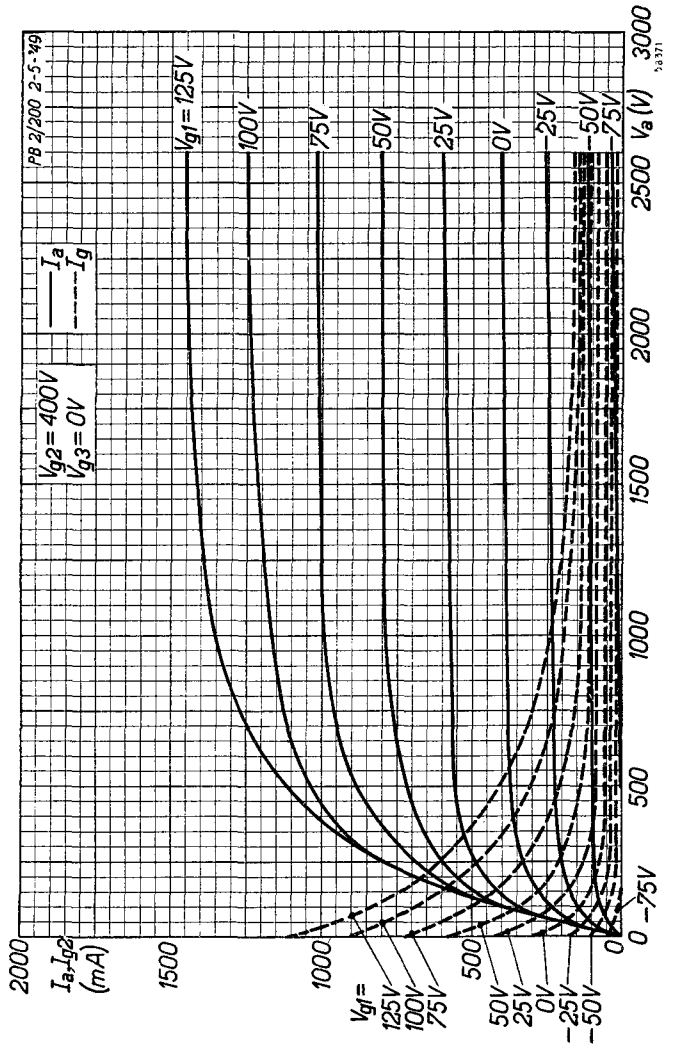
λ	=	>15	>15	5[1])	m
Va	=	2000	1500	1500	V
Vg1	=	-150	-150	-150	V
Vg2	=	300	300	400	V
Vg3	=	-180	-160	-185	V
Ia	=	68	80	180	mA
Ig1	=	8	6	4	mA
Ig2	=	83	80	125	mA
Vg1p	=	240	250	175	V
Wig1	=	1,9	1,5	0,7	W
Wg2	=	25	24	50	W
Wia	=	135	120	270	W
Wa	=	92	85	205	W
Wo	=	43	35	65	W
η	=	32	29	24	%
m	=	90	90	80	%
Vg3p	=	180	160	185	V
Wmod	=	0	0	0	W

[1]) Two valves; deux tubes; zwei Röhren

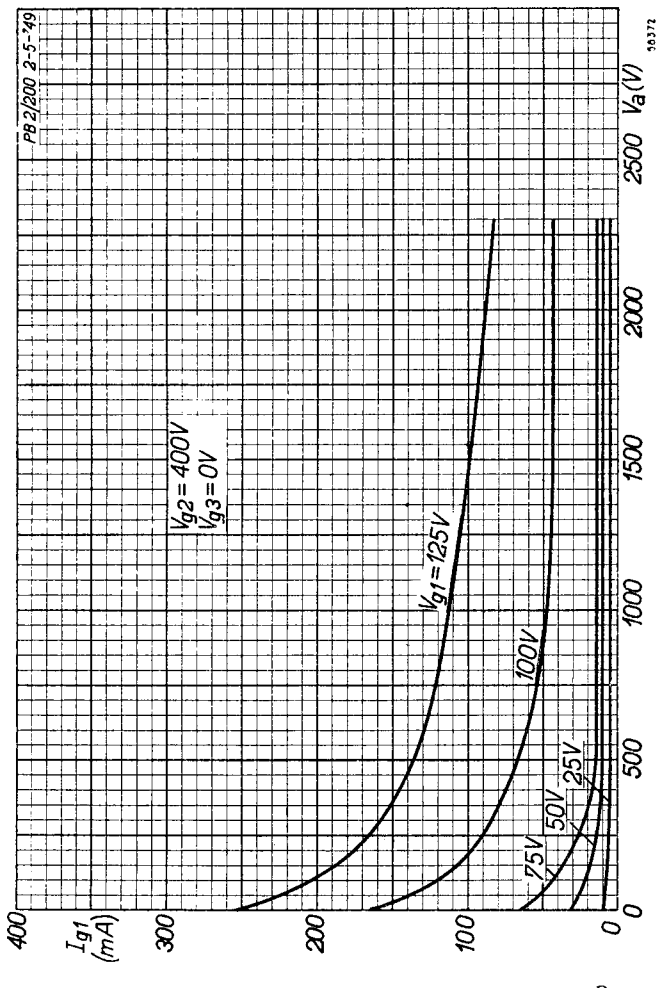
PHILIPS

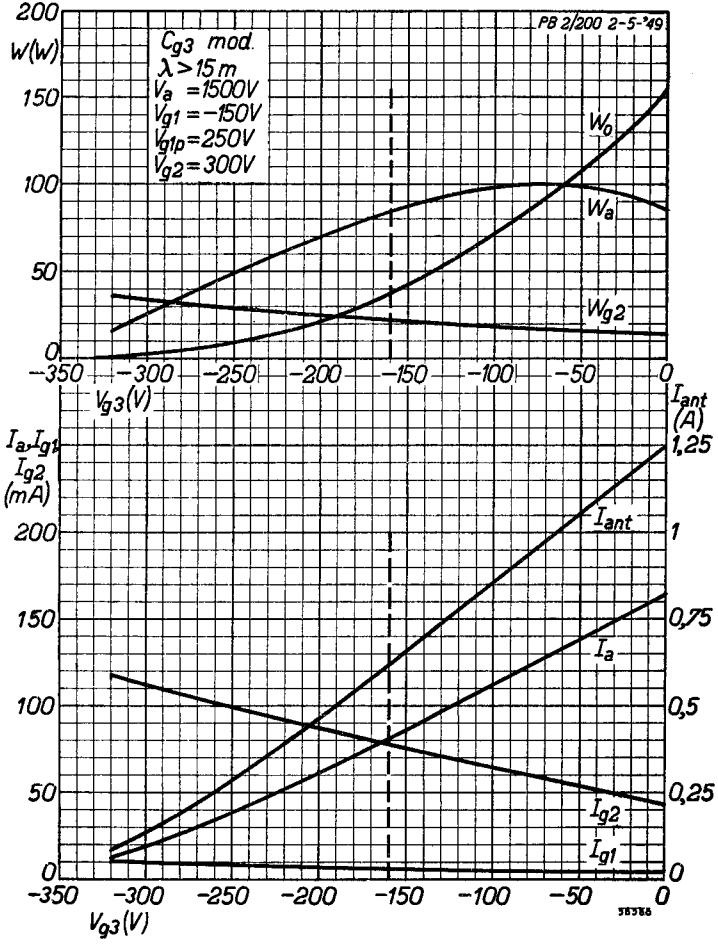
Operating conditions as L.F. class B amplifier and modulator, two valves
Caractéristiques d'utilisation comme amplificatrice et modulatrice B.F. classe B, deux tubes
Betriebsdaten als N.F. Verstärker und Modulator Klasse B, zwei Röhren

Va	=	2000		V
Vg1	=	-75		V
Vg2	=	400		V
Vg3	=	0		V
Raa	=	16		kΩ
Vg1g1p	=	0	200	V
Ia	=	2x20	2x142,5	mA
Ig1	=	0	2x3,5	mA
Ig2	=	2x3	2x40	mA
Wig1	=	0	2x0,4	W
Wg2	=	2x1,2	2x16	W
Wia	=	2x40	2x285	W
Wa	=	2x40	2x85	W
Wo	=	0	400	W
η	=	-	70	%


PB 2/200 2-5-'49
Vg2 = 400V
Vg3 = 0V
Ia
Ig
Vg1 = 125V
100V
75V
50V
25V
0V
-25V
-50V
-75V
Va (V)
3000
2500
2000
1500
1000
500
0
Ia, Ig2 (mA)
2000
1500
1000
500
0
Vg1 =
125V
100V
75V
50V
25V
0V
-25V
-50V
-75V
5371

PHILIPS


PB 2/200 2-5-'49
V_{g2} = 400V
V_{g3} = 0V
V_{g1} = 125V
100V
75V
50V
25V
I_{g1} (mA)
400
300
200
100
0
0
500
1000
1500
2000
2500
V_a (V)
59372


PB 2/200 2-5-'49
C_{g3} mod.
λ > 15 m
V_a = 1500V
V_{g1} = −150V
V_{g1p} = 250V
V_{g2} = 300V
W(W)
200
150
100
50
0
W_o
W_a
W_{g2}
−350 −300 −250 −200 −150 −100 −50 0
V_{g3}(V)
I_a, I_{g1}, I_{g2} (mA)
200
150
100
50
0
I_{ant} (A)
1,25
1
0,75
0,5
0,25
0
I_{ant}
I_a
I_{g2}
I_{g1}
−350 −300 −250 −200 −150 −100 −50 0
V_{g3}(V)
58388

6.5.1949

C

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Electronic Tube

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PB2/200

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1	1	1954.07.07
2	2	1954.07.07
3	3	1949.03.14
4	4	1949.03.14
5	5	1949.03.14
6	6	1949.03.14
7	A	1949.05.06
8	B	1949.05.06
9	C	1949.05.06
10	FP	2000.04.04

PENTODE for use as H.F. amplifier
PENTHODE pour utilisation comme amplificatrice H.F.
PENTHODE zur Verwendung als H.F. Verstärker

Filament : thoriated tungsten
Filament : tungstène thorié
Heizfaden: thoriertes Wolfram

Heating : direct
Chauffage: direct
Heizung : direkt

Vf = 12 V
If = 7,3 A

Capacitances
Capacités
Kapazitäten

Ca = 20 pF
Cg1 = 23 pF
Cag1 = 0,2 pF

Typical characteristics
Caractéristiques typiques
Kenndaten

$\mu g2g1$ = 6,2
S (Ia=120 mA)= 6 mA/V

λ	Freq.	C telegr		B teleph.		Cag2 mod.		Cg3 mod.	
m	Mc/s	Va (V)	Wo (W)	Va (V)	Wo (W)	Va (V)	Wo (W)	Va (V)	Wo (W)
>30	<10	2500	600			2000	325		
>15	<20	2000	550	2000	90	1800	290	2000	100
5[1])	60 [1])	1500	625	1500	100	1200	350	1500	90

Limiting values
Caractéristiques limites
Grenzdaten

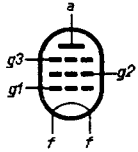
Va = max. 2500 V
Wa = max. 250 W
Vg2 = max. 500 V
Wg2 = max. 60 W
temperature of pin seals
température des points de scellement des broches
Temperatur der Stiftenverschlüsse
= max. 200 °C

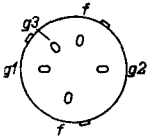
R_{g3} = max. 40 kΩ ←
Wg1 = max. 20 W
Rg1 = max. 40 kΩ
Ik = max. 600 mA
Ikp = max. 2400 mA

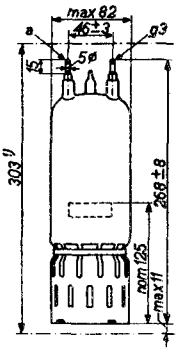
[1]) Two valves; deux tubes; zwei Röhren

PHILIPS

Dimensions in mm
Dimensions en mm
Abmessungen in mm







Socket
Support
Fassung 40200

Clips
Bornes de connexion 40600
Anschlussklemmen

Mounting position : vertical with base up[2]) or down
Montage : vertical avec culot en haut[2]) ou en bas
Einbau : senkrecht mit Sockel oben[2]) oder unten

Net weight		Shipping weight	
Poids net	0,63 kg	Poids brut	2,3 kg
Nettogewicht		Bruttogewicht	

---

1) Required height in apparatus
Hauteur nécessaire dans l'appareil
Benötigte Höhe im Gerät

2) In that case it is recommended to support the tube
Dans ce cas il est recommandé de supporter le tube
In diesem Fall empfiehlt es sich die Röhre zu stützen

Operating conditions H.F. class C telegraphy
Caractéristiques d'utilisation H.F. classe C télégraphie
Betriebsdaten H.F. Klasse C Telegraphie

λ	=	>30	>15	5[1])	m
Va	=	2500	2000	1500	V
Vg1	=	-150	-150	-150	V
Vg2	=	400	400	450	V
Vg3	=	0	0	0	V
Ia	=	340	400	750	mA
Ig1	=	20	20	30	mA
Ig2	=	150	150	260	mA
Vg1p	=	270	320	420	V
Wig1	=	5,4	6,4	14	W
Wg2	=	60	60	117	W
Wia	=	850	800	1125	W
Wa	=	250	250	500	W
Wo	=	600	550	625	W
η	=	70,5	69	55	%

Operating conditions H.F. class B telephony
Caractéristiques d'utilisation H.F. classe B téléphonie
Betriebsdaten H.F. Klasse B Telephonie

λ	=	>15	5[1])	m
Va	=	2000	1500	V
Vg1	=	-50	-50	V
Vg2	=	350	260	V
Vg3	=	0	0	V
Ia	=	170	300	mA
Ig2	=	12	40	mA
Vg1p	=	60	80	V
Wg2	=	4,2	11	W
Wia	=	340	450	W
Wa	=	250	350	W
Wo	=	90	100	W
η	=	26,5	22	%
m	=	100	100	%
Ig1	=	6	30	mA
Wig1	=	0,7	5	W

[1]) Two valves; deux tubes; zwei Röhren

PHILIPS

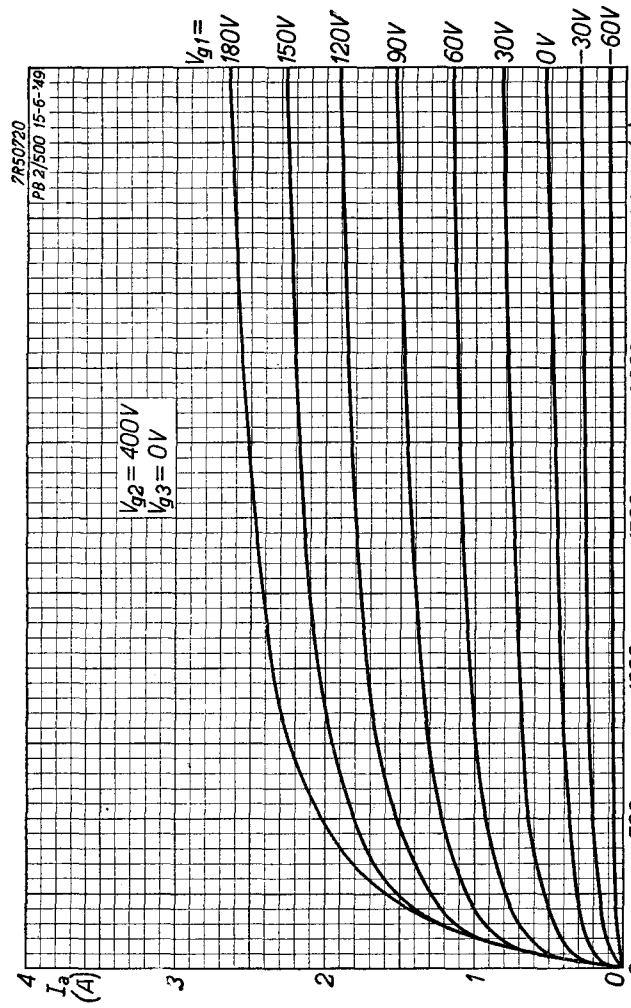
Operating conditions H.F. class C
Caractéristiques d'utilisation H.F. classe C
Betriebsdaten H.F. Klasse C

	anode- and screen grid modulation modulation d'anode et de grille-écran Anoden- und Schirmgitter-modulation			suppressor grid modulation modulation de grille d'arrêt Fanggittermodulation		
λ =	>30	>15	5[1])	>15	5[1])	m
Va =	2000	1800	1200	2000	1500	V
Vg1 =	-150	-150	-150	-150	-150	V
Vg2 =	300	300	400	300	500	V
Vg3 =	0	0	0	-250	-260	V
Ia =	235	235	570	175	270	mA
Ig1 =	25	30	30	24	7	mA
Ig2 =	120	133	220	153	240	mA
Vg1p =	300	270	325	260	190	V
Wig1 =	7,5	8,1	10	6,2	2	W
Wg2 =	36	40	88	46	120	W
Wia =	470	423	685	350	405	W
Wa =	145	133	335	250	315	W
Wo =	325	290	350	100	90	W
η =	69	68,5	51	28,5	22	%
m =	100	100	100	100	90	%
Vg2p =	300	300	400			V
Vg3p =				250	260	V
Wmod =	253	235	390	0	0	W

[1]) Two valves; deux tubes; zwei Röhren

Operating conditions as L.F. class B amplifier and modulator, two valves
Caractéristiques d'utilisation comme amplificatrice et modulatrice B.F. classe B, deux tubes
Betriebsdaten als N.F. Verstärker und Modulator Klasse B, zwei Röhren

Va	=		2500	V
Vg1	=		-90	V
Vg2	=		500	V
Vg3	=		0	V
Raa	=		10	kΩ
Vg1g1p	=	0	290	V
Ia	=	2x50	2x283	mA
Ig1	=	0	2x7	mA
Ig2	=	2x6	2x95	mA
Wig1	=	0	2x1	W
Wg2	=	2x3	2x47,5	W
Wia	=	2x125	2x708	W
Wa	=	2x125	2x208	W
Wo	=	0	1000	W
η	=	-	70	%


7R50720
PB 2/500 15-6-'49
V_{g1} =
180V
150V
120V
90V
60V
30V
0V
-30V
-60V
V_{g2} = 400V
V_{g3} = 0V
I_a (A)
V_a (V)
0
500
1000
1500
2000
2500
3000
1
2
3
4

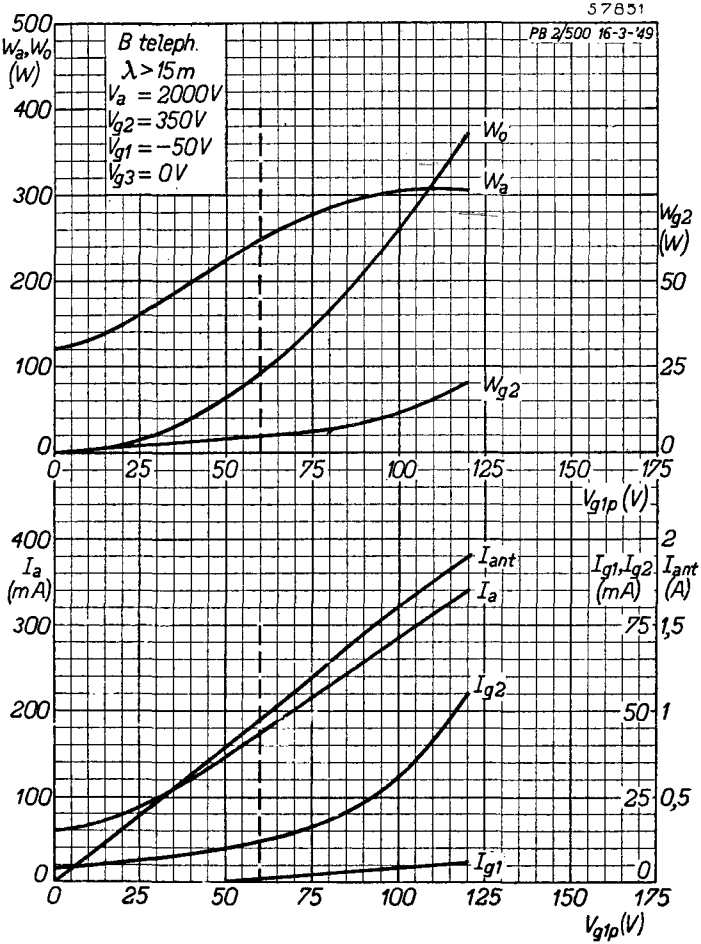
PB 2/500

PHILIPS

B

PHILIPS

PB 2/500

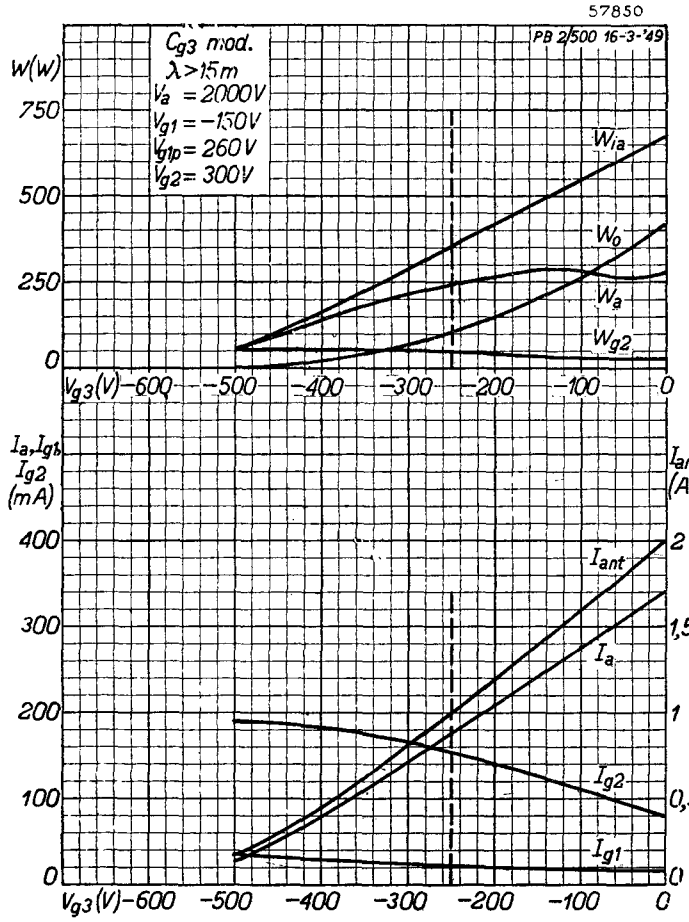


18.3.1949

C

PB 2/500 **PHILIPS**

57850



D

PHILIPS

Electronic Tube

HANDBOOK

PB2/500

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1	1	1954.07.07
2	2	1954.07.07
3	3	1949.03.03
4	4	1949.03.03
5	5	1949.03.03
6	A	1949.07.07
7	B	1949.07.07
8	C	1949.03.18
9	D	1949.03.18
10	FP	2000.04.04

PENTODE for use as H.F. amplifier
PENTHODE pour utilisation comme amplificatrice H.F.
PENTHODE zur Verwendung als H.F. Verstärker

Filament : thoriated tungsten
Filament : tungstène thorié
Heizfaden: thoriertes Wolfram

Heating : direct
Chauffage: direct
Heizung : direkt

Vf = 12 V
If = 7,5 A

Capacitances
Capacités
Kapazitäten

Ca = 20 pF
Cg1 = 45 pF
Cag1 = 0,05 pF

Typical characteristics
Caractéristiques typiques
Kenndaten

$\mu g2g1$ = 4
S (Ia=300 mA) = 6,5 mA/V

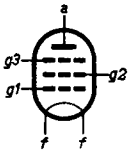
λ	Freq.	C telegr.		B teleph.		Can.mod.	
m	Mc/s	Va (V)	Wo (W)	Va (V)	Wo (W)	Va (V)	Wo (W)
>60	< 5	3000	1250	3000	275	3000	450
		2500	1000			2500	400
		2000	700			2000	350
15	20	2500	900				
		Cag2 mod.		Cg2 mod.		Cg3 mod.	
>60	< 5	3000	750	3000	250	3000	210
		2500	600				
		2000	425				

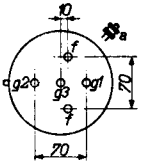
Limiting values
Caractéristiques limites
Grenzdaten

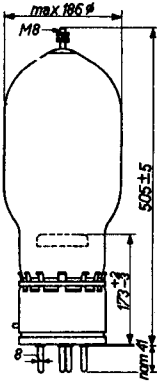
Va = max. 3000 V
Wa = max. 600 W
Vg2 = max. 1000 V
Wg2 = max. 100 W
Wg1 = max. 16 W
Rg1 = max. 10 kΩ
Ik = max. 700 mA
Ikp = max. 2800 mA

PHILIPS

Dimensions in mm
Dimensions en mm
Abmessungen in mm







Mounting position: vertical with base down
Montage : vertical avec le culot en bas
Aufstellung : senkrecht mit Sockel unten

Net weight
Poids net 3,9 kg
Nettogewicht

Shipping weight
Poids brut 12 kg
Bruttogewicht

PHILIPS

Electronic Tube

HANDBOOK

PB3/1000

page	sheet	date
1	1	1954.07.07
2	2	1954.07.07
3	FP	2000.04.04

PENTODE for use as H.F. amplifier and oscillator
PENTHODE pour utilisation en amplificatrice H.F. et oscillatrice
PENTODE zur Verwendung als H.F. Verstärker und Oszillator

Filament : thoriated tungsten
Filament : tungstène thorié
Heizfaden : thoriertes Wolfram

Heating : direct
Chauffage : direct
Heizung : direkt

V_f = 12 V
I_f = 8,5 A

Capacitances
Capacités
Kapazitäten

C_a = 21 pF
C_{g1} = 29 pF
C_{ag1} = 0,05 pF

Typical characteristics
Caractéristiques types
Kenndaten

μ_{g2g1} = 3,5
S (I_a=225 mA)= 6,5 mA/V

	Freq.	C telegr.		B teleph.	
m	Mc/s	V_a (V)	W_o (W)	V_a (V)	W_o (W)
>30	<10	3000	1200	3000	190
>15	<20	2500	950	2500	130
5	60	1800	485	1800	68
		C_{ag2} mod.		C_{g3} mod.	
>30	<10	2500	580	3000	200
>15	<20	2000	425	2500	150

B mod.[1])	
V_a (V)	W_o (W)
3000	1600

Limiting values
Caractéristiques limites
Grenzdaten

V_a	= max. 3000 V	R_{g3}	= max. 30 kΩ
W_a	= max. 450 W	W_{g1}	= max. 20 W
V_{g2}	= max. 600 V	R_{g1}	= max. 30 kΩ
V_{g2}(B mod.)	= max. 750 V	I_k	= max. 700 mA
W_{g2}	= max. 100 W	I_{kp}	= max. 4500 mA

temperature of pin seals a and g3)
temp. des points de scellement des broches a et g3) = max. 200 °C
Temp. der Verschlüsse a und g3)

[1]) Two tubes, deux tubes, zwei Röhren.

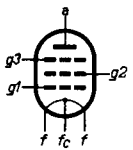
PHILIPS

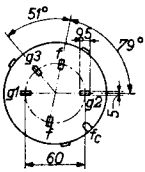
To insure safe seal temperatures a low velocity air flow is required above 60 Mc/s

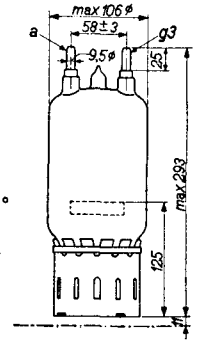
Un courant d'air à vélocité peu élevée est nécessaire aux fréquences dépassant 60 Mc/s pour assurer une température assez basse aux points de scellement

Bei Frequenzen höher als 60 MHz ist ein schwacher Luftstrom notwendig, damit die Temperatur der Stiftenverschlüsse die höchstzulässige Temperatur nicht überschreitet.

Dimensions in mm
Dimensions en mm
Abmessungen in mm







Socket
Support 40201
Fassung

Clips
Bornes de connexion 40626
Anschlussklemmen

Mounting position: vertical with base up[1]) or down
Montage : vertical avec culot en haut[1]) ou en bas
Einbau : senkrecht mit Sockel oben[1]) oder unten

Net weight		Shipping weight	
Poids net	0,78 kg	Poids brut	2,5 kg
Nettogewicht		Bruttogewicht	

[1]) In that case it is recommended to support the tube
Dans ce cas il est recommandé de supporter le tube
In diesem Fall empfiehlt es sich die Röhre zu stützen

Operating conditions H.F. class C telegraphy
Caractéristiques d'utilisation H.F. classe C télégraphie
Betriebsdaten H.F. Klasse C Telegraphie

			Vg2 = Vg3		
λ	=	>30	>15	5[1])	m
Va	=	3000	2500	1800	V
Vg1	=	-200	-200	-150	V
Vg2=Vg3	=	300	300	300	V
Ia	=	550	550	985	mA
Ig1	=	25	20	30	mA
Ig2+g3	=	100	100	200	mA
Vg1p	=	370	360	300	V
Wig1	=	9	7	9	W
Wg2+g3	=	30	30	60	W
Wia	=	1650	1375	1775	W
Wa	=	450	425	800	W
Wo	=	1200	950	975	W
η	=	72,5	69	55	%
			Vg3 = 0		
λ	=	>30	>15	5[1])	m
Va	=	3000	2500	1800	V
Vg1	=	-300	-300	-200	V
Vg2	=	500	500	500	V
Vg3	=	0	0	0	V
Ia	=	465	470	945	mA
Ig1	=	20	20	30	mA
Ig2	=	200	200	320	mA
Vg1p	=	450	450	350	V
Wig1	=	9	9	11	W
Wg2	=	100	100	160	W
Wia	=	1400	1175	1700	W
Wa	=	450	450	800	W
Wo	=	950	725	900	W
η	=	68	61,5	53	%

[1]) Two valves; deux tubes; zwei Röhren

PHILIPS

Operating conditions H.F. class B telephony
Caractéristiques d'utilisation H.F. classe B téléphonie
Betriebsdaten H.F. Klasse B Telephonie

λ	=	>30	>15	5[1])	m
Va	=	3000	2500	1800	V
Vg1	=	-120	-115	-90	V
Vg2	=	500	500	420	V
Vg3	=	0	0	0	V
Ia	=	215	230	350	mA
Ig2	=	30	30	50	mA
Vg1p	=	80	75	60	V
Wg2	=	15	15	21	W
Wia	=	640	580	630	W
Wa	=	450	450	495	W
Wo	=	190	130	135	W
η	=	30	22	21	%
m	=	100	100	100	%
Ig1	=	4	3	6	mA
Wig1	=	0,7	0,5	0,8	W

[1]) Two valves; deux tubes; zwei Röhren

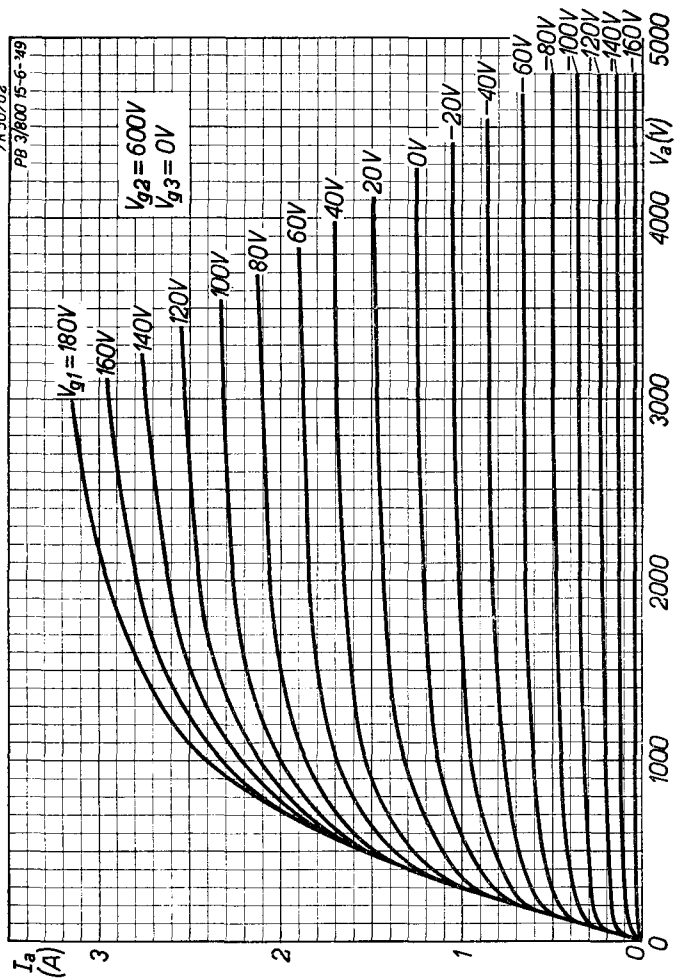
Operating conditions H.F. class C
Caractéristiques d'utilisation H.F. classe C
Betriebsdaten H.F. Klasse C

	anode- and screen grid modulation modulation d'anode et de grille-écran Anoden- und Schirmgittermodulation		suppressor grid modulation modulation de grille d'arrêt Fanggittermodulation				
λ =	>30	>15	>30	>15	>30	>15	m
Va =	2500	2000	3000	2500	3000	2500	V
Vg1 =	-300	-300	-300	-300	-300	-300	V
Vg2 =	500	500	600	600	600	600	V
Vg3 =	0	0	-190	-170	-210	-200	V
Ia =	325	315	190	165	175	175	mA
Ig1 =	7	7	5	5	5	5	mA
Ig2 =	135	135	165	165	165	165	mA
Vg1p =	385	385	335	335	335	335	V
Wig1 =	2,7	2,7	1,7	1,7	1,7	1,7	W
Wg2 =	67	67	100	100	100	100	W
Wia =	815	630	570	415	525	425	W
Wa =	235	205	370	265	360	325	W
Wo =	580	425	200	150	165	100	W
η =	71	67,5	35	36	31	23,5	%
m =	100	100	80	80	100	100	%
Vg2p =	500	500					V
Vg3p =			190	170	210	200	V
Wmod =	440	350	0	0	0	0	W

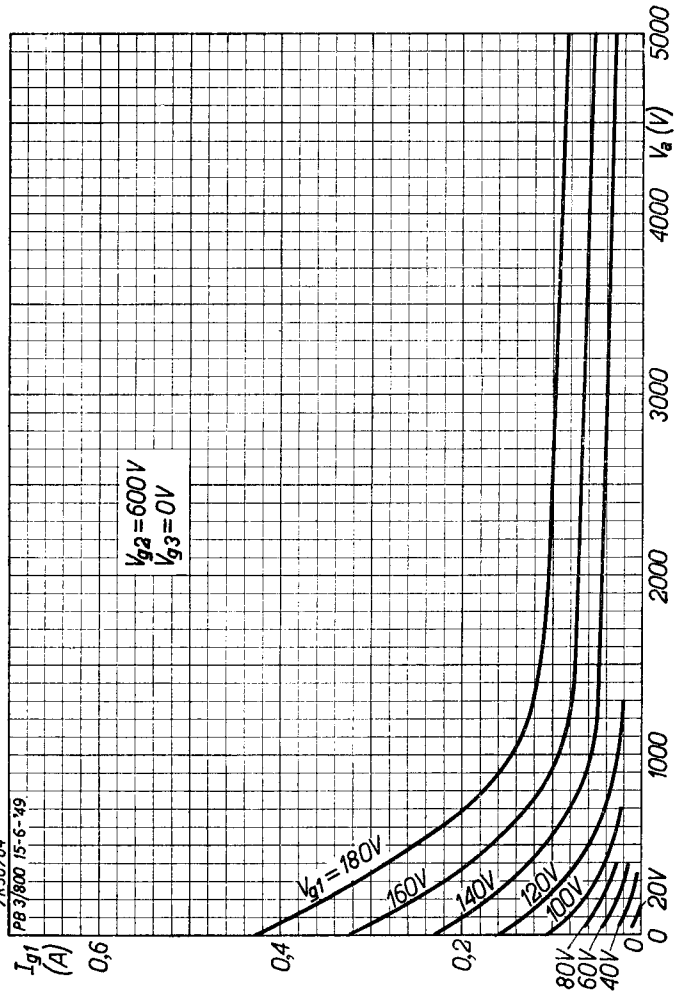
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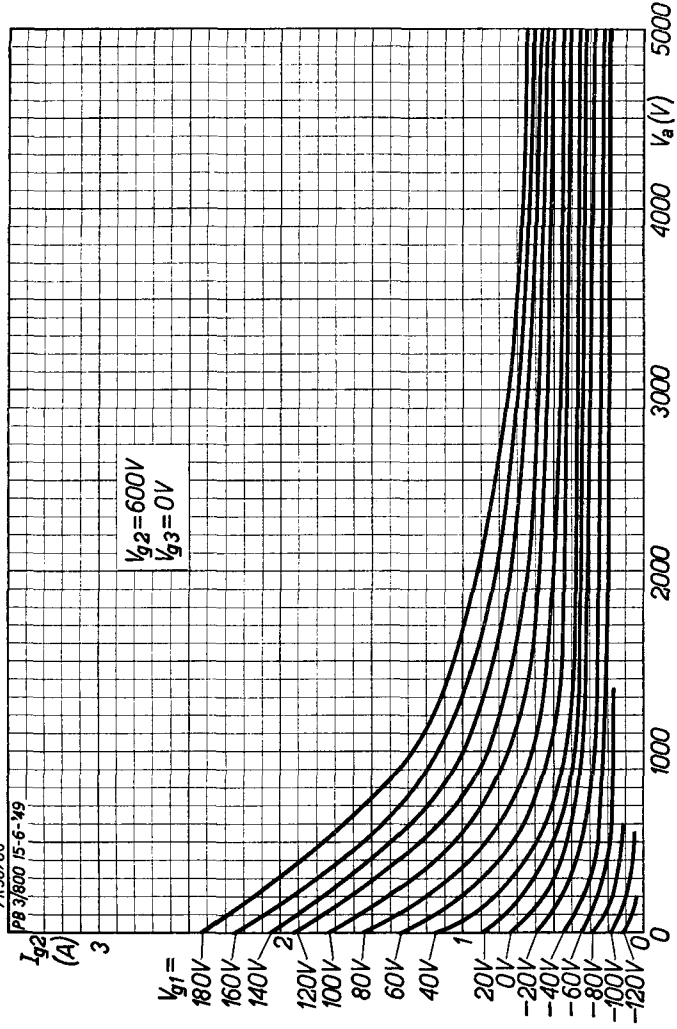
Operating conditions as L.F. class B amplifier and modulator, two valves
Caractéristiques d'utilisation comme amplificatrice et modulatrice B.F. classe B, deux tubes
Betriebsdaten als N.F. Verstärker und Modulator Klasse B, zwei Röhren

Va	=		3000	V
Vg1	=		-160	V
Vg2	=		600	V
Vg3	=		0	V
Raa	=		8,8	kΩ
Vg1g1p	=	0	360	V
Ia	=	2x50	2x385	mA
Ig1	=	0	2x6	mA
Ig2	=	2x8	2x105	mA
Wig1	=	0	2x1,1	W
Wg2	=	2x4,8	2x63	W
Wia	=	2x150	2x1155	W
Wa	=	2x150	2x355	W
Wo	=	0	1600	W
η	=	-	69	%

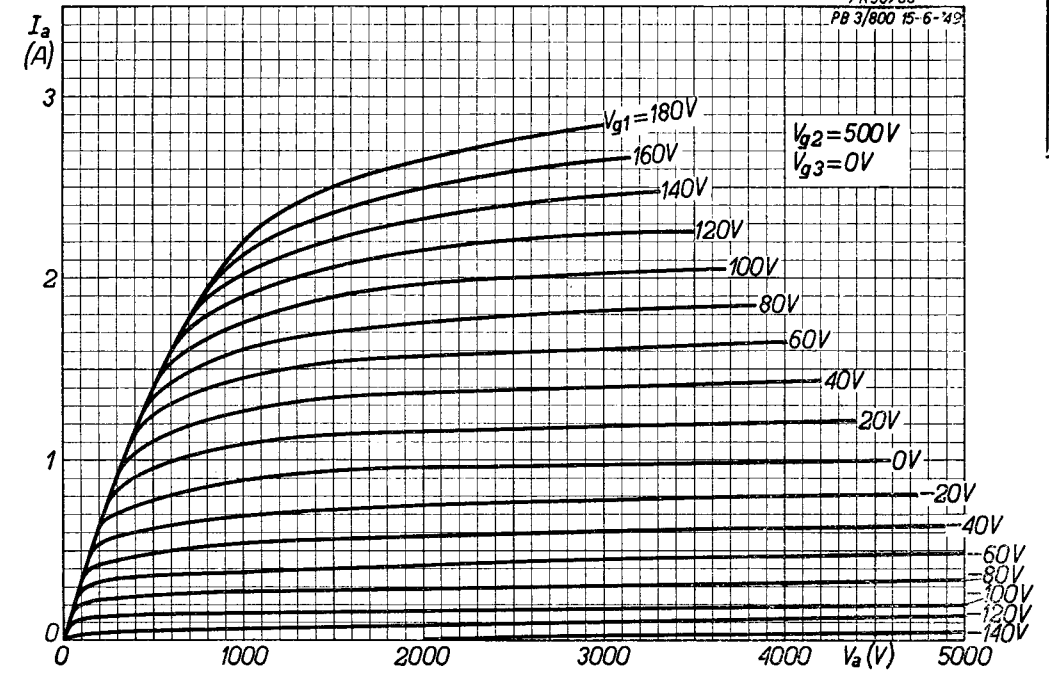

7R.50702
PB 3/800 15-6-49
$V_{g2} = 600V$
$V_{g3} = 0V$
$V_{g1} = 180V$
160V
140V
120V
100V
80V
60V
40V
20V
0V
-20V
-40V
-60V
-80V
-100V
-120V
-140V
-160V
I_a (A)
V_a (V)
0
1
2
3
1000
2000
3000
4000
5000

PHILIPS


I_{g1} (A)
0,6
0,4
0,2
0
V_a (V)
0
1000
2000
3000
4000
5000
V_{g2}=600 V
V_{g3}=0 V
V_{g1}=180V
160V
140V
120V
100V
80V
60V
40V
20V
0
7R50704
PB 3/800 15-6-'49


7R50706
PB 3/800 15-6-'49
I_{g2} (A)
3
2
1
0
V_{g1} =
180V
160V
140V
120V
100V
80V
60V
40V
20V
0V
−20V
−40V
−60V
−80V
−100V
−120V
V_{g2}=600V
V_{g3}=0V
1000
2000
3000
4000
5000
V_a (V)

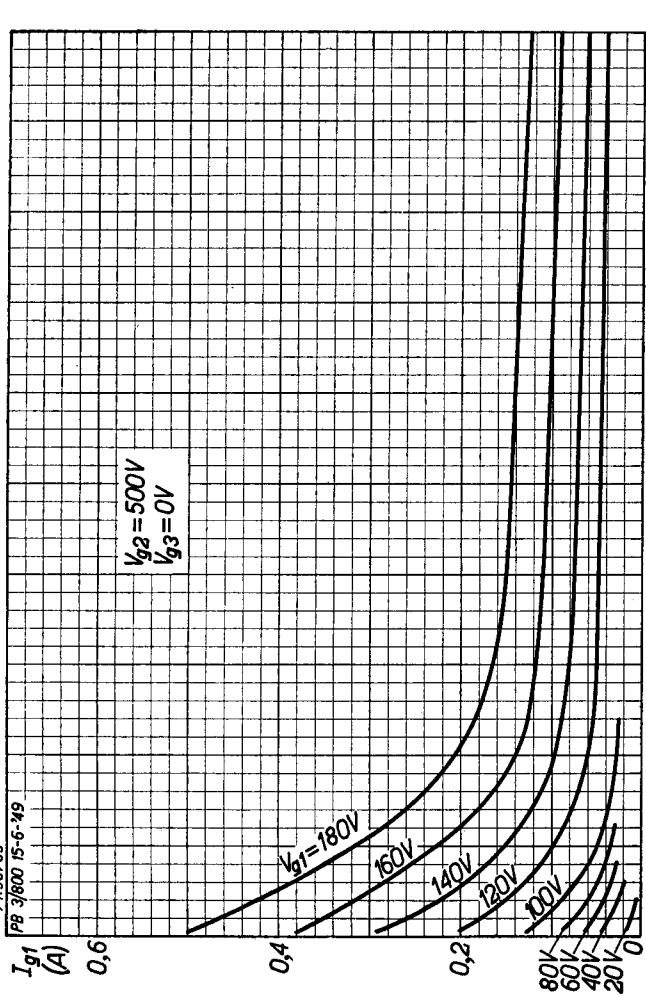
PHILIPS


7R50703
PB 3/800 15-6-'49
I_a (A)
3
2
1
0
V_{g1}=180V
160V
140V
120V
100V
80V
60V
40V
20V
0V
-20V
-40V
-60V
-80V
-100V
-120V
-140V
V_{g2}=500V
V_{g3}=0V
0
1000
2000
3000
4000
V_a (V)
5000

D

PHILIPS

PB 3/800



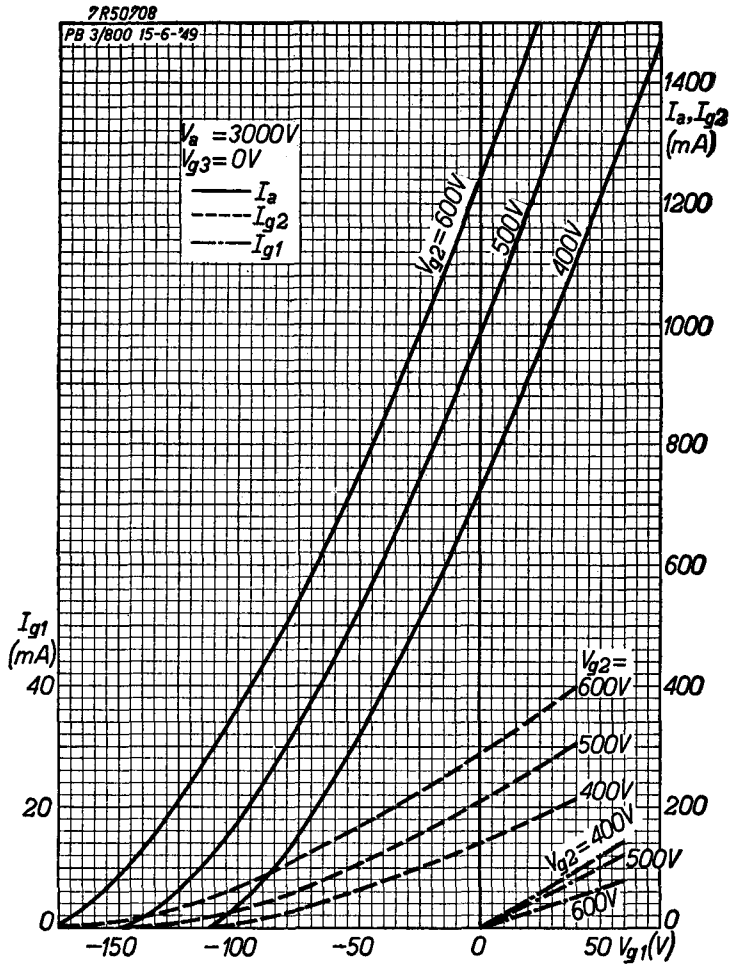
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E

PB 3/800

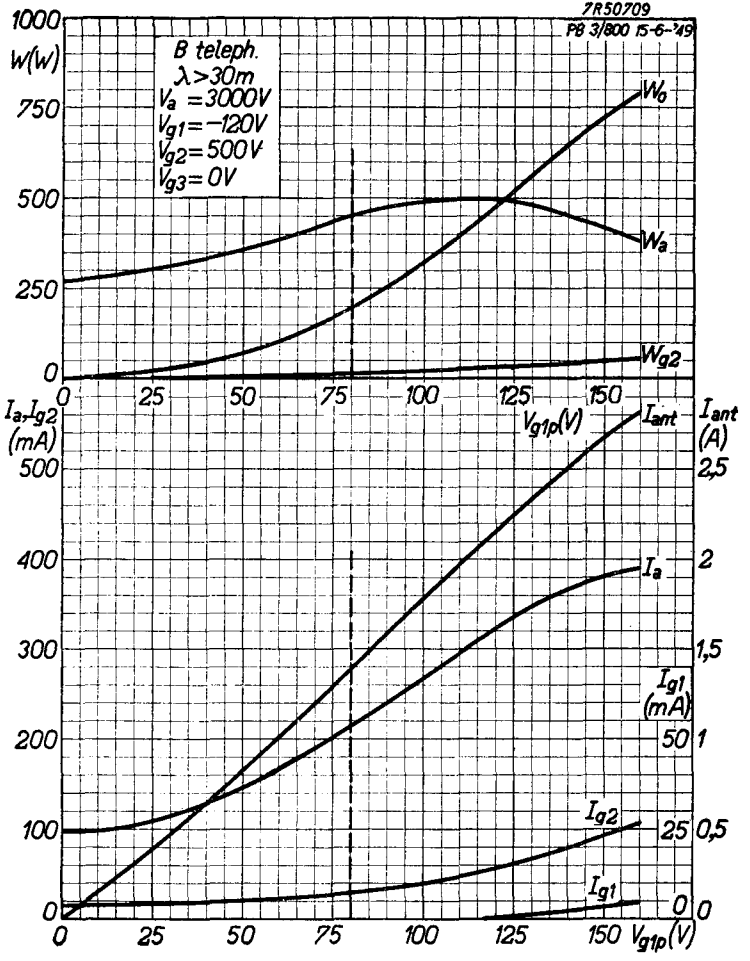
PHILIPS

F

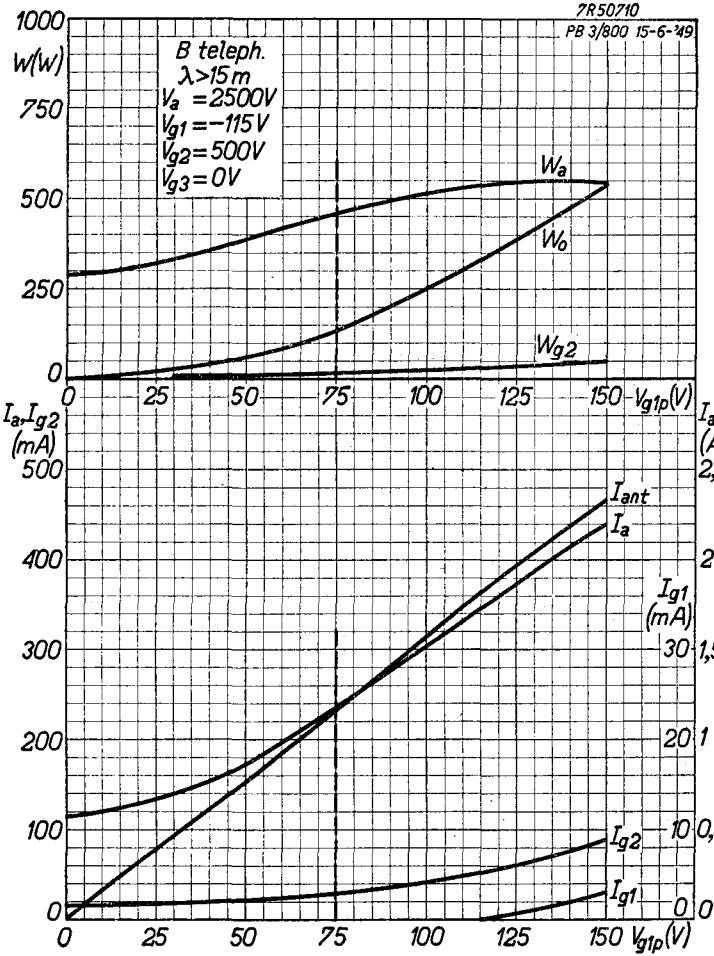

2R50708
PB 3/800 15-6-'49
V_a =3000V
V_{g3}= 0V
I_a
I_{g2}
I_{g1}
V_{g2}=600V
500V
400V
I_{g1} (mA)
40
20
0
V_{g2}=
600V
500V
400V
V_{g2}=400V
500V
600V
1400
I_a, I_{g2} (mA)
1200
1000
800
600
400
200
0
−150
−100
−50
0
50 V_{g1}(V)

PB 3/800

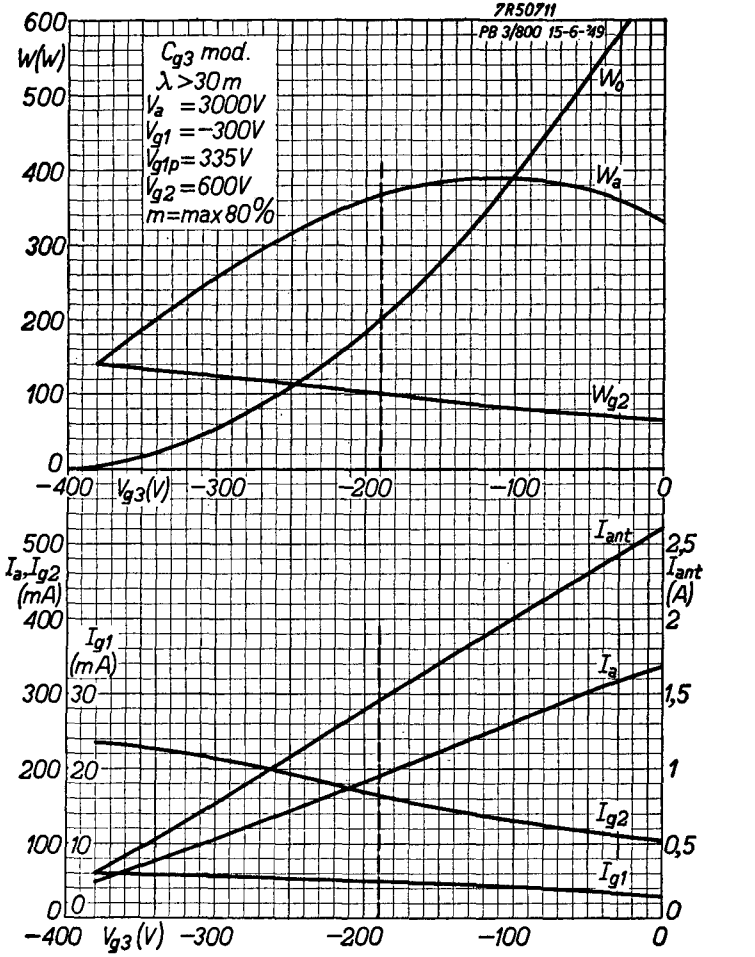
PHILIPS

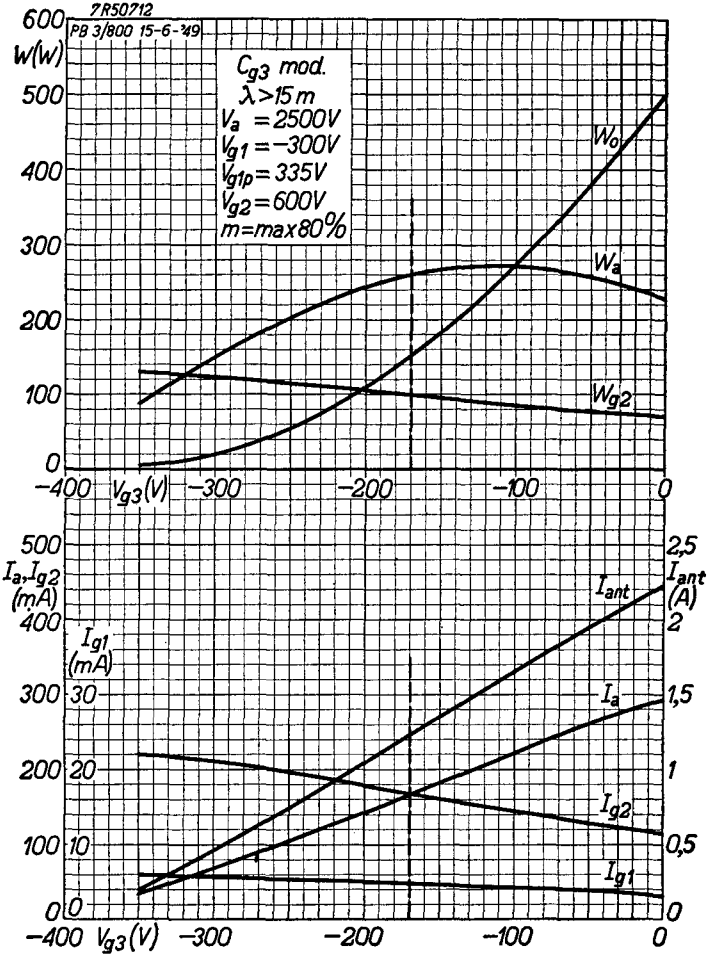


H

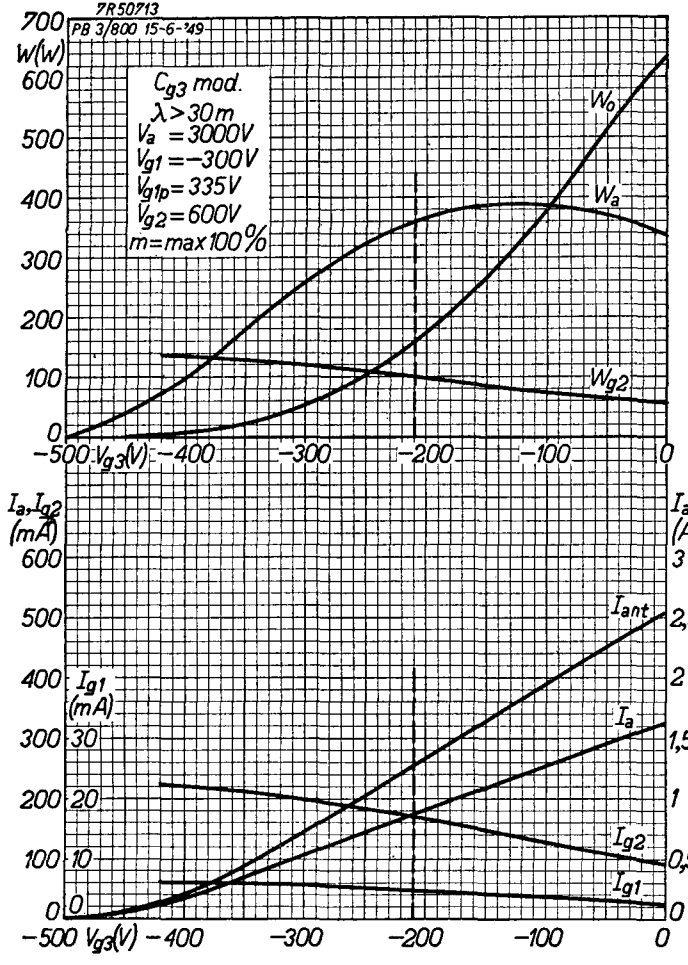

7R50710
PB 3/800 15-6-'49
B teleph.
λ>15 m
Va =2500V
Vg1 =−115V
Vg2=500V
Vg3=0V
W(W)
1000
750
500
250
0
Wa
Wo
Wg2
0
25
50
75
100
125
150
Vg1p(V)
Ia,Ig2 (mA)
500
400
300
200
100
0
Iant (A)
2,5
2
1,5
1
0,5
0
Iant
Ia
Ig1 (mA)
30
20
10
0
Ig2
Ig1

PHILIPS

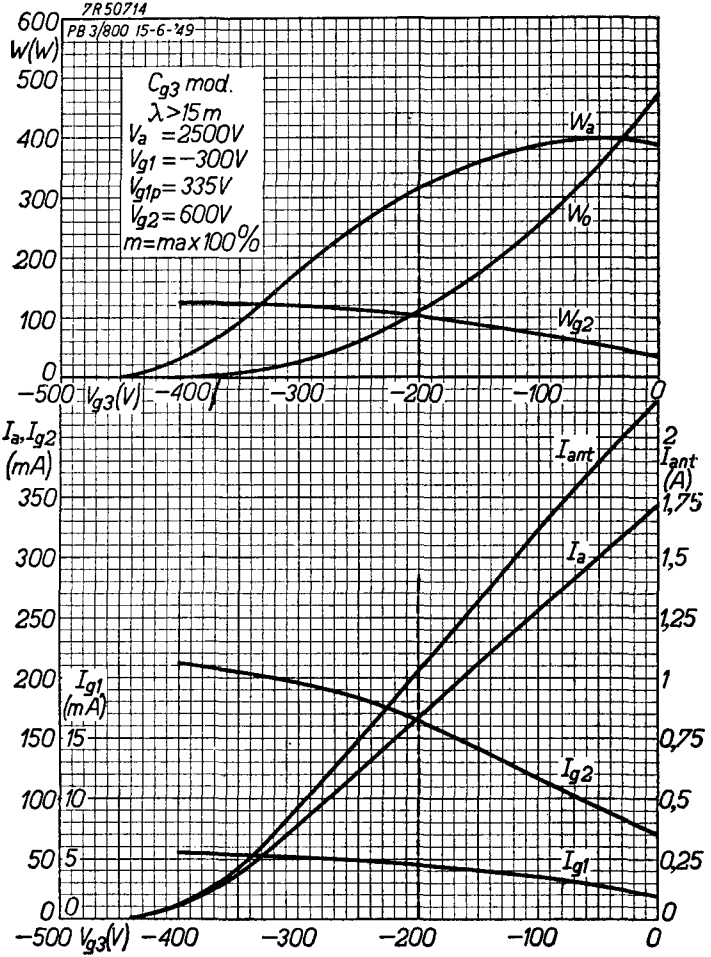

7R50711
PB 3/800 15-6-'49
C_{g3} mod.
λ >30 m
V_a =3000V
V_{g1} =−300V
V_{g1p}= 335V
V_{g2} =600V
m=max 80%
W(w)
W_o
W_a
W_{g2}
V_{g3}(V)
I_a,I_{g2} (mA)
I_{g1} (mA)
I_{ant} (A)
I_{ant}
I_a
I_{g2}
I_{g1}


7R50712
PB 3/800 15-6-'49
C_{g3} mod.
$\lambda > 15$ m
$V_a = 2500V$
$V_{g1} = -300V$
$V_{g1p} = 335V$
$V_{g2} = 600V$
$m = max\,80\%$
W(W)
600
500
400
300
200
100
0
W_o
W_a
W_{g2}
−400
V_{g3}(V)
−300
−200
−100
0
I_a, I_{g2} (mA)
500
400
300
200
100
0
I_{g1} (mA)
30
20
10
0
I_{ant} (A)
2,5
2
1,5
1
0,5
0
I_{ant}
I_a
I_{g2}
I_{g1}

PHILIPS

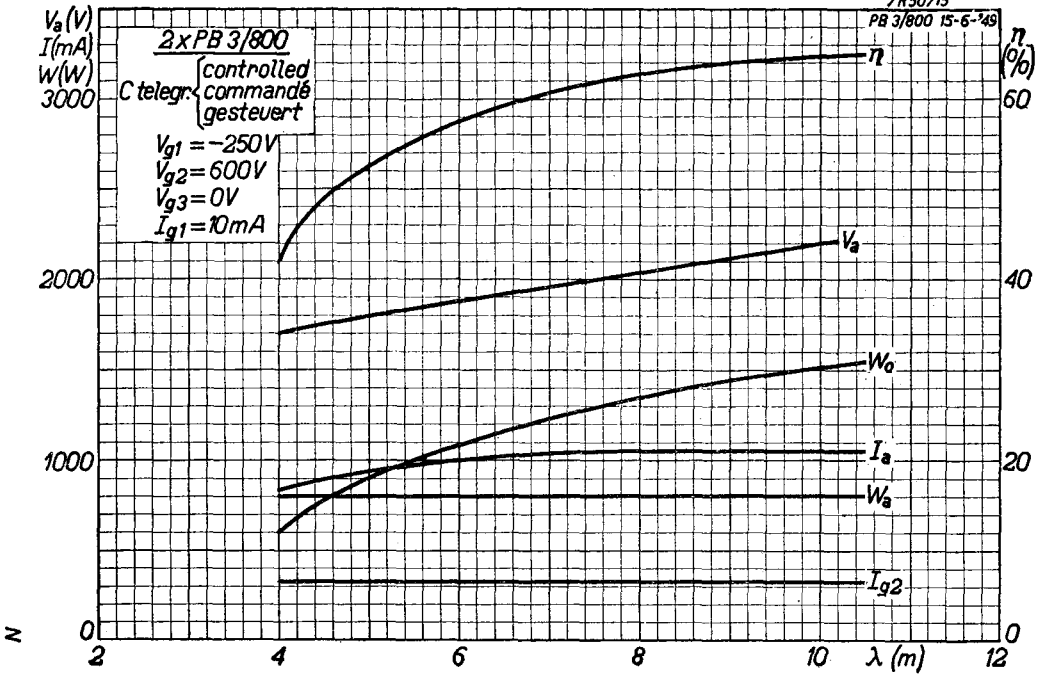

7R50713
PB 3/800 15-6-'49
C_{g3} mod.
$\lambda > 30$ m
$V_a = 3000$V
$V_{g1} = -300$V
$V_{g1p} = 335$V
$V_{g2} = 600$V
$m = \max 100\%$
W(w)
W_o
W_a
W_{g2}
V_{g3}(V)
I_a, I_{g2} (mA)
I_{ant} (A)
I_{g1} (mA)
I_{ant}
I_a
I_{g2}
I_{g1}

L


7R50714
PB 3/800 15-6-'49
C_{g3} mod.
λ>15 m
V_a =2500V
V_{g1} =−300V
V_{g1p} = 335V
V_{g2} = 600V
m=max 100%
W(W)
W_a
W_o
W_{g2}
V_{g3}(V)
I_a, I_{g2} (mA)
I_{ant}
I_{ant} (A)
I_a
I_{g2}
I_{g1}
I_{g1} (mA)

7.7.1949

M



PB 3/800

PHILIPS



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3	3	1949.04.05
4	4	1949.04.05
5	5	1950.02.02
6	6	1950.02.02
7	A	1954.07.07
8	B	1954.07.07
9	C	1954.07.07
10	D	1954.07.07
11	E	1954.07.07
12	F	1954.07.07
13	G	1954.07.07
14	H	1954.07.07
15	I	1954.07.07
16	J	1954.07.07
17	K	1954.07.07
18	L	1954.07.07
19	M	1954.07.07

20	N	1954.07.07
21, 22	FP	2000.04.04

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ZENDLAMP PC 03/3

Deze penthode is van een oxydegloeidraad voorzien, die zich onderscheidt door groote stevigheid en laag stroomverbruik bij een betrekkelijk hooge electronenemissie.

Door het schermrooster is de anode/stuurrooster capaciteit zoo klein, dat een neutrodyniseering — evenals bij schermroosterlampen — overbodig is, hetgeen vooral bij het uitzenden op verschillende golflengten een groot voordeel is.

Verder bezit de PC 03/3 een vangrooster, zoodat er geen enkel bezwaar tegen is, dat de momenteele waarde van de anodespanning aanzienlijk onder de schermroosterspanning daalt, terwijl bovendien bij maximum rendement een groot vermogen wordt afgegeven. Tenslotte kan door middel van het vangrooster op gemakkelijke wijze een zeer goede modulatie worden verkregen.



Onderstaand worden eenige practische instellingen aangegeven bij een golflengte van 15 m, een anodespanning van 300 V en een schermroosterspanning van 125 V.

Wordt de PC 03/3 als H.F. klasse-C versterker in een telegrafiezender gebruikt, dan bedraagt het afgegeven vermogen 3,5 W [1]) bij een rendement van 66%.

Als Klasse-B versterker (telefonie) van gemoduleerde H.F. energie, bedraagt het afgegeven vermogen van de draaggolf 1,0 W [1]) bij een rendement van 26%.

Het afgegeven vermogen in de draaggolf en het rendement bij gebruik van de PC 03/3 als H.F. klasse-C versterker op een golflengte van 15 m bij verschillende modulatiemethoden, kunnen uit onderstaande tabel worden afgelezen.

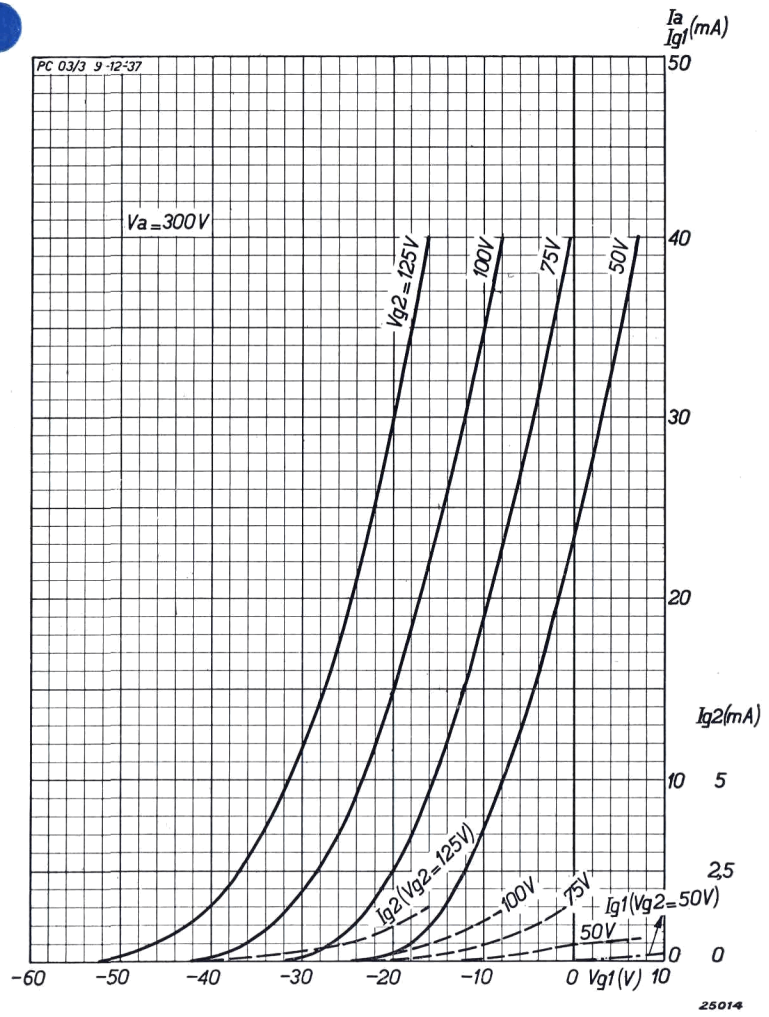
	Afgegeven vermogen	Rendement
Anodemodulatie	2,0 W [1])	56%
Schermroostermodulatie	2,0 W [1])	40%
Vangroostermodulatie	0,9 W [1])	31%
Anode- en schermroostermodulatie	3,0 W [1])	67%

Het benoodigde modulatievermogen is 0 W, indien vangroostermodulatie wordt toegepast.

[1]) Voor kringverliezen moet van deze waarde ca. 10% worden afgetrokken.

PHILIPS

ZENDLAMP
PC 03/3



Gloeispanning	V_f	=	4,0 V
Gloeistroom	I_f	=	ca. 0,13 A
Verzadigingsstroom	I_s	=	ca. 0,10 A
Anodespanning	V_a	=	max. 300 V
Schermroosterspanning	V_{g_2}	=	max. 125 V
Maximum toelaatbare anodedissipatie	W_a	=	max. 3,0 W
Anodedissipatie tijdens meting	W_{at}	=	6,0 W
Maximum toelaatbare schermroosterdissipatie	W_{g_2}	=	max. 1,5 W [1]
Versterkingsfactor ten opzichte van schermrooster	$\mu_{g_1g_2}$	=	ca. 3,3
Steilheid bij Va = 300 V, Vg_2 = 125 V, Ia = 25 mA	S	=	ca. 1,4 mA/V
Maximum steilheid	S_{max}	=	ca. 3,0 mA/V
Maximum kathodestroom	I_k	=	max. 25 mA
Anode/kathode capaciteit	C_{af}	=	ca. 11 pF [2]
Stuurrooster/kathode capaciteit	C_{g_1f}	=	ca. 10 pF [2]
Anode/stuurrooster capaciteit	C_{ag_1}	=	ca. 0,12 pF [2]
Grootste diameter	d	=	53 mm
Totale lengte	l	=	119 mm

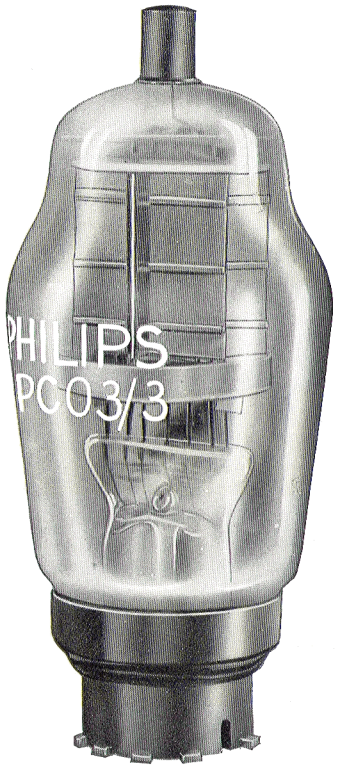
1) Deze waarde verkrijgt men door vermenigvuldiging van de schermroosterspanning in volt met den schermroosterstroom in ampère.
2) Deze waarde geldt, indien schermrooster en vangrooster met de kathode zijn verbonden.

PHILIPS PENTODE PC 03/3 A UND B

Die Sendepentode PC 03/3 wird in zwei Ausführungen geliefert, nämlich als PC 03/3 A und als PC 03/3 B. Diese beiden Ausführungen unterscheiden sich nur durch ihren Heizfaden; die Heizspannung der PC 03/3 A beträgt 2,0 V und diejenige der PC 03/3 B 4,0 V. In beiden Ausführungen gelangt ein Oxydheizfaden zur Verwendung, dessen mechanische Festigkeit sehr groß ist und der eine hohe Elektronenemission bei niedrigem Stromverbrauch gewährleistet.

Diese Röhre kann als H.F.-Verstärker oder Oszillatorröhre auf Wellenlängen bis zu 5 m herab verwendet werden. Infolge der verhältnismäßig hohen Nutzleistung, die ohne Steuergitterstrom erzielt werden kann, eignet sich diese Röhre besonders zum Gebrauch in einer Trennstufe. Die Stabilität ist auch bei Verwendung als elektronengekoppelter Oszillator sehr befriedigend. Die Röhre kann in der Anode, im Fanggitter, im Schirmgitter oder in der Anode und im Schirmgitter gemeinsam moduliert werden. Bei der Modulation im Fanggitter ist keine Modulationsleistung erforderlich.

Die bei verschiedenen Einstellungen auf Wellenlängen bis zu 15 m herab erzielbare Nutzleistung und der entsprechende Wirkungsgrad sind in untenstehender Tabelle angegeben; diese gilt für eine Anodenspannung von 300 V:



Einstellung	Schirmgitterspannung	Nutzleistung	Wirkungsgrad
H.F.-Klasse C (Telegraphie) ohne Steuergitterstrom	300 V	3 W[1])	52,5%
(Trennstufe)	125 V	2 W[1])	51 %
H.F.-Klasse C (Telegraphie) mit Steuergitterstrom	125 V	3 W[1])	60 %
H.F.-Klasse B (Telephonie)	125 V	1 W[1])[2])	26 %
H.F.-Klasse C (Modulation in der Anode)	125 V	2 W[1])[2])	56 %
H.F.-Klasse C (Modulation im Fanggitter)	125 V	0,9W[1])[2])	31 %
H.F.-Klasse C (Modulation im Schirmgitter)	125 V	2 W[1])[2])	40 %
H.F.-Klasse C (Modulation in der Anode und dem Schirmgitter)	300 V	2,4W[1])[2])	53,5%
	125 V	3 W[1])[2])	67 %

Die gesamte Nutzleistung und der Wirkungsgrad, die mit **zwei** in Gegentakt geschalteten Röhren in einem H.F.-Verstärker Klasse C auf einer Wellenlänge von 5 m erzielt werden können, sind untenstehend angegeben:

Einstellung	Schirmgitterspannung	Nutzleistung	Wirkungsgrad
Telegraphie	60 V	6 W[1])	50%
Modulation im Fanggitter	100 V	1,9W[1])[2])	24%

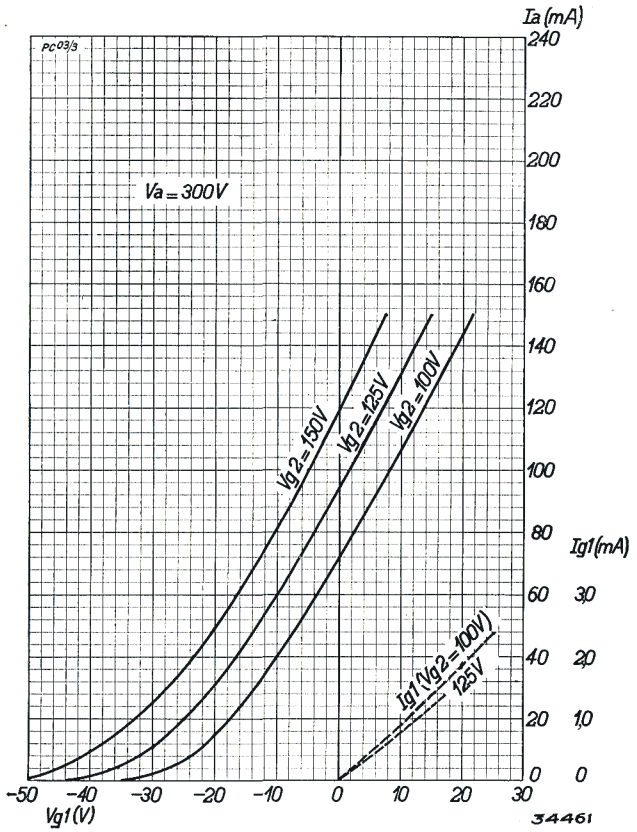
[1]) Kreisverluste sind abzuziehen.
[2]) Nutzleistung in der Trägerwelle (max. Modulationstiefe 100%).

PHILIPS EMISSION

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B 5251/1
B 5257/1

PHILIPS PENTODE PC 03/3 A UND B



Heizspannung der PC 03/3 A	V_f	=	2,0 V
Heizspannung der PC 03/3 B	V_f	=	4,0 A
Heizstrom der PC 03/3 A	I_f	=	ca. 0,24 V
Heizstrom der PC 03/3 B	I_f	=	ca. 0,13 A
Sättigungsstrom	I_s	=	ca. 0,10 A
Anodenspannung	V_a	=	max. 300 V
Schirmgitterspannung	V_{g_2}	=	max. 300 V
Höchstzulässiger Anodenverlust . . .	W_a	=	max. 3,0 W
Geprüfter Anodenverlust	W_{at}	=	6,0 W
Höchstzulässiger Schirmgitterverlust .	W_{g_2}	=	max. 1,5 W[1])
Verstärkungsfaktor gegen Schirmgitter .	$\mu_{g_1g_2}$	=	ca. 3,3
Steilheit bei V_a = 300 V, V_{g_2} = 125 V, I_a = 25 mA	S	=	ca. 1,4 mA/V
Höchstzulässiger Kathodenstrom . . .	I_k	=	max. 25 mA
Anoden/Kathodenkapazität	C_{ak}	=	ca. 11 pF[2])
Steuergitter/Kathodenkapazität	C_{g_1k}	=	ca. 8,5 pF[2])
Anoden/Steuergitterkapazität	C_{ag_1}	=	ca. 0,2 pF[2])
Maximale Gesamtlänge	l	=	119 mm
Maximaler Durchmesser	d	=	53 mm

[1]) Dieser Wert wird bestimmt durch Multiplikation der Schirmgitterspannung in Volt mit dem Schirmgitterstrom in Ampere.

[2]) Dieser Wert gilt bei Verbindung des Schirm- und Fanggitters mit der Kathode.

PHILIPS EMISSION

All data of the pentode PC 03/3B are the same as those of type PC 03/3A, except that:
Vf = 4,0 V
If = 0,13 A

Alle Daten der Penthode PC 03/3B sind die selben wie die der Penthode PC 03/3A, mit ausnahme von:
Vf = 4,0 V
If = 0,13 A

Toutes les données de la penthode PC 03/3B sont les mêmes que celles du type PC 03/3A sauf:
Vf = 4,0 V
If = 0,13 A

Alle gegevens van de penthode PC 03/3B zijn dezelfde als die van de penthode PC 03/3A, met uitzondering van:
Vf = 4,0 V
If = 0,13 A

Todos los datos del pentodo PC 03/3B son iguales a los del tipo PC 03/3A, con excepcion de:
Vf = 4,0 V
If = 0,13 A

PHILIPS

PC 05/15

PENTODE for use as H.F. amplifier
PENTHODE pour utilisation comme amplificatrice H.F.
PENTHODE zur Verwendung als H.F. Verstärker

Filament : oxide-coated
Filament : oxyde
Heizfaden: Oxyd

Heating : direct
Chauffage: direct
Heizung : direkt

Vf = 4 V
If = 1,1 A

Capacitances
Capacités
Kapazitäten

Ca = 10 pF
Cg1 = 11,5 pF
Cag1 = 0,2 pF

Typical characteristics
Caractèristiques typiques
Kenndaten

$\mu g2g1$ = 3,5
S (Ia=40 mA) = 1,25 mA/V

λ	Freq.	C telegr.		B teleph.		Cag2 mod.		Cg3 mod.	
m	Mc/s	Va (V)	Wo (W)	Va (V)	Wo (W)	Va (V)	Wo (W)	Va (V)	Wo (W)
>15	<20	500	20	500	4	500	16	500	3
		400	15						

Limiting values
Caractéristiques limites
Grenzdaten

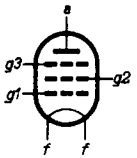
Va = max. 500 V
Wa = max. 15 W
Vg2 = max. 300 V
Wg2 = max. 5 W
Wg1 = max. 1 W
Ik = max. 85 mA
Ikp = max. 340 mA

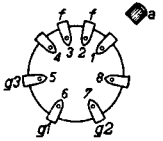
Rg1 { with fixed grid bias / à polarisation fixe / mit fester Gittervorspannung } = max. 50 kΩ

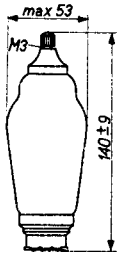
Rg1 { with automatic grid bias / à polarisation automatique / mit autom. Gittervorspannung } = max. 100 kΩ

PHILIPS

Dimensions in mm
Dimensions en mm
Abmessungen in mm







Base
Culot P
Sockel

Socket
Support 5900/02
Fassung

Mounting position: vertical with base up or down
horizontal with plane of filament vertical
Montage : vertical avec culot en haut ou en bas
horizontal avec plan du filament vertical
Einbau : senkrecht mit Sockel oben oder unten
wagerecht mit der Heizfadenfläche senkrecht

Net weight
Poids net 85 g
Nettogewicht

Shipping weight
Poids brut 150 g
Bruttogewicht

PHILIPS

Electronic Tube

HANDBOOK

PC05/15

page	sheet	date
1	1	1954.07.07
2	2	1954.07.07
3	FP	2000.04.04

PHILIPS PENTODE PC 1/50

Die Oxydkathode der PC 1/50 ist direkt geheizt und gewährleistet eine hohe Elektronenemission bei einem verhältnismäßig niedrigen Stromverbrauch; der Heizfaden ist sehr stark. Die Sendepentode PC 1/50 kann als Oszillator-, H.F.-Verstärker- oder Frequenzverdopplerröhre verwendet werden. Verwendung als elektronengekoppelte Oszillatorröhre ist ebenfalls möglich. Die Röhre kann in der Anode, im Fanggitter, im Schirmgitter oder in der Anode und im Schirmgitter zugleich moduliert werden. Bei der Modulation im Fanggitter braucht keine Modulationsleistung zugeführt zu werden, vorausgesetzt, daß das Fanggitter während der Modulation nicht positiv wird. Die hohe Nutzleistung, die ohne Steuergitterstrom erreicht werden kann, ermöglicht es, die Röhre in einer Trennstufe zu verwenden.



PHILIPS EMISSION

Die Nutzleistung und der Wirkungsgrad, die bei verschiedenen Einstellungen erreicht werden können, sind in untenstehender Tabelle angegeben; diese gilt für Wellenlängen bis zu 15 m herab und eine Anodenspannung von 1000 V.

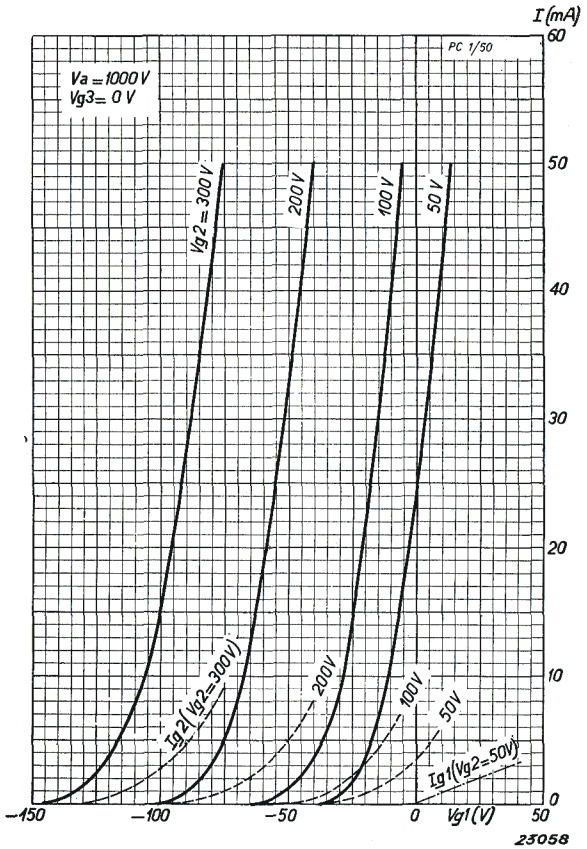
Einstellung	Schirmgitterspannung	Nutzleistung	Wirkungsgrad
H.F.-Klasse C (Telegraphie) ohne Steuergitterstrom (Trennstufe)	300 V	40 W[1])	67 %
H.F.-Klasse C (Telegraphie) mit Steuergitterstrom	250 V	50 W[1])	62,5%
H.F.-Klasse B (Telephonie)	300 V	14 W[1])[2])	28 %
H.F.-Klasse C (Modulation in der Anode)	200 V	27 W[1])[2])	71 %
H.F.-Klasse C (Modulation im Fanggitter)	200 V	12 W[1])[2])	29 %
H.F.-Klasse C (Modulation im Schirmgitter)	150 V	6 W[1])[2])	33 %
H.F.-Klasse C (Modulation in der Anode und dem Schirmgitter)	250 V	35 W[1])[2])	58 %

[1]) Kreisverluste sind abzuziehen.
[2]) Nutzleistung in der Trägerwelle (max. Modulationstiefe 100%).

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B 5371/1

PHILIPS PENTODE PC 1/50



Heizspannung	V_f	=	4,0 V
Heizstrom	I_f	=	ca. 2 A
Sättigungsstrom	I_s	=	ca. 0,8 A
Anodenspannung	V_a	=	max. 1000 V
Schirmgitterspannung	V_{g_2}	=	max. 300 V
Höchstzulässiger Anodenverlust	W_a	=	max. 35 W
Geprüfter Anodenverlust	W_{at}	=	45 W
Höchstzulässiger Schirmgitterverlust	W_{g_2}	=	max. 10 W[1])
Verstärkungsfaktor gegen Schirmgitter.	$\mu_{g_1g_2}$	=	ca. 3
Steilheit bei V_a = 1000 V, V_{g_2} = 250 V, I_a = 40 mA	S	=	ca. 1,5 mA/V
Höchstzulässiger Kathodenstrom	I_k	=	max. 110 mA
Anoden/Kathodenkapazität	C_{ak}	=	ca. 19 pF[2])
Steuergitter/Kathodenkapazität	C_{g_1k}	=	ca. 14 pF[2])
Anoden/Steuergitterkapazität	C_{ag_1}	=	ca. 0,04 pF[2])
Maximale Gesamtlänge	l	=	179 mm
Maximaler Durchmesser	d	=	61,5 mm

[1]) Dieser Wert wird bestimmt durch Multiplikation der Schirmgitterspannung in Volt mit dem Schirmgitterstrom in Ampere.

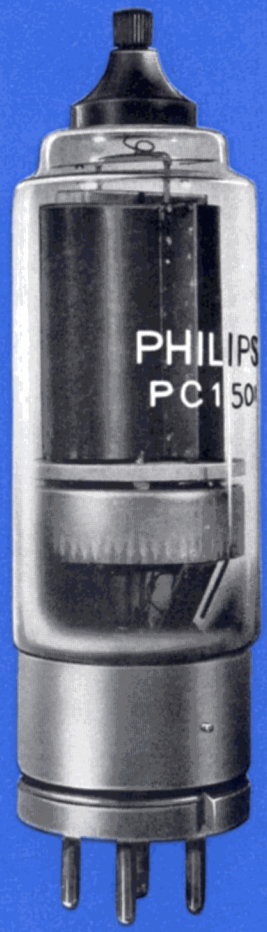
[2]) Dieser Wert gilt bei Verbindung des Schirm- und Fanggitters mit der Kathode.

PHILIPS

ZENDLAMP
PC 1/50-I

Deze penthode-zendlamp heeft een oxyd-kathode, waardoor een groote electronenemissie en sterke constructie werd verkregen.

De PC 1/50-I heeft met schermroosterlampen de zeer lage anode/stuurrooster-capaciteit gemeen, waardoor neutrodyniseering overbodig is. Dank zij het vangrooster, mag de anodespanning belangrijk onder de schermroosterspanning dalen. Daar het goede functionneeren van de lamp niet door secondaire electronenemissie van anode of schermrooster wordt beïnvloed, is het mogelijk een zeer hoog afgegeven vermogen bij een maximaal nuttig effect te bereiken. De schermroosterspanning kan met behulp van een serieweerstand van de anodespanning worden afgetakt, daar de schermroosterstroom nagenoeg constant is.



Indien de lamp als klasse C versterker op een golflengte van 150 m wordt gebruikt, is het vermogen, dat door een 5 W lamp kan worden afgegeven, ruimschoots voldoende om de PC 1/50-I te exciteeren; in dat geval kan een afgegeven vermogen van 52 W (V_a = 1000 V, V_{g2} = 250 V, I_a = 80 mA en I_{g1} = 4,0 mA) worden verkregen. De PC 1/50-I kan op haar beurt een Philips TA 3/500-I, QB 3/500 of PC 3/1000 exciteeren.

Bij gebruik van de PC 1/50-I als electronisch gekoppelde oscillator wordt een groote stabiliteit verkregen.

Een andere vermeldenswaardige eigenschap van de lamp is, dat zij in het vangrooster kan worden gemoduleerd; aan dit rooster moet dan een voldoende negatieve voorspanning worden gelegd.

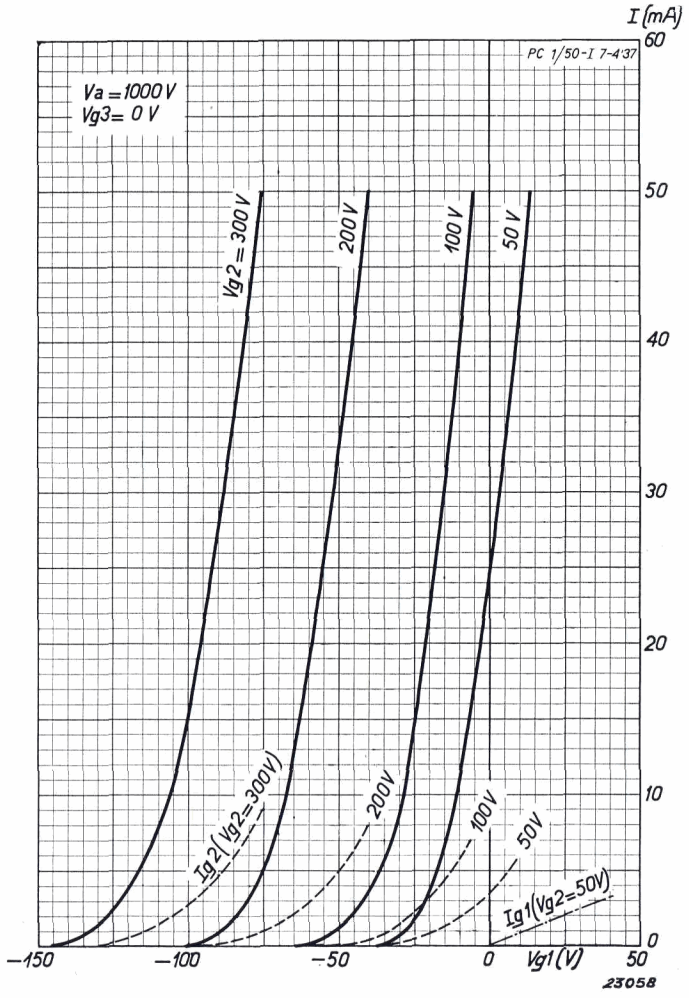
De PC 1/50-I mag op golflengten vanaf 14 m werken. De door de kathode afgegeven totale stroom mag 110 mA niet overschrijden.

Voor het leveren van de anodespanning worden twee Philips enkelfasige kwikdamp-gelijkrichtlampen DCG 1/150 of een of twee dubbelfasige hoogvacuum gelijkrichtlampen DE 2/200 aanbevolen.

PHILIPS

ZENDLAMP

P C 1/50-I



Gloeispanning	V_f	=	4,0 V
Gloeistroom	I_f	=	ca. 2,0 A
Verzadigingsstroom	I_s	=	ca. 0,80 A
Anodespanning	V_a	=	1000 V
Schermroosterspanning	V_{g2}	=	100-300 V
Maximum toelaatbare anodedissipatie	W_a	=	35 W
Anodedissipatie tijdens meting	W_{at}	=	45 W
Maximum toelaatbare schermroosterdissipatie	W_{g2}	=	10 W[1])
Versterkingsfactor t.o.v. schermrooster	μ_{g1g2}	=	ca. 2,7
Steilheid bij V_a = 1000 V, V_{g2} = 250 V, I_a = 40 mA	S	=	ca. 1,5 mA/V
Grootste steilheid	S_{max}	=	ca. 3,5 mA/V
Maximum kathodestroom	I_k	=	max. 110 mA
Anode/kathodecapaciteit	C_{af}	=	ca. 19 $\mu\mu$F [2])
Stuurrooster/kathodecapaciteit	C_{g1f}	=	ca. 14 $\mu\mu$F [2])
Anode/stuurroostercapaciteit	C_{ag1}	=	ca. 0,04 $\mu\mu$F [2])
Grootste diameter	d	=	51 mm
Totale lengte	l	=	ca. 190 mm

[1]) Deze waarde verkrijgt men door vermenigvuldiging van de schermroosterspanning in volt met den schermroosterstroom in ampère.

[2]) Deze waarde geldt, indien schermrooster en vangrooster met de kathode zijn verbonden.

PHILIPS

ZENDLAMP
PC
1,5/100

De penthode-zendlamp PC 1,5/100 is voorzien van een oxyd-kathode en heeft, zooals schermrooster-zendlampen, een zeer lage anode/stuurroostercapaciteit, waardoor neutrodyniseering overbodig wordt gemaakt. De lamp heeft tengevolge van het vangrooster tusschen schermrooster en anode enkele bijzondere eigenschappen, waarvan de meest belangrijke onderstaand worden besproken.

De momenteele waarde van de anodespanning kan belangrijk beneden de schermroosterspanning dalen, zonder dat de goede werking tengevolge van secondaire electronenemisise van de anode wordt geschaad. De secondaire electronenemissie van het schermrooster heeft evenmin nadeeligen invloed op de goede werking van de lamp; dientengevolge zal een zeer hoog vermogen bij een maximaal nuttig effect worden verkregen. Door het feit, dat de schermroosterstroom nagenoeg constant is, is het mogelijk de schermroosterspanning met behulp van een serieweerstand van de anodespanning af te takken.



Indien de lamp als klasse C versterker op een golflengte van 150 m wordt gebruikt, bereikt het afgegeven vermogen, reeds bij een vrijwel te verwaarloozen stuurroosterexcitatie, een waarde van ca. 140 W (bij $V_a = 1500$ V; $V_{g2} = 300$ V; $I_a = 145$ mA; en een stuurroosterstroom van 3,5 mA). Het nuttig effect bedraagt dan 65 %.

Verder verdient vermelding, dat een goede stabiliteit wordt verkregen, indien deze lamp als electronisch gekoppelde oscillator wordt gebruikt.

Tenslotte wordt er nog de aandacht op gevestigd, dat een zeer diepe en goede modulatie mogelijk is door toepassing van vangroostermodulatie; aan dit rooster moet dan een voldoende negatieve voorspanning worden gelegd.

De minimum golflengte, waarop de lamp mag werken, is 14 m. De door de kathode geleverde stroom mag in geen geval 200 mA overschrijden.

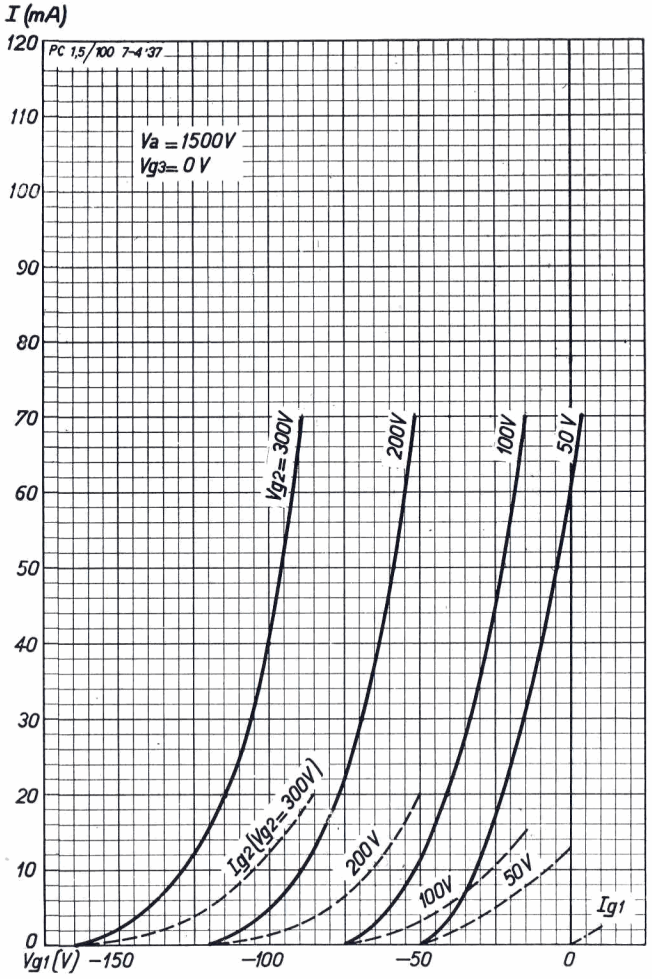
Werkt de PC 1,5/100 als H.F.-versterker, dan kan deze lamp een Philips TA 4/1500-I of TA 4/1500 K-I exciteeren.

Twee enkelfasige kwikdampgelijkrichtlampen DCG 4/1000 of twee dubbelfasige hoogvacuum gelijkrichtlampen, type DE 2/200, kunnen voor het leveren van de anodespanning worden gebruikt.

PHILIPS

ZENDLAMP

PC 1,5/100



Gloeispanning	V_f	=	10,0 V
Gloeistroom	I_f	=	ca. 2,0 A
Verzadigingsstroom	I_s	=	ca. 2,0 A
Anodespanning	V_a	=	1500 V
Schermroosterspanning	V_{g2}	=	100—500 V
Maximum toelaatbare anodedissipatie	W_a	=	85 W
Anodedissipatie tijdens meting	W_{at}	=	100 W
Maximum toelaatbare schermroosterdissipatie	W_{g2}	=	25 W[1])
Versterkingsfactor t.o.v. schermrooster	μ_{g1g2}	=	ca. 2,7
Steilheid bij V_a = 1500 V, V_{g2} = 400 V, I_a = 60 mA	S	=	ca. 1,7 mA/V
Grootste steilheid	S_{max}	=	ca. 4,0 mA/V
Maximum kathodestroom	I_k	=	max. 200 mA
Anode/kathodecapaciteit	C_{af}	=	ca. 21 $\mu\mu$F[2])
Stuurrooster/kathodecapaciteit	C_{g1f}	=	ca. 28 $\mu\mu$F[2])
Anode/stuurroostercapaciteit	C_{ag1}	=	ca. 0,03 $\mu\mu$F[2])
Grootste diameter	d	=	66 mm
Totale lengte	l	=	ca. 262 mm

[1]) Deze waarde verkrijgt men door vermenigvuldiging van de schermroosterspanning in volt met den schermroosterstroom in ampère.

[2]) Deze waarde geldt, indien schermrooster en vangrooster met de kathode zijn verbonden.

PHILIPS

SENDERÖHRE PC 3/1000

Die PC 3/1000 ist eine Sendepenthode mit einem Oxydheizfaden, der eine hohe Elektronenemission gewährleistet.
Die Röhre wurde für die Benutzung als Hochfrequenzverstärker konstruiert und kann für Wellenlängen bis zu 15 m abwärts verwendet werden, wobei die Anodenspannung auf 2500 V ermässigt werden muss. Bei Wellenlängen von mehr als 100 m darf die Anodenspannung den Wert von 3000 V erreichen.
Die innere Kapazität dieser Sendepenthode ist, ebenso wie bei Schirmgitterröhren, ausserordentlich niedrig. Die Anoden-Steuergitterkapazität der PC 3/1000 beträgt nur 0,05 $\mu\mu$F, so dass sich eine Neutralisierung erübrigt, ein sehr grosser Vorteil bei Sendern mit veränderlicher Wellenlänge.

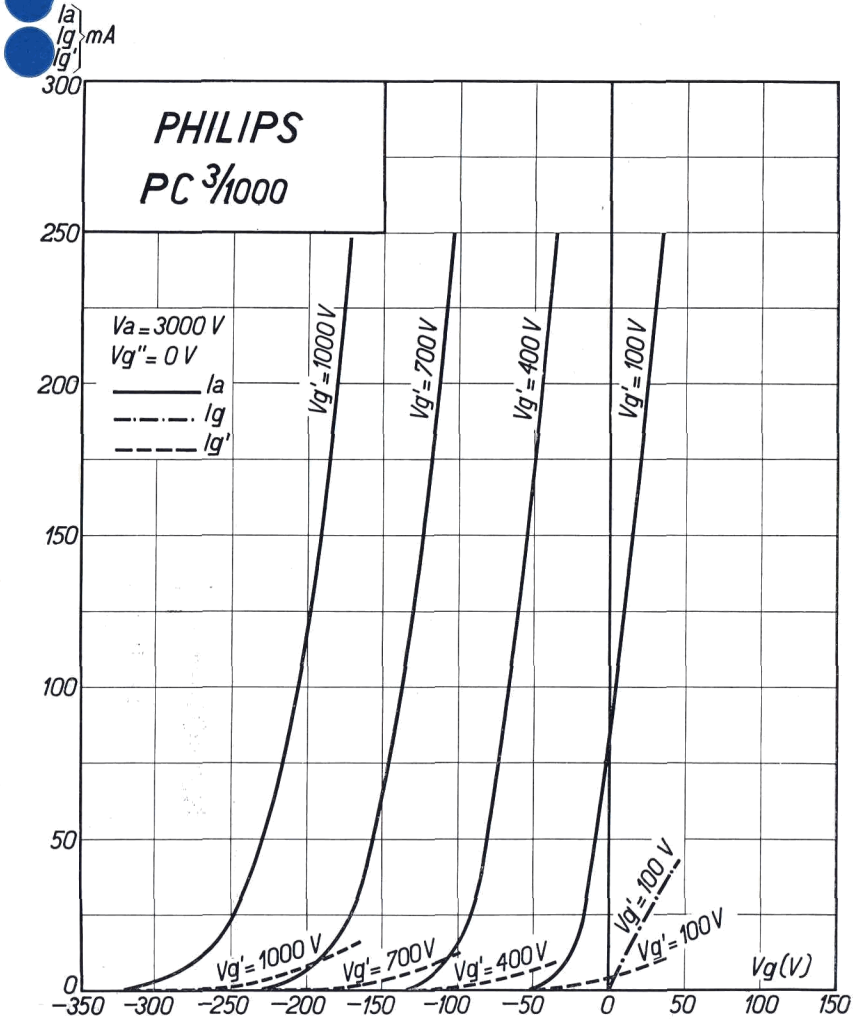


Falls während des Betriebes die Anodenspannung unter den Wert der Schirmgitterspannung sinkt, so wird das gute Arbeiten der Röhre nicht durch die Emission von Sekundärelektronen durch die Anode beeinträchtigt. Auch die Emission von Sekundärelektronen durch das Schirmgitter hat hierauf keinen Einfluss. Die Röhre hat darum eine beträchtliche Ausgangsleistung bei einem hohen Wirkungsgrad.
Da der Schirmgitterstrom sehr stabil ist, kann die Schirmgitterspannung mittels eines Serienwiderstandes der Anodenspannung entnommen werden.
Die für diese Röhre erforderliche Steuerleistung ist bemerkenswert niedrig. So genügt z.B. eine Leistung von 10 W zur Erzielung einer Ausgangsleistung von mehr als 1100 W. Diese kann sogar noch etwas erhöht werden, indem man dem Fanggitter, statt dieses mit dem Heizfaden zu verbinden, eine geringe positive Spannung zuführt.
Um die PC 3/1000 zu modulieren, können die N.F.-Schwingungen dem Fanggitter zugeführt werden, vorausgesetzt, dass dieses eine ausreichende negative Vorspannung erhält.

PHILIPS

SENDERÖHRE

PC 3/1000



Heizspannung	V_f	=	12,0 V
Heizstrom	I_f	=	ca. 4,0 A
Sättigungsstrom	I_s	=	ca. 4,5 A
Anodenspannung	V_a	=	2000—3000 V
Schirmgitterspannung	$V_{g'}$	=	400—1000 V
Höchstzulässiger Anodenverlust	W_a	=	600 W
Geprüfter Anodenverlust	W_{at}	=	700 W
Grösster Schirmgitterverlust	$W_{g'}$	=	100 W[1])
Verstärkungsfaktor des Schirmgitters	g'	=	ca. 4,5
Steilheit bei V_a = 2000 V, $V_{g'}$ = 400 V, I_a = 350 mA	S_{norm}	=	ca. 6,0 mA/V
Grösste Steilheit	S_{max}	=	ca. 9,0 mA/V
Anoden-Kathodenkapazität	C_{af}	=	ca. 20 $\mu\mu$F[2])
Gitter-Kathodenkapazität	C_{gf}	=	ca. 45 $\mu\mu$F[2])
Anoden-Steuergitterkapazität	C_{cg}	=	ca. 0,05 $\mu\mu$F[2])
Grösster Durchmesser	d	=	181 mm
Gesamtlänge	l	=	ca. 552 mm

[1]) Diesen Wert erhält man durch Multiplikation der Schirmgitterspannung in Volt mit dem Schirmgitterstrom in Ampere.

[2]) Dieser Wert gilt, wenn Schirmgitter und Fanggitter mit der Kathode verbunden sind.

U.H.F. TRIODE

Triode intended for use as grounded grid U.H.F. amplifier, oscillator or mixer for bands IV and V.

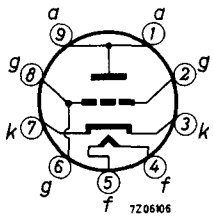
QUICK REFERENCE DATA			
Anode current	I_a	12	mA
Transconductance	S	14	mA/V
Amplification factor	μ	68	-

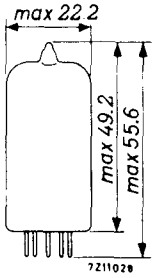
HEATING: Indirect by A.C. or D.C.; series supply

Heater current	I_f	300	mA
Heater voltage	V_f	3.8	V

DIMENSIONS AND CONNECTIONS Dimensions in mm

Base: Noval





OPERATING CHARACTERISTICS

As grounded grid amplifier

Anode voltage	V_a	175	V
Cathode resistor	R_k	125	Ω
Anode current	I_a	12	mA
Transconductance	S	14	mA/V

As self-oscillating mixer

Supply voltage	V_{ba}	220	V
Anode resistor	R_a	5.6	kΩ
Grid resistor	R_g	47	kΩ
Anode current	I_a	12	mA
Grid current	I_g	50	μA

LIMITING VALUES (Design centre rating system)

Anode voltage	V_{a_o}	max.	550	V
	V_a	max.	220	V
Anode dissipation	W_a	max.	2.2	W
Cathode current	I_k	max.	20	mA
Grid voltage	$-V_g$	max.	50	V
Grid resistor	R_g	max.	1	MΩ
Cathode to heater voltage	$V_{kf(k\,pos)}$	max.	100	V [1]

[1]) A.C. component max. 50 V_{RMS}.

CAPACITANCES

Without external shield

Anode to grid	C_{ag}	2.2	pF
Anode to cathode	C_{ak}	0.24	pF
Grid to cathode	C_{gk}	3.5	pF
Grid to heater	C_{gf}	0.27	pF
Cathode to grid + heater	$C_{k/gf}$	6.3	pF
Grid to cathode + heater	$C_{g/kf}$	3.8	pF
Anode to cathode + heater	$C_{a/kf}$	0.35	pF
Anode to grid + heater	$C_{a/gf}$	2.3	pF

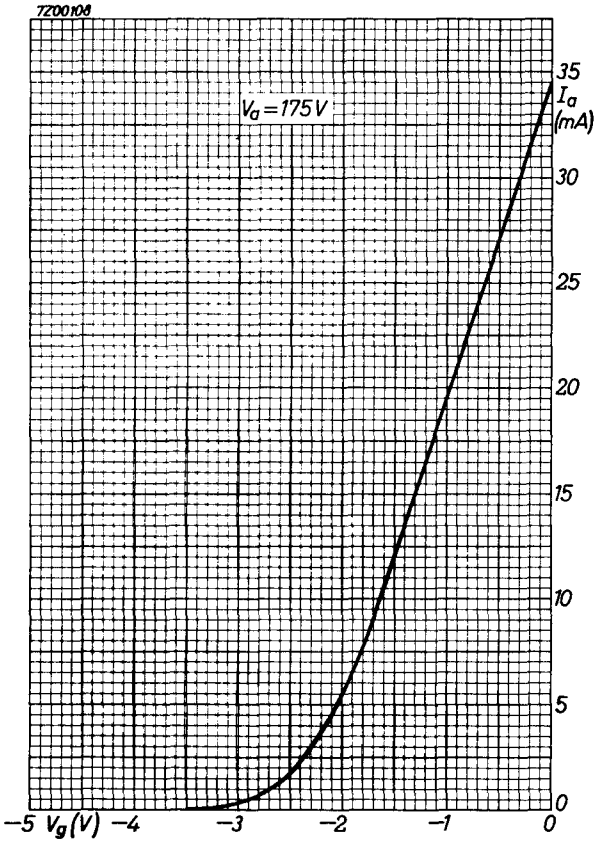
With external shield

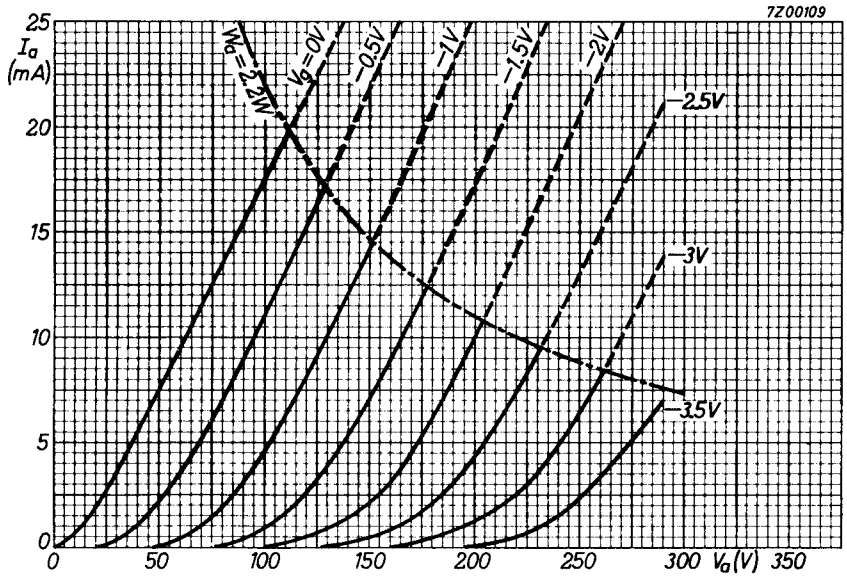
Anode to grid + screen	$C_{a/gs}$	3.3	pF
Cathode + heater to grid + screen	$C_{kf/gs}$	4.1	pF
Anode to cathode + heater	$C_{a/kf}$	0.3	pF

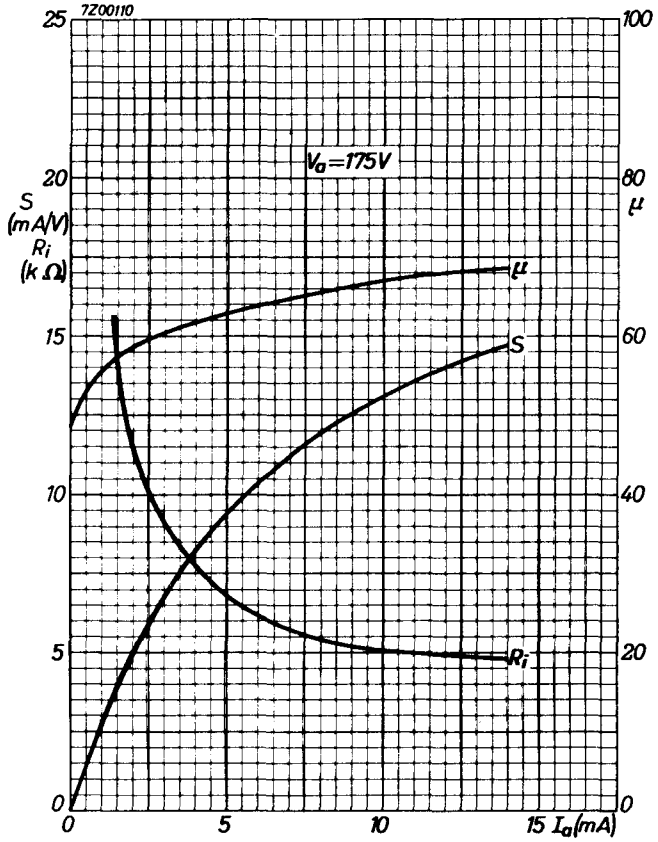
TYPICAL CHARACTERISTICS

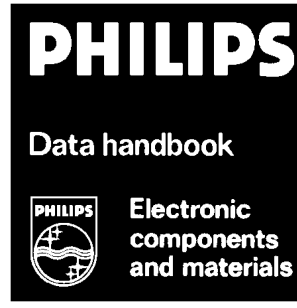
Anode voltage	V_a	175	V
Grid voltage	V_g	-1.5	V
Anode current	I_a	12	mA
Transconductance	S	14	mA/V
Amplification factor	μ	68	-
Equivalent noise resistance	R_{eq}	230	Ω
Increase C_g	ΔC_g	2	pF [1]

[1]) Difference between C_g of cold and hot tube.


7Z00108
$V_a = 175\,V$
35
I_a
(mA)
30
25
20
15
10
5
0
−5 V_g(V) −4
−3
−2
−1
0


7Z00109
25
I_a (mA)
20
15
10
5
0
0
50
100
150
200
250
300
V_a(V)
350
V_g=-2.5V
V_g=0V
-0.5V
-1V
-1.5V
-2V
-2.5V
-3V
-3.5V


7Z00110
25
20
15
10
5
0
S (mA/V)
Ri (kΩ)
100
80
60
40
20
0
μ
V_a=175V
μ
S
Ri
0
5
10
15 I_a(mA)



PC86

page	sheet	date
1	1	196912
2	2	1969.01
3	3	1969.01
4	4	1969.01
5	5	1969.01
6	6	1969.01
7	FP	1999.07.30

PHILIPS

PC88

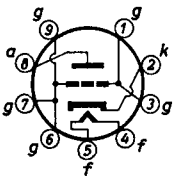
TRIODE for use as grounded grid U.H.F. amplifier in tuners for television bands IV and V

HEATING

Indirect by A.C. or D.C.; series supply

Heater current I_f = 300 mA
Heater voltage V_f = 3.8 V

Dimensions in mm



Base: NOVAL

CAPACITANCES

Without external screening

Anode to grid	C_{ag}	= 1.2 pF

With external screening (inside diameter 22.2 mm)

Anode to grid	C_{ag}	= 1.7 pF
Grid to heater and cathode	$C_{g(k+f)}$	= 3.8 pF
Anode to heater and cathode	$C_{a(k+f)}$	= 0.055 pF

LIMITING VALUES (Design centre limits)

Anode voltage in cold condition	V_{ao}	= max. 550 V
Anode voltage	V_a	= max. 175 V
Anode dissipation	W_a	= max. 2 W
Cathode current	I_k	= max. 13 mA
Negative grid voltage	$-V_g$	= max. 50 V
External grid resistance (at cathode resistor R_k = 100 Ω)	$R_{g(R_k=100\ \Omega)}$	= max. 1 MΩ
Voltage between heater and cathode	V_{kf}	= max. 100 V[1]

[1]) To fulfil the modulation hum requirements, the A.C. component should not exceed 50 V (R.M.S.)

CHARACTERISTICS

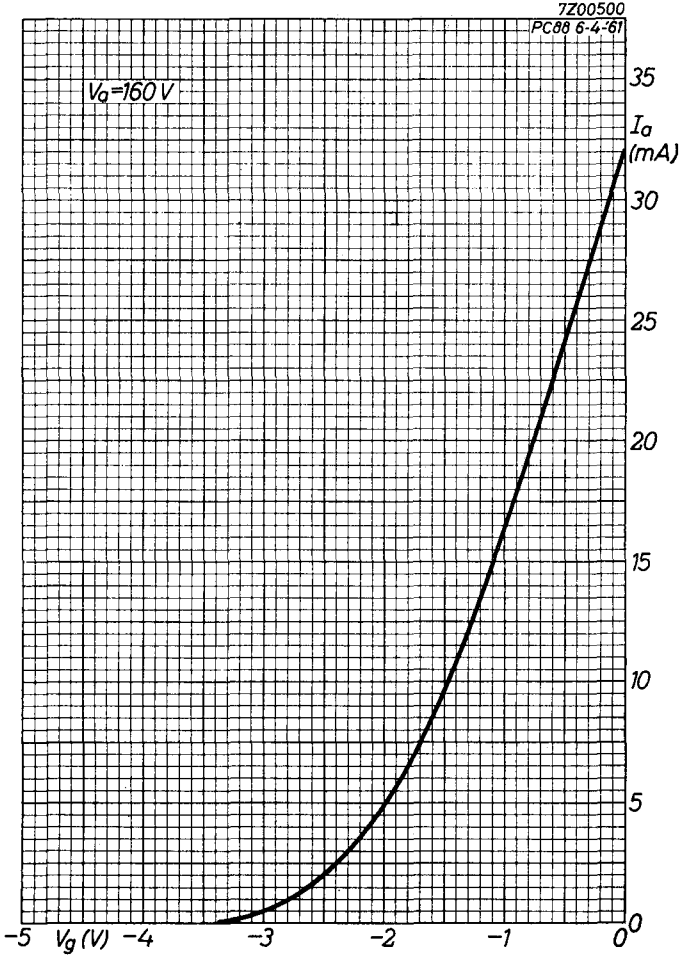
Heater current	I_f	=	300 mA [1]
Anode voltage	V_a	=	160 V [1]
Cathode resistor	R_k	=	100 Ω [1]
Anode current	I_a	=	12.5 mA
Mutual conductance	S	=	13.5 mA/V
Amplification factor	μ	=	65
Equivalent noise resistance	R_{eq}	=	240 Ω
Noise figure	F	=	10 dB
Heater current	I_f	=	300 mA
Anode voltage	V_a	=	0 V
Positive grid current	$+I_g$	=	0.3 μA
Negative grid voltage	$-V_g$	=	max. 1.3 V

Series resonance frequencies

Measured between a point on the relevant tube pin close to the tube bottom and a point close to the relevant pin on a metal reference plane, placed against the tube bottom. All the pins, except the relevant one, are connected to the reference plane with a negligible impedance
The tube is screened by a metal cylinder with an inside diameter of 22.2 mm placed upon the metal reference plane

Heater voltage	V_f	=	0 V
Anode voltage	V_a	=	0 V
Anode resonance frequency	f_{o_a}	=	1700 Mc/s
Cathode resonance frequuency	f_{o_k}	=	1000 Mc/s

[1]) Recommended operating conditions


7Z00500
PC88 6-4-61
V_a=160 V
35
I_a
(mA)
30
25
20
15
10
5
0
−5
V_g (V)
−4
−3
−2
−1
0

PC 88 **PHILIPS**

PHILIPS

Electronic Tube

HANDBOOK

PC88

page	sheet	date
1	1	1962.07.07
2	2	1962.07.07
3	A	1961.04.04
4	B	1961.04.04
5	FP	2000.04.09

V.H.F. TRIODE

Triode intended for use as R.F. amplifier in V.H.F. television receivers.

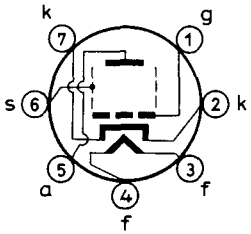
QUICK REFERENCE DATA				
Cathode current	I_k	max.	20	mA
Transconductance	S		20	mA/V
Amplification factor	μ		84	

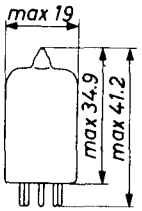
HEATING: Indirect by A.C. or D.C.; series supply

Heater current	I_f	300	mA
Heater voltage	V_f	3.9	V

DIMENSIONS AND CONNECTIONS Dimensions in mm

Base: Miniature 7p





CAPACITANCES (with external shield, internal diameter 19.1 mm, connected to cathode)

Anode to all except grid	$C_{a(g)}$	3.0	pF
Grid to all except anode	$C_{g(a)}$	4.5	pF
Anode to grid	C_{ag}	0.365	pF
Anode to cathode	C_{ak}	0.08	pF
Grid to cathode	C_{gk}	3.3	pF
Grid to heater	C_{gf}	max. 0.07	pF
Cathode to heater	C_{kf}	2.3	pF

TYPICAL CHARACTERISTICS

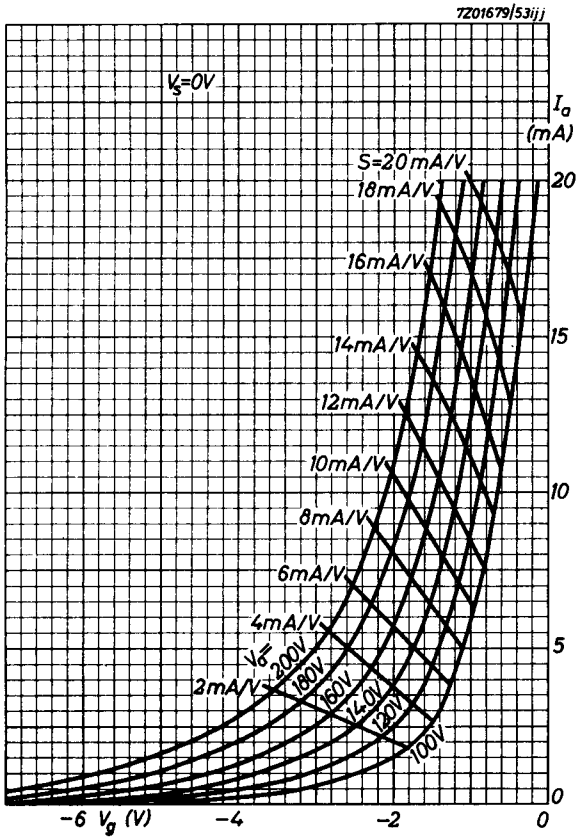
Anode voltage	V_a		135		V
Shield voltage	V_s		0		V
Grid voltage	V_g	-1	-2.8	-5.9	V
Anode current	I_a	11.5	-	-	mA
Transconductance	S	14.5	1.45	0.145	mA/V
Amplification factor	μ	76	-	-	

OPERATING CHARACTERISTICS

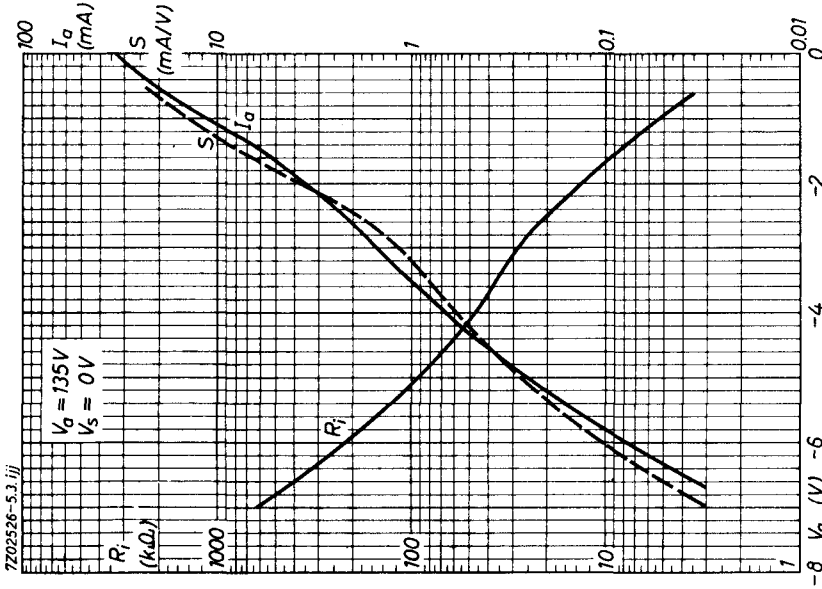
Anode supply voltage	V_{ba}	135	200	200	V
Anode resistor	R_a	1.5	5.6	5.6	kΩ
Shield voltage	V_s	0	0	0	V
Cathode resistor	R_k	0	0	87	Ω
Anode current	I_a	16.5	16.5	11.5	mA
Grid current	I_g	20	20	-	μA
Transconductance	S	20	20	14.5	mA/V
Amplification factor	μ	84	84	76	
Transconductance	S	2	2	1.45	mA/V
Grid voltage	V_g	-2.3	-3.2	-3.8	V
Transconductance	S	0.2	0.2	0.145	mA/V
Grid voltage	V_g	-5.3	-7.7	-8.3	V

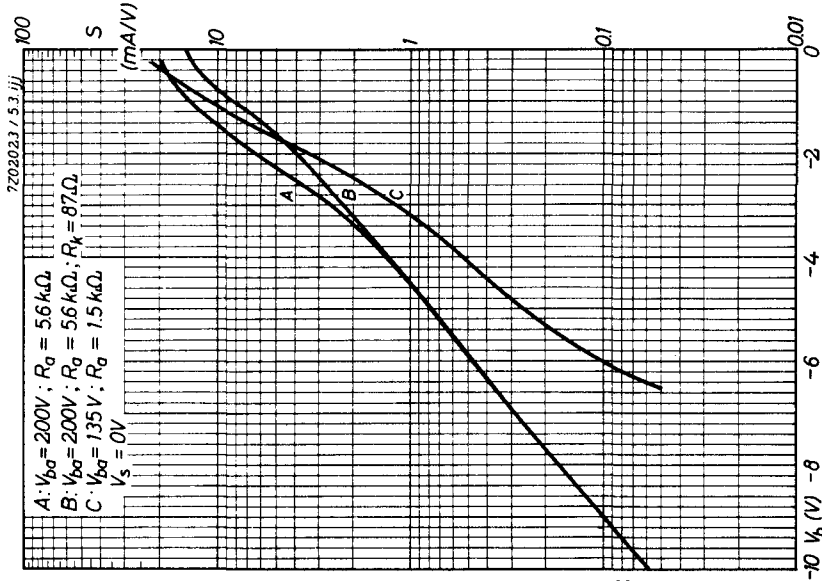
LIMITING VALUES (Design centre rating system)

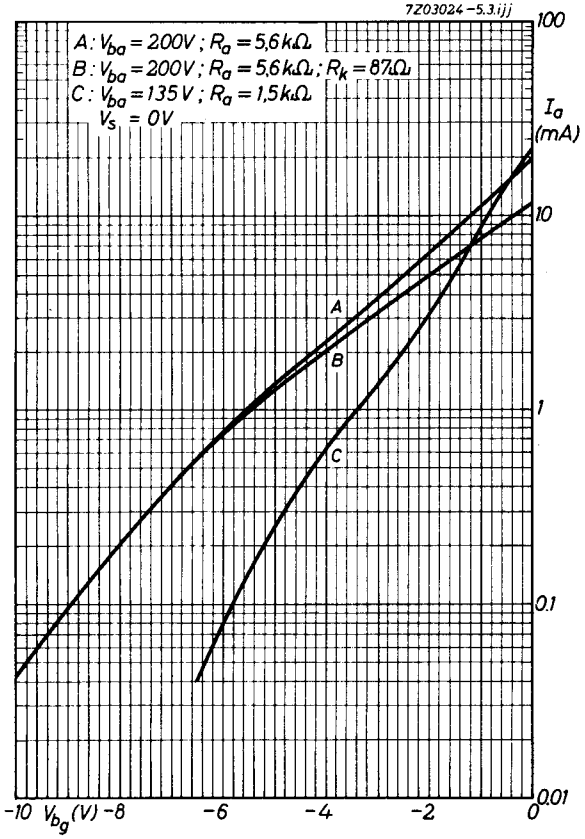
Anode voltage	V_{a_o}	max. 550	V
	V_a	max. 200	V
Anode dissipation	W_a	max. 2.2	W
Cathode current	I_k	max. 20	mA
Negative grid voltage	$-V_g$	max. 50	V
Grid resistor	R_g	max. 1	MΩ
Grid resistor in A.G.C. circuits	R_g	max. 3	MΩ
Cathode to heater voltage	V_{kf}	max. 100	V [1]

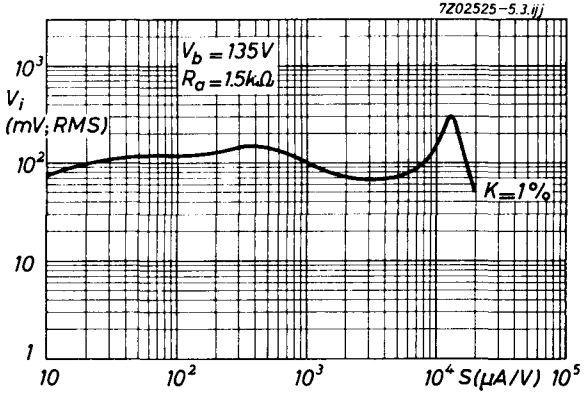


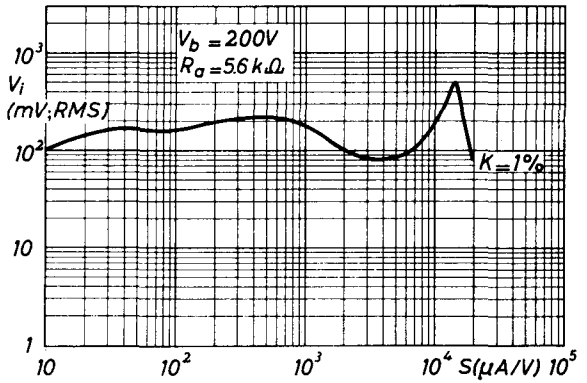
[1]) To fulfil the modulation hum requirements, V_{kf} should not exceed 55 V_{RMS}.

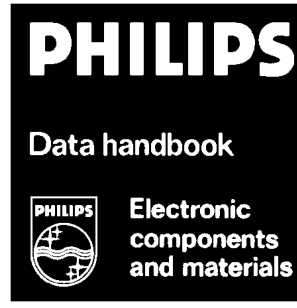

7Z02526-5.3.iij
V_a = 135 V
V_s = 0 V
R_i (kΩ)
I_a (mA)
S (mA/V)
V_g (V)


7Z02023 / 5.3.iij
A: V_{ba} = 200 V ; R_a = 5.6 kΩ
B: V_{ba} = 200 V ; R_a = 5.6 kΩ ; R_k = 87 Ω
C: V_{ba} = 135 V ; R_a = 1.5 kΩ
V_s = 0 V
S (mA/V)
V_{bg} (V)


7Z03024-5.3ijj
A: V_{ba} = 200V ; R_a = 5,6 kΩ
B: V_{ba} = 200V ; R_a = 5,6 kΩ ; R_k = 87Ω
C: V_{ba} = 135 V ; R_a = 1,5 kΩ
V_s = 0V
100
I_a (mA)
10
1
0.1
0.01
A
B
C
-10
V_{bg} (V)
-8
-6
-4
-2
0


7Z02525-5.3.ijj
$V_b = 135V$
$R_a = 1.5k\Omega$
10^3
V_i
(mV; RMS)
10^2
10
1
$K = 1\%$
10
10^2
10^3
10^4 S(μA/V) 10^5


$V_b = 200V$
$R_a = 5.6\,k\Omega$
10^3
V_i
(mV; RMS)
10^2
10
1
$K = 1\%$
10
10^2
10^3
10^4 S(μA/V) 10^5



PC900

page	sheet	date
1	1	1970.01
2	2	1970.01
3	3	1970.01
4	4	1970.01
5	5	1970.01
6	6	1970.01
7	FP	1999.07.30

H.F. TRIODE

Triode intended for use as H.F. amplifier, oscillator, mixer and in frame deflection circuits and line deflection circuits of TV receivers.

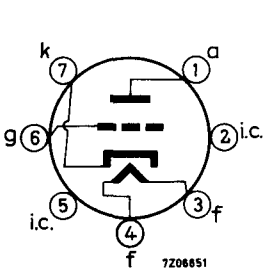
QUICK REFERENCE DATA			
Anode current	I_a	12	mA
Transconductance	S	7.2	mA/V
Amplification factor	μ	67	-

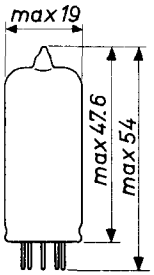
HEATING: Indirect by A.C. or D.C.; series supply

Heater current	I_f	300	mA
Heater voltage	V_f	3.1	V

DIMENSIONS AND CONNECTIONS Dimensions in mm

Base: 7 pin miniature





LIMITING VALUES (Design centre rating system)

Anode voltage	V_{a_o}	max.	550	V
	V_a	max.	250	V
Anode dissipation	W_a	max.	2.5	W
Grid voltage	$-V_g$	max.	50	V
Cathode current, average	I_k	max.	15	mA
peak	I_{k_p}	max.	150	mA [3]
Cathode to heater voltage (k pos.)	V_{kf}	max.	250	V [1]
(k neg.)	V_{kf}	max.	250	V
	(D.C. component	max.	100	V)
Grid resistor (automatic bias)	R_g	max.	1	MΩ

OPERATING CONDITIONS AS BLOCKING OSCILLATOR

To take into account the tube tolerances, the decrease of the characteristics during life and the decrease of the emission at underheating, the circuit should be designed so that acceptable performance is obtained with a cathode peak current of 100 mA [2] (150 mA [3]). It is recommended to limit the peak current of new tubes by an automatic amplitude limiting circuit e.g. by the use of non by-passed grid and anode resistors.

[1]) During the warm-up period of the tubes V_{kf} (k pos.) (D.C. component) max. 315 V.

[2]) Pulse duration 4% of a cycle and max. 0.8 ms.

[3]) Pulse duration 1% of a cycle and max. 0.2 ms.

CAPACITANCES

Grounded cathode circuit

without external shield

Input	C_i	2.8	pF
Output	C_o	0.55	pF
Anode to grid	C_{ag}	1.8	pF

With external shield 19.5 mm diameter

Anode to cathode, heater and shield	$C_{a/kfs}$	1.4	pF
Cathode to grid, heater and shield	$C_{k/gfs}$	4.7	pF
Anode to grid, heater and shield	$C_{a/gfs}$	2.9	pF

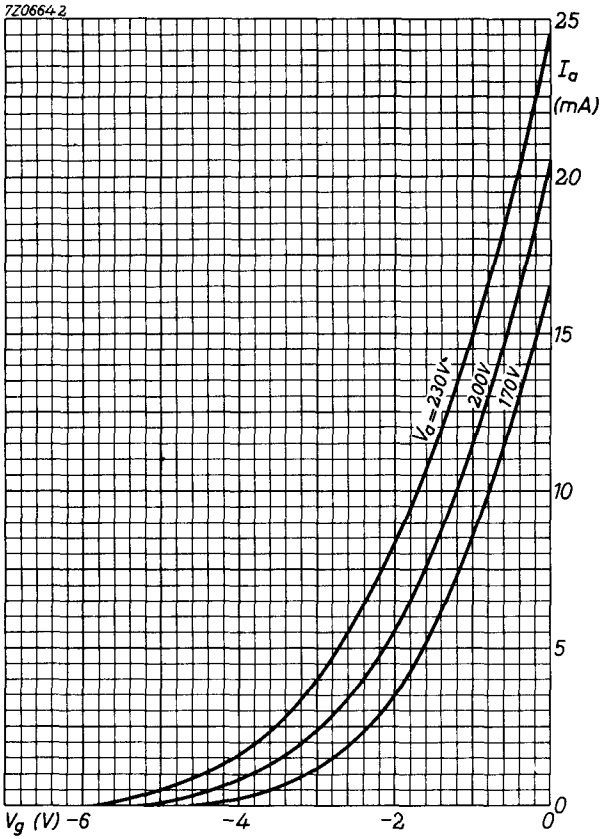
Grounded grid circuit

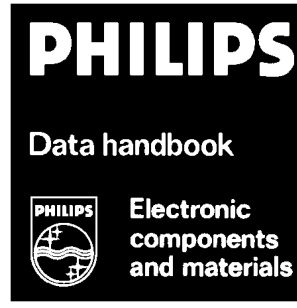
without external shield

Input	C_i	4.6	pF
Output	C_o	2.0	pF
Anode to cathode	C_{ak}	0.24	pF
Cathode to heater	C_{kf}	2.0	pF
Grid to heater	C_{gf}	max. 0.15	pF

TYPICAL CHARACTERISTICS

Anode voltage	V_a	100	170	200	230	V
Grid voltage	V_g	-0.9	-1.0	-0.9	-1.6	V
Anode current	I_a	3.0	8.5	12.0	10.5	mA
Transconductance	S	3.8	6.0	7.2	6.0	mA/V
Amplification factor	μ	58	65	67	62	-
Equivalent noise resistance	R_{eq}		0.5	0.4	0.5	kΩ


7Z06642
25
I_a
(mA)
20
15
10
5
0
V_a=230V
200V
170V
V_g (V) −6
−4
−2
0



PC92

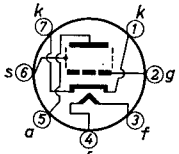
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2	2	1969.01
3	3	1969.01
4	4	1969.01
5	FP	1999.07.30

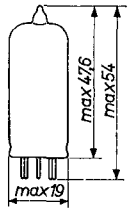
TRIODE with variable mutual conductance and low anode to grid capacitance for use in V.H.F. television tuners.
TRIODE à pente variable et à petite capacité anode-grille pour l'utilisation dans l'étage d'entrée de récepteurs de télévision pour très hautes fréquences
TRIODE mit veränderlicher Steilheit und niedriger Anoden-Gitter Kapazität zur Verwendung in Eingangsstufen von Fernsehempfängern für sehr hohe Frequenzen

Heating : indirect by A.C. or D.C. series supply
Chauffage: indirect par C.A. ou C.C. alimentation série
Heizung : indirekt durch Wechsel- oder Gleichstrom; Serien-speisung

I_f = 300 mA
V_f = 3,6 V

Dimensions in mm
Dimensions en mm
Abmessungen in mm





Base, culot, Sockel: Miniature

Capacitances
Capacités
Kapazitäten

Without external screening Sans blindage extérieur Ohne äussere Abschirmung	With external screening Avec blindage extérieur Mit äusserer Abschirmung
C_{ag} = 0,38 pF	C_{ag} = 0,36 pF
C_g = 4,4 pF	C_g = 4,4 pF
C_a = 3,0 pF	C_a = 4,0 pF
C_{ak} = 0,24 pF	C_{ak} = 0,20 pF
C_{gk} = 3,1 pF	C_{gk} = 3,1 pF
C_{gf} < 0,28 pF	C_{gf} < 0,28 pF
C_{kf} = 2,8 pF	C_{kf} = 2,8 pF

PHILIPS

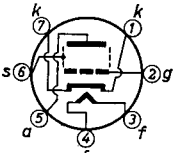
PC 95

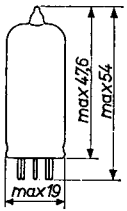
TRIODE with variable mutual conductance and low anode to grid capacitance for use in V.H.F. television tuners.
TRIODE à pente variable et à petite capacité anode-grille pour l'utilisation dans l'étage d'entrée de récepteurs de télévision pour très hautes fréquences
TRIODE mit veränderlicher Steilheit und niedriger Anoden-Gitter Kapazität zur Verwendung in Eingangsstufen von Fernsehempfängern für sehr hohe Frequenzen

Heating : indirect by A.C. or D.C. series supply
Chauffage: indirect par C.A. ou C.C. alimentation série
Heizung : indirekt durch Wechsel- oder Gleichstrom; Serienspeisung

I_f = 300 mA
V_f = 3,6 V

Dimensions in mm
Dimensions en mm
Abmessungen in mm





Base, culot, Sockel: Miniature

Capacitances
Capacités
Kapazitäten

Without external screening Sans blindage extérieur Ohne äussere Abschirmung	With external screening Avec blindage extérieur Mit äusserer Abschirmung
C_{ag} = 0,38 pF	C_{ag} = 0,36 pF
C_g = 4,4 pF	C_g = 4,4 pF
C_a = 3,0 pF	C_a = 4,0 pF
C_{ak} = 0,24 pF	C_{ak} = 0,20 pF
C_{gk} = 3,1 pF	C_{gk} = 3,1 pF
C_{gf} < 0,28 pF	C_{gf} < 0,28 pF
C_{kf} = 2,8 pF	C_{kf} = 2,8 pF

Typical characteristics
Caractéristiques types
Kenndaten

V_a	=	200	200	200 V
V_g	=	-1,2	-3,8	-5,6 V
I_a	=	10	—	— mA
S	=	10,5	0,5	0,1 mA/V
μ	=	80	—	—

Cross modulation
Transmodulation
Kreuzmodulation

V_i for / pour / für $K = 1\%$

at	S = 10,5 mA/V	> 100 mV
à	S = 0,5 mA/V	100 mV
bei	S = 0,1 mA/V	> 100 mV

Limiting values
Caractéristiques limites
Grenzdaten

V_{a_o}	=	max.	550 V
V_a	=	max.	250 V
W_a	=	max.	2,2 W
I_k	=	max.	20 mA
$-V_g$	=	max.	50 V
R_g	=	max.	1 MΩ
V_{kf}	=	max.	100 V
R_{kf}	=	max.	20 kΩ

Typical characteristics
Caractéristiques types
Kenndaten

V_a	=		200		V
V_g	=	-1,2	-3,8	-5,6	V
I_a	=	10	-	-	mA
S	=	10,5	0,5	0,1	mA/V
μ	=	80	-	-	

Cross modulation
Transmodulation
Kreuzmodulation

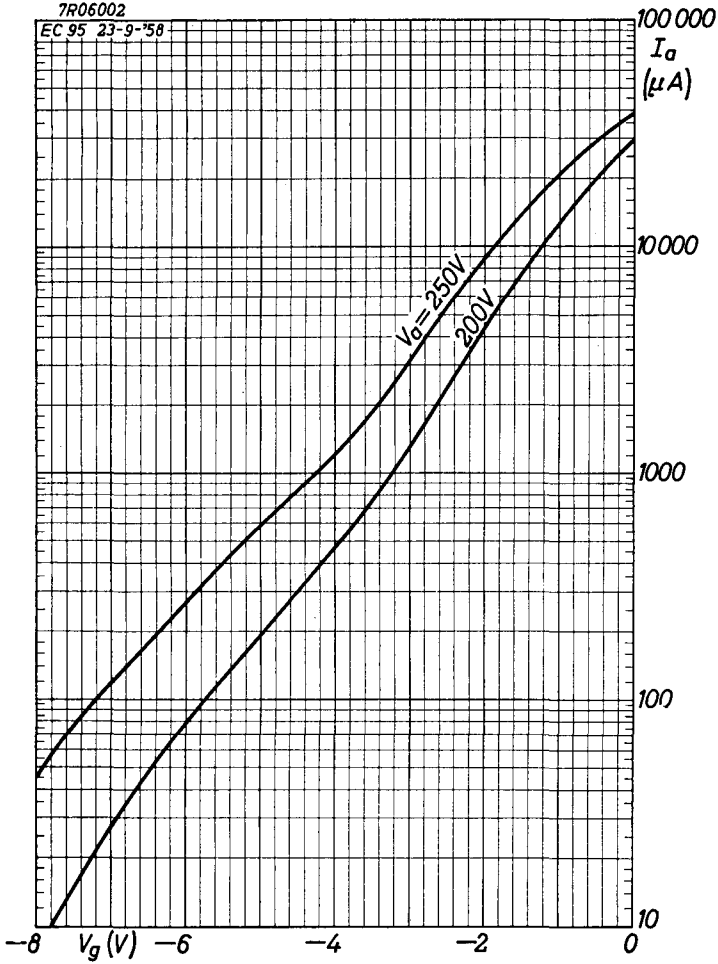
V_i for / pour / für K = 1% { at / à / bei } S = 10,5 mA/V > 100 mV
S = 0,5 mA/V 100 mV
S = 0,1 mA/V > 100 mV

Limiting values
Caractéristiques limites
Grenzdaten

V_{a_o}	= max.	550	V
V_a	= max.	250	V
W_a	= max.	2,2	W
I_k	= max.	20	mA
$-V_g$	= max.	50	V
R_g	= max.	1	MΩ
V_{kf}	= max.	100	V
R_{kf}	= max.	20	kΩ

PHILIPS

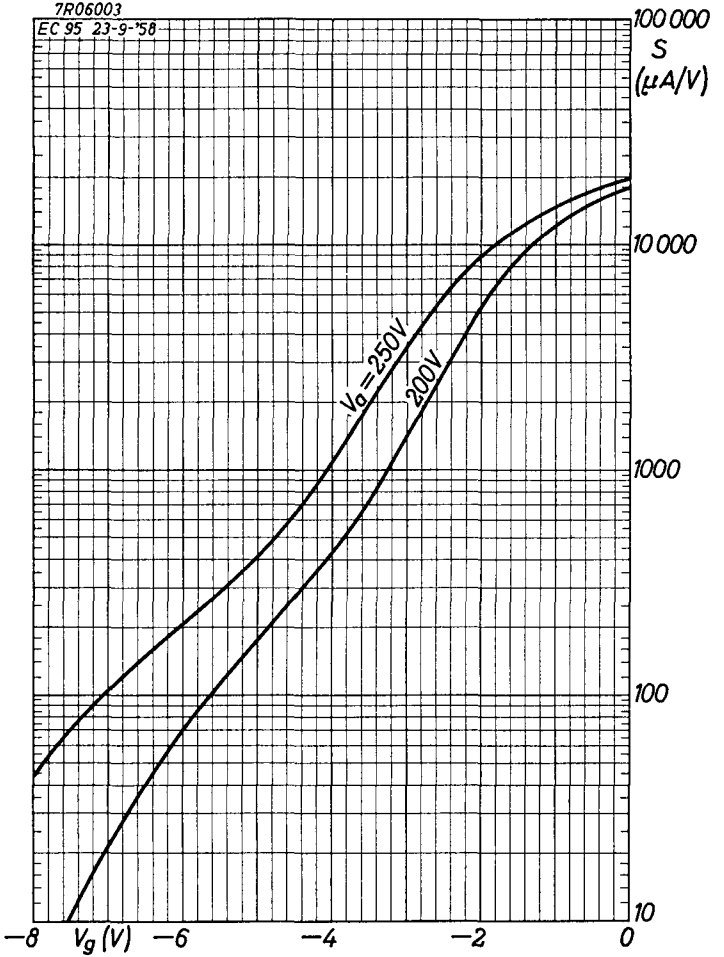
PC 95



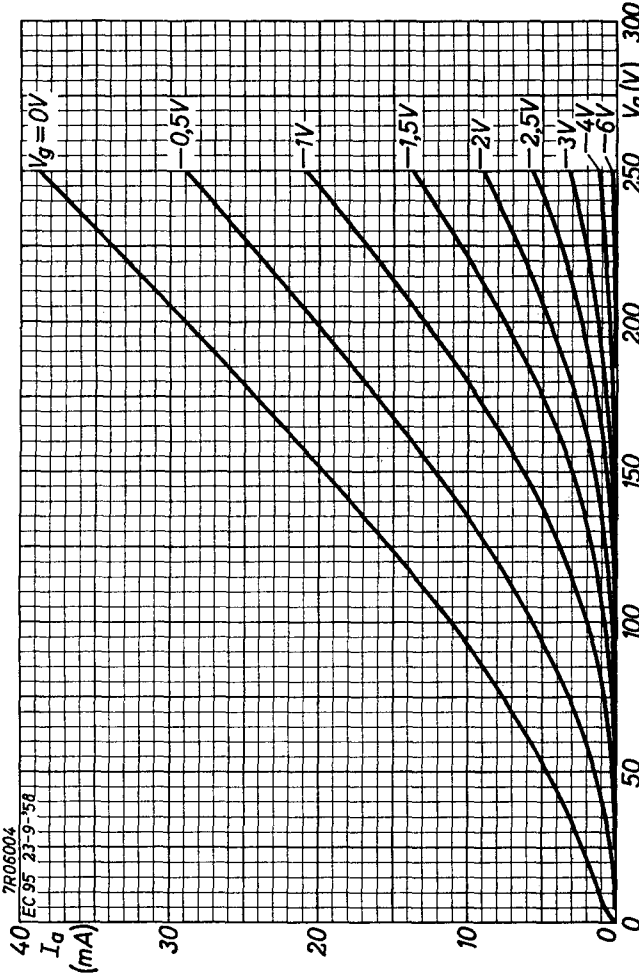
3.3.1959

A

PC 95 **PHILIPS**

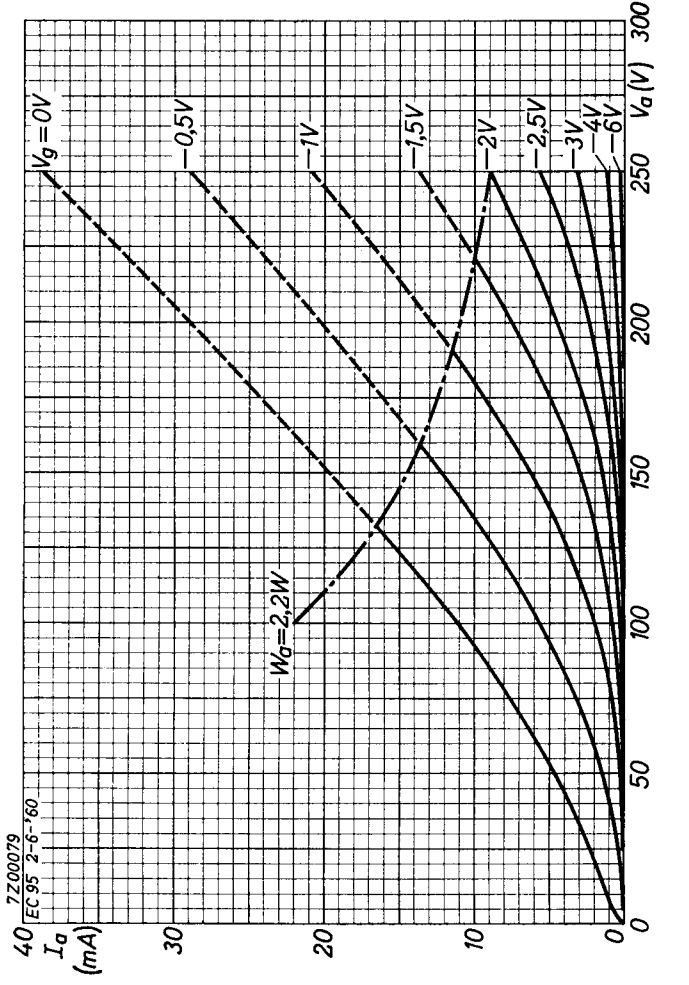


B


7R06004
EC 95 23-9-58
I_a (mA)
40
30
20
10
0
0
50
100
150
200
250
300
V_a (V)
$V_g = 0V$
−0,5V
−1V
−1,5V
−2V
−2,5V
−3V
−4V
−6V

PHILIPS

PC 95



6.6.1960

C

PHILIPS

Electronic Tube

HANDBOOK

PC95

page	sheet	date
1	1	1959.03.03
2	1	1960.06.06
3	2	1959.03.03
4	2	1960.06.06
5	A	1959.03.03
6	B	1959.03.03
7	C	1959.03.03
8	C	1960.06.06
9	FP	2000.04.09

PHILIPS

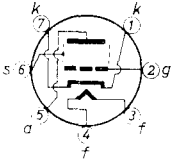
PC97

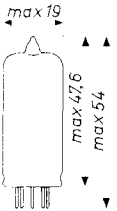
TRIODE for use as R.F. amplifier in V.H.F. television tuners
TRIODE pour utilisation en amplificatrice H.F. dans le pré-amplificateur V.H.F. des récepteurs de télévision
TRIODE zur Verwendung als HF-Verstärkerröhre in der VHF-Vorverstärker von Fernsehempfängern

Heating : indirect by A.C. or D.C. series supply
Chauffage: indirect par C.A. ou C.C. alimentation série
Heizung : indirekt durch Gleich- oder Wechselstrom Serienspeisung

$\frac{I_f = 300 \text{ mA}}{V_f = 4,5 \text{ V}}$

Dimensions in mm
Dimensions en mm
Abmessungen in mm





Base, culot, Sockel: MINIATURE

Capacitances
Capacités
Kapazitäten

with external screening avec blindage extérieur [1] mit äusserer Abschirmung	without external screening sans blindage extérieur ohne äussere Abschirmung
C_a = 4,3 pF	C_a = 3,3 pF
C_g = 5,0 pF	C_g = 5,0 pF
C_{ag} = 0,48 pF	C_{ag} = 0,5 pF
C_{ak} = 0,21 pF	C_{ak} = 0,25 pF
C_{gk} = 3,2 pF	C_{gk} = 3,2 pF
C_{gf} < 0,28 pF	C_{gf} < 0,28 pF
C_{kf} = 2,5 pF	C_{kf} = 2,5 pF

[1] Inside diameter 19,1 mm
Diamètre intérieur 19,1 mm
Innerer Durchmesser 19,1 mm

Typical characteristics (pin 6 connected to cathode)
Caractéristiques types (broche 6 reliée à la cathode)
Kenndaten (Stift 6 mit der Katode verbunden)

V_a	=	135 V
V_g	=	-1 V
I_a	=	11 mA
S	=	13 mA/V
μ	=	65
R_i	=	5 kΩ
V_g (S = 0,65 mA/V)	=	-3,1 V
V_g (S = 0,13 mA/V)	=	-5,0 V
V_g (I_a = 0,1 mA)	=	-5,0 V

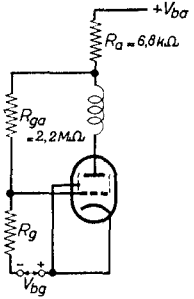
Operating characteristics (pin 6 connected to cathode)
Caractéristiques d'utilisation (broche 6 reliée à la cathode)
Kenndaten (Stift 6 mit der Katode verbunden)

V_{ba}	=	200 [1]			200 [2]			V
R_a	=	5,6			5,6			kΩ
R_k	=	82			0			Ω
R_g	=	0			1,0			MΩ
V_{bg}	=	0	-4,4	-7,5	0	-4,2	-7,3	V
I_a	=	12	-	-	13	-	-	mA
S	=	14	0,7	0,14	15,5	0,78	0,155	mA/V

[1]) See curves 1 pages C and D
Voir les courbes 1 pages C et D
Siehe die Kurven 1 auf Seiten C und D

[2]) See curves 2 pages C and D
Voir les courbes 2 pages C et D
Siehe die Kurven 2 auf Seiten C und D

Operating characteristics (continued)
Caractéristiques d'utilisation (suite)
Betriebsdaten (Fortsetzung)



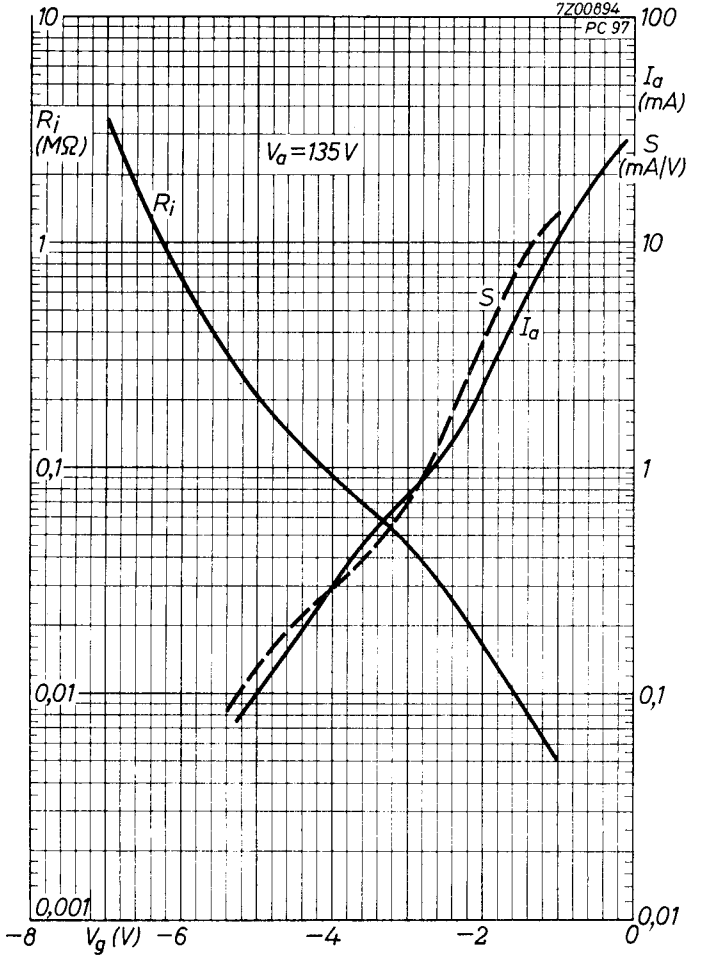
V_{ba}	=	200 [3]			200 [4]			V
R_g	=	0,22			0,56			MΩ
V_{bg}	=	0	-5,9	-9,0	0	-9,2	-12,5	V
I_a	=	14	-	-	14	-	-	mA
S	=	16	0,80	0,16	16	0,80	0,16	mA/V

Limiting values (Design centre limites)
Caractéristiques limites (Limites moyennes)
Grenzdaten (Normalgrenzdaten)

V_{ao}	= max.	550	V
V_a	= max.	200	V
W_a	= max.	2,2	W
I_k	= max.	20	mA
$-V_g$	= max.	50	V
R_g	= max.	1	MΩ
V_{kf}	= max.	100	V

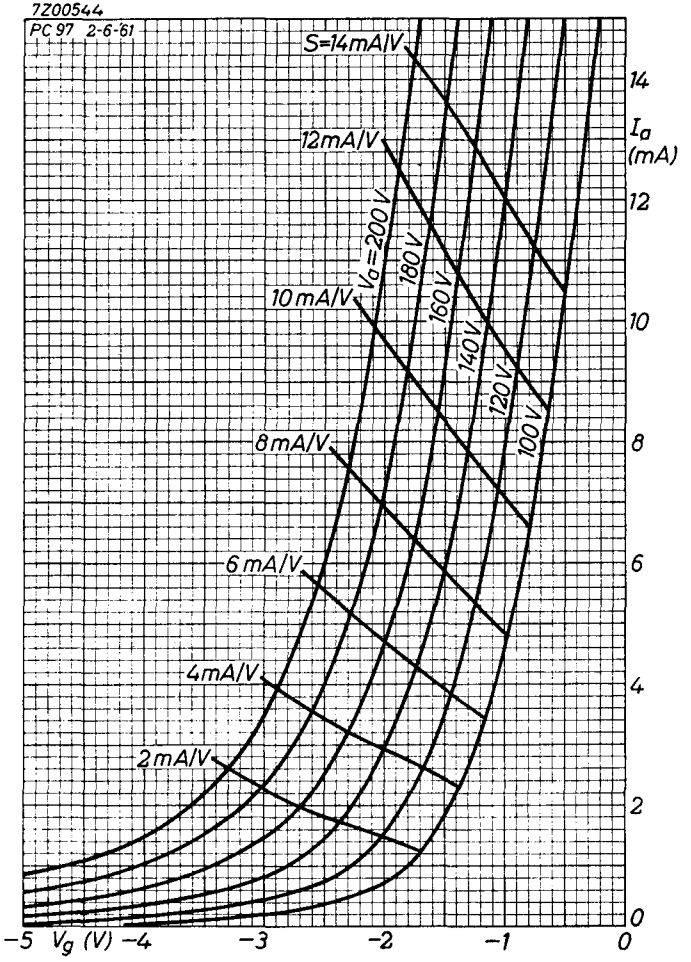
[3]) See curves 3 pages C and D
Voir courbes 3 pages C et D
Siehe Kurven 3 auf Seiten C und D

[4]) See curves 4 pages C and D
Voir courbes 4 pages C et D
Siehe Kurven 4 auf Seiten C und D

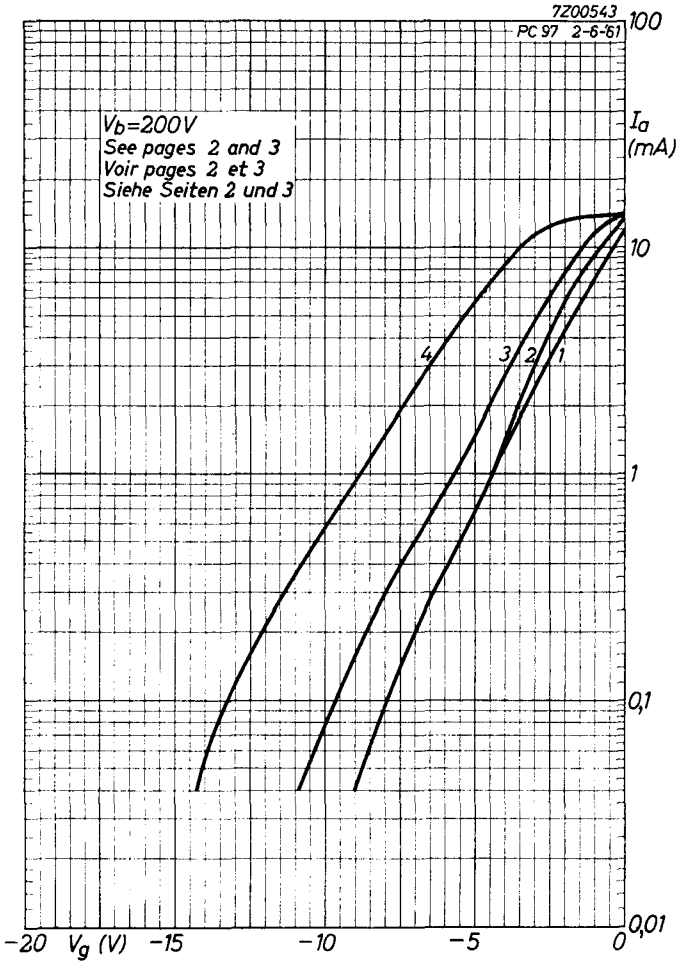

7Z00894
PC 97
10
1
0,1
0,01
0,001
R_i (MΩ)
V_a = 135 V
R_i
S
I_a
100
10
1
0,1
0,01
I_a (mA)
S (mA/V)
−8
V_g (V)
−6
−4
−2
0

PC97

PHILIPS



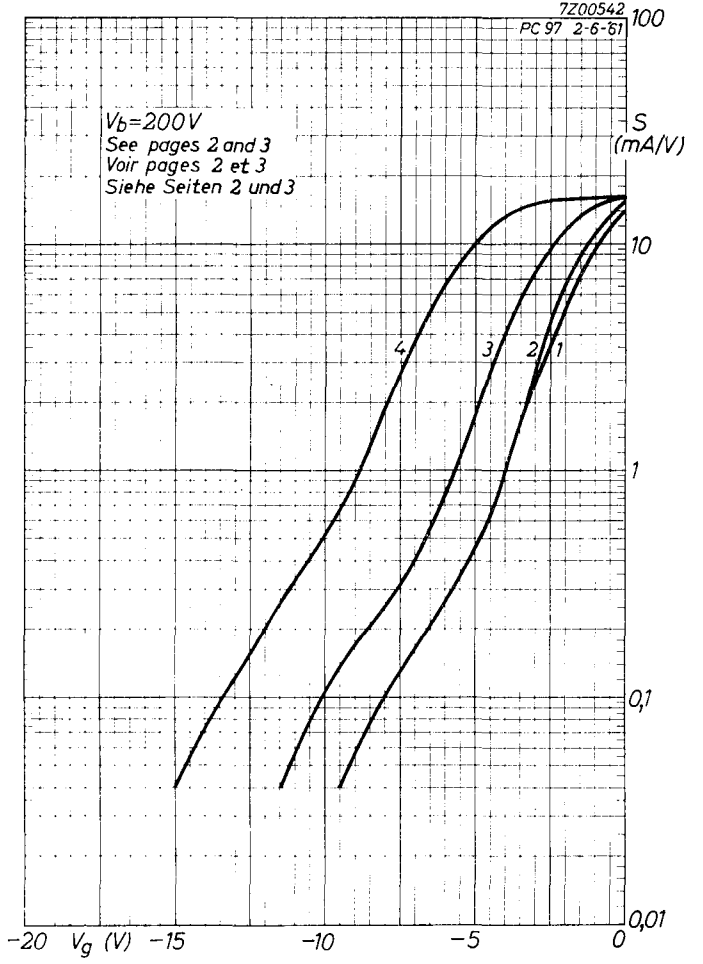
B


7Z00543
PC 97 2-6-61
V_b=200V
See pages 2 and 3
Voir pages 2 et 3
Siehe Seiten 2 und 3
I_a (mA)
100
10
1
0,1
0,01
4
3
2
1
−20 V_g (V) −15 −10 −5 0

3.3.1962

C

PHILIPS


7Z00542
PC 97 2-6-81
V_b=200V
See pages 2 and 3
Voir pages 2 et 3
Siehe Seiten 2 und 3
S
(mA/V)
100
10
1
0,1
0,01
4
3
2
1
−20
V_g (V)
−15
−10
−5
0

PHILIPS

Electronic Tube

HANDBOOK

PC97

page	sheet	date
1	1	1962.03.03
2	2	1962.03.03
3	3	1962.03.03
4	A	1962.03.03
5	B	1962.03.03
6	C	1962.03.03
7	D	1962.03.03
8	FP	2000.01.08

R.F. DOUBLE TRIODE

Double triode with variable transconductance intended for use as V.H.F. cascode amplifier in television receivers.

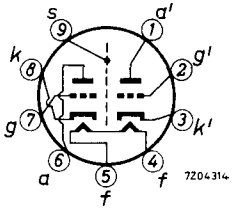
QUICK REFERENCE DATA			
Anode current	I_a	15	mA
Transconductance	S	12.5	mA/V
Amplification factor	μ	31	-

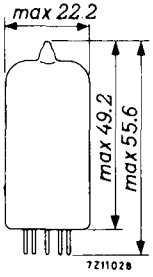
HEATING: Indirect by A.C. or D.C.; series supply

Heater current	I_f	300	mA
Heater voltage	V_f	7.6	V

DIMENSIONS AND CONNECTIONS Dimensions in mm

Base: Noval





CAPACITANCES		with external screen 22.2 mm diam.	without external screen	
Grid to cathode + heater + screen	$C_{g/kfs}$	3.5	3.5	pF
Anode to cathode + heater + screen	$C_{a/kfs}$	2.3	1.7	pF
Anode to grid	C_{ag}	1.9	1.9	pF
Grid to heater	C_{gf}	max. 0.28	max. 0.28	pF
Cathode to grid + heater + screen	$C_{k'/g'fs}$	6.0	6.0	pF
Anode to grid, heater + screen	$C_{a'/g'fs}$	4.0	3.4	pF
Anode to cathode	$C_{a'k'}$	0.17	0.18	pF
Cathode to heater	$C_{k'f}$	2.7	2.7	pF
Anode to grid	$C_{a'g'}$	1.9	1.9	pF
Anode to anode	$C_{aa'}$	max. 0.015	max. 0.045	pF
Grid to anode other unit	$C_{ga'}$	max. 0.004	max. 0.004	pF

TYPICAL CHARACTERISTICS (each unit)

Anode voltage	V_a	90	V
Grid voltage	V_g	-1.4	V
Anode current	I_a	15	mA
Transconductance	S	12.5	mA/V
Internal resistance	R_i	2.5	kΩ
Grid voltage	V_g	-5	V
Transconductance	S	0.625	mA/V
Grid voltage	V_g	-9	V
Transconductance	S	0.125	mA/V

LIMITING VALUES (Design centre rating system) (Each unit)

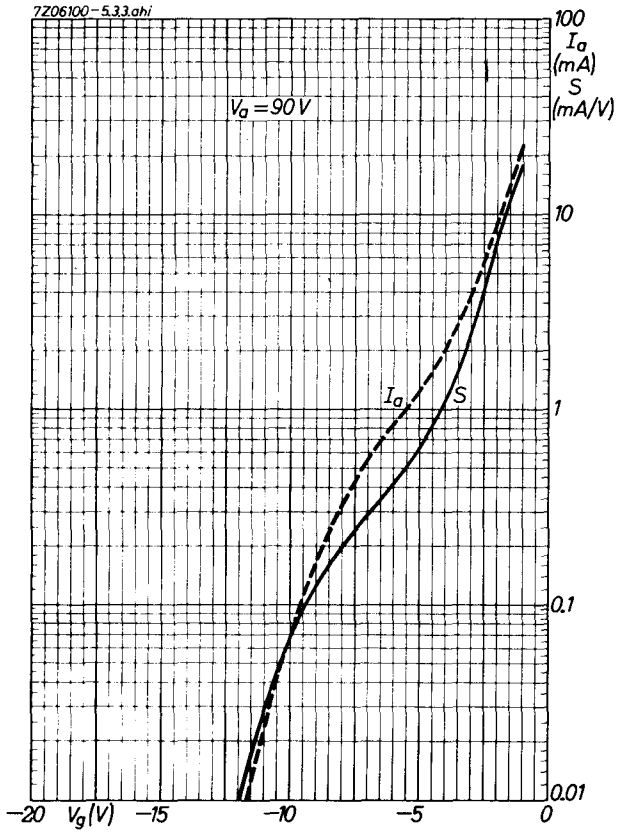
Anode voltage	V_{a_o}	max.	550	V
	V_a	max.	130	V
Anode dissipation	W_a	max.	1.8	W
Grid voltage	$-V_g$	max.	50	V
Grid resistor				
unit a, g, k	R_g	max.	1	MΩ
unit a', g', k'	$R_{g'}$	max.	0.5	MΩ
Cathode current	I_k	max.	22	mA
Cathode to heater voltage				
unit a, g, k	V_{kf}	max.	80	V
unit a', g', k' (cathode positive)	$V_{k'f}$	max.	180	V [1])

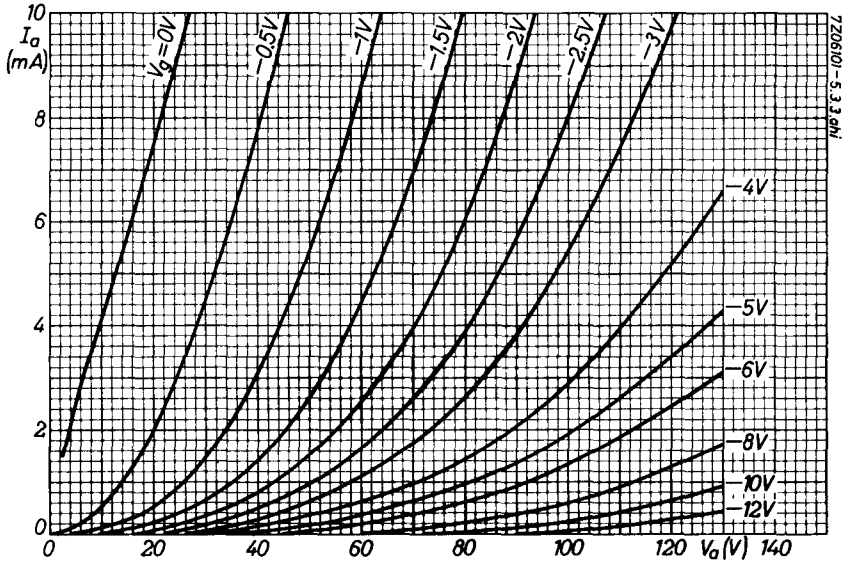
REMARKS

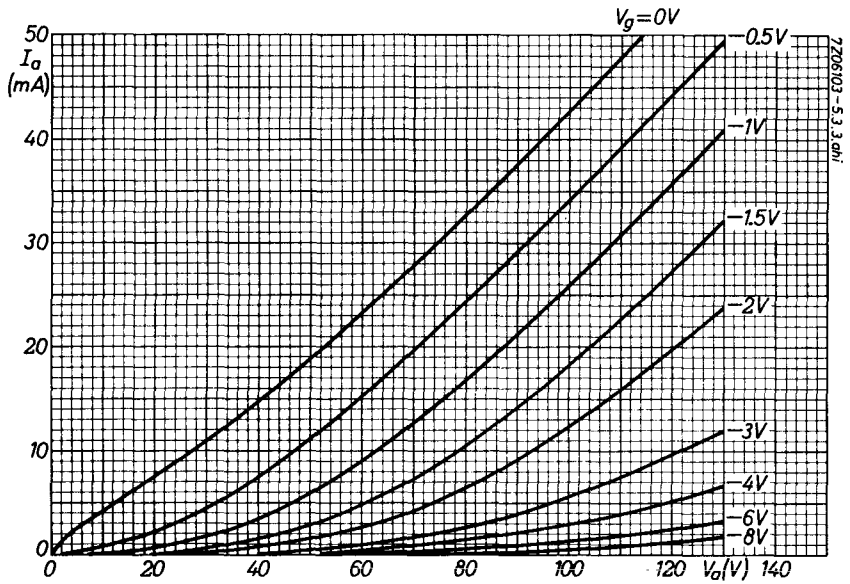
In order not to exceed the maximum permissible anode voltage when the tube is controlled, it is necessary to use a voltage divider for the grid of the grounded grid section.

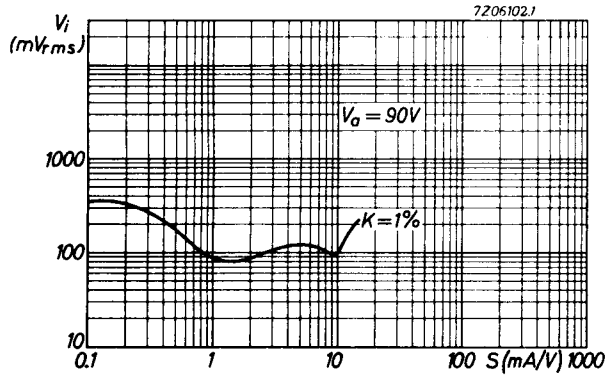
The system a, g, k should be used as the grounded cathode input section and the system a', g', k' as the grounded grid output section.

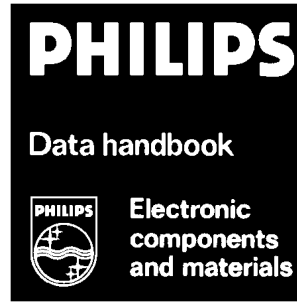
[1]) D.C. component max. 130 V.


7Z06100-5.3.3.ahi
100
Ia
(mA)
S
(mA/V)
Va = 90 V
10
1
0.1
0.01
Ia
S
−20
Vg (V)
−15
−10
−5
0


10
I_a (mA)
8
6
4
2
0
V_g=0V
−0.5V
−1V
−1.5V
−2V
−2.5V
−3V
−4V
−5V
−6V
−8V
−10V
−12V
0
20
40
60
80
100
120
V_a(V)
140
7206101-5.3.3.ohi


50
I_a (mA)
40
30
20
10
0
V_g=0V
−0.5V
−1V
−1.5V
−2V
−3V
−4V
−6V
−8V
0
20
40
60
80
100
120
V_a(V)
140
7206103-5.3.3.ohi


7206102.1
V_i (mV_{rms})
$V_a = 90V$
K = 1%
1000
100
10
0.1
1
10
100
S(mA/V)
1000



PCC189

page	sheet	date
1	1	1969.12
2	2	1969.12
3	3	1969.01
4	4	1969.01
5	5	1969.01
6	6	1969.12
7	FP	1999.07.31

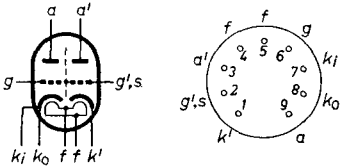
PHILIPS PCC 84

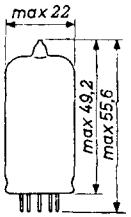
DOUBLE TRIODE particularly designed for use as R.F. cascode amplifier in tuners for television receivers up to 220 Mc/s
DOUBLE TRIODE conçue particulièrement pour être utilisée comme amplificatrice H.F. en montage cascode dans les étages d'entrée des récepteurs de télévision jusqu'à 220 Mc/s
DOPPELTRIODE speziell entworfen zur Verwendung als HF-Verstärker in Kaskodenschaltung in Eingangsstufen von Fernsehempfängern bis zu 220 MHz

Heating : indirect by A.C. or D.C.; series supply
Chauffage: indirect par C.A. ou C.C.; alimentation série
Heizung : indirekt durch Wechsel- oder Gleichstrom; Serienspeisung

V_f = 7 V
I_f = 300 mA

Dimensions in mm
Dimensions en mm
Abmessungen in mm





Base, culot, Sockel: Noval

Capacitances (without external shield)
Capacités (sans blindage extérieur)
Kapazitäten (ohne äussere Abschirmung)

C_{ag}	=	1,2 pF	$C_{a'k'}$	=	0,16 pF
C_g	=	2,3 pF	$C_{k'(g'+f)}$	=	4,7 pF
C_a	=	0,45 pF	$C_{a'(g'+f)}$	=	2,5 pF
C_{gf}	<	0,25 pF	$C_{k'f}$	=	2,7 pF
			$C_{a'g'}$	=	2,3 pF

$C_{a-(k+f+g')}$ = 1,2 pF
$C_{aa'}$ < 0,035 pF
$C_{ga'}$ < 0,006 pF

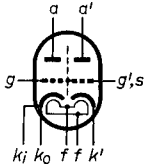
PHILIPS PCC 84

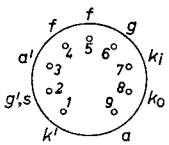
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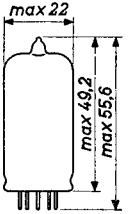
Heating : indirect by A.C. or D.C.; series supply
Chauffage: indirect par C.A. ou C.C.; alimentation série
Heizung : indirekt durch Wechsel- oder Gleichstrom; Serienspeisung

V_f = 7 V
I_f = 300 mA

Dimensions in mm
Dimensions en mm
Abmessungen in mm







Base, culot, Sockel: Noval

Capacitances (without external shield)
Capacités (sans blindage extérieur)
Kapazitäten (ohne äussere Abschirmung)

C_{ag}	=	1,2 pF	$C_{a'k'}$	=	0,16 pF
C_g	=	2,1 pF	$C_{k'(g'+f)}$	=	4,7 pF
C_a	=	0,45 pF	$C_{a'(g'+f)}$	=	2,5 pF
C_{gf}	<	0,25 pF	$C_{k'f}$	=	2,7 pF
			$C_{a'g'}$	=	2,3 pF

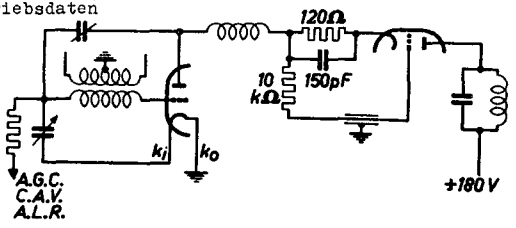
$C_{a-(k+f+g')}$ = 1,2 pF
$C_{aa'}$ < 0,035 pF
$C_{ga'}$ < 0,006 pF

Typical characteristics (each system)
Caractéristiques types (chaque système)
Kenndaten (jedes System)

V_a	=	90 V
V_g	=	-1,5 V
I_a	=	12 mA
S	=	6 mA/V
μ	=	24

Input conductance at 200 Mc/s
Conductance d'entrée à 200 Mc/s
Eingangsleitwert bei 200 MHz — 250 μA/V[1])

Operating characteristics
Caractéristiques d'utilisation
Betriebsdaten



Noise figure
(bandwidth of input circuit 7-8 Mc/s) — 6,5[1])
Indice de souffle
(largeur de bande du circuit d'entrée 7-8Mc/s) — 6,5[1])
Rauschzahl
(Bandbreite der Eingangsschaltung 7-8 MHz) — 6,5[1])

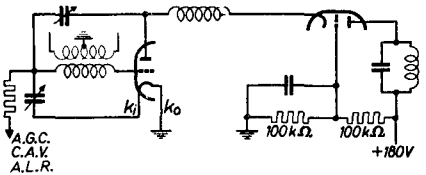
[1])The quoted values of the input conductance and the noise figure are valid in the case that the cathode lead ki is connected to the input circuit and k_o to the chassis. The noise figure will be reduced to about 5 when the cathode leads are connected in parallel;the input conductance will increase, however, in this case to about 700 µA/V
Les valeurs mentionnées de la conductance d'entrée et de l'indice de souffle s'appliquent au cas que la connection cathodique ki soit connectée au circuit d'entrée et k_o au châssis. L'indice de souffle sera diminuée à 5 si les connections cathodiques sont montées en parallèle; pourtant, la conductance d'entrée s'elèvera à 700 µA/V dans ce cas
Die genannten Werte des Eingangsleitwertes und der Rauschzahl gelten im Falle dass die Katodenleitung ki mit dem Eingangskreis verbunden ist und k_o mit dem Chassis. Die Rauschzahl wird bis zu etwa 5 verringert wenn die Katodenleitungen parallel geschaltet sind;der Eingangsleitwert wird in diesem Falle aber bis zu etwa 700 µA/V erhöht werden

Typical characteristics (each system)
Caractéristiques types (chaque système)
Kenndaten (jedes System)

V_a	=	90 V
V_g	=	-1,5 V
I_a	=	12 mA
S	=	6 mA/V
μ	=	24

Input conductance at 200 Mc/s
Conductance d'entrée à 200 Mc/s
Eingangsleitwert bei 200 MHz — 250 μA/V[1])

Operating characteristics
Caractéristiques d'utilisation
Betriebsdaten



Noise figure
(bandwidth of input circuit 7-8 Mc/s) — 6,5[1])
Indice de souffle
(largeur de bande du circuit d'entrée 7-8Mc/s) — 6,5[1])
Rauschzahl
(Bandbreite der Eingangsschaltung 7-8 MHz) — 6,5[1])

[1]) The quoted values of the input conductance and the noise figure are valid in the case that the cathode lead ki is connected to the input circuit and k_o to the chassis. The noise figure will be reduced to about 5 when the cathode leads are connected in parallel; the input conductance will increase, however, in this case to about 700 μA/V
Les valeurs mentionnées de la conductance d'entrée et de l'indice de souffle s'appliquent au cas que la connection cathodique ki soit connectée au circuit d'entrée et k_o au châssis. L'indice de souffle sera diminuée à 5 si les connections cathodiques sont montées en parallèle; pourtant, la conductance d'entrée s'elèvera à 700 μA/V dans ce cas
Die genannten Werte des Eingangsleitwertes und der Rauschzahl gelten im Falle dass die Katodenleitung ki mit dem Eingangskreis verbunden ist und k_o mit dem Chassis. Die Rauschzahl wird bis zu etwa 5 verringert wenn die Katodenleitungen parallel geschaltet sind; der Eingangsleitwert wird in diesem Falle aber bis zu etwa 700 μA/V erhöht werden

Remarks

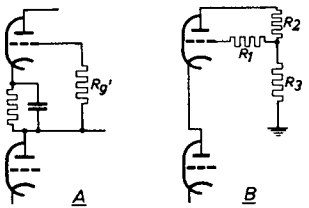
1. The section a,g,k_i,k_o is the grounded cathode triode of the cascode amplifier and the section a', g',k' the grounded grid triode.
2. The grounded cathode section has two cathode leads, of which k_i should be connected to the input circuit and k_o to the chassis.
3. The bias of the grounded grid section can be achieved by means of a decoupled cathode resistor, a typical value of which is 120 Ω (fig.A). It can also be achieved by means of a potentiometer(fig.B). Typical values of R_2 and R_3 are 100 kΩ each.

Observations

1. La section a,g,k_i,k_o est la triode à cathode à la terre de l'amplificateur cascode et la section a', g',k' la triode à grille à la terre.
2. La triode à cathode à la terre a deux connections de la cathode, l'une (k_i)destinée d'être connectée au circuit d'entrée et l'autre (k_o) au châssis.
3. La tension de polarisation de la section à grille à la terre peut être obtenue par l'intermédiaire d'une résistance cathodique découplée, une valeur typique étant de 120 Ω (fig.A). Elle peut être obtenue aussi par l'intermédiaire d'un potentiomètre (fig.B). Des valeurs typiques de R_2 et de R_3 sont de 100 kΩ.

Bemerkungen

1. Das System a,g,k_i,k_o ist die Katodenbasistriode des Kaskodenverstärkers und das System a',g', k' die Gitterbasistriode.
2. Die Katodenbasistriode hat zwei Katodenanschlüsse, der eine (k_i) zum Anschluss am Eingangskreis, der andere (k_o) zum Anschluss am Chassis.
3. Die Vorspannung der Gitterbasistriode kann erhalten werden mittels eines Katodenwiderstandes mit einem Wert von 120 Ω z.B. (Abb.A).Diese Vorspannung kann auch erhalten werden mittels eines Spannungsteilers (Abb.B). Die Werte von R_2 und R_3 sind z.B. 100 kΩ



A B

939 4871
11.11.1954

Remarks

1. The section a,g.k$_i$,k$_o$ is the grounded cathode triode of the cascode amplifier and the section a',g',k' the grounded grid triode
2. The grounded cathode section has two cathode leads, of which k$_i$ should be connected to the input circuit and k$_o$ to the chassis

Observations

1. La section a,g,k$_i$,k$_o$ est la triode à cathode à la terre de l'amplificateur cascode et la section a',g',k' la triode à grille à la terre
2. La triode à cathode à la terre a deux connections de la cathode, l'une (k$_i$) destinée d'être connectée au circuit d'entrée et l'autre (k$_o$) au châssis

Bemerkungen

1. Das System a,g,k$_i$,k$_o$ ist die Katodenbasistriode des Kaskodenverstärkers und das System a',g',k' die Gitterbasistriode
2. Die Katodenbasistriode hat zwei Katodenanschlüsse, der eine (k$_i$) zum Anschluss am Eingangskreis, der andere (k$_o$) zum Anschluss am Chassis

→ Limiting values
Caractéristiques limites
Grenzdaten

V_{b_o}	≈ max.	550	V
$V_a = V_{a'}$	≈ max.	180	V
$W_a = W_{a'}$	≈ max.	2	W
$I_k = I_{k'}$	≈ max.	22	mA
$-V_g = -V_{g'}$	≈ max.	50	V
R_g	≈ max.	0,5	MΩ [1]
$R_{g'}$	≈ max.	0,5	MΩ
$V_{k'f}$ (k' pos.,f neg.)	≈ max.	250	V [2]
$V_{k'f}$ (k' neg.,f pos.)	≈ max.	100	V
V_{kf}	≈ max.	100	V
R_{kf}	≈ max.	20	kΩ

[1] In the case of parallel supply of the heater the max. value of R_g is 1.5 MΩ
Dans le cas d'alimentation en parallèle du filament la valeur max. de R_g est de 1,5 MΩ
Im Falle von Parallelspeisung des Heizfadens ist der max. Wert von R_g 1,5 MΩ

[2] D.C. component max. 180 V
La composante continue 180 V au max.
Gleichspannungskomponent max. 180 V

Remarks

1. The section a,g,k_i,k_o is the grounded cathode triode of the cascode amplifier and the section a',g',k' the grounded grid triode
2. The grounded cathode section has two cathode leads, of which k_i should be connected to the input circuit and k_o to the chassis

Observations

1. La section a,g,k_i,k_o est la triode à cathode à la terre de l'amplificateur cascode et la section a',g',k' la triode à grille à la terre
2. La triode à cathode à la terre a deux connections de la cathode, l'une (k_i) destinée d'être connectée au circuit d'entrée et l'autre (k_o) au châssis

Bemerkungen

1. Das System a,g,k_i,k_o ist die Katodenbasistriode des Kaskodenverstärkers und das System a',g',k' die Gitterbasistriode
2. Die Katodenbasistriode hat zwei Katodenanschlüsse, der eine (k_i) zum Anschluss am Eingangskreis, der andere (k_o) zum Anschluss am Chassis

Limiting values
Caractéristiques limites
Grenzdaten

V_{bo}	= max.	550 V
$V_a = V_{a'}$	= max.	180 V
$W_a = W_{a'}$	= max.	2 W
$I_k = I_{k'}$	= max.	22 mA
$-V_g = -V_{g'}$	= max.	50 V
R_g	= max.	1 MΩ
$R_{g'}$	= max.	0,5 MΩ
$V_{k'f}$ (k' pos., f neg.)	= max.	250 V [1]
$V_{k'f}$ (k' neg., f pos.)	= max.	100 V
V_{kf}	= max.	100 V
R_{kf}	= max.	20 kΩ

[1]) D.C. component max. 180 V
La composante continue 180 V au max.
Gleichspannungskomponente max. 180 V

Limiting values
Caractéristiques limites
Grenzdaten

V_{b_o}	= max.	550	V
$V_a = V_a'$	= max.	180	V
$W_a = W_a'$	= max.	2	W
$I_k = I_k'$	= max.	18	mA
$-V_g = -V_g'$	= max.	50	V
R_g	= max.	0,5	MΩ [1]
R_g'	= max.	0,02	MΩ [2]
$V_{k'fp}$ (k' pos., f neg.)	= max.	250	V [3]
$V_{k'f}$ (k' neg., f pos.)	= max.	90	V
V_{kf}	= max.	90	V
R_{kf}	= max.	20	kΩ

---

[1]) In the case of parallel supply of the heater the max. value of R_g is 1.5 MΩ

Dans le cas d'alimentation en parallèle du filament la valeur max. de Rg est de 1,5 MΩ

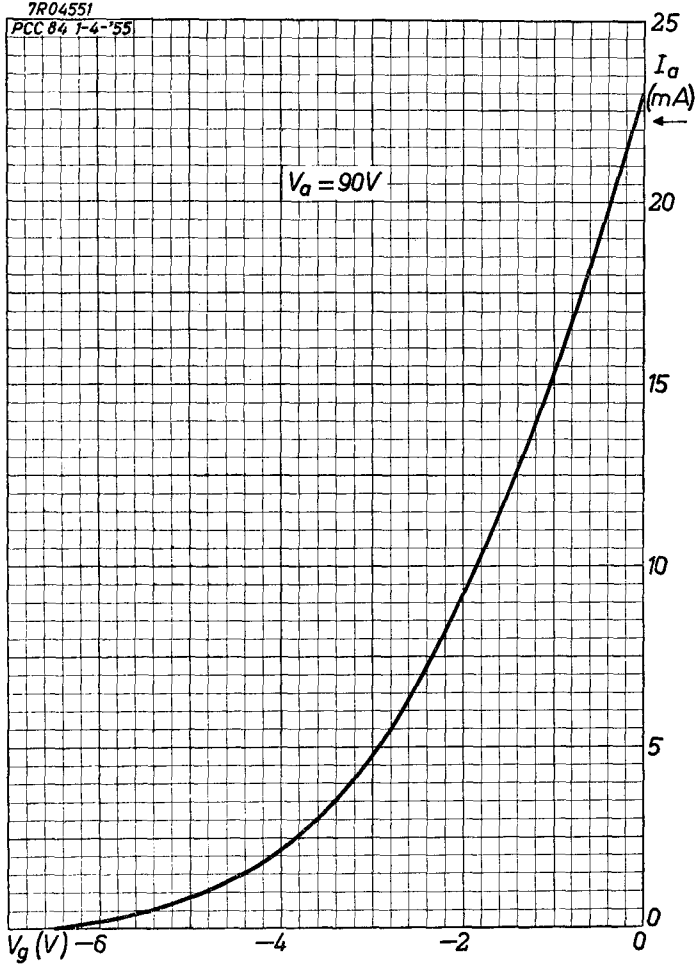
Im Falle von Parallelspeisung des Heizfadens ist der max. Wert von R_g 1,5 MΩ

[2]) If R_g' is connected, according to circuit A, the max. value is 20 kΩ
In case of circuit B the max. value of $(R_1 + \frac{R2 \times R3}{R2+R3})$ is 0.5 MΩ

Quand R_g' est connectée conforme à schéma A, la valeur max. de R_g' est de 20 kΩ
Quand schéma B est utilisé, la valeur max. de $(R_1 + \frac{R2 \times R3}{R2+R3})$ est de 0,5 MΩ

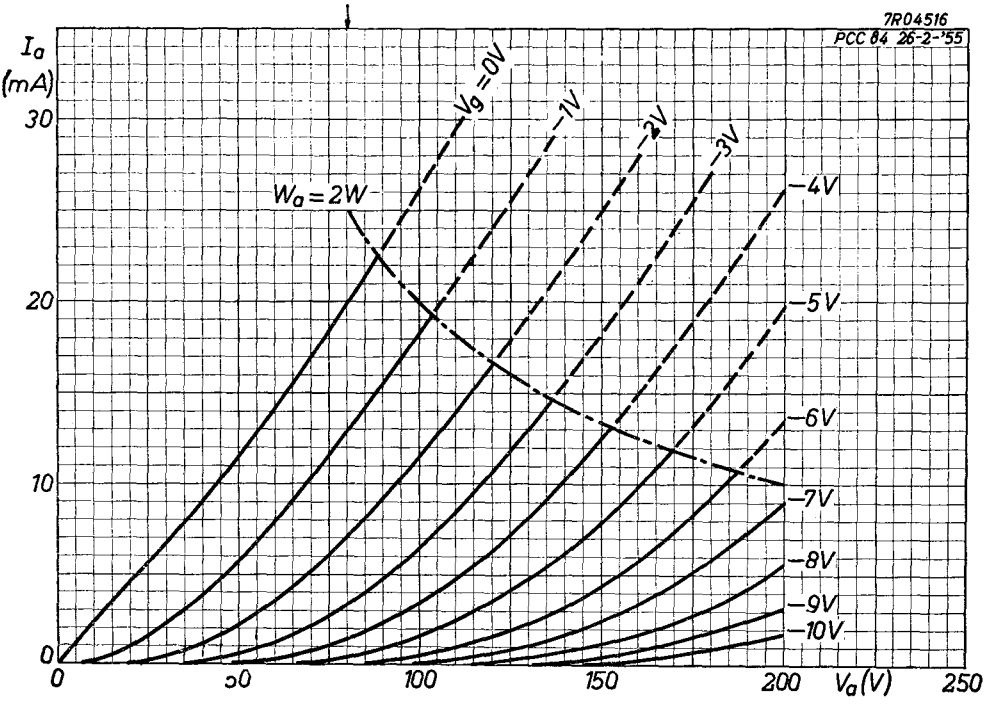
Wenn R_g' geschaltet ist nach Schaltbild A, ist der max. zulässige Wert 20 kΩ
Wenn das Schaltbild B benutzt wird, ist der max. zulässige Wert von $(R_1 + \frac{R2 \times R3}{R2+R3}) = 0,5$ MΩ

[3]) D.C. component max. 180 V
La composante continue 180 V au max.
Gleichspannungskomponent max. 180 V



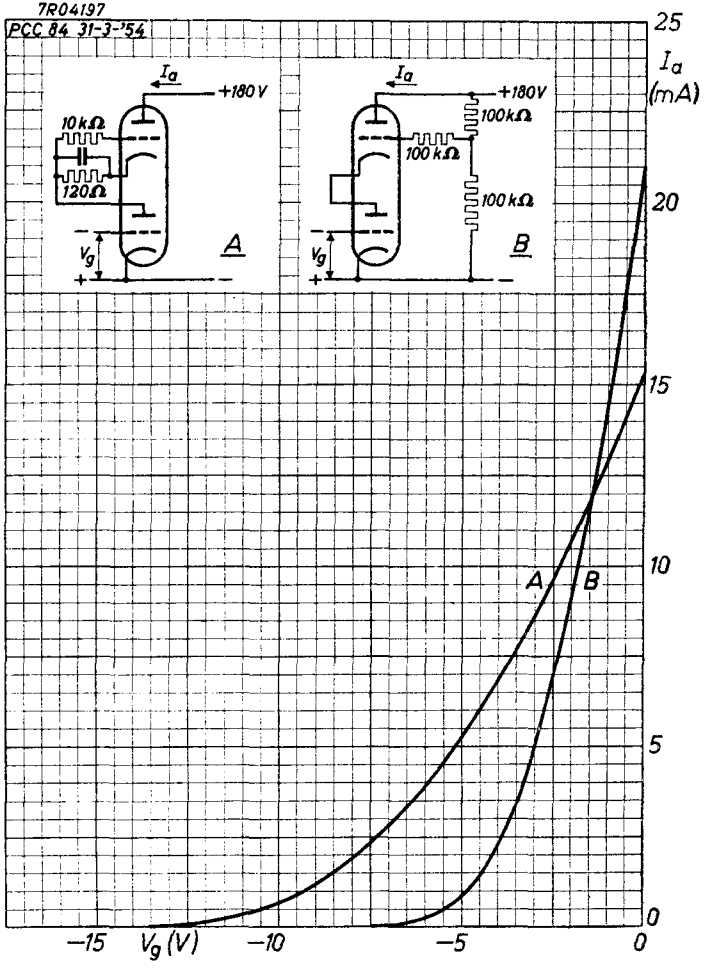
4.4.1955

A


7R04516
PCC 84 26-2-'55
I_a (mA)
30
20
10
0
$W_a = 2W$
$V_g = 0V$
−1V
−2V
−3V
−4V
−5V
−6V
−7V
−8V
−9V
−10V
0
50
100
150
200
V_a(V)
250

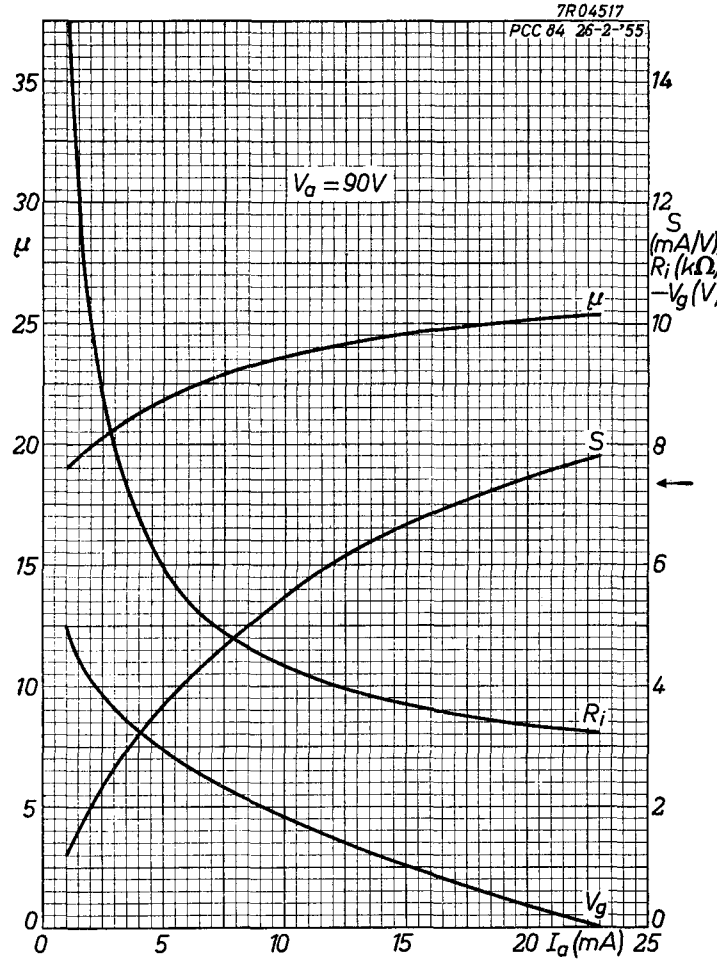
PHILIPS

PCC 84

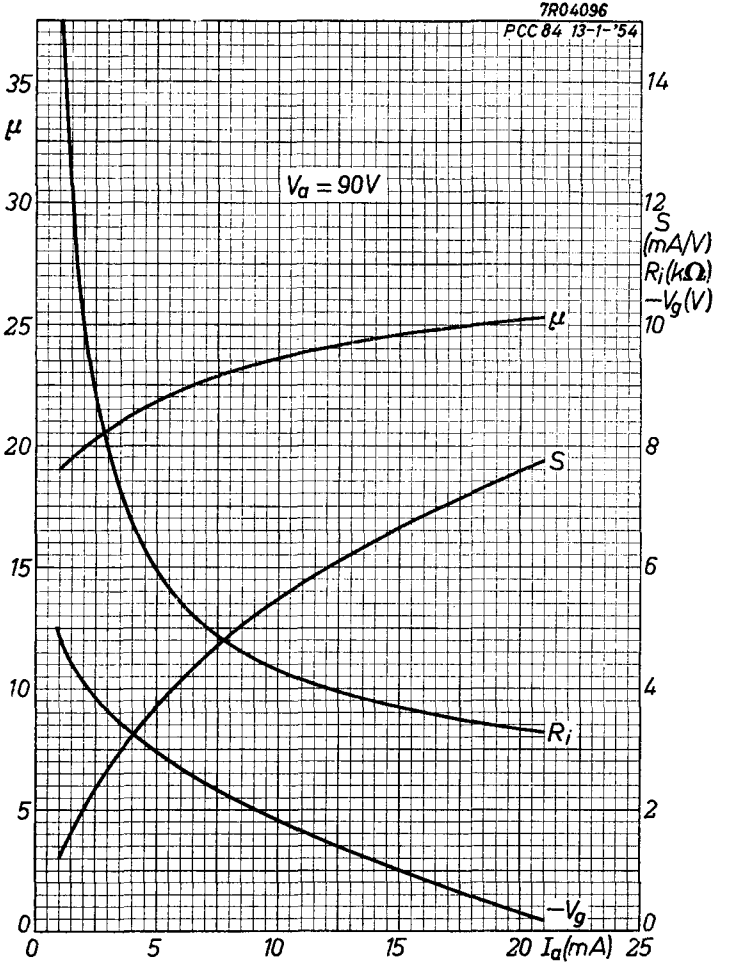


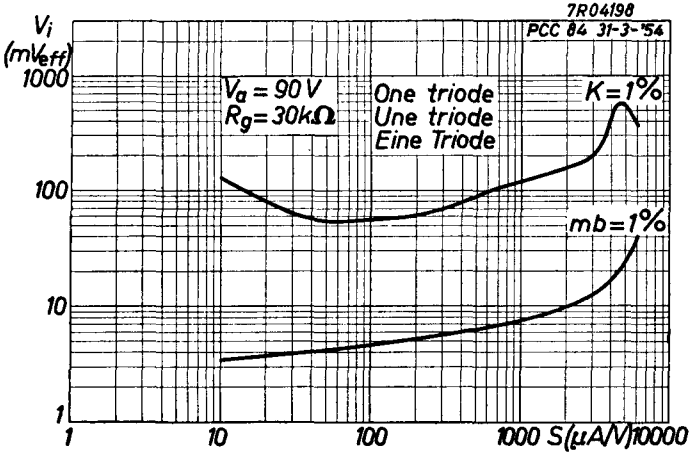
5.5.1954

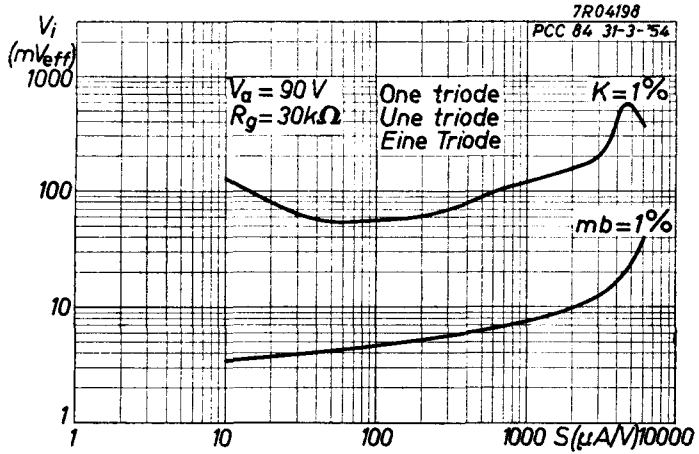
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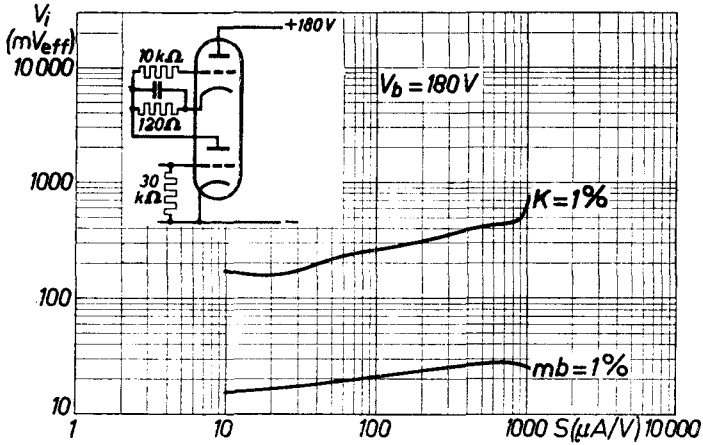

7R04517
PCC 84 26-2-'55
$V_a = 90V$
μ
S (mA/V)
R_i (kΩ)
$-V_g$ (V)
μ
S
R_i
V_g
35
30
25
20
15
10
5
0
14
12
10
8
6
4
2
0
0
5
10
15
20 I_a (mA)
25

PCC 84 PHILIPS




7R04198
PCC 84 31-3-'54
V_i
(mV_{eff})
1000
100
10
1
$V_a = 90\,V$
$R_g = 30k\Omega$
One triode
Une triode
Eine Triode
K=1%
mb=1%
1
10
100
1000 S(μA/V)10000


7R04198
PCC 84 31-3-'54
V_i (mV_{eff})
1000
100
10
1
$V_a = 90\,V$
$R_g = 30k\Omega$
One triode
Une triode
Eine Triode
K=1%
mb=1%
1
10
100
1000 S(μA/V)10000


V_i (mV_{eff})
10 000
1000
100
10
1
+180V
10kΩ
120Ω
30 kΩ
$V_b = 180\,V$
K=1%
mb=1%
10
100
1000 S(μA/V) 10000

PHILIPS

Electronic Tube

HANDBOOK

PCC84

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1	1	1954.11.11
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5	3	1954.11.11
6	3	1955.06.06
7	3	1957.08.08
8	4	1954.11.11
9	A	1955.04.04
10	B	1955.04.04
11	C	1954.05.05
12	C	1955.08.08
13	D	1954.05.05
14	D	1955.08.08
15	E	1954.05.05
16	FP	2000.04.10

R.F. DOUBLE TRIODE

Double triode intended for various applications in television receivers.

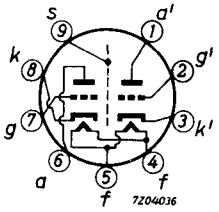
QUICK REFERENCE DATA			
Anode current	I_a	10	mA
Transconductance	S	6.7	mA/V
Amplification factor	μ	48	-

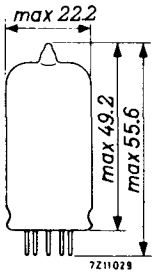
HEATING: Indirect by A.C. or D.C.; series supply

Heater current	I_f	300	mA
Heater voltage	V_f	9.0	V

DIMENSIONS AND CONNECTIONS Dimensions in mm

Base: Noval





CAPACITANCES (each unit unless otherwise specified)

Anode to grid	C_{ag}	1.5	pF
Anode to cathode	C_{ak}	0.18	pF
Anode to cathode + heater + screen	$C_{a/kfs}$	1.2	pF
Grid to cathode + heater + screen	$C_{g/kfs}$	3.1	pF
Anode to cathode + heater + screen (measured with external screen of 22.5 mm diam.)	$C_{a/kfs}$	1.8	pF
Anode to anode other unit	$C_{aa'}$	max. 0.04	pF
Anode to anode other unit (measured with external screen of 22.5 mm diam.)	$C_{aa'}$	max. 0.008	pF
Grid to grid other unit	$C_{gg'}$	max. 0.003	pF
Anode to grid other unit	$C_{ag'}$	max. 0.008	pF
Anode to grid other unit	$C_{a'g}$	max. 0.008	pF
Anode to cathode other unit	$C_{ak'}$	max. 0.008	pF
Anode to cathode other unit	$C_{a'k}$	max. 0.008	pF
Grid to cathode other unit	$C_{gk'}$	max. 0.003	pF
Grid to cathode other unit	$C_{g'k}$	max. 0.003	pF

TYPICAL CHARACTERISTICS (each unit)

Anode voltage	V_a	100	170	200	V
Grid voltage	V_g	−1.2 [1])	−1.75	−2.4	V
Anode current	I_a	4.5	10	10	mA
Transconductance	S	4.8	6.7	6	mA/V
Amplification factor	μ	46	48	46	

REMARK

Microphony

This tube can be used without special precautions against microphony in A.F. applications in which the input voltage $V_i \geq 5$ mV for an output of 50 mW (or 50 mV for an output 5 W) provided the peak acceleration of the tube is not greater than indicated in the section "Microphony" of the "General Operational Recommendations".

[1]) In this case grid current may occur. If this is not permissible, a condition with a bias of −1.5 V should be chosen.

OPERATING CHARACTERISTICS (each unit)

As self-oscillating additive mixer

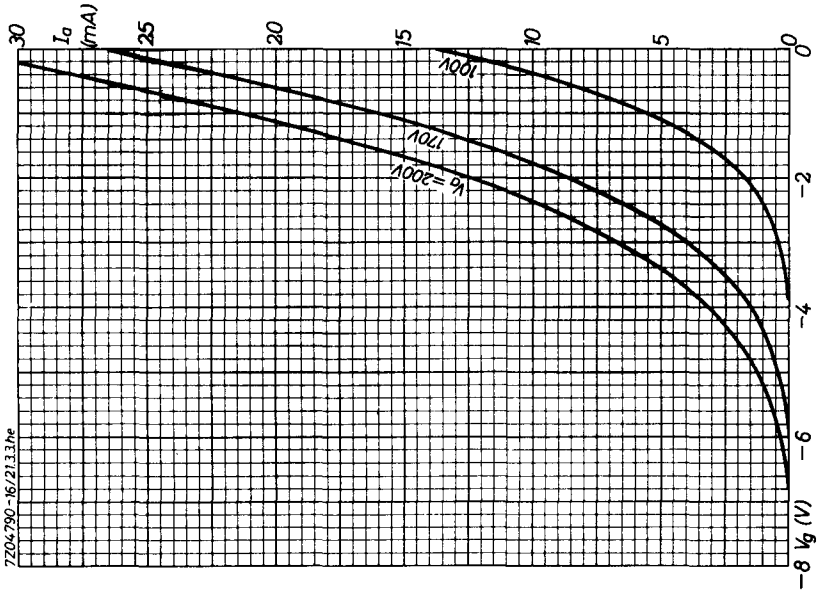
Anode supply voltage	V_b	100	170	200	V
Anode resistor	R_a	4.7	4.7	8.2	kΩ
Grid resistor	R_g	1	1	1	MΩ
Oscillator voltage	$V_{osc.}$	1.8	2.8	2.8	V_{RMS}
Anode current	I_a	2.7	5.5	6	mA
Conversion conductance	S_c	2.2	2.8	2.9	mA/V
Internal resistance	R_i	19	15	14	kΩ
Grid input resistance (f = 100 MHz)	r_g		15		kΩ

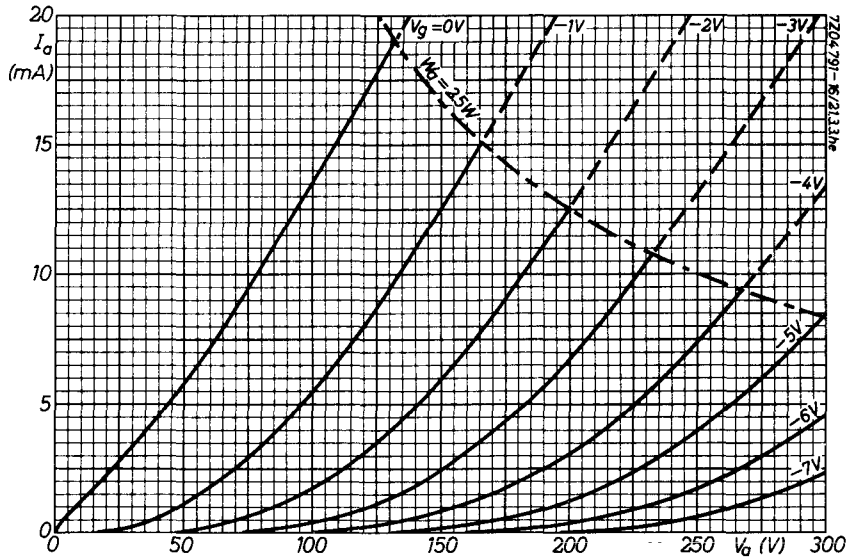
As oscillator in television receivers

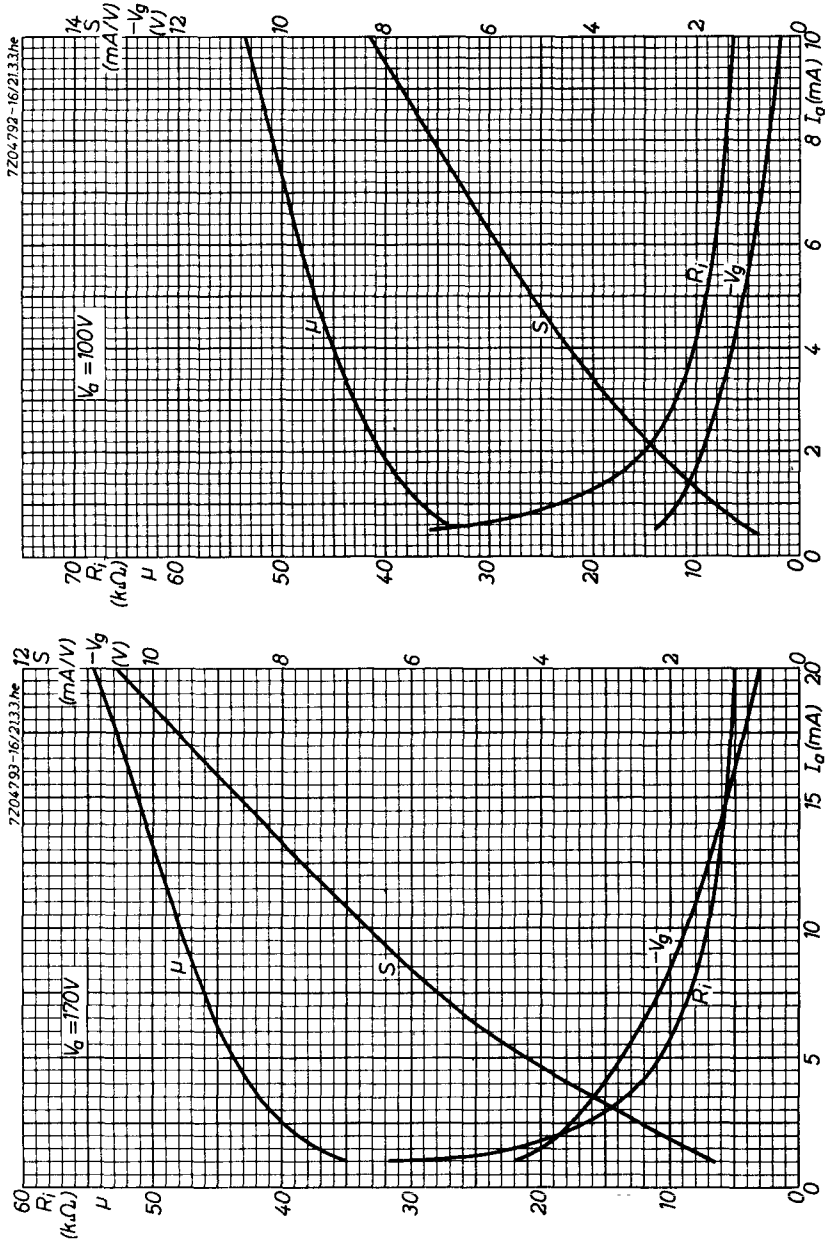
Anode supply voltage	V_b			180	V
Anode resistor	R_a			4.4	kΩ
Grid resistor	R_g			22	kΩ
Oscillator voltage	$V_{osc.}$			9	V_{RMS}
Anode current	I_a			7.4	mA
Anode dissipation	W_a			1.2	W

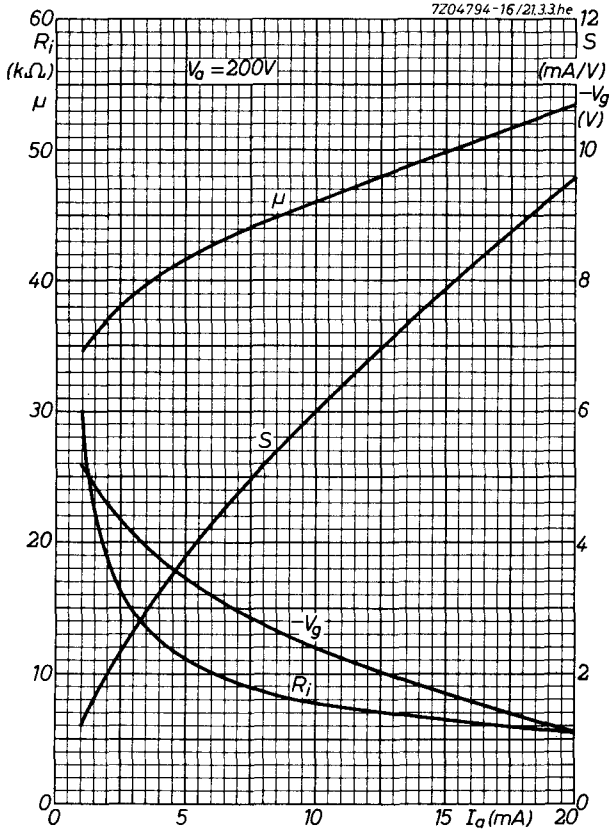
LIMITING VALUES (each unit) (Design centre rating system)

Anode voltage	V_{a_o}	max.	550	V
	V_a	max.	250	V
Anode dissipation	W_a	max.	2.5	W
Anode dissipation, total	$W_a+W_{a'}$	max.	4.5	W
Cathode current	I_k	max.	15	mA
Cathode to heater voltage	V_{kf}	max.	90	V
Grid voltage, negative	$-V_g$	max.	100	V
Grid resistor	R_g	max.	1	MΩ


30
I_a (mA)
25
20
15
10
5
0
100V
170V
V_a = 200V
0
-2
-4
-6
-8 V_g (V)
7Z04790-16/21.3.1he


20
I_a
(mA)
15
10
5
0
V_g =0V
-1V
-2V
-3V
V_a =250V
-4V
-5V
-6V
-7V
0
50
100
150
200
250
V_a (V)
300
7Z04791-16/21.3.1he


7Z04792-16/21.3.3he
V_g = 100V
S (mA/V)
$-V_g$ (V)
R_i (kΩ)
μ
I_a (mA)
7Z04793-16/21.3.3he
V_g = 170V
S (mA/V)
$-V_g$ (V)
R_i (kΩ)
μ
I_a (mA)


7Z04794-16/21.3.3he
60
R_i
(kΩ)
μ
50
40
30
20
10
0
V_a = 200V
μ
S
$-V_g$
R_i
0
5
10
15
I_a(mA)
20
12
S
(mA/V)
$-V_g$
(V)
10
8
6
4
2
0

PHILIPS

Data handbook

PHILIPS Electronic components and materials

PCC85

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6	6	1969.01
7	FP	1999.07.31

R.F. DOUBLE TRIODE

Double triode intended for use as cascode amplifier in television tuners.

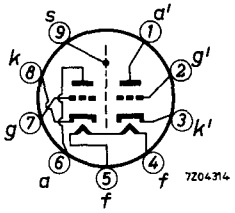
QUICK REFERENCE DATA (Each unit)			
Anode current	I_a	15	mA
Transconductance	S	12.5	mA/V
Amplification factor	μ	33	-

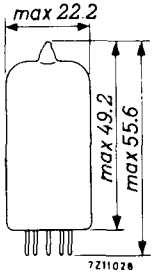
HEATING: Indirect by A.C. or D.C.; series supply

Heater current	I_f	300	mA
Heater voltage	V_f	7.6	V

DIMENSIONS AND CONNECTIONS Dimensions in mm

Base: Noval





CAPACITANCES

		without external screen	with external screen	
Anode to grid	C_{ag}	1.4	1.4	pF
Grid to cathode + heater + screen	$C_{g/kfs}$	3.3	3.3	pF
Anode to cathode + heater + screen	$C_{a/kfs}$	1.8	2.5	pF
Grid to heater	C_{gf}	0.13	0.13	pF
Anode to grid	$C_{a'g'}$	1.4	1.4	pF
Cathode to grid + heater + screen	$C_{k'/g'fs}$	6	6	pF
Anode to grid + heater + screen	$C_{a'/g'fs}$	2.8	3.7	pF
Cathode to heater	$C_{k'f}$	2.7	2.7	pF
Anode to cathode	$C_{a'k'}$	0.18	0.16	pF
Anode to anode	$C_{aa'}$	max. 0.045	max. 0.015	pF
Grid to anode other unit	$C_{ga'}$	max. 0.005	max. 0.005	pF

REMARK

The unit a, g, k should be used as the grounded cathode input section and unit a', g', k' as the grounded grid output unit.

TYPICAL CHARACTERISTICS

Anode voltage	V_a	90	V
Grid voltage	V_g	-1.3	V
Anode current	I_a	15	mA
Transconductance	S	12.5	mA/V
Amplification factor	μ	33	-
Equivalent noise resistance	R_{eq}	300	Ω

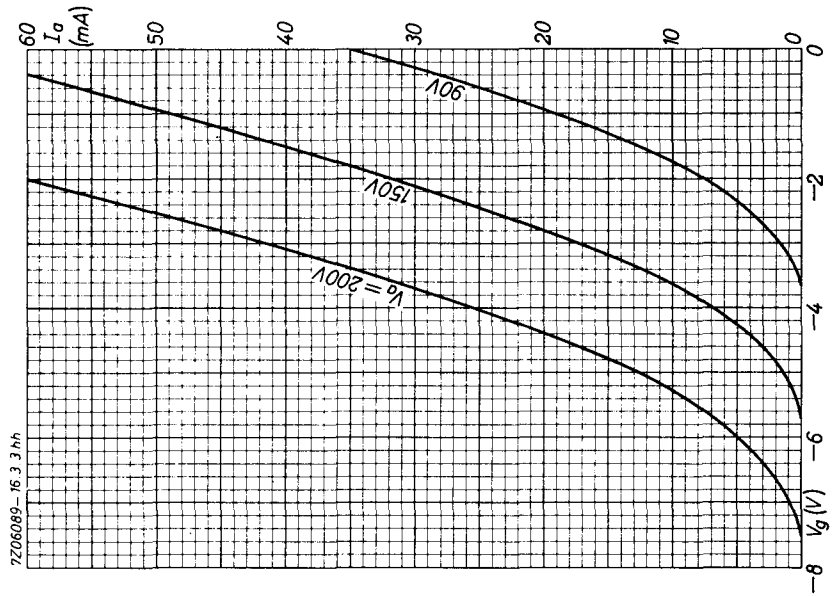
LIMITING VALUES (Design centre rating system) (each unit, unless otherwise stated)

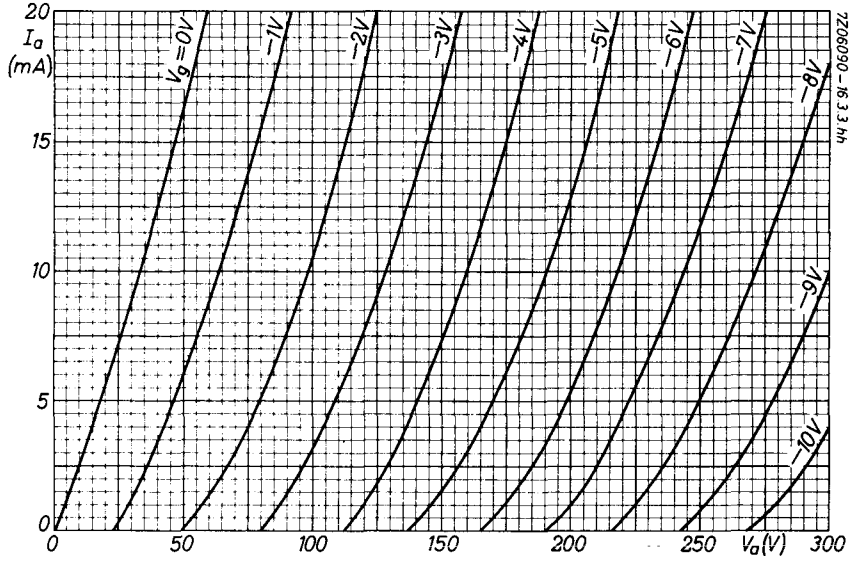
Anode voltage	V_{a_o}	max.	550	V
	V_a	max.	130	V
Anode dissipation	W_a	max.	1.8	W
Cathode current	I_k	max.	25	mA
Grid voltage	$-V_g$	max.	50	V
Grid resistor	R_g	max.	1	MΩ
Cathode to heater voltage	V_{kf}	max.	50	V
	$V_{k'f(k'pos)}$	max.	150	V [1])

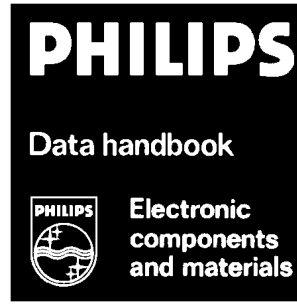
REMARK

In order not to exceed the maximum permissible anode voltage when the cascode amplifier is controlled, it is necessary to use a voltage divider for the grid of the grounded grid section. With grid current biasing for the grounded cathode section the anode voltage across this section should not be more than 75 V in the not controlled condition.

[1]) D.C. component max. 130 V.


60
I_a (mA)
50
40
30
20
10
0
0
−2
−4
−6
−8
V_g (V)
90V
150V
V_a = 200V
7Z06089-16 3 3 hh


20
I_a
(mA)
15
10
5
0
0
50
100
150
200
250
300
V_a(V)
V_g=0V
−1V
−2V
−3V
−4V
−5V
−6V
−7V
−8V
−9V
−10V
7Z06090-16 3 3 hh



PCC88

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TRIODE-PENTODE

Triode-pentode intended for use in television receivers; triode section as limiter, noise detector, A.G.C. amplifier, sync. separator and pulse-amplifier; pentode section as sound I.F. amplifier and video I.F. amplifier.

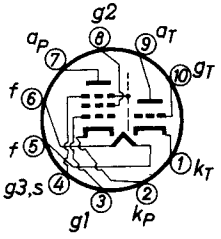
QUICK REFERENCE DATA			
Pentode section			
Anode current	I_a	13	mA
Transconductance	S	14	mA/V
Amplification factor	$\mu_{g_2g_1}$	53	-
Triode section			
Anode current	I_a	8.5	mA
Transconductance	S	5.2	mA/V
Amplification factor	μ	57	-

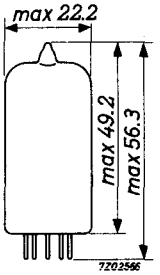
HEATING: Indirect by A.C. or D.C.; series supply

Heater current	I_f	300	mA
Heater voltage	V_f	8.5	V

DIMENSIONS AND CONNECTIONS Dimensions in mm

Base: Decal





CAPACITANCES

Triode section			
Grid to all except anode	$C_{g(a)}$	2.1	pF
Anode to all except grid	$C_{a(g)}$	3.0	pF
Anode to grid	C_{ag}	2.2	pF
Pentode section			
Grid No.1 to all except anode	$C_{g_1(a)}$	6.0	pF
Anode to all except grid No.1	$C_{a(g_1)}$	3.3	pF
Anode to grid No.1	C_{ag_1}	0.0056	pF
	C_{ag_1} max.	0.008	pF
Grid No.1 to grid No.2	$C_{g_1g_2}$	1.7	pF
Grid No.1 to cathode	C_{g_1k}	3.7	pF
Between triode and pentode sections			
Pentode anode to triode anode	$C_{aP\text{-}aT}$	max. 0.015	pF
Pentode grid No.1 to triode anode	$C_{g_1P\text{-}aT}$	max. 0.0012	pF
Pentode grid No.1 to triode grid	$C_{g_1P\text{-}gT}$	max. 0.0015	pF

TYPICAL CHARACTERISTICS

Pentode section			
Anode voltage	V_a	160	V
Grid No.3 voltage	V_{g_3}	0	V
Grid No.2 voltage	V_{g_2}	135	V
Grid No.1 voltage	V_{g_1}	-1.7	V
Anode current	I_a	13	mA
Grid No.2 current	I_{g_2}	5.3	mA
Transconductance	S	14	mA/V
Amplification factor	$\mu_{g_2g_1}$	53	-
Triode section			
Anode voltage	V_a	170	V
Grid voltage	V_g	-1.0	V
Anode current	I_a	8.5	mA
Transconductance	S	5.2	mA/V
Amplification factor	μ	57	-

OPERATING CHARACTERISTICS

Pentode section as sound or video I.F. amplifier (g_3 connected to earth)

Supply voltage	V_b	210	230	V
Anode resistor	R_a	3.9	5.6	kΩ
Grid No.2 resistor	R_{g_2}	15	22	kΩ
Cathode resistor	R_k	91	83	Ω
Anode current	I_a	13.0	12.5	mA
Grid No.2 current	I_{g_2}	5.3	5.1	mA
Transconductance	S	14	14	mA/V
Input resistance at 40 MHz	r_{g_1}	6.6	6.6	kΩ

Triode section as sync separator

Anode supply voltage	V_b	130	to 150	V
Anode resistor	R_a	33		kΩ
Grid current	I_g	1		μA
Anode current	I_a	min. 2		mA

LIMITING VALUES (Design centre rating system)

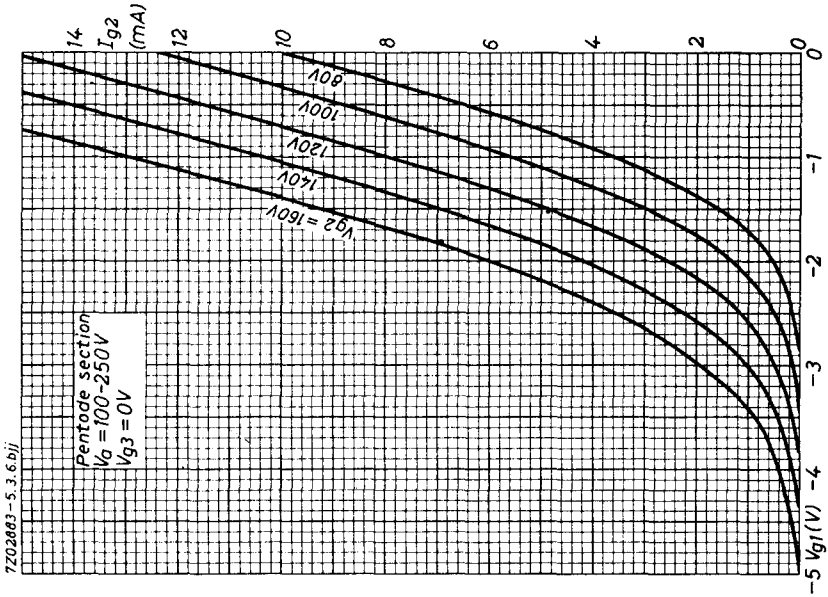
Pentode section

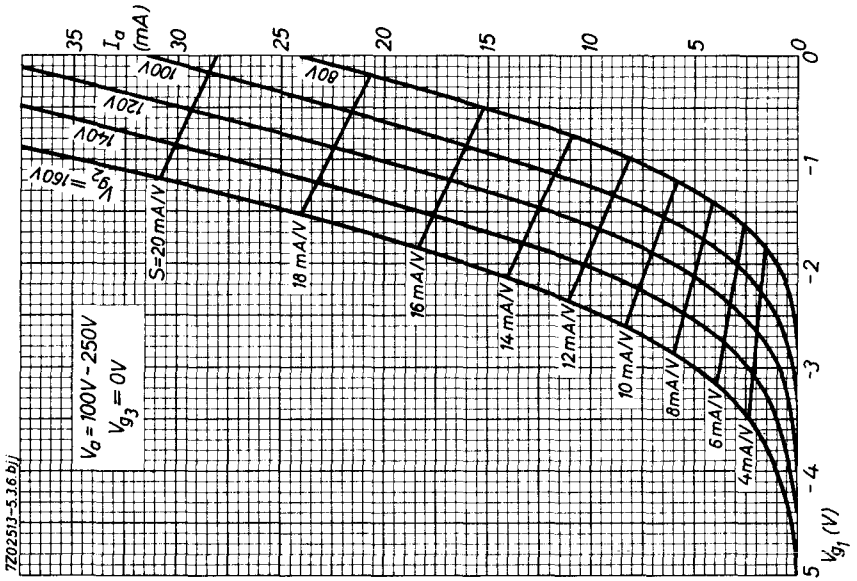
Anode voltage	V_{a_o}	max.	550	V
	V_a	max.	250	V
Anode dissipation	W_a	max.	2.1	W
Cathode current	I_k	max.	20	mA
Grid No.2 voltage	V_{g2_o}	max.	550	V
	V_{g_2}	max.	250	V
Grid No.2 dissipation	W_{g_2}	max.	0.75	W
Cathode to heater voltage	V_{kf}	max.	150	V
Grid No.1 resistor	R_{g_1}	max.	1	MΩ

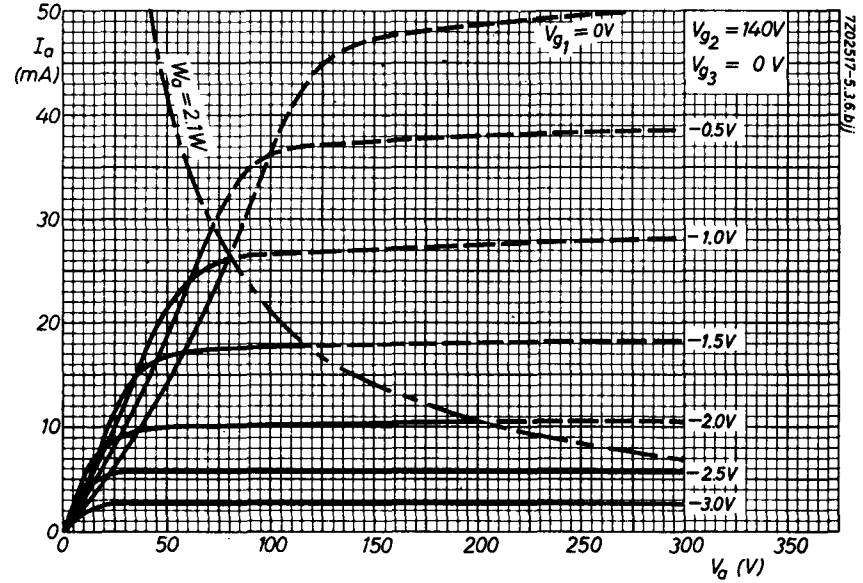
Triode section

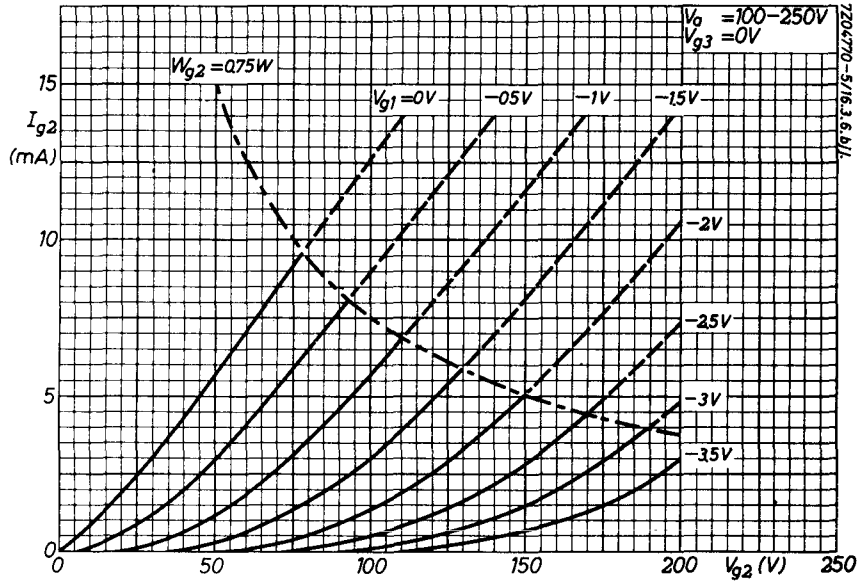
Peak anode voltage ($I_a < 0.1$ mA)	V_{a_p}	max.	600	V [1]
Anode voltage	V_{a_o}	max.	550	V
	V_a	max.	250	V
Anode dissipation	W_a	max.	1.5	W
Cathode current	I_k	max.	18	mA
Grid resistor	R_g	max.	1	MΩ
Cathode to heater voltage:				
cathode negative with respect to heater	V_{kf}	max.	150	V
cathode positive with respect to heater	V_{kf}	max. + max.	200 150	V V_{RMS}

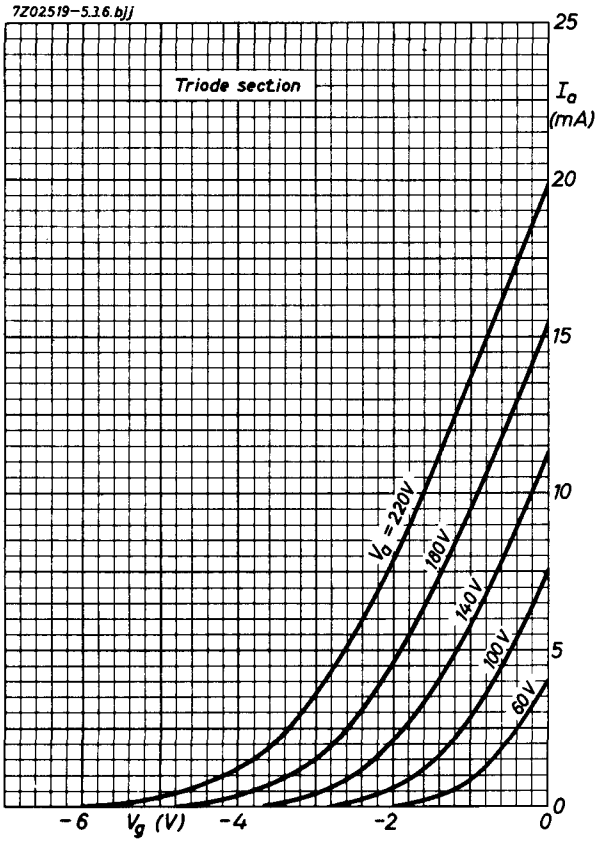
[1]) Max. pulse duration is 18 % of a cycle but max. 18 μsec.

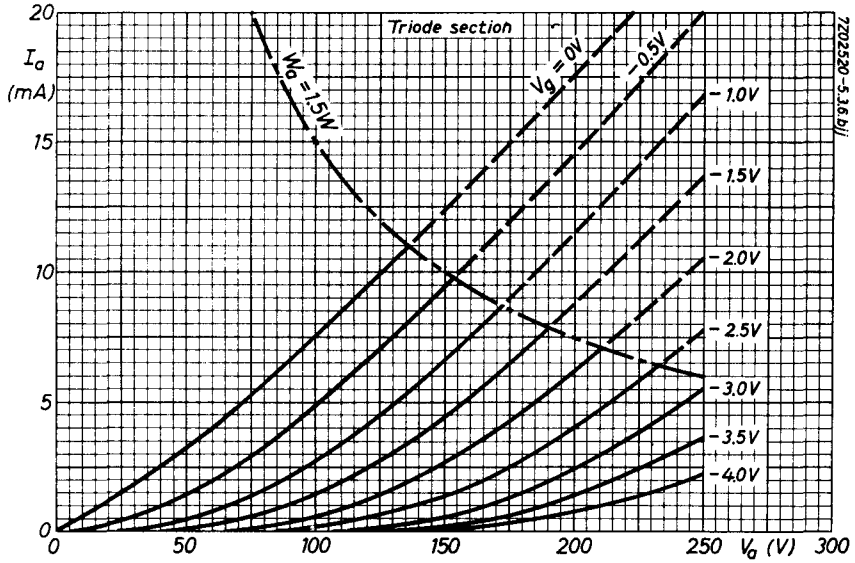

Pentode section
V_a = 100-250V
V_{g3} = 0V
V_{g2} = 160V
140V
120V
100V
80V
I_{g2} (mA)
V_{g1} (V)
7Z02643-5.3.6.bij

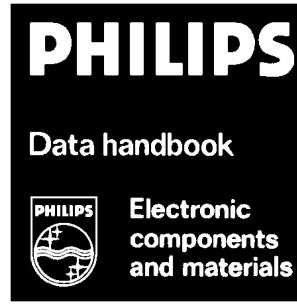

V_a = 100V-250V
V_{g3} = 0V
V_{g2} = 160V
140V
120V
100V
80V
S=20mA/V
18 mA/V
16 mA/V
14 mA/V
12mA/V
10 mA/V
8mA/V
6 mA/V
4mA/V
I_a (mA)
V_{g1} (V)
7Z02513-5.3.6.bij


50
I_a (mA)
40
30
20
10
0
0
50
100
150
200
250
300
350
V_a (V)
W_a = 2.1W
V_{g1} = 0V
V_{g2} = 140V
V_{g3} = 0 V
−0.5V
−1.0V
−1.5V
−2.0V
−2.5V
−3.0V
7202517-5.1.6.bij


15
I_{g2} (mA)
10
5
0
0
50
100
150
200
250
V_{g2} (V)
W_{g2} = 0.75W
V_{g1} = 0V
−0.5V
−1V
−1.5V
−2V
−2.5V
−3V
−3.5V
V_a = 100−250V
V_{g3} = 0V
7204770-5.1.6.3.6.bij


7Z02519-5.3.6.bjj
Triode section
I_a (mA)
25
20
15
10
5
0
V_a = 220V
180V
140V
100V
60V
-6
V_g (V)
-4
-2
0


Triode section
I_a (mA)
20
15
10
5
0
0
50
100
150
200
250
300
V_a (V)
W_a = 1.5W
V_g = 0V
-0.5V
-1.0V
-1.5V
-2.0V
-2.5V
-3.0V
-3.5V
-4.0V
7Z02520-5.16/1



PCF200

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6	6	1969.12
7	7	1969.12
8	8	1969.12
9	FP	1999.08.01

TRIODE-PENTODE

Triode pentode intended for use in T.V. receivers; triode section as line-blocking oscillator, part of a multivibrator, sync separator, pulse amplifier or A.G.C. delay diode; pentode section with remote cut-off as video I.F. amplifier.

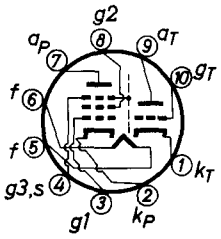
QUICK REFERENCE DATA			
Pentode section			
Anode current	I_a	13	mA
Transconductance	S	12.6	mA/V
Amplification factor	$\mu_{g_2g_1}$	45	-
Triode section			
Anode current	I_a	14	mA
Transconductance	S	4.8	mA/V
Amplification factor	μ	17.5	-
Cathode peak current	I_{k_p}	max. 50	mA

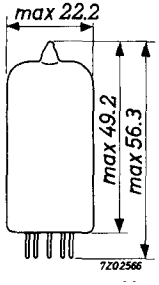
HEATING: Indirect by A.C. or D.C.; series supply

Heater current	I_f	300	mA
Heater voltage	V_f	8.5	V

DIMENSIONS AND CONNECTIONS Dimensions in mm

Base: Decal





CAPACITANCES

Pentode section			
Anode to all except grid No.1	$C_{a(g_1)}$	3.3	pF
Grid No.1 to all except anode	$C_{g1(a)}$	6.0	pF
Grid No.1 to cathode	C_{kg_1}	3.7	pF
Anode to grid No.1	C_{ag_1}	0.0056	pF
	C_{ag_1}	max. 0.008	pF
Grid No.1 to grid No.2	C_{g1g2}	1.7	pF
Triode section			
Anode to all except grid	$C_{a(g)}$	3.0	pF
Grid to all except anode	$C_{g(a)}$	2.1	pF
Anode to grid	C_{ag}	2.0	pF
Between pentode and triode sections			
Pentode anode to triode anode	C_{aPaT}	max. 0.015	pF
Pentode grid No.1 to triode anode	C_{g_1PaT}	max. 0.0012	pF
Pentode grid No.1 to triode grid	C_{g_1PgT}	max. 0.0015	pF

TYPICAL CHARACTERISTICS

Pentode section			
Anode voltage	V_a	160	V
Grid No.3 voltage	V_{g_3}	0	V
Grid No.2 voltage	V_{g_2}	110	V
Grid No.1 voltage	V_{g_1}	-1.4	V
Anode current	I_a	13	mA
Grid No.2 current	I_{g_2}	5.3	mA
Transconductance	S	12.6	mA/V
Amplification factor	$\mu_{g_2g_1}$	45	-
Triode section			
Anode voltage	V_a	100	V
Grid voltage	V_g	-2	V
Anode current	I_a	14	mA
Transconductance	S	4.8	mA/V
Amplification factor	μ	17.5	-

OPERATING CHARACTERISTICS

Pentode section as video I.F. amplifier (g_3 connected to earth)

Supply voltage	V_b	210	230	250	V
Anode resistor	R_a	3.9	5.6	6.8	kΩ
Grid No.2 resistor	R_{g_2}	18	22	27	kΩ
Cathode resistor	R_k	79	79	76	Ω
Anode current	I_a	13.2	13.2	12.8	mA
Grid No.2 current	I_{g_2}	5.4	5.4	5.2	mA
Transconductance	S	12.6	12.6	12.6	mA/V
Grid No.1 voltage at 0.1 S	V_{g_1}	-5.1	-5.4	-5.7	V
Grid No.1 voltage at 0.01 S	V_{g_1}	-19	-20.5	-22	V
Grid No.1 input resistance at 40 MHz	r_{g_1}	7.4	7.4	7.4	kΩ

Triode section as line-blocking oscillator

Anode voltage	V_a	30	V
Peak cathode current	I_{k_p}	40	mA
Peak anode current	I_{a_p}	25	mA
Peak grid current	I_{g_p}	15	mA

Triode section as sync. separator

Anode supply voltage	V_{b_a}	130 to 150	V
Anode resistor	R_a	33	kΩ
Grid current	I_g	1	μA
Anode current	I_a	min. 2	mA

LIMITING VALUES (Design centre rating system)

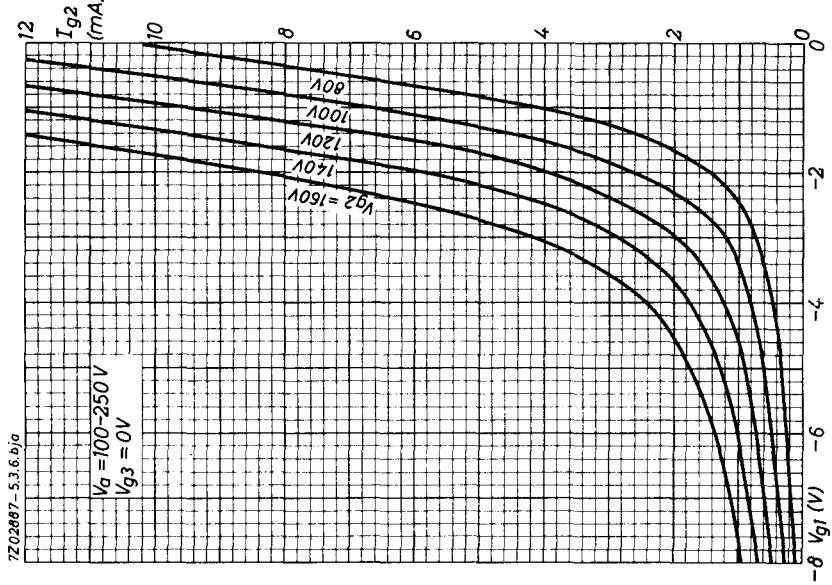
Pentode section

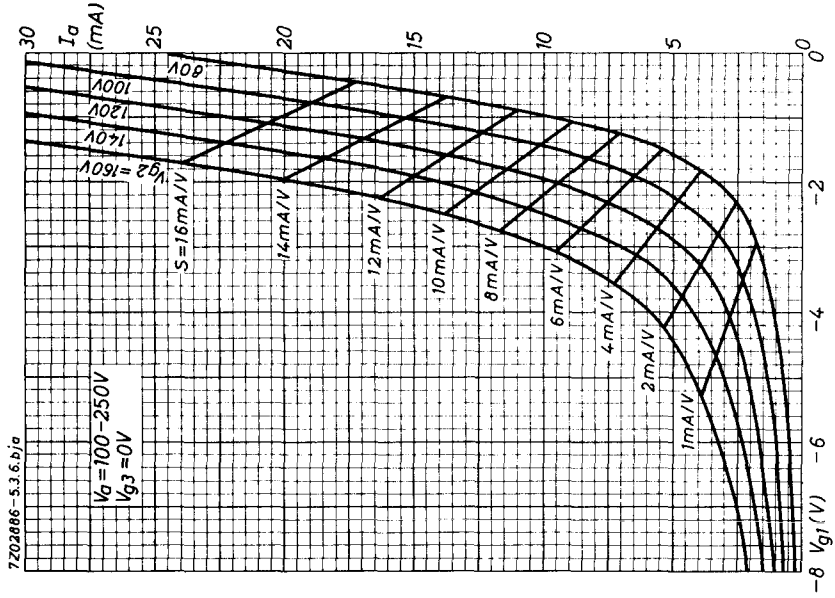
Anode voltage	V_{a_o}	max.	550	V
	V_a	max.	250	V
Anode dissipation	W_a	max.	2.1	W
Grid No.2 voltage	$V_{g_{2o}}$	max.	550	V
	V_{g_2}	max.	250	V
Grid No.2 dissipation	W_{g_2}	max.	0.7	W
Grid No.1 resistor	R_{g_1}	max.	1	MΩ
Cathode current	I_k	max.	20	mA
Cathode to heater voltage	V_{kf}	max.	150	V

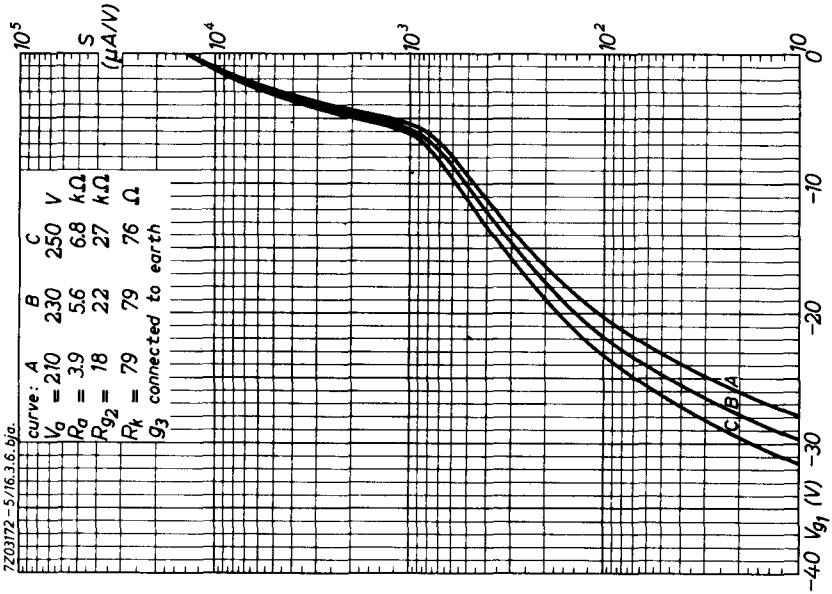
Triode section

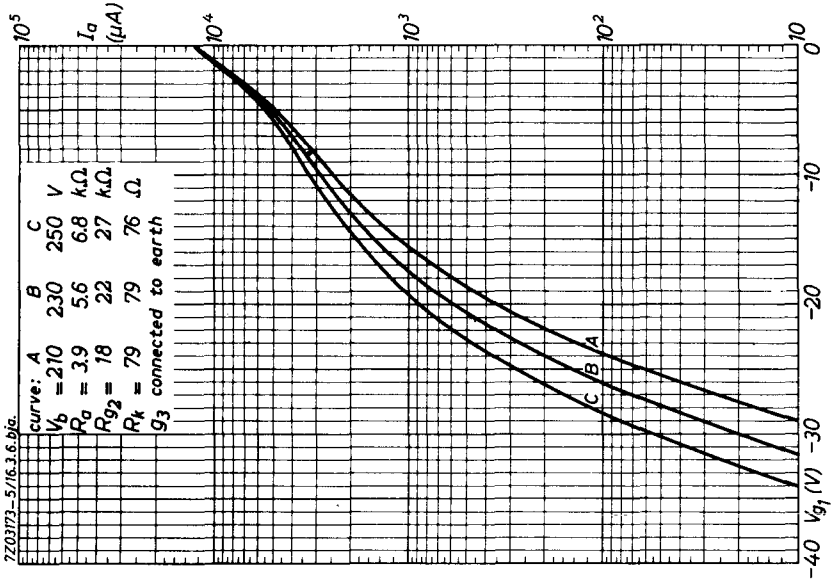
Anode voltage	V_{a_o}	max.	550	V
	V_a	max.	250	V
Anode dissipation	W_a	max.	1.5	W
Grid resistor	R_g	max.	1	MΩ
Cathode current	I_k	max.	18	mA
Peak cathode current	I_{k_p}	max.	50	mA[1])
Cathode to heater voltage	V_{kf}	max.	150	V

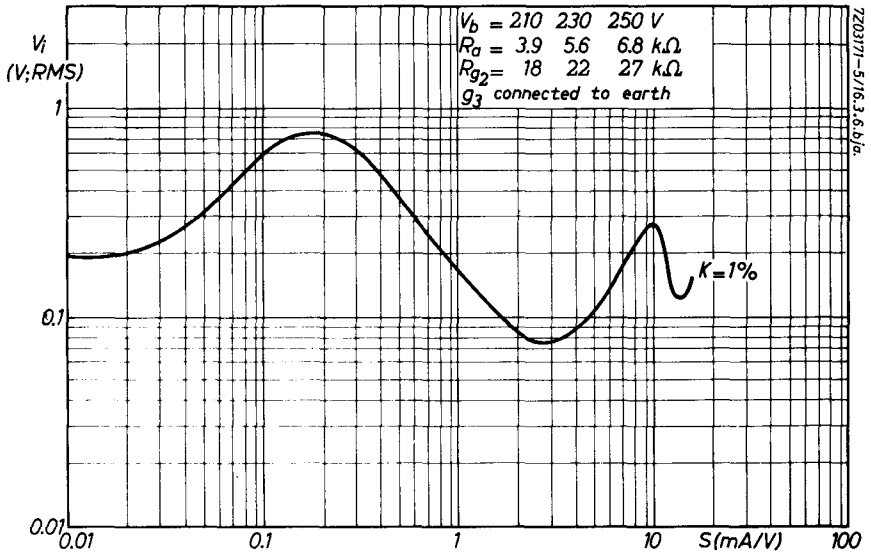
[1]) Maximum pulse duration 10% of a cycle but max. 10 μs.

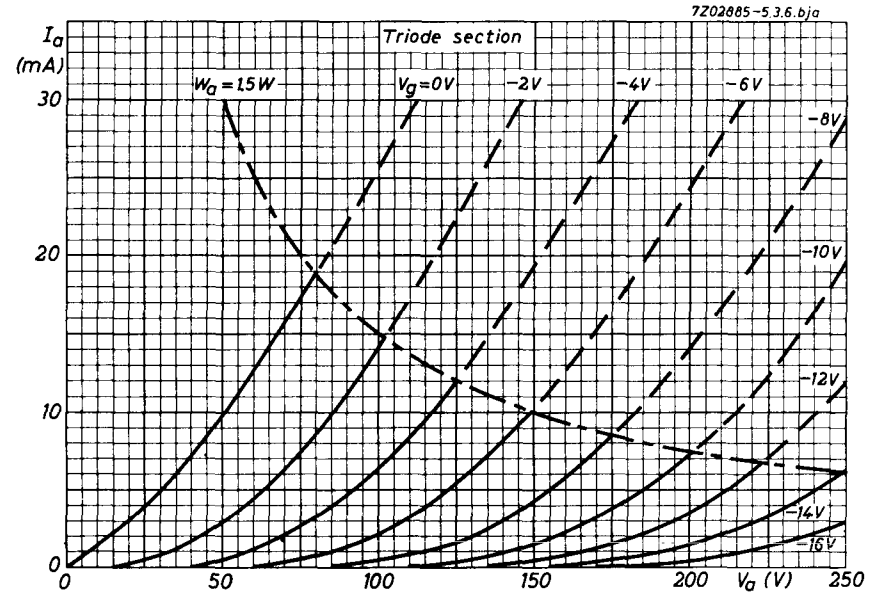

I_{g2} (mA)
12
10
8
6
4
2
0
80V
100V
120V
140V
V_{g2} = 160V
V_a = 100-250 V
V_{g3} = 0V
7Z02887-5.3.6.bja
-8
-6
-4
-2
0
V_{g1} (V)

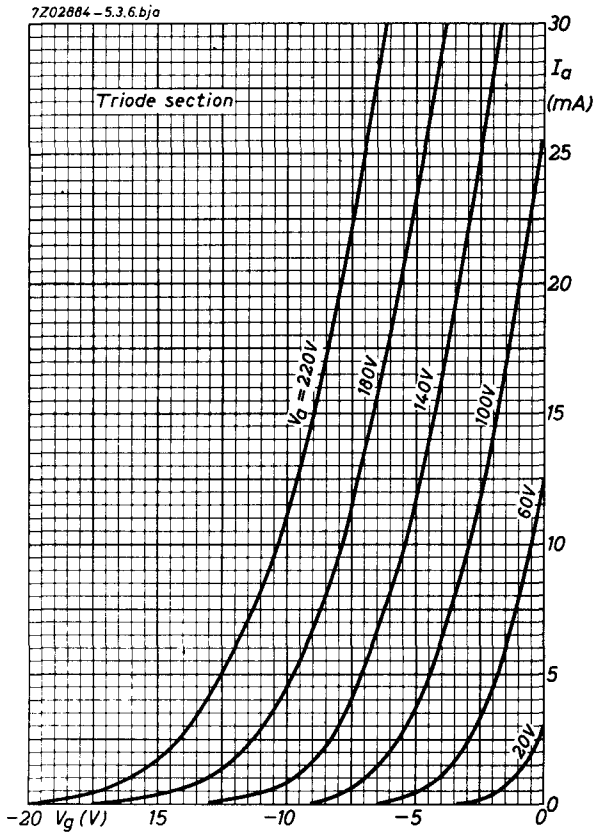

I_a (mA)
30
25
20
15
10
5
0
80V
100V
120V
140V
V_{g2} = 160V
S = 16 mA/V
14 mA/V
12 mA/V
10 mA/V
8 mA/V
6 mA/V
4 mA/V
2 mA/V
1 mA/V
V_a = 100-250 V
V_{g3} = 0V
7Z02886-5.3.6.bja
-8
-6
-4
-2
0
V_{g1} (V)

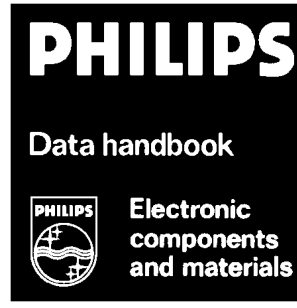

7Z03172-5/16.3.6.bia.
curve: A B C
V_b = 210 230 250 V
R_a = 3.9 5.6 6.8 kΩ
R_{g_2} = 18 22 27 kΩ
R_k = 79 79 76 Ω
g_3 connected to earth
S (μA/V)
10^5
10^4
10^3
10^2
0
-10
-20
-30
-40 V_{g_1} (V)
A
B
C


7Z03173-5/16.3.6.bia.
curve: A B C
V_b = 210 230 250 V
R_a = 3.9 5.6 6.8 kΩ
R_{g_2} = 18 22 27 kΩ
R_k = 79 79 76 Ω
g_3 connected to earth
I_a (μA)
10^5
10^4
10^3
10^2
0
-10
-20
-30
-40 V_{g_1} (V)
A
B
C


V_b = 210 230 250 V
R_a = 3.9 5.6 6.8 kΩ
R_{g_2} = 18 22 27 kΩ
g_3 connected to earth
K=1%
Vi
(V;RMS)
1
0.1
0.01
0.01
0.1
1
10
S(mA/V)
100
7Z03171-5/16.3.6.bja.


7Z02885-5.3.6.bja
Triode section
I_a
(mA)
W_a = 1.5 W
V_g=0V
-2V
-4V
-6V
-8V
-10V
-12V
-14V
-16V
30
20
10
0
0
50
100
150
200
V_a (V)
250


7Z02884 – 5.3.6.bjo
Triode section
I_a (mA)
30
25
20
15
10
5
0
V_a = 220V
180V
140V
100V
60V
20V
−20 V_g (V)
15
−10
−5
0



PCF201

page	sheet	date
1	1	1969.12
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5	5	1969.12
6	6	1969.12
7	7	1969.12
8	8	1969.12
9	FP	1999.08.01

TRIODE PENTODE

Triode pentode with separate cathodes intended for use as frequency changer in television receivers.

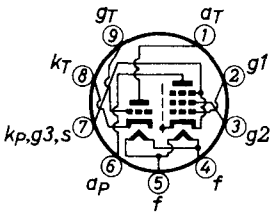
QUICK REFERENCE DATA			
Triode section			
Anode current	I_a	14	mA
Transconductance	S	5	mA/V
Amplification factor	μ	20	–
Pentode section			
Anode current	I_a	10	mA
Transconductance	S	6.2	mA/V
Amplification factor	$\mu_{g_2g_1}$	47	–

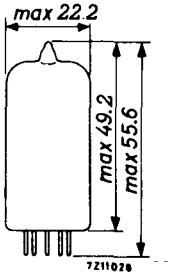
HEATING: Indirect by A.C. or D.C.; series supply

Heater current	I_f	300	mA
Heater voltage	V_f	9	V

DIMENSIONS AND CONNECTIONS Dimensions in mm

Base: Noval





CAPACITANCES

Triode section (numbers denote pin number)			
Anode to all except grid (1-4+5+7+8)	$C_{a(g)}$	1.8	pF
Grid to all except anode (9-4+5+7+8)	$C_{g(a)}$	2.5	pF
Anode to grid	C_{ag}	1.5	pF
Pentode section			
Anode to all except grid No.1	$C_{a(g_1)}$	3.4	pF
Grid No.1 to all except anode	$C_{g_1(a)}$	5.2	pF
Anode to grid No.1	C_{ag_1}	max. 0.025	pF
Between triode and pentode sections			
Anode triode to grid No.1 pentode	$C_{a_Tg_{1P}}$	max. 0.16	pF
Grid triode to anode pentode	$C_{g_Ta_P}$	max. 0.02	pF
Anode triode to anode pentode	$C_{a_Ta_P}$	max. 0.07	pF

TYPICAL CHARACTERISTICS

Triode section			
Anode voltage	V_a	100	V
Grid voltage	V_g	−2	V
Anode current	I_a	14	mA
Transconductance	S	5	mA/V
Amplification factor	μ	20	–
Pentode section			
Anode voltage	V_a	170	V
Grid No.2 voltage	V_{g_2}	170	V
Grid No.1 voltage	V_{g_1}	−2	V
Anode current	I_a	10	mA
Grid No.2 current	I_{g_2}	2.8	mA
Transconductance	S	6.2	mA/V
Amplification factor	$\mu_{g_2g_1}$	47	–
Internal resistance	R_i	0.4	MΩ
Grid No.1 impedance (Frequency 50 MHz)	r_{g_1}	10	kΩ
Equivalent noise resistance	R_{eq}	1.5	kΩ

OPERATING CONDITIONS

As frequency changer (It is recommended to employ the triode in a Colpitts type of circuit and not in a Hartley type)

Anode voltage	V_a	170	170	V
Grid No.2 voltage	V_{g_2}	170	170	V
Grid No.1 resistor	R_{g_1}	0.1	0.1	MΩ
Cathode resistor	R_k	330	820	Ω
Oscillator voltage	V_{osc}	3.5	3.5	V_{RMS}
Anode current	I_a	6.5	5.2	mA
Grid No.2 current	I_{g_2}	2.0	1.5	mA
Grid No.1 current	I_{g_1}	20	0	μA
Conversion conductance	S_c	2.2	2.1	mA/V
Internal resistance	R_i	800	870	kΩ

Frame output application (Optimum peak cathode current of the triode section)

To allow for tube spread, for deterioration during life and for emission drop at underheating the equipment should be so designed that it still operates satisfactorily with a peak cathode current of 100 mA (max. pulse duration 4 % of a cycle, but maximum 0.8 ms). The amplitude of the peak current occurring with new tubes should be limited automatically to this max. value of 100 mA. (E.g. by non-bypassed resistances in the grid lead.)

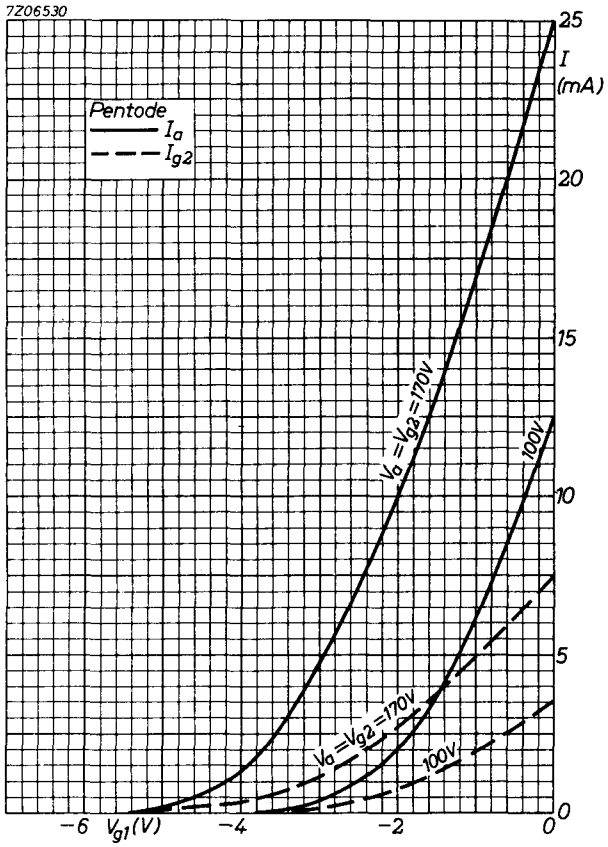
LIMITING VALUES (Design centre rating system)

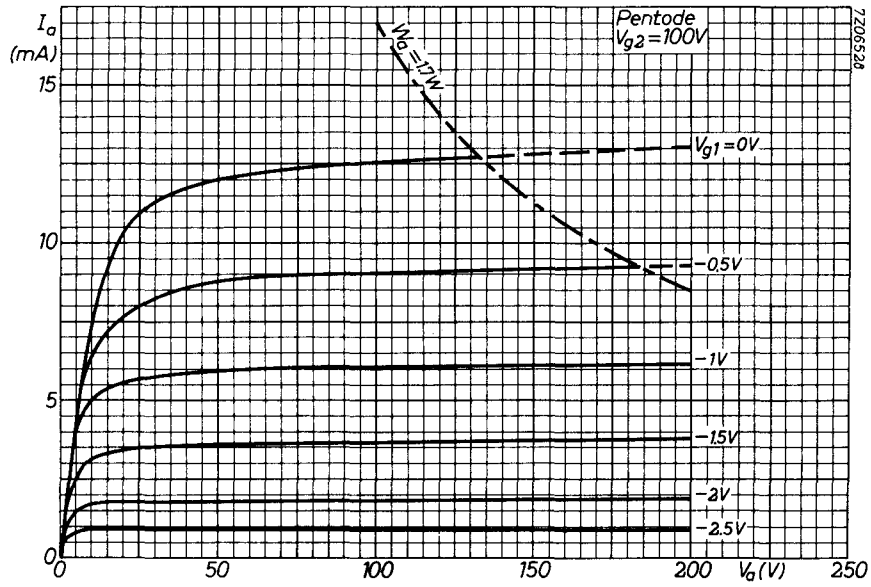
Triode section

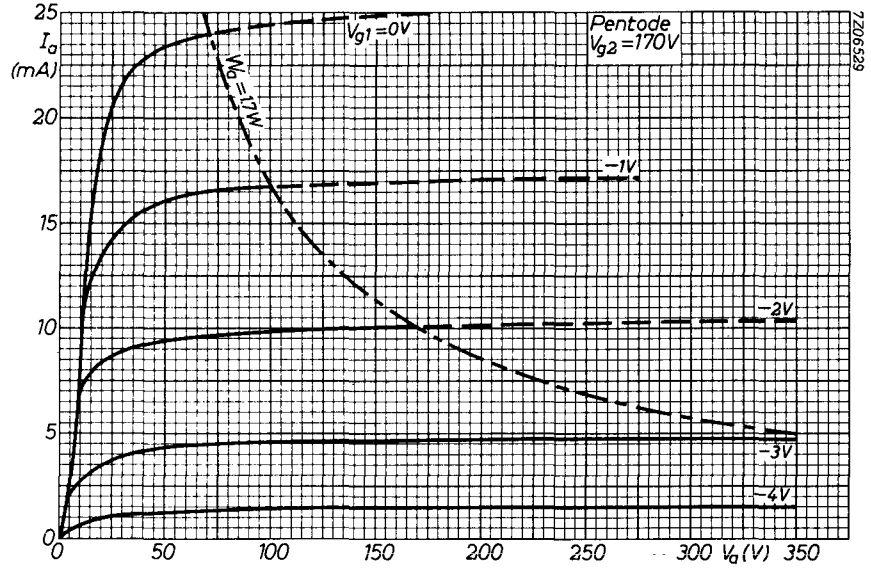
Anode voltage		V_{a_o}	max. 550	V
		V_a	max. 250	V
Anode dissipation		W_a	max. 1.5	W
Cathode current				
average		I_k	max. 14	mA
peak	I_{kp}	see under "frame output applications"		
Grid resistor		R_g	max. 0.5	MΩ
Cathode to heater voltage				
cathode neg		V_{kf}	max. 100	V
cathode pos		V_{kf}	max. 200	V
		D.C. component	max. 120	V

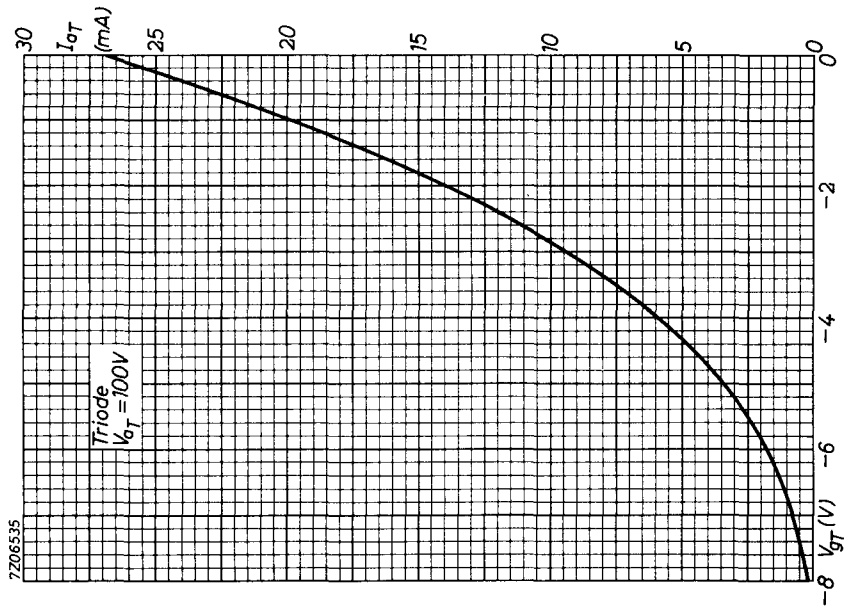
Pentode section

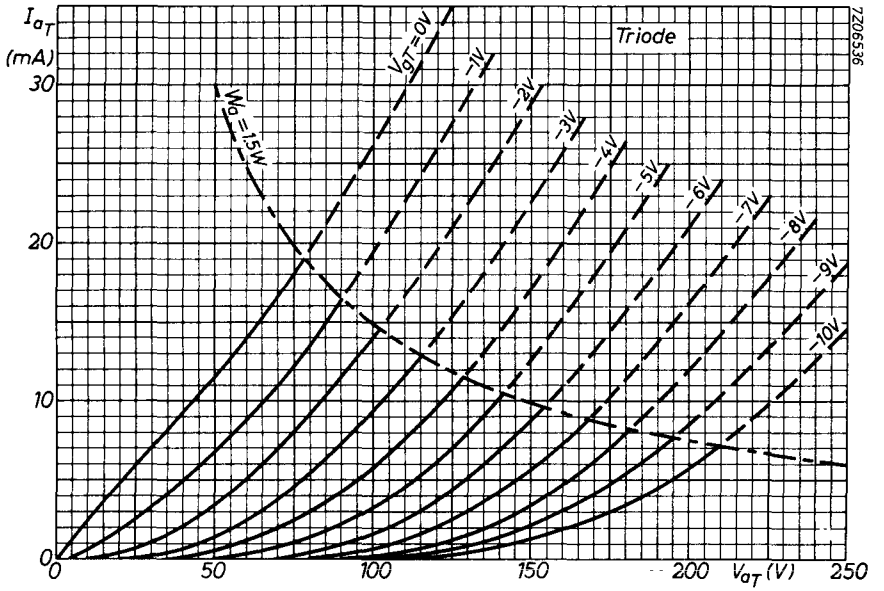
Anode voltage		V_{a_o}	max. 550	V
		V_a	max. 250	V
Grid No.2 voltage		V_{g2_o}	max. 550	V
I_k = 14 mA		V_{g_2}	max. 175	V
I_k = max. 10 mA		V_{g_2}	max. 200	V
Anode dissipation		W_a	max. 1.7	W
Grid No.2 dissipation				
at W_a = min. 1.2 W		W_{g_2}	max. 0.5	W
at W_a = max. 1.2 W		W_{g_2}	max. 0.75	W
Cathode current		I_k	max. 14	mA
Grid resistor				
fixed bias		R_{g_1}	max. 0.5	MΩ
automatic bias		R_{g_1}	max. 1	MΩ
Cathode to heater voltage				
cathode neg		V_{kf}	max. 100	V
cathode pos		V_{kf}	max. 200	V
		D.C. component	max. 120	V

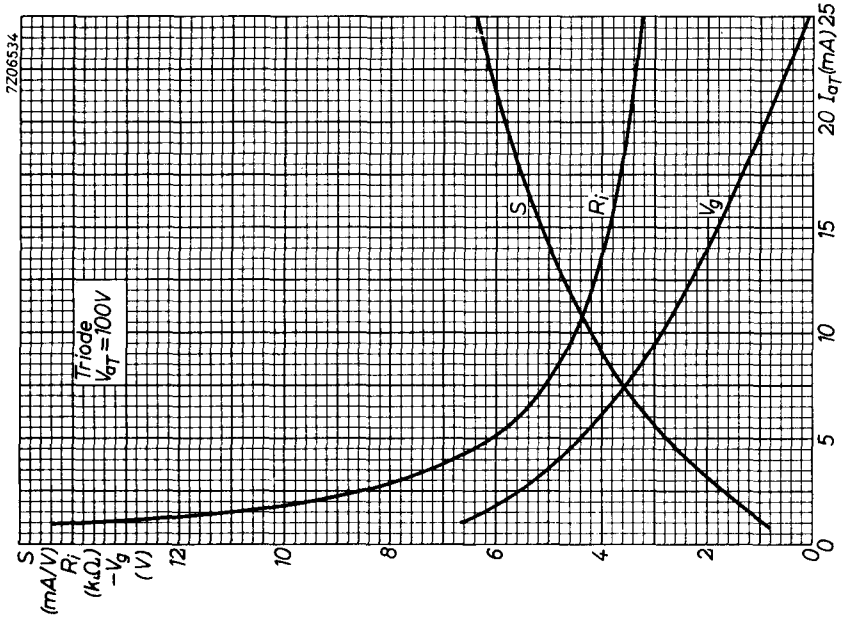

7Z06530
Pentode
I_a
I_{g2}
25
I
(mA)
20
15
10
5
0
$V_a = V_{g2} = 170V$
100V
$V_a = V_{g2} = 170V$
100V
−6
V_{g1}(V)
−4
−2
0

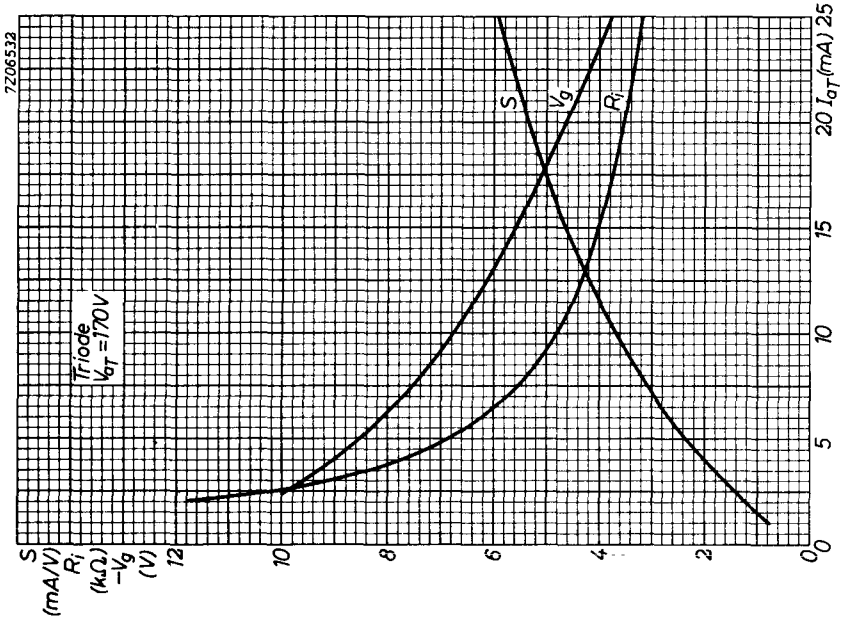

Pentode
V_{g2}=100V
7206528
I_a (mA)
V_a=17W
V_{g1}=0V
-0.5V
-1V
-1.5V
-2V
-2.5V
0
5
10
15
0
50
100
150
200
V_a(V)
250

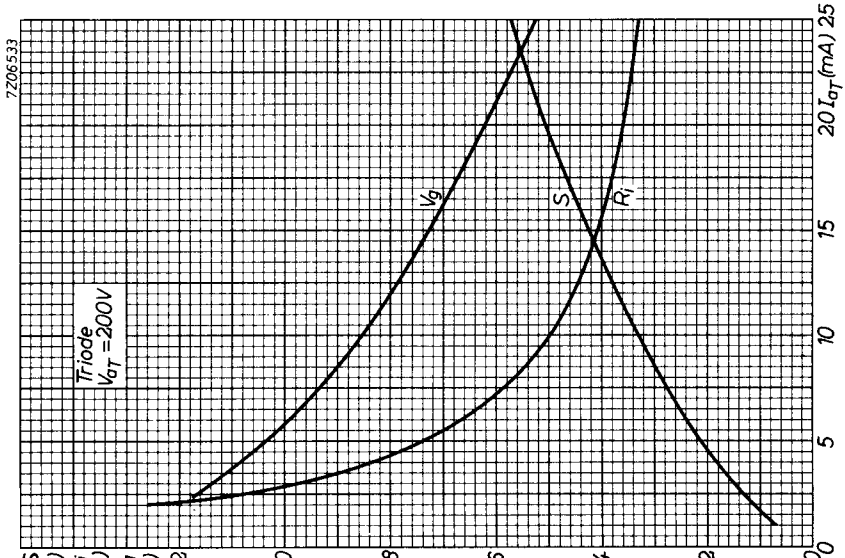

Pentode
V_{g2}=170V
7206529
I_a (mA)
V_{g1}=0V
V_a=17W
-1V
-2V
-3V
-4V
0
5
10
15
20
25
0
50
100
150
200
250
300
V_a(V)
350

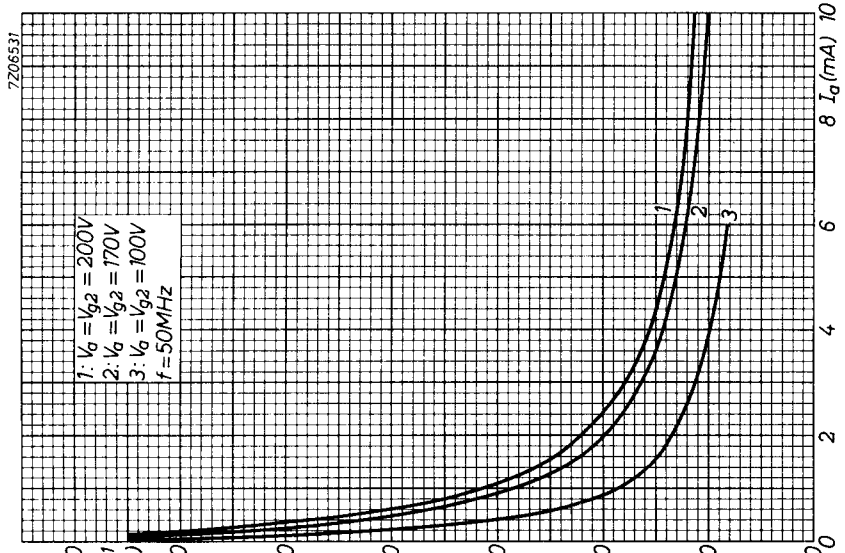

30
I_{aT} (mA)
25
20
15
10
5
0
-2
-4
-6
-8
V_{gT} (V)
Triode
V_{aT} = 100V
7206535

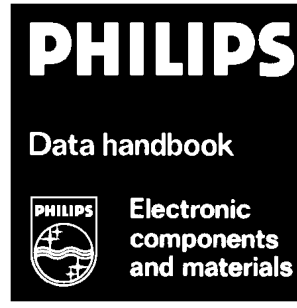

I_{aT}
(mA)
30
20
10
0
Triode
V_{gT} = 0V
-1V
-2V
-3V
-4V
-5V
-6V
-7V
-8V
-9V
-10V
W_a = 1.5W
0
50
100
150
200
V_{aT} (V)
250
7206536


7206534
Triode
V_{aT} = 100V
S (mA/V)
R_i (kΩ)
$-V_g$ (V)
S
R_i
V_g
0
2
4
6
8
10
12
0
5
10
15
20
25
I_{aT} (mA)


7206533
Triode
V_{aT} = 170V
S (mA/V)
R_i (kΩ)
$-V_g$ (V)
S
V_g
R_i
0
2
4
6
8
10
12
0
5
10
15
20
25
I_{aT} (mA)


7206533
Triode
V_{aT} = 200V
S (mA/V)
R_i (kΩ)
$-V_g$ (V)
V_g
S
R_i
I_{aT} (mA)


7206531
1: $V_a = V_{g2}$ = 200V
2: $V_a = V_{g2}$ = 170V
3: $V_a = V_{g2}$ = 100V
f = 50MHz
r_{g1} (kΩ)
I_a (mA)
1
2
3



PCF80

page	sheet	date
1	1	1970.01
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4	4	1970.01
5	5	1970.01
6	6	1970.01
7	7	1972.01
8	8	1972.01
9	9	1972.01
10	FP	1999.07.31

TRIODE-PENTODE

High transconductance triode and R.F. pentode intended for use as frequency changer in V.H.F. T.V. tuners.

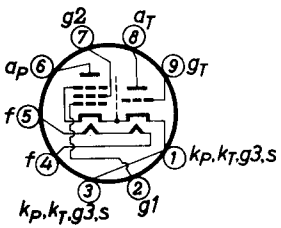
QUICK REFERENCE DATA			
Pentode section			
Anode current	I_a	10	mA
Transconductance	S	11	mA/V
Amplification factor	$\mu_{g_2g_1}$	55	-
Internal resistance	R_i	min. 350	kΩ
Triode section			
Anode current	I_a	15	mA
Transconductance	S	9	mA/V
Amplification factor	μ	20	-

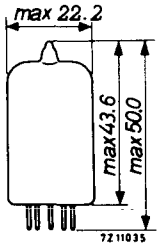
HEATING: Indirect by A.C. or D.C.; series supply

Heater current	I_f	0.3 A
Heater voltage	V_f	8.5 V

DIMENSIONS AND CONNECTIONS Dimensions in mm

Base: Noval





CAPACITANCES (with external shield)

Pentode section

Grid No.1 to all except anode	$C_{g_1(a)}$	5.9	pF
Anode to all except grid No.1	$C_{a(g_1)}$	3.7	pF
Anode to grid No.1	C_{ag_1}	0.009	pF
	C_{ag_1}	max. 0.012	pF
Grid No.1 to grid No.2	$C_{g_1g_2}$	1.6	pF

Triode section

Grid to all except anode	$C_{g(a)}$	3.3	pF
Anode to all except grid	$C_{a(g)}$	1.7	pF
Anode to grid	C_{ag}	1.8	pF

Between pentode and triode sections

Pentode anode to triode anode	C_{aPaT}	max. 0.025	pF
Pentode anode to triode grid	C_{aPgT}	max. 0.010	pF
Pentode grid No.1 to triode anode	C_{g1PaT}	max. 0.010	pF
Pentode grid No.1 to triode grid	C_{g1PgT}	max. 0.010	pF

TYPICAL CHARACTERISTICS

Pentode section

Anode voltage	V_a		170	V
Grid No.2 voltage	V_{g_2}		120	V
Grid No.1 voltage	V_{g_1}		-1.4	V
Anode current	I_a		10	mA
Grid No.2 current	I_{g_2}		3	mA
Transconductance	S		11	mA/V
Internal resistance	R_i	min.	350	kΩ
Amplification factor	$\mu_{g_2g_1}$		55	
Equivalent noise resistance	R_{eq}		1.5	kΩ

TYPICAL CHARACTERISTICS (continued)

Triode section

Anode voltage	V_a	100	V
Grid voltage	V_g	-3	V
Anode current	I_a	15	mA
Transconductance	S	9	mA/V
Amplification factor	μ	20	-

OPERATING CHARACTERISTICS

Pentode section as I.F. amplifier

Anode supply voltage	V_{ba}	200		V
Grid No.2 supply voltage	V_{bg_2}	200		V
Grid No.2 resistor	R_{g_2}	27		kΩ
Anode resistor	R_a	2.7	4.7	kΩ
Grid No.1 supply voltage	V_{bg_1}	-1.4	0	V
Grid No.1 resistor	R_{g_1}	0.1	1	MΩ
Anode current	I_a	10	13	mA
Grid No.2 current	I_{g_2}	3.0	3.9	mA
Transconductance	S	11	14.5	mA/V
Input resistance at 50 MHz	r_{g_1}	10	10	kΩ
Grid No.1 voltage	V_{g_1}	-12	-	V
Transconductance	S	0.11	-	mA/V

OPERATING CHARACTERISTICS (continued)

Pentode section as mixer

Anode supply voltage	V_{ba}	200		V
Grid No.2 supply voltage	V_{bg_2}	200		V
Grid No.2 resistor	R_{g_2}	27		kΩ
Anode resistor	R_a	2.7	4.7	kΩ
Grid No.1 supply voltage	V_{bg_1}	-1.4	0	V
Grid No.1 resistor	R_{g_1}	0.1	1	MΩ
Oscillator voltage	V_{osc}	1.6	1.6	$V_{(RMS)}$
Anode current	I_a	10	9.3	mA
Grid No.2 current	I_{g_2}	3.0	2.9	mA
Grid No.1 current	I_{g_1}	8	2.3	μA
Conversion conductance	S_c	5	4.7	mA/V

OPERATING CHARACTERISTICS

Triode section as oscillator

Anode supply voltage	V_{ba}	200		V
Grid resistor	R_g	10		kΩ
Anode resistor	R_a	8.2	12	kΩ
Oscillator voltage	V_{osc}	4.5	3.3	$V_{(RMS)}$
Anode current	I_a	16	12	mA
Effective transconductance (without higher harmonics)	S_{eff}	3.7	3.7	mA/V

LIMITING VALUES (Design centre rating system)

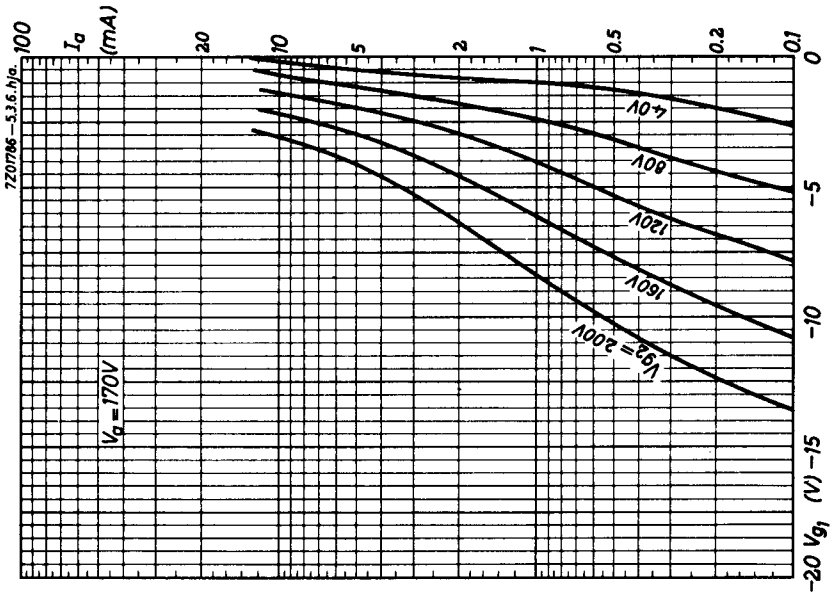
Pentode section

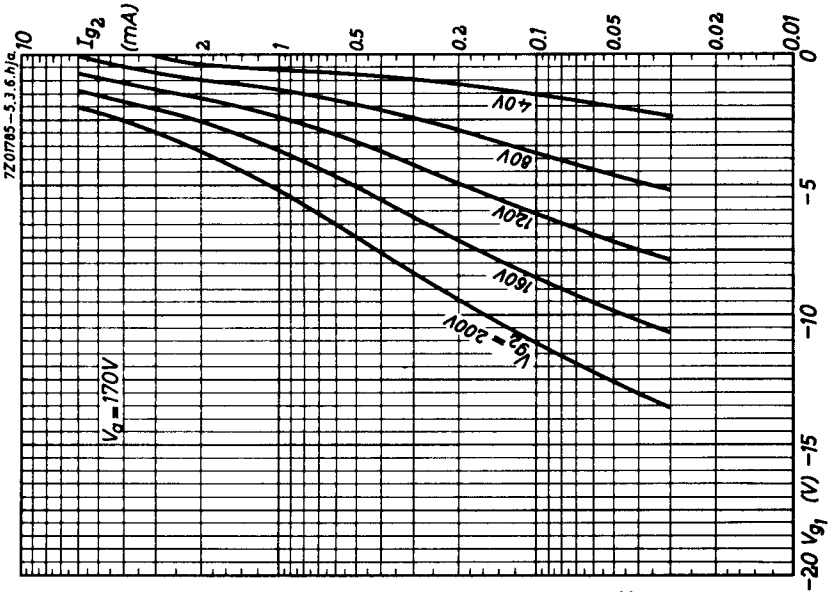
Anode voltage	V_{a_o}	max.	550	V
	V_a	max.	250	V
Anode dissipation	W_a	max.	2.0	W
Grid No.2 voltage	$V_{g_{2o}}$	max.	550	V
Grid No.2 supply voltage	V_{bg_2}	max.	250	V
Grid No.2 voltage	V_{g_2}	max.	250	V
Grid No.2 dissipation	See page 10			
Grid No.1 voltage	$-V_{g_1}$	max.	50	V
Grid No.1 resistor, fixed bias	R_{g_1}	max.	1	MΩ
automatic bias	R_{g_1}	max.	2.2	MΩ
Cathode current	I_k	max.	18	mA
Cathode to heater voltage	V_{kf}	max.	100	V [1])

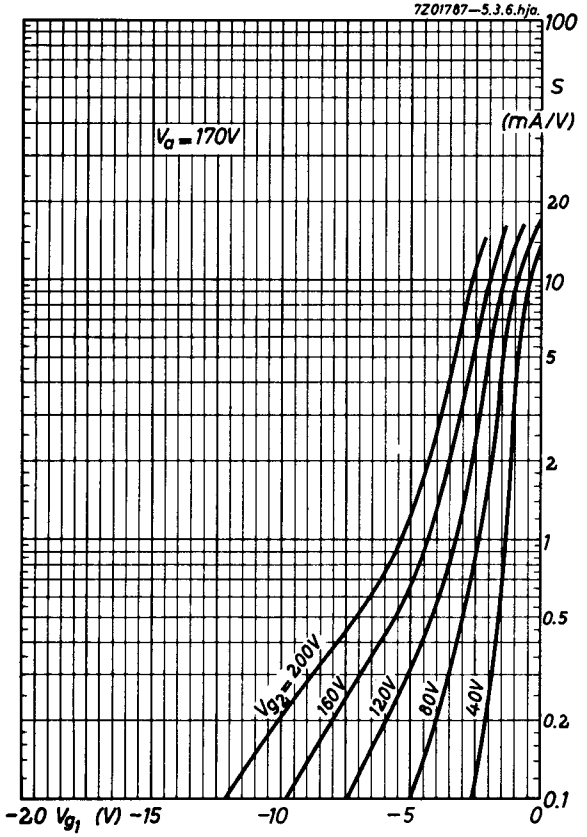
Triode section

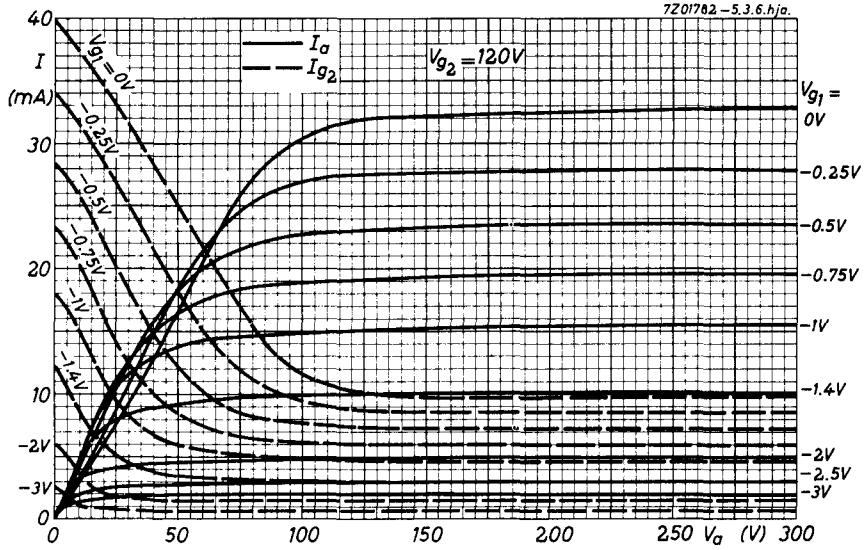
Anode voltage	V_{a_o}	max.	550	V
Anode supply voltage	V_{b_a}	max.	250	V
Anode voltage	V_a	max.	125	V
Anode dissipation	W_a	max.	1.5	W
Grid voltage	$-V_g$	max.	50	V
Grid resistor	R_g	max.	0.5	MΩ
Cathode current	I_k	max.	20	mA
Cathode to heater voltage	V_{kf}	max.	100	V [1])

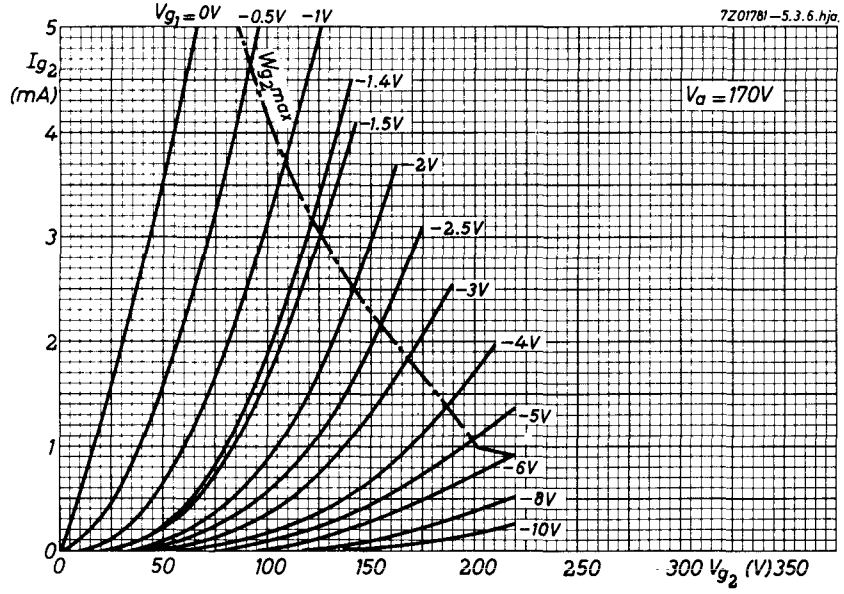
[1]) To fulfil the modulation hum requirements in intercarrier receivers, the voltage between heater and cathode should not exceed 100 $V_{(RMS)}$.
With respect to modulation hum in A.M. sound receivers the voltage between heater and cathode should not exceed 50 $V_{(RMS)}$.

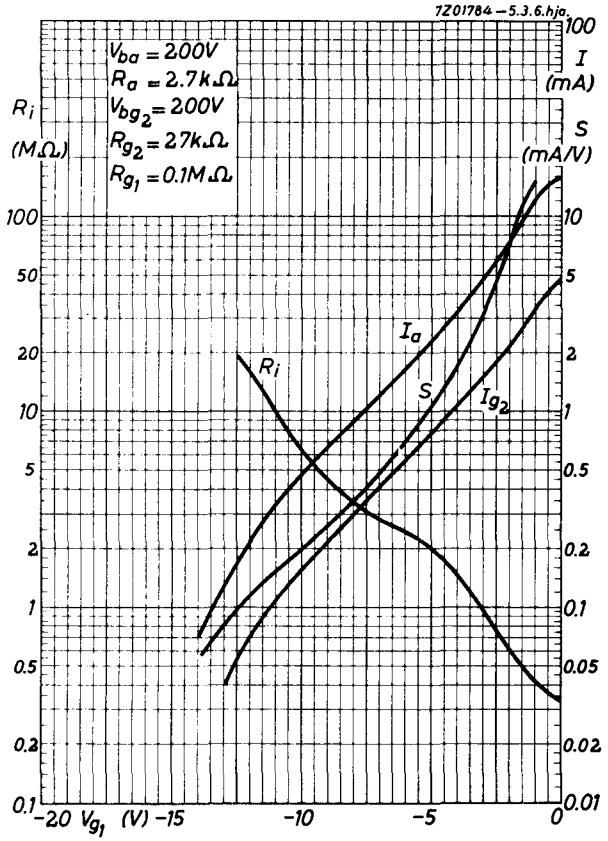

7Z01786—5.3.6.hja.
I_a (mA)
100
20
10
5
2
1
0.5
0.2
0.1
0
-5
-10
-15
-20 V_{g1} (V)
V_a = 170V
V_{g2} = 200V
160V
120V
80V
40V

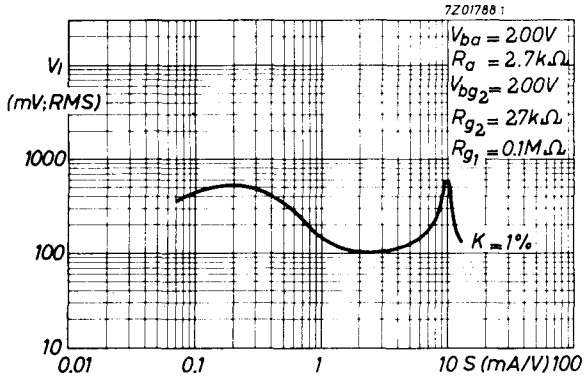

7Z01785—5.3.6.hja.
I_{g2} (mA)
10
2
1
0.5
0.2
0.1
0.05
0.02
0.01
0
-5
-10
-15
-20 V_{g1} (V)
V_a = 170V
V_{g2} = 200V
160V
120V
80V
40V

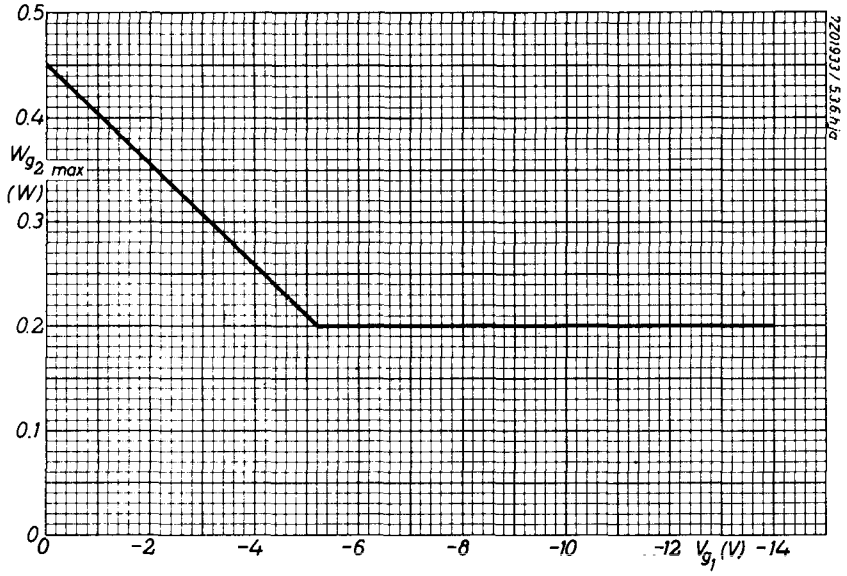

7Z01787—5.3.6.hja.
100
S
(mA/V)
20
10
5
2
1
0.5
0.2
0.1
V_a = 170V
V_{g2} = 200V
160V
120V
80V
40V
-20 V_{g1} (V) -15
-10
-5
0

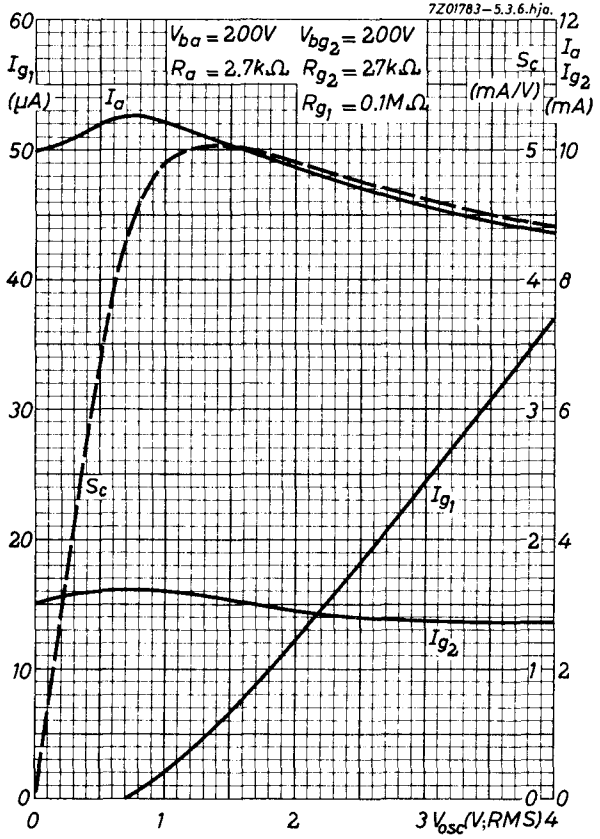

7Z01782–5.3.6.hja.
I (mA)
I_a
I_{g_2}
V_{g_2} = 120V
V_{g_1} = 0V
−0.25V
−0.5V
−0.75V
−1V
−1.4V
−2V
−2.5V
−3V
0
50
100
150
200
250 V_a (V) 300
40
30
20
10

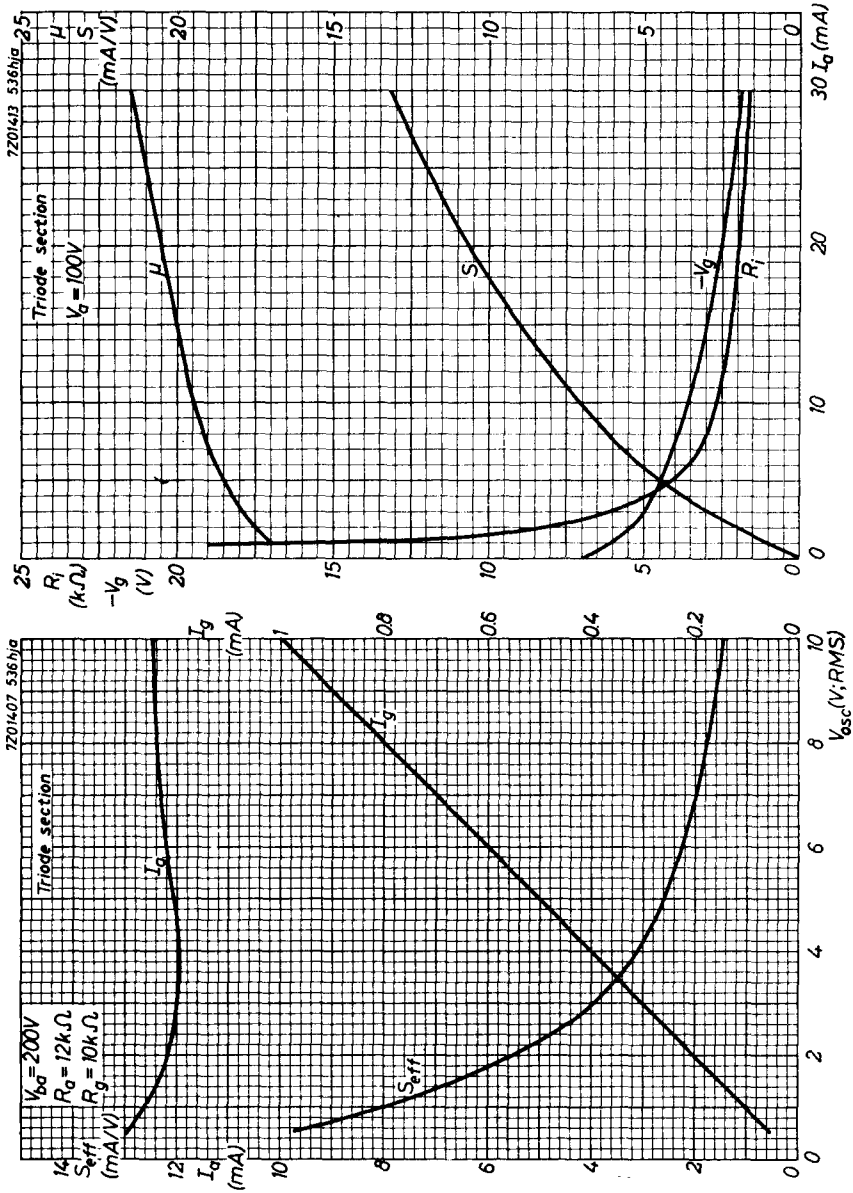

7Z01781–5.3.6.hja.
I_{g_2} (mA)
V_{g_1} = 0V
−0.5V
−1V
V_{g_2} max
−1.4V
−1.5V
−2V
−2.5V
−3V
−4V
−5V
−6V
−8V
−10V
V_a = 170V
0
50
100
150
200
250
300 V_{g_2} (V) 350
5
4
3
2
1


7Z01784—5.3.6.hja
$V_{ba} = 200V$
$R_a = 2.7k\Omega$
$V_{bg_2} = 200V$
$R_{g_2} = 27k\Omega$
$R_{g_1} = 0.1M\Omega$
R_i (MΩ)
I (mA)
S (mA/V)
100
50
20
10
5
2
1
0.5
0.2
0.1
100
10
5
2
1
0.5
0.2
0.1
0.05
0.02
0.01
I_a
R_i
S
I_{g_2}
−20 V_{g_1} (V) −15
−10
−5
0


7Z01788.1
V_{ba} = 200V
R_a = 2.7kΩ
V_{bg_2} = 200V
R_{g_2} = 27kΩ
R_{g_1} = 0.1MΩ
K = 1%
V_i (mV;RMS)
1000
100
10
0.01
0.1
1
10 S (mA/V) 100


7201931.5369.2
$W_{g_2\ max}$ (W)
0.5
0.4
0.3
0.2
0.1
0
0
-2
-4
-6
-8
-10
-12
V_{g_1} (V) -14


7Z01783-5.3.6.hja.
V_{ba} = 200V V_{bg_2} = 200V
R_a = 2.7kΩ R_{g_2} = 27kΩ
R_{g_1} = 0.1MΩ
I_{g_1} (μA)
I_a
S_c
(mA/V)
I_a
I_{g_2} (mA)
I_{g_1}
I_{g_2}
60
50
40
30
20
10
0
12
10
8
6
4
2
0
5
4
3
2
1
0
0
1
2
3
4
V_{osc}(V;RMS)


7201413 536hja
Triode section
V_a=100V
μ
S (mA/V)
R_i (kΩ)
$-V_g$ (V)
I_a (mA)
7201407 536hja
Triode section
V_{ba}=200V
R_a=12kΩ
R_g=10kΩ
S_{eff} (mA/V)
I_a (mA)
I_g (mA)
V_{osc} (V; RMS)

PHILIPS

Data handbook

PHILIPS Electronic components and materials

PCF801

page	sheet	date
1	1	1970.01
2	2	1970.01
3	3	1970.01
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5	5	1970.01
6	6	1970.01
7	7	1970.01
8	8	1970.01
9	9	1970.01
10	10	1970.01
11	11	1970.01
12	12	1970.01
13	FP	1999.08.01

TRIODE-PENTODE

Triode pentode; triode section intended for use as reactance tube, pentode section intended for use as sine wave oscillator or pulse shaper in television receivers.

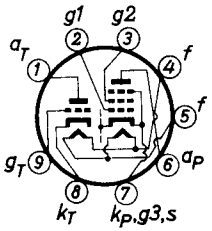
QUICK REFERENCE DATA			
Pentode section			
Anode current	I_a	6	mA
Transconductance	S	5.5	mA/V
Amplification factor	$\mu_{g_2g_1}$	47	-
Internal resistance	R_i	400	kΩ
Triode section			
Anode current	I_a	3.5	mA
Transconductance	S	3.5	mA/V
Amplification factor	μ	70	-

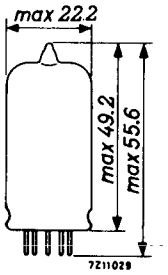
HEATING: Indirect by A.C. or D.C.; series supply

Heater current	I_f	300	mA
Heater voltage	V_f	9	V

DIMENSIONS AND CONNECTIONS Dimensions in mm

Base: Noval





CAPACITANCES

Pentode section

Grid No.1 to all except anode	$C_{g_1(a)}$	5.4	pF
Anode to grid No.1	C_{ag_1}	0.06	pF
Grid No.1 to heater	C_{g_1f}	max. 0.1	pF

Triode section

Grid to all except anode	$C_{g(a)}$	2.4	pF
Anode to grid	C_{ag}	1.5	pF
Grid to heater	C_{gf}	max. 0.1	pF

TYPICAL CHARACTERISTICS

Pentode section

Anode voltage	V_a	100	100	200	100	V
Grid No.2 voltage	V_{g_2}	100	100	200	100	V
Grid No.1 voltage	V_{g_1}	−1	0	max. −16	max. −1.3	V
Anode current	I_a	6	12.5	0.01	−	mA
Grid No.2 current	I_{g_2}	1.7	3.5	−	−	mA
Transconductance	S	5.5	−	−	−	mA/V
Internal resistance	R_i	400	−	−	−	kΩ
Amplification factor	$\mu_{g_2g_1}$	47	−	−	−	−
Grid No.1 current	I_{g_1}	−	−	−	0.3	μA

Triode section

Anode voltage	V_a	200	200	200	V
Grid voltage	V_g	−2	−	max. −1.3	V
Anode current	I_a	3.5	10	−	mA
Transconductance	S	3.5	−	−	mA/V
Internal resistance	R_i	20	−	−	kΩ
Amplification factor	μ	70	−	−	−
Grid current	I_g	−	10	0.3	μA

LIMITING VALUES (Design centre rating system)

Pentode section

Anode voltage	V_{a_o}	max.	550	V
	V_a	max.	250	V
Anode dissipation	W_a	max.	1.2	W
Grid No.2 voltage	V_{g2_o}	max.	550	V [1]
	V_{g2}	max.	250	V
Grid No.2 dissipation	W_{g2}	max.	0.8	W
Grid No.1 voltage	$-V_{g1}$	max.	220	V [1]
Grid resistor, fixed bias	R_{g1}	max.	0.56	MΩ
automatic bias	R_{g1}	max.	1	MΩ
Cathode current, average	I_k	max.	15	mA
peak T_{imp} = max. 30 μs, δ = max. 0.3	I_{kp}	max.	50	mA
Cathode to heater voltage	V_{kf}	max.	100	V [2]
Grid circuit impedance	Z_{g1} (f = 50 Hz)	max.	300	kΩ [2]

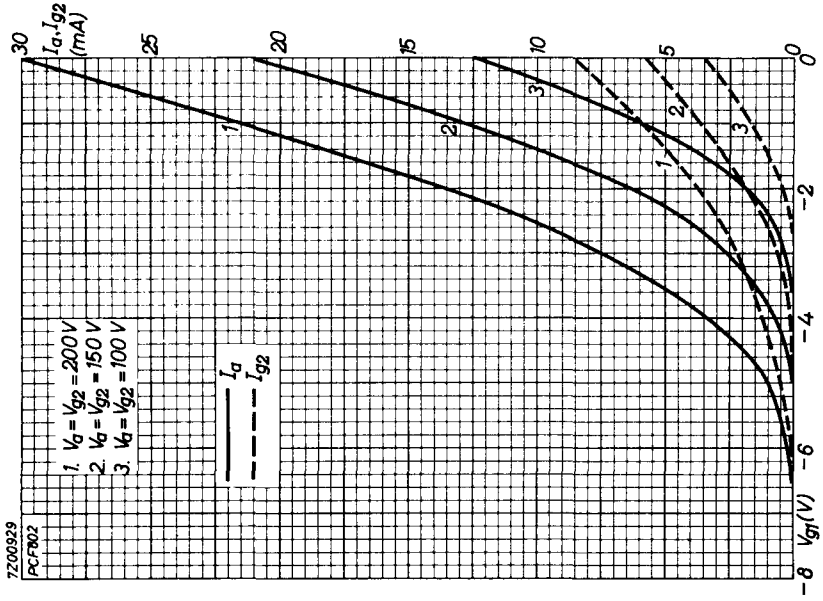
Triode section

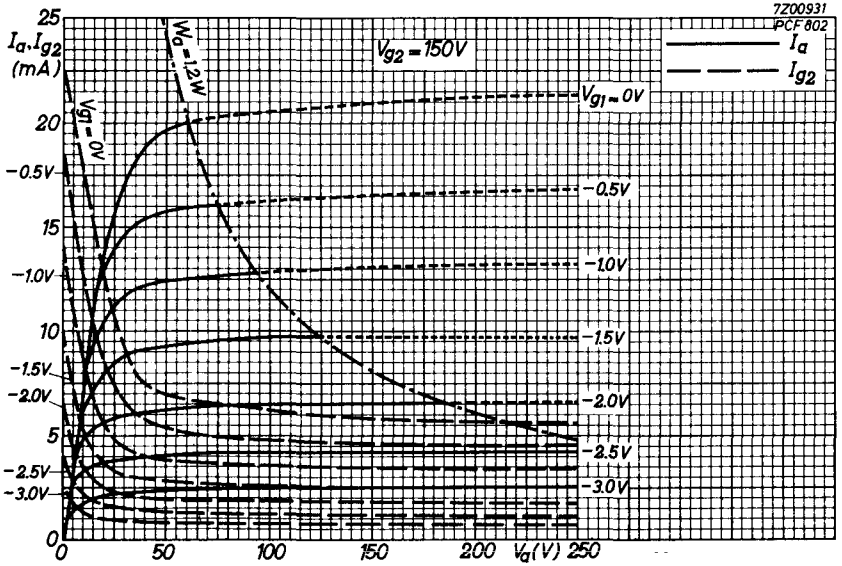
Anode voltage	V_{a_o}	max.	550	V
	V_a	max.	250	V
Anode dissipation	W_a	max.	1.4	W
Grid resistor, fixed bias	R_g	max.	3	MΩ
Cathode current	I_k	max.	10	mA
Cathode to heater voltage	V_{kf}	max.	100	V [3]
Grid circuit impedance	Z_g (f = 50 Hz)	max.	50	kΩ [3]

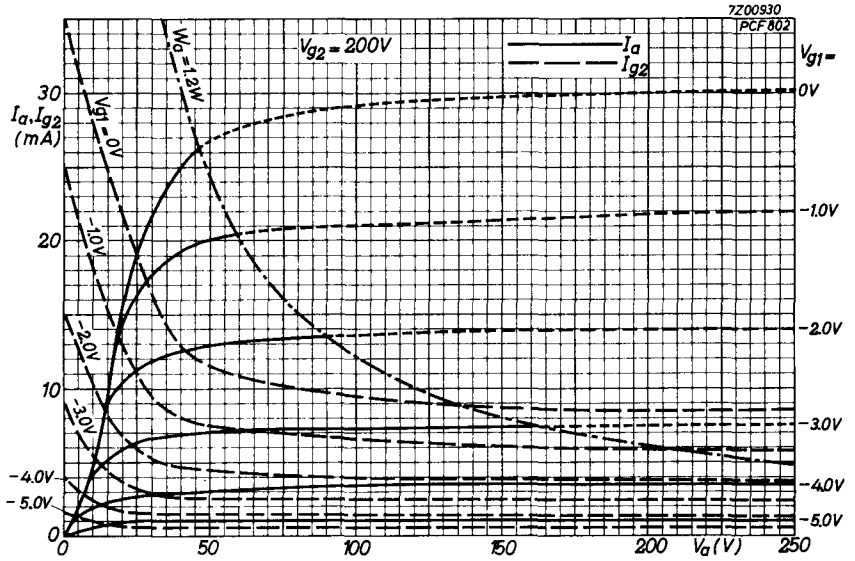
1) The instantaneous voltage between grid No.1 and grid No.2 should never exceed 550 V.

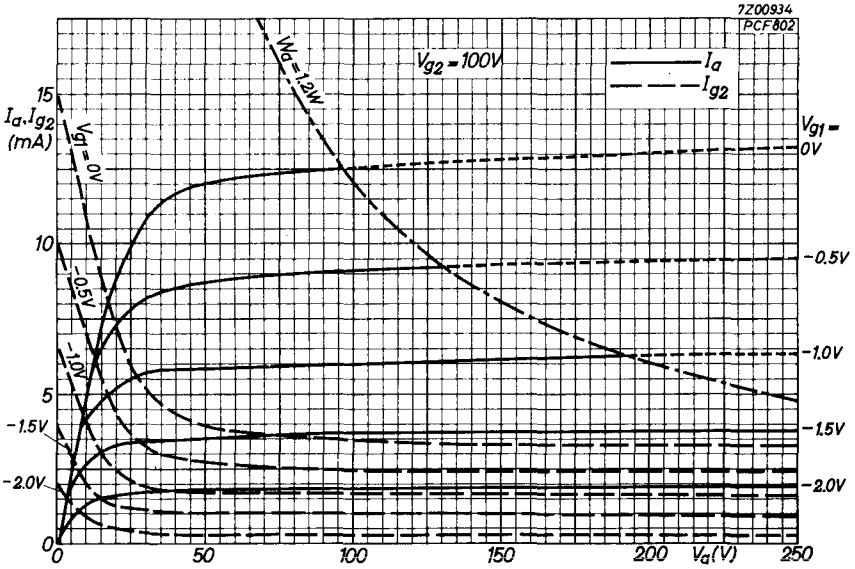
2) To avoid hum interference the A.C. component of V_{kf} should not exceed 65 V at the specified value of Z_{g1}.

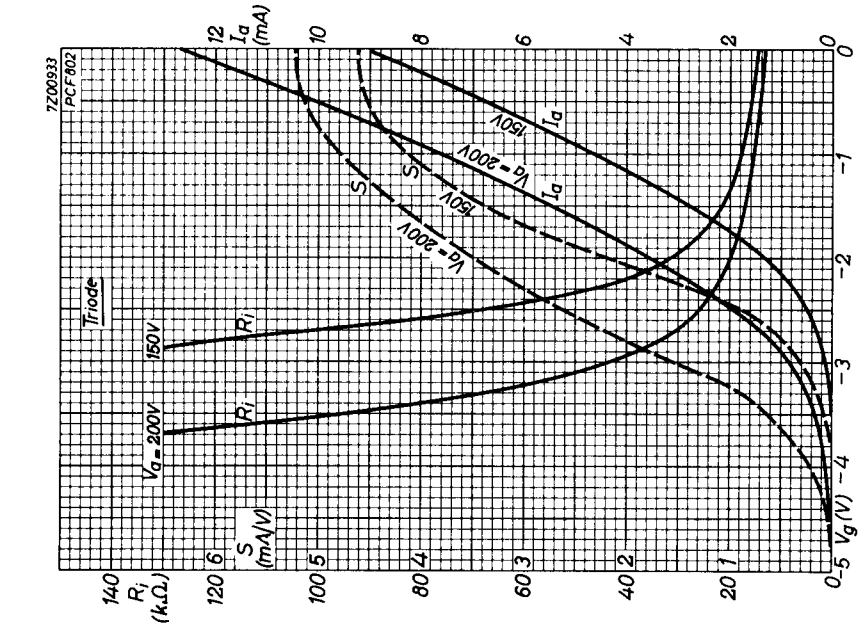
3) To minimise hum interference decoupling of R_k is recommended. In circuits with undecoupled R_k the hum interference between grid and cathode will remain below 1000 μV when the A.C. component of V_{kf} does not exceed 25 V and the R_k is not higher than 1.2 kΩ at the specified value of Z_g.

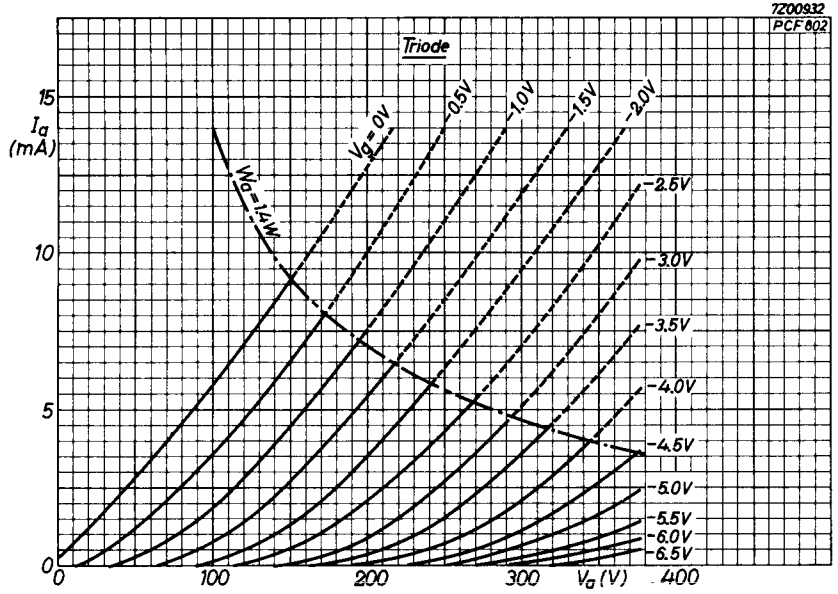

I_a, I_{g2} (mA)
30
25
20
15
10
5
0
1
2
3
1
2
3
−2
−4
−6
−8
V_{g1}(V)
1. $V_a = V_{g2}$ = 200 V
2. $V_a = V_{g2}$ = 150 V
3. $V_a = V_{g2}$ = 100 V
I_a
I_{g2}
7Z00929
PCF802

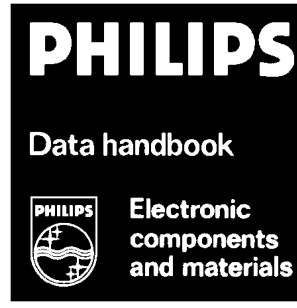

7Z00931
PCF802
I_a, I_{g2} (mA)
25
20
15
10
5
0
V_{g2} = 150V
W_a = 12W
V_{g1} = 0V
−0.5V
−1.0V
−1.5V
−2.0V
−2.5V
−3.0V
I_a
I_{g2}
0
50
100
150
200
V_a(V) 250


7Z00930
PCF802
V_{g2} = 200V
I_a
I_{g2}
V_{g1} =
0V
-1.0V
-2.0V
-3.0V
-4.0V
-5.0V
W_a = 1.2W
V_{g1} = 0V
-1.0V
-2.0V
-3.0V
-4.0V
-5.0V
I_a, I_{g2} (mA)
30
20
10
0
0
50
100
150
200
250
V_a (V)


7Z00934
PCF802
V_{g2} = 100V
I_a
I_{g2}
V_{g1} =
0V
-0.5V
-1.0V
-1.5V
-2.0V
W_a = 1.2W
V_{g1} = 0V
-0.5V
-1.0V
-1.5V
-2.0V
I_a, I_{g2} (mA)
15
10
5
0
0
50
100
150
200
250
V_a (V)


7Z00933
PCF802
Triode
Ia (mA)
S (mA/V)
Ri (kΩ)
Vg (V)
Ia
S
Ri
Va = 150V
Va = 200V


7Z00932
PCF802
Triode
Ia (mA)
Vg (V)
Va = 1.4W
0V
-0.5V
-1.0V
-1.5V
-2.0V
-2.5V
-3.0V
-3.5V
-4.0V
-4.5V
-5.0V
-5.5V
-6.0V
-6.5V



PCF802

page	sheet	date
1	1	1969.12
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4	4	1969.11
5	5	1969.11
6	6	1969.11
7	FP	1999.08.01

TRIODE-PENTODE

Triode pentode intended for use as frequency changer in V.H.F. television tuners.

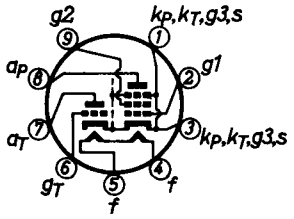
QUICK REFERENCE DATA			
Triode section			
Anode current	I_a	14	mA
Transconductance	S	5.7	mA/V
Amplification factor	μ	17	-
Pentode section			
Anode current	I_a	10	mA
Transconductance	S	12	mA/V
Amplification factor	$\mu_{g_2g_1}$	70	-

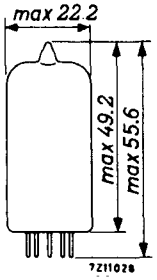
HEATING: Indirect by A.C. or D.C.; series supply

Heater current	I_f	300	mA
Heater voltage	V_f	8	V

DIMENSIONS AND CONNECTIONS Dimensions in mm

Base: Noval





CAPACITANCES

Triode section			
Anode to all except grid	$C_{a(g)}$	1.1	pF
Grid to all except anode	$C_{g(a)}$	2.4	pF
Anode to grid	C_{ag}	2.0	pF
Pentode section			
Anode to all except grid No. 1	$C_{a(g_1)}$	3.5	pF
Grid No. 1 to all except anode	$C_{g_1(a)}$	5.8	pF
Anode to grid No. 1	C_{ag_1}	0.012	pF
Grid No. 1 to grid No. 2	$C_{g_1g_2}$	1.7	pF
Between triode and pentode sections			
Anode triode to anode pentode	$C_{a_Ta_P}$	0.125	pF
Grid triode to anode pentode	$C_{g_Ta_P}$	0.014	pF
Anode triode to grid No. 1 pentode	$C_{a_Tg_{1P}}$	max. 0.010	pF
Grid triode to grid No. 1 pentode	$C_{g_Tg_{1P}}$	max. 0.010	pF

TYPICAL CHARACTERISTICS

Triode section				
Anode voltage	V_a		100	V
Grid voltage	V_g		-3	V
Anode current	I_a		14	mA
Transconductance	S		5.7	mA/V
Amplification factor	μ		17	-
Pentode section				
Anode voltage	V_a		170	V
Grid No. 2 voltage	V_{g_2}		150	V
Grid No. 1 voltage	V_{g_1}		-1.2	V
Anode current	I_a		10	mA
Grid No. 2 current	I_{g_2}		3.8	mA
Transconductance	S		12	mA/V
Amplification factor	$\mu_{g_2g_1}$		70	-
Internal resistance	R_i	min.	350	kΩ
Equivalent noise resistance	R_{eq}		1	kΩ

OPERATING CHARACTERISTICS

Triode section as oscillator

Anode supply voltage	V_{ba}	190	V
Anode resistor	R_a	8.2	kΩ
Grid resistor	R_g	10	kΩ
Oscillator voltage	V_{osc}	4.5	V_{RMS}
Anode current	I_a	12	mA
Effective transconductance	S_{eff}	3.5	mA/V

Pentode section as mixer

Anode supply voltage	V_{ba}	190	V
Grid No.2 supply voltage	V_{bg_2}	190	V
Grid No.2 resistor	R_{g_2}	18	kΩ
Grid No.1 resistor	R_{g_1}	100	kΩ
Oscillator voltage	V_{osc}	2.3	V_{RMS}
Anode current	I_a	8.5	mA
Grid No.2 current	I_{g_2}	3.0	mA
Grid No.1 current	I_{g_1}	30	μA
Conversion conductance	S_c	4.5	mA/V
Internal resistance	R_i	0.6	MΩ

LIMITING VALUES

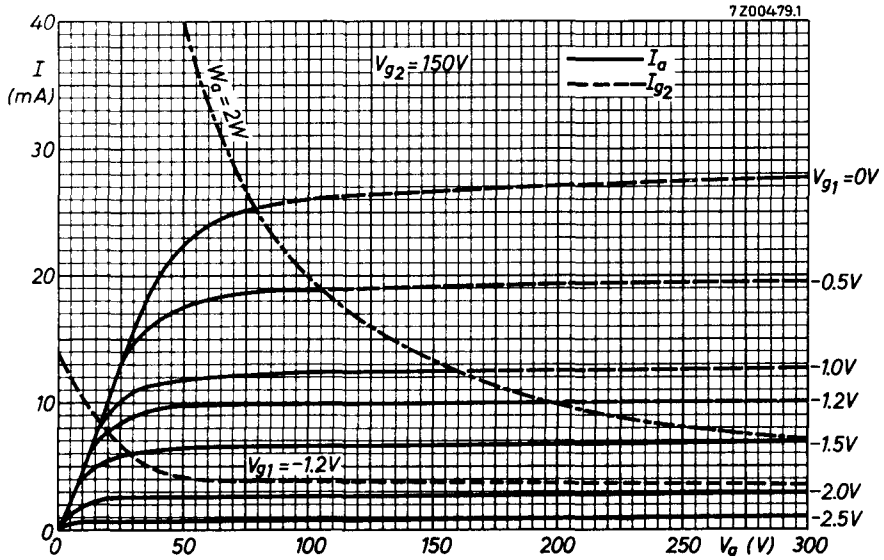
Triode section

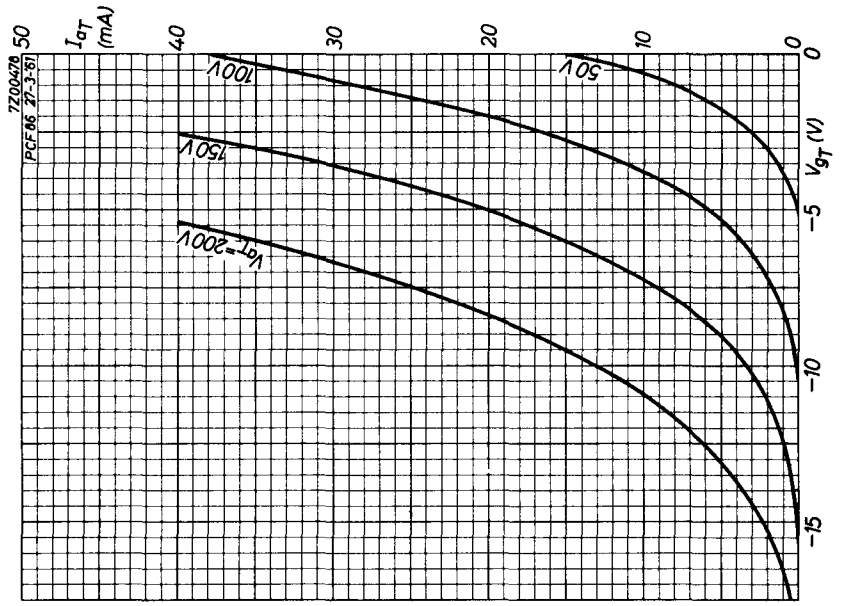
Anode voltage	V_{a_o}	max. 550	V
	V_a	max. 250	V
Anode dissipation	W_a	max. 1.5	W
Cathode current	I_k	max. 15	mA
Grid resistor	R_g	max. 0.5	MΩ
Cathode to heater voltage	V_{kf}	max. 100	V [1])

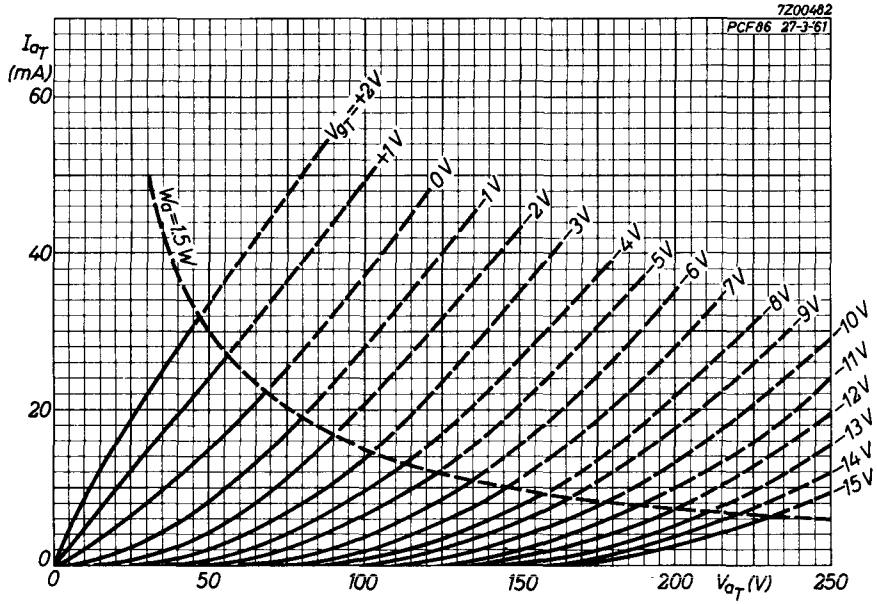
Pentode section

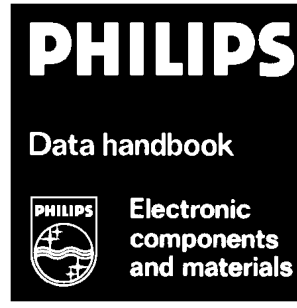
Anode voltage	V_{a_o}	max. 550	V
	V_a	max. 250	V
Grid No.2 voltage	V_{g2_o}	max. 550	V
	V_{g_2}	max. 150	V
Anode dissipation	W_a	max. 2.0	W
Grid No.2 dissipation	W_{g_2}	max. 0.5	W
Cathode current	I_k	max. 18	mA
Grid No.1 resistor	R_{g_1}	max. 0.5	MΩ
Cathode to heater voltage	V_{kf}	max. 100	V [1])

[1]) To fulfil the modulation hum requirements in intercarrier receivers, V_{kf} should not exceed 75 V_{RMS}.
With respect to modulation hum in A.M. sound receivers, V_{kf} should not exceed 50 V_{RMS}.


7Z00479.1
40
I
(mA)
30
20
10
0
0
50
100
150
200
250
300
V_a (V)
V_{g2}=150V
W_a=2W
I_a
I_{g2}
V_{g1}=0V
-0.5V
-1.0V
-1.2V
-1.5V
-2.0V
-2.5V
V_{g1}=-1.2V


7Z00478
PCF86 27-3-61
I_{aT} (mA)
50
40
30
20
10
0
100V
150V
V_{aT}=200V
50V
0
−5
−10
−15
V_{gT} (V)


7Z00482
PCF86 27-3-61
I_{aT} (mA)
60
40
20
0
W_a=1,5W
V_{gT}=+2V
+1V
0V
−1V
−2V
−3V
−4V
−5V
−6V
−7V
−8V
−9V
−10V
−11V
−12V
−13V
−14V
−15V
0
50
100
150
200
250
V_{aT} (V)



PCF86

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1	1	1969.12
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3	3	1969.12
4	4	1969.12
5	5	1969.12
6	6	1969.01
7	FP	1999.07.31

TRIODE-HEPTODE

Triode-heptode; triode section intended for use as pulse amplifier and heptode section for use as noise gated sync. separator.

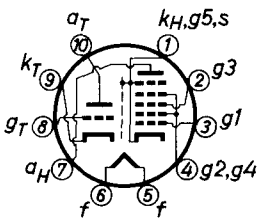
QUICK REFERENCE DATA					
Triode section					
Anode current	I_a		9		mA
Transconductance	S		8.8		mA/V
Amplification factor	μ		50		-
Heptode section					
Grid No.1 voltage	V_{g_1}	0	-1.8	0	V
Grid No.3 voltage	V_{g_3}	0	0	-1.8	V
Anode current	I_a	1500	20	20	μA

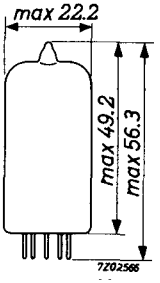
HEATING: Indirect by A.C. or D.C.; series supply

Heater current	I_f	300	mA
Heater voltage	V_f	8.5	V

DIMENSIONS AND CONNECTIONS Dimensions in mm

Base: decal





CAPACITANCES

Heptode section

Grid No.1 to all except anode	$C_{g_1(a)}$	4.4	pF
Anode to all except grid No.1	$C_{a(g_1)}$	5.4	pF
Anode to grid No.1	C_{ag_1}	max. 0.1	pF
Anode to grid No.3	C_{ag_3}	max. 0.25	pF
Grid No.1 to grid No.3	$C_{g_1g_3}$	0.3	pF

Triode section

Grid to all except anode	$C_{g\,(a)}$	3.3	pF
Anode to all except grid	$C_{a\,(g)}$	1.7	pF
Anode to grid	C_{ag}	1.8	pF

Between heptode and triode sections

Heptode grid No.1 to triode grid	C_{g_1HgT}	max. 0.005	pF
Heptode grid No.1 to triode anode	C_{g_1HaT}	max. 0.010	pF
Heptode grid No.3 to triode grid	C_{g_3HgT}	max. 0.020	pF
Heptode anode to triode anode	C_{aHaT}	max. 0.150	pF

TYPICAL CHARACTERISTICS

Triode section

Anode voltage	V_a	100	200	V
Anode current	I_a	9.0	0.1	mA
Grid voltage	V_g	−1	−7 (<11)	V
Transconductance	S	8.8	−	mA/V
Amplification factor	μ	50		-

Heptode section

Anode voltage	V_a	14	14	14		V
Grids No.2 and 4 voltage	V_{g_2, g_4}	14	14	14		V
Grid No.3 voltage	V_{g_3}	0	0	−1.8 (<2.2)		V
Grid No.1 voltage	V_{g_1}	0	−1.8	0		V
Anode current	I_a	1500	20	20		μA
Grids No.2 and 4 current	$I_{g_2+g_4}$	1300	−	−		μA

OPERATING CHARACTERISTICS

Heptode section as sync. separator

Anode voltage	V_a	14	1	14	14	V
Grids No.2 and 4 voltage	V_{g_2, g_4}	14	14	14	14	V
Grid No.3 voltage	V_{g_3}	−	−	+25	−1.9 (<2.3)	V
Grid No.1 voltage	V_{g_1}	−	−	−2	−	V
Anode current	I_a	750	>300	20	20	μA
Grid No.3 current	I_{g_3}	1	1	−	−	μA
Grid No.1 current	I_{g_1}	100	100	−	100	μA

LIMITING VALUES (Design centre rating system)

Triode section

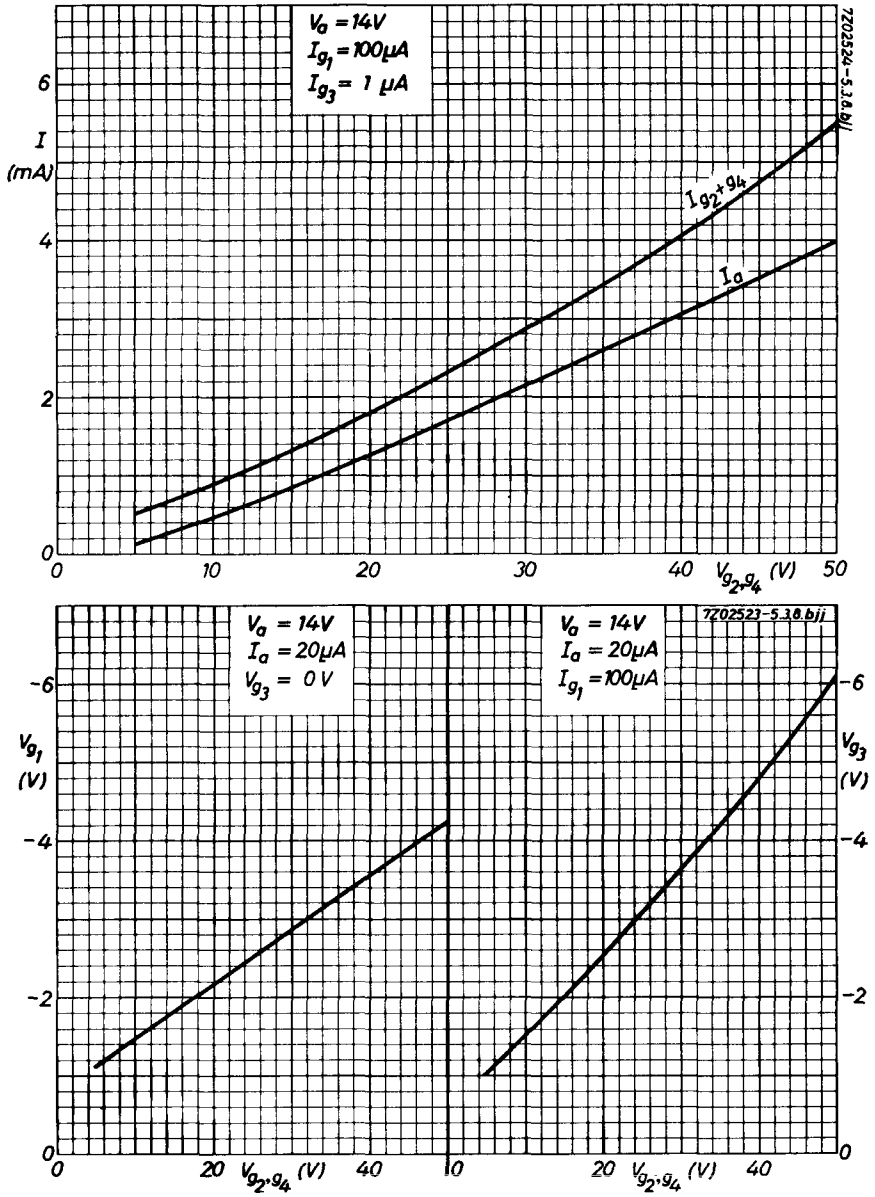
Anode voltage	V_{a_o}	max.	550	V
	V_a	max.	250	V
Anode dissipation	W_a	max.	1.5	W
Cathode current	I_k	max.	20	mA
Grid resistor (fixed bias)	R_g	max.	2	MΩ
(automatic bias)	R_g	max.	3	MΩ
Grid voltage, negative peak	$-V_{g_p}$	max.	200	V
Cathode to heater voltage	V_{kf}	max.	70	V [1]
			+100	V_{RMS}

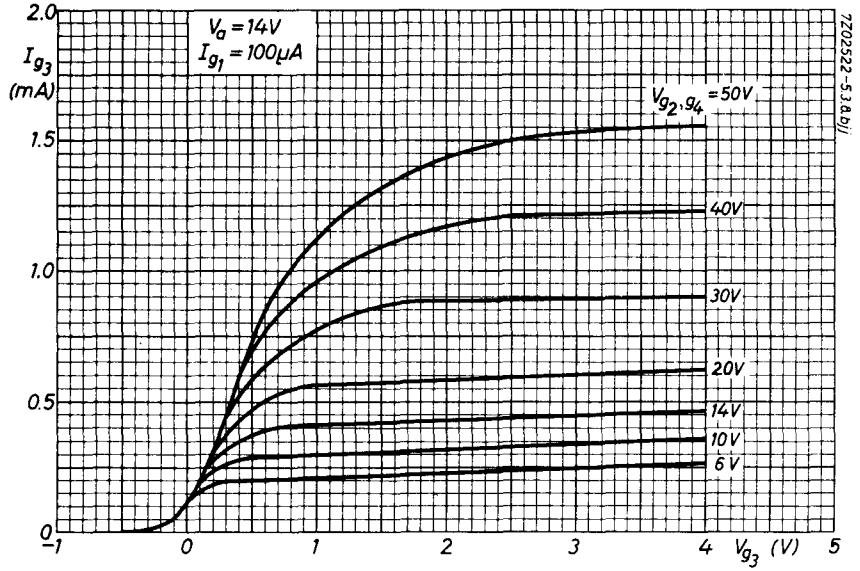
Heptode section

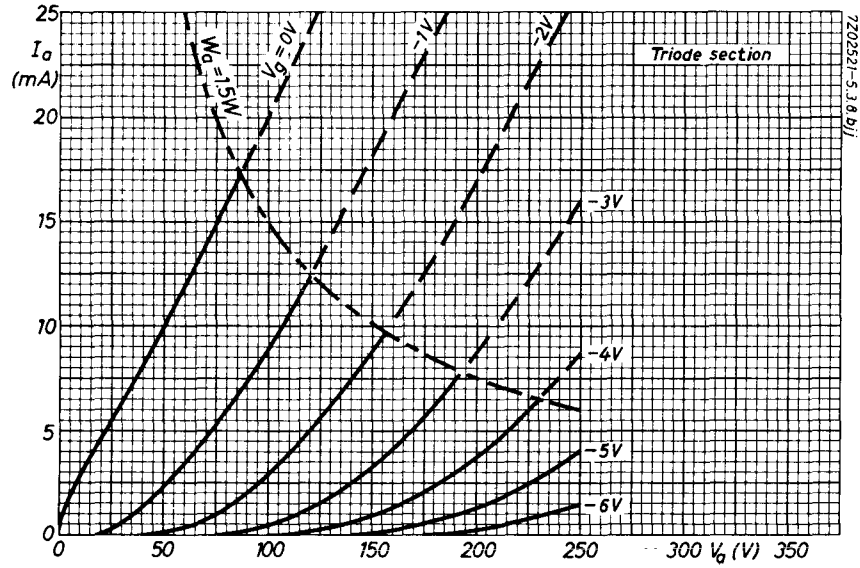
Anode voltage	V_{a_o}	max.	550	V
	V_a	max.	100	V
Grids No.2 and 4 voltage	$V_{(g_2, g_4)_o}$	max.	550	V
	V_{g_2, g_4}	max.	50	V [2]
Anode dissipation	W_a	max.	0.5	W
Grids No.2 and 4 dissipation	$W_{g_2+g_4}$	max.	0.5	W
Cathode current	I_k	max.	8	mA
Grid No.1 resistor	R_{g_1}	max.	3	MΩ
Grid No.3 resistor	R_{g_3}	max.	3	MΩ
Grid No.1 voltage, negative peak	$-V_{g_{1p}}$	max.	100	V
Grid No.3 voltage, negative peak	$-V_{g_{3p}}$	max.	150	V
Cathode to heater voltage	V_{kf}	max.	100	V

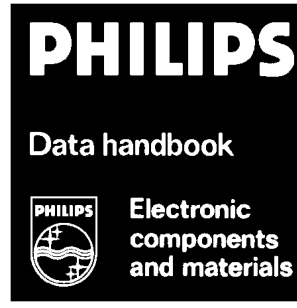
1) Cathode positive with respect to heater.

2) The grids No.2 and 4 voltage should not be less than 6 V with an average tube under the worst probable operating conditions.


V_a = 14V
I_{g_1} = 100µA
I_{g_3} = 1 µA
7Z02524-5.3.8.bji
I (mA)
$I_{g_2+g_4}$
I_a
V_{g_2,g_4} (V)
V_a = 14V
I_a = 20µA
V_{g_3} = 0 V
V_{g_1} (V)
V_a = 14V
I_a = 20µA
I_{g_1} = 100µA
7Z02523-5.3.8.bji
V_{g_3} (V)


V_a = 14V
I_{g_1} = 100µA
I_{g_3} (mA)
V_{g_2,g_4} = 50V
40V
30V
20V
14V
10V
6V
2.0
1.5
1.0
0.5
0
−1
0
1
2
3
4
5
V_{g_3} (V)
7Z02522-5.1.8.bij


I_a (mA)
W_a = 1.5W
V_g = 0V
−1V
−2V
−3V
−4V
−5V
−6V
Triode section
25
20
15
10
5
0
0
50
100
150
200
250
300
V_a (V)
350
7Z02521-5.1.8.bij



PCH200

page	sheet	date
1	1	1969.01
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3	3	1969.01
4	4	1969.01
5	5	1969.01
6	6	1969.01
7	FP	1999.08.01

TRIODE-OUTPUT PENTODE

The triode section is intended for use as frame oscillator and A.F. amplifier. The pentode section is intended for use as frame output tube and A.F. power amplifier.

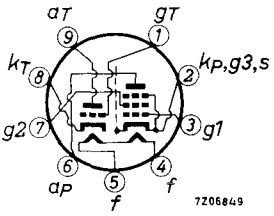
QUICK REFERENCE DATA			
Triode section			
Anode current	I_a	3.5	mA
Transconductance	S	2.2	mA/V
Amplification factor	μ	70	-
Pentode section			
Anode peak voltage	V_{a_p}	max. 2.5	kV
Anode current	I_a	41	mA
Transconductance	S	7.5	mA/V
Amplification factor	$\mu_{g_2g_1}$	9.5	-
Output power	W_o	3.3	W

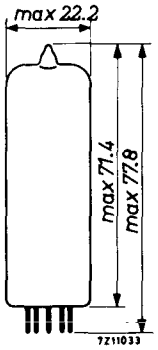
HEATING: Indirect by A.C. or D.C.; series supply

Heater current	I_f	300	mA
Heater voltage	V_f	16	V

DIMENSIONS AND CONNECTIONS Dimensions in mm

Base: Noval





CAPACITANCES

Triode section			
Anode to all except grid	$C_{a(g)}$	4.3	pF
Grid to all except anode	$C_{g(a)}$	2.7	pF
Anode to grid	C_{ag}	4.4	pF
Grid to heater	C_{gf}	max. 0.02	pF
Pentode section			
Anode to all except grid No.1	$C_{a(g_1)}$	8.0	pF
Grid No.1 to all except anode	$C_{g_1(a)}$	9.3	pF
Anode to grid No.1	C_{ag_1}	max. 0.3	pF
Grid No.1 to heater	C_{g_1f}	max. 0.3	pF
Between triode and pentode sections			
Anode triode to grid No.1 pentode	C_{aTg_1P}	max. 0.02	pF
Grid triode to anode pentode	C_{gTaP}	max. 0.02	pF
Grid triode to grid No.1 pentode	C_{gTg_1P}	max.0.025	pF
Anode triode to anode pentode	C_{aTaP}	max. 0.25	pF

TYPICAL CHARACTERISTICS

Triode section			
Anode voltage	V_a	100	V
Grid voltage	V_g	0	V
Anode current	I_a	3.5	mA
Transconductance	S	2.2	mA/V
Amplification factor	μ	70	-
Pentode section			
Anode voltage	V_a	170	V
Grid No.2 voltage	V_{g_2}	170	V
Grid No.1 voltage	V_{g_1}	-11.5	V
Anode current	I_a	41	mA
Grid No.2 current	I_{g_2}	9	mA
Transconductance	S	7.5	mA/V
Amplification factor	$\mu_{g_2g_1}$	9.5	-
Internal resistance	R_i	16	kΩ

OPERATING CHARACTERISTICS

Triode section as A.F. amplifier

A. Signal source resistance	R_s	0.22		MΩ
Grid resistor	R_g	3		MΩ
Grid resistor of next stage	$R_{g'}$	0.68		MΩ
Supply voltage	V_b	200	170	V
Cathode resistor	R_k	2.2	2.7	kΩ
Anode resistor	R_a	220	220	kΩ
Anode current	I_a	0.52	0.43	mA
Voltage gain	V_o/V_i 1)	52	51	-
Max. output voltage	V_o max	26	25	V_{RMS}
Distortion	d_{tot} 2)	1.6	2.3	%

B. Signal source resistance	R_s	0.22				MΩ
Grid resistor	R_g	22				MΩ
Grid resistor of next stage	$R_{g'}$	0.68				MΩ
Supply voltage	V_b	200	200	170	170	V
Cathode resistor	R_k	0	0	0	0	Ω
Anode resistor	R_a	100	220	100	220	kΩ
Anode current	I_a	1.05	0.61	0.86	0.50	mA
Voltage gain	V_o/V_i 1)	50	55	49	53	-
Max. output voltage	V_o max	24	25	19	20	V_{RMS}
Distortion	d_{tot} 3)	1.5	1.4	1.4	1.4	%

MICROPHONY AND HUM

The triode section can be used without special precautions against microphony and hum in circuits in which an input voltage $V_i \geqq 10$ mV_{RMS} gives an output of 50 mW of the output stage. Z_g (50 Hz) = 0.25 MΩ. The A.C. voltage between pin 4 and cathode should not exceed 6.3 V. If the tube is used in television circuits where the frequency of the heater supply is not synchronized with the frame frequency, this may cause interference due to hum. At page 8 the relation is shown between the permissible value of Z_{g_1} of the pentode section and the A.C. voltage between pin 4 and the cathode. This curve applies to C_{g1f} is 0.8 pF (inclusive of wiring and tube socket).

1) Measured at small input voltage
2) At lower output voltages the distortion is proportionally lower.
3) At lower output voltages down to 5 V_{RMS} the distortion remains approximately constant. At values below 5 V_{RMS} the distortion is approximately proportional to V_o.

OPERATING CHARACTERISTICS

Pentode section

A.F. power amplifier, class A (measured with V_k constant)

Supply voltage	$V_{ba}=V_{bg_2}$	170			200			230		V
Grid No.2 series resistor (non-decoupled)	R_{g_2}	0			470			1200		Ω
Cathode resistor	R_k	200			330			490		Ω
Load resistance	$R_{a\sim}$	3.25			4.5			6		kΩ
Grid No.1 driving voltage	V_i	0	0.61	5.9	0	0.66	6.7	0	0.75	7.8 V$_{RMS}$
Anode current	I_a	42	–	44	35	–	37	30	–	31 mA
Grid No.2 current	I_{g_2}	9.2	–	15.5	7.8	–	13.3	6.6	–	11.0 mA
Output power	W_o	0	0.05	3.2	0	0.05	3.3	0	0.05	3.25 W
Distortion	d_{tot}	–	–	10	–	–	10	–	–	10 %

A.F. power amplifier, class AB, two tubes in push-pull

Anode supply voltage	V_{ba}	200		230		V
Grid No.2 supply voltage	V_{bg_2}	200		200		V
Common cathode resistor	R_k	170		200		Ω
Load resistance	$R_{aa\sim}$	4.5		7		kΩ
Grid No.1 driving voltage	V_i	0	14.2	0	13.0	V$_{RMS}$
Anode current	I_a	2x35	2x42.5	2x30	2x34.5	mA
Grid No.2 current	I_{g_2}	2x8	2x16.5	2x6.2	2x13.5	mA
Output power	W_o	0	9.3	0	10	W
Distortion	d_{tot}	–	6.3	–	5.5	%

Frame output application

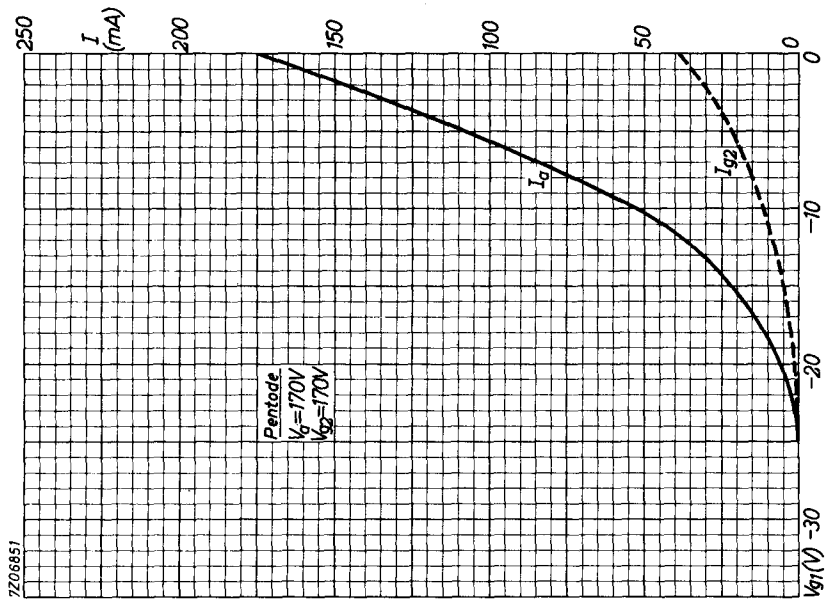
The circuit should operate satisfactorily with peak anode current I_{a_p} = 85 mA at V_a = 50 V, V_{g_2} = 170 V, I_f = 300 mA. The minimum available I_{a_p} value at end of life is

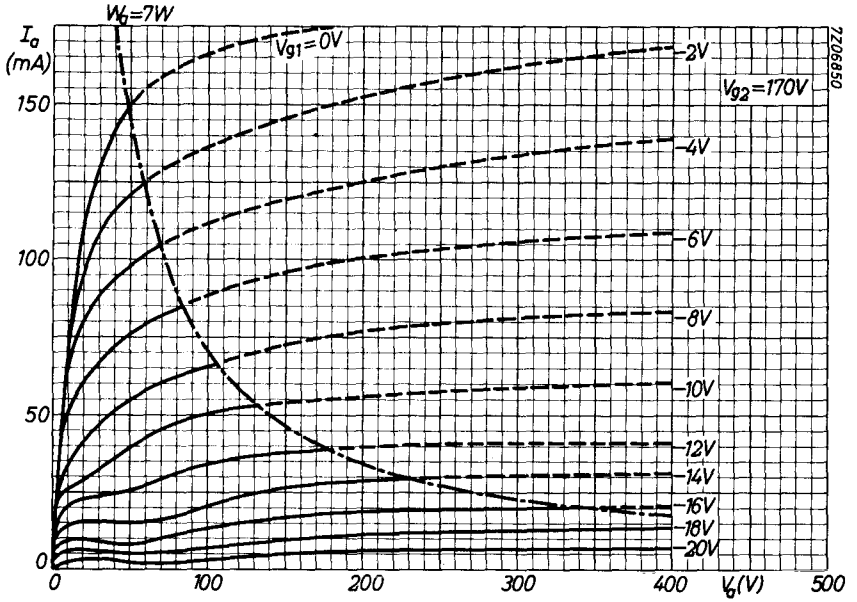
70 mA at V_a = 50 V, V_{g_2} = 170 V, I_f = 280 mA
80 mA at V_a = 50 V, V_{g_2} = 190 V, I_f = 280 mA

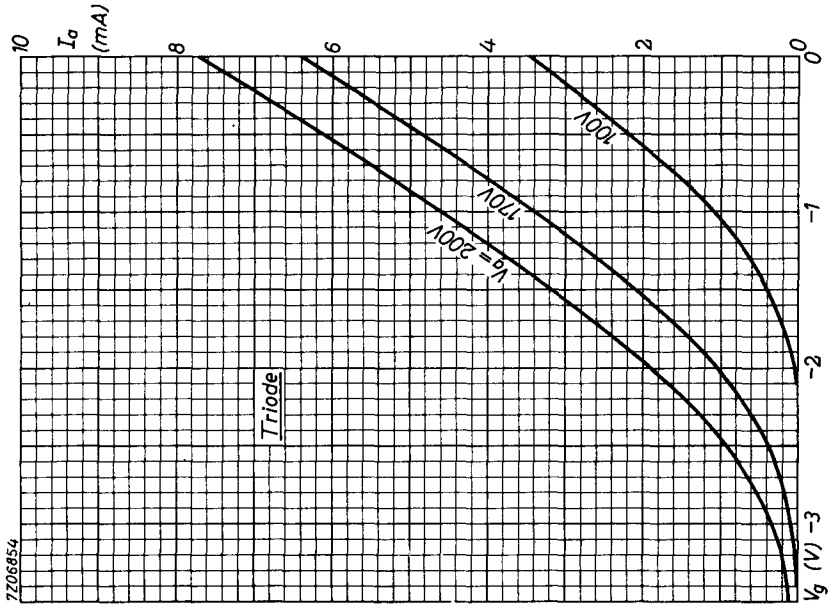
LIMITING VALUES (*Design centre rating system*)

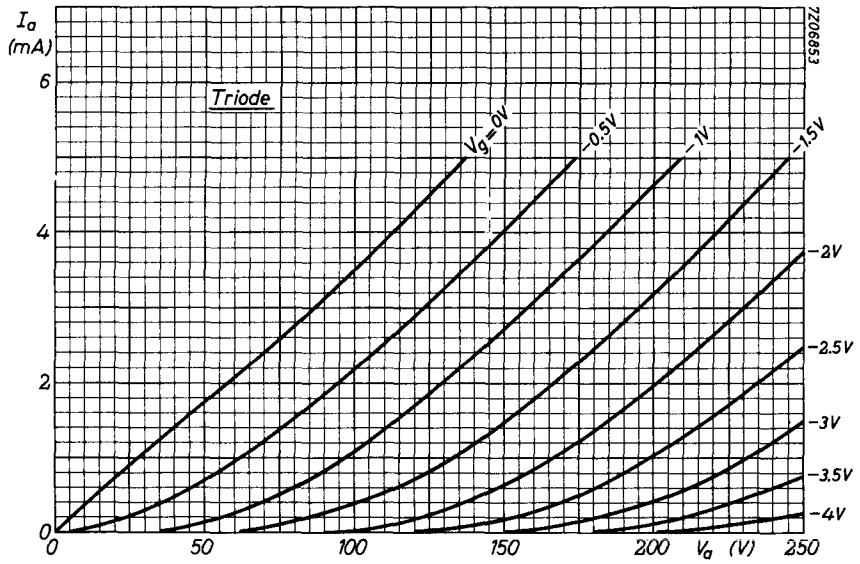
Triode section				
Anode voltage	V_{a_o}	max.	550	V
	V_a	max.	250	V
Anode peak voltage	V_{a_p}	max.	600	V [1]
Anode dissipation	W_a	max.	1	W
Cathode current, average	I_k	max.	15	mA
peak	I_{k_p}	max.	100	mA [1]
Grid resistor, for fixed bias	R_g	max.	1	MΩ
for automatic bias	R_g	max.	3	MΩ
Grid impedance at 50 Hz	Z_g	max.	0.5	MΩ
Cathode to heater voltage	V_{kf}	max.	200	V
Pentode section				
Anode voltage	V_{a_o}	max.	550	V
	V_a	max.	250	V
Anode peak voltage, positive	V_{a_p}	max.	2.5	kV
negative	$-V_{a_p}$	max.	500	V
Grid No.2 voltage	$V_{g_{2o}}$	max.	550	V
	V_{g_2}	max.	250	V
Anode dissipation for frame output application	W_a	max.	5	W
for A.F. output application	W_a	max.	7	W
Grid No.2 dissipation, average	W_{g_2}	max.	1.8	W
average for frame output application (W_a max 4 W)	W_{g_2}	max.	2	W
peak	$W_{g_{2p}}$	max.	3.2	W
Cathode current	I_k	max.	50	mA
Grid No.1 resistor, for fixed bias	R_{g_1}	max.	1	MΩ
for automatic bias	R_{g_1}	max.	2	MΩ
Cathode to heater voltage	V_{kf}	max.	200	V

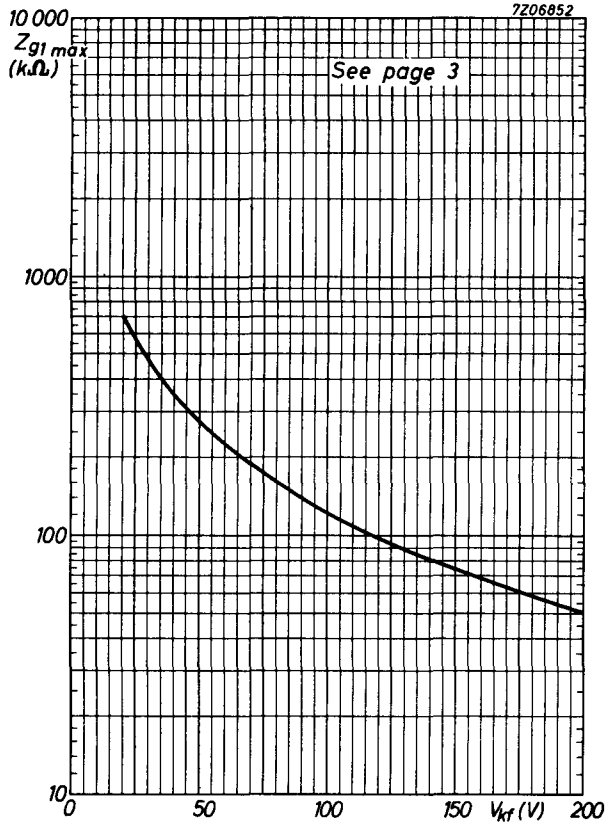
[1]) Max. pulse duration 4% of a cycle with a maximum of 0.8 msec.


I (mA)
250
200
150
100
50
0
0
-10
-20
-30
V_{g1}(V)
I_a
I_{g2}
Pentode
V_a=170V
V_{g2}=170V
7Z06851


W_a=7W
I_a (mA)
150
100
50
0
V_{g1}=0V
-2V
-4V
-6V
-8V
-10V
-12V
-14V
-16V
-18V
-20V
V_{g2}=170V
0
100
200
300
400
500
V_a(V)
7Z06850


I_a (mA)
10
8
6
4
2
0
100V
170V
V_a = 200V
Triode
-1
-2
-3
V_g (V)
ZZ06854


I_a (mA)
6
4
2
0
Triode
V_g=0V
-0.5V
-1V
-1.5V
-2V
-2.5V
-3V
-3.5V
-4V
0
50
100
150
200
250
V_a (V)
ZZ06853


7Z06852
10 000
$Z_{g1\ max}$ (kΩ)
See page 3
1000
100
10
0
50
100
150
V_{kf} (V)
200

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Data handbook

PHILIPS Electronic components and materials

PCL82

page	sheet	date
1	1	1970.01
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3	3	1970.01
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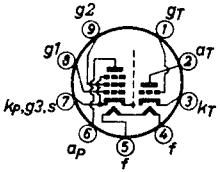
PHILIPS PCL 84

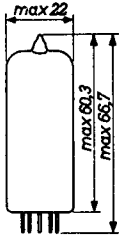
TRIODE-PENTODE with separate cathodes. Triode for use in circuits for keyed A.G.C., sync-separation, sync-amplification and noise suppression. Pentode for use as video output tube
TRIODE PENTHODE avec cathodes séparées. La triode pour utilisation dans circuits pour le C.A.V. verrouillé, pour la séparation de synchronisation, l'amplification de synchronisation et la suppression de bruit. La penthode pour utilisation comme tube de sortie vidéo
TRIODE PENTODE mit getrennten Katoden. Triode zur Verwendung in Schaltungen für getastete Schwundregelung, Synchronisationsabtrennung, Synchronisationsverstärkung und Störunterdrückung. Pentode zur Verwendung als Video-Endröhre

Heating : indirect by A.C. or D.C. series supply
Chauffage: indirect par C.A. ou C.C. alimentation série
Heizung : indirekt durch Wechsel- oder Gleichstrom; Serienspeisung

I_f = 300 mA
V_f = 15 V

Dimensions in mm
Dimensions en mm
Abmessungen in mm





Base, culot, Sockel: NOVAL

Capacitances Capacités Kapazitäten	Triode section Partie triode Triodenteil			Pentode section Partie penthode Pentodenteil		
	C_g	=	4 pF	C_{g1}	=	9 pF
	C_a	=	2,3 pF	C_a	=	4,5 pF
	C_{ag}	=	2,7 pF	C_{ag1}	<	0,1 pF
	C_{gf}	<	0,1 pF	C_{g1f}	<	0,1 pF

Between triode and pentode section
Entre la partie triode et penthode
Zwischen Trioden- und Pentodenteil

C_{aTg1P} < 0,01 pF
C_{gTg1P} < 0,01 pF

TRIODE-PENTODE with separate cathodes. Triode for use in circuits for keyed A.G.C., sync-separation, sync-amplification and noise suppression. Pentode for use as video output tube

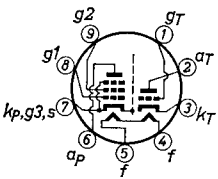
TRIODE PENTHODE avec cathodes séparées. La triode pour utilisation dans circuits pour le C.A.V. verrouillé, pour la séparation de synchronisation, l'amplification de synchronisation et la suppression de bruit. La penthode pour utilisation comme tube de sortie vidéo

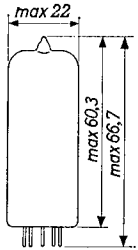
TRIODE PENTODE mit getrennten Katoden. Triode zur Verwendung in Schaltungen für getastete Schwundregelung, Synchronisationsabtrennung, Synchronisationsverstärkung und Störunterdrückung. Pentode zur Verwendung als Video-Endröhre

Heating : indirect by A.C. or D.C. series supply
Chauffage: indirect par C.A. ou C.C. alimentation série
Heizung : indirekt durch Wechsel- oder Gleichstrom; Serienspeisung.

$\frac{I_f = 300\ mA}{V_f = 15\ V}$

Dimensions in mm
Dimensions en mm
Abmessungen in mm





Base, culot, Sockel: NOVAL

Capacitances Capacités Kapazitäten	Triode section Partie triode Triodenteil	Pentode section Partie penthode Pentodenteil
	C_g = 3,8 pF	C_{g1} = 8,7 pF ←
	C_a = 2,3 pF	C_a = 4,2 pF ←
	C_{ag} = 2,7 pF	C_{ag1} < 0,1 pF
	C_{gf} < 0,1 pF	C_{g1f} < 0,1 pF

Between triode and pentode section
Entre la partie triode et penthode
Zwischen Trioden- und Pentodenteil

C_{aTg1P} < 0,01 pF
C_{gTg1P} < 0,01 pF

Typical characteristics of the triode section
Caractéristiques types de la partie triode
Kenndaten des Triodenteils

V_a	=	200 V
V_g	=	-1,7 V
I_a	=	3 mA
S	=	4 mA/V
μ	=	65
$-V_g$ (I_g = +0,3 µA)	=	1,3 V

Typical characteristics of the pentode section
Caractéristiques types de la partie penthode
Kenndaten des Pentodenteils

V_a	=	170	200	220 V
V_{g2}	=	170	200	220 V
V_{g1}	=	-2,1	-2,9	-3,4 V
I_a	=	18	18	18 mA
I_{g2}	=	3,0	3,0	3,0 mA
S	=	11	10,4	10 mA/V
R_i	>	100	130	150 kΩ
μ_{g2g1}	=	36	36	36
$-V_{g1}$ (I_{g1} = +0,3 µA)	<	1,3	1,3	1,3

Operating characteristics of the pentode section as video output tube
Caractéristiques d'utilisation de la partie penthode comme tube de sortie vidéo
Betriebsdaten des Pentodenteils als Video-Endröhre

$V_b = V_{g2}$	=	170	200	220 V
R_a	=	3	3	3 kΩ
V_{g1}	=	-2	-2,8	-3,3 V
I_a	=	18	18	18 mA
I_{g2}	=	3,2	3,1	3,1 mA
S	=	10,4	10,0	9,7 mA/V

Typical characteristics of the triode section
Caractéristiques types de la partie triode
Kenndaten des Triodenteils

V_a	=	200 V
V_g	=	-1,7 V
I_a	=	3 mA
S	=	4 mA/V
μ	=	65
$-V_g$ (I_g = +0,3 µA)	=	1,3 V

Typical characteristics of the pentode section
Caractéristiques types de la partie penthode
Kenndaten des Pentodenteils

V_a	=	170	200	220 V
V_{g2}	=	170	200	220 V
V_{g1}	=	-2,1	-2,9	-3,4 V
I_a	=	18	18	18 mA
I_{g2}	=	3,0	3,0	3,0 mA
S	=	11	10,4	10 mA/V
R_i	>	100	130	150 kΩ
μ_{g2g1}	=	36	36	36
$-V_{g1}$ (I_{g1} = +0,3 µA)	<	1,3	1,3	1,3

Operating characteristics of the pentode section as video output tube
Caractéristiques d'utilisation de la partie penthode comme tube de sortie vidéo
Betriebsdaten des Pentodenteils als Video-Endröhre

$V_b = V_{g2}$	=	170	200	220 V
R_a	=	3	3	3 kΩ
V_{g1}	=	-2	-2,8	-3,3 V
I_a	=	18	18	18 mA
I_{g2}	=	3,2	3,1	3,1 mA
S	=	10,4	10,0	9,7 mA/V

→

Limiting values of the pentode section
Caractéristiques limites de la partie penthode
Grenzdaten des Pentodenteils

V_{a_o}	= max.	550 V
V_a	= max.	250 V
W_a	= max.	4 W
V_{g2_o}	= max.	550 V
V_{g2}	= max.	250 V
W_{g2}	= max.	1,7 W
I_k	= max.	40 mA
R_{g1}	= max.	1 MΩ [1]
R_{g1}	= max.	2 MΩ [2]
V_{kf}	= max.	200 V
R_{kf}	= max.	20 kΩ

Limiting values of the triode section
Caractéristiques limites de la partie triode
Grenzdaten des Triodenteils

V_{a_o}	= max.	550 V
V_a	= max.	250 V
V_{a_p}	= max.	400 V
W_a	= max.	1 W
I_k	= max.	12 mA
R_g	= max.	1 MΩ [1]
R_g	= max.	3 MΩ [2]
V_{kf} (k neg.; f pos.)	= max.	150 V
V_{kf} (k pos.; f neg.)	= max.	200 $V_=$ + 150 V_{eff}
R_{kf}	= max.	20 kΩ

---

[1] Fixed bias
Polarisation fixe
Feste Vorspannung

[2] Automatic bias
Polarisation automatique
Automatische Vorspannung

Limiting values of the pentode section
Caractéristiques limites de la partie penthode
Grenzdaten des Pentodenteils

V_{a_o}	= max.	550 V
V_a	= max.	250 V
W_a	= max.	4 W
V_{g2_o}	= max.	550 V
V_{g2}	= max.	250 V
W_{g2}	= max.	1,7 W
I_k	= max.	40 mA
R_{g1}	= max.	1 MΩ [1])
R_{g1}	= max.	2 MΩ [2])
V_{kf}	= max.	200 V
R_{kf}	= max.	20 kΩ

Limiting values of the triode section
Caractéristiques limites de la partie triode
Grenzdaten des Triodenteils

V_{a_o}	= max.	± 550 V
V_a	= max.	± 250 V
V_{a_p} (I_a < 0,1 mA)	= max.	600 V [3])
W_a	= max.	1 W
I_k	= max.	12 mA
R_g	= max.	1 MΩ [1])
R_g	= max.	3 MΩ [2])
V_{kf} (k neg.; f pos.)	= max.	150 V
V_{kf} (k pos.; f neg.)	= max.	200 V= +150 Veff
R_{kf}	= max.	20 kΩ

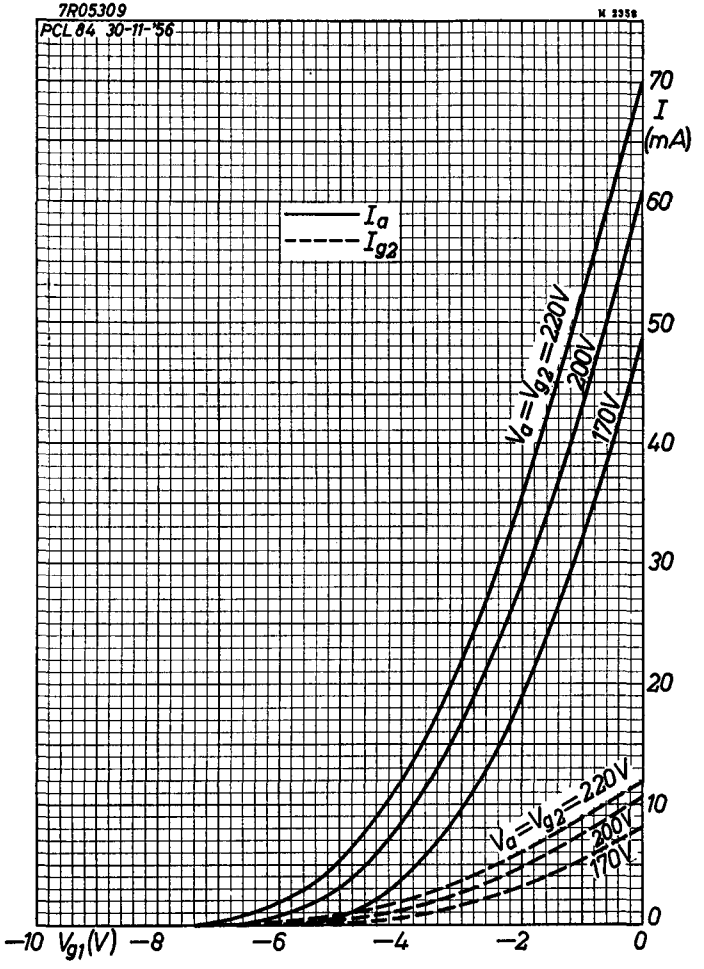
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[1]) Fixed bias
Polarisation fixe
Feste Vorspannung

[2]) Automatic bias
Polarisation automatique
Automatische Vorspannung

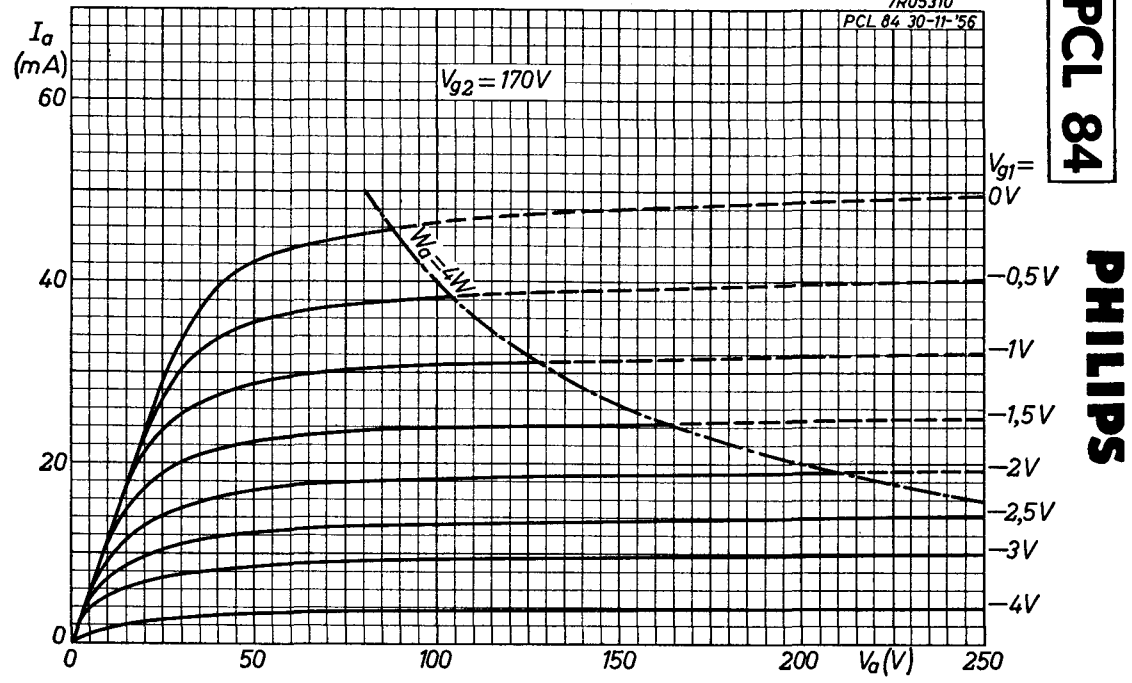
[3]) Max. pulse duration 18% of a cycle with a maximum of 18 µsec
Durée de l'impulsion max. 18% d'un cycle avec un maximum de 18 µsec
Impulszeit max. 18 % einer Periode mit einem Maximum von 18 µsec

PHILIPS PCL 84



3.3.1957

A



PCL 84

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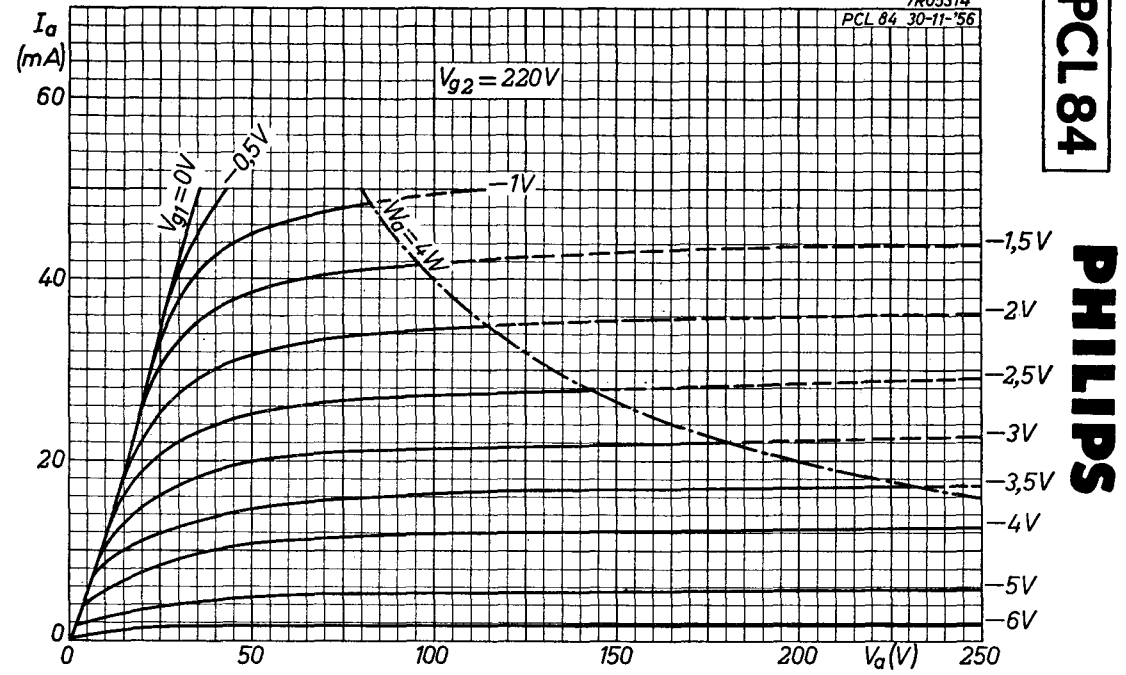
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PCL84

3.3.1957

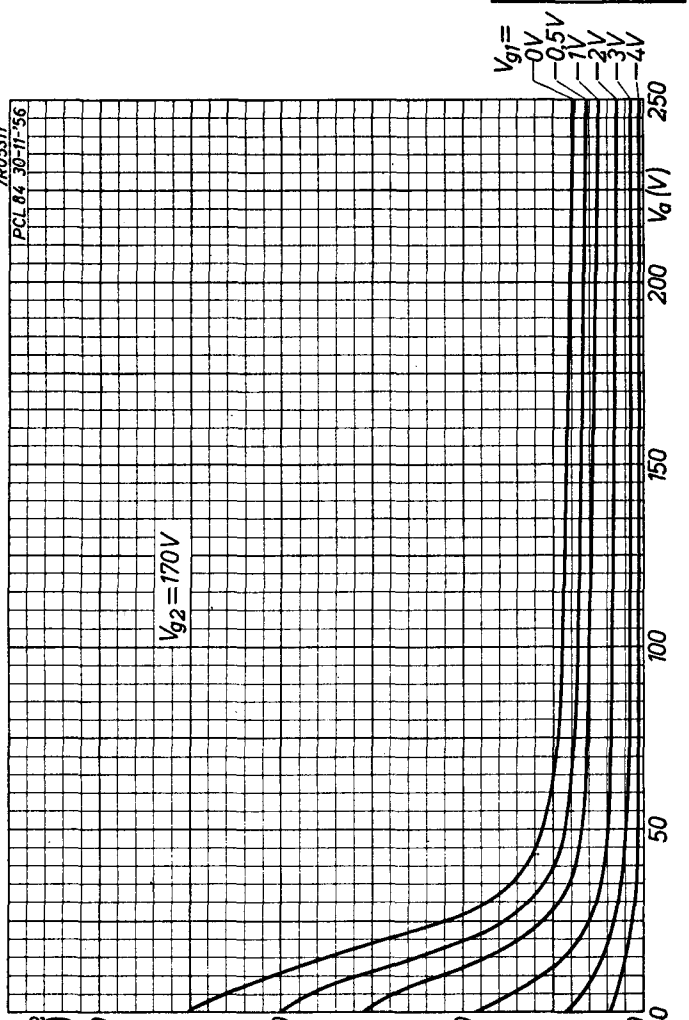
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PCL 84

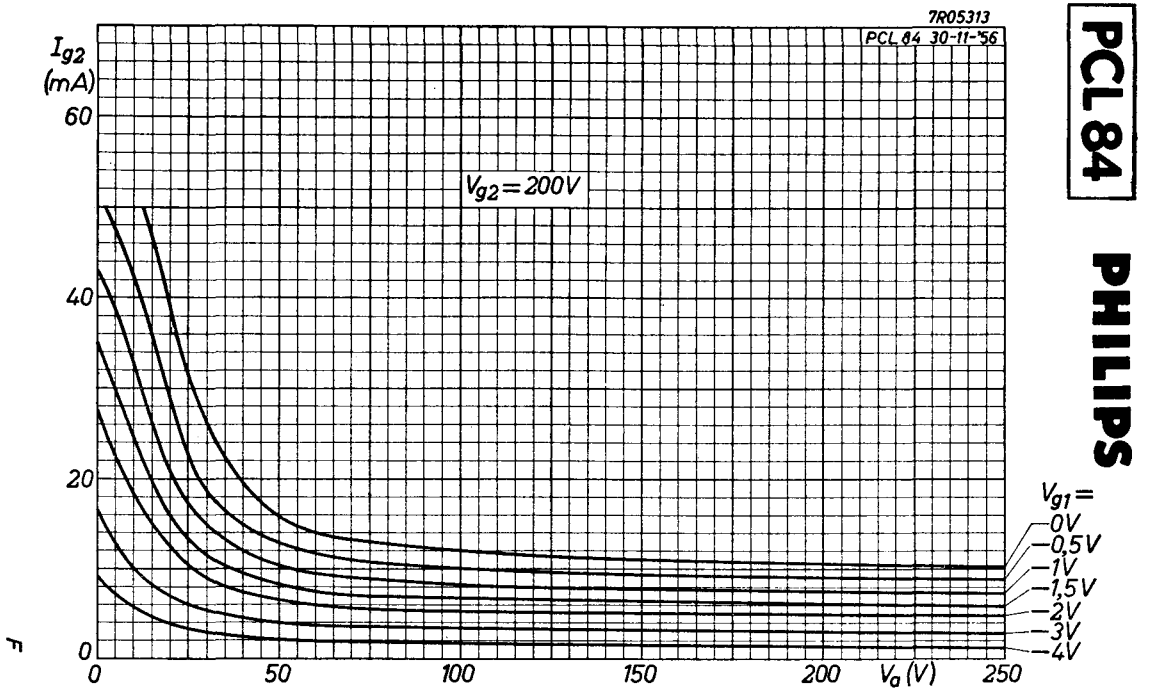
PHILIPS

PHILIPS PCL 84



3.3.1957

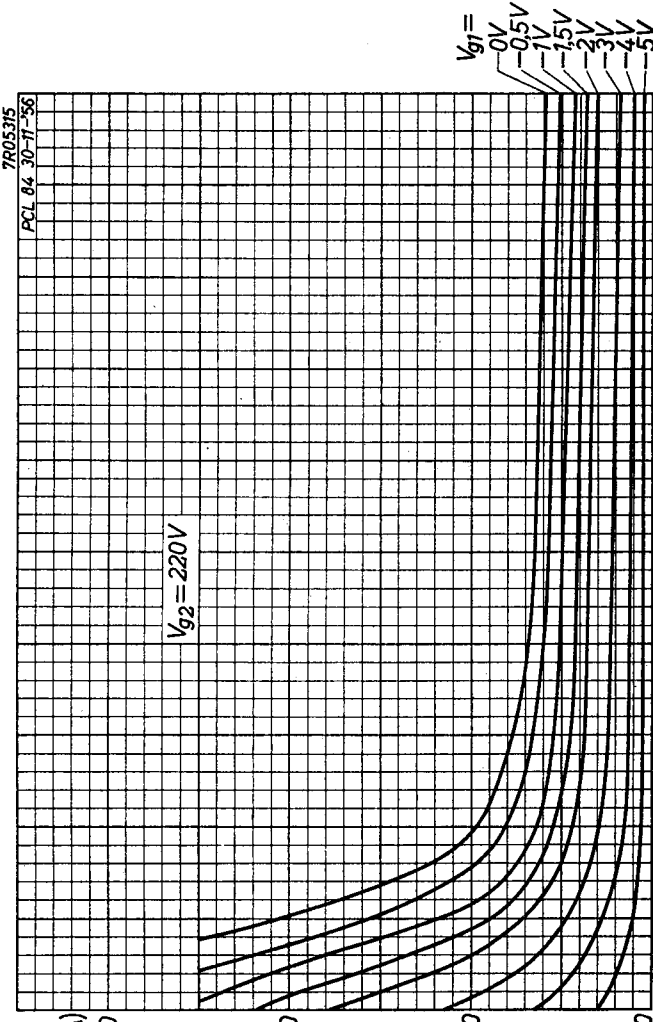
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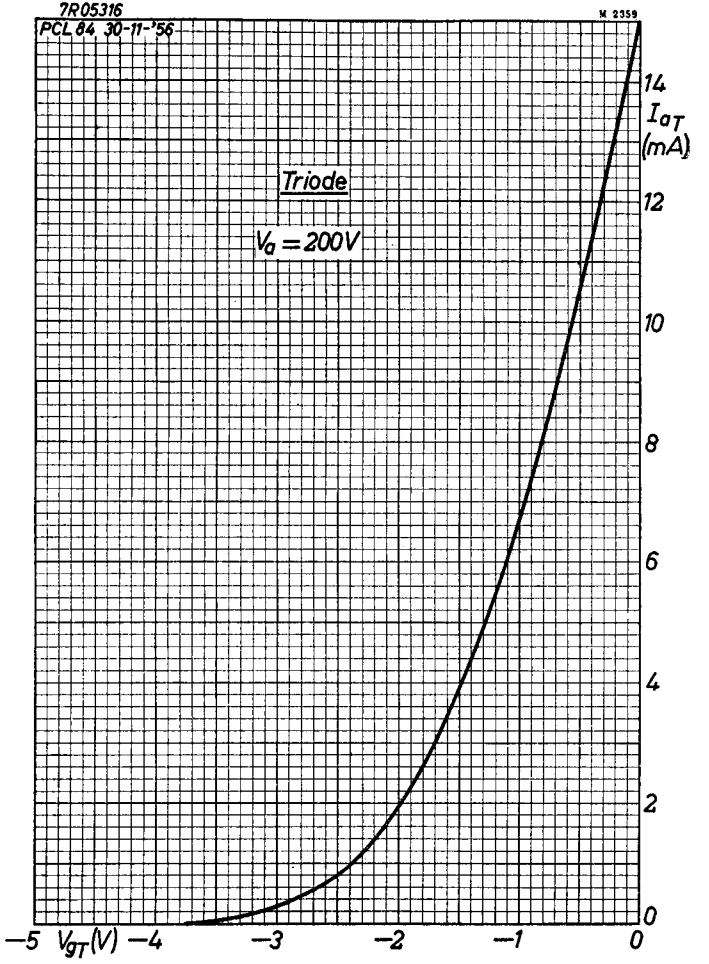
PCL 84

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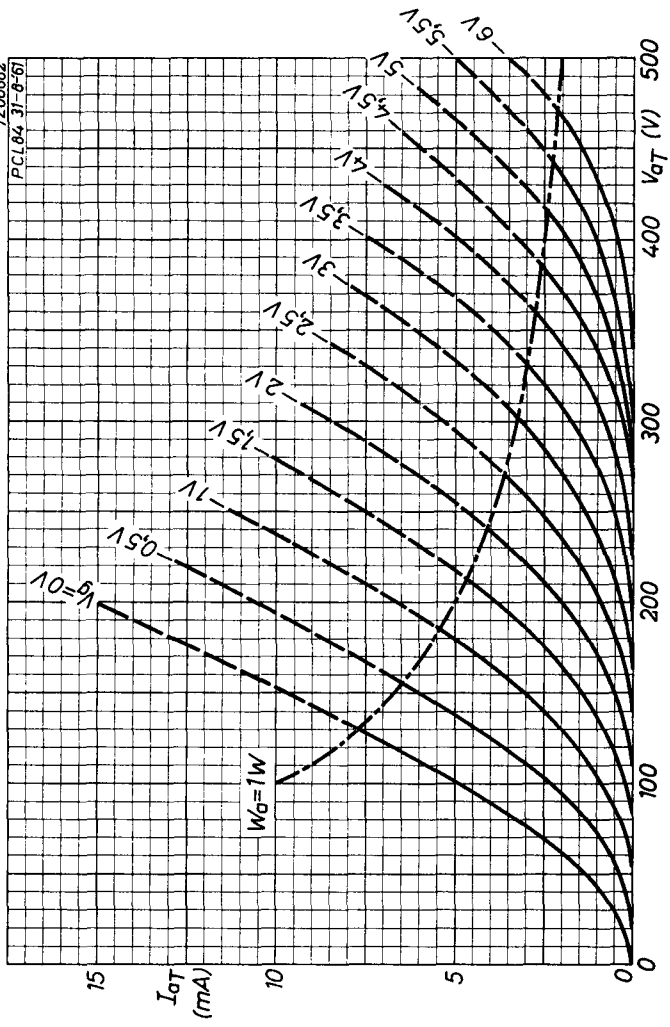
F


7R05315
PCL 84 30-11-56
V_{g1} =
0V
−0,5V
−1V
−1,5V
−2V
−3V
−4V
−5V
V_{g2} = 220V
I_{g2} (mA)
60
40
20
0
V_a (V)
250
200
150
100
50
0

PCL 84 PHILIPS



H


7200682
PCL84 31-8-61
6V
5,5V
5V
4,5V
4V
3,5V
3V
2,5V
2V
1,5V
1V
0,5V
Vg=0V
Wa=1W
0
100
200
300
400
500
VaT (V)
0
5
10
15
IaT (mA)



PCL84

page	sheet	date
1	1	1958.01.01
2	1	1959.02.02
3	2	1958.01.01
4	2	1959.02.02
5	3	1957.03.03
6	3	1958.01.01
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8	B	1957.03.03
9	C	1957.03.03
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11	E	1957.03.03
12	F	1957.03.03
13	G	1957.03.03
14	H	1957.03.03
15	I	1961.07.07
16	FP	2000.04.29

TRIODE-FRAME OUTPUT PENTODE

Triode-pentode with separate cathodes. Triode intended for use as frame oscillator or pulse amplifier.
Pentode intended for use as frame output tube.

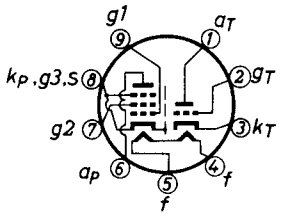
QUICK REFERENCE DATA				
Triode section				
Anode current	I_a		10.5	mA
Transconductance	S		7	mA/V
Amplification factor	μ		63	-
Cathode peak current	I_{kp}	max.	150	mA
Pentode section				
Anode peak voltage	V_{ap}	max.	2	kV
Cathode current	I_k	max.	75	mA
Anode dissipation	W_a	max.	8	W

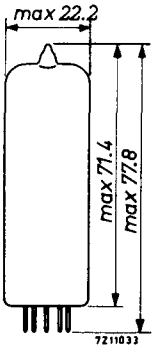
HEATING: Indirect by A.C. or D.C.; series supply

Heater current	I_f	300	mA
Heater voltage	V_f	17.5	V

DIMENSIONS AND CONNECTIONS Dimensions in mm

Base: Noval





CAPACITANCES

Grid triode to anode pentode	$C_{g_T a_P}$	max.	0.05	pF
Grid triode to heater	$C_{g_T f}$	max.	0.15	pF
Grid No.1 pentode to anode pentode	$C_{g_{1P} a_P}$	max.	1.0	pF
Grid No.1 pentode to anode triode	$C_{g_{1P} a_T}$	max.	0.08	pF
Grid No.1 pentode to heater	$C_{g_{1P} f}$	max.	0.20	pF

TYPICAL CHARACTERISTICS

Triode section

Anode voltage	V_a	100	100	V
Grid voltage	V_g	-0.85	0	V
Anode current	I_a	5	10.5	mA
Transconductance	S	5.5	7.0	mA/V
Amplification factor	μ	60	63	-
Internal resistance	R_i	11	9	kΩ

OPERATING CHARACTERISTICS

Pentode section

Frame output application

Anode voltage	V_a	50	65	V
Grid No.2 voltage	V_{g_2}	170	210	V
Grid No.1 voltage	V_{g_1}	-1	-1	V
Anode peak current	I_{a_p}	200	285	mA
Grid No.2 peak current	$I_{g_{2p}}$	35	45	mA

Remarks

The minimum I_{a_p} value to be expected as a result of spread of the tube characteristics, tube deterioration during life and decrease of the mains voltage to 10% below the nominal value, can be derived from the curves on page 9 by decreasing by 40% the I_a values of curve A-B at the V_{g_2} value occuring at the decreased mains voltage.

In order not to exceed the maximum permissible value of W_{g_2}, the circuit should be designed such that at a mains voltage of 10% below nominal, V_a at the end of scan will not be lower than the value determined by curve A-B at the relevant V_{g_2} value.

HUM

The equivalent pentode grid hum voltage without negative feedback is max. 10 mV when Z_{g_1} (at f = 50 Hz) ≦ 0.5 MΩ, C_{g_1-f} = 0.2 pF and V_{kf} = 150 V_{RMS}.

LIMITING VALUES (Design centre rating system)

Triode section

Anode voltage	V_{a_o}	max.	550	V
	V_a	max.	300	V
Anode dissipation	W_a	max.	0.5	W
Cathode current				
average	I_k	max.	15	mA
peak	I_{k_p}	max.	150	mA [1]
peak	I_{k_p}	max.	100	mA [2]
Grid resistor				
for fixed bias	R_g	max.	1	MΩ
for automatic bias	R_g	max.	3.3	MΩ
Cathode to heater voltage	V_{kf}	max.	200	V [3]

Remark

A cathode peak current of 100 mA will be available throughout life and at under-heating.

---

[1]) Max. pulse duration 2% of a cycle with a maximum of 400 μsec.

[2]) Max. pulse duration 4% of a cycle with a maximum of 800 μsec.

[3]) During warming up the D.C. component of V_{kf} = max. 315 V, k pos.

LIMITING VALUES (continued)

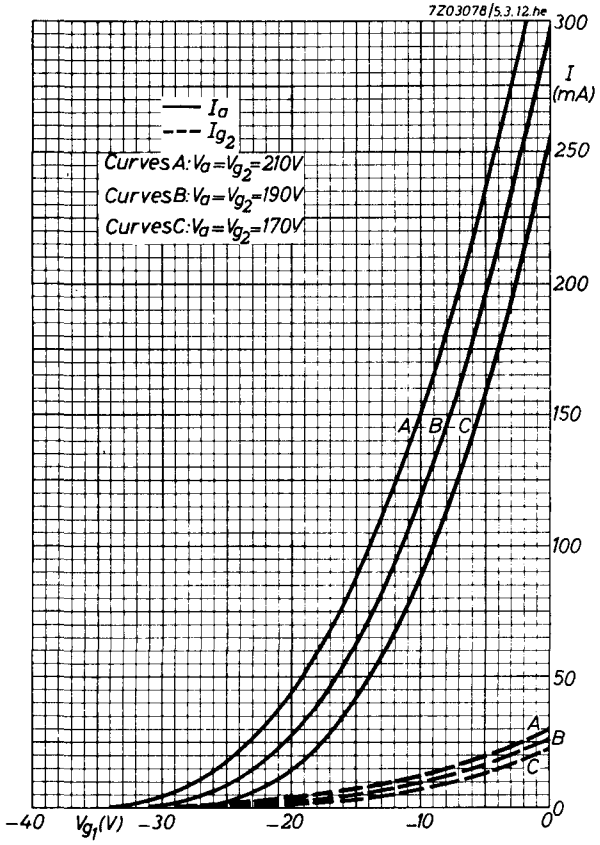
Pentode section

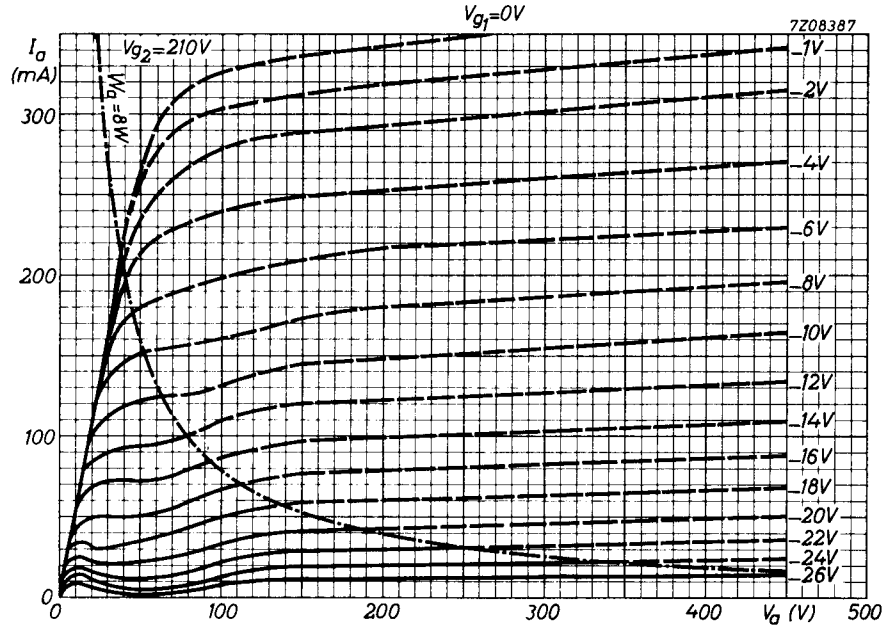
Anode voltage	V_{a_o}	max.	550	V
	V_a	max.	300	V
Anode peak voltage	V_{a_p}	max.	2	kV[1])
Grid No.2 voltage	$V_{g_{2o}}$	max.	550	V
	V_{g_2}	max.	250	V
Anode dissipation	W_a	max.	8	W [2])
Grid No.2 dissipation	W_{g_2}	max.	1.5	W [3])
Cathode current	I_k	max.	75	mA
Grid No.1 resistor				
for fixed bias	R_{g_1}	max.	1.0	MΩ
for automatic bias	R_{g_1}	max.	2.2	MΩ
Cathode to heater voltage	V_{kf}	max.	200	V

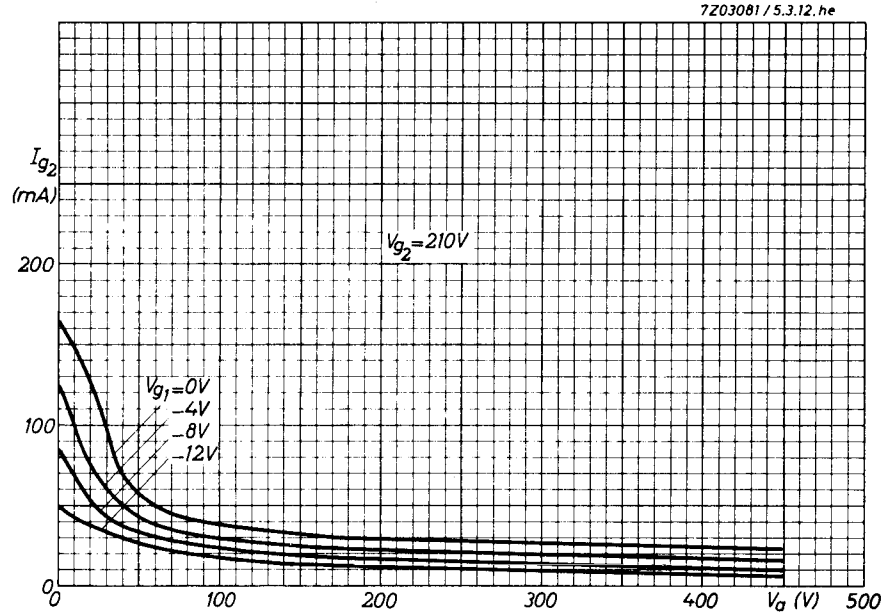
[1]) Max. pulse duration 5% of a cycle with a maximum of 1 ms.

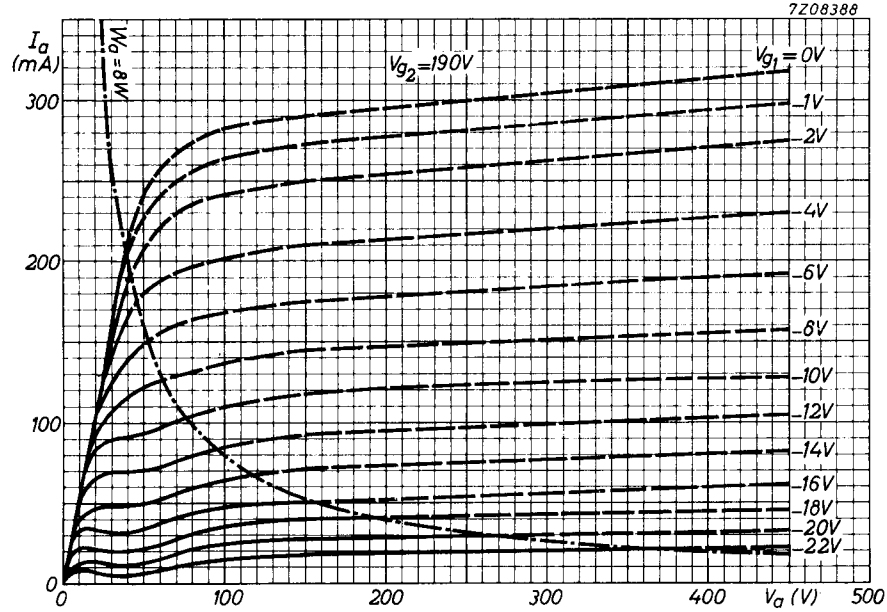
[2]) For a nominal tube at the worst probable operating conditions and at normal picture height W_a should not exceed 10.5 W.

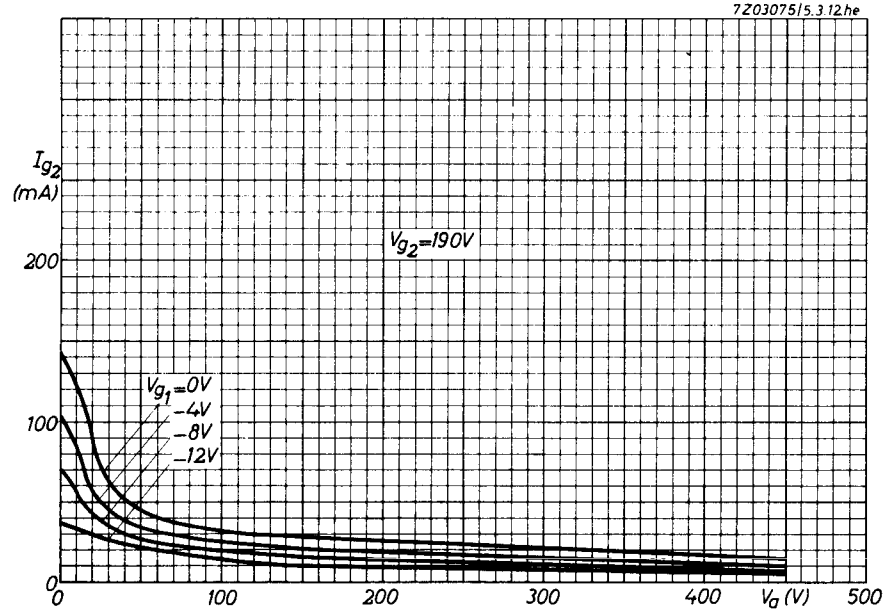
[3]) For a nominal tube at the worst probable operating conditions and at normal picture height W_{g_2} should not exceed 2 W.

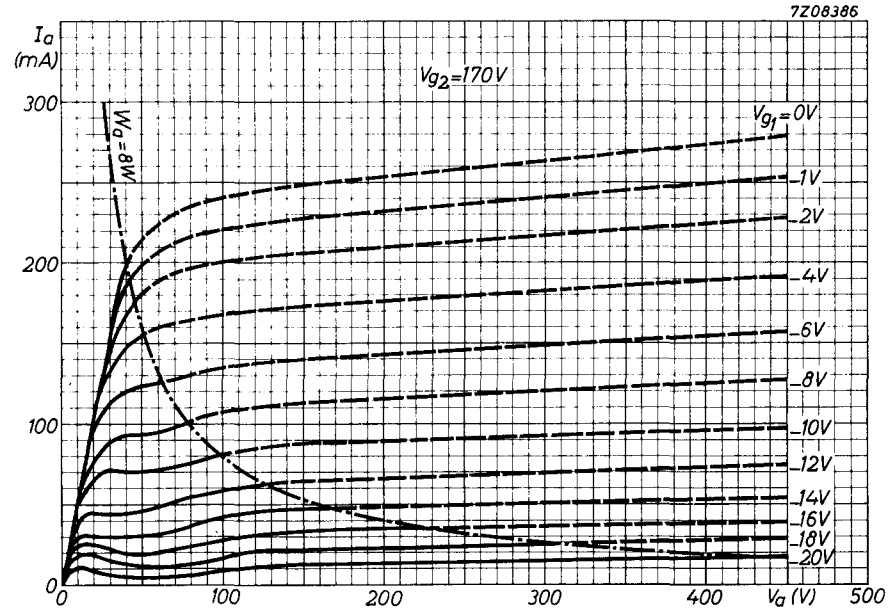

7Z03078/5.3.12.he
300
I
(mA)
250
200
150
100
50
0
—— I_a
--- I_{g_2}
Curves A: $V_a = V_{g_2} = 210V$
Curves B: $V_a = V_{g_2} = 190V$
Curves C: $V_a = V_{g_2} = 170V$
A
B
C
A
B
C
−40
V_{g_1}(V)
−30
−20
−10
0

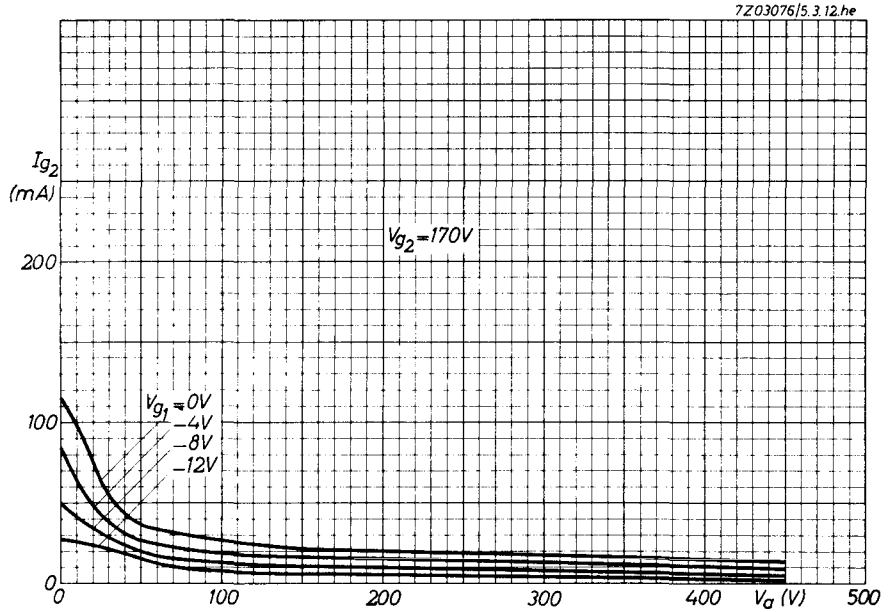

V_{g_1}=0V
7Z08387
I_a (mA)
V_{g_2}=210V
W_a=8W
-1V
-2V
-4V
-6V
-8V
-10V
-12V
-14V
-16V
-18V
-20V
-22V
-24V
-26V
300
200
100
0
0
100
200
300
400
V_a (V)
500

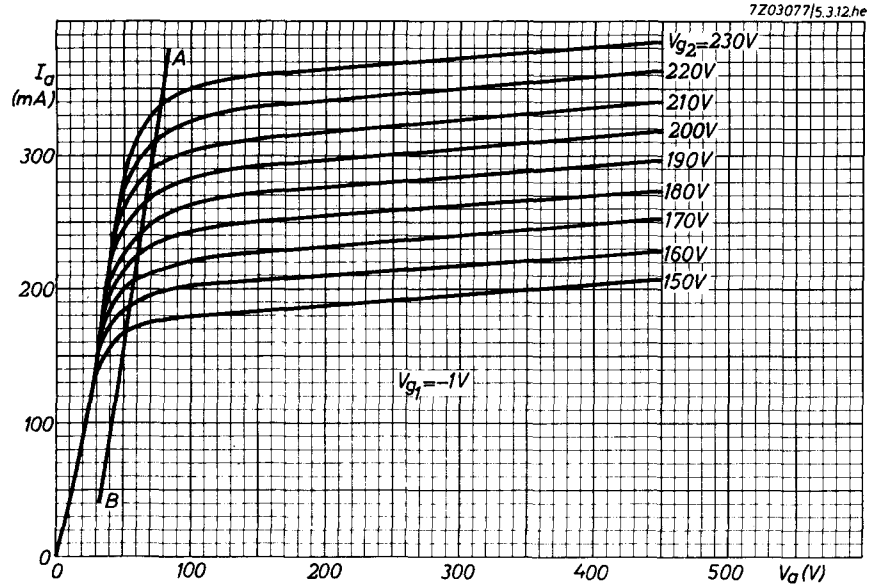

7Z03081 / 5.3.12.he
I_{g_2} (mA)
V_{g_2}=210V
V_{g_1}=0V
-4V
-8V
-12V
200
100
0
0
100
200
300
400
V_a (V)
500

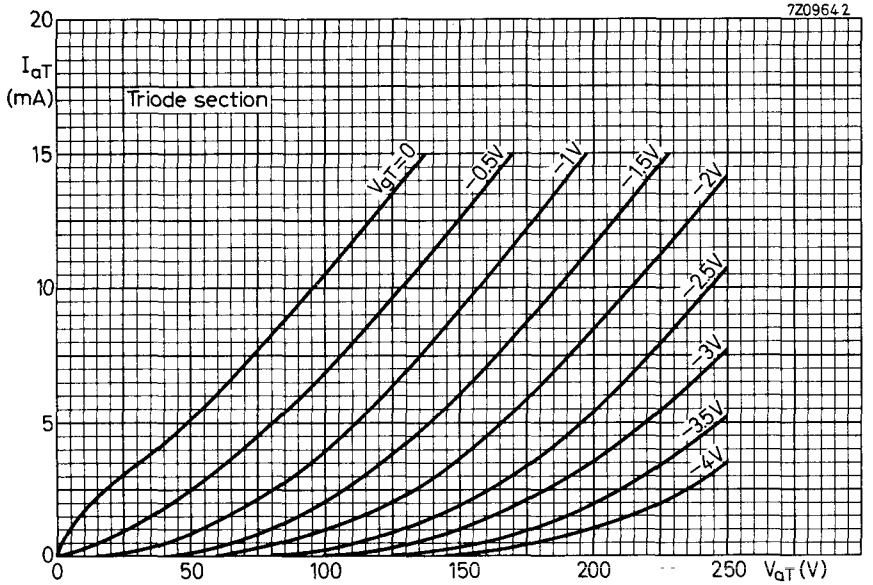

7Z08388
I_a (mA)
V_{g_2}=190V
V_{g_1}=0V
-1V
-2V
-4V
-6V
-8V
-10V
-12V
-14V
-16V
-18V
-20V
-22V
V_a=8W
300
200
100
0
0
100
200
300
400
V_a (V)
500

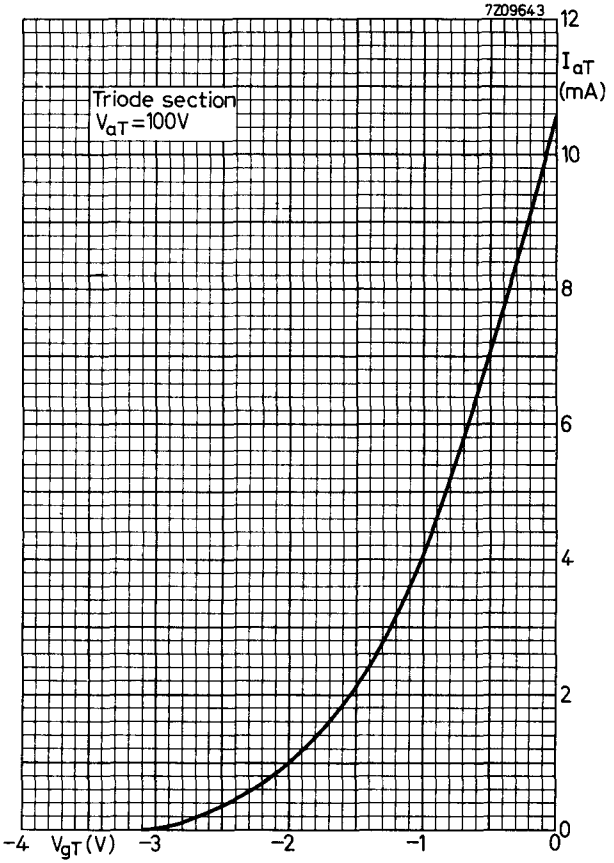

7Z03075/5.3.12he
I_{g_2} (mA)
V_{g_2}=190V
V_{g_1}=0V
-4V
-8V
-12V
200
100
0
0
100
200
300
400
V_a (V)
500


7Z08386
I_a (mA)
V_{g_2}=170V
V_{g_1}=0V
-1V
-2V
-4V
-6V
-8V
-10V
-12V
-14V
-16V
-18V
-20V
V_a=8W
300
200
100
0
0
100
200
300
400
V_a (V)
500


7Z03076/5.3.12.he
I_{g_2} (mA)
V_{g_2}=170V
V_{g_1}=0V
-4V
-8V
-12V
200
100
0
0
100
200
300
400
V_a (V)
500


7Z03077/5.3.12.he
I_a (mA)
300
200
100
0
A
B
V_{g_2}=230V
220V
210V
200V
190V
180V
170V
160V
150V
V_{g_1}=-1V
0
100
200
300
400
500
V_a (V)


7Z09642
20
I_{aT} (mA)
Triode section
15
10
5
0
V_{aT}=0
-0.5V
-1V
-1.5V
-2V
-2.5V
-3V
-3.5V
-4V
0
50
100
150
200
250
V_{aT} (V)


7Z09643
Triode section
V_{aT}=100V
I_{aT}
(mA)
12
10
8
6
4
2
0
−4
V_{gT}(V)
−3
−2
−1
0

PHILIPS

Data handbook

PHILIPS Electronic components and materials

PCL85 PCL805

page	sheet	date
1	1	1969.12
2	2	1969.01
3	3	1968.09
4	4	1968.09
5	5	1968.09
6	6	1968.09
7	7	1968.09
8	8	1968.09
9	9	1968.09
10	10	1968.09
11	FP	1999.08.02

TRIODE-OUTPUT PENTODE

Triode-pentode with separate cathodes.
The triode section is intended for use as A.F. amplifier.
The pentode section is intended for use as A.F. power amplifier.

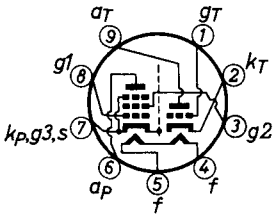
QUICK REFERENCE DATA			
Triode section			
Anode current	I_a	1.2	mA
Transconductance	S	1.6	mA/V
Amplification factor	μ	100	-
Pentode section			
Anode current	I_a	39	mA
Transconductance	S	10.5	mA/V
Amplification factor	$\mu_{g_2g_1}$	21	-
Output power	W_o	4.1	W

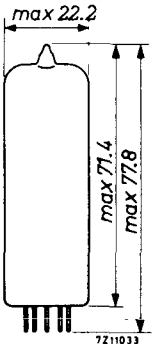
HEATING: Indirect by A.C. or D.C.; series supply

Heater current	I_f	300	mA
Heater voltage	V_f	13.3	V

DIMENSIONS AND CONNECTIONS Dimensions in mm

Base: Noval





CAPACITANCES

Triode section			
Anode to all except grid	$C_{a(g)}$	2.5	pF
Grid to all except anode	$C_{g(a)}$	2.3	pF
Anode to grid	C_{ag}	1.4	pF
Grid to heater	C_{gf}	max. 0.006	pF
Pentode section			
Grid No.1 to all except anode	$C_{g_1(a)}$	10	pF
Anode to grid No.1	C_{ag_1}	max. 0.4	pF
Grid No.1 to heater	C_{g_1f}	max. 0.24	pF
Between triode and pentode sections			
Anode triode to grid No.1 pentode	$C_{a_Tg_{1P}}$	max. 0.2	pF
Grid triode to grid No.1 pentode	$C_{g_Tg_{1P}}$	max. 0.02	pF
Anode triode to anode pentode	$C_{a_Ta_P}$	max. 0.15	pF
Grid triode to anode pentode	$C_{g_Ta_P}$	max. 0.006	pF [1]

TYPICAL CHARACTERISTICS

Triode section			
Anode voltage	V_a	230	V
Grid voltage	V_g	-1.7	V
Anode current	I_a	1.2	mA
Transconductance	S	1.6	mA/V
Amplification factor	μ	100	
Pentode section			
Anode voltage	V_a	230	V
Grid No.2 voltage	V_{g_2}	230	V
Grid No.1 voltage	V_{g_1}	-5.7	V
Anode current	I_a	39	mA
Grid No.2 current	I_{g_2}	6.5	nA
Transconductance	S	10.5	mA/V
Amplification factor	$\mu_{g_2g_1}$	21	
Internal resistance	R_i	45	kΩ

[1] The capacitance between triode grid and pentode anode ($C_{g_T\text{-}a_P}$) can be reduced to a value of less than 0.002 pF by using a shielding ring with a diameter of 22.5 mm and a height of 15 mm with respect to the tube base.

OPERATING CHARACTERISTICS

Triode section

A.F. amplifier

Supply voltage	V_b	200	230	200	230	V
Cathode resistor	R_k	0	0	2.6	2.1	kΩ
Anode resistor	R_a	220	220	220	220	kΩ
Grid resistor	R_g	10	10	-	-	MΩ
Grid resistor of following stage	R_g'	680	680	680	680	kΩ
Signal source resistance	R_s	47	47	-	-	kΩ
Anode current	I_a	0.42	0.52	0.42	0.52	mA
Output voltage	V_o	3.2	3.2	3.2	3.2	V_{RMS}
Voltage gain	V_o/V_i	66	68	66	68	
Distortion	d_{tot}	0.6	0.5	0.6	0.5	%

Microphony

The triode section can be used without special precautions against microphonic effect in circuits in which an output of 50 mW is obtained at an input voltage of not less than 10 mV_{RMS}.

Hum

The hum level will be better than 60 dB under the following conditions;
Input voltage minimum 10 mV_{RMS} for 50 mW output.
Grid circuit impedance max. 0.5 MΩ at 50 Hz.
Cathode decoupling capacitor minimum 100 μF.
Pin 4 connected to earth.
A.C. voltage between pin 4 and cathode max. 30 V_{RMS}.

OPERATING CHARACTERISTICS

Pentode section

Class A (Measured with V_k constant)

Anode voltage	V_a		200			230			V
Grid No. 2 voltage	V_{g_2}		200			230			V
Cathode resistor	R_k		115			125			Ω
(Grid No. 1 voltage)	V_{g_1}		-4.7			-5.7			V)
Load resistance	$R_{a\sim}$		5.6			5.1			kΩ
Grid No. 1 driving voltage	V_i	0	0.32	3.2	0	0.34	3.6	V_{RMS}	
Anode current	I_a	35	-	34	39	-	40.7	mA	
Grid No. 2 current	I_{g_2}	6.0	-	9.0	6.5	-	10.5	mA	
Output power	W_o	0	0.05	3.1	0	0.05	4.1	W	
Distortion	d_{tot}	-	0.9	10	-	0.9	10	%	

LIMITING VALUES (Design centre rating system)

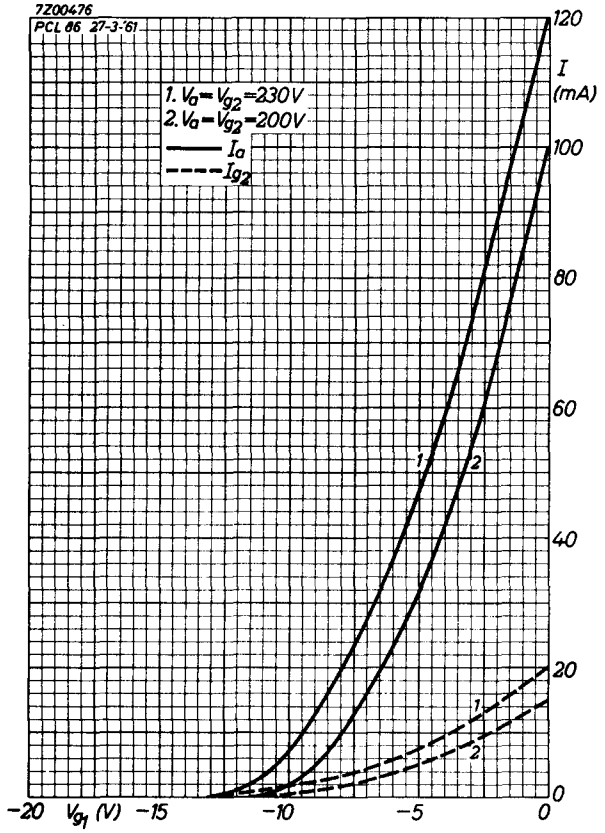
Triode section

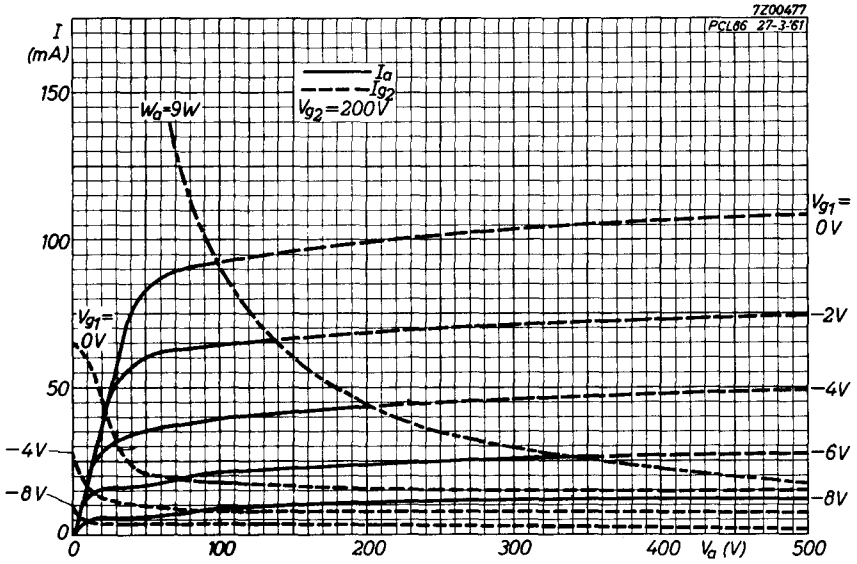
Anode voltage	V_{a_o}	max.	550	V
	V_a	max.	300	V
Anode dissipation	W_a	max.	0.5	W
Cathode current	I_k	max.	4	mA
Grid resistor	R_g	max.	1	MΩ [1])
Cathode to heater voltage	V_{kf}	max.	100	V

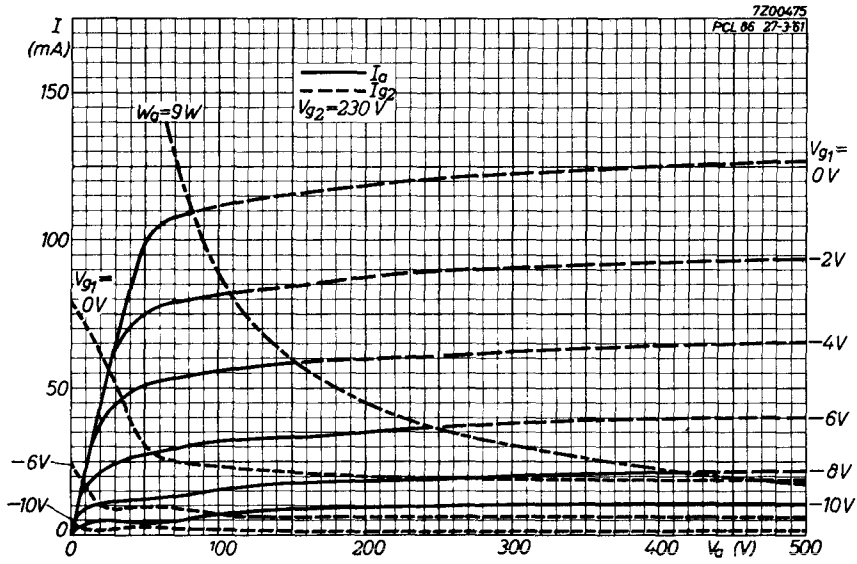
Pentode section

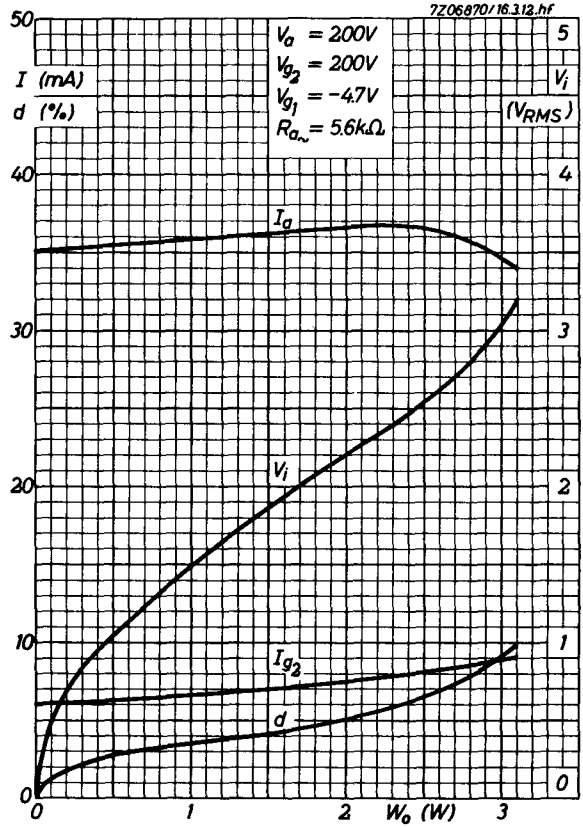
Anode voltage	V_{a_o}	max.	550	V
	V_a	max.	300	V
Grid No. 2 voltage	$V_{g_{2o}}$	max.	550	V
	V_{g_2}	max.	300	V
Anode dissipation	W_a	max.	9	W
Grid No. 2 dissipation, average	W_{g_2}	max.	1.8	W
peak	$W_{g_{2p}}$	max.	3.25	W
Cathode current	I_k	max.	55	mA
Grid No. 1 resistor, for automatic bias	R_{g_1}	max.	1	MΩ
Cathode to heater voltage	V_{kf}	max.	100	V

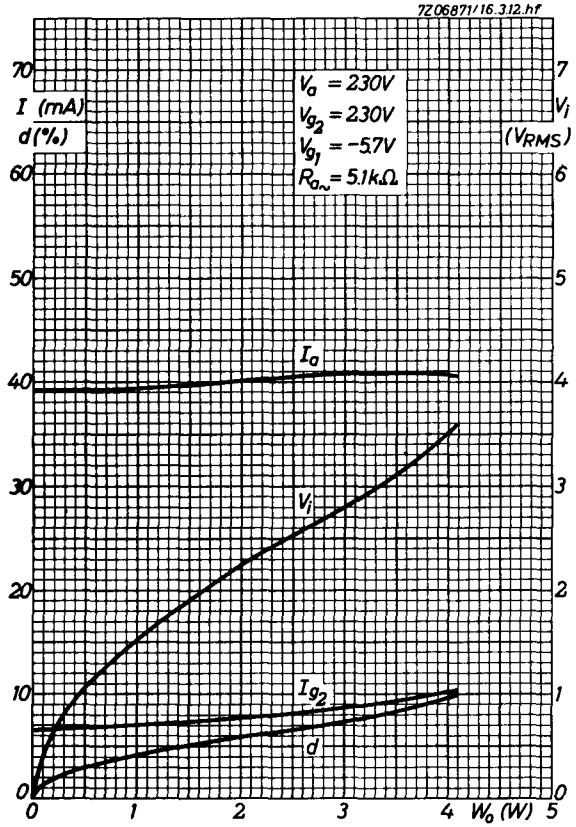
[1]) This value applies to operation with fixed bias. It may be multiplied by the D.C. inverse feedback factor resulting from e.g. cathode or anode resistors to a maximum of 10 MΩ.

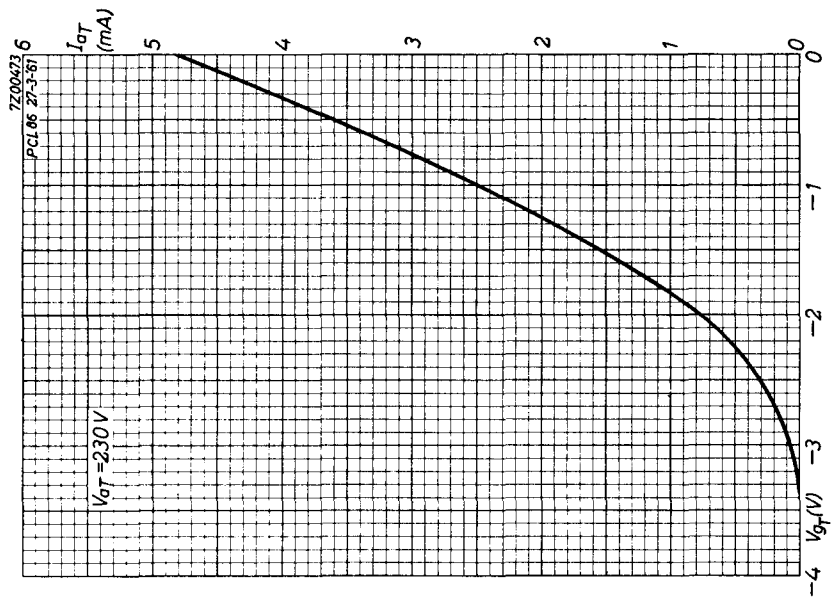

7Z00476
PCL 86 27-3-'61
1. $V_a = V_{g2}$ = 230 V
2. $V_a = V_{g2}$ = 200 V
I_a
I_{g_2}
120
I
(mA)
100
80
60
40
20
0
1
2
1
2
−20
V_{g_1} (V)
−15
−10
−5
0

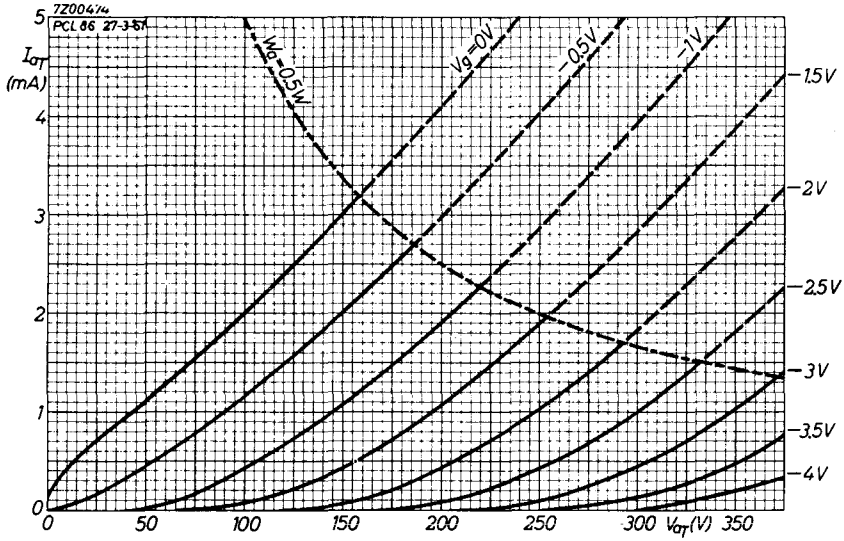

7Z00477
PCL86 27-3-'61
I (mA)
150
100
50
0
I_a
I_{g2}
V_{g2}=200V
W_a=9W
V_{g1}= 0V
V_{g1}= 0V
-2V
-4V
-6V
-8V
-4V
-8V
0
100
200
300
400
V_a (V)
500


7Z00475
PCL 86 27-3-'61
I (mA)
150
100
50
0
I_a
I_{g2}
V_{g2}=230V
W_a=9W
V_{g1}= 0V
V_{g1}= 0V
-2V
-4V
-6V
-8V
-10V
-6V
-10V
0
100
200
300
400
V_a (V)
500


7Z06870/16.3.12.hf
V_a = 200V
V_{g_2} = 200V
V_{g_1} = −4.7V
$R_{a\sim}$ = 5.6kΩ
I (mA)
d (%)
V_i (V_{RMS})
I_a
V_i
I_{g_2}
d
W_o (W)
50
40
30
20
10
0
5
4
3
2
1
0
0
1
2
3


7Z06871/16.312.hf
V_a = 230V
V_{g_2} = 230V
V_{g_1} = −5.7V
$R_{a\sim}$ = 5.1kΩ
I (mA)
d(%)
V_i (VRMS)
I_a
V_i
I_{g_2}
d
W_o (W)
0
10
20
30
40
50
60
70
1
2
3
4
5
6
7


7Z00473
PCL 86 27-3-67
I_{aT} (mA)
6
5
4
3
2
1
0
0
−1
−2
−3
−4
V_{gT}(V)
V_{aT}=230 V


7Z00474
PCL 86 27-3-67
I_{aT} (mA)
5
4
3
2
1
0
W_a=0,5 W
V_g=0V
−0,5V
−1V
−1,5V
−2V
−2,5V
−3V
−3,5V
−4V
0
50
100
150
200
250
300
350
V_{aT}(V)

PHILIPS

Data handbook

PHILIPS Electronic components and materials

PCL86

page	sheet	date
1	1	1969.12
2	2	1968.09
3	3	1968.09
4	4	1968.09
5	5	1968.09
6	6	1968.09
7	7	1968.09
8	8	1968.09
9	9	1968.09
10	10	1968.09
11	FP	1999.08.02

SHUNT STABILIZER TRIODE

Shunt stabilizer triode intended for use as in colour TV receivers.

QUICK REFERENCE DATA			
Anode voltage	V_a	25	kV
Anode current	I_a	max. 1.6	mA

HEATING: Indirect by A.C. or D.C.; series supply

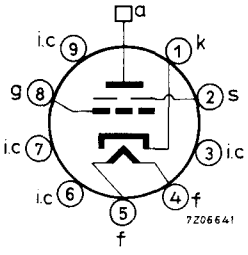
Heater current	I_f	300	mA
Heater voltage	V_f	7.3	V

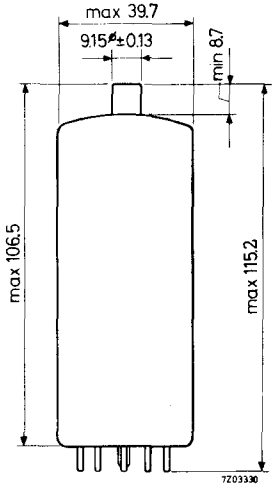
DIMENSIONS AND CONNECTIONS

Dimensions in mm

Base: Magnoval

Top cap: Type 2





Mounting: Additional supporting of the tube at the top is required.
To prevent corona-effects any metal screening applied around the tube should be at least 5 cm from the nearest point of the bulb.
Adequate ventilation should be provided for.

TYPICAL CHARACTERISTICS

Anode voltage	V_a	25	kV
Screen voltage	V_s	0	V
Grid voltage change for an anode current change from 0.1 to 1.5 mA	ΔV_g	max. 10	V
Grid voltage at I_a = 1.5 mA	V_g	-7 to -30	V
at I_a = 0.1 mA	V_g	max. -40	V

LIMITING VALUES (Design centre rating system unless otherwise specified)

Anode voltage	V_a	max.	25	kV
Anode voltage (absolute max.)	V_a	max.	27.5	kV [1]
Anode current	I_a	max.	1.6	mA
Anode dissipation	W_a	max.	30	W
Anode dissipation (absolute max.)	W_a	max.	40	W [2]
Negative grid voltage	$-V_g$	max.	150	V [3]
Grid resistor	R_g	max.	5	MΩ
Cathode to heater voltage				
cathode positive	V_{kf}	max.	400 V_{DC} +250	V_{AC}
cathode negative	$-V_{kf}$	max.	250	V
Screen voltage	V_s	max.	0	V
	$-V_s$	max.	400	V [4]
Anode seal temperature (absolute max.)	t_s	max.	200	°C

Precaution: x-ray shielding may be required to give protection against excessive radiation.

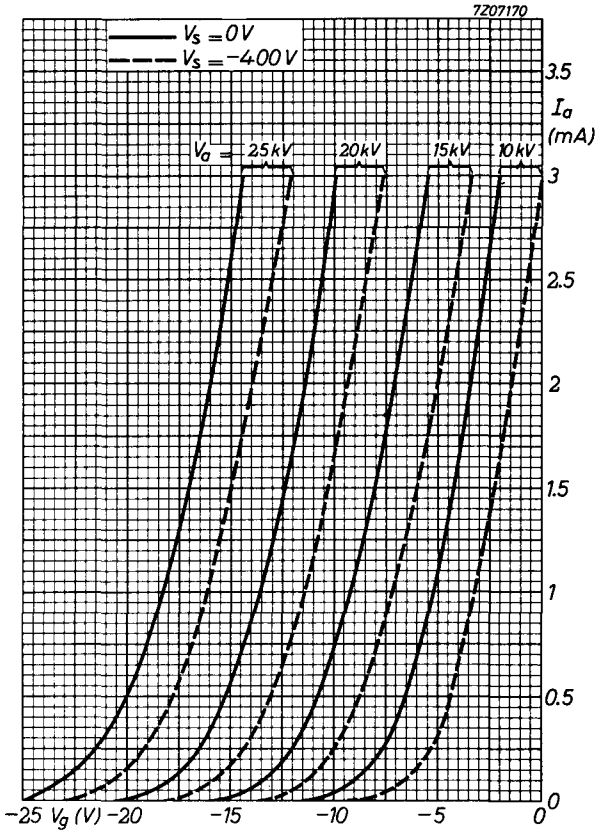
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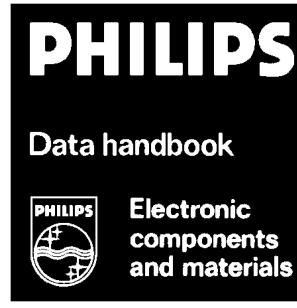
1) If due to a circuit failure the anode current becomes 0 mA the anode voltage should never exceed 45 kV (abs. max.)

2) Permissible only during short periods; in total up to a maximum of 10% of the operation time of the tube.

3) During equipment warm-up and for brief interval during receiver adjustment this voltage may rise to 440 V max.

4) The screen connected to pin 2 is provided to shield grid and cathode from the high anode voltage.
It is recommended to connect the screen directly to earth, with a minimum lead inductance.
The modulating influence of possible hum ripple of the screen to cathode voltage should be taken into account; the sensitivity for these variations in Vs/k is 2.5 μA/V max.


7Z07170
$V_s = 0V$
$V_s = -400V$
$V_a =$ 25kV
20kV
15kV
10kV
I_a (mA)
3.5
3
2.5
2
1.5
1
0.5
0
−25 V_g (V) −20
−15
−10
−5
0



PD500

page	sheet	date
1	1	1969.12
2	2	1969.12
3	3	1969.12
4	FP	1999.02.24

SHUNT STABILIZER TRIODE

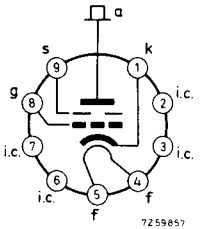
Shunt stabilizer triode intended for use in colour TV receivers.

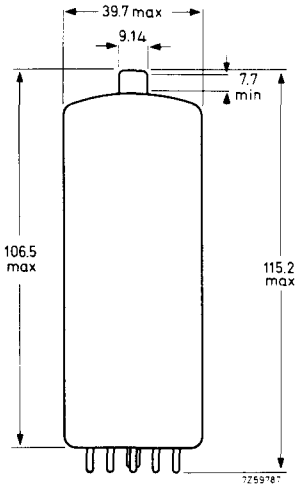
HEATING: Indirect by A.C. or D.C.; series supply

Heater current	I_f	300	mA
Heater voltage	V_f	7.3	V

DIMENSIONS AND CONNECTIONS Dimensions in mm.

Base: Magnoval
Top cap: Type 2





Mounting: Additional supporting of the tube at the top is required. To prevent corona effects any metal screening applied around the tube should be at least 5 cm from the nearest point of the bulb. Adequate ventilation should be provided for.

TYPICAL CHARACTERISTICS

Anode voltage	V_a		25	kV
Screen voltage	V_s		0	V
Grid voltage change for an anode current change from 0.1 mA to 1.5 mA	ΔV_g	max.	10	V
Grid voltage at I_a = 1.5 mA	V_g	−9 to	−28	V
at I_a = 0.1 mA	V_g	max.	−38	V

Data based on pre-production tubes

LIMITING VALUES (Design centre rating system unless otherwise specified)

Anode voltage	V_a	max.	25	kV
Anode voltage (absolute max.)	V_a	max.	27.5	kV [1]
Anode current	I_a	max.	1.6	mA
Anode dissipation	W_a	max.	30	W
Anode dissipation (absolute max.)	W_a	max.	40	W [2]
Negative grid voltage	$-V_g$	max.	150	V [3]
Grid resistor	R_g	max.	5	MΩ
Cathode to heater voltage				
cathode positive	V_{kf}	max.	400 V_{DC} + 250 V_{AC}	
cathode negative	$-V_{kf}$	max.	250	V
Screen voltage	V_s	max.	0	V
	$-V_s$	max.	50	V [4]
Anode seal temperature (absolute max.)	t_s	max.	200	°C

X-RAYS

When operating this tube will produce X-radiation, and a suitable screen may be required.
Because of the difference in X-ray characteristics the PD510 should never be replaced by a PD500 in equipment designed for the PD510.

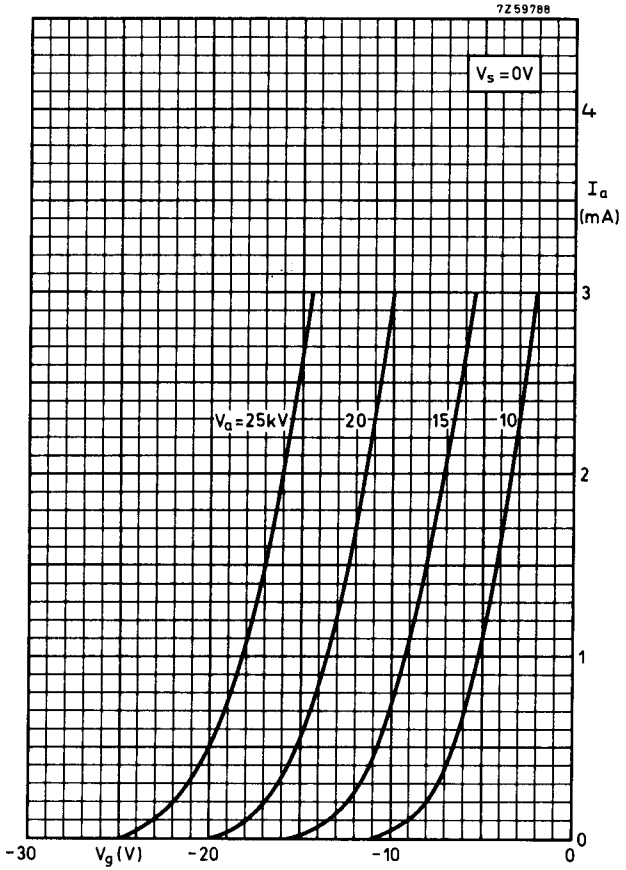
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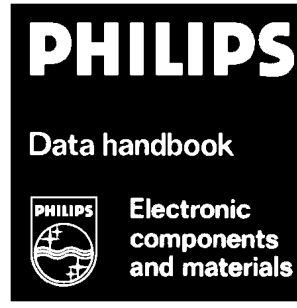
1) If due to a circuit failure the anode current becomes 0 mA the anode voltage should never exceed 45 kV (abs. max.)

2) Permissible only during short periods; in total up to a maximum of 10% of the operation time of the tube.

3) During equipment warm-up and for brief interval during receiver adjustment this voltage may rise to 440 V max.

4) The screen connected to pin 9 is provided to shield grid and cathode from the high anode voltage.
It is recommended to connect the screen directly to earth, with a minimum lead inductance.


7Z59788
$V_s = 0V$
I_a (mA)
4
3
2
1
0
$V_a = 25kV$
20
15
10
-30
V_g (V)
-20
-10
0



PD510

page	sheet	date
1	1	1970.09
2	2	1970.09
3	3	1970.09
4	FP	1998.12.28

PHILIPS PENTODE PE 04/10

Diese Sendepentode hat eine indirekt geheizte Oxydkathode, deren Elektronenemission trotz des verhältnismäßig niedrigen Stromverbrauches sehr hoch ist und die eine große mechanische Festigkeit aufweist.

Die PE 04/10 kann als H.F.-Verstärker- oder Oszillatorröhre bei Wellenlängen bis zu 5 m herab verwendet werden. Eine niedrige Steuerleistung genügt zur vollen Aussteuerung dieser Röhre. Es ist möglich, ohne Steuergitterstrom eine beträchtliche Nutzleistung zu erzielen, so daß die Röhre auch in einer Trennstufe verwendet werden kann. Sie eignet sich ebenfalls zum Gebrauch als elektronengekoppelter Oszillator.

Die Modulation der PE 04/10 kann entweder in der Anode, im Fanggitter oder in der Anode und dem Schirmgitter gemeinsam erfolgen. Bei der Modulation im Fanggitter ist die erforderliche Modulationsleistung gleich null.

Die bei verschiedenen Einstellungen erreichbare Nutzleistung und der Wirkungsgrad sind nebenstehender Tabelle zu entnehmen; diese Tabelle gilt für Wellenlängen bis zu 15 m herab und eine Anodenspannung von 500 V.



PHILIPS EMISSION

Einstellung	Schirmgitterspannung	Nutzleistung	Wirkungsgrad
H.F.-Klasse C (Telegraphie) ohne Steuergitterstrom (Trennstufe)	250 V	7,5 W[1])	50 %
H.F.-Klasse C (Telegraphie) mit Steuergitterstrom	250 V	15 W[1])	60 %
H.F.-Klasse B (Telephonie)	300 V	4 W[1])[2])	31 %
H.F.-Klasse C (Modulation in der Anode)	200 V	5 W[1])[2])	62,5%
H.F.-Klasse C (Modulation im Fanggitter)	250 V	1,5 W[1])[3])	30 %
H.F.-Klasse C (Modulation in der Anode und dem Schirmgitter)	ca. 210 V	10 W[1])[2])	62,5%

Die Nutzleistung und der entsprechende Wirkungsgrad, die mit **zwei** in Gegentakt geschalteten Röhren PE 04/10 bei Wellenlängen bis zu 5 m herab erzielt werden können, sind in untenstehender Tabelle angegeben:

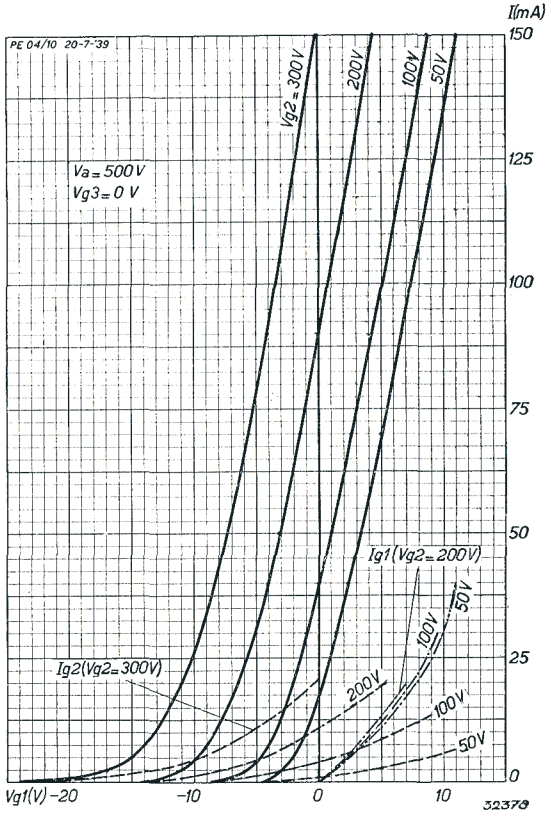
Einstellung	Anodenspannung	Schirmgitterspannung	Nutzleistung	Wirkungsgrad
H.F.-Klasse C (Telegraphie)	450 V	210 V	20 W[1])	50 %
H.F.-Klasse B (Telephonie)	450 V	250 V	4 W[1])[2])	17 %
H.F.-Klasse C (Modulation im Fanggitter)	450 V	135 V	3,7 W[1])[2])	19,5%
H.F.-Klasse C (Modulation in der Anode und dem Schirmgitter)	400 V	150 V	12,5 W[1])[2])	49 %

[1]) Kreisverluste sind abzuziehen.
[2]) Nutzleistung in der Trägerwelle (max. Modulationstiefe 100%).
[3]) Nutzleistung in der Trägerwelle (max. Modulationstiefe 90%).

6/40

B 5306/1

PHILIPS PENTODE PE 04/10



Heizspannung	V_f	=	12,0 V
Heizstrom	I_f	=	ca. 0,65 A
Sättigungsstrom	I_s	=	ca. 0,8 A
Anodenspannung	V_a	=	max. 500 V
Schirmgitterspannung	V_{g_2}	=	max. 300 V
Höchstzulässiger Anodenverlust	W_a	=	max. 10 W
Geprüfter Anodenverlust	W_{at}	=	15 W
Höchstzulässiger Schirmgitterverlust	W_{g_2}	=	max. 3,0 W[1])
Verstärkungsfaktor gegen Schirmgitter	$\mu_{g_1g_2}$	=	ca. 25
Steilheit bei V_a = 500 V, V_{g_2} = 300 V, I_a = 50 mA	S	=	ca. 7,5 mA/V
Höchstzulässiger Kathodenstrom	I_k	=	max. 85 mA
Höchstzulässige Spannung zwischen Kathode und Heizfaden	V_{kf}	=	max. 75 V
Anoden/Kathodenkapazität	C_{ak}	=	ca. 7,5 pF[2])
Steuergitter/Kathodenkapazität	C_{g_1k}	=	ca. 16 pF[2])
Anoden/Steuergitterkapazität	C_{ag_1}	=	ca. 0,1 pF[2])
Maximale Gesamtlänge	l	=	133 mm
Maximaler Durchmesser	d	=	53 mm

[1]) Dieser Wert wird bestimmt durch Multiplikation der Schirmgitterspannung in Volt mit dem Schirmgitterstrom in Ampere.

[2]) Dieser Wert gilt bei Verbindung des Schirm- und Fanggitters mit der Kathode.

PENTODE for use as H.F. amplifier
PENTHODE pour utilisation comme amplificatrice H.F.
PENTHODE zur Verwendung als H.F. Verstärker

Cathode : oxide-coated
Cathode : oxyde
Kathode : Oxyd

Heating : indirect
Chauffage: indirect
Heizung : indirekt

Vf = 12 V
If = 0,37 A

Capacitances
Capacités
Kapazitäten

Ca = 5,7 pF
Cg1 = 12,7 pF
Cag1 = 0,12 pF

Typical characteristics
Caractéristiques typiques
Kenndaten

μg2g1 = 3
S (Ia=40 mA)= 1,5 mA/V

λ	Freq.	C telegr.		B teleph.		Cag2 mod.		Cg3 mod.	
m	Mc/s	Va (V)	Wo (W)	Va (V)	Wo (W)	Va (V)	Wo (W)	Va (V)	Wo (W)
>15	<20	500 400	17 12,5	500	3	500	10	500	3,5
5[1])	60 [1])	500 400	34 25					500	6,6

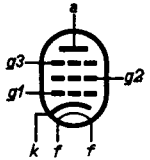
Limiting values
Caractéristiques limites
Grenzdaten

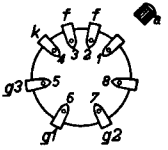
Va = 500 V
Wa = 15 W
Vg2 = 300 V
Wg2 = 5 W
Wg1 = 4 W
Rg1 = 30 kΩ
Ik = 85 mA
Ikp = 340 mA
Vfk = 200 V

[1]) Two valves; deux tubes; zwei Röhren

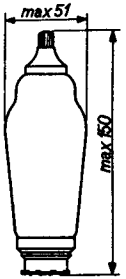
PHILIPS

Dimensions in mm
Dimensions en mm
Abmessungen in mm





Base
Culot P
Sockel



Socket
Support
Fassung 5900/02

Mounting position : arbitrary
Montage : arbitrairement
Einbau : willkürlich

Net weight
Poids net
Nettogewicht 75 g

Shipping weight 12 tubes
Poids brut 12 tubes 2,4 kg
Bruttogewicht 12 Röhren

PHILIPS

Electronic Tube

HANDBOOK

PE05/15

page	sheet	date
1	1	1954.07.07
2	2	1954.07.07
3	FP	2000.01.09

PENTODE for use as H.F. and L.F. amplifier and oscillator
PENTHODE pour utilisation comme amplificatrice H.F. et B.F. et oscillatrice
PENTHODE zur Verwendung als H.F. und N.F. Verstärker und Oszillator

Cathode : oxide-coated
Cathode : **oxyde**
Kathode : Oxyd

Heating : indirect
Chauffage: indirect
Heizung : indirekt

Vf = 12,6 V
If = 0,7 A

Capacitances
Capacités
Kapazitäten

Ca = 7,8 pF
Cg1 = 14,5 pF
Cag1 = 0,15 pF

Typical characteristics
Caractéristiques typiques
Kenndaten

μg2g1 = 7,6
S (Ia=30 mA) = 3,3 mA/V

λ	Freq.	C telegr.		B teleph.		C ag2 mod.	
m	Mc/s	Va (V)	Wo (W)	Va (V)	Wo (W)	Va (V)	Wo (W)
>3	<100	500	33	500	6	400	20
		400	28	400	5,4	300	16
		300	24				

λ	Freq.	C fr.mult.	
m	Mc/s	Va (V)	Wo (W)
5,4/1,8	55/165	400	9

Limiting values
Caractéristiques limites
Grenzdaten

Va = max. 500 V
Wa = max. 12 W
Vg2 = max. 300 V
Wg2 = max. 5 W
Wg1 = max. 0,5 W

Rg1 = max. 50 kΩ [1]
Rg1 = max. 100 kΩ [2]
Ik = max. 130 mA
Ikp = max. 800 mA
Vfk = max. 75 V

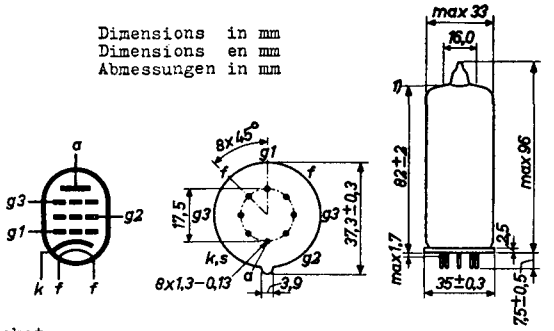
bottomtemperature
température du fond
Bodentemperatur
= max. 180 °C

[1]) With fixed grid bias; à polarisation fixe; mit fester Gittervorspannung

[2]) With automatic grid bias; à polarisation automatique; mit automatischer Gittervorspannung

PHILIPS

Dimensions in mm
Dimensions en mm
Abmessungen in mm



Socket
Support
Fassung

40210/02

Mounting position: arbitrary
Montage : arbitrairement
Einbau : willkürlich

Net weight
Poids net
Nettogewicht

50 g

Shipping weight
Poids brut
Bruttogewicht

65 g

---

[1]) Reference line
Ligne de référence
Bezugslinie

Operating conditions H.F. class C telegraphy
Caractéristiques d'utilisation H.F. classe C télégraphie
Betriebsdaten H.F. Klasse C Telegraphie

λ	=	>3	>3	>3	m
V_a	=	500	400	300	V
V_{g1}	=	−80	−80	−80	V
V_{g2}	=	250	250	250	V
V_{g3}	=	0	0	0	V
I_a	=	90	100	117	mA
I_{g1}	=	3	3,5	4,5	mA
I_{g2}	=	5	5,5	8	mA
V_{g1p}	=	96	103	110	V
W_{ig1}	=	0,26	0,33	0,45	W
W_{g2}	=	1,25	1,4	2	W
W_{ia}	=	45	40	35,1	W
W_a	=	12	12	11,1	W
W_o	=	33	28	24	W
η	=	73,5	70	68	%

Operating conditions H.F. class B telephony
Caractéristiques d'utilisation H.F. classe B téléphonie
Betriebsdaten H.F. Klasse B Telephonie

λ	=	>3	>3	m
V_a	=	500	400	V
V_{g1}	=	−28	−28	V
V_{g2}	=	250	250	V
V_{g3}	=	0	0	V
I_a	=	36	42,5	mA
I_{g2}	=	3	3,5	mA
V_{g1p}	=	17,5	21,25	V
W_{g2}	=	0,75	0,9	W
W_{ia}	=	18	17	W
W_a	=	12	11,6	W
W_o	=	6	5,4	W
η	=	33,5	32	%
m	=	100	100	%
I_{g1}	=	2	3,4	mA
W_{ig1}	=	0,07	0,13	W

PHILIPS

Operating conditions H.F. class C anode- and screen grid modulation
Caractéristiques d'utilisation H.F. classe C modulation d'anode et de grille-écran
Betriebsdaten H.F.Klasse C Anoden- und Schirmgittermodulation

λ	=	>3	>3	m
V_a	=	400	300	V
V_{g1}	=	-80	-80	V
V_{g2}	=	200	200	V
V_{g3}	=	0	0	V
I_a	=	70	77	mA
I_{g1}	=	2,5	3,5	mA
I_{g2}	=	4,5	7	mA
V_{g1p}	=	100	105	V
W_{ig1}	=	0,25	0,35	W
W_{g2}	=	0,9	1,4	W
W_{ia}	=	28	23	W
W_a	=	8	7	W
W_o	=	20	16	W
	=	71	69,5	%
m	=	100	100	%
V_{g2p}	=	190	190	V
W_{mod}	=	15	13	W

Operating conditions as class C frequency multiplier
Caractéristiques d'utilisation comme multiplicatrice de fréquence classe C
Betriebsdaten als Klasse C Frequenzvervielfacher

λ	=	5,4/1,8	5,4/1,8	5,4/1,8	m
V_a	=	400	400	400	V
V_{g1}	=	-175	-200	-250	V
V_{g2}	=	250	250	250	V
V_{g3}	=	0	0	0	V
I_a	=	47	50	52,5	mA
I_{g1}	=	0,9	1	1,2	mA
I_{g2}	=	2	2,5	3	mA
V_{g1p}	=	200	220	270	V
W_{ig1}	=	0,16	0,2	0,3	W
W_{g2}	=	0,5	0,65	0,75	W
W_{ia}	=	18,8	20	21	W
W_a	=	12	12	12	W
W_o	=	6,8	8	9	W
η	=	36	40	43	%

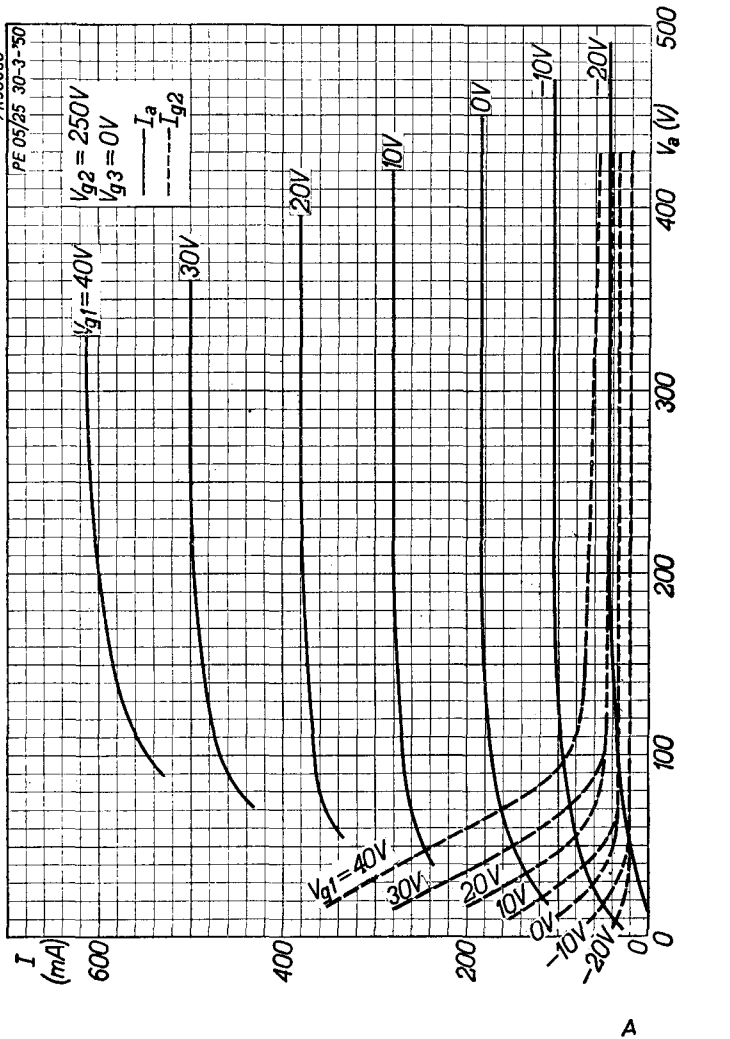
Operating conditions as L.F. class B amplifier and modulator, two valves
Caractéristiques d'utilisation comme amplificatrice et modulatrice B.F. classe B, deux tubes
Betriebsdaten als NF - Klasse B Verstärker und Modulator, zwei Röhren

V_a	=	500		400		V
V_{g1}	=	-24		-18,5		V
V_{g2}	=	250		200		V
V_{g3}	=	0		0		V
R_{aa}	=	9		5,5		kΩ
V_{g1g1p}	=	0	70	0	82	V
I_a	=	2x18	2x71	2x15	2x89	mA
I_{g1}	=	0	2x1,8	0	2x4,4	mA
I_{g2}	=	2x0,6	2x11,2	2x0,5	2x10,5	mA
W_{ig1}	=	0	2x57	0	2x165	mW
W_{g2}	=	2x0,15	2x2,8	2x0,1	2x2,1	W
W_{ia}	=	2x9	2x35,5	2x6	2x35,5	W
W_a	=	2x9	2x11	2x6	2x11	W
W_o	=	0	49	0	49	W
d_{tot}	=	-	5	-	5	%
η	=	-	69	-	69	%

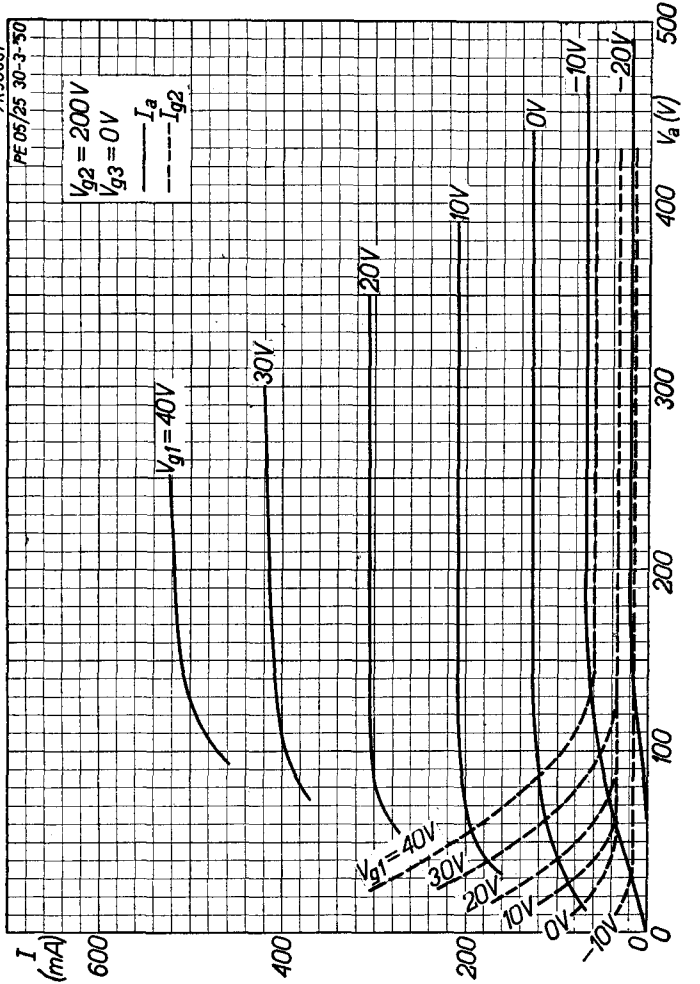
V_a	=	300		V
V_{g1}	=	-18		V
V_{g2}	=	200		V
V_{g3}	=	0		V
R_{aa}	=	3		kΩ
V_{g1g1p}	=	0	100	V
I_a	=	2x15	2x108	mA
I_{g1}	=	0	2x6	mA
I_{g2}	=	2x0,5	2x13	mA
W_{ig1}	=	0	2x270	mW
W_{g2}	=	2x0,1	2x2,6	W
W_{ia}	=	2x4,5	2x32,5	W
W_a	=	2x4,5	2x12,5	W
W_o	=	0	40	W
d_{tot}	=	-	5	%
η	=	-	62	%

PE 05/25

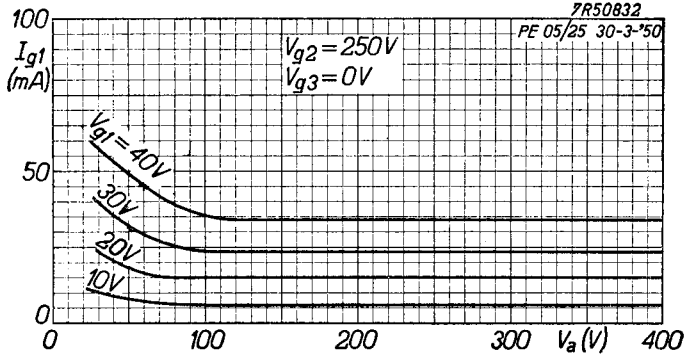
PHILIPS

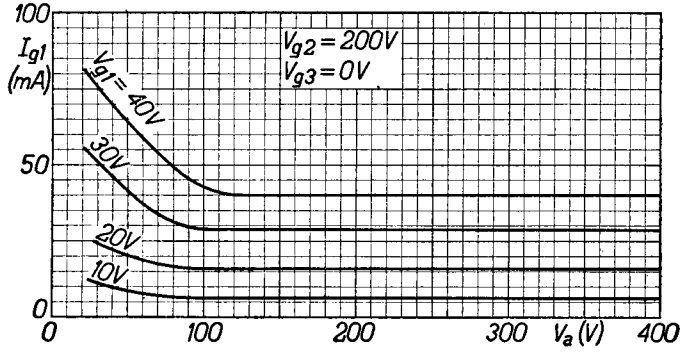


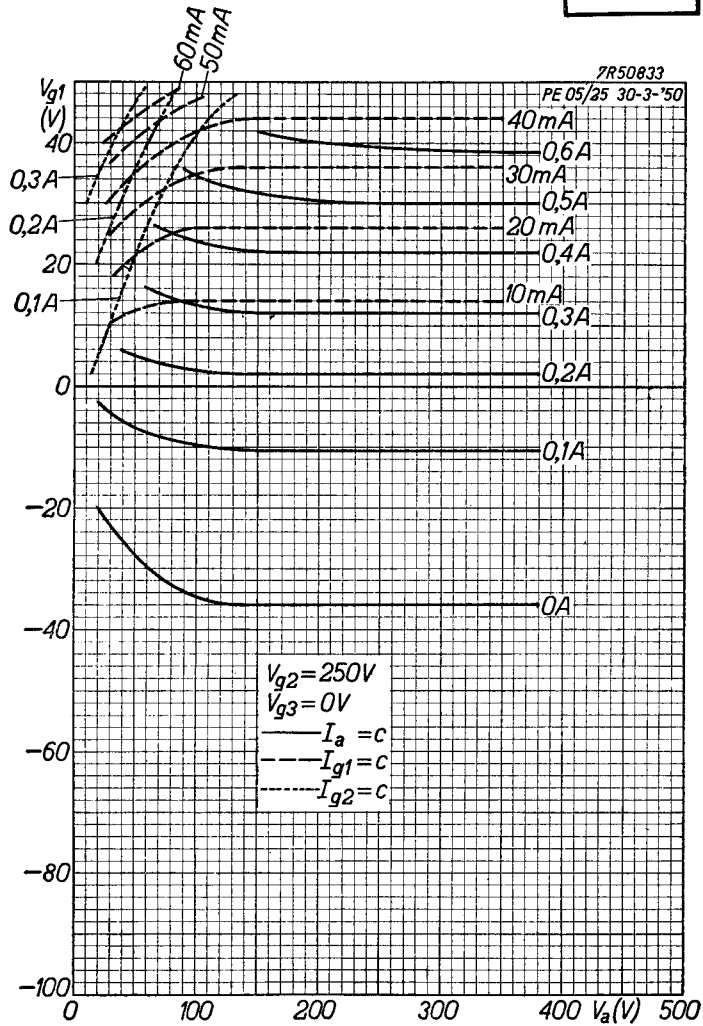
A


7R50831
PE 05/25 30-3-'50
$V_{g2} = 200V$
$V_{g3} = 0V$
——— I_a
– – – I_{g2}
$V_{g1} = 40V$
30V
20V
10V
0V
−10V
−20V
V_a (V)
I (mA)
600
400
200
0
100
200
300
400
500

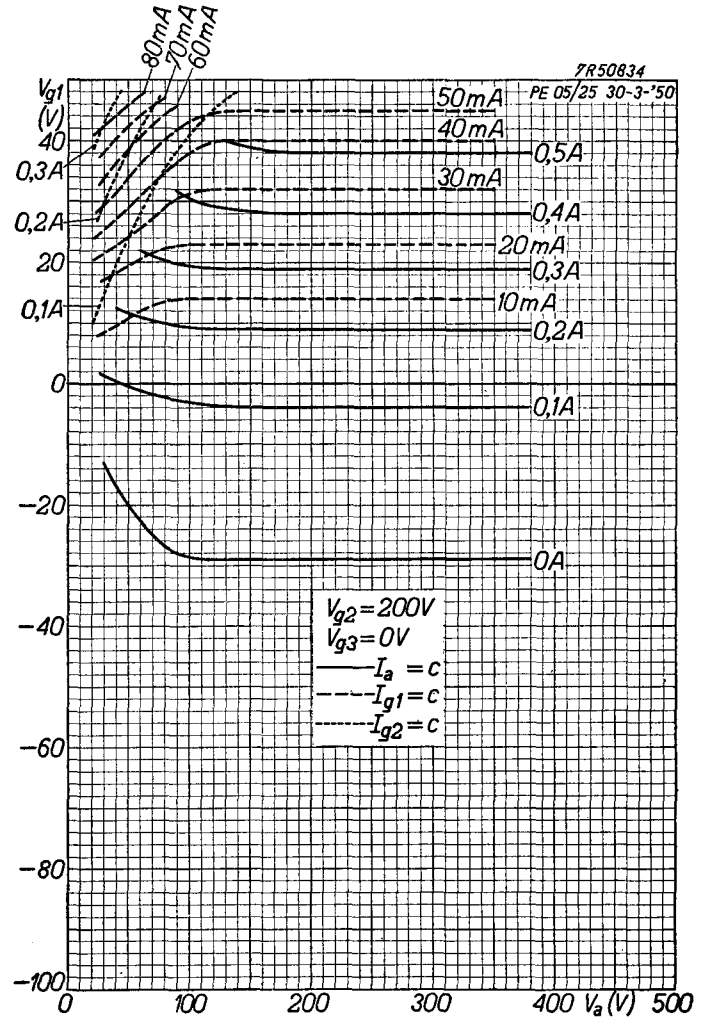
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7R50832
PE 05/25 30-3-'50
100
I_{g1} (mA)
$V_{g2} = 250V$
$V_{g3} = 0V$
$V_{g1} = 40V$
30V
20V
10V
50
0
0
100
200
300
V_a (V)
400


100
I_{g1} (mA)
$V_{g2} = 200V$
$V_{g3} = 0V$
$V_{g1} = 40V$
30V
20V
10V
50
0
0
100
200
300
V_a (V)
400

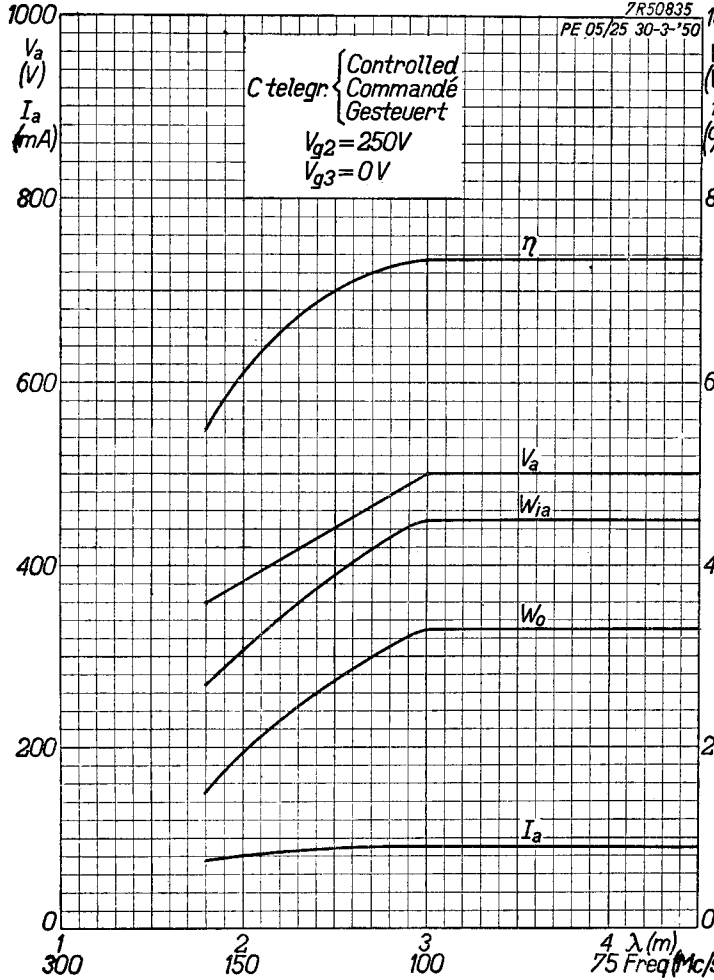

7R50833
PE 05/25 30-3-'50
V_{g1} (V)
60mA
50mA
40mA
0,6A
30mA
0,5A
20mA
0,4A
10mA
0,3A
0,2A
0,1A
0A
0,3A
0,2A
20
40
0
−20
−40
−60
−80
−100
0
100
200
300
400
V_a(V)
500
$V_{g2}=250V$
$V_{g3}=0V$
$I_a=c$
$I_{g1}=c$
$I_{g2}=c$

PHILIPS


7R50834
PE 05/25 30-3-'50
V_{g1} (V)
80mA
70mA
60mA
50mA
40mA
30mA
20mA
10mA
0,5A
0,4A
0,3A
0,2A
0,1A
0A
$V_{g2}=200V$
$V_{g3}=0V$
$I_a = c$
$I_{g1}=c$
$I_{g2}=c$
40
20
0
−20
−40
−60
−80
−100
0
100
200
300
400
500
V_a (V)

PHILIPS

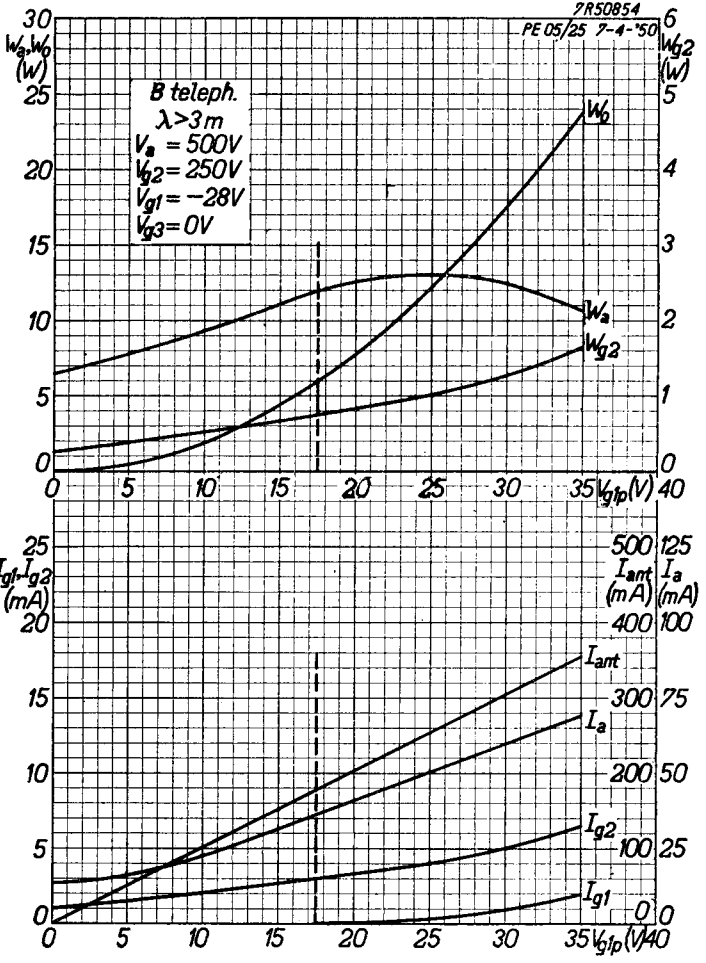
PE 05/25

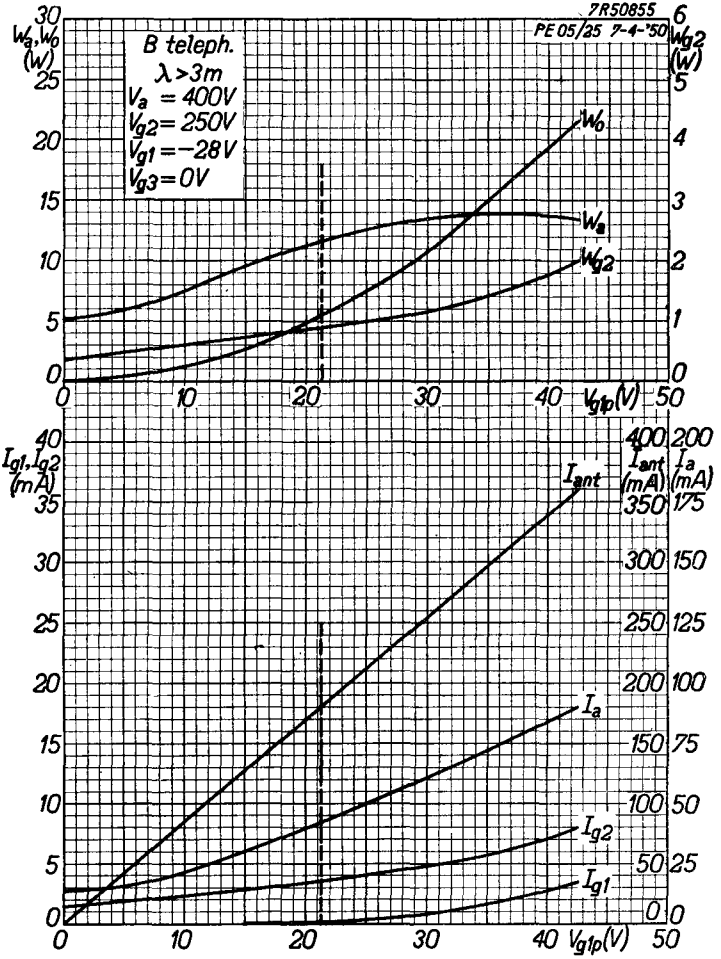


7.7.1954

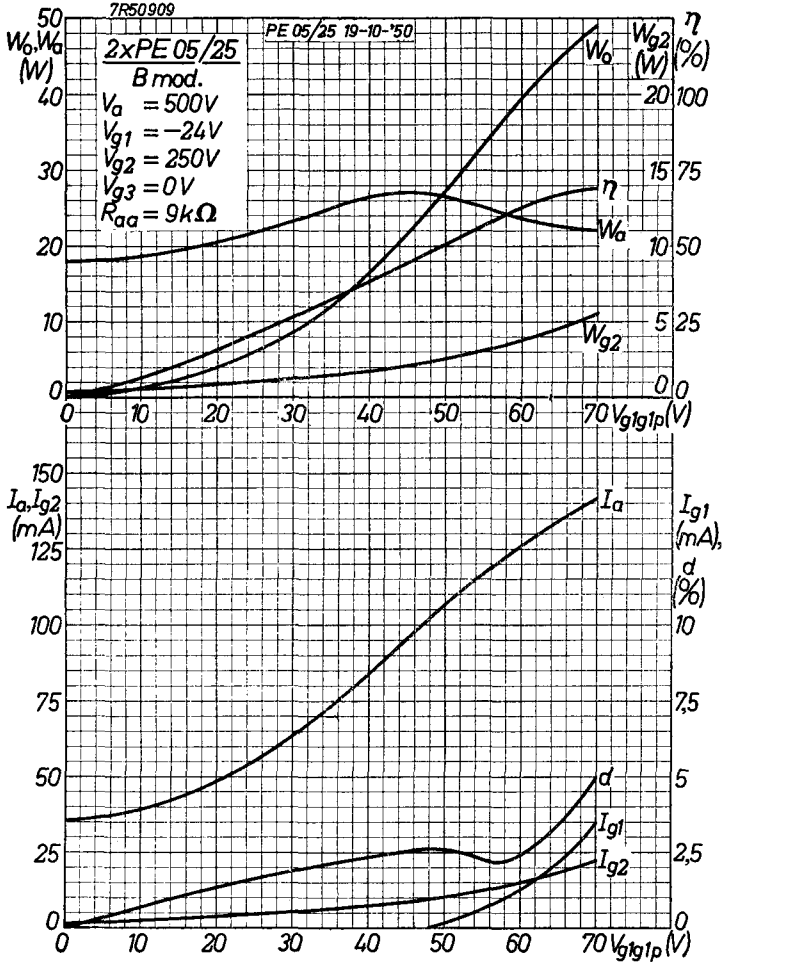
F

PHILIPS


7R50854
PE 05/25 7-4-'50
B teleph.
λ>3m
Va = 500V
Vg2 = 250V
Vg1 = −28V
Vg3 = 0V
Wa,Wb (W)
Wg2 (W)
Wb
Wa
Wg2
Vg1p (V)
Ig1+Ig2 (mA)
Iant (mA)
Ia (mA)
Iant
Ia
Ig2
Ig1
Vg1p (V)

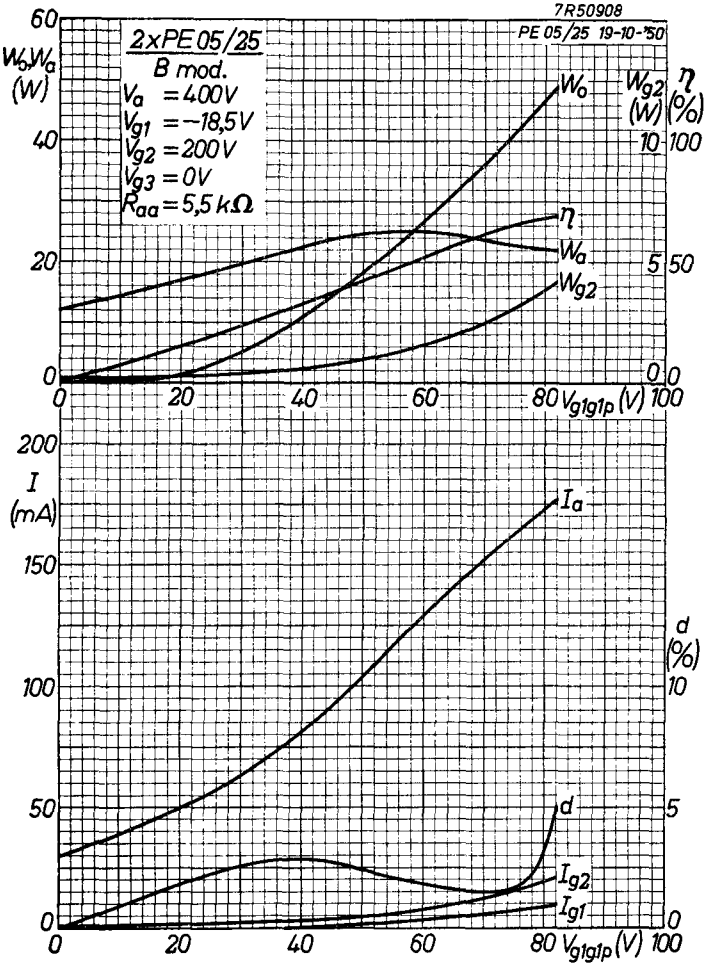

7R50855
PE 05/25 7-4-'50
B teleph.
λ > 3m
Va = 400V
Vg2 = 250V
Vg1 = −28V
Vg3 = 0V
Wa, Wo (W)
Wg2 (W)
Wo
Wa
Wg2
Vg1p (V)
Ig1, Ig2 (mA)
Iant (mA)
Ia (mA)
Iant
Ia
Ig2
Ig1

PHILIPS


7R50909
PE 05/25 19-10-'50
2xPE 05/25
B mod.
V_a = 500V
V_{g1} = −24V
V_{g2} = 250V
V_{g3} = 0V
R_{aa} = 9kΩ
W_o,W_a (W)
W_{g2} (W)
η (%)
W_o
η
W_a
W_{g2}
V_{g1g1p} (V)
I_a,I_{g2} (mA)
I_{g1} (mA), d (%)
I_a
d
I_{g1}
I_{g2}

PHILIPS

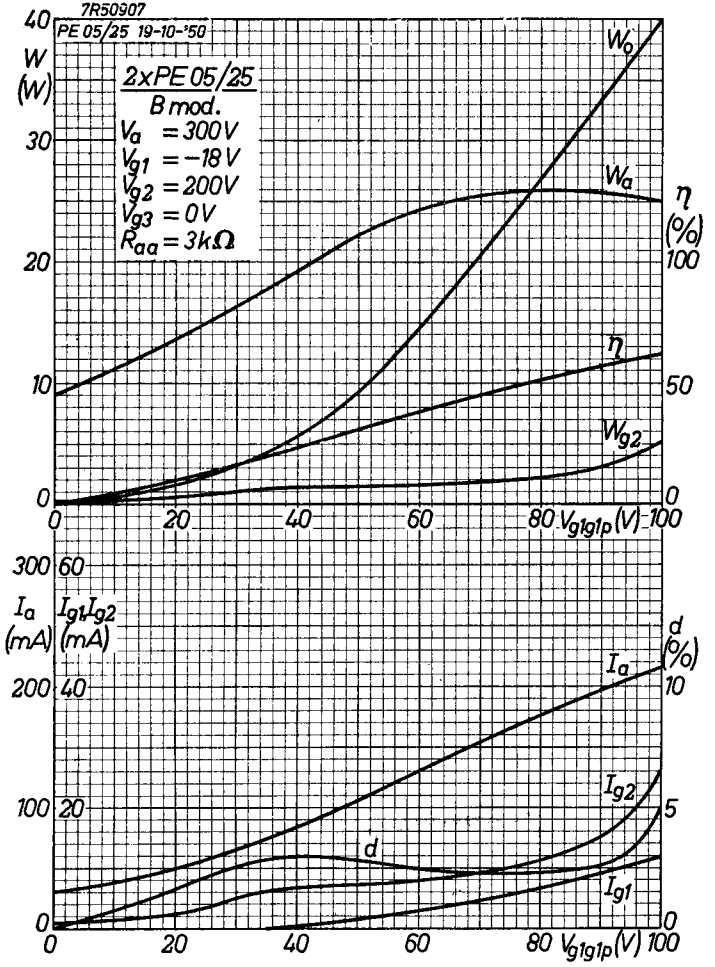
PE 05/25



7.7.1954

PE 05/25

PHILIPS



K



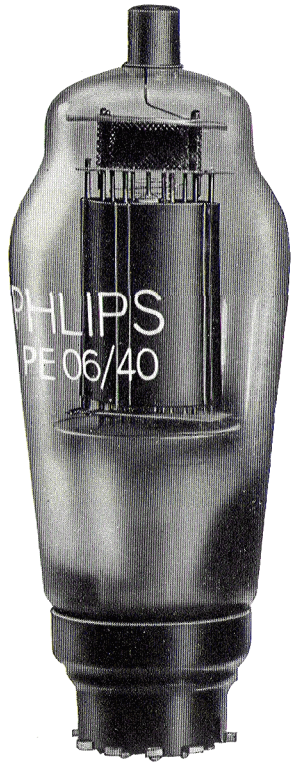
PE05/25

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2	2	1954.07.07
3	3	1950.03.03
4	4	1950.03.03
5	5	1954.07.07
6	A	1954.07.07
7	B	1954.07.07
8	C	1954.07.07
9	D	1954.07.07
10	E	1954.07.07
11	F	1954.07.07
12	G	1954.07.07
13	H	1954.07.07
14	I	1954.07.07
15	J	1954.07.07
16	K	1954.07.07
17	FP	2000.05.05

PHILIPS PENTODE PE 06/40

Die indirekt geheizte Oxydkathode dieser Sendepenthode gewährleistet eine sehr hohe Elektronenemission. Infolge ihres verhältnismäßig niedrigen Heizstromverbrauches, der die Speisung des Heizfadens durch einen 6-V-Akkumulator ermöglicht, eignet sich die Röhre besonders für Verwendung in tragbaren Sendern, umsomehr da eine beträchtliche Nutzleistung bei einer verhältnismäßig niedrigen Anodenspannung erzielt werden kann.

Die PE 06/40 kann auf Wellenlängen bis zu 5 m herab als H.F.-Verstärker, Oszillator oder als Frequenzverdoppler verwendet werden. Sie eignet sich besonders zum Gebrauch in einer Trennstufe und bei Benutzung als elektronengekoppelter Oszillator ist die Frequenzstabilität durchaus befriedigend. Die Röhre kann sowohl gleichzeitig in der Anode und im Schirmgitter wie lediglich im Schirmgitter moduliert werden. In nebenstehender Tabelle sind die bei verschiedenen Einstellungen auf Wellenlängen bis zu 15 m herab zu erzielende Nutzleistung und Wirkungsgrad angegeben:



PHILIPS EMISSION

Einstellung	Anodenspannung	Schirmgitterspannung	Nutzleistung	Wirkungsgrad
H.F.-Klasse C (Telegraphie) ohne Steuergitterstrom (Trennstufe)	600 V	300 V	40 W[1]	62 %
H.F.-Klasse C (Telegraphie) mit Steuergitterstrom	600 V	300 V	45 W[1]	69 %
H.F.-Klasse B (Telephonie)	600 V	250 V	11 W[1])[2]	30,6%
H.F.-Klasse C (Modulation in der Anode und dem Schirmgitter)	500 V	300 V	38 W[1],[2]	69 %

Die gesamte Nutzleistung und der Wirkungsgrad von **zwei** in Gegentakt auf einer Wellenlänge von 5 m arbeitenden Röhren PE 06/40 sind untenstehender Tabelle zu entnehmen:

Einstellung	Anodenspannung	Schirmgitterspannung	Nutzleistung	Wirkungsgrad
H.F.-Klasse C (Telegraphie)	600 V	160 V	63 W[1]	56 %
H.F.-Klasse B (Telephonie)	600 V	250 V	13 W[1])[2]	20,5%
H.F.-Klasse C (Modulation im Schirmgitter)	600 V	130 V	17 W[1])[2]	30,5%
H.F.-Klasse C (Modulation in der Anode und dem Schirmgitter)	500 V	160 V	40 W[1])[2]	55 %

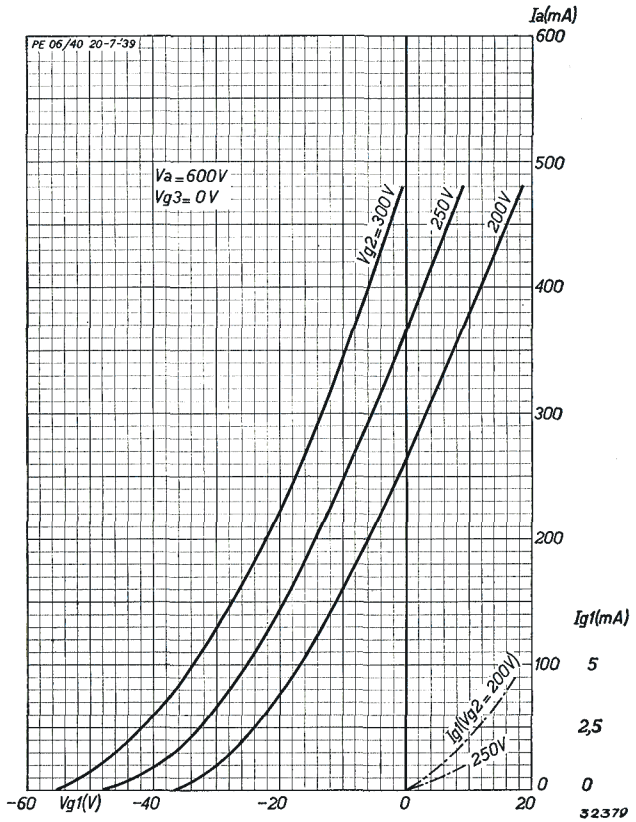
[1]) Kreisverluste sind abzuziehen.

[2]) Nutzleistung in der Trägerwelle (max. Modulationstiefe 100%).

7/40

B 5366/1

PHILIPS PENTODE PE 06/40



Heizspannung	V_f	=	6,3 V
Heizstrom	I_f	=	ca. 1,3 A
Sättigungsstrom	I_s	=	ca. 0,8 A
Anodenspannung	V_a	=	max. 600 V
Schirmgitterspannung	V_{g_2}	=	max. 300 V
Höchstzulässiger Anodenverlust	W_a	=	max. 25 W
Geprüfter Anodenverlust	W_{at}	=	30 W
Höchstzulässiger Schirmgitterverlust	W_{g_2}	=	max. 5,0 W[1])
Verstärkungsfaktor gegen Schirmgitter	$\mu_{g_1g_2}$	=	ca. 5,5
Steilheit bei V_a = 600 V, V_{g_2} = 300 V, I_a = 40 mA	S	=	ca. 4 mA/V
Höchstzulässiger Kathodenstrom	I_k	=	max. 130 mA
Höchstzulässige Spannung zwischen Kathode und Heizfaden	V_{kf}	=	max. 75 V
Anoden/Kathodenkapazität	C_{ak}	=	ca. 8,6 pF[2])
Steuergitter/Kathodenkapazität	C_{g_1k}	=	ca. 14 pF[2])
Anoden/Steuergitterkapazität	C_{ag_1}	=	ca. 0,1 pF[2])
Maximale Gesamtlänge	l	=	134 mm
Maximaler Durchmesser	d	=	51 mm

[1]) Dieser Wert wird bestimmt durch Multiplikation der Schirmgitterspannung in Volt mit dem Schirmgitterstrom in Ampere.

[2]) Dieser Wert gilt bei Verbindung des Schirm- und des Fanggitters mit der Kathode.

PENTODE for use as H.F. and L.F. amplifier
PENTHODE pour utilisation en amplificatrice H.F. et B.F.
PENTODE zur Verwendung als H.F. und N.F. Verstärker

Cathode : oxide-coated
Cathode : oxyde
Kathode : Oxyd

Heating : indirect — V_f = 12,6 V
Chauffage: indirect — I_f = 1,35 A
Heizung : indirekt

Capacitances
Capacités
Kapazitäten

C_a = 11 pF
C_{g1} = 20,5 pF ←
C_{ag1} = 0,1 pF

Typical characteristics
Caractéristiques types
Kenndaten

μ_{g2g1} = 6,7
S (I_a=40 mA) = 6 mA/V

λ	Freq.	C telegr.		B teleph.	
m	Mc/s	V_a (V)	W_o (W)	V_a (V)	W_o (W)
>5	<60	1000	132	1000	23
		800	107	800	23
		600	78	600	23
		C_{ag2} mod.		C_{g3} mod.	
>5	<60	800	75	1000	27
		600	51	800	26
				600	22

B mod.[1])

V_a (V)	W_o (W)
1000	194
800	110
600	82

Limiting values
Caractéristiques limites
Grenzdaten

V_a = max. 1000 V
W_a = max. 45 W
V_{g2} = max. 300 V
W_{g2} = max. 7 W
W_{g1} = max. 0,5 W

R_{g3} = max. 50 kΩ
R_{g1} = max. 25 kΩ[2])
R_{g1} = max. 50 kΩ[3])
I_k = max. 240 mA
I_{kp} = max. 1,5 A
V_{kf} = max. 100 V

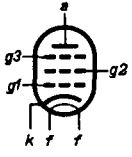
[1]) Two valves; deux tubes; zwei Röhren

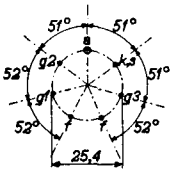
[2]) With fixed grid bias; à polarisation fixe; mit fester Gittervorspannung

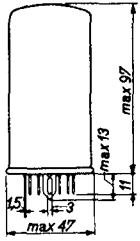
[3]) With automatic grid bias; à polarisation automatique; mit automatischer Gittervorspannung

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Dimensions in mm
Dimensions en mm
Abmessungen in mm







Base, culot, Sockel: Septar

Socket
Support 40202
Fassung

Mounting position: arbitrary
Montage : arbitrairement
Aufstellung : willkürlich

Net weight
Poids net 80 g
Nettogewicht

Shipping weight
Poids brut 125 g
Bruttogewicht

Operating conditions H.F. class C telegraphy
Caractéristiques d'utilisation H.F. classe C télégraphie
Betriebsdaten H.F. Klasse C Telegraphie

λ	=	>5	>5	>5	m
V_a	=	1000	800	600	V
V_{g1}	=	-120	-110	-100	V
V_{g2}	=	250	250	250	V
V_{g3}	=	0	0	0	V
I_a	=	177	190	205	mA
I_{g1}	=	5	6	7,5	mA
I_{g2}	=	28	28	28	mA
V_{g1p}	=	144	134	124	V
W_{ig1}	=	0,65	0,73	0,84	W
W_{g2}	=	7	7	7	W
W_{ia}	=	177	152	123	W
W_a	=	45	45	45	W
W_o	=	132	107	78	W
η	=	74,5	70,5	63,5	%

Operating conditions H.F. class B telephony
Caractéristiques d'utilisation H.F. classe B téléphonie
Betriebsdaten H.F. Klasse B Telephonie

λ	=	>5	>5	>5	m
V_a	=	1000	800	600	V
V_{g1}	=	-34	-33	-30,5	V
V_{g2}	=	250	250	250	V
V_{g3}	=	0	0	0	V
I_a	=	68	85	114	mA
I_{g2}	=	4,5	6	7,5	mA
V_{g1p}	=	20,5	22,5	26,5	V
W_{g2}	=	1,15	1,5	1,9	W
W_{ia}	=	68	68	68,4	W
W_a	=	45	45	45	W
W_o	=	23	23	23,4	W
η	=	34	34	34	%
m	=	100	100	100	%
I_{g1}	=	2	4	8	mA
W_{ig1}	=	0,08	0,17	0,38	W

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Operating conditions H.F. class C
Caractéristiques d'utilisation H.F. classe C
Betriebsdaten HF- Klasse C

		anode and screen grid modulation modulation d'anode et de grille-écran Anoden- und Schirmgitter-modulation		suppressor grid modulation modulation de grille d'arrêt Fanggittermodulation	
λ	=	>5	>5	>5	m
V_a	=	800	600	1000	V
V_{g1}	=	-120	-120	-100	V
V_{g2}	=	250	250	150	V
V_{g3}	=	0	0	-100	V
I_a	=	120	120	72	mA
I_{g1}	=	6,5	6,5	10	mA
I_{g2}	=	23	23	24	mA
V_{g1p}	=	150	150	140	V
W_{ig1}	=	0,9	0,9	1,3	W
W_{g2}	=	5,8	5,8	3,6	W
W_{ia}	=	96	72	72	W
W_a	=	21	21	45	W
W_o	=	75	51	27	W
η	=	78	71	37,5	%
m	=	100	100	100	%
V_{g2p}	=	250	250	-	V
V_{g3p}	=	-	-	100	V
W_{mod}	=	48	36	0	W

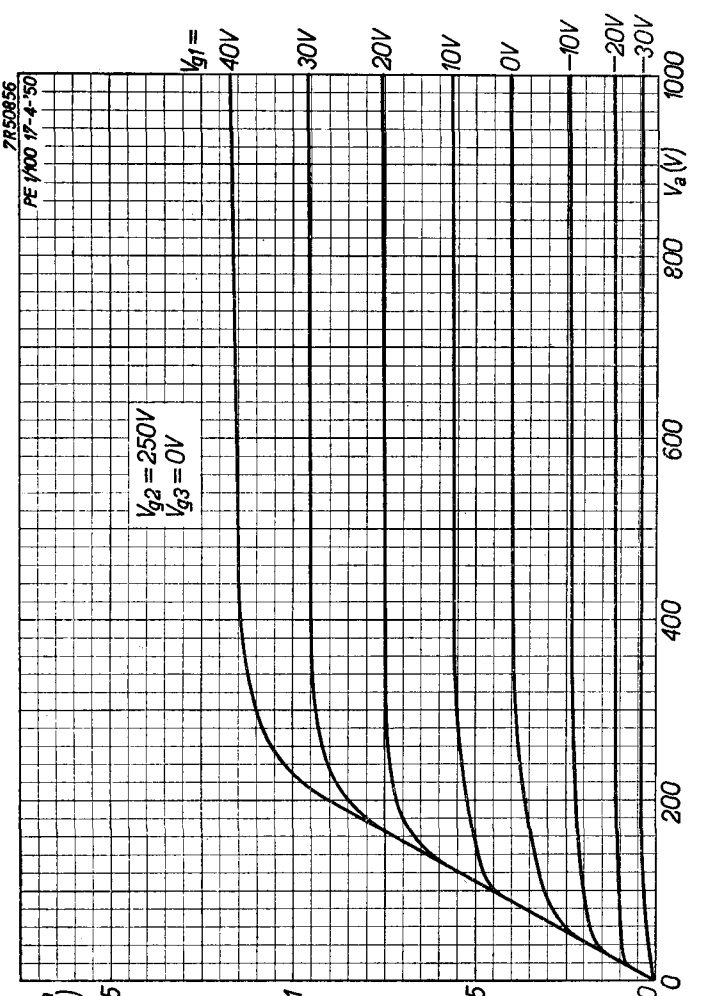
Operating conditions as L.F. class B amplifier and modulator, two valves
Caractéristiques d'utilisation comme amplificatrice et modulatrice B.F. classe B, deux tubes
Betriebsdaten als N.F. Verstärker und Modulator Klasse B, zwei Röhren

V_a	=	1000		800		V
V_{g1}	=	-34		-33,5		V
V_{g2}	=	250		250		V
V_{g3}	=	0		0		V
R_{aa}	=	8800		7560		Ω
V_{g1g1p}	=	0	84	0	68	V
I_a	=	2x26	2x134	2x28	2x108	mA
I_{g1}	=	0	2x0,8	0	0	mA
I_{g2}	=	2x5	2x28	2x8	2x27	mA
W_{ig1}	=	0	2x0,03	0	0	W
W_{g2}	=	2x1,3	2x7	2x2	2x6,8	W
W_{ia}	=	2x26	2x134	2x22,4	2x86,4	W
W_a	=	2x26	2x37	2x22,4	2x31,4	W
W_o	=	0	194	0	110	W
d_{tot}	=	-	5	-	4,5	%
η	=	-	72	-	63,5	%

V_a	=	600		V
V_{g1}	=	-33		V
V_{g2}	=	250		V
V_{g3}	=	0		V
R_{aa}	=	6320		Ω
V_{g1g1p}	=	0	66	V
I_a	=	2x28	2x102	mA
I_{g1}	=	0	0	mA
I_{g2}	=	2x11	2x28	mA
W_{ig1}	=	0	0	W
W_{g2}	=	2x2,8	2x7	W
W_{ia}	=	2x16,8	2x61,2	W
W_a	=	2x16,8	2x20,2	W
W_o	=	0	82	W
d_{tot}	=	-	3,3	%
η	=	-	67	%

PHILIPS

PE 1/100

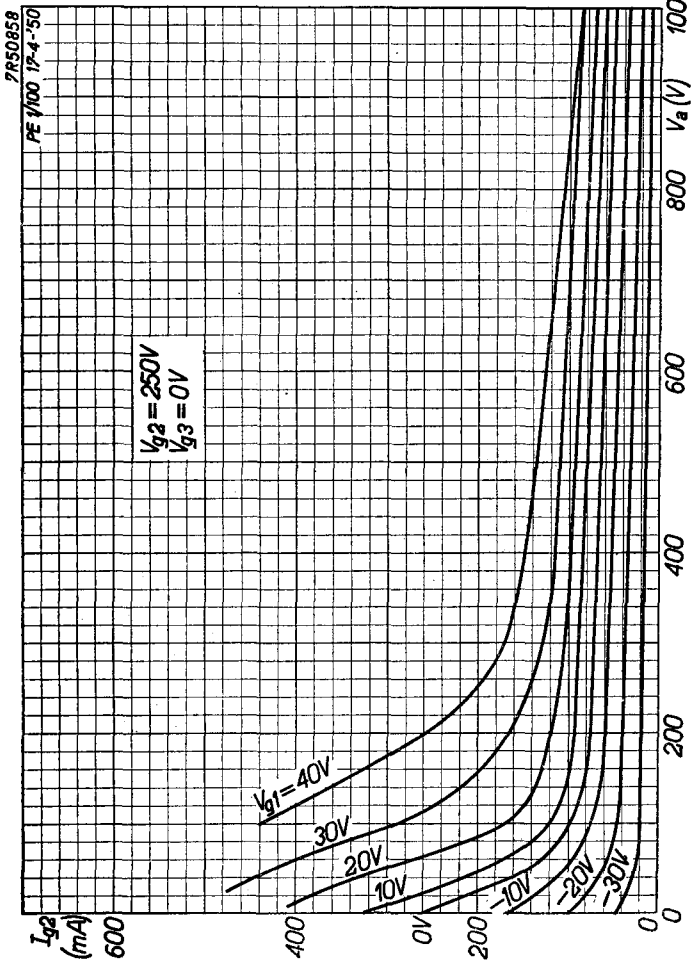


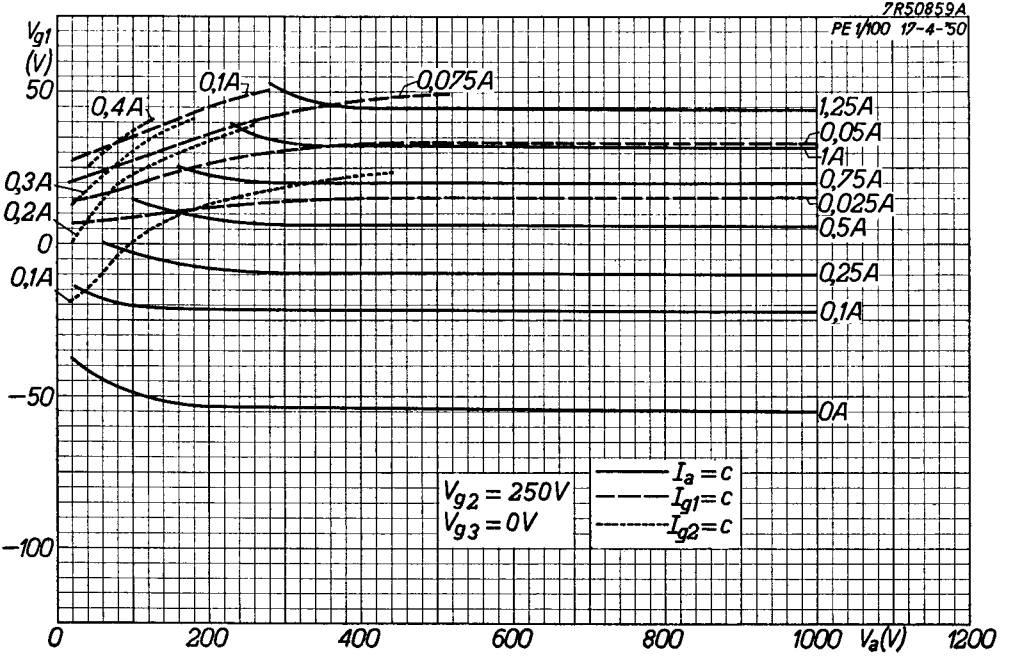
7.7.1954

A

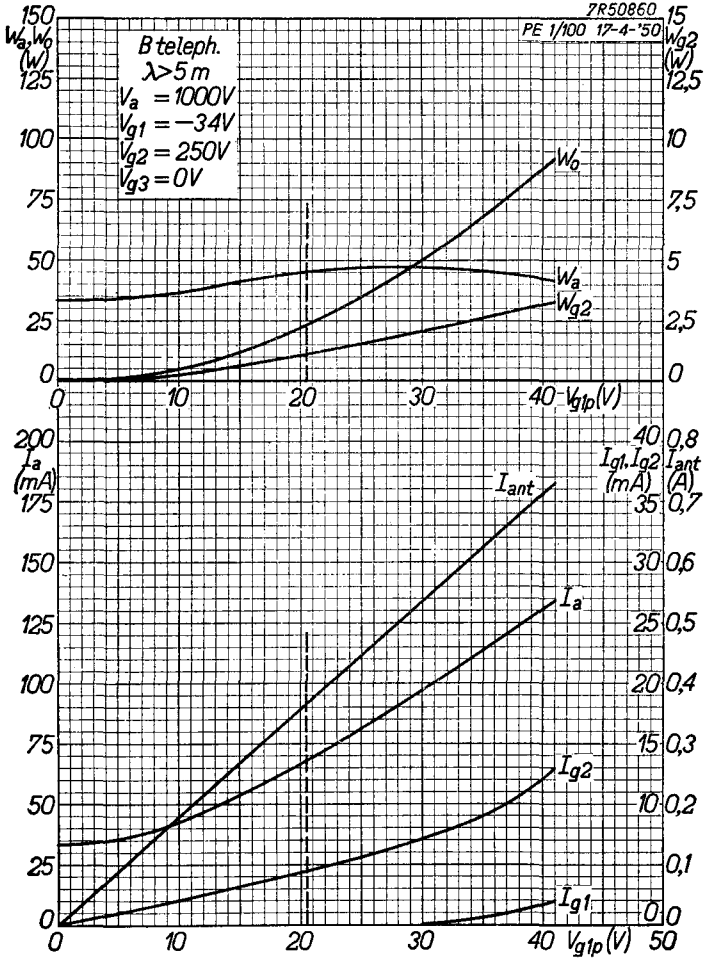
PE 1/100

PHILIPS


7R50858
PE 1/100 17-4-'50
V_{g2} = 250V
V_{g3} = 0V
V_{g1} = 40V
30V
20V
10V
0V
-10V
-20V
-30V
I_{g2} (mA)
600
400
200
0
V_a (V)
0
200
400
600
800
1000


7R50859A
PE 1/100 17-4-50
V_{g1} (V)
50
0,4A
0,1A
0,075A
1,25A
0,05A
1A
0,3A
0,75A
0,2A
0,025A
0
0,5A
0,1A
0,25A
0,1A
−50
0A
−100
$V_{g2} = 250V$
$V_{g3} = 0V$
$I_a = c$
$I_{g1} = c$
$I_{g2} = c$
0
200
400
600
800
1000
V_a(V)
1200

PHILIPS

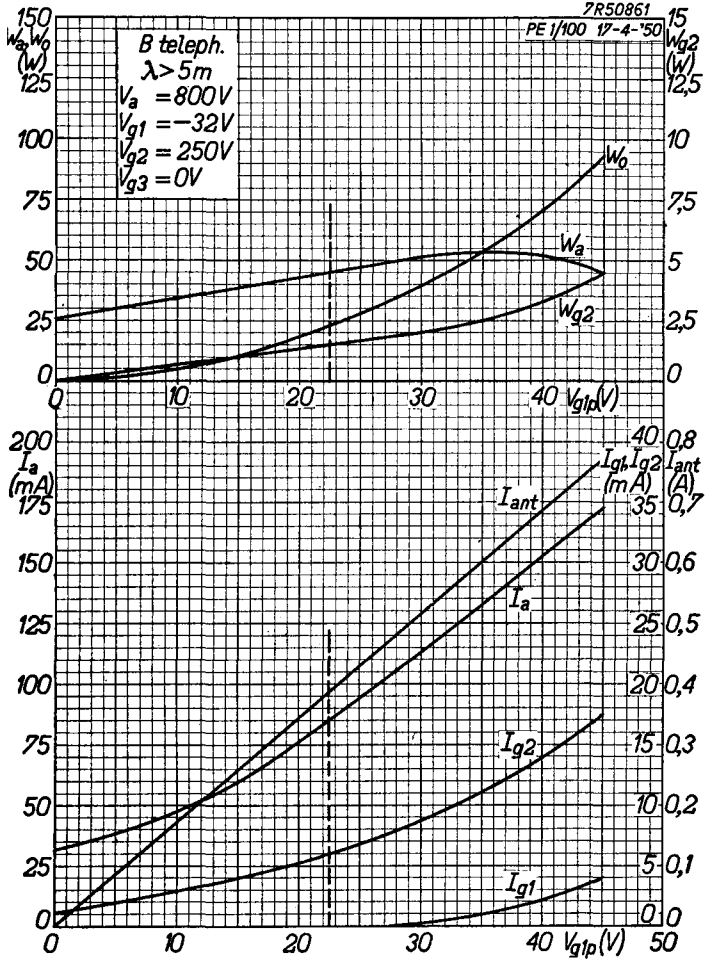

7R50860
PE 1/100 17-4-'50
B teleph.
λ>5 m
Va = 1000V
Vg1 = −34V
Vg2 = 250V
Vg3 = 0V
Wa, Wo (W)
Wg2 (W)
Wo
Wa
Wg2
Vg1p (V)
Ia (mA)
Ig1, Ig2 (mA)
Iant (A)
Iant
Ia
Ig2
Ig1

7.7.1954

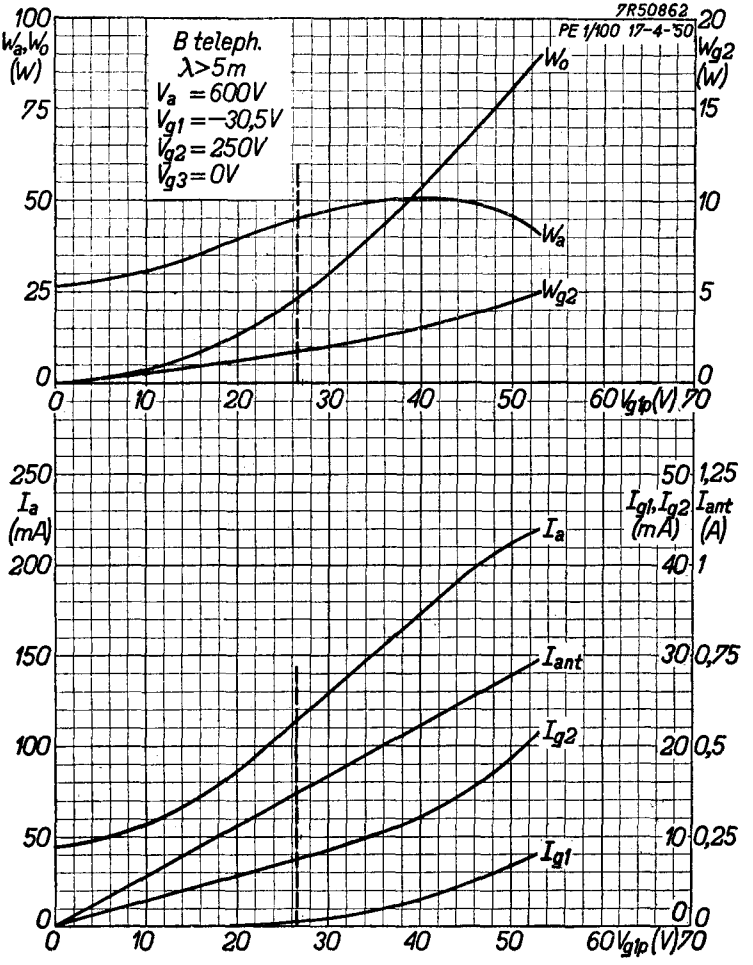
E

PHILIPS

PE 1/100

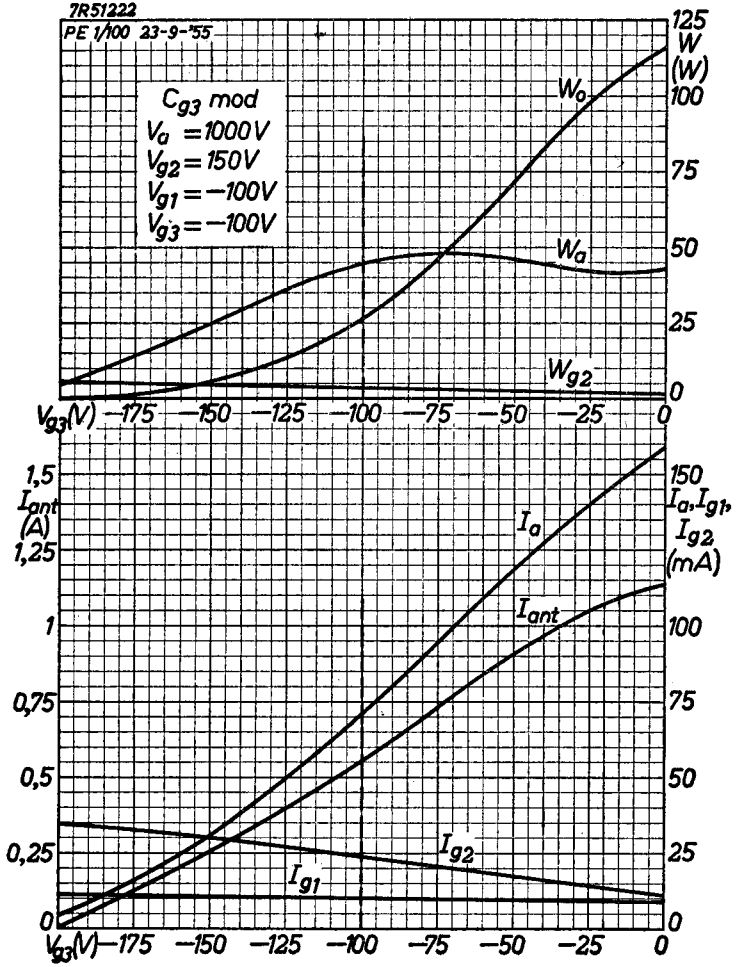


F

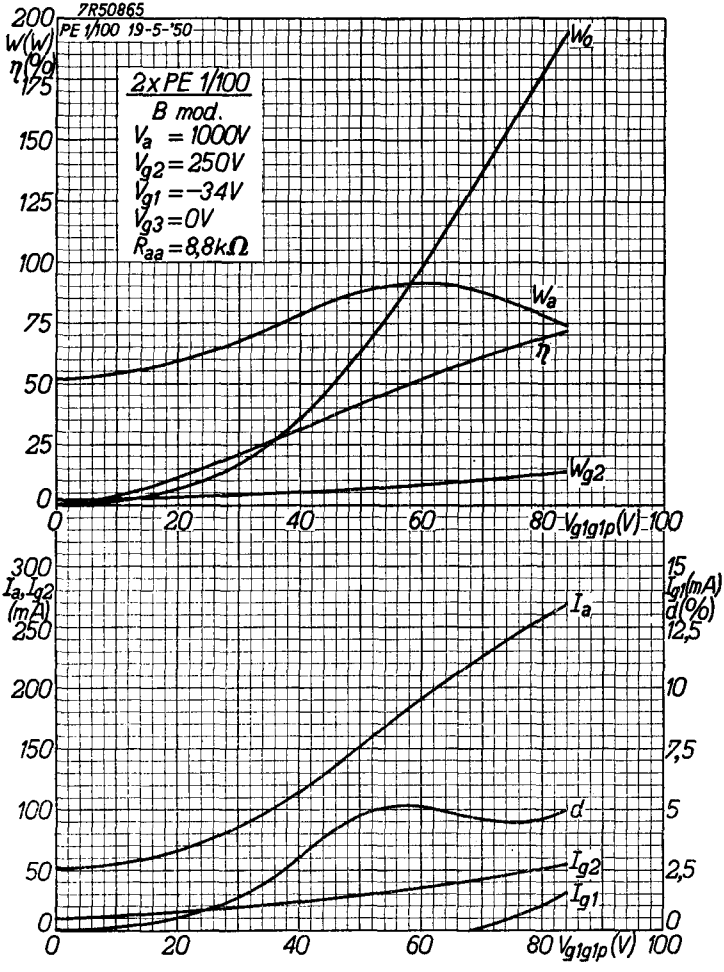

7R50862
PE 1/100 17-4-50
B teleph.
λ>5m
Va = 600V
Vg1 = −30,5V
Vg2 = 250V
Vg3 = 0V
Wa, Wo (W)
Wg2 (W)
Wo
Wa
Wg2
Vg1p (V)
Ia (mA)
Ig1, Ig2 (mA)
Iant (A)
Ia
Iant
Ig2
Ig1

PE 1/100

PHILIPS

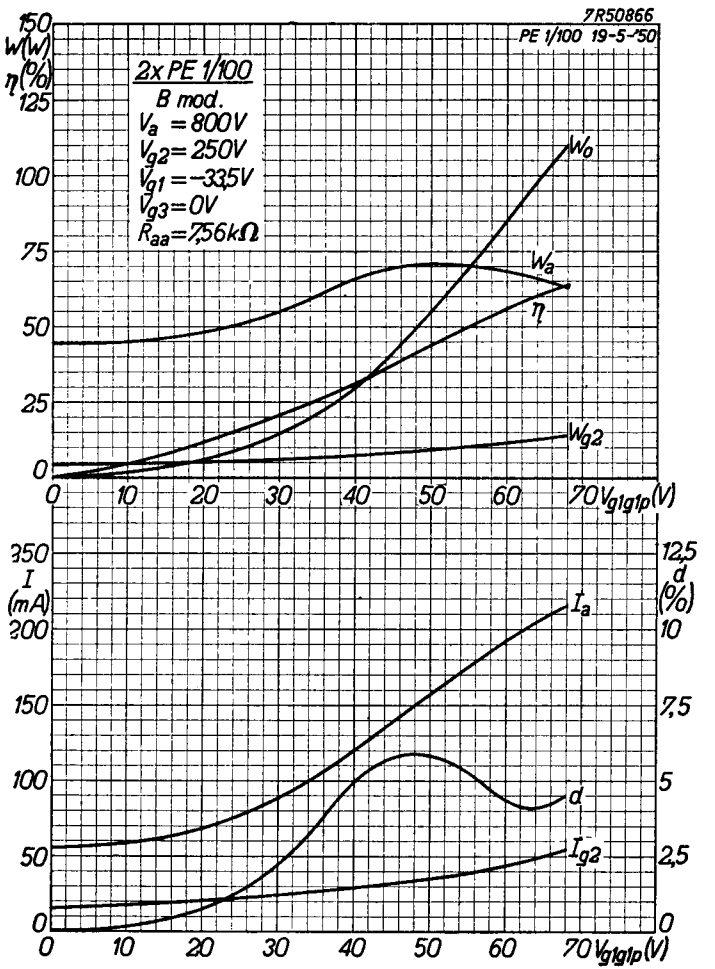


H

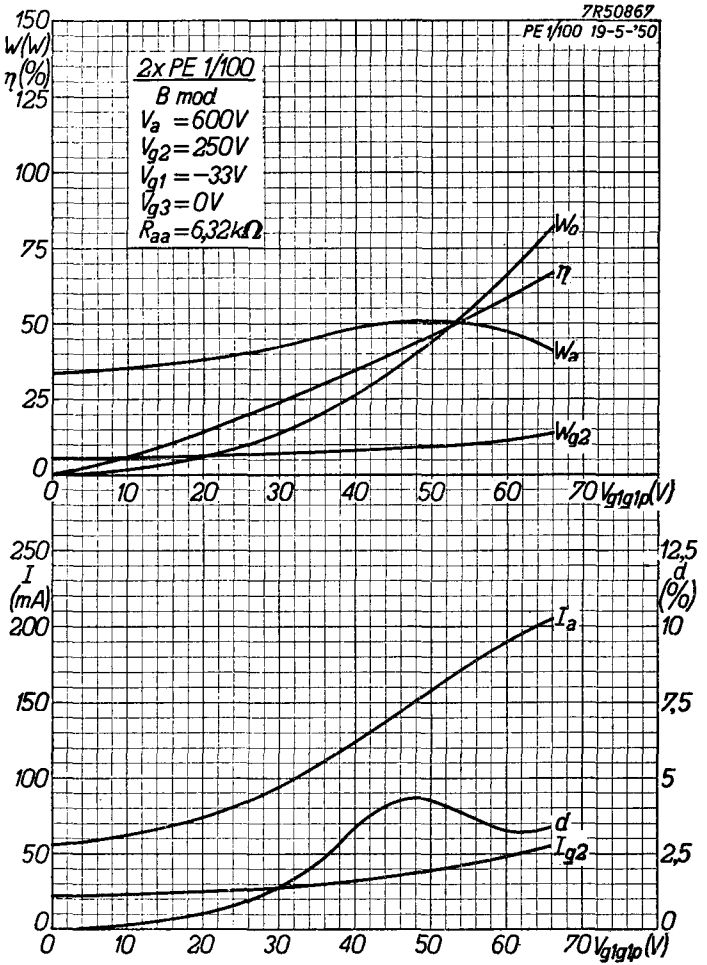

7R50865
PE 1/100 19-5-'50
2x PE 1/100
B mod.
V_a = 1000V
V_{g2} = 250V
V_{g1} = −34V
V_{g3} = 0V
R_{aa} = 8,8kΩ
W_o
W_a
η
W_{g2}
W(W) η(%)
200
175
150
125
100
75
50
25
0
0
20
40
60
80
V_{g1g1p}(V)
100
I_a, I_{g2} (mA)
300
250
200
150
100
50
0
I_{g1}(mA) d(%)
15
12,5
10
7,5
5
2,5
0
I_a
d
I_{g2}
I_{g1}

PE 1/100

PHILIPS



J


7R50867
PE 1/100 19-5-'50
2x PE 1/100
B mod
V_a = 600V
V_{g2} = 250V
V_{g1} = −33V
V_{g3} = 0V
R_{aa} = 6,32kΩ
W(W)
η(%)
W_o
η
W_a
W_{g2}
V_{g1g1p}(V)
I (mA)
d (%)
I_a
d
I_{g2}
V_{g1g1p}(V)



PE1/100

page	sheet	date
1	1	1959.02.02
2	2	1959.02.02
3	3	1955.10.10
4	4	1955.10.10
5	5	1954.07.07
6	A	1954.07.07
7	B	1954.07.07
8	C	1954.07.07
9	D	1954.07.07
10	E	1954.07.07
11	F	1954.07.07
12	G	1955.10.10
13	H	1955.10.10
14	I	1956.01.01
15	J	1956.01.01
16	K	1956.01.01
17	FP	2000.05.05

PENTODE for use as H.F. amplifier
PENTHODE pour utilisation comme amplificatrice H.F.
PENTHODE zur Verwendung als H.F. Verstärker

Cathode : oxide-coated
Cathode : oxyde
Kathode : Oxyd

Heating : indirect
Chauffage: indirect
Heizung : indirekt

Vf = 12 V
If = 0,9 A

Capacitances
Capacités
Kapazitäten

Ca = 12 pF
Cg1 = 15 pF
Cag1 = 0,1 pF

Typical characteristics
Caractéristiques typiques
Kenndaten

μg2g1 = 3,9

S (Ia =40 mA)= 2,5 mA/V

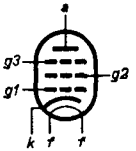
λ	Freq.	C telegr.		B teleph.		Cag2 mod.	
m	Mc/s	Va (V)	Wo (W)	Va (V)	Wo (W)	Va (V)	Wo (W)
>15	<20	1000	85	1000	13	1000	60
		750	60				
5	60	625	32,5	625	12		
		Cg2 mod.		Cg3 mod.			
>15	<20	1000	18	1000	10		
5	60	625	11,5	625	8		

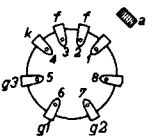
Limiting values
Caractéristiques limites
Grenzdaten

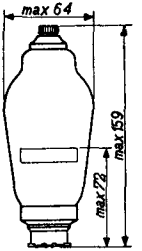
Va = max. 1000 V
Wa = max. 35 W
Vg2 = max. 500 V
Wg2 = max. 6 W
Wg1 = max. 4 W
Rg1 = max. 30 kΩ
Ik = max. 160 mA
Ikp = max. 650 mA
Vfk = max. 170 V

PHILIPS

Dimensions in mm
Dimensions en mm
Abmessungen in mm







Base, culot, Sockel: P

Socket
Support 5900/02
Fassung

Mounting position: arbitrary
Montage : arbitrairement
Einbau : willkürlich

Net weight
Poids net 120 g
Nettogewicht

Shipping weight
Poids brut 210 g
Bruttogewicht

PHILIPS

Electronic Tube HANDBOOK

PE1/80

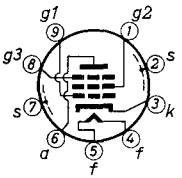
page	sheet	date
1	1	1954.07.07
2	2	1954.07.07
3	FP	2000.05.05

PENTODE FOR USE IN TRANSITRON CIRCUITS in television receivers
PENTHODE POUR UTILISATION DANS DES CIRCUITS TRANSITRONS dans des récepteurs de télévision
PENTODE ZUR VERWENDUNG IN TRANSITRONSCHALTUNGEN in Fernsehempfängern

Heating : indirect by A.C. or D.C. series supply
Chauffage: indirect par C.A. ou C.C. alimentation série
Heizung : indirekt durch Wechsel- oder Gleichstrom Serienspeisung

$I_f = 300$ mA
$V_f = 4{,}5$ V

Dimensions in mm
Dimensions en mm
Abmessungen in mm



Base, culot, Sockel: Noval

Capacitances
Capacités
Kapazitäten

C_{g_1}	=	3,5 pF
C_a	=	5,0 pF
C_{ag_1}	<	0,05 pF
C_{g_1f}	<	0,003 pF

Typical characteristics
Caractéristiques types
Kenndaten

V_a	=	100	250 V
V_{g_3}	=	-30	0 V
V_{g_2}	=	35	140 V
V_{g_1}	=	0	-2 V
I_a	=	<0,01	3,0 mA
I_{g_2}	=		0,6 mA
S	=		2,0 mA/V
$\mu_{g_2g_1}$	=		38
R_i	=		2,5 MΩ

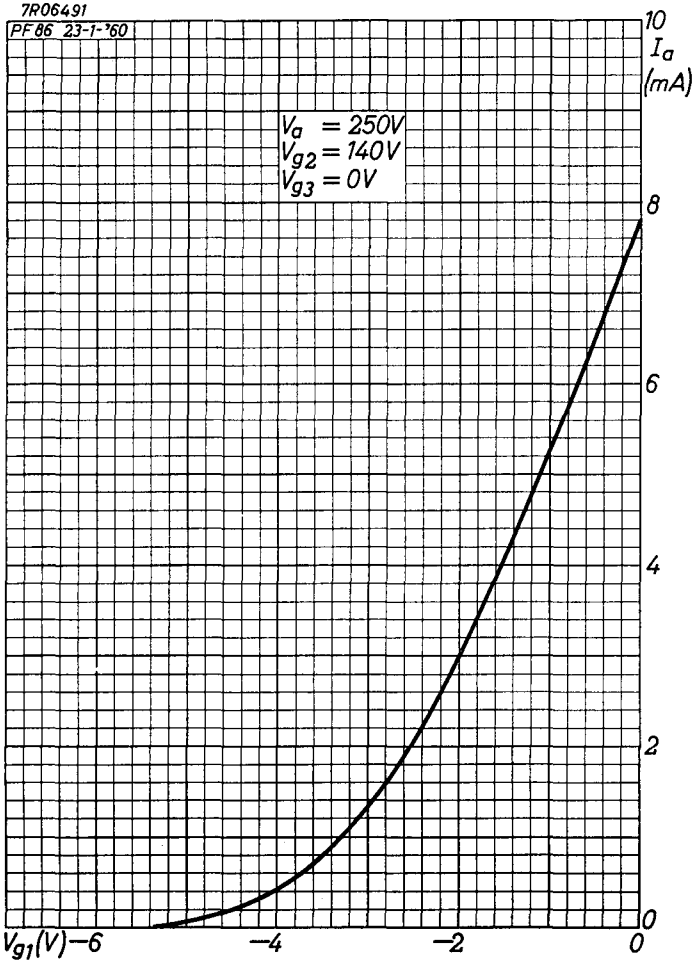
Limiting values
Caractéristiques limites
Grenzdaten

V_{a_o}		= max.	550 V
V_a		= max.	300 V
W_a		= max.	1 W
$V_{g_{2_o}}$		= max.	550 V
V_{g_2}		= max.	200 V
W_{g_2}		= max.	0,2 W
I_k		= max.	4 mA
I_{kp}		= max.	25 mA [1]
R_{g_1}	(W_a < 0,2 W)	= max.	10 MΩ
R_{g_1}	(W_a > 0,2 W)	= max.	3 MΩ
R_{g_3}		= max.	0,1 MΩ
V_{kf}		= max.	100 V
R_{kf}		= max.	20 kΩ

[1]) Max. pulse duration 4% of a cycle with a maximum of 0,8 msec
Durée de l'impulsion max. 4% d'un cycle avec un maximum de 0,8 msec
Impulszeit max. 4% einer Periode mit einem Maximum von 0,8 mSek.

PHILIPS

PF 86



1.1.1960

A

PF 86

PHILIPS



PF86

page	sheet	date
1	1	1960.01.01
2	2	1960.01.01
3	A	1960.01.01
4	B	1960.01.01
5	FP	2000.05.06

DOUBLE PENTODE

Double pentode intended for use as video output tube, sync. separator, A.G.C. amplifier or I.F. sound amplifier.

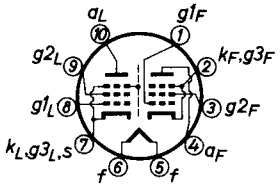
QUICK REFERENCE DATA			
F section			
Anode current	I_a	10	mA
Transconductance	S	8.5	mA/V
Amplification factor	$\mu_{g_2g_1}$	38	-
Internal resistance	R_i	150	kΩ
L section			
Anode current	I_a	30	mA
Transconductance	S	22	mA/V
Amplification factor	$\mu_{g_2g_1}$	38	-
Internal resistance	R_i	33	kΩ

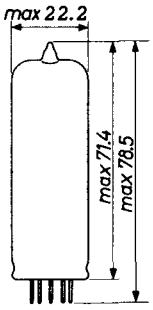
HEATING: Indirect by A.C. or D.C.; series supply

Heater current	I_f	300	mA
Heater voltage	V_f	17	V

DIMENSIONS AND CONNECTIONS Dimensions in mm

Base: Decal





CAPACITANCES		L section	F section	
Anode to all except grid No.1	$C_{a(g_1)}$	6.5	10.5	pF
Grid No.1 to all except anode	$C_{g_1(a)}$	12.5	10.5	pF
Anode to grid No.1	C_{ag_1}	0.100	0.15	pF
Grid No.1 to heater	C_{g_1f}		max. 0.15	pF
Between the two pentode sections				
Anode L section to anode F section	$C_{a_La_F}$		max. 0.15	pF
Grid No.1 L section to grid No.1 F section	$C_{g_{1_L}g_{1_F}}$		max. 0.01	pF
Anode L section to grid No.1 F section	$C_{a_Lg_{1_F}}$		max. 0.10	pF
Grid No.1 L section to anode F section	$C_{g_{1_L}a_F}$		max. 0.005	pF

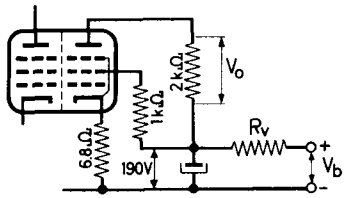
TYPICAL CHARACTERISTICS

Output pentode (L section)			
Anode voltage	V_a	170	V
Grid No.2 voltage	V_{g_2}	170	V
Grid No.1 voltage	V_{g_1}	-2.7	V
Anode current	I_a	30	mA
Grid No.2 current	I_{g_2}	7	mA
Transconductance	S	22	mA/V
Internal resistance	R_i	33	kΩ
Amplification factor	$\mu_{g_2g_1}$	38	-

Amplifier pentode (F section)			
Anode voltage	V_a	150	V
Grid No.2 voltage	V_{g_2}	150	V
Grid No.1 voltage	V_{g_1}	-2.1	V
Anode current	I_a	10	mA
Grid No.2 current	I_{g_2}	3.0	mA
Transconductance	S	8.5	mA/V
Internal resistance	R_i	150	kΩ
Amplification factor	$\mu_{g_2g_1}$	38	-

OPERATING CHARACTERISTICS

Output pentode (L section) as video output tube



Supply voltage V_b = 210 230 V

Series resistor R_v = 390 820 Ω

R_v should be added to avoid excessive dissipation

Input voltage (peak to peak) V_{ip-p} = 3.6 V

Output voltage (peak to peak) V_{op-p} = 100 V

Amplifier pentode (F section)

		Sync Separator		A.G.C. amplifier		I.F. amplifier	
Supply voltage	V_b	200 to 250	V				
Anode resistor	R_a	50	kΩ				
Anode voltage	V_a			100 to 150	V	150	V
Grid No.2 voltage	V_{g_2}	75	V	60	V	150	V
Grid No.1 resistor	R_{g_1}	1	MΩ				
Grid No.1 voltage	V_{g_1}	-2.7	V	-1.5	V	-2.1	V
Anode current	I_a	0.1	mA	1	mA	10	mA
Transconductance	S	0.2	mA/V	2.0	mA/V	8.5	mA/V

LIMITING VALUES (Design centre rating system)

Output pentode (L section)

Anode voltage	V_{a_o}	max.	550	V
	V_a	max.	250	V
Anode dissipation	W_a	max.	5.1	W
Grid No. 2 voltage	$V_{g_{2o}}$	max.	550	V
	V_{g_2}	max.	250	V
Grid No. 2 dissipation	W_{g_2}	max.	2.5	W [1]
Grid No. 1 resistor	R_{g_1}	max.	1	MΩ
Cathode current	I_k	max.	60	mA [2]
Cathode to heater voltage	V_{kf}	max.	200	V

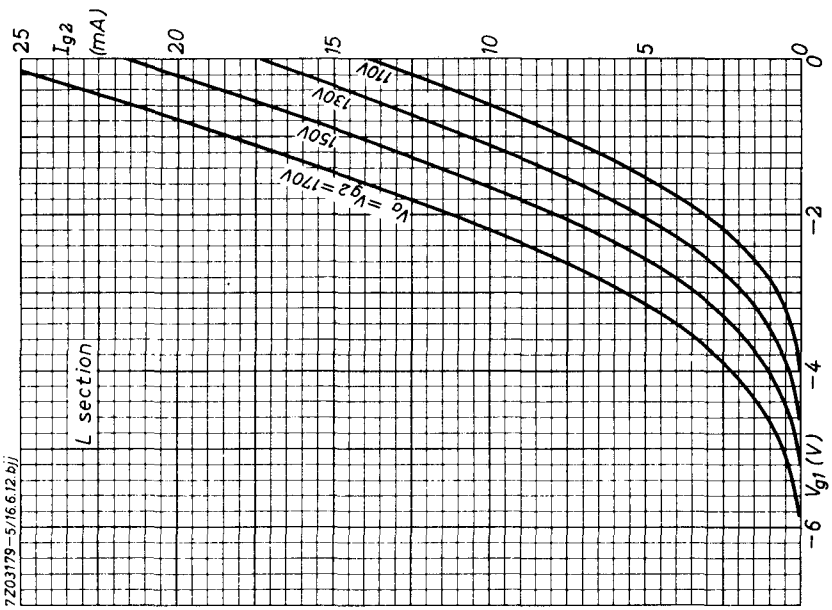
Amplifier pentode (F section)

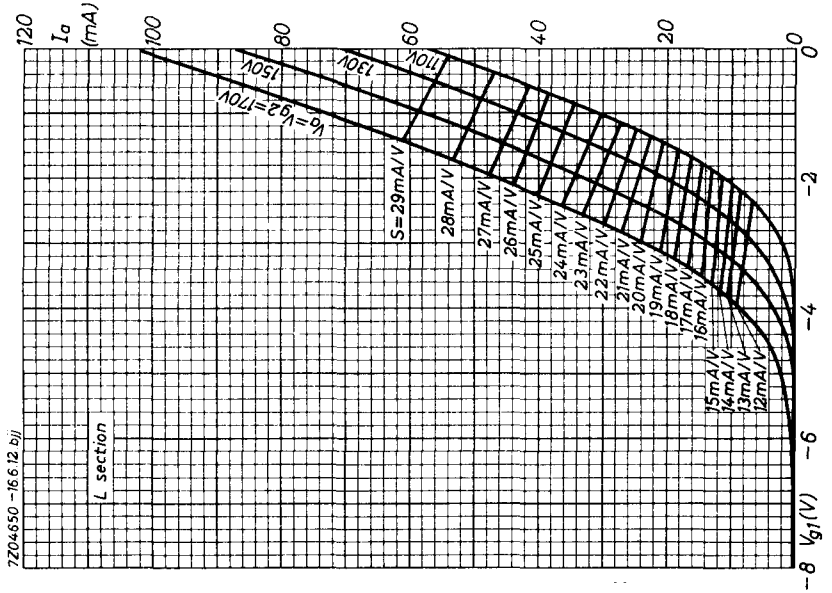
Anode voltage, peak ($I_a < 0.1$ mA)	V_{a_p}	max.	600	V [3]
	V_{a_o}	max.	550	V
	V_a	max.	250	V
Anode dissipation	W_a	max.	1.5	W
Grid No. 2 voltage	$V_{g_{2o}}$	max.	550	V
	V_{g_2}	max.	250	V
Grid No. 2 dissipation	W_{g_2}	max.	0.5	W
Grid No. 1 resistor	R_{g_1}	max.	1	MΩ
Cathode current	I_k	max.	15	mA
Cathode to heater voltage	V_{kf}	max.	200	V

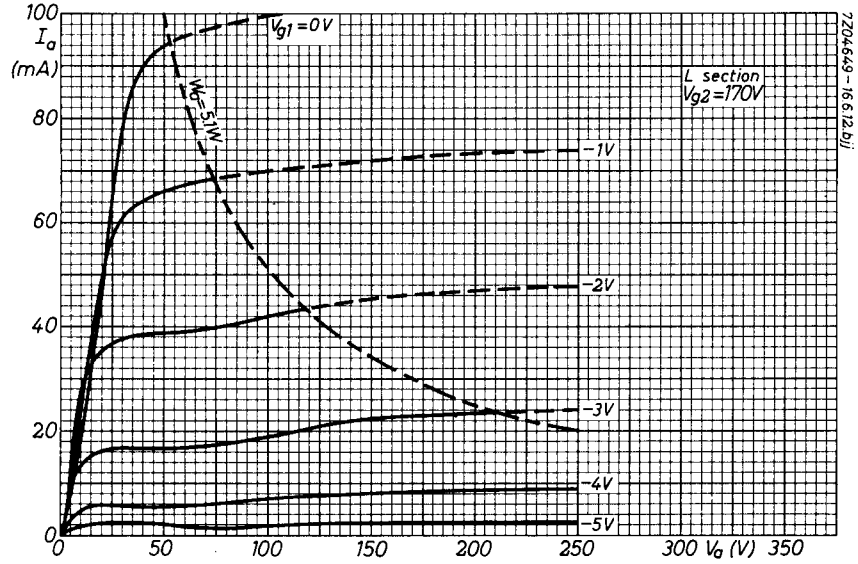
[1]) During short periods W_{g_2} = max. 3.2 W

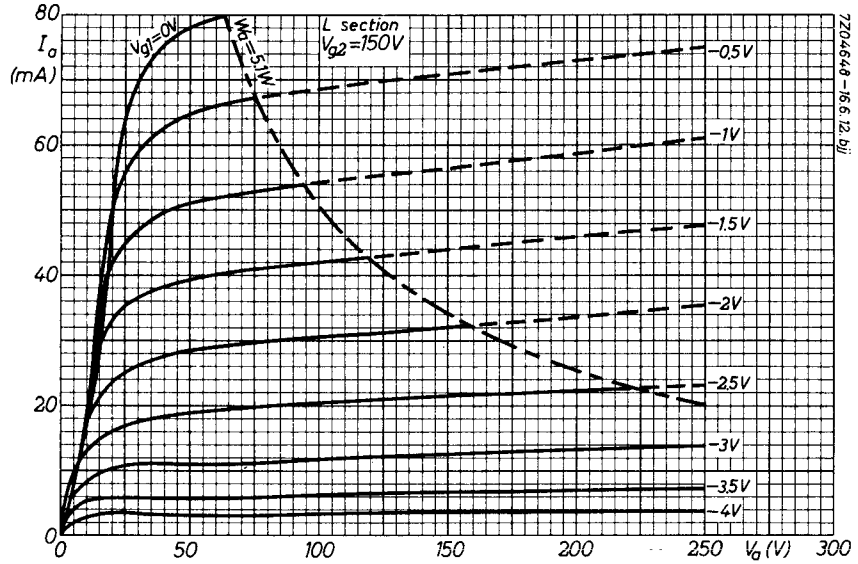
[2]) During short periods I_k = max. 85 mA

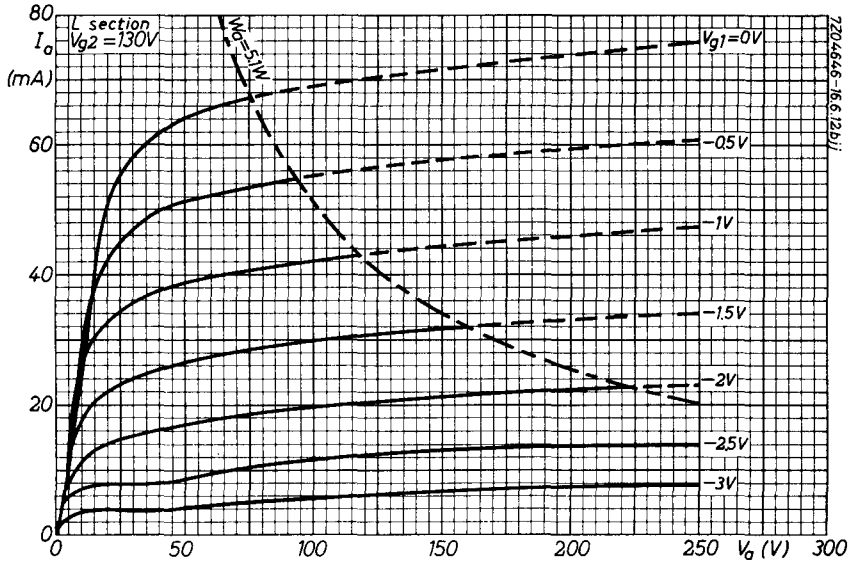
[3]) Max. pulse duration 18% of a cycle, with a max. of 18 μsec.

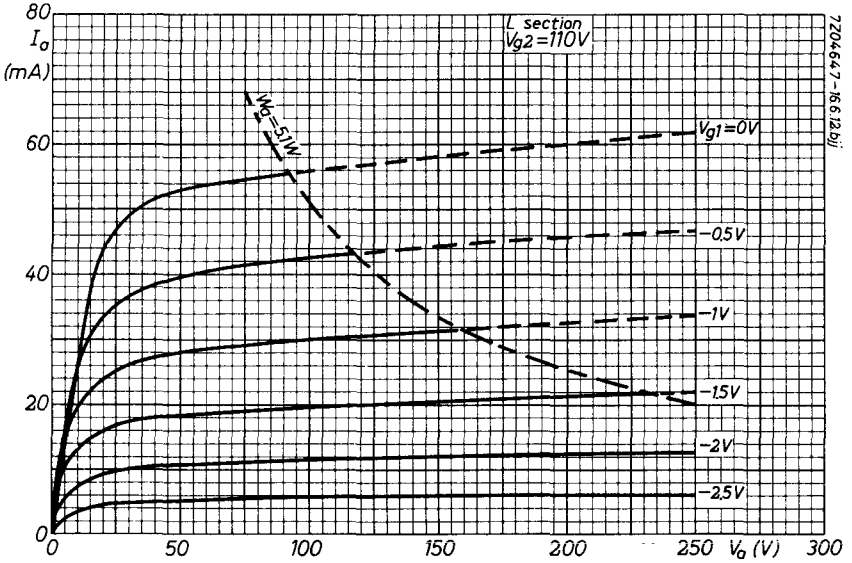

7203179-5/16.6.12.bij
L section
I_{g2} (mA)
25
20
15
10
5
0
$V_a = V_{g2} = 170V$
150V
130V
110V
0
-2
-4
-6
V_{g1} (V)

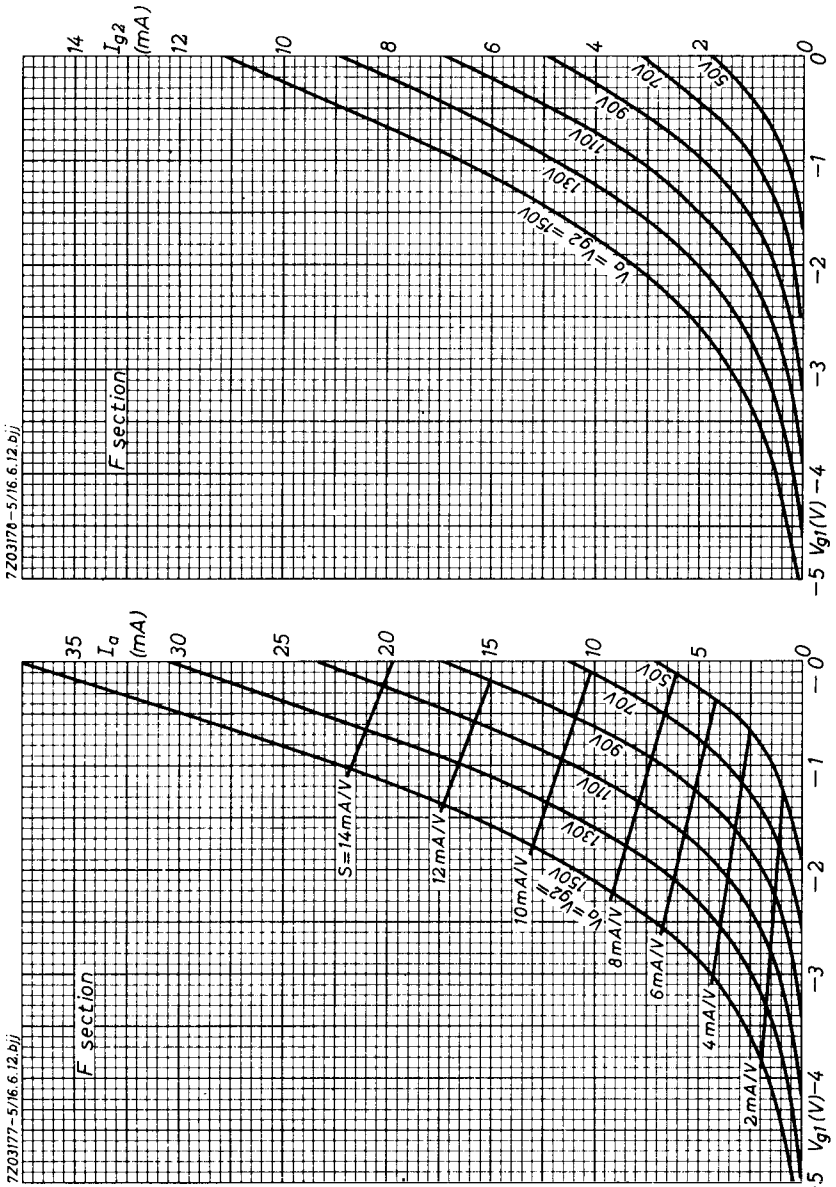

7204650-16.6.12.bij
L section
I_a (mA)
120
100
80
60
40
20
0
$V_a = V_{g2} = 170V$
150V
130V
110V
S=29mA/V
28mA/V
27mA/V
26mA/V
25mA/V
24mA/V
23mA/V
22mA/V
21mA/V
20mA/V
19mA/V
18mA/V
17mA/V
16mA/V
15mA/V
14mA/V
13mA/V
12mA/V
0
-2
-4
-6
-8
V_{g1} (V)

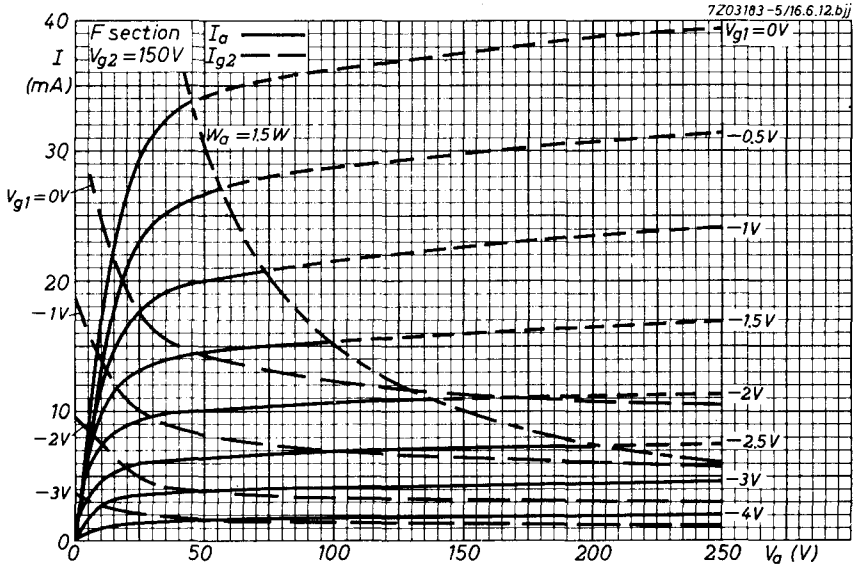

100
I_a
(mA)
80
60
40
20
0
0
50
100
150
200
250
300 V_a (V) 350
V_{g1} = 0 V
W_a = 5,1 W
L section
V_{g2} = 170 V
-1V
-2V
-3V
-4V
-5V
7204649 - 16.6.12.bij

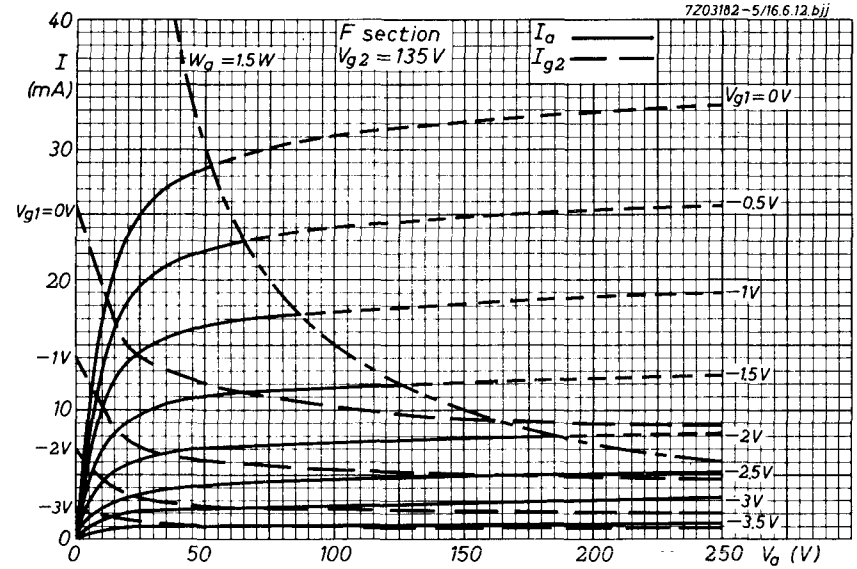

80
I_a
(mA)
60
40
20
0
0
50
100
150
200
250 V_a (V) 300
V_{g1} = 0V
W_a = 5,1 W
L section
V_{g2} = 150 V
-0,5 V
-1V
-1,5 V
-2V
-2,5 V
-3V
-3,5 V
-4V
7204648 - 16.6.12.bij

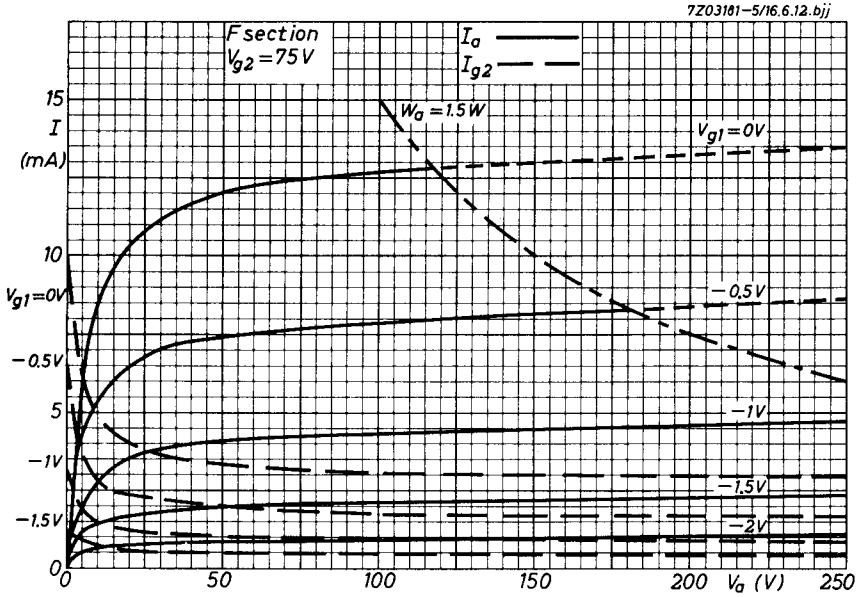

L section
Vg2 = 130V
Wg = 5.1W
Vg1 = 0V
-0.5V
-1V
-1.5V
-2V
-2.5V
-3V
Ia (mA)
Va (V)
0
20
40
60
80
0
50
100
150
200
250
300
7204646-16.6.12bij

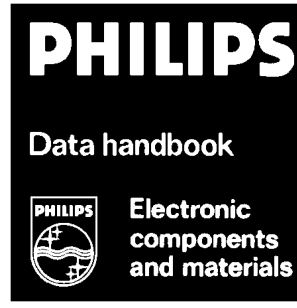

L section
Vg2 = 110V
Wg = 5.1W
Vg1 = 0V
-0.5V
-1V
-1.5V
-2V
-2.5V
Ia (mA)
Va (V)
0
20
40
60
80
0
50
100
150
200
250
300
7204647-16.6.12bij


F section
7Z03178-5/16.6.12.bij
I_{g2} (mA)
V_{g1} (V)
$V_a = V_{g2}$ = 150V
130V
110V
90V
70V
50V
F section
7Z03177-5/16.6.12.bij
I_a (mA)
V_{g1} (V)
S = 14 mA/V
12 mA/V
10 mA/V
8 mA/V
6 mA/V
4 mA/V
2 mA/V
$V_a = V_{g2}$ = 150V
130V
110V
90V
70V
50V


7Z03183-5/16.6.12.bij
F section
V_{g2} = 150 V
I_a
I_{g2}
W_a = 1.5 W
I (mA)
V_{g1} = 0V
−1V
−2V
−3V
−0.5V
−1.5V
−2.5V
−4V
0
50
100
150
200
250
V_a (V)


7Z03182-5/16.6.12.bij
F section
V_{g2} = 135 V
I_a
I_{g2}
W_a = 1.5 W
I (mA)
V_{g1} = 0V
−1V
−2V
−3V
−0.5V
−1.5V
−2.5V
−3.5V
0
50
100
150
200
250
V_a (V)


7Z03181–5/16.6.12.bjj
F section
V_{g2} = 75 V
I_a
I_{g2}
W_a = 1.5 W
V_{g1} = 0 V
−0.5 V
−1 V
−1.5 V
−2 V
I (mA)
15
10
5
0
V_{g1} = 0 V
−0.5 V
−1 V
−1.5 V
0
50
100
150
200
250
V_a (V)



PFL200

page	sheet	date
1	1	1970.01
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5	5	1970.01
6	6	1970.01
7	7	1970.01
8	8	1970.01
9	9	1970.01
10	10	1970.01
11	FP	1999.08.03

PHILIPS

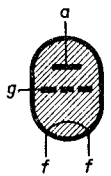
PL 10

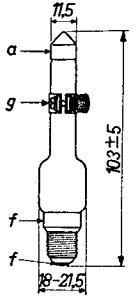
GAS-FILLED TRIODE with high insulated external grid for use in pulse and relay circuits
TRIODE A REMPLISSAGE DE GAZ avec grille extérieur à grande résistance d'isolation pour utilisation en circuits d'impulsions et de relais
GASGEFÜLLTE TRIODE mit hochisoliertem äusserem Gitter zur Verwendung in Impuls- und Relaisschaltungen

Heating : direct
Chauffage: direct
Heizung : direkt

V_f = 1,85 V
I_f = 3,4 A
T_h = 0 sec

Dimensions in mm
Dimensions en mm
Abmessungen in mm





Socket :
Support: Mignon 88168/01
Fassung:

Anode clip
Borne de connexion de l'anode S 80 37 00
Anodenanschluss-klemme

General characteristics
Caractéristiques générales
Allgemeine Daten

$V_{arc}(I_a=0,1\text{-}4\ A) = 20\text{-}35\ V$

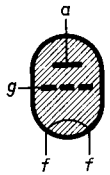
PHILIPS PL 10

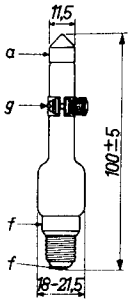
GAS-FILLED TRIODE with high insulated external grid for use in pulse and relay circuits
TRIODE A REMPLISSAGE DE GAZ avec grille extérieur à grande résistance d'isolation pour utilisation en circuits d'impulsions et de relais
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Heating : direct
Chauffage: direct
Heizung : direkt

V_f = 1,85 V
I_f = 3,4 A
T_h = 0 sec

Dimensions in mm
Dimensions en mm
Abmessungen in mm





Socket :
Support:
Fassung: Mignon 88168/01

Anode clip
Borne de connexion de l'anode S 80 37 00
Anodenanschluss-klemme

General characteristics
Caractéristiques générales
Allgemeine Daten

$V_{arc}(I_a=0,1\text{-}4\ A)$ = 20-35 V

Limiting values
Caractéristiques limites [1])
Grenzdaten

V_{a_p}	= max.	400 V
$V_{a\ inv_p}$	= max.	400 V
I_a	= max.	0,1 A [2])
I_{a_p}	= max.	4 A
$+V_{g_p}$	= max.	1800 V
$-V_{g_p}$	= max.	1800 V
R_g -	= max.	10 MΩ
t_{amb}	=	-75/+90 °C

Remark — Thanks to the special grid construction which prevents striking at normal anode voltage during short circuit between anode and grid, a high safety is obtained.

Observation — Par la construction spéciale de la grille, qui prévient l'amorçage à la tension anodique normale pendant un court-circuit entre l'anode et la grille, une grande sûreté est obtenue.

Bemerkung — Durch die spezielle Gitterkonstruktion die die Zündung bei normaler Anodenspannung während Kurzschluss zwischen Anode und Gitter verhütet, wird eine hohe Sicherheit erreicht.

[1]) At f = max. 100 c/s
A f = max. 100 c/s
Bei f = max. 100 Hz.

[2]) T_{av} = 10 sec.

Limiting values
Caractéristiques limites [1])
Grenzdaten

V_{ap}	= max.	400 V
$V_{a\ inv_p}$	= max.	400 V
I_a	= max.	0,1 A [2])
I_{a_p}	= max.	4 A
$+V_{g_p}$	= max.	1800 V
$-V_{g_p}$	= max.	1800 V
R_g -	= max.	10 MΩ
t_{amb}	=	-75/+90 °C

Remark — Thanks to the special grid construction which prevents striking at normal anode voltage during short circuit between anode and grid, a high safety is obtained.

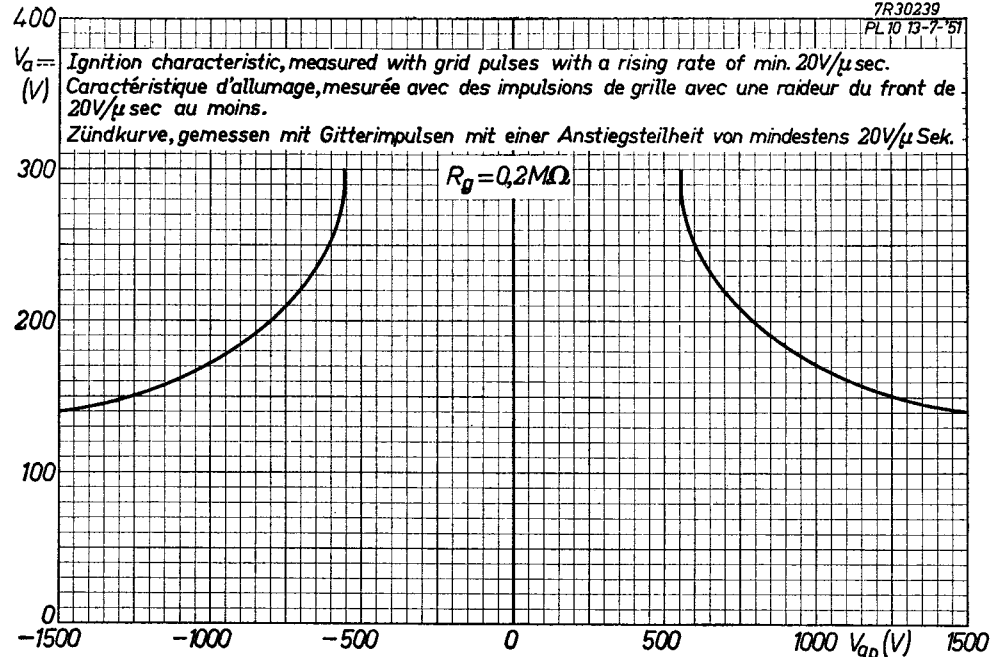
Observation — Par la construction spéciale de la grille, qui prévient l'amorçage à la tension anodique normale pendant un court-circuit entre l'anode et la grille, une grande sûreté est obtenue.

Bemerkung — Durch die spezielle Gitterkonstruktion die die Zündung bei normaler Anodenspannung während Kurzschluss zwischen Anode und Gitter verhütet, wird eine hohe Sicherheit erreicht.

[1]) At f = max. 100 c/s
A f = max. 100 c/s
Bei f = max. 100 Hz.

[2]) T_{av} = 10 sec.

6.6.1951



A

PHILIPS

PL10

PHILIPS

Electronic Tube

HANDBOOK

PL10

page	sheet	date
1	1	1954.11.11
2	1	1957.08.08
3	2	1954.11.11
4	2	1957.08.08
5	A	1951.06.06
6	FP	2000.05.14

THYRATRON, mercury-vapour tetrode
THYRATRON, tétrode à vapeur de mercure
STROMTORRÖHRE, Quecksilberdampftetrode

Application: D.C.: for use as rectifier with variable or stabilised output voltage and for electronic D.C. motor speed control.
A.C.: for use as electronic switch and control of ignitron circuits; control of electric furnaces, incandescent lamps and discharge lamps; for resistance welding up to 27 kVA

Application: C.C.: pour utilisation comme redresseur avec tension de sortie régulée ou stabilisée et pour réglage électronique de la vitesse de moteurs à C.C.
C.A.: pour utilisation comme interrupteur électronique et pour commande des circuits d'ignitron; réglage des fours électriques, des lamps à incandescence et des lamps à décharge; pour soudure par résistance jusqu'à 27 kVA

Anwendung : Gleichstrom: zur Verwendung als Gleichrichter mit geregelter oder stabilisierter Ausgangsspannung und zur elektronischen Drehzahlregelung von Gleichstrommotoren
Wechselstrom: zur Verwendung als elektronischer Schalter und Regelung von Ignitronschaltungen; Regelung von elektrischen Öfen, Glühlampen und Entladungslampen; für Widerstandsschweissung bis 27 kVA

See also "Explanation of the technical data of thyratrons" in front of this section

Voir aussi "L'explication des caractéristiques techniques des thyratrons" en tête de ce chapitre

Siehe auch die "Erläuterung zu den technischen Daten der Stromtorröhren" am Anfang dieses Abschnitts

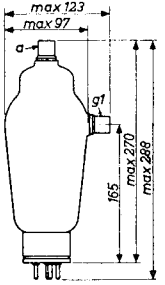
PL 105 PHILIPS

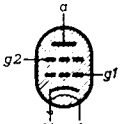
Heating : indirect
Chauffage: indirect
Heizung : indirekt

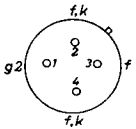
V_f = 5,0 V ± 5%
I_f = 10 A
T_w = min. 5 min[1])

Dimensions in mm
Dimensions en mm
Abmessungen in mm

Base : Super Jumbo with bayonet
Culot : Super Jumbo à baionnette
Sockel: Super Jumbo mit Bajonette







Pins 2 and 3 heater, pin 4 cathode return
Broches 2 et 3 filament, broche 4 circuit de retour de la cathode
Stifte 2 und 3 Heizfaden, Stift 4 Katodenrückleitung

Socket		Cap	
Support	40403/00	Capot	40620
Passung		Haube	

Mounting position: vertical, base down
Montage : vertical, culot en bas
Einbau : senkrecht, Sockel unten

Net weight		Shipping weight	
Poids net	510 g	Poids brut	1400 g
Nettogewicht		Bruttogewicht	

Capacitances
Capacités
Kapazitäten

C_{ag1} = 1,8 pF
C_{g1k} = 5,0 pF

Typical characteristics
Caractéristiques types
Kenndaten

V_{arc} = 12 V
T_{ion} = 10 µs
T_{dion} = 1000 µs
f = max. 150 c/s

[1])See note [1])page 4; voir note [1])page 4; siehe Note [1])Seite 4

Limiting values (absolute limits)
Caractéristiques limites (limites absolues)
Grenzdaten (Absolute Grenzen)

Continuous service
Service continue [2])
Dauerbetrieb

V_{a_p}	= max.	2500	V
$V_{a\ inv_p}$	= max.	2500	V
$-V_{g2}$	= max.	500	V
$-V_{g2}$	= max.	10	V [3])
$-V_{g1}$	= max.	1000	V
$-V_{g1}$	= max.	10	V [3])
I_{a_p} (f< 25 c/s)	= max.	12,8	A
I_{a_p} (f≧25 c/s)	= max.	40	A
I_a (T_{av}= max.15 s)	= max.	6,4	A
I_{g2_p}	= max.	2,0	A
I_{g2} (T_{av}= max.15 s)	= max.	0,5	A
I_{g1_p}	= max.	1,0	A
I_{g1} (T_{av}= max.15 s)	= max.	0,25	A
R_{g2}	= max.	10	kΩ
R_{g2}	=	10	kΩ [4])
R_{g1}	= max.	100	kΩ
R_{g1}	=	10	kΩ [4])
t_{Hg}	=	40-80	°C
t_{Hg}	=	60	°C [4])
Isurge (T =max.0,1 s)	= max.	400	A

[2]) For intermittent service see page 4
Pour service intermittent voir page 4
Für Aussetzender Betrieb siehe Seite 4

[3]) Tube conductive
Tube conductif
Gezündete Röhre

[4]) Recommended value
Valeur recommandée
Empfohlener Wert

Limiting values (absolute limits)
Caractéristiques limites (limites absolues)
Grenzdaten (absolute Grenzen)

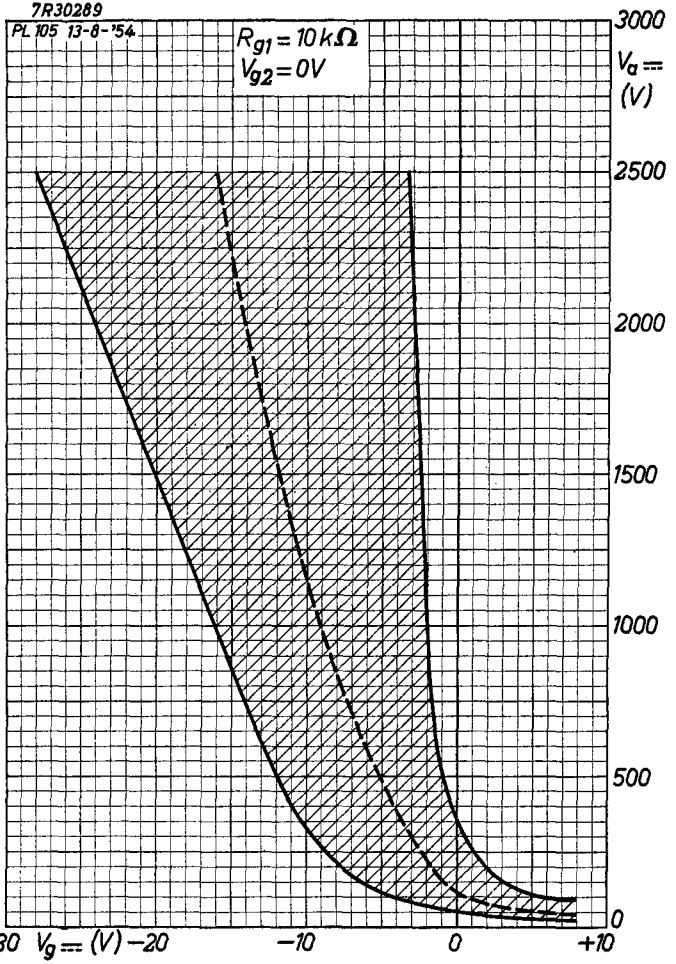
Intermittent service
Service intermittent
Aussetzender Betrieb

V_{a_p}	= max.	750 V
$V_{a\ inv_p}$	= max.	750 V
$-V_{g2}$	= max.	500 V
$-V_{g2}$	= max.	10 V[3]
$-V_{g1}$	= max.	1000 V
$-V_{g1}$	= max.	10 V[3]
I_{a_p} (f< 25 c/s)	= max.	5,0 A
I_{a_p} (f≥25 c/s)	= max.	77 A
I_a (T_{av}=max.5 s)	= max.	2,5 A
I_{g2_p}	= max.	2,0 A
I_{g2} (T_{av}=max.5 s)	= max.	0,5 A
I_{g1_p}	= max.	1,0 A
I_{g1} (T_{av}=max.5 s)	= max.	0,25 A
R_{g2}	= max.	10 kΩ
R_{g2}	=	10 kΩ[4]
R_{g1}	=	100 kΩ
R_{g1}	=	10 kΩ[4]
t_{Hg}	=	40-80 °C
t_{Hg}	=	60 °C[4]
I_{surge}(T=max.0,1 s)	= max.	400 A

[3][4]) See page 3; voir page 3; siehe Seite 3

[1])See curves on page C. During long periods of interrupted service (e.g. during night hours)it is recommended to reduce Vf to 60-80% instead of switching off the filament. In this way the value of Tw can be decreased according to the dotted curve
Voir les courbes sur page C. Pendant les périodes du service interrompu longues (p.e. pendant les heures de nuit) il est recommandé de reducer Vf à 60-80% au lieu de mettre hors circuit le filament. De cette manière la valeur de Tw peut être diminuée selon la courbe pointilée
Siehe die Kurven auf Seite C. Während langen Betriebsunterbrechungen (z.B. während der Nachtstunden) ist es empfehlenswert Vf zu reduzieren bis auf 60-80% statt den Glühfaden auszuschalten. In dieser Weise kann den Wert von Tw entsprechend die gestrichelte Kurve verringert werden

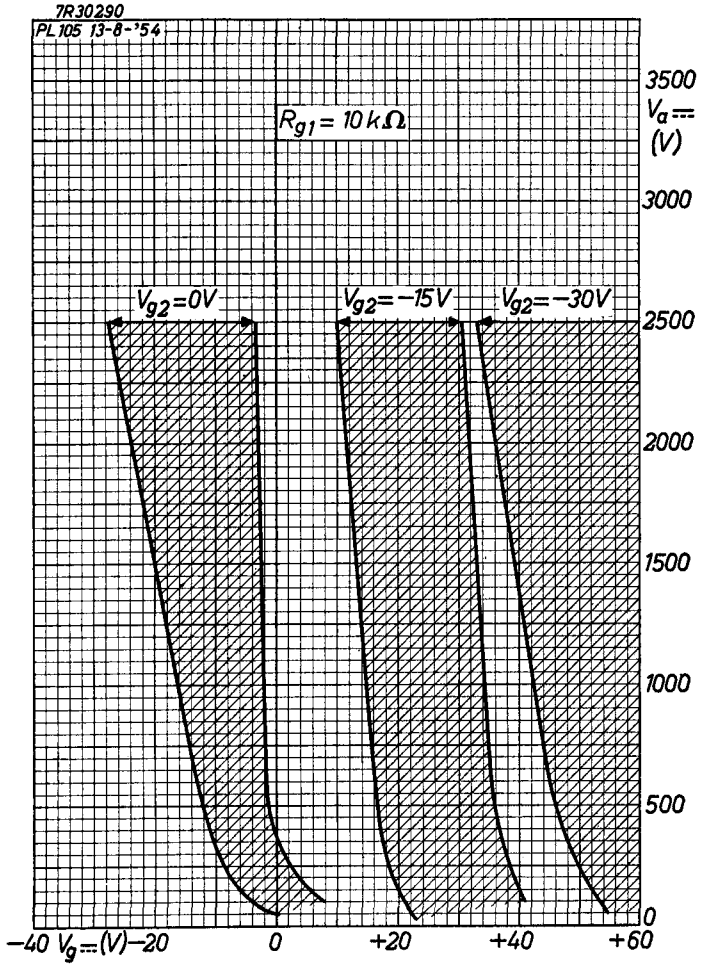
PHILIPS PL105

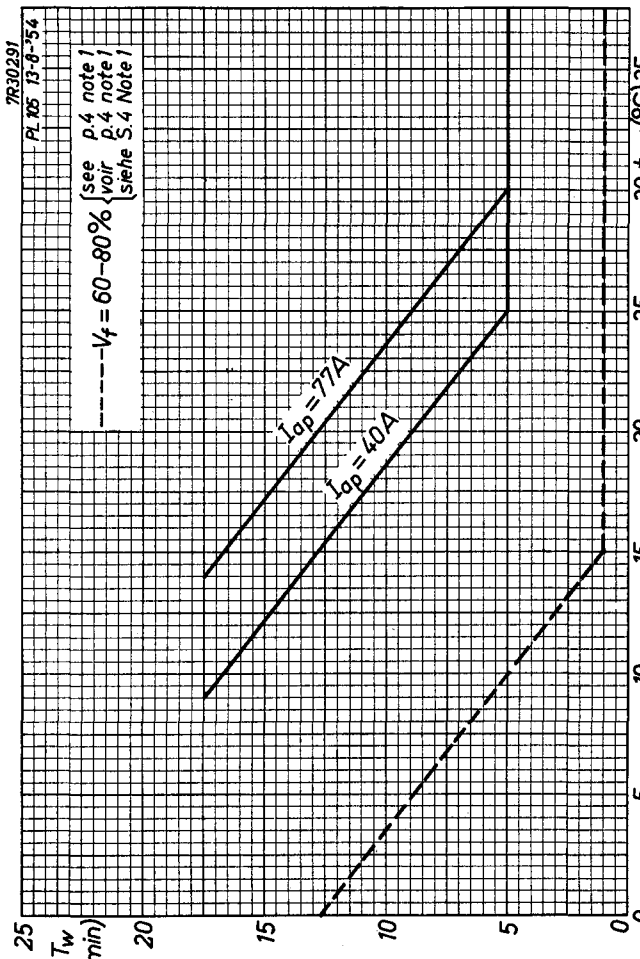


8.8.1954

A

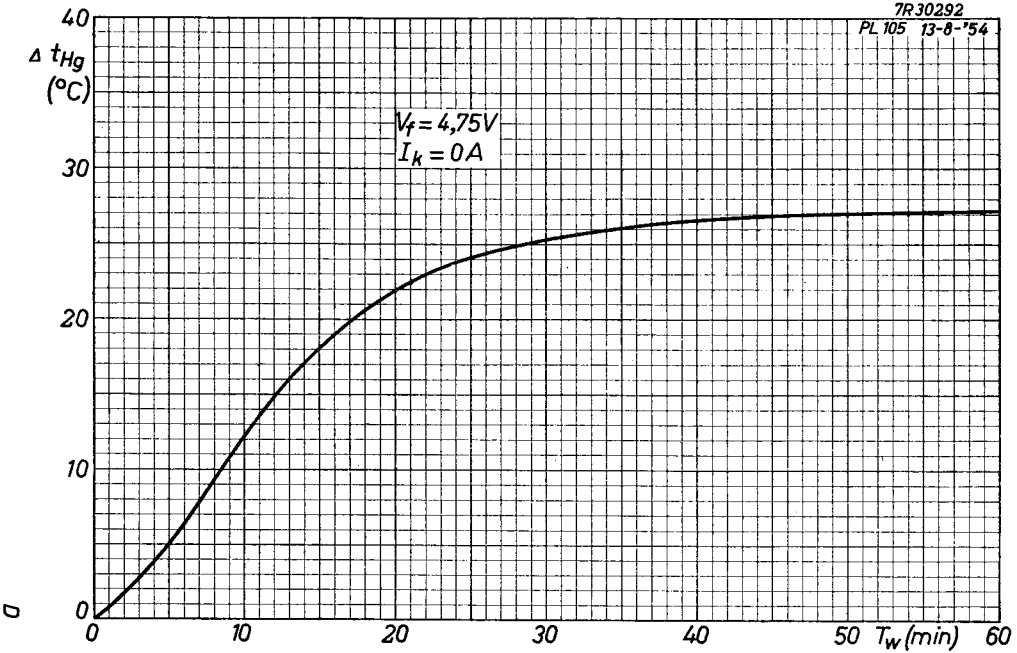
PL 105 PHILIPS




7R30291
PL 105 13-8-'54
V_f = 60–80% (see p.4 note 1 / voir p.4 note 1 / siehe S.4 Note 1)
I_{ap} = 77A
I_{ap} = 40A
T_w (min)
25
20
15
10
5
0
t_{amb}(°C)
0
5
10
15
20
25
30
35

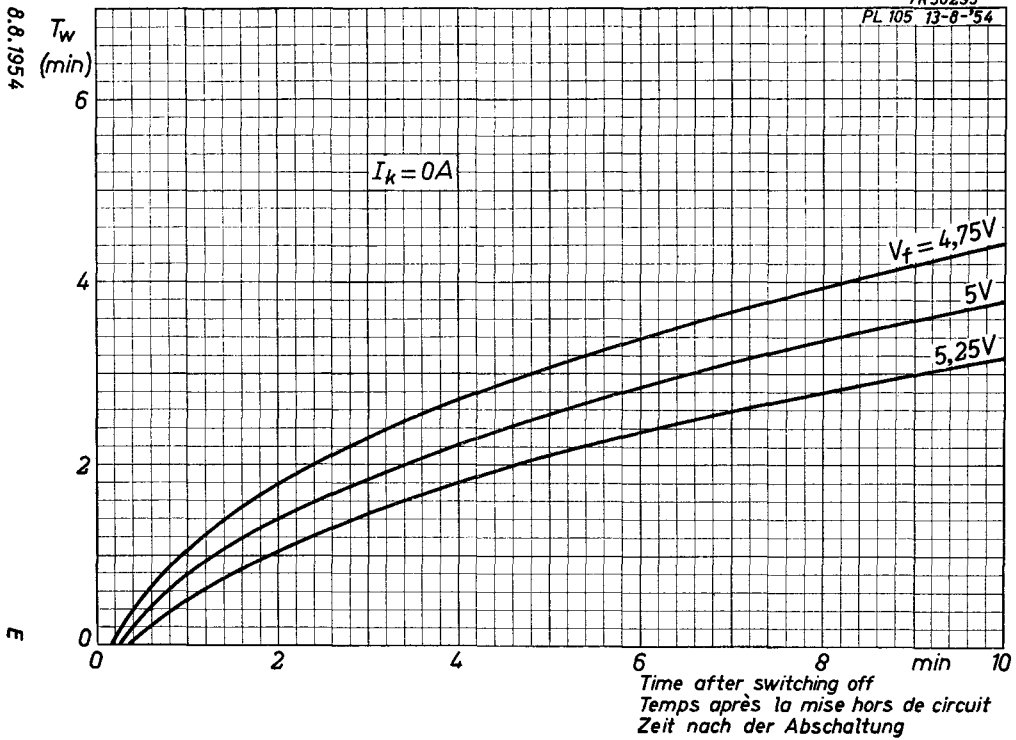
8.8.1954

C



PL 105

PHILIPS



PHILIPS

PL 105



PL105

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1	1	1954.07.07
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3	3	1954.07.07
4	4	1954.07.07
5	A	1954.08.08
6	B	1954.08.08
7	C	1954.08.08
8	D	1954.08.08
9	E	1954.08.08
10	FP	2000.05.14

PHILIPS

PL 106

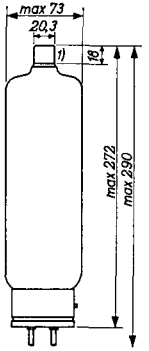
THYRATRON, mercury-vapour and inert gas-filled triode
THYRATRON, triode à remplissage de vapeur de mercure et de gaz inerte
STROMTORRÖHRE, Triode mit Quecksilberdampf- und Edelgasfüllung

Application: Motor control, A.C. control and other industrial applications.
Application: Commande de moteurs, commande de courant alternatif et d'autres applications industrielles
Anwendung : Motorsteuerung, Wechselstromsteuerung und andere industrielle Anwendungen.

Heating : direct
Chauffage: direct
Heizung : direkt

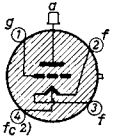
V_f = 2,5 V
I_f = 22 A
T_w = min. 30 sec [3]

Dimensions in mm
Dimensions en mm
Abmessungen in mm



Socket
Support 40403
Fassung

Cap
Capot 40619
Haube



Base: : Super Jumbo with bayonet
Culot : Super Jumbo à baïonnette
Sockel: Super Jumbo mit Bayonette

[1])Cross section of flexible anode lead at least 10 mm^2
Section du conducteur anodique souple de 10 mm^2 au moins
Querschnitt der biegsamen Anodenanschlussleitung mindestens 10 mm^2

[2])f_c should preferably be used as cathode return connection
f_c sera utilisé de préférence comme connexion de retour de la cathode
f_c soll vorzugsweise als Katodenrückleitung verwendet werden

[3])Recommended value 60 sec
Valeur recommandée 60 sec
Empfohlener Wert 60 Sek

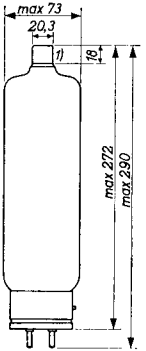
THYRATRON, mercury-vapour and inert gas-filled triode
THYRATRON, triode à remplissage de vapeur de mercure et de gaz inerte
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Application: Motor control, A.C. control and other industrial applications.
Application: Commande de moteurs, commande de courant alternatif et d'autres applications industrielles
Anwendung : Motorsteuerung, Wechselstromsteuerung und andere industrielle Anwendungen.

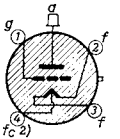
Heating : direct
Chauffage: direct
Heizung : direkt

V_f = 2,5 V
I_f = 22 A
T_w = min. 30 sec [3]

Dimensions in mm
Dimensions en mm
Abmessungen in mm



Cap
Capot 40620
Haube



Base : Super Jumbo with bayonet
Culot : Super Jumbo à baïonnette
Sockel: Super Jumbo mit Bayonette

[1])Cross section of flexible anode lead at least 10 mm^2
Section du conducteur anodique souple de 10 mm^2 au moins
Querschnitt der biegsamen Anodenanschlussleitung mindestens 10 mm^2

[2])f_c should preferably be used as cathode return connection
f_c sera utilisé de préférence comme connexion de retour de la cathode
f_c soll vorzugsweise als Katodenrückleitung verwendet werden

[3])Recommended value 60 sec
Valeur recommandée 60 sec
Empfohlener Wert 60 Sek

Mounting position: Base down
Montage : Culot en bas
Einbau : Sockel unten

Net Weight / Poids net / Nettogewicht	480 g	Shipping weight / Poids brut / Bruttogewicht	2135 g

Capacitances / Capacités / Kapazitäten

C_{ag}	=	9 pF
C_{gk}	=	19 pF

Typical characteristics / Caractéristiques types / Kenndaten

V_{arc}	=	12 V
T_{ion}	=	10 µsec
T_{dion}	=	500 µsec

Limiting values (Absolute limits)
Caractéristiques limites (Limites absolues)
Grenzdaten (absolute Grenzwerte)

V_{ap}	= max.	2000 V
$V_{a_{invp}}$	= max.	2000 V
$-V_g$	= max.	500 V
$-V_g$	= max.	10 V[1]
I_k (T_{av} = max. 15 sec)	= max.	6,4 A
I_{kp}	= max.	80 A
$I_{k_{surge}}$ (T = max. 0,1 sec)	= max.	800 A
I_g	= max.	0,25 A
t_{Hg}	= min.	25 °C
	= max.	80 °C
t_{amb}	= min.	-40 °C
	= max.	+50 °C

Max. circuit values
Valeurs max. des éléments de montage
Max. Werte der Schaltungsteile

R_g	= max.	100 kΩ[2]
Anode fuse / Fusible anodique / Anodensicherung	= max.	20 A [3]

[1]) Tube conductive; tube conductif; gezündete Röhre

[2]) Recommended value 30 kΩ
Valeur recommandée 30 kΩ
Empfohlener Wert 30 kΩ

[3]) Recommended value 15 A
Valeur recommandée 15 A
Empfohlener Wert 15 A

Mounting position: Base down
Montage : Culot en bas
Einbau : Sockel unten

Net Weight Poids net Nettogewicht	480 g	Shipping weight Poids brut Bruttogewicht	2135 g

Capacitances Capacités Kapazitäten	C_{ag}	=	9 pF
	C_{gk}	=	19 pF
Typical characteristics Caractéristiques types Kenndaten	V_{arc}	=	12 V
	T_{ion}	=	10 µsec
	T_{dion}	=	500 µsec

Limiting values (Absolute limits)
Caractéristiques limites (Limites absolues)
Grenzdaten (absolute Grenzwerte)

V_{ap}	= max.	2000	V
V_{ainvp}	= max.	2000	V
$-V_g$	= max.	500	V
$-V_g$	= max.	10	V [1]
I_k (T_{av} = max. 15 sec)	= max.	6,4	A
I_{kp}	= max.	80	A
I_{ksurge} (T = max. 0,1 sec)	= max.	800	A
I_g	= max.	0,25	A
t_{Hg}	= min.	25	°C
	= max.	80	°C
t_{amb}	= min.	-40	°C
	= max.	+50	°C

Max. circuit values
Valeurs max. des éléments de montage
Max. Werte der Schaltungsteile

R_g	= max.	100	kΩ [2]
Anode fuse Fusible anodique Anodensicherung	= max.	20	A [3]

[1]) Tube conductive; tube conductif; gezündete Röhre

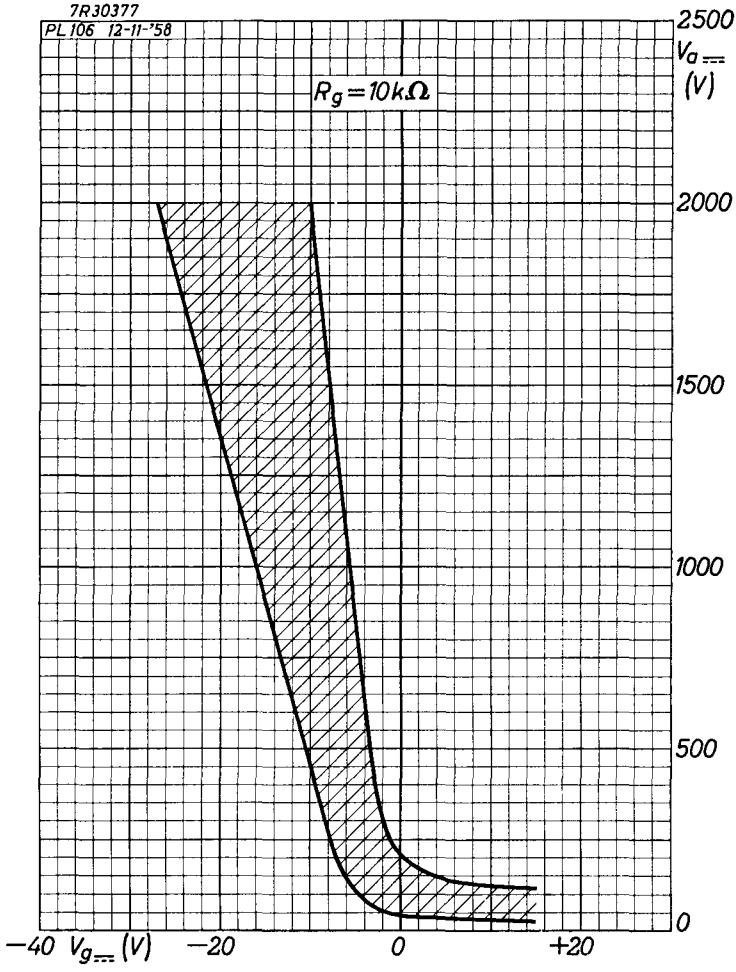
[2]) Recommended value 30 kΩ
Valeur recommandée 30 kΩ
Empfohlener Wert 30 kΩ

[3]) Recommended value 15 A
Valeur recommandée 15 A
Empfohlener Wert 15 A

→

PHILIPS

PL 106



12.12.1958

A

PL 106

PHILIPS

B



PL106

page	sheet	date
1	1	1959.02.02
2	1	1961.04.04
3	2	1959.02.02
4	2	1961.04.04
5	A	1958.12.12
6	B	1958.12.12
7	FP	2000.05.14

PHILIPS

PL 1267 /Z 300T

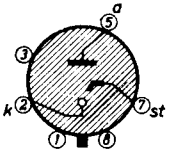
COLD CATHODE TRIGGER TUBE
TUBE DECLENCHEUR A CATHODE FROIDE
RELAISRÖHRE MIT KALTER KATODE

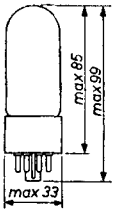
Application: For use in welding timers, relay and counting circuits, power switching and similar application

Application: Pour utilisation dans des minuteries de soudure, des circuits relais, des circuits de comptage, pour des commutateurs de puissance et des applications similaires

Verwendung : In Zeitschaltern für Schweissgeräte, Relais und Zählschaltungen, für Leistungsschalter und ähnliche Zwecke

Dimensions in mm
Dimensions en mm
Abmessungen in mm





Base, culot, Sockel: OCTAL

→ Typical characteristics
Caractéristiques types
Kenndaten

V_{ba}	=	117 Veff
V_a ign (V_{st} = 0 V)	= min.	225 V
	=	255 V
	= max.	310 V
V_{st} ign	= min.	73 V
V_{st} ign	= max.	93 V
V_a (I_a = 25 mA)	=	70 V
V_{st} (burning voltage / Tension de régime / Brennspannung)	=	60 V
I_{st} transf (V_a = 140 V)	= max.	100 µA

Limiting values (ABSOLUTE LIMITS)
Valeurs limites (LIMITES ABSOLUES)
Grenzdaten (ABSOLUTE WERTE)

I_a (T_{av} = max. 15 sec.)	= max.	25 mA
I_{ap}	= max.	100 mA

Remarks : The tube is recommended for operation only with both anode and starter voltage positive

The tube must be exposed to some light. Full sunlight or complete darkness should be avoided

Observations: Le tube est recommandé pour fonctionnement exclusif avec une tension positive de l'anode et le déclencheur

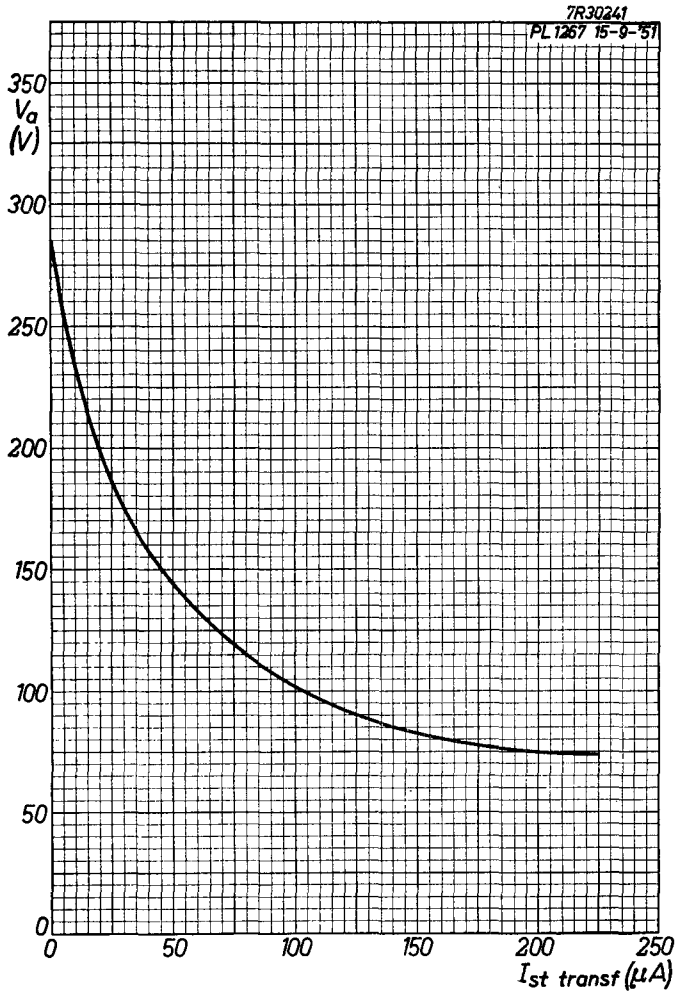
Le tube doit être exposé à une lumière moyenne L'on devra éviter la lumière solaire directe et l'obscurité totale

Bemerkungen: Es wird empfohlen die Röhre nur mit positiver Anodenspannung und positiver Starterspannung zu betreiben

Die Röhre muss einem gewissen Lichteinfall ausgesetzt sein; helles Sonnenlicht oder völliger Dunkelheit sind zu vermeiden

PHILIPS

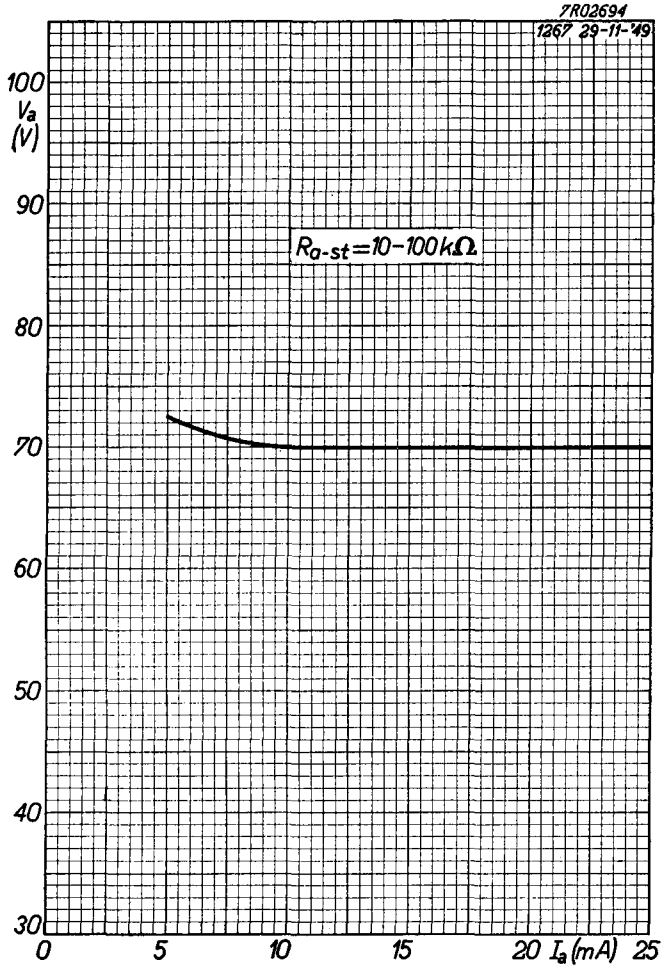
PL 1267 / Z 300 T



3.3.1957

A

PL1267 / Z300T **PHILIPS**



B

PHILIPS

Electronic Tube

HANDBOOK

PL1267 Z300T

page	sheet	date
1	1	1957.03.03
2	2	1957.03.03
3	A	1957.03.03
4	B	1957.03.03
5	FP	2000.05.14

THYRATRON, mercury-vapour and gas-filled triode
THYRATRON, triode à vapeur de mercure et à gaz
STROMTORRÖHRE, Triode mit Quecksilberdampf- und Gasfüllung

Application: cinema rectifiers, battery chargers, rectifiers for feeding bookkeeping machines etc.

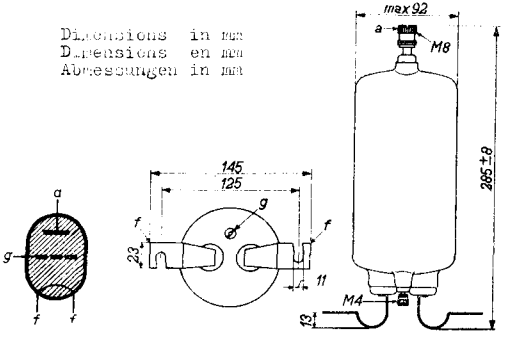
Application: redresseurs de cinéma, chargeurs d'accumulateurs, redresseurs pour des machines comptables etc.

Anwendung : Kinogleichrichter, Batterieladegeräten, Gleichrichter zur Speisung von Buchhaltungsmaschinen usw.

Heating : direct
Chauffage: direct
Heizung : direkt

V_f = 1,9 V ± 5%
I_f = 26 A
T_w = 1 min[1])

Dimensions in mm
Dimensions en mm
Abmessungen in mm



Mounting position: vertical, base down
Montage : vertical, culot en bas
Einbau : Senkrecht, Sockel unten

See also "Explanation of the technical data of thyratrons" in front of this section
Voir aussi "L'explication des caractéristiques techniques des thyratrons" en tête de ce chapitre
Siehe auch die "Erläuterung zu den technischen Daten der Stromtorröhren" am Anfang dieses Abschnitts

[1])See curve on page B; voir la courbe sur page B; siehe die Kurve auf Seite B

Net weight Poids net Nettogewicht	550 g	Shipping weight Poids brut Bruttogewicht	2400 g

Capacitance Capacité Kapazität	C_g	=	8 pF
	C_{ag}	=	28 pF

Typical characteristics Caractéristiques types Kenndaten	$V_{arc}(I_a=15A)$	=	12 V
	T_{ion}	=	10 µs
	T_{dion}	=	1000 µs

Limiting values (absolute limits)
Caractéristiques limites (limites absolues)
Grenzdaten (Absolute Grenzen)

Continuous service;Service continu;Dauerbetrieb

$-V_g$ (V_a=neg.)	= max.	150 V[1]
$-V_g$ (V_a= 0 V)	= max.	150 V[1]
$-V_g$ (V_{a_p}=240 V)	= max.	50 V[1]
I_{a_p}	= max.	90 A
I_a (T_{av}=max.15 s)	= max.	15 A
I_{g_p}	= max.	0,1 A
Isurge(T=max.0,1 s)	= max.	750 A
R_g	=	10-33 kΩ
t_{Hg}	=	40-80 °C
t_{Hg}	=	60-70 °C[2]

Without phase control
Sans réglage de phase
Ohne Phasenregelung

V_{ap} = max. 240 V
$V_{a\ inv_p}$ = max. 500 V

With phase control(with or without a back e.m.f.)
Avec réglage de phase(avec ou sans force contre-électromotrice)
Mit Phasenregelung(mit oder ohne gegen-EMK)

Number of phases Nombre de phases Anzahl Phasen	Load, charge, Belastung non inductive induktionsfrei	 inductive induktive
max. 3 [3]	V_{arms}=max.170 V	V_{arms}=max.85 V
6	V_{arms}=max.110 V	V_{arms}=max.55 V

[1],[2],[3]) See page 4;voir page 4; siehe Seite 4

Limiting values (absolute limits)
Caractéristiques limites (limites absolues)
Grenzdaten (absolute Grenzen)

Intermittent service (cinema rectifiers) [4]
Service intermittent (redresseurs cinéma)
Aussetzender Betrieb (Kinogleichrichter)

V_{a_p}	= max.	120	V
$V_{a\,inv_p}$	= max.	250	V
$-V_g$ (V_a = neg.)	= max.	150	V [1]
$-V_g$ (V_a = 0 V)	= max.	150	V [1]
$-V_g$ (V_{ap}=240 V)	= max.	50	V [1]
I_{a_p}	= max.	65	A
I_a (T_{av}=max.15 s)	= max.	17	A
I_{g_p}	= max.	0,1	A
I_{surge} (T=max.0,1 s)	= max.	750	A
R_g	=	10-33	kΩ
t_{Hg}	=	40-80	°C
t_{Hg}	=	60-70	°C [2]

[1], [2]) See page 4; voir page 4; siehe Seite 4

[4])Operating periode max.20 min followed by an "off"period lasting at least 75% of the "on" period

Période d'opération 20 min au max. suivie par une période "hors circuit" d'une durée de 75% au moins de la période "en circuit"

Arbeitsperiode max. 20 Min mit anschliessender "Aus" Periode mit einer Dauer von wenigstens 75% der "Ein"Periode

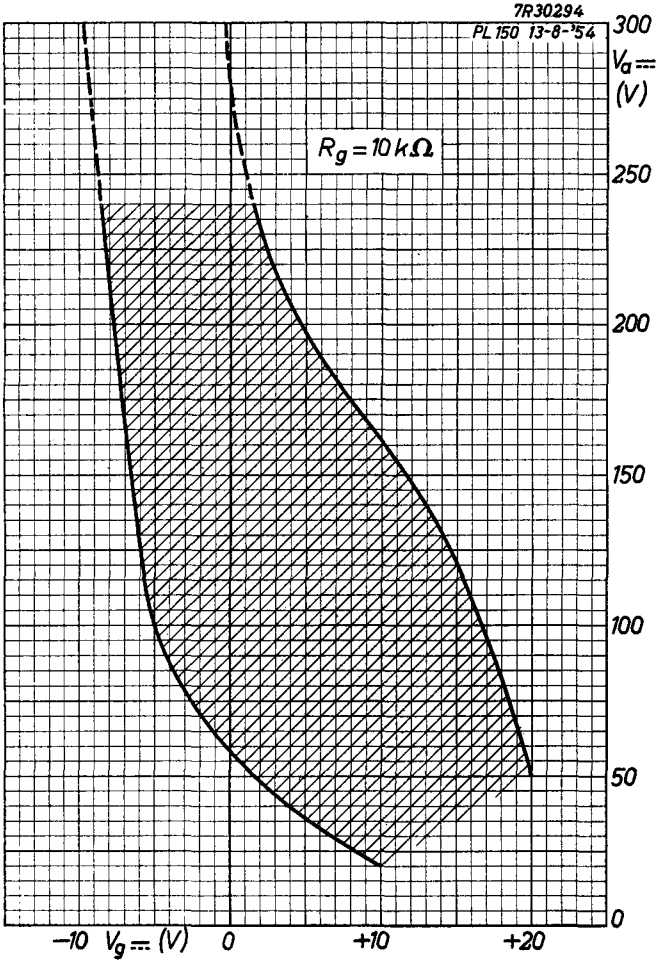
[1])Tube non conductive
In pulse firing operation these values indicate that at V_{ap} = 240 V a D.C. bias voltage of max.-50 V and a pulse voltage of max.100 V can be used. For V_{ap} < 240 V these voltages can be derived from the curve on page C, which gives the relation between the maximum allowed instantaneous grid voltage and the instantaneous anode voltage

Tube non conductif
Dans des circuits avec opération par inpulsions d'amorçage ces valeurs indiquent qu'on peut utiliser à V_{ap}= 240 V une tension de polarisation de grille de -50 V au max. et une tension de crête d'impulsion de 100 V au max. Pour V_{ap} < 240 V ces tensions peuvent être obtenues à l'aide de la courbe sur page C, qui donne le rapport entre la tension instantanée maximum admissible de grille et la tension instantanée d'anode

Gelöschte Röhre
In Schaltungen mit Impulszündung bezeichnen diese Werte dass man bei V_{ap} = 240 V eine negatieve Gittervorspannung von max.-50 V und eine Impulsspannung von max.100 V kann verwenden. Für V_{ap} < 240 V kann man diese Spannungen bestimmen mit Hilfe der Kurve auf Seite C, die das Verhältnis zwischen dem maximal zulässigen Augenblickswert der Gitterspannung und dem Augenblickswert der Anodenspannung darstellt

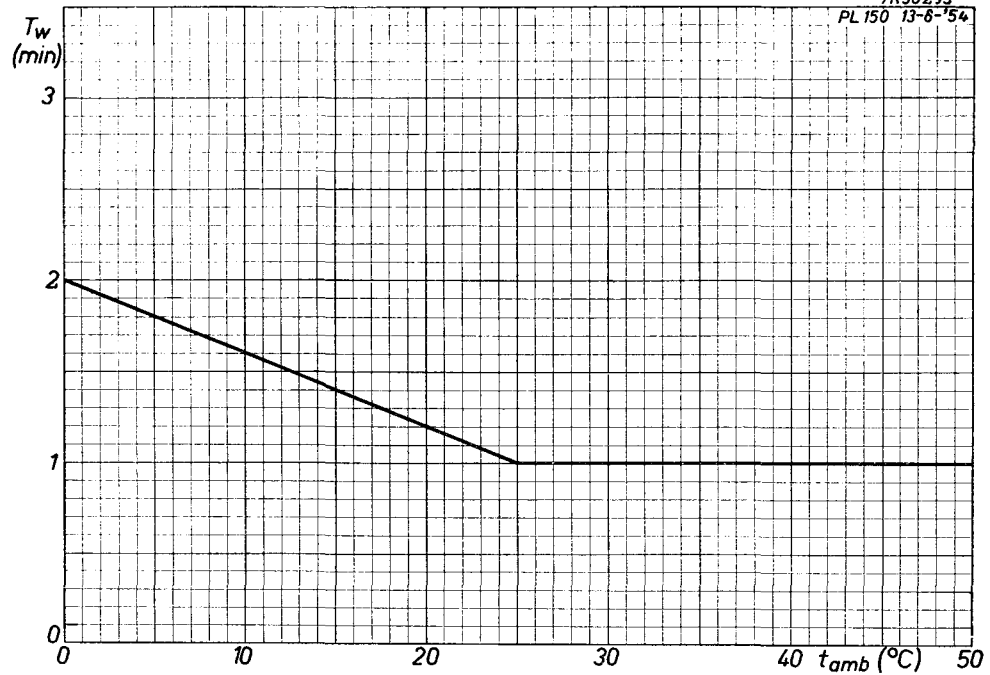
[2])Recommended value
Valeur recommandée
Empfohlener Wert

[3])Double 3 phase with interphase choke included
3 phases double avec transformateur-équilibreur y inclus
Einschliesslich doppel 3 Phasen mit Ausgleichtransformator


7R30294
PL 150 13-8-'54
$R_g = 10\,k\Omega$
300
V_a ⎓ (V)
250
200
150
100
50
0
−10 V_g ⎓ (V) 0 +10 +20

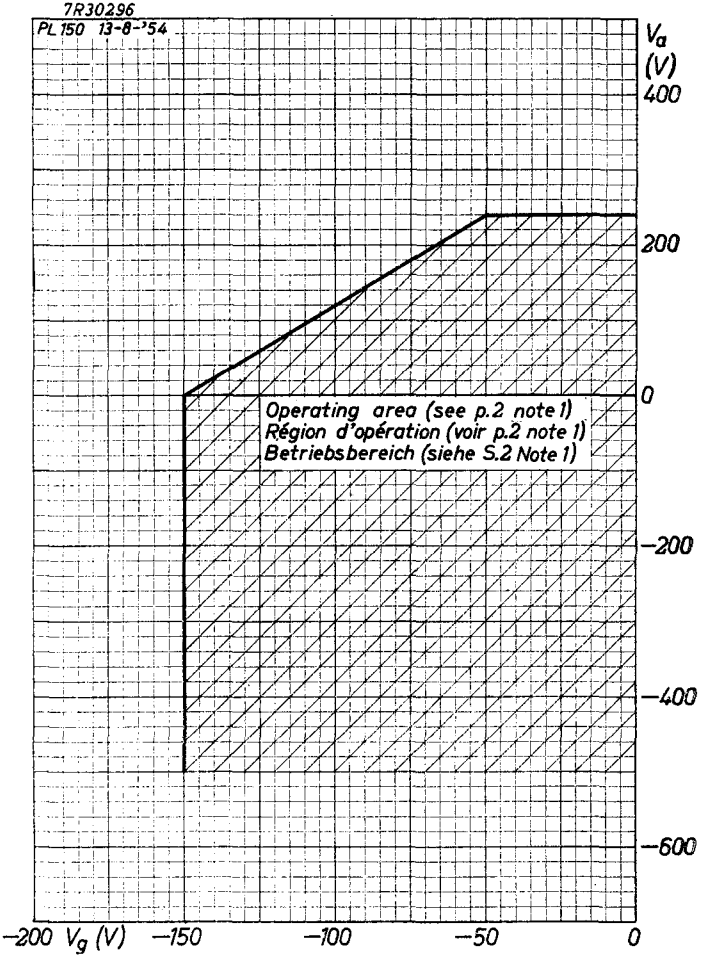
8.8.1954

A


7R30295
PL 150 13-6-'54
T_w (min)
3
2
1
0
0
10
20
30
40
t_{amb} (°C)
50

PHILIPS

PL 150



8.8.1954

C

PHILIPS

Electronic Tube

HANDBOOK

PL150

page	sheet	date
1	1	1954.08.08
2	2	1954.08.08
3	3	1954.08.08
4	4	1954.08.08
5	A	1954.08.08
6	B	1954.08.08
7	C	1954.08.08
8	FP	2000.05.14

THYRATRON, xenon-filled tetrode
THYRATRON, tétrode à remplissage de xenon
STROMTORRÖHRE, Tetrode mit Xenonfüllung

Application: electronic timers, in grid-controlled rectifiers with variable or constant output voltage
Application: dans des minuteries électroniques, dans des redresseurs commandés par grille avec tension de sortie variable ou constante
Anwendung : in elektronischen Zeitschaltern in gittergesteuerte Gleichrichter mit veränderlicher oder stabilisierter Ausgangsspannung

Heating : direct
Chauffage: direct
Heizung : direkt

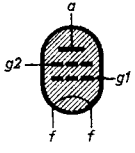
V_f = 2,0 V ± 5%
I_f = 2,6 A
T_w = min. 30 s

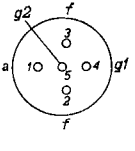
See also "Explanation of the technical data of thyratrons" in front of this section

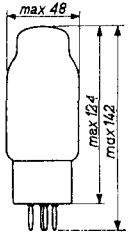
Voir aussi "L'explication des caractéristiques techniques des thyratrons" en tête de ce chapitre

Siehe auch die "Erlauterung zu den technischen Daten der Stromtorröhren" am Anfang dieses Abschnitts

Dimensions in mm
Dimensions en mm
Abmessungen in mm







Base, culot, Sockel: O

Pin 3 cathode return; broche 3 circuit de retour de la cathode; Stift 3 Katodenrückleitung

Mounting position: arbitrary
Montage : arbitrairement
Einbau : willkürlich

Socket
Support type 40465
Fassung

Net weight
Poids net 75 g
Nettogewicht

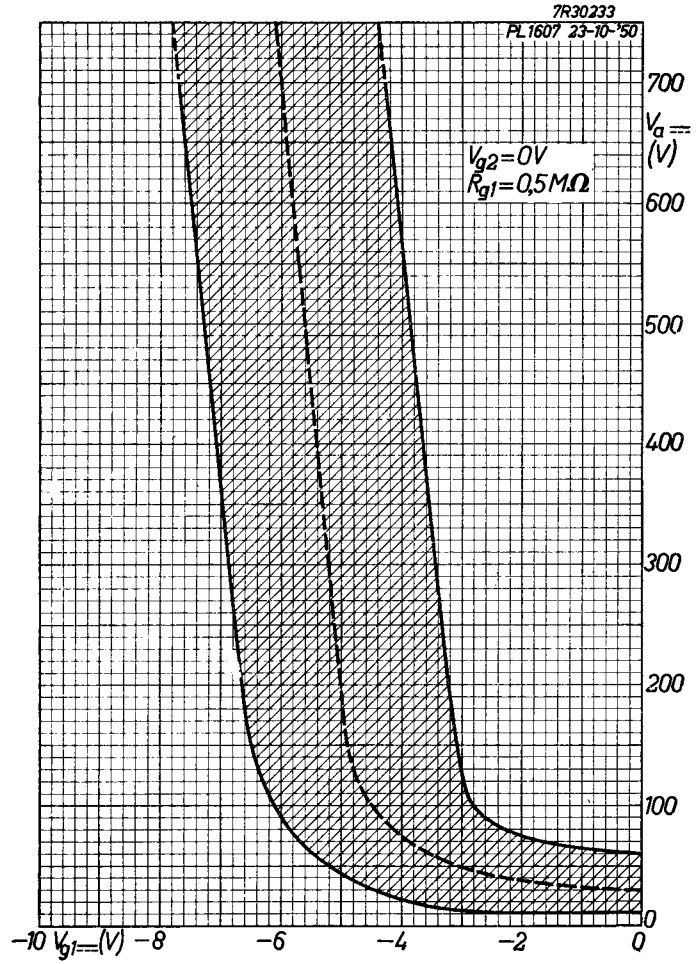
Shipping weight (12 tubes)
Poids brut (12 tubes) 2800 g
Bruttogewicht (12 Röhren)

Capacitances Capacités Kapazitäten	C_{ag1}	=	0,55 pF
	C_{ag2}	=	12 pF
Typical characteristics Caractéristiques types Kenndaten	V_{arc}	=	15 V
	T_{dion}	=	500 µs

Limiting values
Caractéristiques limites
Grenzdaten

V_{a_p}	= max.	650	V
$V_{a\ inv_p}$	= max.	650	V
$-V_{g2}$	= max.	100	V
$-V_{g2}$	= max.	10	V [1]
$-V_{g1}$	= max.	100	V
$-V_{g1}$	= max.	10	V [1]
I_{a_p} (f ≧ 25 c/s)	= max.	2	A
I_{a_p} (f < 25 c/s)	= max.	1	A
I_a (T_{av}=max.15 s)	= max.	0,5	A
I_{g2_p}	= max.	0,25	A
I_{g2}(T_{av}= max.15 s)	= max.	0,05	A
I_{g1_p}	= max.	0,25	A
I_{g1} (T_{av}=max.15 s)	= max.	0,05	A
R_{g2}	=	0,1 - 1	MΩ
R_{g1}	=	0,1 - 5	MΩ
t_{amb}	=	-75/+90	°C

[1])Tube conductive
Tube conductif
Gezündete Röhre


7R30233
PL 1607 23-10-'50
V_{g2}=0V
R_{g1}=0,5 MΩ
700
600
500
400
300
200
100
0
V_a = (V)
−10 V_{g1}= (V) −8
−6
−4
−2
0

3.3.1954

A

PHILIPS

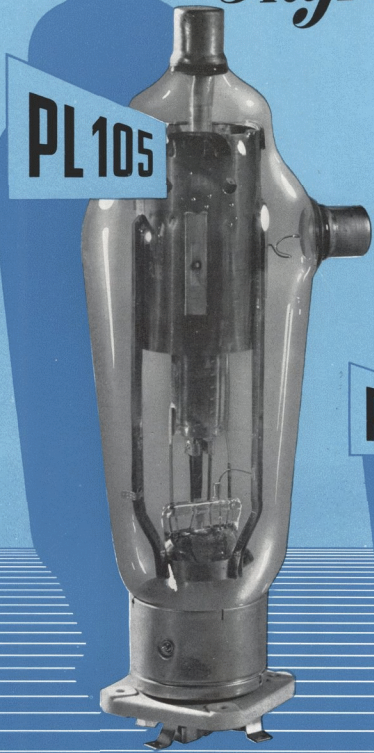
Electronic Tube

HANDBOOK

PL1607

page	sheet	date
1	1	1954.08.08
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3	A	1954.08.08
4	FP	2000.05.14

PHILIPS *Thyratrons*



INDUSTRIEGRUPPE ELEKTRONENRÖHREN - ABT. INDUSTRIELLE RÖHREN



PL 17



PL 105

Die Elektronentechnik, die ständig an Bedeutung gewinnt, ist heute in fast allen Zweigen der Industrie verbreitet. In nahezu jeder elektronischen Schaltung kommen die Thyratronröhren zur Anwendung. Neuerdings werden sie zum Beispiel zur Regelung der Drehzahl von Gleichstrommotoren, zur Temperaturkontrolle, Strom- und Spannungsregelung, zum Sortieren und Zählen von Gegenständen, zum Schalten auf elektronischem Wege, wie auch in Apparaten zur Regelung der Lichtstärke usw. verwendet.
Seit mehr als 25 Jahren ist man in den Philipswerken in der Entwicklung und Herstellung von Elektronenröhren spezialisiert.
Der Name „Philips" gewährleistet somit, dass es sich um fachmännisch hochwertige Erzeugnisse handelt, in die jeder Benutzer volles Vertrauen haben kann.

PHILIPS *Thyratrons*

- ***Elektrisch zuverlässig.***
- ***Von grosser mechanischer Festigkeit.***
- ***Mit anderen Röhrentypen austauschbar.***

ANWENDUNGSGEBIETE

Die **PL 17** ersetzt:

FG17, WL17, WL5557, Chatham 17, MT17, TT17, RCA5557, Amperex 1701, NL715, CT1-500, BT19, WT272A, CE30Q, 38217, 272, Q67, 0517, 4261.

Die PL 17 ist eine direkt geheizte quecksilberdampfgefüllte Triode; sie wird in Schaltungen verwendet, in denen die Röhren im Gebiet der negativen Gittervorspannung gesteuert werden, wie z.B. in Relaisschaltungen, Alarm- und Sicherungssystemen, und in allen jenen Fällen, wo eine sehr kleine Eingangssteuerleistung zur Verfügung steht. Ebenso ist die PL 17 zur Verwendung in gesteuerten Gleichrichtern mit geregelter oder stabilisierter Ausgangsleistung sehr geeignet.
Ausserdem kann sie zusammen mit einem Serientransformator für die Regelung von Wechselstromleistung verwendet werden.

Die **PL 105** ersetzt:

FG105, WL105, WL172, FG172, MT105, RCA105, BT27, CST1-6000, KU676.

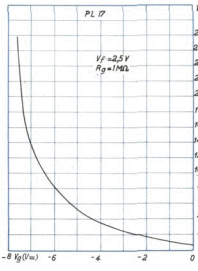
Die PL 105 ist eine indirekt geheizte quecksilberdampfgefüllte Tetrode mit verhältnismässig niedrigem Heizstromverbrauch.
Die zwei Gitter und die hohe Ausgangsleistung ermöglichen es, diese Röhre in einer grossen Zahl von Schaltungen zu verwenden.
Die PL 105 wird zur Regelung der Drehzahl von Gleichstrommotoren, in automatisch geregelten Ladegleichrichtern oder in Gleichrichtern mit einer stabilisierten Ausgangsleistung benutzt.
In Antiparallelschaltung können zwei solche Röhren zum Regeln und Schalten von Wechselstrom dienen, und zwar in Apparaten zur Regelung der Lichtstärke von Fluoreszens- und andern Gasenladungslampen, wie auch in Zeitschaltern für Schweissgeräte.

*

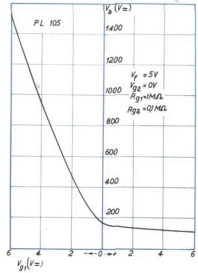
Nähere Auskünfte und Da

TECHNISCHE DATEN

	PL 17	PL 105
Anodenanzahl	3	4
Füllung	Hg-Dampf	Hg-Dampf
Kathode:		
Typ	dir. geheizt	ind. geheizt
Anheizzeit	5 Sec	5 Min
Heizspannung	2,5 V	5 V
Heizstrom	5 A	10 A
Bogenspannung	16 V	16 V
Steuerkennlinie	neg.	neg./pos.
Entionisierungszeit	1000 µsec	1000 µsec
Scheitelwert der Anodenspannung (max.)	2500 V	2500 V
Scheitelwert der Anodengegenspannung (max.)	5000 V	2500 V
Max. neg. Steuergitterspannung:		
Bei gelöschter Röhre	—	500 V
Bei gezündeter Röhre	—	10 V
Max. neg. Schirmgitterspannung:		
Bei gelöschter Röhre	500 V	1000 V
Bei gezündeter Röhre	10 V	10 V
Max. Anodenstrom:		
Augenblickswert bei einer Frequenz über 25 Hz	2 A	40 A
Augenblickswert bei der einer Frequenz unter 25 Hz	1 A	12,8 A
Mittelwert	0,5 A	6,4 A
Max. Steuergitterstrom:		
Augenblickswert	0,25 A	1 A
Mittelwert	0,05 A	0,25 A
Max. Schirmgitterstrom:		
Augenblickswert	—	2 A
Mittelwert	—	0,5 A
Max. Integrationszeit zur Ermittlung des Strom-Mittelwertes	15 Sec	15 Sec
Temperaturgrenze des kondensierten Quecksilbers	40° - 80° C	40° - 80° C
Für kondensiertes Quecksilber empfohlene Temperatur	40° C	40° C
Nettogewicht	100 g	500 g
Bruttogewicht	240 g	2400 g

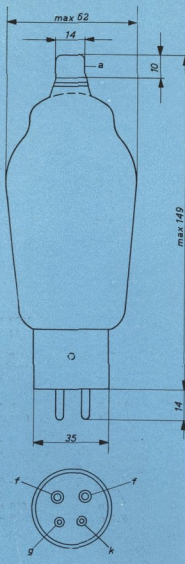


Va/Vg Charakteristik der Philips Thyratronröhre, Typ PL 17.

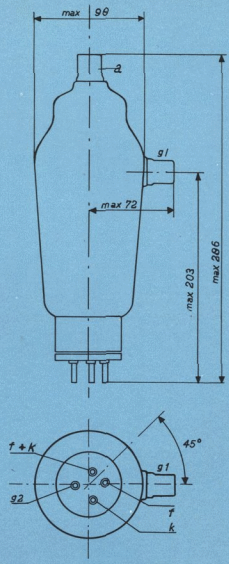


Va/Vg Charakteristik der Philips Thyratronröhre, Typ PL 105.

...aten gerne auf Anfrage

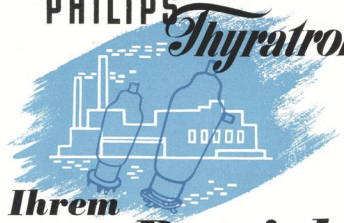


Abmessungen der
Philips Thyratronröhre, Typ PL 17.



Abmessungen der
Philips Thyratronröhre, Typ PL 105.

PHILIPS Thyratrons



Auch in Ihrem **Betrieb!**

PHILIPS PL 2052A

Water cooled IGNITRON with provisions for mounting a thermostatic control unit
IGNITRON à refroidissement par eau avec possibilité de monter un dispositif à commande thermostatique
Wassergekühltes IGNITRON mit Anordnung zur Montierung einer thermostatischen Regelvorrichtung

Application: Single phase welding control and similar control applications. Equipped with suitable thermostatic switches it has the advantage of diminishing the cooling-water consumption and of protecting the tube and associated equipment from overloads and overheating

Application: Réglage en soudage monophasé et d'autres réglages similaires. Fonctionnant avec des commutateurs thermostatiques propres, il présente l'avantage de diminuer la consommation d'eau de refroidissement et de protéger le tube et les appareils auxiliaires contre les surcharges et le surchauffage

Anwendung : Regelung von Einphasenschweissung und ähnliches Ausgerüstet mit geeigneten thermostatischen Schaltern bietet es den Vorteil eines verminderten Kühlwasserbedarfs und erhöhten Schutzes der Röhre und der dazugehörigen Ausrüstung gegen Überlastung und Überhitzung

Frequency range
Gamme de fréquences 25 - 60 c/s
Frequenzbereich

Net weight		Shipping weight	
Poids net	3400 g	Poids brut	4500 g
Nettogewicht		Bruttogewicht	

Water saving thermostat
Thermostat pour économie d'eau 55305
Thermostat zur Wassereinsparung

Overload protecting switch
Interrupteur de sécurité contre la surcharge 55306
Überlastungsschutzschalter

Cooling; refroidissement; Kühlung

Typical characteristics
Caractéristiques types
Kenndaten

p_i (q = 4 l/min.) = max. 0,20 kg/cm^2
$t_o - t_i$ (q = 4 l/min.) = max. 6 °C

Cooling (continued)
Refroidissement (suite)
Kühlung (Fortsetzung)

Limiting values (with or without thermostatic control; absolute limits)
Caractéristiques limites (sans ou avec réglage thermostatique; limites absolues)
Grenzdaten (mit oder ohne thermostatische Regelung; absolute Grenzwerte)

A.C. control service
Service de réglage C.A.
Wechselstromsteuerung

q	= min.	4 l/min. [1]
t_i	= min.	10 °C [2]
	= max.	45 °C [2]
t_m (V = 220-250 V_{eff})	= max.	60 °C [3]
t_m (V = 380 V_{eff})	= max.	55 °C
t_m (V = 500 V_{eff})	= max.	55 °C
t_m (V = 600 V_{eff})	= max.	50 °C

Intermittent rectifier service
Service redresseur intermittent
Aussetzender Gleichrichterbetrieb

q	= min.	4 l/min. [1]
t_i	= min.	10 °C [2]
	= max.	45 °C [2]
t_m	= max.	50 °C [3]

---

[1]) At max. demand and max. I_a; solenoid valve open. For use without thermostatic control the waterflow may be reduced provided $t_o < 45$ °C
A la demande de puissance max. et à I_a max.; soupape à solénoïde ouverte. Pour l'utilisation sans réglage thermostatique il est permis de diminuer la quantité d'eau, pourvu que $t_o < 45$ °C
Bei max. Leistungsbedarf und max. I_a; Solenoidventil offen. Bei Verwendung ohne thermostatische Regelung kann die Wassermenge verringert werden, wenn nur $t_o < 45$ °C

[2]) When a number of tubes is cooled in series, ti_{min} is measured at the coldest and ti_{max} at the hottest tube
Si un nombre de tubes est refroidi en série, ti_{min} est mesuré au tube le plus froid et ti_{max} au tube le plus chaud
Wenn mehrere Röhren in Reihe gekühlt werden, muss ti_{min} an der kältesten und ti_{max} an der heissesten Röhre gemessen werden

[3]) See page 3; voir page 3; siehe Seite 3

Cooling (continued)
Refroidissement (suite)
Kühlung (Fortsetzung)

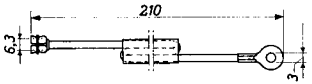
When the cooling systems of a number of tubes are connected in series, the water saving thermostat should be mounted on the last but one and the overload protecting thermostat on the last tube

Quand les dispositifs de refroidissement de quelques tubes sont reliés en série, il faut monter le thermostat pour le réglage de l'eau de refroidissement sur le tube final à un près et le thermostat de sécurité contre la surcharge sur le tube final

Wenn die Kühlvorrichtungen einiger Röhren in Reihe geschaltet werden, soll der Thermostat zur Wassereinsparung auf die zweitletzte und der Überlastungsschutzthermostat auf die letzte Röhre montiert werden

Dimensions in mm
Dimensions en mm
Abmessungen in mm

Unfolded length 330mm
Longueur dépliée 330mm
Entfaltete Länge 330mm



Ignitor connector
Connexion de l'électrode d'amorçage
Zündelektrodenanschluss
(Type Nr.55351)

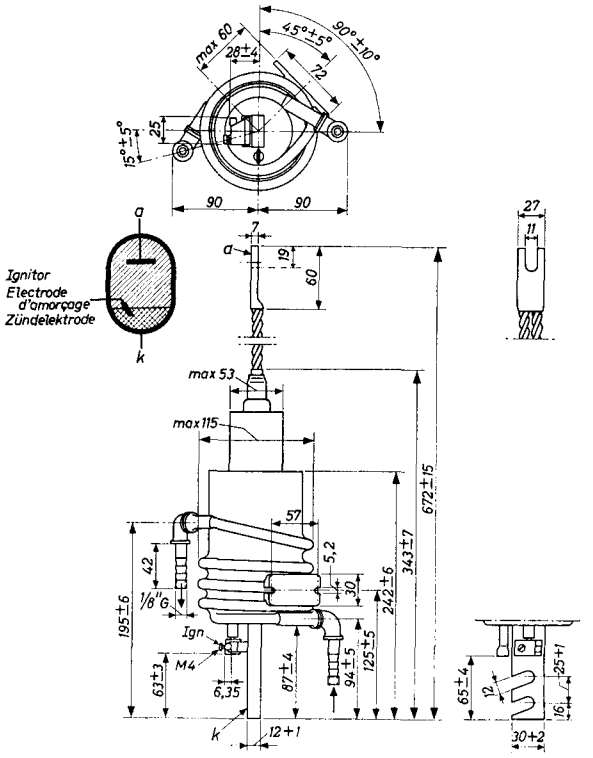
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[3]) t_m = temperature of thermostat mount
Warning: The thermostat mount is at full line voltage

t_m = température de la plaque de montage du thermostat
Avis: La plaque de montage du thermostat est à la tension du secteur

t_m = Temperatur der Montageplatte des Thermostats
Warnung: Die Montageplatte des Thermostats befindet sich auf Netzspannung

Dimensions in mm
Dimensions en mm
Abmessungen in mm



Mounting position: vertical, anode connection up
Montage : vertical, la connexion de l'anode en haut
Einbau : senkrecht, Anodenanschluss oben

Limiting values (Absolute limits)
Caractéristiques limites (Limites absolues)
Grenzdaten (Absolute Grenzwerte)

Remark: The limiting values are based on full-cycle conduction without phase delay, regardless of whether or not phase control is used
Observation: Les caractéristiques limites s'appliquent à une conduction pendant le cycle complet sans déçalage, abstraction faite d'un contrôle de phase éventuel
Bemerkung: Die Grenzwerte beziehen sich auf einen Stromdurchgang ohne Phasendrehung während der ganzen Periode, auch wenn mit Phasenanschnitt gearbeitet wird

Single phase A.C. control; two tubes in inverse parallel connection
Réglage de courant alternatif monophasé; deux tubes en montage anti-parallèle
Einphasen-Wechselstromsteuerung; zwei Röhren in Anti-Parallelschaltung

Mains voltage Tension de secteur (V_{eff}) Netzspannung	220	250	380	500	600
Max. demand Demande de puissance max. [1] (kVA) Max.Leistungsbedarf	1060	1200	1200	1200	1200
$I_{a\ max}$ [2] (A)	75,6	75,6	75,6	75,6	75,6
$I_{a\ max}$ (A)	140	140	140	140	140
Max. demand Demande de puissance max. [3] (kVA) Max.Leistungsbedarf	350	400	400	400	400
$T_{av\ max}$ [4] (sec)	14	14	9,4	7,0	5,8
$I_{surge\ p\ max}$ (T = max.0,15 sec) (A)	13400	13400	8800	6700	5600

[1]) See also page A; voir aussi page A; siehe auch Seite A

[2]) Max. average current of each tube at max. demand
Courant moyen max. par tube à la demande max.
Max. mittlerer Strom jeder Röhre bei dem max. Bedarf

[3]) Max. demand at max. average current
Demande de puissance max. au courant moyen max.
Max. Leistungsbedarf bei dem max. mittleren Strom

[4]) For mains voltages between 250 V and 600 V, Tav is inversely proportional to the voltage
Pour les tensions de secteur entre 250 V et 600 V, Tav est inversement proportionnel à la tension
Für Netzspannungen zwischen 250 V und 600 V ist Tav umgekehrt proportional zu der Spannung

Limiting values (Absolute limits; continued)
Caractéristiques limites (Limites absolues; suite)
Grenzdaten (Absolute Grenzwerte; Fortsetzung)

See remark page 5
Voir l'observation page 5
Siehe Bemerkung Seite 5

Intermittent rectifier service
Service redresseur intermittent
Aussetzender Gleichrichterbetrieb

$V_{a\ fwd\ p}$	= max.	500 V
$V_{a\ inv\ p}$	= max.	500 V
I_{ap}	= max.	1600 A
I_a	= max.	100 A
T_{av}	= max.	6 sec

Ignitor; Electrode d'amorçage; Zündelektrode

Limiting values (Absolute limits)
Caractéristiques limites (Limites absolues)
Grenzdaten (Absolute Grenzwerte)

$V_{fwd\ p}$	= max. $V_{a\ fwd\ p}$
$V_{inv\ p}$	= max. 5 V
I_p	= max. 100 A
I_{eff}	= max. 10 A
$I(T_{av}$ = max. 5 s)	= max. 1 A

A. Anode excitation
Excitation par la tension anodique
Anodenzündung

Ignitor characteristics
Caractéristiques de l'électrode d'amorçage
Kenndaten der Zündelektrode

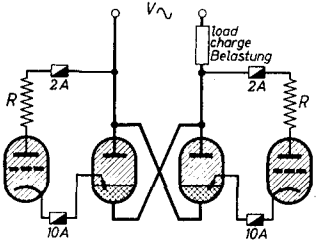
Firing voltage Tension d'amorçage Zündspannung	= max. 200 V
Firing current Courant d'amorçage Zündstrom	= 6-8 A = max. 12 A
Ignition time at the above voltage or current Temps d'amorçage à la tension ou au courant sus-mentionnés Zündzeit bei der obenerwähnten Spannung oder Strom	= max. 100 µsec

Ignition circuit requirements
Exigences au circuit d'amorçage
Bedingungen für die Zündschaltung

Peak voltage required to fire Tension de crête nécessaire pour l'amorçage Zur Zündung erforderliche Spitzenspannung	= min. 200 V
Peak current required to fire Courant de crête nécessaire pour l'amorçage Zur Zündung erforderlicher Spitzenstrom	= min. 12 A

The rate of rise of the ignitor current must be sufficient to reach the required ignition time (e.g. for an ignition time of max. 100 µsec, di/dt = min. 0.12 A/µsec)
Le taux d'accroissement du courant de l'électrode d'amorçage doit suffire à obtenir le temps d'amorçage requis (p.e. pour un temps d'amorçage de 100 µsec au max., di/dt = 0,12 A/µsec au moins)
Die Zunahme des Zündstromes muss genügen zur Erhaltung der erforderlichen Zündzeit (für eine Zündzeit von max. 100 µSek z.B. muss di/dt = min. 0,12 A/µSek sein)

Recommended circuit for anode excitation
Circuit recommandé pour excitation par la tension anodique
Empfohlene Schaltung für Anodenzündung

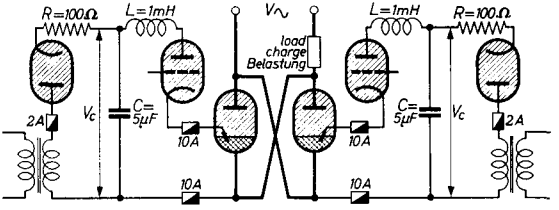


Recommended value of R
Valeur recommandée de R
Empfohlener Wert von R

Mains voltage Tension de secteur Netzspannung	R
220 Veff	2 Ω
250 Veff	2 Ω
380 Veff	4 Ω
500 Veff	5 Ω
600 Veff	6 Ω

B. Separate excitation
Excitation séparée
Fremdsteuerung

Recommended circuit
Circuit recommandé
Empfohlene Schaltung



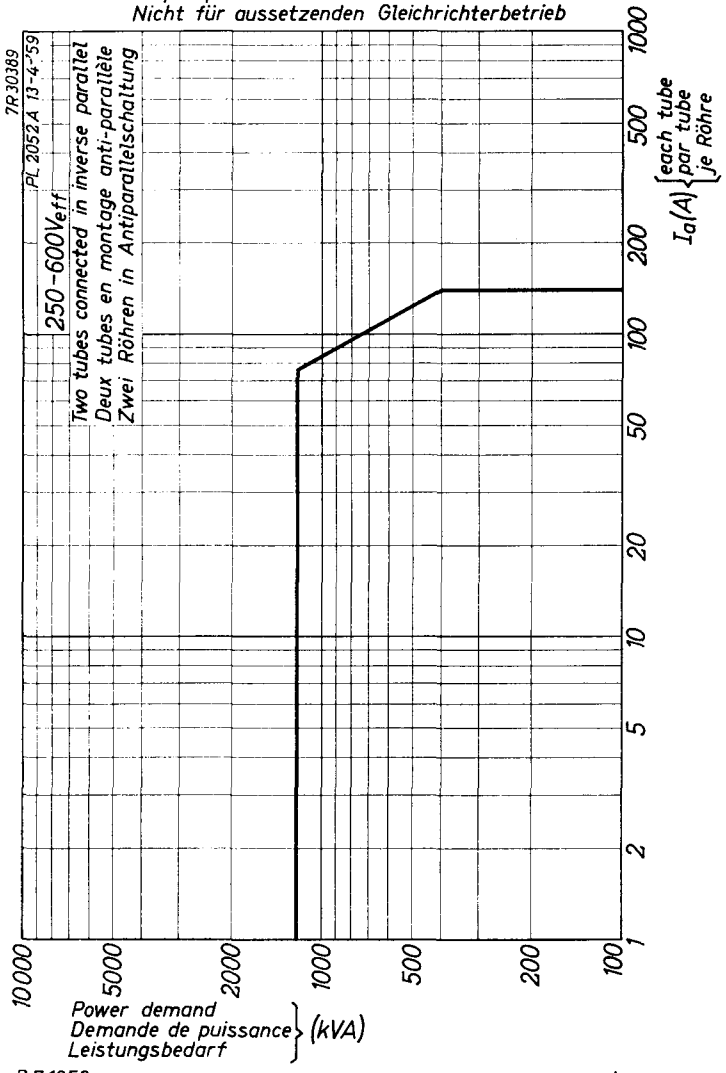
Ohmic resistance of series inductance (1 mH)
Résistance ohmique de l'inductance en série(1 mH) = max. 2 Ω
Ohmscher Widerstand der Serienselbstinduktion(1 mH)

V_c { Under operating conditions / Dans les conditions de fonctionnement / Unter Betriebsverhältnisse } = 650±50 V

Peak value of closed circuit current
Valeur de crête du courant en circuit fermé = 40 - 50 A
Spitzenwert des Stromes bei geschlossenem Kreis

PHILIPS **PL 2052A**

Not for intermittent rectifier service
Ne pas pour service redresseur intermittent
Nicht für aussetzenden Gleichrichterbetrieb

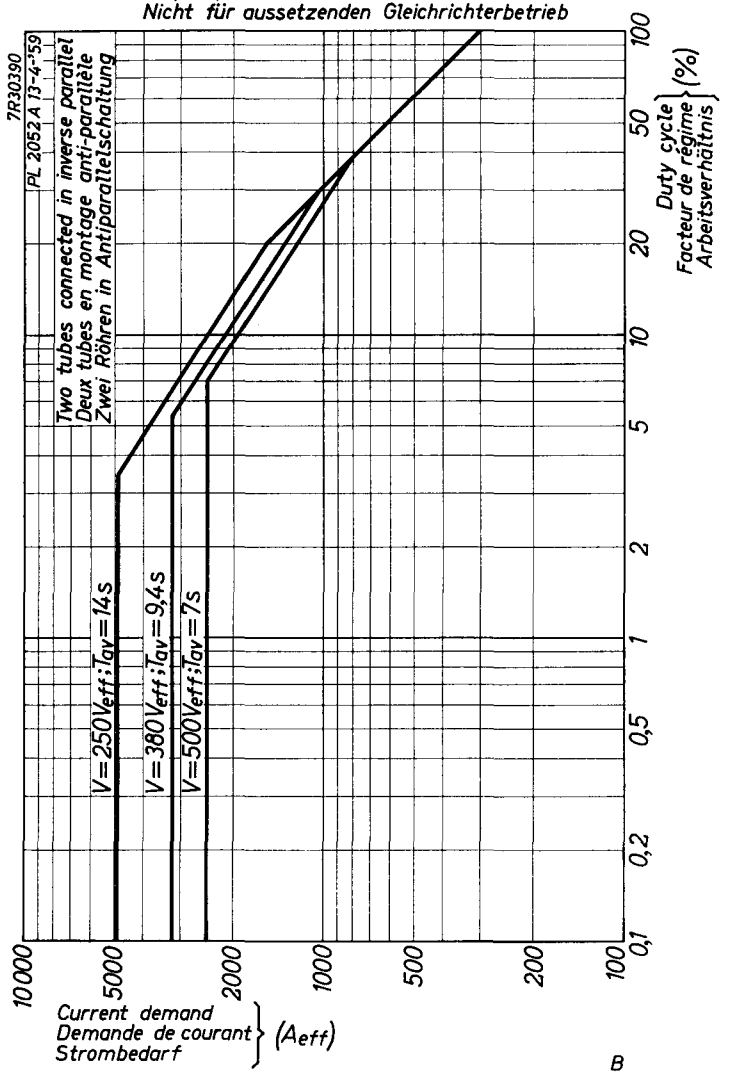


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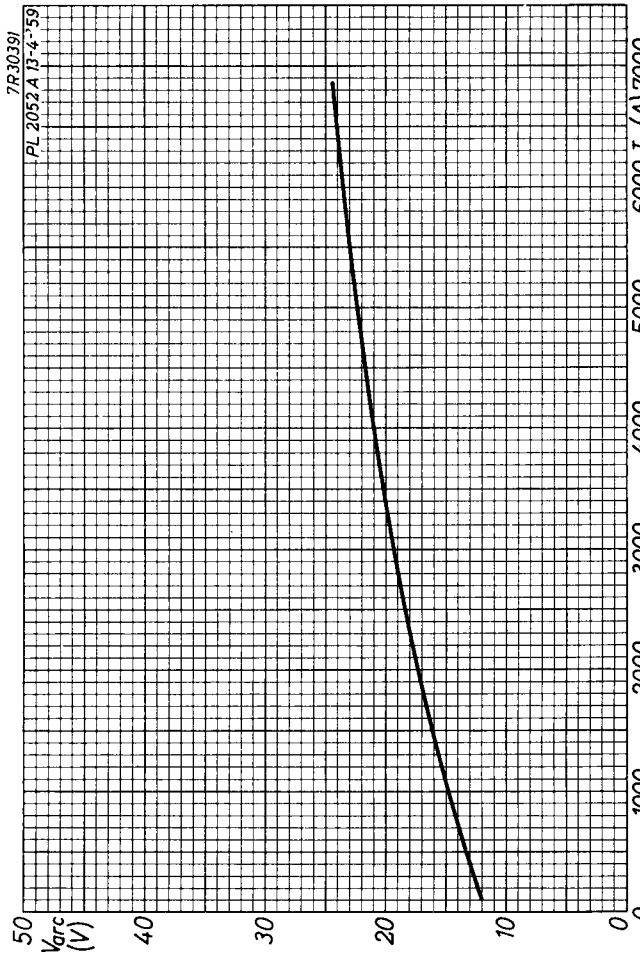
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PL2052A **PHILIPS**

Not for intermittent rectifier service
Ne pas pour service redresseur intermittent
Nicht für aussetzenden Gleichrichterbetrieb



B


7R:30391
PL 2052 A 13-4-'59
0
1000
2000
3000
4000
5000
6000
7000
I_p (A)
50
40
30
20
10
0
V_{arc} (V)

7.7.1959

C



PL2052A

page	sheet	date
1	1	1959.07.07
2	2	1959.07.07
3	3	1959.07.07
4	4	1959.07.07
5	5	1959.07.07
6	6	1959.07.07
7	7	1959.07.07
8	8	1959.07.07
9	A	1959.07.07
10	B	1959.07.07
11	C	1959.07.07
12	FP	2001.09.30

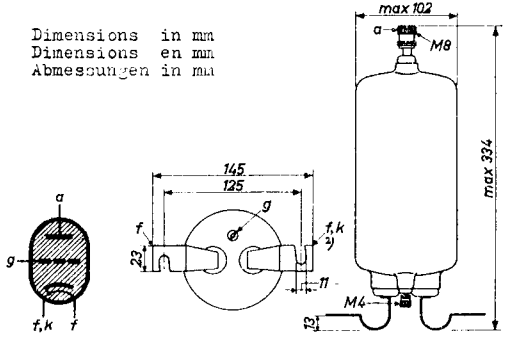
THYRATRON, mercury-vapour triode
THYRATRON, triode à vapeur de mercure
STROMTORRÖHRE, Quecksilberdampftriode

Application: electronic motor control equipment (continuous service up to 600 V D.C.), production machine control, automatic elevator control, resistance welding
Application: équipement électronique pour la commande de moteurs (service continue jusqu'à 600 V tension continue), la commande des machines de production, la commande automatique des élévateurs, soudure par résistance
Anwendung : elektronische Einrichtungen für Regelung von Motoren (Dauerbetrieb bis 600 V Gleichspannung), Regelung von Produktionsmaschinen, automatische Steuerung von Aufzüge, Widerstandsschweissung

Heating : indirect
Chauffage : indirect
Heizung : indirekt

V_f = 5,0 V
I_f = 14 A
T_w = min. 5 min[1])

Dimensions in mm
Dimensions en mm
Abmessungen in mm



Mounting position: vertical, base down
Montage : vertical, culot en bas
Einbau : senkrecht, Sockel unten

Net weight
Poids net 820 g
Nettogewicht

Shipping weight
Poids brut 1500 g
Bruttogewicht

See also "Explanation of the technical data of thyratrons" in front of this section
Voir aussi "L'explication des caractéristiques techniques des thyratrons" en tête de ce chapitre
Siehe auch die "Erläuterung zu den technischen Daten der Stromtorröhren" am Anfang dieses Abschnitts
1) See page 3; voir page 3; siehe Seite 3
2) Marked red; marqué en rouge; rot gemerkt

PHILIPS

PL255

THYRATRON, mercury-vapour triode

APPLICATION

Electronic motor control equipment (continuous service up to 600 V D.C.)

Production machine control

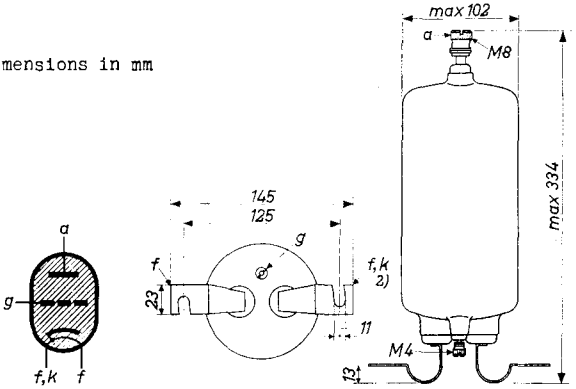
Automatic elevator control

Resistance welding

HEATING: indirect

Heater voltage	V_f	=	5.0 V
Heater current	$I_f(V_f=5.0\ V)$	=	11 A
		= max.	13 A
Waiting time	T_w	= min.	10 min.[1]

Dimensions in mm



Mounting position: vertical, base down

Net weight: 820 g Shipping weight: 1500 g

CAPACITANCES

Grid to all other elements except anode	C_g	= 30 pF
Anode to grid	C_{ag}	= 8 pF

[1]) See page B
If during long periods of service interruption (e.g. during night hours) the heater voltage is maintained at 5 V, the waiting time can be omitted

[2]) Marked red

Capacitances Capacités Kapazitäten		C_{ag} =	8 pF
		C_g =	30 pF
Typical characteristics Caractéristiques types Kenndaten		V_{arc} =	10 V
		T_{ion} =	10 µs
		T_{dion} =	1000 µs
		f = max	150 c/s

Limiting values (absolute limits)
Caractéristiques limites (limites absolues)
Grenzdaten (Absolute Grenzen)

Continuous service (motor control)
Service continue (commande de moteur)
Dauerbetrieb (Regelung von Motoren)

V_{a_p}	=		max.	1500 V
V_{ainv_p}	=		max.	2500 V
$-V_g$	=		max.	300 V
$-V_g$	=		max.	10 V[5]
$I_{surge(T=max.0,1s)}$	=		max.	1500 A
$I_{g(Va=pos)}$	=		max.	0,25 A
I_{g_p}	=		min.	0,5 mA
I_{g_p}	=		max.	1 A
R_g	=		max.	50 kΩ
R_g	=			10 kΩ[2]
I_{k_p}	= max.	30 A	100 A	160[3] A
I_k	= max.	12,5 A	10 A	20[3] A
I_{krms}	= max.	30 A	30 A	50[3] A
T_{av}	= max.	15 s	max. 15 s	[4]
t_{Hg}	=	35-75 °C	35-75 °C	40-75 °C
t_{Hg}	=	60 °C	60 °C	60 °C[2]

[2] Recommended value; valeur recommandée; Empfohlener Wert

[3] Overload, during max.5 sec in each 5 minutes operating period
Surcharge, durée 5 sec au max. dans chaque période d'opération de 5 minutes
Überlastung, während max.5 Sek. in jeder Betriebsperiode von 5 Minuten

[4] Max. 1 cycle
1 cycle au max.
Max. 1 Periode

[5] Tube conductive
Tube conductif
Gezündete Röhre

TYPICAL CHARACTERISTICS

Tube voltage drop	V_{arc} =	10 V
Ionisation time	T_{ion} =	10 µsec
Deionisation time	T_{dion} =	1000 µsec

LIMITING VALUES (Absolute limits)

I. For continuous service (motor control)

Frequency	f	= max. 150 c/s
Peak anode voltage	V_{ap}	= max. 1500 V
Peak inverse anode voltage	$V_{a\ inv\ p}$	= max. 2500 V
Grid voltage before conduction	$-V_g$	= max. 300 V
Grid voltage during conduction	$-V_g$	= max. 10 V
Surge current	$I_{a\ surge}$	= max. 1500 A
Max. duration	T	= max. 0.1 sec
Grid current (anode positive)	I_g	= max. 0.25 A
Peak grid current	I_{gp}	= max. 1 A = min. 0.5 mA
Grid circuit resistance	R_g	= max. 50 kΩ[1]

Peak cathode current	I_{kp}	= max.	80	100	160[2]	A
Cathode current (RMS value)	I_k	= max.	30	30	50[2]	A(RMS)
Average cathode current	I_k	= max.	12.5	10	20[2]	A
Averaging time	T_{av}	= max.	15	15	[3]	sec
Mercury temperature	t_{Hg}	= max.	75	75	75	°C [4]
		= min.	35	35	40	°C

[1]) Recommended value 10 kΩ

[2]) Overload during max. 5 sec in each 5 minutes operation period

[3]) Max. 1 cycle

[4]) Recommended value 60 °C

Limiting values (absolute limits)
Caractéristiques limites (limites absolues)
Grenzdaten (absolute Grenzen)

A.C. and welder operation (two tubes in inverse parallel)
Opération C.A. et de soudure (deux tubes en montage anti parallèle)
Wechselstrom- und Schweissbetrieb (zwei Röhren in Antiparallelschaltung)

V_{a_p}	=		max. 750	V
V_{ainv_p}	=		max. 750	V
$-V_g$	=		max. 300	V
$-V_g$	=		max. 10	V [5]
Duty cycle Facteur de marche= Einschaltdauer		10	50	100 %
I_{k_p}	= max.	156	78	39 A
I_k	= max.	5	12,5	12,5 A
$I_{o_{rms}}$	= max.	110	55	27,5 A
T_{av}	= max.	5	5	15 sec
I_{surge} (T=max.0,1 s)	=		max.	1500 A
I_g (Va = pos.)	=		max.	0,25 A
R_g	=		max.	50 kΩ
R_g	=			10 kΩ [2]
t_{Hg}	=			40-80 °C
t_{Hg}	=			60 °C [2]

[2] [5] See page 2; voir page 2; siehe Seite 2

[1] See curves on page B
During long periods of interrupted service (e.g. during night hours) it is recommended to reduce Vf to 60-80% instead of switching off the filament. In this way the value of Tw can be decreased according to the dotted curve
Voir les courbes sur page B
Pendant les périodes du service interrompu longues (p.e. pendant les heures de nuit) il est recommandé de reducer Vf à 60-80% au lieu de mettre hors circuit le filament. De cette manière la valeur de Tw peut être diminuée selon la courbe pointilée
Siehe die Kurven auf Seite B
Während langen Betriebsunterbrechungen (z.B. während der Nachtstunden) ist es empfehlenswert Vf zu reduzieren bis auf 60-80% statt den Glühfaden auszuschalten. In dieser Weise kann den Wert von Tw entsprechend die gestrichelte Kurve verringert werden

LIMITING VALUES (Absolute limits; continued)

II. For A.C. and welding control operation

Two tubes in inverse parallel

Frequency	f	= max.	150 c/s
Peak anode voltage	V_{a_p}	= max.	750 V
Peak inverse anode voltage	$V_{a\ inv\ p}$	= max.	750 V
Grid voltage before conduction	$-V_g$	= max.	300 V
Grid voltage during conduction	$-V_g$	= max.	10 V
Surge current	$I_{a_{surge}}$	= max.	1500 A
Max. duration	T	= max.	0.1 sec
Grid current (anode positive)	I_g	= max.	0.25 A
Grid circuit resistance	R_g	= max.	50 kΩ[1])
Mercury temperature	t_{Hg}	= max.	80 °C
		= min.	40 °C[2])

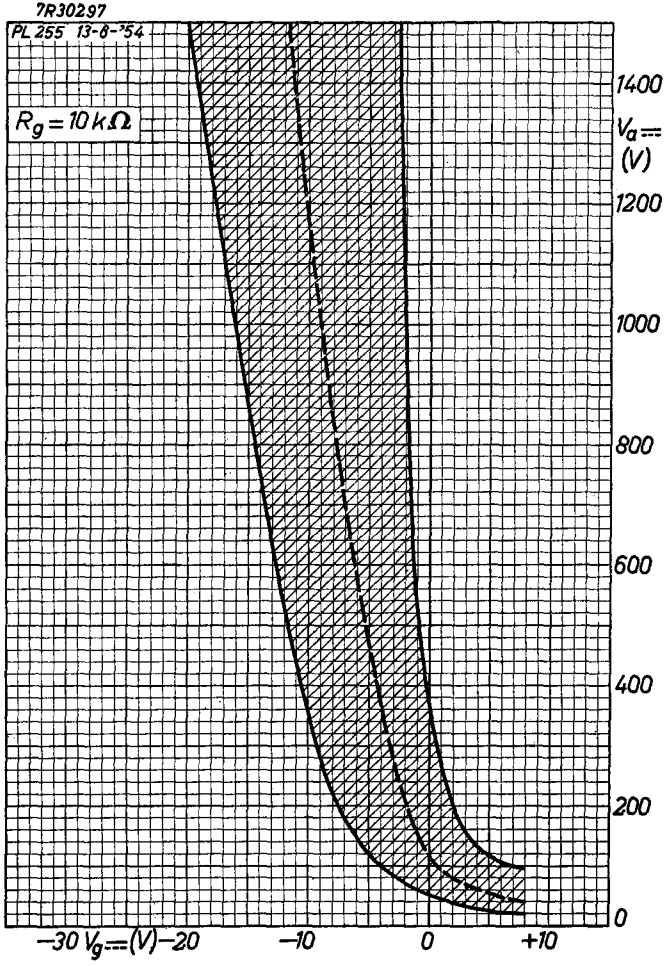
Duty factor	δ	=	10	50	100 %
Peak cathode current	I_{k_p}	= max.	156	78	39 A
Cathode current (RMS value)	I_k	= max.	110	55	27.5 A(RMS)
Average cathode current	I_k	= max.	5	12.5	12.5 A
Averaging time	T_{av}	= max.	5	5	15 sec

[1]) Recommended value 10 kΩ

[2]) Recommended value 60 °C

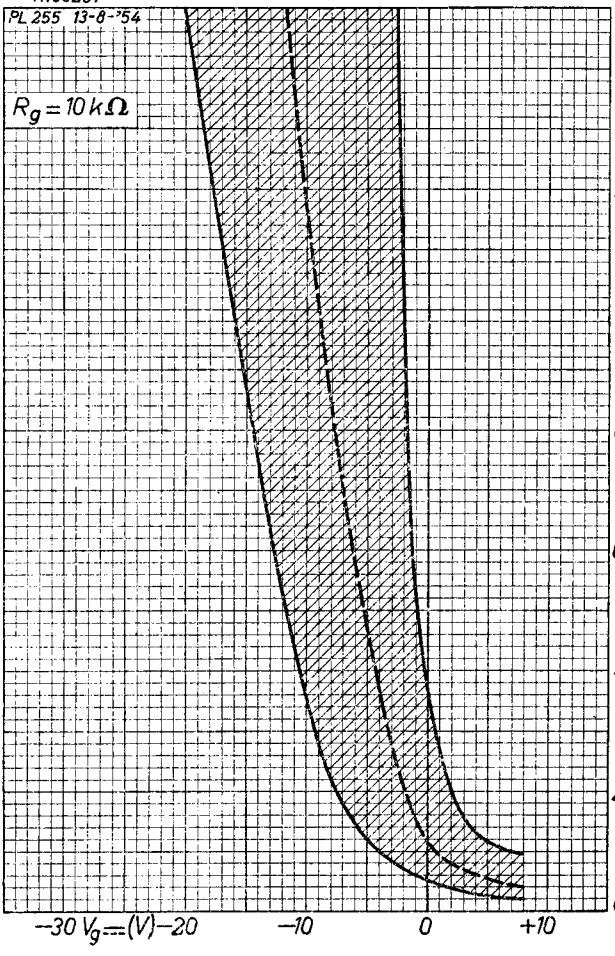
PHILIPS

PL 255



8.8.1954

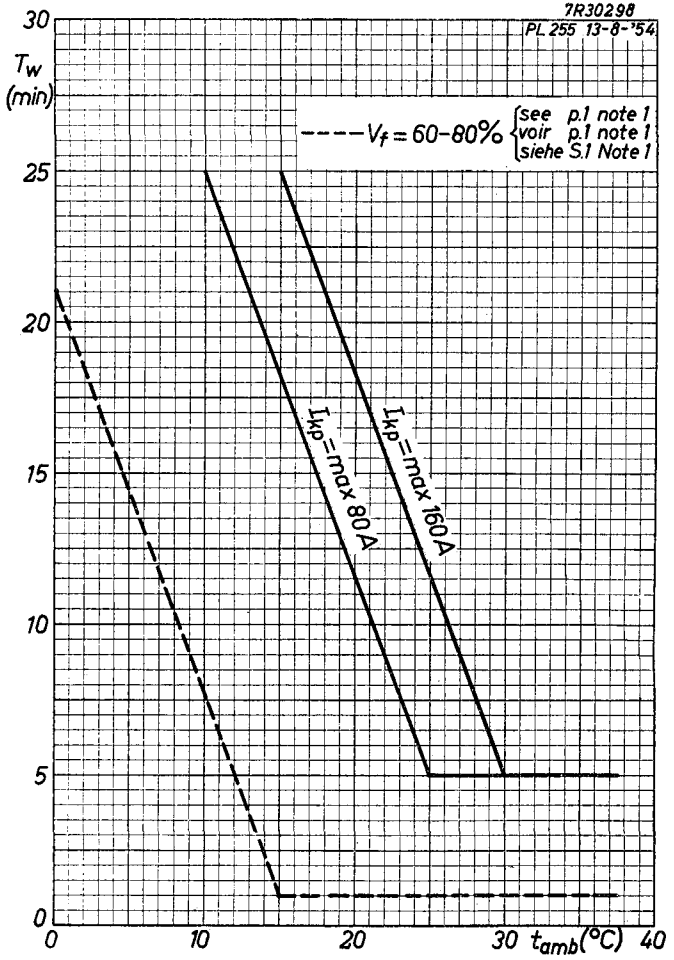
A


7R30297
PL 255 13-8-'54
$R_g = 10\,k\Omega$
1400
V_a =
(V)
1200
1000
800
600
400
200
0
−30 V_g =(V) −20
−10
0
+10

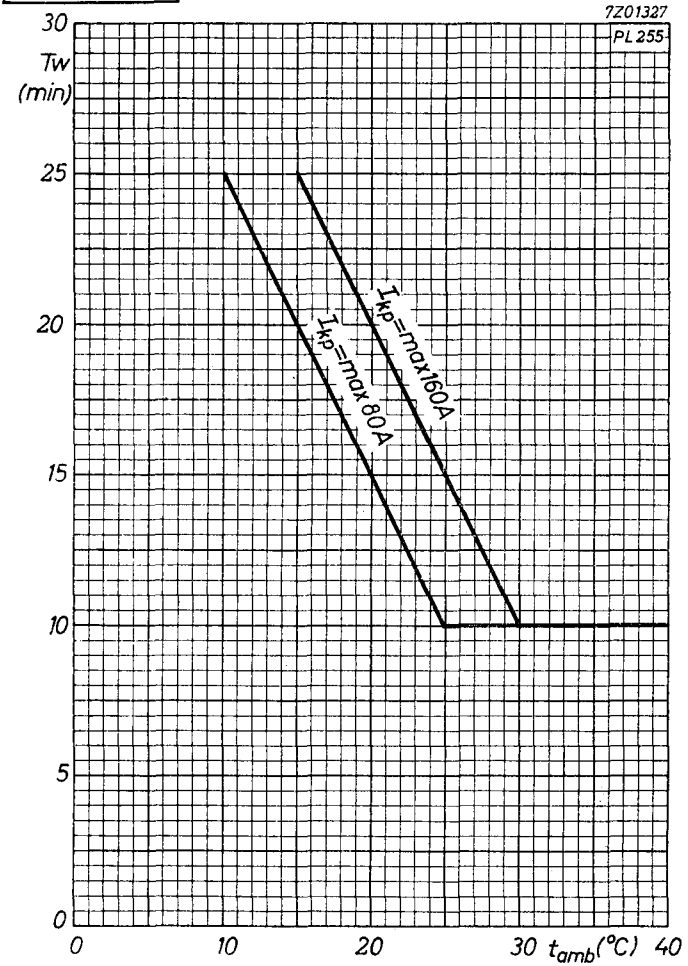
12.12.1962

A

PL 255 **PHILIPS**



B


7Z01327
PL 255
30
Tw
(min)
25
20
15
10
5
0
0
10
20
30
t_{amb}(°C)
40
I_{kp}=max 160A
I_{kp}=max 80A

PHILIPS

Electronic Tube

HANDBOOK

PL255

page	sheet	date
1	1	1954.08.08
2	1	1962.12.12
3	2	1954.08.08
4	2	1962.12.12
5	3	1954.08.08
6	3	1962.12.12
7	A	1954.08.08
8	A	1962.12.12
9	B	1954.08.08
10	B	1962.12.12
11	FP	2000.05.16

PHILIPS PL 260

THYRATRON, mercury-vapour triode
THYRATRON, triode à vapeur de mercure
STROMTORRÖHRE, Quecksilberdampftriode

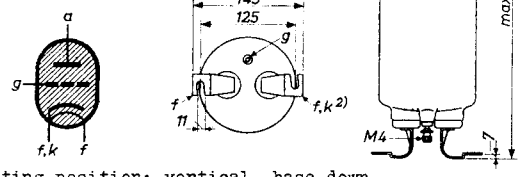
Application: electronic motor control equipment (continuous service up to 600 V D.C.), production machine control, automatic elevator control, resistance welding

Application: équipement électronique pour la commande de moteurs (service continue jusqu'à 600 V tension continue), la commande des machines de production, la commande automatique des élévateurs, soudure par résistance

Anwendung : elektronische Einrichtungen für Regelung von Motoren (Dauerbetrieb bis 600 V Gleichspannung), Regelung von Produktionsmaschinen, automatische Steuerung von Aufzüge, Widerstandsschweissung

Heating	: indirect	Vf	= 5,0 V
Chauffage	: indirect	If	= 25 A
Heizung	: indirekt	If	= max.27,5 A
		T_w	= min. 10 min [1]

Dimensions in mm
Dimensions en mm
Abmessungen in mm



Mounting position: vertical, base down
Montage : vertical, culot en bas
Einbau : senkrecht, Sockel unten

Net weight		Shipping weight	
Poids net	1600 g	Poids brut	5600 g
Nettogewicht		Bruttogewicht	

See also "Explanation of the technical data of thyratrons" in front of this section
Voir aussi "L'explication des caractéristiques techniques des thyratrons" en tête de ce chapitre
Siehe auch die "Erläuterung zu den technischen Daten der Stromtorröhren" am Anfang dieses Abschnitts

[1]) See page 5; voir page 5; siehe Seite 5
[2]) Marked red; marqué en rouge; rot gemerkt

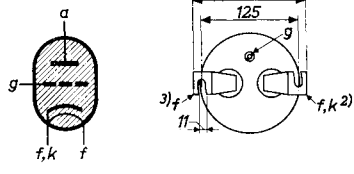
THYRATRON, mercury-vapour triode
THYRATRON, triode à vapeur de mercure
STROMTORRÖHRE, Quecksilberdampftriode

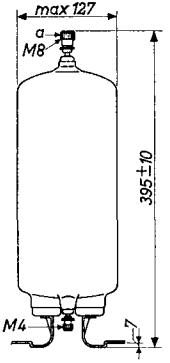
Application: Motor control (continuous operation up to 600 V D.C.), relay service and other industrial applications.
Application: Commande de moteurs (service continu jusqu'à 600 V tension continue), commande de relais et d'autres applications industrielles.
Anwendung : Regelung von Motoren (Dauerbetrieb bis 600 V Gleichspannung), Bedienung von Relais und andere industrielle Anwendungen.

Heating : indirect
Chauffage : indirect
Heizung : indirekt

V_f = 5 V
I_f = 25 A
I_f = max. 27,5 A
T_w = min. 10 min.[1])

Dimensions in mm
Dimensions en mm
Abmessungen in mm





Capacitances
Capacités
Kapazitäten

C_{ag} = 15 pF
C_g = 60 pF

[1]) See page 5; voir page 5; siehe Seite 5

[2]) Marked red
Marqué en rouge
Rot gelackt

[3]) Marked black
Marqué en noir
Schwarz gelackt

PHILIPS

PL260

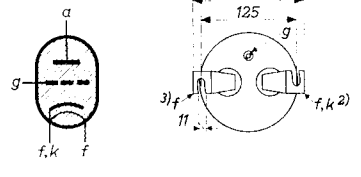
THYRATRON, mercury-vapour triode
THYRATRON, triode à vapeur de mercure
STROMTORRÖHRE, Quecksilberdampftriode

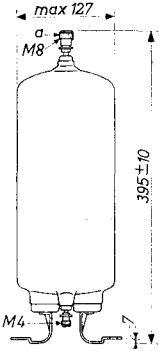
Application: Motor control (continuous operation up to 600 V D.C.), relay service and other industrial applications.
Application: Commande de moteurs (service continu jusqu'à 600 V tension continue), commande de relais et d'autres applications industrielles.
Anwendung : Regelung von Motoren (Dauerbetrieb bis 600 V Gleichspannung), Bedienung von Relais und andere industrielle Anwendungen.

Heating : indirect
Chauffage : indirect
Heizung : indirekt

V_f	=		5 V
I_f	=		19 A
I_f	=	max.	21 A
T_w	=	min.	10 min.[1]

Dimensions in mm
Dimensions en mm
Abmessungen in mm





Capacitances
Capacités
Kapazitäten

C_{ag} = 15 pF
C_g = 60 pF

[1]) See page 5; voir page 5; siehe Seite 5

[2]) Marked red
Marqué en rouge
Rot gelackt

[3]) Marked black
Marqué en noir
Schwarz gelackt

Capacitances Capacités Kapazitäten	C_{ag}	= 15 pF
	C_g	= 60 pF

Limiting values (absolute limits)
Caractéristiques limites (limites absolues)
Grenzdaten (absolute Grenzen)

Continuous service (motor control)
Service continue (commande de moteur)
Dauerbetrieb (Regelung von Motoren)

Va_p	= max.			1500	V
$Va\ inv_p$	= max.			2500	V
$-V_g$	= max.			300	V
$-V_g$	= max.			10	V [3]
I_{surge}	= max.			2500	A [4]
I_g (V_a=pos.)	= max.			0,25	A [5]
I_{g_p}	= max.			1	A
I_{g_p}	= min.			3	mA
R_g	= max.			20	kΩ
R_g	=			10	kΩ [6]
Ik_p	= max.	160	200	300	A [7]
I_k	= max.	25	20	40	A [7]
I_{krms}	= max.	60	60	100	A [7]
T_{av}	= max.	15	15		s [8]
t_{Hg}	=	35-75	35-75	40-75	°C
t_{Hg}	=	60	60	60	°C [6]

Remark : Under normal operating conditions (V_f = 5 V; I_k = 25 A), $t_{Hg} - t_{amb}$ = 35 to 40 °C. When t_{amb} > 35 °C, a low velocity air flow may be necessary

Observation: Dans des conditions normales (V_f = 5 V; I_k = 25 A), $t_{Hg} - t_{amb}$ = 35 jusqu'à 40 °C. Quand t_{amb} > 35 °C, un léger courant d'air peut être nécessaire

Bemerkung : Unter normalen Bedingungen (V_f = 5 V; I_k = 25 A), $t_{Hg} - t_{amb}$ = 35 bis 40 °C. Wenn aber t_{amb} > 35 °C, kann ein schwacher Luftstrom notwendig sein

[3)4)6)] See page 3; voir page 3; siehe Seite 3

[5)7)8)] See page 4; voir page 4; siehe Seite 4

Typical characteristics
Caractéristiques types
Kenndaten

V_{arc}	=	10 V
T_{ion}	=	10 µsec
T_{dion}	=	1000 µsec
f	= max.	150 c/s

Cooling
Refroidissement
Kühlung

Under normal operating conditions (V_f = 5 V; I_k = 25 A) $t_{Hg} - t_{amb}$ = 35 to 40 °C. When t_{amb} > 35 °C, a low velocity air flow may be necessary

Dans des conditions normales (V_f = 5 V; I_k = 25 A) $t_{Hg} - t_{amb}$ = 35 jusqu'à 40 °C. Quand t_{amb} > 35 °C, un léger courant d'air peut être nécessaire

Unter normalen Bedingungen (V_f = 5 V; I_k = 25 A) ist $t_{Hg} - t_{amb}$ = 35 bis 40 °C. When aber t_{amb} > 35 °C, kann ein schwacher Luftstrom notwendig sein

Mounting position: vertical, base down
Montage : vertical, culot en bas
Einbau : senkrecht, Sockel unten

Net weight		Shipping weight	
Poids net	1600 g	Poids brut	5600 g
Nettogewicht		Bruttogewicht	

[8] Recommended max. value of t_{Hg} 60 °C
Valeur max. recommandée de t_{Hg} 60 °C
Empfohlener max. Wert von t_{Hg} 60 °C

[9] T_{av} = max. 5 sec

Typical characteristics
Caractéristiques types
Kenndaten

V_{arc} = 10 V
T_{ion} = 10 µsec
T_{dion} = 1000 µsec
f = max. 150 c/s

Cooling
Refroidissement
Kühlung

Under normal operating conditions (V_f = 5 V; I_k = 25 A) $t_{Hg} - t_{amb}$ = 35 to 40 °C. When t_{amb} > 35 °C, a low velocity air flow may be necessary

Dans des conditions normales (V_f = 5 V; I_k = 25 A) $t_{Hg} - t_{amb}$ = 35 jusqu'à 40 °C. Quand t_{amb} > 35 °C, un léger courant d'air peut être nécessaire

Unter normalen Bedingungen (V_f = 5 V; I_k = 25 A) ist $t_{Hg} - t_{amb}$ = 35 bis 40 °C. When aber t_{amb} > 35 °C, kann ein schwacher Luftstrom notwendig sein

Mounting position: vertical, base down
Montage : vertical, culot en bas
Einbau : senkrecht,Sockel unten

Net weight		Shipping weight	
Poids net	1600 g	Poids brut	5600 g
Nettogewicht		Bruttogewicht	

[8])Recommended max. value of t_{Hg} 60 °C
Valeur max. recommandée de t_{Hg} 60 °C
Empfohlener max. Wert von t_{Hg} 60 °C

[9])T_{av} = max. 5 sec

Typical characteristics
Caractéristiques types
Kenndaten

V_{arc}	=	10 V
T_{ion}	=	10 µs
T_{dion}	=	1000 µs
f	=	max. 150 s/c

Limiting values (absolute limits)
Caractéristiques limites (limites absolues)
Grenzdaten (absolute Grenzen)

A.C. and welder operation (two tubes in inverse parallel)
Opération C.A. et de soudure (deux tubes en montage anti parallèle)
Wechselstrom- und Schweissbetrieb (zwei Röhren in Antiparallelschaltung)

V_{a_p}	=		max. 750	V
$V_{a\ inv_p}$	=		max. 750	V
$-V_g$	=		max. 300	V
$-V_g$	=		max. 10	V [3]
Duty cycle Facteur de marche Einschaltdauer	=	10	50	100 %
I_{k_p}	=	max. 285	156	78 A
I_k	=	max. 9	25	25 A
$I_{o_{rms}}$	=	max. 200	110	55 A
T_{av}	=	max. 5	5	15 s
I_{surge} (T=max.0,1 s)	=		max. 2500	A
I_g (V_a = pos.)	=		max. 0,25	A [5]
R_g	=		max. 20	kΩ
R_g	=		10	kΩ [6]
t_{Hg}	=		40-80	°C
t_{Hg}	=		60	°C [6]

[3]) Tube conductive
Tube conductif
Gezündete Röhre

[4]) During max.0.1 sec.Anode fuse max.80A (recommended 60A)
Pendant 0,1 sec. au max. Fusible d'anode 80 A au max. (recommandé 60 A)
Während max. 0,1 Sek. Anodensicherung max. 80 A (empfohlen 60 A)

[5]) See page 4; voir page 4; siehe Seite 4

[6]) Recommended value
Valeur recommandée
Empfohlener Wert

Limiting values (Absolute limits)
Caractéristiques limites (Limites absolues)
Grenzdaten (Absolute Grenzen)

For motor control (continuous operation)
Pour commande de moteurs (service continu)
Für Regelung von Motoren (Dauerbetrieb)

V_{ap}	=		max. 2000 V	←
$V_{a\ invp}$	=		max. 2500 V	
$-V_g$	=		max. 300 V [1]	
$-V_g$	=		max. 10 V [2]	
$I_g(V_a>oV)$	=		max. 0,25 A [3]	
I_{g_p}	=		min. 3 mA max. 1 A	
R_g	=		max. 20 kΩ [4]	
$I_{k\,surge}$	=		max. 2500 A [5]	
I_K	= max.	25 [6] 20 [6]	40 [7] A	
I_{k_p}	= max.	160 200	300 [7] A	
I_K	= max.	60 60	100 [7] A_{eff}	
t_{Hg} [8]	=	35-75 35-75	40-75 [7] °C	

[1]) Before conduction
Avant l'allumage
Gelöschte Röhre

[2]) During conduction
Pendant la période de conduction
Gezündete Röhre

[3]) See page 4; voir page 4; siehe Seite 5

[4]) Recommended value 10 kΩ; valeur recommandée 10 kΩ; Empfohlener Wert 10 kΩ

[5]) Max. duration 0.1 sec. Anode fuse max. 80 A, recommended 60 A.
Pendant 0,1 sec au max. Fusible d'anode 80 A au max., recommandé 60 A.
Während max. 0,1 Sek. Anodensicherung max. 80 A, empfohlen 60 A.

[6]) T_{av} = max. 15 sec.

[7]) Overload during max. 5 sec. in each 5 minutes operating period. T_{av} = max. 1 cycle.
Surcharge, durée 5 sec au max. dans chaque période de service de 5 minutes. T_{av} = 1 cycle au max.
Überlastung während max. 5 Sek. in jeder Betriebsperiode von 5 minuten. T_{av} = max. 1 Periode.

[8]) See page 2; voir page 2; siehe Seite 2

5) In order to facilitate the ingnition of the tube a positive grid current of at least 3 mA is necessary. The use of a fixed negative grid bias (30-50 V for D.C. output voltages of 200-600 V) and a sharp grid pulse (100-130 V) is recommended (R_g = 10 kΩ, impedance of pulse transformer max. 10 kΩ)
If a sinusoidal grid voltage is used for control, this voltage should be at least 60 V (r.m.s. value)
The impedance of the source for the negative bias should be low compared with the total grid series impedance

Pour faciliter l'amorçage du tube, un courant de grille positif de 3 mA au moins est nécessaire. Il est recommandé d'utiliser une polarisation négative de grille fixe (30-50 V aux tensions de sortie continues de 220-600 V) et une impulsion de grille aigue de 100 à 130 V (R_g = 10 kΩ, impédance du transformateur d'impulsions 10kΩ au max.)
Quand une tension de grille sinusoïdale est utilisée pour la commande, cette tension doit être 60V au moins (valeur efficace)
L'impédance de la source pour la polarisation négative doit être basse comparée à l'impédance série totale de la grille

Zur Erzielung einer niedrigeren Zündspannung der Röhre ist ein positiver Gitterstrom von wenigstens 3 mA erforderlich. Es wird empfohlen einen festen negativen Gittervorspannung (30-50 V für Ausgangsgleichspannungen von 220-600 V) und einen scharfen Gitterimpuls (100-130 V) zu verwenden (R_g=10 kΩ, Impedanz des Impulstransformators max.10 kΩ)
Wenn ein sinusförmige Gitterspannung für Steuerung verwendet wird soll diese Spannung wenigstens 60 V betragen (Effektivwert)
Die Impedanz der Spannungsquelle für den negativen Gitterspannung soll klein sein im Vergleich mit dem Gesamtgitterserienwiderstand

7) Overload, during max.5 sec in each 5 minutes operating period
Surcharge, durée 5 sec au max. dans chaque période d'opération de 5 minuten
Überlastung, während max.5 Sek. in jeder Betriebsperiode von 5 Minuten

8) Max. 1 cycle; 1 cycle au max.; Max. 1 Periode

Limiting values (absolute limits)
Caractéristiques limites (limites absolues)
Grenzdaten (absolute Grenzen)

A.C. and welder operation (two tubes in inverse parallel)
Opération C.A. et de soudure (deux tubes en montage anti parallèle)
Wechselstrom- und Schweissbetrieb (zwei Röhren in Antiparallelschaltung)

V_{ap}			= max.	750	V
$V_{a\ inv_p}$			= max.	750	V
$-V_g$			= max.	300	V [1]
$-V_g$			= max.	10	V [2]
I_g (V_a >0 V)			= max.	0,25	A [3]
R_g			= max.	20	kΩ [4]
$I_{k\ surge}$ (T = max. 0,1 sec)			= max.	2500	A
δ	=	10	50	100	%
I_k	= max.	9 [9]	25 [9]	25 [6]	A
I_{kp}	= max.	285	156	78	A
I_o	= max.	200	110	55	A_{eff}
t_{Hg}			=	40-80	°C [8]

[1],[2],[4],[6],[8],[9] See pages 2 and 3; Voir pages 2 et 3; Siehe Seiten 2 und 3

[3] In order to facilitate the ignition of the tube a positive grid current of at least 3 mA is necessary. The use of a fixed negative grid bias (30-50 V for D.C. output voltages of 220-600 V) and a sharp grid pulse (100-130 V) is recommended (R_g = 10 kΩ, impedance of pulse transformer max. 10 kΩ)
If a sinusoidal grid voltage is used for control, this voltage should be at least 60 V (r.m.s. value)
The impedance of the source for the bias should be low compared with the total grid series impedance

Pour faciliter l'amorçage du tube, un courant de grille positif de 3 mA au moins est nécessaire. Il est recommandé d'utiliser une polarisation négative de grille fixe (30-50 V aux tensions de sortie continues de 220-600 V) et une impulsion de grille aiguë de 100 à 130 V (R_g = 10 kΩ, impédance du transformateur d'impulsions 10 kΩ au max.)
Quand une tension de grille sinusoïdale est utilisée pour la commande, cette tension doit être 60 V au moins (valeur efficace)
L'impédance de la source pour la polarisation doit être basse comparée à l'impédance série totale de la grille

Siehe Seite 5.

[1])See curves on page B
During long periods of interrupted service (e.g. during night hours) it is recommended to reduce Vf to 60-80 % instead of switching off the filament. In this way the value of Tw can be decreased according to the dotted curve

When the filament has been switched off during less than 5 minutes, Tw should be at least twice the off time. After a longer switching-off time the normal Tw of min. 10 minutes can be applied

Voir les courbes sur page B
Pendant les périodes du service interrompu longues (p.e. pendant les heures de nuit) il est recommandé de réducer Vf à 60-80 % au lieu de mettre hors circuit le filament. De cette manière la valeur de Tw peut être diminuée selon la courbe pointilée

Quand le filament a été mis hors circuit pendant moins de 5 minutes, Tw doit être deux fois le temps-hors circuit au moins. Après un temps de déclanchement plus long le Tw normal de 10 minutes au moins peut être appliqué

Siehe die Kurven auf Seite B
Während langen Betriebsunterbrechungen (z.B. während der Nachtstunden) ist es empfehlenswert Vf zu reduzieren bis auf 60-80 % statt den Heizfaden auszuschalten. In dieser Weise kann den Wert von Tw entsprechend die gestrichelte Kurve verringert werden

Wenn der Heizfaden kürzer als 5 Minuten ausgeschaltet gewesen ist, soll Tw mindesten zweimal die Ausschaltzeit sein. Nach einer längeren Ausschaltzeit kann die normale Tw von min. 10 Minuten angewandt werden.

[1]) From page 1; de page 1; von Seite 1

See curves on page B

During long periods of interrupted service (e.g. during night hours) it is recommended to reduce V_f to 60-80 % instead of switching off the filament. In this way the value of T_W can be decreased according to the dotted curve

When the filament has been switched off during less than 5 minutes, T_W should be at least twice the off time. After a longer switching-off time the normal T_W of min. 10 minutes can be applied

Voir les courbes page B

Pendant les périodes de service interrompu longues (p.e. pendant les heures de nuit) il est recommandé de réduire V_f à 60-80 % au lieu de mettre hors circuit le filament. De cette manière la valeur de T_W peut être diminuée selon la courbe pointillée

Quand le filament a été mis hors circuit pendant moins de 5 minutes, T_W doit être deux fois le temps de hors circuit au moins. Après un temps de déclanchement plus long le T_W normal de 10 minutes au moins peut être appliqué

Siehe die Kurven auf Seite B

Während langen Betriebsunterbrechungen (z.B. während der Nachtstunden) ist es empfehlenswert V_f zu reduzieren bis auf 60-80 % statt den Heizfaden auszuschalten. In dieser Weise kann der Wert von T_W entsprechend der getrichelten Kurve verringert werden

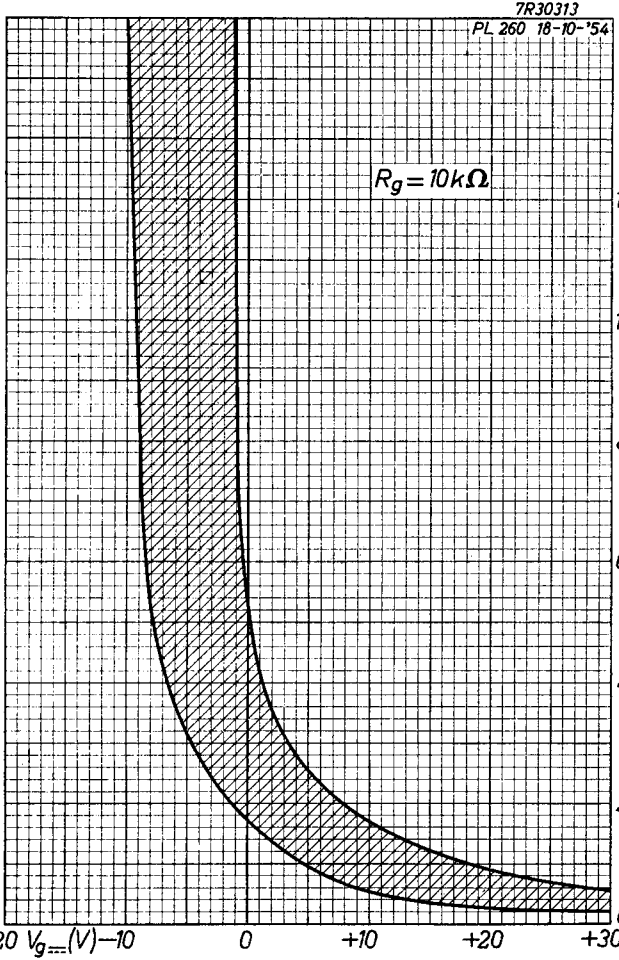
Wenn der Heizfaden kürzer als 5 Minuten ausgeschaltet gewesen ist, soll T_W mindesten zweimal die Ausschaltzeit sein. Nach einer längeren Ausschaltzeit kann die normale T_W von min. 10 Minuten angewandt werden.

[3]) Von Seite 4

Zur Erzielung einer niedrigeren Zündspannung der Röhre ist ein positiver Gitterstrom von wenigstens 3 mA erforderlich. Es wird empfohlen eine feste negative Gittervorspannung (30-50 V für Ausgangsgleichspannungen von 220-600 V) und einen scharfen Gitterimpuls (100-130 V) zu verwenden (R_g = 10 kΩ, Impedanz des Impulstransformators max. 10 kΩ)

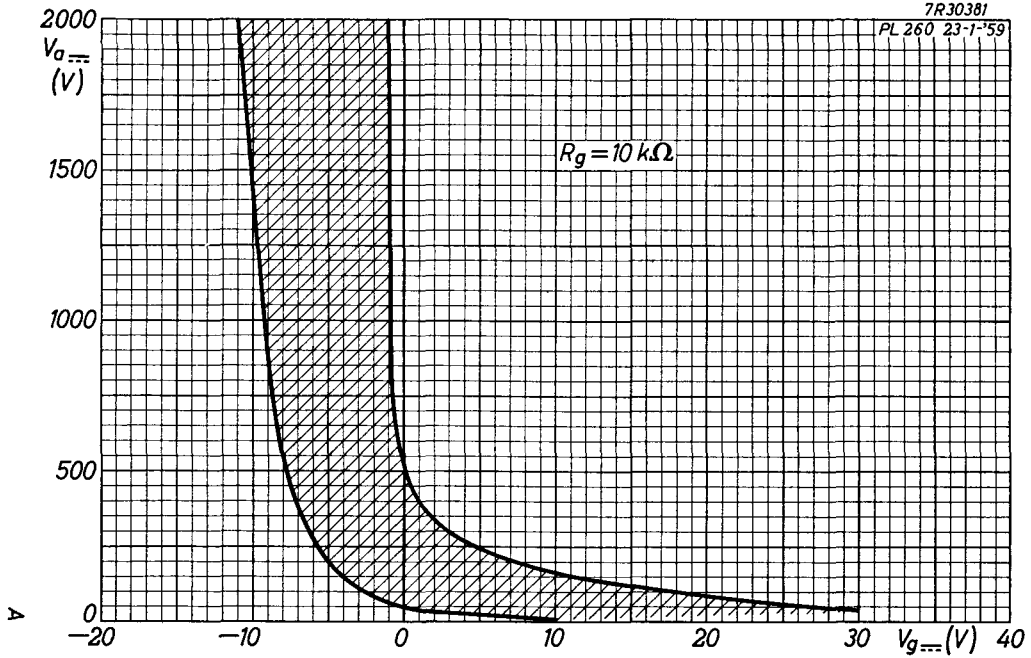
Wenn eine sinusförmige Gitterspannung für Steuerung verwendet wird, soll diese Spannung wenigstens 60 V betragen (Effektivwert)

Die Impedanz der Spannungsquelle für die Gitterspannung soll klein sein im Vergleich mit dem Gesamtgitterserienwiderstand


7R30313
PL 260 18-10-'54
1400
$V_{a=}$
(V)
$R_g = 10k\Omega$
1200
1000
800
600
400
200
0
−20 $V_{g=}$(V) −10
0
+10
+20
+30

4.4.1956

A

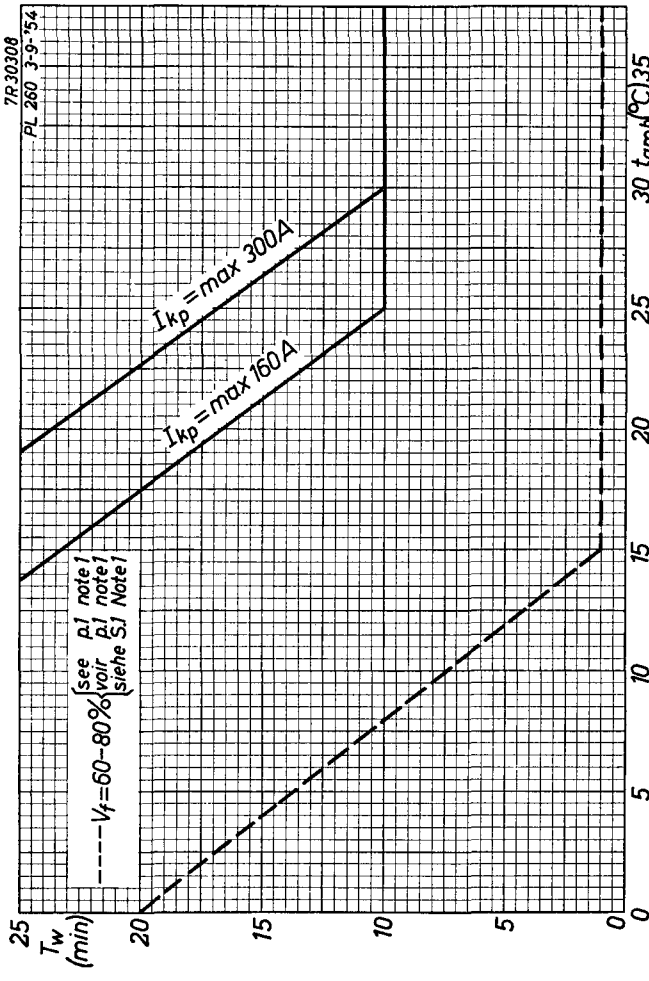


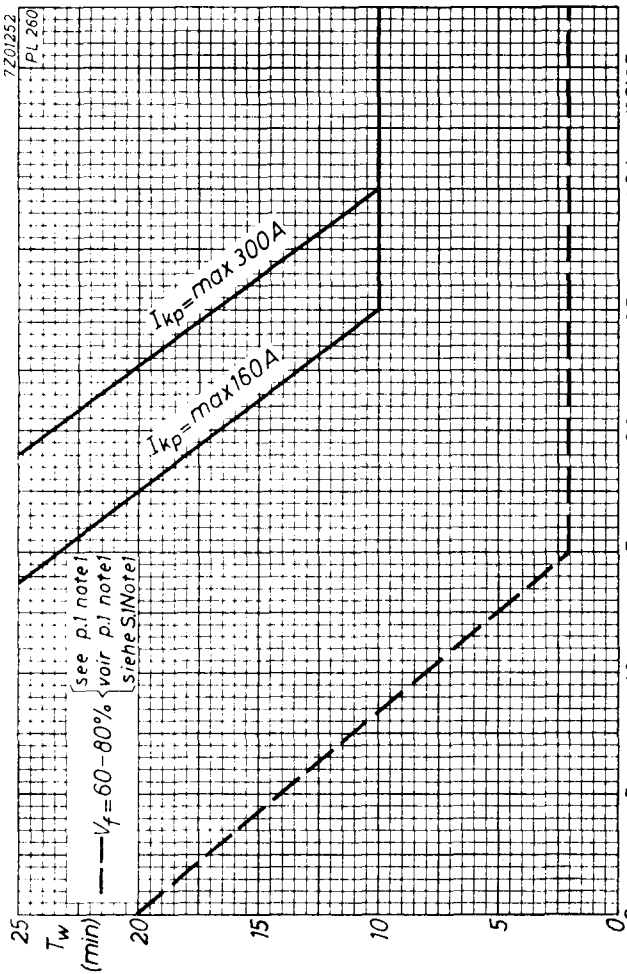
PL 260

PHILIPS

PHILIPS

7R30308
PL 260 3-9-'54
T_w (min)
25
20
15
10
5
0
0
5
10
15
20
25
30 t_{amb}(°C)35
I_{kp} = max 300A
I_{kp} = max 160A
---- V_f=60-80% see p.1 note 1
voir p.1 note 1
siehe S.1 Note 1


7R30308
PL 260 3-9-'54
I_{kp} = max 300A
I_{kp} = max 160A
V_f=60–80% (see p.1 note1 / voir p.1 note1 / siehe S.1 Note1)
T_w (min)
25
20
15
10
5
0
0
5
10
15
20
25
30
35
t_{amb}(°C)


7Z01252
PL 260
I_{kp}=max 300A
I_{kp}=max160A
——V_f=60-80% {see p.1 note1 / voir p.1 note1 / siehe S.1Note1}
T_w (min)
25
20
15
10
5
0
0
5
10
15
20
25
30 t_{amb}(°C)35

11.11.1962

B

PHILIPS **PL 260**

7R30325
PL 260 1-12-'54

$V_f = 4{,}75\ V$
$I_a = 0$

Δt_{Hg} (°C)

30
20
10
0

0 20 40 60 80 100 T_w (min)

12.12.1954

C

PL260

PHILIPS

c

PL260 **PHILIPS**

c



PL260

page	sheet	date
1	1	1956.04.04
2	1	1959.02.02
3	1	1962.11.11
4	2	1956.04.04
5	2	1959.02.02
6	2	1962.11.11
7	3	1956.04.04
8	3	1959.02.02
9	4	1956.04.04
10	4	1959.02.02
11	5	1956.04.04
12	5	1959.02.02
13	A	1956.04.04
14	A	1959.02.02
15	B	1956.04.04
16	B	1959.02.02
17	B	1962.11.11
18	C	1956.04.04
19	C	1959.02.02

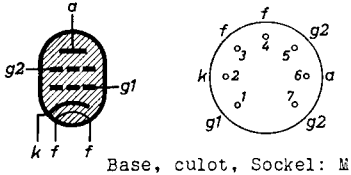
20	C	1962.11.11
21, 22	FP	2000.05.16

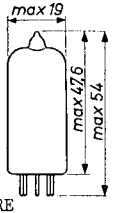
THYRATRON, gas filled tetrode
THYRATRON, tétrode à gaz
STROMTORRÖHRE, gasgefüllte Tetrode

Application: relay service, electronic timers, stabilized rectifiers, stabilization of A.C. output, in grid circuits of power thyratrons
Application: service de relais, dans des minuteries électroniques, dans des redresseurs stabilisés, stabilisation de puissance de sortie C.A., dans des circuits de grille des thyratrons de grande puissance
Anwendung: Bedienung von Relais, in elektronischen Zeitschaltern, in stabilisierten Gleichrichtern, Stabilisierung von Wechselstromleistung, in Gitterschaltungen von Stromtorröhren für höhe Leistung

Heating : indirect by A.C. or D.C.	V_f	= 6,3 V ± 10%
Chauffage: indirect par C.A. ou C.C.	I_f	= 600 mA
Heizung : indirekt durch Wechsel- oder Gleichstrom	T_w	= 20 sec [1] ←

Dimensions in mm
Dimensions en mm
Abmessungen in mm





Base, culot, Sockel: MINIATURE

Socket		Mounting position:	arbitrary
Support	5909/36	Montage	: à volonté
Fassung		Einbau	: willkürlich

Capacitances	C_{g1}	= 2,4 pF
Capacités	C_a	= 1,6 pF
Kapazitäten	C_{ag1}	= 0,026 pF

Net weight		Shipping weight	
Poids net	10 g	Poids brut	50 g
Nettogewicht		Bruttogewicht	

[1]) If urgently wanted T_w may be decreased to min. 10 sec.
Au besoin T_w peut être réduite jusqu'à 10 sec. au min
Falls dringend erforderlich darf T_w bis min. 10 Sek herabgesetzt werden

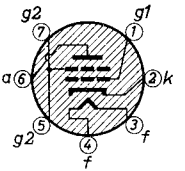
PHILIPS PL 2D21

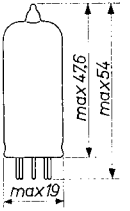
THYRATRON, gas filled tetrode
THYRATRON, tétrode à gaz
STROMTORRÖHRE, gasgefüllte Tetrode

Application: relay service, electronic timers, stabilized rectifiers, stabilization of A.C. output, in grid circuits of power thyratrons
Application: service de relais, dans des minuteries électroniques, dans des redresseurs stabilisés, stabilisation de puissance de sortie C.A., dans des circuits de grille des thyratrons de grande puissance
Anwendung: Bedienung von Relais, in elektronischen Zeitschaltern, in stabilisierten Gleichrichtern, Stabilisierung von Wechselstromleistung, in Gitterschaltungen von Stromtorröhren für hohe Leistung

Heating	: indirect by A.C. or D.C.	V_f =	6,3 V ± 10%
Chauffage	: indirect par C.A. ou C.C.	I_f =	600 mA
Heizung	: indirekt durch Wechsel- oder Gleichstrom	T_w =	20 sec [1]

Dimensions in mm
Dimensions en mm
Abmessungen in mm





Base, culot, Sockel: MINIATURE

Socket	Mounting position: arbitrary
Support	Montage : à volonté
Fassung	Einbau : willkürlich

Capacitances	C_{g_1} =	2,4 pF
Capacités	C_a =	1,6 pF
Kapazitäten	C_{ag_1} =	0,026 pF

Net weight		Shipping weight	
Poids net	10 g	Poids brut	50 g
Nettogewicht		Bruttogewicht	

[1]) If urgently wanted T_w may be decreased to min. 10 sec.
Au besoin T_w peut être réduite jusqu' à 10 sec. au min
Falls dringend erforderlich darf T_w bis min. 10 Sek herabgesetzt werden

Typical characteristics
Caractéristiques types
Kenndaten

T_{ion}	=	0,5 µs[1])
T_{dion}	=	35 µs[2])
T_{dion}	=	75 µs[3])
V_{arc}	=	8 V

Critical grid current
Courant de grille critique
Kritischer Gitterstrom $\{V_a=460\ V_{eff};\ I_a=0,1\ A\}$ = 0,5 µA

$\frac{V_a}{V_{g1}}$ at striking point
à l'allumage
bei Zündung $\{R_{g1}=0\ M\Omega;\ V_{g2}=0\ V\}$ = 250

$\frac{V_a}{V_{g2}}$ at striking point
à l'allumage
bei Zündung $\{V_{g1}=0\ V;\ R_{g1}=0\ M\Omega;\ R_{g2}=0\ M\Omega\}$ = 1000

Operating characteristics for relay service
Caractéristiques d'utilisation pour service de relais
Betriebsdaten zur Bedienung von Relais

$V_{a\sim}$	=	117	400 V_{eff}
V_{g2}	=	0	0 V
$V_{g1\sim}$	=	5	- V_{eff}[4])
$V_{g1\overline{\ldots}}$	=	-	-6 V
V_{g1_p}	=	5	6 V
R_a	=	1,2	2,0 kΩ
R_{g1}	=	1,0	1,0 MΩ

[1]) $V_{a\overline{\ldots}}$ = 100 V
I_{a_p} = 0,5 A
Grid over-voltage (square pulse)
Surtension de grille (impulsion carrée) = 50 V
Gitterüberspannung (rechteckiger Impuls)

[2]) $V_{a\overline{\ldots}}$ = 125 V
$-V_{g1}$ = 100 V
R_{g1} = 1 kΩ
I_a = 0,1 A

[3]) $V_{a\overline{\ldots}}$ =125 V
$-V_{g1}$ = 10 V
R_{g1} = 1 kΩ
I_a =0,1 A

[4]) Phase difference between V_{g1} and V_a approx. 180 °
Différence de phase entre V_{g1} et V_a environ 180 °
Phasenunterschied zwischen V_{g1} und V_a etwa 180 °

Typical characteristics
Caractéristiques types
Kenndaten

T_{ion}	=	0,5 µs[1])
T_{dion}	=	35 µs[2])
T_{dion}	=	75 µs[3])
V_{arc}	=	8 V

Critical grid current
Courant de grille critique (V_a=460 V_{eff}, I_a=0,1 A) = 0,5 µA
Kritischer Gitterstrom

$\frac{V_a}{V_{g1}}$ at striking point, à l'allumage, bei Zündung (R_{g1}= 0 MΩ, V_{g2}= 0 V) = 250

$\frac{V_a}{V_{g2}}$ at striking point, à l'allumage, bei Zündung (V_{g1}= 0 V, R_{g1}= 0 MΩ, R_{g2}= 0 MΩ) = 1000

Operating characteristics for relay service
Caractéristiques d'utilisation pour service de relais
Betriebsdaten zur Bedienung von Relais

$V_{a\sim}$	=	117	400 V_{eff}
V_{g2}	=	0	0 V
$V_{g1\sim}$	=	5	- V_{eff}[4])
$V_{g1\overline{\sim}}$	=	-	-6 V
V_{g1_p}	=	5	6 V
R_a	=	1,2	2,0 kΩ
R_{g1}	=	1,0	1,0 MΩ

1) $V_{a\overline{\sim}}$ = 100 V
I_{a_p} = 0,5 A
Grid over-voltage (square pulse)
Surtension de grille (impulsion carrée) = 50 V
Gitterüberspannung (rechteckiger Impuls)

2) $V_{a\overline{\sim}}$ = 125 V
-V_{g1} = 100 V
R_{g1} = 1 kΩ
I_a = 0,1 A

3) $V_{a\overline{\sim}}$ =125 V
-V_{g1} = 10 V
R_{g1} = 1 kΩ
I_a =0,1 A

4) Phase difference between V_{g1} and V_a approx. 180 °
Différence de phase entre V_{g1} et V_a environ 180 °
Phasenunterschied zwischen V_{g1} und V_a etwa 180 °

Limiting values for relay and grid-controlled rectifier service
Caractéristiques limites pour le service de relais et pour utilisation comme redresseur commandé par grille
Grenzdaten für Bedienung von Relais und für Gittergesteuerte Gleichrichter

V_{a_p}	≈ max.	650	V
$V_{a\ inv_p}$	≈ max.	1300	V
$-V_{g2}$	≈ max.	100	V
$-V_{g2}$ (T_{av} = max. 30 s)	≈ max.	10	V[1])
$-V_{g1}$	≈ max.	100	V
$-V_{g1}$ (T_{av} = max. 30 s)	≈ max.	10	V[1])
I_{k_p}	≈ max.	0,5	A
I_k (T_{av} = max. 30 s)	≈ max.	0,1	A
I_{g2} (T_{av} = max. 30 s)	≈ max.	0,01	A[3])
I_{g1} (T_{av} = max. 30 s)	≈ max.	0,01	A
R_{g1}	≈ max.	10	MΩ
R_{g1}	≈ max.	1	MΩ[2])
V_{kf_p} (k pos., f neg.)	≈ max.	100	V
V_{kf_p} (k neg., f pos.)	≈ max.	25	V
V_f	≈ max.	6,9	V
	≈ min.	5,7	V
I_{surge} (T = max. 0,1 s)	≈ max.	10	A
t_{amb}	≈ max.	+90	°C
	≈ min.	-75	°C

Remark : It is not recommanded to use the second grid as controle electrode
Observation: Il n'est pas recommandé d'utiliser la seconde grille comme électrode de commande
Bemerkung : Es wird nicht empfohlen das zweite Gitter als Steuerelektrode zu verwenden

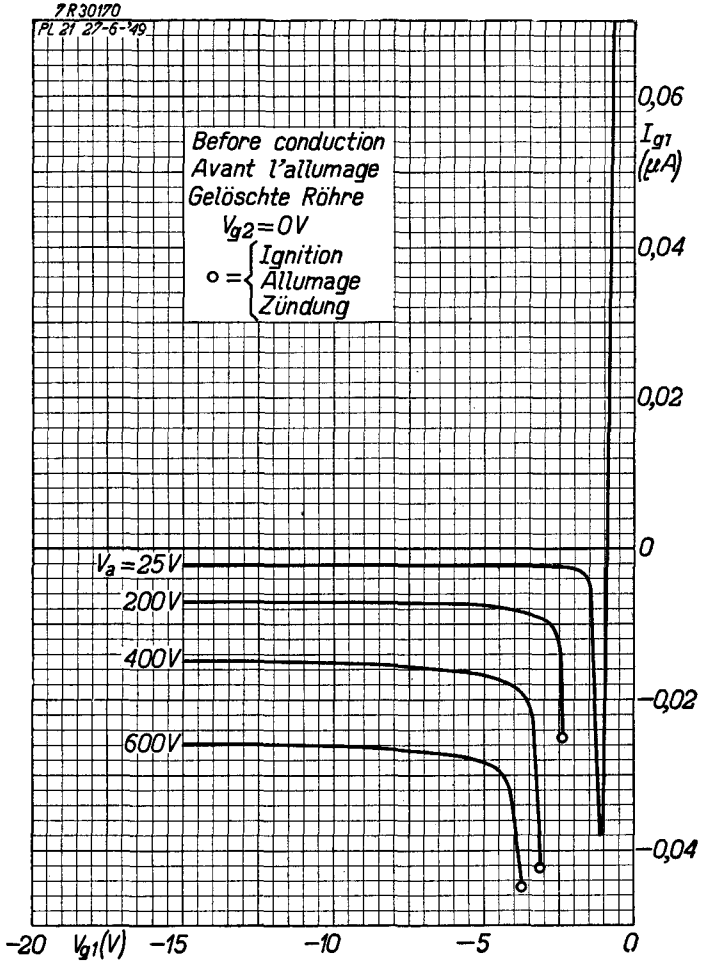
[1]) Tube conductive
Tube conductif
Gezündete Röhre

[2]) Recommended value
Valeur recommandée
Empfohlener Wert

[3]) In order not to exceed this maximum value, it is recommended to insert a series resistor of 1000 Ω in the screen-grid lead

Afin de ne pas dépasser cette valeur maximum, il est recommandé d'insérer une résistance série de 1000 Ω dans la connection de la grille-écran

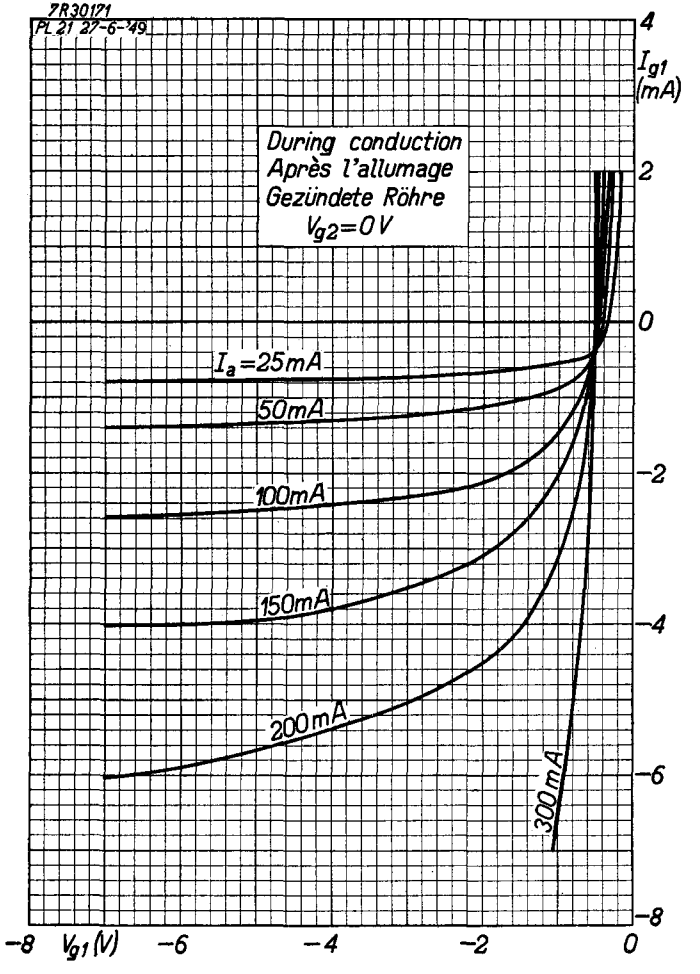
Damit dieser maximale Wert nicht überschritten wird, wird einen Serienwiderstand von 1000 Ω in der Schirmgitterleitung empfohlen


7.R30170
PL 21 27-6-'49
Before conduction
Avant l'allumage
Gelöschte Röhre
$V_{g2}=0V$
o = Ignition
Allumage
Zündung
$V_a=25V$
200V
400V
600V
0,06
I_{g1} (μA)
0,04
0,02
0
-0,02
-0,04
-20
V_{g1}(V)
-15
-10
-5
0

7.7.1954

A

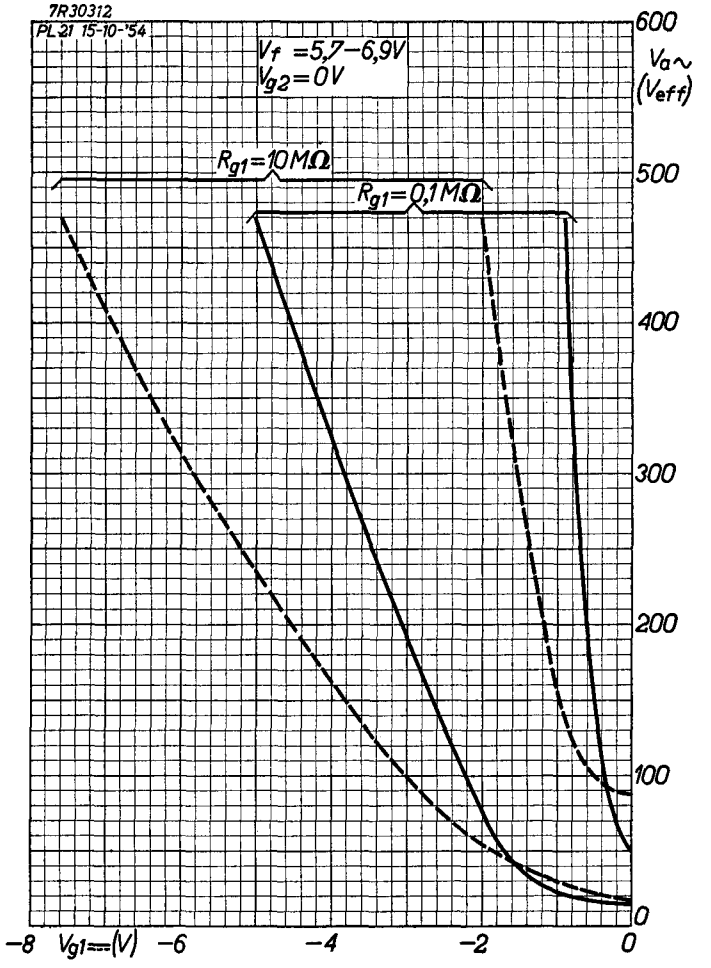
PL 2 D 21 **PHILIPS**



B

PHILIPS

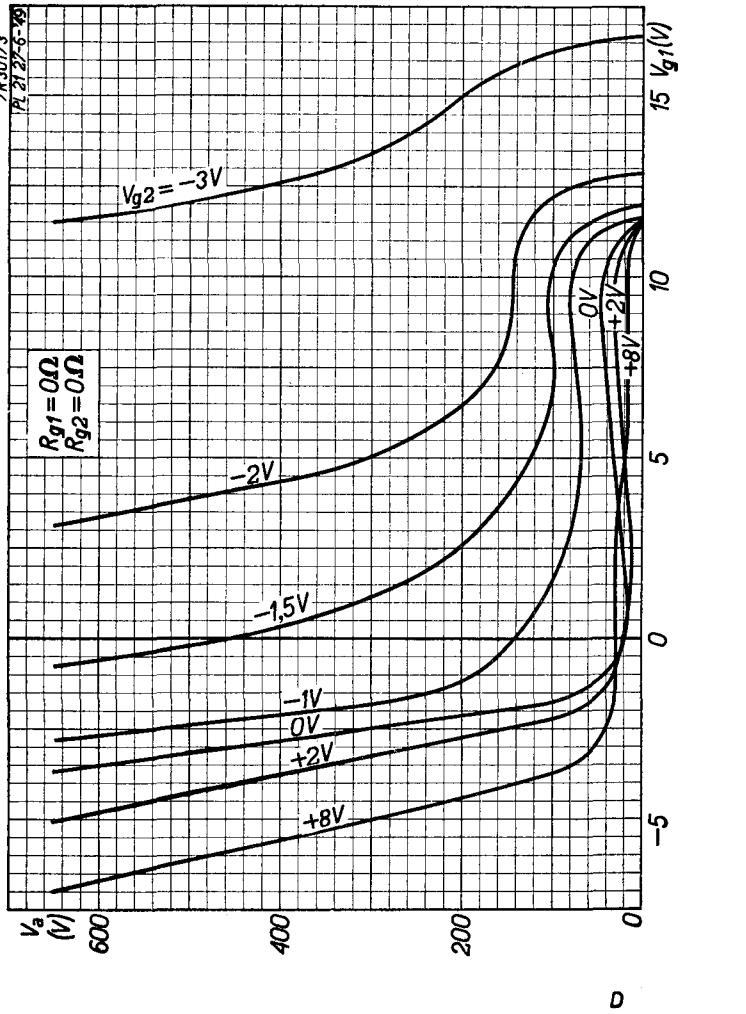
PL 2D21



10.10.1954

C

PHILIPS


7R30173
PL 21 27-6-49
Vg2 = −3V
Rg1 = 0Ω
Rg2 = 0Ω
−2V
−1,5V
−1V
0V
+2V
+8V
Va (V)
600
400
200
0
15
10
5
0
−5
Vg1(V)

D



PL2D21

page	sheet	date
1	1	1956.06.06
2	1	1959.09.09
3	2	1956.06.06
4	2	1959.09.09
5	3	1956.06.06
6	A	1954.07.07
7	B	1954.07.07
8	C	1954.10.10
9	D	1954.10.10
10	FP	2000.05.14

LINE OUTPUT PENTODE

Pentode intended for use as line output tube in television receivers.

QUICK REFERENCE DATA			
Anode peak voltage	V_{a_p}	max. 7	kV
Cathode current	I_k	max. 200	mA
Drive at V_{a_p} = 7 kV		min. 120	V

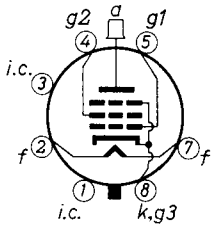
HEATING: Indirect by A.C. or D.C.; series supply

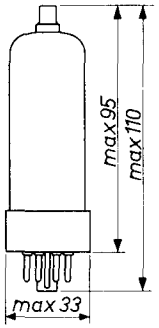
Heater current	I_f	300	mA
Heater voltage	V_f	25	V

DIMENSIONS AND CONNECTIONS Dimensions in mm

Base: Octal

Top cap: Type 1





CAPACITANCES

Anode to all except grid No.1	$C_{a(g_1)}$	8	pF
Grid No.1 to all except anode	$C_{g_1(a)}$	17.5	pF
Anode to grid No.1	C_{ag_1}	max. 1.1	pF

TYPICAL CHARACTERISTICS

Anode voltage	V_a	100	V
Grid No.2 voltage	V_{g_2}	100	V
Grid No.1 voltage	V_{g_1}	-8.2	V
Anode current	I_a	100	mA
Grid No.2 current	I_{g_2}	7	mA
Transconductance	S	14	mA/V
Amplification factor	$\mu_{g_2g_1}$	5.6	
Internal resistance	R_i	5	kΩ

REMARKS

On pages D to M curves are given for nominal new tubes. On designing a line output circuit it has to be taken into account that due to tube spread and deterioration during life the current may be reduced by 25%.

When the tube is operated below the knee of its I_a-V_a characteristic the screen grid series resistor must have a minimum value of 2.2 kΩ to avoid the occurrence of Barkhausen oscillations.

The min. drive at V_{a_p} = 5 kV is 100 V

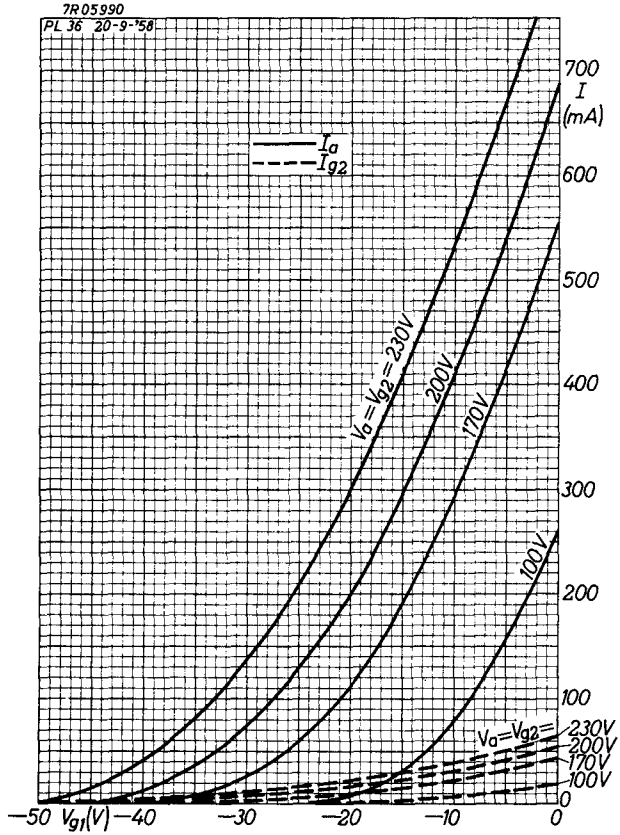
and at V_{a_p} = 7 kV 120 V

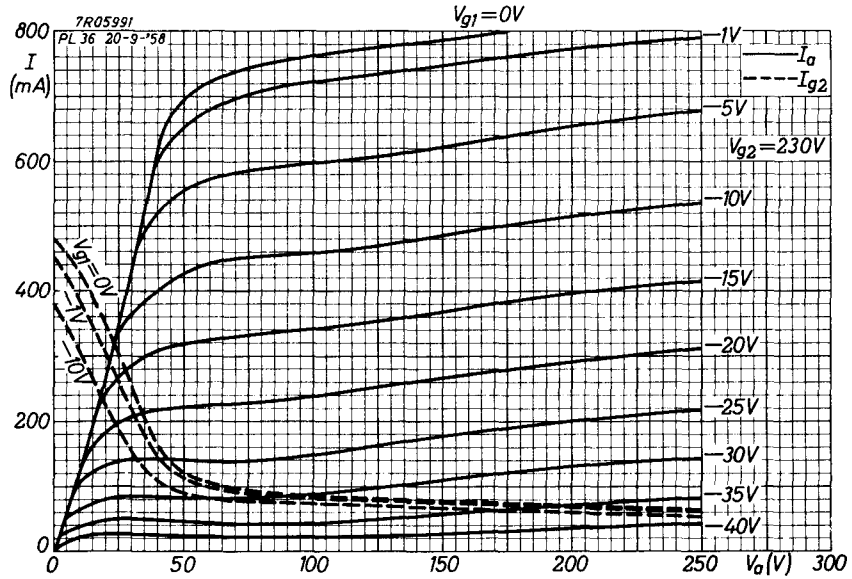
LIMITING VALUES (Design centre rating system)

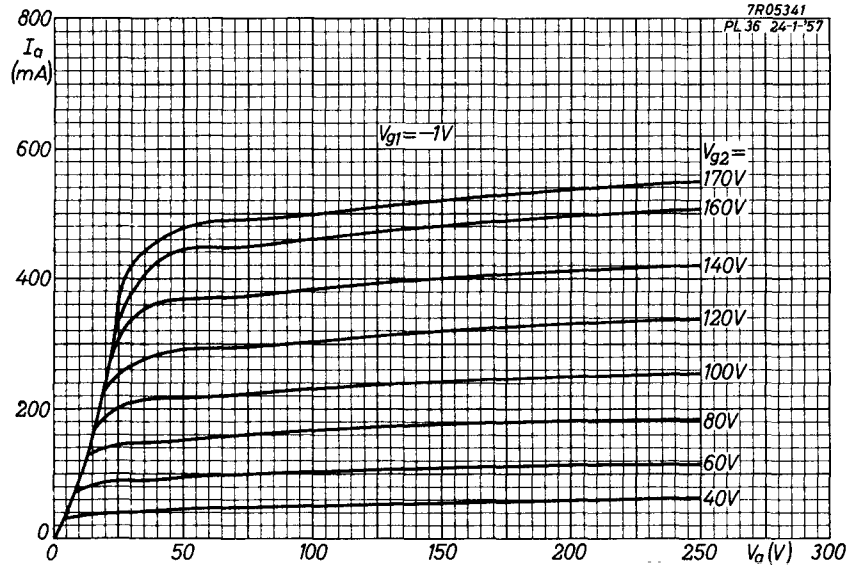
Anode voltage	V_{a_o}	max.	550	V
	V_a	max.	250	V
Anode peak voltage				
positive	V_{a_p}	max.	7	kV [1]
negative	$-V_{a_p}$	max.	1.5	kV [1]
Grid No.2 voltage	$V_{g_{2o}}$	max.	550	V
	V_{g_2}	max.	250	V
Grid No.1 peak voltage	$V_{g_{1p}}$	max.	1	kV [1]
Anode dissipation	W_a	See page 7		
Grid No.2 dissipation	W_{g_2}			
Anode + grid No.2 dissipation	$W_a+W_{g_2}$			
Cathode current	I_k	max.	200	mA
Grid No.1 resistor	R_{g_1}	max.	0.5	MΩ [2]
Cathode to heater voltage				
A.C. value	V_{kf}	max.	250	V_{RMS}
D.C. value, k pos.	V_{kf}	max.	250	V
D.C. value, k neg.	V_{kf}	max.	200	V

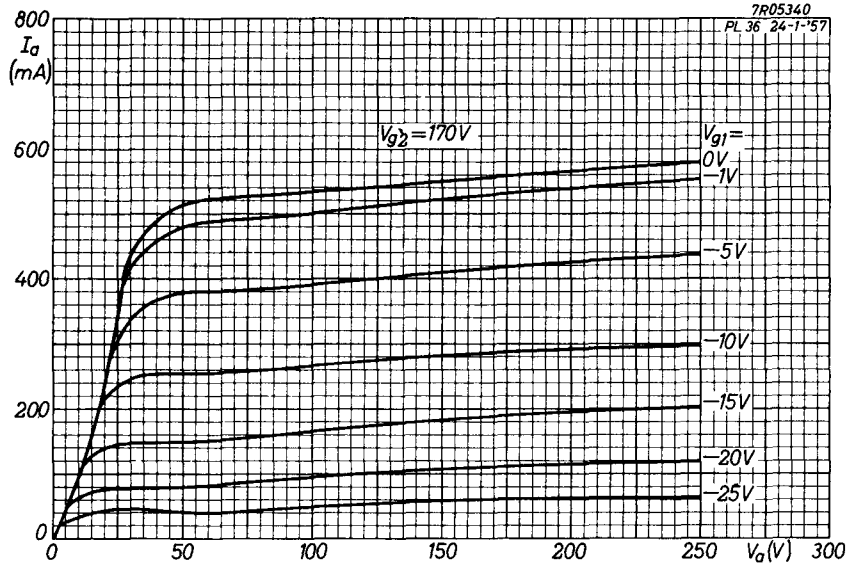
[1]) Valid for application in line output circuits where the max. pulse duration is 22% of a cycle with a max. of 18 μs.

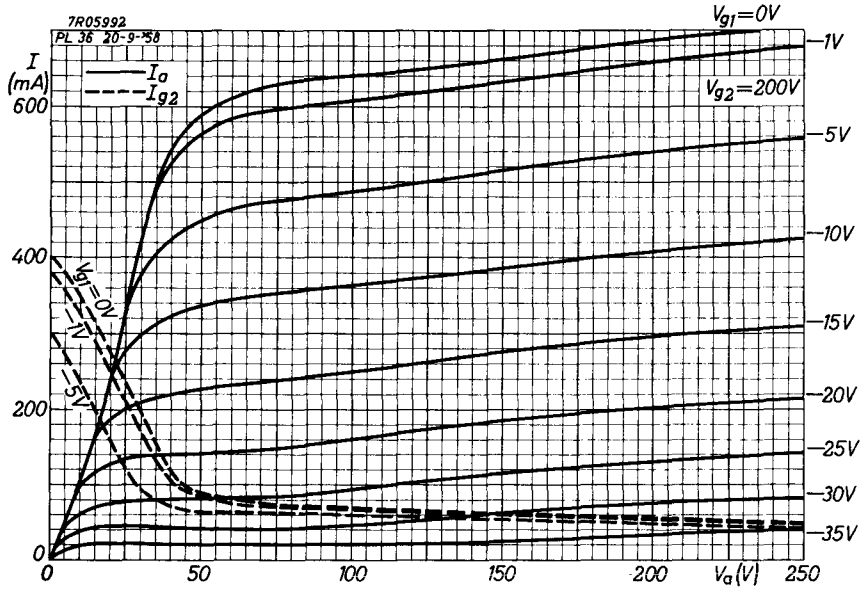
[2]) R_{g_1} = max. 2.2 MΩ for line output application only.

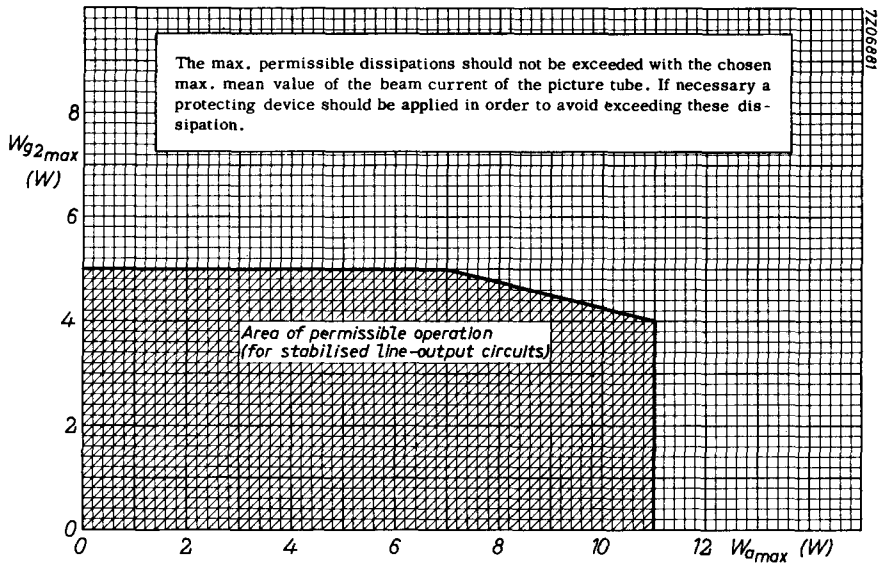

7R05990
PL 36 20-9-'58
I_a
I_{g2}
$V_a = V_{g2} = 230V$
200V
170V
100V
700
I
(mA)
600
500
400
300
200
100
0
$V_a = V_{g2} =$
230V
200V
170V
100V
−50 V_{g1}(V) −40
−30
−20
−10
0

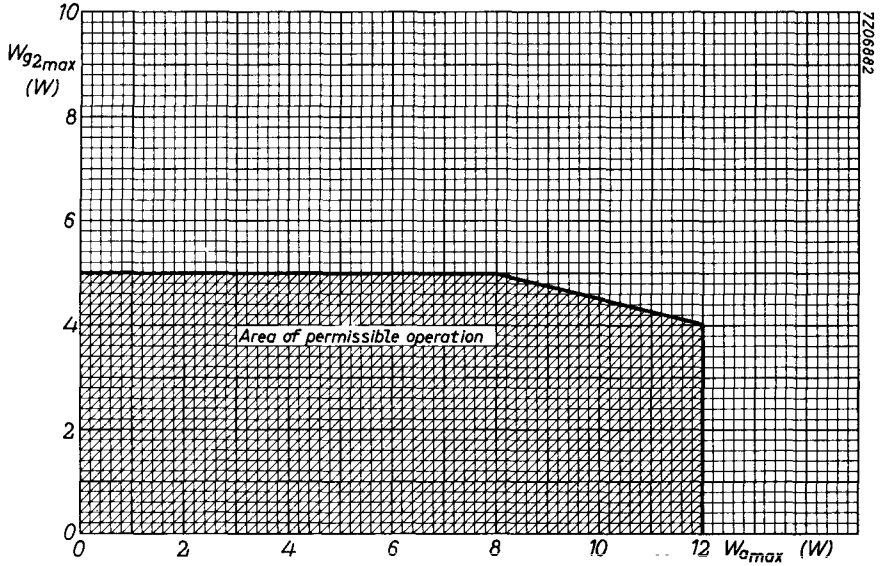

7R05991
PL 36 20-9-'58
$V_{g1}=0V$
I (mA)
800
600
400
200
0
$V_{g1}=0V$
−1V
−10V
−1V
−5V
−10V
−15V
−20V
−25V
−30V
−35V
−40V
I_a
I_{g2}
$V_{g2}=230V$
0
50
100
150
200
250
V_a(V)
300

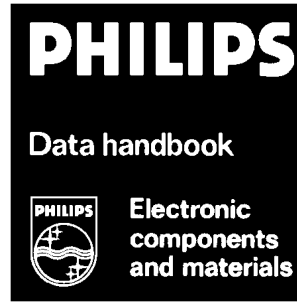

7R05341
PL 36 24-1-'57
I_a (mA)
800
600
400
200
0
$V_{g1}=-1V$
$V_{g2}=$
170V
160V
140V
120V
100V
80V
60V
40V
0
50
100
150
200
250
V_a(V)
300


7R05340
PL 36 24-1-'57
800
Ia
(mA)
600
400
200
0
Vg2=170V
Vg1=
0V
-1V
-5V
-10V
-15V
-20V
-25V
0
50
100
150
200
250
Va(V)
300


7R05992
PL 36 20-9-'58
I
(mA)
600
400
200
0
Ia
Ig2
Vg1=0V
-1V
-5V
Vg1=0V
Vg2=200V
-1V
-5V
-10V
-15V
-20V
-25V
-30V
-35V
0
50
100
150
200
Va(V)
250


7Z06881
The max. permissible dissipations should not be exceeded with the chosen max. mean value of the beam current of the picture tube. If necessary a protecting device should be applied in order to avoid exceeding these dissipation.
W_{g2max} (W)
8
6
4
2
0
Area of permissible operation (for stabilised line-output circuits)
0
2
4
6
8
10
12
W_{amax} (W)


7Z06882
W_{g2max} (W)
10
8
6
4
2
0
Area of permissible operation
0
2
4
6
8
10
12
W_{amax} (W)



PL36

page	sheet	date
1	1	1969.01
2	2	1969.01
3	3	1969.01
4	4	1969.01
5	5	1969.01
6	6	1969.01
7	7	1969.01
8	FP	1999.03.19

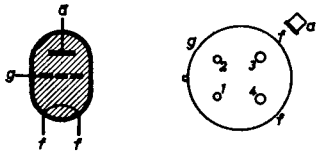
PHILIPS PL 3C23

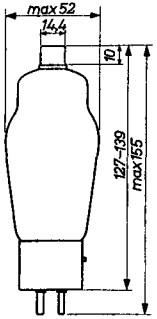
THYRATRON; mercury vapour and inert gas filled triode with negative control characteristic
THYRATRON; triode à remplissage de vapeur de mercure et de gaz inerte avec caractéristique de commande négative
STRÖMTORRÖHRE; quecksilberdampf- und edelgasgefüllte Triode mit negativer Steuerkennlinie

Heating : direct
Chauffage: direct
Heizung : direkt

V_f = 2,5 V
I_f = 7 A
T_w = 30 sec[1])

Dimensions in mm
Dimensions en mm
Abmessungen in mm





Base : Medium 4p with bayonet
Culot : Medium 4p à baionette
Sockel: Medium 4p mit Bajonett

Socket :
Support: 40218/03
Fassung:

Cap :
Capot: 40619
Haube:

Capacitance
Capacité
Kapazität

C_{ag} = 3,8 pF

Mounting position: vertical, base down
Montage : vertical, le culot en bas
Einbau : Senkrecht, Sockel unten

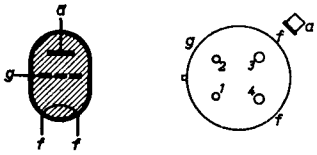
[1])See page 2; voir page 2; siehe Seite 2

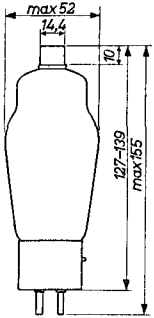
PHILIPS PL 3C23

THYRATRON; mercury vapour and inert gas filled triode with negative control characteristic
THYRATRON; triode à remplissage de vapeur de mercure et de gaz inerte avec caractéristique de commande négative
STROMTORRÖHRE; quecksilberdampf- und edelgasgefüllte Triode mit negativer Steuerkennlinie

Heating : direct Chauffage: direct Heizung : direkt	V_f	= 2,5 V
	I_f	= 7 A
	T_w	= 30 sec[1])

Dimensions in mm
Dimensions en mm
Abmessungen in mm





Base : Medium 4p with bayonet
Culot : Medium 4p à baionette
Sockel: Medium 4p mit Bajonett

Socket : Support: Fassung:	40218/03	Cap : Capot: Haube:	40619

Capacitance
Capacité
Kapazität

C_{ag} = 3,8 pF

Mounting position: vertical, base down
Montage : vertical, le culot en bas
Einbau : Senkrecht, Sockel unten

[1])See page 2; voir page 2; siehe Seite 2

Typical characteristics
Caractéristiques types
Kenndaten

V_{arc}	=	12 V
T_{ion}	=	10 µsec
T_{dion}	=	1000 µsec

Limiting values (ABSOLUTE LIMITS)
Caractéristiques limites (VALEURS ABSOLUES)
Grenzdaten (ABSOLUTE WERTE)

V_{a_p}	= max.	1500	V
V_{inv_p}	= max.	1500	V
$-V_g$	= max.	500	V [2]
$-V_g$	= max.	10	V [3]
I_{k_p}	= max.	6,4	A
I_k (T_{av} = 5 sec.)	= max.	1,6	A
I_{surge} (max.0,1 sec.)	= max.	120	A
I_g (V_a pos. T_{av} = 5 sec)	= max.	10	mA
I_{g_p}	= max.	50	mA
R_g	=	5-100	kΩ [4]
t_{amb}	=	-40/+50	°C
t_{Hg}	=	-40/+80	°C [5]

---

[1] If urgently wanted T_w may be decreased to min. 15 sec
En cas d'urgence T_w peut être réduite jusqu'à 15 sec au min.
Falls dringend erforderlich darf T_w bis min. 15 Sek herabgesetzt werden

[2] Before conduction
Avant l'allumage
Vor Zündung der Röhre

[3] During conduction
Pendant la période de conduction
Während des Stromdurchganges

[4] Recommended value 50 kΩ
Valeur recommandée 50 kΩ
Empfohlener Wert 50 kΩ

[5] Recommended temperature 40°C
Température recommandée 40 °C
Empfohlene Temperatur 40°C

Typical characteristics
Caractéristiques types
Kenndaten

V_{arc}	=	12 V
T_{ion}	=	10 µsec
T_{dion}	=	1000 µsec

Limiting values (ABSOLUTE LIMITS)
Caractéristiques limites (VALEURS ABSOLUES)
Grenzdaten (ABSOLUTE WERTE)

V_{a_p}	=	max.	1500 V
V_{inv_p}	=	max.	1500 V
$-V_g$	=	max.	500 V [2]
$-V_g$	=	max.	10 V [3]
I_{k_p}	=	max.	6,4 A
I_k (T_{av} = 5 sec.)	=	max.	1,6 A
I_{surge} (max.0,1 sec.)	=	max.	120 A
I_g (V_a pos. T_{av} = 5 sec)	=	max.	10 mA
I_{g_p}	=	max.	50 mA
R_g	=		5-100 kΩ [4]
t_{amb}	=		-40/+50 °C
t_{Hg}	=		-40/+80 °C [5]

---

[1] If urgently wanted T_w may be decreased to min. 15 sec
En cas d'urgence T_w peut être réduite jusqu'à 15 sec au min.
Falls dringend erforderlich darf T_w bis min. 15 Sek herabgesetzt werden

[2] Before conduction
Avant l'allumage
Vor Zündung der Röhre

[3] During conduction
Pendant la période de conduction
Während des Stromdurchganges

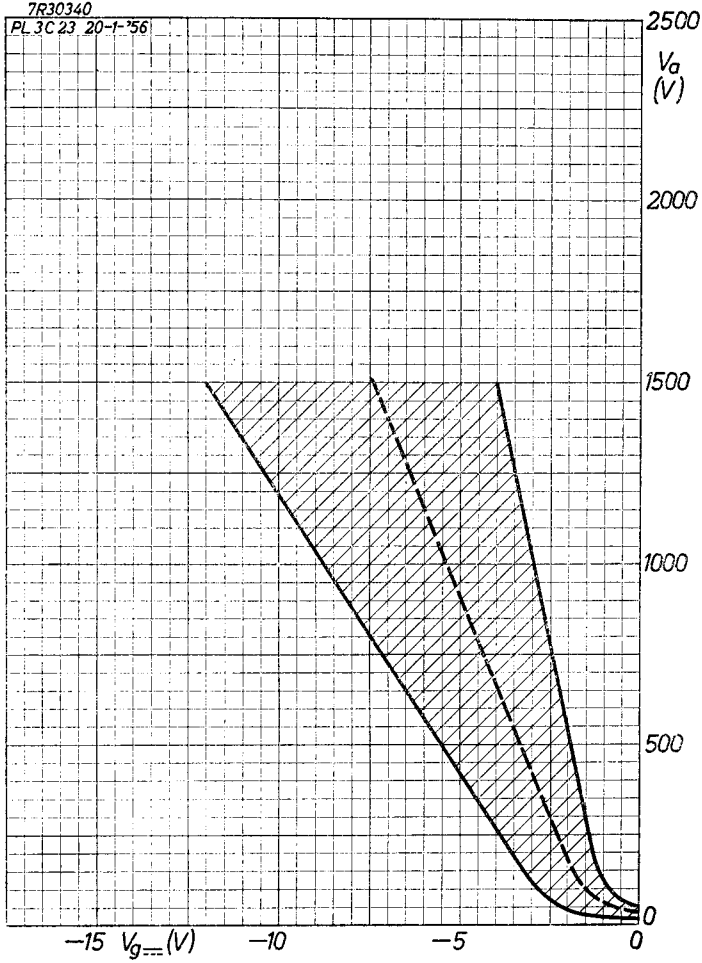
[4] Recommended value 50 kΩ
Valeur recommandée 50 kΩ
Empfohlener Wert 50 kΩ

[5] Recommended temperature 40 °C
Température recommandée 40 °C
Empfohlene Temperatur 40 °C

→

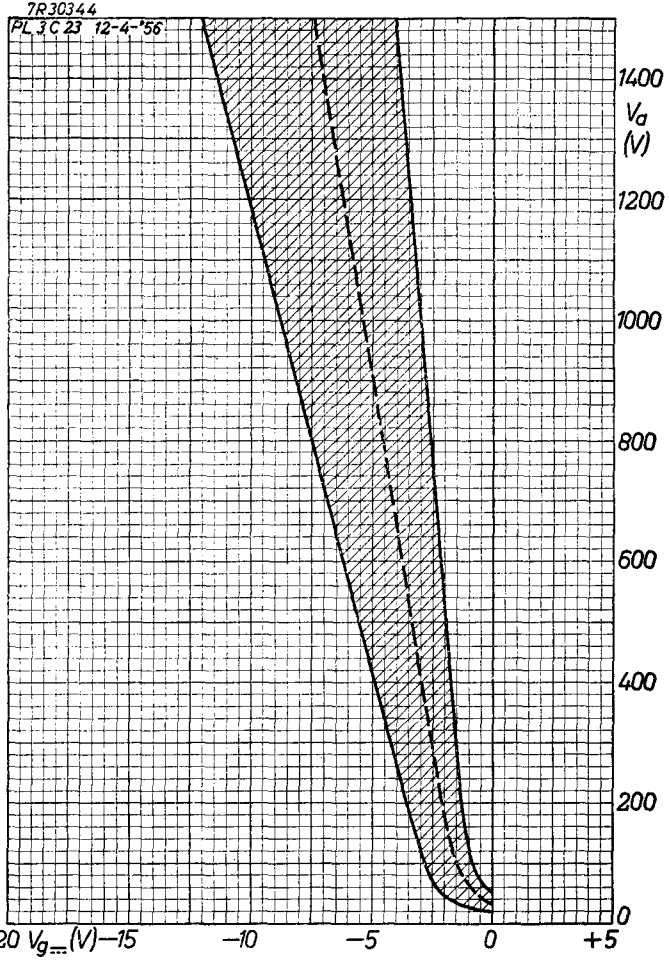
PHILIPS

PL 3C23



2.2.1956

A


7R30344
PL 3C 23 12-4-'56
1400
V_a
(V)
1200
1000
800
600
400
200
0
−20 V_{g_3} (V) −15
−10
−5
0
+5

5.5.1956

A

PHILIPS

Electronic Tube HANDBOOK

PL3C23

page	sheet	date
1	1	1957.03.03
2	1	1958.01.01
3	2	1957.03.03
4	2	1958.01.01
5	A	1956.02.02
6	A	1956.05.05
7	FP	2000.05.18

PHILIPS

PL 435
PL 522

The following type numbers have been changed :
Les numéros de type suivants ont été changés:
Die folgenden Typennummern sind geändert :

PL 435 = 4C35
PL 522 = 5C22

PHILIPS

PL 435
PL 522

The following type numbers have been changed:
Les numéros de type suivants ont été changés:
Die folgenden Typennummer sind geändert :

PL 435 = 4C35
PL 522 = 5C22

For data sheets please refer to the chapter "Tubes for Microwave Equipment", in this volume

Pour les feuilles de données voir sous le chapitre "Tubes pour Equipements Micro-ondes", dans ce tome

Für Datenblätter siehe unter "Röhren für Mikrowellenanlagen", in diesem Band

PHILIPS

Electronic Tube

HANDBOOK

PL435 PL522

page	sheet	date
1	1	1954.12.12
2	1	1957.07.07
3	FP	2000.05.18

PHILIPS

PL 5

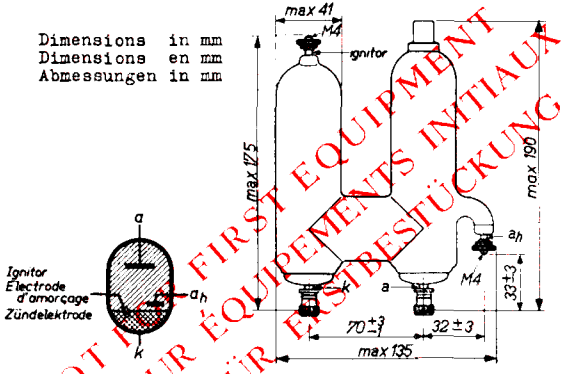
RELAY VALVE with capacitive ignition
TUBE RELAIS avec amorçage capacitif
RELAISRÖHRE mit kapazitiver Zündung

Application: For stroboscopes and film projection in television transmitters

Application: Pour des stroboscopes et la projection du film dans les émetteurs de télévision

Anwendung : Für Stroboskope und für die Filmprojektion bei Fernsehsendern

Dimensions in mm
Dimensions en mm
Abmessungen in mm



NOT FOR FIRST EQUIPMENT
PAS POUR ÉQUIPEMENTS INITIAUX
NICHT FÜR ERSTBESTÜCKUNG

Operating characteristics and limiting values
Caractéristiques d'utilisation et caractéristiques limites
Betriebs- und Grenzdaten

V_a	= max.		500	V_{eff}
	= min.		20	V_{eff}
$V_{a\ inv_p}$	= max.		1500	V
I_a (Tav= max. 1 s)	= max.	0,5	3,5	A [1])
I_{a_p}	= max.	1000	100	A [1])
V_{ign}	= max.	25	25	V
V_{arc}	=	40	15	V
f	= max.		300	c/s
t_{Hg}	=		10-40	°C

[1]) With fan cooling
Avec refroidissement par ventilateur
Mit Ventilatorkühlung

PHILIPS

PL 5

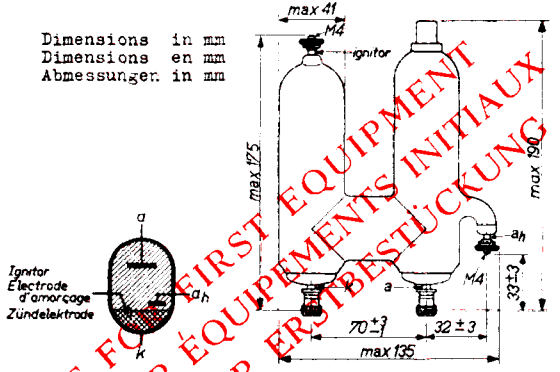
RELAY VALVE with capacitive ignition
TUBE RELAIS avec amorçage capacitif
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Application: For stroboscopes and film projection in television transmitters

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Dimensions in mm
Dimensions en mm
Abmessungen in mm



NOT FOR FIRST EQUIPMENT
PAS POUR ÉQUIPEMENTS INITIAUX
NICHT FÜR ERSTBESTÜCKUNG

Operating characteristics and limiting values
Caractéristiques d'utilisation et caractéristiques limites
Betriebs- und Grenzdaten

V_a	= max.		500	V_{eff}
	= min.		20	V_{eff}
V_a inv_p	= max.		1500	V
I_a (Tav= max. 1 s)	= max.	0,5	3,5	A [1])
I_{a_p}	= max.	1000	100	A [1])
V_{ign}	= max.	25	25	V
V_{arc}	=	40	15	V
f	= max.		300	c/s
t_{Hg}	=		10–40	°C

[1]) With fan cooling
Avec refroidissement par ventilateur
Mit Ventilatorkühlung

Ignitor; électrode d'amorçage; Zündelektrode

	V_p =	12-15 kV
	I_p = max.	0,1 A
Capacitance between ignitor and cathode Capacité entre l'électrode d'amorçage et la cathode Kapazität zwischen Zündelektrode und Katode	=	10 pF
Input energy per ignition cycle Energie pour l'amorçage par cycle $\frac{1}{2}CV^2$ Zündenergie pro Periode	=	12-25 mWs

Auxiliary anode; anode auxiliaire; Hilfsanode

To be connected to the ignitor
A connecter à l'électrode d'amorçage
Mit der Zündelektrode zu verbinden

Net weight Poids net Nettogewicht	600 g	Shipping weight Poids brut Bruttogewicht	7500 g

Observation; Bemerkung

Before the tube is put into operation, the chrome-iron parts of the cathode, the anode and the auxiliary anode must be equally covered with mercury

Avant la mise en circuit du tube, il faut couvrir uniformément de mercure les parties en chrome-fer de la cathode, de l'anode et de l'anode auxiliaire

Vor Inbetriebnahme der Röhre sind die Chromeisenteile von Katode, Anode und Hilfsanode gleichmässig mit Quecksilber zu bedecken

PHILIPS

Ignitor; électrode d'amorçage; Zündelektrode

V_p	=	12-15 kV
I_p	= max.	0,1 A

Capacitance between ignitor and cathode
Capacité entre l'électrode d'amorçage et la cathode = 10 pF
Kapazität zwischen Zündelektrode und Katode

Input energy per ignition cycle
Energie pour l'amorçage par cycle $\frac{1}{2}CV^2$ = 12-25 mWs
Zündenergie pro Periode

Auxiliary anode; anode auxiliaire; Hilfsanode

To be connected to the ignitor
A connecter à l'électrode d'amorçage
Mit der Zündelektrode zu verbinden

Net weight Poids net Nettogewicht	600 g	Shipping weight Poids brut Bruttogewicht	7500 g

Observation; Bemerkung

Before the tube is put into operation, the chrome-iron parts of the cathode, the anode and the auxiliary anode must be equally covered with mercury

Avant la mise en circuit du tube, il faut couvrir uniformément de mercure les parties en chrome-fer de la cathode, de l'anode et de l'anode auxiliaire

Vor Inbetriebnahme der Röhre sind die Chromeisenteile von Katode, Anode und Hilfsanode gleichmässig mit Quecksilber zu bedecken



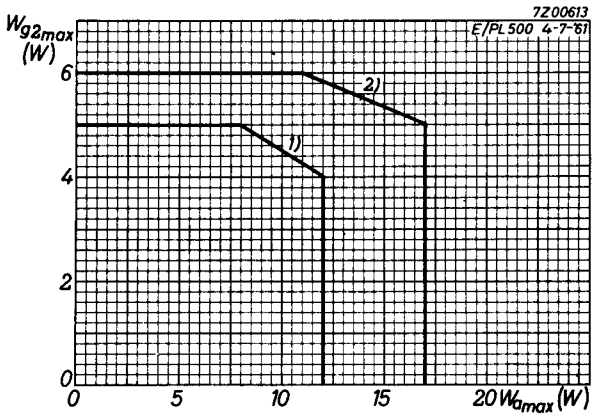
PL5

page	sheet	date
1	1	1954.10.10
2	1	1956.04.04
3	2	1954.10.10
4	2	1956.04.04
5	FP	2000.05.20

LINE OUTPUT PENTODE

Beam pentode intended for use as line output tube in television receivers.

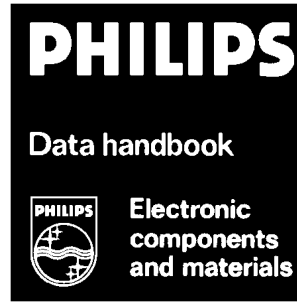
QUICK REFERENCE DATA				
Anode peak voltage	V_{a_p}	max.	7	kV
Cathode current	I_k	max.	250	mA
Anode dissipation	W_a	max.	12	W



1) Design centre limits for W_a and W_{g2}.

2) These limits for W_a and W_{g2} should not be exceeded with a nominal tube operating in a normal line deflection circuit under the worst probable conditions.

For further data and curves of this type please refer to PL504



PL500

page	sheet	date
1	1	1969.01
2	FP	1999.03.19

LINE OUTPUT PENTODE

Beam pentode intended for use as line output tube in television receivers.

QUICK REFERENCE DATA				
Anode peak voltage	V_{ap}	max.	7	kV
Cathode current	I_k	max.	250	mA
Anode dissipation	W_a	max.	16	W

HEATING: Indirect by A.C. or D.C.; series supply

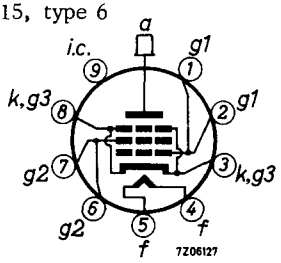
Heater current	I_f	300	mA
Heater voltage	V_f	27	V

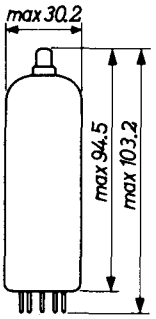
DIMENSIONS AND CONNECTIONS Dimensions in mm

Base: Magnoval; IEC 67-I-36a

Cap : Type 1

Outline: IEC67-II-15, type 6





CAPACITANCES

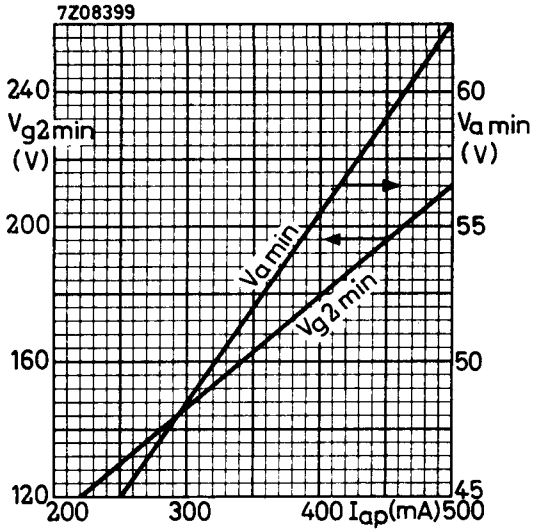
Anode to grid No. 1	C_{ag_1}		1.75	pF
Grid No. 1 to heater	C_{g_1f}	max.	0.2	pF

TYPICAL DYNAMIC CHARACTERISTICS (measured under pulse conditions)

Anode voltage	V_a	50	7000	V
Grid No.2 voltage	V_{g2}	200	200	V
Grid No.1 voltage	V_{g1}	-10	-120	V
Anode current	I_a	420	0.05	mA
Grid No.2 current	I_{g2}	37		mA

OPERATING CHARACTERISTICS

Stabilized circuits (D.C. feedback)



Minimum required values of the screen grid voltage and of the anode voltage when the tube is used in line output stages. The graphs refer to nominal mains voltage provided the specified values of V_a are increased by 10% of the anode supply voltage. The specified values of I_{a_p} will be available throughout life of the tube at supply voltage values 10% below nominal.

In order to prevent Barkhausen interferences, care should be taken that the anode voltage never drops below the specified V_a min. during the scanning period.

Non stabilized circuits

Supply voltage	V_b	190	230	V
Grid No.2 series resistor	R_{g_2}	2.2	2.2	kΩ
Grid No.1 voltage	V_{g_1}	+1	+1	V
Anode peak current	I_{a_p}	230	320	mA[1])

[1]) See page 3

HUM

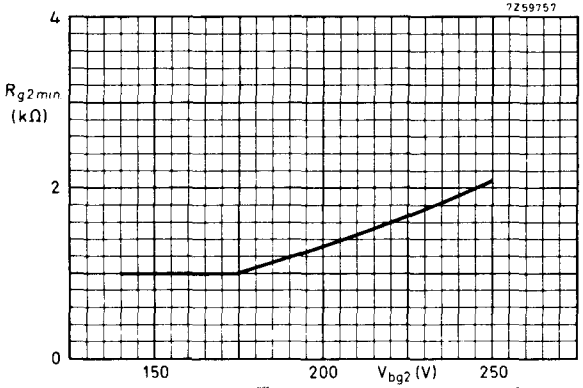
At Z_{g1} = 200 kΩ (f = 50 Hz), V_{kf} = 220 V_{RMS} and without wiring and socket capacitances, the equivalent grid hum voltage is < 5 mV.

LIMITING VALUES (Design centre rating system unless otherwise stated)

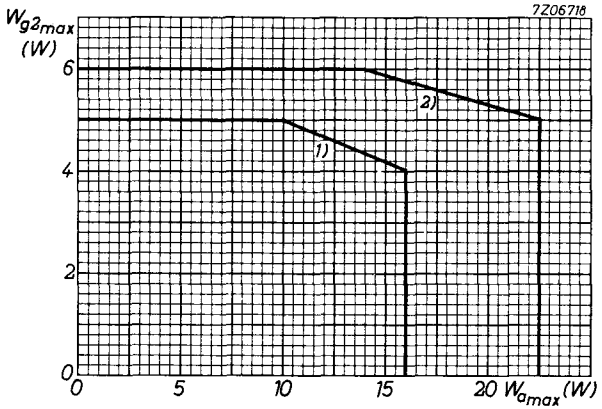
Anode voltage	V_{a_o}	max.	550	V
Anode voltage	V_a	max.	250	V
Anode voltage, peak	V_{a_p}	max.	7000	V 3)4)
Grid No.2 voltage	V_{g2o}	max.	550	V
Grid No.2 voltage	V_{g2}	max.	250	V
Anode dissipation	W_a	see page 4		
Grid No.2 dissipation	W_{g2}	see page 4		2)
Cathode current	I_k	max.	250	mA
Grid No.1 resistor	R_{g1}	max.	0.5	MΩ 5)
Cathode to heater voltage	V_{kf}	max.	250	V
Bulb temperature	t_{bulb}	max.	280	°C 6)

NOTES

1. To allow for tube spread, deterioration during life and a mains voltage 10 % below nominal, the specified values for I_{a_p} should not be exceeded at nominal mains voltage and at the specified conditions.
2. To prevent an excessive value of W_{g2} during the heating-up period, the minimum R_{g2} values are given in the graph below.

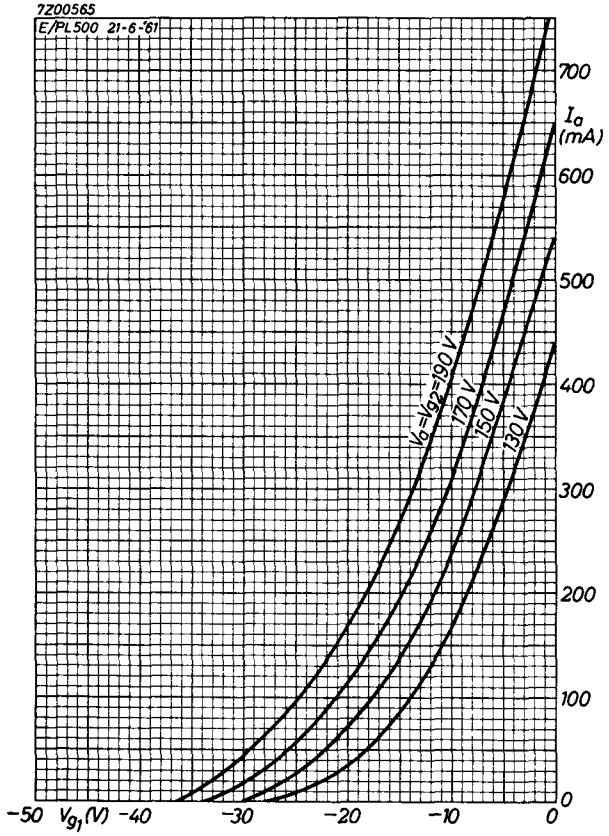


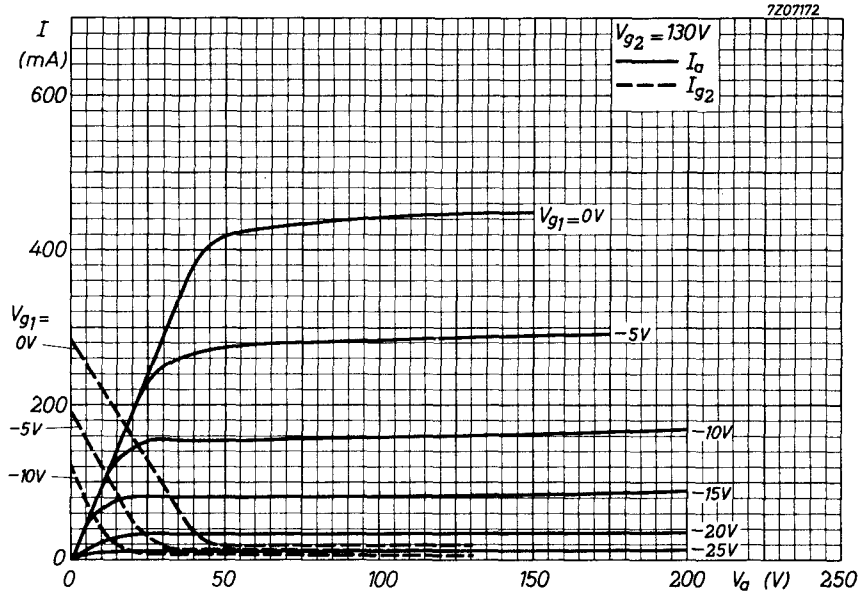
3. Maximum pulse duration is 22 % of a cycle and max. 18 μs.
4. V_{ap} design max. 8 kV
5. R_{g1} = max. 2.2 MΩ for line output application.
6. Absolute max. value.

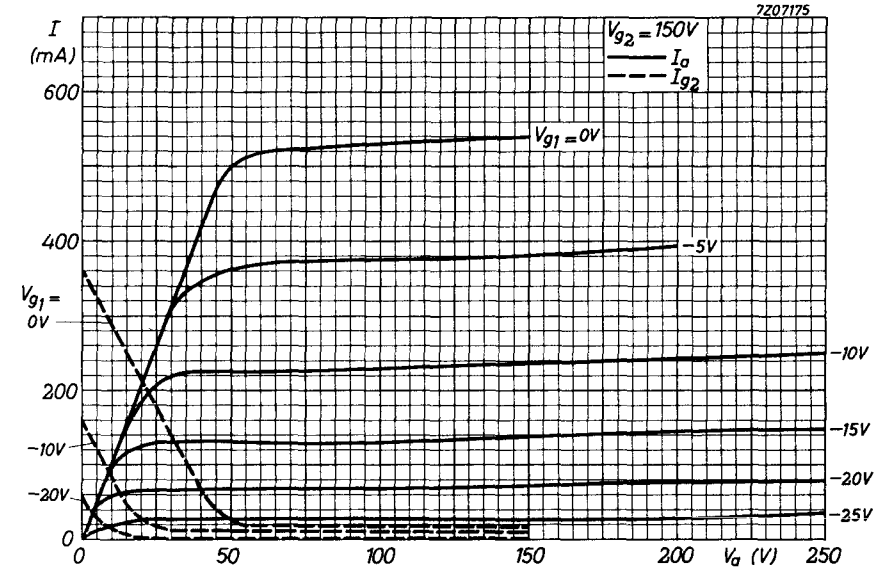


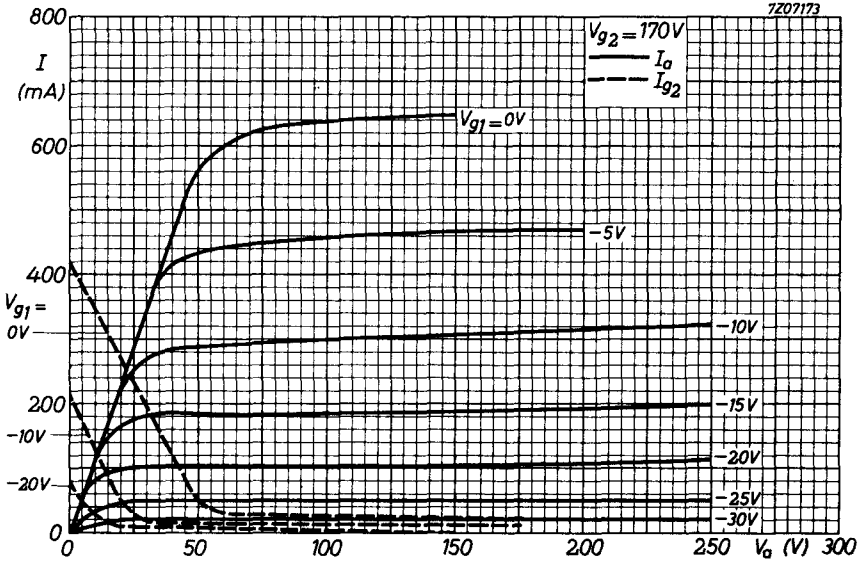
1) Disign centre limits for W_a and W_{g_2}.

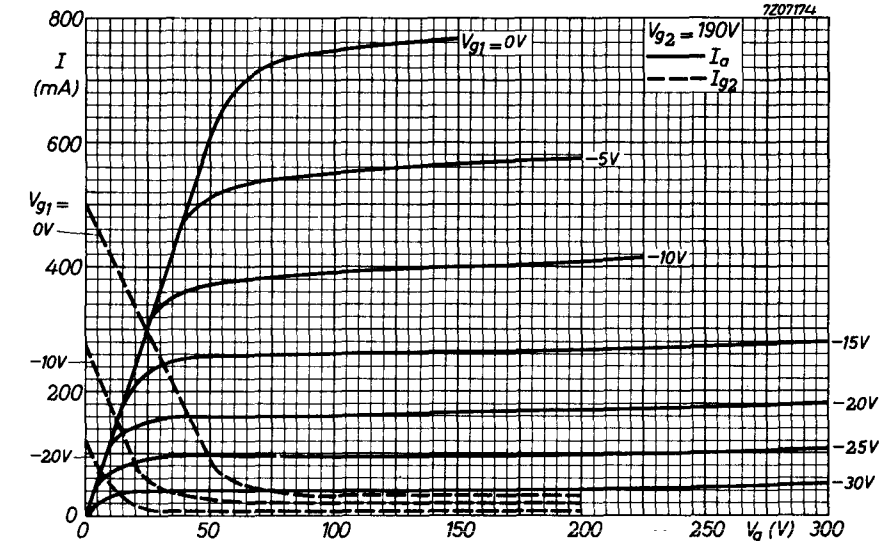
2) These limits for W_a and W_{g_2} should not be exceeded with a nominal tube operating in a normal line deflection circuit under the worst probable conditions.

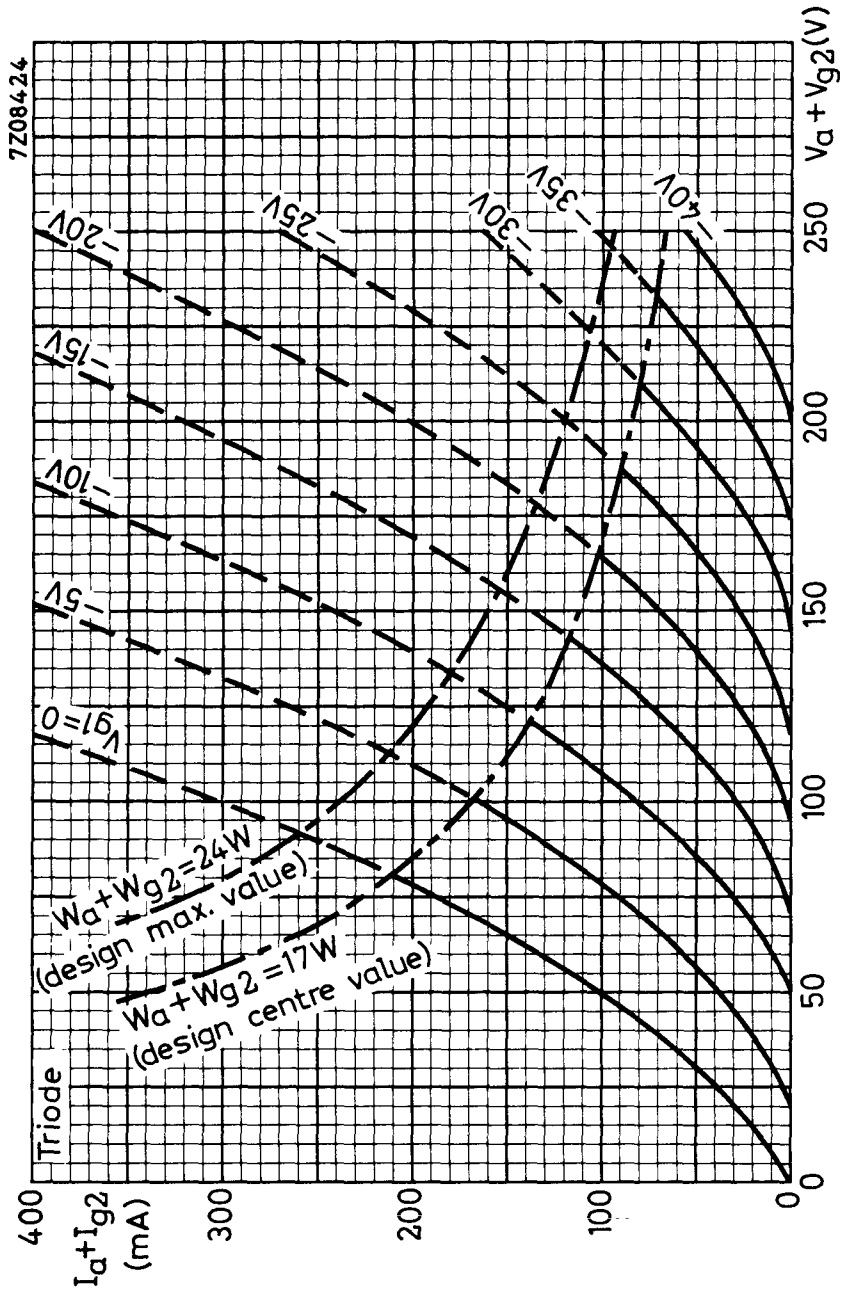



7Z07172
I
(mA)
600
400
200
0
V_{g2} = 130V
I_a
I_{g2}
V_{g1} = 0V
V_{g1} = −5V
−10V
−15V
−20V
−25V
V_{g1} = 0V
−5V
−10V
0
50
100
150
200
V_a (V)
250


7Z07175
I
(mA)
600
400
200
0
V_{g2} = 150V
I_a
I_{g2}
V_{g1} = 0V
V_{g1} = −5V
−10V
−15V
−20V
−25V
V_{g1} = 0V
−10V
−20V
0
50
100
150
200
V_a (V)
250


7Z07173
800
I
(mA)
600
400
200
0
V_{g2} = 170V
I_a
I_{g2}
V_{g1} = 0V
−5V
−10V
−15V
−20V
−25V
−30V
V_{g1} = 0V
−10V
−20V
0
50
100
150
200
250
V_a (V)
300


7Z07174
800
I
(mA)
600
400
200
0
V_{g2} = 190V
I_a
I_{g2}
V_{g1} = 0V
−5V
−10V
−15V
−20V
−25V
−30V
V_{g1} = 0V
−10V
−20V
0
50
100
150
200
250
V_a (V)
300


7Z08424
Va + Vg2 (V)
0
50
100
150
200
250
Ia + Ig2 (mA)
400
300
200
100
0
Triode
Vg1=0
-5V
-10V
-15V
-20V
-25V
-30V
-35V
-40V
Wa+Wg2=24W
(design max. value)
Wa+Wg2=17W
(design centre value)

PHILIPS

Data handbook

Electronic components and materials

PL504

page	sheet	date
1	1	1970.09
2	2	1970.09
3	3	1970.09
4	4	1970.09
5	5	1970.09
6	6	1970.09
7	7	1970.09
8	FP	1999.03.19

LINE OUTPUT PENTODE

Output pentode intended for colour TV line deflection circuits.

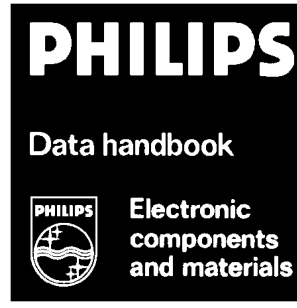
QUICK REFERENCE DATA				
Anode peak voltage	V_{a_p}		7000	V
Cathode current	I_k	max.	500	mA
Anode dissipation	W_a	max.	25	W

LIMITING VALUES (Design centre rating system)

Anode dissipation	W_a	max.	25	W
Anode + grid No. 2 dissipation (triode connected)	$W_a+W_{g_2}$	max.	26	W
(Design max. rating system) [1])				
Anode dissipation	W_a	max.	34	W
Anode + grid No. 2 dissipation (triode connected)	$W_a+W_{g_2}$	max.	35	W

For further data and curves of this type please refer to type PL 509

[1]) The design maximum limits should not be exceeded with a nominal tube under the worst probable operating conditions at a normal picture width.



PL505

page	sheet	date
1	1	1969.01
2	FP	1999.03.19

FRAME OUTPUT PENTODE

Pentode intended for use as frame output amplifier in colour television receivers.

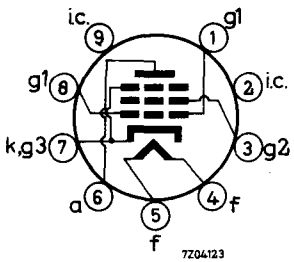
QUICK REFERENCE DATA				
Cathode current, average	I_k	max.	100	mA
Anode dissipation	W_a	max.	12	W

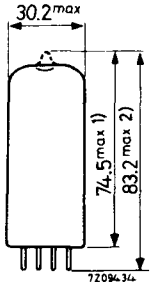
HEATING: Indirect by A.C. or D.C.; series supply

Heater current	I_f	300	mA
Heater voltage	V_f	17	V

DIMENSIONS AND CONNECTIONS Dimensions in mm

Base: Magnoval





CAPACITANCES

Anode to grid No. 1	C_{ag1}	max.	1.6	pF
Grid No. 1 to heater	C_{g1f}	max.	0.2	pF

1) Max. 71.4
2) Max. 80.1
for execution with pumping stem on base side.

TYPICAL CHARACTERISTICS

(Measured under pulse conditions)

Anode voltage	V_a		50	V_a	190	V
Grid No.2 voltage	V_{g_2}		190	V_{g_2}	190	V
Grid No.1 voltage	V_{g_1}		-1	V_{g_1}	-17	V
Anode current	I_{a_p}		320	I_a	60	mA
Grid No.2 current	I_{g_2}	approx.	60	I_{g_2}	5	mA
Transconductance				S	9	mA/V
Amplification factor				$\mu_{g_2g_1}$	8	-

Remarks.

The minimum I_a to be expected as a result of spread of the tube characteristics tube deterioration during life and decrease of the mains voltage to 10 % below the nominal value can be derived from the curves on page B by decreasing by 40 % the I_a values situated on the curve A-B at V_{g_2} occuring at the decreased mains voltage.

In order not to exceed the maximum permissible value of W_{g_2}, the circuit should be designed in such a way that the anode voltage should never be lower than the value determined by curve A-B at the relevant V_{g_2} value.

OPERATING CHARACTERISTICS (end of scan values)

Anode voltage	V_a	70	V
Grid No.2 voltage	V_{g_2}	200	V
Grid No.1 voltage	V_{g_1}	-5	V
Anode peak current	I_{a_p}	230	mA

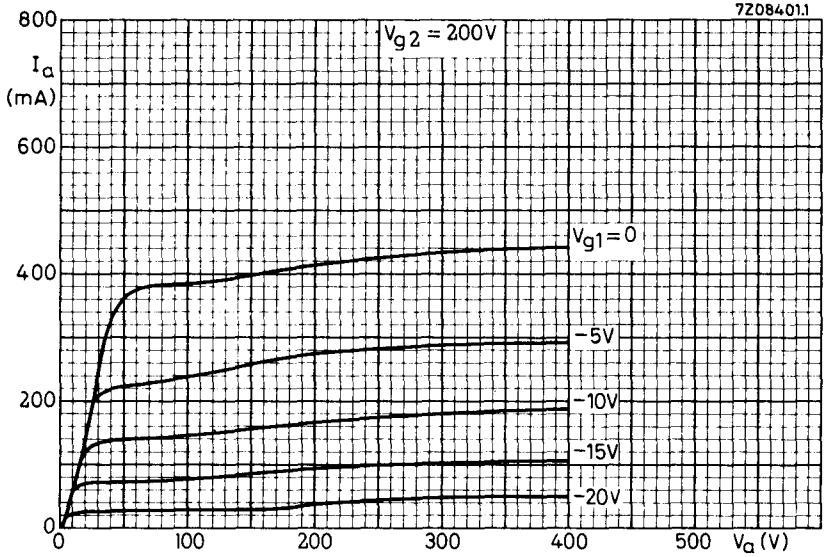
LIMITING VALUES (design centre rating system) unless otherwise stated

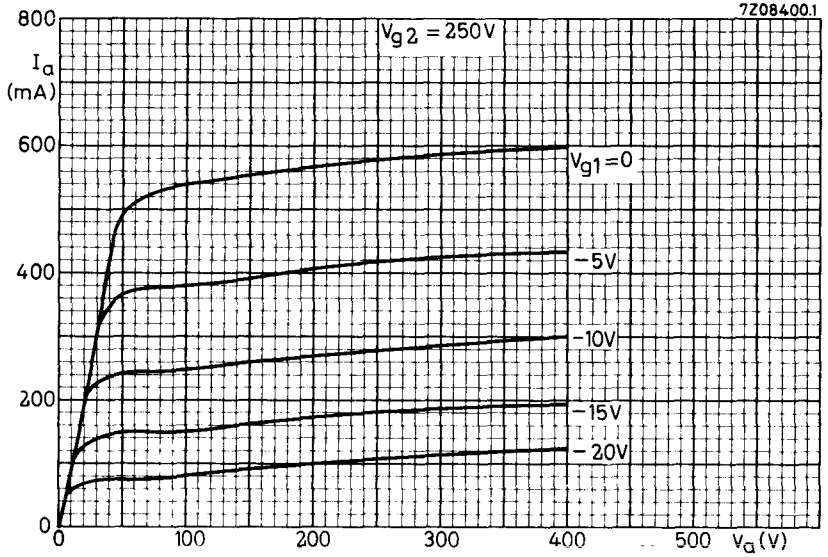
Anode voltage	V_{a_o}	max.	700	V	
	V_a	max.	400	V	
Anode peak voltage	V_{a_p}	max.	2.5	kV	1)
Grid No.2 voltage	V_{g2o}	max.	700	V	
	V_{g2}	max.	275	V	
Anode dissipation	W_a	max.	12	W	
Grid No.2 dissipation	W_{g2}	max.	3	W	
design max.	W_{g2}	max.	4	W	
Cathode current	I_k	max.	100	mA	
Grid No.1 resistor, fixed bias	R_{g_1}	max.	1	MΩ	
automatic bias	R_{g_1}	max.	2.2	MΩ	
Cathode to heater voltage	V_{kf}	max.	220	V	

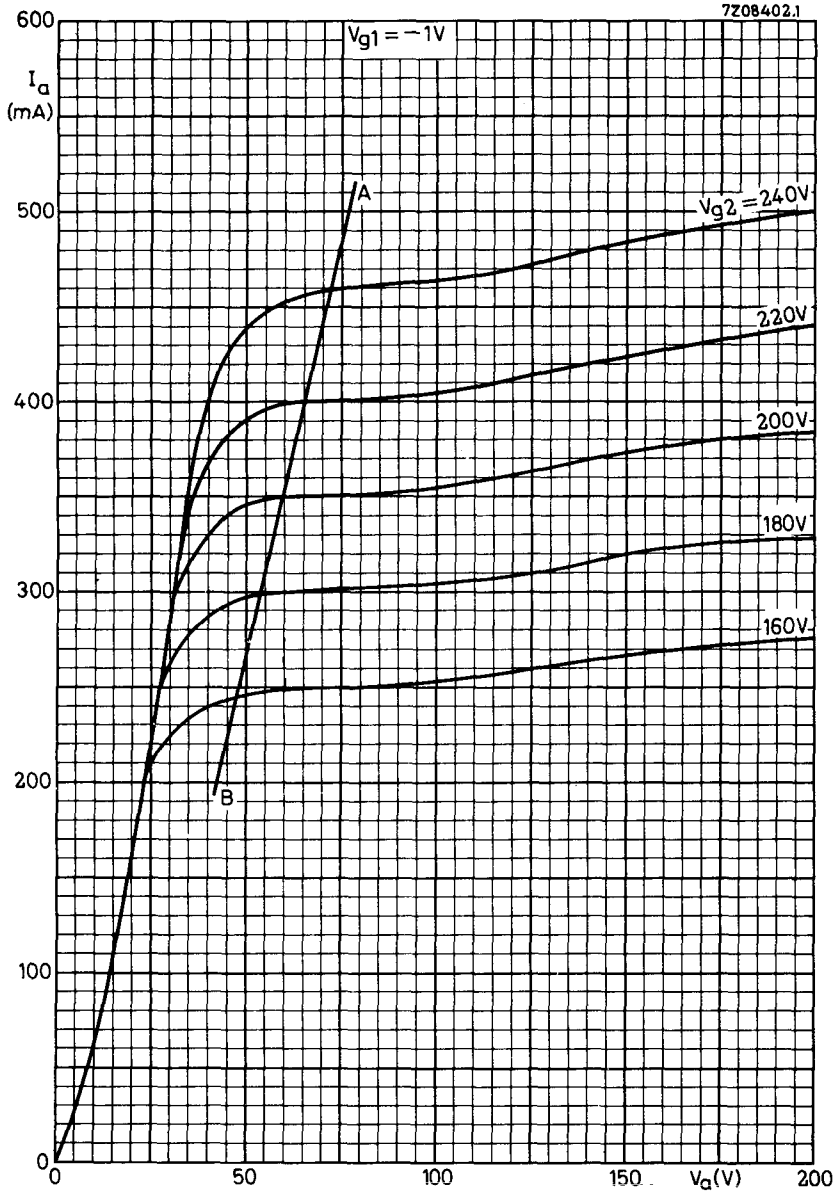
MICROPHONY

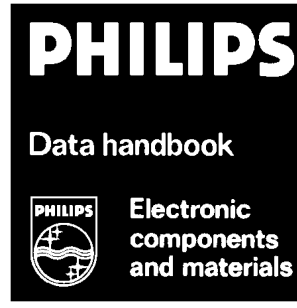
The maximum peak accelaration to which the tube may be subjected under the most unfavourable conditions is 1.5 g at frequencies < 600 Hz. and 0.2 g at frequencies > 600 Hz. The equivalent interferance voltage at grid No.1 will than be < 25 mV.

1) Max. pulse duration 5% of a cycle and max. 1 ms.


7Z08401.1
800
I_a
(mA)
600
400
200
0
V_{g2} = 200V
V_{g1} = 0
−5V
−10V
−15V
−20V
0
100
200
300
400
500
V_a (V)


7Z08400.1
800
I_a
(mA)
600
400
200
0
V_{g2} = 250V
V_{g1} = 0
−5V
−10V
−15V
−20V
0
100
200
300
400
500
V_a (V)


7Z08402.1
$V_{g1} = -1V$
I_a (mA)
600
500
400
300
200
100
0
A
B
$V_{g2} = 240V$
220V
200V
180V
160V
0
50
100
150
V_a(V)
200



PL508

page	sheet	date
1	1	1969.01
2	2	1969.01
3	3	1969.01
4	4	1969.01
5	5	1969.01
6	FP	1999.06.06

LINE OUTPUT PENTODE

Output pentode intended for colour TV line deflection circuits.

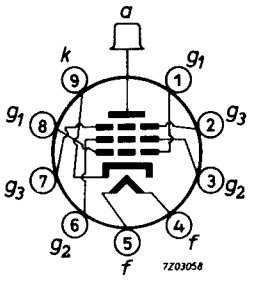
QUICK REFERENCE DATA				
Anode peak voltage	V_{a_p}		7000	V
Cathode current	I_k	max.	500	mA
Anode dissipation	W_a	max.	30	W

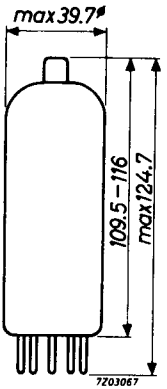
HEATING: Indirect by A.C. or D.C.; series supply

Heater current	I_f	300	mA
Heater voltage	V_f	40	V

DIMENSIONS AND CONNECTIONS Dimensions in mm

Base: Magnoval
Top cap: Type 1
Mounting: Additional supporting of the tube at the top is required.





CAPACITANCES

Grid No.1 to filament	C_{g_1f}	max.	0.2	pF
Anode to grid No.1	C_{ag_1}	max.	3.0	pF
	C_{ag_1}		2.5	pF

TYPICAL CHARACTERISTICS (measured under pulse conditions)

Anode voltage	V_a	160	50	V
Grid No.3 voltage	V_{g_3}	0	0	V
Grid No.2 voltage	V_{g_2}	160	175	V
Grid No.1 voltage	V_{g_1}	0	−10	V
Anode current	I_a	1400	800	mA
Grid No.2 current	I_{g_2}	45	70	mA

OPERATING CONDITIONS (D.C. feedback)

Cut-off voltage

The minimum required cut-off voltage ($-V_{g_1}$) during flyback at V_a = 7000 V and at line frequency is at:

V_{g_2} = 150 V : V_{g_1} = −175 V
V_{g_2} = 200 V : V_{g_1} = −195 V
V_{g_2} = 250 V : V_{g_1} = −215 V

Supply voltages: See pages 4-5-6

Minimum required anode voltage: $V_{a\ min}$

In order to prevent Barkhausen interference and loss of stabilization, care should be taken that the anode voltage never drops below the specified $V_{a\ min}$ during the scanning period.
If low values of $V_{a\ min}$ are required, the $V_{a\ min}$ 1-line can be shifted over 10 V to $V_{a\ min}$ 2, provided a D.C. voltage of at least +20 V is applied to the beamplate (g3).
To compensate for the influence of mains voltage variations, the specified values of $V_{a\ min}$ have to be increased with 10% of the anode supply voltage.

Minimum required values of the screen grid voltage: $V_{g2\ min}$

The graph refers to nominal mains voltage. The specified values of I_{a_p} will be available throughout life of the tube at supply voltages 10% below nominal.

Maximum permissible screen grid series resistance: R_{g2} max. See pages 4-5-6

Decoupling-capacitors in the grid no 2 and/or grid no 3 circuit

In circuits where decoupling capacitors in the grid no 2 or the grid no 3 circuits are applied, incidental flashover in the tube may give rise to excessive dischargecurrents and component or tube failure.
Therefore it is recommended to limit the dischargecurrents to these capacitors by means of an 100 Ohm resistance between g2 and the g2-bypass capacitance.
The 1000 Ohms resistance should be protected by a spark-gap connected between g^3 and earth.

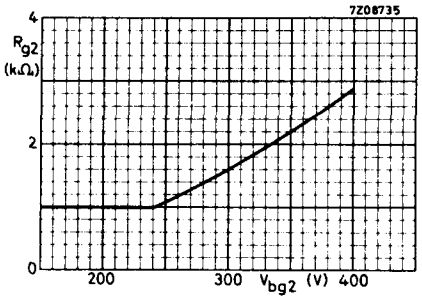
Hum

At Z_{g_1} = 200 k (f = 50 Hz), $V_{k/f}$ = 220 V_{RMS} and without wiring and socket capacitance, the equivalent grid hum voltage is less than 5 mV.

LIMITING VALUES

Design centre rating system					
Anode voltage in cold condition	V_{ao}	max.	700	V	
Anode peak voltage	V_{ap}	max.	7000	V	1)
Anode dissipation	W_a	max.	30	W	
Anode + grid No.2 dissipation (triode-connected)	$W_a + W_{g_2}$	max.	31	W	
Grid No.3 voltage	V_{g_3}	max.	50	V	
Grid No.2 voltage in cold condition	$V_{g_{2o}}$	max.	700	V	
Grid No.2 voltage	V_{g_2}	max.	275	V	
Grid No.2 dissipation	W_{g_2}	max.	7	W	2)
Cathode current	I_k	max.	500	mA	
Cathode peak current	I_{k_p}	max.	1200	mA	
Cathode-to-heater voltage	V_{kf}	max.	250	V	
Grid No.1 resistor: fixed bias	R_{g_1}	max.	0.5	MΩ	3)
stabilized circuits	R_{g_1}	max.	2.2	MΩ	3)
Grid No.3 circuit resistance	R_{g_3}	max.	10	kΩ	4)
Bulb temperature	t_{bulb}	max.	300	°C	5)
Design max. rating system 6)					
Anode dissipation	W_a	max.	40	W	
Anode + grid No.2 dissipation (triode connected)	$W_a + W_{g_2}$	max.	42	W	
Grid No.2 dissipation	W_{g_2}	max.	9	W	
Anode peak voltage	V_{ap}	max.	8000	V	1)
Neg. grid No.1 peak voltage	$-V_{g_1p}$	max.	550	V	1)

1. Max. pulse duration is 22% of a cycle and max. 18 μs.
2. To prevent an excessive value of W_{g_2} the minimum R_{g_2} values are given in the graph below.



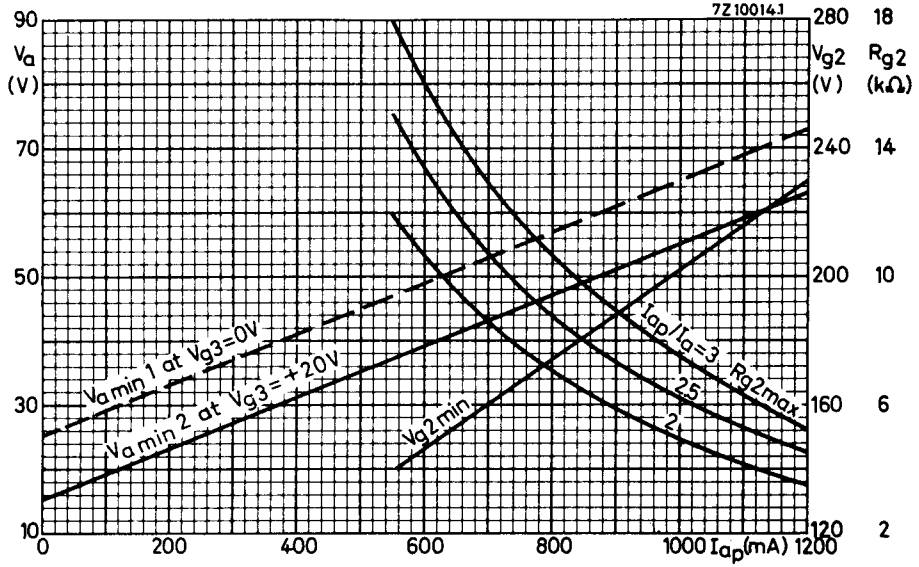
3. The circuit design has to be such that negative control grid currents up to 5 micro-amperes do not have any detrimental effect upon tube adjustment or circuit performance.
   Care should be taken that with 5 micro-amperes grid current the limiting values for I_k, W_a and W_{g_2} are not exceeded.
4. With $R_{g_3} \leq 10$ kΩ capacitive decoupling of g_3 is not required.
5. Absolute max. value.
6. The design maximum limits should not be exceeded with a nominal tube under the worst probable operating conditions at a normal picture width.

Min. required anode voltage.

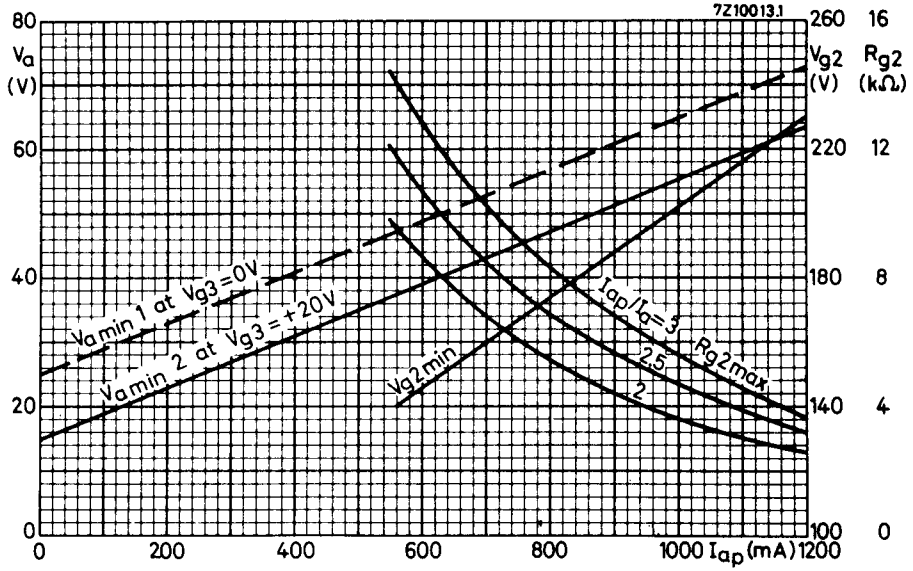
$R_{g_2\ max}$: max. permissible screen grid series resistance for 400 V screen grid supply.

The specified values of I_{a_p} are available at supply voltages 10% below nominal and throughout the tube life.

Remark: $R_{g_2\ min}$ for 400 V screen grid supply is 2.9 kΩ. (See page 3)



Min. required anode voltage.
$R_{g_2\,max}$: max. permissible screen grid series resistance for 350 V screen grid supply.
The specified values of I_{a_p} are available at supply voltages 10% below nominal and throughout the tube life.
Remark: $R_{g_2\,min}$ for 350 V screen grid supply is 2.2 kΩ. (See page 3)

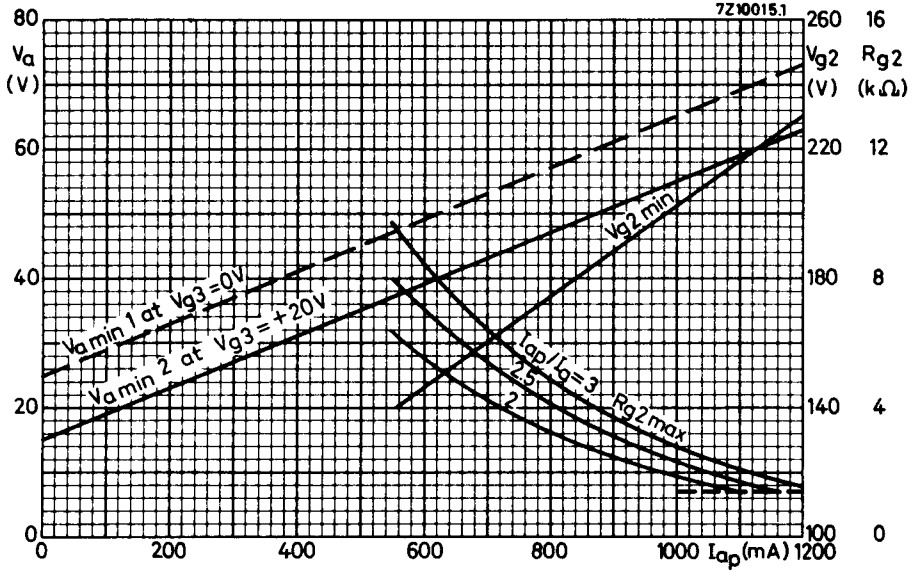


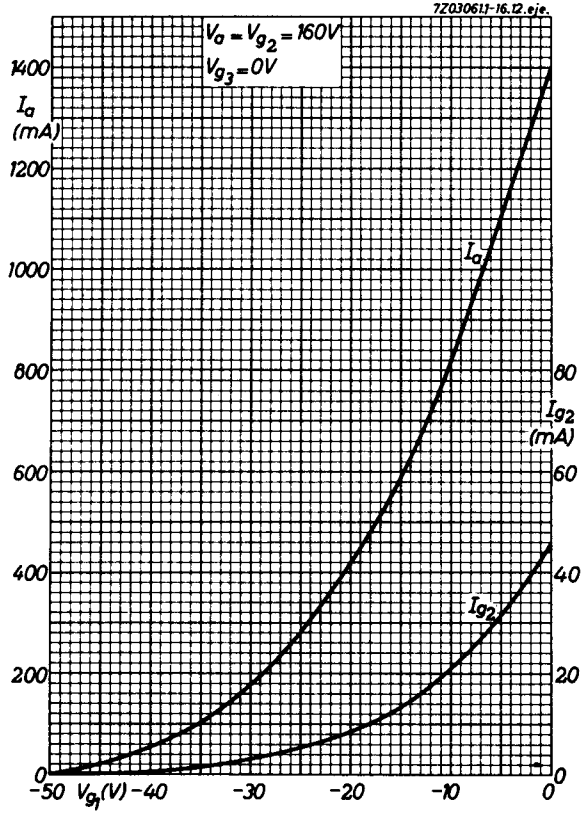
Min. required anode voltage.

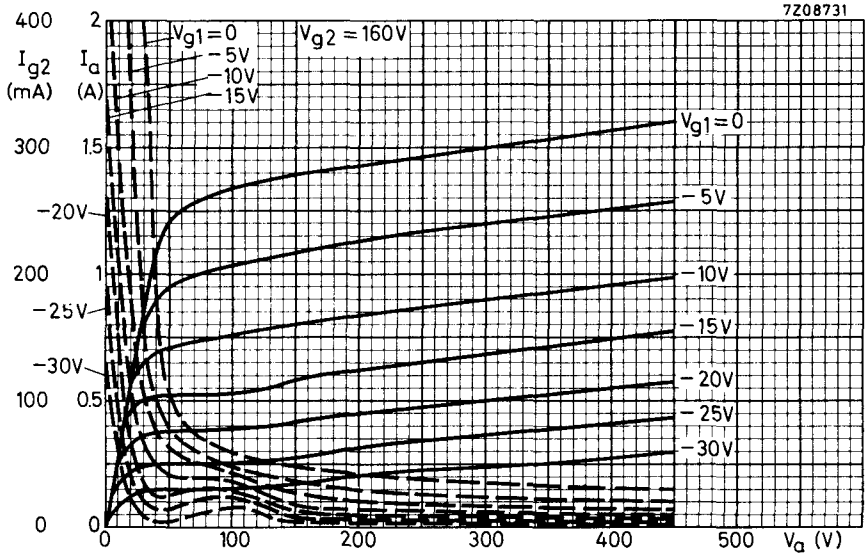
R_{g2} max.: max. permissible screen grid series resistance for 280 V screen grid supply.

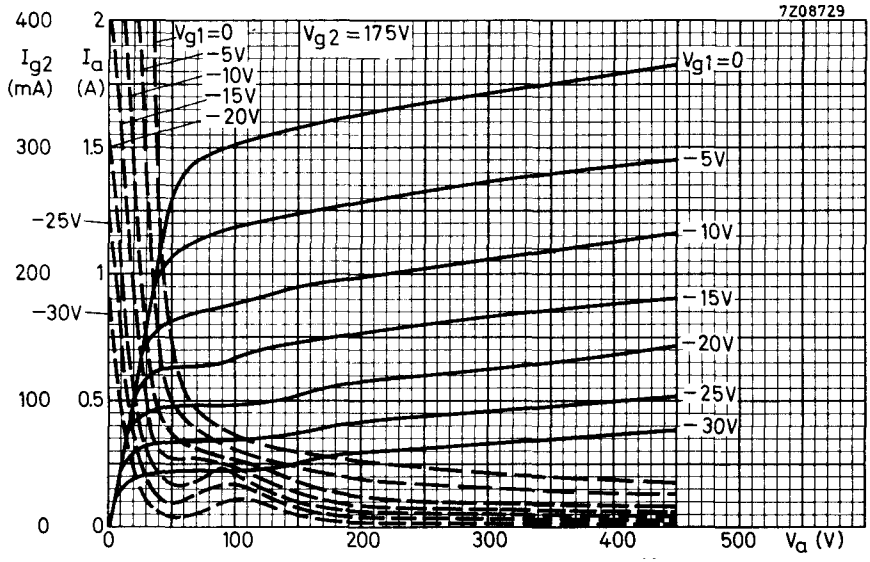
The specified values of I_{a_p} are available at supply voltages 10% below nominal and throughout the tube life.

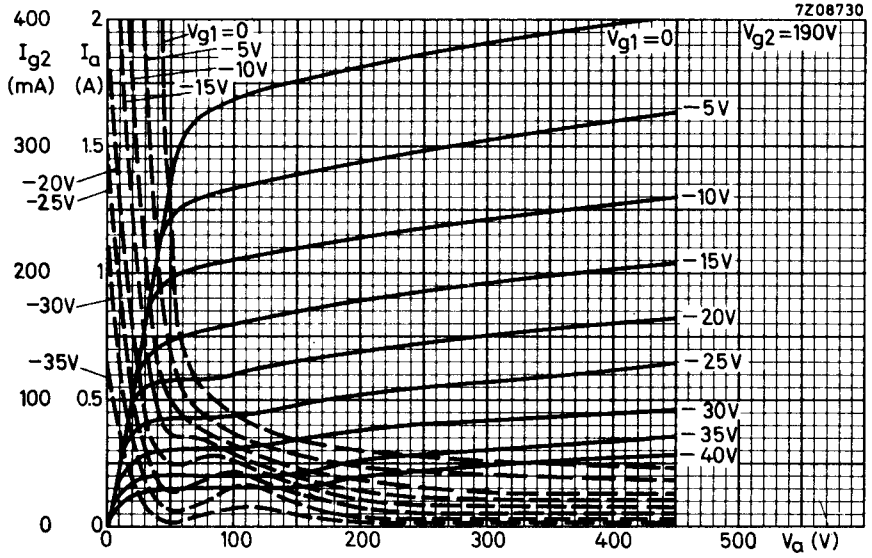
Remark: R_{g_2} min for 280 V screen grid supply is 1.4 kΩ. (See page 3)

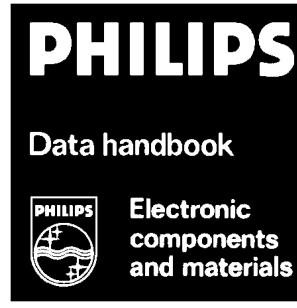



7Z03061J-16.12.ejc.
$V_a = V_{g_2} = 160V$
$V_{g_3} = 0V$
I_a (mA)
1400
1200
1000
800
600
400
200
0
I_a
I_{g_2} (mA)
80
60
40
20
0
I_{g_2}
-50 V_{g_1}(V) -40 -30 -20 -10 0


7Z08731
V_{g2} = 160V
V_{g1} = 0
−5V
−10V
−15V
−20V
−25V
−30V
I_{g2} (mA)
I_a (A)
V_a (V)
400
300
200
100
0
2
1.5
1
0.5
0
0
100
200
300
400
500


7Z08729
V_{g2} = 175V
V_{g1} = 0
−5V
−10V
−15V
−20V
−25V
−30V
I_{g2} (mA)
I_a (A)
V_a (V)
400
300
200
100
0
2
1.5
1
0.5
0
0
100
200
300
400
500


7Z08730
400
I_{g2} (mA)
2
I_a (A)
300
1.5
200
1
100
0.5
0
0
100
200
300
400
500
V_a (V)
$V_{g1}=0$
−5V
−10V
−15V
−20V
−25V
−30V
−35V
−40V
$V_{g2}=190V$



PL509

page	sheet	date
1	1	1969.11
2	2	1972.01
3	3	1969.11
4	4	1969.11
5	5	1969.11
6	6	1969.11
7	7	1969.11
8	8	1969.11
9	9	1969.11
10	FP	1999.03.20

LINE OUTPUT PENTODE

Output pentode intended for colour TV line deflection circuits.

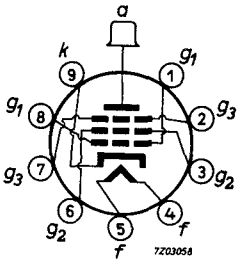
HEATING: Indirect by A.C. or D.C.; series supply

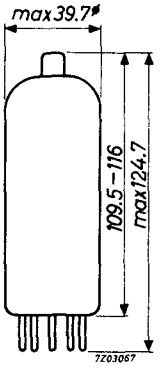
Heater current	I_f	300	mA
Heater voltage	V_f	40	V

DIMENSIONS AND CONNECTIONS

Base: Magnoval
Top cap: Type 1
Mounting: Additional supporting of the tube at the top is required.

Dimensions in mm





CAPACITANCES

Grid No. 1 to filament	C_{g1f}	max.	0.2	pF
Anode to grid No. 1	C_{ag1}	max.	3.0	pF
	C_{ag1}		2.5	pF

TYPICAL CHARACTERISTICS (measured under pulse conditions)

Anode voltage	V_a	160	50	70	V
Grid No. 3 voltage	V_{g3}	0	0	0	V
Grid No. 2 voltage	V_{g2}	160	175	205	V
Grid No. 1 voltage	V_{g1}	0	−10	−11	V
Anode current	I_a	1400	800	1100	mA
Grid No. 2 current	I_{g2}	45	70	85	mA

OPERATING CONDITIONS (D.C. feedback)

Cut-off voltage

The minimum required cut-off voltage ($-V_{g1}$) during flyback at V_a = 7000 V and at line frequency is at:

V_{g2} = 150 V : V_{g1} = −175 V
V_{g2} = 200 V : V_{g1} = −195 V
V_{g2} = 250 V : V_{g1} = −215 V

Minimum required anode voltage during the scanning period: V_a min. See page 6

Minimum required screen grid voltage: V_{g2} min. See page 4, 5

Recommended screen grid series resistor: R_{g2} rec See page 4, 5

Decoupling capacitors in the grid no.2 and/or grid no.3 circuit

In circuits where decoupling capacitors in the grid no.2 or the grid no.3 circuits are applied, incidental flashover in the tube may give rise to excessive discharge currents and component or tube failure.
Therefore it is recommended to limit the discharge currents from these capacitors by means of a 100 Ω resistor between g_2 and the g_2-bypass capacitor and a 1000 Ω resistor between g_3 and the g_3-bypass capacitor. The 1000 Ω resistor should be protected by a spark-gap connected between g_3 and earth.

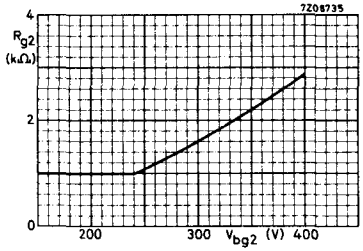
Hum

At Z_{g1} = 200 kΩ (f = 50 Hz), $V_{kf\,RMS}$ = 220 V and without wiring and socket capacitance, the equivalent grid hum voltage is less than 5 mV.

LIMITING VALUES

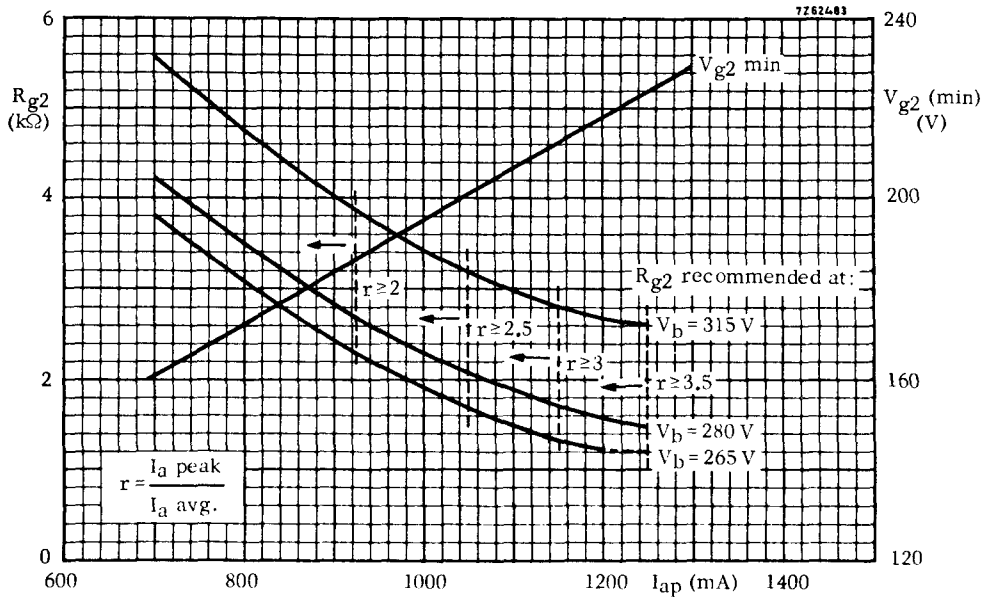
		Design centre rating system			
Anode voltage in cold condition	V_{ao}	max.	700	V	
Anode peak voltage	V_{ap}	max.	7000	V	
Anode dissipation	W_a	max.	35	W	
Grid No. 3 voltage	V_{g3}	max.	30	V	
Grid No. 2 voltage in cold condition	V_{g2o}	max.	700	V	
Grid No. 2 voltage	V_{g2}	max.	275	V	
Grid No. 2 dissipation	W_{g2}	max.	7	W	2)
Cathode current	I_k	max.	500	mA	
Cathode peak current	I_{kp}	max.	1500	mA	
Cathode-to-heater voltage	V_{kf}	max.	250	V	
Grid No. 1 resistor: fixed bias	R_{g1}	max.	0.5	MΩ	3)
stabilized circuits	R_{g1}	max.	2.2	MΩ	3)
Grid No. 3 circuit resistance	R_{g3}	max.	10	kΩ	4)
Bulb temperature	t_{bulb}	max.	300	°C	5)
		Design max. rating system			6)
Anode dissipation	W_a	max.	45	W	
Grid No. 2 dissipation	W_{g2}	max.	9	W	
Anode peak voltage	V_{ap}	max.	8000	V	1)
Neg. grid No. 1 peak voltage	$-V_{g1p}$	max.	550	V	1)

1. Max. pulse duration is 22% of a cycle and max. 18 μs.
2. To prevent an excessive value of W_{g2} the minimum R_{g2} values are given in the graph below.

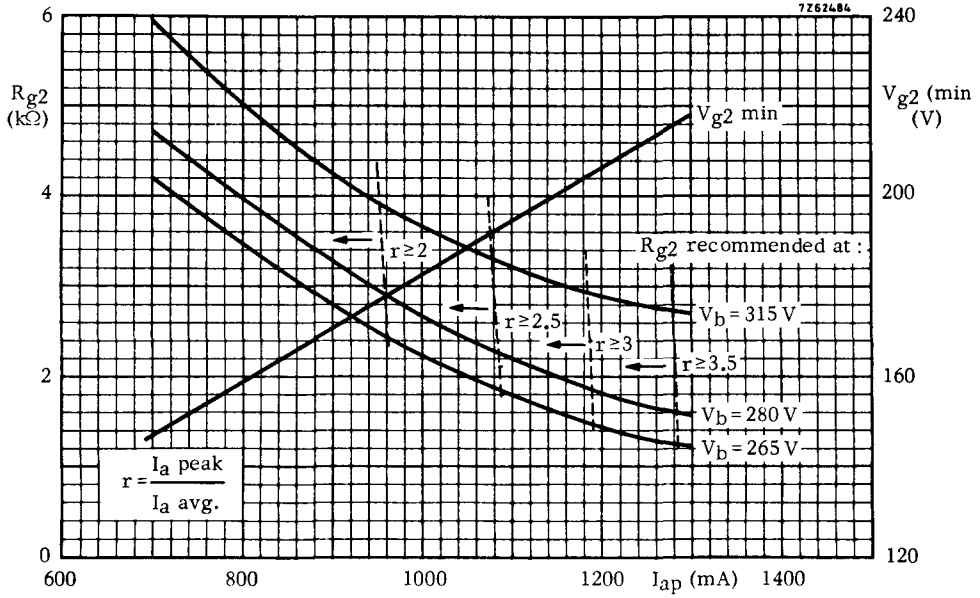


3. The circuit design has to be such that negative control grid currents up to 5 micro-amperes do not have any detrimental effect upon tube adjustment or circuit performance.
   Care should be taken that with 5 micro-amperes grid current the limiting values for I_k, W_a and W_{g2} are not exceeded.
4. With $R_{g3} \leq 10$ KΩ capacitive decoupling of g_3 is not required.
5. Absolute max. value.
6. The design maximum limits should not be exceeded with a nominal tube under the worst probable operating conditions at a normal picture width.

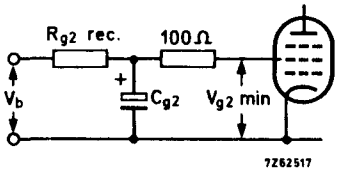
Min. required V_{g_2} and recommended R_{g_2}
Non-stabilized supply voltages.



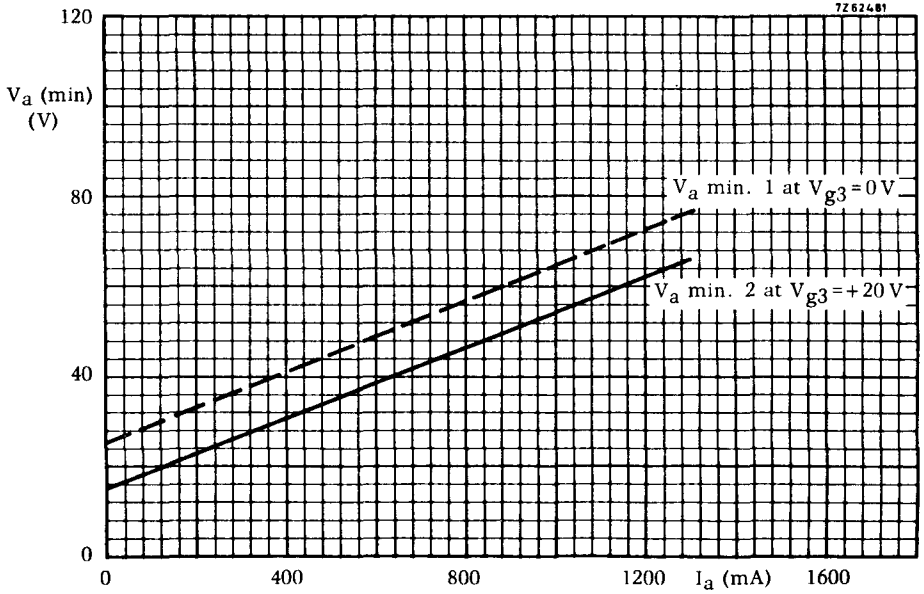
Min. required V_{g_2} and recommended R_{g_2}
Stabilized supply voltage.



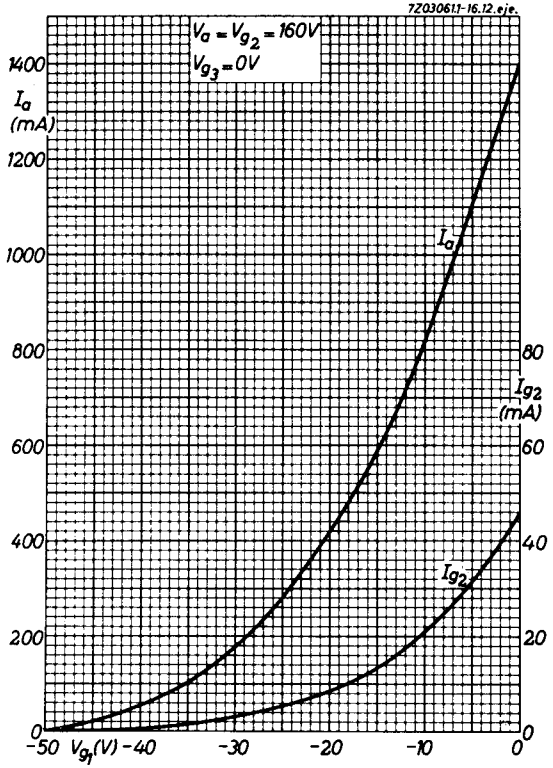
The above graphs concern the design of a line-output circuit adjusted at a beam current of 1000 μA and a nominal mains voltage.
If the recommended R_{g_2} is used, V_{g_2} will be equal to higher or than the specified V_{g_2} min. and there will be adequate reserve in anode peak current throughout the life of the tube. (Tolerances of deflection-components and 10 % mains voltage fluctuations taken into account).

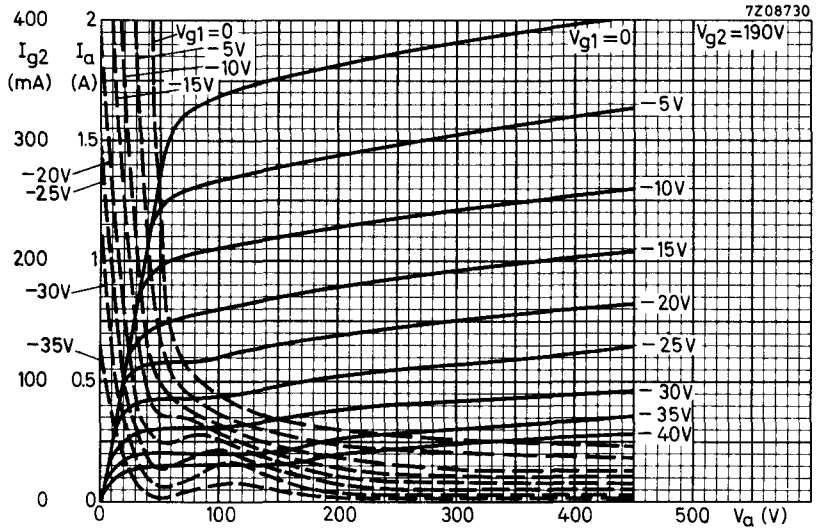


Min. required anode voltage, during the scanning period.



To suppress Barkhausen interference and to ensure stability, the anode load line should not be allowed to drop below the V_a line shown in the diagram. If V_a min. must be low, the V_a min. 1-line can be shifted over 10 V to $V_a$min. 2, provided a D.C. voltage of at least +20 V is applied to the beam plate (g_3). To compensate for the influence of mains voltage fluctuations, the specified values of V_a min. must be increased with 10 % of the anode supply voltage when not stabilized.


7Z03061.1-16.12.ejc.
$V_a = V_{g_2} = 160V$
$V_{g_3} = 0V$
I_a (mA)
1400
1200
1000
800
600
400
200
0
I_a
I_{g_2} (mA)
80
60
40
20
0
I_{g_2}
-50 V_{g_1}(V) -40
-30
-20
-10
0


7Z08730
400
I_{g2} (mA)
2
I_a (A)
300
1.5
200
1
100
0.5
0
0
100
200
300
400
500
V_a (V)
$V_{g1}=0$
−5V
−10V
−15V
−20V
−25V
−30V
−35V
−40V
$V_{g2}=190V$

PHILIPS

Data handbook

Electronic components and materials

PL519

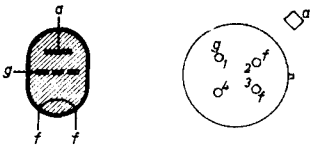
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9	FP	1999.02.24

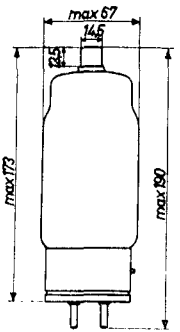
THYRATRON, xenon-filled triode
THYRATRON, triode à remplissage de xenon
STROMTORRÖHRE, Triode mit Xenonfüllung

Application: motor control, ignitron firing service
Application: réglage de moteurs, circuits d'amorcage des ignitrons
Anwendung : Regelung von Motoren, Zündung von Ignitrons

Heating	: direct	V_f	= 2,5 V ± 5%
Chauffage	: direct	I_f	= 12 A
Heizung	: direkt	T_w	= min. 60 s

Dimensions in mm
Dimensions en mm
Abmessungen in mm





Base : Super Jumbo with bayonet
Culot : Super Jumbo à baïonnette
Sockel: Super Jumbo mit Bayonette

Socket, support, Fassung: 40403/00

Cap, capot, Haube : 40619

Mounting position: Arbitrary between horizontal and vertical with base down
Montage : Arbitrairement entre horizontal et vertical avec culot en bas
Einbau : Willkürlich zwischen waagerecht und senkrecht mit Sockel unten

Net weight		Shipping weight	
Poids net	300 g	Poids brut	1350 g
Nettogewicht		Bruttogewicht	

See also "Explanation of the technical data of thyratrons" in front of this section
Voir aussi "L'explication des caractéristiques techniques des thyratrons" en tête de ce chapitre
Siehe auch die "Erläuterung zu den technischen Daten der Stromtorröhren" am Anfang dieses Abschnitts

Capacitances Capacités Kapazitäten	C_{ag}	=	0,8 pF
	C_{gk}	=	45 pF
Typical characteristics Caractéristiques types Kenndaten	Varc	=	12 V
	Tion	=	10 µs
	Tdion(V_g=-250V)	=	40 µs
	Tdion(V_g= -12V)	=	400 µs

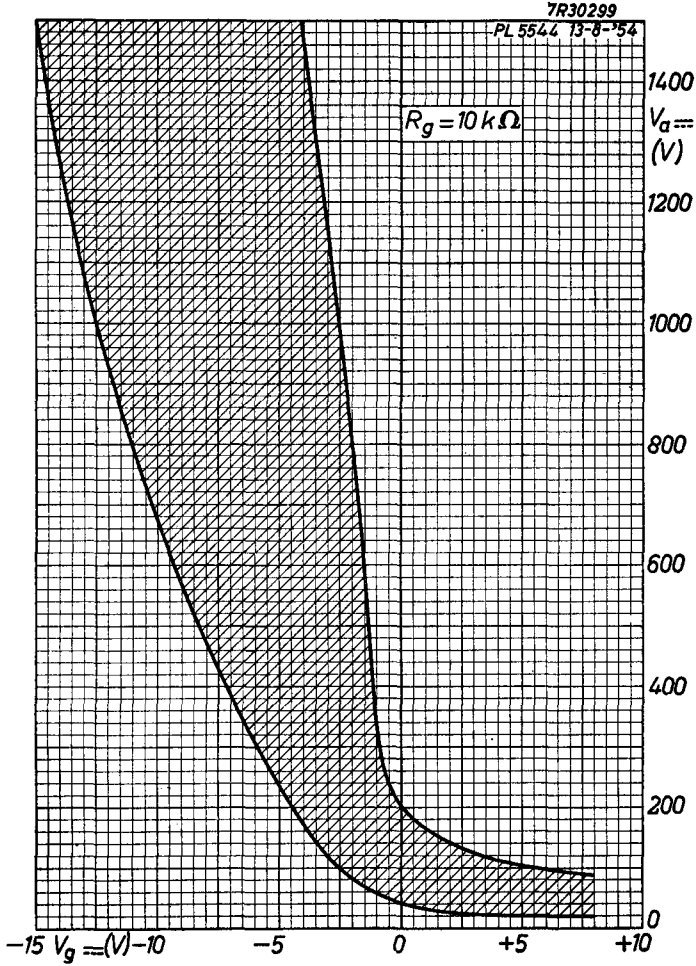
Limiting values (absolute limits)
Caractéristiques limites (limites absolues)
Grenzdaten (Absolute Grenzen)

Va_p	= max.	1500	V
$Va\ inv_p$	= max.	1500	V
$-V_g$	= max.	250	V
$-V_g$	= max.	10	V [1]
Ik_p	= max.	40	A
Ik (Tav=max.15 s)	= max.	3,2	A
Ig	= max.	0,2	A [2]
I_{surge}(T=max.0,1 s)	= max.	560	A
R_g	=	0,5-100	kΩ
R_g	=	10	kΩ [3]
t_{amb}	=	-55/+70	°C

[1]) Tube conductive
Tube conductif
Gezündete Röhre

[2]) Tav = max. 1 cycle
Tav = 1 cycle au max
Tav = max. 1 Periode

[3]) Recommended value
Valeur recommandée
Empfohlener Wert


7R30299
PL 5544 13-8-'54
$R_g = 10\,k\Omega$
1400
V_a ⎓
(V)
1200
1000
800
600
400
200
0
−15 V_g ⎓(V) −10
−5
0
+5
+10

PHILIPS

Electronic Tube

HANDBOOK

PL5544

page	sheet	date
1	1	1954.08.08
2	2	1954.08.08
3	A	1954.08.08
	FP	1999.04.03

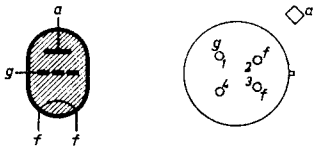
THYRATRON, xenon-filled triode
THYRATRON, triode à remplissage de xenon
STROMTORRÖHRE, Triode mit Xenonfüllung

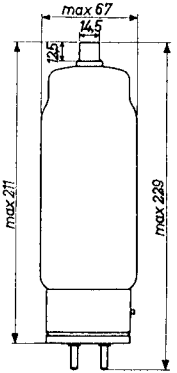
Application: motor control, ignitron firing service
Application: réglage de moteurs, circuits d'amorçage des ignitrons
Anwendung : Regelung von Motoren, Zündung von Ignitrons

Heating : direct
Chauffage : direct
Heizung : direkt

V_f = 2,5 V ± 5%
I_f = 21 A
T_w = min. 60 s

Dimensions in mm
Dimensions en mm
Abmessungen in mm





Base : Super Jumbo with bayonet
Culot : Super Jumbo à baïonnette
Sockel: Super Jumbo mit Bayonette

Socket, support, Fassung : 40403/00

Cap, capot, Haube : 40619

Mounting position: arbitrary between horizontal and vertical with base down
Montage : arbitrairement entre horizontal et vertical avec culot en bas
Einbau : Willkürlich zwischen waagerecht und senkrecht mit Sockel unten

Net weight, Poids brut, Nettogewicht 340 g

Shipping weight, Poids brut, Bruttogewicht 1350 g

See also "Explanation of the technical data of thyratrons" in front of this section
Voir aussi "L'explication des caractéristiques techniques des thyratrons" en tête de ce chapitre
Siehe auch die "Erläuterung zu den technischen Daten der Stromtorröhren" am Anfang dieses Abschnitts

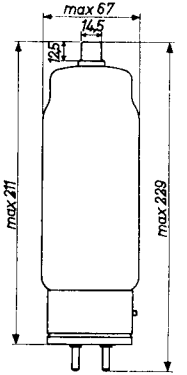
THYRATRON, xenon-filled triode
THYRATRON, triode à remplissage de xenon
STROMTORRÖHRE, Triode mit Xenonfüllung

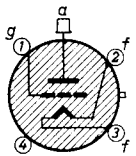
Application: motor control, ignitron firing service
Application: réglage de moteurs, circuits d'amorçage des ignitrons
Anwendung : Regelung von Motoren, Zündung von Ignitrons

Heating : direct
Chauffage : direct
Heizung : direkt

V_f = 2,5 V ± 5%
I_f = 21 A
T_w = min. 60 s

Dimensions in mm
Dimensions en mm
Abmessungen in mm





Base : Super Jumbo with bayonet
Culot : Super Jumbo à baïonnette
Sockel: Super Jumbo mit Bayonette

Socket, support, Fassung :

Cap, capot, Haube : 40619

Mounting position: arbitrary between horizontal and vertical with base down
Montage : arbitrairement entre horizontal et vertical avec culot en bas
Einbau : Willkürlich zwischen waagerecht und senkrecht mit Sockel unten

Net weight, Poids brut, Nettogewicht 340 g

Shipping weight, Poids brut, Bruttogewicht 1350 g

See also "Explanation of the technical data of thyratrons" in front of this section
Voir aussi "L'explication des caractéristiques techniques des thyratrons" en tête de ce chapitre
Siehe auch die "Erläuterung zu den technischen Daten der Stromtorröhren" am Anfang dieses Abschnitts

Capacitances Capacités Kapazitäten	C_{ag}	=	0,8 pF
	C_{gk}	=	45 pF

Typical characteristics Caractéristiques types Kenndaten	V_{arc}	=	12 V
	T_{ion}	=	10 µs
	$T_{dion}(V_g=-250V)$	=	50 µs
	$T_{dion}(V_g= -12V)$	=	500 µs

Limiting values (absolute limits)
Caractéristiques limites (limites absolues)
Grenzdaten (Absolute Grenzen)

V_{a_p}	= max.	1500 V
$V_{a\ inv_p}$	= max.	1500 V
$-V_g$	= max.	250 V
$-V_g$	= max.	10 V [1]
I_{k_p}	= max.	80 A
I_k (T_{av}=max. 15 s)	= max.	6,4 A
I_g	= max.	0,2 A [2]
I_{surge}(T=max.0,1 s)	= max.	1120 A
R_g	=	0,5-100 kΩ
R_g	=	10 kΩ [3]
tamb	=	-55/+70 °C

[1] Tube conductive
Tube conductif
Gezündete Röhre

[2] T_{av} is max . 1 cycle
T_{av} est 1 cycle au max.
T_{av} ist max. 1 Periode

[3] Recommended value
Valeur recommandée
Empfohlener Wert

Capacitances Capacités Kapazitäten	C_{ag}	= 0,8 pF
	C_{gk}	= 45 pF

Typical characteristics Caractéristiques types Kenndaten	V_{arc}	= 12 V
	T_{ion}	= 10 µs
	$T_{dion}(V_g=-250V)$	= 50 µs
	$T_{dion}(V_g=-12V)$	= 500 µs

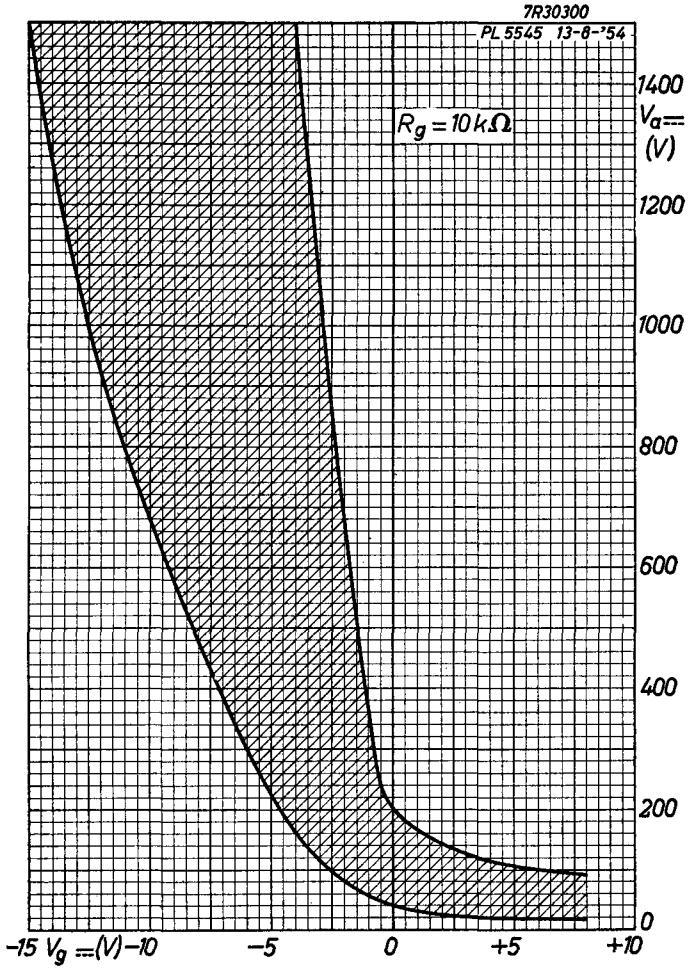
Limiting values (absolute limits)
Caractéristiques limites (limites absolues)
Grenzdaten (Absolute Grenzen)

V_{a_p}	= max. 1500 V
$V_{a\ inv_p}$	= max. 1500 V
$-V_g$	= max. 250 V
$-V_g$	= max. 10 V [1]
I_{k_p}	= max. 80 A
I_k (T_{av}=max. 15 s)	= max. 6,4 A
I_g	= max. 0,2 A [2]
I_{surge}(T=max.0,1 s)	= max. 1120 A
R_g	= 0,5-100 kΩ
R_g	= 10 kΩ [3]
t_{amb}	= -55/+70 °C

1) Tube conductive
Tube conductif
Gezündete Röhre

2) T_{av} is max . 1 cycle
T_{av} est 1 cycle au max.
T_{av} ist max. 1 Periode

3) Recommended value
Valeur recommandée
Empfohlener Wert


7R30300
PL 5545 13-8-'54
$R_g = 10\,k\Omega$
1400
V_a =
(V)
1200
1000
800
600
400
200
0
−15 V_g =(V) −10
−5
0
+5
+10

8.8.1954

A

PHILIPS

Electronic Tube

HANDBOOK

PL5545

page	sheet	date
1	1	1954.08.08
2	1	1959.09.09
3	2	1954.08.08
4	3	1959.09.09
5	A	1954.08.08
6	FP	1999.04.24

PHILIPS PL 5551

Water cooled IGNITRON
IGNITRON à refroidissement par l'eau
Wassergekühltes IGNITRON

Application: A.C. control: two tubes in inverse parallel connection will control 600 kVA at 250 - 600 V and 530 kVA at 220 V
Power rectification: for energy storage of resistance welders (intermittent service)

Application: Réglage C.A.: deux tubes en montage anti-parallèle peuvent régler 600 kVA à 250 - 600 V et 530 kVA à 220 V
Redressement de puissance: pour accumulation de puissance en soudure par résistance (service intermittent)

Anwendung : Wechselstromregelung: zwei Röhren in Anti-Parallelschaltung können bei 250 - 600 V 600 kVA und bei 220 V 530 kVA regulieren
Kraftstromgleichrichtung: für Energiespeicherung bei Widerstandsschweissung (aussetzender Betrieb)

Frequency range
Gamme de fréquences 25 - 60 c/s
Frequenzbereich

Mounting position: vertical, anode connection up
Montage : vertical, la connexion de l'anode en haut
Einbau : senkrecht, Anodenanschluss oben

Cooling
Refroidissement
Kühlung

$q^{1)}$		= min.	4 l/min
p_i	(q=4 l/min)	= max.	0,13 kg/cm^2
$t_o - t_i$	(q=4 l/min)	= max.	4 °C
t_i		= min.	10 °C
t_o		= max.	40 °C

Net weight
Poids net 1630 g
Nettogewicht

Shipping weight
Poids brut 5500 g
Bruttogewicht

1) At max. demand
A la demande d'énergie maximum
Bei maximalem Energiebedarf

Water cooled IGNITRON
IGNITRON à refroidissement par l'eau
Wassergekühltes IGNITRON

Application: A.C. control: two tubes in inverse parallel connection will control 600 kVA at 250 - 600 V and 530 kVA at 220 V
Power rectification: for energy storage of resistance welders (intermittent service)

Application: Réglage C.A.: deux tubes en montage anti-parallèle peuvent régler 600 kVA à 250 - 600 V et 530 kVA à 220 V
Redressement de puissance: pour accumulation de puissance en soudure par résistance (service intermittent)

Anwendung : Wechselstromregelung: zwei Röhren in Anti-Parallelschaltung können bei 250 - 600 V 600 kVA und bei 220 V 530 kVA regulieren
Kraftstromgleichrichtung: für Energiespeicherung bei Widerstandsschweissung (aussetzender Betrieb)

Frequency range
Gamme de fréquences 25 - 60 c/s
Frequenzbereich

Mounting position: vertical, anode connection up
Montage : vertical, la connexion de l'anode en haut
Einbau : senkrecht, Anodenanschluss oben

Cooling
Refroidissement
Kühlung

q [1])		= min.	4 l/min
p_i	(q=4 l/min)	= max.	0,13 kg/cm^2
$t_o - t_i$	(q=4 l/min)	= max.	4 °C
t_i		= min.	10 °C
t_o		= max.	40 °C

Net weight
Poids net
Nettogewicht 1630 g

Shipping weight
Poids brut
Bruttogewicht 5500 g

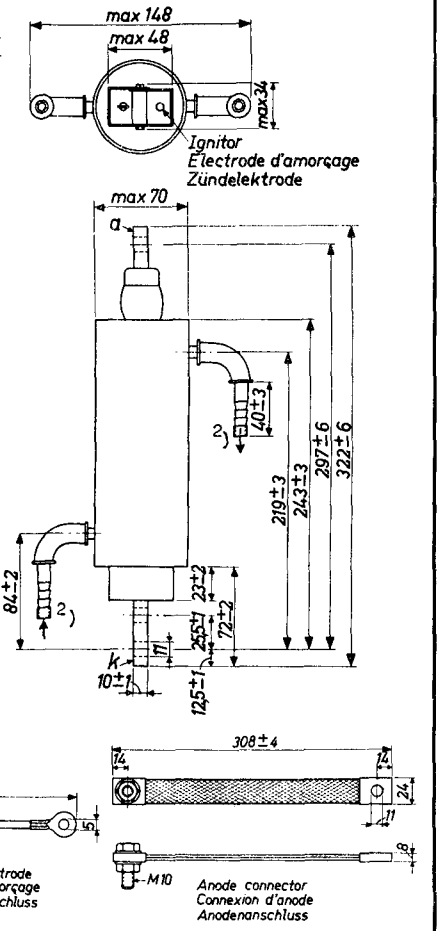
[1]) At max. demand
A la demande d'énergie maximum
Bei maximalem Energiebedarf

The PL5551 is equivalent to the PL5551A, but is not suitable for being equipped with a thermostatic control unit

Le tube PL5551 est équivalent au tube PL5551A, mais ne peut pas être équipé d'un dispositif à commande thermostatique

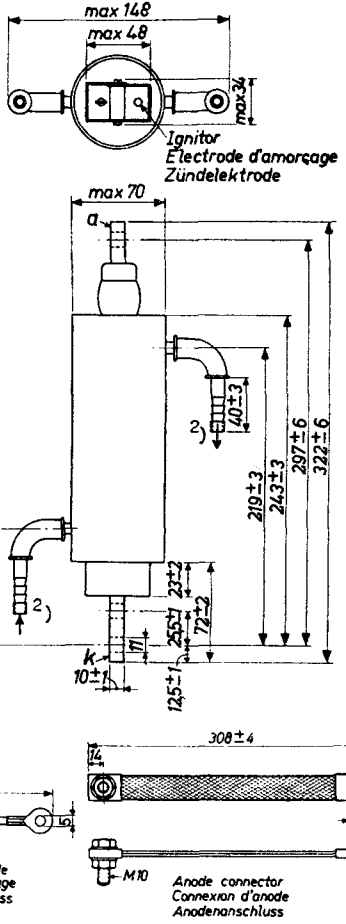
Die Röhre PL5551 stimmt mit der Röhre PL5551A überein, kann aber nicht mit einer thermostatischen Regelvorrichtung versehen werden

Dimensions in mm
Dimensions en mm
Abmessungen in mm



2) 1/8" pipe thread; 1/8" pas à gaz; 1/8" Gasrohrgewinde

Dimensions in mm
Dimensions en mm
Abmessungen in mm



2) 1/8" pipe thread; 1/8" pas à gaz; 1/8" Gasrohrgewinde

Limiting values (ABSOLUTE VALUES)
Caractéristiques limites (VALEURS ABSOLUES)
Grenzdaten (ABSOLUTWERTE)

A.C. control; Réglage C.A.; Wechselstromregelung

Two tubes in inverse parallel connection
Deux tubes en montage anti-parallèle
Zwei Röhren in Anti-Parallelschaltung

Voltage range Gamme de tension (V) Spannungsbereich	220		250		600[6]	
Demand Demande d'énergie[3]) (kVA) Energiebedarf	180	[7])530	200	[7])600	200	[7])600
I_a (max.) [3]) (A)	56	30,2	56	30,2	56	30,2
T_{av} (max.) (s)	18	18	[4])18	[4])18	[4])7,5	[4])7,5
Isurge (max.) [5]) (T = max.0,15s) (A)	6720	6720	6720	6720	2800	2800

Rectifying tube (intermittent service)
Tube redresseur (service intermittent)
Gleichrichterröhre (aussetzender Betrieb)

V_a fwd_p (V)	V_a inv_p (V)	I_{a_p} (A)	I_a (max) (A)	T_{av} (max) (s)	$\frac{I_a}{I_p}$ (max) (T_{av}=0,2s)	$\frac{I_{surge}}{I_{a_p}}$ (max)
1200	1200	600[7])	5	10	0,166	12,5
		135	22,5			
1500[6])	1500[6])	480[7])	4	10	0,166	12,5
		108	18			

[3])For other values of the demand the corresponding max. average anode current per tube I_a may be derived from the curve on page A
Pour autres valeurs de la demande d'énergie le courant moyen correspondant max. de l'anode par tube I_a peut être dérivé de la courbe sur page A
Für anderen Werte des Energiebedarfs ist der entsprechende maximalen Mittelwert des Anodenstromes pro Röhre I_a von der Kurve auf Seite A abzuleiten

[4])[5])[6])[7])See page 4; voir page 4; siehe Seite 4

Limiting values (ABSOLUTE VALUES)
Caractéristiques limites (VALEURS ABSOLUES)
Grenzdaten (ABSOLUTWERTE)

A.C. control; Reglage C.A.; Wechselstromsteuerung

Two tubes in inverse parallel connection
Deux tubes en montage anti-parallèle
Zwei Röhren in Anti-Parallelschaltung

Voltage range Gamme de tension Spannungsbereich	(V)	220		250		600 [4]	
Demand Demande d'énergie [3] Energiebedarf	(kVA)	180	530 [5]	200	600 [5]	200	600 [5]
I_a (max.) [3]	(A)	56	30,2	56	30,2	56	30,2
T_{av} (max.)	(s)	18	18	18 [6]	18 [6]	7,5 [6]	7,5 [6]
→ I_{surge} (max.) (T = max.0,15 s)	(A)	6720	6720	6720	6720	2800	2800

Rectifying tube (intermittent service)
Tube redresseur (service intermittent)
Gleichrichterröhre (aussetzender Betrieb)

V_a fwd$_p$ (V)	V_a inv$_p$ (V)	I_{a_p} (A)	I_a (max) (A)	T_{av} (max) (s)	$\frac{I_a}{I_p}$ (max) (T_{av}=0,2s)	$\frac{I_{surge}}{I_{a_p}}$ (max)
1200	1200	600 [5]	5	10	0,166	12,5
		135	22,5			
1500 [4]	1500 [4]	480 [5]	4	10	0,166	12,5
		108	18			

[3] For other values of the demand the corresponding max. average anode current per tube (I_a) may be derived from the curve on page A
Pour autres valeurs de la demande d'énergie, le courant moyen correspondant max. de l'anode par tube (I_a) peut être dérivé de la courbe sur page A
Für andere Werte des Energiebedarfs ist der entsprechende maximale Mittelwert des Anodenstromes pro Röhre (I_a) von der Kurve auf Seite A abzuleiten

[4] [5] [6] See page 4; voir page 4; siehe Seite 4

Ignitor; Electrode d'amorçage; Zündelektrode

Requirements for cathode excitation
Conditions pour l'excitation de la cathode
Bedingungen für Katodeerregung

V_{fwd_p}	= min. 200 V
I_p	= min. 30 A

Typical value of starting time at required min. voltage or current
Valeur type du temps d'amorçage à la tension ou au courant demandé minimum
Mittelwert der Zündungszeit bei der erforderlichen min. Spannung oder Strom — 100 µsec

Limiting values
Caractéristiques limites
Grenzdaten

V_{fwd_p}	= max. 900 V
V_{inv_p}	= max. 5 V
I_p	= max. 100 A
I_{rms}	= max. 10 A
I_{av} (T_{av}=max.5 sec)	= max. 1 A

Remark : The limiting values of the demand voltage, current and kVA are on the basis of full cycle conduction without phase delay, regardless of whether or not phase control is used

Observation: Les valeurs limites de la tension, du courant et de la demande d'énergie se basent sur une conduction pendant le cycle complet sans décalage, abstraction faite d'un contrôle de phase éventuel

Bemerkung : Die Grenzwerte der Spannung, des Stromes und des Energiebedarfs sind basiert auf einen Stromdurchgang ohne Phasendrehung während der ganzen Periode, abgesehen von einem eventuellen Phasenanschnitt

4) For intermediate values T_{av} is inversely proportional to the voltage
Pour des valeurs intermédiaires T_{av} est inversement proportionnel à la tension
Für zwischenliegenden Werte ist T_{av} umgekehrt proportional zu der Spannung

5) 280% of max. demand current (rms value)
280% de la demande de courant max. (valeur efficace)
280% des max. Strombedarfs (effektivwert)

6) Max. permissible value
Valeur admissible maximum
Max. zulässiger Wert

7) Max. value at the indicated voltage
Valeur max. à la tension indiquée
Max. Wert bei gegebener Spannung

Ignitor; Electrode d'amorçage; Zündelektrode

Requirements for cathode excitation
Conditions pour l'exitation de la cathode
Bedingungen für Katodeerregung

V_{fwd_p}	=	200 V
I_p	=	30 A

Typical value of starting time at required voltage or current
Valeur type du temps d'amorçage à la tension ou au courant demandé
Mittelwert der Zündungszeit bei der erforderlichen Spannung oder Strom: 100 µsec

Limiting values
Caractéristiques limites
Grenzdaten

V_{fwd_p}	= max.	900 V
V_{inv_p}	= max.	5 V
I_p	= max.	100 A
I_{rms}	= max.	10 A
I_{av} (T_{av} = max. 5 sec)	= max.	1 A

Remark: The limiting values of the demand voltage, current and kVA are on the basis of full cycle conduction without phase delay, regardless of whether or not phase control is used
Observation: Les valeurs limites de la tension, du courant et de la demande d'énergie se basent sur une conduction pendant le cycle complet sans décalage, abstraction faite d'un contrôle de phase éventuel
Bemerkung: Die Grenzwerte der Spannung, des Stromes und des Energiebedarfs sind basiert auf einen Stromdurchgang ohne Phasendrehung während der ganzen Periode, abgesehen von einem eventuellen Phasenanschnitt

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4) Max. permissible value
Valeur admissible maximum
Max. zulässiger Wert

5) Max. value at the indicated voltage
Valeur max. à la tension indiquée
Max. Wert bei gegebener Spannung

6) For intermediate values T_{av} is inversely proportional to the voltage
Pour des valeurs intermédiaires T_{av} est inversement proportionnel à la tension
Für zwischenliegenden Werte ist T_{av} umgekehrt proportional zu der Spannung

PHILIPS

PL 5551

Not for intermittent rectifier service
Ne pas pour service de redressement intermittent
Nicht für aussetzenden Gleichrichterbetrieb

7R30316 22-11-54

PL 5551

Two tubes connected in inverse parallel
Deux tubes en montage anti-parallèle
Zwei Röhren in Antiparallelschaltung

I_a (A) { each tube / par tube / je Röhre }

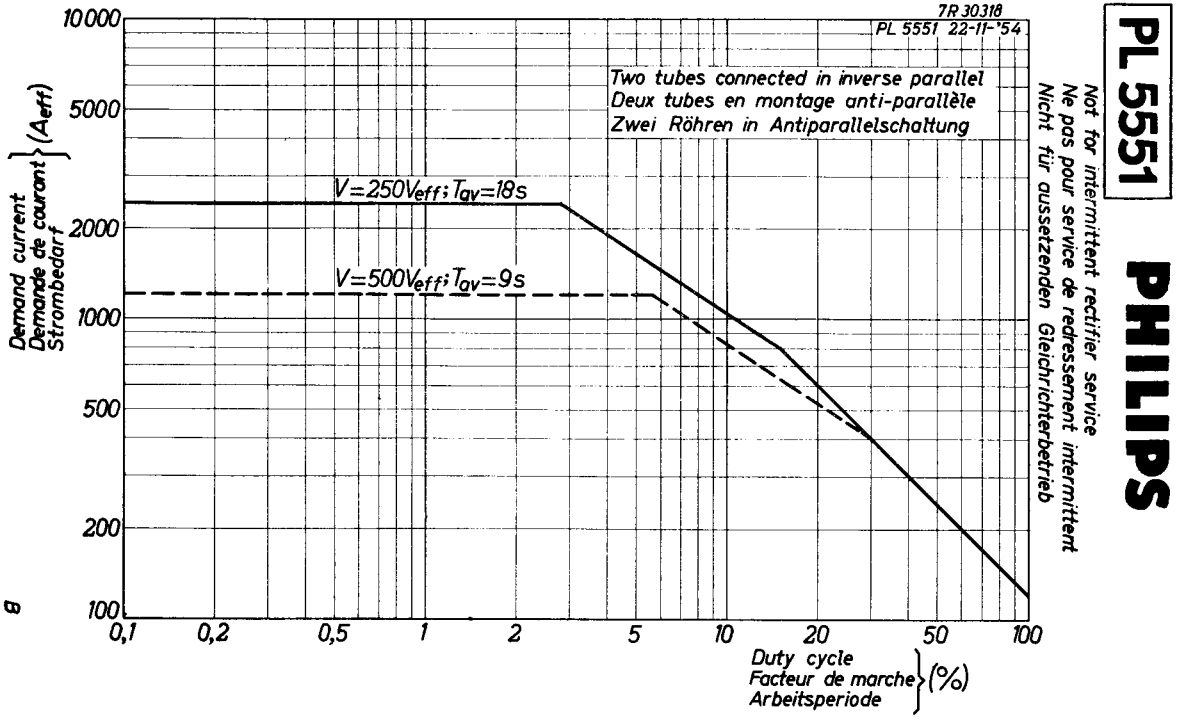
1 2 5 10 20 50 100 200 500 1000

Demand / Demande d'énergie / Energiebedarf } (kVA)

10 20 50 100 200 500 1000

12.12.1954

A



PL 5551

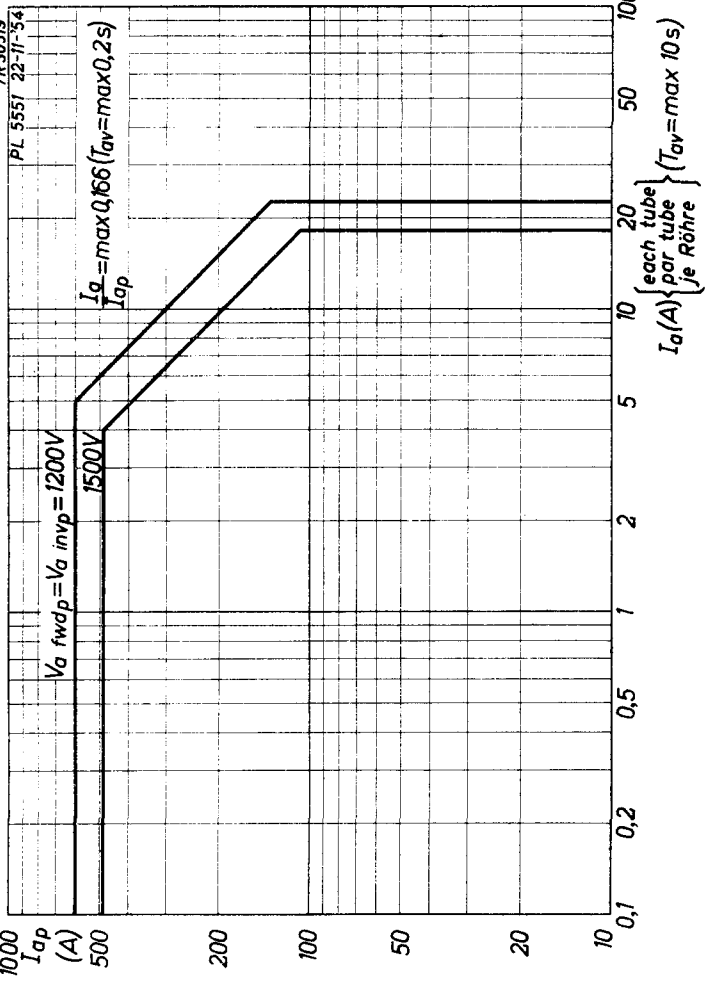
PHILIPS

Not for intermittent rectifier service
Ne pas pour service de redressement intermittent
Nicht für aussetzenden Gleichrichterbetrieb

PHILIPS

PL 5551

Intermittent rectifier service
Service de redressement intermittent
Aussetzender Gleichrichterbetrieb



12.12.1954

C



PL5551

page	sheet	date
1	1	1954.12.12
2	1	1956.04.04
3	1	1959.05.05
4	2	1954.12.12
5	2	1956.04.04
6	3	1954.12.12
7	3	1956.04.04
8	4	1954.12.12
9	4	1956.04.04
10	A	1954.12.12
11	B	1954.12.12
12	C	1954.12.12
13	FP	2000.05.28

Water cooled IGNITRON with provisions for mounting a thermostatic control unit
IGNITRON à refroidissement par eau avec possibilité de monter un dispositif à commande thermostatique
Wassergekühltes IGNITRON mit Anordnung zur Montierung einer thermostatischen Regelvorrichtung

Application: Single and three-phase welding control and similar control applications. Equipped with suitable thermostatic switches it has the advantage of diminishing the cooling-water consumption and of protecting the tube and associated equipment from overloads and overheating

Application: Réglage en soudage monophasé et triphasé et autres réglages simulaires. Fonctionnant avec des commutateurs thermostatiques appropriés, il présente l'avantage de diminuer la consommation d'eau de refroidissement et de protéger le tube et les appareils auxiliaires contre les surcharges et le surchauffage.

Anwendung : Regelung von Einphasen- und Dreiphasenschweissung und ähnliches. Ausgerüstet mit geeigneten thermostatischen Schaltern bietet es den Vorteil eines verminderten Kühlwasserbedarfs und erhöhten Schutzes der Röhre und der dazugehörigen Ausrüstung gegen Überlastung und Überhitzung

Frequency range
Gamme de fréquence 25 - 60 c/s
Frequenzbereich

Mounting position: vertical, anode connection up
Montage : vertical, la connexion de l'anode en haut
Einbau : senkrecht, Anodenanschluss oben

Cooling, Refroidissement, Kühlung

Typical characteristics
Caractéristiques types
Kenndaten

p_i (q = 4 l/min) = max. 0,13 kg/cm²

$t_o - t_i$ (q = 4 l/min) = max. 4 °C

Limiting values
Caractéristiques limites [1])
Grenzdaten

A. With thermostatic control
Avec réglage thermostatique
Mit thermostatischer Regelung

t_i = min. 10 °C q = min. 4 l/min [2])[3])

t_i = max. 40 °C t_o = max. 45 °C

[1])[2])[3])See page 2; voir page 2; siehe Seite 2

Water cooled IGNITRON with provisions for mounting a thermostatic control unit
IGNITRON à refroidissement par eau avec possibilité de monter un dispositif à commande thermostatique
Wassergekühltes IGNITRON mit Anordnung zur Montierung einer thermostatischen Regelvorrichtung

Application: Single and three-phase welding control and similar control applications. Equipped with suitable thermostatic switches it has the advantage of diminishing the cooling-water consumption and of protecting the tube and associated equipment from overloads and overheating

Application: Réglage en soudage monophasé et triphasé et autres réglages simulaires. Fonctionnant avec des commutateurs thermostatiques appropriés, il présente l'avantage de diminuer la consommation d'eau de refroidissement et de protéger le tube et les appareils auxiliaires contre les surcharges et le surchauffage.

Anwendung : Regelung von Einphasen- und Dreiphasenschweissung und ähnliches. Ausgerüstet mit geeigneten thermostatischen Schaltern bietet es den Vorteil eines verminderten Kühlwasserbedarfs und erhöhten Schutzes der Röhre und der dazugehörigen Ausrüstung gegen Überlastung und Überhitzung

→ Cooling water thermostat
Thermostat d'eau de refroidissement 55305
Kühlwasserthermostat

→ Overload protecting switch
Interrupteur de securité contre la surcharge 55306
Überlastungsschutzschalter

Cooling; Refroidissement; Kühlung

Typical characteristics
Caractéristiques types
Kenndaten

p_1 (q = 4 l/min) = max. 0,13 kg/cm²
$t_o - t_i$ (q = 4 l/min) = max. 4 °C

Limiting values
Caractéristiques limites [1])
Grenzdaten

A. With thermostatic control
Avec réglage thermostatique
Mit thermostatischer Regelung

t_i = min. 10 °C q = min. 4 l/min [2])[3])
t_i = max. 40 °C t_c = max. 45 °C

[1])[2])[3])See page 2; voir page 2; siehe Seite 2

Water cooled IGNITRON with provisions for mounting a thermostatic control unit
IGNITRON à refroidissement par eau avec possibilité de monter un dispositif à commande thermostatique
Wassergekühltes IGNITRON mit Anordnung zur Montierung einer thermostatischen Regelvorrichtung

Application: Single and three-phase welding control and similar control applications. Equipped with suitable thermostatic switches it has the advantage of diminishing the cooling-water consumption and of protecting the tube and associated equipment from overloads and overheating

Application: Réglage en soudage monophasé et triphasé et d'autres réglages similaires. Fonctionnant avec des commutateurs thermostatiques propres, il présente l'avantage de diminuer la consommation d'eau de refroidissement et de protéger le tube et les appareils auxiliaires contre les surcharges et le surchauffage.

Anwendung : Regelung von Einphasen- und Dreiphasenschweissung und ähnliches. Ausgerüstet mit geeigneten thermostatischen Schaltern bietet es den Vorteil eines Verminderten Kühlwasserbedarfs und erhöhten Schutzes der Röhre und der dazugehörigen Ausrüstung gegen Überlastung und Überhitzung

Frequency range
Gamme de fréquences 25 - 60 c/s
Frequenzbereich

Net weight Poids net Nettogewicht	2000 g	Shipping weight Poids brut Bruttogewicht	2900 g ←

Water saving thermostat
Thermostat pour économie d'eau 55305
Thermostat zur Wassereinsparung

Overload protecting switch
Interrupteur de sécurité contre la surcharge 55306
Überlastungsschutzschalter

Cooling; refroidissement; Kühlung

Typical characteristics
Caractéristiques types
Kenndaten

p_i (q = 4 l/min.) = max. 0,13 kg/cm²
$t_o - t_i$ (q = 4 l/min.) = max. 4 °C

B. Without thermostatic control
Sans réglage thermostatique
Ohne thermostatische Regelung

q	= min.	4 l/min [2]
t_i	= min.	10 °C
t_o	= max.	40 °C

Net weight Poids net Nettogewicht	1800 g	Shipping weight Poids brut Bruttogewicht	2700 g

For curves please refer to type PL 5551
Pour les courbes voir type PL5551
Kennlinien siehe Type PL5551

[1] When the cooling systems of the tubes are connected in series the max. values of t_o and t_i hold for the hottest tube

Lorsque les dispositifs de refroidissement des tubes sont reliés en série, les valeurs maxima de t_o et t_i sont valable pour le tube à sa température la plus élevée.

Werden die Kühlsysteme der Röhren in Serie geschaltet, so gelten die Maximalwerte t_o und t_i für die heisseste Röhre

[2] At max. demand
A la demande d'énergie max.
Bei maximalem Energiebedarf

[3] Solenoid valve open
Soupape à solénoide ouverte
Solenoidventil offen

B. Without thermostatic control
Sans réglage thermostatique
Ohne thermostatischer Regelung

q	= min.	4 l/min [2]
t_i	= min.	10 °C
t_o	= max.	40 °C

Net weight Poids net Nettogewicht	1800 g	Shipping weight Poids brut Bruttogewicht	2700 g

For further data and curves please refer to type PL 5551
Pour les autres caractéristiques et courbes voir type PL5551
Für weitere Daten und Kennlinien siehe Typ PL 5551

[1]) When the cooling systems of the tubes are connected in series the max. values of t_o and t_i hold for the hottest tube

Lorsque les dispositifs de refroidissement des tubes sont reliés en série, les valeurs maxima de t_o et t_i sont valable pour le tube à sa température la plus élevée .

Werden die Kühlsysteme der Röhren in Serie geschaltet, so gelten die Maximalwerte t_o und t_i für die heisseste Röhre

[2]) At max. demand
A la demande d'énergie max.
Bei maximalem Energiebedarf

[3]) Solenoid valve open
Soupape à solénoïde ouverte
Solenoidventil offen

Cooling (continued)
Refroidissement (suite)
Kühlung (Fortsetzung)

Limiting values (with or without thermostatic control; absolute limits)
Caractéristiques limites (sans ou avec réglage thermostatique; limites absolues)
Grenzdaten (mit oder ohne thermostatische Regelung; absolute Grenzwerte)

A.C. control service
Service de réglage C.A.
Wechselstromsteuerung

q	=	min.	4	l/min.[1]
t_i	=	min.	10 °C	[2]
	=	max.	40 °C	[2]
t_m (V = 220-250 V_{eff})	=	max.	55 °C	[3]
t_m (V = 380 V_{eff})	=	max.	50 °C	
t_m (V = 500 V_{eff})	=	max.	50 °C	
t_m (V = 600 V_{eff})	=	max.	45 °C	

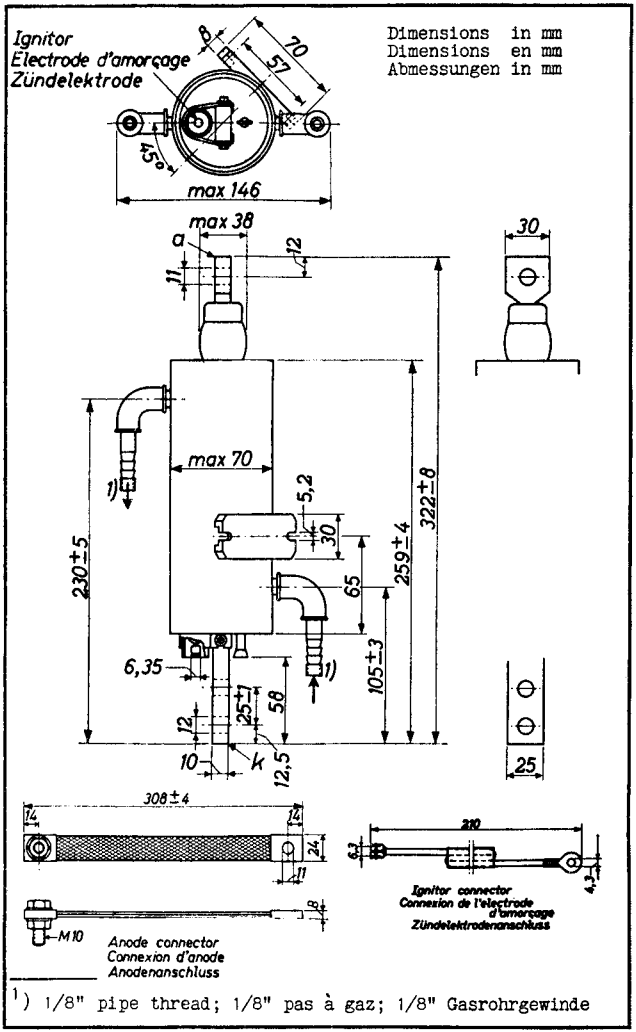
Intermittent rectifier or three-phase welding service
Service redresseur intermittent ou soudage triphasé
Aussetzender Gleichrichter-oder Dreiphasenschweissbetrieb

q	=	min.	4	l/min.[1]
t_i	=	min.	10 °C	[2]
	=	max.	35 °C	[2]
t_m	=	max.	45 °C	[3]

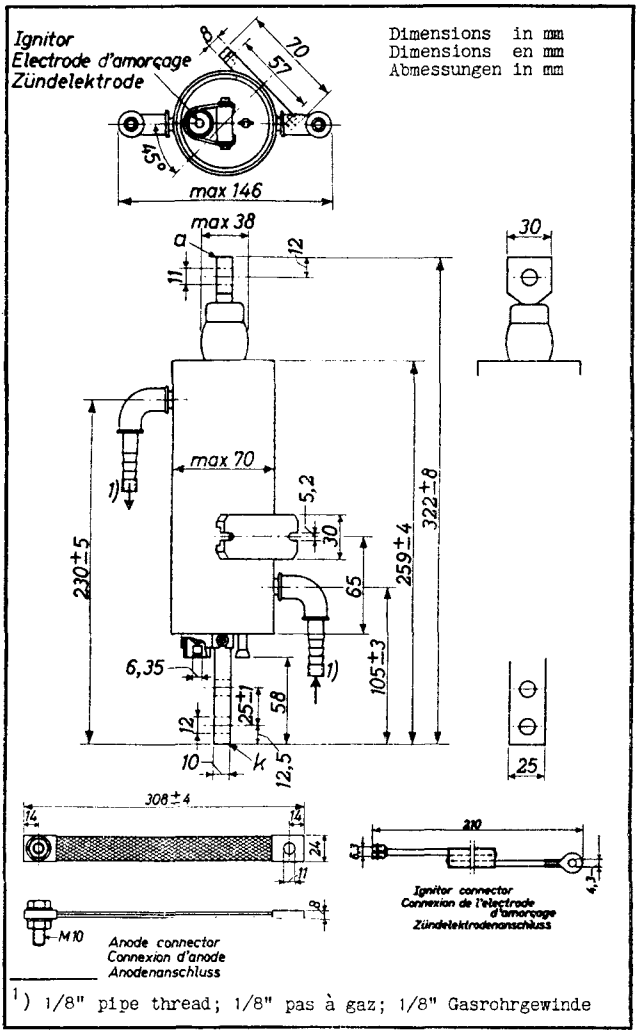
[1]) At max. demand and max. I_a; solenoid valve open.
À la demande d'énergie max. et à I_a max.; soupape à solénoïde ouverte.
Bei max. Energiebedarf und max. I_a; Solenoidventil offen.

[2]) When a number of tubes is cooled in series, ti_{min} is measured at the coldest and ti_{max} at the hottest tube.
Si un nombre de tubes est refroidi en série, ti_{min} est mesuré au tube le plus froid et ti_{max} au tube le plus chaud.
Wenn mehrere Röhren in Reihe gekühlt werden, muss ti_{min} an der kältesten und ti_{max} an der heissesten Röhre gemessen werden.

[3]) See page 3; voir page 3; siehe Seite 3



[1]) 1/8" pipe thread; 1/8" pas à gaz; 1/8" Gasrohrgewinde



[1]) 1/8" pipe thread; 1/8" pas à gaz; 1/8" Gasrohrgewinde

Cooling (continued)
Refroidissement (suite)
Kühlung (Fortsetzung)

When the cooling systems of a number of tubes are connected in series, the water saving thermostat should be mounted on the last but one and the overload protecting thermostat on the last tube. In three phase welding service using six tubes it is recommended to cool not more than three tubes in series

Quand les dispositifs de refroidissement de quelques tubes sont reliés en série, il faut monter le thermostat pour le réglage de l'eau de refroidissement sur le tube final à un près et le thermostat de sécurité contre la surcharge sur le tube final. En service de soudure triphasé avec six tubes il est recommandé de ne pas refroidir plus de trois tubes en serie

Wenn die Kühlvorrichtungen einiger Röhren in Reihe geschaltet werden, soll der Thermostat zur Wassereinsparung auf die zweitletzte und der Überlastungsschutzthermostat auf die letzte Röhre montiert werden. Bei Dreiphasenschweissbetrieb unter Verwendung von sechs Röhren wird es empfohlen nicht mehr als drei Röhren in Reihe zu kühlen

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[3]) t_m = temperature of thermostat mount
Warning: The thermostat mount is at full line voltage

t_m = température de la plaque de montage du thermostat
Avis : La plaque de montage du thermostat est à la tension du secteur.

t_m = Temperatur der Montageplatte des Thermostats
Warnung: Die Montageplatte des Thermostats befindet sich auf Netzspannung.

Limiting values (ABSOLUTE VALUES)
Caractéristiques limites (VALEURS ABSOLUES)
Grenzdaten (ABSOLUTWERTE)

A.C. control; Réglage C.A.; Wechselstromregelung

Two tubes in inverse parallel connection
Deux tubes en montage anti-parallèle
Zwei Röhren in Anti-Parallelschaltung

Voltage range Gamme de tension (V) Spannungsbereich	220		250		600 [4]	
Demand Demande d'énergie [3] (kVA) Energiebedarf	180	[5] 530	200	[5] 600	200	[5] 600
Ia (max.) [3] (A)	56	30,2	56	30,2	56	30,2
Tav (max.) (s)	18	18	[6] 18	[6] 18	[6] 7,5	[6] 7,5
Isurge (max.) (T = max.0,15s) (A)	6720	6720	6720	6720	2800	2800

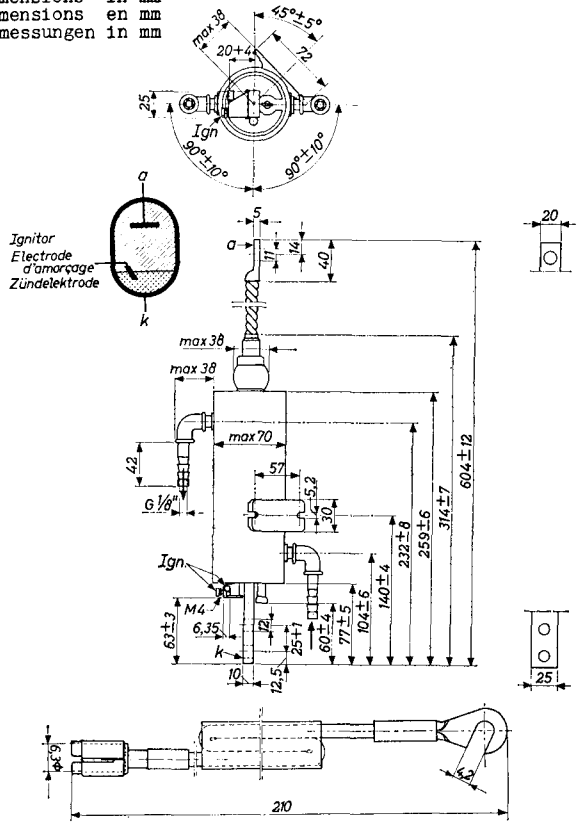
Rectifying tube (intermittent service)
Tube redresseur (service intermittent)
Gleichrichterröhre (aussetzender Betrieb)

$V_{a\ fwd_p}$ (V)	$V_{a\ inv_p}$ (V)	I_{a_p} (A)	I_a (max) (A)	Tav (max) (s)	$\frac{I_a}{I_p}$ (max) (Tav=0,2s)	$\frac{I_{surge}}{I_{a_p}}$ (max)
1200	1200	600 [5]	5	10	0,166	12,5
		135	22,5			
1500 [4]	1500 [4]	480 [5]	4	10	0,166	12,5
		108	18			

[3] For other values of the demand the corresponding max. average anode current per tube Ia may be derived from the curve on page A
Pour autres valeurs de la demande d'énergie le courant moyen correspondant max. de l'anode par tube Ia peut être dérivé de la courbe sur page A
Für andere Werte des Energiebedarfs ist der entsprechende maximale Mittelwert des Anodenstromes pro Röhre Ia von der Kurve auf Seite A abzuleiten

[4][5][6] See page 4; voir page 4; siehe Seite 4

Dimensions in mm
Dimensions en mm
Abmessungen in mm



Type No. 55351-01
Ignitor connector. Unfolded length 330 mm
Connexion de l'électrode d'amorçage. Longueur dépliée 330 mm
Zündelektrodenanschluss. Entfaltete Länge 330 mm

Mounting position: vertical, anode connection up
Montage : vertical, la connexion de l'anode en haut
Einbau : senkrecht, Anodenanschluss oben

Limiting values (Absolute limits)
Caractéristiques limites (Limites absolues)
Grenzdaten (Absolute Grenzwerte)

Remark: The limiting values are based on full-cycle conduction without phase delay, regardless of whether or not phase control is used
Observation: Les caractéristiques limites s'appliquent à une conduction pendant le cycle complet sans décalage, abstraction faite d'un contrôle de phase éventuel
Bemerkung: Die Grenzwerte beziehen sich auf einen Stromdurchgang ohne Phasendrehung während der ganzen Periode, auch wenn mit Phasenanschnitt gearbeitet wird

Single phase A.C. control; two tubes in inverse parallel connection
Réglage de courant alternatif monophasé; deux tubes en montage anti-parallèle
Einphasen-Wechselstromsteuerung; zwei Röhren in Anti-Parallelschaltung

Mains voltage Tension de secteur (Veff) Netzspannung	220	250	380	500	600
Max. demand Demande de puissance max. [1] (kVA) Max.Leistungsbedarf	530	600	600	600	600
I_a max. [2] (A)	30,2	30,2	30,2	30,2	30,2
I_a max. (A)	56	56	56	56	56
Max. demand Demande de puissance max. [3] (kVA) Max.Leistungsbedarf	180	200	200	200	200
T_{av} max. [4] (sec)	18	18	11,8	9,0	7,5
Isurge p max. (T = max.0,15 sec) (A)	6720	6720	4400	3360	2800

[1]) See also page A; voir aussi page A; siehe auch Seite A

[2]) Max. average current of each tube at max. demand
Courant moyen max. par tube à la demande max.
Max. mittlerer Strom jeder Röhre bei dem max. Bedarf

[3]) Max. demand at max. average current
Demande de puissance max. au courant moyen max.
Max. Leistungsbedarf bei dem max. mittleren Strom

[4]) For mains voltages between 250 V and 600 V, T_{av} is inversely proportional to the voltage
Pour les tensions de secteur entre 250 V et 600 V, T_{av} est inversement proportionnel à la tension
Für Netzspannungen zwischen 250 V und 600 V ist T_{av} umgekehrt proportional zu der Spannung

Limiting values (Absolute limits; continued)
Caractéristiques limites (Limites absolues; suite)
Grenzdaten (Absolute Grenzwerte; Fortsetzung)

See remark page 5
Voir l'observation page 5
Siehe Bemerkung Seite 5

Intermittent rectifier service or Frequency changer resistance welding service
Service redresseur intermittent ou Service soudeur à résistance avec conversion de fréquence
Aussetzender Gleichrichterbetrieb oder Widerstandsschweissbetrieb mit Frequenzumformung

f = 50-60 c/s

$V_{a\ fwd\ p}$	(V)	1200	1500
$V_{a\ inv\ p}$	(V)	1200	1500
$I_{ap\ max.}$	(A)	600	480
$I_{a\ max.}$ [1]	(A)	5	4
$I_{a\ max.}$	(A)	22,5	18
$I_{ap\ max.}$ [2]	(A)	135	108
$T_{av\ max.}$	(sec)	10	10
$\frac{I_a}{I_{ap}}$ (max.)(T_{av} = max. 0,2 sec)		0,166	0,166
$\frac{I_{surge\ p}}{I_{ap}}$ (max.) $T(I_{surge})$ = max.0,15 sec		12,5	12,5

[1]) Max. average current at max. peak current
Courant moyen max. au courant de crête max.
Max. mittlerer Strom beim max. Spitzenwert des Stromes

[2]) Max. peak current at max. average current
Courant de crête max. au courant moyen max.
Max. Spitzenwert des Stromes bei dem max. mittleren Strom

Ignitor; Electrode d'amorçage; Zündelektrode

Limiting values (Absolute limits)
Caractéristiques limites (Limites absolues)
Grenzdaten (Absolute Grenzwerte)

$V_{fwd\ p}$	= max.	Va fwd p ←
$V_{inv\ p}$	= max.	5 V
I_p	= max.	100 A
I_{eff}	= max.	10 A
$I(T_{av}$ = max. 5 s)	= max.	1 A

A. Anode excitation
Excitation par la tension anodique
Anodenzündung

Ignitor characteristics
Caractéristiques de l'électrode d'amorçage
Kenndaten der Zündelektrode

Firing voltage
Tension d'amorçage = max. 200 V
Zündspannung

Firing current
Courant d'amorçage = 6-8 A ←
Zündstrom = max. 12 A

Ignition time at the above voltage or current
Temps d'amorçage à la tension ou au courant sus-mentionnés = max. 100 µsec
Zündzeit bei der obenerwähnten Spannung oder Strom

Ignition circuit requirements
Exigences au circuit d'amorçage
Bedingungen für die Zündschaltung

Peak voltage required to fire
Tension de crête nécessaire pour l'amorçage = min. 200 V
Zur Zündung erforderliche Spitzenspannung

Peak current required to fire
Courant de crête nécessaire pour l'amorçage = min. 12 A ←
Zur Zündung erforderlicher Spitzenstrom.

The rate of rise of the ignitor current must be sufficient ← to reach the required ignition time (e.g. for an ignition time of max. 100 µsec, di/dt = min. 0.12 A/µsec)
Le taux d'accroissement du courant de l'électrode d'amorçage doit suffire à obtenir le temps d'amorçage requis (p.e. pour un temps d'amorçage de 100 µsec au max., di/dt = 0,12 A/µsec au moins)
Die Zunahme des Zündstromes muss genügen zur Erhaltung der erforderlichen Zündzeit (für eine Zündzeit von max. 100 µSek z.B. muss di/dt = min.0,12 A/µSek sein)

Ignitor; Electrode d'amorçage; Zündelektrode

Limiting values (Absolute limits)
Caractéristiques limites (Limites absolues)
Grenzdaten (Absolute Grenzwerte)

Vfwd p	= max. Va fwd p
Vinv p	= max. 5 V
Ip	= max. 100 A
Ieff	= max. 10 A
I(T_{av} = max. 5 s)	= max. 1 A

A. Anode excitation
Excitation par la tension anodique
Anodenzündung

Ignitor characteristics
Caractéristiques de l'électrode d'amorçage
Kenndaten der Zündelektrode

Firing voltage
Tension d'amorçage = max. 200 V
Zündspannung

Firing current
Courant d'amorçage = 6-8 A
Zündstrom = max. 12 A

Ignition time at the above voltage or current
Temps d'amorçage à la tension ou au courant sus-mentionnés = max. 100 µsec
Zündzeit bei der obenerwähnten Spannung oder Strom

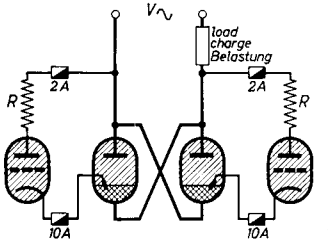
Ignition circuit requirements
Exigences au circuit d'amorçage
Bedingungen für die Zündschaltung

Peak voltage required to fire
Tension de crête nécessaire pour l'amorçage = min. 200 V
Zur Zündung erforderliche Spitzenspannung

Peak current required to fire
Courant de crête nécessaire pour l'amorçage = min. 12 A
Zur Zündung erforderlicher Spitzenstrom.

The rate of rise of the ignitor current must be sufficient to reach the required ignition time (e.g. for an ignition time of max. 100 µsec, di/dt = min. 0.12 A/µsec)
Le taux d'accroissement du courant de l'électrode d'amorçage doit suffire à obtenir le temps d'amorçage requis (p.e. pour un temps d'amorçage de 100 µsec au max., di/dt = 0,12 A/µsec au moins)
Die Zunahme des Zündstromes muss genügen zur Erhaltung der erforderlichen Zündzeit (für eine Zündzeit von max. 100 µSek z.B. muss di/dt = min.0,12 A/µSek sein)

Recommended circuit for anode excitation
Circuit recommandé pour excitation par la tension anodique
Empfohlene Schaltung für Anodenzündung

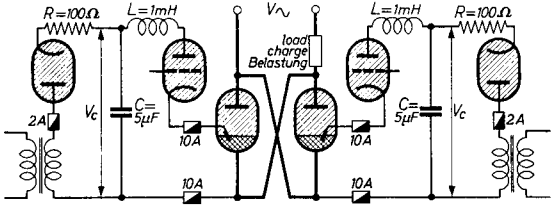


Recommended value of R
Valeur recommandée de R
Empfohlener Wert von R

Mains voltage Tension de secteur Netzspannung	R
220 Veff	2 Ω
250 Veff	2 Ω
380 Veff	4 Ω
500 Veff	5 Ω
600 Veff	6 Ω

B. Separate excitation
Excitation séparée
Fremdsteuerung

Recommended circuit
Circuit recommandé
Empfohlene Schaltung

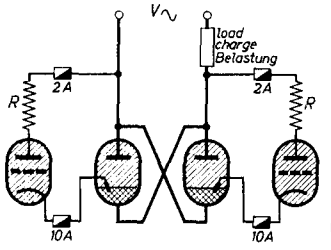


Ohmic resistance of series inductance (1 mH)
Résistance ohmique de l'inductance en série(1 mH) = max. 2 Ω
Ohmscher Widerstand der Serienselbstinduktion(1 mH)

Vc { Under operating conditions / Dans les conditions de fonctionnement / Unter Betriebsverhältnisse } = 650±50 V

Peak value of closed circuit current
Valeur de crête du courant en circuit fermé = 40 - 50 A
Spitzenwert des Stromes bei geschlossenem Kreis

Recommended circuit for anode excitation
Circuit recommandé pour excitation par la tension anodique
Empfohlene Schaltung für Anodenzündung

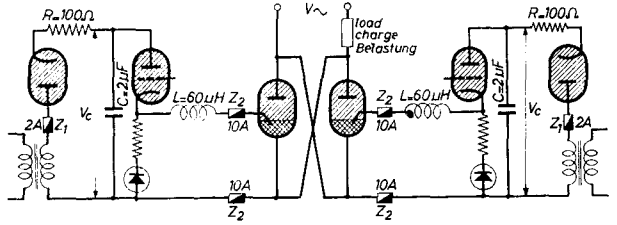


Recommended value of R
Valeur recommandée de R
Empfohlener Wert von R

Mains voltage Tension de secteur Netzspannung	R
220 Veff	2 Ω
250 Veff	2 Ω
380 Veff	4 Ω
500 Veff	5 Ω
600 Veff	6 Ω

→ B. Separate excitation
Excitation séparée
Fremdsteuerung

Recommended circuit
Circuit recommandé
Empfohlene Schaltung



Ohmic resistance of 60 µH inductance
Résistance ohmique de l'inductance de 60 µH = max. 2 Ω
Ohmscher Widerstand der Selbstinduktion von 60 µH

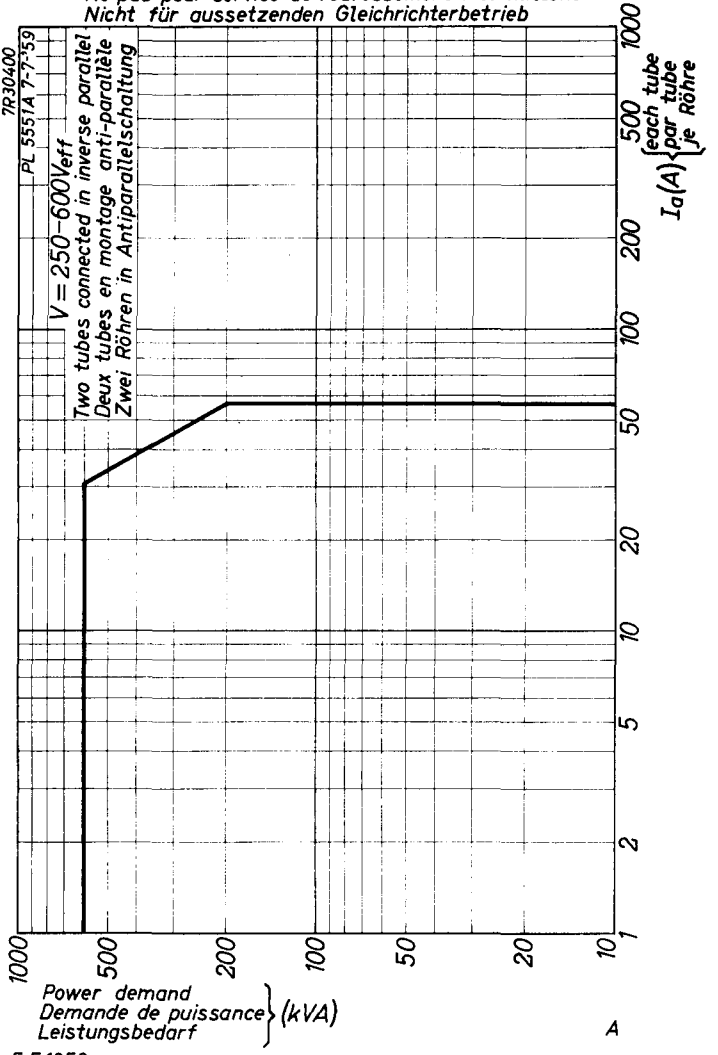
V_c { Under operating conditions / Dans les conditions de fonctionnement / Unter Betriebsverhältnisse } = 650±50 V

Peak value of closed circuit current
Valeur de crête du courant en circuit fermé = 80-100 A
Spitzenwert des Stromes bei geschlossenem Kreis

PHILIPS

PL 5551A

Not for intermittent rectifier service
Ne pas pour service de redressement intermittent
Nicht für aussetzenden Gleichrichterbetrieb



A

5.5.1959

PL 5551A PHILIPS

Not for intermittent rectifier service
Ne pas pour service de redressement intermittent
Nicht für aussetzenden Gleichrichterbetrieb

B

PHILIPS **PL 5551A**

Intermittent rectifier service
Service de redressement intermittent
Aussetzender Gleichrichterbetrieb

5.5.1959

C

PHILIPS

Electronic Tube

HANDBOOK

PL5551A

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1	1	1955.12.12
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3	1	1960.06.06
4	2	1955.12.12
5	2	1956.04.04
6	2	1960.06.06
7	3	1955.12.12
8	3	1956.04.04
9	3	1961.06.06
10	4	1955.12.12
11	4	1961.06.06
12	5	1959.05.05
13	6	1959.05.05
14	7	1959.05.05
15	7	1962.10.10
16	8	1959.05.05
17	8	1962.10.10
18	A	1959.05.05
19	B	1959.05.05

20	C	1959.05.05
21, 22	FP	2000.05.28

Water cooled IGNITRON
IGNITRON à refroidissement par l'eau
Wassergekühltes IGNITRON

Application: A.C. control: two tubes in inverse parallel connection will control 1200 kVA at 250 - 600 V and 1060 kVA at 220 V
Power rectification: for energy storage of resistance welders (intermittent service)

Application: Réglage C.A.: deux tubes en montage anti-parallèle peuvent régler 1200 kVA à 250-600 V et 1060 kVA à 220 V
Redressement de puissance: pour accumulation de puissance en soudure par résistance (service intermittent)

Anwendung : Wechselstromregelung: zwei Röhren in Anti-Parallelschaltung können bei 250 - 600 V 1200 kVA und bei 220 V 1060 kVA regulieren
Kraftstromgleichrichtung: für Energiespeicherung bei Widerstandsschweissung (aussetzender Betrieb)

Frequency range
Gamme de fréquences 25 - 60 c/s
Frequenzbereich

Mounting position: vertical, anode connection up
Montage : vertical, la connexion de l'anode en haut
Einbau : senkrecht, Anodenanschluss oben

Cooling
Refroidissement
Kühlung

q [1]		= min.	6,0 l/min
P_i	(q=6,0 l/min.)	= max.	0,35 kg/cm^2
$t_o - t_i$	(q=6,0 l/min.)	= max.	6 °C
t_i		= min.	10 °C
t_o		= max.	40 °C

Net weight Poids net Nettogewicht	3600 g	Shipping weight Poids brut Bruttogewicht	8600 g

[1] At max. demand
A la demande d'énergie maximum
Bei maximalem Energiebedarf

Water cooled IGNITRON
IGNITRON à refroidissement par l'eau
Wassergekühltes IGNITRON

Application: A.C. control: two tubes in inverse parallel connection will control 1200 kVA at 250 - 600 V and 1060 kVA at 220 V
Power rectification: for energy storage of resistance welders (intermittent service)

Application: Réglage C.A.: deux tubes en montage anti-parallèle peuvent régler 1200 kVA à 250-600 V et 1060 kVA à 220 V
Redressement de puissance: pour accumulation de puissance en soudure par résistance (service intermittent)

Anwendung : Wechselstromregelung: zwei Röhren in Anti-Parallelschaltung können bei 250 - 600 V 1200 kVA und bei 220 V 1060 kVA regulieren
Kraftstromgleichrichtung: für Energiespeicherung bei Widerstandsschweissung (aussetzender Betrieb)

Frequency range
Gamme de fréquences 25 - 60 c/s
Frequenzbereich

Mounting position: vertical, anode connection up
Montage : vertical, la connexion de l'anode en haut
Einbau : senkrecht, Anodenanschluss oben

Cooling
Refroidissement
Kühlung

$q^{1)}$		= min.	6,0 l/min
Pi	(q=6,0 l/min.)	= max.	0,35 kg/cm^2
t_o-t_i	(q=6,0 l/min.)	= max.	6 °C
t_i		= min.	10 °C
t_o		= max.	40 °C

Net weight Poids net Nettogewicht	3600 g	Shipping weight Poids brut Bruttogewicht	8500 g

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[1]) At max. demand
A la demande d'énergie maximum
Bei maximalem Energiebedarf

939 0483
4.4.1956

PHILIPS PL 5552

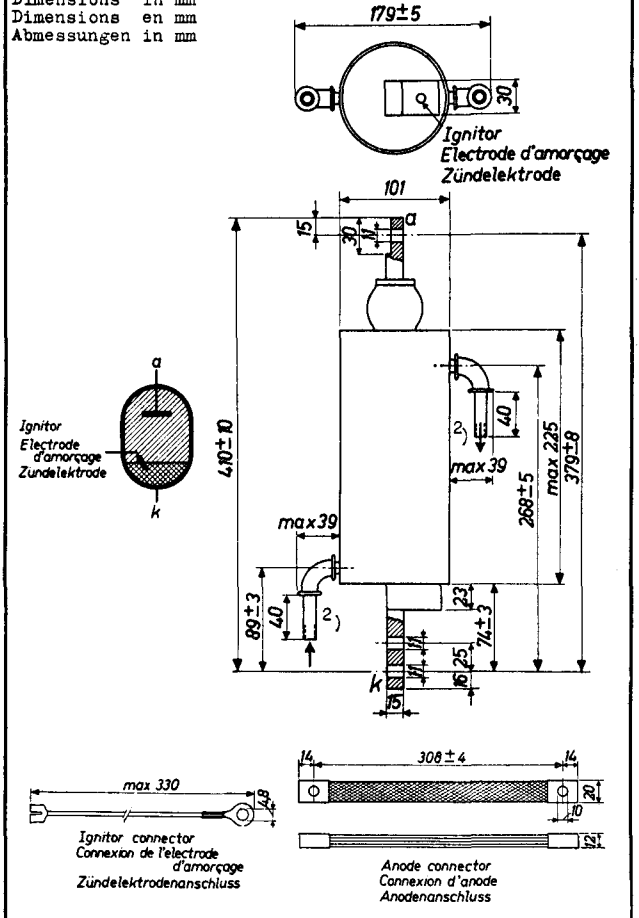
The PL5552 is equivalent to the PL5552A, but is not suitable for being equipped with a thermostatic control unit

Le tube PL5552 est équivalent au tube PL5552A, mais ne peut pas être équipé d'un dispositif à commande thermostatique

Die Röhre PL5552 stimmt mit der Röhre PL5552A überein, kann aber nicht mit einer thermostatischen Regelvorrichtung versehen werden

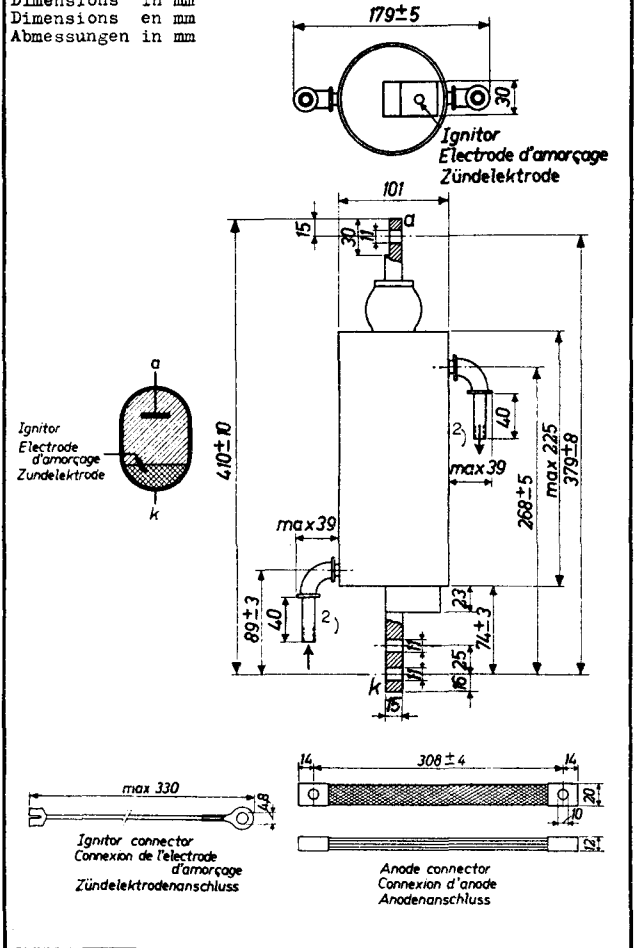
PL 5552 PHILIPS

Dimensions in mm
Dimensions en mm
Abmessungen in mm



2) 1/8" pipe thread; 1/8" pas à gaz; 1/8" Gasrohrgewinde

Dimensions in mm
Dimensions en mm
Abmessungen in mm



2) 1/8" pipe thread; 1/8" pas à gaz; 1/8" Gasrohrgewinde

Limiting values (ABSOLUTE VALUES)
Caractéristiques limites (VALEURS ABSOLUES)
Grenzdaten (ABSOLUTWERTE)

A.C. control; Réglage C.A.; Wechselstromregelung

Two tubes in inverse parallel connection
Deux tubes en montage anti-parallèle
Zwei Röhren in Anti-Parallelschaltung

Voltage range / Gamme de tension / Spannungsbereich (V)	220		250		[6]600	
Demand / Demande d'énergie [3] (kVA) / Energiebedarf	350	[7]1060	400	[7]1200	400	[7]1200
I_a (max.) [3] (A)	140	75,6	140	75,6	140	75,6
T_{av} (max.) (s)	14	14	[4]14	[4]14	[4]5,8	[4]5,8
Isurge (max.) [5] (T = max.0,15 s) (A)	13450	13450	13450	13450	5600	5600

Rectifying tube (intermittent service)
Tube redresseur (service intermittent)
Gleichrichterröhre (aussetzender Betrieb)

V_{afwd_p} (max.) (V)	V_{ainv_p} (max.) (V)	I_{a_p} (max.) (A)	I_a (max.) (A)	T_{av} (max.) (s)
500	500	1600	100	6

[3] For other values of the demand the corresponding max. average anode current per tube Ia may be derived from the curve on page A
Pour autres valeurs de la demande d'énergie le courant moyen correspondant max. de l'anode par tube Ia peut être dérivé de la courbe sur page A
Für anderen Werte des Energiebedarfs ist der entsprechende maximalen Mittelwert des Anodenstromes pro Röhre Ia von der Kurve auf Seite A abzuleiten

[4] [5] [6] [7] See page 4; voir page 4; siehe Seite 4

Limiting values (ABSOLUTE VALUES)
Caractéristiques limites (VALEURS ABSOLUES)
Grenzdaten (ABSOLUTWERTE)

A.C. control; Réglage C.A.; Wechselstromregelung

Two tubes in inverse parallel connection
Deux tubes en montage anti-parallèle
Zwei Röhren in Anti-Parallelschaltung

Voltage range Gamme de tension (V) Spannungsbereich	220		250		[6])600	
Demand Demande d'énergie [3])(kVA) Energiebedarf	350	[7])1060	400	[7])1200	400	[7])1200
Ia (max.) [3]) (A)	140	75,6	140	75,6	140	75,6
T_{av} (max.) (s)	14	14	[4])14	[4])14	[4])5,8	[4])5,8
Isurge (max.) [5]) (T = max.0,15 s) (A)	13450	13450	13450	13450	5600	5600

Rectifying tube (intermittent service)
Tube redresseur (service intermittent)
Gleichrichterröhre (aussetzender Betrieb)

V_{afwd_p} (max.) (V)	V_{ainv_p} (max.) (V)	Ia_p (max.) (A)	Ia (max.) (A)	Tav (max.) (s)
500	500	1600	100	6

[3])For other values of the demand the corresponding max. average anode current per tube Ia may be derived from the curve on page A
Pour autres valeurs de la demande d'énergie le courant moyen correspondant max. de l'anode par tube Ia peut être dérivé de la courbe sur page A
Für anderen Werte des Energiebedarfs ist der entsprechende maximalen Mittelwert des Anodenstromes pro Röhre Ia von der Kurve auf Seite A abzuleiten

[4])[5])[6])[7])See page 4; voir page 4; siehe Seite 4

Ignitor; Electrode d'amorçage; Zündelektrode

Requirements for cathode excitation
Conditions pour l'excitation de la cathode
Bedingungen für Katodeerregung

V_{fwd_p}	= min.	200 V
I_p	= min.	30 A

Typical value of starting time at required min. voltage or current
Valeur type du temps d'amorçage à la tension ou au courant demandé minimum
Mittelwert der Zündungszeit bei der erforderlichen min. Spannung oder Strom — 100 µsec

Limiting values
Caractéristiques limites
Grenzdaten

V_{fwd_p}	= max.	900 V
V_{inv_p}	= max.	5 V
I_p	= max.	100 A
I_{rms}	= max.	10 A
I_{av} (T_{av} =max.5 sec)	= max.	1 A

Remark : The limiting values of the demand voltage, current and kVA are on the basis of full cycle conduction without phase delay, regardless of whether or not phase control is used

Observation: Les valeurs limites de la tension, du courant et de la demande d'énergie se basent sur une conduction pendant le cycle complet sans décalage, abstraction faite d'un contrôle de phase éventuel

Bemerkung : Die Grenzwerte der Spannung, des Stromes und des Energiebedarfs sind basiert auf einen Stromdurchgang ohne Phasendrehung während der ganzen Periode, abgesehen von einem eventuellen Phasenanschnitt

---

4) For intermediate values T_{av} is inversely proportional to the voltage
Pour des valeurs intermédiaires T_{av} est inversement proportionnel à la tension
Für zwischenliegendeh Werte ist T_{av} umgekehrt proportional zu der Spannung

5) 280% of max. demand current (rms value)
280% de la demande de courant max. (valeur efficace)
280% des max. Strombedarfs (effektivwert)

6) Max. permissible value
Valeur admissible maximum
Max. zulässiger Wert

7) Max. value at the indicated voltage
Valeur max. à la tension indiquée
Max. Wert bei gegebener Spannung

Ignitor; Electrode d'amorçage; Zündelektrode

Requirements for cathode excitation
Conditions pour l'excitation de la cathode
Bedingungen für Katodeerregung

V_{fwd_p}	= min.	200 V
I_p	= min.	30 A

Typical value of starting time at required min. voltage or current
Valeur type du temps d'amorçage à la tension ou au courant demandé minimum
Mittelwert der Zündungszeit bei der erforderlichen min. Spannung oder Strom — 100 µsec

Limiting values
Caractéristiques limites
Grenzdaten

V_{fwd_p}	= max.	900 V
V_{inv_p}	= max.	5 V
I_p	= max.	100 A
I_{rms}	= max.	10 A
I_{av} (Tav =max.5 sec)	= max.	1 A

Remark : The limiting values of the demand voltage, current and kVA are on the basis of full cycle conduction without phase delay, regardless of whether or not phase control is used

Observation: Les valeurs limites de la tension, du courant et de la demande d'énergie se basent sur une conduction pendant le cycle complet sans décalage, abstraction faite d'un contrôle de phase éventuel

Bemerkung : Die Grenzwerte der Spannung, des Stromes und des Energiebedarfs sind basiert auf einen Stromdurchgang ohne Phasendrehung während der ganzen Periode, abgesehen von einem eventuellen Phasenanschnitt

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4) For intermediate values Tav is inversely proportional to the voltage
Pour des valeurs intermédiaires Tav est inversement proportionnel à la tension
Für zwischenliegenden Werte ist Tav umgekehrt proportional zu der Spannung

5) 280% of max. demand current (rms value)
280% de la demande de courant max. (valeur efficace)
280% des max. Strombedarfs (effektivwert)

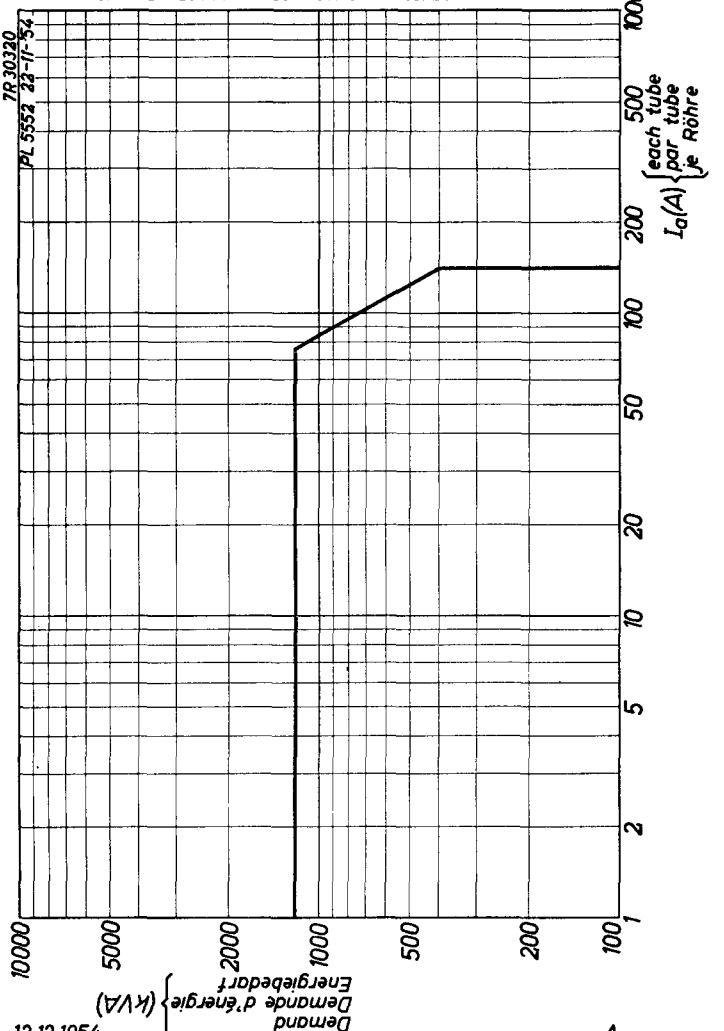
6) Max. permissible value
Valeur admissible maximum
Max. zulässiger Wert

7) Max. value at the indicated voltage
Valeur max. à la tension indiquée
Max. Wert bei gegebener Spannung

PHILIPS

PL 5552

Not for intermittent rectifier service
Ne pas pour service de redressement intermittent
Nicht für aussetzenden Gleichrichterbetrieb



12.12.1954

A

PL 5552 PHILIPS

Not for intermittent rectifier service
Ne pas pour service de redressement intermittent
Nicht für aussetzenden Gleichrichterbetrieb

7R30322
PL 5552 22-11-54

Two tubes connected in inverse parallel
Deux tubes en montage anti-parallèle
Zwei Röhren in Antiparallelschaltung

$V = 250\,V_{eff}$; $T_{gv} = 14\,s$

$V = 500\,V_{eff}$; $T_{gv} = 7{,}1\,s$

Demand current
Demande de courant
Strombedarf
$\}$ (A_{eff})

10000
5000
2000
1000
500
200
100

0,1 0,2 0,5 1 2 5 10 20 50 100

Duty cycle
Facteur de marche
Arbeitsperiode
$\}$ (%)

B

PHILIPS

Electronic Tube

HANDBOOK

PL5552

page	sheet	date
1	1	1954.12.12
2	1	1956.04.04
3	1	1959.05.05
4	2	1954.12.12
5	2	1956.04.04
6	3	1954.12.12
7	3	1956.04.04
8	4	1954.12.12
9	4	1956.04.04
10	A	1954.12.12
11	B	1954.12.12
12	FP	2000.05.28

Water cooled IGNITRON with provisions for mounting a thermostatic control unit
IGNITRON à refroidissement par eau avec possibilité de monter un dispositif à commande thermostatique
Wassergekühltes IGNITRON mit Anordnung zur Montierung einer thermostatischen Regelvorrichtung

Application: Single phase welding control and similar control applications. Equipped with suitable thermostatic switches it has the advantage of diminishing the cooling-water consumption and of protecting the tube and associated equipment from overloads and overheating

Application: Réglage en soudage monophasé et autres réglages simulaires. Fonctionnant avec des commutateurs thermostatiques appropriés, il présente l'avantage de diminuer la consommation d'eau de refroidissement et de protéger le tube et les appareils auxiliaires contre les surcharges et le surchauffage

Anwendung : Regelung von Einphasenschweissung und ähnliches Ausgerüstet mit geeigneten thermostatischen Schaltern bietet es den Vorteil eines verminderten Kühlwasserbedarfs und erhöhten Schutzes der Röhre und der dazugehörigen Ausrüstung gegen Überlastung und Überhitzung

Cooling water thermostat
Thermostat d'eau de refroidissement 55305
Kühlwasserthermostat

Overload protecting switch
Interrupteur de securité contre la surcharge 55306
Überlastungsschutzschalter

Cooling; Refroidissement; Kühlung

Typical characteristics
Caractéristiques types
Kenndaten

p_i (q = 6 l/min) = max. 0,35 kg/cm²
$t_o - t_i$ (q = 6 l/min) = max. 6 °C

Limiting values
Caractéristiques limites [1])
Grenzdaten

A. With thermostatic control
Avec réglage thermostatique
Mit thermostatischer Regelung

t_i = min. 10 °C q = min. 6 l/min.[2])[3])
t_i = max. 40 °C t_o = max. 45 °C

[1])[2])[3])See page 2; voir page 2; siehe Seite 2

PHILIPS PL 5552A

Water cooled IGNITRON with provisions for mounting a thermostatic control unit
IGNITRON à refroidissement par eau avec possibilité de monter un dispositif à commande thermostatique
Wassergekühltes IGNITRON mit Anordnung zur Montierung einer thermostatischen Regelvorrichtung

Application: Single phase welding control and similar control applications. Equipped with suitable thermostatic switches it has the advantage of diminishing the cooling-water consumption and of protecting the tube and associated equipment from overloads and overheating
Application: Réglage en soudage monophasé et d'autres réglages similaires. Fonctionnant avec des commutateurs thermostatiques propres, il présente l'avantage de diminuer la consommation d'eau de refroidissement et de protéger le tube et les appareils auxiliaires contre les surcharges et le surchauffage
Anwendung: Regelung von Einphasenschweissung und ähnliches, Ausgerüstet mit geeigneten thermostatischen Schaltern bietet es den Vorteil eines verminderten Kühlwasserbedarfs und erhöhten Schutzes der Röhre und der dazugehörigen Ausrüstung gegen Überlastung und Überhitzung

Frequency range
Gamme de fréquences 25-60 c/s
Frequenzbereich

Net weight Poids net Nettogewicht	3600 g	Shipping weight Poids brut Bruttogewicht	5000 g ←

Water saving thermostat
Thermostat pour économie d'eau 55305
Thermostat zur Wassereinsparung

Overload protecting switch
Interrupteur de sécurité contre la surcharge 55306
Überlastungsschutzschalter

Cooling; refroidissement; Kühlung

Typical characteristics
Caractéristiques types
Kenndaten

p_i (q = 6 l/min.) = max. 0,35 kg/cm^2
$t_o - t_i$ (q = 6 l/min.) = max. 4 °C ←

B. Without thermostatic control
Sans réglage thermostatique
Ohne thermostatische Regelung

q	= min.	6 l/min.[2]
t_i	= min.	10 °C
t_o	= max.	40 °C

Net weight Poids net Nettogewicht	3800 g	Shipping weight Poids brut Bruttogewicht	9200 g

For further data and curves please refer to type PL 5552
Pour les autres caractéristiques et courbes voir type PL5552
Für weitere Daten und Kennlinien siehe Typ PL 5552

[1] When the cooling systems of the tubes are connected in series the max. values of t_o and t_i hold for the hottest tube

Lorsque les dispositifs de refroidissement des tubes sont reliés en série, les valeurs maxima de t_o et t_i sont valable pour le tube à sa température la plus élevée.

Werden die Kühlsysteme der Röhren in Serie geschaltet, so gelten die Maximalwerte t_o und t_i für die heisseste Röhre

[2] At max. demand
A la demande d'énergie maximum
Bei maximalem Energiebedarf

[3] Solenoid valve open
Soupape à solénoïde ouverte
Solenoidventil offen

Cooling (continued)
Refroidissement (suite)
Kühlung (Fortsetzung)

Limiting values (with or without thermostatic control; absolute limits)
Caractéristiques limites (sans ou avec réglage thermostatique; limites absolues)
Grenzdaten (mit oder ohne thermostatische Regelung; absolute Grenzwerte)

A.C. control service
Service de réglage C.A.
Wechselstromsteuerung

q	= min. 6 l/min.[1]
t_i	= min. 10 °C [2] = max. 40 °C [2]
t_m (V = 220-250 Veff)	= max. 55 °C [3]
t_m (V = 380 Veff)	= max. 50 °C
t_m (V = 500 Veff)	= max. 50 °C
t_m (V = 600 Veff)	= max. 45 °C

Intermittent rectifier service
Service redresseur intermittent
Aussetzender Gleichrichterbetrieb

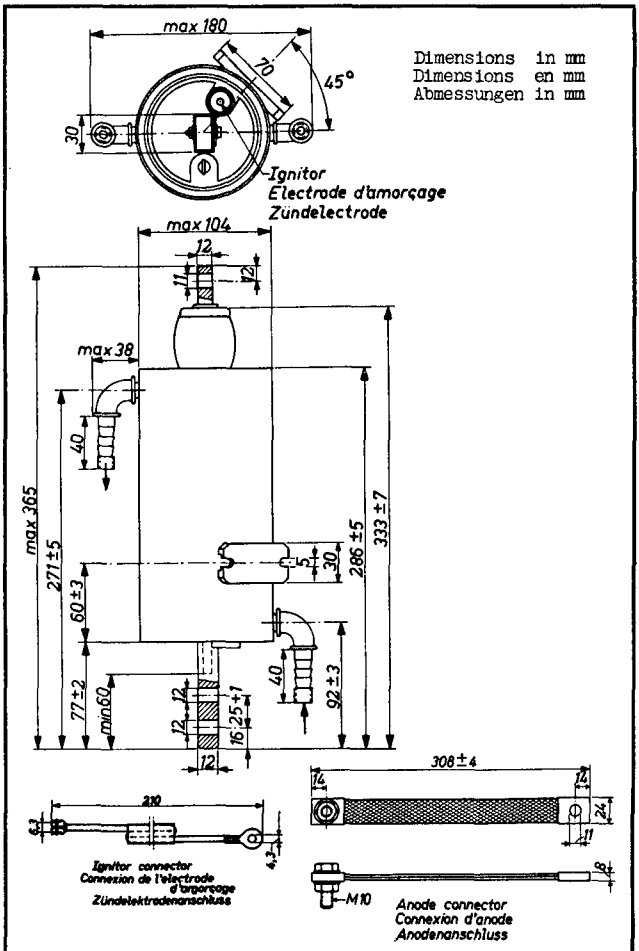
q	= min. 6 l/min.[1]
t_i	= min. 10 °C [2] = max. 35 °C [2]
t_m	= max. 45 °C [3]

---

[1]) At max. demand and max. Ia; solenoid valve open
A la demande d'énergie max. et à Ia max.; soupape à solénoïde ouverte
Bei max. Energiebedarf und max. Ia; Solenoidventil offen

[2]) When a number of tubes is cooled in series, t_i min is measured at the coldest and t_i max. at the hottest tube
Si un nombre de tubes est refroidi en série, t_i min est mesuré au tube le plus froid et t_i max au tube le plus chaud
Wenn mehrere Röhren in Reihe gekühlt werden, muss t_i min an der kältesten und t_i max an der heissesten Röhre gemessen werden

[3]) t_m = temperature of thermostat mount
Warning: The thermostat mount is at full line voltage
t_m = température de la plaque de montage du thermostat
Avis: La plaque de montage du thermostat est à la tension du secteur
t_m = Temperatur der Montageplatte des Thermostats
Warnung: Die Montageplatte des Thermostats befindet sich auf Netzspannung



[1]) 1/8" pipe thread; 1/8" pas à gaz; 1/8" Gasrohrgewinde

Cooling (continued)
Refroidissement (suite)
Kühlung (Fortsetzung)

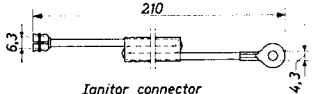
When the cooling systems of a number of tubes are connected in series, the water saving thermostat should be mounted on the last but one and the overload protecting thermostat on the last tube

Quand les dispositifs de refroidissement de quelques tubes sont reliés en série, il faut monter le thermostat pour le réglage de l'eau de refroidissement sur le tube final à un près et le thermostat de sécurité contre la surcharge sur le tube final

Wenn die Kühlvorrichtungen einiger Röhren in Reihe geschaltet werden, soll der Thermostat zur Wassereinsparung auf die zweitletzte und der Überlastungsschutzthermostat auf die letzte Röhre montiert werden

Dimensions in mm
Dimensions en mm
Abmessungen in mm

Unfolded length 330mm
Longueur dépliée 330mm
Entfaltete Länge 330mm



Ignitor connector
Connexion de l'électrode d'amorçage
Zündelektrodenanschluss
(Type Nr.55351)

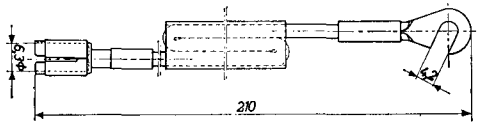
Cooling (continued)
Refroidissement (suite)
Kühlung (Fortsetzung)

When the cooling systems of a number of tubes are connected in series, the water saving thermostat should be mounted on the last but one and the overload protecting thermostat on the last tube

Quand les dispositifs de refroidissement de quelques tubes sont reliés en série, il faut monter le thermostat pour le réglage de l'eau de refroidissement sur le tube final à un près et le thermostat de sécurité contre la surcharge sur le tube final

Wenn die Kühlvorrichtungen einiger Röhren in Reihe geschaltet werden, soll der Thermostat zur Wassereinsparung auf die zweitletzte und der Überlastungsschutzthermostat auf die letzte Röhre montiert werden

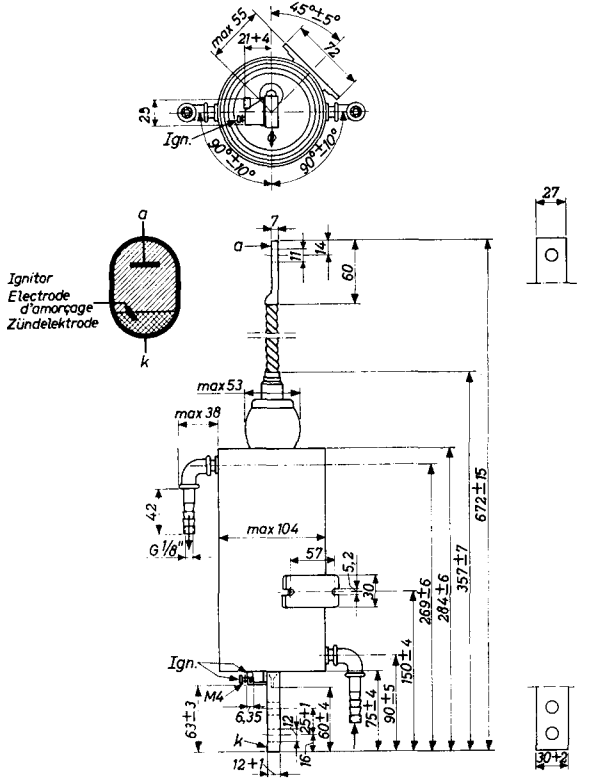
Ignitor connector. Unfolded length 330 mm
Connexion de l'électrode d'amorçage. Longueur dépliée 330 mm
Zündelektrodenanschluss. Entfaltete Länge 330 mm



Dimensions in mm
Dimensions en mm
Abmessungen in mm

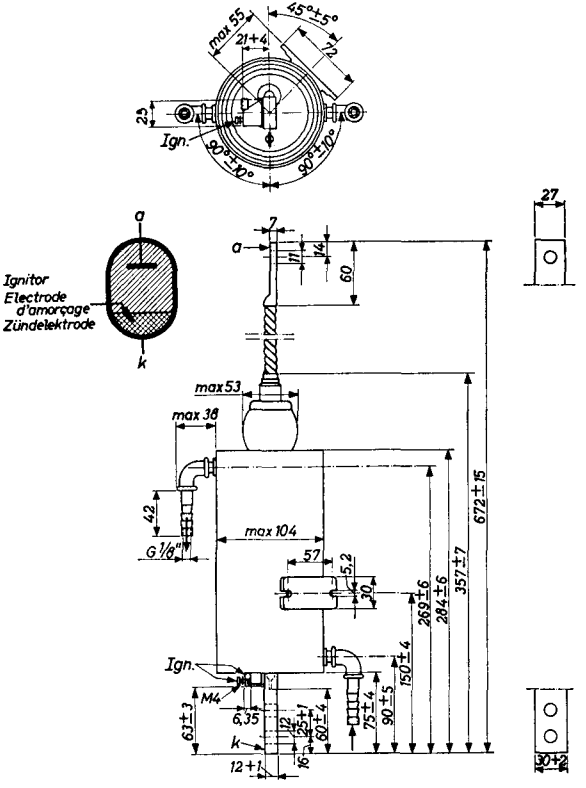
Type No. 55351-01

Dimensions in mm
Dimensions en mm
Abmessungen in mm



Mounting position: vertical, anode connection up
Montage : vertical, la connexion de l'anode en haut
Einbau : senkrecht, Anodenanschluss oben

Dimensions in mm
Dimensions en mm
Abmessungen in mm



Mounting position: vertical, anode connection up
Montage : vertical, la connexion de l'anode en haut
Einbau : senkrecht, Anodenanschluss oben

Limiting values (Absolute limits)
Caractéristiques limites (Limites absolues)
Grenzdaten (Absolute Grenzwerte)

Remark: The limiting values are based on full-cycle conduction without phase delay, regardless of whether or not phase control is used
Observation: Les caractéristiques limites s'appliquent à une conduction pendant le cycle complet sans décalage, abstraction faite d'un contrôle de phase éventuel
Bemerkung: Die Grenzwerte beziehen sich auf einen Stromdurchgang ohne Phasendrehung während der ganzen Periode, auch wenn mit Phasenanschnitt gearbeitet wird

Single phase A.C. control; two tubes in inverse parallel connection
Réglage de courant alternatif monophasé; deux tubes en montage anti-parallèle
Einphasen-Wechselstromsteuerung; zwei Röhren in Anti-Parallelschaltung

Mains voltage Tension de secteur (Veff) Netzspannung	220	250	380	500	600
Max. demand Demande de puissance max. [1] (kVA) Max.Leistungsbedarf	1060	1200	1200	1200	1200
Ia max. [2] (A)	75,6	75,6	75,6	75,6	75,6
Ia max. (A)	140	140	140	140	140
Max. demand Demande de puissance max. [3] (kVA) Max.Leistungsbedarf	350	400	400	400	400
Tav max. [4] (sec)	14	14	9,4	7,0	5,8
Isurge p max. (T = max.0,15 sec) (A)	13400	13400	8800	6700	5600

[1]) See also page A; voir aussi page A; siehe auch Seite A

[2]) Max. average current of each tube at max. demand
Courant moyen max. par tube à la demande max.
Max. mittlerer Strom jeder Röhre bei dem max. Bedarf

[3]) Max. demand at max. average current
Demande de puissance max. au courant moyen max.
Max. Leistungsbedarf bei dem max. mittleren Strom

[4]) For mains voltages between 250 V and 600 V, Tav is inversely proportional to the voltage
Pour les tensions de secteur entre 250 V et 600 V, Tav est inversement proportionnel à la tension
Für Netzspannungen zwischen 250 V und 600 V ist Tav umgekehrt proportional zu der Spannung

Limiting values (Absolute limits; continued)
Caractéristiques limites (Limites absolues; suite)
Grenzdaten (Absolute Grenzwerte; Fortsetzung)

See remark page 5
Voir l'observation page 5
Siehe Bemerkung Seite 5

Intermittent rectifier service
Service redresseur intermittent
Aussetzender Gleichrichterbetrieb

$V_{a\ fwd\ p}$	= max.	500 V
$V_{a\ inv\ p}$	= max.	500 V
I_{ap}	= max.	1600 A
I_a	= max.	100 A
T_{av}	= max.	6 sec

Ignitor; Electrode d'amorçage; Zündelektrode

Limiting values (Absolute limits)
Caractéristiques limites (Limites absolues)
Grenzdaten (Absolute Grenzwerte)

$V_{fwd\ p}$	= max.	$V_{a\ fwd\ p}$
$V_{inv\ p}$	= max.	5 V
I_p	= max.	100 A
I_{eff}	= max.	10 A
$I(T_{av}$ = max. 5 s)	= max.	1 A

A. Anode excitation
Excitation par la tension anodique
Anodenzündung

Ignitor characteristics
Caractéristiques de l'électrode d'amorçage
Kenndaten der Zündelektrode

Firing voltage
Tension d'amorçage
Zündspannung = max. 200 V

Firing current
Courant d'amorçage
Zündstrom = 6-8 A
= max. 12 A

Ignition time at the above voltage or current
Temps d'amorçage à la tension ou au courant sus-mentionnés
Zündzeit bei der obenerwähnten Spannung oder Strom = max. 100 µsec

Ignition circuit requirements
Exigences au circuit d'amorçage
Bedingungen für die Zündschaltung

Peak voltage required to fire
Tension de crête nécessaire pour l'amorçage
Zur Zündung erforderliche Spitzenspannung = min. 200 V

Peak current required to fire
Courant de crête nécessaire pour l'amorçage
Zur Zündung erforderlicher Spitzenstrom. = min. 12 A

The rate of rise of the ignitor current must be sufficient to reach the required ignition time (e.g. for an ignition time of max. 100 µsec, di/dt = min. 0,12 A/µsec)
Le taux d'accroissement du courant de l'électrode d'amorçage doit suffire à obtenir le temps d'amorçage requis (p.e. pour un temps d'amorçage de 100 µsec au max., di/dt = 0,12 A/µsec au moins)
Die Zunahme des Zündstromes muss genügen zur Erhaltung der erforderlichen Zündzeit (für eine Zündzeit von max. 100 µSek z.B. muss di/dt = min.0,12A/µSek sein)

Ignitor; Electrode d'amorçage; Zündelektrode

Limiting values (Absolute limits)
Caractéristiques limites (Limites absolues)
Grenzdaten (Absolute Grenzwerte)

Vfwd p	= max. Va fwd p
Vinv p	= max. 5 V
Ip	= max. 100 A
Ieff	= max. 10 A
I(T_{av} = max. 5 s)	= max. 1 A

A. Anode excitation
Excitation par la tension anodique
Anodenzündung

Ignitor characteristics
Caractéristiques de l'électrode d'amorçage
Kenndaten der Zündelektrode

Firing voltage
Tension d'amorçage = max. 200 V
Zündspannung

Firing current
Courant d'amorçage = 6-8 A
Zündstrom = max. 12 A

Ignition time at the above voltage or current
Temps d'amorçage à la tension ou au courant sus-mentionnés = max. 100 µsec
Zündzeit bei der obenerwähnten Spannung oder Strom

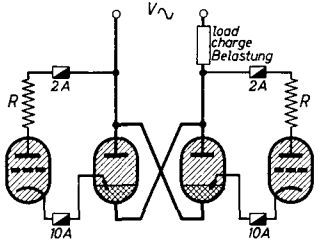
Ignition circuit requirements
Exigences au circuit d'amorçage
Bedingungen für die Zündschaltung

Peak voltage required to fire
Tension de crête nécessaire pour l'amorçage = min. 200 V
Zur Zündung erforderliche Spitzenspannung

Peak current required to fire
Courant de crête nécessaire pour l'amorçage = min. 12 A
Zur Zündung erforderlicher Spitzenstrom.

The rate of rise of the ignitor current must be sufficient to reach the required ignition time (e.g. for an ignition time of max. 100 µsec, di/dt = min. 0.12 A/µsec)
Le taux d'accroissement du courant de l'électrode d'amorçage doit suffire à obtenir le temps d'amorçage requis (p.e. pour un temps d'amorçage de 100 µsec au max., di/dt = 0,12 A/µsec au moins)
Die Zunahme des Zündstromes muss genügen zur Erhaltung der erforderlichen Zündzeit (für eine Zündzeit von max. 100 µSek z.B. muss di/dt = min.0,12 A/µSek sein)

Recommended circuit for anode excitation
Circuit recommandé pour excitation par la tension anodique
Empfohlene Schaltung für Anodenzündung

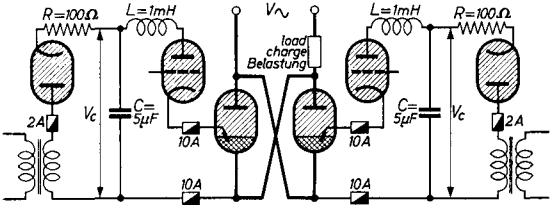


Recommended value of R
Valeur recommandée de R
Empfohlener Wert von R

Mains voltage Tension de secteur Netzspannung	R
220 Veff	2 Ω
250 Veff	2 Ω
380 Veff	4 Ω
500 Veff	5 Ω
600 Veff	6 Ω

B. Separate excitation
Excitation séparée
Fremdsteuerung

Recommended circuit
Circuit recommandé
Empfohlene Schaltung

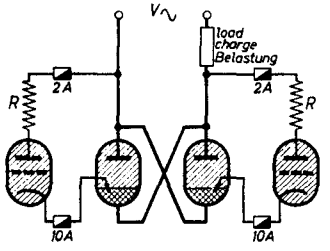


Ohmic resistance of series inductance (1 mH)
Résistance ohmique de l'inductance en série(1 mH) = max. 2 Ω
Ohmscher Widerstand der Serienselbstinduktion(1 mH)

Vc { Under operating conditions / Dans les conditions de fonctionnement / Unter Betriebsverhältnisse } = 650±50 V

Peak value of closed circuit current
Valeur de crête du courant en circuit fermé = 40 - 50 A
Spitzenwert des Stromes bei geschlossenem Kreis

Recommended circuit for anode excitation
Circuit recommandé pour excitation par la tension anodique
Empfohlene Schaltung für Anodenzündung

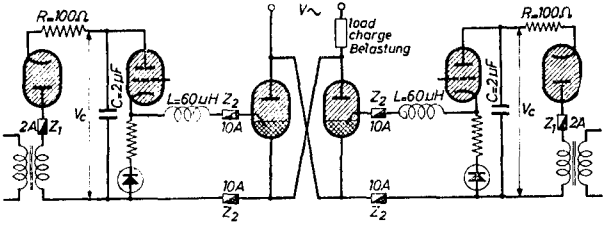


Recommended value of R
Valeur recommandée de R
Empfohlener Wert von R

Mains voltage Tension de secteur *Netzspannung*	R
220 Veff	2 Ω
250 Veff	2 Ω
380 Veff	4 Ω
500 Veff	5 Ω
600 Veff	6 Ω

→ B. Separate excitation
Excitation séparée
Fremdsteuerung

Recommended circuit
Circuit recommandé
Empfohlene Schaltung



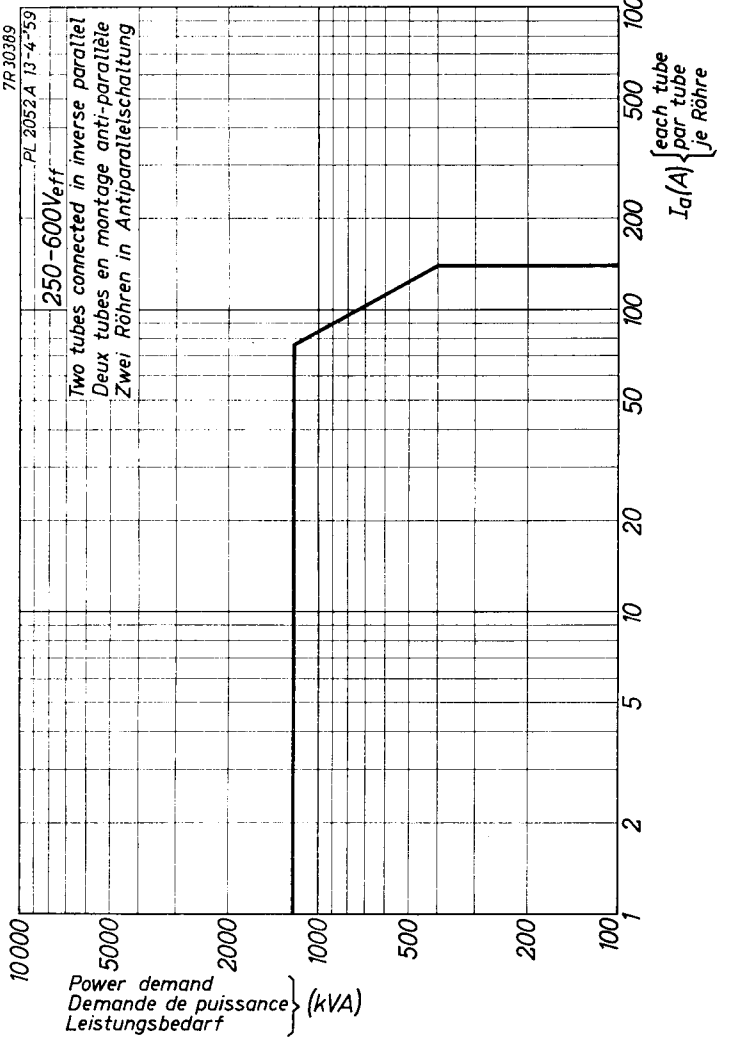
Ohmic resistance of 60 µH inductance
Résistance ohmique de l'inductance de 60 µH = max. 2 Ω
Ohmscher Widerstand der Selbstinduktion von 60 µH

V_c { Under operating conditions / Dans les conditions de fonctionnement / Unter Betriebsverhältnisse } = 650±50 V

Peak value of closed circuit current
Valeur de crête du courant en circuit fermé = 80-100 A
Spitzenwert des Stromes bei geschlossenem Kreis

PHILIPS PL 5552A

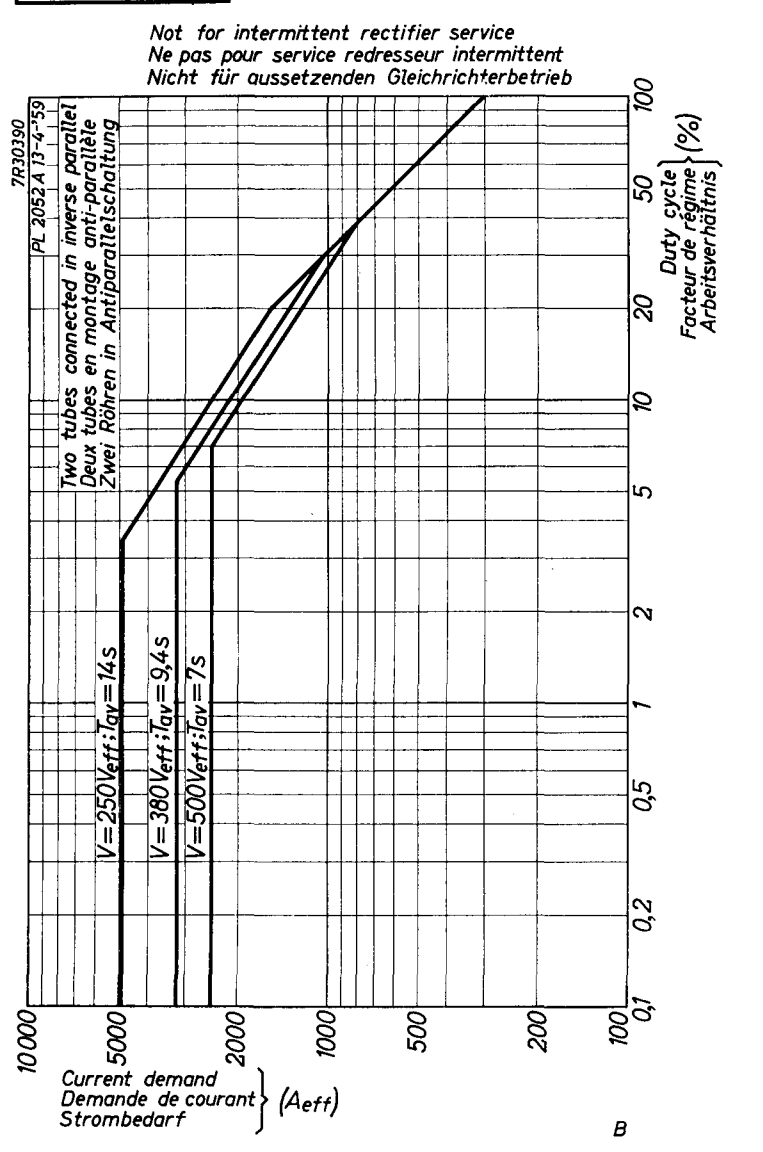
Not for intermittent rectifier service
Ne pas pour service redresseur intermittent
Nicht für aussetzenden Gleichrichterbetrieb



5.5.1959

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PL 5552A PHILIPS



PHILIPS

Electronic Tube

HANDBOOK

PL5552A

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1	1	1956.10.10
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5	3	1956.10.10
6	3	1959.05.05
7	3	1961.06.06
8	4	1959.05.05
9	4	1961.06.06
10	5	1959.05.05
11	6	1959.05.05
12	7	1959.05.05
13	7	1962.10.10
14	8	1959.05.05
15	8	1962.10.10
16	A	1959.05.05
17	B	1959.05.05
18	FP	2000.05.28

Water cooled IGNITRON with provisions for mounting a thermostatic control unit
IGNITRON à refroidissement par eau avec possibilité de monter un dispositif à commande thermostatique
Wassergekühltes IGNITRON mit Anordnung zur Montierung einer thermostatischen Regelvorrichtung

Application: Single and three-phase welding control and similar control applications. Equipped with suitable thermostatic switches it has the advantage of diminishing the cooling-water consumption and of protecting the tube and associated equipment from overloads and overheating
Application: Réglage en soudage monophasé et triphasé et autres réglages simulaires. Fonctionnant avec des commutateurs thermostatiques appropriés, il présente l'avantage de diminuer la consommation d'eau de refroidissement et de protéger le tube et les appareils auxiliaires contre les surcharges et le surchauffage.
Anwendung : Regelung von Einphasen- und Dreiphasenschweissung und ähnliches. Ausgerüstet mit geeigneten thermostatischen Schaltern bietet es den Vorteil eines verminderten Kühlwasserbedarfs und erhöhten Schutzes der Röhre und der dazugehörigen Ausrüstung gegen Überlastung und Überhitzung

Cooling water thermostat
Thermostat d'eau de refroidissement 55305
Kühlwasserthermostat

Overload protecting switch
Interrupteur de securité contre la surcharge 55306
Überlastungsschutzschalter

Cooling; Refroidissement; Kühlung

Typical characteristics
Caractéristiques types
Kenndaten

p_i (q = 12 l/min.) = max. 0,4 kg/cm²
$t_o - t_i$ (q = 12 l/min.) = max. 6 °C

Limiting values
Caractéristiques limites [1])
Grenzdaten

A. With thermostatic control
Avec réglage thermostatique
Mit thermostatischer Regelung

t_i = min. 10 °C q = min. 12 l/min.[2])[3])
t_i = max. 40 °C t_o = max. 45 °C

[1])[2])[3])See page 2; voir page 2; siehe Seite 2

Water cooled IGNITRON with provisions for mounting a thermostatic control unit
IGNITRON à refroidissement par eau avec possibilité de monter un dispositif à commande thermostatique
Wassergekühltes IGNITRON mit Anordnung zur Montierung einer thermostatischen Regelvorrichtung

Application: Single and three phase welding control and similar control applications. Equipped with suitable thermostatic switches it has the advantage of diminishing the cooling-water consumption and of protecting the tube and associated equipment from overloads and overheating

Application: Réglage en soudage monophasé et triphasé et d'autres réglages similaires. Fonctionnant avec des commutateurs thermostatiques propres, il présente l'avantage de diminuer la consommation d'eau de refroidissement et de protéger le tube et les appareils auxiliaires contre les surcharges et le surchauffage

Anwendung: Regelung von Einphasen- und Dreiphasenschweissung und ähnliches. Ausgerüstet mit geeigneten thermostatischen Schaltern bietet es den Vorteil eines verminderten Kühlwasserbedarfs und erhöhten Schutzes der Röhre und der dazugehörigen Ausrüstung gegen Überlastung und Überhitzung

Frequency range
Gamme de fréquences
Frequenzbereich
$f = 25 - 60$ c/s

Net weight		Shipping weight	
Poids net	9,6 kg	Poids brut	12,6 kg
Nettogewicht		Bruttogewicht	

Water saving thermostat
Thermostat pour économie d'eau 55305
Thermostat zur Wassereinsparung

Overload protecting switch
Interrupteur de sécurité contre la surcharge 55306
Überlastungsschutzschalter

Cooling; refroidissement; Kühlung

Typical characteristics
Caractéristiques types
Kenndaten

p_i (q = 9 l/min.) = max. 0,35 kg/cm^2
$t_o - t_i$ (q = 9 l/min.) = max. 6 °C

B. Without thermostatic control
Sans réglage thermostatique
Ohne thermostatische Regelung

q	= min.12 l/min.[2])
t_i	= min.10 °C
t_o	= max.40 °C

Net weight
Poids net 9600 g
Nettogewicht

Shipping weight
Poids brut 18 000 g
Bruttogewicht

Frequency range
Gamme de fréquences 25 - 60 c/s
Frequenzbereich

Mounting position: vertical, anode connection up
Montage : vertical, la connexion de l'anode en haut
Einbau : senkrecht, Anodenanschluss oben

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[1])When the cooling systems of the tubes are connected in series the max. values of t_o and t_i hold for the hottest tube

Lorsque les dispositifs de refroidissement des tubes sont reliés en série, les valeurs maxima de t_o et t_i sont valable pour le tube à sa température la plus elevée.

Werden die Kühlsysteme der Röhren in Serie geschaltet, so gelten die Maximalwerte t_o und ti für die heisseste Röhre

[2])At max. demand
A la demande d'énergie maximum
Bei maximalem Energiebedarf

[3])Solenoid valve open
Soupape à solénoïde ouverte
Solenoidventil offen

Cooling (continued)
Refroidissement (suite)
Kühlung (Fortsetzung)

Limiting values (with or without thermostatic control; absolute limits)
Caractéristiques limites (sans ou avec réglage thermostatique; limites absolues)
Grenzdaten (mit oder ohne thermostatische Regelung; absolute Grenzwerte)

A.C. control service
Service de réglage C.A.
Wechselstromsteuerung

q	= min. 9 l/min.[1]
ti	= min. 10 °C [2] = max. 40 °C [2]
tm (V = 220-250 Veff)	= max. 60 °C [3]
tm (V = 380 Veff)	= max. 55 °C
tm (V = 500 Veff)	= max. 55 °C
tm (V = 600 Veff)	= max. 50 °C

Intermittent rectifier or three-phase welding service
Service redresseur intermittent ou soudage triphasé
Aussetzender Gleichrichter- oder Dreiphasenschweissbetrieb

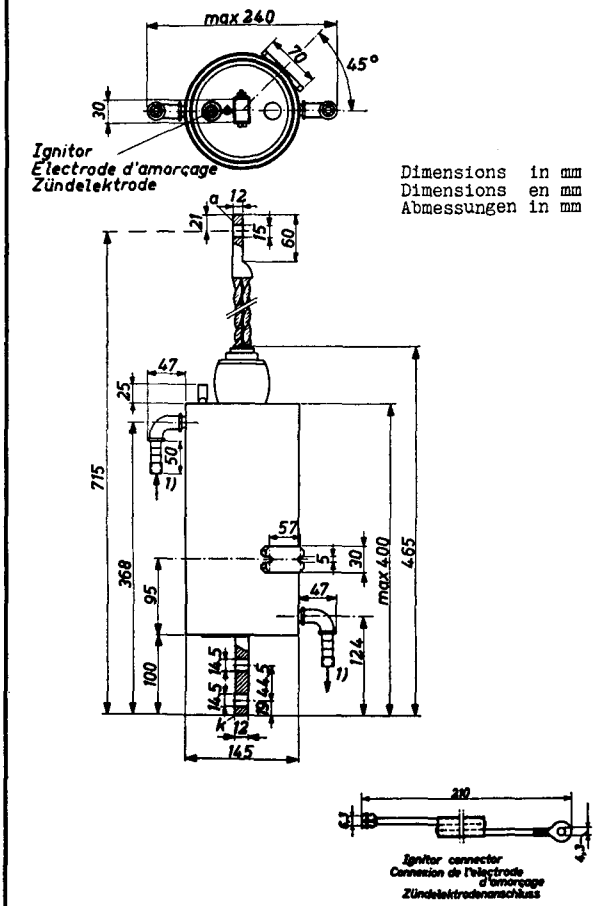
q	= min. 9 l/min.[1]
t_i	= min. 10 °C [2] = max. 35 °C [2]
t_m	= max. 45 °C [3]

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[1]) At max. demand and max. I_a; solenoid valve open
A la demande d'énergie max. et à I_a max.; soupape à solénoïde ouverte
Bei max. Energiebedarf und max. I_a; Solenoidventil offen

[2]) When a number of tubes is cooled in series, t_i min is measured at the coldest and t_i max. at the hottest tube
Si un nombre de tubes est refroidi en série, t_i min est mesuré au tube le plus froid et t_i max au tube le plus chaud
Wenn mehrere Röhren in Reihe gekühlt werden, muss t_i min an der kältesten und t_i max an der heissesten Röhre gemessen werden

[3]) t_m = temperature of thermostat mount
Warning: The thermostat mount is at full line voltage
t_m = température de la plaque de montage du thermostat
Avis: La plaque de montage du thermostat est à la tension du secteur
t_m = Temperatur der Montageplatte des Thermostats
Warnung: Die Montageplatte des Thermostats befindet sich auf Netzspannung



[1]) 1/8" pipe thread; 1/8" pas à gaz; 1/8" Gasrohrgewinde

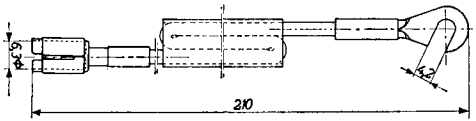
Cooling (continued)
Refroidissement (suite)
Kühlung (Fortsetzung)

When the cooling systems of a number of tubes are connected in series, the water saving thermostat should be mounted on the last but one and the overload protecting thermostat on the last tube. In three phase welding service using six tubes it is recommended to cool notmore than three tubes in series

Quand les dispositifs de refroidissement de quelques tubes sont reliés en série, il faut monter le thermostat pour le réglage de l'eau de refroidissement sur le tube final à un près et le thermostat de sécurité contre la surcharge sur le tube final. En service de soudure triphasé avec six tubes il est recommandé de ne pas refroidir plus de trois tubes en série

Wenn die Kühlvorrichtungen einiger Röhren in Reihe geschaltet werden, soll der Thermostat zur Wassereinsparung auf die zweitletzte und der Überlastungsschutzthermostat auf die letzte Röhre montiert werden. Bei Dreiphasenschweissbetrieb unter Verwendung von sechs Röhren wird es empfohlen nicht mehr als drei Röhren in Reihe zu kühlen

Ignitor connector. Unfolded length 330 mm
Conexion de l'électrode d'amorçage. Longueur déplíée 330 mm
Zündelektrodenanschluss. Entfaltete Länge 330 mm



Dimensions in mm
Dimensions en mm
Abmessungen in mm

Type No. 55351-01

Limiting values (ABSOLUTE VALUES)
Caractéristiques limites (VALEURS ABSOLUES)
Grenzdaten (ABSOLUTE WERTE)

A.C. control: Two tubes in inverse parallel connection will control 2400 kVA at 250 - 600 V and 2120 kVA at 220 V (see table below) f = 25-60 c/s
Réglage C.A.: Deux tubes en montage anti-parallèle peuvent régler 2400 kVA à 250 - 600 V et 2120 kVA à 220 V (voir le tableau ci-dessous) f = 25-60 Hz
Wechselstromregelung: Zwei Röhren in Anti-Parallelschaltung können bei 250 - 600 V 2400 kVA und bei 220 V 2120 kVA steuern (siehe untenstehende Tabelle) f = 25-60 Hz

W = Demand; Demande d'énergie; Energiebedarf

V	W [1]	I_a [1] (max)	I_{a_p} (max)	T_{av} (max)	I_{surge} (T=max.0,15s) (max)
(V_{eff})	(kVA)	(A)	(A)	(s)	(A)
220	2120 [3] 705	192 355	13500 4500	11	27000
250	2400 [3] 800	192 355	13500 4500	11 [4]	27000
380	2400 [3] 800	192 355	8900 2950	7,3 [4]	17800
600 [2]	2400 [3] 800	192 355	5600 1870	4,6 [4]	11200

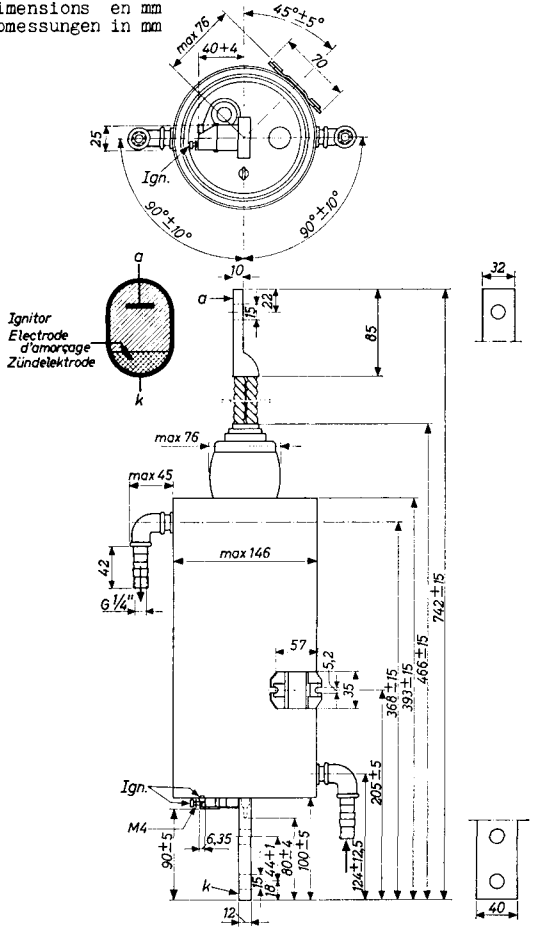
Rectifying tube (intermittent service)
Tube redresseur (service intermittent) f = 50-60 c/s
Gleichrichterröhre (aussetzender Betrieb)

[+])T_{av} = 0,2 s [++])T = max.0,15 s

$V_{a_{fwd_p}}$	$V_{a_{inv_p}}$	I_a	I_{ap} (max)	T_{av} (max)	$\frac{I_a}{I_{a_p}}$ [+])	I_{surge} [++]) (max)
(V)	(V)	(A)	(A)	(s)		(A)
600	600	54 190 [3]	4000 1140	6,25	0,166	50000 14250
1200	1200	40 140 [3]	3000 840	6,25	0,166	37500 10500
1500	1500	32 112 [3]	2400 672	6,25	0,166	30000 8400

1)2)3)4) See page 6; voir page 6; siehe Seite 6

Dimensions in mm
Dimensions en mm
Abmessungen in mm



Mounting position: vertical, anode connection up
Montage : vertical, la connexion de l'anode en haut
Einbau : senkrecht, Anodenanschluss oben

Ignitor; Electrode d'amorçage; Zündelektrode

Requirements for cathode excitation
Conditions pour l'excitation de la cathode
Bedingungen für Katodeerregung

V_{fwd_p}	$\geq$	200 V
I_p	$\geq$	30 A

Typical value of starting time at required voltage or current
Valeur type du temps d'amorçage à la tension ou au courant demandé
Mittelwert der Zündungszeit bei der erforderlichen Spannung oder Strom

100 µsec

Limiting values
Caractéristiques limites
Grenzdaten

V_{fwd_p}	= max.	900 V
V_{inv_p}	= max.	5 V
I_p	= max.	100 A
Irms	= max.	10 A
I_{av} (T_{av} = max. 5 sec.)	= max.	1 A

Remark: The limiting values of the demand voltage, current and kVA are on the basis of full cycle conduction without phase delay, regardless of whether or not phase control is used

Observation: Les valeurs limites de la tension, du courant et de la demande d'énergie se basent sur une conduction pendant le cycle complet sans décalage, abstraction faite d'un contrôle de phase éventuel

Bemerkung: Dei grenzwerte der Spannung, des Stromes und des Energiebedarfs sind basiert auf einen Stromdurchgang ohne Phasendrehung während der ganzen Periode, abgesehen von einem eventuellen Phasenanschnitt

Limiting values (Absolute limits)
Caractéristiques limites (Limites absolues)
Grenzdaten (Absolute Grenzwerte)

Remark: The limiting values are based on full-cycle conduction without phase delay, regardless of whether or not phase control is used
Observation: Les caractéristiques limites s'appliquent à une conduction pendant le cycle complet sans décalage, abstraction faite d'un contrôle de phase éventuel
Bemerkung: Die Grenzwerte beziehen sich auf einen Stromdurchgang ohne Phasendrehung während der ganzen Periode, auch wenn mit Phasenanschnitt gearbeitet wird

Single phase A.C. control; two tubes in inverse parallel connection
Réglage de courant alternatif monophasé; deux tubes en montage anti-parallele
Einphasen-Wechselstromsteuerung; zwei Röhren in Anti-Parallelschaltung

Mains voltage Tension de secteur (V_{eff}) Netzspannung	220	250	380	500	600
Max. demand Demande de puissance max. [1] (kVA) Max.Leistungsbedarf	2120	2400	2400	2400	2400
Ia max. [2] (A)	192	192	192	192	192
Ia max. (A)	355	355	355	355	355
Max. demand Demande de puissance max. [3] (kVA) Max.Leistungsbedarf	705	800	800	800	800
T_{av} max. [4] (sec)	11	11	7,3	5,6	4,6
Isurge p max. (T = max. 0,15 sec) (A)	27000	27000	17800	13500	11200

[1]) See also page A; voir aussi page A; siehe auch Seite A

[2]) Max. average current of each tube at max. demand
Courant moyen max. par tube à la demande max.
Max. mittlerer Strom jeder Röhre bei dem max. Bedarf

[3]) Max. demand at max. average current
Demande de puissance max. au courant moyen max.
Max. Leistungsbedarf bei dem max. mittleren Strom

[4]) For mains voltages between 250 V and 600 V, T_{av} is inversely proportional to the voltage
Pour les tensions de secteur entre 250 V et 600 V, T_{av} est inversement proportionnel à la tension
Für Netzspannungen zwischen 250 V und 600 V ist T_{av} umgekehrt proportional zu der Spannung

[1])For other values of the demand the corresponding max. average anode current per tube (I_a) may be derived from the curve on page A

Pour autres valeurs de la demande d'énergie le courant moyen correspondant max. de l'anode par tube (I_a) peut être dérivé de la courbe sur page A

Für andere Werte des Energiebedarfs ist der entsprechende maximale Mittelwert des Anodenstromes pro Röhre (I_a) von der Kurve auf Seite A abzuleiten

[2])Max. permissible value
Valeur admissible maximum
Max. zulässiger Wert

[3])Max. value at the indicated voltage
Valeur max. à la tension indiquée
Max. Wert bei gegebener Spannung

[4])For intermediate values T_{av} is inversely proportional to the voltage

Pour des valeurs intermédiaires T_{av} est inversement proportionnel à la tension

Für zwischenliegenden Werte ist T_{av} umgekehrt proportional zu der Spannung

Limiting values (Absolute limits; continued)
Caractéristiques limites (Limites absolues; suite)
Grenzdaten (Absolute Grenzwerte; Fortsetzung)

See remark page 5
Voir l'observation page 5
Siehe Bemerkung Seite 5

Intermittent rectifier service or Frequency changer resistance welding service
Service redresseur intermittent ou Service soudeur à résistance avec conversion de fréquence
Aussetzender Gleichrichterbetrieb oder Widerstandsschweissbetrieb mit Frequenzumformung

Frequency range
Gamme de fréquences 50-60 c/s
Frequenzbereich

Va fwd p (V)	600	1200	1500
Va inv p (V)	600	1200	1500
Iap max (A)	4000	3000	2400
Ia max [1] (A)	54	40	32
Ia max (A)	190	140	112
Iap max [2] (A)	1140	840	672
Tav max (sec)	6,25	6,25	6,25
$\frac{Ia}{Iap}$ (max)(Tav = max. 0,2 sec)	0,166	0,166	0,166
→ $\frac{I_{surge\ p}}{Iap}$ (max) [3]	12,5	12,5	12,5

[1]) Max. average current at max. peak current
Courant moyen max. au courant de crête max.
Max. mittlerer Strom beim max. Spitzenwert des Stromes

[2]) Max. peak current at max. average current
Courant de crête max. au courant moyen max.
Max. Spitzenwert des Stromes bei dem max. mittleren Strom

[3]) $T(I_{surge})$ = max. 0,15 sec

Ignitor; Electrode d'amorçage; Zündelektrode

Limiting values (Absolute limits)
Caractéristiques limites (Limites absolues)
Grenzdaten (Absolute Grenzwerte)

$V_{fwd\ p}$	= max.	$V_{a\ fwd\ p}$
$V_{inv\ p}$	= max.	5 V
I_p	= max.	100 A
I_{eff}	= max.	10 A
$I(T_{av}$ = max. 5 s)	= max.	1 A

A. Anode excitation
Excitation par la tension anodique
Anodenzündung

Ignitor characteristics
Caractéristiques de l'électrode d'amorçage
Kenndaten der Zündelektrode

Firing voltage Tension d'amorçage Zündspannung	= max.	200 V
Firing current Courant d'amorçage Zündstrom	= = max.	6-8 A 12 A
Ignition time at the above voltage or current Temps d'amorçage à la tension ou au courant sus-mentionnés Zündzeit bei der obenerwähnten Spannung oder Strom	= max.	100 µsec

Ignition circuit requirements
Exigences au circuit d'amorçage
Bedingungen für die Zündschaltung

Peak voltage required to fire Tension de crête nécessaire pour l'amorçage Zur Zündung erforderliche Spitzenspannung	= min.	200 V
Peak current required for anode take over Courant de crête nécessaire pour l'amorçage de l'anode principale Zur Zündung der Hauptanode erforderlicher Spitzenstrom	= min.	30 A [1]

[1]) The rate of rise of the ignitor current must be sufficient to reach the required ignition time (e.g. for an ignition time of max. 100 µsec, di/dt= min. 0,3 A/µsec)
Le taux d'accroissement du courant de l'électrode d'amorçage doit suffire à obtenir le temps d'amorçage requis (p.e. pour un temps d'amorçage de 100 µsec au max., di/dt = 0,3 A/µsec au moins)

Siehe Seite 8

Ignitor; Electrode d'amorçage; Zündelektrode

Limiting values (Absolute limits)
Caractéristiques limites (Limites absolues)
Grenzdaten (Absolute Grenzwerte)

$V_{fwd\ p}$	= max. $V_{a\ fwd\ p}$
$V_{inv\ p}$	= max. 5 V
I_p	= max. 100 A
I_{eff}	= max. 10 A
$I(T_{av}$ = max. 5 s)	= max. 1 A

A. Anode excitation
Excitation par la tension anodique
Anodenzündung

Ignitor characteristics
Caractéristiques de l'électrode d'amorçage
Kenndaten der Zündelektrode

Firing voltage
Tension d'amorçage = max. 200 V
Zündspannung

Firing current
Courant d'amorçage = 6-8 A
Zündstrom = max. 12 A

Ignition time at the above voltage or current
Temps d'amorçage à la tension ou au courant sus-mentionnés = max. 100 µsec
Zündzeit bei der obenerwähnten Spannung oder Strom

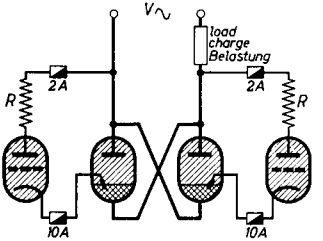
Ignition circuit requirements
Exigences au circuit d'amorçage
Bedingungen für die Zündschaltung

Peak voltage required to fire
Tension de crête nécessaire pour l'amorçage = min. 200 V
Zur Zündung erforderliche Spitzenspannung

Peak current required for anode take over
Courant de crête nécessaire pour l'amorçage de l'anode principale = min. 30 A [1])
Zur Zündung der Hauptanode erforderlicher Spitzenstrom

[1]) The rate of rise of the ignitor current must be sufficient to reach the required ignition time (e.g. for an ignition time of max. 100 µsec, di/dt= min. 0,3 A/µsec)
Le taux d'accroissement du courant de l'électrode d'amorçage doit suffire à obtenir le temps d'amorçage requis (p.e. pour un temps d'amorçage de 100 µsec au max., di/dt = 0,3 A/µsec au moins)
Siehe Seite 8

Recommended circuit for anode excitation
Circuit recommandé pour excitation par la tension anodique
Empfohlene Schaltung für Anodenzündung

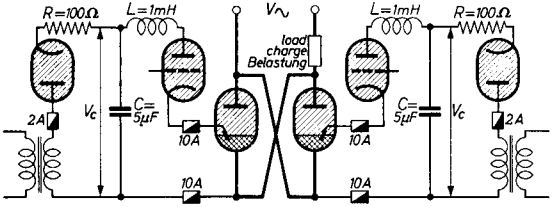


Recommended value of R
Valeur recommandée de R
Empfohlener Wert von R

Mains voltage Tension de secteur Netzspannung	R
220 Veff	2 Ω
250 Veff	2 Ω
380 Veff	4 Ω
500 Veff	5 Ω
600 Veff	6 Ω

B. Separate excitation
Excitation séparée
Fremdsteuerung

Recommended circuit
Circuit recommandé
Empfohlene Schaltung



Ohmic resistance of series inductance (1 mH)
Résistance ohmique de l'inductance en série(1 mH) = max. 2 Ω
Ohmscher Widerstand der Serienselbstinduktion(1 mH)

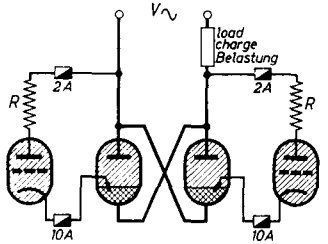
V_c { Under operating conditions / Dans les conditions de fonctionnement / Unter Betriebsverhältnisse } = 650±50 V

Peak value of closed circuit current
Valeur de crête du courent en circuit fermé = 40 - 50 A
Spitzenwert des Stromes bei geschlossenem Kreis

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[1]) Seite 7
Die Zunahme des Zündstromes muss genügen zur Erhaltung der erforderlichen Zündzeit (für eine Zündzeit von max. 100 µSek z.B. muss di/dt = min. 0,3 A/µSek sein)

Recommended circuit for anode excitation
Circuit recommandé pour excitation par la tension anodique
Empfohlene Schaltung für Anodenzündung

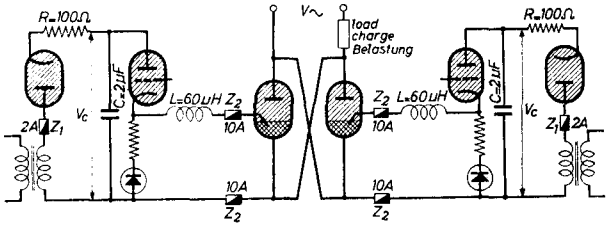


Recommended value of R
Valeur recommandée de R
Empfohlener Wert von R

Mains voltage Tension de secteur Netzspannung	R
220 Veff	2 Ω
250 Veff	2 Ω
380 Veff	4 Ω
500 Veff	5 Ω
600 Veff	6 Ω

→ B. Separate excitation
Excitation séparée
Fremdsteuerung

Recommended circuit
Circuit recommandé
Empfohlene Schaltung

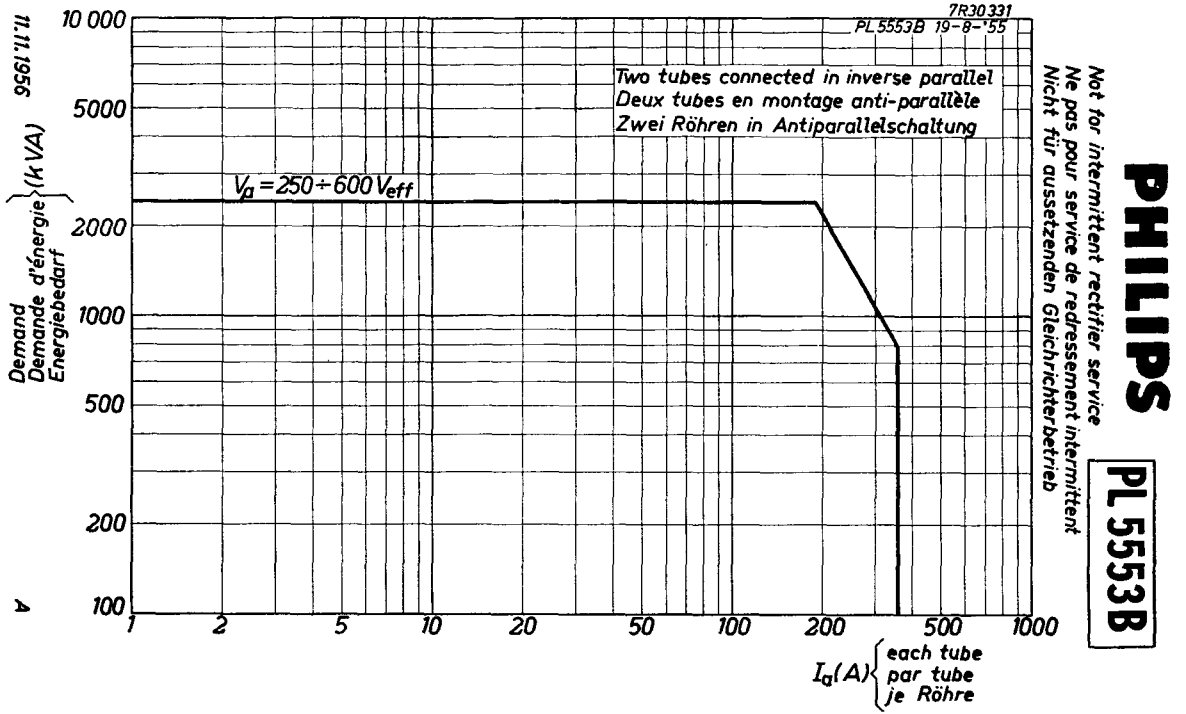


Ohmic resistance of 60 µH inductance
Résistance ohmique de l'inductance de 60 µH = max. 2 Ω
Ohmscher Widerstand der Selbstinduktion von 60 µH

V_c { Under operating conditions / Dans les conditions de fonctionnement / Unter Betriebsverhältnisse } = 650±50 V

Peak value of closed circuit current
Valeur de crête du courent en circuit fermé = 80-100 A
Spitzenwert des Stromes bei geschlossenem Kreis

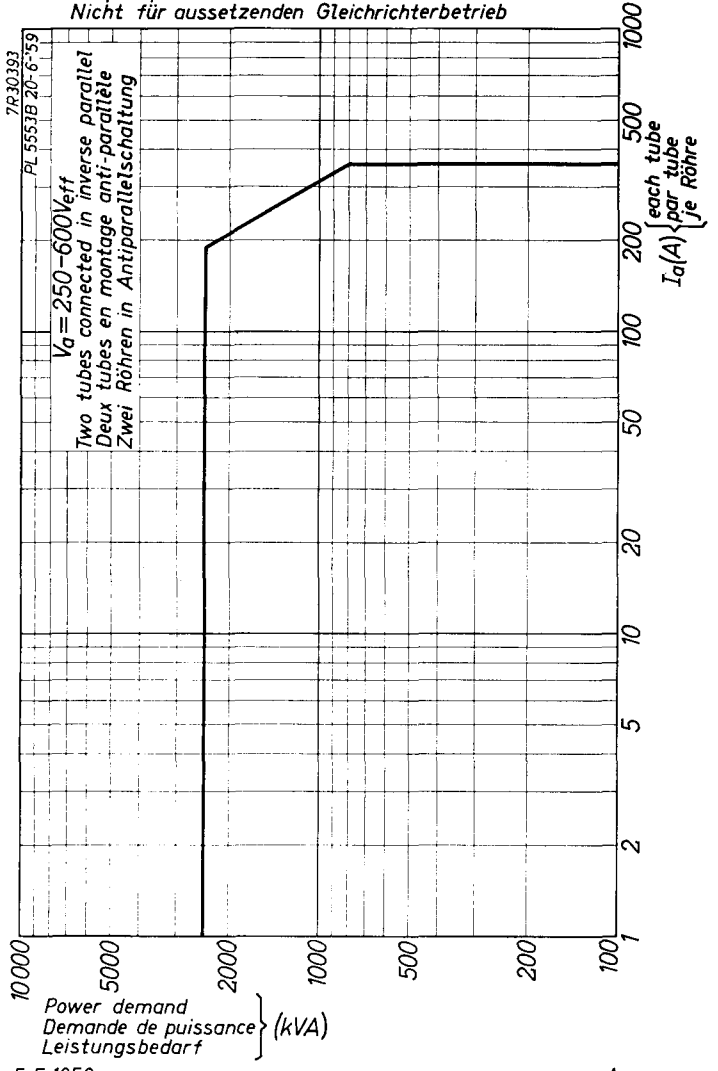
[1]) **Seite 7**
Die Zunahme des Zündstromes muss genügen zur Erhaltung der erforderlichen Zündzeit (für eine Zündzeit von max. 100 µSek z.B. muss di/dt = min. 0,3 A/µSek sein)


7R30331
PL5553B 19-8-'55
Two tubes connected in inverse parallel
Deux tubes en montage anti-parallèle
Zwei Röhren in Antiparallelschaltung
$V_a = 250 \div 600\ V_{eff}$
Demand
Demande d'énergie
Energiebedarf
(kVA)
10 000
5000
2000
1000
500
200
100
1
2
5
10
20
50
100
200
500
1000
I_a(A)
each tube
par tube
je Röhre
11.11.1956
A
PHILIPS
PL 5553B
Not for intermittent rectifier service
Ne pas pour service de redressement intermittent
Nicht für aussetzenden Gleichrichterbetrieb

PHILIPS

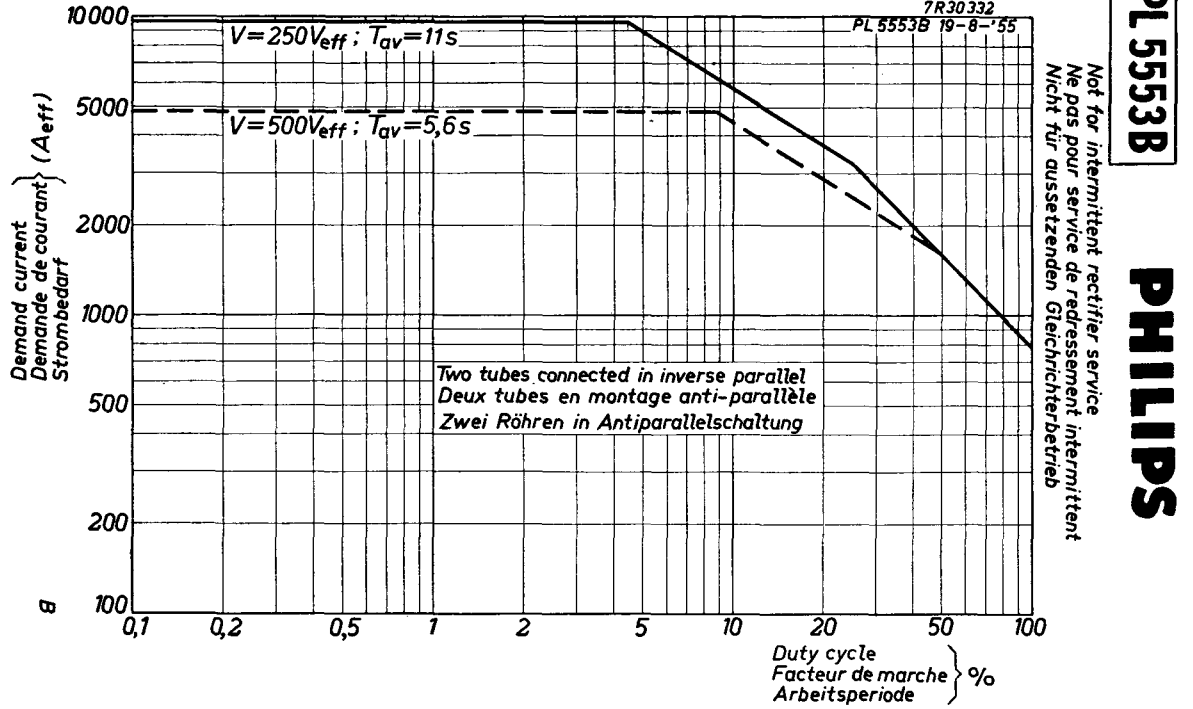
PL 5553B

Not for intermittent rectifier service
Ne pas pour service de redressement intermittent
Nicht für aussetzenden Gleichrichterbetrieb



5.5.1959

A


7R30332
PL 5553B 19-8-'55
PL 5553B
PHILIPS
Not for intermittent rectifier service
Ne pas pour service de redressement intermittent
Nicht für aussetzenden Gleichrichterbetrieb
10000
5000
2000
1000
500
200
100
V=250Veff ; Tav=11s
V=500Veff ; Tav=5,6s
Two tubes connected in inverse parallel
Deux tubes en montage anti-parallèle
Zwei Röhren in Antiparallelschaltung
Demand current
Demande de courant
Strombedarf
(Aeff)
0,1
0,2
0,5
1
2
5
10
20
50
100
Duty cycle
Facteur de marche
Arbeitsperiode
%

PL 5553B PHILIPS

Not for intermittent rectifier service
Ne pas pour service de redressement intermittent
Nicht für aussetzenden Gleichrichterbetrieb

7R30394
PL 5553 B 20-6-'59

$V = 250 V_{eff}$; $T_{av} = 11s$
$V = 380 V_{eff}$; $T_{av} = 7{,}3s$
$V = 500 V_{eff}$; $T_{av} = 5{,}6s$

Two tubes connected in inverse parallel
Deux tubes en montage anti-parallèle
Zwei Röhren in Antiparallelschaltung

Demand current
Demande de courant
Strombedarf } (A_{eff})

10000 5000 2000 1000 500 200 100

Duty cycle
Facteur de marche
Arbeitsverhältnis } (%)

0,1 0,2 0,5 1 2 5 10 20 50 100

B

PHILIPS

PL 5553B

Intermittent rectifier service
Service de redressement intermittent
Aussetzender Gleichrichterbetrieb

7R30333
PL 5553B 19-8-'55

I_{ap} (A)

10000
5000
2000
1000
500
200
100

$V_{a\ fwdp} = V_{a\ invp} = 600V$
1200V
1500V

I_a (A) {each tube / par tube / je Röhre} (T_{av} = max 6,25 s)

1
2
5
10
20
50
100
200
500
1000

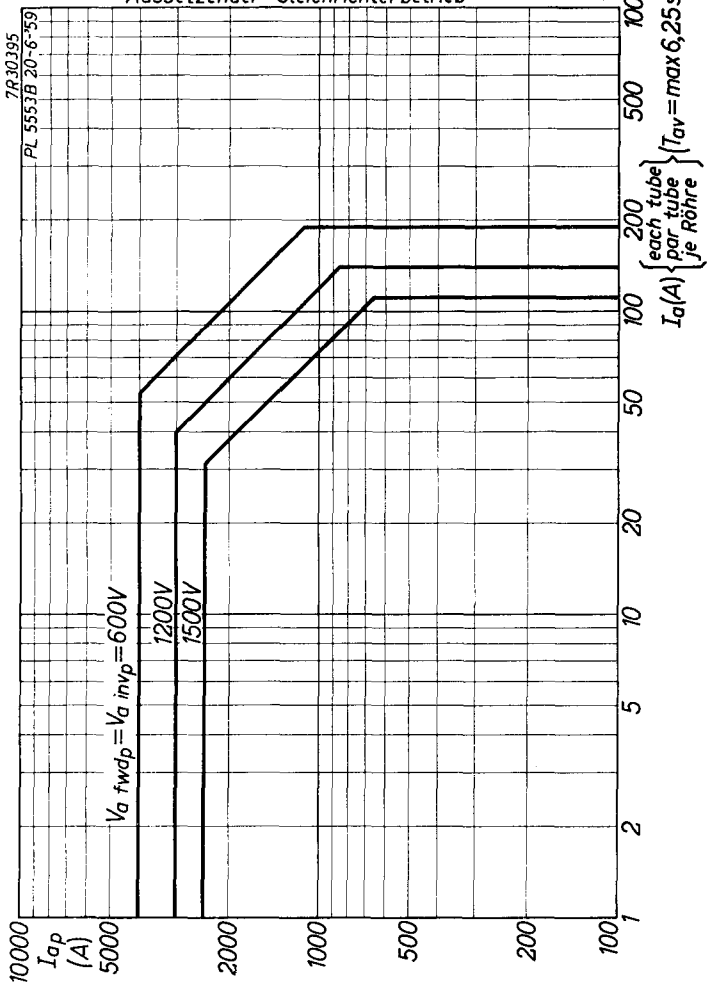
11.11.1956

C

PHILIPS

PL 5553B

Intermittent rectifier service
Service de redressement intermittent
Aussetzender Gleichrichterbetrieb



5.5.1959

C



PL5553B

page	sheet	date
1	1	1956.10.10
2	1	1959.05.05
3	2	1956.10.10
4	2	1959.05.05
5	3	1956.10.10
6	3	1961.06.06
7	4	1956.10.10
8	4	1961.06.06
9	5	1956.10.10
10	5	1959.05.05
11	6	1956.10.10
12	6	1959.05.05
13	7	1959.05.05
14	7	1962.10.10
15	8	1959.05.05
16	8	1962.10.10
17	A	1956.11.11
18	A	1959.05.05
19	B	1956.11.11

20	B	1959.05.05
21	C	1956.11.11
22	C	1959.05.05
23, 24	FP	2000.05.28

Water cooled IGNITRON
IGNITRON à refroidissement par l'eau
Wassergekühltes IGNITRON

Application: A.C. control: two tubes in inverse parallel connection will control 2400 kVA at 2400 V
Rectification: six tubes will rectify up to 300 kW at 300 V D.C. and up to 500 kW at 600 to 900 V D.C.

Application: Réglage C.A.: deux tubes en montage anti-parallèle peuvent régler 2400 kVA à 2400 V
Redressement: six tubes peuvent redresser jusqu'à 300 kW à 300 V tension continue et jusqu'à 500 kW à 600-900 V tension continue

Anwendung : Wechselstromregelung: zwei Röhren in Anti-Parallelschaltung können 2400 kVA regulieren bei 2400 V
Gleichrichtung: sechs Röhren können bis 300 kW bei 300 V Gleichspannung und 500 kW bei 600-900 V Gleichspannung gleichrichten

Frequency range
Gamme de fréquences 25 - 60 c/s
Frequenzbereich

Mounting position: vertical, anode connection up
Montage : vertical, la connection de l'anode en haut
Einbau : senkrecht, Anodenanschluss oben

Cooling	$q^{1})$	= min.	12 l/min
Refroidissement	p_i (q=12 l/min)	=	0,2-0,55 kg/cm^2
Kühlung	t_o-t_i (q=12 l/min)	= max.	4,5 °C
	t_i	= min.	6 °C [2])
	t_o (V_{ainv_p}= 900 V)	= max.	60 °C
	t_o (V_{ainv_p}=2100 V)	= max.	45 °C

Net weight		Shipping weight	
Poids net	9600 g	Poids brut	17100 g
Nettogewicht		Bruttogewicht	

[1])At max. demand
A la demande d'énergie maximum
Bei maximalem Energiebedarf

[2])Recommended value 10 °C
Valeur recommandée 10 °C
Empfohlener Wert 10 °C

PHILIPS PL 5555

Water cooled IGNITRON
IGNITRON à refroidissement par l'eau
Wassergekühltes IGNITRON

Application: A.C. control: two tubes in inverse parallel connection will control 2400 kVA at 2400 V
Rectification: six tubes will rectify up to 300 kW at 300 V D.C. and up to 500 kW at 600 to 900 V D.C.

Application: Réglage C.A.: deux tubes en montage anti-parallèle peuvent régler 2400 kVA à 2400 V
Redressement: six tubes peuvent redresser jusqu'à 300 kW à 300 V tension continue et jusqu'à 500 kW à 600-900 V tension continue

Anwendung: Wechselstromregelung: zwei Röhren in Anti-Parallelschaltung können 2400 kVA regulieren bei 2400 V
Gleichrichtung: sechs Röhren können bis 300 kW bei 300 V Gleichspannung und 500 kW bei 600-900 V Gleichspannung gleichrichten

Frequency range
Gamme de fréquences 25 - 60 c/s
Frequenzbereich

Mounting position: vertical, anode connection up
Montage : vertical, la connection de l'anode en haut
Einbau : senkrecht, Anodenanschluss oben

Cooling Refroidissement Kühlung			
	q [1]	= min.	12 l/min
	p_i (q=12 l/min)	=	0,2-0,55 kg/cm^2
	$t_o - t_i$ (q=12 l/min)	= max.	4,5 °C
	t_i	= min.	6 °C [2]
	t_o (V_{ainv_p}= 900 V)	= max.	60 °C
	t_o (V_{ainv_p}=2100 V)	= max.	45 °C

Net weight Poids net Nettogewicht	Shipping weight Poids brut Bruttogewicht
9600 g	17100 g

[1] At max. demand
A la demande d'énergie maximum
Bei maximalem Energiebedarf

[2] Recommended value 10 °C
Valeur recommandée 10 °C
Empfohlener Wert 10 °C

PHILIPS

PL 5555

Water cooled IGNITRON
IGNITRON à refroidissement par l'eau
Wassergekühltes IGNITRON

→ Application: Power rectification: Operation in 300, 600 and 900 V D.C. industrial rectifier circuits. Up to 400 V D.C. the continuous average anode current rating is 200 A per tube.
A.C. control: Single and three phase welding control and other control applications with constant or variable loading, intermittent or continuous.

Application: Redressement de puissance: Fonctionnement dans des circuits redresseurs industriels à 300, 600 et 900 V, tension continue. La valeur limite du courant anodique continu moyen jusqu'à 400 V tension continue est de 200 A par tube.
Réglage de courant alternative: Réglage en service de soudure monophasé et triphasé et d'autres applications de réglage avec charge constante ou variable, service continu ou intermittent.

Anwendung : Leistungsgleichrichtung: Betrieb in industriellen Gleichrichterschaltungen bei 300, 600 und 900 V Gleichspannung. Der Grenzwert des mittleren Anodendauerstromes bis zu 400 V Gleichspannung ist 200 A pro Röhre.
Wechselstromregelung: Regelung in Ein- und Dreiphasenschweissbetrieb und andere Regelanwendungen mit konstanter oder veränderlicher Belastung mit aussetzendem oder Dauerbetrieb.

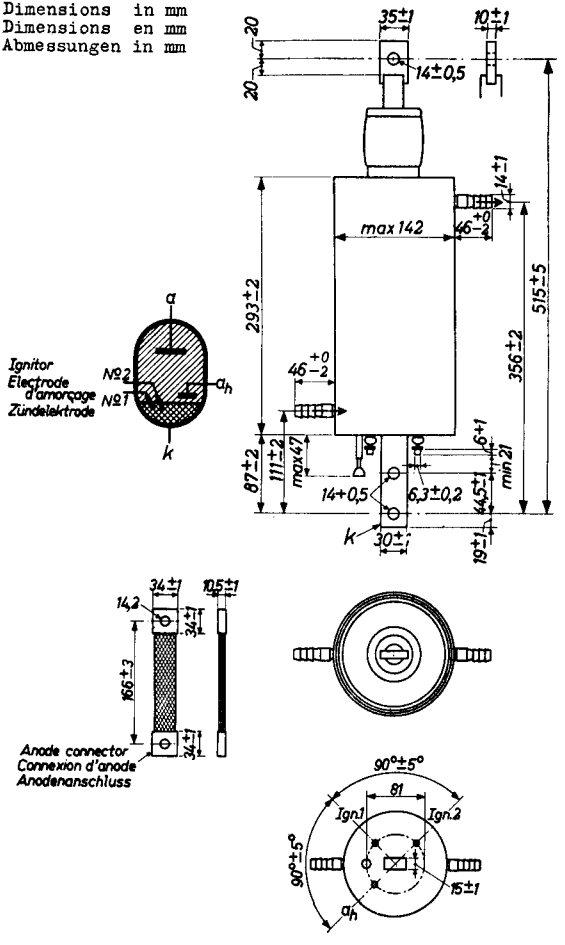
Frequency range
Gamme de fréquence 25-60 c/s
Frequenzbereich

Mounting position: vertical, anode connection up
Montage: vertical, la connection de l'anode en haut
Einbau : senkrecht, Anodenanschluss oben.

Net weight
Poids net 9,6 kg
Nettogewicht

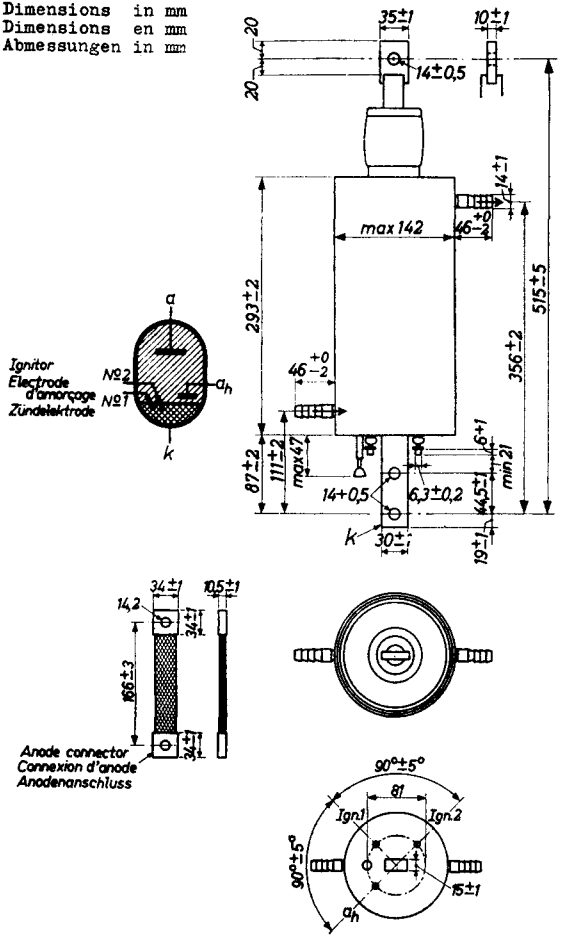
Shipping weight
→ Poids brut 12,6 kg
Bruttogewicht

Dimensions in mm
Dimensions en mm
Abmessungen in mm



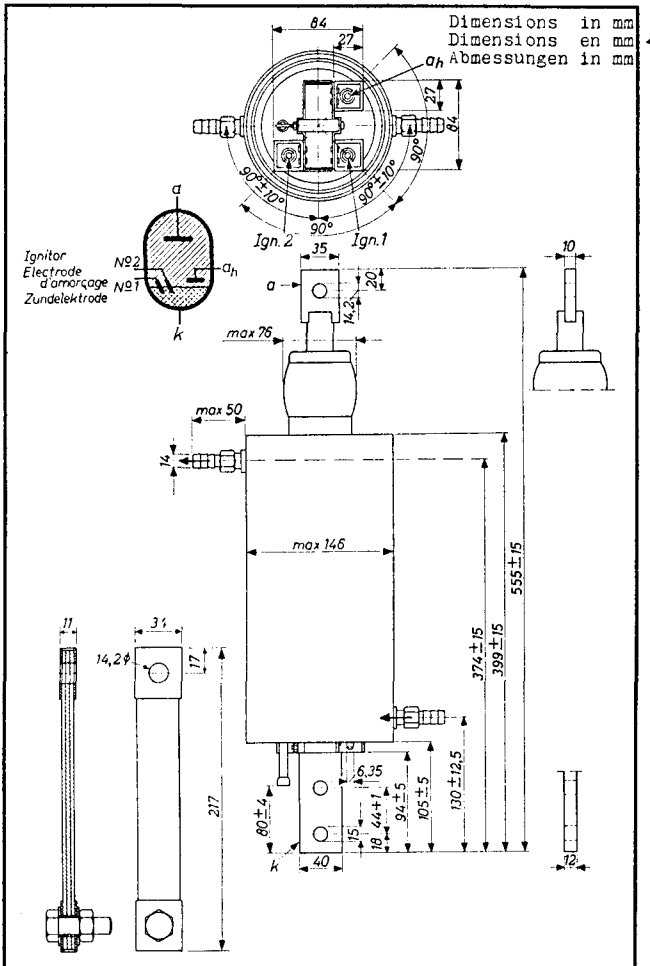
PL 5555 PHILIPS

Dimensions in mm
Dimensions en mm
Abmessungen in mm



PHILIPS

Dimensions in mm
Dimensions en mm
Abmessungen in mm



Anode connector
Connexion d'anode 55350
Anodenanschluss

Limiting values (ABSOLUTE VALUES)
Caractéristiques limites (VALEURS ABSOLUES)
Grenzdaten (ABSOLUTWERTE)

A.C. control; Réglage C.A.; Wechselstromregelung

Two tubes in inverse parallel connection
Deux tubes en montage anti-parallèle
Zwei Röhren in Anti-Parallelschaltung

Voltage range Gamme de tension (V) Spannungsbereich		max. 2400[3]	
Demand Demande d'energie (kVA) Energiebedarf		2400[4]	1105
I_a (max.)	(A)	135	207
T_{av} (max.)	(s)	1,66	1,66
I_{surge} (max.) (T = max. 0,15 s)	(A)	6000	6000

Rectifying tube
Tube redresseur
Gleichrichterröhre

V_{afwd_p} (max) (V)	V_{ainv_p} (max.) (V)	I_{ap} (max) (A)	I_a (max) (A)	I_{surge} (T = max. 0,15 s) (A)
900	900	1800	200 400[6]	12000
2100[5]	2100[5]	1200	150 300[6]	9000

Ignitor; Electrode d'amorçage; Zündelektrode

Requirements for cathode excitation
Conditions pour l'excitation de la cathode
Bedingungen für Katodeerregung

V_{fwd_p} = min. 150 V
I_p = min. 40 A

Typical value of starting time at required min. voltage or current
Valeur type du temps d'amorçage à la tension ou au courant demandé minimum
Mittelwert der Zündungszeit bei der erforderlichen min. Spannung oder Strom — 100 µsec

3)4)5)6) See page 4; voir page 4; siehe Seite 4

Limiting values (ABSOLUTE VALUES)
Caractéristiques limites (VALEURS ABSOLUES)
Grenzdaten (ABSOLUTWERTE)

A.C. control; Réglage C.A.; Wechselstromregelung

Two tubes in inverse parallel connection
Deux tubes en montage anti-parallèle
Zwei Röhren in Anti-Parallelschaltung

Voltage range Gamme de tension (V) Spannungsbereich		max. 2400[3]	
Demand Demande d'energie (kVA) Energiebedarf		2400[4]	1105
I_a (max.)	(A)	135	207
T_{av} (max.)	(s)	1,66	1,66
I_{surge} (max.) (T =max.0,15 s)	(A)	6000	6000

Rectifying tube
Tube redresseur
Gleichrichterröhre

V_{afwd_p} (max.) (V)	V_{ainv_p} (max.) (V)	I_{ap} (max) (A)	I_a (max) (A)	I_{surge} (T = max.0,15 s) (A)
900	900	1800	200 400[6]	12000
2100[5]	2100[5]	1200	150 300[6]	9000

Ignitor; Electrode d'amorçage; Zündelektrode

Requirements for cathode excitation
Conditions pour l'excitation de la cathode
Bedingungen für Katodeerregung

V_{fwd_p} = min. 150 V
I_p = min. 40 A

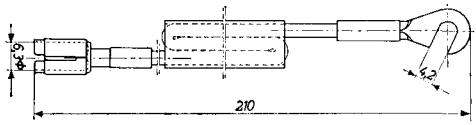
Typical value of starting time at required min. voltage or current
Valeur type du temps d'amorçage à la tension ou au courant demandé minimum
Mittelwert der Zündungszeit bei der erforderlichen min. Spannung oder Strom — 100 µsec

[3][4][5][6] See page 4; voir page 4; siehe Seite 4

Cooling
Refroidissement
Kühlung

q [1]	= min.	9 l/min
q (at no load / sans charge / ohne Belastung)	= min.	3 l/min.
p_i (q = 9 l/min.)	= max.	0,2 kg/cm^2
$t_o - t_i$ (q = 9 l/min.)	= max.	5,5 °C
t_i [2]	= min.	6 °C
t_i [3]	= min.	10 °C
t_i [4]	= min.	20 °C

→ Ignitor connector. Unfolded length 330 mm
Connexion de l'électrode d'amorçage. Longueur dépliée 330 mm
Zündelektrodenanschluss. Entfaltete Länge 330 mm



Type No. 55351-01

Dimensions in mm
Dimensions en mm
Abmessungen in mm

[1]) At max. demand and max. I_a
A la demande de puissance max. et à I_a max.
Bei max. Leistungsbedarf und max. I_a

[2]) For substantially constant load
Pour une charge assez constante
Für ziemlich konstante Belastung

[3]) For substantially constant load, recommended value
Pour une charge assez constante, valeur conseillée
Für ziemlich konstante Belastung, empfohlener Wert

[4]) For widely fluctuating load
Pour une charge variant considérablement
Für stark veränderliche Belastung

Limiting values
Caractéristiques limites
Grenzdaten

V_{fwd_p}	= max.	V_{a_p}	
V_{inv_p}	= max.	5	V
I_p	= max.	100	A
I_{rms}	= max.	15	A
I_{av} (Tav =max.10 sec)	= max.	2	A

Auxiliary anode; anode auxiliaire; Hilfsanode

$V\ inv_p$ { main anode conducting / anode principale conduisant / Hauptanode leitend	= max.	25	V
$V\ inv_p$ { main anode not conducting / anode principale non conduisant / Hauptanode nicht leitend	= max.	160	V
V_{fwd_p}	= max.	160	V
I_p	= max.	20	A
I (Tav = max.10 s)	= max.	5	A

3) t_o (2400 V rms) max. 30 °C

4) Max. value at the indicated voltage
Valeur max. à la tension indiquée
Max. Wert bei gegebener Spannung

5) Max. permissible value
Valeur admissible maximum
Max. zulässiger Wert

6) During 1 minute
Pendant 1 minute
Während 1 Minute

Limiting values
Caractétistiques limites
Grenzdaten

V_{fwd_p}	= max.	V_{a_p}
V_{inv_p}	= max.	5 V
I_p	= max.	100 A
I_{rms}	= max.	15 A
I_{av} (T_{av} =max.10 sec)	= max.	2 A

Auxiliary anode; anode auxiliaire; Hilfsanode

V_{inv_p} main anode conducting / anode principale conduisant / Hauptanode leitend	= max.	25 V
V_{inv_p} main anode not conducting / anode principale non conduisant / Hauptanode nicht leitend	= max.	160 V
V_{fwd_p}	= max.	160 V
I_p	= max.	20 A
I (T_{av} = max.10 s)	= max.	5 A

3) t_o (2400 V rms) max. 30 °C

4) Max. value at the indicated voltage
Valeur max. à la tension indiquée
Max. Wert bei gegebener Spannung

5) Max. permissible value
Valeur admissible maximum
Max. zulässiger Wert

6) During 1 minute
Pendant 1 minute
Während 1 Minute

Limiting values for rectifier service and for three phase frequency changer (Absolute limits)
Caractéristiques limites pour service redresseur et pour convertisseur de fréquence triphasé (Limites absolues)
Grenzdaten für Gleichrichterbetrieb und für dreiphasige Frequenzwandler (Absolute Grenzwerte)

Remark: The limiting values are based on full-cycle conduction without phase delay, regardless of whether or not phase control is used.
Observation: Les caractéristiques limites s'appliquent à une conduction pendant le cycle complet sans décalage, abstraction faite d'un contrôle de phase éventuel.
Bemerkung: Die Grenzwerte beziehen sich auf einen Stromdurchgang ohne Phasendrehung während der ganzen Periode, auch wenn mit Phasenanschnitt gearbeitet wird.

$V_{a\ fwd_p}$	= max.	900	2100 V
$V_{a\ inv_p}$	= max.	900	2100 V
I_{a_p}	= max.	1800	1200 A
I_a	= max.	200	150 A
I_a [1)][3)]	= max.	300	225 A
I_a [2)][3)]	= max.	400	300 A
I_a surge (T = max. 0,15 sec)	= max.	12000	9000 A

[1]) Two-hours overload; T_{av} = max. 2 min.; repeated not more than once every 24 hours.
Surcharge pendant deux heures; T_{av} = 2 min. au max.; ne répétée plus d'une fois par 24 heures.
Überlastung während zwei Stunden; T_{av} = max. 2 Min.; nicht mehr als einmal in 24 Stunden zu wiederholen.

[2]) One-minute overload; T_{av} = max. 1 min.; repeated not more than once every 2 hours.
Surcharge pendant une minute; T_{av} = 1 min. au max.; ne répétée plus d'une fois par 2 heurs.
Überlastung während einer Minute; T_{av} = max. 1 Min.; nicht mehr als einmal in 2 Stunden zu wiederholen

[3]) Overload based on the thermal characteristics of the tube. During the intervals between the specified overloads, the rated continuous load may not be exceeded. The two specified periods with overload may not overlap.
Surcharge fondée sur les caractéristiques thermiques du tube. Pendant les intervalles entre les surcharges mentionnées, la charge continue max. ne doit pas être surpassée. Les deux périodes de surcharge mentionnées ne doivent pas se recouvrir.
Überlastung gegründet auf die thermischen Daten der Röhre. Während der Zeit zwischen zwei der genannten Überlastungen darf die max. Dauerbelastung nicht überschritten werden. Die zwei verschiedenen Überlastungsperioden dürfen einander nicht überlappen.

Limiting values for single phase A.C. control (Absolute limits)
Caractéristiques limites pour réglage de courant alternatif monophasé. (Limites absolues)
Grenzdaten für einphasige Wechselstromregelung (Absolute Grenzwerte)

Remark: The limiting values are based on full-cycle conduction without phase delay, regardless of whether or not phase-control is used.
→ Observation: Les caractéristiques limites s'appliquent à une conduction pendant le cycle complet sans décalage, abstraction faite d'un contrôle de phase éventuel
Bemerkung: Die Grenzwerte beziehen sich auf einen Stromdurchgang ohne Phasendrehung während der ganzen Periode, auch wenn mit Phasenanschnitt gearbeitet wird.

Mains voltage Tension de secteur Netzspannung	= max. 2400	2400 V_{eff}
Demand Demande de puissance Leistungsbedarf	= max. 2400	1105 kVA
I_a (T_{av} = max. 1,66 sec)	= max. 135	207 A
I_{surge} (T = max. 0,15 sec)	= max. 6000	6000 A

Limiting values for auxiliary anode (Absolute limits)
Caractéristiques limites pour l'anode auxiliare (Limites absolues)
Grenzdaten für Hilfsanode (Absolute Grenzwerte)

$V_{ah\ fwd_p}$	= max.	160 V
$V_{ah\ inv_p}$	= max.	25 V [1]
$V_{a_h\ inv_p}$	= max.	160 V [2]
I_{ahp}	= max.	20 A
I_{ah} (T_{av} = max. 10 sec)	= max.	5 A

[1]) Main anode conducting
Anode principale conductive
Hauptanode stromführend

[2]) Main anode not conducting
Anode principale non conductive
Hauptanode nicht stromführend

Limiting values for single phase A.C. control (Absolute limits)
Caractéristiques limites pour réglage de courant alternatif monophasé. (Limites absolues)
Grenzdaten für einphasige Wechselstromregelung (Absolute Grenzwerte)

Remark: The limiting values are based on full-cycle conduction without phase delay, regardless of whether or not phase-control is used.
Observation: Les caractéristiques limites s'appliquent à une conduction pendant le cycle complet sans décalage, abstraction faite d'un contrôle de phase éventuel
Bemerkung: Die Grenzwerte beziehen sich auf einen Stromdurchgang ohne Phasendrehung während der ganzen Periode, auch wenn mit Phasenanschnitt gearbeitet wird.

Mains voltage Tension de secteur Netzspannung	= max. 2400	2400 V_{eff}
Demand Demande de puissance Leistungsbedarf	= max. 2400	1105 kVA
I_a (T_{av} = max. 1,66 sec)	= max. 135	207 A
I_{surge} (T = max. 0,15 sec)	= max. 6000	6000 A

Limiting values for auxiliary anode (Absolute limits)
Caractéristiques limites pour l'anode auxiliare (Limites absolues)
Grenzdaten für Hilfsanode (Absolute Grenzwerte)

$V_{ah\ fwdp}$	= max.	160 V
$V_{ah\ invp}$	= max.	25 V [1]
$V_{ah\ invp}$	= max.	160 V [2]
I_{ahp}	= max.	20 A
I_{ah} (T_{av} = max. 10 sec)	= max.	5 A

[1]) Main anode conducting
Anode principale conductive
Hauptanode stromführend

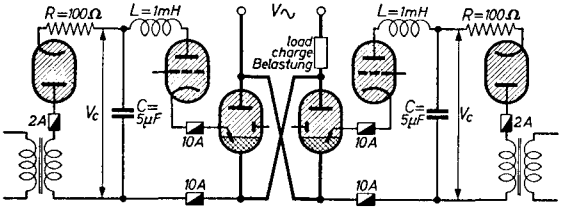
[2]) Main anode not conducting
Anode principale non conductive
Hauptanode nicht stromführend

Limiting values for ignitor (Absolute limits)
Caractéristiques limites pour l'électrode d'amorçage (Limites absolues)
Grenzdaten für die Zündelektrode (Absolute Grenzwerte)

$V_{fwd\ p}$	= max. V_{ap}
$V_{inv\ p}$	= max. 5 V
I_p	= max. 100 A
I_{eff}	= max. 15 A
I (T_{av} = max.10 sec)	= max. 2 A

Ignition circuit requirements for separate excitation
Exigences pour le circuit d'amorçage à excitation séparée
Bedingungen für die Zündschaltung mit Fremdsteuerung

Recommended circuit
Circuit recommandé
Empfohlene Schaltung



Ohmic resistance of series inductance (1 mH)
Résistance ohmique de l'inductance en serie (1mH) = max. 2 Ω
Ohmscher Widerstand der Serienselbstinduktion (1 mH)

V_C { Under operating conditions / Dans les conditions de fonctionnement / Unter Betriebsverhältnisse } = 650±50 V

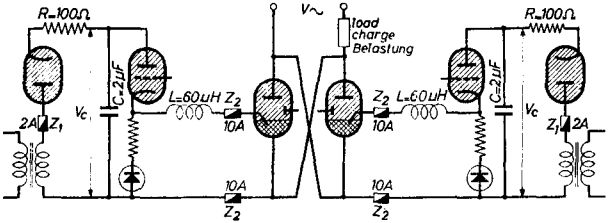
Peak value of closed circuit current
Valeur de crête du courent en circuit fermé = 40 - 50 A
Spitzenwert des Stromes bei geschlossenem Kreis

Limiting values for ignitor (Absolute limits)
Caractéristiques limites pour l'électrode d'amorçage (Limites absolues)
Grenzdaten für die Zündelektrode (Absolute Grenzwerte)

$V_{fwd\ p}$	= max. V_{ap}
$V_{inv\ p}$	= max. 5 V
I_p	= max. 100 A
I_{eff}	= max. 15 A
I (T_{av} = max.10 sec)	= max. 2 A

Ignition circuit requirements for separate excitation
Exigences pour le circuit d'amorçage à excitation séparée
Bedingungen für die Zündschaltung mit Fremdsteuerung

Recommended circuit
Circuit recommandé
Empfohlene Schaltung

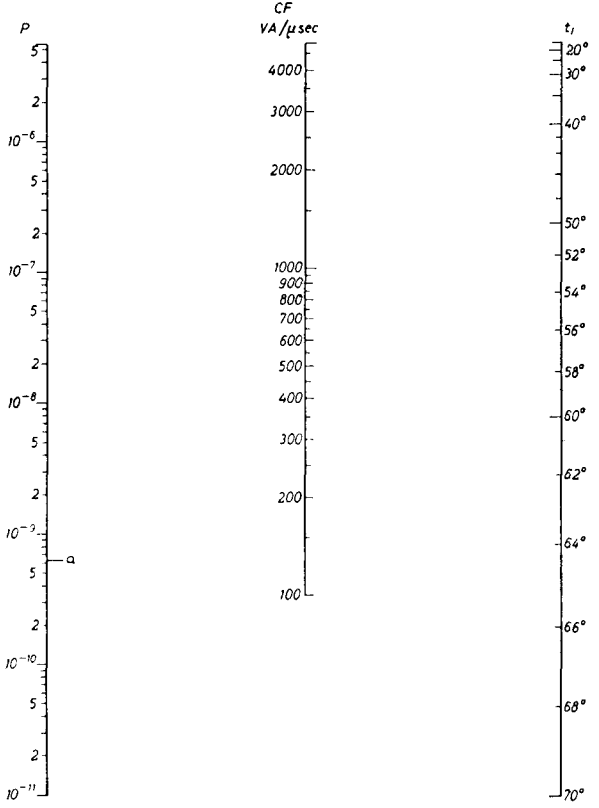


Ohmic resistance of 60 µH inductance
Résistance ohmique de l'inductance de 60 µH = max. 2 Ω
Ohmscher Widerstand der Selbstinduktion von 60 µH

V_C { Under operating conditions / Dans les conditions de fonctionnement / Unter Betriebsverhältnisse } = 650±50 V

Peak value of closed circuit current
Valeur de crête du courent en circuit fermé = 80-100 A
Spitzenwert des Stromes bei geschlossenem Kreis

PROBABILITY OF ARC-BACK
PROBABILITE D'ALLUMAGE EN RETOUR
WAHRSCHEINLICHKEIT DER RÜCKZÜNDUNG



For the meaning of the symbols please refer to page 8
Pour la signification des symboles voir page 8
Für die Bedeutung der Symbole siehe Seite 8

Meaning of the symbols of the nomogram of page 7
Signification des symboles de l'abaque page 7
Bedeutung der Symbole des Nomogramms Seite 7

P — Probability of arc-back at constant load
Probabilité d'allumage en retour à charge constante
Wahrscheinlichkeit der Rückzündung bei konstanter Belastung

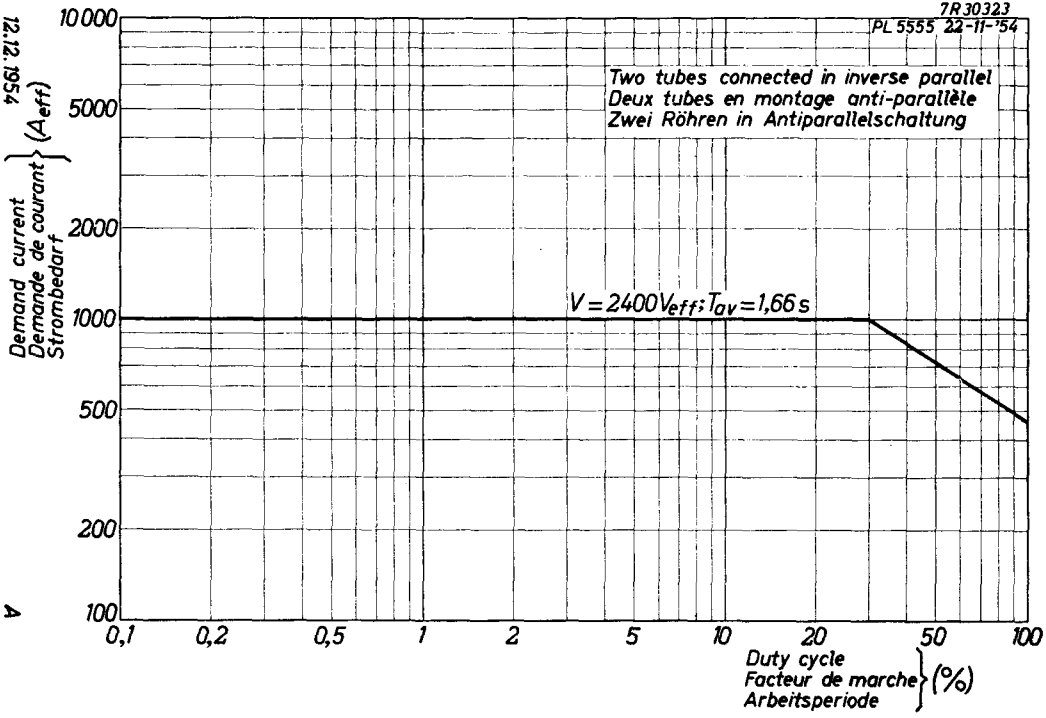
CF — Commutation factor
Facteur de commutation $CF = E.di/dt$ (VA/µsec)
Kommutierungsfaktor

E — Inverse voltage jump just after commutation
Saut de tension inverse immédiatement après la commutation
Gegenspannungsstoss gleich nach der Umschaltung

di/dt — Rate of current decay during the last 10 µsec of the current wave
Taux de diminution du courant pendant les dernières 10 µsec du passage de courant
Stromabnahme während der letzten 10 µSek des Stromdurchganges

t_i — Temperature of cooling water at the inlet of the tube
Température de l'eau de refroidissement à l'entrée du tube
Kühlwassertemperatur am Eingang der Röhre

a — 6.3×10^{-10}, point on P scale for one arc-back per tube per year at 50 c/s
$6,3.10^{-10}$, point de l'échelle de P pour un allumage en retour par tube et par année à 50 Hz
$6,3.10^{-10}$, Punkt der P-Skala für eine Rückzündung pro Röhre und pro Jahr bei 50 Hz



PHILIPS

PL 5555

7Z00111A
PL 5555 23-6-'60
A.C. welder control service
Réglage de courant alternatif en service de soudure
Wechselstromsteuerung bei Schweissbetrieb
Two tubes connected in inverse parallel
Deux tubes en montage anti-parallel
Zwei Röhren in Antiparallelschaltung
Full cycle conduction
Conduction pendant le cycle complet
Stromdurchgang während der ganzen Periode
Tav = 1,66 sec
V ≤ 2400 Veff
to ≤ 30 °C
q ≥ 9 l/min
2000
1000
500
200
100
0,1
0,2
0,5
1
2
5
10
20
50 δ (%) 100
Demand current
Demande de courant
Strombedarf
(Aeff)



PL5555

page	sheet	date
1	1	1954.12.12
2	1	1956.04.04
3	1	1960.05.05
4	2	1954.12.12
5	2	1956.04.04
6	2	1960.05.05
7	3	1954.12.12
8	3	1956.04.04
9	3	1961.06.06
10	4	1954.12.12
11	4	1956.04.04
12	4	1961.06.06
13	5	1960.05.05
14	5	1962.10.10
15	6	1960.05.05
16	6	1962.10.10
17	7	1960.05.05
18	8	1960.05.05
19	A	1954.12.12

20	A	1960.05.05
21, 22	FP	2000.05.28

THYRATRON, mercury-vapour triode
THYRATRON, triode à vapeur de mercure
STROMTORRÖHRE, Quecksilberdampftriode

Application: relay service, alarm and protection installations, D.C. and A.C. motor control, circuits for obtaining a variable A.C. output current (inverse parallel circuit) rectifier in a half-wave or full-wave circuit (with or without grid control)

Application: service de relais, des dispositives d'alarme et de protection, réglage de moteurs C.C. ou C.A., pour obtenir une courant de sortie C.A. variable (circuit anti-parallèle) redresseur à une ou à deux alternances (avec ou sans réglage de grille)

Anwendung : Bedienung von Relais, Alarm- und Schutzanlagen, Regelung von Gleich- und Wechselstrommotoren, Schaltungen zur Erhaltung eines veränderlichen Ausgangswechselstromes (Anti-parallelschaltung)
Gleichrichter in Einweg- und Zweiwegschaltungen (mit oder ohne Gitterregelung)

Heating : direct
Chauffage: direct
Heizung : direkt

V_f	=	2,5 V
I_f	=	5,0 A
T_w	=	10 s [1]
T_w	= min.	5 s [2]

Capacitances
Capacités
Kapazitäten

C_{ag}	= 3,3 pF
C_{gk}	= 5,0 pF

See also "Explanation of the technical data of thyratrons" in front of this section

Voir aussi "L'explication des caractéristiques techniques des thyratrons" en tête de ce chapitre

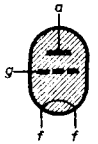
Siehe auch die "Erläuterung zu den technischen Daten der Stromtorröhren" am Anfang dieses Abschnitts

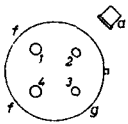
[1]) Recommended value
Valeur recommandée
Empfohlener Wert

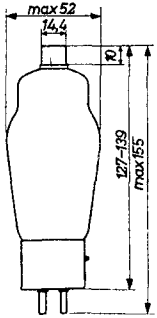
[2]) See curve on page B
Voir la courbe sur page B
Siehe die Kurve auf Seite B

PL 5557 PHILIPS

Dimensions in mm
Dimensions en mm
Abmessungen in mm







Base : Medium 4p with bayonet
Culot : Medium 4p à baionnette
Sockel: Medium 4p mit Bajonett

Socket		Cap	
Support	40218/03	Capot	40619
Fassung		Haube	

Mounting position: vertical, base down
Montage : vertical, culot en bas
Einbau : senkrecht, Sockel unten

Net weight
Poids net 100 g
Nettogewicht

Shipping weight (50 tubes)
Poids brut (50 tubes) 7500 g
Bruttogewicht (50 Röhren)

Typical characteristics
Caractéristiques types
Kenndaten

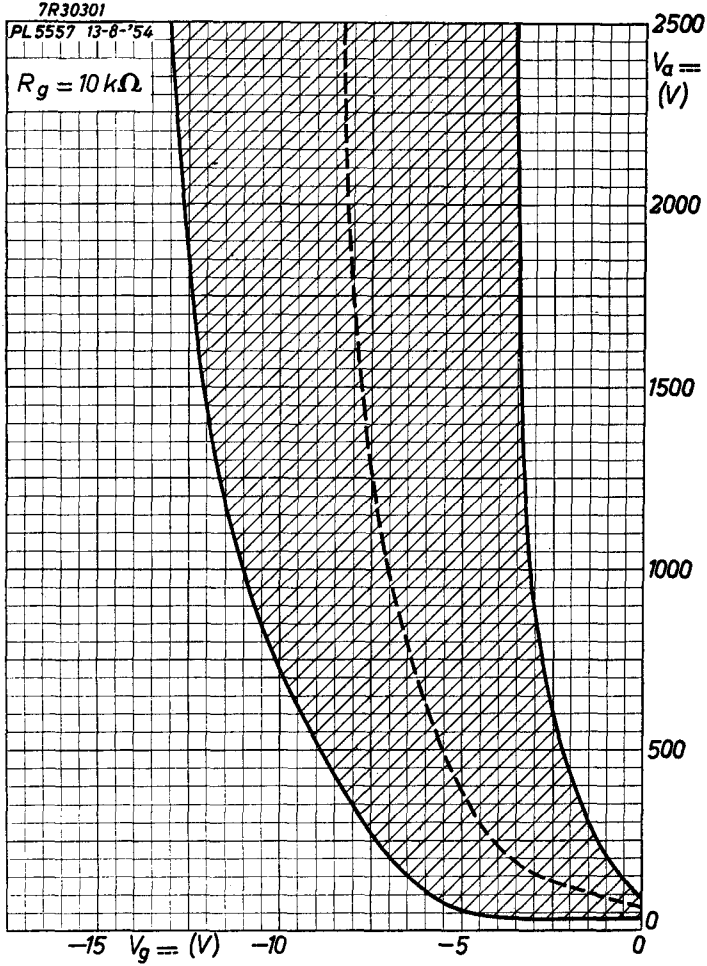
Varc	=	12 V
Tion	=	10 µs
Tdion	=	1000 µs
f	= max.	150 c/s

Limiting values (absolute limits)
Caractéristiques limites (limites absolues)
Grenzdaten (absolute Grenzen)

Va_p	= max.	2500	V
$Va\ inv_p$	= max.	5000	V
$-V_g$	= max.	500	V
$-V_g$	= max.	10	V[1]
Ia_p (f < 25 c/s)	= max.	1	A
Ia_p (f ≧ 25 c/s)	= max.	2	A
Ia (T_{av} = max. 15 s)	= max.	0,5	A
Ig (T_{av} = max. 15 s)	= max.	0,05	A
Rg	= max.	100	kΩ
Rg	=	10	kΩ[2]
t_{Hg}	=	35-80	°C
t_{Hg}	=	50	°C[2]
Isurge (T=max.0,1 s)	= max.	40	A

[1] Tube conductive
Tube conductif
Gezündete Röhre

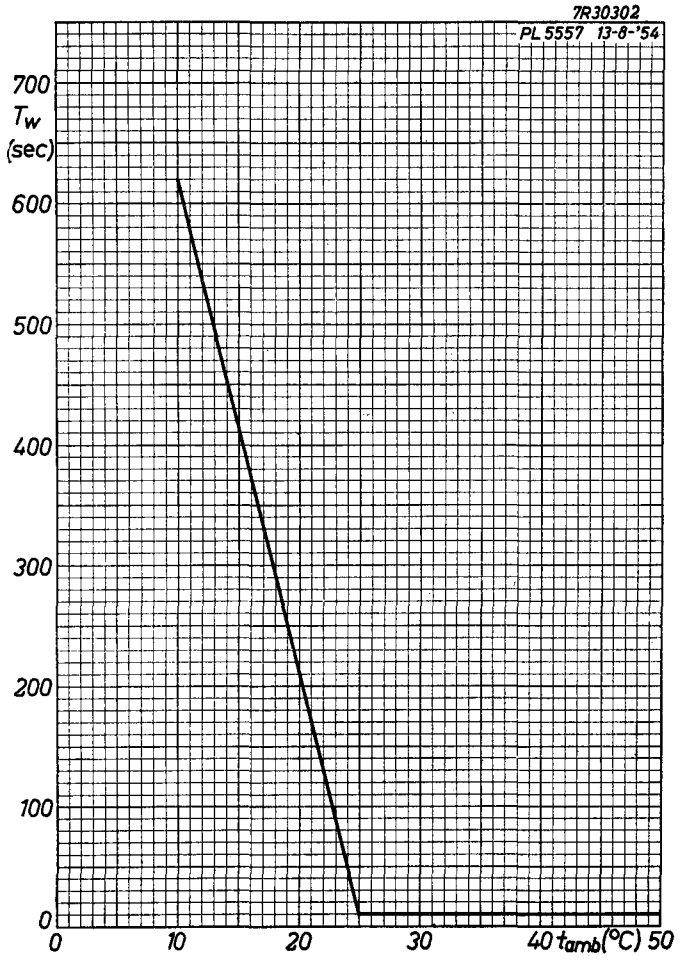
[2] Recommended value
Valeur recommandé
Empfohlener Wert


7R30301
PL5557 13-8-'54
$R_g = 10\,k\Omega$
2500
$V_a =$ (V)
2000
1500
1000
500
0
−15
$V_g =$ (V)
−10
−5
0

8.8.1954

A

PL5557 **PHILIPS**



B

PHILIPS PL 5557

6.6.1956

C



PL5557

page	sheet	date
1	1	1956.03.03
2	2	1956.03.03
3	3	1954.07.07
4	A	1954.08.08
5	B	1954.08.08
6	C	1956.06.06
7	FP	2000.05.14

PHILIPS PL 5559

THYRATRON, mercury-vapour triode
THYRATRON, triode à vapeur de mercure
STROMTORRÖHRE, Quecksilberdampftriode

Application: relay service, control of D.C. motor speed, variable and stabilized output rectifiers, automatically operated battery chargers. In anti-parallel circuits the tube can also be used for controlling and switching A.C. power and for firing ignitrons

Application: service de relais, contrôle de la vitesse des moteurs à C.C., redresseurs stabilisés ou avec tension de sortie variable, chargeurs de batterie avec commande automatique. Dans des circuits anti-parallèles le tube peut être utilisé pour le contrôle et la commutation de puissance C.A. et pour l'amorçage des ignitrons

Anwendung : Bedienung von Relais, Steuerung der Geschwindigkeit von Gleichstrommotoren, stabilisierte Gleichrichter, Gleichrichter mit veränderlicher Spannung, automatisch betriebene Batterielader. In Anti-parallelschaltung kann die Röhre benutzt werden für die Steuerung und Schaltung von Wechselstromleistung und für Zündung von Ignitrons

Heating : indirect Chauffage: indirect Heizung : indirekt	V_f =	5,0 V ± 5%
	I_f =	4,5 A
	T_w = min.	5 min [1]
Capacitances Capacités Kapazitäten	C_{ag} =	3,6 pF
	C_{gk} =	7,8 pF
Typical characteristics Caractéristiques types Kenndaten	V_{arc} =	12 V
	T_{ion} =	10 µs
	T_{dion} =	1000 µs
	f = max.	150 c/s

See also "Explanation of the technical data of thyratrons" in front of this section
Voir aussi "L'explication des caractéristiques techniques des thyratrons" en tête de ce chapitre
Siehe auch die "Erläuterung zu den technischen Daten der Stromtorröhren" am Anfang dieses Abschnitts

[1] See curve on page B; voir la courbe sur page B; Siehe die Kurve auf Seite B

THYRATRON, mercury-vapour triode
THYRATRON, triode à vapeur de mercure
STROMTORRÖHRE, Quecksilberdampftriode

Application: relay service, control of D.C. motor speed, variable and stabilized output rectifiers, automatically operated battery chargers. In anti-parallel circuits the tube can also be used for controlling and switching A.C. power and for firing ignitrons

Application: service de relais, contrôle de la vitesse des moteurs à C.C., redresseurs stabilisés ou avec tension de sortie variable, chargeurs de batterie avec commande automatique. Dans des circuits anti-parallèles le tube peut être utilisé pour le contrôle et la commutation de puissance C.A. et pour l'amorçage des ignitrons

Anwendung : Bedienung von Relais, Steuerung der Geschwindigkeit von Gleichstrommotoren, stabilisierte Gleichrichter, Gleichrichter mit veränderlicher Spannung, automatisch betriebene Batterielader. In Anti-parallelschaltung kann die Röhre benutzt werden für die Steuerung und Schaltung von Wechselstromleistung und für Zündung von Ignitrons

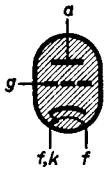
Heating : indirect Chauffage: indirect Heizung : indirekt	V_f	= 5,0 V ± 5%
	I_f	= 4,5 A
	T_w	= min. 5 min [1]
Capacitances Capacités Kapazitäten	C_{ag}	= 3,6 pF
	C_{gk}	= 7,8 pF
Typical characteristics Caractéristiques types Kenndaten	V_{arc}	= 12 V
	T_{ion}	= 10 µs
	T_{dion}	= 1000 µs
	f	= max. 150 c/s

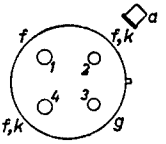
See also "Explanation of the technical data of thyratrons" in front or this section
Voir aussi "L'explication des caractéristiques techniques des thyratrons" en tête de ce chapitre
Siehe auch die "Erläuterung zu den technischen Daten der Stromtorröhren" am Anfang dieses Abschnitts

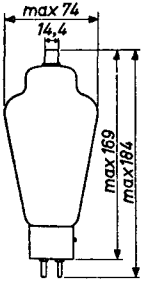
[1] See curve on page B; voir la courbe sur page B; Siehe die Kurve auf Seite B

PL 5559 PHILIPS

Dimensions in mm
Dimensions en mm
Abmessungen in mm







Base : Medium 4p with bayonet
Culot : Medium 4p à baïonnette
Sockel: Medium 4p mit Bajonette

Socket
Support type 40218/03
Fassung

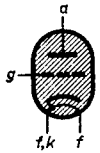
Cap
Capot type 40619
Haube

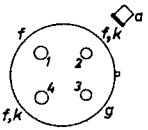
Mounting position: vertical, base down
Montage : vertical, culot en bas
Einbau : senkrecht, Sockel unten

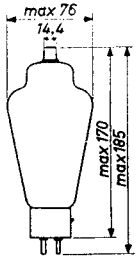
Net weight
Poids net 125 g
Nettogewicht

Shipping weight (50 tubes)
Poids brut (50 tubes)8500 g
Bruttogewicht (50 Röhren)

Dimensions in mm
Dimensions en mm
Abmessungen in mm







Base : Medium 4p with bayonet
Culot : Medium 4p à baionnette
Sockel: Medium 4p mit Bajonett

Pins 1 and 4 heater, pin 2 cathode return
Broches 1 et 4 filament, broche 2 circuit de retour de la cathode
Stifte 1 und 4 Heizfaden, Stift 2 Katodenrückleitung

Socket
Support 40218/03
Fassung

Cap
Capot 40619
Haube

Mounting position: vertical, base down
Montage : vertical, culot en bas
Einbau : senkrecht, Sockel unten

Net weight
Poids net 125 g
Nettogewicht

Shipping weight (50 tubes)
Poids brut (50 tubes) 8500 g
Bruttogewicht (50 Röhren)

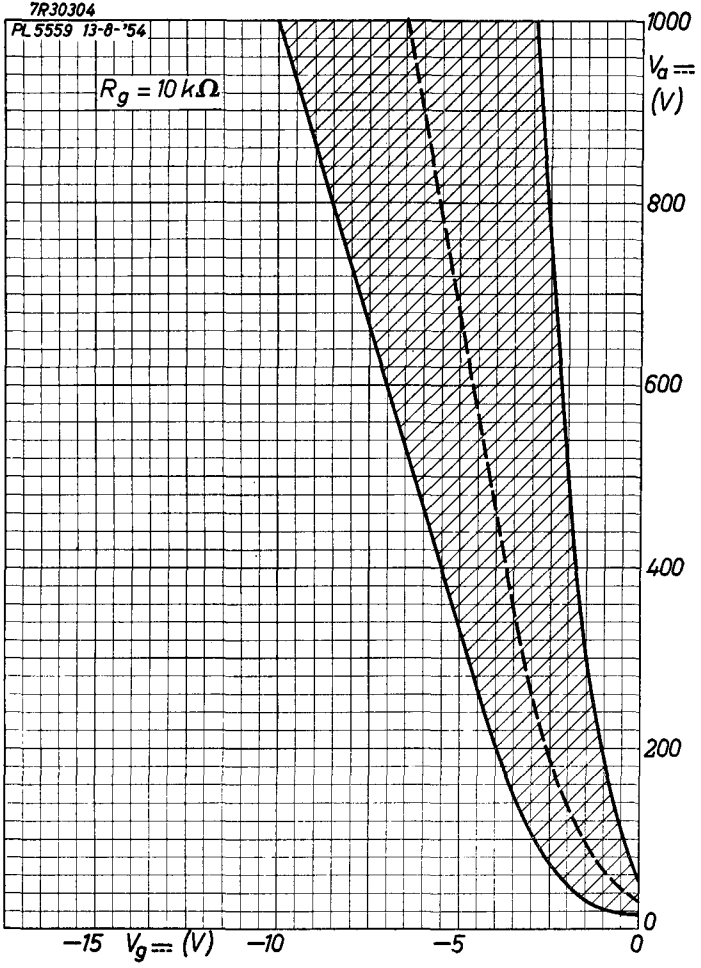
Limiting values (absolute limits)
Caractéristiques limites (limites absolues)
Grenzdaten (absolute Grenzen)

V_{a_p}	= max.	1000	V
$V_{a\ inv_p}$	= max.	1000	V
$-V_g$	= max.	500	V
$-V_g$	= max.	10	V [1]
I_{k_p} (f < 25 c/s)	= max.	5	A
I_{k_p} (f ≧ 25 c/s)	= max.	15	A
I_k (Tav= max. 15 s)	= max.	2,5	A
I_g (Tav= max. 15 s)	= max.	0,25	A
R_g	= max.	100	kΩ
R_g	=	10	kΩ [2]
t_{Hg}	=	40-80	°C
t_{Hg}	=	60	°C [2]
I_{surge} (T=max.0,1 s)	= max.	200	A
I_{k_p}	= max.	40	A [3]
I_k	= max.	1	A [3]

[1]) Tube conductive
Tube conductif
Gezündete Röhre

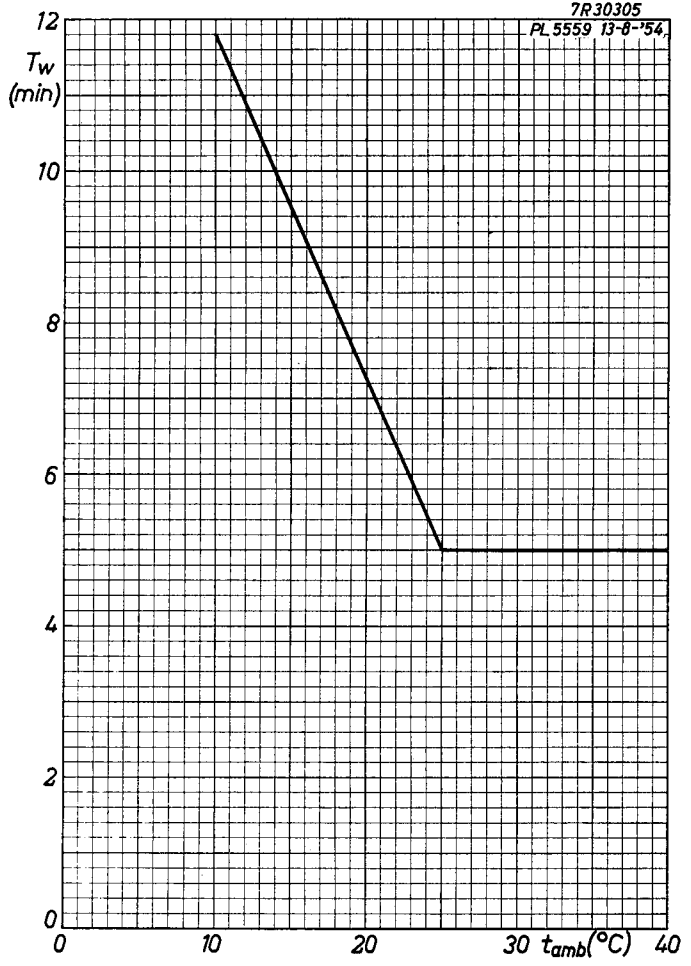
[2]) Recommanded value
Valeur recommandée
Empfohlener Wert

[3]) In firing circuits of ignitrons
Dans les circuits d'amorçage des ignitrons
In Zündungsschaltungen für Ignitrons


7R30304
PL 5559 13-8-'54
$R_g = 10\,k\Omega$
1000
V_a =
(V)
800
600
400
200
0
−15
V_g = (V)
−10
−5
0

8.8.1954

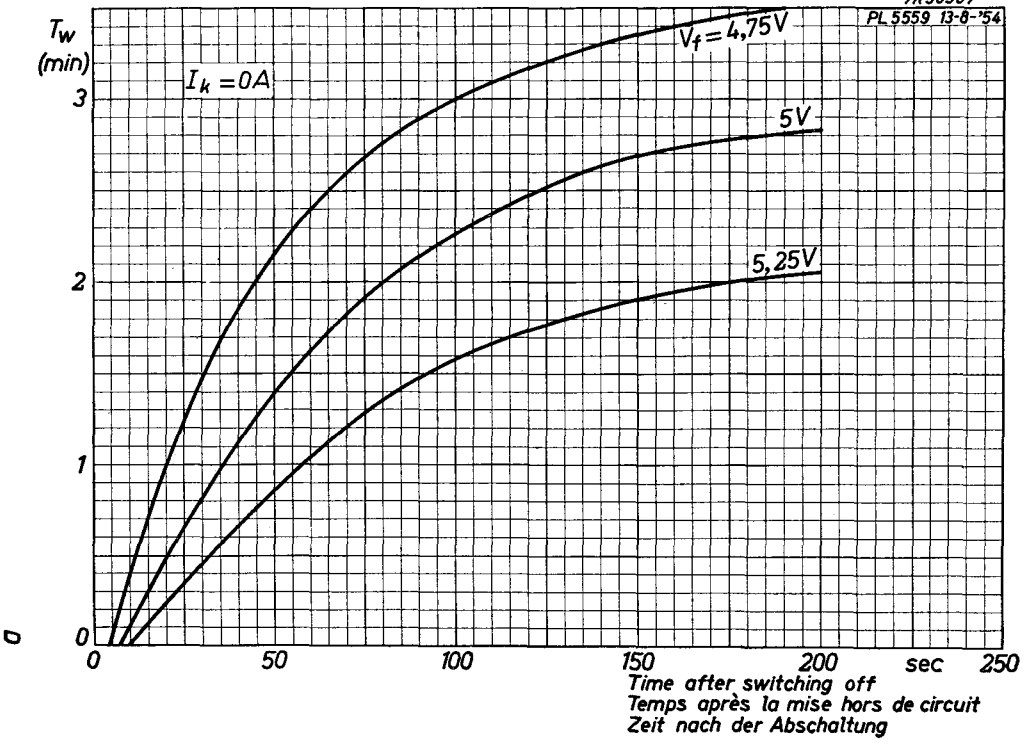
A


7R30305
PL 5559 13-8-'54.
12
T_w (min)
10
8
6
4
2
0
0
10
20
30
t_{amb}(°C)
40

7R30306
PL 5559 13-8-'54
$V_f = 4{,}75V$
$I_k = 0A$
Δt_{Hg} (°C)
50
40
30
20
10
0
0
5
10
15
20
25
30
35
T_w (min)

8.8.1954

C


7R30307
PL 5559 13-8-'54
T_w (min)
$I_k = 0A$
$V_f = 4{,}75V$
5V
5,25V
0
1
2
3
0
50
100
150
200
sec
250
Time after switching off
Temps après la mise hors de circuit
Zeit nach der Abschaltung



PL5559

page	sheet	date
1	1	1954.08.08
2	1	1956.04.04
3	2	1954.08.08
4	2	1956.04.04
5	3	1954.08.08
6	A	1954.08.08
7	B	1954.08.08
8	C	1954.08.08
9	D	1954.08.08
10	FP	2000.05.14

PHILIPS

PL5632 /C3J

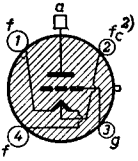
THYRATRON; xenon-filled triode with negative control characteristic
THYRATRON; triode à remplissage de xenon avec caractéristique de commande négative
STROMTORRÖHRE; Triode mit Xenonfüllung mit negativer Steuerkennlinie

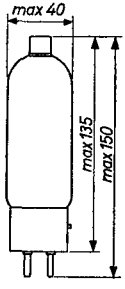
Application: Relay service, motor control, ignitor firing service
Application: Service relais, commande du régime de moteurs, amorçage d'ignitrons
Anwendung : Relaisbetrieb, Motorsteuerung, Zündung von Ignitrons

Heating : direct
Chauffage: direct
Heizung : direkt

V_f = 2,5 V
I_f = 8,5 A
T_w = min. 30 sec[1])

Dimensions in mm
Dimensions en mm
Abmessungen in mm





Base : Medium 4p with bayonet
Culot : Medium 4p à baionette
Sockel: Medium 4p mit Bajonett

Socket :		Cap :	
Support:	40218/03	Capot:	40619
Fassung:		Haube:	

[1])Recommended value 60 sec.
Valeur recommandée 60 sec.
Empfohlener Wert 60 Sek.

[2])Load return
Circuit de retour de la charge
Belastungsrückleitung

PHILIPS

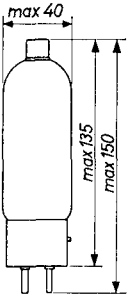
PL 5632 /C3J

THYRATRON; xenon-filled triode with negative control characteristic
THYRATRON; triode à remplissage de xénon avec caractéristique de commande négative
STROMTORRÖHRE; Triode mit Xenonfüllung mit negativer Steuerkennlinie

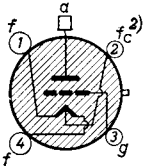
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Application: Service relais, commande du régime de moteurs, amorçage d'ignitrons
Anwendung : Relaisbetrieb, Motorsteuerung, Zündung von Ignitrons

Heating : direct
Chauffage: direct
Heizung : direkt

V_f = 2,5 V
I_f = 8,5 A
T_w = min. 30 sec[1])



Dimensions in mm
Dimensions en mm
Abmessungen in mm



Base : Medium 4p with bayonet
Culot : Medium 4p à baïonette
Sockel: Medium 4p mit Bajonett

Socket :
Support:
Fassung:

Cap :
Capot: 40619
Haube:

[1]) Recommended value 60 sec.
Valeur recommandée 60 sec.
Empfohlener Wert 60 Sek.

[2]) Load return
Circuit de retour de la charge
Belastungsrückleitung

PHILIPS

PL 5632 /C3J

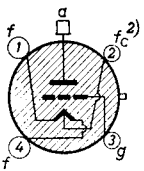
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THYRATRON; triode à remplissage de xénon avec caractéristique de commande négative
STROMTORRÖHRE; Triode mit Xenonfüllung mit negativer Steuerkennlinie

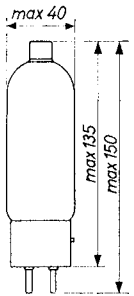
Application: Relay service, motor control, ignitor firing service
Application: Service relais, commande du régime de moteurs, amorçage d'ignitrons
Anwendung : Relaisbetrieb, Motorsteuerung, Zündung von Ignitrons

Heating : direct
Chauffage: direct
Heizung : direkt

V_f = 2,5 V
I_f = 9 A
T_w = min. 30 sec[1])

Dimensions in mm
Dimensions en mm
Abmessungen in mm





Base : Medium 4p with bayonet
Culot : Medium 4p à baïonette
Sockel: Medium 4p mit Bajonett

Socket :
Support:
Fassung:

Cap :
Capot: 40619
Haube:

[1]) Recommended value 60 sec.
Valeur recommandée 60 sec.
Empfohlener Wert 60 Sek.

[2]) Load return
Circuit de retour de la charge
Belastungsrückleitung

Mounting position: any
Montage : à volonté
Einbau : beliebig

Net weight
Poids net 95 g
Nettogewicht

Capacitances
Capacités
Kapazitäten

C_{ag}	=	3 pF
C_{gk}	=	14 pF

Typical characteristics
Caractéristiques types
Kenndaten

V_{arc}	=	10 V
T_{ion}	=	10 µsec
T_{dion}	=	1000 µsec

Limiting values (ABSOLUTE LIMITS)
Caractéristiques limites (VALEURS ABSOLUES)
Grenzdaten (ABSOLUTE WERTE)

V_{ap}	= max.	900 V
V_{invp}	= max.	1250 V
$-V_g$	= max.	300 V [3]
$-V_g$	= max.	10 V [4]
I_{kp}	= max.	30 A
I_k (Tav = 5 sec.)	= max.	2,5 A
I_{surge} (max. 0,1 sec.)	= max.	300 A [5]
I_g (T_{av} = 1 cycle / = 1 Periode)	= max.	0,1 A
I_{gp}	= max.	0,5 A
R_g	=	10-100 kΩ [6]
t_{amb}	=	-55/+75 °C
Commutation factor / Facteur de commutation / Kommutationsfaktor	=	0,7 $\frac{V}{\mu sec} \times \frac{A}{\mu sec}$

---

[3] Before conduction
Avant l'allumage
Gelöschte Röhre

[4][5][6] See page 3; voir page 3; siehe Seite 3

Mounting position: any
Montage : à volonté
Einbau : beliebig

Net weight
Poids net 95 g
Nettogewicht

Capacitances
Capacités
Kapazitäten

C_{ag}	=	3 pF
C_{gk}	=	14 pF

Typical characteristics
Caractéristiques types
Kenndaten

V_{arc}	=	10 V
T_{ion}	=	10 µsec
T_{dion}	=	1000 µsec

Limiting values (ABSOLUTE LIMITS)
Caractéristiques limites (VALEURS ABSOLUES)
Grenzdaten (ABSOLUTE WERTE)

V_{ap}	= max.	900 V
V_{invp}	= max.	1250 V
$-V_g$	= max.	300 V [3]
$-V_g$	= max.	10 V [4]
I_{kp}	= max.	30 A
I_k (Tav = 5 sec.)	= max.	2,5 A
I_{surge} (max. 0,1 sec.)	= max.	300 A [5]
I_g (T_{av} = 1 cycle / = 1 Periode)	= max.	0,1 A
I_{gp}	= max.	0,5 A
R_g	=	10-100 kΩ [6]
t_{amb}	=	-55/+75 °C
Commutation factor Facteur de commutation Kommutationsfaktor	=	$0,7 \frac{V}{\mu sec} \times \frac{A}{\mu sec}$

[3] Before conduction
Avant l'allumage
Gelöschte Röhre

[4] [5] [6] See page 3; voir page 3; siehe Seite 3

PHILIPS

Mounting position: any
Montage : a volonté
Einbau : beliebig

Net weight
Poids net 95 g
Nettogewicht

Capacitances
Capacités
Kapazitäten

C_{ag}	=	3 pF
C_{gk}	=	14 pF

Typical characteristics
Caractéristiques types
Kenndaten

V_{arc}	=	10 V
T_{ion}	=	10 µsec
T_{dion}	=	1000 µsec

Limiting values (ABSOLUTE LIMITS)
Caractéristiques limites (VALEURS ABSOLUES)
Grenzdaten (ABSOLUTE WERTE)

V_{ap}	= max.	900 V
V_{invp}	= max.	1250 V
$-V_g$	= max.	300 V[3]
$-V_g$	= max.	10 V[4]
I_{kp}	= max.	30 A
I_k (Tav = 5 sec.)	= max.	2,5 A
I_{surge} (max. 0,1 sec.)	= max.	300 A[5]
I_g (T_{av} = 1 cycle / 1 Periode)	= max.	0,1 A
I_{gp}	= max.	0,5 A
R_g	=	10-100 kΩ[6]
t_{amb}	=	-55/+75 °C
Commutation factor / Facteur de commutation / Kommutationsfaktor	=	0,7 $\frac{V}{\mu sec} \times \frac{A}{\mu sec}$

[3] Before conduction
Avant l'allumage
Gelöschte Röhre

[4][5][6] See page 3; voir page 3; siehe Seite 3

→

[4])During conduction
Pendant la période de conduction
Gezündete Röhre

[5])Fuse in anode circuit max. 10 A (recommended 6 A)
Fusible dans le circuit anodique max. 10 A (valeur recommandée 6 A)
Sicherung im Anodenkreis max. 10 A (empfohlener Wert 6 A)

[6])Recommended value 33 kΩ
Valeur recommandée 33 kΩ
Empfohlener Wert 33 kΩ

---

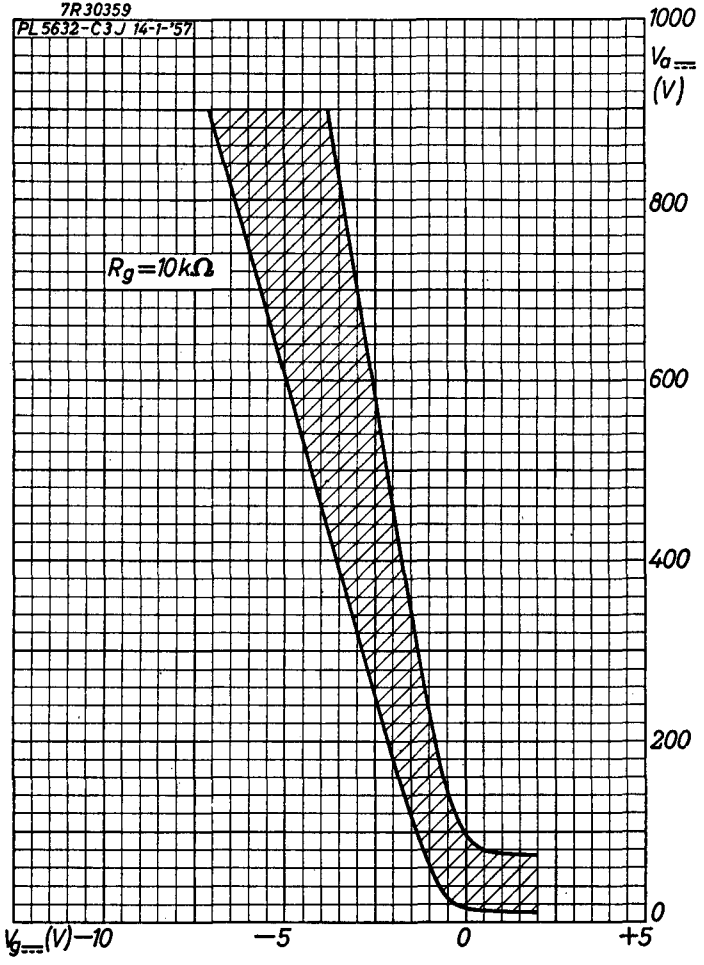
[4])During conduction
Pendant la période de conduction
Gezündete Röhre

[5])Fuse in anode circuit max. 10 A (recommended 6 A)
Fusible dans le circuit anodique max. 10 A (valeur recommandée 6 A)
Sicherung im Anodenkreis max. 10 A (empfohlener Wert 6 A)

[6])Recommended value 33 kΩ
Valeur recommandée 33 kΩ
Empfohlener Wert 33 kΩ

PHILIPS

PL 5632 /C3J

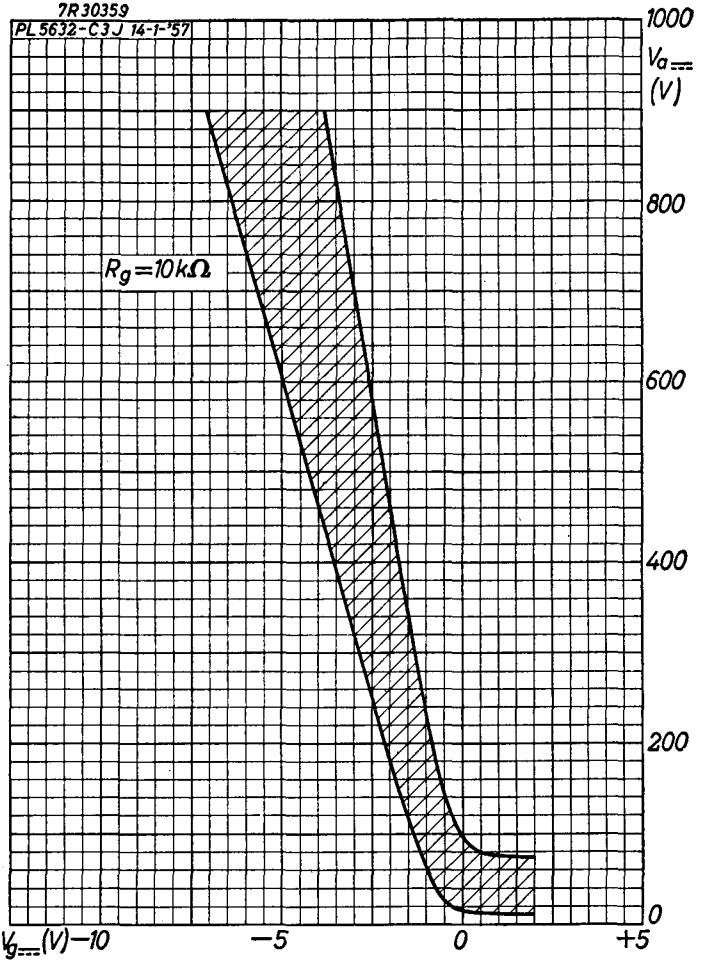


2.2.1957

A

PL 5632 /C3J

PHILIPS



A



PL5632 = C3J

page	sheet	date
1	1	1957.03.03
2	1	1959.03.03
3	1	1960.05.05
4	2	1957.03.03
5	2	1959.03.03
6	2	1960.05.05
7	3	1957.03.03
8	3	1960.05.05
9	A	1957.02.02
10	A	1960.05.05
11	FP	2000.05.30

PHILIPS

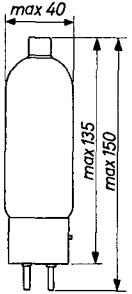
PL 5684 /C3JA

THYRATRON; xenon-filled triode with negative control characteristic
THYRATRON; triode à remplissage de xenon avec caractéristique de commande négative
STROMTORRÖHRE; Triode mit Xenonfüllung mit negativer Steuerkennlinie

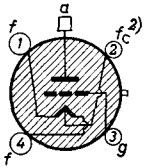
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Application: Service relais, commande du régime de moteurs, amorçage d'ignitrons
Anwendung : Relaisbetrieb, Motorsteuerung, Zündung von Ignitrons

Heating : direct
Chauffage: direct
Heizung : direkt

V_f = 2,5 V
I_f = 9,0 A
T_w = min. 30 sec[1])



Dimensions in mm
Dimensions en mm
Abmessungen in mm



Base : Medium 4p with bayonet
Culot : Medium 4p à baïonette
Sockel: Medium 4p mit Bajonett

Socket :
Support:
Fassung:

Cap :
Capot: 40619
Haube:

[1])Recommended value 60 sec.
Valeur recommandée 60 sec.
Empfohlener Wert 60 Sek.

[2])Load return
Circuit de retour de la charge
Belastungsrückleitung

PHILIPS

PL 5684 /C3JA

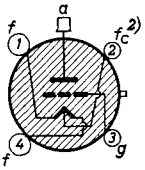
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THYRATRON; triode à remplissage de xenon avec caractéristique de commande négative
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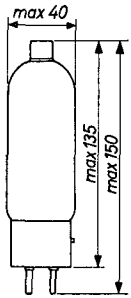
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Application: Service relais, commande du régime de moteurs, amorçage d'ignitrons
Anwendung : Relaisbetrieb, Motorsteuerung, Zündung von Ignitrons

Heating : direct
Chauffage: direct
Heizung : direkt

V_f = 2,5 V
I_f = 9,0 A
T_w = min. 30 sec[1])

Dimensions in mm
Dimensions en mm
Abmessungen in mm





Base : Medium 4p with bayonet
Culot : Medium 4p à baïonette
Sockel: Medium 4p mit Bajonett

Socket :
Support:
Fassung:

Cap :
Capot: 40619
Haube:

---

[1])Recommended value 60 sec.
Valeur recommandée 60 sec.
Empfohlener Wert 60 Sek.

[2])Load return
Circuit de retour de la charge
Belastungsrückleitung

Mounting position: any
Montage : à volonté
Einbau : beliebig

Net weight
Poids net 95 g
Nettogewicht

Capacitances
Capacités
Kapazitäten

C_{ag} = 3 pF
C_{gk} = 14 pF

Typical characteristics
Caractéristiques types
Kenndaten

V_{arc} = 10 V
T_{ion} = 10 µsec
T_{dion} = 1000 µsec

Limiting values (ABSOLUTE LIMITS)
Caractéristiques limites (VALEURS ABSOLUES)
Grenzdaten (ABSOLUTE WERTE)

V_{a_p}	= max.	1000 V
V_{inv_p}	= max.	1250 V
$-V_g$	= max.	300 V[3]
$-V_g$	= max.	10 V[4]
I_{k_p}	= max.	30 A
I_k (T_{av} = 5 sec.)	= max.	2,5 A
Isurge (max. 0,1 sec.)	= max.	300 A[5]
I_g (T_{av} = 1 cycle = 1 Periode)	= max.	0,1 A
I_{g_p}	= max.	0,5 A
R_g	=	10-100 kΩ[6]
t_{amb}	=	-55/+75 °C
Commutation factor Facteur de commutation Kommutationsfaktor	=	0,7 $\frac{V}{\mu sec} \times \frac{A}{\mu sec}$

3) Before conduction
400 V may be tolerated up to V_a = 900 V and R_g = 50-100 kΩ
Avant l'allumage
Une valeur de 400 V est admissible jusqu'à V_a = 900 V et R_g = 50-100 kΩ
Gelöschte Röhre
Ein Wert von 400 V ist zulässig bis V_a = 900 V und R_g = 50-100 kΩ

4) 5) 6) See page 3; voir page 3; siehe Seite 3

PHILIPS

Mounting position: any
Montage : à volonté
Einbau : beliebig

Net weight
Poids net 95 g
Nettogewicht

Capacitances
Capacités
Kapazitäten

C_{ag} = 3 pF
C_{gk} = 14 pF

Typical characteristics
Caractéristiques types
Kenndaten

V_{arc} = 10 V
T_{ion} = 10 µsec
T_{dion} = 1000 µsec

Limiting values (ABSOLUTE LIMITS)
Caractéristiques limites (VALEURS ABSOLUES)
Grenzdaten (ABSOLUTE WERTE)

V_{a_p}	= max.	1000 V
V_{inv_p}	= max.	1250 V
$-V_g$	= max.	300 V[3]
$-V_g$	= max.	10 V[4]
I_{k_p}	= max.	30 A
I_k (T_{av} = 5 sec.)	= max.	2,5 A
Isurge (max. 0,1 sec.)	= max.	300 A[5]
I_g (T_{av} = 1 cycle = 1 Periode)	= max.	0,1 A
I_{g_p}	= max.	0,5 A
R_g	=	10-100 kΩ[6]
t_{amb}	=	-55/+75 °C
Commutation factor Facteur de commutation Kommutationsfaktor	=	0,7 $\frac{V}{\mu sec} \times \frac{A}{\mu sec}$

3) Before conduction
400 V may be tolerated up to V_a = 900 V and R_g = 50-100 kΩ
Avant l'allumage
Une valeur de 400 V est admissible jusqu'à V_a = 900 V et R_g = 50-100 kΩ
Gelöschte Röhre
Ein Wert von 400 V ist zulässig bis V_a = 900 V und R_g = 50-100 kΩ

4)5)6) See page 3; voir page 3; siehe Seite 3

→

[4]) During conduction
Pendant la période de conduction
Gezündete Röhre

[5]) Fuse in anode circuit max. 10 A (recommended 6 A)
Fusible dans le circuit anodique max. 10 A (valeur recommandée 6 A)
Sicherung im Anodenkreis max. 10 A (empfohlener Wert 6 A)

[6]) Recommended value 33 kΩ
Valeur recommandée 33 kΩ
Empfohlener Wert 33 kΩ

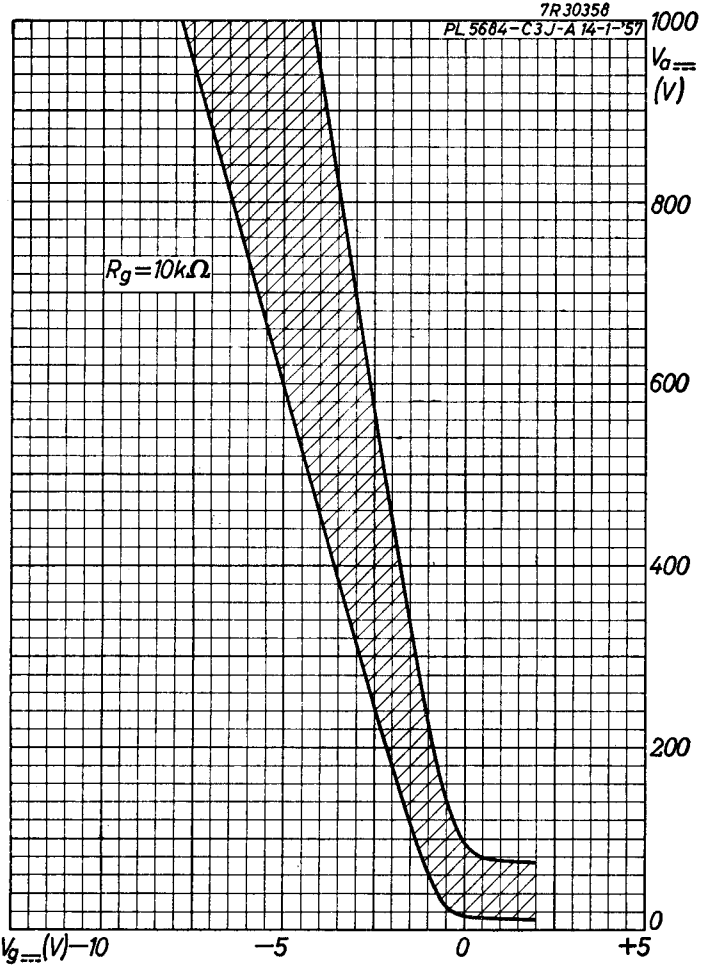
[4])During conduction
Pendant la période de conduction
Gezündete Röhre

[5])Fuse in anode circuit max. 10 A (recommended 6 A)
Fusible dans le circuit anodique max. 10 A (valeur recommandée 6 A)
Sicherung im Anodenkreis max. 10 A (empfohlener Wert 6 A)

[6])Recommended value 33 kΩ
Valeur recommandée 33 kΩ
Empfohlener Wert 33 kΩ

PHILIPS

PL 5684 /C3J A



2.2.1957

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Electronic Tube

HANDBOOK

PL5684 = C3JA

page	sheet	date
1	1	1957.08.08
2	1	1959.04.04
3	2	1957.08.08
4	2	1959.04.04
5	3	1957.03.03
6	3	1959.04.04
7	A	1957.02.02
8	FP	2000.05.30

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PL 5727

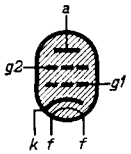
THYRATRON; inert gas filled tetrode with negative control characteristic, specially designed to assure dependable life and reliable operation
THYRATRON; tétrode à remplissage de gaz inerte avec caractéristique de commande négative, spécialement conçu pour assurer une durée de vie prononcée et un fonctionnement sûr
STROMTORRÖHRE; edelgasgefüllte Tetrode mit negativer Steuerkennlinie. Spezialausführung mit zuverlässiger Lebensdauer und grosser Betriebssicherheit

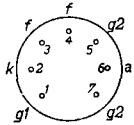
Application: Relay and servo control in aircraft and other mobile equipment
Application: Relais et servo-commande dans les appareils d'aviation et d'autres installations mobiles
Anwendung : Relais- und Servosteuerung in Flugzeug- und anderen beweglichen Anlagen

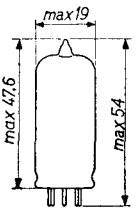
Heating : indirect
Chauffage : indirect
Heizung : indirekt

V_f = 6,3 V
I_f = 600 mA
T_w = 20 sec.[1)]

Dimensions in mm
Dimensions en mm
Abmessungen in mm







Base, culot, Sockel: MINIATURE

Socket :
Support: 5909/36
Fassung:

Mounting position: any
Montage : à volonté
Einbau : beliebig

[1)] If urgently wanted T_w may be decreased to min. 10 sec.
Au besoin T_w peut être réduite jusqu'à 10 sec. au min
Falls dringend erforderlich darf T_w bis min. 10 Sek herabgesetzt werden

SQ PHILIPS PL 5727

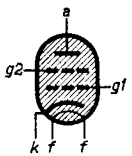
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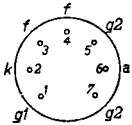
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Anwendung : Relais- und Servosteuerung in Flugzeug- und anderen beweglichen Anlagen

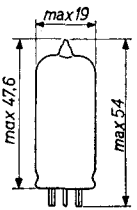
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Chauffage : indirect
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V_f = 6,3 V
I_f = 600 mA
T_w = 20 sec.[1])

Dimensions in mm
Dimensions en mm
Abmessungen in mm







Base, culot, Sockel: MINIATURE

Socket :
Support: 5909/36
Fassung:

Mounting position: any
Montage : à volonté
Einbau : beliebig

[1])If urgently wanted T_w may be decreased to min. 10 sec.
Au besoin T_w peut être réduite jusqu'à 10 sec. au min
Falls dringend erforderlich darf T_w bis min. 10 Sek herabgesetzt werden

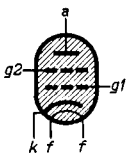
SQ PHILIPS PL 5727

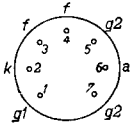
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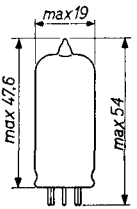
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Application: Relais et servo-commande dans les appareils d'aviation et d'autres installations mobiles
Anwendung : Relais- und Servosteuerung in Flugzeug- und anderen beweglichen Anlagen

Heating	: indirect	V_f	=	6,3 V
Chauffage	: indirect	I_f	=	600 mA
Heizung	: indirekt	T_w	=	20 sec.[1])

Dimensions in mm
Dimensions en mm
Abmessungen in mm







Base, culot, Sockel: MINIATURE

Socket :		Mounting position:	any
Support:	5909/36	Montage	: à volonté
Fassung:		Einbau	: beliebig

[1]) If urgently wanted T_w may be decreased to min. 10 sec.
Au besoin T_w peut être réduite jusqu'à 10 sec. au min
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SQ PHILIPS PL 5727

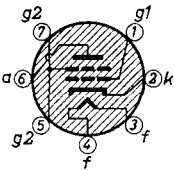
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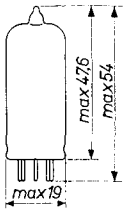
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Heating : indirect
Chauffage : indirect
Heizung : indirekt

V_f = 6,3 V
I_f = 600 mA
T_w = 20 sec.[1])

Dimensions in mm
Dimensions en mm
Abmessungen in mm





Base, culot, Sockel: MINIATURE

Socket :
Support:
Fassung:

Mounting position: any
Montage : à volonté
Einbau : beliebig

[1])If urgently wanted T_w may be decreased to min. 10 sec.
Au besoin T_w peut être réduite jusqu'à 10 sec. au min
Falls dringend erforderlich darf T_w bis min. 10 Sek herabgesetzt werden

Capacitances Capacités Kapazitäten	C_{g1}	=	2,4 pF
	C_{ag1}	=	0,026 pF

Typical characteristics
Caractéristiques types
Kenndaten

V_{arc}		=	8 V
T_{ion}		=	0,5 µsec
T_{dion}	(V_b=125V; I_a=0,1A; V_{g1}=-100V)	=	35 µsec
T_{dion}	(V_b=125V; I_a=0,1A; V_{g1}= -11V)	=	75 µsec

Limiting values (ABSOLUTE LIMITS)
Caractéristiques limites (LIMITES ABSOLUES)
Grenzdaten (ABSOLUTE GRENZEN)

A. For use as grid controlled rectifier
Pour utilisation comme redresseur commandé par grille
Für Verwendung als gittergesteuerte Gleichrichter

$V_{a\ inv_p}$	=	max.	1300 V
V_{a_p}	=	max.	650 V
I_{k_p}	=	max.	500 mA
I_k (T_{av} = max. 30 sec.)	=	max.	100 mA
I_{surge} (max. 0,1 sec.)	=	max.	10 A
$-V_{g1}$	=	max.	100 V[1]
$-V_{g1}$	=	max.	10 V[2]
I_{g1}	=	max.	10 mA[3]
$-V_{g2}$	=	max.	100 V[1]
$-V_{g2}$	=	max.	10 V[2]
I_{g2}	=	max.	10 mA[3][4]
V_{kf} (k pos.; f neg.)	=	max.	100 V
V_{kf} (k neg.; f pos.)	=	max.	25 V
R_{g1}	=	max.	0,1 MΩ
t_{amb}	=	max.	+90 °C
t_{amb}	=	min.	-75 °C

[1] Before conduction
Avant l'allumage du tube
Vor Zündung der Röhre

[2] During conduction
Pendant la période de conduction
Während des Stromdurchganges

[3][4] See page 4; voir page 4; siehe Seite 4

Capacitances Capacités Kapazitäten	C_{g1}	=	2,4 pF
	C_{ag1}	=	0,026 pF

Typical characteristics
Caractéristiques types
Kenndaten

V_{arc}		=	8 V
T_{ion}		=	0,5 µsec
T_{dion}	(V_b=125V; I_a=0,1A; V_{g1}=-100V)	=	35 µsec
T_{dion}	(V_b=125V; I_a=0,1A; V_{g1}= -11V)	=	75 µsec

Limiting values (ABSOLUTE LIMITS)
Caractéristiques limites (LIMITES ABSOLUES)
Grenzdaten (ABSOLUTE GRENZEN)

A. For use as grid controlled rectifier
Pour utilisation comme redresseur commandé par grille
Für Verwendung als gittergesteuerte Gleichrichter

$V_{a\ inv_p}$	=	max.	1300 V
V_{ap}	=	max.	650 V
I_{kp}	=	max.	500 mA
I_k (T_{av} = max. 30 sec.)	=	max.	100 mA
I_{surge} (max. 0,1 sec.)	=	max.	10 A
$-V_{g1}$	=	max.	100 V[1]
$-V_{g1}$	=	max.	10 V[2]
I_{g1}	=	max.	10 mA[3]
$-V_{g2}$	=	max.	100 V[1]
$-V_{g2}$	=	max.	10 V[2]
I_{g2}	=	max.	10 mA[3][4]
V_{kf} (k pos.; f neg.)	=	max.	100 V
V_{kf} (k neg.; f pos.)	=	max.	25 V
R_{g1}	=	max.	0,1 MΩ
t_{amb}	=	max.	+90 °C
t_{amb}	=	min.	-75 °C

[1])Before conduction
Avant l'allumage du tube
Vor Zündung der Röhre

[2])During conduction
Pendant la période de conduction
Während des Stromdurchganges

[3])[4])See page 4; voir page 4; siehe Seite 4

Capacitances
Capacités
Kapazitäten

C_{g1}	=	2,4 pF
C_{ag1}	=	0,026 pF

Typical characteristics
Caractéristiques types
Kenndaten

V_{arc}	= 8 V
T_{ion}	= 0,5 µsec
T_{dion} (V_b=125V; I_a=0,1A; V_{g1}=-100V)	= 35 µsec
T_{dion} (V_b=125V; I_a=0,1A; V_{g1}= -11V)	= 75 µsec

Limiting values (ABSOLUTE LIMITS)
Caractéristiques limites (LIMITES ABSOLUES)
Grenzdaten (ABSOLUTE GRENZEN)

A. For use as grid controlled rectifier
Pour utilisation comme redresseur commandé par grille
Für Verwendung als gittergesteuerte Gleichrichter

$V_{a\ inv_p}$	= max.	1300 V
V_{a_p}	= max.	650 V
I_{k_p}	= max.	500 mA
I_k (T_{av} = max. 30 sec.)	= max.	100 mA
I_{surge} (max. 0,1 sec.)	= max.	10 A
$-V_{g1}$	= max.	100 V[1])
$-V_{g1}$	= max.	10 V[2])
I_{g1}	= max.	10 mA[3])
$-V_{g2}$	= max.	100 V[1])
$-V_{g2}$	= max.	10 V[2])
I_{g2}	= max.	10 mA[3])[4])
V_{kf} (k pos.; f neg.)	= max.	100 V
V_{kf} (k neg.; f pos.)	= max.	25 V
R_{g1}	= max.	0,1 MΩ
t_{amb}	= max.	+90 °C
t_{amb}	= min.	-75 °C

[1]) Before conduction
Avant l'allumage du tube
Vor Zündung der Röhre

[2]) During conduction
Pendant la période de conduction
Während des Stromdurchganges

[3])[4]) See page 4; voir page 4; siehe Seite 4

Capacitances
Capacités
Kapazitäten

C_{g1}	=	2,4 pF
C_{ag1}	=	0,026 pF

Typical characteristics
Caractéristiques types
Kenndaten

V_{arc}	= 8 V
T_{ion}	= 0,5 µsec
T_{dion} (V_b=125V; I_a=0,1A; V_{g1}=-100V)	= 35 µsec
T_{dion} (V_b=125V; I_a=0,1A; V_{g1}= -11V)	= 75 µsec

Limiting values (ABSOLUTE LIMITS)
Caractéristiques limites (LIMITES ABSOLUES)
Grenzdaten (ABSOLUTE GRENZEN)

A. For use as grid controlled rectifier
Pour utilisation comme redresseur commandé par grille
Für Verwendung als gittergesteuerte Gleichrichter

$V_{a\ inv_p}$	= max.	1300 V
V_{a_p}	= max.	650 V
I_{k_p}	= max.	500 mA
I_k (T_{av} = max. 30 sec.)	= max.	100 mA
I_{surge} (max. 0,1 sec.)	= max.	10 A
$-V_{g1}$	= max.	100 V[1]
$-V_{g1}$	= max.	10 V[2]
I_{g1}	= max.	10 mA[3]
$-V_{g2}$	= max.	100 V[1]
$-V_{g2}$	= max.	10 V[2]
I_{g2}	= max.	10 mA[3][4]
V_{kf} (k pos.; f neg.)	= max.	100 V
V_{kf} (k neg.; f pos.)	= max.	25 V
R_{g1}	= max.	0,1 MΩ
t_{amb}	= max.	+90 °C
t_{amb}	= min.	-75 °C

[1]) Before conduction
Avant l'allumage du tube
Vor Zündung der Röhre

[2]) During conduction
Pendant la période de conduction
Während des Stromdurchganges

[3])[4]) See page 4; voir page 4; siehe Seite 4

B. For use as pulse modulator
Pour utilisation comme modulateur par impulsions
Für Verwendung als Impulsmodulator

$V_{a\ inv_p}$	= max.	100 V
V_{a_p}	= max.	500 V [5]
I_{k_p}	= max.	10 A
I_k	= max.	0,01 A
$-V_{g1}$	= max.	100 V [1]
$-V_{g1}$	= max.	10 V [2]
I_{g1}	= max.	20 mA
$-V_{g2}$	= max.	50 V [1]
$-V_{g2}$	= max.	10 V [2]
I_{g2}	= max.	20 mA [4]
T_{imp}	= max.	5 µsec
Pulse repetition rate Fréquence des impulsion Impulsfrequenz	= max.	500 c/s
δ	= max.	0,1 %
Rate of change of cathode current Grösse der Katodenstromänderung Taux de la variation du courant cathodique	= max.	100 A/µsec
V_{kf}	= max.	0 V
R_{g2}	= max.	25 kΩ
R_{g2}	= min.	2 kΩ
R_{g1}	= max.	0,5 MΩ
t_{amb}	= max.	+90 °C
t_{amb}	= min.	-75 °C

Shock resistance: The tube can withstand impact shocks in any direction of max. 750 g
Résistance aux chocs: Le tube peut supporter en tout sens des chocs par impact, de 750 g max.
Stossfestigkeit: Die Röhre hält Stossbeschleunigungen von max. 750 g in jeder Richtung stand

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[1)2)] See page 2; voir page 2; siehe Seite 2

[3)4)5)] See page 4; voir page 4; siehe Seite 4

B. For use as pulse modulator
Pour utilisation comme modulateur par impulsions
Für Verwendung als Impulsmodulator

$V_{a\ inv_p}$	= max.	100 V
V_{a_p}	= max.	500 V[5])
I_{k_p}	= max.	10 A
I_k	= max.	0,01 A
$-V_{g1}$	= max.	100 V[1])
$-V_{g1}$	= max.	10 V[2])
I_{g1}	= max.	20 mA
$-V_{g2}$	= max.	50 V[1])
$-V_{g2}$	= max.	10 V[2])
I_{g2}	= max.	20 mA[4]) ←
T_{imp}	= max.	5 µsec
Pulse repetition rate Fréquence des impulsion Impulsfrequenz	= max.	500 c/s
δ	= max.	0,1 %
Rate of change of cathode current Grösse der Katodenstromänderung Taux de la variation du courant cathodique	= max.	100 A/µsec
V_{kf}	= max.	0 V
R_{g2}	= max.	25 kΩ
R_{g2}	= min.	2 kΩ
R_{g1}	= max.	0,5 MΩ
t_{amb}	= max.	+90 °C
t_{amb}	= min.	-75 °C

Shock resistance: The tube can withstand impact shocks in any direction of max. 750 g
Résistance aux chocs: Le tube peut supporter en tout sens des chocs par impact, de 750 g max.
Stossfestigkeit: Die Röhre hält Stossbeschleunigungen von max. 750 g in jeder Richtung stand

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[1])[2])See page 2; voir page 2; siehe Seite 2

[3])[4])[5])See page 4; voir page 4; siehe Seite 4

For curves please refer to type PL 2D21
Pour les courbes voir type PL 2D21
Kennlinien siehe Type PL 2D21

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3) T_{av} = max. 1 cyle
T_{av} = max. 1 Periode

4) In order not to exceed this maximum value, it is recommended to insert a series resistor of 1000 Ω in the screen-grid lead

Afin de ne pas dépasser cette valeur maximum, il est recommandé d'insérer une résistance série de 1000 Ω dans la connection de la grille-écran

Damit dieser maximale Wert nicht überschritten wird, wird einen Serienwiderstand von 1000 Ω in der Schirmgitterleitung empfohlen

5) After the completion of a pulse, a 20 µsec. delay is required before a positive voltage of more than 10 V is applied to the tube

Après l'achèvement d'une impulsion, un retard de 20 µsec est nécessaire avant qu'une tension positive supérieure à 10 V soit appliquée au tube

Nach Beendigung eines Impulses darf vor Ablauf von 20 µSek keine Spannung von mehr als 10 V an die Röhre gelegt werden

[3])T_{av} = max. 1 cyle
T_{av} = max. 1 Periode

[4])In order not to exceed this maximum value, it is recommended to insert a series resistor of 1000 Ω in the screen-grid lead

Afin de ne pas dépasser cette valeur maximum, il est recommandé d'insérer une résistance série de 1000 Ω dans la connection de la grille-écran

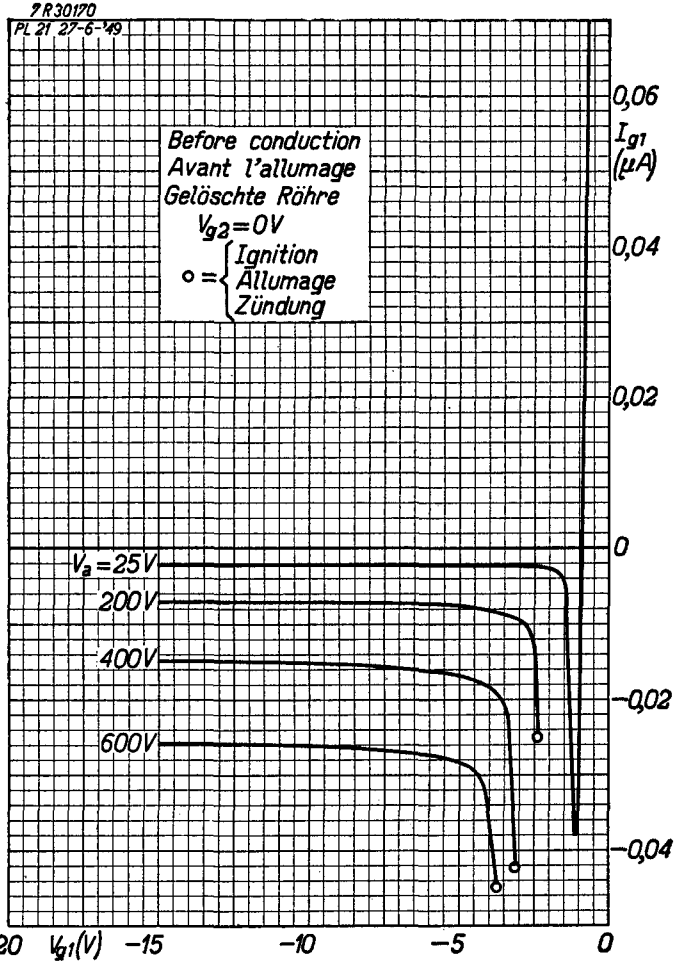
Damit dieser maximale Wert nicht überschritten wird, wird einen Serienwiderstand von 1000 Ω in der Schirmgitterleitung empfohlen

[5])After the completion of a pulse, a 20 µsec. delay is required before a positive voltage of more than 10 V is applied to the tube

Après l'achèvement d'une impulsion, un retard de 20 µsec est nécessaire avant qu'une tension positive supérieure à 10 V soit appliquée au tube

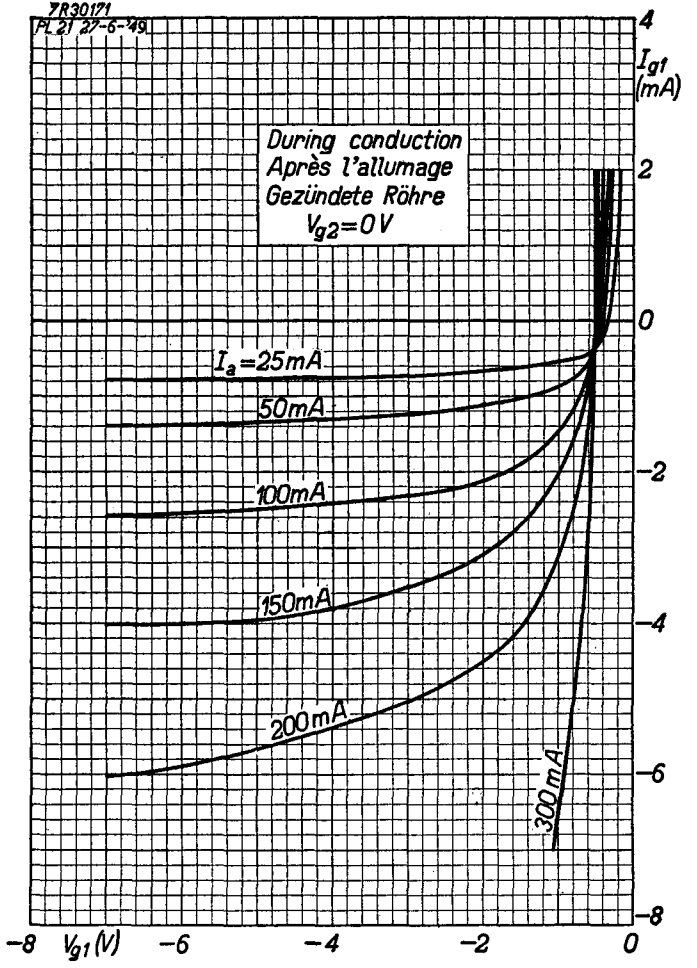
Nach Beendigung eines Impulses darf vor Ablauf von 20 µSek keine Spannung von mehr als 10 V an die Röhre gelegt werden

SQ **PHILIPS** PL 5727

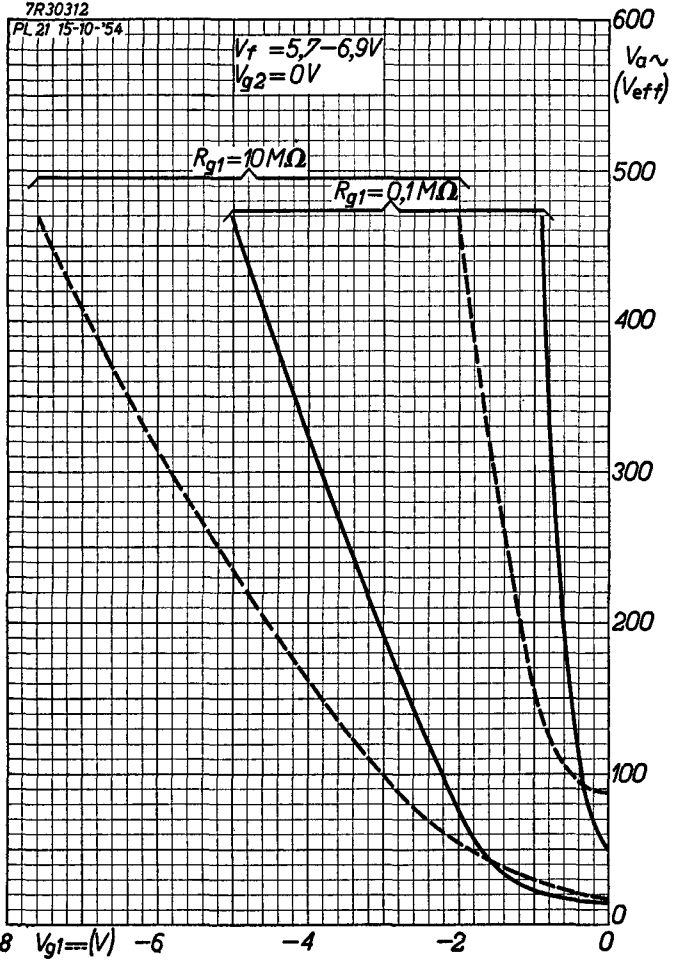


6.6.1957

A

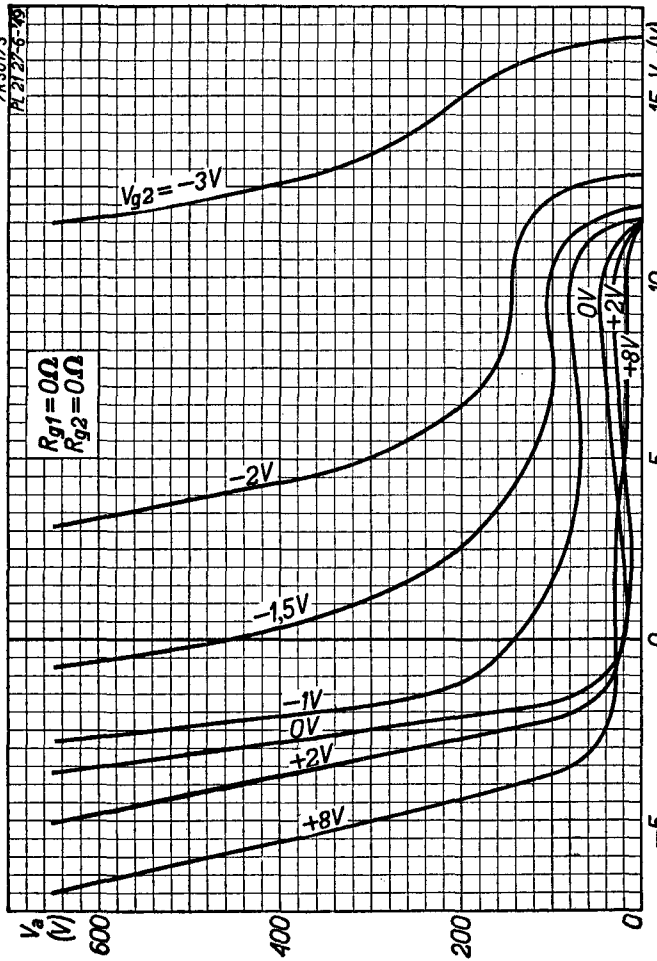

7R30171
PL 21 27-6-49
During conduction
Après l'allumage
Gezündete Röhre
$V_{g2}=0V$
$I_a=25mA$
50mA
100mA
150mA
200mA
300mA
I_{g1} (mA)
4
2
0
−2
−4
−6
−8
−8
V_{g1}(V)
−6
−4
−2
0

SQ **PHILIPS** PL 5727



6.6.1957

C


2R30173
PL 21 27-6-49
$V_{g2} = -3V$
$R_{g1} = 0\Omega$
$R_{g2} = 0\Omega$
-2V
-1,5V
-1V
0V
+2V
+8V
+8V
+2V
0V
15
10
5
0
−5
V_{g1}(V)
V_a (V)
600
400
200
0



PL5727

page	sheet	date
1	1	1956.06.06
2	1	1957.06.06
3	1	1958.01.01
4	1	1959.09.09
5	2	1956.06.06
6	2	1957.06.06
7	2	1958.01.01
8	2	1959.09.09
9	3	1956.06.06
10	3	1958.01.01
11	4	1956.06.06
12	4	1958.01.01
13	A	1957.06.06
14	B	1957.06.06
15	C	1957.06.06
16	D	1957.06.06
17	FP	2000.05.30

PHILIPS PL 5822

Water cooled IGNITRON
IGNITRON à refroidissement par l'eau
Wassergekühltes IGNITRON

Application: Control of frequency-changer resistance welders
Application: Réglage des soudeurs à resistance avec transformation de fréquence
Anwendung : Regelung von Widerstandsschweisser mit Frequenzumformung

Frequency range
Gamme de frequences 50 - 60 c/s
Frequenzbereich

Mounting position: vertical, anode connection up
Montage : vertical, la connection de l'anode en haut
Einbau : senkrecht, Anodenanschluss oben

Cooling
Refroidissement
Kühlung

q [1]		= min.	6 l/min
p_i	(q = 6 l/min)	= max.	0,35 kg/cm^2
$t_o - t_i$	(q = 6 l/min)	= max.	6 °C
t_i		= min.	10 °C
t_o		= max.	35 °C

Net weight Poids net Nettogewicht	3460 g	Shipping weight Poids brut Bruttogewicht	9785 g

[1])At stated I_{av}
A I_{av} indiqué
Bei gegebenem I_{av}

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t_o-t_i	(q = 6 l/min)	= max.	6 °C
t_i		= min.	10 °C
t_o		= max.	35 °C

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A I_{av} indiqué
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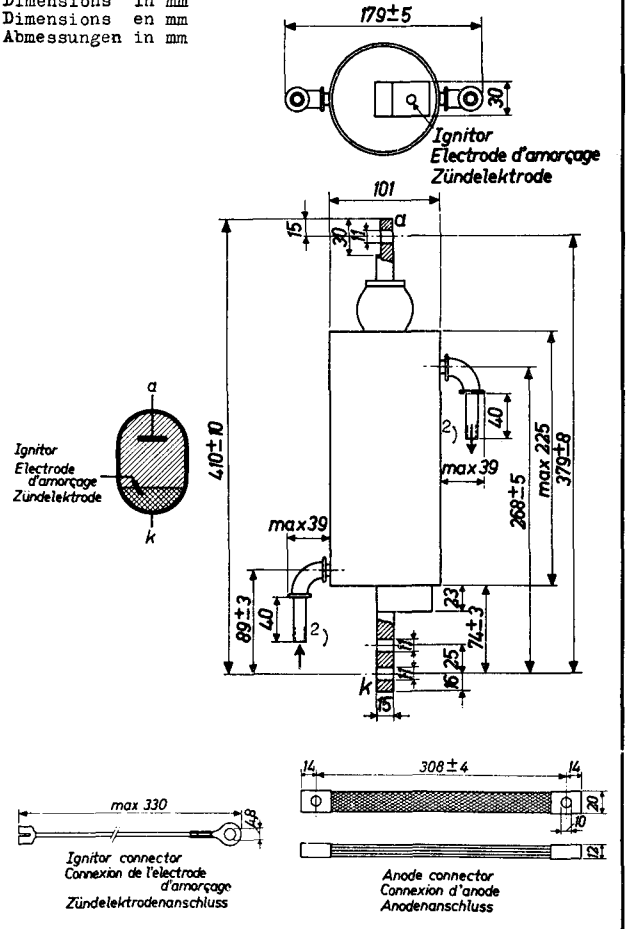
PHILIPS PL 5822

The PL5822 is equivalent to the PL5822A, but is not suitable for being equipped with a thermostatic control unit

Le tube PL5822 est équivalent au tube PL5822A, mais ne peut pas être équipé d'un dispositif à commande thermostatique

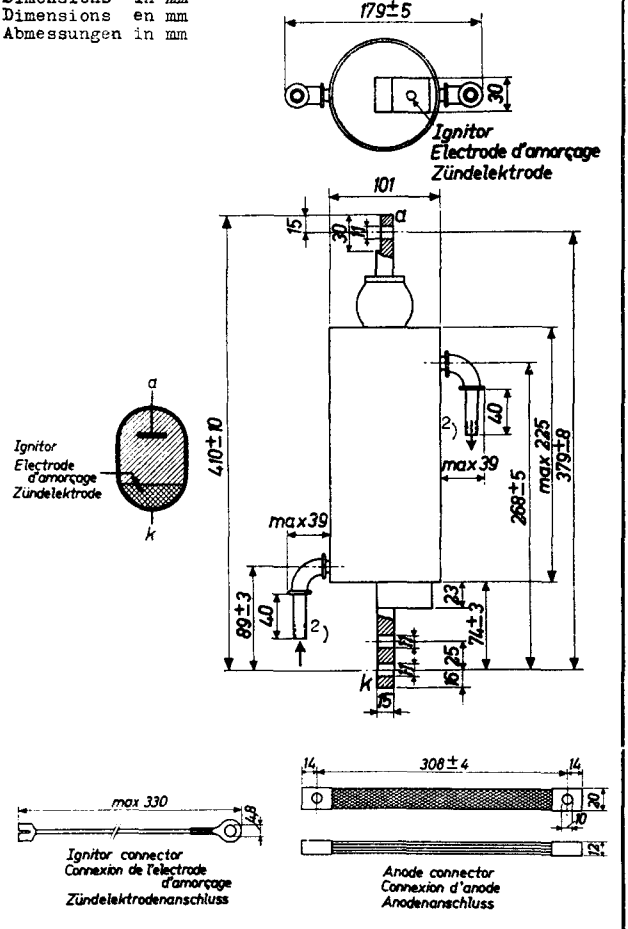
Die Röhre PL5822 stimmt mit der Röhre PL5822A überein, kann aber nicht mit einer thermostatischen Regelvorrichtung versehen werden

Dimensions in mm
Dimensions en mm
Abmessungen in mm



2) 1/8" pipe thread; 1/8" pas à gaz; 1/8" Gasrohrgewinde

Dimensions in mm
Dimensions en mm
Abmessungen in mm



2) 1/8" pipe thread; 1/8" pas à gaz; 1/8" Gasrohrgewinde

Limiting values (ABSOLUTE VALUES)
Caractéristiques limites (VALEURS ABSOLUES)
Grenzdaten (ABSOLUTWERTE)

Phase control angle = 0
Contrôle de phase = 0
Phasenanschnitt = 0

V_{afwd_p} (V)	V_{ainv_p} (V)	I_{a_p} [3] (A)	I_a [3] (max) (A)	Tav (max) (s)	$\frac{I_a}{I_p}$ (max) (T_{av}=0,2 s)	$\frac{I_{surge}}{I_{ap}}$ (max) (T=max.0,15s)
1200	1200	1500 [5]	20	6,25	0,166	12,5
		420	70			
1500 [4]	1500 [4]	1200 [5]	16	6,25	0,166	12,5
		336	56			

Ignitor; Electrode d'amorçage; Zündelektrode

Requirements for cathode excitation
Conditions pour l'excitation de la cathode
Bedingungen für Katodeerregung

V_{fwd_p} = min. 200 V
I_p = min. 30 A

Typical value of starting time at required min. voltage or current
Valeur type du temps d'amorçage à la tension ou au courant demandé minimum
Mittelwert der Zündungszeit bei der erforderlichen min. Spannung oder Strom — 100 µsec

Limiting values
Caractéristiques limites
Grenzdaten

V_{fwd_p} = max. V_{ap}
V_{inv_p} = max. 5 V
I_p = max. 100 A
Irms = max. 10 A
I_{av} (Tav=max.5 sec) = max. 1 A

[3)4)5)] See page 4; voir page 4; siehe Seite 4

Limiting values (Absolute limits)
Caractéristiques limites (Limites absolues)
Grenzdaten (Absolutwerte)

Phase control angle = 0
Contrôle de phase = 0
Phasenanschnitt = 0

V_{afwd_p} (V)	V_{ainv_p} (V)	I_{ap} [3] (A)	I_a [3] (max) (A)	T_{av} (max) (s)	$\frac{I_a}{I_{ap}}$ (max) (T_{av}=0,2 s)	$\frac{I_{surge}}{I_{ap}}$ (max) (T=max.0,15 s)
1200	1200	1500 [5]	20	6,25	0,166	12,5
		420	70			
1500 [4]	1500 [4]	1200 [5]	16	6,25	0,166	12,5
		336	56			

Ignitor; Electrode d'amorçage; Zündelektrode

Requirements for cathode excitation
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Valeur type du temps d'amorçage à la tension ou au courant demandé minimum
Mittelwert der Zündungszeit bei der erforderlichen min. Spannung oder Strom — 100 µsec

Limiting values (Absolute limits)
Caractéristiques limites (Limites absolues)
Grenzdaten (Absolutwerte)

V_{fwd_p} = max. V_{afwd_p} [6] ←
V_{inv_p} = max. 5 V
I_p = max. 100 A
I_{eff} = max. 10 A
I (T_{av}=max.5 sec) = max. 1 A

[3)4)5)6)] See page 4; voir page 4; siehe Seite 4

[3])For other values of I_{ap} the corresponding max. average anode current per tube I_a may be derived from the curve on page A
Pour autres valeurs de I_{ap} le courant moyen correspondant max. de l'anode par tube I_a peut être dérivé de la courbe sur page A
Für andere Werte von I_{ap} ist der entsprechende maximum Mittelwert des Anodenstromes pro Röhre I_a von der Kurve auf Seite A abzuleiten

[4])Max. permissible value
Valeur admissible maximum
Max. zulässiger Wert

[5])Max. value at the indicated voltage
Valeur max. à la tension indiquée
Max. Wert bei gegebener Spannung

---

[3]) For other values of I_{ap} the corresponding max. average anode current per tube (I_a) may be derived from the curve on page A

Pour d'autres valeurs de I_{ap} le courant anodique moyen max. correspondant par tube (I_a) peut être dérivé de la courbe sur page A

Für andere Werte von I_{ap} erfolgt der entsprechende maximale Mittelwert des Anodenstromes pro Röhre (I_a) aus der Kurve auf Seite A

[4]) Max. permissible value
Valeur admissible maximum
Max. zulässiger Wert

[5]) Max. value at the indicated voltage
Valeur max. à la tension indiquée
Max. Wert bei der gegebenen Spannung

[6]) A limiting resistor of about 1 % of the R.M.S. mains voltage value has to be included in the ignitor circuit

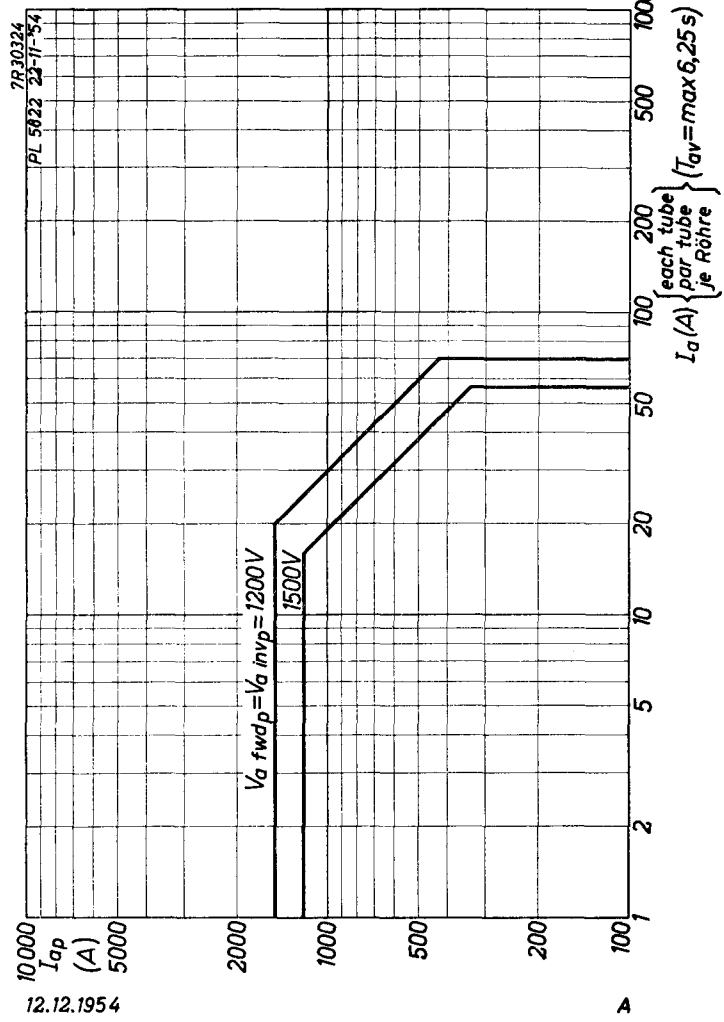
Une résistance limiteuse d'environ 1 % de la valeur effective de la tension du secteur doit être incorporée dans le circuit de l'électrode d'amorçage

Ein Begrenzungswiderstand von etwa 1 % des effektiven Netzspannungswertes muss in dem Zündelektrodenkreis aufgenommen werden

PHILIPS

PL 5822

Intermittent rectifier service
Service de redressement intermittent
Aussetzender Gleichrichterbetrieb



12.12.1954

A

PHILIPS

Electronic Tube

HANDBOOK

PL5822

page	sheet	date
1	1	1954.12.12
2	1	1956.04.04
3	1	1959.05.05
4	2	1954.12.12
5	2	1956.04.04
6	3	1956.04.04
7	3	1958.03.03
8	4	1956.04.04
9	4	1958.03.03
10	A	1954.12.12
11	FP	2000.06.01

Water-cooled IGNITRON for welding service with provisions for mounting a thermostatic control unit

IGNITRON à refroidissement par l'eau pour service de soudure avec possibilité de monter un dispositif à commande thermostatique

Wassergekühltes IGNITRON für Schweissbetrieb mit Anordnung zur Montage einer thermostatischen Regelvorrichtung

Application: Control of frequency-converting resistance welders. Mounting of suitable thermostatic switches has the advantage of diminishing the cooling water consumption and of protecting the tube from overheating due to an insufficient flow of cooling water

Application: Réglage de soudeurs a résistance sous convertissement de fréquence. Le montage de commutateurs thermostatiques appropriés offre l'avantage de diminuer la consommation d'eau de refroidissement et de protéger le tube contre le surchauffage par suite d'un écoulement insuffisant d'eau de refroidissement

Anwendung: Regelung von Widerstandsschweissgeräten mit Frequenzumformung. Die Montage geeigneter thermostatischen Schalter bietet den Vorteil eines verringerten Kühlwasserbedarfs und eines Schutzes der Röhre gegen Überhitzung infolge eines unzureichenden Kühlwasserstromes

Frequency range Gamme de fréquences Frequenzbereich	f_i	=	50-60	c/s
	f_o	=	min. 5	c/s [1]

Cooling water control thermostat with mounting bracket
Thermostat pour le réglage de l'eau de refroidissement avec support de montage 55305
Thermostat zur Regelung des Kühlwassers mit Montagestütze

Overload protecting thermostat with mounting bracket
Thermostat de sécurité contre la surcharge avec support de montage 55306
Überlastungsschutzthermostat mit Montagestütze

Typical temperature data of recommended thermostats
Données de température des thermostats recommandés
Temperaturkenndaten der empfohlenen Thermostate

	55305		
Closing temperature Température de fermeture Schliessungstemperatur	35°C	Breaking temperature Température d'ouverture Öffnungstemperatur	25°C

	55306		
Breaking temperature Température d'ouverture Öffnungstemperatur	52°C	Closing temperature Température de fermeture Schliessungstemperatur	45°C

[1]) See page 2; voir page 2; siehe Seite 2

Water cooled IGNITRON with provisions for mounting a thermostatic control unit
IGNITRON à refroidissement par eau avec possibilité de monter un dispositif à commande thermostatique
Wassergekühltes IGNITRON mit Anordnung zur Montierung einer thermostatischen Regelvorrichtung

Application: Frequency-changer resistance welding service. Equipped with suitable thermostatic switches it has the advantage of diminishing the cooling-water consumption and of protecting the tube and associated equipment from overloads and overheating
Application: Soudeur à résistance avec conversion de fréquence. Fonctionnant avec des commutateurs thermostatiques propres, il présente l'avantage de diminuer la consommation d'eau de refroidissement et de protéger le tube et les appareils auxiliaires contre les surcharges et le surchauffage
Anwendung: Widerstandsschweissbetrieb mit Frequenzumformung. Ausgerüstet mit geeigneten thermostatischen Schaltern bietet es den Vorteil eines verminderten Kühlwasserbedarfs und erhöhten Schutzes der Röhre und der dazugehörigen Ausrüstung gegen Überlastung und Überhitzung

Input supply frequency
Fréquence de la tension d'alimentation 50-60 c/s
Frequenz der Speisespannung

Output frequency
Fréquence de sortie [1]) min. 5 c/s
Ausgangsfrequenz

Net weight		Shipping weight	
Poids net	3,7 kg	Poids brut	5 kg
Nettogewicht		Bruttogewicht	

Water saving thermostat
Thermostat pour économie d'eau 55305
Thermostat zur Wassereinsparung

Overload protecting switch
Interrupteur de sécurité contre la surcharge 55306
Überlastungsschutzschalter

Cooling; refroidissement; Kühlung

Typical characteristics
Caractéristiques types
Kenndaten

p_i (q = 6 l/min.) = max. 0,35 kg/cm^2
$t_o - t_i$ (q = 6 l/min.) = max. 4 °C

---

[1]) In usual frequency-changer resistance welding service
En service usuel de soudure à résistance avec conversion de fréquence
In üblichem Widerstandsschweissbetrieb mit Frequenzumformung

Cooling; refroidissement; Kühlung

Typical characteristics
Caractéristiques types
Kenndaten

A With thermostatic control
Avec réglage thermostatique
Mit thermostatischer Regelung

pi (q = 6 l/min) = max. 0,35 kg/cm²

B Without thermostatic control
Sans réglage thermostatique
Ohne thermostatische Regelung

pi (q = 6 l/min) = max. 0,35 kg/cm²
to-ti(q= 6 l/min) = max. 6 °C [2])

Limiting values
Caractéristiques limites
Grenzdaten

A With thermostatic control
Avec réglage thermostatique [3])
Mit thermostatischer Regelung

ti = min. 10 °C q = min. 6 l/min[4])
ti = max. 35 °C

B Without thermostatic control
Sans réglage thermostatique
Ohne thermostatische Regelung

ti = min. 10 °C q = min. 6 l/min[5])
ti = max. 35 °C

Net weight	Shipping weight
Poids net 3,7 kg	Poids brut 5 kg
Nettogewicht	Bruttogewicht

For further data and curve please refer to type PL5822
Pour les autres données et la courbe voir type PL5822
Für weitere Daten und Kennlinie siehe Typ PL5822

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[1]) In usual frequency-converting resistance welding service
En service usuel de soudure à resistance sous convertissement de fréquence
In üblichem Widerstandsschweissbetrieb mit Frequenzumformung

[2]) Per tube; par tube; pro Röhre

[3])[4])[5]) See page 4; voir page 4; siehe Seite

Cooling (continued)
Refroidissement (suite)
Kühlung (Fortsetzung)

Limiting values (with or without thermostatic control; absolute limits)
Caractéristiques limites (sans ou avec réglage thermostatique; limites absolues)
Grenzdaten (mit oder ohne thermostatische Regelung; absolute Grenzwerte)

Intermittent rectifier or three-phase welding service
Service redresseur intermittent ou soudage triphasé
Aussetzender Gleichrichter- oder Dreiphasenschweissbetrieb

q = min. 6 l/min. [1])
t_i = min. 10 °C [2])
t_i = max. 35 °C [2])
t_m = max. 45 °C [3])

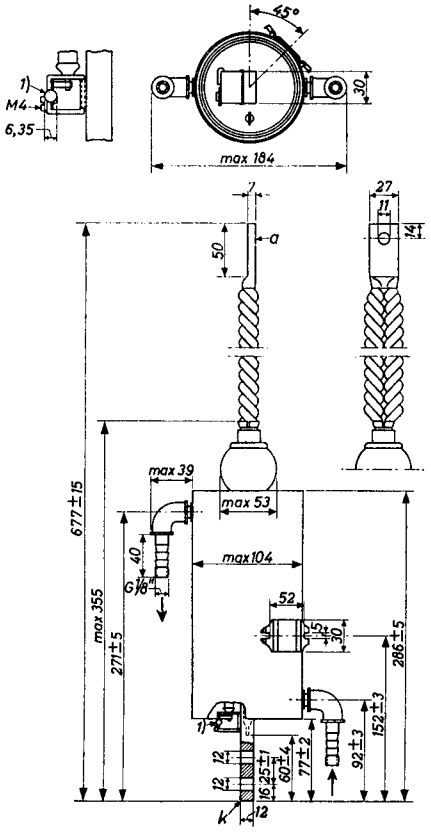
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[1]) At max. demand and max. I_a; solenoid valve open
A la demande d'énergie max. et à I_a max.; soupape à solénoïde ouverte
Bei max. Energiebedarf und max. I_a; Solenoidventil offen

[2]) When a number of tubes is cooled in series, t_i min is measured at the coldest and t_i max. at the hottest tube
Si un nombre de tubes est refroidi en série, t_i min est mesuré au tube le plus froid et t_i max au tube le plus chaud
Wenn mehrere Röhren in Reihe gekühlt werden, muss t_i min an der kältesten und t_i max an der heissesten Röhre gemessen werden

[3]) tm = temperature of thermostat mount
Warning: The thermostat mount is at full line voltage
tm = température de la plaque de montage du thermostat
Avis: La plaque de montage du thermostat est à la tension du secteur
tm = Temperatur der Montageplatte des Thermostats
Warnung: Die Montageplatte des Thermostats befindet sich auf Netzspannung

Dimensions in mm; dimensions en mm; Abmessungen in mm



---

[1]) This contact pin or screw M4 can be used for electrical connection of the ignitor
Cette broche de contact ou le vis M4 peut être utilisé pour la connexion électrique de l'électrode d'amorçage
Dieser Kontaktstift oder die Schraube M4 kann für die elektrische Verbindung der Zündelektrode verwendet werden

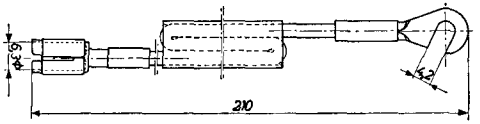
Cooling (continued)
Refroidissement (suite)
Kühlung (Fortsetzung)

When the cooling systems of a number of tubes are connected in series, the water saving thermostat should be mounted on the last but one and the overload protecting thermostat on the last tube. *In three phase welding service* using six tubes it is recommended to cool not more than three tubes in series

Quand les dispositifs de refroidissement de quelques tubes sont reliés en série, il faut monter le thermostat pour le réglage de l'eau de refroidissement sur le tube final à un près et le thermostat de sécurité contre la surcharge sur le tube final. En service de soudure triphasé avec six tubes il est recommandé de ne pas refroidir plus de trois tubes en série

Wenn die Kühlvorrichtungen einiger Röhren in Reihe geschaltet werden, soll der Thermostat zur Wassereinsparung auf die zweitletzte und der Überlastungsschutzthermostat auf die letzte Röhre montiert werden. Bei Dreiphasenschweissbetrieb unter Verwendung von sechs Röhren wird es empfohlen nicht mehr als drei Röhren in Reihe zu kühlen

Ignitor connector. Unfolded length 330 mm
Connexion de l'électrode d'amorçage. Longueur dépliée 330 mm
Zündelektrodenanschluss. Entfaltete Länge 330 mm



Dimensions in mm
Dimensions en mm
Abmessungen in mm

Type No. 55351-01

3) When the cooling systems of a number of tubes are connected in series the cooling water control thermostat should be mounted on the last but one and the overload protecting thermostat on the last tube. In three phase welding service using six tubes it is recommended to cool no more than three tubes in ries
Both thermostats have to be used. The overload protecting thermostat should not be used for water-saving because in that way all tubes controlled in series may be damaged after a short time

Quand les dispositifs de refroidissement de quelques tubes sont reliés en série il faut monter le thermostat pour le réglage de l'eau de refroidissement sur le tube final à un près et le thermostat de sécurité contre la surcharge sur le tube final. En service de soudure triphasé avec six tubes il est recommandé de ne pas refroidir plus que trois tubes en série
Tous les deux thermostats doivent être utilisés. Le thermostat de sécurité contre la surcharge ne sera pas utilisé pour économiser de l'eau parce que dans ce cas tous les tubes réglés en série puissent être endommagés après une courte période

Wenn die Kühlvorrichtungen einiger Röhren in Reihe geschaltet werden soll der Thermostat zur Regelung des Kühlwassers auf die zweitletzte und der Überlastungsschutzthermostat auf die letzte Röhre montiert werden. Bei Dreiphasenschweissbetrieb unter Verwendung von sechs Röhren wird es empfohlen nicht mehr als drei Röhren in Reihe zu kühlen
Beide Thermostate müssen verwendet werden. Der Überlastungsschutzthermostat soll nicht zum Kühlwassererspamis benutzt werden da in diesem Fall alle in Reihe geregelten Röhren nach kurzer Zeit beschädigt werden könnten

4) Solenoid valve open
Soupape à solenoïde ouverte
Solenoidventil offen

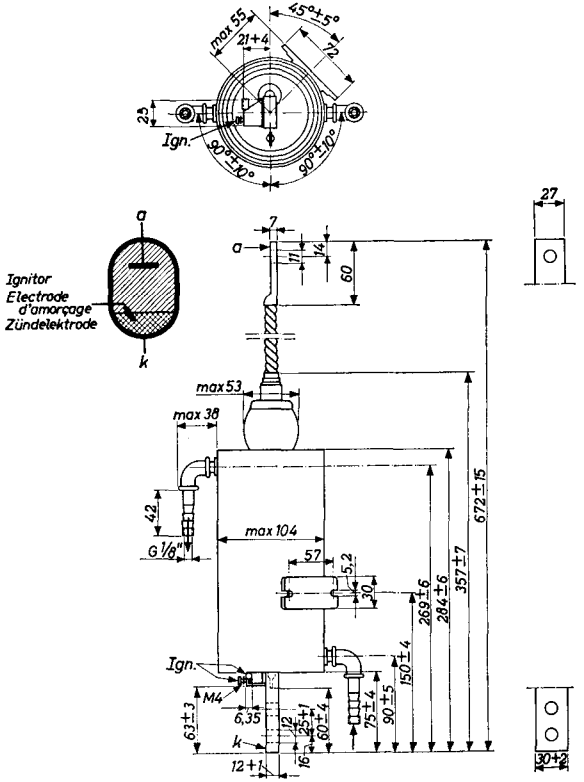
5) This value holds for continuous maximum average current. At lower current values the minimum amount of cooling water can be determined by interpolation between 6 l at the continuous maximum average current and 1.5 l at no load

Cette valeur se rapporte au courant moyen maximum continu A des valeurs de courant plus basses on peut déterminer la quantité minimum d'eau de refroidissement par l'interpolation entre 6 l au courant moyen continu maximum et 1,5 l à tube non-chargé

Dieser Wert bezieht sich auf Dauerbetrieb mit dem maximalen mittleren Strom. Bei niedrigeren Stromwerten kann man die minimale Quantität des Kühlwassers errechnen durch Interpolation zwischen 6 l bei Dauerbetrieb mit dem maximalen mittleren Strom und 1.5 l bei nicht belasteter Röhre

PHILIPS

Dimensions in mm
Dimensions en mm
Abmessungen in mm



Mounting position: vertical, anode connection up
Montage : vertical, la connexion de l'anode en haut
Einbau : senkrecht, Anodenanschluss oben

Limiting values (Absolute limits)
Caractéristiques limites (Limites absolues)
Grenzdaten (Absolute Grenzwerte)

Remark: The limiting values are based on full-cycle conduction without phase delay, regardless of whether or not phase control is used
Observation: Les caractéristiques limites s'appliquent à une conduction pendant le cycle complet sans décalage, abstraction faite d'un contrôle de phase éventuel
Bemerkung: Die Grenzwerte beziehen sich auf einen Stromdurchgang ohne Phasendrehung während der ganzen Periode, auch wenn mit Phasenanschnitt gearbeitet wird

Intermittent rectifier service or Frequency changer resistance welding service
Service redresseur intermittent ou Service soudeur à resistance avec conversion de fréquence
Aussetzender Gleichrichterbetrieb oder Widerstandsschweissbetrieb mit Frequenzumformung

$V_{a\ fwd\ p}$ (V)	1200	1500
$V_{a\ inv\ p}$ (V)	1200	1500
$I_{ap\ max}$ (A)	1500	1200
$I_{a\ max}$ [1] (A)	20	16
$I_{a\ max}$ (A)	70	56
$I_{ap\ max}$ [2] (A)	420	336
$T_{av\ max}$ (sec)	6,25	6,25
$\frac{I_a}{I_{ap}}$ (max) (T_{av} = max. 0,2 sec)	0,166	0,166
$\frac{I_{surge\ p}}{I_{ap}}$ (max) $T(I_{surge})$ = max.0,15 sec	12,5	12,5

[1]) Max. average current at max. peak current
Courant moyen max. au courant de crête max.
Max. mittlerer Strom beim max. Spitzenwert des Stromes

[2]) Max. peak current at max. average current
Courant de crête max. au courant moyen max.
Max. Spitzenwert des Stromes bei dem max. mittleren Strom

Ignitor; Electrode d'amorçage; Zündelektrode

Limiting values (Absolute limits)
Caractéristiques limites (Limites absolues)
Grenzdaten (Absolute Grenzwerte)

$V_{fwd\ p}$	= max. $V_{a\ fwd\ p}$
$V_{inv\ p}$	= max. 5 V
I_p	= max. 100 A
I_{eff}	= max. 10 A
$I\ (T_{av}$ = max. 5 s)	= max. 1 A

A. Anode excitation
Excitation par la tension anodique
Anodenzündung

Ignitor characteristics
Caractéristiques de l'électrode d'amorçage
Kenndaten der Zündelektrode

Firing voltage Tension d'amorçage Zündspannung	= max. 200 V
Firing current Courant d'amorçage Zündstrom	= 6-8 A = max. 12 A
Ignition time at the above voltage or current Temps d'amorçage à la tension ou au courant sus-mentionnés Zündzeit bei der obenerwähnten Spannung oder Strom	= max. 100 µsec

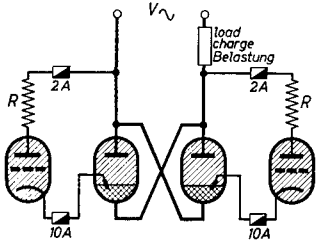
Ignition circuit requirements
Exigences au circuit d'amorçage
Bedingungen für die Zündschaltung

Peak voltage required to fire Tension de crête nécessaire pour l'amorçage Zur Zündung erforderliche Spitzenspannung	= min. 200 V
Peak current required for anode take over Courant de crête nécessaire pour l'amorçage de l'anode principale Zur Zündung der Hauptanode erforderlicher Spitzenstrom	= min. 25 A [1]

[1]) The rate of rise of the ignitor current must be sufficient to reach the required ignition time (e.g. for an ignition time of max.100 µsec, di/dt = min.0.25 A/µsec)
Le taux d'accroissement du courant de l'électrode d'amorçage doit suffire à obtenir le temps d'amorçage requis (p.e. pour un temps d'amorçage de 100 µsec au max., di/dt = 0,25 A/µsec au moins)

Siehe Seite 7

Recommended circuit for anode excitation
Circuit recommandé pour excitation par la tension anodique
Empfohlene Schaltung für Anodenzündung

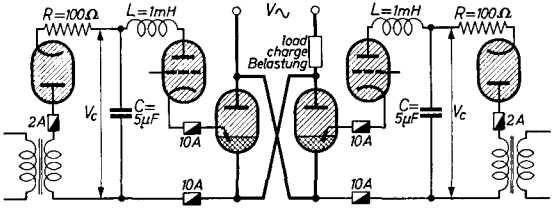


Recommended value of R
Valeur recommandée de R
Empfohlener Wert von R.

Mains voltage Tension de secteur Netzspannung	R
220 V	2 Ω
250 V	2 Ω
380 V	4 Ω
500 V	5 Ω
600 V	6 Ω

B. Separate excitation
Excitation séparée
Fremdsteuerung

Recommended circuit
Circuit recommandé
Empfohlene Schaltung



Ohmic resistance of series inductance (1 mH)
Résistance ohmique de l'inductance en série(1 mH) = max. 2 Ω
Ohmscher Widerstand der Serienselbstinduktion(1 mH)

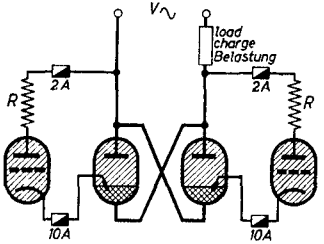
Vc { Under operating conditions / Dans les conditions de fonctionnement / Unter Betriebsverhältnisse } = 650±50 V

Peak value of closed circuit current
Valeur de crête du courant en circuit fermé = 40 - 50 A
Spitzenwert des Stromes bei geschlossenem Kreis

[1]) Seite 6

Die Zunahme des Zündstromes muss genügen zur Erhaltung der erforderlichen Zündzeit (für eine Zündzeit von max. 100 µSek z.B. muss di/dt = min. 0,25 µSek sein)

Recommended circuit for anode excitation
Circuit recommandé pour excitation par la tension anodique
Empfohlene Schaltung für Anodenzündung

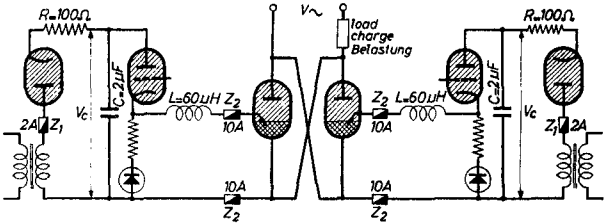


Recommended value of R
Valeur recommandée de R
Empfohlener Wert von R

Mains voltage Tension de secteur Netzspannung	R
220 V	2 Ω
250 V	2 Ω
380 V	4 Ω
500 V	5 Ω
600 V	6 Ω

→ B. Separate excitation
Excitation séparée
Fremdsteuerung

Recommended circuit
Circuit recommandé
Empfohlene Schaltung



Ohmic resistance of 60 µH inductance
Résistance ohmique de l'inductance de 60 µH = max. 2 Ω
Ohmscher Widerstand der Selbstinduktion von 60 µH

V_c { Under operating conditions / Dans les conditions de fonctionnement / Unter Betriebsverhältnisse } = 650±50 V

Peak value of closed circuit current
Valeur de crête du courant en circuit fermé =80-100 A
Spitzenwert des Stromes bei geschlossenem Kreis

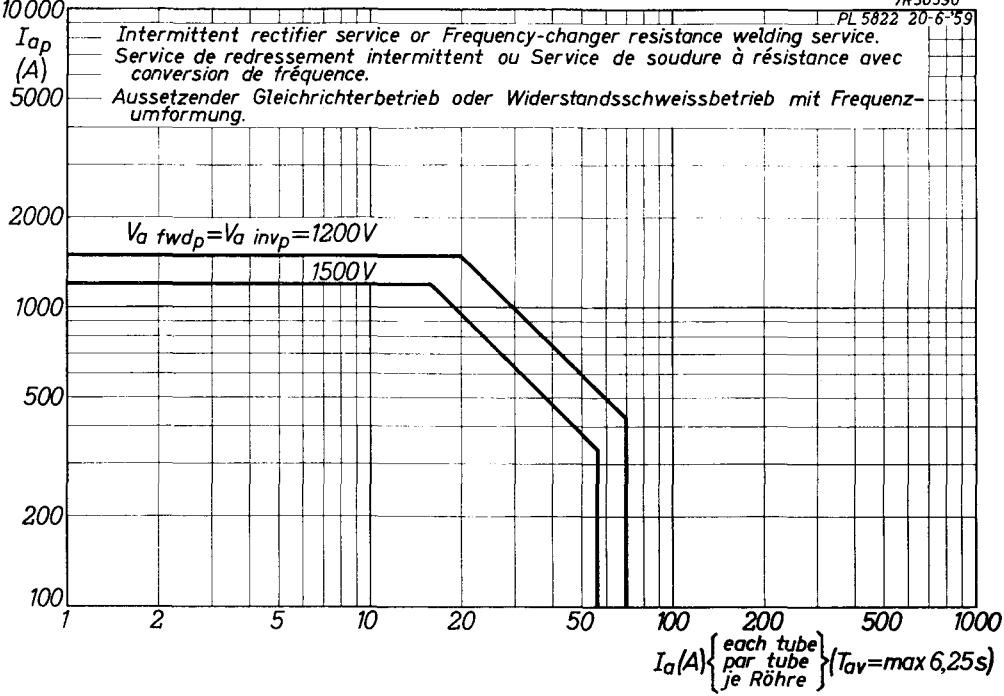
[1]) Seite 6

Die Zunahme des Zündstromes muss genügen zur Erhaltung der erforderlichen Zündzeit (für eine Zündzeit von max. 100 µSek z.B. muss di/dt = min. 0,25 A/µSek sein) ←

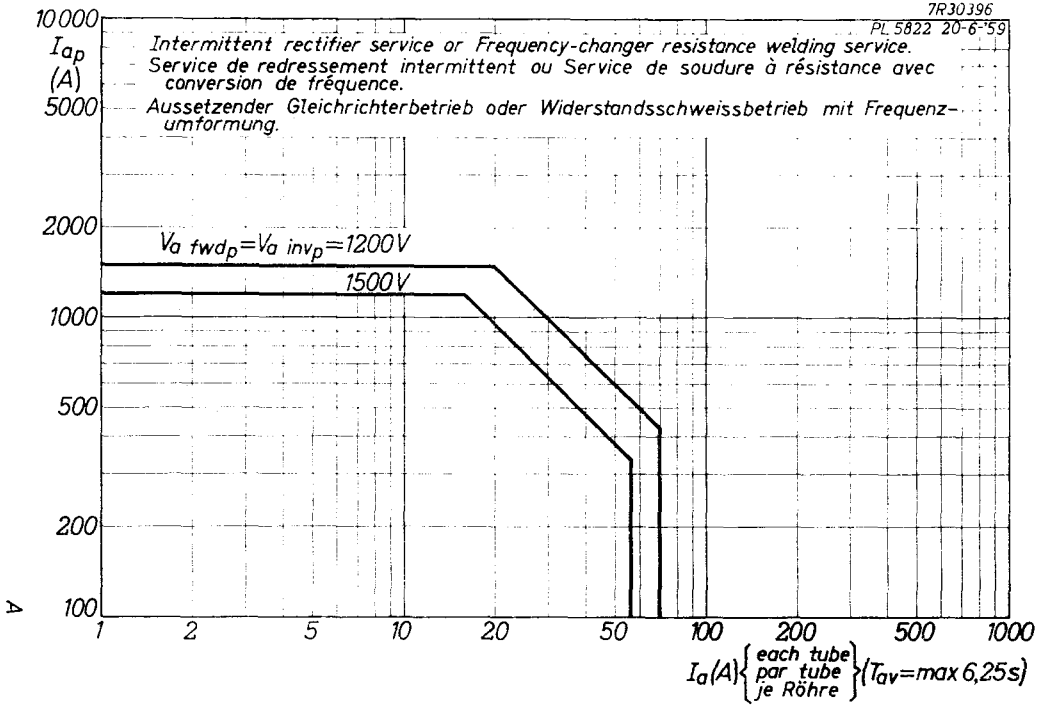
PL 5822 20-6-'59

PL 5822A

PHILIPS



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7R30396
PL 5822 20-6-'59
Intermittent rectifier service or Frequency-changer resistance welding service.
Service de redressement intermittent ou Service de soudure à résistance avec conversion de fréquence.
Aussetzender Gleichrichterbetrieb oder Widerstandsschweissbetrieb mit Frequenzumformung.
I_{ap} (A)
10000
5000
2000
1000
500
200
100
$V_{a\ fwd_p}=V_{a\ inv_p}=1200V$
1500V
1
2
5
10
20
50
100
200
500
1000
I_a(A) { each tube / par tube / je Röhre } (T_{av}=max 6,25s)

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Electronic Tube

HANDBOOK

PL5822A

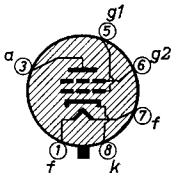
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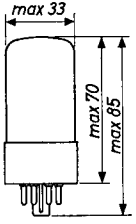
THYRATRON; inert gas filled tetrode with negative control characteristic
THYRATRON; tétrode à remplissage de gaz inerte avec caractéristique de commande négative
STROMTORRÖHRE; edelgasgefüllte Tetrode mit negativer Steuerkennlinie

Heating : indirect
Chauffage: indirect
Heizung : indirekt

V_f = 6,3 V
I_f = 950 mA
T_w = min. 20 sec [1]

Dimensions in mm
Dimensions en mm
Abmessungen in mm





Base, culot, Sockel: OCTAL

Typical characteristics
Caractéristiques types
Kenndaten

V_{arc}		=	10	V
V_a/V_{g1}	(V_{g2} = 0 V) (R_{g1} = 0 Ω)	=	275	[2]
V_a/V_{g2}	(V_{g1} = 0 V) (R_{g2} = 0 Ω)	=	370	[2]

V_a		=	650	V
I_{ap}		=	2	A
R_{g1}		=	100	kΩ
V_{g1}		=	-100 -50	V
T_{dion}		=	240 1000	µsec

[1]) For I_{kp} = 2 A
Pour I_{kp} = 2 A
Für I_{kp} = 2 A

[2]) At striking point
A l'allumage
Bei Zündung

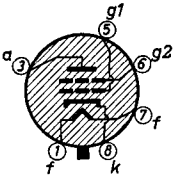
PHILIPS PL6574

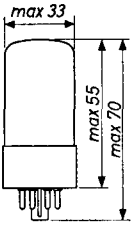
THYRATRON; inert gas filled tetrode with negative control characteristic
THYRATRON; tétrode à remplissage de gaz inerte avec caractéristique de commande négative
STROMTORRÖHRE; edelgasgefüllte Tetrode mit negativer Steuerkennlinie

Heating :indirect
Chauffage:indirect
Heizung :indirekt

V_f = 6,3 V
I_f = 950 mA
T_w = min. 15 sec

Dimensions in mm
Dimensions en mm
Abmessungen in mm





Base, culot, Sockel: OCTAL

Typical characteristics
Caractéristiques types
Kenndaten

V_{arc}		=	10 V
V_a/V_{g1}	(V_{g2} = 0 V) (R_{g1} = 0 Ω)	=	275 [1]
V_a/V_{g2}	(V_{g1} = 0 V) (R_{g2} = 0 Ω)	=	370 [1]

[1] At striking point
A l'allumage
Bei Zündung

Capacitances Capacités Kapazitäten	C_{ag_1} = 0,25 pF C_{ak} = 0,06 pF C_{g_1k} = 0,2 pF C_{ag_2} = 3,0 pF

Limiting values (Absolute limits)
Caractéristiques limites (Limites absolues)
Grenzdaten (Absolute Werte)

V_{ap}	= max. 650 V
$V_{a\ invp}$	= max. 1300 V
$-V_{g_2}$	= max. 100 V [3]
$-V_{g_2}$	= max. 10 V [4]
$+I_{g_2}$ (V_a > -10 V)	= max. 20 mA [5]
R_{g_2}	= max. 1 MΩ [6]
$-V_{g_1}$	= max. 250 V [3]
$-V_{g_1}$	= max. 10 V [4]
$+I_{g_1}$ (V_a > -10 V)	= max. 20 mA [5]
R_{g_1} (I_a < 200 mA)	= max. 10 MΩ
R_{g_1} (I_a > 200 mA)	= max. 2 MΩ
I_k (T_{av} = max. 15 sec)	= max. 300 mA
I_{kp}	= max. 2 A
I_k surge (T = max. 0,1 sec)	= max. 10 A
V_{kfp} (k neg.; f pos.)	= max. 25 V
V_{kfp} (k pos.; f neg.)	= max. 100 V
t_{amb}	= -75°C/+90°C

---

[3]) Before conduction
Avant l'allumage
Gelöschte Röhre

[4]) During conduction
Pendant la période de conduction
Gezündete Röhre

[5]) T_{av} = 1 cycle
T_{av} = 1 Periode

[6]) Where circuit conditions permit, g_2 should be connected directly to the cathode
Si le montage le permet, g_2 doit être reliée directement à la cathode
g_2 soll möglichst direkt mit der Katode verbunden werden

Limiting values (ABSOLUTE LIMITS)
Caractéristiques limites (LIMITES ABSOLUES)
Grenzdaten (ABSOLUTE WERTE)

V_{a_p}	= max.	650	V
$V_{a\ inv_p}$	= max.	1,3	kV
$-V_{g2}$	= max.	100	V [2]
$-V_{g2}$	= max.	10	V [3]
$-V_{g1}$	= max.	250	V [2]
$-V_{g1}$	= max.	10	V [3]
I_k (T_{av} = max. 15 sec)	= max.	300	mA
I_{k_p}	= max.	2	A
$I_{k\ surge}$ (T = max. 0,1 sec)	= max.	10	A
$+I_{g2}$ (V_a > -10 V)	= max.	20	mA [4]
$+I_{g1}$ (V_a > -10 V)	= max.	20	mA [4]
$+I_{g1_p}$	= max.	1	mA [5]
R_{g1} (I_k = 200 mA)	= max.	10	MΩ
V_{kf_p} (k pos.; f neg.)	= max.	100	V
V_{kf_p} (k neg.; f pos.)	= max.	25	V
t_{amb}	=	-75/+90	°C

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[2] Before conduction
Avant l'allumage
Gelöschte Röhre

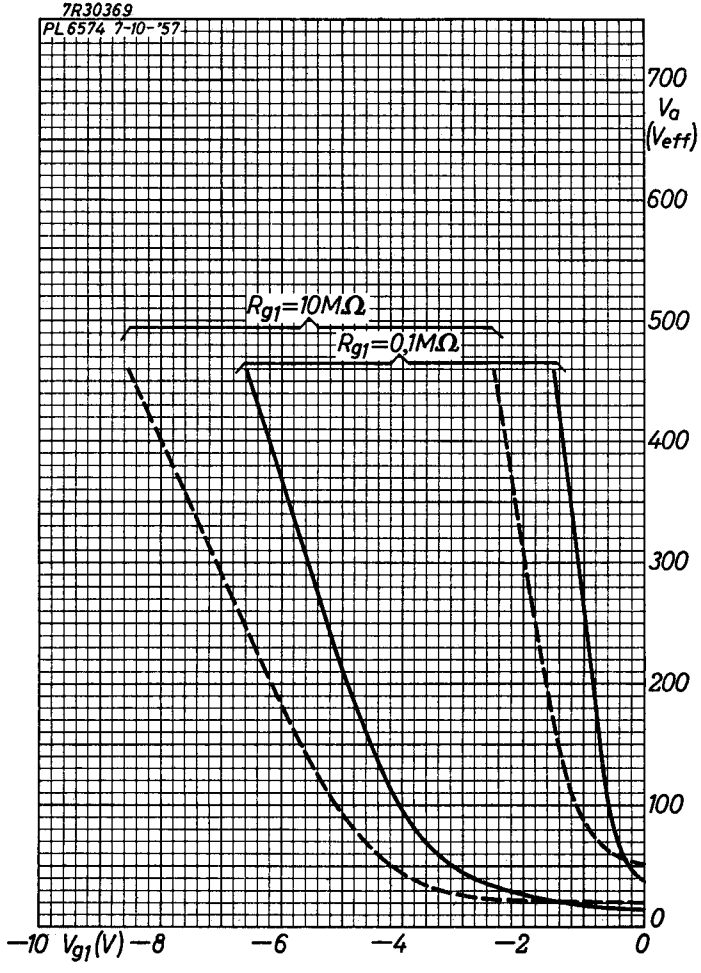
[3] During conduction
Pendant la periode de conduction
Gezündete Röhre

[4] T_{av} = 1 cycle
T_{av} = 1 Periode

[5] During the time that V_a is more negative than -10 V
Pendant le temps où V_a est plus negative que -10 V
Während der Zeit wenn V_a mehr negatif ist als -10 V

→

PHILIPS PL 6574



10.10.1957

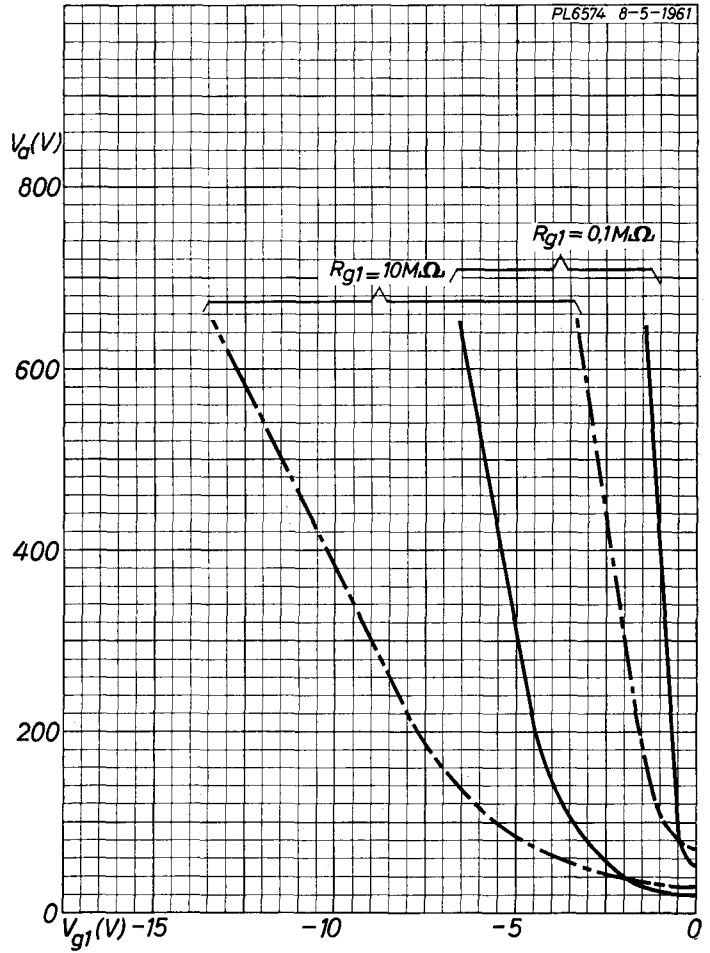
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PL 6574

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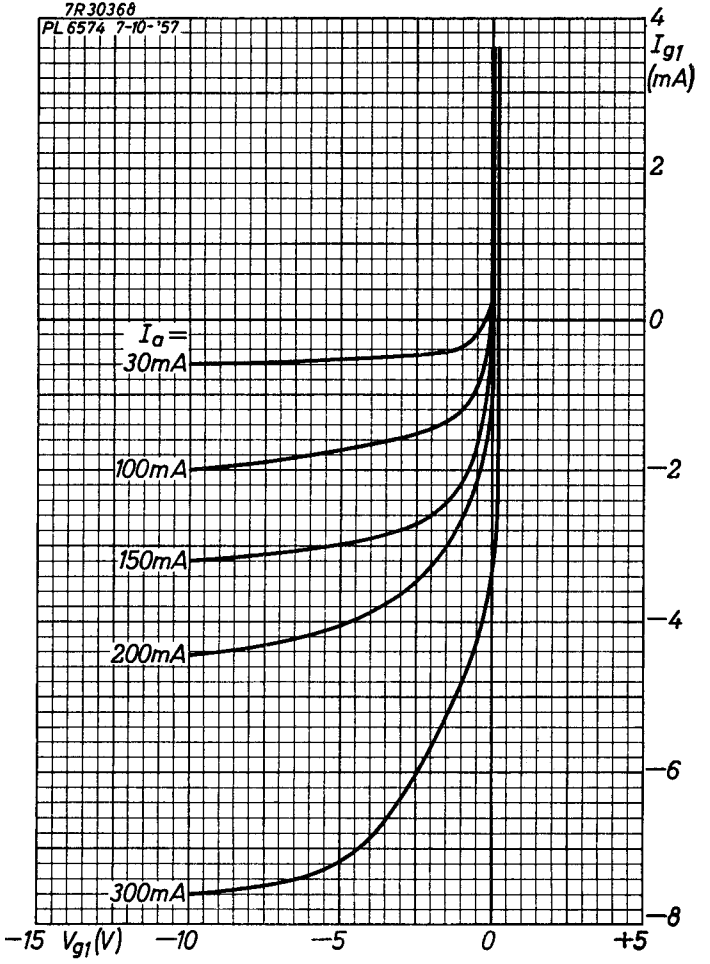
PL6574 8-5-1961



10.10.1961

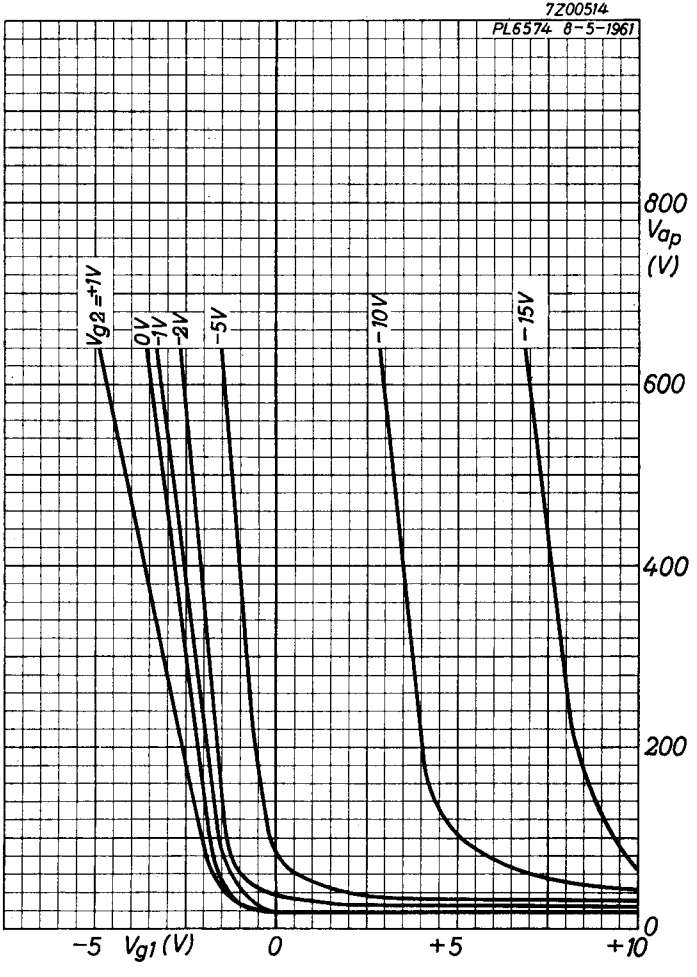
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PL 6574 **PHILIPS**



PL 6574

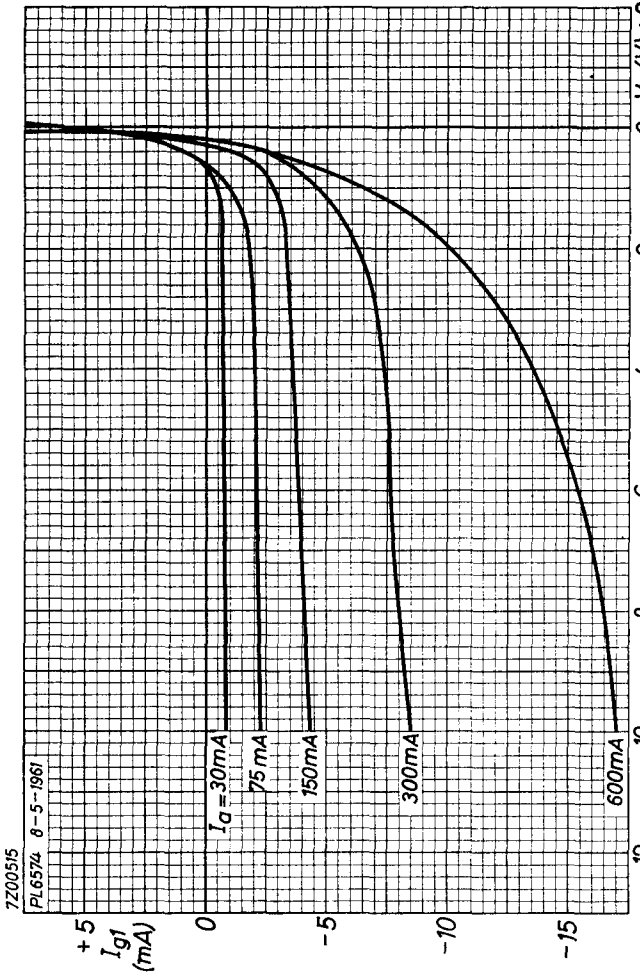
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B

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PL 6574

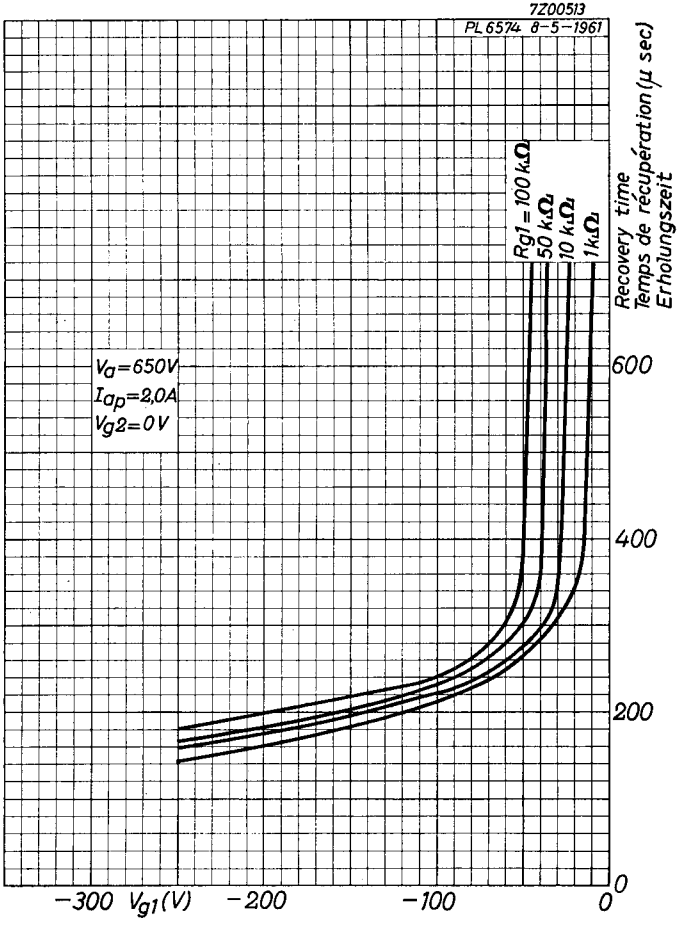


10.10.1961

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PL 6574

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D

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Electronic Tube

HANDBOOK

PL6574

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7	B	1957.10.10
8	B	1961.10.10
9	C	1961.10.10
10	D	1961.10.10
11	FP	2000.06.01

PHILIPS PL 6755

THYRATRON, mercury-vapour and inert gas-filled triode
THYRATRON, triode à vapeur de mercure et à gaz rare
STROMTORRÖHRE, Triode mit Quecksilberdampf- und Edelgasfüllung

Application: A. Dimming installations for stage-lighting, fluorescent lighting etc.
B. for motor control service and for rectifiers with variable and stabilized output
C. ignitor firing
D. A.C. control

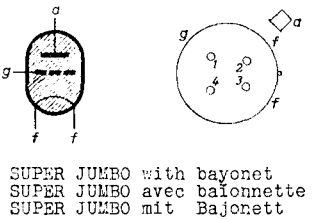
Application: A. installations de réglage progressif pour éclairages scéniques, éclairage fluorescent etc.
B. Commande du régime de moteurs et redresseurs à puissance sortie variable et stabilisée
C. amorçage d'ignitrons
D. réglage C.A.

Anwendung : A. Abblendeinrichtungen für Bühnebeleuchtung, Fluoreszenzbeleuchtung usw.
B. für Motorsteuerung und für gesteuerte und stabilisierte Gleichrichter
C. Zündung von Ignitrons
D. Wechselstromsteuerung

Heating : direct
Chauffage : direct
Heizung : direkt

V_f = 2,5 V
I_f = 11 A
T_w = min. 60 sec

Dimensions in mm
Dimensions en mm
Abmessungen in mm



Base : SUPER JUMBO with bayonet
Culot : SUPER JUMBO avec baïonnette
Sockel: SUPER JUMBO mit Bajonett

[1]) Cross section flexible anode lead ≧ 4 mm²
Coupe transversale du conducteur anodique flexible ≧ 4 mm²
Querschnitt der biegsamen Anodenleitung ≧ 4 mm²

PHILIPS

PL 6755

THYRATRON, mercury-vapour and inert gas-filled triode
THYRATRON, triode à vapeur de mercure et à gaz rare
STROMTORRÖHRE, Triode mit Quecksilberdampf- und Edelgasfüllung

Application: A. Dimming installations for stage-lighting, fluorescent lighting etc.
B. for motor control service and for rectifiers with variable and stabilized output
C. ignitor firing
D. A.C. control

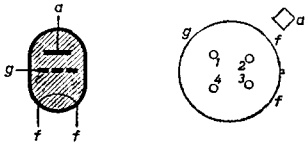
Application: A. installations de réglage progressif pour éclairages scéniques, éclairage fluorescent etc.
B. Commande du régime de moteurs et redresseurs à puissance sortie variable et stabilisée
C. amorçage d'ignitrons
D. réglage C.A.

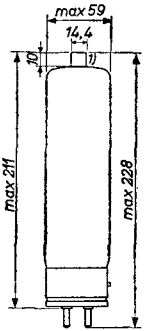
Anwendung : A. Abblendeinrichtungen für Bühnebeleuchtung, Fluoreszenzbeleuchtung usw.
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Heating : direct
Chauffage : direct
Heizung : direkt

V_f = 2,5 V
I_f = 11 A
T_w = min. 60 sec

Dimensions in mm
Dimensions en mm
Abmessungen in mm





Base : SUPER JUMBO with bayonet
Culot : SUPER JUMBO avec baïonnette
Sockel: SUPER JUMBO mit Bajonett

1) Cross section flexible anode lead ≥ 4 mm²
Coupe transversale du conducteur anodique flexible ≥ 4 mm²
Querschnitt der biegsamen Anodenleitung ≥ 4 mm²

Socket : Support: Fassung:	40403/00	Cap : Capot: Haube:	40619

Mounting position: vertical, base down
Montage : vertical, culot en bas
Einbau : senkrecht, Sockel unten

Net weight Poids net Nettogewicht	345 g	Shipping weight Poids brut Bruttogewicht	1350 g

Capacitances
Capacités
Kapazitäten

C_{ag}	=	7 pF
C_{gk}	=	10 pF

Typical characteristics
Caractéristiques types
Kenndaten

V_{arc}	=	12 V
T_{ion}	=	10 µsec
T_{dion}	=	500 µsec

Limiting values (ABSOLUTE LIMITS)
Caractéristiques limites(LIMITES ABSOLUES)
Grenzdaten (ABSOLUTE GRENZEN)

	For application A Pour application A Für Anwendung A	For application B Pour application B Für Anwendung B
V_{a_p}	= max. 1000	1500 V
V_{inv_p}	= max. 1000	1500 V
$-V_g$	= max. 500	300 V
$-V_g$	= max. 10	10 V [2]
I_{k_p}	= max. 15	20 A
I_k (T_{av} = max.15 sec)	= max. 3,6	3,2 A
I_g	= max. 0,25	0,25 A
I_{surge} (T_{av}= max.0,1sec)	= max. 200	200 A [3]
R_g	= max. 0,3 [4]	0,1 MΩ
R_g	= 0,1	0,03 MΩ [5]
t_{Hg}	= 20-85	25-80 °C
t_{amb}	= 0-45	0-40 °C
f	= max. 150	150 c/s

[2][3][4][5] See page 3; voir page 3; siehe Seite 3

Socket : Support: Fassung:	40403/00	Cap : Capot: Hoube:	40619

Mounting position: vertical, base down
Montage : vertical, culot en bas
Einbau : senkrecht, Sockel unten

Net weight Poids net Nettogewicht	345 g	Shipping weight Poids brut Bruttogewicht	1350 g

Capacitances
Capacités
Kapazitäten

C_{ag}	=	7 pF
C_{gk}	=	10 pF

Typical characteristics
Caractéristiques types
Kenndaten

V_{arc}	=	12 V
T_{ion}	=	10 µsec
T_{dion}	=	500 µsec

Limiting values (ABSOLUTE LIMITS)
Caractéristiques limites(LIMITES ABSOLUES)
Grenzdaten (ABSOLUTE GRENZEN)

	For application A Pour application A Für Anwendung A	For application B Pour application B Für Anwendung B
V_{a_p}	= max. 1000	1500 V
V_{inv_p}	= max. 1000	1500 V
$-V_g$	= max. 500	300 V
$-V_g$	= max. 10	10 V[2]
I_{k_p}	= max. 15	20 A
I_k (T_{av} = max.15 sec)	= max. 3,6	3,2 A
I_g	= max. 0,25	0,25 A
I_{surge} (T_{av}= max.0,1sec)	= max. 200	200 A[3]
R_g	= max. 0,3 [4]	0,1 MΩ
R_g	= 0,1	0,03 MΩ[5]
t_{Hg}	= 20-85	25-80 °C
t_{amb}	= 0-45	0-40 °C
f	= max. 150	150 c/s

2)3)4)5)See page 3; voir page 3; siehe Seite 3

Limiting values (ABSOLUTE LIMITS)
Caractéristiques limites (LIMITES ABSOLUES)
Grenzdaten (ABSOLUTE GRENZEN)

	For application C Pour application C Für Anwendung C	For application D Pour application D Für Anwendung D			
V_{a_p}	= max. 1500	1000			V
V_{inv_p}	= max. 1500	1000			V
$-V_g$	= max. 300	300			V
$-V_g$	= max. 10	10			V[2]
δ	=	10	50	100	%
I_k (T_{av} = max. 15 sec)	= max. 0,5	1,25	3,2	3,6	A
I_{k_p}	= max. 40				A
I_k	= max.	28	14	8	Aeff[6]
I_g	= max. 0,25	0,25			A
I_{surge} (T_{av} = max.0,1sec)	= max. 200	200			A[3]
R_g	= max. 0,1	0,1			MΩ
→ R_g	= 0,03	0,03			MΩ[5]
t_{Hg}	= 25-80	25-85			°C
t_{amb}	= 0-40	0-45			°C
f	= max. 150	150			c/s

---

[2] Tube conductive
Tube allumé
Röhre gezündet

[3] Fuse in anode circuit max. 10 A
Fusible dans le circuit anodique max. 10 A
Sicherung im Anodenkreis max. 10 A

[4] High values of R_g are only recommended for grid-controlled circuits which are insensitive to grid current
Des valeurs élevées de R_g sont recommandées seulement pour les circuits à command par grille, qui sont insensibles au courant de grille
Hohe Werte von R_g werden nur empfohlen für gittergesteuerte Schaltungen welche unempfindlich für Gitterstrom sind

[5] Recommended value; valeur recommandée; Empfohlener Wert

[6] Total R.M.S. current for two tubes in inverse-parallel
Courant efficace total de deux tubes en montage anti-parallèle
Effektivwert der Gesamtstrom zweier Röhren in Anti-Parallelschaltung

Limiting values (ABSOLUTE LIMITS)
Caractéristiques limites (LIMITES ABSOLUES)
Grenzdaten (ABSOLUTE GRENZEN)

	For application C Pour application C Für Anwendung C	For application D Pour application D Für Anwendung D	
V_{a_p}	= max. 1500	1000	V
V_{inv_p}	= max. 1500	1000	V
$-V_g$	= max. 300	300	V
$-V_g$	= max. 10	10	V[2]
δ	=	10 50 100	%
I_k (Tav = max. 15 sec)	= max. 0,5	1,25 3,2 3,6	A
I_{k_p}	= max. 40		A
I_k	= max.	28 14 8	Aeff[6]
I_g	= max. 0,25	0,25	A
Isurge(Tav = max.0,1sec)	= max. 200	200	A[3]
R_g	= max. 0,1	0,1	MΩ
→ R_g	= 0,03	0,03	MΩ[5]
t_{Hg}	= 25-80	25-85	°C
t_{amb}	= 0-40	0-45	°C
f	= max. 150	150	c/s

---

[2] Tube conductive
Tube allumé
Röhre gezündet

[3] Fuse in anode circuit max. 10 A
Fusible dans le circuit anodique max. 10 A
Sicherung im Anodenkreis max. 10 A

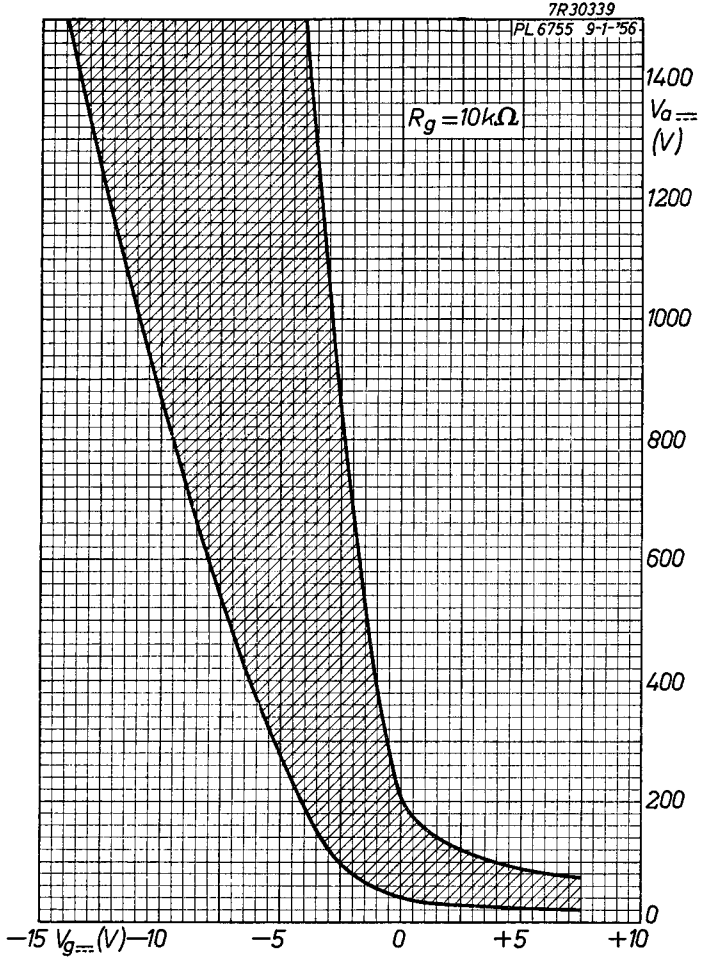
[4] High values of R_g are only recommended for grid-controlled circuits which are insensitive to grid current
Des valeurs élevées de R_g sont recommandées seulement pour les circuits à command par grille, qui sont insensibles au courant de grille
Hohe Werte von R_g werden nur empfohlen für gittergesteuerte Schaltungen welche unempfindlich für Gitterstrom sind

[5] Recommended value; valeur recommandée; Empfohlener Wert

[6] Total R.M.S. current for two tubes in inverse-parallel
Courant efficace total de deux tubes en montage anti-parallèle
Effektivwert der Gesamtstrom zweier Röhren in Anti-Parallelschaltung

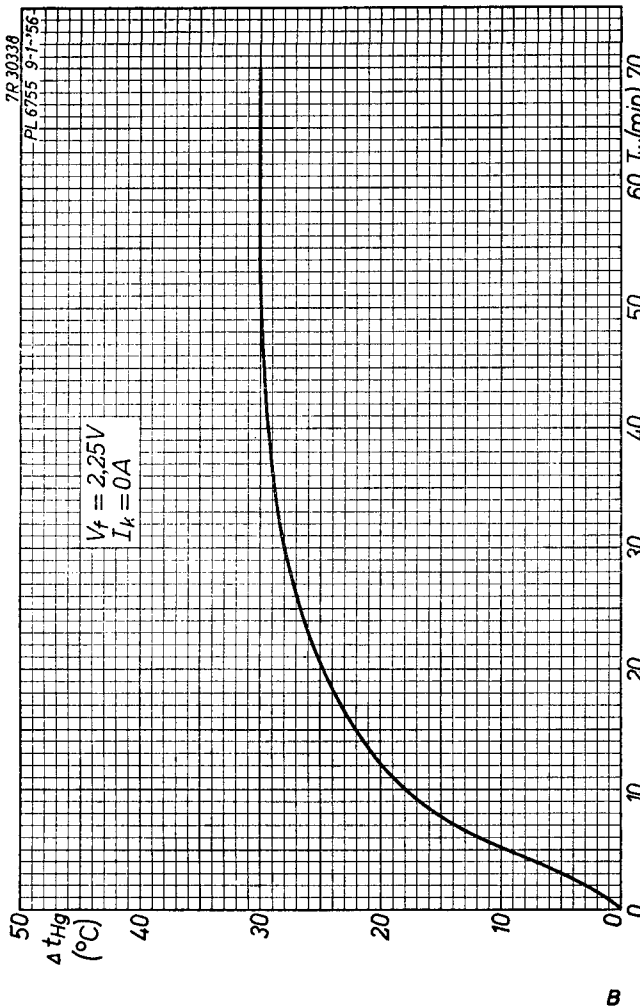
PHILIPS

PL 6755



1.1.1956

A


7R 30338
PL 6755 9-1-56
$V_f = 2{,}25V$
$I_k = 0A$
Δt_{Hg} (°C)
50
40
30
20
10
0
0
10
20
30
40
50
60 T_w(min) 70

B

PHILIPS

Electronic Tube

HANDBOOK

PL6755

page	sheet	date
1	1	1956.03.03
2	1	1958.01.01
3	2	1956.03.03
4	2	1958.01.01
5	3	1956.02.02
6	3	1958.01.01
7	A	1956.01.01
8	B	1956.01.01
9	FP	2000.06.01

VIDEO OUTPUT PENTODE

Luminance output tube in colour TV receivers.

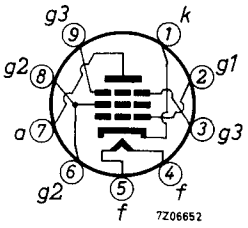
QUICK REFERENCE DATA				
Anode current	I_a		30	mA
Transconductance	S		40	mA/V
Anode dissipation	W_a	max.	6	W

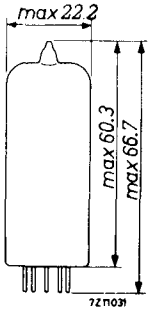
HEATING: Indirect by A.C. or D.C.; series supply

Heater current	I_f	300	mA
Heater voltage	V_f	16	V

DIMENSIONS AND CONNECTIONS Dimensions in mm

Base: Noval





CAPACITANCES

Anode to all except grid No.1	$C_{a(g_1)}$		4	pF
Grid No.1 to all except anode	$C_{g_1(a)}$		20	pF
Anode to grid No.1	C_{ag_1}		0.075	pF
Anode to grid No.1	C_{ag_1}	max.	0.1	pF

TYPICAL CHARACTERISTICS

Anode voltage	V_a	170	V
Grid No.2 voltage	V_{g_2}	170	V
Grid No.3 voltage	V_{g_3}	0	V
Grid No.1 supply voltage	V_{bg_1}	0	V
Cathode resistor (decoupled)	R_k	36	Ω
Anode current	I_a	30	mA
Grid No.2 current	I_{g_2}	6.5	mA
Transconductance	S	40	mA/V
Amplification factor	$\mu_{g_2g_1}$	70	-

LIMITING VALUES (Design centre rating system unless otherwise stated)

Anode supply voltage	V_{b_a}	max.	400	V
Anode voltage,	V_{a_o}	max.	550	V
long term average	Va	max.	300	V
Grid No.2 voltage	$V_{g_{2o}}$	max.	550	V
	V_{g_2}	max.	300	V
Anode dissipation	W_a	max.	6	W
Grid No.2 dissipation	W_{g_2}	max.	2.5	W
	W_{g_2}	max.	3.0	W 1)
Cathode current	I_k	max.	100	mA
Grid No.1 resistor	R_{g_1}	max.	0.1	MΩ
at $R_k \geq 39\ \Omega$	R_{g_1}	max.	0.5	MΩ
Cathode to heater voltage	V_{kf}	max.	200	V

1) Design maximum rating system including no signal condition.

OPERATING CONDITIONS (negative modulation)

V_b	=	250	V
R_b	=	330	Ω
R_{av}	=	560	Ω
R_a	=	2.7	kΩ
R_{g_2}	=	5.6	kΩ
R_k [1]	=	39	Ω
$+V_{bg_1}$	=	4	V

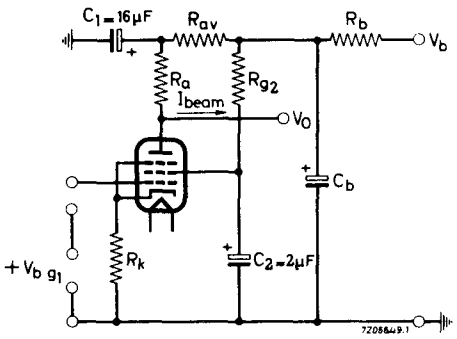


fig.1

V_{o_1}	=	100	V
V_{opp}	≧	140	V
Video-linearity	≧	0.8	–
V_{ipp}	ca.	5	V
I_{beam}	max.	7	mA

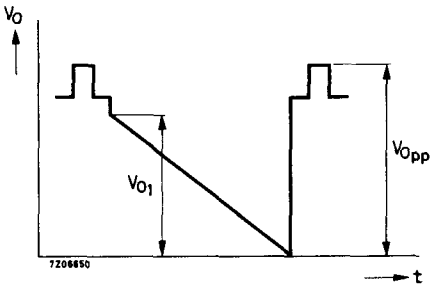
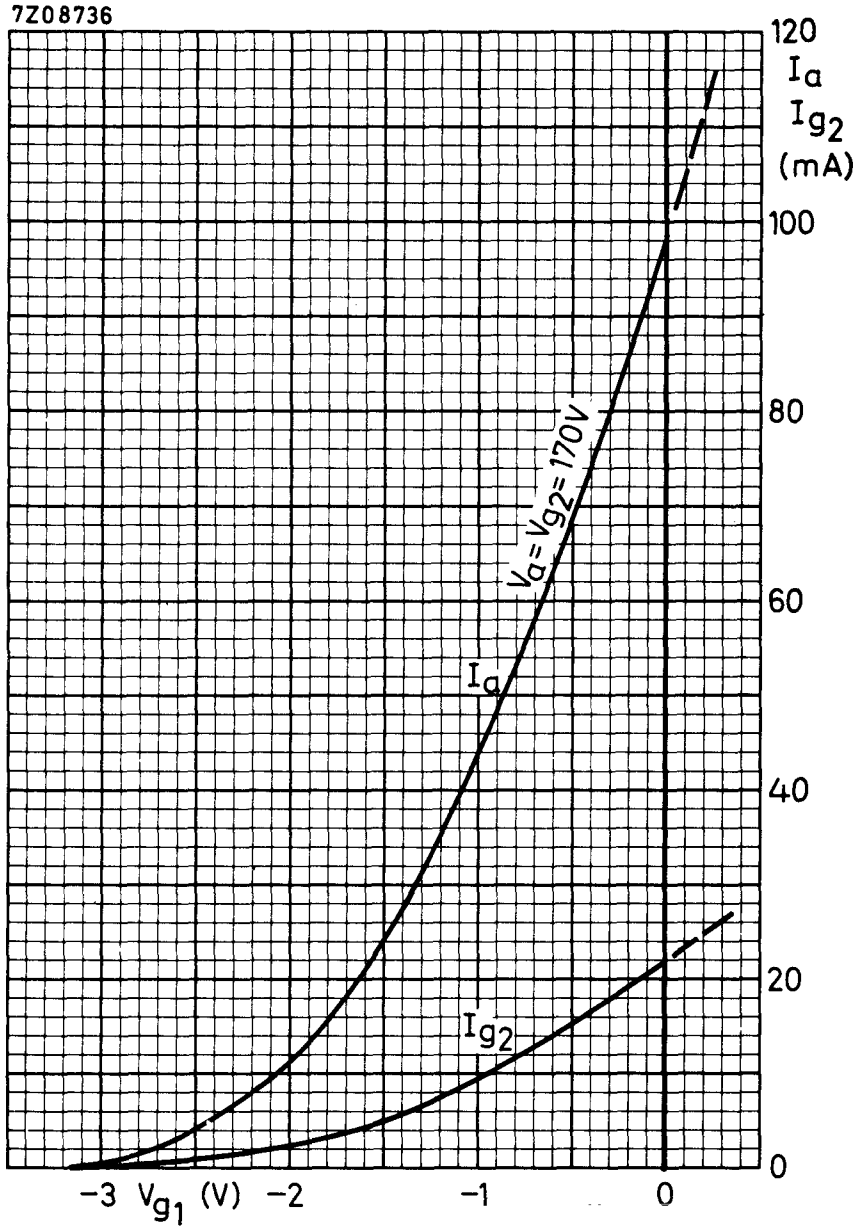
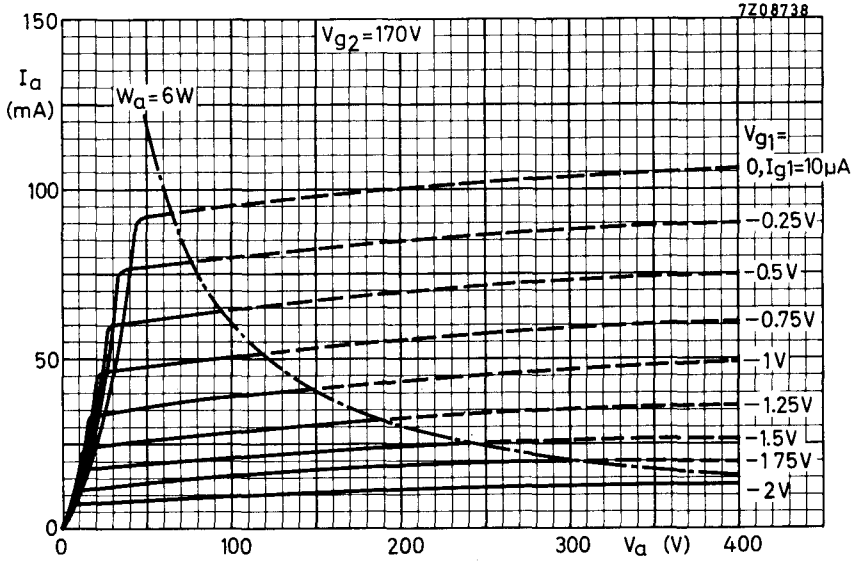
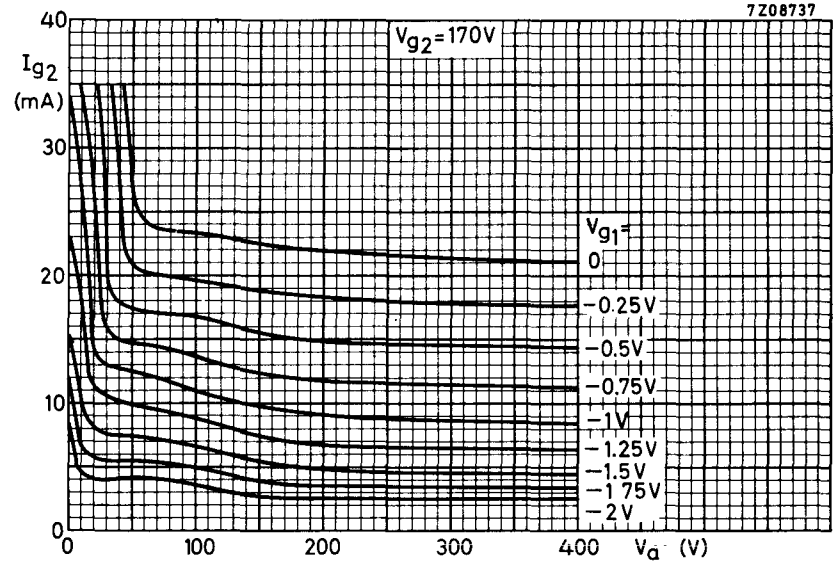


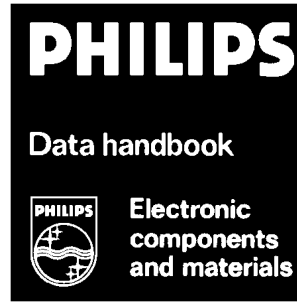
fig.2

[1]) Without by-pass capacitor.


7Z08736
120
Ia
Ig2
(mA)
100
80
60
40
20
0
Va = Vg2 = 170V
Ia
Ig2
−3 Vg1 (V) −2
−1
0


7Z08738
V_{g2}=170V
I_a (mA)
W_a=6W
V_{g1}=
0, I_{g1}=10μA
−0.25V
−0.5V
−0.75V
−1V
−1.25V
−1.5V
−1.75V
−2V
150
100
50
0
0
100
200
300
400
V_a (V)

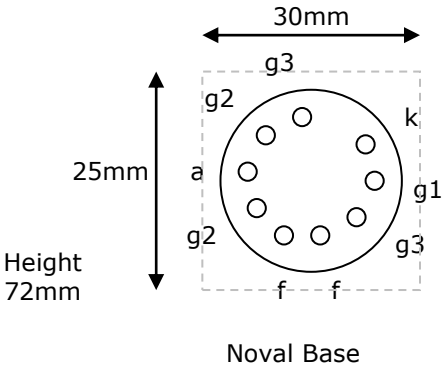

7Z08737
V_{g2}=170V
I_{g2} (mA)
V_{g1}=
0
−0.25V
−0.5V
−0.75V
−1V
−1.25V
−1.5V
−1.75V
−2V
40
30
20
10
0
0
100
200
300
400
V_a (V)



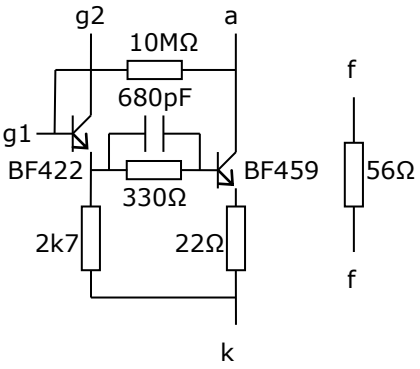
PL802

page	sheet	date
1	1	1969.12
2	2	1969.12
3	3	1969.12
4	4	1969.12
5	5	1969.12
6	FP	1999.06.06

Philips PL802S



Noval Base





OUTPUT PENTODE FOR LINE DEFLECTION

Output pentode intended for use as horizontal deflection amplifier in small screen television receivers.

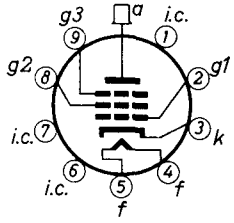
QUICK REFERENCE DATA				
Anode peak voltage	V_{a_p}	max.	7	kV
Cathode current	I_k	max.	180	mA

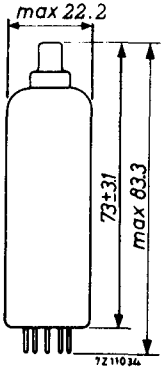
HEATING : Indirect by A.C. or D.C.; series supply

Heater current	I_f	300	mA
Heater voltage	V_f	21.5	V

DIMENSIONS AND CONNECTIONS Dimensions in mm

Base: Noval





CAPACITANCES

Anode to all except grid No. 1	$C_{a(g1)}$	6	pF
Grid No. 1 to all except anode	$C_{g1(a)}$	14	pF
Anode to grid No. 1	C_{ag1}	max. 0.8	pF
Anode to cathode	C_{ak}	max. 0.1	pF
Grid No. 1 to heater	C_{g1f}	max. 0.2	pF

TYPICAL CHARACTERISTICS

A)

Anode voltage	V_a	170	V
Grid No. 3 voltage	V_{g3}	0	V
Grid No. 2 voltage	V_{g2}	170	V
Grid No. 1 voltage	V_{g1}	−24	V
Anode current	I_a	45	mA
Grid No. 2 current	I_{g2}	2.4	mA
Transconductance	S	6.3	mA/V
Internal resistance	R_i	11	kΩ
Amplification factor	μ_{g2g1}	5.0	

TYPICAL CHARACTERISTICS (continued)

B) (Measured under pulse conditions)

Anode voltage	V_a	40	V
Grid No. 3 voltage	V_{g3}	0	V
Grid No. 2 supply voltage	V_{bg2}	190	V
Grid No. 2 series resistor	R_{g2}	4.7	kΩ
Grid No. 1 voltage	V_{g1}	0	V
Anode current	I_a	180	mA
Grid No. 2 current	I_{g2}	18	mA

OPERATING CONDITIONS

Stabilized circuits (D.C. feedback)

Cut-off voltage

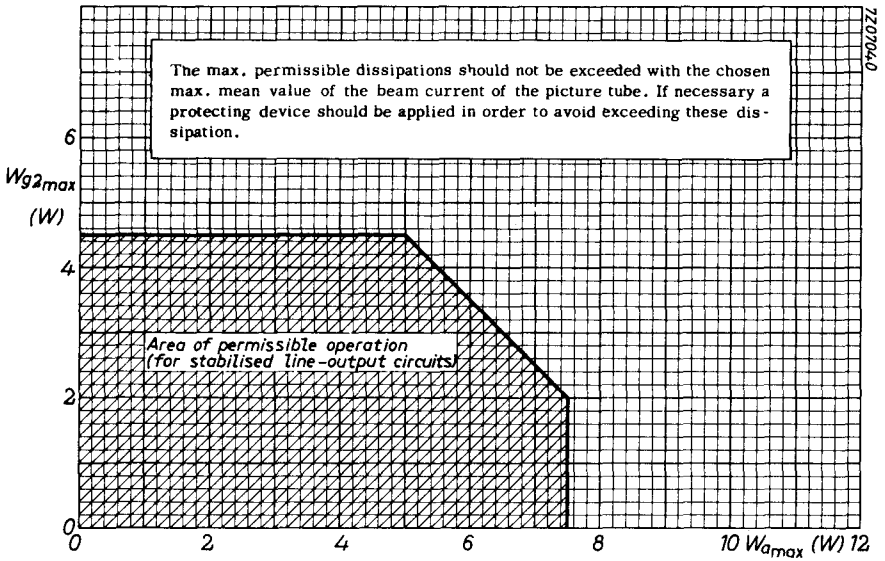
The minimum required cut-off voltage ($-V_{g1}$) during flyback is 120 V at V_a = 6000 V, V_{g2} = 190 V and Z_{g1} = 1 kΩ at line frequency.

Supply voltage: See page 5

Minimum required values of the screengrid voltage and of the anode voltage, when the tube is used in a line output stage.
The graphs refer to nominal mains voltage provided the specified values of I_a at $V_{a\ min}$, will be available throughout life of the tube at supply voltage values 10% below nominal.
In order to prevent Barkhausen interferences and less of stabilisation, care should be taken that the anode voltage never drops below the specified $V_{a\ min}$ during the scanning period.

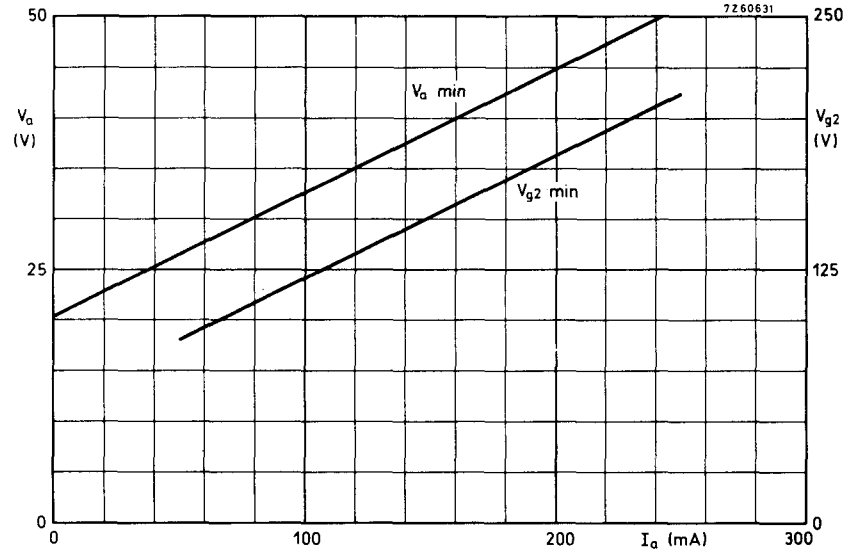
LIMITING VALUES (Design centre rating system)

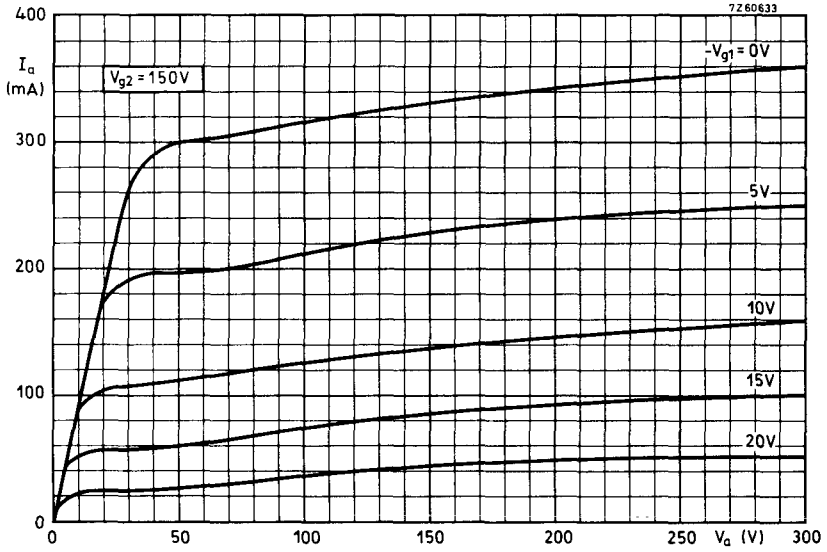
Anode voltage	V_{a_o}	max.	550	V
	V_a	max.	250	V
Anode voltage, peak	V_{a_p}	max.	7	kV [1]
negative peak	$-V_{a_p}$	max.	7	kV [1]
Anode dissipation	W_a	see figure below		
Grid No. 2 dissipation	W_{g2} [2]	see figure below		
Anode + grid No. 2 dissipation	$W_a + W_{g2}$	see figure below		
Grid No. 2 voltage	V_{g2_o}	max.	550	V
	V_{g_2}	max.	250	V
Cathode current	I_k	max.	180	mA
Cathode to heater voltage	V_{kf}	max.	200	V
Grid No. 1 resistor	R_{g1}	max.	0.5	MΩ

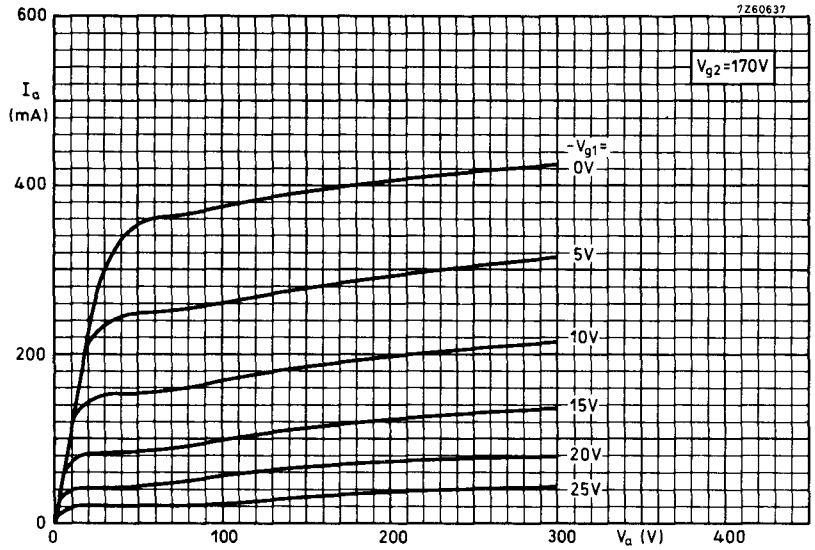


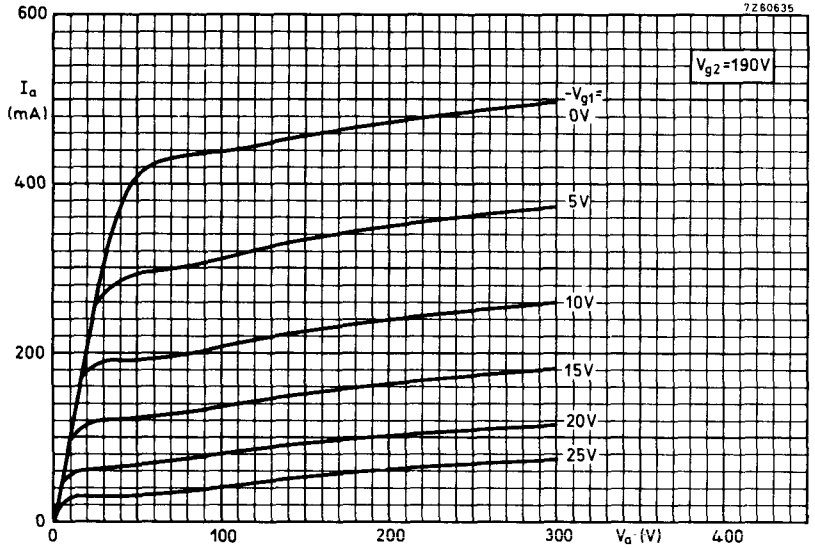
[1]) Maximum pulse duration 22 % of a cycle but maximum 18 μs.

[2]) During the heating-up of the cathode W_{g_2} = max. 6 W.


7Z60631
50
250
V_a (V)
V_{g2} (V)
V_a min
V_{g2} min
25
125
0
0
100
200
I_a (mA)
300


7Z60633
400
I_a (mA)
V_{g2} = 150V
$-V_{g1}$ = 0V
5V
10V
15V
20V
300
200
100
0
0
50
100
150
200
250
V_a (V)
300


7Z60637
600
400
200
0
I_a (mA)
V_{g2}=170V
$-V_{g1}$=
0V
5V
10V
15V
20V
25V
0
100
200
300
V_a (V)
400


7Z60635
600
400
200
0
I_a (mA)
V_{g2}=190V
$-V_{g1}$=
0V
5V
10V
15V
20V
25V
0
100
200
300
V_a (V)
400

PHILIPS

Data handbook

Electronic components and materials

PL81

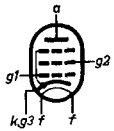
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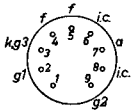
PENTODE for use as frame and sound output valve
PENTODE pour utilisation en amplificatrice de sortie de base de temps image et du son
PENTODE zur Verwendung als Endröhre für die vertikale Ablenkung und für die Schallwiedergabe

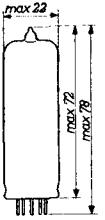
Heating:	indirect by A.C. or D.C.; series supply		
Chauffage:	indirect par C.A. ou C.C.; alimentation en série	I_f	= 300 mA
Heizung:	indirekt durch Wechsel- oder Gleichstrom; Serienspeisung	V_f	= 16,5 V

Capacitances Capacités Kapazitäten	C_{g1}	= 11 pF
	C_a	= 5,9 pF
	C_{ag1}	< 1 pF
	C_{g1f}	< 0,15 pF

Dimensions in mm
Dimensions en mm
Abmessungen in mm







Base, culot, Sockel: NOVAL

Optimum peak anode current in frame output operation

To allow for valve spread and for deterioration during life in frame output application the circuit should be designed around a peak anode current not exceeding
90 mA at V_a = 50 V, V_{g2} = 170 V
120 mA at V_a = 60 V, V_{g2} = 200 V.

Courant anodique de crête optimum en application comme tube final de base de temps image

A l'application comme tube final de base de temps image il faut tenir compte des tolérances du tube et de la détérioration pendant la durée de vie en dessinant le circuit pour un courant anodique de crête ne dépassant pas
90 mA à V_a = 50 V, V_{g2} = 170 V
120 mA à V_a = 60 V, V_{g2} = 200 V.

PHILIPS

PL 82

PENTODE for use as frame and sound output tube
PENTODE pour utilisation en amplificatrice de sortie de base de temps image et du son
PENTODE zur Verwendung als Endröhre für die vertikale Ablenkung und für die Schallwiedergabe

Heating : indirect by A.C. or D.C. series supply
Chauffage: indirect par C.A. ou C.C. alimentation-série
Heizung : indirekt durch Wechsel- oder Gleichstrom Serienspeisung

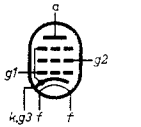
I_f = 300 mA
V_f = 16,5 V

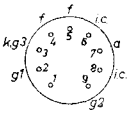
Base, culot, Sockel: NOVAL

Overall length: 78 mm
See pages 205 and 253

Hauteur totale: 78 mm
Voir pages 205 et 253

Gesamthöhe : 78 mm
Siehe S. 205 und 253





Capacitances
Capacités
Kapazitäten

C_{g1} = 11 pF
C_a = 5,9 pF
C_{ag1} < 1 pF
C_{g1f} < 0,15 pF

Optimum peak anode current in frame output operation

To allow for tube spread and for deterioration during life in frame output application the circuit should be designed around a peak anode current not exceeding

90 mA at V_a = 50 V, V_{g2} = 170 V
120 mA at V_a = 60 V, V_{g2} = 200 V

Courant anodique de crête optimum en application comme tube final de base de temps image

A l'application comme tube final de base de temps image il faut tenir compte des tolérances du tube et de la détérioration pendant la durée en dessinant le circuit pour un courant anodique de crête ne dépassant pas

90 mA à V_a = 50 V, V_{g2} = 170 V
120 mA à V_a = 60 V, V_{g2} = 200 V

PHILIPS

PL 82

PENTODE for use as frame and sound output tube
PENTODE pour utilisation en amplificatrice de sortie de base de temps image et du son
PENTODE zur Verwendung als Endröhre für die vertikale Ablenkung und für die Schallwiedergabe

Heating : indirect by A.C. or D.C. series supply
Chauffage: indirect par C.A. ou C.C. alimentation-série
Heizung : indirekt durch Wechsel- oder Gleichstrom Serienspeisung

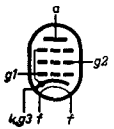
I_f = 300 mA
V_f = 16,5 V

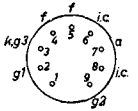
Base, culot, Sockel: NOVAL

Overall length: 78 mm
See pages 205 and 253

Hauteur totale: 78 mm
Voir pages 205 et 253

Gesamthöhe : 78 mm
Siehe S. 205 und 253





Capacitances Capacités Kapazitäten	C_{g1}	= 11 pF
	C_a	= 5,9 pF
	C_{ag1}	< 1 pF
	C_{g1f}	< 0,15 pF

Optimum peak anode current in frame output operation

To allow for tube spread and for deterioration during life in frame output application the circuit should be designed around a peak anode current not exceeding

90 mA at V_a = 50 V, V_{g2} = 170 V
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Courant anodique de crête optimum en application comme tube final de base de temps image

A l'application comme tube final de base de temps image il faut tenir compte des tolérances du tube et de la détérioration pendant la durée en dessinant le circuit pour un courant anodique de crête ne dépassant pas

90 mA à V_a = 50 V, V_{g2} = 170 V
120 mA à V_a = 60 V, V_{g2} = 200 V

Höchstwert des Anodenspitzenstromes beim Gebrauch als Endröhre für die vertikale Ablenkung

Beim Gebrauch als Endröhre für die vertikale Ablenkung muss den Röhrentoleranzen und der Verschlechterung der Röhre während der Lebensdauer Rechnung getragen werden indem die Schaltung entworfen wird für einen Anodenspitzenstrom der einen Wert von

90 mA bei V_a = 50 V, V_{g2} = 170 V
120 mA bei V_a = 60 V, V_{g2} = 200 V.

nicht überschreitet.

Operating characteristics as class A sound output amplifier
Caractéristiques d'utilisation en amplificatrice finale de son classe A
Betriebsdaten als Klasse A Endverstärker für Schallwiedergabe

V_a=V_b	=	170	200	V
V_{g2}	=	170	-	V
R_{g2}	=	0	680	Ω
V_{g1}	=	-10,4	-13,9	V
I_a	=	53	45	mA
I_{g2}	=	10	8,5	mA
S	=	9,0	7,6	mA/V
R_i	=	20	24	kΩ
R_a	=	3	4	kΩ
μ_{g2g1}	=	10	10	
W_o (d = 10%)	=	4,0	4,2	W
V_i (d = 10%)	=	6	7	V_{eff}
V_i (W_o = 50 mW)	=	0,5	0,55	V_{eff}

Höchstwert des Anodenspitzenstromes beim Gebrauch als Endröhre für die vertikale Ablenkung

Beim Gebrauch als Endröhre für die vertikale Ablenkung muss den Röhrentoleranzen und der Verschlechterung der Röhre während der Lebensdauer Rechnung getragen werden indem die Schaltung entworfen wird für einen Anodenspitzenstrom der einen Wert von

90 mA bei V_a = 50 V, V_{g2} = 170 V
120 mA bei V_a = 60 V, V_{g2} = 200 V.

nicht überschreitet.

Operating characteristics as class A sound output amplifier
Caractéristiques d'utilisation en amplificatrice finale de son classe A
Betriebsdaten als Klasse A Endverstärker für Schallwiedergabe

V_a=V_b	=	170	200	V
V_{g2}	=	170	-	V
R_{g2}	=	0	680	Ω
V_{g1}	=	-10,4	-13,9	V
I_a	=	53	45	mA
I_{g2}	=	10	8,5	mA
S	=	9,0	7,6	mA/V
R_i	=	20	24	kΩ
R_a	=	3	4	kΩ
μ_{g2g1}	=	10	10	
W_o (d = 10%)	=	4,0	4,2	W
V_i (d = 10%)	=	6	7	V_{eff}
V_i (W_o = 50 mW)	=	0,5	0,55	V_{eff}

Höchstwert des Anodenspitzenstromes beim Gebrauch als Endröhre für die vertikale Ablenkung

Beim Gebrauch als Endröhre für die vertikale Ablenkung muss den Röhrentoleranzen und der Verschlechterung der Röhre während der Lebensdauer Rechnung getragen werden indem die Schaltung entworfen wird für einen Anodenspitzenstrom der einen Wert von

90 mA bei V_a = 50 V, V_{g2} = 170 V
120 mA bei V_a = 60 V, V_{g2} = 200 V

nicht überschreitet

Operating characteristics as class A sound output amplifier
Caractéristiques d'utilisation en amplificatrice finale de son classe A
Betriebsdaten als Klasse A Endverstärker für Schallwiedergabe

V_a=V_b	= 170	200	V
V_{g2}	= 170	-	V
R_{g2}	= 0	680	Ω
V_{g1}	= -10,4	-13,9	V
I_a	= 53	45	mA
I_{g2}	= 10	8,5	mA
S	= 10,2	8,6	mA/V
R_1	= 20	24	kΩ
R_a	= 3	4	kΩ
μ_{g2g1}	= 10	10	
W_o (d = 10%)	= 4,0	4,2	W
V_i (d = 10%)	= 6	7	V_{eff}
V_i (W_o = 50 mW)	= 0,5	0,55	V_{eff}

Operating characteristics as class A push-pull sound output amplifier
Caractéristiques d'utilisation en amplificatrice push-pull de son en classe A
Betriebsdaten als Klasse A Gegentaktverstärker für Schallwiedergabe

V_a	=	170		200		V
V_{g2}	=	170		200		V
Rk	=	100		135		Ω
R_{aa}	=	4		4		kΩ
V_i	=	0	2x9,3	0	2x13,5	V_{eff}
I_a	=	2x46	2x50	2x45	2x52	mA
I_{g2}	=	2x8,7	2x17	2x8,5	2x19	mA
W_o	=	0	9	0	12	W
d_{tot}	=	-	5	-	5	%

Limiting values
Caractéristiques limites
Grenzdaten

V_{a_o} = max. 550 V	W_{g2}	= max. 2,5 W	
V_{a_p} = max. 2500 V[1])	I_k	= max. 75 mA	
$-V_{a_p}$ = max. 500 V	V_{g1} (I_{g1}=+0,3µA)	= max.-1,3 V	
V_a = max. 250 V[4])	R_{g1}	= max. 1 MΩ[2])	
W_a = max. 9 W	R_{g1}	= max. 0,4 MΩ[3])	
V_{g2_o} = max. 550 V	R_{kf}	= max. 20 kΩ	
V_{g2} = max. 250 V	V_{kf}	= max. 200 V	

[1]) Max. pulse duration 10% of a cycle, with a maximum of 2 m sec.
Durée de l'impulsion max. 10% d'un cycle, avec un maximum de 2 m sec.
Impulszeit max. 10% einer Periode, mit einem Maximum von 2 Sek.

[2]) With automatic grid bias
Avec polarisation négative fixe
Mit automatischer negativer Gittervorspannung

[3]) With fixed grid bias
Avec polarisation négative fixe
Mit fester negativer Gittervorspannung

→ [4]) When used as frame output tube with $W_a \leq 4.5$ W, V_a = max. 450 V.
En utilisation comme tube de sortie de base de temps image avec $W_a \leq 4,5$ W, V_a = 450 V au max.
Beim Gebrauch als Endröhre für die vertikale Ablenkung mit $W_a \leq 4,5$ W, ist V_a = max. 450 V.

Operating characteristics as class A push-pull sound output amplifier
Caractéristiques d'utilisation en amplificatrice push-pull de son en classe A
Betriebsdaten als Klasse A Gegentaktverstärker für Schallwiedergabe

V_a	=	170		200		V
V_{g2}	=	170		200		V
R_k	=	100		135		Ω
R_{aa}	=	4		4		kΩ
V_i	=	0	2x9,3	0	2x13,5	V_{eff}
I_a	=	2x46	2x50	2x45	2x52	mA
I_{g2}	=	2x8,7	2x17	2x8,5	2x19	mA
W_o	=	0	9	0	12	W
d_{tot}	=	-	5	-	5	%

Limiting values
Caractéristiques limites
Grenzdaten

V_{a_o} = max. 550 V	W_{g2}	= max. 2,5 W	
V_{a_p} = max. 2500 V [1])	I_k	= max. 75 mA	
$-V_{a_p}$ = max. 500 V	V_{g1} (I_{g1}=+0,3μA)	= max. -1,3 V	
V_a = max. 250 V [4])	R_{g1}	= max. 1 MΩ [2])	
W_a = max. 9 W	R_{g1}	= max. 0,4 MΩ [3])	
V_{g2_o} = max. 550 V	R_{kf}	= max. 20 kΩ	
V_{g2} = max. 250 V	V_{kf}	= max. 200 V	

[1]) Max. pulse duration 10% of a cycle, with a maximum of 2 m sec.
Durée de l'impulsion max. 10% d'un cycle, avec un maximum de 2 m sec.
Impulszeit max. 10% einer Periode, mit einem Maximum von 2 Sek.

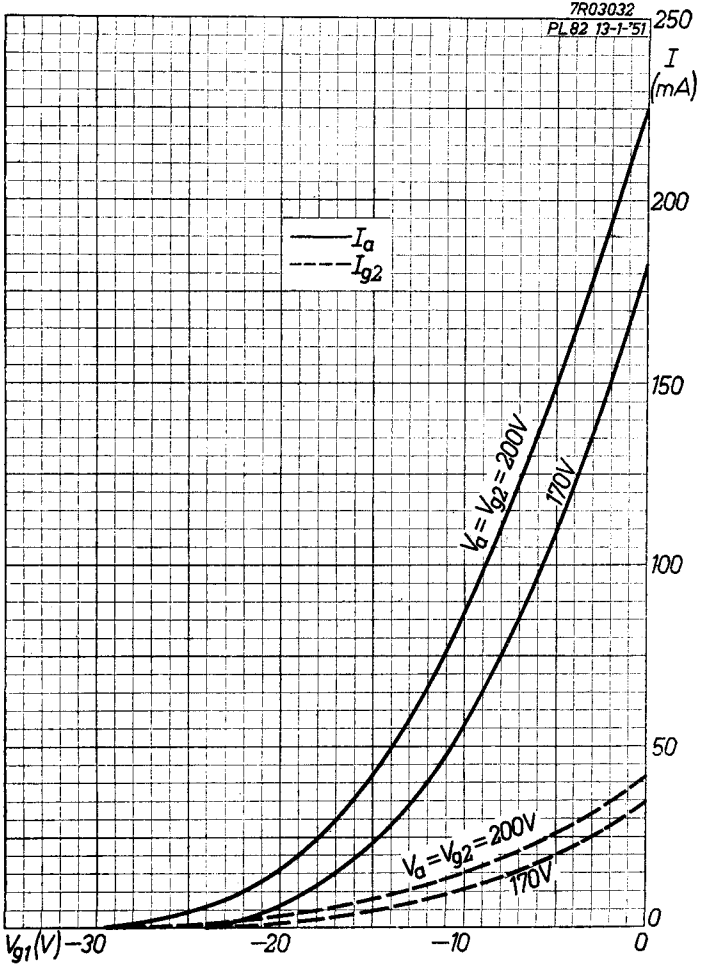
[2]) With automatic grid bias
Avec polarisation négative automatique
Mit automatischer negativer Gittervorspannung

[3]) With fixed grid bias
Avec polarisation négative fixe
Mit fester negativer Gittervorspannung

[4]) When used as frame output tube with $W_a \leq 4.5$ W, V_a = max. 450 V.
En utilisation comme tube de sortie de base de temps image avec $W_a \leq 4,5$ W, V_a = 450 V au max.
Beim Gebrauch als Endröhre für die vertikale Ablenkung mit $W_a \leq 4,5$ W, ist V_a = max. 450 V.

PL 82

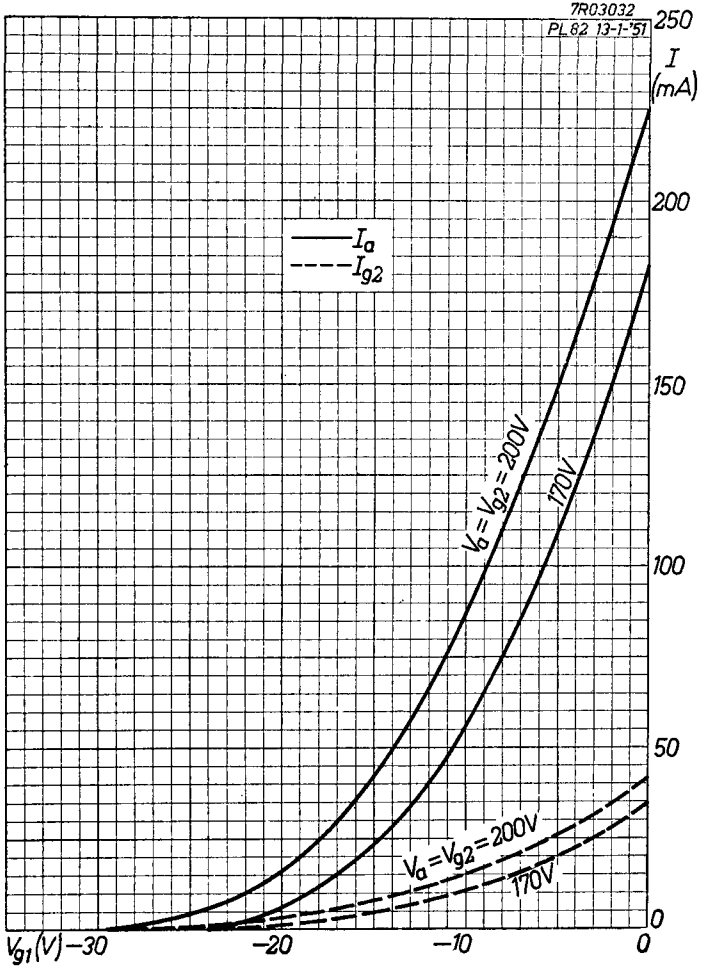
PHILIPS



A

PL 82

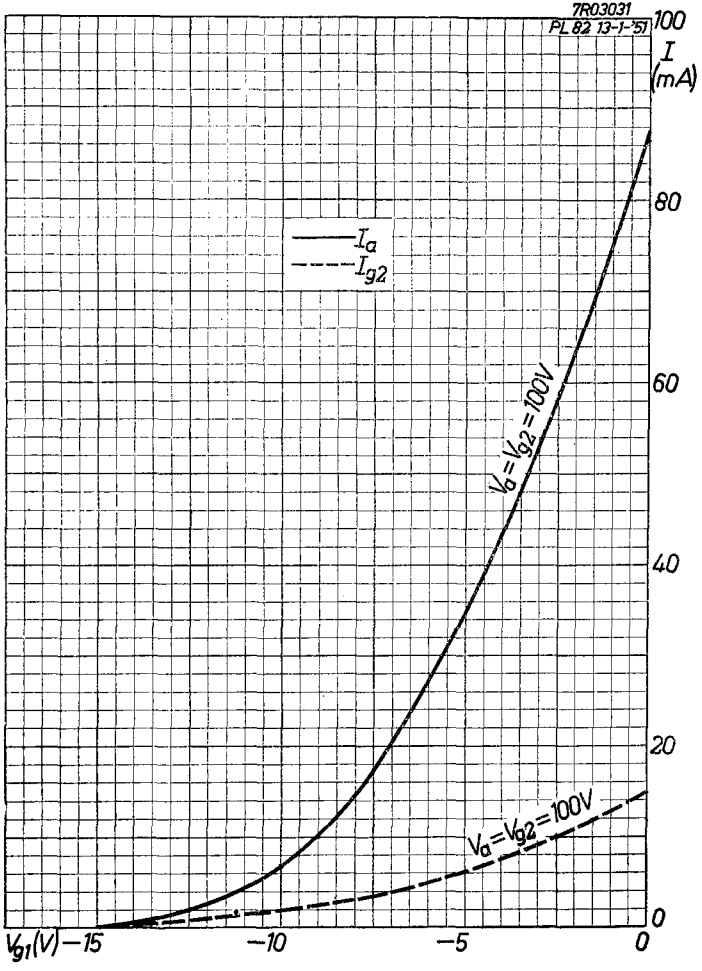
PHILIPS



A

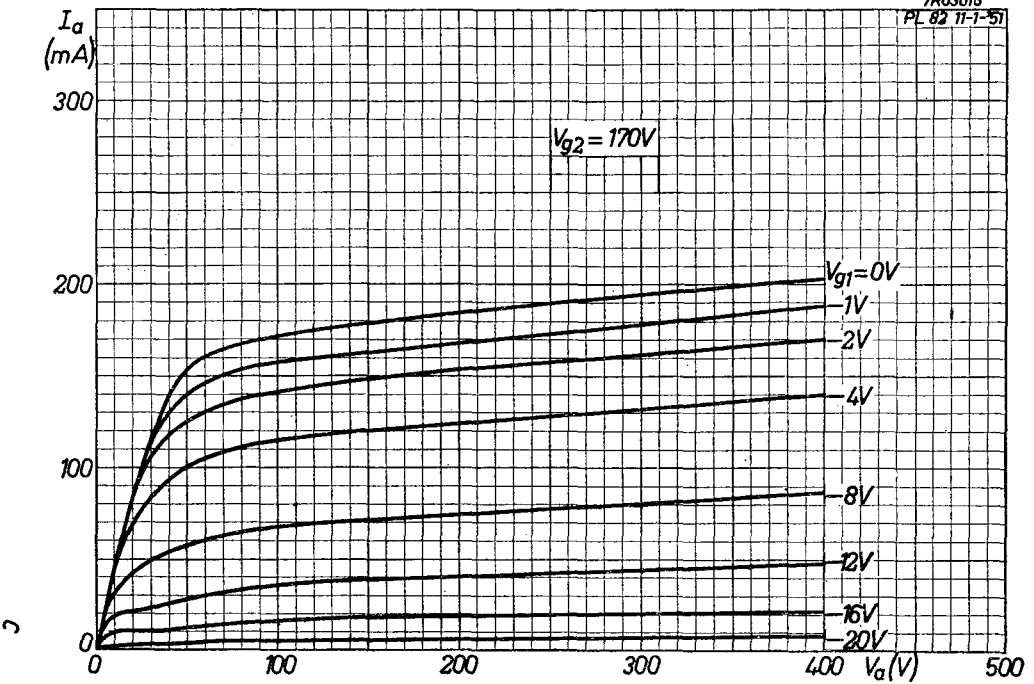
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PL 82



2.2.1951

B

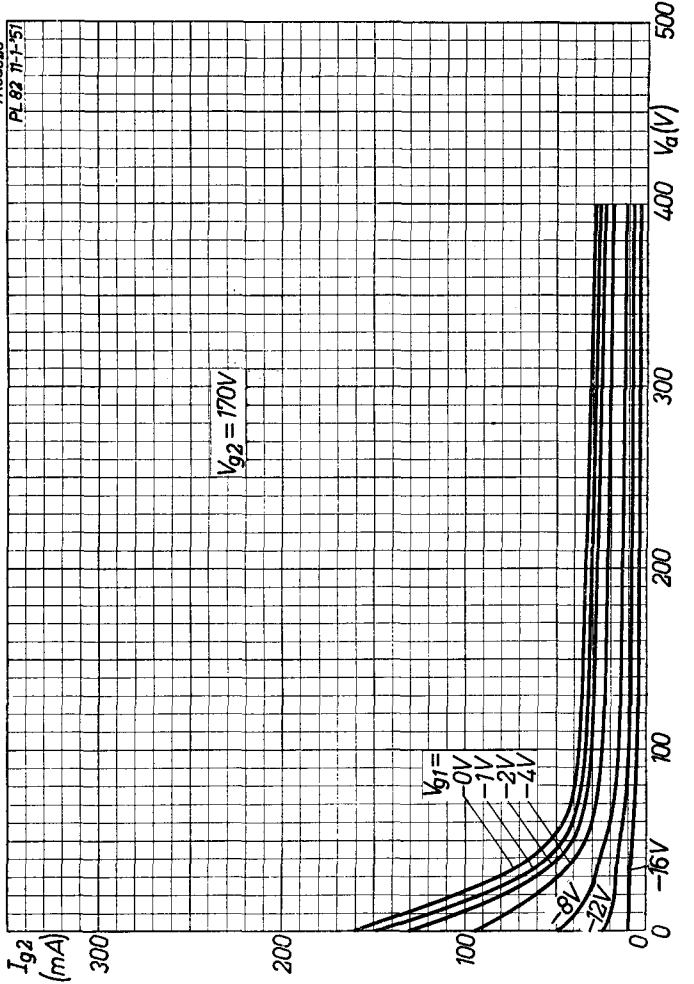


PL 82

PHILIPS

PHILIPS

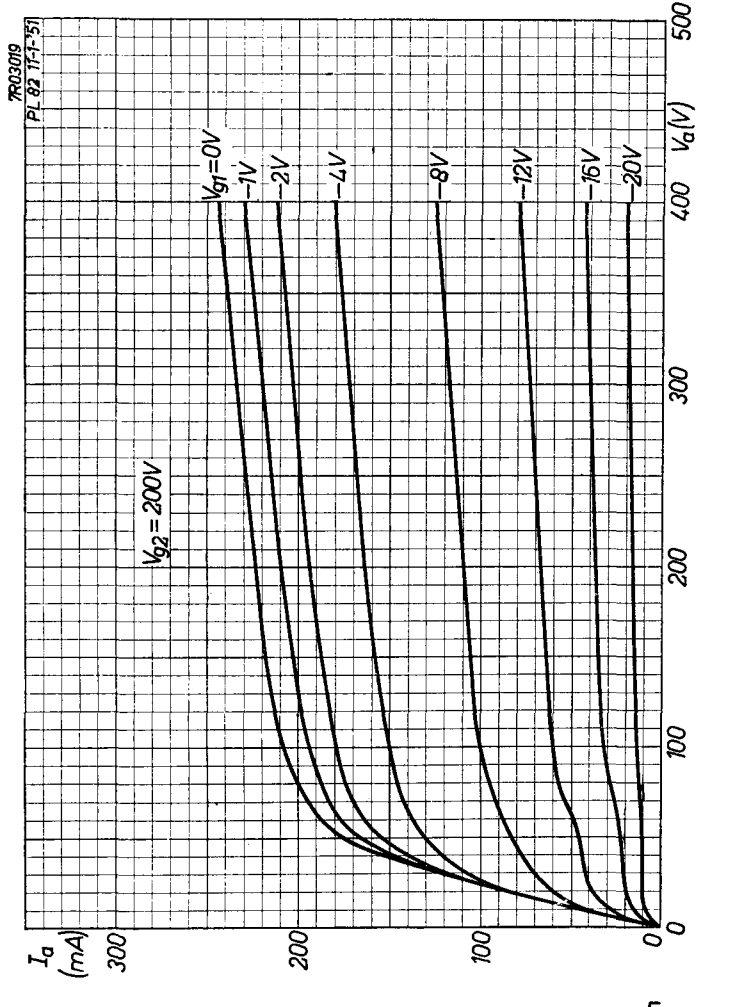
PL 82



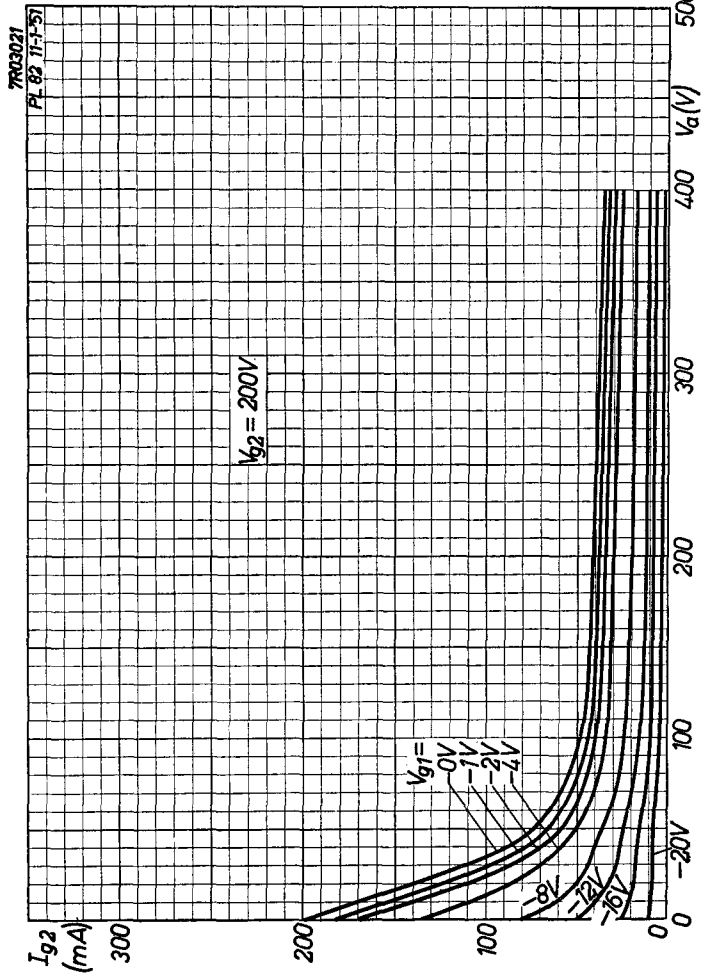
2.2.1951

D

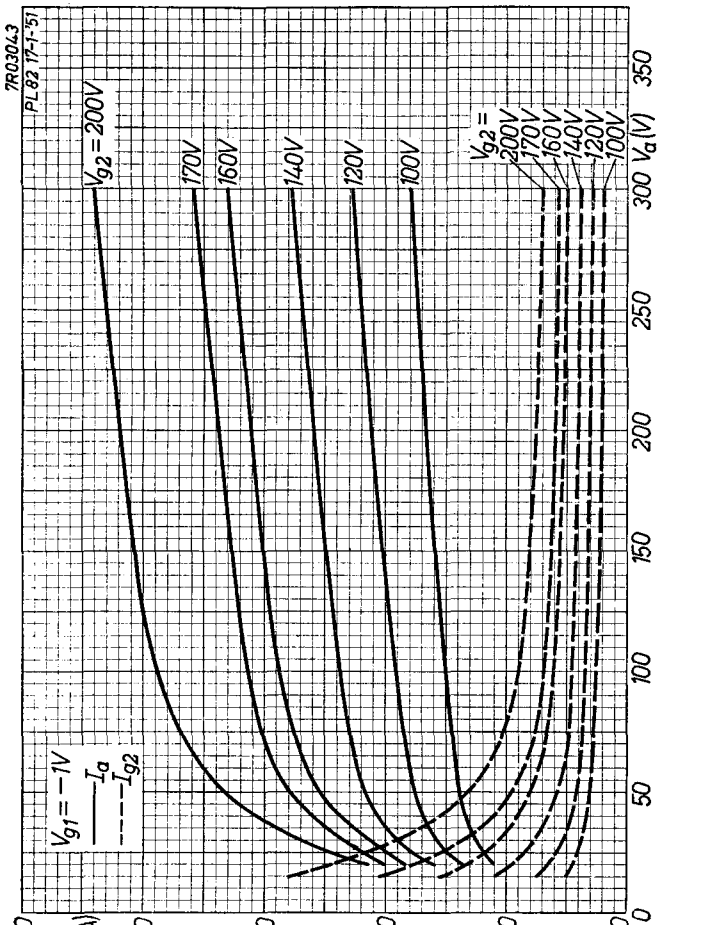
PL 82 **PHILIPS**



E


7R03021
PL 82 11-1-51
I_{g2} (mA)
300
200
100
0
V_a (V)
500
400
300
200
100
0
−20V
V_{g2} = 200V
V_{g1} =
0V
−1V
−2V
−4V
−8V
−12V
−16V

PL 82 **PHILIPS**



PHILIPS

PL 82

2.2.1951

H

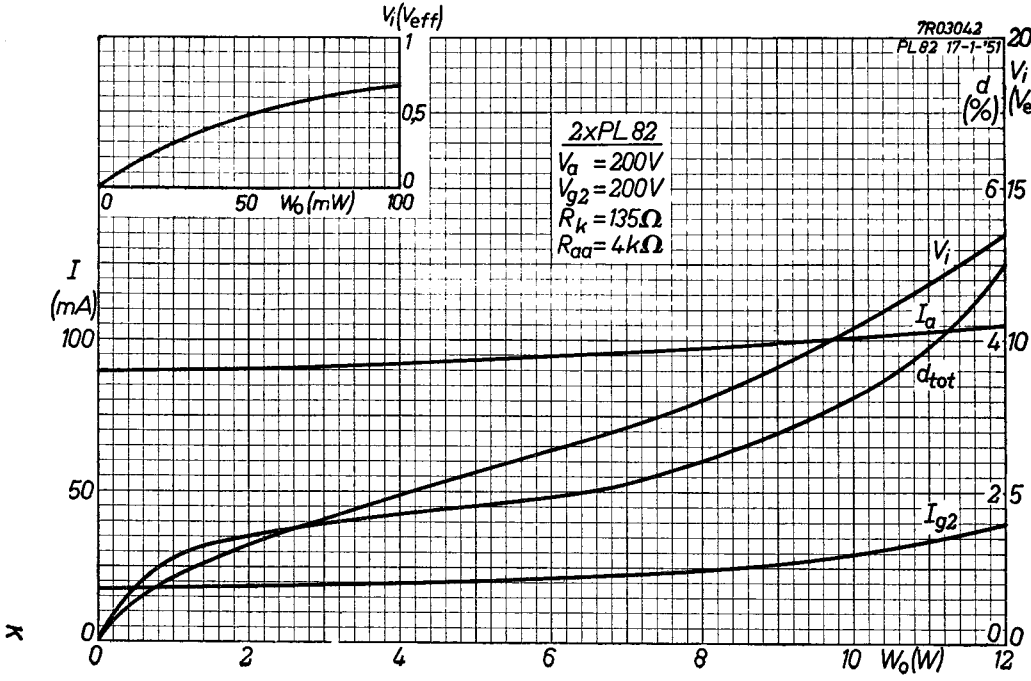
PL 82 **PHILIPS**

PHILIPS

PL82

6.6.1951

J


PL82
PHILIPS
7R03042
PL82 17-1-'51
2xPL82
V_a = 200V
V_{g2} = 200V
R_k = 135Ω
R_{aa} = 4kΩ
$V_i(V_{eff})$
1
0,5
0
0
50
W_0(mW)
100
I
(mA)
100
50
0
V_i
I_a
d_{tot}
I_{g2}
d
(%)
20
15
10
5
0
6
4
2
0
2
4
6
8
10
W_0(W)
12

PHILIPS

Electronic Tube

HANDBOOK

PL82

page	sheet	date
1	1	1952.12.12
2	1	1953.12.12
3	1	1962.05.05
4	2	1952.12.12
5	2	1953.12.12
6	2	1962.05.05
7	3	1952.12.12
8	3	1962.05.05
9	A	1952.12.12
10	A	1962.05.05
11	B	1951.02.02
12	C	1951.02.02
13	D	1951.02.02
14	E	1951.02.02
15	F	1951.02.02
16	G	1951.02.02
17	H	1951.02.02
18	I	1951.02.02
19	J	1951.02.02

20	K	1951.02.02
21, 22	FP	2000.01.09

VIDEO OUTPUT PENTODE

Pentode intended for use as video output tube.

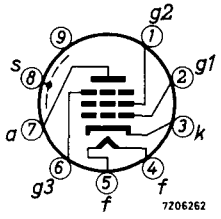
QUICK REFERENCE DATA			
Anode current	I_a	36	mA
Transconductance	S	10.5	mA/V
Amplification factor	$\mu_{g_2g_1}$	24	-

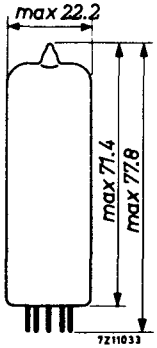
HEATING: Indirect by A.C. or D.C.; series supply

Heater current	I_f	300	mA
Heater voltage	V_f	15	V

DIMENSIONS AND CONNECTIONS Dimensions in mm

Base: Noval





CAPACITANCES

Anode to all except grid No.1	$C_{a(g_1)}$	6.6	pF
Grid No.1 to all except anode	$C_{g_1(a)}$	10.8	pF
Anode to grid No.1	C_{ag_1}	max. 0.1	pF
Grid No.1 to grid No.2	$C_{g_1g_2}$	3.2	pF
Grid No.1 to heater	C_{g_1f}	max. 0.15	pF

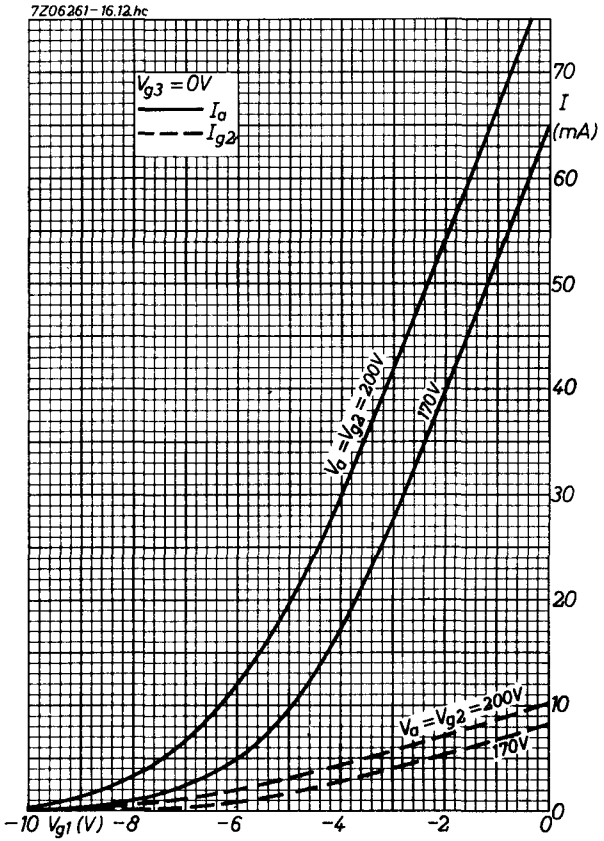
TYPICAL CHARACTERISTICS

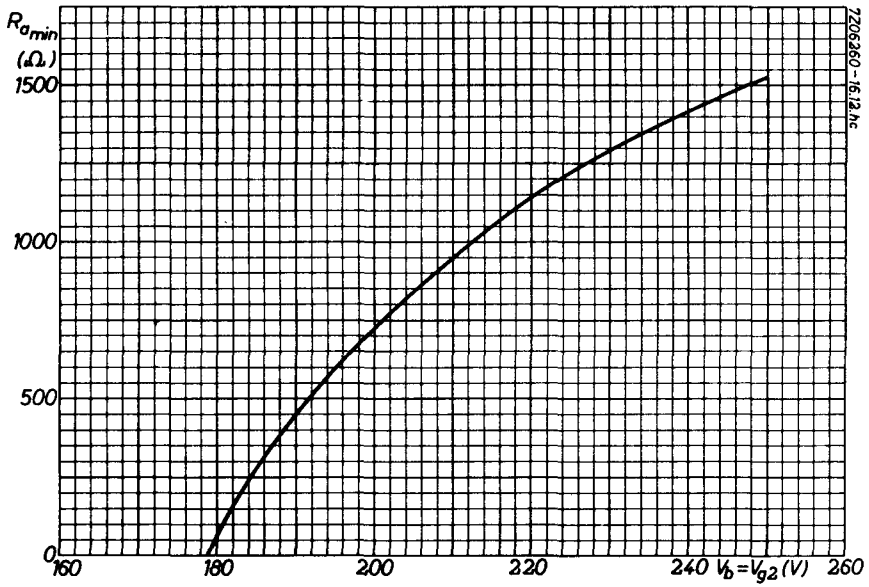
Anode voltage	V_a	170	200	V
Grid No.3 voltage	V_{g_3}	0	0	V
Grid No.2 voltage	V_{g_2}	170	200	V
Grid No.1 voltage	V_{g_1}	-2.3	-3.5	V
Anode current	I_a	36	36	mA
Grid No.2 current	I_{g_2}	5.0	5.0	mA
Transconductance	S	10.5	10.5	mA/V
Amplification factor	$\mu_{g_2g_1}$	24	24	–
Internal resistance	R_i	0.1	0.1	MΩ

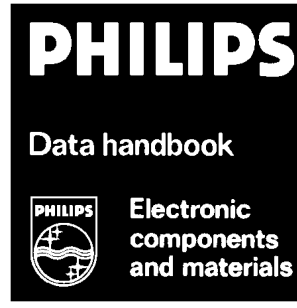
LIMITING VALUES (Design centre rating system)

Anode voltage	V_{a_o}	max.	550	V
	V_a	max.	250	V
Grid No.2 voltage	$V_{g_{2o}}$	max.	550	V
	V_{g_2}	max.	250	V
Anode dissipation	W_a	max.	9	W
Grid No.2 dissipation	W_{g_2}	max.	2	W
Cathode current	I_k	max.	70	mA
Grid No.1 resistor				
for fixed bias	R_{g_1}	max.	0.5	MΩ
for automatic bias	R_{g_1}	max.	1	MΩ
Cathode to heater voltage	V_{kf}	max.	200	V [1]

[1] D.C. component max. 150 V


7Z06261-16.12.hc
V_{g3} = 0V
I_a
I_{g2}
70
I
(mA)
60
50
40
30
20
10
0
$V_a = V_{g2}$ = 200V
170V
$V_a = V_{g2}$ = 200V
170V
−10 V_{g1} (V) −8
−6
−4
−2
0


$R_{a\,min}$
(Ω)
1500
1000
500
0
160
180
200
220
240
$V_b = V_{g2}$ (V)
260
7206260-16.12.hc



PL83

page	sheet	date
1	1	1969.12
2	2	1969.01
3	3	1969.01
4	4	1969.01
5	FP	1999.08.03

FRAME AND A.F. OUTPUT PENTODE

Pentode intended for use as frame output tube in television receivers and as A.F. power amplifier.

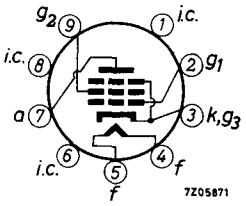
QUICK REFERENCE DATA				
Anode peak voltage	V_{a_p}	max.	2	kV
Cathode current	I_k	max.	100	mA
Output power	W_o		5.3	W

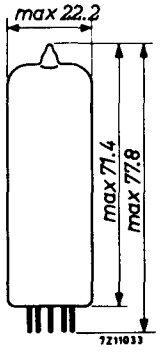
HEATING: Indirect by A.C. or D.C.; series supply

Heater current	I_f	300	mA
Heater voltage	V_f	15	V

DIMENSIONS AND CONNECTIONS Dimensions in mm

Base: Noval





CAPACITANCES

Anode to all except grid No.1	$C_{a(g_1)}$		6.8	pF
Grid No.1 to all except anode	$C_{g_1(a)}$		13	pF
Anode to grid No.1	C_{ag_1}	max.	0.6	pF
Grid No.1 to heater	C_{g_1f}	max.	0.25	pF

OPTIMUM PEAK ANODE CURRENT IN FRAME OUTPUT APPLICATION

The circuit should be designed so that the peak anode current does not exceed:

145 mA at V_a = 60 V, V_{g_2} = 170 V, I_f = 300 mA
190 mA at V_a = 70 V, V_{g_2} = 200 V, I_f = 300 mA
220 mA at V_a = 80 V, V_{g_2} = 220 V, I_f = 300 mA

The minimum available value of the peak anode current at end of life and I_f = 285 mA is:

125 mA at V_a = 60 V, V_{g_2} = 170 V
160 mA at V_a = 70 V, V_{g_2} = 200 V
185 mA at V_a = 80 V, V_{g_2} = 220 V

OPERATING CHARACTERISTICS

A.F. power amplifier, class A (measured with V_K constant)

Supply voltage	V_b		170			200		V
Grid No.2 series resistor (non decoupled)	R_{g_2}		0			470		Ω
Cathode resistor	R_k		130			215		Ω
Load resistance	$R_{a\sim}$		2			2.5		kΩ
Grid No.1 driving voltage	V_i	0	0.47	6.1	0	0.52	7.0	V_{RMS}
Anode current	I_a	75	–	76	65	–	64	mA
Grid No.2 current	I_{g_2}	4.0	–	16.5	3.2	–	11.4	mA
Output power	W_o	0	0.05	5.1	0	0.05	5.3	W
Distortion	d_{tot}	–	–	10	–	–	10	%

Anode supply voltage	V_{ba}					230		V
Grid No.2 supply voltage	V_{bg_2}					200		V
Grid No.2 series resistor (non decoupled)	R_{g_2}					220		Ω
Cathode resistor	R_k					270		Ω
Load resistance	$R_{a\sim}$					3.25		kΩ
Grid No.1 driving voltage	V_i				0	0.42	5.7	V_{RMS}
Anode current	I_a				56	–	54	mA
Grid No.2 current	I_{g_2}				2.2	–	9.7	mA
Output power	W_o				0	0.05	5.4	W
Distortion	d_{tot}				–		10	%

OPERATING CHARACTERISTICS

A.F. power amplifier, class AB, two tubes in push-pull

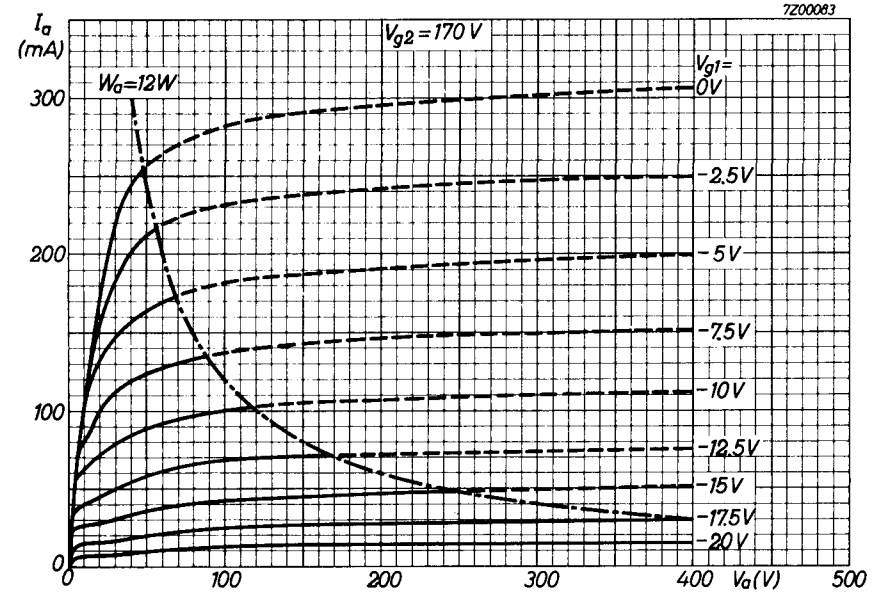
Anode supply voltage	V_{ba}	200			230			V
Grid No.2 voltage	V_{bg_2}	200			200			V
Common cathode resistor	R_k	120			130			Ω
Load resistance	$R_{aa\sim}$	3			4			kΩ
Grid No.1 driving voltage	V_i	0	0.47	14.3	0	0.4	14.6	V_{RMS}
Anode current	I_a	2x60	-	2x64.5	2x56	-	2x61	mA
Grid No.2 current	I_{g_2}	2x3.0	-	2x18.5	2x2.3	-	2x17.5	mA
Output power	W_o	0	0.05	14.3	0	0.05	17.5	W
Distortion	d_{tot}	-	-	3.8	-	-	5.4	%

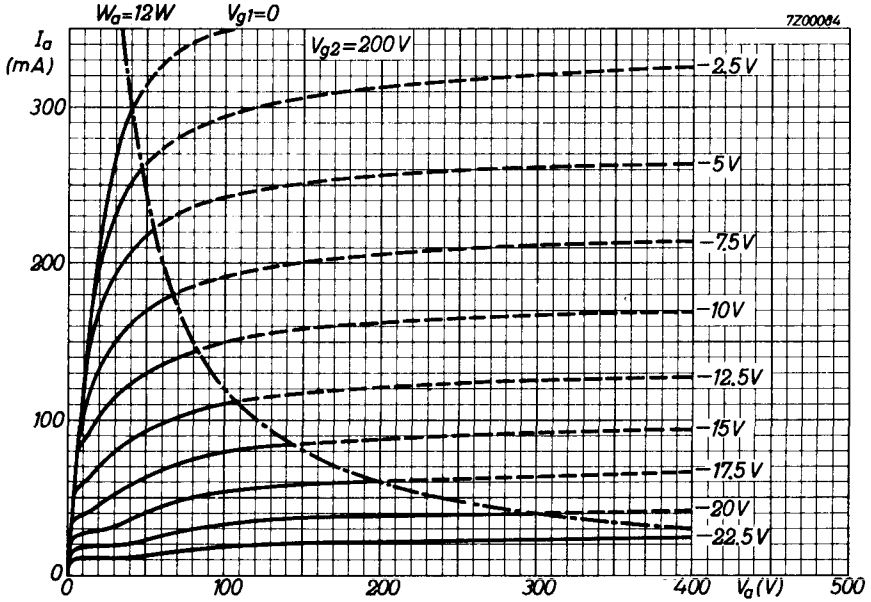
LIMITING VALUES (Design centre rating system)

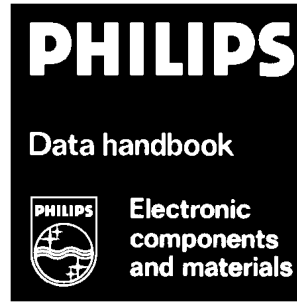
Anode voltage	V_{a_o}	max.	550	V
	V_a	max.	250	V
Anode peak voltage	V_{a_p}	max.	2	kV [1]
Grid No.2 voltage	$V_{g_{2o}}$	max.	550	V
	V_{g_2}	max.	250	V
Anode dissipation	W_a	max.	12	W [2]
Grid No.2 dissipation				
average	W_{g_2}	max.	1.75	W
peak	$W_{g_{2p}}$	max.	6	W
Cathode current	I_k	max.	100	mA
Grid No.1 resistor				
for automatic bias	R_{g_1}	max.	1	MΩ
for frame output with automatic bias	R_{g_1}	max.	2	MΩ
Cathode to heater voltage	V_{kf}	max.	200	V

1) In frame output circuits where the max. pulse duration is 4% of a cycle with a max. of 0.8 ms.

2) For frame output application W_a = max. 10 W.


7Z00083
I_a (mA)
V_{g2} = 170 V
W_a=12W
V_{g1}= 0V
-2.5V
-5V
-7.5V
-10V
-12.5V
-15V
-17.5V
-20V
300
200
100
0
0
100
200
300
400
V_a(V)
500


W_a=12W
V_{g1}=0
7Z00084
I_a (mA)
V_{g2}=200V
-2.5V
-5V
-7.5V
-10V
-12.5V
-15V
-17.5V
-20V
-22.5V
300
200
100
0
0
100
200
300
400
V_a(V)
500



PL84

page	sheet	date
1	1	1969.12
2	2	1969.01
3	3	1969.01
4	4	1969.01
5	FP	1999.03.19

A.F. OUTPUT PENTODE

Pentode intended for use as A.F. power amplifier.

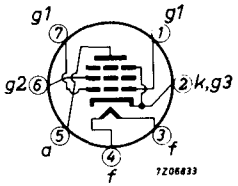
QUICK REFERENCE DATA			
Anode current	I_a	24	mA
Transconductance	S	5.4	mA/V
Amplification factor	μ_{g2g1}	17	
Output power	W_o	3	W

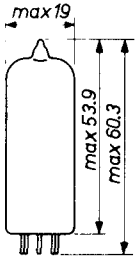
HEATING: Indirect by A.C. or D.C.; series supply

Heater current	I_f 300 mA
Heater voltage	V_f 4.5 V

DIMENSIONS AND CONNECTIONS Dimensions in mm

Base: miniature 7-pin





CAPACITANCES

Anode to all except grid No.1	$C_{a(g_1)}$	3.5	pF
Grid No.1 to all except anode	$C_{g_1(a)}$	5.3	pF
Anode to grid No.1	C_{ag_1}	max. 0.4	pF
Grid No.1 to heater	C_{g_1f}	max. 0.2	pF

TYPICAL CHARACTERISTICS

Anode voltage	V_a	250	V
Grid No.2 voltage	V_{g2}	250	V
Grid No.1 voltage	V_{g1}	-9.0	V
Anode current	I_a	24	mA
Grid No.2 current	I_{g2}	4.5	mA
Transconductance	S	5.4	mA/V
Amplification factor	μ_{g2g1}	17	
Internal resistance	R_i	70	kΩ

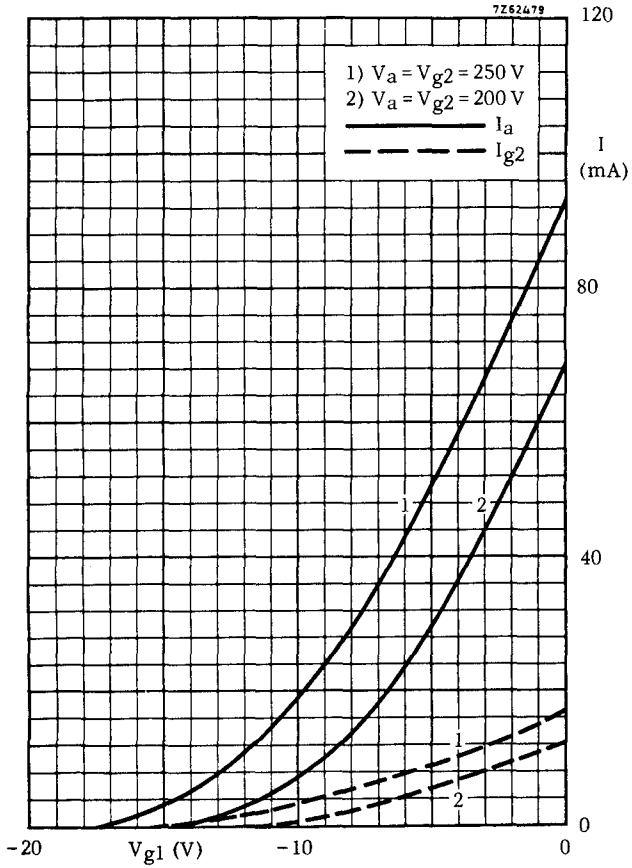
OPERATING CHARACTERISTICS

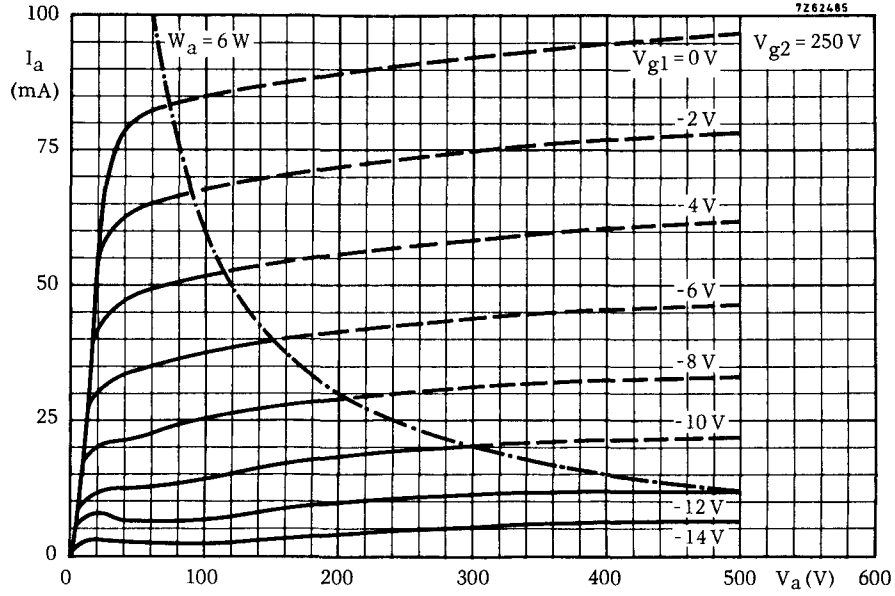
Class A

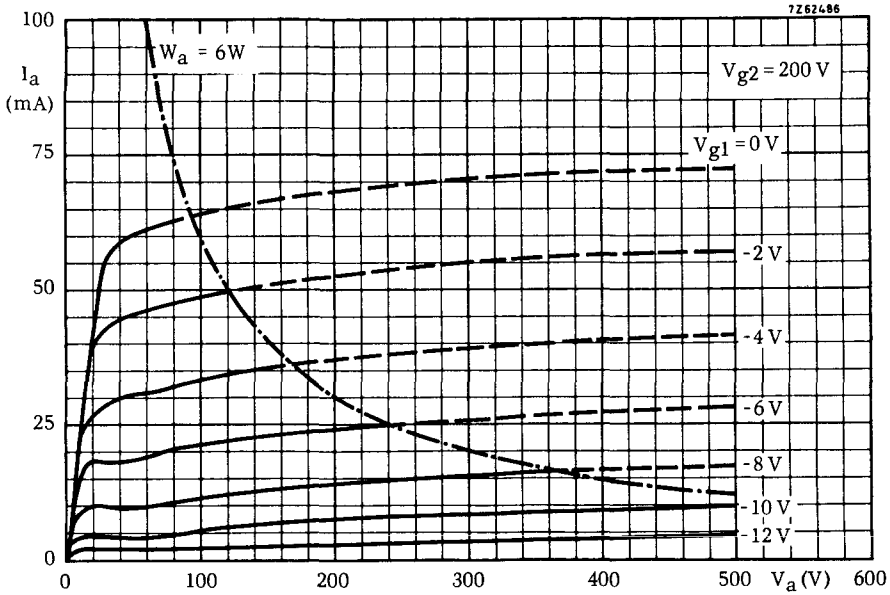
Anode voltage	V_a	200	250	V
Grid No.2 voltage	V_{g2}	200	250	V
Cathode resistor	R_k	230	320	Ω
Anode current (V_i = 0)	I_a	23	24	mA
Grid No.2 current (V_i = 0)	I_{g2}	4.2	4.5	mA
Load resistance	R_a ~	8	10	kΩ
Grid No.1 driving voltage	V_i	4.5	5	V_{RMS}
Output power	W_o	2.3	3.0	W
Distortion	d_{tot}	10	10	%
Grid No.1 driving voltage for W_o = 50 mW	V_i	0.50	0.50	V_{RMS}

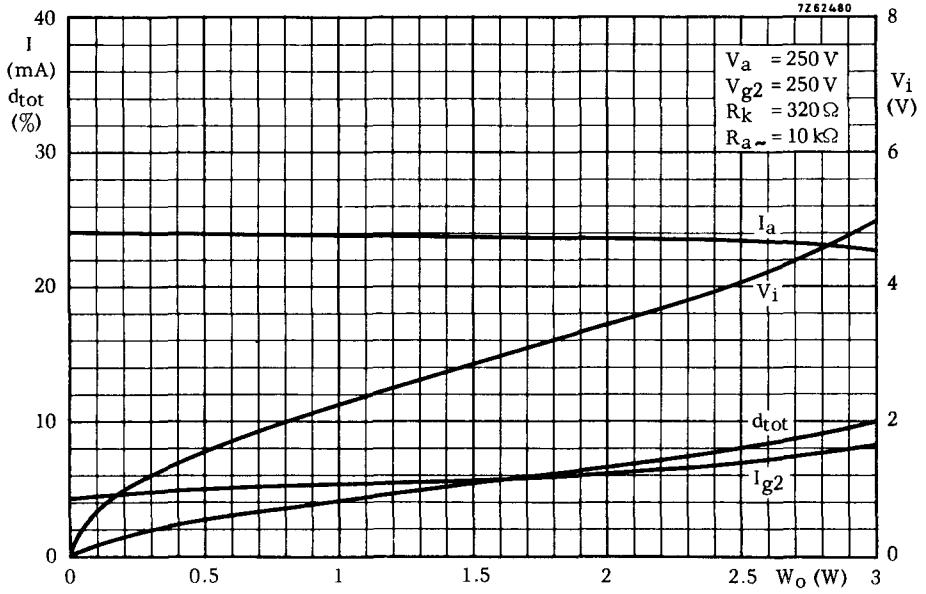
LIMITING VALUES (Design centre rating system)

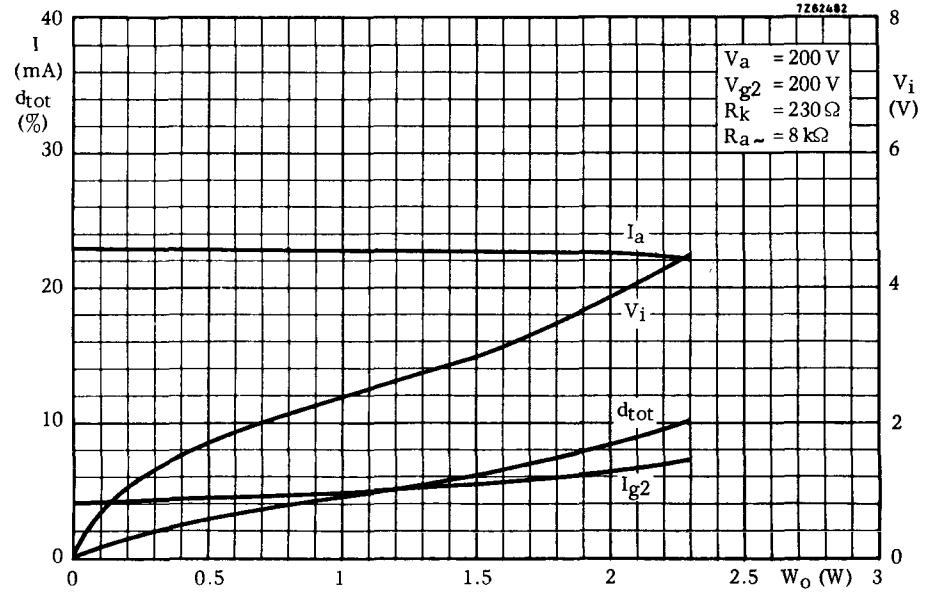
Anode voltage	V_{a_o}	max.	550	V
	V_a	max.	300	V
Grid No.2 voltage	V_{g2_o}	max.	550	V
	V_{g2}	max.	300	V
Anode dissipation	W_a	max.	6	W
Grid No.2 dissipation				
average at $V_i = 0$	W_{g2}	max.	1.25	W
peak	W_{g2_p}	max.	2.5	W
Cathode current	I_k	max.	35	mA
Grid No.1 resistor, automatic bias	R_{g1}	max.	2.2	MΩ
Cathode to heater voltage	V_{kf}	max.	200	V

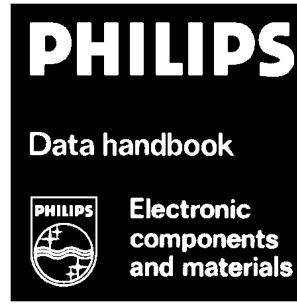

7Z62479
1) $V_a = V_{g2} = 250$ V
2) $V_a = V_{g2} = 200$ V
I_a
I_{g2}
120
I
(mA)
80
40
0
1
2
1
2
-20
V_{g1} (V)
-10
0


7Z62485
100
I_a (mA)
75
50
25
0
W_a = 6 W
V_{g2} = 250 V
V_{g1} = 0 V
-2 V
-4 V
-6 V
-8 V
-10 V
-12 V
-14 V
0
100
200
300
400
500
V_a (V)
600


7Z62486
100
I_a (mA)
75
50
25
0
W_a = 6W
V_{g2} = 200 V
V_{g1} = 0 V
-2 V
-4 V
-6 V
-8 V
-10 V
-12 V
0
100
200
300
400
500
V_a (V)
600


7Z62480
I (mA) d_{tot} (%)
V_i (V)
V_a = 250 V
V_{g2} = 250 V
R_k = 320 Ω
$R_{a\sim}$ = 10 kΩ
I_a
V_i
d_{tot}
I_{g2}
W_o (W)


7Z62482
I (mA) d_{tot} (%)
V_i (V)
V_a = 200 V
V_{g2} = 200 V
R_k = 230 Ω
$R_{a\sim}$ = 8 kΩ
I_a
V_i
d_{tot}
I_{g2}
W_o (W)



PL95

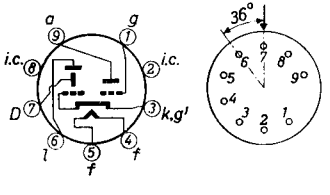
page	sheet	date
1	1	1972.01
2	2	1972.01
3	3	1972.01
4	4	1972.01
5	5	1972.01
6	6	1972.01
7	FP	1999.03.19

INDICATOR TUBE with amplifying triode for use as tuning indicator
TUBE INDICATEUR avec triode amplificatrice pour utilisation comme indicateur de syntonisation
ANZEIGERÖHRE mit Verstärkertriode zur Verwendung als Abstimmanzeigeröhre

Heating : indirect by A.C. or D.C.; series supply
Chauffage: indirect par C.A. ou C.C.; alimentation série
Heizung : indirekt durch Wechsel- oder Gleichstrom; Serienspeisung

If = 300 mA
Vf = 4,2 V

Dimensions in mm
Dimensions en mm
Abmessungen in mm



Base, culot, Sockel: NOVAL

Operating characteristics (D connected to a)
Caractéristiques d'utilisation (D relié à l'anode)
Betriebsdaten (D mit a verbunden)

V_b	=	170		220		V
V_ℓ	=	170		220		V
$R_{a,D}$	=	470		470		kΩ
R_g	=	3		3		MΩ
V_{bg}	=	0	-15	0	-19,5	V
I_{a+D}	=	0,3	0,04	0,4	0,055	mA
I_ℓ	=	0,6	1,05	0,85	1,5	mA
a	=	20±5	0	21±5	0	mm

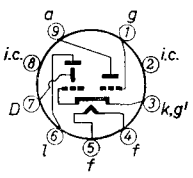
[1]) Shadown length
Longueur d'ombre
Schattenlänge

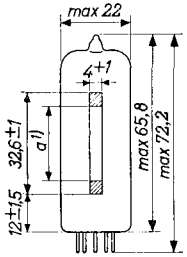
INDICATOR TUBE with amplifying triode for use as tuning indicator
TUBE INDICATEUR avec triode amplificatrice pour utilisation comme indicateur de syntonisation
ANZEIGERÖHRE mit Verstärkertriode zur Verwendung als Abstimmanzeigeröhre

Heating : indirect by A.C. or D.C.; series supply
Chauffage: indirect par C.A. ou C.C.; alimentation série
Heizung : indirekt durch Wechsel- oder Gleichstrom; Serienspeisung

If = 300 mA
Vf = 4,2 V

Dimensions in mm
Dimensions en mm
Abmessungen in mm





Base, culot, Sockel: NOVAL

Operating characteristics (D connected to a)
Caractéristiques d'utilisation (D relié à l'anode)
Betriebsdaten (D mit a verbunden)

Vb	=	170		220		V
V_ℓ	=	170		220		V
Ra,D	=	470		470		kΩ
Rg	=	3		3		MΩ
Vbg	=	0	-15	0	-19,5	V
Ia+D	=	0,3	0,04	0,4	0,055	mA
I_ℓ	=	0,6	1,05	0,85	1,5	mA
a	=	20±5	0	21±5	0	mm

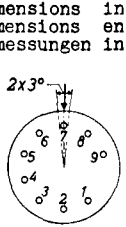
1) Shadown length
Longueur d'ombre
Schattenlänge

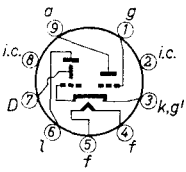
INDICATOR TUBE with amplifying triode for use as tuning indicator
TUBE INDICATEUR avec triode amplificatrice pour utilisation comme indicateur de syntonisation
ANZEIGERÖHRE mit Verstärkertriode zur Verwendung als Abstimmanzeigeröhre

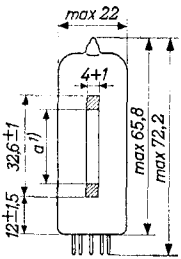
Heating : Indirect by A.C. or D.C.; series supply
Chauffage: indirect par C.A. ou C.C.; alimentation série
Heizung: : indirekt durch Wechsel- oder Gleichstrom Serienspeisung

I_f = 300 mA
V_f = 4,2 V

Dimensions in mm
Dimensions en mm
Abmessungen in mm







Base, culot, Sockel: NOVAL

The arrow near pin 7 indicates the viewing direction
La flèche près de la broche 7 indique le sens d'observation
Der Pfeil bei Stift 7 bezeichnet die Blickrichtung

Operating characteristics (D connected to a)
Caractéristiques d'utilisation (D relié à l'anode)
Betriebsdaten (D mit a verbunden)

V_b	=	170		220	V
V_l	=	170		220	V
$R_{a,D}$	=	470		470	kΩ
R_g	=	3		3	MΩ
V_{bg}	=	0	-15	0	-19,5 V
I_{a+D}	=	0,3	0,04	0,4	0,055 mA
I_l	=	0,6	1,05	0,85	1,5 mA
a	=	20±5	0	21±5	0 mm

1) Shadow length; Longueur d'ombre; Schattenlänge

Limiting values
Caractéristiques limites
Grenzdaten

V_{ao}	= max.	550	V
V_a	= max.	250	V
W_a	= max.	0,5	W
V_{Do}	= max.	550	V
V_D	= max.	250	V
$V_{\ell o}$	= max.	550	V
V_ℓ	= max.	250	V
	min.	170	V
I_k	= max.	3,0	mA
R_g	= max.	3	MΩ
V_{kf} (k pos.)	= max.	250	V
V_{kf} (k neg.)	= max.	50 $V_{=}$ + 200	Veff
R_{kf}	= max.	100	kΩ
t_{bulb}	= max.	120	°C
$-V_g$ (I_g = +0,3 μA)	= max.	1,3	V

Limiting values
Caractéristiques limites
Grenzdaten

V_{ao}	= max.	550 V
V_a	= max.	250 V
W_a	= max.	0,5 W
V_{Do}	= max.	550 V
V_D	= max.	250 V
$V_{\ell o}$	= max.	550 V
V_ℓ	= max.	250 V
	min.	170 V
I_k	= max.	3,0 mA
R_g	= max.	3 MΩ
V_{kf} (k pos.)	= max.	250 V
V_{kf} (k neg.)	= max.	50 $V_{\pm}$ + 200 Veff
R_{kf}	= max.	100 kΩ
t_{bulb}	= max.	120 °C
$-V_g$ (I_g = +0,3 μA)	= max.	1,3 V

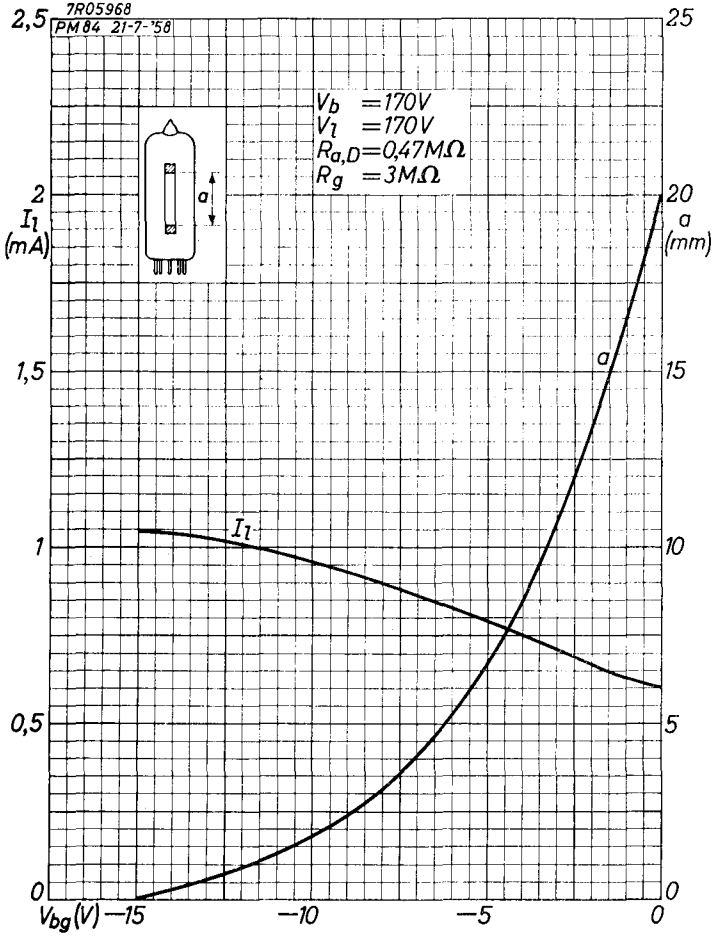
→

Limiting values
Caractéristiques limites
Grenzdaten

V_{ao}	= max.	550	V
V_a	= max.	250	V
W_a	= max.	0,5	W
V_{Do}	= max.	550	V
V_D	= max.	250	V
$V_{\ell o}$	= max.	550	V
V_ℓ	= max.	250	V
	min.	170	V
I_k	= max.	3,0	mA
R_g	= max.	3	MΩ
V_{kf} (k pos.)	= max.	250	V
V_{kf} (k neg.)	= max.	50 $V_{=}$ + 200	Veff
R_{kf}	= max.	100	kΩ
t_{bulb}	= max.	120	°C
$-V_g$ (I_g = +0,3 μA)	= max.	1,3	V

PHILIPS

PM84



7.7.1958

A

PHILIPS

Electronic Tube

HANDBOOK

PM84

page	sheet	date
1	1	1958.07.07
2	1	1959.04.04
3	1	1962.05.05
4	2	1958.07.07
5	2	1959.04.04
6	2	1962.05.05
7	A	1958.07.07
8	FP	2000.01.09

BOOSTER DIODE

Booster diode for timebase circuits of colour TV receivers.

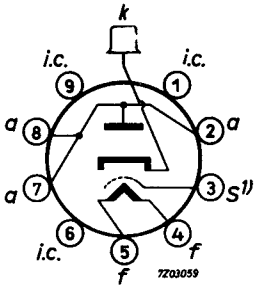
HEATING: Indirect by A.C. or D.C.; series supply

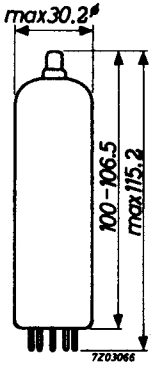
Heater current	I_f	300	mA
Heater voltage	V_f	42	V

MECHANICAL DATA Dimensions in mm

Base: Magnoval

Cap: Type 1





CAPACITANCES

Anode to cathode	C_{ak}	13	pF
Cathode to heater	C_{kf}	3.7	pF

[1]) Insertion of a resistor of 300 Ω between pins 3 and 5 is recommended to improve the high-tension properties of the tube. If no resistor is used, pins 3 and 4 should be interconnected.

TYPICAL CHARACTERISTICS

Internal resistance (I_a = 440 mA)	R_i	45.5	Ω

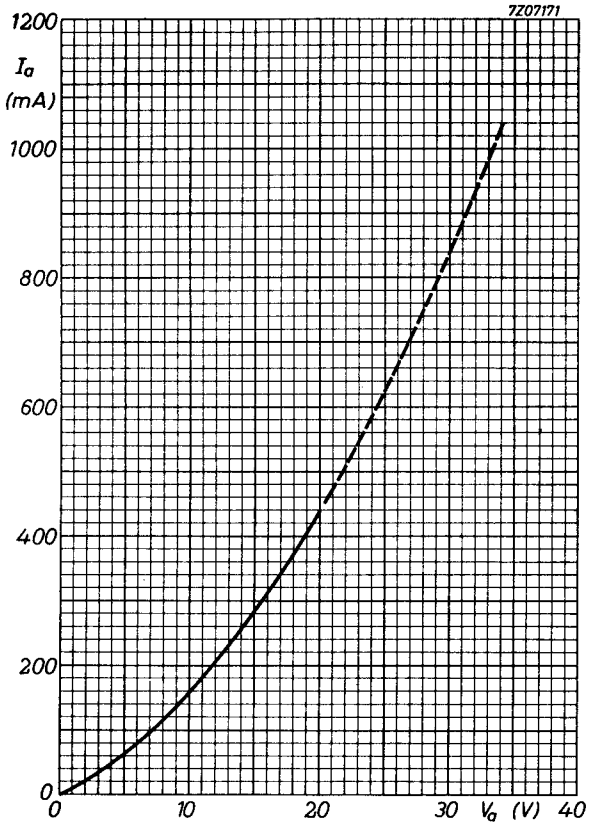
LIMITING VALUES (Design centre rating system)

Anode dissipation	W_a	max.	11	W
Anode current, average	I_a	max.	440	mA
peak	I_{a_p}	max.	800	mA
Anode voltage, negative peak	$-V_{a_p}$	max.	5600	V [1]
negative peak,(absolute max.)	$-V_{a_p}$	max.	7000	V [1]
Cathode to heater voltage, peak	V_{kf_p}	max.	6300	V [1]

Series resistance heater chain

During operation, the external resistance between either heater pin of the PY500 and either mains terminal should be at least 100 Ω when Vf/earth = 220 V_{RMS}
50 Ω when Vf/earth = 110 V_{RMS}
The hot heater resistances of other tubes in the heater chain can serve for this purpose.

[1]) Max. pulse duration 22% of a cycle, but max. 18 μs.


7Z07171
1200
I_a
(mA)
1000
800
600
400
200
0
0
10
20
30
V_a (V)
40

PHILIPS

Data handbook

Electronic components and materials

PY500

page	sheet	date
1	1	1970.08
2	2	1970.08
3	3	1970.08
4	FP	1999.02.24

BOOSTER DIODE

Booster diode for timebase circuits of colour television receivers. The PY500A is unilaterally interchangeable with the PY500 in existing circuits. In new equipment designs the 300 Ω protection resistance between pins 3 and 5 can be deleted for the PY500A.

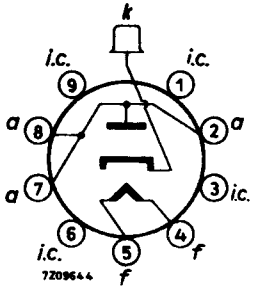
HEATING: Indirect by A.C. or D.C.; series supply

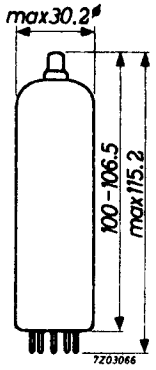
Heater current	I_f	300	mA
Heater voltage	V_f	42	V

MECHANICAL DATA Dimensions in mm

Base: Magnoval

Cap: Type 1





CAPACITANCES

Anode to cathode	C_{ak}	12.5	pF
Cathode to heater	C_{kf}	3.1	pF ←

TYPICAL CHARACTERISTICS

Internal resistance (I_a = 440 mA)	R_i	45.5	Ω

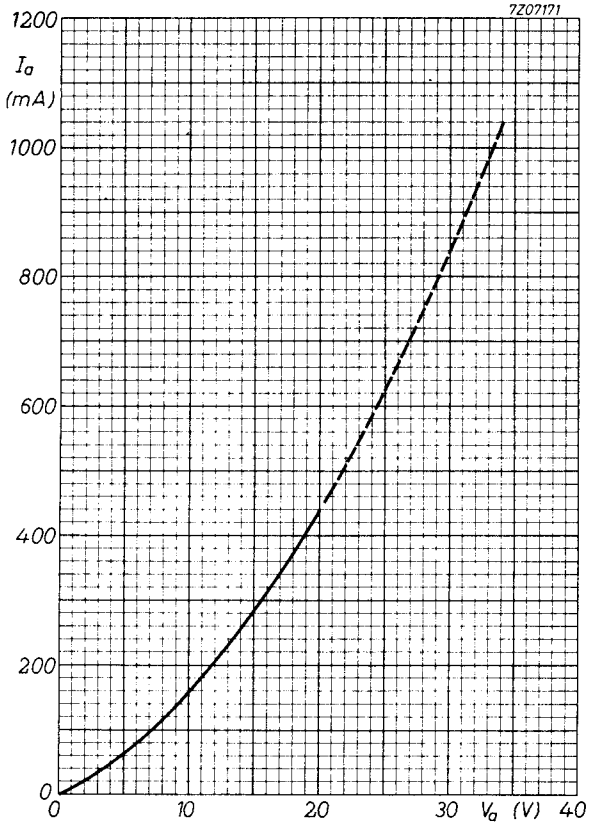
LIMITING VALUES (Design centre rating system)

Anode dissipation	W_a	max.	11	W
Anode current, average	I_a	max.	440	mA
peak	I_{a_p}	max.	1000	mA
Anode voltage, negative peak	$-V_{a_p}$	max.	5600	V [1]
negative peak (absolute max.)	$-V_{a_p}$	max.	7000	V [1]
Cathode to heater voltage, peak	V_{kfp}	max.	6300	V [1]

Series resistance heater chain

During operation, the external resistance between either heater pin of the PY500A and either mains terminal should be at least 100 Ω when Vf/earth = 220 V_{RMS}
50 Ω when Vf/earth = 110 V_{RMS}
The hot heater resistances of other tubes in the heater chain can serve for this purpose.

[1]) Max. pulse duration 22% of a cycle, but max. 18 μs.


7Z07171
1200
I_a
(mA)
1000
800
600
400
200
0
0
10
20
30
V_a (V)
40

PHILIPS

Data handbook

Electronic components and materials

PY500A

page	sheet	date
1	1	1970.08
2	2	1970.08
3	3	1970.08
4	FP	1999.02.24

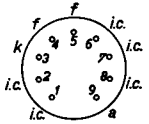
DIODE for use as booster
DIODE pour l'utilisation comme survolteuse
DIODE zur Verwendung als Spannungserhöher

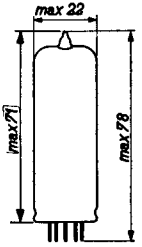
Heating: indirect by A.C. or D.C.; series supply
Chauffage: indirect par C.A. ou C.C.; alimentation en série
Heizung: indirekt durch Wechsel- oder Gleichstrom; Serienspeisung

I_f = 300 mA
V_f = 19 V

Dimensions in mm
Dimensions en mm
Abmessungen in mm







Base, culot, Sockel: NOVAL

Capacitances
Capacités
Kapazitäten

C_a = 5,5 pF

Limiting values
Caractéristiques limites
Grenzdaten

$V_{a\ inv_p}$ = max. 4 kV [1])
I_a = max. 180 mA
I_{a_p} = max. 400 mA
V_{kf_p} = max. 650 V [2])
C_{filt} = max. 4 µF

[1]) Max. pulse duration 18% of a cycle with a maximum of 18 µsec.
Durée de l'impulsion max. 18% d'un cycle avec un maximum de 18 µsec.
Impulszeit max. 18% einer Periode mit einem Maximum von 18 µSek.

[2]) Max. 160 V_{eff} A.C.voltage + max.450 V D.C.voltage
Cathode positive with respect to the filament.
160 V_{eff} au max. tension alternative + 450 V au max. tension directe.
Cathode positive par rapport au filament.
Max. 160 V_{eff} Wechselsp. + max. 450 V Gleichsp.
Kathode positiv in bezug auf den Glühfaden.

PHILIPS

PY 80

DIODE for use as booster
DIODE pour utilisation en survolteuse
DIODE zur Verwendung als Spannungserhöher

Heating : indirect by A.C. or D.C. series supply
Chauffage: indirect par C.A. ou C.C. alimentation- série
Heizung : indirekt durch Wechsel- oder Gleichstrom; Serienspeisung

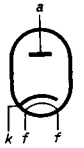
I_f = 300 mA
V_f = 19 V

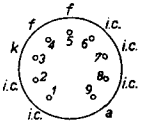
Base, culot, Sockel: NOVAL

Overall length: 78 mm
See pages 205 and 253

Hauteur totale: 78 mm
Voir pages 205 et 253

Gesamthöhe : 78 mm
Siehe S. 205 und 253





Capacitances
Capacités
Kapazitäten

C_a = 5,5 pF

Limiting values
Caractéristiques limites
Grenzdaten

$V_{a\ inv_p}$	= max.	4 kV[1]
I_a	= max.	180 mA
I_{a_p}	= max.	400 mA
V_{kf_p}	= max.	650 V[2]
C_{boost}	= max.	4 µF

[1] Max. pulse duration 18% of a cycle with a maximum of 18 µsec.
Durée de l'impulsion max. 18% d'un cycle avec un maximum de 18 µsec.
Impulszeit max. 18% einer Periode mit einem Maximum von 18 µSek.

[2] Max. 100 Veff mains voltage+max.500 V D.C.voltage
Cathode positive with respect to the filament
100 Veff au max. tension de réseau + 500 V au max. tension directe
Cathode positive par rapport au filament
Max. 100 Veff Netzspannung + max. 500 V Gleichspannung
Kathode positive in bezug auf den Glühfaden

When using the PY 80 in the valve holder 5908/03 at peak voltages above 3 kV, it must be isolated from the chassis by means of an insulating plate with a diameter of at least 40 mm.

Si le tube PY 80 est utilisé à des tensions de crête au-dessus de 3 kV dans le support 5908/03, il faut isoler le support du châssis par l'intermédiaire d'une plaquette isolante d'un diamètre de 40 mm au moins.

Wenn die Röhre PY 80 bei Spitzenspannungen höher als 3 kV im Röhrenhalter 5908/03 verwendet wird, muss der Halter vom Chassis isoliert werden mittels einer isolierenden Platte mit einem Durchmesser von mindestens 40 mm.

When using the PY 80 at peak voltages above 3 kV, the centre bush and contact No. 8 of the valve holder must be removed. ←

En utilisant le tube PY 80 à des tensions de crête au-dessus de 3 kV, il faut éloigner la douille centrale et le contact No. 8 du support de tube. ←

Wenn die Röhre PY 80 verwendet wird bei Spitzenspannungen höher als 3 kV, so müssen die Mittelbuchse und der Kontakt No. 8 des Röhrenhalters entfernt werden. ←

When using the PY 80 in the valve holder 5908/03 at peak voltages above 3 kV, it must be isolated from the chassis by means of an insulating plate with a diameter of at least 40 mm.

Si le tube PY 80 est utilisé à des tensions de crête au-dessus de 3 kV dans le support 5908/03, il faut isoler le support du châssis par l'intermédiaire d'une plaquette isolante d'un diamètre de 40 mm au moins.

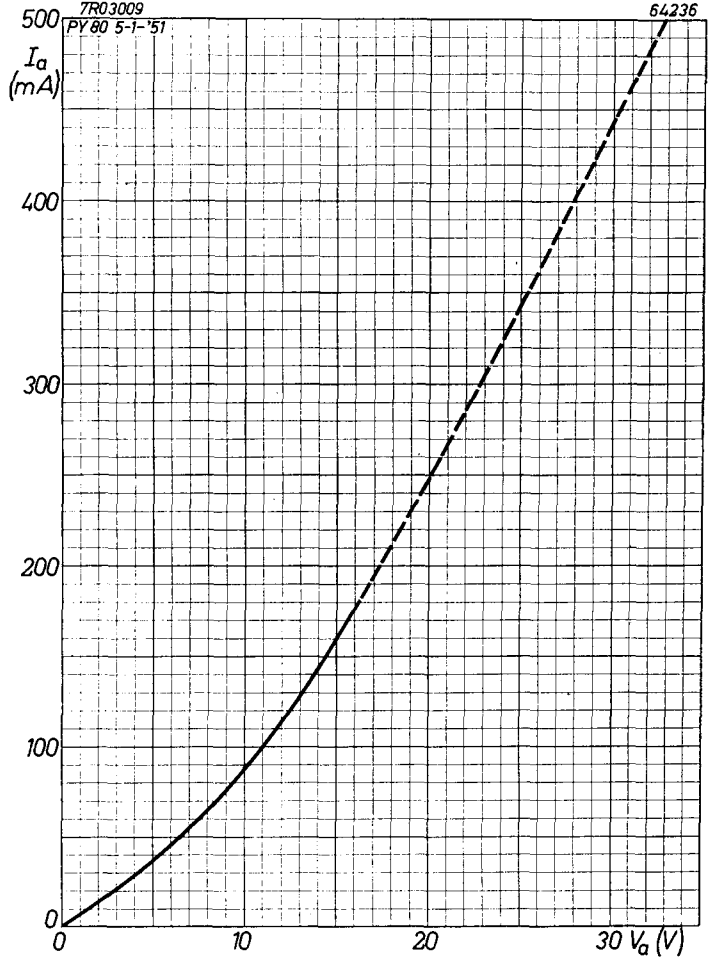
Wenn die Röhre PY 80 bei Spitzenspannungen höher als 3 kV im Röhrenhalter 5908/03 verwendet wird, muss der Halter vom Chassis isoliert werden mittels einer isolierenden Platte mit einem Durchmesser von mindestens 40 mm.

When using the PY 80 at peak voltages above 3 kV, the centre bush and contact No. 8 of the valve holder must be removed.

En utilisant le tube PY 80 à des tensions de crête au-dessus de 3 kV, il faut éloigner la douille centrale et le contact No. 8 du support de tube.

Wenn die Röhre PY 80 verwendet wird bei Spitzenspannungen höher als 3 kV, so müssen die Mittelbuchse und der Kontakt No. 8 des Röhrenhalters entfernt werden.

"Miniwatt" PY80



2.2.1951

A

PHILIPS

Electronic Tube

HANDBOOK

PY80

page	sheet	date
1	1	1951.11.11
2	1	1953.12.12
3	2	1951.11.11
4	2	1953.12.12
5	A	1951.02.02
6	FP	2000.06.02

BOOSTER DIODE

Booster diode intended for use in line time-base circuits of transformerless television receivers.

QUICK REFERENCE DATA				
Anode current, peak	I_{a_p}	max.	450	mA
Anode voltage, peak	V_{a_p}	max.	5000	V
Cathode to heater voltage, peak	V_{kf_p}	max.	5000	V

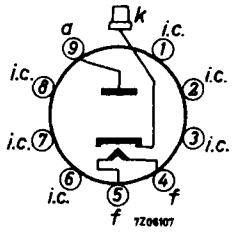
HEATING: Indirect by A.C. or D.C.; series supply

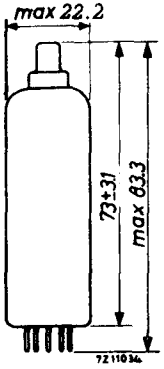
Heater current	I_f	300	mA
Heater voltage	V_f	17	V

DIMENSIONS AND CONNECTIONS Dimensions in mm

Base: Noval

Top cap: Type 1





CAPACITANCES

Anode to all	C_a	6.4	pF
Cathode to heater	C_{kf}	2.8	pF

LIMITING VALUES (Design centre rating system, unless otherwise specified)

Supply voltage	V_{b_o}	max.	550	V
	V_b	max.	250	V
Anode dissipation	W_a	max.	3.5	W
Anode current, average	I_a	max	150	mA
peak	I_{a_p}	max.	450	mA
Anode voltage, peak	V_{a_p}	max	5000	V [1)2)]
Absolute max.	V_{a_p}	max.	5600	V [1)2)]
Cathode to heater voltage, peak	V_{kf_p}	max.	5000	V [1)]
Series resistance heater chain	R_s	min.	80	Ω [3)]
Heater to earth voltage	$V_{f/earth}$	max.	220	V_{RMS}

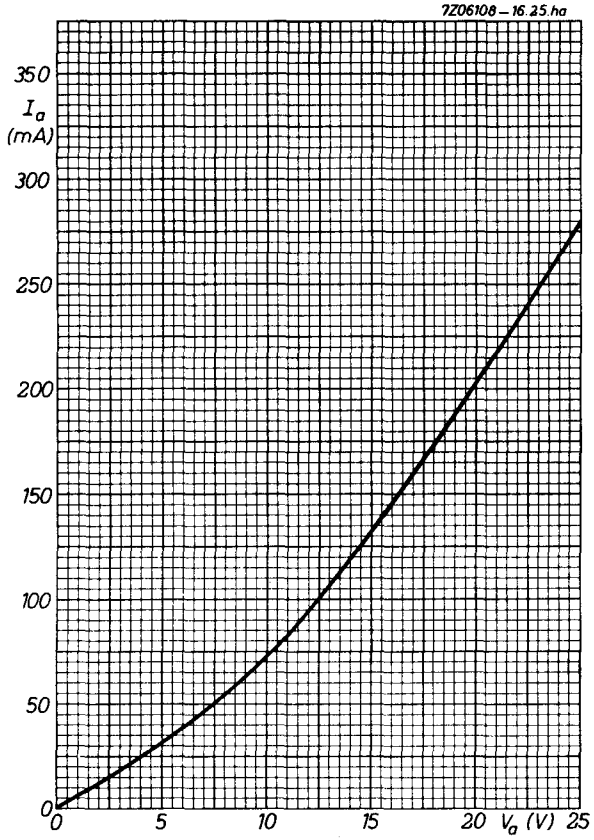
REMARK

In general it will be necessary to take measures in order to prevent the maximum permissible screen grid dissipation of the tube that derive their anode voltage from this booster diode, from being exceeded during the heating-up time of the booster diode.

1) Max. pulse duration 22% of a cycle with a maximum of 18 μsec.

2) Cathode positive with respect to the anode.

3) R_S = minimum resistance of the heater chain between any heater pin and any mains terminal under working conditions (the heater of another tube can be used for this resistance).


7Z06108 – 16.25.ha
350
I_a
(mA)
300
250
200
150
100
50
0
0
5
10
15
20
V_a (V)
25

PHILIPS

Data handbook

Electronic components and materials

PY81

page	sheet	date
1	1	1969.12
2	2	1969.01
3	3	1969.01
4	FP	1999.08.03

SINGLE ANODE RECTIFYING TUBE

Single anode high vacuum rectifying tube.

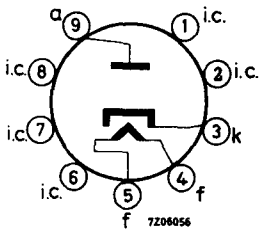
QUICK REFERENCE DATA			
Transformer voltage	V_{tr}	250	V_{RMS}
D.C. current	I_o	180	mA

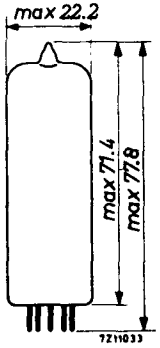
HEATING: Indirect by A.C. or D.C.; series supply

Heater current	I_f	300	mA
Heater voltage	V_f	19	V

DIMENSIONS AND CONNECTIONS Dimensions in mm

Base: Noval



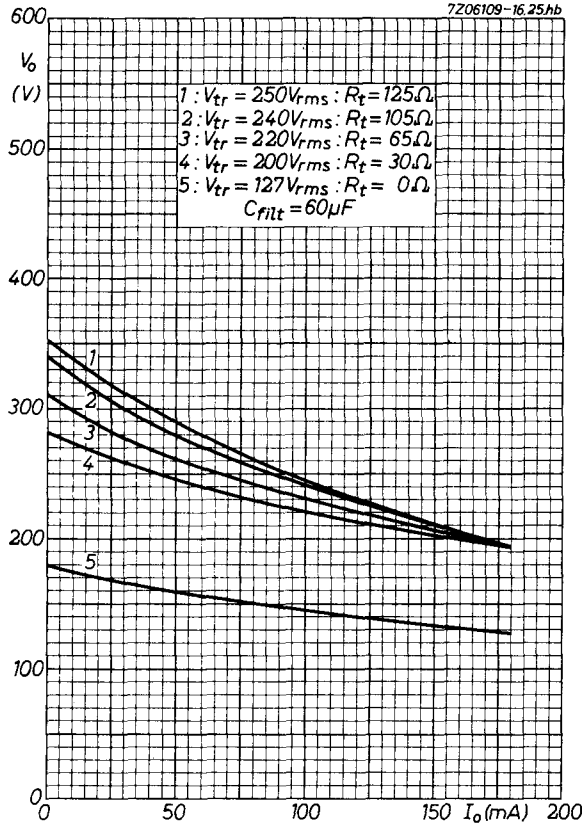


OPERATING CHARACTERISTICS as single-phase half-wave rectifier

Transformer voltage	V_{tr}	250	240	220	200	127	V_{RMS}
D.C. output voltage	V_o	195	195	195	195	127	V
D.C. current	I_o	180	180	180	180	180	mA
Protecting resistance	R_t	125	105	65	30	0	Ω
Input capacitance of smoothing filter	C_{filt}	60	60	60	60	60	μF

LIMITING VALUES (Design centre rating system)

Transformer voltage	V_{tr}	max.	250			V_{RMS}	
Anode voltage, peak inverse	$V_{a\,inv_p}$	max.	700			V	
D.C. current	I_o	max.	180			mA	
Cathode to heater voltage, peak	V_{kf_p}	max.	550			V [1]	
Input capacitance of smoothing filter	C_{filt}	max.	60			μF [2]	
Protecting resistance	R_t	min.	100	80	40	30	0 Ω
at transformer voltage	V_{tr}		250	240	220	200	127 V



1) Max. 220 V_{RMS} A.C. voltage + max. 250 $V_{D.C.}$ voltage. Cathode positive with respect to the heater.

2) When two tubes are placed in parallel, C_{filt} = max. 100 μF. The resistor R_t must be inserted in the anode lead of each tube.

PHILIPS

Data handbook

Electronic components and materials

PY82

page	sheet	date
1	1	1970.01
2	2	1970.01
3	FP	1999.08.03

BOOSTER DIODE

Booster diode intended for use in line time-base circuits of transformerless television receivers.

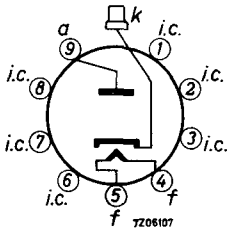
QUICK REFERENCE DATA		
Anode current, peak	I_{ap}	max. 550 mA
Anode voltage, negative peak	$-V_{ap}$	max. 6000 V
Cathode to heater voltage, peak	V_{kfp}	max. 6600 V

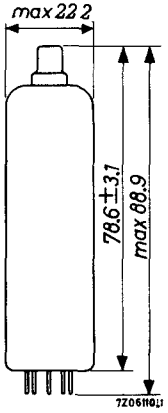
HEATING: Indirect by A.C. or D.C.; series supply

Heater current	I_f	300 mA
Heater voltage	V_f	30 V

DIMENSIONS AND CONNECTIONS Dimensions in.mm

Base: Noval
Top cap: Type 1





CAPACITANCES

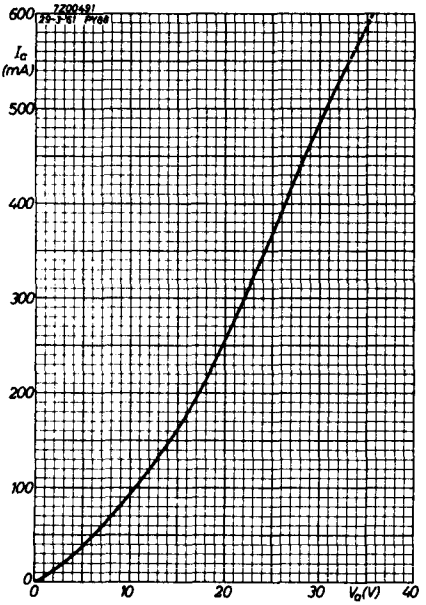
Anode to all	C_a	8.6 pF
Cathode to heater	C_{kf}	2.7 pF

LIMITING VALUES (Design centre rating system unless otherwise specified)

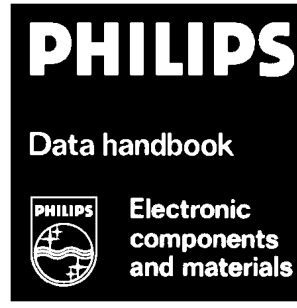
Supply voltage	V_{b_o}	max.	550	V
	V_b	max.	250	V
Anode dissipation	W_a	max.	5	W
Anode current, average	I_a	max.	220	mA
peak	I_{a_p}	max.	550	mA
Anode voltage, negative peak	$-V_{a_p}$	max.	6000	V [1]
negative peak (absolute max.)	$-V_{a_p}$	max.	7500	V [1]
Cathode to heater voltage, peak	V_{kf_p}	max.	6600	V [1]
Heater to earth voltage	$V_{f/earth}$	max.	220	V_{RMS}

Series resistance heater chain

During operation, the external resistance between either heater pin of the PY88 and either mains terminal should be at least 80 Ω when Vf/earth = 220 V_{RMS}
40 Ω when Vf/earth = 110 V_{RMS}
The hot heater resistances of other tubes in the heater chain can serve for this purpose.



[1]) Max. pulse duration 22% of a cycle but maximum 18 μs.



PY88

page	sheet	date
1	1	1970.08
2	2	1970.08
3	FP	1999.08.03

FLYING SPOT SCANNER TUBE

The Q13-110GU is a 13 cm diameter cathode-ray tube intended for flying spot applications.

QUICK REFERENCE DATA		
Accelerator voltage	25	kV
Deflection angle	40°	
Resolution	1000	lines

SCREEN

Metal backed phosphor
Type : GU
Colour : white
Persistance : very short

Useful screen diameter	min.	108	mm

HEATING

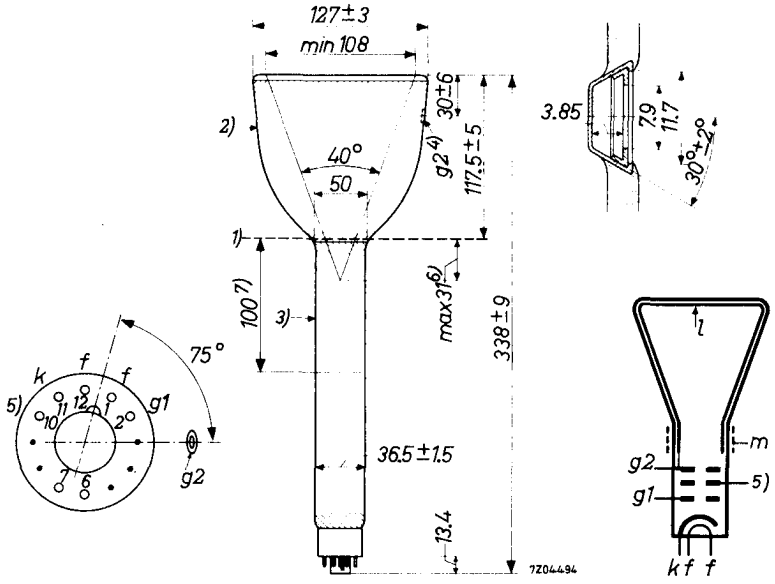
Indirect by A.C. or D.C.; series or parallel supply

Heater voltage	V_f	6,3	V
Heater current	I_f	300	mA

CAPACITANCES

Grid No.1 to all other electrodes	C_{g1}	6,5	pF
Cathode to all other electrodes	C_k	6,5	pF
Accelerator to outer conductive coating	$C_{g2(\ell)/m}$	250 to 450	pF

MECHANICAL DATA Dimensions in mm



Mounting position: any, except with screen downwards and the axis of the tube making an angle of less than 50° with the vertical.

Base Duodecal 7p.

1) Reference line, determined by the plane of the upper edge of the reference line gauge when the gauge is resting on the cone.

2) Insulating outer coating; should not be in close proximity to any metal part.

3) Conductive outer coating; to be grounded.

4) Recessed cavity contact.

5) Spark trap; to be grounded.

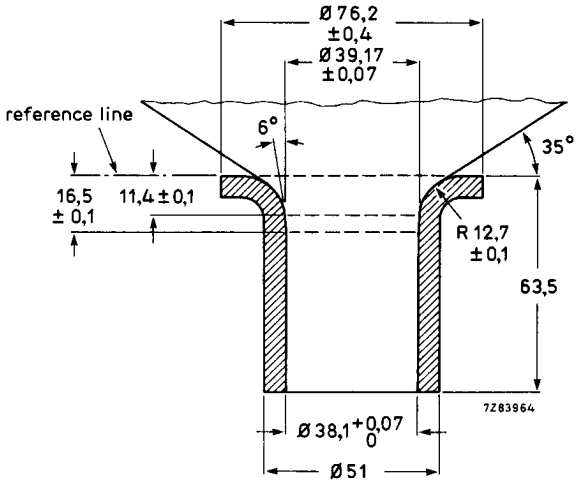
6) The distance between the deflection centre and the reference line should not exceed 31 mm.

7) Distance between the centre of the magnetic length of the focusing unit and the reference line.

FOCUSING magnetic

DEFLECTION magnetic

REFERENCE LINE GAUGE Dimensions in mmm



OPERATING CHARACTERISTICS

Accelerator voltage	$V_{g2(\ell)}$	25	kV
Beam current	I_ℓ	50 to 150	μA
Negative grid No. 1 cut-off voltage	$-V_{g1}(I_\ell = 0)$	50 to 100	V

Resolution at centre of screen better than 1000 lines

LIMITING VALUES (Absolute max. rating system)

Accelerator voltage	$V_{g_2(\ell)}$	max. min.	27 20	kV kV
Grid No.1 voltage,				
negative value	$-V_{g_1}$	max.	200	V
positive value	$+V_{g_1}$	max.	0	V
peak positive value	$+V_{g_{1p}}$	max.	2	V
Cathode current	I_k	max.	150	μA
Voltage between heater and cathode [1]				
cathode negative	V_{kf} (k neg.)	max.	125	V
cathode positive	V_{kf} (k pos.)	max.	200	V
peak value, cathode positive	V_{kf_p} (k pos.)	max.	410	V [2]
External resistance between heater and cathode	R_{kf}	max.	1	MΩ
External grid No.1 resistance	R_{g_1}	max.	1.5	MΩ
External grid No.1 impedance at a frequency of 50 Hz	Z_{g_1} (f = 50 Hz)	max.	0.5	MΩ

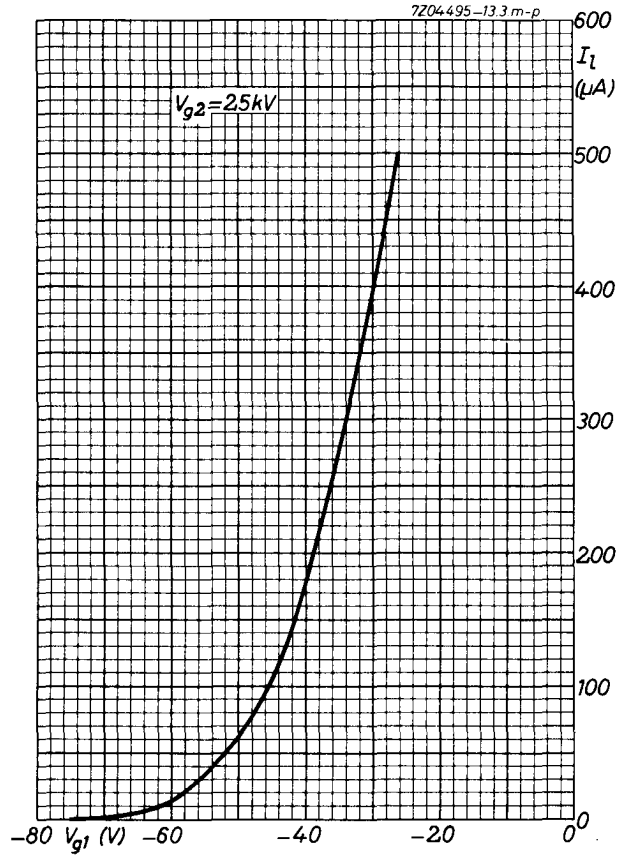
REMARKS

Measures should be taken for the beam current to be switched off immediately when one of the time-base circuits becomes defective.

An X-ray radiation shielding with an equivalent lead thickness of 0.5 mm is required to protect the observer.

1) In order to avoid excessive hum, the A.C. component of the heater to cathode voltage should be as low as possible and should not exceed 20 V_{RMS}.

2) During a heating-up period not exceeding 45 sec.


7Z04495–13.3 m-p
V_{g2}=2.5kV
600
I_l
(μA)
500
400
300
200
100
0
–80 V_{g1} (V) –60
–40
–20
0

BEAM POWER TETRODE for use as A.F. or R.F. amplifier or oscillator
TUBE AMPLIFICATEUR A FAISCEAUX pour utilisation en amplificateur B.F. ou H.F. ou oscillateur
BÜNDELRÖHRE zur Verwendung als NF- oder HF-Verstärker oder Oszillator

Cathode: thoriated tungsten
Cathode: tungstène thorié
Katode : thoriertes Wolfram

Heating : direct
Chauffage: direct
Heizung : direkt

V_f = 10 V
I_f = 5 A

Capacitances
Capacités
Kapazitäten

C_{g1} = 16,3 pF
C_a = 14,0 pF
C_{ag1} < 0,25 pF

Typical characteristics
Caractéristiques types
Kenndaten

μ_{g2g1} = 8,5
$S(I_a = 50\ mA)$ = 3,75 mA/V

λ	Freq.	C telegr.			B teleph			C_{ag2} mod		
m	Mc/s	V_a (V)	W_o (W) CCS	W_o (W) ICAS	V_a (V)	W_o (W) CCS	W_o (W) ICAS	V_a (V)	W_o (W) CCS	W_o (W) ICAS
10	30	2000	275		2000	50		1600	180	
		1500	210		1500	50		1250	140	
		1250	170							
		2250		375	2250		70	2000		300

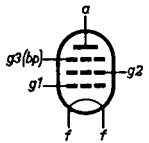
λ	Freq.	C_{g1} mod			AB mod[1])		
m	Mc/s	V_a (V)	W_o (W) CCS	W_o (W) ICAS	V_a (V)	W_o (W) CCS	W_o (W) ICAS
10	30	2000	50		2250	380	
		1500	40		2000	335	
		2250		75	1500	260	
					2500		490

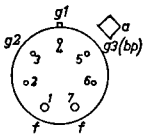
[1]) Without grid current; two tubes
Sans courant de grille; deux tubes
Ohne Gitterstrom; zwei Röhren

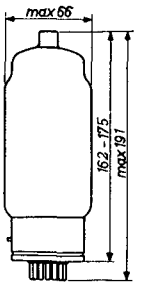
PHILIPS

Dimensions in mm
Dimensions en mm
Abmessungen in mm

Cap; capot; Haube 40619







Base, culot, Sockel: Giant 7-pin

Mounting position: Vertical, base up or down
Horizontal, pins 2 and 6 in 1 vertical plane
Montage: Vertical, culot en haut ou en bas
Horizontal, broche 2 et 6 dans un plan vertical
Einbau: Senkrecht, Sockel oben oder unten
Waagerecht, Stifte 2 und 6 in einer senkrechten Fläche

Net weight		Shipping weight	
Poids net	230 g	Poids brut	600 g
Nettogewicht		Bruttogewicht	

---

[2])from pages 5 and 6; des pages 5 et 6; von Seiten 5 und 6

Obtained preferably from a separate source modulated with the plate supply or from the modulated plate supply through a series resistor of

27 kΩ at V_a = 1250 V
43 kΩ at V_a = 1600 V
41 kΩ at V_a = 2000 V

Obtenu de préférence d'une source séparée modulée avec l'alimentation anodique, ou de l'alimentation anodique modulée à travers une résistance série de

27 kΩ à V_a = 1250 V
43 kΩ à V_a = 1600 V
41 kΩ à V_a = 2000 V

Vorzugsweise erhalten von einer separaten Spannungsquelle, moduliert mit der Anodenspeisung oder von der modulierten Anodenspeisung mittels eines Serienwiderstandes von

27 kΩ bei V_a = 1250 V
43 kΩ bei V_a = 1600 V
41 kΩ bei V_a = 2000 V

H.F. class C telegraphy
H.F. classe C télégraphie
HF-Klasse C Telegraphie

Limiting values, continuous service
C.C.S. Caractéristiques limites, service continu
Grenzdaten, Dauerbetrieb

f ___ ≡ max. 30 Mc/s		f ___ ≡ max. 60 Mc/s	
V_a	= max. 2000 V	V_a	= max. 1500 V
W_{ia}	= max. 360 W	W_{ia}	= max. 270 W
W_a	= max. 100 W		
I_a	= max. 180 mA		
V_{g2}	= max. 400 V	f ___ ≡ max. 120 Mc/s	
W_{g2}	= max. 22 W	V_a	= max. 1000 V
$-V_{g1}$	= max. 300 V	W_{ia}	= max. 180 W
I_{g1}	= max. 25 mA		
R_{g1}	= max. 30 kΩ		

Operating conditions, continuous service
C.C.S. Caractéristiques d'utilisation, service continu
Betriebsdaten, Dauerbetrieb

V_a	=	2000	1500	1250 V
V_{g1}	=	-120	-90	-75 V[1])
V_{g2}	=	400	300	300 V
V_{g3}	=	0	0	0 V
I_a	=	180	180	180 mA
I_{g1}	=	10	12	12 mA
I_{g2}	=	45	30	35 mA
V_{g1p}	=	205	175	160 V
W_{ig1}	=	1,9	1,9	1,7 W
W_{g2}	=	18	9,0	10,5 W
W_{ia}	=	360	270	225 W
W_a	=	85	60	55 W
W_o	=	275	210	170 W
η	=	76,5	78	75,5 %

[1])For A.C. filament supply
Pour chauffage du filament par courant alternatif
Für Wechselstromspeisung des Heizfadens

H.F. class C telegraphy
H.F. classe C télégraphie
HF-Klasse C Telegraphie

I.C.A.S. Limiting values, intermittent service
Caractéristiques limites, service intermittent
Grenzdaten, aussetzender Betrieb

f = max. 30 Mc/s		f = max. 60 Mc/s	
V_a	= max. 2250 V	V_a	= max. 1700 V
W_{ia}	= max. 500 W	W_{ia}	= max. 375 W
W_a	= max. 125 W		
I_a	= max. 225 mA		
V_{g2}	= max. 400 V	**f = max. 120 Mc/s**	
W_{g2}	= max. 22 W	**V_a**	**= max. 1125 V**
$-V_{g1}$	= max. 300 V	**W_{ia}**	**= max. 250 W**
I_{g1}	= max. 30 mA		
R_{g1}	= max. 30 kΩ		

I.C.A.S. Operating conditions, intermittent service
Caractéristiques d'utilisation, service intermittent
Betriebsdaten, aussetzender Betrieb

V_a	=	2250 V
V_{g1}	=	-155 V[1])
V_{g2}	=	400 V
V_{g3}	=	0 V
I_a	=	220 mA
I_{g1}	=	15 mA
I_{g2}	=	40 mA
V_{g1p}	=	275 V
W_{ig1}	=	4 W
W_{g2}	=	16 W
W_{ia}	=	495 W
W_a	=	120 W
W_o	=	375 W
η	=	76 %

[1])For A.C. filament supply
Pour chauffage du filament par courant alternatif
Für Wechselstromspeisung des Heizfadens

H.F. class C anode and screen grid modulation
H.F. classe C modulation d'anode et de grille-écran
HF-Klasse C Anoden- und Schirmgittermodulation

Limiting values, continuous service
C.C.S. Caractéristiques limites, service continu
Grenzdaten, Dauerbetrieb

f = max. 30 Mc/s		f = max. 60 Mc/s	
V_a	= max. 1600 V	V_a	= max. 1200 V
W_{ia}	= max. 240 W	W_{ia}	= max. 180 W
W_a	= max. 67 W		
I_a	= max. 150 mA		
V_{g2}	= max. 400 V	f	= max. 120 Mc/s
W_{g2}	= max. 15 W	V_a	= max. 800 V
$-V_{g1}$	= max. 300 V	W_{ia}	= max. 120 W
I_{g1}	= max. 25 mA		
R_{g1}	= max. 30 kΩ		

Operating characteristics, continuous service
C.C.S. Caractéristiques d'utilisation, service continu
Betriebsdaten, Dauerbetrieb

V_a	=	1600	1250 V
V_{g1}	=	-160	-160 V[1])
V_{g2}	=	300	300 V[2])
V_{g3}	=	0	0 V
I_a	=	150	150 mA
I_{g1}	=	12	13 mA
I_{g2}	=	30	35 mA
V_{g1_p}	=	250	250 V
W_{ig1}	=	2,7	2,9 W
W_{g2}	=	9	10,5 W
W_{ia}	=	240	187,5 W
W_a	=	60	47,5 W
W_o	=	180	140 W
η	=	75	74,5 %
m	=	100	100 %
W_{mod}	=	120	94 W

[1]) See page 4; voir page 4; siehe Seite 4
[2]) See page 2; voir page 2; siehe Seite 2

PHILIPS

H.F. class C anode and screen grid modulation
H.F. classe C modulation d'anode et de grille-écran
HF-Klasse C Anoden- und Schirmgittermodulation

Limiting values, intermittent service
I.C.A.S. Caractéristiques limites, service intermittent
Grenzdaten, aussetzender Betrieb

f = max. 30 Mc/s

V_a	= max.	2000 V
W_{ia}	= max.	400 W
W_a	= max.	100 W
I_a	= max.	200 mA
V_{g2}	= max.	400 V
W_{g2}	= max.	20 W
$-V_{g1}$	= max.	300 V
I_{g1}	= max.	30 mA
R_{g1}	= max.	30 kΩ

f = max. 60 Mc/s

V_a	= max.	1500 V
W_{ia}	= max.	300 W

f = max. 120 Mc/s

V_a	= max.	1000 V
W_{ia}	= max.	200 W

Operating characteristics, intermittent service
I.C.A.S. Caractéristiques d'utilisation, service intermittent
Betriebsdaten, aussetzender Betrieb

V_a	=	2000 V
V_{g1}	=	-175 V[1])
V_{g2}	=	350 V[2])
V_{g3}	=	0 V
I_a	=	200 mA
I_{g1}	=	16 mA
I_{g2}	=	40 mA
V_{g1_p}	=	300 V
W_{ig1}	=	4,3 W
W_{g2}	=	14 W
W_{ia}	=	400 W
W_a	=	100 W
W_o	=	300 W
η	=	75 %
m	=	100 %
W_{mod}	=	200 W

[1]) For A.C. filament supply
Pour chauffage du filament par courant alternatif
Für Wechselstromspeisung des Heizfadens

[2]) See page 2; voir page 2; siehe Seite 2

L.F.class B amplifier and modulator
Amplificatrice et modulatrice B.F.classe B
NF- Verstärker und Modulator Klasse B

Limiting values
Caractéristiques limites
Grenzdaten

V_a	= max.2250 V
I_a	= max. 180 mA
W_{ia}	= max. 360 W
W_a	= max. 100 W
V_{g2}	= max.1100 V
W_{g2}	= max. 22 W

Operating characteristics, two valves
Caractéristiques d'utilisation, deux tubes
Betriebsdaten, zwei Röhren

V_a	=	2250		2000		V
V_{g1}	=	-90		-90		V [1]
V_{g2}	=	750		750		V
V_{g3}	=	0		0		V
$R_{aa'}$	=	18,5		16		kΩ
V_{g1g1p}	=	0	230	0	230	V
I_a	=	2x22,5	2x15,7	2x20	2x22,5	mA
I_{g2}	=	2x0,75	2x29	2x0,75	2x29	mA
W_{ig1}	=		0,1		0,1	W [2]
W_{g2}	=	2x0,56	2x22	2x0,56	2x22	W
W_{ia}	=	2x51	2x355	2x40	2x315	W
W_a	=	2x51	2x97,5	2x40	2x87,5	W
W_o	=		515		455	W
η	=		72,5		72	%

[1]) For A.C. filament
Pour chauffage du filament par courant alternatif
Für Wechselstromspeisung des Heizfadens

[2]) Driver stage should be capable of supplying the specified driving power at low distortion. The effective resistance per g_1 circuit should be held at a low value.
L'étage de commande sera capable de fournir la puissance de commande spécifiée à une distorsion basse. La résistance efficace des circuits de grille sera maintenue à une valeur basse.
Die Steuerstufe soll im Stande sein die erforderliche Steuerleistung bei kleiner Verzerrung zu liefern. Der effektive Widerstand in den Gitterleitungen soll einen niedrigen Wert haben.

H.F. class C grid modulation
H.F. classe C modulation de grille
HF-Klasse C Gittermodulation

C.C.S. Limiting values, continuous service
Caractéristiques limites, service continu
Grenzdaten, Dauerbetrieb

f = max.	60 Mc/s	f = max.	30 Mc/s
V_a = max.	1760 V	V_a = max.	2000 V
W_{ia} = max.	132 W	W_{ia} = max.	150 W
		W_a = max.	100 W
f = max.	120 Mc/s	I_a = max.	100 mA
V_a = max.	1520 V	V_{g2} = max.	400 V
W_{ia} = max.	114 W	W_{g2} = max.	15 W
		$-V_{g1}$ = max.	200 V
		R_{g1} = max.	30 kΩ

C.C.S. Operating characteristics, continuous service
Caractéristiques d'utilisation, service continu
Betriebsdaten, Dauerbetrieb

V_a	=	2000	1500 V
V_{g1}	=	-120	-140 V [3]
V_{g2}	=	400	400 V
V_{g3}	=	0	0 V
I_a	=	75	70 mA
I_{g1}	=		[4]
I_{g2}	=	3	3 mA
V_{g1p} (H.F.)	=	120	145 V
V_{g1p} (A.F.,B.F.,N.F.)	=	60	60 V
W_{ig1}	=		[5]
W_{g2}	=	1,2	1,2 W
W_{ia}	=	150	105 W
W_a	=	100	65 W
W_o	=	50	40 W
η	=	33	38 %

[3] Fixed supply or cathode resistor bias, unbypassed for A.F., is recommended
Il est recommandé d'utiliser polarisation fixe ou polarisation par une résistance cathodique, ne pas shuntée pour B.F.
Feste Vorspannung oder Vorspannung mittels eines für NF nicht überbrückten Katodenwiderstandes wird empfohlen

[4] Usually negligible
Ordinairement à négliger
Gewöhnlich zu vernachlässigen

[5] See page 8; voir page 8; siehe Seite 8

PHILIPS

H.F. class C grid modulation
H.F. classe C modulation de grille
HF-Klasse C Gittermodulation

Limiting values, intermittent service
I.C.A.S. Caractéristiques limites, service intermittent
Grenzdaten, aussetzender Betrieb

f = max.	60 Mc/s	f = max.	30 Mc/s
V_a = max.	1980 V	V_a = max.	2250 V
W_{ia} = max.	176 W	W_{ia} = max.	200 W
		W_a = max.	125 W
f = max.	120 Mc/s	I_a = max.	125 mA
V_a = max.	1710 V	V_{g2} = max.	400 V
W_{ia} = max.	152 W	W_{g2} = max.	20 W
		$-V_{g1}$ = max.	200 V
		R_{g1} = max.	30 kΩ

Operating characteristics, intermittent service
I.C.A.S. Caractéristiques d'utilisation, service intermittent
Betriebsdaten, aussetzender Betrieb

V_a	=	2250 V
V_{g1}	=	-110 V [3]
V_{g2}	=	400 V
V_{g3}	=	0 V
I_a	=	85 mA
I_{g1}	=	[4]
I_{g2}	=	2,5 mA
V_{g1p} (H.F.)	=	135 V
V_{g1p} (A.F.,B.F.,N.F.)	=	55 V
W_{ig1}	=	[5]
W_{g2}	=	1,0 W
W_{ia}	=	191 W
W_a	=	116 W
W_o	=	75 W
η	=	39 %

[3][4] See page 7; voir page 7; siehe Seite 7

[5] H.F. driving power is never more than 2 W
A.F. driving power is usually not more than 1 W
La puissance de commande H.F. n'est jamais plus de 2 W
Généralement la puissance de commande B.F. n'est plus de 1 W
Die H.F. Steuerleistung ist nie mehr als 2 W
Die NF-Steuerleistung ist gewöhnlich nicht mehr als 1 W

H.F. class B telephony
H.F. classe B téléphonie
HF-Klasse B Telephonie

Limiting values, continuous service
C.C.S. Caractéristiques limites, service continu
Grenzdaten, Dauerbetrieb

f = max. 30 Mc/s		f = max. 60 Mc/s	
V_a	= max. 2000 V	V_a	= max. 1760 V
W_{ia}	= max. 150 W	W_{ia}	= max. 132 W
W_a	= max. 100 W		
I_a	= max. 100 mA	f = max. 120 Mc/s	
V_{g2}	= max. 400 V	V_a	= max. 1520 V
W_{g2}	= max. 15 W	W_{ia}	= max. 114 W

Operating characteristics, continuous service
C.C.S. Caractéristiques d'utilisation, service continu
Betriebsdaten, Dauerbetrieb

V_a	=	2000	1500 V
V_{g1}	=	-75	-60 V[1])
V_{g2}	=	400	400 V
V_{g3}	=	0	0 V
I_a	=	75	100 mA
I_{g2}	=	3	4 mA
V_{g1p}	=	80	70 V
W_{g2}	=	1,2	1,6 W
W_{ia}	=	150	150 W
W_a	=	100	100 W
W_o	=	50	50 W
η	=	33	33 %
m	=	100	100 %
W_{ig1}	=	≤2	≤2 W

[1])For A.C. filament supply
Pour chauffage du filament par courant alternatif
Für Wechselstromspeisung des Heizfadens

H.F. class B telephony
H.F. classe B téléphonie
HF-Klasse B Telephonie

Limiting values, intermittent service
I.C.A.S. Caractéristiques limites, service intermittent
Grenzdaten, aussetzender Betrieb

f = max. 30 Mc/s		f = max. 60 Mc/s	
V_a	= max. 2250 V	V_a	= max. 1980 V
W_{ia}	= max. 200 W	W_{ia}	= max. 176 W
W_a	= max. 125 W		
I_a	= max. 125 mA	f = max. 120 Mc/s	
V_{g2}	= max. 400 V	V_a	= max. 1710 V
W_{g2}	= max. 20 W	W_{ia}	= max. 152 W

Operating characteristics, intermittent service
I.C.A.S. Caractéristiques d'utilisation, service intermittent
Betriebsdaten, aussetzender Betrieb

V_a	=	2250 V
V_{g1}	=	-60 V[1])
V_{g2}	=	400 V
V_{g3}	=	0 V
I_a	=	85 mA
I_{g2}	=	3 mA
V_{g1p}	=	70 V
W_{g2}	=	1,2 W
W_{ia}	=	191 W
W_a	=	121 W
W_o	=	70 W
η	=	36,5 %
m	=	100 %
W_{ig1}	≤	2 W

[1])For A.C. filament supply
Pour chauffage du filament par courant alternatif
Für Wechselstromspeisung des Heizfadens

A.F. class AB amplifier and modulator
Amplificatrice et modulatrice B.F. classe AB
NF-Verstärker und Modulator Klasse AB

Limiting values, continuous service
C.C.S. Caractéristiques limites, service continu
Grenzdaten, Dauerbetrieb

V_a	= max. 2250 V	W_a	= max. 100 W
I_a	= max. 180 mA	V_{g2}	= max. 1100 V
W_{ia}	= max. 360 W	W_{g2}	= max. 22 W
		R_{g1}	= max. 30 kΩ [6])

Operating characteristics, continuous service; two tubes
C.C.S. Caractéristiques d'utilisation, service continu; deux tubes
Betriebsdaten, Dauerbetrieb; zwei Röhren

V_a	=	2250		2000	V
V_{g1}	=	-95		-90	V [1])
V_{g2}	=	750		750	V
V_{g3}	=	0		0	V
R_{aa}	=	20		16	kΩ
V_{g1g1p}	=	0	170	0	160 V
I_a	=	2x25	2x127,5	2x25	2x132,5 mA
I_{g2}	=	2x1,0	2x26,5	2x1,0	2x21,5 mA
W_{ig1}	=	0	0	0	0 W
W_{g2}	=	2x0,75	2x19,9	2x0,75	2x16,1 W
W_{ia}	=	2x56	2x287	2x50	2x265 W
W_a	=	2x56	2x97	2x50	2x97,5 W
W_o	=	0	380	0	335 W
η	=	-	66	-	63 %

V_a	=	1500		V
V_{g1}	=	-85		V [1])
V_{g2}	=	750		V
V_{g3}	=	0		V
R_{aa}	=	9,3		kΩ
V_{g1g1p}	=	0	160	V
I_a	=	2x25	2x152,5	mA
I_{g2}	=	2x1,0	2x22,5	mA
W_{ig1}	=	0	0	W
W_{g2}	=	2x0,75	2x16,9	W
W_{ia}	=	2x37,5	2x229	W
W_a	=	2x37,5	2x99	W
W_o	=	0	260	W
η	=	-	57	%

[1])[6])See page 12; voir page 12; siehe Seite 12

PHILIPS

A.F. class AB amplifier and modulator
Amplificatrice et modulatrice B.F. classe AB
NF-Verstärker und Modulator Klasse AB

Limiting values, intermittent service
I.C.A.S. Caractéristiques limites, service intermittent
Grenzdaten, aussetzender Betrieb

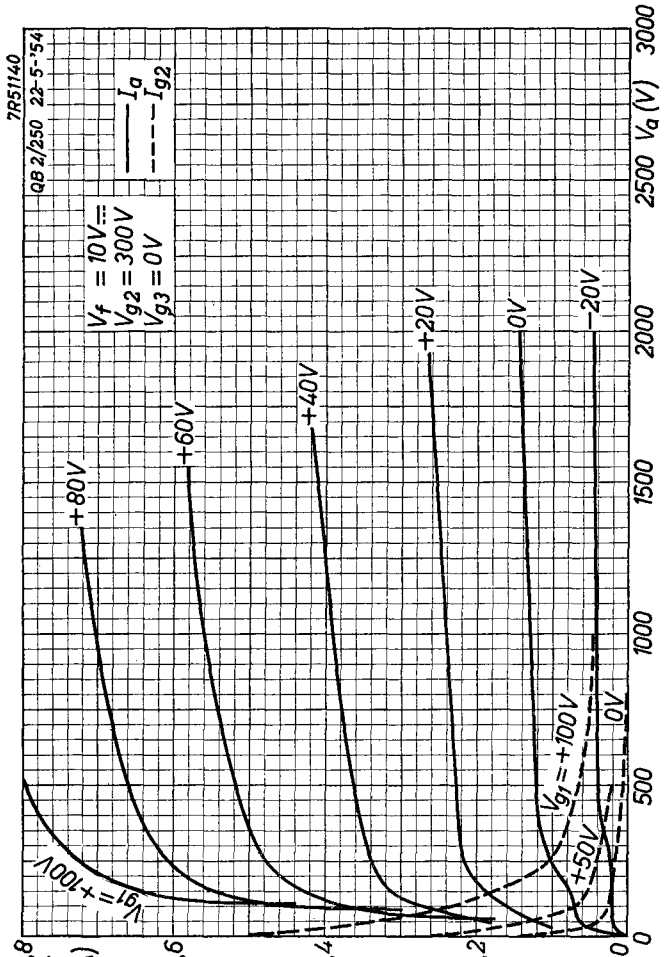
V_a	= max.	2500	V
I_a	= max.	225	mA
W_{ia}	= max.	450	W
W_a	= max.	125	W
V_{g2}	= max.	1100	V
W_{g2}	= max.	22	W
R_{g1}	= max.	30	kΩ [6]

Operating characteristics, intermittent service; two tubes
I.C.A.S. Caractéristiques d'utilisation, service intermittent deux tubes
Betriebsdaten, aussetzender Betrieb; zwei Röhren

V_a	=	2500	V
V_{g1}	=	-95	V [1]
V_{g2}	=	750	V
V_{g3}	=	0	V
R_{aa}	=	19	kΩ
V_{g1g1p}	-	0 | 180	V
I_a	=	2x25 | 2x145	mA
I_{g2}	=	2x1,0 | 2x27	mA
W_{ig1}	=	0 | 0	W
W_{g2}	=	2x0,75 | 2x20,3	W
W_{ia}	=	2x62,5 | 2x362,5	W
W_a	=	2x62,5 | 2x117,5	W
W_o	=	0 | 490	W
η	=	| 67,5	%

[1] For A.C. filament supply
Pour chauffage du filament par courant alternatif
Für Wechselstromspeisung des Heizfadens

[6] With fixed grid bias. Cathode bias is not recommended
Avec polarisation de grille fixe. Polarisation de cathode n'est pas recommandée
Mit fester Gittervorspannung. Vorspannung mittels eines Katodenwiderstandes wird nicht empfohlen

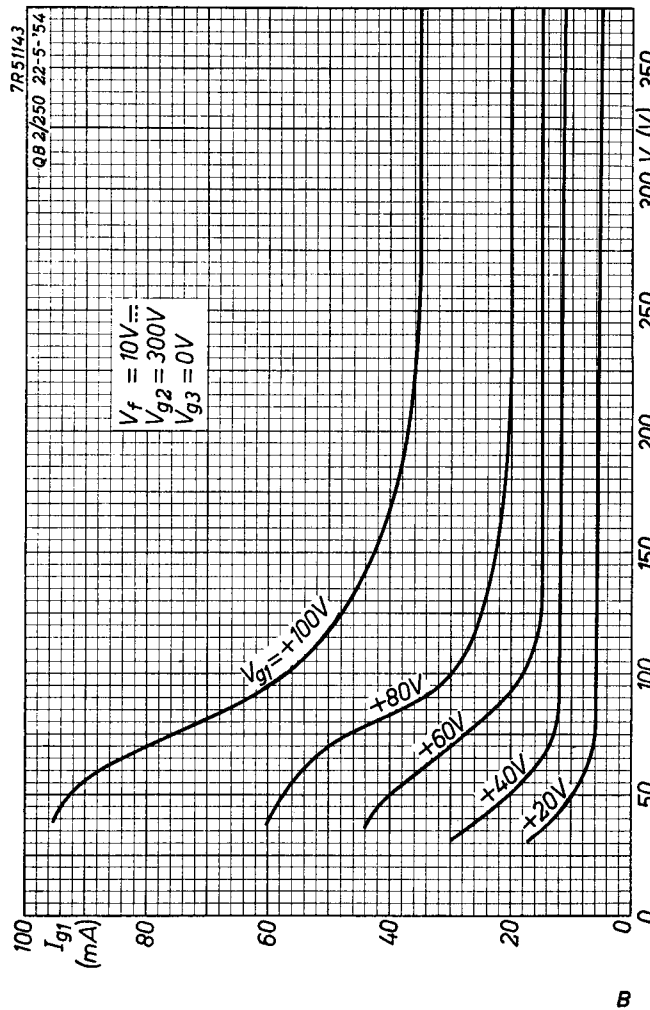

7R51140
QB 2/250 22-5-'54
V_f = 10 V~
V_{g2} = 300 V
V_{g3} = 0 V
I_a
I_{g2}
+80 V
+60 V
+40 V
+20 V
0 V
−20 V
V_{g1} = +100 V
V_{g1} = +100 V
+50 V
0 V
I (A)
0,8
0,6
0,4
0,2
0
0
500
1000
1500
2000
2500
3000
V_a (V)

6.6.1954

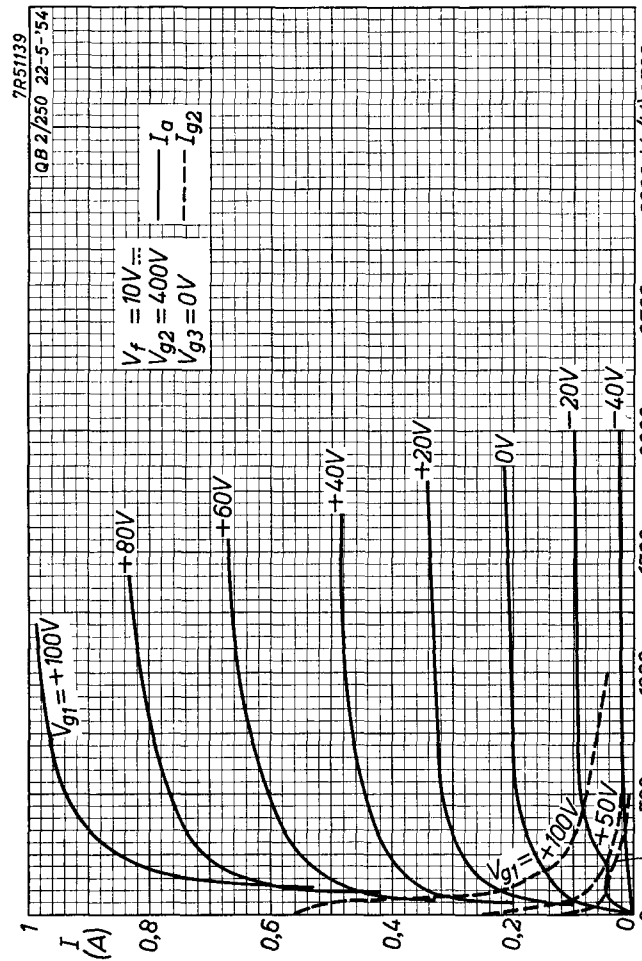
A

QB 2/250

PHILIPS

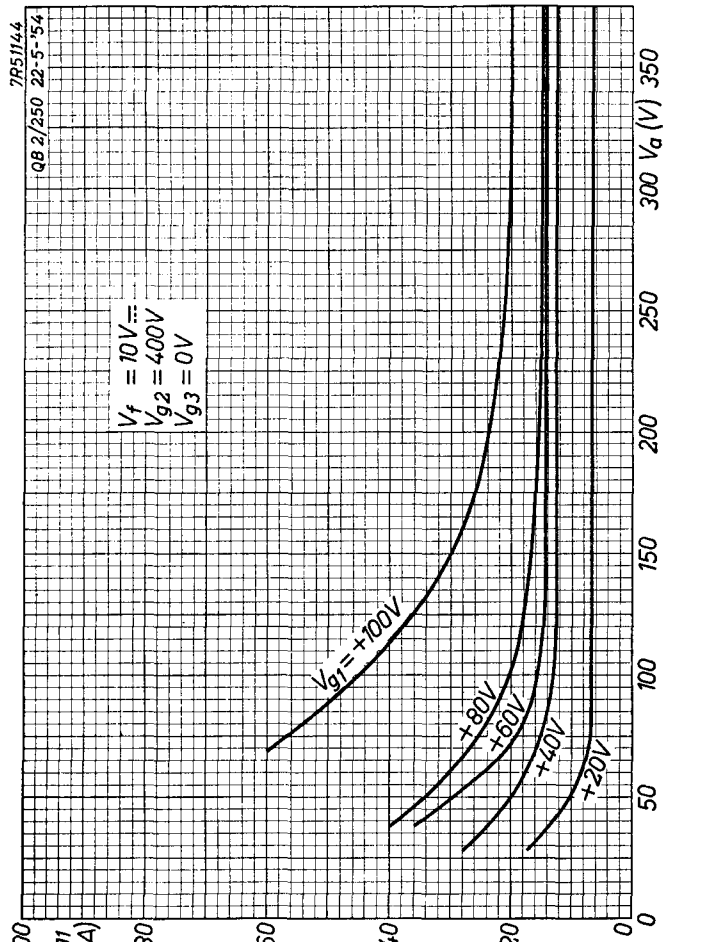


B

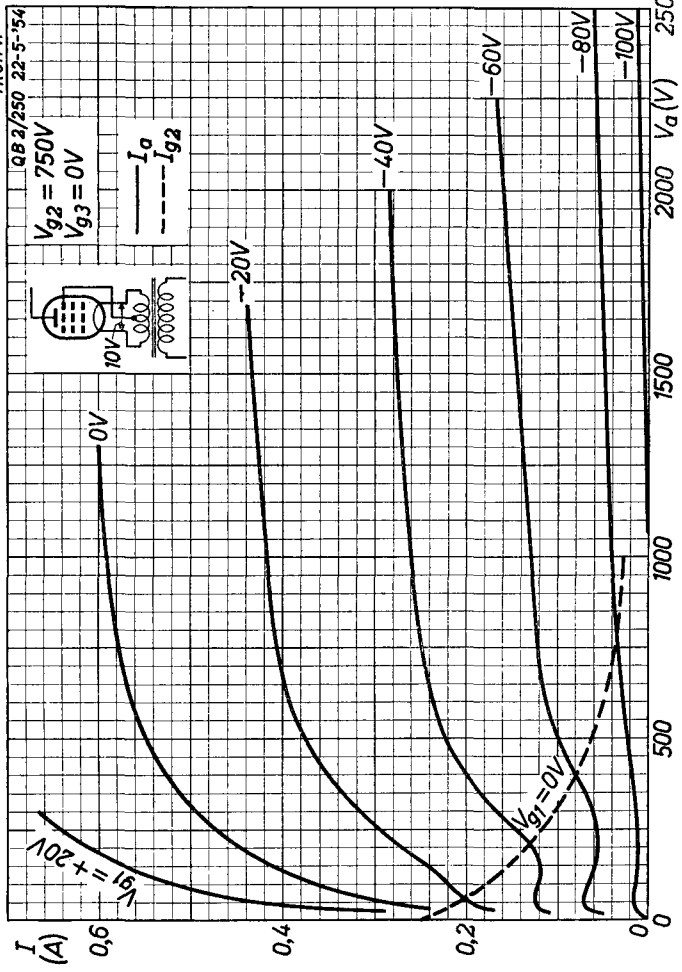

7R51139
QB 2/250 22-5-'54
V_f = 10V~
V_{g2} = 400V
V_{g3} = 0V
——— I_a
– – – I_{g2}
V_{g1} = +100V
+80V
+60V
+40V
+20V
0V
−20V
−40V
V_{g1} = +100V
+50V
0V
I (A)
1
0,8
0,6
0,4
0,2
0
0
500
1000
1500
2000
2500
3000
3500
V_a (V)

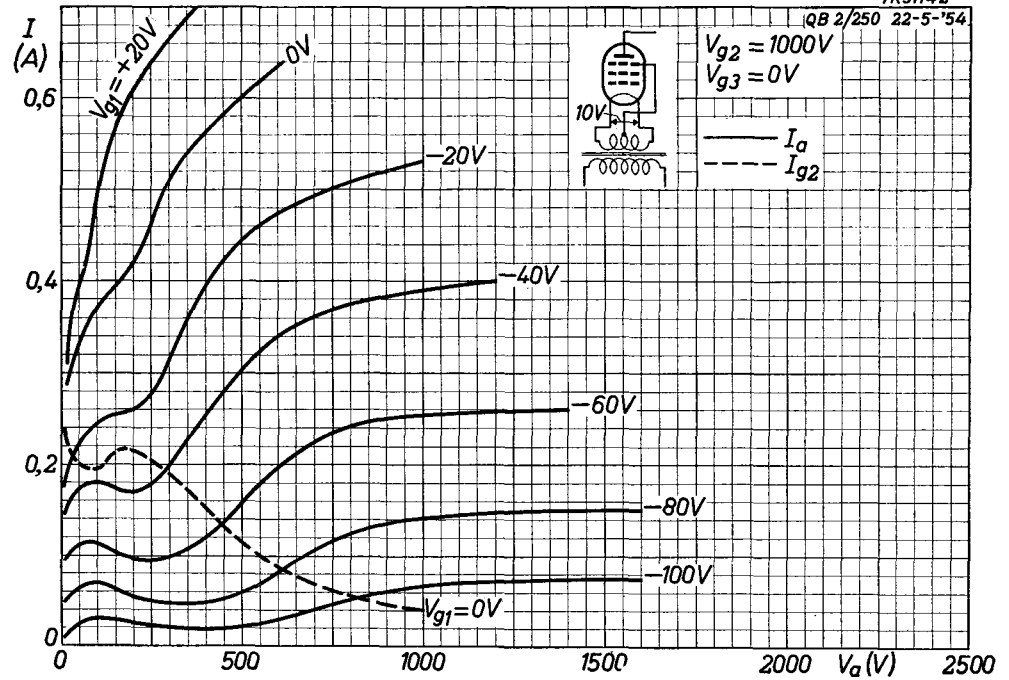
QB 2/250

PHILIPS



D


7R51141
QB 2/250 22-5-'54
$V_{g2} = 750V$
$V_{g3} = 0V$
I_a
I_{g2}
10V
0V
−20V
−40V
−60V
−80V
−100V
$V_{g1} = +20V$
$V_{g1} = 0V$
I (A)
0,6
0,4
0,2
0
0
500
1000
1500
2000
2500
V_a (V)


I
(A)
0,6
0,4
0,2
0
0
500
1000
1500
2000
2500
V_a (V)
V_{g1} = +20V
0V
−20V
−40V
−60V
−80V
−100V
V_{g1} = 0V
V_{g2} = 1000V
V_{g3} = 0V
I_a
I_{g2}
10V

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F

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Electronic Tube HANDBOOK

QB2/250

page	sheet	date
1	1	1956.10.10
2	2	1956.10.10
3	3	1956.10.10
4	4	1956.10.10
5	5	1956.10.10
6	6	1956.10.10
7	7	1949.07.07
8	7	1956.10.10
9	8	1956.10.10
10	9	1956.10.10
11	10	1956.10.10
12	11	1956.10.10
13	12	1956.10.10
14	A	1954.06.06
15	B	1954.06.06
16	C	1954.06.06
17	D	1954.06.06
18	E	1954.06.06
19	F	1954.06.06

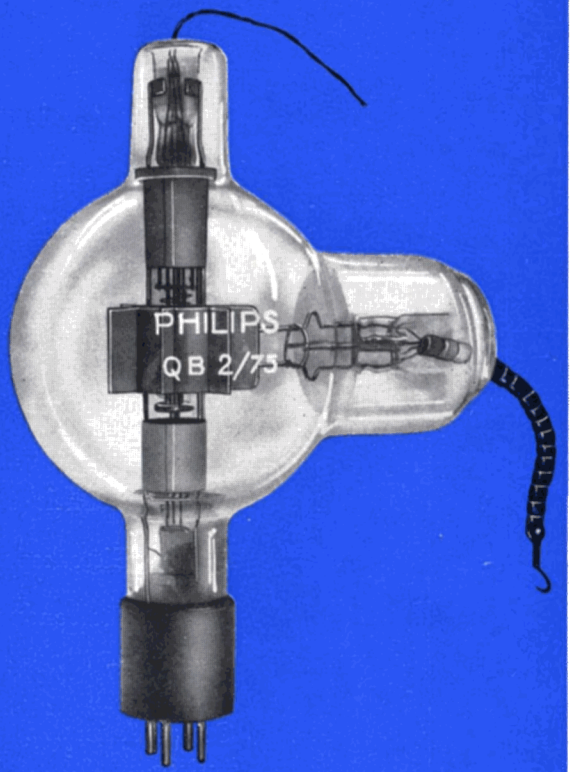
PHILIPS

SENDERÖHRE QB 2/75

Die Philips Schirmgitterröhre QB 2/75 ist für die H.F.-Verstärkung, namentlich auf kurzen Wellen, entworfen worden. Sie enthält zwischen Anode und Steuergitter ein Schirmgitter, durch das die Anoden-Gitterkapazität bis auf etwa 0,02 $\mu\mu$F verringert wird. Damit die äussere Abschirmung den Rand des Schirmgitters umschliesst, setzt sich dieses bis zur oberen Röhrenwand fort.

In Sendern mit veränderlicher Wellenlänge muss es als ein bedeutender Vorteil bezeichnet werden, dass die Verwendung dieser Röhre jede Neutralisierung überflüssig macht, weil dadurch die Konstruktion und die Bedienung des Senders in hohem Masse vereinfacht werden.

Ausserdem ist zur vollen Aussteuerung dieser Röhre eine geringere Steuerleistung erforderlich als bei einer Triode unter sonst gleichen Umständen.



Die Nutzleistung für Telegraphie auf grösseren Wellenlängen beträgt 100 W. Die Eingangsleistung darf 200 W niemals überschreiten.

Die QB 2/75 eignet sich zur Steuerung der Philips Senderöhre QB 3/500 oder der TA 4/1500; in der vorhergehenden Stufe lässt sich die Philips Senderöhre TC 04/10 oder QC 05/15 verwenden.

Der Schirmgitterverlust ($W_{g'}$) dieser Röhre darf 25 W keinesfalls überschreiten und wird auf Grund untenstehender Formel berechnet:

$$W_{g'} = 0{,}4\ (I_{g'} + I_a)\ V_{g'}$$

worin $I_{g'}$ = Schirmgittergleichstrom,
I_a = Anodengleichstrom,
$V_{g'}$ = Schirmgittergleichspannung.

Die folgende Formel ermöglicht die Berechnung des Anodenverlustes (W_a), der bis 75 W betragen darf:

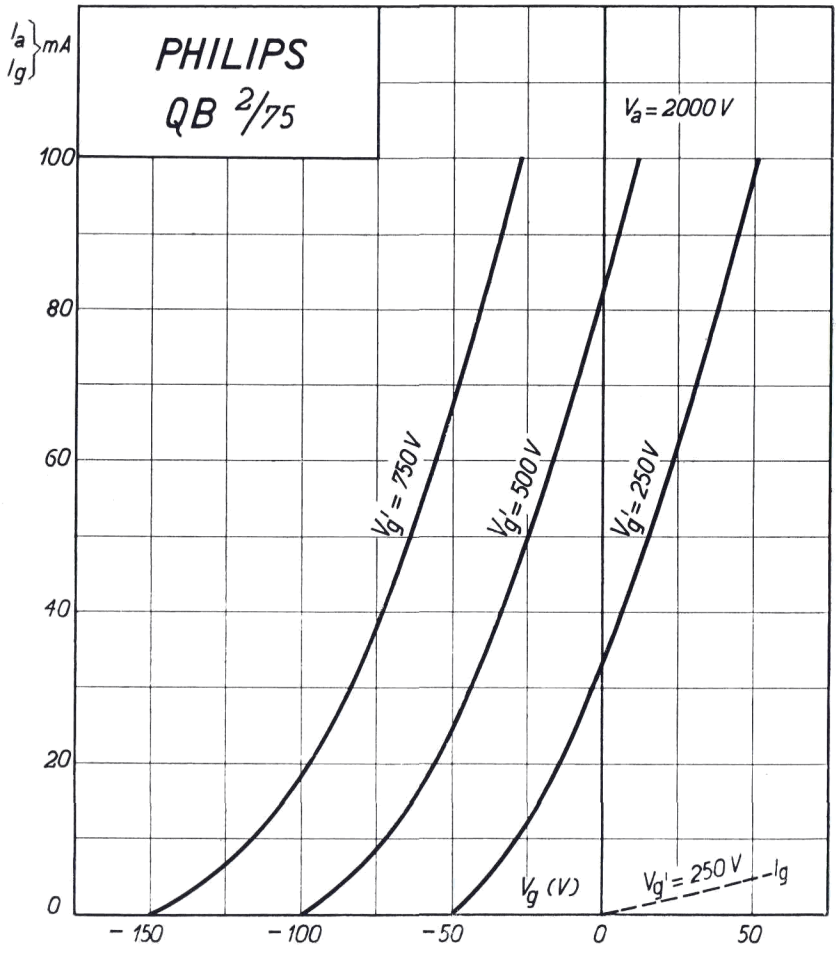
$$W_a = (V_a \cdot I_a + V_{g'} \cdot I_{g'}) - (W_{g'} + W)$$

worin V_a = Anodenspannung,
W = Nutzleistung und
$V_a \cdot I_a + V_{g'} \cdot I_{g'}$ = Eingangsleistung.

PHILIPS

SENDERÖHRE

QB 2/75



Heizspannung	V_f	= 10,0 V
Heizstrom	I_f	= ca. 3,25 A
Sättigungsstrom	I_s	= ca. 2 A
Anodenspannung	V_a	= 1500-2000 V
Schirmgitterspannung	$V_{g'}$	= 300—500 V
Zulässiger Anodenverlust	W_a	= 75 W*)
Zulässiger Schirmgitterverlust	$W_{g'}$	= 25 W*)
Geprüfter Anodenverlust	W_{at}	= 150 W
Verstärkungsfaktor des Schirmgitters	g'	= ca. 6,3
Durchgriff des Schirmgitters	D'	= ca. 15 %
Steilheit bei V_a = 2000 V, $V_{g'}$ = 500 V, I_a = 100 mA	S_{norm}	= ca. 1,5 mA/V
Grösste Steilheit	S_{max}	= ca. 3 mA/V
Anoden-Gitterkapazität	C_{ag}	= ca. 0,02 $\mu\mu$F
Grösster Kolbendurchmesser	d	= 100 mm
Grösster Gesamtdurchmesser	d'	= ca. 150 mm
Gesamtlänge	l	= ca. 215 mm

*) Unter der Bedingung, dass die Berechnung nach umstehenden Vorschriften erfolgt.

PHILIPS

QB3/200

TETRODE for use as R.F. or A.F. amplifier
TÉTRODE pour utilisation comme amplificatrice H.F. ou B.F.
TETRODE zur Verwendung als HF- oder NF-Verstärker

Cooling : radiation/low velocity air flow
Refroidissement: radiation/léger courant d'air
Kühlung : Strahlung/schwacher Luftstrom

Filament : thoriated tungsten
Filament : tungstène thorié
Heizfaden: thoriertes Wolfram

Heating : direct
Chauffage: direct
Heizung : direkt

V_f = 6 V
I_f = 3,5 A

Capacitances
Capacités
Kapazitäten

C_a = 2,1 pF
C_{g1} = 8 pF
C_{ag1} = 0,08 pF

Typical characteristics
Caractéristiques types
Kenndaten

V_a = 500 V
V_{g2} = 250 V
I_a = 125 mA
S = 4 mA/V
$\mu_{g_2g_1}$ = 5

Freq.	C.telegr.		Cag2 mod.		SSB	
(Mc/s)	V_a (V)	W_o (W)	V_a (V)	W_o (W)	V_a (V)	W_ℓ [1] (W)
50	3000	280	2500	230		
50	1500	165	1500	140		
50	600	45	600	45		
220	1500	110	1500	75		
30					2500	87
30					2000	77
30					1500	58

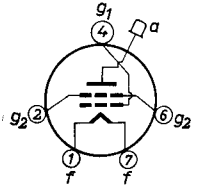
[1]) Useful power in the load
Puissance utile dans la charge
Nutzbare Leistung in der Belastung

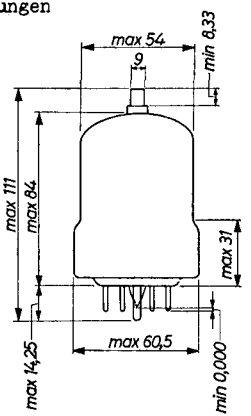
PHILIPS

Temperatures
Températures
Temperaturen

Temperature of bulb and seals
Température de l'ampoule et des scellements = max. 225°C
Temperatur des Kolbens und der Durchführungen

Dimensions in mm
Dimensions en mm
Abmessungen in mm





Base, culot, Sockel: SEPTAR

Socket
Support 40202
Fassung

Anode connector
Connecteur de l'anode 40624
Anodenanschluss

Mounting position: vertical with base up or down
Montage: vertical, avec le culot en haut ou en bas
Einbau: senkrecht mit dem Sockel oben oder unten

Net weight
Poids net 85 g
Nettogewicht

H.F. class C telegraphy
H.F. classe C télégraphie
HF-Klasse C Telegraphie

Limiting values
Caractéristiques limites
Grenzdaten

f = max. 150 Mc/s		f = max. 250 Mc/s	
V_a	= max. 3000 V	V_a	= max. 1500 V
I_a	= max. 150 mA		
W_{ia}	= max. 450 W		
W_a	= max. 65 W		
V_{g2}	= max. 400 V		
W_{g2}	= max. 10 W		
$-V_{g1}$	= max. 500 V		
I_{g1}	= max. 30 mA		
W_{g1}	= max. 5 W		

Operating conditions
Caractéristiques d'utilisation
Betriebsdaten

f	=	50	50	50	220	Mc/s
V_a	=	3000	1500	600	1500	V
V_{g2}	=	250	250	250	250	V
V_{g1}	=	-100	-85	-75	-85	V
I_a	=	115	150	150	117	mA
I_{g2}	=	8	24	40	24	mA
I_{g1}	=	5	12	15	12	mA
V_{g1_p}	=	180	185	170	190	V
W_{ig1}	=	0,8	2,0	2,3	8	W
W_{g2}	=	2,0	6	10	6	W
W_{ia}	=	345	225	90	175	W
W_a	=	65	60	45	65	W
W_o	=	280	165	45	110	W
η	=	81	73	50	63	%

PHILIPS

H.F. class C anode and screen grid modulation
H.F. classe C modulation d'anode et de grille-écran
HF-Klasse C Anoden- und Schirmgittermodulation

Limiting values
Caractéristiques limites
Grenzdaten

f = max. 150 Mc/s		f = max. 250 Mc/s	
V_a	= max. 2500 V	V_a	= max. 1500 V
I_a	= max. 120 mA		
W_{ia}	= max. 300 W		
W_a	= max. 45 W		
V_{g2}	= max. 400 V		
W_{g2}	= max. 10 W		
$-V_{g1}$	= max. 500 V		
I_{g1}	= max. 25 mA		

Operating conditions
Caractéristiques d'utilisation
Betriebsdaten

f	= 50	50	50	220	Mc/s
V_a	= 2500	1500	600	1500	V
V_{g_2}	= 250	250	250	250	V
V_{g_1}	= -135	-125	-120	-85	V
I_a	= 110	120	120	80	mA
I_{g2}	= 10	15	30	27	mA
I_{g_1}	= 6	8	12	12	mA
$V_{g_{1p}}$	= 215	220	215	185	V
Wi_{g_1}	= 1,2	1,6	2,3	8	W
W_{g_2}	= 2,5	3,8	7,5	6,25	W
Wi_a	= 275	180	72	120	W
W_a	= 45	40	27	45	W
W_o	= 230	140	45	75	W
η	= 84	78	62	63	%
m	= 100	100	100	100	%
$V_{g_{2p}}$	= 250	250	250	250	V
W_{mod}	= 137	90	36	60	W

H.F. class B amplifier, single side band
Amplificatrice H.F. classe B à une bande latérale
HF-Klasse B Einseitenbandverstärker

Limiting values
Caractéristiques limites
Grenzdaten

V_a	= max. 3000 V	V_{g_2}	= max. 600 V
I_a	= max. 150 mA	W_{g_2}	= max. 10 W
W_{i_a}	= max. 450 W	R_{g_1}	= max. 250 kΩ
W_a	= max. 65 W		

Operating conditions
Caractéristiques d'utilisation
Betriebsdaten

f	=	30		30		30	Mc/s
V_a	=	2500		2000		1500	V
V_{g_2}	=	405		450		480	V
V_{g_1} [1])	=	-88		-100		-86	V
$V_{g_{1p}}$	=	0	165	0	190	0	150 V
I_a	=	7	70	22	80	30	90 mA
I_{g_2}	=	-	2	-	2	-	3 mA
I_{g_1}	=	-	8	-	20	-	15 mA
W_{g_2}	=	-	22,5	-	26	-	13,5 W
$W_{i_{g_1}}$	=	-	1,3	-	3,8	-	2,3 W
W_{i_a}	=	42,5	175	44	160	45	135 W
W_a	=	42,5	60	44	60	45	60 W
W_ℓ [2])	=	0	87	0	77	0	58 W

[1]) To be adjusted for the stated zero signal anode current
V_{g_1} doit être réglé pour la valeur donnée pour le courant anodique sans signal d'entrée
V_{g_1} soll so eingestellt werden dass der Anodenstrom ohne Eingangssignal den angegebenen Wert hat

[2]) Useful power in the load measured in a circuit having an efficiency of about 75 %
Puissance utile dans la charge, mesurée dans un montage avec un rendement d'environ 75%
Nutzleistung in der Belastung, gemessen in einer Schaltung mit einem Wirkungsgrad von etwa 75%

L.F. class B amplifier and modulator
Amplificatrice et modulatrice B.F. classe B
NF-Klasse B Verstärker und Modulator

Limiting values
Caractéristiques limites
Grenzdaten

V_a	= max.	3000 V
I_a	= max.	150 mA
W_a	= max.	65 W
V_{g_2}	= max.	600 V
W_{g_2}	= max.	20 W
$-V_{g_1}$	= max.	500 V
I_{g_1}	= max.	20 mA
R_{g_1}	= max.	250 kΩ

Operating conditions, two tubes
Caractéristiques d'utilisation, deux tubes $I_{g_1} = 0$
Betriebsdaten, zwei Röhren

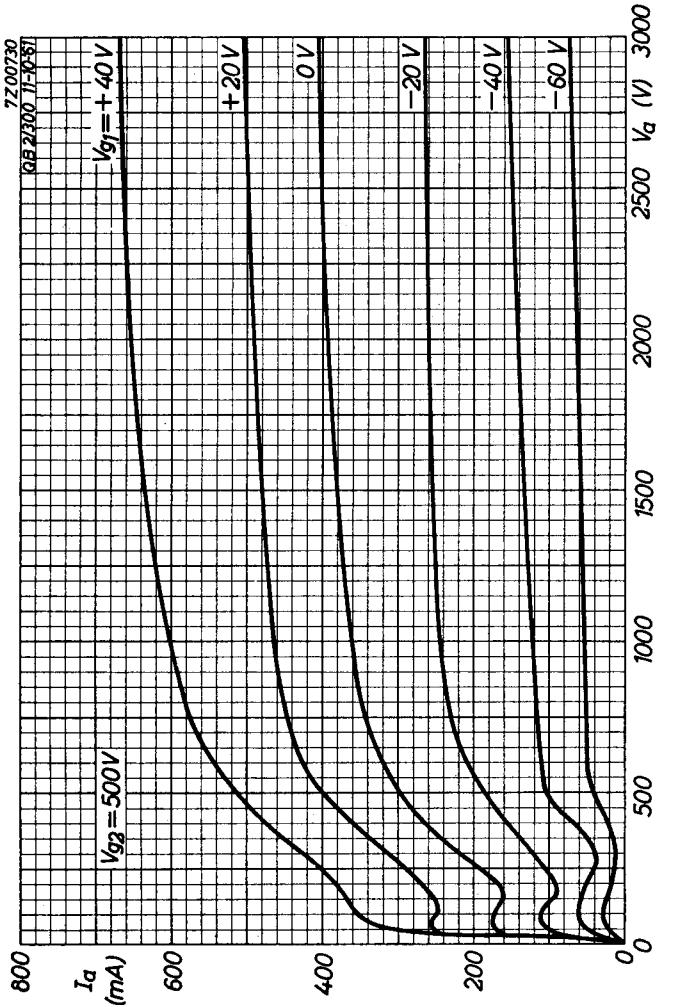
V_a	=	1750		1500		1000			V
V_{g_2}	=	500		500		500			V
V_{g_1}	=	-115		-110		-100			V
$R_{aa\sim}$	=	20		15		9			kΩ
$V_{g_1g_{1p}}$	=	0	180	0	170	0		170	V
I_a	=	2x20	2x 85	2x30	2x 90	2x30	2x	85	mA
I_{g2}	=	-	2x11,5	-	2x 10	-	2x	15	mA
W_{g_2}	=	-	2x 6	-	2x 5	-	2x	7,5	W
W_{ia}	=	2x35	2x 150	2x45	2x 135	2x30	2x	85	W
W_a	=	2x35	2x62,5	2x45	2x62,5	2x30	2x	45	W
W_o	=	0	175	0	145	0		80	W
η	=	-	59	-	54	-		47	%
d_{tot}	=	-	4,5	-	3	-		3	%

L.F. class B amplifier and modulator (continued)
Amplificatrice et modulatrice B.F. classe B (suite)
NF-Klasse B Verstärker und Modulator (Fortsetzung)

Operating conditions, two tubes
Caractéristiques d'utilisation, deux tubes $Ig_1>o$
Betriebsdaten, zwei Röhren

V_a	=	1800		1500		V
V_{g_2}	=	250		250		V
V_{g_1}	=	-50		-45		V
$R_{aa\sim}$	=	20		14		kΩ
$V_{g_1g_{1p}}$	=	0	180	0	200	V
I_a	=	2x25	2x110	2x30	2x125	mA
I_{g_2}	=	-	2x15	-	2x20	mA
I_{g_1}	=	0	2x9	0	2x10	mA
W_{g_2}	=	-	2x4	-	2x5	W
W_{ig_1}	=	0	2x0,8	0	2x0,9	W
W_{ia}	=	2x45	2x198	2x45	2x188	W
W_a	=	2x45	2x63	2x45	2x63	W
W_o	=	0	270	0	250	W
η	=	-	68	-	67	%
d_{tot}	=	-	5	-	6	%

V_a	=	1000		600		V
V_{g_2}	=	250		250		V
V_{g_1}	=	-40		-40		V
$R_{aa\sim}$	=	6,8		3,6		kΩ
$V_{g_1g_{1p}}$	=	0	210	0	240	V
I_a	=	2x30	2x150	2x30	2x150	mA
I_{g_2}	=	-	2x30	-	2x40	mA
I_{g_1}	=	0	2x14	0	2x15	mA
W_{g_2}	=	-	2x7,5	-	2x10	W
W_{ig_1}	=	0	2x1,3	0	2x1,6	W
W_{ia}	=	2x30	2x150	2x18	2x90	W
W_a	=	2x30	2x65	2x18	2x45	W
W_o	=	0	170	0	90	W
η	=	-	57	-	50	%
d_{tot}	=	-	6	-	10	%


7Z00730
QB2/300 11-10-61
V_{g1} = +40 V
+20 V
0 V
−20 V
−40 V
−60 V
V_{g2} = 500 V
I_a (mA)
800
600
400
200
0
0
500
1000
1500
2000
2500
3000
V_a (V)

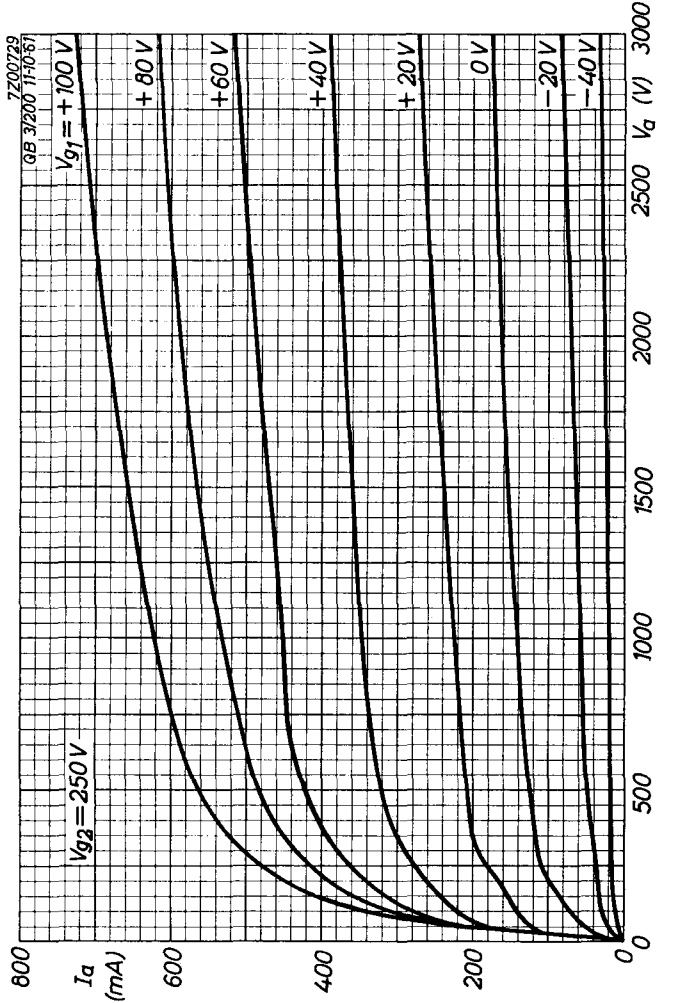
QB 3/200

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B

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QB 3/200



4.4.1961

C

QB3/200

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D

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Electronic Tube

HANDBOOK

QB3/200

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1	1	1961.04.04
2	2	1961.04.04
3	3	1961.04.04
4	4	1961.04.04
5	5	1961.04.04
6	6	1961.04.04
7	7	1961.04.04
8	A	1961.04.04
9	B	1961.04.04
10	C	1961.04.04
11	D	1961.04.04
12	FP	2000.01.15

TETRODE for use as H.F. or L.F. amplifier
TETRODE pour utilisation en amplificatrice H.F. ou B.F.
TETRODE zur Verwendung als HF- oder NF-Verstärker

Cooling : radiation/low velocity air flow
Refroidissement: radiation/léger courant d'air
Kühlung : Strahlung/schwacher Luftstrom

Filament : thoriated tungsten
Filament : tungstène thorié
Heizfaden: thoriertes Wolfram

Heating : direct
Chauffage: direct
Heizung : direkt

V_f = 5 V
I_f = 6,5 A

Capacitances
Capacités
Kapazitäten

C_a = 3,5 pF
C_{g1} = 10,8 pF
C_{ag1} = 0,05 pF

Typical characteristics
Caractéristiques types
Kenndaten

μ_{g2g1} = 6,2
S (I_a=40 mA) = 2,2 mA/V

λ	Freq.	C telegr.		B teleph.		C ag2 mod.		B mod. [1]	
m	Mc/s	V_a (V)	W_o (W)	V_a (V)	W_o (W)	V_a (V)	W_o (W)	V_a (V)	W_o (W)
2,5	120	3000	375	3000	58	2500	300	2500	550
		2500	375	2500	55	2000	225	2000	550
		2000	275	2000	54	1500	157	1500	455
		1500	110						
2	150	2500	360						
1,5	200	2000	225						

[1]) Two tubes; deux tubes; zwei Röhren

Temperatures and cooling
Températures et refroidissement
Temperaturen und Kühlung

Temperature of anode seal
Température de la sortie de l'anode = max.220 °C
Temperatur der Anodendurchführung

Temperature of pin seals
Température des scellements des broches= max.180 °C
Temperatur der Stiftendurchführungen

Bulb temperature
Température de l'ampoule = max.350 °C
Kolbentemperatur

In general cooling of the tube is not necessary at normal ambient temperature at frequencies below 50 Mc/s. When the tube is used at or near maximum ratings at frequencies above 50 Mc/s, it will be necessary to direct a low velocity air flow on the anode seal and the bottom of the envelope.

In order to prevent overheating of the screen-grid pins by high-frequency current it is recommended to include both screen-grid socket connections in the circuit.

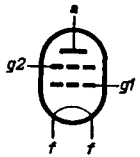
En général il ne faut pas refroidir le tube à la température normale de l'ambiance à des fréquences au-dessous de 50 Mc/s. Si le tube est utilisé à ou près des caractéristiques maximum admissibles au-dessus de 50 Mc/s, il faut diriger un léger courant d'air sur le scellement de la sortie de l'anode et sur le fond du tube.

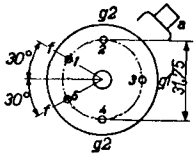
Il est recommandé d'incorporer les deux bornes de raccordement de la grille-écran dans le circuit pour éviter le surchauffage des broches de la grille-écran par le courant haute fréquence.

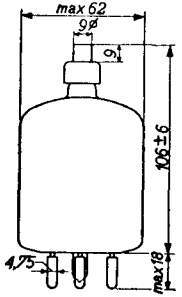
Im allgemeinen braucht die Röhre bei normaler Umgebungstemperatur bei Frequenzen unterhalb 50 MHz nicht gekühlt zu werden. Wird die Röhre bei den maximalen Betriebsdaten bei Frequenzen höher als 50 MHz betrieben, so ist ein schwacher Luftstrom auf die Anodendurchführung und den Boden der Röhre notwendig.

Es empfiehlt sich, zur Vermeidung einer Überhitzung der Schirmgitterstifte vom Hochfrequenzstrom, beide Anschlussklemmen des Schirmgitters an der Schaltung zu beteiligen.

Dimensions in mm
Dimensions en mm
Abmessungen in mm







Socket
Support 40211/01
Fassung

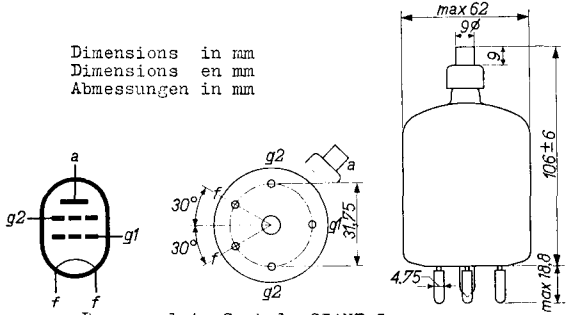
Clip
Borne de connexion 40624
Anschlussklemme

Mounting position: vertical with base up or down
Montage : vertical avec le pied en haut ou en bas
Einbau : senkrecht mit dem Sockel oben oder unten

Net weight
Poids net 120 g
Nettogewicht

Shipping weight
Poids brut 850 g
Bruttogewicht

Dimensions in mm
Dimensions en mm
Abmessungen in mm



Base, culot, Sockel: GIANT 5p.

Socket
Support 40211/01
Fassung

Clip
Borne de connexion 40624
Anschlussklemme

Mounting position: vertical with base up or down
Montage : vertical avec le pied en haut ou en bas
Einbau : senkrecht mit dem Sockel oben oder unten

Net weight
Poids net 120 g
Nettogewicht

Shipping weight
Poids brut 850 g
Bruttogewicht

H.F. class C telegraphy
H.F. classe C télégraphie
HF - Klasse C Telegraphie

Limiting values
Caractéristiques limites
Grenzdaten

f	= max. 120 Mc/s	f	= max. 170 Mc/s
V_a	= max. 3000 V	V_a	= max. 2500 V
I_a	= max. 225 mA	W_{ia}	= max. 560 W
W_{ia}	= max. 625 W		
W_a	= max. 125 W[1])		
V_{g2}	= max. 400 V		
W_{g2}	= max. 20 W	f	= max. 200 Mc/s
$-V_{g1}$	= max. 500 V	V_a	= max. 2200 V
I_{g1}	= max. 15 mA	W_{ia}	= max. 435 W

Operating conditions
Caractéristiques d'utilisation
Betriebsdaten

f	= <120	<120	<120	<120 Mc/s	
V_a	= 3000	2500	2000	1500 V	
V_{g2}	= 350	350	350	350 V	
V_{g1}	= -150	-150	-100	-150 V	
I_a	= 167	200	200	110 mA	
I_{g2}	= 30	40	50	56 mA	←
I_{g1}	= 6,5	9	9	8 mA	
V_{g1_p}	= 300	330	260	225 V	
W_{ig1}	= 2	3	2,4	1,7 W	
W_{g2}	= 10,5	14	17,5	19,6 W	←
W_{ia}	= 500	500	400	165 W	
W_a	= 125	125	125	55 W	
W_o	= 375	375	275	110 W	
η	= 75	75	69	67 %	

[1]) Anode red hot, temperature = 850 °C
Anode portée au rouge, température = 850 °C
Anode rotheiss, Temperatur = 850 °C

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H.F. class C telegraphy
H.F. classe C télégraphie
HF - Klasse C Telegraphie

Limiting values
Caractéristiques limites
Grenzdaten

f = max. 120 Mc/s			
V_a	= max. 3000 V		
I_a	= max. 225 mA		
W_{ia}	= max. 625 W		
W_a	= max. 125 W[1])		
V_{g2}	= max. 400 V		
W_{g2}	= max. 20 W	f = max. 200 Mc/s	
$-V_{g1}$	= max. 500 V	V_a	= max. 2200 V
I_{g1}	= max. 15 mA	W_{ia}	= max. 435 W
		f = max. 170 Mc/s	
		V_a	= max. 2500 V
		W_{ia}	= max. 560 W

Operating conditions
Caractéristiques d'utilisation
Betriebsdaten

f =	<120	<120	<120	<120 Mc/s
V_a =	3000	2500	2000	1500 V
V_{g2} =	350	350	350	350 V
V_{g1} =	-150	-150	-100	-150 V
I_a =	167	200	200	110 mA
I_{g2} =	30	40	50	56 mA
I_{g1} =	6,5	9	9	8 mA
V_{g1_p} =	300	330	260	225 V
W_{ig1} =	2	3	2,4	1,7 W
W_{g2} =	10,5	14	17,5	19,6 W
W_{ia} =	500	500	400	165 W
W_a =	125	125	125	55 W
W_o =	375	375	275	110 W
η =	75	75	69	67 %

[1]) Anode red hot, temperature = 850 °C
Anode portée au rouge, température = 850 °C
Anode rotheiss, Temperatur = 850 °C

H.F. class B telephony
H.F. classe B téléphonie
HF - Klasse B Telephonie

Limiting values
Caractéristiques limites
Grenzdaten

f = max. 120 Mc/s		f = max. 170 Mc/s	
V_a	= max. 3000 V	V_a	= max. 2500 V
I_a	= max. 135 mA	W_{ia}	= max. 190 W
W_{ia}	= max. 200 W		
W_a	= max. 125 W[1])	f = max. 200 Mc/s	
V_{g2}	= max. 400 V	V_a	= max. 2200 V
W_{g2}	= max. 14 W	W_{ia}	= max. 150 W

Operating conditions
Caractéristiques d'utilisation
Betriebsdaten

f =	< 120	< 120	< 120 Mc/s
V_a =	3000	2500	2000 V
V_{g2} =	350	350	350 V
V_{g1} =	-50	-50	-50 V
I_a =	60	70	83 mA
I_{g2} =	1	1	1,5 mA
V_{g1_p} =	50	55	65 V
W_{g2} =	0,35	0,35	0,52 W
W_{ia} =	180	175	166 W
W_a =	122	120	112 W
W_o =	58	55	54 W
η =	32	31,5	32,5 %
m =	100	100	100 %
I_{g1} =	4,5	4	4 mA
W_{ig1} =	0,45	0,44	0,52 W

1) See page 4
Voir page 4
Siehe Seite 4

PHILIPS

H.F. class C anode and screen grid modulation
H.F. classe C modulation d'anode et de grille-écran
HF - Klasse C Anoden- und Schirmgittermodulation

Limiting values
Caractéristiques limites
Grenzdaten

f = max. 120 Mc/s		f = max. 170 Mc/s	
V_a	= max. 2500 V	V_a	= max. 2100 V ←
I_a	= max. 200 mA	W_{ia}	= max. 375 W
W_{ia}	= max. 415 W		
W_a	= max. 83 W		
V_{g2}	= max. 400 V		
W_{g2}	= max. 20 W	f = max. 200 Mc/s	
$-V_{g1}$	= max. 500 V	V_a	= max. 1800 V ←
I_{g1}	= max. 15 mA	W_{ia}	= max. 290 W

Operating conditions
Caractéristiques d'utilisation
Betriebsdaten

f =	< 120	< 120	< 120 Mc/s
V_a =	2500	2000	1500 V
V_{g2} =	350	350	300 V
V_{g1} =	-210	-220	-150 V
I_a =	152	150	160 mA
I_{g2} =	30	33	33 mA
I_{g1} =	4,5	5	10 mA
V_{g1_p} =	380	390	250 V
W_{ig1} =	1,7	2	2,5 W
W_{g2} =	10,5	11,5	10 W
W_{ia} =	380	300	240 W
W_a =	80	75	83 W
W_o =	300	225	157 W
η =	79	75	65 %
m =	100	100	100 %
V_{g2_p} =	300	300	255 V
W_{mod} =	190	150	120 W

L.F. class B amplifier and modulator)
Amplificatrice et modulatrice B.F.classe B) $I_{g1} = 0$
NF - Verstärker und Modulator Klasse B)

Limiting values
Caractéristiques limites
Grenzdaten

V_a	= max.	3000 V
I_a	= max.	225 mA
W_a	= max.	125 W [1]
V_{g2}	= max.	600 V
W_{g2}	= max.	20 W
$-V_{g1}$	= max.	500 V
R_{g1}	= max.	150 kΩ

Operating conditions, two valves
Caractéristiques d'utilisation, deux tubes
Betriebsdaten, zwei Röhren

V_a	=	2500		2000		1500		V
V_{g1}	=	-97		-95,5		-94		V
V_{g2}	=	600		600		600		V
R_{aa}	=	25		17,6		12		kΩ
$V_{g1g_{ip}}$	=	0	190	0	186	0	185	V
Ia	=	2x30	2x108	2x30	2x111	2x30	2x109	mA
Ig2	=	2x0,1	2x13	2x0,1	2x12	2x0,15	2x13,5	mA
W_{g2}	=	2x0,1	2x7,8	2x0,1	2x7,2	2x0,1	2x8,1	W
W_{ia}	=	2x75	2x270	2x60	2x222	2x45	2x163	W
W_a	=	2x75	2x97,5	2x60	2x92	2x45	2x78	W
W_o	=	0	345	0	260	0	170	W
η	=	-	64	-	58,5	-	52	%
dtot	=	-	4,0	-	3,6	-	3,5	%

[1])Anode red hot, temperature = 850 °C
Anode portée au rouge, température = 850 °C
Anode rotheiss, Temperatur = 850 °C

L.F. class B amplifier and modulator)
Amplificatrice et modulatrice B.F. classe B) $I_{g1} > 0$
NF - Verstärker und Modulator Klasse B)

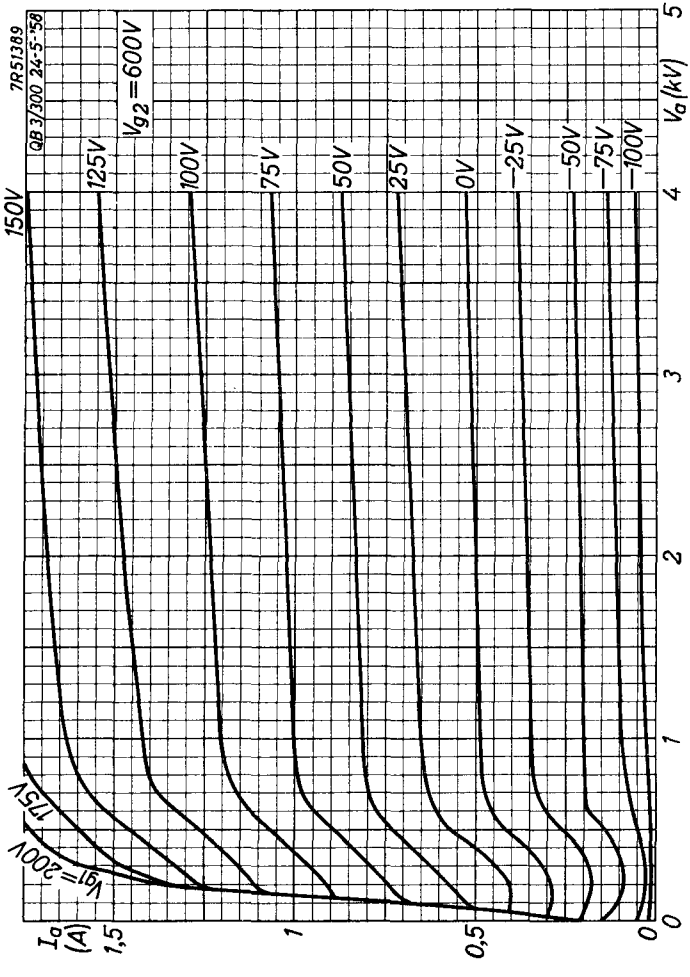
Limiting values
Caractéristiques limites
Grenzdaten

V_a	= max.	3000	V
I_a	= max.	225	mA
W_a	= max.	125	W [1]
V_{g2}	= max.	400	V
W_{g2}	= max.	20	W
$-V_{g1}$	= max.	500	V

Operating conditions, two valves
Caractéristiques d'utilisation, deux tubes
Betriebsdaten, zwei Röhren

V_a	=	2500		2000		1500		V
V_{g1}	=	-51		-50		-48		V
V_{g2}	=	350		350		350		V
R_{aa}	=	20		12		7,2		kΩ
V_{g1g1_p}	=	0	240	0	296	0	330	V
I_a	=	2x30	2x151	2x30	2x197,5	2x30	2x227,5	mA
I_{g1}	=	0	2x8,5	0	2x12	0	2x16	mA
I_{g2}	=	2x0,1	2x18	2x0,15	2x32	2x0,25	2x42	mA
W_{ig1}	=	0	2x0,9	0	2x1,6	0	2x2,4	W
W_{g2}	=	0	2x6,3	2x0,1	2x11,2	2x0,1	2x15	W
W_{ia}	=	2x75	2x377,5	2x60	2x395	2x45	2x341,5	W
W_a	=	2x75	2x102,5	2x60	2x120	2x45	2x114	W
W_o	=	0	550	0	550	0	455	W
η	=	-	72,5	-	69,5	-	66,5	%
dtot	=	-	5	-	5	-	5	%

[1])Anode red hot, temperature = 850 °C
Anode portée au rouge, température = 850°C
Anode rotheiss, Temperatur = 850 °C


7R51389
QB 3/300 24-5-58
V_{g2} = 600V
150V
125V
100V
75V
50V
25V
0V
−25V
−50V
−75V
−100V
V_{g1} = 200V
175V
I_a (A)
1,5
1
0,5
0
0
1
2
3
4
5
V_a (kV)

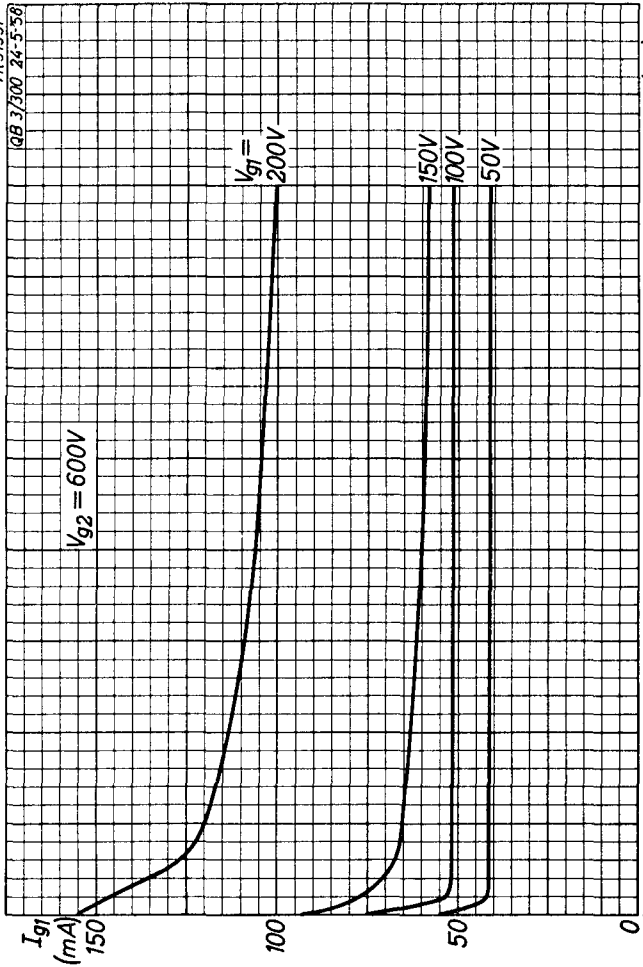
6.6.1958

A

QB 3/300

PHILIPS

B


7R51391
QB 3/300 24-5-58
V_{g1} = 200V
150V
100V
50V
V_{g2} = 600V
I_{g1} (mA)
150
100
50
0
0
1
2
3
4
5
V_a (kV)

6.6.1958

C

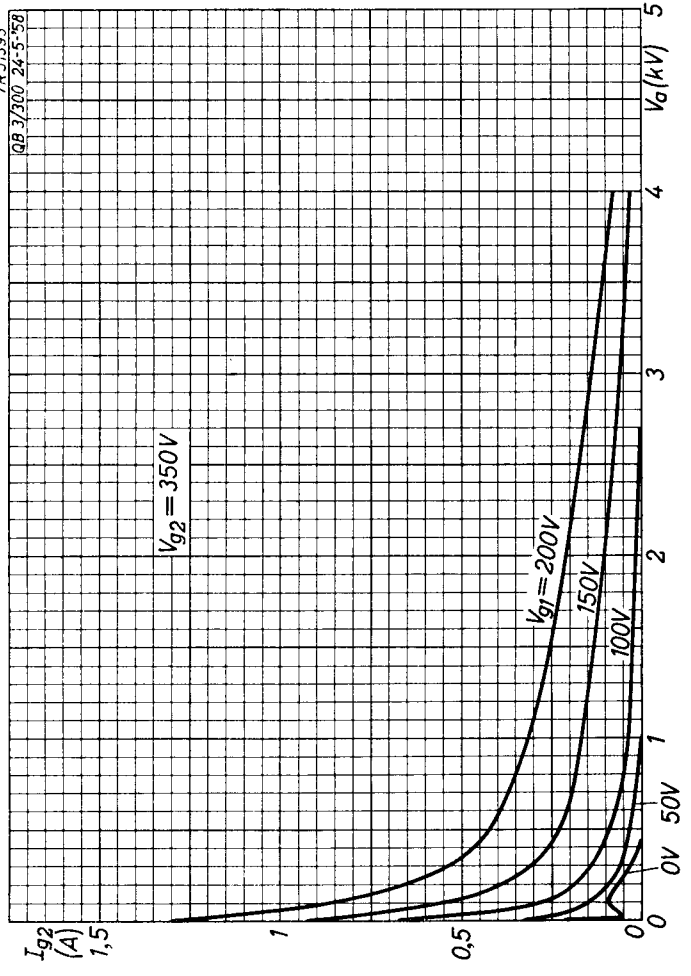
QB 3/300

PHILIPS

D

PHILIPS

QB 3/300



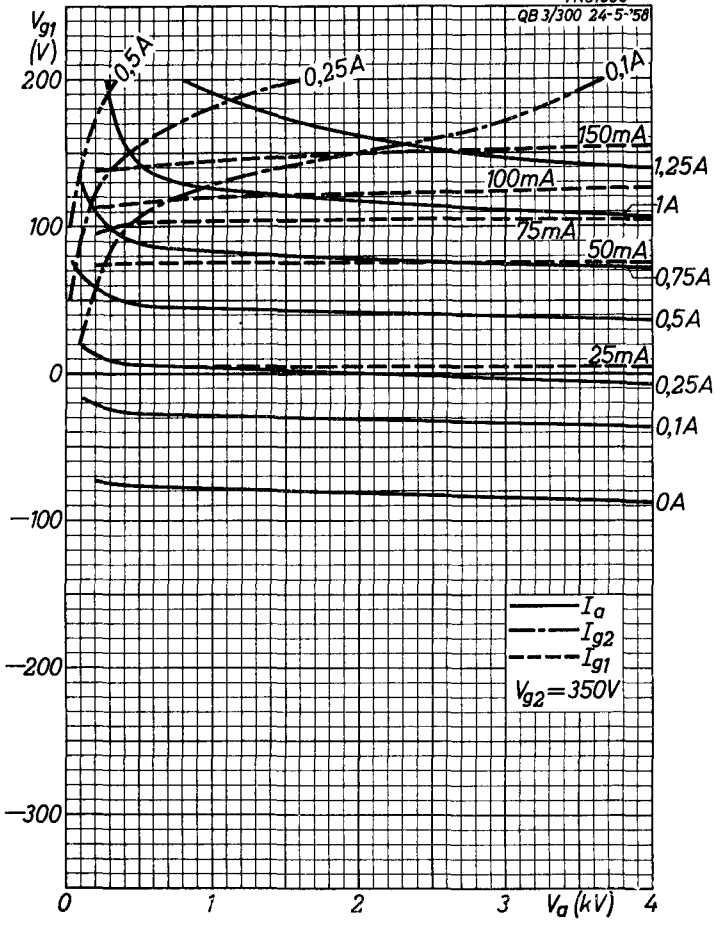
6.6.1958

E

QB 3/300

PHILIPS

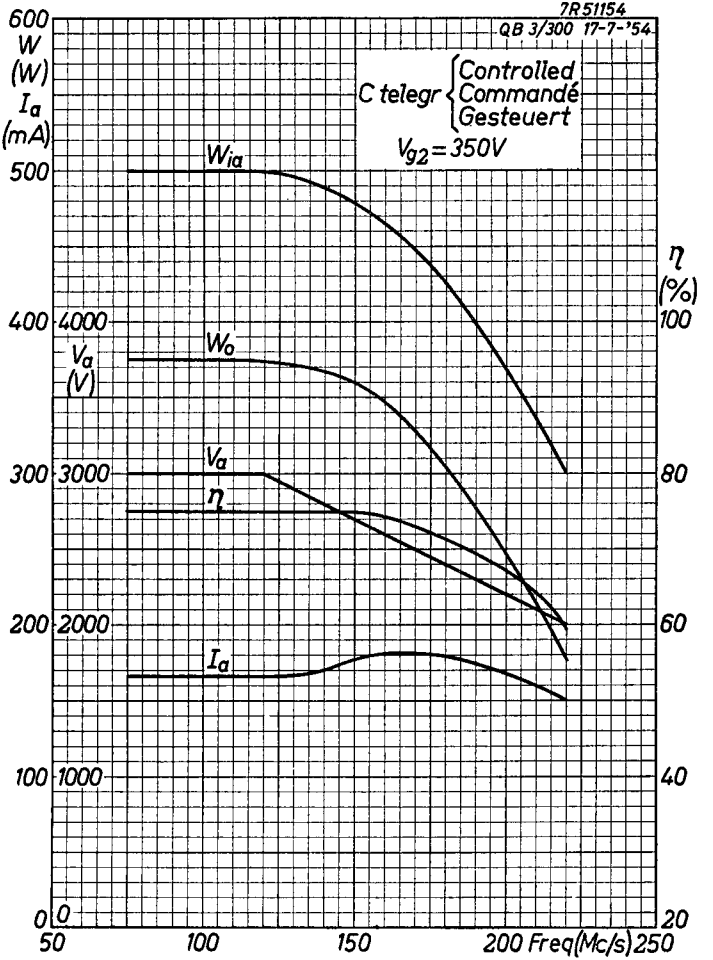
F


7R51395
QB 3/300 24-5-'58
V_{g1} (V)
200
100
0
−100
−200
−300
0,5A
0,25A
0,1A
150mA
100mA
75mA
50mA
25mA
1,25A
1A
0,75A
0,5A
0,25A
0,1A
0A
I_a
I_{g2}
I_{g1}
V_{g2}=350V
0
1
2
3
V_a (kV)
4

6.6.1958 G

QB 3/300

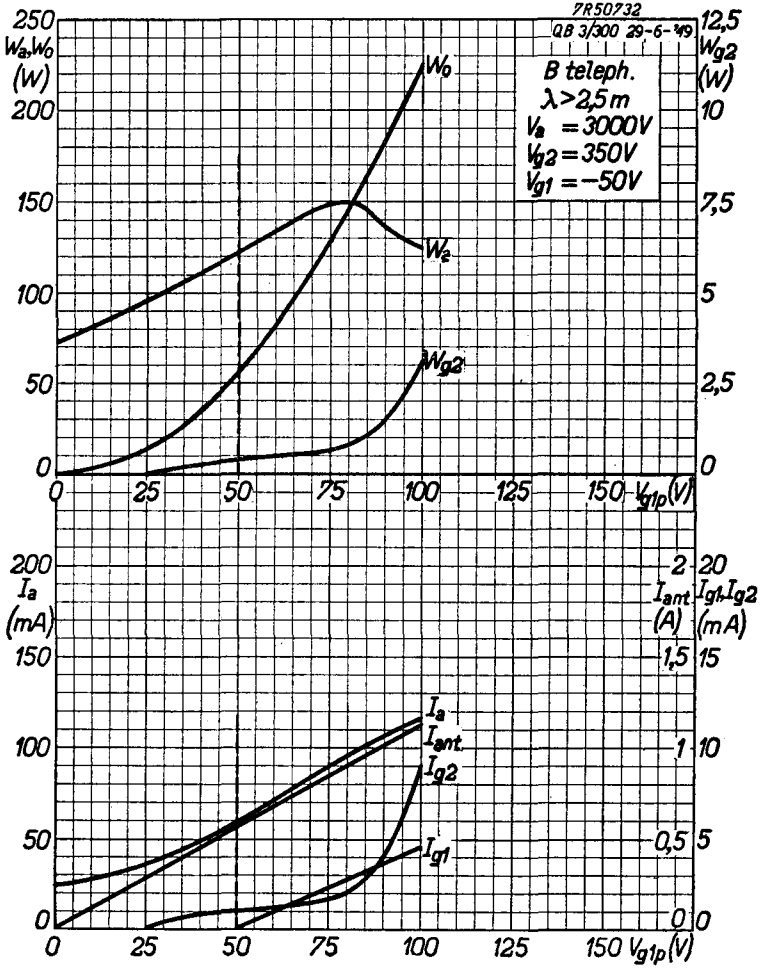
PHILIPS



H

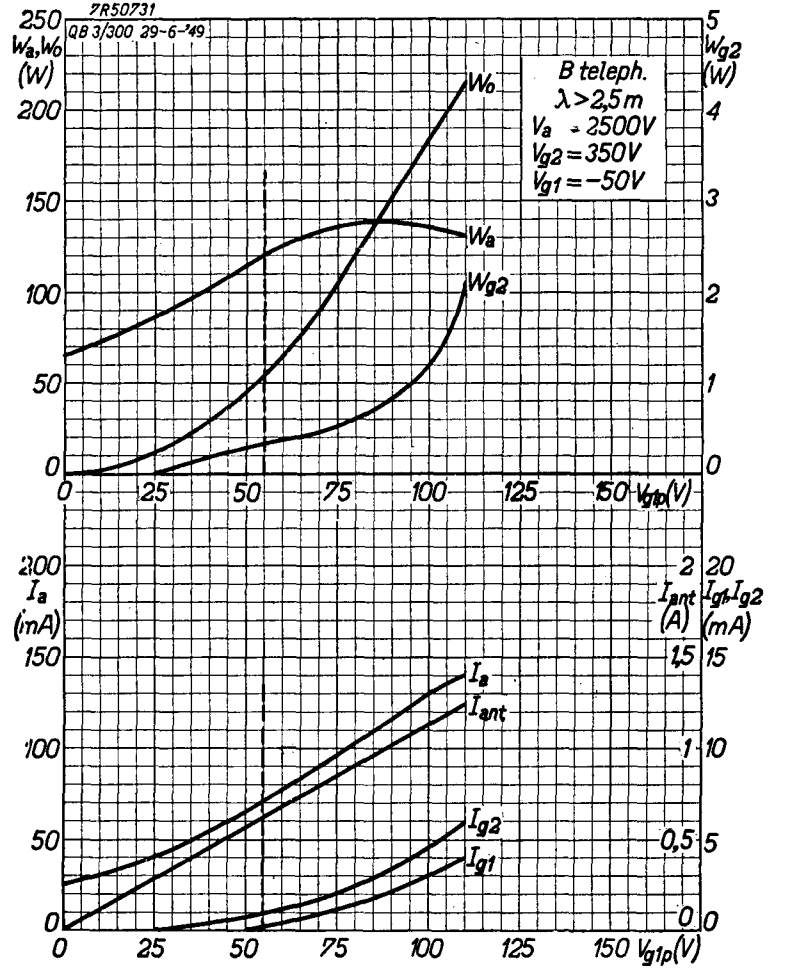
PHILIPS

QB 3/300



QB 3/300

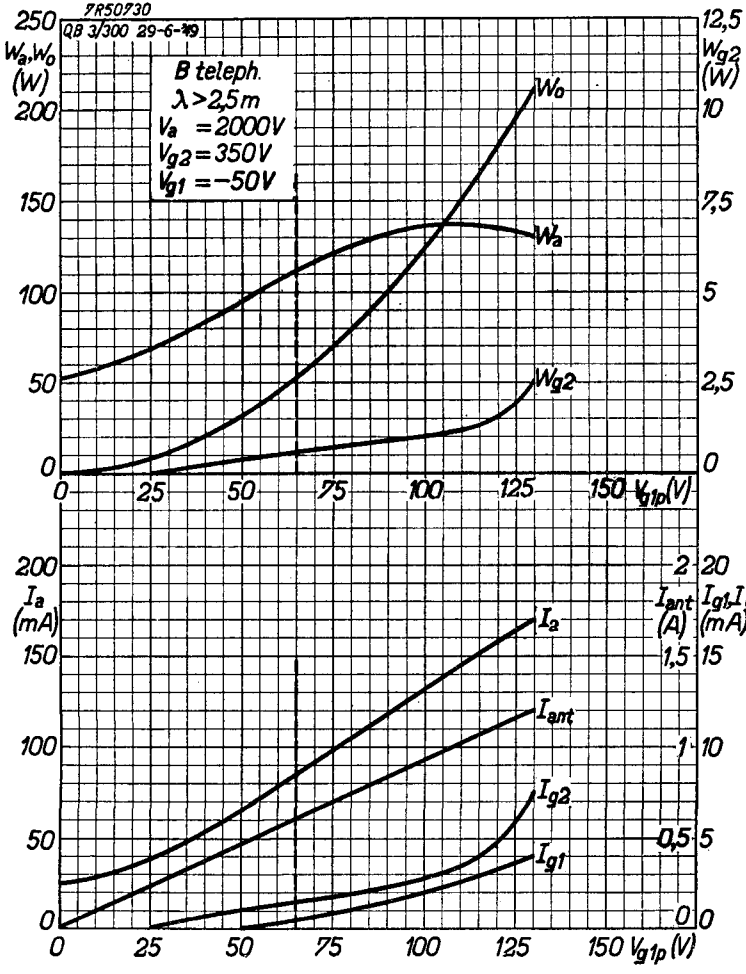
PHILIPS



J

PHILIPS

QB 3/300

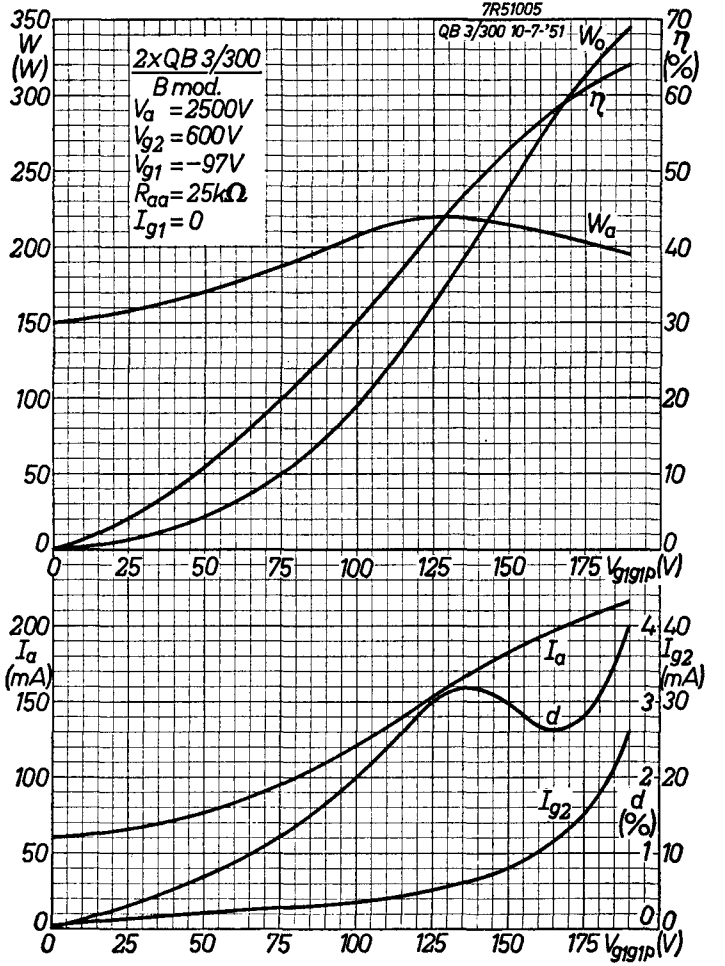


7.7.1954

K

QB 3/300

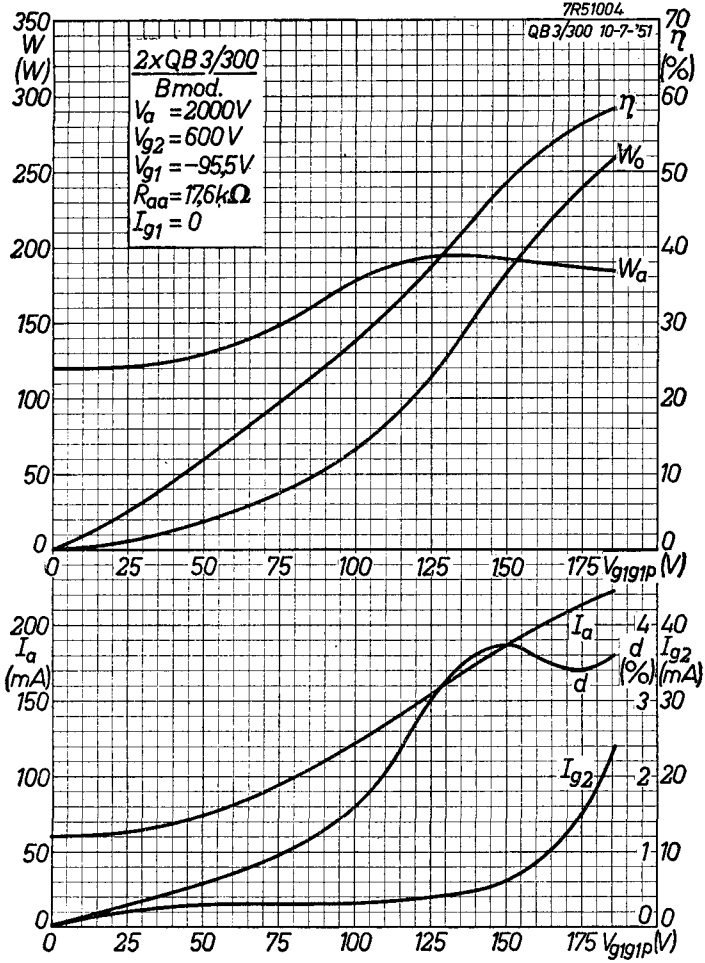
PHILIPS



L

PHILIPS

QB 3/300

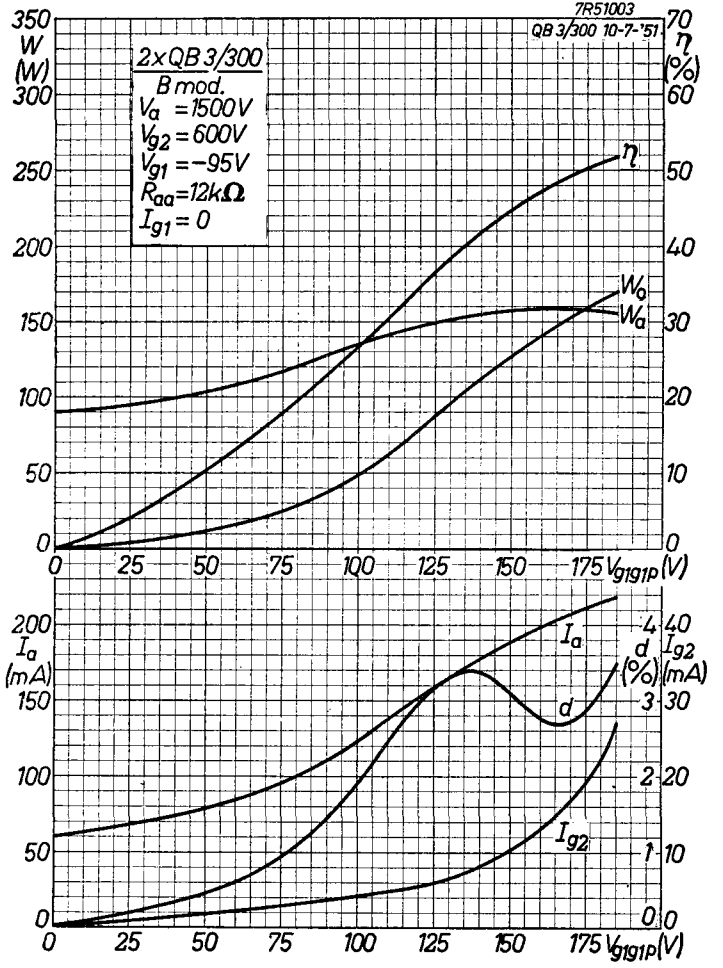


7.7.1954

M

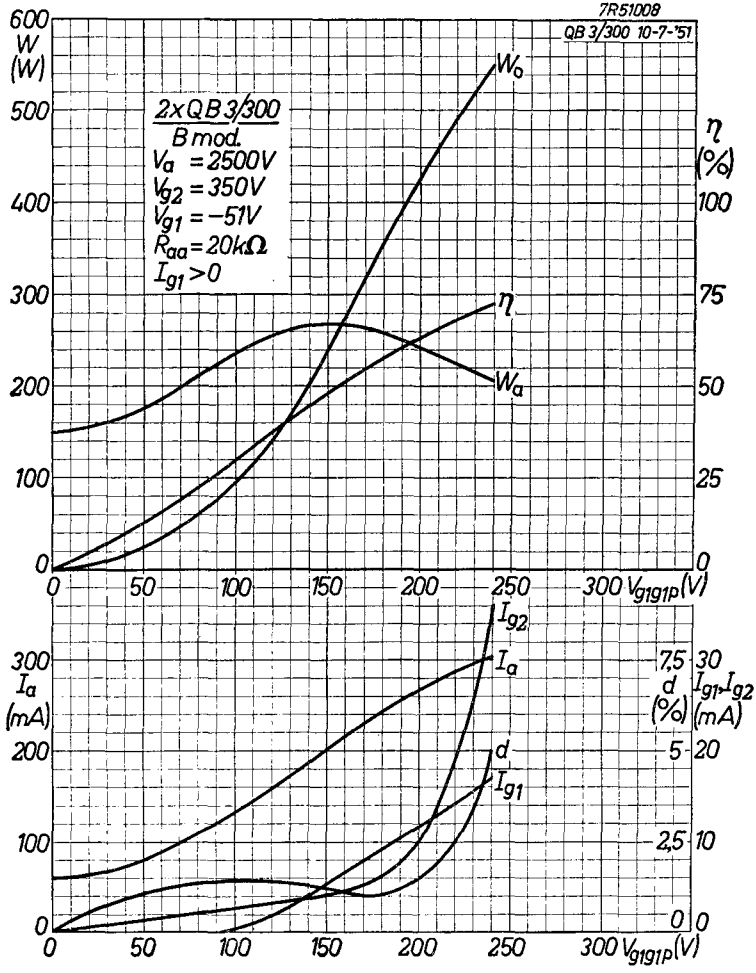
QB 3/300

PHILIPS



PHILIPS

QB 3/300

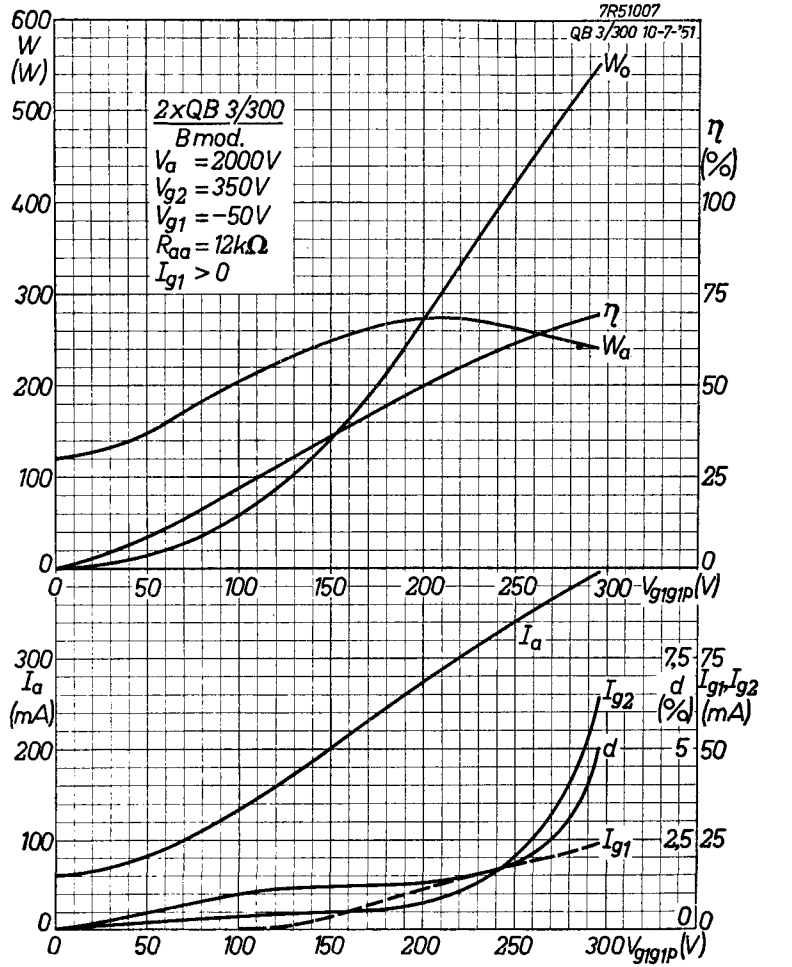


7.7.1954

O

QB 3/300

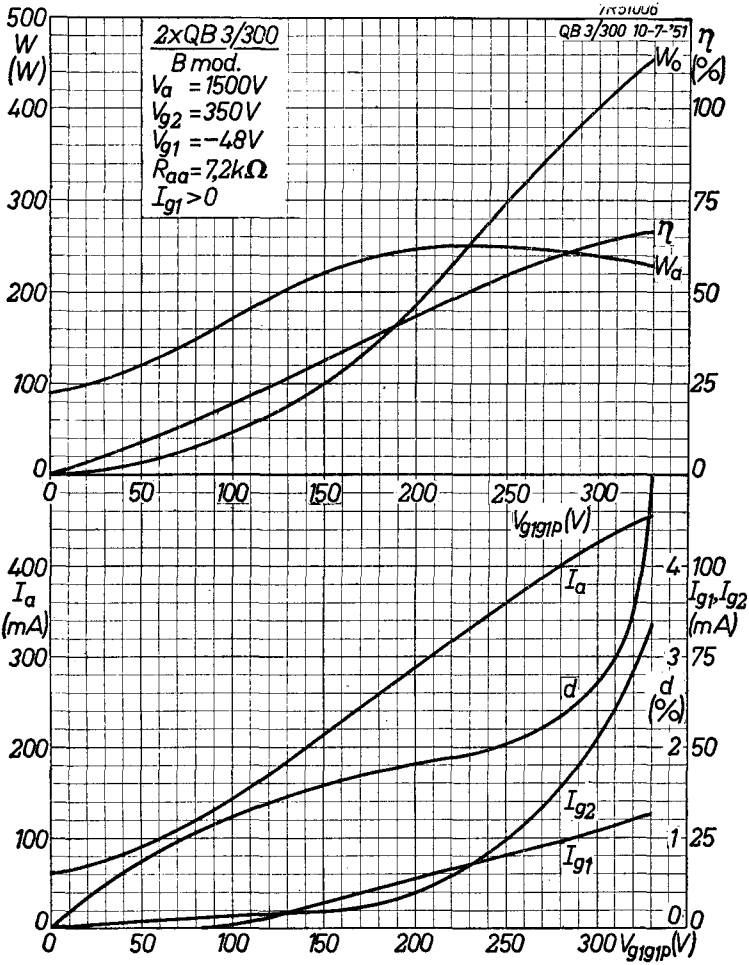
PHILIPS



P

PHILIPS

QB 3/300



7.7.1954

Q

PHILIPS

Electronic Tube

HANDBOOK

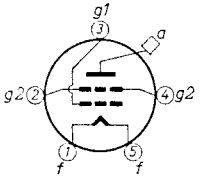
QB3/300

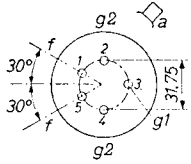
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2	2	1954.07.07
3	3	1959.03.03
4	3	1960.09.09
5	4	1959.03.03
6	4	1960.09.09
7	5	1956.03.03
8	6	1956.03.03
9	7	1954.07.07
10	8	1954.07.07
11	A	1958.06.06
12	B	1958.06.06
13	C	1958.06.06
14	D	1958.06.06
15	E	1958.06.06
16	F	1958.06.06
17	G	1958.06.06
18	H	1958.06.06
19	I	1954.07.07

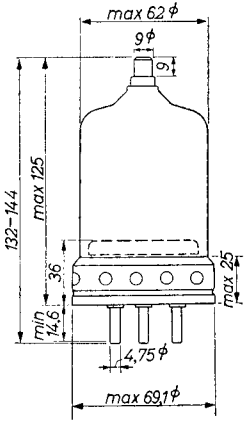
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21	K	1954.07.07
22	L	1954.07.07
23	M	1954.07.07
24	N	1954.07.07
25	O	1954.07.07
26	P	1954.07.07
27	Q	1954.07.07
28, 29	FP	2000.01.15

TETRODE for use as H.F. or L.F. amplifier
TETRODE pour utilisation en amplificatrice H.F. ou B.F.
TETRODE zur Verwendung als HF- oder NF-Verstärker

Dimensions in mm
Dimensions en mm
Abmessungen in mm







Base : Metal-shell Giant 5p.
Culot : Giant 5p. avec culot métallique
Sockel: Giant 5p. mit Metallring

Socket
Support 40211/01
Fassung

For further data and curves please refer to QB 3/300
Pour les autres données et les courbes voir QB 3/300
Für die übrigen Daten und Kurven siehe QB 3/300

PHILIPS

Electronic Tube

HANDBOOK

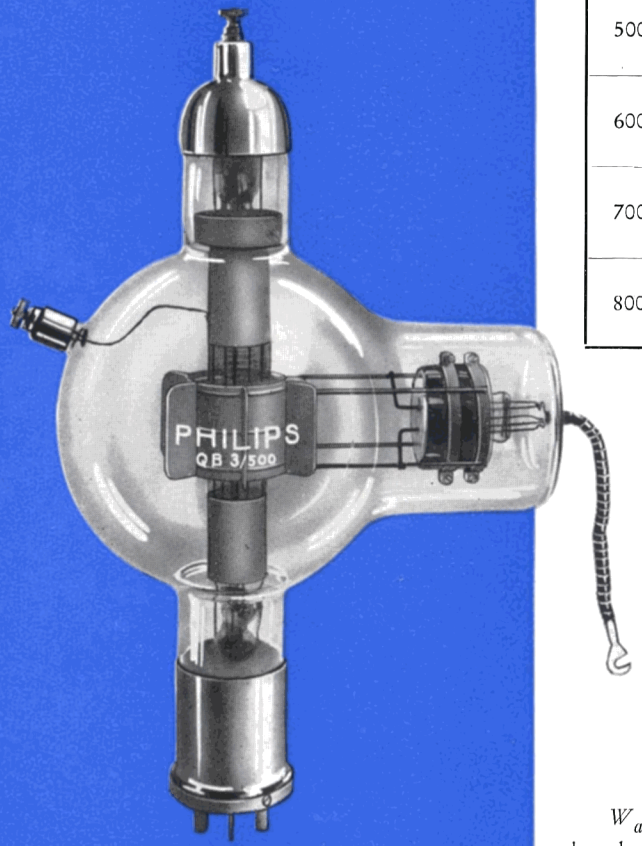
QB3/300GA

page	sheet	date
1	1	1960.07.07
2	FP	2000.01.15

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TUBE EMETTEUR QB 3/500

Ce tube à grille-écran a été conçu pour l'emploi comme amplificateur H.F., notamment sur ondes courtes. La grille-écran insérée entre l'anode et la grille de commande réduit la capacité grille-plaque à 0,02 $\mu\mu$F env. Elle atteint le bord supérieur de l'ampoule afin que l'écran extérieur entre les circuits de grille et de plaque puisse l'entourer.
Le neutrodynage n'est pas nécessaire, ce qui constitue un avantage remarquable pour les émetteurs à longueur d'onde variable tout en simplifiant largement la construction et le maniement.
En outre, ce tube peut être entièrement chargé avec une puissance d'excitation relativement plus faible que celle nécessaire pour une triode correspandante.
Le tableau ci-contre se rapporte à la télégraphie (ondes > 150 m) pour une tension anodique de 3000 V. Le rapport entre la puissance d'excitation requise et la puissance débitée est pour des valeurs élevées de la tension de grille-écran plus favorable que pour des valeurs plus basses. En appliquant ces valeurs élevées il faut veiller à ce que la dissipation de grille-écran (100 W) ne soit pas depassée.
Dans l'étage précédant on peut employer le tube émetteur Philips QB 2/75 ou le TC 1/75; le QB 3/500 lui-même peut servir pour l'excitation d'un tube émetteur Philips TA 10/5000K.



Tension de grille-écran en V	Rendement en %	Puissance appliquée en W	Puissance utile en W	Dissipation anodique en W	Dissipation de grille-écran en W
500	55	930	510	350	70
	60	1065	640	350	75
	65	1065	690	300	75
600	55	965	530	350	85
	60	1065	640	335	90
	65	1065	690	285	90
700	55	1000	550	350	100
	60	1000	600	300	100
	65	1000	650	250	100
800	55	875	480	295	100
	60	875	525	250	100
	65	875	570	205	100

La dissipation de grille-écran ($W_{g'}$) est calculée d'après la formule suivante:

$$W_{g'} = 0{,}4\ (I_{g'} + I_a)\ V_{g'}$$

dans laquelle:

$I_{g'}$ = courant continu de grille-écran en ampères

I_a = courant continu anodique en ampères

$V_{g'}$ = tension continue de grille-écran en volts

La dissipation anodique (W_a) qui peut être de 350 W au maximum, se tire alors de la formule:

$$W_a = (V_a \cdot I_a + V_{g'} \cdot I_{g'}) - (W_{g'} + W)$$

dans laquelle: V_a = tension anodique en volts

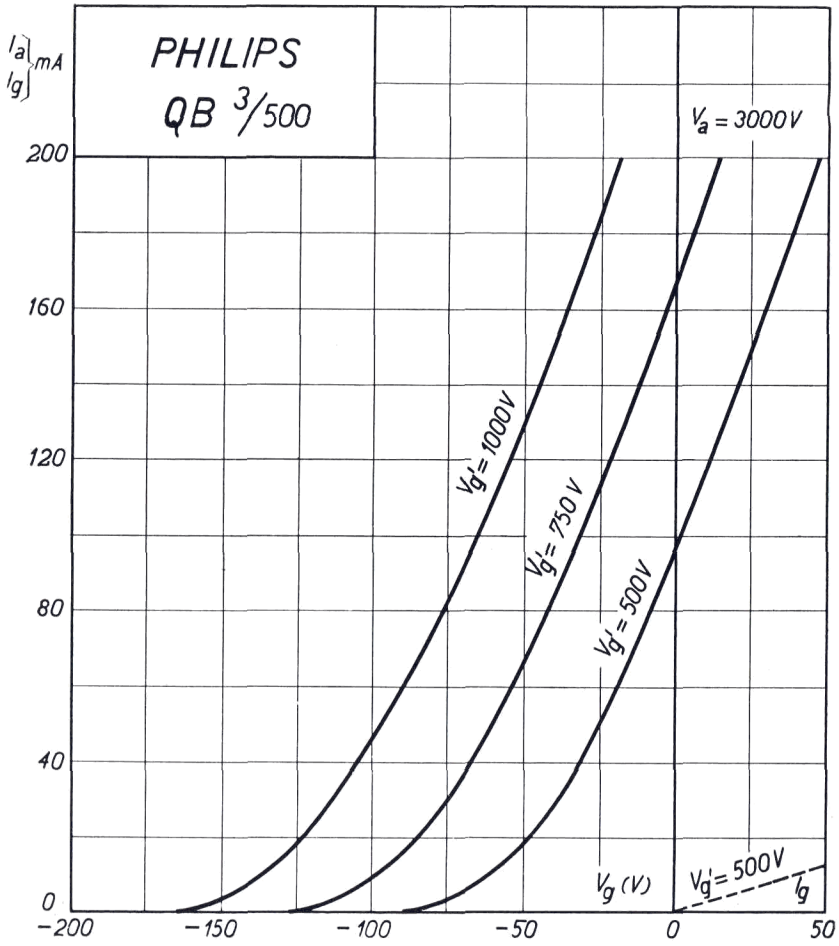
W = puissance utile en watts et

$V_a \cdot I_a + V_{g'} \cdot I_{g'}$ = puissance appliquée.

PHILIPS

TUBE EMETTEUR

QB 3/500



Tension de chauffage	V_f	= 11,0 V
Courant de chauffage	I_f	= 10 A env.
Courant de saturation	I_s	= 7 A env.
Tension anodique	V_a	= 2000-3000 V
Tension de grille-écran	$V_{g'}$	= 500-800 V
Dissipation anodique admissible	W_a	= 350 W*)
Dissipation de grille-écran admissible	$W_{g'}$	= 100 W*)
Dissipation anodique d'essai	W_{at}	= 600 W
Coefficient d'amplification de la grille-écran	k'	= 7,5 env.
Inclinaison pour V_a = 3000 V, $V_{g'}$ = 750 V, I_a = 135 mA	S_{norm}	= 2,2 mA/V env.
Inclinaison maximum	S_{max}	= 3,5 mA/V env.
Capacité grille-plaque	C_{ag}	= 0,02 $\mu\mu$F env.
Diamètre maximum de l'ampoule	d	= 100 mm
Diamètre total maximum	d'	= 250 mm env.
Longueur totale	l	= 440 mm env.

*) Pourvu que le calcul s'effectue d'après les stipulations au verso.

Tetrode for use in A.M. and F.M. transmitters
Tétrode pour utilisation dans des émetteurs A.M. et F.M.
Tetrode zur Verwendung in AM- und FM-Sendern

Cooling : radiation and forced air
Refroidissement : radiation et ventilation forcée
Kühlung : Strahlung und Pressluftkühlung

Filament : thoriated tungsten
Filament : tungstène thorié
Heizfaden: thoriertes Wolfram

Heating : direct
Chauffage: direct
Heizung : direkt

V_f = 5 V
I_f = 14,1 A

Capacitances
Capacités
Kapazitäten

C_a = 4,9 pF
C_{g_1} = 12,7 pF
C_{ag_1} = 0,12 pF

Typical characteristics
Caractéristiques types
Kenndaten

V_a = 2500 V
V_{g_2} = 500 V
I_a = 100 mA
S = 4,0 mA/V
$\mu_{g_2g_1}$ = 5,1

Freq	C telegr.		C_{ag_2} mod.		B S.S.B.	
Mc/s	V_a (V)	W_o (W)	V_a (V)	W_o (W)	V_a (V)	W_o (W)
30			3650	765[1]		
75	4000	1100	3000	630		
	3000	800	2500	510		
	2500	640	2000	380		
100	4000	800				
	3500	650				
110					4000	650
					3500	600
					3000	500

B AF;BF;NF		
V_a (V)	W_o (W)[2]	
	$I_{g_1}>0$	$I_{g_1}=0$
4000	1750	1540
3500	1650	1330
3000	1375	1110
2500	1110	850

[1]) Intermittent service, ICAS
Service intermittent, ICAS
Aussetzender Betrieb, ICAS

[2]) Two tubes; deux tubes, zwei Röhren

Cooling. At W_a < 250 W a low velocity air flow directed on the anode seal and the base will be sufficient. At W_a > 250 W the glass chimney should be used for circulating forced air along the bulb. At W_a = 400 W at least 0.4 m^3/min. air will be necessary, which is obtained by a static pressure of min. 5 mm water below the chassis (see drawing page 3)

Refroidissement. A W_a < 250 W un léger courant d'air dirigé vers le scellement de l'anode et le fond suffira. A W_a > 250 W la cheminée de verre doit être utilisée pour faire circuler l'air forcé le long de l'ampoule. A W_a = 400 W 0,4 m^3/min. d'air sera nécessaire au moins, cequi est obtenu par une pression de 5 mm d'eau au moins au-dessous du châssis (voir le croquis page 3)

Kühlung. Bei W_a < 250 W genügt ein schwacher auf die Anodeneinschmelzung und den Boden gerichteter Luftstrom. Bei W_a > 250 W soll der gläserne Luftführungszylinder zur Führung von Pressluft entlang des Kolbens verwendet werden. Bei W_a = 400 W ist mindestens 0,4 m^3/min erforderlich, was durch einen Druck von mindestens 5 mm Wasser unter dem Chassis erhalten werden kann (siehe Skizze Seite 3)

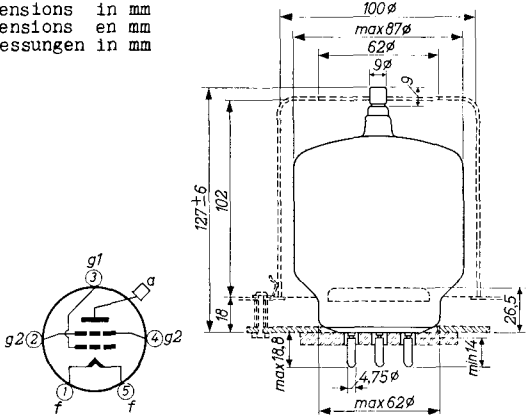
Temperatures
Températures
Temperaturen

Anode seal temperature Température du scellement de l'anode Anodeneinschmelzungstemperatur	max.	220 °C
Temperature of pin seals Température des scellements des broches Temperatur der Einschmelzungen der Stifte	max.	180 °C
Bulb temperature Température de l'ampoule Kolbentemperatur	max.	350 °C

Net weight
Poids net
Nettogewicht 190 g

Shipping weight (9 tubes)
Poids brut (9 tubes)
Bruttogewicht (9 Röhren) 6,5 kg

Dimensions in mm
Dimensions en mm
Abmessungen in mm



Base Culot Sockel	Giant 5p	Socket Support Fassung	40211/01
Top cap Capot supérieur Kolbenanschluss	Small	Cap Capot Haube	40624
Chimney Cheminée Luftführungsring	40666		

Mounting position: Vertical with base up or down
Montage : Vertical avec le pied en haut ou en bas
Einbau : Senkrecht mit dem Sockel oben oder unten

H.F. class C telegraphy
H.F. classe C télégraphie
HF-Klasse C Telegraphie

Limiting values (Absolute limits)
Caractéristiques limites (Limites absolues)
Grenzdaten (Absolute Grenzwerte)

f	=		110	Mc/s
V_a	=	max.	4000	V
W_{ia}	=	max.	1400	W
W_a	=	max.	400	W
I_a	=	max.	350	mA
V_{g2}	=	max.	600	V
W_{g2}	=	max.	35	W
$-V_{g1}$	=	max.	500	V
I_{g1}	=	max.	25	mA

Operating conditions
Caractéristiques d'utilisation
Betriebsdaten

f	=	75	75	75	100	100	Mc/s
V_a	=	4000	3000	2500	4000	3500	V
V_{g2}	=	500	500	500	500	500	V
V_{g1}	=	-220	-220	-200	-170	-170	V
I_a	=	350	350	350	270	250	mA
I_{g2}	=	25	30	35	16	17	mA
I_{g1}	=	6	6	6,5	9,5	9	mA
V_{g1p}	=	305	305	290	240	235	V
W_{ig1}	=	1,8	1,8	1,8	2	1,8	W
W_{g2}	=	12,5	15	17,5	8	8,5	W
W_{ia}	=	1400	1050	875	1080	875	W
W_a	=	300	250	235	280	225	W
W_o	=	1100	800	640	800	650	W
η	=	78,5	76	73	74	74	%

H.F. class C anode and screen grid modulation
H.F. classe C modulation d'anode et de grille-écran
HF-Klasse C Anoden- und Schirmgittermodulation

Limiting values (Absolute limits; carrier conditions with m = max. 100 %)
Caractéristiques limites (Limites absolues; caractéristiques de l'onde porteuse à m = max. 100 %)
Grenzdaten (Absolute Grenzwerte; Trägerdaten mit m = max. 100 %)

CCS = continuous service / service continu / Dauerbetrieb
ICAS = intermittent service / service intermittent / aussetzender Betrieb

		CCS	ICAS	
f	=	75	30	Mc/s
V_a	= max.	3200	4000	V
W_{ia}	= max.	880	1100	W
W_a	= max.	270	270	W
I_a	= max.	275	275	mA
V_{g_2}	= max.	600	600	V
W_{g_2}	= max.	35	35	W
$-V_{g_1}$	= max.	500	500	V
I_{g_1}	= max.	25	25	mA

Operating conditions
Caractéristiques d'utilisation
Betriebsdaten

		CCS			ICAS	
f	=	75	75	75	30	Mc/s
V_a	=	3000	2500	2000	3650	V
V_{g_2}	=	500	500	500	500	V
V_{g_1}	=	-220	-220	-220	-225	V
I_a	=	275	275	275	275	mA
I_{g_2}	=	36	38	40	30	mA
I_{g_1}	=	6	6	6	6	mA
V_{g_1p}	=	305	308	305	308	V
W_{ig_1}	=	1,6	1,7	1,6	1,7	W
W_{g_2}	=	18	19	20	15	W
W_{ia}	=	825	688	550	1000	W
W_a	=	195	178	170	235	W
W_o	=	630	510	380	765	W
η	=	76	74	69	76,5	%
m	=	100	100	100	100	%
V_{g_2p}	=	400	400	400	400	V [1]
W_{mod}	=	413	344	275	500	W

[1]) g_2 modulated with transformer; g_2 modulée par transformateur; g_2 moduliert mittels Transformators

PHILIPS

H.F. class B amplifier, single side band
Amplificatrice H.F. classe B à une bande latérale $I_{g_1} = 0$
HF-Einseitenbandverstärker Klasse B

Limiting values (Absolute limits)
Caractéristiques limites (Limites absolues)
Grenzdaten (Absolute Grenzwerte)

f	=	110 Mc/s
V_a	= max.	4000 V
W_{ia}	= max.	1400 W
W_a	= max.	400 W
I_a	= max.	350 mA
V_{g_2}	= max.	850 V
W_{g_2}	= max.	35 W

Operating conditions (two tubes)
Caractéristiques d'utilisation (deux tubes)
Betriebsdaten (zwei Röhren)

f	=		110			110		Mc/s
V_a	=		4000			3500		V
V_{g_1}	=		-130			-135		V
V_{g_2}	=		705			750		V
			[1]	[2]		[1]	[2]	
V_{g_1p}	=	0	130		0	135		V
I_a	=	65	250	175	75	280	200	mA
I_{g_2}	=		10	7		12	8,4	mA
W_{g_2}	=		7,05	4,95		9	6,3	W
W_{ia}	=	260	1000	700	263	980	700	W
W_a	=	260	350	375	263	380	400	W
W_o	=		650	325		600	300	W
η	=		65	46,5		61,2	43	%

[1]) Single tone
Signal monofréquence
Einzelton

[2]) Double tone
Signal difréquence
Doppelton

H.F. class B amplifier, single side band (continued)
Amplificatrice H.F. classe B à une bande latérale (suite)
HF-Einseitenbandverstärker Klasse B (Fortsetzung)

Operating conditions (two tubes)
Caractéristiques d'utilisation (deux tubes)
Betriebsdaten (zwei Röhren)

f	=		110		Mc/s
V_a	=		3000		V
V_{g1}	=		-140		V
V_{g2}	=		810		V
			[1]	[2]	
V_{g1p}	=	0	140		V
I_a	=	90	300	215	mA
I_{g2}	=		15	10,5	mA
W_{g2}	=		12,2	8,5	W
W_{ia}	=	270	900	645	W
W_a	=	270	400	395	W
W_o	=		500	250	W
η	=		55,5	38,8	%

A.F. class B amplifier
Amplificatrice B.F. classe B
NF-Klasse B-Verstärker

$I_{g1} > 0$

Limiting values (Absolute limits)
Caractéristiques limites (Limites absolues)
Grenzdaten (Absolute Grenzwerte)

V_a	=	max.	4000	V
W_a	=	max.	400	W
I_a	=	max.	350	mA
V_{g2}	=	max.	800 V	[3]
W_{g2}	=	max.	35	W
$-I_{g1}$	=	max.	25	mA

[1][2] See page 6; voir page 6; siehe Seite 6

[3] V_{g2} = max. 1000 V if the temperature of the pin seals is kept below 120 °C
V_{g2} = max. 1000 V si la température des scellements des broches est au-dessous de 120 °C
V_{g2} = max. 1000 V wenn die Temperatur der Einschmelzungen der Stifte unterhalb 120 °C ist

A.F. class B amplifier (continued)
Amplificatrice B.F. classe B (suite)
NF-Klasse B-Verstärker (Fortsetzung)

Operating conditions (two tubes)
Caractéristiques d'utilisation (deux tubes)
Betriebsdaten (zwei Röhren)

V_a	=	4000		3500		V
V_{g_2}	=	500		500		V
V_{g_1}	=	-90		-85		V
$R_{aa\sim}$	=	15000		11300		Ω
$V_{g_1g_1p}$	=	0	290	0	305	V
I_a	=	2x80	2x319	2x80	2x350	mA
I_{g_2}	=		2x20		2x20	mA
I_{g_1}	=		2x6		2x6,5	mA
W_{g_2}	=		2x10		2x10	W
W_{ig_1}	=		2x0,8		2x0,9	W
W_{ia}	=	2x320	2x1275	2x280	2x1225	W
W_a	=	2x320	2x400	2x280	2x400	W
W_o	=		1750		1650	W
η	=		68,5		67,5	%

V_a	=	3000		2500		V
V_{g_2}	=	500		500		V
V_{g_1}	=	-80		-75		V
$R_{aa\sim}$	=	10000		8000		Ω
$V_{g_1g_1p}$	=	0	292	0	290	V
I_a	=	2x90	2x350	2x95	2x350	mA
I_{g_2}	=		2x20		2x30	mA
I_{g_1}	=		2x6,5		2x7	mA
W_{g_2}	=		2x10		2x15	W
W_{ig_1}	=		2x0,85		2x0,91	W
W_{ia}	=	2x270	2x1050	2x238	2x875	W
W_a	=	2x270	2x362	2x238	2x320	W
W_o	=		1375		1110	W
η	=		65,5		63,5	%

A.F. class B amplifier
Amplificatrice B.F. classe B
NF-Klasse B-Verstärker

I_{g1} = 0

Limiting values (Absolute limits)
Caractéristiques limites (Limites absolues)
Grenzdaten (Absolute Grenzwerte)

V_a	=	max.	4000	V
W_a	=	max.	400	W
I_a	=	max.	350	mA
V_{g2}	=	max.	800	V [3]
W_{g2}	=	max.	35	W
I_{g1}	=	max.	25	mA

Operating conditions (two tubes)
Caractéristiques d'utilisation (deux tubes)
Betriebsdaten (zwei Röhren)

V_a	=	4000		3500		V
V_{g2}	=	750		750		V
V_{g1}	=	-150		-145		V
$R_{aa\sim}$	=	14500		11500		Ω
V_{g1g1p}	=	0	300	0	290	V
I_a	=	2x60	2x293	2x70	2x305	mA
I_{g2}	=		2x15		2x13,5	mA
W_{g2}	=		2x11,2		2x10,4	W
W_{ia}	=	2x240	2x1170	2x245	2x1065	W
W_a	=	2x240	2x400	2x245	2x400	W
W_o	=		1540		1330	W
η	=		66		62,5	%

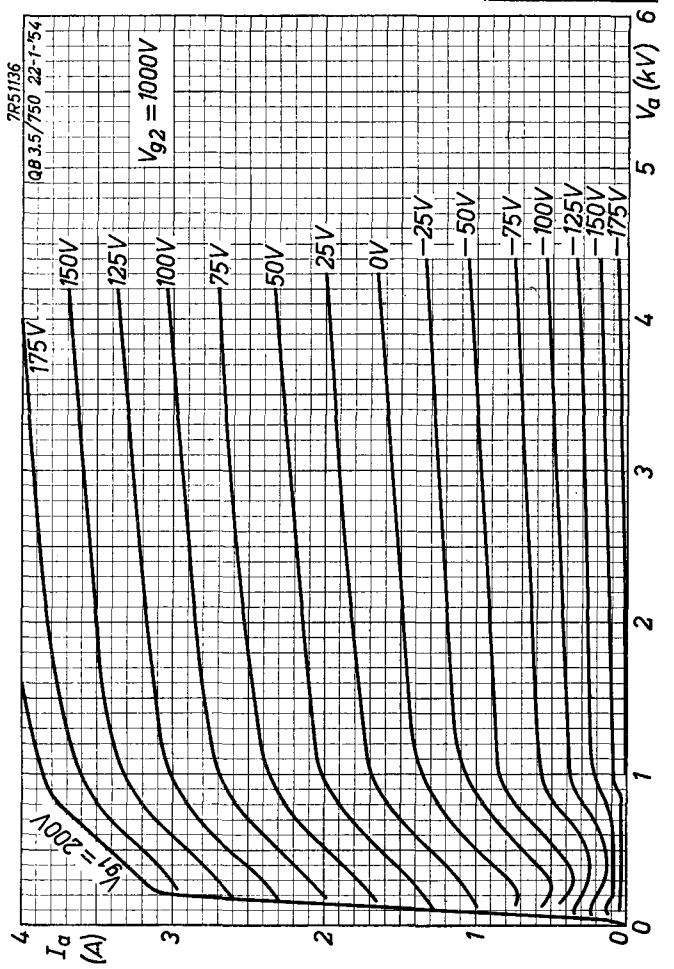
[1]) V_{g2} = max. 1000 V if the temperature of the pin seals is kept below 120 °C
V_{g2} = max. 1000 V si la température des scellements des broches est au-dessous de 120 °C
V_{g2} = max. 1000 V wenn die Temperatur der Einschmelzungen der Stifte unterhalb 120 °C ist

PHILIPS

A.F. class B amplifier (continued)
Amplificatrice B.F. classe B (suite) $I_{g1} = 0$
NF-Klasse B-Verstärker (Fortsetzung)

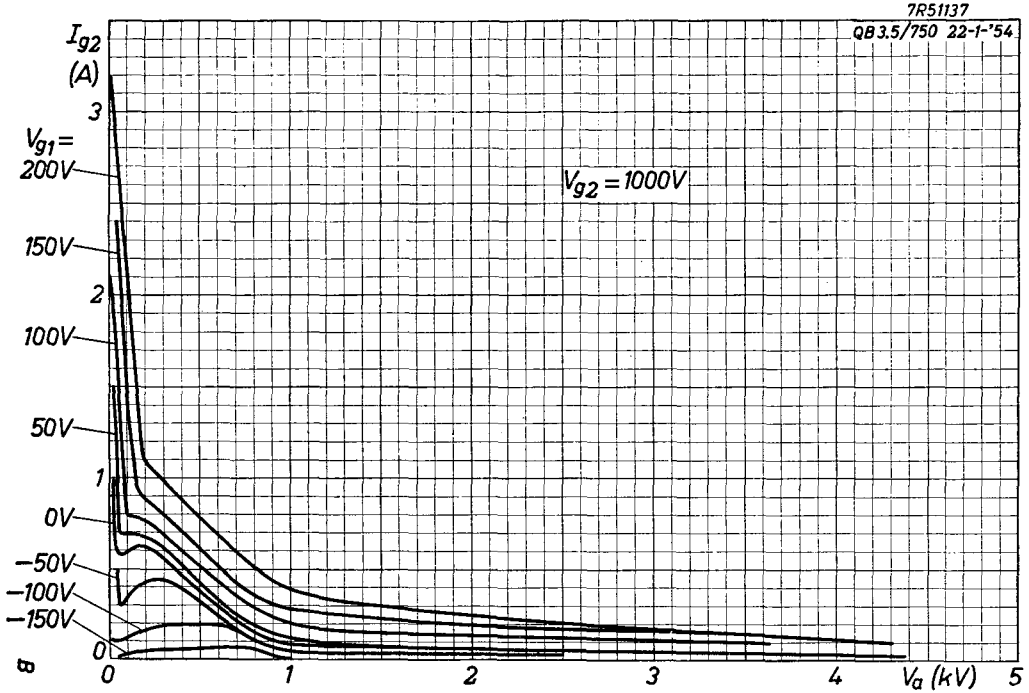
Operating conditions (two tubes)
Caractéristiques d'utilisation (deux tubes)
Betriebsdaten (zwei Röhren)

V_a	=	3000		2500		V
V_{g2}	=	750		750		V
V_{g1}	=	-137		-130		V
$R_{aa\sim}$	=	8900		6800		Ω
V_{g1g1p}	=	0	274	0	260	V
I_a	=	2x80	2x318	2x95	2x318	mA
I_{g2}	=		2x11		2x11,6	mA
W_{g2}	=		2x10,3		2x8,7	W
W_{ia}	=	2x240	2x955	2x238	2x795	W
W_a	=	2x240	2x400	2x238	2x370	W
W_o	=		1110		850	W
η	=		58		53,5	%


7R51136
QB 3.5/750 22-1-54
V_{g2} = 1000V
175V
150V
125V
100V
75V
50V
25V
0V
−25V
−50V
−75V
−100V
−125V
−150V
−175V
V_{g1} = 200V
I_a (A)
V_a (kV)
0
1
2
3
4
5
6

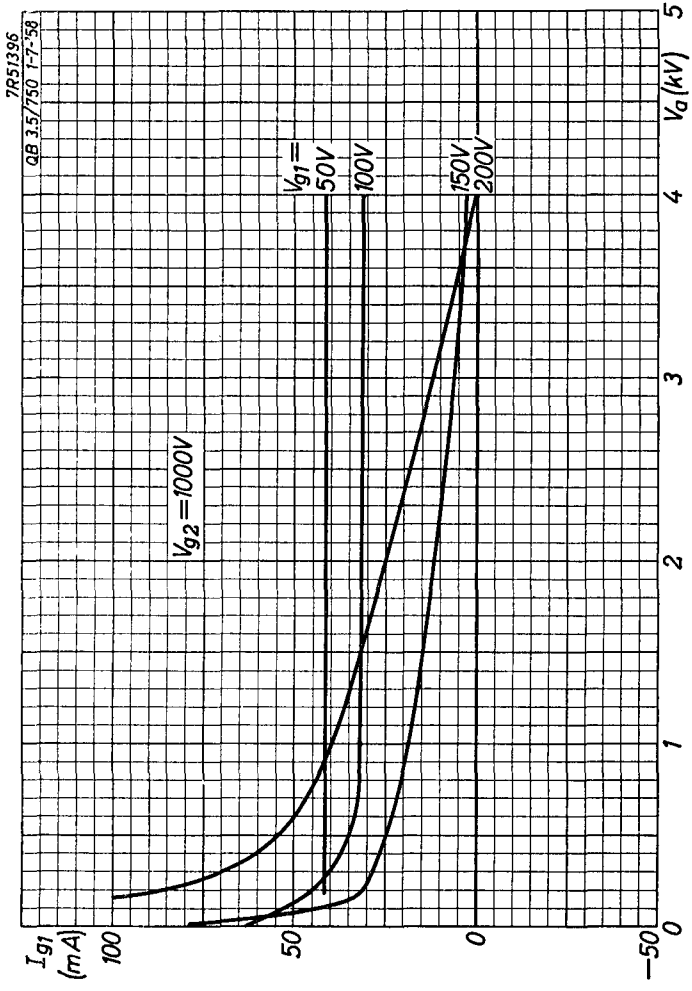
A

3.3.1960



QB 4/1100

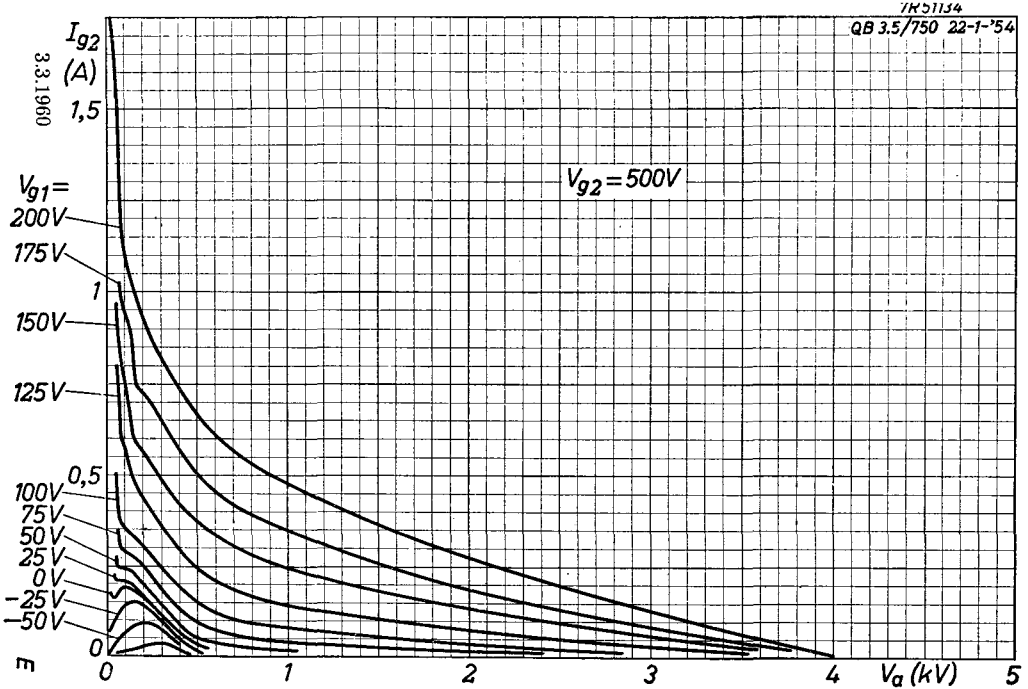
PHILIPS


7R51396
QB 3.5/750 1-7-'58
V_{g1} = 50V
100V
150V
200V
V_{g2} = 1000V
I_{g1} (mA)
100
50
0
−50
0
1
2
3
4
5
V_a (kV)

QB 4/1100

PHILIPS

D



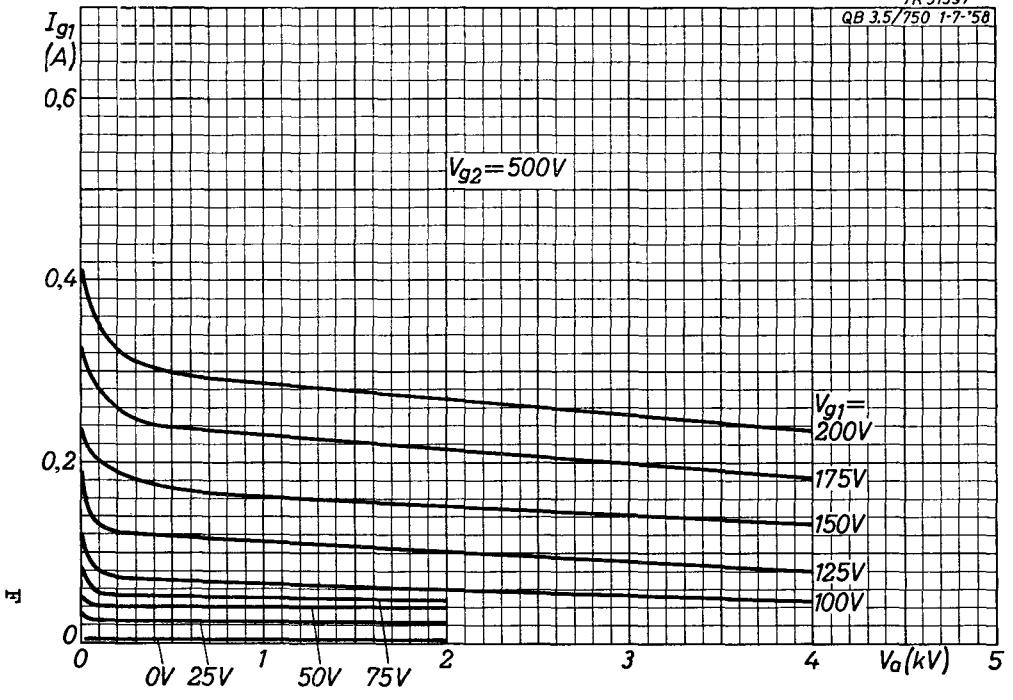
3.3.1960

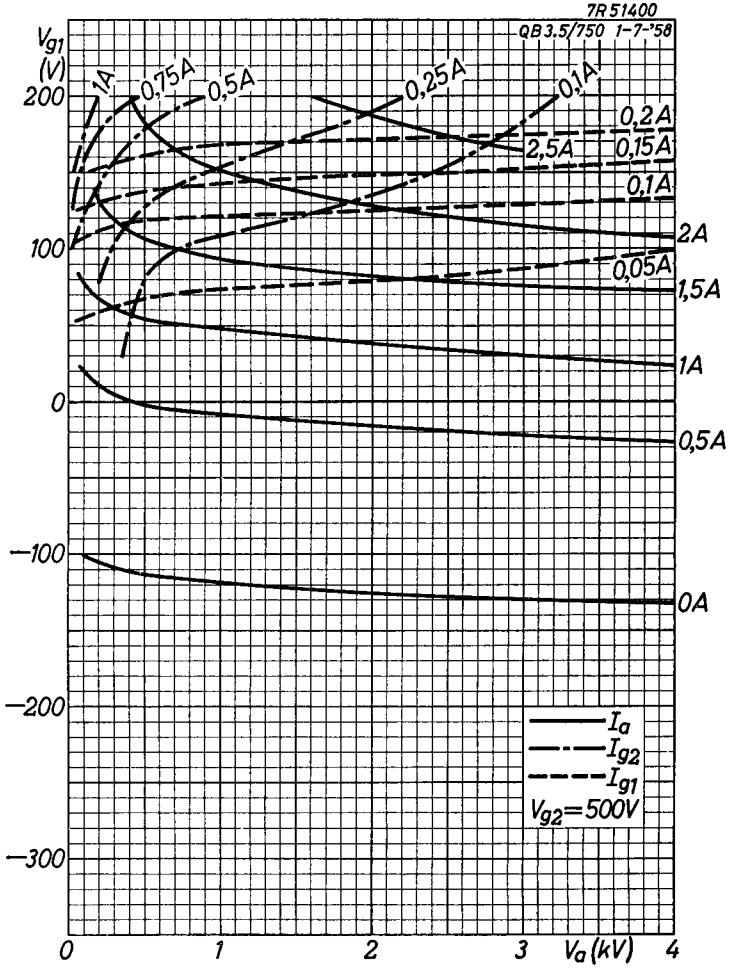
PHILIPS

QB 4/1100

QB 4/1100

PHILIPS




7R51400
QB3.5/750 1-7-'58
V_{g1} (V)
200
100
0
−100
−200
−300
1A
0,75A
0,5A
0,25A
0,1A
0,2A
0,15A
0,1A
0,05A
2,5A
2A
1,5A
1A
0,5A
0A
I_a
I_{g2}
I_{g1}
V_{g2}=500V
0
1
2
3
V_a(kV)
4

PHILIPS

Electronic Tube

HANDBOOK

QB4/1100

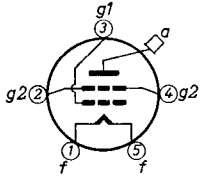
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4	4	1960.09.09
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7	7	1959.05.05
8	8	1959.05.05
9	9	1959.05.05
10	10	1959.05.05
11	A	1960.03.03
12	B	1960.03.03
13	C	1960.03.03
14	D	1960.03.03
15	E	1960.03.03
16	F	1960.03.03
17	G	1960.03.03
18	FP	2000.01.15

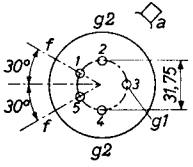
PHILIPS

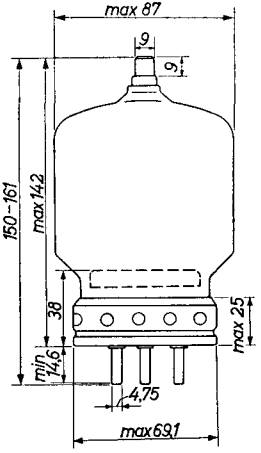
QB 4/1100 GA

TETRODE for use in A.M. and F.M. transmitters
TETRODE pour utilisation dans des émetteurs A.M. et F.M.
TETRODE zur Verwendung in AM- und FM-Sendern

Dimensions in mm
Dimensions en mm
Abmessungen in mm







Base : Metal-shell Giant 5p.
Culot : Giant 5p. avec culot métallique
Sockel: Giant 5p. mit Metallring

Socket
Support 40211/01
Fassung

For further data and curves please refer to QB 4/1100
Pour les autres données et les courbes voir QB 4/1100
Für die übrigen Daten und Kurven siehe QB 4/1100

PHILIPS

Electronic Tube

HANDBOOK

QB4/1100GA

page	sheet	date
1	1	1960.07.07
2	FP	2000.01.15

TETRODE for use as H.F.amplifier,frequency multiplier or modulator
TETRODE pour utilisation en amplificatrice H.F., multiplicatrice de fréquence ou modulatrice
TETRODE zur Verwendung als HF-Verstärker, Frequenzvervielfacher oder Modulator

Cooling : radiation/low velocity air flow
Refroidissement: radiation/léger courant d'air
Kühlung : Strahlung/schwacher Luftstrom

Filament : thoriated tungsten
Filament : tungstène thorié
Heizfaden: thoriertes Wolfram

Heating : direct
Chauffage: direct
Heizung : direkt

V_f = 10 V
I_f = 9,9 A

Capacitances
Capacités
Kapazitäten

C_{g1} = 24 pF
C_a = 8,3 pF
C_{ag1} = 0,25 pF

Typical characteristics
Caractéristiques types
Kenndaten

μ_{g2g1} (I_a = 120 mA)= 9,5
S (I_a = 120 mA)= 7 mA/V

λ	Freq.	C telegr.		C_{ag2} mod		C_{g1} mod	
(m)	(Mc/s)	V_a (V)	W_o (W)	V_a (V)	W_o (W)	V_a (V)	W_o (W)
5	60	5000	1760	4000	1200	4500	400
		4000	1410			4000	330

λ	Freq.	Single side band B Une bande latérale Ein Seitenband		B_{mod} [1]	
(m)	(Mc/s)	V_a (V)	W_o (W)	V_a (V)	W_o (W)
5	60	5000	900	5000	2220
				4000	2250

Industrial application, H.F. class C
Application industrielle, H.F. classe C
Industrielle Anwendung, HF-Klasse C

λ	Freq.	∿ 2)		⎓ 3)	
(m)	(Mc/s)	V_{tr} (V_{eff})	W_o (W)	V_{tr} (V_{eff})[4]	W_o (W)
5	60	4800	750	4250	1110

1)2)3)4) See page 3; voir page 3; siehe Seite 3

PHILIPS

Cooling
Refroidissement
Kühlung

In order to keep the temperatures below the maximum permitted values it may be necessary to direct an air flow to the seals

Afin de maintenir les temperatures au-dessous des valeurs maximum admissible il peut être nécessaire de diriger un courant d'air vers les scellements

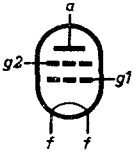
Damit die Temperaturen unterhalb der höchstzulässigen Werte bleiben, kann ein Luftstrom auf die Einschmelzungen notwendig sein

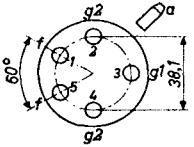
Bulb temperature
Température de l'ampoule = max. 250 °C
Kolbentemperatur

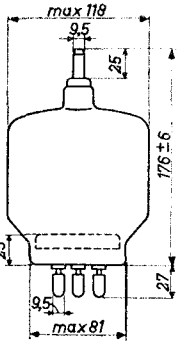
Temperature of anode seal
Température du scellement de l'anode = max. 220 °C
Temperatur der Anodeneinschmelzung

Temperature of pin seals
Température des scellements des broches = max. 180 °C
Temperatur der Stifteneinschmelzungen

Dimensions in mm
Dimensions en mm
Abmessungen in mm







Mounting position: Montage Einbau	vertical with base up or down : verticale avec le culot en haut ou en bas : senkrecht mit dem Sockel oben oder unten	
Accessories Accessoires Zubehörteile	Socket Support Fassung	40216
	Clip for ande connection Borne de connexion de l'anode Anodenanschlussklemme	40626
Net weight Poids net Nettogewicht	375 g	
Shipping weight Poids brut Bruttogewicht	1,35 kg	

---

[1]) Two tubes
Deux tubes
Zwei Röhren

→ [2]) = selfrectification
= auto-redressement
= Selbstgleichrichtung

→ [3]) = two phase half wave rectification without filter
= redressement biphasé à une alternance sans filtre
= Zweiphasen-Einweggleichrichtung ohne Filter

[4]) Each phase
Chaque phase
Jede Phase

PHILIPS

H.F. class C telegraphy
H.F. classe C télégraphie
HF- Klasse C Telegraphie

Limiting values
Caractéristiques limites
Grenzdaten

f	= max.	75	Mc/s	
V_a	= max.	5	kV	
N_{1a}	= max.	2250	W	
W_a	= max.	500	W	
I_a	= max.	450	mA	
V_{g2}	= max.	700	V	
W_{g2}	= max.	65	W	
$-V_{g1}$	= max.	500	V	
W_{g1}	= max.	25	W	

f	= max.	110	Mc/s[1]
V_a	= max.	4,5	kV
N_{1a}	= max.	1800	W

Operating conditions
Caractéristiques d'utilisation
Betriebsdaten

f	≤	60	60	60	60	Mc/s
V_a	=	5	5	4	4	kV
V_{g2}	=	600	700	600	700	V
V_{g1}	=	-200	-200	-200	-200	V
I_a	=	440	440	450	450	mA
I_{g2}	=	80	75	90	85	mA
I_{g1}	=	35	25	39	27	mA
V_{g1p}	=	350	340	350	340	V
W_{1a}	=	2200	2200	1800	1800	W
W_{1g1}	=	12	8	14	8,5	W
W_{1g2}	=	48	52,5	54	59,5	W
W_a	=	440	440	390	390	W
W_o	=	1760	1760	1410	1410	W
η	=	80	80	78	78	%

[1])See page N; voir page N; siehe Seite N

H.F.class C anode and screen grid modulation
H.F.classe C modulation d'anode et de grille écran
HF- Klasse C Anoden- und Schirmgittermodulation

Screen grid modulated via a choke of 2 H
La grille-écran modulée à travers une bobine de 2 H
Schirmgitter moduliert über eine Drosselspule von 2 H

Limiting values
Caractéristiques limites
Grenzdaten

f	= max.	75 Mc/s
V_a	= max.	4 kV
W_{ia}	= max.	1600 W
W_a	= max.	330 W
I_a	= max.	400 mA
V_{g2}	= max.	700 V
W_{g2}	= max.	50 W
$-V_{g1}$	= max.	500 V
W_{g1}	= max.	25 W

Operating conditions
Caractéristiques d'utilisation
Betriebsdaten

f	≤	60 Mc/s
V_a	=	4 kV
V_{g2}	=	600 V
V_{g1}	=	-240 V
V_{g2p}	=	340 V
V_{g1p}	=	415 V
I_a	=	380 mA
I_{g2}	=	80 mA
I_{g1}	=	20 mA
W_{ia}	=	1520 W
W_{ig1}	=	7,5 W
W_{ig2}	=	48 W
W_a	=	320 W
W_o	=	1200 W
η	=	79 %
m	=	100 %
W_{mod}	=	760 W

PHILIPS

H.F. class C control grid modulation
H.F. classe C modulation de grille de commande
HF-Klasse C Steuergittermodulation

Limiting values
Caractéristiques limites
Grenzdaten

f	=	max.	75 Mc/s
V_a	=	max.	5000 V
W_{ia}	=	max.	1000 W
W_a	=	max.	500 W
I_a	=	max.	225 mA
V_{g2}	=	max.	700 V
W_{g2}	=	max.	50 W
$-V_{g1}$	=	max.	500 V

Operating conditions
Caractéristiques d'utilisation
Betriebsdaten

f	≤	60	60 Mc/s
V_a	=	4500	4000 V
V_{g2}	=	600	600 V
V_{g1}	=	-180[1])	-180[1])V
R_{g1}	=	1400	1400 Ω
$V_{gi\,p}$	=	220	210 V
I_a	=	200	200 mA
I_{g2}	=	5	5 mA
I_{g1}	=	6,5	6,5 mA
W_{igl}	=	1,3	1,2 W
W_{ia}	=	900	800 W
W_a	=	500	470 W
W_{g2}	=	3	3 W
W_o	=	400	330 W
η	=	44,5	41 %
m	=	100	100 %
$V_{gl\,mod\,p}$	=	100	100 V
I_{gl} [2])	=	26	27 mA
W_{igl} [2])	=	5	5 W

[1])[2])See page 7; voir page 7; siehe Seite 7

H.F. class B amplifier single side band
H.F. classe B amplificateur à une bande latérale
HF-Klasse B Einseitenbandverstärker

Limiting values
Caractéristiques limites
Grenzdaten

f	= max.	75	Mc/s
V_a	= max.	5000	V
W_{ia}	= max.	2250	W
W_a	= max.	500	W
I_a	= max.	450	mA
V_{g2}	= max.	700	V
W_{g2}	= max.	65	W
R_{g1}	= max.	50	kΩ

Operating conditions
Caractéristiques d'utilisation
Betriebsdaten

f	=	60		Mc/s
V_a	=	5000		V
V_{g2}	=	700		V
V_{g1}	=	-90		V
V_{g1p}	=	0	130	V
I_a	=	56	280	mA
I_{g2}	=	0	25	mA
I_{g1}	=	0	1	mA
W_{1g1}	=	0	1	W
W_{1a}	=	280	1400	W
W_a	=	280	500	W
W_{g2}	=	0	18	W
W_o	=	0	900	W
η	=		64,5	%

[1]) With -170 V from fixed bias supply included
Y compris une tension de polarisation fixe de -170 V
Einschliesslich einer festen Vorspannung von -170 V

[2]) At crest of modulation
A la crête de modulation
Beim Scheitel der Modulation

Operating conditions as H.F. class C amplifier for industrial use with self rectification
Caractéristiques d'utilisation en amplificatrice H.F. classe C pour des applications industrielles à auto redressement
Betriebsdaten als HF-Klasse C Verstärker für industrielle Anwendungen mit Selbstgleichrichtung

Limiting values (absolute values)
Caractéristiques limites (valeurs absolues)
Grenzdaten (absolute Werte)

f	= max. 75 Mc/s	$V_{tr\,g2}$ [1])	= max. 780 Veff
$V_{tr\,a}$ [1])	= max. 5600 Veff	W_{g2}	= max. 65 W
W_{ia}	= max. 1460 W	$-V_{g1}$	= max. 500 V
W_a	= max. 500 W	I_{g1}	= max. 25 mA
I_a	= max. 340 mA	R_{g1}	= max. 50 kΩ

Operating conditions
Caractéristiques d'utilisation [2])
Betriebsdaten

f	≤	60 Mc/s
$V_{tr\,a}$ [1])	=	4800 Veff
$V_{tr\,g2}$ [1])	=	670 Veff
R_{g1}	=	16 kΩ
V_{g1p}	=	350 V
I_a	=	200 mA
I_{g2}	=	32 mA
I_{g1}	=	11 mA
W_{ig1}	=	3,5 W
W_{ia}	=	1060 W
W_a	=	310 W
W_{g2}	=	24 W
W_o	=	750 W
η	=	71 %

[1]) See page 9; voir page 9; siehe Seite 9

[2]) Under these conditions normal deviations of voltages and load are permissible. The absolute limiting values of the tube must, however, not be exceeded
Dans cettes conditions des déviations normales des tensions et de la charge sont permises. Il ne faut cependant pas dépasser les caractéristiques limites absolues
Unter diesen Bedingungen sind normale Abweichungen der Spannungen und der Belastung gestattet. Die absoluten Grenzwerte dürfen jedoch nicht überschritten werden

Operating conditions as H.F. class C amplifier for industrial use with anode voltage from two-phase half-wave rectifier without filter
Caractéristiques d'utilisation en amplificatrice H.F. classe C pour des applications industrielles avec tension anodique dérivée d'un redresseur biphasé à une alternance sans filtre
Betriebsdaten als HF-Klasse C Verstärker für industrielle Anwendungen mit der Anodenspannung abgenommen von einem Zweiphasen-Einweggleichrichter ohne Filter

Limiting values (absolute limits)
Caractéristiques limites (valeurs absolues)
Grenzdaten (absolute Werte)

f	= max. 75 Mc/s	$V_{tr\ g2}$ [1]	= max.	700	V_{eff}
$V_{tr\ a}$ [1]	= max. 5000 V_{eff}	W_{g2}	= max.	65	W
W_{ia}	= max. 2250 W	$-V_{g1}$	= max.	500	V
W_a	= max. 500 W	W_{g1}	= max.	25	W
I_a	= max. 400 V_{eff}	I_{g1}	= max.	45	mA
		R_{g1}	= max.	50	kΩ

Operating conditions
Caractéristiques d'utilisation [2]
Betriebsdaten

f	≤	60 Mc/s
V_{tr_a} [1]	=	4250 V_{eff}
V_a [3]	=	3825 V
$V_{tr_{g2}}$ [1]	=	600 V
V_{g2} [3]	=	540 V
R_{g1}	=	14 kΩ
V_{g1p}	=	300 V
I_a	=	325 mA
I_{g2}	=	20 mA
I_{g1}	=	15 mA
W_{ig1}	=	4 W
W_{ia}	=	1535 W
W_a	=	425 W
W_{g2}	=	13,3 W
W_o	=	1110 W
η	=	72 %

[1] $V_{tr\ a}$ und $V_{tr\ g2}$ are the anode transformer secondary voltage per phase and the screen grid transformer secondary voltage per phase respectively
$V_{tr\ a}$ et $V_{tr\ g2}$ sont les tensions secondaires par phase des transformateurs d'anode respectivement de la grille-écran
$V_{tr\ a}$ und $V_{tr\ g2}$ sind die Sekundärspannungen pro Phase des Anoden-bzw. Schirmgittertransformators.

[2] See page 8; voir page 8; siehe Seite 8

[3] D.C. value; valeur moyenne; mittlerer Wert

PHILIPS

L.F. class B amplifier and modulator
Amplificatrice et modulatrice B.F. classe B
NF-Verstärker und Modulator Klasse B

Limiting values
Caractéristiques limites
Grenzdaten

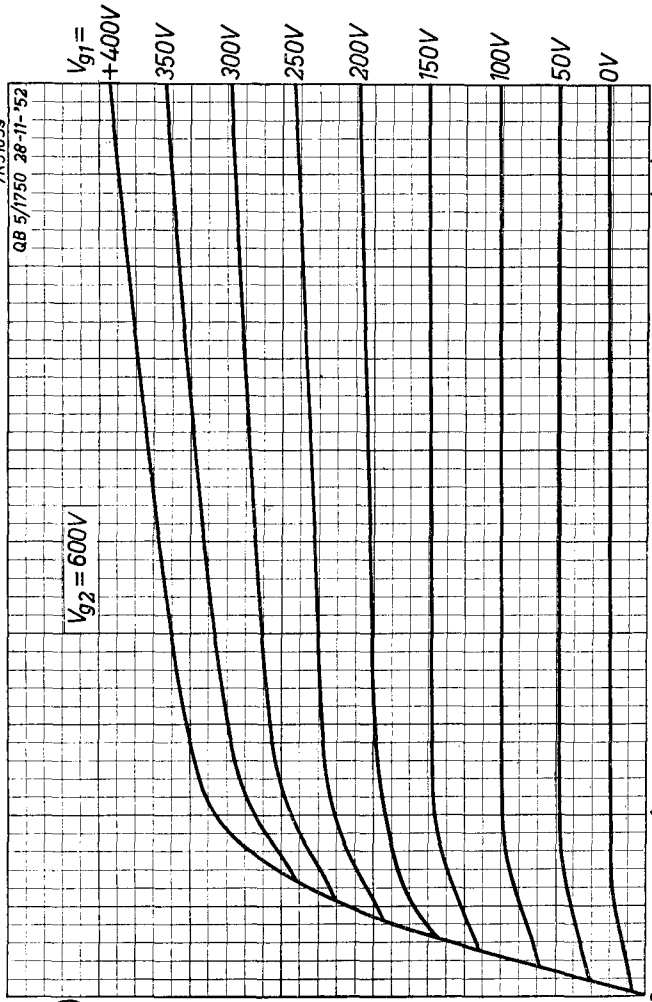
V_a	= max.	5000 V
W_{ia}	= max.	2250 W
W_a	= max.	500 W
I_a	= max.	450 mA
V_{g2}	= max.	700 V
W_{g2}	= max.	65 W
$-V_{g1}$	= max.	500 V
I_{g1}	= max.	45 mA
R_{g1}	= max.	50 kΩ

Operating conditions, two tubes
Caractéristiques d'utilisation, deux tubes
Betriebsdaten, zwei Röhren

V_a	=	5000		4000		4000	V
V_{g2}	=	600		600		600	V
V_{g1}	=	-62,5		-62,5		-60	V
$R_{aa\sim}$	=	26		20		16	kΩ
V_{g1g1_p}	=	0	260	0	254	0	305 V
I_a	=	2x50	2x290	2x45	2x285	2x55	2x366 mA
I_{g2}	=	0	2x43	0	2x40	0	2x60 mA
I_{g1}	=	0	2x13	0	2x13,5	0	2x18 mA
W_{ig1}	=	0	2x1,5	0	2x1,5	0	2x2,5 W
W_{ia}	=	2x250	2x1450	2x180	2x1140	2x220	2x1465 W
W_a	=	2x250	2x340	2x180	2x300	2x220	2x340 W
W_{g2}	=	0	2x26	0	2x24	0	2x36 W
W_o	=	0	2220	0	1680	0	2250 W
d_{tot}	=	-	5	-	4,7	-	5 %
η	=	-	76,5	-	74	-	76,5 %

PHILIPS

QB 5/1750

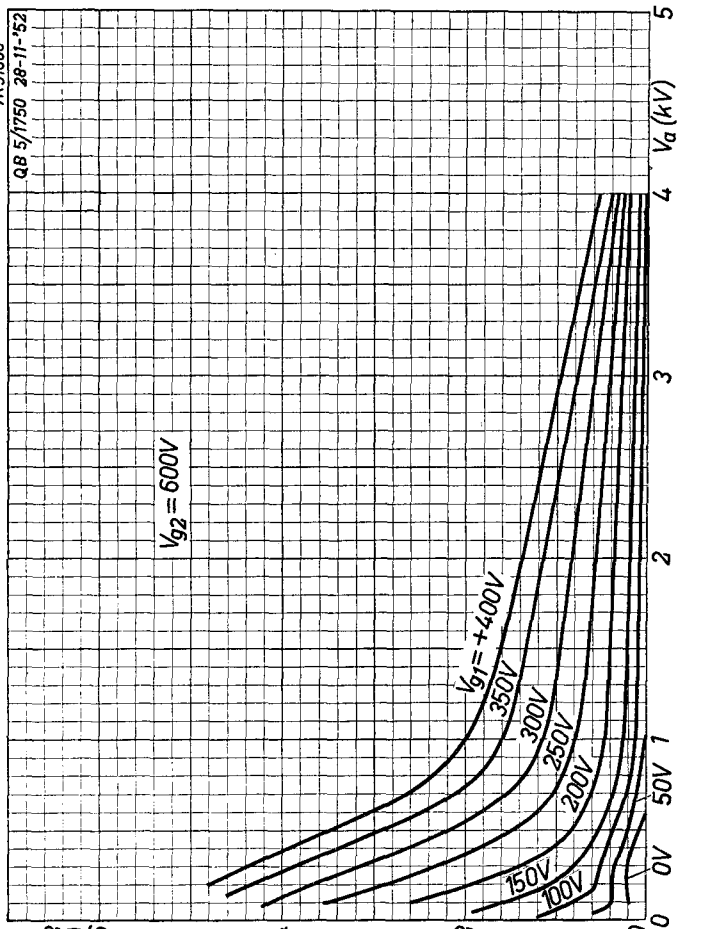


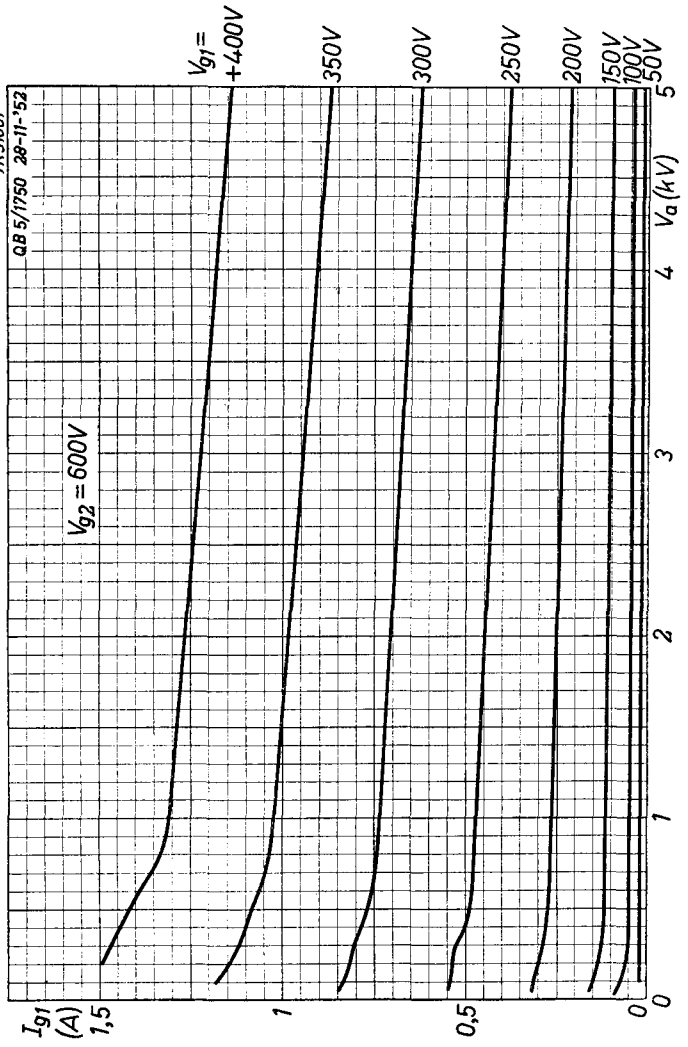
12.12.1952

A

QB 5/1750

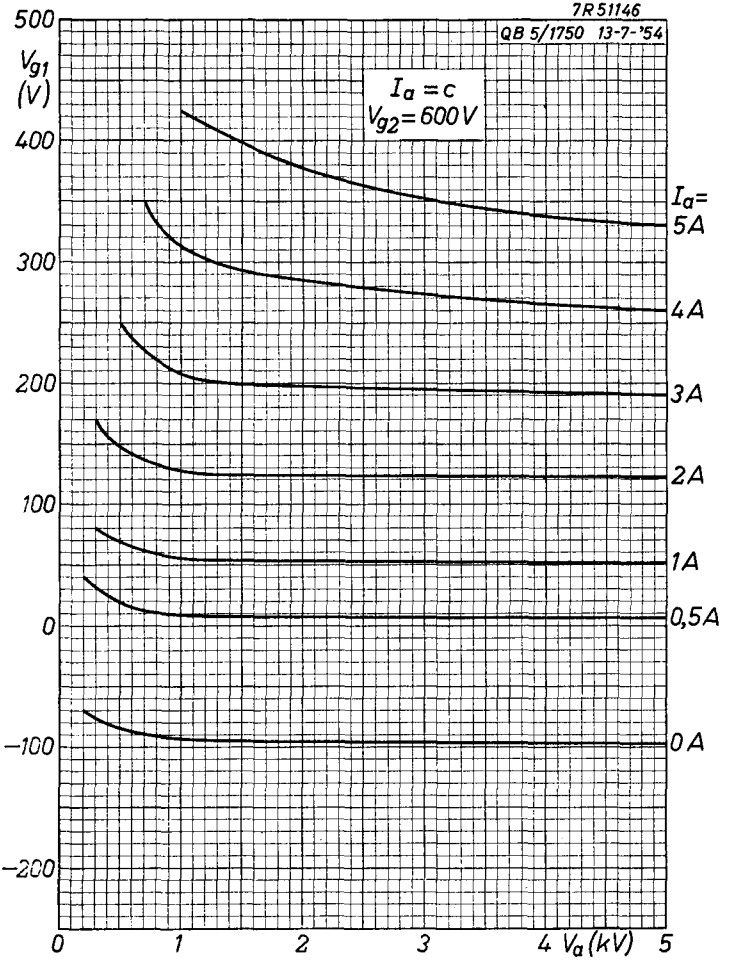
PHILIPS



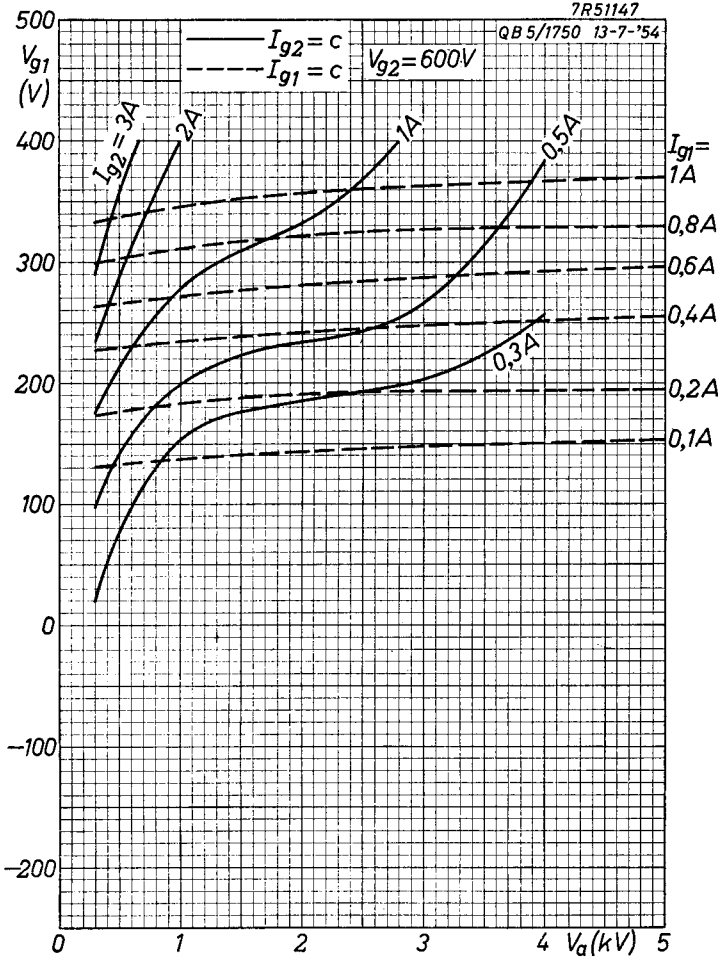

7R51061
QB 5/1750 28-11-'52
V_{g1} = +400V
350V
300V
250V
200V
150V
100V
50V
V_{g2} = 600V
I_{g1} (A)
1,5
1
0,5
0
0
1
2
3
4
5
V_a (kV)

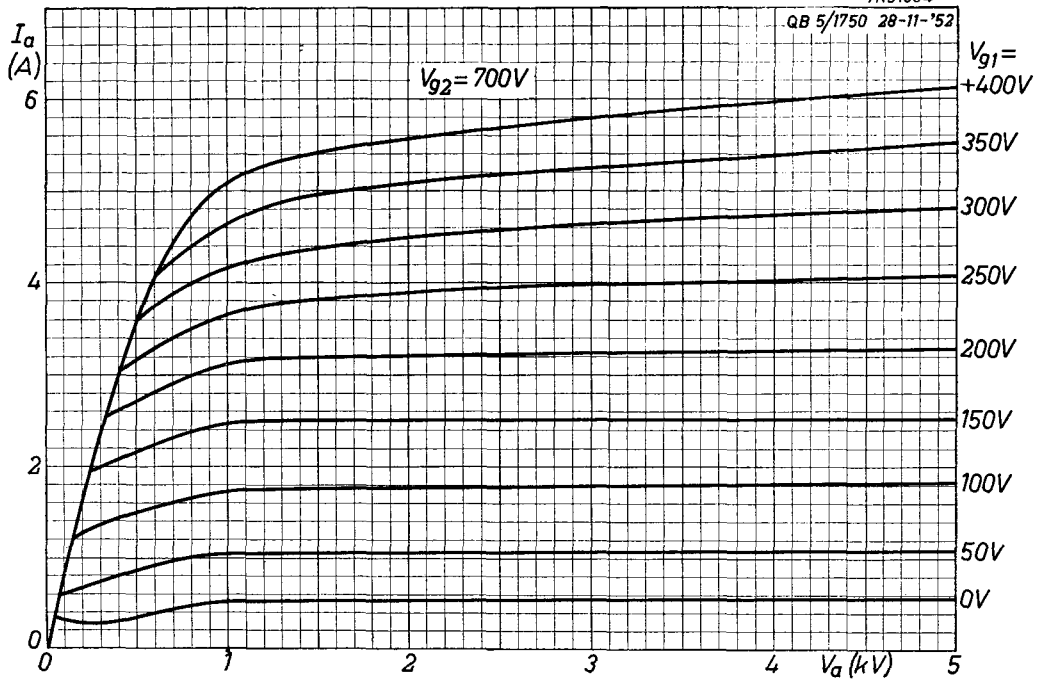
QB 5/1750

PHILIPS



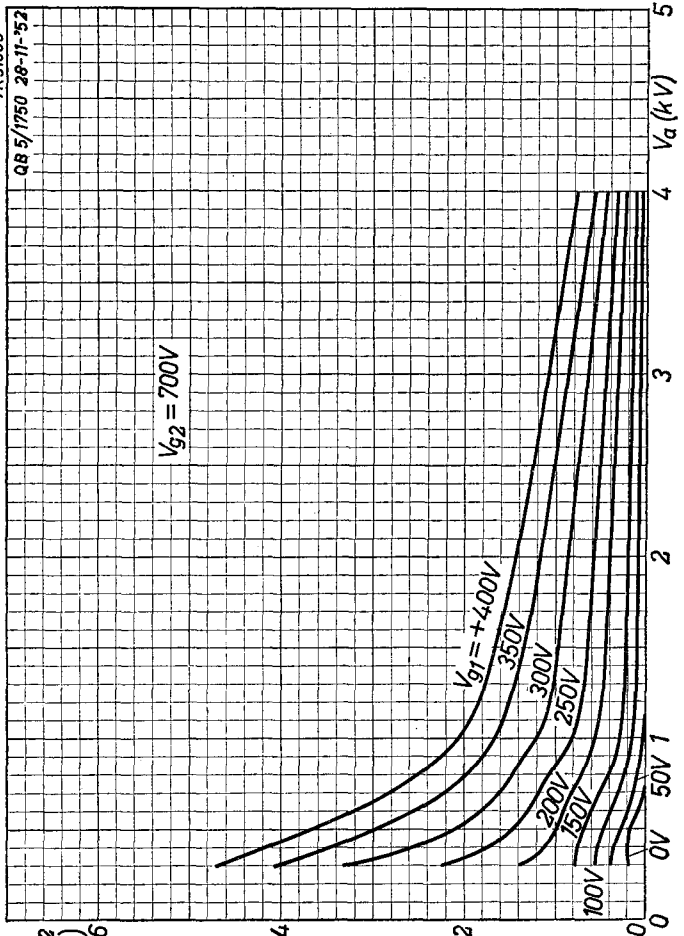
D

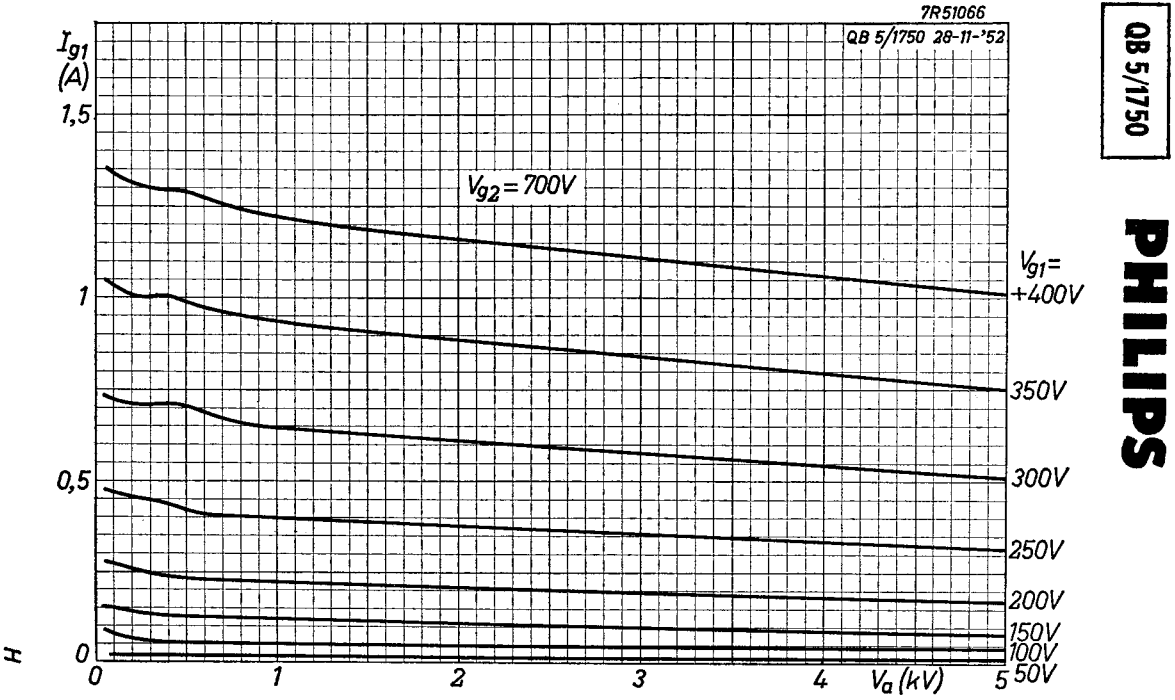

7R51147
QB 5/1750 13-7-'54
I_{g2} = c
I_{g1} = c
V_{g2} = 600V
V_{g1} (V)
500
400
300
200
100
0
−100
−200
I_{g2} = 3A
2A
1A
0,5A
0,3A
I_{g1} =
1A
0,8A
0,6A
0,4A
0,2A
0,1A
0
1
2
3
4
V_a (kV)
5


7R51064
QB 5/1750 28-11-'52
I_a (A)
V_{g2} = 700V
V_{g1} =
+400V
350V
300V
250V
200V
150V
100V
50V
0V
6
4
2
0
0
1
2
3
4
5
V_a (kV)

PHILIPS

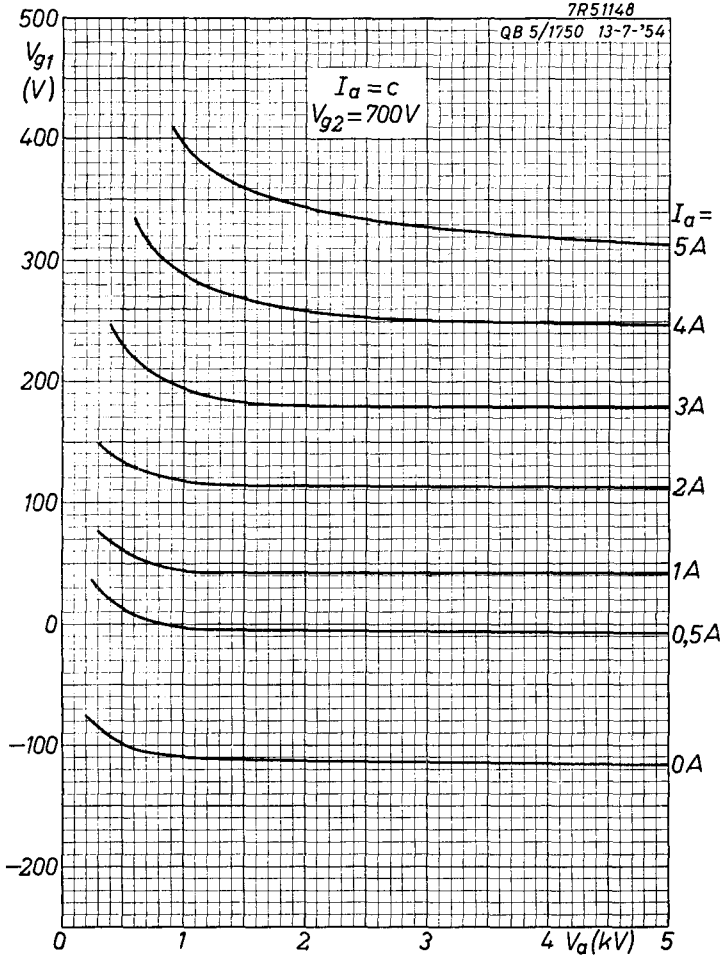
F


7R51065
QB 5/1750 28-11-'52
I_{g2} (A)
6
4
2
0
V_{g2} = 700V
V_{g1} = +400V
350V
300V
250V
200V
150V
100V
50V
1
0V
0
2
3
4
5
V_a (kV)



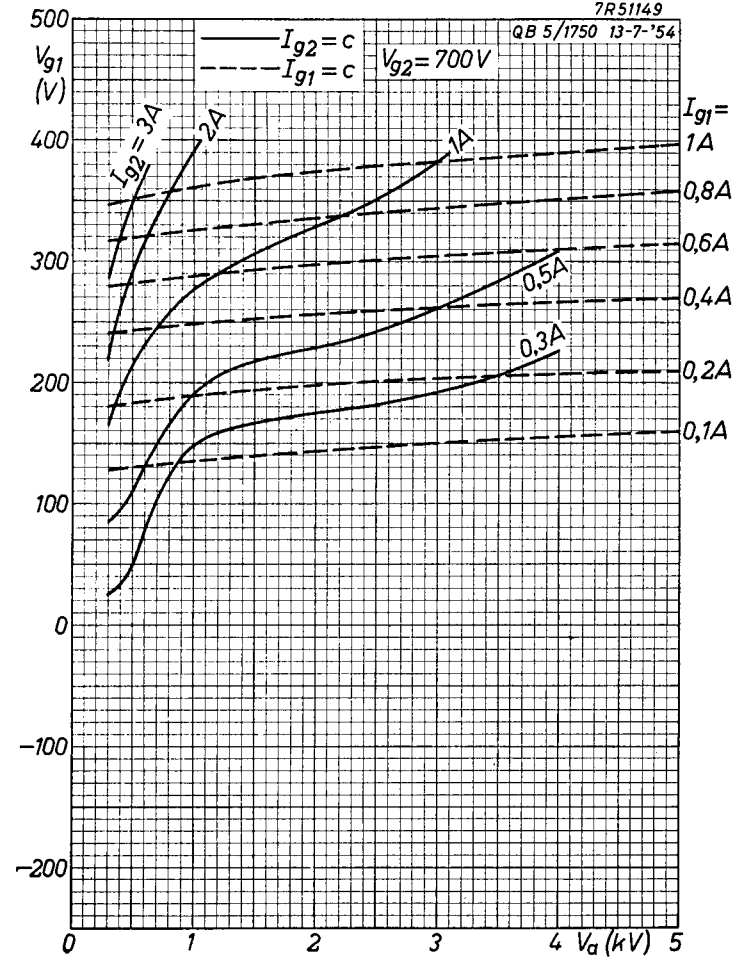
QB 5/1750

PHILIPS


7R51148
QB 5/1750 13-7-'54
$I_a = c$
$V_{g2} = 700V$
V_{g1} (V)
500
400
300
200
100
0
−100
−200
I_a =
5A
4A
3A
2A
1A
0,5A
0A
0
1
2
3
4 V_a(kV)
5

QB 5/1750

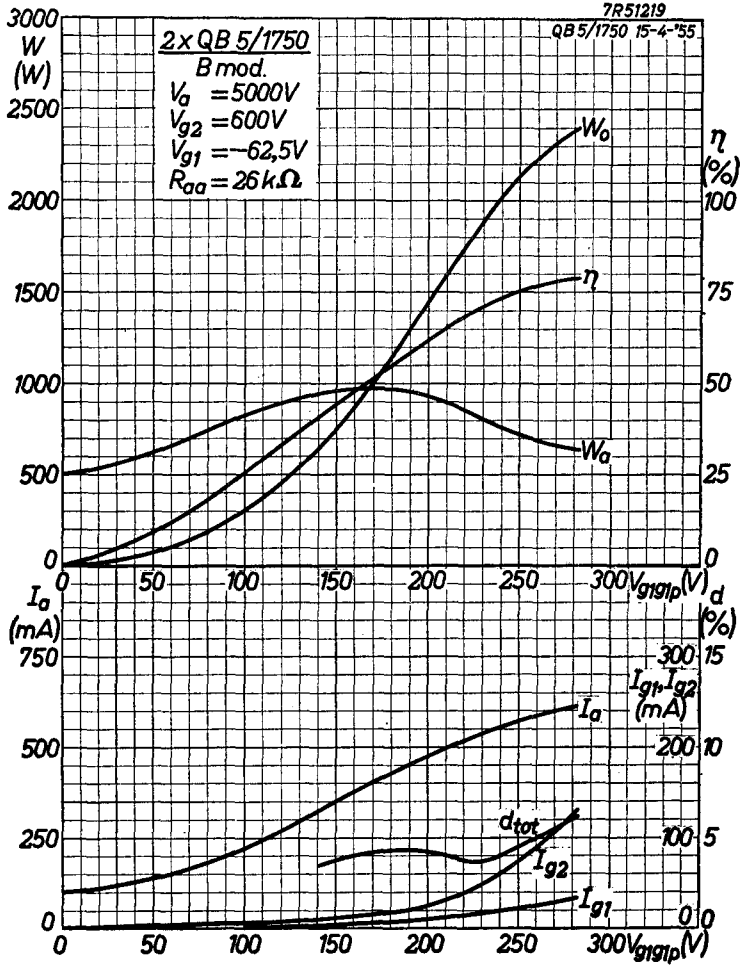
PHILIPS



J

PHILIPS

QB 5/1750

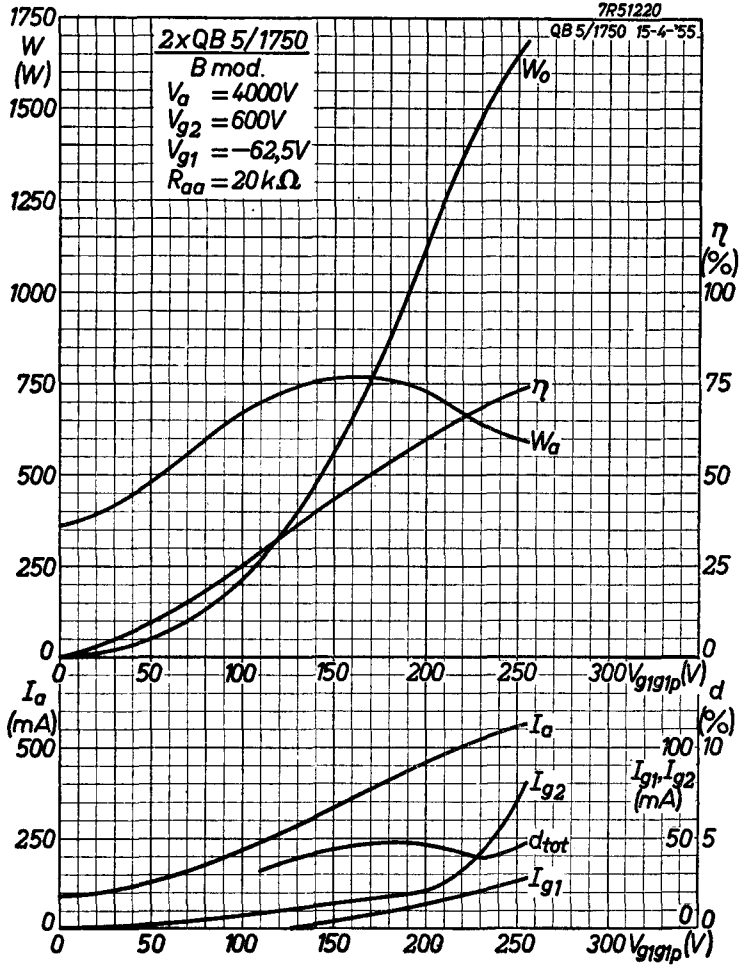


10.10.1955

K

QB 5/1750

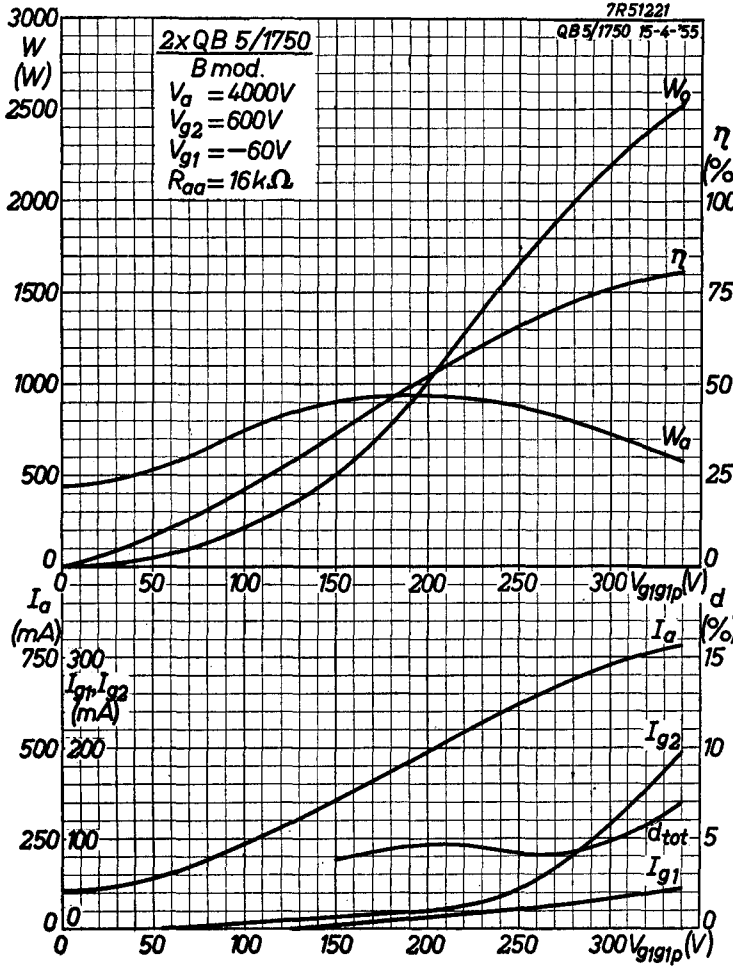
PHILIPS



L

PHILIPS

QB 5/1750

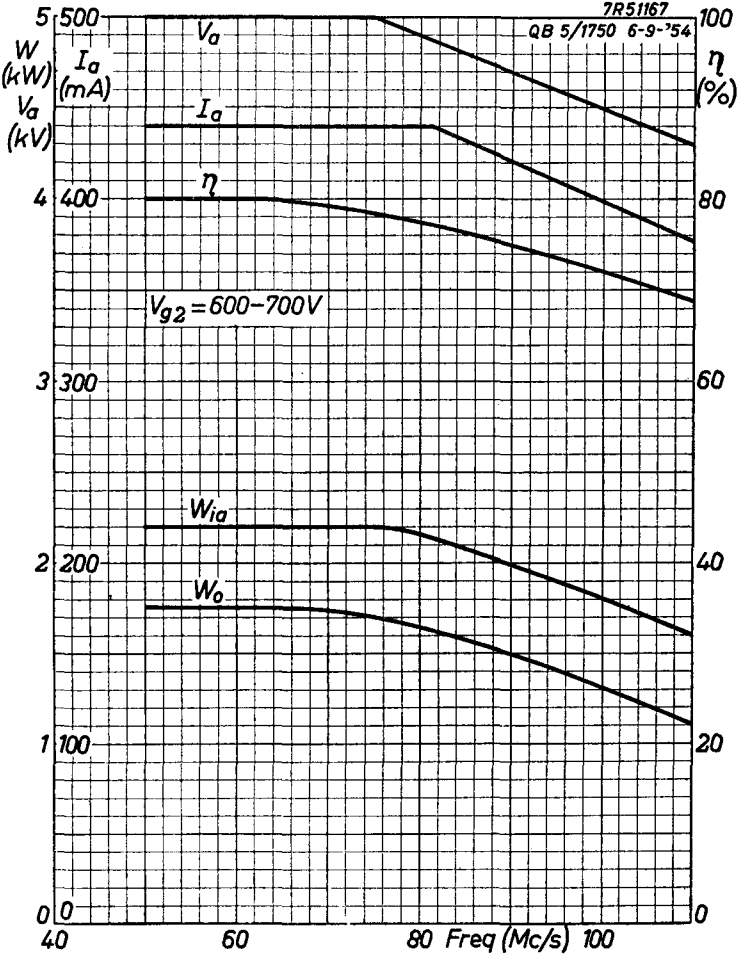


10.10.1955

M

QB 5/1750

PHILIPS



N

PHILIPS

Electronic Tube

HANDBOOK

QB5/1750

page	Sheet	date
1	1	1955.10.10
2	2	1955.10.10
3	3	1955.10.10
4	4	1955.10.10
5	5	1955.10.10
6	6	1955.10.10
7	7	1955.10.10
8	8	1955.10.10
9	9	1955.10.10
10	10	1955.10.10
11	A	1952.12.12
12	B	1952.12.12
13	C	1954.07.07
14	D	1954.07.07
15	E	1954.07.07
16	F	1954.07.07
17	G	1952.12.12
18	H	1952.12.12
19	I	1954.07.07

20	J	1954.07.07
21	K	1955.10.10
22	L	1955.10.10
23	M	1955.10.10
24	N	1955.10.10
25, 26	FP	1999.10.17

POWER TETRODE for use as A.M. and single side band amplifier

FILAMENT: thoriated tungsten

HEATING: direct; parallel supply

Filament voltage	V_f	= 7.5 V
Filament current	I_f	= 22.6 A

The filament current must never exceed a peak value of 45 A instantaneously at any time during the energizing schedule

CAPACITANCES

Anode to all other elements	C_a	= 9.5 pF
Grid No.1 to all other elements	C_{g_1}	= 47.6 pF
Grid No.1 to anode	C_{ag_1}	= 0.1 pF

TYPICAL CHARACTERISTICS

Anode voltage	V_a	= 4000 V
Grid No.2 voltage	V_{g_2}	= 600 V
Anode current	I_a	= 200 mA
Mutual conductance	S	= 10 mA/V
Amplification factor of grid No.1 with respect to grid No.2	$\mu_{g_2g_1}$	= 5.1

Frequency	C telegraphy		B, single side band	
(Mc/s)	V_a(kV)	W_o(kW)	V_a(kV)	W_o(P.E.P.; kW)
30	5	2.4	4	1.3

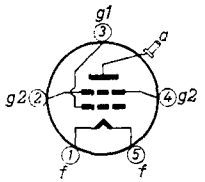
COOLING: radiation and convection; low velocity air flow

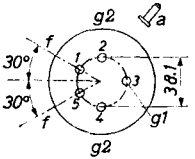
TEMPERATURES

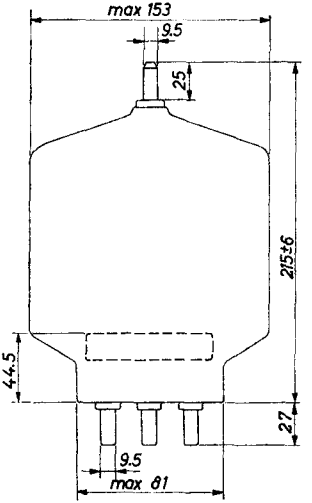
Anode seal temperature	max. 220 °C
Bottom pin seal temperature	max. 180 °C
Bulb temperature	max. 350 °C

PHILIPS

Dimensions in mm







Base: GIANT 5p
Socket: 40216
Anode clip: 40665

Mounting position: vertical

Net weight: 620 g
Shipping weight: 2.25 kg

H.F. class C amplifier

LIMITING VALUES (Absolute limits)

Frequency	f	up to 30	Mc/s
Anode voltage	V_a	= max. 5.5	kV
Anode dissipation	W_a	= max. 800	W
Anode input power	W_{i_a}	= max. 3.5	kW
Anode current	I_a	= max. 700	mA
Grid No.2 voltage	V_{g_2}	= max. 800	V
Grid No.2 dissipation	W_{g_2}	= max. 120	W
Negative grid No.1 voltage	$-V_{g_1}$	= max. 500	V
Grid No.1 current	I_{g_1}	= max. 35	mA

OPERATING CONDITIONS

Frequency	f	= 30	Mc/s
Anode voltage	V_a	= 5	kV
Grid No.2 voltage	V_{g_2}	= 600	V
Grid No.1 voltage	V_{g_1}	= -240	V
Anode current	I_a	= 600	mA
Grid No.2 current	I_{g_2}	= 185	mA
Grid No.1 current	I_{g_1}	= 20	mA
Peak H.F. grid No.1 voltage	$V_{g_1\,p}$	= 300	V
Driving power	W_{dr}	= 10	W
Anode input power	W_{i_a}	= 3000	W
Grid No.2 input power	$W_{i_{g2}}$	= 110	W
Anode dissipation	W_a	= 600	W
Output power	W_o	= 2400	W
Efficiency	η	= 80	%

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H.F. class B single side band amplifier without grid current

LIMITING VALUES (Absolute limits)

		f up to 30 Mc/s
Frequency		
Anode voltage	V_a	= max. 5.5 kV
Anode dissipation	W_a	= max. 800 W
Anode input power	W_{i_a}	= max. 2.5 kW
Anode current	I_a	= max. 600 mA
Grid No.2 voltage	V_{g_2}	= max. 800 V
Grid No.2 dissipation	W_{g_2}	= max. 120 W
Negative grid No.1 voltage	$-V_{g_1}$	= max. 500 V
Grid No.1 circuit resistance	R_{g_1}	= max. 20 kΩ

OPERATING CONDITIONS

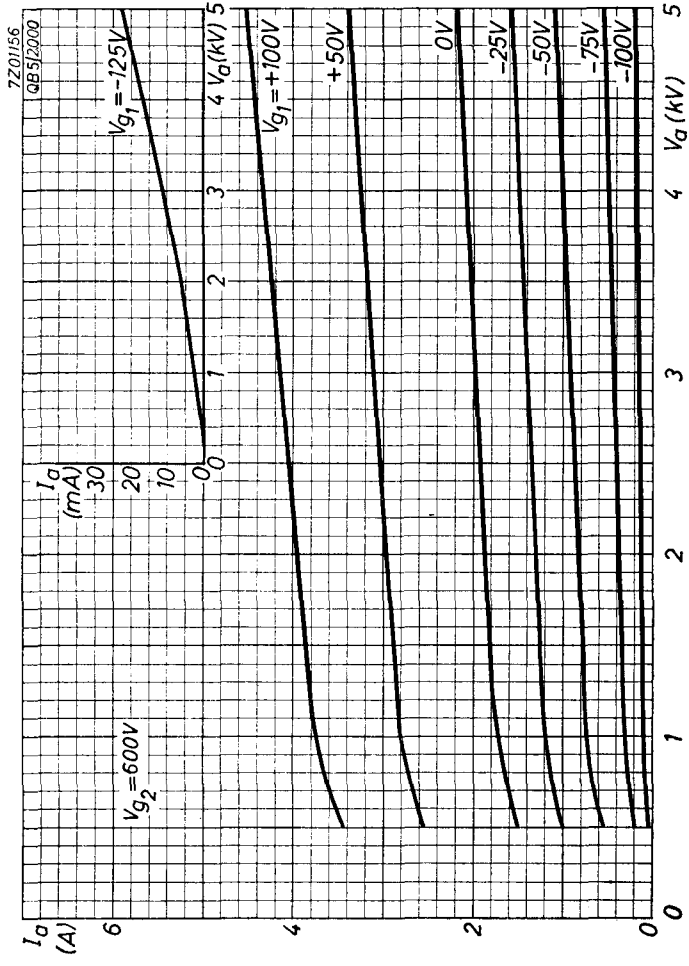
Frequency	f	=	30			Mc/s
Anode voltage	V_a	=	4			kV
Grid No.2 voltage	V_{g_2}	=	600			V
Grid No.1 voltage	V_{g_1}	=	-105			V [1]
			zero signal	single tone signal	double tone signal	
Peak H.F. grid voltage	$V_{g_1\ p}$	=	0	100	100	V
Anode current	I_a	=	150	465	330	mA
Grid No.2 current	I_{g_2}	=	8	85	40	mA
Grid No.1 current	I_{g_1}	=	0	0	0	mA
Anode input power	W_{i_a}	=	600	1860	1320	W
Grid No.2 dissipation	W_{g_2}	=	4.8	51	24	W
Anode dissipation	W_a	=	600	560	670	W
Output power	W_o	=	0	1300	650	W
Driving power	W_{dr}	=	0	0	0	W
Efficiency	η	=	-	69	49	%
Peak envelope power	$W_{o(PEP)}$	=			1300	W
Intermodulation distortion						
of the third order	d_{i_3}	=			<-35	dB [2]
of the fifth order	d_{i_5}	=			<-40	dB [2]

[1] To be adjusted so that I_a = 150 mA at $V_{g_1\ p}$ = 0 V

[2] Distortion levels with reference to either of the tones in a double tone test signal. The quoted figures are the maximum encountered values at any driving level up to 100 %

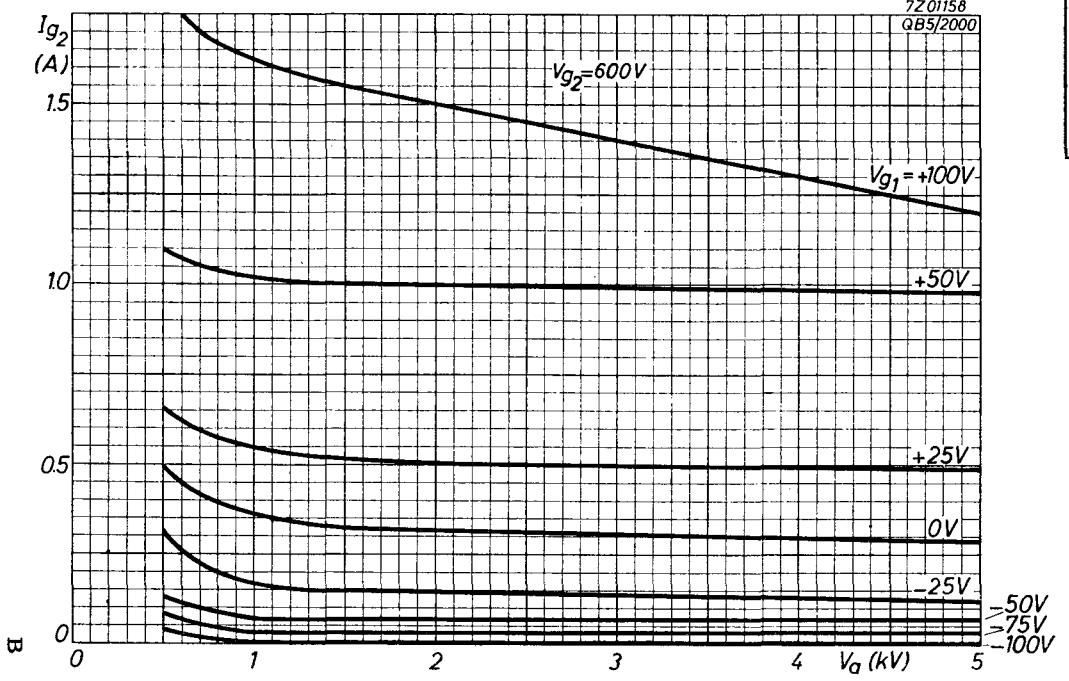
PHILIPS

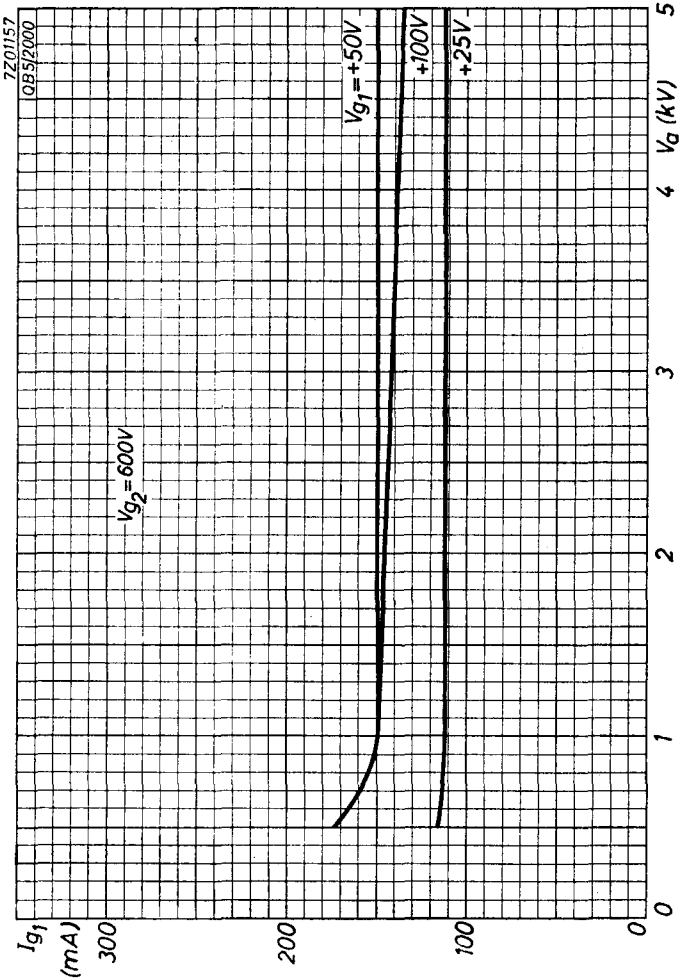
QB5/2000



12.12.1962

A

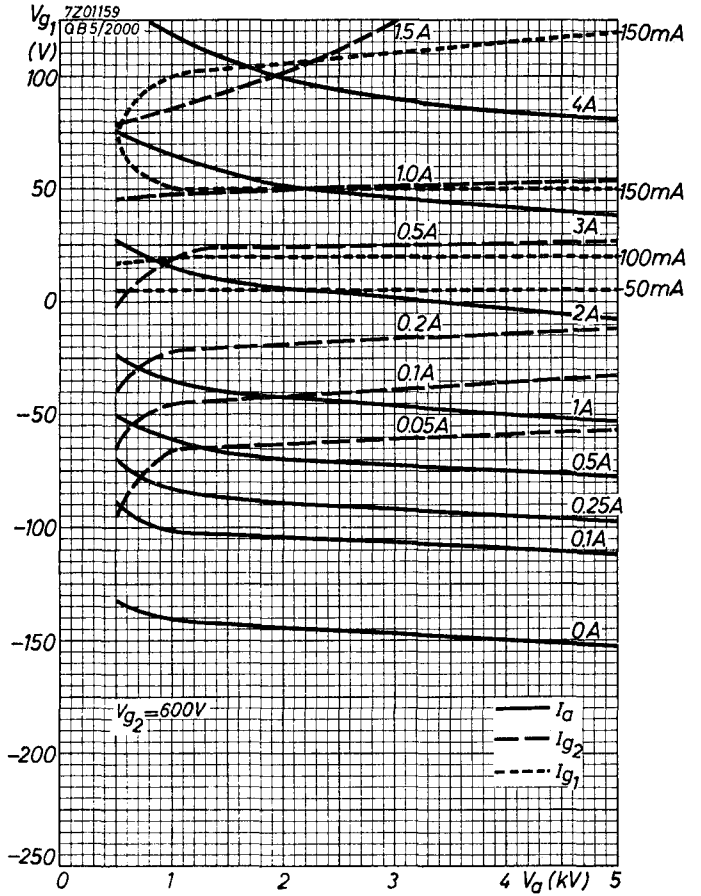

7Z01158
QB5/2000
I_{g_2} (A)
V_{g_2}=600V
V_{g_1} = +100V
+50V
+25V
0V
−25V
−50V
−75V
−100V
1.5
1.0
0.5
0
0
1
2
3
4
5
V_a (kV)
B


ZZ01157
QB5/2000
V_{g_1}=+50V
+100V
+25V
V_{g_2}=600V
I_{g_1} (mA)
300
200
100
0
0
1
2
3
4
5
V_a (kV)

12.12.1962

C

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V_{g_1} (V)
7Z01159
QB5/2000
100
50
0
−50
−100
−150
−200
−250
0
1
2
3
4
V_a (kV)
5
1.5A
150mA
4A
1.0A
150mA
0.5A
3A
100mA
50mA
2A
0.2A
0.1A
1A
0.05A
0.5A
0.25A
0.1A
0A
V_{g_2}=600V
I_a
I_{g_2}
I_{g_1}

D

PHILIPS

Electronic Tube

HANDBOOK

QB5/2000

page	sheet	date
1	1	1962.12.12
2	2	1962.12.12
3	3	1962.12.12
4	4	1962.12.12
5	A	1962.12.12
6	B	1962.12.12
7	C	1962.12.12
8	D	1962.12.12
9	FP	2000.01.15

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QBL 4/800

TETRODE for use as H.F. amplifier, modulator or frequency multiplier
TETRODE pour utilisation en amplificatrice H.F., modulatrice ou multiplicatrice de fréquence
TETRODE zur Verwendung als HF-Verstärker, Modulator oder Frequenzvervielfacher

Cooling : forced air
Refroidissement : ventilation forcée
Kühlung : Pressluftkühlung

Filament : thoriated tungsten
Filament : tungstène thorié
Heizfaden : thoriertes Wolfram

Heating : direct
Chauffage : direct
Heizung : direkt

V_f = 5 V
I_f = 13,5 A

Capacitances
Capacités
Kapazitäten

C_a = 5,6 pF
C_{g1} = 12,8 pF
C_{ag1} = 0,05 pF

Typical characteristics
Caractéristiques types
Kenndaten

μ_{g2g1} = 6,2
$S(I_a=200\ mA)$ = 5,2 mA/V

H.F. class C telegraphy
H.F. classe C télégraphie
HF - Klasse C Telegraphie

Freq. (Mc/s)	V_a (V)	W_o (W)
110	4000	930
	3000	670
	2500	530

Television service
Service de télévision
Fernsehbetrieb
Neg.mod. Pos.synchr.

Freq. (Mc/s)	V_a (V)	W_o (W)	
		sync.	black noir schwarz
220	2400	600	340
	1850	300	170

Temperatures
Températures
Temperaturen

Temperature of seals
Température des scellements = max. 150 °C
Temperatur der Einschmelzungen

Anode temperature
Température de l'anode = max. 150 °C
Anodentemperatur

In order to keep the temperatures of the seals below the maximum permissible value it is necessary to direct an air flow on to the seals. Cooling air must be applied to the seals and the anode cooler prior to the application of filament power and the cooling must be continued for three minutes after the power has been removed from the filament

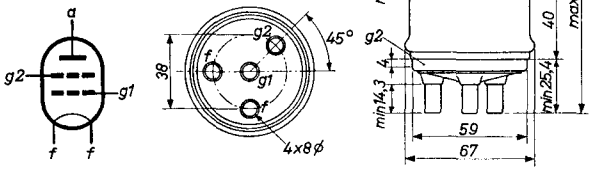
Afin de maintenir la température des scellements au-dessous de la valeur admissible au max. il est nécessaire de diriger un courant d'air vers les scellements. Il faut appliquer l'air de refroidissement vers les scellements et le refroidisseur de l'anode avant l'application de la puissance du filament et continuer le refroidissement pendant trois minutes après que la puissance a été éloignée du filament

Damit die Temperatur der Einschmelzungen unterhalb des höchstzulässigen Wertes bleibt, ist ein Luftstrom auf die Einschmelzungen notwendig. Kühlluft soll den Einschmelzungen und dem Anodenkühler vor der Anlegung der Heizspannung zugeführt werden und die Kühlung soll bis drei Minuten nach der Entfernung der Heizspannung fortgesetzt werden

Cooling characteristics
Caractéristiques de refroidissement
Kühlungsdaten

W_a (W)	h (m)	$t_{i\,max.}$ (°C)	$q_{min.}$ (m^3/min.)	p_i (mm H_2O)
300	0	35	0,50	9,8
	0	45	0,59	12,9
	1500	35	0,60	12,0
	3000	25	0,63	11,5
400	0	35	0,77	17,5
	0	45	0,90	23,0
	1500	35	0,93	21,3
	3000	25	0,97	20,5
500	0	35	1,13	35,5
	0	45	1,32	46,9
	1500	35	1,36	43,3
	3000	25	1,42	41,5

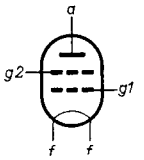
Dimensions in mm
Dimensions en mm
Abmessungen in mm

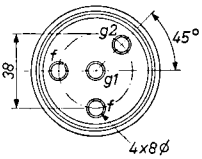


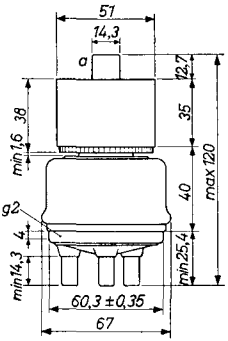
Mounting position: vertical with anode up or down
Montage : vertical avec l'anode en haut ou en bas
Einbau : senkrecht mit der Anode oben oder unten

Net weight
Poids net 530 g
Nettogewicht

Dimensions in mm
Dimensions en mm
Abmessungen in mm







Mounting position: vertical with anode up or down
Montage : vertical avec l'anode en haut ou en bas
Einbau : senkrecht mit der Anode oben oder unten

Net weight
Poids net 530 g
Nettogewicht

H.F. class C telegraphy
H.F. classe C télégraphie
HF - Klasse C Telegraphie

Limiting values (absolute values)
Caractéristiques limites (valeurs absolues)
Grenzdaten (absolute Werte)

f	=	max.	120 Mc/s
V_a	=	max.	4000 V
W_{ia}	=	max.	1400 W
W_a	=	max.	500 W
I_a	=	max.	350 mA
V_{g2}	=	max.	500 V
W_{g2}	=	max.	30 W
$-V_{g1}$	=	max.	500 V
I_{g1}	=	max.	30 mA
R_{g1}	=	max.	30 kΩ

Operating conditions
Caractéristiques d'utilisation
Betriebsdaten

f	=	110	110	110 Mc/s
V_a	=	4000	3000	2500 V
V_{g2}	=	500	500	500 V
V_{g1}	=	-150	-150	-150 V
I_a	=	315	310	310 mA
I_{g2}	=	22	24	26 mA
I_{g1}	=	16	16	15 mA
V_{g1p}	=	230	230	230 V
W_{ig1}	=	5	5	5 W
W_{g2}	=	11	12	13 W
W_{ia}	=	1260	930	775 W
W_a	=	330	260	245 W
W_o	=	930	670	530 W
η	=	73,5	72	68,5 %
W_ℓ[1])	=	835	600	475 W

[1]) Useful power in the load
Puissance utile dans la charge
Nützliche Leistung in der Belastung

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H.F. class C telegraphy
H.F. classe C télégraphie
HF - Klasse C Telegraphie

Limiting values (absolute values)
Caractéristiques limites (valeurs absolues)
Grenzdaten (absolute Werte)

f	=	max.	120 Mc/s
V_a	=	max.	4000 V
W_{ia}	=	max.	1400 W
W_a	=	max.	500 W
I_a	=	max.	350 mA
V_{g2}	=	max.	500 V
W_{g2}	=	max.	30 W
$-V_{g1}$	=	max.	500 V
I_{g1}	=	max.	30 mA
R_{g1}	=	max.	30 kΩ

Operating conditions
Caractéristiques d'utilisation
Betriebsdaten

f	=	110	110	110 Mc/s
V_a	=	4000	3000	2500 V
V_{g2}	=	500	500	500 V
V_{g1}	=	-150	-150	-150 V
I_a	=	315	310	310 mA
I_{g2}	=	22	24	26 mA
I_{g1}	=	16	16	15 mA
V_{g1p}	=	230	230	230 V
W_{ig1}	=	5	5	5 W
W_{g2}	=	11	12	13 W
W_{ia}	=	1260	930	775 W
W_a	=	330	260	245 W
W_o	=	930	670	530 W
η	=	73,5	72	68,5 %
W_ℓ[1])	=	835	600	475 W

[1]) Useful power in the load
Puissance utile dans la charge
Nützliche Leistung in der Belastung

H.F. class B amplifier for television service; negative modulation, positive synchronisation
Amplificatrice H.F. classe B pour télévision; modulation négative, synchronisation positive
HF-Klasse B Verstärker für Fernsehsender; negative Modulation, positive Synchronisierung

Limiting values (black level; absolute values)
Caractéristiques limites(niveau de noir; valeurs absolues)
Grenzdaten (Schwarzpegel; absolute Werte)

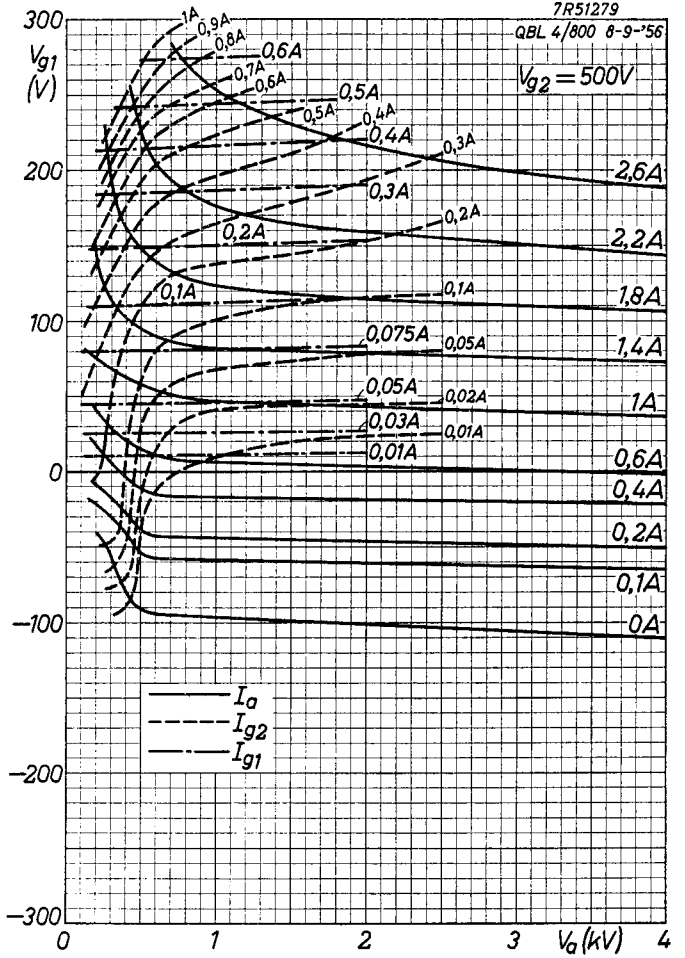
f	= max.	220 Mc/s
V_a	= max.	3000 V
V_{g2}	= max.	500 V
I_a	= max.	350 mA
W_{ia}	= max.	1050 W
W_a	= max.	500 W
W_{g2}	= max.	30 W
I_{g1}	= max.	30 mA
R_{g1}	= max.	30 kΩ

Operating conditions, one tube
Caractéristiques d'utilisation, une tube
Betriebsdaten, eine Röhre

f	=	220	220 Mc/s
B	=	6	6 Mc/s
V_a	=	2400	1850 V
V_{g2}	=	500	500 V
V_{g1}	=	-100	-100 V
V_{g1p} sync	=	185	140 V
I_a sync	=	400	285 mA
I_a black, noir, schwarz	=	300	215 mA
I_{g2} sync	=	35	20 mA
I_{g2} black, noir, schwarz	=	3	2 mA
I_{g1} sync	=	15	10 mA
I_{g1} black, noir, schwarz	=	5	2 mA
W_{ig1} sync	=	25	15 W
W_{ia} sync	=	960	525 W
W_{ia} black, noir, schwarz	=	720	400 W
W_o sync	=	600	300 W
W_o black, noir, schwarz	=	340	170 W

QBL 4/800

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A

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Electronic Tube

HANDBOOK

QBL4/800

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1	1	1957.09.09
2	2	1957.09.09
3	3	1957.09.09
4	3	1960.07.07
5	4	1957.09.09
6	4	1960.07.07
7	5	1957.09.09
8	A	1957.09.09
9	FP	2000.01.15

TETRODE for use as H.F. amplifier, modulator or frequency multiplier
TETRODE pour utilisation en amplificatrice H.F., modulatrice ou multiplicatrice de fréquence
TETRODE zur Verwendung als HF-Verstärker, Modulator oder Frequenzvervielfacher

Cooling Refroidissement Kühlung	forced air ventilation forcée Pressluftkühlung

Filament : Thoriated tungsten
Filament : Tungstène thorié
Heizfaden: Thoriertes Wolfram

Heating : direct Chauffage: direct Heizung : direkt	V_f	= 6,3 V
	I_f	= 32,5 A
Capacitances Capacités Kapazitäten	C_a	= 8,4 pF
	C_{g1}	= 23,5 pF
	C_{ag1}	< 0,35 pF
Typical characteristics Caractéristiques types Kenndaten	μ_{g2g1}	= 8,5
	$S(I_a=2A)$	= 19 mA/V

λ	Freq.	C telegr.		C_{ag2} mod.	
m	(Mc/s)	V_a (kV)	W_o (kW)	V_a (kV)	W_o (kW)
4	75	5	4,1		
		4	3,15		
2,7	110	5	3,9	4	2,7
1,36	220	4	2,9		

Television, télévision, Fernsehen

	Freq. (Mc/s)	Neg. mod. pos. synchr.			Pos. mod. neg. synchr.	
		V_a (kV)	W_o sync (kW)	W_o (kW) black noir schwarz	V_a kV	W_o (kW) white blanc weiss
Narrow band Bande étroite Schmaler Band	170-220	4	5,9	3,3	4	4,0
Broad band	54-88	5	8,0	4,5		
Bande large Breiter Band	170-220	4	5,0	2,8	4	2,8

Temperatures and cooling
Températures et refroidissement
Temperaturen und Kühlung

Temperature of seals
Température des scellements = max. 180 °C
Temperatur der Einschmelzungen

Bulb temperature
Température de l'ampoule = max. 250 °C
Kolbentemperatur

Cooling characteristics
Caractéristiques de refroidissement
Kühlungsdaten

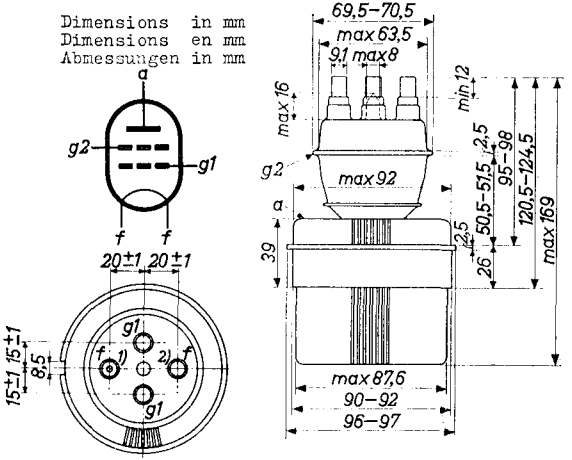
W_a (kW)	h (m)	t_i (°C)	q (m^3/min)	P_i (mmH_2O)
1	0	35	1,8	10
1	0	45	2,2	15
1	1500	35	2,2	13
1	3000	25	2,3	13
2,5	0	35	4,5	60
2,5	0	45	5,4	85
2,5	1500	35	5,4	73
2,5	3000	25	5,8	75
3	0	35	5,7	95

In order to keep the temperature of the seals below the maximum permissible value, it may be necessary to direct an airflow to the seals

Afin de maintenir la température des scellements au-dessous de la valeur maximum admissible il peut être nécessaire de diriger un courant d'air vers les scellements

Damit die Temperatur der Einschmelzungen unterhalb des höchstzulässigen Wertes bleibt, kann ein Luftstrom auf die Einschmelzungen notwendig sein

Dimensions in mm
Dimensions en mm
Abmessungen in mm



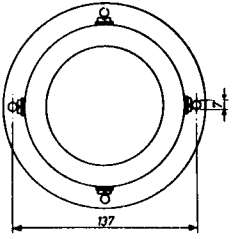
Accessories
Accessoires
Zubehörteile

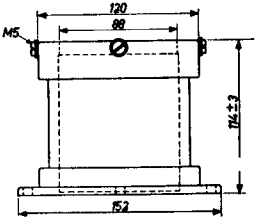
Clips for filament and control grid Bornes de connexion du filament et de la grille de commande Anschlussklemmen für Heizfaden und Steuergitter	40634
Screen grid connector Connecteur pour la grille-écran Schirmgitteranschlussring	40622
Insulating pedestal (see page 4) Socle isolant (voir page 4) Isolierender Sockel (siehe Seite 4)	40635

1) This pin is marked "0"
Cette broche est marquée "0"
Dieser Stift ist mit "0" gekennzeichnet

2) This pin should be used for connecting the anode return lead
Cette broche sera utilisée pour connecter le conducteur de retour du circuit anodique
Dieser Stift soll zum Anschliessen der Anodenrückleitung verwendet werden

Mounting position: vertical with anode up or down
Montage : vertical avec l'anode en haut ou en bas
Einbau : senkrecht mit der Anode oben oder unten





40635

At frequencies above 30 Mc/s both connecting pins must be used when connecting the control grid
Aux fréquences au-dessus de 30 Mc/s il faut utiliser les deux broches de connexion pour la connexion de la grille de commande
Bei Frequenzen über 30 MHz müssen die beiden Anschlussstifte zum Anschliessen des Steuergitters verwendet werden

Tube Tube Röhre	Net weight Poids net Nettogewicht	2,25 kg
	Shipping weight Poids brut Bruttogewicht	5,7 kg

40635

	Net weight Poids net Nettogewicht	1,6 kg
	Shipping weight Poids brut Bruttogewicht	2,7 kg

H.F. class C telegraphy
H.F. classe C télégraphie
H.F. Klasse C Telegraphie

Limiting values
Caractéristiques limites
Grenzdaten

f	= max.	30 Mc/s	f	= max.	110 Mc/s
V_a	= max.	5,5 kV	V_a	= max.	5 kV
W_{ia}	= max.	5,5 kW			
W_a	= max.	3 kW	f	= max.	220 Mc/s
I_a	= max.	1,1 A	V_a	= max.	4 kV
V_{g2}	= max.	800 V			
W_{g2}	= max.	100 W			
$-V_{g1}$	= max.	500 V			
W_{g1}	= max.	30 W			

Operating conditions
Caractéristiques d'utilisation
Betriebsdaten

f	=	75	110	75	220 Mc/s
V_a	=	5	5	4	4 kV
V_{g2}	=	800	800	800	800 V
V_{g1}	=	-250	-250	-250	-250 V
I_a	=	1,1	1,1	1,1	1,1 A
I_{g2}	=	100	100	120	120 mA
I_{g1}	=	70	70	80	80 mA
V_{g1p}	=	480	480	500	500 V
W_{ig1}	=	30	30	36	36 W
W_{g2}	=	80	80	96	96 W
W_{ia}	=	5,5	5,5	4,4	4,4 kW
W_a	=	1,4	1,6	1,25	1,5 kW
W_o	=	4,1	3,9	3,15	2,9 kW
η	=	74,5	71	72	66 %

PHILIPS

H.F. class C anode and screen grid modulation
H.F. classe C modulation d'anode et de grille-écran
HF Klasse C Anoden- und Schirmgittermodulation

Screen grid modulated via a choke of 60 H
La grille-écran modulée à travers une bobine de 60 H
Schirmgitter moduliert über eine Drosselspule von 60 H

Limiting values
Caractéristiques limites
Grenzdaten

f	= max.	30 Mc/s	f	= max.	110 Mc/s
V_a	= max.	4,5 kV	V_a	= max.	4 kV
W_{ia}	= max.	3,6 kW			
W_a	= max.	2 kW			
I_a	= max.	0,9 A			
V_{g2}	= max.	800 V			
W_{g2}	= max.	100 W[1])			
$-V_{g1}$	= max.	500 V	f	= max.	220 Mc/s
W_{g1}	= max.	30 W	V_a	= max.	3,2 kV

Operating conditions
Caractéristiques d'utilisation
Betriebsdaten

f	=	110 Mc/s
V_a	=	4 kV
V_{g2}	=	800 V
V_{g1}	=	-375 V
V_{g1p}	=	625 V
I_a	=	0,9 A
I_{g2}	=	120 mA
I_{g1}	=	85 mA
W_{ia}	=	3,6 kW
W_a	=	0,9 kW
W_o	=	2,7 kW
W_{g2}	=	96 W
W_{ig1}	=	48 W
η	=	75 %
m	=	100 %
W_{mod}	=	1,8 kW

[1]) For all other modulation methods W_{g2} = max. 65 W
Pour toutes les autres méthodes de modulation W_{g2} = max. 65 W
Für alle andere Modulationsverfahren ist W_{g2} = max. 65 W

H.F. class B amplifier, single side band
Amplificatrice H.F. classe B à une bande latérale
HF Einseitenbandverstärker, Klasse B

Limiting values
Caractéristiques limites
Grenzdaten

f = max. 110 Mc/s

V_a	= max.	5 kV
I_a	= max.	1,3 A
W_{ia}	= max.	6,5 kW
W_a	= max.	3 kW
V_{g2}	= max.	800 V
W_{g2}	= max.	100 W
I_{g1}	= max.	80 mA

Operating conditions
Caractéristiques d'utilisation
Betriebsdaten

V_a	=	5		4,5		4	kV
V_{g2}	=	800		800		800	V
V_{g1}	=	-107		-105		-104	V
V_{g1p}	=	0	277	0	275	0	274 V
I_a	=	0,08	1,3	0,08	1,29	0,07	1,28 A
I_{g2}	=	0	75	0	75	0	78 mA
I_{g1}	=	0	55	0	55	0	54 mA
W_{ig1}	=	0	15	0	15	0	15 W
W_{g2}	=	0	60	0	60	0	62,5 W
W_{ia}	=	0,40	6,5	0,36	5,8	0,28	5,1 kW
W_a	=	0,40	2,1	0,36	1,95	0,28	1,8 kW
W_o	=	-	4,4	-	3,85	-	3,3 kW
η	=	-	68	-	66,5	-	65 %

Page 8; Seite 8

[1])At full modulation I_a = max. 1.5 A
A modulation complète I_a = max. 1,5 A
Bei Vollaussteuerung ist I_a = max. 1,5 A

H.F. class B amplifier, single side band
Amplificatrice H.F. classe B à une bande latérale
HF Einseitenbandverstärker, Klasse B

Limiting values
Caractéristiques limites
Grenzdaten

f = max. 110 Mc/s

V_a	= max.	5	kV
I_a	= max.	1,3	A
W_{ia}	= max.	6,5	kW
W_a	= max.	3	kW
V_{g2}	= max.	800	V
W_{g2}	= max.	100	W
I_{g1}	= max.	80	mA

Operating conditions
Caractéristiques d'utilisation
Betriebsdaten

V_a	=	5		4,5		4	kV
V_{g2}	=	800		800		800	V
V_{g1}	=	-107		-105		-104	V
V_{g1p}	=	0	277	0	275	0	274 V
I_a	=	0,08	1,3	0,08	1,29	0,07	1,28 A
I_{g2}	=	0	75	0	75	0	78 mA
I_{g1}	=	0	55	0	55	0	54 mA
W_{ig1}	=	0	15	0	15	0	15 W
W_{g2}	=	0	60	0	60	0	62,5 W
W_{ia}	=	0,40	6,5	0,36	5,8	0,28	5,1 kW
W_a	=	0,40	2,1	0,36	1,95	0,28	1,8 kW
W_o	=	-	4,4	-	3,85	-	3,3 kW
η	=	-	68	-	66,5	-	65 %

→ [1]) Page 8; Seite 8

At 100 % modulation with single tone sine wave I_a = max. 1.5 A
A modulation de 100 % par onde sinusoïdale monofréquence I_a = 1,5 A au max.
Bei 100 % Modulation mit sinusförmigem Signal einer einzigen Frequenz ist I_a = max. 1,5 A

L.F. class B amplifier and modulator
Amplificatrice et modulatrice B.F. classe B
NF Klasse B Verstärker und Modulator

Limiting values
Caractéristiques limites
Grenzdaten

V_a	= max.	5 kV	I_a	= max.	1,1 A[1])
W_{ia}	= max.	5,5 kW	V_{g2}	= max.	800 V
W_a	= max.	3 kW	W_{g2}	= max.	100 W
			$-V_{g1}$	= max.	500 V
			W_{g1}	= max.	30 W

Operating conditions, two tubes
Caractéristiques d'utilisation, deux tubes
Betriebsdaten, zwei Röhren

V_a	=	5		5		kV
V_{g2}	=	800		800		V
V_{g1}	=	-107		-107		V
$R_{aa'}$	=	3700		5000		Ω
V_{g1g1_p}	=	0	714	0	594	V
I_a	=	2x0,1	2x1,46	2x0,1	2x1,1	A
I_{g2}	=	0	2x120	0	2x50	mA
I_{g1}	=	0	2x150	0	2x40	mA
I_{g1_p}	=	0	2x750	0	2x460	mA
W_{ig1}	=	0	2x50	0	2x11	W
W_{g2}	=	0	2x96	0	2x40	W
W_{ia}	=	2x0,5	2x7,3	2x0,5	2x5,5	kW
W_a	=	2x0,5	2x2,55	2x0,5	2x1,9	kW
W_o	=	0	9,5	0	7,2	kW
η	=	-	65	-	65	%

V_a	=	5		4		kV
V_{g2}	=	800		800		V
V_{g1}	=	-107		-103		V
$R_{aa'}$	=	17600		7000		Ω
V_{g1g1_p}	=	0	214	0	366	V
I_a	=	2x0,1	2x0,32	2x0,1	2x0,6	A
I_{g2}	=	0	2x10	0	2x60	mA
I_{g1}	=	0	0	0	2x11	mA
I_{g1_p}	=	0	0	0	2x70	mA
W_{ig1}	=	0	0	0	2x2	W
W_{g2}	=	0	2x8	0	2x48	W
W_{ia}	=	2x0,5	2x1,6	2x0,4	2x2,4	kW
W_a	=	2x0,5	2x0,55	2x0,4	2x0,9	kW
W_o	=	0	2,1	0	3,0	kW
η	=	-	65	-	62	%

[1])See page 7; voir page 7; siehe Seite 7

L.F. class B amplifier and modulator
Amplificatrice et modulatrice B.F. classe B
NF Klasse B Verstärker und Modulator

Limiting values
Caractéristiques limites
Grenzdaten

V_a	= max.	5 kV	I_a	= max.	1,1 A[1])
W_{ia}	= max.	5,5 kW	V_{g2}	= max.	800 V
W_a	= max.	3 kW	W_{g2}	= max.	100 W
			$-V_{g1}$	= max.	500 V
			W_{g1}	= max.	30 W

Operating conditions, two tubes
Caractéristiques d'utilisation, deux tubes
Betriebsdaten, zwei Röhren

V_a	=	5		5		kV
V_{g2}	=	800		800		V
V_{g1}	=	-107		-107		V
$R_{aa'}$	=	3700		5000		Ω
V_{g1g1p}	=	0	714	0	594	V
I_a	=	2x0,1	2x1,46	2x0,1	2x1,1	A
I_{g2}	=	0	2x120	0	2x50	mA
I_{g1}	=	0	2x150	0	2x40	mA
I_{g1p}	=	0	2x750	0	2x460	mA
W_{ig1}	=	0	2x50	0	2x11	W
W_{g2}	=	0	2x96	0	2x40	W
W_{ia}	=	2x0,5	2x7,3	2x0,5	2x5,5	kW
W_a	=	2x0,5	2x2,55	2x0,5	2x1,9	kW
W_o	=	0	9,5	0	7,2	kW
η	=	-	65	-	65	%

V_a	=	5		4		kV
V_{g2}	=	800		800		V
V_{g1}	=	-107		-103		V
$R_{aa'}$	=	17600		7000		Ω
V_{g1g1p}	=	0	214	0	366	V
I_a	=	2x0,1	2x0,32	2x0,1	2x0,6	A
I_{g2}	=	0	2x10	0	2x60	mA
I_{g1}	=	0	0	0	2x11	mA
I_{g1p}	=	0	0	0	2x70	mA
W_{ig1}	=	0	0	0	2x2	W
W_{g2}	=	0	2x8	0	2x48	W
W_{ia}	=	2x0,5	2x1,6	2x0,4	2x2,4	kW
W_a	=	2x0,5	2x0,55	2x0,4	2x0,9	kW
W_o	=	0	2,1	0	3,0	kW
η	=	-	65	-	62	%

[1])See page 7; voir page 7; siehe Seite 7

Grid modulated H.F.class C amplifier for television service, negative modulation, positive synchronisation
Amplificatrice H.F. classe C pour télévision, modulation de grille, modulation négative, synchronisation positive
HF Klasse C Verstärker für Fernsehsender, Gittermodulation, negative Modulation, positive Synchronisierung

Limiting values
Caractéristiques limites
Grenzdaten

f = max. 110 Mc/s		f = max. 220 Mc/s	
V_a = max.	5 kV	V_a = max.	4 kV
I_a sync = max.	1,5 A	W_{ia} sync = max.	6 kW
W_{ia} sync = max.	7 kW		
W_a sync = max.	3 kW		
V_{g2} = max.	800 V		
W_{g2} sync = max.	100 W		
$-V_{g1}$ = max.	500 V		
I_{g1} sync = max.	80 mA		

Operating conditions, two tubes in push-pull
Caractéristiques d'utilisation, deux tubes en push-pull
Betriebsdaten, zwei Röhren in Gegentakt

f	54-88 [1]	170-220 [1]	170-220	Mc/s
B (-1,5 db)	6,5	6,5	-	Mc/s [2]
B (-3 db)	12	12	7,5	Mc/s [2]
V_a	5	4	4	kV
V_{g2}	800	800	800	V
V_{g1} sync	-175	-150	-150	V
V_{g1} black, noir, schwarz	-260	-230	-260	V
V_{g1} white, blanc, weiss	-450	-450	-450	V
V_{g1g1_p}	900	850	850	V [3]
I_a sync	2,7	2,75	2,75	A
I_a black, noir, schwarz	1,75	2,1	1,5	A
I_{g2} sync	145	110	250	mA
I_{g2} black, noir, schwarz	40	50	65	mA
I_{g1} sync	82	100	80	mA
I_{g1} black, noir, schwarz	35	50	20	mA
W_{ig1} sync	200-300	300-400	200-300	W [4]
W_o sync	8,0	5,0	5,9	kW
W_o black, noir, schwarz	4,5	2,8	3,3	kW

[1], [2], [3], [4]) See page 14 ; voir page 14 ; siehe Seite 14

PHILIPS

H.F. class B amplifier for television service, negative modulation, positive synchronisation.
Amplificatrice H.F. classe B pour télévision, modulation négative, synchronisation positive
HF Klasse B Verstärker für Fernsehsender, negative Modulation, positive Synchronisierung

Limiting values
Caractéristiques limites
Grenzdaten

f = max. 110 Mc/s		f = max. 220 Mc/s	
V_a = max.	5 kV	V_a = max.	4 kV
V_{g2} = max.	800 V	W_{ia} sync = max.	6 kW
I_a sync = max.	1,5 A		
W_{ia} sync = max.	7 kW		
W_a sync = max.	3 kW		
W_{g2} sync = max.	100 W		
I_{g1} sync = max.	80 mA		

Operating conditions, two tubes in push-pull
Caractéristiques d'utilisation, deux tubes en push-pull
Betriebsdaten, zwei Röhren in Gegentakt

f		54-88	170- 220 Mc/s[1]
B (-1,5 db)		6,5	6,5 Mc/s[2]
B (-3 db)		12	12 Mc/s[2]
V_a		5	4 kV
V_{g2}		800	800 V
V_{g1}		-175	-150 V
V_{g1g1_p}	sync	900	850 V[3]
	black, noir, schwarz	730	700 V[3]
I_a	sync	2,7	2,75 A
	black, noir, schwarz	1,75	2,1 A
I_{g2}	sync	145	110 mA
	black, noir, schwarz	40	50 mA
I_{g1}	sync	82	100 mA
	black, noir, schwarz	35	50 mA
W_{ig1}	sync	200-300	300-400 W[4]
W_o	sync	8,0	5,0 kW
	black, noir, schwarz	4,5	2,8 kW

[1], [2], [3], [4]) See page 14; voir page 14; siehe Seite 14

Grid modulated H.F.class C amplifier for television service, positive modulation, negative synchronisation
Amplificatrice H.F. classe C pour télévision, modulation de grille, modulation positive, synchronisation négative
HF Klasse C Verstärker für Fernsehsender, Gittermodulation, positive Modulation, negative Synchronisierung

Limiting values
Caractéristiques limites
Grenzdaten

f	= max. 110 Mc/s	f	= max. 220 Mc/s
V_a	= max. 5 kV	V_a	= max. 4 kV
V_{g2}	= max. 800 V	W_{ia} white, blanc, weiss	= max. 4,4 kW
$-V_{g1}$	= max. 500 V		
I_a	= max. 1,1 A		
W_{ia} white, blanc, weiss	= max. 5,5 kW		
W_a white, blanc, weiss	= max. 3 kW		
W_{g2} white, blanc, weiss	= max. 100 W		
I_{g1} white, blanc, weiss	= max. 80 mA		

Operating conditions, two tubes in push-pull
Caractéristiques d'utilisation, deux tubes en push-pull
Betriebsdaten, zwei Röhren in Gegentakt

f		170-220[1]	170-220 Mc/s
B (-1,5 db)		6,5	- Mc/s[2]
B (-3 db)		12	7,5 Mc/s[2]
V_a		4	4 kV
V_{g2}		800	800 V
V_{g1}	white, blanc, weiss	-230	-230 V
	black, noir, schwarz	-380	-380 V
V_{g1g1_p}		850	850 V[3]
I_a	white, blanc, weiss	2,1	1,7 A
	black, noir, schwarz	0,6	0,5 A
I_{g2}	white, blanc, weiss	50	80 mA
	black, noir, schwarz	10	10 mA
I_{g1}	white, blanc, weiss	50	25 mA
	black, noir, schwarz	0	0 mA
W_{ig1}		300-400	200-300 W[4]
W_o	white, blanc, weiss	2,8[5]	4,0 kW
	black, noir, schwarz	0,25	0,36 kW

[1],[2],[3],[4],[5] See page 14; voir page 14; siehe Seite 14 ←

H.F. class B amplifier for television service, positive modulation, negative synchronisation
Amplificatrice H.F.classe B pour télévision, modulation positive, synchronisation négative
HF Klasse B Verstärker für Fernsehsender, positive Modulation, negative Synchronisierung

Limiting values
Caractéristiques limites
Grenzdaten

	f	= max. 110 Mc/s	f	= max. 220 Mc/s
	V_a	= max. 5 kV	V_a	= max. 4 kV
	V_{g2}	= max. 800 V		
white / blanc / weiss	I_a	= max. 1,1 A		
	W_{ia}	= max. 5,5 kW	W_{ia} (white / blanc / weiss)	= max. 4,4 kW
	W_a	= max. 3 kW		
	W_{g2}	= max. 100 W		
	I_{g1}	= max. 80 mA		

Operating conditions, two tubes in push-pull
Caractéristiques d'utilisation, deux tubes en push-pull
Betriebsdaten, zwei Röhren in Gegentakt

f		=	170 - 220 Mc/s [1]
B (-1,5 db)		=	6,5 Mc/s [2]
B (-3 db)		=	12 Mc/s [2]
V_a		=	4 kV
V_{g2}		=	800 V
V_{g1}		=	-150 V
V_{g1g1_p}	white, blanc, weiss	=	700 V [3]
	black, noir, schwarz	=	350 V [3]
I_a	white, blanc, weiss	=	2,1 A
	black, noir, schwarz	=	0,6 A
I_{g2}	white, blanc, weiss	=	50 mA
	black, noir, schwarz	=	10 mA
I_{g1}	white, blanc, weiss	=	50 mA
	black, noir, schwarz	=	0 mA
W_{ig1}	white, blanc, weiss	=	200-300 W [4]
W_o	white, blanc, weiss	=	2,8 kW [5]
	black, noir, schwarz	=	0,25 kW

[1], [2], [3], [4], [5] See page 14 ; voir page 14 ; siehe Seite 14 ←

Grid modulated H.F. class C amplifier for colour-television service, negative modulation, positive synchronisation
Amplificatrice H.F. classe C pour télévision en couleurs, modulation de grille; modulation négative, synchronisation positive
HF Klasse C Verstärker für Farbfernsehsender, Gittermodulation; negative Modulation, positive Synchronisierung

Limiting values
Caractéristiques limites
Grenzdaten

f _ _ _ _ = max. 110 Mc/s		f _ _ _ _ _ = max. 220 Mc/s	
V_a	= max. 5 kV	V_a	= max. 4 kV
I_a sync	= max. 1,5 A	W_{ia} sync	= max. 6 kW
W_{ia} sync	= max. 7 kW		
W_a sync	= max. 3 kW		
V_{g2}	= max. 800 V		
W_{g2} sync	= max. 100 W		
$-V_{g1}$	= max. 500 V		
I_{g1} sync	= max. 80 mA		

Operating conditions, two tubes in push-pull
Caractéristiques d'utilisation, deux tubes en push-pull
Betriebsdaten, zwei Röhren in Gegentakt

f		= 170 - 220 Mc/s [1]
B (-1,5 db)		= 4 Mc/s [2]
B (- 3 db)		= 8,5 Mc/s [2]
V_a		= 3,5 kV
V_{g2}		= 700 V
V_{g1}	sync	= -120 V
	black, noir, schwarz	= -170 V
	white, blanc, weiss	= -320 V
V_{g1g1p}		= 640 V [3]
I_a	sync	= 2 A
	black, noir, schwarz	= 1,5 A
I_{g2}	sync	= 82 mA
	black, noir, schwarz	= 38 mA
I_{g1}	sync	= 100 mA
	black, noir, schwarz	= 50 mA
W_{ig1}	sync	= 100 - 200 W [4]
W_o	sync	= 3 kW
	black, noir, schwarz	= 1,7 kW

[1])[2])[3])[4]) See page 14; voir page 14; siehe Seite 14

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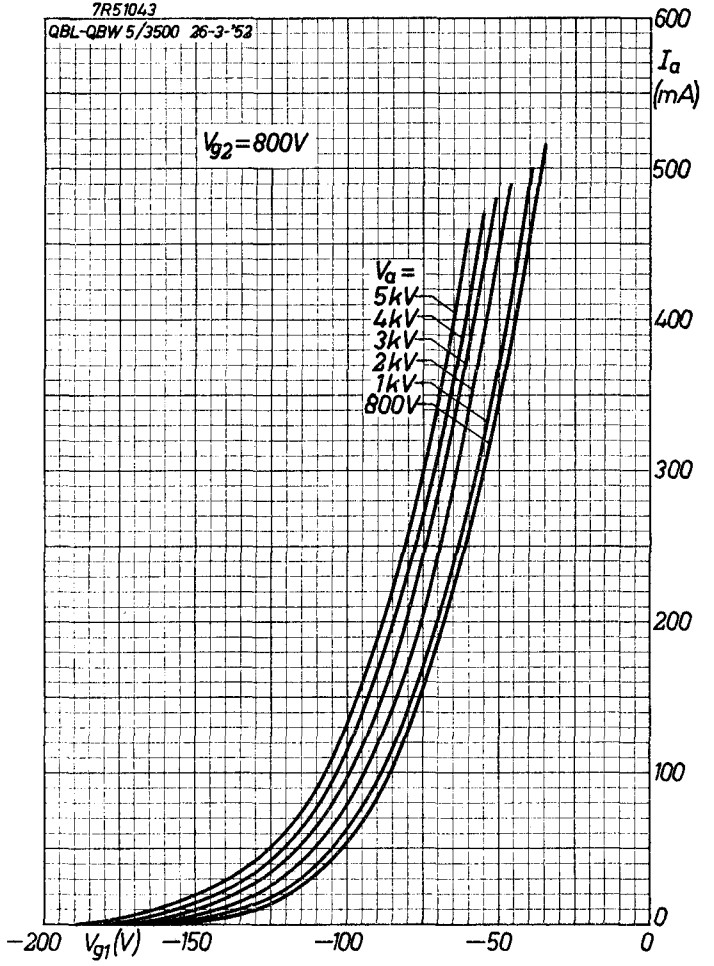
1) The operating conditions are given at a frequency slightly below the peak of the resonance curve
Les caractéristiques d'utilisation sont données à une fréquence un peu au-dessous de la crête de la courbe de résonance
Die Betriebsdaten gelten bei einer Frequenz ein wenig unterhalb des Scheitels der Abstimmkurve.

2) This value of bandwidth is based on measurements on a circuit with a single LC section
Cette valeur de la largeur de bande se rapporte à des mesures à un montage avec un seul circuit LC.
Dieser Wert der Bandbreite bezieht sich auf Messungen an einer Schaltung mit einem einzigen LC-Kreis.

3) Measured by the slide back method
Mesuré par la méthode de glissement de la tension de polarisation
Gemessen mittels Verschiebung der Gittervorspannung

4) Driving power is accounted for largely by circuit losses. The indicated driving power is required to take care of losses in damping resistors, circuit losses and tube driving power
La puissance d'entrée est nécessaire pour la plupart pour les pertes dans le circuit. La puissance mentionnée est nécessaire pour les pertes dans les résistances d'amortissement, dans le circuit et pour la puissance d'entrée du tube
Die Eingangsleistung ist grossenteils nötig für die Verluste in der Schaltung. Die genannte Leistung ist nötig für die Verluste in Dämpfungswiderständen, in Kreisen und für die Eingangsleistung der Röhre

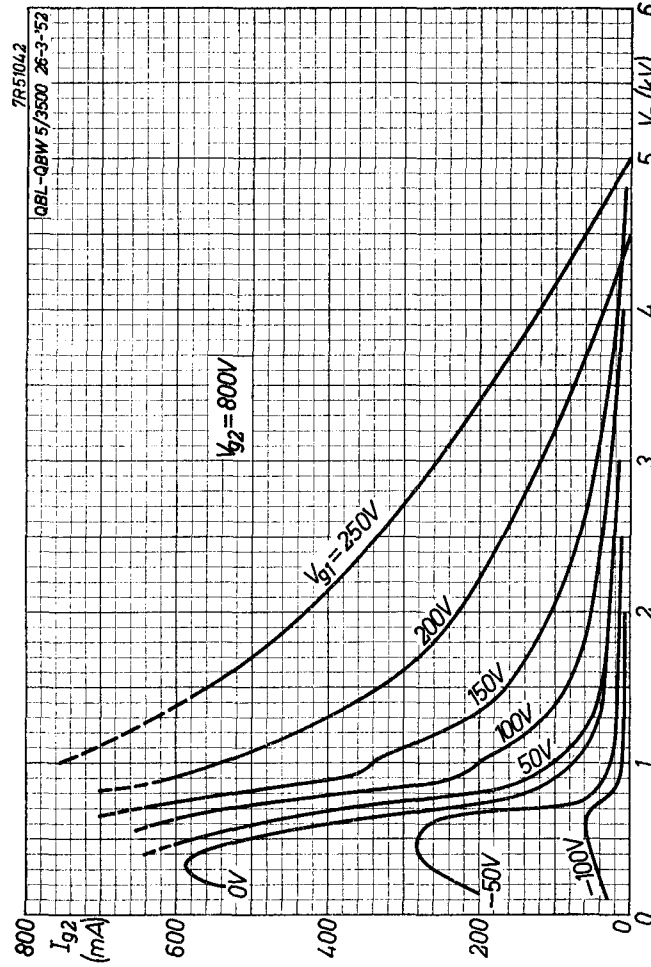
5) In the peak of the resonance curve W_o(white)=3,3 kW
A la crete de la courbe de résonance W_o (blanc) = 3,3 kW
Im Scheitel der Abstimmkurve ist W_o(weiss)=3,3 kW


7R51043
QBL-QBW 5/3500 26-3-'52
V_{g2}=800V
V_a =
5kV
4kV
3kV
2kV
1kV
800V
600
I_a
(mA)
500
400
300
200
100
0
−200
V_{g1}(V)
−150
−100
−50
0

QBL 5/3500

PHILIPS

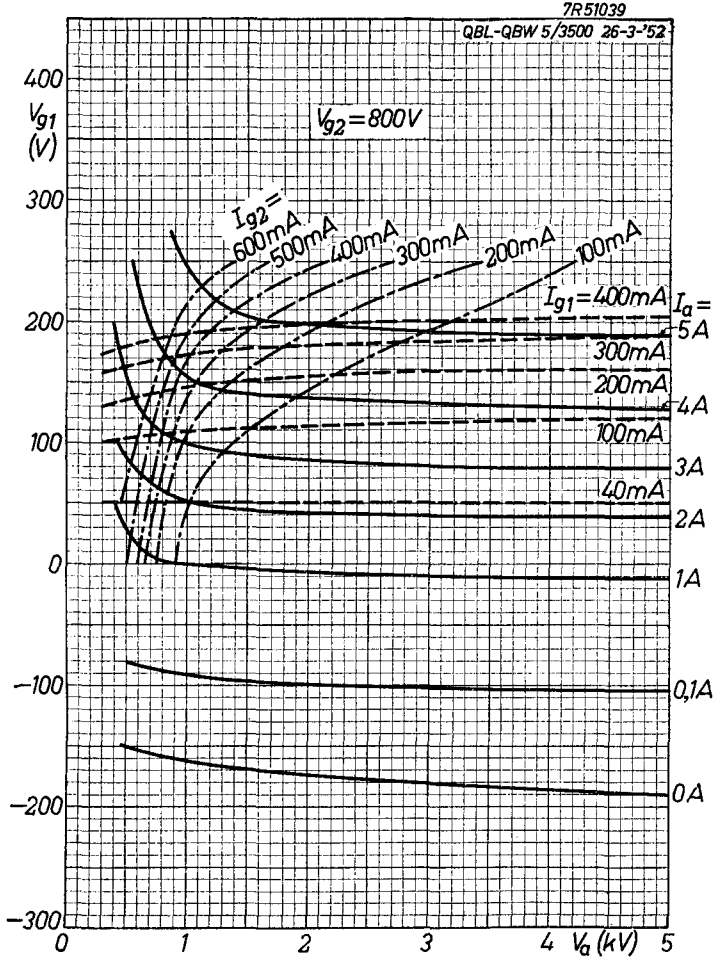
B


7R51042
QBL-QBW 5/3500 26-3-'52
V_{g2} = 800V
V_{g1} = 250V
200V
150V
100V
50V
0V
−50V
−100V
I_{g2} (mA)
800
600
400
200
0
V_a (kV)
0
1
2
3
4
5
6

QBL 5/3500

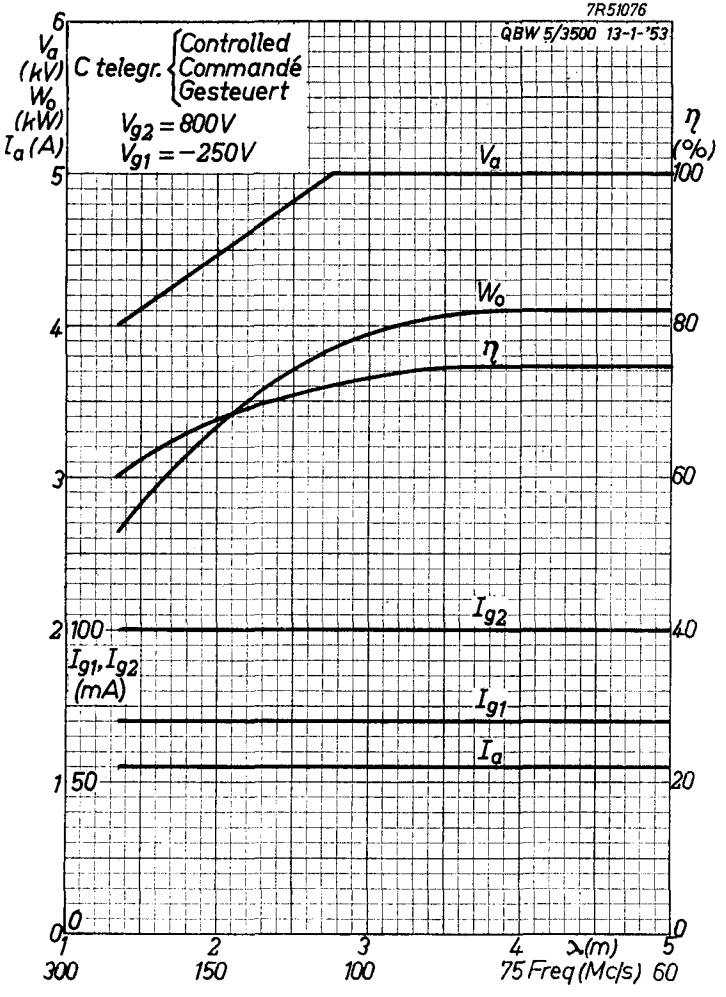
PHILIPS

D


7R51039
QBL-QBW 5/3500 26-3-'52
V_{g1} (V)
V_{g2}=800V
I_{g2}=
600mA
500mA
400mA
300mA
200mA
100mA
I_{g1}=400mA
300mA
200mA
100mA
40mA
I_a=
5A
4A
3A
2A
1A
0,1A
0A
400
300
200
100
0
−100
−200
−300
0
1
2
3
4
5
V_a (kV)

QBL 5/3500

PHILIPS

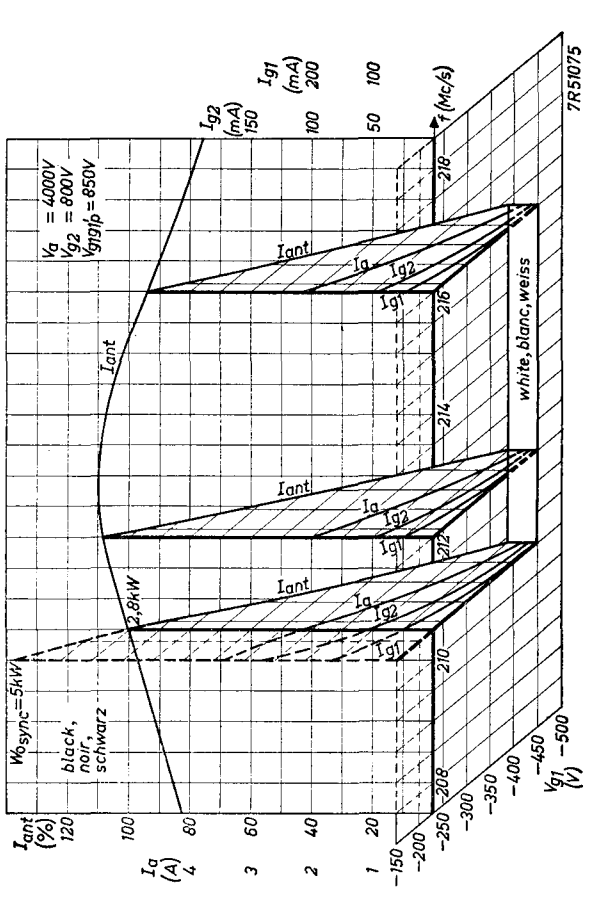


F

PHILIPS

QBL 5/3500

Grid-modulated H.F. class C amplifier for television service (2 valves in push-pull)
Amplificateur H.F. classe C modulé par la grille pour la télévision (2 tubes en montage push-pull)
H.F. Klasse C Verstärker mit Gittermodulation für Fernsehbetrieb (2 Röhren in Gegentaktschaltung)

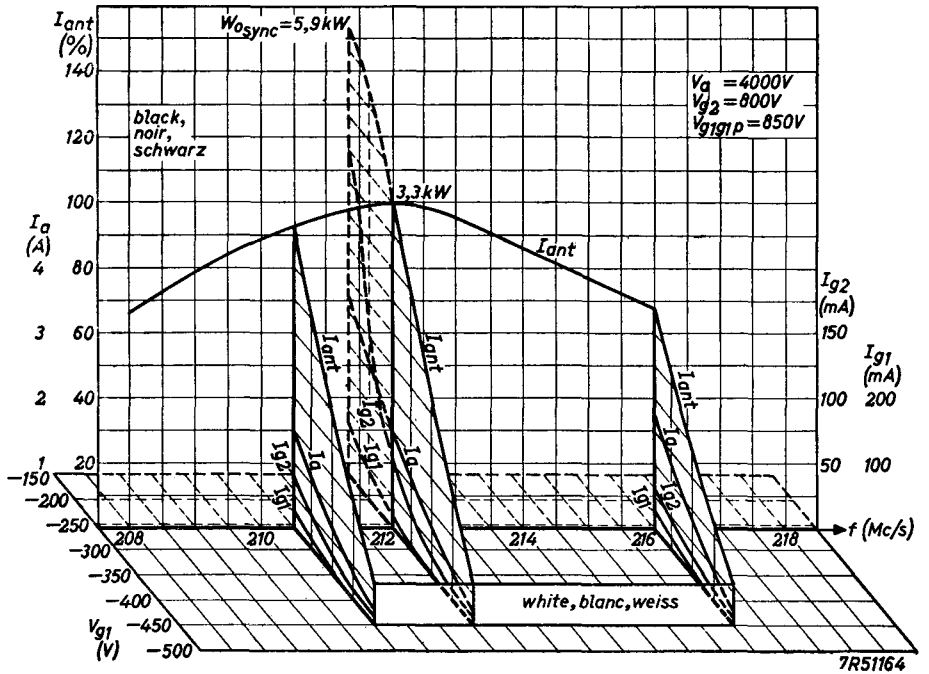


7.7.1954

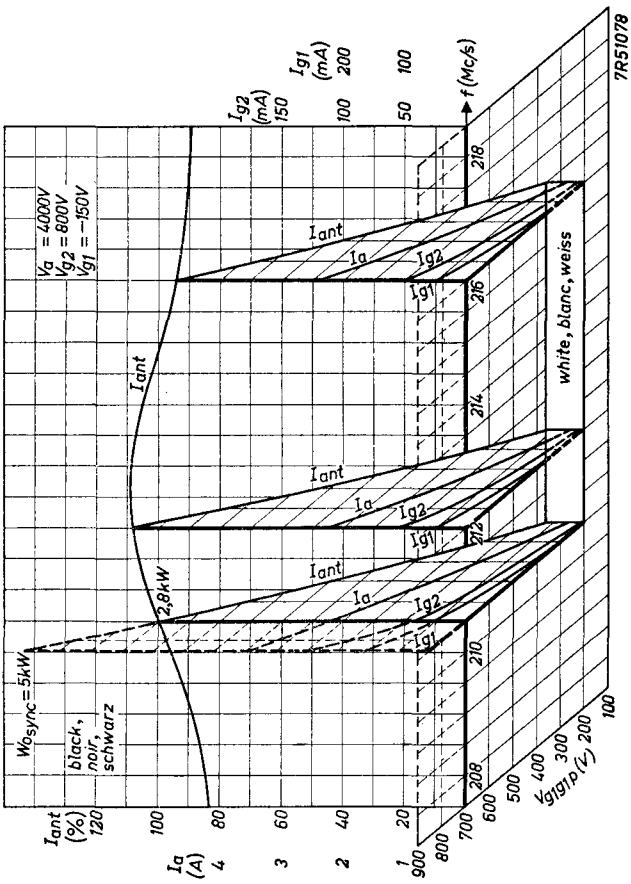
G

PHILIPS

Grid-modulated H.F. class C amplifier for television service (2 valves in push-pull)
Amplificateur H.F. class C modulé par la grille pour la télévision (2 tubes en montage push-pull)
H.F. Klasse C Verstärker mit Gittermodulation für Fernsehbetrieb (2 Röhren in Gegentaktschaltung)



H


Grid-modulated H.F. class B amplifier for television service (2 valves in push-pull)
Amplificateur H.F. classe B module par la grille pour la télévision (2 tubes en montage push-pull)
H.F. Klasse B Verstärker mit Gittermodulation für Fernsehbetrieb (2 Röhren in Gegentaktschaltung)
Wosync = 5kW
2,8kW
black, noir, schwarz
white, blanc, weiss
Va = 4000V
Vg2 = 800V
Vg1 = −150V
Iant (%)
Ia (A)
Ig2 (mA)
Ig1 (mA)
f (Mc/s)
Vg1g1p (V)
7R51078

7.7.1954

QBL 5/3500

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QBL 5/3500

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Electronic Tube

HANDBOOK

QBL5/3500

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3	3	1959.02.02
4	4	1959.02.02
5	5	1956.02.02
6	6	1956.02.02
7	7	1956.01.01
8	7	1959.05.05
9	8	1956.01.01
10	8	1959.05.05
11	9	1956.01.01
12	10	1956.01.01
13	11	1956.01.01
14	12	1956.01.01
15	13	1956.01.01
16	14	1956.01.01
17	A	1954.07.07
18	B	1954.07.07
19	C	1954.07.07

20	D	1954.07.07
21	E	1954.07.07
22	F	1954.07.07
23	G	1954.07.07
24	H	1954.07.07
25	I	1954.07.07
26	J	1954.07.07
27	K	1954.07.07
28, 29	FP	2000.01.15

TETRODE for use as H.F. amplifier, modulator or frequency multiplier
TETRODE pour utilisation en amplificatrice H.F., modulatrice ou multiplicatrice de fréquence
TETRODE zur Verwendung als HF-Verstärker, Modulator oder Frequenzvervielfacher

Cooling : water/air flow to seals
Refroidissement: circulation d'eau/air aux scellements
Kühlung : Wasser/Luftstrom auf Einschmelzungen

Filament : Thoriated tungsten
Filament : Tungstène thorié
Heizfaden: Thoriertes Wolfram

Heating : direct
Chauffage: direct
Heizung : direkt

V_f = 6,3 V
I_f = 32,5 A

Capacitances
Capacités
Kapazitäten

C_a = 8,4 pF
C_{g1} = 23,5 pF
C_{ag1} < 0,35 pF

Typical characteristics
Caractéristiques types
Kenndaten

μ_{g2g1} = 8,5
$S(I_a=2A)$ = 19 mA/V

λ	Freq.	C telegr.		Cag2 mod.	
m	(Mc/s)	V_a (kV)	W_o (kW)	V_a (kV)	W_o (kW)
4	75	5	4,1		
		4	3,15		
2,7	110	5	3,9	4	2,7
1,36	220	4	2,9		

Television, télévision, Fernsehen

	Freq. (Mc/s)	Neg. mod. pos. synchr. V_a (kV)	Neg. mod. pos. synchr. W_o sync (kW)	Neg. mod. pos. synchr. W_o black noir schwarz (kW)	Pos.mod neg.synchr. V_a kV	Pos.mod neg.synchr. W_o White blanc weiss (kW)
Narrow band Bande étroite Schmaler Band	170–220	4	5,9	3,3	4	4,0
Broad band Bande large Breiter Band	54–88	5	8,0	4,5		
	170–220	4	5,0	2,8	4	2,8

Cooling characteristics
Caractéristiques de refroidissement
Kühlungsdaten

W_a (kW)	t_i (°C)	q (l/min)	p_i (atm)
1	20	2,5	0,073
	50	3,0	0,1
2	20	2,5	0,073
	50	4,8	0,25
3	20	3,0	0,105
	50	6,9	0,55

See cooling characteristics
Voir les courbes de refroidissement
Siehe die Kühlungskurven

t_i = max. 50 °C

Temperature of seals
Température des scellements = max. 180 °C
Temperatur der Einschmelzungen

Bulb temperature
Température de l'ampoule = max. 250 °C
Kolbentemperatur

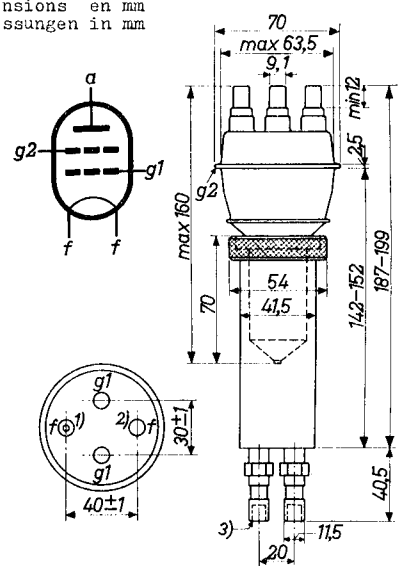
To keep the seal temperature below 180 °C it may be necessary to direct an air flow of sufficient velocity to the seals. At frequencies below 75 Mc/s this air cooling will in general not be necessary at $V_a \leq 4$ kV ($V_a \leq 3.2$ kV in the case of class C anode and screen grid modulation). At $V_a \leq 5$ kV ($V_a \leq 4$ kV in the case of class C a and g_2 modulation) air cooling will generally be necessary at each frequency.

Dans bien des cas un courant d'air à vitesse suffisante sera nécessaire, afin que la température des scellements ne depasse pas 180°C. En général, le refroidissement par air ne sera pas nécessaire au dessous de 75 Mc/s à $V_a \leq 4$ kV (à $V_a \leq 3,2$ kV en cas de modulation d'anode et de grille écran classe C). Généralement le refroidissement par air sera nécessaire à chaque fréquence à $V_a \leq 5$ kV (à $V_a \leq 4$ kV en cas de modulation d'anode et de grille écran classe C).

In vielen Fällen ist ein auf die Einschmelzungen gerichteter genügend starker Luftstrom notwendig, damit die Temperatur von 180°C der Einschmelzungen nicht überschritten wird. Im allgemeinen brauchen die Einschmelzungen bei Frequenzen bis zu 75 MHz und $V_a \leq 4$ kV nicht gekühlt zu werden (bei Klasse C Anoden- und Schirmgittermodulation nicht bei $V_a \leq 3,2$ kV). Bei $V_a \leq 5$ kV (4 kV bei Klasse C Anoden- und Schirmgittermodulation) wird im allgemeinen die Luftkühlung bei jeder Frequenz erforderlich sein.

Tube mounted in water-jacket type K 713
Tube monté dans le refroidisseur type K 713
Röhre in Kühltopf Typ K 713 montiert

Dimensions in mm
Dimensions en mm
Abmessungen in mm



1) This pin is marked "0"
Cette broche est marquée "0"
Dieser Stift ist mit "0" gekennzeichnet

2) This pin should be used for connecting the anode return lead
Cette broche sera utilisée pour connecter le conducteur de retour du circuit anodique
Dieser Stift soll zum Anschliessen der Anodenrückleitung verwendet werden

3) 1/8"pipe thread; 1/8" pas à gaz; 1/8"Gasrohrgewinde

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Mounting position: vertical with anode down
Montage : vertical avec l'anode en bas
Einbau : senkrecht mit der Anode unten

Clips for filament and control grid
Bornes de connexion pour le filament et la grille de commande 40634
Anschlussklemmen für Heizfaden und Steuergitter

Screen grid connector
Connecteur pour la grille écran 40622
Schirmgitteranschlussring

At frequencies above 30 Mc/s both connecting pins must be used when connecting the control grid
Aux fréquences au-dessus de 30 Mc/s il faut utiliser les deux broches de connexion pour la connexion de la grille de commande
Bei Frequenzen über 30 MHz müssen die beiden Anschlussstifte zum Anschliessen des Steuergitters verwendet werden

Tube : Net weight
Tube : Poids net 0,35 kg
Röhre: Nettogewicht

Tube : Shipping weight
Tube : Poids brut 1,1 kg
Röhre: Bruttogewicht

K 713

Net weight
Poids net 0,52 kg
Nettogewicht

Shipping weight
Poids brut 0,75 kg
Bruttogewicht

H.F. class C telegraphy
H.F. classe C télégraphie
H.F. Klasse C Telegraphie

Limiting values
Caractéristiques limites
Grenzdaten

f	= max.	30 Mc/s	f	= max.	110 Mc/s
V_a	= max.	5,5 kV	V_a	= max.	5 kV
W_{ia}	= max.	5,5 kW			
W_a	= max.	3 kW	f	= max.	220 Mc/s
I_a	= max.	1,1 A	V_a	= max.	4 kV
V_{g2}	= max.	800 V			
W_{g2}	= max.	100 W			
$-V_{g1}$	= max.	500 V			
W_{g1}	= max.	30 W			

Operating conditions
Caractéristiques d'utilisation
Betriebsdaten

f	=	75	110	75	220	Mc/s
V_a	=	5	5	4	4	kV
V_{g2}	=	800	800	800	800	V
V_{g1}	=	-250	-250	-250	-250	V
I_a	=	1,1	1,1	1,1	1,1	A
I_{g2}	=	100	100	120	120	mA
I_{g1}	=	70	70	80	80	mA
V_{g1p}	=	480	480	500	500	V
W_{ig1}	=	30	30	36	36	W
W_{g2}	=	80	80	96	96	W
W_{ia}	=	5,5	5,5	4,4	4,4	kW
W_a	=	1,4	1,6	1,25	1,5	kW
W_o	=	4,1	3,9	3,15	2,9	kW
η	=	74,5	71	72	66	%

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H.F. class C anode and screen grid modulation
H.F. classe C modulation d'anode et de grille-écran
HF Klasse C Anoden- und Schirmgittermodulation

Screen grid modulated via a choke of 60 H
La grille-écran modulée à travers une bobine de 60 H
Schirmgitter moduliert über eine Drosselspule von 60 H

Limiting values
Caractéristiques limites
Grenzdaten

f	= max.	30 Mc/s	f	= max.	110 Mc/s
V_a	= max.	4,5 kV	V_a	= max.	4 kV
W_{ia}	= max.	3,6 kW			
W_a	= max.	2 kW			
I_a	= max.	0,9 A			
V_{g2}	= max.	800 V			
W_{g2}	= max.	100 W[1])			
$-V_{g1}$	= max.	500 V	f	= max.	220 Mc/s
W_{g1}	= max.	30 W	V_a	= max.	3,2 kV

Operating conditions
Caractéristiques d'utilisation
Betriebsdaten

f	=	110 Mc/s
V_a	=	4 kV
V_{g2}	=	800 V
V_{g1}	=	-375 V
V_{g1p}	=	625 V
I_a	=	0,9 A
I_{g2}	=	120 mA
I_{g1}	=	85 mA
W_{ia}	=	3,6 kW
W_a	=	0,9 kW
W_o	=	2,7 kW
W_{g2}	=	96 W
W_{ig1}	=	48 W
η	=	75 %
m	=	100 %
W_{mod}	=	1,8 kW

[1]) For all other modulation methods W_{g2} = max. 65 W
Pour toutes les autres méthodes de modulation W_{g2} = max. 65 W
Für alle andere Modulationsverfahren ist W_{g2} = max. 65 W

H.F. class B amplifier, single side band
Amplificatrice H.F. classe B à une bande latérale
HF Einseitenbandverstärker, Klasse B

Limiting values
Caractéristiques limites
Grenzdaten

f = max. 110 Mc/s

V_a	= max.	5 kV
I_a	= max.	1,3 A
W_{ia}	= max.	6,5 kW
W_a	= max.	3 kW
V_{g2}	= max.	800 V
W_{g2}	= max.	100 W
I_{g1}	= max.	80 mA

Operating conditions
Caractéristiques d'utilisation
Betriebsdaten

V_a	=	5		4,5		4	kV
V_{g2}	=	800		800		800	V
V_{g1}	=	-107		-105		-104	V
V_{g1_p}	=	0	277	0	275	0	274 V
I_a	=	0,08	1,3	0,08	1,29	0,07	1,28 A
I_{g2}	=	0	75	0	75	0	78 mA
I_{g1}	=	0	55	0	55	0	54 mA
W_{ig1}	=	0	15	0	15	0	15 W
W_{g2}	=	0	60	0	60	0	62,5 W
W_{ia}	=	0,40	6,5	0,36	5,8	0,28	5,1 kW
W_a	=	0,40	2,1	0,36	1,95	0,28	1,8 kW
W_o	=	-	4,4	-	3,85	-	3,3 kW
η	=	-	68	-	66,5	-	65 %

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[1])At full modulation I_a = max. 1.5 A
A modulation complète I_a = max. 1,5 A
Bei Vollaussteuerung ist I_a = max. 1,5 A

H.F. class B amplifier, single side band
Amplificatrice H.F. classe B à une bande latérale
HF Einseitenbandverstärker, Klasse B

Limiting values
Caractéristiques limites
Grenzdaten

f = max. 110 Mc/s

V_a	= max.	5 kV
I_a	= max.	1,3 A
W_{ia}	= max.	6,5 kW
W_a	= max.	3 kW
V_{g2}	= max.	800 V
W_{g2}	= max.	100 W
I_{g1}	= max.	80 mA

Operating conditions
Caractéristiques d'utilisation
Betriebsdaten

V_a	=	5		4,5		4	kV
V_{g2}	=	800		800		800	V
V_{g1}	=	-107		-105		-104	V
V_{g1p}	=	0	277	0	275	0	274 V
I_a	=	0,08	1,3	0,08	1,29	0,07	1,28 A
I_{g2}	=	0	75	0	75	0	78 mA
I_{g1}	=	0	55	0	55	0	54 mA
W_{ig1}	=	0	15	0	15	0	15 W
W_{g2}	=	0	60	0	60	0	62,5 W
W_{ia}	=	0,40	6,5	0,36	5,8	0,28	5,1 kW
W_a	=	0,40	2,1	0,36	1,95	0,28	1,8 kW
W_o	=	-	4,4	-	3,85	-	3,3 kW
η	=	-	68	-	66,5	-	65 %

→ [1]) Page 8; Seite 8

At 100 % modulation with single tone sine wave I_a = max. 1.5 A
A modulation de 100 % par onde sinusoïdale monofréquence I_a = 1,5 A au max.
Bei 100 % Modulation mit sinusförmigem Signal einer einzigen Frequenz ist I_a = max. 1,5 A

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L.F. class B amplifier and modulator
Amplificatrice et modulatrice B.F. classe B
NF Klasse B Verstärker und Modulator

Limiting values
Caractéristiques limites
Grenzdaten

V_a	= max.	5 kV	I_a	= max.	1,1 A[1])
			V_{g2}	= max.	800 V
W_{ia}	= max.	5,5 kW	W_{g2}	= max.	100 W
			$-V_{g1}$	= max.	500 V
W_a	= max.	3 kW	W_{g1}	= max.	30 W

Operating conditions, two tubes
Caractéristiques d'utilisation, deux tubes
Betriebsdaten, zwei Röhren

V_a	=	5		5		kV
V_{g2}	=	800		800		V
V_{g1}	=	-107		-107		V
$R_{aa'}$	=	3700		5000		Ω
V_{g1g1_p}	=	0	714	0	594	V
I_a	=	2x0,1	2x1,46	2x0,1	2x1,1	A
I_{g2}	=	0	2x120	0	2x50	mA
I_{g1}	=	0	2x150	0	2x40	mA
I_{g1_p}	=	0	2x750	0	2x460	mA
W_{ig1}	=	0	2x50	0	2x11	W
W_{g2}	=	0	2x96	0	2x40	W
W_{ia}	=	2x0,5	2x7,3	2x0,5	2x5,5	kW
W_a	=	2x0,5	2x2,55	2x0,5	2x1,9	kW
W_o	=	0	9,5	0	7,2	kW
η	=	-	65	-	65	%

V_a	=	5		4		kV
V_{g2}	=	800		800		V
V_{g1}	=	-107		-103		V
$R_{aa'}$	=	17600		7000		Ω
V_{g1g1_p}	=	0	214	0	366	V
I_a	=	2x0,1	2x0,32	2x0,1	2x0,6	A
I_{g2}	=	0	2x10	0	2x60	mA
I_{g1}	=	0	0	0	2x11	mA
I_{g1_p}	=	0	0	0	2x70	mA
W_{ig1}	=	0	0	0	2x2	W
W_{g2}	=	0	2x8	0	2x48	W
W_{ia}	=	2x0,5	2x1,6	2x0,4	2x2,4	kW
W_a	=	2x0,5	2x0,55	2x0,4	2x0,9	kW
W_o	=	0	2,1	0	3,0	kW
η	=	-	65	-	62	%

[1])See page 7; voir page 7; siehe Seite 7

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L.F. class B amplifier and modulator
Amplificatrice et modulatrice B.F. classe B
NF Klasse B Verstärker und Modulator

Limiting values
Caractéristiques limites
Grenzdaten

V_a	= max.	5 kV	I_a	= max.	1,1 A[1])
			V_{g2}	= max.	800 V
W_{ia}	= max.	5,5 kW	W_{g2}	= max.	100 W
			$-V_{g1}$	= max.	500 V
W_a	= max.	3 kW	W_{g1}	= max.	30 W

Operating conditions, two tubes
Caractéristiques d'utilisation, deux tubes
Betriebsdaten, zwei Röhren

V_a	=	5		5		kV
V_{g2}	=	800		800		V
V_{g1}	=	-107		-107		V
$R_{aa'}$	=	3700		5000		Ω
V_{g1g1_p}	=	0	714	0	594	V
I_a	=	2x0,1	2x1,46	2x0,1	2x1,1	A
I_{g2}	=	0	2x120	0	2x50	mA
I_{g1}	=	0	2x150	0	2x40	mA
I_{g1_p}	=	0	2x750	0	2x460	mA
W_{ig1}	=	0	2x50	0	2x11	W
W_{g2}	=	0	2x96	0	2x40	W
W_{ia}	=	2x0,5	2x7,3	2x0,5	2x5,5	kW
W_a	=	2x0,5	2x2,55	2x0,5	2x1,9	kW
W_o	=	0	9,5	0	7,2	kW
η	=	-	65	-	65	%

V_a	=	5		4		kV
V_{g2}	=	800		800		V
V_{g1}	=	-107		-103		V
$R_{aa'}$	=	17600		7000		Ω
V_{g1g1_p}	=	0	214	0	366	V
I_a	=	2x0,1	2x0,32	2x0,1	2x0,6	A
I_{g2}	=	0	2x10	0	2x60	mA
I_{g1}	=	0	0	0	2x11	mA
I_{g1_p}	=	0	0	0	2x70	mA
W_{ig1}	=	0	0	0	2x2	W
W_{g2}	=	0	2x8	0	2x48	W
W_{ia}	=	2x0,5	2x1,6	2x0,4	2x2,4	kW
W_a	=	2x0,5	2x0,55	2x0,4	2x0,9	kW
W_o	=	0	2,1	0	3,0	kW
η	=	-	65	-	62	%

[1])See page 7; voir page 7; siehe Seite 7

Grid modulated H.F.class C amplifier for television service, negative modulation, positive synchronisation
Amplificatrice H.F. classe C pour télévision, modulation de grille, modulation négative, synchronisation positive
HF Klasse C Verstärker für Fernsehsender, Gittermodulation, negative Modulation, positive Synchronisierung

Limiting values
Caractéristiques limites
Grenzdaten

f	= max.	110	Mc/s	f	= max.	220	Mc/s
V_a	= max.	5	kV	V_a	= max.	4	kV
I_a sync	= max.	1,5	A	W_{ia} sync	= max.	6	kW
W_{ia} sync	= max.	7	kW				
W_a sync	= max.	3	kW				
V_{g2}	= max.	800	V				
W_{g2} sync	= max.	100	W				
$-V_{g1}$	= max.	500	V				
I_{g1} sync	= max.	80	mA				

Operating conditions, two tubes in push-pull
Caractéristiques d'utilisation, deux tubes en push-pull
Betriebsdaten, zwei Röhren in Gegentakt

f		54-88[1]	170-220[1]	170-220	Mc/s
B (-1,5 db)		6,5	6,5	-	Mc/s[2]
B (-3 db)		12	12	7,5	Mc/s[2]
V_a		5	4	4	kV
V_{g2}		800	800	800	V
V_{g1}	sync	-175	-150	-150	V
	black, noir, schwarz	-260	-230	-260	V
	white, blanc, weiss	-450	-450	-450	V
V_{g1g1_p}		900	850	850	V[3]
I_a	sync	2,7	2,75	2,75	A
	black, noir, schwarz	1,75	2,1	1,5	A
I_{g2}	sync	145	110	250	mA
	black, noir, schwarz	40	50	65	mA
I_{g1}	sync	82	100	80	mA
	black, noir, schwarz	35	50	20	mA
W_{ig1} sync		200-300	300-400	200-300	W[4]
W_o	sync	8,0	5,0	5,9	kW
	black, noir, schwarz	4,5	2,8	3,3	kW

[1], [2], [3], [4]) See page 14 ; voir page 14 ; siehe Seite 14

H.F. class B amplifier for television service, negative modulation, positive synchronisation.
Amplificatrice H.F. classe B pour télévision, modulation négative, synchronisation positive
HF Klasse B Verstärker für Fernsehsender, negative Modulation, positive Synchronisierung

Limiting values
Caractéristiques limites
Grenzdaten

f = max. 110 Mc/s		f = max. 220 Mc/s	
V_a = max.	5 kV	V_a = max.	4 kV
V_{g2} = max.	800 V	W_{ia} sync = max.	6 kW
I_a sync = max.	1,5 A		
W_{ia} sync = max.	7 kW		
W_a sync = max.	3 kW		
W_{g2} sync = max.	100 W		
I_{g1} sync = max.	80 mA		

Operating conditions, two tubes in push-pull
Caractéristiques d'utilisation, deux tubes en push-pull
Betriebsdaten, zwei Röhren in Gegentakt

f		54-88	170- 220 Mc/s[1]
B (-1,5 db)		6,5	6,5 Mc/s[2]
B (-3 db)		12	12 Mc/s[2]
V_a		5	4 kV
V_{g2}		800	800 V
V_{g1}		-175	-150 V
V_{g1g1_p}	sync	900	850 V[3]
	black, noir, schwarz	730	700 V[3]
I_a	sync	2,7	2,75 A
	black, noir, schwarz	1,75	2,1 A
I_{g2}	sync	145	110 mA
	black, noir, schwarz	40	50 mA
I_{g1}	sync	82	100 mA
	black, noir, schwarz	35	50 mA
W_{ig1}	sync	200-300	300-400 W[4]
W_o	sync	8,0	5,0 kW
	black, noir, schwarz	4,5	2,8 kW

[1], [2], [3], [4]) See page 14; voir page 14; siehe Seite 14

Grid modulated H.F.class C amplifier for television service, positive modulation, negative synchronisation
Amplificatrice H.F. classe C pour télévision, modulation de grille, modulation positive, synchronisation négative
HF Klasse C Verstärker für Fernsehsender, Gittermodulation, positive Modulation, negative Synchronisierung

Limiting values
Caractéristiques limites
Grenzdaten

f	= max. 110 Mc/s	f	= max. 220 Mc/s
V_a	= max. 5 kV	V_a	= max. 4 kV
V_{g2}	= max. 800 V	W_{ia} white, blanc, weiss	= max. 4,4 kW
$-V_{g1}$	= max. 500 V		
I_a	= max. 1,1 A		
W_{ia} white, blanc, weiss	= max. 5,5 kW		
W_a white, blanc, weiss	= max. 3 kW		
W_{g2} white, blanc, weiss	= max. 100 W		
I_{g1} white, blanc, weiss	= max. 80 mA		

Operating conditions, two tubes in push-pull
Caractéristiques d'utilisation, deux tubes en push-pull
Betriebsdaten, zwei Röhren in Gegentakt

f		170-220 [1]	170-220 Mc/s
B (-1,5 db)		6,5	- Mc/s [2]
B (-3 db)		12	7,5 Mc/s [2]
V_a		4	4 kV
V_{g2}		800	800 V
V_{g1}	white, blanc, weiss	-230	-230 V
	black, noir, schwarz	-380	-380 V
V_{g1g1_p}		850	850 V [3]
I_a	white, blanc, weiss	2,1	1,7 A
	black, noir, schwarz	0,6	0,5 A
I_{g2}	white, blanc, weiss	50	80 mA
	black, noir, schwarz	10	10 mA
I_{g1}	white, blanc, weiss	50	25 mA
	black, noir, schwarz	0	0 mA
W_{ig1}		300-400	200-300 W [4]
W_o	white, blanc, weiss	2,8 [5]	4,0 kW
	black, noir, schwarz	0,25	0,36 kW

[1], [2], [3], [4], [5] See page 14; voir page 14; siehe Seite 14

PHILIPS

H.F. class B amplifier for television service, positive modulation, negative synchronisation
Amplificatrice H.F.classe B pour télévision, modulation positive, synchronisation négative
HF Klasse B Verstärker für Fernsehsender, positive Modulation, negative Synchronisierung

Limiting values
Caractéristiques limites
Grenzdaten

f	= max. 110 Mc/s	f	= max. 220 Mc/s
V_a	= max. 5 kV	V_a	= max. 4 kV
V_{g2}	= max. 800 V	W_{ia} white / blanc / weiss	= max. 4,4 kW
white / blanc / weiss I_a	= max. 1,1 A		
white / blanc / weiss W_{ia}	= max. 5,5 kW		
white / blanc / weiss W_a	= max. 3 kW		
white / blanc / weiss W_{g2}	= max. 100 W		
white / blanc / weiss I_{g1}	= max. 80 mA		

Operating conditions, two tubes in push-pull
Caractéristiques d'utilisation, deux tubes en push-pull
Betriebsdaten, zwei Röhren in Gegentakt

f		=	170 - 220 Mc/s [1]
B (-1,5 db)		=	6,5 Mc/s [2]
B (-3 db)		=	12 Mc/s [2]
V_a		=	4 kV
V_{g2}		=	800 V
V_{g1}		=	-150 V
V_{g1g1p}	white, blanc, weiss	=	700 V [3]
	black, noir, schwarz	=	350 V [3]
I_a	white, blanc, weiss	=	2,1 A
	black, noir, schwarz	=	0,6 A
I_{g2}	white, blanc, weiss	=	50 mA
	black, noir, schwarz	=	10 mA
I_{g1}	white, blanc, weiss	=	50 mA
	black, noir, schwarz	=	0 mA
W_{ig1}	white, blanc, weiss	=	200-300 W [4]
W_o	white, blanc, weiss	=	2,8 kW [5]
	black, noir, schwarz	=	0,25 kW

[1], [2], [3], [4], [5] See page 14 ; voir page 14 ; siehe Seite 14 ←

Grid modulated H.F. class C amplifier for colour-television service, negative modulation, positive synchronisation
Amplificatrice H.F. classe C pour télévision en couleurs, modulation de grille; modulation négative, synchronisation positive
HF Klasse C Verstärker für Farbfernsehsender, Gittermodulation; negative Modulation, positive Synchronisierung

Limiting values
Caractéristiques limites
Grenzdaten

f = max. 110 Mc/s		f = max. 220 Mc/s	
V_a	= max. 5 kV	V_a	= max. 4 kV
I_a sync	= max. 1,5 A	W_{ia} sync	= max. 6 kW
W_{ia} sync	= max. 7 kW		
W_a sync	= max. 3 kW		
V_{g2}	= max. 800 V		
W_{g2} sync	= max. 100 W		
$-V_{g1}$	= max. 500 V		
I_{g1} sync	= max. 80 mA		

Operating conditions, two tubes in push-pull
Caractéristiques d'utilisation, deux tubes en push-pull
Betriebsdaten, zwei Röhren in Gegentakt

f		= 170 - 220 Mc/s [1]
B (-1,5 db)		= 4 Mc/s [2]
B (- 3 db)		= 8,5 Mc/s [2]
V_a		= 3,5 kV
V_{g2}		= 700 V
V_{g1}	sync	= -120 V
	black, noir, schwarz	= -170 V
	white, blanc, weiss	= -320 V
V_{g1g1p}		= 640 V [3]
I_a	sync	= 2 A
	black, noir, schwarz	= 1,5 A
I_{g2}	sync	= 82 mA
	black, noir, schwarz	= 38 mA
I_{g1}	sync	= 100 mA
	black, noir, schwarz	= 50 mA
W_{ig1}	sync	= 100 - 200 W [4]
W_o	sync	= 3 kW
	black, noir, schwarz	= 1,7 kW

[1])[2])[3])[4]) See page 14; voir page 14; siehe Seite 14

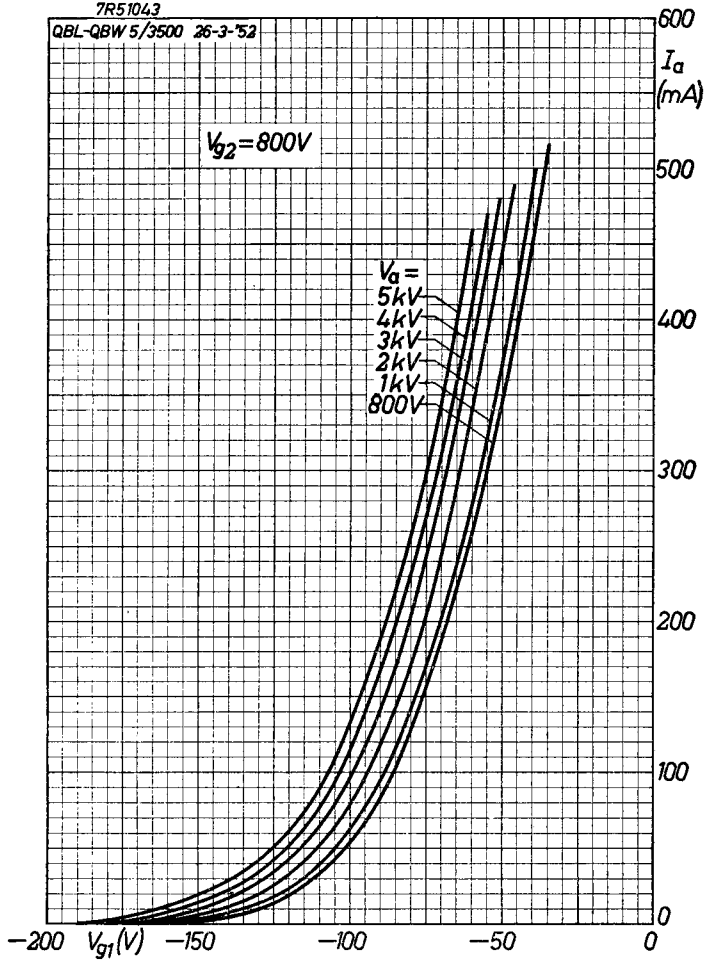
1) The operating conditions are given at a frequency slightly below the peak of the resonance curve
Les caractéristiques d'utilisation sont données à une fréquence un peu au-dessous de la crête de la courbe de résonance
Die Betriebsdaten gelten bei einer Frequenz ein wenig unterhalb des Scheitels der Abstimmkurve.

2) This value of bandwidth is based on measurements on a circuit with a single LC section
Cette valeur de la largeur de bande se rapporte à des mesures à un montage avec un seul circuit LC.
Dieser Wert der Bandbreite bezieht sich auf Messungen an einer Schaltung mit einem einzigen LC-Kreis.

3) Measured by the slide back method
Mesuré par la méthode de glissement de la tension de polarisation
Gemessen mittels Verschiebung der Gittervorspannung

4) Driving power is accounted for largely by circuit losses. The indicated driving power is required to take care of losses in damping resistors, circuit losses and tube driving power
La puissance d'entrée est nécessaire pour la plupart pour les pertes dans le circuit. La puissance mentionnée est nécessaire pour les pertes dans les résistances d'amortissement, dans le circuit et pour la puissance d'entrée du tube
Die Eingangsleistung ist grossenteils nötig für die Verluste in der Schaltung. Die genannte Leistung ist nötig für die Verluste in Dämpfungswiderständen, in Kreisen und für die Eingangsleistung der Röhre

5) In the peak of the resonance curve W_o(white)=3,3 kW
A la crete de la courbe de résonance W_o (blanc) = 3,3 kW
Im Scheitel der Abstimmkurve ist W_o(weiss)=3,3 kW

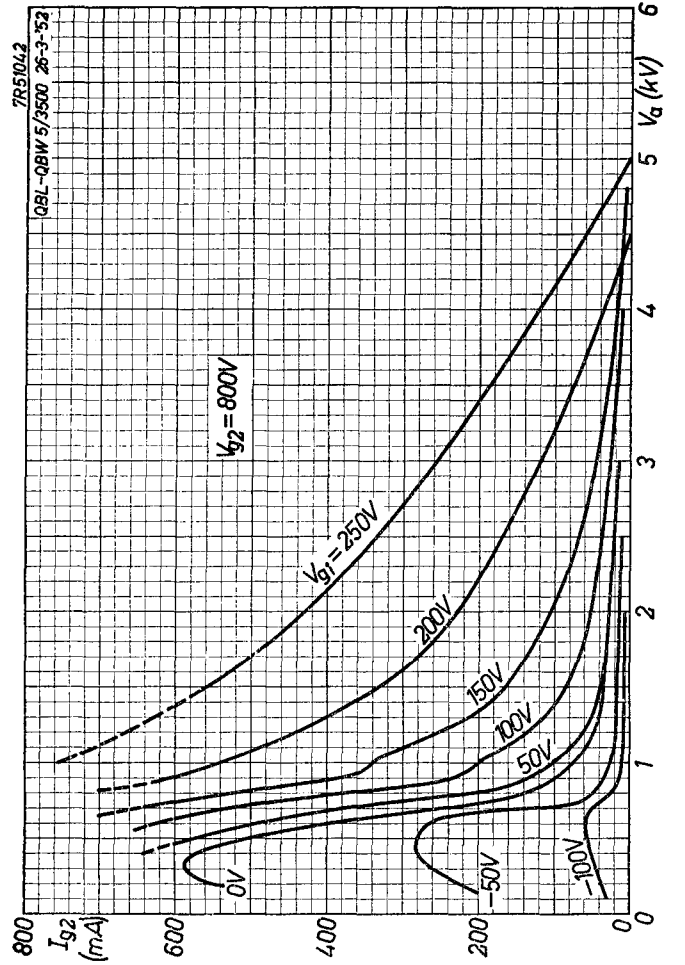

7R51043
QBL-QBW 5/3500 26-3-'52
V_{g2}=800V
V_a =
5kV
4kV
3kV
2kV
1kV
800V
600
I_a
(mA)
500
400
300
200
100
0
−200
V_{g1}(V)
−150
−100
−50
0

11.11.1952

A

QBW 5/3500

PHILIPS


7R5104.2
QBL-QBW 5/3500 26-3-'52
V_{g2} = 800V
V_{g1} = 250V
200V
150V
100V
50V
0V
−50V
−100V
I_{g2} (mA)
800
600
400
200
0
0
1
2
3
4
5
6
V_a (kV)

11.11.1952

C

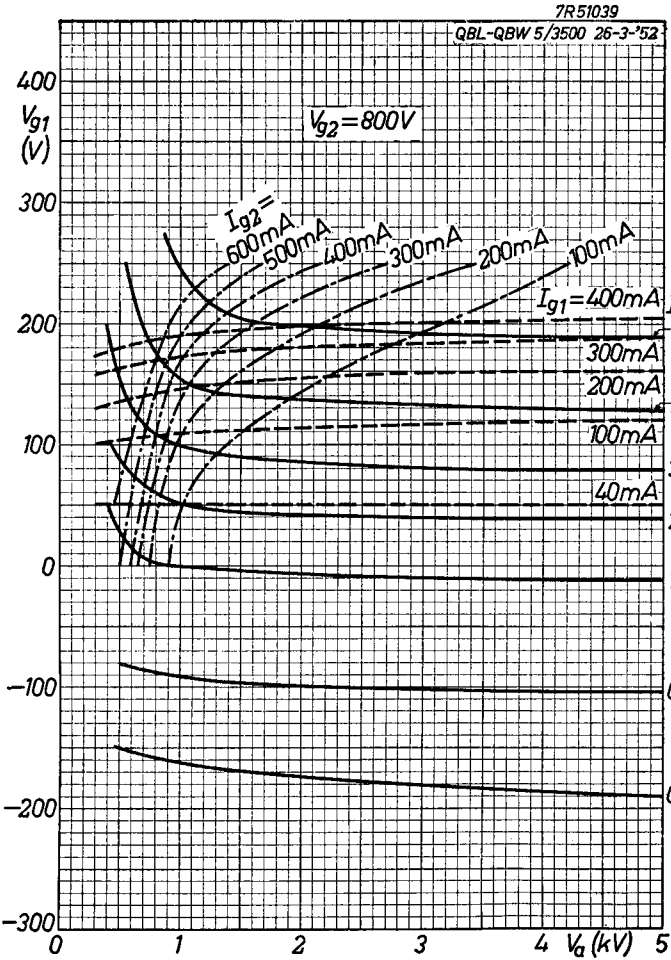
QBW 5/3500

PHILIPS

D

PHILIPS

QBW 5/3500

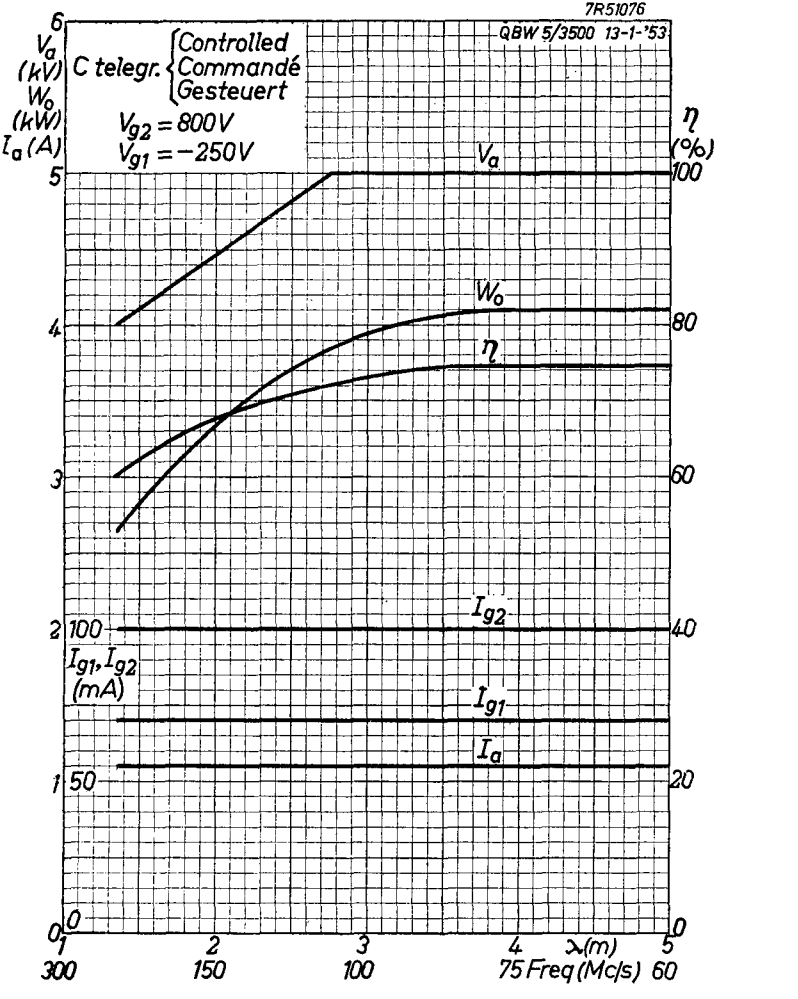


11.11.1952

E

QBW 5/3500

PHILIPS

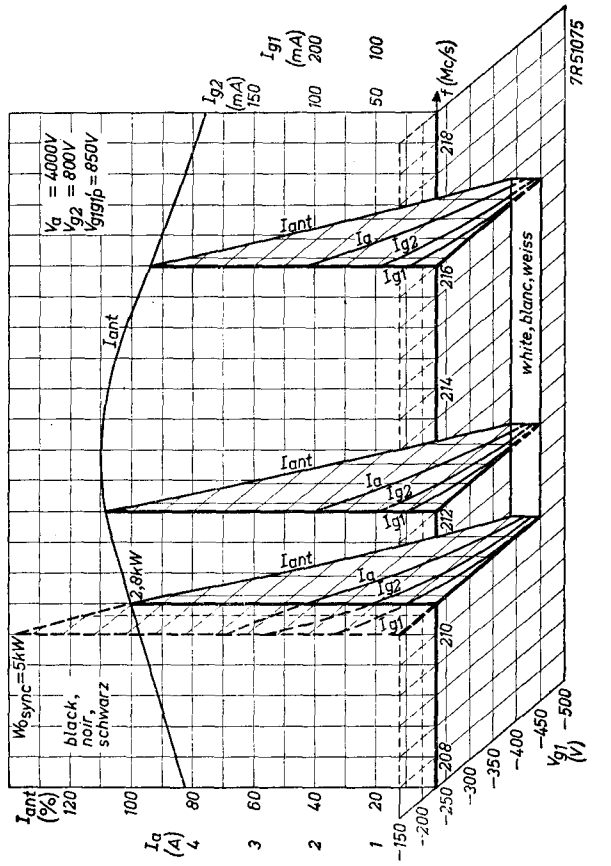


F

PHILIPS

QBW 5/3500

Grid-modulated H.F. class C amplifier for television service (2 valves in push-pull)
Amplificateur HF. classe C modulé par la grille pour la télévision (2 tubes en montage push-pull)
H.F. Klasse C Verstärker mit Gittermodulation für Fernsehbetrieb (2 Röhren in Gegentaktschaltung)

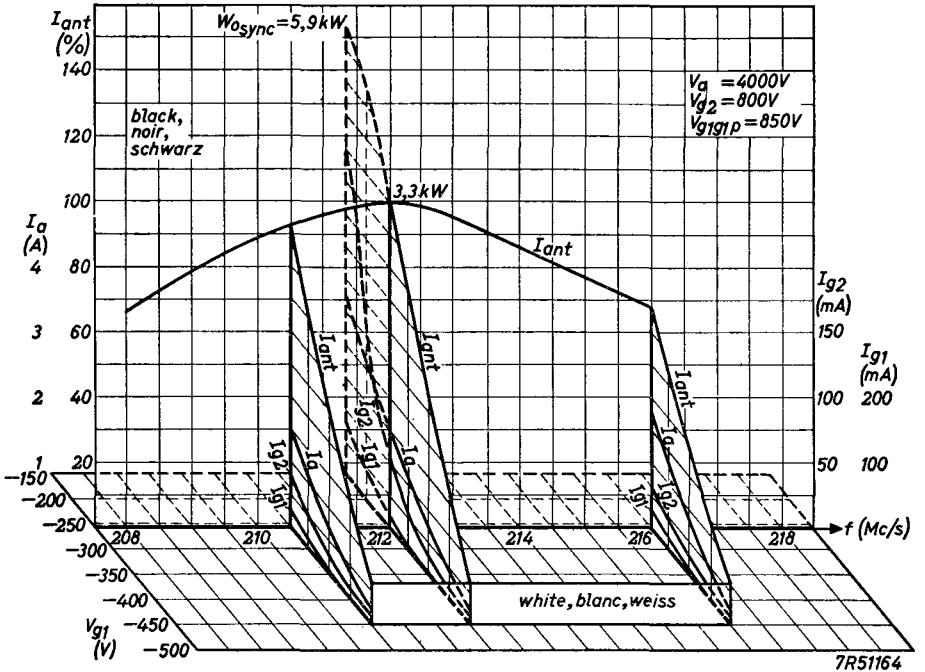


7.7.1954

G

PHILIPS

Grid-modulated H.F. class C amplifier for television service (2 valves in push-pull)
Amplificateur H.F. class C modulé par la grille pour la télévision (2 tubes en montage push-pull)
H.F. Klasse C Verstärker mit Gittermodulation für Fernsehbetrieb (2 Röhren in Gegentaktschaltung)



H

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QBW 5/3500

Grid-modulated H.F. class B amplifier for television service (2 valves in push-pull)
Amplificateur H.F. classe B modulé par la grille pour la télévision (2 tubes en montage push-pull)
H.F. Klasse B Verstärker mit Gittermodulation für Fernsehbetrieb (2 Röhren in Gegentaktschaltung)

12.12.1952

QBW 5/3500

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Electronic Tube

HANDBOOK

QBW5/3500

page	sheet	date
1	1	1955.03.03
2	2	1955.03.03
3	3	1959.02.02
4	4	1959.02.02
5	5	1956.02.02
6	6	1956.02.02
7	7	1956.01.01
8	7	1959.05.05
9	8	1956.01.01
10	8	1959.05.05
11	9	1956.01.01
12	10	1956.01.01
13	11	1956.01.01
14	12	1956.01.01
15	13	1956.01.01
16	14	1956.01.01
17	A	1952.11.11
18	B	1952.11.11
19	C	1952.11.11

20	D	1952.11.11
21	E	1952.11.11
22	F	1952.11.11
23	G	1954.07.07
24	H	1954.07.07
25	I	1952.12.12
26	J	1952.12.12
27, 28	FP	2000.01.15

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ZENDBUIS QC 05/15

Deze schermroosterzendbuis is bestemd voor H.F. versterking, in het bijzonder op de korte golf (tot 15 m). De QC 05/15 bezit een oxyd-kathode met een groot emissievermogen bij een laag gloeistroomverbruik. Tusschen de anode en het stuurrooster bevindt zich een schermrooster, waardoor de anode-stuurroostercapaciteit tot ca. 0,004 pF wordt teruggebracht. Een uitwendig scherm tusschen rooster- en anodeketen kan zoodanig worden aangebracht, dat dit op het schermrooster aansluit.
Bij zenders met variabele golflengten biedt het gebruik van deze buis een groot voordeel, daar neutrodyniseering overbodig is, waardoor de constructie en de bediening van den zender worden vereenvoudigd. Bovendien kan voor het sturen van deze buis met een kleinere buis worden volstaan, dan voor het sturen van een triode onder dezelfde omstandigheden. De onderstaande tabel geeft het afgegeven vermogen en het rendement van deze buis aan,



op een golflengte van 15 m en bij een anodespanning van 500 V.

Schakeling	Scherm-rooster-spanning	Afgegeven vermogen	Rendement ca.
H.F. klasse C (telegrafie)	125 V	15 W[1])	47%
H.F. klasse B (telefonie)	125 V	6,5 W[1])[2])	28%
H.F. klasse C (anode-modulatie)	125 V	8,5 W[1])[2])	46,5%
H.F. klasse C (schermrooster-modulatie)	110 V	3,3 W[1])[1])	16,7%
H.F. klasse C (schermrooster- en anode-modulatie)	125 V	9,8 W[1])[2])	42%

[1]) De kringverliezen moeten worden afgetrokken
[2]) Afgegeven vermogen in de draaggolf

De schermroosterdissipatie (W_{g2}), die bij deze buis niet hooger dan 6 W mag zijn, wordt als volgt berekend:

$$W_{g2} = 0{,}6\ (I_{g2} + I_a)\ .\ V_{g2}$$

waarin:

I_{g2} = schermroostergelijkstroom
I_a = anodegelijkstroom
V_{g2} = schermroostergelijkspanning

De anodedissipatie mag 15 W bedragen en kan uit de volgende formule worden afgeleid:

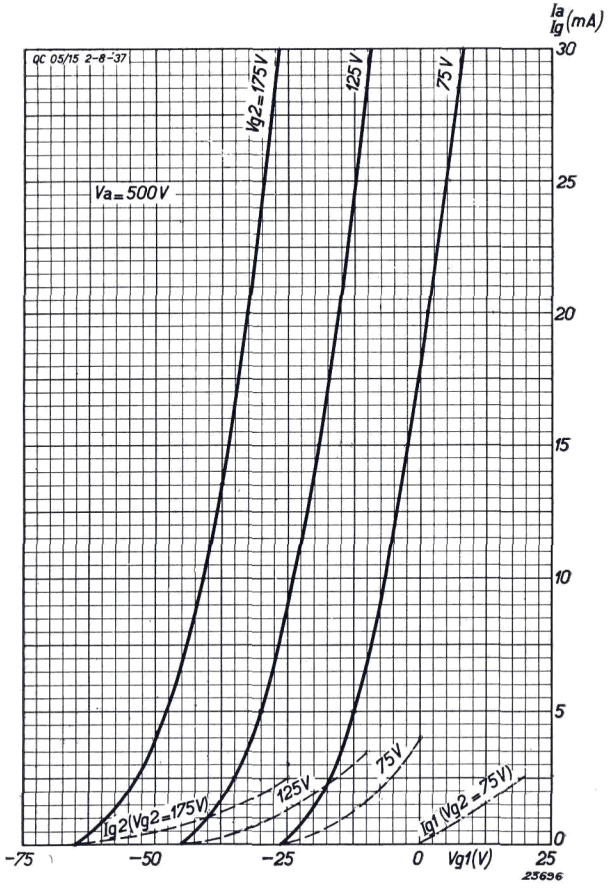
$$W_a = (V_a \cdot I_a + V_{g2} \cdot I_{g2}) - (W_{g2} + W_o)$$

waarin:

V_a = anodespanning
W_o = afgegeven vermogen en
$V_a \cdot I_a + V_{g2} \cdot I_{g2}$ = input.

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ZENDBUIS QC 05/15



Gloeispanning	V_f	= 4,0 V
Gloeistroom	I_f	= ca. 1,1 A
Verzadigingsstroom	I_s	= ca. 0,40 A
Anodespanning	V_a	= max. 500 V
Schermroosterspanning	V_{g2}	= max. 125 V
Toelaatbare anodedissipatie	W_a	= max. 15 W*)
Anodedissipatie tijdens meting	W_{at}	= 18 W
Schermroosterdissipatie	W_{g2}	= max. 6 W*)
Versterkingsfactor t.o.v. het schermrooster	μ_{g1g2}	= ca. 3,0
Steilheid bij V_a = 500 V, V_{g2} = 125 V, I_a = 20 mA	S	= ca. 1,5 mA/V
Maximum steilheid	S_{max}	= ca. 2,5 mA/V
Maximum kathodestroom	I_k	= max. 75 mA
Anode/kathodecapaciteit	C_{af}	= ca. 14,5 pF
Stuurrooster/kathodecapaciteit	C_{g1f}	= ca. 13,7 pF
Anode/stuurroostercapaciteit	C_{ag1}	= ca. 0,004 pF
Grootste diameter van den ballon	d	= 51 mm
Grootste diameter	d'	= 77 mm
Grootste lengte	l	= 163,5 mm

*) Zie ommezijde

QUICK HEATING BEAM POWER TETRODE for use as R.F. amplifier, oscillator and frequency multiplier in mobile and fixed equipment
TÉTRODE À FAISCEAUX À CHAUFFAGE RAPIDE pour utilisation en amplificatrice, oscillatrice et multiplicatrice de fréquence H.F. pour installations mobiles et fixes
SCHNELLHEIZENDE BÜNDELTETRODE zur Verwendung als HF-Verstärker, Oszillator und Frequenzvervielfacher in mobilen und festen Anlagen

Filament : oxide-coated
Filament : oxyde
Heizfaden : Oxyd — V_f = 1,6 V ± 15%

Heating : direct
Chauffage : direct
Heizung : direkt — I_f = 3,2 A

The cathode heating time for W_o > 70% of W_o max is 0.4 sec.

Le temps de chauffage de la cathode pour W_o > 70% de W_o max est de 0,4 sec.

Die Anheizzeit der Katode für W_o > 70% von W_o max ist 0,4 Sek.

Capacitances
Capacités
Kapazitäten

C_a = 8,5 pF
C_{g_1} = 13,5 pF
C_{ag_1} < 0,24 pF

Typical characteristics
Caractéristiques types
Kenndaten

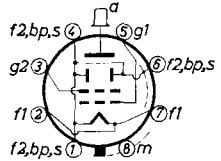
V_a = 200 V
V_{g2} = 200 V
I_a = 100 mA
S = 7 mA/V
μ_{g2g1} = 4,5

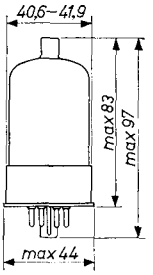
Freq	C telegr. FM teleph.		C_{ag_2} mod.	
(Mc/s)	V_a (V)	W_o (W) IMS [1])	V_a (V)	W_o (W) IMS [1])
60	600	65	475	34
			400	32
175	400	35		

[1]) Intermittent mobile service
Service intermittent mobile
Aussetzender mobiler Betrieb

PHILIPS

Dimensions in mm
Dimensions en mm
Abmessungen in mm





Base, culot, Sockel : OCTAL 8 p.

Socket, support, Fassung: 5903/13
Cap, capot, Haube : 28 906 022

Mounting position: When the tube is mounted with its main axis deviating from the vertical it is recommended that the pins 3 and 7 be placed in a vertical plane
Montage: Si le tube est monté de telle manière que l'axe principal n'est pas vertical, il est conseillé de placer les broches 3 et 7 dans un plan vertical
Einbau: When die Röhre derart eingebaut wird dass die Hauptachse nicht senkrecht ist, wird empfohlen die Stifte 3 und 7 in einer senkrechten Ebene liegen zu lassen

Net weight		Shipping weight	
Poids net	57 g	Poids brut	85 g
Nettogewicht		Bruttogewicht	

Bulb temperature
Température de l'ampoule max. 220 °C
Kolbentemperatur

Derating table of the limiting values of V_a and W_{ia} as a function of the operating frequency
Tableau d'abaissement des caractéristiques limites de V_a et W_{ia} en fonction de la fréquence de fonctionnement
Reduktionstabelle für die Grenzwerte von V_a und W_{ia} als Funktion der Betriebsfrequenz

Freq. (Mc/s)	V_a (%)	W_{ia} (%)
60	100	100
80	84	92
125	65	78
150	58	72
160	56	70
175	53	67

H.F. class C telegraphy and F.M. telephony. Intermittent mobile service
H.F. classe C télégraphie et F.M. téléphonie. Service intermittent mobile
HF-Klasse C Telegraphie und FM Telephonie. Aussetzender mobiler Betrieb

Limiting values (Absolute limits)
Caractéristiques limites (Limites absolues)
Grenzdaten (Absolute Grenzwerte)

See also page 2 for Derating table
Voir aussi page 2 pour Tableau d'abaissement
Siehe auch Seite 2 für Reduktionstabelle

f = max. 60 Mc/s		V_{g_2} = max. 200 V	
V_a = max. 650 V		W_{g_2} = max. 5 W	
W_{i_a} = max. 90 W		$-V_{g_1}$ = max. 150 V	
W_a = max. 25 W		I_{g_1} = max. 5 mA	
I_a = max. 160 mA		R_{g_1} = max. 30 kΩ [1]	

Operating characteristics
Caractéristiques d'utilisation
Betriebsdaten

f	=	60	175 Mc/s
V_a	=	600	400 V
V_{g_2}	=	180	190 V [2]
V_{g_1}	=	-71	-54 V [3]
$V_{g_{1p}}$	=	91	68 V
I_a	=	150	150 mA
I_{g_2}	=	15	15 mA
I_{g_1}	=	2,8	2,2 mA
$W_{i_{g_1}}$	=	0,3	3 W
W_{i_a}	=	90	60 W
W_a	=	25	25 W
W_o	=	65	35 W
η	=	73,5	58 %

[1])[2])[3]) See page 5; voir page 5; Siehe Seite 5.

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H.F. class C anode and screen grid modulation. Intermittent mobile service
H.F. classe C modulation d'anode et de grille-écran. Service intermittent mobile
HF-Klasse C Anoden- und Schirmgittermodulation. Aussetzender mobiler Betrieb

Limiting values (Absolute limits)
Caractéristiques limites (Limites absolues)
Grenzdaten (Absolute Grenzwerte)

See also page 2 for Derating table
Voir aussi page 2 pour Tableau d'abaissement
Siehe auch Seite 2 für Reduktionstabelle

f	= max. 60 Mc/s	V_{g_2}	= max. 250 V
V_a	= max. 480 V	W_{g_2}	= max. 2 W
W_{i_a}	= max. 45 W	$-V_{g_1}$	= max. 150 V
W_a	= max. 14 W	I_{g_1}	= max. 3,5 mA
I_a	= max. 120 mA	R_{g_1}	= max. 30 kΩ[1]

Operating characteristics
Caractéristiques d'utilisation
Betriebsdaten

f	=	60	60 Mc/s
V_a	=	475	400 V
V_{g_2}	=	135	150 V [4]
V_{g_1}	=	-77	-87 V [3]
$V_{g_{1p}}$	=	95	107 V
I_a	=	94	112 mA
I_{g_2}	=	9	12 mA
I_{g_1}	=	2,8	3,4 mA
W_{ig_1}	=	0,3	0,4 W
W_{i_a}	=	45	45 W
W_a	=	11	13 W
W_o	=	34	32 W
η	=	75	71 %
m	=	100	100 %
W_{mod}	=	23	23 W

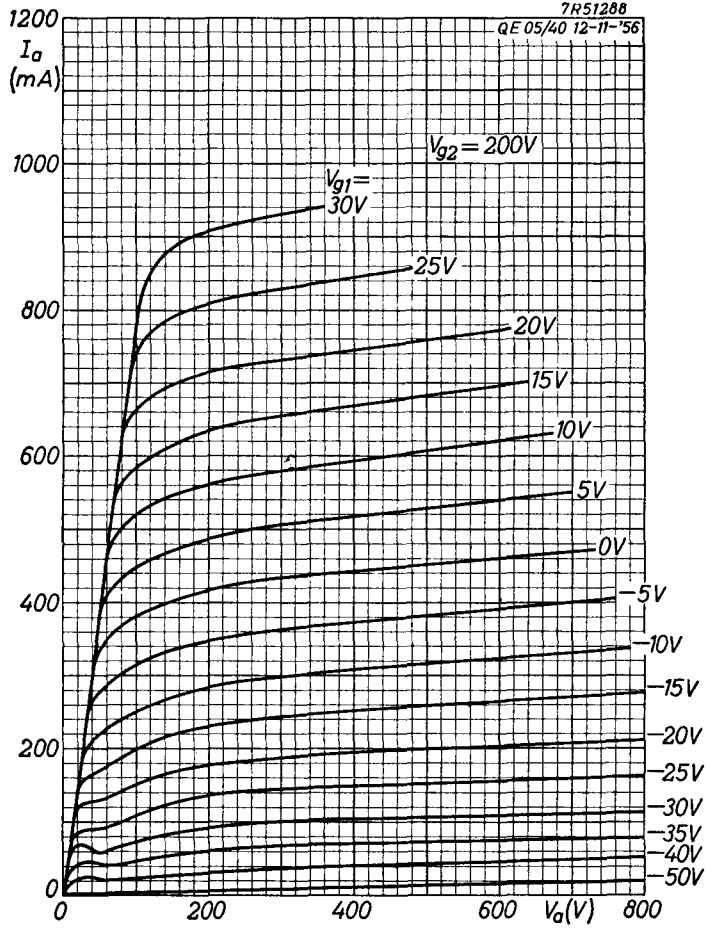
[1)2)3)] See page 5; voir page 5; siehe Seite 5.

[1]) For operation at maximum ratings
Pour le fonctionnement aux caractéristiques limites
Für Betrieb bei den Grenzdaten

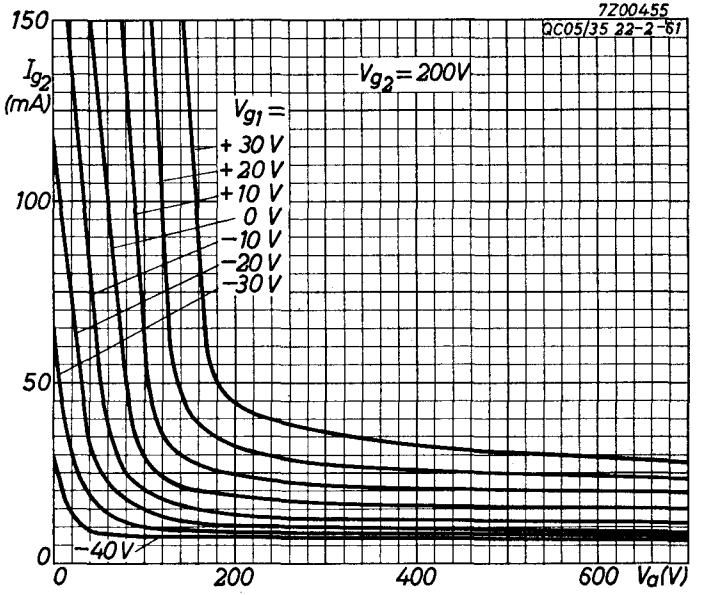
[2]) Obtained preferably from the anode supply through a series resistor
Obtenue de préférence de l'alimentation anodique à travers une résistance série
Vorzugsweise über einen Serienwiderstand von der Anodenspeisung erhalten

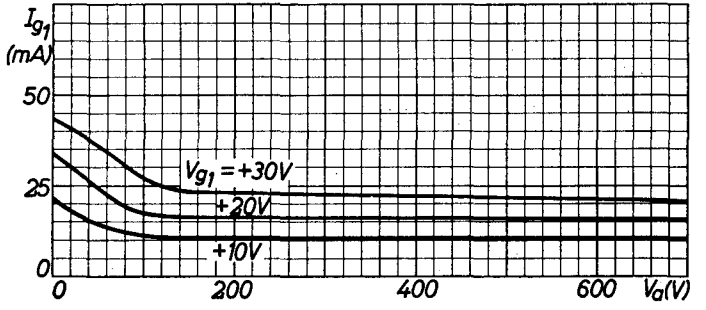
[3]) Vg_1 may be obtained by means of a grid resistor or from a combination of grid resistor and fixed supply
Vg_1 peut être obtenue par moyen d'une résistance de grille ou de la combinaison d'une résistance de grille et une polarisation fixe
Vg_1 kann mittels eines Gitterwiderstandes oder von der Kombination eines Gitterwiderstandes und einer festen Vorspannung erhalten werden

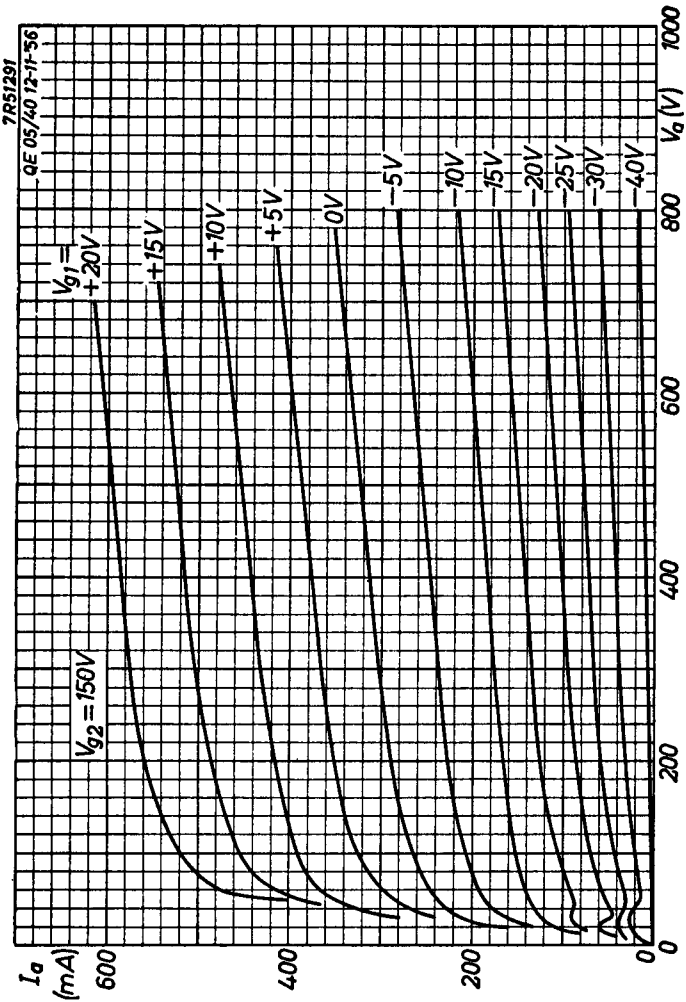
[4]) Obtained preferably from a separate source modulated from the anode supply or from the modulated anode supply through a series resistance
Obtenue de préférence d'une source séparée modulée par l'alimentation anodique ou bien de l'alimentation anodique modulée à travers une résistance série
Vorzugsweise von einer eigenen von der Anodenspeisung modulierten Spannungsquelle oder über einen Serienwiderstand von der modulierten Anodenspeisung erhalten


7R51288
QE 05/40 12-11-'56
1200
I_a
(mA)
1000
800
600
400
200
0
V_{g2} = 200V
V_{g1} =
30V
25V
20V
15V
10V
5V
0V
−5V
−10V
−15V
−20V
−25V
−30V
−35V
−40V
−50V
0
200
400
600
V_a(V)
800

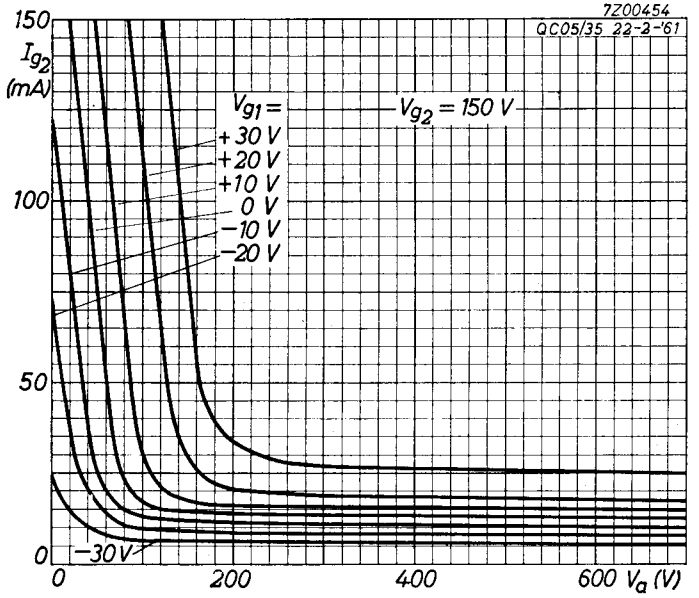
PHILIPS

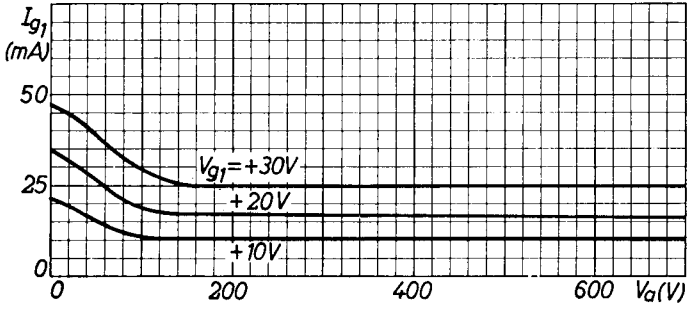

7Z00455
QC05/35 22-2-61
150
I_{g_2} (mA)
100
50
0
V_{g_2} = 200V
V_{g_1} =
+ 30 V
+ 20 V
+ 10 V
0 V
−10 V
−20 V
−30 V
−40 V
0
200
400
600
V_a(V)


I_{g_1} (mA)
50
25
0
V_{g_1} = +30V
+20V
+10V
0
200
400
600
V_a(V)


7R51291
QE 05/40 12-11-56
V_{g1} =
+20V
+15V
+10V
+5V
0V
−5V
−10V
−15V
−20V
−25V
−30V
−40V
V_{g2} = 150V
I_a (mA)
600
400
200
0
V_a (V)
1000
800
600
400
200
0

PHILIPS


7Z00454
QC05/35 22-2-'61
150
I_{g_2}
(mA)
100
50
0
V_{g_1} =
+30 V
+20 V
+10 V
0 V
−10 V
−20 V
V_{g_2} = 150 V
−30 V
0
200
400
600 V_a (V)


I_{g_1}
(mA)
50
25
0
V_{g_1} = +30V
+20V
+10V
0
200
400
600 V_a(V)

PHILIPS

Electronic Tube

HANDBOOK

QC03/35

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1	1	1961.10.10
2	2	1961.10.10
3	3	1961.10.10
4	4	1961.10.10
5	5	1961.10.10
6	A	1961.10.10
7	B	1961.10.10
8	C	1961.10.10
9	D	1961.10.10
10	FP	2000.01.15

TETRODE for use as H.F. amplifier, oscillator or frequency multiplier
TETRODE pour utilisation comme amplificatrice ou oscillatrice H.F. ou multiplicatrice de fréquence
TETRODE zur Verwendung als HF-Verstärker oder Oszillator oder Frequenzvervielfacher

Cathode : oxide-coated
Cathode : oxyde
Katode : Oxyd

Heating : indirect
Chauffage: indirect
Heizung : indirekt

V_f = 6,3 V
I_f = 0,6 A
T_{hk} = 22 s

Capacitances
Capacités
Kapazitäten

C_a = 5,4 pF
C_{g1} = 8 pF
C_{ag1} < 0,1 pF

Typical characteristics
Caractéristiques types
Kenndaten

μ_{g2g1} = 5,6
S (I_a=25 mA) = 1,9 mA/V
R_i = 67 kΩ

λ	Freq.	C telegr.	
m	Mc/s	V_a (V)	W_o (W)
>5	<60	300	8
3	100	300	7,4
2	150	300	6,3
1,7	175	280	5,4
		C ag2 mod.	
>5	<60	250	5,8

λ	Freq.	C fr.mult.	
m	Mc/s	V_a (V)	W_o (W)
8/4	37,5/75	300	5,6
6/3	50/100	300	4,4
4/2	75/150	250	2,3
12/4	25/75	300	3,2
9/3	33,3/100	275	2,8
6/2	50/150	225	1,5

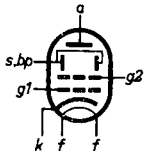
Limiting values
Caractéristiques limites
Grenzdaten

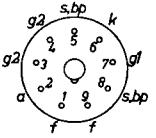
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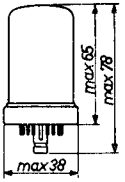
V_a = max. 400 V
W_a = max. 7,5 W
V_{g2} = max. 250 V
W_{g2} = max. 2 W
W_{g1} = max. 0,25 W
R_{g1} = max. 0,1 MΩ
I_{g1} = max. 6 mA
I_k = max. 50 mA
V_{kf} = max. 100 V

PHILIPS

Dimensions in mm
Dimensions en mm
Abmessungen in mm







Base, culot, Sockel: B9G

Socket
Support 40212
Fassung

Mounting position: arbitrary
Montage : arbitrairement
Einbau : beliebig

Net weight
Poids net 40 g
Nettogewicht

Shipping weight
Poids brut 55 g
Bruttogewicht

Operating conditions H.F. class C telegraphy
Caractéristiques d'utilisation H.F. classe C télégraphie
Betriebsdaten HF - Klasse C Telegrafie

λ =	>5	>5	3	2	2	1,7[1])	m
V_a =	300	300	300	300	300	280	V
V_{g1} =	-60	-35	-60	-50	-30	-50	V
V_{g2} =	250	150	250	250	150	250	V
I_a =	43	40	44,5	46	44	2x46	mA
I_{g1} =	0,5	2,8	0,4	0,4	1,5	2x0,3	mA
I_{g2} =	6,7	7,2	5,3	4	4,5	2x3,5	mA
V_{g1p} =	68	58	68	57	52	55	V
W_{ig1} =	31	150	25	21	70	2x15	mW
W_{g2} =	1,7	1,1	1,4	1	0,7	2x0,9	W
W_{ia} =	12,9	12	13,4	13,8	13,2	2x12,9	W
W_a =	4,9	4,9	6	7,5	6,9	2x7,5	W
W_o =	8	7,1	7,4	6,3	6,3	10,8	W
η =	62	59	55	46	48	42	%

Operating conditions H.F. class C anode- and screen grid modulation
Caractéristiques d'utilisation H.F. classe C modulation d'anode et de grille-écran
Betriebsdaten HF - Klasse C Anoden- und Schirmgittermodulation

λ	=	>5	m
V_a	=	250	V
V_{g1}	=	-50	V
V_{g2}	=	200	V
I_a	=	38,5	mA
I_{g1}	=	1,5	mA
I_{g2}	=	10	mA
V_{g1p}	=	72	V
W_{ig1}	=	0,1	W
W_{g2}	=	2	W
W_{ia}	=	9,6	W
W_a	=	3,8	W
W_o	=	5,8	W
η	=	60	%
m	=	100	%
V_{g2p}	=	176	V
W_{mod}	=	5	W

[1]) Two valves in push-pull; deux tubes en push-pull; zwei Röhren in Gegentakt

PHILIPS

Operating conditions as class C frequency doubler
Caractéristiques d'utilisation comme doubleur de fréquence classe C
Betriebsdaten als Frequenzverdoppler Klasse C

λ	=	8/4	6/3	4/2	m
V_a	=	300	300	250	V
V_{g1}	=	-120	-120	-120	V
V_{g2}	=	250	200	200	V
I_a	=	43,3	38,4	36,8	mA
I_{g1}	=	1,2	1,5	1,1	mA
I_{g2}	=	5,5	2,6	2,1	mA
V_{g1p}	=	124	120	144	V
W_{ig1}	=	134	162	143	mW
W_{g2}	=	1,4	0,52	0,42	W
W_{ia}	=	13	11,5	9,2	W
W_a	=	7,4	7,1	6,9	W
W_o	=	5,6	4,4	2,3	W
η	=	43	38	25	%

Operating conditions as class C frequency tripler
Caractéristiques d'utilisation comme tripleur de fréquence classe C
Betriebsdaten als Frequenzverdreifacher Klasse C

λ	=	12/4	9/3	6/2[1])	m
V_a	=	300	275	225	V
V_{g1}	=	-140	-140	-140	V
V_{g2}	=	250	200	200	V
I_a	=	34,3	36	2x36	mA
I_{g1}	=	0	1,5	2x1,3	mA
I_{g2}	=	2,8	2,5	2x2,5	mA
V_{g1p}	=	130	142	152	V
W_{ig1}	=	0	192	2x180	mW
W_{g2}	=	0,7	0,5	2x0,5	W
W_{ia}	=	10,3	9,9	2x8,1	W
W_a	=	7,1	7,1	2x6,6	W
W_o	=	3,2	2,8	3	W
η	=	31	28,5	18,5	%

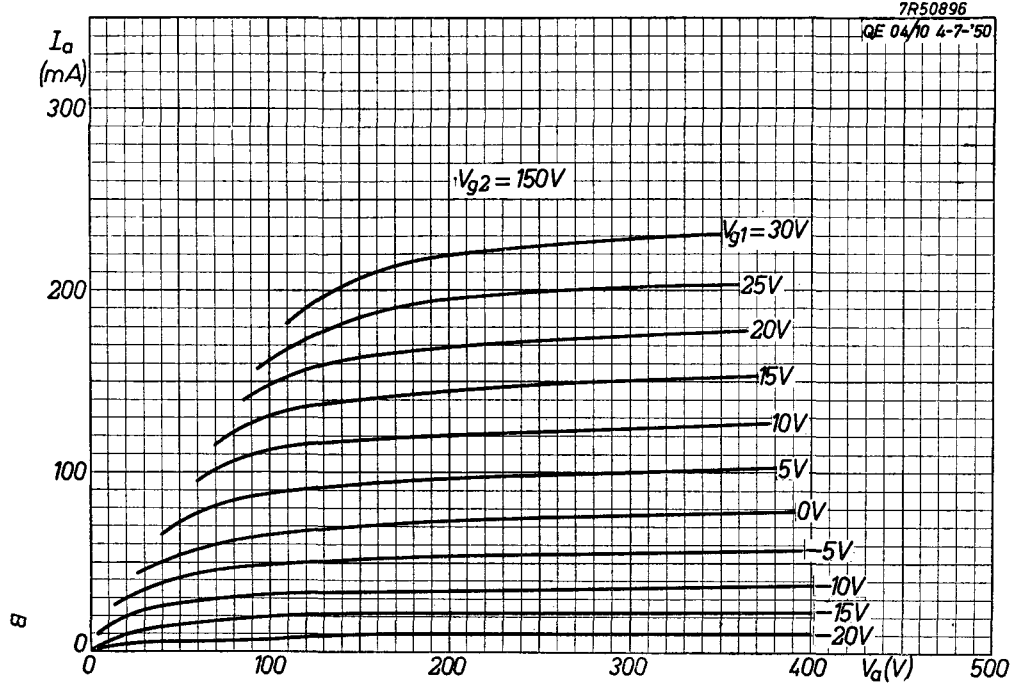
[1]) Two valves in push-pull; deux tubes en push-pull; zwei Röhren in Gegentakt

PHILIPS

QE 04/10

7. 7. 1950

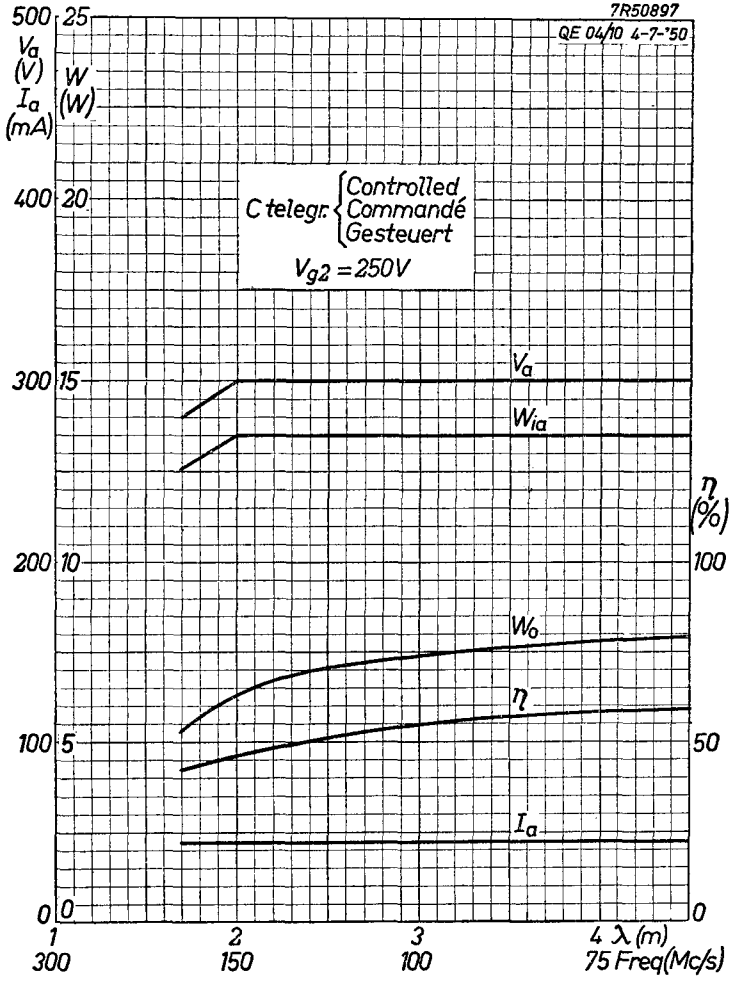
A


7R50896
QE 04/10 4-7-'50
I_a (mA)
300
200
100
0
$V_{g2} = 150V$
$V_{g1} = 30V$
25V
20V
15V
10V
5V
0V
-5V
-10V
-15V
-20V
0
100
200
300
400
V_a(V)
500

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PHILIPS

QE 04/10



7.7.1950

C

PHILIPS

Electronic Tube

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1	1	1957.03.03
2	2	1957.03.03
3	3	1950.07.07
4	4	1950.07.07
5	A	1950.07.07
6	B	1950.07.07
7	C	1950.07.07
8	FP	1999.10.24

BEAM POWER TETRODE for use as R.F. amplifier, oscillator and frequency multiplier and as A.F. amplifier and modulator in mobile and fixed equipment
TETRODE A FAISCEAU pour utilisation en amplificatrice, oscillatrice et multiplicatrice de fréquence H.F. et en amplificatrice et modulatrice B.F. dans installations mobiles et fixes
BÜNDELTETRODE zur Verwendung als HF-Verstärker, Oszillator und Frequenzvervielfacher und als NF-Verstärker und Modulator in beweglichen und festen Geräten

Cathode : oxide-coated
Cathode : oxyde
Katode : Oxyd

Heating : indirect
Chauffage: indirect
Heizung : indirekt

V_f = 6,3 V
I_f = 1,25 A

Capacitances
Capacités
Kapazitäten

C_a = 8,5 pF
C_{g1} = 13,5 pF
C_{ag1} < 0,24 pF

Typical characteristics
Caractéristiques types
Kenndaten

μ_{g2g1} (V_a = 200 V, V_{g2} = 200 V, I_a = 100 mA) = 4,5
S = 7 mA/V

λ	Freq.	C telegr.			Cag2 mod.		
m	Mc/s	V_a (V)	W_o (W) CCS	W_o (W) ICAS	V_a (V)	W_o (W) CCS	W_o (W) ICAS
5	60	750		70	600		52
		600	52	66	475	34	
		500	48		400	32	
1,7	175	400		35			
		320	25				

AB mod.[1][2]			AB mod.[1][3]			AB mod.[1][4]		
V_a (V)	W_o (W) CCS	W_o (W) ICAS	V_a (V)	W_o (W) CCS	W_o (W) ICAS	V_a (V)	W_o (W) CCS	W_o (W) ICAS
750		120	750		131	400	22	22
600	82	95	600	90	113	250	10	
500	70		500	83				
400	55		400	62				

[1] Two tubes
Deux tubes
Zwei Röhren

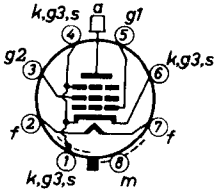
[2] Without grid current
Sans courant de grille
Ohne Gitterstrom

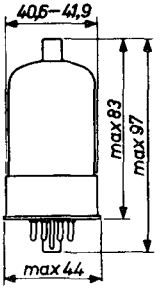
[3] With grid current
Avec courant de grille
Mit Gitterstrom

[4] In triode connection
En montage triode
In Triodenschaltung

PHILIPS

Dimensions in mm
Dimensions en mm
Abmessungen in mm





Base, culot, Sockel: Octal 8-pin

Socket, support, Fassung: 5903/13
Cap , capot , Haube : 28 906 022

Mounting position: arbitrary
Montage : arbitrairement
Einbau : willkürlich

Net weight		Shipping weight		
Poids net	57g	Poids brut	85 g	←
Nettogewicht		Bruttogewicht		

Bulb temperature
Température de l'ampoule max. 220 °C
Kolbentemperatur

---

[1])For operation at maximum ratings
Pour opération aux caractéristiques limites
Für Betrieb bei den Grenzwerten

[3])V_{g1} may be obtained from a separate supply, or from R_{g1} or R_k, or by combination methods
V_{g1} peut être obtenue d'une source séparée, ou par moyen de R_{g1} ou R_k, ou par une combinaison de ces méthodes
V_{g1} kann von einer eigenen Quelle, oder mittels R_{g1} oder R_k, oder mittels einer Kombination dieser Methoden erhalten werden

[9])For values of R_{g1} exceeding 100 kΩ, cathode bias is required
Pour des valeurs de R_{g1} dépassant 100 kΩ il faut utiliser polarisation de cathode
Für Werte von R_{g1} oberhalb 100 kΩ ist Gittervorspannung mittels Katodenwiderstand erforderlich

[4]) Obtained preferably from a separate source, or from the anode supply with a voltage divider or through a series resistor
When the tube is keyed, a series screen resistor should not be used. V_{g2} must not exceed 400 V under key-up conditions
Obtenu de préférence d'une source séparée, ou de l'alimentation anodique par moyen d'un potentiomètre ou à travers une résistance série
Si le tube est manié, une résistance série de grille-écran ne sera pas utilisée. V_{g2} ne dépassera pas une valeur de 400 V dans le cas de manipulateur levé.
Vorzugsweise von einer eigenen Quelle oder mittels eines Spannungsteilers oder über einen Serienwiderstand von der Anodenspeisung erhalten
Wenn die Röhre mit Tastung betrieben wird, soll kein Schirmgitterserienwiderstand verwendet werden. V_{g2} soll im Falle gehobener Taste einen Wert von 400 V nicht überschreiten

[5]) V_{g1} may be obtained by means of a grid resistor or from a combination of grid resistor with either fixed supply or cathode resistor
V_{g1} peut être obtenu par moyen d'une résistance de grille ou d'une combinaison d'une résistance de grille et ou bien une polarisation fixe ou bien une résistance cathodique
V_{g1} kann mittels eines Gitterwiderstandes oder von einer Kombination eines Gitterwiderstandes und entweder einer festen Vorspannung oder eines Katodenwiderstandes erhalten werden

[6]) Obtained preferably from a separate source modulated with the anode supply or from the modulated anode supply through a series resistor
Obtenu de préférence d'une source séparée modulée par l'alimentation anodique ou bien de l'alimentation anodique modulée à travers une résistance série
Vorzugsweise von einer eigenen mit der Anodenspeisung modulierten Spannungsquelle oder von der Anodenspeisung über einen Serienwiderstand erhalten

[7]) Under these conditions only fixed bias is recommended
Dans ces conditions seulement une polarisation fixe est recommandée
Unter diesen Umständen wird nur eine feste Vorspannung empfohlen

[8]) Obtained preferably from a separate source or from the anode supply using a voltage divider
Obtenu de préférence d'une source séparée ou bien de l'alimentation anodique en utilisant un potentiomètre
Vorzugsweise von einer eigenen Quelle oder von der Anodenspeisung mit Verwendung eines Spannungsteilers erhalten

H.F. class C telegraphy and H.F. class C anode and screen grid modulation
H.F. classe C télégraphie et H.F. classe C modulation d'anode et de grille-écran
HF-Klasse C Telegraphie und HF-Klasse C Anoden- und Schirmgittermodulation

---

DERATING TABLE of the limiting values of V_a and W_{ia} (in %) as a function of the operating frequency

TABLEAU D'ABAISSEMENT des caractéristiques limites de V_a et W_{ia} (en %) en fonction de la fréquence d'opération.

REDUKTIONSTABELLE der Grenzwerte von V_a und W_{ia} (in %) als Funktion der Betriebsfrequenz

Freq. (Mc/s)	V_a (%)	W_{ia} (%)
60	100	100
80	84	92
125	65	78
150	58	72
160	56	70
175	53	67

H.F. class C telegraphy
H.F. classe C télégraphie
H.F. Klasse C Telegrafie

Limiting values
Caractéristiques limites
Grenzdaten

			C.C.S.	I.C.A.S.	
	f	= max.	60	60	Mc/s
	V_a	= max.	600	750	V
See page 4 for Derating table	W_{ia}	= max.	67,5	90	W
	W_a	= max.	20	25	W
	I_a	= max.	140	150	mA
	V_{g2}	= max.	250	250	V
Voir page 4 pour Tableau d'abaissement	W_{g2}	= max.	3	3	W
	$-V_{g1}$	= max.	150	150	V
	I_{g1}	= max.	3,5	4	mA
Für Reduktionstabelle siehe Seite 4	$V_{kf\,p}$	= max.	135	135	V
	R_{g1} [1]	= max.	30	30	kΩ

C.C.S. = Continuous service / Service continu / Dauerbetrieb
I.C.A.S. = Intermittent service / Service intermittent / Aussetzender Betrieb

Operating conditions
Caractéristiques d'utilisation
Betriebsdaten

		C.C.S.			I.C.A.S.			
f	=	60	60	175	60	60	175	Mc/s
V_a	=	600	500	320	750	600	400	V
V_{g1} [3]	=	-58	-66	-51	-62	-71	-54	V
V_{g2} [4]	=	150	170	180	160	180	190	V
I_a	=	112	135	140	120	150	150	mA
I_{g1}	=	2,8	2,5	2,0	3,1	2,8	2,2	mA
I_{g2}	=	9	9	10	11	10	10,4	mA
V_{g1p}	=	73	84	64	79	91	68	V
W_{ig1}	=	0,2	0,2	3	0,2	0,3	3	W
W_{g2}	=	1,4	1,6	1,8	1,8	1,8	2,0	W
W_{ia}	=	67,5	67,5	45	90	90	60	W
W_a	=	15,5	19,5	20	20	24	25	W
W_o	=	52	48	25	70	66	35	W
η	=	77	71	55,5	78	73,5	58	%

[1] [3] [4] See page 2 and 3; voir page 2 et 3; siehe Seite 2 und 3

H.F. class C anode and screen grid modulation
H.F. classe C modulation d'anode et de grille-écran
HF-Klasse C Anoden- und Schirmgittermodulation

Limiting values
Caractéristiques limites
Grenzdaten

		C.C.S.	I.C.A.S.	
f	= max.	60	60	Mc/s
V_a	= max.	480	600	V
W_{ia}	= max.	45	67,5	W
W_a	= max.	13,3	16,7	W
I_a	= max.	117	125	mA
V_{g_2}	= max.	250	250	V
W_{g_2}	= max.	2	2	W
$-V_{g_1}$	= max.	150	150	V
I_{g_1}	= max.	3,5	4	mA
V_{kf_p}	= max.	135	135	V
R_{g_1} [1]	= max.	30	30	kΩ

See page 4 for Derating table
Voir page 4 pour Tableau d'abaissement
Für Reduktionstabelle siehe Seite 4

C.C.S. = Continuous service / Service continu / Dauerbetrieb
I.C.A.S. = Intermittent service / Service intermittent / Aussetzender Betrieb

Operating conditions
Caractéristiques d'utilisation
Betriebsdaten

		C.C.S.		I.C.A.S.	
f	=	60	60	60	Mc/s
V_a	=	475	400	600	V
→ V_{g_1} [5]	=	-77	-87	-87	V
V_{g_2} [6]	=	135	150	150	V
I_a	=	94	112	112	mA
I_{g_1}	=	2,8	3,4	3,4	mA
I_{g_2}	=	6,4	7,8	7,8	mA
V_{g_1p}	=	95	107	107	V
W_{ig_1}	=	0,3	0,4	0,4	W
W_{g_2}	=	1,0	1,2	1,2	W
W_{ia}	=	45	45	67,5	W
W_a	=	11	13	15,5	W
W_o	=	34	32	52	W
η	=	75,5	71	77	%
m	=	100	100	100	%
W_{mod}	=	23	23	34	W

[1][5][6] See page 2 and 3; voir page 2 et 3; siehe Seite 2 und 3

A.F. class AB amplifier and modulator (I_{g1} = 0)
Amplificatrice et modulatrice B.F. classe AB (I_{g1} = 0)
NF-Klasse AB Verstärker und Modulator (I_{g1} = 0)

Limiting values; continuous service
C.C.S. Caractéristiques limites, service continu
Grenzdaten, Dauerbetrieb

V_a	= max. 600 V	V_{g2}	= max. 250 V
W_{ia}	= max. 60 W	W_{g2}	= max. 3 W
W_a	= max. 20 W	V_{kf_p}	= max. 135 V
I_a	= max. 125 mA	R_{g1}	= max. 100 kΩ

Operating conditions, continuous service; two tubes
C.C.S. Caractéristiques d'utilisation, service continu; deux tubes
Betriebsdaten, Dauerbetrieb; zwei Röhren

V_a	=	600		500	V
V_{g2} [8]	=	180		185	V
V_{g1} [7]	=	-45		-40	V
R_{aa}	=	7000		5500	Ω
V_{g1g1_p}	=	0	90	0	80 V
I_a	=	2x13	2x100	2x29	2x108 mA
I_{g2}	=	2x0,5	2x12	2x1	2x13 mA
W_{ig1}	=	0	0	0	0 W
W_{g2}	=	2x0,1	2x2	2x0,2	2x2,4 W
W_{ia}	=	2x7,8	2x60	2x14,5	2x54 W
W_a	=	2x7,8	2x19	2x14,5	2x19 W
W_o	=	0	82	0	70 W
η	=	-	68		65 %

V_a	=	400	V
V_{g2} [8]	=	190	V
V_{g1} [7]	=	-40	V
R_{aa}	=	4000	Ω
V_{g1g1_p}	=	0	80 V
I_a	=	2x32	2x114 mA
I_{g2}	=	2x1,3	2x13 mA
W_{ig1}	=	0	0 W
W_{g2}	=	2x0,25	2x2,5 W
W_{ia}	=	2x12,8	2x45,5 W
W_a	=	2x12,8	2x18 W
W_o	=	0	55 W
η	=	-	60 %

[7][8] See page 8; voir page 8; siehe Seite 8

A.F. class AB amplifier and modulator (Ig1 = 0)
Amplificatrice et modulatrice B.F. classe AB (Ig1 = 0)
NF-Klasse AB Verstärker und Modulator (Ig1 =0)

Limiting values, intermittent service
I.C.A.S. Caractéristiques limites, service intermittent
Grenzdaten, aussetzender Betrieb

V_a	= max. 750 V	V_{g2}	= max. 250 V
W_{ia}	= max. 85 W	W_{g2}	= max. 3 W
W_a	= max. 25 W	V_{kfp} [7]	= max. 135 V
I_a	= max. 135 mA	R_{g1} [7]	= max. 100 kΩ

Operating conditions, intermittent service; two tubes
I.C.A.S. Caractéristiques d'utilisation, service intermittent; deux tubes
Betriebsdaten, aussetzender Betrieb; zwei Röhren

V_a	=	750		600	V
V_{g2} [8]	=	195		200	V
V_{g1} [7]	=	-50		-50	V
R_{aa}	=	8000		6000	Ω
V_{g1g1p}	=	0 | 100		0 | 100	V
I_a	=	2x12	2x110	2x14	2x115 mA
I_{g2}	=	2x0,5	2x13	2x0,5	2x13,5 mA
W_{ig1}	=	0	0	0	0 W
W_{g2}	=	2x0,1	2x2,5	2x0,1	2x2,7 W
W_{ia}	=	2x8,7	2x82,5	2x8,4	2x69 W
W_a	=	2x8,7	2x22,5	2x8,4	2x21,5 W
W_o	=	0	120	0	95 W
η	=	-	72,5	-	69 %

[7] Under these conditions only fixed bias is recommended
Dans ces conditions seulement une polarisation fixe est recommandée
Unter diesen Umständen wird nur eine feste Vorspannung empfohlen

[8] Obtained preferably from a separate source or from the anode supply using a voltage divider
Obtenu de préférence d'une source séparée ou bien de l'alimentation anodique en utilisant un potentiomètre
Vorzugsweise von einer eigenen Quelle oder von der Anodenspeisung mit Verwendung eines Spannungsteilers erhalten

A.F. class AB amplifier and modulator (Ig1 > 0)
Amplificatrice et modulatrice B.F. classe AB (Ig1 > 0)
NF-Klasse AB Verstärker und Modulator (Ig1 > 0)

Limiting values, continuous service
C.C.S. Caractéristiques limites, service continu
Grenzdaten, Dauerbetrieb

V_a	= max. 600 V	V_{g2}	= max. 250 V
W_{ia}	= max. 62,5 W	W_{g2}	= max. 3 W
W_a	= max. 20 W	V_{kfp}	= max. 135 V
I_a	= max. 125 mA	R_{g1} [7]	= max. 30 kΩ

Operating conditions, continuous service; two tubes
C.C.S. Caractéristiques d'utilisation, service continu; deux tubes
Betriebsdaten, Dauerbetrieb; zwei Röhren

V_a	=	600		500	V
V_{g2} [8]	=	165		175	V
V_{g1} [7]	=	-44		-44	V
R_{aa}	=	6800		4600	Ω
V_{g1g1p}	=	0	97	0	102 V
I_a	=	2x11	2x103	2x13	2x121 mA
I_{g2}	=	2x0,3	2x8,5	2x0,3	2x9 mA
I_{g1}	=	0	2x0,5	0	2x1,0 mA
W_{ig1}	=	0	2x0,1	0	2x0,15 W
W_{g2}	=	2x0,05	2x1,4	2x0,06	2x1,6 W
W_{ia}	=	2x6,6	2x62	2x6,5	2x60,5 W
W_a	=	2x6,6	2x17	2x6,5	2x19 W
W_o	=	0	90	0	83 W
η	=	-	72,5		68,5 %

V_a	=	400	V
V_{g2} [8]	=	175	V
V_{g1} [7]	=	-41	V
R_{aa}	=	3700	Ω
V_{g1g1p}	=	0	95 V
I_a	=	2x16	2x116 mA
I_{g2}	=	2x0,5	2x9 mA
I_{g1}	=	0	2x0,8 mA
W_{ig1}	=	0	2x0,1 W
W_{g2}	=	2x0,1	2x1,6 W
W_{ia}	=	2x6,4	2x46,5 W
W_a	=	2x6,4	2x15,5 W
W_o	=	0	62 W
η	=		66,5 %

[7)8)] See page 8; voir page 8; siehe Seite 8

A.F. class AB amplifier and modulator (Ig1 › 0)
Amplificatrice et modulatrice B.F. classe AB (Ig1 › 0)
NF-Klasse AB Verstärker und Modulator (Ig1 › 0)

I.C.A.S.

Limiting values, intermittent service
Caractéristiques limites, service intermittent
Grenzdaten, aussetzender Betrieb

V_a	= max. 750 V	V_{g2}	= max. 250 V
W_{ia}	= max. 90 W	W_{g2}	= max. 3 W
W_a	= max. 25 W	V_{kf_p}	= max. 135 V
I_a	= max. 135 mA	R_{g1} [7]	= max. 30 kΩ

I.C.A.S.

Operating conditions, intermittent service; two tubes
Caractéristiques d'utilisation, service intermittent; deux tubes
Betriebsdaten, aussetzender Betrieb; zwei Röhren

V_a	=	750		600	V
V_{g2} [8]	=	165		190	V
V_{g1} [7]	=	-46		-48	V
R_{aa}	=	7400		5000	Ω
V_{g1g1p}	=	0	108	0	109 V
I_a	=	2x11	2x120	2x14	2x135 mA
I_{g2}	=	2x0,15	2x10	2x0,6	2x10 mA
I_{g1}	=	0	2x1,3	0	2x1,0 mA
W_{ig1}	=	0	2x0,2	0	2x0,15 W
W_{g2}	=	2x0,03	2x1,7	2x0,1	2x1,9 W
W_{ia}	=	2x8,3	2x90	2x8,4	2x81 W
W_a	=	2x8,3	2x24,5	2x8,4	2x24,5 W
W_o	=	0	131	0	113 W
η	=	-	73	-	70 %

7) Under these conditions only fixed bias is recommended
Dans ces conditions seulement une polarisation fixe est recommandée
Unter diesen Umständen wird nur eine feste Vorspannung empfohlen

8) Obtained preferably from a separate source or from the anode supply using a voltage divider
Obtenu de préférence d'une source séparée ou bien de l'alimentation anodique en utilisant un potentiomètre
Vorzugsweise von einer eigenen Quelle oder von der Anodenspeisung mit Verwendung eines Spannungsteilers erhalten

A.F. class AB amplifier and modulator in triode connection (g2 connected to anode; I_{g1}= 0)
Amplificatrice et modulatrice B.F. classe AB en montage triode (g2 connecté à a; I_{g1} = 0)
NF-Klasse AB Verstärker und Modulator in Triodenschaltung (g2 verbunden mit a; I_{g1} = 0)

Limiting values
Caractéristiques limites
Grenzdaten

		C.C.S.	I.C.A.S.	
V_a	= max.	400	400	V
I_a	= max.	90	90	mA
W_{ia}	= max.	35	35	W
W_a	= max.	20	25	W
V_{kf_p}	= max.	135	135	V
R_{g1} [9]	= max.	100	100	kΩ
R_{g1} [9]	= max.	500	500	kΩ

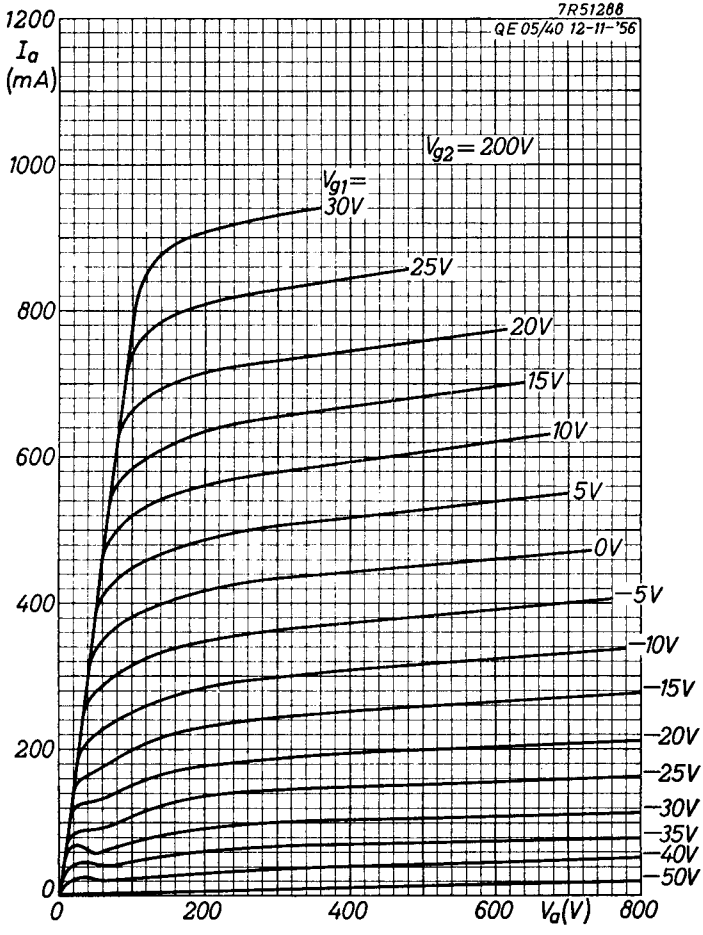
C.C.S. = continuous service / service continu / Dauerbetrieb
I.C.A.S. = intermittent service / service intermittent / aussetzender Betrieb

Operating conditions, two tubes
Caractéristiques d'utilisation, deux tubes
Betriebsdaten, zwei Röhren

V_a	=	400		250	V
V_{g1} [9]	=	-100		-50	V
R_{aa}	=	8000		5000	Ω
C.C.S. V_{gg_p}	=	0	200	0	100 V
C.C.S. I_a	=	2x20	2x50	2x60	2x62 mA
C.C.S. W_{ia}	=	2x8	2x20	2x15	2x15,5 W
C.C.S. W_a	=	2x8	2x9	2x15	2x10,5 W
C.C.S. W_o	=	0	22	0	10 W
C.C.S. η	=	-	55	-	32 %

V_a	=	400		V
V_{g1} [9]	=	-100		V
R_{aa}	=	8000		Ω
I.C.A.S. V_{gg_p}	=	0	200	V
I.C.A.S. I_a	=	2x20	2x50	mA
I.C.A.S. W_{ia}	=	2x8	2x20	W
I.C.A.S. W_a	=	2x8	2x9	W
I.C.A.S. W_o	=	0	22	W
I.C.A.S. η	=	-	55	%

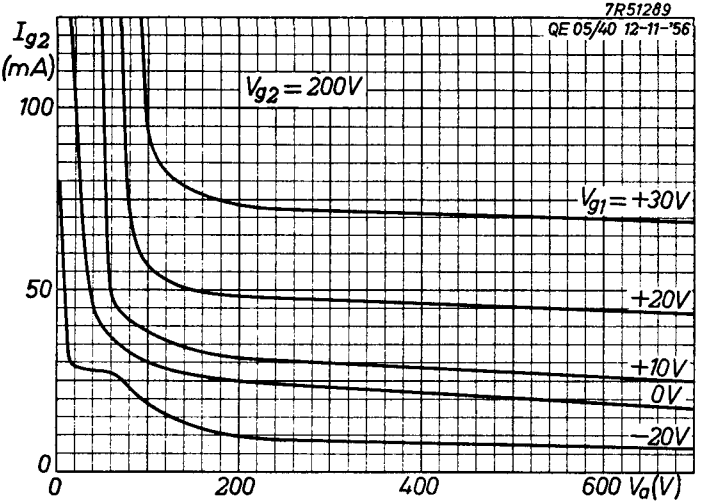
[9] See page 2; voir page 2; siehe Seite 2

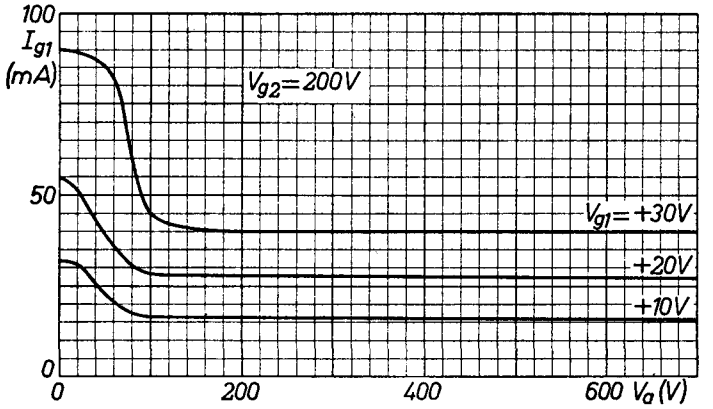

7R51288
QE 05/40 12-11-'56
1200
I_a
(mA)
1000
800
600
400
200
0
$V_{g2} = 200V$
V_{g1}=
30V
25V
20V
15V
10V
5V
0V
−5V
−10V
−15V
−20V
−25V
−30V
−35V
−40V
−50V
0
200
400
600
V_a(V)
800

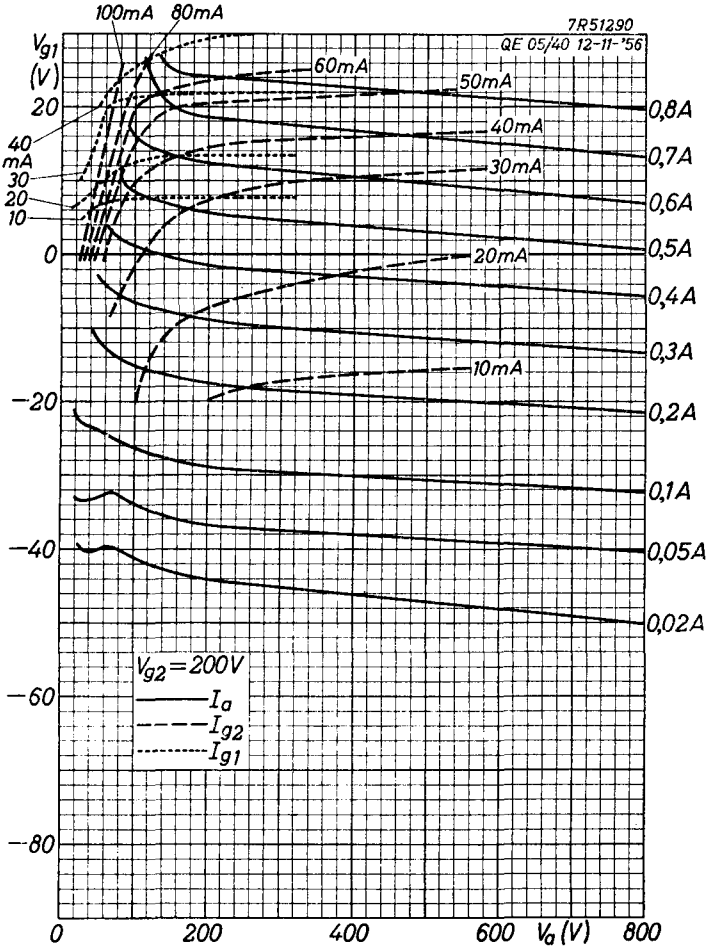
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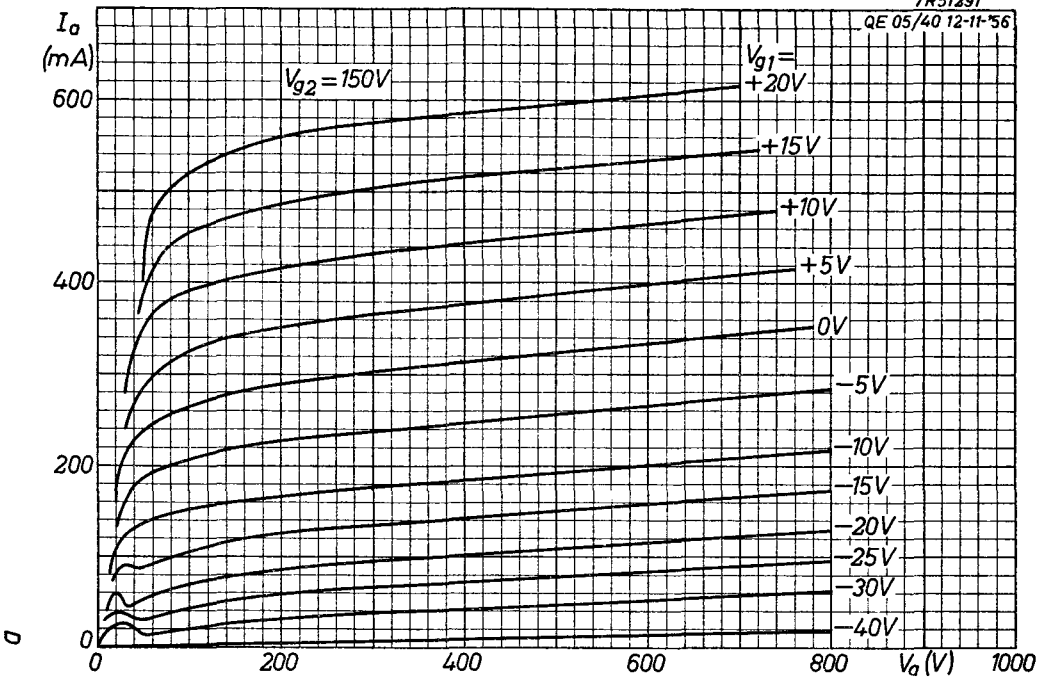
A

PHILIPS


7R51289
QE 05/40 12-11-'56
I_{g2} (mA)
100
50
0
$V_{g2} = 200V$
$V_{g1} = +30V$
+20V
+10V
0V
−20V
0
200
400
600 V_a(V)

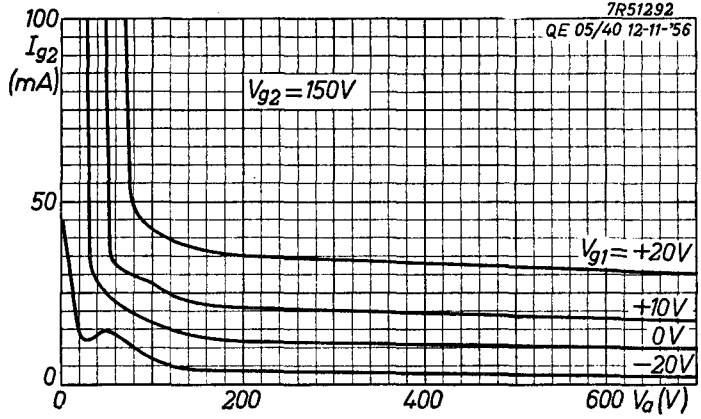

100
I_{g1} (mA)
50
0
$V_{g2} = 200V$
$V_{g1} = +30V$
+20V
+10V
0
200
400
600 V_a(V)

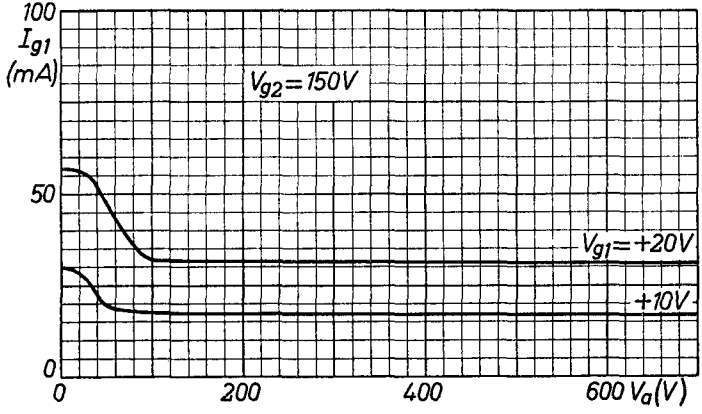

7R51290
QE 05/40 12-11-'56
100mA
80mA
60mA
50mA
40mA
30mA
20mA
10mA
V_{g1} (V)
20
40 mA
30
20
10
0
−20
−40
−60
−80
0,8A
0,7A
0,6A
0,5A
0,4A
0,3A
0,2A
0,1A
0,05A
0,02A
$V_{g2}=200V$
I_a
I_{g2}
I_{g1}
0
200
400
600
V_a (V)
800



QE 05/40

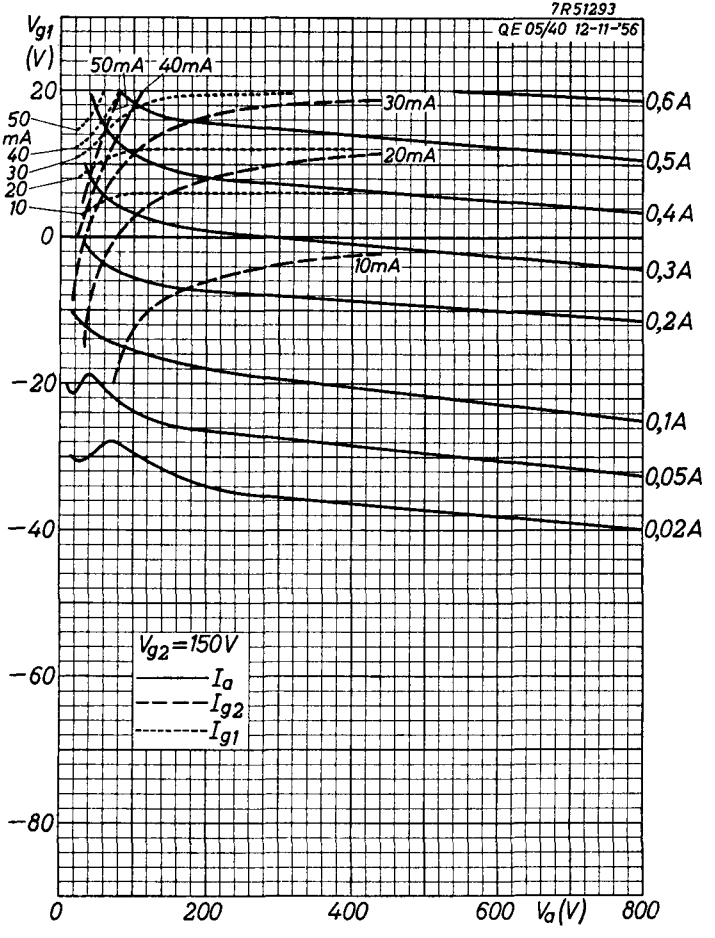
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7R51292
QE 05/40 12-11-'56
100
I_{g2}
(mA)
$V_{g2}=150V$
50
0
$V_{g1}=+20V$
+10V
0V
−20V
0
200
400
600 V_a(V)

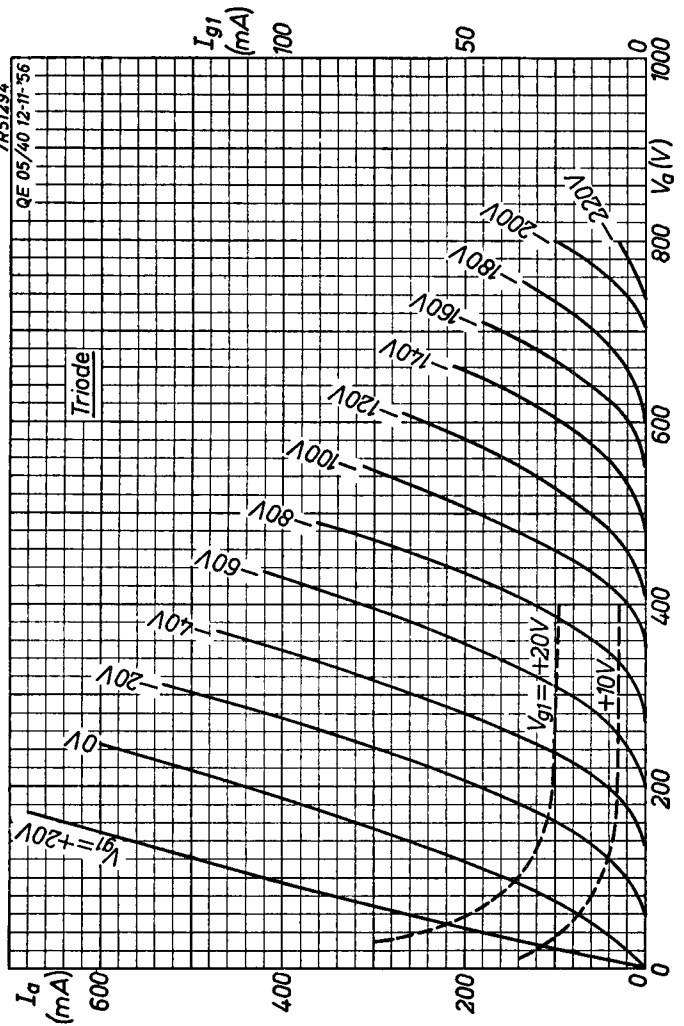

100
I_{g1}
(mA)
$V_{g2}=150V$
50
0
$V_{g1}=+20V$
+10V
0
200
400
600 V_a(V)

QE 05/40

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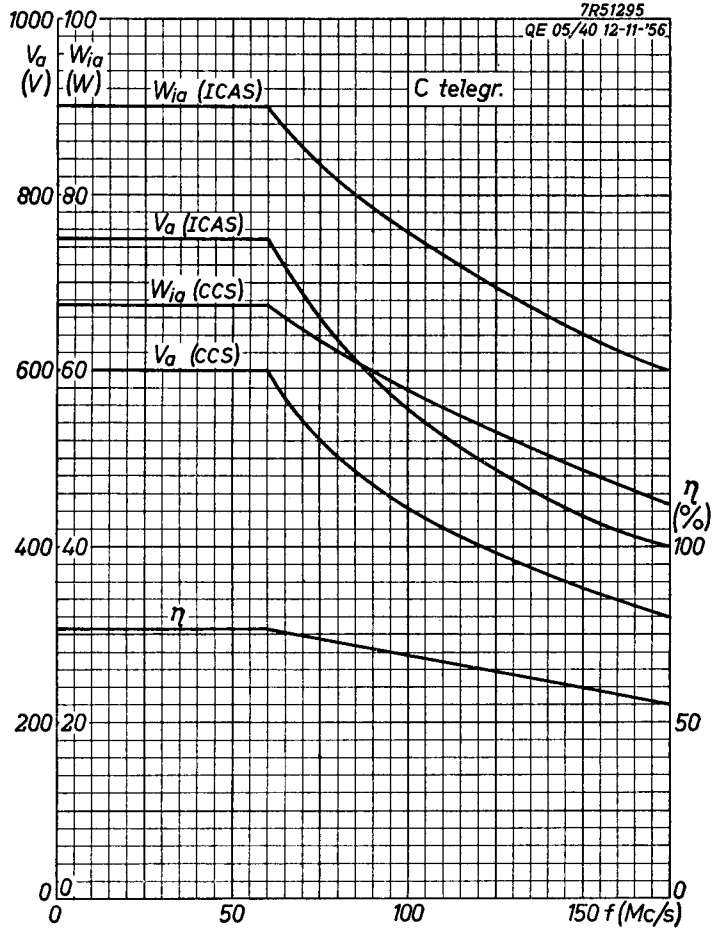


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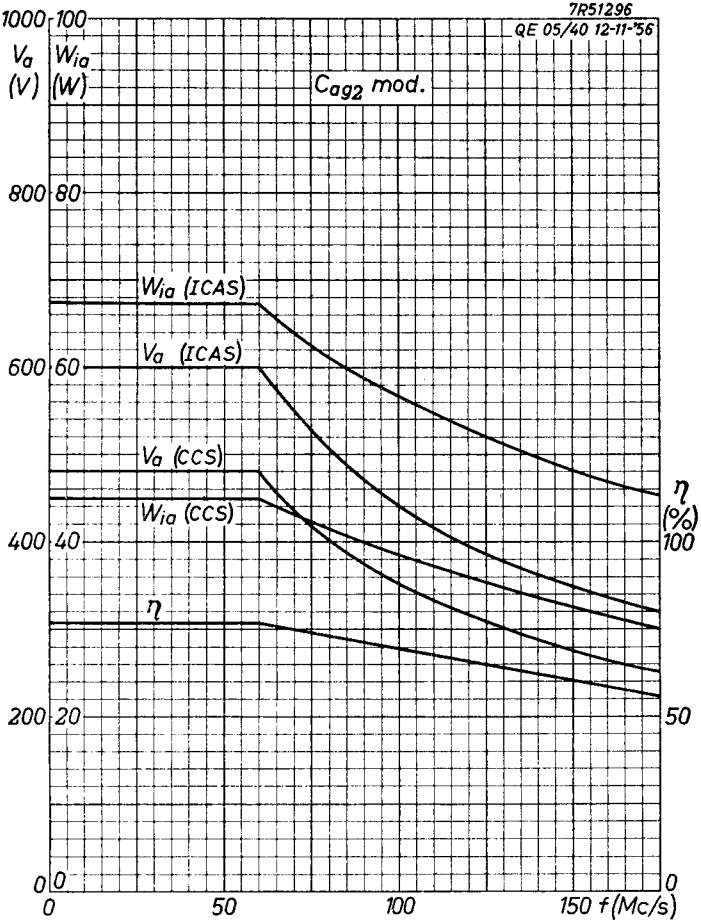

7R51294
QE 05/40 12-11-56
Triode
I_{g1} (mA)
100
50
0
1000
800
600
400
200
0
V_a (V)
220V
200V
180V
160V
140V
120V
100V
80V
60V
40V
20V
0V
V_{g1}=+20V
V_{g1}=+10V
I_a (mA)
600
400
200
0

QE 05/40

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H


7R51296
QE 05/40 12-11-'56
V_a (V)
W_{ia} (W)
C_{ag_2} mod.
W_{ia} (ICAS)
V_a (ICAS)
V_a (CCS)
W_{ia} (CCS)
η
η (%)
1000
800
600
400
200
0
100
80
60
40
20
0
100
50
0
0
50
100
150 f (Mc/s)



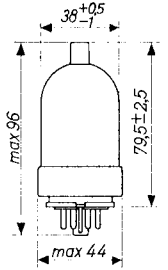
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page	sheet	date
1	1	1958.12.12
2	2	1958.12.12
3	3	1956.10.10
4	4	1956.10.10
5	5	1958.12.12
6	6	1958.12.12
7	7	1956.10.10
8	8	1956.10.10
9	9	1956.10.10
10	10	1956.10.10
11	11	1956.10.10
12	A	1957.03.03
13	B	1957.03.03
14	C	1957.03.03
15	D	1957.03.03
16	E	1957.03.03
17	F	1957.03.03
18	G	1957.03.03
19	H	1957.03.03

20	I	1957.03.03
21, 22	FP	1999.10.26

QE05/40F

V_f = 12,6 V
I_f = 0,625 A



Base, culot, Sockel: Octal 8-p

For further data and curves please refer to QE 05/40
Pour les autres données et courbes voir QE 05/40
Für die übrigen Daten und Kennlinien siehe QE 05/40

QE05/40H

V_f = 26,5 V
I_f = 0,3 A

For further data and curves please refer to QE 05/40
Pour les autres données et courbes voir QE 05/40
Für die übrigen Daten und Kennlinien siehe QE 05/40

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Electronic Tube

HANDBOOK

QE05/40F QE05/40H

page	sheet	date
1	1	1960.02.02
2	FP	2000.01.15

BEAM POWER TETRODE for use as A.F. and R.F. amplifier and oscillator
TETRODE A FAISCEAU pour utilisation en amplificatrice B.F. et H.F. et oscillatrice
BÜNDELTETRODE zur Verwendung als NF- und HF-Verstärker und Oszillator

Cathode : oxide-coated
Cathode : oxyde
Katode : Oxyd

Heating : indirect
Chauffage: indirect
Heizung : indirekt

V_f = 6,3 V
I_f = 0,9 A

Capacitances
Capacités
Kapazitäten

C_a = 7 pF
C_{g1} = 12 pF
C_{ag1} < 0,2 pF[1])

Typical characteristics
Caractéristiques types
Kenndaten

μ_{g2g1} = 8
S (I_a = 72 mA) = 6 mA/V

λ	Freq.	C telegr.			B teleph.			C_{ag2} mod.		
		V_a	W_o (W)		V_a	W_o (W)		V_a	W_o (W)	
m	Mc/s	(V)	CCS	ICAS	(V)	CCS	ICAS	(V)	CCS	ICAS
5	60	600	40		600	12,5		475	28	
		500	32		500	11		400	22	
		400	25		400	9		325	17	
		750		54	750		15	600		44

AB mod[2])[3])			AB mod[2])[4])		
V_a	W_o (W)		V_a	W_o (W)	
(V)	CCS	ICAS	(V)	CCS	ICAS
600	56		600	80	
500	46		500	75	
400	36		400	55	
750		72[5])	750		120
400	15[5])	15[5])			

[1]) With external shield connected to cathode
Avec blindage extérieur connecté à la cathode
Mit äusserer Abschirmung verbunden mit Katode

[2]) Two tubes; deux tubes; zwei Röhren

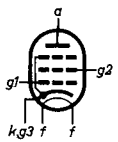
[3]) Without grid current
Sans courant de grille
Ohne Gitterstrom

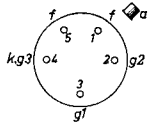
[4]) With grid current
Avec courant de grille
Mit Gitterstrom

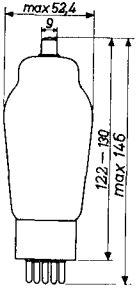
[5]) Two tubes in triode connection
Deux tubes en montage triode
Zwei Röhren in Triodenschaltung

PHILIPS

Dimensions in mm
Dimensions en mm
Abmessungen in mm







Base, culot, Sockel: Medium 5-pin

Socket, support, Fassung: 40219

Cap , capot , Haube : 28 906 022

Mounting position: arbitrary
Montage : arbitrairement
Einbau : willkürlich

Net weight		Shipping weight	
Poids net	60 g	Poids brut	85 g
Nettogewicht		Bruttogewicht	

[1]) Page 5 and 6; page 5 et 6; Seite 5 und 6

Obtained preferably from a separate source modulated with the plate supply or from the modulated plate supply through a series resistor of

12.5 kΩ at V_a = 325 V
25 kΩ at V_a = 400 V
28 kΩ at V_a = 475 V
37.5 kΩ at V_a = 600 V

Obtenu de préférence d'une source séparée modulée avec l'alimentation anodique, ou de l'alimentation anodique modulée à travers une résistance série de

12,5 kΩ à V_a = 325 V
25 kΩ à V_a = 400 V
28 kΩ à V_a = 475 V
37,5 kΩ à V_a = 600 V

Vorzugsweise erhalten von einer separaten Spannungsquelle, moduliert mit der Anodenspeisung oder von der modulierten Anodenspeisung mittels eines Serienwiderstandes von

12,5 kΩ bei V_a = 325 V
25 kΩ bei V_a = 400 V
28 kΩ bei V_a = 475 V
37,5 kΩ bei V_a = 600 V

H.F. class C telegraphy
H.F. classe C télégraphie
HF-Klasse C Telegraphie

Limiting values, continuous service
C.C.S. Caractéristiques limites, service continu
Grenzdaten, Dauerbetrieb

f	= max.	60 Mc/s
V_a	= max.	600 V
W_{ia}	= max.	60 W
W_a	= max.	25 W
I_a	= max.	100 mA
V_{g2}	= max.	300 V
W_{g2}	= max.	3,5 W
$-V_{g1}$	= max.	200 V
I_{g1}	= max.	5 mA
V_{kf}	= max.	135 V
R_{g1}	= max.	30 kΩ

f	= max.	80 Mc/s
V_a	= max.	480 V
W_{ia}	= max.	48 W

f	= max.	125 Mc/s
V_a	= max.	330 V
W_{ia}	= max.	33 W

Operating conditions, continuous service
C.C.S. Caractéristiques d'utilisation, service continu
Betriebsdaten, Dauerbetrieb

V_a	=	600	500	400 V
V_{g1}	=	-45	-45	-45 V
V_{g2}	=	250	250	250 V
I_a	=	100	100	100 mA
I_{g1}	=	4	4	4 mA
I_{g2}	=	8	8	8 mA
V_{g1_p}	=	65	65	65 V
W_{ig1}	=	0,3	0,3	0,3 W
W_{g2}	=	2	2	2 W
W_{ia}	=	60	50	40 W
W_a	=	20	18	15 W
W_o	=	40	32	25 W
η	=	66,5	64	62,5 %

PHILIPS

H.F. class C telegraphy
H.F. classe C télégraphie
HF-Klasse C Telegraphie

Limiting values, intermittent service
I.C.A.S. Caractéristiques limites, service intermittent
Grenzdaten, aussetzender Betrieb

f	= max.	60 Mc/s
V_a	= max.	750 V
W_{ia}	= max.	75 W
W_a	= max.	30 W
I_a	= max.	100 mA
V_{g2}	= max.	300 V
W_{g2}	= max.	3,5 W
$-V_{g1}$	= max.	200 V
I_{g1}	= max.	5 mA
V_{kf}	= max.	135 V
R_{g1}	= max.	30 kΩ

f	= max.	80 Mc/s
V_a	= max.	600 V
W_{ia}	= max.	60 W

f	= max.	125 Mc/s
V_a	= max.	415 V
W_{ia}	= max.	41,5 W

Operating conditions, intermittent service
I.C.A.S. Caractéristiques d'utilisation, service intermittent
Grenzdaten, aussetzender Betrieb

V_a	=	750 V
V_{g1}	=	-45 V
V_{g2}	=	250 V
I_a	=	100 mA
I_{g1}	=	4 mA
I_{g2}	=	8 mA
V_{g1_p}	=	65 V
W_{ig1}	=	0,3 W
W_{g2}	=	2 W
W_{ia}	=	75 W
W_a	=	21 W
W_o	=	54 W
η	=	72 %

H.F. classe C anode and screen grid modulation
H.F. classe C modulation d'anode et de grille écran
HF-Klasse C Anoden- und Schirmgittermodulation

Limiting values, continuous service
C.C.S. Caractéristiques limites, service continu
Grenzdaten, Dauerbetrieb

f	= max.	60	Mc/s	
V_a	= max.	475	V	
W_{ia}	= max.	40	W	
W_a	= max.	16,5	W	
I_a	= max.	83	mA	
V_{g2}	= max.	300	V	
W_{g2}	= max.	2,5	W	
$-V_{g1}$	= max.	200	V	
I_{g1}	= max.	5	mA	
V_{kf}	= max.	135	V	
R_{g1}	= max.	30	kΩ	

f	= max.	80	Mc/s
V_a	= max.	380	V
W_{ia}	= max.	32	W

f	= max.	125	Mc/s
V_a	= max.	260	V
W_{ia}	= max.	22	W

Operating conditions, continuous service
C.C.S. Caractéristiques d'utilisation, service continu
Betriebsdaten, Dauerbetrieb

V_a	=	475	400	325 V
V_{g1}	=	-85	-75	-75 V
V_{g2}[1])	=	250	250	250 V
I_a	=	83	80	80 mA
I_{g1}	=	4	3,5	3,5 mA
I_{g2}	=	8	6	6 mA
V_{g1_p}	=	108	95	95 V
W_{ig1}	=	0,4	0,3	0,3 W
W_{g2}	=	2	1,5	1,5 W
W_{ia}	=	39,5	32	26 W
W_a	=	11,5	10	9 W
W_o	=	28	22	17 W
η	=	71	69	65,5 %
m	=	100	100	100 %
W_{mod}	=	20	16	13 W

1) See page 2; voir page 2; siehe Seite 2

H.F. class C anode and screen grid modulation
H.F. classe C modulation d'anode et de grille écran
HF-Klasse C Anoden- und Schirmgittermodulation

Limiting values, intermittent service
I.C.A.S. Caractéristiques limites, service intermittent
Grenzdaten, aussetzender Betrieb

f = max. 60 Mc/s

V_a	= max.	600 V
W_{ia}	= max.	60 W
W_a	= max.	25 W
I_a	= max.	100 mA
V_{g2}	= max.	300 V
W_{g2}	= max.	2,5 W
V_{g1}	= max.	200 V
I_{g1}	= max.	5 mA
V_{kf}	= max.	135 V
R_{g1}	= max.	30 kΩ

f = max. 80 Mc/s

V_a	= max.	480 V
W_{ia}	= max.	48 W

f = max. 125 Mc/s

V_a	= max.	330 V
W_{ia}	= max.	33 W

Operating conditions, intermittent service
I.C.A.S. Caractéristiques d'utilisation, service intermittent
Betriebsdaten, aussetzender Betrieb

V_a	=	600 V
V_{g1}	=	-85 V
V_{g2} [1)]	=	300 V
I_a	=	100 mA
I_{g1}	=	4 mA
I_{g2}	=	8 mA
V_{g1p}	=	107 V
W_{ig1}	=	0,4 W
W_{g2}	=	2,4 W
W_{ia}	=	60 W
W_a	=	16 W
W_o	=	44 W
η	=	73 %
m	=	100 %
W_{mod}	=	30 W

1) See page 2; voir page 2; siehe Seite 2

H.F. class B telephony
H.F. classe B téléphonie
HF-Klasse B Telefonie

Limiting values, continuous service
C.C.S. Caractéristiques limites; service continu
Grenzdaten, Dauerbetrieb

f = max. 60 Mc/s
V_a = max. 600 V
W_{ia} = max. 37,5 W
W_a = max. 25 W
I_a = max. 80 mA
V_{g2} = max. 300 V
W_{g2} = max. 2,5 W
V_{kf} = max. 135 V
R_{g1} = max. 30 kΩ

f = max. 80 Mc/s
V_a = max. 540 V
W_{ia} = max. 34 W

f = max. 125 Mc/s
V_a = max. 450 V
W_{ia} = max. 28 W

Operating conditions, continuous service
C.C.S. Caractéristiques d'utilisation, service continu
Betriebsdaten, Dauerbetrieb

V_a	=	600	500	400 V
V_{g1}	=	-40	-40	-40 V
V_{g2}	=	300	300	300 V
I_a	=	62,5	70	75 mA
I_{g2}	=	4	4	5 mA
V_{g1_p}	=	36	38	40 V
W_{g2}	=	1,2	1,2	1,5 W
W_{ia}	=	37,5	35	30 W
W_a	=	25	24	21 W
W_o	=	12,5	11	9 W
η	=	33	31,5	30 %
m	=	100	100	100 %
W_{ig1}	=	0,2	0,3	0,4 W

H.F. class B telephony
H.F. classe B téléphonie
HF-Klasse B Telefonie

Limiting values, intermittent service
I.C.A.S. Caractéristiques limites, service intermittent
Grenzdaten, aussetzender Betrieb

f = max. 60 Mc/s			
V_a	= max. 750 V	f = max. 80 Mc/s	
W_{ia}	= max. 45 W	V_a	= max. 675 V
W_a	= max. 30 W	W_{ia}	= max. 40,5 W
I_a	= max. 90 mA		
V_{g2}	= max. 300 V	f = max. 125 Mc/s	
W_{g2}	= max. 2,5 W	V_a	= max. 562 V
V_{kf}	= max. 135 V	W_{ia}	= max. 34 W
R_{g1}	= max. 30 kΩ		

Operating conditions, intermittent service
I.C.A.S. Caractéristiques d'utilisation, service intermittent
Betriebsdaten, aussetzender Betrieb

V_a	=	750 V
V_{g1}	=	-40 V
V_{g2}	=	300 V
I_a	=	60 mA
I_{g2}	=	3 mA
V_{g1_p}	=	35 V
W_{g2}	=	0,9 W
W_{ia}	=	45 W
W_a	=	30 W
W_o	=	15 W
η	=	33 %
m	=	100 %
W_{ig1}	=	0,2 W

A.F. class AB amplifier and modulator ($I_{g1} > 0$)
Amplificatrice et modulatrice B.F. classe AB ($I_{g1} > 0$)
NF-Klasse AB Verstärker und Modulator ($I_{g1} > 0$)

Limiting values, continuous service
C.C.S. Caractéristiques limites, service continu
Grenzdaten, Dauerbetrieb

V_a	= max. 600 V	V_{g2}	= max. 300 V
W_{ia}	= max. 60 W	W_{g2}	= max. 3,5 W
W_a	= max. 25 W	V_{kf}	= max. 135 V
I_a	= max. 120 mA	R_{g1}	= max. 30 kΩ [1]

Operating conditions, continuous service; two tubes
C.C.S. Caractéristiques d'utilisation, service continu ; deux tubes
Betriebsdaten, Dauerbetrieb; zwei Röhren

V_a	=	600		500		V
V_{g2}	=	300		300		V
V_{g1}	=	-32		-30		V
R_{aa}	=	6900		4600		Ω
V_{g1g1p}	=	0	90	0	86	V
I_a	=	2x24	2x100	2x30	2x120	mA
I_{g2}	=	2x0,35	2x9	2x0,45	2x10	mA
W_{ig1}	=	0	0,1	0	0,2	W
W_{g2}	=	2x0,11	2x2,7	2x0,14	2x3	W
W_{ia}	=	2x14,4	2x60	2x15	2x60	W
W_a	=	2x14,4	2x20	2x15	2x22,5	W
W_o	=	0	80	0	75	W
η	=	-	66,5	-	62,5	%
d	=	-	2	-	2	% [2]

V_a	=	400	V
V_{g2}	=	300	V
V_{g1}	=	-28	V
R_{aa}	=	3700	Ω
V_{g1g1p}	=	0	80 V
I_a	=	2x36	2x120 mA
I_{g2}	=	2x1	2x10 mA
W_{ig1}	=	0	0,2 W
W_{g2}	=	2x0,3	2x3 W
W_{ia}	=	2x14,4	2x48 W
W_a	=	2x14,4	2x20,5 W
W_o	=	0	55 W
η	=	-	57 %
d	=	-	2 % [2]

[1] [2] See page 10, voir page 10, siehe Seite 10

PHILIPS

A.F. class AB amplifier and modulator ($I_{g1} > 0$)
Amplificatrice et modulatrice B.F. classe AB ($I_{g1} > 0$)
NF-Klasse AB Verstärker und modulator ($I_{g1} > 0$)

Limiting values, intermittent service
I.C.A.S. Caractéristiques limites, service intermittent
Grenzdaten, aussetzender Betrieb

V_a	= max. 750 V	V_{g2}	= max. 300 V
W_{ia}	= max. 90 W	W_{g2}	= max. 3,5 W
W_a	= max. 30 W	V_{kf}	= max. 135 V
I_a	= max. 120 mA	R_{g1}	= max. 30 kΩ [1]

Operating conditions, intermittent service; two tubes
I.C.A.S. Caractéristiques d'utilisation, service intermittent; deux tubes
Betriebsdaten, aussetzender Betrieb; zwei Röhren

V_a	=	750	V
V_{g2}	=	300	V
V_{g1}	=	-35	V
R_{aa}	=	7300	Ω
V_{g1g1p}	=	0	96 V
I_a	=	2x15	2x120 mA
I_{g2}	=	2x0,25	2x10 mA
W_{ig1}	=	0	0,2 W
W_{g2}	=	2x0,08	2x3 W
W_{ia}	=	2x11,25	2x90 W
W_a	=	2x11,25	2x30 W
W_o	=	0	120 W
η	=	-	66,5 %
d	=	-	2 % [2]

[1] With fixed bias. Cathode bias is not recommended
Avec polarisation fixe. Polarisation de cathode n'est pas recommandée
Mit fester Vorspannung. Vorspannung mittels Katodenwiderstand wird nicht empfohlen

[2] Distortion with zero-impedance driver
Distorsion avec un pré-amplificateur sans résistance interne
Verzerrung bei Verwendung eines Vorverstärkers ohne inneren Widerstand

A.F. class AB amplifier and modulator (I_{g1} = 0)
Amplificatrice et modulatrice B.F. classe AB (I_{g1} = 0)
NF-Klasse AB Verstärker und Modulator (I_{g1} = 0)

Limiting values, continuous service
C.C.S. Caractéristiques limites, service continu
Grenzdaten, Dauerbetrieb

V_a = max.	600 V	V_{g2} = max.	300 V
W_{ia} = max.	60 W	W_{g2} = max.	3,5 W
W_a = max.	25 W	V_{kf} = max.	135 V
I_a = max.	120 mA	R_{g1} = max.	100 kΩ[1])

Operating conditions, continuous service; two tubes
C.C.S. Caractéristiques d'utilisation, service continu; deux tubes
Betriebsdaten, Dauerbetrieb; zwei Röhren

V_a =	600		500		V
V_{g2} =	300		300		V
V_{g1} =	-34		-32		V
R_{aa} =	10000		8200		Ω
V_{g1g1p} =	0	68	0	64	V
I_a =	2x18	2x69,5	2x22	2x70,5	mA
I_{g2} =	2x0,3	2x7,5	2x0,5	2x7,5	mA
W_{ig1} =	0	0	0	0	W
W_{g2} =	2x0,09	2x2,25	2x0,15	2x2,25	W
W_{ia} =	2x10,8	2x41,7	2x11	2x35,3	W
W_a =	2x10,8	2x13,7	2x11	2x12,3	W
W_o =	0	56	0	46	W
η =	-	67	-	65	%

V_a =	400		V
V_{g2} =	300		V
V_{g1} =	-30		V
R_{aa} =	6800		Ω
V_{g1g1p} =	0	60	V
I_a =	2x28	2x71,5	mA
I_{g2} =	2x1	2x8	mA
W_{ig1} =	0	0	W
W_{g2} =	2x0,3	2x2,4	W
W_{ia} =	2x11,2	2x28,6	W
W_a =	2x11,2	2x10,6	W
W_o =	0	36	W
η =	-	63	%

[1])See page 10; voir page 10; siehe Seite 10

A.F. class AB amplifier and modulator (Ig1 = 0)
Amplificatrice et modulatrice B.F. classe AB (Ig1 = 0)
NF-Klasse AB Verstärker und Modulator (Ig1 = 0)

Limiting values, intermittent service
I.C.A.S. Caractéristiques limites, service intermittent
Grenzdaten, aussetzender Betrieb

V_a	= max. 750 V	V_{g2}	= max.	300	V
W_{ia}	= max. 90 W	W_{g2}	= max.	3,5	W
W_a	= max. 30 W	V_{kf}	= max.	135	V
I_a	= max. 120 mA	R_{g1}	= max.	100	kΩ[1])

Operating conditions, intermittent service; two tubes
I.C.A.S. Caractéristiques d'utilisation, service intermittent; deux tubes
Betriebsdaten, aussetzender Betrieb; zwei Röhren

V_a	=	750	V
V_{g2}	=	300	V
V_{g1}	=	-35	V
R_{aa}	=	12000	Ω
V_{g1g1_p}	=	0 | 70	V
I_a	=	2x15 | 2x69,5	mA
I_{g2}	=	2x0,25 | 2x8	mA
W_{ig1}	=	0 | 0	W
W_{g2}	=	2x0,075 | 2x2,4	W
W_{ia}	=	2x11,25 | 2x52	W
W_a	=	2x11,25 | 2x16	W
W_o	=	0 | 72	W
η	=	- | 69	%

[1]) With fixed bias. Cathode bias is not recommended
Avec polarisation fixe. Polarisation de cathode n'est pas recommandée
Mit fester Vorspannung. Vorspannung mittels Katodenwiderstand wird nicht empfohlen

A.F. class AB amplifier and modulator in triode connection (g2 connected to a; Ig1 = 0)
Amplificatrice et modulatrice B.F. classe AB en montage triode (g2 connecté à a; Ig1 = 0)
NF-Klasse AB Verstärker und Modulator in Triodenschaltung (g2 verbunden mit a; Ig1 = 0)

C.C.S. Limiting values, continuous service
Caractéristiques limites, service continu
Grenzdaten, Dauerbetrieb

V_a	= max.	400	V
I_a	= max.	125	mA
W_{ia}	= max.	50	W
W_a	= max.	25	W
V_{kf}	= max.	135	V
R_{g1}	= max.	0,1	MΩ [1]
R_{g1}	= max.	0,5	MΩ [2]

C.C.S. Operating conditions, continuous service; two tubes
Caractéristiques d'utilisation, service continu; deux tubes
Betriebsdaten, Dauerbetrieb; zwei Röhren

V_a	=	400		V
V_{g1}	=	-45		V
R_{aa}	=	3		kΩ
V_{gg_p}	=	0	90	V
I_a	=	2x32	2x70	mA
W_{ia}	=	2x12,8	2x28	W
W_a	=	2x12,8	2x20,5	W
W_o	=	0	15	W
η	=	-	27	%

[1] With fixed bias
Avec polarisation fixe
Mit fester Gittervorspannung

[2] With cathode bias
Avec polarisation de cathode
Mit Vorspannung mittels Katodenwiderstand

A.F. class AB amplifier and modulator in triode connection (g2 connected to a; Ig1 = 0)
Amplificatrice et modulatrice B.F. classe AB en montage triode (g2 connecté à a; Ig1 = 0)
NF-Klasse AB Verstärker und Modulator in Triodenschaltung (g2 verbunden mit a; Ig1 = 0)

Limiting values, intermittent service
I.C.A.S. Caractéristiques limites, service intermittent
Grenzdaten, aussetzender Betrieb

V_a	= max.	400	V
I_a	= max.	125	mA
W_{ia}	= max.	50	W
W_a	= max.	30	W
V_{kf}	= max.	135	V
R_{g1}	= max.	0,1	MΩ [1]
R_{g1}	= max.	0,5	MΩ [2]

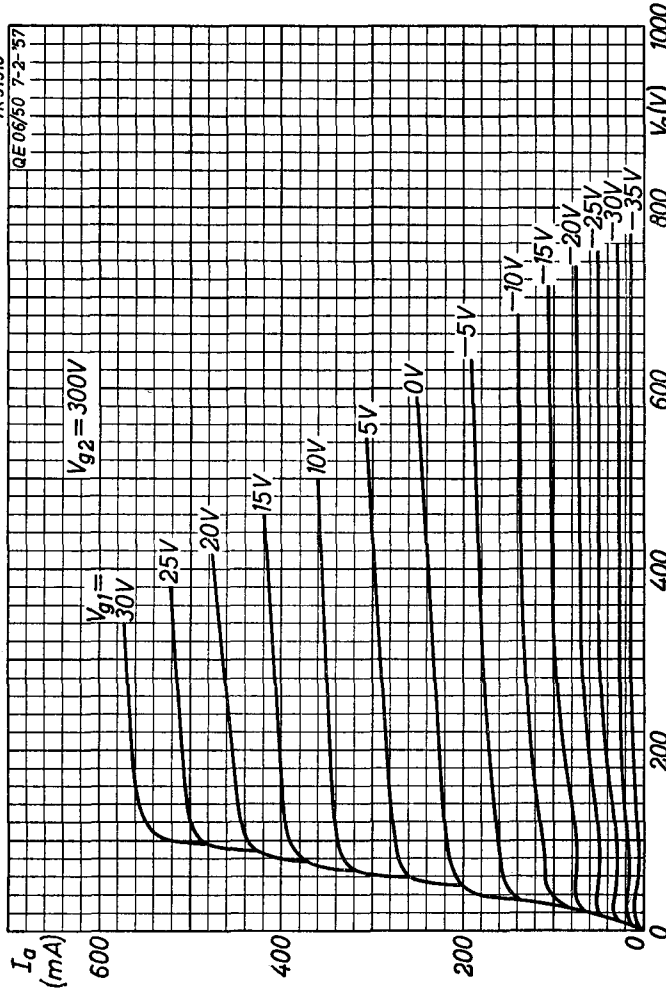
Operating conditions, intermittent service; two tubes
I.C.A.S. Caractéristiques d'utilisation, service intermittent; deux tubes
Betriebsdaten, aussetzender Betrieb; zwei Röhren

V_a	=	400		V
V_{g1}	=	-45		V
R_{aa}	=	3		kΩ
V_{gg_p}	=	0	90	V
I_a	=	2x32	2x70	mA
W_{ia}	=	2x12,8	2x28	W
W_a	=	2x12,8	2x20,5	W
W_o	=	0	15	W
η	=	-	27	%

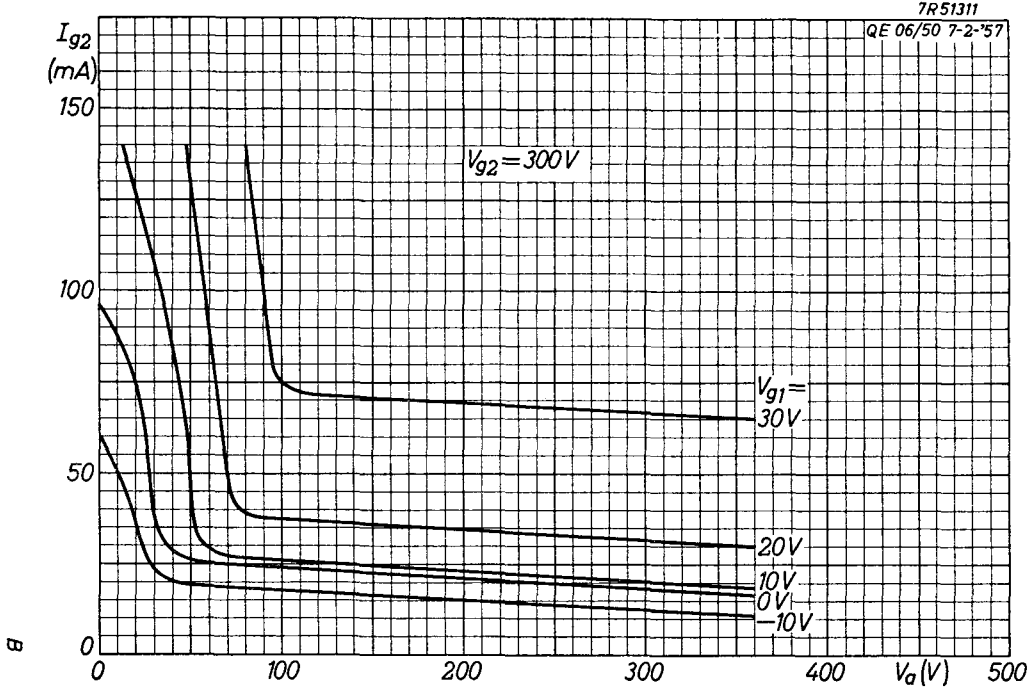
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[1] With fixed bias
Avec polarisation fixe
Mit fester Vorspannung

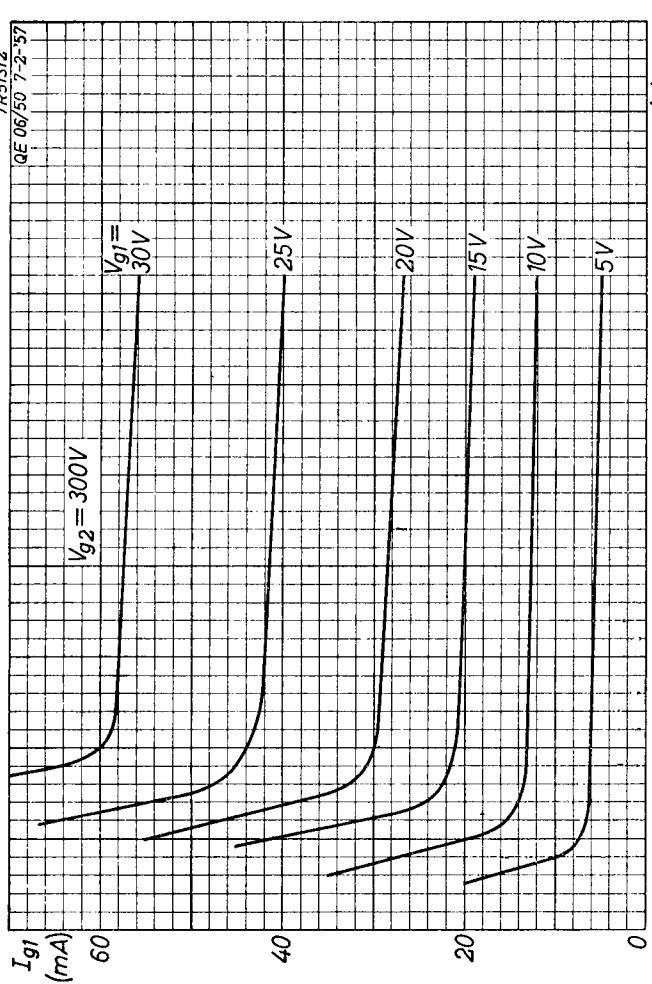
[2] With cathode bias
Avec polarisation de cathode
Mit Vorspannung mittels Katodenwiderstand


7R51310
QE 06/50 7-2-'57
I_a (mA)
600
400
200
0
0
200
400
600
800
1000
V_a(V)
V_{g2} = 300V
V_{g1} = 30V
25V
20V
15V
10V
5V
0V
−5V
−10V
−15V
−20V
−25V
−30V
−35V

PHILIPS


7R51311
QE 06/50 7-2-'57
I_{g2} (mA)
150
100
50
0
$V_{g2}=300V$
$V_{g1}=$
30V
20V
10V
0V
−10V
0
100
200
300
400
V_a(V)
500

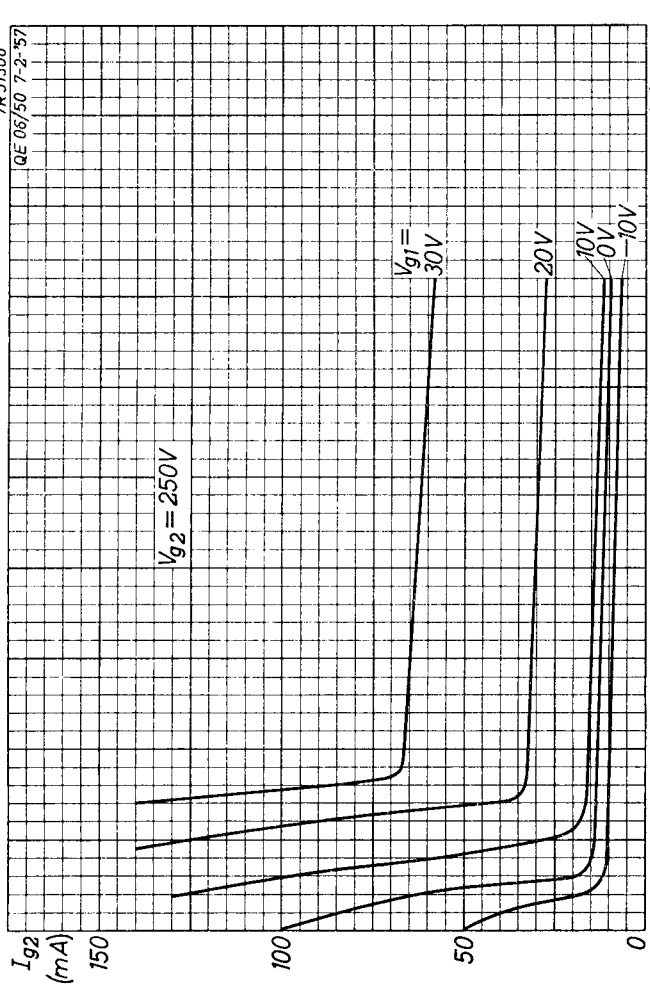
B


7R51312
QE 06/50 7-2-'57
I_{g1} (mA)
60
40
20
0
$V_{g2} = 300V$
V_{g1} = 30V
25V
20V
15V
10V
5V
0
100
200
300
400
500
V_a (V)

QE 06/50

PHILIPS

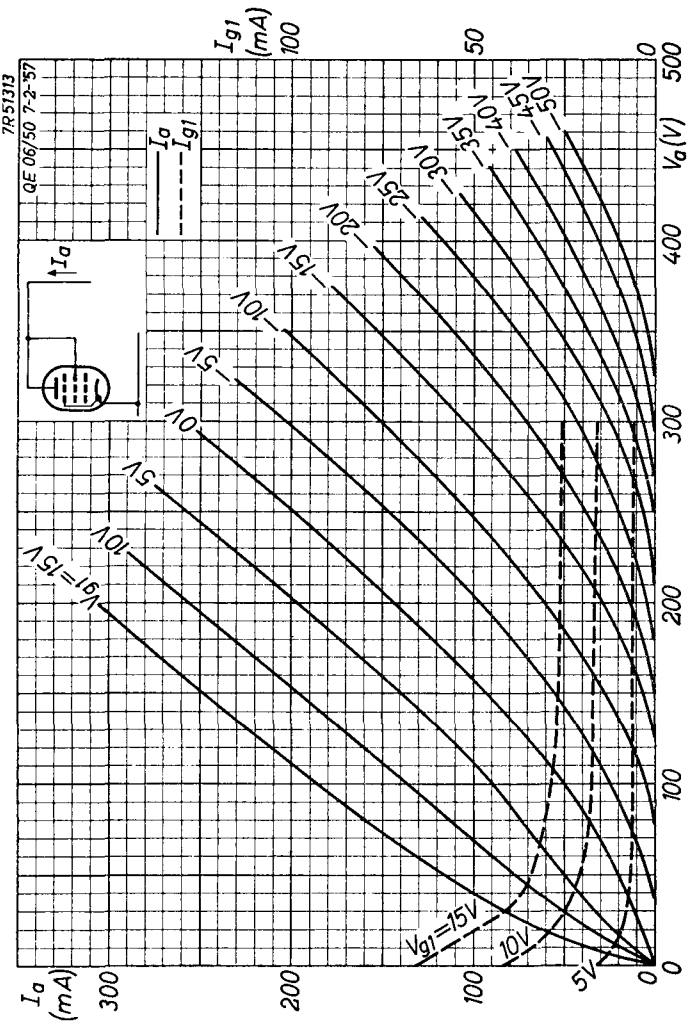
D


7R5108
QE 06/50 7-2-'57
I_{g2} (mA)
150
100
50
0
$V_{g2} = 250V$
V_{g1} =
30V
20V
10V
0V
-10V
0
100
200
300
400
500
V_a (V)

QE 06/50

PHILIPS

F


7R51313
QE 06/50 7-2-57
Ia
Ig1
Ia
Ig1 (mA)
100
50
0
Va (V)
500
400
300
200
100
0
Ia (mA)
300
200
100
0
Vg1=15V
10V
5V
0V
Vg1=15V
10V
5V
0V
15V
20V
25V
30V
35V
40V
45V
50V



QE06/50

page	sheet	date
1	1	1959.03.03
2	2	1959.03.03
3	3	1956.10.10
4	4	1956.10.10
5	5	1956.10.10
6	6	1956.10.10
7	7	1956.10.10
8	8	1956.10.10
9	9	1956.10.10
10	10	1956.10.10
11	11	1956.10.10
12	12	1956.10.10
13	13	1956.10.10
14	14	1956.10.10
15	A	1957.03.03
16	B	1957.03.03
17	C	1957.03.03
18	D	1957.03.03
19	E	1957.03.03

20	F	1957.03.03
21	G	1957.03.03
22, 23	FP	1999.08.21

PHILIPS

QE 08/200

BEAMPOWER TETRODE for use as amplifier, oscillator, frequency multiplier or modulator in A.M., S.S.B. and F.M. transmitters
TÉTRODE À FAISCEAUX pour utilisation comme amplificatrice, oscillatrice, multiplicatrice de fréquence ou modulatrice dans des émetteurs A.M., à une bande latérale ou F.M.
BÜNDELTETRODE zur Verwendung als Verstärker, Oszillator, Frequenzvervielfacher oder Modulator in AM-, Einseitenband- oder FM-Sendern

Cathode : oxide coated
Cathode : oxyde
Katode : Oxyd

Heating : indirect
Chauffage: indirect
Heizung : indirekt

V_f = 6,3 V
I_f = 3,9 A

Capacitances
Capacités
Kapazitäten

C_a = 12,7 pF
C_{g_1} = 30 pF
C_{ag_1} < 0,5 pF

Typical characteristics
Caractéristiques types
Kenndaten

V_a = 750 V
V_{g_2} = 250 V
I_a = 100 mA
S = 9 mA/V
$\mu_{g_2g_1}$ = 5,7

Freq.	C telegr.		C_{ag_2} mod.		B S.S.B.		B mod.[2])	
Mc/s	V_a (V)	W_o (W)	V_a (V)	W_o (W)	V_a (V)	W_o [1]) (W)	V_a (V)	W_o (W)
30	750	200	600	130	750	220	750 600	300 200

Net weight
Poids net 220 g
Nettogewicht

Shipping weight
Poids brut 400 g
Bruttogewicht

[1]) Peak envelope power with double tone
Puissance à la crête de l'enveloppe avec signal d'entrée difréquence
Leistung beim Scheitelwert der Hüllkurve mit Doppeltonverfahren

[2]) Two tubes
Deux tubes
Zwei Röhren

BEAMPOWER TETRODE for use as amplifier, oscillator, frequency multiplier or modulator in A.M., S.S.B. and F.M. transmitters
TÉTRODE À FAISCEAUX pour utilisation comme amplificatrice, oscillatrice, multiplicatrice de fréquence ou modulatrice dans des émetteurs A.M., à une bande latérale ou F.M.
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Capacités
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Freq.	C telegr.		C_{ag_2} mod.		B S.S.B.		B mod.[2])	
Mc/s	V_a (V)	W_o (W)	V_a (V)	W_o (W)	V_a (V)	W_o [1]) (W)	V_a (V)	W_o (W)
30	750	200	600	130	750	220	750	300
							600	200

Net weight
Poids net 220 g
Nettogewicht

Shipping weight
Poids brut 400 g
Bruttogewicht

---

[1]) Peak envelope power with double tone
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Deux tubes
Zwei Röhren

Cooling : Radiation and convection
Refroidissement: Rayonnement et convection
Kühlung : Strahlung und Konvektion

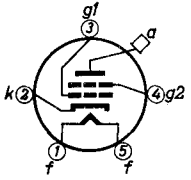
Temperatures
Températures
Temperaturen

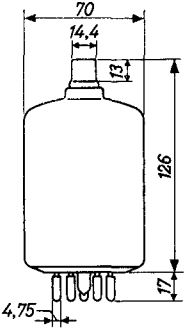
Anode seal temperature
Température du scellement de l'anode max. 220 °C
Anodeneinschmelzungstemperatur

Pin temperature
Température des broches max. 180 °C
Stiftentemperatur

Bulb temperature
Température de l'ampoule max. 300 °C
Kolbentemperatur

Dimensions in mm
Dimensions en mm
Abmessungen in mm





Base
Culot Giant 5p.
Sockel

Socket
Support 40 211/01
Fassung

Top cap
Capot supérieur Medium
Kolbenanschluss

Cap
Capot 40 619
Haube

Mounting position: Vertical, or horizontal with plane of anodes vertical
Montage : Vertical, ou horizontal avec le plan des anodes vertical
Einbau : Senkrecht, oder waagerecht mit der Fläche der Anoden senkrecht

PHILIPS

Cooling : Radiation and convection
Refroidissement: Rayonnement et convection
Kühlung : Strahlung und Konvektion

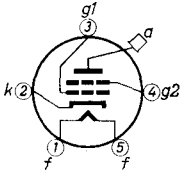
Temperatures
Températures
Temperaturen

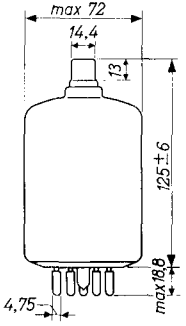
Anode seal temperature
Température du scellement de l'anode max. 220 °C
Anodeneinschmelzungstemperatur

Pin temperature
Température des broches max. 180 °C
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Température de l'ampoule max. 300 °C
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Dimensions in mm
Dimensions en mm
Abmessungen in mm





Base
Culot Giant 5p.
Sockel

Socket
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Top cap
Capot supérieur Medium
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Capot 40 619
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Mounting position: Vertical, or horizontal with plane of anodes vertical
Montage : Vertical, ou horizontal avec le plan des anodes vertical
Einbau : Senkrecht, oder waagerecht mit der Fläche der Anoden senkrecht

R.F. class C telegraphy
H.F. classe C télégraphie
HF-Klasse C Telegraphie

Limiting values
Caractéristiques limites
Grenzdaten

			f = 30 Mc/s	
V_a	=	max.	825	V
W_{ia}	=	max.	300	W
W_a	=	max.	100	W
I_a	=	max.	400	mA
V_{g2}	=	max.	300	V
W_{g2}	=	max.	12	W
$-V_{g1}$	=	max.	100	V
I_{g1}	=	max.	30	mA
R_{g1}	=	max.	15	kΩ
V_{kf}	=	max.	125	V

Operating conditions
Caractéristiques d'utilisation
Betriebsdaten

f	=	30	Mc/s
V_a	=	750	V
V_{g2}	=	250	V
V_{g1}	=	-90	V
I_a	=	385	mA
I_{g2}	=	30	mA
I_{g1}	=	10	mA
V_{g1p}	=	120	V
W_{ia}	=	285	W
W_{ig1}	=	1,5	W
W_{g2}	=	7,5	W
W_a	=	85	W
W_o	=	200	W
η	=	70	%

R.F. class C telegraphy
H.F. classe C télégraphie
HF-Klasse C Telegraphie

Limiting values
Caractéristiques limites
Grenzdaten

			f = 30 Mc/s	
V_a	=	max.	825	V
W_{ia}	=	max.	300	W
W_a	=	max.	100	W
I_a	=	max.	400	mA
V_{g2}	=	max.	300	V
W_{g2}	=	max.	12	W
$-V_{g1}$	=	max.	150	V
I_{g1}	=	max.	30	mA
R_{g1}	=	max.	25	kΩ
V_{kf}	=	max.	125	V

Operating conditions
Caractéristiques d'utilisation
Betriebsdaten

f	=	30	Mc/s
V_a	=	750	V
V_{g2}	=	250	V
V_{g1}	=	-90	V
I_a	=	385	mA
I_{g2}	=	20	mA
I_{g1}	=	7	mA
V_{g1p}	=	120	V
W_{ia}	=	285	W
W_{ig1}	=	1,0	W
W_{g2}	=	5	W
W_a	=	85	W
W_o	=	200	W
η	=	70	%

R.F. class C anode and screen-grid modulation
H.F. classe C modulation d'anode et de grille-écran
HF-Klasse C Anoden- und Schirmgittermodulation

Limiting values
Caractéristiques limites
Grenzdaten

f	= 30 Mc/s	V_{g2}	= max. 300 V
V_a	= max. 650 V	W_{g2}	= max. 10 W
W_{ia}	= max. 200 W	$-V_{g1}$	= max. 120 V
W_a	= max. 67 W	I_{g1}	= max. 30 mA
I_a	= max. 350 mA	R_{g1}	= max. 15 kΩ
		V_{kf}	= max. 125 V

Operating conditions
Caractéristiques d'utilisation
Betriebsdaten

f	=	30 Mc/s
V_a	=	600 V
V_{g2}	=	250 V
V_{g1}	=	-100 V
I_a	=	300 mA
I_{g2}	=	20 mA
I_{g1}	=	4 mA
V_{g1p}	=	110 V
W_{ia}	=	180 W
W_{ig1}	=	0,4 W
W_{g2}	=	5 W
W_a	=	50 W
W_o	=	130 W
η	=	72 %
m	=	100 %
V_{g2p}	=	220 V [1]
W_{mod}	=	90 W

[1]) Obtained from a separate winding on the modulation transformer
Obtenu d'un enroulement séparé du transformateur de modulation
Von einer getrennten Wicklung des Modulationstransformators erhalten

R.F. class C anode and screen-grid modulation
H.F. classe C modulation d'anode et de grille-écran
HF-Klasse C Anoden- und Schirmgittermodulation

Limiting values
Caractéristiques limites
Grenzdaten

		V_{g2} = max.	300 V
f	= 30 Mc/s	W_{g2} = max.	10 W
V_a	= max. 650 V	$-V_{g1}$ = max.	150 V ←
W_{ia}	= max. 200 W	I_{g1} = max.	30 mA
W_a	= max. 67 W	R_{g1} = max.	25 kΩ ←
I_a	= max. 350 mA	V_{kf} = max.	125 V

Operating conditions
Caractéristiques d'utilisation
Betriebsdaten

f	=	30 Mc/s
V_a	=	600 V
V_{g2}	=	250 V
V_{g1}	=	-100 V
I_a	=	300 mA
I_{g2}	=	20 mA
I_{g1}	=	4 mA
V_{g1p}	=	110 V
W_{ia}	=	180 W
W_{ig1}	=	0,4 W
W_{g2}	=	5 W
W_a	=	50 W
W_o	=	130 W
η	=	72 %
m	=	100 %
V_{g2p}	=	220 V [1]
W_{mod}	=	90 W

[1]) Obtained from a separate winding on the modulation transformer
Obtenu d'un enroulement séparé du transformateur de modulation
Von einer getrennten Wicklung des Modulationstransformators erhalten

R.F. class B single sideband amplifier
Amplificateur H.F. classe B à une bande latérale
HF-Klasse B Einseitenbandverstärker

Limiting values
Caractéristiques limites
Grenzdaten

f =	30 Mc/s		
V_a	= max. 825 V	I_a	= max. 400 mA
W_{ia}	= max. 250 W	V_{g2}	= max. 350 V
W_a	= max. 100 W	W_{g2}	= max. 12 W
		V_{kf}	= max. 125 V

Operating conditions with double-tone modulation
Caractéristiques d'utilisation avec modulation difréquence
Betriebsdaten mit Doppeltonmodulation

The R.F. voltage is modulated with two sinusoidal A.F. signals of equal strength but different frequency
La tension H.F. est modulée avec deux signaux B.F. sinusoïdaux d'intensité égale mais de fréquence différente
Die HF-Spannung ist mittels zweier sinusförmigen NF-Signale gleicher Stärke aber verschiedener Frequenz moduliert

f	=	30	Mc/s
V_a	=	750	V
V_{g2}	=	310	V
V_{g1}	=	-45	V [1]
V_{g1p}	=	0 45 [2]	V
I_a	=	130 270	mA
I_{g2}	=	<5 26	mA
I_{g1}	=	0 0	mA
W_{ia}	=	98 200	W
W_{g1}	=	0 0	W
W_{g2}	=	1,5 8	W
W_a	=	98 90	W
W_o	=	0 220	W [3]
η	=	- 55	%

[1]) To be adjusted so that I_a = 130 mA at V_{g1p} = 0
A régler jusqu'à ce que I_a = 130 mA à V_{g1p} = 0
Einzustellen bis I_a = 130 mA wenn V_{g1p} = 0

[2]) To be adjusted so that I_{g1} = 0
A régler jusqu'à ce que I_{g1} = 0
Einzustellen bis I_{g1} = 0

[3]) Peak envelop power; puissance à la crête de l'enveloppe; Leistung beim Scheitelwert der Hüllkurve

R.F. class B single sideband amplifier
Amplificateur H.F. classe B à une bande latérale
HF-Klasse B Einseitenbandverstärker

Limiting values
Caractéristiques limites
Grenzdaten

f	= 30 Mc/s	I_a	= max. 400 mA
V_a	= max. 825 V	V_{g2}	= max. 350 V
W_{ia}	= max. 250 W	W_{g2}	= max. 12 W
W_a	= max. 100 W	R_{g1}	= max. 25 kΩ
		V_{kf}	= max. 125 V

Operating conditions with double-tone modulation
Caractéristiques d'utilisation avec modulation difréquence
Betriebsdaten mit Doppeltonmodulation

The R.F. voltage is modulated with two sinusoidal A.F. signals of equal strength but different frequency
La tension H.F. est modulée avec deux signaux B.F. sinusoïdaux d'intensité égale mais de fréquence différente
Die HF-Spannung ist mittels zweier sinusförmigen NF-Signale gleicher Stärke aber verschiedener Frequenz moduliert

f	=	30	Mc/s
V_a	=	750	V
V_{g2}	=	310	V
V_{g1}	=	-45	V [1]
V_{g1p}	=	0	45 [2] V
I_a	=	130	270 mA
I_{g2}	=	<5	26 mA
I_{g1}	=	0	0 mA
W_{ia}	=	98	200 W
W_{g1}	=	0	0 W
W_{g2}	=	1,5	8 W
W_a	=	98	90 W
W_o	=	0	220 W [3]
η	=	-	55 %

[1]) To be adjusted so that I_a = 130 mA at V_{g1p} = 0
A régler jusqu'à ce que I_a = 130 mA à V_{g1p} = 0
Einzustellen bis I_a = 130 mA wenn V_{g1p} = 0

[2]) To be adjusted so that I_{g1} = 0
A régler jusqu'à ce que I_{g1} = 0
Einzustellen bis I_{g1} = 0

[3]) Peak envelop power; puissance à la crête de l'enveloppe; Leistung beim Scheitelwert der Hüllkurve

A.F. class B amplifier
Amplificatrice B.F. classe B
NF-Klasse B Verstärker

Limiting values
Caractéristiques provisoires
Grenzdaten

V_a	= max.	825	V
W_a	= max.	100	W
I_a	= max.	400	mA
V_{g2}	= max.	300	V
W_{g2}	= max.	12	W
$-V_{g1}$	= max.	100	V
I_{g1}	= max.	30	mA
R_{g1}	= max.	15	kΩ
V_{kf}	= max.	125	V

Operating conditions, two tubes
Caractéristiques d'utilisation, deux tubes
Betriebsdaten, zwei Röhren

V_a	=	750		600		V
V_{g2}	=	250		250		V
V_{g1}	=	-45		-45		V
$R_{aa\sim}$	=	3600		3500		Ω
V_{g1g1p}		0	110	0	105	V
I_a	=	2x45	2x280	2x25	2x235	mA
I_{g2}	=	0	2x40	2x0,5	2x24	mA
I_{g1}	=	0	2x1	0	2x0,5	mA
W_{ia}	=	2x34	2x210	2x15	2x140	W
W_{g2}	=	0	2x10	0	2x6	W
W_a	=	2x34	2x60	2x15	2x40	W
W_o	=	0	300	0	200	W
d_{tot}	=	-	6,5	-	5	%
η	=	-	71,5	-	71,5	%

A.F. class B amplifier
Amplificatrice B.F. classe B
NF-Klasse B Verstärker

Limiting values
Caractéristiques limites
Grenzdaten

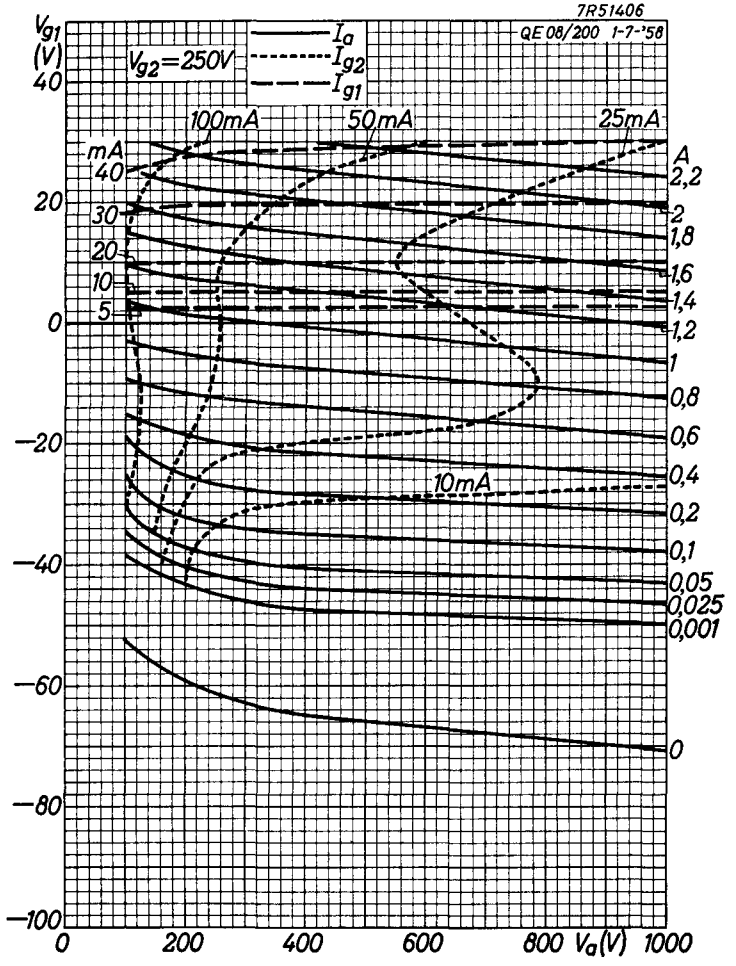
V_a	= max.	825	V
W_a	= max.	100	W
I_a	= max.	400	mA
V_{g2}	= max.	300	V
W_{g2}	= max.	12	W
$-V_{g1}$	= max.	150	V
I_{g1}	= max.	30	mA
R_{g1}	= max.	15	kΩ
V_{kf}	= max.	125	V

Operating conditions, two tubes
Caractéristiques d'utilisation, deux tubes
Betriebsdaten, zwei Röhren

V_a	=	750		600		V
V_{g2}	=	250		250		V
V_{g1}	=	-45		-45		V
$R_{aa\sim}$	=	3600		3500		Ω
V_{g1g1p}		0	110	0	105	V
I_a	=	2x45	2x280	2x25	2x235	mA
I_{g2}	=	0	2x40	2x0,5	2x24	mA
I_{g1}	=	0	2x1	0	2x0,5	mA
W_{ia}	=	2x34	2x210	2x15	2x140	W
W_{g2}	=	0	2x10	0	2x6	W
W_a	=	2x34	2x60	2x15	2x40	W
W_o	=	0	300	0	200	W
d_{tot}	=	-	6,5	-	5	%
η	=	-	71,5	-	71,5	%

PHILIPS

QE 08/200



7.7.1958

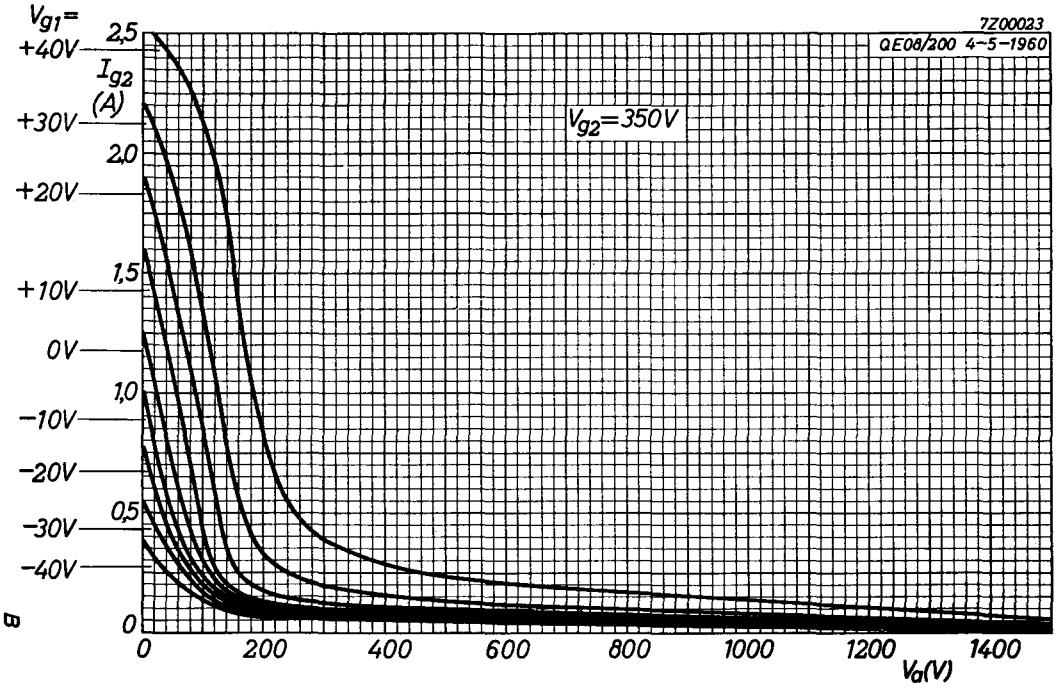
A

PHILIPS

QE08/200

6.6.1960

A



QE08/200

PHILIPS

PHILIPS

QE08/200

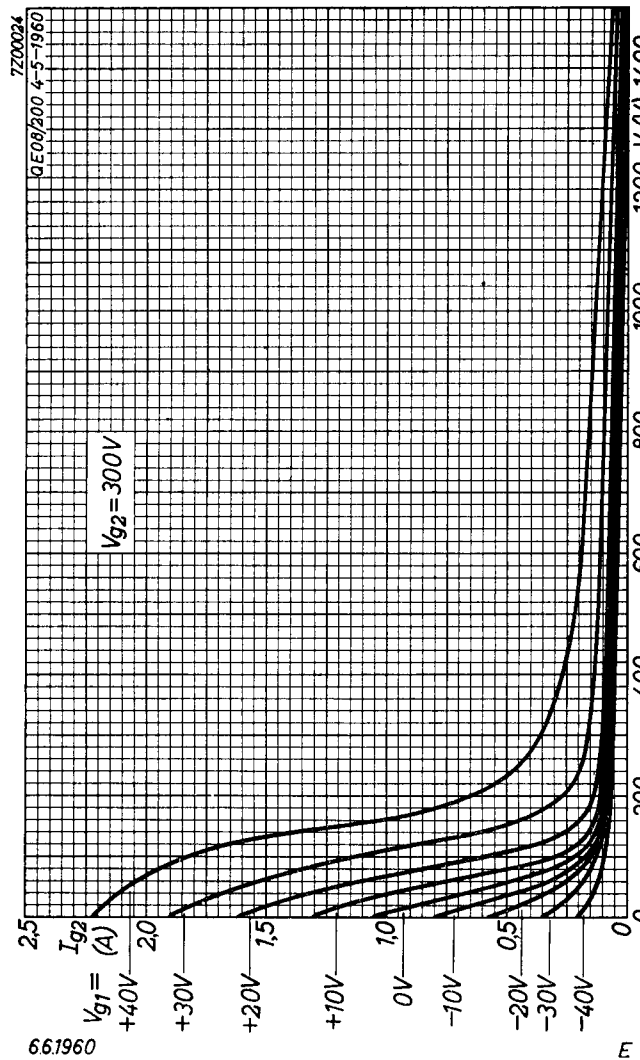
6.6.1960

C

PHILIPS

QE08/200

D

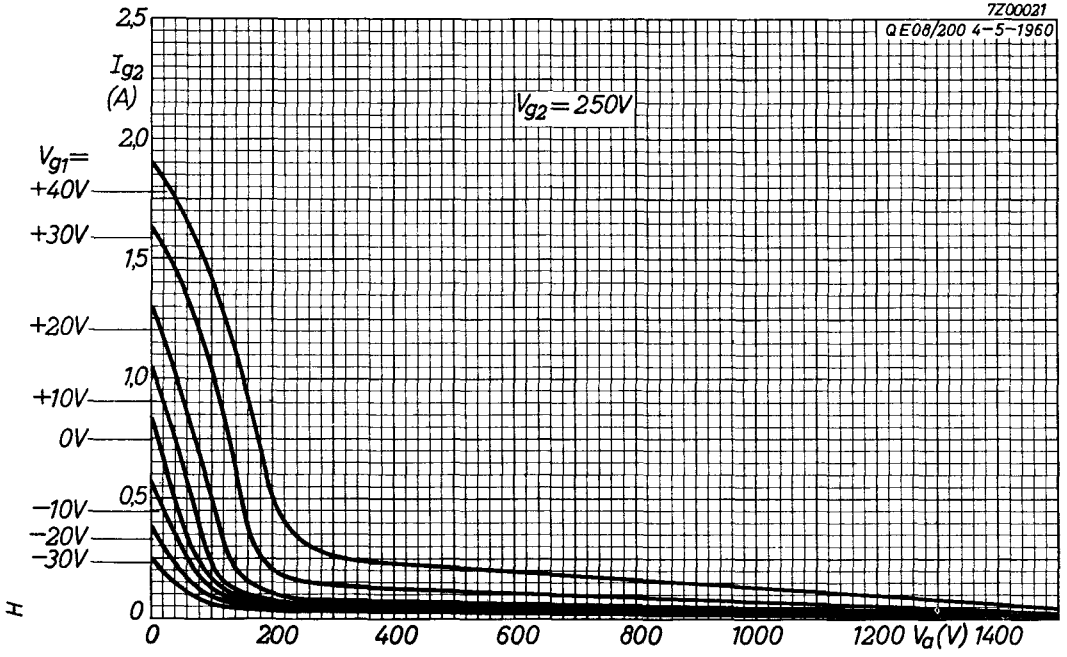

7Z00024
QE08/200 4-5-1960
V_{g2} = 300 V
I_{g2} (A)
V_{g1} =
+40V
+30V
+20V
+10V
0V
−10V
−20V
−30V
−40V
2,5
2,0
1,5
1,0
0,5
0
0
200
400
600
800
1000
1200
1400
V_a(V)

QE08/200

PHILIPS

F

7Z00016
QE08/200 4-5-1960
V_{g1} =
+40V
+30V
+20V
+10V
0V
−10V
−20V
−30V
−40V
−50V
V_{g2} = 250V
I_a (A)
V_a (V)
0
1
2
3
4
5
200
400
600
800
1000
1200
1400



QE08/200

PHILIPS

PHILIPS

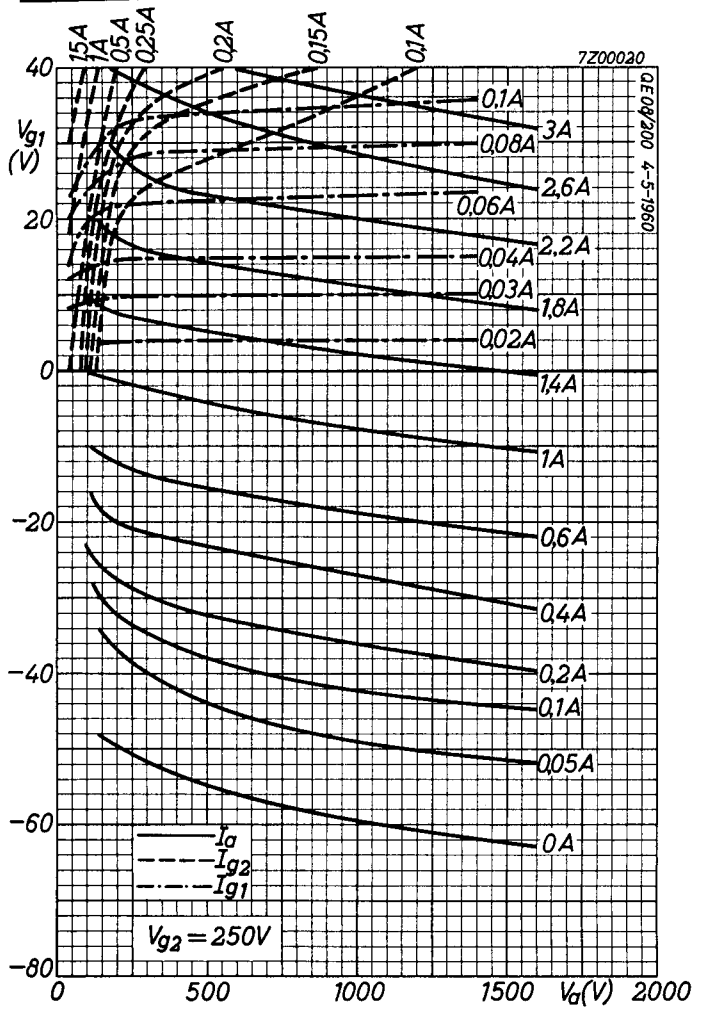
QE08/200

6.6.1960

I

QE08/200

PHILIPS



J

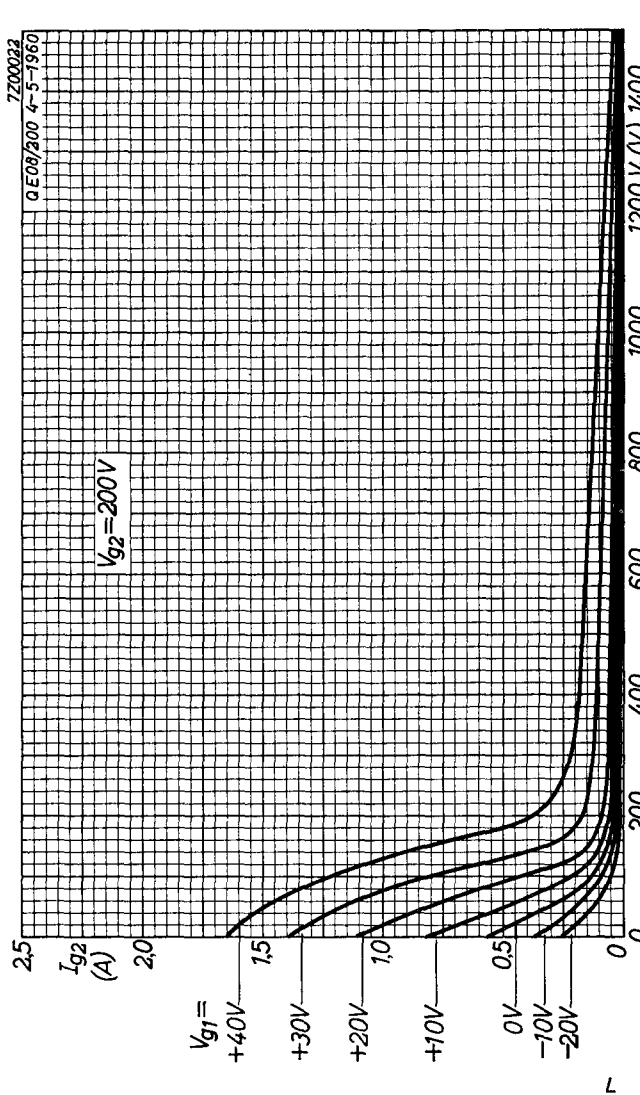
PHILIPS

QE08/200

6.6.1960

K

PHILIPS


7Z00022
QE08/200 4-5-1960
V_{g2}=200V
I_{g2} (A)
2,5
2,0
1,5
1,0
0,5
0
V_{g1} =
+40V
+30V
+20V
+10V
0V
−10V
−20V
0
200
400
600
800
1000
1200
V_g(V) 1400

PHILIPS

QE08/200

6.6.1960

M

PHILIPS

Electronic Tube

HANDBOOK

QE08/200

page	sheet	date
1	1	1958.07.07
2	1	1960.09.09
3	2	1958.07.07
4	2	1960.09.09
5	3	1958.07.07
6	3	1959.05.05
7	4	1958.07.07
8	4	1959.05.05
9	5	1958.07.07
10	5	1959.05.05
11	6	1958.07.07
12	6	1959.05.05
13	A	1958.07.07
14	A	1960.06.06
15	B	1960.06.06
16	C	1960.06.06
17	D	1960.06.06
18	E	1960.06.06
19	F	1960.06.06

20	G	1960.06.06
21	H	1960.06.06
22	I	1960.06.06
23	J	1960.06.06
24	K	1960.06.06
25	L	1960.06.06
26	M	1960.06.06
27, 28	FP	2000.01.15

PHILIPS

QE08/200H

BEAMPOWER TETRODE for use as amplifier, oscillator, frequency multiplier or modulator in A.M., S.S.B. and F.M. transmitters
TETRODE À FAISCEAUX pour utilisation comme amplificatrice, oscillatrice, multiplicatrice de fréquence ou modulatrice dans des émetteurs A.M., à une bande latérale ou F.M.
BÜNDELTETRODE zur Verwendung als Verstärker, Oszillator, Frequenzverfielfacher oder Modulator in AM-, Einseitenband- oder FM-Sendern

Heating : indirect — V_f = 26,5 V
Chauffage: indirect — I_f = 0,85 A
Heizung : indirekt

For further data and curves please refer to QE 08/200
Pour les autres données et les courbes voir QE 08/200
Für die übrigen Daten und Kurven siehe QE 08/200

PHILIPS

Electronic Tube

HANDBOOK

QE08/200H

page	sheet	date
1	1	1963.02.02
2	FP	2000.01.15

V.H.F./U.H.F. TETRODE for use as H.F. amplifier, oscillator, frequency-multiplier and modulator at frequencies up to 500 Mc/s
TETRODE V.H.F./U.H.F. pour utilisation en amplificatrice et oscillatrice H.F., multiplicatrice de fréquence et modulatrice à des fréquences jusqu'à 500 MHz
VHF/UHF-TETRODE zur Verwendung als HF-Verstärker und Oszillator, Frequenzvervielfacher und Modulator bei Frequenzen bis zu 500 MHz

Cathode : oxide-coated
Cathode : oxyde
Katode : Oxyd

Heating : indirect
Chauffage: indirect
Heizung : indirekt

V_f = 6,0 V
I_f = 2,6 A
T_h = min. 30 sec

Capacitances
Capacités
Kapazitäten

C_a = 4,5 pF
C_{g1} = 15,5 pF
C_{ag1} = 0,03 pF

Typical characteristics
Caractéristiques types
Kenndaten

μ_{g2g1} = 5

S (V_a = 500 V; V_{g2} = 250 V; I_a = 200 mA) = 12 mA/V

λ	Freq.	C telegr.		Cag2 mod.		AB mod		
		V_a	W_o	V_a	W_o	V_a	W_o [3]	W_o [4]
(cm)	(Mc/s)	(V)	(W)	(V)	(W)	(V)	(W)	(W)
182	165	1250	195	1000	140	1250	310	425
		1000	150	800	100	1000	240	315
		750	110	600	80	800	195	240
		600	85	400	55	600	140	170
60	500	1250	140 [1]					
		1000	110 [1]					
		800	90 [1]					
		600	65 [1]					
				Telev. class B				
140	216			1250	250 [2]			
				1000	200 [2]			
				750	135 [2]			

[1] Useful output power in load
Puissance de sortie dans la charge
Nützliche Ausgangsleistung in der Belastung

[2][3][4] See page 3; voir page 3; siehe Seite 3

FORCED-AIR COOLED TRANSMITTING TETRODE for use as H.F. amplifier, oscillator, frequency multiplier and modulator at frequencies up to 500 Mc/s

CATHODE: oxide coated

HEATING: indirect by A.C. or D.C.

Heater voltage	V_f	=	6.0 V
Heater current	I_f	=	2.6 A
Waiting time	T_w	=	min. 30 sec

When the tube is driven to max. input as a straight through class C amplifier the heater voltage should be reduced according to the following table

f	$\leqq$ 300 Mc/s	300-400 Mc/s	400-500 Mc/s
V_f	6.0 V	5.75 V	5.5 V

TYPICAL CHARACTERISTICS

Anode voltage	V_a	=	500 V
Grid No.2 voltage	V_{g_2}	=	250 V
Anode current	I_a	=	200 mA
Mutual conductance	S	=	12 mA/V
Amplification factor of grid No.1 with respect to grid No.2	$\mu_{g_2g_1}$	=	5

Freq (Mc/s)	C telegr.		$Ca g_2$ mod	
	V_a (V)	W_o (W)	V_a (V)	W_o (W)
< 150	2000	370	1600	230
	1500	260	1200	160
165	1250	195	1000	140
	1000	150	800	100
	750	110	600	80
	600	85	400	55
500	1250	170		
	1000	120		
	800	95		
	600	50		

AB mod		
V_a (V)	W_o1) (W)	W_o2) (W)
2000	580	630
1500	400	440
1000	230	270
800	170	215

Freq. (Mc/s)	B SSB	
	V_a (V)	W_o (PEP) (W)
175	2000	300
	1500	220
	1000	130

Freq. (Mc/s)	B television	
	V_a (V)	W_o (sync) (W)
216	1250	250
	1000	200
	750	135

1) Without grid current, two tubes

2) With grid current, two tubes

Cooling

Forced air through the radiator and in general to the base end of the tube. Air flow and heater voltage must be applied simultaneously.

Seal temperature	max. 150°C
Air-system socket (air-system chimney included)	40222[5])
Air-system chimney (See page 4)	56 590 81/40 ←

The use of this air-system socket with chimney is recommended, since a standard Loctal socket does not ensure an adequate cooling of the base.
All four cathode connections should be used.

[5])Socket type 40222 is intended for circuits where the cathode is at chassis potential.

Refroidissement

Air forcé par le radiateur et en général à la partie inférieure du tube. Le courant d'air et la tension de chauffage seront appliqués simultanément.

Température des scellements	max. 150°C
Support de tube pour le système de ventilation (y incluse la cheminée)	40222[5])
Cheminée pour le système de ventilation (voir page 4)	56 590 81/40 ←

L'usage du support de tube 40222 avec la cheminée 56 590 81/40 est recommandé, un support Loctal normal n'assurant pas un refroidissement adéquat du culot du tube.
Il faut utiliser toutes les quatre connexions de cathode

[5])Le support de tube 40222 est destiné pour des circuits dont la cathode a le potentiel du châssis.

Kühlung

Pressluft durch den Kühler und im allgemeinen auf die Unterseite der Röhre. Luftströmung und Heizspannung müssen gleichzeitig eingeschaltet werden.

Temperatur der Einschmelzungen	max. 150°C
Röhrenfassung für die Ventilationsanlage (Lüftführungsring einbegriffen)	40222[5])
Luftführungsring für die Ventilationsanlage (siehe Seite 4)	56 590 81/40 ←

Da eine richtige Kühlung des Röhrenbodens von einem normalen Loctalfassung nicht gesichert ist, wird die Verwendung der Röhrenfassung 40222 mit dem Führungsring 56 590 81/40 empfohlen. ←
Alle vier Katodenanschlüsse müssen verwendet werden.

[5])Die Fassung 40222 ist bestimmt für Schaltungen in denen die Katode das Chassispotential hat.

CAPACITANCES

Anode to all other elements except grid No.1	C_a	= 4.4 pF
Grid No.1 to all other elements except anode	C_{g_1}	= 16 pF
Anode to grid No.1	C_{ag_1}	= 0.03 pF

COOLING

The use of the air-system socket with chimney is recommended, since a standard loctal socket does not ensure an adequate cooling of the base.
With the air-system socket air is directed over the base seals, past grid No.2 seal, glass envelope and anode seal and through the radiator to provide effective cooling with minimum air flow.
All four cathode connections should be used.

The figures in the table below apply to the simultaneous cooling of the radiator and the base, making use of the socket 40 222 with air chimney 56 590 81/40.

W_a	h	t_i	q min	p_i [1])
250 W	0 m	20 °C	0.16 m^3/min	12 mm H_2O

TEMPERATURE LIMITS (Absolute limits)

Anode temperature	max. 250 °C [2])
Anode seal temperature	max. 200 °C
Base seals and grid No.2 seal temperature	max. 175 °C

MOUNTING POSITION: arbitrary

NET WEIGHT: 130 g Shipping weight: 300 g

[1]) Pressure drop in caveties etc. excluded

[2]) Measured on base end of anode surface at the junction with the radiator fins

Cooling characteristics
Caractéristiques de refroidissement
Kühlungsdaten

The figures in this table apply to the simultaneous cooling of the radiator and the base, making use of the socket 40222 with chimney 56 590 81/40 ←

Les nombres de cette liste s'appliquent au refroidissement simultané du radiateur et de la côté inférieure du tube, en utilisant le support 40222 avec la cheminée 56 590 81/40 ←

Die Zahlen dieser Tafel gelten bei gleichzeitiger Kühlung des Kühlers und des Röhrenbodens, mit Verwendung der Fassung 40222 mit dem Schornstein 56 590 81/40 ←

Wa (W)	h (m)	ti (°C)	q (m³/min)	pi (mm H_2O)
150	0	35	0,220	15,0
	0	45	0,258	19,8
	1500	35	0,264	18,3
	3000	25	0,278	17,5

Mounting position: arbitrary
Montage : arbitrairement
Einbau : willkürlich

Net weight 130 g
Poids net
Nettogewicht

Shipping weight 300 g
Poids brut
Bruttogewicht

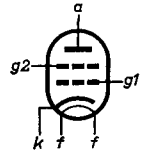
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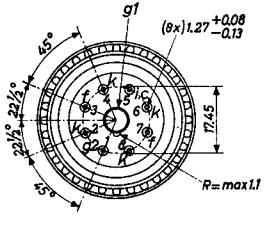
[2]) During sync-pulse peak
Pendant la crête de l'impulsion de synchronisation
Während des Scheitels des Synchronisierungsimpulses

[3]) Two tubes. Without grid current
Deux tubes. Sans courant de grille
Zwei Röhren. Ohne Gitterstrom

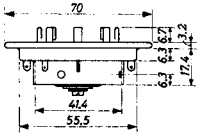
[4]) Two tubes. With grid current
Deux tubes. Avec courant de grille
Zwei Röhren. Mit Gitterstrom

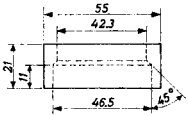
Dimensions in mm



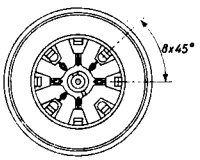


At higher frequencies the ring-surface terminal should be used for connecting the screen grid





Chimney 56 590 81/40



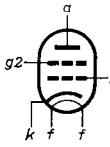
Socket 40 222

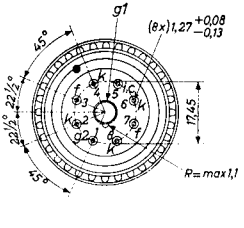
The socket 40 222 is intended for circuits where the cathode is at chassis potential

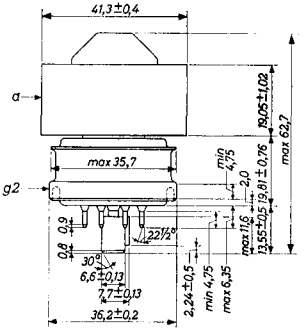
The type number 40 222 includes the chimney 56 590 81/40

PHILIPS

Dimensions in mm
Dimensions en mm
Abmessungen in mm



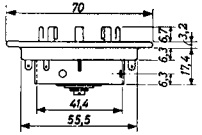


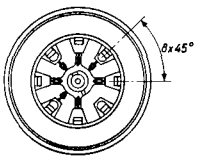


At higher frequencies the ring-surface terminal should be used for connecting the screen grid

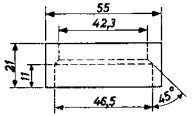
A des fréquences élevées la connexion superficielle annulaire sera utilisée pour connecter la grille-écran

Bei höheren Frequenzen muss zum Anschliessen des Schirmgitters der Oberflächenkontaktring benutzt werden





Socket, support, Fassung
40222



Chimney, cheminée, Luftführungsring
56 590 81/40 ←

→ H.F. amplifier and oscillator class C telegraphy or F.M. telephony

LIMITING VALUES (Absolute limits)

Frequency		f up to	150	150-500 Mc/s
Anode voltage	V_a	= max.	2000	1250 V
Anode current	I_a	= max.	250	250 mA
Anode input power	W_{ia}	= max.	500	320 W
Anode dissipation	W_a	= max.	250	250 W
Grid No.2 voltage	V_{g_2}	= max.	300	300 V
Grid No.2 dissipation	W_{g2}	= max.	12	12 W
Grid No.1 voltage	$-V_{g_1}$	= max.	250	250 V
Grid No.1 dissipation	W_{g_1}	= max.	2	2 W
Grid No.1 circuit resistance	R_{g_1}	= max.	25	25 kΩ
Peak heater to cathode voltage	V_{kf_p}	= max.	150	150 V

OPERATING CONDITIONS

Frequency	f		< 150	< 150 Mc/s
Anode voltage	V_a	=	2000	1500 V
Grid No.2 voltage	V_{g_2}	=	250	250 V
Grid No.1 voltage	V_{g_1}	=	-88	-88 V
Peak grid No.1 A.C. voltage	$V_{g_{1p}}$	=	110	110 V
Anode current	I_a	=	250	250 mA
Grid No.2 current	I_{g_2}	=	24	24 mA
Grid No.1 current	I_{g_1}	=	8	8 mA
Grid No.1 input power	W_{ig_1}	=	2.5	1.5 W
Anode input power	W_{ia}	=	500	375 W
Anode dissipation	W_a	=	130	115 W
Output power	W_o	=	370	260 W

H.F. class C telegraphy
H.F. classe C télégraphie
HF-Klasse C Telegraphie

Limiting values
Caractéristiques limites
Grenzdaten

f = max. 500 Mc/s

V_a	= max.	1250 V	V_{g2}	= max.	300 V
W_{ia}	= max.	300 W	W_{g2}	= max.	12 W
W_a	= max.	150 W	$-V_{g1}$	= max.	250 V
I_a	= max.	250 mA	W_{g1}	= max.	2 W

Operating conditions
Caractéristiques d'utilisation
Betriebsdaten

λ	$\geq$	180	180	180	180 cm
f	$\leq$	165	165	165	165 Mc/s
V_a	=	1250	1000	750	600 V
V_{g2}	=	250	250	250	250 V
V_{g1}	=	-90	-80	-80	-75 V
V_{g1p}	=	105	95	95	90 V
I_a	=	200	200	200	200 mA
I_{g2}	=	20	30	37	37 mA
I_{g1}	=	10	10	10	10 mA
W_{ig1} [1])	=	0,8	0,7	0,7	0,7 W
W_{g2}	=	5	7,5	9,3	9,3 W
W_{ia}	=	250	200	150	120 W
W_a	=	55	50	40	35 W
W_o	=	195	150	110	85 W
η	=	78	75	73,5	71 %

[1])Driver output, circuit losses not included
Puissance de l'excitateur, ne pas y compris les pertes du circuit
Leistung der Steuerstufe, Kringverluste nicht einbegriffen

H.F. amplifier and oscillator class C telegraphy or F.M. telephony (continued)

OPERATING CONDITIONS (continued)

							With coaxial cavity				
Frequency	f	=	165	165	165	165	500	500	500	500	Mc/s
Anode voltage	V_a	=	1250	1000	750	600	1250	1000	800	600	V
Grid No.2 voltage	V_{g_2}	=	250	250	250	250	280	250	250	250	V
Grid No.1 voltage	V_{g_1}	=	-90	-80	-80	-75	-90	-110	-110	-110	V
Peak grid No.1 A.C. voltage	$V_{g_1 p}$	=	106	95	96	91	-	-	-	-	V
Anode current	I_a	=	200	200	200	200	250	200	200	170	mA
Grid No.2 current	I_{g_2}	=	20	31	37	37	6	7	7	6	mA
Grid No.1 current	I_{g_1}	=	11	10	11	11	12	10	10	6	mA
Grid No.1 input power	$W_{i g_1}$	=	1.2	1.0	1.0	1.0	-	-	-	-	W
Driver output power	W_{dr}	=	-	-	-	-	30	25	20	15	W
Anode input power	$W_{i a}$	=	250	200	150	120	312	200	160	102	W
Anode dissipation	W_a	=	55	50	40	35	142	80	65	52	W
Output power	W_o	=	195	150	110	85	170	120	95	50	W

H.F. class C telegraphy (continued)
H.F. classe C télégraphie (continuation)
HF-Klasse C Telegraphie (Fortsetzung)

Operating conditions, single tube, coaxial cavity
Caractéristiques d'utilisation, tube simple, cavité coaxiale
Betriebsdaten, eine Röhre, koaxialer Hohlraum

λ	$\geq$	60	60	60	60 cm
f	$\leq$	500	500	500	500 Mc/s
V_a	=	1250	1000	800	600 V
V_{g2}	=	250	250	250	250 V
V_{g1}	=	-80	-80	-80	-80 V
I_a	=	200	200	200	200 mA
I_{g2}	=	7	7	7	7 mA
I_{g1}	=	10	10	10	10 mA
W_{ig1}	=	10	10	10	10 W
W_{g2}	=	1,8	1,8	1,8	1,8 W
W_{ia}	=	250	200	160	120 W
W_o	=	140	110	90	65 W
η	=	56	55	56	54 %

H.F. class C anode and screen-grid modulation
H.F. classe C modulation de l'anode et de la grille écran
HF-Klasse C Anoden- und Schirmgittermodulation

Screen-grid modulation 55% at 100% anode modulation. Self-modulation of the screen-grid by means of a series resistor or choke should not be applied

Modulation de la grille écran 55% à 100% modulation de l'anode. Auto-modulation de la grille écran au moyen d'une résistance ou d'une bobine n'est pas recommandée

Schirmgittermodulation 55% bei einer Anodenmodulation von 100%. Selbstmodulation des Schirmgitters mittels eines Reihenwiderstandes oder einer Reihendrossel wird nicht empfohlen

H.F. amplifier class C telephony, anode and screen grid modulator →

LIMITING VALUES (Absolute limits)

		f up to 150	150-500 Mc/s
Frequency			
Anode voltage	V_a	= max. 1600	1000 V
Anode current	I_a	= max. 200	200 mA
Anode input power	W_{i_a}	= max. 480	300 W
Anode dissipation	W_a	= max. 165	165 W
Grid No.2 voltage	V_{g_2}	= max. 300	300 V
Grid No.2 dissipation	W_{g_2}	= max. 10	10 W
Grid No.1 voltage	$-V_{g_1}$	= max. 250	250 V
Grid No.1 dissipation	W_{g_1}	= max. 2	2 W
Grid No.1 circuit resistance	R_{g_1}	= max. 25	25 kΩ
Peak heater to cathode voltage	V_{kfp}	= max. 150	150 V

OPERATING CONDITIONS

Frequency	f	< 150	< 150 Mc/s
Anode voltage	V_a	= 1600	1200 V
Grid No.2 voltage	V_{g_2}	= 250	250 V
Grid No.1 voltage	V_{g_1}	= -118	-118 V [1]
Peak grid No.1 A.C. voltage	$V_{g_1 p}$	= 136	136 V
Anode current	I_a	= 200	200 mA
Grid No.2 current	I_{g_2}	= 23	23 mA
Grid No.1 current	I_{g_1}	= 5	5 mA
Grid No.1 input power	$W_{i_{g_1}}$	= 3	2 W
Anode input power	W_{i_a}	= 320	240 W
Anode dissipation	W_a	= 90	80 W
Output power	W_o	= 230	160 W
Modulation depth	m	= 100	100 %
Peak grid No.2 modulation voltage	$V_{g_2 p}$	= 200	180 V
Modulation power	W_{mod}	= 115	80 W

[1]) Obtained from grid No.1 resistor or from a combination of grid No.1 resistor with either fixed supply or cathode resistor

H.F. class C anode and screen-grid modulation (continued)
H.F. classe C modulation de l'anode et de grille écran (continuation)
HF-Klasse C Anoden- und Schirmgittermodulation (Fortsetzung)

Limiting values
Caractéristiques limites
Grenzdaten

V_a	= max.	1000 V	V_{g2}	= max.	300 V
W_{ia}	= max.	200 W	W_{g2}	= max.	12 W
W_a	= max.	100 W	$-V_{g1}$	= max.	250 V
I_a	= max.	200 mA	W_{g1}	= max.	2 W

Operating conditions
Caractéristiques d'utilisation
Betriebsdaten

λ	≥	180	180	180	180 cm
f	≤	165	165	165	165 Mc/s
V_a	=	1000	800	600	400 V
V_{g2}	=	250	250	250	250 V
V_{g1}	=	-105	-100	-95	-90 V
V_{g1p}	=	125	120	120	110 V
I_a	=	200	200	200	200 mA
I_{g2}	=	20	25	35	40 mA
I_{g1}	=	15	10	8	7 mA
W_{ig1}	=	2	1,5	1	1 W
W_{g2}	=	5	6,3	8,8	10 W
W_{ia}	=	200	160	120	80 W
W_a	=	60	60	40	25 W
W_o	=	140	100	80	55 W
η	=	70	63	66	69 %
m	=	100	100	100	100 %
V_{g2p}	=	170	160	150	140 V
W_{mod}	=	100	80	60	40 W

H.F. amplifier class C telephony, anode and screen grid modulator (continued)

OPERATING CONDITIONS (continued)

Frequency	f	=	165	165	165	165 Mc/s
Anode voltage	V_a	=	1000	800	600	400 V
Grid No.2 voltage	V_{g_2}	=	250	250	250	250 V
Grid No.1 voltage	V_{g_1}	=	-105	-100	-95	-90 V 1)
Peak grid No.1 A.C. voltage	$V_{g_1\,p}$	=	125	120	120	110 V
Anode current	I_a	=	200	200	200	200 mA
Grid No.2 current	I_{g_2}	=	20	25	30	35 mA
Grid No.1 current	I_{g_1}	=	15	10	8	7 mA
Grid No.1 input power	$W_{i_{g_1}}$	=	2	1.5	1.0	1.0 W
Anode input power	W_{i_a}	=	200	160	120	80 W
Anode dissipation	W_a	=	60	60	40	25 W
Output power	W_o	=	140	100	80	55 W
Modulation depth	m	=	100	100	100	100 %
Peak grid No.2 modulation voltage	$V_{g_2\,p}$	=	170	160	150	140 V
Modulation power	W_{mod}	=	70	50	40	27.5 W

1) Obtained from grid No.1 resistor or from a combination of grid No.1 resistor with either fixed supply or cathode resistor

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H.F. class B amplifier for television service, negative modulation, positive synchronisation
Amplificatrice H.F. classe B pour télévision, modulation négative, synchronisation positive
HF-Klasse B Verstärker für Fernsehsender, negative Modulation, positive Synchronisierung

Limiting values
Caractéristiques limites
Grenzdaten

f = max. 220 Mc/s		I_a = max.	250 mA
V_a = max.	1250 V	W_a = max.	150 W
V_{g2} = max.	400 V	W_{g2} = max.	12 W
$-V_{g1}$ = max.	250 V	W_{g1} = max.	2 W

Operating conditions
Caractéristiques d'utilisation
Betriebsdaten

f		=	216	216	216 Mc/s
B		=	5	5	5 Mc/s
V_a		=	1250	1000	750 V
V_{g2}		=	300	300	300 V
V_{g1}		=	-70	-65	-60 V
V_{g1p}	sync	=	100	95	85 V
	black, noir, schwarz	=	75	70	65 V
I_a	sync	=	305	330	335 mA
	black, noir, schwarz	=	230	240	245 mA
I_{g2}	sync	=	45	45	50 mA
	black, noir, schwarz	=	10	15	20 mA
I_{g1}	sync	=	25	20	15 mA
	black, noir, schwarz	=	4	4	4 mA
W_{ig1}	sync	=	9	8	7 W
	black, noir, schwarz	=	5,5	4,7	4,25 W
W_{ia}	black, noir, schwarz	=	290	240	185 W
W_o	sync	=	250	200	135 W
	black, noir, schwarz	=	140	110	75 W

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→ H.F. class B amplifier, single side band

LIMITING VALUES (Absolute limits)

Frequency	f	up to	175	500 Mc/s
Anode voltage	V_a	= max.	2000	1250 V
Anode current	I_a	= max.	250	250 mA
Anode input power	W_{i_a}	= max.	500	315 W
Anode dissipation	W_a	= max.	250	250 W
Grid No.2 voltage	V_{g_2}	= max.	400	400 V
Grid No.2 dissipation	W_{g_2}	= max.	12	12 W
Grid No.1 voltage	$-V_{g_1}$	= max.	250	250 V
Grid No.1 circuit resistance (with fixed bias)	R_{g_1}	= max.	25	25 kΩ
Peak cathode to heater voltage	$V_{kf\ p}$	= max.	150	150 V

OPERATING CONDITIONS

Operation with cathode bias is not recommended

Frequency	f	=	175	Mc/s
Anode voltage	V_a	=	2000	V
Grid No.2 voltage	V_{g_2}	=	300	V
Grid No.1 voltage	V_{g_1}	=	-47	V
Load resistance	$R_{a_\sim}$	=	4200	Ω

			zero signal	single tone signal	double tone signal
Peak grid No.1 A.C. voltage	$V_{g_1\ p}$	=	0	47	47 V
Anode current	I_a	=	75	250	160 mA
Grid No.2 current	I_{g_2}	=	-1	-7	-5 mA
Grid No.1 current	I_{g_1}	=	0	0	0 mA
Grid No.1 input power	$W_{i_{g_1}}$	=	0	0	0 W
Anode input power	W_{i_a}	=	150	500	320 W
Anode dissipation	W_a	=	150	200	170 W
Output power	W_o	=	0	300	150 W
Peak envelope power	W_o(PEP)	=	-	-	300 W
Third harmonic distortion	d_3	=	-	-	-32 dB

L.F.class AB amplifier and modulator
Amplificatrice et modulatrice B.F. classe AB
NF-Verstärker und Modulator Klasse AB

Limiting values
Caractéristiques limites
Grenzdaten

V_a	= max.	1250 V	W_{g2}	= max.	12 W
W_{ia}	= max.	300 W	W_{g1}	= max.	2 W
W_a	= max.	150 W	R_{g1}	= max.	100 kΩ[1])
I_a	= max.	250 mA			
V_{g2}	= max.	400 V			

Operating conditions, two tubes without grid current
Caractéristiques d'utilisation, deux tubes sans courant de grille
Betriebsdaten, zwei Röhren ohne Gitterstrom

V_a	=	1250	1000	V
V_{g2}	=	300	300	V
V_{g1}	=	-48	-47	V
R_{aa}	=	7200	5850	Ω
V_{g1g1_p}	=	0 96	0 94	V
I_a	=	2x57,5 2x195	2x60 2x190	mA
I_{g2}	=	0 2x20	0 2x30	mA
W_{g2}	=	0 2x6	0 2x9	W
W_{ia}	=	2x72 2x244	2x60 2x190	W
W_a	=	2x72 2x89	2x60 2x70	W
W_o	=	0 310	0 240	W
η	=	- 63,5	- 63	%

[1]) Each tube
Chaque tube
Jede Röhre

H.F. class B amplifier, single side band (continued)

OPERATING CONDITIONS (continued)

Operation with cathode bias is not recommended

Frequency	f	=	175			175			Mc/s
Anode voltage	V_a	=	1500			1000			V
Grid No.2 voltage	V_{g_2}	=	300			315			V
Grid No.1 voltage	V_{g_1}	=	-45			-44.5			V
Load resistance	$Ra_{\sim}$	=	2900			1850			Ω
			zero signal	single tone signal	double tone signal	zero signal	single tone signal	double tone signal	
Peak grid No.1 A.C. voltage	$V_{g_{1p}}$	=	0	45	45	0	44.5	44.5	V
Anode current	I_a	=	75	250	165	100	250	180	mA
Grid No.2 current	I_{g_2}	=	-2	-4	-5	-4	20	0	mA
Grid No.1 current	I_{g_1}	=	0	0	0	0	0	0	mA
Grid No.1 input power	Wi_{g_1}	=	0	0	0	0	0	0	W
Anode input power	Wi_a	=	115	375	250	100	250	180	W
Anode dissipation	W_a	=	115	155	140	100	120	115	W
Output power	W_o	=	0	220	110	0	130	65	W
Peak envelope power	$W_{o(PEP)}$	=	-	-	220	-	-	130	W
Third harmonic distortion	d_3	=	-	-	-31	-	-	-30	dB

L.F.class AB amplifier and modulator (continued)
Amplificatrice et modulatrice B.F. classe AB(continuation)
NF-Verstärker und Modulator Klasse AB(Fortsetzung)

Operating conditions, two tubes without grid current
Caractéristiques d'utilisation, deux tubes sans courant de grille
Betriebsdaten, zwei Röhren ohne Gitterstrom

V_a	=	800		600		V
V_{g2}	=	300		300		V
V_{g1}	=	-47		-44		V
R_{aa}	=	4625		3550		Ω
V_{g1g1_p}	=	0	94	0	88	V
I_a	=	2x60	2x190	2x80	2x190	mA
I_{g2}	=	0	2x32,5	0	2x32,5	mA
W_{g2}	=	0	2x9,8	0	2x9,8	W
W_{ia}	=	2x48	2x152	2x48	2x114	W
W_a	=	2x48	2x55	2x48	2x44	W
W_o	=	0	195	0	140	W
η	=	-	64	-	61	%

Operating conditions, two tubes with grid current
Caractéristiques d'utilisation deux tubes à courant de grille
Betriebsdaten, zwei Röhren mit Gitterstrom

V_a	=	1250		1000		V
V_{g2}	=	300		300		V
V_{g1}	=	-44		-43		V
R_{aa}	=	5600		4600		Ω
V_{g1g1_p}	=	0	100	0	98	V
I_a	=	2x90	2x238	2x82,5	2x247	mA
I_{g2}	=	0	2x32,5	0	2x35	mA
I_{g1_p}	=	0	10	0	10	mA
W_{ig1}	=	0	2x0,037	0	2x0.037	W
W_{g2}	=	0	2x10	0	2x10	W
W_{ia}	=	2x112	2x297	2x82,5	2x247	W
W_a	=	2x112	2x85	2x82,5	2x90	W
W_o	=	0	425	0	315	W
η	=	-	72	-	64	%

→ A.F. power amplifier and modulator, class AB without grid current

LIMITING VALUES (Absolute limits)

Anode voltage	V_a	= max.	2000	V
Anode current	I_a	= max.	250	mA
Anode dissipation	W_a	= max.	250	W
Anode input power	W_{ia}	= max.	500	W
Grid No.2 voltage	V_{g2}	= max.	400	V
Grid No.2 dissipation	W_{g2}	= max.	12	W
Grid No.1 circuit resistance (each tube)	R_{g_1}	= max.	100	kΩ
Peak cathode to heater voltage	$V_{kf\ p}$	= max.	150	V

OPERATING CONDITIONS (two tubes)

Anode voltage	V_a	=	2000		V
Grid No.2 voltage	V_{g_2}	=	300		V
Grid No.1 voltage	V_{g1}	=	-50		V
Load resistance	$Ra_{\sim}$	=	8760		Ω
Peak grid to grid A.C. voltage	V_{g1g1p}	=	0	100	V
Anode current	I_a	=	2x50	2x235	mA
Grid No.2 current	I_{g2}	=	-	2x18	mA
Grid No.2 dissipation	W_{g2}	=	-	2x5.4	W
Anode input power	W_{ia}	=	2x100	2x470	W
Anode dissipation	W_a	=	2x100	2x180	W
Output power	W_o	=	0	580	W

L.F.class AB amplifier and modulator (continued)
Amplificatrice et modulatrice B.F. classe AB(cont.)
NF-Verstärker und Modulator Klasse AB(Fortsetzung)

Operating conditions, two tubes with grid current
Caractéristiques d'utilisation, deux tubes à courant de grille
Betriebsdaten, zwei Röhren mit Gitterstrom

V_a	=	800		600		V
V_{g2}	=	300		300		V
V_{g1}	=	-43		-41		V
R_{aa}	=	3500		2600		Ω
V_{g1g1_p}	=	0	96	0	94	V
I_a	=	2x80	2x245	2x92,5	2x243	mA
I_{g2}	=	0	2x37,5	0	2x42,5	mA
I_{g1_p}	=	0	10	0	10	mA
W_{ig1}	=	0	2x0,037	0	2x0,037	W
W_{g2}	=	0	2x11	0	2x12,7	W
W_{ia}	=	2x64	2x196	2x55,5	2x146	W
W_a	=	2x64	2x76	2x55,5	2x61	W
W_o	=	0	240	0	170	W
η	=	-	61	-	58	%

A.F. power amplifier and modulator, class AB without grid current (continued)

OPERATING CONDITIONS (two tubes; continued)

Anode voltage	V_a	=	1500		1000		800		V
Grid No.2 voltage	V_{g_2}	=	300		300		300		V
Grid No.1 voltage	V_{g_1}	=	-50		-43		-40		V
Load resistance	$Ra_{\sim}$	=	6570		4250		4400		Ω
Peak grid to grid A.C. voltage	$V_{g_1g_1\,p}$	=	0	100	0	86	0	80	V
Anode current	I_a	=	2x50	2x228	2x82.5	2x225	2x105	2x218	mA
Grid No.2 current	I_{g_2}	=	-	2x21	-	2x26	-	2x38	mA
Grid No.2 dissipation	W_{g_2}	=	-	2x6.3	-	2x7.8	-	2x11.4	W
Anode input power	W_{i_a}	=	2x75	2x340	2x82.5	2x225	2x84	2x174	W
Anode dissipation	W_a	=	2x75	2x140	2x82.5	2x110	2x84	2x89	W
Output power	W_o	=	0	400	0	230	0	170	W

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→ A.F. power amplifier and modulator, class AB with grid current

LIMITING VALUES (Absolute limits)

Anode voltage	V_a	= max.	2000	V
Anode current	I_a	= max.	250	mA
Anode dissipation	W_a	= max.	250	W
Anode input power	W_{i_a}	= max.	500	W
Grid No.2 voltage	V_{g_2}	= max.	400	V
Grid No.2 dissipation	W_{g_2}	= max.	12	W
Grid No.1 dissipation	W_{g_1}	= max.	2	W
Grid No.1 circuit resistance (each tube)	R_{g_1}	= max.	100	kΩ
Peak cathode to heater voltage	V_{kf_p}	= max.	150	V

OPERATING CONDITIONS (two tubes)

Anode voltage	V_a	=	2000		V
Grid No.2 voltage	V_{g_2}	=	300		V
Grid No.1 voltage	V_{g_1}	=	-50		V
Load resistance	$R_{a_\sim}$	=	8100		Ω
Peak grid to grid A.C. voltage	$V_{g_1g_1\,p}$	=	0	106	V
Driving power	W_{dr}	=	0	0.2	W
Anode current	I_a	=	2x50	2x250	mA
Grid No.2 current	I_{g_2}	=	-	2x18	mA
Grid No.2 dissipation	W_{g_2}	=	-	2x5.4	W
Anode input power	W_{i_a}	=	2x100	2x500	W
Anode dissipation	W_a	=	2x100	2x185	W
Output power	W_o	=	-	630	W

A.F. amplifier and modulator, class AB with grid current (continued)

OPERATING CONDITIONS (two tubes; continued)

Anode voltage	V_a	=	1500		1000		800		V
Grid No.2 voltage	V_{g2}	=	300		300		300		V
Grid No.1 voltage	V_{g1}	=	-50		-45		-40		V
Load resistance	$R_{a\sim}$	=	5970		3950		3140		Ω
Peak grid to grid A.C. voltage	$V_{g1g1\,p}$	=	0	106	0	98	0	90	V
Driving power	W_{dr}	=	0	0.2	0	0.15	0	0.15	W
Anode current	I_a	=	2x50	2x250	2x83	2x247	2x105	2x250	mA
Grid No.2 current	I_{g2}	=	-	2x18	-	2x29	-	2x40	mA
Grid No.2 dissipation	W_{g2}	=	-	2x5.4	-	2x8.7	-	2x12	W
Anode input power	W_{i_a}	=	2x75	2x375	2x83	2x247	2x84	2x200	W
Anode dissipation	W_a	=	2x75	2x155	2x83	2x112	2x84	2x93	W
Output power	W_o	=	0	440	0	270	0	215	W

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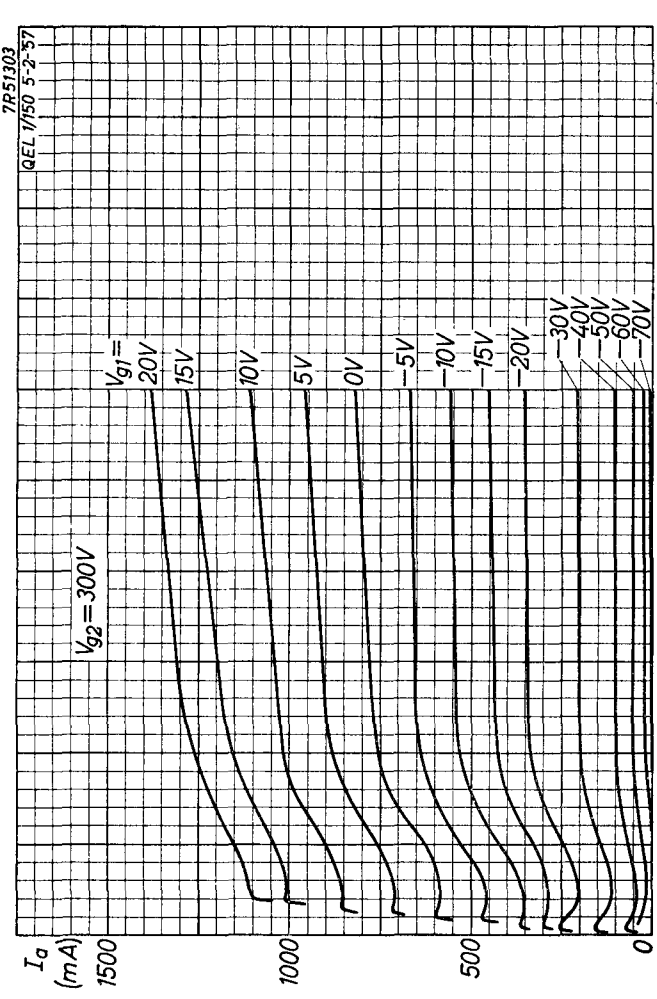
H.F. amplifier, class B television service
Negative modulation, positive synchronisation

→ LIMITING VALUES (Absolute limits)

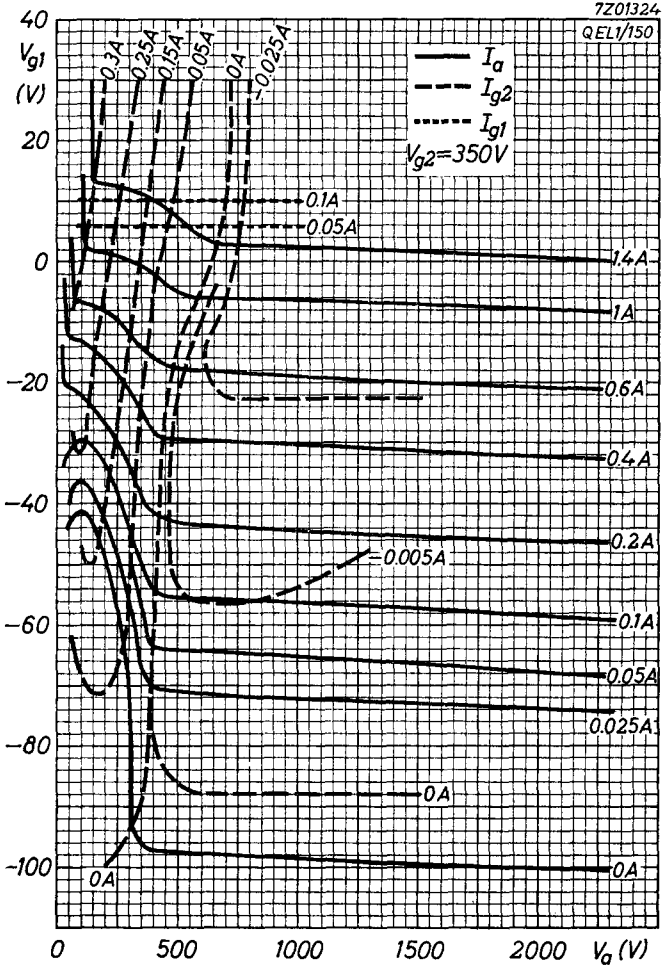
Frequency	f	=	54 to 216 Mc/s
Anode voltage	V_a	= max.	1250 V
Anode current	I_a	= max.	250 mA
Anode dissipation	W_a	= max.	250 W
Anode input power	Wi_a	= max.	500 W
Grid No.2 voltage	V_{g_2}	= max.	400 V
Grid No.2 dissipation	W_{g_2}	= max.	12 W
Grid No.1 voltage	$-V_{g_1}$	= max.	250 V
Grid No.1 dissipation	W_{g_1}	= max.	2 W
Grid No.1 circuit resistance	R_{g_1}	= max.	50 kΩ
Peak cathode to heater voltage	$V_{kf\,p}$	= max.	150 V

OPERATING CONDITIONS at centre frequency of resonance curve

Frequency	f	=	216	216	216 Mc/s
Bandwidth at -1.5 dB	B	=	5	5	5 Mc/s
Anode voltage	V_a	=	1250	1000	750 V
Grid No.2 voltage	V_{g_2}	=	300	300	300 V
Grid No.1 voltage	V_{g_1}	=	-70	-65	-60 V
Peak grid No.1 A.C. voltage	V_{g_1p} sync	=	100	95	85 V
	V_{g_1p} black	=	75	70	65 V
Anode current	I_a sync	=	305	330	335 mA
	I_a black	=	230	240	245 mA
Grid No.2 current	I_{g_2} sync	=	45	45	50 mA
	I_{g_2} black	=	10	15	20 mA
Grid No.1 current	I_{g_1} sync	=	25	20	15 mA
	I_{g_1} black	=	4	4	4 mA
Grid No.1 input power	Wi_{g_1} sync	=	9	8	7 W
	Wi_{g_1} black	=	5.5	4.7	4.25 W
Output power	W_o sync	=	250	200	135 W
	W_o black	=	140	110	75 W


7P51303
QEL 1/150 5-2-57
I_a (mA)
1500
1000
500
0
0
500
1000
1500
2000
2500
V_a (V)
V_{g2} = 300V
V_{g1} =
20V
15V
10V
5V
0V
−5V
−10V
−15V
−20V
−30V
−40V
−50V
−60V
−70V

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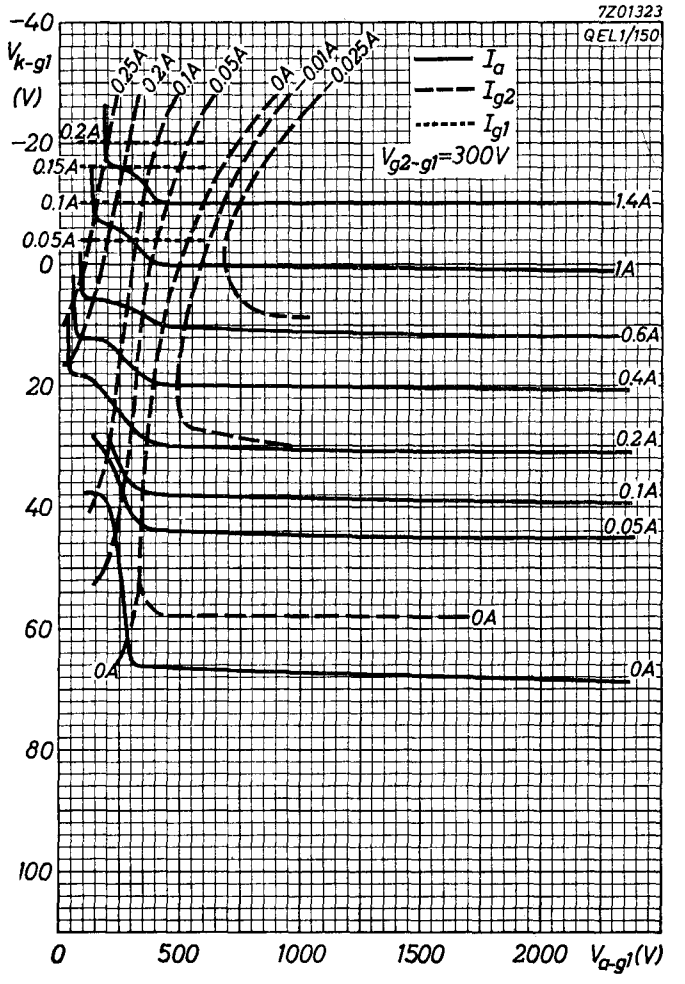
QEL 1/150

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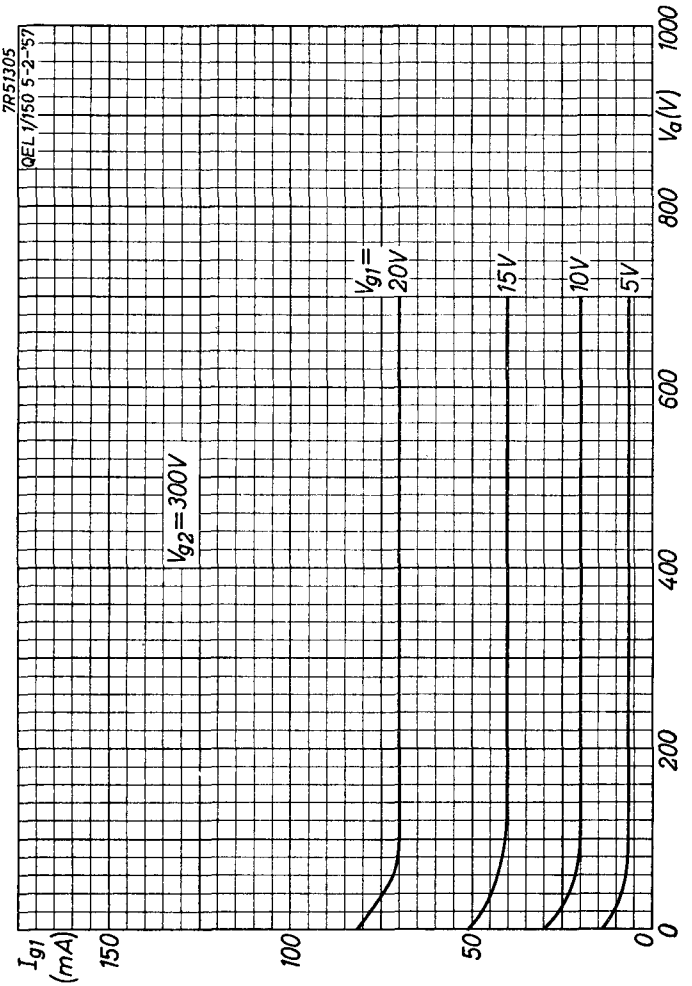
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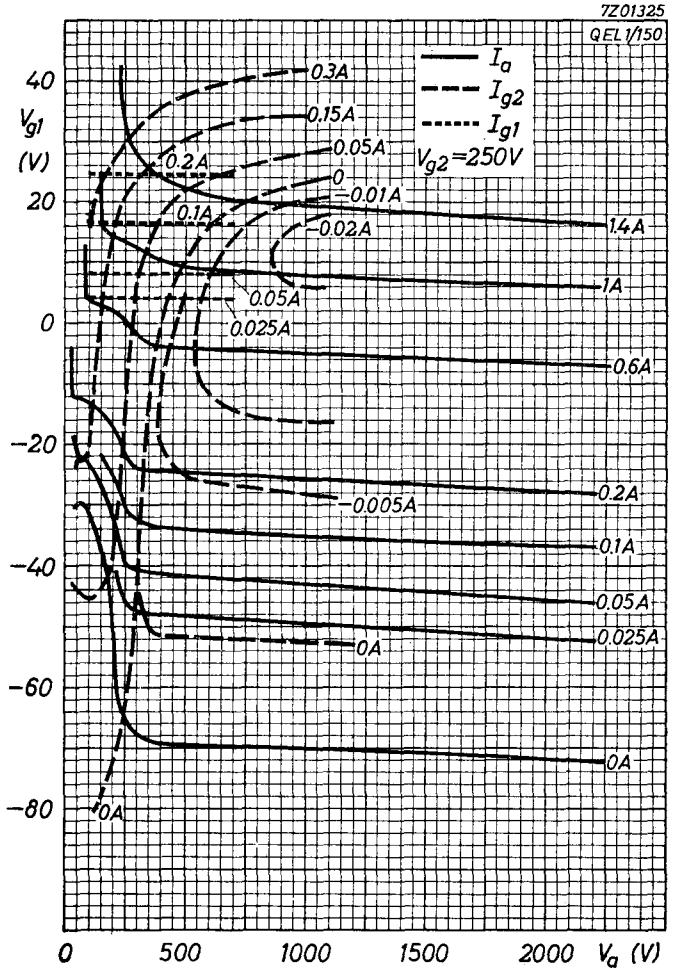
QEL1/150

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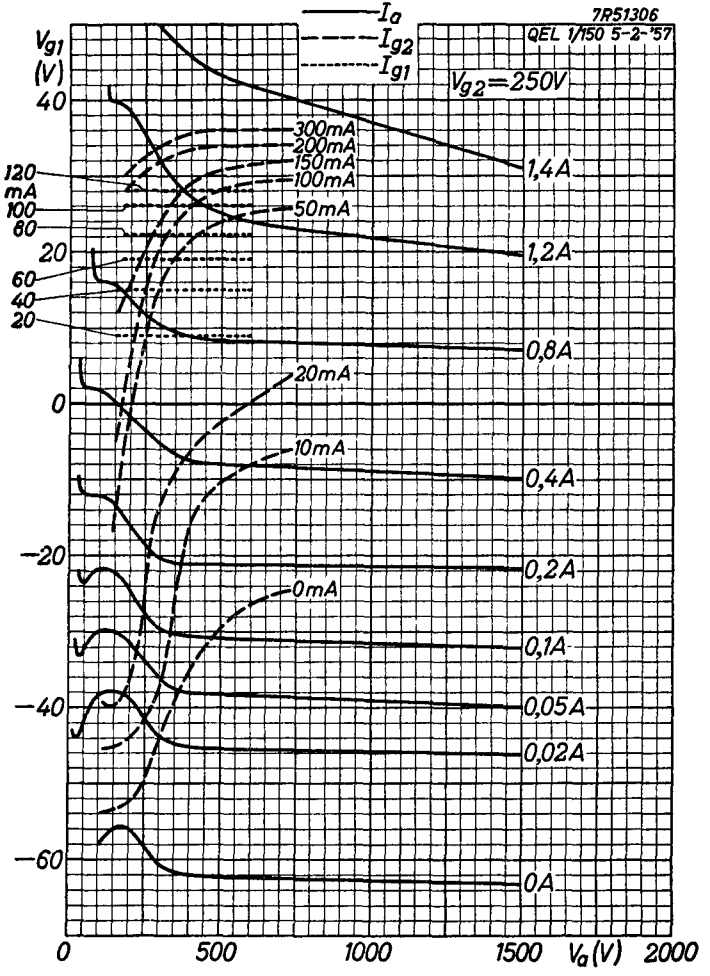
B


7R51305
QEL 1/150 5-2-'57
I_{g1} (mA)
150
100
50
0
V_{g2}=300V
V_{g1} =
20V
15V
10V
5V
0
200
400
600
800
1000
V_a(V)


7Z01325
QEL1/150
I_a
I_{g2}
I_{g1}
V_{g2}=250V
V_{g1} (V)
40
20
0
−20
−40
−60
−80
0.3A
0.15A
0.05A
0.2A
0
0.01A
0.1A
0.02A
1.4A
0.05A
1A
0.025A
0.6A
0.2A
0.005A
0.1A
0.05A
0A
0.025A
0A
0A
0
500
1000
1500
2000
V_a (V)

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D

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PHILIPS

Electronic Tube HANDBOOK

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31	C	1963.02.02
32	D	1957.02.02
33	D	1963.02.02
34, 35	FP	2000.01.15

V.H.F./U.H.F. TETRODE for use as H.F. amplifier, oscillator, frequency-multiplier and modulator at frequencies up to 500 Mc/s

TETRODE V.H.F./U.H.F. pour utilisation en amplificatrice et oscillatrice H.F., multiplicatrice de fréquence et modulatrice à des fréquences jusqu'à 500 MHz

VHF/UHF-TETRODE zur Verwendung als HF-Verstärker und Oszillator, Frequenzvervielfacher und Modulator bei Frequenzen bis zu 500 MHz

Cathode : oxide-coated
Cathode : oxyde
Katode : Oxyd

Heating : indirect
Chauffage: indirect
Heizung : indirekt

Capacitances
Capacités
Kapazitäten

Typical characteristics
Caractéristiques types
Kenndaten

V_f	=	6,0 V[1])
I_f	=	2,6 A
T_w	=	min. 30 sec
C_a	=	4,5 pF
C_{g_1}	=	15,7 pF
C_{ag_1}	<	0,06 pF
V_a	=	500 V
V_{g_2}	=	250 V
I_a	=	200 mA
S	=	12 mA/V
$\mu_{g_2g_1}$	=	5,2

Freq	C telegr		C_{ag_2} mod		B teleph		B teleph SSB	
(Mc/s)	V_a (V)	W_o (W)	V_a (V)	W_o (W)	V_a (V)	W_o (W)	V_a (V)	W_o (W)
175	2000	390	1500	235	2000	65	2000	300
	1500	280	1000	145	1500	50	1500	215
	1000	190	500	60	1000	30	1000	120
	500	70						
500	2000	225[2])						

AB mod	
V_a (V)	W_o[3]) (W)
2000	600
1500	430
1000	240

[1]) See page 3; voir page 3; siehe Seite 3

[2]) Useful output power in the load
Puissance de sortie utile dans la charge
Nützliche Ausgangsleistung in der Belastung

[3]) Two tubes
Deux tubes
Zwei Röhren

Temperatures; températures; Temperaturen

Temperature of ceramic to metal seals
Température des joints céramique-métal max. 250 °C
Temperatur des Keramik zu Metalleinschmelzungen

Temperature of glass to metal seals
Température des joints verre-métal max. 175 °C
Temperatur der Glas zu Metalleinschmelzungen

Temperature of anode core
Température du noyau anodique max. 250 °C
Temperatur des Anodenkerns

Socket; support; Fassung

Air system socket
(Air system chimney included)
Support de tube pour le systeme de ventilation (y incluse la cheminée) 40222 [1])
Röhrenfassung für die Ventilationsanlage
(Luftführungsring einbegriffen)

Air system chimney (see page 4)
Cheminée pour le système de ventilation (voir page 4) 56 590 81/40
Luftführungsring (siehe Seite 4)

Cooling; refroidissement; Kühlung

Forced air through the radiator and in general to the base end of the tube.
The use of the socket 40222 with chimney is recommended since a standard loctal socket does not ensure an adequate cooling of the base.
Air flow and heater voltage must be applied simultaneously.
All four cathode connections should be used

Air forcé par le radiateur et, en général, à la partie inférieure du tube.
L'utilisation du support 40222 avec la cheminée est recommandée, un support loctal normal n'assurant pas un refroidissement adéquat du culot.
Le courant d'air et la tension de chauffage seront appliqués simultanément.
Il faut utiliser toutes les quatre connexions de cathode

Pressluft durch den Kühler und im allgemeinen auf die Unterseite der Röhre. Da eine richtige Kühlung des Röhrenbodens von einem normalen Loctalfassung nicht gesichert ist, wird die Verwendung der Fassung 40222 mit Luftführungsring empfohlen.
Luftkühlung und Heizspannung müssen gleichzeitig eingeschaltet werden.
Alle vier Katodenanschlüsse müssen verwendet werden

[1]) Intended for circuits where the cathode is at chassis potential
Destiné pour des circuits dont la cathode a le potentiel du châssis
Bestimmt für Schaltungen in denen die Katode das Chassispotential hat

Cooling characteristics
Caractéristiques de refroidissement
Kühlungsdaten

The figures apply to the simultaneous cooling of the radiator and the base, making use of the socket 40222 with chimney
Les nombres s'appliquent au refroidissement simultané du radiateur et le culot du tube en utilisant le support 40222 avec la cheminée
Die Zahlen gelten bei gleichzeitiger Kühlung des Kühlers und des Röhrenbodens, mit Verwendung der Fassung 40222 mit dem Luftführungsring

W_a (W)	h (m)	t_i (^oC)	q (m^3/min)	p_i (mm H_2O)
250	0	20	0,11	6,4

Mounting position: arbitrary
Montage : arbitrairement
Einbau : willkürlich

Net weight 120 g
Poids net
Nettogewicht

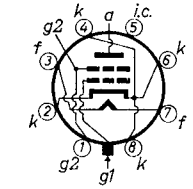
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Poids brut
Bruttogewicht

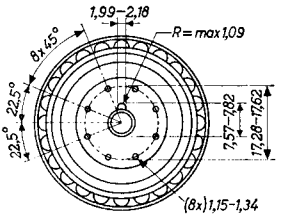
[1]) When the tube is driven to max. input as a class C amplifier, but not as a frequency multiplier, the heater voltage should be reduced according to the table below
Lorsque le tube est utilisé en amplificateur classe C (mais ne pas en multiplicateur de fréquence) avec puissance d'entrée max., la tension de chauffage doit être dimenuée selon la table sous-mentionnée
Wenn die Röhre als Klasse C Verstärker (aber nicht als Frequenzvervielfacher) mit max. Eingangsleistung verwendet wird, muss die Heizspannung nach untenstehender Tabelle verringert werden

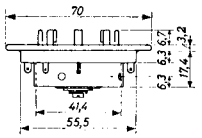
f	≦ 300 Mc/s	300-400 Mc/s	400-500 Mc/s
V_f	6 V	5,75 V	5,5 V

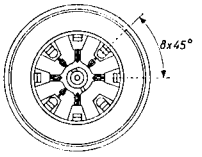
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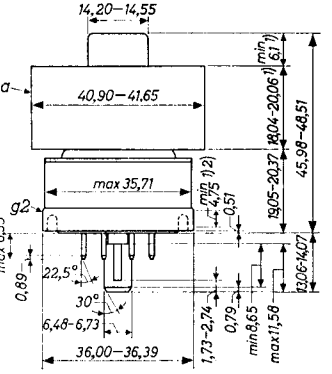
Dimensions in mm
Dimensions en mm
Abmessungen in mm



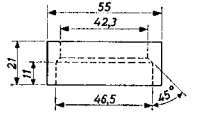








Socket, support, Fassung
40222



Chimney
Cheminée 56 590 81/40
Luftführungsring

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[1]) Contact surface
Surface de contact
Kontaktfläche

[2]) Screen grid contact at the outer cylindrical surface only
Contact de la grille écran seulement à la surface cylindrique extérieure
Schirmgitterkontaktfläche nur an der Aussenseite

H.F. class C telegraphy
H.F. classe C télégraphie
HF-Klasse C Telegraphie

Limiting values
Caractéristiques limites
Grenzdaten

f = max. 500 Mc/s

V_a = max.	2000 V	V_{g_2} = max.	300 V
W_{ia} = max.	500 W	W_{g_2} = max.	12 W
W_a = max.	250 W	$-V_{g_1}$ = max.	250 V
I_a = max.	250 mA	W_{g_1} = max.	2 W

Operating conditions
Caractéristiques d'utilisation
Betriebsdaten

f	=	175	175	175	175	500	Mc/s
V_a	=	2000	1500	1000	500	2000	V
V_{g_2}	=	250	250	250	250	300	V
V_{g_1}	=	-90	-90	-90	-90	-90	V
V_{g_1p}	=	112	112	114	114	-	V
I_a	=	250	250	250	250	250	mA
I_{g_2}	=	19	21	38	45	10 [1]	mA
I_{g_1}	=	26	28	31	35	25 [1]	mA
W_{ig_1}	=	2,9	3,2	3,5	4	-	W
W_{g_2}	=	4,75	5,25	9,5	8,75	3	W
W_{ia}	=	500	375	250	125	500	W
W_a	=	110	95	60	55	-	W
W_o	=	390	280	190	70	225 [1]	W
η	=	78	75	76	56	-	%

[1]) Measured values for a typical circuit having an efficiency of about 75 %
Valeurs mesurées dans un circuit avec un rendement d'environ 75 %
Werte gemessen in einer Schaltung mit einem Wirkungsgrad von etwa 75 %

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H.F. class C anode and screen-grid modulation
H.F. classe C modulation d'anode et de grille-écran
HF-Klasse C Anoden-und Schirmgittermodulation

Limiting values
Caractéristiques limites
Grenzdaten

V_a	= max. 1500 V	V_{g_2}	= max. 300 V
W_{ia}	= max. 300 W	W_{g_2}	= max. 12 W
W_a	= max. 165 W	$-V_{g_1}$	= max. 250 V
I_a	= max. 200 mA	W_{g_1}	= max. 2 W

Operating conditions
Caractéristiques d'utilisation
Betriebsdaten

f	=	175	175	175	Mc/s
V_a	=	1500	1000	500	V
V_{g_2}	=	250	250	250	V
V_{g_1}	=	-100	-100	-100	V
$V_{g_{1p}}$	=	117	117	118	V
I_a	=	200	200	200	mA
I_{g_2}	=	20	22	31	mA
I_{g_1}	=	14	14	15	mA
W_{ig_1}	=	1,7	1,7	1,8	W
W_{g_2}	=	5	5,5	7,75	W
W_{ia}	=	300	200	100	W
W_a	=	65	55	40	W
W_o	=	235	145	60	W
η	=	78	72,5	60	%
m	=	100	100	100	%
W_{mod}	=	150	100	50	W

H.F. class B telephony
H.F. classe B téléphonie
HF-Klasse B Telephonie

Limiting values
Caractéristiques limites
Grenzdaten

V_a = max.	2000 V	V_{g_2} = max.	400 V
W_{ia} = max.	500 W	W_{g_2} = max.	12 W
W_a = max.	250 W	W_{g_1} = max.	2 W
I_a = max.	250 mA		

Operating conditions
Caractéristiques d'utilisation
Betriebsdaten

f	=	175	175	175 Mc/s
V_a	=	2000	1500	1000 V
V_{g_2}	=	350	350	350 V
V_{g_1}	=	-55	-55	-55 mA
$V_{g_{1p}}$	=	25	25	25 V
I_a	=	100	100	100 mA
I_{g_2}	=	-4	-3	-3 mA
W_{g_2}	=	1,4	1	1 W
W_{i_a}	=	200	150	100 W
W_a	=	135	100	70 W
W_o	=	65	50	30 W
η	=	32,5	33	30 %

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H.F. class B telephony, single side band
H.F. classe B téléphonie à une bande latérale
HF-Klasse B Einseitenband

Limiting values
Caractéristiques limites
Grenzdaten

f	= max.	500 Mc/s
V_a	= max.	2000 V
W_{i_a}	= max.	500 W
W_a	= max.	250 W
I_a	= max.	250 mA
V_{g_2}	= max.	400 V
W_{g_2}	= max.	12 W
$-V_{g_1}$	= max.	250 V

Operating conditions
Caractéristiques d'utilisation
Betriebsdaten

f	=	175			175			Mc/s
V_a	=	2000			1500			V
V_{g2}	=	300			300			V
V_{g_1}	=	-47			-45			V
$R_{a_\sim}$	=	4200			2900			Ω
$V_{g_{1p}}$	=	0	47 [1]	47 [2]	0	45 [1]	45 [2]	V
I_a	=	75	250	160	75	250	165	mA
I_{g_2}	=	-1	-7	-5	-2	-4	-5	mA
I_{g_1}	=	0	0	0	0	0	0	mA
W_{i_a}	=	150	500	320	115	375	250	W
$W_{i_{g_1}}$	=	0	0	0	0	0	0	W
W_a	=	150	200	170	115	155	140	W
W_o	=	0	300	150	0	220	110	W
W_o pep [3]	=	—	—	300	—	—	220	W
d_3 [4]	=	—	—	-32	—	—	-31	dB

[1] Single tone modulation
Modulation à une fréquence
Eintonmodulation

[2] Two tone modulation
Modulation à deux fréquences
Zweitonmodulation

[3][4] See page 9, voir page 9, siehe Seite 9.

H.F. class B telephony, single side band (continued)
H.F. classe B téléphonie à une bande latérale (suite)
HF-Klasse B Einseitenband (Fortsetzung)

Operating conditions
Caractéristiques d'utilisation
Betriebsdaten

f	=		175		Mc/s
V_a	=		1000		V
V_{g2}	=		315		V
V_{g1}	=		-44,5		V
$R_{a\sim}$	=		1850		Ω
V_{g1p}	=	0	44,5[1]	44,5[2]	V
I_a	=	100	250	180	mA
I_{g2}	=	-4	20	0	mA
I_{g1}	=	0	0	0	mA
W_{ia}	=	100	250	180	W
W_{ig1}	=	0	0	0	W
W_a	=	100	120	115	W
W_o	=	0	130	65	W
$W_{o\ pep}$[3])	=	—	—	130	W
d_3 [4])	=	—	—	-30	dB

[3]) Peak envelope power
Puissance à la crête de l'enveloppe
Leistung beim Scheitel der Umhüllungskurve

[4]) Third harmonic distortion
Distorsion par la troisième harmonique
Verzerrung vom dritten Harmonischen

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L.F. class AB amplifier and modulator
Amplificatrice et modulatrice B.F. classe AB
NF-Verstärker und Modulator Klasse AB

Limiting values
Caractéristiques limites
Grenzdaten

V_a	= max.	2000 V	V_{g_2}	= max.	400 V
W_{i_a}	= max.	500 W	W_{g_2}	= max.	12 W
W_a	= max.	250 W	W_{g_1}	= max.	2 W
I_a	= max.	250 mA	R_{g_1}	= max.	100 kΩ [1])

Operating conditions (two tubes)
Caractéristiques d'utilisation (deux tubes)
Betriebsdaten (zwei Röhren)

V_a	=	2000		1500		V
V_{g_2}	=	350		350		V
V_{g_1}	=	-55		-55		V
$R_{aa\sim}$	=	9500		6200		Ω
$V_{g_1g_{1p}}$	=	0	100	0	100	V
I_a	=	2x100	2x250	2x100	2x250	mA
I_{g_2}	=	0	2x5	0	2x8	mA
W_{g_2}	=	0	2x1,75	0	2x2,8	W
W_{i_a}	=	2x200	2x500	2x150	2x375	W
W_a	=	2x200	2x200	2x150	2x160	W
W_o	=	0	600	0	430	W
η	=	-	60	-	57	%

[1]) Each tube
Chaque tube
Jede Röhre

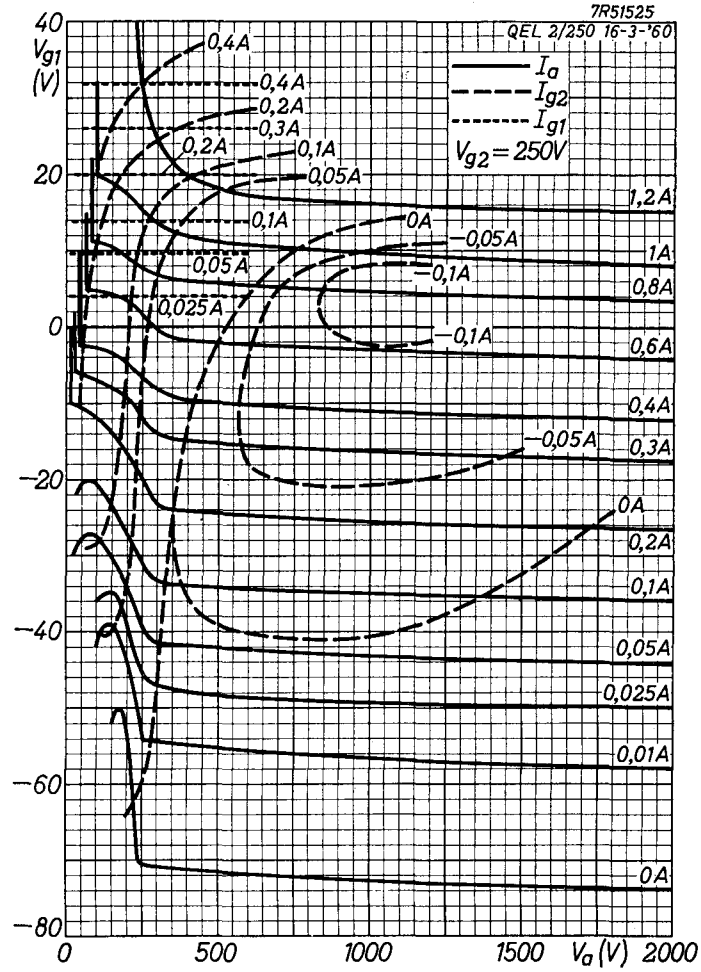
L.F. class AB amplifier and modulator (continued)
Amplificatrice et modulatrice B.F. classe AB (suite)
NF-Verstärker und Modulator Klasse AB (Fortsetzung)

Operating conditions (continued)
Caractéristiques d'utilisation (suite)
Betriebsdaten (Fortsetzung)

V_a	=	1000		V
V_{g_2}	=	350		V
V_{g_1}	=	-55		V
$R_{aa\sim}$		3500		Ω
$V_{g_1g_{1p}}$	=	0	100	V
I_a	=	2x100	2x250	mA
I_{g_2}	=	0	2x10	mA
W_{g_2}	=	0	2x3,5	W
W_{i_a}	=	2x100	2x250	W
W_a	=	2x100	2x130	W
W_o	=	0	240	W
η	=	-	48	%

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QEL 2/250

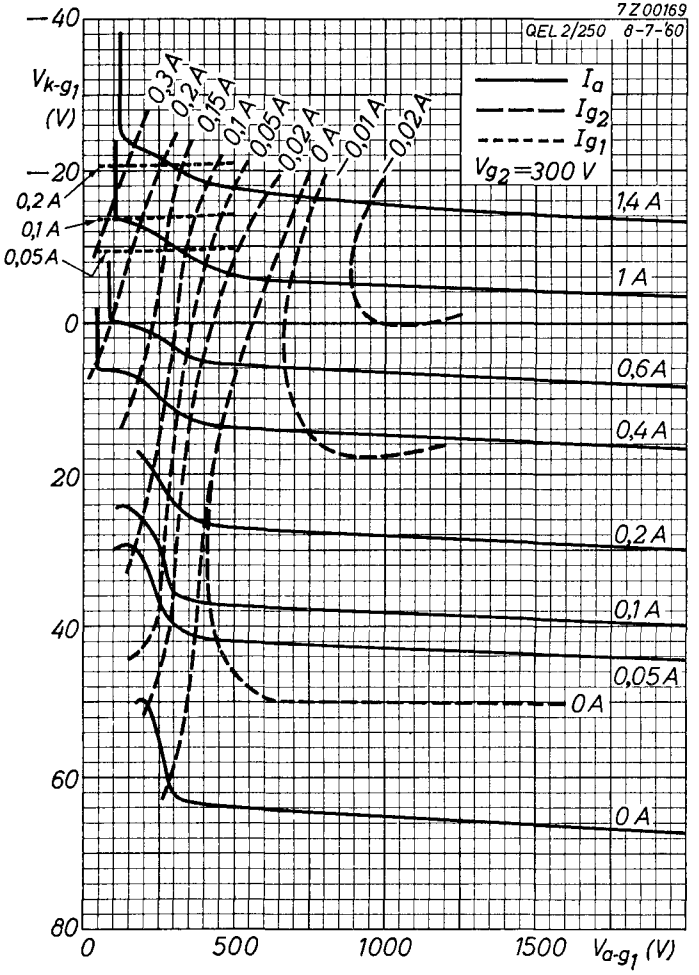


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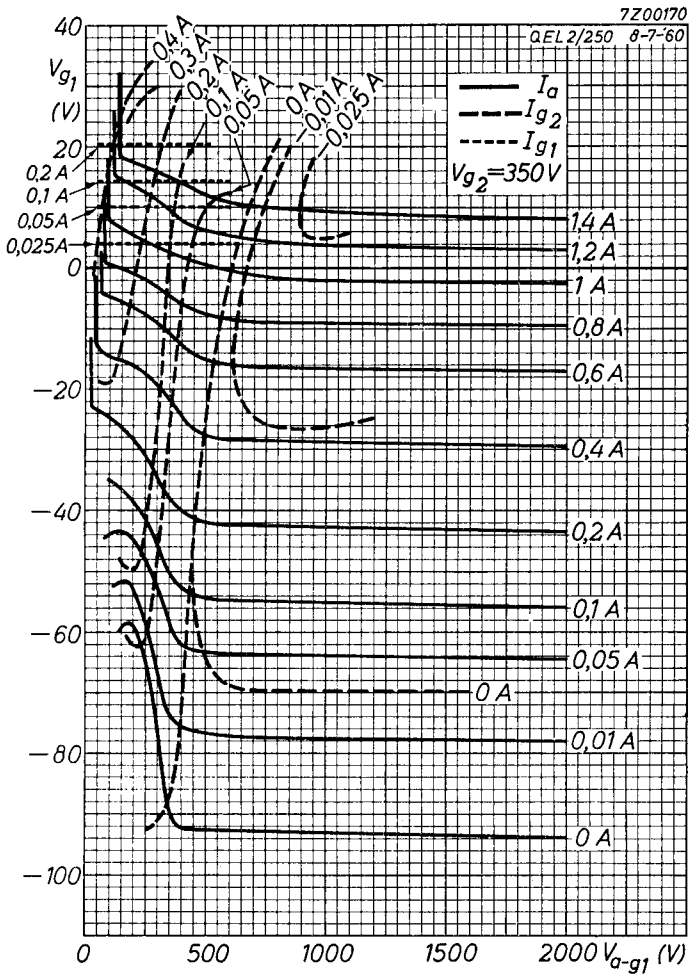
A

QEL 2/250

PHILIPS



B


7Z00170
QEL 2/250 8-7-60
V_{g_1} (V)
I_a
I_{g_2}
I_{g_1}
V_{g_2}=350V
0,4 A
0,3 A
0,2 A
0,1 A
0,05 A
0 A
0,01 A
0,025 A
0,2 A
0,1 A
0,05A
0,025A
1,4 A
1,2 A
1 A
0,8 A
0,6 A
0,4 A
0,2 A
0,1 A
0,05 A
0 A
0,01 A
0 A
40
20
0
−20
−40
−60
−80
−100
0
500
1000
1500
2000 V_{a-g1} (V)

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10	10	1961.04.04
11	11	1961.04.04
12	A	1960.07.07
13	B	1960.07.07
14	C	1960.07.07
15	FP	2000.01.15

TETRODE for use as pulse modulator in circuits with inductive or resistive load

TETRODE pour utilisation en **modulatrice** d'impulsions dans circuits à charge inductive ou résistive

TETRODE zur Verwendung als Impuls-Modulator in Stromkreisen mit einer induktiven oder ohmischen Belastung

Cooling : natural radiation and convection
Refroidissement: radiation et convection naturelles
Kühlung : natürliche Strahlung und Konvektion

Heating : indirect; oxide cathode
Chauffage: indirect; cathode à oxydes
Heizung : indirekt; Oxydkatode

V_f = 26 V ± 10 %
I_f = 2,25 A
T_w = min. 3 min.

Capacitances
Capacités
Kapazitäten

C_{ag1} = 0,3 pF
C_{ak} = 9 pF
C_{g1k} = 43 pF

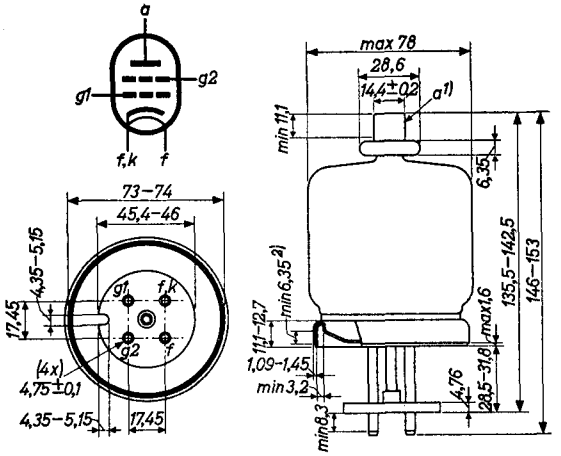
Pulse modulator service
Service comme modulateur d'impulsions
Impuls-Modulator Betrieb

Limiting values (absolute limits)
Caractéristiques limites (limites absolues)
Grenzdaten (Absolutwerte)

V_a	= max.	20	kV
V_{ap}	= max.	25	kV
V_{g2}	= max.	1500	V
R_{g2}	= min.	20	kΩ [1]
$-V_{g1}$	= max.	1000	V
R_{g1}	= max.	100	kΩ
$+V_{g1p}$	= max.	300	V
I_{ap}	= max.	18	A
W_a	= max.	60	W
W_{ia}	= max.	360	W
W_{g2}	= max.	8	W
δ (I_{ap} > 5 A)	= max.	0,001	[2][3]
δ (I_{ap} < 5 A)	= max.		[2][4]

[1]) A capacitor must be inserted between screen-grid and cathode
Il faut insérer un condensateur entre la grille-écran et la cathode
Es muss ein Kondensator zwischen Schirmgitter und Katode aufgenommen werden

[2][3][4]) See page 3 ; voir page 3; siehe Seite 3



Mounting position: any
Montage : à volonté
Einbau : beliebig

Seal temperature
Température des scellements max. 200 °C
Temperatur der Einschmelzungen

---

1) For the connection of the anode a heat-dissipating connector should be used
Pour la connexion de l'anode il faut utiliser un connecteur dissipant de la chaleur
Für die Anodenverbindung soll ein wärmezerstreuender Verbindungsleiter verwendet werden

2) Cylindrical surface available for clamping, which must not be deformed by action of clamps
Surface cylindrique pour faire des connexions de serrage. Cette surface ne doit pas être déformée par l'action des brides de serrage
Zylindrische Oberfläche für Klemmverbindungen. Diese Oberfläche darf durch die Wirkung von Klammern nicht deformiert werden

Operating characteristics
Caractéristiques d'utilisation
Betriebsdaten

Timp	= 2	2	µs
fimp	= 500	500	c/s
Vba	= 15,8	20	kV
Vg2	= 1250	1250	V [5]
Vg1	= -600	-600	V
Vg1 imp	= 700	700	V
Vap	= 25	25	kV
Ia imp	= 14	16	A
Iap	= 16	18	A
Ig2 imp	= 4	3	A
Ig1 imp	= 1,1	1,1	A
Wi imp	= 220	320	kW
Rg	= 1,07	1,2	kΩ
Wo imp	= 210	305	kW
Voimp	= 15	19	kV

---

[2]) The product of peak anode current (A) and pulse duration (µs) shall not exceed 40
Le produit du courant anodique de crête (A) et la durée d'impulsion (µs) ne dépassera pas 40
Das Produkt von Anodenspitzenstrom (A) und Impulsdauer (µs) darf den Wert 40 nicht überschreiten

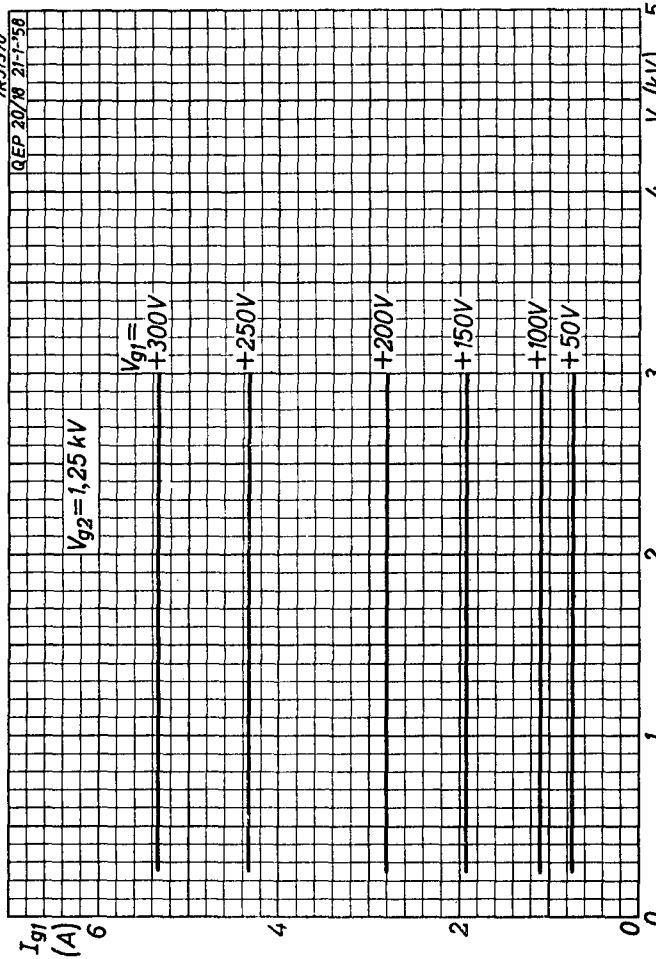
[3]) The tube shall not be operated for longer than 5 µs in any 100 µs interval
Le tube ne fonctionnera pas plus longtemps que 5 µs dans chaque intervalle de 100 µs
Die Röhre darf in jeder Zeitspanne von 100 µs nicht länger als 5 µs in Betrieb sein

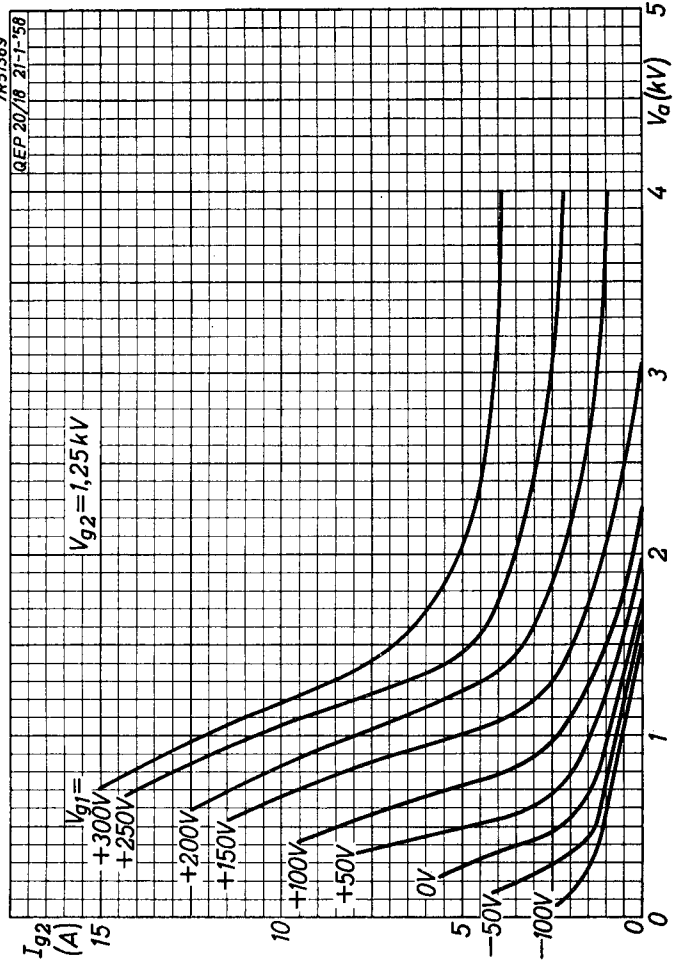
[4]) Maximum permissible duty cycle is determined by the maximum rating of 60 W for the average anode dissipation
Le taux d'utilisation tolérable tout au plus est déterminé par la valeur maximum de 60 W pour la dissipation anodique moyenne
Das **höchstzulässige** Tastverhältnis wird bestimmt von dem Maximalwert von 60 W für die mittlere Anodenverlustleistung

[5]) R_{g_2} = **min. 20 kΩ**

PHILIPS **QEP 20/18**

PHILIPS


7R51370
QEP 20/18 27-1-58
I_{g1} (A)
6
4
2
0
0
1
2
3
4
5
V_a (kV)
V_{g2} = 1,25 kV
V_{g1} =
+300V
+250V
+200V
+150V
+100V
+50V


7R51369
QEP 20/18 21-1-'58
I_{g2} (A)
15
10
5
0
V_{g2}=1,25kV
V_{g1}=
+300V
+250V
+200V
+150V
+100V
+50V
0V
−50V
−100V
0
1
2
3
4
5
V_a(kV)

PHILIPS

Electronic Tube

HANDBOOK

QEP20/18

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1	1	1957.12.12
2	2	1957.12.12
3	3	1957.12.12
4	A	1957.12.12
5	B	1957.12.12
6	C	1957.12.12
7	FP	1999.10.30

QUICK HEATING DOUBLE TETRODE for use as output tube, frequency multiplier or modulator. The tube has been designed for intermittent filament service in transistorized mobile equipment

FILAMENT: oxide coated

HEATING: direct; parallel supply

Filament voltage	V_f = 3.15 V ± 10 %
Filament current	I_f = 1.65 A

Cathode heating time for obtaining an output power of more than 70 % of the ultimate power Th = max. 1 sec.
It is recommended that the filament be fed from a D.C.-A.C. converter

TYPICAL CHARACTERISTICS

Anode voltage	V_a	= 200 V
Grid No.2 voltage	V_{g_2}	= 200 V
Anode current	I_a	= 30 mA
Mutual conductance	S	= 3.2 mA/V
Amplification factor of grid No.1 with respect to grid No.2	$\mu_{g_2g_1}$	= 7.5

INTERMITTENT SERVICE

Freq.	C telegr. [1] FM teleph.		Tripler - doubler	
(Mc/s)	V_a(V)	W_ℓ(W) [2]	V_a(V)	W_ℓ(W) [3]
200	250	11		
	200	9.5		
27.5/165			250	1.25
			200	1.0

[1]) Two systems in push-pull

[2]) Output power in the load according to circuit diagram page 3

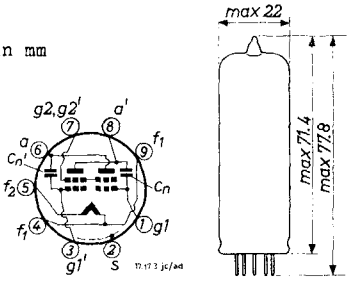
[3]) Output power in the load according to circuit diagram page 4

CAPACITANCES (without external shield)

Anode to all other elements except grid No.1	C_a	$= C_a'$	= 3.2 pF
Grid No.1 to all other elements except anode	C_{g_1}	$= C_{g_1}'$	= 6.8 pF
Grid No.1 to anode	C_{ag_1}	$= C_{ag_1}'$	< 0.1 pF
Anode of one system to grid No.1 of the other system	C_{ag_1}'	$= C_{ag_1}'$	< 0.13 pF
Between the grids No.1	$C_{g_1g_1}'$		= 1.9 pF
Between the anodes	C_{aa}'		= 0.09 pF

The tube has been internally neutralized up to 200 Mc/s

Dimensions in mm



Base: NOVAL

ACCESSORIES

Socket	B8 700 19
Tube retainer	40647

MOUNTING POSITION

If the tube is mounted with its main axis deviating from the vertical, it is recommended that the pins 2 and 7 be placed in a vertical plane

COOLING: radiation and convection

The use of a closed tube shield is not allowed

TEMPERATURE LIMITS (Absolute limits)

Bulb temperature = max. 225 °C

Pin temperature = max. 120 °C

NET WEIGHT: 16 g Shipping weight: 23 g

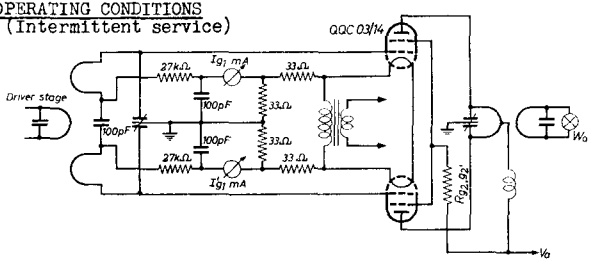
REMARK. The filament voltage should be switched on during the whole conversation period. Interrupting the filament voltage during this period is not recommended.

H.F. class C telegraphy or F.M. telephony; two systems in push-pull

LIMITING VALUES (Intermittent service; absolute limits)

Frequency		f up to	200 Mc/s
Anode voltage	$V_a = V_a'$	= max.	300 V
Anode dissipation	$W_a = W_a'$	= max.	7 W
Anode current	$I_a = I_a'$	= max.	55 mA
Grids No.2 voltage	$V_{g_2,g_2'}$	= max.	200 V
Grids No.2 dissipation	$W_{g_2,g_2'}$	= max.	2x1 W
Negative grid No.1 voltage	$-V_{g_1}=-V_{g_1'}$	= max.	150 V
Grid No.1 dissipation	$W_{g_1}= W_{g_1'}$	= max.	0.2 W
Grid No.1 current	$I_{g_1}= I_{g_1'}$	= max.	4 mA
Grid No.1 circuit resistance	$R_{g_1}= R_{g_1'}$	= max.	100 kΩ
Cathode current	I_k	= max.	2x65 mA
Peak cathode current	I_{kp}	= max.	2x300 mA

OPERATING CONDITIONS
(Intermittent service)



Frequency		f =	200	200 Mc/s
Anode voltage	$V_a = V_a'$	=	250	200 V
Grids No.2 supply voltage	$V_{bg_2,g_2'}$	=	250	200 V
Grids No.2 resistor	$R_{g_2,g_2'}$	=	22	6.8 kΩ
Anode current	$I_a = I_a'$	=	45	45 mA
Grids No.2 current	$I_{g_2,g_2'}$	=	4.2	5.1 mA
Grid No.1 current	$I_{g_1}=I_{g_1'}$	=	1.5	1.5 mA
Anode input power	$W_{i_a}=W_{i_a'}$	=	11.2	9.0 W
Anode dissipation	$W_a = W_a'$	=	4.5	3.5 W
Grids No.2 dissipation	$W_{g_2,g_2'}$	=	0.65	0.85 W
Output power	W_ℓ	=	11	9.5 W [1]

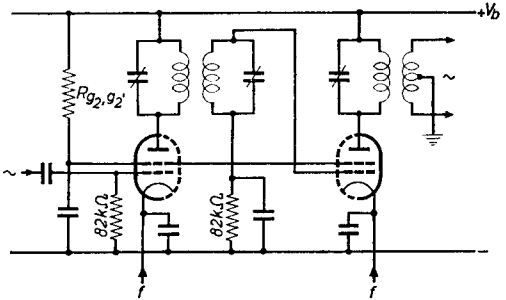
[1]) Useful power in the load

H.F. class C frequency tripler and doubler (one system as tripler and one system as doubler)

LIMITING VALUES (Intermittent service; absolute limits)

		f up to 200 Mc/s	
Frequency			
Anode voltage	$V_a = V_a'$	= max.	300 V
Anode dissipation	$W_a = W_a'$	= max.	7 W
Anode current	$I_a = I_a'$	= max.	45 mA
Grids No.2 voltage	$V_{g_2,g_2'}$	= max.	200 V
Grids No.2 dissipation	$W_{g_2,g_2'}$	= max.	2x1 W
Grid No.1 current	$I_{g_1} = I_{g_1'}$	= max.	3 mA
Grid No.1 circuit resistance	$R_{g_1} = R_{g_1'}$	= max.	100 kΩ
Cathode current	I_k	= max.	2x50 mA
Peak cathode current	I_{kp}	= max.	2x300 mA

OPERATING CONDITIONS (Intermittent service)



For data see page 5.

OPERATING CONDITIONS as frequency tripler and doubler; intermittent service (continued)

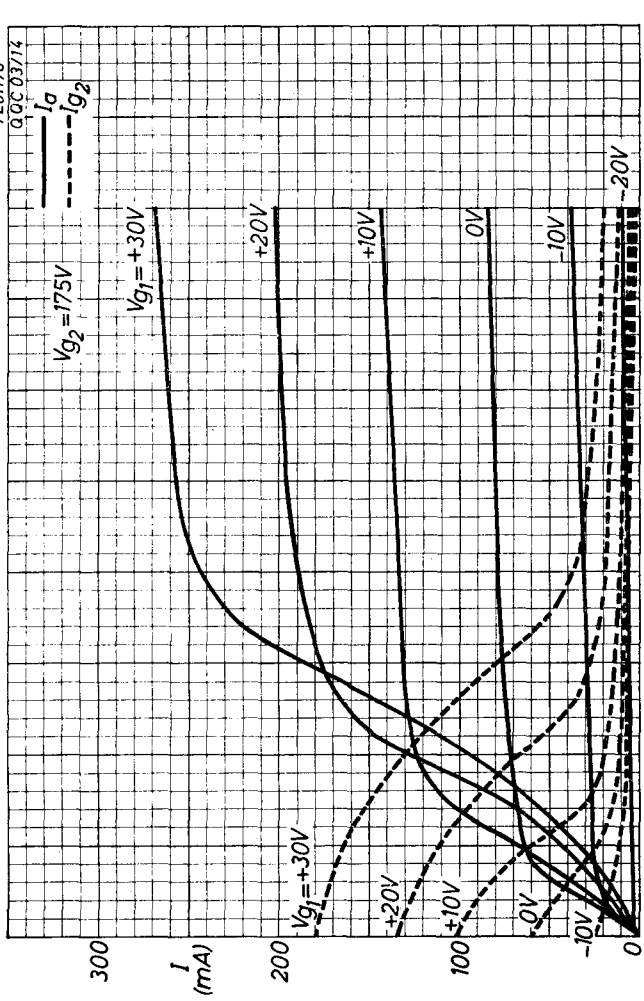
			Tripler		Doubler	
Frequency	f	=	27.5/82.5		82.5/165	Mc/s
Anode voltage	$V_a = V_a'$	=	250		250	V
Grids No.2 supply voltage	$V_{bg_2,g_2'}$	=		250		V
Grids No.2 resistor	$R_{g_2,g_2'}$	=		39		kΩ
Anode current	$I_a = I_a'$	=	20		20	mA
Grids No.2 current	$I_{g_2,g_2'}$	=		4.0		mA
Grid No.1 current	$I_{g_1} = I_{g_1'}$	=	0.75		1.25	mA
Anode input power	$W_{ia} = W_{ia'}$	=	5.0		5.0	W
Anode dissipation	$W_a = W_a'$	=	3.5		3.0	W
Grids No.2 dissipation	$W_{g_2,g_2'}$	=		0.38		W
Output power	W_o	=	1.5		2.0	W
Efficiency	η	=	30		40	%
Output power	W_ℓ	=	1.25		1.25	W [1]

			Tripler		Doubler	
Frequency	f	=	27.5/82.5		82.5/165	Mc/s
Anode voltage	$V_a = V_a'$	=	200		200	V
Grids No.2 supply voltage	$V_{bg_2,g_2'}$	=		200		V
Grids No.2 resistor	$R_{g_2,g_2'}$	=		22		kΩ
Anode current	$I_a = I_a'$	=	20		20	mA
Grids No.2 current	$I_{g_2,g_2'}$	=		4.0		mA
Grid No.1 current	$I_{g_1} = I_{g_1'}$	=	0.75		1.25	mA
Anode input power	$W_{ia} = W_{ia'}$	=	4.0		4.0	W
Anode dissipation	$W_a = W_a'$	=	2.8		2.4	W
Grids No.2 dissipation	$W_{g_2,g_2'}$			0.45		W
Output power	W_o	=	1.2		1.6	W
Efficiency	η	=	30		40	%
Output power	W_ℓ	=	1.0		1.0	W [1]

[1]) Useful power in the load

PHILIPS

7Z01175
QQC03/14
Ia
Ig2
Vg1 = +30V
+20V
+10V
0V
-10V
-20V
Vg2 = 200V
Vg1 = +30V
+20V
+10V
0V
-10V
I (mA)
300
200
100
0
0
50
100
150
200
250
Va (V)


7Z01176
QQC 03/14
I_a
$-I_{g_2}$
V_{g_2}=175V
V_{g_1}=+30V
+20V
+10V
0V
-10V
-20V
V_a (V)
I (mA)
300
200
100
0
50
150
250

QQC03/14

PHILIPS

PHILIPS

Electronic Tube

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7	B	1962.12.12
8	C	1962.12.12
9	FP	2000.01.15

PHILIPS

QQC 04/15

DOUBLE TETRODE for use as H.F. amplifier or oscillator, frequency multiplier or modulator
DOUBLE TETRODE pour utilisation en amplificatrice ou oscillatrice H.F., multiplicatrice de fréquence ou modulatrice
DOPPELTETRODE zur Verwendung als HF-Verstärker. oder Oszillator, Frequenzvervielfacher oder Modulator

Filament : oxide-coated Filament : oxyde Heizfaden: Oxyd	V_f =	3-3,15 [1]) 6-6,3 V [1])
	I_f =	1,36 0,68 A
Heating : direct Chauffage: direct Heizung : direkt	Pins Broches Stifte	3-(1+5) 1-5

Capacitances Capacités Kapazitäten	per system par système pro System	in push-pull en push-pull in Gegentakt
	C_a = 3,3 pF	C_o = 1,7 pF
	C_{g1} = 8,5 pF	C_i = 5,7 pF
	C_{ag1} = 0,05 pF	

Typical characteristics
Caractéristiques types
Kenndaten

μ_{g2g1} = 7,5
S [3]) (I_a = 20 mA) = 2 mA/V

λ	Freq.	C telegr.			Cag2 mod.			B mod	
m	Mc/s	V_a (V)	W_o [2]) (W)		V_a (V)	W_o [2]) (W)		V_a (V)	W_o (W)
			CCS	ICAS		CCS	ICAS	C.C.S	
5	60	600	26,6	35	450	17,5		450	18
		400	17,6	23,2	400	15,4		400	17
		250	10,6	14,0	250	6,2	8,2	350	16
1,6	186	600	25,6	33,6	250	6,0	7,8	250	9
		400	16,8	22,0				I.C.A.S	
		250	10,2	13,2				600	28,2
		C fr.mult.							
4,8/1,6	62/186	400	7,2	10	tripler				
		250	4,6	6,2	tripleur				
					Verdreifacher				
3,2/1,6	93/186	400	6,5	8,0	doubler				
		250	4,0	4,9	doubleur [3])				
					Verdoppler				

1) Nominal values; valeurs nominales; Nennwerte

2) CCS = continous service; service continu; Dauerbetrieb

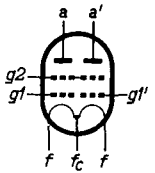
ICAS = intermittent service; service intermittent; aussetzender Betrieb

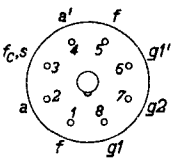
3) One system; un système; ein System

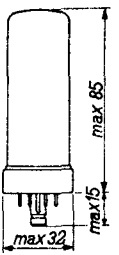
Pin temperature
Temp. des broches = max. 100 °C
Stiftentemperatur

Bulb temperature
Temp. de l'ampoule = max. 200 °C
Kolbentemperatur

Dimensions in mm
Dimensions en mm
Abmessungen in mm







Base, culot, Sockel: Loctal

Socket
Support 40213
Fassung

Mounting position: vertical with base up or down
Horizontal with pins 1 and 5 in one horizontal plane

Montage : vertical avec le culot en haut ou en bas
Horizontal avec les broches 1 et 5 situées dans le même plan horizontal

Einbau : senkrecht mit Sockel oben oder unten
Waagerecht mit den Stiften 1 und 5 in einer waagerechten Ebene

Net weight
Poids net 40 g
Nettogewicht

Shipping weight
Poids brut 55 g
Bruttogewicht

H.F. class C telegraphy, two systems in push-pull
H.F. classe C télégraphie, deux systèmes en push-pull
HF Klasse C Telegraphie, zwei Systeme in Gegentakt

C.C.S. Limiting values, continuous service
Caractéristiques limites, service continu
Grenzdaten, Dauerbetrieb

f = max. 186 Mc/s		f = max. 300 Mc/s	
V_a = max. 600	V	V_a = max. 450	V
W_{ia} = max. 2x18	W	W_{ia} = max. 2x9	W
W_a = max. 2x6	W		
I_a = max. 2x30	mA		
V_{g2} = max. 250	V		
W_{g2} = max. 7	W		
$-V_{g1}$ = max. 200	V		
I_{g1} = max. 2x5	mA		

C.C.S. Operating conditions; continuous service
Caractéristiques d'utilisation; service continu
Betriebsdaten; Dauerbetrieb

f =	60	60	60 Mc/s
V_a =	600	400	250 V
V_{g2} =	200	200	175 V
V_{g1} =	-80	-80	-70 V
I_a =	2x30	2x30	2x30 mA
I_{g2} =	6	6	6,5 mA
I_{g1} =	2x1,0	2x1,2	2x1,8 mA
$V_{g1g1'p}$ =	210	210	210 V
W_{ig1} =	2x0,1	2x0,11	2x0,17 W
W_{g2} =	1,2	1,2	1,1 W
W_{ia} =	2x18	2x12	2x7,5 W
W_a =	2x4,7	2x3,2	2x2,2 W
W_o =	26,6	17,6	10,6 W
η =	74	73	71 %

H.F. class C telegraphy, two systems in push-pull; continued
H.F. classe C télégraphie, deux systèmes en push-pull; continuation
HF Klasse C Telegraphie, zwei Systeme in Gegentakt; Fortsetzung

Operating conditions; continuous service
C.C.S. Caractéristiques d'utilisation; service continu
Betriebsdaten; Dauerbetrieb

f	=	186	186	186 Mc/s
V_a	=	600	400	250 V
V_{g1}	=	-80	-80	-70 V
V_{g2}	=	200	200	175 V
I_a	=	2x30	2x30	2x30 mA
I_{g1}	=	2x1,0	2x1,0	2x1,5 mA
I_{g2}	=	3,0	3,5	4,5 mA
$V_{g1g1'p}$	=	210	210	220 V
W_{ig1}	=	2x0,1	2x0,1	2x0,15 W
W_{g2}	=	0,6	0,7	0,8 W
W_{ia}	=	2x18	2x12	2x7,5 W
W_a	=	2x5,2	2x3,6	2x2,4 W
W_o	=	25,6	16,8	10,2 W
η	=	71[1])	70	68 %

Limiting values, intermittent service
I.C.A.S. Caractéristiques limites, service intermittent
Grenzdaten, aussetzender Betrieb

f	= max.	186 Mc/s	f = max. 300 Mc/s
V_a	= max.	600 V	V_a = max. 450 V
W_{ia}	= max.	2x24 W	W_{ia} = max. 2x12 W
W_a	= max.	2x8 W	
I_a	= max.	2x40 mA	
V_{g2}	= max.	250 V	
W_{g2}	= max.	7 W	
$-V_{g1}$	= max.	200 V	
I_{g1}	= max.	2x5 mA	

1) In order to prevent overheating a low velocity air flow should be directed on the bulb and the base
Afin de prévenir le surchauffage il faut diriger un léger courant d'air sur l'ampoule et le culot
Zur Vermeidung einer Überhitzung ist ein schwacher Lufstrom auf den Kolben und den Sockel notwendig

H.F. class C telegraphy, two systems in push-pull; continued
H.F. classe C télégraphie, deux systèmes en push-pull; continuation
HF Klasse C Telegraphie, zwei Systeme in Gegentakt; Fortsetzung

Operating conditions; intermittent service
I.C.A.S. Caractéristiques d'utilisation; service intermittent
Betriebsdaten; aussetzender Betrieb

f	=	60	60	60 Mc/s
V_a	=	600	400	250 V
V_{g2}	=	200	200	175 V
V_{g1}	=	-80	-80	-70 V
I_a	=	2x40	2x40	2x40 mA
I_{g2}	=	5,5	6,0	7,5 mA
I_{g1}	=	2x1,2	2x2,0	2x2,5 mA
$V_{g1g1'p}$	=	220	220	230 V
W_{ig1}	=	2x0,12	2x0,22	2x0,26 W
W_{g2}	=	1,1	1,2	1,3 W
W_{ia}	=	2x24	2x16	2x10 W
W_a	=	2x6,5	2x4,4	2x3,0 W
W_o	=	35	23,2	14,0 W
η	=	73	72,5	70 %
f	=	186	186	186 Mc/s
V_a	=	600	400	250 V
V_{g2}	=	200	200	175 V
V_{g1}	=	-80	-80	-70 V
I_a	=	2x40	2x40	2x40 mA
I_{g2}	=	4,5	5,0	7,5 mA
I_{g1}	=	2x1,3	2x1,5	2x2,0 mA
$V_{g1g1'p}$	=	220	220	230 V
W_{ig1}	=	2x0,13	2x0,15	2x0,26 W
W_{g2}	=	0,9	1,0	1,3 W
W_{ia}	=	2x24	2x16	2x10 W
W_a	=	2x7,2	2x5	2x3,4 W
W_o	=	33,6	22	13,2 W
η	=	70[1])	69	66 %

[1])See page 4; voir page 4; siehe Seite 4

PHILIPS

H.F. class C anode and screen grid modulation, two systems in push-pull
H.F. classe C modulation d'anode et de grille-écran, deux systèmes en push-pull
HF Klasse C Anoden- und Schirmgittermodulation, zwei Systeme in Gegentakt

Limiting values, continuous service
C.C.S. Caractéristiques limites, service continu
Grenzdaten, Dauerbetrieb

	f = max. 186 Mc/s		f = max. 300 Mc/s	
V_a	= max.	480 V	V_a = max.	360 V
W_{ia}	= max.	2x11,5 W	W_{ia} = max.	2x5,25 W
W_a	= max.	2x4 W		
I_a	= max.	2x25 mA		
V_{g2}	= max.	250 V		
W_{g2}	= max.	4,5 W		
$-V_{g1}$	= max.	200 V		
I_{g1}	= max.	2x5 mA		

Operating conditions, continuous service
C.C.S. Caractéristiques d'utilisation, service continu
Betriebsdaten, Dauerbetrieb

f	=	60	60	186	Mc/s
V_a	=	450	400	250	250 V
R_{g2}	=	18	18	10	10 kΩ
V_{g1}	=	-80	-80	-70	-70 V
I_a	=	2x25	2x25	2x19,5	2x19,5 mA
I_{g2}	=	14	11	11	11 mA
I_{g1}	=	2x1,0	2x0,8	2x1,5	2x1,5 mA
V_{g1_p}	=	83	83	110	110 V
W_{ig1}	=	2x0,08	2x0,06	2x0,15	2x0,15 W
W_{g2}	=	2,8	2,2	1,6	1,6 W
W_{ia}	=	2x11,25	2x10	2x4,9	2x4,9 W
W_a	=	2x2,5	2x2,3	2x1,8	2x1,9 W
W_o	=	17,5	15,4	6,2	6,0 W
η	=	77,5	77	63	61 %
m	=	100	100	100	100 %
W_{mod}	=	11,5	10	5	5 W

H.F. class C anode and screen grid modulation, two systems in push-pull; continued
H.F. classe C modulation d'anode et de grille-écran, deux systèmes en push-pull; continuation
HF Klasse C Anoden- und Schirmgittermodulation, zwei Systeme in Gegentakt; Forsetzung

Limiting values, intermittent service
I.C.A.S. Caractéristiques limites, service intermittent
Grenzdaten, aussetzender Betrieb

f = max.	186 Mc/s	f = max.	300 Mc/s
V_a = max.	480 V	V_a = max.	360 V
W_{ia} = max.	2x15,5 W	W_{ia} = max.	2x7 W
W_a = max.	2x5 W		
I_a = max.	2x32 mA		
V_{g2} = max.	250 V		
W_{g2} = max.	4,5 W		
$-V_{g1}$ = max.	200 V		
I_{g1} = max.	2x5 mA		

Operating conditions, intermittent service
I.C.A.S. Caractéristiques d'utilisation, service intermittent
Betriebsdaten, aussetzender Betrieb

f	=	60	186 Mc/s
V_a	=	250	250 V
R_{g2}	=	10	10 kΩ
V_{g1}	=	-70	-70 V
I_a	=	2x26,5	2x26,5 mA
I_{g2}	=	9	9 mA
I_{g1}	=	2x1,8	2x1,5 mA
V_{g1_p}	=	110	110 V
W_{ig1}	=	2x0,18	2x0,15 W
W_{g2}	=	1,5	1,5 W
W_{ia}	=	2x6,6	2x6,6 W
W_a	=	2x2,5	2x2,7 W
W_o	=	8,2	7,8 W
η	=	62	59 %
m	=	100	100 %
W_{mod}	=	7	7 W

PHILIPS

Class C frequency tripler, two systems in push-pull
Classe C tripleur de fréquence, deux systèmes en push-pull
Klasse C Frequenzverdreifacher, zwei Systeme in Gegentakt

C.C.S. Limiting values, continuous service
Caractéristiques limites, service continu
Grenzdaten, Dauerbetrieb

f = max. 186 Mc/s		f = max. 300 Mc/s	
V_a = max.	600 V	V_a = max.	450 V
W_{ia} = max.	2x12 W	W_{ia} = max.	2x9 W
W_a = max.	2x6 W		
I_a = max.	2x30 mA		
V_{g2} = max.	250 V		
W_{g2} = max.	7 W		
$-V_{g1}$ = max.	200 V		
I_{g1} = max.	2x5 mA		

C.C.S. Operating conditions, continuous service
Caractéristiques d'utilisation, service continu
Betriebsdaten, Dauerbetrieb

f	=	62/186	62/186 Mc/s
V_a	=	400	250 V
V_{g2}	=	200	200 V
V_{g1}	=	-175	-175 V
I_a	=	2x24	2x30 mA
I_{g2}	=	3	6 mA
I_{g1}	=	2x0,6	2x1,1 mA
$V_{g1g1'p}$	=	430	430 V
W_{ig1}	=	2x0,12	2x0,22 W
W_{g2}	=	0,6	1,2 W
W_{ia}	=	2x9,6	2x7,5 W
W_a	=	2x6	2x5,2 W
W_o	=	7,2	4,6 W
η	=	37,5	31 %

Class C frequency tripler, two systems in push-pull; continued
Classe C tripleur de fréquence, deux systèmes en push-pull; continuation
Klasse C Frequenzverdreifacher, zwei Systeme in Gegentakt; Fortsetzung

I.C.A.S. Limiting values, intermittent service
Caractéristiques limites, service intermittent
Grenzdaten, aussetzender Betrieb

f = max. 186 Mc/s		f = max. 300 Mc/s	
V_a = max.	600 V	V_a = max.	450 V
W_{ia} = max.	2x16 W	W_{ia} = max.	2x12 W
W_a = max.	2x8 W		
I_a = max.	2x40 mA		
V_{g2} = max.	250 V		
W_{g2} = max.	7 W		
$-V_{g1}$ = max.	200 V		
I_{g1} = max.	2x5 mA		

I.C.A.S. Operating conditions, intermittent service
Caractéristiques d'utilisation, service intermittent
Betriebsdaten, aussetzender Betrieb

f	=	62/186	62/186 Mc/s
V_a	=	400	250 V
V_{g2}	=	200	200 V
V_{g1}	=	-175	-175 V
I_a	=	2x32,5	2x40 mA
I_{g2}	=	4	6,5 mA
I_{g1}	=	2x1,1	2x1,5 mA
$V_{g1g1'p}$	=	430	430 V
W_{ig1}	=	2x0,22	2x0,3 W
W_{g2}	=	0,8	1,3 W
W_{ia}	=	2x13	2x10 W
W_a	=	2x8	2x6,9 W
W_o	=	10	6,2 W
η	=	38,5	31 %

PHILIPS

Class C frequency doubler
Classe C doubleur de fréquence
Klasse C Frequenzverdoppler

C.C.S. Limiting values, per tube
Caractéristiques limites, par tube
Grenzdaten, pro Röhre

f = max. 186 Mc/s		f = max. 300 Mc/s	
V_a = max.	600 V	V_a = max.	450 V
W_{ia} = max.	2x12 W	W_{ia} = max.	2x9 W
W_a = max.	2x6 W		
I_a = max.	2x30 mA		
V_{g2} = max.	250 V		
W_{g2} = max.	7 W		
$-V_{g1}$ = max.	200 V		
I_{g1} = max.	2x5 mA		

C.C.S. Operating conditions, one system, continuous service
Caractéristiques d'utilisation, un système, service continu
Betriebsdaten, ein System, Dauerbetrieb

		f = 93/186	93/186 Mc/s
V_a	=	400	250 V
V_{g1}	=	-175	-175 V
V_{g2}	=	200	200 V
I_a	=	30	30 mA
I_{g1}	=	1,2	1,5 mA
I_{g2}	=	1,5	2 mA
V_{g1_p}	=	210	220 V
W_{ig1}	=	0,23	0,3 W
W_{g2}	=	0,3	0,4 W
W_{ia}	=	12	7,5 W
W_a	=	5,5	3,5 W
W_o	=	6,5	4 W
η	=	54	53 %

Class C frequency doubler
Classe C doubleur de fréquence
Klasse C Frequenzverdoppler

I.C.A.S.

Limiting values, per tube
Caractéristiques limites, par tube
Grenzdaten, pro Röhre

f = max. 186 Mc/s		f = max. 300 Mc/s	
V_a = max.	600 V	V_a = max.	450 V
W_{ia} = max.	2x16 W	W_{ia} = max.	2x12 W
W_a = max.	2x8 W		
I_a = max.	2x40 mA		
V_{g2} = max.	250 V		
W_{g2} = max.	7 W		
$-V_{g1}$ = max.	200 V		
I_{g1} = max.	2x5 mA		

I.C.A.S.

Operating conditions, one system, intermittent service
Caractéristiques d'utilisation, un système, service intermittent
Betriebsdaten, ein System, aussetzender Betrieb

f	=	93/186	93/186 Mc/s
V_a	=	400	250 V
V_{g2}	=	200	200 V
V_{g1}	=	-175	-175 V
I_a	=	40	40 mA
I_{g2}	=	2,5	3 mA
I_{g1}	=	1,5	2 mA
V_{g1_p}	=	220	230 V
W_{ig1}	=	0,3	0,42 W
W_{g2}	=	0,5	0,6 W
W_{ia}	=	16	10 W
W_a	=	8	5,1 W
W_o	=	8	4,9 W
η	=	50	49 %

L.F. class B amplifier and modulator, two systems in push-pull
Amplificatrice et modulatrice B.F. classe B, deux systèmes en push-pull
NF-Verstärker und Modulator Klasse B, zwei Systeme in Gegentakt

C.C.S. Limiting values, continuous service
Caractéristiques limites, service continu
Grenzdaten, Dauerbetrieb

V_a	= max.	600	V
W_{ia}	= max.	2x18	W
W_a	= max.	2x6	W
I_a	= max.	2x30	mA
V_{g2}	= max.	250	V
W_{g2}	= max.	7	W
$-V_{g1}$	= max.	200	V

C.C.S. Operating conditions, continuous service
Caractéristiques d'utilisation, service continu
Betriebsdaten, Dauerbetrieb

V_f	=	6,3[1]		6,3[1]		V
V_a	=	450		400		V
V_{g2}	=	200		200		V
V_{g1}	=	-24		-24		V
$R_{aa'}$	=	20		16		kΩ
$V_{g1g1'p}$	=	0	94	0	94	V
I_a	=	2x2,8	2x32,5	2x2,7	2x35	mA
I_{g2}	=	2x0,16	2x5	2x0,15	2x5,3	mA
I_{g1}	=	0	2x1,1	0	2x1,3	mA
W_{ia}	=	2x1,3	2x14,6	2x1,1	2x14	W
W_a	=	2x1,3	2x5,6	2x1,1	2x5,5	W
W_o	=	-	18	-	17	W
d_{tot}	=	-	5	-	5	%
η	=	-	61,5	-	60,5	%

[1] D.C. voltage
Tension directe
Gleichspannung

L.F. class B amplifier and modulator, two systems in push-pull; continued
Amplificatrice et modulatrice B.F. classe B, deux systèmes en push-pull; continuation
NF-Verstärker und Modulator Klasse B, zwei Systeme in Gegentakt; Fortsetzung

C.C.S. Operating conditions, continuous service
Caractéristiques d'utilisation, service continu
Betriebsdaten, Dauerbetrieb

V_f	=	6,3[1]		6,3[1]		V
V_a	=	350		250		V
V_{g2}	=	200		175		V
V_{g1}	=	-24		-20		V
R_{aa}	=	12		8		kΩ
$V_{g1g1'p}$	=	0	104	0	100	V
I_a	=	2x2,5	2x37,5	2x2,9	2x36	mA
I_{g2}	=	2x0,14	2x5,5	2x0,2	2x5	mA
I_{g1}	=	0	2x1,4	0	2x1,5	mA
W_{ia}	=	2x0,88	2x13,1	2x0,71	2x9	W
W_a	=	2x0,88	2x5,1	2x0,71	2x4,5	W
W_o	=	-	16	-	9	W
dtot	=	-	5	-	5	%
η	=	-	61	-	50	%

[1]) Direct voltage
Tension directe
Gleichspannung

L.F. class B amplifier and modulator, two systems in push-pull; continued
Amplificatrice et modulatrice B.F. classe B, deux systèmes en push-pull; *continuation*
NF-Verstärker und Modulator Klasse B, zwei Systeme in Gegentakt; Fortsetzung

I.C.A.S. Limiting values, intermittent service
Caractéristiques limites, service intermittent
Grenzdaten, aussetzender Betrieb

V_a	= max.	600	V
W_{ia}	= max.	2x24	W
W_a	= max.	2x8	W
I_a	= max.	2x40	mA
V_{g2}	= max.	250	V
W_{g2}	= max.	7	W
$-V_{g1}$	= max.	200	V

I.C.A.S. Operating conditions, intermittent service
Caractéristiques d'utilisation, service intermittent
Betriebsdaten, aussetzender Betrieb

V_f	=	6,3[1])		V
V_a	=	600		V
V_{g2}	=	200		V
V_{g1}	=	-24		V
$R_{aa'}$	=	25		kΩ
$V_{g1g1'p}$	=	0	85	V
I_a	=	2x3,0	2x33,5	mA
I_{g2}	=	2x0,18	2x4,5	mA
I_{g1}	=	0	2x1,2	mA
W_{ia}	=	2x1,8	2x20,1	W
W_a	=	2x1,8	2x6	W
W_o	=	0	28,2	W
d_{tot}	=	-	5	%
η	=	0	70	%

PHILIPS

QQC 04/15

7.7.1954

A

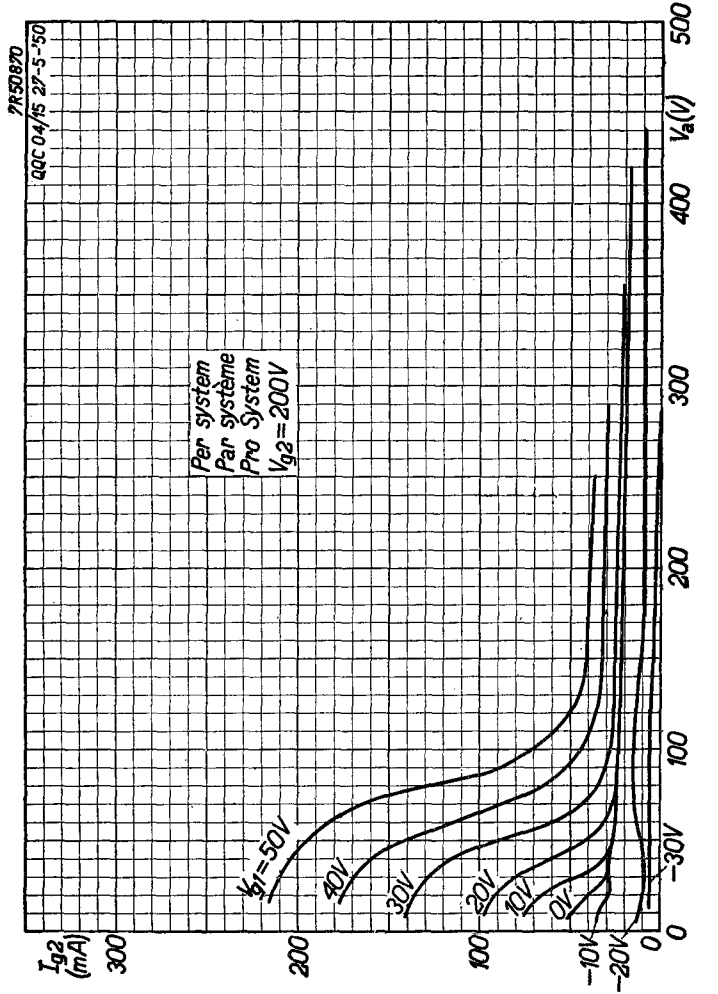
QQC 04/15

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B

PHILIPS

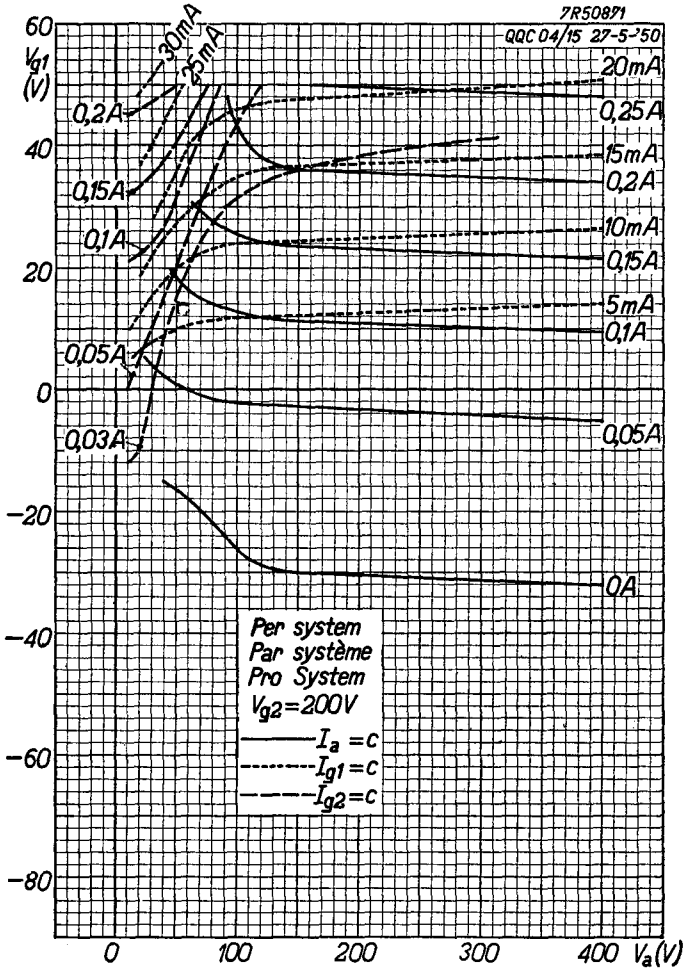
QQC 04/15

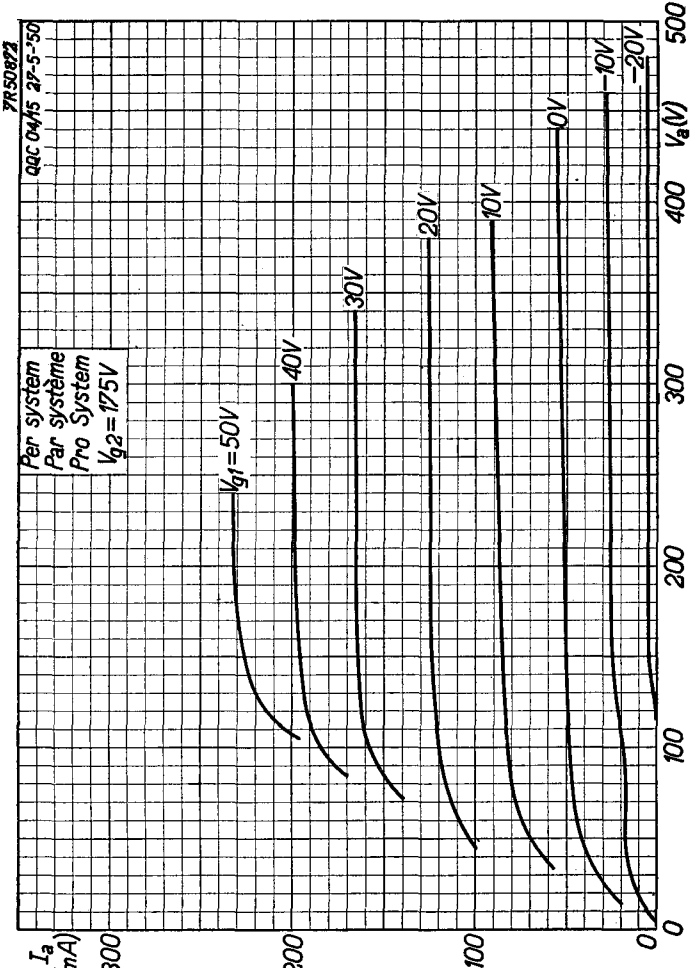


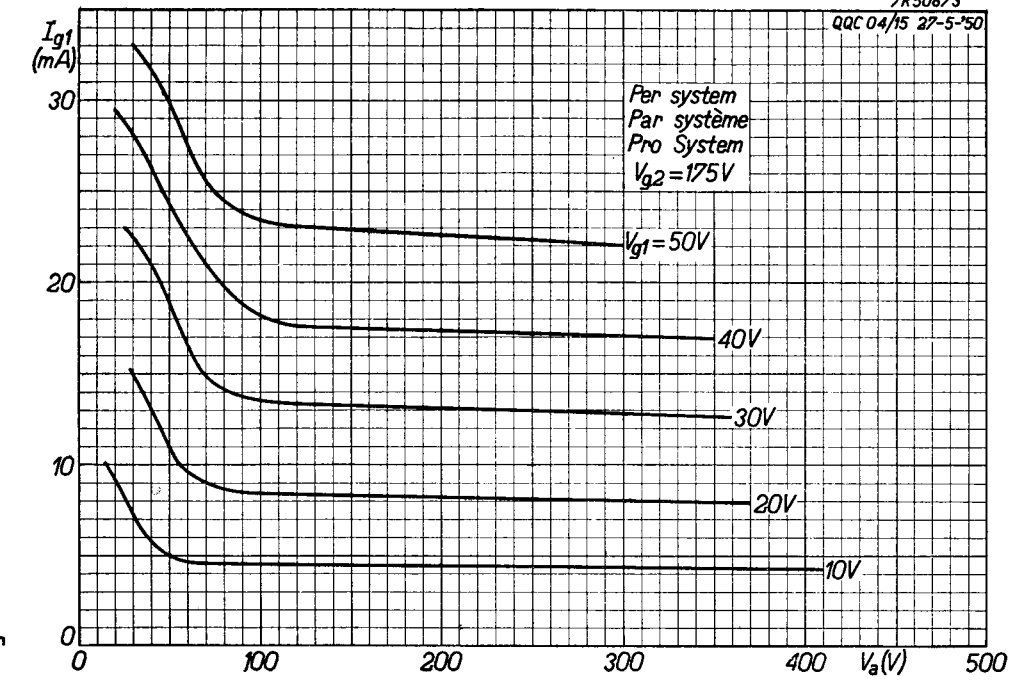
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C

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7R50871
QQC 04/15 27-5-50
V_{g1} (V)
60
40
20
0
−20
−40
−60
−80
0
100
200
300
400
V_a(V)
30mA
25mA
20mA
0,25A
15mA
0,2A
0,2A
10mA
0,15A
0,15A
5mA
0,1A
0,1A
0,05A
0,05A
0,03A
0A
Per system
Par système
Pro System
V_{g2}=200V
I_a =c
I_{g1} =c
I_{g2} =c


7R50822
QQC 04/15 27-5-'50
Per system
Par système
Pro System
V_{g2} = 175V
V_{g1} = 50V
40V
30V
20V
10V
0V
-10V
-20V
I_a (mA)
300
200
100
0
0
100
200
300
400
500
V_a (V)

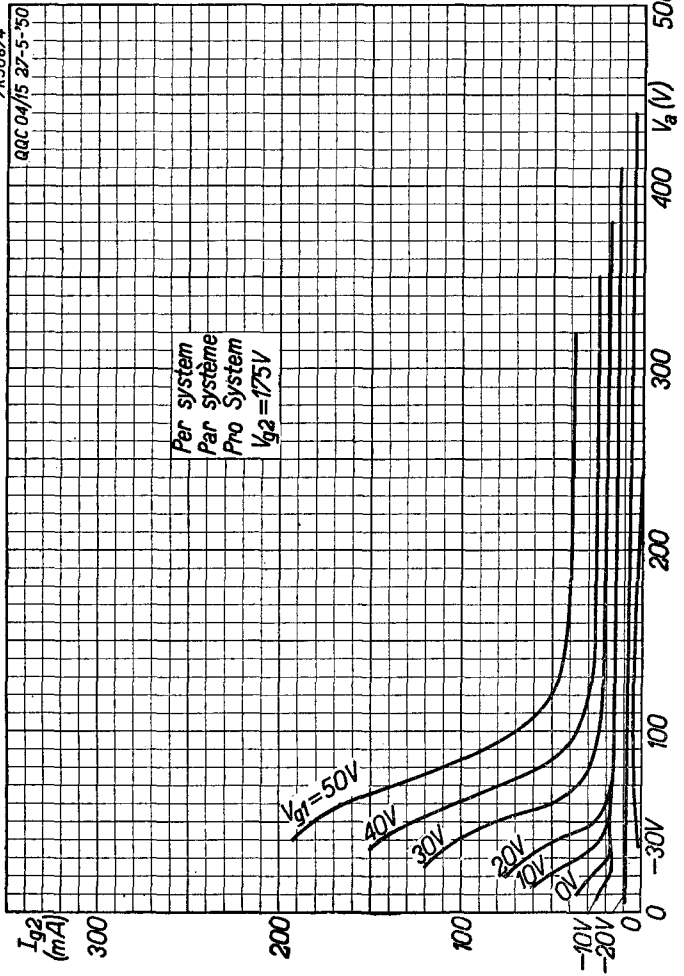

7R50873
QQC 04/15 27-5-'50
I_{g1} (mA)
30
20
10
0
Per system
Par système
Pro System
V_{g2} = 175V
V_{g1} = 50V
40V
30V
20V
10V
0
100
200
300
400
V_a(V)
500

F

PHILIPS

PHILIPS

QQC 04/15

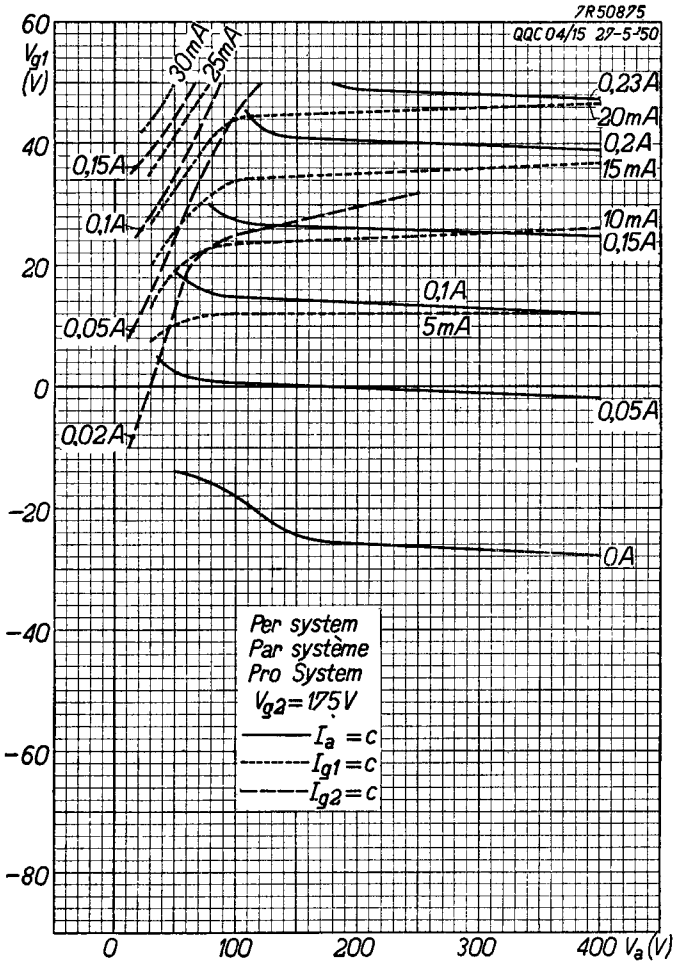


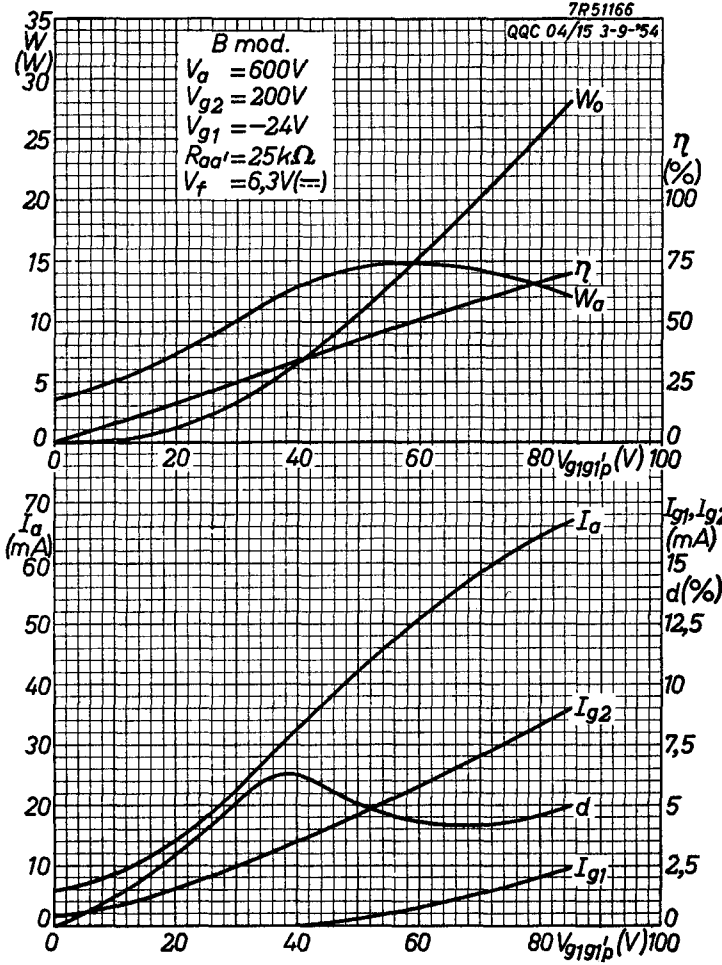
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G

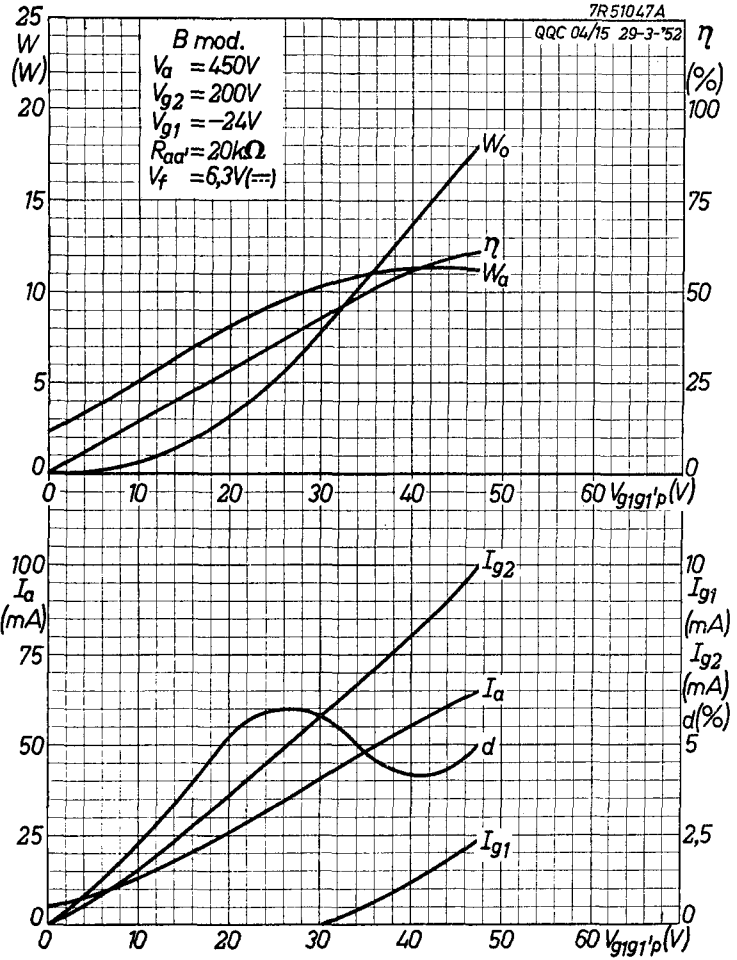
QQC 04/15

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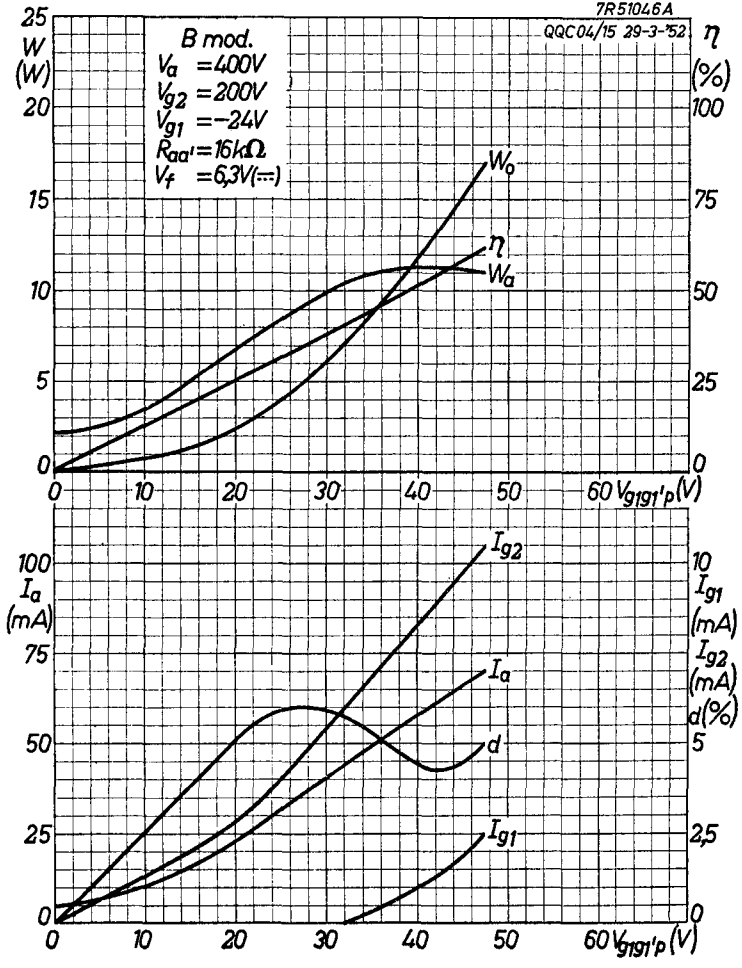



7R51166
QQC 04/15 3-9-'54
B mod.
V_a = 600V
V_{g2} = 200V
V_{g1} = −24V
$R_{aa'}$ = 25kΩ
V_f = 6,3V(=)
W (W)
η (%)
W_o
η
W_a
$V_{g1g1'b}$ (V)
I_a (mA)
I_{g1}, I_{g2} (mA)
d (%)
I_a
I_{g2}
d
I_{g1}

PHILIPS


7R51047A
QQC 04/15 29-3-'52
B mod.
V_a = 450V
V_{g2} = 200V
V_{g1} = −24V
$R_{aa'}$ = 20kΩ
V_f = 6,3V(=)
W_o
η
W_a
W (W)
η (%)
$V_{g1g1'p}$ (V)
I_{g2}
I_a
d
I_{g1}
I_a (mA)
I_{g1} (mA)
I_{g2} (mA)
d (%)

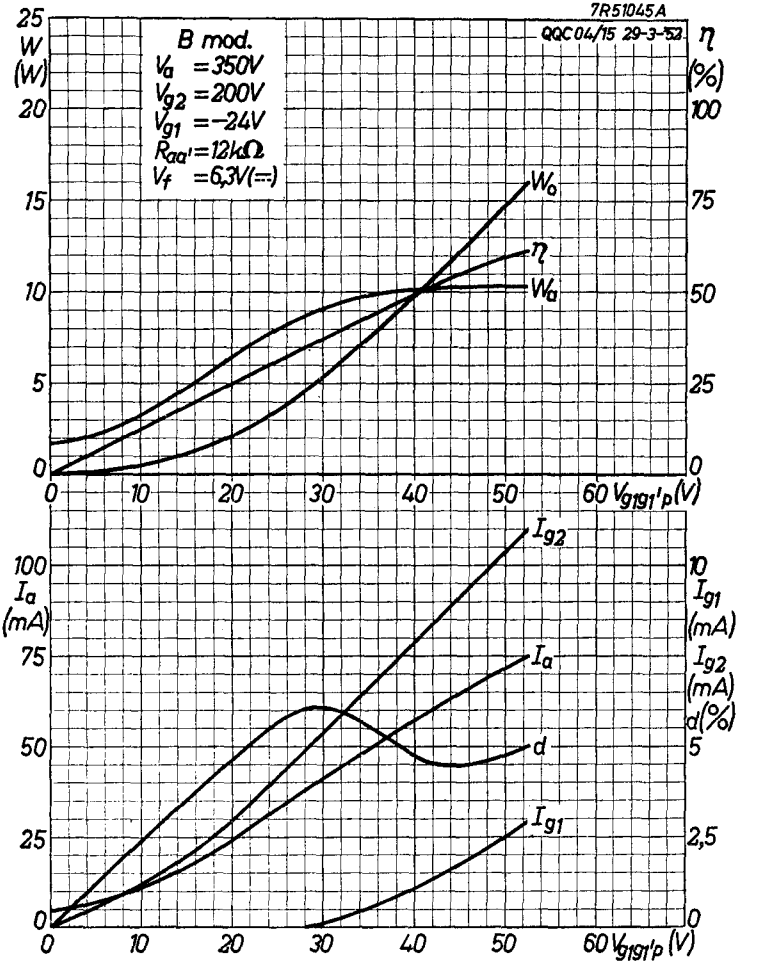
J

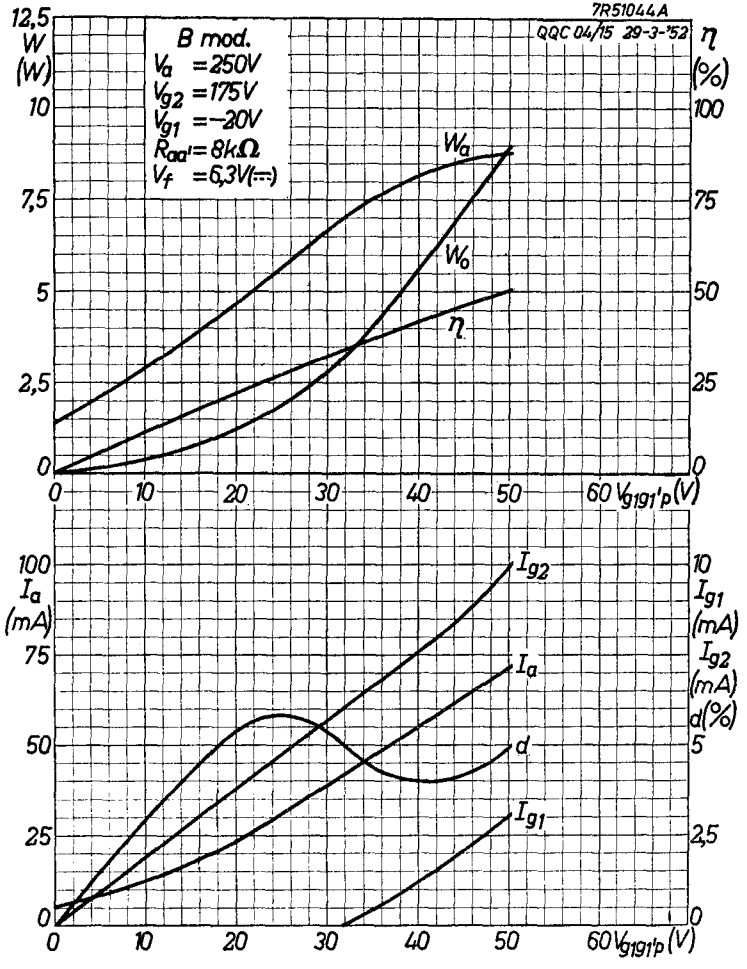

7R51046A
QQC04/15 29-3-'52
B mod.
V_a =400V
V_{g2} =200V
V_{g1} =−24V
$R_{aa'}$=16kΩ
V_f =6,3V(≂)
W (W)
η (%)
W_o
η
W_a
$V_{g1g1'p}$ (V)
I_a (mA)
I_{g2}
I_a
d
I_{g1}
I_{g1} (mA)
I_{g2} (mA)
d(%)

7.7.1954

K

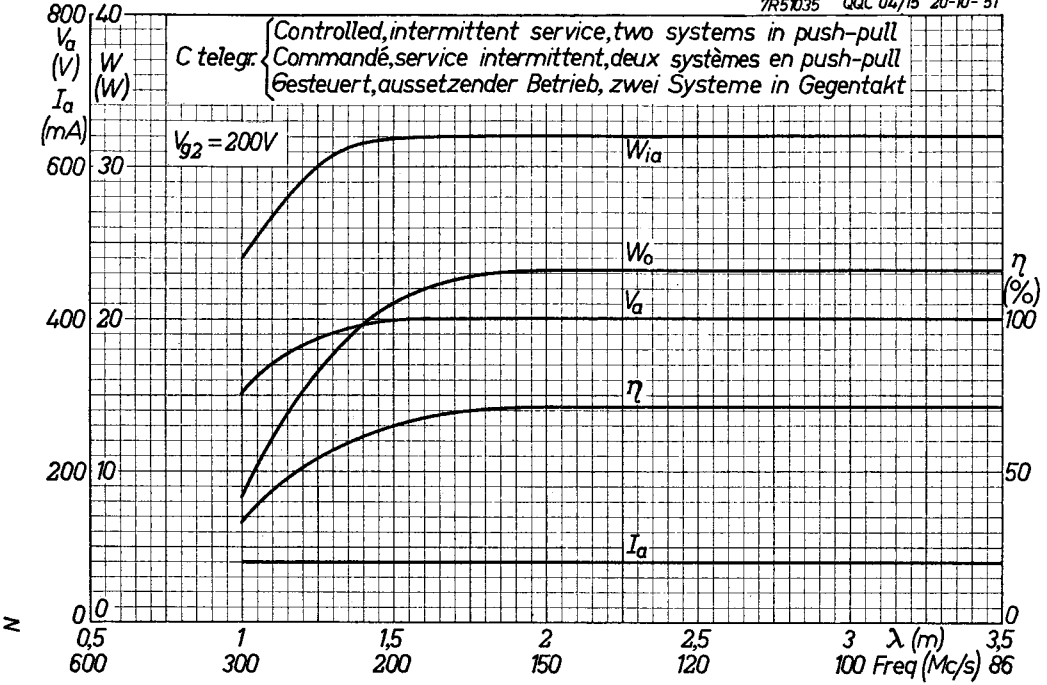
PHILIPS


7R51045A
QQC 04/15 29-3-52
B mod.
V_a = 350V
V_{g2} = 200V
V_{g1} = −24V
$R_{aa'}$ = 12kΩ
V_f = 6,3V(=)
W (W)
η (%)
W_o
η
W_a
$V_{g1g1'p}$ (V)
I_a (mA)
I_{g2}
I_a
d
I_{g1}
I_{g1} (mA)
I_{g2} (mA)
d(%)


7R51044A
QQC 04/15 29-3-'52
B mod.
V_a = 250V
V_{g2} = 175V
V_{g1} = −20V
$R_{aa'}$ = 8kΩ
V_f = 6,3V(⎓)
12,5
W
(W)
10
7,5
5
2,5
0
W_a
W_o
η
η
(%)
100
75
50
25
0
0
10
20
30
40
50
60 $V_{g1g1'p}$(V)
100
I_a
(mA)
75
50
25
0
I_{g2}
I_a
d
I_{g1}
10
I_{g1}
(mA)
I_{g2}
(mA)
d(%)
5
2,5
0
0
10
20
30
40
50
60 $V_{g1g1'p}$(V)

7. 7. 1954

M


C telegr. {Controlled, intermittent service, two systems in push-pull
Commandé, service intermittent, deux systèmes en push-pull
Gesteuert, aussetzender Betrieb, zwei Systeme in Gegentakt
$V_{g2} = 200V$
W_{ia}
W_o
V_a
η
I_a
V_a (V)
I_a (mA)
W (W)
η (%)
800
600
400
200
0
40
30
20
10
0
100
50
0,5
1
1,5
2
2,5
3
3,5
λ (m)
600
300
200
150
120
100
86
Freq (Mc/s)

PHILIPS

Electronic Tube HANDBOOK

QQC04/15

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1	1	1955.10.10
2	2	1955.10.10
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18	D	1954.07.07
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20	F	1954.07.07
21	G	1954.07.07
22	H	1954.07.07
23	I	1954.07.07
24	J	1954.07.07
25	K	1954.07.07
26	L	1954.07.07
27	M	1954.07.07
28	N	1954.07.07
29, 30	FP	1999.10.31

DOUBLE TETRODE for use as H.F. amplifier, oscillator and frequency multiplier
DOUBLE TÉTRODE pour utilisation en amplificatrice, oscillatrice et multiplicatrice de fréquence H.F.
DOPPELTETRODE zur Verwendung als HF-Verstärker, Oszillator und Frequenzvervielfacher

Cathode: oxide-coated
Cathode: oxyde
Katode : Oxyd

V_f = 6,3 — 12,6 V [1])
I_f = 0,6 — 0,3 A

Heating : indirect
Chauffage: indirect
Heizung : indirekt

Pins
Broches 9-(4+5) — 4-5
Stifte

Capacitances Capacités Kapazitäten	per system par système pro System	in push-pull en push-pull in Gegentakt
	C_a = 1,6 pF	C_o = 0,95 pF
	C_{g1} = 6,4 pF	C_i = 3,8 pF
	C_{ag1} = 0,16 pF	

The tube is internally neutralized
Le tube est neutrodyné internement
Die Röhre ist innerlich neutrodynisiert

Typical characteristics per system
Caractéristiques types par système
Kenndaten pro System

V_a	=	150 V
V_{g2}	=	150 V
I_a	=	25 mA
μ_{g2g1}	=	31
S	=	10,5 mA/V

λ	Freq	C telegr.			C_{ag_2} mod.		
		V_a	W_o (W) [2])		V_a	W_o (W) [2])	
(m)	(Mc/s)	(V)	CCS	ICAS	(V)	CCS	ICAS
0,6	500	180	5,8		180	4,2	5,8
		200		7,2			

λ	Freq	C fr.mult.		
		V_a	W_o (W) [2])	
(m)	(Mc/s)	(V)	CCS	ICAS
1,8/0,6	167/500	180	2,35	
		200		2,95

[1]) See page 2; voir page 2; siehe Seite 2
[2]) Two systems; deux systèmes; zwei Systeme

PHILIPS

Cooling: Radiation and convection. The use of a closed can is not allowed
Refroidissement: Rayonnement et convection. Il n'est pas permis d'utiliser un écran fermé
Kühlung: Strahlung und Konvektion. Die Verwendung einer geschlossenen Buchse ist nicht gestattet

Bulb temperature (at hottest point)
Température de l'ampoule (au point le plus chaud) max. 225 °C
Kolbentemperatur (an der wärmsten Stelle)

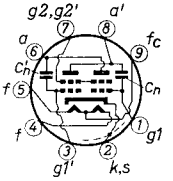
Pin seal temperature
Température des scellements des broches max. 120 °C
Temperatur der Stifteneinschmelzungen

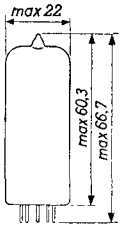
Mounting position: arbitrary
Montage: arbitrairement
Einbau : willkürlich

Base :
Culot : Noval
Sockel:

Socket :
Support: B8 700 19
Fassung:

Dimensions in mm
Dimensions en mm
Abmessungen in mm





Low loss socket without collar is recommended. At high frequencies use of a metal retaining device is not recommended due to loss of output power

Un support à faibles pertes sans manchon est recommandé A hautes fréquences l'utilisation d'un dispositif métallique pour retenir le tube n'est pas recommandée à cause de la perte de puissance de sortie

Eine verlustarme Fassung ohne Metallring wird empfohlen. Bei hohen Frequenzen wird eine metallene Vorrichtung zum festhalten der Röhre der Ausgangsleistungsverluste wegen nicht empfohlen

---

1) A temporary deviation of 10 % of V_f is permissible; e.g. when the tube is fed from an accumulator, the actual V_f should not exceed 7 V or 14 V and the accumulator may be used until its voltage has decreased to such an extent that V_f is 5.7 V or 11.4 V

Une déviation temporaire de V_f de 10% est admissible; par exemple si le tube est alimenté d'un accumulateur, le V_f actuel ne surpassera pas 7 V ou 14 V et l'accumulateur peut être utilisé jusqu'à sa tension est diminuée de telle manière que V_f = 5,7 V ou 11,4 V

Eine vorübergehende Abweichung von V_f von 10 % ist zulässig; wenn z.B. die Röhre von einem Akkumulator gespeist wird, so soll die an der Röhre gemessene Heizspannung 7 V oder 14 V nicht überschreiten und kann der Akkumulator verwendet werden bis die Spannung so weit verringert ist dass V_f = 5,7 V oder 11,4 V

H.F. class C telegraphy; two systems in push-pull
H.F. classe C télégraphie; deux systèmes en push-pull
HF-Klasse C Telegraphie; zwei Systeme in Gegentakt

Limiting values (absolute values)
Caractéristiques limites(valeurs absolues)
Grenzdaten (absolute Werte)

	C.C.S.	I.C.A.S.	
f	= max. 500	max. 500	Mc/s
V_a	= max. 250	max. 250	V
W_{ia}	= max. 2x6	max. 2x7	W
W_a	= max. 2x3	max. 2x3,75	W
I_a	= max. 2x45	max. 2x50	mA
V_{g2}	= max. 200	max. 200	V
W_{g2}	= max. 2x1,5	max. 2x1,75	W
$-V_{g1}$	= max. 50	max. 50	V
I_{g1}	= max. 2x3	max. 2x4	mA
V_{kf}	= max. 100	max. 100	V

Operating conditions
Caractéristiques d'utilisation
Betriebsdaten

	C.C.S.	I.C.A.S.	
f	= 500	500	Mc/s
V_a	= 180	200	V
V_{g2}	= 180	200	V
V_{g1}	= -20	-20	V
R_{g1}	= 27	27	kΩ [1]
$V_{g1g1'p}$	= 50	50	V
I_a	= 2x27,5	2x31	mA
I_{g2}	= 12,5	14	mA
I_{g1}	= 2x0,75	2x0,75	mA
W_{ia}	= 2x5	2x6,2	W
W_a	= 2x2,1	2x2,6	W
W_{g2}	= 2,25	2,8	W
W_{ig1} [2]	= 1,2	1,2	W
W_o	= 5,8	7,2	W
η	= 58	58	%
W_ℓ [3]	= 5	6	W

[1])...[3]) See page 6; voir page 6 siehe Seite 6

H.F. class C telegraphy; two systems in push-pull
H.F. classe C télégraphie; deux systèmes en push-pull
HF-Klasse C Telegraphie; zwei Systeme in Gegentakt

Limiting values (absolute values)
Caractéristiques limites(valeurs absolues)
Grenzdaten (absolute Werte)

	C.C.S.	I.C.A.S.	
f	= max. 500	max. 500	Mc/s
V_a	= max. 250	max. 250	V
W_{ia}	= max. 2x6	max. 2x7	W
W_a	= max. 2x3	max. 2x3,75	W
I_a	= max. 2x45	max. 2x50	mA
V_{g2}	= max. 200	max. 200	V
W_{g2}	= max. 2x1,5	max. 2x1,75	W
$-V_{g1}$	= max. 100	max. 100	V
I_{g1}	= max. 2x3	max. 2x4	mA
V_{kf}	= max. 100	max. 100	V

Operating conditions
Caractéristiques d'utilisation
Betriebsdaten

	C.C.S.	I.C.A.S.	
f	= 500	500	Mc/s
V_a	= 180	200	V
V_{g2}	= 180	200	V
V_{g1}	= -20	-20	V
R_{g1}	= 27	27	kΩ [1]
$V_{g1g1'p}$	= 50	50	V
I_a	= 2x27,5	2x31	mA
I_{g2}	= 12,5	14	mA
I_{g1}	= 2x0,75	2x0,75	mA
W_{ia}	= 2x5	2x6,2	W
W_a	= 2x2,1	2x2,6	W
W_{g2}	= 2,25	2,8	W
W_{ig1} [2]	= 1,2	1,2	W
W_o	= 5,8	7,2	W
η	= 58	58	%
W_ℓ [3]	= 5	6	W

[1])...[3]) See page 6; voir page 6; siehe Seite 6

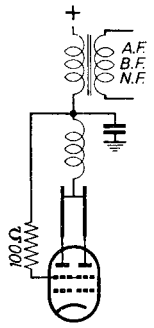
PHILIPS

H.F. Class C anode and screen grid modulation, two systems in push-pull
H.F. classe C modulation d'anode et de grille-écran, deux systèmes en push-pull
HF-Klasse C Anoden- und Schirmgittermodulation, zwei Systeme in Gegentakt

Limiting values (absolute values)
Caractéristiques limites (valeurs absolues)
Grenzdaten (absolute Werte)

		C.C.S.		I.C.A.S.	
f	=	max.	500	max.	500 Mc/s
V_a	=	max.	200	max.	200 V
W_{ia}	=	max.	2x4	max.	2x5 W
W_a	=	max.	2x2	max.	2x2,5 W
I_a	=	max.	2x32	max.	2x40 mA
V_{g2}	=	max.	200	max.	200 V
W_{g2}	=	max.	2x1,0	max.	2x1,15 W
$-V_{g1}$	=	max.	50	max.	50 V
I_{g1}	=	max.	2x3	max.	2x4 mA
V_{kf}	=	max.	100	max.	100 V

Operating conditions
Caractéristiques d'utilisation
Betriebsdaten



		C.C.S.	I.C.A.S.	
f	=	500	500	Mc/s
V_a	=	180	180	V
V_{g2}	=			[4]
V_{g1}	=	-20	-20	V
R_{g1}	=	68	27	kΩ [1]
$V_{g1g1'p}$	=	45	50	V
I_a	=	2x20	2x27,5	mA
I_{g2}	=	9,5	12,5	mA
I_{g1}	=	2x0,3	2x0,75	mA
W_{ia}	=	2x3,6	2x5,0	W
W_a	=	2x1,5	2x2,1	W
W_{g2}	=	1,7	2,25	W
W_{ig1}	=	1,0	1,2	W [2]
W_o	=	4,2	5,8	W
η	=	58	58	%
W_z	=	3,5	5,0	W [3]
m	=	100	100	%
W_{mod}	=	4,5	6,1	W

[4] See circuit diagram
Voir le schéma
Siehe Schaltbild

[1]...[3] See page 6; voir page 6; siehe Seite 6

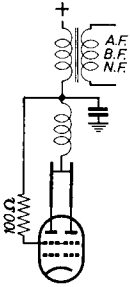
PHILIPS

H.F. Class C anode and screen grid modulation, two systems in push-pull
H.F. classe C modulation d'anode et de grille-écran, deux systèmes en push-pull
HF-Klasse C Anoden- und Schirmgittermodulation, zwei Systeme in Gegentakt

Limiting values (absolute values)
Caractéristiques limites (valeurs absolues)
Grenzdaten (absolute Werte)

		C.C.S.		I.C.A.S.	
f	=	max.	500	max.	500 Mc/s
V_a	=	max.	200	max.	200 V
W_{ia}	=	max.	2x4	max.	2x5 W
W_a	=	max.	2x2	max.	2x2,5 W
I_a	=	max.	2x32	max.	2x40 mA
V_{g2}	=	max.	200	max.	200 V
W_{g2}	=	max.	2x1,0	max.	2x1,15 W
$-V_{g1}$	=	max.	100	max.	100 V
I_{g1}	=	max.	2x3	max.	2x4 mA
V_{kf}	=	max.	100	max.	100 V

Operating conditions
Caractéristiques d'utilisation
Betriebsdaten



		C.C.S.	I.C.A.S.	
f	=	500	500	Mc/s
V_a	=	180	180	V
V_{g2}	=			4)
V_{g1}	=	-20	-20	V
R_{g1}	=	68	27	kΩ 1)
$V_{g1g1'p}$	=	45	50	V
I_a	=	2x20	2x27,5	mA
I_{g2}	=	9,5	12,5	mA
I_{g1}	=	2x0,3	2x0,75	mA
W_{ia}	=	2x3,6	2x5,0	W
W_a	=	2x1,5	2x2,1	W
W_{g2}	=	1,7	2,25	W
W_{ig1}	=	1,0	1,2	W 2)
W_o	=	4,2	5,8	W
η	=	58	58	%
W_ℓ	=	3,5	5,0	W 3)
m	=	100	100	%
W_{mod}	=	4,5	6,1	W

4) See circuit diagram
Voir le schéma
Siehe Schaltbild

1)...3) See page 6; voir page 6; siehe Seite 6

H.F. class C frequency tripler, two systems in push-pull
H.F. classe C tripleur de fréquence, deux systèmes en push-pull
HF-Klasse C Frequenzverdreifacher, zwei Systeme in Gegentakt

Limiting values (absolute values)
Caractéristiques limites (valeurs absolues)
Grenzdaten (absolute Werte)

		C.C.S.	I.C.A.S.	
f	= max.	500	max. 500	Mc/s
V_a	= max.	250	max. 250	V
W_{ia}	= max.	2x4	max. 2x5	W
W_a	= max.	2x3	max. 2x3,75	W
I_a	= max.	2x30	max. 2x40	mA
V_{g2}	= max.	200	max. 200	V
W_{g2}	= max.	2x1,5	max. 2x1,75	W
$-V_{g1}$	= max.	100	max. 100	V
I_{g1}	= max.	2x3	max. 2x4	mA
V_{kf}	= max.	100	max. 100	V

Operating conditions
Caractéristiques d'utilisation
Betriebsdaten

	C.C.S.	I.C.A.S.	
f =	167/500	167/500	Mc/s
V_a =	180	200	V
V_{bg2} =	180	200	V
R_{g2} =	1200	1200	Ω
R_{g1} =	82	82	kΩ [1) 5)]
$V_{g1g1'p}$ =	165	165	V
I_a =	2x20	2x22,5	mA
I_{g2} =	9,7	11,0	mA
I_{g1} =	2x0,9	2x0,9	mA
W_{ia} =	2x3,6	2x4,5	W
W_a =	2x2,45	2x3,05	W
W_{g2} =	1,65	2,05	W
W_{ig1} [2)] =	1,1	1,1	W
W_o =	2,35	2,95	W
η =	33	33	%
W_ℓ [3)] =	1,8	2,2	W

[1)...5)] See page 6; voir page 6; siehe Seite 6

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[1]) Each system; chaque système; jedes System

[2]) Driver output power
Puissance de sortie du préamplificateur
Ausgangsleistung der Treiberstufe

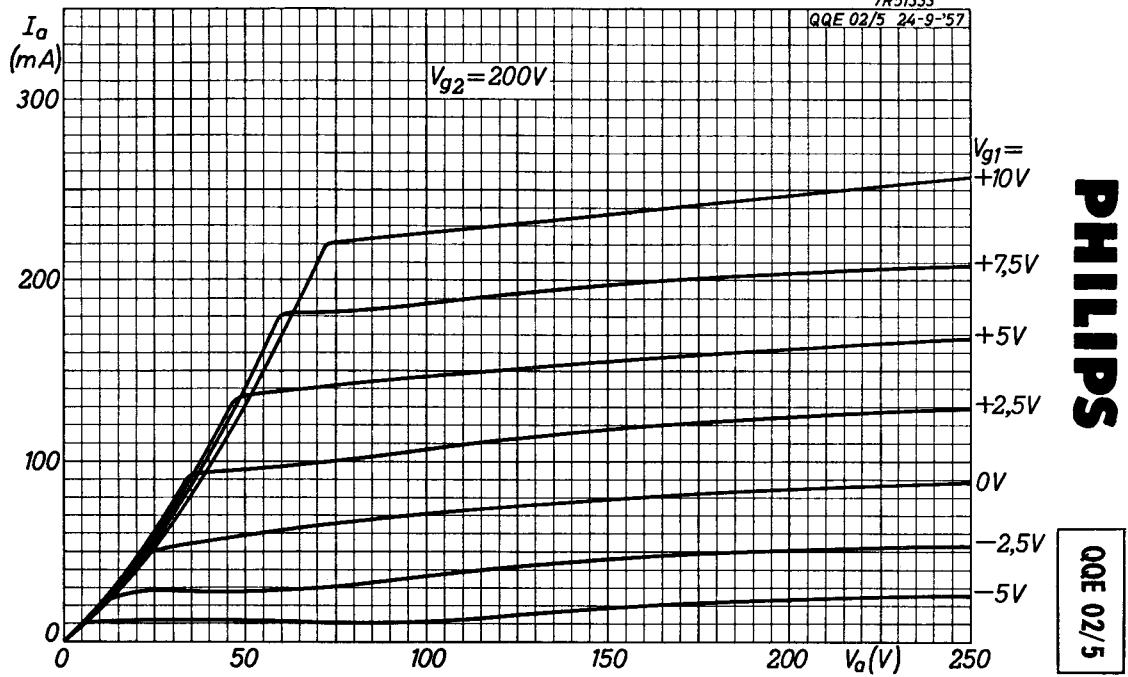
[3]) Output power in load
Puissance dans la charge
Leistung in der Belastung

[4]) See circuit diagram
Voir le schéma
Siehe das Schaltbild

[5]) Fixed bias or a combination of fixed bias and grid current biasing is not recommended

Polarisation fixe ou une combinaison de polarisation fixe et polarisation par courant de grille n'est pas recommandée

Feste Gittervorspannung oder eine Kombination von fester Gittervorspannung und Gittervorspannung mittels Gitterstromes wird nicht empfohlen



9.9.1957

A

PHILIPS

QQE 02/5

QQE 02/5

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B

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QQE 02/5

9.9.1957

C

QQE 02/5

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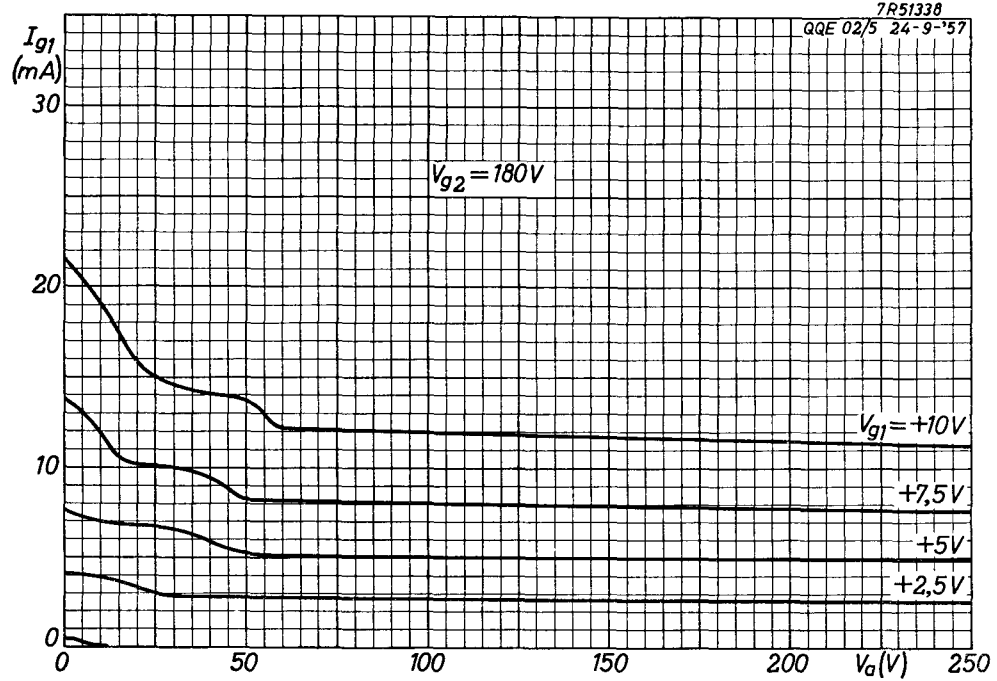
D

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QQE 02/5

9.9.1957

E


7R51338
QQE 02/5 24-9-'57
I_{g1} (mA)
30
20
10
0
V_{g2} = 180V
V_{g1} = +10V
+7,5V
+5V
+2,5V
0
50
100
150
200
V_a(V)
250

PHILIPS

Electronic Tube

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2	2	1957.09.09
3	3	1957.09.09
4	3	1961.04.04
5	4	1957.09.09
6	4	1961.04.04
7	5	1957.09.09
8	6	1957.09.09
9	A	1957.09.09
10	B	1957.09.09
11	C	1957.09.09
12	D	1957.09.09
13	E	1957.09.09
14	F	1957.09.09
15	FP	2000.01.15

DOUBLE TETRODE for use as H.F. amplifier and oscillator, frequency multiplier and modulator
DOUBLE TETRODE pour utilisation en amplificatrice et oscillatrice H.F., multiplicatrice de fréquence et modulatrice
DOPPELTETRODE zur Verwendung als HF-Verstärker und Oszillator, Frequenzvervielfacher und Modulator

Cathode: oxide-coated Cathode: oxyde Katode : Oxyd	V_f	= 6,3	12,6 V [1]
	I_f	= 0,82	0,41 A
Heating : indirect Chauffage: indirect Heizung : indirekt	Pins Broches 9-(4+5) Stifte		4-5

Capacitances Capacités Kapazitäten	per system par système pro System	in push-pull en push-pull in Gegentakt
The tube is internally neutralized Le tube est neutrodyné internement Die Röhre ist innerlich neutrodynisiert	C_a = 2,6 pF	C_o = 1,4 pF
	C_{g_1} = 6,2 pF	C_i = 5,1 pF
	C_{ag_1} < 0,1 pF	

Typical characteristics per system
Caractéristiques types par système
Kenndaten pro System

$\mu_{g_2g_1}$ (I_a = 30 mA) = 7,5
S (I_a = 30 mA) = 3,3 mA/V

λ	Freq	C telegr			Cag_2 mod		
		V_a	W_o(W)[2]		V_a	W_o(W)[2]	
(m)	(Mc/s)	(V)	CCS	ICAS	(V)	CCS	ICAS
1,5	200	300	12	16	200	7,1	8,8
		250	9,0	11,2			
		200	7,4	9,0			

λ	Freq	C fr.mult.			B mod	
		V_a	W_o(W)[2]		V_a	W_o[2]
(m)	(Mc/s)	(V)	CCS	ICAS	(V)	(W)
4,5/1,5	67/200	300	3,5	4,8	300	17,5
		250	3,0	4,2	250	14
		200	2,8	3,5	200	8,7

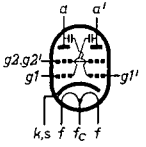
[1] See page 2; voir page 2; siehe Seite 2
[2] Two systems in push-pull, useful power output in load
Deux systèmes en push-pull, puissance de sortie utile dans la charge
Zwei Systeme in Gegentakt, nützliche Ausgangsleistung in der Belastung

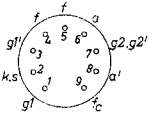
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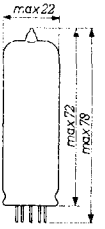
Cooling: Radiation and convection. The use of a closed can is not allowed
Refroidissement: Rayonnement et convection. Il n'est pas permis d'utiliser un écran fermé
Kühlung: Strahlung und Konvektion. Die Verwendung einer geschlossenen Buchse ist nicht gestattet

Bulb temperature	Pin temperature
Temp. d'ampoule max. 225°C	Temp. des broches max. 120°C ←
Kolbentemperatur	Stiftentemperatur

Dimensions in mm Base
Dimensions en mm Culot NOVAL
Abmessungen in mm Sockel







Socket		Tube retainer	
Support	5908/36	Ressort pour retenir le tube	40647
Röhrenhalter		Feder zum Festhalten der Röhre	

Mounting position: arbitrary; if the tube is mounted horizontally, it is recommanded that pins 2 and 7 are placed in a vertical plane
Montage: arbitrairement; si le tube est monté horizontalement, il est recommandé que les broches 2 et 7 sont montées dans un plan vertical
Einbau : willkürlich; wenn die Röhre waagerecht aufgestellt ist, wird empfohlen die Stifte 2 und 7 in einer senkrechten Ebene aufzustellen

→ Net weight, poids net, Nettogewicht : 16 g
→ Shipping weight, poids brut, Bruttogewicht: 23 g

→ [1])Occasional operation at 5.3 V or 7.8 V (resp. 10.6 V or 15.6 V) is acceptable. The tube may be used with only half the heater energized during the stand-by period of a transmitter in order to reduce heater current consumption during this time.
Opération occassionelle à 5,3 V ou 7,8 V (10,6 ou 15,6 resp.) est acceptable. Afin de réduire la consommation de courant de chauffage pendant le temps d'attente d'un émetteur, le tube peut être utilisé avec la moitié du filament seulement chauffée pendant ce temps.
Gelegentliche Wirkung bei 5,3 V oder 7,8 V (bzw. 10,6 V oder 15,6 V) ist akzeptabel. Zur Verringerung des Heizstromverbrauches während der Ruhezeit eines Senders darf die Röhre während dieser Zeit mit nur der Hälfte des Heizfadens geheizt gebraucht werden.

H.F. class C telegraphy; two systems in push-pull
H.F. classe C télégraphie; deux systèmes en push-pull
HF- Klasse C Telegraphie; zwei Systeme in Gegentakt

C.C.S. Limiting values, continuous service
Caractéristiques limites, service continu
Grenzdaten, Dauerbetrieb

f	= max.	200	Mc/s
V_a	= max.	300	V
W_a	= max.	2x5	W
W_{ia}	= max.	2x11,25	W
I_a	= max.	2x45	mA
V_{g_2}	= max.	200	V
W_{g_2}	= max.	2x1	W
$-V_{g_1}$	= max.	150	V
W_{g_1}	= max.	2x0,2	W
I_{g_1}	= max.	2x3	mA
I_k	= max.	2x50	mA
I_{k_p}	= max.	225	mA
V_{kf}	= max.	100	V

C.C.S. Operating characteristics, continuous service
Caractéristiques d'utilisation, service continu
Betriebsdaten, Dauerbetrieb

f	=	200	200	200	Mc/s
$V_a = V_b$	=	300	250	200	V
V_{g_2}	=	175	-	-	V
R_{g_2}	=	-	47	22	kΩ
V_{g_1}	=	-40	-	-	V
R_{g_1} 1)	=	-	18	15	kΩ
$V_{g_1 g_1 p}$	=	110	110	115	V
I_a	=	2x37,5	2x33,5	2x35	mA
I_{g_2}	=	2,3	1,8	2,2	mA
I_{g_1}	=	2x0,9	2,2	2,7	mA
W_{ia}	=	2x11,25	2x8,4	2x7	W
W_a	=	2x4	2x2,9	2x2,8	W
W_{g_2}	=	0,4	0,3	0,33	W
W_{ig_1}	=	2x0,05	0,12	0,14	W
W_o	=	14,5	11	8,4	W
η	=	65	65	60	%
W_o 2)	=	12	9	7,4	W

1) 2) See page 4; voir page 4; siehe Seite 4

H.F.class C telegraphy, two systems in push-pull; continued
H.F.classe C télégraphie, deux systèmes en push-pull; continuation
HF-Klasse C Telegraphie, zwei Systeme in Gegentakt; Fortsetzung

Limiting values, intermittent service
I.C.A.S. Caractéristiques limites, service intermittent
Grenzdaten, aussetzender Betrieb

f	= max.	200	Mc/s
V_a	= max.	300	V
W_a	= max.	2x7	W
W_{ia}	= max.	2x15	W
I_a	= max.	2x55	mA
V_{g_2}	= max.	200	V
W_{g_2}	= max.	2x1	W
$-V_{g_1}$	= max.	150	V
W_{g_1}	= max.	2x0,2	W
I_{g_1}	= max.	2x4	mA
I_k	= max.	2x65	mA
I_{k_p}	= max.	2x300	mA
V_{kf}	= max.	100	V

Operating conditions, intermittent service
I.C.A.S. Caractéristiques d'utilisation, service intermittent
Betriebsdaten, aussetzender Betrieb

f	=	200	200	200	Mc/s
$V_a = V_b$	=	300	250	200	V
V_{g_2}	=	200	-	-	V
R_{g_2}	=	-	27	8,2	kΩ
V_{g_1}	=	-45			V
R_{g_1} [1]	=	-	18	15	kΩ
$V_{g_1 g_1 p}$	=	130	120	130	V
I_a	=	2x50	2x40	2x42	mA
I_{g_2}	=	3,0	2,4	3,1	mA
I_{g_1}	=	2x1,5	2,5	3,0	mA
W_{ia}	=	2x15	2x10	2x8,4	W
W_a	=	2x6	2x3,5	2x3,4	W
W_{g_2}	=	0,6	0,45	0,55	W
W_{ig_1}	=	2x0,1	0,15	0,18	W
W_o	=	18,5	13	10	W
η	=	62	65	60	%
W_o [2]	=	16	11,2	9	W

[1] Common resistor for both systems
Résistance commune pour les deux systèmes
Gemeinsamer Widerstand für beide Systeme

[2] Useful power output in load
Puissance utile dans la charge
Nützliche Leistung in der Belastung

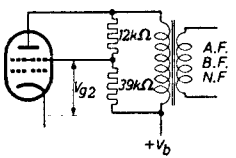
H.F. class C anode and screen grid modulation, two systems in push-pull
H.F. classe C modulation d'anode et de grille-écran, deux systèmes en push-pull
HF- Klasse C Anoden- und Schirmgittermodulation, zwei Systeme in Gegentakt

C.C.S. Limiting values, continuous service
Caractéristiques limites, service continu
Grenzdaten, Dauerbetrieb

f	= max.	200 Mc/s
V_a	= max.	240 V
W_a	= max.	2x3,3 W
W_{ia}	= max.	2x7,5 W
I_a	= max.	2x37,5 mA
V_{g_2}	= max.	200 V
W_{g_2}	= max.	1,3 W
$-V_{g_1}$	= max.	150 V
W_{g_1}	= max.	2x0,2 W
I_{g_1}	= max.	2x3 mA
I_k	= max.	2x40 mA
I_{k_p}	= max.	2x180 mA
V_{kf}	= max.	100 V

C.C.S. Operating conditions, continuous service
Caractéristiques d'utilisation, service continu
Betriebsdaten, Dauerbetrieb

f	=	200 Mc/s
$V_a=V_b$	=	200 V
V_{g_2} [3]	=	
R_{g_1} [1]	=	33 kΩ
$V_{g_1 g_1 p}$	=	130 V
I_a	=	2x33,5 mA
I_{g_2}	=	2,6 mA
I_{g_1}	=	1,5 mA
W_{ia}	=	2x6,7 W
W_a	=	2x2,65 W
W_{g_2}	=	0,46 W
W_{ig_1}	=	0,1 W
W_o	=	8,1 W
η	=	60 %
W_o [2]	=	7,1 W
m	=	100 %
W_{mod}	=	6,7 W



[1] [2] See page 4; voir page 4; siehe Seite 4
[3] See diagram; voir le schéma; siehe das Schaltbild

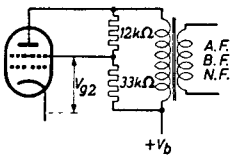
H.F. class C anode and screen grid modulation, two systems in push-pull; continued
H.F. classe C modulation d'anode et de grille-écran, deux systèmes en push-pull; continuation
HF-Klasse C Anoden- und Schirmgittermodulation, zwei Systeme in Gegentakt; Fortsetzung

I.C.A.S. Limiting values, intermittent service
Caractéristiques limites, service intermittent
Grenzdaten, aussetzender Betrieb

f	= max.	200 Mc/s
V_a	= max.	240 V
W_a	= max.	2x4,6 W
W_{ia}	= max.	2x10 W
I_a	= max.	2x46 mA
V_{g2}	= max.	200 V
W_{g2}	= max.	1,3 W
$-V_{g1}$	= max.	150 V
W_{g1}	= max.	2x0,2 W
I_{g1}	= max.	2x4 mA
I_k	= max.	2x52 mA
I_{kp}	= max.	2x240 mA
V_{kf}	= max.	100 V

I.C.A.S. Operating conditions, intermittent service
Caractéristiques d'utilisation, service intermittent
Betriebsdaten, aussetzender Betrieb

f	=	200 Mc/s
$V_a = V_b$	=	200 V
V_{g2} [3]		
R_{g1} [1]	=	15 kΩ
V_{g1} p	=	130 V
I_a	=	2x43 mA
I_{g2}	=	3,1 mA
I_{g1}	=	3,3 mA
W_{ia}	=	2x8,6 W
W_a	=	2x3,7 W
W_{g2}	=	0,54 W
W_{ig1}	=	0,2 W
W_o	=	9,8 W
η	=	57 %
W_o [2]	=	8,8 W
m	=	100 %
W_{mod}	=	8,6 W



[1] [2] See page 4; voir page 4; siehe Seite 4
[3] See diagram; voir le schéma; siehe das Schaltbild

H.F. class C frequency tripler, two systems in push-pull
H.F. classe C tripleur de fréquence, deux systèmes en push-pull
HF-Klasse C Frequenzverdreifacher, zwei Systeme in Gegentakt

C.C.S. Limiting values, continuous service
Caractéristiques limites, service continu
Grenzdaten, Dauerbetrieb

f	= max.	200 Mc/s
V_a	= max.	300 V
W_a	= max.	2x5 W
W_{ia}	= max.	2x7,5 W
I_a	= max.	2x30 mA
V_{g_2}	= max.	200 V
W_{g_2}	= max.	2 W
$-V_{g_1}$	= max.	150 V
W_{g_1}	= max.	2x0,2 W
I_{g_1}	= max.	2x2 mA
I_k	= max.	2x35 mA
I_{k_p}	= max.	2x225 mA
V_{kf}	= max.	100 V

C.C.S. Operating conditions, continuous service
Caractéristiques d'utilisation, service continu
Betriebsdaten, Dauerbetrieb

f	=	67/200	67/200	67/200 Mc/s
$V_a = V_b$	=	300	250	200 V
V_{g_2}	=	150	161	155 V
R_{g_2}	=	-	47	15 kΩ
V_{g_1}	=	-100	-	- V
R_{g_1} [1]	=	-	47	33 kΩ
$V_{g_1 g_1 p}$	=	230	230	230 V
I_a	=	2x24	2x25	2x28,5 mA
I_{g_2}	=	2,0	1,9	3,0 mA
I_{g_1}	=	2x1,0	2x1,0	2x1,6 mA
W_{ia}	=	2x7,2	2x6,25	2x5,7 W
W_a	=	2x4,0	2x3,75	2x3,8 W
W_{g_2}	=	0,30	0,31	0,46 W
W_{ig_1}	=	0,23	0,23	0,35 W
W_o	=	6,5	5,0	3,8 W
η	=	45	40	33,5 %
W_o [2]	=	3,5	3,0	2,8 W

[1] [2] See page 4; voir page 4; siehe Seite 4

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H.F. class C frequency tripler, two systems in push-pull; continued
H.F. classe C tripleur de fréquence, deux systèmes en push-pull; continuation
HF-Klasse C Frequenzverdreifacher, zwei Systeme in Gegentakt; Fortsetzung

Limiting values, intermittent service
I.C.A.S. Caractéristiques limites, service intermittent
Grenzdaten, aussetzender Betrieb

f	= max.	200	Mc/s
V_a	= max.	300	V
W_a	= max.	2x7	W
W_{ia}	= max.	2x10	W
I_a	= max.	2x42	mA
V_{g2}	= max.	200	V
W_{g2}	= max.	2	W
$-V_{g1}$	= max.	150	V
W_{g1}	= max.	2x0,2	W
I_{g1}	= max.	2x3	mA
I_k	= max.	2x45	mA
I_{kp}	= max.	2x300	mA
V_{kf}	= max.	100	V

Operating conditions, intermittent service
I.C.A.S. Caractéristiques d'utilisation, service intermittent
Betriebsdaten, aussetzender Betrieb

f	=67/200	67/200	67/200	67/200	Mc/s
$V_a = V_b$	= 300	300	250	200	V
V_{g2}	= 150	175	176	175	V
R_{g2}	= -	-	18	4,7	kΩ
V_{g1}	= -100	-100	-	-	V
R_{g1} [1]	= -	-	27	22	kΩ
V_{g1g1p}	= 240	230	230	230	V
I_a	=2x32,5	2x32,5	2x36	2x39	mA
I_{g2}	= 3,5	2,7	4,1	5,2	mA
I_{g1}	= 2x1,9	2x1,2	2x1,9	2x2,3	mA
W_{ia}	= 2x9,7	2x9,7	2x9	2x7,8	W
W_a	= 2x5,8	2x6,1	2x5,9	2x5,55	W
W_{g2}	= 0,53	0,47	0,72	0,91	W
W_{ig1}	= 0,45	0,28	0,43	0,52	W
W_o	= 7,8	7,2	6,2	4,5	W
η	= 40	37	34,5	29	%
W_o [2]	= 4,8	4,2	4,2	3,5	W

1) 2) See page 4; voir page 4; siehe Seite 4

L.F. class AB amplifier and modulator without grid current
Amplificatrice et modulatrice B.F. classe AB sans courant de grille
NF-Verstärker und Modulator Klasse AB ohne Gitterstrom

Limiting values; only for speech and music
Caractéristiques limites; seulement pour parole et musique
Grenzdaten; nur für Sprache und Musik

V_a	= max.	300	V
W_a	= max.	2x7	W
W_{ia}	= max.	2x15	W
I_a	= max.	2x50	mA
V_{g2}	= max.	200	V
W_{g2}	= max.	2x1	W ←
W_{g2p}	= max.	2x2	W ←
$-V_{g1}$	= max.	150	V
W_{g1}	= max.	2x0,2	W
I_{g1}	= max.	2x4	mA
I_k	= max.	2x60	mA
I_{kp}	= max.	2x300	mA
V_{kf}	= max.	100	V

Operating conditions
Caractéristiques d'utilisation
Betriebsdaten

V_a	=	300		250		200	V
V_{g2}	=	200		200		200	V
V_{g1} [1]	=	-21,5		-21,5		-21,5	V
$R_{aa'}$	=	10		8		6,5	kΩ
$V_{g1g1'p}$	=	0	43,5	0	44,5	0	43,5 V
I_a	=	2x15	2x36	2x15	2x34,5	2x15	2x33 mA
I_{g2}	=	1,2	12,6	1,4	12,4	2,4	14 mA
W_{g2}	=	0,24	2,5	0,28	2,5	0,48	2,8 W
W_{ia}	=	2x4,5	2x10,8	2x3,75	2x8,65	2x3,0	2x6,6 W
W_a	=	2x4,5	2x4,8	2x3,75	2x4,0	2x3,0	2x3,1 W
W_o	=	0	12	0	9,3	0	7,0 W
η	=	-	56	-	54	-	53 %
d_{tot}	=	-	2,5	-	2,7	-	3,2 %

→ [1] Individual adjustment of the grid bias of each system is recommended
Il est recommandé de régler la polarisation négative de chaque système individuellement
Es wird empfohlen die Gittervorspannung jedes Systems einzeln zu regeln

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L.F. class AB amplifier and modulator with grid current
Amplificatrice et modulatrice B.F. classe AB avec courant de grille
NF-Verstärker und Modulator Klasse AB mit Gitterstrom

Limiting values; only for speech and music
Caractéristiques limites; seulement pour parole et musique
Grenzdaten; nur für Sprache und Musik

V_a	= max.	300 V
W_a	= max.	2x7 W
W_{ia}	= max.	2x15 W
I_a	= max.	2x50 mA
V_{g2}	= max.	200 V
W_{g2}	= max.	2x1 W
W_{g2p}	= max.	2x2 W
$-V_{g1}$	= max.	150 V
W_{g1}	= max.	2x0,2 W
I_{g1}	= max.	2x4 mA
I_k	= max.	2x60 mA
I_{kp}	= max.	2x300 mA
V_{kf}	= max.	100 V

Operating conditions
Caractéristiques d'utilisation
Betriebsdaten

V_a	=	300		250		200	V
V_{g2}	=	200		200		200	V
V_{g1} [1]	=	-21,5		-21,5		-21,5	V
$R_{aa'}$	=	6,5		5,0		5,0	kΩ
$V_{g1g1'p}$	=	0	64	0	67	0	54 V
I_a	=	2x15	2x50	2x15	2x50	2x15	2x41,1 mA
I_{g2}	=	1,2	11,4	1,4	13	2,4	19 mA
I_{g1}	=	0	2x0,56	0	2x0,62	0	2x0,22 mA
W_{g2}	=	0,24	2,3	0,28	2,6	0,48	3,8 W
W_{ig1}	=	0	2x0,02	0	2x0,02	0	2x0,01 W
W_{ia}	=	2x4,5	2x15	2x3,75	2x12,5	2x3,0	2x8,22 W
W_a	=	2x4,5	2x6,25	2x3,75	2x5,5	2x3,0	2x3,87 W
W_o	=	0	17,5	0	14	0	8,7 W
η	=	-	58	-	56	-	53 %
d_{tot}	=	-	5,0	-	5,5	-	6,0 %

[1] See page 9; voir page 9; siehe Seite 9

7R51200
QQE 03/12 4-3-'55
V_{g2} = 150V
V_{g1} = +30V
+25V
+20V
+15V
+10V
+5V
0
−5V
−10V
−15V
I_a (mA)
400
300
200
100
0
0
50
100
150
200
250
300
V_a (V)

PHILIPS

7R5120I
QQE 03/12 4-3-'55
I_{g2} (mA)
400
300
200
100
0
$V_{g2}=150V$
$V_{g1}=+30V$
+25V
+20V
+15V
+10V
+5V
0V
−5V
−10V
−15V
50
100
150
200
250
300
V_a (V)

PHILIPS

QQE 03/12

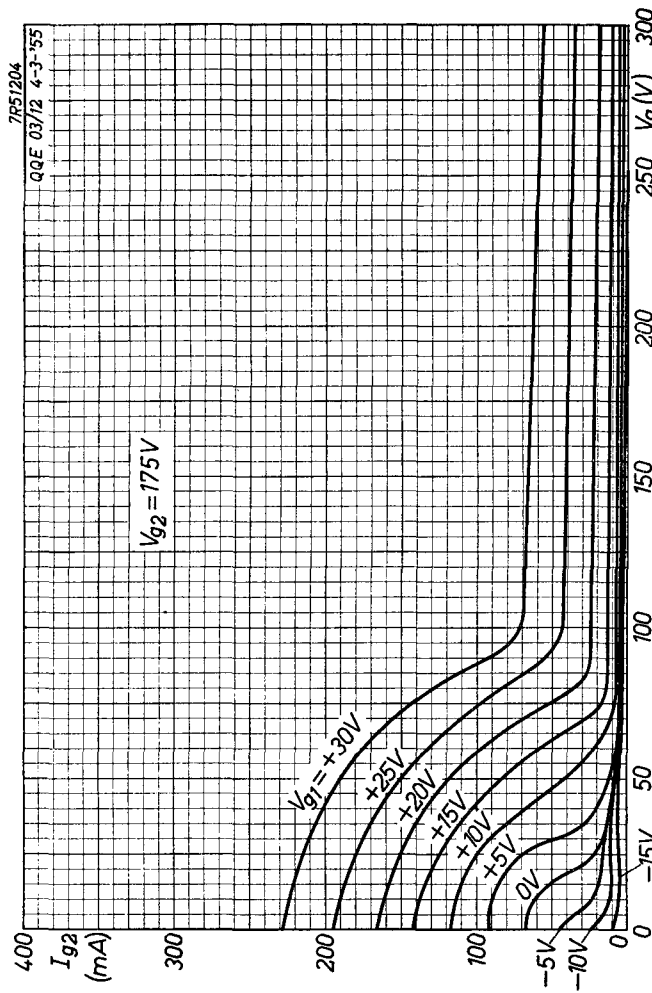
3.3.1955

C

QQE 03/12

PHILIPS

D


7R51204
QQE 03/12 4-3-'55
V_{g2} = 175 V
V_{g1} = +30V
+25V
+20V
+15V
+10V
+5V
0V
−5V
−10V
−15V
I_{g2} (mA)
400
300
200
100
0
0
50
100
150
200
250
300
V_a (V)

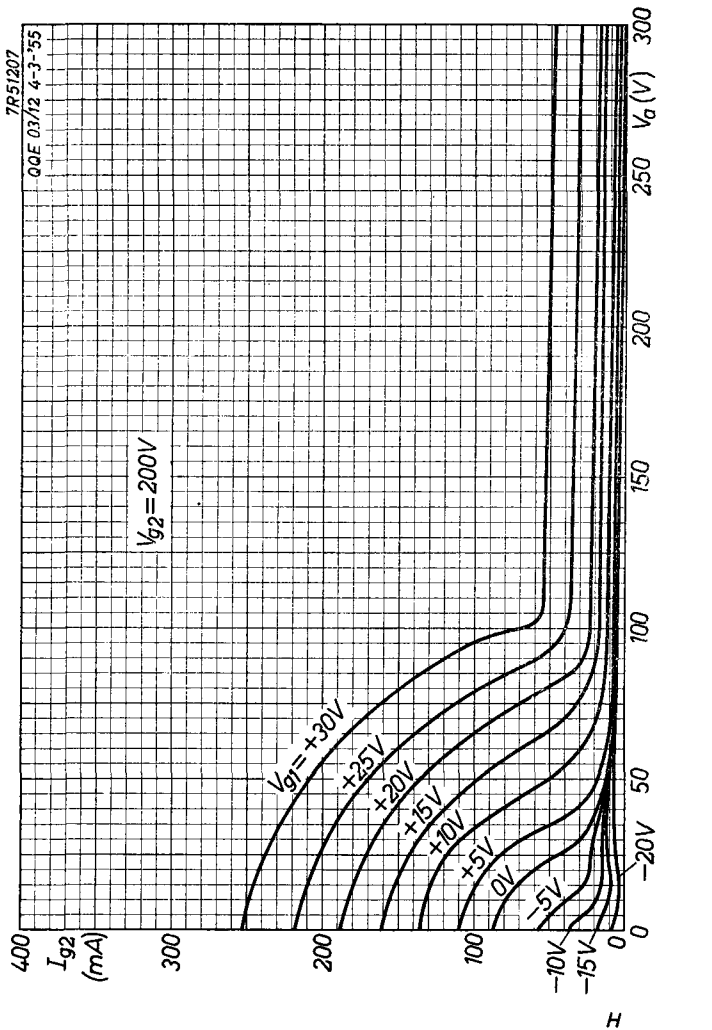
QQE 03/12

PHILIPS

F

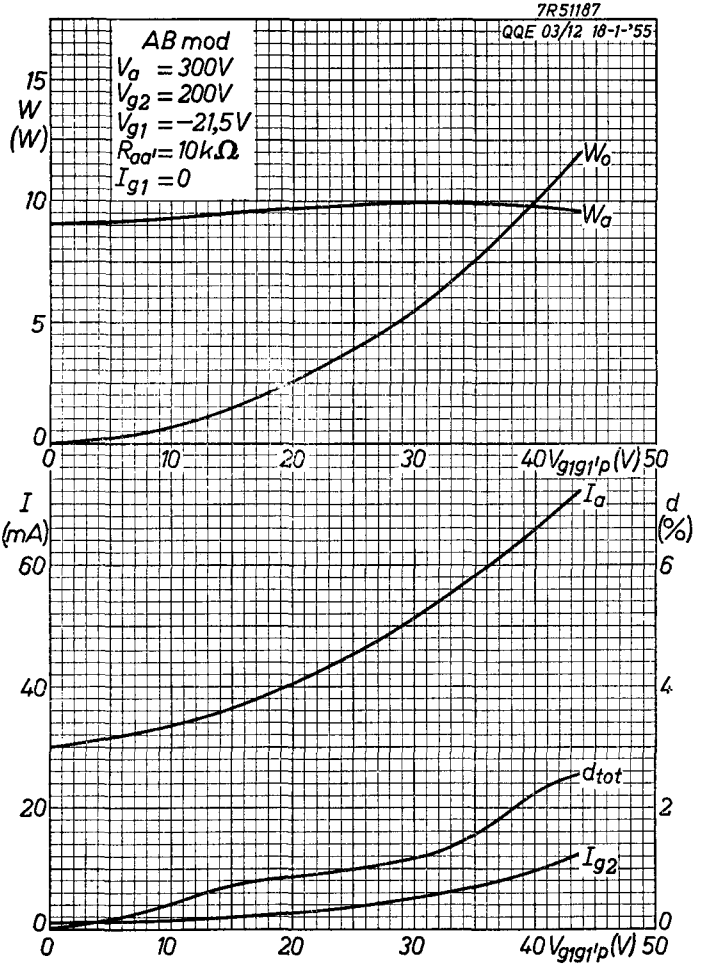
7R51206
QQE 03/12 4-3-'55
V_{g2} = 200 V
V_{g1} = +30V
+25V
+20V
+15V
+10V
+5V
0V
−5V
−10V
−15V
−20V
I_a (mA)
400
300
200
100
0
0
50
100
150
200
250
300
V_a (V)

PHILIPS

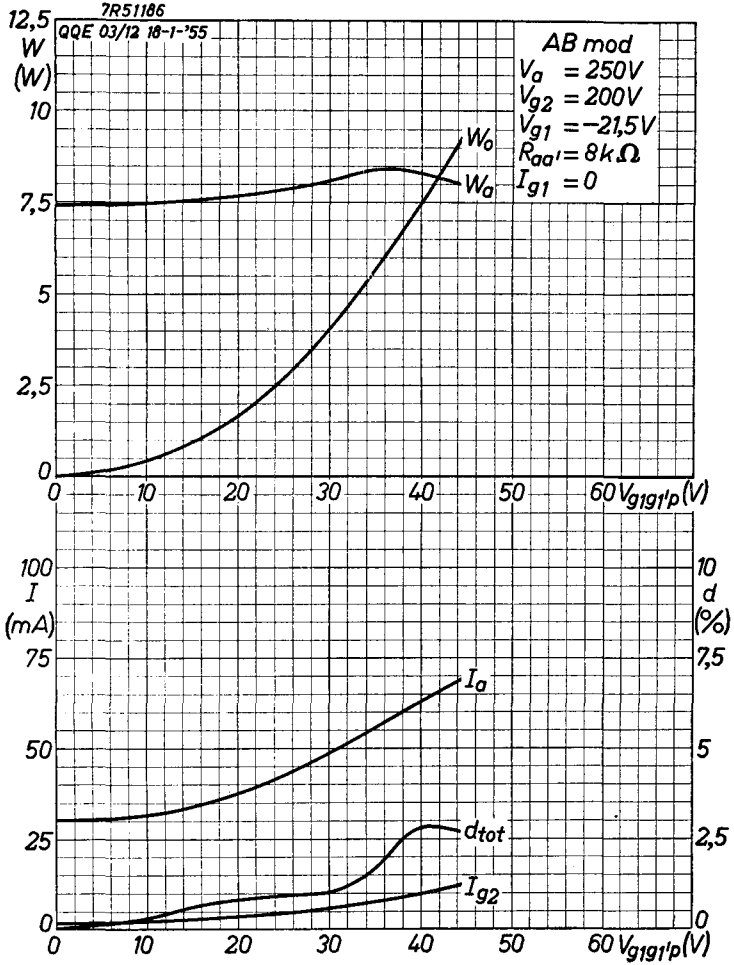

7R51207
QQE 03/12 4-3-'55
V_{g2} = 200V
V_{g1} = +30V
+25V
+20V
+15V
+10V
+5V
0V
−5V
−10V
−15V
−20V
I_{g2} (mA)
400
300
200
100
0
0
50
100
150
200
250
300
V_a (V)
H

7R51208
QQE 03/12 4-3-'55
V_{g1} =
+30V
+25V
+20V
+15V
+10V
+5V
V_{g2} = 200V
I_{g1} (mA)
80
60
40
20
0
0
50
100
150
200
250
300
V_a (V)

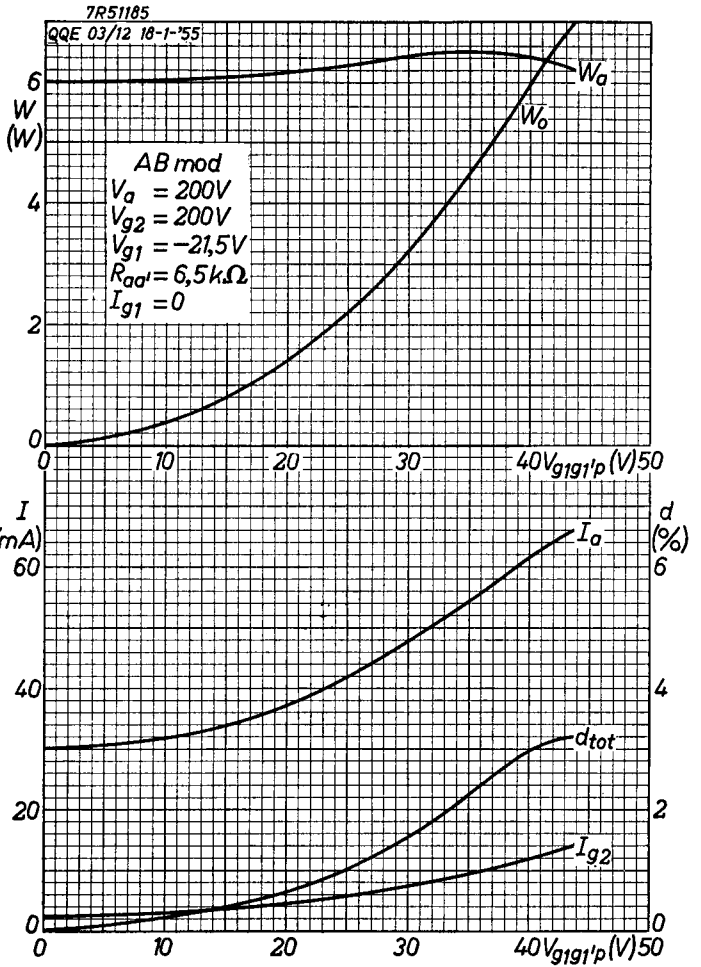
PHILIPS


7R51187
QQE 03/12 18-1-'55
AB mod
V_a = 300V
V_{g2} = 200V
V_{g1} = −21,5V
$R_{aa'}$ = 10kΩ
I_{g1} = 0
W (W)
15
10
5
0
W_o
W_a
0
10
20
30
40
50
$V_{g1g1'p}$ (V)
I (mA)
60
40
20
0
I_a
d_{tot}
I_{g2}
d (%)
6
4
2
0

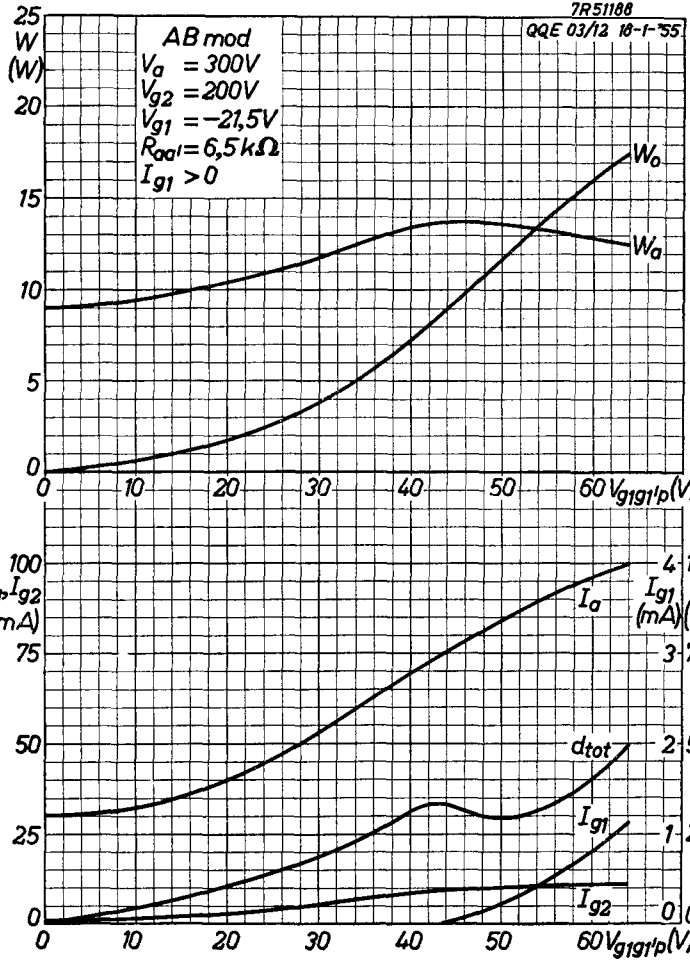
J


7R51186
QQE 03/12 18-1-'55
12,5
W
(W)
10
7,5
5
2,5
0
AB mod
V_a = 250V
V_{g2} = 200V
V_{g1} = −21,5V
$R_{aa'}$ = 8kΩ
I_{g1} = 0
W_o
W_a
0
10
20
30
40
50
60 $V_{g1g1'p}$(V)
100
I
(mA)
75
50
25
0
10
d
(%)
7,5
5
2,5
0
I_a
d_{tot}
I_{g2}
0
10
20
30
40
50
60 $V_{g1g1'p}$(V)

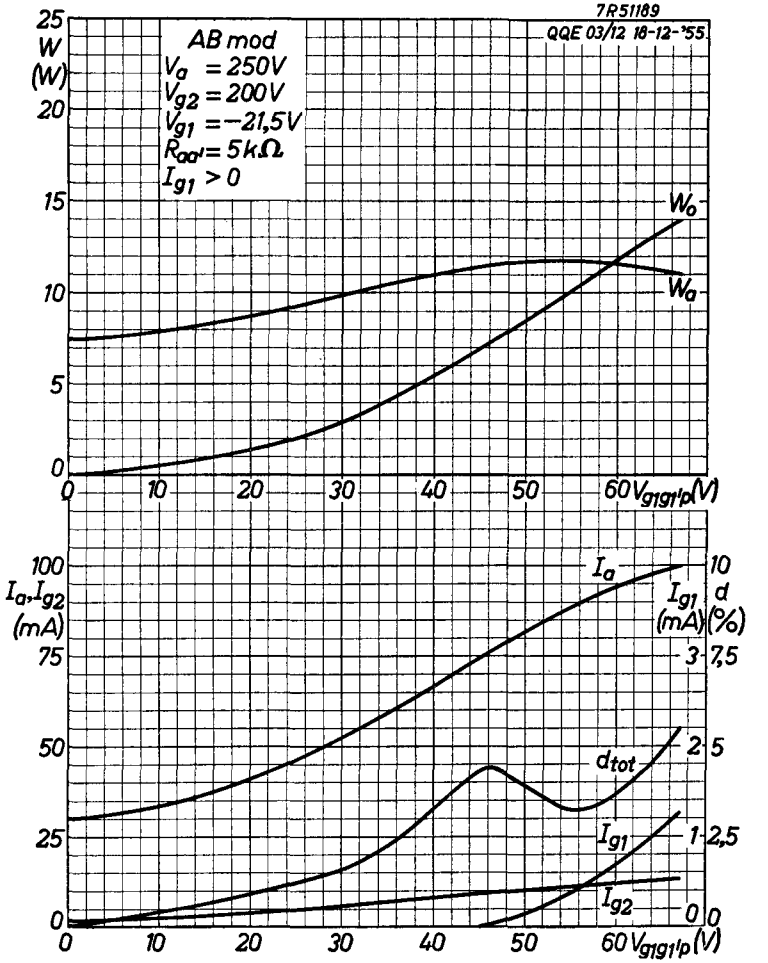
PHILIPS


7R51185
QQE 03/12 18-1-'55
W
(W)
6
4
2
0
W_a
W_o
AB mod
V_a = 200V
V_{g2} = 200V
V_{g1} = −21,5V
$R_{aa'}$ = 6,5 kΩ
I_{g1} = 0
0
10
20
30
40
$V_{g1g1'p}$ (V)
50
I
(mA)
60
40
20
0
d
(%)
6
4
2
0
I_a
d_{tot}
I_{g2}

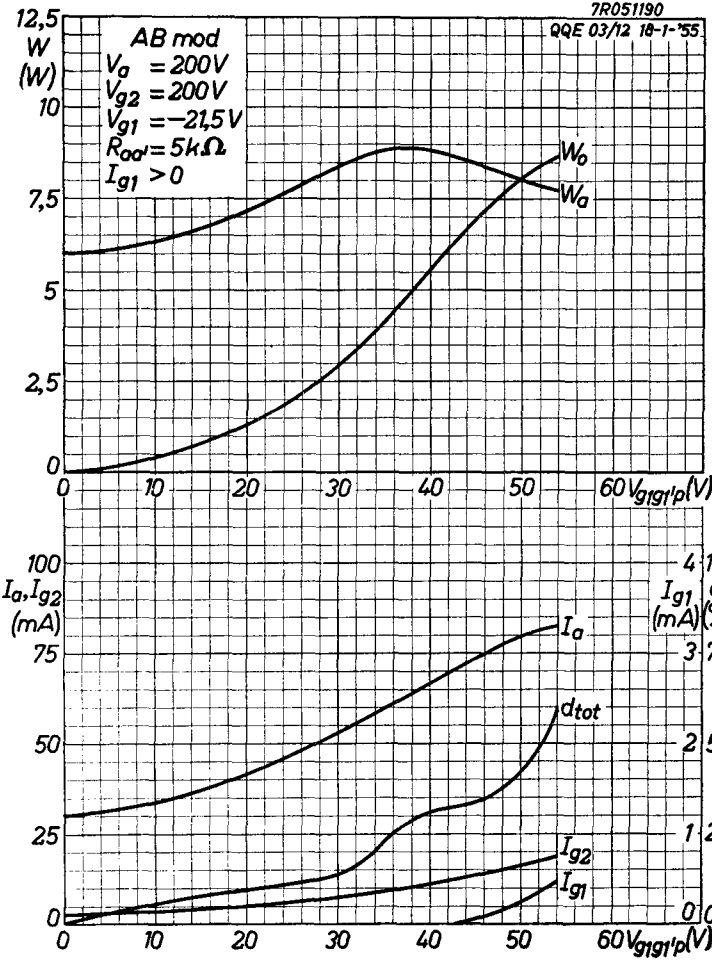
L


7R51188
QQE 03/12 18-1-'55
AB mod
V_a = 300V
V_{g2} = 200V
V_{g1} = −21,5V
$R_{aa'}$ = 6,5 kΩ
I_{g1} > 0
W (W)
W_o
W_a
$V_{g1g1'p}$ (V)
I_a, I_{g2} (mA)
I_a
I_{g1} (mA)
d (%)
d_{tot}
I_{g1}
I_{g2}

PHILIPS


7R51189
QQE 03/12 18-12-'55
AB mod
V_a = 250V
V_{g2} = 200V
V_{g1} = −21,5V
$R_{aa'}$ = 5kΩ
I_{g1} > 0
W (W)
W_o
W_a
$V_{g1g1'p}$ (V)
I_{a}, I_{g2} (mA)
I_a
I_{g1} (mA)
d (%)
d_{tot}
I_{g1}
I_{g2}

N


7R051190
QQE 03/12 18-1-'55
AB mod
V_a = 200V
V_{g2} = 200V
V_{g1} = −21,5V
$R_{aa'}$ = 5kΩ
I_{g1} > 0
12,5
W
(W)
10
7,5
5
2,5
0
W_o
W_a
0
10
20
30
40
50
60 $V_{g1g1'p}$(V)
100
I_a,I_{g2}
(mA)
75
50
25
0
I_a
d_{tot}
I_{g2}
I_{g1}
4
3
2
1
0
I_{g1}
(mA)
10
7,5
5
2,5
0
d
(%)

PHILIPS

Electronic Tube HANDBOOK

QQE03/12

page	sheet	date
1	1	1956.03.03
2	2	1956.03.03
3	3	1956.03.03
4	4	1956.03.03
5	5	1955.04.04
6	6	1955.04.04
7	7	1956.03.03
8	8	1956.03.03
9	9	1956.02.02
10	10	1956.02.02
11	A	1955.03.03
12	B	1955.03.03
13	C	1955.03.03
14	D	1955.03.03
15	E	1955.03.03
16	F	1955.03.03
17	G	1955.03.03
18	H	1955.03.03
19	I	1955.03.03

20	J	1955.03.03
21	K	1955.03.03
22	L	1955.03.03
23	M	1955.03.03
24	N	1955.03.03
25	O	1955.03.03
26, 27	FP	1999.09.18

DOUBLE TETRODE for use as R.F. class C amplifier at frequencies up to 600 Mc/s or as L.F. amplifier
DOUBLE TETRODE pour utilisation en amplificatrice H.F. classe C à des fréquences jusqu'à 600 Mc/s ou en amplificatrice B.F.
DOPPELTETRODE zur Verwendung als H.F. Klasse C Verstärker bei Frequenzen bis 600 MHz oder als NF-Verstärker

Cathode: oxide coated
Cathode: oxyde
Katode : Oxyd

V_f = 6,3 12,6 V
I_f = 1,3 0,65 A

Pins
Broches 5-(1+7) 1-7
Stifte

Heating : indirect, series or parallel supply
Chauffage: indirect, alimentation en série ou en parallèle
Heizung : indirekt, Serien- oder Parallelspeisung

Capacitances Capacités Kapazitäten	per system par système pro System		in push-pull en push-pull in Gegentakt	
See page 2 for internal neutralisation (C_n, C_n') Voir page 2 pour neutralisation interne (C_n, C_n') Für Neutrodynisierung siehe Seite 2 (C_n, C_n')	C_a =	2,6 pF	C_o =	1,6 pF
	C_{g1} =	7,0 pF	C_i =	4,4 pF
	C_{ag1} <	0,08 pF		
	C_{ag1}-C_n <	0,035 pF		

Typical characteristics
Caractéristiques types
Kenndaten

μ_{g2g1} (I_a=20 mA) = 8
S (I_a=20 mA) = 2,5 mA/V

Two systems; deux systèmes; zwei Systeme

λ	Freq.	C telegr.		C_{ag2} mod		λ	Freq.	Cfr. mult	
		V_a	W_o	V_a	W_o			V_a	W_o
m	Mc/s	(V)	(W)	(V)	(W)	m	Mc/s	(V)	(W)
1,5	200	600	48	500	31	4,5/1,5	67/200	300	10
		400	30	300	17	2,25/0,75	133/400	300	8
		300	21						
		200	13						
→ 0,75	400	400	24	300	13				
		300	17						
		200	11						
→ 0,5	600	400	20						

B mod.	
V_a (V)	W_o (W)
500	23,5
400	13,2

DOUBLE TETRODE for use as R.F. class C amplifier at frequencies up to 600 Mc/s or as L.F. amplifier
DOUBLE TETRODE pour utilisation en amplificatrice H.F. classe C à des fréquences jusqu'à 600 Mc/s ou en amplificatrice B.F.
DOPPELTETRODE zur Verwendung als H.F. Klasse C Verstärker bei Frequenzen bis 600 MHz oder als NF-Verstärker

Cathode: oxide coated — V_f = 6,3 12,6 V
Cathode: oxyde — I_f = 1,3 0,65 A
Katode : Oxyd

Pins
Broches 5-(1+7) 1-7
Stifte

Heating : indirect, series or parallel supply
Chauffage: indirect, alimentation en série ou en parallèle
Heizung : indirekt, Serien- oder Parallelspeisung

Capacitances Capacités Kapazitäten	per system par système pro System		in push-pull en push-pull in Gegentakt	
See page 2 for internal neutralisation (C_n, C_n') Voir page 2 pour neutralisation interne (C_n, C_n') Für Neutrodynisierung siehe Seite 2 (C_n, C_n')	C_a = 2,6 pF		C_o = 1,6 pF	
	C_{g1} = 7,0 pF		C_i = 4,4 pF	
	C_{ag1} < 0,08 pF			
	C_{ag1-Cn} < 0,035 pF			

Typical characteristics
Caractéristiques types
Kenndaten

μ_{g2g1} (I_a=20 mA) = 8
S (I_a=20 mA) = 2,5 mA/V

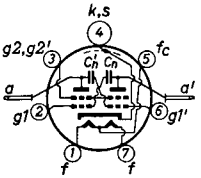
Two systems; deux systèmes; zwei Systeme

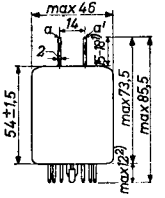
λ	Freq.	C telegr.		C_{ag2} mod	
		V_a	W_o	V_a	W_o
m	Mc/s	(V)	(W)	(V)	(W)
1,5	200	600	48	500	31
		400	30	300	17
		300	21		
		200	13		
0,75	400	400	24	300	13
		300	17		
		200	11		
0,5	600	400	20		

λ	Freq.	Cfr. mult	
		V_a	W_o
m	Mc/s	(V)	(W)
4,5/1,5	67/200	300	10
2,25/0,75	133/400	300	8

B mod.	
V_a	W_o
(V)	(W)
500	23,5
400	13,2

Dimensions in mm
Dimensions en mm
Abmessungen in mm





Base, culot, Sockel: SEPTAR

Socket		Clips	
Support	40202	Bornes de connexion	40623
Fassung		Anschlussklemmen	

Mounting position: arbitrary
Montage : arbitrairement
Einbau : willkürlich

Cooling Temperature of seals max. 180 °C

Generally natural cooling is sufficient with:
V_a = 600 V up to 150 Mc/s
V_a = 500 V up to 200 Mc/s
V_a = 300 V up to 430 Mc/s
Above these limits or with high ambient temperatures it may be necessary to direct an air flow of about 15 l/min. on top of the bulb to keep the seal temperature within the stated limit.

Refroidissement Température des scellements max. 180 °C

En général refroidissement naturel est suffisant à:
V_a = 600 V jusqu'à 150 MHz
V_a = 500 V jusqu'à 200 MHz
V_a = 300 V jusqu'à 430 MHz

A des fréquences plus élevées ou à des températures élevées il peut être nécessaire de diriger un courant d'air d'environ 15 l/min. sur la partie supérieure de l'ampoule afin de ne pas passer la limite de température mentionnée

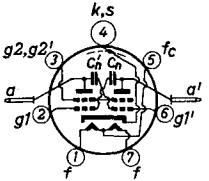
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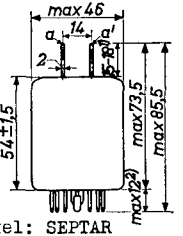
[1] Max. 3 mm glass included
Y inclus 3 mm de verre au max.
Einschliesslich max. 3 mm Glas

[2] Max. 2.5 mm glas included
Y inclus 2,5 mm de verre au max.
Einschliesslich max. 2,5 mm Glas

PHILIPS

Dimensions in mm
Dimensions en mm
Abmessungen in mm





Base, culot, Sockel: SEPTAR

Socket		Clips	
Support	40202	Bornes de connexion	40623
Fassung		Anschlussklemmen	

Mounting position: arbitrary
Montage : arbitrairement
Einbau : willkürlich

→ Cooling Temperature of anode seals and bulb max. 220 °C
Temperature of bottom seals max. 180 °C

Generally natural cooling is sufficient with:
V_a = 600 V up to 150 Mc/s
V_a = 500 V up to 200 Mc/s
V_a = 300 V up to 430 Mc/s
Above these limits or with high ambient temperatures it may be necessary to direct an air flow of about 15 l/min. on top of the bulb to keep the seal temperatures within the stated limits

→ Refroidissement Température des scellements anodiques et de l'ampoule max. 220 °C
Température des scellements du fond max. 180 °C

En général refroidissement naturel est suffisant à:
V_a = 600 V jusqu'à 150 MHz
V_a = 500 V jusqu'à 200 MHz
V_a = 300 V jusqu'à 430 MHz

A des fréquences plus élevées ou à des températures élevées il peut être nécessaire de diriger un courant d'air d'environ 15 l/min. sur la partie supérieure de l'ampoule afin de ne pas dépasser les limites de température mentionnées

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1) Max. 3 mm glass included
Y inclus 3 mm de verre au max.
Einschliesslich max. 3 mm Glas

2) Max. 2.5 mm glas included
Y inclus 2,5 mm de verre au max.
Einschliesslich max. 2,5 mm Glas

Kühlung Temperatur der Einschmelzungen max. 180°C

Im allgemeinen wird natürliche Kühlung genügen wenn:

V_a = 600 V bis 150 MHz
V_a = 500 V bis 200 MHz
V_a = 300 V bis 430 MHz

Oberhalb dieser Grenzen oder bei hohen Umgebungstemperaturen kann ein Luftstrom von etwa 15 l/min. auf die Obenseite des Kolbens nötig sein, damit die genannte Temperaturgrenze der Einschmelzungen nicht überschritten wird.

Net weight
Poids net
Nettogewicht 55 g

Shipping weight
Poids brut
Bruttogewicht 140 g

H.F. class C telegraphy
H.F. classe C télégraphie
H.F. Klasse C Telegrafie

Limiting values
Caractéristiques limites
Grenzdaten

V_a	= max.	600 V
W_a	= max.	2x10 W
V_{g2}	= max.	250 V
W_{g2}	= max.	2x1,5 W
$-V_{g1}$	= max.	75 V
I_k	= max.	2x55 mA
R_{g1} [1])	= max.	50 kΩ
R_{g1} [2])	= max.	100 kΩ
I_{g1}	= max.	2x2,5 mA
V_{kf}	= max.	100 V ←

[1]) Fixed bias
Polarisation de grille fixe
Feste Gittervorspannung

[2]) Automatic bias
Polarisation de grille automatique
Automatische Gittervorspannung

→ Kühlung Temperatur der Anodeneinschmelzungen und des Kolbens max. 220 °C
Temperatur der Bodeneinschmelzungen max. 180 °C

Im allgemeinen wird natürliche Kühlung genügen wenn:

V_a = 600 V bis 150 MHz
V_a = 500 V bis 200 MHz
V_a = 300 V bis 430 MHz

Oberhalb dieser Grenzen oder bei hohen Umgebungstemperaturen kann ein Luftstrom von etwa 15 l/Min. auf die Obenseite des Kolbens nötig sein, damit die genannte Temperaturgrenzen der Einschmelzungen nicht überschritten werden.

Net weight
Poids net
Nettogewicht 55 g

Shipping weight
Poids brut
Bruttogewicht 140 g

H.F. class C telegraphy
H.F. classe C télégraphie
H.F. Klasse C Telegrafie

Limiting values
Caractéristiques limites
Grenzdaten

V_a	= max.	600	V
W_a	= max.	2x10	W
V_{g_2}	= max.	250	V
W_{g_2}	= max.	2x1,5	W
$-V_{g_1}$	= max.	75	V
I_k	= max.	2x55	mA
R_{g_1} [1]	= max.	50	kΩ
R_{g_1} [2]	= max.	100	kΩ
I_{g_1}	= max.	2x2,5	mA
V_{kf}	= max.	100	V

[1]) Fixed bias
Polarisation de grille fixe
Feste Gittervorspannung

[2]) Automatic bias
Polarisation de grille automatique
Automatische Gittervorspannung

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H.F. class C telegraphy (continued)
H.F. classe C télégraphie (continuation)
HF Klasse C Telegraphie (Fortsetzung)

Operating conditions
Caractéristiques d'utilisation
Betriebsdaten

λ	=	1,5	1,5	1,5	1,5	m
f	=	200	200	200	200	Mc/s
V_a	=	600	400	300	200	V
V_{g2}	=	250	250	250	200	V
V_{g1}	=	-60	-50	-40	-30	V
I_a	=	2x50	2x50	2x50	2x50	mA
I_{g2}	=	2x4	2x4	2x4,5	2x4	mA
I_{g1}	=	2x0,7	2x0,7	2x0,7	2x1	mA
W_{ia}	=	2x30	2x20	2x15	2x10	W
W_a	=	2x6	2x5	2x4,5	2x3,5	W
W_{g2}	=	2x1,0	2x1,0	2x1,1	2x0,8	W
W_{ig1}	=	1,5	1	< 1	< 1	W
W_o	=	48	30	21	13	W
η	=	80	75	70	65	%
λ	=	0,75	0,75	0,75	0,5	m
f	=	400	400	400	600	Mc/s
V_a	=	400	300	200	400	V
V_{g2}	=	250	250	200	250	V
V_{g1}	=	-50	-40	-30	-50	V
I_a	=	2x50	2x50	2x50	2x50	mA
I_{g2}	=	2x2,5	2x2,5	2x3,0	2x2,5	mA
I_{g1}	=	2x0,7	2x0,6	2x0,5	2x0,7	mA
W_{ia}	=	2x20	2x15	2x10	2x20	W
W_a	=	2x8	2x6,5	2x4,5	2x10	W
W_{g2}	=	2x0,6	2x0,6	2x0,6	2x0,63	W
W_{ig1}	=	2	1,5	1		W
W_o	=	24	17	11	20	W
η	=	60	57	55	50	%

PHILIPS

H.F. class C telegraphy (continued)
H.F. classe C télégraphie (continuation)
HF Klasse C Telegraphie (Fortsetzung)

Operating conditions
Caractéristiques d'utilisation
Betriebsdaten

λ	=	1,5	1,5	1,5	1,5	m
f	=	200	200	200	200	Mc/s
V_a	=	600	400	300	200	V
V_{g2}	=	250	250	250	200	V
V_{g1}	=	-60	-50	-40	-30	V
I_a	=	2x50	2x50	2x50	2x50	mA
I_{g2}	=	2x4	2x4	2x4,5	2x4	mA
I_{g1}	=	2x0,7	2x0,7	2x0,7	2x1	mA
W_{ia}	=	2x30	2x20	2x15	2x10	W
W_a	=	2x6	2x5	2x4,5	2x3,5	W
W_{g2}	=	2x1,0	2x1,0	2x1,1	2x0,8	W
W_{ig1}	=	1,5	1	< 1	< 1	W
W_o	=	48	30	21	13	W
η	=	80	75	70	65	%

λ	=	0,75	0,75	0,75	0,5	m
f	=	400	400	400	600	Mc/s
V_a	=	400	300	200	400	V
V_{g2}	=	250	250	200	250	V
V_{g1}	=	-50	-40	-30	-50	V
I_a	=	2x50	2x50	2x50	2x50	mA
I_{g2}	=	2x2,5	2x2,5	2x3,0	2x2,5	mA
I_{g1}	=	2x0,7	2x0,6	2x0,5	2x0,7	mA
W_{ia}	=	2x20	2x15	2x10	2x20	W
W_a	=	2x8	2x6,5	2x4,5	2x10	W
W_{g2}	=	2x0,6	2x0,6	2x0,6	2x0,63	W
W_{ig1}	=	2	1,5	1		W
W_o	=	24	17	11	20	W
η	=	60	57	55	50	%

H.F. class C anode and screen-grid modulation
H.F. classe C modulation d'anode et de grille-écran
HF Klasse C Anoden- und Schirmgittermodulation

Limiting values
Caractéristiques limites
Grenzdaten

V_a	= max.	500	V
W_a	= max.	2x10	W
V_{g2}	= max.	250	V
W_{g2}	= max.	2x1,5	W
$-V_{g1}$	= max.	100	V
I_k	= max.	2x50	mA
I_{g1}	= max.	2x2,5	mA
V_{kf}	= max.	100	V

Operating conditions
Caractéristiques d'utilisation
Betriebsdaten

λ	=	1,5	1,5	0,75 m
f	=	200	200	400 Mc/s
V_a	=	500	300	300 V
V_{g2}	=	250	250	250 V
V_{g1}	=	-80	-50	-50 V
I_a	=	2x40	2x40	2x40 mA
I_{g2}	=	2x4	2x4	2x3 mA
I_{g1}	=	2x1,0	2x1,0	2x1,0 mA
W_{ia}	=	2x20	2x12	2x12 W
W_a	=	2x4,5	2x3,5	2x5,5 W
W_{g2}	=	2x1	2x1	2x0,75 W
W_{ig1}	=	2x5	2x2,5	W
W_o	=	31	17	13 W
η	=	77,5	71	54 %
m	=	100	100	100 %
W_{mod}	=	20	12	12 W

PHILIPS

H.F. class C frequency trebler
H.F. classe C tripleur de fréquence
HF Klasse C Frequenzverdreifacher

Limiting values Caractéristiques limites Grenzdaten	V_a	= max.	600 V
	W_a	= max.	2x10 W
	V_{g2}	= max.	250 V
	W_{g2}	= max.	2x1,5 W
	$-V_{g1}$	= max.	200 V
	I_k	= max.	2x50 mA
	R_{g1} [1]	= max.	50 kΩ
	R_{g1} [2]	= max.	100 kΩ
	I_{g1}	= max.	2x2,5 mA
	V_{kf}	= max.	100 V ←

Operating conditions
Caractéristiques d'utilisation
Betriebsdaten

λ	=	4,5/1,5	2,25/0,75 m
f	=	66,7/200	133/400 Mc/s
V_a	=	300	300 V
V_{g2}	=	250	250 V
V_{g1}	=	-175	-175 V
I_a	=	2x45	2x45 mA
I_{g2}	=	2x3,0	2x2,8 mA
I_{g1}	=	2x1,5	2x1,2 mA
W_{ia}	=	2x13,5	2x13,5 W
W_a	=	2x8,5	2x9,5 W
W_{g2}	=	2x0,75	2x0,7 W
W_{ig1}	=	2x1	2x2 W
W_o	=	10	8,0 W
η	=	37	29,5 %

[1]) Fixed bias
Polarisation de grille fixe
Feste Gittervorspannung

[2]) Automatic bias
Polarisation de grille automatique
Automatische Gittervorspannung

L.F. class B amplifier and modulator
Amplificatrice et modulatrice B.F. classe B
NF Klasse B Verstärker und Modulator

Limiting values
Caractéristiques limites
Grenzdaten

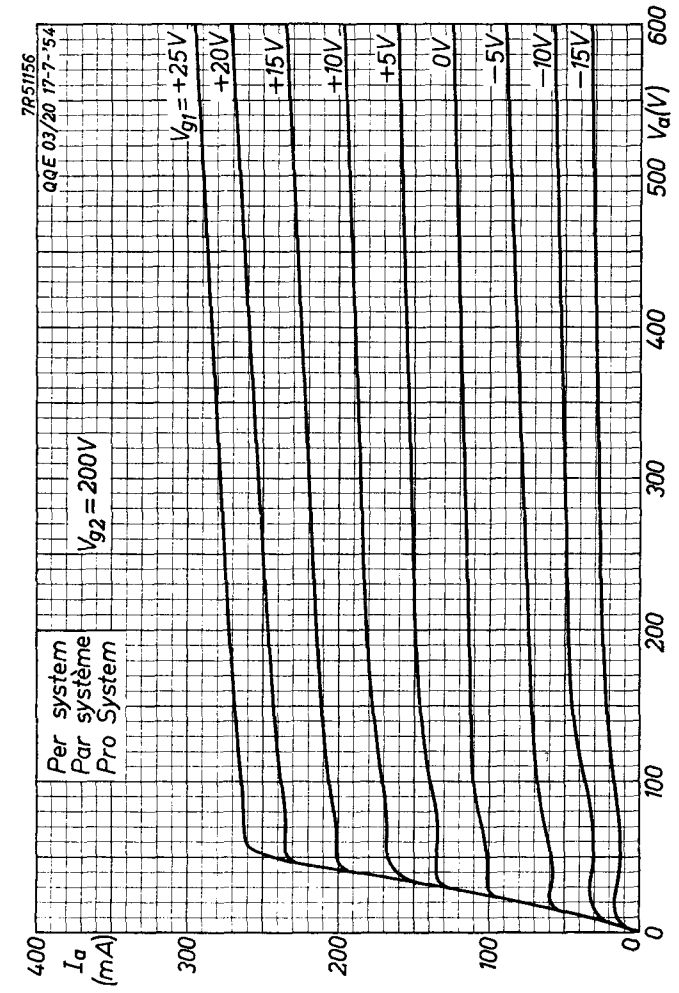
V_a	= max.	600	V
W_a	= max.	2x10	W
V_{g2}	= max.	250	V
W_{g2}	= max.	2x1,5	W
$-V_{g1}$	= max.	75	V
I_k	= max.	2x55	mA
R_{g1}	= max.	50	kΩ [1]
R_{g1}	= max.	100	kΩ [2]
V_{kf}	= max.	100	V

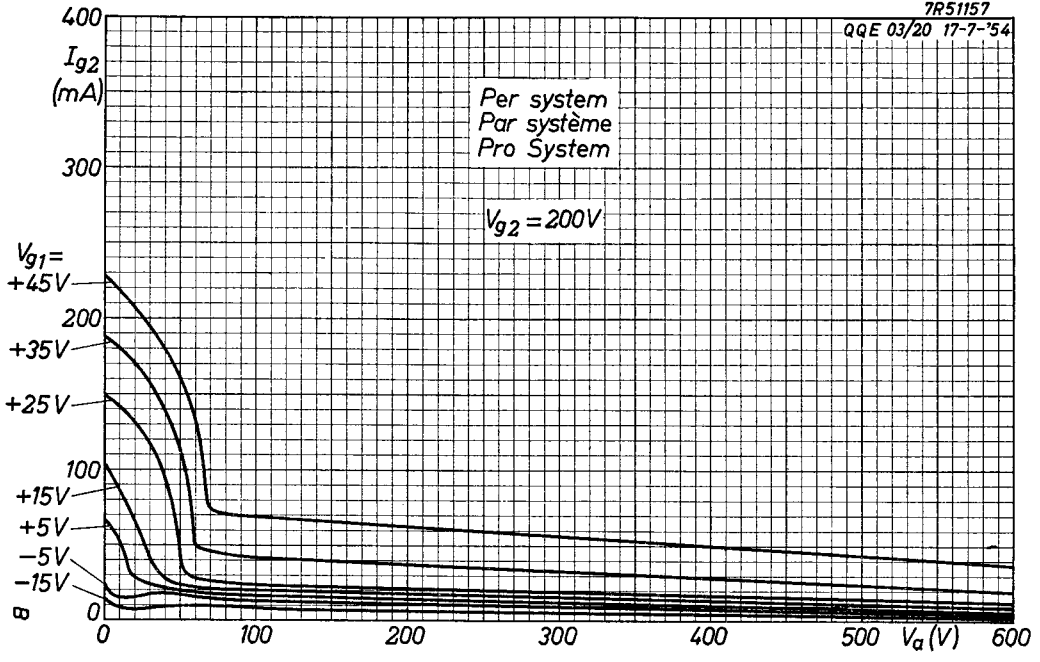
Operating conditions
Caractéristiques d'utilisation
Betriebsdaten

V_a	=	500		300		V
V_{g2}	=	250		250		V
V_{g1}	=	-26		-25		V
$R_{aa'}$	=	20		11		kΩ
$V_{g1g1'_p}$	=	0	52	0	50	V
I_a	=	2x12,5	2x36,5	2x12,5	2x35	mA
I_{g2}	=	2x0,35	2x8,1	2x0,6	2x9,5	mA
W_{g2}	=	0,18	4,05	0,3	4,75	W
W_{ia}	=	2x6,25	2x18,25	2x3,75	2x10,5	W
W_a	=	2x6,25	2x6,5	2x3,75	2x3,9	W
W_o	=	0	23,5	0	13,2	W
d_{tot}	=	-	3,5	-	3,5	%
η	=	-	63,5	-	63	%

[1] Fixed bias
Polarisation de grille fixe
Feste Gittervorspannung

[2] Automatic bias
Polarisation de grille automatique
Automatische Gittervorspannung


7R51156
QQE 03/20 17-7-54
Per system
Par système
Pro System
$V_{g2} = 200V$
$V_{g1} = +25V$
+20V
+15V
+10V
+5V
0V
−5V
−10V
−15V
I_a (mA)
400
300
200
100
0
0
100
200
300
400
500
600
V_a(V)

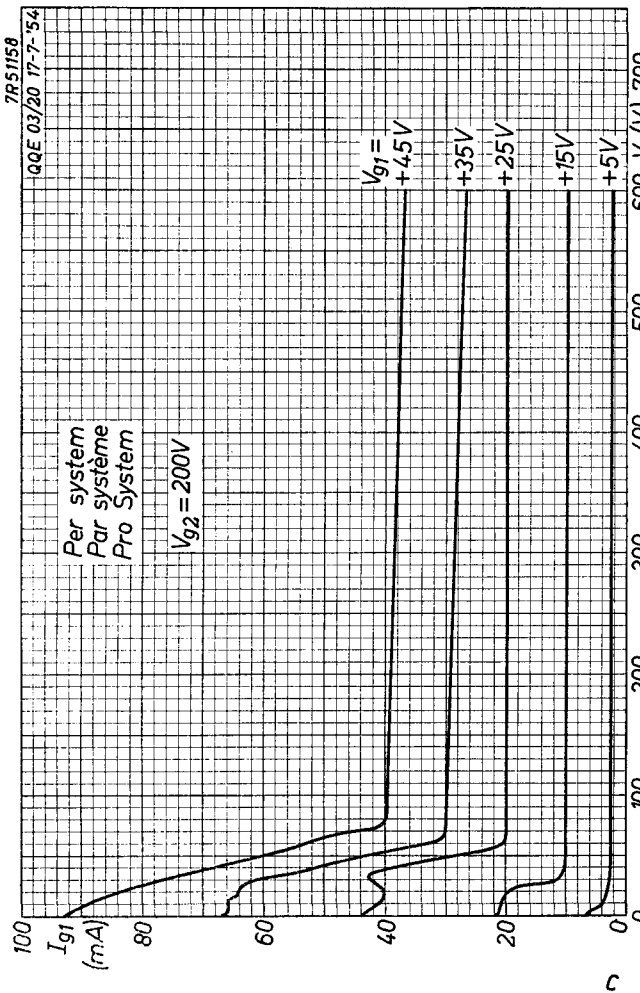


QQE 03/20

PHILIPS

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QQE 03/20



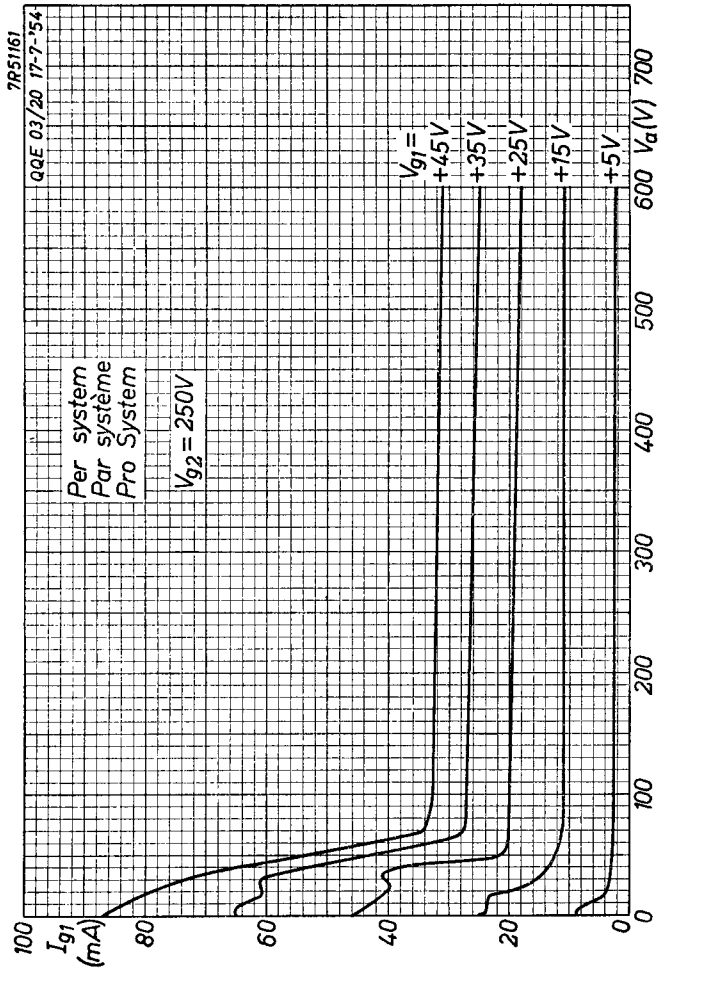
7.7.1954

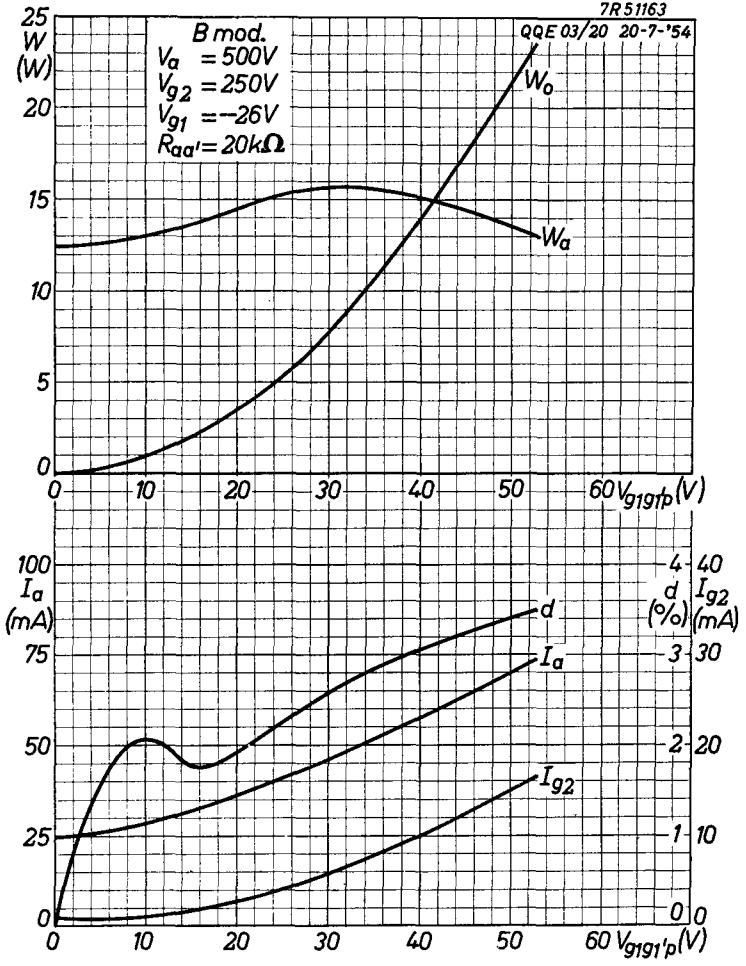
PHILIPS

7R51159
QQE 03/20 17-7-'54
Per system
Par système
Pro System
$V_{g2} = 250V$
$V_{g1} = +25V$
+20V
+15V
+10V
+5V
0V
−5V
−10V
−15V
−20V
I_a (mA)
400
300
200
100
0
0
100
200
300
400
500
600
V_a(V)

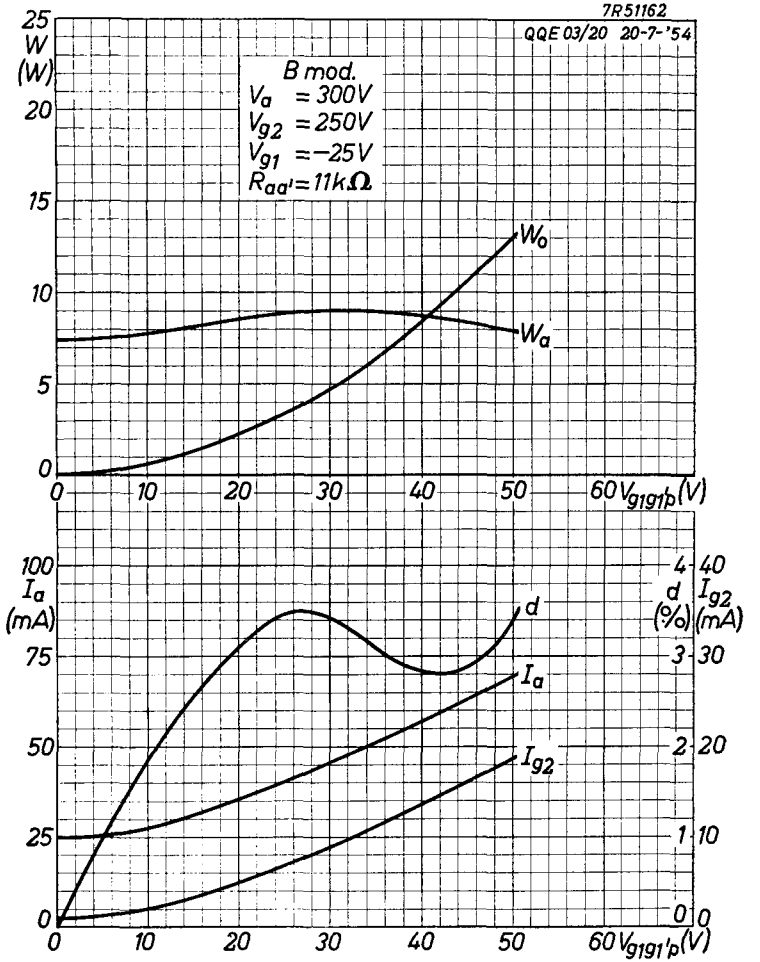
7P5116
QQE 03/20 17-7-54
Per system
Par système
Pro System
$V_{g2} = 250V$
I_{g2} (mA)
400
300
200
100
0
V_{g1}=
+45V
+35V
+25V
+15V
+5V
−5V
−15V
−25V
0
100
200
300
400
500
600
V_a(V)

PHILIPS


7R51161
QQE 03/20 17-7-'54
Per system
Par système
Pro System
V_{g2} = 250V
V_{g1} =
+45V
+35V
+25V
+15V
+5V
I_{g1} (mA)
100
80
60
40
20
0
0
100
200
300
400
500
600
700
V_a(V)


7R 51163
QQE 03/20 20-7-'54
B mod.
V_a = 500V
V_{g2} = 250V
V_{g1} = −26V
$R_{aa'}$ = 20kΩ
W (W)
W_o
W_a
$V_{g1g1'p}$ (V)
I_a (mA)
d (%)
I_{g2} (mA)
d
I_a
I_{g2}
$V_{g1g1'p}$ (V)

PHILIPS


7R51162
QQE 03/20 20-7-'54
B mod.
V_a = 300V
V_{g2} = 250V
V_{g1} = −25V
$R_{aa'}$ = 11kΩ
W (W)
W_o
W_a
$V_{g191'p}$ (V)
I_a (mA)
d (%)
I_{g2} (mA)
d
I_a
I_{g2}



QQE03/20

page	sheet	date
1	1	1957.03.03
2	1	1961.04.04
3	2	1957.03.03
4	2	1961.04.04
5	3	1955.03.03
6	3	1961.04.04
7	4	1955.03.03
8	4	1961.04.04
9	5	1955.03.03
10	6	1955.03.03
11	7	1955.03.03
12	A	1954.07.07
13	B	1954.07.07
14	C	1954.07.07
15	D	1954.07.07
16	E	1954.07.07
17	F	1954.07.07
18	G	1954.07.07
19	H	1954.07.07

DOUBLE TETRODE for use as H.F. amplifier and oscillator
DOUBLE TETRODE pour utilisation en amplificatrice et oscillatrice H.F.
DOPPELTETRODE zur Verwendung als HF-Verstärker und Oszillator

Cathode : oxide coated Cathode : oxyde Katode : Oxyd	V_f =	6,3	12,6 V
	I_f =	1,6	0,8 A
Heating : indirect Chauffage: indirect Heizung : indirekt	Pins Broches 5-(1+7) Stifte		1-7
Capacitances Capacités Kapazitäten	per system C_a =	3,8 pF	
	par système C_{g1} =	8 pF	
	pro System C_{ag1} <	0,07 pF	
	C_{g2k} =	65 pF[1]	
Typical characteristics Caractéristiques types Kenndaten	μ_{g2g1} =	6,5	
	$S(I_a=30mA)$[2] =	3 mA/V	

λ	Freq.	C telegr.[3]			Cag2 mod.[3]		
(m)	(Mc/s)	V_a (V)	W_o (W)		V_a (V)	W_o (W)	
			CCS	ICAS		CCS	ICAS
1,5	200	750	26	35	600	17	26
		500	26		425	16	
1,2	250	500	23				

Temperature of anode and pin seals
Température des scellements de l'anode et des broches max.180 °C
Temperatur der Anoden- und Stifteneinschmelzungen

bulb temperature
Température de l'ampoule max.220 °C
Kolbentemperatur

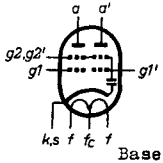
[1] Including internal capacitor between grid No.2 and cathode
Y compris le condensateur interne entre grille No.2 et la cathode
Einschliesslich des inneren Kondensators zwischen Gitter 2 und Katode

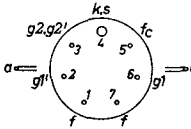
[2] Per system; par système; pro System

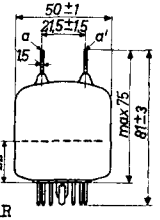
[3] Two systems in push-pull; deux systèmes en push-pull; zwei Systeme in Gegentakt

PHILIPS

Dimensions in mm
Dimensions en mm
Abmessungen in mm







Base, culot, Sockel: SEPTAR

Socket
Support 40202
Fassung

Anode clips
Bornes de connexion de l'anode 40615
Anodenanschlussklemmen

Mounting position: arbitrary
Montage : arbitrairement
Aufstellung : willkürlich

Net weight
Poids net 60 g
Nettogewicht

Shipping weight
Poids brut 150 g
Bruttogewicht

H.F. class C telegraphy, two systems in push-pull
H.F. classe C télégraphie, deux systèmes en push-pull
HF Klasse C Telegraphie, zwei Systeme in Gegentakt

Limiting values, continuous service
C.C.S. Caractéristiques limites, service continu
Grenzdaten, Dauerbetrieb

f	= max.	200 Mc/s	f	= max.	250 Mc/s
V_a	= max.	750 V	V_a	= max.	670 V
W_{ia}	= max.	2x18 W	W_{ia}	= max.	2x16 W
W_a	= max.	2x7,5 W			
I_a	= max.	2x45 mA			
V_{g2}	= max.	250 V			
W_{g2}	= max.	5 W			
$-V_{g1}$	= max.	175 V			
I_{g1}	= max.	2x5 mA			
R_{g1}	= max.	50 kΩ[1]			
R_{g1}	= max.	25 kΩ[2]			
V_{kf}	= max.	100 V			

Operating conditions, continuous service
C.C.S. Caractéristiques d'utilisation, service continu
Betriebsdaten, Dauerbetrieb

f	=	200	200	200	250	250 Mc/s
V_a	=	750	500	400	500	400 V
V_{g2}	=	200	200	200	200	200 V
V_{g1}	=	-65	-65	-65	-65	-65 V
I_a	=	2x24	2x36	2x45	2x32	2x40 mA
I_{g2}	=	15	14	14	12	14 mA
I_{g1}	=	2x1,4	2x1,3	2x1,4	2x0,9	2x1,0 mA
$V_{g1g1'p}$	=	150	150	150	140	140 V
W_{ig1}	=	2x0,10	2x0,09	2x0,10	2x0,06	2x0,07 W
W_{g2}	=	3,0	2,8	2,8	2,4	2,8 W
W_{ia}	=	2x18	2x18	2x18	2x16	2x16 W
W_a	=	2x5	2x5	2x5,25	2x7,0	2x7,5 W
W_o	=	26	26	25,5	18	17 W
η	=	72	72	71	56	53 %

[1]) Per system; par système; pro System

[2]) Per tube; par tube; pro Röhre

H.F. class C telegraphy, two systems in push-pull; continued
H.F. classe C télégraphie, deux systèmes en push-pull; continuation
HF Klasse C Telegraphie, zwei Systeme in Gegentakt; Fortsetzung

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I.C.A.S. Limiting values, intermittent service
Caractéristiques limites, service intermittent
Grenzdaten, aussetzender Betrieb

	f = max. 200 Mc/s	f = max. 250 Mc/s
V_a	= max. 750 V	= max. 670 V
W_{ia}	= max. 2x25 W	= max. 2x22 W
W_a	= max. 2x10 W	
I_a	= max. 2x57,5 mA	
V_{g2}	= max. 250 V	
W_{g2}	= max. 5 W	
$-V_{g1}$	= max. 175 V	
I_{g1}	= max. 2x5 mA	
R_{g1}	= max. 50 kΩ[1])	
R_{g1}	= max. 25 kΩ[2])	
V_{kf}	= max. 100 V	

I.C.A.S. Operating conditions, intermittent service
Caractéristiques d'utilisation, service intermittent
Betriebsdaten, aussetzender Betrieb

f	=	200 Mc/s
V_a	=	750 V
V_{g2}	=	200 V
V_{g1}	=	-50 V
I_a	=	2x32,5 mA
I_{g2}	=	22 mA
I_{g1}	=	2x2,0 mA
$V_{g1g1'p}$	=	130 V
W_{ig1}	=	2x0,12 W
W_{g2}	=	4,4 W
W_{ia}	=	2x24,4 W
W_a	=	2x6,9 W
W_o	=	35 W
η	=	72 %

1)Per system; par système; pro System
2)Per tube; par tube; pro Röhre

H.F. class C anode and screen grid modulation, two systems in push-pull
H.F. classe C modulation d'anode et de grille-écran, deux systèmes en push-pull
HF Klasse C Anoden- und Schirmgittermodulation, zwei Systeme in Gegentakt

Limiting values, continuous service
C.C.S. Caractéristiques d'utilisation, service continu
Grenzdaten, Dauerbetrieb

		f = max. 200 Mc/s	f = max. 250 Mc/s
V_a	= max.	600 V	530 V
W_{ia}	= max.	2x11 W	2x10 W
W_a	= max.	2x5 W	
I_a	= max.	2x37,5 mA	
V_{g2}	= max.	250 V	
W_{g2}	= max.	3,4 W	
$-V_{g1}$	= max.	175 V	
I_{g1}	= max.	2x5 mA	
R_{g1}	= max.	50 kΩ[1])	
R_{g1}	= max.	25 kΩ[2])	
V_{kf}	= max.	100 V	

Operating conditions, continuous service
C.C.S. Caractéristiques d'utilisation, service continu
Betriebsdaten, Dauerbetrieb

f	=	200	200 Mc/s
V_a	=	600	425 V
V_{g2}	=	200	200 V
V_{g1}	=	-65	-60 V
I_a	=	2x18	2x26 mA
I_{g2}	=	16	16 mA
I_{g1}	=	2x1,3	2x1,2 mA
$V_{g1g1'p}$	=	150	140 V
W_{ig1}	=	2x0,09	2x0,075 W
W_{g2}	=	3,2	3,2 W
W_{ia}	=	2x10,8	2x11 W
W_a	=	2x2,3	2x3 W
W_o	=	17	16 W
η	=	79	72 %
m	=	100	100 %
W_{mod}	=	13,5	13,5 W

[1])Per system; par système; pro System
[2])Per tube; par tube; pro Röhre

H.F. class C anode and screen grid modulation, two systems in push-pull; continued
H.F. classe C modulation d'anode et de grille-écran, deux systèmes en push-pull; continuation
HF Klasse C Anoden- und Schirmgittermodulation, zwei Systeme in Gegentakt; Fortsetzung

Limiting values, intermittent service
I.C.A.S. Caractéristiques limites, service intermittent
Grenzdaten, aussetzender Betrieb

f	= max.	200 Mc/s
V_a	= max.	600 V
W_{ia}	= max.	2x18 W
W_a	= max.	2x7,5 W
I_a	= max.	2x47,5 mA
V_{g2}	= max.	250 V
W_{g2}	= max.	5 W
$-V_{g1}$	= max.	175 V
I_{g1}	= max.	2x5 mA
R_{g1}	= max.	50 kΩ [1]
R_{g1}	= max.	25 kΩ [2]
V_{kf}	= max.	100 V

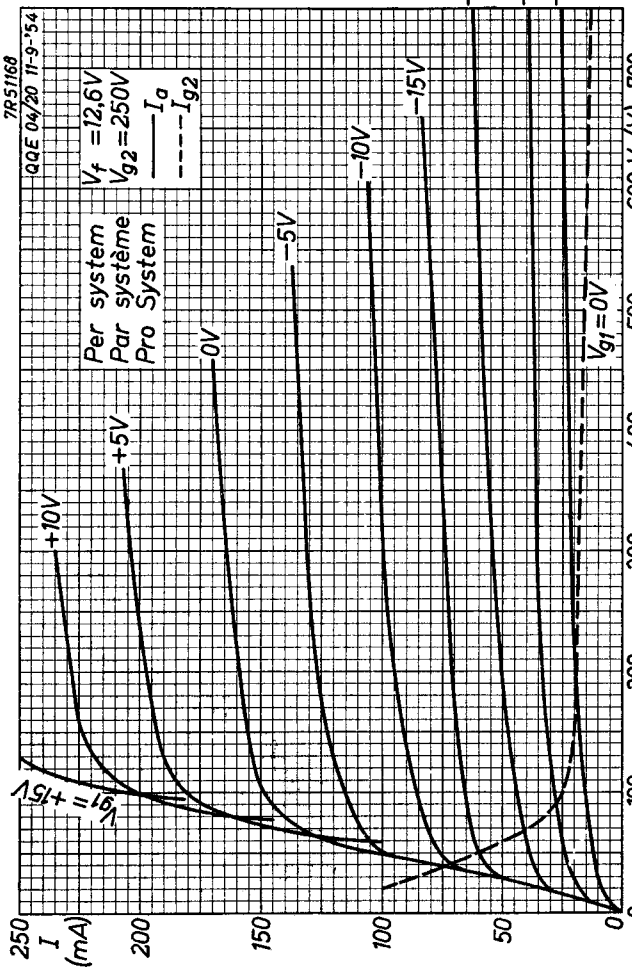
Operating conditions, intermittent service
I.C.A.S. Caractéristiques d'utilisation, service intermittent
Betriebsdaten, aussetzender Betrieb

f	=	200 Mc/s
V_a	=	600 V
V_{g2}	=	200 V
V_{g1}	=	-70 V
I_a	=	2x30 mA
I_{g2}	=	20 mA
I_{g1}	=	2x1,5 mA
$V_{g1g1'p}$	=	160 V
W_{ig1}	=	2x0,105 W
W_{g2}	=	4,0 W
W_{ia}	=	2x18 W
W_a	=	2x5 W
W_o	=	26 W
η	=	72 %
m	=	100 %
W_{mod}	=	20 W

[1])Per system; par système; pro System
[2])Per tube; par tube; pro Röhre

PHILIPS

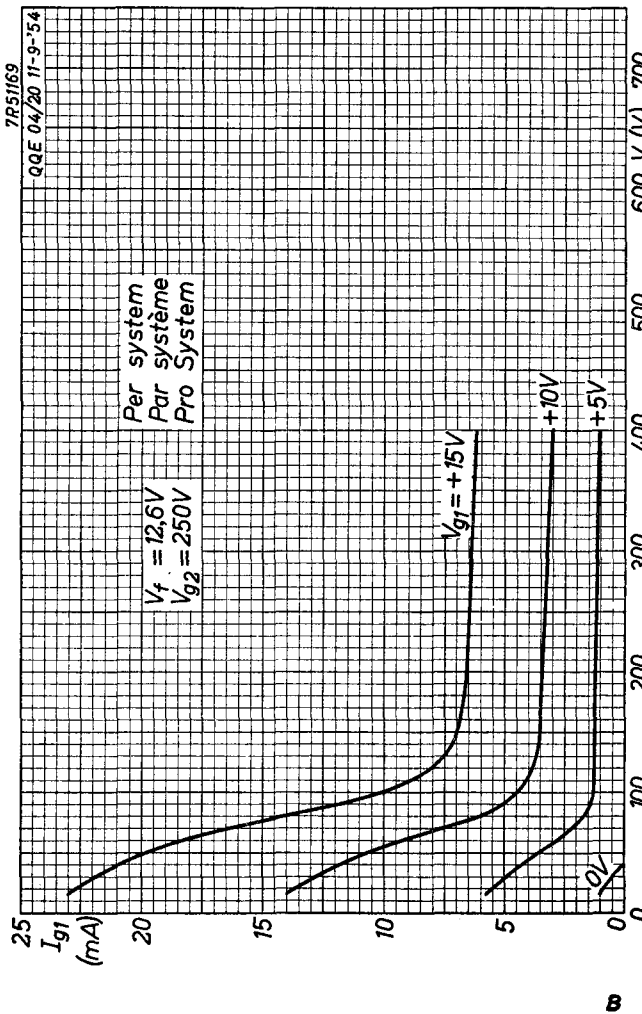
QQE 04/20



7. 7. 1954

A

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7R51169
QQE 04/20 11-9-'54
I_{g1} (mA)
25
20
15
10
5
0
0
100
200
300
400
500
600
700
V_a(V)
Per system
Par système
Pro System
V_f = 12,6V
V_{g2} = 250V
V_{g1} = +15V
+10V
+5V
0V



QQE04/20

page	sheet	date
1	1	1954.07.07
2	2	1954.07.07
3	3	1954.07.07
4	4	1954.07.07
5	5	1954.07.07
6	6	1954.07.07
7	A	1954.07.07
8	B	1954.07.07
9	FP	1999.11.06

DOUBLE TETRODE with internal neutralisation for use as oscillator, frequency tripler and amplifier
TETRODE DOUBLE avec neutralisation interne pour utilisation en oscillatrice, tripleuse de fréquence et amplificatrice
DOPPELTETRODE mit Innenneutrodynisierung zur Verwendung als Oszillator, Frequenzverdreifacher und Verstärker

Cathode: oxide coated	V_f	= 6,3 V ± 10 %	12,6 V ± 10 %
Cathode: oxyde	I_f	= 0,6 A	0,3 A
Katode : Oxyd			
	Pins		
	Broches	7-(1+8)	1-8
	Stifte		

Heating : indirect
Chauffage: indirect
Heizung : indirekt

Capacitances (each system)
Capacités (chaque système)
Kapazitäten (jedes System)

C_a	=	1,35 pF
C_{g_1}	=	4,5 pF
C_{ag_1}	=	0,145 pF

Typical characteristics
Caractéristiques types
Kenndaten

V_a	=	350 V
V_{g_2}	=	200 V
I_a	=	25 mA
S	=	10,5 mA/V
$\mu_{g_2g_1}$	=	26

Freq.	C telegr.				C freq. tripler			
	C.C.S.		I.C.A.S.		C.C.S.		I.C.A.S.	
Mc/s	V_a (V)	W_o (W)	V_a (V)	W_o (W)	V_a (V)	W_o (W)	V_a (V)	W_o (W)
960	250	7	250	8				
320/960					250	2,75	250	3

Temperatures
Températures
Temperaturen

Pin seals
Scellements des broches max.220°C
Stifteneinschmelzungen

Bulb, ampoule, Kolben max.220°C

DOUBLE TETRODE with internal neutralisation for use as oscillator, frequency tripler and amplifier
TETRODE DOUBLE avec neutralisation interne pour utilisation en oscillatrice, tripleuse de fréquence et amplificatrice
DOPPELTETRODE mit Innenneutrodynisierung zur Verwendung als Oszillator, Frequenzverdreifacher und Verstärker

Cathode: oxide coated Cathode: oxyde Katode : Oxyd	V_f	= 6,3 V ± 10 %	12,6 V ± 10 %
	I_f	= 0,6 A	0,3 A
	Pins Broches Stifte	7-(1+8)	1-8

Heating : indirect
Chauffage: indirect
Heizung : indirekt

Capacitances (each system)
Capacités (chaque système)
Kapazitäten (jedes System)

C_a	=	1,35 pF
C_{g_1}	=	4,5 pF
C_{ag_1}	=	0,145 pF

Typical characteristics
Caractéristiques types
Kenndaten

V_a	=	350 V
V_{g_2}	=	200 V
I_a	=	25 mA
S	=	10,5 mA/V
$\mu_{g_2g_1}$	=	26

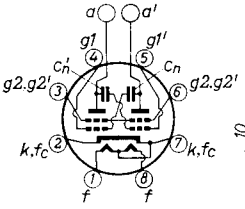
Freq.	C telegr.				C freq. tripler			
	C.C.S.		I.C.A.S.		C.C.S.		I.C.A.S.	
Mc/s	V_a (V)	W_o (W)	V_a (V)	W_o (W)	V_a (V)	W_o (W)	V_a (V)	W_o (W)
960	250	7	250	8				
320/960					250	2,75	250	3

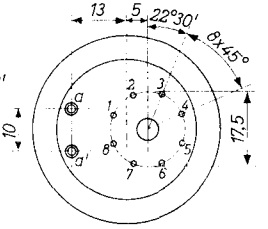
Temperatures
Températures
Temperaturen

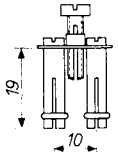
Pin seals
Scellements des broches max.220°C
Stifteneinschmelzungen

Bulb, ampoule, Kolben max.220°C

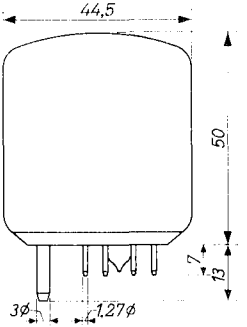
PHILIPS

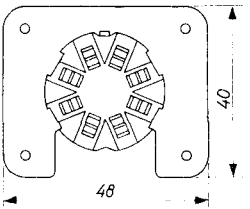






Anode connector
Connecteur des anodes
Anodenanschluss





Dimensions in mm
Dimensions en mm
Abmessungen in mm

Socket (loctal) 40213
(without metal plate)

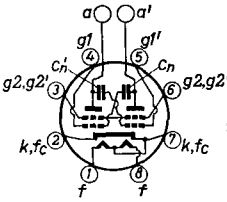
Support (loctal)40213
(sans plaque métallique)

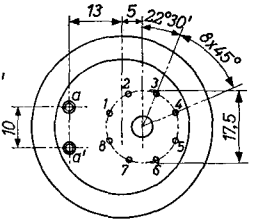
Fassung (Loctal)40213
(Ohne Metallplatte)

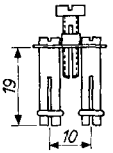
Mounting position: arbitrary
Montage : arbitrairement
Einbau : beliebig

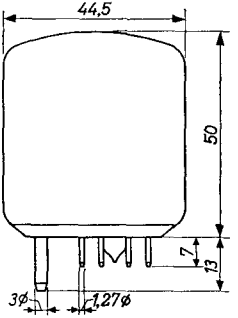
Net weight		Shipping weight	
Poids net	35 g	Poids brut	55 g
Nettogewicht		Bruttogewicht	

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Example of anode-tank circuit connector at 960 Mc/s

Exemple d'un connecteur anode-circuit accordé à 960 MHz

Beispiel einer Verbindung Anode-abgestimmter Kreis bei 960 MHz

Dimensions in mm
Dimensions en mm
Abmessungen in mm

Socket assembly
Assemblage du support B8 700 71
Zusammenstellung Fassung

Mounting position: arbitrary
Montage : arbitrairement
Einbau : beliebig

Net weight		Shipping weight	
Poids net	35 g	Poids brut	55 g
Nettogewicht		Bruttogewicht	

H.F. class C telegraphy; two systems in push-pull
H.F. classe C télégraphie; deux systèmes en push-pull
HF-Klasse C Telegraphie; zwei Systeme in Gegentakt

Limiting values
Caractéristiques limites
Grenzdaten

		C.C.S.	I.C.A.S.	
f	=	max. 960	max. 960	Mc/s
V_a	=	max. 400	max. 400	V
I_a	=	max. 2 x 45	max. 2 x 50	mA
W_a	=	max. 2 x 8	max. 2 x 10	W
W_{ia}	=	max. 2 x 10	max. 2 x 12	W
V_{g2}	=	max. 225	max. 225	V
W_{g2}	=	max. 2 x 1,5	max. 2 x 1,75	W
$-V_{g1}$	=	max. 100	max. 100	V
I_{g1}	=	max. 2 x 4	max. 2 x 5	mA

Operating characteristics
Caractéristiques d'utilisation
Betriebsdaten

		C.C.S.	I.C.A.S.	
f	=	960	960	Mc/s
V_a	=	250	250	V
V_{g2}	=	160 [1]	170 [2]	V
V_{g1}	=	-15	-15	V
R_{g1}	=	20	20	kΩ
I_a	=	2 x 35	2 x 40	mA
I_{g2}	=	15	15	mA
I_{g1}	=	2 x 0,75	2 x 0,75	mA
W_{ia}	=	2 x 8,8	2 x 10	W
W_a	=	2 x 5,4	2 x 5,4	W
W_{g2}	=	2,5	2,9	W
W_{dr} [3]	=	1,4	1,4	W
W_o	=	7	8	W
W_l [4]	=	4	5	W
η	=	40	40	%

[1]) Adjust V_{g2} until I_a = 2x35 mA at W_o max.
Régler V_{g2} jusqu'à ce que I_a = 2x35 mA à W_o max.
V_{g2} einstellen bis I_a = 2x35 mA wenn W_o max. ist.

[2]) Adjust V_{g2} until I_a = 2x40 mA at W_o max.
Régler V_{g2} jusqu'à ce que I_a = 2x40 mA à W_o max.
V_{g2} einstellen bis I_a = 2x40 mA wenn W_o max. ist

[3]) See page 4; voir page 4; siehe Seite 4

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H.F. class C frequency tripler (two systems in push-pull)
H.F. classe C tripleur de fréquence (deux systèmes en push-pull)
HF-KlasseC Frequenzverdreifacher (zwei Systeme in Gegentakt)

Limiting values
Caractéristiques limites
Grenzdaten

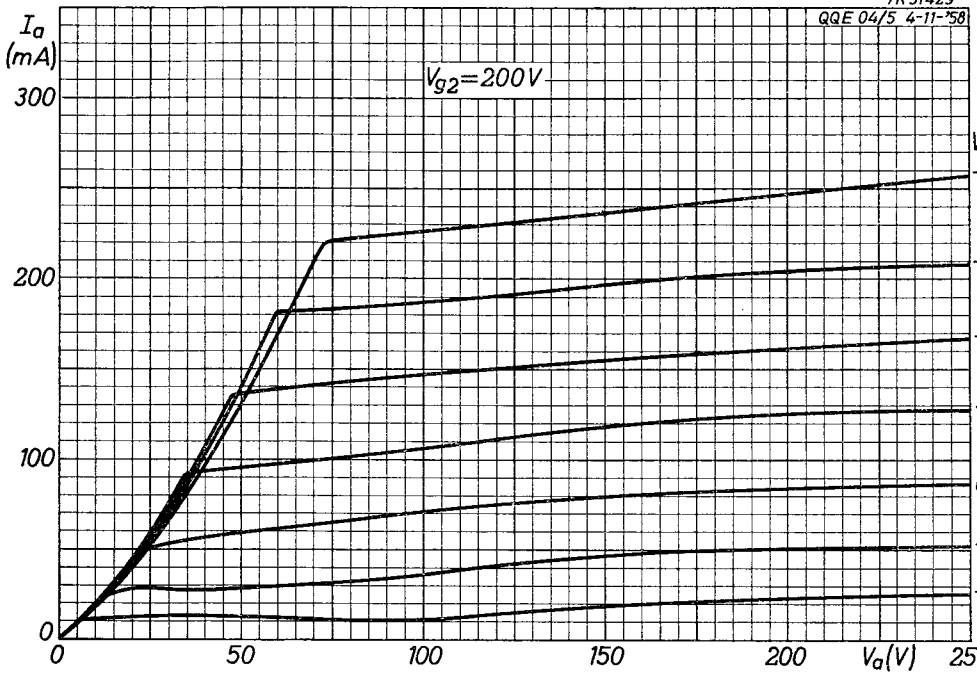
		C.C.S.	I.C.A.S.	
f	= max.	960	max. 960	Mc/s
V_a	= max.	400	max. 400	V
I_a	= max.	2 x 40	max. 2 x 40	mA
W_a	= max.	2 x 8	max. 2 x 10	W
W_{ia}	= max.	2 x 10	max. 2 x 12	W
V_{g2}	= max.	225	max. 250	V
W_{g2}	= max.	2 x 1,5	max. 2 x 1,75	W
$-V_{g1}$	= max.	100	max. 100	V
I_{g1}	= max.	2 x 4	max. 2 x 5	mA

Operating characteristics
Caractéristiques d'utilisation
Betriebsdaten

		C.C.S.	I.C.A.S.	
f	=	320/960	320/960	Mc/s
V_a	=	250	250	V
V_{g2}	=	150	170	V
R_{g1}	=	20	20	kΩ
I_a	=	2 x 37,5	2 x 40	mA
I_{g2}	=	15	16	mA
I_{g1}	=	2 x 2,25	2 x 2,25	mA
W_{ia}	=	2 x 9,5	2 x 10	W
W_a	=	2 x 8	2 x 8,5	W
W_{g2}	=	2,25	2,8	W
W_{dr} [3])	=	3	3	W
W_o	=	2,75	3	W
W_ℓ [4])	=	1,5	1,8	W
η	=	14,7	15	%

[3]) Driver output power
Puissance de sortie du tube d'attaque
Ausgangsleistung der Treiberstufe

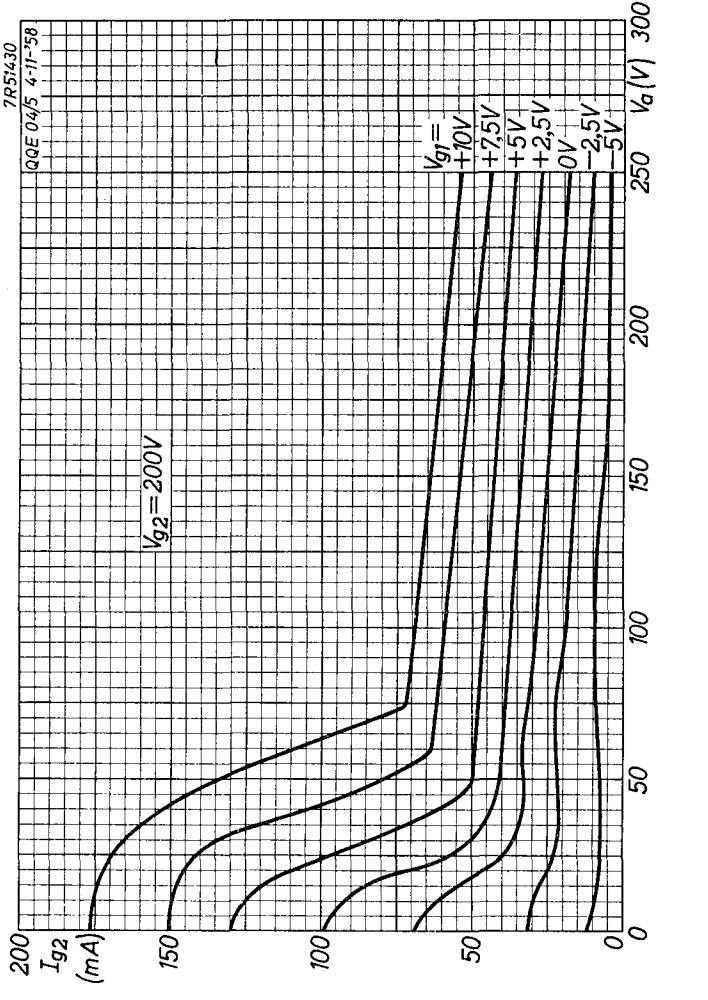
[4]) Useful power in the load
Puissance utile dans la charge
Nutzleistung in der Belastung

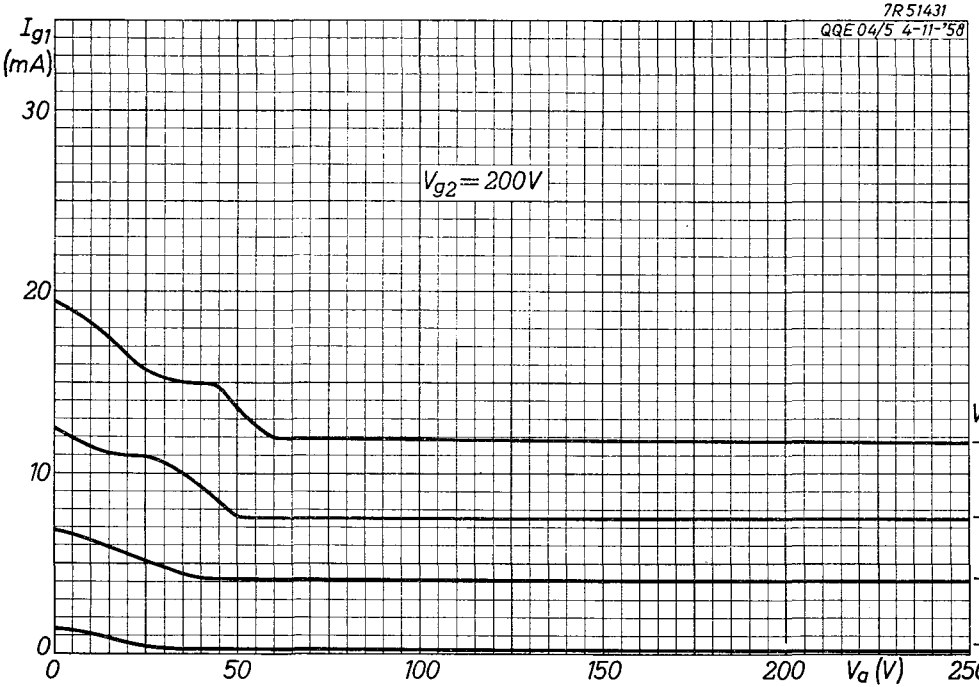


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QQE 04/5

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7R51430
QQE 04/5 4-11-'58
I_{g2} (mA)
200
150
100
50
0
V_{g2}=200V
V_{g1}=
+10V
+7,5V
+5V
+2,5V
0V
−2,5V
−5V
0
50
100
150
200
250
300
V_a (V)



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QQE 04/5

QQE 04/5

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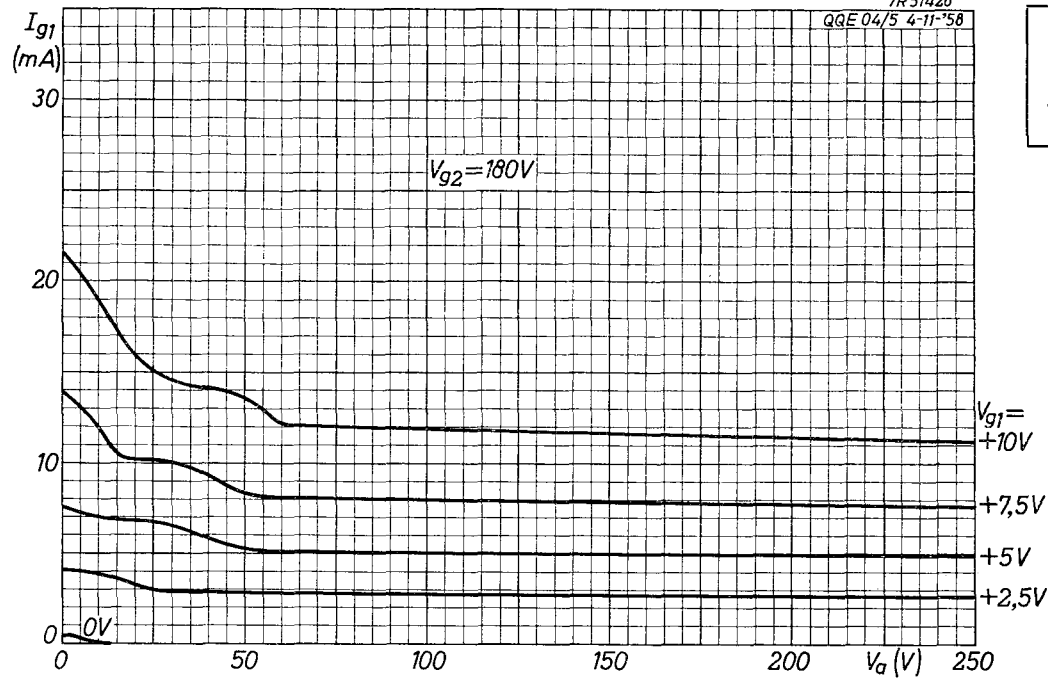
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QQE 04/5

12.12.1958

E



QQE 04/5

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F



QQE04/5

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1	1	1958.12.12
2	1	1960.09.09
3	2	1958.12.12
4	2	1960.09.09
5	3	1958.12.12
6	4	1958.12.12
7	A	1958.12.12
8	B	1958.12.12
9	C	1958.12.12
10	D	1958.12.12
11	E	1958.12.12
12	F	1958.12.12
13	FP	2000.01.15

DOUBLE TETRODE for use as H.F. amplifier and oscillator, frequency multiplier and modulator (internally neutralised)
DOUBLE TETRODE pour utilisation en amplificatrice et oscillatrice H.F., multiplicatrice de fréquence et modulatrice (avec neutralisation interne)
DOPPELTETRODE zur Verwendung als HF-Verstärker und Oszillator, Frequenzvervielfacher und Modulator (mit innerer Neutralisation)

Cathode : oxide-coated
Cathode : oxyde
Katode : Oxyd

V_f	6,3	12,6 V
I_f	1,8	0,9 A

Heating : indirect
Chauffage: indirect
Heizung : indirekt

pins
broches 5-(1+7) 1-7
Stifte

Capacitances Capacités Kapazitäten	per system par système pro System		in push-pull en push-pull in Gegentakt	
See page 2 for internal neutralisation (C_n, C_n') Voir page 2 pour neutralisation interne (C_n,C_n') Für Neutrodynisierung siehe Seite 2 (C_n, C_n')	C_a	= 3,2 pF	C_o	= 2,1 pF
	C_{g1}	= 10,5 pF	C_i	= 6,7 pF
	C_{ag1}	< 0,09 pF		
	C_{ag1}-C_n	< 0,035 pF		

Typical characteristics
Caractéristiques types
Kenndaten

μ_{g2g1}	= 8,2
$S^{1)}$ (I_a= 30 mA)	= 4,5 mA/V

λ	Freq.	C telegr.				C_{ag2} mod.			
		C.C.S.		I.C.A.S.		C.C.S.		I.C.A.S.	
(m)	Mc/s	Va (V)	Wo (W)	Va (V)	Wo (W)	Va (V)	Wo (W)	Va (V)	Wo (W)
5	60					600	71	600	79
1,5	200	600	90						
1,2	250	750	85	750	96	600	64	600	71
0,7	430	520	66						
0,6	500	500	60						

λ	Freq.	Cfr.mult.		B mod.	
(m)	(Mc/s)	Va (V)	Wo (W)	Va (V)	Wo (W)
6/2	50/150	500	20	600	86
		400	18	450	60
4/1,3	75/225	400	12	300	37

1)Per system; par système; pro System

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QQE 06/40

DOUBLE TETRODE for use as H.F. amplifier and oscillator, frequency multiplier and modulator (internally neutralised)
DOUBLE TETRODE pour utilisation en amplificatrice et oscillatrice H.F., multiplicatrice de fréquence et modulatrice (avec neutralisation interne)
DOPPELTETRODE zur Verwendung als HF-Verstärker und Oszillator, Frequenzvervielfacher und Modulator (mit innerer Neutralisation)

Cathode : oxide-coated Cathode : oxydée Katode : Oxyd	V_f	6,3	12,6 V
	I_f	1,8	0,9 A
Heating : indirect Chauffage: indirect Heizung : indirekt	pins broches 5-(1+7) Stifte		1-7

Capacitances Capacités Kapazitäten	per system par système pro System		in push-pull en push-pull in Gegentakt
See page 2 for internal neutralisation (C_n, C_n') Voir page 2 pour neutralisation interne (C_n,C_n') Für Neutrodynisierung siehe Seite 2 (C_n, C_n')	C_a = 3,2 pF C_{g1} = 10,5 pF C_{ag1} < 0,09 pF C_{ag1}-C_n < 0,035 pF		C_o = 2,1 pF C_i = 6,7 pF

Typical characteristics Caractéristiques types Kenndaten		
	μ_{g2g1}	= 8,2
	S[1] (I_a= 30 mA)	= 4,5 mA/V

λ	Freq.	C telegr.				C_{ag2} mod.			
		C.C.S.		I.C.A.S.		C.C.S.		I.C.A.S.	
(m)	Mc/s	Va (V)	Wo (W)	Va (V)	Wo (W)	Va (V)	Wo (W)	Va (V)	Wo (W)
5	60					600	71	600	79
1,5	200	600	90						
1,2	250	750	85	750	96	600	64	600	71
0,7	430	520	66						
0,6	500	500	60						

λ	Freq.	Cfr.mult.		B mod.	
(m)	(Mc/s)	Va (V)	Wo (W)	Va (V)	Wo (W)
6/2	50/150	500	20	600	86
		400	18	450	60
4/1,3	75/225	400	12	300	37

[1])Per system; par système; pro System

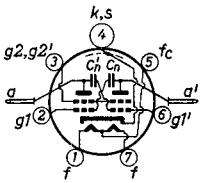
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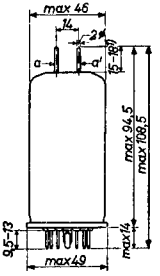
Cooling: radiation. When the tube is used at frequencies above 150 Mc/s it may be necessary to direct a low velocity air flow on the bulb and the anode seals.
Temperature of bulb and anode seals max. 200 °C
Temperature of bottom pin seals max. 180 °C

Refroidissement: radiation. Si le tube est utilisé aux fréquences supérieures à 150 Mc/s, il peut être nécessaire de diriger un léger courant d'air sur l'ampoule et sur les scellements des sorties d'anode.
Température de l'ampoule et des scellements des sorties d'anode max. 200 °C
Température des scellements des broches du fond max. 180 °C

Kühlung: Strahlung. Wenn die Röhre bei Frequenzen höher als 150 MHz benutzt wird, kann ein Luftstrom auf den Kolben und die Anodenverschlüsse notwendig sein.
Temperatur des Kolben und der Anodenverschlüsse max. 200 °C
Temperatur der Bodenstiftverschlüsse max. 180 °C

Dimensions in mm
Dimensions en mm
Abmessungen in mm





Base, culot, Sockel	:	Septar
Socket, support, Fassung	:	40202
Clips, bornes de connexion, Anschlussklemmen	:	40623

Mounting position: vertical with base up or down.
horizontal with anode pins in one horizontal plane
Montage : vertical avec le pied en haut ou en bas.
horizontal avec les broches des anodes situées dans le même plan horizontal.
Aufstellung: senkrecht mit Sockel oben oder unten
waagerecht mit der Fläche durch beide Anodenstifte waagerecht.

Net weight		Shipping weight	
Poids net	60 g	Poids brut	155 g
Nettogewicht		Bruttogewicht	

[1]) Max. 3 mm glass included
3 mm de verre au max. y inclus
Einschliesslich max. 3 mm Glas

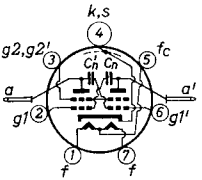
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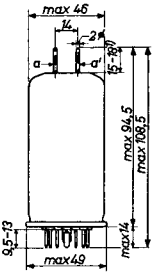
Cooling: radiation. When the tube is used at frequencies above 150 Mc/s it may be necessary to direct a low velocity air flow on the bulb and the anode seals.
Temperature of bulb and anode seals max. 250 °C ←
Temperature of bottom pin seals max. 180 °C

Refroidissement: radiation. Si le tube est utilisé aux fréquences supérieures à 150 Mc/s, il peut être nécessaire de diriger un léger courant d'air sur l'ampoule et sur les scellements des sorties d'anode.
Température de l'ampoule et des scellements des sorties d'anode max. 250 °C ←
Température des scellements des broches du fond max. 180 °C

Kühlung: Strahlung. Wenn die Röhre bei Frequenzen höher als 150 MHz benutzt wird, kann ein Luftstrom auf den Kolben und die Anodenverschlüsse notwendig sein.
Temperatur des Kolben und der Anodenverschlüsse max. 250 °C ←
Temperatur der Bodenstiftverschlüsse max. 180 °C

Dimensions in mm
Dimensions en mm
Abmessungen in mm





Base, culot, Sockel	: Septar
Socket, support, Fassung	: 40202
Clips, bornes de connexion, Anschlussklemmen	: 40623

Mounting position: vertical with base up or down.
horizontal with anode pins in one horizontal plane
Montage : vertical avec le pied en haut ou en bas.
horizontal avec les broches des anodes situées dans le même plan horizontal.
Aufstellung: senkrecht mit Sockel oben oder unten
waagerecht mit der Fläche durch beide Anodenstifte waagerecht.

Net weight		Shipping weight	
Poids net	60 g	Poids brut	155 g
Nettogewicht		Bruttogewicht	

1) Max. 3 mm glass included
3 mm de verre au max. y inclus
Einschliesslich max. 3 mm Glas

H.F. class C telegraphy, two systems in push-pull
H.F. classe C télégraphie, deux systèmes en push-pull
HF Klasse C Telegraphie, zwei Systeme in Gegentakt

Limiting values, continuous service
C.C.S. Caractéristiques limites, service continu
Grenzdaten, Dauerbetrieb

f	= max.	250	Mc/s	f = max.	500 Mc/s
V_a	= max.	750	V	V_a = max.	600 V
W_{ia}	= max.	2x60	W	W_{ia} = max.	2x50 W
W_a	= max.	2x20	W		
I_a	= max.	2x110	mA		
→ V_{g2}	= max.	300	V		
W_{g2}	= max.	2x3,5	W		
$-V_{g1}$	= max.	175	V		
I_{g1}	= max.	2x5	mA		
R_{g1}	= max.	50	kΩ		
V_{kf}	= max.	100	V		

Operating conditions, continuous service
C.C.S. Caractéristiques d'utilisation, service continu
Betriebsdaten, Dauerbetrieb

f	=	200	250	430	500 Mc/s
V_a	=	600	750	520	500 V
V_{g1}	=	-80	-80	-80	- V
R_{g1}	=	-	-	-	20 kΩ
V_{g2}	=	250	250	250	250 V
I_a	=	2x100	2x80	2x100	2x100 mA
I_{g1}	=	2x2,5	2x1,5	2x2,8	2x3 mA
I_{g2}	=	16	17	18	20 mA
$V_{g1g1'_p}$	=	200	250	-	- V
W_{g2}	=	4	4,25	4,5	5 W
W_{ia}	=	2x60	2x60	2x52	2x50 W
W_a	=	2x15	2x17,5	2x19	2x20 W
W_o	=	90	85	66	60 W
η	=	75	71	64	60 %

PHILIPS

H.F. class C telegraphy, two systems in push-pull; continued
H.F. classe C télégraphie, deux systèmes en push-pull; continuation
HF Klasse C Telegraphie, zwei Systeme in Gegentakt; Fortsetzung

I.C.A.S

Limiting values, intermittent service
Caractéristiques limites, service intermittent
Grenzdaten, aussetzender Betrieb

f = max. 250 Mc/s		f = max. 500 Mc/s	
V_a = max.	750 V	V_a = max.	600 V
W_{ia} = max.	2x75 W	W_{ia} = max.	2x60 W
W_a = max.	2x22,5 W		
I_a = max.	2x120 mA		
→ V_{g2} = max.	300 V		
W_{g2} = max.	2x4 W		
$-V_{g1}$ = max.	175 V		
I_{g1} = max.	2x5 mA		
R_{g1} = max.	50 kΩ		
V_{kf} = max.	100 V		

I.C.A.S

Operating conditions, intermittent service
Caractéristiques d'utilisation, service intermittent
Betriebsdaten, aussetzender Betrieb

f	=	250 Mc/s
V_a	=	750 V
V_{g1}	=	-80 V
V_{g2}	=	250 V
I_a	=	2x90 mA
I_{g1}	=	2x1,7 mA
I_{g2}	=	14 mA
$V_{g1g1'p}$	=	260 V
W_{g2}	=	3,5 W
W_{ia}	=	2x67,5 W
W_a	=	2x19,5 W
W_o	=	96 W
η	=	71 %

H.F. class C anode and screen grid modulation, two systems in push-pull
H.F. classe C modulation d'anode et de grille-écran, deux systèmes en push-pull
HF Klasse C Anoden- und Schirmgittermodulation, zwei Systeme in Gegentakt

C.C.S. Limiting values, continuous service
Caractéristiques limites, service continu
Grenzdaten, Dauerbetrieb

f = max. 250 Mc/s

V_a	= max. 600 V	R_{g1} = max.	50 kΩ[3]
W_{ia}	= max. 2x45 W	R_{g1} = max.	25 kΩ[4]
W_a	= max. 2x14 W	V_{kf} = max.	100 V
I_a	= max. 2x92 mA		
V_{g2}	= max. 300 V		
W_{g2}	= max. 2x3,5 W[1]		
W_{g2}	= max. 2x2,3 W[2]	f = max.	500 Mc/s
$-V_{g1}$	= max. 175 V	V_a = max.	480 V
I_{g1}	= max. 2x5 mA	W_{ia} = max.	2x33,5 W

C.C.S. Operating conditions, continuous service
Caractéristiques d'utilisation, service continu
Betriebsdaten, Dauerbetrieb

f	=	60	250 Mc/s
V_a	=	600	600 V
V_{g2}	=	250	250 V
V_{g1}	=	-80	-80 V
I_a	=	2x75	2x75 mA
I_{g2}	=	20	18 mA
I_{g1}	=	2x3,8	2x1,6 mA
V_{g1_p}	=	105	130 V
W_{g2}	=	5	4,5 W
W_{ia}	=	2x45	2x45 W
W_a	=	2x9,5	2x13 W
W_o	=	71	64 W
η	=	79	71 %
m	=	100	100 %
V_{g2_p}	=	90	90 V
W_{mod}	=	45	45 W

[1]) Screen grid modulated via a choke
La grille-écran modulée à travers une bobine de choc
Schirmgitter moduliert über eine Drosselspule
2),3),4) See page 6; voir page 6; siehe Seite 6

H.F. class C anode and screen grid modulation, two systems in push-pull
H.F. classe C modulation d'anode et de grille-écran, deux systèmes en push-pull
HF Klasse C Anoden- und Schirmgittermodulation, zwei Systeme in Gegentakt

I.C.A.S. Limiting values, intermittent service
Caractéristiques limites, service intermittent
Grenzdaten, aussetzender Betrieb

f = max. 250 Mc/s

V_a	= max.	600 V	R_{g1}	= max.	50 kΩ[3]
W_{ia}	= max.	2x50 W	R_{g1}	= max.	25 kΩ[4]
W_a	= max.	2x15 W	V_{kf}	= max.	100 V
I_a	= max.	2x100 mA			
V_{g2}	= max.	300 V			
W_{g2}	= max.	2x4 W[1]			
W_{g2}	= max.	2x2,6 W[2]			
$-V_{g1}$	= max.	175 V	f	= max.	500 Mc/s
I_{g1}	= max.	2x5 mA	V_a	= max.	480 V
			W_{ia}	= max.	2x40 W

I.C.A.S. Operating conditions, intermittent service
Caractéristiques d'utilisation, service intermittent
Betriebsdaten, aussetzender Betrieb

f	=	60	250 Mc/s
V_a	=	500	600 V
V_{g2}	=	250	250 V
V_{g1}	=	-80	-80 V
I_a	=	2x83	2x83 mA
I_{g2}	=	16	16 mA
I_{g1}	=	2x4	2x1,7 mA
V_{g1_p}	=	105	130 V
W_{g2}	=	4	4 W
W_{ia}	=	2x50	2x50 W
W_a	=	2x10,5	2x14,5 W
W_o	=	79	71 W
η	=	79	71 %
m	=	100	100 %
V_{g2_p}	=	90	90 V
W_{mod}	=	50	50 W

[1])See page 5, voir page 5; siehe Seite 5
[2])For all other modulation methods
Pour toutes les autres méthodes de modulation
Für alle andere Modulationsarten
[3])Per system; par système; pro System
[4])Per tube; par tube; pro Röhre

H.F. class C frequency tripler, two systems in push-pull
H.F. classe C tripleur de fréquence, deux systèmes en push-pull
HF - Klasse C Frequenzverdreifacher, zwei Systeme in Gegentakt

Limiting values
Caractéristiques limites
Grenzdaten

f	= max.	250 Mc/s				
V_a	= max.	750 V				
W_{ia}	= max.	2x60 W				
W_a	= max.	2x20 W				
I_a	= max.	2x110 mA				
→ V_{g2}	= max.	300 V				
W_{g2}	= max.	2x3,5 W				
$-V_{g1}$	= max.	175 V				
I_{g1}	= max.	2x5 mA	f	= max.	500 Mc/s	
R_{g1}	= max.	50 kΩ	V_a	= max.	600 V	
V_{kf}	= max.	100 V	W_{ia}	= max.	2x 50 W	

Operating conditions
Caractéristiques d'utilisation
Betriebsdaten

λ	=	6/2	6/2	4/1,3	m
V_a	=	500	400	400	V
V_{g1}	=	-150	-150	-150	V
V_{g2}	=	250	250	250	V
I_a	=	2x60	2x73	2x65	mA
I_{g1}	=	2x 3	2x2,5	2x 1,5	mA
I_{g2}	=	10	16	20	mA
$V_{g1g1'p}$	=	360	360	360	V
W_{ig1}	=	2x0,6	2x0,5	2x 0,3	W
W_{g2}	=	2,5	4	5	W
W_{ia}	=	2x30	2x29	2x26	W
W_a	=	2x20	2x20	2x20	W
W_o	=	20	18	12	W
η	=	33	31	23	%

H.F. class C frequency tripler, two systems in push-pull
H.F. classe C tripleur de fréquence, deux systèmes en push-pull
HF - Klasse C Frequenzverdreifacher, zwei Systeme in Gegentakt

Limiting values
Caractéristiques limites
Grenzdaten

f	= max.	250 Mc/s			
V_a	= max.	750 V			
W_{ia}	= max.	2x60 W			
W_a	= max.	2x20 W			
I_a	= max.	2x110 mA			
V_{g2}	= max.	300 V			
W_{g2}	= max.	2x3,5 W			
$-V_{g1}$	= max.	175 V			
I_{g1}	= max.	2x5 mA	f	= max.	500 Mc/s
R_{g1}	= max.	50 kΩ	V_a	= max.	600 V
V_{kf}	= max.	100 V	W_{ia}	= max.	2x 50 W

Operating conditions
Caractéristiques d'utilisation
Betriebsdaten

λ	=	6/2	6/2	4/1,3	m
V_a	=	500	400	400	V
V_{g1}	=	-150	-150	-150	V
V_{g2}	=	250	250	250	V
I_a	=	2x60	2x73	2x65	mA
I_{g1}	=	2x 3	2x2,5	2x 1,5	mA
I_{g2}	=	10	16	20	mA
$V_{g1g1'p}$	=	360	360	360	V
W_{ig1}	=	2x0,6	2x0,5	2x 0,3	W
W_{g2}	=	2,5	4	5	W
W_{ia}	=	2x30	2x29	2x26	W
W_a	=	2x20	2x20	2x20	W
W_o	=	20	18	12	W
η	=	33	31	23	%

PHILIPS

Pulse modulator
Modulateur par impulsion
Impulsmodulator

Limiting values
Caractéristiques limites
Grenzdaten

V_a [1]	= max. 7 kV	I_{g_2p}	= max. 2x1 A
V_{a_p} [2]	= max. 8 kV	W_{g_2}	= max. 2x1,5 W
W_a	= max. 2x7,5 W	$-V_{g_1}$ [1]	= max. 200 V
W_{ia}	= max. 2x30 W	V_{g_1p}	= max. 450 V
V_{g_2} [1]	= max. 850 V	I_{g_1p}	= max. 2x1 A
		W_{g_1}	= max. 2x0,5 W
		V_{kf}	= max. 100 V
		T_{imp}	= max. 1,2 µsec

I_{a_p} (T_{imp} = max. 1,2 µsec) = max. 5 A
I_{a_p} (T_{imp} = max. 0,2 µsec) = max. 6 A

Pulse repetition rate
Fréquence des impulsions = max. 1250 c/s
Impulsfrequenz

Duty cycle
Cycle d'opération = max. 0,0015
Arbeitsperiode

Operating conditions
Caractéristiques d'opération
Kenndaten

V_a	=	7	7 kV
V_{g_2}	=	850	650 V
V_{g_1}	=	-200	-200 V
V_{g_1p}	=	450	450 V
R_a	=	400	1000 Ω
I_{a_p}	=	5	6 A
T_{imp}	=	1,2	0,13 µsec
Pulse repetition rate Fréquence des impulsions Impulsfrequenz	=	1250	500 c/s
Duty cycle Cycle d'opération Arbeitsperiode	=	0,0015	0,000 065 ←
Time of rise Temps de montée Ansteigzeit	=		0,01 µsec

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[1] See page 9; voir page 9; siehe Seite 9 ←
[2] Due to transients
Pour des tensions transitoires
Für Ausgleichsspannungen

L.F. class B amplifier and modulator without grid current
Amplificatrice et modulatrice B.F. classe B sans courant de grille
NF-Verstärker und Modulator Klasse B ohne Gitterstrom

Limiting values
Caractéristiques limites
Grenzdaten

V_a	= max.	600	V
W_{ia}	= max.	2x60	W
W_a	= max.	2x20	W
I_a	= max.	2x110	mA
V_{g2}	= max.	300	V
W_{g2}	= max.	2x3,5	W
R_{g1}	= max.	50	kΩ
V_{kf}	= max.	100	V

Operating conditions
Caractéristiques d'utilisation
Betriebsdaten

V_a	=	600		450		300		V
V_{g1} [1]	=	-27,5		-27,5		-26		V
V_{g2}	=	250		250		250		V
$R_{aa'}$	=	12,5		10		6,5		kΩ
$V_{g1g1'p}$	=	0	55	0	55	0	52	V
I_a	=	2x20	2x62	2x20	2x58	2x20	2x56	mA
I_{g2}	=	0,9	23	1,4	27	2,2	28	mA
W_{g2}	=	0,2	5,8	0,4	6,7	0,6	7,0	W
W_{ia}	=	2x12	2x37	2x9,0	2x26	2x6,0	2x16,8	W
W_a	=	2x12	2x12	2x9,0	2x8,5	2x6,0	2x5,6	W
W_o	=	0	50	0	35	0	22,5	W
dtot	=	-	2,4	-	3.1	-	2,9	%
η	=	-	67,5	-	67,5	-	67	%

[1] Individual adjustment of the grid bias of each system is recommended
Il est recommandé de régler la polarisation négative de chaque système individuellement
Es wird empfohlen die Gittervorspannung jedes Systems einzeln zu regeln.

[1])The tube should be protected by sufficient DC resistance in the supply circuit of the anode, the screen grid and the control grid, so that in case of short-circuit the current is limited to 0.5 A in each circuit

Le tube doit être protégé par des résistances ohmiques de valeur suffisante dans les circuits de l'anode, de la grille-écran et de la grille de commande, de sorte qu'en cas de court-circuit le courant soit limité dans chaque circuit à 0,5 A

Die Röhre soll mittels ohmscher Widerstände genügender Grösse in den Anoden-, Schirmgitter- und Steuergitterleitungen geschützt werden, so dass bei Kurzschluss der Strom in jeder Leitung auf 0,5 A begrenzt wird

L.F. class B amplifier and modulator with grid current
Amplificatrice et modulatrice B.F. classe B avec courant de grille
NF-Verstärker und Modulator Klasse B mit Gitterstrom

Limiting values
Caractéristiques limites
Grenzdaten

V_a	= max.	600	V
W_{ia}	= max.	2x60	W
W_a	= max.	2x20	W
I_a	= max.	2x110	mA
V_{g2}	= max.	300	V
W_{g2}	= max.	2x3,5	W
I_{g1}	= max.	2x5	mA
R_{g1}	= max.	50	kΩ
V_{kf}	= max.	100	V

Operating conditions
Caractéristiques d'utilisation
Betriebsdaten

V_a	=	600		450		300		V
V_{g1} [1])	=	-25		-25		-25		V
V_{g2}	=	250		250		250		V
$R_{aa'}$	=	8,0		6,0		4,0		kΩ
$V_{g1g1'p}$	=	0	78	0	76	0	75	V
I_a	=	2x25	2x100	2x25	2x97	2x25	2x94	mA
I_{g1}	=	0	2x2,6	0	2x2,6	0	2x2,6	mA
I_{g2}	=	1,2	26	1,9	28	2,8	28	mA
W_{ig1}	=	0	2x0,1	0	2x0,1	0	2x0,1	W
W_{g2}	=	0,3	6,5	0,5	7,0	0,7	7,0	W
W_{ia}	=	2x15	2x60	2x11,2	2x43,5	2x7,5	2x28,2	W
W_a	=	2x15	2x17	2x11,2	2x13,5	2x7,5	2x9,7	W
W_o	=	0	86	0	60	0	37	W
d_{tot}	=	-	5	-	5	-	5	%
η	=	-	71,5	-	69	-	65,5	%

[1]) Individual adjustment of the grid bias of each system is recommended
Il est recommandé de régler la polarisation négative de chaque système individuellement
Es wird empfohlen die Gittervorspannung jedes Systems einzeln zu regeln

PHILIPS

L.F. class B amplifier and modulator without grid current
Amplificatrice et modulatrice B.F. classe B sans courant de grille
NF-Verstärker und Modulator Klasse B ohne Gitterstrom

Limiting values
Caractéristiques limites
Grenzdaten

V_a	= max.	600	V
W_{ia}	= max.	2x60	W
W_a	= max.	2x20	W
I_a	= max.	2x110	mA
V_{g2}	= max.	300	V
W_{g2}	= max.	2x3,5	W
R_{g1}	= max.	50	kΩ
V_{kf}	= max.	100	V

Operating conditions
Caractéristiques d'utilisation
Betriebsdaten

V_a	=	600		450		300		V
V_{g1} [1]	=	-27,5		-27,5		-26		V
V_{g2}	=	250		250		250		V
$R_{aa'}$	=	12,5		10		6,5		kΩ
$V_{g1g1'p}$	=	0	55	0	55	0	52	V
I_a	=	2x20	2x62	2x20	2x58	2x20	2x56	mA
I_{g2}	=	0,9	23	1,4	27	2,2	28	mA
W_{g2}	=	0,2	5,8	0,4	6,7	0,6	7,0	W
W_{ia}	=	2x12	2x37	2x9,0	2x26	2x6,0	2x16,8	W
W_a	=	2x12	2x12	2x9,0	2x8,5	2x6,0	2x5,6	W
W_o	=	0	50	0	35	0	22,5	W
d_{tot}	=	-	2,4	-	3,1	-	2,9	%
η	=	-	67,5	-	67,5	-	67	%

[1]) Individual adjustment of the grid bias of each system is recommended
Il est recommandé de régler la polarisation négative de chaque système individuellement
Es wird empfohlen die Gittervorspannung jedes Systems einzeln zu regeln.

L.F. class B amplifier and modulator with grid current
Amplificatrice et modulatrice B.F. classe B avec courant de grille
NF-Verstärker und Modulator Klasse B mit Gitterstrom

Limiting values
Caractéristiques limites
Grenzdaten

V_a	= max.	600 V
W_{ia}	= max.	2x60 W
W_a	= max.	2x20 W
I_a	= max.	2x110 mA
V_{g2}	= max.	300 V
W_{g2}	= max.	2x3,5 W
I_{g1}	= max.	2x5 mA
R_{g1}	= max.	50 kΩ
V_{kf}	= max.	100 V

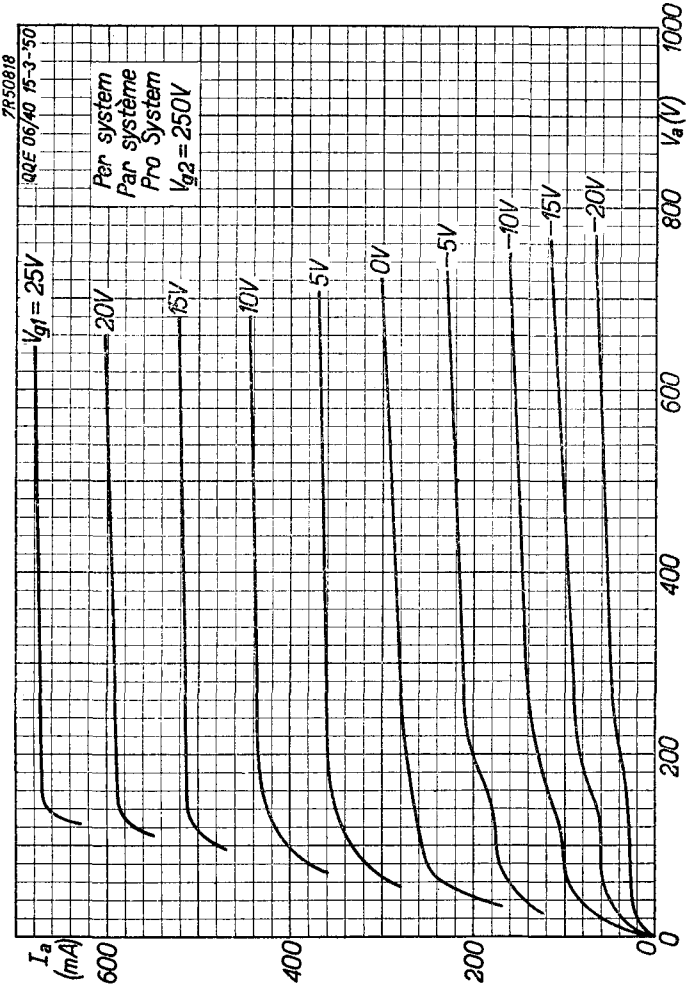
Operating conditions
Caractéristiques d'utilisation
Betriebsdaten

V_a	=	600		450		300	V
V_{g1} [1])	=	-25		-25		-25	V
V_{g2}	=	250		250		250	V
$R_{aa'}$	=	8,0		6,0		4,0	kΩ
$V_{g1g1'p}$	=	0	78	0	76	0	75 V
I_a	=	2x25	2x100	2x25	2x97	2x25	2x94 mA
I_{g1}	=	0	2x2,6	0	2x2,6	0	2x2,6 mA
I_{g2}	=	1,2	26	1,9	28	2,8	28 mA
W_{ig1}	=	0	2x0,1	0	2x0,1	0	2x0,1 W
W_{g2}	=	0,3	6,5	0,5	7,0	0,7	7,0 W
W_{ia}	=	2x15	2x60	2x11,2	2x43,5	2x7,5	2x28,2 W
W_a	=	2x15	2x17	2x11,2	2x13,5	2x7,5	2x9,7 W
W_o	=	0	86	0	60	0	37 W
d_{tot}	=	-	5	-	5	-	5 %
η	=	-	71,5	-	69	-	65,5 %

[1]) Individual adjustment of the grid bias of each system is recommended
Il est recommandé de régler la polarisation négative de chaque système individuellement
Es wird empfohlen die Gittervorspannung jedes Systems einzeln zu regeln

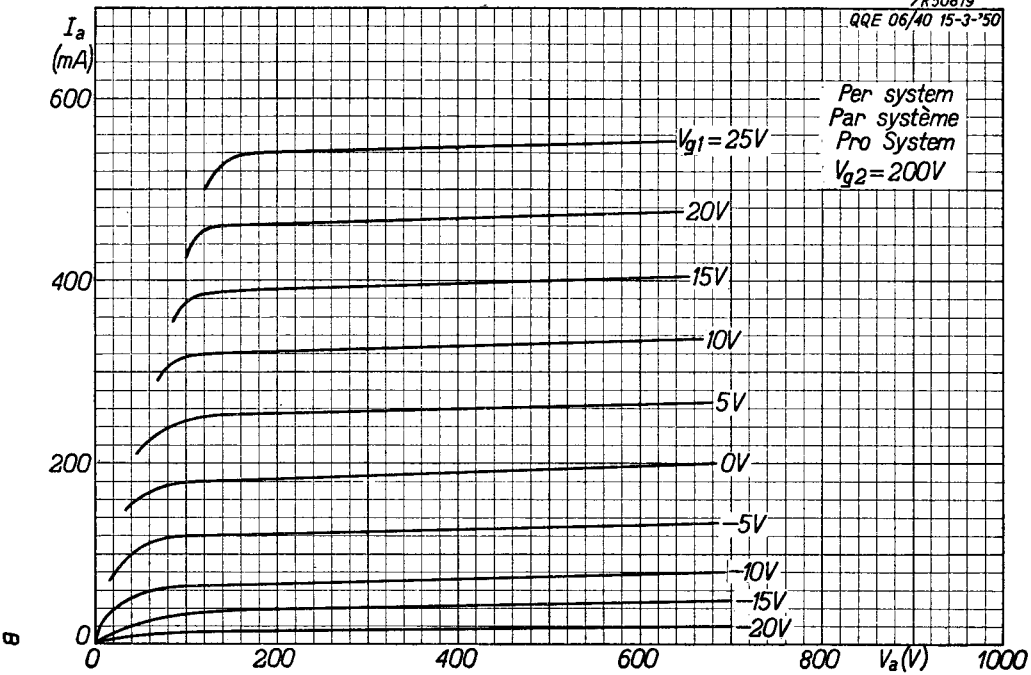
PHILIPS

QQE 06/40

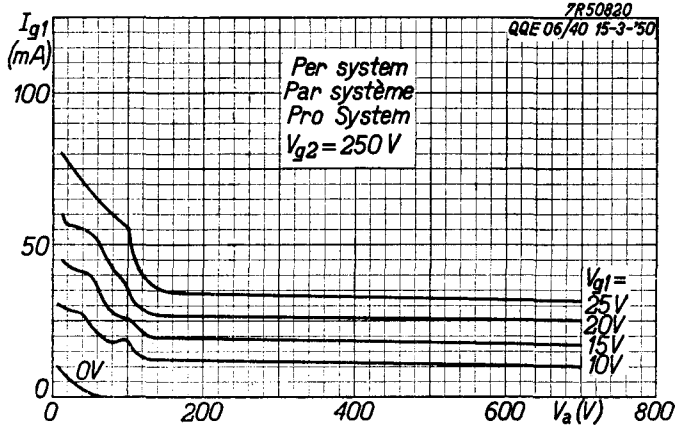


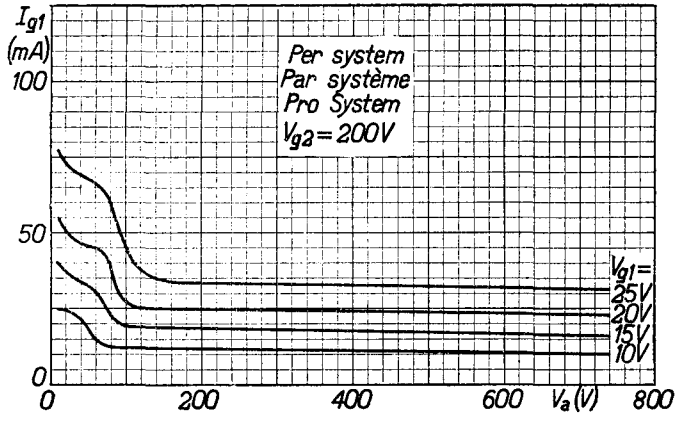
7.7.1954

A

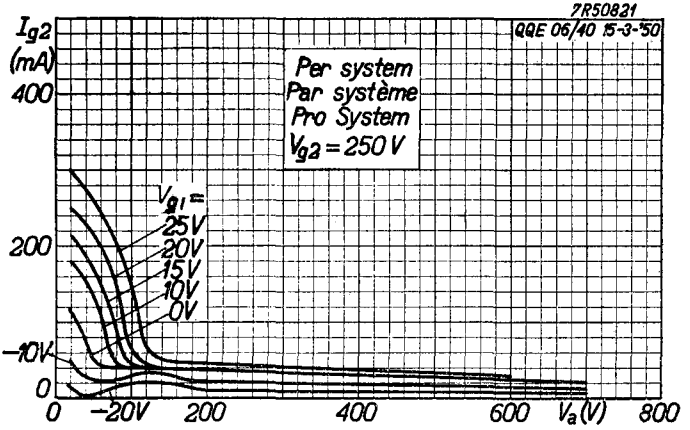

7R50819
QQE 06/40 15-3-'50
I_a (mA)
600
400
200
0
Per system
Par système
Pro System
V_{g2} = 200V
V_{g1} = 25V
20V
15V
10V
5V
0V
−5V
−10V
−15V
−20V
0
200
400
600
800
V_a (V)
1000

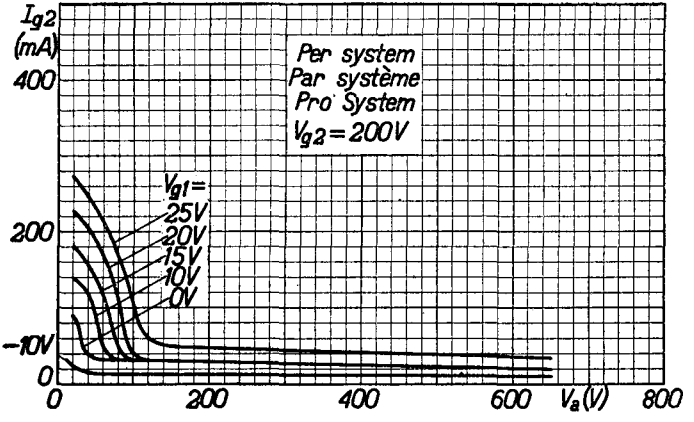
PHILIPS


7R50820
QQE 06/40 15-3-'50
I_{g1} (mA)
100
50
0
Per system
Par système
Pro System
V_{g2} = 250 V
V_{g1} =
25V
20V
15V
10V
0V
0
200
400
600
V_a (V)
800


I_{g1} (mA)
100
50
0
Per system
Par système
Pro System
V_{g2} = 200V
V_{g1} =
25V
20V
15V
10V
0
200
400
600
V_a (V)
800

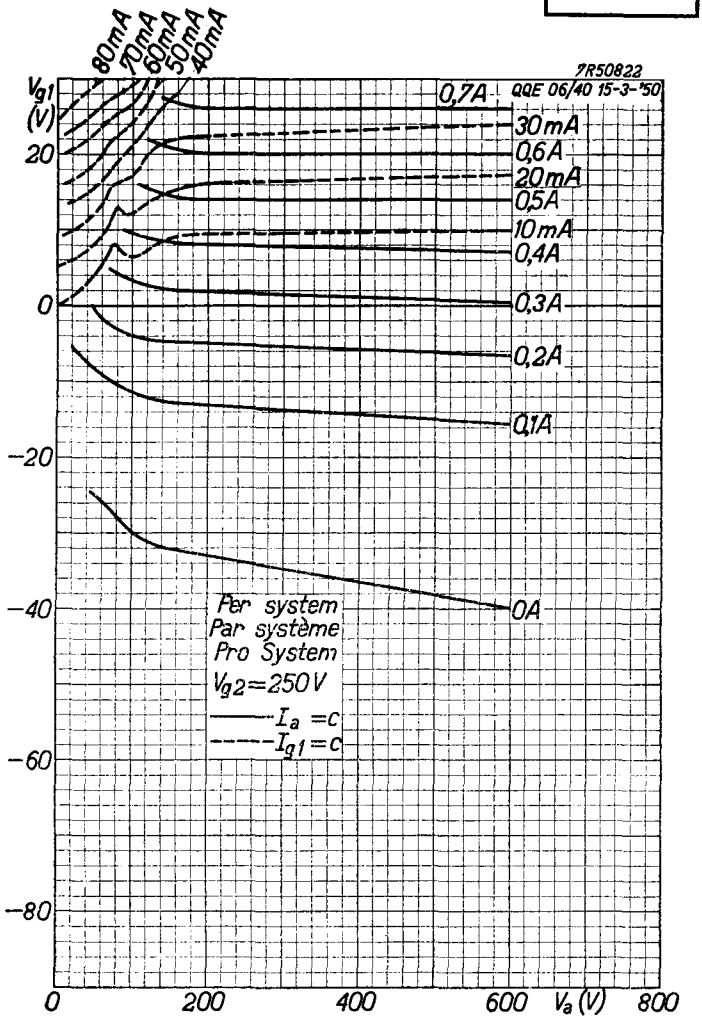
PHILIPS


7R50821
QQE 06/40 15-3-50
I_{g2} (mA)
400
200
−10V
0
Per system
Par système
Pro System
V_{g2} = 250 V
V_{g1} =
25V
20V
15V
10V
0V
0
−20V
200
400
600
V_a (V)
800


I_{g2} (mA)
400
200
−10V
0
Per system
Par système
Pro System
V_{g2} = 200V
V_{g1} =
25V
20V
15V
10V
0V
0
200
400
600
V_a (V)
800

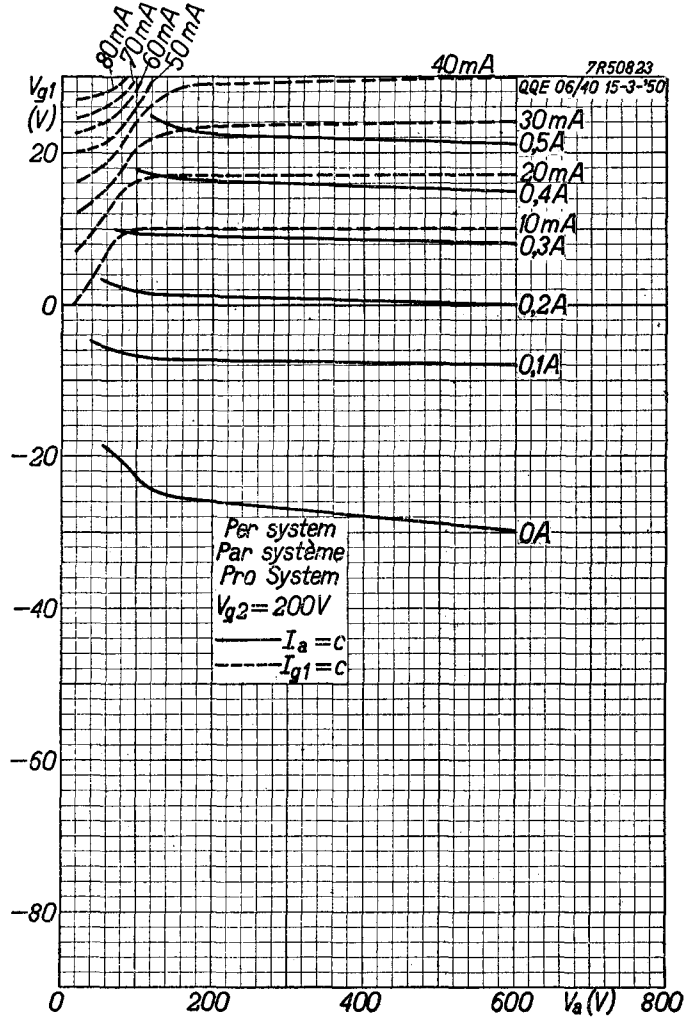
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QQE 06/40

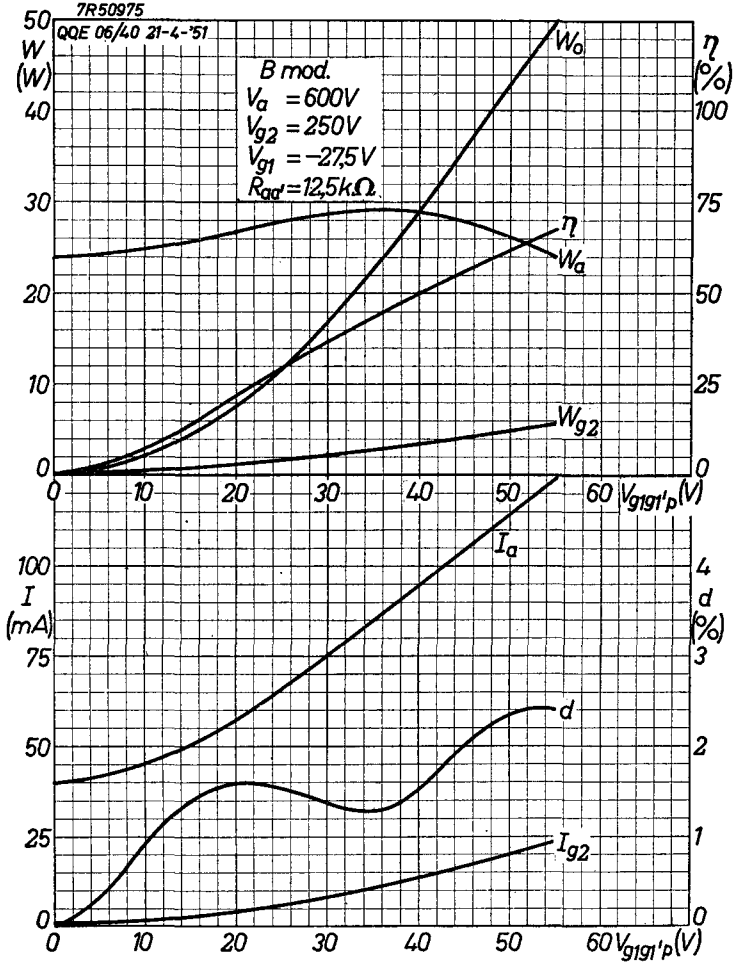


QQE 06/40

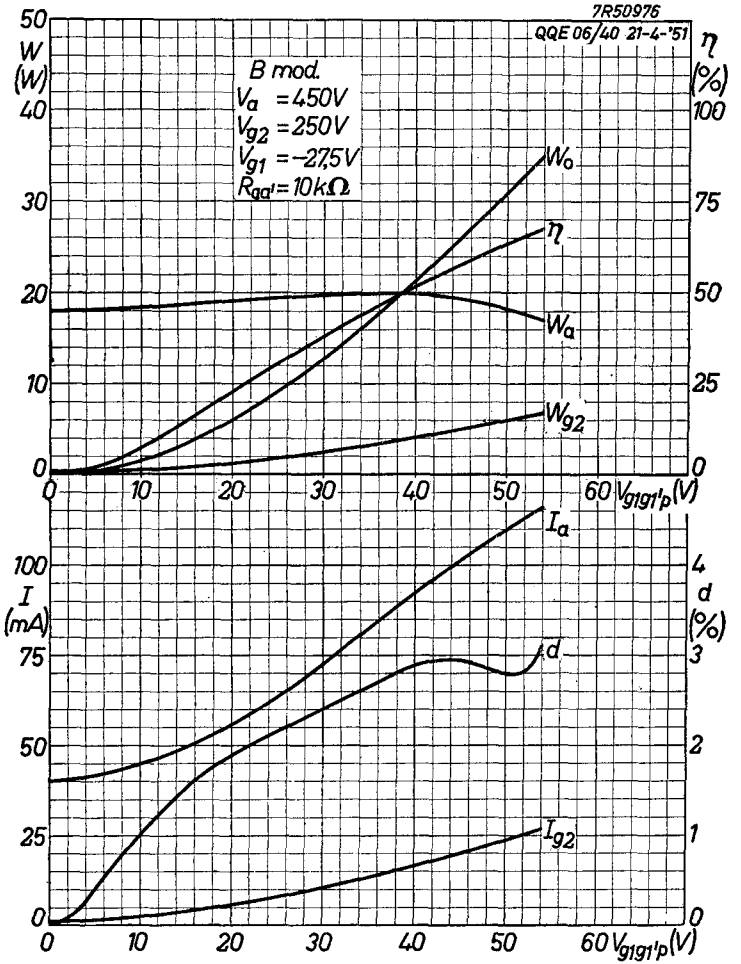
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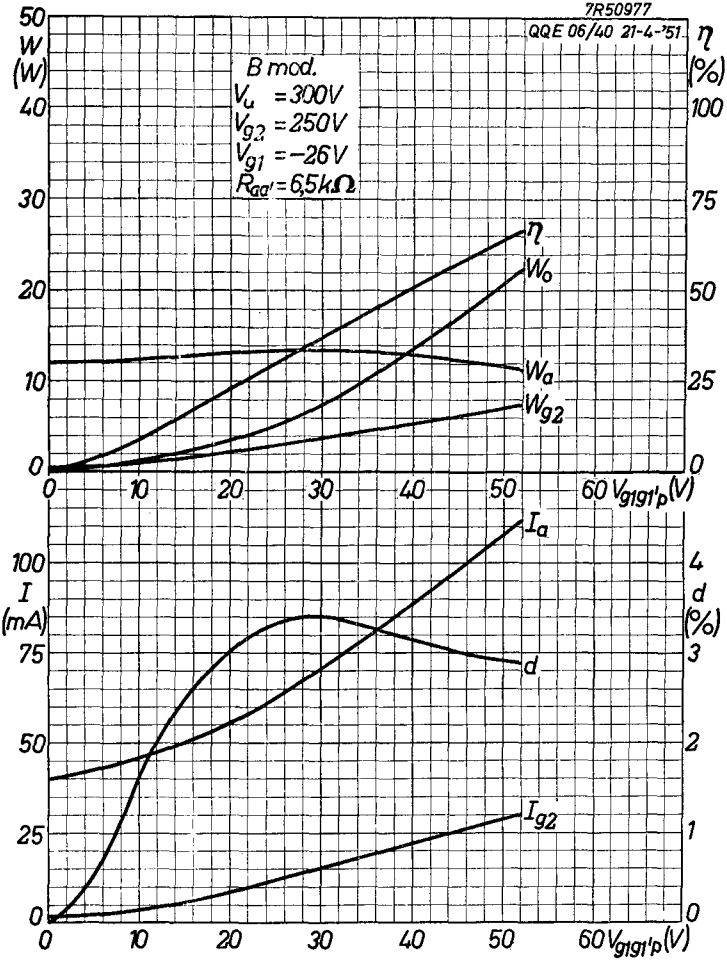


F


7R50975
QQE 06/40 21-4-'51
B mod.
V_a = 600V
V_{g2} = 250V
V_{g1} = −27,5V
$R_{aa'}$ = 12,5kΩ
W (W)
η (%)
W_o
η
W_a
W_{g2}
$V_{g1g1'p}$ (V)
I (mA)
d (%)
I_a
d
I_{g2}
$V_{g1g1'p}$ (V)

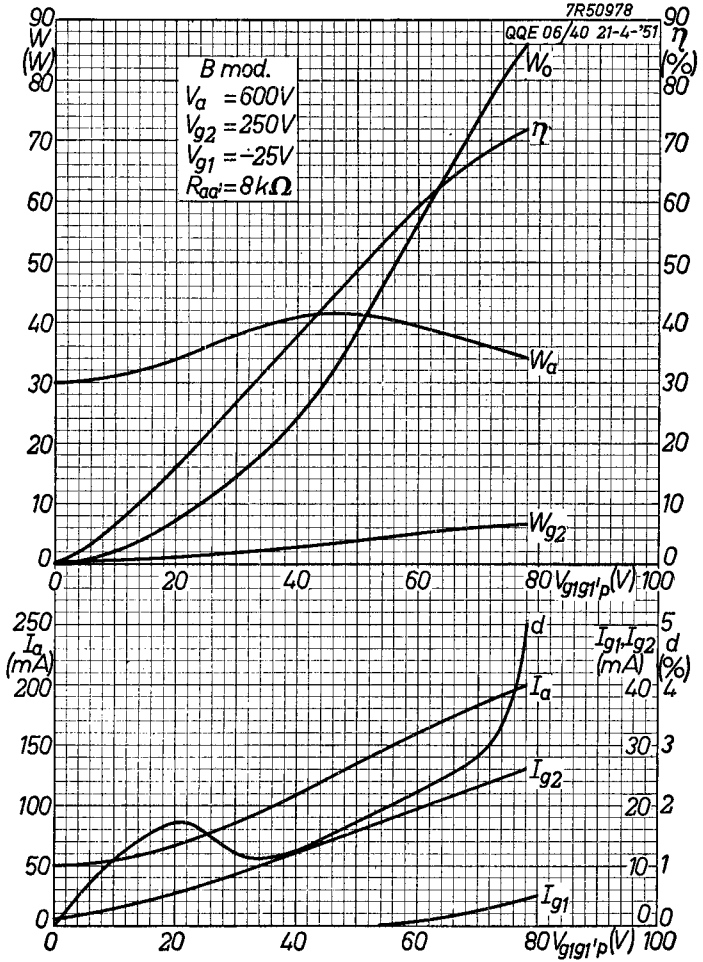
PHILIPS


7R50976
QQE 06/40 21-4-'51
B mod.
V_a = 450V
V_{g2} = 250V
V_{g1} = −27,5V
$R_{gg'}$ = 10kΩ
W (W)
η (%)
W_o
η
W_a
W_{g2}
$V_{g1g1'p}$ (V)
I (mA)
d (%)
I_a
d
I_{g2}
$V_{g1g1'p}$ (V)

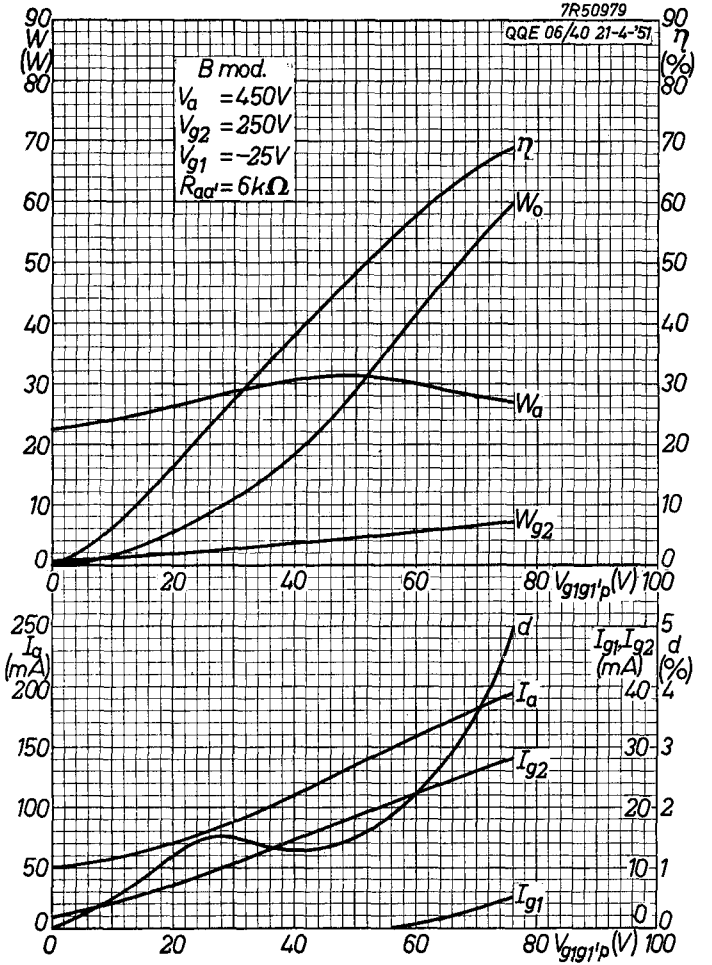

7R50977
QQE 06/40 21-4-'51
B mod.
V_u = 300V
V_{g2} = 250V
V_{g1} = −26V
$R_{aa'}$ = 6,5kΩ
W (W)
η (%)
W_o
W_a
W_{g2}
$V_{g1g1'p}$ (V)
I (mA)
d (%)
I_a
I_{g2}

QQE 06/40

PHILIPS

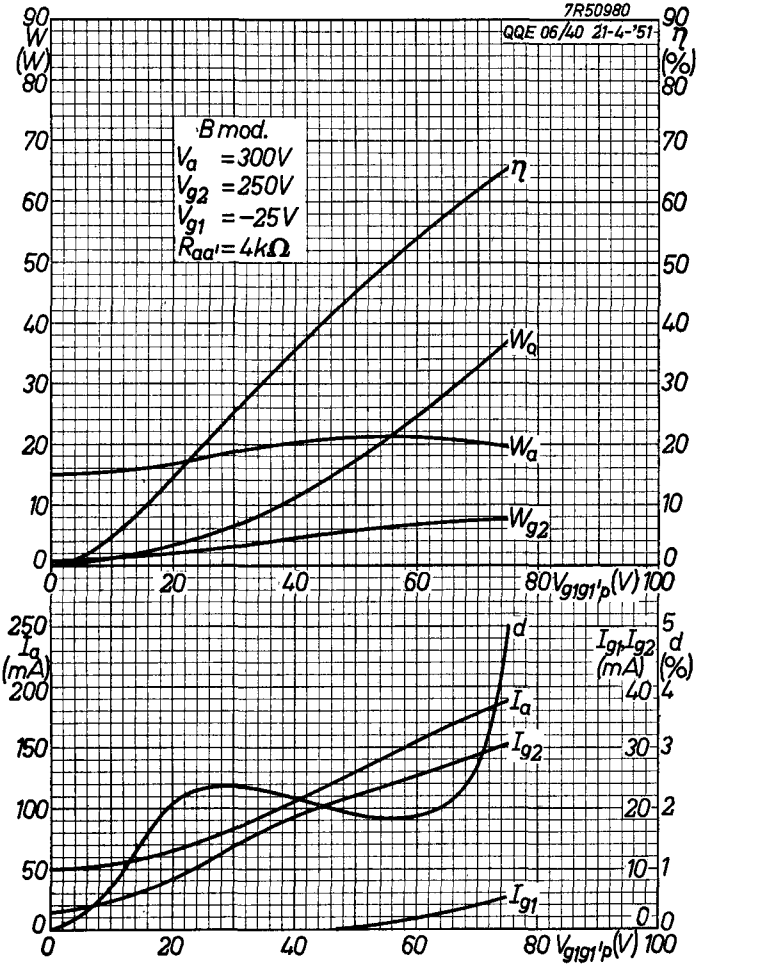


J


7R50979
QQE 06/40 21-4-'51
B mod.
V_a = 450V
V_{g2} = 250V
V_{g1} = −25V
$R_{aa'}$ = 6kΩ
W (W)
η (%)
W_o
W_a
W_{g2}
$V_{g1g1'p}$ (V)
I_a (mA)
I_{g1}, I_{g2} (mA)
d (%)
I_a
I_{g2}
I_{g1}

QQE 06/40

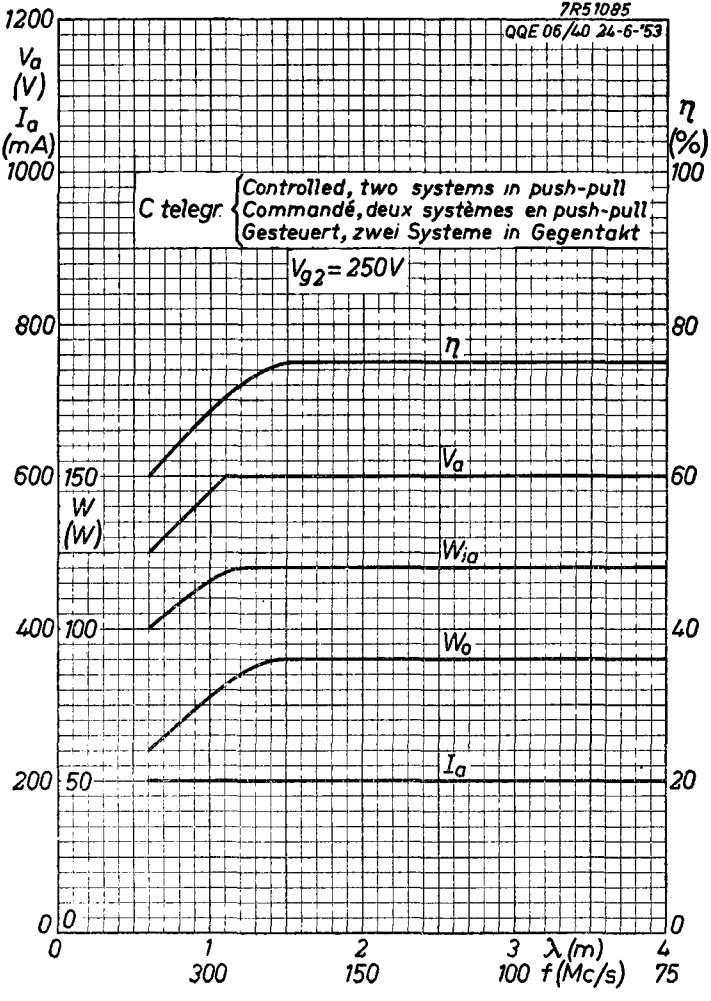
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L

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QQE 06/40



6.6.1953

M



QQE06/40

page	sheet	date
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2	1	1959.05.05
3	2	1957.03.03
4	2	1959.05.05
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18	B	1954.07.07
19	C	1954.07.07

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22	F	1954.07.07
23	G	1951.05.05
24	H	1951.05.05
25	I	1951.05.05
26	J	1951.05.05
27	K	1951.05.05
28	L	1951.05.05
29	M	1951.05.05
30, 31	FP	2000.01.15

DRY REED SWITCH

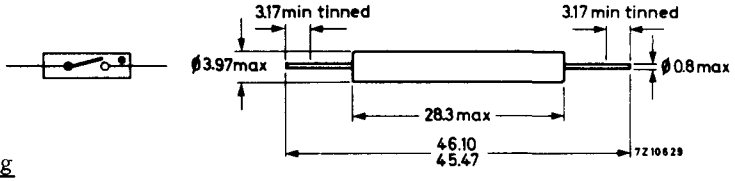
Miniature dry reed switch hermetically sealed in a gas-filled glass capsule. Single-pole, single-throw type, having normally open contacts, and containing two magnetically actuated reeds. The switch is of the double-ended type and may be actuated by means of either an electromagnet or a permanent magnet or combinations of both. The switch is intended for use in telephone equipment and other applications where exceptional reliability is required.

QUICK REFERENCE DATA	
Contact	S.P.S.T. normally open
Switched power	5 W
Switched voltage	50 V
Switched current	100 mA
Failure rate	$< 5 \times 10^{-8}$

MECHANICAL DATA

Dimensions in mm

Contact material	gold
Contact arrangement	normally open
Terminal finish	tinned
Resonant frequency of single reed	approx. 1650 Hz
Net weigth	approx. 0.6 g
Mounting position	any



Mounting

The leads should not be bent nearer than 2 mm to the glass-to-metal seals.
Stress on the glass-to-metal seals should be avoided.
The robustness of terminations is tested according to IEC Publication 68-2-1, test Ua (load 3 kg), Ub (load 1 kg, 4 bends) and Uc.
Care must be taken to prevent stray magnetic fields from influencing the operating and measuring conditions.

Data based on pre-production devices.

Soldering

The switch may be soldered direct into the circuit but heat conducted to the glass-to-metal seals should be kept to a minimum by the use of a thermal shunt.

Dip-soldering is permitted to a minimum of 4 mm from the seals at a solder temperature of 240 °C during maximum 10 s.

Solderability

Solderability is tested according to IEC Publication 68-2-20, test T, solder globule method.

CHARACTERISTICS

Non-operative			
Breakdown voltage	min.	1000	V
Insulation resistance, initial (V = 100 V)	min.	10^5	MΩ
Capacitance without test coil		0.70	pF
Capacitance with earthed test coil		0.35	pF
Non-operative ampere turns	max.	30	A.T. [1]
Operative			
Operating ampere turns	max.	58	A.T. [1]
Operating time, including bounce	av.	0.6	ms [1][2]
	max.	1.0	ms [1][2]
Switched current	max.	100	mA
Hold			
Hold ampere turns	min.	27	A.T. [1]
Current through closed contacts	max.	1	A
Contact resistance, initial	min.	60	mΩ [1][3]
	max.	150	mΩ [1][3]
Release			
Release ampere turns	max.	15	A.T. [1]
Release time	max.	50	μs [1][2]
Switched current	max.	100	mA
Switched power	max.	5	W

[1]) Measured in a standard coil of 5000 turns of 42 SWG single enamelled copper wire on a coil former of 25.4 mm winding length and a core diameter of 8.75 mm.

[2]) Measured with 80 A.T.

[3]) Measured with 40 A.T.

LIMITING VALUES (Absolute max. rating system)

See also "Life expectancy and reliability"

Switched power	max.	5	W
Switched voltage	max.	65	V
Switched current	max.	100	mA
surge (T = max. 100 ns)	max.	1.5	A
Temperature, operating	min.	−55	°C
	max.	+80	°C

LIFE EXPECTANCY AND RELIABILITY

End of life is assumed to be reached when:

a) the contact resistance exceeds 1 Ω for no load conditions or 2.5 Ω for loaded conditions

b) the release time exceeds 1.5 ms (latching or contact sticking)

No load conditions

Life expectancy min. 10^7 operations with a failure rate of less than 5.5×10^{-9} with 90% confidence level.

Loaded conditions

Life expectancy min. 5×10^6 operations with a failure rate of less than 10^{-8} with 90% confidence level.

If inductive loads are to be interrupted, contact protection is recommended (diode or RC network).

Reliability - testing conditions

Capacitive loading resulting in a peak current of 1.4 A, $i_1/i_2 = 1.4$, T = 80 ns to 100 ns, see Fig.1. Nominal switched voltage 50 V, nominal switched current 100 mA.

Under these conditions a life of more than 5×10^6 operations can be reached with a failure rate of less than 8.5×10^{-9}.

Remark

Higher loads may be switched if a reduced life expectancy and reliability are acceptable. The manufacturer should be consulted before doing so.

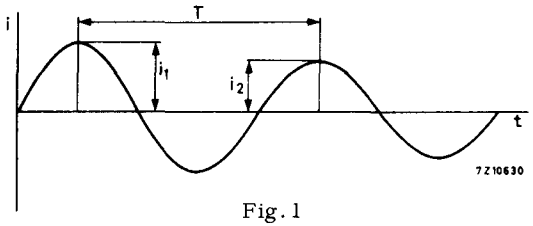


Fig.1

SHOCK AND VIBRATION

Impact : Acceleration 50 g during 11 ms, due to a force perpendicular to the flat sides of the reeds.
Such an impact will not cause an open contact (no magnetic field present) to close, nor a contact kept closed by an 80 A.T. coil to open.

Vibration: Frequency range 50 Hz to 1500 Hz, acceleration 20 g due to a force perpendicular to the flat side of the reed.
Such a vibration will not cause an open contact (no magnetic field present) to close, nor a contact kept closed by an 80 A.T. coil to open.

PHILIPS

Data handbook

Electronic components and materials

RI12

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1	1	1969.07
2	2	1969.07
3	3	1969.07
4	4	1969.07
5	FP	2001.05.18

PHILIPS AMATEURZENDLAMPEN TA 04/5, TA 08/10 EN TB 04/10

Van de zendlampen met wolframgloeidraad zijn de typen TA 04/5 en TA 08/10 bijzonder geschikt voor amateur-doeleinden. De anodespanning is in verhouding tot het vermogen laag, terwijl dank zij de groote steilheid een goed rendement verkregen kan worden. De lampen zijn mechanisch zeer sterk geconstrueerd. De anodedissipatie is bovendien zoo hoog, dat ook bij overbelasting van de lamp door minder juiste instelling deze niet onbruikbaar wordt.

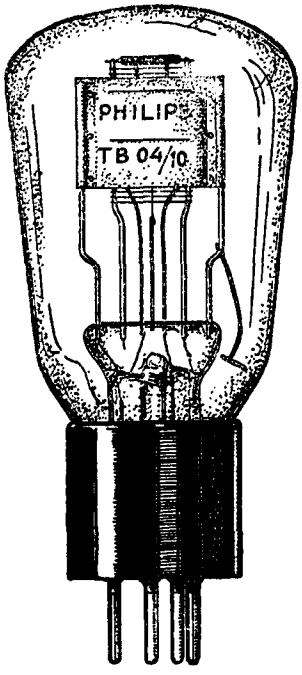
De TA 04/5 is een 5-watt zendlamp met de volgende gegevens:

Gloeispanning	v_f	= 5,0 V
Gloeistroom	i_f	= ± 1,6 A
Anodedissipatie	w_a	= 10 W
Anodedissipatie beproefd op	w_{at}	= 20 W
Verzadigingsstroom	i_s	= 75 mA
Anodespanning	v_a	= 400 V
Versterkingsfactor	g	= ± 10
Steilheid	S	= ± 0,9 mA/V
Inwendige weerstand	R_i	= ± 11000 Ω
Huls		A 34 of G 34

De TA 08/10 is een 10-watt zendlamp met de volgende gegevens:

Gloeispanning	v_f	= 5,7 V
Gloeistroom	i_f	= ± 1,9 A
Anodedissipatie	w_a	= 20 W
Anodedissipatie beproefd op	w_{at}	= 50 W
Verzadigingsstroom	i_s	= 100 mA
Anodespanning	v_a	= 500—800 V
Versterkingsfactor	g	= ± 50
Steilheid	S	= ± 1,4 mA/V
Inwendige weerstand	R_i	= ± 36000 Ω
Huls		A 34 of G 34

Bij de zendlampen TA 04/5 en TA 08/10 behooren de gelijkrichtlampen DA 04/5 en DA 08/10. Voor een TA 04/5 respectievelijk TA 08/10 zijn minstens 2 DA 04/5 respectievelijk DA 08/10 als gelijkrichtlamp noodig.

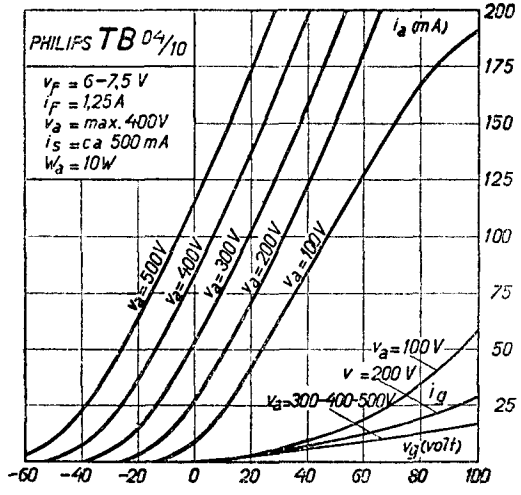


PHILIPS
AMATEUR-ZENDLAMP TB 04/10

Gloeispanning	v_f	=	6—7,5 V
Gloeistroom	i_f	= ±	1,25 A
Anodedissipatie	w_a	=	10 W
Anodedissip. bepr. op	w_{at}	=	15 W
Verzadigingsstroom	i_s	=	ca. 500 mA
Max. anodespanning	v_a	=	200—400 V
Versterkingsfactor	g	=	ca. 7,5
Steilheid	S	=	ca. 2,0 mA/V
Inwendige weerstand	R_i	=	3750 Ω
Huls			A 34 of G 34

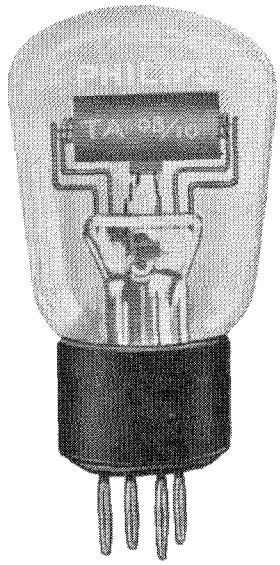
Dit is een amateur-zendlamp met zeer bijzondere eigenschappen. Zij heeft een gethorieerden gloeidraad met zeer hooge emissie en kan voor de volgende doeleinden gebruikt worden:

1. als oscillator in een zender, zoowel voor de kortste als de langste golven, die practisch gebruikt worden. Bij een anodespanning van 400 volt kan een energie van minstens 10 watt afgegeven worden, terwijl bij 220 volt anodespanning aan de lamp een hoogfrequent energie van 5 watt ontnomen kan worden;
2. als modulator in een telefonie-zender;
3. als energieversterker in een zender, waarbij de rooster-excitatie verkregen wordt met behulp van een stuurlamp;
4. als eindversterker in een laagfrequent-versterker met luidspreker, wanneer een aanzienlijke versterking en zeer zuivere weergave wordt gewenscht;
5. als gelijkrichter (diode). Daartoe worden rooster en anode aan elkander verbonden.



Een volledige gebruiksaanwijzing van deze lamp wordt op aanvrage gratis toegezonden.

PHILIPS AMATEURZENDLAMP TA 08/10

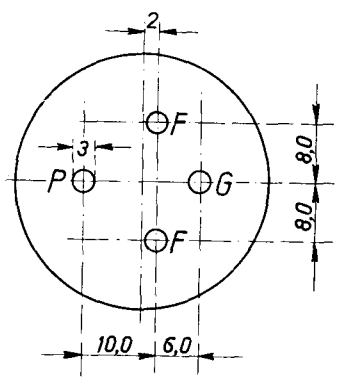


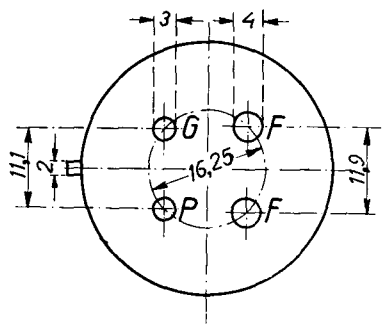
Evenals de TA 04/5 is ook de TA 08/10 bij uitstek geschikt voor experimenteer=doeleinden in amateur=zenders. Het vermogen is twee maal grooter dan van de TA 04/5, d.w.z. bij een anode=spanning van 800 V kan een nuttig vermogen van 10 Watt verkregen worden.

Ook deze lamp is mechanisch zeer sterk geconstrueerd, terwijl de anodedissipatie zoo hoog is, dat een overbelasting practisch is uitgesloten.

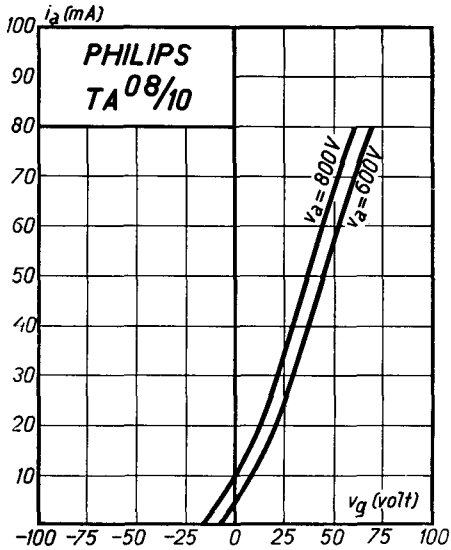
De TA 08/10 is voorzien van de normale Philips huls met 4 pennen type A 34.

Op verzoek kan zij echter ook met de Amerikaansche standaardhuls G 34 geleverd worden.





PHILIPS AMATEURZENDLAMP TA 08/10



Gloeispanning	v_f	= 5,7 V
Gloeistroom	i_f	= ca. 1,9 A
Verzadigingsstroom	i_s	= ca. 100 mA
Anodespanning	v_a	= 500—800 V
Anodedissipatie	W_a	= 20 W
Anodedissipatie beproefd op . .	W_{at}	= 50 W
Versterkingsfactor	g	= ca. 50
Steilheid	S	= ca. 1,4 mA/V
Inwendige weerstand	R_i	= ca. 36000 ohm
Grootste lengte	d	= 54 mm
Grootste diameter	l	= 115 mm

Bij de zendlamp TA 08/10 behoort de gelijkrichtlamp DA 08/10.

PHILIPS SENDERRÖHRE



1/3 der natürl. Grösse

TA 10/1250

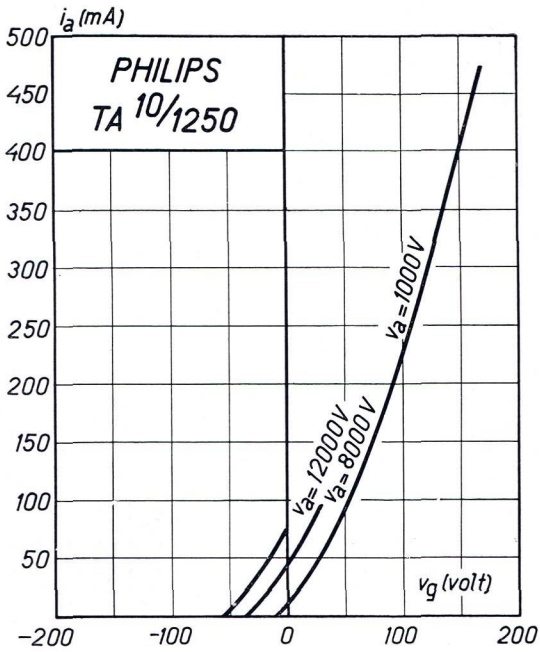
Diese Röhre ist für grosse Telegraphiesender bestimmt. Sie hat eine normale Anodenspannung von 10.000 Volt. Diese Spannung kann bis auf 12.000 Volt gesteigert werden, während bei 4000 Volt noch ein guter Nutzeffekt möglich ist. In untenstehender Tabelle ist für eine Anodenspannung von 10.000 V. die Nutzleistung bei verschiedenen Werten des Nutzeffektes angegeben.

Die TA 10/1250 eignet sich ausserdem als Oszillator in einem Telephoniesender.

Nutzeffekt	40	50	60	70	75	%
Eingangsleistung	660	800	1000	1330	1650	watts
Nutzleistung	260	400	600	930	1250	watts
Anodenverlust	400	400	400	400	400	watts

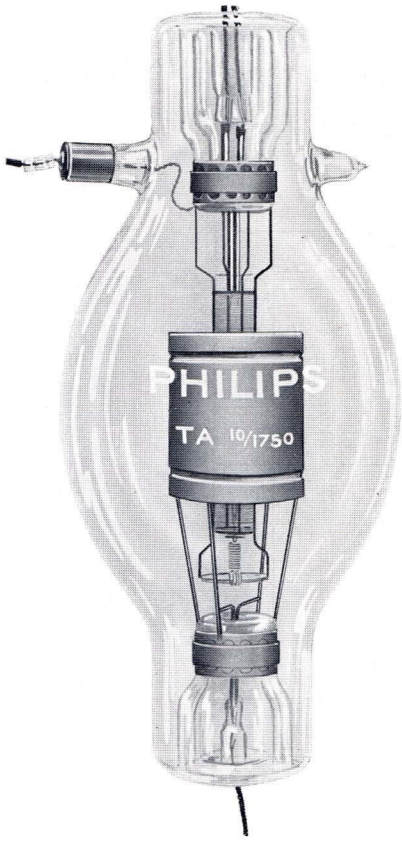
PHILIPS SENDERRÖHRE

TA 10/1250



Heizspannung	v_f	= ca. **15,0** V
Heizstrom	i_f	= ca. **9,5** A
Sättigungsstrom	i_s	= **600** mA
Anodenspannung	v_a	= **4,000-12,000** V
Anodenverlust	w_a	= **400** W
Anodenverlust geprüft auf	w_{at}	= **500** W
Verstärkungsfaktor	g	= ca. **150**
Steilheit (min.)	S	= ca. **3,0** mA/V
Innerer Widerstand (min.)	R_i	= ca. **50,000** Ω
Sättigungsspannung in der Gitterfläche	v_s	= **500** V
Grösster Durchmesser	d	= **170** mm
Grösste Länge	l	= **350** mm

PHILIPS SENDERRÖHRE



Grösse 1 : 4

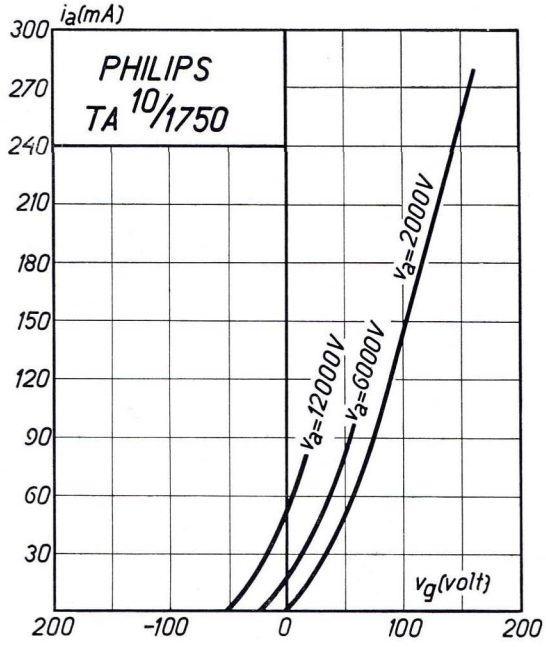
TA 10/1750

Dies ist eine Hochleistungs-senderröhre, die bei einer Anodenspannung von 10000 Volt und einem Nutzeffekt von 75%, 1,9 kW abgeben kann. Die Anodenspannung kann nötigenfalls bis auf 12000 Volt erhöht werden. Auch bei 4000 Volt ist noch ein guter Nutzeffekt möglich. In untenstehender Tabelle für 10000 Volt Anodenspannung ist für verschiedene Nutzeffektwerte die Nutzleistung angegeben.

Nutzeffekt	40	50	60	70	75	%
Zugeführte Leistung . . .	1000	1200	1500	2000	2500	Watt
Nutzleistung	400	600	900	1400	1900	Watt
Anodenverlust	600	600	600	600	600	Watt

PHILIPS SENDERRÖHRE

TA 10/1750

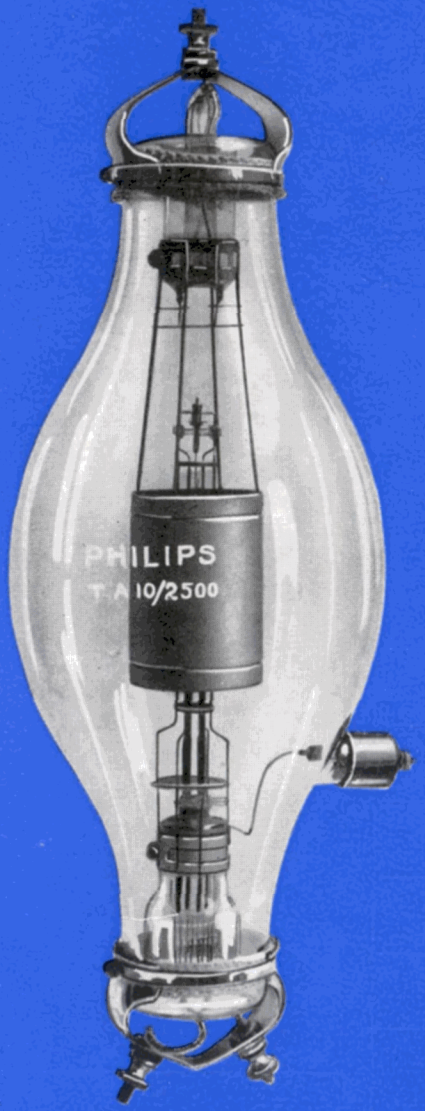


Heizspannung	v_f	= ca. **17** V
Heizstrom	i_f	= ca. **15** A
Sättigungsstrom	i_s	= **900** mA
Anodenspannung	v_a	= **4000—12000** V
Anodenverlust	w_a	= **600** W
Anodenverlust geprüft auf	w_{at}	= **750** W
Verstärkungsfaktor	g	= ca. **200**
Durchgriff	D	= ca. **0,5** %
Steilheit	S	= ca. **2,0** mA/V
Innerer Widerstand	R_i	= ca. **100.000** Ω
Sättigungsspannung in der Gitterfläche	v_s	= **400** V
Grösster Durchmesser	d	= **180** mm
Grösste Länge	l	= **420** mm

PHILIPS

TUBE EMETTEUR

TA 10/2500



Ce tube fournit une puissance utile allant jusqu'à 2,5 kW pour une tension anodique de 10000 V. Bien que cette tension puisse être portée à 12000 V, un rendement relativement bon est déjà possible pour 6000 V. Le tableau suivant indique, pour la télégraphie, la puissance utile pour différentes valeurs du rendement et une tension anodique de 10000 V.

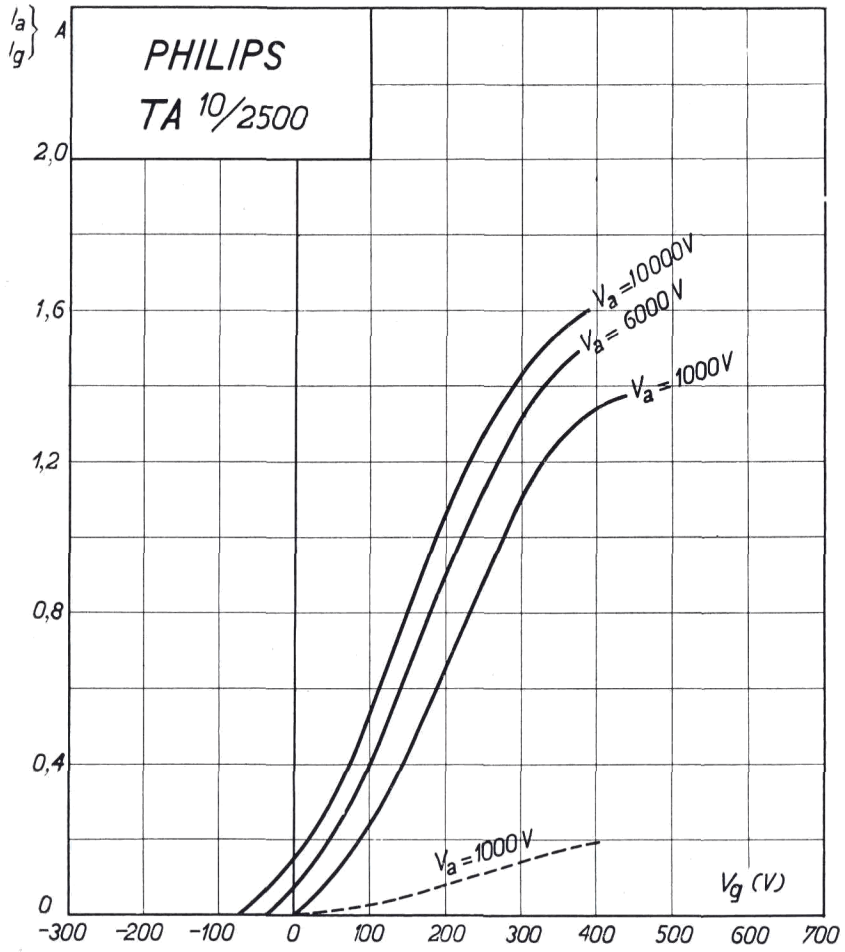
Rendement	40	50	60	70	75	%
Puissance appliquée	1250	1500	1850	2500	3250	W
Puissance utile	500	750	1100	1750	2500	W
Dissipation anodique	750	750	750	750	750	W

Utiliser pour l'obtention de la tension anodique nécessaire à ce tube, un tube redresseur Philips DA 10/5000.

PHILIPS

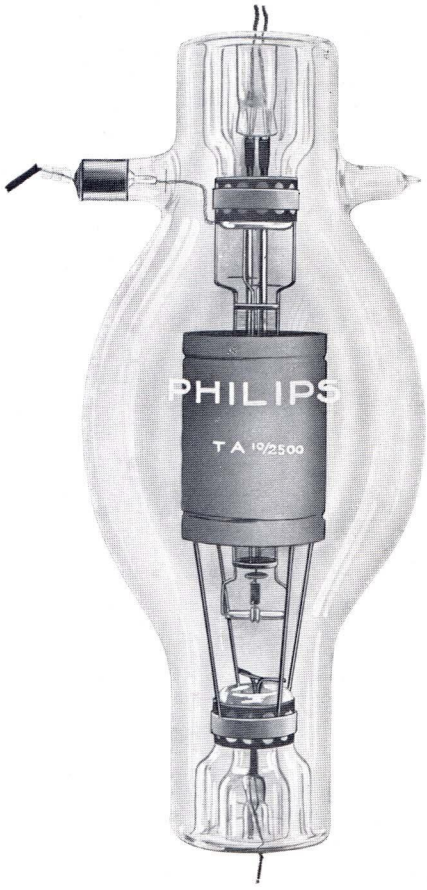
TUBE EMETTEUR

TA 10/2500



Tension de chauffage	V_f	= 12,5 V
Courant de chauffage	I_f	= 24 A env.
Courant de saturation	I_s	= 1,5 A env.
Tension anodique	V_a	= 6000—12000 V
Dissipation anodique admissible	W_a	= 750 W
Dissipation anodique d'essai	W_{at}	= 1000 W
Coefficient d'amplification	k	= 130 env.
Inclinaison pour V_a = 10000 V, I_a = 100 mA	S_{norm}	= 2,5 mA/V env.
Inclinaison maximum	S_{max}	= 5 mA/V env.
Résistance intérieure pour V_a = = 10000 V, I_a = 100 mA	R_i	= 50000 Ω env.
Diamètre maximum de l'ampoule	d	= 200 mm
Diamètre total maximum	d'	= 220 mm env.
Longueur totale	l	= 590 mm env.

PHILIPS SENDERRÖHRE



Grösse 1 : 4

TA 10/2500

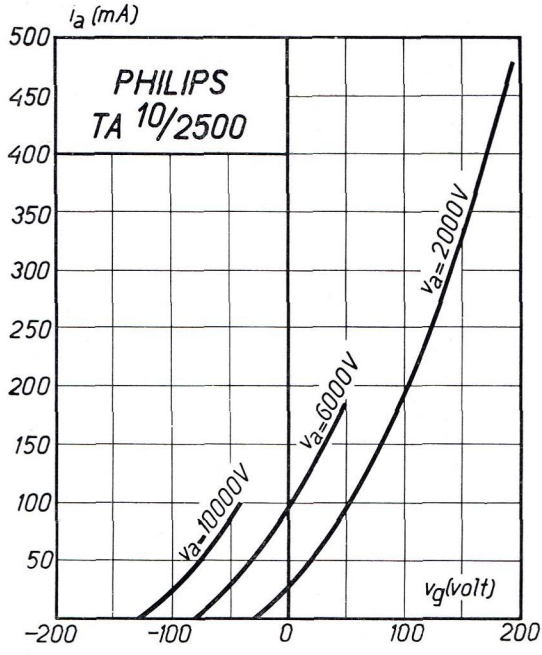
Bei einer Anodenspannung von 10000 Volt kann diese Röhre 2,5 kW abgeben. Die Anodenspannung kann nötigenfalls bis zu 12000 Volt gesteigert werden. Bei 6000 V ist noch ein guter Nutzeffekt möglich.

In untenstehender Tabelle ist für eine Anodenspannung von 10000 Volt die Nutzleistung für verschiedene Nutzeffektwerte angegeben.

Nutzeffekt.	40	50	60	70	75	%
Zugeführte Leistung . . .	1250	1500	1850	2500	3250	Watt
Nutzleistung	500	750	1100	1750	2500	Watt
Anodenverlust	750	750	750	750	750	Watt

PHILIPS SENDERRÖHRE

TA 10/2500



Heizspannung	v_f =	ca. **14,0** V
Heizstrom	i_f =	ca. **24,5** A
Sättigungsstrom	i_s =	**1500** mA
Anodenspannung	v_a =	**6000 – 12000** V
Anodenverlust	w_a =	**750** W
Anodenverlust geprüft auf	w_{at} =	**1000** W
Verstärkungsfaktor	g =	ca. **80**
Durchgriff	D =	**1,25** %
Steilheit	S =	ca. **3,0** mA/V
Innerer Widerstand	R_i =	ca. **30000** Ohm
Sättigungsspannung in der Gitterfläche	v_s =	**400** V
Grösster Durchmesser	d =	**180** mm
Grösste Länge	l =	**420** mm

PHILIPS

TUBE EMETTEUR

TA

10/5000K



Ce tube émetteur à refroidissement par eau convient pour des longueurs d'ondes descendant jusqu'à 14 m. L' anode du tube se compose d'un cylindre en ferrochrome qui est soudé par un procédé spécial à l'ampoule en verre; cette soudure verre métal présente toute la sécurité désirable. Le tube se monte sur un refroidisseur entourant l'anode. La façon pratique dont la grille est amenée vers l'extérieur garantit une sûreté de fonctionnement absolue, même sur les ondes les plus courtes. Le tableau ci-dessous mentionne pour la télégraphie la puissance appliquée maximum et la tension anodique maximum admissible pour différentes longueurs d'ondes.

Longueur d'onde	14	60	110	125	150 et plus	m
Tens. anodique	5000	6000	8000	10000	12000	V
Puissance appliquée maximum	4	5	6,5	8	10	kW

Comme amplificateur classe B et pour $\lambda > 150$ m le tube peut être réglé comme suit:

TENSION ANODIQUE 12000 V

Modulation	Courant anodique	Energie de l'onde porteuse	Energie de pointe
100%	0,40 A	1,45 kW	5,80 kW
80%	0,45 A	1,8 kW	5,83 kW
60%	0,55 A	2,4 kW	6,15 kW

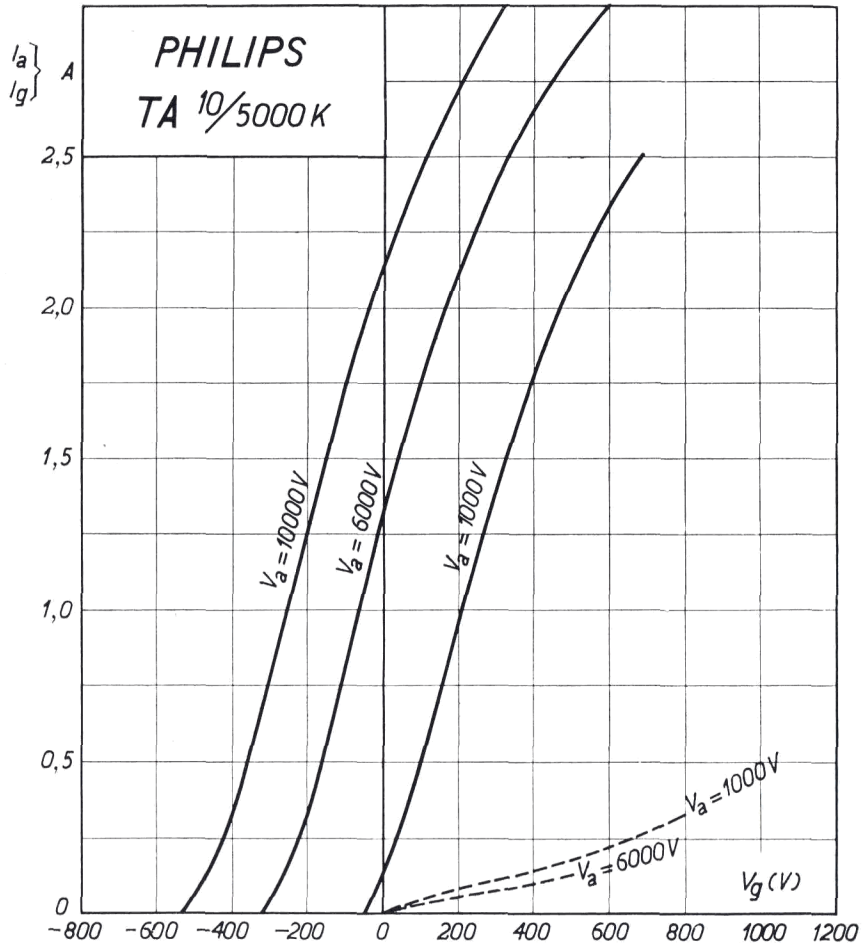
TENSION ANODIQUE 10000 V

Modulation	Courant anodique	Energie de l'onde porteuse	Energie de pointe
100%	0,40 A	1,2 kW	4,80 kW
80%	0,45 A	1,5 kW	4,86 kW
60%	0,55 A	2,0 kW	5,12 kW

PHILIPS

TUBE EMETTEUR

TA 10/5000 K

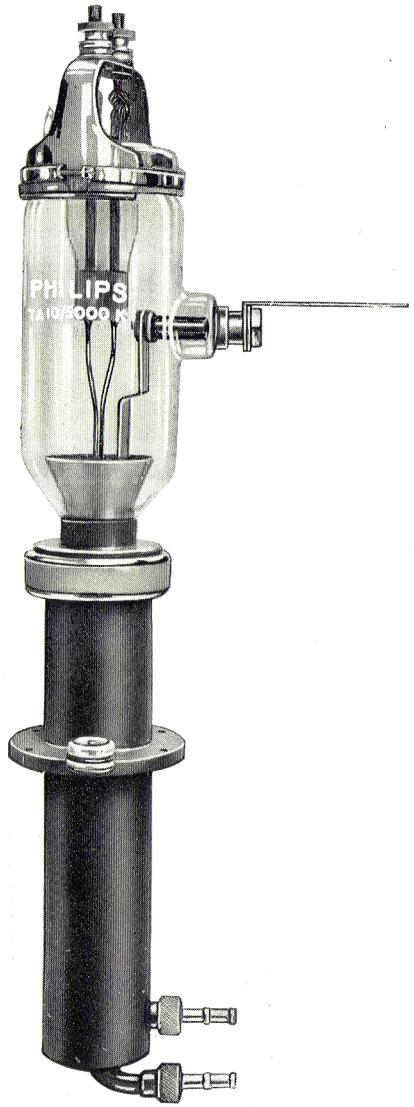


Tension de chauffage	V_f	= 21,5 V
Courant de chauffage	I_f	= 26 A env.
Courant de saturation	I_s	= 3 A env.
Tension anodique	V_a	= 4000—12000 V
Dissipation anodique admissible	W_a	= 5 kW
Dissipation anodique d'essai	W_{at}	= 7,5 kW
Coefficient d'amplification	k	= 20 env.
Inclinaison pour V_a = 10000 V, I_a = 0,5 A	S_{norm}	= 4 mA/V env.
Inclinaison maximum	S_{max}	= 5,5 mA/V env.
Résistance intérieure pour V_a = 10000 V, I_a = 0,5 A	R_i	= 5000 Ω env.
Diamètre maximum de l'ampoule	d	= 90 mm
Longueur totale sans refroidisseur	l	= 585 mm
Longueur totale avec refroidisseur	l'	= 630 mm env.

PHILIPS SENDERÖHRE TA 10/5000 K

Diese wassergekühlte Senderöhre kann als H.F.-Verstärkerröhre in Telegraphie- oder Telephoniesendern benutzt werden. Die höchstzulässige Anodenspannung von 12000 V darf sowohl in Telegraphie- wie in Telephoniesendern bei Wellenlängen bis zu 150 m herab angelegt werden. In Telegraphiesendern darf diese Spannung bei Wellenlängen bis zu 60 m herab 10000 V und bei Wellenlängen bis zu 15 m herab 8000 V betragen. In Telephoniesendern beträgt die höchstzulässige Anodenspannung bei Wellenlängen bis zu 60 m herab 8000 V und bei Wellenlängen bis zu 15 m herab 6500 V.

Die Anode besteht aus einem chromeisernen Zylinder, der durch einen Wasserkühler umgeben ist. Zusätzliche Kühlung der Heizfaden- und Gitteranschlüsse erübrigt sich.



PHILIPS EMISSION

In der nachstehenden Tabelle sind die Nutzleistung und der entsprechende Wirkungsgrad, die bei verschiedenen Einstellungen und Anodenspannungen auf einer Wellenlänge von 150 m erreicht werden können, angegeben.

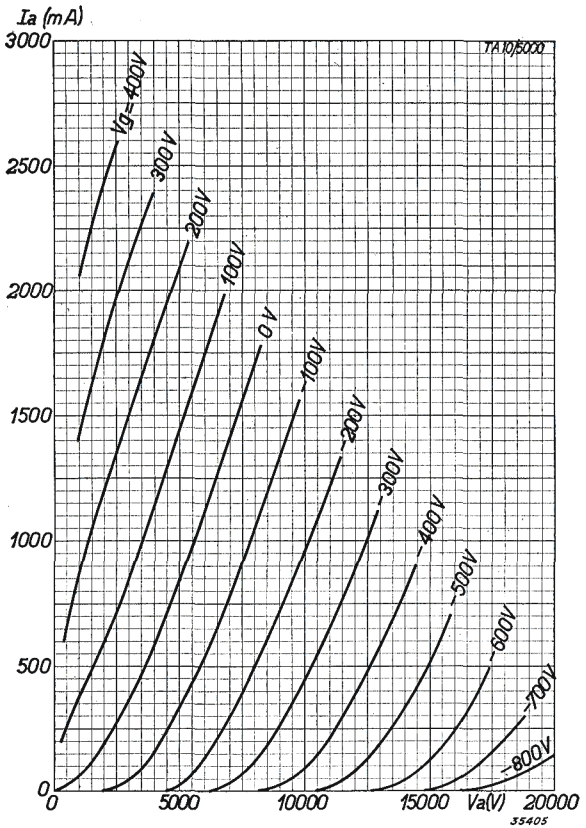
Einstellung	Anodenspannung	Nutzleistung	Wirkungsgrad
H.F.-Klasse C (Telegraphie)	12000 V 10000 V	8,2 kW[1]) 6,85 kW[1])	72 % 72 %
H.F.-Klasse B (Telephonie)	12000 V 10000 V	2 kW[1])[2]) 1,6 kW[1])[2])	35,5% 34 %

[1]) Kreisverluste sind abzuziehen.
[2]) Nutzleistung in der Trägerwelle (max. Modulationstiefe 100%).

6/40

B 3574/1

PHILIPS SENDERÖHRE TA 10/5000 K



Heizspannung	V_f	=	21,5 V
Heizstrom	I_f	=	ca. 26 A
Sättigungsstrom	I_s	=	ca. 3 A
Anodenspannung	V_a	=	max. 12000 V
Höchstzulässiger Anodenverlust	W_a	=	max. 5 kW
Geprüfter Anodenverlust	W_{at}	=	7,5 kW
Verstärkungsfaktor	μ	=	ca. 20
Steilheit bei $V_a = 12000$ V, $I_a = 500$ mA	S	=	ca. 4 mA/V
Anoden/Kathodenkapazität	C_{ak}	=	ca. 1,6 pF
Gitter/Kathodenkapazität	C_{gk}	=	ca. 14 pF
Anoden/Gitterkapazität	C_{ag}	=	ca. 31 pF
Maximale Gesamtlänge ohne Kühler	l	=	555 mm
Maximale Gesamtlänge mit Kühler	l'	=	621 mm
Maximaler Kolbendurchmesser	d	=	96 mm
Maximaler Gesamtdurchmesser	d'	=	158 mm

PHILIPS

ZENDLAMP TA 10/5000 K-I

Deze met water gekoelde zendlamp kan op golflengten van 14 m en hooger worden gebruikt. De anode van de lamp bestaat uit een chroomijzeren cylinder, die aan den glazen ballon is vastgelascht. De lamp wordt geleverd met een koelmantel, welke om de anode is aangebracht. De zware constructie van de roosteraansluiting waarborgt een betrouwbaar functionneeren ook op de kortste golflengten, bij een naar verhouding hoogen roosterwisselstroom.



In onderstaande tabel is het maximum opgenomen vermogen en de bij verschillende golflengten hoogst toelaatbare anodespanning aangegeven.

Golflengte	14	60	110	125	150 en hooger	m
Anodespanning	8000	9000	10000	11000	12000	V
Maximum opgenomen vermogen	6,5	7,2	8,0	9,0	10	kW

De lamp kan als klasse-B versterker bij $\lambda > 150$ m als volgt worden ingesteld:

ANODESPANNING 12000 V

Modulatiediepte	Anodestroom	Energie van de draaggolf	Piekwaarde v. h. vermogen
100%	0,40 A	1,45 kW	5,80 kW
80%	0,45 A	1,8 kW	5,83 kW
60%	0,55 A	2,4 kW	6,15 kW

ANODESPANNING 10000 V

Modulatiediepte	Anodestroom	Energie van de draaggolf	Piekwaarde v. h. vermogen
100%	0,40 A	1,2 kW	4,80 kW
80%	0,45 A	1,5 kW	4,86 kW
60%	0,55 A	2,0 kW	5,12 kW

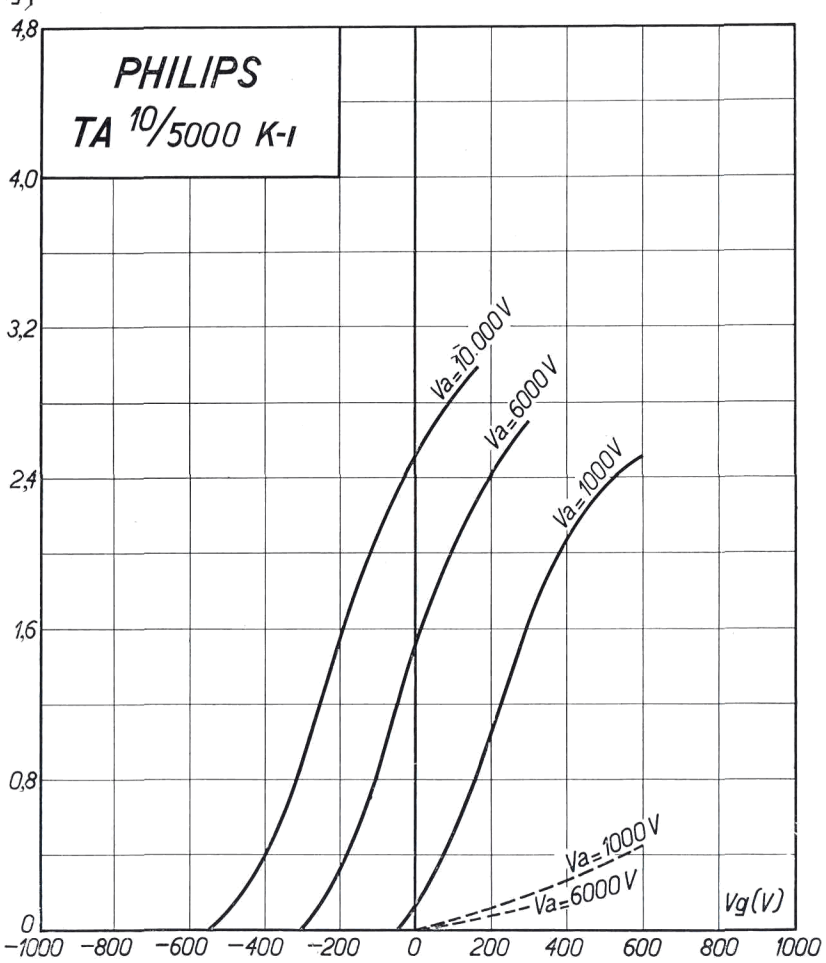
Voor de roosterexcitatie van de TA 10/5000 K-1 zijn de Philips zendlampen QB 3/500, TA 3/500 K, TA 3/500, MA 4/500 of MA 4/600 geschikt. De TA 10/5000 K-1 kan zelf voor de roosterexcitatie van ten hoogste twee lampen TA 12/20 of TA 12/20000 K worden gebruikt. De anodespanning kan worden geleverd door zes Philips kwikdampgelijkrichtlampen DCG 4/1000 of DCG 5/2500 of door drie lampen DCG 10/15.

5/4'37

PHILIPS

ZENDLAMP

TA 10/5000 K-I



Gloeispanning	V_f	= 21,5 V
Gloeistroom	I_f	= ca. 26 A
Verzadigingsstroom	I_s	= ca. 3,0 A
Anodespanning	V_a	= 4000-12000 V
Toelaatbare anodedissipatie	W_a	= 5,0 kW
Anodedissipatie tijdens meting	W_{at}	= 7,5 kW
Versterkingsfactor	g	= ca. 20
Steilheid bij I_a = 0,5 A	S_{norm}	= ca. 4,0 mA/V
Grootste steilheid	S_{max}	= ca. 5,5 mA/V
Inwendige weerstand bij I_a = 0,5 A	R_i	= ca. 5000 Ω
Grootste diameter van de lamp	d	= 96 mm
Totale lengte zonder koelmantel	l	= ca. 555 mm
Totale lengte met koelmantel	l'	= ca. 620 mm

PHILIPS SENDERRÖHRE



1/3 der natürl. Grösse

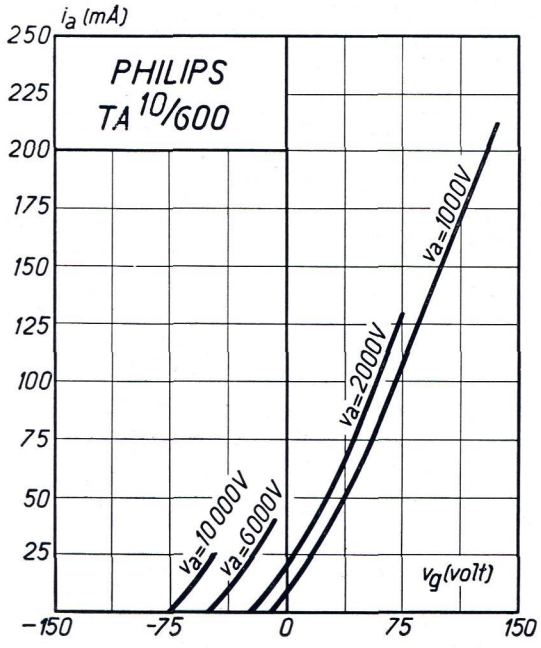
TA 10/600

Diese Senderröhre mit einer normalen Anodenspannung von 10 000 Volt wird bis zu 4000 Volt noch einen guten Wirkungsgrad liefern. Sie ist verwendbar für Schiffssender. In untenstehender Tabelle ist bei einer Anodenspannung von 10.000 Volt die Nutzleistung für verschiedene Werte des Wirkungsgrades angegeben.
Die Anodenspannung kann bis auf 12000 Volt erhöht werden.

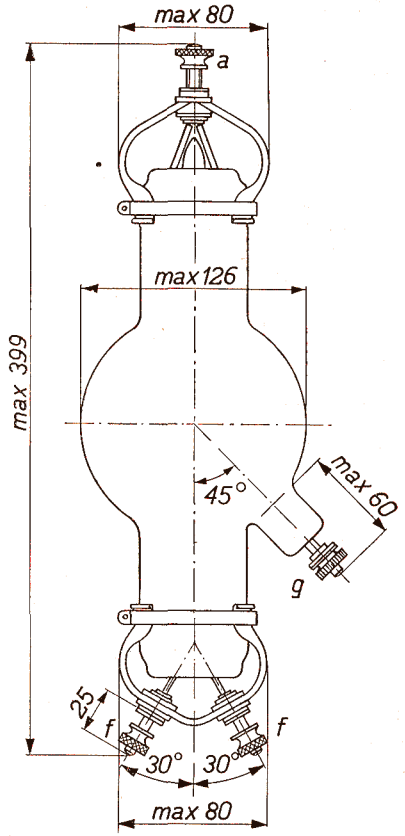
Wirkungsgrad	40	50	60	70	75	%
Eingangsleistung	330	400	500	670	800	Watt
Nutzleistung	130	200	300	470	600	Watt
Anodenverlust	200	200	200	200	200	Watt

PHILIPS SENDERRÖHRE

TA 10/600



Heizspannung	v_f	= ca. **12,5** V
Heizstrom	i_f	= ca. **6,3** A
Sättigungsstrom	i_s	= **260** mA
Anodenspannung	v_a	= **4000 – 12000** V
Zulässiger Anodenverlust	w_a	= **200** W
Anodenverlust geprüft auf	w_{at}	= **300** W
Verstärkungsfaktor	g	= ca. **125**
Durchgriff	D	= ca. **0,8** %
Steilheit	S	= ca. **1,7** mA/V
Inn. Widerstand	R_i	= ca. **75000** Ω
Sättigungsspannung in der Gitterfläche	v_s	= ca. **500** V
Grösster Durchmesser	d	= **120** mm
Grösste Länge	l	= **320** mm



PHILIPS-EMISSION

R.E. 520 E. 11/38

PHILIPS

TRANSMITTING VALVE

TA 10/600

Description

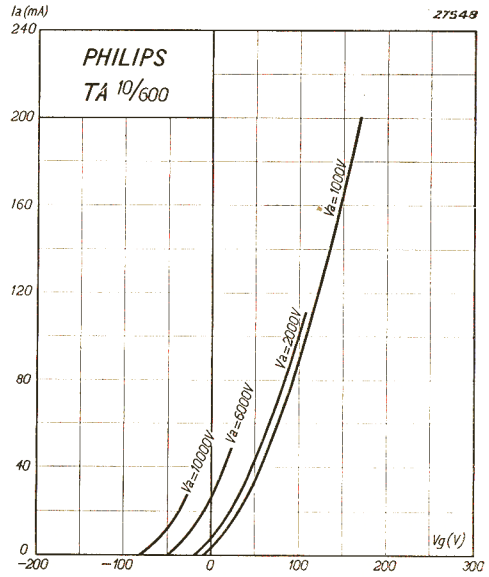
The anode dissipation of this valve with tungsten filament may attain the comparatively high value of 200 watts. In the table below the attainable output is indicated for various values of the efficiency.

These data have been calculated for operation at an anode voltage of 10000 volts. The anode current may reach a value of 80 milliamps. This valve can be used on wavelengths down to 150 metres.

Efficiency	Input	Output	Anode dissipation
50 %	400 watts	200 watts	200 watts
60 %	500 watts	300 watts	200 watts
70 %	670 watts	470 watts	200 watts
75 %	800 watts	600 watts	200 watts

In conjunction with this valve, two Philips rectifying valves DA 10/550 can be used.

If no importance is attached to the construction as per drawing, with terminals for filament and anode connection, this valve can if desired also be had in a more simple construction, viz, not having these terminals with fixing clamp but only beaded leads.



Technical Data

Filament voltage	V_f	= 12·5 V
Filament current	I_f	= appr. 6·3 A
Total emission	I_s	= appr. 0·4 A
Anode voltage	V_a	= max. 10000 V
Max. permissible anode dissipation	W_a	= 200 W
Anode dissipation during test	W_{at}	= 300 W
Amplification factor	μ	= appr. 160
Mutual conductance at I_a = 75 mA	S_{norm}	= appr. 1·3 mA/V
Max. mutual conductance	S_{max}	= appr. 1·8 mA/V
Internal resistance at I_a = 75 mA	R_i	= appr. 120000 ohms

TUBE EMETTEUR PHILIPS



Echelle 1 : 6

TA 12/10000

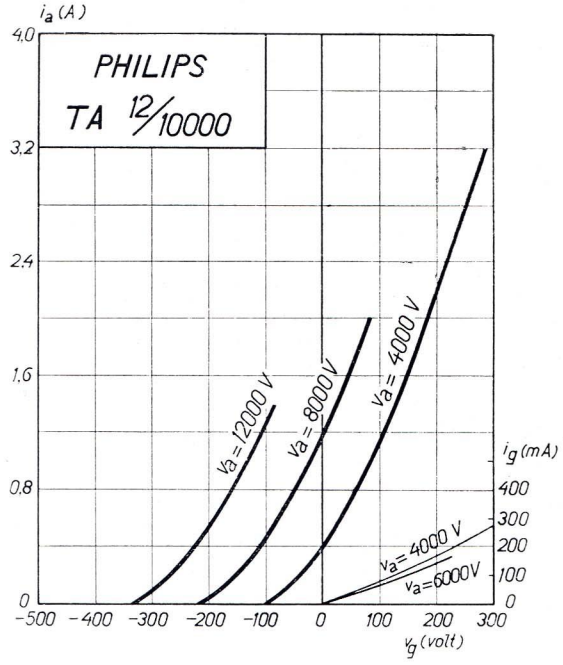
A REFROIDISSEMENT PAR EAU

La TA 12/10.000 est une lampe émettrice refroidie par l'eau, l'anode faisant partie de la paroi extérieure. L'alliage de ferro-chrome utilisé pour la confection de l'anode est d'une étanchéité parfaite. L'assemblage du verre au métal est si robuste que toute fuite doit être considérée comme pratiquement impossible. L'anode est entourée d'un refroidisseur à circulation d'eau. De cette façon la chaleur développée sur l'anode est rapidement enlevée et la dissipation anodique peut atteindre 12 kW. Cette lampe convient aux longueurs d'onde supérieures à 300 m.

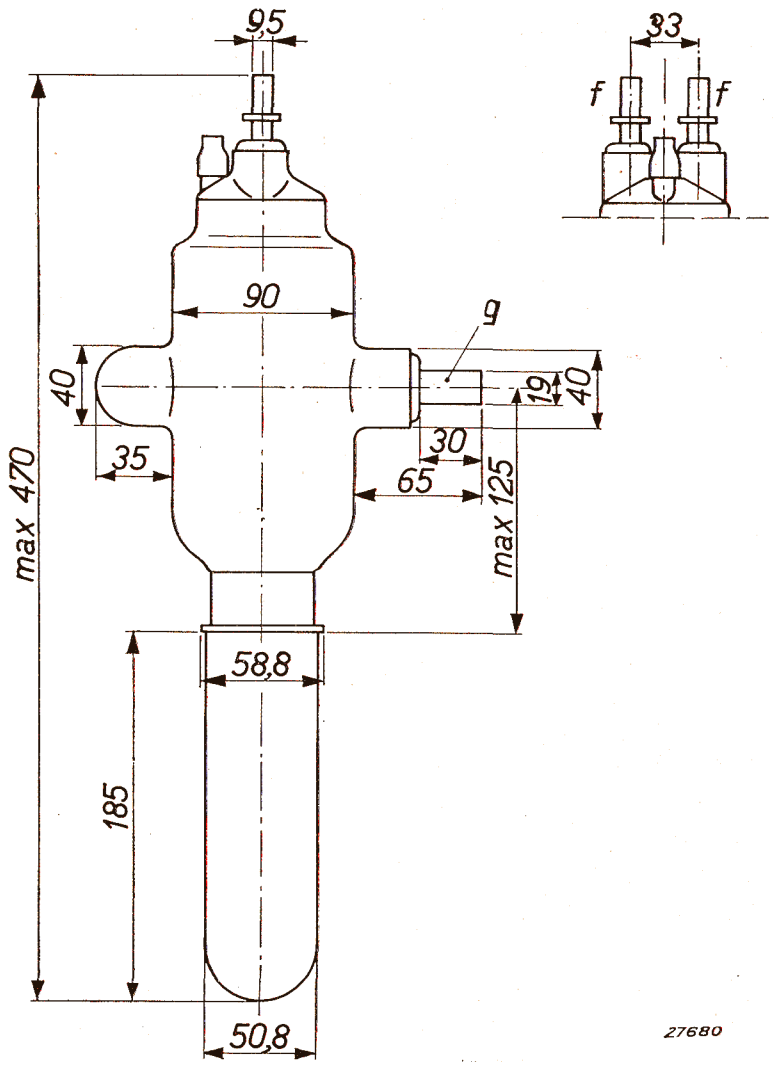
En télégraphie la puissance d'alimentation peut être de 15 kW; en téléphonie, suivant la qualité de la modulation désirée, de 15 à 6 kW.

TUBE EMETTEUR PHILIPS

TA 12/10000



Tension de chauffage	v_f	= env. **22** V
Courant de chauffage	i_f	= env. **38,5** A
Courant de saturation	i_s	= env. **5** A
Tension anodique	v_a	= **6000-12000** V
Dissipation anodique	w_a	= **12000** W
Dissipation anodique d'essai	w_{at}	= **15000** W
Coefficient d'amplification	K	= env. **40**
Inclinaison	S	= env. **10** mA/V
Résistance intérieure	R_i	= env. **4000** Ω
Tension de saturation dans le plan de la grille	v_s	= env. **1000** V
Diamètre maximum sans refroidisseur	d	= **100** mm
Longueur totale sans refroidisseur	l	= **800** mm



PHILIPS-EMISSION

PHILIPS

TRANSMITTING VALVE

TA 12/15

Description

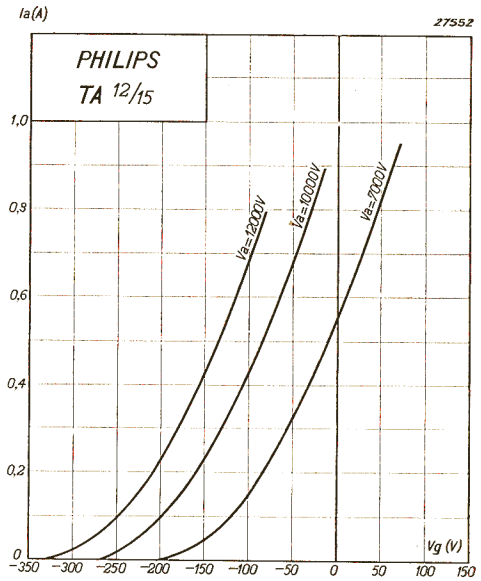
The triode TA 12/15 has a tungsten filament and has been specially designed for H.F. amplification in powerful transmitters for wavelengths down to 150 metres. In the table below the attainable output is indicated for various values of the efficiency at an anode voltage of 12,000 volts and the maximum anode dissipation of 7·5 kW, the maximum anode current being 1·25 amps (for telegraphy only). The TA 12/15 has a watercooled anode.

Efficiency	Input	Output	Anode dissipation
50 %	15 kW	7·5 kW	7·5 kW
60 %	15 kW	9 kW	6 kW
65 %	15 kW	9·8 kW	5·2 kW
70 %	15 kW	10·5 kW	4·5 kW

For use as a H.F. class B amplifier please refer to the table below

Anode voltage	Anode current	Depth of modulation	Carrier power	Peak power
12000 V	0·7 amp	100 %	2·8 kW	11·2 kW
12000 V	0·75 amp	80 %	3·3 kW	11·2 kW
12000 V	0·85 amp	60 %	4·3 kW	11·2 kW

With H.F. class C anode modulation (Heising system) the anode voltage should not exceed 10,000 volts.



Technical Data

Filament voltage	V_f	= 22·0 V
Filament current	I_f	= appr. 41 A
Total emission	I_s	= appr. 6 A
Anode voltage	V_a	= max. 12000 V
Max. permissible anode dissipation	W_a	= 7·5 kW
Anode dissipation during test	W_{at}	= 10 kW
Amplification factor	μ	= appr. 40
Mutual conductance at I_a = 0·8 A	S_{norm}	= appr. 5·5 mA/V
Max. mutual conductance	S_{max}	= appr. 8·0 mA/V
Internal resistance at I_a = 0·8 A	R_i	= appr. 7300 ohms

PHILIPS

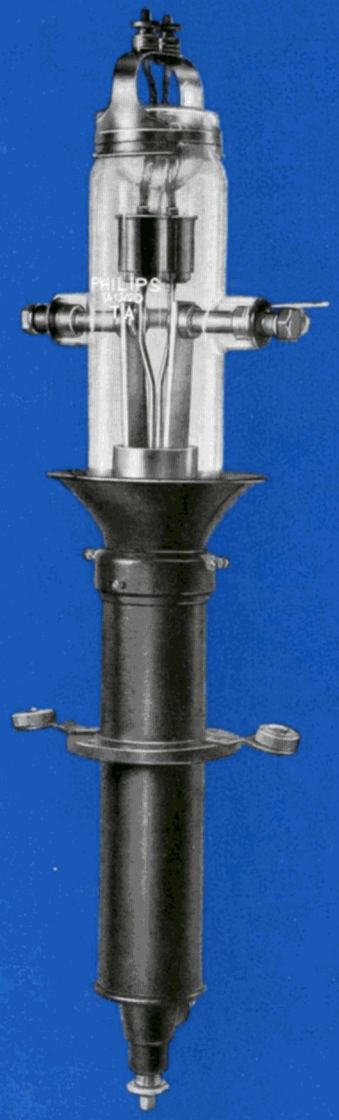
TA 12/20

SENDERÖHRE TA 12/20

Die wassergekühlte Senderöhre TA 12/20 eignet sich bei Benutzung des eigens für diese Röhre konstruierten Kühlmantels Nr. 30 für Wellenlängen bis zu 14 m abwärts.

Sie kann jedoch auch mit dem Kühlmantel Nr. 20 der Röhre TA 12/20000 benutzt werden. In diesem Falle darf der Anodenverlust den Wert von 12 kW nicht übersteigen und die Wellenlänge darf nicht kleiner sein als 150 m.

Die verhältnismässig hohe Anodenspannung, die diese Röhre bei Kurzwellenbetrieb aushalten kann, ist aus den umstehenden Kennlinien ersichtlich. Kurve g gilt für Telephonie und



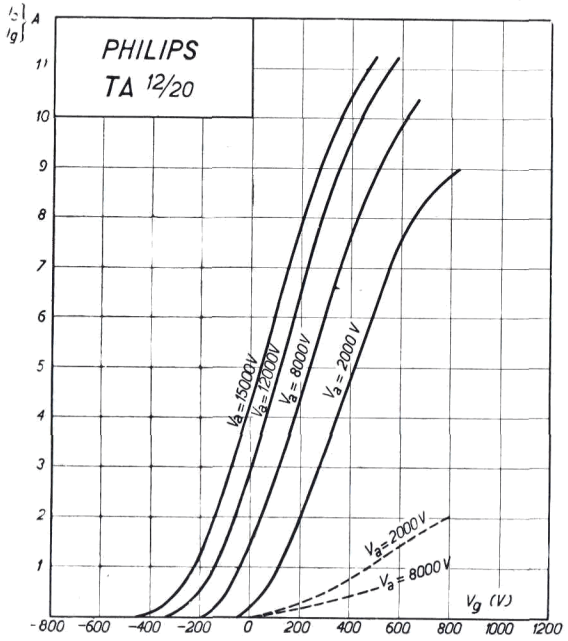
Telegraphie bei Verwendung der Röhre als Klasse-B-Verstärker. Die in diesem Falle zulässige Höchstbelastung ist aus nachstehender Tabelle ersichtlich. Die Eingangsleistung darf, entsprechend der Wellenlänge und daher der Anodenspannung, 25 bis 30 kW betragen.

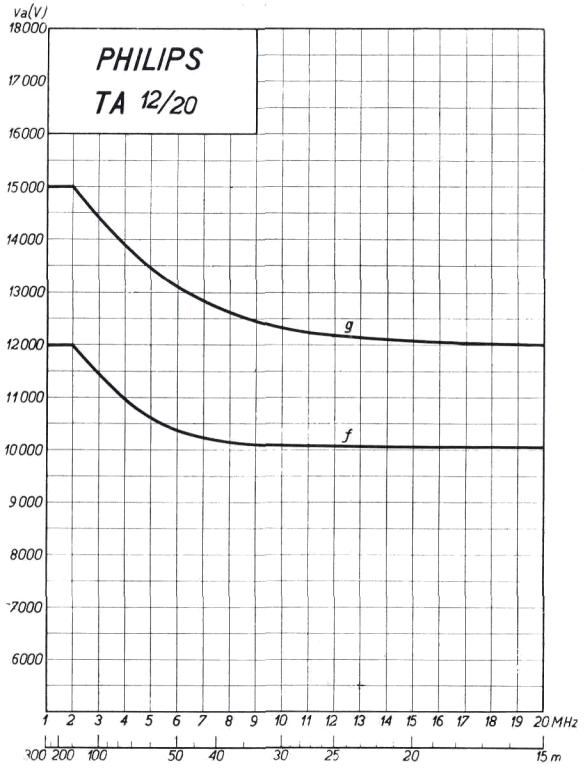
Modulationstiefe	Wellenlänge	Anodenspannung	Anodenstrom	Energie der Trägerwelle	Höchste Ausgangsleistung (Spitzenwert)
100 %	150 m	15000 V	1,3 A	6.5 kW	26 kW
100 %	30 m	12400 V	1,3 A	4 5 kW	18 kW
100 %	15 m	12000 V	1,3 A	4 0 kW	16 kW

Bei Telephonie mit Anodenspannungsmodulation darf die Anodenspannung die durch Kurve f wiedergegebenen Werte erreichen. Der Anodenstrom hängt in hohem Masse von dem Wirkungsgrad der Anlage und von der Modulationstiefe ab und darf daher in weiten Grenzen schwanken. Als Beispiele diene, dass bei einer Wellenlänge von 15 m der Anodenstrom 1,6 A betragen darf, so dass eine fast hundertprozentig modulierte Ausgangsleistung von 8 kW erzielt werden kann. Für die Lieferung der Anodenspannung können zwei Philips Hochvakuum-Gleichrichterröhren DA 12/24000 oder vier Quecksilberdampfröhren DCG 10/15 in Graetz-Schaltung benutzt werden.

PHILIPS

SENDERÖHRE TA 12/20





Heizspannung	V_f	= 21,5 V
Heizstrom	I_f	= ca. 79 A
Sättigungsstrom	I_s	= ca. 11 A
Anodenspannung	V_a	= 6000-15000 V
Höchstzulässiger Anodenverlust	W_a	= 18 kW
Geprüfter Anodenverlust ..	W_{at}	= 20 kW
Verstärkungsfaktor	g	= ca. 40
Steilheit bei V_a = 12000 V I_a = 1,0 A	S_{norm}	= ca. 10 mA/V
Grösste Steilheit	S_{max}	= ca. 18 mA/V
Innerer Widerstand bei V_a = 12000 V, I_a = 1,0 A	R_i	= ca. 4000 Ω
Grösster Kolbendurchmesser	d	= 100 mm
Gesamtdurchmesser	d'	= ca. 225 mm
Gesamtlänge ohne Kühlmantel	l	= ca. 750 mm
Gesamtlänge mit Kühlmantel	l'	= ca. 785 mm

PHILIPS SENDERÖHRE TA 12/20

Die wassergekühlte Senderöhre TA 12/20 kann auf Lang-, Mittel- oder Kurzwellen bis zu 15 m herab benutzt werden. Der Anodenverlust darf 18 kW betragen, vorausgesetzt daß die Röhre in einem Wasserkühler Nr. 30 montiert ist. Die TA 12/20 kann jedoch auch im Kühler Nr. 20 der Röhre TA 12/20000 verwendet werden. In diesem Falle darf der Anodenverlust jedoch 12 kW nicht überschreiten und soll die Röhre nicht auf Wellenlängen kürzer als 150 m betrieben werden. Zusätzliche Kühlung der Gitter- und Heizfadenanschlüsse erübrigt sich.



PHILIPS EMISSION

In der untenstehenden Tabelle werden verschiedene Einstellungen einer auf einer Wellenlänge von 15 m arbeitende Röhre TA 12/20 angegeben:

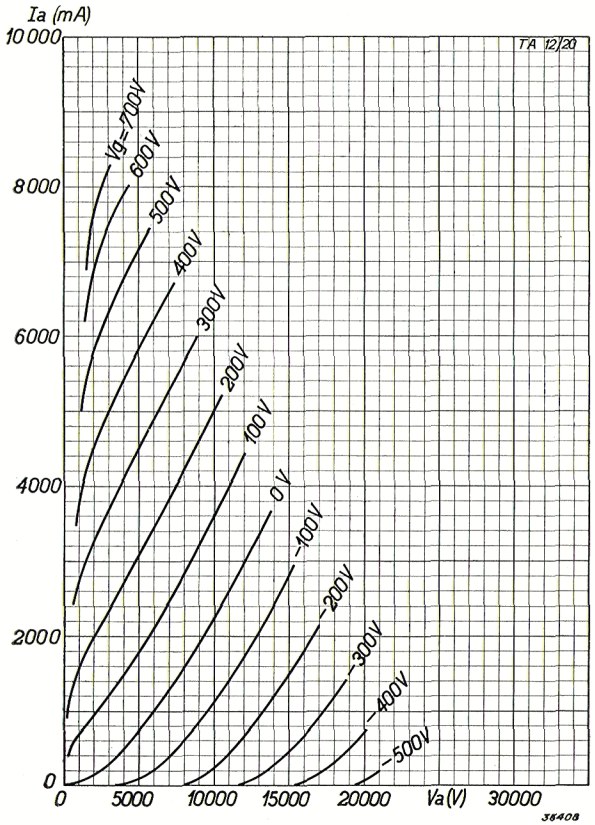
Einstellung	Anodenspannung	Nutzleistung	Wirkungsgrad
H.F.-Klasse C (Telegraphie)	12000 V	22 kW[1])	68%
H.F.-Klasse C (Anodenspannungsmodulation)	10000 V	9,5 kW[1])[2])	68%
H.F.-Klasse B (Telephonie)	12000 V	5 kW[1])[2])	27%

[1]) Kreisverluste sind abzuziehen.
[2]) Nutzleistung in der Trägerwelle (max. Modulationstiefe 100%).

6/40

B 3631/1

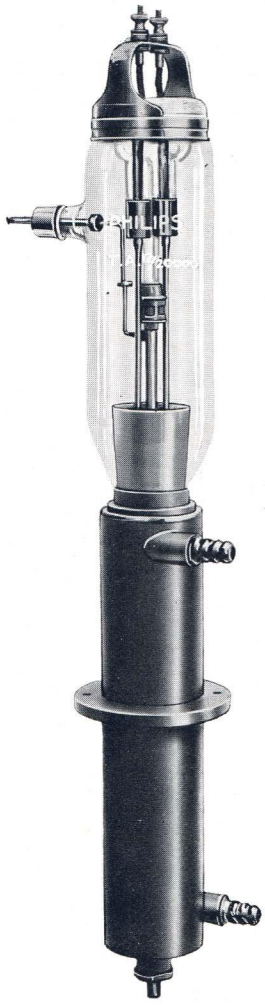
PHILIPS SENDERÖHRE TA 12/20



Heizspannung	V_f	=	21,5 V
Heizstrom	I_f	=	ca. 79 A
Sättigungsstrom	I_s	=	ca. 11 A
Anodenspannung	V_a	=	max. 12000 V
Höchstzulässiger Anodenverlust	W_a	=	max. 18 kW
Geprüfter Anodenverlust	W_{at}	=	20 kW
Verstärkungsfaktor	μ	=	ca. 40
Steilheit bei V_a = 12000 V, I_a = 1 A	S	=	ca. 10 mA/V
Anoden/Kathodenkapazität	C_{ak}	=	ca. 1,4 pF
Gitter/Kathodenkapazität	C_{gk}	=	ca. 23,5 pF
Anoden/Gitterkapazität	C_{ag}	=	ca. 25 pF
Maximale Gesamtlänge ohne Kühler	l	=	741 mm
Maximale Gesamtlänge mit Kühler	l'	=	811 mm
Maximaler Kolbendurchmesser	d	=	104 mm
Maximaler Gesamtdurchmesser	d'	=	226 mm

PHILIPS EMISSION

LAMPE EMETTRICE PHILIPS



Echelle 1 : 6

TA 12/20000

A REFROIDISSEMENT PAR EAU

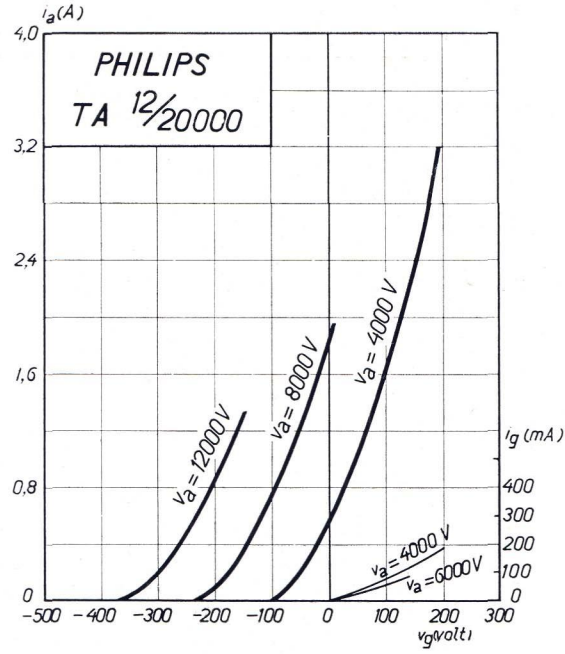
La TA 12/20000 est une lampe émettrice refroidie par l'eau, l'anode faisant partie de la paroi extérieure. L'alliage de ferro-chrome utilisé pour la confection de l'anode est d'une étanchéité parfaite. L'assemblage du verre au métal est si robuste que toute fuite doit être considérée comme pratiquement impossible. L'anode est entourée d'un refroidisseur à circulation d'eau. De cette façon la chaleur développée sur l'anode est rapidement enlevée et la dissipation anodique peut atteindre 12 kW. Cette lampe convient aux longueurs d'onde supérieures à 300 m.

En télégraphie la puissance absorbée peut être de 30 kW ; en téléphonie, suivant la qualité de la modulation désirée, de 30 à 12 kW.

LAMPE EMETTRICE PHILIPS

TA $^{12}/_{20000}$

A REFROIDISSEMENT PAR EAU



Tension de chauffage	v_f	= env. **22** V
Courant de chauffage	i_f	= env. **77** A
Courant de saturation	i_s	= env. **10** A
Tension anodique	v_a	= **6000-12000** V
Dissipation anodique	w_a	= **12000** W
Dissipation anodique d'essai	w_{at}	= **15000** W
Coefficient d'amplification	K	= env. **40**
Inclinaison	S	= env. **12** mA/V
Résistance intérieure	R_i	= env. **3300** Ω
Tension de saturation dans le plan de la grille	v_s	= env. **1000** V
Diamètre maximum	d	= **100** mm
Longueur totale	l	= **800** mm

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TRIODE

TA 12/35

PHILIPS EMISSION

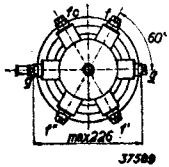
Use	:	H.F. amplifier (watercooled)
Verwendung	:	Hochfrequenzverstärker (wassergekühlt)
Utilisation	:	Amplificateur H.F. (refroidi à l'eau)
Gebruikswijze:		Hoogfrequentversterker (watergekoeld)
Empleo	:	Amplificador de A.F. (refrigerado por agua)

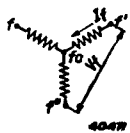
Cathode	:	Tungsten, three phase filament
Kathode	:	Wolfram, Dreiphasen Heizfaden
Cathode	:	Tungstène, filament triphasé
Kathode	:	Wolfram, driefasen gloeidraad
Cátodo	:	Tungsteno. filamento trifásico

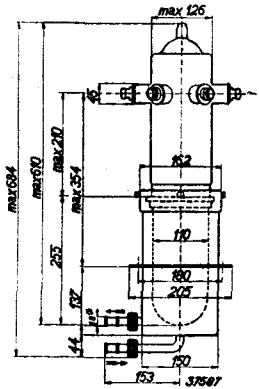
Vf	=		49,0	V
If	≈		3×50	A
Is	≈		25	A
Va	=	max	15	kV
Wa	=	max	18	kW
Wat	=		20	kW
μ	≈		25	
S (Va = 12 kV, Ia = 1,0—1,5 A)	≈		15	mA/V
Caf	≈		4,5	pF
Cfg	≈		60	pF
Cag	≈		25	pF

λ	MHz	Va max	
		Telegr.	Mod. Va
15	20	15 kV	12 kV

Vol aq 20 l/min
$T_2 - T_1 = 13\,^\circ C$
$T_2 max = 60\,^\circ C$





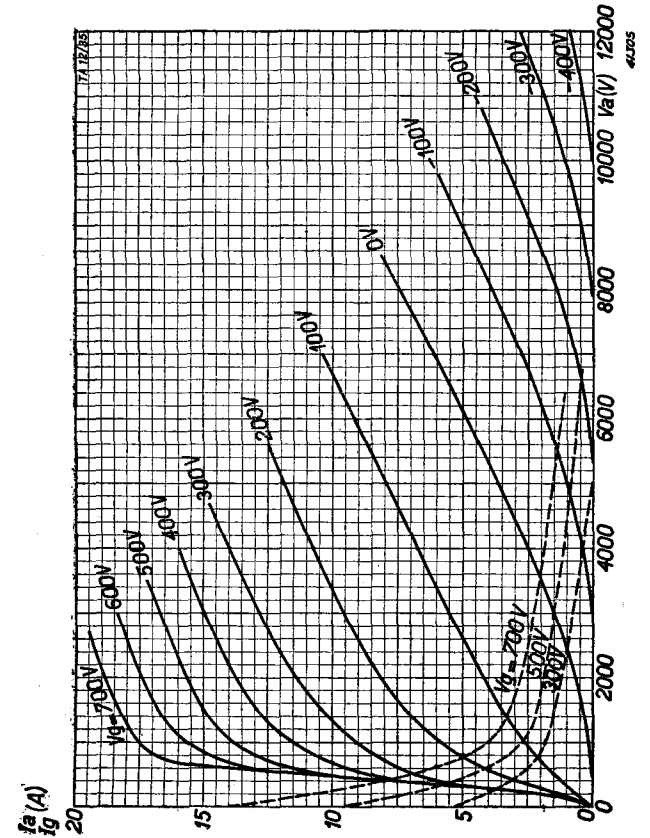


TA 12/35

PHILIPS
TRIODE

PHILIPS EMISSION

Charasteristics	:	Ia-Va, Ig-Vg
Kennlinien	:	
Caractéristiques	:	
Karakteristieken	:	
Características	:	



PHILIPS EMISSION

L.F. class B amplification (two valves)
N.F. Klasse B Verstärkung (zwei Röhren)
B.F. classe B amplification (deux tubes)
L.F. klasse B versterking (twee buizen)
B.F. clase B amplificación (dos válvulas)

Va	12	kV
Vg	≈ —450	V
Ia (Vgp = 0)	0,8	A
Ia (Vgp = max.)	5	A
Ig (Vgp = max.)	≈ 0,7	A
Vgp	850	V
Vgg'p	≈ 1700	V
Wi	60	kW
Wa	≈ 20	kW
Wlf	≈ 0,6	W
Wo	40 [b])	kW
Ra	1375	ohm
Raa	5500	ohm
η	67	%

H.F. class C telegraphy
H.F. Klasse C Telegraphie
H.F. classe C télégraphie
H.F. klasse C telegrafie
A.F. clase C telegrafía

λ	> 15	> 15	> 15	m
Va	15	12	10	kV
Vg	≈—900	≈—700	≈—600	V
Ia	4	4,25	4,25	A
Ig	≈ 450	≈ 475	≈ 475	mA
Vgp	≈ 1550	≈ 1350	≈ 1250	V
Whf	≈ 700	≈ 640	≈ 595	W
Wi	60	51	42,5	kW
Wa	18	16	13,5	kW
Wo	42 *)	35 *)	29 *)	kW
η	70	69	68	%

PHILIPS EMISSION

H.F. class B telephony
H.F. Klasse B Telephonie
H.F. classe B téléphonie
H.F. klasse B telefonie
A.F. clase B telefonía

λ	> 15	> 15	> 15	m
Va	15	12	10	kV
Vg	≈—500	≈—400	≈—315	V
Ia	1,75	2,2	2,65	A
Ig	≈ 300 [1])	≈ 350 [1])	≈ 380 [1])	mA
Vgp	≈ 500	≈ 470	≈ 440	V
Whf	≈ 300 [1])	≈ 330 [1])	≈ 335 [1])	W
Wi	26,2	26,5	26,5	kW
Wa	17,7	18	18	kW
Wo	8,5 *)	8,5 *)	8,5 *)	kW
η	32,5	32	32	%

H.F. class C anode modulation
H.F. Klasse C Anodenmodulation
H.F. classe C modulation d'anode
H.F. klasse C anodemodulatie
A.F. clase C modulación de ánodo

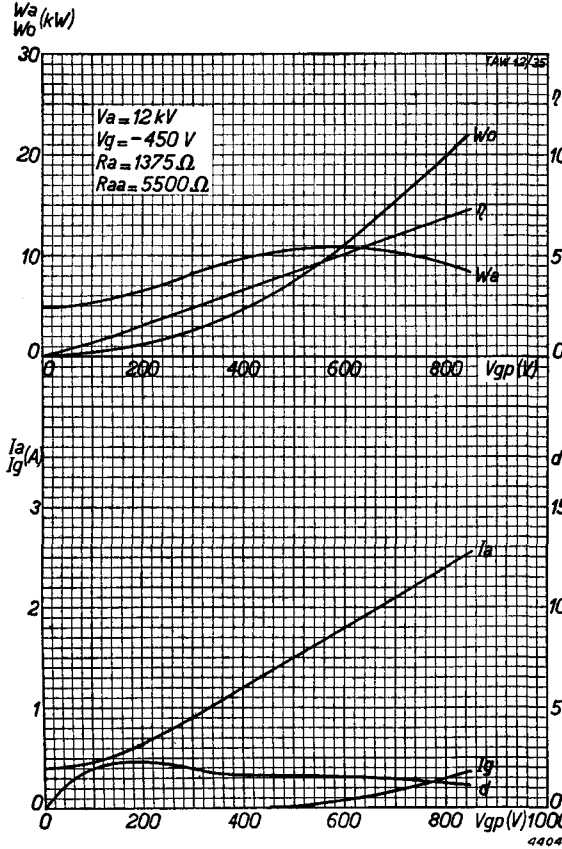
λ	> 15	> 15	m
Va	12	10	kV
Vg	≈—1000	≈—900	V
Ia	3	3	A
Ig	≈ 550	≈ 600	mA
Vg~	≈ 1650	≈ 1550	V
Whf	≈ 910	≈ 930	W
Wmod	≈ 18	15	kW
Wi	36	30	kW
Wa	10	8,5	kW
Wo	26 *)	21,5 *)	kW
η	72	71,5	%

PHILIPS
TRIODE

TA 12/35

PHILIPS EMISSION

Characteristics	:	L.F. class B	amplification (one valve)
Kennlinien	:	N.F. Klasse B	Verstärkung (eine Röhre)
Caractéristiques	:	B.F. classe B	amplification (un tube)
Karakteristieken	:	B.F. klasse B	versterking (één buis)
Características	:	B.F. clase B	amplificación (una válvula)



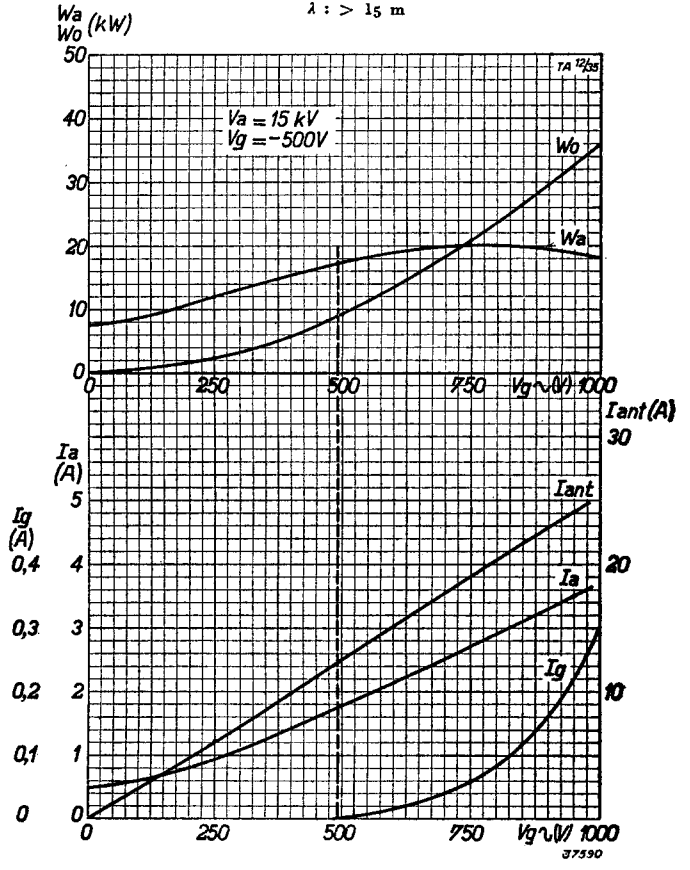
TA 12/35

PHILIPS
TRIODE

PHILIPS EMISSION

Characteristics	:	**H.F. class B telephony**
Kennlinien	:	**H.F. Klasse B Telephonie**
Caractéristiques	:	**H.F. classe B téléphonie**
Karakteristieken	:	**H.F. klasse B telefonie**
Características	:	**A.F. clase B telefonía**

λ : > 15 m



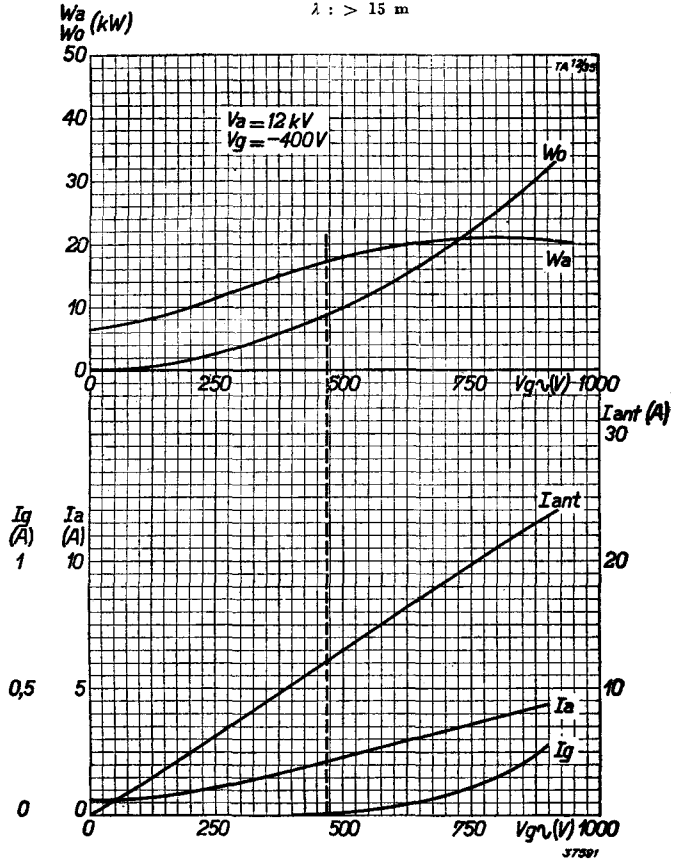
PHILIPS
TRIODE

TA 12/35

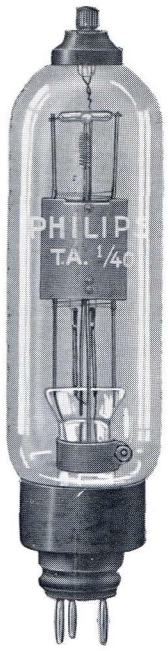
PHILIPS EMISSION

Characteristics	:	H.F. class B telephony
Kennlinien	:	H.F. Klasse B Telephonie
Caractéristiques	:	H.F. classe B téléphonie
Karakteristieken	:	H.F. klasse B telefonie
Características	:	A.F. clase B telefonía

λ : > 15 m



TUBE EMETTEUR PHILIPS



Echelle 1 : 3

TA 1/40

Le tube émetteur Philips T A 1/40 convient très bien aux amateurs qui veulent disposer d'une puissance supérieure aux puissances habituelles. Il convient aussi très bien aux applications militaires.

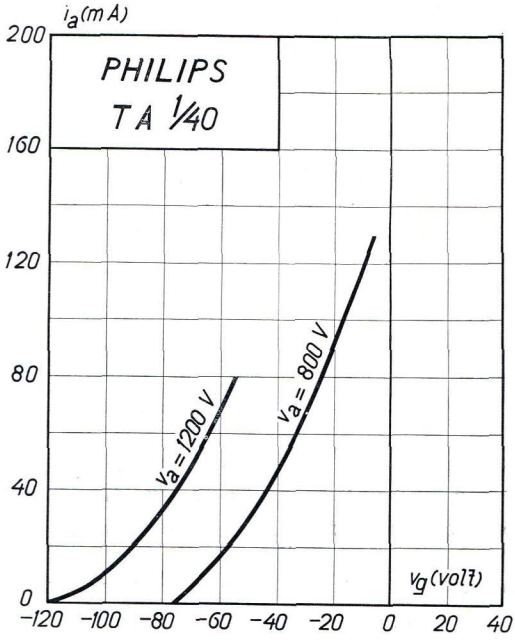
Le contact extérieur de l'anode se trouve au sommet de l'ampoule. La capacité intérieure du tube est, par conséquent, très faible, ce qui permet de l'employer sur ondes courtes, aussi bien que sur ondes longues. Le courant anodique moyen, ne doit jamais dépasser 70 mA, la puissance maximum absorbée est donc limité à 70 Watts.

Le tableau suivant donne les puissances absorbée et utile, ainsi que la dissipation anodique, pour diverses valeurs, du rendement, sous une tension anodique de 1000 V.

Rendement	30	40	50	%
Puissance absorbée . . .	70	70	70	watts
Puissance utile.	21	28	35	watts
Dissipation anodique . .	49	42	35	watts

TUBE EMETTEUR PHILIPS

TA 1/40



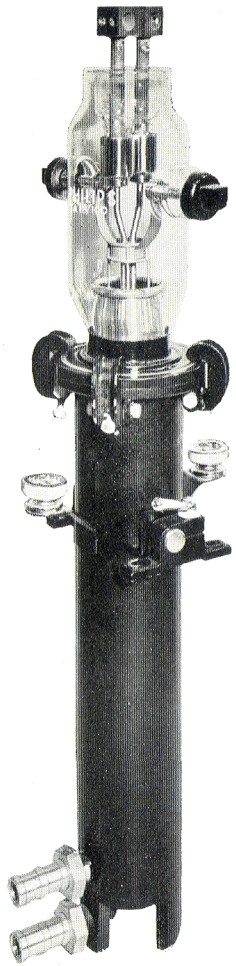
Tension de chauffage	v_f	= **10** V
Courant de chauffage	i_f	= ± **5,5** A
Courant de saturation	i_s	= ± **200** mA
Tension anodique	v_a	= **800 — 1000** V
Dissipation anodique	w_a	= **50** W
Dissipation anodique d'essai	w_{at}	= **75** W
Coefficient d'amplification	k	= ± **12**
Inclinaison	S	= ± **2** mA/V
Résistance intérieure	R_i	= ± **6000** Ω
Diamètre maximum	d	= **55** mm
Longueur totale	l	= **220** mm

PHILIPS SENDERÖHRE TA 18/100

Die TA 18/100 ist eine Senderöhre für sehr große Leistung, die besonders für die Ausgangsstufe in großen Rundfunksendern entworfen wurde.

Die Anode ist von einem Wasserkühler umgeben; zur Kühlung der Anode sind 80 l Wasser pro Minute erforderlich. Die Kolbendurchführungen für die Heizfaden- und Gitteranschlüsse bedürfen keiner zusätzlichen Kühlung.

Die Röhre kann auf Wellenlängen bis zu 15 m herab verwendet werden. Die höchst zulässige Anodenspannung beträgt bei Benutzung der Röhre in einem Telegraphiesender (H.F.-Klasse C) oder bei Schaltung als H.F.-Verstärker Klasse B in einem Telephoniesender 20000 V; bei Anodenmodulation darf die Anodenspannung 12000 V nicht überschreiten.



Die Nutzleistung, die sich mit dieser Röhre bei einer Wellenlänge von 150 m und bei verschiedenen Anodenspannungen erreichen läßt, sowie der entsprechende Wirkungsgrad werden in untenstehender Tabelle angegeben.

Einstellung	Anodenspannung	Nutzleistung	Wirkungsgrad
H.F.-Klasse C (Telegraphie)	20000 V	130 kW[1])	72 %
	18000 V	115 kW[1])	70 %
	15000 V	95 kW[1])	66,5%
H.F.-Klasse B (Telephonie)	20000 V	31 kW[1])[2])	36 %
	18000 V	28 kW[1])[2])	39 %
	15000 V	23 kW[1])[2])	38 %
H.F.-Klasse C (Anodenmodulation)	12000 V	38 kW[1])[2])	70 %

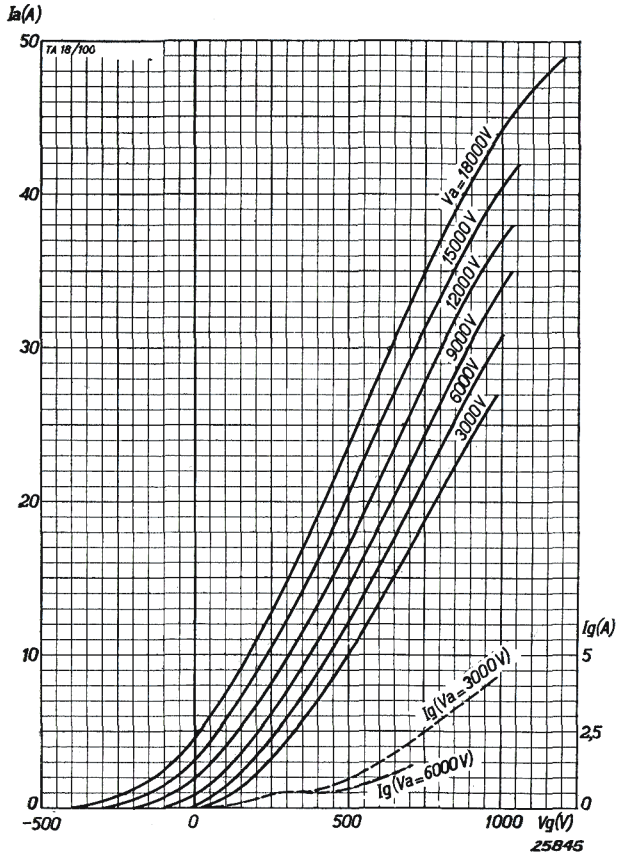
[1]) Kreisverluste sind abzuziehen.
[2]) Nutzleistung in der Trägerwelle (max. Modulationstiefe 100%).

PHILIPS EMISSION

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B 3701/1

PHILIPS SENDERÖHRE TA 18/100



Heizspannung	V_f	=	33,0 V
Heizstrom	I_f	=	ca. 207 A
Sättigungsstrom	I_s	=	ca. 50 A
Anodenspannung	V_a	=	max. 20000 V
Höchst zulässiger Anodenverlust	W_a	=	max. 70 kW
Geprüfter Anodenverlust	W_{at}	=	85 kW
Verstärkungsfaktor	μ	=	ca. 45
Steilheit bei I_a = 4,0 A	S	=	ca. 20 mA/V
Anoden/Kathodenkapazität	C_{ak}	=	ca. 3,8 pF
Gitter/Kathodenkapazität	C_{gk}	=	ca. 52,3 pF
Anoden/Gitterkapazität	C_{ag}	=	ca. 70 pF
Maximale Gesamtlänge ohne Kühler	l	=	1205 mm
Maximale Gesamtlänge mit Kühler	l'	=	1333 mm
Maximaler Kolbendurchmesser	d	=	171 mm
Maximaler Gesamtdurchmesser	d'	=	330 mm

PHILIPS EMISSION

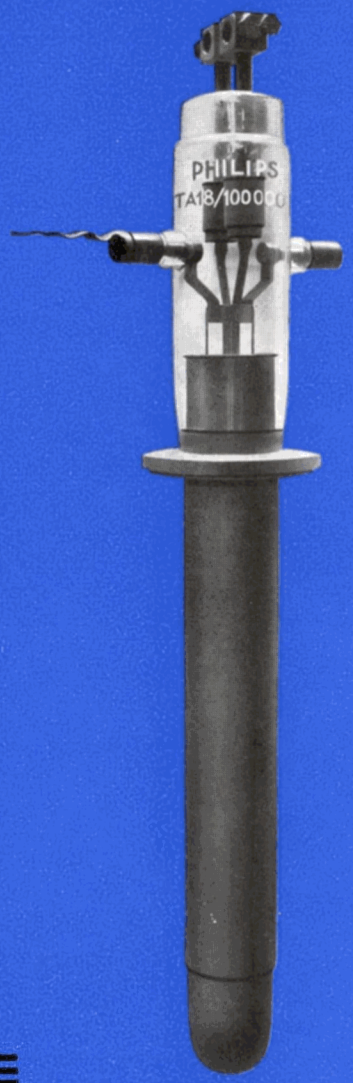
PHILIPS

TUBE EMETTEUR TA 18/100000

Le TA 18/100000 est un tube émetteur à refroidissement par eau, pour grande puissance, qui est spécialement étudié pour l'étage final de grands émetteurs de radiophonie.

L'anode doit être refroidie avec 80 litres d'eau par minute. Refroidissement par l'air n'est pas nécessaire pour ce tube. Ni la sortie de la grille ni les pôles du filament ne nécessitent un refroidissement spécial.

Le tube peut être utilisé sur des longueurs d'onde descendant jusqu'à 150 m. Comme amplificateur classe B le tube peut être réglé comme suit:



TENSION ANODIQUE 18000 V

Modulation	Courant anodique	Energie de l'onde porteuse	Puissance maximum
100%	5,6 A	30 kW	120 kW
80%	5,6 A	35 kW	120 kW
60%	6,1 A	45 kW	120 kW

TENSION ANODIQUE 15000 V

100%	5,0 A	22,5 kW	90 kW
80%	5,2 A	27,5 kW	90 kW
60%	5,9 A	35 kW	90 kW

Pour la télégraphie l'émetteur doit être réglé comme suit:

TENSION ANODIQUE 18000 V

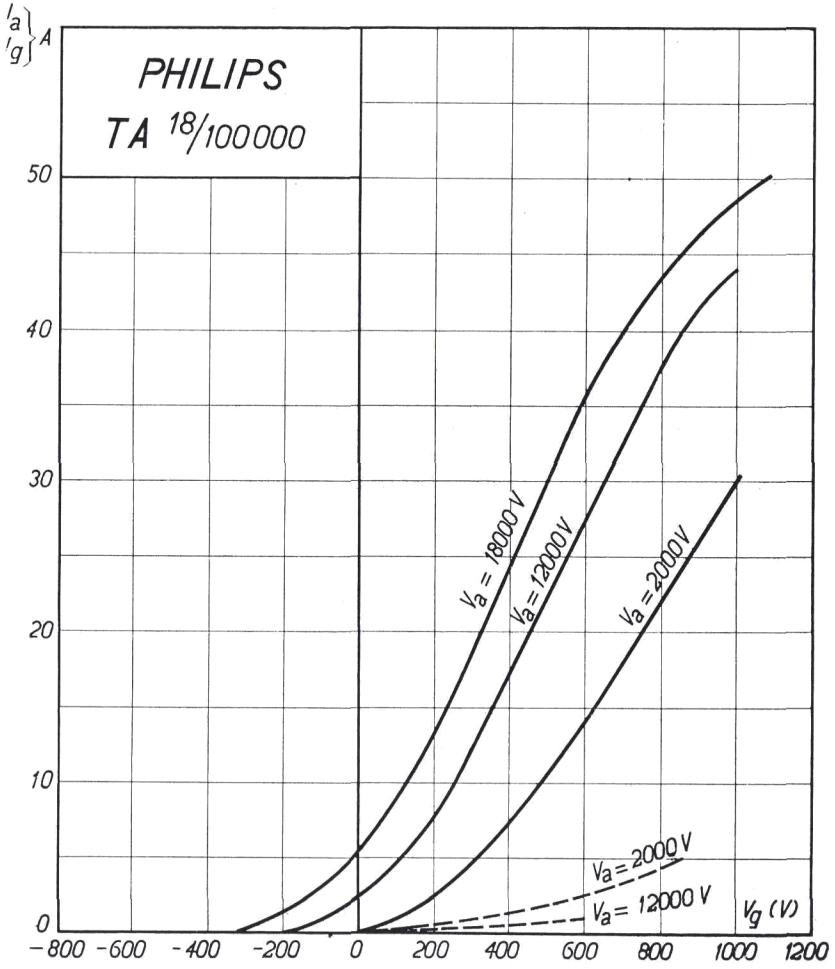
Courant anodique	Puissance de sortie	Dissipation	Rendement
10,5 A	130 kW	60 kW	70%
10,3 A	120 kW	65 kW	65%
9,7 A	105 kW	70 kW	60%

TENSION ANODIQUE 15000 V

10 A	95 kW	55 kW	65%
10 A	90 kW	60 kW	60%

PHILIPS

TUBE EMETTEUR
TA 18/100000



Tension de chauffage	V_f	= 33,0 V
Courant de chauffage	I_f	= 207 A env.
Courant de saturation.....	I_s	= 50 A env.
Tension anodique	V_a	= 15000-18000 V
Dissipation anodique admissible.....	W_a	= 70 kW
Dissipation anodique d'essai	W_{at}	= 85 kW
Coefficient d'amplification	k	= 45 env.
Inclinaison pour V_a = 18000 V, I_a = 4 A	S_{norm}	= 20 mA/V env.
Inclinaison maximum	S_{max}	= 55 mA/V env.
Résistance intérieure pour V_a = 18000 V, I_a = 4 A	R_i	= 2250 Ω
Diamètre maximum de l'ampoule	d	= 130 mm
Longueur totale sans refroidisseur	l	= 1200 mm env.
Longueur totale avec refroidisseur ..	l'	= 1320 mm env.

PHILIPS

SENDERÖHRE TA 20/250

Die Philips Senderöhre TA 20/250 wurde besonders für die Benutzung als Endröhre in Grosssendern konstruiert. Zur Erzielung einer ausreichenden Kühlung ist die Anode mit einem besonderen Kühlmantel umgeben. Die Heizstromanschlüsse sind ebenfalls wassergekühlt, und bei Wellenlängen unterhalb 150 m ist es ferner erforderlich, die Gitteranschlüsse an der Seite der Röhre mit Wasser zu kühlen.

Einige wichtige Daten für verschiedene Anwendungen dieser Röhre bei Wellenlängen von mehr als 150 m sind in den nachfolgenden Tabellen angegeben. Soll die Röhre auf Wellenlängen unter 150 m arbeiten, so wende man sich wegen näherer Einzelheiten an uns.

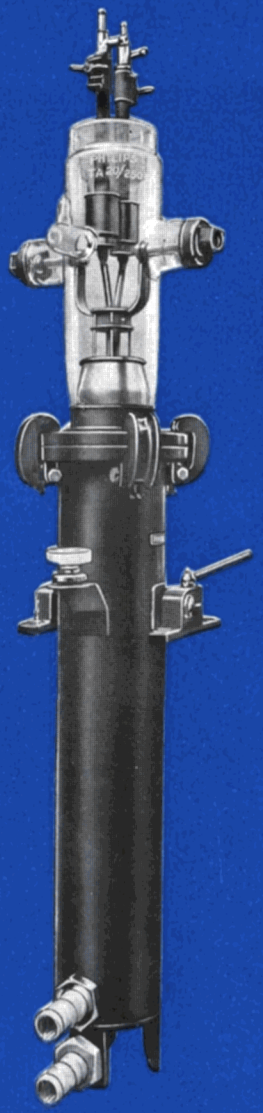


TABELLE I

Zu benutzen bei Verwendung der TA 20/250 als Klasse-C H.F.-Verstärker mit Anodenspannungsmodulation

Höchste Anodenspannung	$V_{a\,max}$	= 15000 V
Höchstzulässiger H.F.-Gitterstrom	$I_{g\,max}$	= 20 A
Mittlerer Anodenstrom	I_a	= 9 A
Ausgangsleistung (Trägerwelle) der Röhre	W_{o^1}	= 90 kW
Ausgangsleistung (100% Modulation) der Röhre	W_{o^2}	= 135 kW

TABELLE II

Zu benutzen bei Verwendung der TA 20/250 als Klasse-C H.F.-Verstärker ohne Anodenspannungsmodulation (Telegraphie)

Höchste Anodenspannung	$V_{a\,max}$	= 20000 V
Höchstzulässiger H.F.-Gitterstrom	$I_{g\,max}$	= 20 A
Mittlerer Anodenstrom	I_a	= 18 A
Ausgangsleistung der Röhre	W_o	= 250 kW

TABELLE III

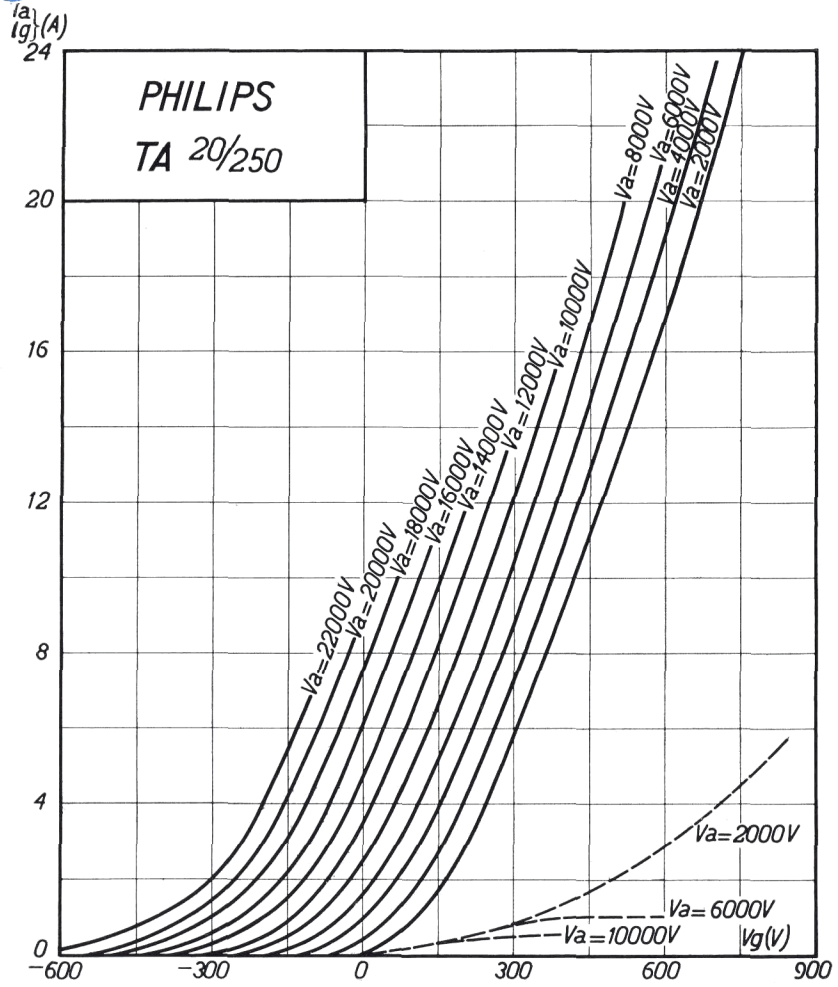
Zu benutzen bei Verwendung dieser Röhre als Klasse-B H.F.-Verstärker

Modulation		*80%*	*100%*
Anodenspannung	$V_{a\,max}$	= 20000 V	20000 V
Höchstzulässiger H.F.-Gitterstrom	I_g	= 20 A	20 A
Mittlerer Anodenstrom	I_a	= 10,7 A	9,75 A
Ausgangsleistung der Röhre	W_o	= 80 kW	65 kW

PHILIPS

SENDERÖHRE

TA 20/250



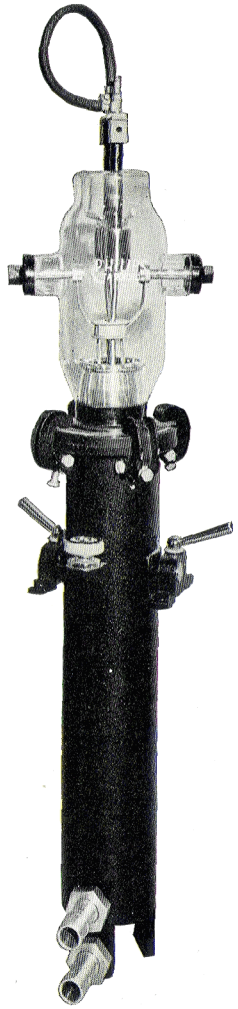
Heizspannung	V_f	=	35,0 V
Heizstrom	I_f	=	ca. 420 A
Sättigungsstrom	I_s	=	ca. 100 A
Anodenspannung	V_a	=	12000-20000 V
Höchstzulässiger Anodenverlust[1])	$W_a{}^1$	=	130 kW
Geprüfter Anodenverlust[1])	W_{at}	=	140 kW
Höchstzulässiger Anodenverlust[2])	$W_a{}^2$	=	100 kW
Verstärkungsfaktor	g	=	ca. 45
Steilheit bei V_a = 20000 V, I_a = 5 A	S_{norm}	=	ca. 25 mA/V
Grösste Steilheit	S_{max}	=	ca. 70 mA/V
Innerer Widerstand bei V_a = 20000 V, I_a = 5 A	R_i	=	ca. 1800 Ω
Grösster Kolbendurchmesser	d	=	130 mm
Grösster Durchmesser	d'	=	330 mm
Gesamtlänge ohne Kühlmantel	l	=	1250 mm
Gesamtlänge mit Kühlmantel	l'	=	1370 mm

[1]) Bei Benutzung als Klasse-B- oder Klasse-C-Verstärker.
[2]) Bei statischer Belastung oder bei Benutzung als Modulator.

PHILIPS SENDERÖHRE TA 20/250

Die Philips Senderöhre TA 20/250 wurde besonders für die Benutzung als Endröhre in Großsendern entworfen. Zur Erzielung einer ausreichenden Kühlung muß die Anode, die von einem Kühlmantel umgeben ist, mit 120 l Wasser pro Minute gekühlt werden. Auch die Heizfadenpole sind mit Wasser zu kühlen, während die Gitteranschlüsse nur bei Verwendung der Röhre auf kürzeren Wellenlängen als 150 m gekühlt zu werden brauchen. Für Kühlung der Heizfadenpole und gegebenenfalls der Gitteranschlüsse genügen 3 l Wasser pro Minute.

Bei einer Wellenlänge von 150 m und bei Verwendung der Röhre als H.F.-Verstärker Klasse C in einem Telegraphiesender oder als H.F.-Verstärker Klasse B in einem Telephoniesender beträgt die höchst zulässige Anodenspannung 20000 V; bei Anodenmodulation der Röhre in einem H.F.-Verstärker Klasse C darf bei dieser Wellenlänge eine Anodenspannung bis zu 12000 V angelegt werden.



PHILIPS EMISSION

Die bei verschiedenen Wellenlängen und Einstellungen erreichbare Nutzleistung und der Wirkungsgrad ersieht man aus untenstehender Tabelle.

Einstellung	Wellenlänge	Anodenspannung	Nutzleistung	Wirkungsgrad
H.F.-Klasse C (Telegraphie)	150 m	20000 V	250 kW[1])	76 %
	150 m	17500 V	210 kW[1])	72,5%
	15 m	12000 V	125 kW[1])	65 %
H.F.-Klasse B (Telephonie)	150 m	20000 V	60 kW[1])[2])	32 %
	50 m	18000 V	56 kW[1])[2])	32 %
	30 m	16000 V	49 kW[1])[2])	32 %
	15 m	14000 V	40 kW[1])[2])	30 %
	13,5 m	13000 V	29,5 kW[1])[2])	24 %
H.F.-Klasse C (Anodenmodulation)	150 m	12000 V	65 kW[1])[2])	64 %
	15 m	10000 V	56 kW[1])[2])	66 %

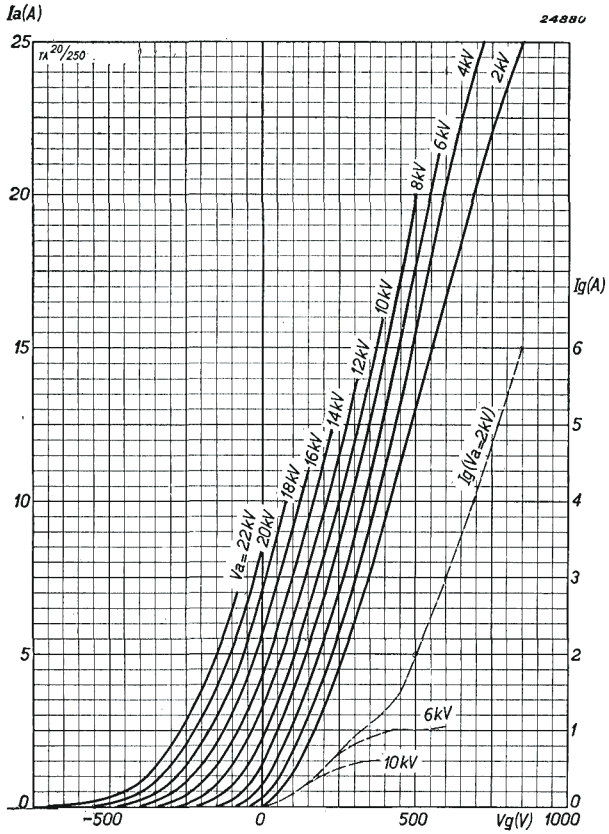
[1]) Kreisverluste sind abzuziehen.

[2]) Nutzleistung in der Trägerwelle (max. Modulationstiefe 100%).

9/40

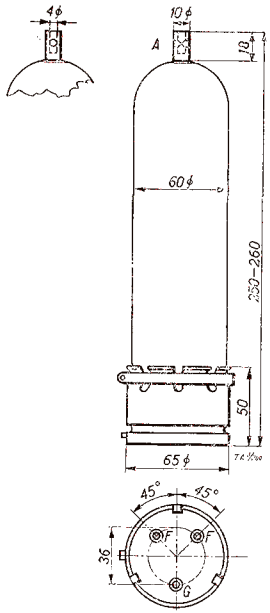
B 3741/1

PHILIPS SENDERÖHRE TA 20/250



Heizspannung	V_f	=	35,0 V
Heizstrom	I_f	=	ca. 420 A
Sättigungsstrom	I_s	=	ca. 100 A
Anodenspannung	V_a	=	max. 20000 V
Höchst zulässiger Anodenverlust	W_{a_1}	=	max. 130 kW
Geprüfter Anodenverlust	W_{at}	=	140 kW
Höchst zulässiger Anodenverlust [1])	W_{a_2}	=	max. 100 kW
Verstärkungsfaktor	μ	=	ca. 45
Steilheit bei I_a = 5,0 A	S	=	ca. 25 mA/V
Anoden/Kathodenkapazität	C_{ak}	=	ca. 5 pF
Gitter/Kathodenkapazität	C_{gk}	=	ca. 65 pF
Anoden/Gitterkapazität	C_{ag}	=	ca. 70 pF
Maximale Gesamtlänge ohne Kühler	l	=	1266 mm
Maximale Gesamtlänge mit Kühler	l'	=	1393 mm
Maximaler Kolbendurchmesser	d	=	171 mm
Maximaler Gesamtdurchmesser	l'	=	330 mm

[1]) Bei Verwendung als Modulatorröhre.



PHILIPS-EMISSION

PHILIPS

TRANSMITTING VALVE

TA 3/200

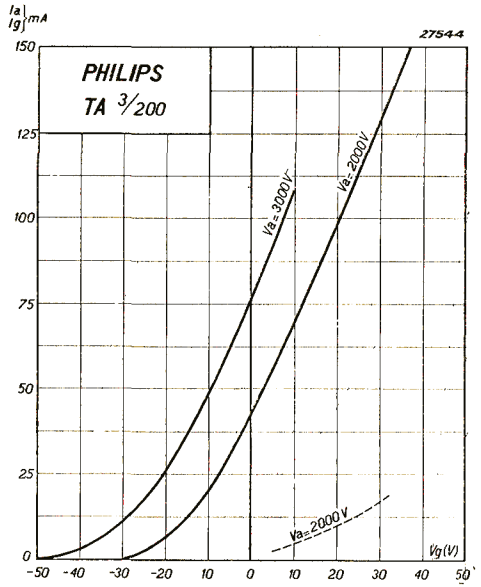
Description

This valve with tungsten filament has been constructed in such a way that compact mounting of the transmitter plant is facilitated. The TA 3/200 can be used in telegraphy or telephony transmitters on wavelengths down to 100 metres. The anode current may not exceed 80 milliamps.

In the following table the output of this valve is indicated as a function of the efficiency. The values apply to an anode voltage of 3000 volts.

Efficiency	Input	Output	Anode dissipation
40 %	240 watts	95 watts	145 watts
50 %	240 watts	120 watts	120 watts
60 %	240 watts	145 watts	95 watts
70 %	240 watts	170 watts	70 watts

The necessary connections are indicated on the dimensioned drawing.



Technical Data

Filament voltage	V_f	= 14·0 V
Filament current	I_f	= appr. 4 A
Total emission	I_s	= appr. 300 mA
Anode voltage	V_a	= max. 3000 V
Max. permissible anode dissipation	W_a	= 150 W
Anode dissipation during test	W_{at}	= 200 W
Amplificator factor	g	= appr. 72
Mutual conductance at I_a = 80 mA	S_{norm}	= appr. 2·9 mA/V
Maximum mutual conductance	S_{max}	= appr. 3·5 mA/V
Internal resistance at I_a = 80 mA	R_i	= appr. 25000 ohms
Anode/filament capacity	C_{af}	= appr. 1·6pF
Anode/grid capacity	C_{ag}	= appr. 5·5pF
Grid/filament capacity	C_{fg}	= appr. 11·2pF

PHILIPS

SENDERÖHRE

TA

3/500



Mit dieser Röhre lässt sich bei einer Anodenspannung von nur 3000 V eine hohe Nutzleistung erzielen. Dank der grossen Steilheit (6,0 mA/V) ist ein hoher Wirkungsgrad erreichbar. Der hohe zulässige Anodenverlust verbürgt eine grosse Betriebssicherheit der Röhre.

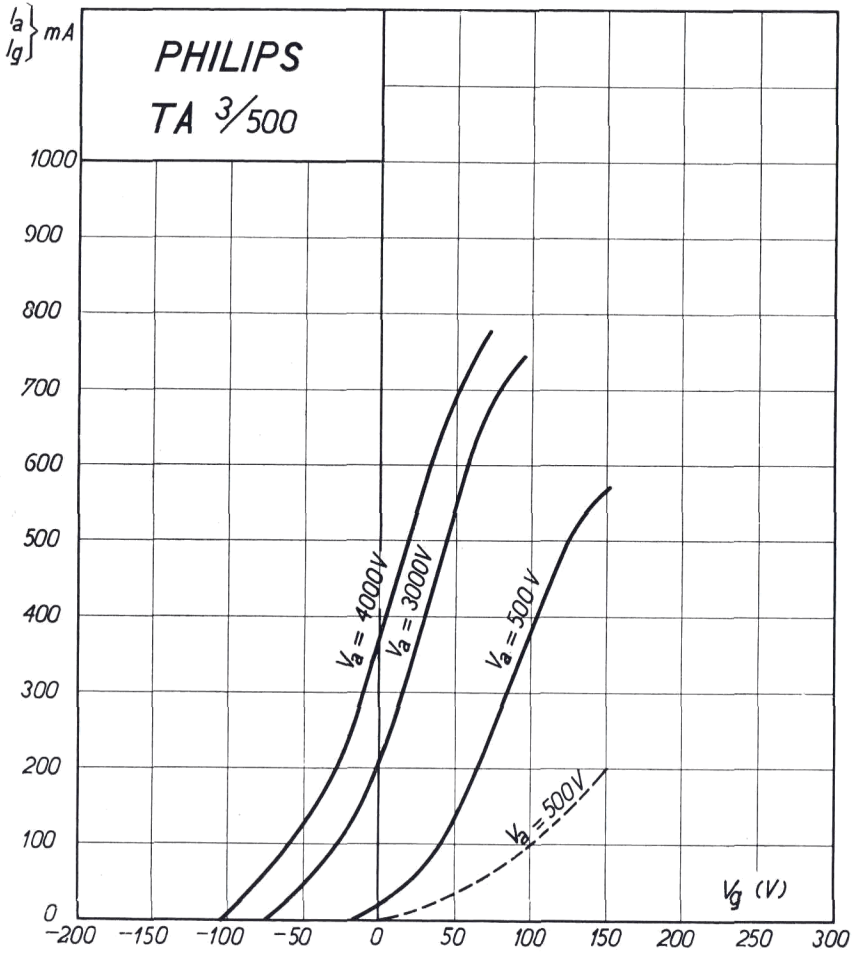
Die folgende Tabelle bezieht sich auf die Verwendung der TA 3/500 in einem Telegraphiesender und gibt die Nutzleistung bei verschiedenen Werten des Wirkungsgrades, bei einer Anodenspannung von 4000 V und einem höchstzulässigen Anodenverlust von 400 W an.

Wirkungsgrad	40	50	65	%
Eingangsleistung	670	750	750	W
Ausgangsleistung	270	375	490	W
Anodenverlust	400	375	260	W

PHILIPS

SENDERÖHRE

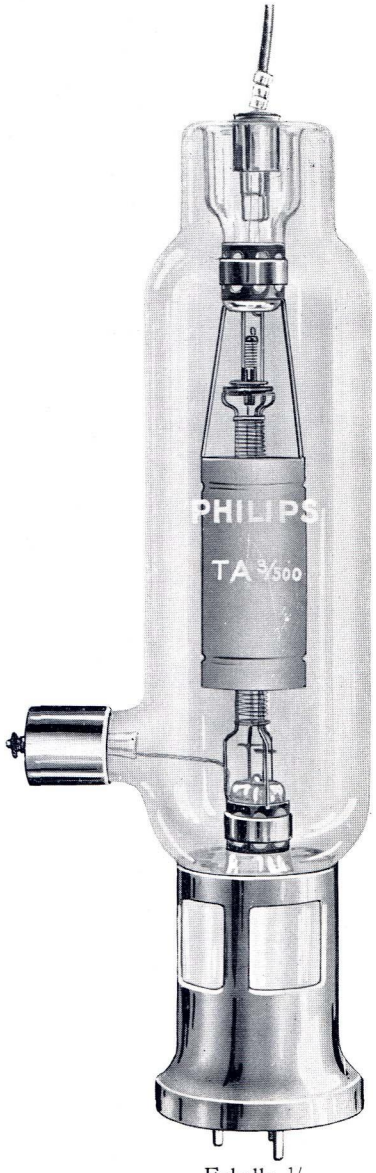
TA 3/500



Heizspannung	V_f	= 16,0 V
Heizstrom	I_f	= ca. 8,5 A
Sättigungsstrom	I_s	= ca. 700 mA
Anodenspannung	V_a	= 3000—4000 V
Zulässiger Anodenverlust	W_a	= 400 W
Geprüfter Anodenverlust	W_{at}	= 600 W
Verstärkungsfaktor	g	= ca. 40
Durchgriff	D	= ca. 2,5 %
Steilheit bei V_a = 4000 V, I_a = 125 mA	S_{norm}	= ca. 3,0 mA/V
Grösste Steilheit	S_{max}	= ca. 6,0 mA/V
Innerer Widerstand bei V_a = 4000 V, I_a = 125 mA	R_i	= ca. 13500 Ω
Grösster Kolbendurchmesser	d	= 120 mm
Grösster Gesamtdurchmesser	d'	= ca. 200 mm
Gesamtlänge	l	= ca. 470 mm

TUBE EMETTEUR PHILIPS

TA 3/500



Echelle 1/3

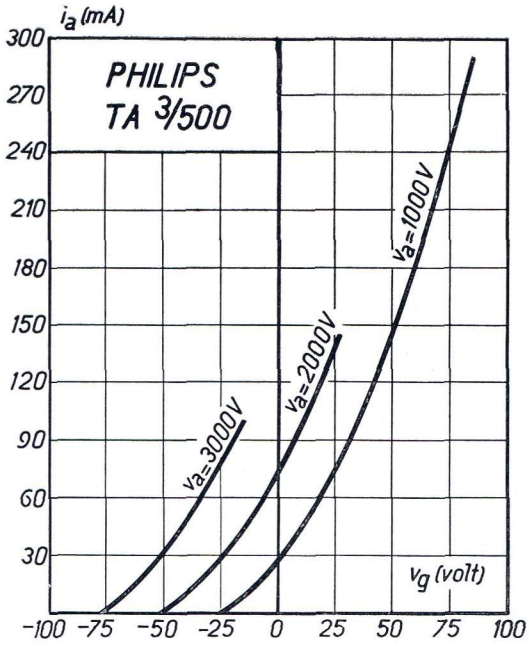
Ce tube émetteur permet de développer une puissance utile de 500 watts sous une tension anodique de 3000 volts. Il se distingue par sa tension anodique réduite, sa forte inclinaison et sa dissipation anodique élevée, ce qui assure une sécurité de fonctionnement exceptionnelle. Pour les longueurs d'onde supérieures à 150 mètres la tension anodique peut être poussée jusqu'à 3500 volts à condition de respecter la valeur de la dissipation anodique. Une tension anodique de 2500 volts permet encore d'obtenir un bon rendement. Ce tube est muni d'un culot en nickel pour montage vertical. Le culot porte 3 fiches dont 2 pour le filament et une troisième pour la stabilité mécanique. Le contact de l'anode se trouve au sommet, celui de la grille sur le côté.

Le tableau suivant indique la puissance utile pour diverses valeurs du rendement, la tension anodique étant de 3000 volts.

Rendement	30	40	50	60	70	%
Puissance absorbée	430	500	600	750	750	watts
Puissance utile	130	200	300	450	500	watts
Dissipation anodique	300	300	300	300	250	watts

TUBE EMETTEUR PHILIPS

TA 3/500



Tension de chauffage	v_f	= **16** V env.
Courant de chauffage	i_f	= **8** A env.
Courant de saturation	i_s	= **750** mA
Tension anodique	v_a	= **2500 - 3500** V
Dissipation anodique	w_a	= **300** W
Dissipation anodique d'essai	w_{at}	= **400** W
Coefficient d'amplification	K	= **40** env.
Inclinaison	S	= **4** mA/V env.
Résistance interne	R_i	= **10000** Ω env.
Tension de saturation dans le plan de la grille	v_s	= **250** V
Diamètre maximum	d	= **90** mm
Longueur totale	l	= **375** mm

PHILIPS

TUBE EMETTEUR

TA

3/500K



Le TA 3/500 K est un tube émetteur spécial pour ondes courtes pouvant être utilisé sur des longueurs d'onde descendant jusqu'à 3 m. Les données correspondent à celles du TA 3/500. Pour la télégraphie, les tensions anodiques suivantes sont admissibles:

2500 V pour une longueur d'onde de 3 m,
3000 V pour une longueur d'onde de 14 m,
4000 V pour une longueur d'onde de 45 m.

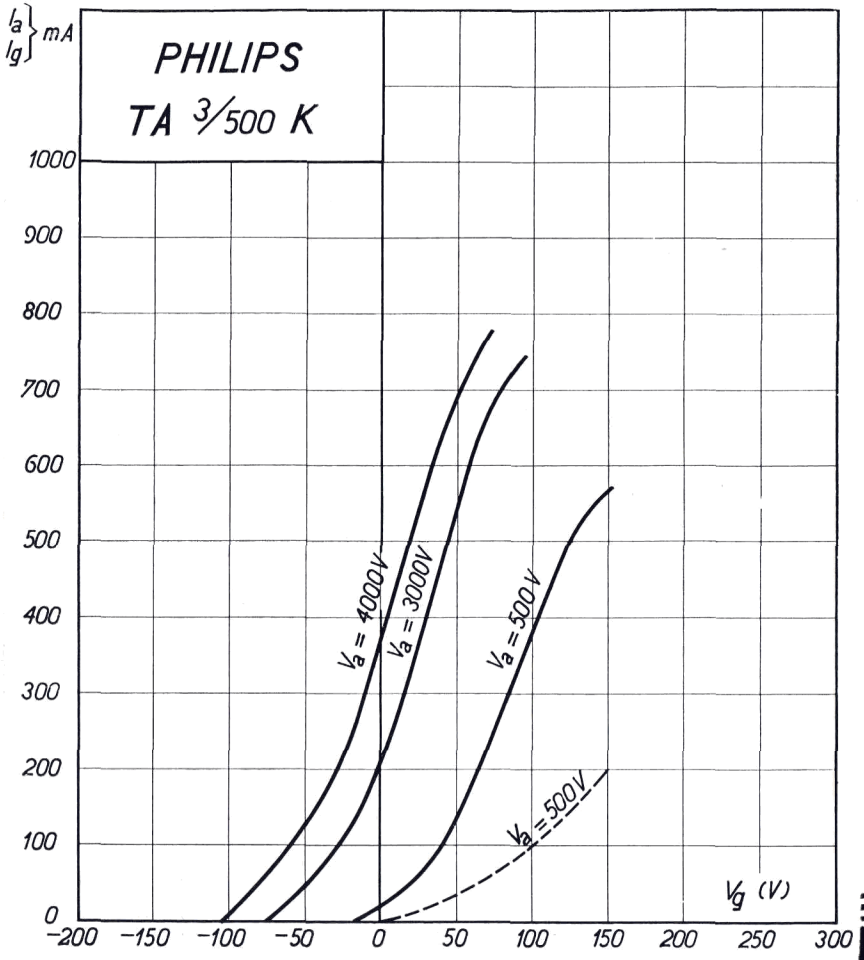
Le tableau ci-après est valable pour la télégraphie pour une longueur d'onde de 15 m et une tension anodique de 3000 V, valeurs pour lesquelles la dissipation anodique n'atteint même pas son maximum de 400 W.

Rendement	40	50	60 %
Puissance appliquée	600	600	600 W
Puissance utile	240	300	360 W
Dissipation anodique	360	300	240 W

PHILIPS

TUBE EMETTEUR

TA 3/500 K



Tension de chauffage	V_f	= 16,0 V
Courant de chauffage	I_f	= 8,5 A env.
Courant de saturation	I_s	= 700 mA env.
Tension anodique	V_a	= 2500—4000 V
Dissipation anodique admissible	W_a	= 400 W
Dissipation anodique d'essai	W_{at}	= 600 W
Coefficient d'amplification	k	= 40 env.
Inclinaison pour V_a = 4000 V, I_a = 125 mA	S_{norm}	= 3,0 mA/V env.
Inclinaison maximum	S_{max}	= 6,0 mA/V env.
Résistance intérieure pour V_a = 4000 V, I_a = 125 mA	R_i	= 13500 Ω env.
Diamètre maximum de l'ampoule	d	= 120 mm
Diamètre total maximum	d'	= 200 mm env.
Longueur totale	l	= 470 mm env.

PHILIPS SENDERRÖHRE



1/3 der natürl. Grösse

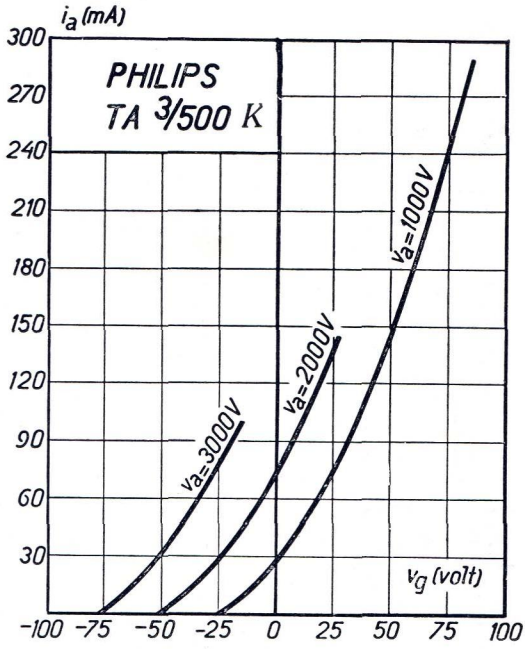
TA 3/500 K

Diese Senderröhre hat dieselben Eigenschaften (Heizspannung usw.) wie die TA 3/500, sie ist infolge ihrer Spezialausführung auch geeignet für Kurzwellenarbeit auf Wellenlängen bis 15 m.
Bei 15 m Wellenlänge ist die maximale Anodenspannung 2000 Volt, die maximale zugeführte Energie 500 Watt. Bei 45 m kann die Anodenspannung 3000 Volt betragen, zwischen 15 und 45 m kann sie von 2000 bis 3000 Volt entsprechend gesteigert werden. Untenstehende Tabelle gilt für eine Anodenspannung von 2000 Volt und eine maximale zugeführte Leistung von 500 Watt. Sie gibt die Nutzleistung für verschiedene Nutzeffektwerte an:

Nutzeffekt	30	40	50	60	70	%
Zugeführte Leistung.	430	500	500	500	500	Watt
Nutzleistung	130	200	250	300	350	Watt
Anodenverlust	300	300	250	200	150	Watt

PHILIPS SENDERRÖHRE

TA 3/500 K



Heizspannung	v_f = ca. **16.0** V
Heizstrom	i_f = ca. **8.0** A
Sättigungsstrom	i_s = **750** mA
Anodenspannung	v_a = **2,000-3,000** V
Anodenverlust	w_a = 300 W
Anodenverlust geprüft auf	w_{at} = 400 W
Durchgriff	g = ca. **40**
Steilheit	S = ca. **4** mA/V
Innerer Widerstand	R_i = ca. **10,000** Ω
Sättigungsspannung in der Gitterfläche	v_s = ca. **250** V
Grösster Durchmesser	d = **90** mm
Grösste Länge	l = **375** mm

PHILIPS

SENDERÖHRE

TA

4/1500



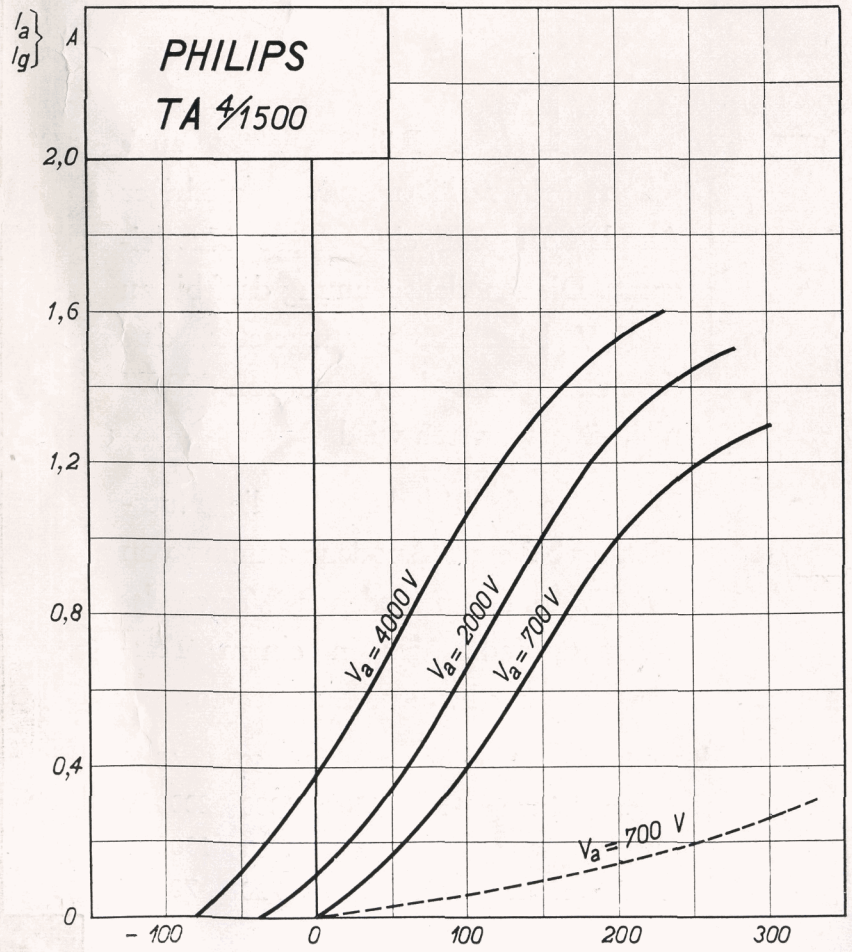
Diese Röhre liefert auch schon bei verhältnismässig niedriger Anodenspannung eine grosse Nutzleistung. Die Anodenspannung darf bis zu 5000 V betragen, vorausgesetzt, dass der zulässige Anodenverlust von 750 W nicht überschritten wird.

Die folgende Tabelle gibt die Nutzleistung bei einer Anodenspannung von 4000 V und verschiedenen Werten des Wirkungsgrades der in einem Telegraphiesender benutzten Röhre an.

Wirkungsgrad	40	50	60	65 %
Eingangsleistung	1250	1500	1800	2000 W
Ausgangsleistung	500	750	1080	1300 W
Anodenverlust	750	750	720	700 W

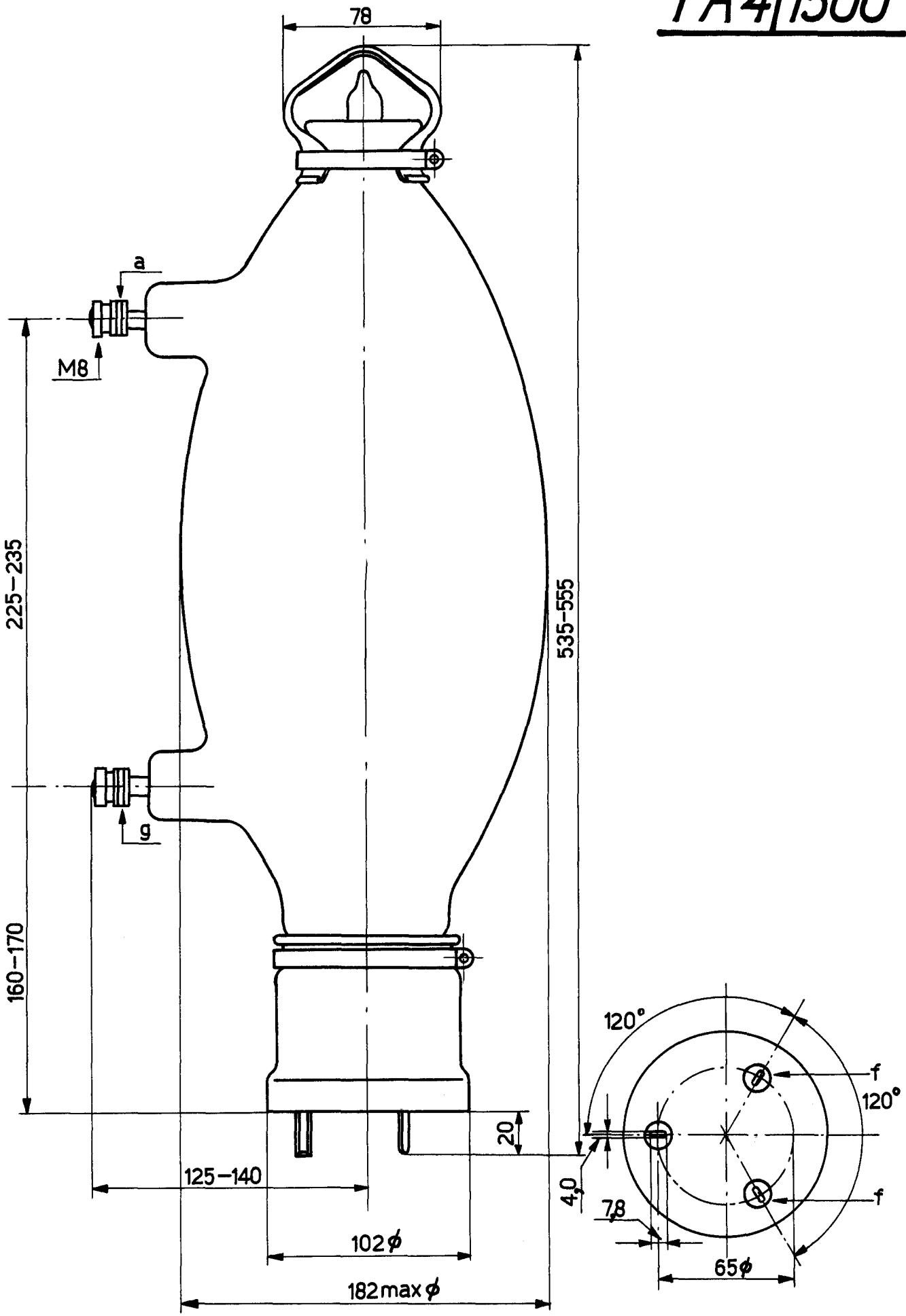
PHILIPS

SENDERÖHRE
TA 4/1500



Heizspannung	V_f	= 16,0 V
Heizstrom	I_f	= ca. 16 A
Sättigungsstrom	I_s	= ca. 1,5 A
Anodenspannung	V_a	= 3000—5000 V
Zulässiger Anodenverlust	W_a	= 750 W
Geprüfter Anodenverlust	W_{at}	= 1000 W
Verstärkungsfaktor	g	= ca. 40
Durchgriff	D	= ca. 2,5 %
Steilheit bei V_a = 4000 V, I_a = 200 mA	S_{norm}	= ca. 4 mA/V
Grösste Steilheit	S_{max}	= ca. 6,5 mA/V
Innerer Widerstand bei V_a = 4000 V, I_a = 200 mA	R_i	= ca. 10000 Ω
Grösster Kolbendurchmesser	d	= 180 mm
Grösster Gesamtdurchmesser	d'	= ca. 250 mm
Gesamtlänge	l	= ca. 550 mm

TA4/1500



PHILIPS7R55088

TUBE EMETTEUR PHILIPS



Echelle 1 : 4

TA 4/1500

Ce tube se distingue par la puissance exceptionnellement grande qu'il peut développer sous une tension anodique de 4000 volts seulement L'inclinaison de 8 mA/V est très elevée et assure un rendement excellent. Le contact de l'anode se trouve au sommet, celui de la grille sur le côté. Le culot présente 3 broches dont 2 pour le filament et une 3ième pour la stabilité mécanique. Ce tube est construit pour le montage vertical.

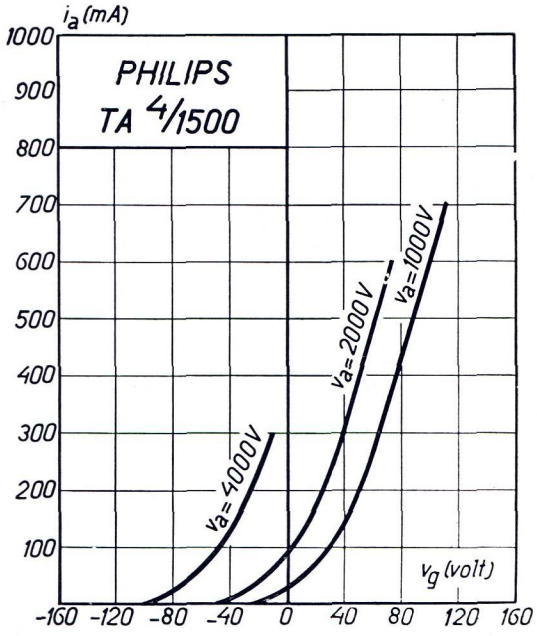
Le tube TA 4/1500 convient en outre comme oscillateur dans un émetteur radio-téléphonique dont le courant anodique moyen maximum ne dépasse pas 200 mA ; il convient aussi comme modulateur système Heising avec un courant anodique moyen de 125 mA.

Le tableau suivant indique la puissance utile pour des valeurs diverses du rendement, la tension anodique étant de 4000 volts.

Rendement	40	50	60	75	%
Puissance absorbée	1250	1500	1800	2000	watts
Puissance utile	500	750	1050	1500	watts
Dissipation anodique	750	750	750	500	watts

TUBE EMETTEUR PHILIPS

TA 4/1500



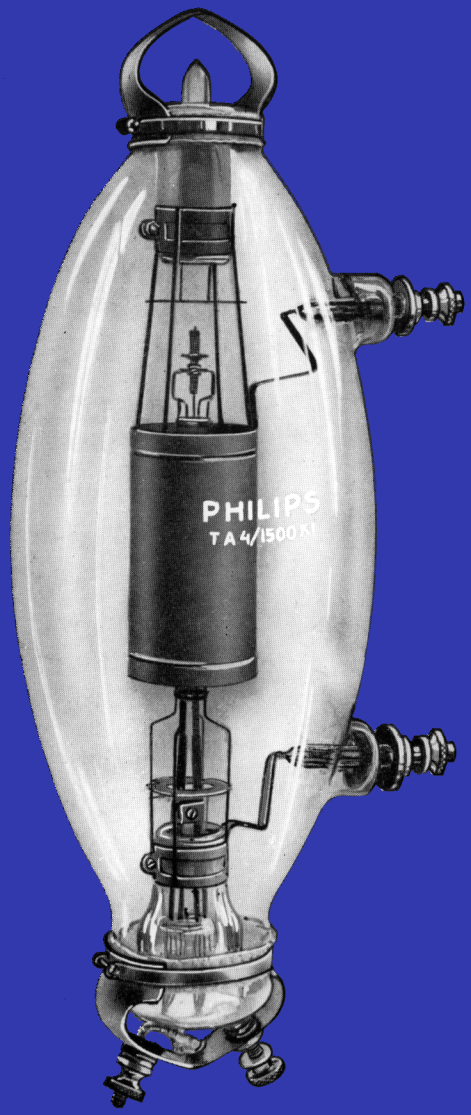
Tension de chauffage	v_f	= env. **16,0** V
Courant de chauffage	i_f	= env. **16,0** A
Courant de saturation	i_s	= **1500** mA
Tension anodique	v_a	= **3000-4000** V
Dissipation anodique	w_a	= **750** W
Dissipation anodique d'essai	w_{at}	= **1000** W
Coefficient d'amplification	K	= env. **40**
Inclinaison	S	= env. **8** mA/V
Résistance interne	R_i	= env. **5000** Ω
Tension de saturation dans le plan de la grille	v_s	= **300** V
Diamètre maximum	d	= **120** mm
Longueur totale	l	= **450** mm

PHILIPS

TRANSMITTING VALVE

TA 4/1500 K

This valve has the same characteristics as the Philips transmitting valve TA 4/1500, but its special construction makes it very suitable for working on wavelengths down to 5 metres. If the valve is used as an H.F. class C amplifier in a telegraphy transmitter the output will be 1,000 watts*) and the efficiency 77%, the anode voltage being



4,000 volts; at an anode voltage of 3,000 volts these values will be 700 watts*) and 72% respectively.

In a telephony transmitter a TA 4/1500 K connected as an H.F. class B amplifier will give an output of 250 watts*) in the carrier at an efficiency of 40%, if an anode voltage of 4,000 volts is applied. At an anode voltage of 3,000 volts the output in the carrier will be 200 watts*).

When the TA 4/1500 K is used as an H.F. class C amplifier with anode modulation the output in the carrier will amount to 525 watts*) and the efficiency to 79·5 % at an anode voltage of 4,000 volts; these values will be 375 watts*) and 76% respectively at an anode voltage of 3,000 volts.

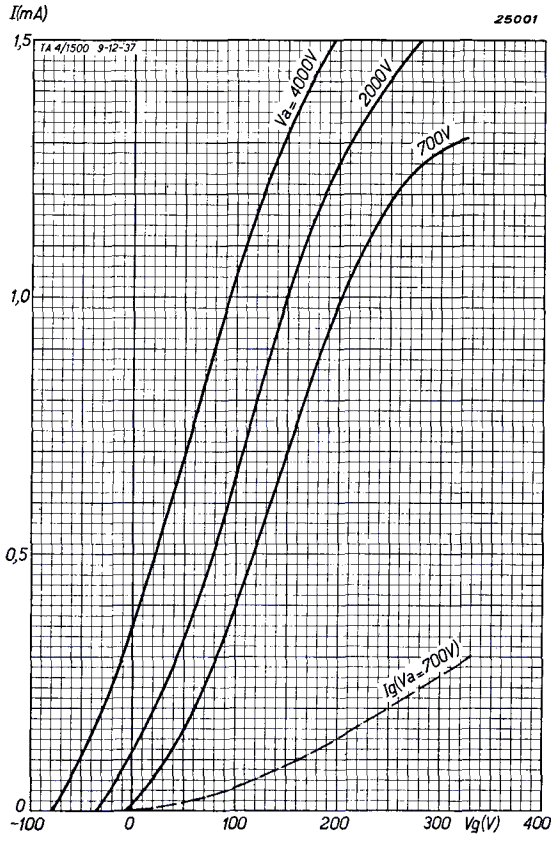
For excitation of the TA 4/1500 K the TC 1/75 will be found very suitable. One or two valves TA 4/1500 K can, in turn, be used for the excitation of a water-cooled valve TA 12/20.

*) Circuit losses must be deducted.

PHILIPS

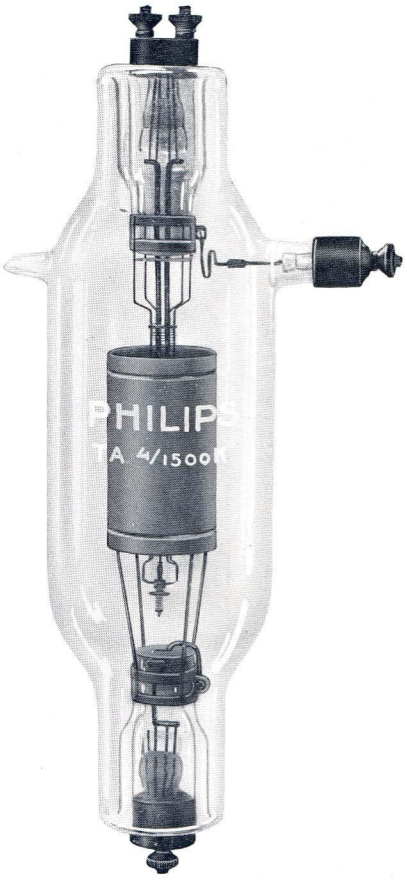
TRANSMITTING VALVE

TA 4/1500 K



Filament voltage	V_f	= 16·0 V
Filament current	I_f	= appr. 16 A
Total emission	I_s	= appr. 1·5 A
Anode voltage	V_a	= max. 4,000 V
Anode dissipation	W_a	= 750 W
Anode dissipation during test	W_{at}	= 1,000 W
Amplification factor	μ	= appr. 40
Mutual conductance at V_a = 4,000 V, I_a = 200 mA	S	= appr. 4·0 mA/V
Max. mutual conductance	S_{max}	= appr. 6·5 mA/V
Internal resistance at V_a = 4,000 V, I_a = 200 mA	R_i	= appr. 10,000 Ω
Anode/cathode capacity	C_{af}	= appr. 1·5 pF
Control-grid/cathode capacity	C_{gf}	= appr. 11 pF
Anode/control-grid capacity	C_{ag}	= appr. 7·5 pF
Max. diameter of bulb	d	= 182 mm
Max. diameter	d'	= appr. 231 mm
Total length	l	= appr. 535 mm

TUBE EMETTEUR PHILIPS



Echelle 1 : 4

TA $^{4}/_{1500}$ K

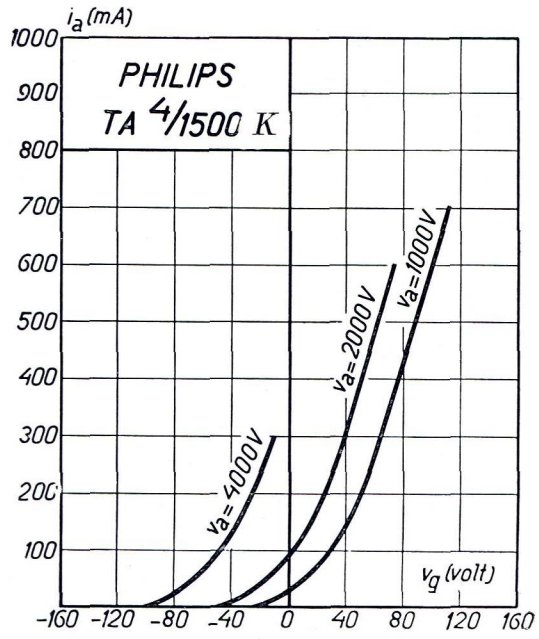
Ce tube émetteur a été construit spécialement pour les postes émetteurs à ondes courtes descendant jusqu' à 15 mètres de longueur d'onde. Pour cette dernière longueur d'onde la tension anodique maximum est de 3000 volts; pour 45 mètres de 4000 volts. Pour les ondes entre 15 et 45 mètres la tension anodique peut être augmentée proportionnellement à la longueur d'onde A 15 mètres la puissance maximum absorbée par la lampe ne doit pas dépasser 1000 watts.

Le tableau suivant a été composé pour une longueur d'onde de 15 mètres, la tension anodique étant de 3000 volts et la puissance absorbée maximum de 1000 watts.

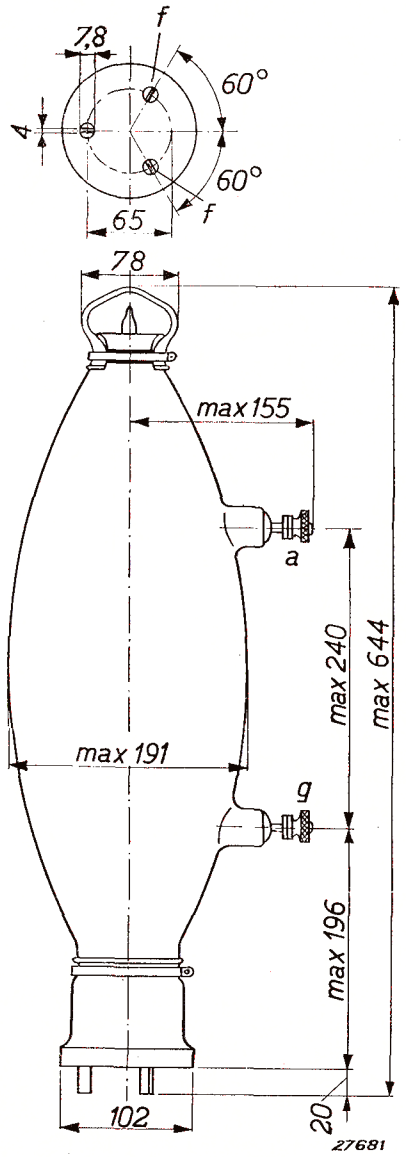
Rendement	40	50	60	75	%
Puissance absorbée	1000	1000	1000	1000	watts
Puissance utile	400	500	600	750	watts
Dissipation anodique	600	500	400	250	watts

TUBE EMETTEUR PHILIPS

TA 4/1500 K



Tension de chauffage	v_f	= env. **16,0** V
Courant de chauffage	i_f	= env. **16,0** A
Courant de saturation	i_s	= **1500** mA
Tension anodique	v_a	= **3000-4000** V
Dissipation anodique	w_a	= **750** W
Dissipation anodique d'essai	w_{at}	= **1000** W
Coefficient d'amplification	K	= env. **40**
Inclinaison maximum	S	= env. **8** mA/V
Résistance interne	R_i	= env. **5000** Ω
Tension de saturation dans le plan de la grille	v_s	= env. **300** V
Diamètre maximum	d	= **140** mm
Longueur totale	l	= **450** mm



PHILIPS-EMISSION

R E 520 E 11/38

PHILIPS

TRANSMITTING VALVE

TA 4/2000

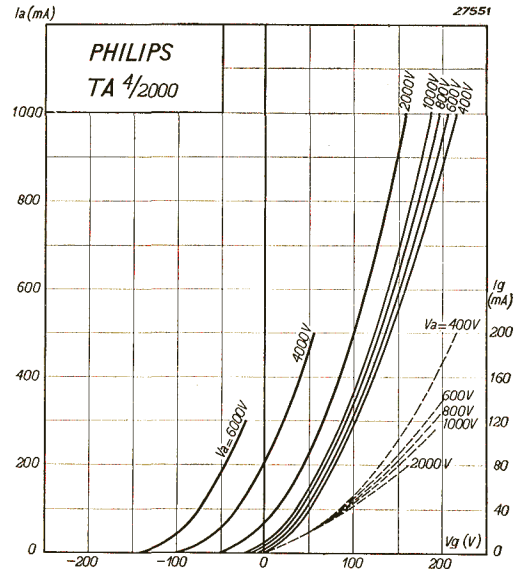
Description

This air-cooled transmitting valve is specially characterised by the valuable feature that it can also be used on short waves down to 15 metres. It possesses a tungsten filament and has a remarkably high output at a relatively low anode voltage. The latter may be 4000 volts for wavelengths down to 100 metres, and 3000 volts for a wavelength of 15 metres. When the valve is used on wavelengths above 150 metres, the anode voltage may be increased to 6000 volts without disadvantage.

The input and output of the valve for different values of the efficiency are indicated in the table below. Attention is drawn to the fact that the anode current must not exceed 750 milliamps.

Efficiency	Input	Output	Anode dissipation
40 %	1650 watts	650 watts	1000 watts
50 %	2000 watts	1000 watts	1000 watts
60 %	2500 watts	1500 watts	1000 watts
65 %	3000 watts	2000 watts	1000 watts

When using this valve on a wavelength of about 15 metres, it is recommended to remove the metal protection cap on top of the valve.



Technical Data

Filament voltage	V_f	= 22·0 V
Filament current	I_f	= appr. 24·5 A
Total emission	I_s	= appr. 2 A
Anode voltage	V_a	= max. 6000 V
Max. permissible anode dissipation	W_a	= 1000 W
Anode dissipation during test	W_{at}	= 1500 W
Amplification factor	μ	= appr. 50
Mutual conductance at I_a = 225 mA	S_{norm}	= appr. 4·0 mA/V
Max. mutual conductance	S_{max}	= appr. 8·0 mA/V
Internal resistance at I_a = 225 mA	R_i	= appr. 12500 ohms

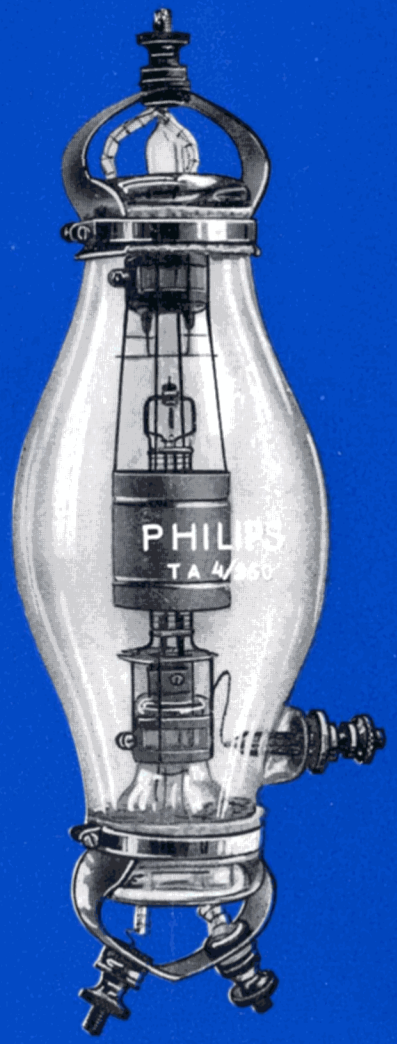
PHILIPS

ZENDBUIS TA 4/250

De TA 4/250 kan op golflengten tot 4 m worden gebruikt. In onderstaande tabel is de hoogst toelaatbare anodespanning voor verschillende golflengten aangegeven.

Golflengte	150	14	5	4	m
Max. anodespanning	4000	3500	3000	2000	V

Wordt de buis op golflengten beneden 10 m gebruikt, dan moet men de beugels met de klemschroeven voor de anode- en gloeidraadaansluiting verwijderen.



Het afgegeven vermogen en nuttig effect voor de verschillende schakelingen en anodespanningen, gemeten op een golflengte van 150 m, zijn in onderstaande tabel aangegeven:

Schakeling	Anode-spanning	Afgegeven vermogen	Rendement ca.
H.F. klasse C (telegrafie)	4000 V 3500 V 3000 V	300 W[1]) 250 W[1]) 210 W[1])	75% 71,5% 70%
H.F. klasse B (telefonie)	4000 V 3500 V 3000 V	95 W[1])[2]) 82 W[1])[2]) 70 W[1])[2])	37% 36% 34%
H.F. klasse C (anode-modulatie)	3500 V 3000 V 2500 V	130 W[1])[2]) 115 W[1])[2]) 90 W[1])[2])	79% 83,5% 82%

[1]) Kringverliezen moeten worden afgetrokken

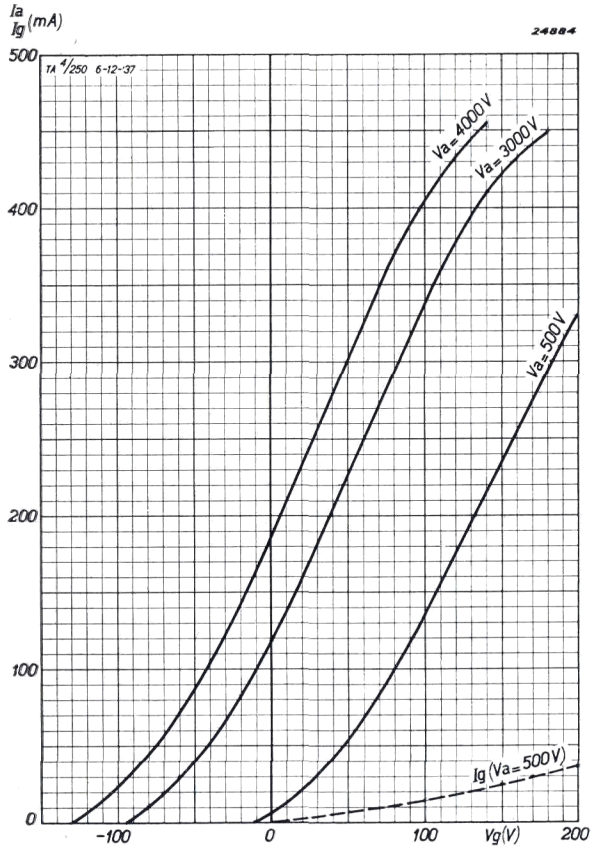
[2]) Afgegeven vermogen in de draaggolf

Eén buis TC 05/25 kan voor de roosterexcitatie van deze buis worden gebruikt. De Philips modulatorbuis MA 4/500 kan een TA 4/250 moduleeren bij toepassing van het Heising-systeem.

PHILIPS

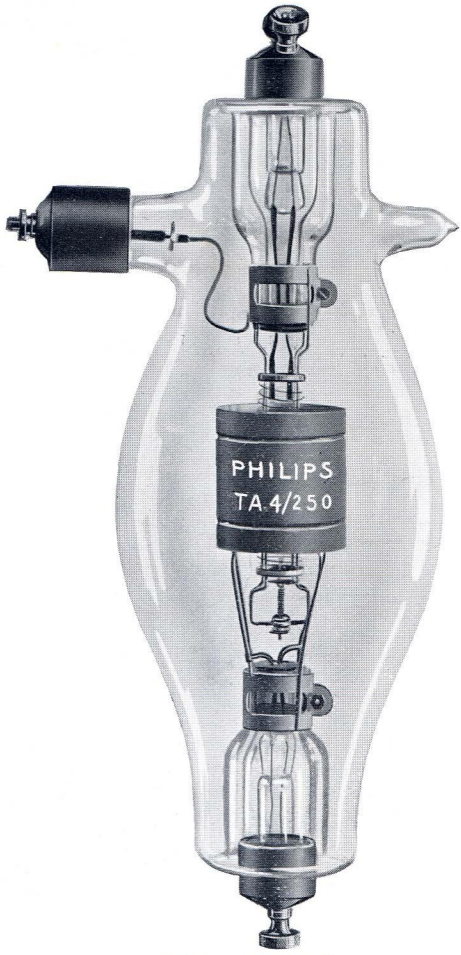
ZENDBUIS

TA 4/250



Gloeispanning	V_f	=	12,5 V
Gloeistroom	I_f	=	ca. 5,5 A
Verzadigingsstroom	I_s	=	ca. 0,45 A
Anodespanning	V_a	=	max. 4000 V
Anodedissipatie	W_a	=	max. 250 W
Anodedissipatie tijdens meting	W_{at}	=	300 W
Versterkingsfactor	μ	=	ca. 30
Steilheid bij $V_a = 4000$ V, $I_a = 125$ mA	S	=	ca. 1,2 mA/V
Maximum steilheid	S_{max}	=	ca. 2,0 mA/V
Inwendige weerstand bij $V_a = 4000$ V, $I_a = 125$ mA	R_i	=	ca. 25000 Ω
Anode/kathode capaciteit	C_{af}	=	ca. 1,3 pF
Stuurrooster/kathode capaciteit	C_{gf}	=	ca. 8,7 pF
Anode/stuurrooster capaciteit	C_{ag}	=	ca. 5,2 pF
Grootste diameter van den ballon	d	=	120 mm
Grootste diameter	d'	=	ca. 160 mm
Totale lengte	l	=	ca. 395 mm

PHILIPS SENDERRÖHRE



Massstab 1 : 3

TA 4/250

Die TA 4/250 ist eine einfache Röhre für mittlere Leistungen, die sich auch für Flugzeugsender und transportable Senderanlagen eignet. Starke Bauart und geringe Abmessungen zeichnen diese Röhre aus.

Die normale Anodenspannung beträgt 4000 V, doch werden auch bei 2000 V noch sehr gute Ergebnisse erzielt.

Auch auf kurzen Wellen kann sie gebraucht werden, und zwar beträgt die maximale Anodenspannung

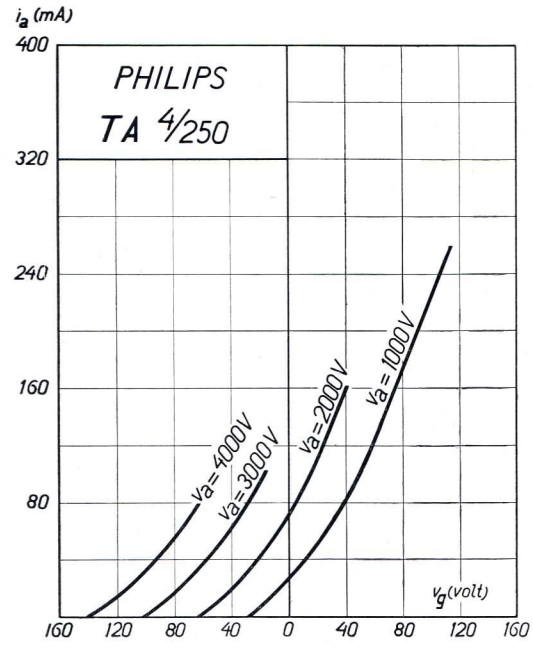
bei 15 m Wellenlänge 1500 V,
„ 20 „ „ 2200 V,
„ 40 „ „ 3000 V.

Untenstehende Tabelle gibt die Nutzleistung bei verschiedenen Werten des Wirkungsgrades an.

Wirkungsgrad	40	50	60	70	%
Eingangsleistung . . .	415	500	500	500	W
Nutzleistung	165	250	300	350	W
Anodenverlust	250	250	200	150	W

PHILIPS SENDERRÖHRE

TA 4/250



Heizspannung	v_f	= ca. **12,5** V
Heizstrom	i_f	= ca. **5,5** A
Sättigungsstrom	i_s	= **400** mA
Anodenspannung	v_a	= **2000—4000** V
Zülässiger Anodenverlust	w_a	= **250** W
Anodenverlust geprüft auf	w_{at}	= **300** W
Verstärkungsfaktor	g	= ca. **25**
Dürchgriff	D	= **4**%
Steilheit	S	= ca. **2** mA/V
Innerer Widerstand	R_i	= ca. **12500** Ω
Sättigungsspannung in der Gitterfläche	v_s	= ca. **300** V
Grösster Durchmesser	d	= **120** mm
Grösste Länge	l	= **375** mm

TRIODE for use as H.F. amplifier and oscillator
TRIODE pour utilisation comme amplificatrice H.F. et oscillatrice
TRIODE zur Verwendung als HF-Verstärker und Oszillator

Filament : tungsten
Filament : tungstène
Heizfaden: Wolfram

Heating : direct
Chauffage: direct
Heizung : direkt

V_f = 23 V
I_f = 14,7 A

Capacitances
Capacités
Kapazitäten

C_a = 0,9 pF
C_g = 11 pF
C_{ag} = 8 pF

Typical characteristics
Caractéristiques typiques
Kenndaten

μ = 41
S (I_a=125 mA) = 4,5 mA/V
I_{sat} = 2,9 A

λ	Freq.	C telegr.		B teleph.		C an.mod.		C osc.[1])	
m	Mc/s	Va (V)	Wo (W)	Va (V)	Wo (W)	Va (V)	Wo (W)	Va (V)	Wo (W)
150	2	4000	1530	4000	260	3000	710		
		3500	1310	3500	250	2500	583		
		3000	1105	3000	240				
		2500	925						
6	50							4000[2])	510

Limiting values
Caractéristiques limites
Grenzdaten

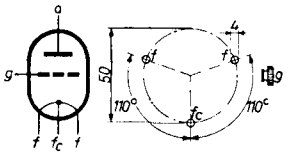
V_a = max. 4000 V
W_a = max. 500 W
W_g = max. 60 W
R_g = max. 100 kΩ

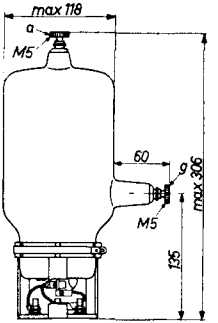
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[1]) Diathermy; Diathermie
[2]) R.M.S. value; valeur efficace; effektiver Wert

PHILIPS

Dimensions in mm
Dimensions en mm
Abmessungen in mm





Mounting position: vertical
Montage : vertical
Einbau : senkrecht

Net weight
Poids net 620 g
Nettogewicht

Shipping weight
Poids brut 3,3 kg
Bruttogewicht

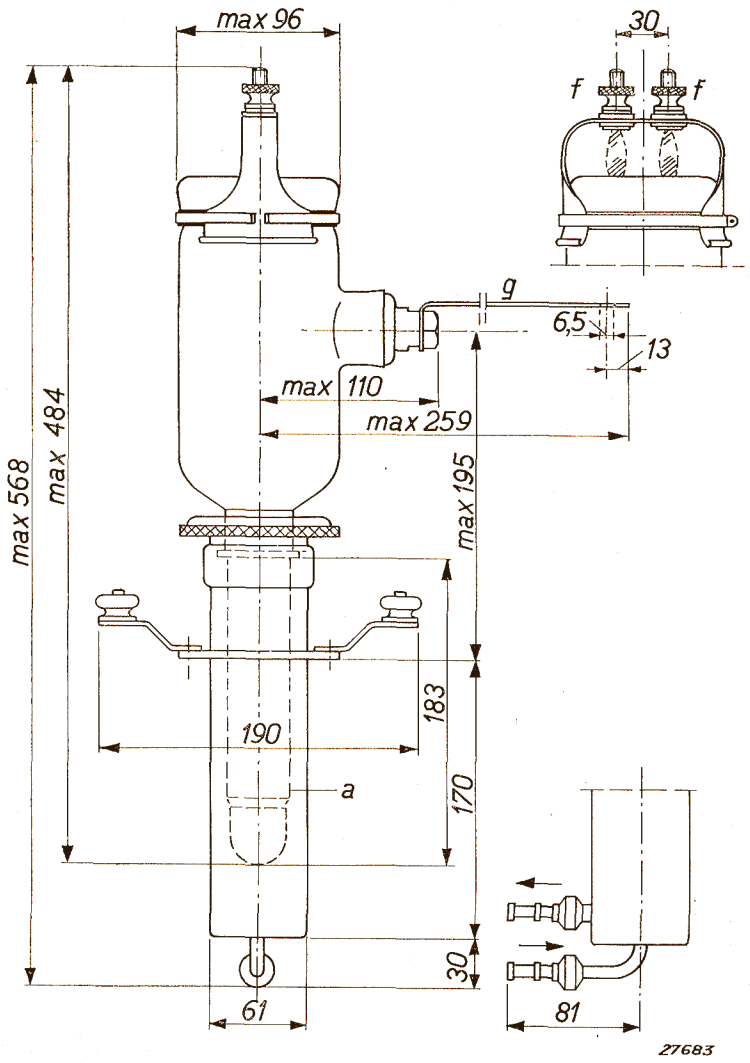
PHILIPS

Electronic Tube

HANDBOOK

TA4/800

page	sheet	date
1	1	1954.07.07
2	2	1954.07.07
3	FP	2000.01.16



PHILIPS-EMISSION

PHILIPS

TRANSMITTING VALVE

TA 5/1000

Description

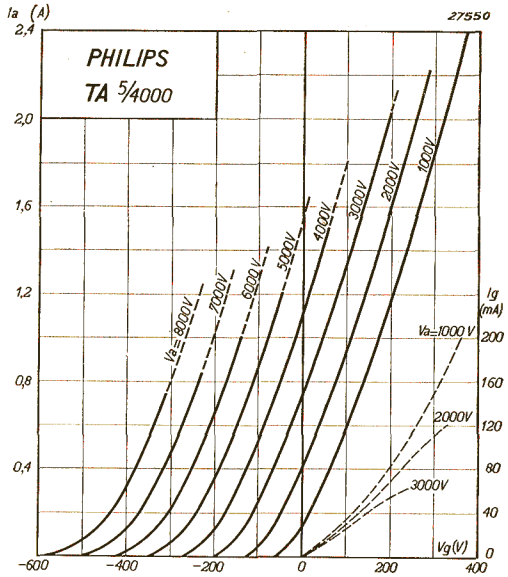
An important feature of this water-cooled transmitting triode is the possibility of using it on wavelengths down to 15 metres. The TA 5/4000 has a tungsten filament and has been specially designed for H.F. amplification in powerful transmitters. The comparatively high value of the output, viz. 4 kilowatts, can be reached at a considerably lower anode voltage than with other valves having a similar output. In the table below the attainable output is indicated for various values of the efficiency, at an anode voltage of 5000 volts, and the maximum anode current of 1250 milliamps (for H.F. class C telegraphy only).

Efficiency	Input	Output	Anode dissipation
40 %	6250 watts	2500 watts	3750 watts
50 %	6250 watts	3125 watts	3125 watts
60 %	6250 watts	3750 watts	2500 watts
65 %	6250 watts	4000 watts	2250 watts

For use as an H.F. class B amplifier the table below should beconsulted; it is to be noted that for wavelengths below 150 metres the efficiency will be somewhat lower.

Anode voltage	Anode current	Depth of modulation	Energy of carr. wave	Peak power
5000 V	0·7 A	100 %	1·1 kW	4·5 kW
5000 V	0·75 A	80 %	1·3 kW	4·5 kW
5000 V	0·85 A	60 %	1·7 kW	4·5 kW

With H.F. class C anode modulation (Heising system) the anode voltage should not exceed 4000 volts.



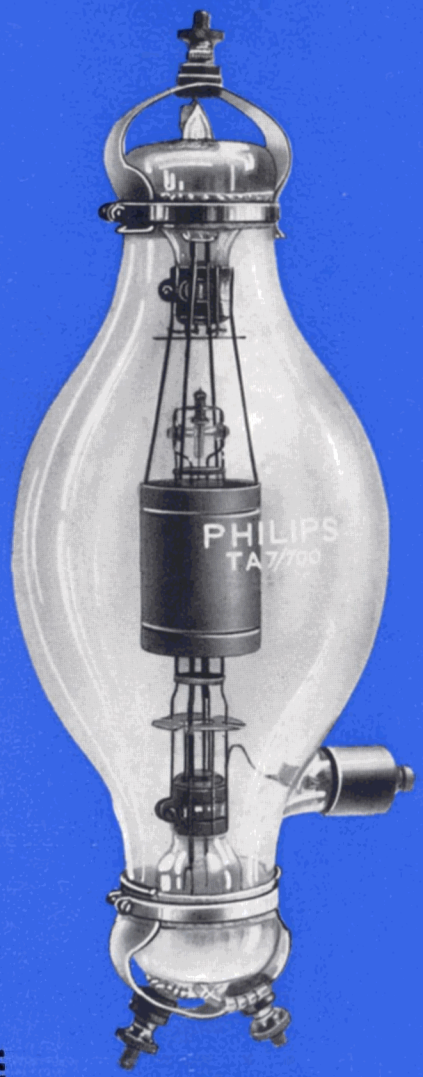
Technical Data

Filament voltage	V_f	= 22·0 V
Filament current	I_f	= appr. 41 A
Total emission	I_s	= appr. 6 A
Anode voltage	V_a	= max. 5000 V
Max. permissible anode dissipation	W_a	= 5 kW
Anode dissipation during test	W_{at}	= 6 kW
Amplification factor	μ	= appr. 16
Mutual conductance at I_a = 1 A	S_{norm}	= appr. 6·0 mA/V
Max. mutual conductance	S_{max}	= appr. 8·0 mA/V
Internal resistance at I_a = 1 A	R_i	= appr. 2700 ohms

PHILIPS

SENDERÖHRE

TA 7/700



Obschon diese besonders stark und betriebssicher ausgeführte Röhre mit einer Anodenspannung bis zu 7000 V arbeiten darf, wird auch schon bei 4000 V ein verhältnismässig guter Wirkungsgrad erreicht.

Untenstehende Tabelle ist für Telegraphie bei einer Anodenspannung von 7000 V berechnet; sie gibt die Nutzleistung bei verschiedenen Werten des Wirkungsgrades an.

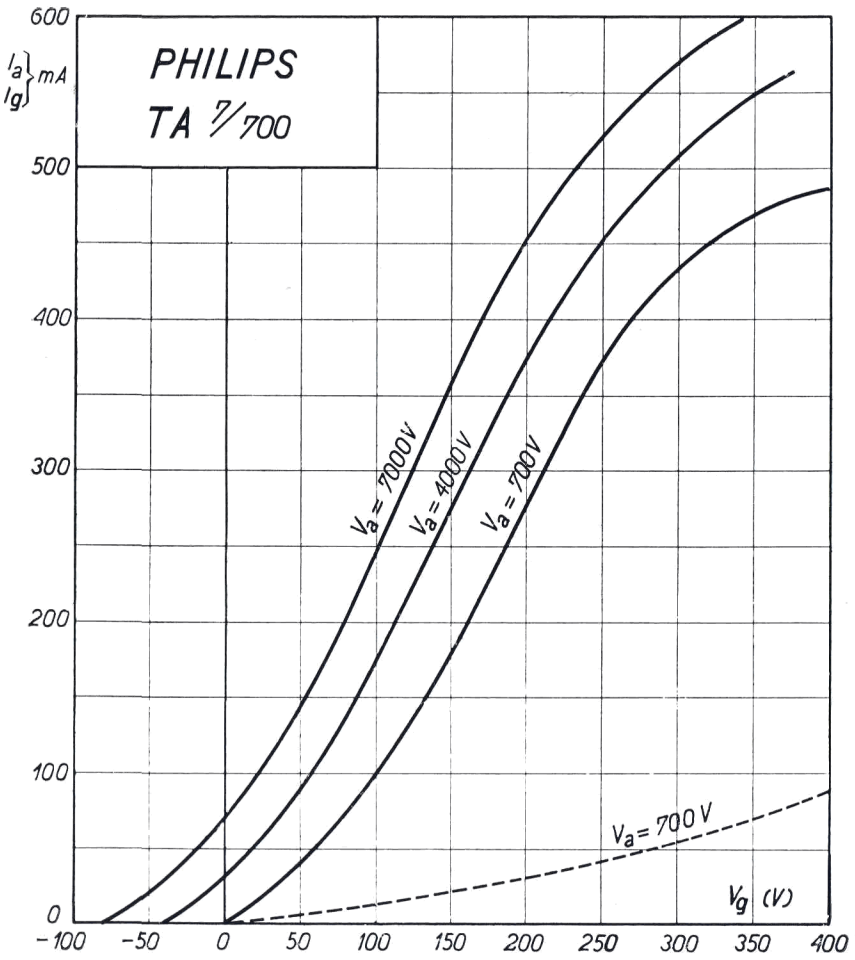
Wirkungsgrad	40	50	60	70	%
Eingangsleistung	650	800	1000	1000	W
Ausgangsleistung	250	400	600	700	W
Anodenverlust	400	400	400	300	W

Zur Lieferung der Anodenspannung für die TA 7/700 wird die Philips Gleichrichterröhre DA 7/700 empfohlen.

PHILIPS

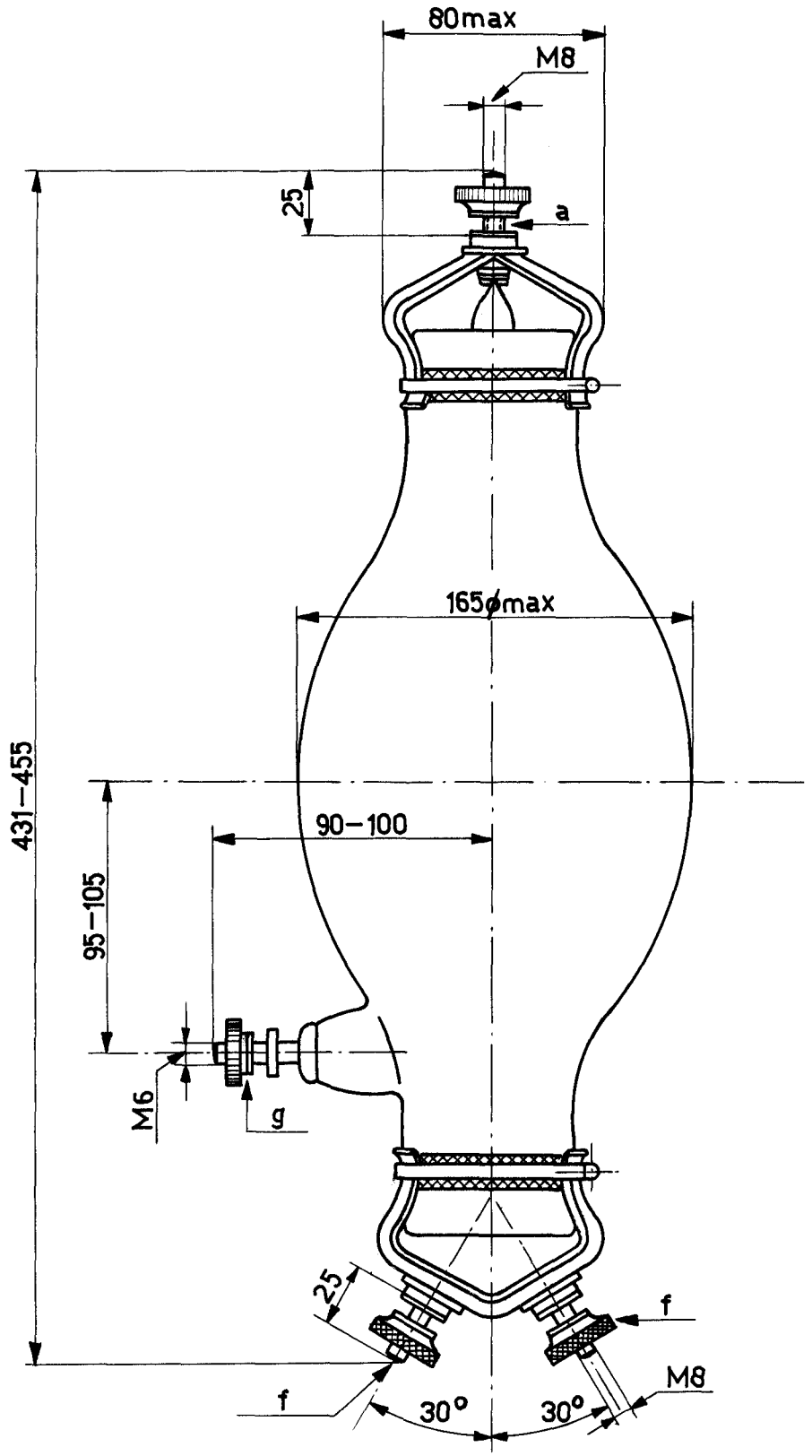
SENDERÖHRE

TA 7/700



Heizspannung	V_f	= 12,5 V
Heizstrom	I_f	= ca. 7,7 A
Sättigungsstrom	I_s	= ca. 450 mA
Anodenspannung	V_a	= 4000—7000 V
Zulässiger Anodenverlust	W_a	= 400 W
Geprüfter Anodenverlust	W_{at}	= 500 W
Verstärkungsfaktor	g	= ca. 75
Durchgriff	D	= ca. 1,3 %
Steilheit bei V_a = 7000 V, I_a = 60 mA	S_{norm}	= ca. 1,7 mA/V
Grösste Steilheit	S_{max}	= ca. 2,0 mA/V
Innerer Widerstand bei V_a = 7000 V, I_a = 60 mA	R_i	= ca. 45000 Ω
Grösster Kolbendurchmesser	d	= 160 mm
Grösster Gesamtdurchmesser	d'	= ca. 180 mm
Gesamtlänge	l	= 450 mm

TA 7/700



PHILIPS7R55085

PHILIPS SENDERRÖHRE

TA 7/700



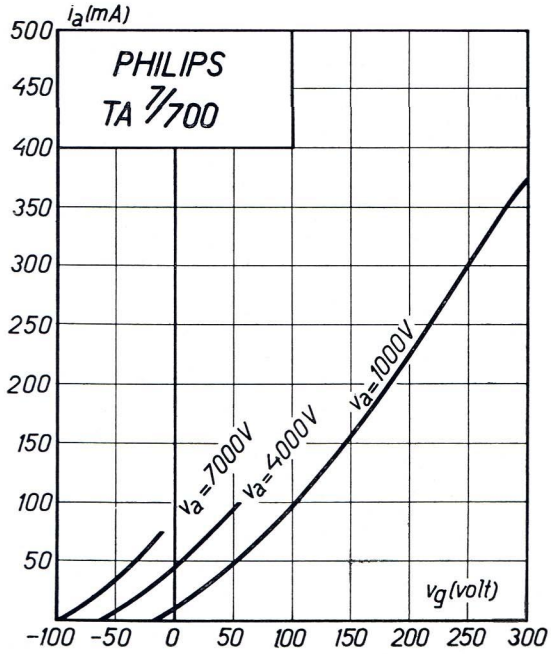
Grösse 1 : 3

Dies ist eine starke und billige Röhre für mittlere Leistung. Die Anodenspannung beträgt normalerweise 7000 Volt, jedoch lässt sich bei 4000 Volt noch ein guter Wirkungsgrad erzielen. Die folgende Tabelle ist für 7000 Volt Anodenspannung berechnet und gibt die Nutzleistung für verschiedene Werte des Wirkungsgrades an.

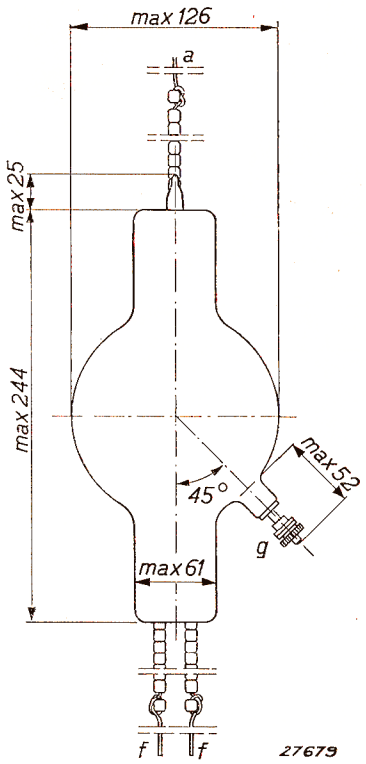
Wirkungsgrad	30	40	50	60	70	%
Eingangsleistung	570	650	800	1000	1000	Watt
Nutzleistung	170	250	400	600	700	Watt
Anodenverlust	400	400	400	400	300	Watt

PHILIPS SENDERRÖHRE

TA 7/700



Heizspannung	v_f	= ca. **12,5** V
Heizstrom	i_f	= ca. **7,7** A
Sättigungsstrom	i_s	= **450** m A
Anodenspannung	v_a	= **4000-7000** V
Anodenverlust	w_a	= **400** W
Anodenverlüst geprüft auf	w_{at}	= **500** W
Verstärkungsfactor	g	= ca. **75**
Steilheit	S	= ca. **1,7** mA/V
Innerer Widerstand	R_i	= ca. **45000** Ω
Sättigungsspannung in der Gitterfläche	v_s	= ca. **500** V
Grösster Durchmesser	d	= **150** mm
Grösste Länge	l	= **350** mm



PHILIPS-EMISSION

R.L. 520 E 11 48

PHILIPS

TRANSMITTING VALVE

TA 8/300

Description

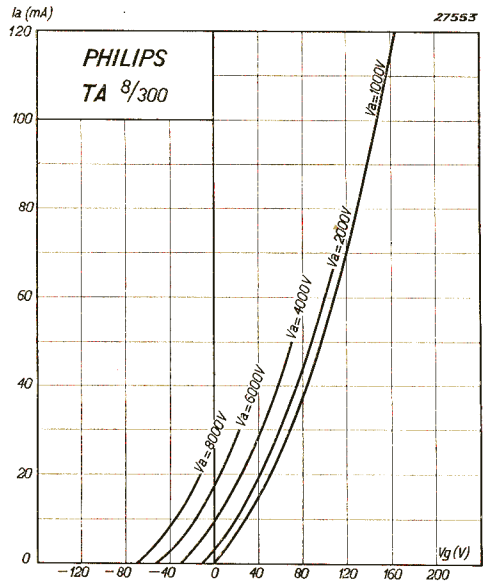
This transmitting triode has been specially designed for use in small telegraphy transmitters.

The output of the valve is indicated below for different values of the efficiency. The table has been based on the maximum permissible anode current of 60 milliamps and an anode dissipation of 150 watts.

Two Philips rectifying valves DA 8/300 are suitable for supplying anode current to one TA 8/300.

Normally the TA 8/300 is delivered as indicated in the dimensioned drawing.

Efficiency	Input	Output	Anode dissipation
50 %	300 watts	150 watts	150 watts
60 %	375 watts	225 watts	150 watts
65 %	430 watts	280 watts	150 watts
70 %	480 watts	335 watts	145 watts



Technical Data

Filament voltage	V_f	= 9·0 V
Filament current	I_f	= appr. 5·6 A
Total emission	I_s	= appr. 350 mA
Anode voltage	V_a	= max. 8000 V
Max. permissible anode dissipation	W_a	= 150 W
Anode dissipation during test	W_{at}	= 200 W
Amplification factor	μ	= appr. 110
Mutual conductance at I_a = 50 mA	S_{norm}	= appr. 0·9 mA/V
Maximum mutual conductance	S_{max}	= appr. 1·5 mA/V
Internal resistance at I_a = 50 mA	R_i	= appr. 120000 ohms

PHILIPS

TAL 12/10
TAW 12/10

TRIODE for use as H.F. and L.F. amplifier and oscillator
TRIODE pour utilisation comme amplificatrice H.F. et B.F. et oscillatrice
TRIODE zur Verwendung als H.F. und N.F. Verstärker und Oszillator

	TAL 12/10	TAW 12/10
Cooling : forced air Refroidissement: à air forcée Kühlung : erzwungene Luftkühlung		water eau Wasser

Filament : tungsten, two-phase
Filament : tungstène, biphasé
Heizfaden: Wolfram, zwei Phasen

Heating : direct Chauffage: direct Heizung : direkt	per phase par phase pro Phase	V_f = 22 V I_f = 39 A	1)

Starting current must never exceed 78 A per phase
La courant de démarrage ne doit jamais excéder 78 A par phase
Der Anlaufstrom darf unter keinen Umständen höher sein als 78 A pro Phase

Capacitances Capacités Kapazitäten	C_a = 4 pF C_g = 24,8 pF C_{ag} = 22 pF

Typical characteristics Caractéristiques typiques Kenndaten	μ S (I_a=0,5 A) Isat	= 22 = 7 mA/V = 8 A

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1) Each tube is marked with the value of the filament voltage at which the saturation current has a value of 8 A
La valeur de tension du filament correspondante à un courant de saturation de 8 A est indiquée à chaque tube
Auf jede Röhre ist der Wert der Heizspannung angegeben wobei der Sättigungsstrom einen Wert von 8 A erhält

PHILIPS

λ	Freq.	C telegr.		B teleph.		C an.mod.		B mod. [1]	
m	Mc/s	Va (kV)	Wo (kW)	Va (kV)	Wo (kW)	Va (kV)	Wo (kW)	Va (kV)	Wo (kW)
>60	< 5	12	10,5			10	7,7	12	17
>15	<20	10	10,5	8	2	8	6	10	16,6
				6	2			8	16,2

Limiting values
Caractéristiques limites
Grenzdaten

V_a = max. 12 kV
W_a = max. 4 kW
W_g = max. 300 W
R_g = max. 10 kΩ

q (t_i=20 °C; W_a= 4 kW) = min. 5,4 m^3/min

t_i = max. 45 °C

t_{anode} = max. 150 °C

temperature of bulb and seals)
température de l'ampoule et des points de scellement) = max. 150 °C
Temperatur des Kolbens und der Verschlüsse)

Pressure loss
Perte de pression
Druckverlust

p_i (q =5,4 m^3/min; t_i= 20 °C) = 117 mm H_2O

Mounting position: exactly vertical with anode down
Montage : exactement vertical avec l'anode en bas
Aufstellung : genau senkrecht mit der Anode unten

Filament bracket
Etriers des filaments 40604
Heizfadenbügel

Protective cap for grid seals
Chapeau de protection pour les sorties de la grille 40632
Schutzkappe für Gitterverschlüsse

[1]) Two valves; deux tubes; zwei Röhren

λ	Freq.	C telegr.		B teleph.		C an.mod.		B mod. [1]	
m	Mc/s	Va (kV)	Wo (kW)	Va (kV)	Wo (kW)	Va (kV)	Wo (kW)	Va (kV)	Wo (kW)
>60	< 5	12	15	12	3,7	10	7,7	12	30
>15	<20	10	12	10	3,3	8	6	10	25
6	50	6,5	6,5					8	19,5
4	75	4	3,5						

Limiting values
Caractéristiques limites
Grenzdaten

V_a = max. 12 kV — t_o = max. 50 °C
W_a = max. 7,5 kW — $t_o - t_i$ = max. 11 °C
W_g = max. 300 W — q (W_a=7,5 kW) = min. 12 l/min
R_g = max. 10 kΩ

temperature of bulb and seals)
température de l'ampoule et des) = max. 150 °C
points de scellement)
Temperatur des Kolbens und der)
Verschlüsse)

Pressure loss
Perte de pression — p_i (q=12 l/min) = 0,3 atm
Druckverlust

Mounting position: exactly vertical with anode down
Montage : exactement vertical avec l'anode en bas
Aufstellung : genau senkrecht mit der Anode unten

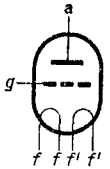
Filament bracket
Etriers des filaments — 40604
Heizfadenbügel

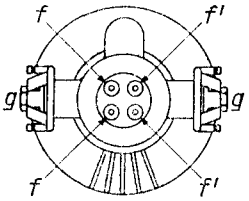
Protective cap for grid seals
Chapeau de protection pour les sorties de la grille — 40632
Schutzkappe für Gitterverschlüsse

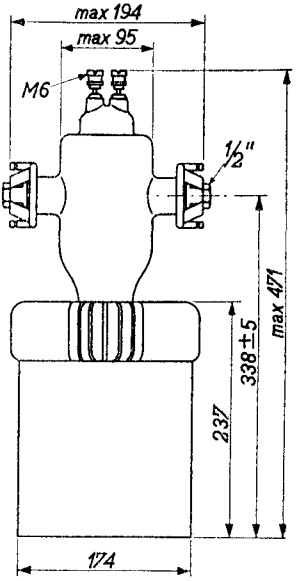
[1]) Two valves; deux tubes; zwei Röhren

PHILIPS

Dimensions in mm
Dimensions en mm
Abmessungen in mm



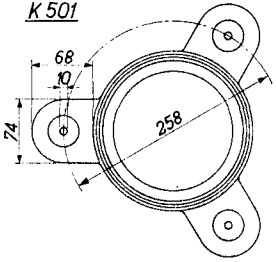


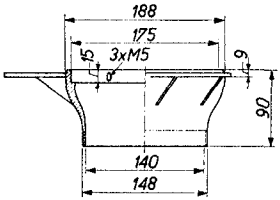


Supporting ring Poignée Tragring		40603		
Foot Pied Fuss	K 501	or ou oder	Insulating collar Support isolant Isollierhalter	40629
Net weight Poids net Nettogewicht		13,5 kg		
Shipping weight Poids brut Bruttogewicht		33 kg		

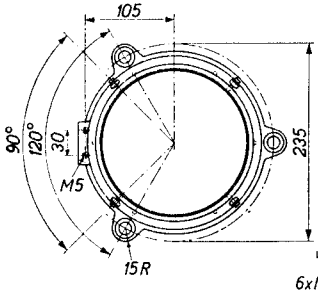
Dimensions in mm ; Dimensions en mm; Abmessungen in mm 59696

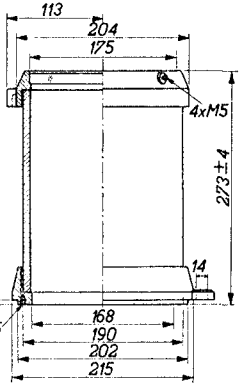
K 501



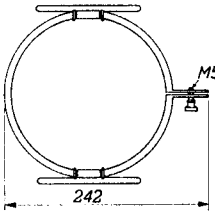


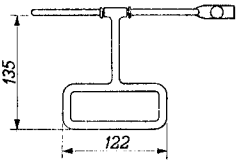
40629





40603

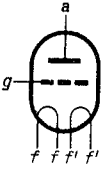


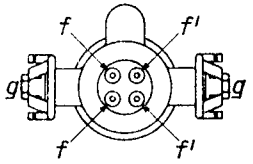


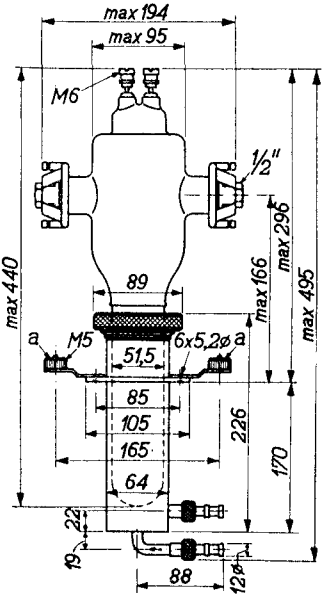
PHILIPS

Valve mounted in water-jacket type K 700
Tube monté dans le réfrigérant type K 700
Röhre in Kühltopf Typ K 700 montiert

Dimensions in mm
Dimensions en mm
Abmessungen in mm







Net weight of the valve
Poids net du tube 2 kg
Netto Röhrengewicht

Shipping weight of the valve
Poids brut du tube 8 kg
Brutto Röhrengewicht

Net weight of the water-jacket
Poids net du réfrigérant 2,1 kg
Nettogewicht des Kühltopfes

Operating conditions H.F. class C telegraphy
Caractéristiques d'utilisation H.F. classe C télégraphie
Betriebsdaten H.F. Klasse C Telegraphie

λ	=	>60	>15	m
V_a	=	12	10	kV
V_g	=	-700	-600	V
I_a	=	1,21	1,45	A
I_g	=	0,28	0,26	A
V_{gp}	=	1100	1050	V
W_{ig}	=	280	250	W
W_{ia}	=	14,5	14,5	kW
W_a	=	4	4	kW
W_o	=	10,5	10,5	kW
η	=	72,5	72,5	%

Operating conditions H.F. class B telephony
Caractéristiques d'utilisation H.F. classe B téléphonie
Betriebsdaten H.F. Klasse B Telephonie

λ	=	> 60	>15	m
V_a	=	8	6	kV
V_g	=	-300	-190	V
I_a	=	0,75	1	A
V_{gp}	=	325	315	V
W_{ia}	=	6	6	kW
W_a	=	4	4	kW
W_o	=	2	2	kW
η	=	33	33	%
m	=	100	100	%
I_g	=	0,26	0,35	A
W_{ig}	=	155	200	W

PHILIPS

Operating conditions H.F. class C anode modulation
Caractéristiques d'utilisation H.F. classe C modulation d'anode
Betriebsdaten H.F. Klasse C Anodenmodulation

λ	=	>60	>15	m
V_a	=	10	8	kV
V_g	=	-800	-700	V
I_a	=	1	1	A
I_g	=	0,44	0,33	A
V_{gp}	=	1200	1150	V
W_{ig}	=	475	345	W
W_{ia}	=	10	8	kW
W_a	=	2,3	2	kW
W_o	=	7,7	6	kW
η	=	77	75	%
m	=	100	100	%
W_{mod}	=	5	4	kW

Operating conditions as L.F. class B amplifier and modulator, two valves
Caractéristiques d'utilisation comme amplificatrice et modulatrice B.F. classe B, deux tubes
Betriebsdaten als N.F. Verstärker und Modulator Klasse B, zwei Röhren

V_a	=	12		10		8	kV
V_g	=	-450		-350		-265	V
R_{aa}	=	16		10		7,12	kΩ
V_{ggp}	=	0	1520	0	1350	0	1300 V
I_a	=	2x0,32	2x0,94	2x0,38	2x1,14	2x0,4	2x1,42 A
I_g	=	0	2x0,14	0	2x0,14	0	2x0,27 A
W_{ig}	=	0	2x96	0	2x86	0	2x158 W
W_{ia}	=	2x3,84	2x11,3	2x3,8	2x11,4	2x3,2	2x11,4 kW
W_a	=	2x3,84	2x2,8	2x3,8	2x3,1	2x3,2	2x3,3 kW
W_o	=	0	17	0	16,6	0	16,2 kW
dtot	=	-	5	-	5	-	5 %
η	=	-	75	-	73	-	71 %

Operating conditions H.F. class C telegraphy
Caractéristiques d'utilisation H.F. classe C télégraphie
Betriebsdaten H.F. Klasse C Telegraphie

λ =	>60	>15	6	4	m
V_a =	12	10	6,5	4	kV
V_g =	-700	-600	-460	-350	V
I_a =	1,7	1,7	1,7	1,7	A
I_g =	0,35	0,28	0,19	0,16	A
V_{gp} =	1100	1070	885	775	V
W_{ig} =	350	270	150	115	W
W_{ia} =	20,4	17	11	6,8	kW
W_a =	5,4	5	4,5	3,3	kW
W_o =	15	12	6,5	3,5	kW
η =	73,5	70,5	59	51,5	%

Operating conditions H.F. class B telephony
Caractéristiques d'utilisation H.F. classe B téléphonie
Betriebsdaten H.F. Klasse B Telephonie

λ =	>60	>15	m
V_a =	12	10	kV
V_g =	-435	-360	V
I_a =	0,93	1	A
V_{gp} =	285	245	V
W_{ia} =	11,2	10	kW
W_a =	7,5	6,7	kW
W_o =	3,7	3,3	kW
η =	33	33	%
m =	100	100	%
I_g =	0,35	0,35	A
W_{ig} =	180	155	W

Operating conditions H.F. class C anode modulation
Caractéristiques d'utilisation H.F. classe C modulation d'anode
Betriebsdaten H.F. Klasse C Anodenmodulation

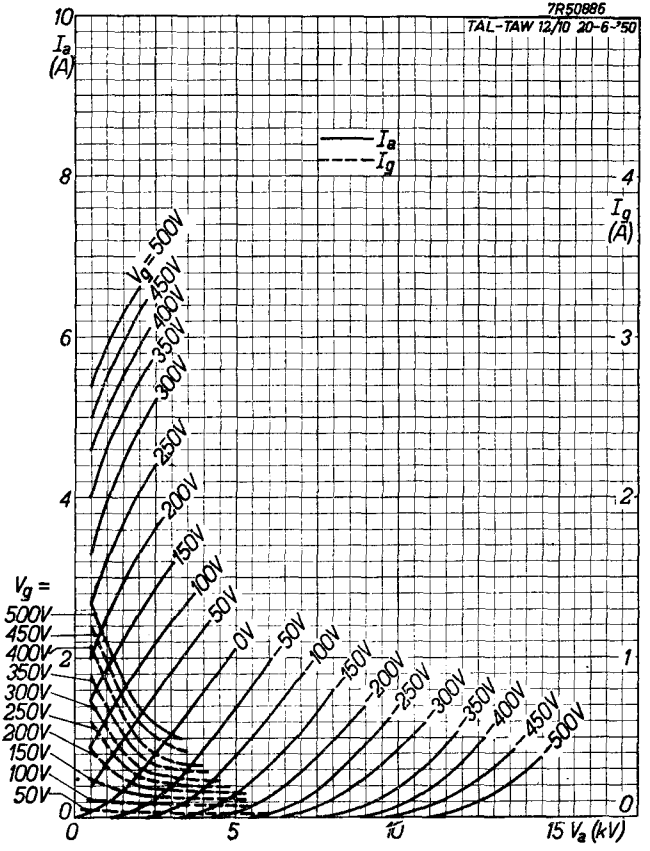
λ	=	>60	>15	m
V_a	=	10	8	kV
V_g	=	-800	-700	V
I_a	=	1	1	A
I_g	=	0,44	0,33	A
V_{gp}	=	1200	1150	V
W_{ig}	=	475	345	W
W_{ia}	=	10	8	kW
W_a	=	2,3	2	kW
W_o	=	7,7	6	kW
η	=	77	75	%
m	=	100	100	%
W_{mod}	=	5	4	kW

Operating conditions as L.F. class B amplifier and modulator, two valves
Caractéristiques d'utilisation comme amplificatrice et modulatrice B.F. classe B, deux tubes
Betriebsdaten als N.F. Verstärker und Modulator Klasse B, zwei Röhren

V_a	=	12		10		8		kV
V_g	=	-415		-350		-260		V
R_{aa}	=	8,32		5,6		5,4		kΩ
V_{ggp}	=	0	1720	0	1560	0	1400	V
I_a	=	2x0,55	2x1,7	2x0,35	2x1,9	2x0,45	2x1,75	A
I_g	=	0	2x0,32	0	2x0,18	0	2x0,38	A
W_{ig}	=	0	2x250	0	2x130	0	2x120	W
W_{ia}	=	2x6,6	2x20,4	2x3,5	2x19	2x3,6	2x14	kW
W_a	=	2x6,6	2x5,4	2x3,5	2x6,5	2x3,6	2x4,25	kW
W_o	=	0	30	0	25	0	19,5	kW
d_{tot}	=	-	5	-	5	-	5	%
η	=	-	73,5	-	66	-	69,5	%

PHILIPS

TAL 12/10
TAW 12/10

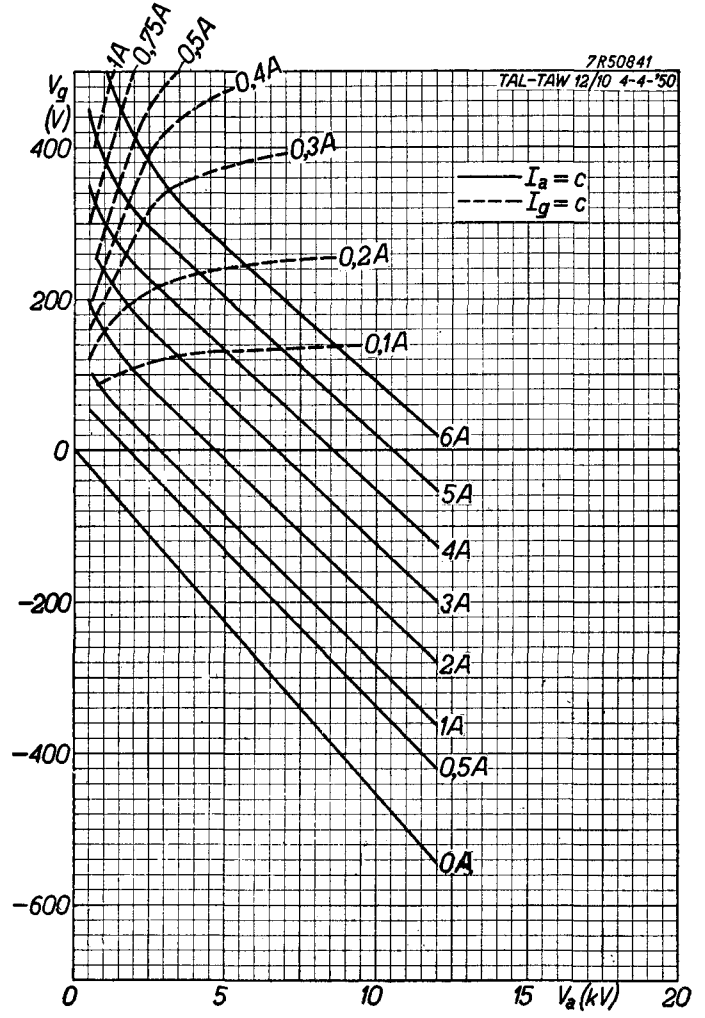


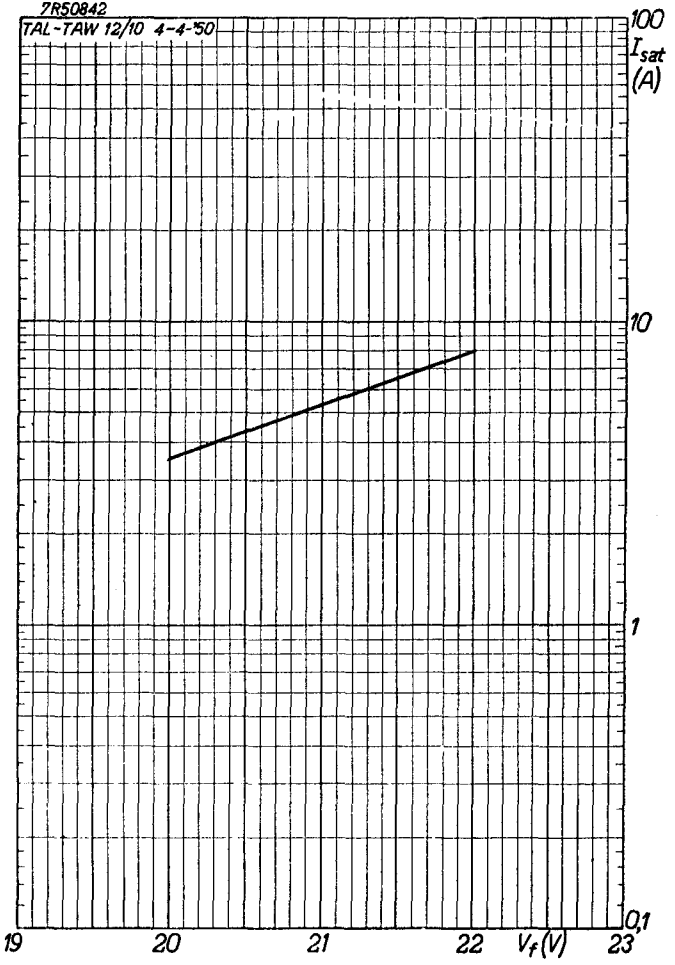
6.6.1950

A

TAL 12/10
TAW 12/10

PHILIPS



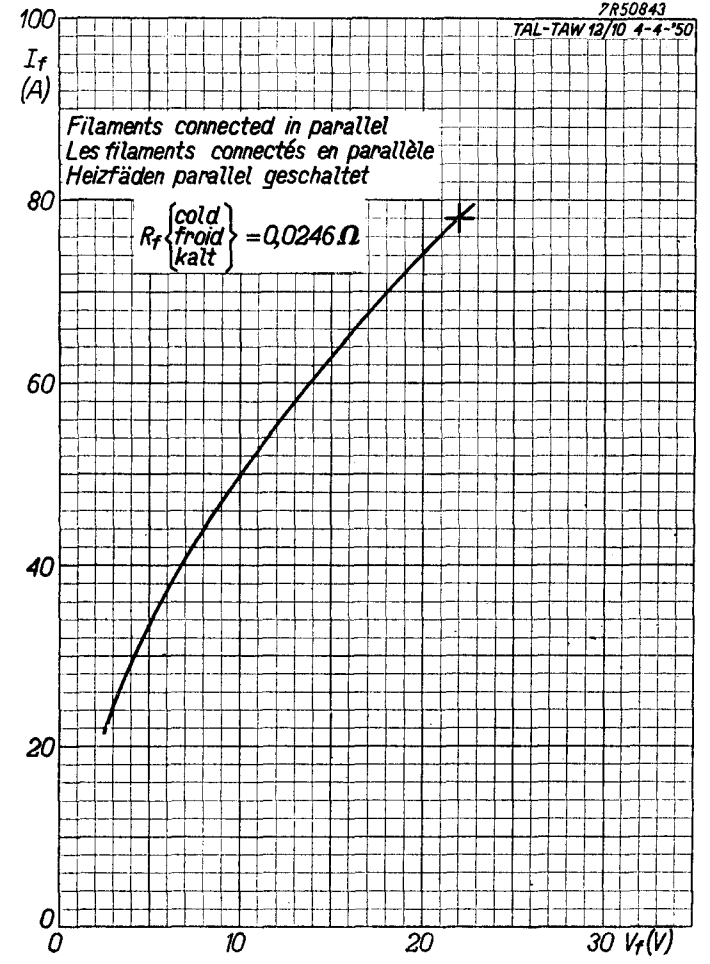


4.4.1950

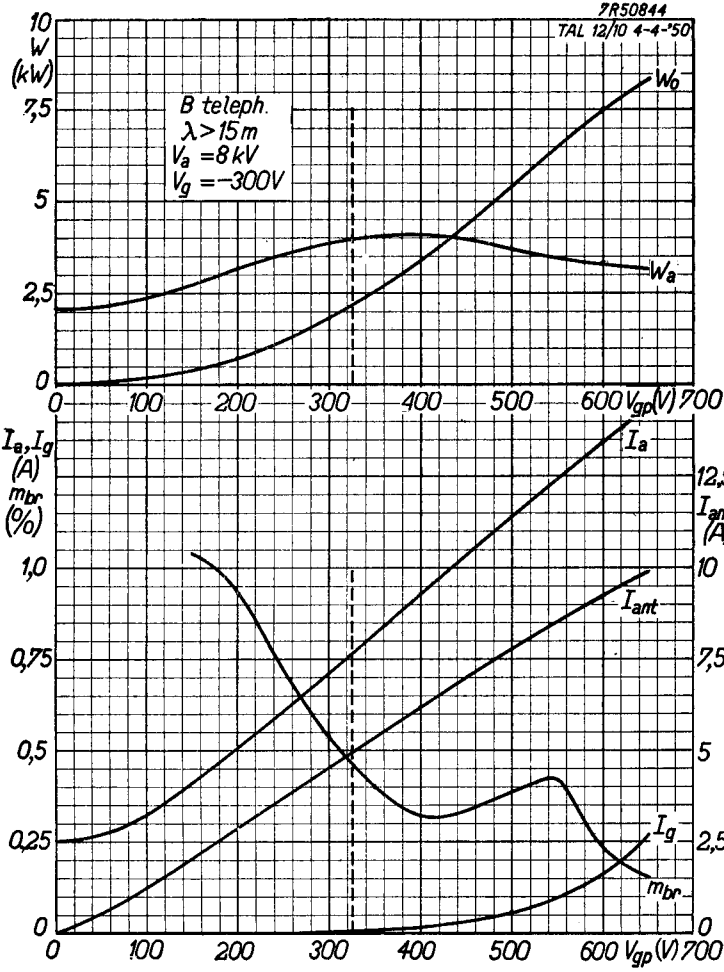
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TAL 12/10
TAW 12/10

PHILIPS

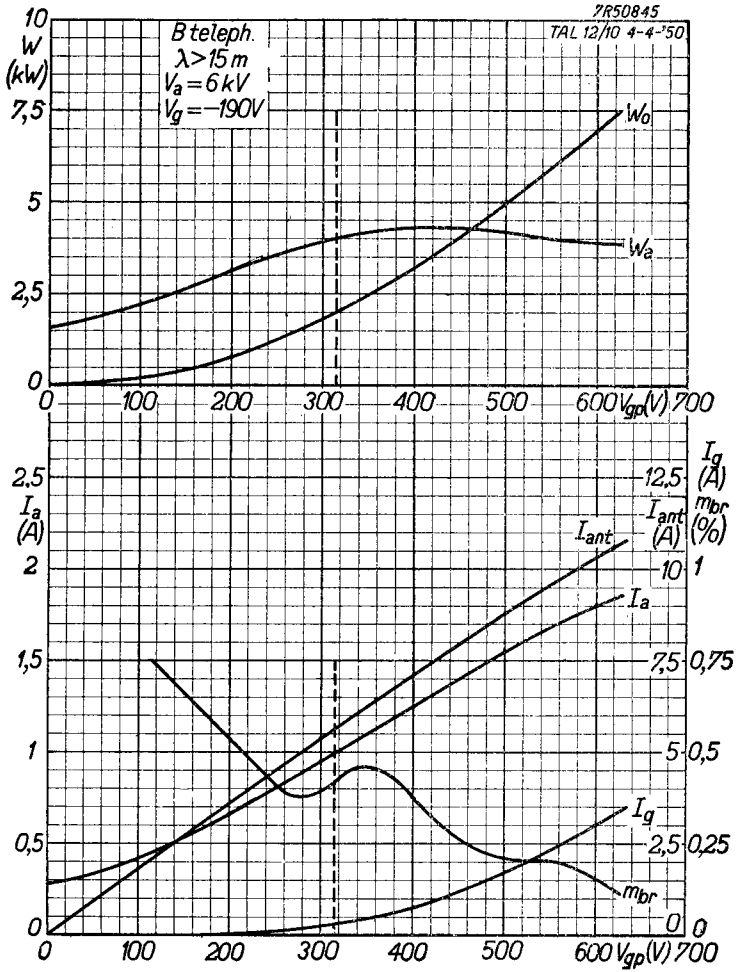


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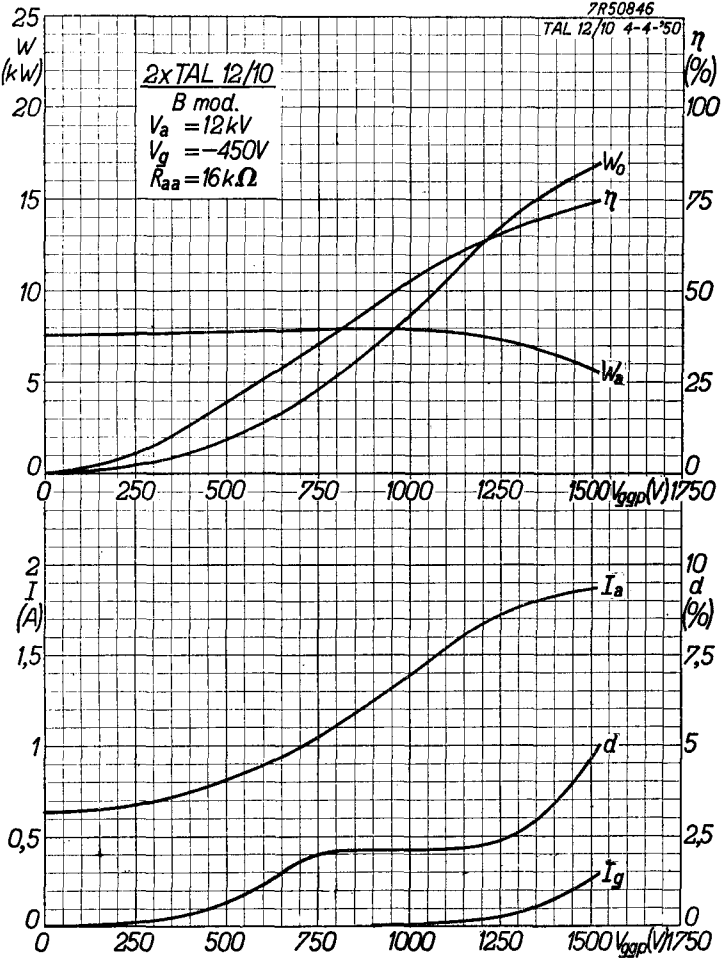

7R50844
TAL 12/10 4-4-'50
W (kW)
10
7,5
5
2,5
0
B teleph.
λ > 15 m
Va = 8 kV
Vg = −300V
Wo
Wa
0
100
200
300
400
500
600
Vgp (V)
700
Ia, Ig (A)
mbr (%)
1,0
0,75
0,5
0,25
0
Ia
Iant
Ig
mbr
12,5
10
7,5
5
2,5
0
Iant (A)

TAL 12/10

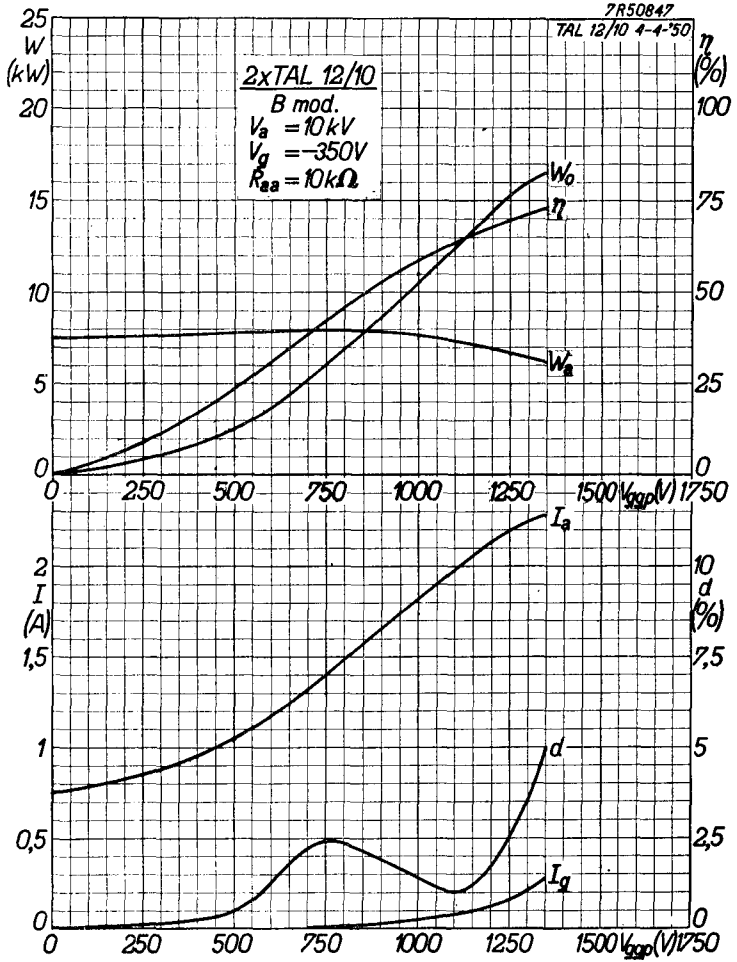
PHILIPS

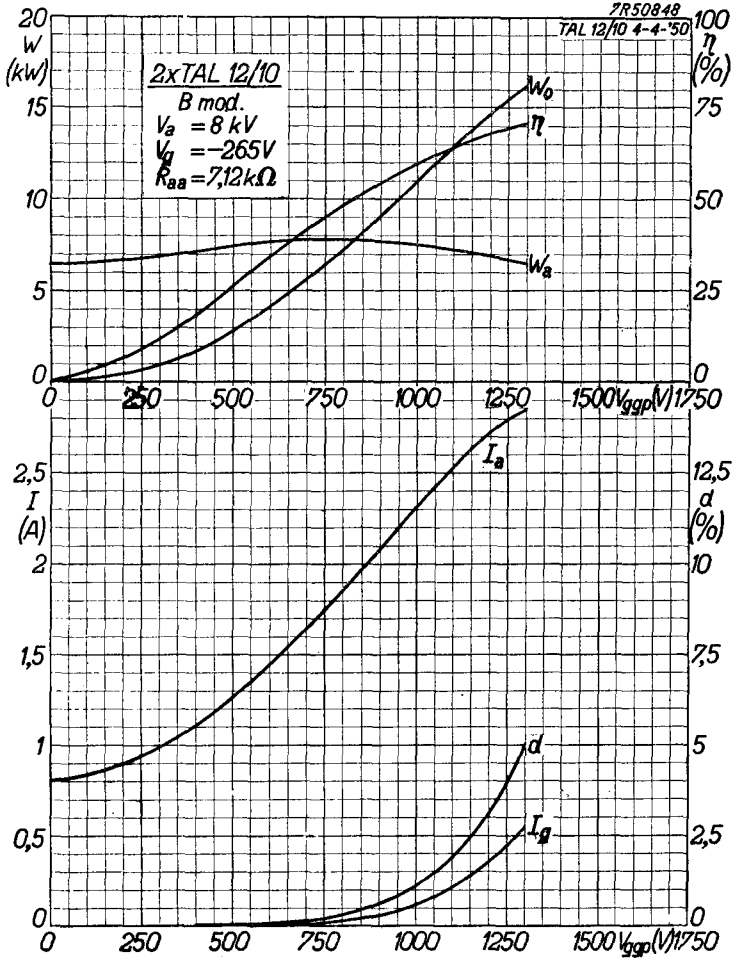


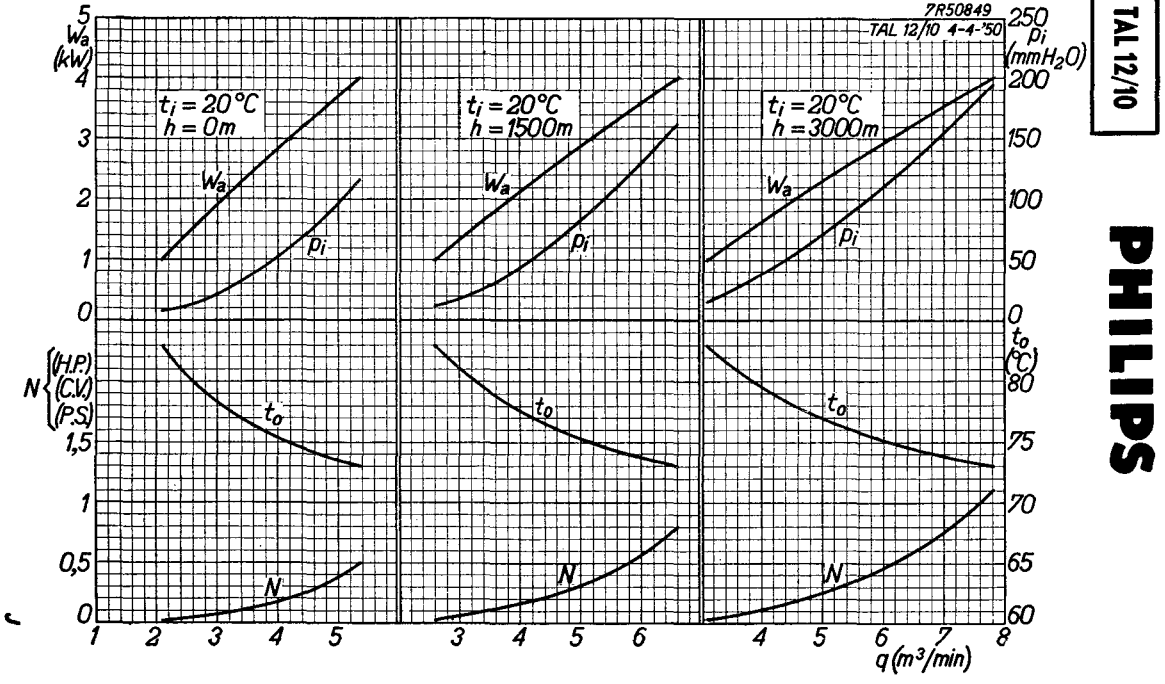
F


7R50846
TAL 12/10 4-4-'50
2x TAL 12/10
B mod.
V_a = 12 kV
V_g = −450 V
R_{aa} = 16 kΩ
W (kW)
η (%)
W_o
η
W_a
V_{ggp} (V)
I (A)
d (%)
I_a
d
I_g
V_{ggp} (V)

PHILIPS


7R50847
TAL 12/10 4-4-'50
2xTAL 12/10
B mod.
V_a = 10 kV
V_g = −350V
R_{aa} = 10kΩ
W_o
η
W_a
W (kW)
η (%)
I_a
I_g
d
I (A)
d (%)
V_{ggp} (V)


7R50848
TAL 12/10 4-4-'50
2xTAL 12/10
B mod.
V_a = 8 kV
V_g = −265V
R_{aa} = 7,12kΩ
W (kW)
η (%)
W_o
η
W_a
I_a
d
I_g
V_{ggp} (V)
I (A)
d (%)



TAL 12/10

PHILIPS

PHILIPS

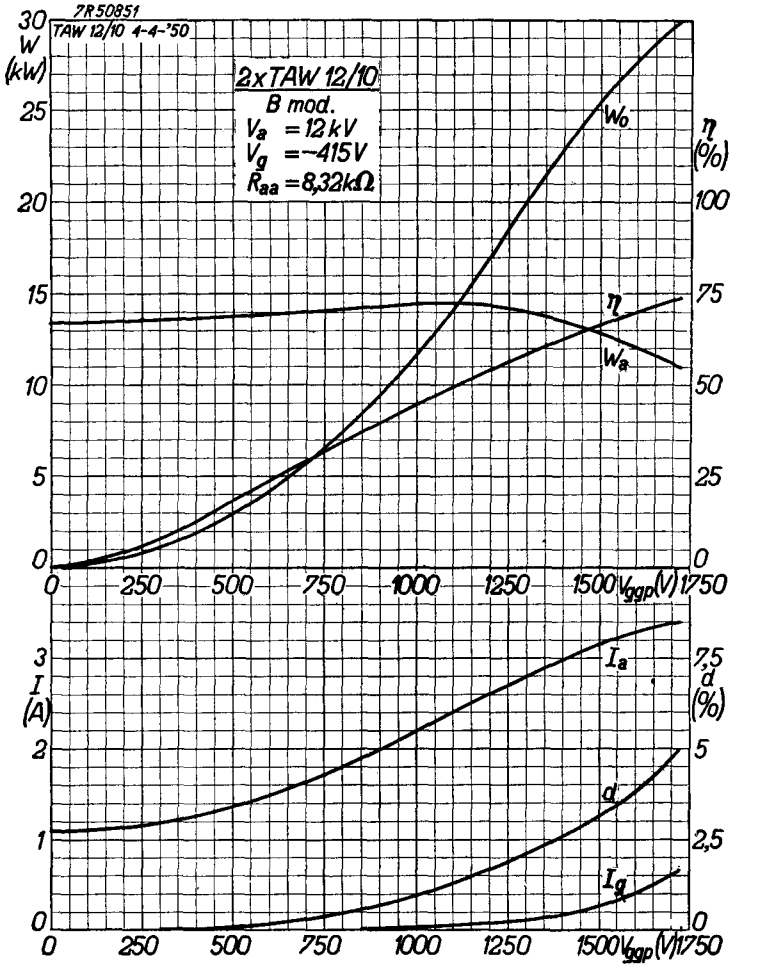
TAL 12/10

4.4.1950

K

TAW 12/10

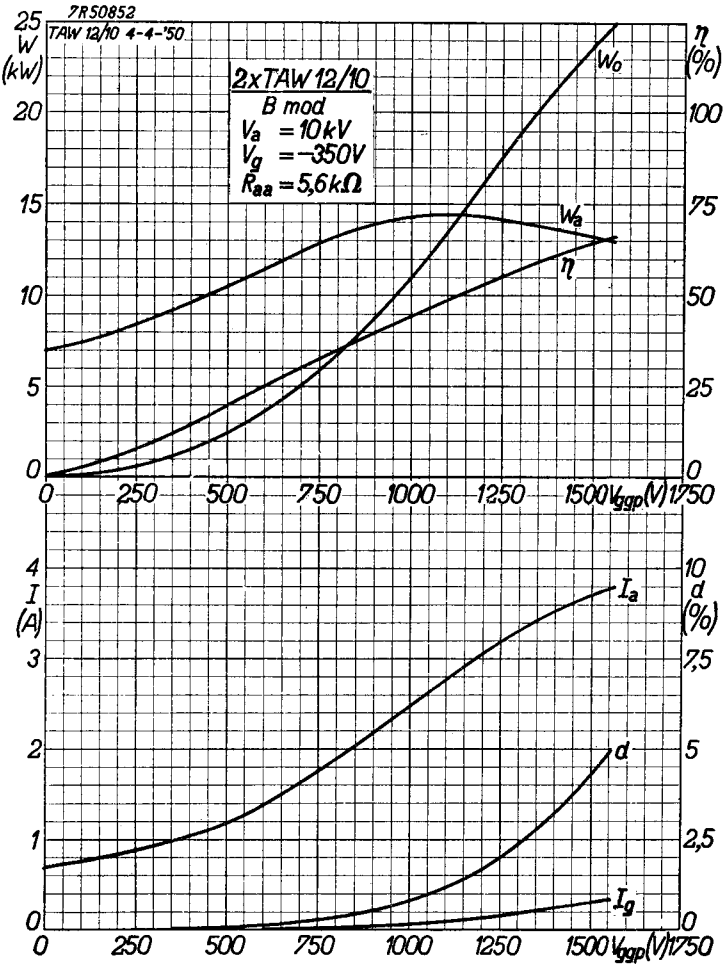
PHILIPS



L

PHILIPS

TAW 12/10

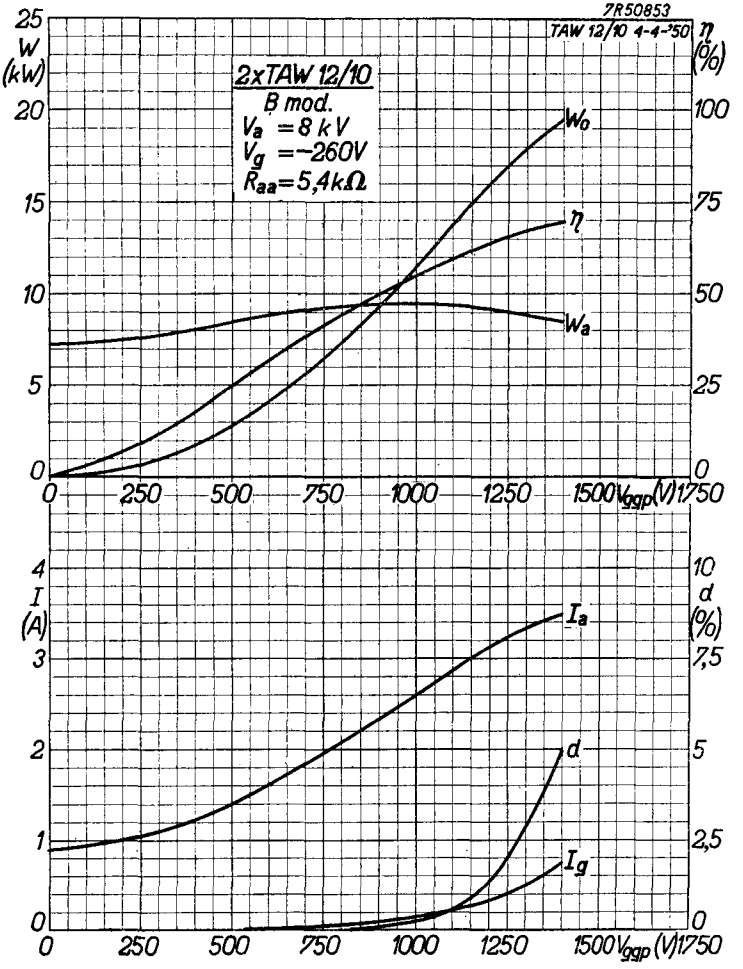


4.4.1950

M

TAW 12/10

PHILIPS



N

PHILIPS

Electronic Tube

HANDBOOK

TAL12/10 TAW12/10

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11	A	1950.06.06
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16	F	1950.04.04
17	G	1950.04.04
18	H	1950.04.04
19	I	1950.04.04

20	J	1950.04.04
21	K	1950.04.04
22	L	1950.04.04
23	M	1950.04.04
24	N	1950.04.04
25, 26	FP	1999.11.14

PHILIPS

TAL 12/20
TAW 12/20

TRIODE for use as H.F. amplifier and oscillator
TRIODE pour utilisation comme amplificatrice H.F. et oscillatrice
TRIODE zur Verwendung als H.F. Verstärker und Oszillator

	TAL 12/20	TAW 12/20
Cooling Refroidissement: Kühlung	: forced air à air forcée : erzwungene Luftkühlung	water eau Wasser

Filament : tungsten
Filament : tungstène
Heizfaden: Wolfram

Heating : direct
Chauffage: direct
Heizung : direkt

Vf = 21,5 V [2]
If = 78 A

Starting current must never exceed 160 A
Le courant de démarrage ne doit jamais excéder 160 A
Der Anlaufstrom darf unter keinen Umständen höher sein als 160 A

Typical characteristics
Caractéristiques typiques
Kenndaten

μ = 38
S (Ia = 1 A) = 10 mA/V
Isat = 11 A

λ	Freq.	C telegr.		B teleph.		Can.mod.		B mod.[1])	
m	Mc/s	Va (kV)	Wo (kW)	Va (kV)	Wo (kW)	Va (kV)	Wo (kW)	Va (kV)	Wo (kW)
>11	<28	12 10	22 18	12	5	10	9,5	12 10	42 16

[1]) Two valves; deux tubes; zwei Röhren

[2]) Each tube is marked with the value of the filament voltage at which the saturation current has a value of 11 A
A chaque tube est indiqué la valeur de tension du filament correspondante à un courant de saturation de 11 A
Auf jede Röhre ist der Wert der Heizspannung angegeben wobei der Sättigungsstrom einen Wert von 11 A erhält

Capacitances Capacités Kapazitäten	Caf = 1,9 pF Cgf = 23,5 pF Cag = 25 pF

Limiting values
Caractéristiques limites
Grenzdaten

Va = max. 12 kV
Wa = max. 18 kW
Wg = max. 500 W
Rg = max. 10 kΩ

q (ti=20 °C, Wa=18 kW) = min. 21,2 m^3/min

t_{anode} = max. 180 °C

temperature of bulb and seals)
température de l'ampoule et des) points de scellement) = max. 150 °C
Temperatur des Kolbens und der) Verschlüsse)

Pressure loss
Perte de pression
Druckverlust

pi (q = 21,2 m^3/min, ti = 20 °C) = 130 mm H_2O

It is necessary to direct a low velocity air flow on the grid seals at frequencies higher than 20 Mc/s
Il faut diriger un courant d'air à vélocité peu élevée sur les points de scellement de la grille aux fréquences dépassant 20 Mc/s
Bei Frequenzen höher als 20 MHz ist ein schwacher Luftstrom auf die Gitterverschlüsse notwendig

Mounting position: exactly vertical with anode down
Montage : exactement vertical avec l'anode en bas
Aufstellung : genau senkrecht mit der Anode unten

Grid bracket
Etrier de la grille
Gitterbügel
40614

Protective cap for grid seals
Chapeau de protection pour les sorties de la grille
Schutzkappe für Gitterverschlüsse
40632

Capacitances
Capacités
Kapazitäten

Caf = 1,4 pF
Cgf = 23,5 pF
Cag = 25 pF

Limiting values
Caractéristiques limites
Grenzdaten

Va = max. 12 kV	to	= max. 60 °C
Wa = max. 18 kW	to-ti	= max. 14 °C
Wg = max. 500 W	q (Wa=18 kW)	= min. 20 l/min
Rg = max. 20 kΩ		

temperature of bulb and seals)
température de l'ampoule et des) points de scellement) = max. 150 °C
Temperatur des Kolbens und der) Verschlüsse)

Pressure loss
Perte de pression pi (q=20 l/min)= 0,5 atm
Druckverlust

It is necessary to direct a low velocity air flow on the grid seals at frequencies higher than 20 Mc/s
Il faut diriger un courant d'air à vélocité peu élevée sur les points de scellement de la grille aux fréquences dépassant 20 Mc/s
Bei Frequenzen höher als 20 MHz ist ein schwacher Luftstrom auf die Gitterverschlüsse notwendig

Mounting position: exactly vertical with anode down
Montage : exactement vertical avec l'anode en bas
Aufstellung : genau senkrecht mit der Anode unten

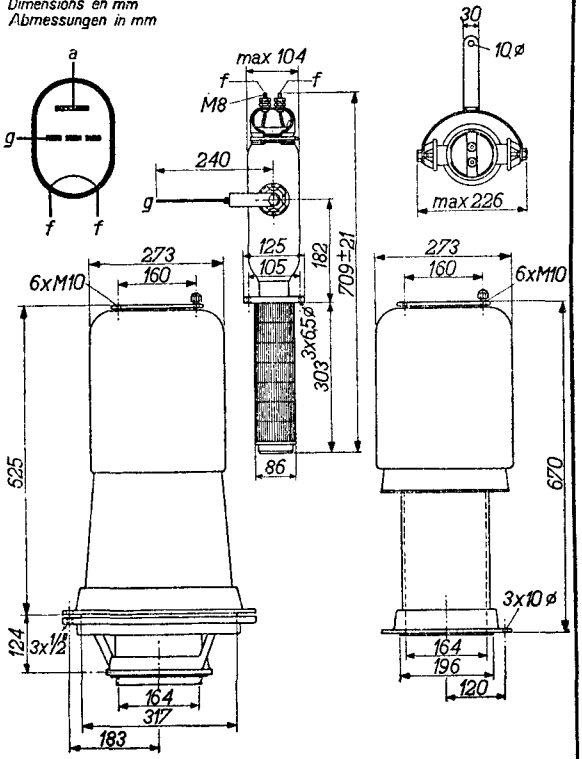
Grid bracket
Etrier de la grille 40614
Gitterbügel

Protective cap for grid seals
Chapeau de protection pour les sorties de la grille 40632
Schutzkappe für Gitterverschlüsse

PHILIPS

Dimensions in mm
Dimensions en mm
Abmessungen in mm

59695



K 503/01

Housing with canalized outlet of the air
Carter avec sortie d'air canalisée
Gehäuse mit kanalisiertem Luftausgang

K 504/01

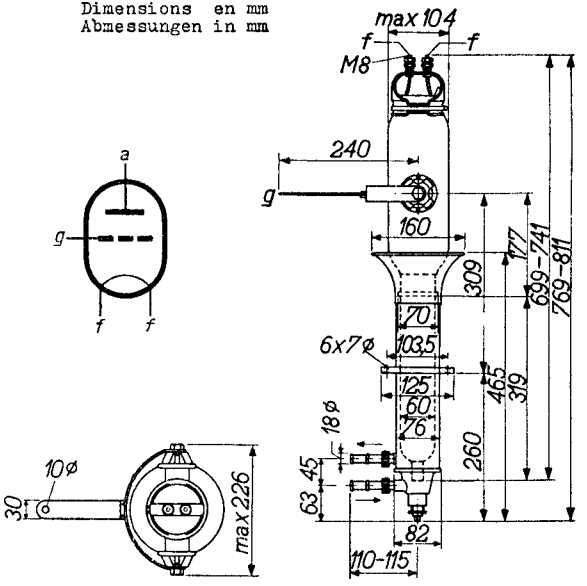
Housing with free outlet of the air
Carter avec sortie d'air libre
Gehäuse mit freiem Luftausgang

Valve: net weight
Tube : poids net 7,5 kg
Röhre: Nettogewicht

shipping weight
poids brut 16 kg
Bruttogewicht

Valve mounted in water-jacket type K 707
Tube monté dans le réfrigérant type K 707
Röhre in Kühltopf Typ K 707 montiert

Dimensions in mm
Dimensions en mm
Abmessungen in mm



Valve: net weight Tube : poids net Röhre: Nettogewicht	3,6 kg	shipping weight poids brut Bruttogewicht	10,3 kg

Water-jacket Réfrigérant Kühltopf	net weight poids net Nettogewicht	4,3 kg
	shipping weight poids brut Bruttogewicht	5,8 kg

PHILIPS

Operating conditions H.F. class C
Caractéristiques d'utilisation H.F. classe C
Betriebsdaten H.F. Klasse C

		telegraphy télégraphie Telegraphie		anode modulation modulation d'anode Anodenmodulation	
λ	=	>11	>11	>11	m
Va	=	12	10	10	kV
Vg	=	-600	-500	-900	V
Ia	=	2,7	2,7	1,4	A
Ig	=	0,4	0,42	0,5	A
Vgp	=	1800	1600	2100	V
Wig	=	720	670	1050	W
Wia	=	32,4	27	14	kW
Wa	=	10,4	9	4,5	kW
Wo	=	22	18	9,5	kW
η	=	68	67	68	%
				m = 100	%
				Wmod = 7	kW

Operating conditions H.F. class B telephony
Caractéristiques d'utilisation H.F. classe B téléphonie
Betriebsdaten H.F. Klasse B Telephonie

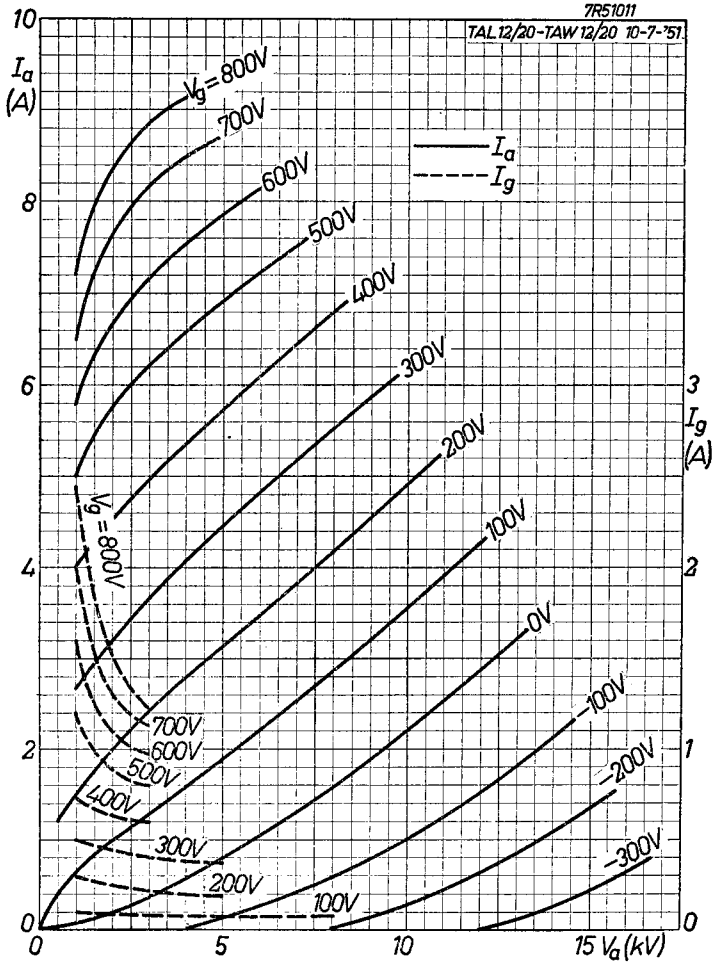
λ	=	>11	m
Va	=	12	kV
Vg	=	-200	V
Ia	=	1,54	A
Vgp	=	435	V
Wia	=	18,5	kW
Wa	=	13,5	kW
Wo	=	5	kW
η	=	27	%
m	=	100	%
Ig	=	0,24	A
Wig	=	210	W

Operating conditions as L.F. class B amplifier and modulator, two valves
Caractéristiques d'utilisation en amplificatrice et modulatrice B.F.,classe B, deux tubes
Betriebsdaten als N.F. Verstärker und Modulator Klasse B, zwei Röhren

V_a	=		12		10	kV
V_g	=		-250		-200	V
$R_{aa\sim}$	=		5,6		10,5	kΩ
V_{gg_p}	=	0	1900	0	1100	V
I_a	=	2x0,32	2x2,45	2x0,25	2x1,1	A
I_g	=	0	2x0,33	0	2x0,17	A
W_{ig}	=	0	2x280	0	2x85	W
W_{ia}	=	2x3,8	2x29	2x2,5	2x11	kW
W_a	=	2x3,8	2x8	2x2,5	2x3	kW
W_o	=	0	42	0	16	kW
η	=	-	72,5	-	73	%
d_{tot}	=	-	3,1	-	1,7	%

PHILIPS

TAL 12/20
TAW 12/20

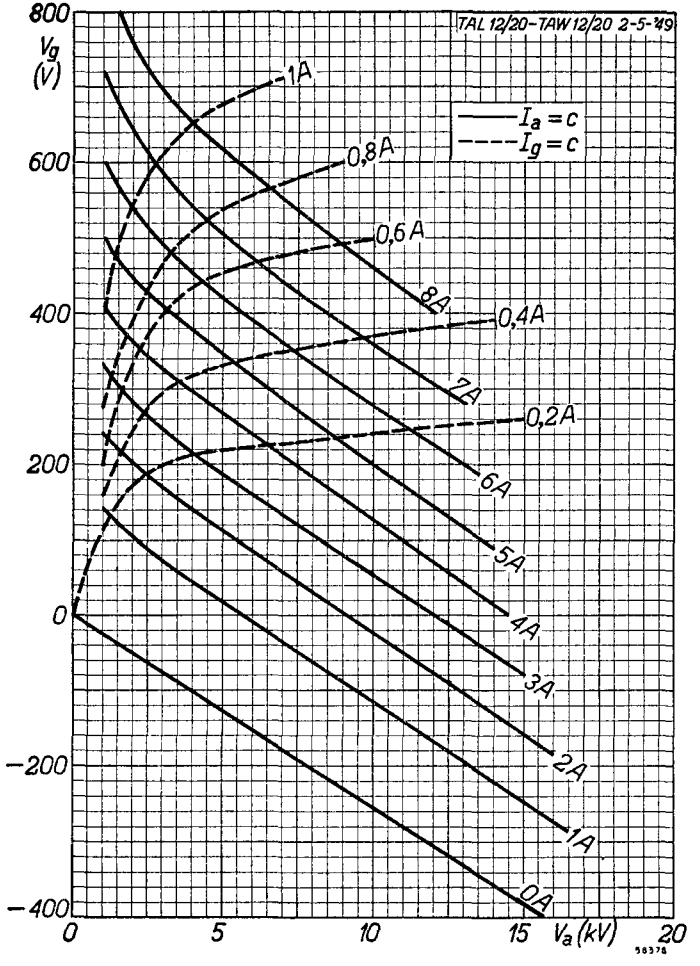


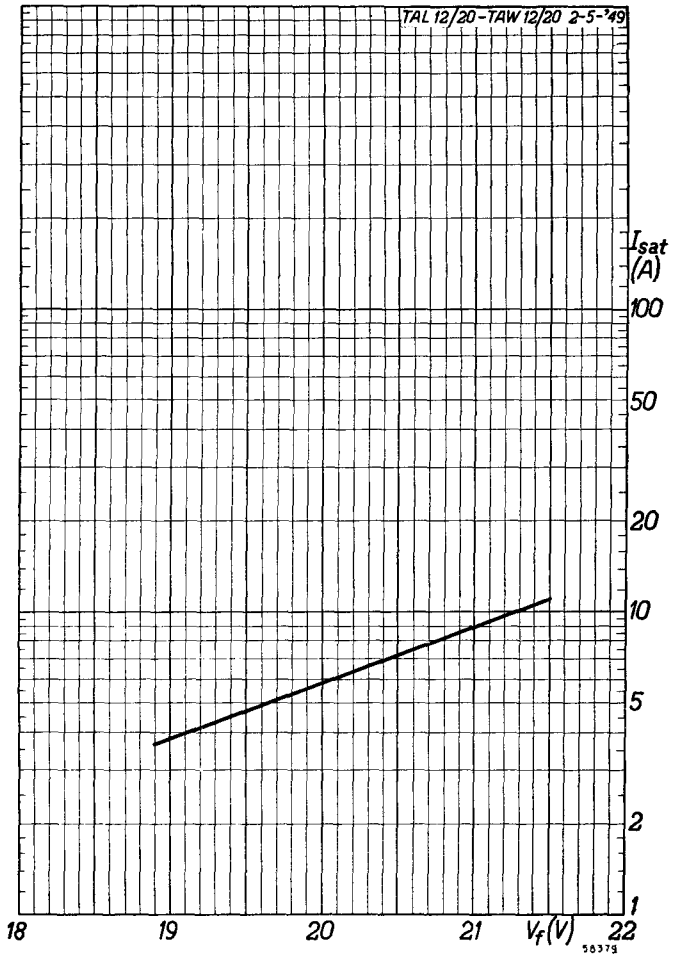
6.6.1951

A

TAL 12/20
TAW 12/20

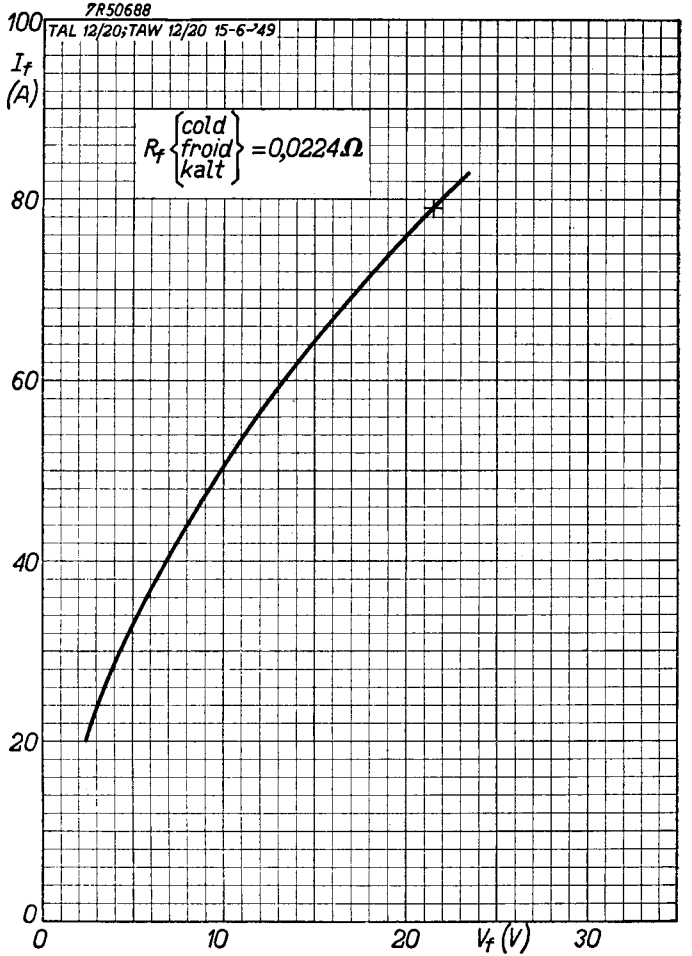
PHILIPS




TAL 12/20-TAW 12/20 2-5-'49
Isat (A)
100
50
20
10
5
2
1
18
19
20
21
Vf(V)
22
56379

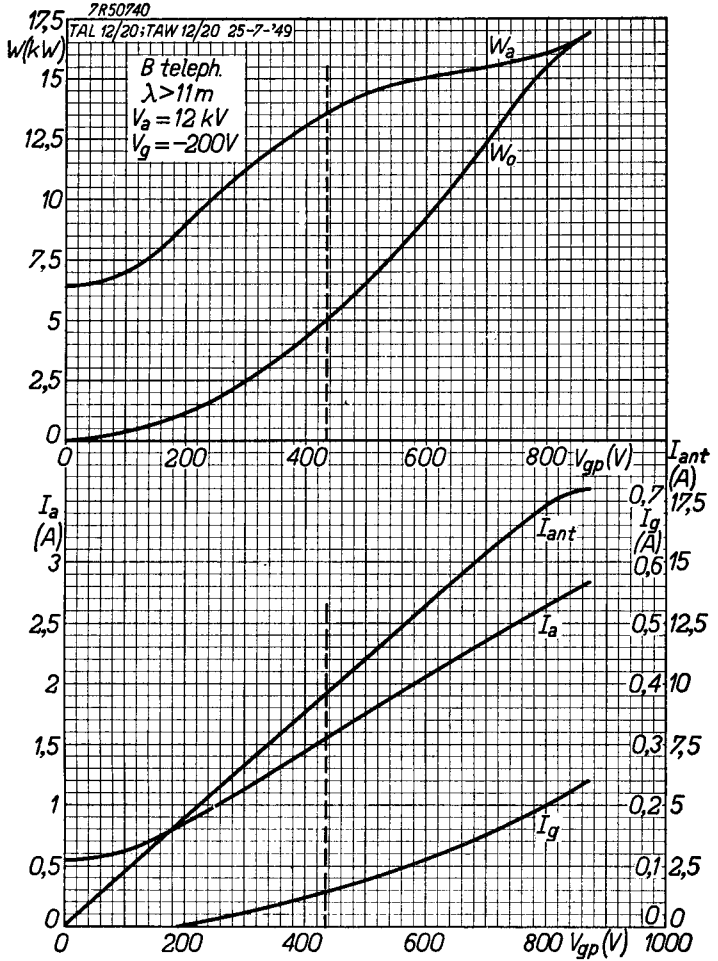
TAL 12/20
TAW 12/20

PHILIPS



PHILIPS

TAL 12/20
TAW 12/20



TAL 12/20

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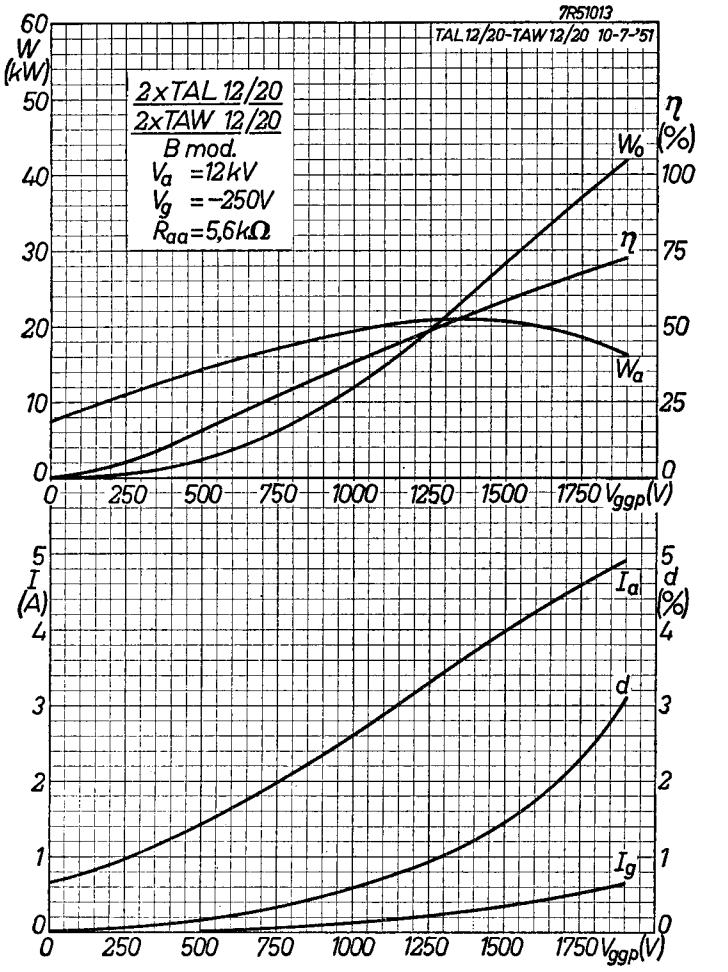
F

PHILIPS

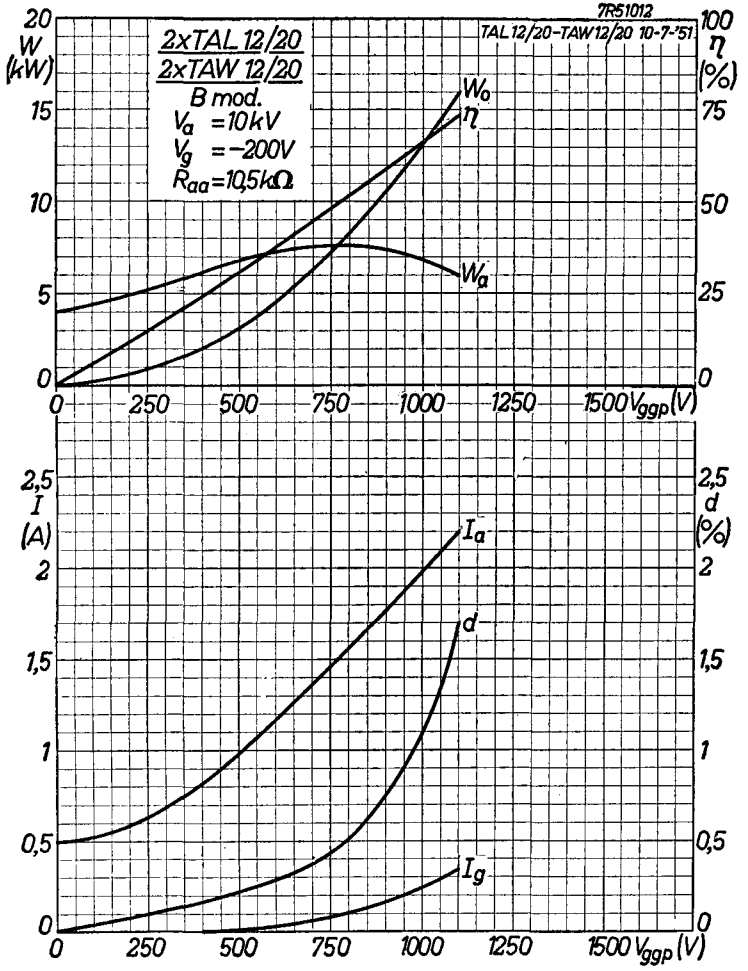
TAL 12/20

6.6.1951

PHILIPS


7R51013
TAL 12/20-TAW 12/20 10-7-'51
2 x TAL 12/20
2 x TAW 12/20
B mod.
V_a = 12 kV
V_g = −250 V
R_{aa} = 5,6 kΩ
W (kW)
η (%)
W_o
η
W_a
V_{ggp} (V)
I (A)
d (%)
I_a
d
I_g

H


7R51012
TAL 12/20–TAW 12/20 10-7-'51
2xTAL 12/20
2xTAW 12/20
B mod.
V_a =10kV
V_g =−200V
R_{aa}=10,5kΩ
W (kW)
η (%)
W_o
η
W_a
I_a
d
I_g
I (A)
d (%)
V_{ggp} (V)



TAL12/20 TAW12/20

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7	7	1959.03.03
8	A	1951.06.06
9	B	1951.06.06
10	C	1950.04.04
11	D	1950.04.04
12	E	1949.08.08
13	F	1949.08.08
14	G	1951.06.06
15	H	1951.06.06
16	I	1951.06.06
17	FP	1999.11.17

TRIODE for use as H.F. or L.F. amplifier or oscillator
TRIODE pour utilisation en amplificatrice H.F. ou B.F. ou en oscillatrice
TRIODE zur Verwendung als HF- oder NF-Verstärker oder Oszillator

Cooling : forced air
Refroidissement : par ventilation forcée
Kühlung : Pressluftkühlung

Filament : tungsten, three-phase
Filament : tungstène, triphasé
Heizfaden: Wolfram, drei Phasen

Heating : direct	per phase	V_f = max. 28,3 V[1]	
Chauffage: direct	par phase	I_f = 48,5 A	
Heizung : direkt	pro Phase		

Filament current must never exceed a peak value of 100 A per phase at any time during initial energising schedule.
Le courant d'enclenchement ne doit jamais dépasser une valeur de crête de 100 A par phase.
Der Anlaufstrom darf niemals einen Scheitelwert von 100 A pro Phase überschreiten.

Capacitances	C_a = 2,6 pF
Capacités	C_g = 72 pF
Kapazitäten	C_{ag} = 31 pF

Typical characteristics	μ (I_a=1,25 A ; V_a= 12 kV)	= 25
Caractéristiques types	S (I_a=1,25 A ; V_a= 12 kV)	= 16,5 mA/V
Kenndaten	I_{sat}	= 23 A

[1]) Each valve is marked with the value of the filament voltage at which the saturation current has a value of 23 A.
La valeur de tension du filament correspondante à un courant de saturation de 23 A est indiquée à chaque tube.
Auf jeder Röhre ist der Wert der Heizspannung angegeben wobei der Sättigungsstrom einen Wert von 23 A erhält.

PHILIPS

λ	Freq.	C telegr.		B teleph.		C an.mod.		B mod. [1]	
m	Mc/s	V_a (kV)	W_o (kW)	V_a (kV)	W_o (kW)	V_a (kV)	W_o (kW)	V_a (kV)	W_o (kW)
								12	80
>15	<20	15	48,5	15	9	12	27	12	38,5
		12	38	12	8,5			10	77
		10	31	10	8	10	21,5	10	32
11	27	15	45			12	26		
						10	20,5		
8	37,5	10	26						

Air cooling characteristics
Caractéristiques de refroidissement par air
Luftkühlungsdaten

W_a (kW)	h (m)	t_i max. (°C)	q min. (m^3/min)	pi (mm H_2O)	
18	0	35	25,5	130	See also cooling curves Voir aussi les courbes de refroidissement Siehe auch die Kühlungskurven.
	0	45	29,5	170	
	1500	35	30,5	155	
	3000	25	32,5	155	
12	0	35	17,5	65	
	0	45	20	80	
	1500	35	20,5	75	
	3000	25	22	75	

temperature of seals
temp. des scellements
Temp. der Einschmelzungen
} = max. 180 °C

When the valve is used at frequencies above 10 Mc/s, special attention must be given to the anode- and grid-seal temperatures.
Cooling of the grid-seals can be effected by means of the caps 40632.
Cooling of the anode-seal is effected by air flowing through the slots provided at the top of the cooler housing. In certain cases, e.g. at low anode dissipation and with cooling by the minimum quantity of air (according to the cooling curves), the air flow to the seal may not be sufficient to maintain the seal temperature below the maximum permissible value at frequencies above 10 Mc/s.
Consequently, in these cases, a larger quantity of air must be supplied.

[1]) Two tubes; deux tubes; zwei Röhren

Il faut faire attention aux températures des scellements de l'anode et de la grille lorsqu'on utilise le tube aux fréquences supérieures à 10 Mc/s.
Le refroidissement des scellements de la grille peut être réalisé au moyen des chapeaux 40632.
Le refroidissement du scellement d'anode s'effectue par air traversant les fentes prévues du côté supérieur du refroidisseur. Dans certains cas, p.ex. aux basses valeurs de la dissipation anodique et au débit d'air minimum prescrit aux feuilles avec les courbes de refroidissement, il y a le risque que le courant d'air ne suffise pas pour un refroidissement effectif du scellement aux fréquences supérieures à 10 Mc/s et que, par conséquent, la température maximum admissible soit dépassée.
Dans ces cas, il est nécessaire d'élever le débit d'air.

Insbesondere sind die Temperaturen der Anoden- und Gitterverschmelzung zu beachten, wenn die Röhre bei höheren Frequenzen als 10 MHz benutzt wird.
Die Gittereinschmelzungen können mit Hilfe der Schutzkappen 40632 gekühlt werden.
Die Anodenverschmelzung wird von dem Luftstrom gekühlt, der durch die am oberen Teil des Luftkühlgehäuses vorgesehenen Spalte hindurchfliesst. Jedoch, bei Frequenzen höher als 10 MHz dürfte in gewissen Fällen, z.B. bei einer niedrigen Anodenverlustleistung, bei dem erforderlichen Mindestluftstrom (siehe die Kühlungskurven) eine zweckmässige Kühlung der Anodenverschmelzung nicht erreicht werden.
Folglich muss in diesen Fällen der Luftstrom in dem Masse den Mindestwert übersteigen, dass die Temperatur der Verschmelzung den höchstzulässigen Wert nicht überschreitet.

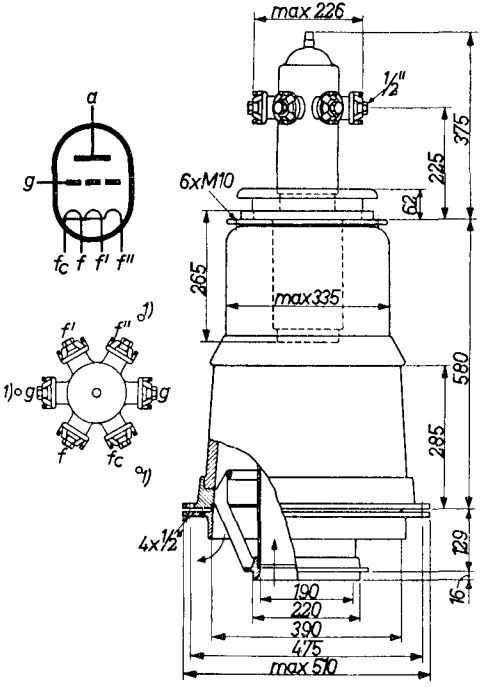
Protective caps for grid- and filament seals Chapeaux de protection pour les sorties de la grille et du filament Schutzkappen für Gitter- und Heizfadenanschlüsse	40632
Filament bracket (for D.C. supply) Etrier du filament (pour alimentation par C.C.) Heizfadenbügel (für Gleichstromspeisung)	40606

Net weight Poids net Nettogewicht	20 kg	Shipping weight Poids brut Bruttogewicht	87 kg

PHILIPS

Tube mounted in cooler housing type K 505
Tube monté dans le refroidisseur type K 505
Röhre im Luftkühlgehäuse Typ K 505 montiert

Dimensions in mm
Dimensions en mm
Abmessungen in mm



Mounting position: vertical with anode down
Montage : vertical avec l'anode en bas
Einbau : senkrecht mit der Anoden unten

1) Holes for locating pins
Trous pour chevilles de localisation
Löcher für Sucherstifte

H.F. class C telegraphy
H.F. classe C télégraphie
HF - Klasse C Telegrafie

		max.		max.
Limiting values Caractéristiques limites Grenzdaten		V_a = 15 kV $-V_g$=1000 V Ia = 5 A		I_g =0,6 A W_{ia}= 75 kW W_a = 18 kW
Operating conditions Caractéristiques d'utilisation Betriebsdaten				
λ =	>15	>15	>15	11	8	m
f =	<20	<20	<20	27	37,5	Mc/s
Va =	15	12	10	15	10	kV
Vg =	-900	-700	-600	-900	-600	V
Ia =	4,2	4,2	4,2	4,2	4,2	A
Ig =	0,42	0,5	0,53	0,42	0,6	A
Vgp =	1470	1350	1160	1470	1200	V
Wig =	560	610	560	560	650	W
Wia =	63	50,4	42	63	42	kW
Wa =	14,5	12,4	11	18	16	kW
Wo =	48,5	38	31	45	26	kW
η =	77	75,5	74	71,5	62	%

H.F. class B telephony
H.F. classe B téléphonie
HF - Klasse B Telefonie

		max.
Limiting values Caractéristiques limites Grenzdaten		Va = 15 kV Ia = 2,5 A Wia = 37,5 kW Wa = 18 kW
Operating conditions Caractéristiques d'utilisation Betriebsdaten		
λ =	>15	>15	>15	m
f =	<20	<20	<20	Mc/s
Va =	15	12	10	kV
Vg =	-500	-400	-315	V
Ia =	1,8	2,2	2,5	A
Vgp =	500	470	440	V
Wia =	27	26,5	25	kW
Wa =	18	18	17	kW
Wo =	9	8,5	8	kW
η =	33	32	32	%
m =	100	100	100	%
Ig =	0,3	0,36	0,4	A
Wig =	270	305	317	W

H.F. class C anode modulation
H.F. classe C modulation d'anode
HF - Klasse C Anodenmodulation

Limiting values
Caractéristiques limites
Grenzdaten

V_a	= max. 12 kV
$-V_g$	= max. 1000 V
I_a	= max. 2,9 A
I_g	= max. 0,6 A
W_{ia}	= max. 35 kW
W_a	= max. 12 kW

Operating conditions
Caractéristiques d'utilisation
Betriebsdaten

λ =	>15	>15	11	11	m
f =	<20	<20	27	27	Mc/s
V_a =	12	10	12	10	kV
V_g [1] =	-1000	-900	-1000	-900	V
I_a =	2,9	2,9	2,9	2,9	A
I_g =	0,4	0,45	0,45	0,5	A
V_{gp} =	1600	1550	1650	1600	V
W_{ig} =	580	630	670	700	W
W_{ia} =	35	29	35	29	kW
W_a =	8	7,5	9	8,5	kW
W_o =	27	21,5	26	20,5	kW
η =	77	74	74	70,5	%
m =	100	100	100	100	%
W_{mod} =	17,5	14,5	17,5	14,5	kW

[1]) Grid bias partially obtained by the grid resistor
Polarisation de grille obtenue partiellement par la résistance de grille
Gittervorspannung, teilweise durch den Gitterwiderstand erzeugt

L.F. class B amplifier and modulator
Amplificatrice et modulatrice B.F. classe B
NF - Verstärker und Modulator Klasse B

Limiting values
Caractéristiques limites
Grenzdaten

V_a = max. 15 kV
I_a = max. 6 A
W_{ia} = max. 90 kW
W_a = max. 18 kW

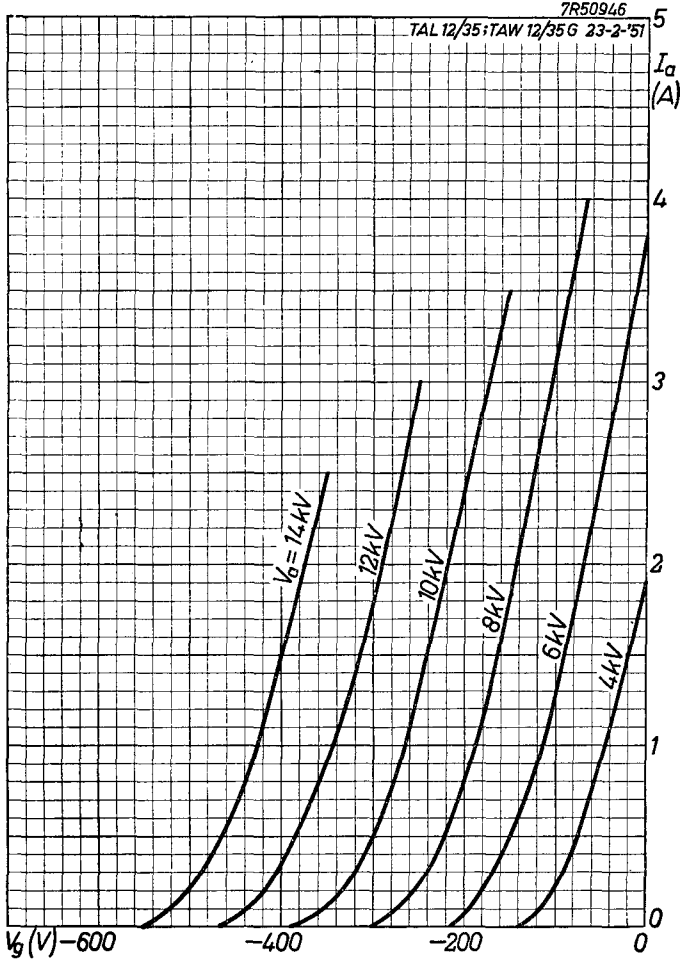
Operating conditions, two valves
Caractéristiques d'utilisation, deux tubes
Betriebsdaten, zwei Röhren

V_a	=	12		12		kV
V_g	=	-400		-425		V
R_{aa}	=	3,2		5,8		kΩ
V_{ggp}	=	0	2000	0	1480	V
I_a	=	2x0,35	2x4,5	2x0,15	2x2,25	A
I_g	=	0	2x0,55	0	2x0,19	A
I_{gp}	=	0	2x3	0	2x1,25	A
W_{ig}	=	0	2x500	0	2x127	W
W_{ia}	=	2x4,2	2x54	2x1,8	2x27	kW
W_a	=	2x4,2	2x14	2x1,8	2x7,7	kW
W_o	=	0	80	0	38,5	kW
d_{tot}	=	-	3,5	-	3,7	%
η	=	-	74	-	71,5	%

V_a	=	10		10		kV
V_g	=	-325		-345		V
R_{aa}	=	2,1		5		kΩ
V_{ggp}	=	0	2050	0	1330	V
I_a	=	2x0,3	2x5,4	2x0,14	2x2,25	A
I_g	=	0	2x0,6	0	2x0,2	A
I_{gp}	=	0	2x3	0	2x1,35	A
W_{ig}	=	0	2x555	0	2x120	W
W_{ia}	=	2x3	2x54	2x1,4	2x22,5	kW
W_a	=	2x3	2x15,5	2x1,4	2x6,5	kW
W_o	=	0	77	0	32	kW
d_{tot}	=	-	3,5	-	4	%
	=	-	71,5	-	71	%

PHILIPS

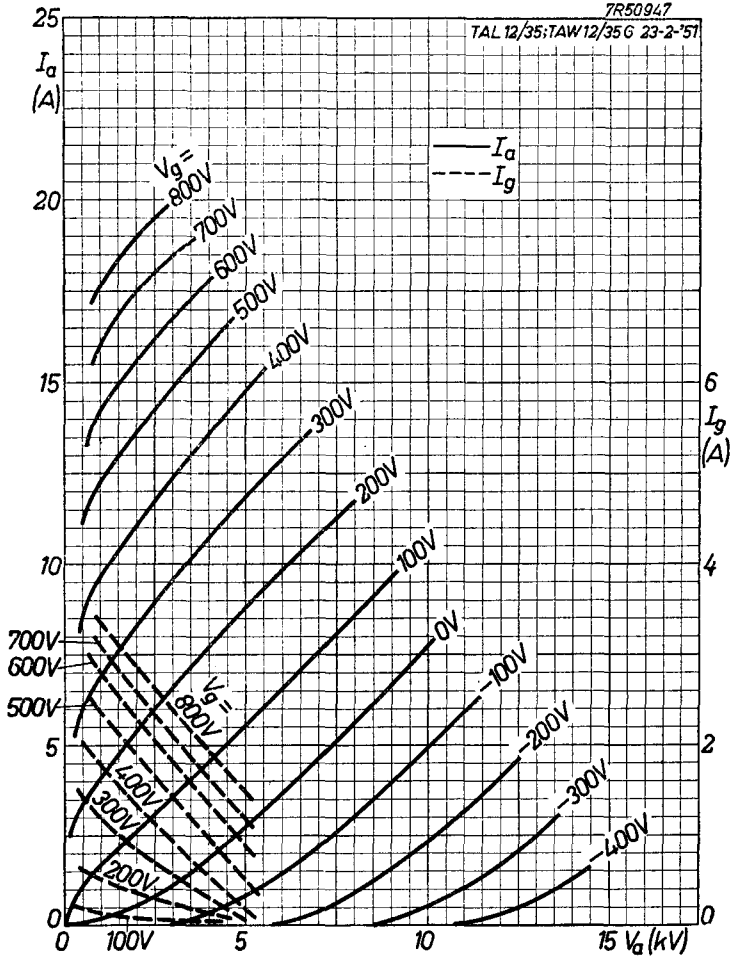
TAL 12/35

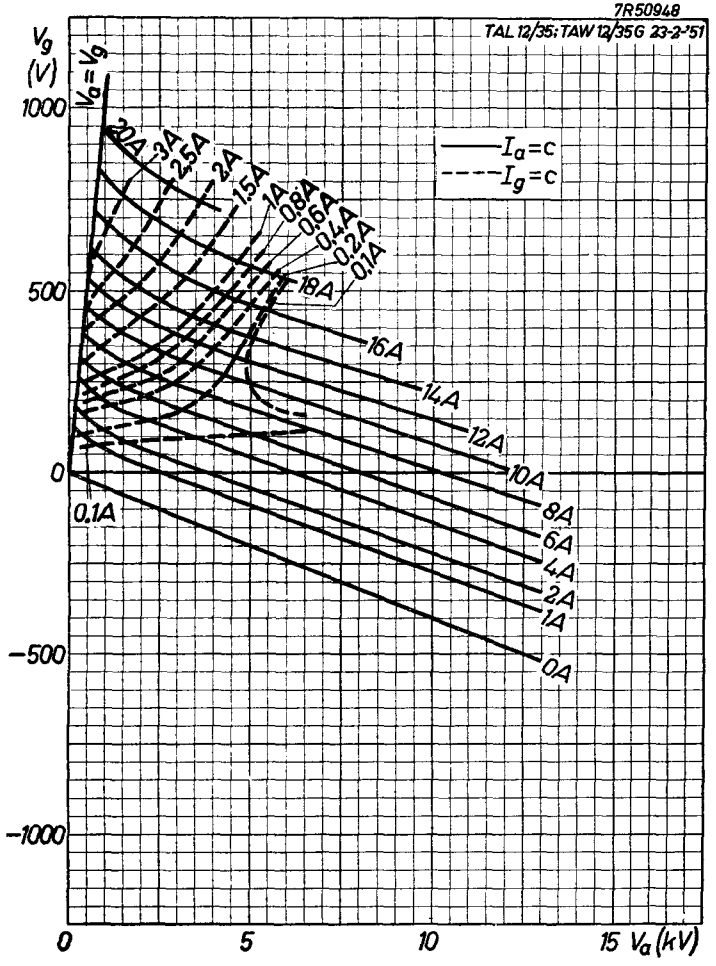


7.7.1954

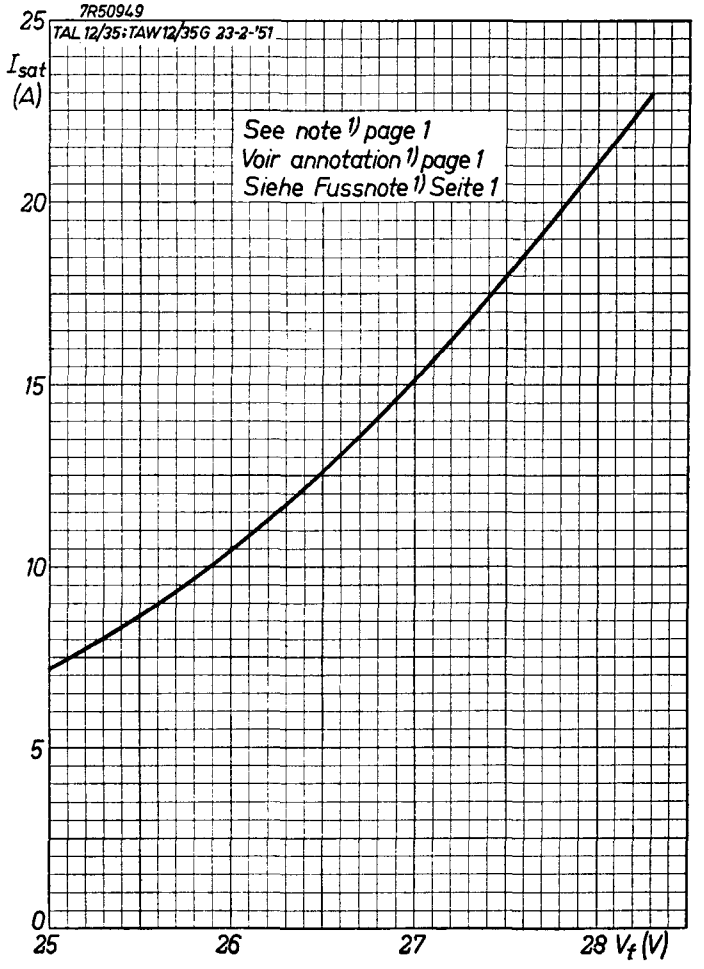
A

PHILIPS

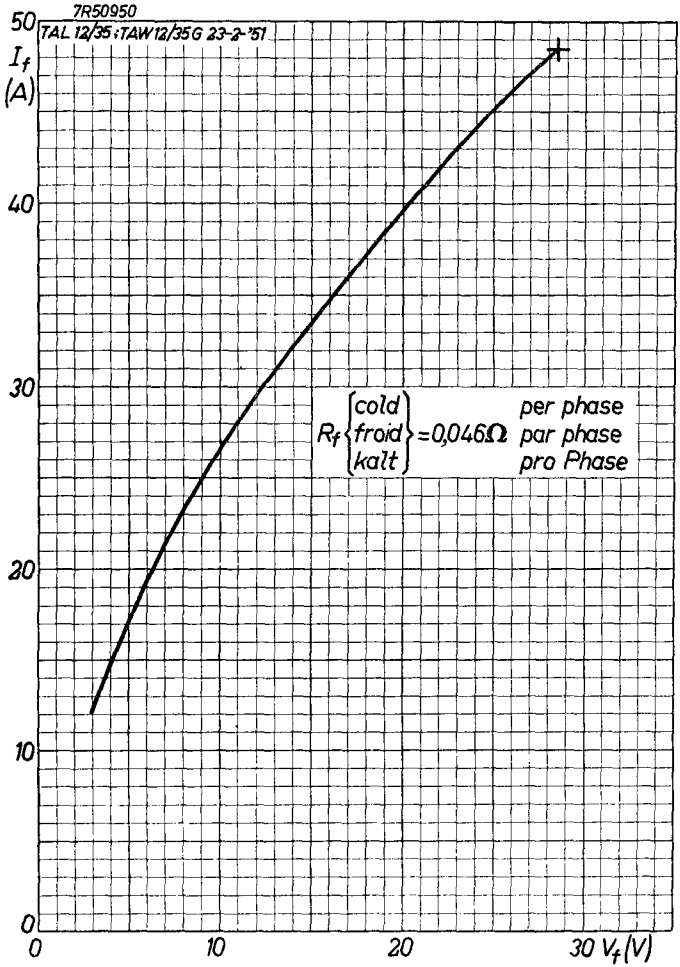

7R50947
TAL 12/35;TAW 12/35 G 23-2-'51
I_a (A)
I_g (A)
I_a
I_g
V_g =
800V
700V
600V
500V
400V
300V
200V
100V
0V
-100V
-200V
-300V
-400V
V_g =
800V
700V
600V
500V
400V
300V
200V
25
20
15
10
5
0
6
4
2
0
0
100V
5
10
15 V_a (kV)


7R50948
TAL 12/35; TAW 12/35G 23-2-'51
V_g (V)
$V_a = V_g$
1000
500
0
−500
−1000
20A
3A
2,5A
2A
1,5A
1A
0,8A
0,6A
0,4A
0,2A
0,1A
18A
16A
14A
12A
10A
8A
6A
4A
2A
1A
0A
0,1A
I_a=c
I_g=c
0
5
10
15 V_a (kV)

PHILIPS


7R50949
TAL 12/35; TAW 12/35 G 23-2-'51
I_{sat} (A)
See note 1) page 1
Voir annotation 1) page 1
Siehe Fussnote 1) Seite 1
25
20
15
10
5
0
25
26
27
28 V_f (V)

D


7R50950
TAL 12/35 ; TAW 12/35 G 23-2-'51
I_f (A)
50
40
30
20
10
0
0
10
20
30 V_f (V)
R_f {cold / froid / kalt} = 0,046 Ω per phase / par phase / pro Phase

7.7.1954

E

TAL 12/35

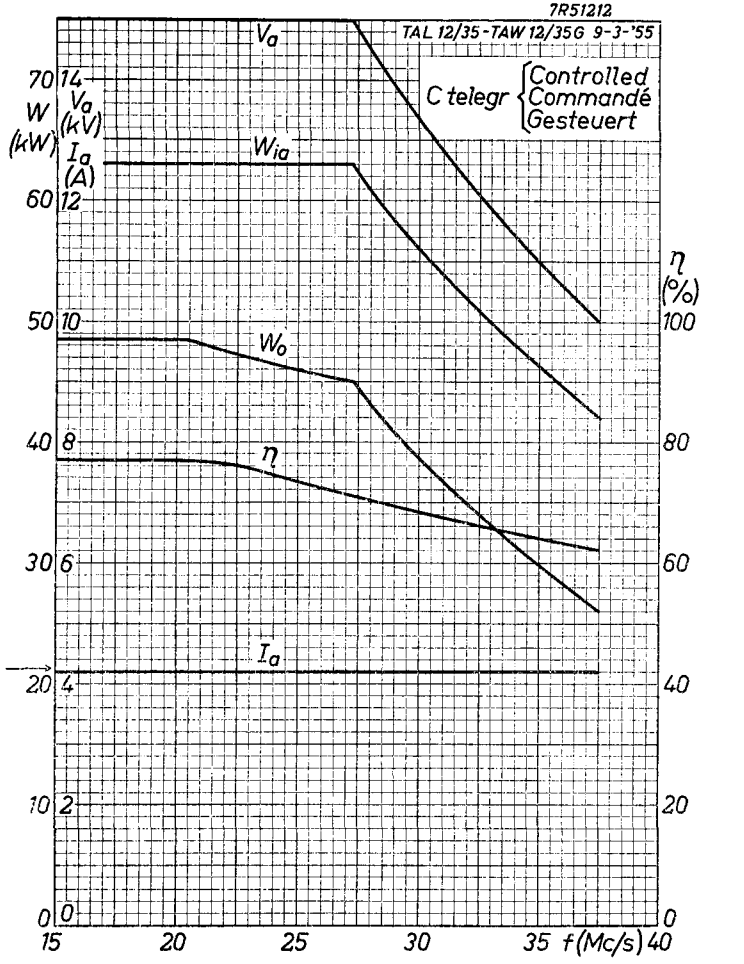
PHILIPS

7750959
TAL 12/35 3-3-'51
h = 3000m
t_i = max 25°C
W_a (kW)
P_i (mmH_2O)
Δt (°C)
N (H.P.) (C.V.) (P.S.)
q (m³/min)

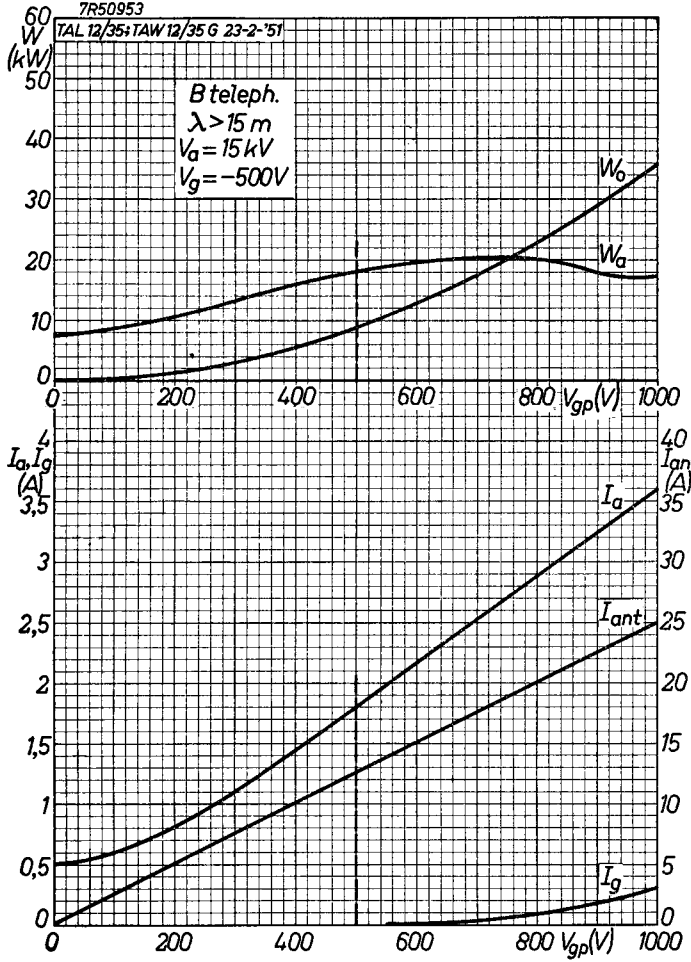
h = 1500m
t_i = max 35°C
W_a (kW)
P_i (mmH_2O)
Δt (°C)
N (H.P.) (C.V.) (P.S.)
q (m³/min)

TAL 12/35

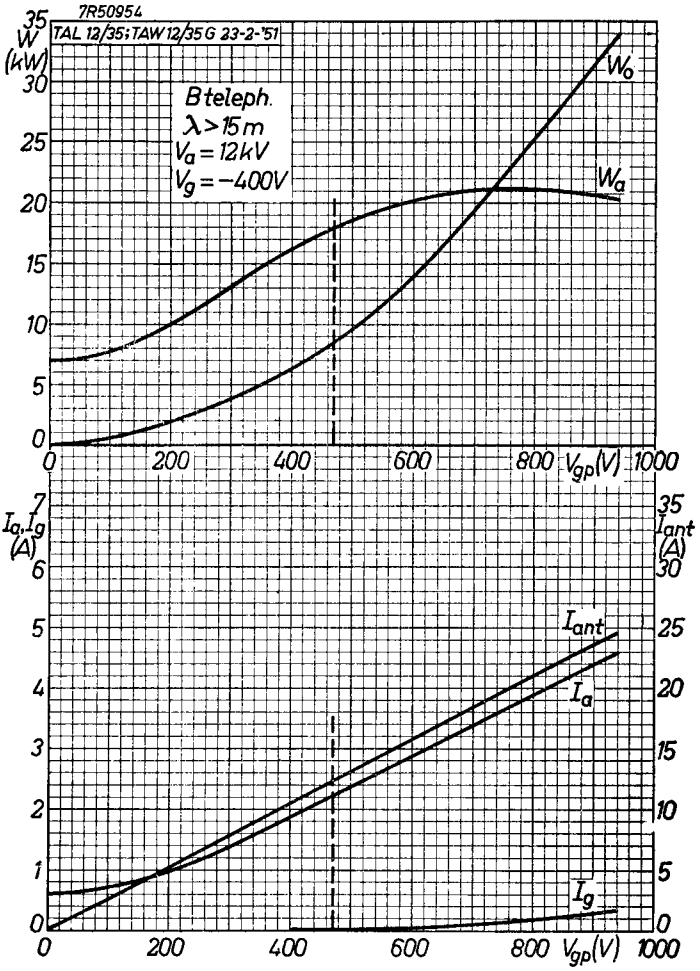
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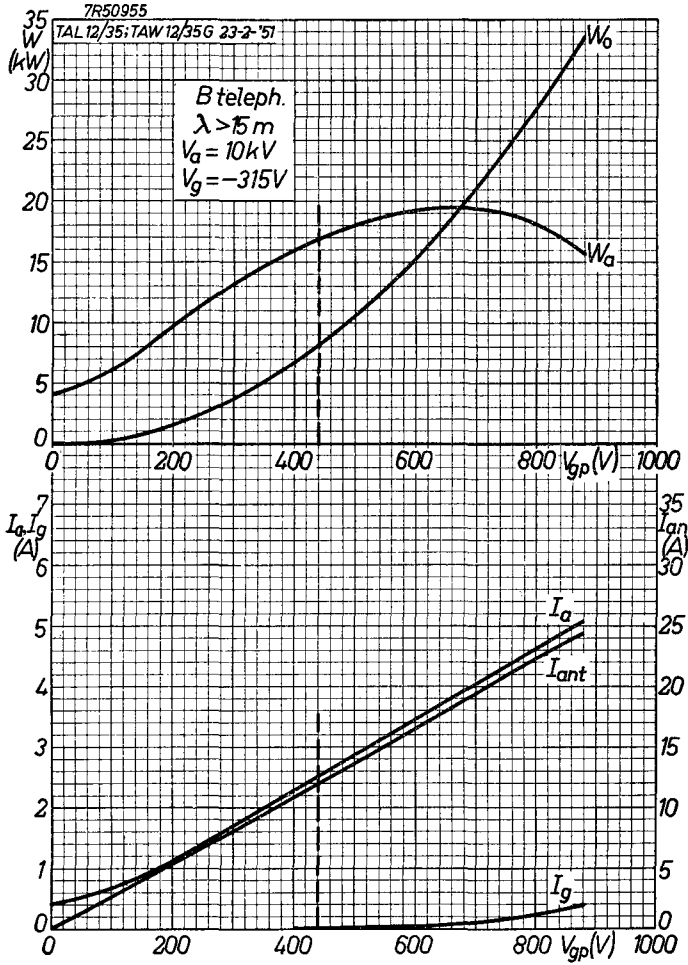


H


7R50953
TAL 12/35; TAW 12/35 G 23-2-'51
B teleph.
λ > 15 m
Va = 15 kV
Vg = −500V
W (kW)
Wo
Wa
Vgp(V)
Ia, Ig (A)
Iant (A)
Ia
Iant
Ig

PHILIPS


7R50954
TAL 12/35; TAW 12/35 G 23-2-'51
W (kW)
B teleph.
λ > 15 m
Va = 12 kV
Vg = −400 V
Wo
Wa
Vgp (V)
Ia, Ig (A)
Iant (A)
Iant
Ia
Ig

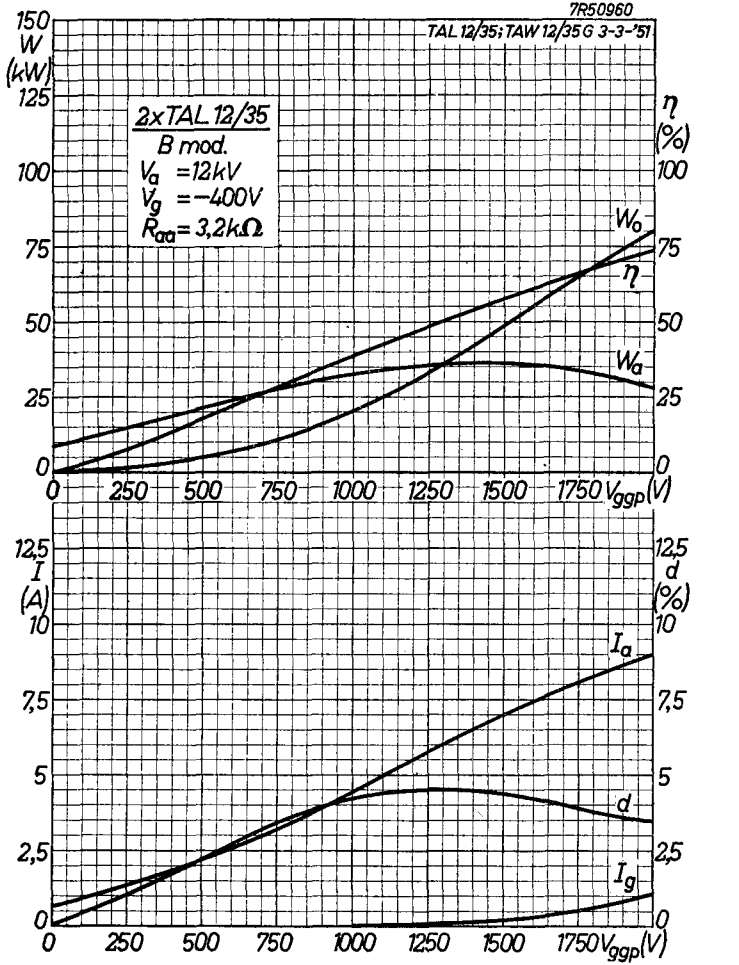

7R50955
TAL 12/35; TAW 12/35 G 23-2-'51
B teleph.
λ > 15 m
Va = 10 kV
Vg = −315 V
W (kW)
Wo
Wa
Vgp (V)
Ia, Ig (A)
Iant (A)
Ia
Iant
Ig

7.7.1954

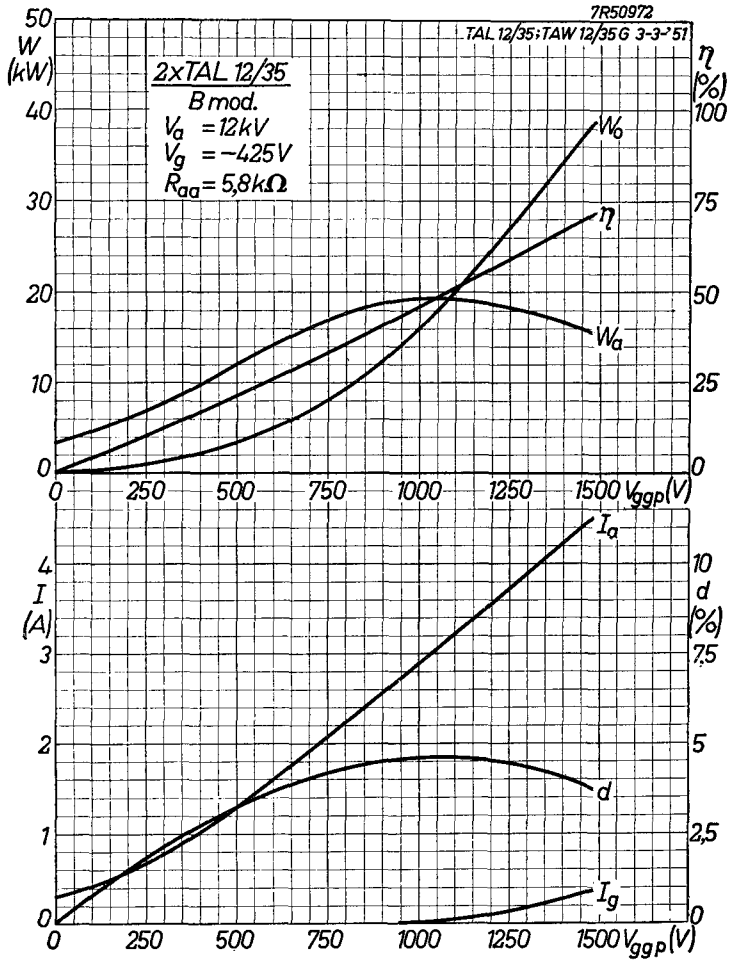
K

TAL 12/35

PHILIPS

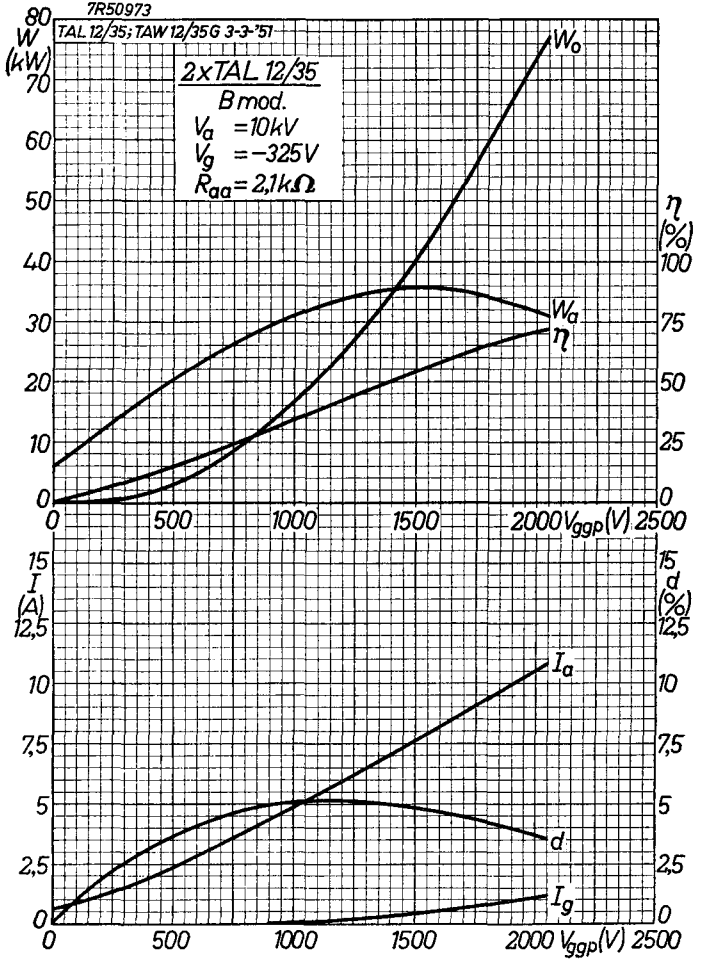


L

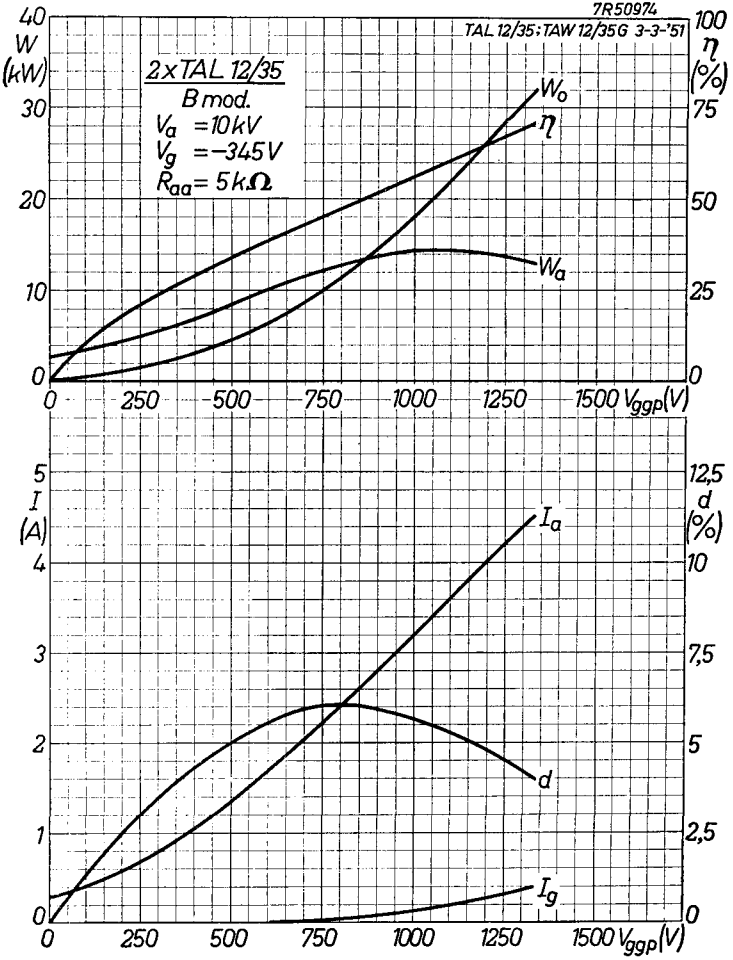

7R50972
TAL 12/35; TAW 12/35 G 3-3-'51
2xTAL 12/35
B mod.
V_a = 12kV
V_g = −425V
R_{aa} = 5,8kΩ
W (kW)
η (%)
W_o
η
W_a
V_{ggp} (V)
I (A)
d (%)
I_a
d
I_g

TAL 12/35

PHILIPS



N


7R50974
TAL 12/35: TAW 12/35G 3-3-'51
2x TAL 12/35
B mod.
V_a = 10 kV
V_g = −345 V
R_{aa} = 5 kΩ
W (kW)
η (%)
W_o
η
W_a
0
10
20
30
40
0
25
50
75
100
0
250
500
750
1000
1250
1500 V_{ggp} (V)
I (A)
d (%)
I_a
d
I_g
0
1
2
3
4
5
0
2,5
5
7,5
10
12,5
0
250
500
750
1000
1250
1500 V_{ggp} (V)



TAL12/35

page	sheet	date
1	1	1954.07.07
2	2	1954.07.07
3	3	1954.07.07
4	4	1954.07.07
5	5	1951.03.03
6	6	1951.03.03
7	7	1954.07.07
8	A	1954.07.07
9	B	1954.07.07
10	C	1954.07.07
11	D	1954.07.07
12	E	1954.07.07
13	F	1954.07.07
14	G	1955.03.03
15	H	1955.03.03
16	I	1954.07.07
17	J	1954.07.07
18	K	1954.07.07
19	L	1954.07.07

20	M	1954.07.07
21	N	1954.07.07
22	O	1954.07.07
23, 24	FP	1999.11.17

PHILIPS
TRIODE

TAW 12/10

PHILIPS EMISSION

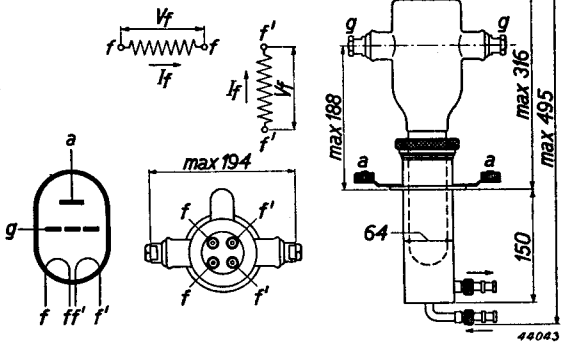
Use	:	H.F. amplifier (watercooled)
Verwendung	:	H.F.-Verstärker (wassergekühlt)
Utilisation	:	Amplificateur H.F. (refroidi par eau)
Gebruikswijze:		Hoogfrequentversterker (watergekoeld)
Empleo	:	Amplificador de A.F. (refrigerado por agua)

Cathode	:	Tungsten, two phase filament
Kathode	:	Wolfram, Zweiphasen-Heizfaden
Cathode	:	Tungstène, filament biphasé
Kathode	:	Wolfraam, tweefasen gloeidraad
Cátodo	:	Tungsteno, filamento bifásico

Vf	=	22,0	V
If	≈	39	A
Isat	≈	8	A
Wat	= max.	7,5	kW
Wat	=	10	kW
μ	≈	22	
S (Ia = 0,5 A)	≈	7	mA/V
Caf	≈	2	pF
Cfg	≈	26	pF
Cag	≈	22	pF

λ	MHz	Va max	
		Telegr.	Mod. Va
60 m	5	12 kV	10 kV
15 m	20	10 kV	8 kV

Vol. aq. ⩾ 12 l/min
$T_2 - T_1$ = 9 ° C
T_2max = 60 ° C



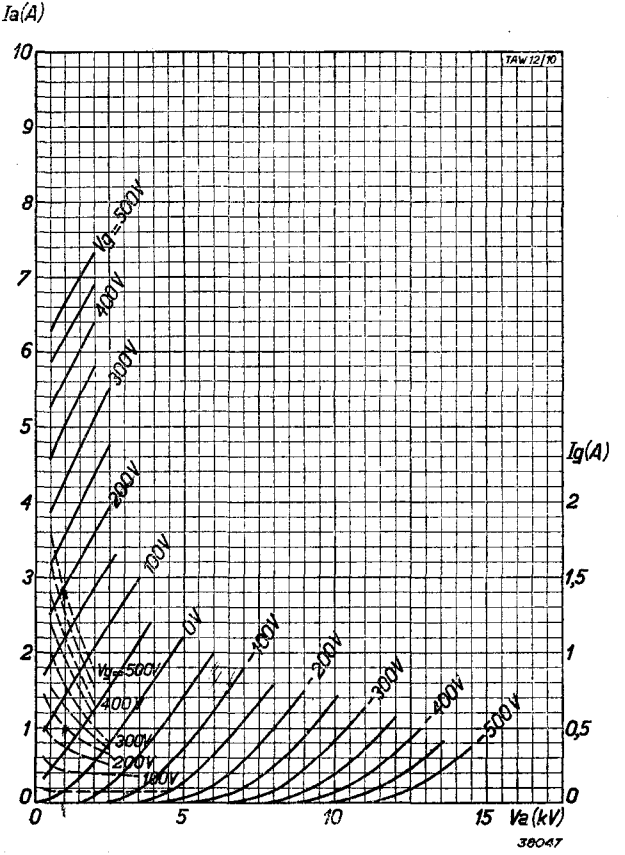
TAW 12/10

PHILIPS
TRIODE

PHILIPS EMISSION

Characteristics :
Kennlinien :
Caractéristiques :
Karakteristieken :
Características :

Ia-Va; Ig-Va



TAW 12/10

PHILIPS EMISSION

L.F. class B amplification (two valves)
N.F. Klasse B Verstärkung (zwei Röhren)
B.F. classe B amplification (deux tubes)
L.F. klasse B versterking (twee buizen)
B.F. clase B amplificación (dos válvulas)

Va	8	kV
Vg	≈— 300	V
Ia (Vg~ = 0)	0,34	A
Ia (Vg~ = max)	1,8	A
Ig (Vg~ = max)	≈ 170	mA
Vg~	≈ 500	V
Vgg~	≈ 1000	V
Wi	14,4	kW
Wa	5	kW
Wg	≈ 85	W
Wo	9,4 *)	kW
Ra	2440	Ohm
Raa	9760	Ohm
η	65	%

H.F. class C telegraphy
H.F. Klasse C Telegraphie
H.F. classe C télégraphie
H.F. klasse C telegrafie
A.F. clase C telegrafía

λ	>60	>15	m
Va	12	10	kV
Vg	≈—700	≈—600	V
Ia	1,7	1,7	A
Ig	≈ 0,35	≈ 0,28	A
Vg~	≈ 1,1	≈ 1,07	kV
Whf	≈ 385	≈ 300	W
Wi	20,4	17	kW
Wa	5,4	5	kW
Wo	15*)	12*)	kW
η	73,5	70,5	%

PHILIPS EMISSION

H.F. class B telephony
H.F. Klasse B Telephonie
H.F. classe B téléphonie
H.F. klasse B telefonie
A.F. clase B telefonía

λ	>60	>15	m
Va	12	10	kV
Vg	≈—435	≈—360	V
Ia	0,93	1,0	A
Ig	≈ 0,35 [1])	≈ 0,35 [1])	A
Vg~	≈ 285	≈ 245	V
Whf	≈ 200 [1])	≈ 170 [1])	W
Wi	11,2	10	kW
Wa	7,5	6,7	kW
Wo	3,7 *)	3,3 *)	kW
η	33	33	%

H.F. class C anode modulation
H.F. Klasse C Anodenmodulation
H.F. classe C modulation d'anode
H.F. klasse C anodemodulatie
A.F. clase C modulación de ánodo

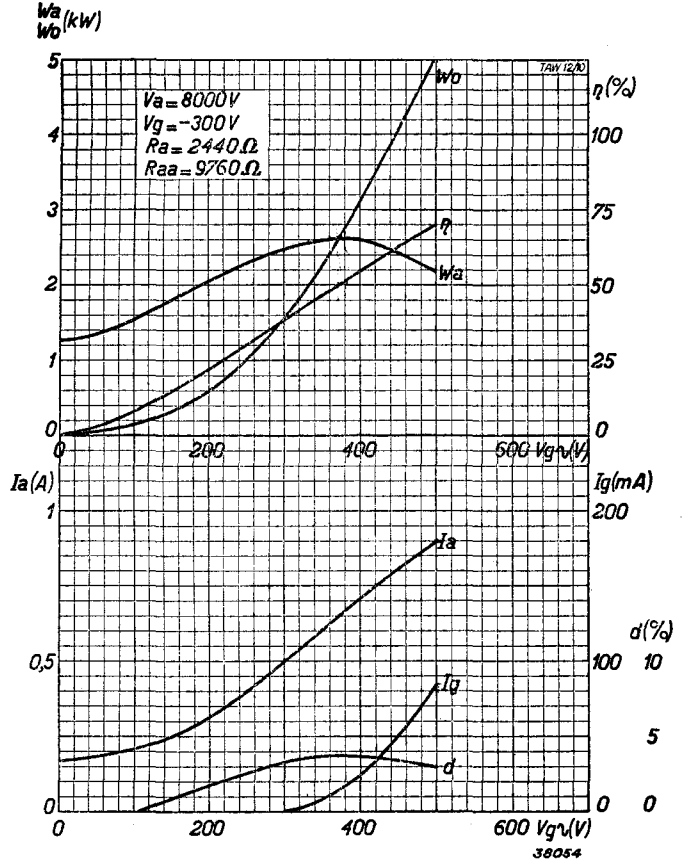
λ	>15	m
Va	8	kV
Vg	≈—700	V
Ia	1,0	A
Ig	≈ 0,325	A
Vg~	≈ 1150	V
Whf	≈ 0,375	kW
Wlf	≈ 4	kW
Wi	8,0	kW
Wa	2	kW
Wo	6 *)	kW
η	75	%

PHILIPS
TRIODE

TAW 12/10

PHILIPS EMISSION

Characteristics	: L.F. class B	amplification (one valve)
Kennlinien	: N.F. Klasse B	Verstärkung (eine Röhre)
Caractéristiques	: B.F. classe B	amplification (un tube)
Karakteristieken	: L.F. klasse B	versterking (één buis)
Características	: B.F. clase B	amplificación (una válvula)



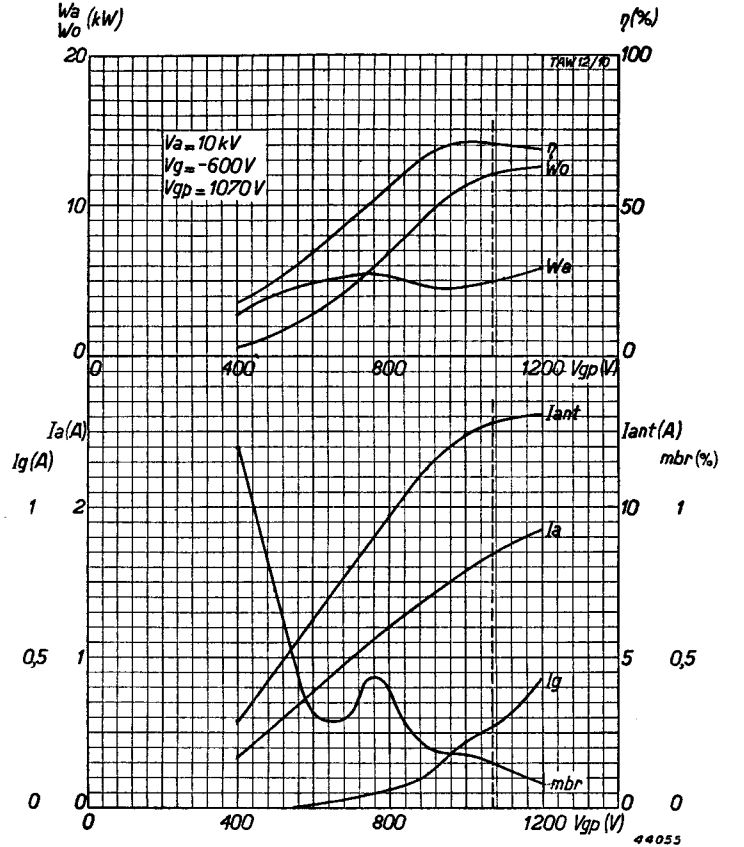
TAW 12/10

PHILIPS
TRIODE

PHILIPS EMISSION

Characteristics	:	H.F. class C telegraphy
Kennlinien	:	H.F. Klasse C Telegraphie
Caractéristiques	:	H.F. classe C télégraphie
Karakteristieken	:	H.F. klasse C telegrafie
Características	:	A.F. clase C telegrafía

λ : > 15 m



1/10-'43

3601/3

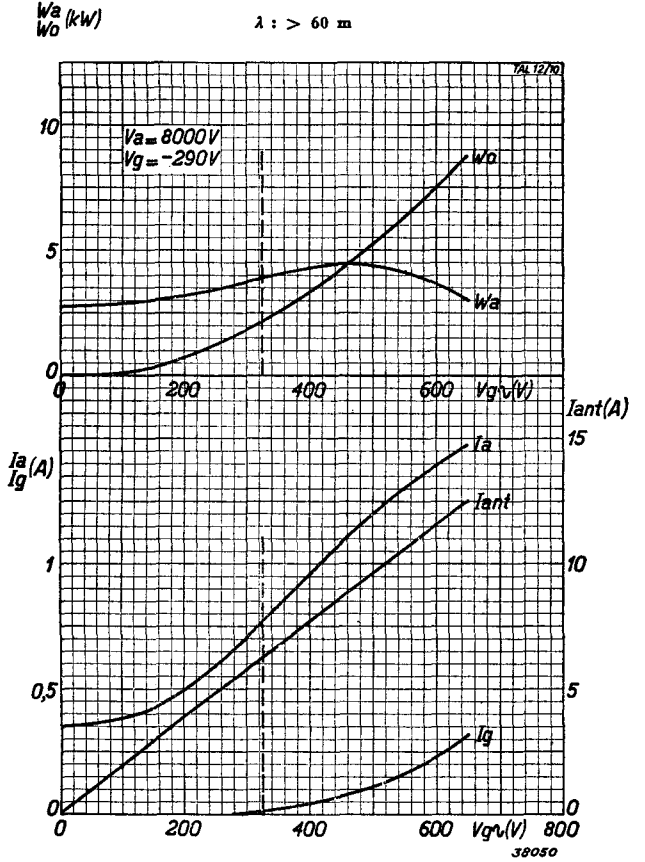
PHILIPS
TRIODE

TAW 12/10

PHILIPS EMISSION

Characteristics	:	**H.F. class**	**B telephony**
Kennlinien	:	**H.F. Klasse**	**B Telephonie**
Caractéristiques	:	**H.F. classe**	**B téléphonie**
Karakteristieken	:	**H.F. klasse**	**B telefonie**
Características	:	**A.F. clase**	**B telefonía**

λ : > 60 m



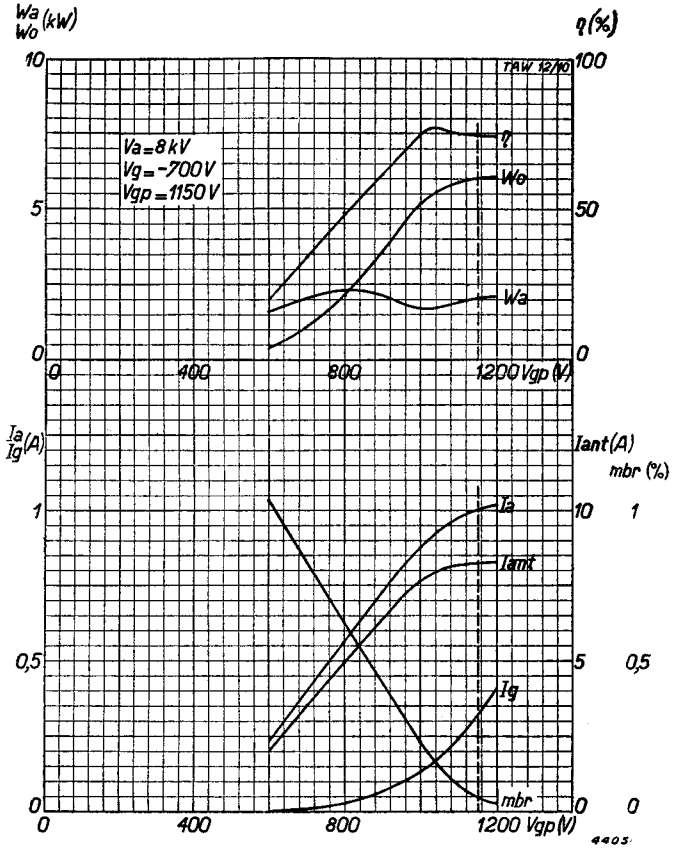
TAW 12/10

PHILIPS
TRIODE

PHILIPS EMISSION

Characteristics	:	**H.F. class C anode modulation**
Kennlinien	:	**H.F. Klasse C Anodenmodulation**
Caractéristiques	:	**H.F. classe C modulation d'anode**
Karakteristieken	:	**H.F. klasse C anodemodulatie**
Características	:	**A.F. clase C modulación de ánodo**

λ : > 15 m



4405

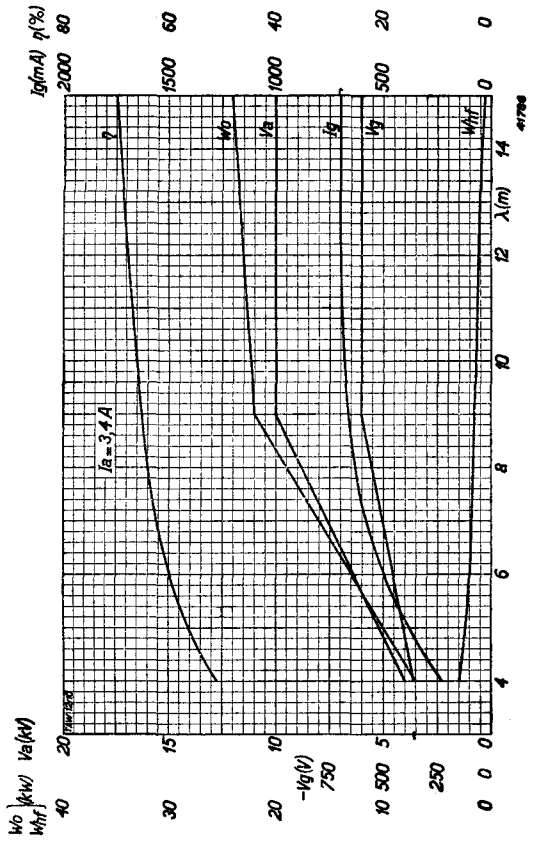
PHILIPS
TRIODE

TAW 12/10

PHILIPS EMISSION

Characteristics	: H.F. class	C telegraphy (controlled, two valves)
Kennlinien	: H.F. Klasse	C Telegraphie (gesteuert, zwei Röhren)
Caractéristiques	: H.F. classe	C télégraphie (commandé, deux tubes)
Karakteristieken	: H.F. klasse	C telegrafie (gestuurd, twee buizen)
Características	: A.F. clase	C telegrafía (mandado, dos válvulas)

λ : < 10 m



PHILIPS

TAW12/35G

TRIODE for use as H.F. or L.F. amplifier or oscillator
TRIODE pour utilisation en amplificatrice H.F. ou B.F. ou en oscillatrice
TRIODE zur Verwendung als HF-oder NF-Verstärker oder Oszillator

Cooling : water/air flow to seals
Refroidissement: circulation d'eau/air aux scellements
Kühlung : Wasser/Luftstrom auf Einschmelzungen

Filament : tungsten, three-phase
Filament : tungstène, triphasé
Heizfaden: Wolfram, drei Phasen

Heating : direct	per phase	V_f = max.28,3 V[1])
Chauffage: direct	par phase	I_f = 48,5 A
Heizung : direkt	pro Phase	

Filament current must never exceed a peak value of 100 A per phase at any time during initial energising schedule.
Le courant d'enclenchement ne doit jamais dépasser une valeur de crête de 100 A par phase.
Der Anlaufstrom darf niemals einen Scheitelwert von 100 A pro Phase überschreiten.

Capacitances	C_a = 2,6 pF
Capacités	C_g = 72 pF
Kapazitäten	C_{ag} = 31 pF

Typical characteristics	μ (I_a=1,25 A)	= 25
Caractéristiques types	(V_a= 12 kV)	
Kenndaten	S (V_a= 12 kV)	= 16,5 mA/V
	I_{sat}	= 23 A

[1]) Each valve is marked with the value of the filament voltage at which the saturation current has a value of 23 A.
La valeur de tension du filament correspondante à un courant de saturation de 23 A est indiquée à chaque tube.
Auf jeder Röhre ist der Wert der Heizspannung angegeben wobei der Sättigungsstrom einen Wert von 23 A erhält.

PHILIPS

λ	Freq.	C telegr.		B teleph.		C an.mod.		B mod. [1]	
m	Mc/s	V_a (kV)	W_o (kW)	V_a (kV)	W_o (kW)	V_a (kV)	W_o (kW)	V_a (kV)	W_o (kW)
								12	107
>15	< 20	15	48,5	15	9	12	27	12	38,5
		12	38	12	8,5			10	77
		10	31	10	8	10	21,5	10	32
11	27	15	45			12	26		
						10	20,5		
8	37,5	10	26						

Cooling characteristics
Caractéristiques de refroidissement
Kühlungsdaten

W_a (kW)	t_i (°C)	q_{min} [2] (l/min)	p_i (atm)	See also the cooling curves Voir aussi les courbes de refroidissement. Siehe auch die Kühlungskurven
10	20	10	0,03	
	50	22	0,15	
20	20	18	0,09	
	50	40	0,4	
30	20	27	0,21	
	50	59	1	

t_i = max. 50 °C

Temperature of seals
Temp. des scellements
Temp. der Einschmelzungen
= max. 180 °C

[1]) Two tubes; deux tubes; zwei Röhren

[2]) At temperatures t_i between 20 and 50 °C the required quantity of water can be found by proportional interpolation.

Le débit d'eau aux températures t_i entre 20 et 50 °C peut être calculé par interpolation linéaire.

Die benötigte Wassermenge für Temperaturwerte ti zwischen 20 und 50 °C kann durch Proportionalinterpolation berechnet werden.

It is necessary to direct a low velocity air flow to the anode- and grid seals at frequencies above 10 Mc/s

Il faut diriger un léger courant d'air sur les scellements de l'anode et de la grille aux fréquences supérieures à 10 Mc/s

Ein schwacher Luftstrom auf die Anoden- und Gittereinschmelzungen ist notwendig, wenn die Röhre bei Frequenzen höher als 10 MHz betrieben wird

Water-jacket
Refroidisseur K 715
Kühltopf

Protective caps for grid- and filament seals
Chapeaux de protection pour les sorties de la grille et du filament 40632
Schutzkappen für Gitter- und Heizfadenanschlüsse

Cooling of the grid seals can be effected by means of these caps
Le refroidissement des scellements de la grille peut être réalisé au moyen de ces chapeaux
Die Gittereinschmelzungen können mit Hilfe dieser Schutzkappen gekühlt werden

Filament bracket (for D.C. supply)
Etrier du filament (pour alimentation par C.C.) 40606
Heizfadenbügel (für Gleichstromspeisung)

Mounting position: vertical with anode down
Montage : vertical avec l'anode en bas
Einbau : senkrecht mit der Anode unten

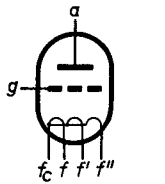
Tube : net weight 6,8 kg
Tube : poids net
Röhre: Nettogewicht

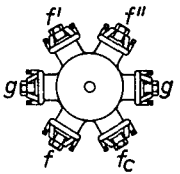
Shipping weight 75 kg
Poids brut
Bruttogewicht

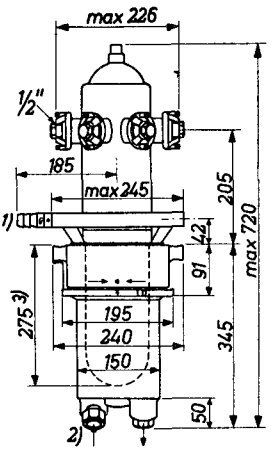
Net weight
K 715 Poids net 16,7 kg
Nettogewicht

Valve mounted in water-jacket type K 715
Tube monté dans le refroidisseur type K 715
Röhre in Kühltopf Typ K 715 montiert

Dimensions in mm
Dimensions en mm
Abmessungen in mm







---

1) Use connecting hose with an inner diameter of 1"
Pour un tuyau flexible d'un diamètre intérieur de 1 pouce
Für Schlauch von 1 Zoll Innendurchmesser

2) Coupling for metal tubing with an outer diameter of 28 mm
Raccord pour un tuyau d'un diamètre extérieur de 28 mm
Anschluss für Rohr mit Aussendurchmesser von 28 mm

3) For removing the valve from its water-jacket the free height above the valve must be at least 275 mm
Pour enlever le tube la hauteur libre au dessus du tube doit être 275 mm au moins
Zum Herausnehmen der Röhre ist eine freie Höhe von mindestens 275 mm oberhalb der Röhre erforderlich

H.F. class C telegraphy
H.F. classe C télégraphie
HF - Klasse C Telegrafie

		max.	max.
Limiting values	V_a =	15 kV	I_g = 0,6 A
Caractéristiques limites	$-V_g$ =	1000 V	W_{ia} = 75 kW
Grenzdaten	I_a =	5 A	W_a = 30 kW

Operating conditions
Caractéristiques d'utilisation
Betriebsdaten

λ =	>15	>15	>15	11	8	m
f =	<20	<20	<20	27	37,5	Mc/s
V_a =	15	12	10	15	10	kV
V_g =	-900	-700	-600	-900	-600	V
I_a =	4,2	4,2	4,2	4,2	4,2	A
I_g =	0,42	0,5	0,53	0,42	0,6	A
V_{gp} =	1470	1350	1160	1470	1200	V
W_{ig} =	560	610	560	560	650	W
W_{ia} =	63	50,4	42	63	42	kW
W_a =	14,5	12,4	11	18	16	kW
W_o =	48,5	38	31	45	26	kW
η =	77	75,5	74	71,5	62	%

H.F. class B telephony
H.F. classe B téléphonie
HF - Klasse B Telefonie

	max.
Limiting values	V_a = 15 kV
Caractéristiques limites	I_a = 2,5 A
Grenzdaten	W_{ia} = 37,5 kW
	W_a = 30 kW

Operating conditions
Caractéristiques d'utilisation
Betriebsdaten

λ =	>15	>15	>15	m
f =	<20	<20	<20	Mc/s
V_a =	15	12	10	kV
V_g =	-500	-400	-315	V
I_a =	1,8	2,2	2,5	A
V_{gp} =	500	470	440	V
W_{ia} =	27	26,5	25	kW
W_a =	18	18	17	kW
W_c =	9	8,5	8	kW
η =	33	32	32	%
m =	100	100	100	%
I_g =	0,3	0,36	0,4	A
W_{ig} =	270	305	317	W

H.F. class C anode modulation
H.F. classe C modulation d'anode
HF - Klasse C Anodenmodulation

Limiting values
Caractéristiques limites
Grenzdaten

V_a	= max.	12 kV
$-V_g$	= max.	1000 V
I_a	= max.	2,9 A
I_g	= max.	0,6 A
W_{ia}	= max.	35 kW
W_a	= max.	20 kW

Operating conditions
Caractéristiques d'utilisation
Betriebsdaten

λ	=	>15	>15	11	11	m
f	=	<20	<20	27	27	Mc/s
V_a	=	12	10	12	10	kV
V_g [1]	=	-1000	-900	-1000	-900	V
I_a	=	2,9	2,9	2,9	2,9	A
I_g	=	0,4	0,45	0,45	0,5	A
V_{gp}	=	1600	1550	1650	1600	V
W_{ig}	=	580	630	670	700	W
W_{ia}	=	35	29	35	29	kW
W_a	=	8	7,5	9	8,5	kW
W_o	=	27	21,5	26	20,5	kW
η	=	77	74	74	70,5	%
m	=	100	100	100	100	%
W_{mod}	=	17,5	14,5	17,5	14,5	kW

[1]) Grid bias partially obtained by the grid resistor
Polarisation de grille obtenue partiellement par la résistance de grille
Gittervorspannung, teilweise durch den Gitterwiderstand erzeugt

L.F. class B amplifier and modulator
Amplificatrice et modulatrice B.F. classe B
NF - Verstärker und Modulator Klasse B

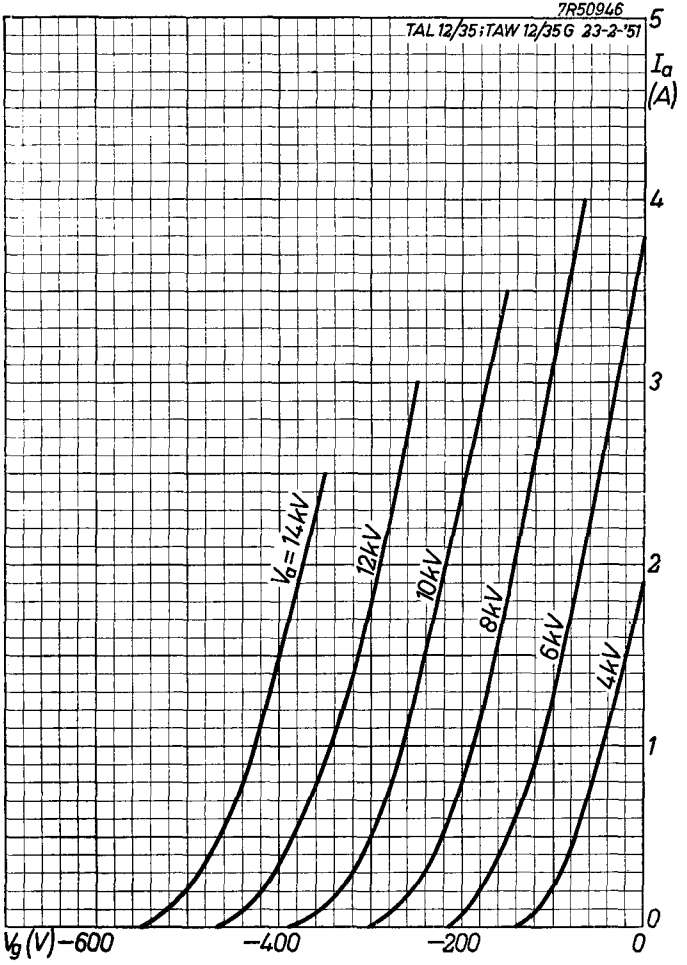
Limiting values
Caractéristiques limites
Grenzdaten

V_a = max. 15 kV
I_a = max. 6 A
W_{ia} = max. 90 kW
W_a = max. 30 kW

Operating conditions, two valves
Caractéristiques d'utilisation, deux tubes
Betriebsdaten, zwei Röhren

V_a	=	12		12		kV
V_g	=	-400		-425		V
R_{aa}	=	2,4		5,8		kΩ
V_{ggp}	=	0	2400	0	1480	V
I_a	=	2x0,35	2x6	2x0,15	2x2,25	A
I_g	=	0	2x0,6	0	2x0,19	A
I_{gp}	=	0	2x3,3	0	2x1,25	A
W_{ig}	=	0	2x650	0	2x127	W
W_{ia}	=	2x4,2	2x72	2x1,8	2x27	kW
W_a	=	2x4,2	2x18,5	2x1,8	2x7,7	kW
W_o	=	0	107	0	38,5	kW
d_{tot}	=	-	4	-	3,7	%
η	=	-	74,5	-	71,5	%

V_a	=	10		10		kV
V_g	=	-325		-345		V
R_{aa}	=	2,1		5		kΩ
V_{ggp}	=	0	2050	0	1330	V
I_a	=	2x0,3	2x5,4	2x0,14	2x2,25	A
I_g	=	0	2x0,6	0	2x0,2	A
I_{gp}	=	0	2x3	0	2x1,35	A
W_{ig}	=	0	2x555	0	2x120	W
W_{ia}	=	2x3	2x54	2x1,4	2x22,5	kW
W_a	=	2x3	2x15,5	2x1,4	2x6,5	kW
W_o	=	0	77	0	32	kW
d_{tot}	=	-	3,5	-	4	%
η	=	-	71,5	-	71	%

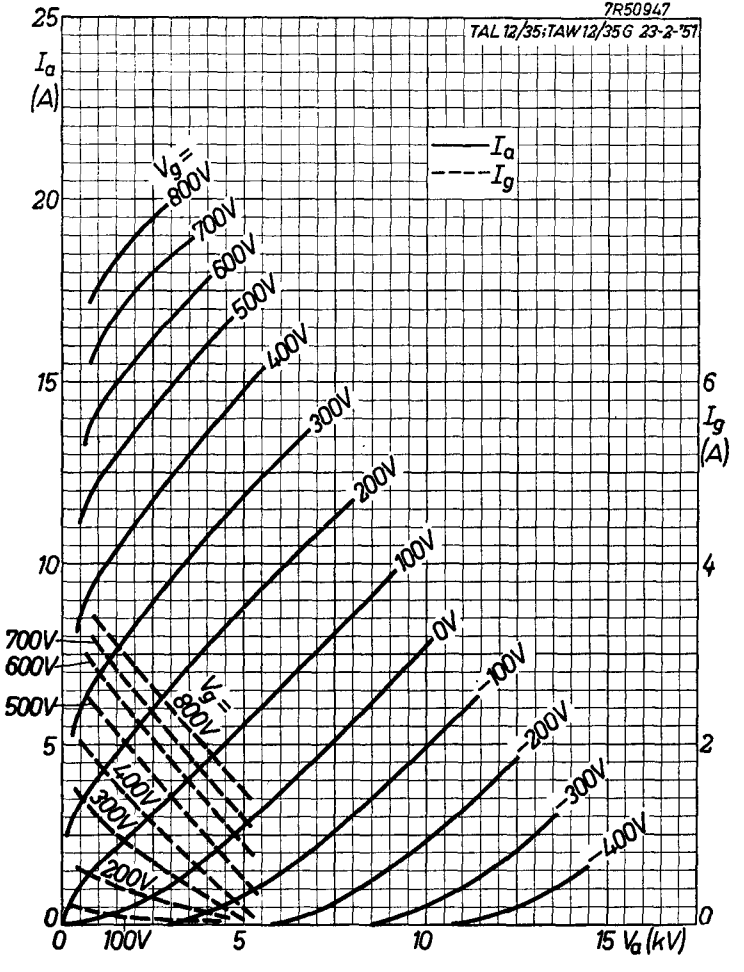

7R50946
TAL 12/35; TAW 12/35 G 23-2-'51
I_a (A)
5
4
3
2
1
0
V_g (V) −600
−400
−200
0
V_a = 14kV
12kV
10kV
8kV
6kV
4kV

3.3.1951

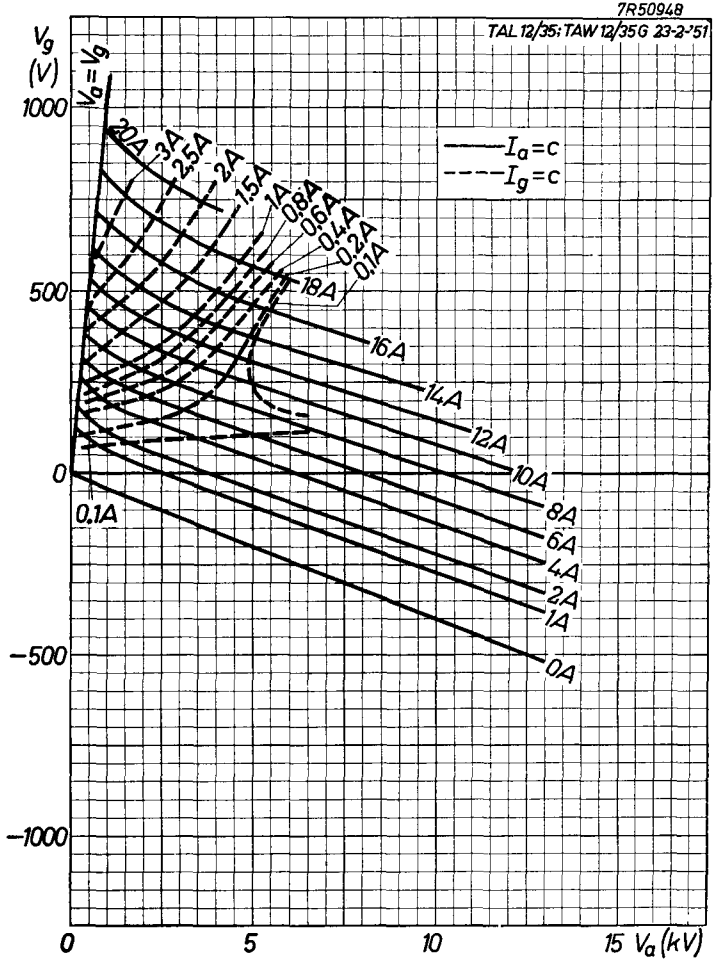
A

TAW 12/35 G

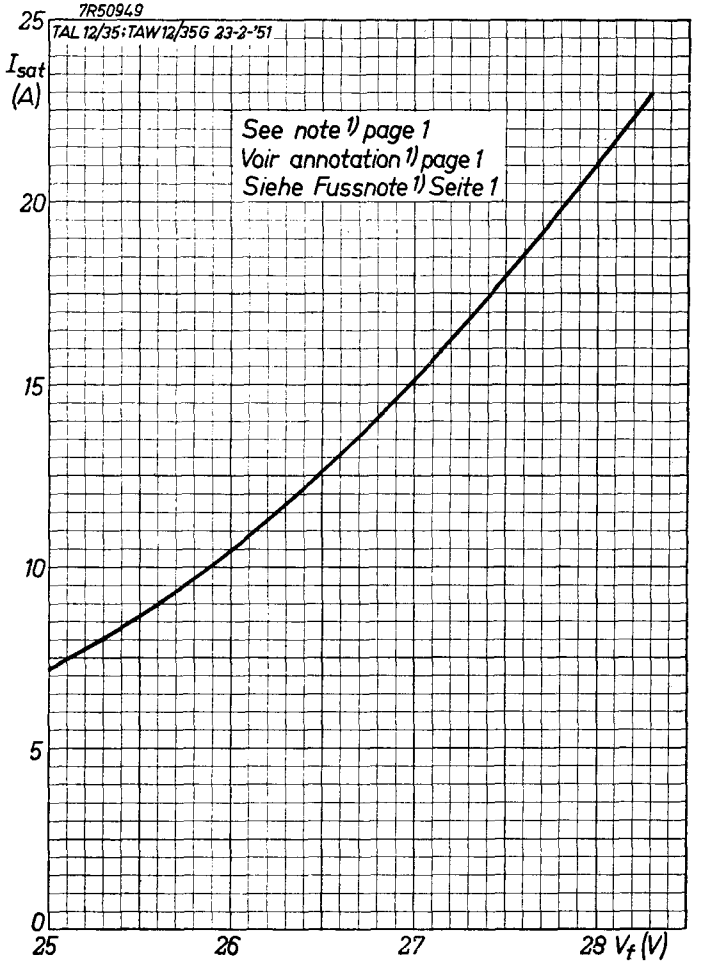
PHILIPS

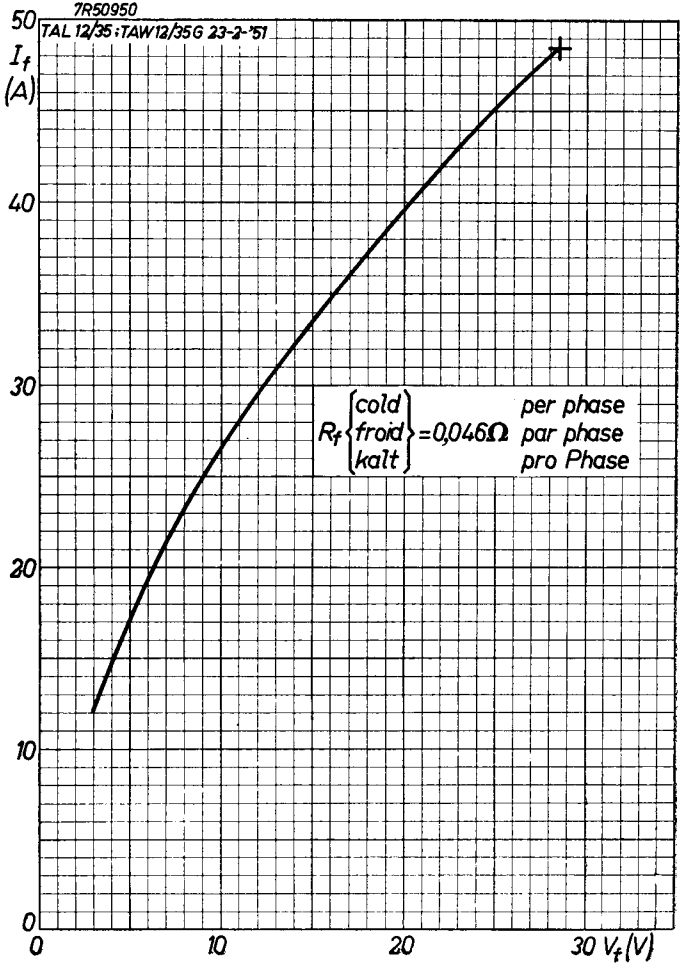


B


7R50948
TAL 12/35; TAW 12/35 G 23-2-'51
V_g (V)
$V_a = V_g$
1000
500
0
−500
−1000
I_a = c
I_g = c
2A
3A
2,5A
2A
1,5A
1A
0,8A
0,6A
0,4A
0,2A
0,1A
18A
16A
14A
12A
10A
8A
6A
4A
2A
1A
0A
0,1A
0
5
10
15 V_a (kV)

PHILIPS


7R50949
TAL 12/35: TAW 12/35G 23-2-'51
I_{sat} (A)
See note 1) page 1
Voir annotation 1) page 1
Siehe Fussnote 1) Seite 1
25
20
15
10
5
0
25
26
27
28 V_f (V)

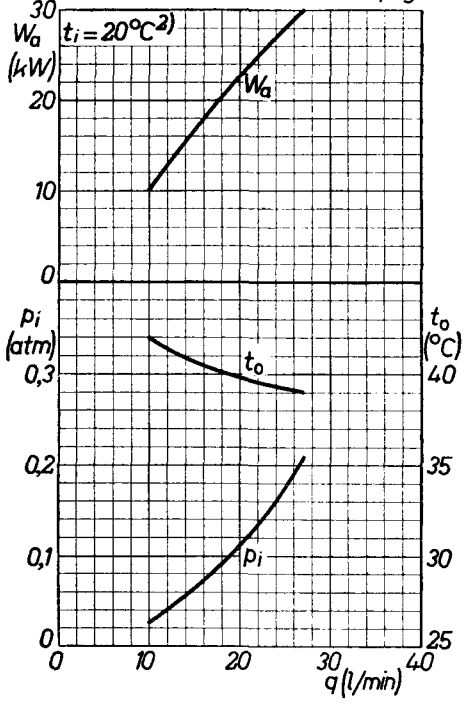

7R50950
TAL 12/35 ; TAW 12/35 G 23-2-'51
50
I_f
(A)
40
30
20
10
0
0
10
20
30 V_f (V)
R_f {cold / froid / kalt} = 0,046 Ω per phase / par phase / pro Phase

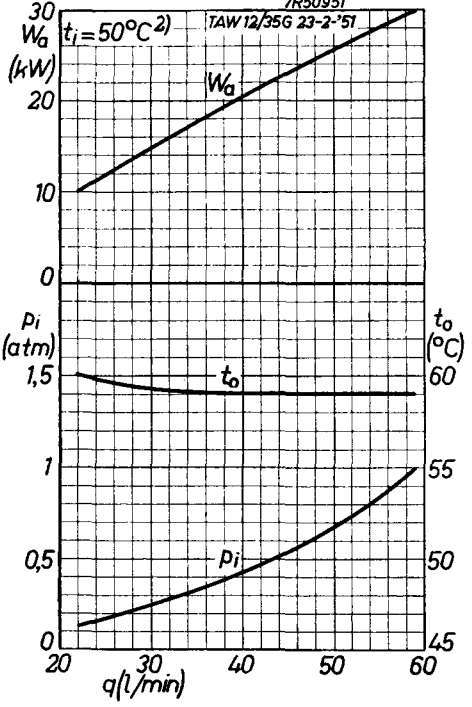
3.3.1951

E

PHILIPS

2) see page 2 ; voir page 2 ; siehe Seite 2



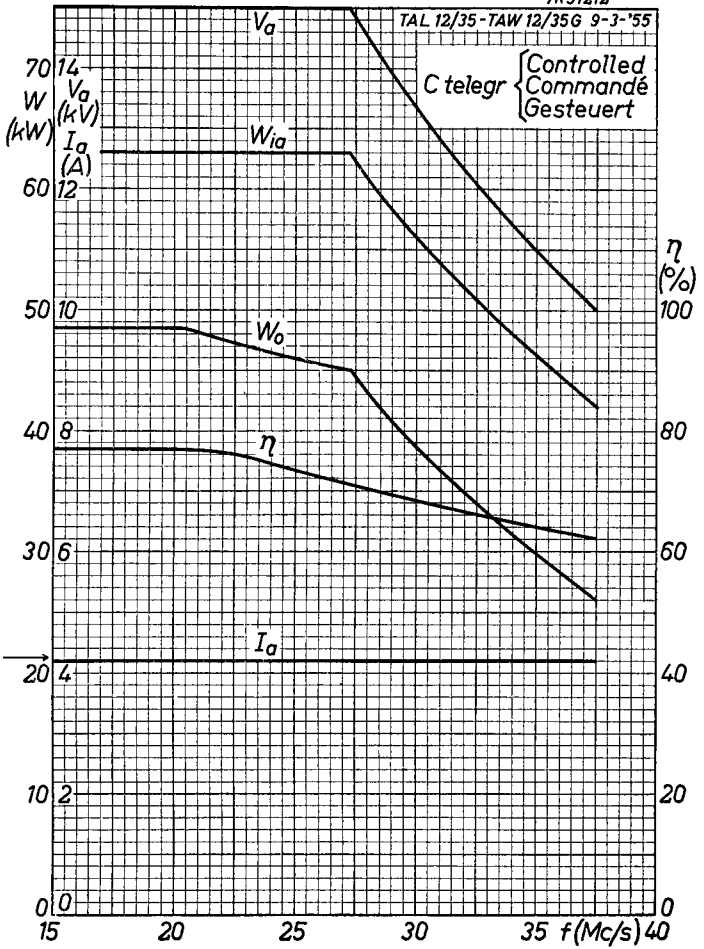


F

PHILIPS **TAW 12/35 G**

7R51212

TAL 12/35-TAW 12/35G 9-3-'55

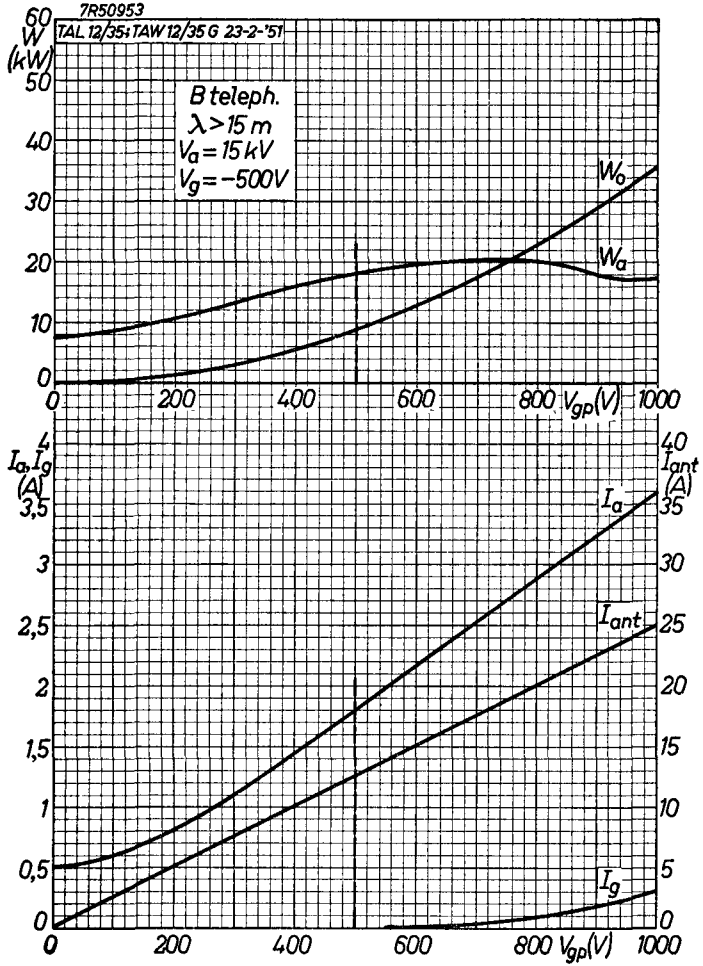


3 3.1955

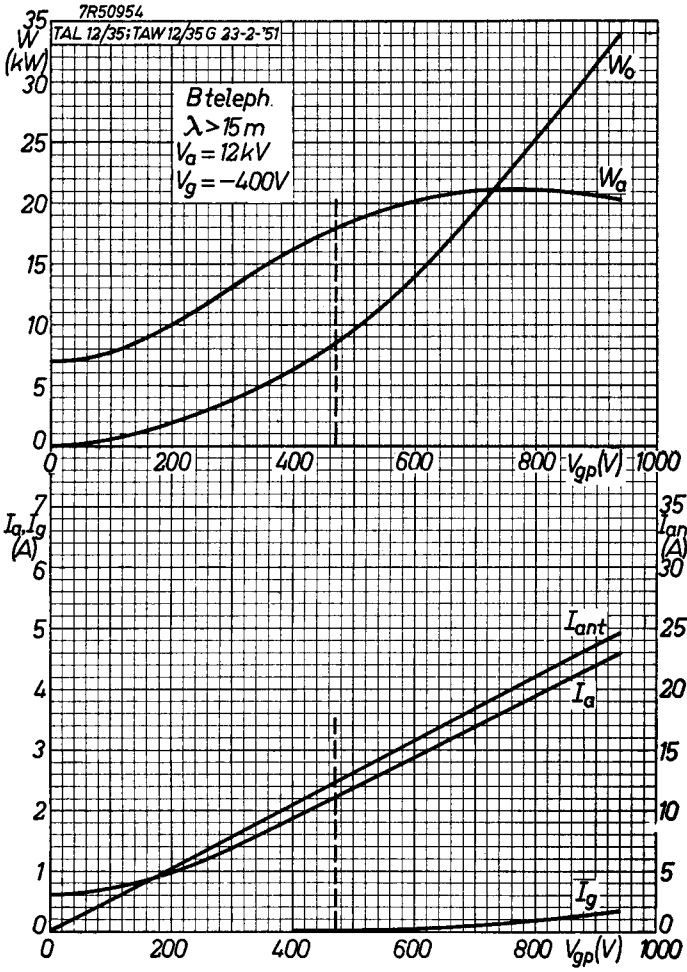
G

TAW 12/35 G

PHILIPS



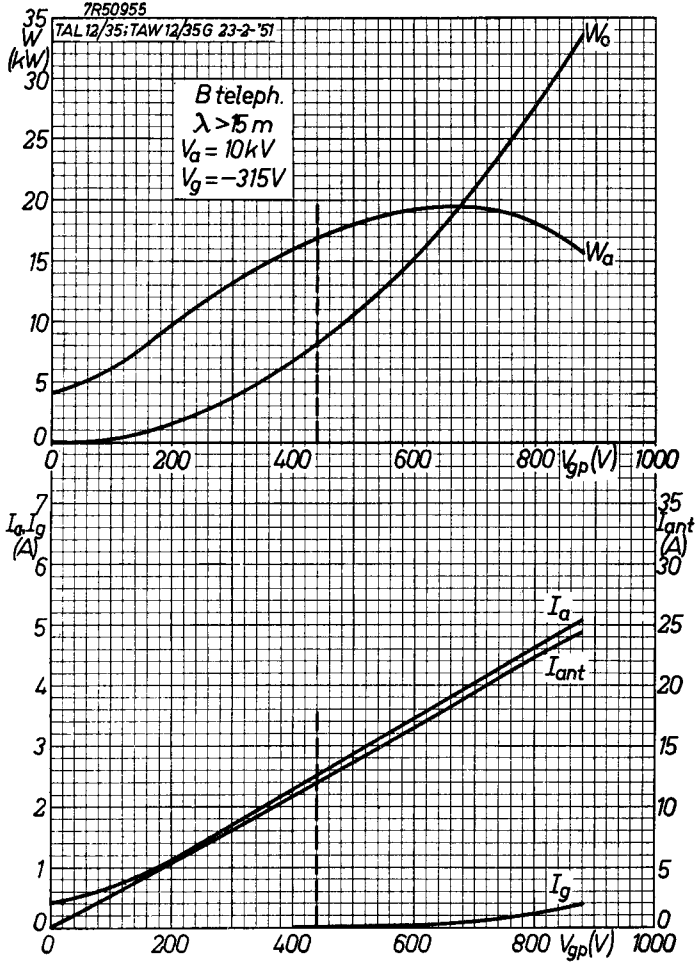
H


7R50954
TAL 12/35; TAW 12/35 G 23-2-'51
W (kW)
B teleph.
λ > 15 m
Va = 12 kV
Vg = −400 V
Wo
Wa
Vgp (V)
Ia, Ig (A)
Iant (A)
Iant
Ia
Ig

3.3.1951

TAW 12/35 G

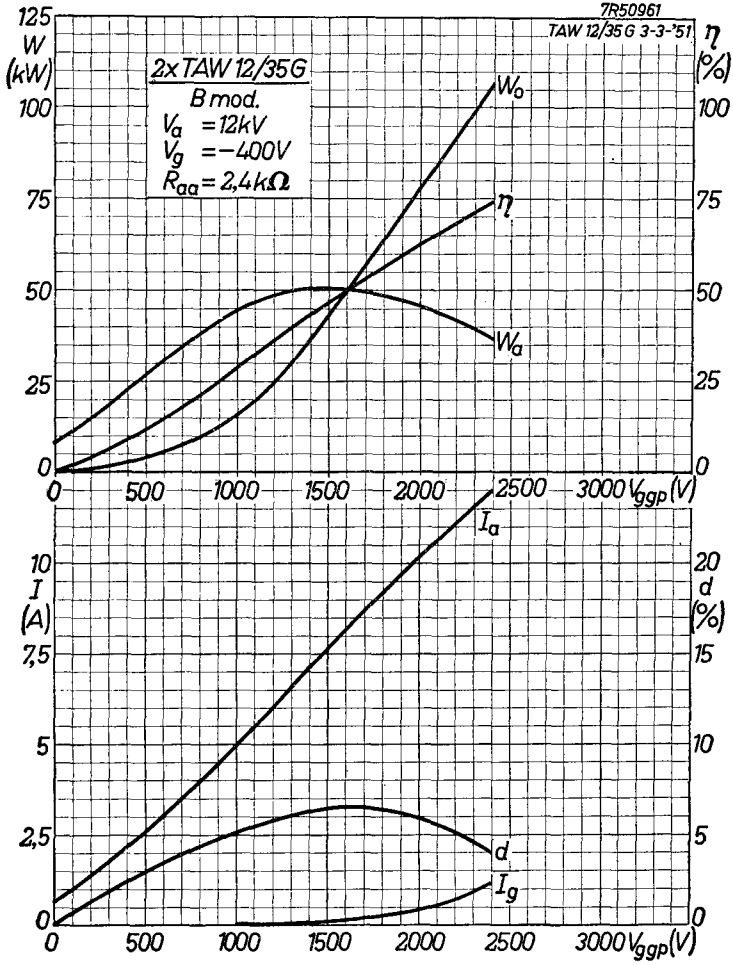
PHILIPS



J

PHILIPS

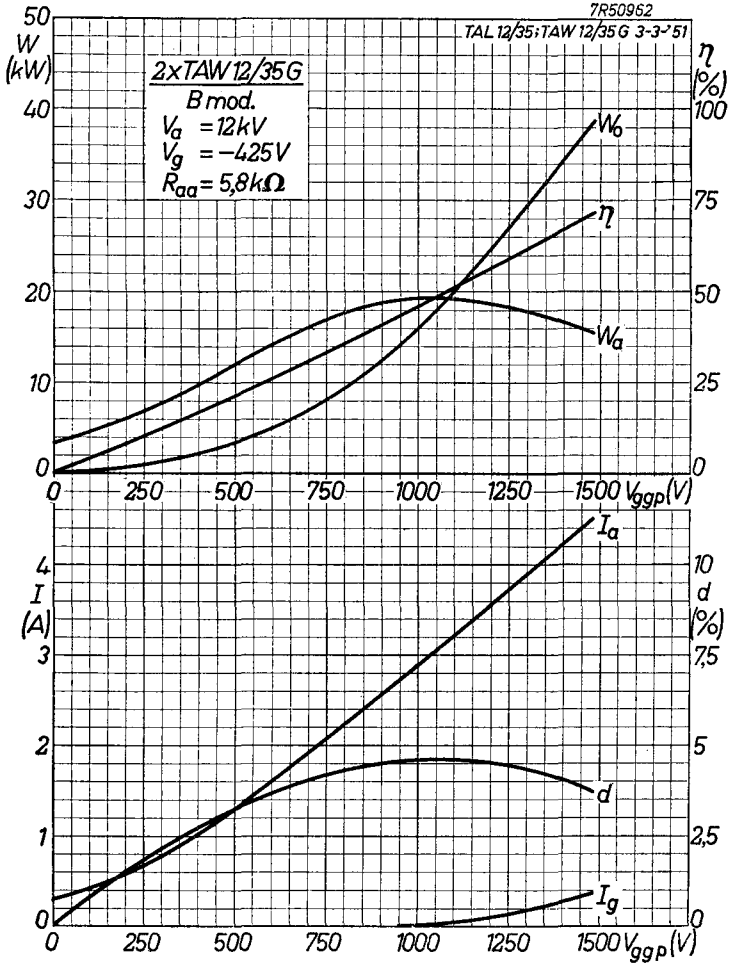
TAW 12/35 G

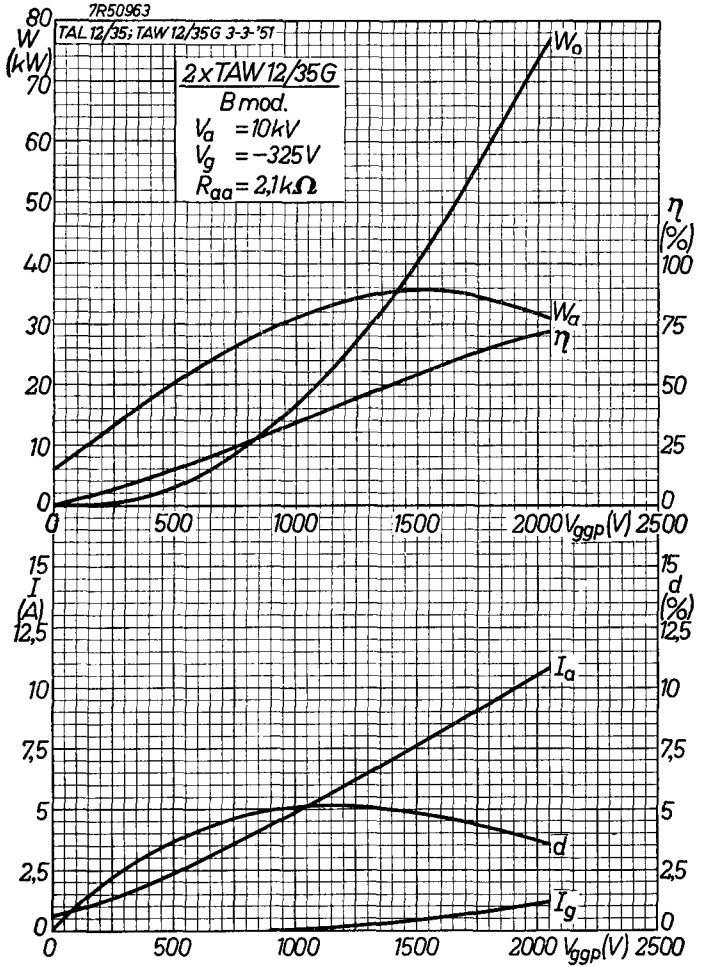


3.3.1951

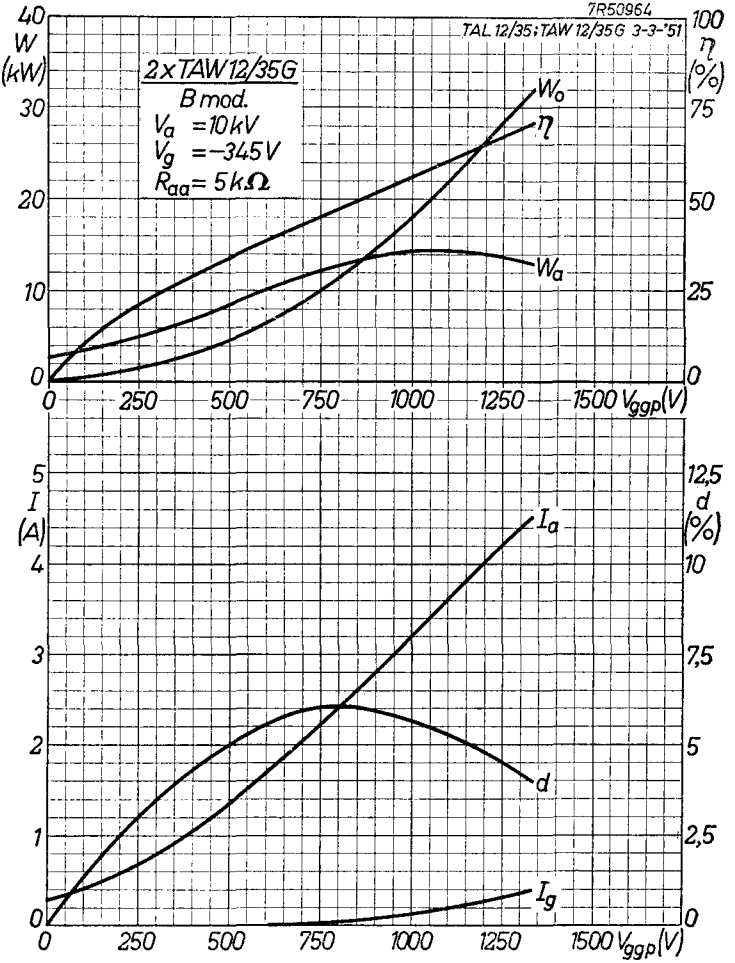
K

PHILIPS


7R50962
TAL 12/35; TAW 12/35 G 3-3-51
2xTAW 12/35 G
B mod.
V_a = 12 kV
V_g = −425 V
R_{aa} = 5,8 kΩ
W (kW)
η (%)
W_o
η
W_a
V_{ggp} (V)
I (A)
d (%)
I_a
d
I_g


7R50963
TAL 12/35; TAW 12/35G 3-3-'51
2 x TAW 12/35 G
B mod.
V_a = 10kV
V_g = −325V
R_{aa} = 2,1kΩ
W (kW)
80
70
60
50
40
30
20
10
0
W_o
W_a
η
η (%)
100
75
50
25
0
0
500
1000
1500
2000
V_{ggp}(V)
2500
I (A)
15
12,5
10
7,5
5
2,5
0
I_a
d
I_g
d (%)
15
12,5
10
7,5
5
2,5
0
0
500
1000
1500
2000
V_{ggp}(V)
2500

PHILIPS


7R50964
TAL 12/35; TAW 12/35 G 3-3-'51
2 x TAW 12/35 G
B mod.
V_a = 10 kV
V_g = −345 V
R_{aa} = 5 kΩ
W (kW)
η (%)
W_o
η
W_a
I_a
d
I_g
I (A)
d (%)
0
250
500
750
1000
1250
1500 V_{ggp} (V)

N

PHILIPS

Electronic Tube

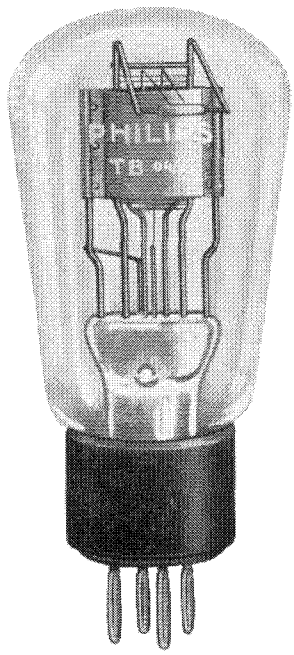
HANDBOOK

TAW12/35G

page	sheet	date
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2	2	1954.07.07
3	3	1954.07.07
4	4	1954.07.07
5	5	1951.03.03
6	6	1951.03.03
7	7	1951.03.03
8	A	1951.03.03
9	B	1951.03.03
10	C	1951.03.03
11	D	1951.03.03
12	E	1951.03.03
13	F	1951.03.03
14	G	1955.03.03
15	H	1955.03.03
16	I	1951.03.03
17	J	1951.03.03
18	K	1951.03.03
19	L	1951.03.03

20	M	1951.03.03
21	N	1951.03.03
22, 23	FP	1999.11.17

PHILIPS AMATEUR-ZENDLAMP TB 04/10



Dit is de amateur-zendlamp bij uitnemendheid. Zij is, dank zij den speciaal geprepareerden gloeidraad, in staat, bij een zeer geringe anodespanning een groote energie af te geven. Zij kan gebruikt worden:

1. Als oscillatorlamp in een zender, zoowel voor de kortste als de langste golven, die practisch gebruikt worden.
2. Als modulatorlamp in een telefoniezender.
3. Als eindversterker in een laagfrequentversterker met luidspreker, wanneer een aanzienlijk geluidsvolume en onvervormde weergave gewenscht wordt, *of in radiocentrales* voor het aansluiten van ten hoogste 100 luidsprekers.
4. Als energieversterker, waarbij de roosterexcitatie verkregen wordt met behulp van een stuurlamp.
5. Als gelijkrichter (diode). Daartoe worden rooster en anode aan elkaar verbonden.

Gebruik als oscillator

In het bijzonder wordt er de aandacht op gevestigd, dat de TB 04/10 met zeer lage anodespanning kan oscilleeren en dat in dergelijke gevallen bij korte golflengten reeds verbindingen over groote afstanden tot stand kunnen worden gebracht; met 220 à 250 V anodespanning kan de opgenomen energie 5 à 10 Watt bedragen.

Bij 400 V anodespanning kan de lekweerstand een waarde hebben van 5000 à 10.000 ohm, afhankelijk van het rendement, dat men wenscht te bereiken.

Bij een hoogere waarde van den lekweerstand wordt het rendement gewoonlijk grooter, echter daalt daarbij de opgenomen energie tevens, zoodat de anodespanning iets verhoogd kan worden.

Bij lagere anodespanning, b.v. 250 V, wordt meer energie aan de antenne afgegeven met een *kleinere* waarde van den lekweerstand. Soms kan de lekweerstand zelfs wel geheel weggelaten worden, echter niet de hoogfrequentsmoorspoel in fig. 1 blz. 8, die in dit geval direct tusschen het rooster en een der gloeidraadpolen geschakeld wordt in serie met den milliampèremeter en de roosterbatterij.

De instelling van de afstemkringen en van de antennekoppeling moet zoodanig zijn, dat de gemiddelde anodestroom een waarde bereikt van 50 à 60 mA bij continu bedrijf (telefonie).

Voor onderbroken bedrijf (telegrafie) mag de anodestroom opgevoerd worden tot 75 mA, *echter nimmer meer.*

Bij juiste instelling zal de roosterstroom 15 à 20 % van den anodestroom bedragen.

Gebruik als eindversterker en modulator

Bij 400 V anodespanning is ca. 27 V roosterspanning noodig.

Bij 250 V anodespanning is ca. 15 V voldoende.

Voor demonstratiedoeleinden kan de TB 04/10 als eindversterker gebruikt worden. Met een anodespanning van 250 V is de TB 04/10 reeds voor dit doel geschikt.

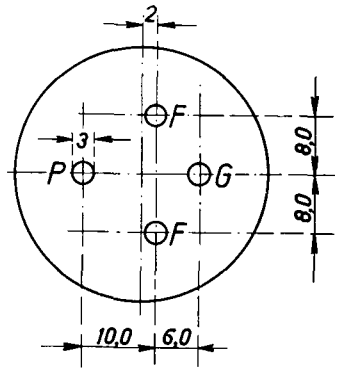
De emissie van den gloeidraad is zoo groot, dat de gloeispanning, bij gebruik van de lamp als eindversterker, meestal zonder bezwaar met een accu van 6 V kan worden verkregen.

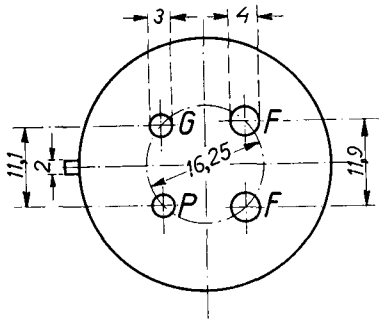
Toepassing als gelijkrichter (diode).

Tot dit doel worden rooster en anode met elkaar verbonden. De gelijkstroom, die maximum bereikt kan worden, bedraagt 50 mA bij een maximale spanning van 400 V. Eén gelijkrichtlamp TB 04/10 is voldoende voor de voeding van een zendlamp TB 04/10.

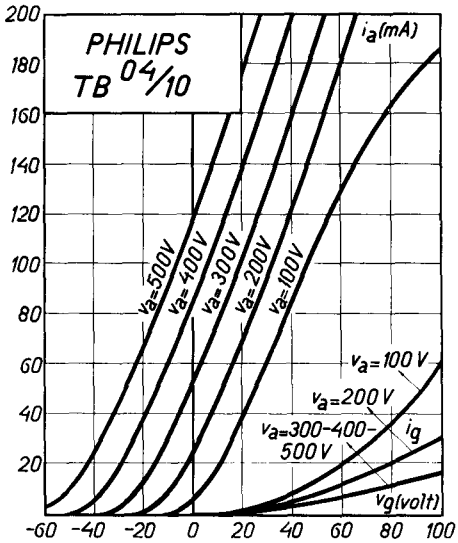
Huls

Het type TB 04/10 is met een normale Philips huls A 34 uitgevoerd. Deze lamp kan echter ook met een Amerikaansche Standaardhuls G 34 geleverd worden.





PHILIPS AMATEUR-ZENDLAMP TB 04/10



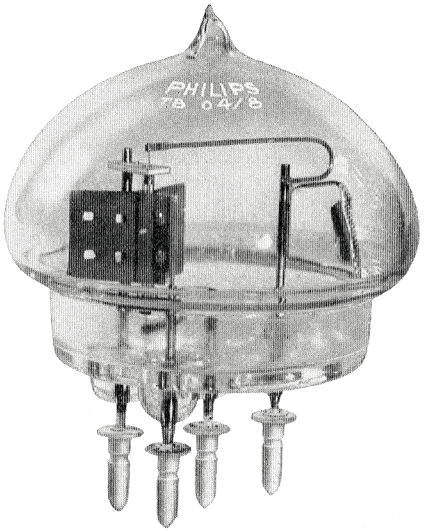
Gloeispanning	v_f	= 6—7,5 V
Gloeistroom	i_f	= ca. 1,25 A
Verzadigingsstroom	i_s	= ca. 500 mA
Anodespanning	v_a	= 220—400 V
Anodedissipatie	W_a	= 10 W
Anodedissipatie beproefd op	W_{at}	= 15 W
Versterkingsfactor	g	= ca. 7,5
Steilheid	S	= ca. 2,0 mA/V
Inwendige weerstand	R_i	= ca. 3750 ohm
Grootste lengte	d	= 56 mm
Grootste diameter	l	= 140 mm

PHILIPS SENDERÖHRE TB 04/8

Diese Sendetriode enthält einen thorierten Wolframheizfaden und wurde nach einem neuartigen Prinzip konstruiert. Die Verluste in der Röhre sind auf ein Mindestmaß zurückgeführt, die gegenseitige Kapazität und Selbstinduktion der Zuführungsleitungen zu den Elektroden äußerst gering.

Die Anschlußstifte sind unmittelbar, ohne Verwendung zusätzlichen Isoliermaterials, mit den Elektrodendurchführungen verbunden. Infolge dieser Konstruktion eignet sich die TB 04/8 zur Verwendung auf Wellenlängen von 5,00 bis 0,50 m hinab. Sie kann in Telephonie- oder Telegraphiesendern als Oszillator- oder H.F.-Verstärkerröhre verwendet werden.

Die Ausgangsleistung und der Wirkungsgrad, die bei verschiedenen Einstellungen mit zwei Röhren in Gegentakt auf einer Wellenlänge von 5 m bei einer Anodenspannung von 400 V erzielt werden können, sind nebenstehender Tabelle zu entnehmen:



PHILIPS EMISSION

Einstellung	Nutzleistung	Wirkungsgrad
H.F.-Klasse C (Telegraphie)	23 W[1])	44%
H.F.-Klasse B (Telephonie)	7,5 W[1])[2])	19%
H.F.-Klasse C (Anodenmodulation)	23 W[1])[2])	46%

Die gesamte Nutzleistung und der Wirkungsgrad einer als selbsterregter Schwingungserzeuger Klasse C geschalteten Röhre TB 04/8 kann man aus tieferstehender Tabelle für verschiedene Wellenlängen ersehen; die Anodenspannung beträgt 400 V.

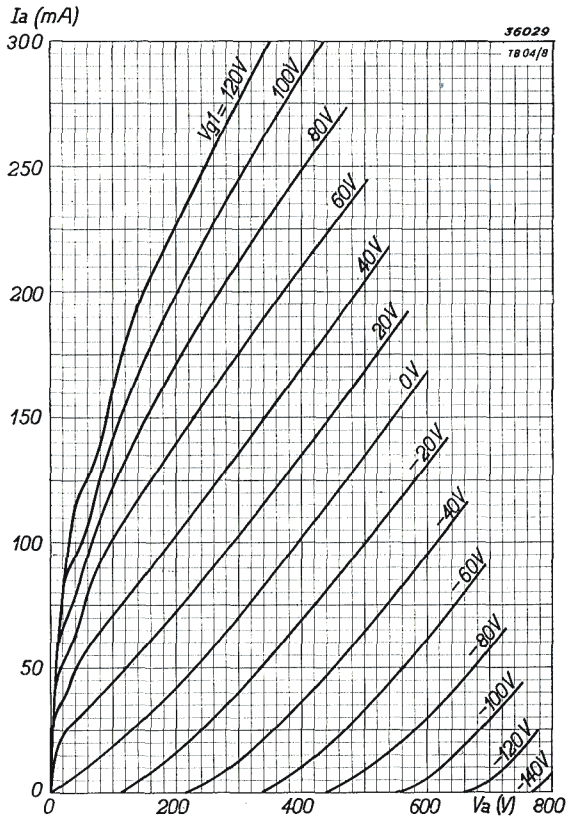
Wellenlänge	Nutzleistung	Wirkungsgrad
1,00 m	9 W[1])	28%
0,80 m	8 W[1])	26%
0,60 m	5 W[1])	17%
0,50 m	2 W[1])	6%

[1]) Kreisverluste sind abzuziehen.
[2]) Ausgangsleistung in der Trägerwelle (max. Modulationstiefe 100%).

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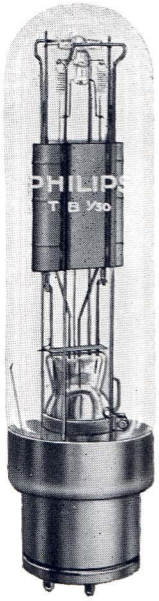
B 3291/1

PHILIPS SENDERÖHRE TB 04/8



Heizspannung	V_f	=	2,0 V
Heizstrom	I_f	=	ca. 3,65 A
Sättigungsstrom	I_s	=	ca. 0,4 A
Anodenspannung	V_a	=	max. 450 V
Höchst zulässiger Anodenverlust	W_a	=	max. 30 W
Geprüfter Anodenverlust	W_{at}	=	33 W
Verstärkungsfaktor	μ	=	ca. 6,5
Steilheit bei $I_a = 50$ mA	S	=	ca. 2,0 mA/V
Maximaler Kathodenstrom	I_k	=	max. 92 mA
Anoden-Kathodenkapazität	C_{ak}	=	ca. 0,8 pF
Gitter-Kathodenkapazität	C_{gk}	=	ca. 1,2 pF
Anoden-Gitterkapazität	C_{ag}	=	ca. 1,9 pF
Maximale Gesamthöhe	l	=	77 mm
Maximaler Durchmesser	d	=	68 mm

PHILIPS SENDERRÖHRE



Grösse 1 : 3

TB 1/50

Die Röhre TB 1/50 hat ebenso wie die TB 04/10 einen thorierten Heizfaden und somit eine sehr hohe Emission. Die normale Anodenspannung beträgt 1000 Volt, aber auch bei 700 Volt ist noch ein guter Wirkungsgrad möglich.

Sie kann verwendet werden:

1) Als Oszillator sowie für Telegraphie als für Telephonie, bis zu 15 Meter Wellenlänge.
2) Als Energieverstärker in einem Sender, wo die Gitter-Erregung mittels einer Steuerröhre erhalten wird.
3) Als Hochleistungs Niederfrequenz-Verstärker, z.B. für eine Grosslautsprecheranlage.
4) Als Gleichrichter.

Als Oszillator in einem Telephoniesender verwendet, kann der Anodenstrom bis zu 125 mA erhöht werden bei einer Anodenspannung von 1000 Volt.

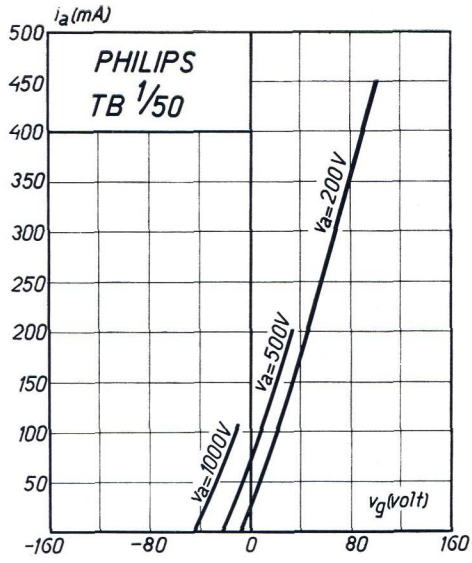
Für unterbrochenen Betrieb (Telegraphie) oder mit niedrigerer Anodenspanning (800 V oder weniger) kann der Anodenstrom bis 150 mA gesteigert werden, keinesfalls jedoch auf einen höheren Wert. Die zugeführte Energie darf nie grösser als 125 Watt sein. Bei einer Anodenspannung von 700 Volt und einem Anodenstrom von 150 mA is die zugeführte Energie 105 Watt. In diesem Falle ist es noch immer möglich, einen guten Wirkungsgrad zu erzielen. Bei Verwendung als Energieverstärker in einem Sender, wobei das Gitter mittels einer Steuerröhre erregt wird, kann eine TB 04/10 (Anodenspannung 400 Volt) zur Erregung des Gitters einer TB 1/50 dienen. Eine TB 1/50 kann zur Erregung der Gitter von 1—3 Röhren TB 2/250 (Anodenspannung 2000 Volt) dienen.

In untenstehender Tabelle ist die Nutzleistung für verschiedene Werte des Wirkungsgrades bei einer Anodenspannung von 1000 V angegeben.

Wirkungsgrad	30	40	50	60	70	%
Zugeführte Leistung . . .	70	83	100	125	125	Watt
Nutzleistung	20	33	50	75	87,5	Watt
Anodenverlust	50	50	50	50	37,5	Watt

PHILIPS SENDERRÖHRE

TB 1/50



Heizspannung	v_f	= **10** V
Heizstrom	i_f	= ca. **3,25** A
Sättigungsstrom	i_s	= ca. **1500** mA
Anodenspannung	v_a	= **700-1000** V
Anodenverlust	w_a	= **50** W
Anodenverlust geprüft auf	w_{at}	= **100** W
Verstärkungsfaktor	g	= ca. **25**
Durchgriff	D	= ca. **4** %
Steilheit	S	= ca. **3** mA/V
Innerer Widerstand	R_i	= ca. **8000** Ω
Grösster Durchmesser	d	= **60** mm
Grösste Länge	l	= **250** mm

PHILIPS

ZENDBUIS

TB 1/60

Deze zendbuis is met een gethoriceerden wolfram gloeidraad uitgerust. De anode en het rooster zijn met twee contactpennen boven op den ballon uitgevoerd, zoodat de capaciteit tusschen gloeidraad, rooster en anode uiterst gering is. De buis is dientengevolge zeer geschikt om op korte of ultrakorte golven te worden gebruikt. Het rendement, dat op verschillende golflengten kan worden verkregen bij gebruik van twee oscillatorbuizen TB 1/60, in push-pull geschakeld en bij



een anodespanning van 1000 V, is in de volgende tabel aangegeven:

Golflengte	10	7	5	3	2	1,5	m
Rendement	69	65	62	53	41	27.5	%

Het afgegeven vermogen en rendement van twee op een golflengte van 5 m werkende zendbuizen TB 1/60 zijn in onderstaande tabel voor verschillende schakelingen vermeld:

Schakeling	Anode-spanning	Afgegeven vermogen	Rendement
H.F. klasse C (telegrafie)	1250 V	145 W[1])	58%
H.F. klasse B (telefonie)	1250 V	39 W[1])[2])	28%
H.F. klasse C (anode-modulatie)	1000 V	114 W[1])[2])	62%

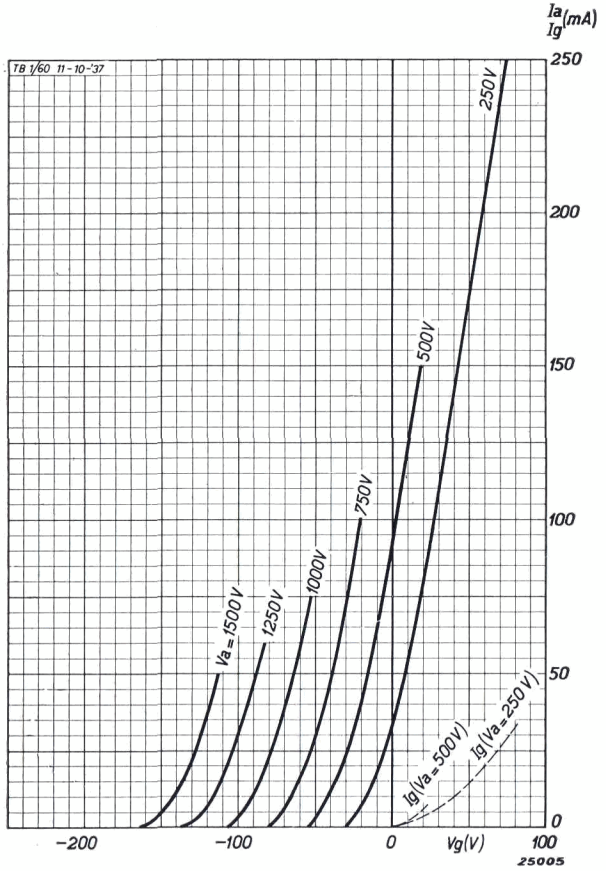
[1]) Kringverliezen moeten worden afgetrokken.

[2]) Afgegeven vermogen in de draaggolf.

PHILIPS

ZENDBUIS

TB 1/60



Gloeispanning	V_f	=	7,5 V
Gloeistroom	I_f	=	ca. 3,25 A
Verzadigingsstroom	I_s	=	ca. 1,5 A
Anodespanning	V_a	=	max. 1250 V
Anodedissipatie	W_a	=	max. 50 W
Anodedissipatie tijdens meting	W_{at}	=	60 W
Versterkingsfactor	μ	=	ca. 10,5
Steilheid bij I_a = 62,5 mA	S	=	ca. 2,0 mA/V
Grootste steilheid	S_{max}	=	ca. 3,5 mA/V
Inwendige weerstand bij I_a = 62,5 mA	R_i	=	ca. 5250 Ω
Max. kathodestroom	I_k	=	max. 120 mA
Anode/kathode capaciteit	C_{af}	=	ca. 0,75 pF
Stuurrooster/kathode capaciteit	C_{gf}	=	ca. 2,2 pF
Anode/stuurrooster capaciteit	C_{ag}	=	ca. 2,8 pF
Max. diameter	d	=	72 mm
Max. totale lengte	l	=	173 mm

PHILIPS SENDERÖHRE TB 1/60

Diese Triode ist mit einem thorierten Wolframheizfaden versehen. Die Anode und das Gitter sind mit zwei Kontaktstiften oben auf dem Kolben verbunden, so daß die Selbstinduktion der Gitter- und Anodenleitungen in der Röhre und die innere Kapazität äußerst gering sind. Die Röhre eignet sich demzufolge hervorragend zum Gebrauch auf Kurz- und Ultrakurzwellen.

Die TB 1/60 kann als H.F.-Verstärker- oder Oszillatorröhre in Telegraphie- oder Telephoniesendern auf Wellenlängen bis zu 1 m herab verwendet werden. Die auf verschiedenen Wellenlängen höchstzulässigen Anodenspannungen sind in der nachstehenden Tabelle angegeben:



Wellenlänge	2,5 m und höher	1,6 m	1 m
Höchstzulässige Anodenspannung	1250 V	900 V	650 V

Die gesamte Nutzleistung und der Wirkungsgrad von zwei in verschiedenen Einstellungen auf einer Wellenlänge von 5 m arbeitenden Röhren TB 1/60 sind in der nachstehenden Tabelle zusammengestellt.

Einstellung	Anodenspannung	Nutzleistung	Wirkungsgrad
H.F.-Klasse C (Telegraphie)	1250 V	145 W[1])	58%
H.F.-Klasse B (Telephonie)	1250 V	39 W[1])[2])	28%
H.F.-Klasse C (Anodenspannungsmodulation)	1000 V	114 W[1])[2])	62%

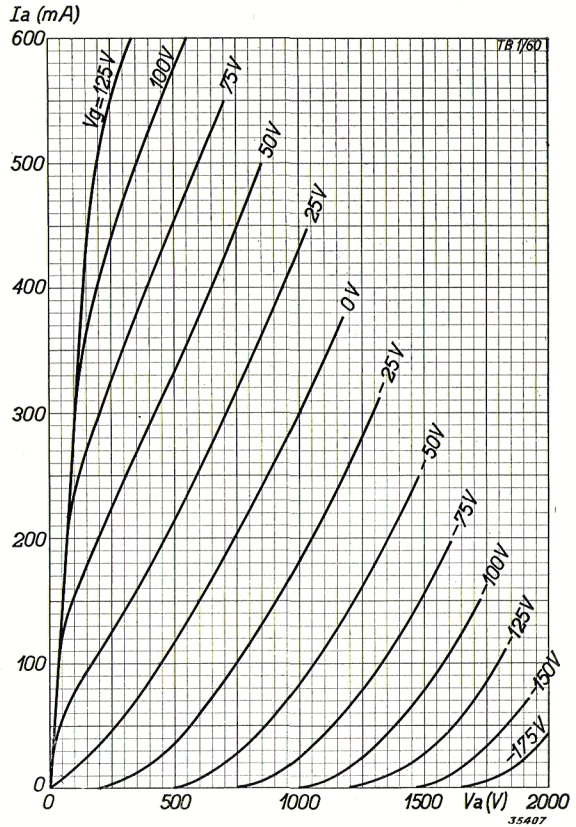
[1]) Kreisverluste sind abzuziehen.
[2]) Nutzleistung in der Trägerwelle (max. Modulationstiefe 100%).

PHILIPS EMISSION

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B 3381/1

PHILIPS SENDERÖHRE TB 1/60



Heizspannung	V_f	=	7,5 V
Heizstrom	I_f	=	ca. 3,25 A
Sättigungsstrom	I_s	=	ca. 1,5 A
Anodenspannung	V_a	=	max. 1250 V
Höchstzulässiger Anodenverlust	W_a	=	max. 50 W
Geprüfter Anodenverlust	W_{at}	=	60 W
Verstärkungsfaktor	μ	=	ca. 10,5
Steilheit bei $V_a = 1250$ V, $I_a = 62{,}5$ mA	S	=	ca. 2,3 mA/V
Höchstzulässiger Kathodenstrom	I_k	=	max. 120 mA
Anoden/Kathodenkapazität	C_{ak}	=	ca. 0,75 pF
Gitter/Kathodenkapazität	C_{gk}	=	ca. 2,2 pF
Anoden/Gitterkapazität	C_{ag}	=	ca. 2,8 pF
Maximale Gesamtlänge	l	=	173 mm
Maximaler Durchmesser	d	=	72 mm

PHILIPS EMISSION

RF POWER TRIODE

QUICK REFERENCE DATA									
λ (m)	Freq. (MHz)	C telegr.		C osc.		B teleph.		C_a mod.	
		V_a (V)	W_o (W)	V_a (V)	W_o (W)	V_a (V)	W_o (W)	V_a (V)	W_o (W)
4	75	2500	390			2500	65	2000	204
		2000	295			2000	64	1500	153
		1500	210			1500	59	1000	95
		1000	126						
2	150			2500	376				
				2000	282				
1.5	200			2000	198				

HEATING: direct; filament thoriated tungsten

Filament voltage	V_f	= 6.3	V
Filament current	I_f	= 5.4	A

CAPACITANCES

Anode to all other elements except grid	C_a	= 0.1	pF
Grid to all other elements except anode	C_g	= 4.3	pF
Anode to grid	C_{ag}	= 5.2	pF

TYPICAL CHARACTERISTICS

Amplification factor	μ	= 25	
Mutual conductance	S (I_a = 44 mA)	= 2.8	mA/V

COOLING: radiation/low-velocity air flow

It is necessary to direct a low-velocity air flow to the bottom and the top seal if the tube is used at or near the limiting values at frequencies above 50 MHz .

LIMITING VALUES

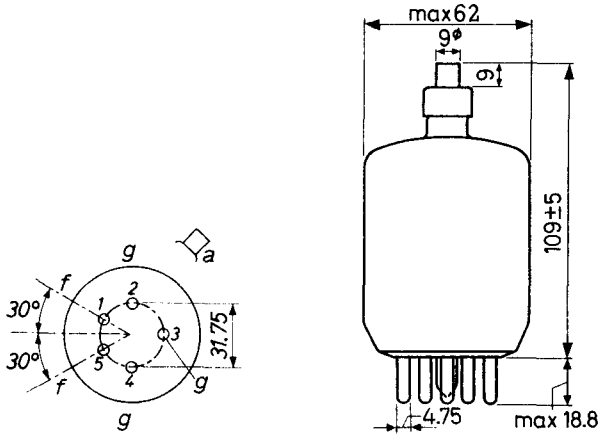
Absolute maximum rating system

Anode voltage	V_a	max.	2500 V
Anode dissipation*	W_a	max.	135 W
Grid dissipation	W_g	max.	16 W
Grid circuit resistance with fixed grid bias	R_g	max.	0,1 MΩ
Grid circuit resistance with automatic grid bias	R_g	max.	0,2 MΩ
Cathode current	I_k	max.	250 mA
Peak cathode current	I_{kp}	max.	1,6 A
Temperature of anode seal		max.	220 °C
Bottom temperature		max.	180 °C

MECHANICAL DATA

Base	giant 5 p
Anode connector	40624
Socket	2422 512 01001
Socket with grounded grid connections	40215/01
Net mass	110 g

Dimensions in mm



Mounting position: vertical with base up or down

Fig. 1 Mechanical outline.

* Anode red hot, temperature = 850 °C.

OPERATING CONDITIONS RF CLASS C TELEGRAPHY

Wavelength	λ	=	4	4	4	4	m
Anode voltage	V_a	=	2500	2000	1500	1000	V
Grid voltage	V_g	=	-200	-150	-110	-80	V
Anode current	I_a	=	205	205	205	205	mA
Grid current	I_g	=	40	40	40	40	mA
Peak grid AC voltage	V_{gp}	=	390	340	300	260	V
Grid input power	W_{ig}	=	14	13	11	10	W
Anode input power	W_{ia}	=	512	410	308	205	W
Anode dissipation	W_a	=	122	115	98	79	W
Output power	W_o	=	390	295	210	126	W
Efficiency	η	=	76	72	68	61.5	%

OPERATING CONDITIONS RF CLASS B TELEPHONY

Wavelength	λ	=	4	4	4	m
Anode voltage	V_a	=	2500	2000	1500	V
Grid voltage	V_g	=	-87	-67	-45	V
Anode current	I_a	=	77	97	120	mA
Peak grid AC voltage	V_{gp}	=	100	100	100	V
Anode input power	W_{ia}	=	193	194	180	W
Anode dissipation	W_a	=	128	130	121	W
Output power	W_o	=	65	64	59	W
Efficiency	η	=	34	33	33	%
Modulation depth	m	=	100	100	100	%
Grid current	I_g	=	20	28	52	mA
Grid input power	W_{ig}	=	3.6	5.1	9.4	W

OPERATING CONDITIONS RF CLASS C ANODE MODULATION; two tubes

Wavelength	λ	=	4	4	4	m
Anode voltage	V_a	=	2000	1500	1000	V
Grid voltage	V_g	=	−225	−180	−130	V
Anode current	I_a	=	255	255	255	mA
Grid current	I_g	=	80	80	80	mA
Peak grid AC voltage	V_{gp}	=	415	370	320	V
Grid input power	W_{ig}	=	30	27	23	W
Anode input power	W_{ia}	=	510	382	255	W
Anode dissipation	W_a	=	102	76	65	W
Output power	W_o	=	408	306	190	W
Efficiency	η	=	80	80	74.5	%
Modulation depth	m	=	100	100	100	%
Modulation power	W_{mod}	=	255	191	126	W

OPERATING CONDITIONS AS RF CLASS C OSCILLATOR; two tubes

Wavelength	λ	=	2	2	1.5	m
Anode voltage	V_a	=	2500	2000	2000	V
Anode current	I_a	=	410	410	346	mA
Grid current	I_g	=	80	80	80	mA
Grid resistor	R_g	=	2500	1875	1875	Ω
Anode input power	W_{ia}	=	1025	820	692	W
Anode dissipation	W_a	=	245	230	270	W
Grid input power	W_{ig}	=	28	26	26	W
Output power	W_o	=	752	564	396	W
Efficiency	η	=	73	69	57	%

OPERATING CONDITIONS AS RF CLASS C OSCILLATOR for high frequency heating and diathermy generators

A. With anode voltage from single-phase full-wave rectifier without filter

Wavelength	λ	=	7.3	m
Anode voltage	V_a	=	2000	V [1]
Anode current	I_a	=	170	mA
Grid current	I_g	=	34	mA
Grid resistor	R_g	=	3750	Ω
Anode input power	W_{ia}	=	420	W
Anode dissipation	W_a	=	120	W
Grid input power	W_{ig}	=	10	W
Output power	W_o	=	290	W
Efficiency	η	=	69	%

B. With anode and grid alternating voltage. Phase-shift of 180^o between V_a and V_g

Wavelength	λ	=	7.3	m
Anode voltage	V_a	=	2500	V_{RMS}
Anode current	I_a	=	90	mA
Grid current	I_g	=	20	mA
Grid resistor	R_g	=	1700	Ω
Grid voltage	V_g	=	85	V_{RMS}
Anode input power	W_{ia}	=	255	W
Anode dissipation	W_a	=	85	W
Output power	W_o	=	170	W
Efficiency	η	=	67	%

[1]) Mean value

OPERATING CONDITIONS RF CLASS C TELEGRAPHY

grounded grid, two tubes

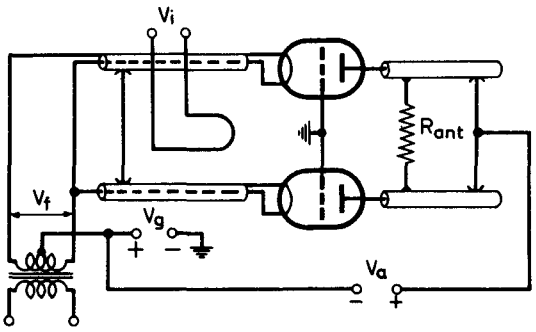


Fig. 2 Grounded-grid configuration.

Wavelength	λ	=	3	3	3	3	m
Anode voltage	V_a	=	2500	2000	1500	1000	V
Grid voltage	V_g	=	−200	−150	−110	−80	V
Anode current	I_a	=	410	410	410	410	mA
Grid current	I_g	=	80	80	80	80	mA
Peak grid AC voltage	V_{gp}	=	390	340	300	260	V
Grid input power	W_{ig}	=	158	136	118	100	W
Anode input power	W_{ia}	=	1025	820	615	410	W
Anode dissipation	W_a	=	245	230	195	158	W
Output power	W_o	=	780+130	590+110	420+96	252+80	W[1]
Efficiency	η	=	76	72	68	61.5	%[2]

1) Power transferred from driving stage included

2) Pure tube efficiency

AF CLASS B AMPLIFIER AND MODULATOR

LIMITING VALUES (Absolute limits)

Anode voltage	V_a	=	max.	2500	V
Anode dissipation	W_a	=	max.	135	W
Grid dissipation	W_g	=	max.	16	W
Cathode current	I_k	=	max.	250	mA
Peak cathode current	I_{kp}	=	max.	1.6	A

OPERATING CONDITIONS, two tubes

Anode voltage	V_a	=	2500		2000		V
Grid voltage	V_g	=	-86		-65		V
Load resistance	$R_{aa\sim}$	=	18.2		12.0		kΩ
Peak grid to grid voltage	V_{ggp}	=	0	412	0	394	V
Anode current	I_a	=	2x30	2x178	2x30	2x208	mA
Grid current	I_g	=	0	2x42	0	2x42	mA
Grid input power	W_{ig}	=	0	2x7.8	0	2x7.3	W
Anode input power	W_{ia}	=	2x75	2x445	2x60	2x416	W
Anode dissipation	W_a	=	2x75	2x95	2x60	2x101	W
Output power	W_o	=	0	700	0	630	W
Total harmonic distortion	d_{tot}	=	-	5.0	-	3.7	%
Efficiency	η	=	-	78.5	-	76	%

Anode voltage	V_a	=	1500		1000		V
Grid voltage	V_g	=	-46		-23		V
Load resistance	$R_{aa\sim}$	=	8.5		5.0		kΩ
Peak grid to grid voltage	V_{ggp}	=	0	340	0	295	V
Anode current	I_a	=	2x30	2x210	2x30	2x210	mA
Grid current	I_g	=	0	2x40	0	2x40	mA
Grid input power	W_{ig}	=	0	2x6.1	0	2x5.4	W
Anode input power	W_{ia}	=	2x45	2x315	2x30	2x210	W
Anode dissipation	W_a	=	2x45	2x90	2x30	2x73	W
Output power	W_o	=	0	450	0	274	W
Total harmonic distortion	d_{tot}	=	-	2.9	-	2.2	%
Efficiency	η	=	-	71.5	-	65	%

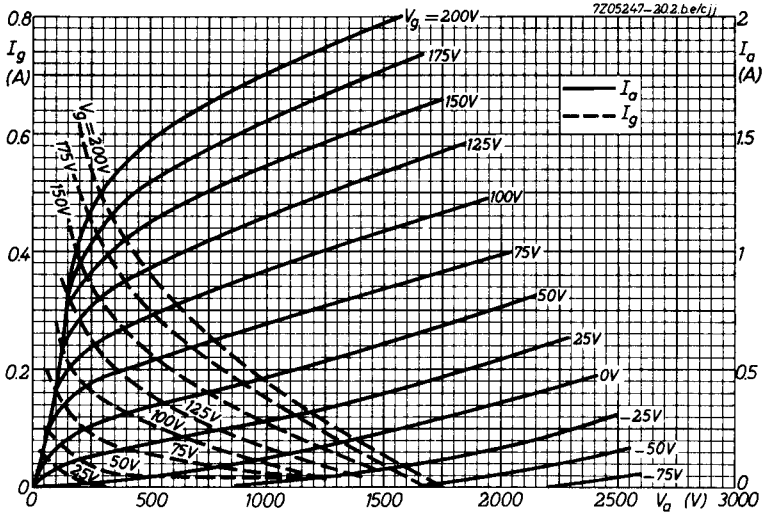


Fig. 3
I_a/I_g characteristics.

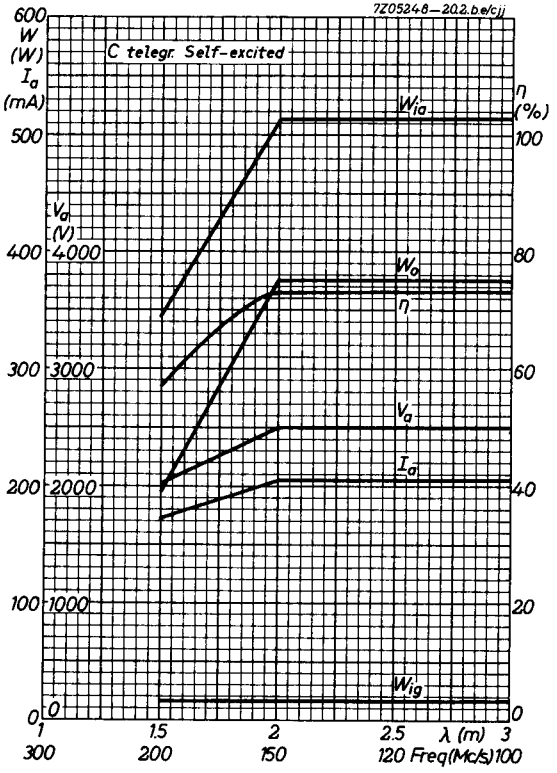


Fig. 4
Characteristics at frequencies above 150 MHz.

PHILIPS

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Electronic components and materials

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9	FP	2000.09.14

RF POWER TRIODE

QUICK REFERENCE DATA

λ (m)	Freq. (MHz)	C telegr.		C grounded grid		B teleph.		C_a mod.	
		V_a (V)	W_o (W)	V_a (V)	W_o (W)	V_a (V)	W_o (W)	V_a (V)	W_o (W)
2	150	2500	390			2500	65		
		2000	295			2000	64	2000	205
		1500	210			1500	59	1500	154
		1000	126					1000	96
3	100			2500	910				
				2000	700				
				1500	516				
				1000	332				

λ (m)	Freq. (MHz)	C osc. industrial				B mod. two tubes	
		V_a ⎓ (V)	W_o (W)	V_a ~ (V)	W_o (W)	V_a (V)	W_o (W)
6	50	2000	290	2500	170	2500	700
						1000	274

HEATING: direct; filament thoriated tungsten

Filament voltage	V_f	=	6.3 V
Filament current	I_f	=	5.8 A

CAPACITANCES

Anode to all other elements except grid	C_a	=	0.1	pF
Grid to all other elements except anode	C_g	=	4.9	pF
Anode to grid	C_{ag}	=	5.0	pF

TYPICAL CHARACTERISTICS

Anode voltage	V_a	=	2500	V
Anode current	I_a	=	60	mA
Amplification factor	μ	=	25	
Mutual conductance	S	=	2.8	mA/V

TEMPERATURE LIMITS

Absolute maximum rating system

Temperature of anode seal	=	max.	220 °C
Bottom temperature	=	max.	180 °C

It is recommended to direct a low-velocity air flow on bottom and top seal if the tube is used at or near the limiting values at frequencies above 50 MHz.

MECHANICAL DATA

Base	giant 5 p
Socket	2422 512 01001
Anode connector	40624
Net mass	125 g

Dimensions in mm

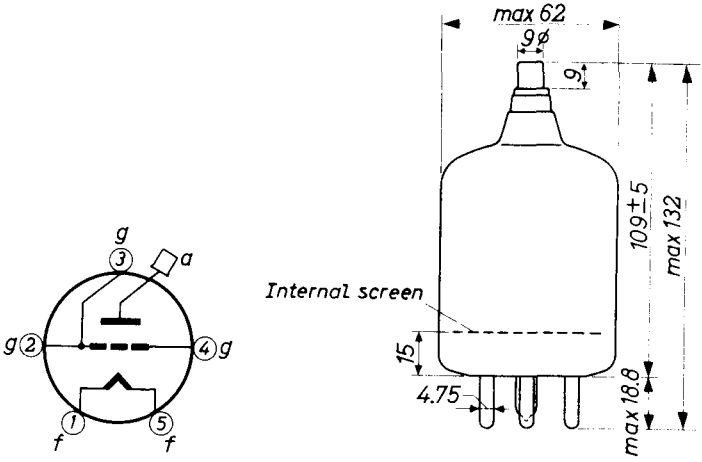


Fig. 1 Mechanical outline.

Mounting position vertical with base up or down

COOLING

Radiation/low-velocity air flow.

RF CLASS C TELEGRAPHY

LIMITING VALUES (Absolute limits)

Frequency					MHz
	f		up to	150	MHz
Anode voltage	V_a	=	max.	3000	V
Anode current	I_a	=	max.	255	mA
Anode dissipation	W_a	=	max.	150	W
Anode input power	W_{ia}	=	max.	512	W
Negative grid voltage	$-V_g$	=	max.	300	V
Grid current	I_g	=	max.	45	mA
Grid circuit resistance with fixed grid bias	R_g	=	max.	0.1	MΩ
Grid circuit resistance with automatic grid bias	R_g	=	max.	0.2	MΩ

OPERATING CONDITIONS

Frequency	f	=	150	150	150	150	MHz
Anode voltage	V_a	=	2500	2000	1500	1000	V
Grid voltage	V_g	=	-200	-150	-110	-80	V
Anode current	I_a	=	205	205	205	205	mA
Grid current	I_g	=	40	40	40	40	mA
Peak grid AC voltage	V_{gp}	=	390	340	300	260	V
Grid input power	W_{ig}	=	14	13	11	10	W
Anode input power	W_{ia}	=	512	410	308	205	W
Anode dissipation	W_a	=	122	115	98	79	W
Output power	W_o	=	390	295	210	126	W
Efficiency	η	=	76	72	68	61.5	%

RF CLASS B TELEPHONY

LIMITING VALUES (Absolute limits)

Frequency					
	f		up to	150	MHz
Anode voltage	V_a	=	max.	3000	V
Anode current	I_a	=	max.	170	mA
Anode dissipation	W_a	=	max.	150	W
Anode input power	W_{ia}	=	max.	200	W
Grid current	I_g	=	max.	55	mA
Grid circuit resistance with fixed grid bias	R_g	=	max.	0.1	MΩ
Grid circuit resistance with automatic grid bias	R_g	=	max.	0.2	MΩ

OPERATING CONDITIONS

Frequency	f	=	150	150	150	MHz
Anode voltage	V_a	=	2500	2000	1500	V
Grid voltage	V_g	=	-87	-67	-45	V
Anode current	I_a	=	77	97	120	mA
Peak grid AC voltage	V_{gp}	=	100	100	100	V
Anode input power	W_{ia}	=	193	194	180	W
Anode dissipation	W_a	=	128	130	121	W
Output power	W_o	=	65	64	59	W
Efficiency	η	=	34	33	33	%
Modulation factor	m	=	100	100	100	%
Grid current	I_g	=	20	28	52	mA
Grid input power	W_{ig}	=	3.6	5.1	9.4	W

RF CLASS C ANODE MODULATION

LIMITING VALUES (Absolute limits)

Frequency		f		up to	150	MHz
Anode voltage		V_a	=	max.	2400	V
Anode current		I_a	=	max.	170	mA
Anode dissipation		W_a	=	max.	100	W
Anode input power		W_{ia}	=	max.	340	W
Negative grid voltage		$-V_g$	=	max.	300	V
Grid current		I_g	=	max.	45	mA
Grid circuit resistance with fixed grid bias		R_g	=	max.	0.1	MΩ
Grid circuit resistance with automatic grid bias		R_g	=	max.	0.2	MΩ

OPERATING CONDITIONS

Frequency	f	=	150	150	150	MHz
Anode voltage	V_a	=	2000	1500	1000	V
Grid voltage	V_g	=	−225	−180	−130	V
Anode current	I_a	=	128	128	128	mA
Grid current	I_g	=	40	40	40	mA
Peak grid AC voltage	V_{gp}	=	415	370	320	V
Grid input power	W_{ig}	=	15	14	12	W
Anode input power	W_{ia}	=	256	192	128	W
Anode dissipation	W_a	=	51	38	32	W
Output power	W_o	=	205	154	96	W
Efficiency	η	=	80	80	75	%
Modulation factor	m	=	100	100	100	%
Modulation power	W_{mod}	=	128	96	64	W

RF CLASS C TELEGRAPHY, grounded grid

LIMITING VALUES (Absolute limits)

Frequency	f		up to	150	MHz
Anode voltage	V_a	=	max.	3000	V
Anode current	I_a	=	max.	205	mA
Anode dissipation	W_a	=	max.	150	W
Anode input power	W_{ia}	=	max.	512	W
Negative grid voltage	$-V_g$	=	max.	300	V
Grid current	I_g	=	max.	45	mA
Grid circuit resistance with fixed grid bias	R_g	=	max.	0.1	MΩ
Grid circuit resistance with automatic grid bias	R_g	=	max.	0.2	MΩ

OPERATING CONDITIONS, two tubes

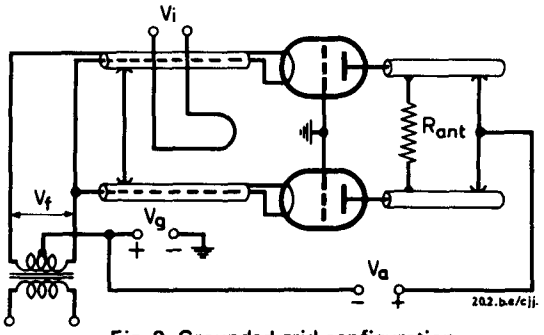


Fig. 2 Grounded grid configuration.

Frequency	f	=	100	100	100	100	MHz
Anode voltage	V_a	=	2500	2000	1500	1000	V
Grid voltage	V_g	=	−200	−150	−110	−80	V
Anode current	I_a	=	410	410	410	410	mA
Grid current	I_g	=	80	80	80	80	mA
Peak grid A.C. voltage	V_{gp}	=	390	340	300	260	V
Grid input power	W_{ig}	=	158	136	118	100	W
Anode input power	W_{ia}	=	1025	820	615	410	W
Anode dissipation	W_a	=	245	230	195	158	W
Output power	W_o	=	780+130	590+110	420+96	252+80	W [1]
Efficiency	η	=	76	72	68	61.5	% [2]

1) Power transferred from driving stage included
2) Pure tube efficiency

RF CLASS C OSCILLATOR for high-frequency heating and diathermy generators, with anode voltage from single-phase full-wave rectifier without filter

LIMITING VALUES (Absolute limits)

Frequency	f		up to	150	MHz
Anode voltage	V_a	=	max.	2700	V [1]
Anode current	I_a	=	max.	180	mA
Anode dissipation	W_a	=	max.	150	W
Anode input power	W_{ia}	=	max.	512	W
Negative grid voltage	$-V_g$	=	max.	300	V
Grid current	I_g	=	max.	40	mA
Grid circuit resistance with fixed grid bias	R_g	=	max.	0.1	MΩ
Grid circuit resistance with automatic grid bias	R_g	=	max.	0.2	MΩ

OPERATING CONDITIONS

Frequency	f	=	50	MHz
Anode voltage	V_a	=	2000	V [1]
Anode current	I_a	=	170	mA
Grid current	I_g	=	34	mA
Grid resistor	R_g	=	3750	Ω
Anode input power	W_{ia}	=	420	W
Anode dissipation	W_a	=	120	W
Grid input power	W_{ig}	=	10	W
Output power	W_o	=	290	W
Efficiency	η	=	69	%

[1]) Mean value

RF CLASS C OSCILLATOR for industrial use with self-rectification. Phase shift of 180° between V_a and V_g

LIMITING VALUES (Absolute limits)

Frequency					
	f		up to	150	MHz
Anode voltage	V_a	=	max.	2825	V_{RMS}
Anode current	I_a	=	max.	110	mA
Anode dissipation	W_a	=	max.	150	W
Anode input power	W_{ia}	=	max.	340	W
Negative grid voltage	$-V_g$	=	max.	300	V
Grid current	I_g	=	max.	35	mA
Grid circuit resistance with fixed grid bias	R_g	=	max.	0.1	MΩ
Grid circuit resistance with automatic grid bias	R_g	=	max.	0.2	MΩ

OPERATING CONDITIONS

Frequency	f	=	50	MHz
Anode voltage	V_a	=	2500	V_{RMS}
Anode current	I_a	=	90	mA
Grid current	I_g	=	20	mA
Grid resistor	R_g	=	1700	Ω
Grid voltage	V_g	=	85	V_{RMS}
Anode input power	W_{ia}	=	255	W
Anode dissipation	W_a	=	85	W
Output power	W_o	=	170	W
Efficiency	η	=	67	%

AF CLASS B AMPLIFIER AND MODULATOR

LIMITING VALUES (Absolute limits)

Anode voltage	V_a	= max.	3000	V
Anode current	I_a	= max.	210	mA
Anode dissipation	W_a	= max.	150	W
Anode input power	W_{ia}	= max.	512	W
Grid current	I_g	= max.	45	mA

OPERATING CONDITIONS, two tubes

Anode voltage	V_a	=	2500		1000		V
Grid voltage	V_g	=	-86		-23		V
Load resistance	$R_{aa\sim}$	=	18.2		5.0		kΩ
Peak grid to grid voltage	V_{ggp}	=	0	412	0	295	V
Anode current	I_a	=	2x30	2x178	2x30	2x210	mA
Grid current	I_g	=	0	2x42	0	2x40	mA
Grid input power	W_{ig}	=	0	2x7.8	0	2x5.4	W
Anode input power	W_{ia}	=	2x75	2x445	2x30	2x210	W
Anode dissipation	W_a	=	2x75	2x95	2x30	2x73	W
Output power	W_o	=	0	700	0	274	W
Total harmonic distortion	d_{tot}	=	-	5.0	-	2.2	%
Efficiency	η	=	-	78.5	-	65	%

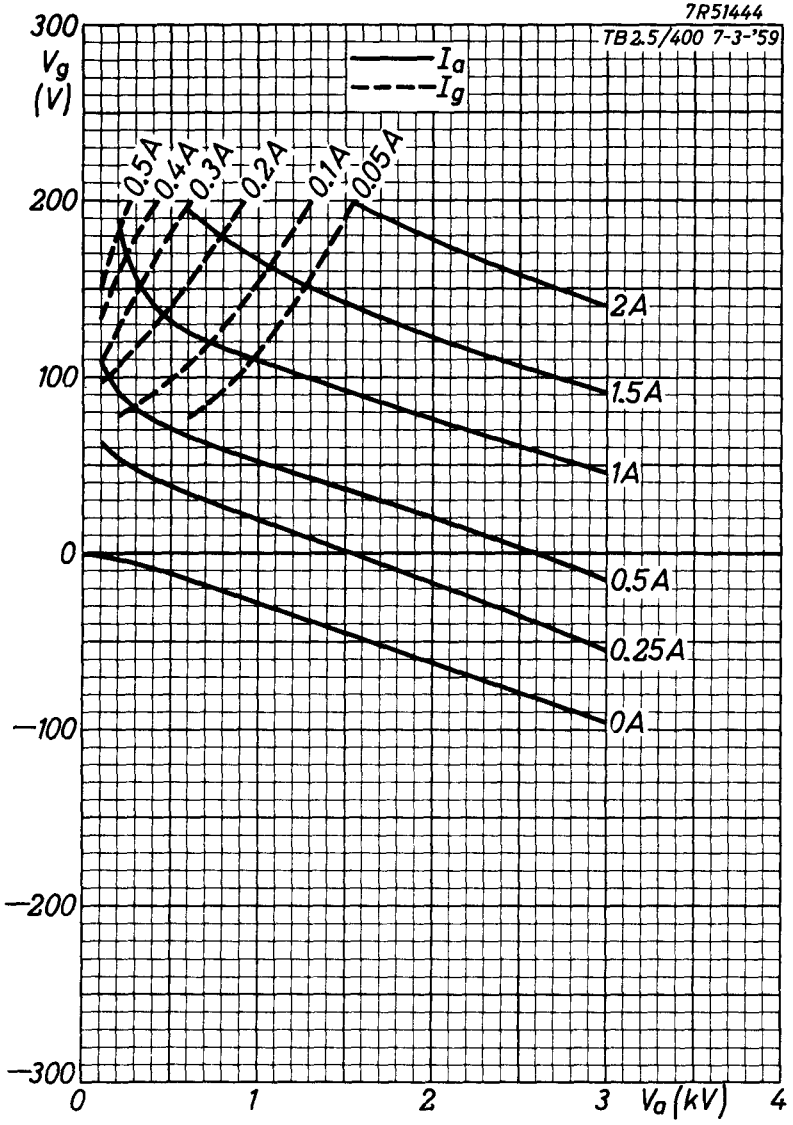


Fig. 3 Constant current characteristics.

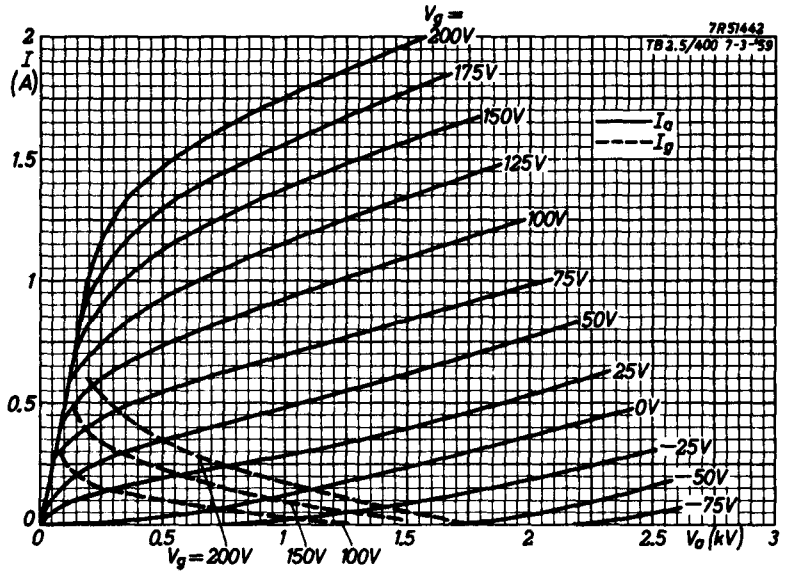


Fig. 4 I_g/V_a characteristics.

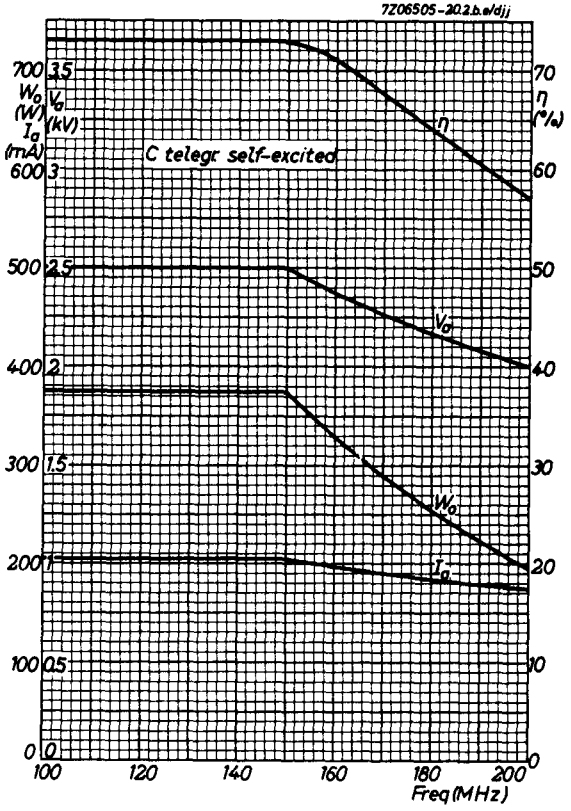


Fig. 5 Operating characteristics at higher frequencies.

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9	45	1988.02
10	46	1988.02
11	47	1988.02
12	FP	2000.09.14

TRIODE for use as H.F. or L.F. amplifier or oscillator
TRIODE pour utilisation comme amplificatrice H.F. ou B.F. ou oscillatrice
TRIODE zur Verwendung als HF- oder NF-Verstärker oder Oszillator

Filament : thoriated tungsten
Filament : tungstène thorié
Heizfaden: thoriertes Wolfram

Heating : direct
Chauffage: direct
Heizung : direkt

V_f = 12 V
I_f = 2,7 A

Capacitances
Capacités
Kapazitäten

C_a = 5,4 pF
C_g = 8,2 pF
C_{ag} = 5,5 pF

Typical characteristics
Caractéristiques types
Kenndaten

μ = 27
S (I_a=50 mA)= 4,2 mA/V

λ	Freq.	C telegr.		B teleph.		Can. mod.		B mod [1])	
m	Mc/s	V_a (V)	W_o (W)	V_a (V)	W_o (W)	V_a (V)	W_o (W)	V_a (V)	W_o (W)
>6,5	<46	2000	275	2000	60	1600	160	2000	540
		1500	200	1500	57	1200	100	1600	240
5	60	1500	200	1500	48	1200	85	1200	168
3	100	1050	120						

Limiting values
Caractéristiques limites
Grenzdaten

V_a = max. 2000 V
W_a = max. 130 W
W_g = max. 18 W
R_g = max. 25 kΩ
I_k = max. 230 mA

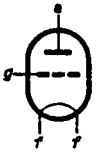
[1]) Two tubes; deux tubes; zwei Röhren

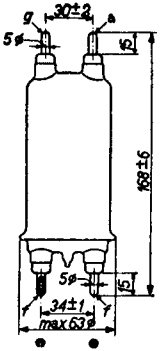
PHILIPS

Temperature of pin seals
Température des scellements des broches = max. 220 °C
Temperatur der Stiftendurchführungen

Bulb temperature
Température de l'ampoule = max. 250 °C
Kolbentemperatur

Dimensions in mm
Dimensions en mm
Abmessungen in mm





Socket		Clips	
Support	40206	Bornes de connexion	40600
Fassung		Anschlussklemmen	

Key
Clé 40608
Schlüssel

Mounting position: vertical with base up[1]) or down
Montage : vertical avec pied en haut[1]) ou en bas
Einbau : senkrecht mit Sockel oben[1])oder unten

Net weight		Shipping weight	
Poids net	160 g	Poids brut	400 g
Nettogewicht		Bruttogewicht	

[1]) In that case the tube should be supported
Dans ce cas le tube doit être supporté
In diesem Fall ist die Röhre zu stützen

Operating conditions H.F. class C telegraphy
Caractéristiques d'utilisation H.F. classe C télégraphie
Betriebsdaten H.F. Klasse C Telegraphie

λ =	>6,5	>6,5	5[1])	m
Va =	2000	1500	1500	V
Vg =	−150	−120	−120	V
Ia =	190	190	400	mA
Ig =	25	35	50	mA
Vgp =	280	270	290	V
Wig =	7	10	15	W
Wia =	380	285	600	W
Wa =	105	85	200	W
Wo =	275	200	400	W
η =	72	70	67	%

Operating conditions H.F. class B telephony
Caractéristiques d'utilisation H.F. classe B téléphonie
Betriebsdaten Klasse B Telephonie

λ =	>6,5	>6,5	5[1])	m
Va =	2000	1500	1500	V
Vg =	−60	−45	−45	V
Ia =	95	118	210	mA
Vgp =	80	90	90	V
Wia =	190	177	315	W
Wa =	130	120	220	W
Wo =	60	57	95	W
η =	31,5	32	30	%
m =	100	100	100	%
Ig =	25	35	70	mA
Wig =	4	6,3	13	W

[1]) Two valves; deux tubes; zwei Röhren

PHILIPS

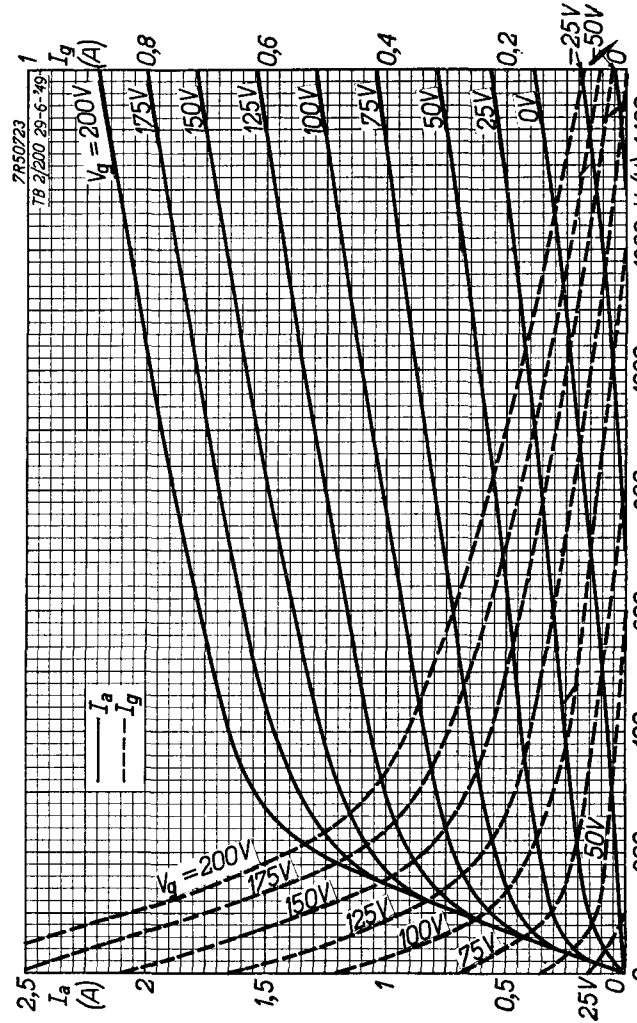
Operating conditions H.F. class C anode modulation
Caractéristiques d'utilisation H.F. classe C modulation d'anode
Betriebsdaten H.F. Klasse C Anodenmodulation

λ	=	>6,5	>6,5	5[1])	m
Va	=	1600	1200	1200	V
Vg	=	-200	-180	-180	V
Ia	=	135	120	240	mA
Ig	=	35	30	50	mA
Vgp	=	330	320	320	V
Wig	=	11,5	10	16	W
Wia	=	216	144	288	W
Wa	=	56	44	118	W
Wo	=	160	100	170	W
η	=	74	70	59	%
m	=	100	100	100	%
Wmod	=	108	72	144	W

Operating conditions as L.F. class B modulator [1])
Caractéristiques d'utilisation en modulatrice B.F. classe B [1])
Betriebsdaten als N.F. Klasse B Modulator [1])

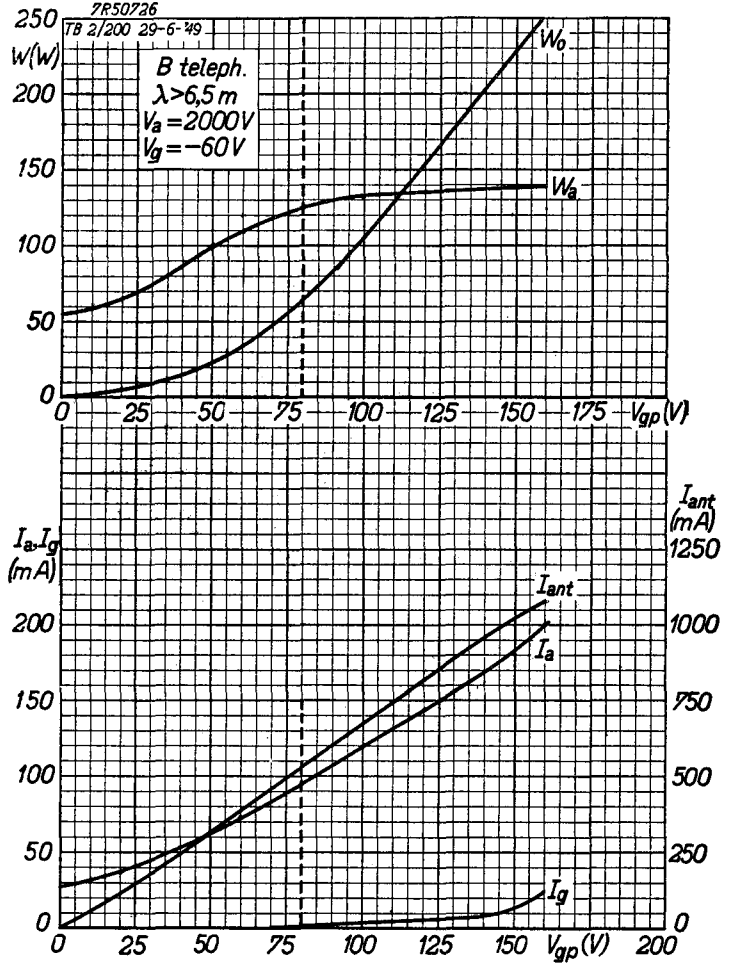
Va	=	2000		1600		1200		V
Vg	=	-70		-55		-40		V
Raa	=	13,2		20		16		kΩ
Vggp	=	0	300	0	210	0	180	V
Ia	=	2x20	2x180	2x18	2x100	2x17	2x93	mA
Ig	=	0	2x15	0	2x6	0	2x10	mA
Igp	=	0	2x130	0	2x50	0	2x100	mA
Wig	=	0	2x2	0	2x0,5	0	2x0,8	W
Wia	=	2x40	2x360	2x29	2x160	2x20,4	2x112	W
Wa	=	2x40	2x90	2x29	2x40	2x20,4	2x28	W
Wo	=	0	540	0	240	0	168	W
η	=	-	75	-	75	-	75	%

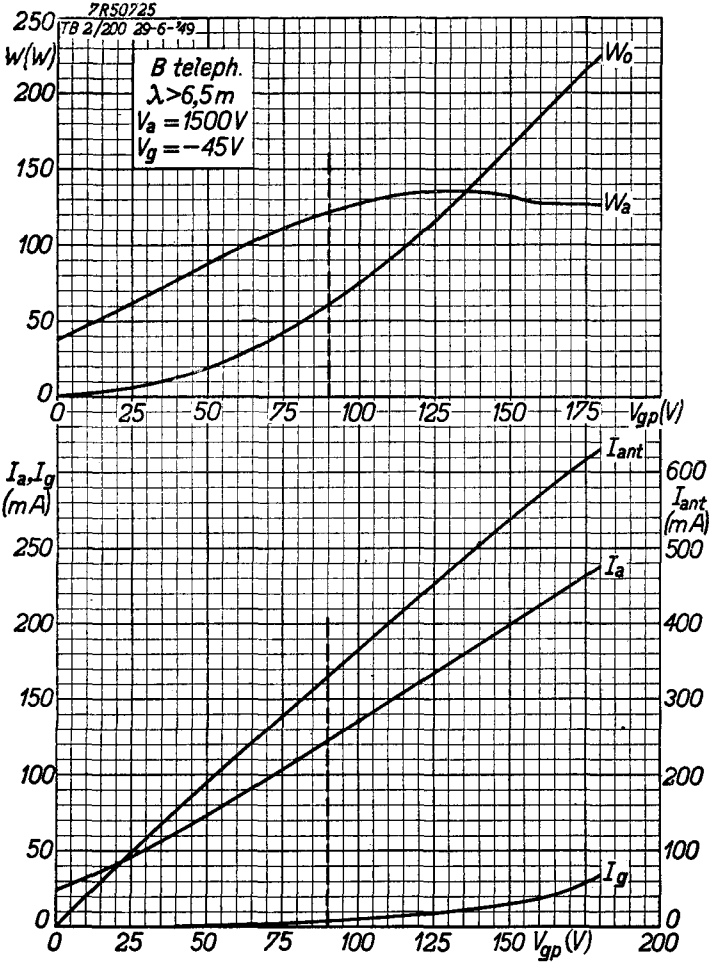
[1]) Two valves; deux tubes; zwei Röhren


7R50223
TB 2/200 29-6-'49
I_g (A)
V_g = 200V
175V
150V
125V
100V
75V
50V
25V
0V
−25V
−50V
V_a (V)
I_a
I_g
I_a (A)

TB 2/200

PHILIPS



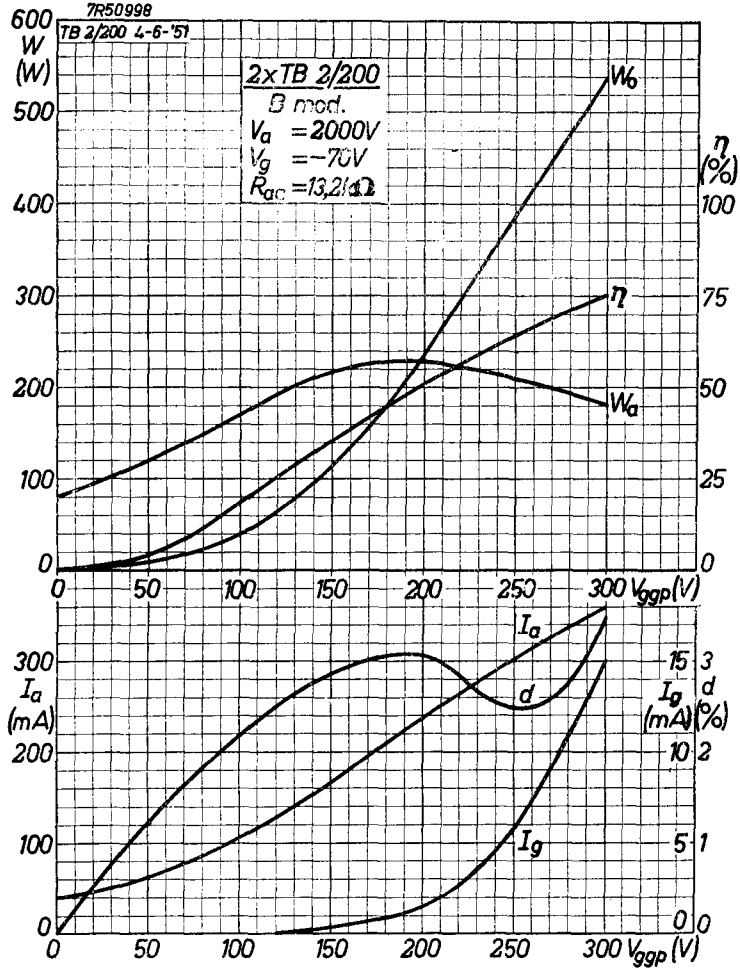

7R50725
TB 2/200 29-6-'49
B teleph.
λ>6,5m
Va = 1500V
Vg = −45V
W(W)
250
200
150
100
50
0
Wo
Wa
0
25
50
75
100
125
150
175
Vgp(V)
Ia,Ig (mA)
250
200
150
100
50
0
Iant
Ia
Ig
Iant (mA)
600
500
400
300
200
100
0
0
25
50
75
100
125
150
Vgp(V)
200

PHILIPS

PR50724
TB 2/200 29-6-49
C telegr. Self-excited Auto-excité Selbsterregt
$R_g = 5-10\,k\Omega$
W_{ia}
W_o
V_a
I_a
η
V_a (V)
W (W)
I_a (mA)
η (%)
λ (m)
4000
3000
2000
1000
0
400
300
200
100
0
100
50
0
2
4
6
8
10
12

PHILIPS

TB 2/200

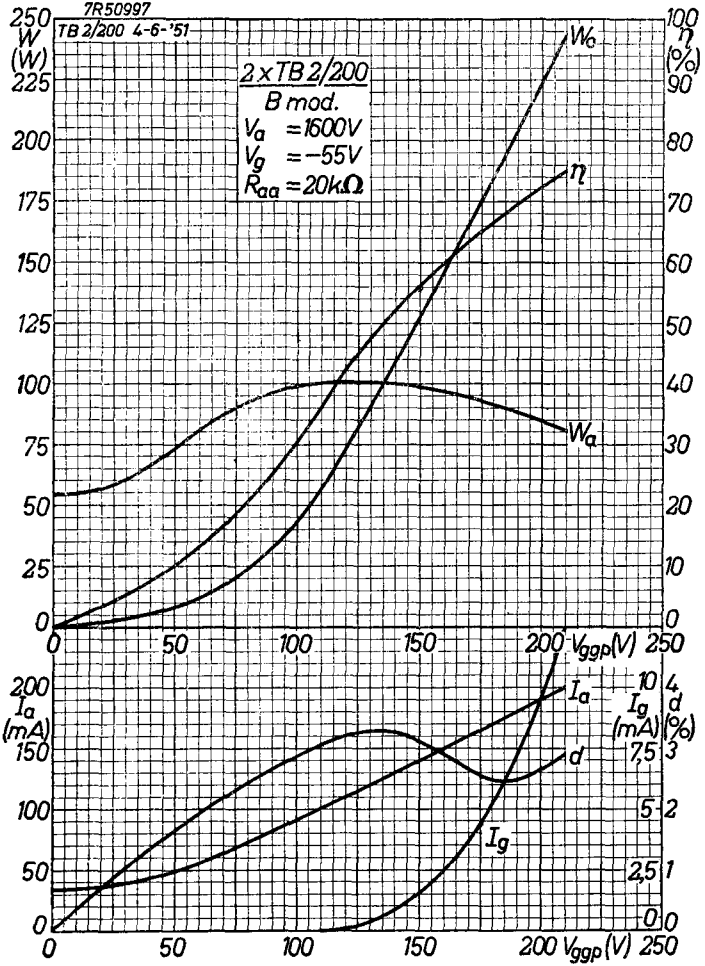


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TB 2/200

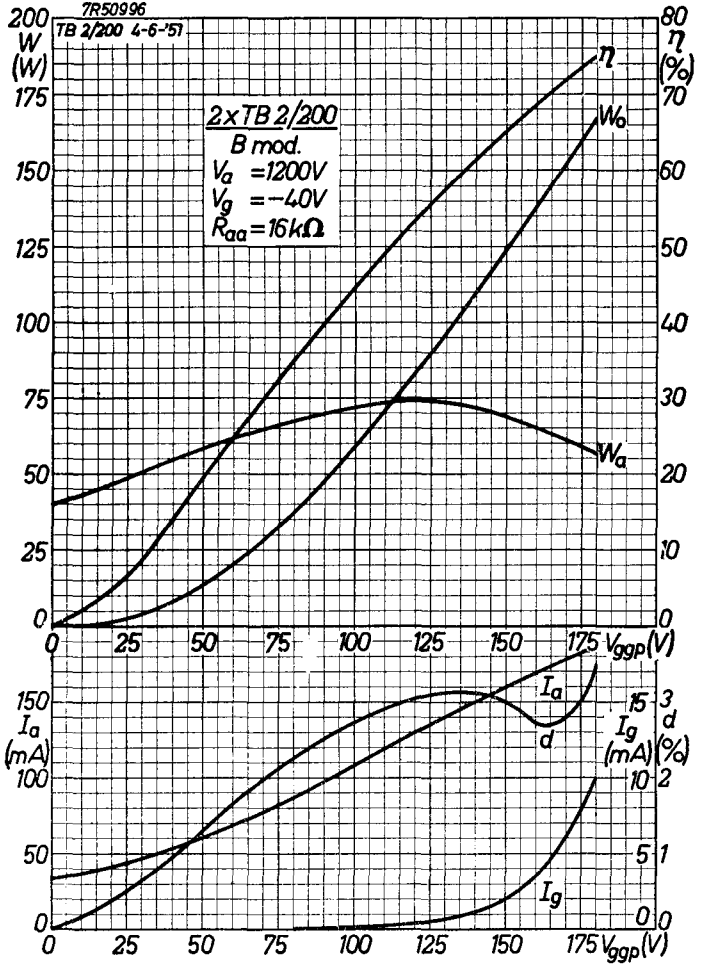
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TB 2/200



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Electronic Tube

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TB2/200

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3	3	1951.06.06
4	4	1951.06.06
5	A	1949.07.07
6	B	1949.07.07
7	C	1949.07.07
8	D	1949.07.07
9	E	1951.06.06
10	F	1951.06.06
11	G	1951.06.06
12	FP	1999.11.18

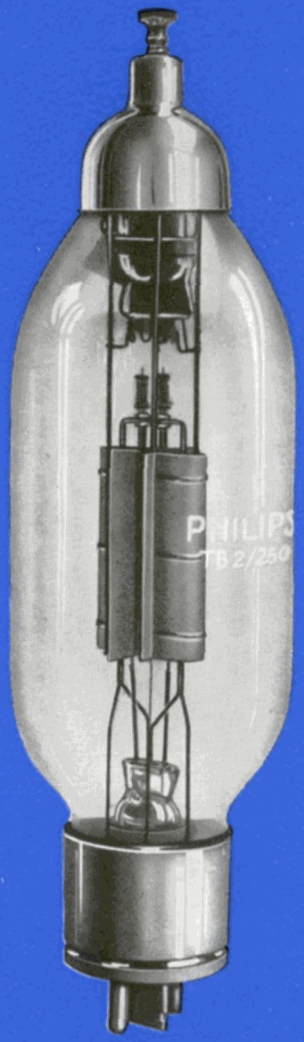
PHILIPS

TUBE EMETTEUR TB 2/250

Le TB 2/250 est pourvu d'un filament thorié d'un grand pouvoir émissif.

Ce tube est construit spécialement pour l'emploi comme oscillateur dans un émetteur télégraphique ou téléphonique et comme amplificateur H.F. d'énergie modulée ou non. Utilisé dans un émetteur télégraphique, le tube peut recevoir une tension anodique allant jusqu'à 2500 V; un bon rendement est cependant encore obtenu avec 1200 V seulement.

La puissance de sortie pour une tension anodique de 2000 V se trouve indiquée dans le tableau suivant:



Rendement	40	50	60	70	%
Puissance appliquée	330	400	450	450	W
Puissance utile	130	200	290	315	W
Dissipation anodique	200	200	160	135	W

Pourvu que la tension anodique correspondante soit appliquée, le TB 2/250 peut servir sur ondes courtes; à 45 m correspond une tension anodique de 2000 V; sur 14 m elle ne doit pas dépasser 1500 V. Dans tous les cas un courant anodique moyen de 225 mA est admissible.

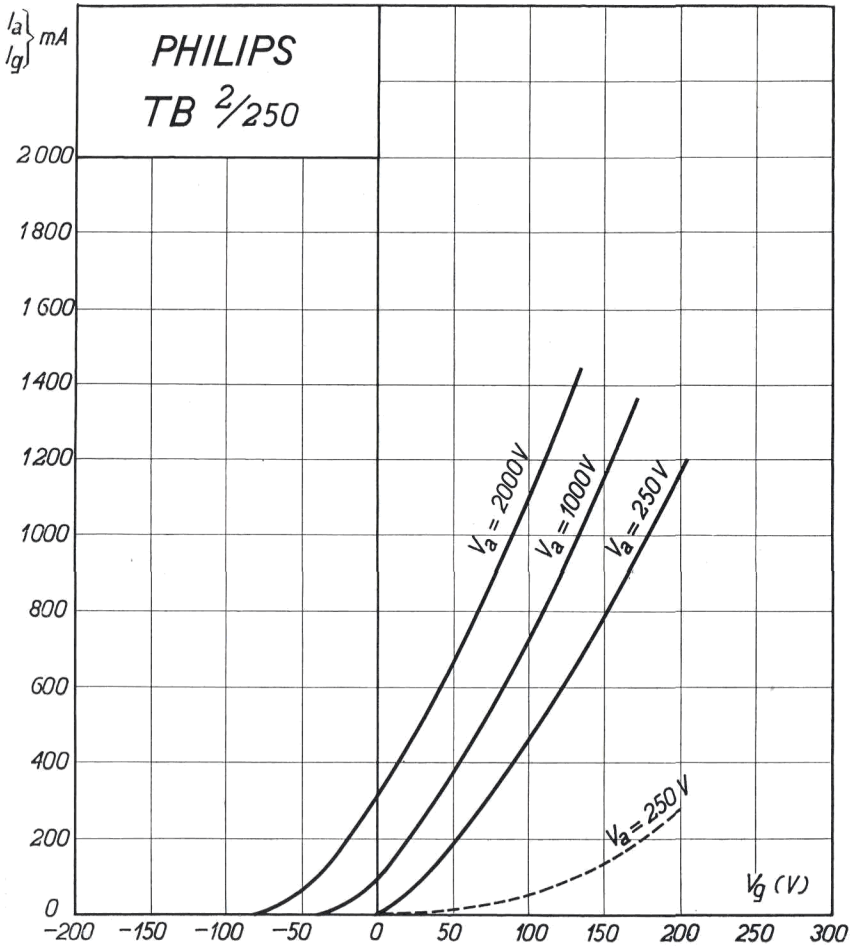
Le tableau ci-après indique la puissance de sortie pour une longueur d'onde de 14 m et une dissipation anodique maximum admissible de 200 W:

Rendement	40	50	60	70	%
Puissance appliquée	335	337	337	337	W
Puissance utile	135	168	202	236	W
Dissipation anodique	200	168	135	101	W

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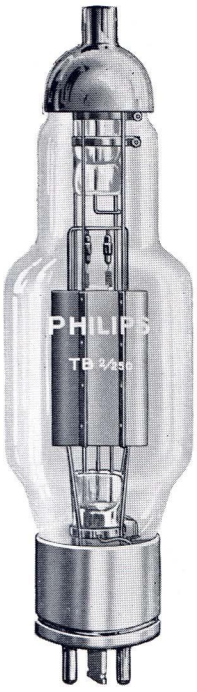
TUBE EMETTEUR

TB 2/250



Tension de chauffage	V_f	= 11,0 V
Courant de chauffage	I_f	= 3,8 A env.
Courant de saturation	I_s	= 2 A env.
Tension anodique	V_a	= 1200-2000 V
Dissipation anodique admissible	W_a	= 200 W
Dissipation anodique d'essai	W_{at}	= 250 W
Coefficient d'amplification	k	= 25 env.
Inclinaison pour V_a = 2000 V, I_a = 125 mA	S_{norm}	= 3 mA/V env.
Inclinaison maximum	S_{max}	= 8 mA/V env.
Résistance intérieure pour V_a = 2000 V, I_a = 125 mA	R_i	= 8300 Ω env.
Diamètre maximum	d	= 110 mm
Longueur totale	l	= 375 mm

PHILIPS SENDERRÖHRE



Grösse 1 : 4

TB 2/250

Diese Senderröhre hat einen thorierten Heizfaden und somit eine sehr hohe Emission. Die normale Anodenspannung beträgt 2000 Volt; auch bei 1000 Volt ist noch ein guter Wirkungsgrad möglich.

Sie kann verwendet werden:

1) als Oszillator bis zu 15 m,
2) als Energieverstärker,
3) als Modulator,
4) als Hochleistungs-Niederfrequenzverstärker z.B. für Grosslautsprecheranlagen,
5) als Gleichrichter für ca. 225 mA Gleichstrom bei einer Höchstspannung von 2000 V.

In untenstehender Tabelle ist die Nutzleistung für verschiedene Werte des Wirkungsgrades bei einer Anodenspannung von 2000 Volt angegeben.

Wirkungsgrad	30	40	50	60	70	%
Zugeführte Leistung	210	245	300	375	450	Watt
Nutzleistung	60	95	150	225	315	Watt
Anodenverlust.	150	150	150	150	135	Watt

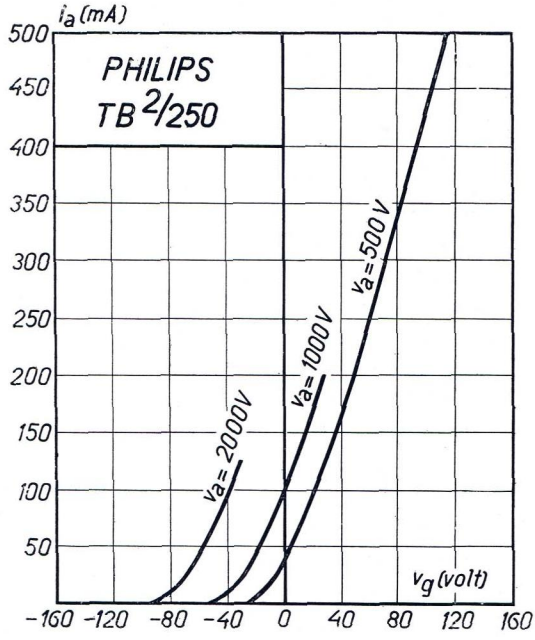
Die TB 2/250 hat hervorragende Eigenschaften als Oszillator in einem Telephoniesender; der mittlere Anodenstrom darf in diesem Falle nicht höher sein als 200 mA. Die TB 2/250 kann in der normalen Ausführung für Wellenlängen bis 15 m verwendet werden. Die Anodenspannung darf dann höchstens 1500 Volt betragen, während der Anodenstrom ebenso wie bei anderen Wellenlängen einen mittleren Wert von 225 mA haben kann. Die maximal zuzuführende Energie beträgt demnach bei der TB 2/250 bei einer Wellenlänge von 15 m $1500 \times 0{,}225 = 337$ Watt. Untenstehende Tabelle gilt für eine Wellenlänge von 15 m und gibt für verschiedene Werte des Wirkungsgrades und eine Anodenspannung von 1500 V die Nutzleistung an, wobei der Anodenverlust von 150 Watt nicht überschritten wird.

Wirkungsgrad.	30	40	50	60	70	%
Zugeführte Leistung.	214	250	300	337	337	Watt
Nutzleistung	64	100	150	202	236	Watt
Anodenverlust.	150	150	150	135	101	Watt

Bei einer Wellenlänge von 45 m kann die Anodenspannung ebenso wie im normalen Fall 2000 Volt betragen; für Wellenlängen zwischen 15 und 45 m kann sie entsprechend von 1500 bis 2000 Volt erhöht werden.

PHILIPS SENDERRÖHRE

TB 2/250



Heizspannung	v_f	= **11** V
Heizstrom	i_f	= ca. **3,8** A
Sättigungsstrom	i_s	= ca. **2000** mA
Anodenspannung	v_a	= **1000-2000** V
Anodenverlust	w_a	= **150** W
Anodenverlust geprüft auf	w_{at}	= **200** W
Verstärkungsfaktor	g	= ca. **25**
Durchgriff	D	= ca. **4** %
Steilheit	S	= ca. **4,0** mA/V
Innerer Widerstand	R_i	= ca. **6000** Ω
Grösster Durchmesser	d	= **100** mm
Grösste Länge	l	= **400** mm

Siehe auch die ausführliche Gebrauchsanweisung.

TRIODE for use as H.F. and L.F. amplifier and oscillator
TRIODE pour utilisation comme amplificatrice H.F. et B.F. et oscillatrice
TRIODE zur Verwendung als H.F. und N.F. Verstärker und Oszillator

Filament : thoriated tungsten
Filament : tungstène thorié
Heizfaden: thoriertes Wolfram

Heating : direct
Chauffage: direct
Heizung : direkt

Vf = 12 V
If = 7,3 A

Capacitances
Capacités
Kapazitäten

Ca = 6 pF
Cg = 12,5 pF
Cag = 6 pF

Typical characteristics
Caractéristiques typiques
Kenndaten

μ = 32
S (Ia=125 mA) = 7,5 mA/V

λ	Freq.	C telegr.		B teleph.		Can.mod.		B mod. [1]	
m	Mc/s	Va (V)	Wo (W)	Va (V)	Wo (W)	Va (V)	Wo (W)	Va (V)	Wo (W)
>15	<20	2000	635	2000	124	1800	430	2000	900
3	100	1700	400						

Limiting values
Caractéristiques limites
Grenzdaten

Va = max. 2000 V
Wa = max. 300 W
Wg = max. 20 W

Ik = max. 600 mA
Ikp = max. 2400 mA

Rg { with fixed grid bias / à polarisation fixe / mit fester Gittervorspannung } = max. 10 kΩ

Rg { with automatic grid bias / à polarisation automatique / mit autom. Gittervorspannung } = max. 20 kΩ

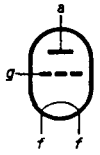
[1]) Two valves; deux tubes; zwei Röhren

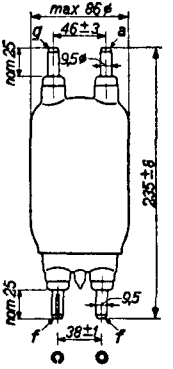
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Temperature of pin seals
Température des scellements des broches = max. 220 °C
Temperatur der Stiftendurchführungen

Bulb temperature
Température de l'ampoule = max. 250 °C
Kolbentemperatur

Dimensions in mm
Dimensions en mm
Abmessungen in mm





Socket		Clips
Support	40204	Bornes de connexion 40626
Fassung		Anschlussklemmen

Key	
Clé	40608
Schlüssel	

Mounting position: vertical with base up[1]) or down
Montage : vertical avec pied en haut[1])ou en bas
Einbau : senkrecht mit Fuss oben[1]) oder unten

Net weight		Shipping weight	
Poids net	0,34 kg	Poids brut	1,2 kg
Nettogewicht		Bruttogewicht	

---

[1]) In that case the tube should be supported
Dans ce cas le tube doit être supporté
In diesem Fall ist die Röhre zu stützen

Operating conditions H.F. class C telegraphy
Caractéristiques d'utilisation H.F. classe C télégraphie
Betriebsdaten H.F. Klasse C Telegraphie

λ =	>15	3	m
Va =	2000	1700	V
Vg =	-120	-105	V
Ia =	467	412	mA
Ig =	68	68	mA
Vgp =	282	268	V
Wig =	20	19	W
Wia =	935	700	W
Wa =	300	300	W
Wo =	635	400	W
η =	68	57	%

Operating conditions H.F. class B telephony
Caractéristiques d'utilisation H.F. classe B téléphonie
Betriebsdaten H.F. Klasse B Telephonie

λ =	>15	m
Va =	2000	V
Vg =	-55	V
Ia =	212	mA
Vgp =	90	V
Wia =	424	W
Wa =	300	W
Wo =	124	W
η =	29	%
m =	100	%
Ig =	35	mA
Wig =	0,3	W

Operating conditions H.F. class C anode modulation
Caractéristiques d'utilisation H.F. classe C modulation d'anode
Betriebsdaten H.F. Klasse C Anodenmodulation

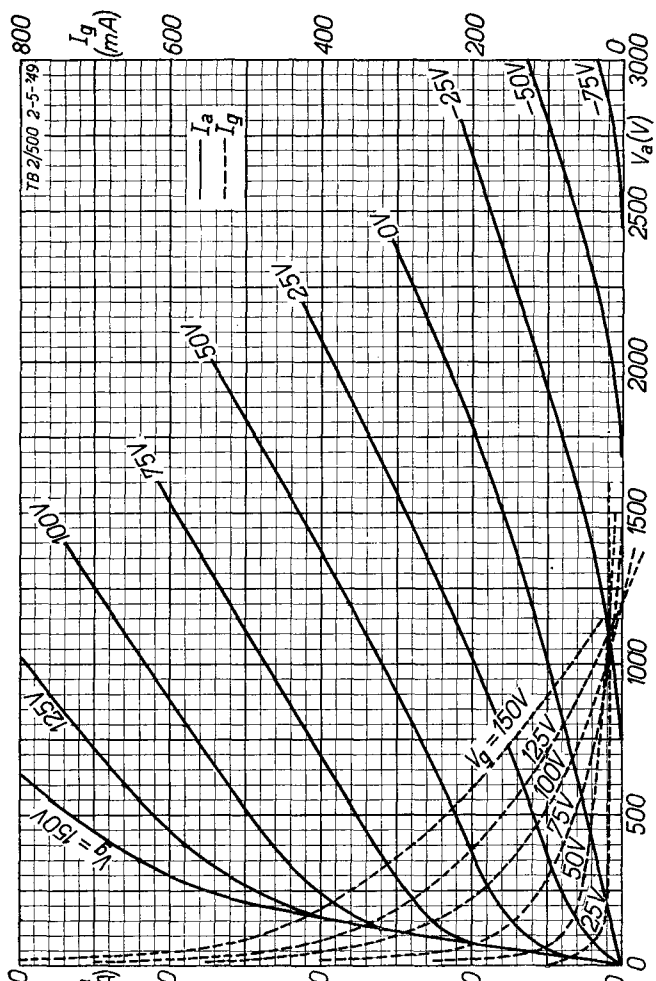
λ	=	>15	m
Va	=	1800	V
Vg	=	-160	V
Ia	=	336	mA
Ig	=	64	mA
Vgp	=	317	V
Wig	=	21	W
Wia	=	605	W
Wa	=	175	W
Wo	=	430	W
η	=	71	%
m	=	100	%
Wmod	=	302	W

Operating conditions as L.F. class B amplifier and modulator, two valves
Caractéristiques d'utilisation comme amplificatrice et modulatrice B.F. classe B, deux tubes
Betriebsdaten als N.F.Verstärker und Modulator Klasse B, zwei Röhren

Va	=	2000		V
Vg	=	-50		V
Raa	=	7,6		kΩ
Vggp	=	0	300	V
Ig	=	0	2x35	mA
Ia	=	2x50	2x315	mA
Wig	=	0	2x5,3	W
Wia	=	2x100	2x630	W
Wa	=	2x100	2x180	W
Wo	=	0	900	W
d_{tot}	=	-	2,8	%
η	=	-	71,5	%

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TB 2/500

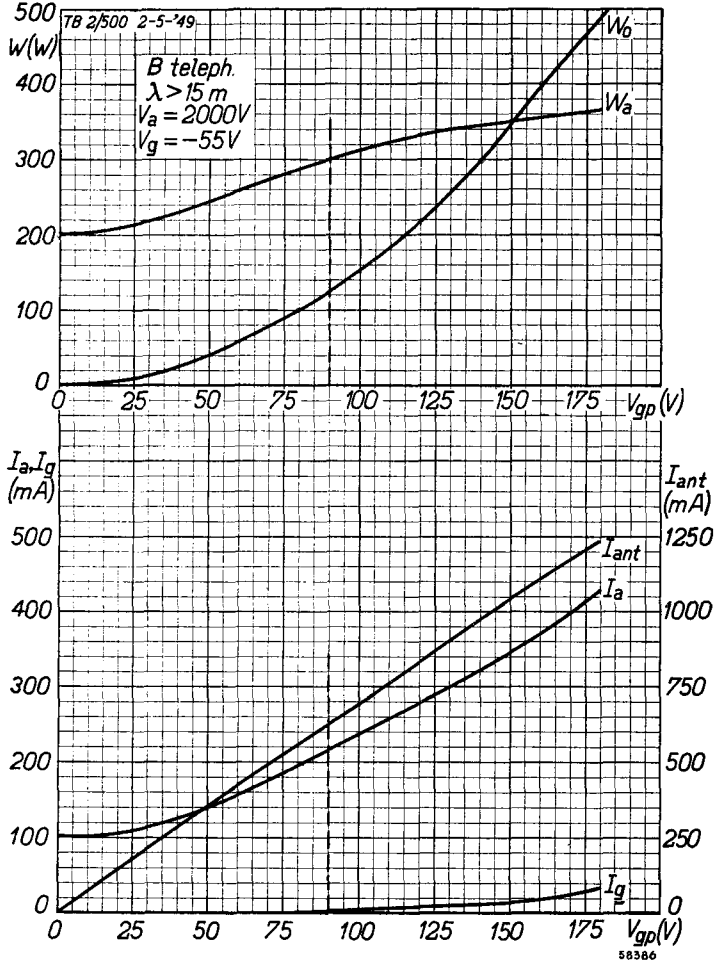


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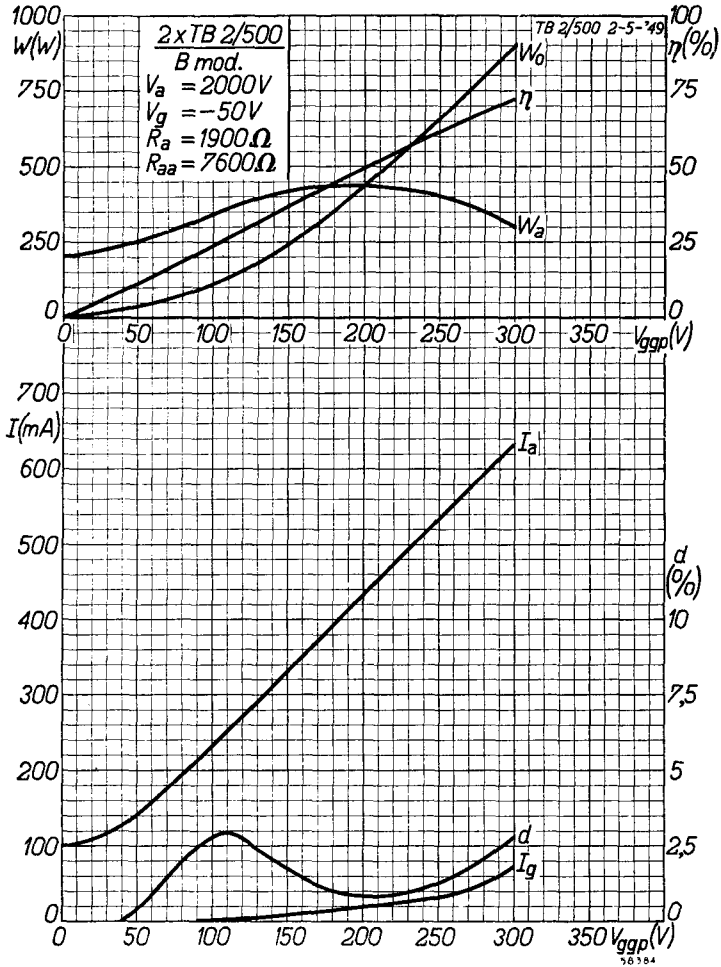
TB 2/500

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TB 2/500



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C

TB 2/500

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D

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Electronic Tube

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3	3	1949.04.06
4	4	1949.04.06
5	A	1949.05.06
6	B	1949.05.06
7	C	1949.05.06
8	D	1949.05.06
9	FP	1999.11.18

TRIODE for use as H.F. and L.F. amplifier and oscillator
TRIODE pour utilisation comme amplificatrice H.F. et B.F. et oscillatrice
TRIODE zur Verwendung als H.F. und N.F. Verstärker und Oszillator

Filament : thoriated tungsten
Filament : tungstène thorié
Heizfaden: thoriertes Wolfram

Heating : direct
Chauffage: direct
Heizung : direkt

Vf = 12 V
If = 8,5 A

Capacitances
Capacités
Kapazitäten

Ca = 7 pF
Cg = 15 pF
Cag = 8 pF

Typical characteristics
Caractéristiques typiques
Kenndaten

μ = 31
S (Ia=150 mA) = 8 mA/V

λ	Freq.	C telegr.		B teleph.		Can.mod.		B mod. [1]	
m	Mc/s	Va (V)	Wo (W)	Va (V)	Wo (W)	Va (V)	Wo (W)	Va (V)	Wo (W)
>15	<20	3000	1200	3000	200	2500	720	3000	1750
								2500	1400
5	60	2600	975			2100	568	2000	1000

Limiting values
Caractéristiques limites
Grenzdaten

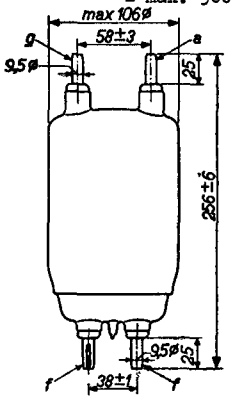
Va = max. 3000 V
Wa (λ >15 m) = max. 500 W
Wa (λ <15 m) = max. 450 W
Wg = max. 40 W
Rg = max. 10 kΩ
Ik = max. 700 mA
Ikp = max. 2800 mA

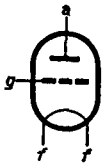
[1]) Two valves; deux tubes; zwei Röhren

Temperature of pin seals
Température des scellements des broches = max. 220 °C
Temperatur der Stifteneinschmelzungen

Bulb temperature
Température de l'ampoule = max. 300 °C
Kolbentemperatur

Dimensions in mm
Dimensions en mm
Abmessungen in mm





Socket
Support 40204
Fassung

Clips
Bornes de connexion 40626
Anschlussklemmen

Key
Clé 40608
Schlüssel

Mounting position: vertical with base up[1]) or down
Montage : vertical avec pied en haut[1])ou en bas
Einbau : senkrecht mit Fuss oben[1]) oder unten

Net weight
Poids net 0,5 kg
Nettogewicht

Shipping weight
Poids brut 1,5 kg
Bruttogewicht

[1]) In that case the tube should be supported
Dans ce cas le tube doit être supporté
In diesem Fall ist die Röhre zu stützen

Operating conditions H.F. class C telegraphy
Caractéristiques d'utilisation H.F. classe C télégraphie
Betriebsdaten H.F. Klasse C Telegraphie

λ	=	>15	5[1])	m
Va	=	3000	2600	V
Vg	=	-200	-200	V
Ia	=	550	1060	mA
Ig	=	50	115	mA
Vgp	=	400	400	V
Wig	=	20	46	W
Wia	=	1650	2750	W
Wa	=	450	800	W
Wo	=	1200	1950	W
η	=	72,5	71	%

Operating conditions H.F. class B telephony
Caractéristiques d'utilisation H.F. classe B téléphonie
Betriebsdaten H.F. Klasse B Telephonie

λ	=	>15	m
Va	=	3000	V
Vg	=	-90	V
Ia	=	220	mA
Vgp	=	127	V
Wia	=	660	W
Wa	=	460	W
Wo	=	200	W
η	=	30	%
m	=	100	%
Ig	=	80	mA
Wig	=	20	W

[1]) Two valves; deux tubes; zwei Röhren

PHILIPS

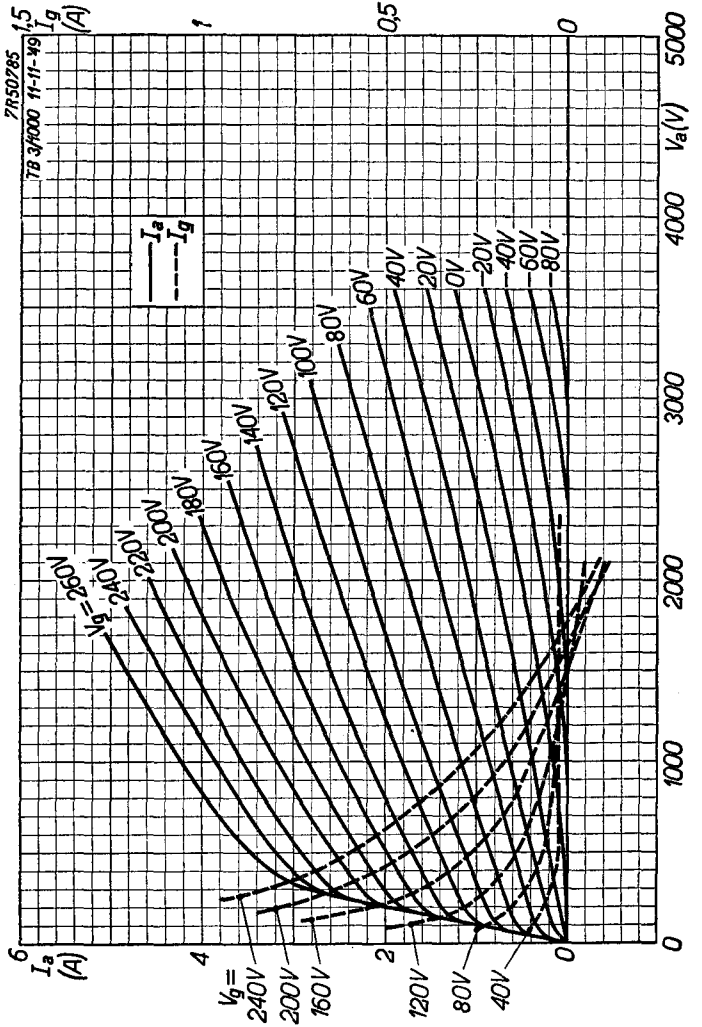
Operating conditions H.F. class C anode modulation
Caractéristiques d'utilisation H.F. classe C modulation d'anode
Betriebsdaten H.F. Klasse C Anodenmodulation

λ	=	>15	5[1])	m
Va	=	2500	2100	V
Vg	=	-250	-250	V
Ia	=	400	750	mA
Ig	=	80	160	mA
Vgp	=	480	480	V
Wig	=	38	76	W
Wia	=	1000	1575	W
Wa	=	280	440	W
Wo	=	720	1135	W
η	=	72	72	%
m	=	100	100	%
Wmod	=	500	790	W

Operating conditions as L.F. class B amplifier and modulator, two valves
Caractéristiques d'utilisation comme amplificatrice et modulatrice B.F. classe B, deux tubes
Betriebsdaten als N.F. Verstärker und Modulator Klasse B, zwei Röhren

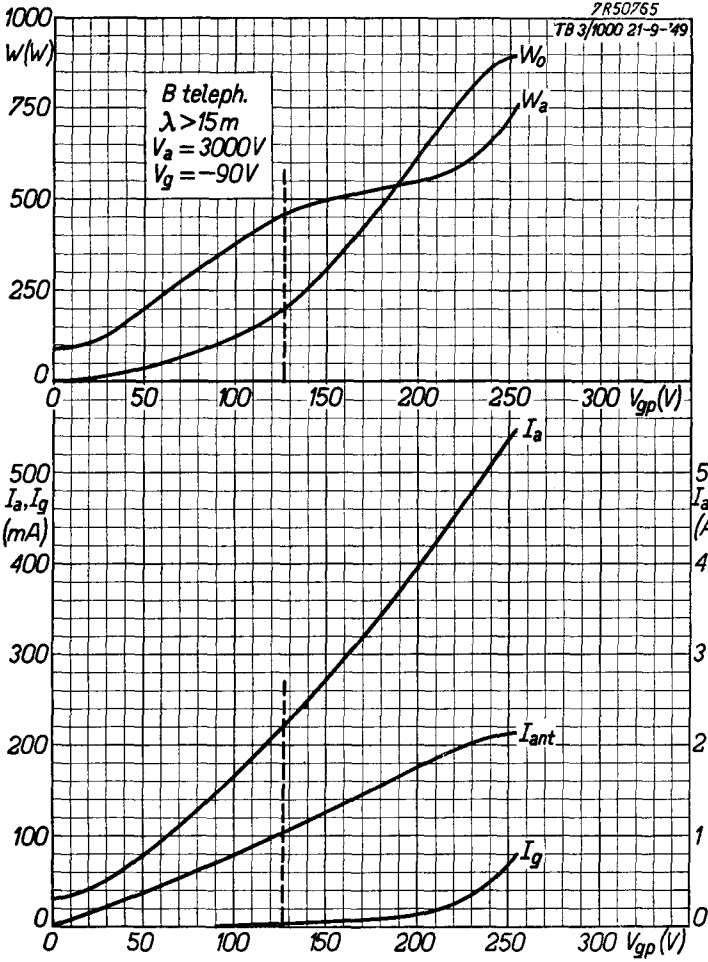
Va	=	3000		2500		2000		V
Vg	=	-75		-60		-50		V
Raa	=	8,2		6,6		5,08		kΩ
Vggp	=	0	390	0	360	0	340	V
Ia	=	2x65	2x430	2x80	2x430	2x50	2x400	mA
Ig	=	0	2x25	0	2x25	0	2x28	mA
Wig	=	0	2x5	0	2x5	0	2x5	W
Wia	=	2x195	2x1290	2x200	2x1075	2x100	2x800	W
Wa	=	2x195	2x415	2x200	2x375	2x100	2x300	W
Wo	=	0	1750	0	1400	0	1000	W
d_{tot}	=	-	1,5	-	1,6	-	1,2	%
η	=	-	68	-	65	-	62,5	%

[1]) Two valves; deux tubes; zwei Röhren


7R50785
TB 3/4000 11-11-49
I_g (A)
1,5
1
0,5
0
I_a
I_g
V_a(V)
5000
4000
3000
2000
1000
0
I_a (A)
6
4
2
0
V_g = 260V
240V
220V
200V
180V
160V
140V
120V
100V
80V
60V
40V
20V
0V
−20V
−40V
−60V
−80V
V_g = 240V
200V
160V
120V
80V
40V

TB 3/1000

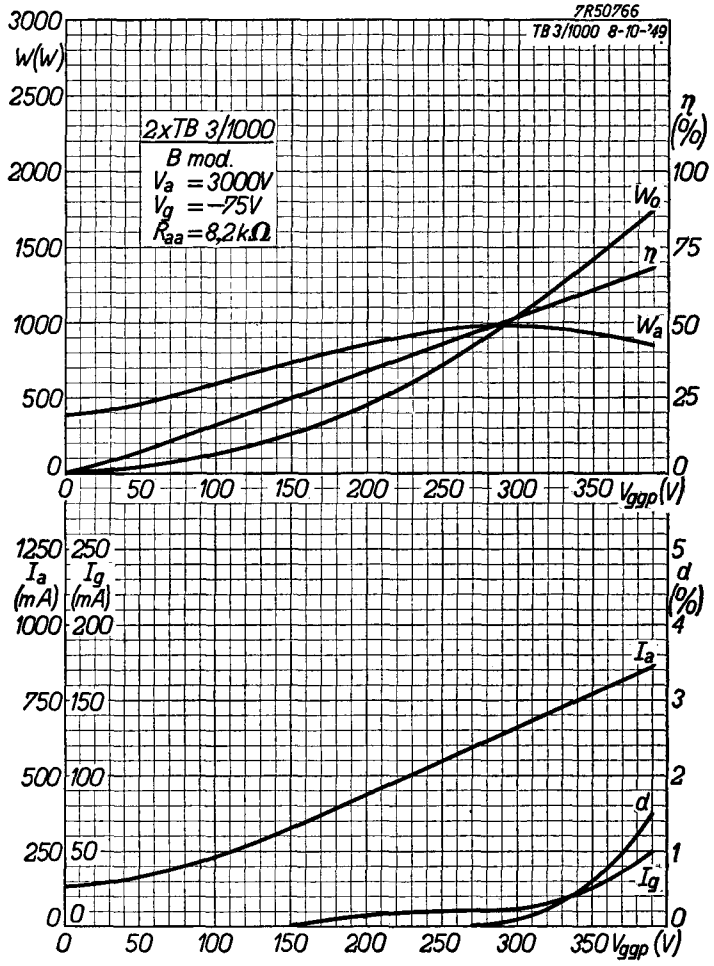
PHILIPS



B

PHILIPS

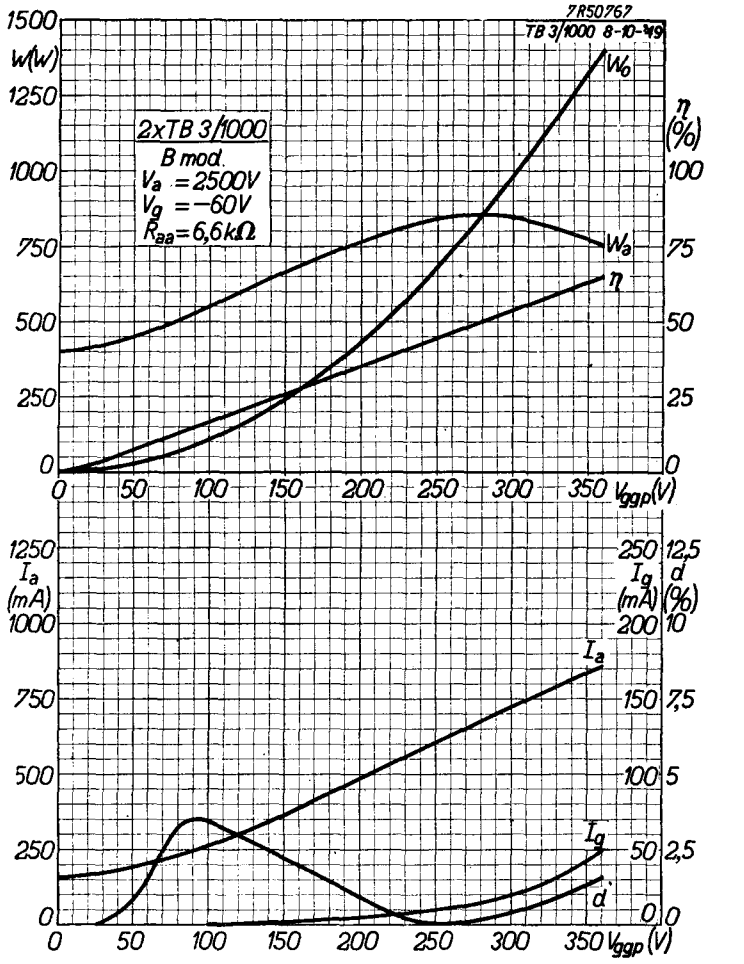
TB 3/1000



10.10.1949

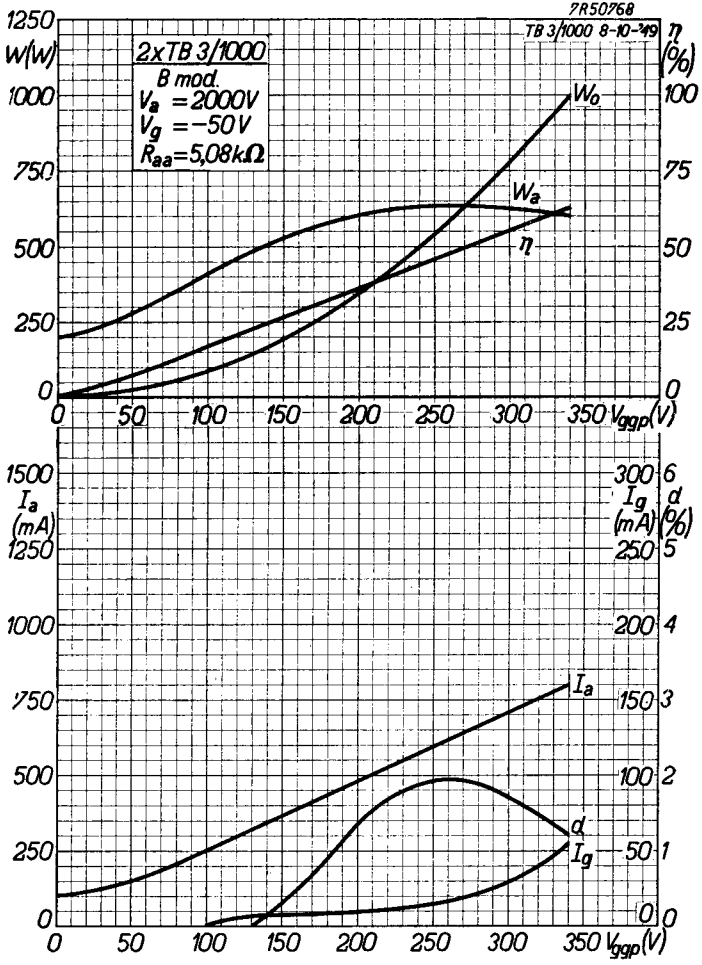
C

PHILIPS


7R50767
TB 3/1000 8-10-49
2xTB 3/1000
B mod.
V_a = 2500V
V_g = −60V
R_{aa} = 6,6 kΩ
W(W)
W_o
W_a
η
η (%)
V_{ggp}(V)
I_a (mA)
I_g (mA)
d (%)
I_a
I_g
d

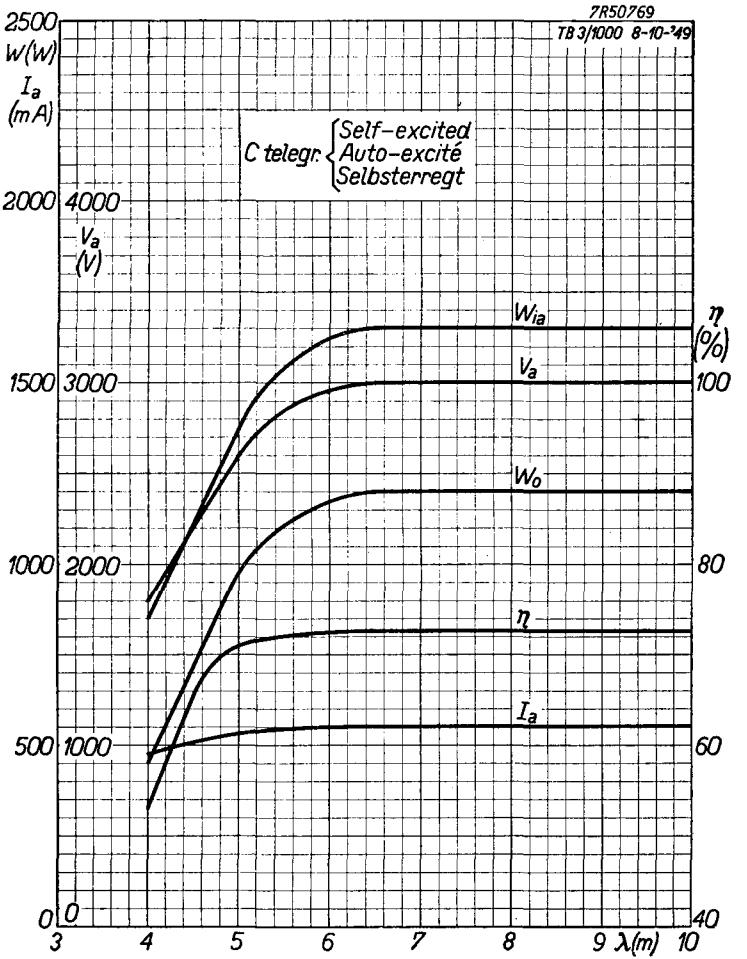
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TB 3/1000



TB 3/1000

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F

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Electronic Tube

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5	A	1949.11.11
6	B	1949.11.11
7	C	1949.10.10
8	D	1949.10.10
9	E	1949.10.10
10	F	1949.10.10
11	FP	1999.11.19

TRIODE for use as H.F. and L.F. amplifier and oscillator
TRIODE pour utilisation comme amplificatrice H.F. et B.F. et oscillatrice
TRIODE zur Verwendung als H.F. und N.F. Verstärker und Oszillator

Filament : thoriated tungsten
Filament : tungstène thorié
Heizfaden: thoriertes Wolfram

Heating : direct
Chauffage: direct
Heizung : direkt

Vf = 12 V
If = 17 A

Capacitances
Capacités
Kapazitäten

Ca = 10,5 pF
Cg = 26 pF
Cag = 13 pF

Typical characteristics
Caractéristiques typiques
Kenndaten

μ = 34
S (Ia=300 mA) = 18 mA/V

λ	Freq.	C telegr.		B teleph.		Can.mod.		B mod. [1]	
m	Mc/s	Va (kV)	Wo (kW)	Va (kV)	Wo (kW)	Va (kV)	Wo (kW)	Va (kV)	Wo (kW)
>150	< 2	3,5	2,9	3,5	0,6	3	1,63	3	3,3
> 15	<20	3	2,6	3	0,52	2,5	1,3	2,5	2,5

Limiting values
Caractéristiques limites
Grenzdaten

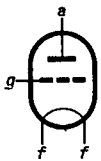
Va = max. 3,5 kV
Wa = max. 1,1 kW
Wg = max. 60 W
Rg = max. 5 kΩ
Ik = max. 1,4 A
Ikp = max. 5,6 A

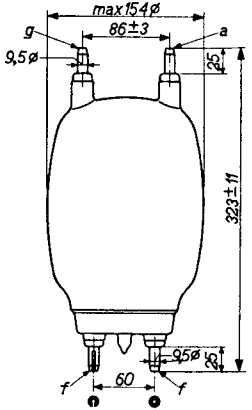
[1]) Two valves; deux tubes; zwei Röhren

Temperature of pin seals
Température des scellements des broches = max. 220 °C
Temperatur der Stifteneinschmelzungen

Bulb temperature
Température de l'ampoule = max. 300 °C
Kolbentemperatur

Dimensions in mm
Dimensions en mm
Abmessungen in mm





Socket
Support 40205
Fassung

Clips
Bornes de connexion 40626
Anschlussklemmen

Key
Clé 40608
Schlüssel

Mounting position: arbitrary with plane of anode vertical[1])
Montage : arbitrairement avec plan de l'anode vertical[1])
Einbau : willkürlich mit der Anodenfläche senkrecht[1])

Net weight 0,9 kg
Poids net
Nettogewicht

Shipping weight 4,4 kg
Poids brut
Bruttogewicht

[1]) The tube should be supported if it is mounted with base up
Le tube doit être supporté pour le cas où il est monté avec le pied en haut
Die Röhre ist zu stützen wenn sie mit dem Fuss nach oben aufgestellt ist.

Operating conditions H.F. class C telegraphy
Caractéristiques d'utilisation H.F. classe C télégraphie
Betriebsdaten H.F. Klasse C Telegraphie

λ =	>150	>15	m
Va =	3500	3000	V
Vg =	-200	-200	V
Ia =	1140	1230	mA
Ig =	100	120	mA
Vgp =	400	450	V
Wig =	40	54	W
Wia =	4000	3700	W
Wa =	1100	1100	W
Wo =	2900	2600	W
η =	72,5	70	%

Operating conditions H.F. class B telephony
Caractéristiques d'utilisation H.F. classe B téléphonie
Betriebsdaten H.F. Klasse B Telephonie

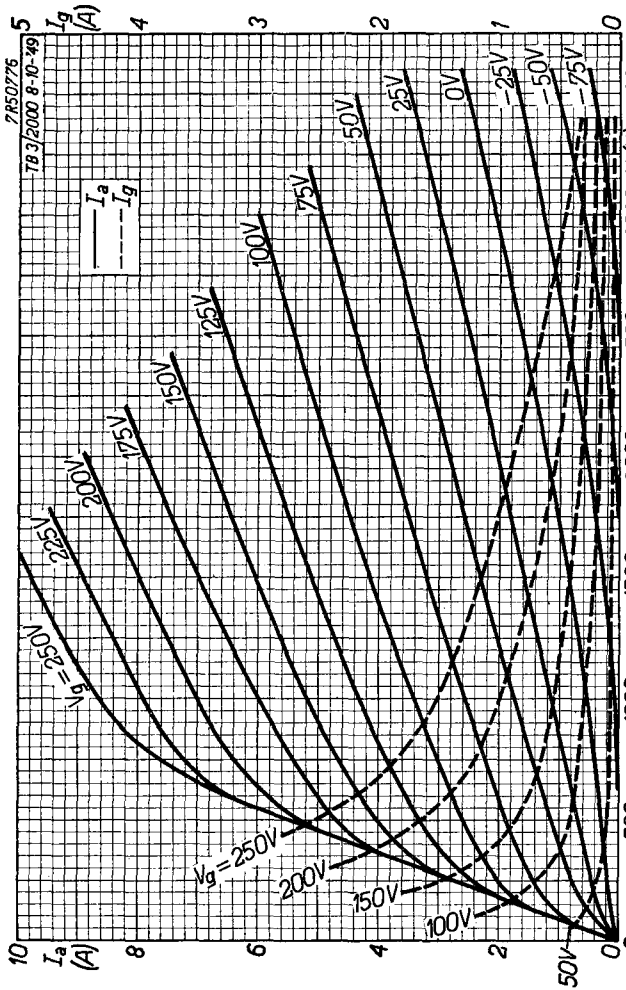
λ =	>150	>15	m
Va =	3500	3000	V
Vg =	-95	-70	V
Ia =	485	540	mA
Vgp =	125	110	V
Wia =	1700	1620	W
Wa =	1100	1100	W
Wo =	600	520	W
η =	35	32	%
m =	100	100	%
Ig =	100	160	mA
Wig =	25	35	W

Operating conditions H.F. class C anode modulation
Caractéristiques d'utilisation H.F. classe C modulation d'anode
Betriebsdaten H.F. Klasse C Anodenmodulation

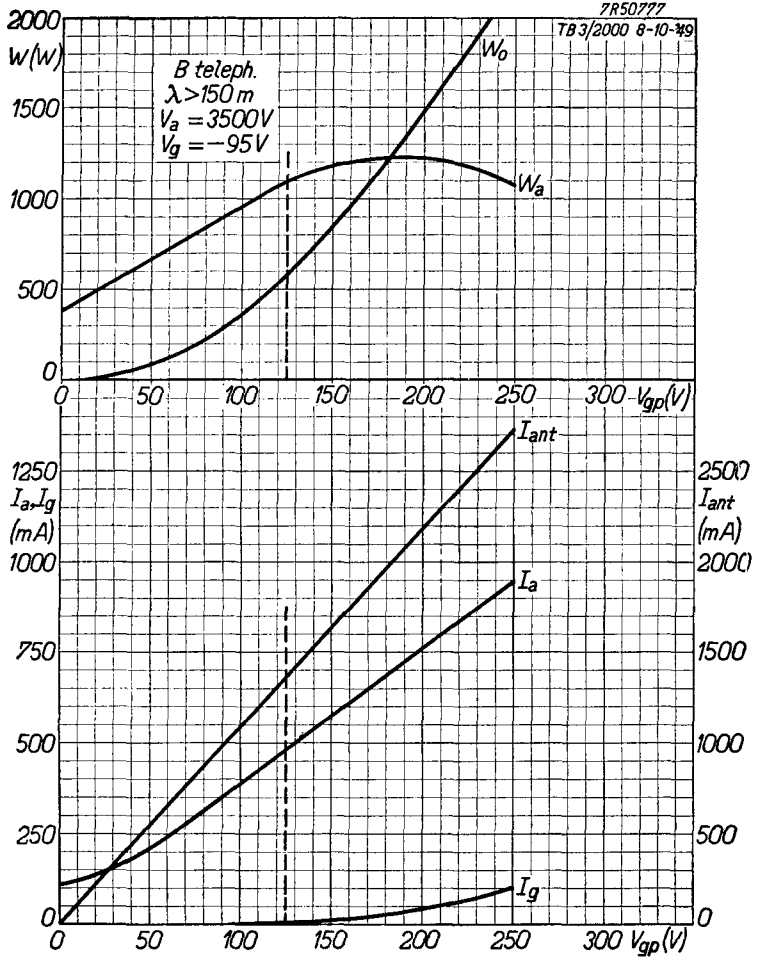
λ	=	>150	>15	m
Va	=	3000	2500	V
Vg	=	-300	-250	V
Ia	=	725	700	mA
Ig	=	165	160	mA
Vgp	=	550	480	V
Wig	=	90	77	W
Wia	=	2175	1750	W
Wa	=	550	450	W
Wo	=	1625	1300	W
η	=	75	74	%
m	=	100	100	%
Wmod	=	1087	875	W

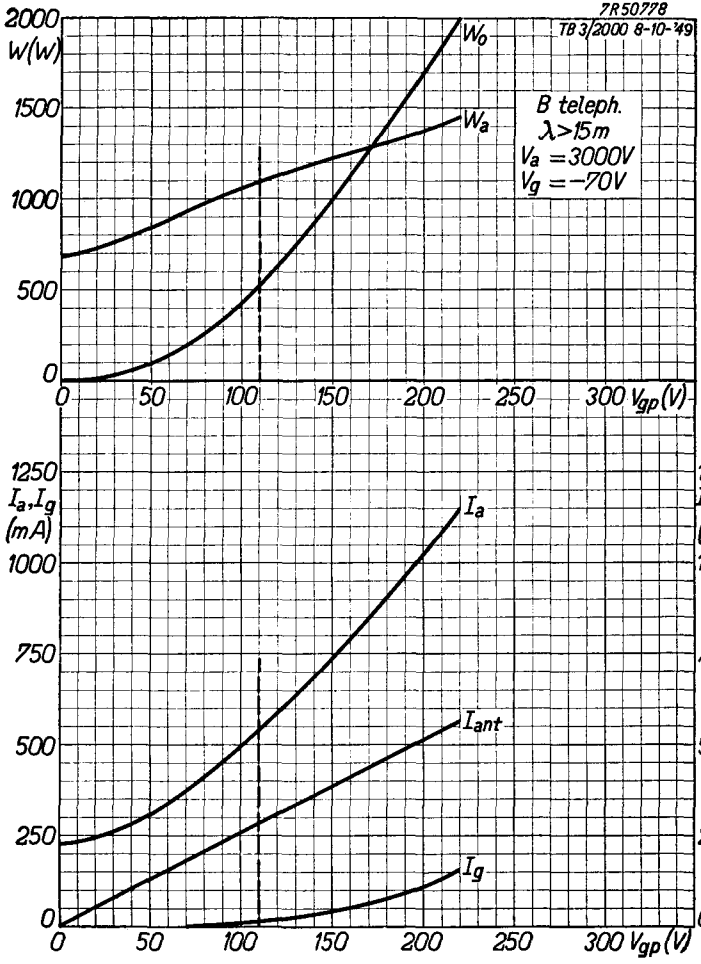
Operating conditions as L.F. class B amplifier and modulator, two valves
Caractéristiques d'utilisation comme amplificatrice et modulatrice B.F. classe B, deux tubes
Betriebsdaten als N.F. Verstärker und Modulator Klasse B, zwei Röhren

Va	=	3000		3000		2500	V
Vg	=	-70		-70		-70	V
Raa	=	4		5,08		4	kΩ
Vggp	=	0	340	0	300	0	340 V
Ia	=	2x135	2x833	2x135	2x650	2x100	2x750 mA
Ig	=	0	2x38	0	2x23	0	2x88 mA
Wig	=	0	2x6,5	0	2x3,5	0	2x15 W
Wia	=	2x405	2x2500	2x405	2x1950	2x250	2x1875 W
Wa	=	2x405	2x850	2x405	2x650	2x250	2x625 W
Wo	=	0	3300	0	2600	0	2500 W
d_{tot}	=	-	1,5	-	1,3	-	1,5 %
η	=	-	66	-	67	-	66,5 %

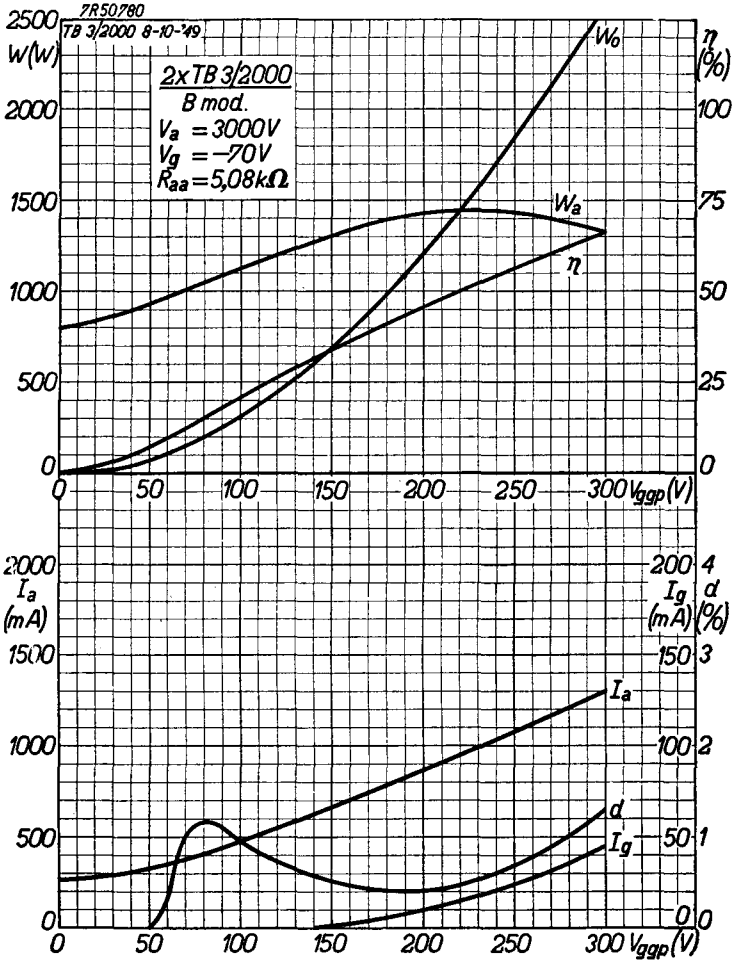

7850776
TB 3/2000 8-10-49
I_a
I_g
I_g (A)
I_a (A)
V_a(V)
V_g=250V
225V
200V
175V
150V
125V
100V
75V
50V
25V
0V
−25V
−50V
−75V
V_g=250V
200V
150V
100V
50V

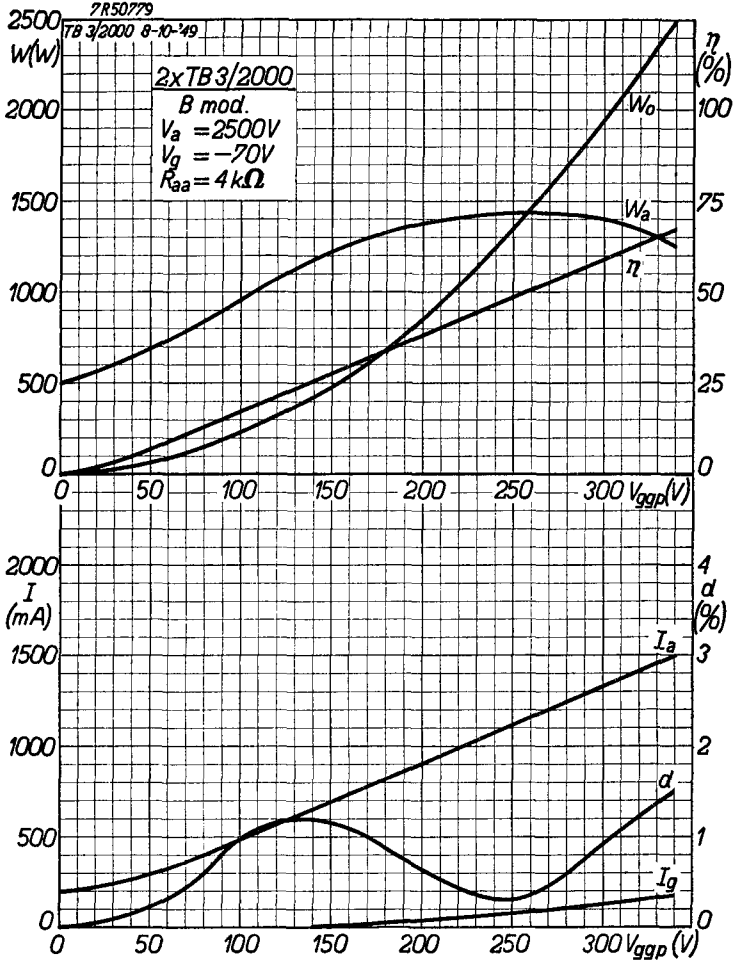
PHILIPS


7R50777
TB 3/2000 8-10-'49
B teleph.
λ>150 m
Va = 3500V
Vg = −95V
W(W)
2000
1500
1000
500
0
Wo
Wa
0
50
100
150
200
250
300
Vgp(V)
Ia, Ig (mA)
1250
1000
750
500
250
0
Iant
Ia
Ig
Iant (mA)
2500
2000
1500
1000
500
0


7R50778
TB 3/2000 8-10-'49
B teleph.
λ>15m
Va =3000V
Vg =-70V
W(W)
Wo
Wa
2000
1500
1000
500
0
0
50
100
150
200
250
300 Vgp(V)
Ia,Ig (mA)
Ia
Iant
Ig
1250
1000
750
500
250
0
12,5
10
7,5
5
2,5
0
Iant (A)

PHILIPS


7R50780
TB 3/2000 8-10-'49
2x TB 3/2000
B mod.
Va = 3000V
Vg = −70V
Raa = 5,08kΩ
W(W)
η (%)
Wo
Wa
η
Vggp (V)
Ia (mA)
Ig (mA)
d (%)
Ia
d
Ig


7R50779
TB 3/2000 8-10-'49
2xTB3/2000
B mod.
V_a =2500V
V_g =−70V
R_{aa}=4kΩ
W(W)
η (%)
W_o
W_a
η
V_{ggp}(V)
I (mA)
d (%)
I_a
d
I_g
V_{ggp} (V)

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Electronic Tube

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7	C	1949.10.10
8	D	1949.10.10
9	E	1949.10.10
10	FP	1999.11.19

TRIODE for use as H.F. or L.F. amplifier or oscillator
TRIODE pour utilisation en amplificatrice H.F. ou B.F.ou oscillatrice
TRIODE zur Verwendung als HF- oder NF-Verstärker oder Oszillator

Filament : thoriated tungsten
Filament : tungstène thorié
Heizfaden: thoriertes Wolfram

Heating : direct
Chauffage: direct
Heizung : direkt

V_f = 5 V
I_f = 6,3 A

Capacitances
Capacités
Kapazitäten

C_a = 0,3 pF
C_g = 2,9 pF
C_{ag} = 2,0 pF

Typical characteristics
Caractéristiques types
Kenndaten

μ = 38
S $\left\{\begin{matrix} V_a = 3000\ V \\ I_a = 200\ mA \end{matrix}\right\}$ = 4,5 mA/V

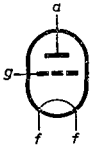
λ	Freq.	C telegr.		C an.mod.	
m	Mc/s	V_a (V)	W_o (W)	V_a (V)	W_o (W)
7,5	40	3000	400	2500	285
		2000	235	2000	235
		1500	185	1500	175

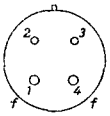
B mod[1])	
V_a (V)	W_o (W)
2500	425
2000	360
1500	280

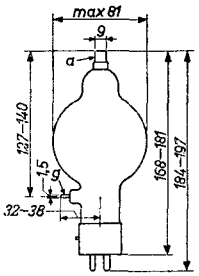
[1])Two tubes
Deux tubes
Zwei Röhren

PHILIPS

Dimensions in mm
Dimensions en mm
Abmessungen in mm







Base : Medium 4-p with bayonet
Culot : Medium 4-p à baïonnette
Sockel: Medium 4-p mit Bajonett

Socket
Support 40218-03
Fassung

Mounting position: vertical with base up or down
Montage : vertical avec le culot en haut ou en bas
Einbau : senkrecht mit Sockel oben oder unten

Net weight
Poids net 115 g
Nettogewicht

H.F. class C telegraphy
H.F. classe C télégraphie
HF- Klasse C Telegraphie

Limiting values
Caractéristiques limites
Grenzdaten

f	= max.	40	Mc/s
V_a	= max.	3000	V
I_a	= max.	225	mA
W_a	= max.	100	W
W_g	= max.	20	W

Operating conditions
Caractéristiques d'utilisation
Betriebsdaten

f	=	40	40	40	Mc/s
V_a	=	3000	2000	1500	V
V_g	=	-200	-80	-65	V
I_a	=	167	167	190	mA
I_g	=	51	39	48	mA
V_{gp}	=	385	230	230	V
W_{ig}	=	18	8	10	W
W_{ia}	=	500	335	285	W
W_a	=	100	100	100	W
W_o	=	400	235	185	W
η	=	80	70	65	%

H.F. class C anode modulation
H.F. classe C modulation d'anode
HF- Klasse C Anodenmodulation

Limiting values
Caractéristiques limites
Grenzdaten

f	= max.	40	Mc/s
V_a	= max.	2500	V
I_a	= max.	180	mA
W_a	= max.	65	W
W_g	= max.	20	W

Operating conditions
Caractéristiques d'utilisation
Betriebsdaten

f	=	40	40	40 Mc/s
V_a	=	2500	2000	1500 V
V_g	=	-250	-200	-150 V
I_a	=	140	150	160 mA
I_g	=	40	41	46 mA
V_{g_p}	=	425	375	325 V
W_{ig}	=	15,5	14	14 W
W_{ia}	=	350	300	240 W
W_a	=	65	65	65 W
W_o	=	285	235	175 W
η	=	81,5	78	73 %
m	=	100	100	100 %
W_{mod}	=	175	150	120 W

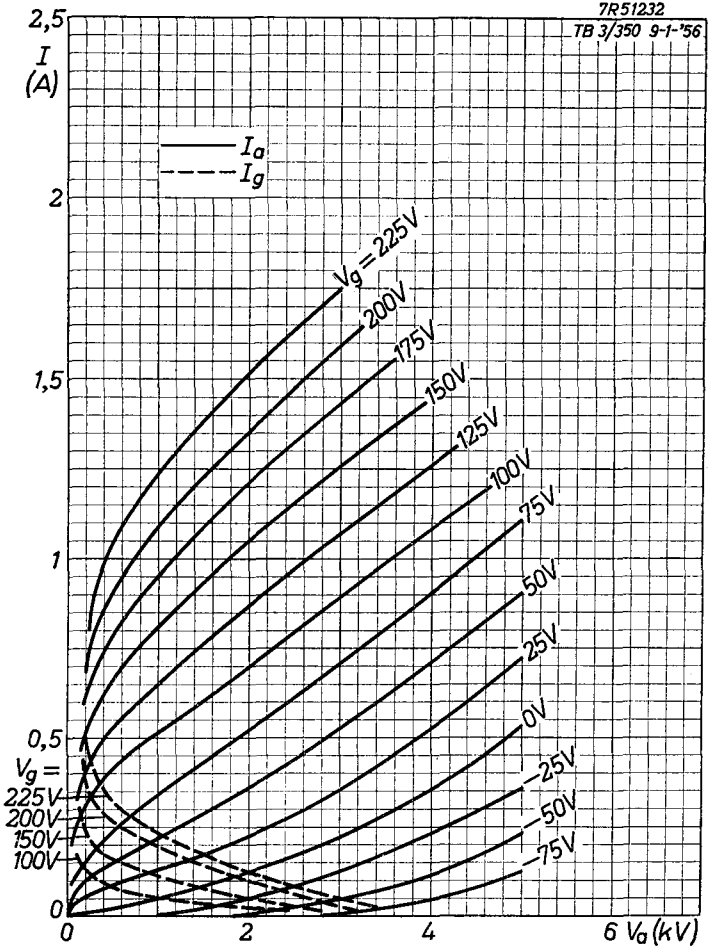
L.F. class B amplifier and modulator
Amplificatrice et modulatrice B.F. classe B
NF- Klasse B Verstärker und Modulator

Limiting values
Caractéristiques limites
Grenzdaten

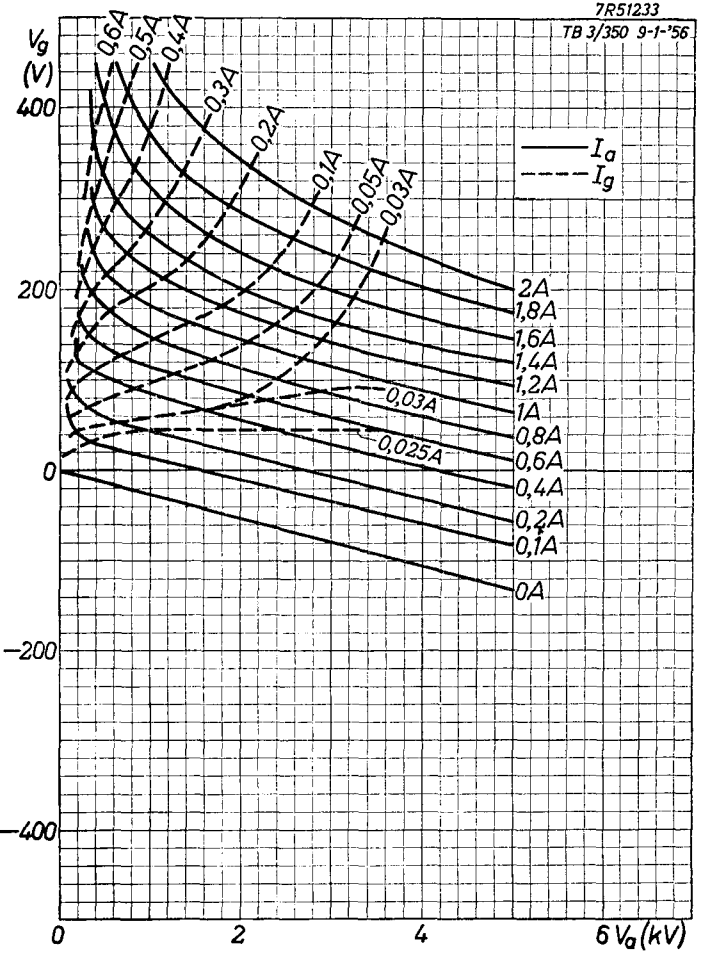
V_a	= max.	3000	V
I_a	= max.	225	mA
W_a	= max.	100	W
W_g	= max.	20	W

Operating conditions, two tubes
Caractéristiques d'utilisation, deux tubes
Betriebsdaten, zwei Röhren

V_a	=	2500		2000		1500		V
V_g	=	-50		-35		-20		V
$R_{aa\sim}$	=	22		15		8,8		kΩ
V_{gg_p}	=	0	310	0	300	0	290	V
I_a	=	2x24	2x125	2x30	2x140	2x40	2x160	mA
I_g	=	0	2x25	0	2x33	0	2x38	mA
I_{g_p}	=	0	2x90	0	2x110	0	2x160	mA
W_{ig}	=	0	2x3,5	0	2x4,5	0	2x5	W
W_{ia}	=	2x60	2x312	2x60	2x280	2x60	2x240	W
W_a	=	2x60	2x100	2x60	2x100	2x60	2x100	W
W_o	=	0	425	0	360	0	280	W
η	=	-	68	-	64	-	58,5	%


7R51232
TB 3/350 9-1-'56
2,5
I
(A)
2
1,5
1
0,5
0
I_a
I_g
V_g = 225V
200V
175V
150V
125V
100V
75V
50V
25V
0V
-25V
-50V
-75V
V_g =
225V
200V
150V
100V
0
2
4
6 V_a (kV)

PHILIPS


7R51233
TB 3/350 9-1-'56
V_g (V)
400
200
0
−200
−400
0
2
4
6 V_a (kV)
I_a
I_g
0,6A
0,5A
0,4A
0,3A
0,2A
0,1A
0,05A
0,03A
2A
1,8A
1,6A
1,4A
1,2A
1A
0,8A
0,6A
0,4A
0,2A
0,1A
0A
0,03A
0,025A

PHILIPS

Electronic Tube

HANDBOOK

TB3/350

page	sheet	date
1	1	1956.01.01
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3	3	1956.01.01
4	4	1956.01.01
5	5	1956.01.01
6	A	1956.01.01
7	B	1956.01.01
8	FP	1999.11.19

RF POWER TRIODE

QUICK REFERENCE DATA

freq.	class-C: telegraphy		grounded grid		oscillator		oscillator, industrial ∩		oscillator, industrial ∿		class-B: modulator	
MHz	V_a kV	W_o W	V_a kV	W_o* W	V_a kV	W_o* W	V_a kV	W_o W	V_a kV	W_o W	V_a kV	W_o* W
100	4	1200			4	2320					4	1500
	3	840	3	1936	3	1626					3	1360
	2,5	750	2,5	1747							2,5	1140
	2	585	2	1374								
	1,5	425	1,5	1040								
50							3,5	1100	4	630		
							2,25	685	3	415		

HEATING: direct, parallel supply; thoriated tungsten filament

Filament voltage	V_f	=	5 V
Filament current	I_f	=	14,1 A

The filament is designed to accept temporary fluctuations of +5% and −10%

CAPACITANCES

Anode to all other elements except grid	C_a	=	0,16 pF
Grid to all other elements except anode	C_g	=	6,3 pF
Anode to grid	C_{ag}	=	5,0 pF

TYPICAL CHARACTERISTICS

Anode voltage	V_a	=	3 kV
Anode current	I_a	=	90 mA
Mutual conductance	S	=	5 mA/V
Amplification factor	μ	=	25

* Two tubes.

TEMPERATURE LIMITS

Absolute maximum rating system			
Bulb temperature	T_{bulb}	max.	350 °C
Anode seal temperature	T_a	max.	220 °C
Pin temperature	T_{pin}	max.	180 °C

COOLING

In cases where the maximum permissible temperatures are likely to be exceeded, as would normally be the case at frequencies above 30 MHz with full ratings, a low-velocity air flow has to be directed onto the anode seal and the bottom of the envelope. The cooling will be facilitated by the use of a blower and a glass chimney type 40666.

MECHANICAL DATA

Socket	2422 512 01001	Base	Giant 5 p.
Anode connector (clip)	40624	Net mass	190 g
Chimney	40666		

Dimensions in mm

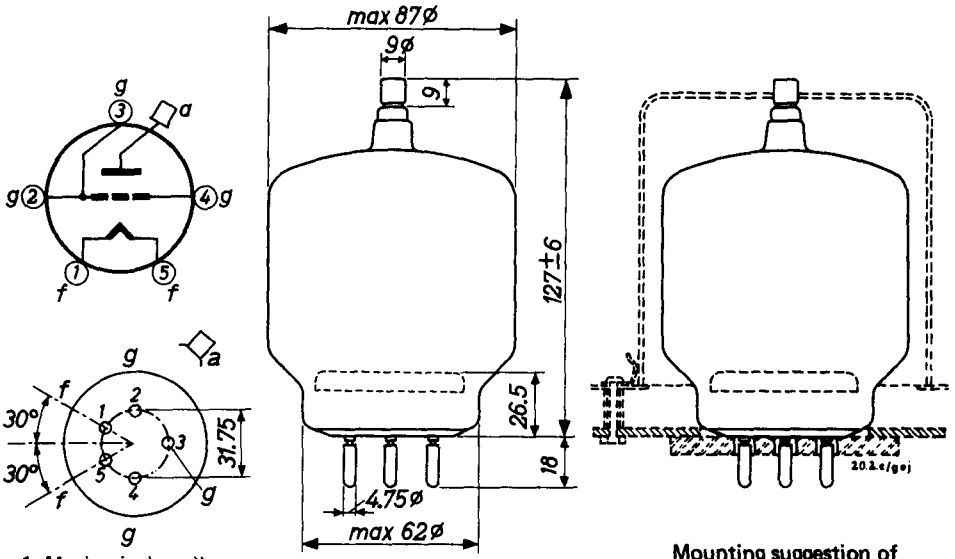


Fig. 1 Mechanical outline.

Mounting suggestion of tube with chimney.

Mounting position vertical with base up or down

In order to prevent overheating of the grid pins by high-frequency current it is recommended to include the three grid socket connections in the circuit.

RF CLASS C TELEGRAPHY OR F.M. TELEPHONY

LIMITING VALUES (Absolute limits)

Frequency							
	f	=	up to	100	MHz		
Anode voltage	V_a	=	max.	4	kV		
Anode input power	W_{ia}	=	max.	1550	W		
Anode dissipation	W_a	=	max.	350	W		
Negative grid voltage	$-V_g$	=	max.	500	V		
Grid dissipation	W_g	=	max.	40	W		
Grid circuit resistance	R_g	=	max.	100	kΩ		
Cathode current	I_k	=	max.	500	mA		

OPERATING CONDITIONS

Frequency	f	=	100	100	100	100	100	MHz
Anode voltage	V_a	=	4	3	2.5	2	1.5	kV
Grid voltage	V_g	=	−350	−250	−200	−150	−120	V
Peak grid AC voltage	V_{gp}	=	535	430	380	320	295	V
Anode current	I_a	=	380	363	400	400	400	mA
Grid current	I_g	=	80	69	69	80	80	mA
Driving power	W_{dr}	=	40	27	23.5	23	21.5	W
Anode input power	W_{ia}	=	1520	1090	1000	800	600	W
Anode dissipation	W_a	=	320	250	250	215	175	W
Output power	W_o	=	1200	840	750	585	425	W
Efficiency	η	=	79	77	75	73	71	%

RF CLASS C TELEGRAPHY OR FM TELEPHONY (continued)

OPERATING CONDITIONS, grounded grid, two tubes

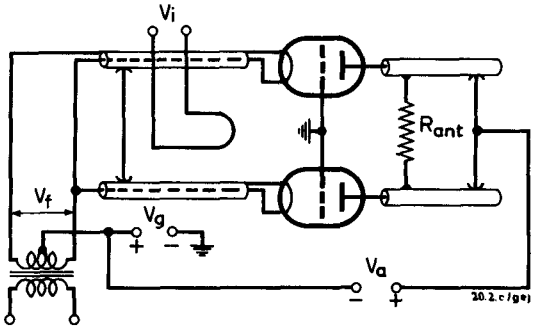


Fig. 2 Ground grid configuration.

Frequency	f	=	100	100	100	100	MHz
Anode voltage	V_a	=	3	2.5	2	1.5	kV
Grid voltage	V_g	=	−250	−200	−150	−120	V
Peak grid AC voltage	V_{gp}	=	430	380	320	295	V
Anode current	I_a	=	726	800	800	800	mA
Grid current	I_g	=	138	138	160	160	mA
Driving power	W_{dr}	=	310	294	250	233	W
Anode input power	W_{ia}	=	2180	2000	1600	1200	W
Anode dissipation	W_a	=	500	500	430	350	W
Output power	W_o	=	1680+256	1500+247	1170+204	850+190	W [1]
Efficiency	η	=	77	75	73	71	%

[1]) Power transferred from driving stage included

RF CLASS C OSCILLATOR

LIMITING VALUES (Absolute limits)

Frequency	f		up to	100	MHz
Anode voltage	V_a	=	max.	4	kV
Anode input power	W_{ia}	=	max.	1550	W
Anode dissipation	W_a	=	max.	350	W
Negative grid voltage	$-V_g$	=	max.	500	V
Grid dissipation	W_g	=	max.	40	W
Grid circuit resistance	R_g	=	max.	100	kΩ
Cathode current	I_k	=	max.	500	mA

OPERATING CONDITIONS, two tubes

Frequency	f	=	100	100	MHz
Anode voltage	V_a	=	4	3	kV
Anode current	I_a	=	760	726	mA
Grid current	I_g	=	160	138	mA
Grid resistor	R_g	=	2200	1800	Ω
Driving power	W_{dr}	=	80	54	W
Anode input power	W_{ia}	=	3040	2180	W
Anode dissipation	W_a	=	640	500	W
Output power	W_o	=	2320	1626	W
Efficiency	η	=	77	75	%

R F CLASS C OSCILLATOR FOR INDUSTRIAL USE with anode voltage from **single-phase full-wave rectifier without filter**

LIMITING VALUES (Absolute limits)

Frequency	f		up to 50	up to 100	up to 150	MHz
Anode voltage	V_a	=	max. 3.8	max. 2.7	max. 1.8	kV
Anode input power	W_{ia}	=	max. 1500	max. 975	max. 650	W
Anode dissipation	W_a	=	max. 350	max. 350	max. 350	W
Negative grid voltage	$-V_g$	=	max. 500	max. 500	max. 500	V
Grid dissipation	W_g	=	max. 40	max. 40	max. 40	W
Grid circuit resistance	R_g	=	max. 100	max. 100	max. 100	kΩ
Cathode current	I_k	=	max. 450	max. 450	max. 450	mA

OPERATING CONDITIONS

Frequency	f	=	50	50	MHz
Anode voltage	V_a	=	3.5	2.25	kV
Anode current	I_a	=	325	340	mA
Grid current	I_g	=	65	60	mA
Grid resistor	R_g	=	4500	3330	Ω
Anode input power	W_{ia}	=	1400	935	W
Anode dissipation	W_a	=	300	250	W
Output power	W_o	=	1100	685	W
Efficiency	η	=	78	73	%
Output power in the load	W_ℓ	=	900	560	W

RF CLASS C OSCILLATOR FOR INDUSTRIAL USE with self rectification, 180° phase shift between V_a and V_g

LIMITING VALUES (Absolute limits)

Frequency	f		up to 50	up to 100	up to 150	MHz
Transformer voltage	V_{tr}	=	max. 4.5	max. 3.5	max. 2.25	kV_{RMS}
Anode input power	W_{ia}	=	max. 900	max. 730	max. 500	W
Anode dissipation	W_a	=	max. 350	max. 350	max. 350	W
Negative grid voltage	$-V_g$	=	max. 500	max. 500	max. 500	V
Grid dissipation	W_g	=	max. 40	max. 40	max. 40	W
Grid circuit resistance	R_g	=	max. 100	max. 100	max. 100	kΩ
Cathode current	I_k	=	max. 285	max. 285	max. 285	mA

OPERATING CONDITIONS

Frequency	f	=	50	50	MHz
Transformer voltage	V_{tr}	=	4	3	kV_{RMS}
Anode current	I_a	=	190	180	mA
Driving voltage	V_g	=	280	110	V_{RMS}
Grid current	I_g	=	35	32	mA
Grid resistor	R_g	=	5500	3000	Ω
Anode input power	W_{ia}	=	840	600	W
Anode dissipation	W_a	=	210	185	W
Output power	W_o	=	630	415	W
Efficiency	η	=	75	69	%
Output power in the load	W_ℓ	=	515	350	W

AF CLASS B AMPLIFIER AND MODULATOR, two tubes in push-pull

LIMITING VALUES (Absolute limits)

Anode voltage	V_a	= max.	4	kV
Anode input power	W_{ia}	= max.	1550	W
Anode dissipation	W_a	= max.	350	W
Negative grid voltage	$-V_g$	= max.	500	V
Grid dissipation	W_g	= max.	40	W
Grid circuit resistance	R_g	= max.	100	kΩ
Cathode current	I_k	= max.	500	mA

OPERATING CONDITIONS

V_a	=	4		3		2.5		kV
V_g	=	-135		-102		-77.5		V[1])
$R_{aa\sim}$	=	20		14.5		12		kΩ
V_{ggp}	=	0	485	0	475	0	400	V
I_a	=	2x88	2x270	2x60	2x290	2x90	2x300	mA
I_g	=	0	2x30	0	2x60	0	2x55	mA
W_{dr}	=	0	2x7	0	2x13	0	2x10	W
W_{ia}	=	2x350	2x1080	2x180	2x870	2x225	2x750	W
W_a	=	2x350	2x305	2x180	2x190	2x225	2x180	W
W_o	=	0	1550	0	1360	0	1140	W
d_{tot}	=	-	< 2.5	-	< 2.5	-	< 2.5	%
η	=	-	71.7	-	78.1	-	76	%

[1]) To be adjusted for zero signal anode current

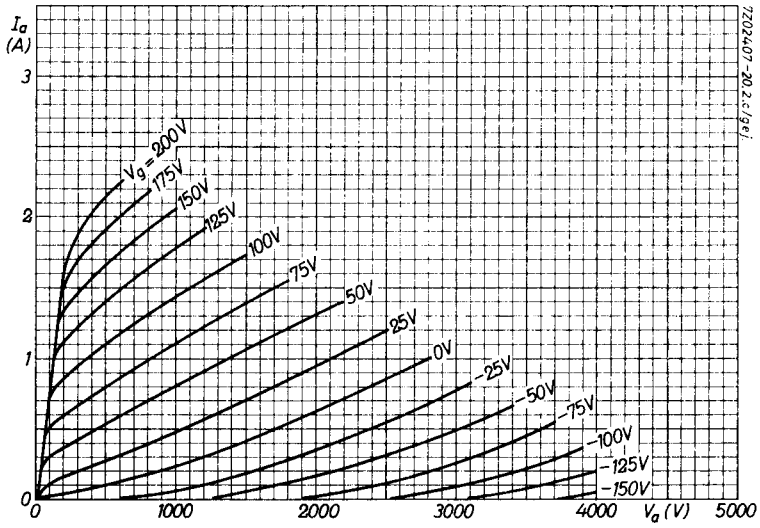


Fig. 3 I_a/V_a characteristics.

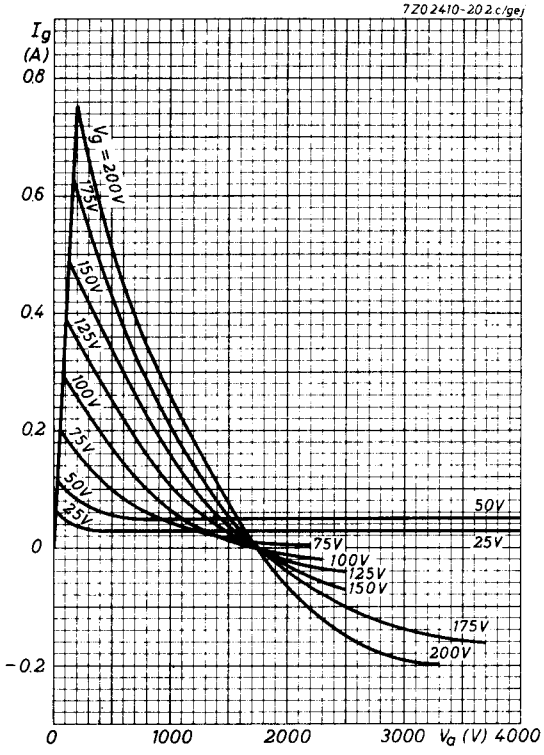


Fig. 4 I_g/V_a characteristics.

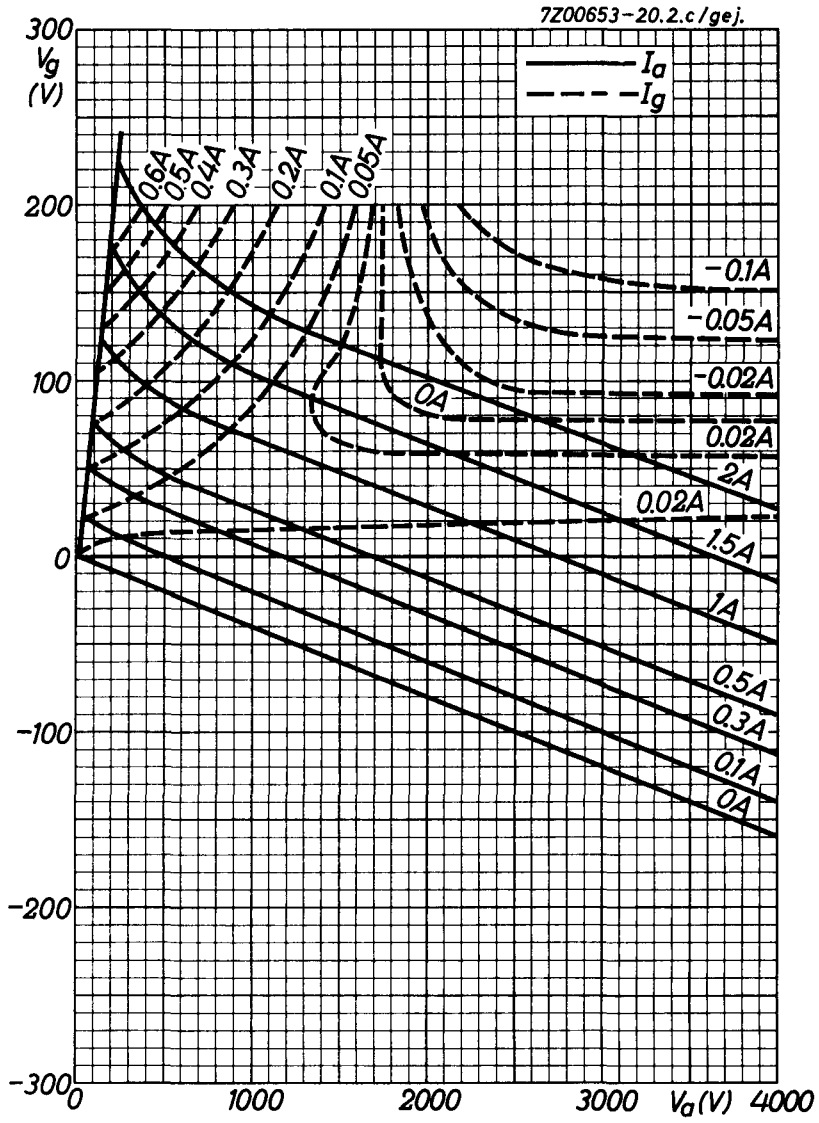


Fig. 5 Constant current characteristics.

PHILIPS

Data handbook

Electronic components and materials

TB3/750

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1	49	1988.02
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8	56	1988.02
9	57	1988.02
10	58	1988.02
11	FP	2000..09.14

RF POWER TRIODE

QUICK REFERENCE DATA										
λ (m)	Freq. (MHz)	C telegr.		C grounded grid		C_a mod.		B mod. [2]	
		V_a (V)	W_o (W)	V_a (V)	W_o [1] (W)	V_a (V)	W_o (W)	V_a (V)	W_o (W)
3	100	4000	1690	4000	1950	3000	1050	4000	2290
		3500	1430	3500	1650			3500	2440
		3000	1175	3000	1375			3000	2310
		2500	950	2500	1120			2500	2000

HEATING: direct; filament thoriated tungsten

Filament voltage	V_f	=	10	V
Filament current	I_f	=	9.9	A

CAPACITANCES

Anode to all other elements except grid	C_a	=	0.17	pF
Grid to all other elements except anode	C_g	=	8.0	pF
Anode to grid	C_{ag}	=	7.0	pF

TYPICAL CHARACTERISTICS

Amplification factor	μ	=	28	
Mutual conductance	S (I_a = 125 mA)	=	4.5	mA/V

TEMPERATURE LIMITS (Absolute limits)

Temperature of anode seal	=	max. 220	°C
Temperature of bottom pin seals	=	max. 180	°C
Bulb temperature	=	max. 250	°C

[1]) Power transferred from driving stage included
[2]) Two tubes

COOLING

In general cooling of the tube is not necessary at normal ambient temperature at frequencies below 50 MHz.

When the tube is used at or near the limiting values at frequencies above 50 Mc/s, it will be necessary to direct a low-velocity air flow on the anode seal and the bottom of the envelope.

MECHANICAL DATA

Dimensions in mm

Socket : 2422 512 00001

Anode connector: 40626

Net mass : 420 g

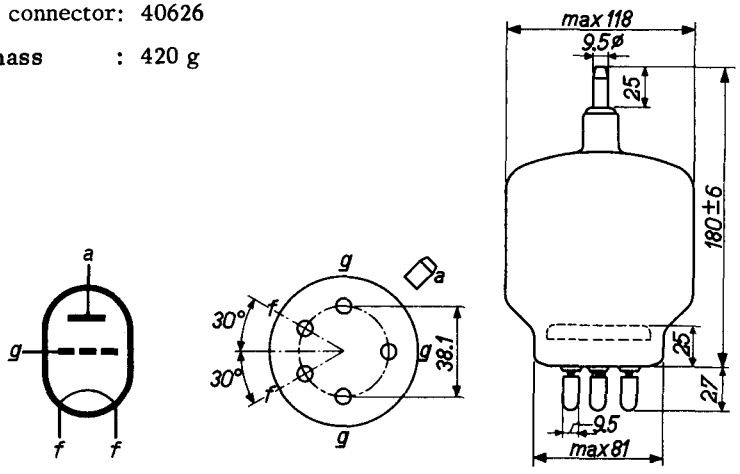


Fig. 1 Mechanical outline.

Mounting position: vertical with base up or down

RF CLASS C TELEGRAPHY

LIMITING VALUES (Absolute limits)

Frequency		f		up to	100	MHz
Anode voltage		V_a	=	max.	4000	V
Anode dissipation		W_a	=	max.	450	W
Grid dissipation		W_g	=	max.	50	W
Grid current		I_g	=	max.	115	mA
Cathode current		I_k	=	max.	650	mA

OPERATING CONDITIONS (controlled)

Wavelength	λ	=	3	3	3	3	m
Anode voltage	V_a	=	4000	3500	3000	2500	V
Grid voltage	V_g	=	-350	-300	-250	-200	V
Anode current	I_a	=	535	535	535	535	mA
Grid current	I_g	=	115	115	115	115	mA
Peak grid AC voltage	V_{gp}	=	580	520	460	405	V
Grid input power	W_{ig}	=	60	54	48	42	W
Anode input power	W_{ia}	=	2140	1880	1600	1340	W
Anode dissipation	W_a	=	450	450	425	390	W
Output power	W_o	=	1690	1430	1175	950	W
Efficiency	η	=	79	76	73.5	71	%

OPERATING CONDITIONS (self excited)

Wavelength	λ	=	3	3	3	3	m
Anode voltage	V_a	=	4000	3500	3000	2500	V
Grid resistor	R_g	=	3000	2600	2200	1800	Ω
Anode current	I_a	=	535	535	535	535	mA
Grid current	I_g	=	115	115	115	115	mA
Peak grid AC voltage	V_{gp}	=	580	520	460	405	V
Grid input power	W_{ig}	=	60	54	48	42	W
Anode input power	W_{ia}	=	2140	1880	1600	1340	W
Anode dissipation	W_a	=	450	450	425	390	W
Output power	W_o	=	1630	1376	1127	908	W
Efficiency	η	=	76.5	73	70.5	67.5	%

OPERATING CONDITIONS RF CLASS C TELEGRAPHY (continued)
Grounded grid circuit, two tubes

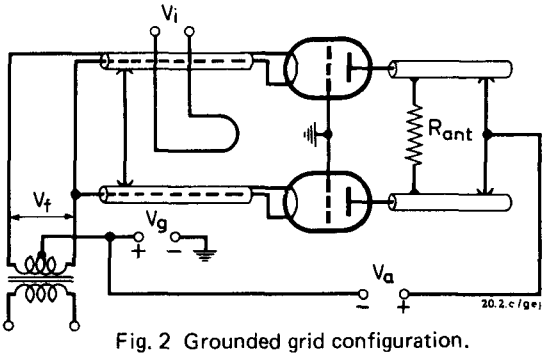


Fig. 2 Grounded grid configuration.

Wavelength	λ	=	3	3	3	3	m
Anode voltage	V_a	=	4000	3500	3000	2500	V
Grid voltage	V_g	=	−350	−300	−250	−200	V
Anode current	I_a	=	2x535	2x535	2x535	2x535	mA
Grid current	I_g	=	2x115	2x115	2x115	2x115	mA
Peak grid voltage	V_{gp}	=	580	520	460	405	V
Grid input power	W_{ig}	=	2x320	2x274	2x248	2x212	W
Anode input power	W_{ia}	=	2x2140	2x1880	2x1600	2x1340	W
Anode dissipation	W_a	=	2x450	2x450	2x425	2x390	W
Output power	W_o	=	3380+520	2860+440	2350+400	1900+340	W[1])
Efficiency	η	=	79	76	73.5	71	%[2])

[1]) Power transferred from driving stage included

[2]) Pure tube efficiency

* See Fig. 6 for operation above 100 MHz.

RF CLASS C ANODE MODULATION

LIMITING VALUES (Absolute limits)

Frequency	f		up to 100	MHz
Anode voltage	V_a	=	max. 3000	V
Anode dissipation	W_a	=	max. 300	W
Grid dissipation	W_g	=	max. 50	W
Grid current	I_g	=	max. 115	mA
Cathode current	I_k	=	max. 550	mA

OPERATING CONDITIONS

Wavelength	λ	=	3	m
Anode voltage	V_a	=	3000	V
Grid voltage	V_g	=	-375	V
Anode current	I_a	=	450	mA
Grid current	I_g	=	85	mA
Peak grid AC voltage	V_{gp}	=	580	V
Grid input power	W_{ig}	=	42	W
Anode input power	W_{ia}	=	1350	W
Anode dissipation	W_a	=	300	W
Output power	W_o	=	1050	W
Efficiency	η	=	78	%
Modulation factor	m	=	100	%
Modulation power	W_{mod}	=	675	W

AF CLASS B AMPLIFIER AND MODULATOR

LIMITING VALUES (Absolute limits)

Anode voltage	V_a	= max.	4000	V
Anode dissipation	W_a	= max.	450	W
Grid dissipation	W_g	= max.	50	W
Cathode current	I_k	= max.	700	mA
Peak cathode current	I_{kp}	= max.	5	A
Grid current	I_g	= max.	130	mA
Grid circuit resistance	R_g	= max.	50	kΩ

OPERATING CONDITIONS, two tubes

Anode voltage	V_a	=	4000		3500		V
Grid voltage	V_g	=	−135		−114		V
Load resistance	$R_{aa\sim}$	=	14.5		10.2		kΩ
Peak grid to grid voltage	V_{ggp}	=	0	566	0	563	V
Anode current	I_a	=	2x70	2x368	2x70	2x442	mA
Grid current	I_g	=	0	2x93	0	2x115	mA
Grid input power	W_{ig}	=	0	2x24	0	2x29	W
Anode input power	W_{ia}	=	2x280	2x1474	2x245	2x1550	W
Anode dissipation	W_a	=	2x280	2x329	2x245	2x330	W
Output power	W_o	=	0	2290	0	2440	W
Total distortion	d_{tot}	=	–	5	–	5	%
Efficiency	η	=	–	77.7	–	78.8	%

Anode voltage	V_a	=	3000		2500		V
Grid voltage	V_g	=	−94		−75		V
Load resistance	$R_{aa\sim}$	=	7.5		5.2		kΩ
Peak grid to grid voltage	V_{ggp}	=	0	560	0	530	V
Anode current	I_a	=	2x70	2x500	2x70	2x555	mA
Grid current	I_g	=	0	2x130	0	2x126	mA
Grid input power	W_{ig}	=	0	2x33	0	2x30	W
Anode input power	W_{ia}	=	2x210	2x1500	2x175	2x1387	W
Anode dissipation	W_a	=	2x210	2x345	2x175	2x387	W
Output power	W_o	=	0	2310	0	2000	W
Total distortion	d_{tot}	=	–	5	–	3.5	%
Efficiency	η	=	–	77	–	72	%

RF CLASS C OSCILLATOR FOR INDUSTRIAL USE with anode voltage from two-phase half-wave rectifier without filter

LIMITING VALUES (Absolute limits)

Frequency					
	f		up to	100	MHz
Anode voltage	V_a	=	max.	3600	V
Negative grid voltage	$-V_g$	=	max.	320	V
Anode current	I_a	=	max.	475	mA
Grid current	I_g	=	max.	100	mA
Anode input power	W_{ia}	=	max.	2200	W
Anode dissipation	W_a	=	max.	450	W
Grid dissipation	W_g	=	max.	50	W

OPERATING CONDITIONS

Transformer voltage	V_{tr}	=	4000[1])	3350[2])	V_{RMS}
Anode voltage	V_a	=	3600	3000	V [3])
Anode current	I_a	=	450	400	mA
Grid current	I_g	=	100	85	mA
Grid resistor	R_g	=	3.0	3.0	kΩ
Anode input power	W_{ia}	=	2000	1480	W
Anode dissipation	W_a	=	450	400	W
Output power	W_o	=	1500	1040	W
Efficiency	η	=	75	70	%

[1]) Care must be taken that under these operating conditions the absolute limiting values are not exceeded by variation of the supply voltage or the load or by tolerances in the circuit elements.

[2]) Under these conditions normal deviations of voltages and load are permissible. The absolute limiting values of the tube must, however, not be exceeded.

[3]) DC value.

RF CLASS C OSCILLATOR FOR INDUSTRIAL USE with anode voltage from three-phase half-wave rectifier without filter

LIMITING VALUES (Absolute limits)

Frequency					
	f		up to	100	MHz
Anode voltage	V_a	=	max.	4000	V
Negative grid voltage	$-V_g$	=	max.	500	V
Anode current	I_a	=	max.	535	mA
Grid current	I_g	=	max.	115	mA
Anode input power	W_{ia}	=	max.	2200	W
Anode dissipation	W_a	=	max.	450	W
Grid dissipation	W_g	=	max.	50	W

OPERATING CONDITIONS

Transformer voltage	V_{tr}	=	3400[1])	2900[2])	V_{RMS}
Anode voltage	V_a	=	4000	3400	V [3])
Anode current	I_a	=	535	450	mA
Grid current	I_g	=	115	100	mA
Grid resistor	R_g	=	3.0	3.0	kΩ
Anode input power	W_{ia}	=	2140	1530	W
Anode dissipation	W_a	=	450	390	W
Output power	W_o	=	1630	1090	W
Efficiency	η	=	76.5	71	%

1) Care must be taken that under these operating conditions the absolute limiting values are not exceeded by variation of the supply voltage or the load or by tolerances in the circuit elements.

2) Under these conditions normal deviations of voltages and load are permissible. The absolute limiting values of the tube must, however, not be exceeded.

3) DC value.

RF CLASS C OSCILLATOR FOR INDUSTRIAL USE with self rectification

LIMITING VALUES (Absolute limits)

Frequency					
	f		up to	100	MHz
Transformer voltage	V_{tr}	=	max.	4500	V_{RMS}
Negative grid voltage	$-V_g$	=	max.	500	V
Anode current	I_a	=	max.	280	mA
Grid current	I_g	=	max.	55	mA
Anode input power	W_{ia}	=	max.	1450	W
Anode dissipation	W_a	=	max.	450	W
Grid dissipation	W_g	=	max.	50	W

OPERATING CONDITIONS

Transformer voltage	V_{tr}	=	4500[1])	3800[2])	V_{RMS}
Anode current	I_a	=	280	240	mA
Grid current	I_g	=	55	47	mA
Grid resistor	R_g	=	3.4	3.4	kΩ
Anode input power	W_{ia}	=	1400	1010	W
Anode dissipation	W_a	=	350	295	W
Output power	W_o	=	1000	670	W
Efficiency	η	=	71.5	66	%

[1]) Care must be taken that under these operating conditions the absolute limiting values are not exceeded by variation of the supply voltage or the load or by tolerances in the circuit elements.

[2]) Under these conditions normal deviations of voltages and load are permissible. The absolute limiting values of the tube must, however, not be exceeded.

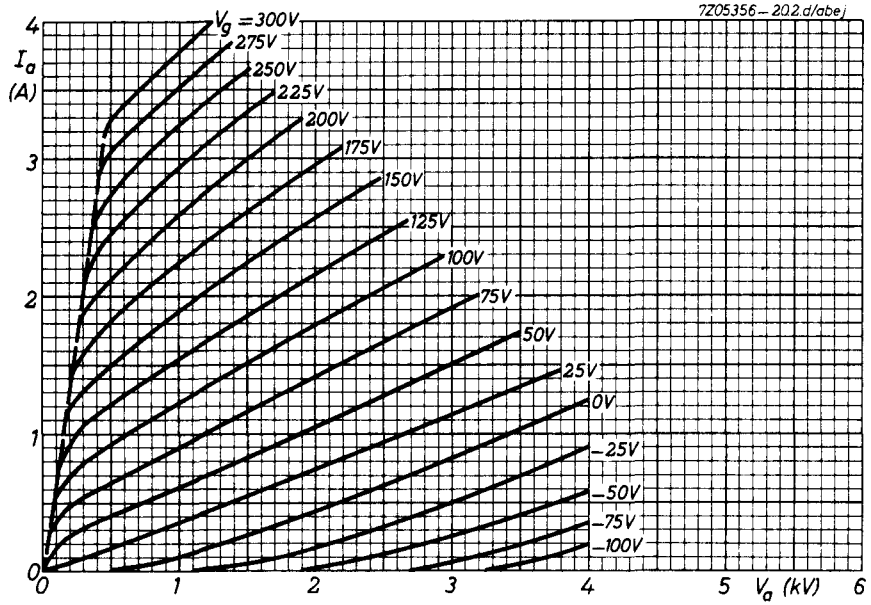


Fig. 3 I_a/V_a characteristics.

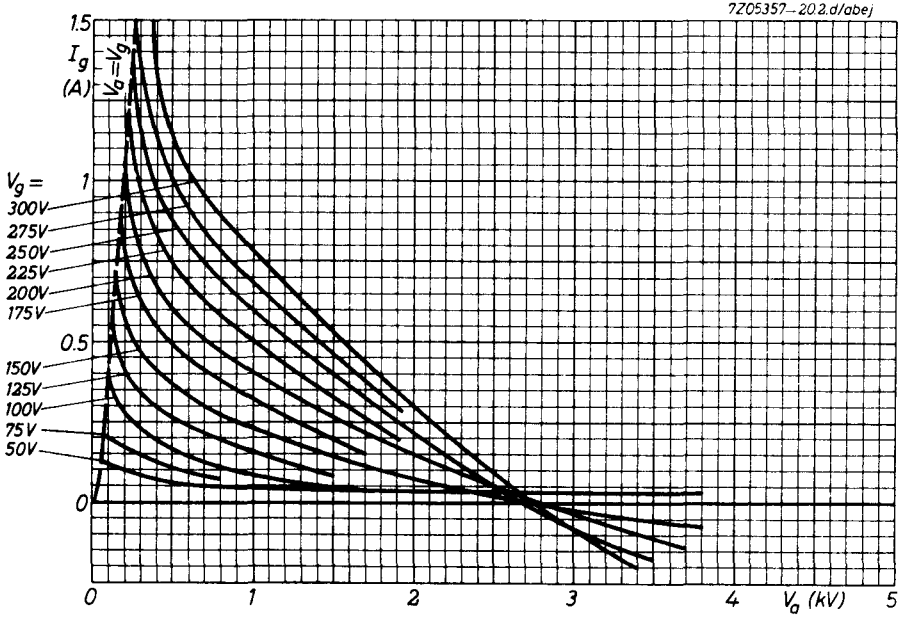


Fig. 4 I_a/V_a characteristics.

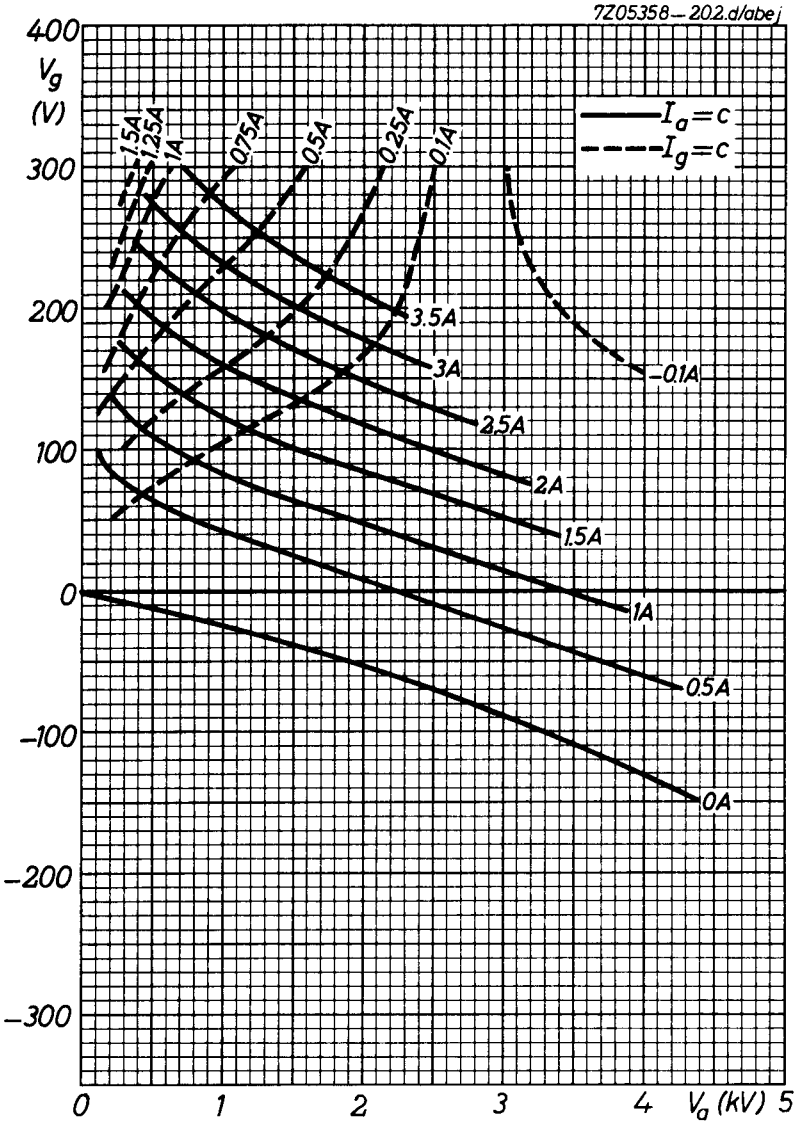


Fig. 5 Constant current characteristics.

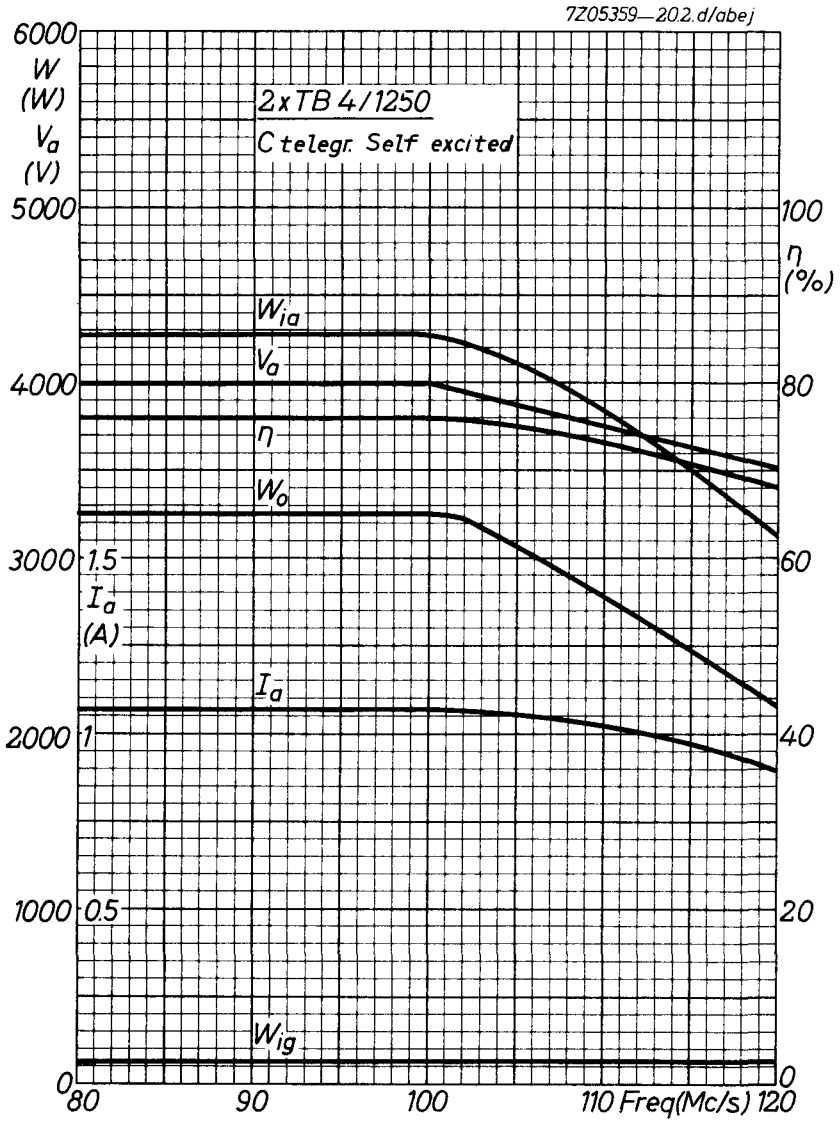


Fig. 6 Characteristics at frequencies above 100 MHz.

PHILIPS

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Electronic components and materials

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1	59	1988.02
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10	68	1988.02
11	69	1988.02
12	70	1988.02
13	FP	2000.09.15

RF POWER TRIODE

Radiation cooled triode of metal-glass construction intended for use as an industrial oscillator

QUICK REFERENCE DATA				
Oscillator output power (W_o-W_{feedb}), typical	W_{osc}		1.58	kW
Frequency for full ratings	f	max.	50	MHz

To be read in conjunction with "General Operational Recommendations"

A. RF CLASS C OSCILLATOR FOR INDUSTRIAL USE

with anode voltage from a three-phase rectifier

OPERATING CONDITIONS continuous service

Frequency	f	50	50	50	MHz
Oscillator output power (W_o-W_{feedb})	W_{osc}	1.55	1.58	1.55	kW
Anode vootage	V_a	6	5	4	kV
Anode current	I_a	350	430	535	mA
Anode input power	W_{ia}	2100	2150	2140	W
Anode dissipation	W_a	460	480	490	W
Anode output power	W_o	1640	1670	1650	W
Anode efficiency	η_a	78	78	77	%
Oscillator efficiency	η_{osc}	74	73.5	72.5	%
Feedback ratio	V_{gp}/V_{ap}	15	15.5	20	%
Grid resistor	R_g	4.2	3.5	2.7	kΩ
Grid current, on load	I_g	120	130	150	mA
Grid voltage, negative	$-V_g$	500	456	405	V
Grid dissipation	W_g	23	29	41	W
Grid resistor dissipation	W_{Rg}	60	59	61	W

LIMITING VALUES (Absolute max. rating system)

Frequency for full ratings	f	up to	50	MHz
Anode voltage	V_a	max.	7	kV
Anode current	I_a	max.	560	mA
Anode input power	W_{ia}	max.	2.5	kW
Anode dissipation	W_a	max.	500	W
Grid voltage	$-V_g$	max.	1250	V
Grid current, on load	I_g	max.	210	mA
off load	I_g	max.	280	mA
Grid dissipation	W_g	max.	100	W
Grid circuit resistance	R_g	max.	15	kΩ
Cathode current, mean	I_k	max.	850	mA
Envelope temperature	T_{env}	max.	350	°C
Seal temperature	t	max.	220	°C

B. **RF CLASS C OSCILLATOR FOR INDUSTRIAL USE,**

with anode voltage from three-phase rectifier,

OPERATING CONDITIONS, intermittent service

Frequency	f	50	50	MHz
Oscillator output power (W_o-W_{feedb})	W_{osc}	3.05	2.28	kW
Anode voltage	V_a	6	6	kV
Anode current	I_a	700	630	mA
Anode input power	W_{ia}	4200	3150	W
Anode dissipation	W_a	1000	750	W
Anode output power	W_o	3200	2400	W
Anode efficiency	η_a	76	76	%
Oscillator efficiency	η_{osc}	72.5	72.5	%
Feedback ratio	V_{gp}/V_{ap}	16	17	%
Grid resistor	R_g	3.3	2.7	kΩ
Grid current, on load	I_g	170	160	mA
Grid voltage, negative	$-V_g$	560	432	V
Grid dissipation	W_g	55	48	W
Grid resistor dissipation	W_{Rg}	95	69	W

LIMITING VALUES (Absolute max. rating system)

Frequency for full ratings	f	up to	50	MHz
Anode voltage	V_a	max.	7	kV
Anode current	I_a	max.	750	mA
Anode input power	W_{ia}	max.	5	kW
Anode dissipation	W_a	max.	See Fig. 2	
Grid voltage	$-V_g$	max.	1250	V
Grid current, on load	I_g	max.	185	mA
off load	I_g	max.	300	mA
Grid dissipation	W_g	max.	100	W
Grid circuit resistance	R_g	max.	15	kΩ
Cathode current, mean	I_k	max.	1.1	A
Envelope temperature	T_{env}	max.	330	°C
Seal temperature	t	max.	220	°C

C. **RF CLASS C OSCILLATOR FOR INDUSTRIAL USE,**

with anode voltage from single-phase rectifier without filter

OPERATING CONDITIONS , continuous service

Frequency	f	50	50	MHz
Oscillator output power (W_o-Wfeedb)	W_{osc}	1.565	1.525	kW
Anode voltage	V_a	5.4	4.5	kV
Anode current	I_a	320	380	mA
Anode input power	W_{ia}	2125	2100	W
Anode dissipation	W_a	490	500	W
Anode output power	W_o	1635	1600	W
Anode efficiency	η_a	77	76	%
Oscillator efficiency	η_{osc}	74	73	%
Feedback ratio	V_{gp}/V_{ap}	13	15.5	%
Grid resistor	R_g	4.2	3.5	kΩ
Grid current, on load	I_g	110	120	mA
Grid voltage, negative	$-V_g$	462	420	V
Grid dissipation	W_g	15	25	W
Grid resistor dissipation	W_{Rg}	50	50	W

LIMITING VALUES (Absolute max. rating system)

Frequency for full ratings	f	up to	50	MHz
Anode voltage	V_a	max.	6.3	kV
Anode current	I_a	max.	500	mA
Anode input power	W_{ia}	max.	2.5	kW
Anode dissipation	W_a	max.	500	W
Grid voltage	$-V_g$	max.	1250	V
Grid current, on load	I_g	max.	185	mA
off load	I_g	max.	280	mA
Grid dissipation	W_g	max.	100	W
Grid circuit resistance	R_g	max.	15	kΩ
Cathode current, mean	I_k	max.	780	mA
Envelope temperature	T_{env}	max.	330	°C
Seal temperature	t	max.	220	°C

D. **RF CLASS C OSCILLATOR FOR INDUSTRIAL USE,**

with self rectification

OPERATING CONDITIONS, continuous service

Frequency	f	50	MHz
Oscillator output power ($W_o - W_{feedb}$)	W_{osc}	990	W
Transformer voltage, RMS	V_{tr}	4.5	kV
Anode current	I_a	280	mA [1]
Anode input power	W_{ia}	1400	W
Anode dissipation	W_a	380	W
Anode output power	W_o	1020	W
Anode efficiency	η_a	78	%
Oscillator efficiency	η_{osc}	71	%
Feedback ratio	V_{gp}/V_{ap}	18	%
Grid resistor	R_g	2.7	kΩ
Grid current, on load	I_g	80	mA [1]
Grid voltage, negative	$-V_g$	216	V
Grid dissipation	W_g	14	W
Grid resistor dissipation	W_{Rg}	17	W

LIMITING VALUES (Absolute max. rating system)

Frequency for full ratings	f	up to	50	MHz
Transformer voltage, RMS	V_a	max.	5	kV
Anode current	I_a	max.	320	mA [1]
Anode input power	W_{ia}	max.	1600	W
Anode dissipation	W_a	max.	500	W
Grid voltage, at peak of mains frequency sine wave	$-V_g$	max.	1350	V
Grid current, on load	I_g	max.	110	mA [1]
off load	I_g	max.	150	mA [1]
Grid dissipation	W_g	max.	100	W
Grid circuit resistance	R_g	max.	15	kΩ
Cathode current, mean	I_k	max.	470	mA [1]
Envelope temperature	T_{env}	max.	330	°C
Seal temperature	t	max.	220	°C

1) Average over any mains frequency cycle.

HEATING : direct; filament thoriated tungsten

Filament voltage	V_f	5	V
Filament current	I_f	32.5	A

The filament is designed to accept temporary fluctuations of +5 % and −10 %.

CAPACITANCES

Anode to filament	C_{af}	0.2	pF
Grid to filament	C_{gf}	7.5	pF
Anode to grid	C_{ag}	5.1	pF

CHARACTERISTICS measured at V_a = 4 kV, I_a = 120 mA

Transconductance	S	3.3	mA/V
Amplification factor	μ	21	

COOLING

In general cooling of the tube working at the published operating conditions with matched load is not necessary. When the tube is mounted in a small cabinet adequate ventilation must be provided.

At non-matched load, combined with the highest operating frequencies a low-velocity airflow on the tube is necessary. A small fan will suffice; it is recommended to mount the fan underneath the tube socket.

ACCESSORIES

Socket	catalogue nr.	2422 511 05001
Anode connector	type	40665

MECHANICAL DATA

Dimensions in mm

Mounting position: vertical

Net weight: approx. 450 g

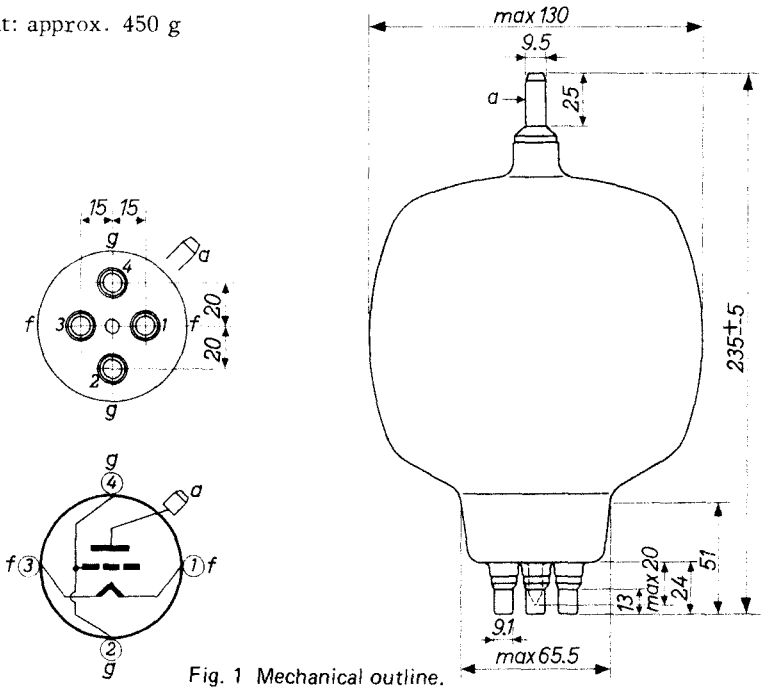


Fig. 1 Mechanical outline.

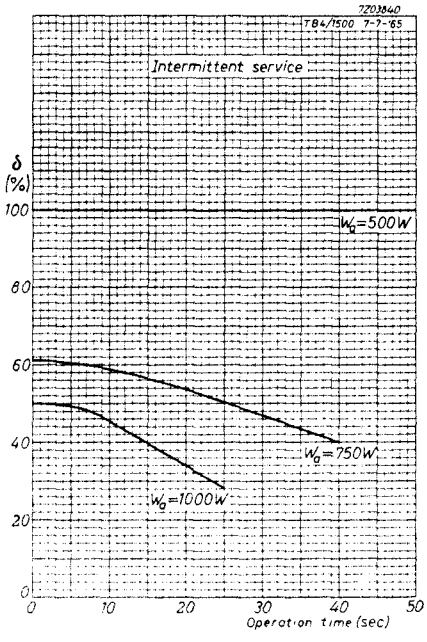


Fig. 2 Intermittent service. Limits of anode dissipation and cooling.

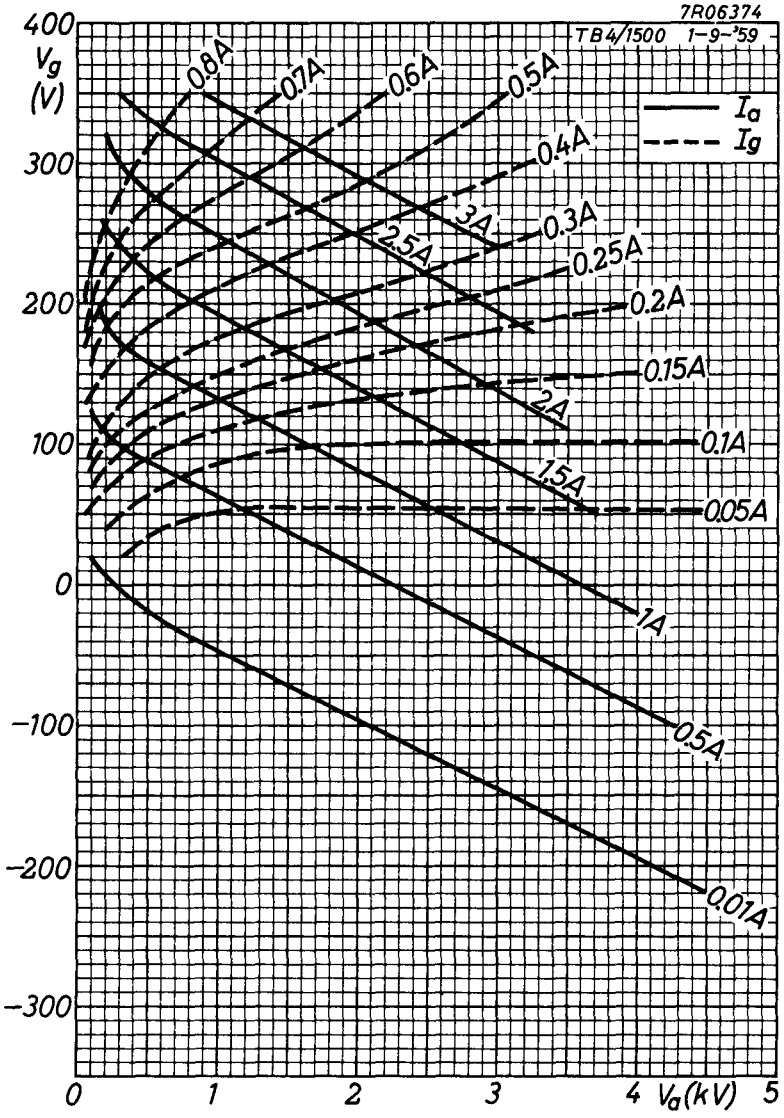


Fig. 3 Constant current characteristics.

PHILIPS

Data handbook

Electronic components and materials

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6	76	1988.02
7	77	1988.02
8	78	1988.02
9	FP	2000.09.15

TRIODE for use as H.F. or L.F. amplifier or oscillator
TRIODE pour utilisation en amplificatrice H.F. ou B.F. ou oscillatrice
TRIODE zur Verwendung als HF- oder NF-Verstärker oder Oszillator

Filament : thoriated tungsten
Filament : tungstène thorié
Heizfaden: thoriertes Wolfram

Heating : direct
Chauffage: direct
Heizung : direkt

V_f = 5 V
I_f = 10,5 A

Capacitances
Capacités
Kapazitäten

C_a = 0,5 pF
C_g = 4,6 pF
C_{ag} = 2,9 pF

Typical characteristics
Caractéristiques types
Kenndaten

μ = 37

S $\left\{\begin{matrix} V_a = 3000\ V \\ I_a = 300\ mA \end{matrix}\right\}$ = 5,6 mA/V

λ	Freq.	C telegr.		C an.mod.		B mod [1])	
m	Mc/s	V_a (V)	Wo (W)	V_a (V)	Wo (W)	V_a (V)	Wo (W)
7,5	40	4000	1000	3000	435	3000	1180
		3000	750	2500	400	2000	900
		2000	464	2000	335	1500	630

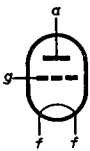
Temperatures
Températures
Temperaturen

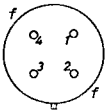
Temperature of anode and grid seals
Température des scellements d'anode et de grille = max. 225 °C
Temperatur der Anoden- und Gittereinschmelzungen

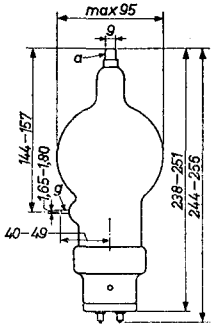
[1])Two tubes, deux tubes, zwei Röhren

PHILIPS

Dimensions in mm
Dimensions en mm
Abmessungen in mm







Base : Jumbo with bayonet
Culot : Jumbo à baïonnette
Sockel: Jumbo mit Bajonett

Socket
Support 40408
Fassung

Mounting position: vertical with base up or down
Montage : vertical avec le culot en haut ou en bas
Einbau : senkrecht mit Sockel oben oder unten

Net weight
Poids net 285 g
Nettogewicht

Shipping weight
Poids brut 1500 g
Bruttogewicht

H.F. class C telegraphy
H.F. classe C télégraphie
HF- Klasse C Telegraphie

Limiting values
Caractéristiques limites
Grenzdaten

f	=	max.	40 Mc/s
V_a	=	max.	4000 V
I_a	=	max.	350 mA
W_a	=	max.	250 W
W_g	=	max.	40 W

Operating conditions
Caractéristiques d'utilisation
Betriebsdaten

f	=	40	40	40 Mc/s
V_a	=	4000	3000	2000 V
V_g	=	-220	-150	-100 V
I_a	=	313	333	357 mA
I_g	=	93	90	94 mA
V_{gp}	=	470	395	345 V
W_{ig}	=	39	32	29 W
W_{ia}	=	1250	1000	714 W
W_a	=	250	250	250 W
W_o	=	1000	750	464 W
η	=	80	75	65 %

H.F. class C anode modulation
H.F. classe C modulation d'anode
HF- Klasse C Anodenmodulation

Limiting values
Caractéristiques limites
Grenzdaten

f	= max.	40	Mc/s
V_a	= max.	3200	V
I_a	= max.	280	mA
W_a	= max.	165	W
W_g	= max.	40	W

Operating conditions
Caractéristiques d'utilisation
Betriebsdaten

f	= 40	40	40	Mc/s
V_a	= 3000	2500	2000	V
V_g	= -200	-180	-160	V
I_a	= 200	225	250	mA
I_g	= 38	45	60	mA
V_{gp}	= 375	365	365	V
W_{ig}	= 14	17	22	W
W_{ia}	= 600	565	500	W
W_a	= 165	165	165	W
W_o	= 435	400	335	W
η	= 72,5	71	67	%
m	= 100	100	100	%
W_{mod}	= 300	282	250	W

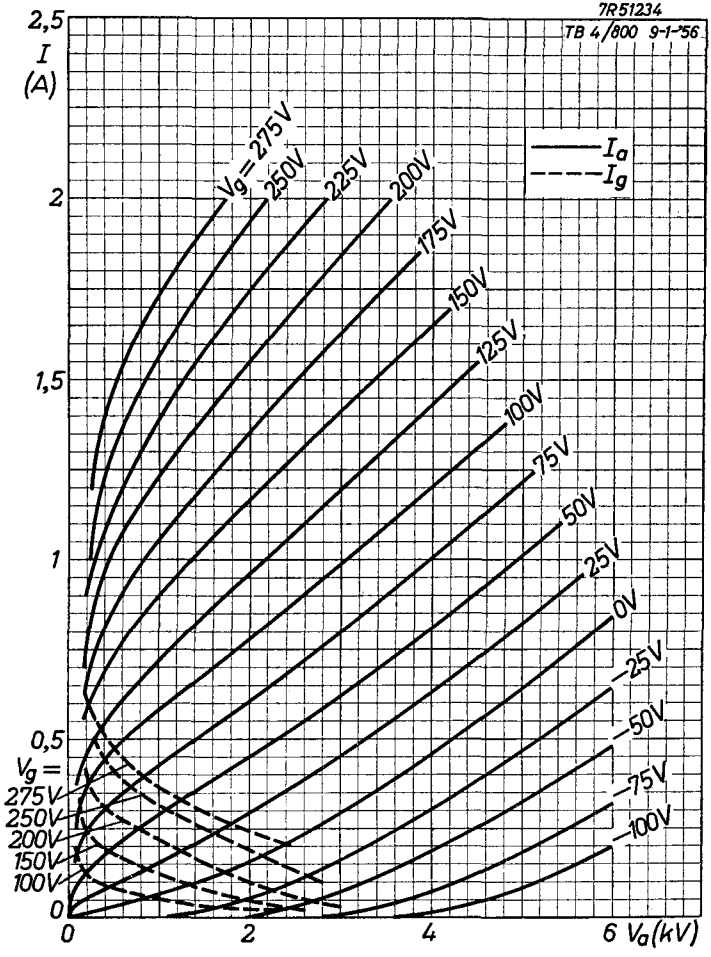
L.F. class B amplifier and modulator
Amplificatrice et modulatrice B.F. classe B
NF- Klasse B Verstärker und modulator

Limiting values
Caractéristiques limites
Grenzdaten

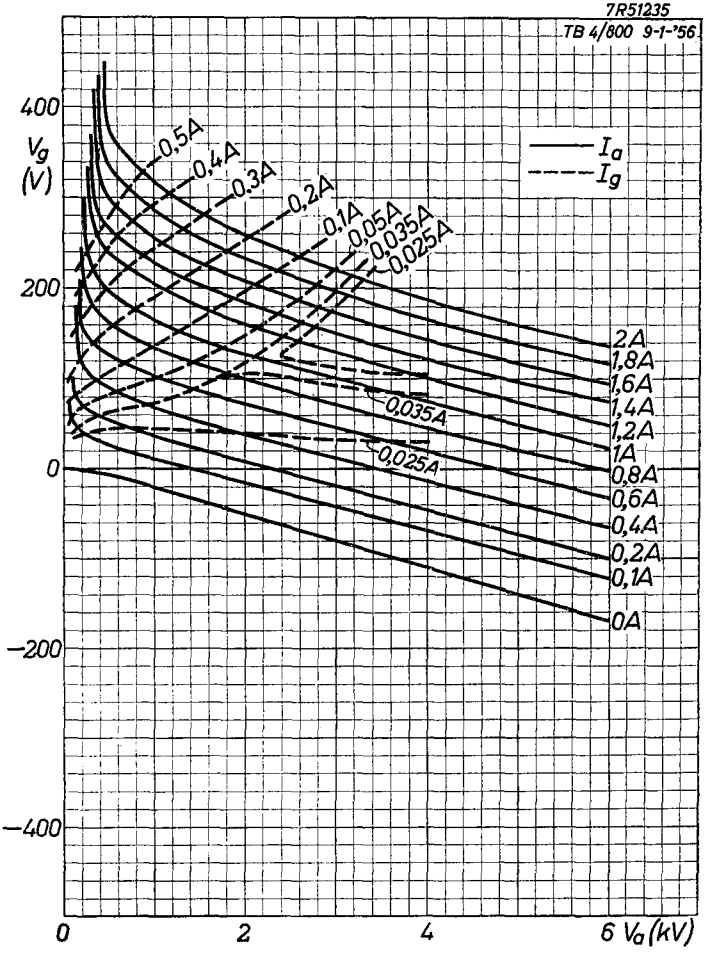
V_a	= max.	4000 V
I_a	= max.	350 mA
W_a	= max.	250 W
W_g	= max.	40 W

Operating characteristics
Caractéristiques d'utilisation
Betriebsdaten

V_a	=	3000		2000		1500	V
V_g	=	-65		-30		0	V
$R_{aa\sim}$	=	12,2		6,0		4,2	kΩ
V_{gg_p}	=	0	520	0	520	0	460 V
I_a	=	2x50	2x280	2x70	2x350	2x110	2x350 mA
I_g	=	0	2x90	0	2x110	0	2x110 mA
I_{g_p}	=	0	2x340	0	2x400	0	2x400 mA
W_{ig}	=	0	2x21	0	2x26	0	2x23 W
W_{ia}	=	2x150	2x840	2x140	2x700	2x165	2x525 W
W_a	=	2x150	2x250	2x140	2x250	2x165	2x210 W
W_o	=	0	1180	0	900	0	630 W
η	=	-	70	-	64	-	60 %


7R51234
TB 4/800 9-1-56
2,5
I
(A)
2
1,5
1
0,5
0
V_g =
275V
250V
200V
150V
100V
V_g = 275V
250V
225V
200V
175V
150V
125V
100V
75V
50V
25V
0V
−25V
−50V
−75V
−100V
I_a
I_g
0
2
4
6 V_a(kV)

PHILIPS


7R51235
TB 4/800 9-1-'56
400
V_g (V)
200
0
−200
−400
0
2
4
6 V_a (kV)
I_a
I_g
0,5A
0,4A
0,3A
0,2A
0,1A
0,05A
0,035A
0,025A
2A
1,8A
1,6A
1,4A
1,2A
1A
0,8A
0,6A
0,4A
0,2A
0,1A
0A



TB4/800

page	sheet	date
1	1	1956.01.01
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3	3	1956.01.01
4	4	1956.01.01
5	5	1956.01.01
6	A	1956.01.01
7	B	1956.01.01
8	FP	2000.01.18

RF POWER TRIODE

Radiation cooled triode of glass construction intended for use as an industrial oscillator

QUICK REFERENCE DATA				
Oscillator output power (W_o - W_{feedb}), typical	W_{osc}		2.73	kW
Frequency for full ratings	f	max.	50	MHz

To be read in conjunction with "General Operational Recommendations"

A. RF CLASS C OSCILLATOR FOR INDUSTRIAL USE

with anode voltage from a three-phase rectifier

OPERATING CONDITIONS, continuous service

Frequency	f	50	50	50	50	MHz
Oscillator output power (W_o-W_{feedb})	W_{osc}	2.73	2.61	2.04	1.44	kW
Anode voltage	V_a	6	5	4	3	kV
Anode current	I_a	600	700	700	700	mA
Anode input power	W_{ia}	3600	3500	2800	2100	W
Anode dissipation	W_a	760	780	640	540	W
Anode output power	W_o	2840	2720	2160	1560	W
Anode efficiency	η_a	79	78	77	74	%
Oscillator efficiency	η_{osc}	76	75	73	69	%
Feedback ratio	V_{gp}/V_{ap}	13	17	20	25	%
Grid resistor	R_g	3	2.5	2	1.5	kΩ
Grid current, on load	I_g	150	160	180	200	mA
Grid voltage, negative	$-V_g$	450	400	360	300	V
Grid dissipation	W_g	43	46	55	60	W
Grid resistor dissipation	W_{Rg}	67	64	65	60	W

Recommended grid blocking capacitor at high frequencies about 100 pF
at 1 MHz about 1000 pF

LIMITING VALUES (Absolute max. rating system)

Frequency for full ratings	f	up to	50	MHz
Anode voltage	V_a	max.	7	kV
Anode current	I_a	max.	750	mA
Anode input power	W_{ia}	max.	4000	W
Anode dissipation	W_a	max.	800	W
Grid voltage	$-V_g$	max.	1250	V
Grid current, on load	I_g	max.	300	mA
off load	I_g	max.	400	mA
Grid dissipation	W_g	max.	150	W
Grid circuit resistance	R_g	max.	10	kΩ
Cathode current, mean	I_k	max.	1.2	A
peak	I_{kp}	max.	4.3	A
Envelope temperature	T_{env}	max.	350	°C
Seal temperature	t	max.	220	°C

B. RF CLASS C OSCILLATOR FOR INDUSTRIAL USE

with anode voltage from a three-phase rectifier

OPERATING CONDITIONS , intermittent service

Frequency	f	50	50	MHz
Oscillator output power (W_o-W_{feedb})	W_{osc}	4.25	3.24	kW
Anode voltage	V_a	6	5	kV
Anode current	I_a	950	900	mA
Anode input power	W_{ia}	5700	4500	W
Anode dissipation	W_a	1300	1125	W
Anode output power	W_o	4400	3375	W
Anode efficiency	η_a	77	75	%
Oscillator efficiency	η_{osc}	74	72	%
Feedback ratio	V_{gp}/V_{ap}	17	20	%
Grid resistor	R_g	2.5	2	kΩ
Grid current, on load	I_g	190	190	mA
Grid voltage, negative	$-V_g$	475	380	V
Grid dissipation	W_g	63	63	W
Grid resistor dissipation	W_{Rg}	90	72	W

LIMITING VALUES (Absolute max. rating system)

Frequency for full ratings	f	max.	50	MHz
Anode voltage	V_a	max.	7	kV
Anode current	I_a	max.	1000	mA
Anode -input power	W_{ia}	max.	7000	W
Anode dissipation	W_a	max.	See Fig. 2	
Grid voltage	$-V_g$	max.	1250	V
Grid current, on load	I_g	max.	300	mA
off load	I_g	max.	400	mA
Grid dissipation	W_g	max.	150	W
Grid circuit resistance	R_g	max.	10	kΩ
Cathode current, mean	I_k	max.	1.4	A
peak	I_{kp}	max.	4.3	A
Envelope temperature	T_{env}	max.	350	°C
Seal temperature	t	max.	220	°C

C. RF CLASS C OSCILLATOR FOR INDUSTRIAL USE

with anode voltage from single-phase rectifier without filter

OPERATING CONDITIONS , continuous service

Frequency	f	50	50	MHz
Oscillator output power (W_o-W_{feedb})	W_{osc}	2655	2451	W
Anode voltage	V_a	5.4	4.5	kV
Anode current	I_a	530	600	mA
Anode input power	W_{ia}	3520	3320	W
Anode dissipation	W_a	770	770	W
Anode output power	W_o	2750	2550	W
Anode efficiency	η_a	78	77	%
Oscillator efficiency	η_{osc}	75	74	%
Feedback ratio	V_{gp}/V_{ap}	13	15.5	%
Grid resistor	R_g	3	2.5	kΩ
Grid current, on load	I_g	140	150	mA
Grid voltage, negative	$-V_g$	420	375	V
Grid dissipation	W_g	36	43	W
Grid resistor dissipation	W_{Rg}	59	56	W

LIMITING VALUES (Absolute max. rating system)

Frequency for full ratings	f	up to	50	MHz
Anode voltage	V_a	max.	6.3	kV
Anode current	I_a	max.	670	mA
Anode input power	W_{ia}	max.	4000	W
Anode dissipation	W_a	max.	800	W
Grid voltage	$-V_g$	max.	1250	V
Grid current, on load	I_g	max.	270	mA
off load	I_g	max.	400	mA
Grid dissipation	W_g	max.	150	W
Grid circuit resistance	R_g	max.	10	kΩ
Cathode current, mean	I_k	max.	1.0	A
peak	I_{kp}	max.	3.3	A
Envelope temperature	T_{env}	max.	350	°C
Seal temperature	t	max.	220	°C

D. RF CLASS C OSCILLATOR FOR INDUSTRIAL USE

with self rectification

OPERATING CONDITIONS

Frequency	f	50	MHz
Oscillator output power ($W_o - W_{feedb}$)	W_{osc}	1.49	kW
Transformer voltage, RMS	V_{tr}	5.2	kV
Anode current	I_a	360	mA [1]
Anode input power	W_{ia}	2080	W
Anode dissipation	W_a	520	W
Anode output power	W_o	1560	W
Anode efficiency	η_a	75	%
Oscillator efficiency	η_{osc}	72	%
Feedback ratio	V_{gp}/V_{ap}	17	%
Grid resistor	R_g	1.8	kΩ
Grid current, on load	I_g	100	mA [1]
Grid voltage, negative	$-V_g$	180	V
Grid dissipation	W_g	54	W
Grid resistor dissipation	W_{Rg}	18	W
Recommended grid blocking capacitor	at high frequencies about	100	pF
	at about 1 MHz about	1000	pF

LIMITING VALUES (Absolute max. rating system)

Frequency for full ratings	f	up to	50	MHz
Transformer voltage, RMS	V_{tr}	max.	5.6	kV
Anode current	I_a	max.	400	mA [1]
Anode input power	W_{ia}	max.	2250	W
Anode dissipation	W_a	max.	800	W
Grid voltage, at peak of mains frequency sine wave	$-V_g$	max.	1250	V
Grid current, on load	I_g	max.	160	mA [1]
off load	I_g	max.	210	mA [1]
Grid dissipation	W_g	max.	150	W
Grid circuit resistance	R_g	max.	10	kΩ
Cathode current, mean	I_k	max.	610	mA [1]
peak	I_{kp}	max.	4.3	A
Envelope temperature	T_{env}	max.	350	°C
Seal temperature	t	max.	220	°C

1) Averaged over any mains frequency cycle

HEATING : direct; filament thoriated tungsten

Filament voltage	Vf	6.3	V
Filament current	If	32.5	A

The filament is designed to accept temporary fluctuations of +5 % and −10 %.

CAPACITANCES

Anode to filament	Caf	0.25	pF
Grid to filament	Cgf	10.5	pF
Anode to grid	Cag	6.2	pF

CHARACTERISTICS measured at V_a = 4 kV, I_a = 190 mA

Transconductance	S	5.1	mA/V
Amplification factor	μ	22	

COOLING

In general cooling of the tube is not necessary at matched load. When the tube is mounted in a small cabinet adequate ventilation must be provided.

At non-matched load or at high anode voltages, combined with the highest operating frequencies a low-velocity air flow directed on the tube is necessary. A small fan will suffice; it is recommended to mount the fan underneath the tube socket.

ACCESSORIES

Socket	catalogue nr.	2422 511 05001
Anode connector	type	40665

MECHANICAL DATA

Dimensions in mm

Mounting positions: vertical

Net weight: approx. 600 g

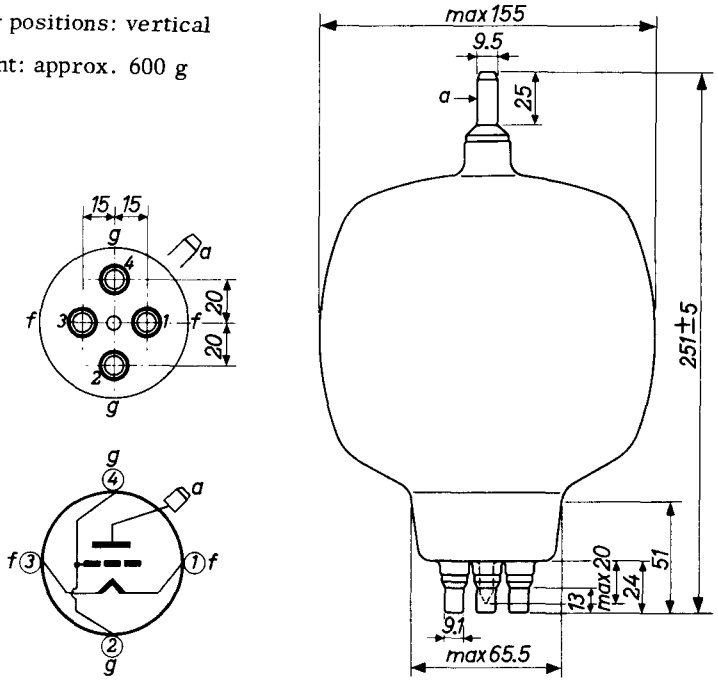


Fig. 1 Mechanical outline.

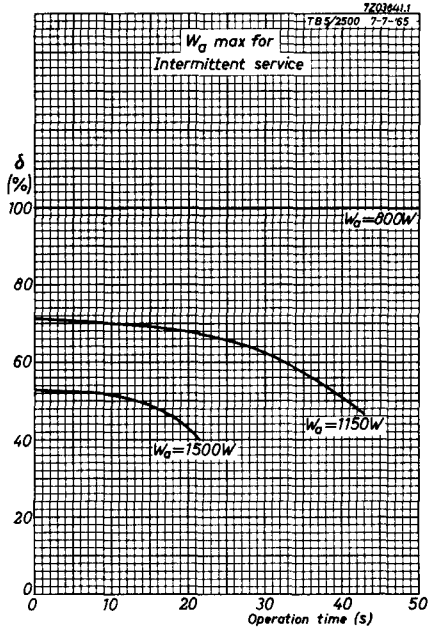


Fig. 2 Intermittent service. Limits of anode dissipation and cooling.

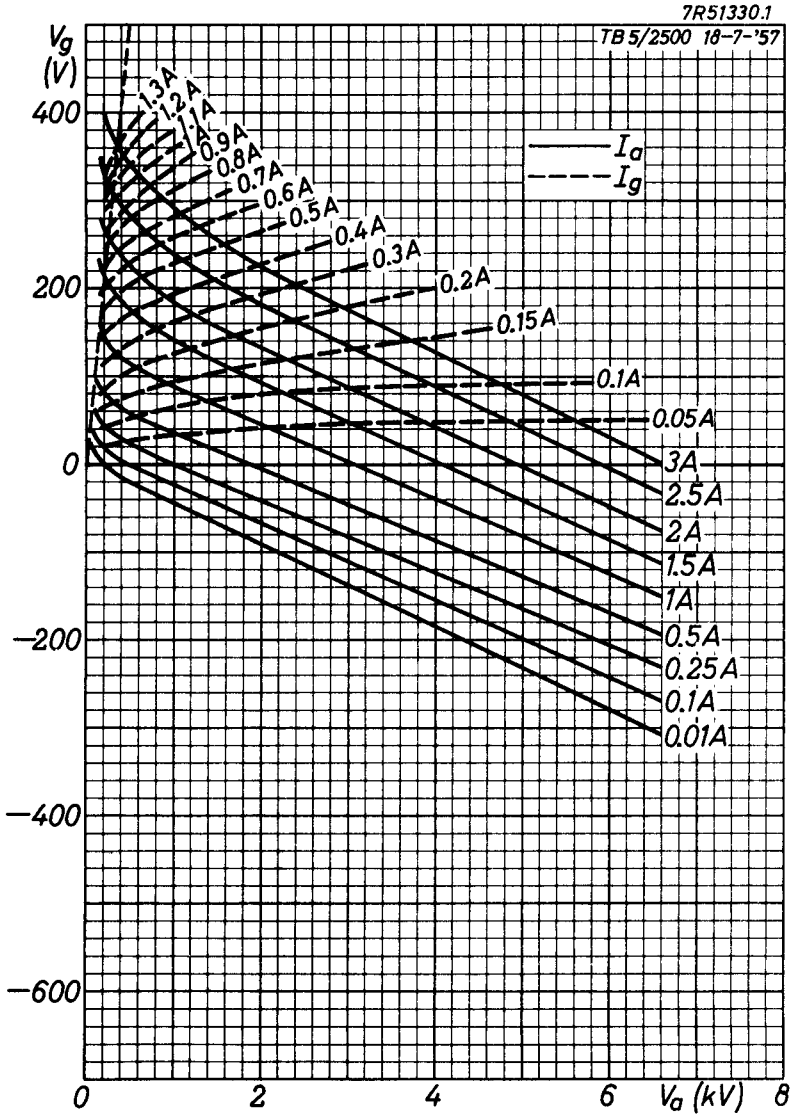


Fig. 3 Constant current characteristics.

PHILIPS

Data handbook

Electronic components and materials

TB5/2500

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5	83	1988.02
6	84	1988.02
7	85	1988.02
8	86	1988.02
9	FP	2000.09.15

WATER COOLED INDUSTRIAL R.F. POWER TRIODE WITH INTEGRAL HELICAL COOLER

QUICK REFERENCE DATA		
Industrial R.F. oscillator class C		
Freq. (MHz)	Three phase	
	V_a (kV)	W_o (kW)
30	12	29.0
	10	23.3
	8	17.9

HEATING: direct; filament thoriated tungsten

Filament voltage	V_f	=	8.0	V $^{+\ 5\%}_{-10\%}$
Filament current	I_f	=	98	A
Cold filament resistance	R_f	=	0.008	Ω

The filament current must never exceed a peak value of 210 A instantaneously at any time during the initial energizing schedule

CAPACITANCES

Anode to all other elements except grid	C_a	=	0.4	pF
Grid to all other elements except anode	C_g	=	37	pF
Anode to grid	C_{ag}	=	30	pF

TYPICAL CHARACTERISTICS

Anode voltage	V_a	=	12	kV
Anode current	I_a	=	2	A
Amplification factor	μ	=	34	
Mutual conductance	S	=	20	mA/V

7Z2 8647

TEMPERATURE LIMITS (Absolute limits)

Water inlet temperature	t_i	=	max. 50	°C
Temperature off all seals		=	max. 220	°C

WATER COOLING CHARACTERISTICS

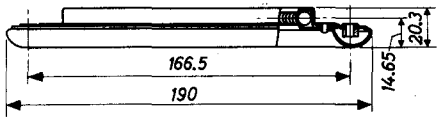
W_a (kW)	t_i (°C)	qmin (l/min)	p_i (atm.)
10	20	4.2	0.08
	50	8.4	0.27
15	20	6.5	0.16
	50	13.0	0.50
20	20	9.3	0.30
	50	18.6	1.0

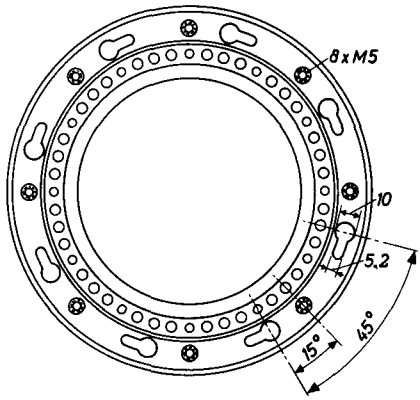
At water inlet temperatures between 20 °C and 50 °C the required quantity of water can be found by linear interpolation

Generally a low velocity air flow to the seals is required

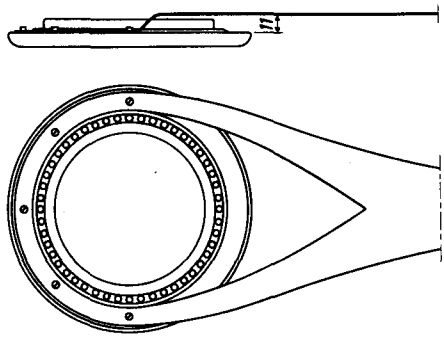
MECHANICAL DATA

Dimensions in mm





Grid connector 40663



Connection of the grid lead

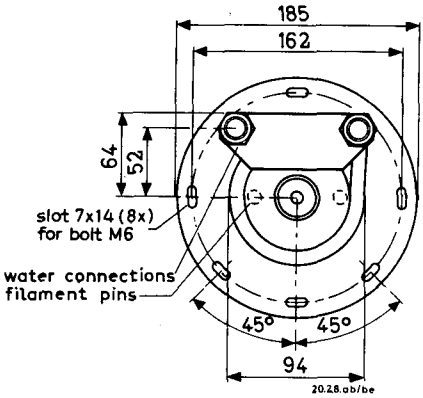
The rounded side of the grid connector should face the anode. To ensure a uniform R.F. current distribution in the grid seal at frequencies higher than 4 MHz, the grid lead should be connected as shown at right.

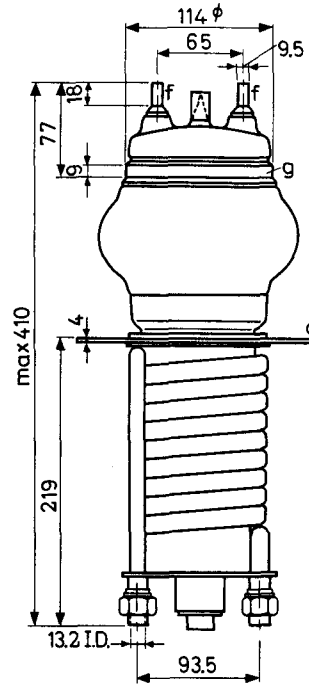
7Z2 3556

MECHANICAL DATA (continued)

Dimensions in mm

Filament connectors with cable	40662
Grid connector	40663
Net weight	5.2 kg





Mounting position: vertical with anode down

R.F. CLASS C OSCILLATOR FOR INDUSTRIAL USE with anode voltage from three-phase half-wave rectifier without filter

LIMITING VALUES (Absolute limits)

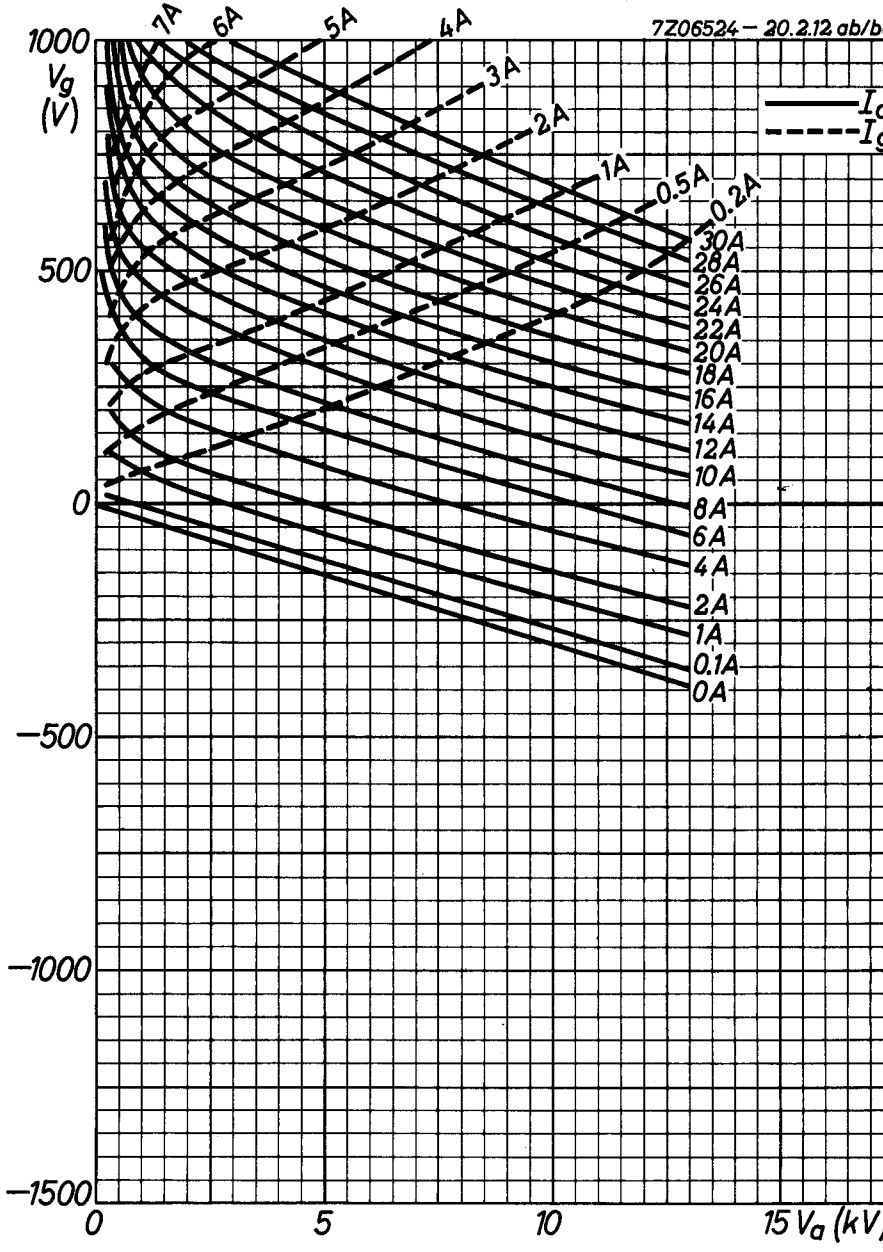
Frequency		f		up to	30	MHz
Anode voltage		V_a	=	max.	13	kV
Anode current		I_a	=	max.	4.8	A
Anode dissipation		W_a	=	max.	20	kW
Anode input power		W_{ia}	=	max.	60	kW
Negative grid voltage		$-V_g$	=	max.	1500	V
Grid current		I_g	=	max.	0.8	A
Grid circuit resistance		R_g	=	max.	10	kΩ

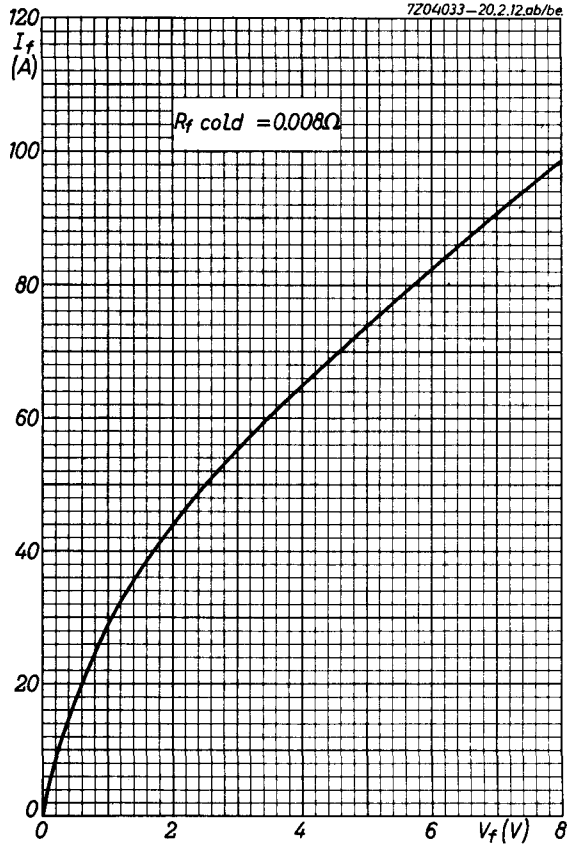
OPERATING CONDITIONS

Frequency	f	=	30	30	30	MHz
Transformer voltage	V_{tr}	=	8.9	7.4	6.0	kV
Anode voltage	V_a	=	12	10	8	kV
Anode current, loaded	I_a	=	3.2	3.2	3.2	A
Anode current, unloaded	I_a	=	0.52	0.50	0.48	A
Grid current, loaded	I_g	=	0.50	0.50	0.50	A
Grid current, unloaded	I_g	=	0.74	0.77	0.80	A
Grid resistor	R_g	=	2.0	1.6	1.1	kΩ
Load resistance	$R_{a\sim}$	=	1800	1450	1100	Ω
Feedback ratio under loaded conditions	$V_{g\sim}/V_{a\sim}$	=	16	17	19	%
Anode input power	W_{ia}	=	38.4	32.0	25.6	kW
Anode dissipation	W_a	=	9.4	8.7	7.7	kW
Output power	W_o	=	29.0	23.3	17.9	kW
Efficiency	η	=	75.5	72.5	70	%
Output power in the load	W_ℓ	=	25	20	15.5	kW[1]

[1] Useful power in the load measured in a circuit having an efficiency of 90%

7Z2 3554


7Z06524 – 20.2.12 ab/be
1000
Vg
(V)
500
0
−500
−1000
−1500
0
5
10
15 Va (kV)
Ia
Ig
7A
6A
5A
4A
3A
2A
1A
0.5A
0.2A
30A
28A
26A
24A
22A
20A
18A
16A
14A
12A
10A
8A
6A
4A
2A
1A
0.1A
0A


7Z04033—20.2.12.ab/be
120
I_f (A)
100
80
60
40
20
0
R_f cold = 0.008Ω
0
2
4
6
V_f (V)
8

WATER COOLED INDUSTRIAL R.F. POWER TRIODE WITH INTEGRAL HELICAL COOLER

QUICK REFERENCE DATA		
Freq. (MHz)	C osc. industrial	
	V_a (kV)	W_o (kW)
30	12	39
	10	31.3
	8	23.2

HEATING: direct; filament thoriated tungsten

Filament voltage	V_f	= 8	V	+ 5 % −10 %
Filament current	I_f	= 130	A	
Cold filament resistance	R_f	= 0.006	Ω	

The filament current must never exceed a peak value of 280 A at any time during the initial energizing schedule

CAPACITANCES

Anode to all other elements except grid	C_a	=	0.9	pF
Grid to all other elements except anode	C_g	=	45	pF
Anode to grid	C_{ag}	=	23.5	pF

TYPICAL CHARACTERISTICS

Anode voltage	V_a	=	12	kV
Anode current	I_a	=	2	A
Amplification factor	μ	=	21	
Mutual conductance	S	=	25	mA/V

TEMPERATURE LIMITS (Absolute limits)

Temperature of all seals = max. 220 °C

Water inlet temperature t_i = max. 50 °C

7Z2 8649

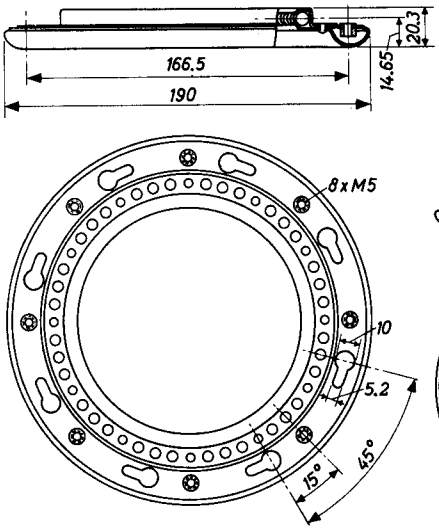
COOLING: Generally a low velocity air flow to the seals is required

WATER COOLING CHARACTERISTICS

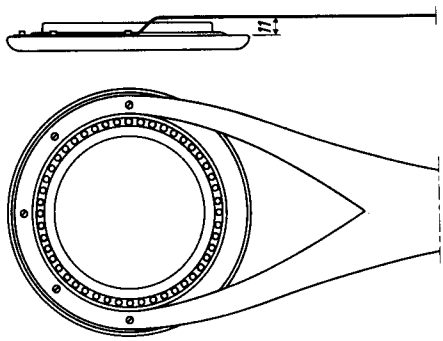
W_a (kW)	t_i (°C)	q_{min} (l/min)	p_i (atm.)
10	20	4.2	0.08
	50	8.4	0.27
15	20	6.5	0.16
	50	13.0	0.5
20	20	9.3	0.3
	50	18.6	1.0

At water inlet temperatures between 20 °C and 50 °C the required quantity of water can be found by linear interpolation

MECHANICAL DATA Dimensions in mm



Grid connector 40663



Connection of the grid lead

The rounded side of the grid connector should face the anode. To ensure a uniform RF current distribution in the grid seal at frequencies higher than 4 MHz, the grid lead should be connected as shown in the figure at right.

7Z2 3567

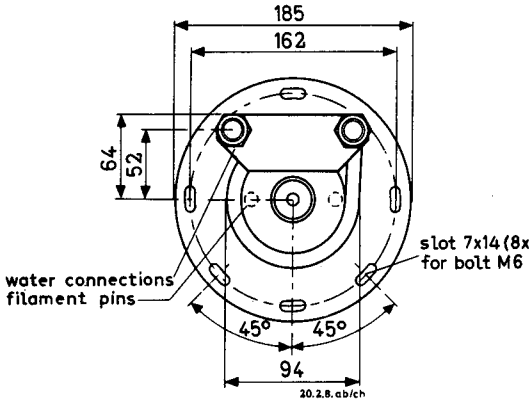
MECHANICAL DATA (continued)

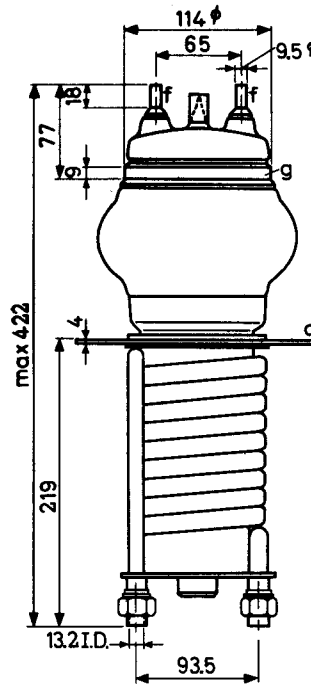
Dimensions in mm

Connectors with cable for filament : 40662

Grid connector 40663

Net weight : 5.4 kg





Mounting position: vertical with anode down

R.F. CLASS C OSCILLATOR FOR INDUSTRIAL USE with anode voltage from three-phase rectifier without filter

LIMITING VALUES (Absolute limits)

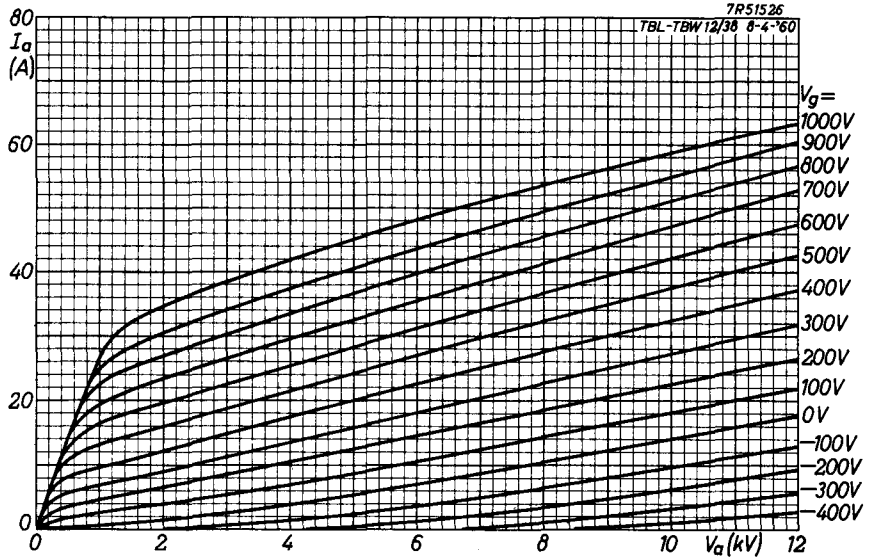
Frequency						
	f		up to	30	MHz
Anode voltage	V_a	= max.	13	kV
Anode current	I_a	= max.	5	A
Anode dissipation	W_a	= max.	20	kW
Anode input power	W_{ia}	= max.	60	kW
Negative grid voltage	$-V_g$	= max.	2	kV
Grid current, loaded	I_g	= max.	1.5	A
Grid current, unloaded	I_g	= max.	2.0	A
Grid circuit resistance	R_g	= max.	10	kΩ

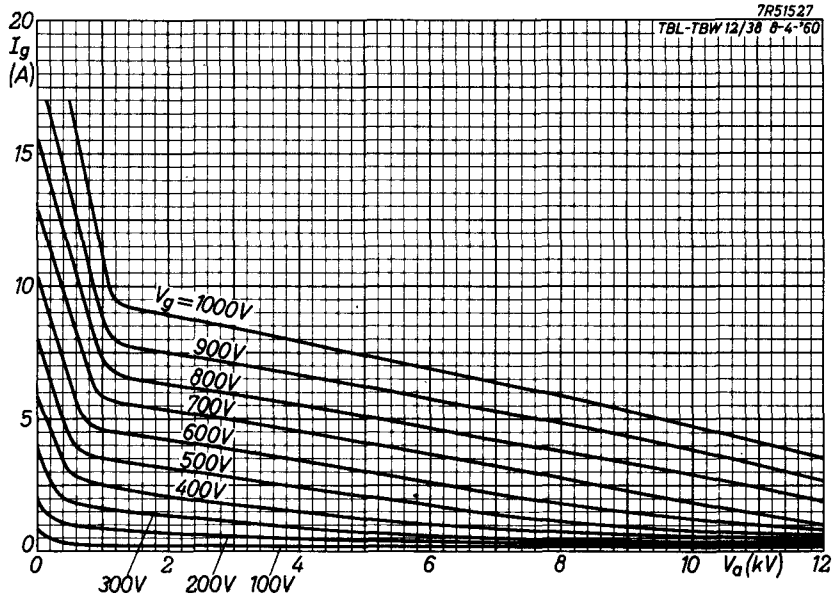
OPERATING CONDITIONS

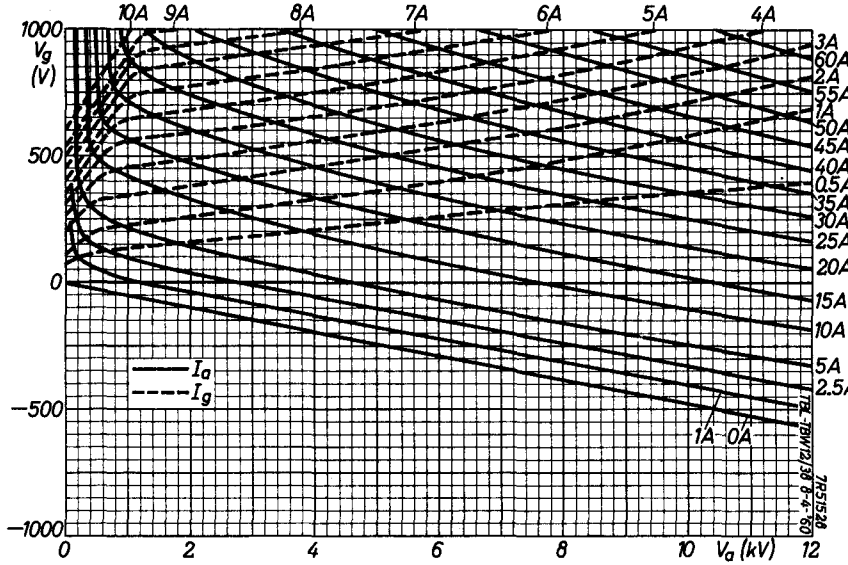
Frequency	f	=	30	30	30	MHz
Anode voltage	V_a	=	12	10	8	kV
Anode current, loaded	I_a	=	4.5	4.5	4.5	A
Anode current, unloaded	I_a	=	0.65	0.63	0.62	A
Grid current, loaded	I_g	=	0.9	0.9	0.9	A
Grid current, unloaded	I_g	=	1.22	1.3	1.35	A
Grid resistor	R_g	=	1100	1000	900	Ω
Load resistance	$R_{a\sim}$	=	1450	1100	800	Ω
Feedback ratio under loaded conditions	$V_{g\sim}/V_{a\sim}$	=	16	19	24	%
Anode input power	W_{ia}	=	54	45	36	kW
Anode dissipation	W_a	=	15	13.7	12.8	kW
Output power	W_o	=	39	31.3	23.2	kW
Efficiency	η	=	72.5	70	64.5	%
Output power in the load	W_ℓ	=	30	25	18	kW[1]

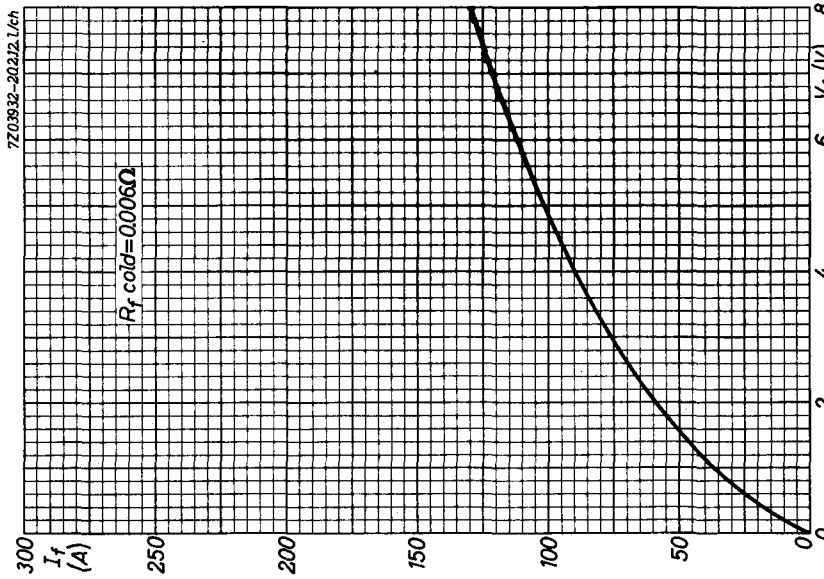
[1] Useful power in the load, measured in a circuit having an efficiency of about 85%.

7Z2 3565


7R51526
TBL-TBW12/38 8-4-'60
I_a (A)
80
60
40
20
0
0
2
4
6
8
10
V_a(kV)
12
V_g=
1000V
900V
800V
700V
600V
500V
400V
300V
200V
100V
0V
−100V
−200V
−300V
−400V


7R51527
TBL-TBW12/38 8-4-'60
I_g (A)
20
15
10
5
0
0
2
4
6
8
10
V_a(kV)
12
V_g=1000V
900V
800V
700V
600V
500V
400V
300V
200V
100V


10A 9A 8A 7A 6A 5A 4A
1000
V_g (V)
500
0
−500
−1000
I_a
I_g
3A
60A
2A
55A
1A
50A
45A
40A
0.5A
35A
30A
25A
20A
15A
10A
5A
2.5A
1A 0A
0 2 4 6 8 10 V_a (kV) 12
7Z03932-2021.2.1/ch


7Z03932-2021.2.1/ch
R_f cold=0.006Ω
300 250 200 150 100 50 0
I_f (A)
0 2 4 6 8
V_f (V)

WATER COOLED INDUSTRIAL R.F. POWER TRIODE WITH INTEGRAL HELICAL COOLER

QUICK REFERENCE DATA		
Industrial R.F. oscillator class C		
Freq. (Mc/s)	three phase	
	V_a (kV)	W_o (kW)
30	7 6	17.7 14.3

HEATING: direct, filament thoriated tungsten

Filament voltage	V_f	=	6.3	V $^{+5\%}_{-10\%}$
Filament current	I_f	=	130	A
Cold filament resistance	R_{fo}	=	0.005	Ω

The filament current must never exceed a peak value of 280 A at any time during the initial energizing schedule

CAPACITANCES

Anode to all other elements except grid	C_a	=	1.2	pF
Grid to all other elements except anode	C_g	=	44.5	pF
Anode to grid	C_{ag}	=	33.5	pF

TYPICAL CHARACTERISTICS

Anode voltage	V_a	=	6	kV
Anode current	I_a	=	2.5	A
Mutual conductance	S	=	23	mA/V
Amplification factor	μ	=	17.5	

TEMPERATURE LIMITS (Absolute limits)

Temperature of all seals = max. 220 °C

WATER COOLING CHARACTERISTICS

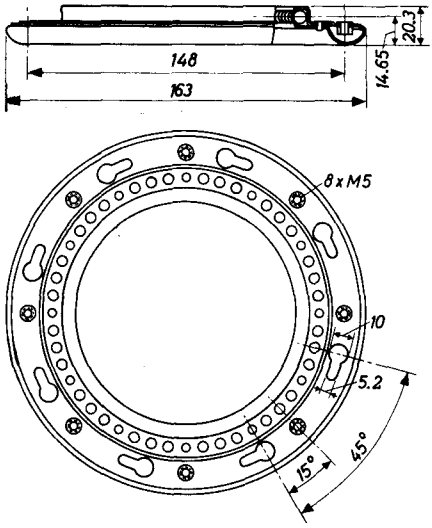
W_a (kW)	t_i (°C)	q_{min} (l/min)	p_i (atm)	t_o (°C)
5	20	2.3	0.02	56
	50	4.6	0.07	68
10	20	4.5	0.06	55
	50	9.0	0.21	67
15	20	7.0	0.14	53
	50	14.0	0.45	66

Water inlet temperature t_i = max. 50 °C

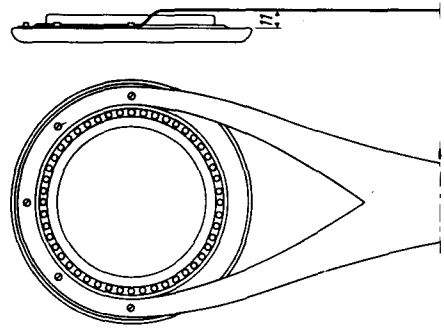
At water inlet temperatures between 20 °C and 50 °C the required quantity of water can be found by linear interpolation

MECHANICAL DATA

Dimensions in mm



Grid connector 40664



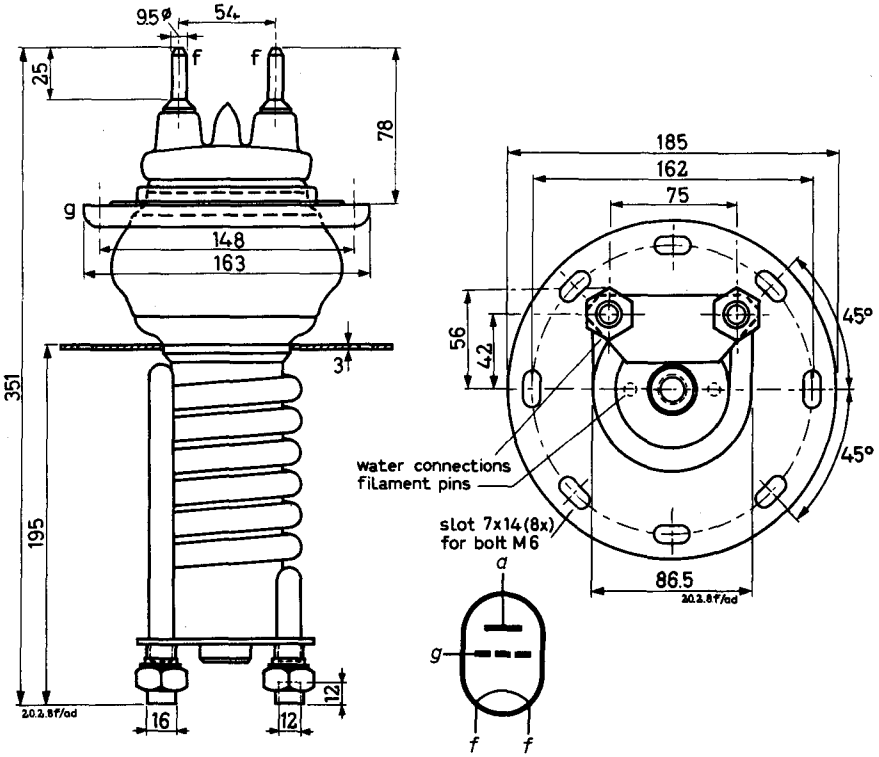
Connection of the grid lead

The rounded side of the grid connector should face the anode. To ensure a uniform R.F. current distribution in the grid seal at frequencies higher than 4 Mc/s, the grid lead should be connected as shown in the figure at right

MECHANICAL DATA (continued)

Dimensions in mm

Filament connectors with cable	40662	Net weight 3.8 kg
Grid connector	40664	



Mounting position: vertical with anode down

R.F. CLASS C OSCILLATOR FOR INDUSTRIAL USE with anode voltage from three-phase rectifier without filter

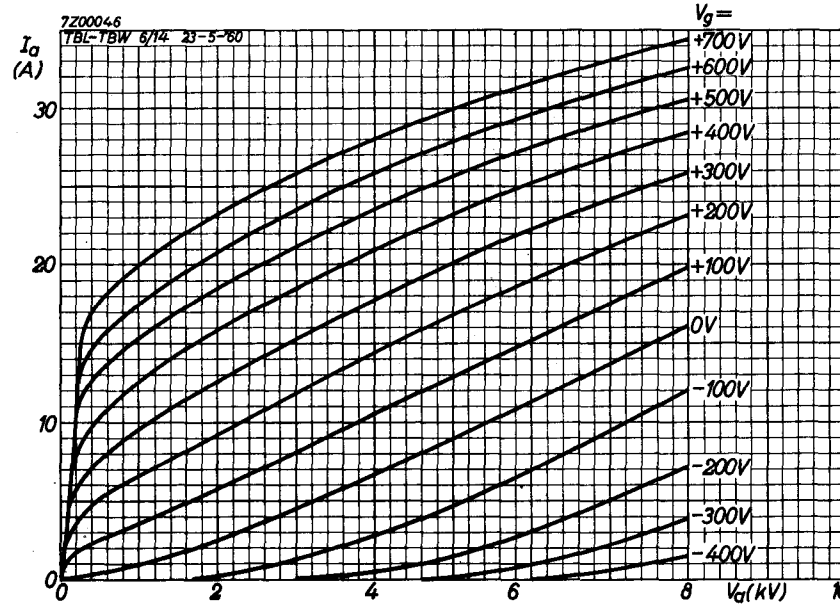
LIMITING VALUES (Absolute limits)

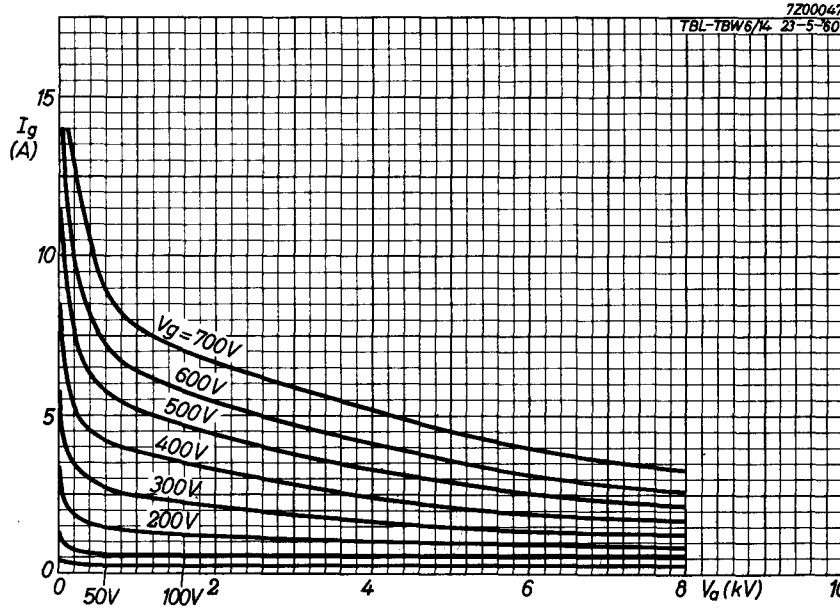
Frequency		f	up to	30	MHz
Anode voltage		V_a	max.	8	kV
Anode input power		W_{ia}	max.	30	kW
Anode dissipation		W_a	max.	15	kW
Anode current		I_a	max.	4.0	A
Negative grid voltage		$-V_g$	max.	1600	V
Grid current, loaded		I_g	max.	1.5	A
Grid current, unloaded		I_g	max.	2.0	A
Grid circuit resistance		R_g	max.	10	kΩ

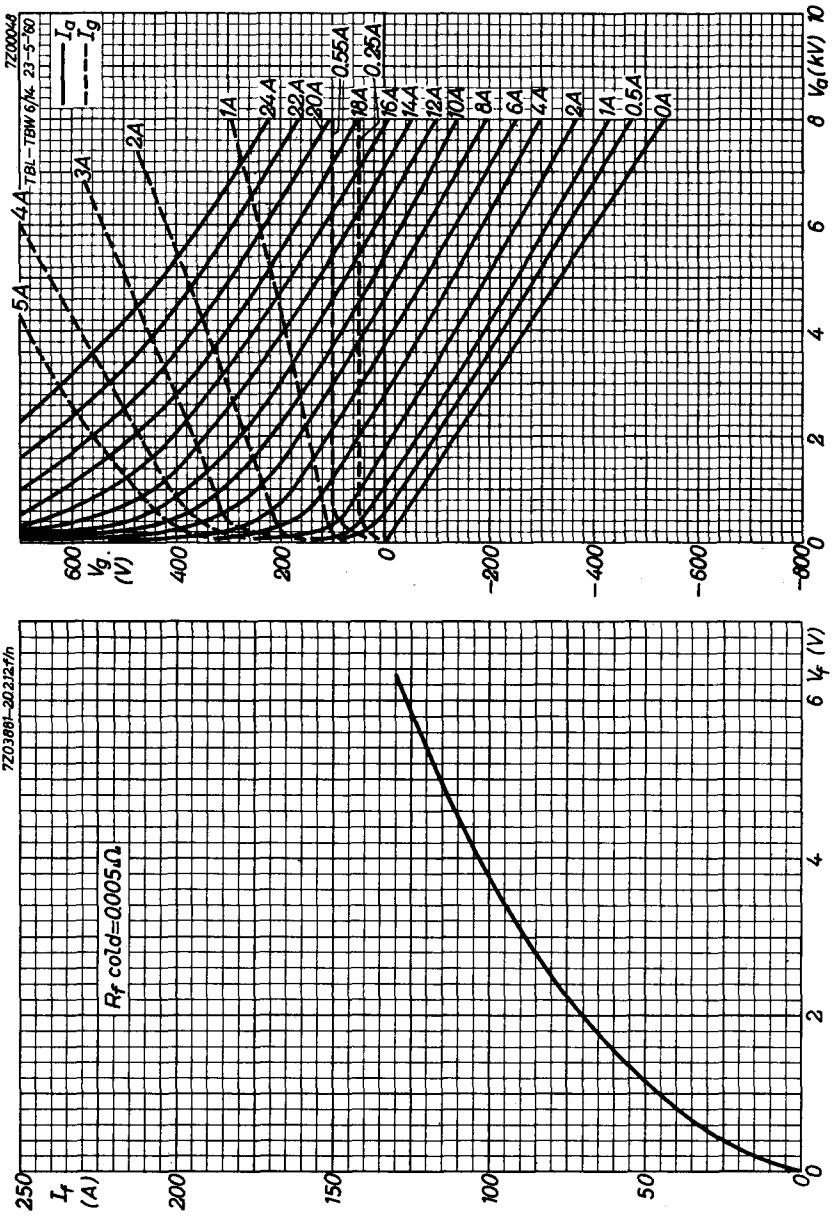
OPERATING CONDITIONS

Frequency	f	30	30	MHz
Anode voltage	V_a	7	6	kV
Anode current, loaded	I_a	3.5	3.3	A
Anode current, unloaded	I_a	0.7	0.51	A
Grid current, loaded	I_g	0.95	0.8	A
Grid current, unloaded	I_g	1.35	1.1	A
Grid resistor	R_g	950	1000	Ω
Load resistance	$R_{a\sim}$	1000	870	Ω
Feedback ratio under loaded conditions	$V_{g\sim}/V_{a\sim}$	25	26	%
Anode input power	W_{ia}	24.5	19.8	kW
Anode dissipation	W_a	6.8	5.5	kW
Output power	W_o	17.7	14.3	kW
Efficiency	η	72	72	%
Output power in the load	W_ℓ	14	11	kW [1]

[1] Useful power in the load, measured in a circuit having an efficiency of about 85%.


7Z00046
TBL-TBW 6/14 23-5-80
I_a (A)
V_g =
+700V
+600V
+500V
+400V
+300V
+200V
+100V
0V
-100V
-200V
-300V
-400V
30
20
10
0
0
2
4
6
8
10
V_a(kV)


7Z00047
TBL-TBW6/14 23-5-80
I_g (A)
15
10
5
0
V_g=700V
600V
500V
400V
300V
200V
0
50V
100V
2
4
6
8
10
V_a(kV)


7Z00048
TBL-TBW 6/4k 23-5-60
Ia
Ig
5A
4A
3A
2A
1A
24A
22A
20A
18A
16A
14A
12A
10A
8A
6A
4A
2A
1A
0.5A
0A
0.55A
0.25A
600
400
200
0
-200
-400
-600
-800
Vg. (V)
0
2
4
6
8 Vg(kV) 10
7Z03881-30212th
Rf cold=0.005Ω
If (A)
250
200
150
100
50
0
2
4
6 Vf (V)

WATER COOLED R.F. POWER TRIODE WITH INTEGRAL HELICAL COOLER

QUICK REFERENCE DATA										
General purposes										
λ (m)	Freq. (MHz)	C telegr.		B teleph.		C_a mod.		B mod. [1]	
		V_a (kV)	W_o (kW)	V_a (kV)	W_o (kW)	V_a (kV)	W_o (kW)	V_a (kV)	W_o (kW)
4	75	6	6.9	6	1.9			6	13.3
		5	5.6	5	1.45	5	4.7	5	6.6
		4	4			4.5	4.1	4.5	6.0
						4	3.5	4	5.3
						3.5	3	3.5	4.6
						3	2.2	3	3.3

Television service					
Freq. (MHz)	Neg. mod. Pos. sync.			Pos. mod.	Neg. sync.
	V_a (kV)	W_o sync (kW)	W_o black (kW)	V_a (kV)	W_o white (kW)
75	5	9	5.35	5	9

HEATING: direct, filament thoriated tungsten

Filament voltage	V_f	12.6	V
Filament current	I_f	33	A

CAPACITANCES

Anode to all other elements except grid	C_a	0.3	pF
Grid to all other elements except anode	C_g	16	pF
Anode to grid	C_{ag}	11	pF

[1]) Two tubes

7Z2 8641

TYPICAL CHARACTERISTICS

Anode voltage	V_a	4	kV
Anode current	I_a	1	A
Amplification factor	μ	32	
Mutual conductance	S	17	mA/V

COOLING : Water and low velocity air flow

TEMPERATURE LIMITS (Absolute limits)

Water inlet temperature	t_i	max.	50	°C
Temperature of filament seals		max.	210	°C
Temperature of anode and grid seals		max.	180	°C

WATER COOLING CHARACTERISTICS

W_a (kW)	t_i (°C)	qmin (l/min)	p_i (atm)	t_o (°C)
2	20	1.5	0.06	44
	50	3	0.22	62
4	20	3	0.22	42
	50	6	0.73	61
6	20	5	0.54	39
	50	10	1.8	59

At water inlet temperatures between 20 °C and 50 °C the required quantity of water can be found by linear interpolation.

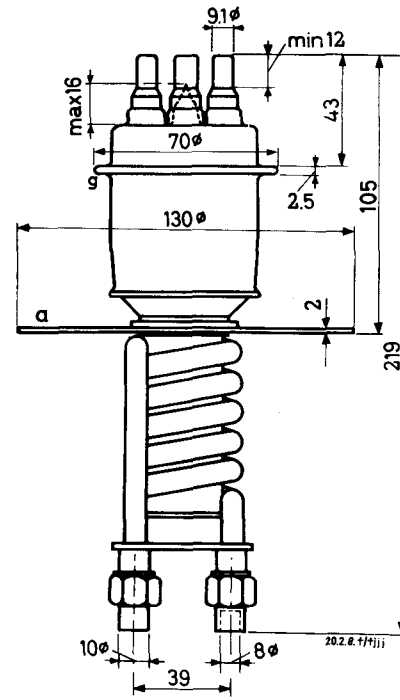
In general no air cooling will be required at ambient temperatures below 35 °C. At higher temperatures a low velocity air flow to the grid and filament seals will be necessary.

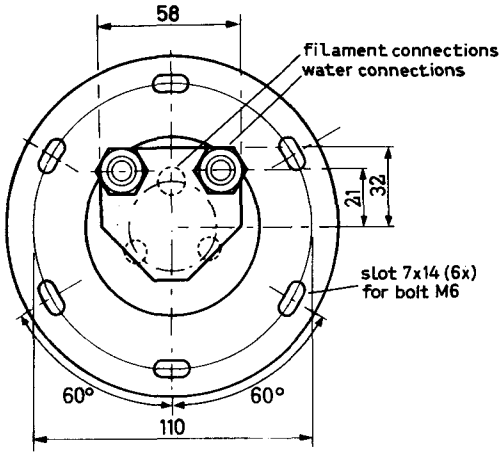
7Z2 8642

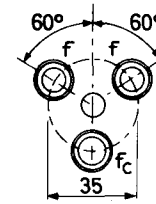
MECHANICAL DATA

Dimensions in mm

Filament connectors	40634	
Grid connector	40622	
Net weight	0.8	kg







The use of wing nuts for connecting the water connections should be avoided

The centre tap f_c must not be used for filament current supply.
The connectors 40634, however, must be used for the cooling of all three filament pins, thus also of pin f_c.

Mounting position: vertical with anode down

For further data except cooling curves, please refer to type TBW6/6000

WATER COOLED INDUSTRIAL R.F. POWER TRIODE WITH INTEGRAL HELICAL COOLER

QUICK REFERENCE DATA		
Freq. (Mc/s)	Class C oscillator	
	V_a (kV)	W_o (kW)
50	6.0	6.0

HEATING: direct; filament thoriated tungsten

Filament voltage	V_f	=	12.6	V
Filament current	I_f	=	33	A

CAPACITANCES

Anode to all other elements except grid	C_a	=	0.3	pF
Grid to all other elements except anode	C_g	=	16	pF
Anode to grid	C_{ag}	=	11	pF

TYPICAL CHARACTERISTICS

Anode current	I_a	=	1	A
Anode voltage	V_a	=	6	kV
Amplification factor	μ	=	32	
Mutual conductance	S	=	15	mA/V

7Z2 8644

WATER COOLING CHARACTERISTICS

W_a (kW)	t_i (°C)	q_{min} (l/min)	p_i (atm)	t_o (°C)
2	20	1.5	0.06	44
	50	3	0.22	62
4	20	3	0.22	42
	50	6	0.73	61
6	20	5	0.54	39
	50	10	1.8	59

At water inlet temperatures between 20 °C and 50 °C the required quantity of water can be found by linear interpolation.

In general no air cooling will be required at frequencies up to 30 Mc/s and at ambient temperatures below 35 °C. At higher temperatures or at higher frequencies a low velocity air flow to the grid and filament seals will be necessary.

TEMPERATURE LIMITS (Absolute limits)

Water inlet temperature	t_i	= max.	50	°C
Temperature of filament seals		= max.	210	°C
Temperature of anode and grid seals		= max.	180	°C

ACCESSORIES

Filament connectors	40634
Connector for centre pin of the filament	40649
Grid connector	40650 or 40622

The centre filament pin f_c must not be used for filament current supply. However, the connector 40649 should be used for cooling of this pin.

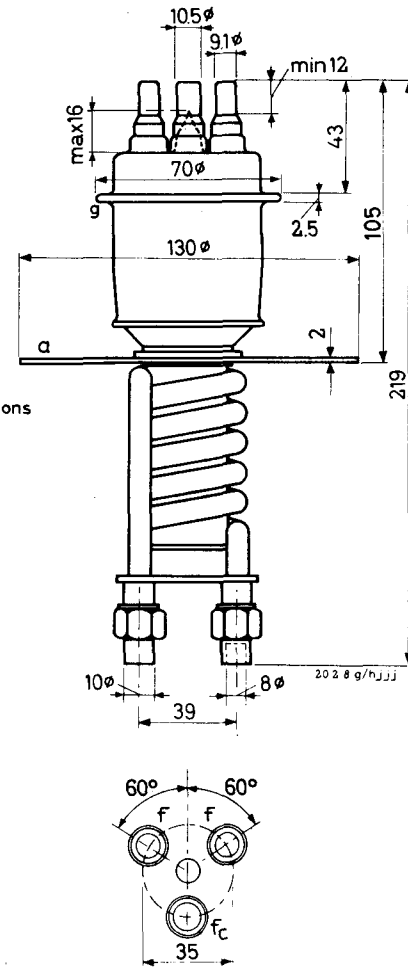
The grid connector 40650 must not be used at frequencies higher than 30 Mc/s.

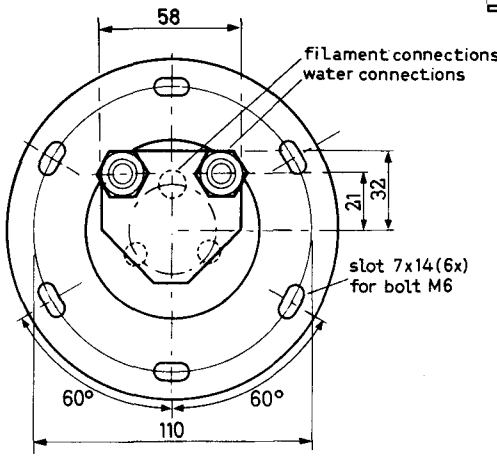
7Z2 8645

MECHANICAL DATA

Dimensions in mm

Net weight 0.8 kg





The use of wing nuts for connecting the water connections should be avoided

Mounting position: Vertical with anode down

R.F. CLASS C OSCILLATOR FOR INDUSTRIAL USE with anode voltage from three-phase half-wave rectifier without filter

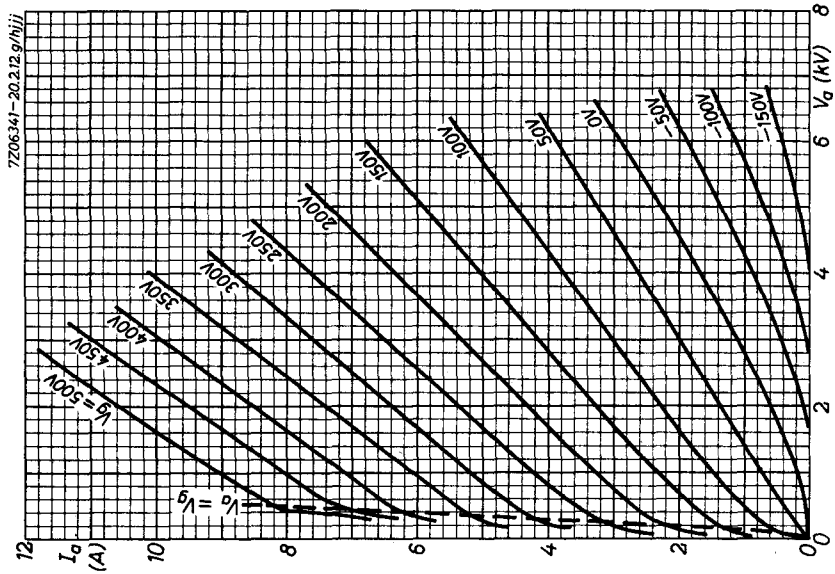
LIMITING VALUES (Absolute limits)

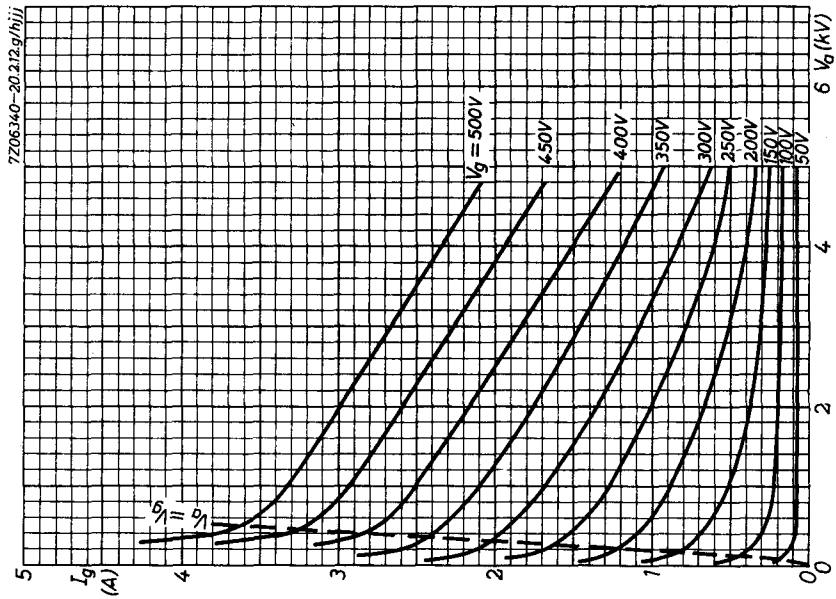
Frequency	f		up to	55	Mc/s
Anode voltage	V_a	=	max.	7	kV
Negative grid voltage	$-V_g$	=	max.	1250	V
Anode current	I_a	=	max.	1.8	A
Grid current, loaded	I_g	=	max.	0.5	A
Grid current, unloaded	I_g	=	max.	0.7	A
Anode input power	W_{ia}	=	max.	11	kW
Anode dissipation	W_a	=	max.	6	kW
Grid resistor	R_g	=	max.	10	kΩ

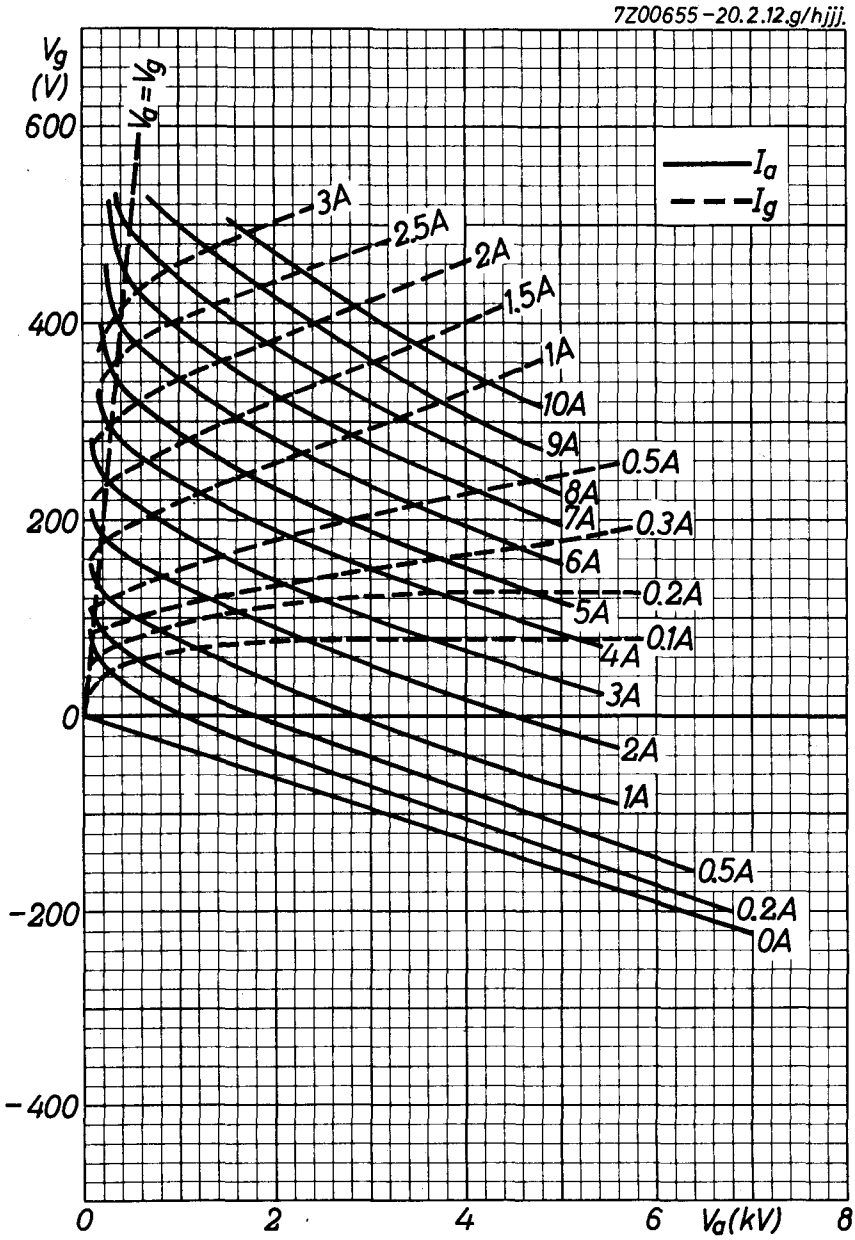
OPERATING CONDITIONS

Frequency	f	=	50	Mc/s
Transformer voltage	V_{tr}	=	5.1	kV_{RMS}
Anode voltage	V_a	=	6.0	kV
Anode current	I_a	=	1.5	A
Grid current	I_g	=	0.4	A
Grid input power	W_{ig}	=	300	W
Anode input power	W_{ia}	=	9	kW
Anode dissipation	W_a	=	2.7	kW
Output power	W_o	=	6	kW
Efficiency	η	=	67	%

7Z2 3530


7Z06341-20.12.g/hjj
I_a (A)
V_a (kV)
V_g = 500V
450V
400V
350V
300V
250V
200V
150V
100V
50V
0
−50V
−100V
−150V
$V_a = V_g$


7Z06340-20.12.g/hjj
I_g (A)
V_a (kV)
V_g = 500V
450V
400V
350V
300V
250V
200V
150V
100V
50V
$V_a = V_g$


7Z00655-20.2.12.g/hjjj.
Vg (V)
600
400
200
0
-200
-400
Va=Vg
3A
2.5A
2A
1.5A
1A
10A
9A
8A
7A
6A
5A
4A
3A
2A
1A
0.5A
0.3A
0.2A
0.1A
0.5A
0.2A
0A
Ia
Ig
0
2
4
6
8
Va(kV)

WATER COOLED INDUSTRIAL R.F. POWER TRIODE WITH INTEGRAL HELICAL COOLER

QUICK REFERENCE DATA		
Industrial R.F. oscillator class C		
Freq.	Three phase	
(MHz)	V_a (kV)	W_ℓ [1] (kW)
50	7.2 6.2	6.1 5.0

HEATING: direct; filament thoriated tungsten

Filament voltage	V_f	=	12.6	V	+5 % −10 %
Filament current	I_f	=	33	A	

CAPACITANCES

Anode to all other elements except grid	C_a	=	1.0	pF
Grid to all other elements except anode	C_g	=	14.2	pF
Anode to grid	C_{ag}	=	7.9	pF

TYPICAL CHARACTERISTICS

Anode voltage	V_a	=	6	kV
Anode current	I_a	=	1	A
Mutual conductance	S	=	12	mA/V
Amplification factor	μ	=	24	

[1]) Useful power in the load

7Z2 8646

TEMPERATURE LIMITS (Absolute limits)

Water inlet temperature t_i = max. 50 °C

Temperature of the seals = max. 220 °C

WATER COOLING CHARACTERISTICS

W_a (kW)	t_i (°C)	q_{min} (l/min)	p_i (atm)	t_o (°C)
2	20	1	0.032	56
	50	2	0.084	68
4	20	2.2	0.10	49
	50	4.4	0.49	65
6	20	4	0.41	43
	50	8	1.4	62

At water inlet temperatures between 20 and 50 °C the required quantity of water can be found by linear interpolation.

At frequencies above 4 MHz a low velocity air flow should be directed to the seals.

At frequencies above 4 MHz both grid terminals should be connected in parallel and care should be taken to distribute the R.F. current equally over both grid terminals to avoid excessive temperatures.

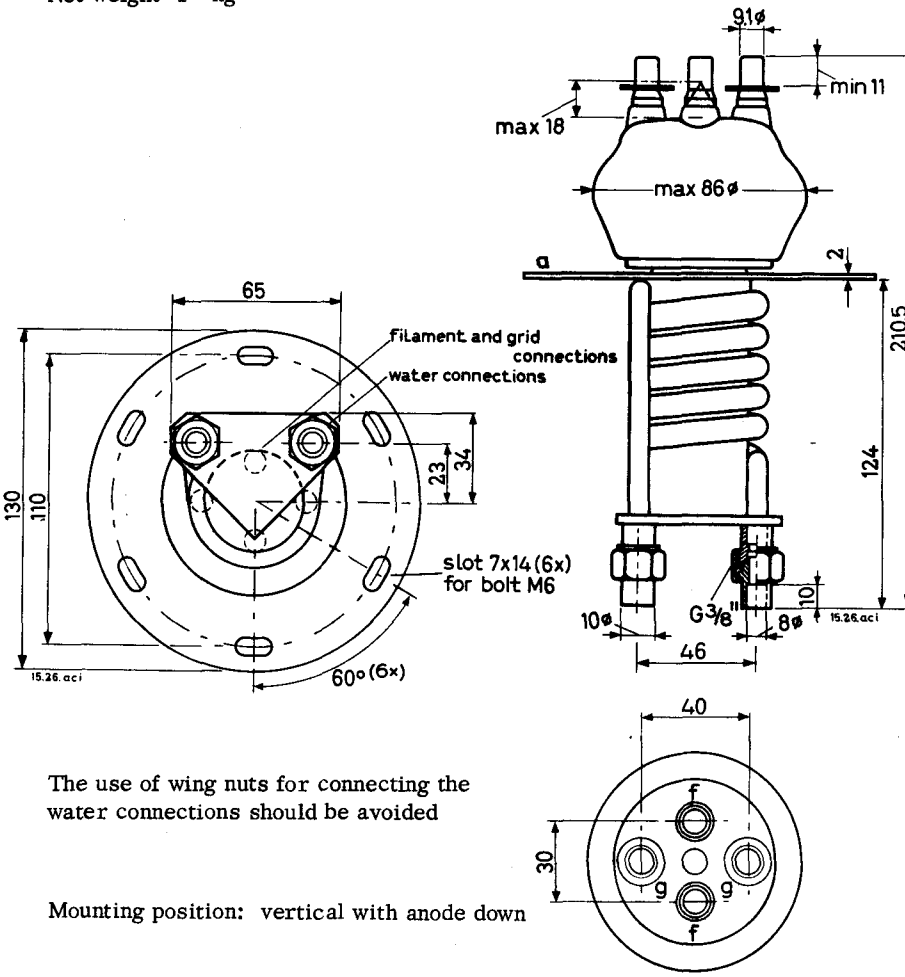
→ **ACCESSORIES**

Filament and grid connectors (4 required) type 40634

MECHANICAL DATA

Dimensions in mm

Net weight 1 kg



The use of wing nuts for connecting the water connections should be avoided

Mounting position: vertical with anode down

R.F. CLASS C OSCILLATOR FOR INDUSTRIAL USE with anode voltage from three-phase rectifier without filter

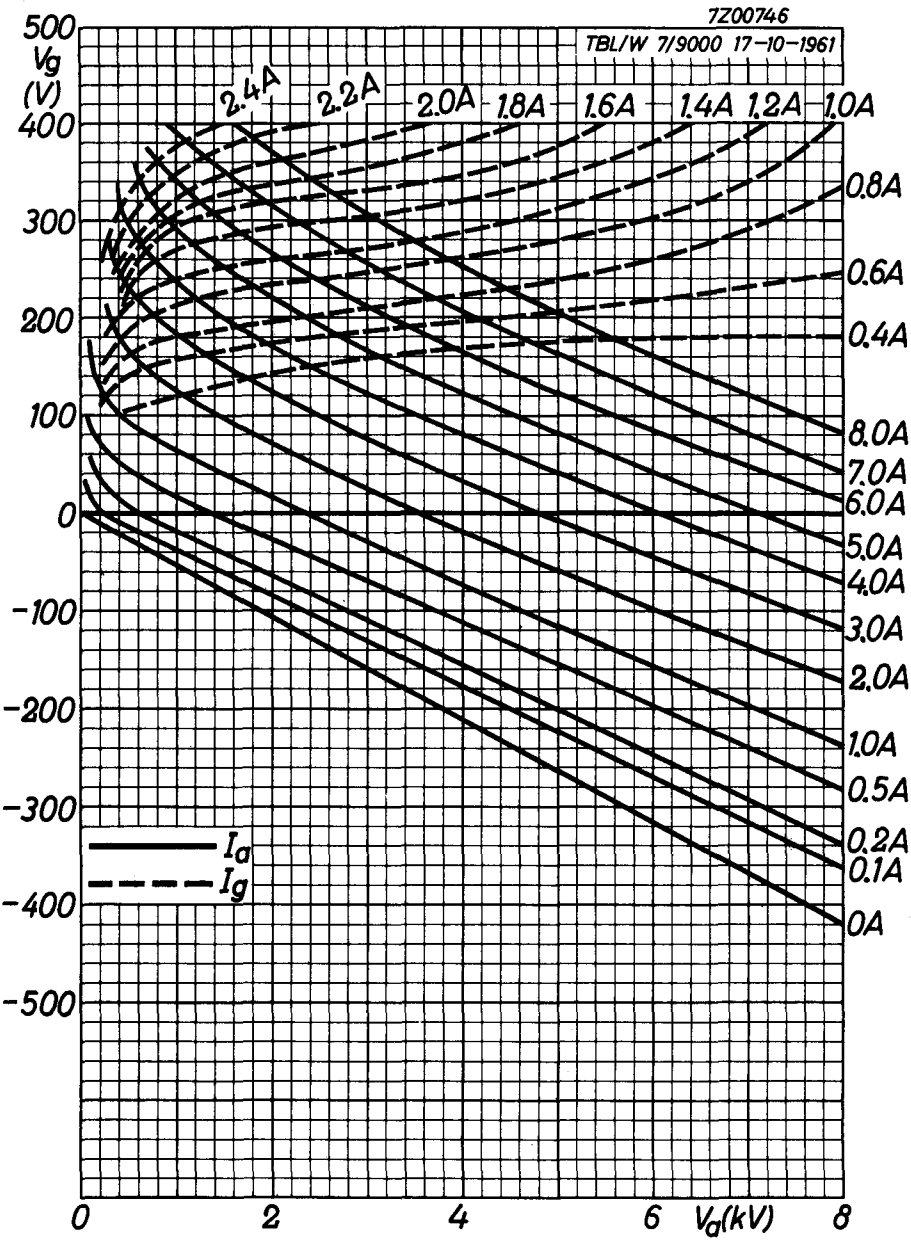
LIMITING VALUES (Absolute limits), continuous service

Frequency	f		up to	50	MHz
Anode voltage	V_a	=	max.	8	kV
Anode input power	W_{ia}	=	max.	12	kW
Anode dissipation	W_a	=	max.	6	kW
Anode current	I_a	=	max.	1.8	A
Negative grid voltage	$-V_g$	=	max.	1250	V
Grid current, loaded	I_g	=	max.	0.4	A
Grid current, unloaded	I_g	=	max.	0.5	A
Grid circuit resistance	R_g	=	max.	10	kΩ

OPERATING CHARACTERISTICS , continuous service

Frequency	f	=	50	50	MHz
Anode voltage	V_a	=	7200	6200	V
Anode current, loaded	I_a	=	1.5	1.4	A
Anode current, unloaded	I_a	=	0.37	0.40	A
Grid current, loaded	I_g	=	0.36	0.37	A
Grid current, unloaded	I_g	=	0.47	0.47	A
Grid resistor	R_g	=	1850	1500	Ω
Load resistance	$R_{a\sim}$	=	2300	2100	Ω
Feedback ratio under loaded conditions	$V_{g\sim}/V_{a\sim}$	=	17	17	%
Anode input power	W_{ia}	=	10.8	8.68	kW
Anode dissipation	W_a	=	3.3	2.5	kW
Efficiency	η	=	70	71	%
Output power in the load	W_ℓ	=	6.1	5.0	kW [1]

[1]) Useful power in the load, measured in a circuit having an efficiency of 85 %


7Z00746
TBL/W 7/9000 17-10-1961
500
Vg
(V)
400
300
200
100
0
-100
-200
-300
-400
-500
2.4A
2.2A
2.0A
1.8A
1.6A
1.4A
1.2A
1.0A
0.8A
0.6A
0.4A
8.0A
7.0A
6.0A
5.0A
4.0A
3.0A
2.0A
1.0A
0.5A
0.2A
0.1A
0A
Ia
Ig
0
2
4
6
Va(kV)
8

TRIODE for use as H.F. or L.F. amplifier or oscillator
TRIODE pour utilisation en amplificatrice H.F. ou B.F. ou en oscillatrice
TRIODE zur Verwendung als HF- oder NF- Verstärker oder Oszillator

Cooling : forced air
Refroidissement : par ventilation forcée
Kühlung : Pressluftkühlung

Filament : thoriated tungsten
Filament : tungstène thorié
Heizfaden : thoriertes Wolfram

Heating : direct
Chauffage : direct
Heizung : direkt

V_f = 17,5 V
I_f = 196 A

Filament current must never exceed a peak value of 420 A at any time during initial energising schedule
Le courant d'enclenchement ne doit jamais dépasser une valeur de crête de 420 A
Der Anlaufstrom darf niemals einen Scheitelwert von 420A überschreiten

Capacitances
Capacités
Kapazitäten

C_a = 3,4 pF
C_g = 116 pF
C_{ag} = 86 pF

Typical characteristics
Caractéristiques types
Kenndaten

μ (I_a= 5 A ; V_a=10 kV) = 27
S (I_a=50 A ; V_a= 3 kV) = 50 mA/V
S_{max} (I_a=50 A ; V_a= 3 kV) = 92 mA/V

λ	Freq.	C telegr.		C an.mod.		B mod. [1]	
m	Mc/s	V_a (kV)	W_o (kW)	V_a (kV)	W_o (kW)	V_a (kV)	W_o (kW)
						12	202
20	15	12	108	10	80	10	116
15	20	12	94,5	10	54,5	10	77
12	25	11	70	9	42,5	9	62
11	27,5	10,5	59	8,5	36,5	8,5	54
10	30	10	50	8	31	8	46,8

Television, télévision
Fernsehen

neg.mod. pos.synchr.		
Freq. (Mc/s)	V_a (kV)	W_o sync (kW)
48-68	6,5	100 [2]

[1] Two tubes; deux tubes; Zwei Röhren

[2] Power transferred from driving stage included
Y compris l'énergie transmise de l'étage pré-amplificateur
Einschliesslich der vom Vorverstärker übertragenen Leistung.

Air cooling characteristics
Caractéristiques du refroidissement par air
Luftkühlungsdaten

W_a (kW)	h (m)	ti max. (°C)	q min. (m^3/min)	pi (mm H_2O)	
30	0	35	35	114	See cooling curves Voir les courbes de refroidissement Siehe die Kühlungskurven
	0	45	40	143	
	1500	35	42	136	
	3000	25	44	132	
45	0	35	54	275	
	0	45	62,5	335	
	1500	35	64,5	322	
	3000	25	68	319	

temperature of seals
temp. des scellements
Temp. der Einschmelzungen
} = max. 180 °C

When the valve is used at frequencies above 6 Mc/s, special attention must be given to the anode- and grid-seal temperatures.
Cooling of these seals is effected by air flowing through the slots provided at the top of the cooler housing. In certain cases, e.g. at low anode dissipation and with cooling by the minimum quantity of air (according to the cooling curves), the air flow to the seals will not be sufficient to maintain the seal temperatures below the maximum permissible value at frequencies above 6 Mc/s.
Consequently, in these cases, a larger quantity of air must be supplied.

When using the special filament connectors type no. 40628, together with connecting leads of adequate cross-section, additional air cooling of the filament terminals is, as a rule, not necessary.

Care should be taken to ensure firm contact of the filament terminals in order to obtain equal distribution of current over these terminals.

Il faut faire attention aux températures des scellements de l'anode et de la grille lorsqu'on utilise le tube aux fréquences supérieures à 6 Mc/s.
Le refroidissement de ces scellements s'effectue par air traversant les fentes prévues du côté supérieur du refroidisseur. Dans certains cas, p.ex. aux basses valeurs de la dissipation anodique, le débit d'air minimum prescrit aux courbes de refroidissement ne produira pas un courant d'air suffisant pour un refroidissement effectif des scellements aux fréquen-

ces supérieures à 6 Mc/s et, par conséquent, la température maximum admissible sera dépassée.
Dans ces cas, il est nécessaire d'élever le débit d'air.

Généralement, un refroidissement additionnel des scellements du filament n'est pas nécessaire en utilisant les bornes de connexion spéciales no. de type 40628 et des câbles de raccordement d'une section suffisante.

Il faut veiller à un bon contact des bornes de connexion du filament pour assurer une répartition uniforme du courant sur ces bornes.

Insbesondere sind die Temperaturen der Anoden- und Gitterverschmelzung zu beachten, wenn die Röhre bei höheren Frequenzen als 6 MHz benutzt wird.
Durch die an der Oberseite des Luftkühlgehäuses vorgesehenen Spalte wird ein Luftstrom auf diese Verschmelzungen gerichtet. In gewissen Fällen, z.B. bei einer niedrigen Anodenverlustleistung, wird bei dem erforderlichen Mindestluftstrom (siehe die Kühlungskurven nicht genügend Luft für die Kühlung der Verschmelzungen geliefert bei Frequenzen höher als 6 MHz. Folglich muss in diesen Fällen der Luftstrom in dem Masse den Mindestwert übersteigen, dass die Temperatur der Verschmelzungen den höchstzulässigen Wert nicht überschreitet.

Im allgemeinen bedürfen die Heizfadenstifte keiner zusätzlichen Kühlung, vorausgesetzt, dass die Anschlussklemmen Typ No. 40628 verwendet werden, und der Leitungsquerschnitt genügend gross bemessen ist.

Es ist darauf zu achten, dass die Heizfadenanschlüsse guten Kontakt geben, damit eine gleichmässige Stromverteilung über die Anschlussklemmen gewährleistet ist.

Clips for filament
Bornes de connexion pour le filament 40628
Anschlussklemmen für den Heizfaden

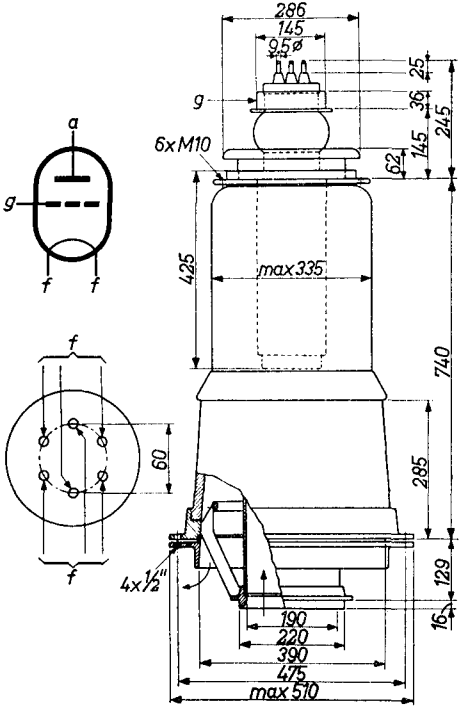
Mounting position: vertical with anode down
Montage : vertical avec l'anode en bas
Einbau : senkrecht mit der Anode unten

Weight, poids, Gewicht	TBL 12/100	K 506
net, netto	28,5 kg	72 kg
shipping, brut, brutto	97 kg	105 kg

PHILIPS

Valve mounted in cooler housing type K 506
Tube monté dans le refroidisseur type K 506
Röhre im Luftkühlgehäuse Typ K 506 montiert

Dimensions in mm
Dimensions en mm
Abmessungen in mm



When connecting the filament the three pins of each group must be joined
Toutes les broches de chaque groupe doivent être réunies en connectant le filament
Der Anschluss des Heizfadens muss an allen Stiften beider Gruppen erfolgen

H.F. class C telegraphy
H.F. classe C télégraphie
HF - Klasse C Telegrafie

Limiting values
Caractéristiques limites
Grenzdaten

		max.
V_a	=	15 kV[1]
$-V_g$	=	1200 V
I_a	=	12 A
I_g	=	3 A
W_{ia}	=	162 kW
W_a	=	45 kW

Operating conditions
Caractéristiques d'utilisation
Betriebsdaten

λ	=	20	15	12	11	10	m
f	=	15	20	25	27,5	30	Mc/s
V_a	=	12	12	11	10,5	10	kV
V_g	=	-1000	-1000	-900	-850	-800	V
I_a	=	12	10,5	8,5	7,5	6,7	A
I_g	=	2,25	2	1,6	1,5	1,4	A
V_{gp}	=	1700	1650	1450	1350	1300	V
W_{ig}	=	3,5	3	2,1	1,9	1,7	kW
W_{ia}	=	144	126	93,5	79	67	kW
W_a	=	36	31,5	23,5	20	17	kW
W_o	=	108	94,5	70	59	50	kW
η	=	75	75	75	75	75	%

[1]) Up to 4 Mc/s. Up to 15 Mc/s V_a = max. 13.5 kV.
Jusqu'à 4 Mc/s. Jusqu'à 15 Mc/s V_a = max. 13,5 kV.
Bis 4 MHz. Bis 15 MHz V_a = max. 13,5 kV.

H.F. class C anode modulation
H.F. classe C modulation d'anode
HF - Klasse C Anodenmodulation

Limiting values
Caractéristiques limites
Grenzdaten

f = max.	15	Mc/s	f = max.	20	Mc/s
V_a = max.	10	kV	V_a = max.	10	kV
$-V_g$ = max.	1200	V	W_{ia} = max.	80	kW
I_a = max.	10,5	A			
I_g = max.	3,5	A	f = max.	30	Mc/s
W_{ia} = max.	105	kW	V_a = max.	8	kV
W_a = max.	30	kW	W_{ia} = max.	50	kW

Operating conditions
Caractéristiques d'utilisation
Betriebsdaten

f =	15	15	20	25	27,5	30	Mc/s
V_a =	10	10	10	9	8,5	8	kV
V_g[1]) =	-1050	-1050	-1050	-925	-900	-850	V
I_a =	10,5	8,5	7,0	6,2	5,7	5,25	A
I_g =	3,5	2,6	2,0	2,0	1,9	1,8	A
V_{g_p} =	1960	1750	1650	1500	1450	1400	V
W_{ig} =	6,2	4,1	3,0	2,7	2,5	2,3	kW
W_{ia} =	105	85	70	56	48,5	42	kW
W_a =	25	17	15,5	13,5	12	11	kW
W_o =	80	68	54,5	42,5	36,5	31	kW
η =	76	80	78	76	75	74	%
m =	100	100	100	100	100	100	%
W_{mod} =	52,5	42,5	35	28	24,5	21	kW

[1]) Grid bias partially obtained by the grid resistor
Polarisation de grille obtenue partiellement par la résistance de grille
Gittervorspannung, teilweise durch den Gitterwiderstand erzeugt

L.F. class B amplifier and modulator
Amplificatrice et modulatrice B.F. classe B
NF - Verstärker und Modulator Klasse B

Limiting values
Caractéristiques limites
Grenzdaten

		max.
V_a	=	15 kV
I_a	=	12 A
W_{ia}	=	162 kW
W_a	=	45 kW
R_g	=	20 kΩ

Operating conditions, two valves
Caractéristiques d'utilisation, deux tubes
Betriebsdaten, zwei Röhren

V_a =	12		10		10		kV
V_g =	-450		-375		-400		V
R_{aa} =	1200		1500		2060		Ω
V_{ggp}=	0	2060	0	1680	0	1460	V
I_a =	2x0,65	2x12	2x0,5	2x7,9	2x0,2	2x5,4	A
I_g =	0	2x2,5	0	2x1,9	0	2x0,7	A
W_{ig} =	0	2x2,4	0	2x1,44	0	2x0,5	kW
W_{ia} =	2x7,8	2x144	2x5	2x79	2x2	2x54	kW
W_a =	2x7,8	2x43	2x5	2x21	2x2	2x15,5	kW
W_o =	0	202	0	116	0	77	kW
η =	-	70	-	75	-	71	%

V_a =	9		8,5		8		kV
V_g =	-350		-325		-300		V
R_{aa} =	2080		2120		2210		Ω
V_{ggp}=	0	1300	0	1200	0	1120	V
I_a =	2x0,25	2x4,8	2x0,25	2x4,4	2x0,25	2x4,1	A
I_g =	0	2x0,65	0	2x0,55	0	2x0,4	A
W_{ig} =	0	2x0,4	0	2x0,3	0	2x0,25	kW
W_{ia} =	2x2,25	2x43,2	2x2,1	2x37,4	2x2	2x32,8	kW
W_a =	2x2,25	2x12,2	2x2,1	2x10,4	2x2	2x9,4	kW
W_o =	0	62	0	54	0	46,8	kW
η =	-	72	-	72	-	71	%

PHILIPS

H.F. class B amplifier for television service, negative modulation, positive synchronisation
Amplificatrice H.F. classe B pour télévision, modulation négative, synchronisation positive
HF Klasse B Verstärker für Fernsehsender, negative Modulation, positive Synchronisierung

Limiting values
Caractéristiques limites
Grenzdaten

f		= max.	68 Mc/s
V_a		= max.	6,5 kV
I_a	sync	= max.	16 A
W_{ia}	sync	= max.	100 kW
W_a	sync	= max.	50 kW
I_g	sync	= max.	2 A

Operating conditions, two tubes in push-pull
Caractéristiques d'utilisation, deux tubes en push-pull
Betriebsdaten, zwei Röhren in Gegentakt

f		=	48-68 Mc/s[1]
B (-1,5 db)		=	5,5 Mc/s[2]
B (-3 db)		=	7,5 Mc/s[2]
V_a		=	6,5 kV
V_g		=	-250 V
V_{gg_p}	sync	=	1740 V[3]
	black, noir, schwarz	=	1300 V[3]
I_a	sync	=	32 A
	black, noir, schwarz	=	24 A
I_g	sync	=	3,4 A
	black, noir, schwarz	=	2,2 A
W_{ig}	sync	=	22,4 kW[4]
W_o	sync	=	80+20 kW[5]
	black, noir, schwarz	=	45+11 kW[5]

[1])...[5])See page 9; voir page 9; siehe Seite 9

[1]) In the frequency range of 60-68 Mc/s a special version of the tube is necessary
Pour la gamme de fréquences de 60-68 Mc/s une exécution speciale du tube est nécessaire
Für das Frequenzbereich von 60-68 MHz ist eine spezielle Ausführung der Röhre erforderlich

[2]) This value of bandwidth is based on measurements on a circuit with a single LC section
Cette valeur de la largeur de bande se rapporte à des mesures à un montage avec un seul circuit LC.
Dieser Wert der Bandbreite bezieht sich auf Messungen an einer Schaltung mit einem einzigen LC-Kreis.

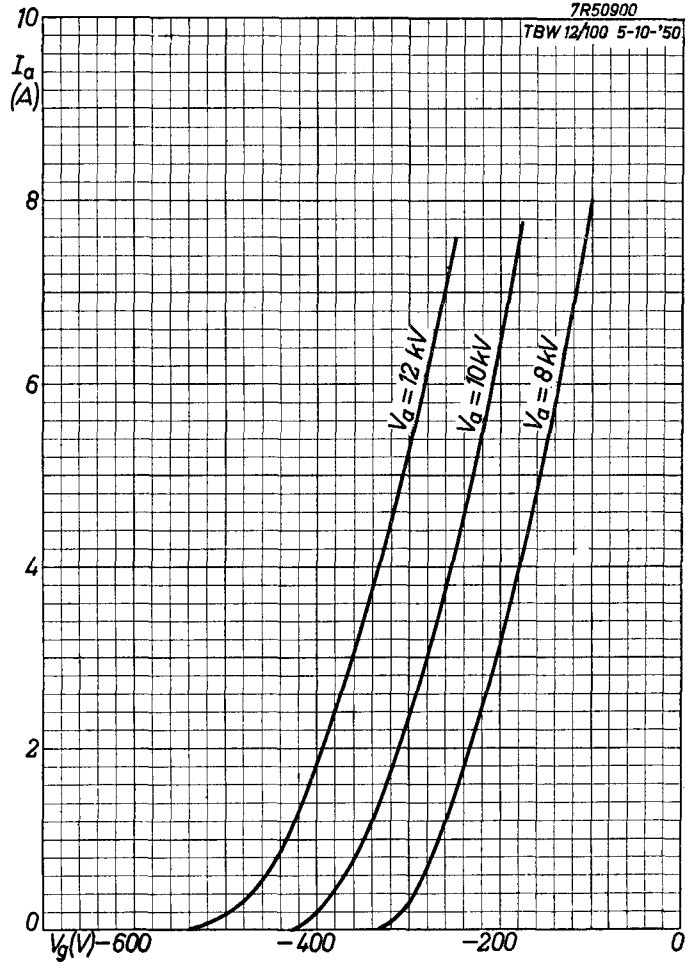
[3]) Measured by the slide back method
Mesuré par la méthode de glissement de la tension de polarisation
Gemessen mittels Verschiebung der Gittervorspannung.

[4]) Driving power is accounted for largely by circuit losses. The indicated driving power is required to take care of losses in damping resistors, circuit losses and tube driving power
La puissance d'entrée est nécessaire pour la plupart pour les pertes dans le circuit. La puissance mentionnée est nécessaire pour les pertes dans les résistances d'amortissement, dans le circuit et pour la puissance d'entrée du tube.
Die Eingangsleistung ist grossenteils nötig für die Verluste in der Schaltung. Die genannte Leistung ist nötig für die Verluste in Dämpfungswiderständen, in Kreisen und für die Eingangsleistung der Röhre.

[5]) Power transferred from driving stage included
Y compris l'énergie transmise de l'étage pre-amplificateur.
Einschliesslich der vom Vorverstärker übertragenen Leistung

PHILIPS

TBL 12/100

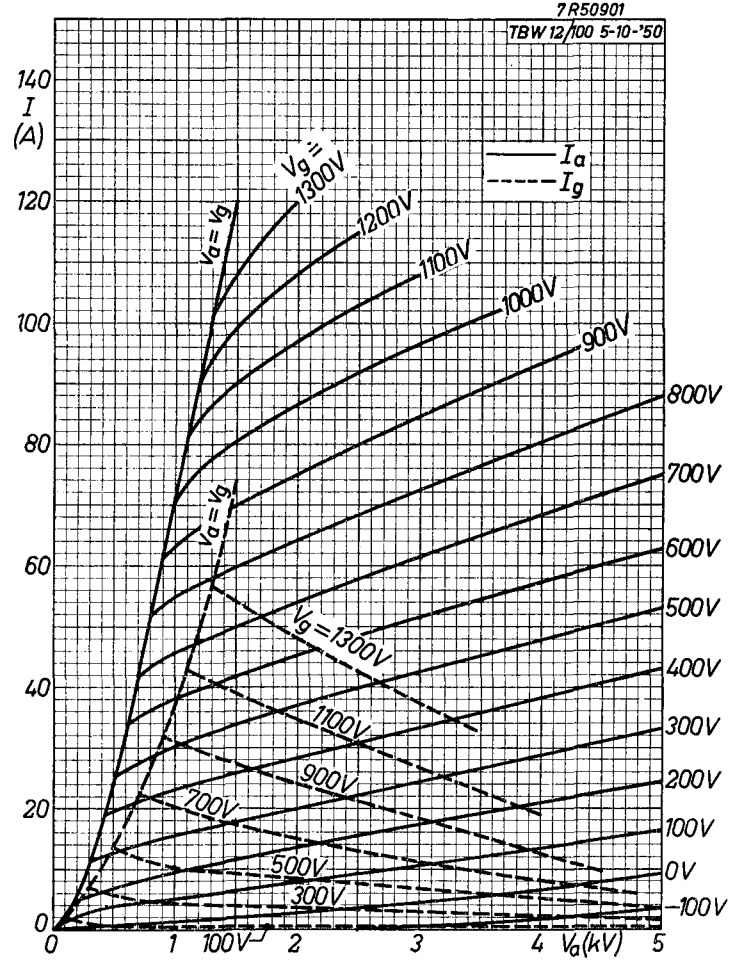


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A

TBL 12/100

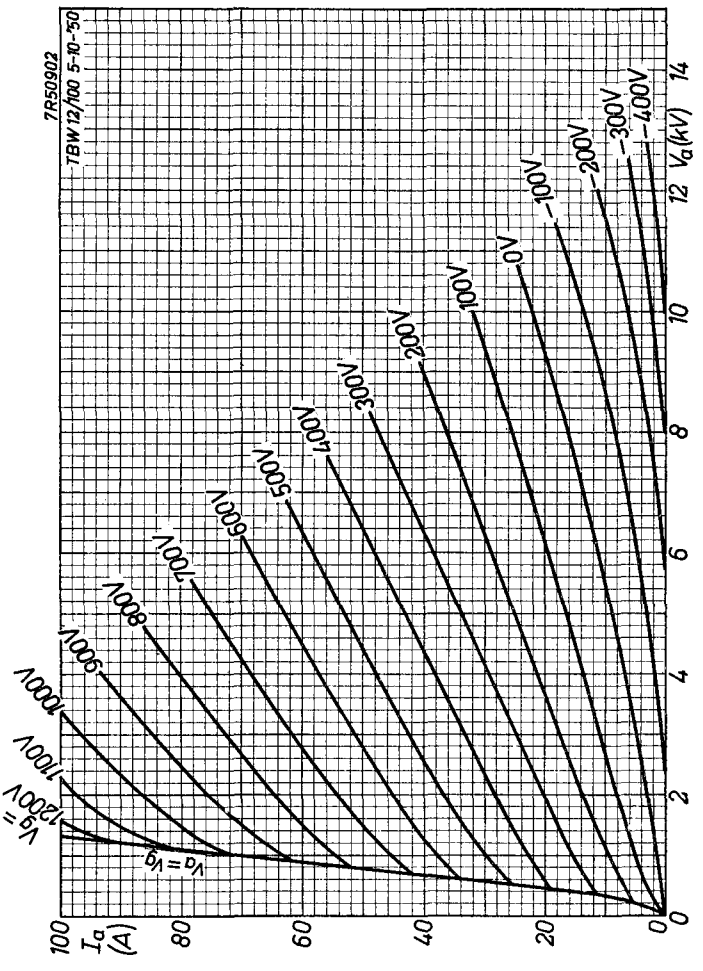
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B

PHILIPS

TBL 12/100

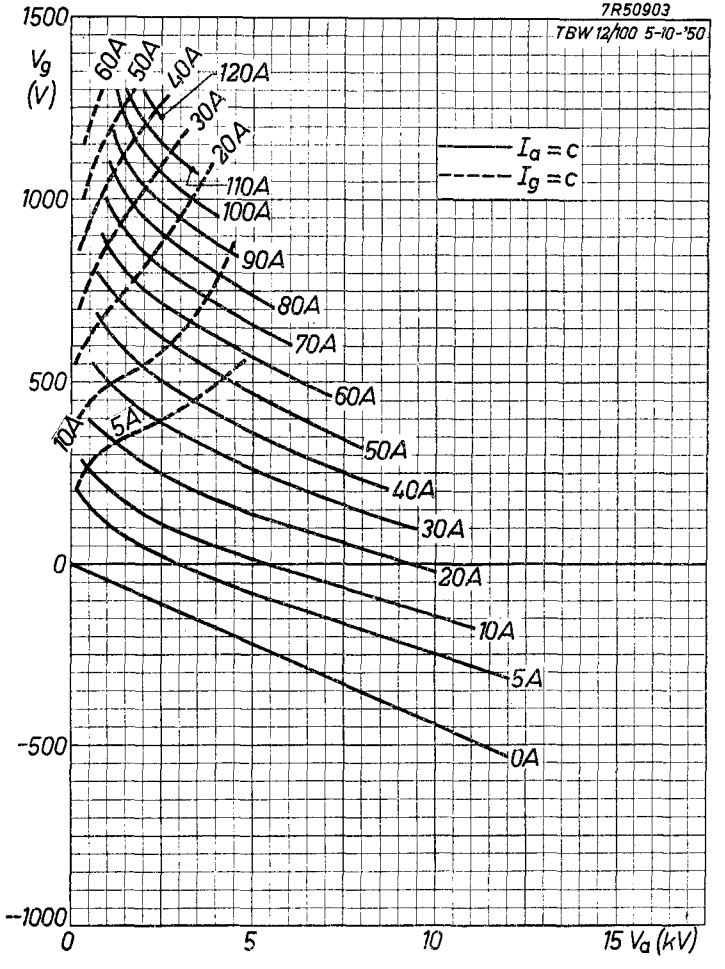


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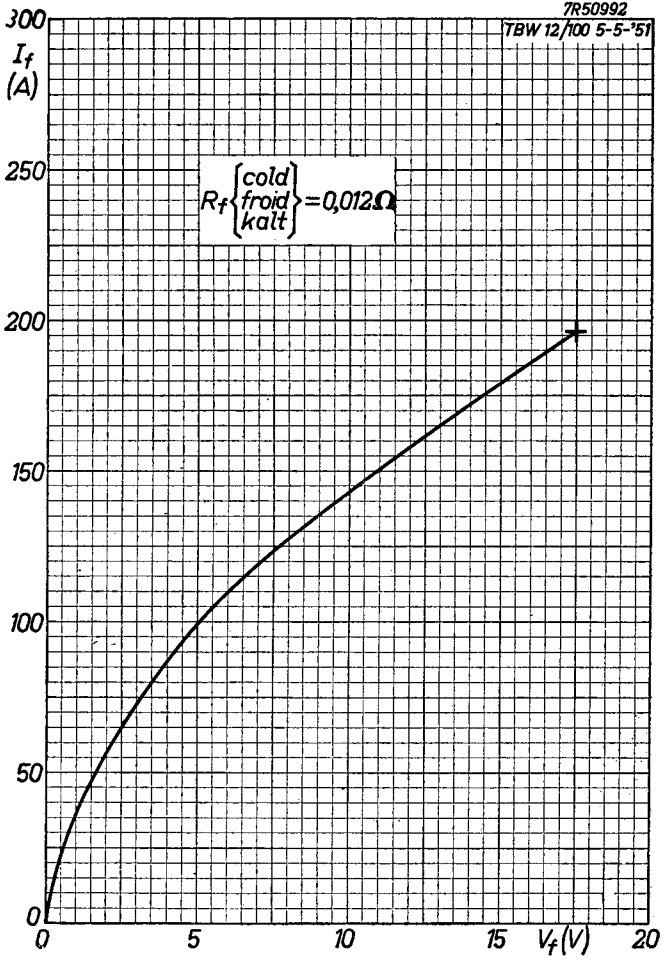
C

TBL 12/100

PHILIPS



D


7R50992
TBW 12/100 5-5-'51
300
I_f
(A)
250
200
150
100
50
0
R_f {cold / froid / kalt} = 0,012 Ω
0
5
10
15
V_f (V)
20

TBL 12/100

PHILIPS

F

PHILIPS

TBL 12/100

4.4.1955

G



TBL12/100

page	sheet	date
1	1	1955.03.03
2	2	1955.03.03
3	3	1954.07.07
4	4	1954.07.07
5	5	1954.07.07
6	6	1954.07.07
7	7	1956.02.02
8	8	1956.02.02
9	9	1956.02.02
10	A	1954.07.07
11	B	1954.07.07
12	C	1954.07.07
13	D	1954.07.07
14	E	1955.04.04
15	F	1955.04.04
16	G	1955.04.04
17	FP	2000.01.20

RF POWER TRIODE

- Air cooled

QUICK REFERENCE DATA

Industrial RF oscillator, class-C

freq.	three phase	
	V_a	W_o
MHZ	kV	kW
30	12	29,0
	10	23,3
	8	17,9

HEATING: direct; thoriated tungsten filament

Filament voltage	V_f	=	8,0 V
Filament current	I_f	=	98 A
Cold filament resistance	R_{fo}	=	0,008 Ω

The filament is designed to accept temporary fluctuations of +5% and −10%

The filament current must never exceed a peak value of 210 A instantaneously at any time during the initial energizing schedule.

CAPACITANCES

Anode to all other elements except grid	C_a	=	0,4 pF
Grid to all other elements except anode	C_g	=	37 pF
Anode to grid	C_{ag}	=	30 pF

TYPICAL CHARACTERISTICS

Anode voltage	V_a	=	12 kV
Anode current	I_a	=	2 A
Mutual conductance	S	=	20 mA/V
Amplification factor	μ	=	34

TEMPERATURE LIMIT (Absolute limit)

Seal temperature		max.	220 °C

Table 1 Air cooling characteristics

W_a (kW)	h (m)	T_i (^oC)	q_{min} (m^3/min)	ΔP (Pa)*	max. outlet temperature T_o (^oC)
7	0	35	6.6	100	100
	0	45	7.7	130	100
	1500	35	7.9	120	100
	3000	25	8.3	120	95
10	0	35	10.5	230	90
	0	45	12.3	310	90
	1500	35	12.6	280	90
	3000	25	13.2	270	85
15	0	35	18.1	600	80
	0	45	21.2	790	80
	1500	35	21.7	730	80
	3000	25	22.8	700	75

To ensure a uniform RF current distribution in the grid seal especially at frequencies higher then 4 MHz, the grid lead should be connected as shown below

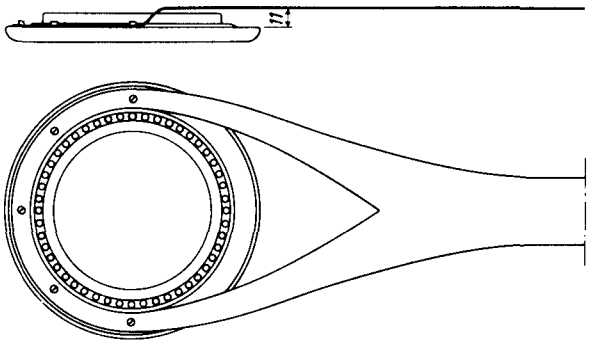


Fig. 1 Grid lead detail.

* 1 Pa ≈ 0,1 mm H_2O.

7Z2 3548

MECHANICAL DATA

Dimensions in mm

Net mass of tube 17,3 kg

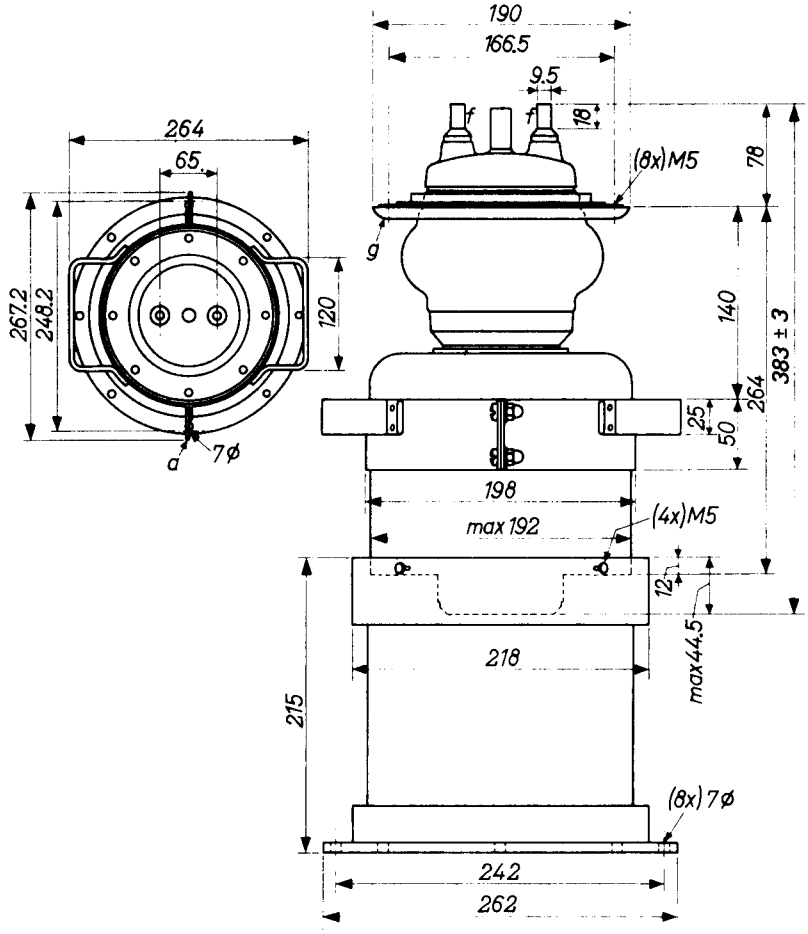


Fig. 2 Mechanical outline.

Mounting position: vertical with anode down

ACCESSORIES

Filament connectors, with cable	40662
Grid connector	40663
Insulating pedestal	40648

RF CLASS C OSCILLATOR FOR INDUSTRIAL USE with anode voltage from three-phase half-wave rectifier without filter

LIMITING VALUES (Absolute limits)

Frequency		f		up to	30	MHz
Anode voltage		V_a	=	max.	13	kV
Anode current		I_a	=	max.	4.8	A
Anode dissipation		W_a	=	max.	15	kW
Anode input power		W_{ia}	=	max.	60	kW
Negative grid voltage		$-V_g$	=	max.	1500	V
Grid current		I_g	=	max.	0.8	A
Grid circuit resistance		R_g	=	max.	10	kΩ

OPERATING CONDITIONS

Frequency	f	=	30	30	30	MHz
Transformer voltage	V_{tr}	=	8.9	7.4	6.0	kV
Anode voltage	V_a	=	12	10	8	kV
Anode current, loaded	I_a	=	3.2	3.2	3.2	A
Anode current, unloaded	I_a	=	0.52	0.50	0.48	A
Grid current, loaded	I_g	=	0.50	0.50	0.50	A
Grid current, unloaded	I_g	=	0.74	0.77	0.80	A
Grid resistor	R_g	=	2.0	1.6	1.1	kΩ
Load resistance	$R_{a\sim}$	=	1800	1450	1100	Ω
Feedback ratio under loaded conditions	$V_{g\sim}/V_{a\sim}$	=	16	17	19	%
Anode input power	W_{ia}	=	38.4	32.0	25.6	kW
Anode dissipation	W_a	=	9.4	8.7	7.7	kW
Output power	W_o	=	29.0	23.3	17.9	kW
Efficiency	η	=	75.5	72.5	70	%
Output power in the load	W_ℓ	=	25	20	15.5	kW [1]

[1]) Useful power in the load measured in a circuit having an efficiency of about 90%

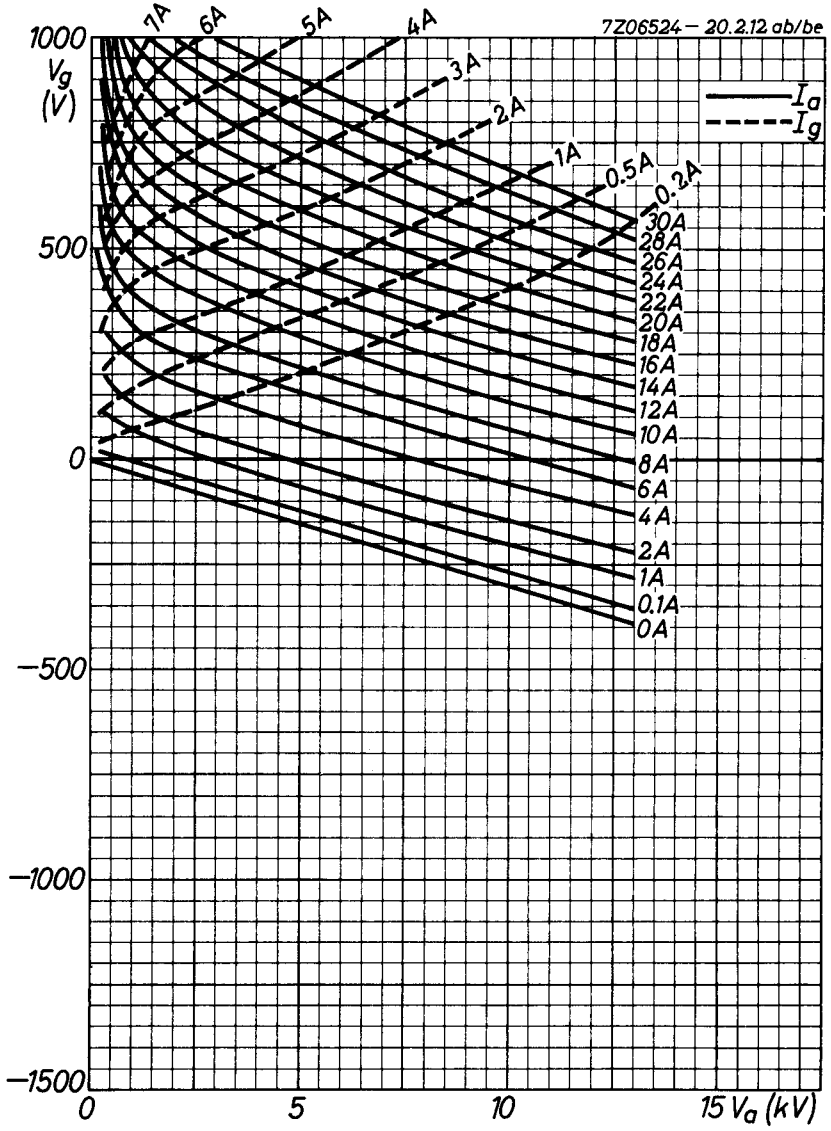


Fig. 3 Constant current characteristics.

PHILIPS

Data handbook

Electronic components and materials

TBL12/25

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1	127	1988.02
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3	129	1988.02
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6	FP	2000.09.22

RF POWER TRIODE

- Air cooled

QUICK REFERENCE DATA

Industrial RF oscillator, class-C

freq.	three phase	
	V_a	W_o
MHz	kV	kW
30	12	39
	10	31,3
	8	23,2

HEATING: direct; thoriated tungsten filament

Filament voltage	V_f	=	8 V
Filament current	I_f	=	130 A
Cold filament resistance	R_{fo}	=	0,006 Ω

The filament is designed to accept temporary fluctuations of +5% and −10%.

The filament current must never exceed a peak value of 280 A at any time during the initial energizing schedule.

CAPACITANCES

Anode to all other elements except grid	C_a	=	0,9 pF
Grid to all other elements except anode	C_g	=	45 pF
Anode to grid	C_{ag}	=	23,5 pF

TYPICAL CHARACTERISTICS

Anode voltage	V_a	=	12 kV
Anode current	I_a	=	2 A
Mutual conductance	S	=	22 mA/V
Amplification factor	μ	=	21

TEMPERATURE LIMIT (Absolute limit)

Temperature of all seals		max.	220 °C

Table 1 Cooling characteristics

anode dissipation W_a kW	altitude h m	inlet temperature T_i °C	rate of flow q_{min} m^3/min	pressure drop ΔP Pa*	outlet temperature T_o max °C
15	0	35	18,1	600	90
10	0	35	10,5	230	90
7	0	35	6,6	100	95
15	0	45	21,2	790	90
10	0	45	12,3	310	90
7	0	45	7,7	130	100
15	1500	35	21,7	730	90
10	1500	35	12,6	280	90
7	1500	35	7,9	120	100
15	3000	25	22,8	700	80
10	3000	25	13,2	270	80
7	3000	25	8,3	120	95

ACCESSORIES

Filament connectors	40662
Grid connector*	40663
Insulating pedestal	40648

The rounded side of the grid connector should face the anode. To ensure a uniform RF current distribution in the grid seal at frequencies higher than 4 MHz, the grid lead should be connected as shown below.

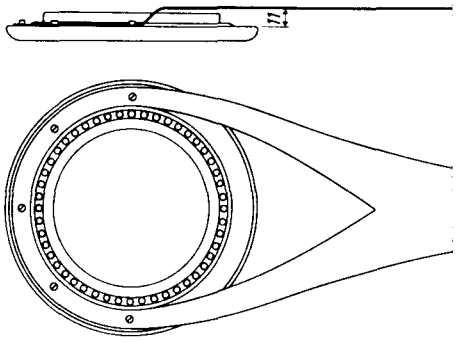


Fig. 1 Grid lead detail.

* 1 Pa ≈ 0,1 mm H_2O.

MECHANICAL DATA

Dimensions in mm

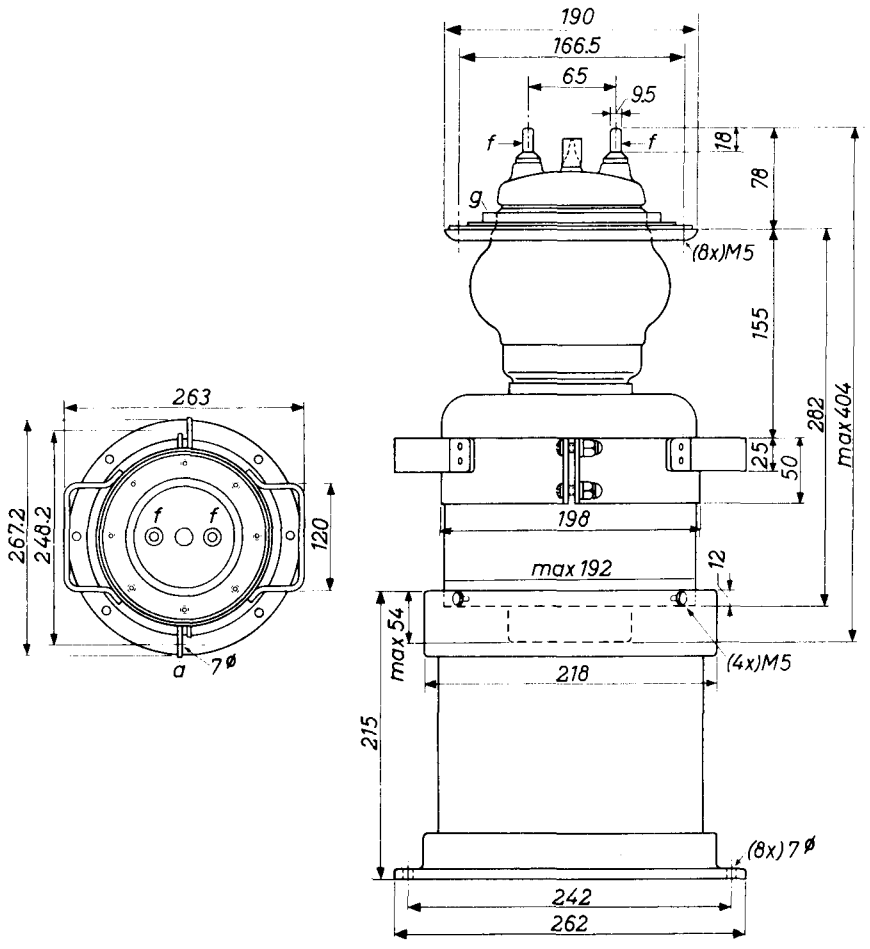


Fig. 2 Mechanical outline.

Mounting position	:	vertical
Net mass of the tube	:	approx. 16,1 kg
Net mass of pedestal	:	7,15 kg

RF CLASS-C OSCILLATOR FOR INDUSTRIAL USE with anode voltage from three-phase rectifier without filter.

LIMITING VALUES (Absolute maximum rating system)

Frequency	f		up to	30	MHz
Anode voltage	V_a		max.	13	kV
Anode current	I_a		max.	5	A
Anode dissipation	W_a		max.	15*	kW
Anode input power	W_{ia}		max.	60	kW
Negative grid voltage	$-V_g$		max.	2	kV
Grid current, on load	I_g		max.	1,5	A
Grid current, off load	I_g		max.	2,0	A
Grid circuit resistance	R_g		max.	10	kΩ
OPERATING CONDITIONS					
Frequency	f	30	30	30	MHz
Anode voltage	V_a	12	10	8	kV
Anode current, on load	I_a	4,5	4,5	4,5	A
Anode current, off load	I_a	0,65	0,63	0,62	A
Grid current, on load	I_g	0,9	0,9	0,9	A
Grid current, off load	I_g	1,22	1,3	1,35	A
Grid resistor	R_g	1100	1000	900	Ω
Load resistance	$R_{a\sim}$	1450	1100	800	Ω
Feedback ratio under loaded conditions	$V_{g\sim}/V_{a\sim}$	16	19	24	%
Anode input power	W_{ia}	54	45	36	kW
Anode dissipation	W_a	15	13,7	12,8	kW
Output power	W_o	39	31,3	23,2	kW
Efficiency	η	72,5	70	64,5	%
Output power in the load**	W_ℓ	30	25	18	kW

* TBW12/38: W_a max. = 20 kW (for intermittent service see Fig. 3).
** Useful power in the load, measured in a circuit having an efficiency of about 85%.

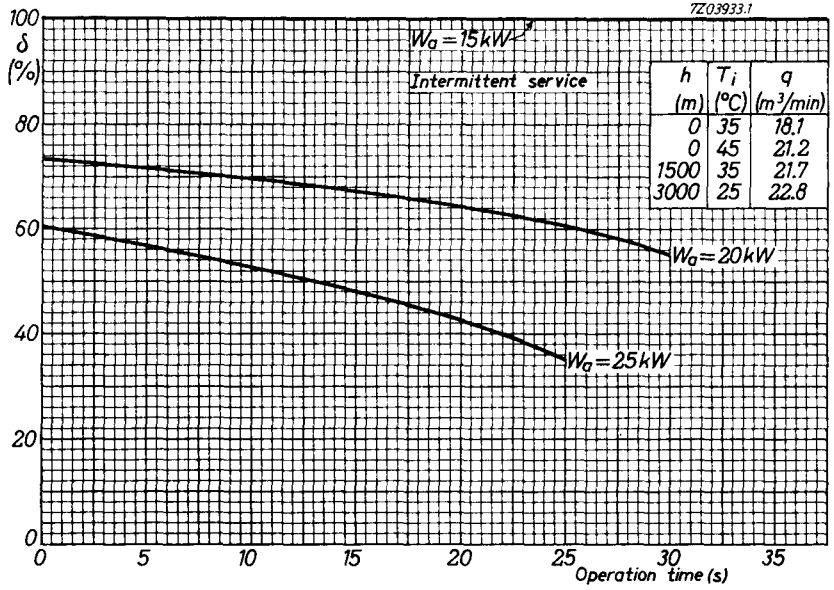


Fig. 3 Intermittent service. Limits of anode dissipation and cooling.

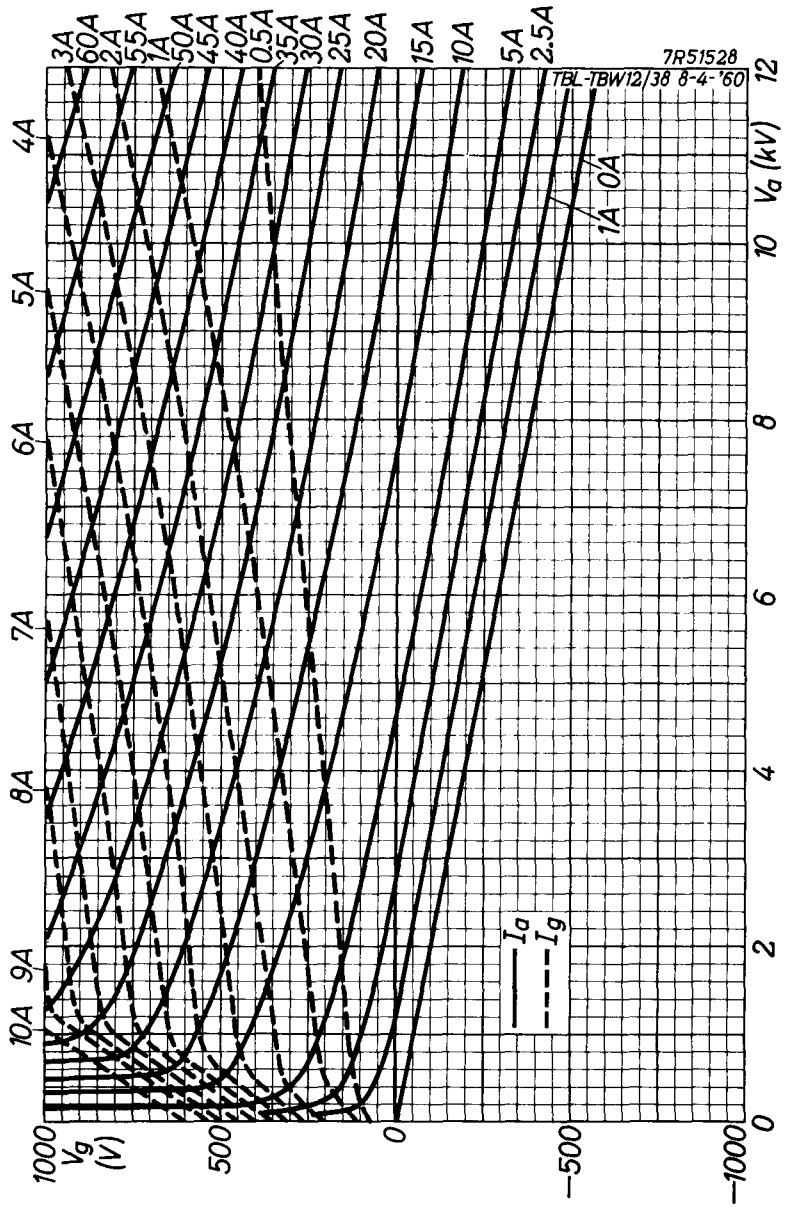


Fig 4 Constant current characteristics.

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Data handbook

Electronic components and materials

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3	135	1988.02
4	136	1988.02
5	137	1988.02
6	138	1988.02
7	FP	2000.09.22

TRIODE for use as R.F. or A.F. amplifier or oscillator
TRIODE pour utilisation comme amplificatrice ou oscillatrice H.F. ou B.F.
TRIODE zur Verwendung als HF- oder NF-Verstärker oder Oszillator

Cooling : forced air
Refroidissement: par ventilation forcée
Kühlung : Pressluftkühlung

Filament : thoriated tungsten
Filament : tungstène thorié
Heizfaden: thoriertes Wolfram

Heating : direct	V_f	=	8	V
Chauffage: direct	I_f	=	130	A
Heizung : direkt				

The filament current must never exceed a peak value of 280 A at any time during the initial energizing schedule
Le courant d'enclenchement ne doit jamais dépasser une valeur de crête de 280 A
Der Anlaufstrom darf niemals einen Scheitelwert von 280 A überschreiten

Capacitances	C_a	=	0,6	pF
Capacités	C_g	=	45	pF
Kapazitäten	C_{ag}	=	27	pF
Typical characteristics	μ (V_a = 12 kV)	=	33	
Caractéristiques types	S (I_a = 2 A)	=	25	mA/V
Kenndaten				

Temperatures
Températures
Temperaturen

Temperature of all seals
Température de tous les scellements = max. 220 °C
Temperatur aller Einschmelzungen

Mounting position: vertical
Montage : vertical
Einbau : senkrecht

TRIODE for use as R.F. or A.F. amplifier or oscillator
TRIODE pour utilisation comme amplificatrice ou oscillatrice H.F. ou B.F.
TRIODE zur Verwendung als HF- oder NF-Verstärker oder Oszillator

Cooling : forced air
Refroidissement: par ventilation forcée
Kühlung : Pressluftkühlung

Filament : thoriated tungsten
Filament : tungstène thorié
Heizfaden: thoriertes Wolfram

Heating : direct Chauffage: direct Heizung : direkt	V_f	=	8	V
	I_f	=	130	A

The filament current must never exceed a peak value of 280 A at any time during the initial energizing schedule
Le courant d'enclenchement ne doit jamais dépasser une valeur de crête de 280 A
Der Anlaufstrom darf niemals einen Scheitelwert von 280 A überschreiten

Capacitances Capacités Kapazitäten	C_a	=	0,6	pF
	C_g	=	45	pF
	C_{ag}	=	27	pF
Typical characteristics Caractéristiques types Kenndaten	μ (V_a = 12 kV, I_a = 2 A)	=	33	
	S (V_a = 12 kV, I_a = 2 A)	=	25	mA/V

Temperatures
Températures
Temperaturen

Temperature of all seals
Température de tous les scellements = max. 220 °C
Temperatur aller Einschmelzungen

Mounting position: vertical
Montage : vertical
Einbau : senkrecht

Net weight
Poids net 19 kg
Nettogewicht

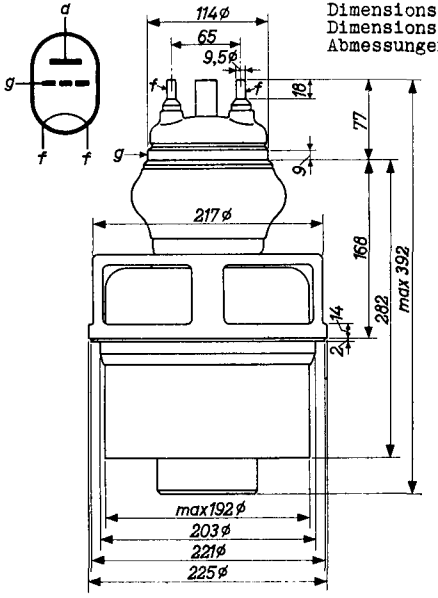
Shipping weight
Poids brut 84,5 kg
Bruttogewicht

PHILIPS

Air cooling characteristics
Caractéristiques du refroidissement par air
Luftkühlungsdaten

W (kW)	h (m)	t_i max. (°C)	q min. (m^3/min)	p_i (mm H_2O)
7	0	35	6,6	10
	0	45	7,7	13
	1500	35	7,9	12
	3000	25	8,3	12
10	0	35	10,5	23
	0	45	12,3	31
	1500	35	12,6	28
	3000	25	13,2	27
15	0	35	18,1	60
	0	45	21,2	79
	1500	35	21,7	73
	3000	25	22,8	70

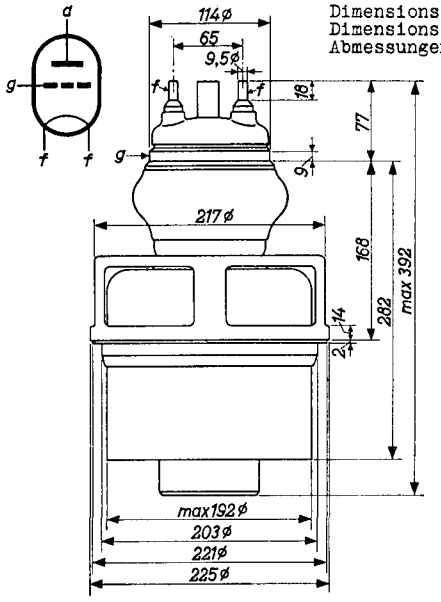
Dimensions in mm
Dimensions en mm
Abmessungen in mm



PHILIPS

Air cooling characteristics
Caractéristiques du refroidissement par air
Luftkühlungsdaten

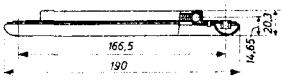
W (kW)	h (m)	t_i max. (°C)	q min. (m^3/min)	p_i (mm H_2O)
7	0	35	6,6	10
	0	45	7,7	13
	1500	35	7,9	12
	3000	25	8,3	12
10	0	35	10,5	23
	0	45	12,3	31
	1500	35	12,6	28
	3000	25	13,2	27
15	0	35	18,1	60
	0	45	21,2	79
	1500	35	21,7	73
	3000	25	22,8	70

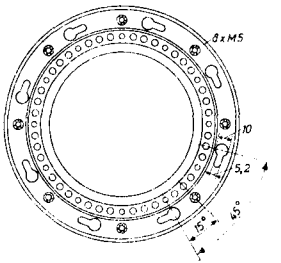


Dimensions in mm
Dimensions en mm
Abmessungen in mm

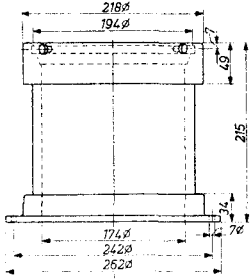
Accessories; accessoires; Zubehör

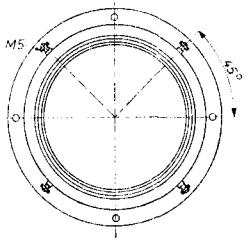
Clips with cable for filament
Bornes avec câble pour le filament 40662
Klemmen mit Kabel für Heizfaden





40663
Grid connector
Connecteur de la grille
Gitteranschlussring



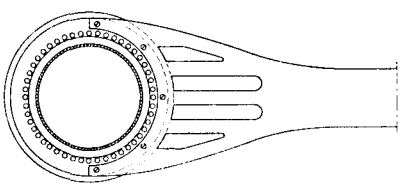


40648
Insulating pedestal
Support isolant
Isoliersockel

The rounded side of the grid connector should face the anode. To ensure a uniform R.F. current distribution in the grid seal at frequencies higher than 4 Mc/s, the grid lead should be connected as shown below

Le côté arrondi du connecteur de la grille sera tourné vers l'anode Afin d'assurer une distribution uniforme du courant H.F. dans le scellement de la grille à des fréquences supérieures à 4 MHz, le conducteur de la grille sera relié selon la figure ci-dessous

Die abgerundete Seite des Gitteranschlussringes soll der Anode zugekehrt sein. Zur Gewährleistung einer gleichmässigen HF-Stromverteilung in der Gittereinschmelzung bei Frequenzen höher als 4 MHz, soll die Gitterleitung nach nebenstehender Figur verbunden werden



R.F. class C telegraphy
H.F. classe C télégraphie
HF-Klasse C Telegraphie

Limiting values
Caractéristiques limites
Grenzdaten

f	=	30	Mc/s
V_a	= max.	13	kV
W_{ia}	= max.	60	kW
W_a	= max.	15	kW
I_a	= max.	4,8	A
$-V_g$	= max.	1500	V
I_g	= max.	1,0	A
R_g	= max.	10	kΩ

Operating conditions
Caractéristiques d'utilisation
Betriebsdaten

f	=	30	Mc/s
V_a	=	12	kV
V_g	=	-1000	V
I_a	=	4,5	A
I_g	=	0,8	A
V_{gp}	=	1600	V
W_{ig}	=	1150	W
W_{ia}	=	54	kW
W_a	=	13	kW
W_o	=	41	kW
η	=	76	%

R.F. class C anode modulation
H.F. classe C modulation d'anode
HF-Klasse C Anodenmodulation

Limiting values
Caractéristiques limites
Grenzdaten

f	= 30 Mc/s	W_a	= max. 10 kW
V_a	= max. 10 kV [1])	I_a	= max. 3,8 A
W_{ia}	= max. 40 kW	$-V_g$	= max. 1500 V
		I_g	= max. 1,0 A
		R_g	= max. 10 kΩ

Operating conditions
Caractéristiques d'utilisation
Betriebsdaten

f	=	30 Mc/s
V_a	=	10 kV
V_g	=	-1000 V [2])
I_a	=	3,5 A
I_g	=	0,8 A
V_{gp}	=	1500 V
W_{ig}	=	1080 W
W_{ia}	=	35 kW
W_a	=	7,5 kW
W_o	=	27,5 kW
η	=	78,5 %
m	=	100 %
W_{mod}	=	17,5 kW

[1]) With 120 % modulation and 3000 m above seal level
A un taux de modulation de 120 % et 3000 m au-dessus du niveau de la mer
Bei 120 % Modulation und 3000 m über dem Meerespiegel

[2]) Grid bias partially obtained by grid resistor
Polarisation de grille obtenue partiellement par la résistance de grille
Gittervorspannung teilweise mittelsdes Gitterwiderstandes erhalten

PHILIPS

A.F. class B amplifier and modulator (especially for use with cathode-follower)
Amplificatrice et modulatrice B.F. classe B (spécialement pour utilisation avec tube d'attaque à charge cathodique)
NF-Klasse B Verstärker und Modulator (besonders für Gebrauch mit Treiberröhre in Anodenbasisschaltung)

Limiting values
Caractéristiques limites
Grenzdaten

V_a	=	max.	13 kV
W_{ia}	=	max.	60 kW
W_a	=	max.	15 kW
I_a	=	max.	4,5 A
R_g	=	max.	10 kΩ

Operating conditions, two tubes
Caractéristiques d'utilisation, deux tubes
Betriebsdaten, zwei Röhren

V_a			10	kV
V_g			-290	V
$R_{aa\sim}$			6240	Ω
V_{ggp}	=	0	900	V
I_a	=	2x0,1	2x1,6	A
I_g	=	0	2x0,035	A
I_{gp}	=	-	2x0,24	A
W_{ig}	=	0	2x14	W
W_{ia}	=	2x1,0	2x16	kW
W_a	=	2x1,0	2x6,4	kW
W_o	=	0	19,2	kW
η	=	-	60	%

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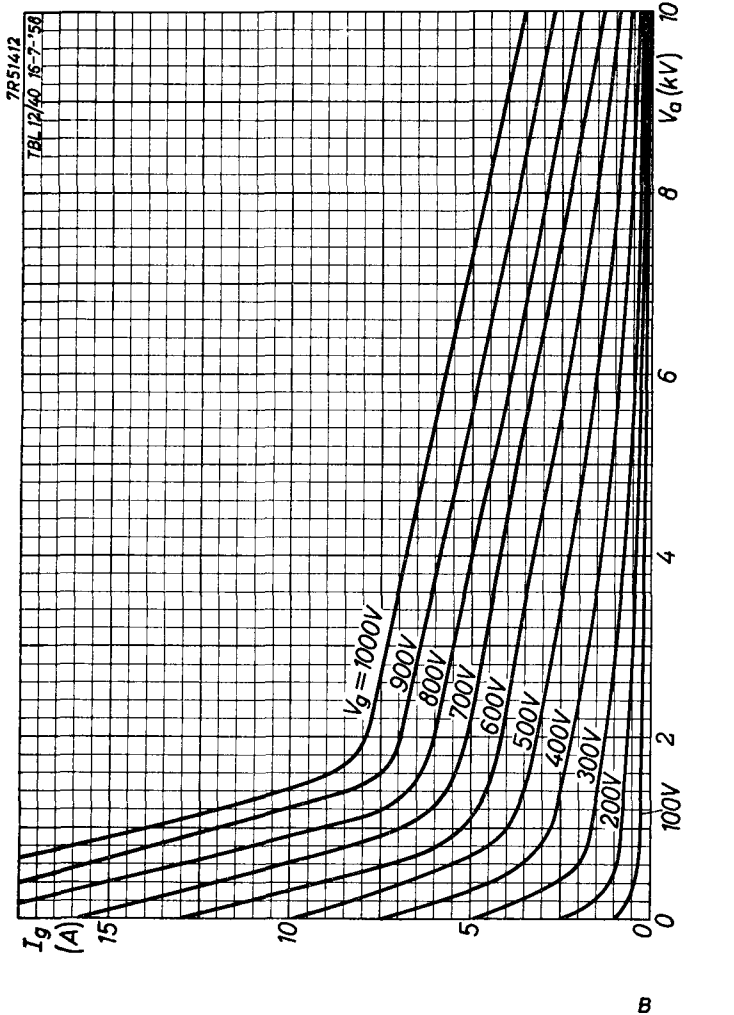
TBL 12/40

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A

TBL 12/40

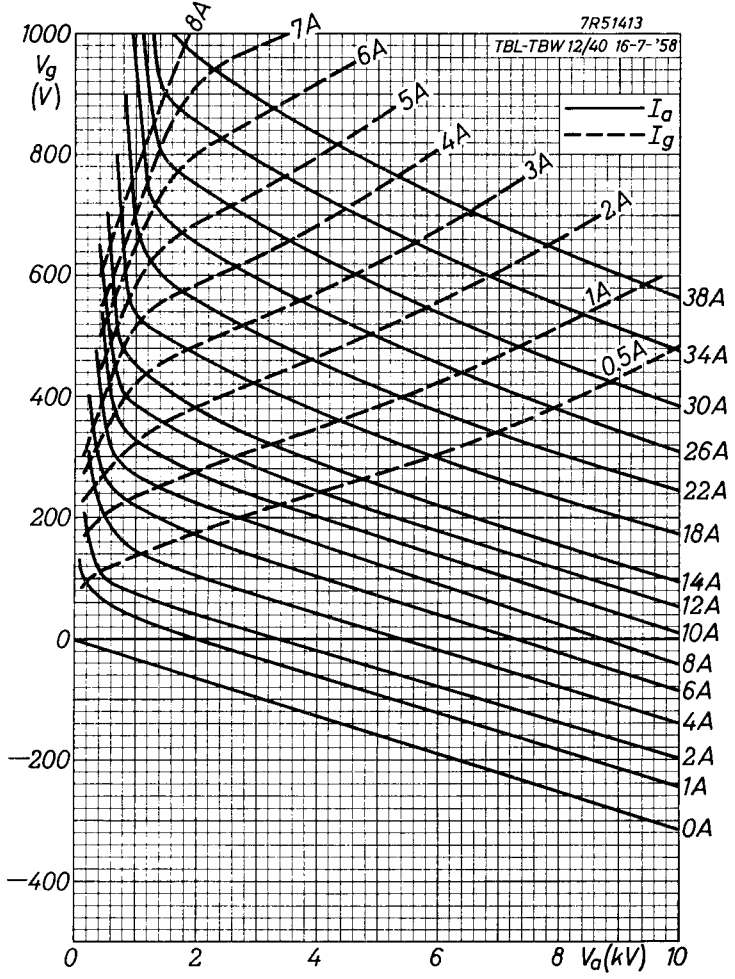
PHILIPS



B

PHILIPS

TBL 12/ 40



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C

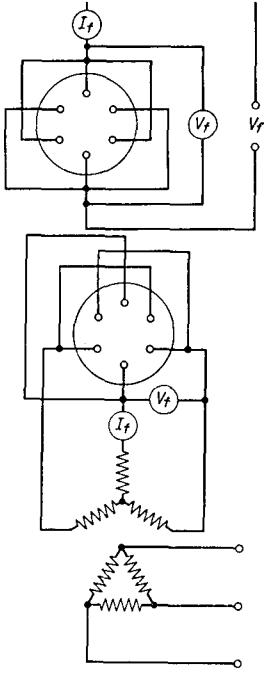


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1	1	1958.07.07
2	1	1960.05.05
3	2	1958.07.07
4	2	1960.05.05
5	3	1958.06.06
6	4	1958.06.06
7	5	1958.09.09
8	6	1958.09.09
9	A	1958.07.07
10	B	1958.07.07
11	C	1958.07.07
12	FP	2000.01.24

TRIODE for use as H.F. or L.F. amplifier or oscillator
TRIODE pour l'utilisation comme amplificatrice H.F. ou B.F. ou comme oscillatrice
TRIODE zur Verwendung als HF- oder NF-Verstärker oder als Oszillator

This type is equivalent to type TBL 12/100 except for the filament data
Ce type est équivalent au type TBL 12/100 à l'exception des données du filament
Dieser Typ ist dem Typ TBL 12/100 gleichwertig mit Ausnahme der Glühfadendaten



Single-phase filament energizing
Alimentation de filament monophasée
Einphasige Glühfadenspeisung

V_f = 17,5 V

I_f = 196 A

Filament current must never exceed a peak value of 420 A at any time during initial energizing schedule

Le courant d'enclenchement ne doit jamais dépasser une valeur de crête de 420 A

Der Anlaufstrom darf niemals einen Scheitelwert von 420 A überschreiten

Three-phase filament energizing
Alimentation de filament triphasée
Dreiphasige Glühfadenspeisung

V_f = 15,5 V

I_f = 131 A

Heater current must never exceed a peak value of 280 A at any time during initial energizing schedule

Le courant d'enclenchement ne doit jamais dépasser une valeur de crête de 280 A

Der Anlaufstrom darf niemals einen Scheitelwert von 280 A überschreiten

A safety device must be used to prevent filament energizing with one phase interrupted
Un dispositif de sécurité doit être utilisé pour prévenir que le filament soit alimenté à une phase interrompue
Es muss eine Schutzvorrichtung verwendet werden zur Verhütung von Glühfadenspeisung wenn eine der Phasen unterbrochen ist

PHILIPS

Electronic Tube

HANDBOOK

TBL15/125

page	sheet	date
1	1	1958.03.03
2	FP	2000.02.05

RF POWER TRIODE

QUICK REFERENCE DATA				
Frequency (MHz)	C telegr.		C an.mod.	
	V_a (V)	W_o (W)	V_a (V)	W_o (W)
175	2500	475	2000	505
300	2000	460	1600	370
470	1750	405	1400	275
600	1600	350	1280	225
900	1300	155	1040	107

Industrial oscillator class C				
Frequency (MHz)	AC operation		Single-phase full-wave with filter	
	V_{tr} (V)	W_o (W)	V_a (V)	W_o (W)
470	1750	235	1750	385

HEATING: direct; filament thoriated tungsten

Frequency	f < 600	600 to 750	750 to 900	MHz
Filament voltage	V_f = 3.4	3.3	3.2	V
Filament current	I_f = 19	–	–	A

CAPACITANCES

Anode to all except grid	C_a	< 0.12	pF
Grid to all except anode	C_g	= 9	pF
Anode to grid	C_{ag}	= 4	pF

TYPICAL CHARACTERISTICS

Anode voltage	V_a	= 2000	V
Anode current	I_a	= 150	mA
Amplification factor	μ	= 32	
Mutual conductance	S	= 10	mA/V

Table 1 *Air cooling characteristics*

W_a (W)	h (m)	t_i (^oC)	q_{min} (m^3/min)	ΔP Pa*
< 300	0	45	0.45	240
	1500	35	0.46	225
	3000	25	0.49	215

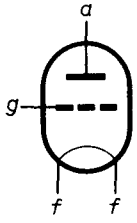
Temperature of envelope = max. 200 ^oC

Generally it will be necessary to direct an air flow to the centre filament seal.

MECHANICAL DATA

Net weight: 143 g

Dimensions in mm



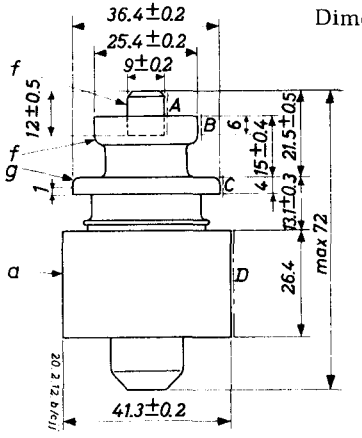


Fig. 1 Mechanical outline.

Eccentricity of the electrode connections: The electrode connections A, B and C are within cylindrical surfaces having a diameter of 9.5, 25.9 and 36.9 mm respectively and being coaxial with the cylindrical surface D.

Mounting position: vertical with anode up or down

* 1 Pa ≈ 0,1 mm H_2O.

RF CLASS C OSCILLATOR FOR INDUSTRIAL USE with self-rectification

LIMITING VALUES (Absolute limits)

Frequency	f		up to 470	MHz
Transformer voltage	V_{tr}	= max.	1800	V(RMS)
Anode current	I_a	= max.	210	mA
Anode input power	W_{i_a}	= max.	400	W
Anode dissipation	W_a	= max.	170	W
Negative grid voltage	$-V_g$	= max.	500	V
Grid current, loaded	I_g	= max.	85	mA
Grid current, unloaded	I_g	= max.	120	mA
Grid circuit resistance	R_g	= max.	5	kΩ

OPERATING CONDITIONS

Frequency	f	=	470	MHz
Transformer voltage	V_{tr}	=	1750	V(RMS)
Anode current, loaded	I_a	=	185	mA
Anode current, unloaded	I_a	=	105	mA
Grid current, loaded	I_g	=	75	mA
Grid current, unloaded [1]	I_g	=	80	mA
Grid circuit resistance under matched conditions	R_g	=	400	Ω
Anode input power	W_{i_a}	=	365	W
Anode dissipation	W_a	=	130	W
Tube output power	W_o	=	235	W
Tube efficiency	η	=	64	%
Output power in the load [2]	W_ℓ	=	165	W

[1] The grid resistance is obtained by a current stabilising device

[2] Measured by a calorimetric method

RF CLASS C OSCILLATOR FOR INDUSTRIAL USE with anode voltage from a single-phase full-wave rectifier with filter.

LIMITING VALUES (Absolute limits)

Frequency	f		up to 470	MHz
Anode voltage	V_a	= max.	1800	V
Anode current	I_a	= max.	400	mA
Anode input power	W_{i_a}	= max.	700	W
Anode dissipation	W_a	= max.	300	W
Negative grid voltage	$-V_g$	= max.	300	V
Grid current, loaded	I_g	= max.	110	mA
Grid current, unloaded	I_g	= max.	120	mA
Grid circuit resistance	R_g	= max.	5	kΩ

OPERATING CONDITIONS

Frequency	f	=	470	MHz
Anode voltage	V_a	=	1750	V
Anode current, loaded	I_a	=	340	mA
Anode current, unloaded	I_a	=	170	mA
Grid current, loaded	I_g	=	95	mA
Grid current, unloaded [1])	I_g	=	100	mA
Grid circuit resistance under matched conditions	R_g	=	1000	Ω
Anode input power	W_{i_a}	=	595	W
Anode dissipation	W_a	=	210	W
Tube output power	W_o	=	385	W
Tube efficiency	η	=	65	%
Output power in the load	W_ℓ	=	270	W

[1]) The grid resistance is obtained by a current stabilising device.

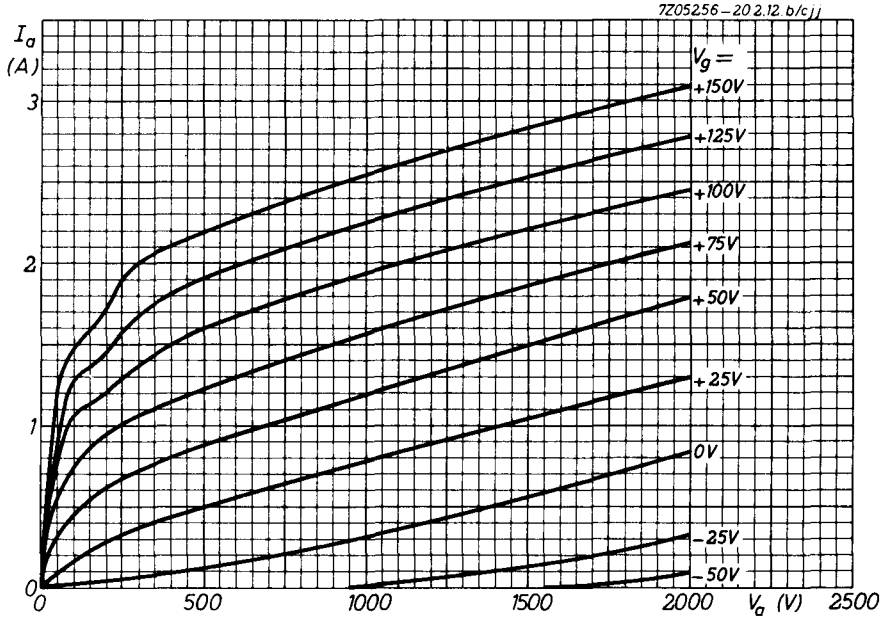


Fig. 2 I_a/V_a characteristics.

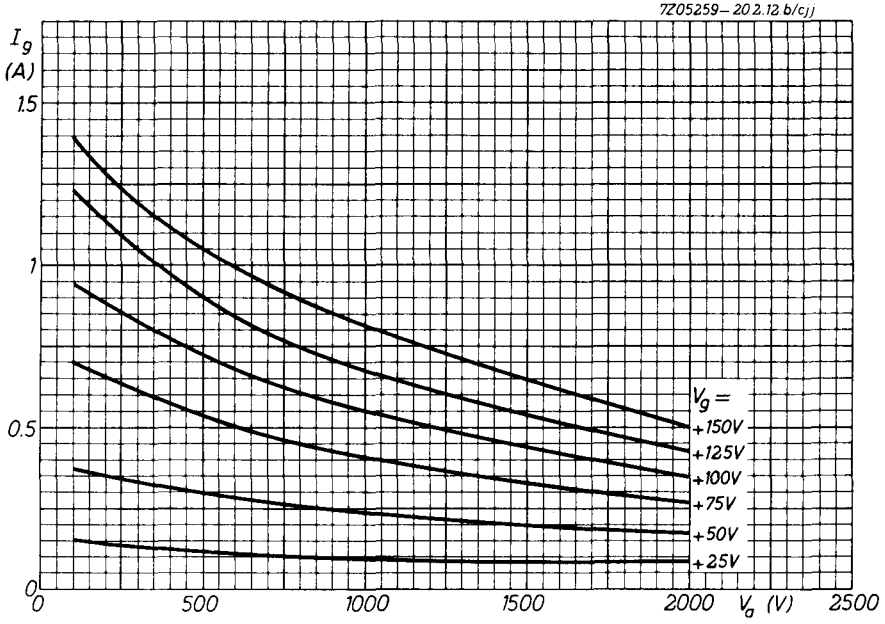


Fig. 3 I_g/V_a characteristics.

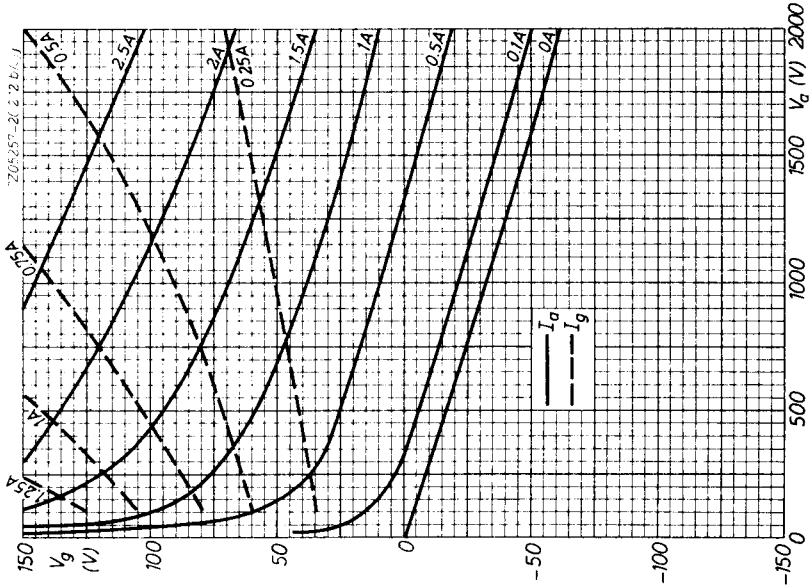


Fig. 5 Constant current characteristics.

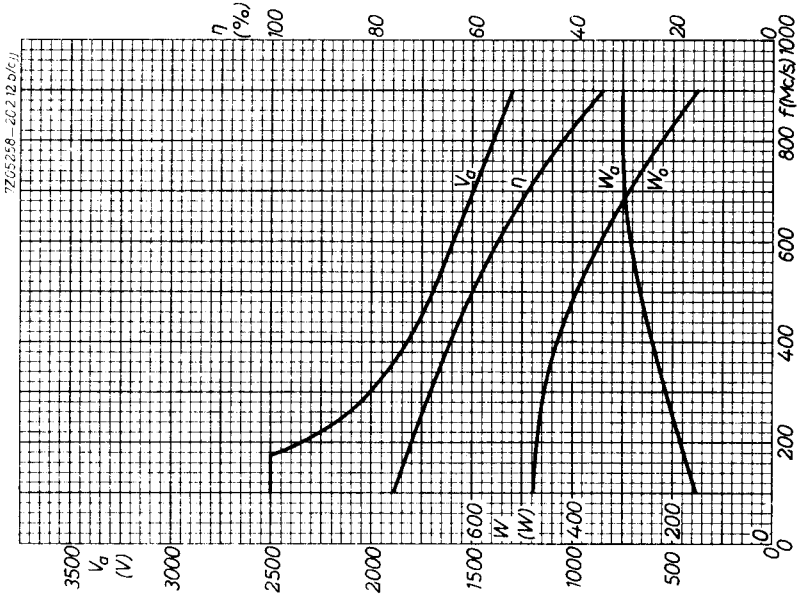


Fig. 4 Frequency dependant characteristics.

PHILIPS

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Electronic components and materials

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page	sheet	date
1	93	1988.02
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RF POWER TRIODE

QUICK REFERENCE DATA						
Frequency (MHz)	C telegr. grounded grid		Industrial oscillator class C			
			DC operation		AC operation	
	V_a (V)	Wo (W)	V_a (V)	W_o (W)	V_{tr} (V)	W_o (W)
470	2000	595	2000	480	1800	230
640	1800	490				
730	1800	460				
810	1800	408	1800	284		

HEATING: direct; filament thoriated tungsten

Frequency	f	< 600	600 to 750	750 to 900	MHz
Filament voltage	V_f	= 3.4	3.3	3.2	V
Filament current	I_f	= 19	–	–	A

CAPACITANCES

Anode to all except grid	C_a	<	0.12	pF
Grid to all except anode	C_g	=	11.5	pF
Anode to grid	C_{ag}	=	6.5	pF

TYPICAL CHARACTERISTICS

Anode voltage	V_a	=	2000	V
Anode current	I_a	=	200	mA
Amplification factor	μ	=	33	
Mutual conductance	S	=	10	mA/V

TEMPERATURE LIMITS (Absolute limits)

Temperature of seal between filament terminals = max. 200 °C

Temperature of other seals = max. 250 °C

Table 1 Cooling characteristics

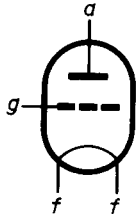
W_a (W)	h (m)	t_i (°C)	qmin (m^3/min)	ΔP (Pa)*
400	0	45	0.65	12
	1500	35	0.65	12
	3000	25	0.65	12

The required quantity of air is independent of the anode dissipation and the frequency.

MECHANICAL DATA

Dimensions in mm

Net weight: 157 g



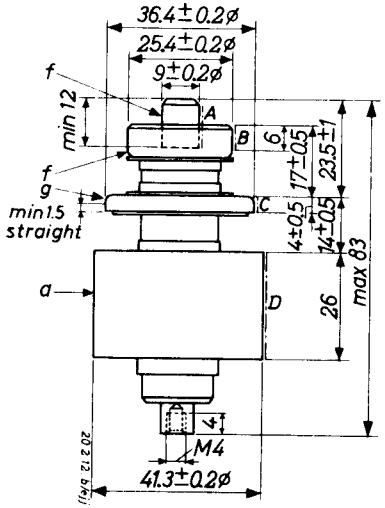


Fig. 1 Mechanical outline.

Eccentricity of the electrode connections: The electrode connections A, B and C are within cylindrical surfaces having a diameter of 9.5, 25.9 and 36.9 mm respectively and being concentric with the cylindrical surface D.

Mounting position: vertical with the anode up or down.

* 1 Pa ≈ 0,1 mm H_2O.

RF CLASS C OSCILLATOR FOR INDUSTRIAL USE

LIMITING VALUES (Absolute limits)

Frequency	f		up to	470	900	MHz
Anode voltage	V_a	=	max.	2200	2000	V
Anode current	I_a	=	max.	400	400	mA
Anode input power	W_{i_a}	=	max.	880	800	W
Anode dissipation	W_a	=	max.	400	400	W
Negative grid voltage	$-V_g$	=	max.	300	300	V
Grid current, loaded	I_g	=	max.	120	120	mA
Grid current, unloaded	I_g	=	max.	130	130	mA
Grid circuit resistance	R_g	=	max.	10	10	kΩ

OPERATING CONDITIONS

Frequency	f	=	470	810	MHz
Anode voltage	V_a	=	2000	1800	V
Anode current, loaded	I_a	=	380	380	mA
Anode current, unloaded	I_a	=	170	–	mA
Grid circuit resistance	R_g	=	1000	1000	Ω [1]
Grid current, loaded	I_g	=	110	110	mA
Grid current, unloaded	I_g	=	120	120	mA
Anode input power	W_{i_a}	=	760	684	W
Anode dissipation	W_a	=	280	400	W
Tube output power	W_o	=	480	284	W
Tube efficiency	η	=	63	41	%
Output power in the load	W_ℓ	=	340	200	W

[1]) The grid circuit resistance is obtained by a current stabilising device. The stated value applies to loaded conditions.

RF CLASS C OSCILLATOR FOR INDUSTRIAL USE in grounded grid circuit with self rectification

LIMITING VALUES (Absolute limits)

Voltages with respect to cathode

Frequency	f	up to	470	MHz
Transformer voltage	V_{tr}	= max.	2000	V(RMS)
Anode current	I_a	= max.	210	mA
Anode input power	W_{i_a}	= max.	450	W
Anode dissipation	W_a	= max.	170	W
Negative grid voltage	$-V_g$	= max.	300	V
Grid current, loaded	I_g	= max.	85	mA
Grid current, unloaded	I_g	= max.	120	mA
Grid circuit resistance	R_g	= max.	5	kΩ

OPERATING CHARACTERISTICS

Voltages with respect to cathode

Frequency	f	=	470	MHz
Transformer voltage	V_{tr}	=	1800	V(RMS)
Anode current, loaded	I_a	=	190	mA
Anode current, unloaded	I_a	=	110	mA
Grid current, loaded	I_g	=	70	mA
Grid current, unloaded	I_g	=	100	mA
Grid circuit resistance	R_g	=	400	Ω
Anode input power	W_{i_a}	=	380	W
Anode dissipation	W_a	=	150	W
Tube output power	W_o	=	230	W
Tube efficiency	η	=	60	%
Output power in the load	W_ℓ	=	160	W

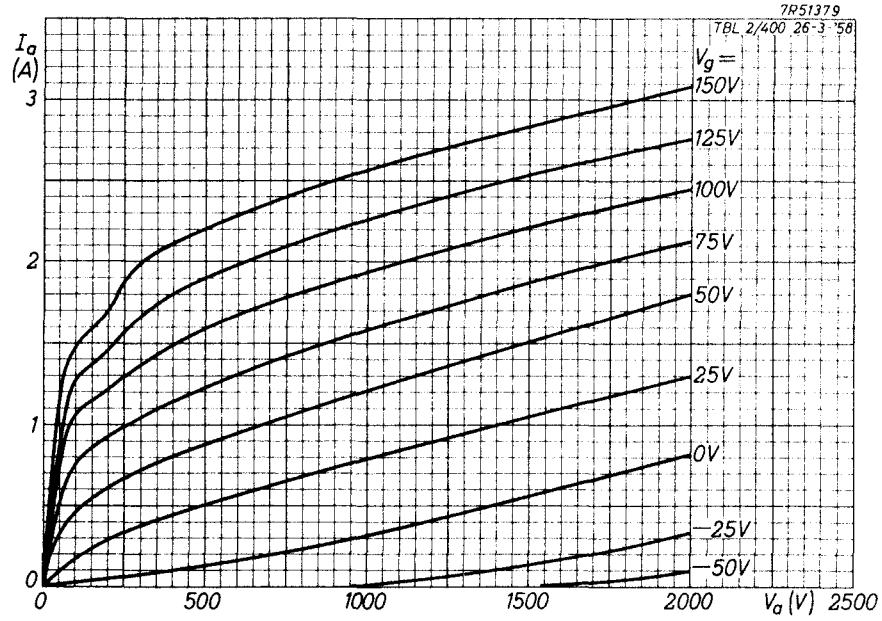


Fig. 2 I_a/V_a characteristics.

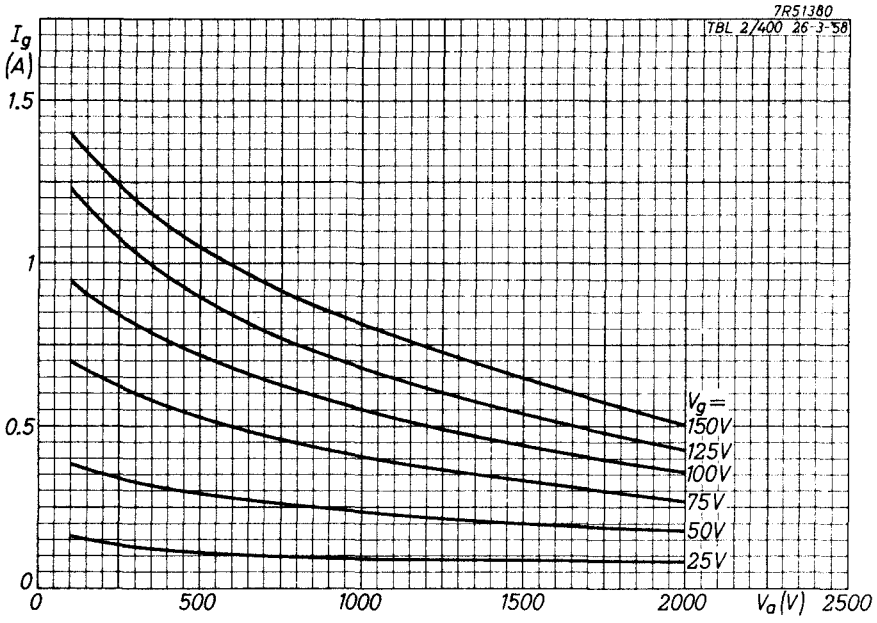


Fig. 3 I_g/V_a characteristics.

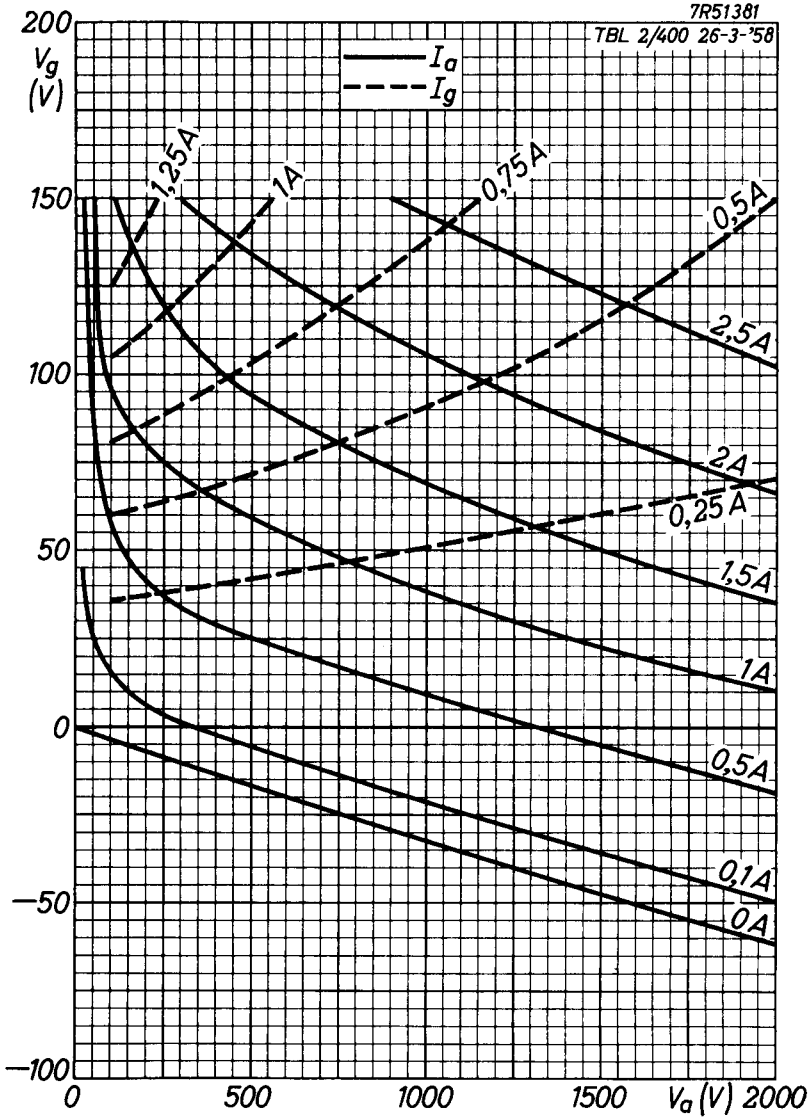


Fig. 4 Constant current characteristics.

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Data handbook

Electronic components and materials

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6	104	1988.02
7	FP	2000.09.16

FORCED AIR COOLED TRIODE WITH CERAMIC ENVELOPE and coaxial arrangement of the terminals for use as U.H.F. amplifier
TRIODE A REFROIDISSEMENT PAR VENTILATION FORCÉE AVEC ENVELOPPE CERAMIQUE et arrangement coaxial des connexions des électrodes pour utilisation en amplificatrice U.H.F.
PRESSLUFTGEKÜHLTE TRIODE MIT KERAMISCHER UMHÜLLUNG und koaxialer Anordnung der Elektrodenanschlüsse zur Verwendung als UHF-Verstärker

Filament : thoriated tungsten
Filament : tungstène thorié
Glühfaden: thoriertes Wolfram

Heating : direct	f	< 600	600-750	> 750 Mc/s
Chauffage: direct	V_f =	3,4	3,3	3,2 V
Heizung : direkt	I_f =	19		A

Capacitances Capacités Kapazitäten	C_a =	0,05 pF
	C_g =	11 pF
	C_{ag} =	3,8 pF
Typical characteristics Caractéristiques types Kenndaten	V_a =	2400 V
	I_a =	240 mA
	μ =	70
	S =	14 mA/V

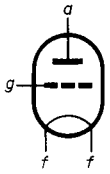
Temperatures and cooling
Températures et refroidissement
Temperaturen und Kühlung

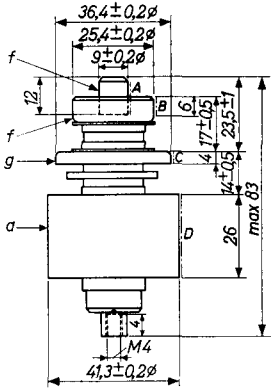
Temperature of envelope
Température de l'enveloppe = max. 200 °C
Temperatur der Umhüllung

W_a (W)	h (m)	ti max. (°C)	q min. (m^3/min.)	pi (mm H_2O)
500	0	45	0,9	24
	1500	35	0,9	20
	3000	25	1,0	21

PHILIPS

Dimensions in mm
Dimensions en mm
Abmessungen in mm





Mounting position: vertical, with the anode up or down
Montage : vertical, avec l'anode en haut ou en bas
Einbau : senkrecht, mit der Anode oben oder unten

Eccentricity of the electrode connections: The electrode connections A, B and C are within cylindrical surfaces having a diameter of 9.5, 25.9 and 36.9 mm respectively and being concentric with the cylindrical surface D
Excentricité des connexions des électrodes: Les connexions des électrodes A, B et C sont situées au-dedans de surfaces cylindriques d'un diamètre de 9,5; 25,9 et 36,9 mm successivement et concentriques avec la surface cylindrique D
Exzentrizität der Elektrodenanschlüsse: Die Elektrodenanschlüsse A, B und C befinden sich innerhalb zylindrischer Flächen mit Durchmesser von beziehungsweise 9,5; 25,9 und 36,9 mm und konzentrisch mit der Zylinderfläche D

Net weight		Shipping weight	
Poids net	157 g	Poids brut	250 g
Nettogewicht		Bruttogewicht	

H.F. class C telegraphy or F.M. telephony
H.F. classe C télégraphie ou F.M. téléphonie
HF-KLASSE C Telegraphie oder FM-Telephonie

Limiting values (Absolute limits)
Caractéristiques limites (Limites absolues)
Grenzdaten (Absolute Grenzwerte)

f = max.	400	625	940	Mc/s
V_a = max.	2700	2500	2000	V
W_{ia} = max.	1000	880	800	W
W_a = max.	500	500	500	W
I_a = max.	400	400	400	mA
$-V_g$ = max.	300	300	300	V
I_g = max.	175	175	160	mA

Operating conditions (grounded grid)
Caractéristiques d'utilisation (grille mise à la terre)
Betriebsdaten (Gitterbasisschaltung)

f =	400	625	Mc/s
V_a =	2500	2200	V
$-V_g$ =	70	60	V
I_a =	380	380	mA
I_g =	160	170	mA
W_{ia} =	950	835	W
W_{ig} =	70	65	W
W_a =	330	302	W
W_o =	620+50	533+47	W [1]
η =	65	64	% [2]
W_l =	470	405	W [3]
W_o/W_i =	9,6	8,9	

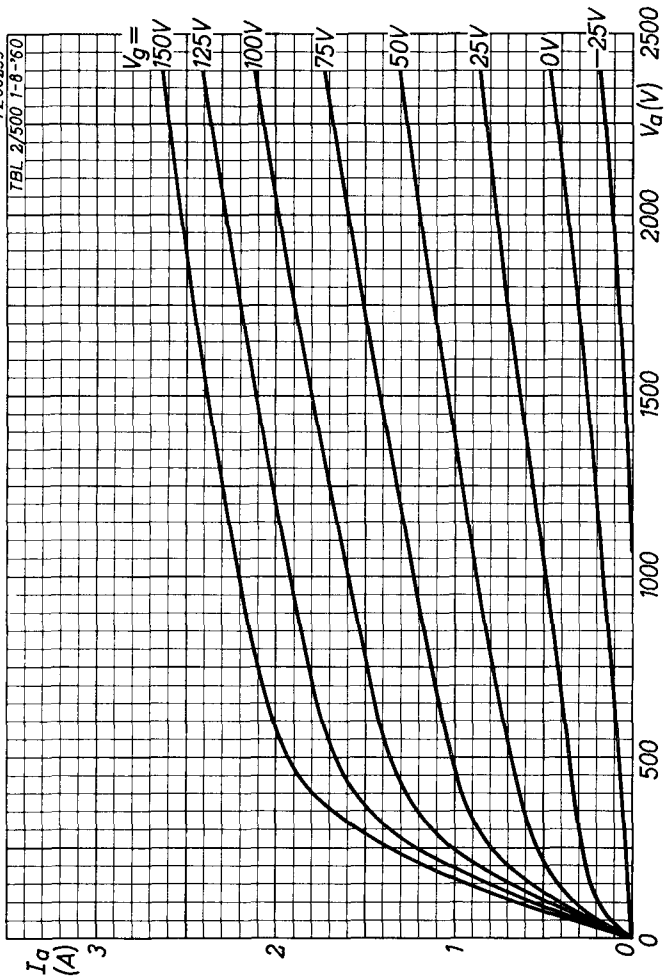
[1]) Power transferred from driving stage included
Y compris la puissance transmise de l'étage préamplificateur
Einschliesslich der vom Vorverstärker übertragenen Leistung

[2]) Pure tube efficiency
Rendement net du tube
Reiner Röhrenwirkungsgrad

[3]) Useful power in the load measured in a circuit having an efficiency of 70 %
Puissance utile dans la charge, mesurée dans un circuit avec un rendement de 70 %
Nutzleistung in der Belastung, gemessen in einer Schaltung mit einem Wirkungsgrad von 70 %

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TBL 2/500



9.9.1960

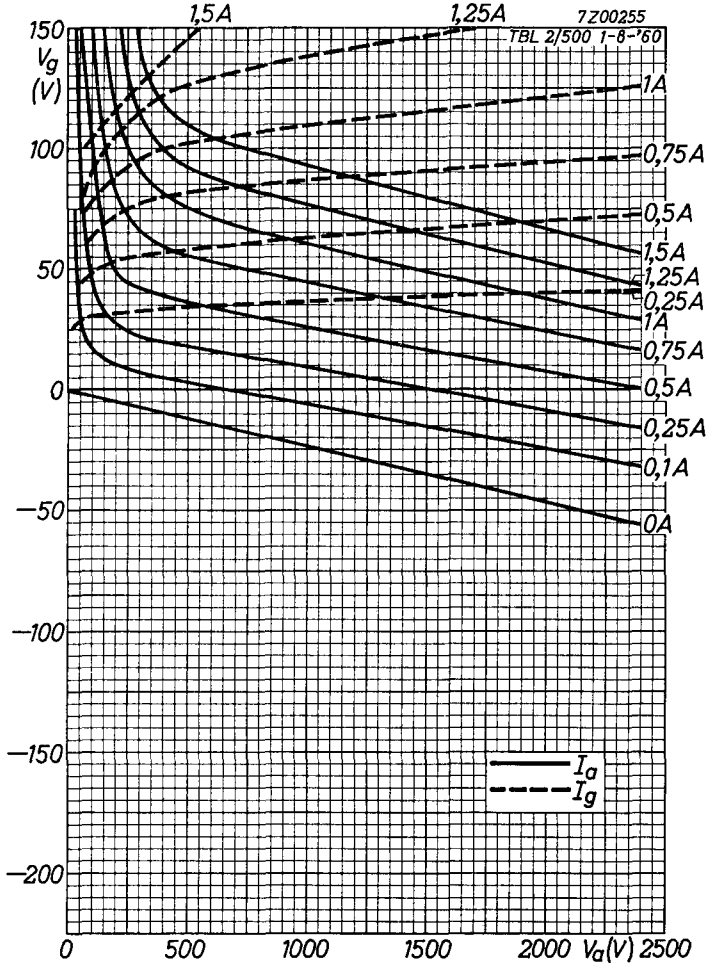
A

TBL 2/500

PHILIPS

PHILIPS

TBL 2/500



9.9.1960

C

PHILIPS

Electronic Tube

HANDBOOK

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1	1	1959.10.10
2	2	1959.10.10
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4	A	1960.09.09
5	B	1960.09.09
6	C	1960.09.09
7	FP	2000.02.05

RF POWER TRIODE

- Air cooled

QUICK REFERENCE DATA

Industrial RF oscillator, class-C

freq.	three phase	
	V_a	W_o
MHz	kV	kW
30	7	17,7
	6	14,3

HEATING: direct; thoriated tungsten filament

Filament voltage	V_f	=	6,3 V
Filament current	I_f	=	136 A
Cold filament resistance	R_{fo}	=	0,005 Ω

The filament is designed to accept temporary fluctuations of +5% and −10%

The filament current must never exceed a peak value of 280 A at any time during the initial energizing schedule.

CAPACITANCES

Anode to all other elements except grid	C_a	=	1,2 pF
Grid to all other elements except anode	C_g	=	44,5 pF
Anode to grid	C_{ag}	=	33,5 pF

TYPICAL CHARACTERISTICS

Anode voltage	V_a	=	6 kV
Anode current	I_a	=	2,5 A
Mutual conductance	S	=	23 mA/V
Amplification factor	μ	=	17,5

TEMPERATURE LIMIT (Absolute limit)

Temperature of all seals		max.	220 °C

Table 1 Cooling

anode dissipation W_a kW	altitude h m	inlet temperature T_i °C	rate of flow q_{min} m^3/min	pressure drop ΔP Pa*	outlet-temperature T_o max °C
10	0	35	11	500	90
7,5	0	35	8,0	270	90
5	0	35	5,2	120	95
10	0	45	12,3	630	95
7,5	0	45	9,0	340	95
5	0	45	5,9	150	100
10	1500	35	13	590	90
7,5	1500	35	9,5	320	90
5	1500	35	6,2	140	95
10	3000	25	14	640	85
7,5	3000	25	10,2	340	85
5	3000	25	6,6	150	90

ACCESSORIES

Filament connectors with cable	40662
Grid connector	40664
Insulating pedestal	K508
or air distributor	K509

The rounded side of the grid connector should face the anode. To ensure a uniform R.F. current distribution in the grid seal at frequencies higher than 4 MHz, the grid lead should be connected as shown below.

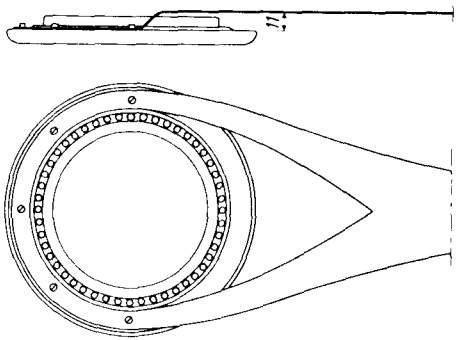
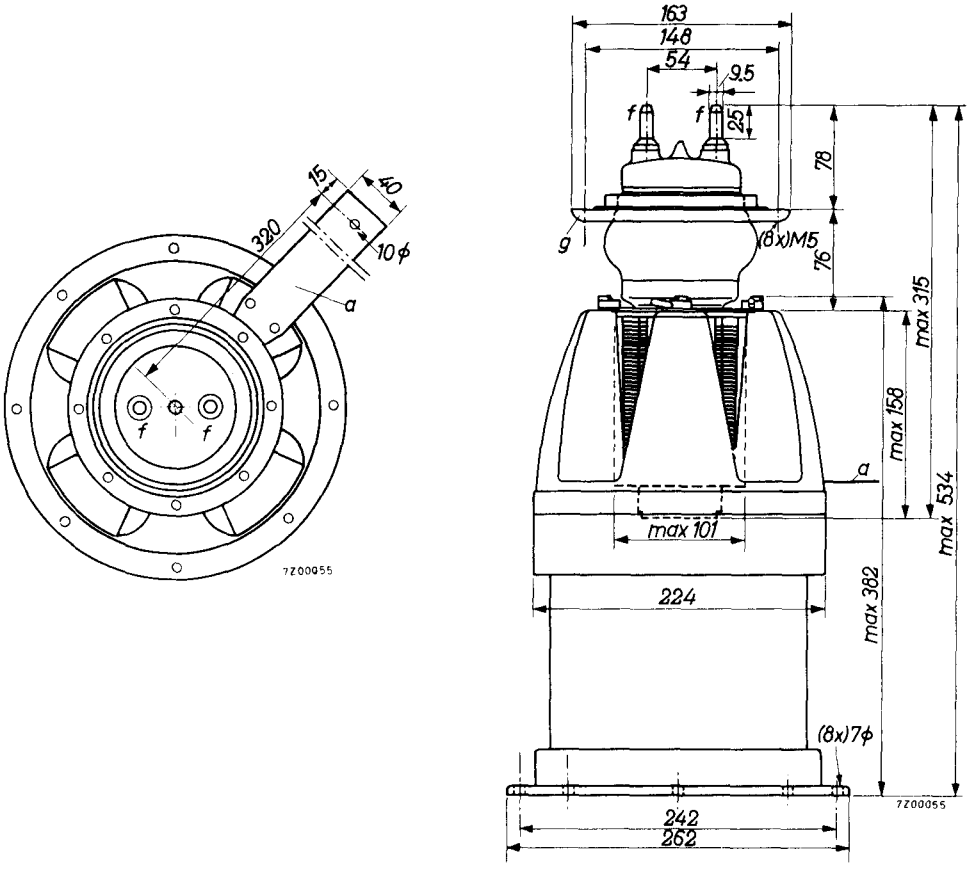


Fig. 1 Connection of the grid lead.

* 1 Pa ≈ 0,1 mm H_2O.

MECHANICAL DATA

Dimensions in mm



Mounting position : vertical with anode down
Net mass of tube : 3,8 kg
Net mass of pedestal : 7,4 kg

Fig. 2 Mechanical outline.

RF CLASS-C OSCILLATOR FOR INDUSTRIAL USE with anode voltage from three-phase rectifier without filter

LIMITING VALUES (Absolute maximum rating system)

Frequency	f	up to	30	MHz
Anode voltage	V_a	max.	8	kV
Anode input power	W_{ia}	max.	30	kW
Anode dissipation (See page 106)	W_a	max.	10*	kW
Anode current	I_a	max.	4,0	A
Negative grid voltage	$-V_g$	max.	1600	V
Grid current, on load	I_g	max.	1,5	A
Grid current, off load	I_g	max.	2,0	A
Grid circuit resistance	R_g	max.	10	kΩ

OPERATING CONDITIONS

Frequency	f	30	30	MHz
Anode voltage	V_a	7	6	kV
Anode current, on load	I_a	3,5	3,3	A
Anode current, off load	I_a	0,7	0,51	A
Grid current, on load	I_g	0,95	0,8	A
Grid current, off load	I_g	1,35	1,1	A
Grid resistor	R_g	950	1000	Ω
Load resistance	$R_{a\sim}$	1000	870	Ω
Feedback ratio under loaded conditions	$V_{g\sim}/V_{a\sim}$	25	26	%
Anode input power	W_{ia}	24,5	19,8	kW
Anode dissipation	W_a	6,8	5,5	kW
Output power	W_o	17,7	14,3	kW
Efficiency	η	72	72	%
Output power in the load **	W_ℓ	14	11	kW

* TBW6/14: $W_{a\ max}$ = 15 kW

** Useful power in the load, measured in a circuit having an efficiency of approx. 85%.

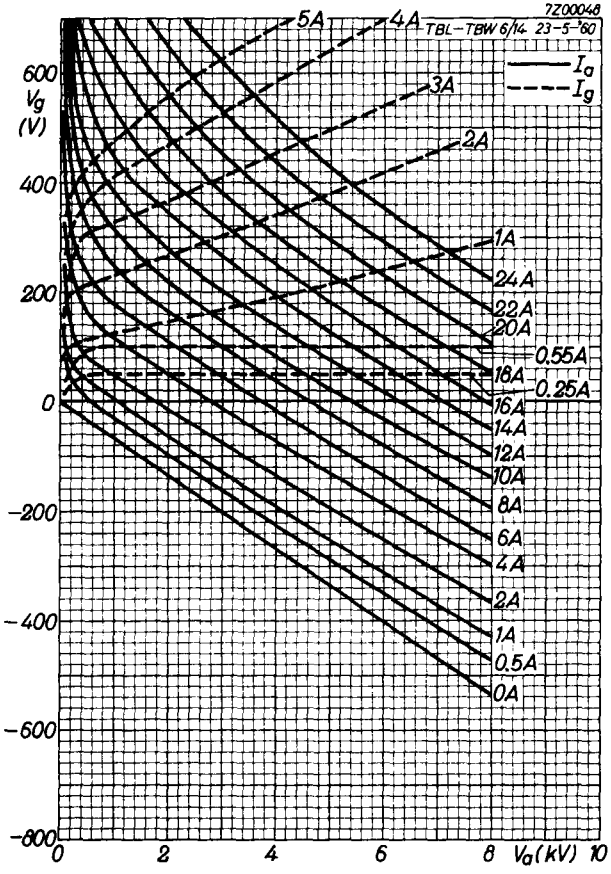
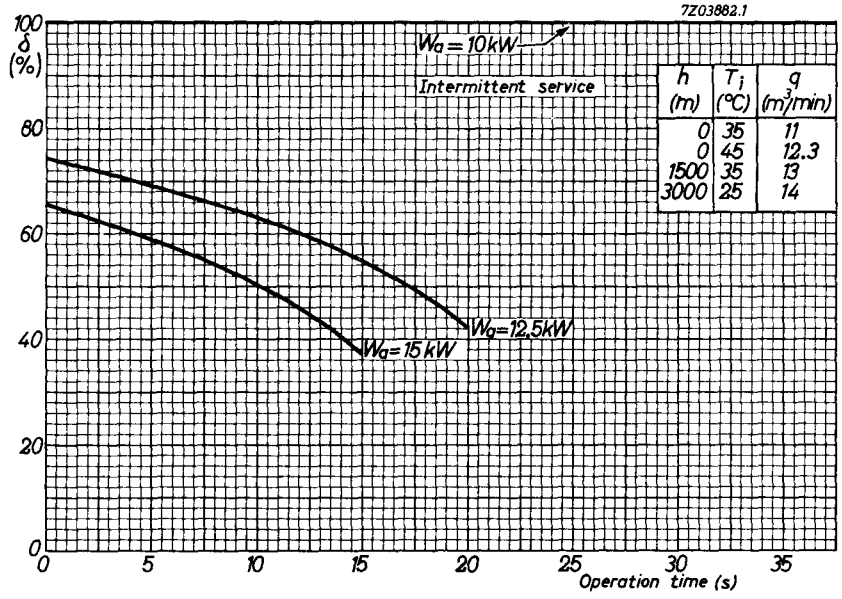
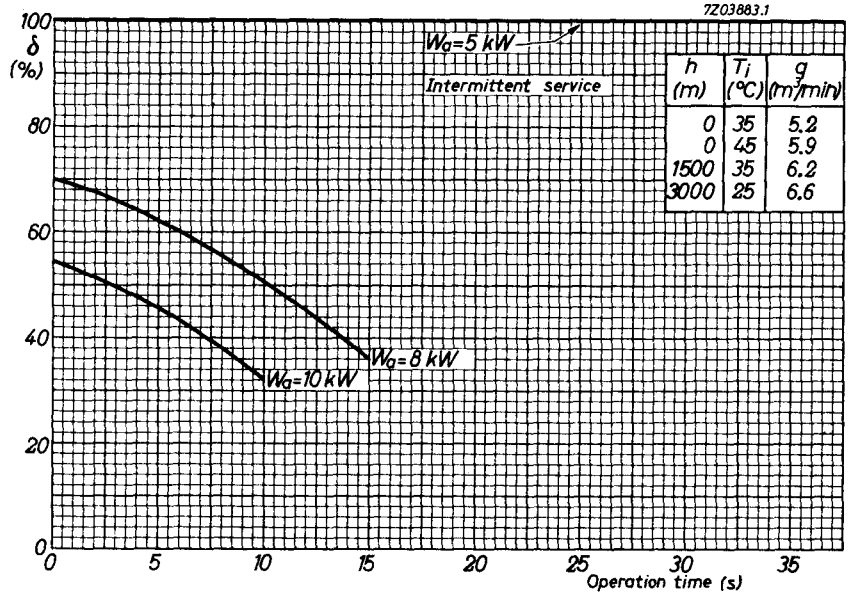


Fig. 3 Constant current characteristics.

Fig. 4 Intermittent service. Limits of anode dissipation and cooling.



(a) For cooling see 10 kW continuous service.



(b) For cooling see 5 kW continuous service.

PHILIPS

Data handbook

Electronic components and materials

TBL6/14

page	sheet	date
1	105	1988.02
2	106	1988.02
3	107	1988.02
4	108	1988.02
5	109	1988.02
6	110	1988.02
7	FP	2000.09.22

COAXIAL TRIODE for use in A.M., F.M. and television transmitters
TRIODE COAXIALE pour utilisation dans émetteurs A.M., F.M. et de télévision
KOAXIALE TRIODE zur Verwendung in AM-,FM- und Fernsehsendern

Cooling : forced air
Refroidissement: par ventilation forcée
Kühlung : Pressluftkühlung

Filament : thoriated tungsten
Filament : tungstène thorié
Heizfaden: thoriertes Wolfram

Heating : direct
Chauffage: direct
Heizung : direkt

V_f = 6,3 V
I_f = 154 A

The filament current must never exceed a peak value of 500 A at any time during the initial energizing schedule
Le courant d'enclenchement ne doit jamais dépasser une valeur de crête de 500 A
Der Anlauf-Heizstrom darf niemals einen Scheitelwert von 500 A überschreiten

Capacitances
Capacités
Kapazitäten

C_a = 0,6 pF [1])
C_g = 65 pF
C_{ag} = 29 pF

Typical characteristics
Caractéristiques types
Kenndaten

μ (I_a = 1 A, V_a = 4 kV) = 60
S (I_a = 1 A, V_a = 4 kV) = 60 mA/V

Air cooling characteristics (For recommended direction of air flow see page 2)
Caractéristiques de refroidissement par air (Pour la direction recommandée du courant d'air voir page 2)
Luftkühlungsdaten (Für die empfohlene Richtung des Luftstromes, siehe Seite 2)

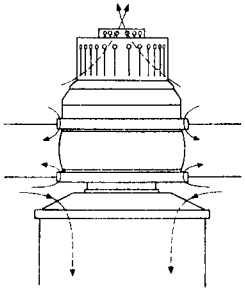
W_a (kW)	h (m)	$t_{i\,max}$ (°C)	q_{min} (m³/min)	p_i (mm H_2O)
5,5	0	35	5,0	16
	1500	35	5,9	16
	3000	25	5,7	16
8	0	35	7,7	35
	1500	35	9	40
	3000	25	9	36
10	0	35	11	65
	1500	35	13	75
	3000	25	13	66

See also the cooling curves (pages E, F)
Voir aussi les courbes de refroidissement (pages E, F)
Siehe auch die Kühlungskurven (Seite E, F)

[1])See page 4; voir page 4; siehe Seite 4

PHILIPS

Recommended direction of air flow
Direction recommandée du courant d'air
Empfohlene Richtung des Luftstromes



Temperature of seals
Température des scellements = max. 180 °C
Temperatur der Einschmelzungen

Generally it is necessary to direct an air flow on the grid, anode and filament seals. E.g. at 220 Mc/s an air flow of 0.6 m³/min on each of these seals is necessary

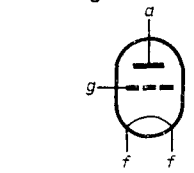
En général il faut diriger un courant d'air sur les scellements de l'anode, de la grille et du filament. Par exemple à 220 MHz un courant d'air de 0,6 m³/min sur chaque de ces scellements est nécessaire

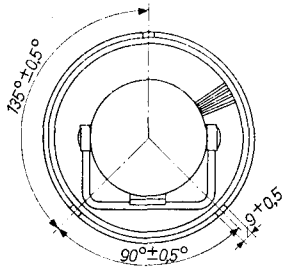
Im allgemeinen ist ein Luftstrom auf die Anoden-, Gitter- und Heizfadeneinschmelzungen erforderlich. Bei 220 MHz zum Beispiel ist ein Luftstrom von 0,6 m³/min auf jede dieser Einschmelzungen notwendig

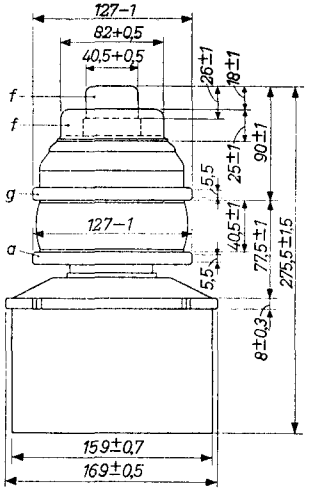
Accessories
Accessoires
Zubehör

Insulating pedestal Support isolant Isoliersockel	40654
Grid and anode connector Connecteur de l'anode et de la grille Gitter- und Anodenanschluss	40651
Inner filament connector Connecteur intérieur du filament Innerer Heizfadenanschluss	40652
Outer filament connector Connecteur extérieur du filament Äusserer Heizfadenanschluss	40653

Dimensions in mm
Dimensions en mm
Abmessungen in mm







Eccentricity of outer diameters of the electrode terminals and of the protruding edge of the radiator housing with respect to the radiator housing max. 1 mm

Excentricité des diamètres extérieurs des connexions des électrodes et du bord saillant du radiateur au regard du radiateur 1 mm au max.

Exzentrizität der äusseren Durchmesser der Elektrodenanschlüsse und des herausragenden Randes des Radiatorgehäusses in Bezug auf den Radiator max. 1 mm

Mounting position: vertical with anode up or down
Montage : vertical avec l'anode en haut ou en bas
Einbau : senkrecht mit der Anode oben oder unten

Net weight :
Poids net : 9,5 kg
Nettogewicht:

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H.F. class C telegraphy, grounded grid
H.F. classe C télégraphie, grille mise à la terre
HF-Klasse C Telegraphie, Gitterbasisschaltung

Limiting values
Caractéristiques limites
Grenzdaten

f	= max.	110	Mc/s
V_a	= max.	5,5	kV
$-V_g$	= max.	500	V
I_a	= max.	6	A
I_g	= max.	1,5	A
W_{ia}	= max.	30	kW
W_a	= max.	10	kW

Operating conditions
Caractéristiques d'utilisation
Betriebsdaten

f	=	110	Mc/s
V_a	=	5	kV
V_g	=	-300	V
I_a	=	4,8	A
I_g	=	1,2	A
V_{gp}	=	520	V
W_{ig}	=	2560	W
W_{ia}	=	24	kW
W_a	=	9	kW
W_o	=	15+2	kW [2]
η	=	62,5	% [3]

[1] Page 1; Seite 1
Anode fully screened from filament terminals by a flat metal screen connected to the grid terminal
L'anode blindée des connexions du filament par un blindage plan métallique connecté à l'anneau de connexion de la grille
Anode mittels einer mit dem Gitteranschlussring verbundenen flachen Metallplatte von den Heizfadenanschlüssen abgeschirmt

[2] Power transferred from driving stage included
Y compris l'énergie transmise de l'étage pré-amplificateur
Einschliesslich der vom Vorverstärker übertragenen Leistung

[3] Pure valve efficiency
Rendement net du tube
Reiner Röhrenwirkungsgrad

H.F. class B telephony for television service; linear, grounded-grid amplifier Negative modulation, positive synchronisation (CCIR and FCC system)

H.F. classe B téléphonie pour télévision; amplificateur linéaire, grille mise à la terre Modulation négative, synchronisation positive (Systèmes CCIR et FCC)

HF-Klasse B Telephonie für Fernsehsender; linearer Verstärker in Gitterbasisschaltung Negative Modulation, positive Synchronisierung (CCIR- und FCC-System)

Limiting values
Caractéristiques limites
Grenzdaten

f	= max.	88 Mc/s	f	= max.	220 Mc/s
V_a	= max.	5,5 kV	V_a	= max.	4,5 kV
W_{ia} sync	= max.	25 kW	W_{ia} sync	= max.	22 kW
W_a sync	= max.	10 kW	W_a sync	= max.	10 kW
I_a sync	= max.	6 A	I_a sync	= max.	6 A
I_g sync	= max.	1,2 A	I_g sync	= max.	1,2 A

Operating conditions (at centre frequency of the resonance curve)
Caractéristiques d'utilisation (à la fréquence centrale de la courbe de résonance)
Betriebsdaten (bei der mittleren Frequenz der Abstimmkurve)

f	=	48-88	170-220[1] Mc/s
B (-1,5 dB)	=	-	7 Mc/s
B (-3 dB)	=	6	12 Mc/s
V_a	=	5	4 kV
V_g	=	-90	-75 V
V_{gp} sync	=	270	255 V
V_{gp} black, noir, schwarz	=	200	180 V
I_a sync	=	4,8	4,8 A
I_a black, noir, schwarz	=	3,6	3,6 A
I_g sync	=	1,0	1,0 A
I_g black, noir, schwarz	=	0,35	0,35 A
W_{ig} sync	=	1,4	1,3 kW
W_o sync	=	17	12 kW
W_o black, noir, schwarz	=	9,6	6,75 kW

[1])See page D; voir page D; siehe Seite D

PHILIPS

H.F. class B telephony for television service; linear, grounded-grid amplifier Positive modulation, negative synchronisation (RTF and BBC system)

H.F. classe B téléphonie pour télévision; amplificateur linéaire, grille mise à la terre Modulation positive, synchronisation négative (Systèmes RTF et BBC)

HF-Klasse B Telephonie für Fernsehsender; linearer Verstärker in Gitterbasisschaltung Positive Modulation, negative Synchronisierung (RTF und BBC System)

Limiting values
Caractéristiques limites
Grenzdaten

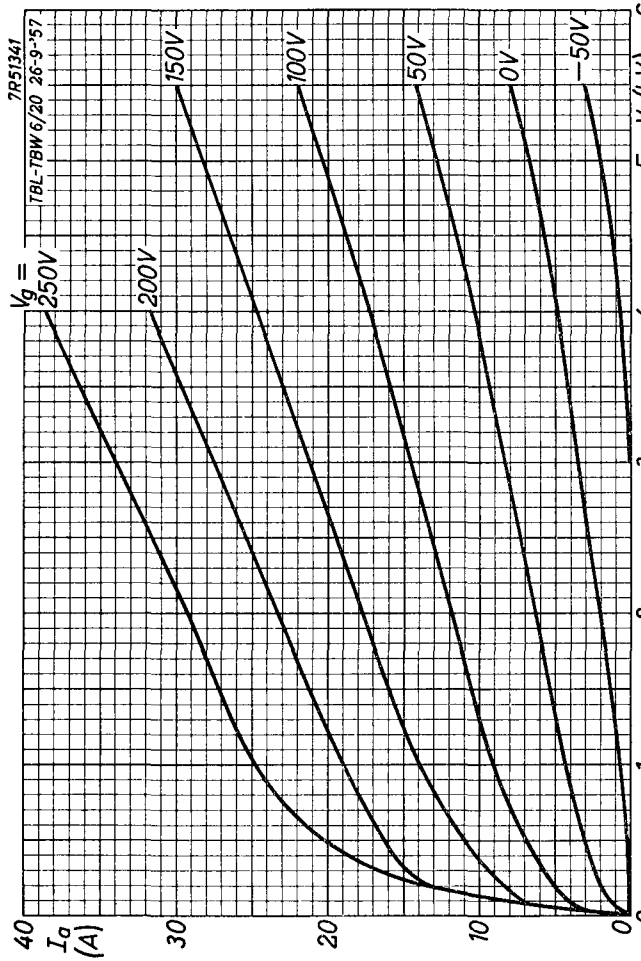
f		= max. 88 Mc/s		f		= max.220 Mc/s
V_a		= max. 5,5 kV		V_a		= max.4,5 kV
W_{ia}	white blanc weiss	= max. 25 kW		W_{ia}	white blanc weiss	= max. 22 kW
I_a		= max. 6 A		I_a		= max. 6 A
I_g		= max. 1,2 A		I_g		= max.1,2 A
W_a		= max. 10 kW		W_a		= max. 10 kW

Operating conditions (at centre frequency of the resonance curve)
Caractéristiques d'utilisation (à la fréquence centrale de la courbe de résonance)
Betriebsdaten (bei der mittleren Frequenz der Abstimmkurve)

f		=	48-88	170-220	Mc/s
B (-3 dB)		=	6	12	Mc/s
V_a		=	5	4	kV
V_g		=	-90	-75	V
V_{gp}	white, blanc, weiss	=	270	255	V
	black, noir, schwarz	=	110	95	V
I_a	white, blanc, weiss	=	4,8	4,8	A
	black, noir, schwarz	=	1,45	1,45	A
I_g	white, blanc. weiss	=	1	1	A
	black, noir, schwarz	=	0,2	0,2	A
W_{ig}	white, blanc, weiss	=	1,4	1,3	kW
W_o	white, blanc, weiss	=	17	12	kW
	black, noir, schwarz	=	1,7	1,2	kW

PHILIPS

TBL 6/20

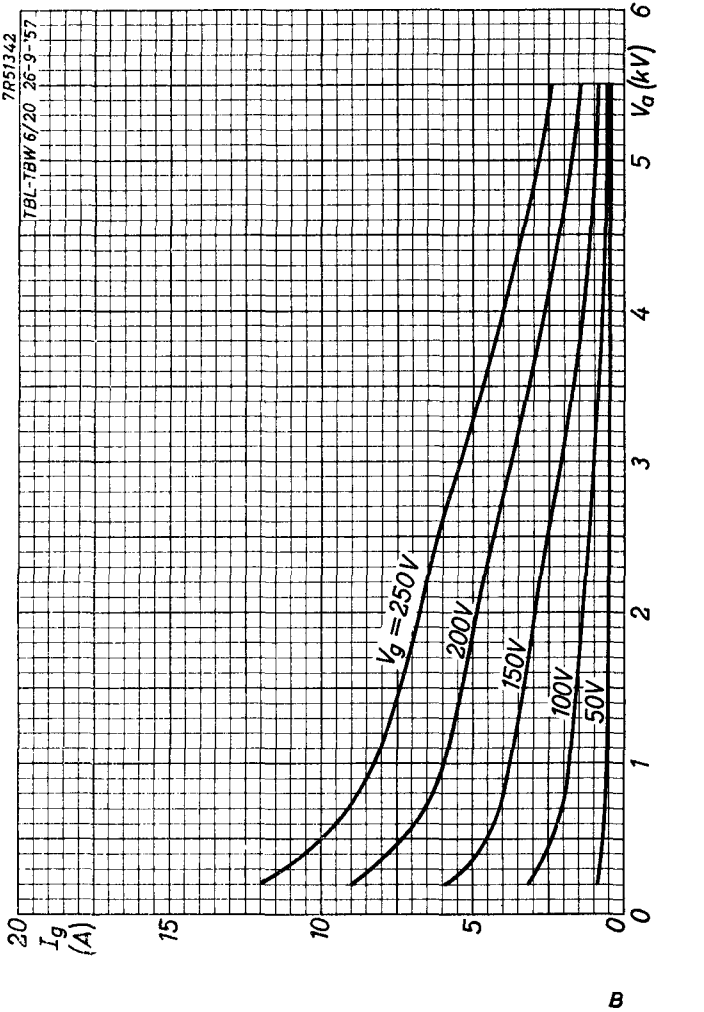


12.12.1957

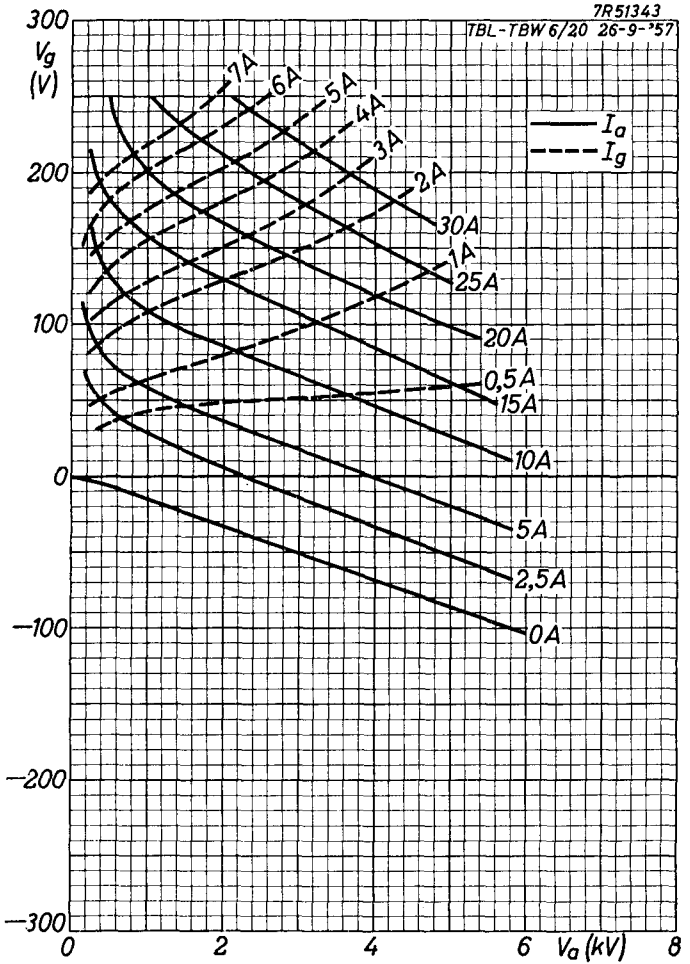
A

TBL 6/20

PHILIPS



B


7R51343
TBL-TBW 6/20 26-9-'57
300
V_g (V)
200
100
0
−100
−200
−300
0
2
4
6
8
V_a (kV)
I_a
I_g
7A
6A
5A
4A
3A
2A
1A
30A
25A
20A
15A
10A
5A
2,5A
0A
0,5A

PHILIPS

Grid-modulated H.F. class B amplifier for television service (2 valves in push-pull)
Amplificateur H.F. classe B modulé par la grille pour la télévision (2 tubes en montage push-pull)
H.F. klasse B Verstärker mit Gittermodulation für Fernsehbetrieb (2 Röhren in Gegentaktschaltung)

W_{0sync} = 24 kW

V_a = 4000 V
V_g = −75 V

Iant (%)
120
110
100
90
80
70
60
50
40
30
20
10
0

black, noir, schwarz

Iant

Ia (A) 10
8
6
4
2
0

Ig (A)
3
2
1
0

f (Mc/s)
228
226
224
222
220
218
216

Iant
Ia
Ig

V_{ggp} (V)
550
500
450
400
350
300
250
200
150
100
50
0

white, blanc, weiss

7R51365

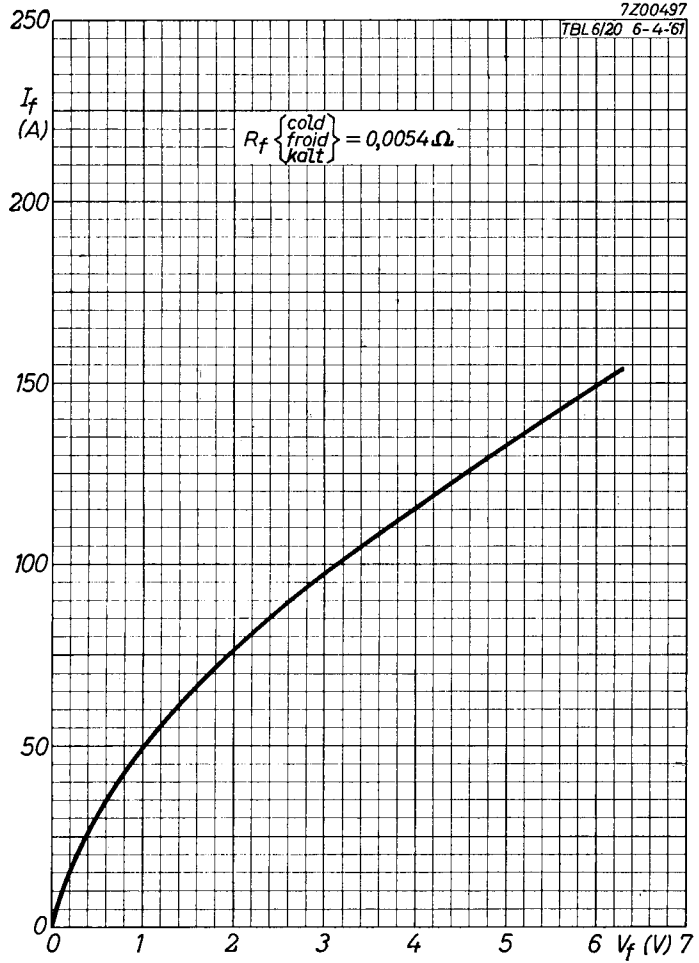
D

PHILIPS

TBL 6/20

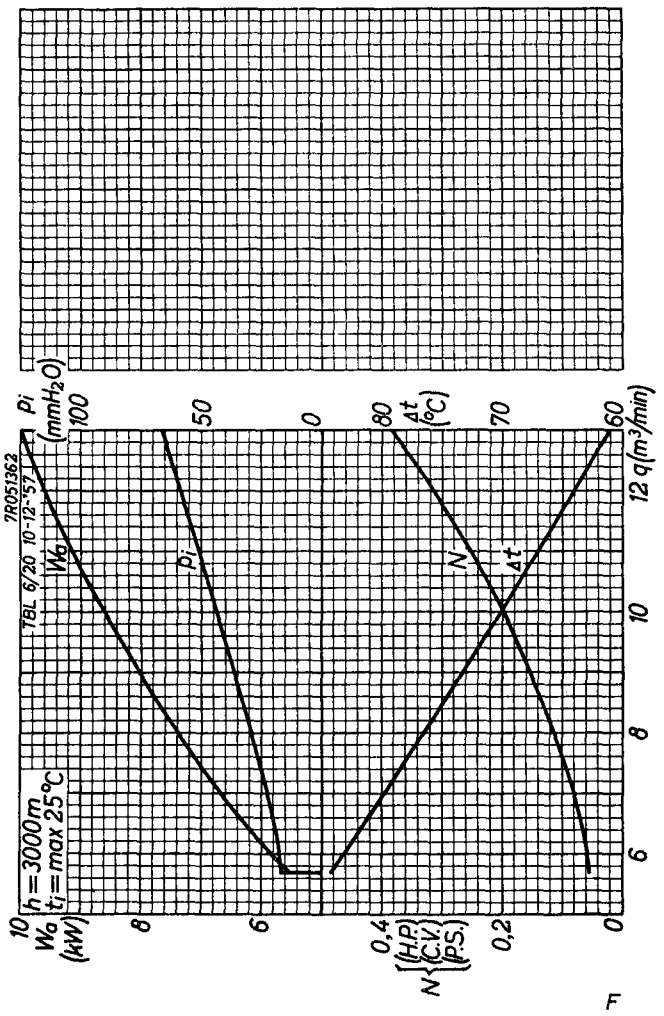
12.12.1957

E


7Z00497
TBL 6/20 6-4-61
250
I_f (A)
200
150
100
50
0
R_f {cold / froid / kalt} = 0,0054 Ω
0
1
2
3
4
5
6
V_f (V)
7

TBL 6/20

PHILIPS

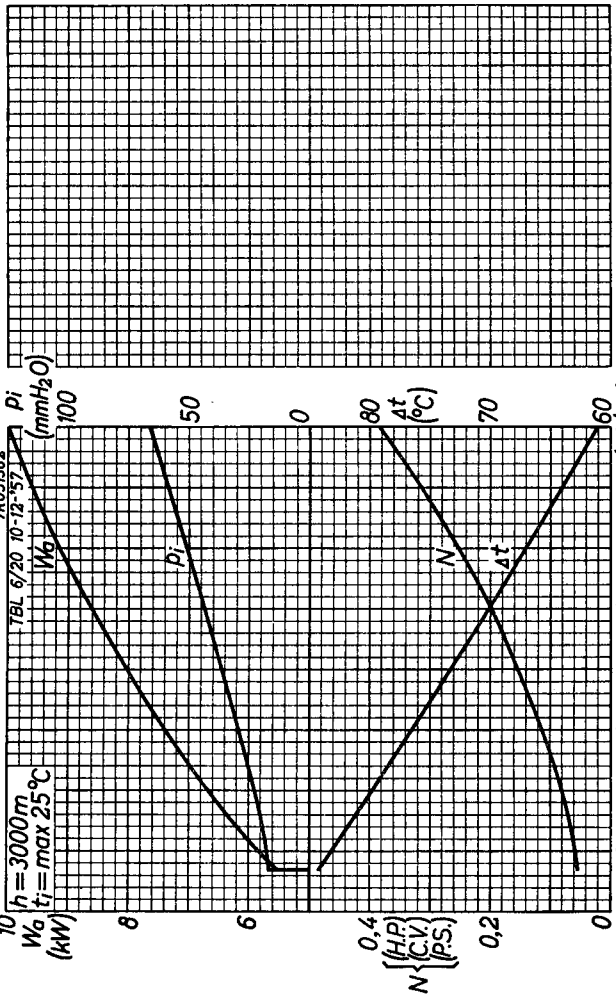


F

TBL 6/20

PHILIPS

F


2R051362
TBL 6/20 10-12-'57
h = 3000m
t_i = max 25°C
W_o (kW)
10
8
6
0,4
0,2
0
N (H.P. / C.V. / P.S.)
p_i (mmH$_2$O)
100
50
0
p_i
W_o
N
80
70
60
Δt (°C)
Δt
6
8
10
12 q(m^3/min)



TBL6/20

page	sheet	date
1	1	1957.09.09
2	2	1957.09.09
3	3	1957.09.09
4	4	1957.09.09
5	5	1957.09.09
6	6	1957.09.09
7	A	1957.12.12
8	B	1957.12.12
9	C	1957.12.12
10	D	1957.12.12
11	E	1957.12.12
12	E	1961.04.04
13	F	1957.12.12
14	F	1961.04.04
15	G	1961.04.04
16	FP	2000.02.05

RF POWER TRIODE

- Air cooled

QUICK REFERENCE DATA

Industrial RF oscillator, class-C

freq.	three-phase rectifier continuous		intermittent	
	V_a	W_o	V_a	W_o
MHz	kV	kW	kV	kW
50	7	4,85		
	6	4,1	6	5,9

HEATING: direct; thoriated tungsten filament

Filament voltage	V_f	=	6,3 V
Filament current	I_f	=	65 A

The filament is designed to accept temporary fluctuations of +5% and −10%

CAPACITANCES

Anode to all other elements except grid	C_a	<	0,5 pF
Grid to all other elements except anode	C_g	=	13 pF
Anode to grid	C_{ag}	=	7,5 pF

TYPICAL CHARACTERISTICS

Anode voltage	V_a	=	6 kV
Anode current	I_a	=	0,24 A
Mutual conductance	S	=	7 mA/V
Amplification factor	μ	=	23

TEMPERATURE LIMITS (Absolute limits)

Temperature of all seals		max.	220 °C
Temperature of external parts of anode		max.	270 °C

Table 1 Cooling

Continuous service	W_a (kW)	q_{min} (m^3/min)	ΔP (Pa)*
	1.3	1.6	160
	1.7	2.1	250

For intermittent service see figure page 113

At higher altitudes and/or temperatures a corresponding higher amount of air should be applied

RECOMMENDED COOLING DEVICE

(1) = metal housing (see page 3)

(2) = glass cylinder

(3) = socket 2422 511 05001

(4) = ground plate (see page 3)

Dimensions of the glass cylinder:

Height : 118 mm

Outside diameter : 150 mm

Inside diameter : 144 mm

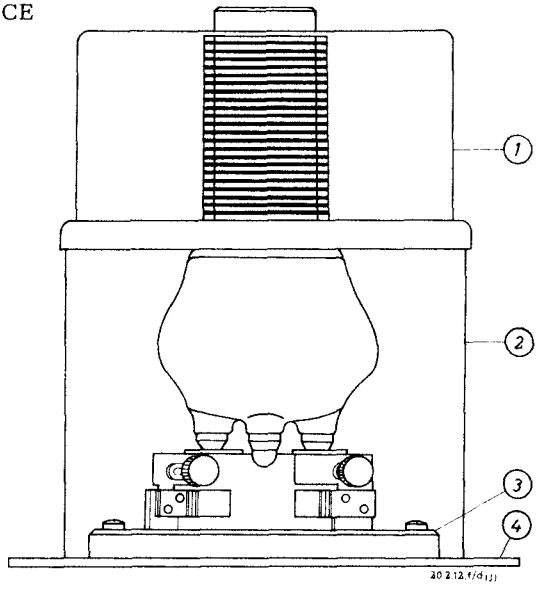


Fig. 1 Recommended cooling device.

The cooling air should preferably be supplied through the space under the ground plate (4). This ground plate should have holes of sufficient cross section to pass the required air flow.

The housing (1) should be connected to the anode connector. At frequencies above 4 MHz both grid terminals should be connected in parallel. At the highest frequencies care should be taken to distribute the RF current equally between both grid terminals to avoid excessive grid seal temperatures.

7Z2 8655

* 1 Pa ≈ 0,1 mm H_2O.

RECOMMENDED COOLING DEVICE (continued)

Dimensions in mm

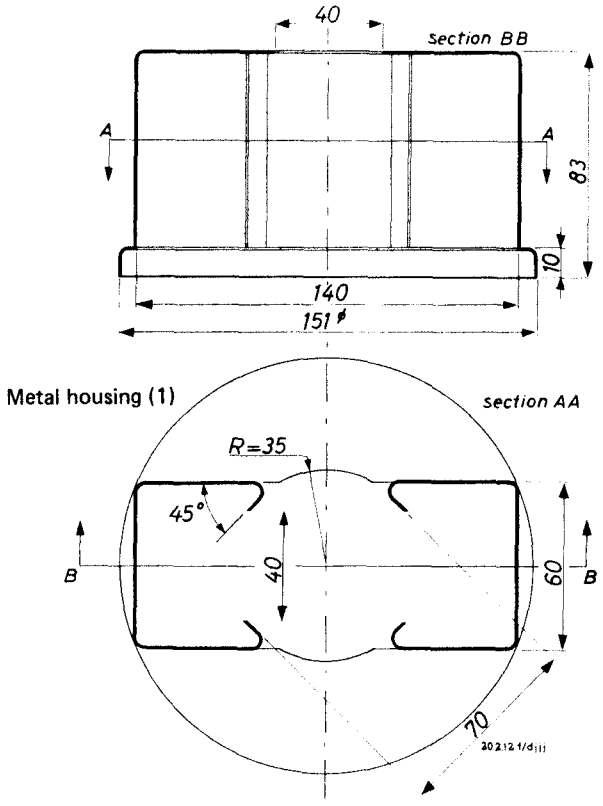
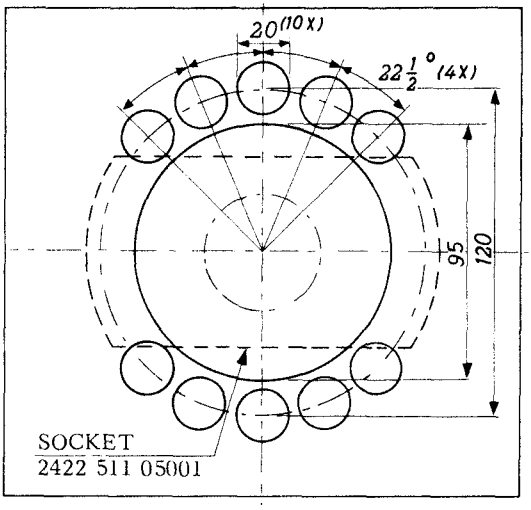


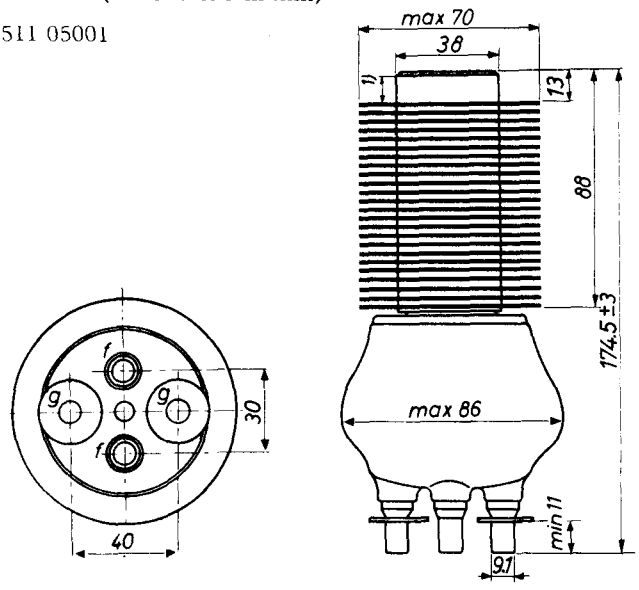
Fig. 2 Cooling device details.

Ground plate (4)



MECHANICAL DATA (dimensions in mm)

Socket: 2422 511 05001



Mounting position: vertical with anode up or down

Fig. 3 Mechanical outline.

1) Area for anode connector

RF CLASS C OSCILLATOR FOR INDUSTRIAL USE with anode voltage from three-phase rectifier without filter

LIMITING VALUES (Absolute limits) continuous service

Frequency	f		up to	50	MHz
Anode voltage	V_a	=	max.	8	kV
Anode current	I_a	=	max.	1	A
Anode input power	W_{ia}	=	max.	7	kW
Anode dissipation	W_a	=	max.	1.7	kW
Negative grid voltage	$-V_g$	=	max.	1250	V
Grid current, loaded	I_g	=	max.	0.4	A
Grid current, unloaded	I_g	=	max.	0.5	A
Grid resistor	R_g	=	max.	10	kΩ

OPERATING CONDITIONS, continuous service

Frequency	f	=	50	50	MHz
Transformer voltage	V_{tr}	=	6.0	5.1	kV_{RMS}
Anode voltage	V_a	=	7	6	kV
Anode current, loaded	I_a	=	0.9	0.9	A
Anode current, unloaded	I_a	=	0.2	0.2	A [1]
Grid current, loaded	I_g	=	0.25	0.28	A
Grid current, unloaded	I_g	=	0.30	0.35	A [1]
Grid resistor	R_g	=	2.5	2	kΩ
Load resistance	$R_{a\sim}$	=	3.85	3.3	kΩ
Feedback ratio under loaded conditions	$V_{g\sim}/V_{a\sim}$	=	15	16	%
Anode input power	W_{ia}	=	6.3	5.4	kW
Anode dissipation	W_a	=	1.45	1.3	kW
Output power	W_o	=	4.85	4.1	kW
Efficiency	η	=	77	76	%
Output power in the load	W_ℓ	=	4.0	3.3	kW [2]

[1] In a typical circuit

[2] Useful power in the load measured in a circuit having an efficiency of 85%.

7Z2 3535

RF CLASS C OSCILLATOR FOR INDUSTRIAL USE with anode voltage from three-phase rectifier without filter

LIMITING VALUES (Absolute limits) intermittent service

Frequency	f		up to	50	MHz
Anode voltage	V_a	=	max.	8	kV
Anode current	I_a	=	max.	1.5	A
Anode input power	W_{ia}	=	max.	9	kW
Anode dissipation	W_a	=	max.	2.1	kW [1]
Negative grid voltage	$-V_g$	=	max.	1250	V
Grid current, loaded	I_g	=	max.	0.4	A
Grid current, unloaded	I_g	=	max.	0.5	A
Grid resistor	R_g	=	max.	10	kΩ

OPERATING CONDITIONS, intermittent service

Frequency	f	=	50	MHz
Transformer voltage	V_{tr}	=	5.1	kV_{RMS}
Anode voltage	V_a	=	6	kV
Anode current, loaded	I_a	=	1.33	A
Anode current, unloaded	I_a	=	0.33	A [2]
Grid current, loaded	I_g	=	0.38	A
Grid current, unloaded	I_g	=	0.48	A [2]
Grid resistor	R_g	=	1450	Ω
Load resistance	$R_{a\sim}$	=	2200	Ω
Feedback ratio under loaded conditions	$V_{g\sim}/V_{a\sim}$	=	17	%
Anode input power	W_{ia}	=	8	kW
Anode dissipation	W_a	=	2.1	kW [1]
Output power	W_o	=	5.9	kW
Efficiency	η	=	74	%
Output power in the load	W_ℓ	=	4.75	kW [3]

[1] See Fig. 4
[2] In a typical circuit
[3] Useful power in the load measured in a circuit having an efficiency of 85%.

7Z2 4051

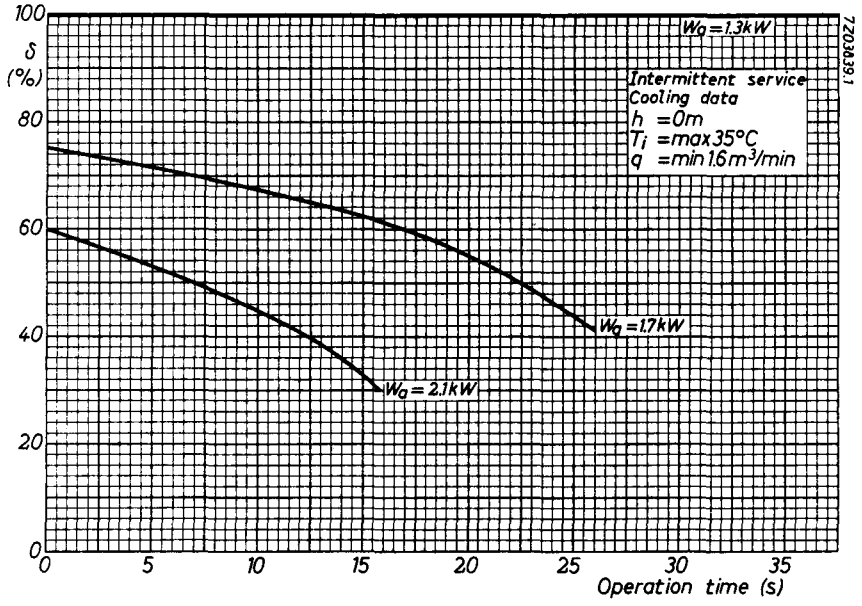


Fig. 4 Intermittent service. Limits of anode dissipation and cooling.

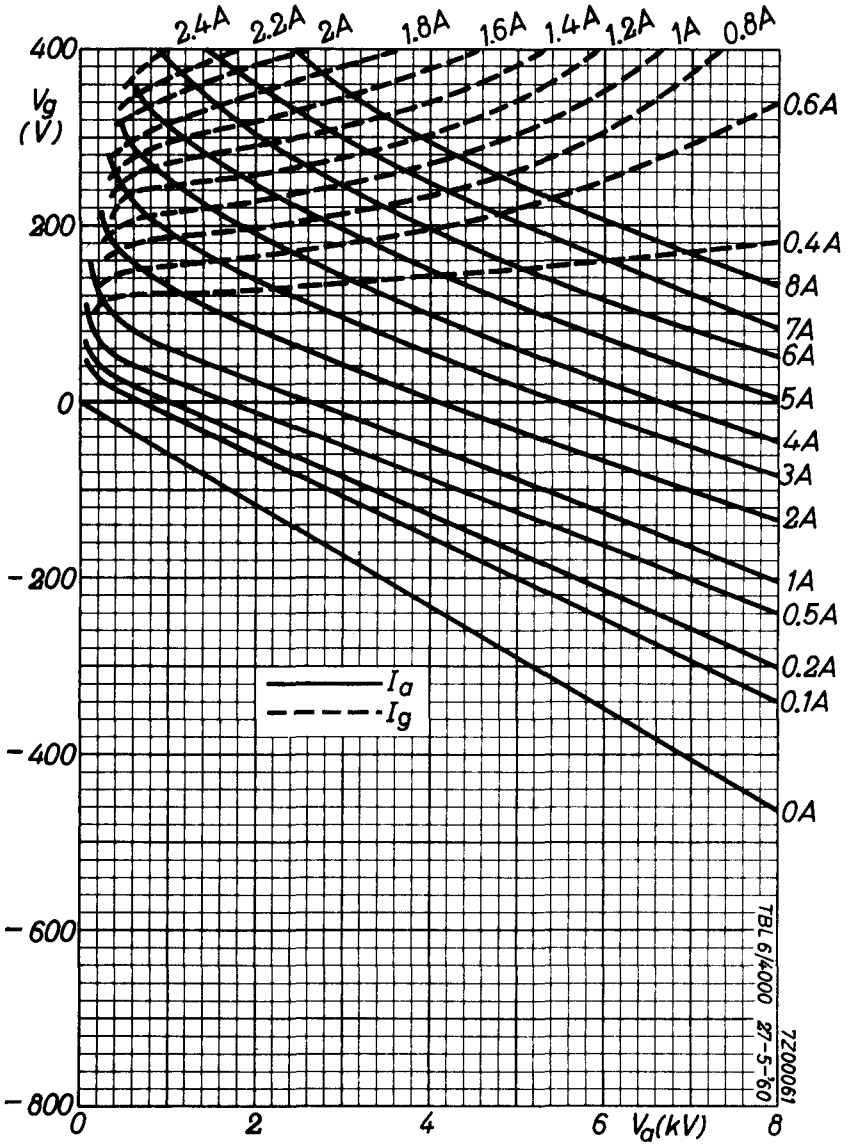


Fig. 5 Constant current characteristics.

PHILIPS

Data handbook

Electronic components and materials

TBL6/4000

page	sheet	date
1	111	1988.02
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4	114	1988.02
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6	116	1988.02
7	117	1988.02
8	118	1988.02
9	FP	2000.09.22

TRIODE for use in television transmitters, A.M. or F.M. transmitters or industrial H.F. generators
TRIODE pour utilisation dans émetteurs de télévision, émetteurs A.M. ou F.M., ou générateurs H.F. industriels
TRIODE zur Verwendung in Fernsehsendern, AM- oder FM-Sendern, oder in HF-Industriegeneratoren

Cooling : forced air
Refroidissement: par ventilation forcée
Kühlung : Pressluftkühlung

Filament : thoriated tungsten
Filament : tungstène thorié
Heizfaden: thoriertes Wolfram

Heating : direct
Chauffage: direct
Heizung : direkt

V_f = 12,6 V
I_f = 33 A

Capacitances
Capacités
Kapazitäten

C_a = 0,3 pF
C_g = 16 pF
C_{ag} = 11 pF

Typical characteristics
Caractéristiques types
Kenndaten

μ (I_a=1 A ; V_a=4 kV) = 32
S (I_a=1 A ; V_a=4 kV) = 17 mA/V

λ	Freq.	C telegr.		B teleph.		C an.mod.		B mod. [1]	
m	Mc/s	V_a (kV)	W_o (kW)	V_a (kV)	W_o (kW)	V_a (kV)	W_o (kW)	V_a (kV)	W_o (kW)
4	75	6	6,9	6	1,9			6	13,3
		5	5,6	5	1,45	5	4,7	5	6,6
		4	4			4,5	4,1	4,9	6
						4	3,5	4	5,3
						3,5	3	3,5	4,6
						3	2,2	3	3,3

Television, télévision, Fernsehen

Freq. (Mc/s)	neg.mod. pos.synchr.			pos.mod. neg.synchr	
	V_a (kV)	W_o sync (kW)	W_o (kW) black noir schwarz	V_a (kV)	W_o (kW) white blanc weiss
75	5	9	5,35	5	9

[1] Two tubes; deux tubes; zwei Röhren

PHILIPS

Air cooling characteristics
Caractéristiques du refroidissement par air
Luftkühlungsdaten

W_a (kW)	h (m)	t_1 max. (^oC)	q min. (m^3/min)	p_1 (mm H_2O)
1	0	35	3	8
	0	45	3,1	8
	1500	35	3,7	9
	3000	25	4,1	10
3	0	35	5,2	23
	0	45	6,1	29
	1500	35	6,2	26
	3000	25	6,6	26
5	0	35	9,2	68
	0	45	10,7	90
	1500	35	11,2	81
	3000	25	11,6	79

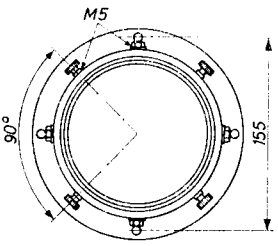
See cooling curves
Voir les courbes de refroidissement
Siehe die Kühlungskurven

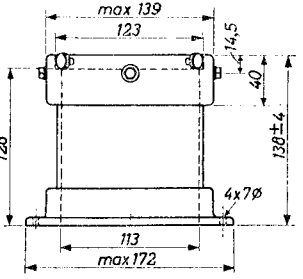
temperature of seals
temp. des scellements = max. 180 °C
Temp. der Einschmelzungen

Clips for filament
Bornes de connexion pour le filament 40634
Heizanschlussklemmen

Grid connector or
Connecteur pour la grille 40650[1]) ou 40622
Gitteranschlussring oder

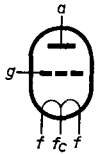
Insulating collar
Support isolant 40630
Isoliersockel

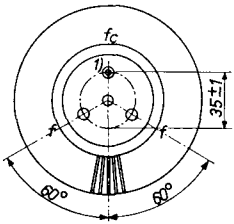


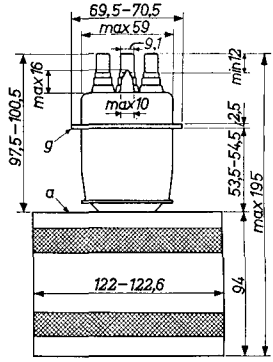


[1]) The connector 40650 should be used only below 30 Mc/s
Le connecteur 40650 sera utilisé au-dessous de 30 MHz seulement
Der Anschlussring 40650 soll nur unterhalb 30 MHz verwendet werden

Dimensions in mm
Dimensions en mm
Abmessungen in mm







The centre tap f_c must not be used for filament current supply. The clips type 40634, however, must be used for the cooling of all three filament pins, thus also of pin f_c.

La prise médiane f_c ne doit pas être utilisée pour l'alimentation du filament. Toutefois les bornes de connexion no. de type 40634 doivent être utilisées pour le refroidissement de toutes les broches du filament, y comprise la broche f_c.

Die Mittelanzapfung f_c darf nicht für die Heizfadenspeisung verwendet werden. Die Heizanschlussklemmen Typ No. 40634 müssen jedoch für die Kühlung aller Heizfadenstifte verwendet werden, also auch für den Stift f_c.

Mounting position: vertical with anode up or down
Montage : vertical avec l'anode en haut ou en bas
Einbau : senkrecht mit der Anode oben oder unten

---

1) This pin is marked "0"
Cette broche est marquée "0"
Dieser Stift ist mit "0" gekennzeichnet

PHILIPS

Tube, tube, Röhre

Net weight / Poids net / Nettogewicht	4,6 kg	Shipping weight / Poids brut / Bruttogewicht	8,1 kg

40630

Net weight / Poids net / Nettogewicht	2,1 kg	Shipping weight / Poids brut / Bruttogewicht	3,1 kg

H.F. class C telegraphy
H.F. classe C télégraphie
HF Klasse C Telegraphie

Limiting values
Caractéristiques limites
Grenzdaten

f	= max.	75 Mc/s
V_a	= max.	6 kV
$-V_g$	= max.	1000 V
I_a	= max.	1,5 A
I_g	= max.	0,35 A
W_g	= max.	120 W
W_{ia}	= max.	9 kW
W_a	= max.	5 kW

Operating conditions
Caractéristiques d'utilisation
Betriebsdaten

λ	=	4	4	4 m
f	=	75	75	75 Mc/s
V_a	=	6	5	4 kV
V_g	=	-400	-300	-200 V
I_a	=	1,5	1,5	1,37 A
I_g	=	0,31	0,33	0,35 A
V_{g_p}	=	740	640	500 V
W_{ig}	=	210	190	160 W
W_{ia}	=	9	7,5	5,5 kW
W_a	=	2,1	1,9	1,5 kW
W_o	=	6,9	5,6	4 kW
η	=	76,5	75	73 %

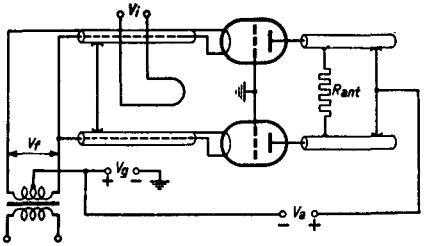
H.F. class C telegraphy, grounded grid
H.F. classe C télégraphie, circuit "grounded-grid"
HF - Klasse C Telegrafie, Gitterbasisschaltung

$f \leqq 75$ Mc/s

Limiting values
Caractéristiques limites
Grenzdaten

V_a	= max.	6 kV
V_{kg}	= max.	1000 V
I_a	= max.	1,5 A
I_g	= max.	0,35 A
W_g	= max.	120 W
W_{ia}	= max.	9 kW
W_a	= max.	5 kW

Operating conditions, two valves
Caractéristiques d'utilisation, deux tubes
Betriebsdaten, zwei Röhren



λ	=	4	2,7[1]	2,7[1]	1,36[1] m
f	=	75	110	110	220 Mc/s
V_a	=	6	5	4	4 kV
V_g	=	400	300	200	200 V
I_a	=	2x1,5	2x1,5	2x1,37	2x1,25 A
I_g	=	2x0,31	2x0,33	2x0,35	2x0,2 A
V_{gp}	=	740	640	500	450 V
W_{ig}	=	2x1120	2x920	2x675	2x380 W
W_{ia}	=	2x9	2x7,5	2x5,5	2x5 kW
W_a	=	2x2,1	2x2,2	2x1,7	2x2,5 kW
W_o [2]	=	13,8+1,82	10,6+1,46	7,6+1,03	5+0,6 kW
η [3]	=	76,5	71	69	50 %

[1]) See page 12; voir page 12; siehe Seite 12

[2]) Power transferred from driving stage included
Y compris l'énergie transmise de l'étage préamplificateur
Einschliesslich der vom Vorverstärker übertragenen Leistung

[3]) Pure valve efficiency; rendement net du tube; reiner Röhrenwirkungsgrad

H.F. class B telephony
H.F. classe B téléphonie
HF - Klasse B Telefonie

Limiting values
Caractéristiques limites
Grenzdaten

$f \leq 75$ Mc/s

V_a	= max.	6 kV
I_a	= max.	1,1 A
W_{ia}	= max.	6,6 kW
W_a	= max.	5 kW

Operating conditions
Caractéristiques d'utilisation
Betriebsdaten

λ	=	4	4	m
f	=	75	75	Mc/s
V_a	=	6	5	kV
V_g	=	-180	-145	V
I_a	=	0,99	0,9	A
V_{gp}	=	250	225	V
W_{ia}	=	5,9	4,5	kW
W_a	=	4	3,05	kW
W_o	=	1,9	1,45	kW
η	=	32	32	%
m	=	100	100	%
I_g	=	0,3	0,32	A
W_{ig}	=	140	130	W

H.F. class C anode modulation
H.F. classe C modulation d'anode
HF - Klasse C Anodenmodulation

Limiting values
Caractéristiques limites
Grenzdaten

$f \leqq 75$ Mc/s

V_a	= max.	5 kV
$-V_g$	= max.	1000 V
I_a	= max.	1,3 A
I_g	= max.	0,35 A
W_g	= max.	120 W
W_{ia}	= max.	6,5 kW
W_a	= max.	3,4 kW

Operating conditions
Caractéristiques d'utilisation
Betriebsdaten

λ =	4	4	4	4	4	m
f =	75	75	75	75	75	Mc/s
V_a =	5	4,5	4	3,5	3	kV
V_g [1] =	-400	-350	-300	-300	-250	V
I_a =	1,2	1,2	1,2	1,2	1	A
I_g =	0,3	0,3	0,3	0,3	0,3	A
V_{gp} =	690	650	600	600	510	V
W_{ig} =	190	180	165	165	140	W
W_{ia} =	6	5,4	4,8	4,2	3	kW
W_a =	1,3	1,3	1,3	1,2	0,8	kW
W_o =	4,7	4,1	3,5	3	2,2	kW
η =	78	76	73	71,5	73	%
m =	100	100	100	100	100	%
W_{mod} =	3	2,7	2,4	2,1	1,5	kW

[1]) Grid bias partially obtained by the grid resistor
Polarisation de grille obtenue partiellement par la résistance de grille
Gittervorspannung, teilweise durch den Gitterwiderstand erzeugt

PHILIPS

L.F. class B amplifier and modulator
Amplificatrice et modulatrice B.F. classe B
NF - Verstärker und Modulator Klasse B

Limiting values
Caractéristiques limites
Grenzdaten

V_a	= max.	6 kV
I_a	= max.	1,5 A
W_{ia}	= max.	9 kW
W_a	= max.	5 kW
R_g	= max.	15 kΩ

Operating conditions, two valves
Caractéristiques d'utilisation, deux tubes
Betriebsdaten, zwei Röhren

V_a	=	6		5		4,5		kV
V_g	=	-165		-138		-125		V
R_{aa}	=	4900		6400		6100		Ω
V_{ggp}	=	0	910	0	661	0	655	V
I_a	=	2x0,125	2x1,5	2x0,11	2x0,91	2x0,1	2x0,92	A
I_g	=	0	2x0,28	0	2x0,14	0	2x0,09	A
W_{ig}	=	0	2x115	0	2x42	0	2x27	W
W_{ia}	=	2x0,75	2x9	2x0,55	2x4,55	2x0,45	2x4,15	kW
W_a	=	2x0,75	2x2,35	2x0,55	2x1,25	2x0,45	2x1,15	kW
W_o	=	0	13,3	0	6,6	0	6	kW
d_{tot}	=	-	4,3	-	3,3	-	3,7	%
η	=	-	74	-	73	-	72	%

V_a	=	4		3,5		3		kV
V_g	=	-112		-100		-90		V
R_{aa}	=	4900		4200		4400		Ω
V_{ggp}	=	0	632	0	618	0	570	V
I_a	=	2x0,1	2x0,94	2x0,075	2x0,95	2x0,065	2x0,8	A
I_g	=	0	2x0,19	0	2x0,18	0	2x0,2	A
W_{ig}	=	0	2x54	0	2x50	0	2x52	W
W_{ia}	=	2x0,4	2x3,75	2x0,26	2x3,3	2x0,2	2x2,4	kW
W_a	=	2x0,4	2x1,1	2x0,26	2x1	2x0,2	2x0,75	kW
W_o	=	0	5,3	0	4,6	0	3,3	kW
d_{tot}	=	-	2,6	-	2,9	-	3,3	%
η	=	-	71	-	70	-	69	%

Grid-modulated H.F. class C amplifier for television service, negative modulation, positive synchronisation (American and European system)
Amplificatrice H.F. classe C pour télévision, modulation de grille, modulation négative, synchronisation positive (système américain et européen)
HF- Klasse C Verstärker für Fernsehsender, Gittermodulation, negative Modulation, positive Synchronisierung (amerikanisches und europäisches System)

Limiting values
Caractéristiques limites
Grenzdaten

f = max. 75 Mc/s		f = max. 220 Mc/s	
V_a	= max. 5 kV	V_a	= max. 4 kV
W_{ia} sync	= max. 9,5 kW	W_{ia} sync	= max. 6,5 kW
W_a sync	= max. 5 kW	W_a sync	= max. 4 kW
I_a sync	= max. 1,9 A	I_a sync	= max. 1,6 A
W_g sync	= max. 120 W	W_g sync	= max. 120 W
$-V_g$	= max. 1000 V	$-V_g$	= max. 1000 V

Operating conditions, two tubes in push-pull
Caractéristiques d'utilisation, deux tubes en push-pull
Betriebsdaten, zwei Röhren in Gegentakt

			[1]	
f		= 48-75	170-220	Mc/s
B (-1,5 db)		= 5,25	6,5	Mc/s^2)
B (-3 db)		= 8	10	Mc/s^2)
V_a		= 5	4	kV
V_g	sync	= -200	-150	V
	black, noir, schwarz	= -300	-225	V
	white, blanc, weiss	= -550	-500	V
V_{gg_p}	sync	= 1000	1000	V[3]
I_a	sync	= 3,8	3,2	A
	black, noir, schwarz	= 2,6	2,6	A
I_g	sync	= 0,5	0,4	A
	black, noir, schwarz	= 0,35	0,22	A
W_{ig}	sync	= 250	350-450	W[4]
W_o	sync	= 9	6	kW
	black, noir, schwarz	= 5,35	3,37	kW

[1], [2], [3], [4] See page 12; voir page 12; siehe Seite 12

PHILIPS

Grid-modulated H.F. class C amplifier for television service, positive modulation, negative synchronisation (BBC system)
Amplificatrice H.F. classe C pour télévision, modulation de grille, modulation positive, synchronisation négative, (système BBC)
HF Klasse C Verstärker für Fernsehsender, Gittermodulation, positive Modulation, negative Synchronisierung (BBC System)

Limiting values
Caractéristiques limites
Grenzdaten

f		= max.	75 Mc/s
V_a		= max.	5 kV
$-V_g$		= max.	1000 V
I_a	white	= max.	1,9 A
W_{ia}	white	= max.	9,5 kW
W_a	white	= max.	5 kW
W_g	white	= max.	120 W

Operating conditions, two valves in push-pull
Caractéristiques d'utilisation, deux tubes en push-pull
Betriebsdaten, zwei Röhren in Gegentakt

f	=	48-75	Mc/s
B (I_{ant} = 85 %)	=	5,25	Mc/s
B (I_{ant} = 70 %)	=	8	Mc/s
V_a	=	5	kV
V_g white, blanc, weiss	=	-200	V
V_g black, noir, schwarz	=	-460	V
V_g sync	=	-580	V
V_{ggp} white, blanc, weiss	=	1000	V
I_a white, blanc, weiss	=	3,8	A
I_a black, noir, schwarz	=	0,8	A
I_g white, blanc, weiss	=	0,5	A
I_g black, noir, schwarz	=	0	A
W_{ig} white, blanc, weiss	=	250	W
W_o white, blanc, weiss	=	9	kW
W_o black, noir, schwarz	=	0,6	kW

H.F. class B telephony for television service (American and European system)
H.F. classe B téléphonie pour télévision (système américain et européen)
HF Klasse B Telephonie für Fernsehsender (amerikanisches und europäisches System)

Limiting values
Caractéristiques limites
Grenzdaten

f = max.	75 Mc/s	f = max.	220 Mc/s
V_a = max.	5 kV	V_a = max.	4 kV
W_{ia} sync = max.	9,5 kW	W_{ia} sync = max.	6,5 kW
W_a sync = max.	5 kW	W_a sync = max.	4 kW
I_a sync = max.	1,9 A	I_a sync = max.	1,6 A
W_g sync = max.	120 W	W_g sync = max.	120 W

Operating conditions, two tubes in push-pull
Caractéristiques d'utilisation, deux tubes en push-pull
Betriebsdaten, zwei Röhren in Gegentakt

				[1]	
f		=	48-75	170-220	Mc/s
B (-1,5 db)		=	5,25	6,5	Mc/s [2]
B (-3 db)		=	8	10	Mc/s [2]
V_a		=	5	4	kV
V_g		=	-200	-150	V
V_{gg_p}	sync	=	1000	1000	V [3]
	black, noir, schwarz	=	800	750	V [3]
	white, blanc, weiss	=	0	200	V [3]
I_a	sync	=	3,8	3,2	A
	black, noir, schwarz	=	3	2,6	A
	white, blanc, weiss	=	0,2	-	A
I_g	sync	=	0,5	0,4	A
	black, noir, schwarz	=	0,22	0,22	A
	white, blanc, weiss	=	0	-	A
W_{ig}	sync	=	250	350-450	W [4]
W_o	sync	=	9	6	kW
	black, noir, schwarz	=	5,35	3,37	kW

[1], [2], [3], [4] See page 12; voir page 12; siehe Seite 12

[1]) Pages 5,9,11; Seite 5,9,11

When using the tube above 108 Mc/s, particular attention must be given to a careful design of the installation, otherwise the tube may be damaged. Therefore, our guarantee for the tubes operating at frequencies above 108 Mc/s can only be given after approval of the installation

Lorsqu'on utilise le tube au-dessus de 108 Mc/s, il est requis d'effectuer le montage avec beaucoup de soin, autrement le tube est susceptible d'être endommagé. Par conséquent, nous ne pouvons garantir les tubes dans ce domaine de fréquences qu'après notre approbation de l'installation

Der Betrieb der Röhre bei höheren Frequenzen als 108 MHz erfordert eine sehr sorgfältige Durchführung der Schaltung und des Aufbaus. Vernachlässigung dieser Bedingung kann eine Beschädigung der Röhre zur Folge haben. Eine Garantie für den Betrieb der Röhren in diesem Frequenzgebiet wird infolgedessen nur dann gegeben, wenn die Anlage unserseits genehmigt worden ist.

---

[2]), [3]), [4]) Pages 9,11; Seite 9,11

[2]) This value of bandwidth is based on measurements on a circuit with a single LC section
Cette valeur de la largeur de bande se rapporte à des mesures à un montage avec un seul circuit LC.
Dieser Wert der Bandbreite bezieht sich auf Messungen an einer Schaltung mit einem einzigen LC-Kreis.

[3]) Measured by the slide back method
Mesuré par la méthode de glissement de la tension de polarisation.
Gemessen mittels Verschiebung der Gittervorspannung

[4]) Driving power is accounted for largely by circuit losses. The indicated driving power is required to take care of losses in damping resistors, circuit losses and tube driving power

La puissance d'entrée est nécessaire pour la plupart pour les pertes dans le circuit. La puissance mentionnée est nécessaire pour les pertes dans les résistances d'amortissement, dans le circuit et pour la puissance d'entrée du tube.

Die Eingangsleistung ist grossenteils nötig für die Verluste in der Schaltung. Die genannte Leistung ist nötig für die Verluste in Dämpfungswiderständen, in Kreisen und für die Eingangsleistung der Röhre.

Operating conditions as H.F. class C oscillator for industrial use with anode voltage from two-phase half-wave rectifier without filter
Caractéristiques d'utilisation en oscillatrice H.F. classe C pour des applications industrielles avec tension anodique dérivée d'un redresseur biphasé à une alternance sans filtre
Betriebsdaten als HF Klasse C Oszillator für industrielle Anwendungen mit der Anodenspannung abgenommen von einem Zweiphasen- Einweggleichrichter ohne Filter

Limiting values (absolute values)
Caractéristiques limites (valeurs absolues)
Grenzdaten (absolute Werte)

f = max.	75 Mc/s	I_g = max.	0,31 A
V_a = max.	5400 V	W_{ia} = max.	9 kW
$-V_g$ = max.	900 V	W_a = max.	5 kW
I_a = max.	1,35 A	W_g = max.	120 W

Operating conditions
Caractéristiques d'utilisation
Betriebsdaten

V_{tr} =	6,0[1]	5,1[2]	kV_{eff}
V_a =	5,4	4,6	kV[3]
I_a =	1,35	1,15	A
I_g =	0,31	0,27	A
R_g =	1300	1100	Ω
W_{ig} =	210	160	W
W_{ia} =	9	6,5	kW
W_a =	2,3	1,84	kW
W_o =	6,5	4,5	kW
η =	72	70	%

[1]) Care must be taken that under these operating conditions the absolute limiting values are not exceeded by variation of the supply voltage or the load or by tolerances in the circuit elements.
Il faut prendre garde de ne pas dépasser les caractéristiques limites absolues par suite de variation de la tension d'alimentation ou de la charge ou par suite des tolérances des éléments du circuit.
Es muss darauf geachtet werden dass die absoluten Grenzwerte nicht überschritten werden infolge Schwankungen der Speisespannung oder der Belastung oder infolge Abweichungen der Schaltteile.

[2]),[3]) see page 14; voir page 14; siehe Seite 14.

Operating conditions as H.F. class C oscillator for industrial use with anode voltage from three-phase half-wave rectifier without filter
Caractéristiques d'utilisation en oscillatrice H.F. classe C pour des applications industrielles avec tension anodique dérivée d'un redresseur triphasé à une seule alternance sans filtre
Betriebsdaten als H.F. Klasse C Oszillator für industrielle Anwendungen mit der Anodenspannung abgenommen von einem Dreiphasen-Einweggleichrichter ohne Filter.

Limiting values (absolute values)
Caractéristiques limites (valeurs absolues)
Grenzdaten (absulute Werte)

f = max.	75 Mc/s	I_g = max.	0,35 A
V_a = max.	6000 V	W_{ia} = max.	9 kW
$-V_g$ = max.	1000 V	W_a = max.	5 kW
I_a = max.	1,5 A	W_g = max.	120 W

Operating conditions
Caractéristiques d'utilisation
Betriebsdaten

V_{tr} =	5,1[1])	4,4[2])	kV_{eff}
V_a =	6,0	5,1	kV[3])
I_a =	1,5	1,25	A
I_g =	0,31	0,28	A
R_g =	1300	1100	Ω
W_{ig} =	210	160	W
W_{ia} =	9	6,4	kW
W_a =	1,9	1,74	kW
W_o =	6,9	4,5	kW
η =	76,5	70	%

[2]) Under these conditions normal deviations of voltages and load are permissible. The absolute limiting values of the valve must,however, not be exceeded.
Dans cettes conditions des déviations normales des tensions et de la charge sont permises. Il ne faut cependant pas dépasser les caractéristiques limites absolues.
Unter diesen Bedingungen sind normale Abweichungen der Spannungen und der Belastung gestattet.Die absoluten Grenzwerte dürfen jedoch nicht überschritten werden.

[3]) D.C. value; valeur moyenne; mittlerer Wert.

[1]) See page 13; voir page 13; siehe Seite 13.

Operating conditions as H.F. class C oscillator for industrial use with self rectification
Caractéristiques d'utilisation en oscillatrice H.F. classe C pour des applications industrielles à autoredressement
Betriebsdaten als H.F.Klasse C Oszillator für industrielle Anwendungen mit Selbstgleichrichtung

Limiting values (absolute values)
Caractéristiques limites (valeurs absolues)
Grenzdaten (absolute Werte)

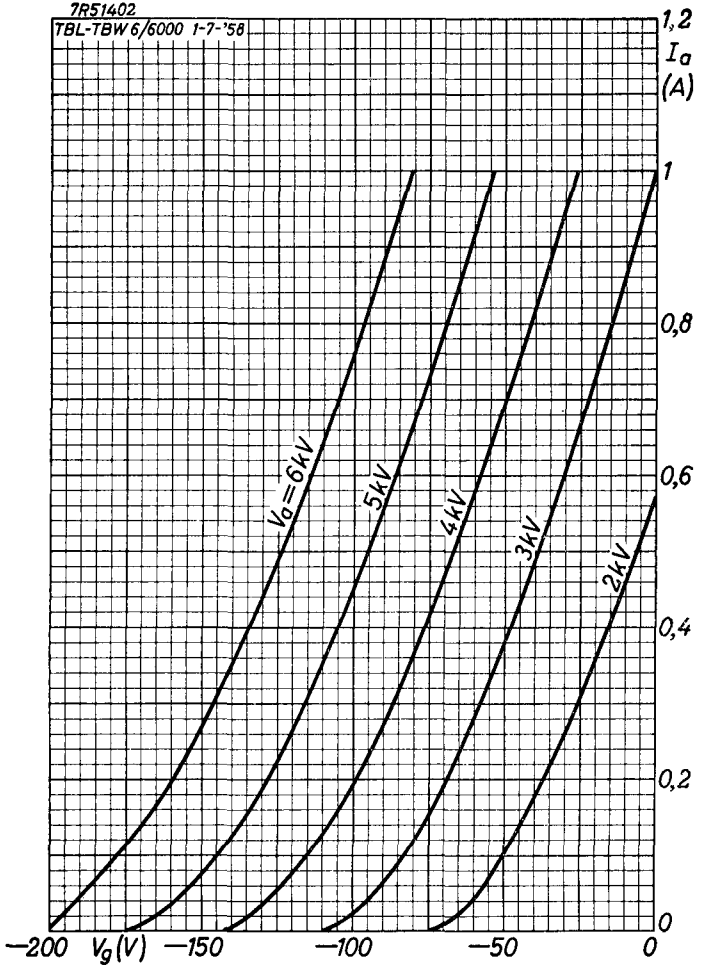
f	= max.	75	Mc/s
V_{tr}	= max.	6800	V_{eff}
$-V_g$	= max.	640	V
I_a	= max.	0,8	A
I_g	= max.	0,19	A
W_{ia}	= max.	9	kW
W_a	= max.	5	kW
W_g	= max.	120	W

Operating conditions
Caractéristiques d'utilisation
Betriebsdaten

V_{tr}	=	6,8[1])	5,9[2])	kV_{eff}
I_a	=	0,8	0,7	A
I_g	=	0,19	0,165	A
R_g	=	1050	1050	Ω
W_{ig}	=			W
W_{ia}	=	6,05	4,6	kW
W_a	=	1,5	1,24	kW
W_o	=	4,55	3,36	kW
η	=	75	73	%

[1]) See note [1]) page 13; voir la note [1]) page 13; siehe Fussnote [1]) Seite 13.

[2]) See note [2]) page 14; voir la note [2]) page 14; siehe Fussnote [2]) Seite 14.


7R51402
TBL-TBW 6/6000 1-7-'58
1,2
Ia
(A)
1
0,8
0,6
0,4
0,2
0
Va=6kV
5kV
4kV
3kV
2kV
−200
Vg(V)
−150
−100
−50
0

7.7.1958

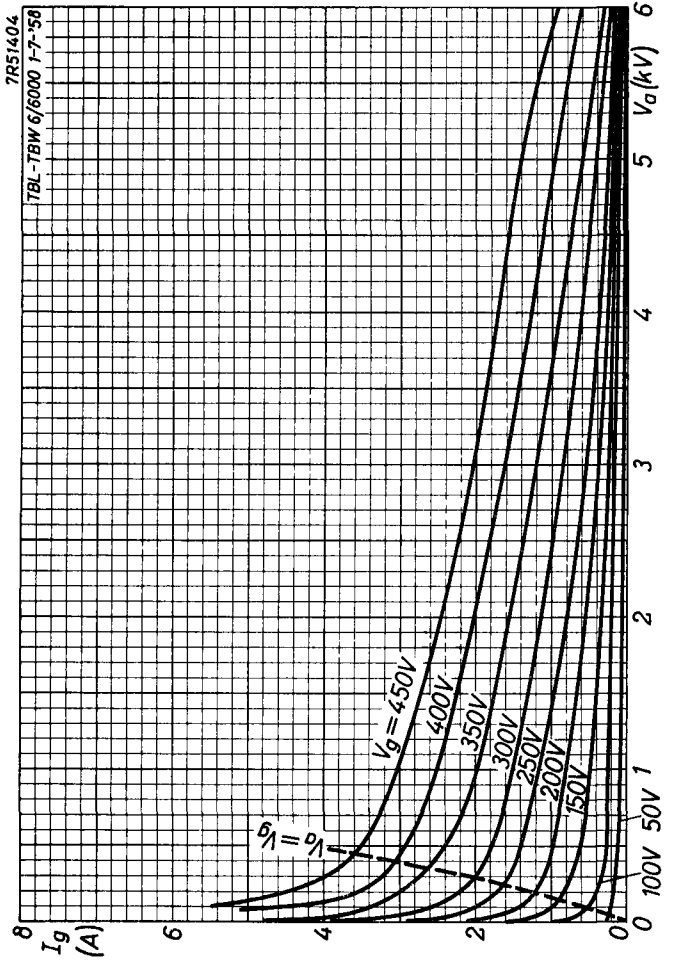
A

TBL 6/6000

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TBL 6/6000

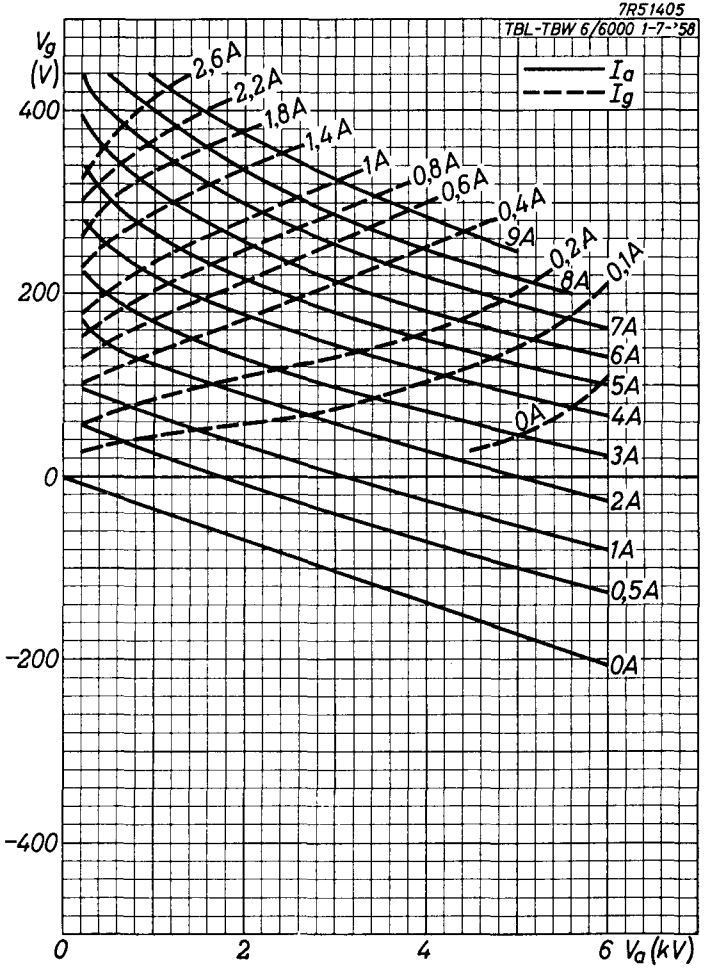


7.7.1958

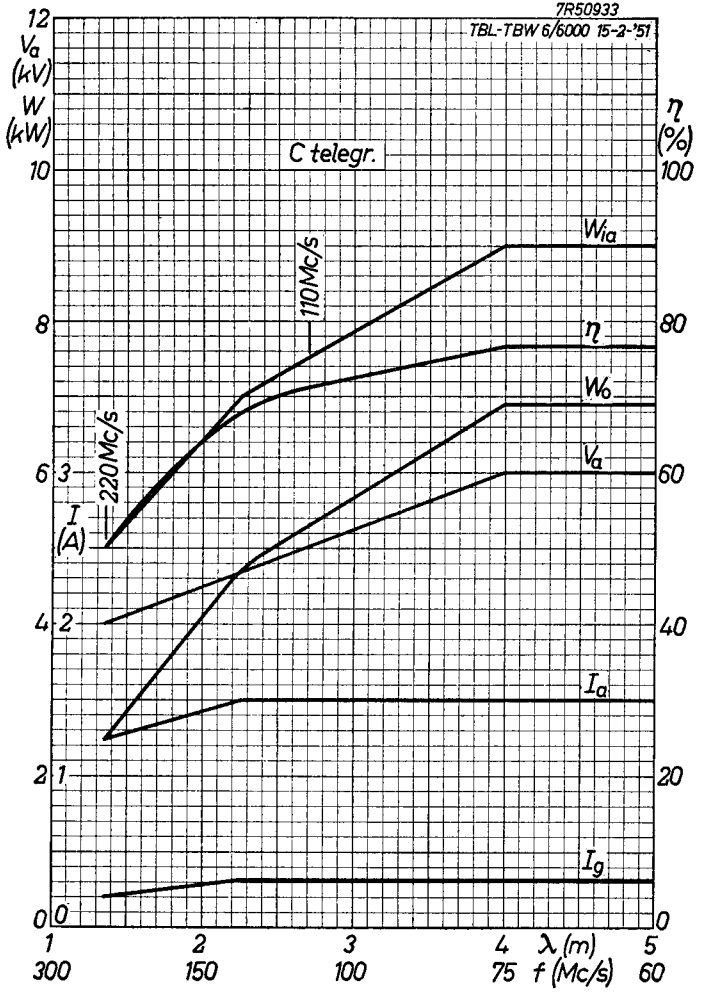
C

TBL 6/6000

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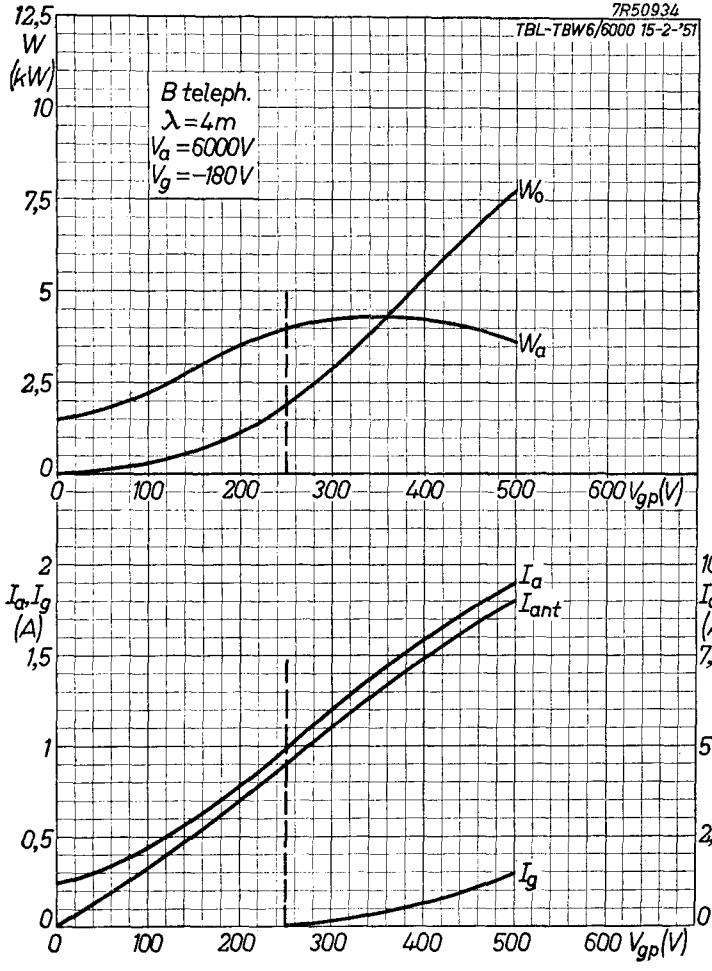
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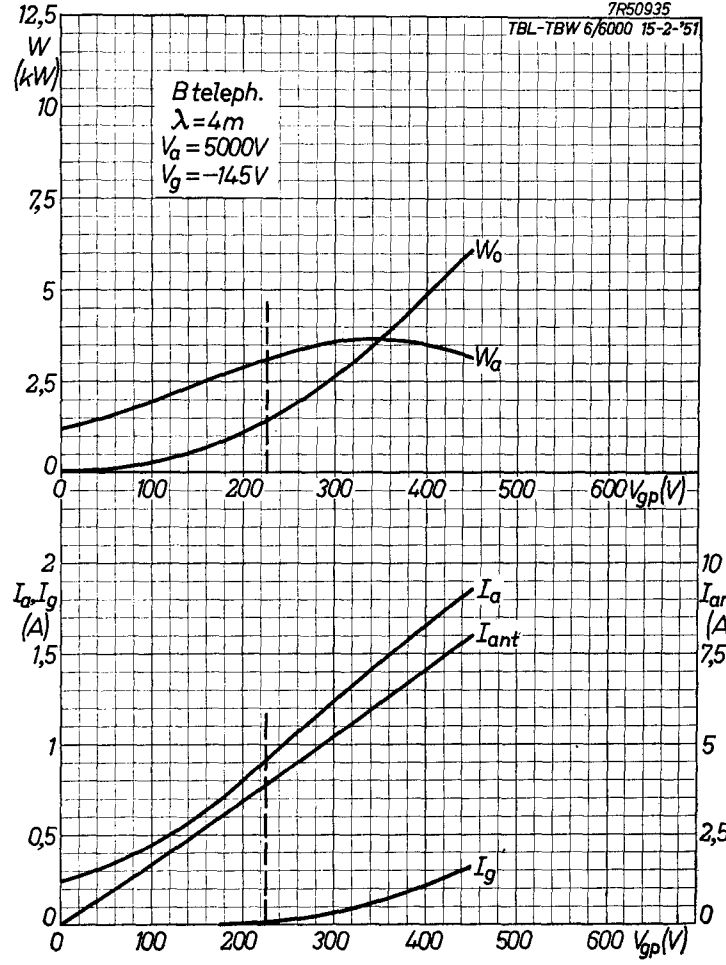

7R50933
TBL-TBW 6/6000 15-2-'51
C telegr.
110 Mc/s
220 Mc/s
V_a (kV)
W (kW)
I (A)
η (%)
W_{ia}
η
W_o
V_a
I_a
I_g
λ (m)
f (Mc/s)

7.7.1954

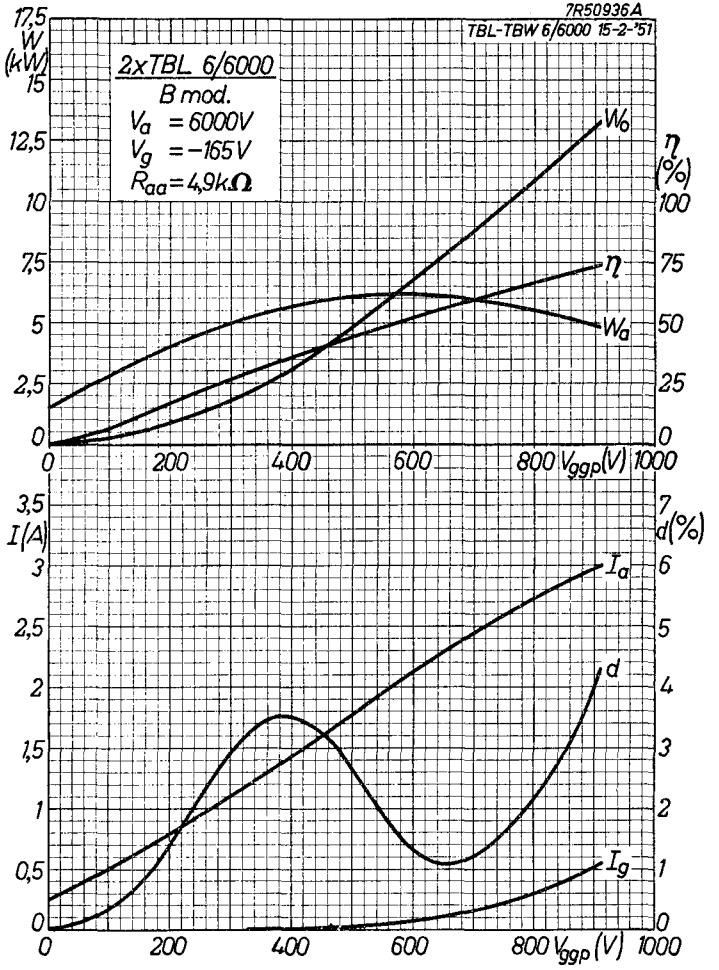
E

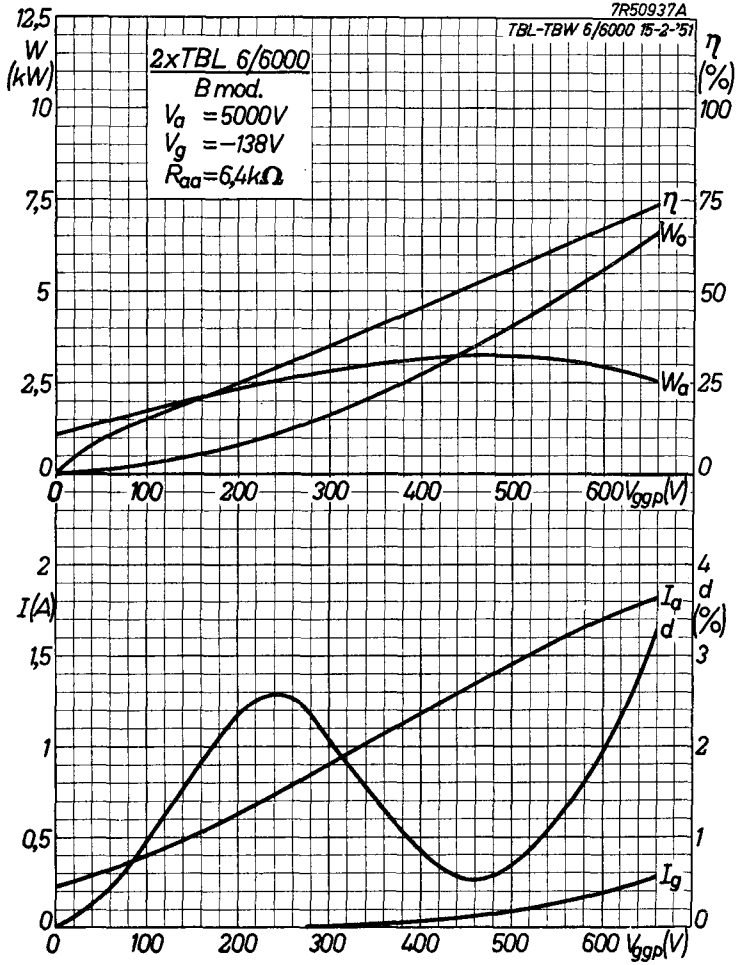
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7R50934
TBL-TBW6/6000 15-2-'51
12,5
W
(kW)
10
7,5
5
2,5
0
B teleph.
λ=4m
V_a=6000V
V_g=−180V
W_o
W_a
0
100
200
300
400
500
600 V_{gp}(V)
2
I_a,I_g
(A)
1,5
1
0,5
0
I_a
I_{ant}
I_g
10
I_{ant}
(A)
7,5
5
2,5
0

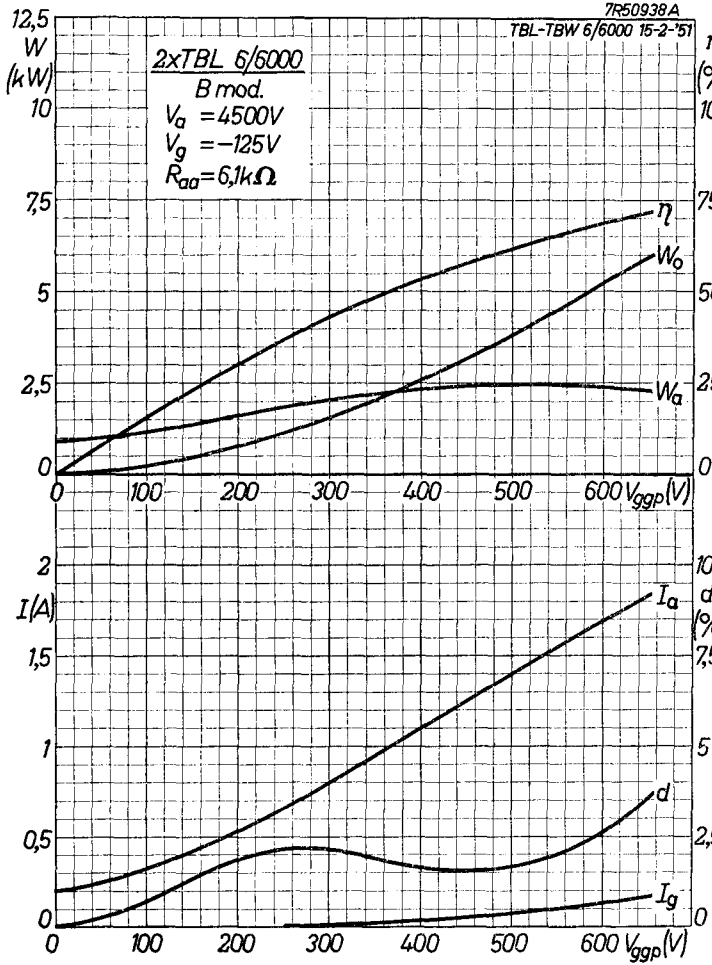

7R50935
TBL-TBW 6/6000 15-2-'51
12,5
W
(kW)
10
7,5
5
2,5
0
B teleph.
λ = 4m
Va = 5000V
Vg = −145V
Wo
Wa
0
100
200
300
400
500
600
Vgp(V)
2
Ia, Ig
(A)
1,5
1
0,5
0
10
Iant
(A)
7,5
5
2,5
0
Ia
Iant
Ig
0
100
200
300
400
500
600
Vgp(V)

PHILIPS

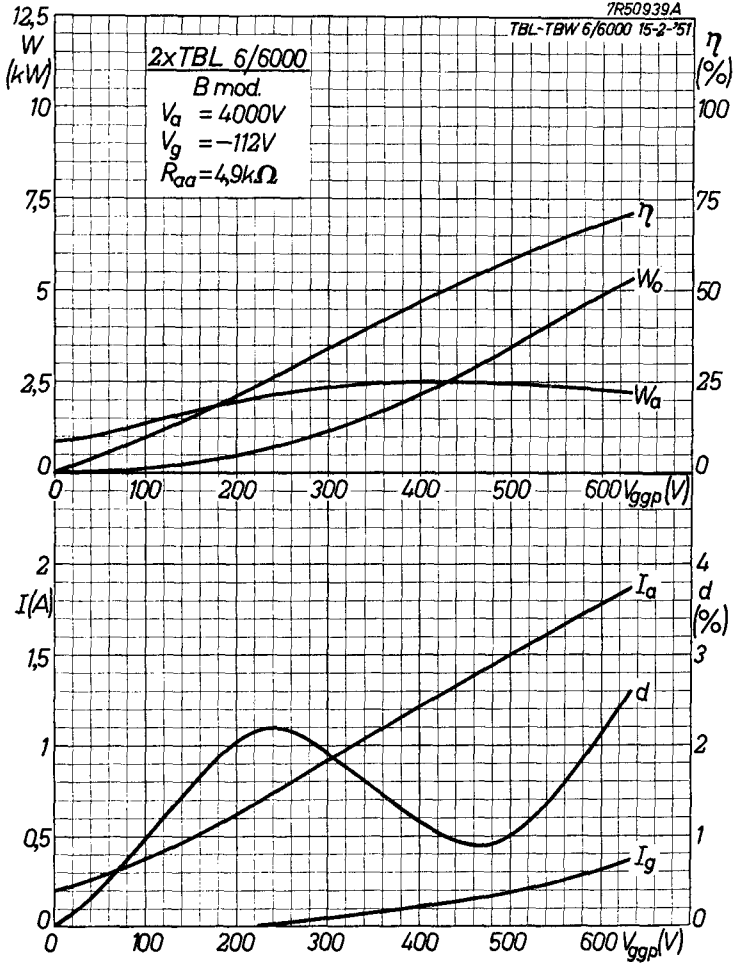

7R50936A
TBL-TBW 6/6000 15-2-'51
2xTBL 6/6000
B mod.
V_a = 6000V
V_g = −165V
R_{aa} = 4,9kΩ
W (kW)
17,5
15
12,5
10
7,5
5
2,5
0
W_o
W_a
η
η (%)
100
75
50
25
0
200
400
600
800
V_{ggp}(V)
1000
I(A)
3,5
3
2,5
2
1,5
1
0,5
I_a
I_g
d
d(%)
7
6
5
4
3
2
1


7R50937A
TBL-TBW 6/6000 15-2-'51
2xTBL 6/6000
B mod.
V_a = 5000V
V_g = −138V
R_{aa} = 6,4kΩ
W (kW)
η (%)
12,5
10
7,5
5
2,5
0
100
75
50
25
0
η
W_o
W_a
0
100
200
300
400
500
600
V_{ggp}(V)
I(A)
d (%)
2
1,5
1
0,5
0
4
3
2
1
0
I_a
d
I_g
0
100
200
300
400
500
600
V_{ggp}(V)

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7R50938A
TBL-TBW 6/6000 15-2-'51
2xTBL 6/6000
B mod.
V_a = 4500V
V_g = −125V
R_{aa} = 6,1kΩ
12,5
W
(kW)
10
7,5
5
2,5
0
η
(%)
100
75
50
25
0
η
W_o
W_a
0
100
200
300
400
500
600 V_{ggp}(V)
2
I(A)
1,5
1
0,5
0
10
d
(%)
7,5
5
2,5
0
I_a
d
I_g
0
100
200
300
400
500
600 V_{ggp}(V)

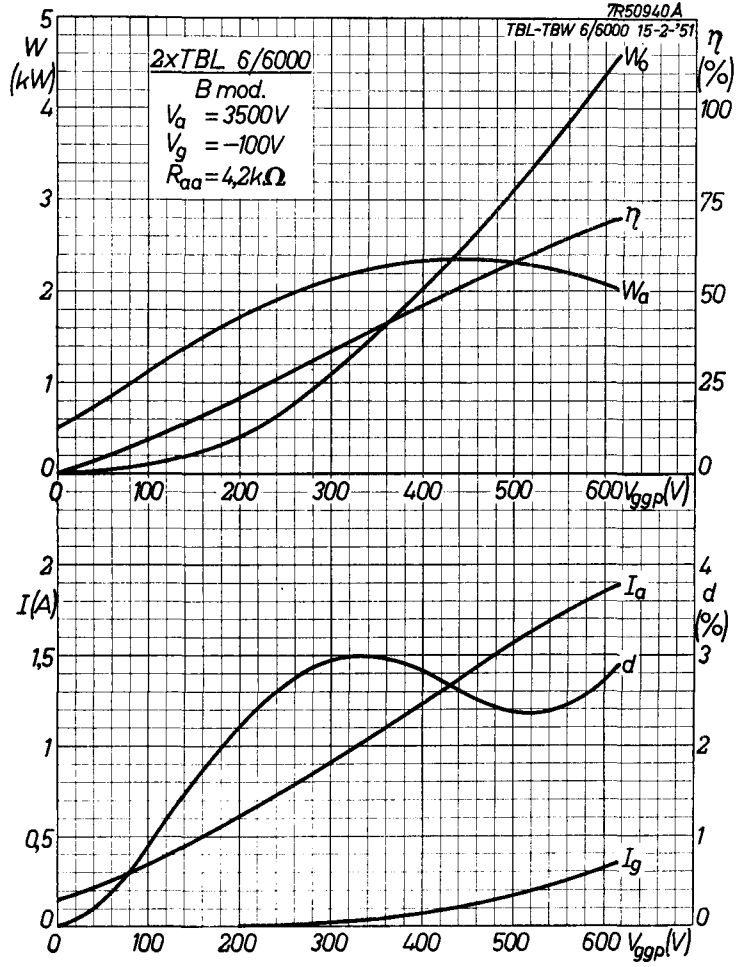
J

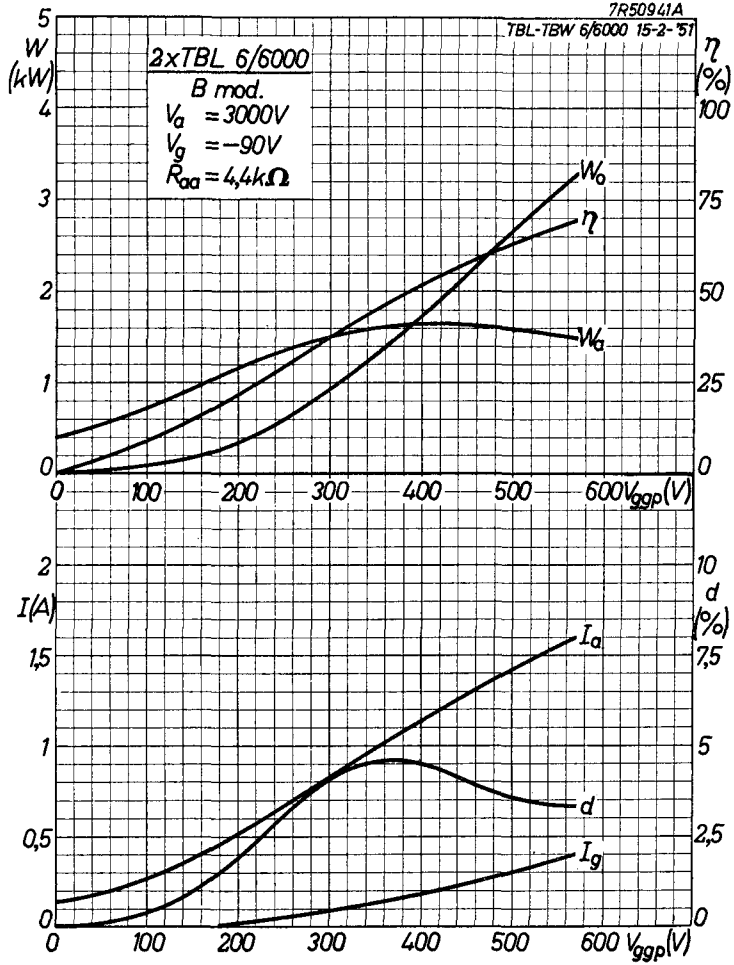

7R50939A
TBL-TBW 6/6000 15-2-'51
2xTBL 6/6000
B mod.
V_a = 4000V
V_g = −112V
R_{aa} = 4,9kΩ
12,5
W
(kW)
10
7,5
5
2,5
0
η
(%)
100
75
50
25
0
W_o
W_a
0 100 200 300 400 500 600 V_{ggp}(V)
2
I(A)
1,5
1
0,5
0
4
d
(%)
3
2
1
0
I_a
d
I_g
0 100 200 300 400 500 600 V_{ggp}(V)

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K

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7R50940A
TBL-TBW 6/6000 15-2-'51
2xTBL 6/6000
B mod.
V_a = 3500V
V_g = −100V
R_{aa} = 4,2kΩ
W (kW)
η (%)
W_o
η
W_a
V_{ggp}(V)
I(A)
d (%)
I_a
d
I_g


7R50941A
TBL-TBW 6/6000 15-2-'51
2xTBL 6/6000
B mod.
V_a = 3000V
V_g = −90V
R_{aa} = 4,4kΩ
W (kW)
η (%)
W_o
η
W_a
V_{ggp} (V)
I (A)
d (%)
I_a
d
I_g

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M

TBL 6/6000

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Electronic Tube

HANDBOOK

TBL6/6000

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4	4	1959.02.02
5	5	1954.07.07
6	6	1954.07.07
7	7	1954.07.07
8	8	1954.07.07
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10	10	1954.07.07
11	11	1954.07.07
12	12	1954.07.07
13	13	1954.07.07
14	14	1954.07.07
15	15	1954.07.07
16	A	1958.07.07
17	B	1958.07.07
18	C	1958.07.07
19	D	1958.07.07

20	E	1954.07.07
21	F	1954.07.07
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23	H	1954.07.07
24	I	1954.07.07
25	J	1954.07.07
26	K	1954.07.07
27	L	1954.07.07
28	M	1954.07.07
29	N	1954.07.07
30	O	1954.07.07
31, 32	FP	2000.02.07

RF POWER TRIODE

Air-cooled triode for use in industrial RF generators and in telegraphy and telephony transmitters.

QUICK REFERENCE DATA

		class-C				class-B	
		telegraphy		oscillator		modulator*	
λ	freq.	V_a	W_o	V_a	W_o	V_a	W_o
m	MHz	kV	kW	kV	kW	kV	kW
10	30	6,5	9,5			7,0	20
		6,0	8,5			5,0	9,0
		5,0	7,1			4,0	7,1
6	50			6,0	6,0		

COOLING: forced air

HEATING: direct; thoriated tungsten filament

Filament voltage	V_f	=	12,6 V
Filament current	I_f	=	33 A

The filament is designed to accept temporary fluctuations of +5% and −10%

CAPACITANCES

Anode to all other elements except grid	C_a	=	0,3 pF
Grid to all other elements except anode	C_g	=	16 pF
Anode to grid	C_{ag}	=	11 pF

TYPICAL CHARACTERISTICS

Anode voltage	V_a	=	6 kV
Anode current	I_a	=	1 A
Mutual conductance	S	=	15 mA/V
Amplification factor	μ	=	32

* Two tubes.

Table 1 Air cooling characteristics

W_a	h	T_i max.	q min.	ΔP
kW	m	°C	m^3/min	Pa*
2	0	35	4,8	200
	0	45	5,7	250
	1500	35	5,7	230
	3000	25	6,1	230
3,5	0	35	6,2	320
	0	45	7,3	420
	1500	35	7,3	360
	3000	25	7,8	360
6	0	35	9,2	680
	0	45	10,7	910
	1500	35	11,2	810
	3000	25	11,7	800

Temperature of filament seals	max.	210 °C
Temperature of grid and anode seals	max.	180 °C

ACCESSORIES

Filament connectors	40634
Connector for centre pin of filament	40649*
Grid connector	40650** or 40622
Insulating pedestal	40630

* 1 pA ≈ 0,1 mm H_2O.

* The centre-tap f_c (diameter 10,5 mm, marked O) must not be used for filament current supply. Connector type 40649, however, must be used for the cooling of this pin.

** Connector 40650 should only be used below 30 MHz.

MECHANICAL DATA

Dimensions in mm

Mounting position: vertical with anode up or down

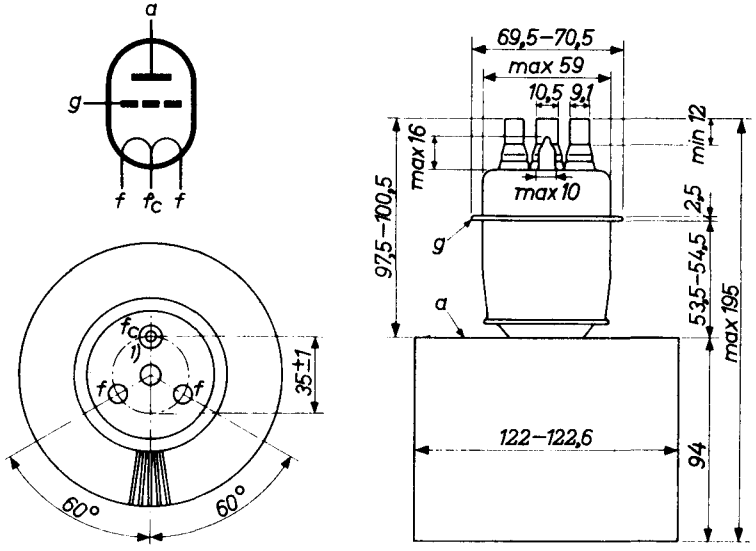


Fig. 1 Mechanical outline.

For further data and curves (except cooling curves) please refer to type TBW7/8000

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Data handbook

Electronic components and materials

TBL7/8000

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3	125	1988.02
4	FP	2000.09.22

TRIODE for use in industrial R.F. generators
TRIODE pour l'utilisation dans les générateurs H.F. industriels
TRIODE zur Verwendung in HF-Industriegeneratoren

Cooling : Forced air
Refroidissement: Par ventilation forcée
Kühlung : Druckluftkühlung

Filament : thoriated tungsten
Filament : tungstène thorié
Heizfaden: thoriertes Wolfram

Heating : direct
Chauffage: direct
Heizung : direkt

V_f = 12,6 V $^{+5}_{-10}$ %
I_f = 32 A

Capacitances
Capacités
Kapazitäten

C_a = 0,4 pF
C_g = 13,5 pF
C_{ag} = 7,4 pF

Typical characteristics
Caractéristiques types
Kenndaten

V_a = 6 kV
I_a = 1 A
S = 12 mA/V
μ = 24

	TBL7/9000	40630
Net weight Poids net Nettogewicht	4,4 kg	2,1 kg
Shipping weight Poids brut Bruttogewicht	10 kg	3,1 kg

Temperatures and cooling
Températures et refroidissement
Temperaturen und Kühlung

Temperature of anode and seals
Température de l'anode et des scellements = max. 220°C
Temperatur der Anode und der Einschmelzungen

Cooling characteristics for continuous service
Caractéristiques de refroidissement pour service continu
Kühldaten für Dauerbetrieb

For intermittent service see page B
Pour service intermittent voir page B
Für aussetzenden Betrieb siehe Seite B

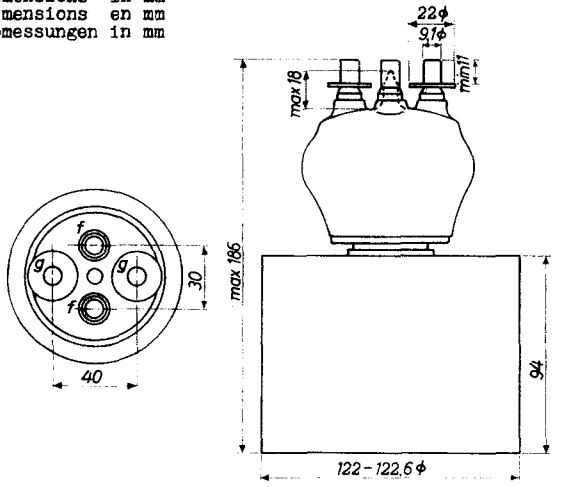
Wa (kW)	h (m)	ti (°C)	qmin (m^3/min.)	Pi (mm H_2O)
2	0	35	4,8	20
	0	45	5,7	25
	1500	35	5,7	23
	3000	25	6,1	23
4	0	35	6,8	38
	0	45	7,9	49
	1500	35	7,8	42
	3000	25	8,4	42
6	0	35	9,2	68
	0	45	10,7	90
	1500	35	11,2	81
	3000	25	11,7	81

At frequencies above 4 Mc/s both grid terminals should be connected in parallel. At the highest frequencies care should be taken to distribute the R.F. current equally over both grid terminals to avoid excessive grid seal temperatures

Aux fréquences supérieures à 4 MHz les deux broches de la grille doivent être reliées en parallèle. Aux fréquences les plus élevées il faut prendre soin à distribuer le courant H.F. uniformément entre les deux broches de la grille pour éviter des températures excessives des scellements de la grille

Bei Frequenzen höher als 4 MHz müssen die beiden Gitteranschlüsse parallelgeschaltet werden. Zur Vermeidung einer zu hohen Temperatur der Gittereinschmelzungen muss bei den höchsten Frequenzen der HF-Strom gleichmässig über die beiden Gitteranschlüsse verteilt werden.

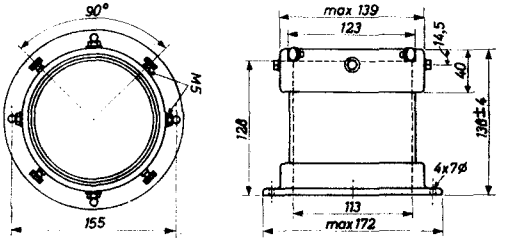
Dimensions in mm
Dimensions en mm
Abmessungen in mm



Accessories
Accessoires
Zubehör

Clip for grid and filament
Bornes de connexion pour la grille et le filament 40634
Anschlussklemme für Gitter und Heizfaden

Insulating pedestal (See figure below)
Support isolant (Voir croquis ci-dessous) 40630
Isoliersockel (Siehe untenstehende Masskizze)



H.F. class C oscillator for industrial use with anode voltage from three-phase rectifier without filter (Continuous service)
Oscillatrice H.F. classe C pour applications industrielles avec tension anodique dérivée d'un redresseur triphasé sans filtre (service continu).
HF-Klasse C Oszillator für industrielle Anwendungen mit der Anodenspannung von einem Dreiphasen-Gleichrichter ohne Filter abgenommen

Limiting values (Absolute limits)
Caractéristiques limites (Limites absolues)
Grenzdaten (Absolute Grenzwerte)

f	= max. 50 Mc/s		
V_a	= max. 8 kV	$-V_g$	= max. 1250 V
W_{i_a}	= max. 12 kW	I_g	= max. 0,4 A [1]
W_a	= max. 6 kW	I_g	= max. 0,5 A [2]
I_a	= max. 1,8 A	R_g	= max. 10 kΩ

Operating characteristics
Caractéristiques d'utilisation
Betriebsdaten

f	=	50	50 Mc/s
V_a	=	7200	6200 V
I_a	=	1,5	1,4 A [1]
I_a	=	0,37	0,40 A [2]
I_g	=	0,36	0,37 A [1]
I_g	=	0,47	0,47 A [2]
R_g	=	1850	1500 Ω
$Ra_\sim$	=	2300	2100 Ω
$V_{g\sim}/V_{a\sim}$	=	17	17 %
W_{i_a}	=	10,8	8,68 kW
W_a	=	3,3	2,5 kW
η	=	70	71 %
W_ℓ	=	6,1	5,0 kW [3]

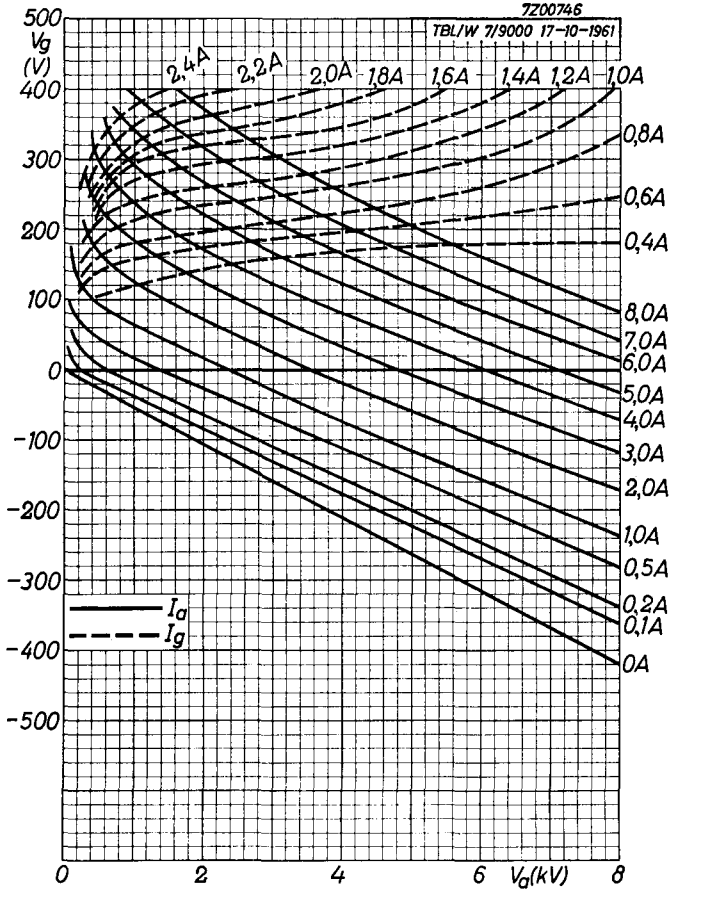
[1]) Loaded; chargé; belastet

[2]) Unloaded; sans charge; unbelastet

[3]) Useful power in the load, measured in a circuit having an efficiency of about 85 %
Puissance utile dans la charge, mesurée dans un circuit avec un rendement d'environ 85 %
Nutzleistung in der Belastung, gemessen in einer Schaltung mit einem Wirkungsgrad von 85 %.

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TBL 7/9000



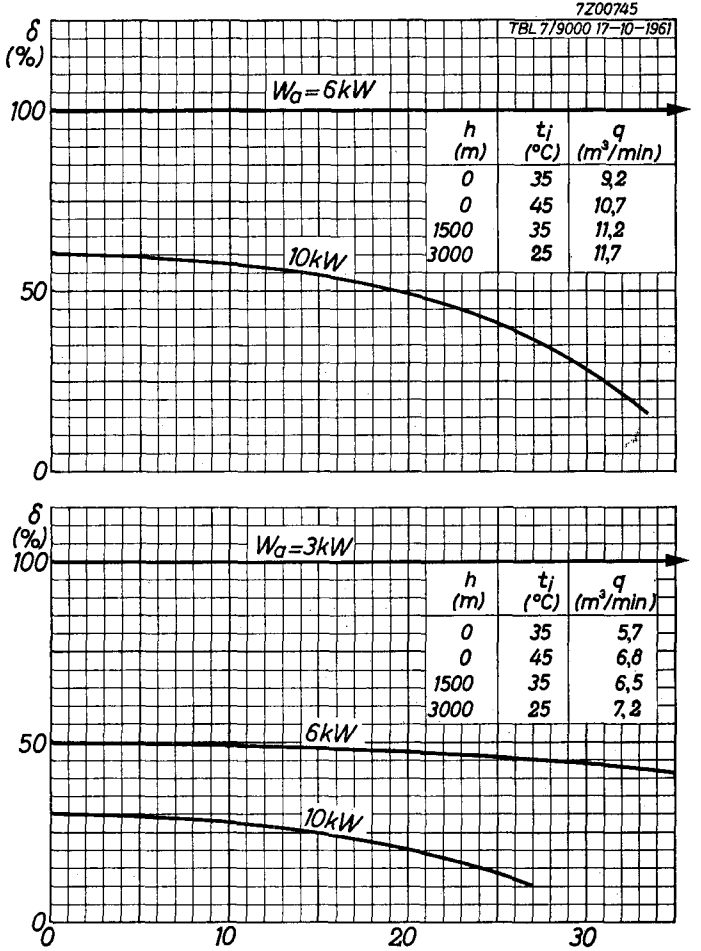
10.10.1961

A

TBL 7/9000

PHILIPS

7Z00745
TBL 7/9000 17-10-1961



B

PHILIPS

Electronic Tube

HANDBOOK

TBL7/9000

page	sheet	date
1	1	1963.02.02
2	2	1963.02.02
3	3	1963.02.02
4	4	1963.02.02
5	A	1961.10.10
6	B	1961.10.10
7	FP	2000.02.07

TRIODE for use as H.F. or L.F. amplifier or oscillator
TRIODE pour utilisation en amplificatrice H.F. ou B.F. ou en oscillatrice
TRIODE zur Verwendung als HF- oder NF-Verstärker oder Oszillator

Cooling : water/air flow to seals
Refroidissement: circulation d'eau/air aux scellements
Kühlung : Wasser/Luftstrom auf Einschmelzungen

Filament : thoriated tungsten
Filament : tungstène thorié
Heizfaden: thoriertes Wolfram

Heating : direct
Chauffage: direct
Heizung : direkt

V_f = 17,5 V
I_f = 196 A

Filament current must never exceed a peak value of 420 A at any time during initial energising schedule
Le courant d'enclenchement ne doit jamais dépasser une valeur de crête de 420 A
Der Anlaufstrom darf niemals einen Scheitelwert von 420 A überschreiten

Capacitances
Capacités
Kapazitäten

C_a = 3,4 pF
C_g = 116 pF
C_{ag} = 86 pF

Typical characteristics
Caractéristiques types
Kenndaten

μ (I_a= 5 A ; V_a=10 kV) = 27
S (I_a= 5 A ; V_a=10 kV) = 50 mA/V
S_{max} (I_a=50 A ; V_a= 3 kV) = 92 mA/V

λ	Freq.	C telegr.		B teleph.		C an.mod.		B mod.[1]	
m	Mc/s	V_a (kV)	W_o (kW)	V_a (kV)	W_o (kW)	V_a (kV)	W_o (kW)	$\hat{V}_a$ (kV)	W_o (kW)
20	15	12	108	12	51,5	10	80	12	202
15	20	12	94,5			10	54,5	10	116
12	25	11	70			9	42,5	10	77
11	27,5	10,5	59			8,5	36,5	9	62
10	30	10	50			8	31	8,5	54
								8	46,8

Television, télévision
Fernsehen

neg.mod. pos.synchr.		
Freq. (Mc/s)	V_a (kV)	W_o sync (kW)
48-68	6,5	100[2])

[1]) Two tubes ; deux tubes; Zwei Röhren

[2]) Power transferred from driving stage included
Y compris l'énergie transmise de l'étage pré-amplificateur
Einschliesslich der vom Vorverstärker übertragenen Leistung.

Cooling characteristics
Caractéristiques du refroidissement
Kühlungsdaten

W_a (kW)	t_i (°C)	q_{min} [1] (l/min)	p_i (atm)	
30	20	25	0,15	See cooling curves Voir les courbes de refroidissement Siehe die Kühlungskurven
	50	45	0,45	
50	20	32	0,25	
	50	65	0,85	
100	20	55	0,6	
	50	120	3	

t_i = max. 50 °C

temperature of seals
temp. des scellements
Temp. der Einschmelzungen
} = max. 180 °C

To keep the seal temperatures below 180 °C it will often be necessary to direct an air flow of sufficient velocity to the seals. This air flow must be started upon or before application of the filament voltage.

Anode- and grid seals can be cooled by connecting a blower of suitable size to the air inlet of the anti-corona ring, attached to the valve. At frequencies below 6 Mc/s, ai cooling will, as a rule, not be necessary. Above 6 Mc/s air cooling must be used in order to prevent overheating of anode- and grid seals. At maximum frequency (30 Mc/s) and the published operating conditions at least 2.5 m^3 (95 cub.ft.) per minute is required with a pressure loss of about 500 mm (20 inch) water column.

When using the special filament connectors type no. 40628, together with connecting leads of adequate cross-section, additional air cooling of the filament terminals is, as a rule, not necessary.

Care should be taken to ensure firm contact of the filament terminals in order to obtain equal distribution of current over these terminals.

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[1]) At temperatures t_i between 20 and 50 °C the required quantity of water can be found by proportional interpolation.

Le débit d'eau aux températures t_i entre 20 et 50 °C peut être calculé par interpolation linéaire.

Die benötigte Wassermenge für Temperaturwerte t_i zwischen 20 und 50 °C kann durch Proportionalinterpolation berechnet werden.

Dans bien des cas un courant d'air à vitesse suffisante sera nécessaire, afin que la température des scellements ne dépasse pas 180 °C. Ce courant d'air doit être mis en marche en même temps ou avant l'application de la tension du filament.

On peut refroidir les scellements de l'anode et de la grille en reliant un ventilateur d'une capacité appropriée à l'entrée d'air de l'anneau protecteur fixé au tube. En général, le refroidissement par air ne sera pas nécessaire au dessous de 6 Mc/s. Pour les fréquences supérieures à 6 Mc/s le refroidissement par air est indispensable pour éviter le surchauffage des scellements. A la fréquence maximum (30 Mc/s) et aux caractéristiques d'utilisation publiées ci-après, le débit d'air devra être 2,5 m^3/min au moins avec une perte de charge d'environ 500 mm d'eau.

Généralement, le refroidissement additionnel des scellements du filament n'est pas nécessaire en utilisant les bornes de connexion spéciales no. de type 40628 et des câbles de raccordement d'une section suffisante.

Il faut veiller à un bon contact des bornes de connexion du filament pour assurer une répartition uniforme du courant sur ces bornes.

In vielen Fällen ist ein auf die Einschmelzungen gerichteter genügend starker Luftstrom notwendig, damit die Höchsttemperatur der Einschmelzungen 180 °C nicht überschreitet. Dieser Luftstrom muss vor oder gleichzeitig mit der Heizfadenspannung eingeschaltet werden.

Die Anoden- und Gitterverschmelzung kann durch ein geeignetes Gebläse gekühlt werden, das mit dem Lufteinlass des Anodenschutzringes verbunden wird. Im allgemeinen brauchen die Verschmelzungen bei Frequenzen bis zu 6 MHz nicht gekühlt zu werden. Bei Frequenzen höher als 6 MHz ist jedoch zur Vermeidung einer Überhitzung der Anoden- und Gitterverschmelzung eine zusätzliche Kühlung erforderlich.
Bei der Höchstfrequenz (30 MHz) und den angegebenen Betriebsdaten ist mindestens 2,5 m^3/min bei einem Druckverlust von ungefähr 500 mm Wassersäule erforderlich.

Im allgemeinen bedürfen die Heizfadenstifte keiner zusätzlichen Kühlung, vorausgesetzt, dass die Anschlussklemmen Typ No. 40628 verwendet werden, und der Leitungsquerschnitt genügend gross bemessen ist.

Es ist darauf zu achten, dass die Heizfadenanschlüsse guten Kontakt geben, damit eine gleichmässige Stromverteilung über die Anschlussklemmen gewährleistet ist.

Water-jacket
Refroidisseur
Kühltopf K 714

Clips for filament
Bornes de connexion pour le filament 40628
Anschlussklemmen für den Heizfaden

When connecting the filament the three pins of each group must be joined
Toutes les broches de chaque groupe doivent être réunies en connectant le filament
Der Anschluss des Heizfadens muss an allen Stiften beider Gruppen erfolgen

Mounting position: vertical with anode down
Montage : vertical avec l'anode en bas
Einbau : senkrecht mit der Anode unten

Tube
Röhre

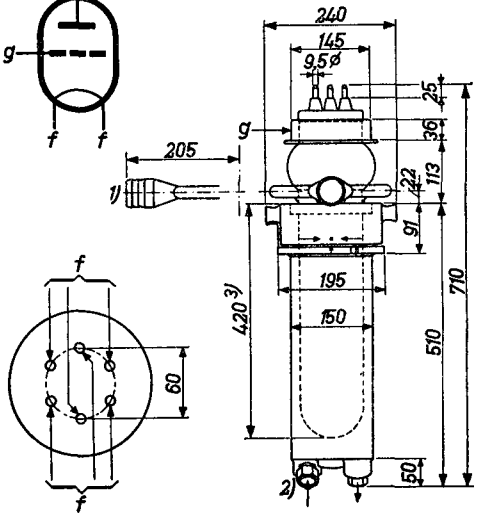
Net weight / Poids net / Nettogewicht		Shipping weight / Poids brut / Bruttogewicht	
	14 kg		82 kg

Water-jacket
Refroidisseur
Kühltopf

Net weight / Poids net / Nettogewicht		Shipping weight / Poids brut / Bruttogewicht	
	20,5 kg		39 kg

Valve mounted in water-jacket type K 714
Tube monté dans le refroidisseur type K 714
Röhre in Kühltopf Typ K 714 montiert

Dimensions in mm
Dimensions en mm
Abmessungen in mm



1) Use connecting hose with an inner diameter of 1¾"
Pour un tuyau flexible d'un diamètre intérieur de 1¾ pouces
Für Schlauch von 1¾ Zoll Innendurchmesser

2) Coupling for metal tubing with an outer diameter of 28 mm
Raccord pour un tuyau d'un diamètre extérieur de 28 mm
Anschluss für Rohr mit Aussendurchmesser von 28 mm

3) For **removing the valve** from its water-jacket the free height above the valve must be at least 420 mm
Pour enlever le tube la hauteur libre au dessus du tube doit être 420 mm au moins
Zum Herausnehmen der Röhre ist eine freie Höhe von mindestens 420 mm oberhalb der Röhre erforderlich

H.F. class C telegraphy
H.F. classe C télégraphie
HF - Klasse C Telegrafie

Limiting values Caractéristiques limites Grenzdaten				max. V_a = 15 kV[1] $-V_g$=1200 V I_a = 12 A		max. I_g = 3 A W_{ia}=162 kW W_a = 50 kW
Operating conditions Caractéristiques d'utilisation Betriebsdaten						
λ	=	20	15	12	11	10 m
f	=	15	20	25	27,5	30 Mc/s
V_a	=	12	12	11	10,5	10 kV
V_g	=	-1000	-1000	-900	-850	-800 V
I_a	=	12	10,5	8,5	7,5	6,7 A
I_g	=	2,25	2	1,6	1,5	1,4 A
V_{gp}	=	1700	1650	1450	1350	1300 V
W_{ig}	=	3,5	3	2,1	1,9	1,7 kW
W_{ia}	=	144	126	93,5	79	67 kW
W_a	=	36	31,5	23,5	20	17 kW
W_o	=	108	94,5	70	59	50 kW
η	=	75	75	75	75	75 %

H.F. class B telephony
H.F. classe B téléphonie
HF - Klasse B Telefonie

Limiting values Caractéristiques limites Grenzdaten		max. V_a = 15 kV[1] I_a = 12,5 A W_{ia} = 150 kW W_a = 100 kW
Operating conditions Caractéristiques d'utilisation Betriebsdaten		
λ	=	20 m
f	=	15 Mc/s
V_a	=	12 kV
V_g	=	-420 V
I_a	=	12,2 A
V_{gp}	=	700 V
W_{ia}	=	146 kW
W_a	=	94,5 kW
W_o	=	51,5 kW
η	=	35 %
m	=	100 %
I_g	=	4,5 A
W_{ig}	=	5,7 kW

[1]) See page 7; voir page 7; siehe Seite 7

H.F.class C anode modulation
H.F.classe C modulation d'anode
HF Klasse C Anodenmodulation

Limiting values
Caractéristiques limites
Grenzdaten

f = max. 15 Mc/s		f = max. 20 Mc/s	
V_a	= max. 10 kV	V_a	= max. 10 kV
$-V_g$	= max. 1200 V	W_{ia}	= max. 80 kW
I_a	= max. 10,5 A		
I_g	= max. 3,5 A	f = max. 30 Mc/s	
W_{ia}	= max. 105 kW	V_a	= max. 8 kV
W_a	= max. 30 kW	W_{ia}	= max. 50 kW

Operating conditions
Caractéristiques d'utilisation
Betriebsdaten

f	=	15	15	20	25	27,5	30 Mc/s
V_a	=	10	10	10	9	8,5	8 kV
V_{g1} [2]	=	-1050	-1050	-1050	-925	-900	-850 V
I_a	=	10,5	8,5	7,0	6,2	5,7	5,25 A
I_g	=	3,5	2,6	2,0	2,0	1,9	1,8 A
V_{gp}	=	1960	1750	1650	1500	1450	1400 V
W_{ig}	=	6,2	4,1	3,0	2,7	2,5	2,3 kW
W_{ia}	=	105	85	70	56	48,5	42 kW
W_a	=	25	17	15,5	13,5	12	11 kW
W_o	=	80	68	54,5	42,5	36,5	31 kW
η	=	76	80	78	76	75	74 %
m	=	100	100	100	100	100	100 %
W_{mod}	=	52,5	42,5	35	28	24,5	21 kW

1) Up to 4 Mc/s. Up to 15 Mc/s V_a = max. 13.5 kV
Jusqu'à 4 Mc/s. Jusqu'à 15 Mc/s V_a = max. 13,5 kV
Bis 4 MHz. Bis 15 MHz V_a = max. 13,5 kV

2) Grid bias partially obtained by the grid resistor
Polarisation de grille obtenue partiellement par la résistance de grille
Gittervorspannung, teilweise durch den Gitterwiderstand erzeugt

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L.F. class B amplifier and modulator
Amplificatrice et modulatrice B.F. classe B
NF - Verstärker und Modulator Klasse B

Limiting values
Caractéristiques limites
Grenzdaten

		max.	
V_a	=	15	kV
I_a	=	12	A
W_{ia}	=	162	kW
W_a	=	50	kW
R_g	=	20	kΩ

Operating conditions, two valves
Caractéristiques d'utilisation, deux tubes
Betriebsdaten, zwei Röhren

V_a	=	12		10		10		kV
V_g	=	-450		-375		-400		V
R_{aa}	=	1200		1500		2060		Ω
V_{gsp}	=	0	2060	0	1680	0	1460	V
I_a	=	2x0,65	2x12	2x0,5	2x7,9	2x0,2	2x5,4	A
I_g	=	0	2x2,5	0	2x1,9	0	2x0,7	A
W_{ig}	=	0	2x2,4	0	2x1,44	0	2x0,5	kW
W_{ia}	=	2x7,8	2x144	2x5	2x79	2x2	2x54	kW
W_a	=	2x7,8	2x43	2x5	2x21	2x2	2x15,5	kW
W_o	=	0	202	0	116	0	77	kW
η	=	-	70	-	75	-	71	%

V_a	=	9		8,5		8		kV
V_g	=	-350		-325		-300		V
R_{aa}	=	2080		2120		2210		Ω
V_{gsp}	=	0	1300	0	1200	0	1120	V
I_a	=	2x0,25	2x4,8	2x0,25	2x4,4	2x0,25	2x4,1	A
I_g	=	0	2x0,65	0	2x0,55	0	2x0,4	A
W_{ig}	=	0	2x0,4	0	2x0,3	0	2x0,25	kW
W_{ia}	=	2x2,25	2x43,2	2x2,1	2x37,4	2x2	2x32,8	kW
W_a	=	2x2,25	2x12,2	2x2,1	2x10,4	2x2	2x9,4	kW
W_o	=	0	62	0	54	0	46,8	kW
η	=	-	72	-	72	-	71	%

H.F. class B amplifier for television service, negative modulation, positive synchronisation
Amplificatrice H.F. classe B pour télévision, modulation négative, synchronisation positive
HF Klasse B Verstärker für Fernsehsender, negative Modulation, positive Synchronisierung

Limiting values
Caractéristiques limites
Grenzdaten

f		= max.	68 Mc/s
V_a		= max.	6,5 kV
I_a	sync	= max.	16 A
W_{ia}	sync	= max.	100 kW
W_a	sync	= max.	50 kW
I_g	sync	= max.	2 A

Operating conditions, two tubes in push-pull
Caractéristiques d'utilisation, deux tubes en push-pull
Betriebsdaten, zwei Röhren in Gegentakt

f		=	48-68 Mc/s[1]
B (-1,5 db)		=	5,5 Mc/s[2]
B (-3 db)		=	7,5 Mc/s[2]
V_a		=	6,5 kV
V_g		=	-250 V
V_{gg_p}	sync	=	1740 V[3]
	black, noir, schwarz	=	1300 V[3]
I_a	sync	=	32 A
	black, noir, schwarz	=	24 A
I_g	sync	=	3,4 A
	black, noir, schwarz	=	2,2 A
W_{ig}	sync	=	22,4 kW[4]
W_o	sync	=	80+20 kW[5]
	black, noir, schwarz	=	45+11 kW[5]

[1])...[5]) See page 10; voir page 10; siehe Seite 10

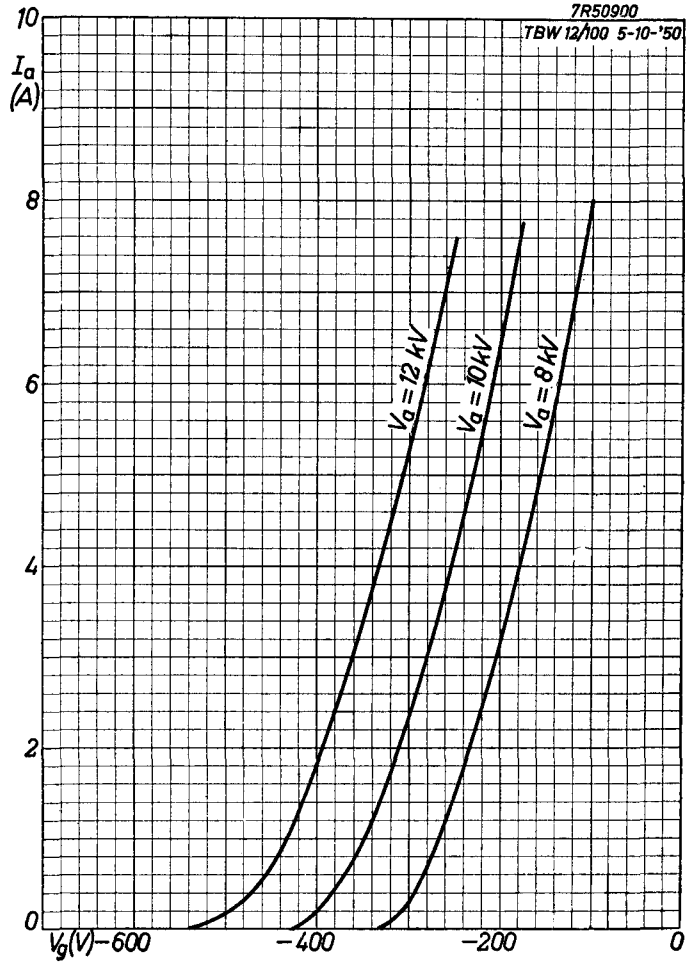
[1]) In the frequency range of 60-68 Mc/s a special version of the tube is necessary
Pour la gamme de fréquences de 60-68 Mc/s une exécution speciale du tube est nécessaire
Für das Frequenzbereich von 60-68 MHz ist eine spezielle Ausführung der Röhre erforderlich

[2]) This value of bandwidth is based on measurements on a circuit with a single LC section
Cette valeur de la largeur de bande se rapporte à des mesures à un montage avec un seul circuit LC.
Dieser Wert der Bandbreite bezieht sich auf Messungen an einer Schaltung mit einem einzigen LC-Kreis.

[3]) Measured by the slide back method
Mesuré par la méthode de glissement de la tension de polarisation
Gemessen mittels Verschiebung der Gittervorspannung

[4]) Driving power is accounted for largely by circuit losses. The indicated driving power is required to take care of losses in damping resistors, circuit losses and tube driving power
La puissance d'entrée est nécessaire pour la plupart pour les pertes dans le circuit. La puissance mentionnée est nécessaire pour les pertes dans les résistances d'amortissement, dans le circuit et pour la puissance d'entrée du tube
Die Eingangsleistung ist grossenteils nötig für die Verluste in der Schaltung. Die genannte Leistung ist nötig für die Verluste in Dämpfungswiderständen, in Kreisen und für die Eingangsleistung der Röhre

[5]) Power transferred from driving stage included
Y compris l'énergie transmise de l'étage pre-amplificateur
Einschliesslich der vom Vorverstärker übertragenen Leistung

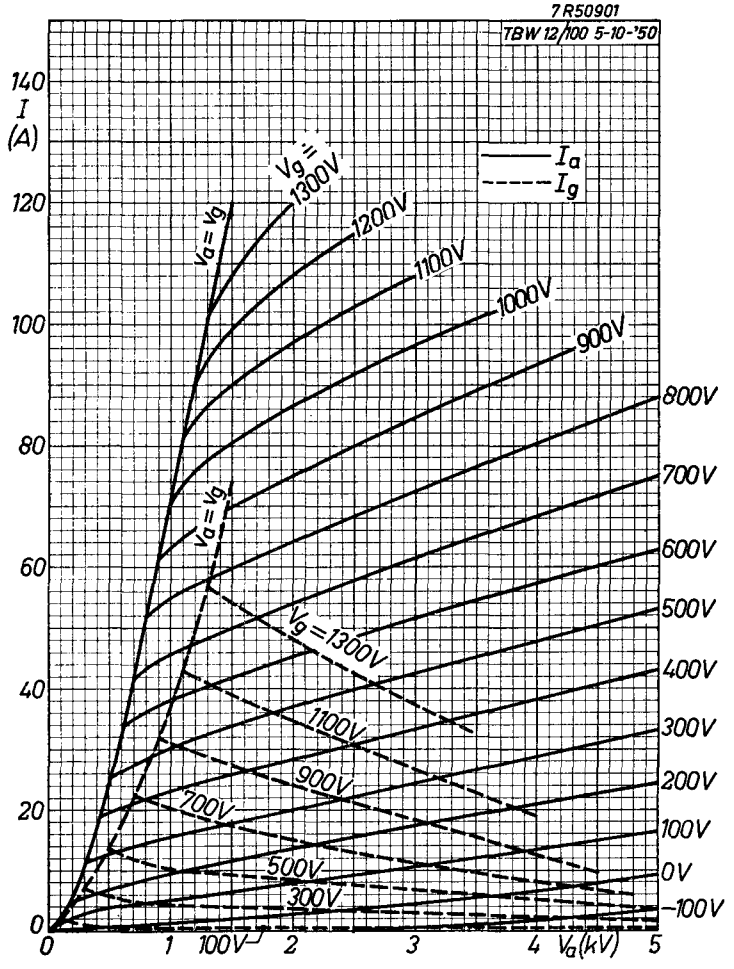

7R50900
TBW 12/100 5-10-'50
I_a (A)
10
8
6
4
2
0
V_a = 12 kV
V_a = 10 kV
V_a = 8 kV
V_g(V) −600
−400
−200
0

7.7.1954

A

TBW 12/100

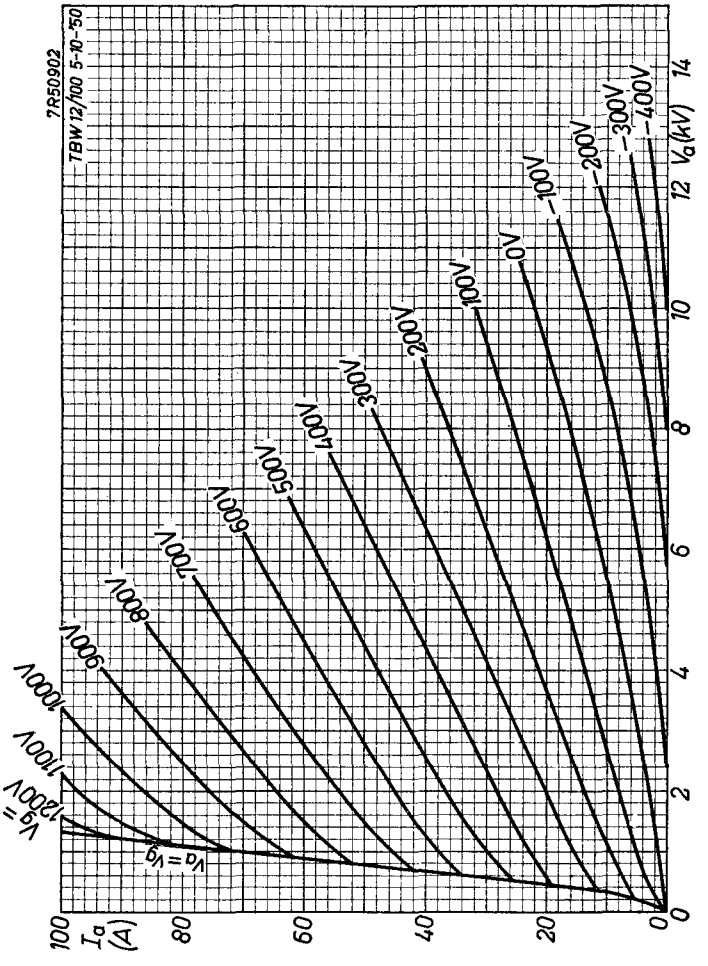
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B

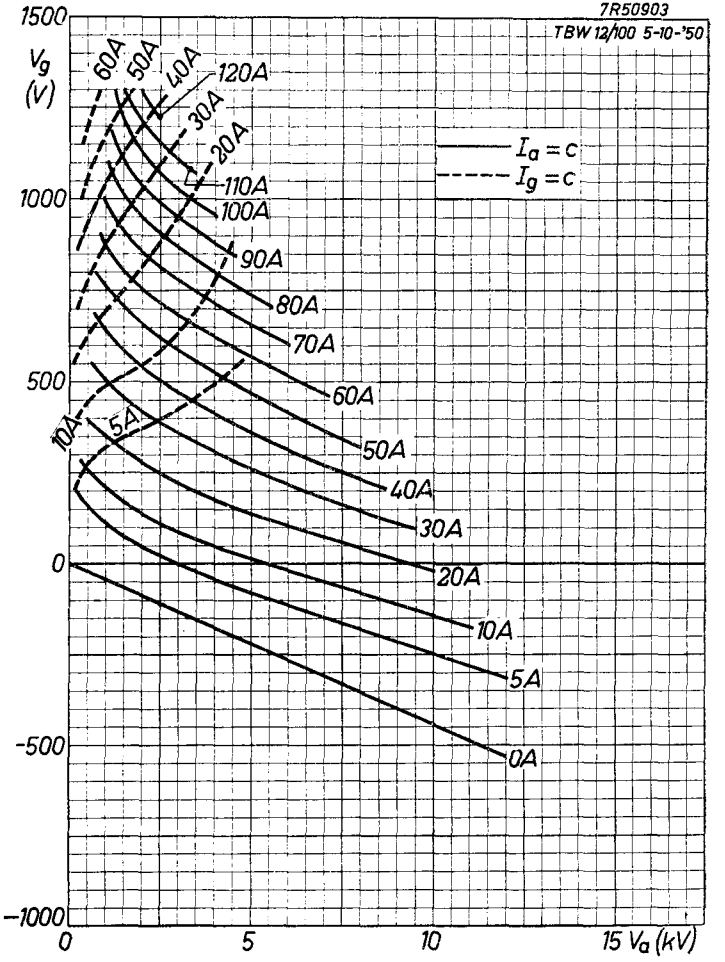
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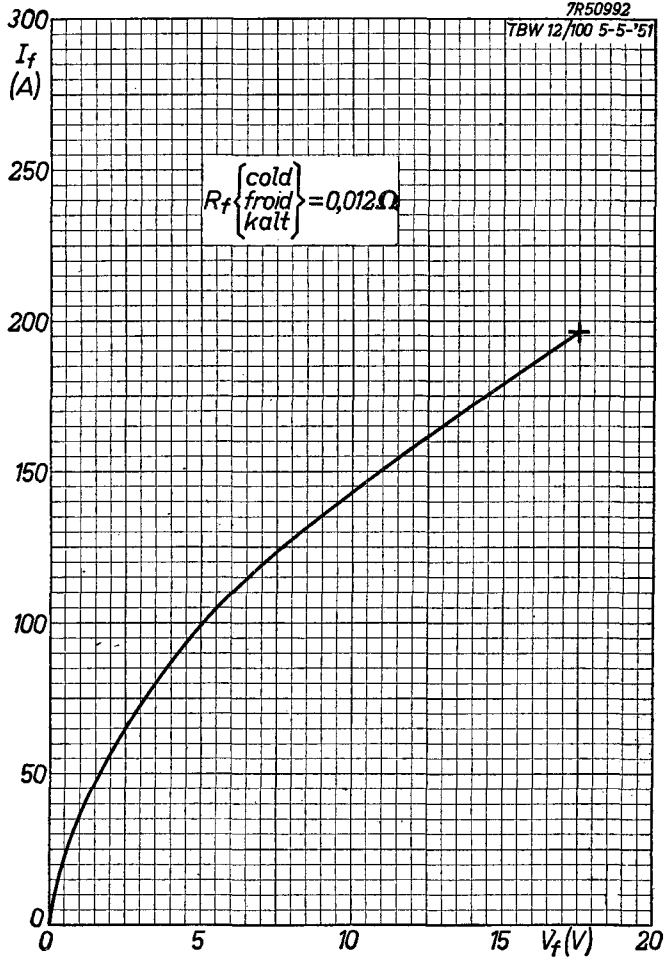
TBW 12/100



7.7.1954

C

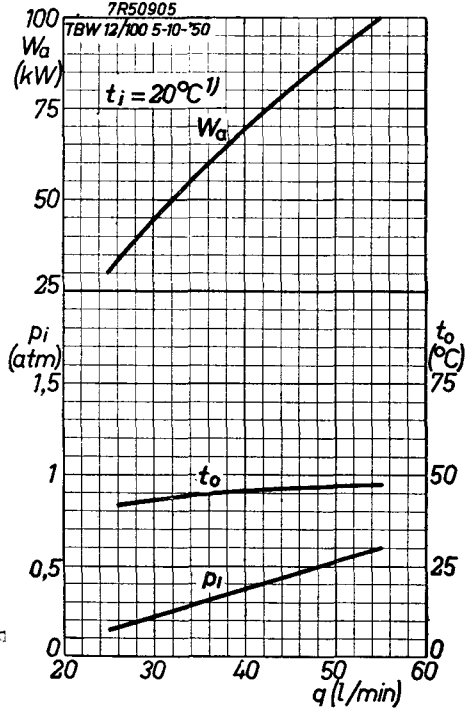

7R50903
TBW 12/100 5-10-'50
1500
V_g (V)
1000
500
0
-500
-1000
0
5
10
15 V_a (kV)
$I_a = c$
$I_g = c$
60A
50A
40A
120A
30A
20A
110A
100A
90A
80A
70A
60A
50A
40A
30A
20A
10A
5A
0A

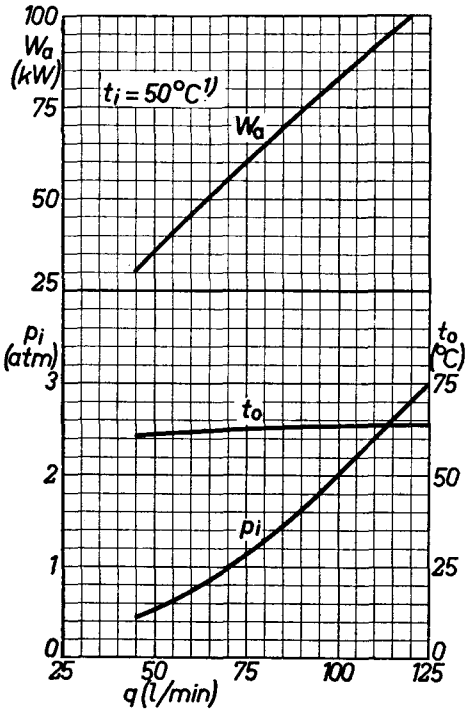

7R50992
TBW 12/100 5-5-'51
300
I_f
(A)
250
200
150
100
50
0
R_f {cold / froid / kalt} = 0,012Ω
0
5
10
15
V_f(V)
20

4.4.1955

E

1) see page 2 ; voir page 2 ; siehe Seite 2





PHILIPS



TBW12/100

page	sheet	date
1	1	1955.03.03
2	2	1955.03.03
3	3	1954.07.07
4	4	1954.07.07
5	5	1954.07.07
6	6	1954.07.07
7	7	1954.07.07
8	8	1954.07.07
9	9	1956.02.02
10	10	1956.02.02
11	A	1954.07.07
12	B	1954.07.07
13	C	1954.07.07
14	D	1954.07.07
15	E	1955.04.04
16	F	1955.04.04
17	FP	2000.02.08

RF POWER TRIODE

- Water cooled

QUICK REFERENCE DATA

Industrial RF oscillator; class-C

freq.	three phase	
	V_a	W_o
MHz	kV	kW
30	12	29,0
	10	23,3
	8	17,9

HEATING: direct; thoriated tungsten filament

Filament voltage	V_f	=	8,0 V
Filament current	I_f	=	98 A
Cold filament resistance	R_{fo}	=	0,008 Ω

The filament is designed to accept temporary fluctuations of +5% and −10%

The filament current must never exceed a peak value of 210 A instantaneously at any time during the initial energizing schedule.

CAPACITANCES

Anode to all other elements except grid	C_a	=	0,4 pF
Grid to all other elements except anode	C_g	=	37 pF
Anode to grid	C_{ag}	=	30 pF

TYPICAL CHARACTERISTICS

Anode voltage	V_a	=	12 kV
Anode current	I_a	=	2 A
Mutual conductance	S	=	20 mA/V
Amplification factor	μ	=	34

TEMPERATURE LIMIT (Absolute limit)

Seal temperature		max.	220 °C

Generally, a low velocity air flow to the seals is required.

Table 1 Water cooling characteristics

T_i = max. 50 °C

W_a (kW)	T_i (°C)	q_{min} [1] (l/min)	ΔP (kPa)*	max. outlet temperature T_o (°C)
5	20	6	2	35
	50	15	22	56
10	20	11	10	35
	50	25	70	56
15	20	16	25	35
	50	37	130	56
20	20	22	50	35
	50	49	230	56

To ensure a uniform RF current distribution in the grid seal especially at frequencies higher than 4 MHz, the grid lead should be connected as shown below.

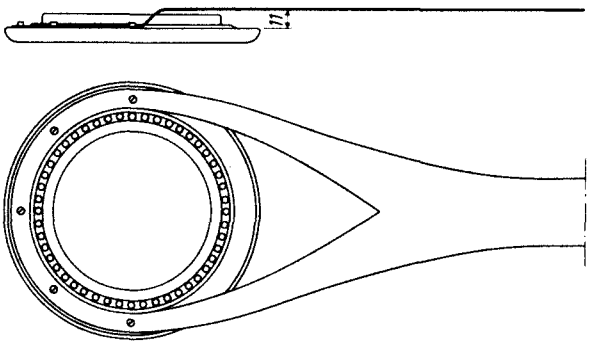


Fig. 1 Grid lead detail.

[1] At inlet temperatures between 20 and 50 °C the required quanity of water can be found by proportional interpolation

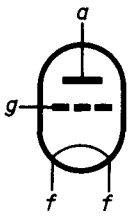
* 100 kPa ≈ 1 at

MECHANICAL DATA

Net weight of the tube : 2.8 kg

Net weight of water jacket: 2.1 kg

Dimensions in mm



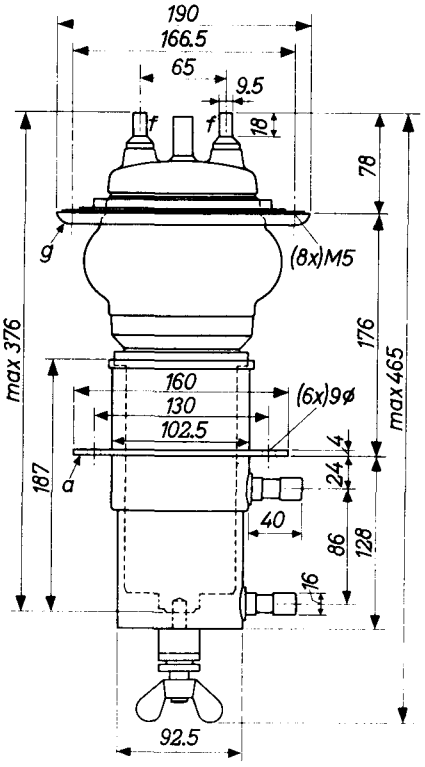


Fig. 2 Mechanical outline.

Tube with grid connector
and water jacket

Mounting position: vertical with anode down

ACCESSORIES

Filament connectors with cable		: 40662
Grid connector		: 40663
Water jacket		: K717
O-ring	large	: 2622 080 30895
	small	: 2622 080 30736

RF CLASS C OSCILLATOR FOR INDUSTRIAL USE with anode voltage from three-phase half-wave rectifier without filter

LIMITING VALUES (Absolute limits)

Frequency		f		up to	30	MHz
Anode voltage		V_a	=	max.	13	kV
Anode current		I_a	=	max.	4.8	A
Anode dissipation		W_a	=	max.	20	kW
Anode input power		W_{ia}	=	max.	60	kW
Negative grid voltage		$-V_g$	=	max.	1500	V
Grid current		I_g	=	max.	0.8	A
Grid circuit resistance		R_g	=	max.	10	kΩ

OPERATING CONDITIONS

Frequency	f	=	30	30	30	MHz
Transformer voltage	V_{tr}	=	8.9	7.4	6.0	kV
Anode voltage	V_a	=	12	10	8	kV
Anode current, loaded	I_a	=	3.2	3.2	3.2	A
Anode current, unloaded	I_a	=	0.52	0.50	0.48	A
Grid current, loaded	I_g	=	0.50	0.50	0.50	A
Grid current, unloaded	I_g	=	0.74	0.77	0.80	A
Grid resistor	R_g	=	2.0	1.6	1.1	kΩ
Load resistance	$R_{a\sim}$	=	1800	1450	1100	Ω
Feedback ratio under loaded conditions	$V_{g\sim}/V_{a\sim}$	=	16	17	19	%
Anode input power	W_{ia}	=	38.4	32.0	25.6	kW
Anode dissipation	W_a	=	9.4	8.7	7.7	kW
Output power	W_o	=	29.0	23.3	17.9	kW
Efficiency	η	=	75.5	72.5	70	%
Output power in the load	W_ℓ	=	25	20	15.5	kW[1]

[1]) Useful power in the load measured in a circuit having an efficiency of 90%

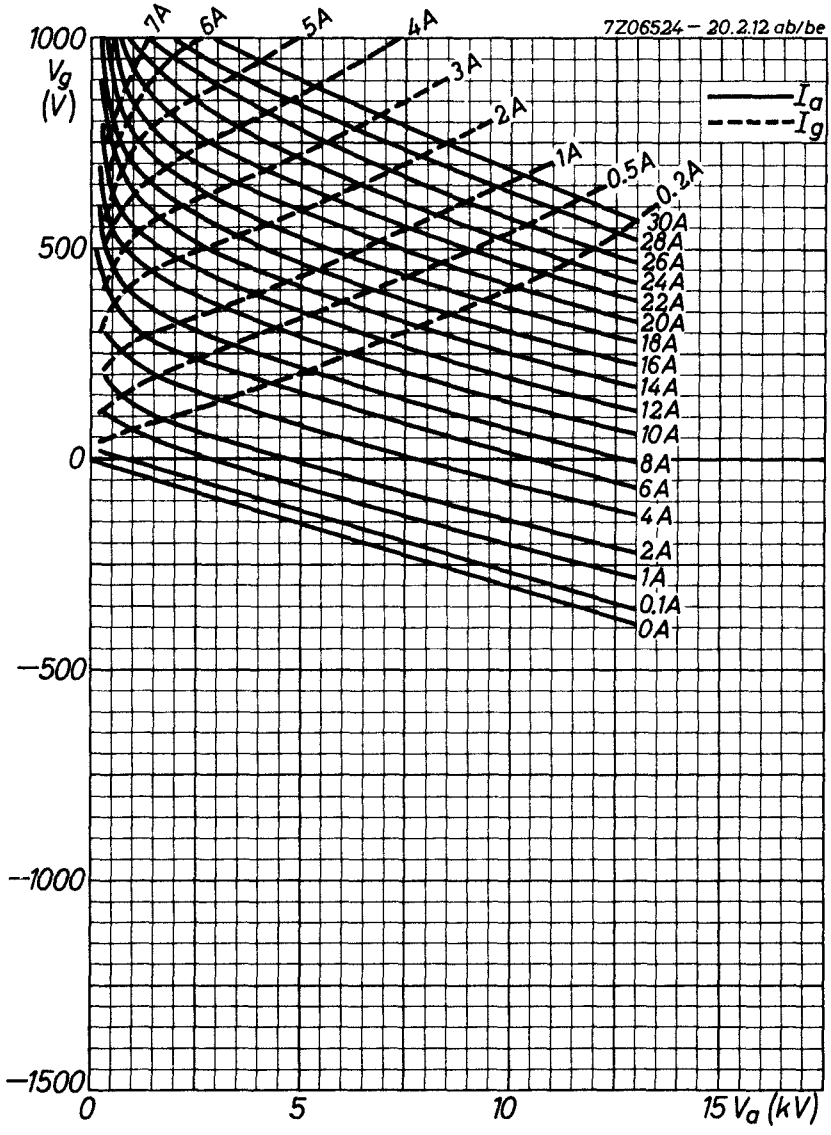


Fig. 3 Constant current characteristics.

PHILIPS

Data handbook

Electronic components and materials

TBW12/25

page	sheet	date
1	165	1988.02
2	166	1988.02
3	167	1988.02
4	168	1988.02
5	169	1988.02
6	FP	2000.09.22

RF POWER TRIODE

- Water cooled

QUICK REFERENCE DATA

Industrial RF oscillator, class-C

freq. MHz	V_a kV	W_o kW
30	12	39
	10	31,3
	8	23,2

HEATING: direct; thoriated tungsten filament

Filament voltage	V_f	=	8 V
Filament current	I_f	=	130 A
Cold filament resistance	R_{fo}	=	0,006 Ω

The filament is designed to accept temporary fluctuations of +5% and −10%.

The filament current must never exceed a peak value of 280 A at any time during the initial energizing schedule.

CAPACITANCES

Anode to all other elements except grid	C_a	=	0,9 pF
Grid to all other elements except anode	C_g	=	45 pF
Anode to grid	C_{ag}	=	23,5 pF

TYPICAL CHARACTERISTICS

Anode voltage	V_a	=	12 kV
Anode current	I_a	=	2 A
Mutual conductance	S	=	22 mA/V
Amplification factor	μ	=	21

TEMPERATURE LIMITS (Absolute limits)

Temperature of all seals		max.	220 °C
Water inlet temperature		max.	50 °C

COOLING Generally a low velocity air flow to the seals is required.

Table 1 Cooling characteristics

anode dissipation W_a kW	inlet temperature T_i °C	rate of flow q_{min} l/min	pressure drop ΔP kPa*	max. outlet temperature T_o (°C)
20	20	22	50	35
	50	49	230	56
15	20	16	25	35
	50	37	130	56
10	20	11	10	35
	50	25	70	56
5	20	6	2	35
	50	15	22	56

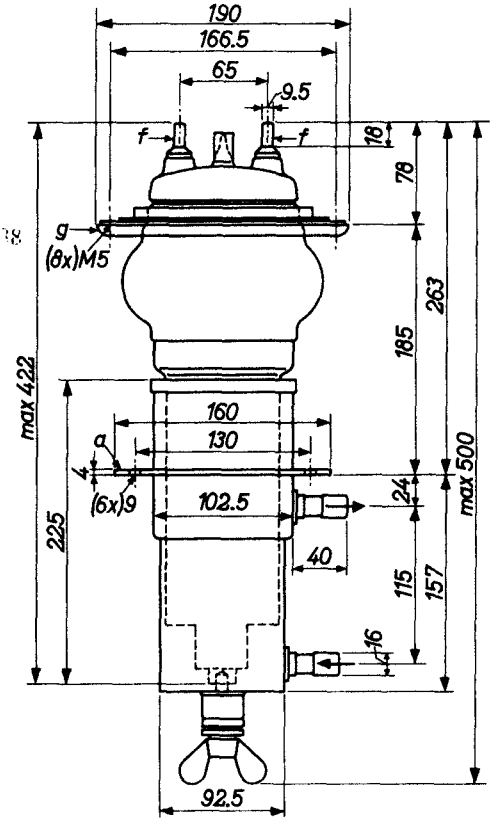
ACCESSORIES

Filament connectors	40662
Grid connector	40663
Water jacket	K722
O-ring, large	2622 080 30895
small	2622 080 30736

* 100 kPa ≈ 1 at

MECHANICAL DATA

Dimensions in mm



Mounting position	:	vertical with anode down.
Net mass of tube	:	3,0 kg
Net mass of water jacket	:	2,7 kg

For further data and curves (except cooling curves) please refer to type TBL12/38

Fig. 1 Mechanical outline.

PHILIPS

Data handbook

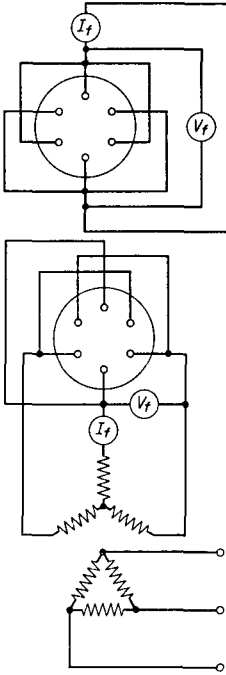
Electronic components and materials

TBW12/38

page	sheet	date
1	171	1988.02
2	172	1988.02
3	173	1988.02
4	FP	2000.09.22

TRIODE for use as H.F. or L.F. amplifier or oscillator
TRIODE pour l'utilisation comme amplificatrice H.F. ou B.F. ou comme oscillatrice
TRIODE zur Verwendung als HF- oder NF-Verstärker oder als Oszillator

This type is equivalent to type TBW 12/100 except for the filament data
Ce type est équivalent au type TBW 12/100 à l'exception des données du filament
Dieser Typ ist dem Typ TBW 12/100 gleichwertig mit Ausnahme der Glühfadendaten



Single-phase filament energizing
Alimentation de filament monophasée
Einphasige Glühfadenspeisung

V_f = 17,5 V
I_f = 196 A

Filament current must never exceed a peak value of 420 A at any time during initial energizing schedule

Le courant d'enclenchement ne doit jamais dépasser une valeur de crête de 420 A

Der Anlaufstrom darf niemals einen Scheitelwert von 420 A überschreiten

Three-phase filament energizing
Alimentation de filament triphasée
Dreiphasige Glühfadenspeisung

V_f = 15,5 V
I_f = 131 A

Heater current must never exceed a peak value of 280 A at any time during initial energizing schedule

Le courant d'enclenchement ne doit jamais dépasser une valeur de crête de 280 A

Der Anlaufstrom darf niemals einen Scheitelwert von 280 A überschreiten

A safety device must be used to prevent filament energizing with one phase interrupted
Un dispositif de sécurité doit être utilisé pour prévenir que le filament soit alimenté à une phase interrompue
Es muss eine Schutzvorrichtung verwendet werden zur Verhütung von Glühfadenspeisung wenn eine der Phasen unterbrochen ist

PHILIPS

Electronic Tube

HANDBOOK

TBW15/125

page	sheet	date
1	1	1958.03.03
2	FP	2000.02.08

RF POWER TRIODE

- Water cooled

QUICK REFERENCE DATA

Industrial RF oscillator, class-C

freq.	three phase	
	V_a	W_o
MHz	kV	kW
30	7	17,7
	6	14,3

HEATING: direct; thoriated tungsten filament

Filament voltage	V_f	=	6,3 V
Filament current	I_f	=	136 A
Cold filament resistance	R_{fo}	=	0,005 Ω

The filament is designed to accept temporary fluctuations of +5% and −10%

The filament current must never exceed a peak value of 280 A at any time during the initial energizing schedule.

CAPACITANCES

Anode to all other elements except grid	C_a	=	1,2 pF
Grid to all other elements except anode	C_g	=	44,5 pF
Anode to grid	C_{ag}	=	33,5 pF

TYPICAL CHARACTERISTICS

Anode voltage	V_a	=	6 kV
Anode current	I_a	=	2,5 A
Mutual conductance	S	=	23 mA/V
Amplification factor	μ	=	17,5

TEMPERATURE LIMIT (Absolute limit)

Temperature of all seals		max.	50 °C
Water inlet temperature			

Table 1 Cooling characteristics

anode dissipation W_a kW	inlet temperature T_i °C	rate of flow q_{min} l/min	pressure drop ΔP kPa	max. outlet temperature T_o (°C)
15	20	15	30	35
	50	34	140	60
10	20	9,5	15	37
	50	22	60	57
5	20	4,5	3	40
	50	12	20	60

ACCESSORIES

Filament clips with cable	40662
Grid connector	40664
Water jacket	K720
O-ring, large	2622 080 30889
small	2622 080 30736

* 100 kPa ≈ 1 at

MECHANICAL DATA

Dimensions in mm

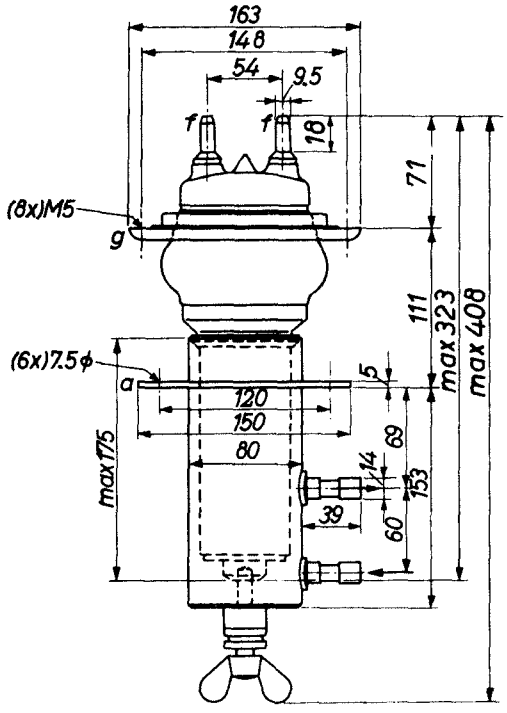


Fig. 1 Mechanical outline.

Mounting position	:	vertical with anode down.
Net mass of tube	:	2 kg
Net mass of water jacket	:	2,2 kg

For further data and curves (except cooling curves) please refer to type TBL 6/14

PHILIPS

Data handbook

Electronic components and materials

TBW6/14

page	sheet	date
1	139	1988.02
2	140	1988.02
3	141	1988.02
4	FP	2000.09.22

COAXIAL TRIODE for use in A.M., F.M. and television transmitters
TRIODE COAXIALE pour utilisation dans émetteurs A.M., F.M. et de télévision
KOAXIALE TRIODE zur Verwendung in AM-,FM- und Fernsehsendern

Cooling : water/additional air flow
Refroidissement: circulation d'au/courant d'air additionnel
Kühlung : Wasser/zusätzlicher Luftstrom

Filament : thoriated tungsten
Filament : tungstène thorié
Heizfaden: thoriertes Wolfram

Heating : direct — Vf = 6,3 V
Chauffage: direct — If = 154 A
Heizung : direkt

The filament current must never exceed a peak value of 500 A at any time during the initial energizing schedule
Le courant d'enclenchement ne doit jamais dépasser une valeur de crête de 500 A
Der Anlauf-Heizstrom darf niemals einen Scheitelwert von 500 A überschreiten

Capacitances / Capacités / Kapazitäten

Ca	=	0,6 pF [1]
Cg	=	65 pF
Cag	=	29 pF

Typical characteristics / Caractéristiques types / Kenndaten (Ia = 1 A, Va = 4 kV)

μ	=	60
S	=	60 mA/V

Water cooling characteristics
Caractéristiques de refroidissement par eau
Wasserkühlungsdaten

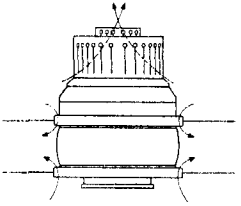
Wa (kW)	ti (°C)	qmin (l/min)	pi (atm)
6	20	6	0,08
	50	12	0,30
8	20	8	0,13
	50	16	0,54
10	20	10	0,21
	50	20	0,84
12	20	12	0,30
	50	24	1,20

See also the cooling curves (page E)
Voir aussi les courbes de refroidissement (page E)
Siehe auch die Kühlungskurven (Seite E)

[1])See page 4; voir page 4; siehe Seite 4

PHILIPS

Recommended direction of additional air flow
Direction recommandée du courant d'air additionnel
Empfohlene Richtung des zusätzlichen Luftstromes



Temperature of seals
Température des scellements = max. 180 °C
Temperatur der Einschmelzungen

Generally it is necessary to direct an air flow on the grid, anode and filament seals. E.g. at 220 Mc/s an air flow of 0.6 m³/min on each of these seals is necessary

En général il faut diriger un courant d'air sur les scellements de l'anode, de la grille et du filament. Par exemple à 220 MHz un courant d'air de 0,6 m³/min sur chaque de ces scellements est nécessaire

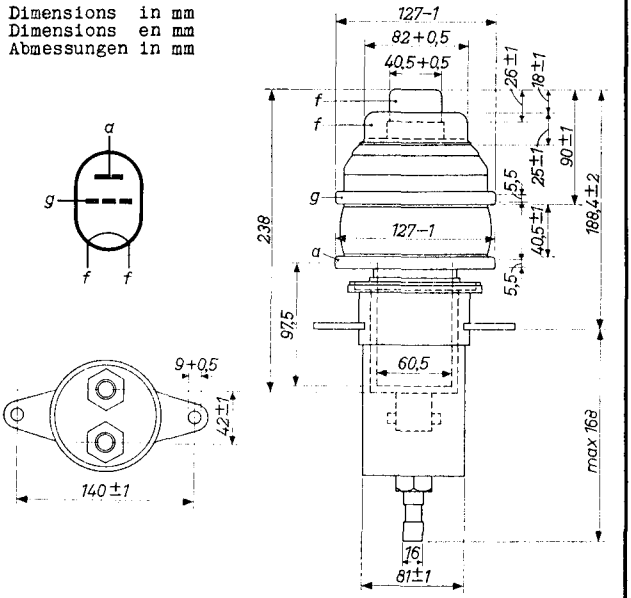
Im allgemeinen ist ein Luftstrom auf die Anoden-, Gitter- und Heizfadeneinschmelzungen erforderlich. Bei 220 MHz zum Beispiel ist ein Luftstrom von 0,6 m³/min auf jede dieser Einschmelzungen notwendig

Accessories
Accessoires
Zubehör

Water jacket Refroidisseur Kühltopf	K718
Grid and anode connector Connecteur de l'anode et de la grille Gitter- und Anodenanschluss	40651
Inner filament connector Connecteur intérieur du filament Innerer Heizfadenanschluss	40652
Outer filament connector Connecteur extérieur du filament Äusserer Heizfadenanschluss	40653

Tube mounted in water-jacket type K718
Tube monté dans le refroidisseur type K718
Röhre in Kühltopf Type K718 montiert

Dimensions in mm
Dimensions en mm
Abmessungen in mm



Eccentricity of outer diameters of the grid and filament terminals with respect to the outer diameter of the anode terminal max. 1 mm

Excentricité des diamètres extérieurs des connexions de la grille et du filament au regard du diamètre extérieur de la connexion de l'anode 1 mm au max.

Exzentrizität der äusseren Durchmesser der Gitter- und Glühfadenanschlüsse in Bezug auf den äusseren Durchmesser des Anodenanschlusses max. 1 mm

Mounting position: Vertical with anode down
Montage : Vertical avec l'anode en bas
Einbau : Senkrecht mit der Anode unten

PHILIPS

H.F. class C telegraphy, grounded grid
H.F. classe C télégraphie, grille mise à la terre
HF-Klasse C Telegraphie, Gitterbasisschaltung

Limiting values
Caractéristiques limites
Grenzdaten

f	= max.	110	Mc/s
V_a	= max.	5,5	kV
$-V_g$	= max.	500	V
I_a	= max.	6	A
I_g	= max.	1,5	A
W_{ia}	= max.	30	kW
W_a	= max.	12	kW

Operating conditions
Caractéristiques d'utilisation
Betriebsdaten

f	=	110	Mc/s
V_a	=	5	kV
V_g	=	-300	V
I_a	=	4,8	A
I_g	=	1,2	A
V_{gp}	=	520	V
W_{ig}	=	2560	W
W_{ia}	=	24	kW
W_a	=	9	kW
W_o [2]	=	15+2	kW
η [3]	=	62,5	%

---

[1] Page 1; Seite 1
Anode fully screened from filament terminals by a flat metal screen connected to the grid terminal
L'anode blindée des connexions du filament par un blindage plan métallique connecté à l'anneau de connexion de la grille
Anode mittels einer mit dem Gitteranschlussring verbundenen flachen Metallplatte von den Heizfadenanschlüssen abgeschirmt

[2] Power transferred from driving stage included
Y compris l'énergie transmise de l'étage pré-amplificateur
Einschliesslich der vom Vorverstärker übertragenen Leistung

[3] Pure valve efficiency
Rendement net du tube
Reiner Röhrenwirkungsgrad

H.F. class B telephony for television service; linear, grounded-grid amplifier Negative modulation, positive synchronisation (CCIR and FCC system)

H.F. classe B téléphonie pour télévision; amplificateur linéaire, grille mise à la terre Modulation négative, synchronisation positive (Systèmes CCIR et FCC)

HF-Klasse B Telephonie für Fernsehsender; linearer Verstärker in Gitterbasisschaltung Negative modulation, positive Synchronisierung (CCIR- und FCC-System)

Limiting values
Caractéristiques limites
Grenzdaten

f	= max. 88 Mc/s	f	= max. 220 Mc/s
V_a	= max. 5,5 kV	V_a	= max. 4,5 kV
W_{ia} sync	= max. 25 kW	W_{ia} sync	= max. 22 kW
W_a sync	= max. 12 kW	W_a sync	= max. 12 kW
I_a sync	= max. 6 A	I_a sync	= max. 6 A
I_g sync	= max. 1,2 A	I_g sync	= max. 1,2 A

Operating conditions (at centre frequency of the resonance curve)
Caractéristiques d'utilisation (à la fréquence centrale de la courbe de résonance)
Betriebsdaten (bei der mittleren Frequenz der Abstimmkurve)

f	=	48-88	170-220 [1] Mc/s
B (-1,5 dB)	=	-	7 Mc/s
B (-3 dB)	=	6	12 Mc/s
V_a	=	5	4 kV
V_g	=	-90	-75 V
V_{gp} sync	=	270	255 V
V_{gp} black, noir, schwarz	=	200	180 V
I_a sync	=	4,8	4,8 A
I_a black, noir, schwarz	=	3,6	3,6 A
I_g sync	=	1,0	1,0 A
I_g black, noir, schwarz	=	0,35	0,35 A
W_{ig} sync	=	1,4	1,3 kW
W_o sync	=	17	12 kW
W_o black, noir, schwarz	=	9,6	6,75 kW

[1] See page D; voir page D; siehe Seite D

PHILIPS

H.F. class B telephony for television service; linear, grounded-grid amplifier Positive modulation, negative synchronisation (RTF and BBC system)

H.F. classe B téléphonie pour télévision; amplificateur linéaire, grille mise à la terre Modulation positive, synchronisation négative (Systèmes RTF et BBC)

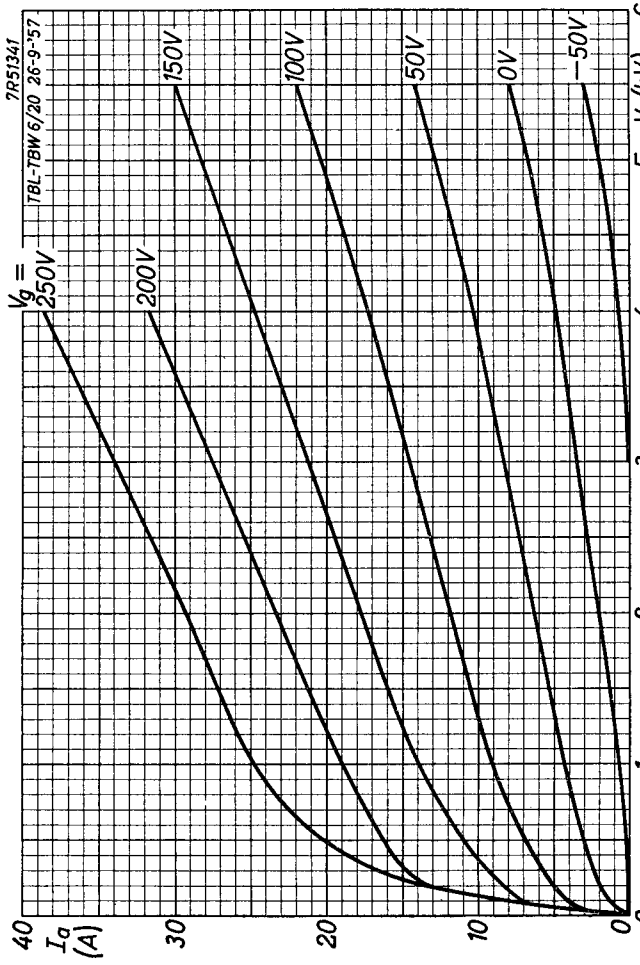
HF-Klasse B Telephonie für Fernsehsender; linearer Verstärker in Gitterbasisschaltung Positive Modulation, negative Synchronisierung (RTF und BBC System)

Limiting values
Caractéristiques limites
Grenzdaten

f	= max.	88	Mc/s	f	= max.	220	Mc/s
V_a	= max.	5,5	kV	V_a	= max.	4,5	kV
W_{ia}	= max.	25	kW	W_{ia}	= max.	22	kW
I_a white/blanc	= max.	6	A	I_a white/blanc	= max.	6	A
I_g weiss	= max.	1,2	A	I_g weiss	= max.	1,2	A
W_a	= max.	12	kW	W_a	= max.	12	kW

Operating conditions (at centre frequency of the resonance curve)
Caractéristiques d'utilisation (à la fréquence centrale de la courbe de résonance)
Betriebsdaten (bei der mittleren Frequenz der Abstimmkurve)

f	=	48-88	170-220	Mc/s
B (-3 dB)	=	6	12	Mc/s
V_a	=	5	4	kV
V_g	=	-90	75	V
V_{gp} white, blanc, weiss	=	270	255	V
V_{gp} black, noir, schwarz	=	110	95	V
I_a white, blanc, weiss	=	4,8	4,8	A
I_a black, noir, schwarz	=	1,45	1,45	A
I_g white, blanc, weiss	=	1	1	A
I_g black, noir, schwarz	=	0,2	0,2	A
W_{ig} white, blanc, weiss	=	1,4	1,3	kW
W_o white, blanc, weiss	=	17	12	kW
W_o black, noir, schwarz	=	1,7	1,2	kW

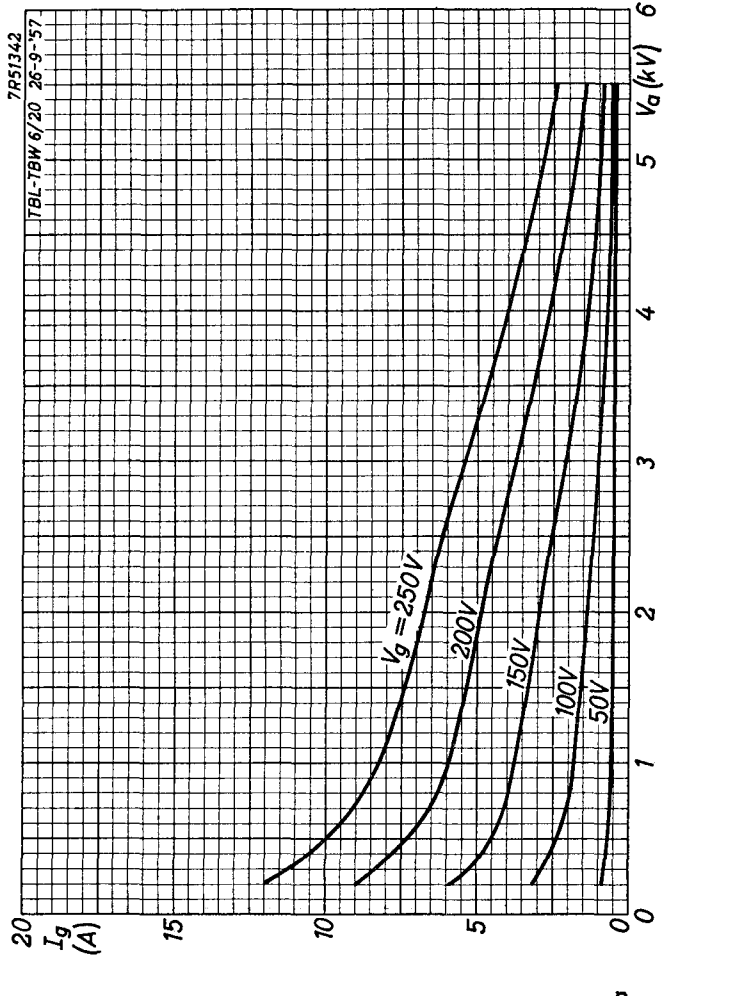

7R51341
TBL-TBW 6/20 26-9-'57
V_g =
250V
200V
150V
100V
50V
0V
−50V
I_a (A)
40
30
20
10
0
V_a (kV)
0
1
2
3
4
5
6

12.12.1957

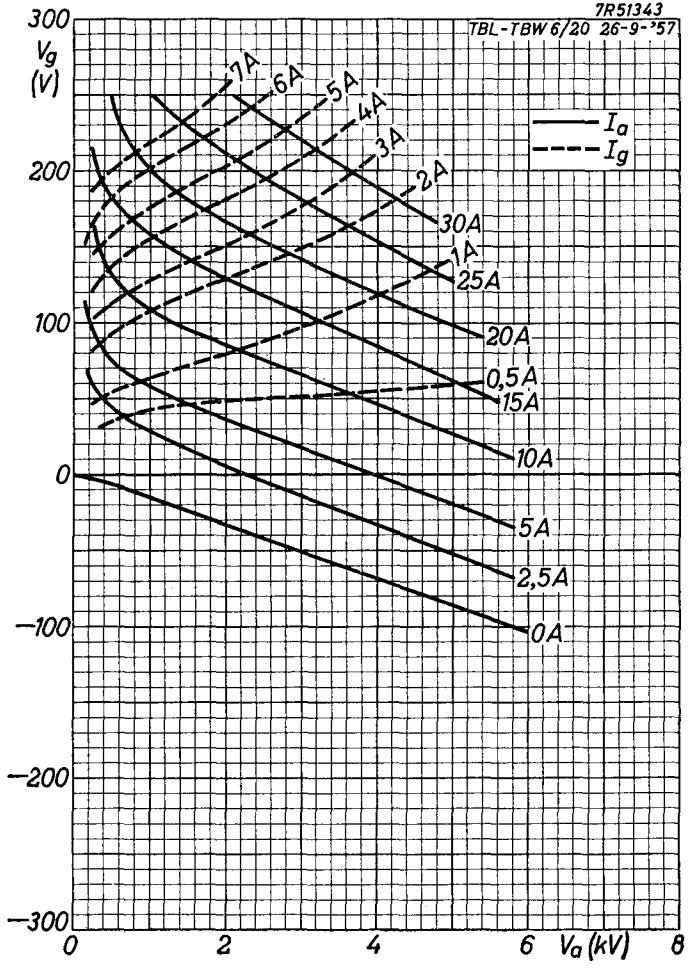
A

TBW 6/20

PHILIPS



B


7R51343
TBL-TBW 6/20 26-9-'57
300
Vg
(V)
200
100
0
−100
−200
−300
0
2
4
6
8
Va (kV)
Ia
Ig
7A
6A
5A
4A
3A
2A
1A
30A
25A
20A
15A
10A
5A
2,5A
0A
0,5A

PHILIPS

Grid-modulated H.F. class B amplifier for television service (2 valves in push-pull)
Amplificateur H.F. classe B modulé par la grille pour la télévision (2 tubes en montage push-pull)
H.F. Klasse B Verstärker mit Gittermodulation für Fernsehbetrieb (2 Röhren in Gegentaktschaltung)

D

PHILIPS

TBW 6/20

7R51360
TBW 6/20 10-12-'57

12.12.1957

E

PHILIPS

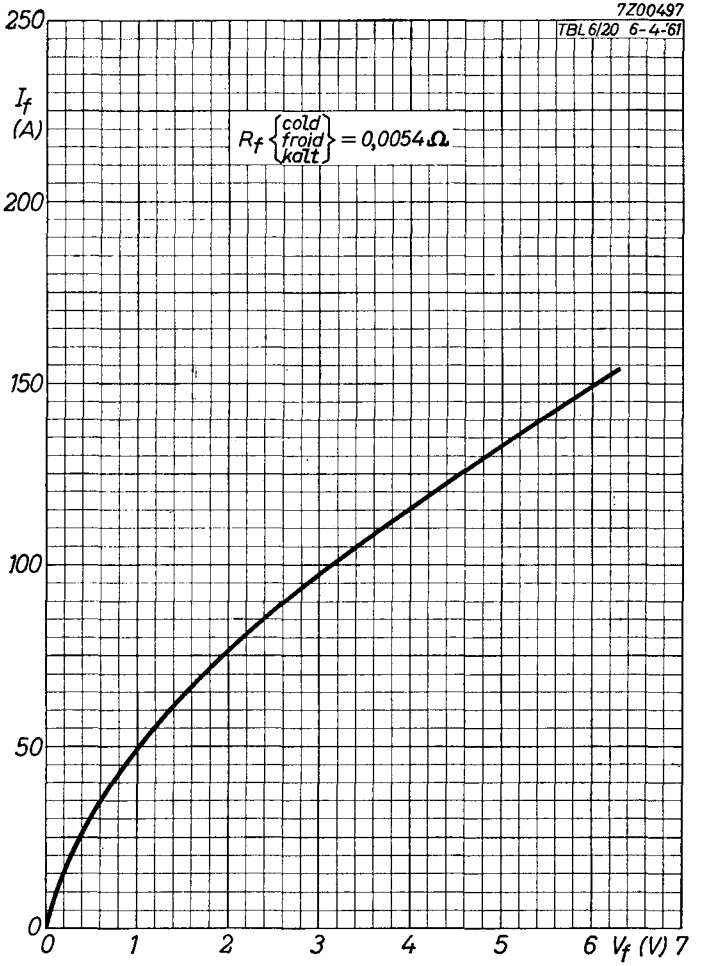
TBW6/20

4.4.1961

E

TBW6/20

PHILIPS



F



TBW6/20

page	sheet	date
1	1	1957.09.09
2	2	1957.09.09
3	3	1957.09.09
4	4	1957.09.09
5	5	1957.09.09
6	6	1957.09.09
7	A	1957.12.12
8	B	1957.12.12
9	C	1957.12.12
10	D	1957.12.12
11	E	1957.12.12
12	E	1961.04.04
13	F	1961.04.04
14	FP	2000.02.12

RF POWER TRIODE

QUICK REFERENCE DATA										
General purposes										
λ (m)	Freq. (MHz)	C telegr.		B teleph.		C_a mod.		B mod. [1])	
		V_a (kV)	W_o (kW)	V_a (kV)	W_o (kW)	V_a (kV)	W_o (kW)	V_a (kV)	W_o (kW)
4	75	6	6.9	6	1.9			6	13.3
		5	5.6	5	1.45	5	4.7	5	6.6
		4	4			4.5	4.1	4.5	6.0
						4	3.5	4	5.3
						3.5	3	3.5	4.6
						3	2.2	3	3.3

Television service					
Freq. (MHz)	Neg. mod. Pos. sync.			Pos. mod. Neg. sync.	
	V_a (kV)	W_o sync (kW)	W_o black (kW)	V_a (kV)	W_o white (kW)
75	5	9	5.35	5	9

HEATING: direct, filament thoriated tungsten

Filament voltage	V_f	12.6	V
Filament current	I_f	33	A

CAPACITANCES

Anode to all other elements except grid	C_a	0.3	pF
Grid to all other elements except anode	C_g	16	pF
Anode to grid	C_{ag}	11	pF

[1]) Two tubes

TYPICAL CHARACTERISTICS

Anode voltage	V_a	4	kV
Anode current	I_a	1	A
Mutual conductance	S	17	mA/V
Amplification factor	μ	32	

COOLING: water/low-velocity air flow

Table 1 Water cooling characteristics

W_a (kW)	T_i (°C)	q_{min} 1) (l/min)	ΔP (kPa)*	max. outlet temperature T_o (°C)
1	20	2.5	8	28
	50	3	10	57
2	20	2.5	8	34
	50	5	30	57
4	20	4	18	36
	50	9	90	57
6	20	6	40	31
	50	14	250	55

It is necessary to direct a low-velocity air flow to the anode and the grid seal at frequencies above 30 MHz
The air flow must be started upon or before application of the filament voltage

TEMPERATURE LIMITS (Absolute limits)

Water inlet temperature	T_i	max.	50	°C
Temperature of seals	T	max.	180	°C

1) At inlet temperatures between 20 and 50 °C the required quantity of water can be found by proportional interpolation

* 100 kPa ≈ 1 at

MECHANICAL DATA

Dimensions in mm

Mounting position: vertical with anode down

Net mass: 0.45 kg

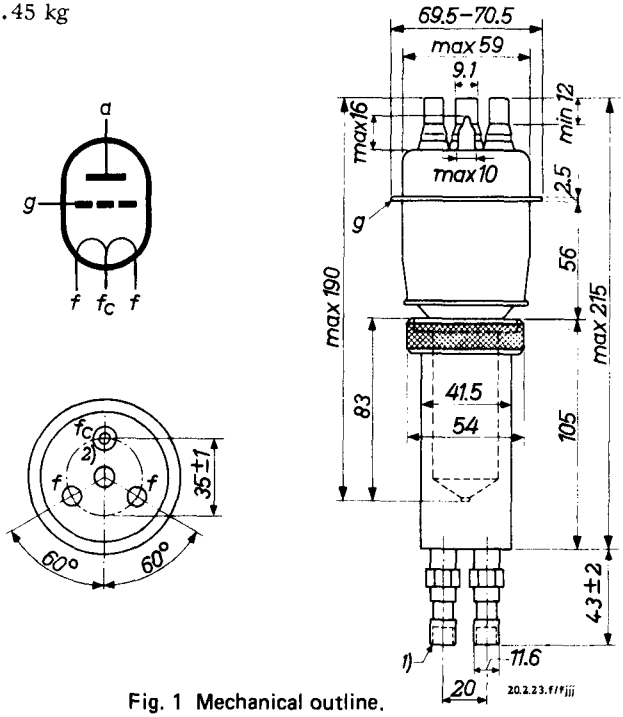


Fig. 1 Mechanical outline.

Tube mounted in water jacket K713

The centre tap f_c must not be used for filament current supply. The connectors type 40634, however, must be used for the cooling of all three filament pins, thus also of pin f_c

ACCESSORIES

Grid connector	type	40650 [3] or 40622
Water jacket		K713
Filament connector		40634
"O" ring		3322 026 82801

---

1) 1/8 in pipe thread

2) This pin is marked "O"

3) The connector 40650 should be used only below 30 MHz.
When the tube is used with this connector at maximum ratings additional cooling of the grid seals will be required.

RF CLASS C TELEGRAPHY, grounded grid

LIMITING VALUES (Absolute limits)

Frequency		f	up to	75	MHz
Anode voltage		V_a	max.	6	kV
Negative grid voltage		$-V_g$	max.	1000	V
Anode current		I_a	max.	1.5	A
Grid current		I_g	max.	0.35	A
Grid dissipation		W_g	max.	120	W
Anode input power		W_{ia}	max.	9	kW
Anode dissipation		W_a	max.	6	kW 1)

OPERATING CONDITIONS

Wavelength	λ	4	4	4	m
Frequency	f	75	75	75	MHz
Anode voltage	V_a	6	5	4	kV
Grid voltage	V_g	-400	-300	-200	V
Anode current	I_a	1.5	1.5	1.37	A
Grid current	I_g	0.31	0.33	0.35	A
Peak grid AC voltage	V_{gp}	740	640	500	V
Grid input power	W_{ig}	210	190	160	W
Anode input power	W_{ia}	9	7.5	5.5	kW
Anode dissipation	W_a	2.1	1.9	1.5	kW
Output power	W_o	6.9	5.6	4	kW
Efficiency	η	76.5	75	73	%

1) TBL6/6000 W_a max. = 5 kW

RF CLASS C TELEGRAPHY, grounded grid

LIMITING VALUES (Absolute limits)

Frequency		f	up to	75	MHz
Anode voltage		V_a	max.	6	kV
Positive cathode to grid voltage		V_{kg}	max.	1000	V
Anode current		I_a	max.	1.5	A
Grid current		I_g	max.	0.35	A
Grid dissipation		W_g	max.	120	W
Anode input power		W_{ia}	max.	9	kW
Anode dissipation		W_a	max.	6	kW [1]

For frequencies from 75 MHz up to 220 MHz, see Fig. 4

OPERATING CONDITIONS, two tubes

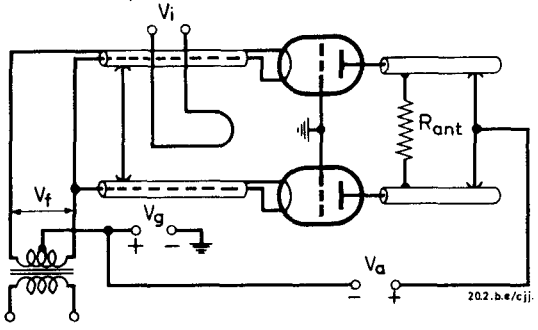


Fig. 2 Grounded grid configuration.

1) TBL6/6000 W_a max. = 5 kW

RF CLASS C TELEGRAPHY, grounded grid (continued)

OPERATING CONDITIONS, two tubes (continued)

λ	4	2.7[1])	2.7[1])	1.36[1])	m
f	75	110	110	220	MHz
V_a	6	5	4	4	kV
V_g	-400	-300	-200	-200	V
I_a	2x1.5	2x1.5	2x1.37	2x1.25	A
I_g	2x0.31	2x0.33	2x0.35	2x0.2	A
V_{g_p}	740	640	500	450	V
W_{ig}	2x1120	2x920	2x675	2x380	W
W_{ia}	2x9	2x7.5	2x5.5	2x5	kW
W_a	2x2.1	2x2.2	2x1.7	2x2.5	kW
W_o	13.8+1.82	10.6+1.46	7.6+1.03	5+0.6	kW [2])
η	76.5	71	69	50	% [3])

[1]) When using the tube above 108 MHz, particular attention must be paid to a careful design of the installation, otherwise the tube may be damaged. Therefore, our guarantee for the tubes operating at frequencies above 108 MHz can only be given after approval of the installation.

[2]) Power transferred from driving stage included.

[3]) Pure tube efficiency.

RF CLASS B TELEPHONY

LIMITING VALUES (Absolute limits)

Frequency	f	up to	75	MHz
Anode voltage	V_a	max.	6	kV
Anode current	I_a	max.	1.1	A
Anode input power	W_{ia}	max.	6.6	kW
Anode dissipation	W_a	max.	6	kW 1)

OPERATING CONDITIONS

Wavelength	λ	4	4	m
Frequency	f	75	75	MHz
Anode voltage	V_a	6	5	kV
Grid voltage	V_g	-180	-145	V
Anode current	I_a	0.99	0.9	A
Peak grid AC voltage	V_{gp}	250	225	V
Anode input power	W_{ia}	5.9	4.5	kW
Anode dissipation	W_a	4	3.05	kW
Output power	W_o	1.9	1.45	kW
Efficiency	η	32	32	%
Modulation factor	m	100	100	%
Grid current	I_g	0.3	0.32	A
Grid input power	W_{ig}	140	130	W

1) TBL6/6000 W_a max. = 5 kW

RF CLASS C ANODE MODULATION

LIMITING VALUES (Absolute limits)

Frequency	f	up to	75	MHz
Anode voltage	V_a	max.	5	kV
Negative grid voltage	$-V_g$	max.	1000	V
Anode current	I_a	max.	1.3	A
Grid current	I_g	max.	0.35	A
Grid dissipation	W_g	max.	120	W
Anode input power	W_{ia}	max.	6.5	kW
Anode dissipation	W_a	max.	4	kW 2)

OPERATING CONDITIONS

Wavelength	λ	4	4	4	4	4	m
Frequency	f	75	75	75	75	75	MHz
Anode voltage	V_a	5	4.5	4	3.5	3	kV
Grid voltage	V_g	-400	-350	-300	-300	-250	V 1)
Anode current	I_a	1.2	1.2	1.2	1.2	1	A
Grid current	I_g	0.3	0.3	0.3	0.3	0.3	A
Peak grid AC voltage	V_{gp}	690	650	600	600	510	V
Grid input power	W_{ig}	190	180	165	165	140	W
Anode input power	W_{ia}	6	5.4	4.8	4.2	3	kW
Anode dissipation	W_a	1.3	1.3	1.3	1.2	0.8	kW
Output power	W_o	4.7	4.1	3.5	3.0	2.2	kW
Efficiency	η	78	76	73	71.5	73	%
Modulation factor	m	100	100	100	100	100	%
Modulation power	W_{mod}	3.0	2.7	2.4	2.1	1.5	kW

1) Grid bias partially obtained by the grid resistor

2) TBL6/6000 W_a max. = 3.4 kW

RF CLASS B TELEPHONY for television service (American and European system).

LIMITING VALUES (Absolute limits)

Frequency	f	up to 75	up to 220	MHz
Anode voltage	V_a	max. 5	max. 4	kV
Anode input power	W_{ia} sync	max. 9.5	max. 6.5	kW
Anode dissipation	W_a sync	max. 5	max. 4	kW
Anode current	I_a sync	max. 1.9	max. 1.6	A
Grid dissipation	W_g sync	max. 120	max. 120	W

OPERATING CONDITIONS, two tubes in push-pull

Frequency	f		48 to 75	170 to 220[1])	MHz
Bandwidth (-1.5 db)	B		5.25	6.5	MHz [2])
Bandwidth (-3 db)	B		8	10	MHz [2])
Anode voltage	V_a		5	4	kV
Grid voltage	V_g		-200	-150	V
Peak grid to grid voltage	V_{ggp}	sync	1000	1000	V [3])
		black	800	750	V [3])
		white	0	200	V [3])
Anode current	I_a	sync	3.8	3.2	A
		black	3	2.6	A
		white	0.2	-	A
Grid current	I_g	sync	0.5	0.4	A
		black	0.22	0.22	A
		white	0	-	A
Grid input power	W_{ig}	sync	250	350 to 450	W [4])
Output power	W_o	sync	9	6	kW
		black	5.35	3.37	kW

[1]) When using the tube above 108 MHz, particular attention must be paid to a careful design of the installation, otherwise the tube may be damaged Therefore, our guarantee for the tubes operating at frequencies above 108 MHz can only be given after approval of the installation

[2]) These values are based on measurements on a circuit with a single LC section

[3]) Measured by the slide back method

[4]) Driving power is accounted for largely by circuit losses. The indicated driving power is required to take care of losses in damping resistors, circuit losses and tube driving power

RF CLASS C OSCILLATOR FOR INDUSTRIAL USE with anode voltage from three-phase half-wave rectifier without filter

LIMITING VALUES (Absolute limits)

Frequency		f	up to	75	MHz
Anode voltage		V_a	max.	6000	V
Negative grid voltage		$-V_g$	max.	1000	V
Anode current		I_a	max.	1.5	A
Grid current		I_g	max.	0.35	A
Anode input power		W_{ia}	max.	9	kW
Anode dissipation		W_a	max.	6	kW [4]
Grid dissipation		W_g	max.	120	W

OPERATING CONDITIONS

Frequency	f	75	75	MHz
Transformer voltage, RMS	V_{tr}	5.1[1]	4.4[2]	kV
Anode voltage	V_a	6.0	5.1	kV[3]
Anode current	I_a	1.5	1.25	A
Grid current	I_g	0.31	0.28	A
Grid resistor	R_g	1300	1100	Ω
Grid input power	W_{ig}	210	160	W
Anode input power	W_{ia}	9	6.4	kW
Anode dissipation	W_a	1.9	1.74	kW
Output power	W_o	6.9	4.5	kW
Efficiency	η	76.5	70	%

[1]) Care must be taken that under these operating conditions the absolute limiting values are not exceeded by variation of the supply voltage or the load or by tolerances in the circuit elements

[2]) Under these conditions normal deviations of voltages and load are permissible. The absolute limiting values of the tube must, however, not be exceeded

[3]) DC value

[4]) TBL6/6000 W_a max. 5 kW

RF CLASS C OSCILLATOR FOR INDUSTRIAL USE with self rectification

LIMITING VALUES (Absolute limits)

Frequency		f	up to	75	MHz
Transformer voltage, RMS		V_{tr}	max.	6800	V
Negative grid voltage		$-V_g$	max.	640	V
Anode current		I_a	max.	0.8	A
Grid current		I_g	max.	0.19	A
Anode input power		W_{ia}	max.	9	kW
Anode dissipation		W_a	max.	6	kW 3)
Grid dissipation		W_g	max.	120	W

OPERATING CONDITIONS

Frequency	f	75	75	MHz
Transformer voltage, RMS	V_{tr}	6.8[1])	5.92)	kV
Anode current	I_a	0.8	0.7	A
Grid current	I_g	0.19	0.165	A
Grid resistor	R_g	1050	1050	
Grid input power	W_{ig}			W
Anode input power	W_{ia}	6.05	4.6	kW
Anode dissipation	W_a	1.5	1.24	kW
Output power	W_o	4.55	3.36	kW
Efficiency	η	75	73	%

---

1) Care must be taken that under these operating conditions the absolute limiting values are not exceeded by variation of the supply voltage or the load or by tolerances in the circuit elements

2) Under these conditions normal deviations of voltages and load are permissible. The absolute limiting values of the tube must, however, not be exceeded

3) TBL6/6000 W_a max. = 5 kW

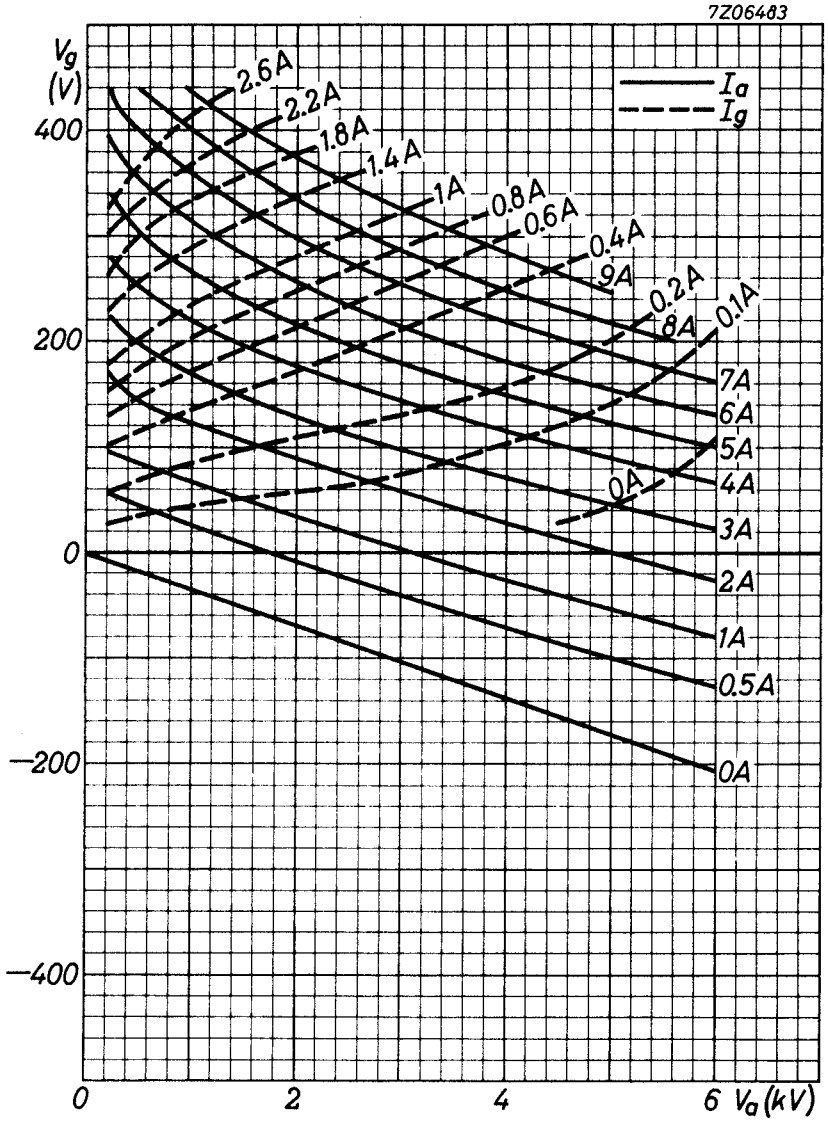


Fig. 3 Constant current characteristics.

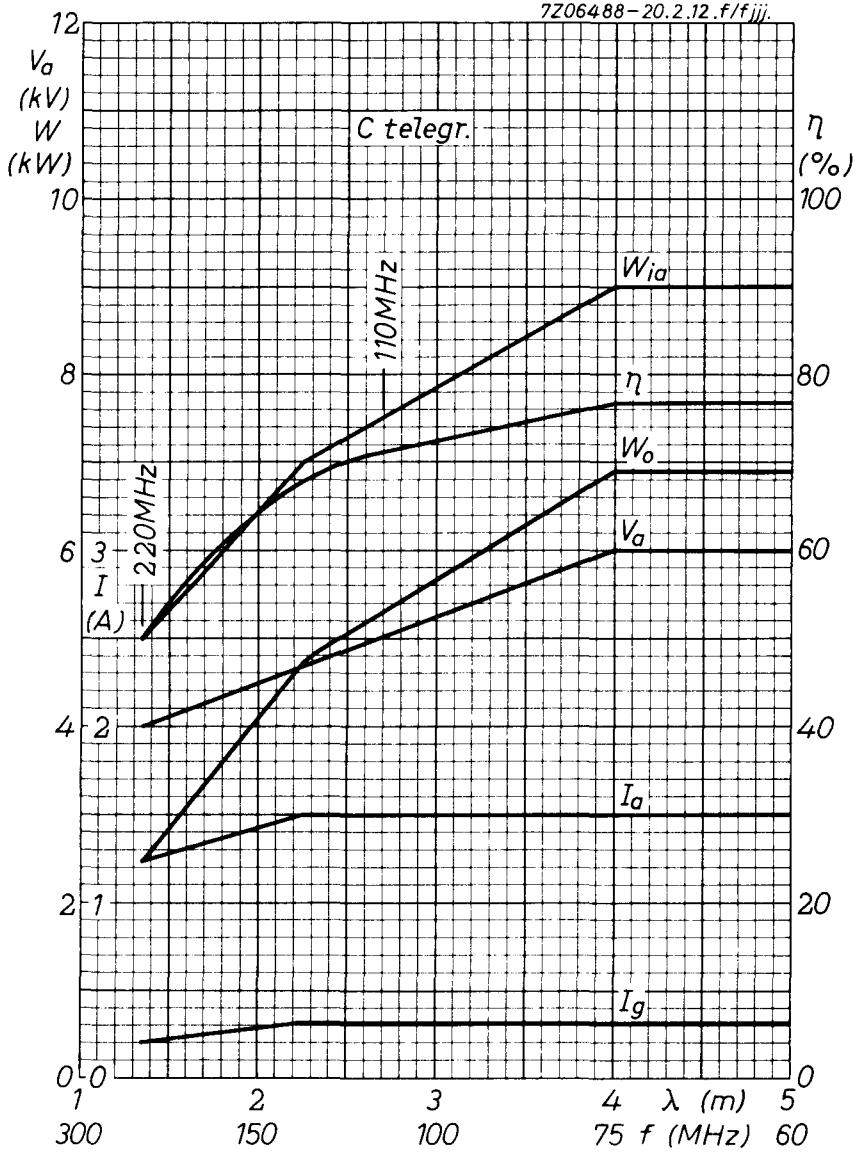


Fig. 4 Frequency dependant characteristics.

PHILIPS

Data handbook

Electronic components and materials

TBW6/6000

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3	145	1988.02
4	146	1988.02
5	147	1988.02
6	148	1988.02
7	149	1988.02
8	150	1988.02
9	151	1988.02
10	152	1988.02
11	153	1988.02
12	154	1988.02
13	155	1988.02
14	FP	2000.09.22

RF POWER TRIODE

QUICK REFERENCE DATA							
λ (m)	Freq. (MHz)	C telegr.		C osc.		B mod. [1]	
		V_a (kV)	W_o (kW)	V_a (kV)	W_o (kW)	V_a (kV)	W_o (kW)
10	30	6.5	9.5			7.0	20
		6.0	8.5			5.0	9.0
		5.0	7.1			4.0	7.1
6	50			6.0	6.0		

COOLING: water/low velocity air flow

HEATING: direct; filament thoriated tungsten

Filament voltage	V_f	12.6 V
Filament current	I_f	33 A

CAPACITANCES

Anode to all other elements except grid	C_a	0.3 pF
Grid to all other elements except anode	C_g	16 pF
Anode to grid	C_{ag}	11 pF

TYPICAL CHARACTERISTICS

Anode voltage	V_a	6 kV
Anode current	I_a	1 A
Amplification factor	μ	32
Mutual conductance	S	15 mA/V

[1]) Two tubes

Table 1 Water cooling characteristics

W_a (kW)	T_i (°C)	q_{min} [1] (l/min)	ΔP (kPa)*	max. outlet temperature T_o (°C)
1	20	2.5	8	30
	50	3	10	56
2	20	2.5	8	35
	50	5	30	57
4	20	4	18	36
	50	9	90	57
6	20	6	40	35
	50	14	250	57

TEMPERATURE LIMITS (Absolute limits)

Inlet temperature	T_i	max.	50	°C
Temperature of filament seals		max.	210	°C
Temperature of grid and anode seals		max.	180	°C

ACCESSORIES

Filament connectors	40634
Connector centre pin of filament	40649 [2]
Grid connector	40622
Water jacket	K713

In general, no air cooling will be required at frequencies up to 30 MHz **and at** ambient temperatures below 35 °C.
At higher frequencies or at higher ambient temperatures a low-velocity air flow to the grid and filament seals will be necessary.

---

1) At water inlet temperatures between 20 and 50 °C the required quantity of water can be found by proportional interpolation

2) The centre tap f_c (diameter 10.5 mm; marked O) must not be used for filament current supply. The connector type 40649, however, must be used for the cooling of this pin

* 100 kPa ≈ 1 at

MECHANICAL DATA

Dimensions in mm

Mounting position: vertical with anode down

Net mass: 0,45 kg

O-ring: 3322 026 82801

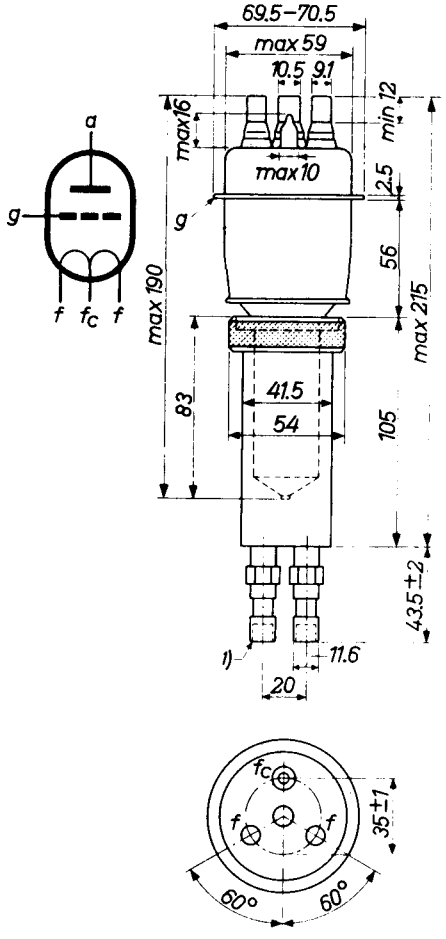


Fig. 1 Mechanical outline.

(1) 1/8-in pipe thread

RF CLASS C TELEGRAPHY

LIMITING VALUES (Absolute limits)

Frequency		f	up to	30	MHz
Anode voltage		V_a	max.	7.2	kV
Negative grid voltage		$-V_g$	max.	1250	V
Anode current		I_a	max.	2.2	A
Grid current		I_g	max.	0.6	A
Anode input power		W_{ia}	max.	14	kW
Anode dissipation		W_a	max.	6	kW

OPERATING CONDITIONS

Wavelength	λ	10	10	10	m
Frequency	f	30	30	30	MHz
Anode voltage	V_a	6.5	6.0	5.0	kV
Grid voltage	V_g	-450	-400	-300	V
Anode current	I_a	2.0	2.0	2.0	A
Grid current	I_g	0.5	0.5	0.5	A
Peak grid AC voltage	V_{gp}	820	780	660	V
Grid input power	W_{ig}	370	350	297	W
Anode input power	W_{ia}	13	12	10	kW
Anode dissipation	W_a	3.5	3.5	2.9	kW
Output power	W_o	9.5	8.5	7.1	kW
Efficiency	η	73	71	71	%

AF CLASS B AMPLIFIER AND MODULATOR

LIMITING VALUES (Absolute limits)

Anode voltage	V_a	max.	7.2	kV
Anode current	I_a	max.	2.2	A
Anode input power	W_{ia}	max.	14	kW
Anode dissipation	W_a	max.	6	kW
Grid circuit resistance	R_g	max.	15	kΩ

OPERATING CONDITIONS, two tubes

V_a	7		5		5		4		kV
V_g	-250		-165		-165		-135		V
$R_{aa\sim}$	4150		4800		5500		3800		Ω
V_{ggp}	0	1300	0	880	0	730	0	930	V
I_a	2x0.2	2x2.0	2x0.15	2x1.25	2x0.15	2x1.1	2x0.1	2x1.25	A
I_g	0	2x0.53	0	2x0.33	0	2x0.22	0	2x0.36	A
I_{gp}	-	2x2.8	-	2x1.75	-	2x1.2	-	2x1.8	A
W_{ig}	0	2x310	0	2x130	0	2x70	0	2x135	W
W_{ia}	2x1.4	2x14	2x0.75	2x6.2	2x0.75	2x5.5	2x0.4	2x5.0	kW
W_a	2x1.4	2x4.0	2x0.75	2x1.7	2x0.75	2x1.5	2x0.4	2x1.45	kW
W_o	0	20	0	9	0	8.0	0	7.1	kW
η	-	71.5	-	72.5	-	72.5	-	71	%

RF CLASS C OSCILLATOR FOR INDUSTRIAL USE with anode voltage from three-phase half-wave rectifier without filter

LIMITING VALUES (Absolute limits)

Frequency	f	up to	55	MHz
Anode voltage	V_a	max.	7	kV
Negative grid voltage	$-V_g$	max.	1250	V
Anode current	I_a	max.	1.8	A
Grid current , off load	I_g	max.	0.5	A [1]
Anode input power	W_{ia}	max.	11	kW
Anode dissipation	W_a	max.	6	kW
Grid circuit resistance	R_g	max.	10	kΩ

OPERATING CONDITIONS

Frequency	f	50	MHz
Transformer voltage	V_{tr}	5100	V_{RMS}
Anode voltage	V_a	6.0	kV
Anode current	I_a	1.5	A
Grid current , on load	I_g	0.4	A
Grid resistor	R_g	1000	Ω
Grid input power	W_{ig}	300	W
Anode input power	W_{ia}	9	kW
Anode dissipation	W_a	2.7	kW
Output power	W_o	6	kW [2]
Efficiency	η	67	%

[1] Off load max. 0.7 A

[2] Available power (load + circuit losses)

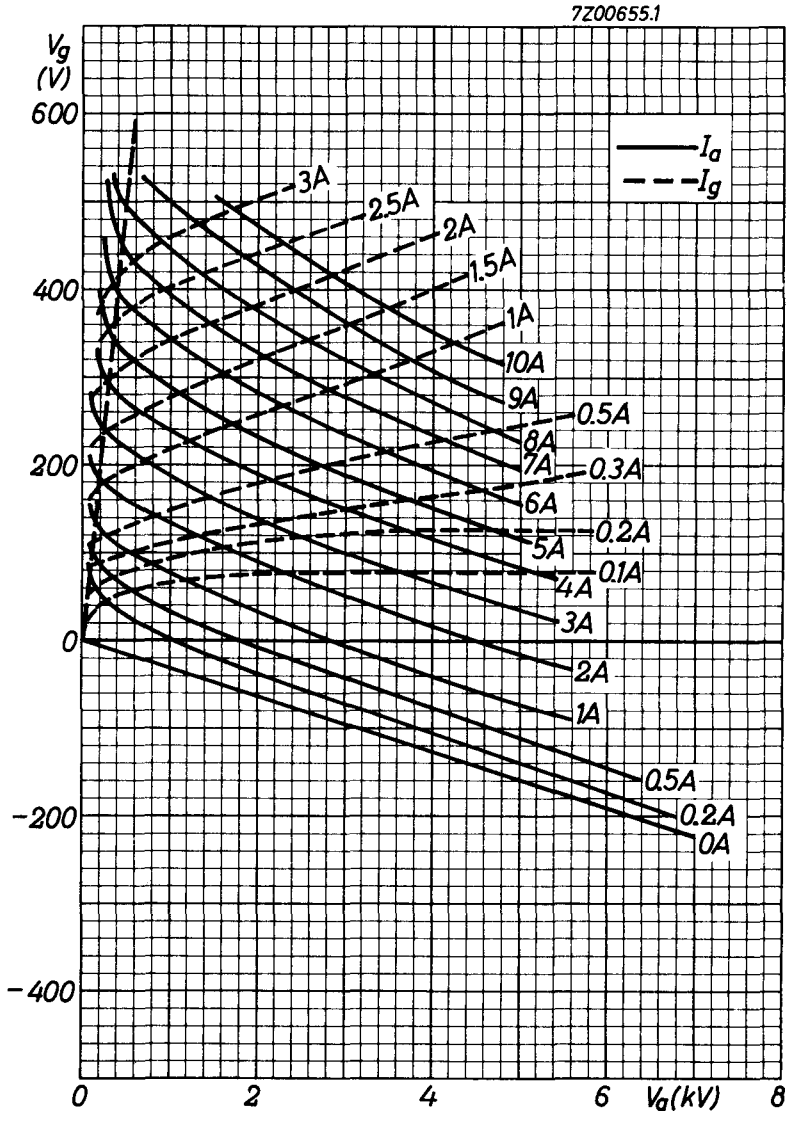


Fig. 2 Constant current characteristics.

PHILIPS

Data handbook

Electronic components and materials

TBW7/8000

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1	157	1988.02
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6	162	1988.02
7	163	1988.02
8	FP	2000.09.22

TRIODE for use in industrial R.F. generators
TRIODE pour l'utilisation dans les générateurs H.F. industriels
TRIODE zur Verwendung in HF-Industriegeneratoren

Cooling : Water cooling for anode
Low velocity air flow on terminals at frequencies above 4 Mc/s
Refroidissement: Circulation d'eau pour l'anode
Léger courant d'air pour les bornes aux fréquences supérieures à 4 MHz
Kühlung : Wasserkühlung für die Anode
Schwacher Luftstrom für die Anschlüsse bei Frequenzen höher als 4 MHz

Filament : thoriated tungsten
Filament : tungstène thorié
Heizfaden: thoriertes Wolfram

Heating : direct
Chauffage: direct
Heizung : direkt

V_f = 12,6 V $^{+5}_{-10}$ %
I_f = 32 A

Capacitances
Capacités
Kapazitäten

C_a = 0,4 pF
C_g = 13,5 pF
C_{ag} = 7,4 pF

Typical characteristics
Caractéristiques types
Kenndaten

V_a = 6 kV
I_a = 1 A
S = 12 mA/V
μ = 24

	TBW7/9000	K721
Net weight Poids net Nettogewicht	0,57 kg	0,76 kg
Shipping weight Poids brut Bruttogewicht	1,35 kg	0,9 kg

Temperatures and cooling
Températures et refroidissement
Temperaturen und Kühlung

Temperature of the seals
Température des scellements = max. 220 °C
Temperatur der Einschmelzungen

Cooling characteristics
Caractéristiques de refroidissement
Kühlungsdaten

W_a (kW)	t_i (°C)	q_{min} (l/min.)	p_i (atm.)
2	20	2,5	0,06
	50	5	0,2
4	20	4	0,14
	50	9	0,7
6	20	6	0,3
	50	14	1,9

t_i = max. 50 °C. At temperatures t_i between 20 and 50 °C the required quantity of water can be found by proportional interpolation

t_i = max. 50 °C. Le débit d'eau aux températures t_i entre 20 et 50 °C peut être calculé par interpolation linéaire

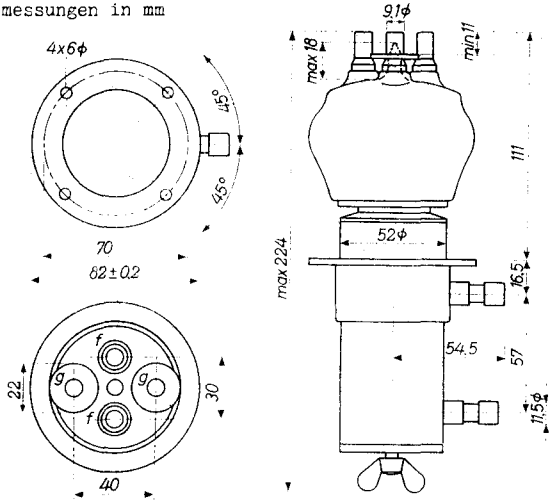
t_i = max. 50 °C. Die benötigte Wassermenge für Temperaturwerte t_i zwischen 20 und 50 °C kann durch Proportionalinterpolation berechnet werden.

At frequencies above 4 Mc/s both grid terminals should be connected in parallel. At the highest frequencies care should be taken to distribute the R.F. current equally over both grid terminals to avoid excessive grid seal temperatures

Aux fréquences supérieures à 4 MHz les deux broches de la grille doivent être reliées en parallèle. Aux fréquences les plus élevées il faut prendre soin à distribuer le courant H.F. uniformément entre les deux broches de la grille pour éviter des températures excessives des scellements de la grille

Bei Frequenzen höher als 4 MHz müssen die beiden Gitteranschlüsse parallelgeschaltet werden. Zur Vermeidung einer zu hohen Temperatur der Gittereinschmelzungen muss bei den höchsten Frequenzen der HF-Strom gleichmässig über die beiden Gitteranschlüsse verteilt werden.

Dimensions in mm
Dimensions en mm
Abmessungen in mm



Accessories
Accessoires
Zubehör

Grid and filament clip Pince pour la grille et le filament Gitter- und Heizfadenanschlüsse	40634
Water jacket Refroidisseur Kühltopf	K 721

H.F. class C oscillator for industrial use with anode voltage from three-phase rectifier without filter (Continuous service)
Oscillatrice H.F. classe C pour applications industrielles avec tension anodique dérivée d'un redresseur triphasé sans filtre (service continu).
HF-Klasse C Oszillator für industrielle Anwendungen mit der Anodenspannung von einem Dreiphasen-Gleichrichter ohne Filter abgenommen

Limiting values (Absolute limits)
Caractéristiques limites (Limites absolues)
Grenzdaten (Absolute Grenzwerte)

f	= max. 50 Mc/s		
V_a	= max. 8 kV	$-V_g$	= max. 1250 V
W_{ia}	= max. 12 kW	I_g	= max. 0,4 A [1]
W_a	= max. 6 kW	I_g	= max. 0,5 A [2]
I_a	= max. 1,8 A	R_g	= max. 10 kΩ

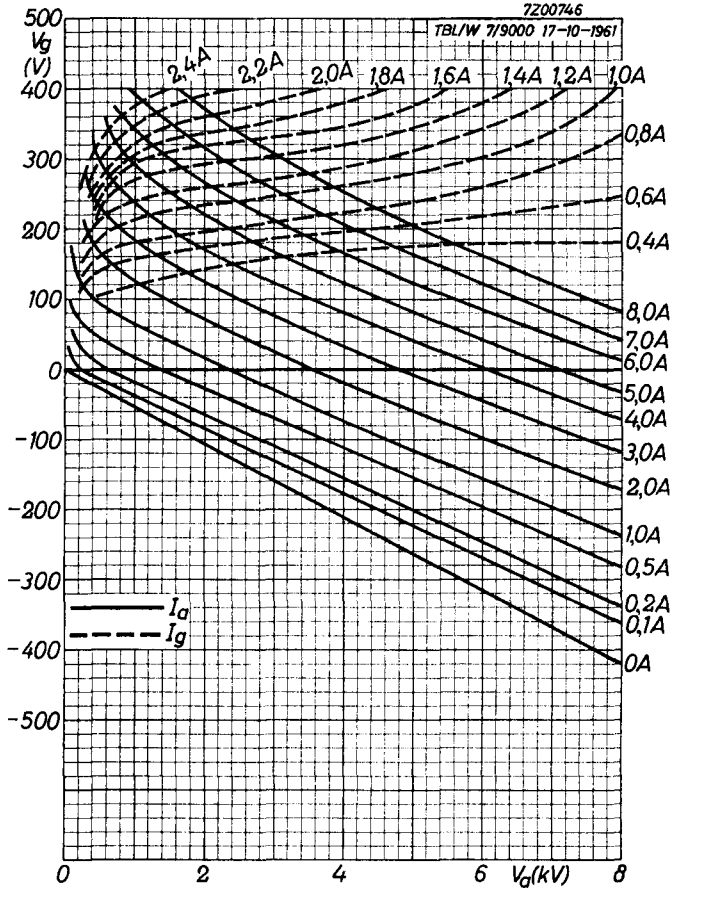
Operating characteristics
Caractéristiques d'utilisation
Betriebsdaten

f	=	50	50 Mc/s
V_a	=	7200	6200 V
I_a	=	1,5	1,4 A [1]
I_a	=	0,37	0,40 A [2]
I_g	=	0,36	0,37 A [1]
I_g	=	0,47	0,47 A [2]
R_g	=	1850	1500 Ω
$Ra_{\sim}$	=	2300	2100 Ω
$Vg_{\sim}/Va_{\sim}$	=	17	17 %
W_{ia}	=	10,8	8,68 kW
W_a	=	3,3	2,5 kW
η	=	70	71 %
W_ℓ	=	6,1	5,0 kW [3]

[1]) Loaded; chargé; belastet

[2]) Unloaded; sans charge; unbelastet

[3]) Useful power in the load, measured in a circuit having an efficiency of about 85 %
Puissance utile dans la charge, mesurée dans un circuit avec un rendement d'environ 85 %
Nutzleistung in der Belastung, gemessen in einer Schaltung mit einem Wirkungsgrad von 85 %.


7Z00746
TBL/W 7/9000 17-10-1961
Vg (V)
500
400
300
200
100
0
-100
-200
-300
-400
-500
2,4A
2,2A
2,0A
1,8A
1,6A
1,4A
1,2A
1,0A
0,8A
0,6A
0,4A
8,0A
7,0A
6,0A
5,0A
4,0A
3,0A
2,0A
1,0A
0,5A
0,2A
0,1A
0A
Ia
Ig
0
2
4
6
Va(kV)
8

2.2.1963

A

TBW7/9000

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Electronic Tube

HANDBOOK

TBW7/9000

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1	1	1963.02.02
2	2	1963.02.02
3	3	1963.02.02
4	4	1963.02.02
5	A	1963.02.02
6	B	1963.02.02
7	FP	2000.02.12

PHILIPS ZENDLAMP



TC 03/5

De TC 03/5 is een 5-Watt zendlamp, welke speciaal geconstrueerd is voor amateurs, die met eenvoudige hulpapparaten, zooals die in de ontvangtechniek gebruikt worden, meer willen bereiken, dan met een ontvanglamp als oscillator mogelijk is.

De lamp is voorzien van een oxyd-gloeidraad met zeer hooge emissie; de gloeispanning bedraagt 4 V, de gloeistroom slechts 0.275 A, zoodat desgewenscht de voeding door een 4-V accu plaats kan hebben. Aanbevolen wordt echter den gloeidraad met wisselstroom te voeden en daarbij gebruik te maken van den Philips gloeistroomtransformator 4009.

De anodespanning is zeer laag; de maximale anodespanning bedraagt 300 V, waarbij een nuttige energie van 5 watt verkregen kan worden. Echter zijn ook bij 220 V anodespanning reeds zeer goede resultaten mogelijk.

Rooster en gloeidraad zijn beide boven uitgevoerd, tengevolge waarvan de lampcapaciteit zeer klein is. Hierdoor kan de lamp ook zeer goed werken op ultra korte golven tot 3,5 m toe.

GELIJKRICHTER.

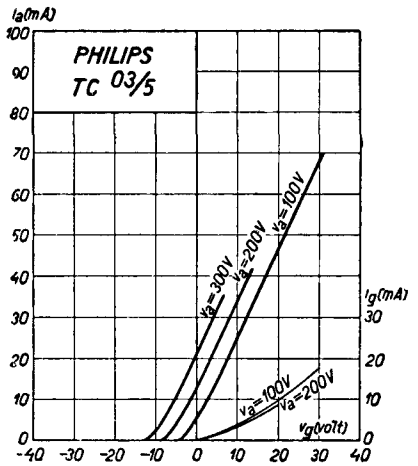
Als gelijkrichtlamp wordt Philips dubbelfasige gelijkrichtlamp No. 506 aanbevolen (2 × 300 V, 75 mA).

Onderstaande tabel geldt voor een anodespanning van 400 V en een golflengte van 15 m.

Rendement	30	40	50	%
Toegevoerd vermogen . .	8,5	10	10	watt
Nuttig vermogen	2,5	4	5	watt
Anodedissipatie	6	6	5	watt

PHILIPS ZENDLAMP

TC 03/5



Gloeispanning	v_f	= 4 V
Gloeistroom	i_f	= 0.275 A
Verzadigingsstroom	i_s	= ca. 100 mA
Anodespanning	v_a	= 150—300 V
Anodedissipatie	w_a	= 6 W
Anodedissipatie beproefd op	w_{at}	= 10 W
Versterkingsfactor	g	= ca. 25
Steilheid	S	= ca. 1.8 mA/V
Inwendige weerstand	R_i	= ca. 14000 Ω
Grootste diameter	d	= 55 mm
Grootste lengte	l	= 130 mm

Alle opgaven gelden voor het gebruik van **gelijkstroom voor de anodevoeding.** Bij gebruik van wisselstroom of gelijkgerichten wisselstroom, die onvoldoende afgevlakt is, zijn de stroomen wat kleiner en het vermogen dus ook.

Gebruik op golflengten grooter dan 15 M.

Bij het gebruik op grootere golflengten mag de anodespanning boven 300 V worden opgevoerd, mits de anodedissipatie niet hooger wordt dan 6 W. Het verdient aanbeveling, de eerste instellingen te verrichten met volle gloeispanning en **lage anodespanning** (300 V) waardoor de kans op ernstige overbelasting tengevolge van een foutieve instelling wordt verminderd. Wanneer de zender eenmaal naar behooren werkt, kan de anodespanning verhoogd worden.

Het is raadzaam bij het werken met hoogere anodespanning, de waarde van den lekweerstand te vergrooten; bij 500 V anodespanning b.v. tot circa 10000 Ohm.

Gebruik op golflengten kleiner dan 15 m.

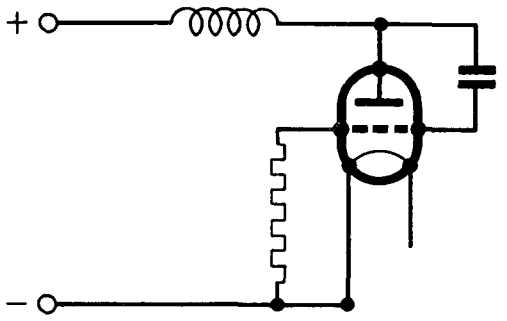


Fig. 4

De kleinste golflengte, die men met terugkoppeling kan bereiken, is ongeveer 3,5 m. Dergelijke korte golven worden verkregen door een draadlus of een recht stuk draad tusschen anode en rooster aan te sluiten, met een scheidingscondensator van de orde van 50 cm in het midden (zie fig. 4).

Gelijkrichter.

Voor de gelijkrichting van de anodespanning kan een gelijkrichtlamp dienen, zooals deze in plaatspanningapparaten gebruikt wordt. In het bijzonder wordt de Philips dubbelphasige gelijkrichtlamp No. 506 aanbevolen (2 × 300 V, 75 mA).

Modulator.

Als modulatorlampen bij anodespanningsmodulatie (Heising) worden 2 parallel geschakelde lampen TC 03/5 aanbevolen. De anodestroom per lamp moet bij 300 V anodespanning op circa 6 mA per lamp worden ingesteld, waarbij een modulatie-diepte van circa 40 % bereikt kan worden.

PRIJS SLECHTS f 10,50

PHILIPS

AMATEUR ZENDLAMP

TC 03/5

R 757 H. 15/529

Rekening houdende met de wenschen van vele amateurs, heeft de N.V. PHILIPS' RADIO een amateurzendlamp - TC 03/5 - geconstrueerd, welke bij lage spanningen uitstekende resultaten geeft, terwijl de prijs haar onder ieders bereik brengt.

De TC 03/5 is speciaal geconstrueerd voor amateurs, die met eenvoudige hulpapparaten, zooals die in de ontvangtechniek gebruikt worden, meer willen bereiken dan met een ontvanglamp als oscillator mogelijk is. De lamp is voorzien van een oxyddraad met zeer hooge emissie; de gloeispanning bedraagt 4 V, de gloeistroom slechts 0,275 A, zoodat desgewenscht de voeding door een 4 V accu kan plaats hebben. Het verdient dan evenwel aanbeveling, de gloeidraad-aansluiting b.v. eenmaal per week te verwisselen, teneinde een meer regelmatige belasting van den gloeidraad te verkrijgen.

Aanbevolen wordt, den gloeidraad met wisselstroom te voeden en daarbij gebruik te maken van den **Philips Gloeistroomtransformator No. 4009.**

De anodespanning is zeer laag; de maximale anodespanning bedraagt 300 V, waarbij een nuttige energie van 5 W verkregen kan worden. Echter zijn ook bij 220 V anodespanning reeds zeer goede resultaten mogelijk.

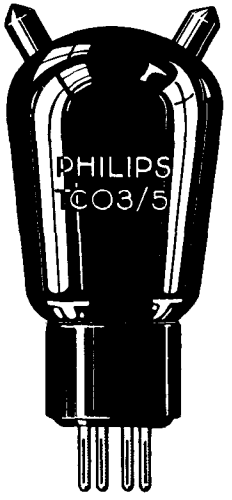


Fig. 1

De TC 03/5 is eveneens bijzonder geschikt voor kleine transportable zenders.

Deze lamp is voorzien van de normale A-huls, waarvan echter alleen de gloeidraadpennen zijn aangesloten, omdat rooster en anode beide naar boven uitgevoerd zijn. Tengevolge van deze speciale uitvoering is de inwendige lampcapaciteit zeer klein en kan de lamp ook op ultra-korte golven, zeer goed werken.

Zij kan gebruikt worden:

1. als oscillator, op golflengten tot 3,5 m;
2. als energie-versterker in een zender, waarbij de rooster-excitatie met behulp van een stuurlamp verkregen wordt.

Gebruik als oscillator op een golflengte van ca. 15 m.

Bij 300 V anodespanning kan de lekweerstand een waarde hebben van 5000 à 10000 ohm, afhankelijk van het rendement, dat men wenscht te bereiken. Bij een hoogere waarde van den lekweerstand wordt het rendement gewoonlijk grooter, echter daalt daarbij de opgenomen (en afgegeven) energie tevens.

GEGEVENS;

gloeispanning	v_f	= 4 V
gloeistroom	i_f	= 0,275 A
verzadigingsstroom	i_s	= ca. 100 mA
anodespanning	v_a	= 150-300 V
anodedissipatie	w_a	= 6 W
anodedissipatie beproefd op	w_{at}	= 10 W
versterkingsfactor	g	= ca. 25
steilheid	S	= ca. 1,8 mA/V
inwendige weerstand	R_i	= ca. 14000 Ω
grootste diameter	d	= 55 mm
grootste lengte	l	= 130 mm

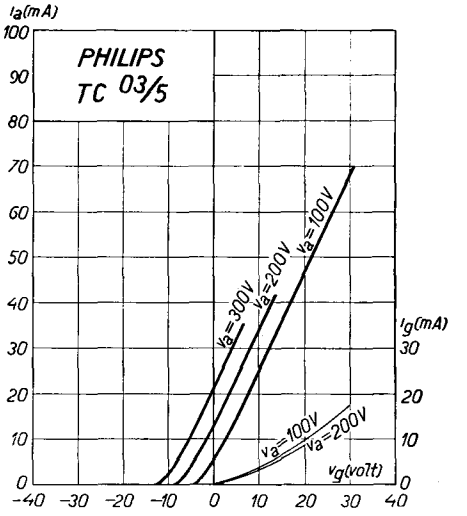


Fig. 2

Bij lagere anodespanning b.v. 200 V, wordt meer energie aan de antenne afgegeven met een **kleinere** waarde van den lekweerstand. Soms kan de lekweerstand zelfs wel geheel weggelaten worden, echter niet de daarmede in serie geschakelde hoogfrequent-smoorspoel, die in dat geval direct tusschen het rooster en een der gloeidraadpolen geschakeld wordt, in serie met een milli-ampèremeter. (Zie fig. 3.)

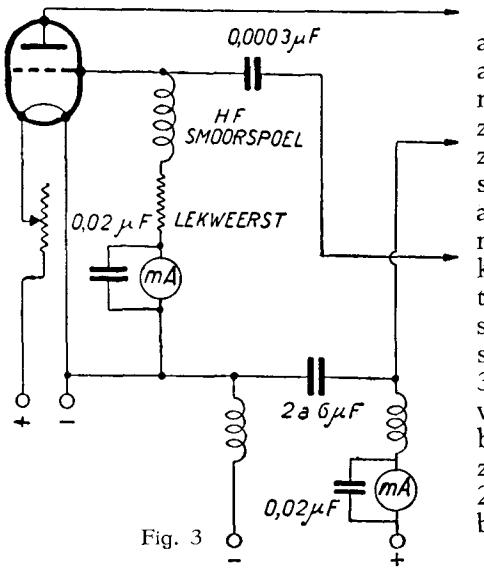


Fig. 3

Met zeer los gekoppelden antennekring, of wanneer de antennekring niet in resonantie is met den zenderkring, zal de anodestroom zeer klein zijn, daarentegen de roosterstroom vrij groot. Door de antennekoppeling vaster te maken en (of) den antennekring op den zenderkring af te stemmen, zal de roosterstroom afnemen en de anodestroom toenemen tot 30 à 35 mA, hetgeen een goede waarde is voor een veilig bedrijf. Bij juiste instelling zal de roosterstroom 15 à 20 % van den anodestroom bedragen.

PHILIPS

SENDERÖHRE TC 03/5-I

Diese 5-Watt-Röhre wurde besonders für den Amateurgebrauch konstruiert. Sie bietet die Möglichkeit, mit eigentlich für Empfangszwecke bestimmten Einzelteilen einen leistungsfähigen Sender zu bauen.

Der Oxydheizfaden der TC 03/5-I zeichnet sich durch seine hohe Elektronenemission aus und benötigt trotzdem nur eine geringe Heizspannung sowie einen niedrigen Heizstrom. Der mässige Strombedarf gestattet sogar die Verwendung eines 4-Volt-Akkumulators als Heizstromquelle.

Bei nur 300 V Anodenspannung ist auf einer Wellenlänge von 14 m eine Ausgangsleistung von 5 W zu erzielen. Auf Wellenlängen von mehr als 40 m darf die Anodenspannung bis auf 400 V gesteigert werden; annehmbare Ergebnisse werden aber auch schon mit einer niedrigeren Anodenspannung erreicht.



Die besondere Bauart dieser Röhre hat eine sehr geringe innere Kapazität zur Folge und ermöglicht den Betrieb der Röhre auf Ultra-Kurzwellen bis zu 2,5 m abwärts.

Die nachstehende Tabelle gilt für eine Anodenspannung von 300 V und eine Wellenlänge von 14 m:

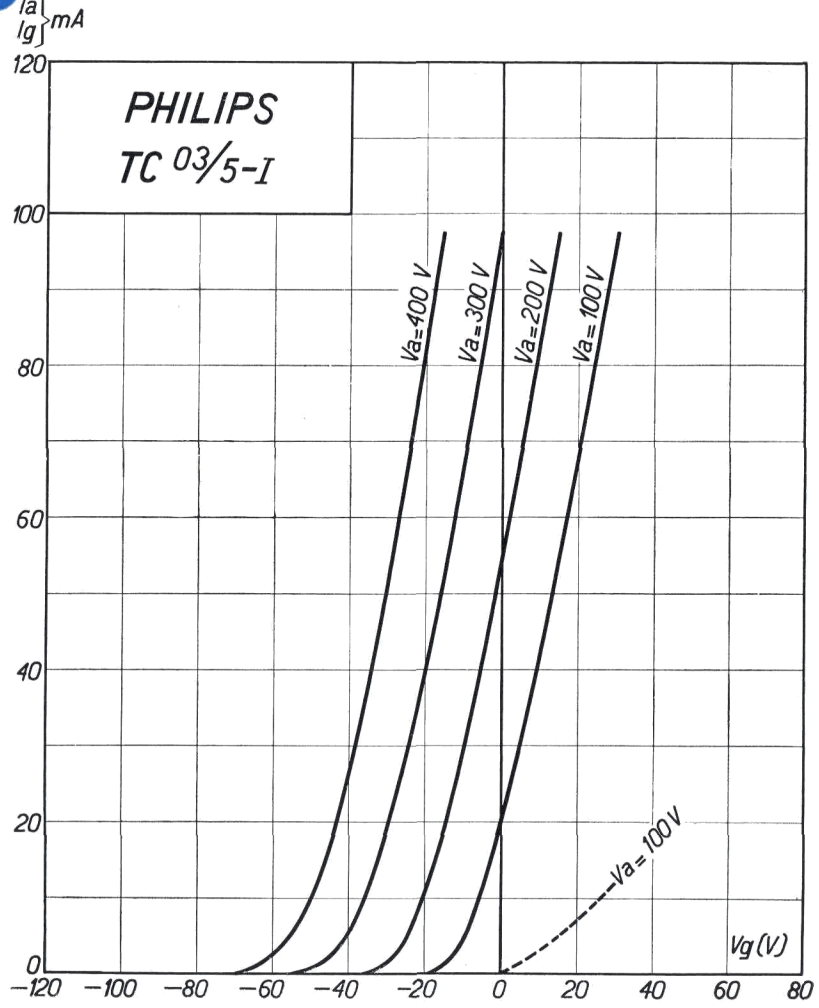
Wirkungsgrad	30	40	50	%
Eingangsleistung	8,5	10	10	W
Ausgangsleistung	2,5	4	5	W
Anodenverlust	6	6	5	W

Die Anodenspannung dieser Senderöhre kann mit einer Philips Vollweggleichrichterröhre AZ1 (2 × 400 V, 75 mA) erzielt werden.

PHILIPS

SENDERÖHRE

TC 03/5-I



Heizspannung	V_f	= 4,0 V
Heizstrom	I_f	= ca. 0,28 A
Sättigungsstrom	I_s	= ca. 0,10 A
Anodenspannung	V_a	= 150-400 V
Zulässiger Anodenverlust	W_a	= 6 W
Geprüfter Anodenverlust	W_{at}	= 10 W
Verstärkungsfaktor	g	= ca. 6
Durchgriff	D	= ca. 17 %
Steilheit bei V_a = 300 V, I_a = 20 mA	S_{norm}	= ca. 1,5 mA/V
Grösste Steilheit	S_{max}	= ca. 2,3 mA/V
Innerer Widerstand bei V_a = 300 V, I_a = 20 mA	R_i	= ca. 4000 Ω
Grösster Durchmesser	d	= 50 mm
Gesamtlänge	l	= 90 mm

PHILIPS SENDERÖHRE TC 04/10

Diese Triode hat eine Oxydkathode mit einer besonders hohen Elektronenemission. Der Heizfaden ist sehr stark und die Röhre eignet sich demzufolge zum Gebrauch in kleinen tragbaren Sendern.

Die Anode und das Gitter sind an Klemmen oben auf dem Röhrenkolben angeschlossen, wodurch die Kapazität und Selbstinduktion zwischen den Elektroden niedrig gehalten wurde. Bei Wellenlängen bis zu 2 m herab darf eine Anodenspannung von 300 V angelegt werden, bei Wellenlängen bis zu 5 m herab darf die Anodenspannung 400 V betragen, während die höchstzulässige Anodenspannung von 500 V bei Wellenlängen von 20 m und höher angelegt werden darf.

Die TC 04/10 kann in einem H.F.-Verstärker Klasse B oder Klasse C oder als Oszillatorröhre verwendet werden.

Die in der untenstehenden Tabelle erwähnten Daten gelten für eine Wellenlänge von 150 m und eine Anodenspannung von 500 V.



Einstellung	Nutzleistung	Wirkungsgrad
H.F.-Klasse C (Telegraphie)	15 W[1])	60%
H.F.-Klasse C (Anodenspannungsmodulation)	10 W[1])[2])	60%
H.F.-Klasse B (Telephonie)	4 W[1])[2])	31%

Die nachstehende Tabelle gilt für Wellenlängen bis zu 15 m herab und eine Anodenspannung von 400 V:

Einstellung	Nutzleistung	Wirkungsgrad
H.F.-Klasse C (Telegraphie)	10 W[1])	58%
H.F.-Klasse C (Anodenspannungsmodulation)	9,3 W[1])[2])	58%
H.F.-Klasse B (Telephonie)	3,6 W[1])[2])	27%

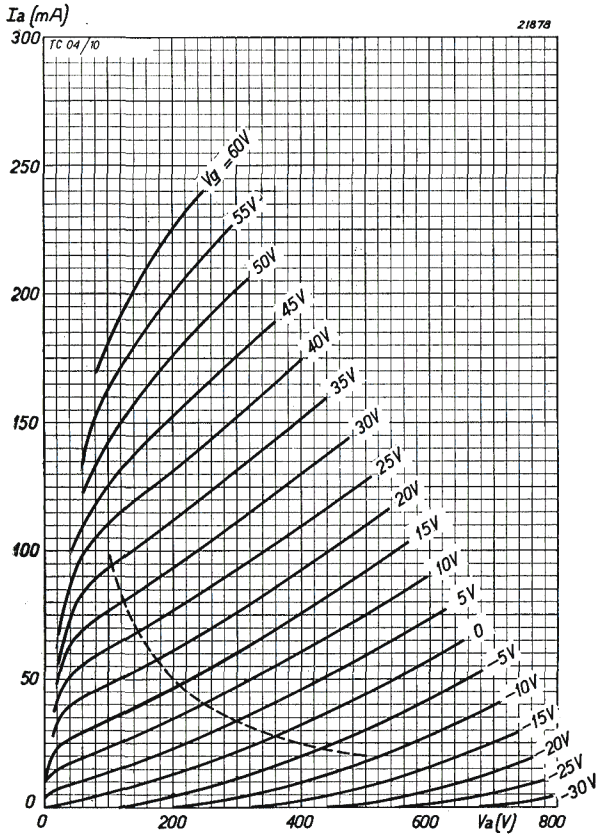
[1]) Kreisverluste sind abzuziehen.
[2]) Nutzleistung in der Trägerwelle (max. Modulationstiefe 100%).

PHILIPS EMISSION

7/40

B 3301/1

PHILIPS SENDERÖHRE TC 04/10



Heizspannung	V_f	=	4,0 V
Heizstrom	I_f	=	ca. 1,1 A
Sättigungsstrom	I_s	=	ca. 0,4 A
Anodenspannung	V_a	=	max. 500 V
Höchstzulässiger Anodenverlust	W_a	=	max. 10 W
Geprüfter Anodenverlust	W_{at}	=	15 W
Verstärkungsfaktor	μ	=	ca. 25
Steilheit bei $V_a = 500$ V, $I_a = 25$ mA	S	=	ca. 2,2 mA/V
Höchstzulässiger Kathodenstrom	I_k	=	max. 60 mA
Anoden/Kathodenkapazität	C_{ak}	=	ca. 3 pF
Gitter/Kathodenkapazität	C_{gk}	=	ca. 3,5 pF
Anoden/Gitterkapazität	C_{ag}	=	ca. 6,8 pF
Maximale Gesamtlänge	l	=	157 mm
Maximaler Kolbendurchmesser	d	=	57 mm
Maximaler Gesamtdurchmesser	d'	=	74 mm

PHILIPS

SENDERÖHRE TC 04/10-I

Diese Röhre besitzt einen Oxydheizfaden, der eine äusserst hohe Elektronenemission ergibt. Mit Rücksicht auf die grosse mechanische Widerstandsfähigkeit dieses Heizfadens ist die Röhre sehr gut in kleinen tragbaren Sendeanlagen zu verwenden.

Anode und Gitter sind zu Anschlussklemmen auf dem Röhrenkolben geführt, wodurch die innere Röhrenkapazität sehr niedrig gehalten wird. Infolgedessen kann die Röhre als Oszillator auf Wellenlängen bis zu 4 m abwärts arbeiten; die Anodenspannung darf in diesem Falle 250 V erreichen.



Bei Wellenlängen von mehr als 14 m ist eine Anodenspannung von 500 V zulässig, unter der Bedingung allerdings, dass der zulässige Anodenverlust von 10 W nicht überschritten wird.

Die untenstehende Tabelle gilt für eine Anodenspannung von 400 V und eine Wellenlänge von etwa 14 m:

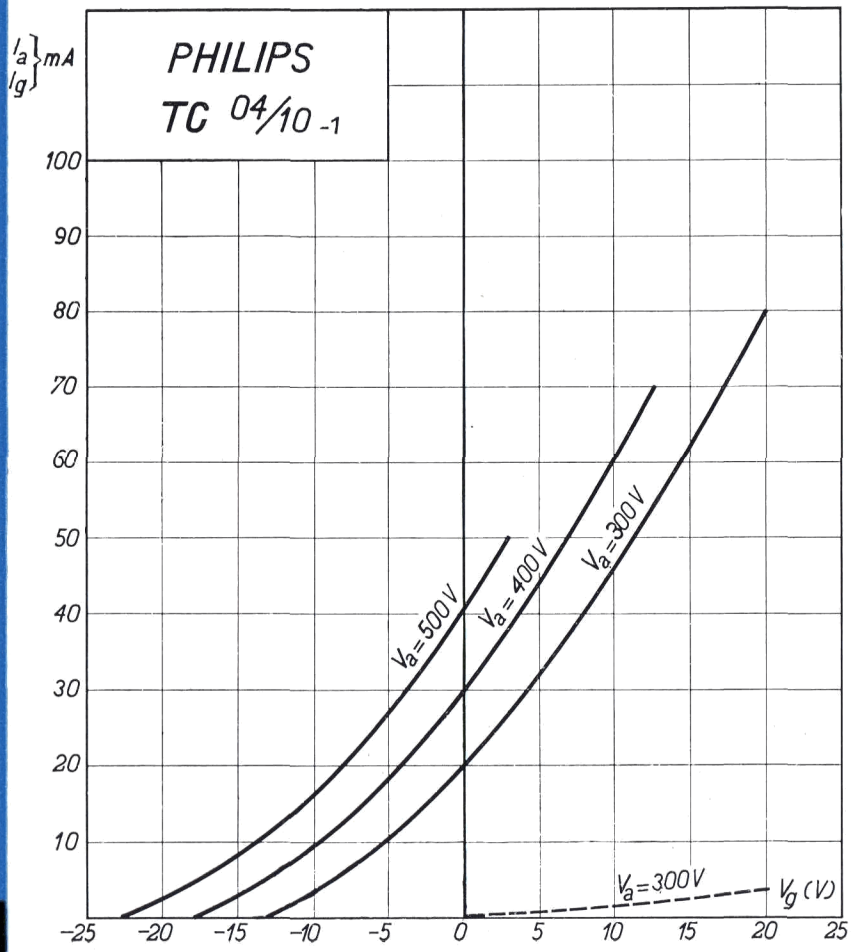
Wirkungsgrad	30	40	50	60	65	%
Eingangsleistung	14	16	20	25	30	W
Ausgangsleistung	4	6	10	15	20	W
Anodenverlust	10	10	10	10	10	W

Für die Lieferung der Anodenspannung wird empfohlen: die Philips Vollweggleichrichterröhre 506 (2×300 V, 75 mA) oder AZ 1 (2×500 V, 60 mA) oder eine Halbweggleichrichterröhre 505 (400 V, 60 mA).

PHILIPS

SENDERÖHRE

TC 04/10-1



Heizspannung	V_f	= 4,0 V
Heizstrom	I_f	= ca. 1,1 A
Sättigungsstrom	I_s	= ca. 0,40 A
Anodenspannung	V_a	= 200-500 V
Zulässiger Anodenverlust	W_a	= 10 W
Geprüfter Anodenverlust	W_{at}	= 20 W
Verstärkungsfaktor	g	= ca. 25
Durchgriff	D	= ca. 4%
Steilheit bei V_a = 400 V, I_a = 25 mA	S_{norm}	= ca. 2,2 mA/V
Grösste Steilheit	S_{max}	= ca. 2,5 mA/V
Innerer Widerstand bei V_a = 400 V, I_a = 25 mA	R_i	= ca. 11400 Ω
Grösster Kolbendurchmesser	d	= 55 mm
Grösster Gesamtdurchmesser	d^1	= ca. 75 mm
Gesamtlänge	l	= ca. 152 mm

PHILIPS
TRIODE

TC 05/25

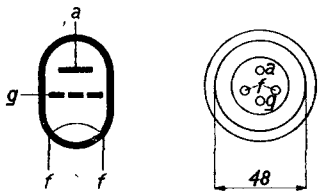
PHILIPS EMISSION

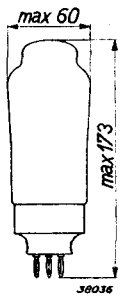
Use	:	Oscillator, H.F. amplifier
Verwendung	:	Oszillator, Hochfrequenzverstärker
Utilisation	:	Oscillateur, amplificateur H.F.
Gebruikswijze:		Oscillator, hoogfrequentversterker
Empleo	:	Oscilador, amplificador de A.F.

Cathode	:	Oxide-coated, directly heated
Kathode	:	Oxyde, direkt geheizt
Cathode	:	Oxyde, à chauffage direct
Kathode	:	Oxyd, direct verhit
Cátodo	:	Oxido, caldeado directamente

Vf	=	4,0	V
If	≈	2,2	A
Isat	≈	0,8	A
Wa	= max.	40	W
Wat	=	50	W
μ	≈	9	
S (Va = 600 V; Ia = 50—80 mA)	≈	2,2	mA/V
Caf	≈	2,7	pF
Cfg	≈	6,2	pF
Cag	≈	6,6	pF
Ik	= max.	100	mA

λ	MHz	Va max.
150 m	2	600 V
15 m	20	500 V





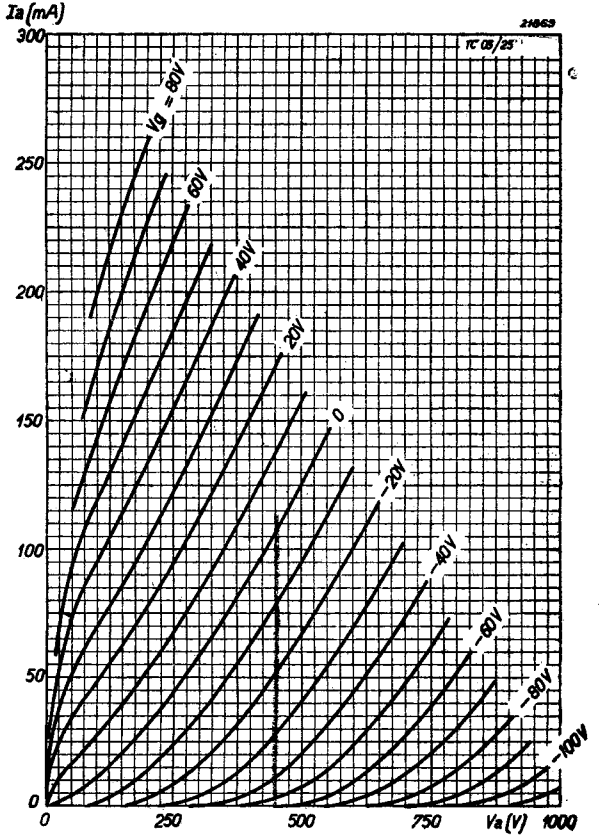
TC 05/25

PHILIPS
TRIODE

PHILIPS EMISSION

Characteristics :
Kennlinien :
Caractéristiques :
Karakteristieken :
Caracteristicas :

Ia-Va



PHILIPS EMISSION

LF class B amplification (two valves)
NF Klasse B Verstärkung (zwei Röhren)
BF classe B amplification (deux tubes)
LF klasse B versterking (twee buizen)
BF clase B amplificación (dos válvulas)

Va	600	V
Vg	≈ —60	V
Ia (Vg~ = 0)	20	mA
Ia (Vg~ = max)	170	mA
Ig (Vg~ = max)	≈ 16	mA
Vg~	≈ 160	V
Vgg~	≈ 320	V
Wi	102	W
Wa	≈ 34	W
Wg	≈ 2,6	W
Wo	68 *)	W
Ra	1900	Ohm
Raa	7600	Ohm
η	67	%

HF class C telegraphy
HF Klasse C Telegraphie
HF classe C télégraphie
HF klasse C telegrafie
AF clase C telegrafía

λ	150	15	m
Va	600	500	V
Vg	≈—170	≈—140	V
Ia	93	90	mA
Igl	≈ 10,6	≈ 12,5	mA
Vg~	≈ 300	≈ 260	V
Whf	≈ 3,2	≈ 3,25	W
Wi	55	45	W
Wa	20	18	W
Wo	35 *)	27 *)	W
η	62	60	%

PHILIPS EMISSION

HF class B telephony
HF Klasse B Telephonie
HF classe B téléphonie
HF klasse B telefonie
AF clase B telefonía

λ	150	15	m
Va	600	500	V
Vg	≈ —60	≈ —45	V
Ia	74	62	mA
Ig1	≈ 18 [1])	≈ 12 [1])	mA
Vg~	≈ 100	≈ 80	V
Whf	≈ 3,6 [1])	≈ 2 [1])	W
Wi	44,5	31	W
Wa	33,5	24	W
Wo	11 *)	7,0 *)	W
η	25	22,5	%

HF class C anode modulation
HF Klasse C Anodenmodulation
HF classe C modulation d'anode
HF klasse C anodemodulatie
AF clase C modulación de ánodo

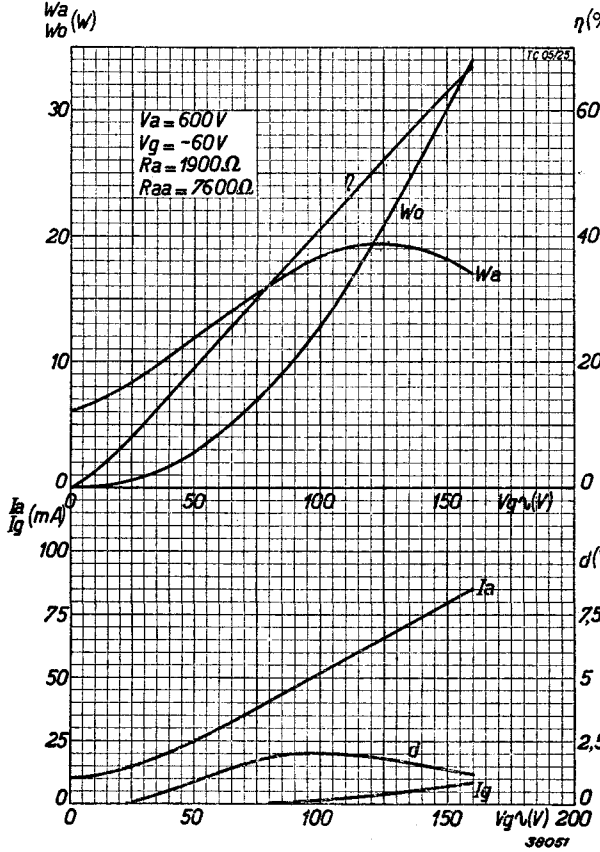
λ	150	15	m
Va	600	500	V
Vg	≈—170	≈—160	V
Ia	95	84	mA
Ig	≈ 11,5	≈ 12,5	mA
Vg~	≈ 300	≈ 280	V
Whf	≈ 3,5	≈ 3,4	W
Wlf	≈ 29 [2])	≈ 21 [2])	W
Wi	57	42	W
Wa	22	16	W
Wo	35 *)	26 *)	W
η	61	61	%

PHILIPS·
TRIODE

TC 05/25

PHILIPS EMISSION

Characteristics	:	LF class	B amplification (one valve)
Kennlinien	:	NF Klasse	B Verstärkung (eine Röhre)
Caractéristiques	:	BF classe	B amplification (un tube)
Karakteristieken	:	LF klasse	B versterking (een buis)
Características	:	BF clase	B amplificación (una válvula)

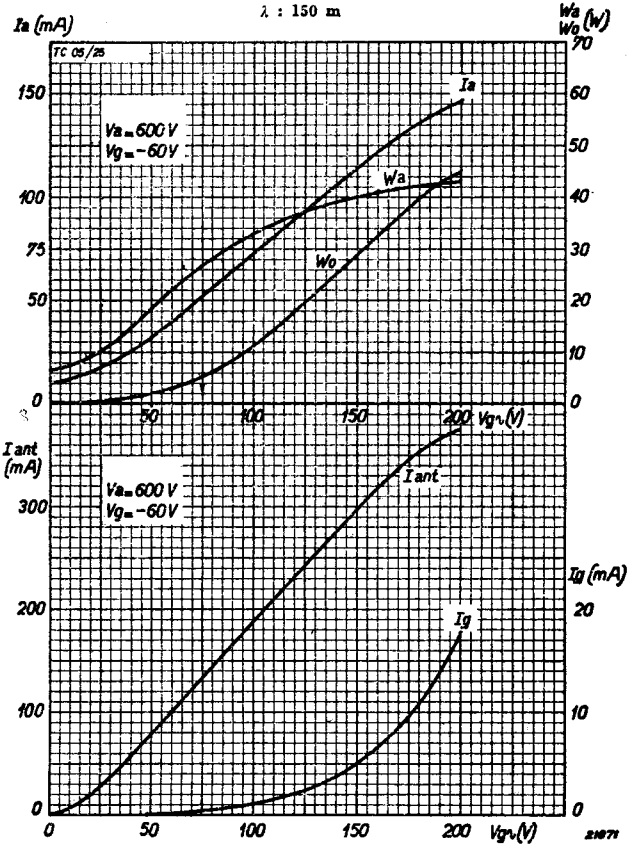


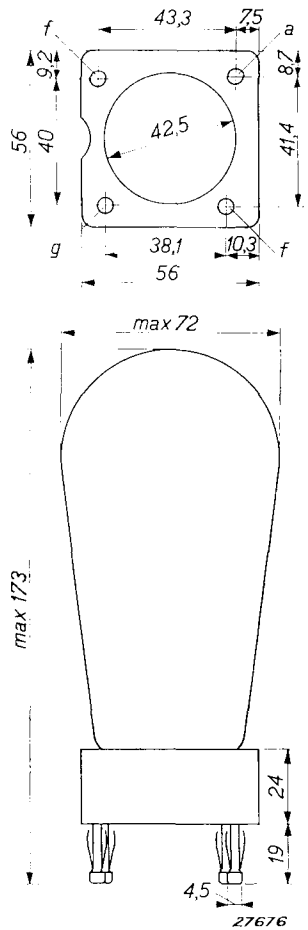
TC 05/25

PHILIPS
TRIODE

PHILIPS EMISSION

Characteristics	:	**HF class B telephony**
Kennlinien	:	**HF Klasse B Telephonie**
Caractéristiques	:	**HF classe B téléphonie**
Karakteristieken	:	**HF klasse B telefonie**
Características	:	**AF clase B telefonía**





PHILIPS-EMISSION

R.E. 520 E 1-48

PHILIPS

TRANSMITTING VALVE

TC 1/40

PHILIPS



PHILIPS - MISSION

Description

This triode valve has an oxide-coated filament characterised by its extremely low filament current consumption and its high emission.

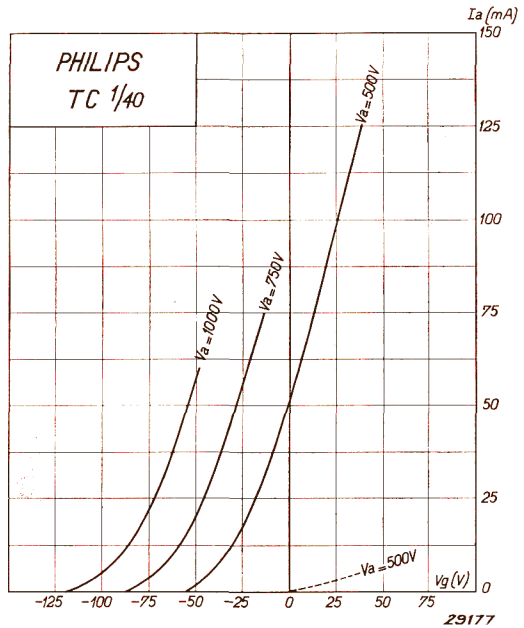
The anode dissipation may be raised to the comparatively high value of 40 watts; the mean value of the anode current may attain 80 milliamps.

The input and output are indicated in the table below for different values of the efficiency.

Efficiency	Input	Output	Anode dissipation
40 %	65 watts	25 watts	40 watts
50 %	80 watts	40 watts	40 watts
60 %	80 watts	48 watts	32 watts
70 %	80 watts	56 watts	24 watts

The valve may be operated on waves down to 100 metres.

The dimensions of the valve and the position of the base-pins are indicated in the drawing.



Technical Data

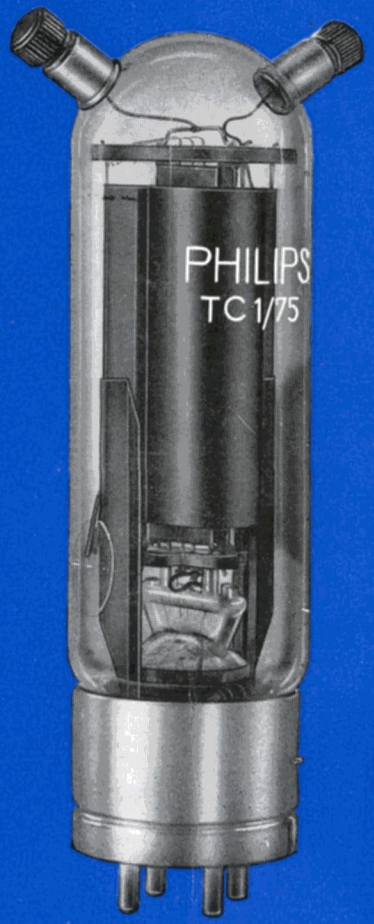
Filament voltage	V_f	= 6·0 V
Filament current	I_f	= appr. 1·1 A
Total emission	I_s	= appr. 0·6 A
Anode voltage	V_a	= max. 1000 V
Max. permissible anode dissipation	W_a	= 40 W
Anode dissipation during test	W_{at}	= 60 W
Amplification factor	μ	= appr. 11
Mutual conductance at I_a = 60 mA	S_{norm}	= appr. 1·6 mA/V
Max. mutual conductance	S_{max}	= appr. 2·5 mA/V
Internal resistance at I_a = 60 mA	R_i	= appr. 6500 ohms

The values of V_g plotted on the abscissa of the characteristic, apply to the negative side of the filament.

PHILIPS ZENDBUIS TC 1/75

De Philips zendbuis TC 1/75 is van een oxyd-kathode voorzien en kan als oscillator of als H.F. versterker in een telefonie- of telegrafiezender worden gebruikt.

Door de speciale constructie van de lamp met anode- en rooster-aansluiting op den ballon, is de inwendige capaciteit betrekkelijk klein, zoodat de buis kan worden gebruikt op golflengten tot ca. 10 m. Op deze golflengte mag de anodespanning 1000 V bedragen; op een golflengte van 20 m kan een spanning van 1250 V worden toegepast en op golflengten van 40 m en daarboven een spanning van 1500 V.



Het afgegeven vermogen en het rendement, die bij verschillende schakelingen en anodespanningen kunnen worden bereikt, volgen hieronder:

Schakeling	Anode-spanning	Afgegeven vermogen	Rendement ca.
H.F. klasse C (telegrafie)	1500 V 1000 V	115 W[1]) 74 W[1])	62% 62%
H.F. klasse B (telefonie)	1500 V 1000 V	30 W[1])[2]) 25 W[1])[2])	31% 26,5%
H.F. klasse C (anode-modulatie)	1250 V 1000 V	93 W[1])[2]) 74 W[1])[2])	64,5% 63%

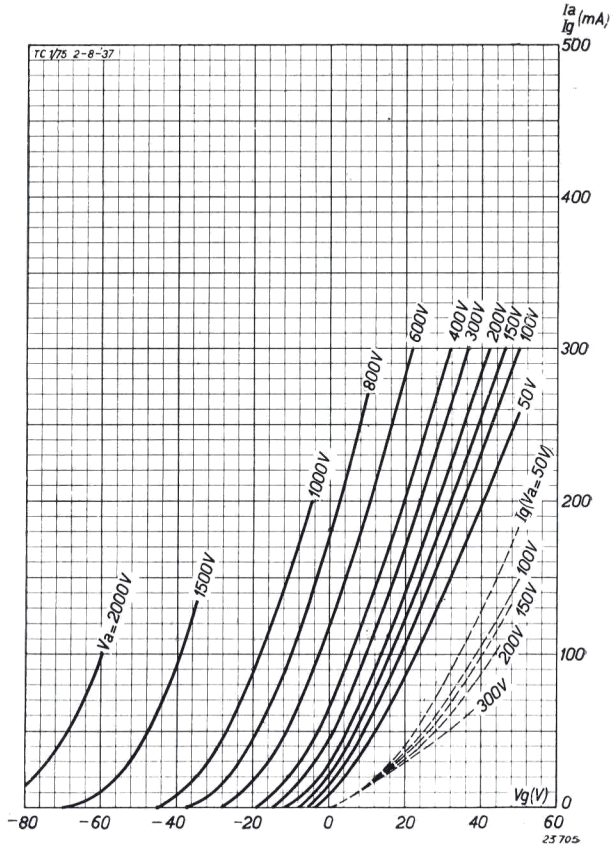
[1]) Kringverliezen moeten worden afgetrokken
[2]) Afgegeven vermogen in de draaggolf

De TC 04/10 kan worden gebruikt voor de roosterexcitatie van een Philips zendbuis TC 1/75, terwijl deze weer één of twee Philips zendbuizen TC 2/250 kan sturen. Een buis TC 1/75 kan met behulp van twee Philips modulatorbuizen MC 1/60 of MC 1/50 worden gemoduleerd bij toepassing van anodespanningsmodulatie (Heising systeem).

PHILIPS

ZENDBUIS

TC 1/75



Gloeispanning	V_f	=	10,0 V
Gloeistroom	I_f	=	ca. 1,6 A
Verzadigingsstroom	I_s	=	ca. 1,5 A
Anodespanning	V_a	=	max. 1500 V
Anodedissipatie	W_a	=	max. 75 W
Anodedissipatie tijdens meting	W_{at}	=	100 W
Versterkingsfactor	μ	=	ca. 25
Steilheid bij $V_a = 1000$ V, $I_a = 75$ mA	S	=	ca. 5,0 mA/V
Maximum steilheid	S_{max}	=	ca. 8,0 mA/V
Inwendige weerstand bij $V_a = 1000$ V, $I_a = 75$ mA	R_i	=	ca. 5000 Ω
Maximum kathodestroom	I_k	=	max. 200 mA
Anode/kathode capaciteit	C_{af}	=	ca. 4,6 pF
Stuurrooster/kathode capaciteit	C_{gf}	=	ca. 9,8 pF
Anode/stuurrooster capaciteit	C_{ag}	=	ca. 10,4 pF
Grootste diameter van den ballon	d	=	51 mm
Maximum diameter	d'	=	80 mm
Totale maximale lengte	l	=	201 mm

PHILIPS
TRIODE

TC 2/250

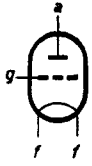
PHILIPS EMISSION

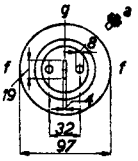
Use	:	Oscillator, H.F. amplifier
Verwendung	:	Oszillator, Hochfrequenzverstärker
Utilisation	:	Oscillateur, amplificateur H.F.
Gebruikswijze	:	Oscillator, H.F. versterker
Empleo	:	Oscilador, amplificador de A.F.

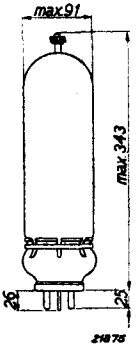
Filament	:	Oxide-coated
Heizfaden	:	Oxydkathode
Filament	:	Cathode à oxyde
Gloeidraad	:	Oxydkathode
Filamento	:	Cátodo de óxido

Vf	=	11,0	V
If	≈	2,5	A
Isat	≈	2,5	A
Wa	=	max. 250	W
Wat	=	300	W
μ	≈	25	
S (Ia = 100 mA)	≈	6,0	mA/V
Caf	≈	3,5	pF
Cfg	≈	26,5	pF
Cag	≈	15,5	pF
Ik	=	max. 430	mA

λ	MHz	Va max
15 m	20	2000 V







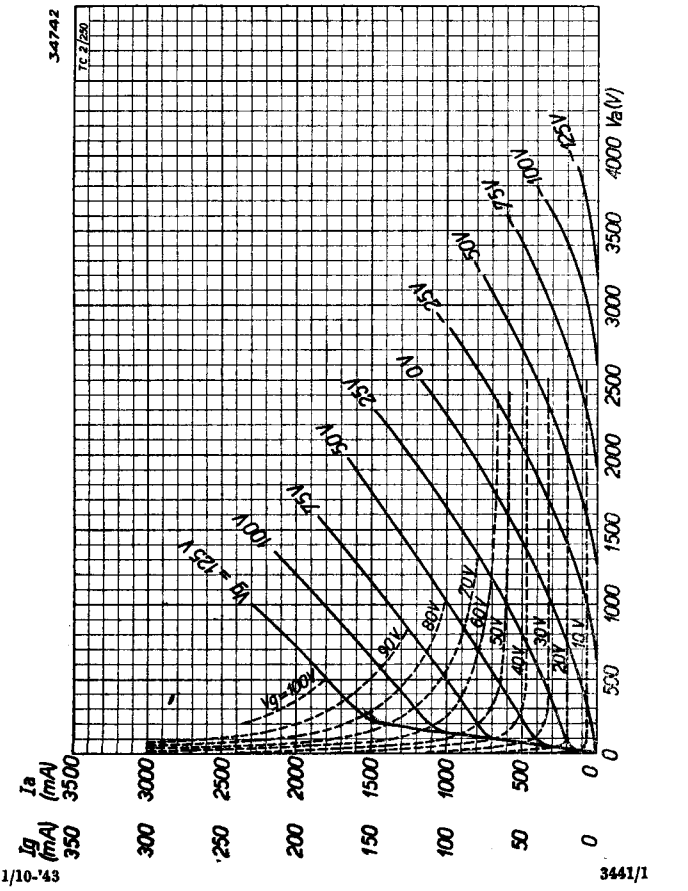
TC 2/250

PHILIPS
TRIODE

PHILIPS EMISSION

Characteristics :
Kennlinien :
Caractéristiques :
Karakteristieken :
Características :

Ia-Va; Ig-Va



1/10-'43

3441/1

TC 2/250

PHILIPS EMISSION

H.F.	class	C	telegraphy	H.F.	class	B	telephony
H.F.	Klasse	C	Telegraphie	H.F.	Klasse	B	Telephonie
H.F.	classe	C	télégraphie	H.F.	classe	B	téléphonie
H.F.	klasse	C	telegrafie	H.F.	klasse	B	telefonie
A.F.	clase	C	telegrafía	A.F.	clase	B	telefonía

λ	dam 15 hm	dam 15 hm	
Va	2000	1500	V
Vg	≈—160	≈—120	V
Ia	375	360	mA
Ig	≈ 55	≈ 60	mA
Vg~	≈ 280	≈ 240	V
Whf	≈ 16	≈ 15	W
Wi	750	540	W
Wa	250	190	W
Wo	500*)	350*)	W
η	67	65	%

λ	dam 15 hm	
Va	2000	V
Vg	≈ — 75	V
Ia	175	mA
Ig	≈ 60[1])	mA
Vg~	≈ 95	V
Whf	≈ 11,5[1])	W
Wi	350	W
Wa	250	W
Wo	100*)	W
η	28,5	%

H.F.	class	C	anode modulation
H.F.	Klasse	C	Anodenmodulation
H.F.	classe	C	modulation d'anode
H.F.	klasse	C	anodemodulatie
A.F.	clase	C	modulación de ánodo

λ	dam 15 hm	dam 15 hm	
Va	2000	1500	V
Vg	≈—200	≈—150	V
Ia	260	≈ 260	mA
Ig	≈ 60	60	mA
Vg~	≈ 315	≈ 260	V
Whf	≈ 19	≈ 16	W
Wlf	≈ 260[2])	≈ 195[2])	W
Wi	520	390	W
Wa	145	120	W
Wo	375*)	270*)	W
η	72	69	%

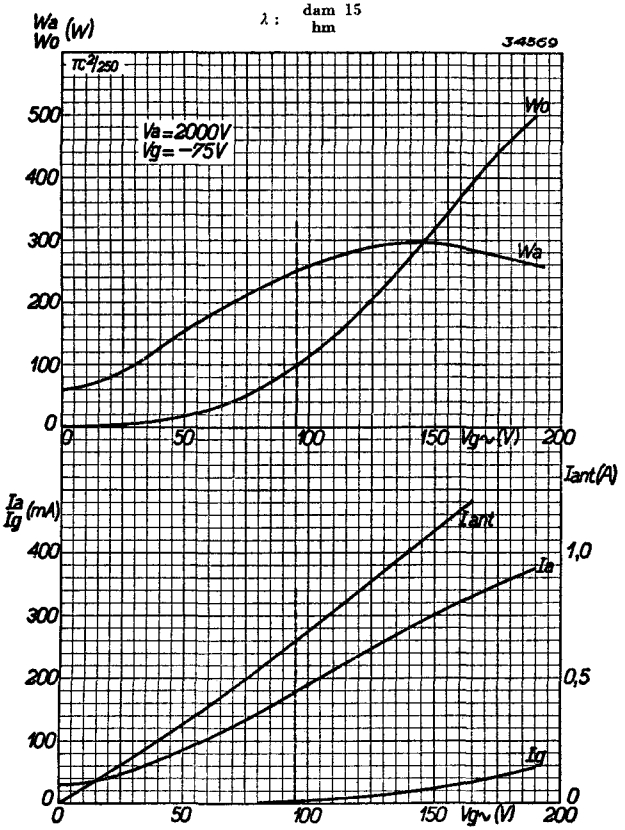
*) vide pag. 0633/2

TC 2/250

PHILIPS
TRIODE

PHILIPS EMISSION

Characteristics	:	H.F. class B telephony
Kennlinien	:	H.F. Klasse B Telephonie
Caractéristiques	:	H.F. classe B téléphonie
Karakteristieken	:	H.F. klasse B telefonie
Características	:	A.F. clase B telefonía

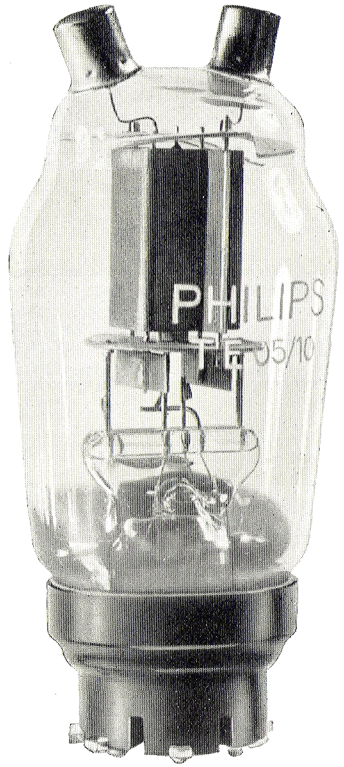


PHILIPS SENDERÖHRE TE 05/10

Die TE 05/10 ist eine Triode mit einer indirekt geheizten Oxydkathode. Diese gewährleistet einerseits einen sehr niedrigen Brummpegel, während andererseits die Elektronenemission trotz des verhältnismäßig niedrigen Heizstromverbrauchs sehr groß ist.

Die Röhre eignet sich besonders zum Gebrauch in tragbaren Sendern und kann bei einer Anodenspannung von 500 V auf Wellenlängen bis zu 5 m abwärts und bei einer Anodenspannung von 400 V auf Wellenlängen bis zu 2 m abwärts verwendet werden.

Die Nutzleistung und der Wirkungsgrad, die mit zwei in Gegentakt geschalteten Röhren TE 05/10 bei verschiedenen Schaltungen erreicht werden können, sind in untenstehender



PHILIPS EMISSION

Tabelle, die für eine Wellenlänge von 5 m gilt, angegeben:

Einstellung	Anodenspannung	Nutzleistung	Wirkungsgrad
H.F.-Klasse C (Telegraphie)	500 V	31 W[1])	56%
H.F.-Klasse B (Telephonie)	500 V	7,5 W[1])[2])	24%
H.F.-Klasse C (Anodenspannungsmodulation)	450 V	22,5 W[1])[2])	55%

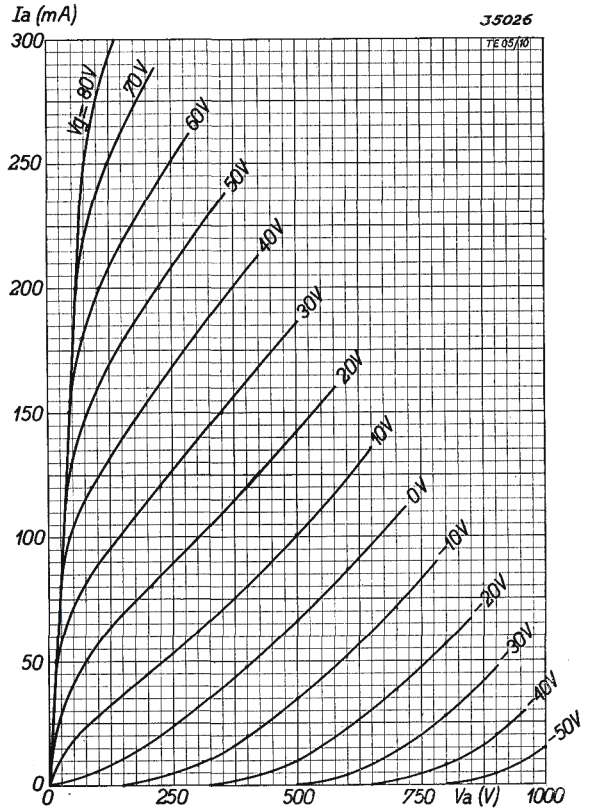
Zwei als Oszillator geschaltete Röhren geben auf einer Wellenlänge von 2 m bei einer Anodenspannung von 400 V eine gesamte Nutzleistung von 18 Watt bei einem Wirkungsgrad von 53%.

[1]) Kreisverluste sind abzuziehen.
[2]) Nutzleistung in der Trägerwelle (max. Modulationstiefe 100%).

6/40

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PHILIPS SENDERÖHRE TE 05/10



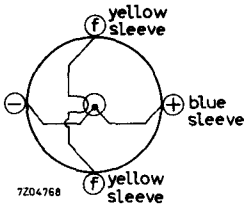
Heizspannung	V_f	=	6,3 V
Heizstrom	I_f	=	ca. 0,8 A
Sättigungsstrom	I_s	=	ca. 0,5 A
Anodenspannung	V_a	=	max. 500 V
Höchstzulässiger Anodenverlust	W_a	=	max. 12 W
Geprüfter Anodenverlust	W_{at}	=	15 W
Verstärkungsfaktor	μ	=	ca. 18
Steilheit bei $V_a = 500$ V, $I_a = 45$ mA	S	=	ca. 3 mA/V
Höchstzulässiger Kathodenstrom	I_k	=	max. 80 mA
Höchstzulässige Spannung zwischen Kathode und Heizfaden	V_{kf}	=	max. 75 V
Anoden/Kathodenkapazität	C_{ak}	=	ca. 1,0 pF
Gitter/Kathodenkapazität	C_{gk}	=	ca. 3,7 pF
Anoden/Gitterkapazität	C_{ag}	=	ca. 3,8 pF
Maximale Gesamtlänge	l	=	118 mm
Maximaler Durchmesser	d	=	47 mm

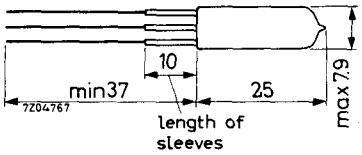
PHILIPS EMISSION

THERMOCOUPLES

Indirectly heated thermocouples in subminiature construction.

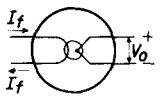
DIMENSIONS AND CONNECTIONS

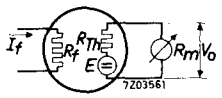




CHARACTERISTICS AND LIMITING VALUES (Absolute max. rating system)

			TH71	TH73	TH75	
Heater current	I_f		0 to 15	0 to 75	0 to 300	mA
Heater current [1]	I_f		0 to 5	0 to 20	0 to 100	mA
Heater current at E = 12 mV	I_f		10	40	200	mA
Heater current (T = max. 1 m)	I_f	max.	20	100	350	mA
Heater resistance	R_f		68	7.0	1.2	Ω
Resistance of thermocouple	R_{TH}		6.0	3.5	3.5	Ω
Response time [2]	T		10	10	10	s
at heater current I_f =			10	40	200	mA
Heater to thermocouple voltage	$V_{f/TH}$	max.	100	100	100	V





[1]) In approximately this range V_o is proportional to the square of I_f

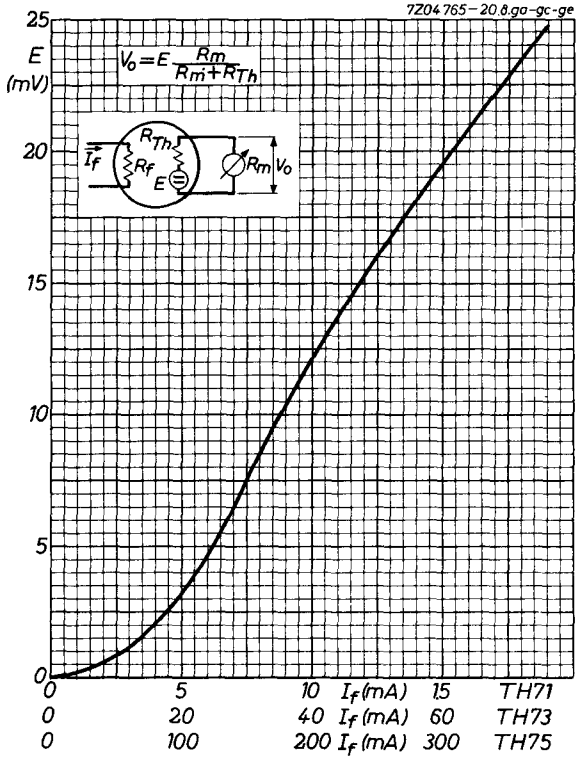
[2]) Time between the moment of switching on of I_f and the moment of reaching max. voltage (See page 4).

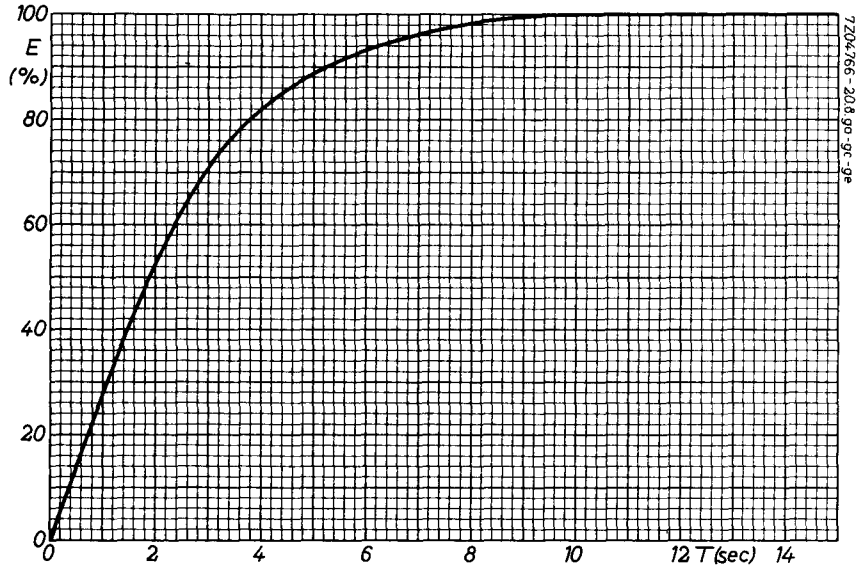
REMARK

The electrical characteristics of the types TH71, TH73 and TH75 are identical to those of the types TH1, TH3, TH5 and TH91, TH93 and TH95 respectively and therefore can be used as replacement for these types.

GENERAL INFORMATION

The "hot" weld of the thermocouple consists of an iron constantan junction.
The "cold" welds are iron to copper and constantan to copper junctions inside the vacuum envelope.
The tube has copper leads.
The measuring results are practically independent of the ambient temperature of the tube so that no corrections need to be made for the temperature of the "cold" weld.


7Z04765-20.8.ga-gc-ge
25
E
(mV)
20
15
10
5
0
$V_o = E \frac{R_m}{R_m + R_{Th}}$
R_{Th}
I_f
R_f
E
R_m
V_o
0 5 10 I_f(mA) 15 TH71
0 20 40 I_f(mA) 60 TH73
0 100 200 I_f(mA) 300 TH75


100
E
(%)
80
60
40
20
0
0
2
4
6
8
10
12 T(sec)
14
7204766-208.go-gr-ge

PHILIPS

Data handbook

Electronic components and materials

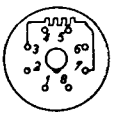
TH71 TH73 TH75

page	sheet	date
1	1	1968.12
2	2	1968.12
3	3	1968.12
4	4	1968.12
5	FP	2001.05.18

PHILIPS U 30

CURRENT REGULATOR for controlling the filament current of the valves UCH 41/42, UF 41, UAF 42, UL 41 and UY41
REGULATEUR DE COURANT pour le réglage du courant de chauffage des tubes UCH41/42, UF41, UAF42, UL41 et UY 41
STROMREGLER für die Regelung des Heizstromes der Röhren UCH 41/42, UF 41, UAF 42, UL 41 und UY 41

Dimensions in mm
Dimensions en mm
Abmessungen in mm



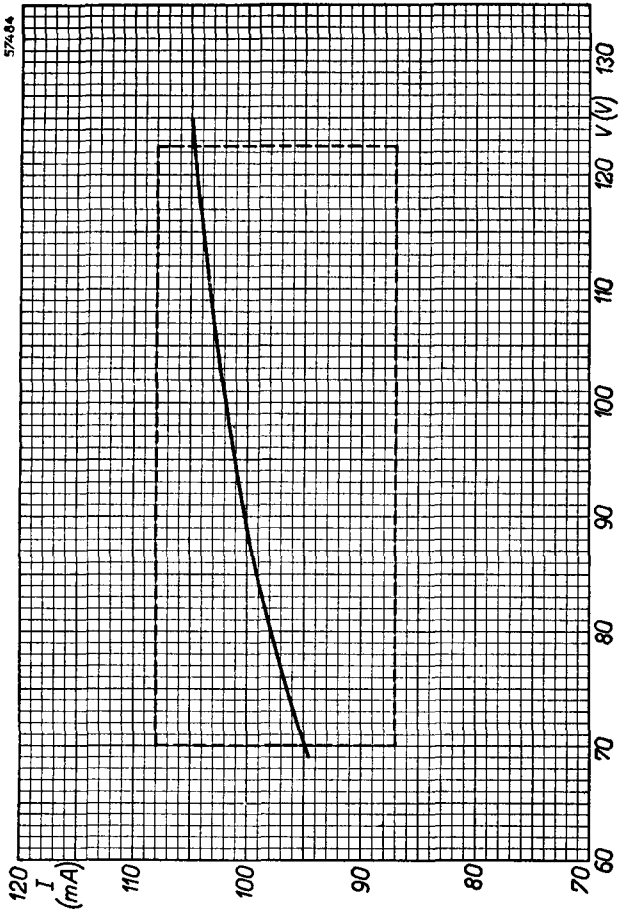


Operating characteristics and limiting values
Caractéristiques d'utilisation et caractéristiques limites
Betriebs- und Grenzdaten

Regulated current, courant réglé, geregelter Strom

I nominal	100	mA
I min. (V = 70 V)	87	mA
I max. (V = 122,5 V)	108	mA

Regulated range Portée réglage Regelbereich	70 - 122,5	V
Mains voltage Tension de réseau Netzspannung	max. 260 min. 170	V V
Heat development Développement de chaleur Wärmeentwicklung	max. 13,5	W
Net weight Poids net Nettogewicht	43	g


5784
I (mA)
120
110
100
90
80
70
60
70
80
90
100
110
120
130
V (V)

PHILIPS

Electronic Tube

HANDBOOK

U30

page	sheet	date
1	1	1949.01.25
2	2	1949.01.25
3	FP	2000.06.06

TRIPLE DIODE-TRIODE

Triple diode-triode intended for F.M. and A.M. signal detection and A.F. signal amplification.

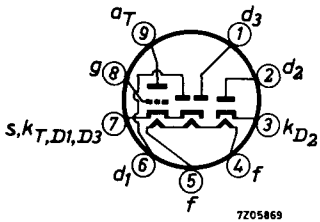
QUICK REFERENCE DATA			
Triode section			
Anode current	I_a	1.0	mA
Transconductance	S	1.45	mA/V
Amplification factor	μ	70	-

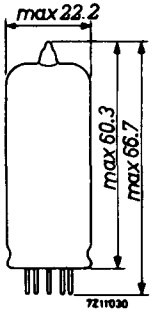
HEATING: Indirect by A.C. or D.C.; series supply

Heater current	I_f	100	mA
Heater voltage	V_f	28	V

DIMENSIONS AND CONNECTIONS Dimensions in mm

Base: Noval





It is recommended to connect pin 5 to earth.

CAPACITANCES

Triode section			
Grid to all except anode	$C_{g(a)}$	1.9	pF
Anode to all except grid	$C_{a(g)}$	1.4	pF
Anode to grid	C_{ag}	2.0	pF
Grid to heater	C_{gf}	max. 0.04	pF
Diode sections			
Diode No.1 to all	C_{d_1}	0.8	pF
Diode No.2 to all	C_{d_2}	4.8	pF
Diode No.3 to all	C_{d_3}	4.8	pF
Cathode (D_2) to all	C_{kD_2}	5.0	pF
Diode No.1 to heater	C_{d_1f}	max. 0.25	pF
Diode No.3 to heater	C_{d_3f}	max. 0.2	pF
Cathode (D_2) to heater	C_{kD_2f}	2.5	pF
Between triode and diode sections			
Anode to diode No.1	C_{ad_1}	max. 0.12	pF
Anode to diode No.3	C_{ad_3}	max. 0.1	pF
Anode to cathode (D_2)	C_{akD_2}	max. 0.01	pF
Grid to diode No.1	C_{gd_1}	max. 0.07	pF
Grid to diode No.3	C_{gd_3}	max. 0.02	pF
Grid to cathode (D_2)	C_{gkD_2}	max. 0.005	pF

TYPICAL CHARACTERISTICS

Triode section

Anode voltage	V_a	100	170	200	V
Grid voltage	V_g	-1	-1.85	-2.3	V
Anode current	I_a	0.8	1.0	1.0	mA
Transconductance	S	1.45	1.45	1.40	mA/V
Amplification factor	μ	70	70	70	-
Internal resistance	R_i	48	48	50	kΩ

OPERATING CHARACTERISTICS

Triode section as R.C. coupled A.F. amplifier

Grid resistor R_g = 10 MΩ

Supply voltage	V_b	200	200	200	170	170	170	V
Anode resistor	R_a	220	100	47	220	100	47	kΩ
Grid resistor next stage	R_g'	0.68	0.33	0.15	0.68	0.33	0.15	MΩ
Anode current	I_a	0.56	1.00	1.60	0.46	0.82	1.25	mA
Voltage gain	V_o/V_i	53	44	34	51	42	32	-
Distortion:								
at output voltage V_o = 3 V_{RMS}	d_{tot}	0.3	0.4	0.5	0.4	0.5	0.6	%
at output voltage V_o = 5 V_{RMS}	d_{tot}	0.4	0.6	0.9	0.5	0.8	1.1	%
at output voltage V_o = 8 V_{RMS}	d_{tot}	0.9	1.0	1.5	1.1	1.3	2.0	%

Supply voltage	V_b	100	100	100	V
Anode resistor	R_a	220	100	47	kΩ
Grid resistor next stage	R_g'	0.68	0.33	0.15	MΩ
Anode current	I_a	0.21	0.35	0.52	mA
Voltage gain	V_o/V_i	44	35	26	-
Distortion:					
at output voltage V_o = 3 V_{RMS}	d_{tot}	1.0	1.3	2.0	%
at output voltage V_o = 5 V_{RMS}	d_{tot}	1.7	2.3	4.3	%

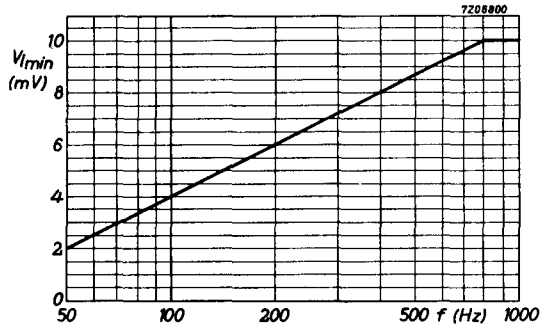
TYPICAL CHARACTERISTICS

Diode section

Internal resistance diode No.1 at diode voltage V_{d_1} = +10 V	$R_i D_1$	5	kΩ
Internal resistance diode No.2 at diode voltage V_{d_2} = +5 V	$R_i D_2$	200	Ω
Internal resistance diode No.3 at diode voltage V_{d_3} = +5 V	$R_i D_3$	200	Ω
Ratio between R_i (D_2) and R_i (D_3)		min. 0.67 max. 1.5	

Microphony Triode section

No special precautions against microphony are required in circuits where the input voltage is min. 10 mV for 50 mW output of the output tube at frequencies higher than 800 Hz.
At lower frequencies the sensitivity may be increased according to the figure below.



LIMITING VALUES (Design centre rating system)

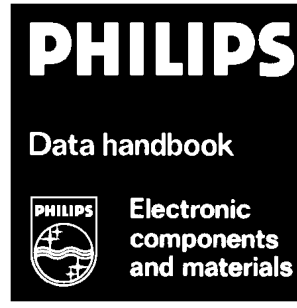
Triode section

Anode voltage	V_{a_o}	max. 550	V
	V_a	max. 250	V
Anode dissipation	W_a	max. 1	W
Cathode current	I_k	max. 5	mA
Grid resistor	R_g	max. 3	MΩ
Grid resistor at grid current bias	R_g	max. 22	MΩ
Cathode to heater voltage	V_{kf}	max. 150	V [1]

Diode sections

Diode No.1 voltage, negative peak	$-V_{d_{1p}}$	max. 350	V
Diode No.2 voltage, negative peak	$-V_{d_{2p}}$	max. 350	V
Diode No.3 voltage, negative peak	$-V_{d_{3p}}$	max. 350	V
Diode No.1 current:			
D.C. component	I_{d_1}	max. 1	mA
peak	$I_{d_{1p}}$	max. 6	mA
Diode No.2 current:			
D.C. component	I_{d_2}	max. 10	mA
peak	$I_{d_{2p}}$	max. 75	mA
Diode No.3 current:			
D.C. component	I_{d_3}	max. 10	mA
peak	$I_{d_{3p}}$	max. 75	mA

[1]) With regard to hum a max. AC heater to cathode voltage of 30 V_{RMS} is recommended.



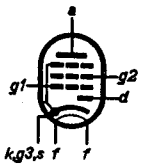
UABC80

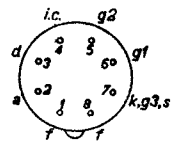
page	sheet	date
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2	2	1969.12
3	3	1969.12
4	4	1969.12
5	5	1969.12
6	FP	1999.07.29

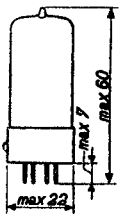
DIODE-PENTODE with variable mutual conductance for use as H.F., I.F. and L.F. amplifier
DIODE-PENTHODE à pente variable pour l'utilisation comme amplificatrice H.F., M.F. et B.F.
DIODE-PENTHODE mit veränderlicher Steilheit zur Verwendung als H.F.-, Z.F.- und N.F. Verstärker

Heating:	indirect by A.C. or D.C.; series supply	
Chauffage:	indirect par C.A. ou C.C.; alimentation en série	Vf = 12,6 V If = 0,1 A
Heizung:	indirekt durch Wechsel- oder Gleichstrom; Serienspeisung	

Dimensions in mm
Dimensions en mm
Abmessungen in mm







Capacities Capacités Kapazitäten	Pentode section Partie penthode Penthodenteil	Diode section Partie diode Diodenteil
	Ca = 6,5 pF	Cdk = 3,8 pF
	Cg1 = 4,0 pF	Cdf < 0,02 pF
	Cag1 < 0,002 pF	
	Cg1f < 0,05 pF	

Between diode and pentode sections
Entre les parties diode et penthode
Zwischen Dioden- und Penthodenteil

Cdg1 < 0,0015 pF
Cda < 0,15 pF

PHILIPS UAF 41

DIODE-PENTODE with variable mutual conductance for use as R.F., I.F. or A.F. amplifier
DIODE-PENTHODE à pente variable pour utilisation en amplificatrice H.F., M.F. ou B.F.
DIODE-PENTODE mit veränderlicher Steilheit zur Verwendung als HF-, ZF- oder NF-Verstärker

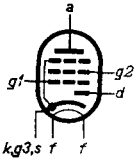
Heating : indirect; series supply — V_f = 12,6 V
Chauffage: indirect; alimentation- série — I_f = 100 mA
Heizung : indirekt; Serienspeisung

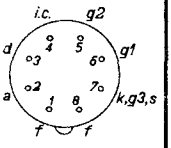
Base, culot, Sockel: RIMLOCK

Overall length: 60 mm
See pages 203 and 252

Hauteur totale: 60 mm
Voir pages 203 et 252

Gesamthöhe : 60 mm
Siehe S. 203 und 252





Capacitances Capacités Kapazitäten	C_a =	6,5 pF	C_{dk} =	3,8 pF
	C_{g1} =	4,0 pF	C_{df} <	0,02 pF
	C_{ag1} <	0,002 pF	C_{dg1} <	0,0015 pF
	C_{g1f} <	0,05 pF	C_{da} <	0,15 pF

Operating characteristics as R.F. or I.F. amplifier
Caractéristiques d'utilisation en amplificatrice H.F. ou M.F.
Betriebsdaten als HF- oder ZF-Verstärker

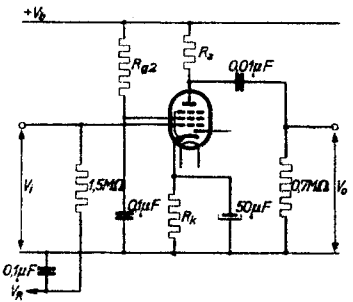
$V_a=V_b$ =	100		170		200		V
R_{g2} =	44		44		44		kΩ
R_k =	300		300		300		Ω
V_{g1} =	-1,1	-17	-2	-28	-2,4	-34	V
I_a =	2,8	-	5	-	6	-	mA
I_{g2} =	0,9	-	1,6	-	1,9	-	mA
S =	1650	16,5	1800	18	1900	19	µA/V
R_i =	1,0	>10	1,2	>10	1,3	>10	MΩ
μ_{g2g1} =	19	-	19	-	19	-	
R_{eq} =	7	-	9	-	9,6	-	kΩ

UAF 41 "Miniwatt"

Operating characteristics of the pentode section as H.F. or I.F. amplifier
Caractéristiques d'utilisation de la partie penthode comme amplificatrice H.F. ou M.F.
Betriebsdaten des Penthodenteiles als H.F.- oder Z.F. Verstärker

Va=Vb=	100		170		200		V
Rg2 =	44		44		44		kΩ
Rk =	300		300		300		Ω
Vg1 =	-1,1	-17	-2	-28	-2,4	-34	V
Ia =	2,8	-	5	-	6	-	mA
Ig2 =	0,9	-	1,6	-	1,9	-	mA
S =	1650	16	1800	18	1900	19	µA/V
Ri =	1,0	>10	1,2	>10	1,3	>10	MΩ
µg2g1=	19	-	19	-	19	-	
Req =	7	-	9	-	9,6	-	kΩ

Operating characteristics of the pentode section as resistance coupled L.F. amplifier
Données caractéristiques de la partie penthode comme amplificatrice B.F. avec couplage à résistances
Betriebsdaten des Penthodenteiles als N.F. Verstärker mit Widerstandskopplung



Operating characteristics as resistance coupled A.F. amplifier
Caractéristiques d'utilisation en amplificatrice B.F. avec couplage à résistances
Betriebdaten als NF-Verstärker mit Widerstandskopplung

A. V_b = 170 V; R_a =0,2 MΩ; R_{g2} = 0,73 MΩ; R_k = 2,7 kΩ

$-V_R$ (V)	I_a (mA)	I_{g2} (mA)	$\frac{V_o}{V_i}$	d_{tot} (%) (V_o=3Veff)	d_{tot} (%) (V_o=5Veff)	d_{tot} (%) (V_o=8Veff)
0	0,58	0,18	78	0,8	1,1	1,6
5	0,46	0,13	25	1,2	2,1	4,0
10	0,36	0,08	15	2,0	3,2	4,8
15	0,26	0,05	10	2,6	3,7	5,8
20	0,18	0,03	7	3,0	4,4	7,3
25	0,12	0,01	5	5,1	8,0	13,0

B. V_b = 100 V; R_a =0,2 MΩ; R_{g2} = 0,73 MΩ; R_k = 2,7 kΩ

$-V_R$ (V)	I_a (mA)	I_{g2} (mA)	$\frac{V_o}{V_i}$	d_{tot} (%) (V_o=3Veff)	d_{tot} (%) (V_o=5Veff)
0	0,34	0,10	73	0,8	1,0
2,5	0,26	0,07	27	3,0	4,0
5	0,20	0,05	15	3,5	5,0
7,5	0,16	0,04	10	3,8	5,7
10	0,12	0,02	7	4,4	7,5
12,5	0,08	0,01	5,5	5,7	9,0

Limiting values
Caractéristiques limites
Grenzdaten

V_{a_o}	= max. 550 V	I_k	= max. 10 mA
V_a	= max. 250 V	R_{g1}	= max. 3 MΩ
W_a	= max. 2 W	R_{kf}	= max. 20 kΩ
V_{g2_o}	= max. 550 V	V_{kf}	= max. 150 V
V_{g2} (I_a< 3 mA)	= max. 250 V		
V_{g2} (I_a= 6 mA)	= max. 150 V	V_{dinv_p}	= max. 350 V
W_{g2}	= max. 0,3 W	I_d	= max. 0,8 mA
V_{g1} (I_{g1}=+0,3μA)	= max. -1,3 V	I_{dp}	= max. 5 mA

A. Vb = 170 V; Ra = 0,2 MΩ; Rg2 = 0,73 MΩ; Rk = 2,7 kΩ

$-V_R$ (V)	Ia (mA)	Ig2 (mA)	$\frac{Vo}{Vi}$	d_{tot} (%) ($Vo=3V_{eff}$)	d_{tot} (%) ($Vo=5V_{eff}$)	d_{tot} (%) ($Vo=8V_{eff}$)
0	0,58	0,18	78	0,8	1,1	1,6
5	0,46	0,13	25	1,2	2,1	4,0
10	0,36	0,08	15	2,0	3,2	4,8
15	0,26	0,05	10	2,6	3,7	5,8
20	0,18	0,03	7	3,0	4,4	7,3
25	0,12	0,01	5	5,1	8,0	13,0

B. Vb = 170 V; Ra = 0,1 MΩ; Rg2 = 0,33 MΩ; Rk = 1,4 kΩ

$-V_R$ (V)	Ia (mA)	Ig2 (mA)	$\frac{Vo}{Vi}$	d_{tot} (%) ($Vo=3V_{eff}$)	d_{tot} (%) ($Vo=5V_{eff}$)	d_{tot} (%) ($Vo=8V_{eff}$)
0	1,18	0,36	71	1,0	1,8	3,0
5	0,84	0,23	22	1,5	2,7	4,2
10	0,60	0,15	12	2,0	3,4	5,0
15	0,42	0,10	7	3,0	4,6	7,2
20	0,27	0,06	5	3,5	4,9	8,4
25	0,15	0,02	3	6,2	9,5	15,0

C. Vb = 100 V; Ra = 0,2 MΩ; Rg2 = 0,73 MΩ; Rk = 2,7 kΩ

$-V_R$ (V)	Ia (mA)	Ig2 (mA)	$\frac{Vo}{Vi}$	d_{tot} (%) ($Vo=3V_{eff}$)	d_{tot} (%) ($Vo=5V_{eff}$)
0	0,34	0,10	73	0,8	1,0
2,5	0,26	0,07	27	3,0	4,0
5	0,20	0,05	15	3,5	5,0
7,5	0,16	0,04	10	3,8	5,7
10	0,12	0,02	7	4,4	7,5
12,5	0,08	0,01	5,5	5,7	9,0

D. Vb = 100 V; Ra = 0,1 MΩ; Rg2 = 0,33 MΩ; Rk = 1,4 kΩ

$-V_R$ (V)	Ia (mA)	Ig2 (mA)	Vo/Vi	d_{tot} (%) (Vo=3V_{eff})	d_{tot} (%) (Vo=5V_{eff})
0	0,66	0,21	66	0,9	1,3
2,5	0,49	0,14	24	2,3	5,3
5	0,36	0,10	13	3,6	5,9
7,5	0,26	0,06	8	4,5	7,3
10	0,18	0,04	5	6,2	9,5
12,5	0,12	0,02	3,5	8,0	12,0

Operating characteristics of the pentode section as resistance coupled L.F.amplifier in triode connection (g2 connected to anode)
Données caractéristiques de la partie penthode comme amplificatrice B.F.avec couplage à résistances montée en triode (g2 reliée à l'anode)
Betriebsdaten des Penthodenteiles als N.F. Verstärker mit Widerstandskopplung in Triodenschaltung (g2 verbunden mit Anode)

A. Vb = 170 V; Ra = 0,1 MΩ; Rk = 1,2 kΩ

$-V_R$ (V)	Ia (mA)	Vo/Vi	d_{tot} (%) (Vo=3V_{eff})	d_{tot} (%) (Vo=5V_{eff})	d_{tot} (%) (Vo=8V_{eff})
0	1,3	15	1,2	1,8	3,4
5	0,9	7,3	1,5	2,4	3,8
10	0,6	5,0	1,3	2,1	3,0
15	0,35	3,7	1,9	3,7	6,0
20	0,20	2,6	4,0	6,8	9,5

B. Vb = 170 V; Ra = 0,05 MΩ; Rk = 0,7 kΩ

$-V_R$ (V)	Ia (mA)	Vo/Vi	d_{tot} (%) (Vo=3V_{eff})	d_{tot} (%) (Vo=5V_{eff})	d_{tot} (%) (Vo=8V_{eff})
0	2,2	15	1,0	1,4	3,0
5	1,35	7	1,9	3,4	5,5
10	0,80	4,5	2,0	3,6	5,8
15	0,45	3,0	3,0	5,8	8,0
20	0,20	1,8	7,5	>10	>10

C. Vb = 100 V; Ra = 0,1 MΩ; Rk = 2,3 kΩ

$-V_R$ (V)	Ia (mA)	Vo/Vi	d_{tot} (%) (Vo=3V_{eff})	d_{tot} (%) (Vo=5V_{eff})
0	0,55	12	1,9	2,8
2,5	0,45	7,2	2,6	5,6
5	0,30	4,9	2,3	4,9
7,5	0,20	3,8	3,0	6,0
10	0,15	2,8	6,0	10,0

D. Vb = 100 V; Ra = 0,05 MΩ; Rk = 1,3 kΩ

$-V_R$ (V)	Ia (mA)	Vo/Vi	d_{tot} (%) (Vo=3V_{eff})	d_{tot} (%) (Vo=5V_{eff})
0	1,15	12	1,4	3,0
2,5	0,80	7,0	3,0	6,4
5	0,50	4,7	3,9	6,8
7,5	0,35	3,5	5,0	8,0
10	0,20	2,3	8,0	>10

Limiting values of the pentode section
Caractéristiques limites de la partie penthode
Grenzdaten des Penthodenteiles

Va_o	= max. 550 V	$Vg2_o$	= max. 550 V
Va	= max. 250 V	Wg2	= max. 0,3 W
Wa	= max. 2 W	Ik	= max. 10 mA
Vg1 (Ig1=+0,3µA)	= max. -1,3 V	Rg1	= max. 3 MΩ
Vg2 (Ia < 3 mA)	= max. 250 V	Rfk	= max. 20 kΩ
Vg2 (Ia = 6 mA)	= max. 150 V	Vfk	= max. 150 V

Limiting values of the diode section
Caractéristiques limites de la partie diode
Grenzdaten des Diodenteiles

Vd	= max. 200 V[1)]	Rfk	= max. 20 kΩ
Id	= max. 0,8 mA	Vfk	= max. 150 V
Vd (Id=+0,3µA)	= max. -1,3 V		

1) Peak value; valeur de crête; Scheitelwert

PHILIPS

Electronic Tube

HANDBOOK

UAF41

page	sheet	date
1	1	1948.09.01
2	1	1953.12.12
3	2	1948.09.01
4	2	1953.12.12
5	3	1948.09.01
6	4	1948.09.01
7	4a	1948.09.01
8	FP	1999.10.12

UAF 42 (UAF 41) Variable-mu diode-pentode

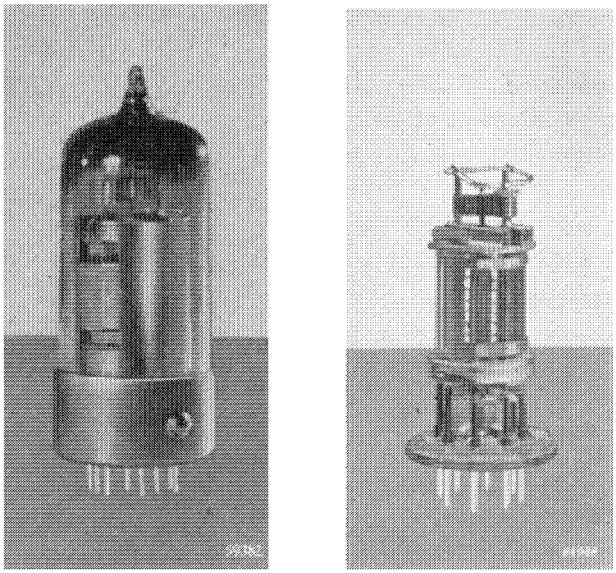


Fig. 1
The UAF 42, showing the electrode system (approximately actual size).

The UAF 42 is a variable-mu diode-pentode for A.C./D.C. receivers having a heater circuit carrying 100 mA. The pentode section is intended for use as R.F., I.F. or A.F. amplifier, the diode section being suitable for detection and A.G.C.
Since the UAF 42 — apart from the heater — is identical with the EAF 42, further particulars will be found in the description of the latter valve.

TECHNICAL DATA OF THE DIODE-PENTODE UAF 41

Heater data

Heating: A.C. or D.C., indirect, series feed

Heater current	I_f	=	100 mA
Heater voltage	V_f	=	12.6 V

Capacitances (cold valve)

Pentode section

Input capacitance	C_{g1}	=	4.0 pF
Output capacitance	C_a	=	6.5 pF
Anode - control grid	C_{ag1}	<	0.002 pF
Heater - control grid	C_{g1f}	<	0.05 pF

UAF 41

Diode section

Anode - cathode	C_d	=	3.8 pF
Anode - heater	C_{df}	<	0.02 pF

Between diode and pentode sections

Diode anode - pentode control grid	C_{dg1}	<	0.0015 pF
Diode anode - pentode anode	C_{da}	<	0.15 pF

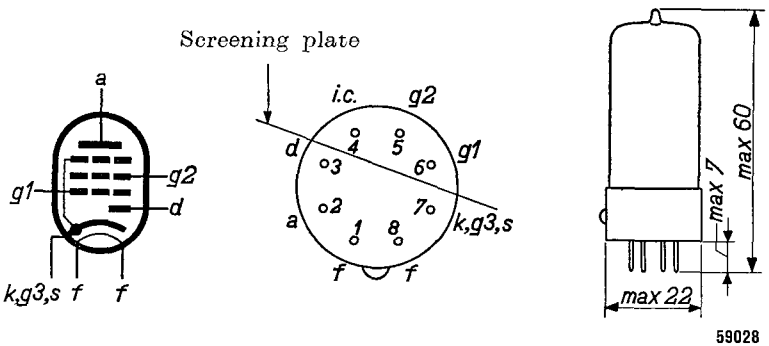


Fig. 2
Electrode arrangement, electrode connections and maximum dimensions in mm of the UAF 41.

Operating characteristics of the pentode section used as R.F. or I.F. amplifier
(see Figs. 6 and 7)

Anode and supply voltage . .	$V_a = V_b =$	100		170		V
Screen grid resistor	R_{g2} =	44		44		kΩ
Bias resistor	R_k =	300		300		Ω
Grid bias	V_{g1} =	−1.1	−17	−2	−28	V
Anode current	I_a =	2.8	—	5	—	mA
Screen grid current	I_{g2} =	0.9	—	1.6	—	mA
Mutual conductance	S =	1650	16.5	1800	18	μA/V
Internal resistance	R_i =	1.0	>10	1.2	>10	MΩ
Equivalent noise resistance . .	R_{eq} =	7	—	9	—	kΩ
Amplification factor, second grid with respect to first grid . .	μ_{g2g1} =	19	—	19	—	

Operating characteristics of the pentode section used as resistance-coupled A.F. amplifier (for circuit see Fig. 5; for microphonic properties of this circuit see description of the EAF 42)

A. Supply voltage V_b=170 V Anode resistor R_a=0.2 MΩ
Bias resistor R_k=2.7 kΩ Screen grid resistor R_{g2}=0.73 MΩ

Control voltage $-V_R$ (V)	Anode current I_a (mA)	Screen grid current I_{g2} (mA)	Amplification V_o/V_i	Distortion (%) at an output voltage of		
				3 V_{RMS}	5 V_{RMS}	8 V_{RMS}
0	0.58	0.18	78	0.8	1.1	1.6
5	0.46	0.13	25	1.2	2.1	4.0
10	0.36	0.08	15	2.0	3.2	4.8
15	0.26	0.05	10	2.6	3.7	5.8
20	0.18	0.03	7	3.0	4.4	7.3
25	0.12	0.01	5	5.1	8.0	13.0

B. Supply voltage V_b=100 V Anode resistor R_a=0.2 MΩ
Bias resistor R_k=2.7 kΩ Screen grid resistor R_{g2}=0.73 MΩ

Control voltage $-V_R$ (V)	Anode current I_a (mA)	Screen grid current I_{g2} (mA)	Amplification V_o/V_i	Distortion (%) at an output voltage of:	
				3 V_{RMS}	5 V_{RMS}
0	0.34	0.10	73	0.8	1.0
2.5	0.26	0.07	27	3.0	4.0
5.0	0.20	0.05	15	3.5	5.0
7.5	0.16	0.04	10	3.8	5.7
10.0	0.12	0.02	7	4.4	7.5
12.5	0.08	0.01	5.5	5.7	9.0

Operating characteristics of the pentode section used as resistance-coupled A.F. triode (screen grid connected to anode)

A. Supply voltage V_b=170 V Anode resistor R_a=0.1 MΩ
Bias resistor R_k=1.2 kΩ

Control voltage $-V_R$ (V)	Anode current I_a (mA)	Amplification V_o/V_i	Distortion (%) at an output voltage of		
			3 V_{RMS}	5 V_{RMS}	8 V_{RMS}
0	1.3	15	1.2	1.8	3.4
5	0.9	7.3	1.5	2.4	3.8
10	0.6	5.0	1.3	2.1	3.0
15	0.4	3.7	1.9	3.7	6.0
20	0.2	2.6	4.0	6.8	9.5

B. Supply voltage V_b=100 V Anode resistor R_a=0.1 MΩ
Bias resistor R_k=2.3 kΩ

Control voltage $-V_R$ (V)	Anode current I_a (mA)	Amplification V_o/V_i	Distortion (%) at an output voltage of		
			3 V_{RMS}	5 V_{RMS}	
0	0.55	12	1.9	2.8	
2.5	0.45	7.2	2.6	5.6	
5.0	0.30	4.9	2.3	4.9	
7.5	0.20	3.8	3.0	6.0	
10	0.15	2.8	6.0	10.0	

Limiting values of the pentode section

Anode voltage, valve biased to cut-off	V_{a_o}	= max.	550	V
Anode voltage	V_a	= max.	250	V
Anode dissipation	W_a	= max.	2	W
Screen grid voltage, valve biased to cut-off	V_{g2_o}	= max.	550	V
Screen grid voltage, valve controlled	$V_{g2}(I_a<3$ mA)	= max.	250	V
Screen grid voltage, valve not controlled	$V_{g2}(I_a=6$ mA)	= max.	150	V
Screen grid dissipation	W_{g2}	= max.	0.3	W
Cathode current	I_k	= max.	10	mA
Grid current starting point	$V_{g1}(I_{g1}=+0.3$ μA)	= max.	—1.3	V
External resistance between first grid and cathode	R_{g1}	= max.	3	MΩ
External resistance between heater and cathode	R_{fk}	= max.	20	kΩ
Voltage between heater and cathode	V_{fk}	= max.	150	V

Limiting values of the diode section

Peak anode inverse voltage	$V_{d\,\mathrm{inv}\,p}$	= max.	350	V
Diode current	I_d	= max.	0.8	mA
Peak diode current	I_{dp}	= max.	5	mA
Diode current starting point	$V_d(I_d=+0.3$ μA)	= max.	—1.3	V
External resistance between heater and cathode	R_{fk}	= max.	20	kΩ
Voltage between heater and cathode	V_{fk}	= max.	150	V

TECHNICAL DATA OF THE DIODE-PENTODE UAF 42

Heater data

Heating: indirect, A.C. or D.C., series feed

Heater current	I_f	=	100 mA
Heater voltage	V_f	=	12.6 V

Capacitances (cold valve)

Pentode section

Input capacitance	C_{g1}	=	4.1 pF
Output capacitance	C_a	=	5.2 pF
Anode - control grid	C_{ag1}	<	0.002 pF
Heater - control grid . . .	C_{g1f}	<	0.05 pF

Diode section

Anode - cathode	C_d	=	3.3 pF
Anode - heater	C_{df}	<	0.02 pF

Between diode and pentode sections

Diode anode - pentode control grid	C_{dg1}	<	0.0015 pF
Diode anode - pentode anode	C_{da}	<	0.15 pF

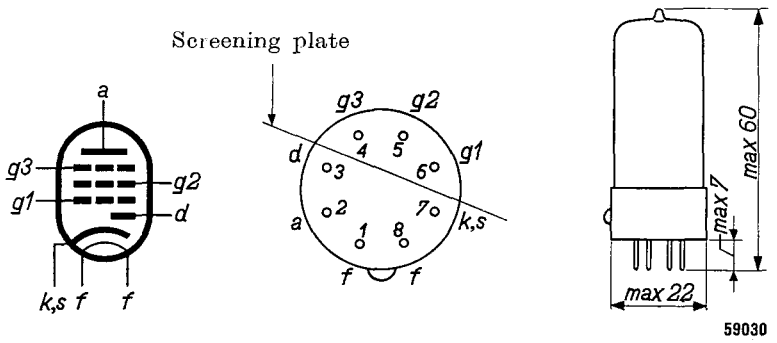


Fig. 3
Electrode arrangement, electrode connections and maximum dimensions in mm of the UAF 42.

UAF 42

Operating characteristics of the pentode section used as R.F. or I.F. amplifier (see Figs. 8 to 11 incl.)

Anode and supply voltage	$V_a =$	$V_b =$	100		170		V
Voltage on third grid	V_{g3}	=	0		0		V
Screen grid resistor	R_{g2}	=	56		56		kΩ
Bias resistor	R_k	=	310		310		Ω
Grid bias	R_{g1}	=	−1.2	−16	−2	−28	V
Screen grid voltage	V_{g2}	=	50	—	85	—	V
Anode current	I_a	=	2.8	—	5	—	mA
Screen grid current	I_{g2}	=	0.9	—	1.5	—	mA
Mutual conductance	S	=	1700	17	2000	20	μA/V
Internal resistance	R_i	=	0.85	>10	0.9	>10	MΩ
Equivalent noise resistance	R_{eq}	=	5.8	—	7.5	—	kΩ
Amplification factor, second grid with respect to first grid	μ_{g2g1}	=	16	—	16	—	

Anode and supply voltage	$V_a =$	$V_b =$	200		V
Voltage on third grid	V_{g3}	=	0		V
Screen grid resistor	R_{g2}	=	76		kΩ
Bias resistor	R_k	=	310		Ω
Grid bias	V_{g1}	=	−2	−34	V
Screen grid voltage	V_{g2}	=	85	—	V
Anode current	I_a	=	5	—	mA
Screen grid current	I_{g2}	=	1.5	—	mA
Mutual conductance	S	=	2000	20	μA/V
Internal resistance	R_i	=	1.0	>10	MΩ
Equivalent noise resistance	R_{eq}	=	7.5	—	kΩ
Amplification factor, second grid with respect to first grid	μ_{g2g1}	=	16	—	

Operating characteristics of the pentode section used as R.F. or I.F. amplifier (Screen grid voltage obtained by means of the same potentiometer as that of the UCH 41, for circuit diagram see Fig. 4 ; see also Figs. 15, 16 and 17)

Anode and supply voltage	$V_a =$	$V_b =$	100		170		V
Voltage on third grid	V_{g3}	=	0		0		V
Resistor between supply voltage and screen grids	R_1	=	12		12		kΩ
Resistor between screen grids and chassis	R_2	=	27		27		kΩ
Bias resistor	R_k	=	250		250		Ω
Grid bias	V_{g1}	=	−1.0	−10.5	−1.8	−18	V
Screen grid voltage	V_{g2}	=	53	69	87	117	V
Anode current	I_a	=	3.0	—	5.5	—	mA
Screen grid current	I_{g2}	=	1.0	—	1.7	—	mA
Mutual conductance	S	=	1850	18	2100	21	μA/V
Internal resistance	R_i	=	0.75	>10	0.8	>10	MΩ
Equivalent noise resistance	R_{eq}	=	6	—	8	—	kΩ
Amplification factor, second grid with respect to first grid	μ_{g2g1}	=	16	—	16	—	

Operating characteristics of the pentode section used as R.F. or I.F. amplifier; screen grid voltages of UAF 42 and UCH 42 obtained by means of a common potentiometer (see Figs. 18, 19 and 20)

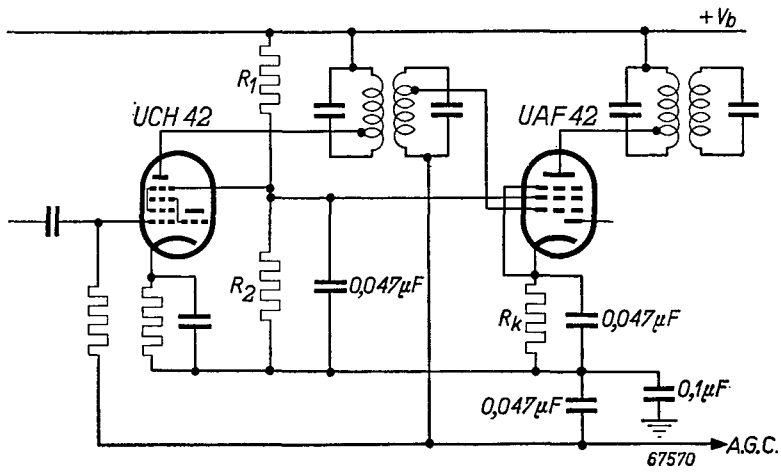
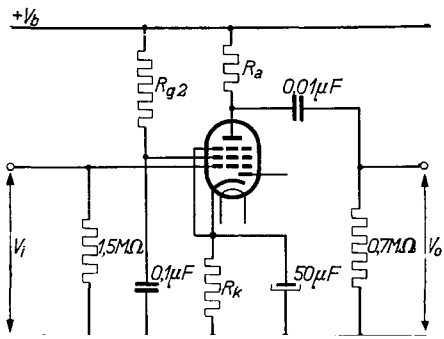


Fig. 4

Anode and supply voltage . .	$V_a = V_b =$	100		170		V
Voltage on third grid	V_{g3} =	0		0		V
Resistor between supply voltage and screen grids	R_1 =	15		15		kΩ
Resistor between screen grids and chassis	R_2 =	22		22		kΩ
Bias resistor	R_k =	330		330		Ω
Grid bias	V_{g1} =	−1.0	−9.5	−1.8	−15.5	V
Screen grid voltage	V_{g2} =	43	58	70	99	V
Anode current	I_a =	2.3	—	4.0	—	mA
Screen grid current	I_{g2} =	0.65	—	1.1	—	mA
Mutual conductance	S =	1500	15	1750	17.5	µA/V
Internal resistance	R_i =	0.95	>10	0.95	>10	MΩ
Equivalent noise resistance . .	R_{eq} =	6.1	—	7.8	—	kΩ
Amplification factor, second grid with respect to first grid . .	μ_{g2g1} =	16	—	16	—	



Operating characteristics of the pentode section used as resistance-coupled A.F. amplifier (for particulars concerning microphony, see description of the EAF 42)

UAF 42

A. Supply voltage V_b=170 V Anode resistor R_a=0.22 MΩ
Bias resistor R_k=2.7 kΩ Screen grid resistor R_{g2}=0.82 MΩ

Control voltage $-V_R$ (V)	Anode current I_a (mA)	Screen grid current I_{g2} (mA)	Amplification V_o/V_i	Distortion (%) at an output voltage of		
				$3V_{RMS}$	$5V_{RMS}$	$8V_{RMS}$
0	0.50	0.17	80	0.8	1.0	1.2
5	0.38	0.12	23	1.5	2.5	4.0
10	0.28	0.09	14	1.9	3.2	5.0
15	0.20	0.06	9	2.6	4.2	6.5
20	0.14	0.04	6	3.6	6.0	9.0

B. Supply voltage V_b=170 V Anode resistor R_a=0.1 MΩ
Bias resistor R_k=1.5 kΩ Screen grid resistor R_{g2}=0.33 MΩ

Control voltage $-V_R$ (V)	Anode current I_a (mA)	Screen grid current I_{g2} (mA)	Amplification V_o/V_i	Distortion (%) at an output voltage of		
				3 V_{RMS}	5 V_{RMS}	8 V_{RMS}
0	1.05	0.37	68	0.75	0.8	1.1
5	0.71	0.25	20	2.2	3.2	5.0
10	0.48	0.17	10	2.4	3.7	5.5
15	0.30	0.11	6	3.0	4.5	7.0
20	0.16	0.07	3.5	5.2	8.0	12

C. Supply voltage V_b=100 V Anode resistor R_a=0.22 MΩ
Bias resistor R_k=2.7 kΩ Screen grid resistor R_{g2}=0.82 MΩ

Control voltage $-V_R$ (V)	Anode current I_a (mA)	Screen grid current I_{g2}(mA)	Amplification V_o/V_i	Distortion (%) at an output voltage of	
				3 V_{RMS}	5 V_{RMS}
0	0.29	0.09	75	0.9	1.1
2.5	0.22	0.07	27	2.6	4.4
5.0	0.17	0.05	15	3.2	5.0
7.5	0.13	0.04	10	4.0	6.5
10	0.10	0.03	7	5.2	8.0

D. Supply voltage V_b=100 V Anode resistor R_a=0.1 MΩ
Bias resistor R_k=1.5 kΩ Screen grid resistor R_{g2}=0.33 MΩ

Control voltage $-V_R$ (V)	Anode current I_a (mA)	Screen grid current I_{g2} (mA)	Amplification V_o/V_i	Distortion (%) at an output voltage of	
				3 V_{RMS}	5 V_{RMS}
0	0.58	0.21	60	0.9	1.0
2.5	0.43	0.14	25	2.3	4.5
5.0	0.31	0.10	12	3.5	6.0
7.5	0.21	0.07	7.5	4.7	8.0
10	0.14	0.05	5	7.0	11

Operating characteristics of the pentode section used as resistance-coupled A.F. triode (screen grid connected to anode)

A. Supply voltage V_b=170 V Anode resistor R_a=0.1 MΩ
Bias resistor R_k=1.8 kΩ

Control voltage $-V_R$ (V)	Anode current I_a (mA)	Amplification V_o/V_i	Distortion (%) at an output voltage of		
			3 V_{RMS}	5 V_{RMS}	8 V_{RMS}
0	1.20	12	1.4	2.2	3.2
5	0.84	6.5	1.4	2.2	3.7
10	0.58	5.0	1.4	2.3	3.8
15	0.37	3.5	1.7	2.7	4.6
20	0.22	2.5	3.2	5.0	8.0

B. Supply voltage V_b=170 V Anode resistor R_a=0.05 MΩ
Bias resistor R_k=1.2 kΩ

Control voltage $-V_R$ (V)	Anode current I_a (mA)	Amplification V_o/V_i	Distortion (%) at an output voltage of		
			3 V_{RMS}	5 V_{RMS}	8 V_{RMS}
0	2.05	12	1.3	2.0	2.9
5	1.37	6.5	1.6	2.8	4.6
10	0.92	4.5	1.7	2.9	4.8
15	0.60	3.5	2.6	4.0	6.6
20	0.32	2.2	4.5	7.5	11

C. Supply voltage V_b=100 V Anode resistor R_a=0.1 MΩ
Bias resistor R_k=1.8 kΩ

Control voltage $-V_R$ (V)	Anode current I_a (mA)	Amplification V_o/V_i	Distortion (%) at an output voltage of	
			3 V_{RMS}	5 V_{RMS}
0	0.70	12	2.0	2.2
2.5	0.50	7	2.4	4.5
5.0	0.36	5	2.4	4.5
7.5	0.25	4	2.7	4.7
10	0.17	3	4.2	6.6

D. Supply voltage V_b=100 V Anode resistor R_a=0.05 MΩ
Bias resistor R_k=1.2 kΩ

Control voltage $-V_R$ (V)	Anode current I_a (mA)	Amplification V_o/V_i	Distortion (%) at an output voltage of	
			3 V_{RMS}	5 V_{RMS}
0	1.18	12	1.7	2.6
2.5	0.80	7	3.0	5.1
5.0	0.56	5	3.6	5.7
7.5	0.38	3.5	4.2	6.8
10	0.24	2.5	6.5	10

Limiting values of the pentode section

Anode voltage, cut-off condition	V_{a_o}	= max.	550 V
Anode voltage	V_a	= max.	250 V
Anode dissipation	W_a	= max.	2 W
Screen grid voltage, cut-off condition	V_{g2_o}	= max.	550 V
Screen grid voltage, valve controlled	$V_{g2}(I_a<2.5$ mA)	= max.	250 V
Screen grid voltage uncontrolled valve	$V_{g2}(I_a=5$ mA)	= max.	125 V
Screen grid dissipation	W_{g2}	= max.	0.3 W
Cathode current	I_k	= max.	10 mA
Grid current starting point	$V_{g1}(I_{g1}=+0.3$ μA)	= max.	−1.3 V
External resistance between grid 1 and cathode	R_{g1}	= max.	3 MΩ
External resistance between grid 3 and cathode	R_{g3}	= max.	3 MΩ
External resistance between heater and cathode	R_{fk}	= max.	20 kΩ
Voltage between heater and cathode	V_{fk}	= max.	150 V

Limiting values of the diode section

Peak anode inverse voltage	$V_{d\,\mathrm{inv}\,p}$	= max.	350 V
Diode current	I_d	= max.	0.8 mA
Peak diode current	I_{dp}	= max.	5 mA

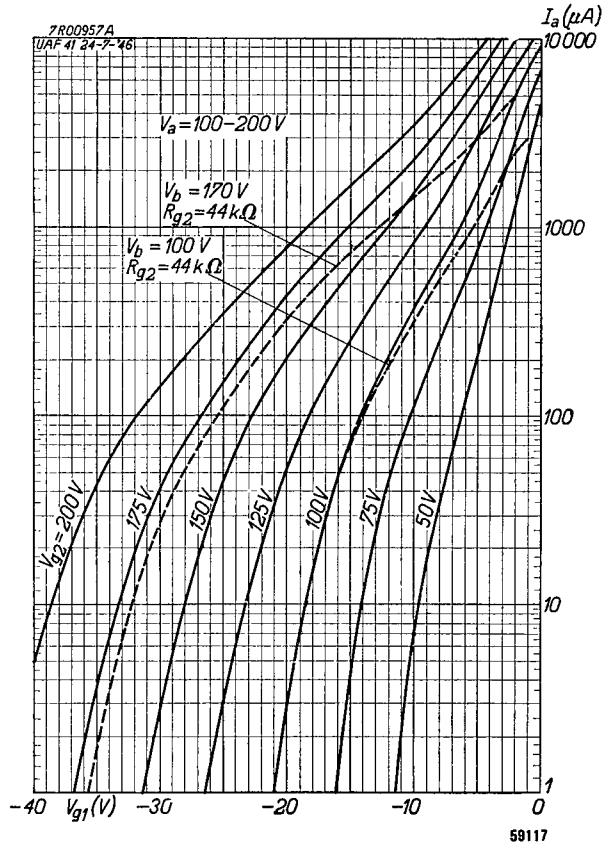


Fig. 6

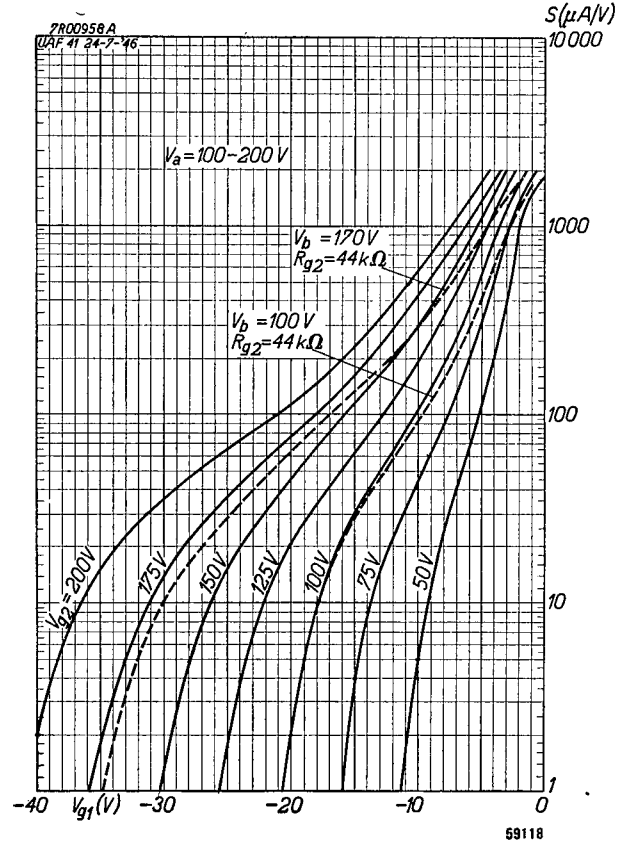


Fig. 7

Anode current (I_a, Fig. 6) and mutual conductance (S, Fig. 7) of the UAF 41 as functions of the grid bias V_{g1} for different values of the screen grid voltage (V_{g2}). The dotted lines indicate the variations in anode current and mutual conductance when a series resistor R_{g2} of 44 kΩ is included in the screen grid circuit.

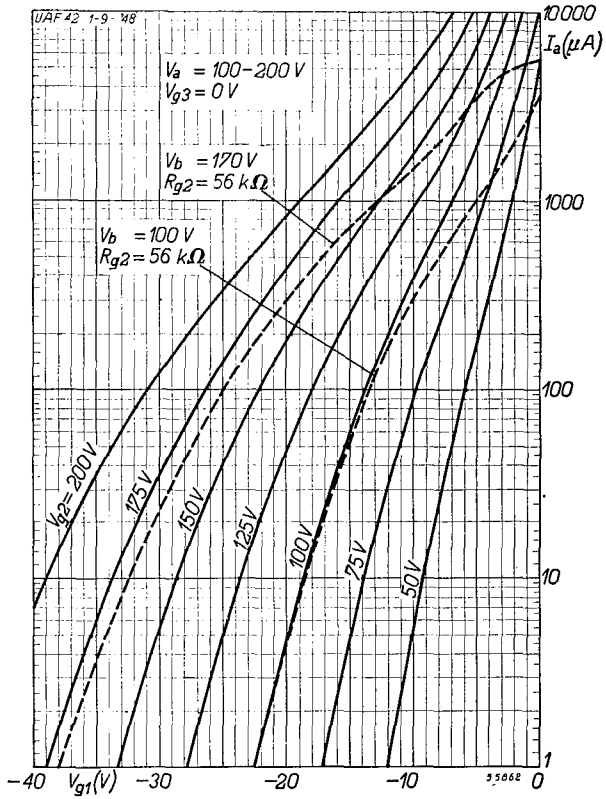


Fig. 8

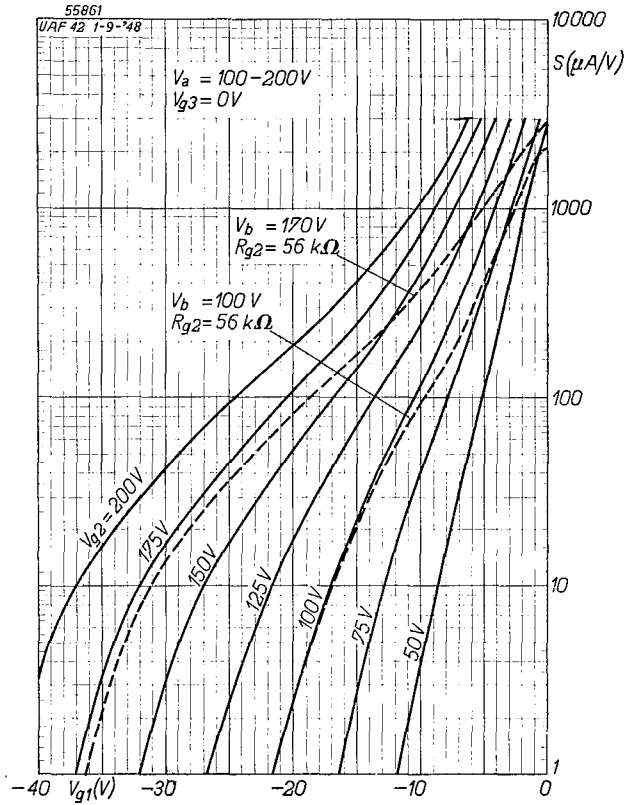


Fig. 9

Anode current (I_a, Fig. 8) and mutual conductance (S, Fig. 9) of the UAF 42 as functions of the grid bias (V_{g1}) for various values of the screen grid voltage (V_{g2}). The dotted lines indicate the variations in anode current and mutual conductance when a series resistor of 56 kΩ is included in the screen grid circuit.

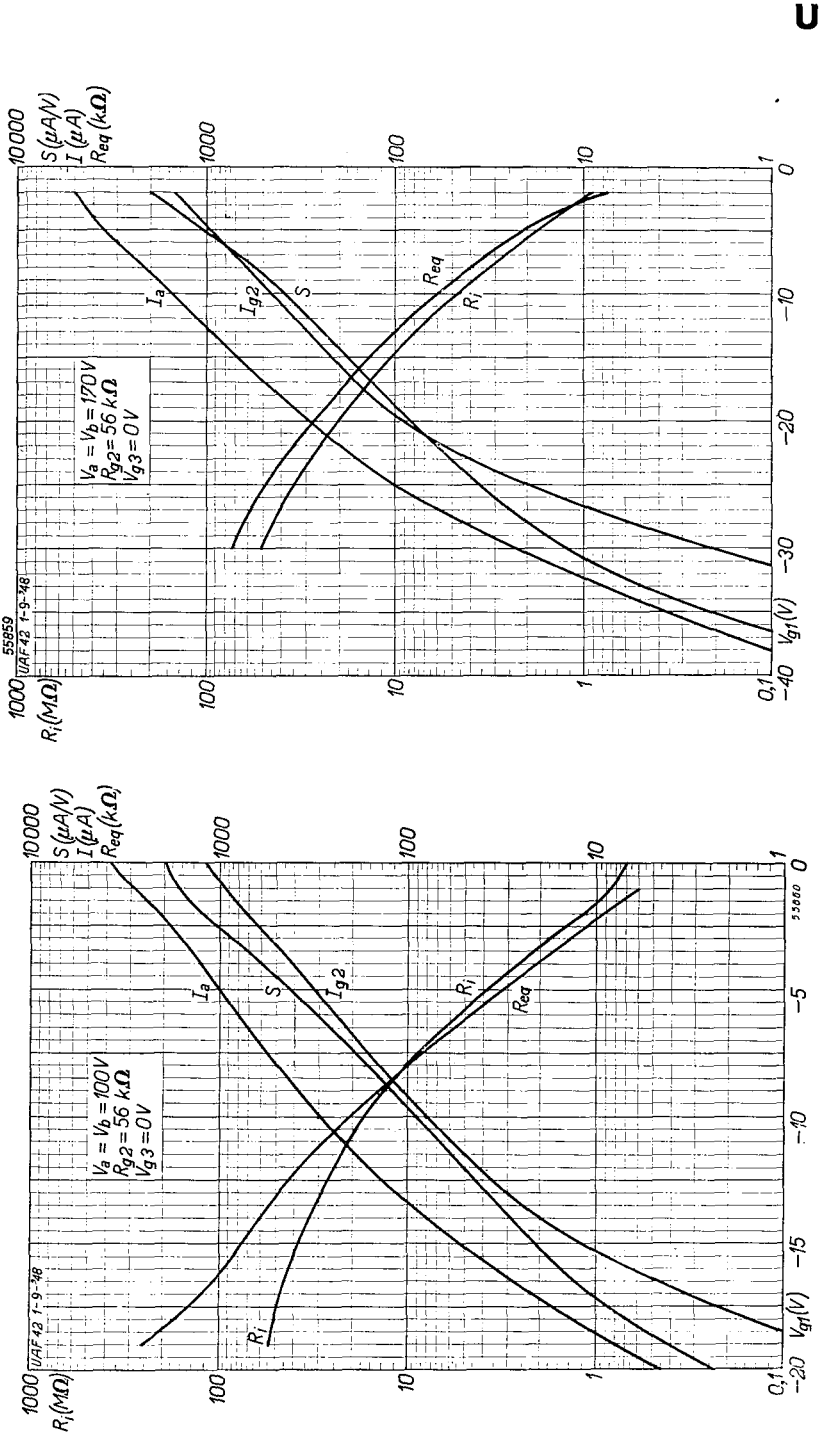


Fig. 10
Anode current (I_a), screen grid current (I_{g2}), mutual conductance (S), internal resistance (R_i) and equivalent noise resistance (R_{eq}) of the pentode section of the UAF 42, as functions of the grid bias (V_{g1}); screen grid resistor $R_{g2} = 56$ kΩ, anode and supply voltage = 100 V (Fig. 10) and 170 V (Fig. 11).

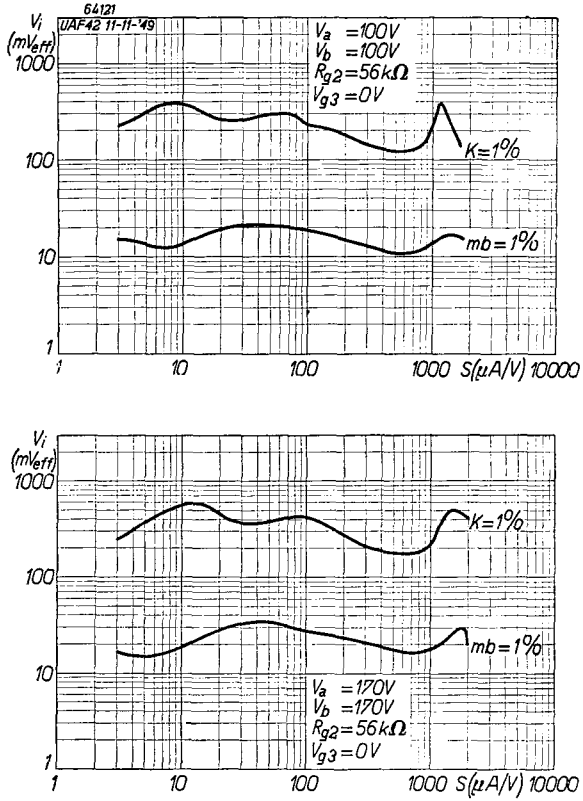


Fig. 12
The effective voltage (V_i) of an interfering R.F. signal on the control grid of the UAF 42, producing 1% cross-modulation; also that of an A.F. signal producing 1% modulation hum (curve m_b=1%), both as a function of the mutual conductance (S). Screen grid series resistor R_{g2}=56 kΩ, anode and supply voltage=100 V (upper figure) and 170 V (lower figure).

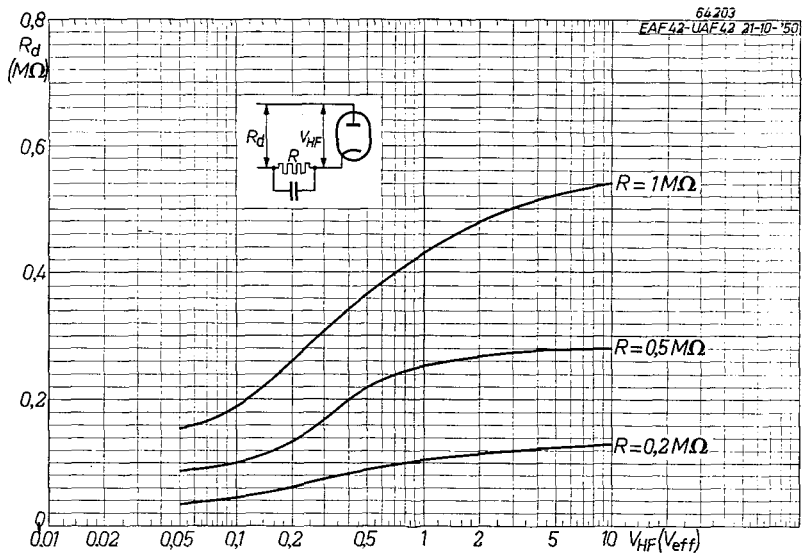


Fig. 13
Damping resistance of the diode of the UAF 42 as a function of the applied R.F. signal, for different values of the series resistor in the detector circuit. For detection characteristic of the diode see Fig. 7 in the description of the EBC 41.

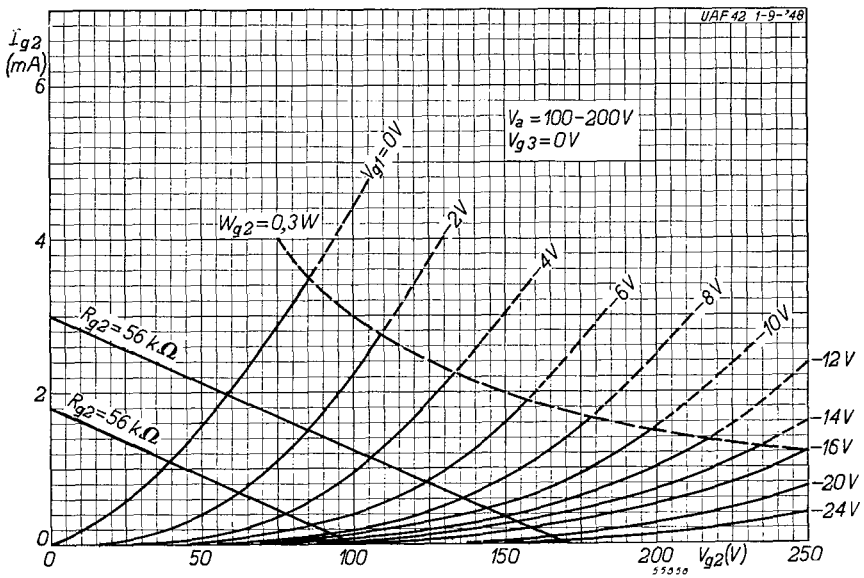


Fig. 14
Screen grid current (I_{g2}) of the pentode section of the UAF 42 as a function of the screen grid voltage (V_{g2}) with grid bias (V_{g1}) as parameter. The maximum permissible screen grid dissipation (0.3 W) is indicated by the dotted line. The straight lines give the working characteristic for a screen grid series resistor of 56 kΩ, at supply voltages of 170 and 100 V.

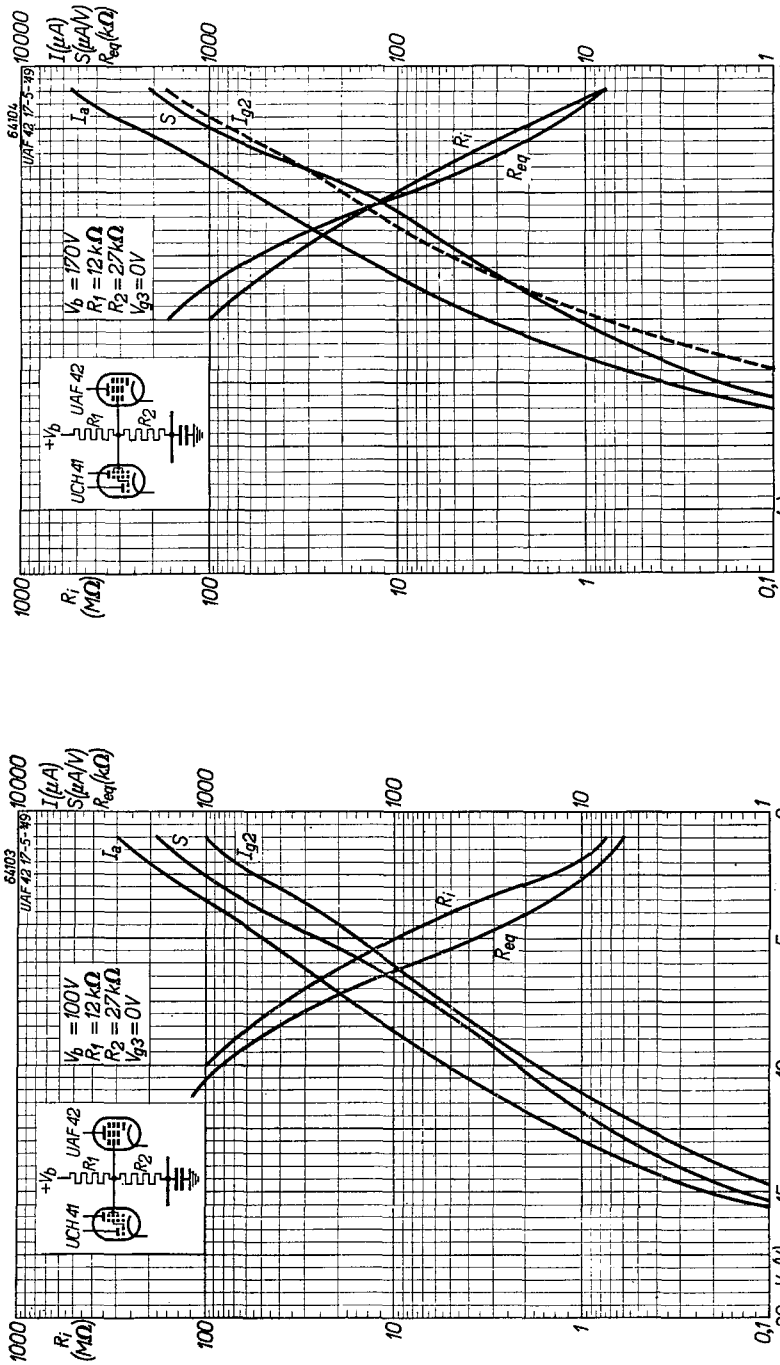
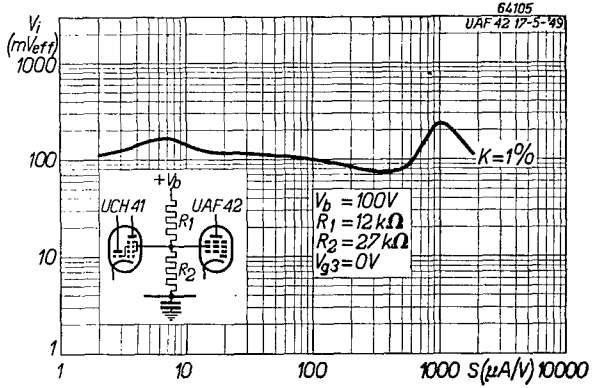


Fig. 15
As Figs. 10 and 11, but with the screen grid voltage of the UAF 42 obtained by means of the same potentiometer as that of the frequency changer UCH 41.

Fig. 16



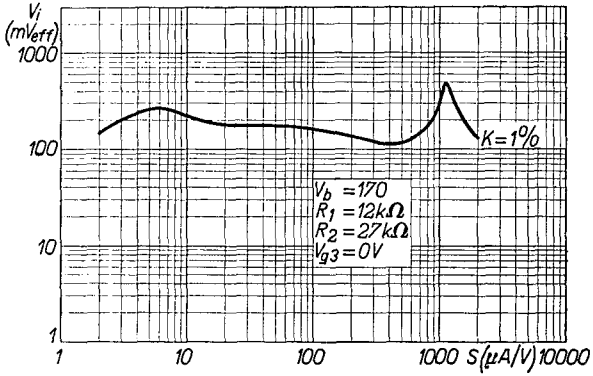
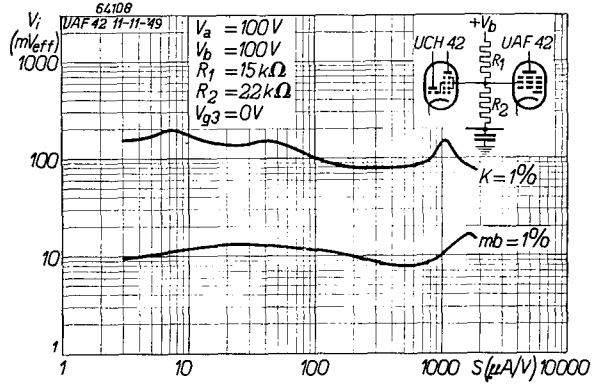


Fig. 17
As Fig. 12, but with the screen grids of the UAF 42 and UCH 41 fed by means of a common potentiometer.



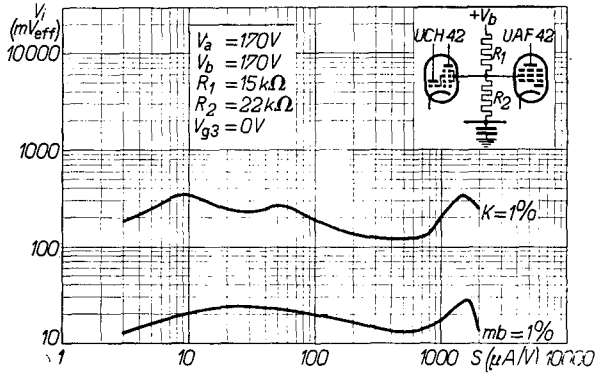


Fig. 18
As Fig. 12, but with the screen grids of the UAF 42 and UCH 42 fed by means of a common potentiometer.

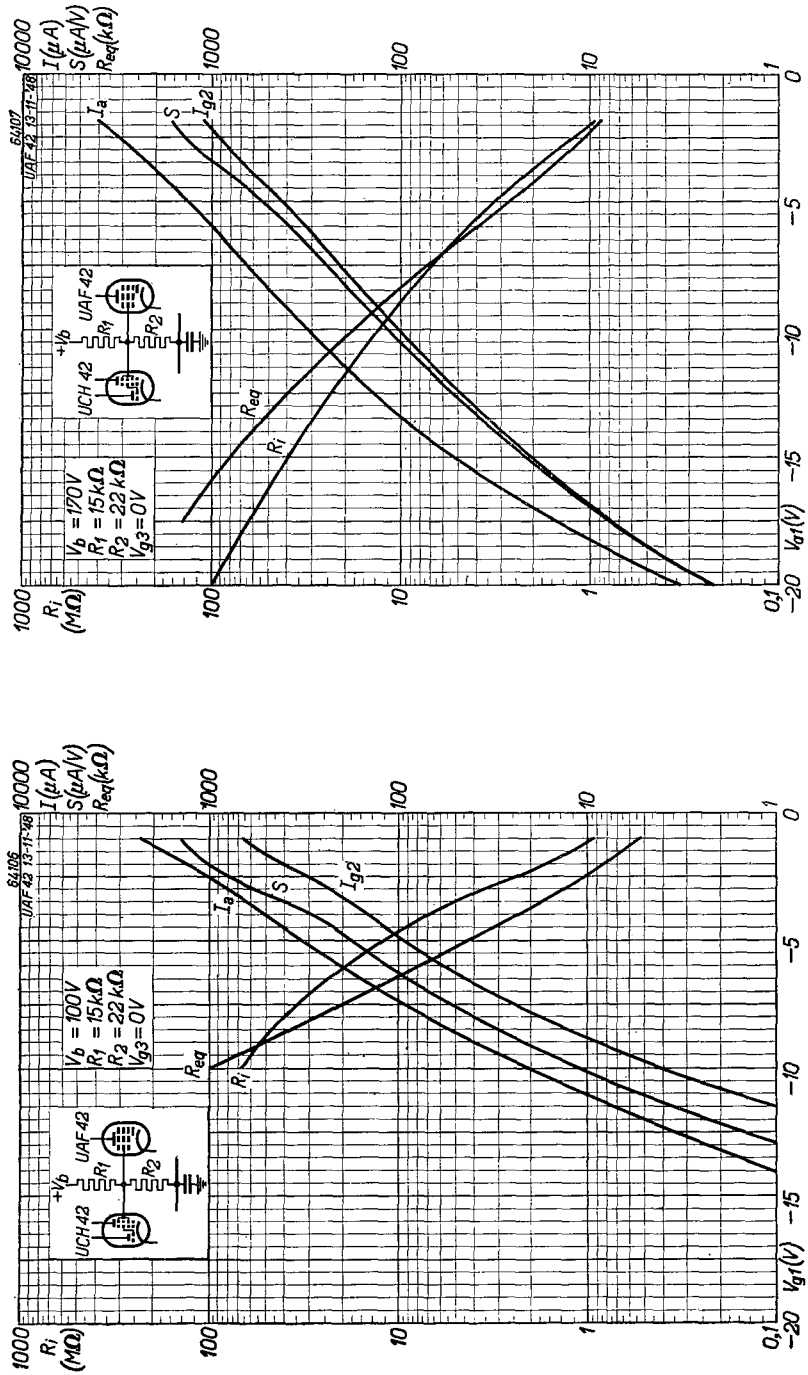


Fig. 19
As Figs. 10 and 11, but with the screen grid feeds of the UAF 42 and UCH 42 taken from a common potentiometer.

Fig. 20

DOUBLE DIODE with separate cathodes for signal detection and other purposes
DIODE DOUBLE avec cathodes séparées pour la détection de signaux et d'autres utilisations
DOPPELDIODE mit getrennten Kathoden für Empfangsgleichrichtung und andere Zwecke

Heating : indirect by A.C. or D.C.; series supply
Chauffage: indirect par C.A.ou C.C.; alimentation- série
Heizung : indirekt durch Wechsel- oder Gleichstrom; Serienspeisung

V_f = 19 V
I_f = 100 mA

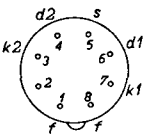
Base, culot, Sockel: RIMLOCK

Overall length: 60 mm
See pages 203 and 252

Hauteur totale: 60 mm
Voir pages 203 et 252

Gesamthöhe : 60 mm
Siehe S. 203 und 252





Capacitances
Capacités
Kapazitäten

C_{d1}	= 3,6 pF
C_{d2}	= 3,6 pF
C_{d1d2}	< 0,03 pF
C_{k1}	= 4,5 pF
C_{k2}	= 4,5 pF

Limiting values (each system)
Caractéristiques limites (par système)
Grenzdaten (jedes System)

$V_{d\ inv_D}$	= max. 420 V
I_d	= max. 9 mA
I_{d_p}	= max. 54 mA
V_{kf} (k neg., f pos.)	= max. 150 V
V_{kf} (k pos., f neg.)	= max. 330 V[1])
R_{kf}	= max. 20 kΩ

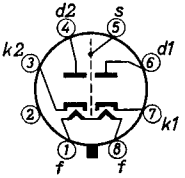
1) D.C. component max.165 V, A.C. component max.165 V (r.m.s.value)
Composante C.C.max.165 V, composante C.A.max.165 V (valeur efficace)
Gleichspannungsanteil max.165 V, Wechselspannungsanteil max.165 V (Effektivwert)

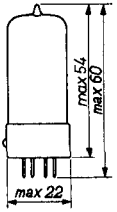
DOUBLE DIODE with separate cathodes for signal detection and other purposes
DOUBLE DIODE avec cathodes séparées pour la détection de signaux et d'autres utilisations
DOPPELDIODE mit getrennten Katoden für Empfangsgleichrichtung und andere Zwecke

Heating : indirect by A.C. or D.C.; series supply
Chauffage: indirect par C.A. ou C.C.; alimentation série
Heizung : indirekt durch Wechsel- oder Gleichstrom; Serienspeisung

V_f = 19 V
I_f = 100 mA

Dimensions in mm
Dimensions en mm
Abmessungen in mm





Capacitances
Capacités
Kapazitäten

C_{d1} = 3,6 pF
C_{d2} = 3,6 pF
C_{d1d2} < 0,03 pF
C_{k1} = 4,5 pF
C_{k2} = 4,5 pF

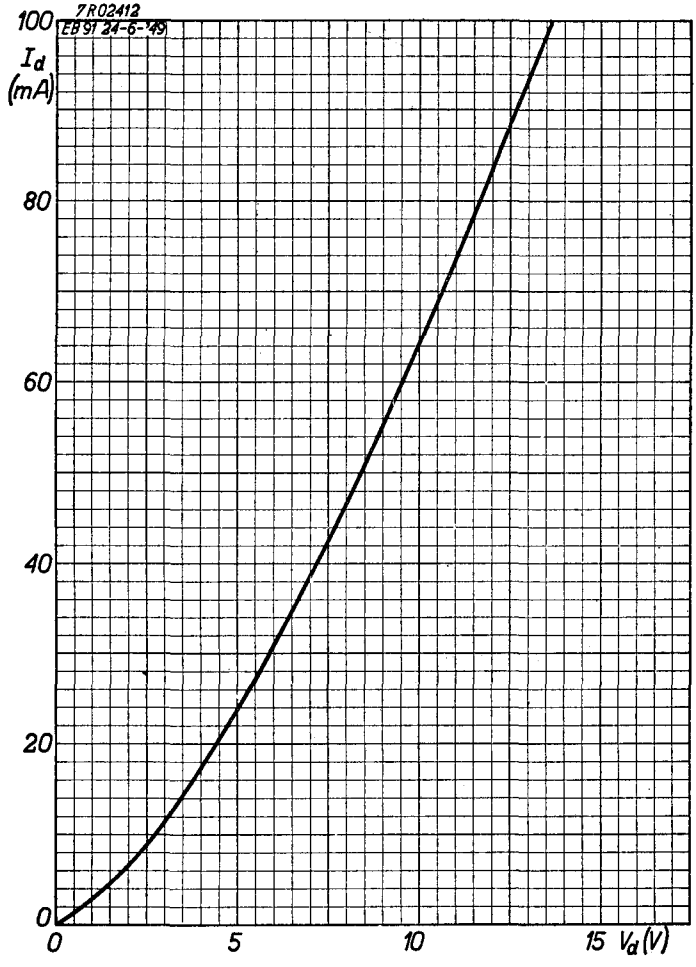
Limiting values (each system)
Caractéristiques limites (chaque système)
Grenzdaten (jedes System)

$V_{d\ inv_p}$	= max. 420 V
I_d	= max. 9 mA
I_{d_p}	= max. 54 mA
V_{kf} (k neg., f pos.)	= max. 150 V
V_{kf} (k pos., f neg.)	= max. 330 V [1])
R_{kf}	= max. 20 kΩ

For curves refer to type EAA91
Pour les courbes voir type EAA91
Für die Kennlinien siehe Typ EAA91

[1]) D.C. component max. 165 V. A.C. component max. 165 V_{rms}
Composante continue max. 165 V, composante alternative max. 165 Veff
Gleichspannungsanteil max. 165 V, Wechselspannungsanteil max. 165 Veff

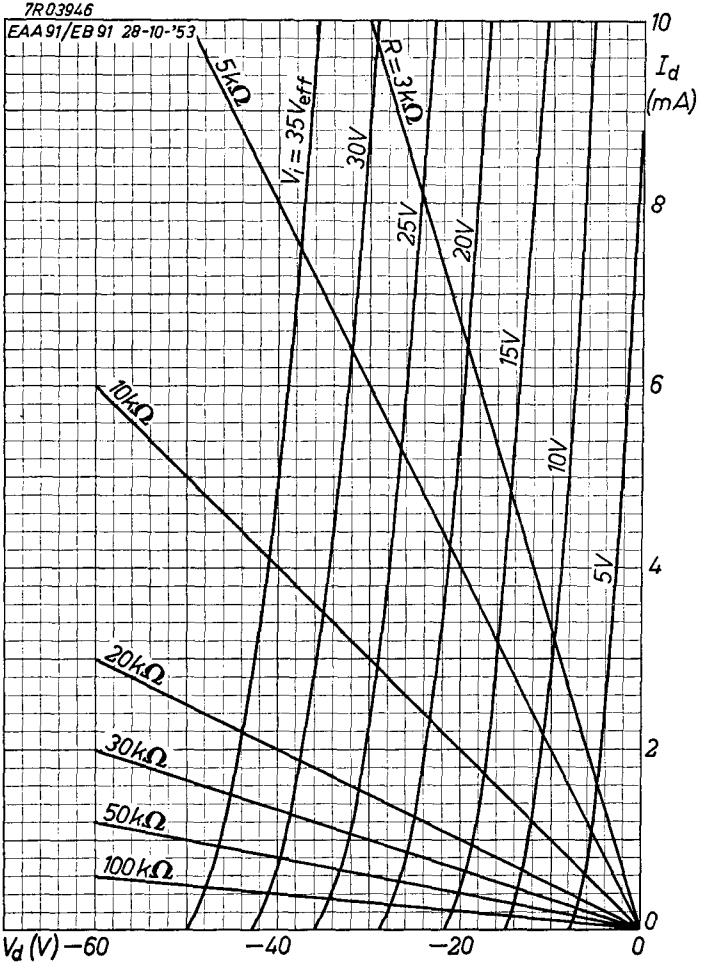
PHILIPS **UB 41**



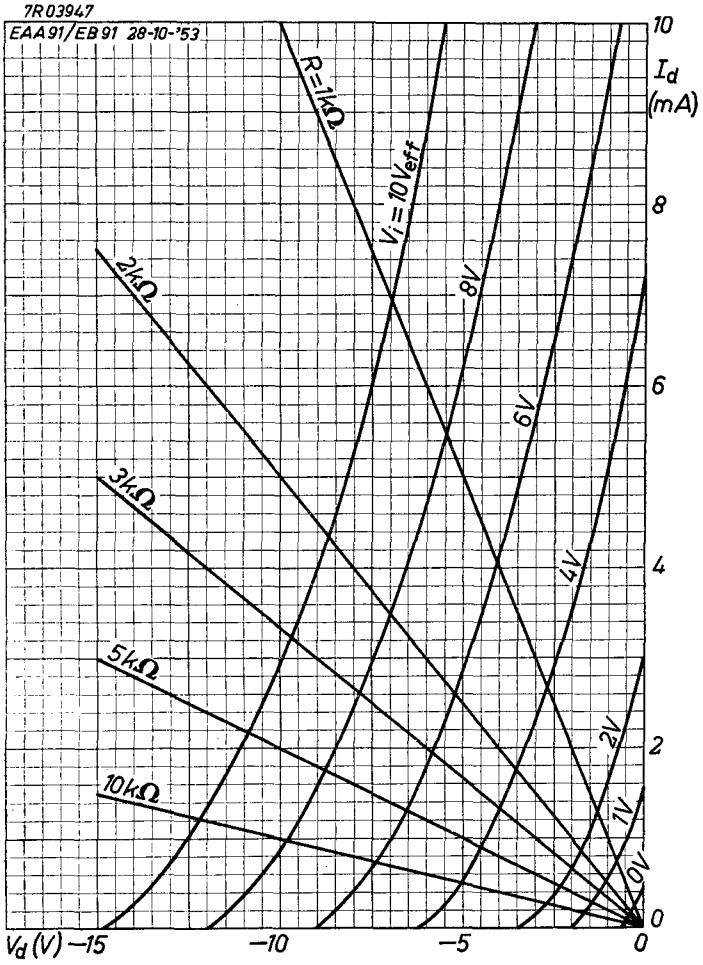
12.12.1953

A

PHILIPS


7R03946
EAA91/EB91 28-10-'53
5kΩ
$V_1 = 35 V_{eff}$
30V
R=3kΩ
25V
20V
15V
10V
5V
10kΩ
20kΩ
30kΩ
50kΩ
100kΩ
I_d (mA)
10
8
6
4
2
0
V_d (V) −60
−40
−20
0

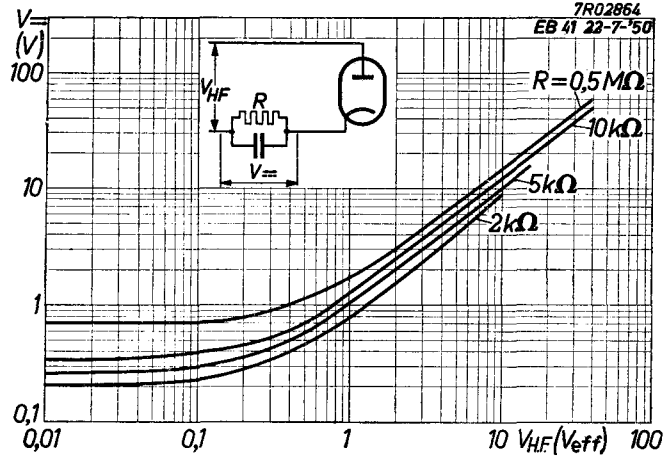
B

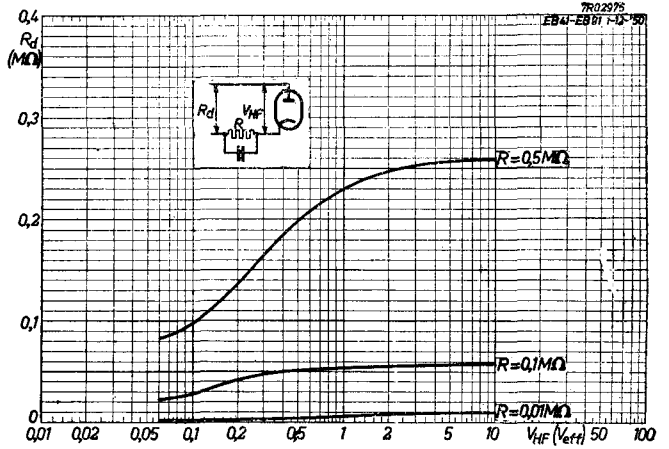

7R03947
EAA91/EB91 28-10-'53
R=1kΩ
Vi=10Veff
8V
6V
4V
2V
1V
0V
2kΩ
3kΩ
5kΩ
10kΩ
Id (mA)
10
8
6
4
2
0
Vd (V) −15
−10
−5
0

12.12.1953

C

PHILIPS


7R02864
EB 41 22-7-'50
V= (V)
100
10
1
0,1
0,01
0,1
1
10 V H.F. (Veff)
100
V HF
R
V=
R=0,5 MΩ
10 kΩ
5 kΩ
2 kΩ


7R02975
EB41-EB91 1-12-'50
Rd (MΩ)
0,4
0,3
0,2
0,1
0
0,01
0,02
0,05
0,1
0,2
0,5
1
2
5
10
V HF (Veff)
50
100
R=0,5MΩ
R=0,1MΩ
R=0,01MΩ

PHILIPS

Electronic Tube

HANDBOOK

UB41

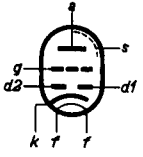
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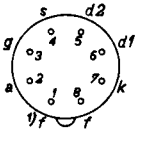
"Miniwatt" UBC 41

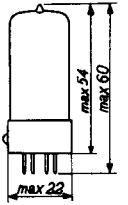
DUODIODE-TRIODE for use as A.F. amplifier
DUODIODE-TRIODE pour l'utilisation comme amplificatrice B.F.
DUODIODE-TRIODE zur Verwendung als N.F.Verstärker

Heating:	indirect by A.C. or D.C.; series supply	
Chauffage:	indirect par C.A. ou C.C.; alimentation en série	Vf = 14 V If = 0,1 A
Heizung:	indirekt durch Wechsel- oder Gleichstrom; Serienspeisung	

Dimensions in mm
Dimensions en mm
Abmessungen in mm







Base, culot, Fuss: Rimlock

Capacitances Capacités Kapazitäten	Triode section Partie triode Triodenteil	Diode section Partie diode Diodenteil
→	Cg = 2,7 pF	Cd1 = 0,8 pF
→	Ca = 1,7 pF	Cd2 = 0,7 pF
→	Cag = 1,5 pF	Cd1d2 < 0,3 pF
	Cgf < 0,05 pF	Cd1f < 0,1 pF
		Cd2f < 0,05 pF

Between triode and diode sections
Entre les parties triode et diode
Zwischen Trioden- und Diodenteilen

Cd1g < 0,007 pF
Cd2g < 0,03 pF
Cd1a < 0,01 pF
Cd2a < 0,01 pF

1) Earthed side of the filament circuit
Côté mise à la terre du circuit de filament
Geerdete Seite der Glühfadenschaltung

PHILIPS UBC 41

DOUBLE DIODE-TRIODE for use as A.F. amplifier
DOUBLE DIODE-TRIODE pour utilisation en amplificatrice B.F.
DOPPELDIODE-TRIODE zur Verwendung als NF-Verstärker

Heating : indirect by A.C. or D.C. series supply
Chauffage: indirect par C.A. ou C.C. alimentation-série
Heizung : indirekt durch Wechsel- oder Gleichstrom Serienspeisung

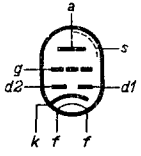
V_f = 14 V
I_f = 100 mA

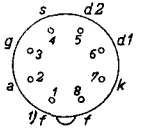
Base, culot, Sockel: RIMLOCK

Overall length: 60 mm
See pages 203 and 252

Hauteur totale: 60 mm
Voir pages 203 et 252

Gesamthöhe : 60 mm
Siehe S. 203 und 252





Capacitances Capacités Kapazitäten	Triode section Partie triode Triodenteil	Diode section Partie diode Diodenteil
	C_g = 2,7 pF	C_{d1} = 0,8 pF
	C_a = 1,7 pF	C_{d2} = 0,7 pF
	C_{ag} = 1,5 pF	C_{d1d2} < 0,3 pF
	C_{gf} < 0,05 pF	C_{d1f} < 0,1 pF
		C_{d2f} < 0,05 pF

Between triode and diode sections
Entre les parties triode et diode
Zwischen Trioden- und Diodenteilen

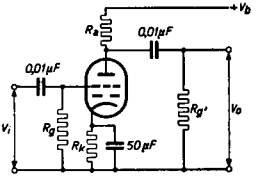
C_{d1g} < 0,007 pF
C_{d2g} < 0,03 pF
C_{d1a} < 0,01 pF
C_{d2a} < 0,01 pF

1) Earthed side of the filament circuit
Côté mise à la terre du circuit de filament
Geerdete Seite der Glühfadenschaltung

Typical characteristics of the triode section
Caractéristiques typiques de la partie triode
Kenndaten des Triodenteiles

Va =	170	100	V
Vg =	-1,55	-1,0	V
Ia =	1,5	0,8	mA
S =	1,65	1,4	mA/V
μ =	70	70	
Ri =	42	50	kΩ

Operating characteristics as L.F. amplifier
Données caractéristiques comme amplificatrice B.F.
Betriebsdaten als N.F. Verstärker



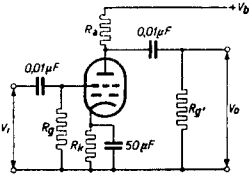
Vb	Ra	Rk	Rg	Rg'	Ia	Vo/Vi	d_{tot} (%) at Vo =		
(V)	(MΩ)	(kΩ)	(MΩ)	(MΩ)	(mA)		$3V_{eff}$	$5V_{eff}$	$8V_{eff}$
170	0,22	5,6	1	0,68	0,28	44	1,1	1,3	1,85
100	0,22	5,6	1	0,68	0,18	41	1,4	1,9	
170	0,1	3,9	1	0,33	0,45	37	1,1	1,7	2,6
100	0,1	3,9	1	0,33	0,28	34	2,0	3,5	
170	0,22	0	22	0,68	0,46	48	0,95	1,1	1,3
100	0,22	0	22	0,68	0,21	41	1,45	2,0	
170	0,1	0	22	0,33	0,82	42	0,75	1,0	1,2
100	0,1	0	22	0,33	0,35	35	1,6	2,8	

This valve can be used without special precautions against microphonic effect in circuits in which the input voltage Vi ≥ 10 mV for an output of 50 mW of the output valve

Typical characteristics of the triode section
Caractéristiques typiques de la partie triode
Kenndaten des Triodenteiles

Va =	170	100	V
Vg =	-1,55	-1,0	V
Ia =	1,5	0,8	mA
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Operating characteristics as L.F. amplifier
Données caractéristiques comme amplificatrice B.F.
Betriebsdaten als N.F. Verstärker



Vb (V)	Ra (MΩ)	Rk (kΩ)	Rg (MΩ)	Rg' (MΩ)	Ia (mA)	Vo/Vi	d_{tot} (%) at Vo = $3V_{eff}$	$5V_{eff}$	$8V_{eff}$
170	0,22	5,6	1	0,68	0,28	44	1,1	1,3	1,85
100	0,22	5,6	1	0,68	0,18	41	1,4	1,9	
170	0,1	3,9	1	0,33	0,45	37	1,1	1,7	2,6
100	0,1	3,9	1	0,33	0,28	34	2,0	3,5	
170	0,22	0	22	0,68	0,46	48	0,95	1,1	1,3
100	0,22	0	22	0,68	0,21	41	1,45	2,0	
170	0,1	0	22	0,33	0,82	42	0,75	1,0	1,2
100	0,1	0	22	0,33	0,35	35	1,6	2,8	

This valve can be used without special precautions against microphonic effect in circuits in which the input voltage Vi ≥ 10 mV for an output of 50 mW of the output valve

Ce tube peut être utilisé sans précautions spéciales contre l'effet microphonique dans des circuits dont la tension d'entrée Vi ≧ 10 mV pour une puissance de 50 mW du tube de sortie

Diese Röhre darf ohne spezielle Massnahmen gegen Mikrophonie verwendet werden in Schaltungen die für eine Eingangsspannung Vi ≧ 10 mV eine Leistung von 50 mW der Endröhre ergeben

Limiting values of the triode section
Caractéristiques limites de la partie triode
Grenzdaten des Triodenteiles

Va_o	= max.	550 V
Va	= max.	250 V
Wa	= max.	0,5 W
Ik	= max.	5 mA
Vg (Ig=+0,3µA)	= max.	-1,3 V
Rg	= max.	3 MΩ[1]
V_{kf}	= max.	150 V
R_{kf}	= max.	20 kΩ

Limiting values of the diode sections
Caractéristiques limites des parties diode
Grenzdaten der Diodenteile

$Vd\ inv_p$	= max.	350 V
I_d	= max.	0,8 mA
I_{dp}	= max.	5 mA
V_{kf}	= max.	150 V
R_{kf}	= max.	20 kΩ

[1]) If the grid bias is obtained only by connecting a leakage resistor in the grid circuit, the max. value of Rg is 22 MΩ.
Si la polarisation négative est obtenue seulement par moyen d'une résistance de fuite dans le circuit de la grille, la valeur maximum de Rg est de 22 MΩ.
Wenn die negative Gittervorspannung nur von einem Ableitungswiderstand in der Gitterleitung erhalten wird, ist der Maximalwert von Rg 22 MΩ.

Ce tube peut être utilisé sans précautions spéciales contre l'effet microphonique dans des circuits dont la tension d'entrée $V_i \geq 10$ mV pour une puissance de sortie de 50 mW du tube de sortie

Diese Röhre darf ohne spezielle Massnahmen gegen Mikrophonie verwendet werden in Schaltungen die für eine Eingangsspannung $V_i \geq 10$ mV eine Ausgangsleistung von 50 mW der Endröhre ergeben

Limiting values of the triode section
Caractéristiques limites de la partie triode
Grenzdaten des Triodenteiles

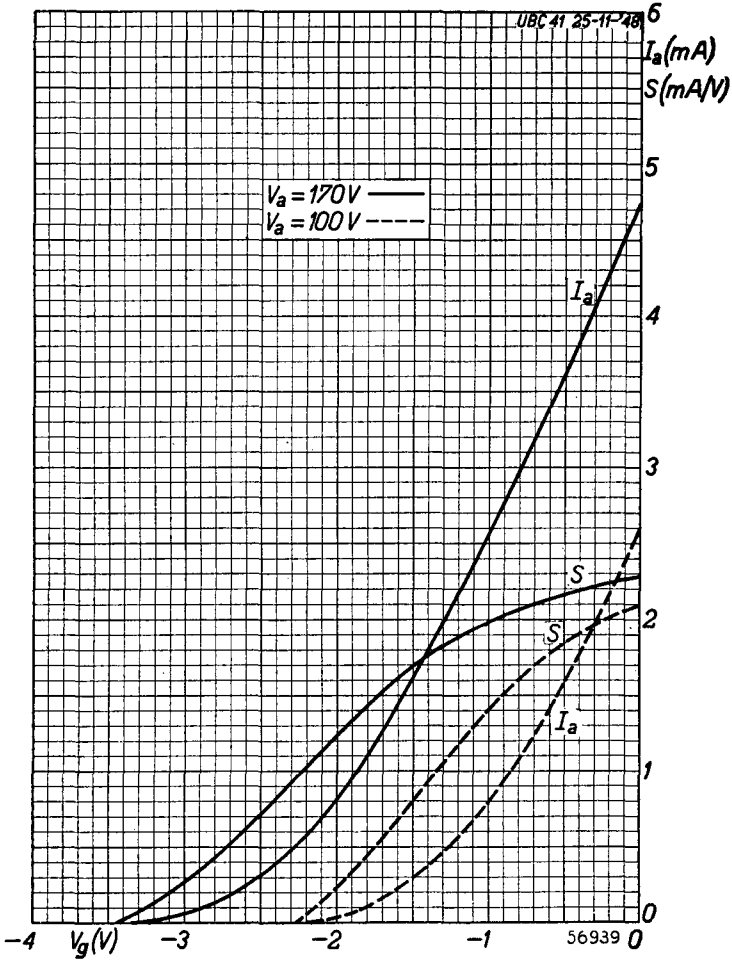
V_{ao}	= max. 550 V
V_a	= max. 250 V
W_a	= max. 0,5 W
I_k	= max. 5 mA
$-V_g$ (I_g = +0,3 µA)	= max. 1,3 V
R_g	= max. 3 MΩ [1]
V_{kf}	= max. 150 V
R_{kf}	= max. 20 kΩ

Limiting values of the diode sections (each diode)
Caractéristiques limites des parties diode (par diode)
Grenzdaten der Diodenteile (pro Diode)

$V_{d\ invp}$	= max. 350 V
I_d	= max. 0,8 mA
I_{dp}	= max. 5 mA
V_{kf}	= max. 150 V
R_{kf}	= max. 20 kΩ

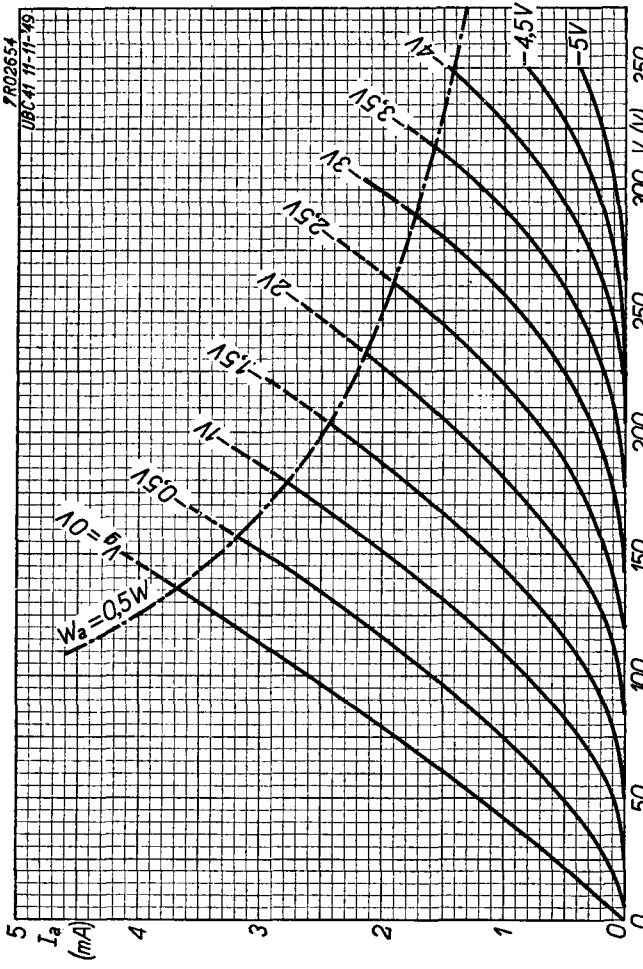
For curves refer to type UBC81
Pour les courbes voir type UBC81
Für die Kennlinien siehe Typ UBC81

[1]) If the grid bias is obtained only by connecting a leakage resistor in the grid circuit, the max. value of R_g is 22 MΩ
Si la polarisation négative est obtenue seulement par moyen d'une résistance de fuite dans le circuit de la grille, la valeur maximum de R_g est de 22 MΩ
Wenn die negative Gittervorspannung nur mittels eines Ableitwiderstandes in der Gitterleitung erhalten wird, ist der Maximalwert von R_g 22 MΩ

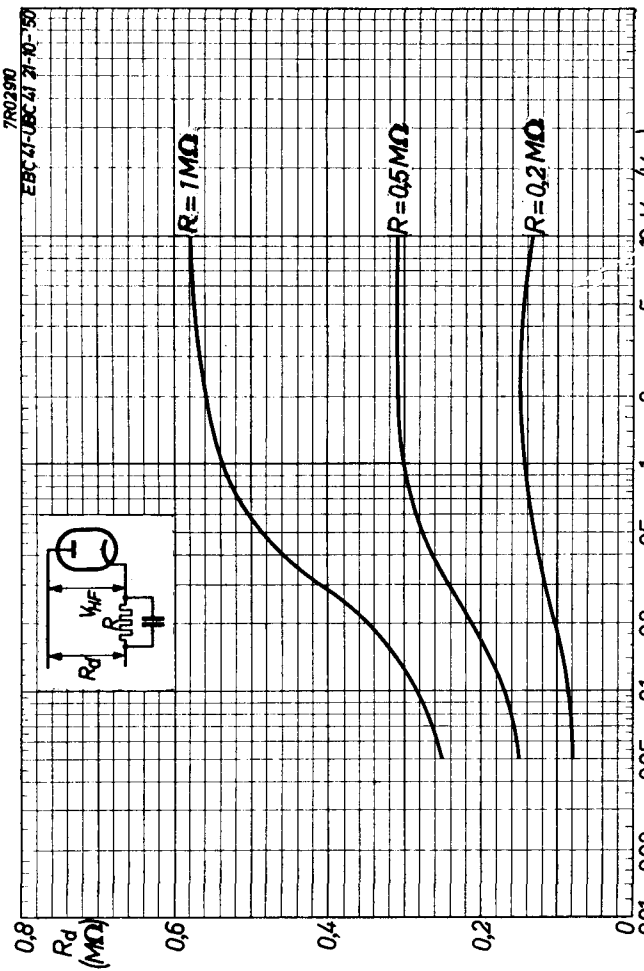

UBC 41 25-11-48
I_a(mA)
S(mA/V)
V_a = 170 V
V_a = 100 V
I_a
S
S
I_a
6
5
4
3
2
1
0
−4
V_g(V)
−3
−2
−1
0
56939

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UBC 41 „Miniwatt"



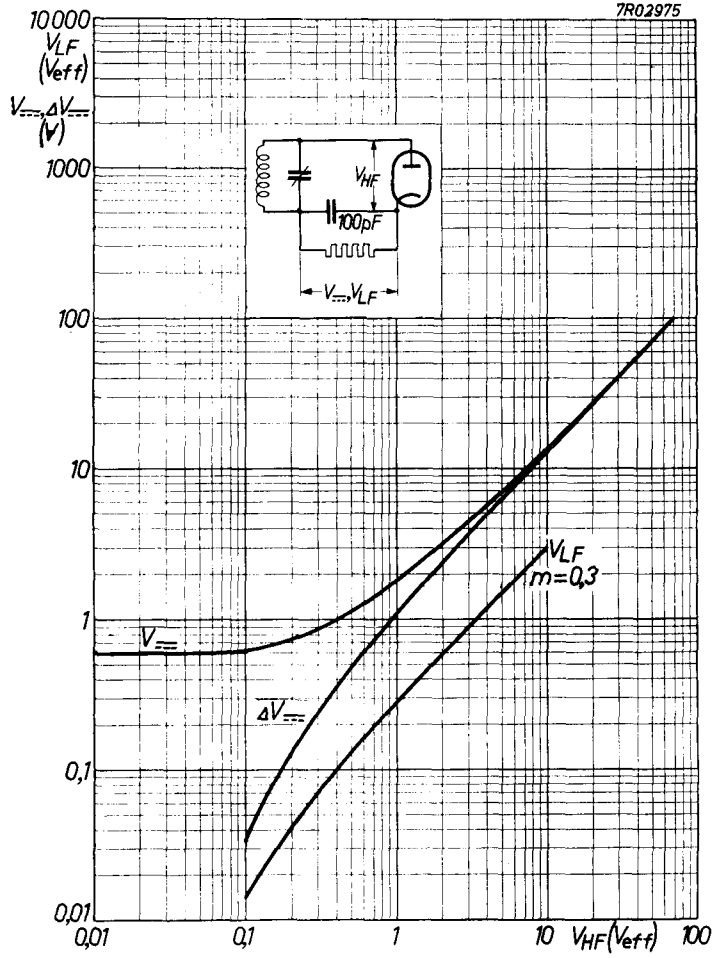
"Miniwatt" **UBC 41**



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UBC 41 "Miniwatt"



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PHILIPS

Electronic Tube

HANDBOOK

UBC41

page	sheet	date
1	1	1951.11.11
2	1	1953.12.12
3	2	1951.11.11
4	2	1953.12.12
5	3	1951.11.11
6	3	1958.02.02
7	A	1949.11.11
8	B	1949.11.11
9	C	1950.12.12
10	D	1950.12.12
11	FP	2000.06.11

DOUBLE DIODE-TRIODE

Double diode-triode. Triode intended for use as A.F. amplifier.

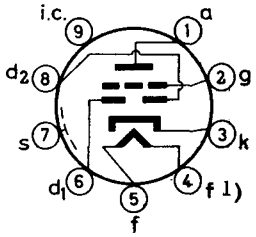
QUICK REFERENCE DATA			
Triode section			
Anode current	I_a	1.5	mA
Transconductance	S	1.65	mA/V
Amplification factor	μ	70	-

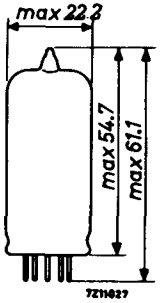
HEATING: Indirect by A.C. or D.C.; series supply

Heater current	I_f	100	mA
Heater voltage	V_f	14	V

DIMENSIONS AND CONNECTIONS Dimensions in mm

Base: Noval





1) Earthed side of the heater circuit.

CAPACITANCES

Triode section

Grid to all except anode	$C_{g(a)}$		2.3	pF
Anode to all except grid	$C_{a(g)}$		2.3	pF
Anode to grid	C_{ag}		1.2	pF
Grid to heater	C_{gf}	max.	0.05	pF

Diode sections

Diode No.1 to all	C_{d_1}		0.9	pF
Diode No.2 to all	C_{d_2}		0.9	pF
Diode No.1 to diode No.2	$C_{d_1d_2}$	max.	0.2	pF
Diode No.1 to heater	C_{d_1f}	max.	0.25	pF
Diode No.2 to heater	C_{d_2f}	max.	0.05	pF

Between triode and diode sections

Diode No.1 to grid	C_{d_1g}	max.	0.007	pF
Diode No.2 to grid	C_{d_2g}	max.	0.007	pF
Diode No.1 to anode	C_{d_1a}	max.	0.005	pF
Diode No.2 to anode	C_{d_2a}	max.	0.01	pF

TYPICAL CHARACTERISTICS OF THE TRIODE SECTION

Anode voltage	V_a	170	100	V
Grid voltage	V_g	-1.55	-1.0	V
Anode current	I_a	1.5	0.8	mA
Transconductance	S	1.65	1.4	mA/V
Amplification factor	μ	70	70	-
Internal resistance	R_i	42	50	kΩ

OPERATING CHARACTERISTICS

Triode section as A.F. amplifier, circuit Fig.1

Supply voltage	V_b	170	100	170	100	V
Anode resistor	R_a	0.22	0.22	0.1	0.1	MΩ
Cathode resistor	R_k	5.6	5.6	3.9	3.9	kΩ
Grid resistor	R_g	1.0	1.0	1.0	1.0	MΩ
Grid resistor next stage	R_g	0.68	0.68	0.33	0.33	MΩ
Anode current	I_a	0.28	0.18	0.45	0.28	mA
Voltage gain	V_o/V_i	44	41	37	34	
Distortion at:						
output voltage V_o = 3 V_{RMS}	d_t	1.1	1.4	1.1	2.0	%
output voltage V_o = 5 V_{RMS}	d_t	1.3	1.9	1.7	3.5	%
output voltage V_o = 8 V_{RMS}	d_t	1.85	-	2.6	-	%
Supply voltage	V_b	170	100	170	100	V
Anode resistor	R_a	0.22	0.22	0.1	0.1	MΩ
Cathode resistor	R_k	0	0	0	0	Ω
Grid resistor	R_g	22	22	22	22	MΩ
Grid resistor next stage	R_g'	0.68	0.68	0.33	0.33	MΩ
Anode current	I_a	0.46	0.21	0.82	0.35	mA
Voltage gain	V_o/V_i	48	41	42	35	
Distortion at						
output voltage V_o = 3 V_{RMS}	d_t	0.95	1.45	0.75	1.6	%
output voltage V_o = 5 V_{RMS}	d_t	1.1	2.0	1.0	2.8	%
output voltage V_o = 8 V_{RMS}	d_t	1.3	-	1.2	-	%

OPERATING CHARACTERISTICS (continued)

Microphony

No special precautions against microphony are required in circuits where the input voltage is min. 10 mV for 50 mW output of the output tube.

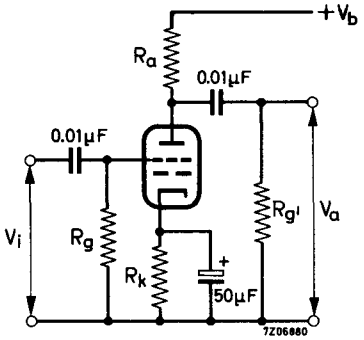


Fig.1

LIMITING VALUES (Design centre rating system)

Triode section

Anode voltage	V_{a_o}	max.	550	V
	V_a	max.	250	V
Anode dissipation	W_a	max.	0.5	W
Cathode current	I_k	max.	5	mA
Grid resistor	R_g	max.	3	MΩ
Cathode to heater voltage	V_{kf}	max.	100	V

Diode sections (each diode)

Diode voltage, negative peak	$-V_{d_p}$	max.	350	V
Diode current:				
average	I_d	max.	0.8	mA
peak	I_{d_p}	max.	5	mA
Cathode to heater voltage	V_{kf}	max.	100	V

PHILIPS

Data handbook

Electronic components and materials

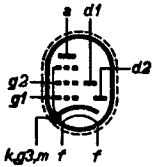
UBC81

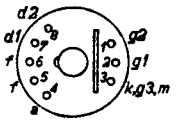
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5	FP	1999.07.29

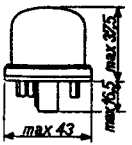
DUODIODE-PENTODE with variable mutual conductance for use as H.F., I.F. or L.F. amplifier
DUODIODE-PENTHODE à pente variable pour utilisation comme amplificatrice H.F., M.F. ou B.F.
DUODIODE-PENTHODE mit veränderlicher Steilheit zur Verwendung als H.F., Z.F. oder N.F. Verstärker

Heating:	indirect by A.C. or D.C.; series supply	
Chauffage:	indirect par C.A. ou C.C.; alimentation en série	Vf = 20 V If = 0,100 A
Heizung:	indirekt durch Wechsel- oder Gleichstrom; Serienspeisung	

Dimensions in mm
Dimensions en mm
Abmessungen in mm







Capacities Capacités Kapazitäten	Pentode section Partie penthode Penthodenteil	Diode section Partie diode Diodenteil
	Ca = 6,5 pF	Cd1d2 < 0,5 pF
	Cag1 < 0,002 pF	Cd1 = 2,7 pF
	Cg1 = 6,0 pF	Cd2 = 3,0 pF
	Cg1f < 0,001 pF	Cd1f < 0,65 pF
		Cd2f < 0,1 pF

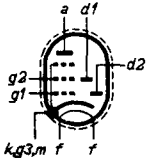
Between pentode and diode sections
Entre les parties penthode et diode
Zwischen Penthoden- und Diodenteilen

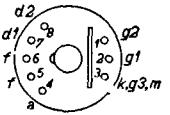
Cd1a	< 0,015 pF
Cd2a	< 0,01 pF
C(d1+d2)a	< 0,015 pF
Cd1g1	< 0,001 pF
Cd2g1	< 0,001 pF
C(d1+d2)g1	< 0,002 pF

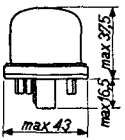
DOUBLE DIODE-PENTODE with variable mutual conductance for use as R.F., I.F. or A.F. amplifier
DOUBLE DIODE-PENTHODE à pente variable pour utilisation en amplificatrice H.F., M.F. ou B.F.
DOPPELDIODE-PENTODE mit veränderlicher Steilheit zur verwendung als HF-, ZF- oder NF-Verstärker

Heating : indirect; series supply — V_f = 20 V
Chauffage: indirect; alimentation- série — I_f = 100 mA
Heizung : indirekt; Serienspeisung

Dimensions in mm,dimensions en mm,Abmessungen in mm







Base, culot, Sockel: Y

Capacitances, Capacités, Kapazitäten

C_a = 6,5 pF	C_{ag1} < 0,002 pF	C_{g1} = 6,0 pF	C_{g1f} < 0,001 pF
C_{d1d2} < 0,5 pF	C_{d1} = 2,7 pF	C_{d2} = 3,0 pF	C_{d1f} < 0,65 pF
			C_{d2f} < 0,1 pF

C_{d1a}	< 0,015 pF	C_{d1g1}	< 0,001 pF
C_{d2a}	< 0,01 pF	C_{d2g1}	< 0,001 pF
$C_{(d1+d2)a}$	< 0,015 pF	$C_{(d1+d2)g1}$	< 0,002 pF

Operating characteristics as R.F. or I.F. amplifier
Caractéristiques d'utilisation en amplificatrice H.F. ou M.F.
Betriebsdaten als HF- oder ZF-Verstärker

V_a	=	100			200		V
R_{g2}	=	70			70		kΩ
R_k	=	300			300		Ω
μ_{g2g1}	=	14			14		
V_{g1}	=	-1	-22	-23	-2	-42	-46 V
V_{g2}	=	40	-	100	80	-	200 V
I_a	=	2,6	-	-	5	-	- mA
I_{g2}	=	0,85	-	-	1,7	-	- mA
S	=	1300	13	9	1800	18	9 μA/V
R_i	=	0,9	>10	>10	1,5	>10	>10 MΩ

UBF 11 "Miniwatt"

Operating characteristics of the pentode section as H.F. or I.F. amplifier
Caractéristiques d'utilisation de la partie penthode comme amplificatrice H.F. ou M.F.
Betriebsdaten des Penthodenteiles als H.F. oder Z.F. Verstärker

Va	=		100			200		V
Rg2	=		70			70		kΩ
Rk	=		300			300		Ω
μg2g1	=		14			14		
Vg1	=	-1	-22	-23	-2	-42	-46	V
Vg2	=	40	-	100	80	-	200	V
Ia	=	2,6	-	-	5	-	-	mA
Ig2	=	0,85	-	-	1,7	-	-	mA
S	=	1300	13	9	1800	18	9	μA/V
Ri	=	0,9	>10	>10	1,5	>10	>10	MΩ

Operating characteristics of the pentode section as L.F. amplifier
Caractéristiques d'utilisation de la partie penthode comme amplificatrice B.F.
Betriebsdaten des Penthodenteiles als N.F. Verstärker

A. Vb= 200 V; Ra = 0,2 MΩ; Rg2 = 0,7 MΩ; Rk = 2,4 kΩ

$-V_R$ (V)	Ia (mA)	Ig2 (mA)	$\frac{Vo}{Vi}$	d_{tot} (%) (Vo = 3 V_{eff})	d_{tot} (%) (Vo = 5 V_{eff})
0	0,66	0,24	82	0,72	1,2
5	0,50	0,19	28	1,02	1,7
10	0,37	0,15	20	1,14	1,9
15	0,27	0,12	10,5	1,32	2,2
20	0,20	0,09	6,7	2,04	3,4

B. Vb= 100 V; Ra = 0,2 MΩ; Rg2 = 0,7 MΩ; Rk = 2,4 kΩ

$-V_R$ (V)	Ia (mA)	Ig2 (mA)	$\frac{Vo}{Vi}$	d_{tot} (%) (Vo = 3 V_{eff})	d_{tot} (%) (Vo = 5 V_{eff})
0	0,33	0,12	76	0,72	1,2
2,5	0,245	0,095	28,4	1,62	2,7
5	0,185	0,075	22,7	2,04	3,4
10	0,10	0,045	6,3	7,44	12,4

55396

Operating characteristics as A.F. amplifier
Caractéristiques d'utilisation en amplificatrice B.F.
Betriebsdaten NF-Verstärker

A. V_b = 200 V; R_a = 0,2 MΩ; R_{g2} = 0,7 MΩ; R_k = 2,4 kΩ

$-V_R$ (V)	I_a (mA)	I_{g2} (mA)	$\frac{V_o}{V_i}$	dtot (%) (V_o = 3 Veff)	dtot (%) (V_o = 5 Veff)
0	0,66	0,24	82	0,72	1,2
5	0,50	0,19	28	1,02	1,7
10	0,37	0,15	20	1,14	1,9
15	0,27	0,12	10,5	1,32	2,2
20	0,20	0,09	6,7	2,04	3,4

B. V_b = 100 V; R_a = 0,2 MΩ; R_{g2} = 0,7 MΩ; R_k = 2,4 kΩ

$-V_R$ (V)	I_a (mA)	I_{g2} (mA)	$\frac{V_o}{V_i}$	dtot (%) (V_o = 3 Veff)	dtot (%) (V_o = 5 Veff)
0	0,33	0,12	76	0,72	1,2
2,5	0,245	0,095	28,4	1,62	2,7
5	0,185	0,075	22,7	2,04	3,4
10	0,10	0,045	6,3	7,44	12,4

Limiting values
Caractéristiques limites
Grenzdaten

V_{a_o}	= max.	550 V
V_a	= max.	250 V
W_a	= max.	1,5 W
V_{g2_o}	= max.	550 V
V_{g2} (I_a < 2 mA)	= max.	250 V
V_{g2} (I_a = 5 mA	= max.	125 V
W_{g2}	= max.	0,3 W
I_k	= max.	10 mA
V_{g1} (I_{g1}=+0,3μA)	= max.	-1,3 V
R_{g1}	= max.	3 MΩ
R_{kf}	= max.	20 kΩ
V_{kf}	= max.	125 V
Each diode; chaque diode; jede Diode		
V_{dinv_p}	= max.	350 V
I_d	= max.	0,8 mA
I_{d_p}	= max.	50 mA

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Electronic Tube

HANDBOOK

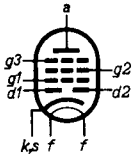
UBF11

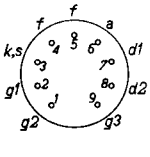
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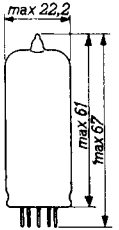
DUODIODE-PENTODE with variable mutual conductance for use as R.F., I.F. or A.F. amplifier
DUODIODE-PENTHODE à pente variable pour utilisation en amplificatrice H.F., M.F. ou B.F.
DUODIODE-PENTODE mit veränderlicher Steilheit zur Verwendung als H.F., Z.F. oder N.F. Verstärker

Heating:	indirect by A.C. or D.C.; series supply		
Chauffage:	indirect par C.A. ou C.C.; alimentation en série	I_f =	100 mA
Heizung:	indirekt durch Wechsel- oder Gleichstrom; Serienspeisung	V_f =	17 V

Dimensions in mm
Dimensions en mm
Abmessungen in mm







Base, culot, Sockel: NOVAL

Capacitances Capacités Kapazitäten	Pentode section Partie penthode Pentodenteil	Diode section Partie diode Diodenteil
	C_a = 4,9 pF	C_{d1} = 2,2 pF
	C_{g1} = 4,2 pF	C_{d2} = 2,35 pF
	C_{ag1} < 0,0025 pF	C_{d1d2} < 0,35 pF
	C_{g1f} < 0,07 pF	C_{d1f} < 0,02 pF
		C_{d2f} < 0,005 pF

Between pentode and diode sections
Entre les parties penthode et diode
Zwischen Pentoden- und Diodenteilen

C_{d1g1} < 0,0008 pF
C_{d2g1} < 0,001 pF
C_{d1a} < 0,2 pF
C_{d2a} < 0,05 pF

DOUBLE DIODE-PENTODE with variable mutual conductance for use as R.F., I.F. or A.F. amplifier
DOUBLE DIODE-PENTHODE à pente variable pour utilisation en amplificatrice H.F., M.F. ou B.F.
DOPPELDIODE-PENTODE mit veränderlicher Steilheit zur Verwendung als HF-, ZF- oder NF-Verstärker

Heating : indirect by A.C. or D.C. series supply
Chauffage: indirect par C.A. ou C.C. alimentation-série
Heizung : indirekt durch Wechsel- oder Gleichstrom Serienspeisung

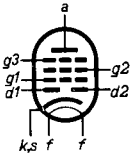
I_f = 100 mA
V_f = 17 V

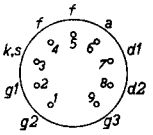
Base, culot, Sockel: NOVAL

Overall length: 67 mm
See pages 205 and 253

Hauteur totale: 67 mm
Voir pages 205 et 253

Gesamthöhe : 67 mm
Siehe S. 205 und 253





Capacitances Capacités Kapazitäten	Pentode section Partie penthode Pentodenteil	Diode section Partie diode Diodenteil
	C_a = 4,9 pF	C_{d1} = 2,2 pF
	C_{g1} = 4,2 pF	C_{d2} = 2,35 pF
	C_{ag1} < 0,0025 pF	C_{d1d2} < 0,35 pF
	C_{g1f} < 0,07 pF	C_{d1f} < 0,02 pF
		C_{d2f} < 0,005 pF

Between pentode and diode sections
Entre les parties penthode et diode
Zwischen Pentoden- und Diodenteilen

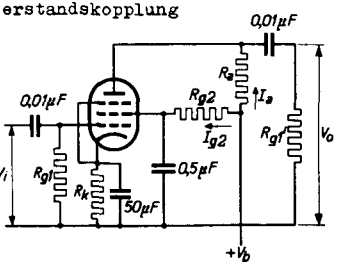
C_{d1g1} < 0,0008 pF
C_{d2g1} < 0,001 pF
C_{d1a} < 0,2 pF
C_{d2a} < 0,05 pF

UBF 80 "Miniwatt"

Operating characteristics as R.F. or I.F. amplifier
Caractéristiques d'utilisation en amplificatrice H.F. ou M.F.
Betriebsdaten als H.F. oder Z.F. Verstärker

$V_a=V_b$	=	100		170		200		V
R_{g2}	=	47		47		68		kΩ
V_{g3}	=	0		0		0		V
R_k	=	295		295		295		Ω
V_{g1}	=	-1,15	-15,5	-2	-26,5	-2	-31,5	V
I_a	=	2,8	-	5,0	-	5,0	-	mA
I_{g2}	=	1,0	-	1,75	-	1,75	-	mA
S	=	1900	19	2200	22	2200	22	µA/V
R_i	=	0,9	>10	0,9	>10	1,0	>10	MΩ
μ_{g2g1}	=	18	-	18	-	18	-	
R_{eq}	=	4,6	-	6,2	-	6,2	-	kΩ

Operating characteristics of the pentode section as resistance coupled A.F. amplifier
Données caractéristiques de la partie penthode en amplificatrice B.F. avec couplage à résistances
Betriebsdaten des Pentodenteiles als N.F. Verstärker mit Widerstandskopplung

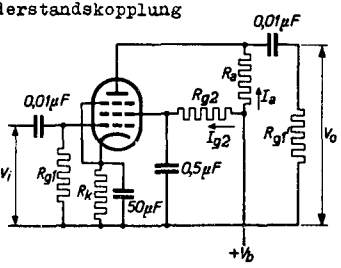


This valve can be used without special precautions against microphonic effect in circuits in which the input voltage $V_i \geqq 25$ mV for an output of 50 mW of the output valve.
Ce tube peut être utilisé sans précautions spéciales contre l'effet microphonique dans des circuits dont la tension d'entrée $V_i \geqq 25$ mV pour une puissance de 50 mW du tube de sortie
Diese Röhre darf ohne spezielle Massnahmen gegen Mikrophonie verwendet werden in Schaltungen die für eine Eingangsspannung $V_i \geqq 25$ mV eine Leistung von 50 mW der Endröhre ergeben.

Operating characteristics as R.F. or I.F. amplifier
Caractéristiques d'utilisation en amplificatrice H.F. ou M.F.
Betriebsdaten als H.F. oder Z.F. Verstärker

$V_a=V_b$	=	100		170		200		V
R_{g2}	=	47		47		68		kΩ
V_{g3}	=	0		0		0		V
R_k	=	295		295		295		Ω
V_{g1}	=	-1,15	-15,5	-2	-26,5	-2	-31,5	V
I_a	=	2,8	-	5,0	-	5,0	-	mA
I_{g2}	=	1,0	-	1,75	-	1,75	-	mA
S	=	1900	19	2200	22	2200	22	µA/V
R_i	=	0,9	>10	0,9	>10	1,0	>10	MΩ
μ_{g2g1}	=	18	-	18	-	18	-	
R_{eq}	=	4,6	-	6,2	-	6,2	-	kΩ

Operating characteristics of the pentode section as resistance coupled A.F. amplifier
Données caractéristiques de la partie penthode en amplificatrice B.F. avec couplage à résistances
Betriebsdaten des Pentodenteiles als N.F. Verstärker mit Widerstandskopplung



This valve can be used without special precautions against microphonic effect in circuits in which the input voltage $V_i \geqq 25$ mV for an output of 50 mW of the output valve.
Ce tube peut être utilisé sans précautions spéciales contre l'effet microphonique dans des circuits dont la tension d'entrée $V_i \geqq 25$ mV pour une puissance de 50 mW du tube de sortie
Diese Röhre darf ohne spezielle Massnahmen gegen Mikrophonie verwendet werden in Schaltungen die für eine Eingangsspannung $V_i \geqq 25$ mV eine Leistung von 50 mW der Endröhre ergeben.

V_b = 170 V

R_a (MΩ)	R_{g2} (MΩ)	R_{g1} (MΩ)	R_k (Ω)	R_{g1}' (MΩ)	I_a (mA)	I_{g2} (mA)	$\frac{V_o}{V_i}$	d_{tot} (%)		
								V_o= $3V_{eff}$	V_o= $5V_{eff}$	V_o= $8V_{eff}$
0,22	0,68	1	2700	0,68	0,56	0,20	85	1,2	1,5	1,8
0,1	0,27	1	1000	0,33	1,25	0,50	70	1,2	1,6	2,0
0,22	0,82	10	0	0,68	0,56	0,19	140	0,8	1,0	1,4
0,1	0,33	10	0	0,33	1,16	0,46	100	0,8	1,4	2,0

V_b = 100 V

R_a (MΩ)	R_{g2} (MΩ)	R_{g1} (MΩ)	R_k (Ω)	R_{g1}' (MΩ)	I_a (mA)	I_{g2} (mA)	$\frac{V_o}{V_i}$	d_{tot} (%)	
								V_o= $3V_{eff}$	V_o= $5V_{eff}$
0,22	0,68	1	2700	0,68	0,32	0,12	82	1,4	1,9
0,1	0,27	1	1000	0,33	0,73	0,29	67	1,4	1,8
0,22	0,82	10	0	0,68	0,32	0,11	100	2,8	3,0
0,1	0,33	10	0	0,33	0,66	0,25	70	1,7	3,2

Operating characteristics as resistance coupled A.F. amplifier in triode connection(g2 connected to anode)
Données caractéristiques en amplificatrice B.F. avec couplage à résistances montée en triode (g2 relié à l'anode)
Betriebsdaten als N.F.Verstärkermit Widerstandskopplung in Triodenschaltung (g2 verbunden mit Anode)

V_b (V)	R_a (MΩ)	R_{g1} (MΩ)	R_k (Ω)	R_{g1}' (MΩ)	I_a (mA)	$\frac{V_o}{V_i}$	d_{tot} (%)		
							V_o= $3V_{eff}$	V_o= $5V_{eff}$	V_o= $8V_{eff}$
170	0,1	1	1800	0,33	1,25	11	2,1	3,5	4,8
170	0,047	1	1000	0,15	2,4	11	1,8	3,1	4,6
170	0,1	10	0	0,33	1,4	14	2,5	3,8	5,0
170	0,047	10	0	0,15	2,8	14	2,1	3,4	4,7
100	0,1	1	1800	0,33	0,74	11	3,2	4,9	
100	0,047	1	1000	0,15	1,4	11	3,0	4,8	
100	0,1	10	0	0,33	0,8	12	3,0	4,7	
100	0,047	10	0	0,15	1,5	12	3,0	4,8	

Limiting values of the pentode section
Caractéristiques limites de la partie penthode
Grenzdaten des Pentodenteiles

V_{a_o}	= max.	550	V
V_a	= max.	250	V
W_a	= max.	1,5	W
V_{g2_o}	= max.	550	V
V_{g2} (I_a < 2 mA)	= max.	250	V
V_{g2} (I_a = 5 mA)	= max.	125	V
W_{g2}	= max.	0,3	W
I_k	= max.	10	mA
V_{g1} (I_{g1}=+0,3µA)	= max.	-1,3	V
R_{g1} (R_k = 295Ω)[1]	= max.	3	MΩ
R_{kf}	= max.	20	kΩ
V_{kf}	= max.	150	V

Limiting values of the diode section
Caractéristiques limites de la partie diode
Grenzdaten des Diodenteiles

$V_{d1\ inv_p}$	= max.	350	V
$V_{d2\ inv_p}$	= max.	350	V
I_{d1}	= max.	0,8	mA
I_{d2}	= max.	0,8	mA
I_{d1_p}	= max.	5	mA
I_{d2_p}	= max.	5	mA
R_{kf}	= max.	20	kΩ
V_{kf}	= max.	150	V

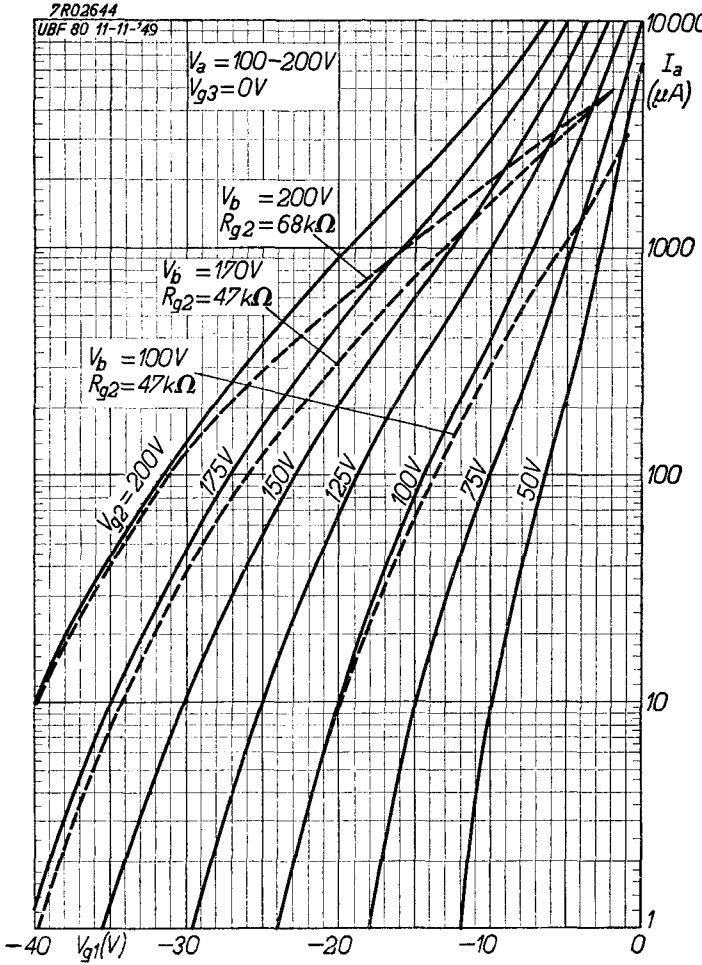
[1]) If the grid bias is obtained only by connecting a leakage resistor in the grid circuit, the maximum value of R_{g1} is 22 MΩ.

Si la polarisation négative est obtenue seulement par moyen d'une résistance de fuite dans le circuit de la grille, la valeur maximum de R_{g1} est de 22 MΩ.

Wenn die negative Gittervorspannung nur von einem Ableitungswiderstand in der Gitterleitung erhalten wird, ist der Maximalwert von R_{g1} 22 MΩ.

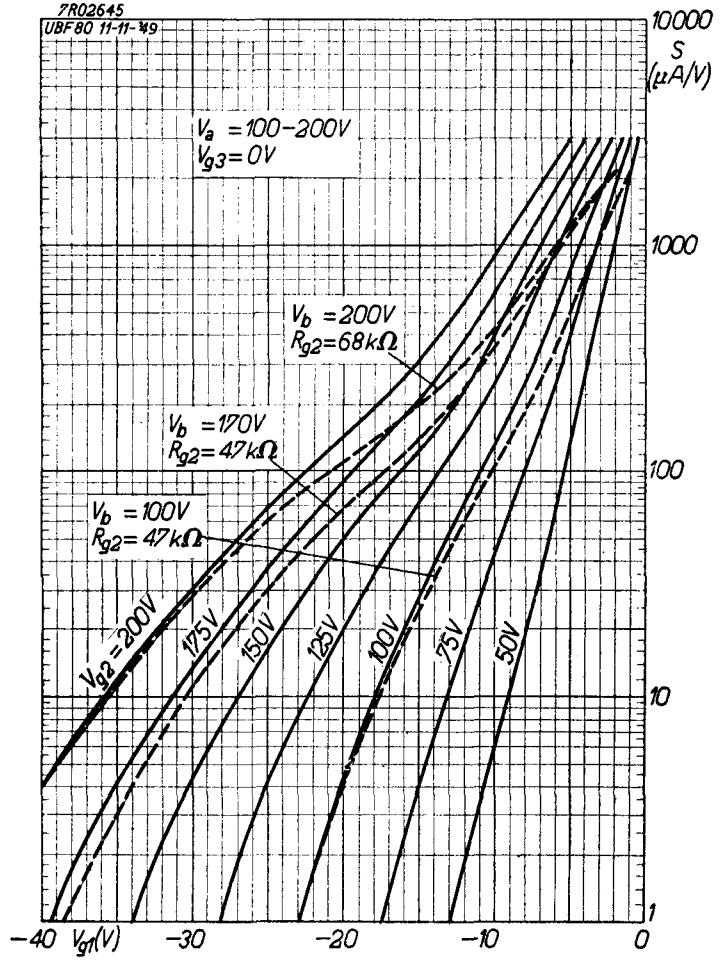
PHILIPS

UBF 80

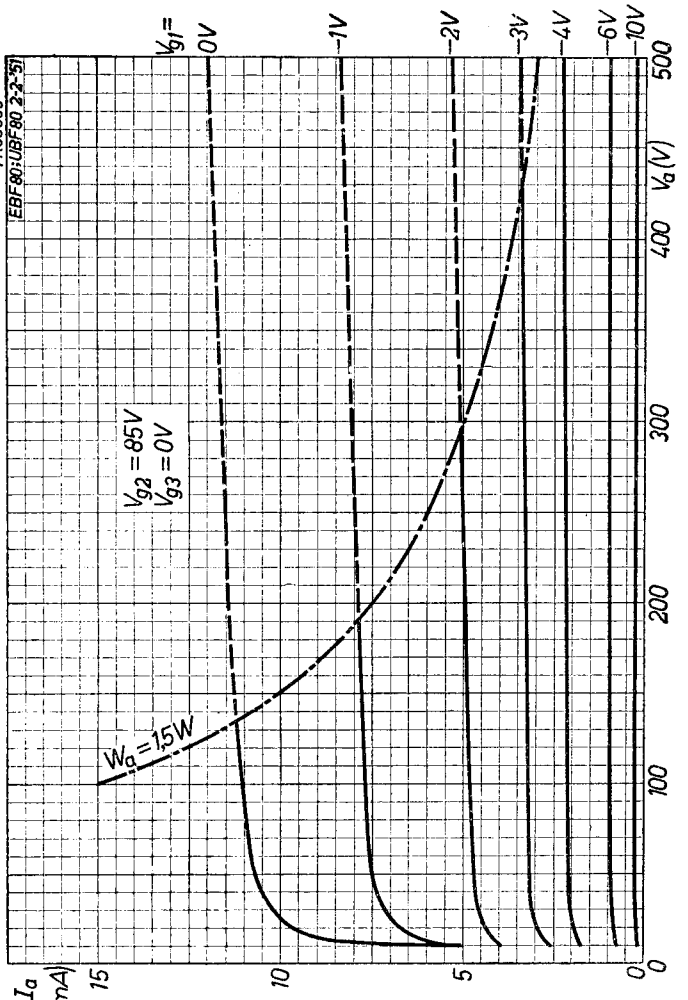


11.11.1949

A


7R02645
UBF 80 11-11-49
V_a = 100–200V
V_{g3} = 0V
V_b = 200V
R_{g2} = 68kΩ
V_b = 170V
R_{g2} = 47kΩ
V_b = 100V
R_{g2} = 47kΩ
V_{g2} = 200V
175V
150V
125V
100V
75V
50V
10000
S
(μA/V)
1000
100
10
1
−40
V_{g1}(V)
−30
−20
−10
0

B

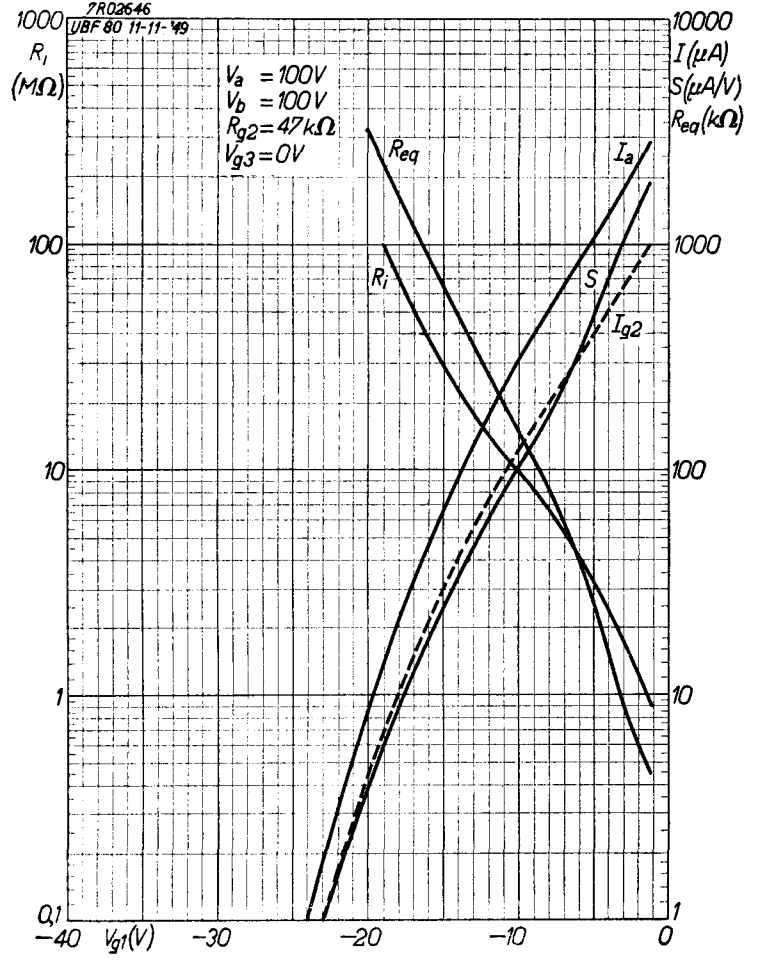

7R03066
EBF80;UBF80 2-2-51
V_{g1}= 0V
-1V
-2V
-3V
-4V
-6V
-10V
V_{g2} = 85V
V_{g3} = 0V
W_a = 1,5W
I_a (mA)
15
10
5
0
0
100
200
300
400
500
V_a (V)

2.2.1951

C

UBF 80

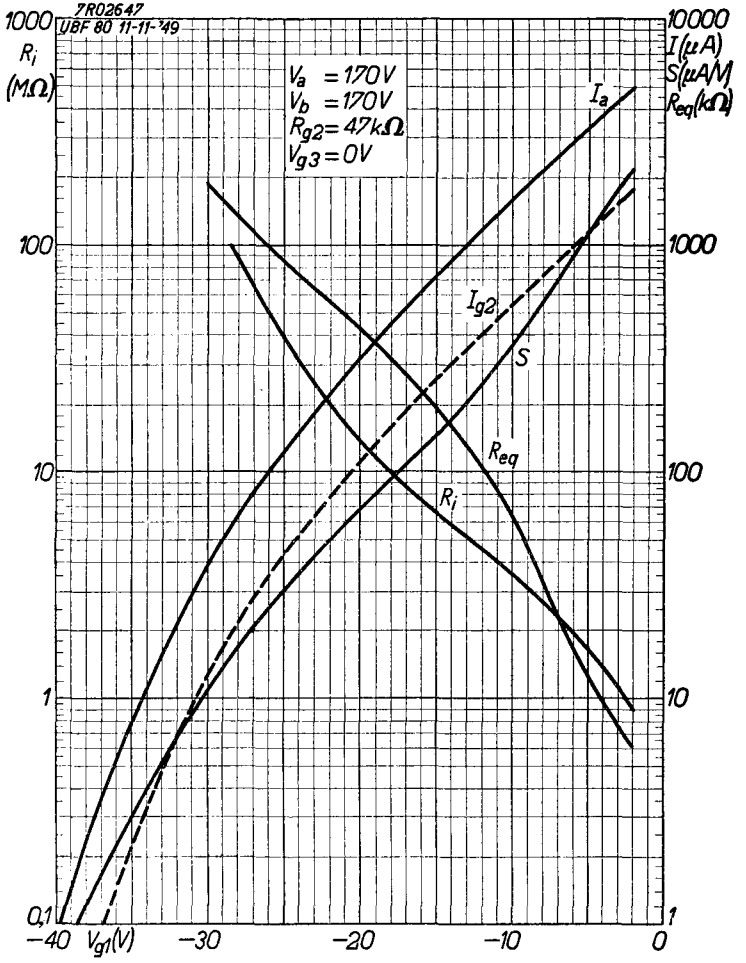
PHILIPS



D

PHILIPS

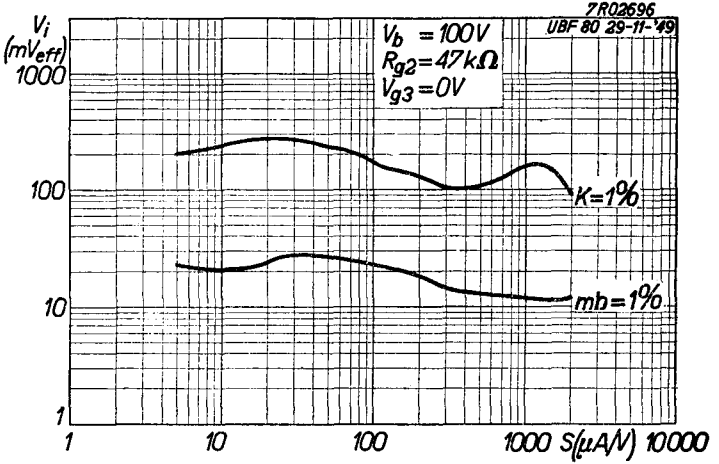
UBF 80

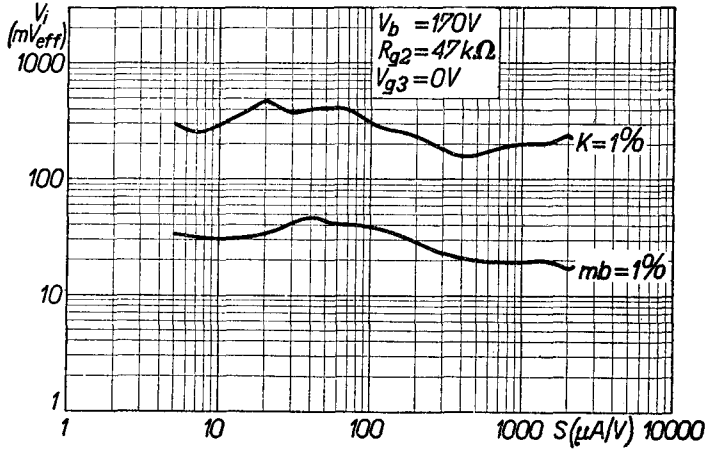


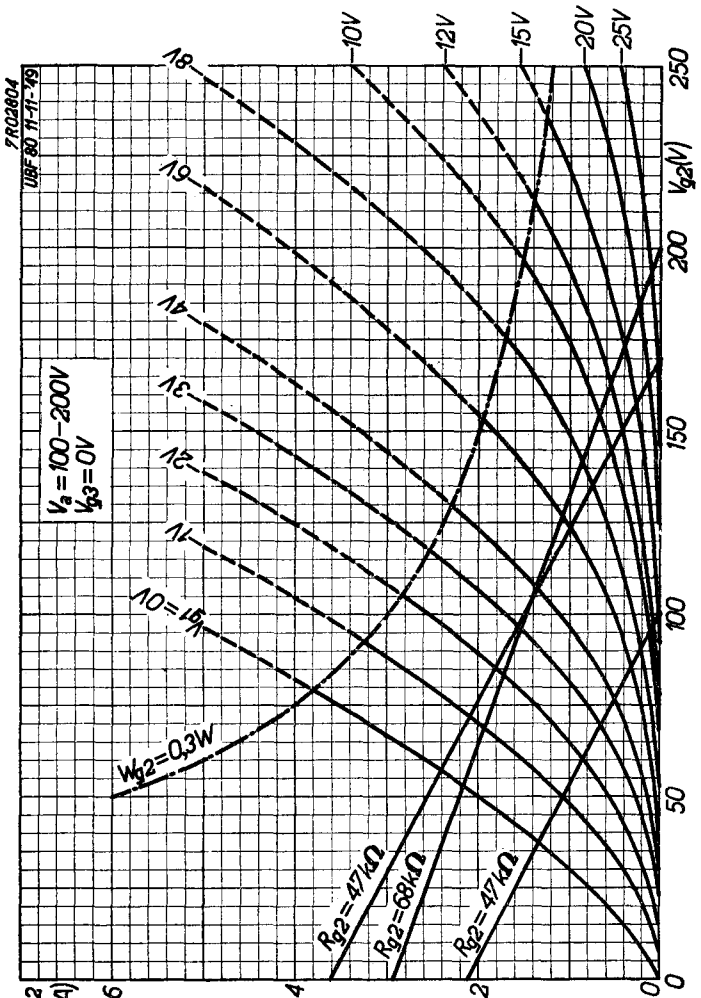
2.2.1951

E

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7R02696
UBF 80 29-11-'49
V_i (mV_{eff})
1000
100
10
1
V_b = 100V
R_{g2} = 47kΩ
V_{g3} = 0V
K=1%
mb=1%
1
10
100
1000 S(μA/V) 10000


V_i (mV_{eff})
1000
100
10
1
V_b = 170V
R_{g2} = 47kΩ
V_{g3} = 0V
K=1%
mb=1%
1
10
100
1000 S(μA/V) 10000


7RO2804
UBF 80 11-11-49
$V_a = 100-200V$
$V_{g3} = 0V$
V_{g2}(V)
I_{g2} (mA)
$W_{g2}=0,3W$
$R_{g2}=47k\Omega$
$R_{g2}=68k\Omega$
$R_{g2}=47k\Omega$
10V
12V
15V
20V
25V
18
19
41
31
21
11
10=15

PHILIPS

Electronic Tube

HANDBOOK

UBF80

page	sheet	date
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2	1	1953.12.12
3	2	1950.12.12
4	2	1953.12.12
5	3	1950.12.12
6	4	1950.12.12
7	A	1949.11.11
8	B	1949.11.11
9	C	1951.02.02
10	D	1951.02.02
11	E	1951.02.02
12	F	1951.02.02
13	G	1951.02.02
14	FP	2000.06.11

DOUBLE DIODE-PENTODE

Double diode-pentode. Pentode intended for use as R.F. or I.F. amplifier.

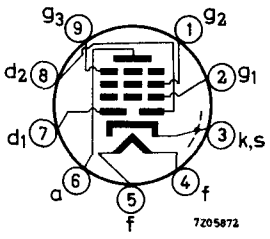
QUICK REFERENCE DATA			
Pentode section			
Variable transconductance			
Anode current	I_a	11	mA
Transconductance	S	4.5	mA/V
Amplification factor	$\mu_{g_2g_1}$	20	-

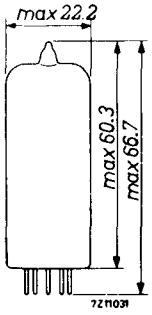
HEATING: Indirect by A.C. or D.C.; series supply

Heater current	I_f	100	mA
Heater voltage	V_f	19	V

DIMENSIONS AND CONNECTIONS Dimensions in mm

Base: Noval





CAPACITANCES

Pentode section

Anode to all except grid No.1	$C_{a(g_1)}$	5.2	pF
Grid No.1 to all except anode	$C_{g_1(a)}$	5.0	pF
Anode to grid No.1	C_{ag_1}	max. 0.0025	pF
Grid No.1 to heater	C_{g_1f}	max. 0.05	pF

Diode sections

Diode No.1 to all	C_{d_1}	2.5	pF
Diode No.2 to all	C_{d_2}	2.5	pF
Diode No.1 to diode No.2	$C_{d_1d_2}$	max. 0.25	pF
Diode No.1 to heater	C_{d_1f}	max. 0.015	pF
Diode No.2 to heater	C_{d_2f}	max. 0.003	pF

Between pentode and diode sections

Diode No.1 to grid No.1	$C_{d_1g_1}$	max. 0.0008	pF
Diode No.2 to grid No.1	$C_{d_2g_1}$	max. 0.001	pF
Diode No.1 to anode	C_{d_1a}	max. 0.15	pF
Diode No.2 to anode	C_{d_2a}	max. 0.025	pF

TYPICAL CHARACTERISTICS

Pentode section

Anode voltage	V_a	200	170	100	V
Grid No.2 voltage	V_{g_2}	100	100	100	V
Grid No.3 voltage	V_{g_3}	0	0	0	V
Grid No.1 voltage	V_{g_1}	-1.5	-1 [1])	-2	V
Anode current	I_a	11	12	8.5	mA
Grid No.2 current	I_{g_2}	3.3	4	2.8	mA
Transconductance	S	4.5	5	3.5	mA/V
Amplification factor	$\mu_{g_2g_1}$	20	20	20	-
Internal resistance	R_i	0.6	0.4	0.3	MΩ

OPERATING CHARACTERISTICS

Pentode section as R.F. or I.F. amplifier

Supply voltage	V_b	200		100		V
Anode resistor	R_a	0		0		Ω
Grid No.3 voltage	V_{g_3}	0		0		V
Grid No.2 resistor	R_{g_2}	30		0		kΩ
Grid No.1 voltage	V_{g_1}	-1.5	-20	-2	-10	V
Anode current	I_a	11	-	8.5	-	mA
Grid No.2 current	I_{g_2}	3.3	-	2.8	-	mA
Transconductance	S	4.5	0.12	3.5	0.11	mA/V
Internal resistance	R_i	0.6	-	0.3	-	MΩ

[1]) To avoid grid No.1 current the negative grid No.1 voltage should be min. 1.5 V

LIMITING VALUES (Design centre rating system)

Pentode section

Anode voltage	V_{a_o}	max.	550	V
	V_a	max.	250	V
Anode dissipation	W_a	max.	2.25	W
Grid No.2 voltage	$V_{g_{2o}}$	max.	550	V
Grid No.2 voltage				
at anode current I_a max. 4 mA	V_{g_2}	max.	250	V
at anode current I_a min. 8 mA	V_{g_2}	max.	125	V
Grid No.2 dissipation	W_{g_2}	max.	0.45	W
Cathode current	I_k	max.	16.5	mA
Grid No.1 resistor	R_{g_1}	max.	3	MΩ
Grid No.3 resistor	R_{g_3}	max.	10	kΩ
Cathode to heater voltage	V_{kf}	max.	100	V

Diode sections (each diode)

Diode voltage, negative peak	$-V_{dp}$	max.	200	V
Diode current; average	I_d	max.	0.8	mA
peak	I_{d_p}	max.	5	mA
Cathode to heater voltage	V_{kf}	max.	100	V

PHILIPS

Data handbook

Electronic components and materials

UBF89

page	sheet	date
1	1	1970.01
2	2	1970.01
3	3	1970.01
4	4	1970.01
5	FP	1999.07.29

"Miniwatt"

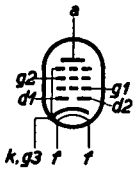
UBL1

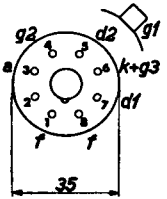
DUODIODE-OUTPUT PENTODE
DUODIODE-PENTHODE DE SORTIE
DUODIODE-ENDPENTHODE

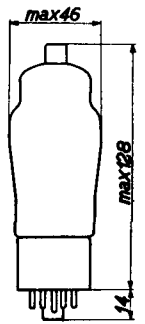
Only to be used with self-bias or with semi automatic bias
N'utiliser qu'avec polarisation automatique ou semi automatique
Nur mit automatischer oder halbautomatischer Gittervorspannung zu verwenden

Heating:	indirect by A.C. or D.C.; series supply	
Chauffage:	indirect par C.A. ou C.C.; alimentation en série	Vf = 55 V If = 0,100 A
Heizung:	indirekt durch Wechsel- oder Gleichstrom; Serienspeisung	

Dimensions in mm
Dimensions en mm
Abmessungen in mm







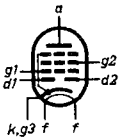
Capacities Capacités Kapazitäten	Pentode section Partie penthode Penthodenteil	Diode section Partie diode Diodenteil
	Cag1 < 0,8 pF	Cd1k = 4,8 pF
		Cd2k = 4,6 pF
		Cd1d2 < 0,08 pF

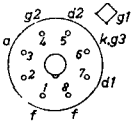
DOUBLE DIODE-OUTPUT PENTODE
DOUBLE DIODE-PENTHODE DE SORTIE
DOPPELDIODE-ENDPENTODE

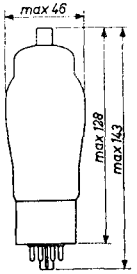
Heating : indirect by A.C. or D.C. series supply
Chauffage: indirect par C.A.ou C.C. alimentation-série
Heizung : indirekt durch Wechsel- oder Gleichstrom Serienspeisung

V_f = 55 V
I_f = 100 mA

Dimensions in mm
Dimensions en mm
Abmessungen in mm







Base, culot, Sockel: OCTAL

Capacitances Capacités Kapazitäten				
	C_{ag1}	< 0,8 pF	C_{d1}	= 4,8 pF
	C_{d1a}	< 0,08 pF	C_{d2}	= 4,6 pF
	C_{d2a}	< 0,08 pF	C_{d1d2}	< 0,08 pF
	C_{d1g1}	< 0,05 pF	C_{d2g1}	< 0,05 pF

Remarks, observations, Bemerkungen

The tube should only be used with automatic or with semi-automatic bias
In order to avoid excessive hum the gain between the detection diode and the pentode grid should not exceed 15

Le tube ne sera utilisé qu'avec polarisation automatique ou semi-automatique
Pour éviter le ronflement excessif, une amplification de 15 fois entre la diode détectrice et la grille de la penthode ne sera pas dépassée

Die Röhre soll nur mit automatischer oder mit halbautomatischer Gittervorspannung verwendet werden
Mit Rücksicht auf Brummen soll keine höhere als eine 15-fache Verstärkung zwischen der Signaldiode und dem Gitter der Pentode verwendet werden

Capacities
Capacités
Kapazitäten

Between pentode and diode sections
Entre les parties penthode et diode
Zwischen Penthoden- und Diodenteil

Cd1a < 0,08 pF
Cd2a < 0,08 pF
Cd1g1 < 0,05 pF
Cd2g1 < 0,05 pF

Operating characteristics class A
Caractéristiques d'utilisation classe A
Betriebsdaten Klasse A

Va	=	100	185	200	200	V
Vg2	=	100	185	200	200	V
Rk	=	145	140	240	175	Ω
Vg1	=	-5	-10	-13	-11,5	V
Ia	=	28,5	59	45	55	mA
Ig2	=	5,25	11,3	9,0	11	mA
S	=	7	8,8	7,5	8,5	mA/V
Ri	=	25	23	28	20	kΩ
Ra	=	3	3	4,5	3,5	kΩ
Wo	=	1,05	5	4	5,2	W
d_{tot}	=	6,8	10	10	10	%
Vi (Wo=max.)	=	3,3	7	6,4	7	V_{eff}
Vi (Wo=50mW)	=	0,6	0,5	0,5	0,5	V_{eff}
$\mu g2g1$	=	11	11	11	11	

Limiting values of the diode sections
Caractéristiques limites des parties diode
Grenzdaten der Diodenteile

Vd1[1]	= max.	200 V
Id1	= max.	0,8 mA
Vd1 (Id1 = + 0,3 µA)	= max.	-1,3 V
Vd2[1]	= max.	200 V
Id2	= max.	0,8 mA
Vd2 (Id2 = + 0,3 µA)	= max.	-1,3 V

[1] Peak value; valeur de crête; Scheitelspannung

Operating characteristics class A
Caractéristiques d'utilisation classe A
Betriebsdaten Klasse A

V_a	=	100	185	200	200	V
V_{g2}	=	100	185	200	200	V
R_k	=	145	140	240	175	Ω
V_{g1}	=	-5	-10	-13	-11,5	V
I_a	=	28,5	59	45	55	mA
I_{g2}	=	5,25	11,3	9,0	11	mA
S	=	7	8,8	7,5	8,5	mA/V
μ_{g2g1}	=	11	11	11	11	
R_i	=	25	23	28	20	kΩ
$R_{a\sim}$	=	3	3	4,5	3,5	kΩ
W_o	=	1,05	5	4	5,2	W
dtot	=	6,8	10	10	10	%
V_i (Wo=max.)	=	3,3	7	6,4	7	V_{eff}
V_i (Wo=50mW)	=	0,6	0,5	0,5	0,5	V_{eff}

Limiting values
Caractéristiques limites
Grenzdaten

V_{a_o}	= max.	550 V
V_a	= max.	250 V
W_a	= max.	11 W
V_{g2_o}	= max.	550 V
V_{g2}	= max.	250 V
W_{g2} (Vi = 0)	= max.	2,5 W
W_{g2} (Wo = max.)	= max.	4,0 W
I_k	= max.	70 mA
V_{g1} (I_{g1} = +0,3 µA)	= max.	-1,3 V
R_{g1}	= max.	1 MΩ
R_{kf}	= max.	20 kΩ
V_{kf}	= max.	150 V

Each diode; chaque diode; jede Diode

V_{dinv_p}	= max.	350 V
I_d	= max.	0,8 mA
I_{dp}	= max.	5 mA

Limiting values of the pentode section
Caractéristiques limites de la partie penthode
Grenzdaten des Penthodenteiles

Va_o	= max.	550 V
Va	= max.	250 V
Wa	= max.	11 W
$Vg2_o$	= max.	550 V
Vg2	= max.	250 V
Wg2 (Vi = 0)	= max.	2,5 W
Wg2 (Wo = max.)	= max.	4,0 W
Ik	= max.	70 mA
Vg1 (Ig1 = +0,3 µA)	= max.	-1,3 V
Rg1	= max.	1 MΩ
Rfk	= max.	20 kΩ
Vfk	= max.	150 V

In order to avoid excessive hum the gain between detection diode and pentode grid should not exceed 15
Pour éviter le ronflement excessif une amplification de 15 fois entre la diode détectrice et la grille de la penthode ne sera pas dépassée
Mit Rücksicht auf Brumm soll keine höhere als eine 15- fache Verstärkung zwischen der Empfangsdiode und dem Gitter der Penthode angebracht werden



UBL1

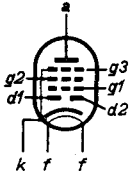
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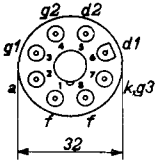
DUODIODE-OUTPUT PENTODE
DUODIODE-PENTHODE DE SORTIE
DUODIODE-ENDPENTHODE

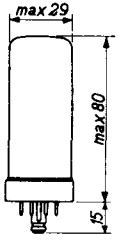
Only to be used with self-bias or with semi-automatic bias
N'utiliser qu'avec polarisation automatique ou semi automatique
Nur mit automatischer oder halbautomatischer Gittervorspannung zu verwenden

Heating:	indirect by A.C. or D.C.; series supply	
Chauffage:	indirect par C.A. ou C.C.; alimentation en série	Vf = 55 V If = C,100 A
Heizung:	indirekt durch Wechsel- oder Gleichstrom; Serienspeisung	

Dimensions in mm
Dimensions en mm
Abmessungen in mm





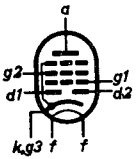


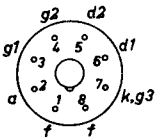
Capacitances Capacités Kapazitäten	Pentode section Partie penthode Penthodenteil	Diode section Partie diode Diodenteil
	Cagl < 1,2 pF	Cd1k = 1,8 pF
		Cd2k = 2,C pF
		Cd1d2 < C,15 pF

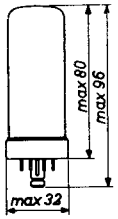
DOUBLE DIODE-OUTPUT PENTODE
DOUBLE DIODE-PENTHODE DE SORTIE
DOPPELDIODE-ENDPENTODE

Heating : indirect; series supply — V_f = 55 V
Chauffage: indirect; alimentation- série — I_f = 100 mA
Heizung : indirekt; Serienspeisung

Dimensions in mm
Dimensions en mm
Abmessungen in mm







Base, culot, Sockel: Loctal 8p.

Operating characteristics class A
Caractéristiques d'utilisation classe A
Betriebsdaten Klasse A

V_a	= 100	180	200	V
V_{g2}	= 100	180	200	V
R_k	= 140	140	200	Ω
V_{g1}	= -5,3	-10	-13	V
I_a	= 32,5	61	55	mA
I_{g2}	= 5,5	10	9,5	mA
S	= 7,5	9,0	8,0	mA/V
R_i	= 25	22	25	kΩ
μ_{g2g1}	= 9	9	9	
$R_{a\sim}$	= 3	3	3,5	kΩ
W_o	= 1,35	4,8	4,8	W
d_{tot}	= 10	10	10	%
V_i (W_o max.)	= 3,8	6,2	6,2	Veff
V_i (W_o=50 mW)	= 0,55	0,5	0,5	Veff

Capacitances Capacités Kapazitäten	Between pentode and diode sections Entre les parties penthode et diode Zwischen Penthoden- und Diodenteil	
	Cd1a	< 0,06 pF
	Cd2a	< 0,02 pF
	Cd1g1	< 0,1 pF
	Cd2g1	< 0,05 pF
	C(d1+d2)g1	< 0,2 pF
	C(d1+d2)a	< 0,07 pF

Operating characteristics class A
Caractéristiques d'utilisation classe A
Betriebsdaten Klasse A

Va	=	100	180	200	V
Vg2	=	100	180	200	V
Rk	=	140	140	200	Ω
Vg1	=	-5,3	-10	-13	V
Ia	=	32,5	61	55	mA
Ig2	=	5,5	10	9,5	mA
S	=	7,5	9,0	8,0	mA/V
Ri	=	25	22	25	kΩ
μg2g1	=	9	9	9	
Ra	=	3	3	3,5	kΩ
Wo	=	1,35	4,8	4,8	W
d_{tot}	=	10	10	10	%
Vi (Wo = max.)	=	3,8	6,2	6,2	V_{eff}
Vi (Wo = 50 mW)	=	0,55	0,5	0,5	V_{eff}

Limiting values of the diode sections
Caractéristiques limites des parties diode
Grenzdaten der Diodenteile

Vd1	= max. 200 V[1])
Id1	= max. 0,8 mA
Vd1 (Id1 = +0,3 μA)	= max. -1,3 V
Vd2	= max. 200 V[1])
Id2	= max. 0,8 mA
Vd2 (Id2 = +0,3 μA)	= max. -1,3 V

[1]) Peak value; valeur de crête; Scheitelspannung

Operating characteristics class AB
Caractéristiques d'utilisation classe AB
Betriebsdaten Klasse AB

V_a	=		100			200		V
V_{g2}	=		100			200		V
R_k	=		170			116		Ω
$R_{aa\sim}$	=		5,5			4		kΩ
V_i	=	0	0,62	6,2	0	0,5	12	V_{eff}
I_a	=	2x17,5	-	2x19,6	2x50	-	2x56	mA
I_{g2}	=	2x2,8	-	2x5	2x7,8	-	2x14	mA
W_o	=	0	0,05	2,2	0	0,05	12,5	W
d_{tot}	=	0	-	4	0	-	3,9	%

Limiting values
Caractéristiques limites
Grenzdaten

V_{a_o}	= max.	550	V
V_a	= max.	250	V
W_a	= max.	11	W
V_{g2_o}	= max.	550	V
V_{g2}	= max.	250	V
$W_{g2}(W_o$=max.)	= max.	3,5	W
$W_{g2}(V_i$=0)	= max.	1,9	W
I_k	= max.	75	mA
$V_{g1}(I_{g1}$=+0,3µA)	= max.	-1,3	V
R_{g1}	= max.	1	MΩ
R_{kf}	= max.	20	kΩ
V_{kf}	= max.	150	V
V_{dinv_p}	= max.	350	V
I_d	= max.	0,8	mA
I_{dp}	= max.	5	mA

In order to avoid excessive hum the gain between detection diode and pentode grid should not exceed 60
Pour éviter le ronflement excessif une amplification de 60 fois entre la diode détectrice et la grille de la penthode ne sera pas dépassée
Mit Rücksicht auf Brumm soll keine höhere als eine 60- fache Verstärkung zwischen der Empfangsdiode und dem Gitter der Pentode angebracht werden

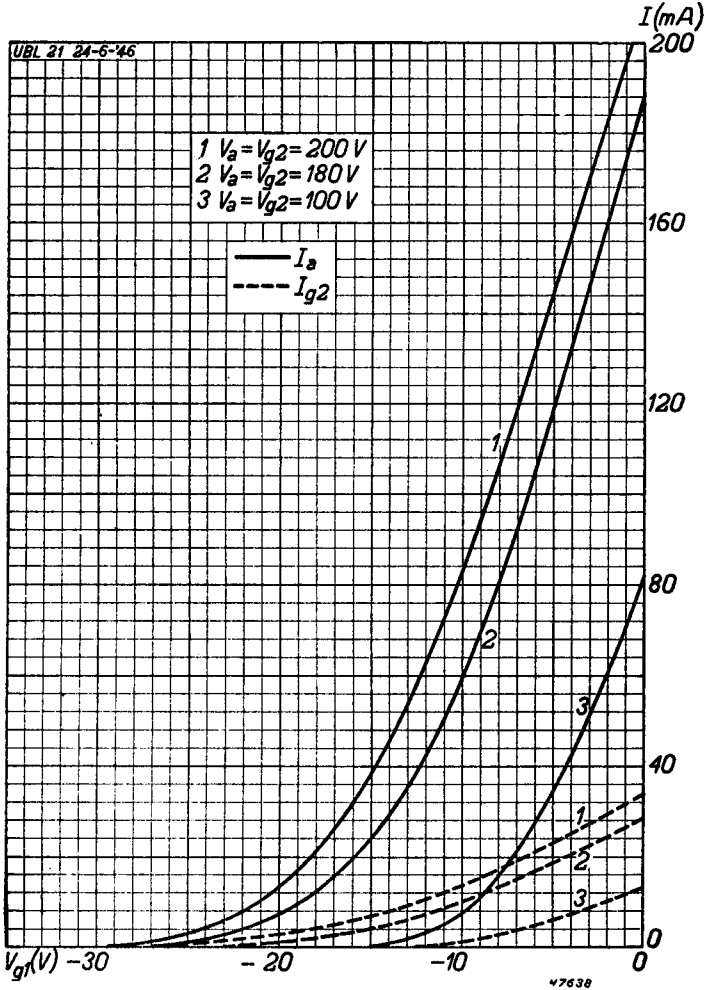
Operating characteristics class AB
Caractéristiques d'utilisation classe AB
Betriebsdaten Klasse AB

Va	=		100			200		V
Vg2	=		100			200		V
Rk	=		170			116		Ω
Raa'	=		5,5			4		kΩ
Vi	=	0	0,62	6,2	0	0,5	12	V_{eff}
Ia	=	2x17,5	-	2x19,6	2x50	-	2x56	mA
Ig2	=	2x2,8	-	2x5	2x7,8	-	2x14	mA
Wo	=	0	0,05	2,2	0	0,05	12,5	W
d_{tot}	=	0	-	4	0	-	3,9	%

Limiting values of the pentode section
Caractéristiques limites de la partie penthode
Grenzdaten des Penthodenteiles

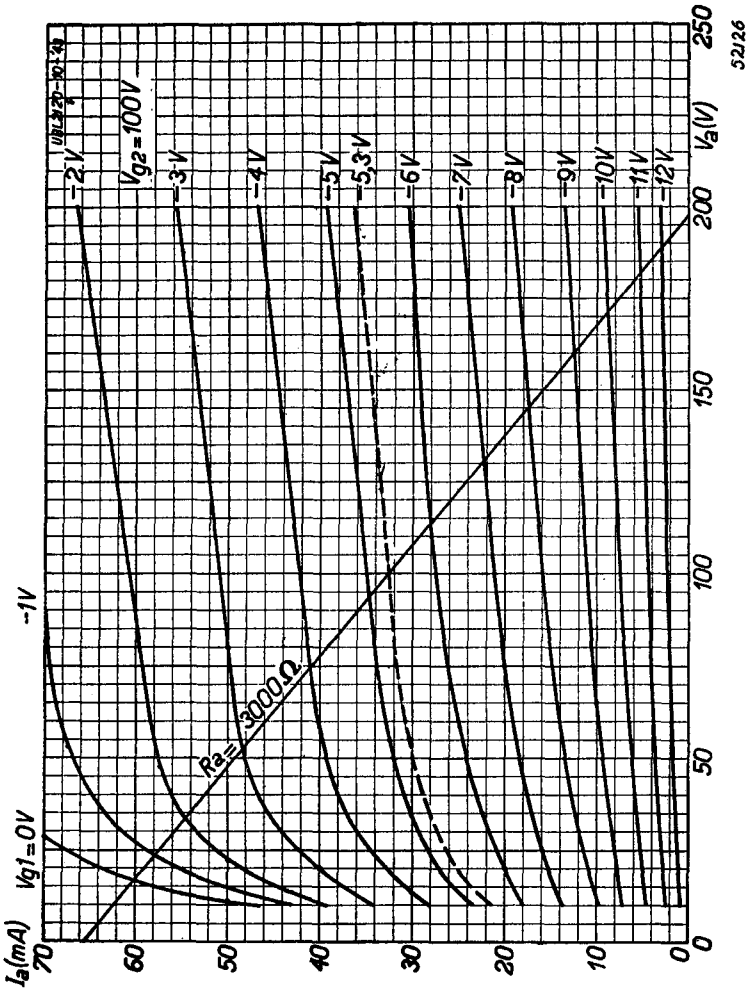
Va_o	= max. 550 V
Va	= max. 250 V
Wa	= max. 11 W
$Vg2_o$	= max. 550 V
Vg2	= max. 250 V
Wg2 (Wo= max.)	= max. 3,5 W
Wg2 (Vi= 0)	= max. 1,9 W
Ik	= max. 75 mA
Vgl (Igl = +0,3 µA)	= max.-1,3 V
Rgl	= max. 1 MΩ
RfK	= max. 20 kΩ
Vfk	= max. 150 V

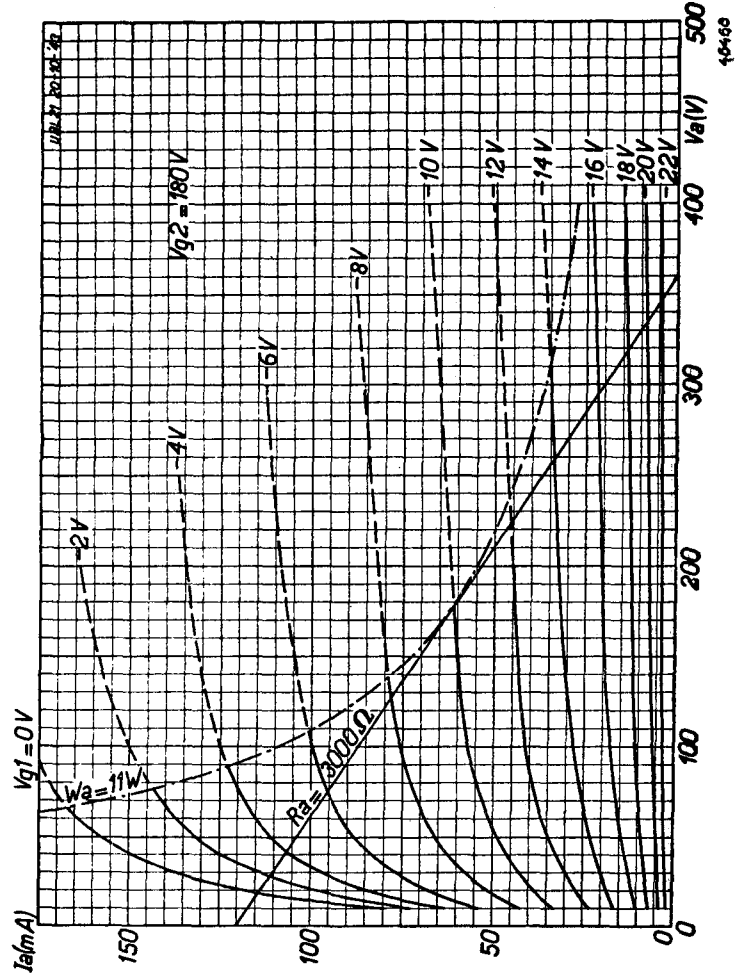
In order to avoid excessive hum the gain between detection diode and pentode grid should not exceed 60
Pour éviter le ronflement excessif une amplification de 60 fois entre la diode détectrice et la grille de la penthode ne sera pas dépassée
Mit Rücksicht auf Brumm soll keine höhere als eine 60- fache Verstärkung zwischen der Empfangsdiode und dem Gitter der Penthode angebracht werden


I(mA)
UBL 21 24-6-46
1 $V_a = V_{g2} = 200\,V$
2 $V_a = V_{g2} = 180\,V$
3 $V_a = V_{g2} = 100\,V$
I_a
I_{g2}
200
160
120
80
40
0
1
2
3
1
2
3
V_{g1}(V) −30
− 20
−10
0
47638

UBL 21

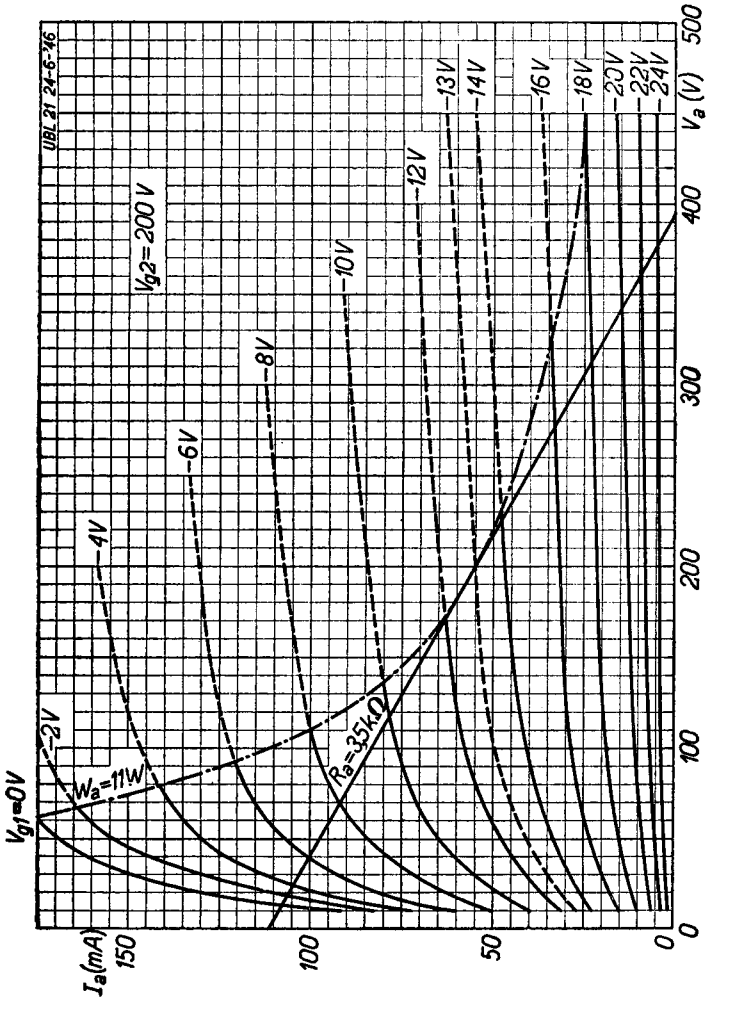
"Miniwatt"




Vg2 = 180V
-2V
-4V
-6V
-8V
-10 V
-12 V
-14 V
-16 V
-18 V
-20V
-22V
Vg1 = 0 V
Wa = 11W
Ra = 3000Ω
Ia(mA)
150
100
50
0
Va(V)
500
400
300
200
100
0

UBL 21

"Miniwatt"



16-5-1947

6-5

50364

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UBL21

page	sheet	date
1	1	1949.06.06
2	1	1953.12.12
3	2	1949.06.06
4	2	1953.12.12
5	2a	1948.08.19
6	3	1948.03.01
7	4	1948.03.01
8	5	1947.06.20
9	6	1947.05.16
10	FP	1999.08.20

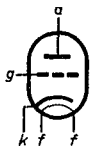
PHILIPS UC 92

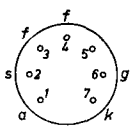
R.F.TRIODE for use as oscillator or mixer in F.M./A.M. receivers
TRIODE H.F.pour utilisation en oscillatrice ou mélangeuse dans des récepteurs F.M./A.M.
HF-TRIODE zur Verwendung als Oszillator oder Mischröhre in FM/AM-Empfängern

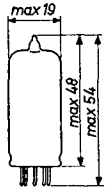
Heating : indirect by A.C. or D.C.; series supply
Chauffage: indirect par C.A. ou C.C.; alimentation série
Heizung : indirekt durch Wechsel- oder Gleichstrom; Serienspeisung

V_f = 9,5 V
I_f = 100 mA

Dimensions in mm
Dimensions en mm
Abmessungen in mm







Base, culot, Sockel: Miniature

Capacitances
Capacités
Kapazitäten

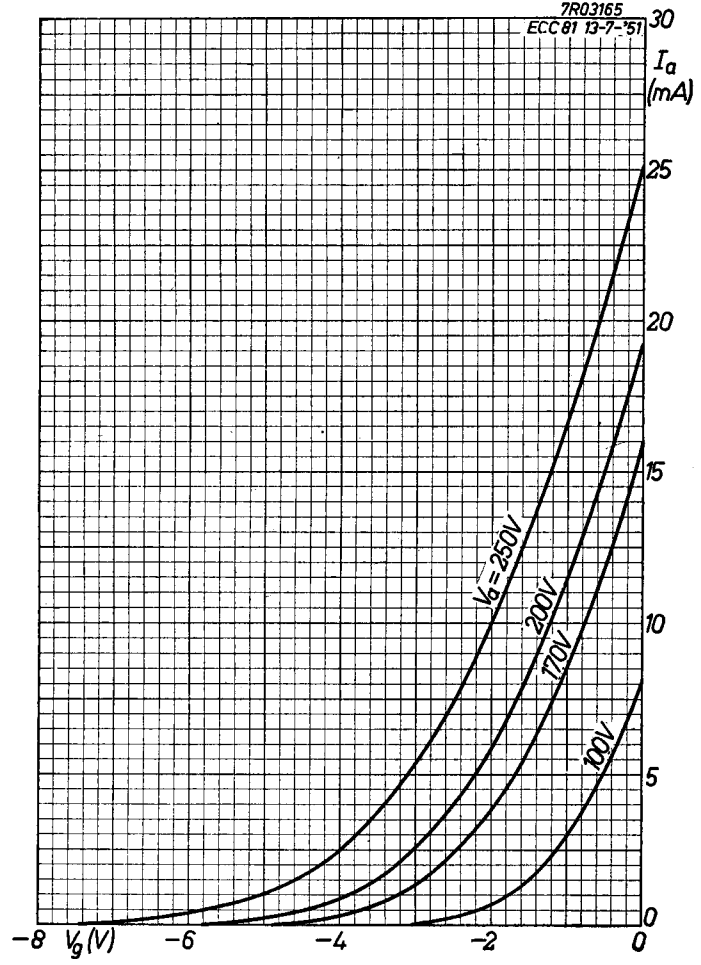
C_g	= 2,6 pF	C_k (g+f)	= 4,5 pF
C_a	= 0,55 pF	C_a (g+f)	= 1,8 pF
C_{ag}	= 1,6 pF		
C_{kf}	= 2,2 pF		
C_{gf}	< 0,15 pF		
C_{ak}	= 0,24 pF		

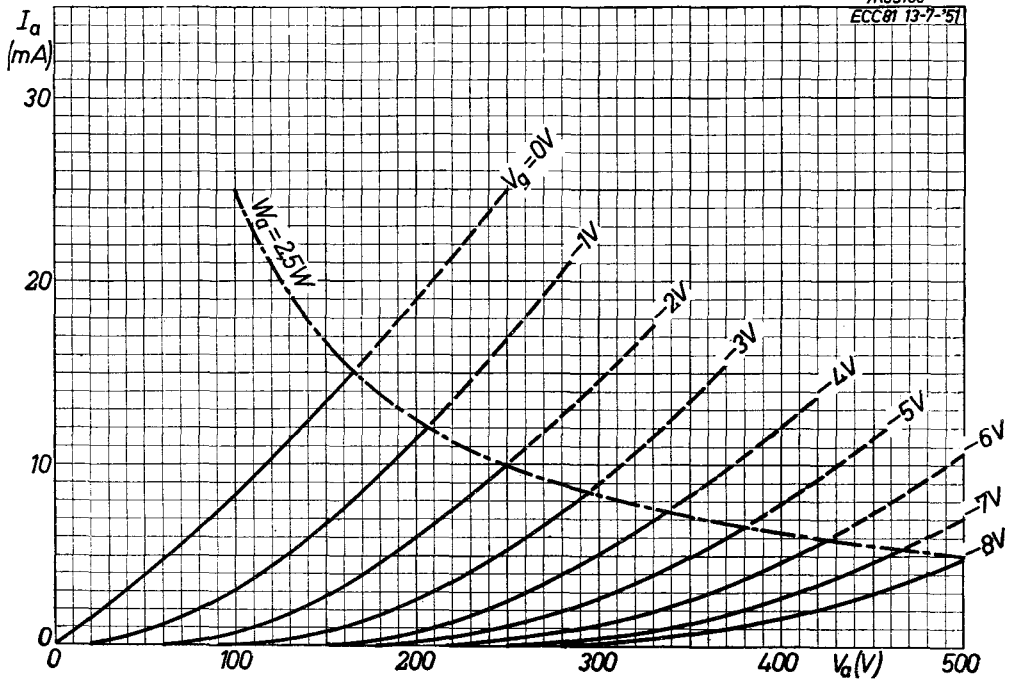
Typical characteristics
Caractéristiques types
Kenndaten

V_a	=	100	170	200 V
V_g	=	-1	-1	-1 V
I_a	=	3	8,5	11,5 mA
S	=	3,75	5,9	6,7 mA/V
μ	=	62	66	70
R_i	=	16,5	11	10,5 kΩ

Limiting values
Caractéristiques limites
Grenzdaten

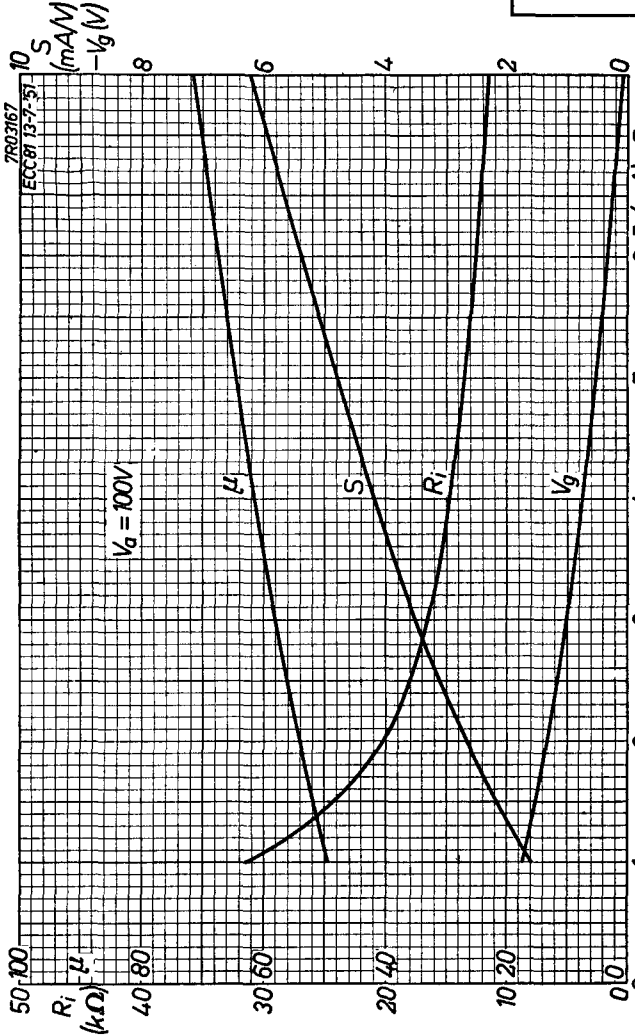
V_{a_o}	= max.	550	V
V_a	= max.	300	V
W_a	= max.	2,5	W
I_k	= max.	15	mA
$-V_g$	= max.	50	V
R_g	= max.	1	MΩ
V_{kf}	= max.	90	V
R_{kf}	= max.	20	kΩ
$V_g(I_g=+0,3\mu A)$	= max.	-1,3	V


7R03165
ECC 81 13-7-'51
I_a (mA)
30
25
20
15
10
5
0
V_a = 250V
200V
170V
100V
−8
V_g (V)
−6
−4
−2
0


7R03166
ECC81 13-7-'51
I_a (mA)
30
20
10
0
0
100
200
300
400
500
V_a(V)
W_a = 2,5W
V_g = 0V
-1V
-2V
-3V
-4V
-5V
-6V
-7V
-8V

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1.1.1954

C

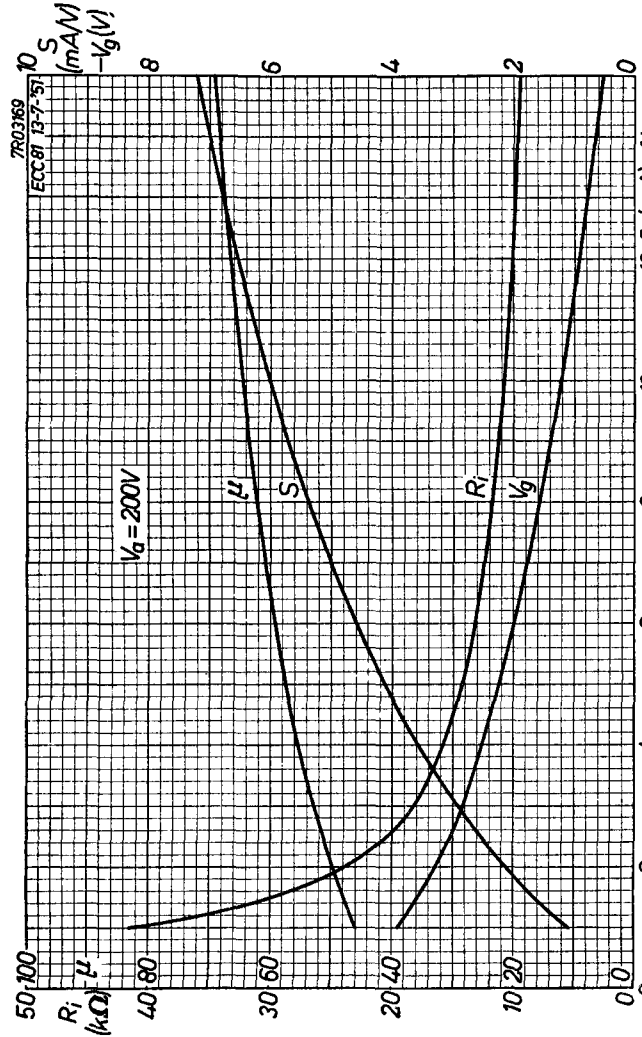
UC 92

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D

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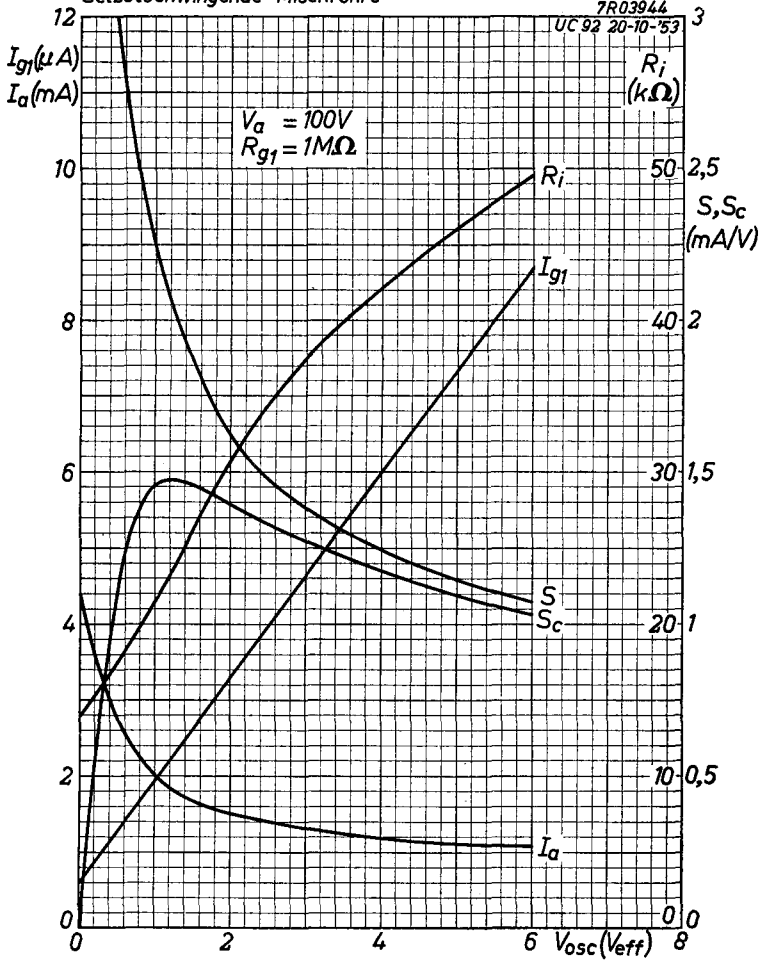


1.1.1954

E

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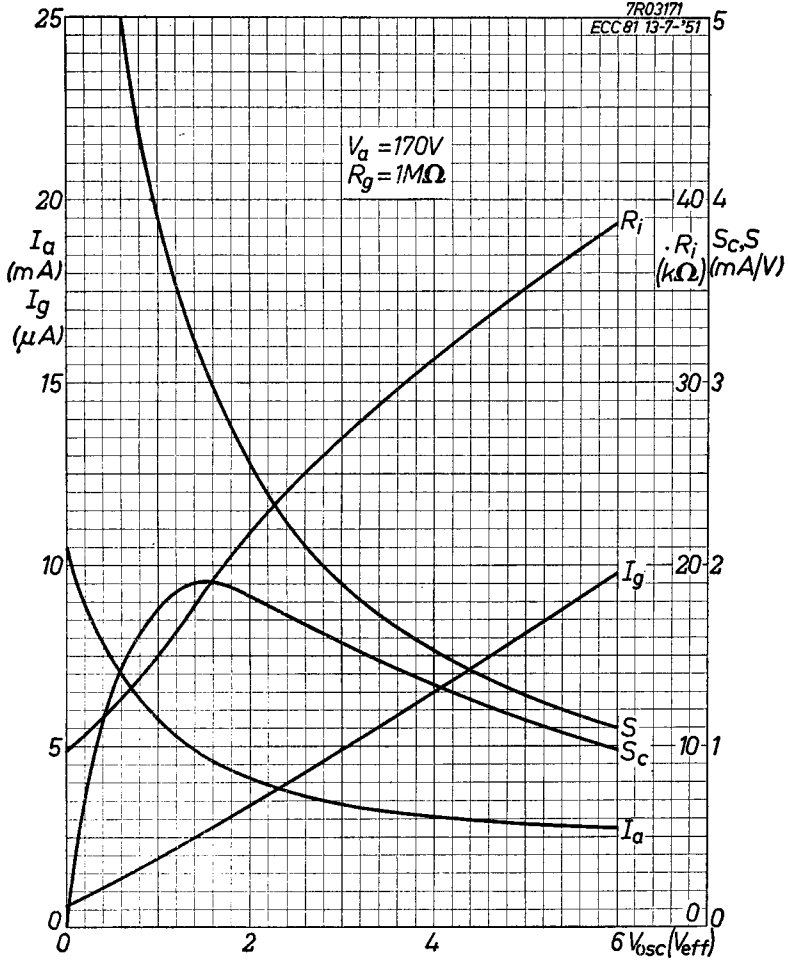
Self-oscillating frequency changer
Changeur de fréquence à auto-oscillation
Selbstschwingende Mischröhre



F

PHILIPS

UC 92

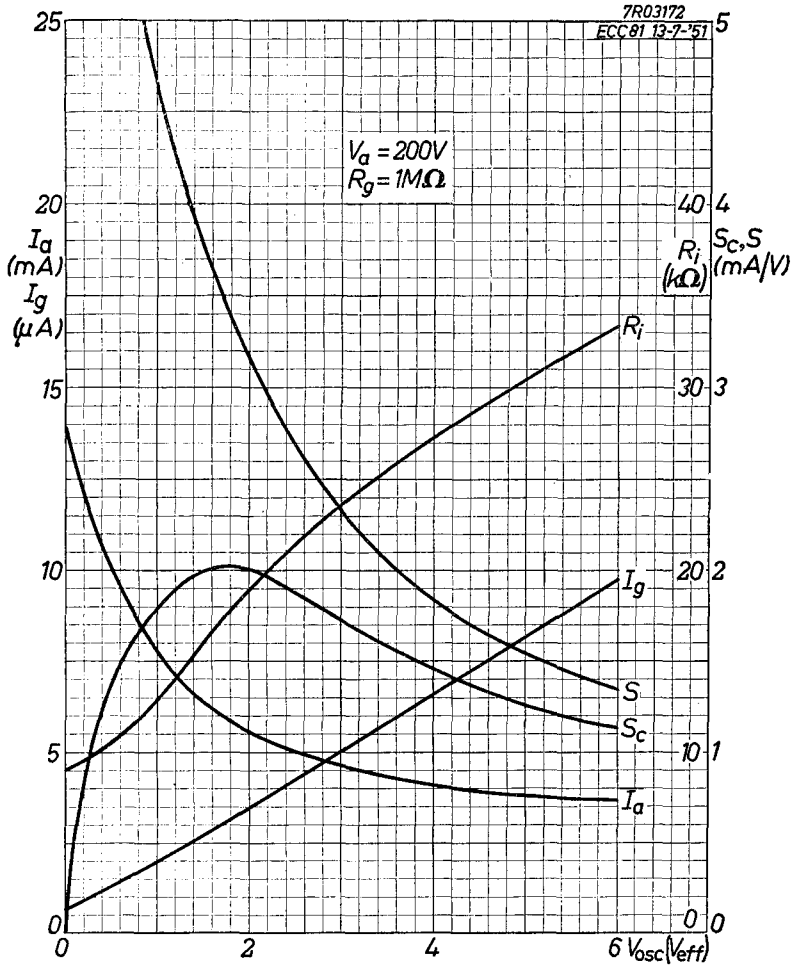


1.1.1954

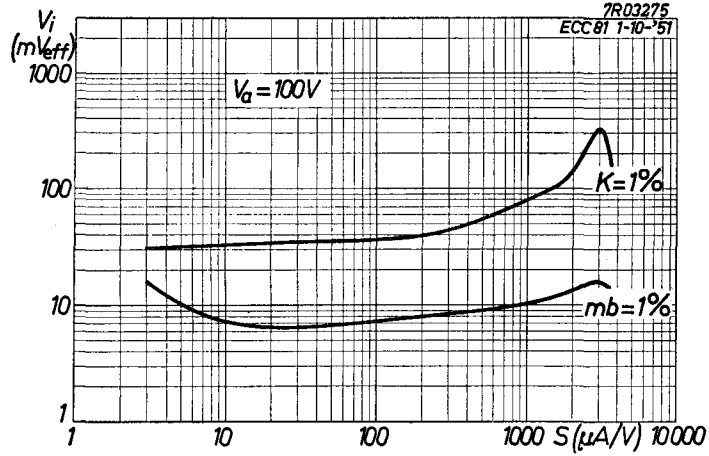
G

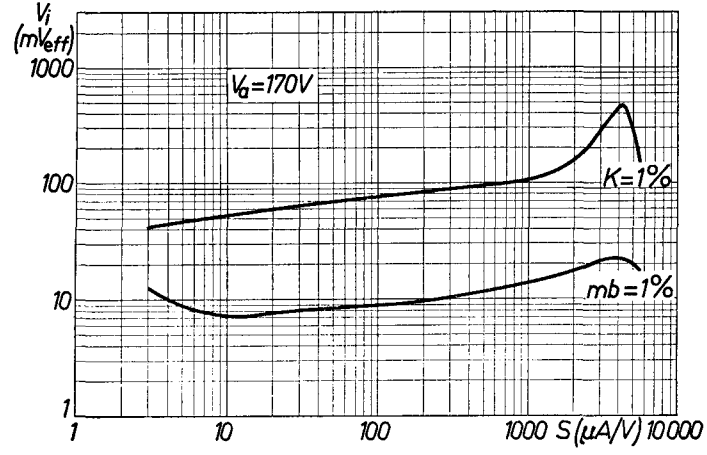
UC 92

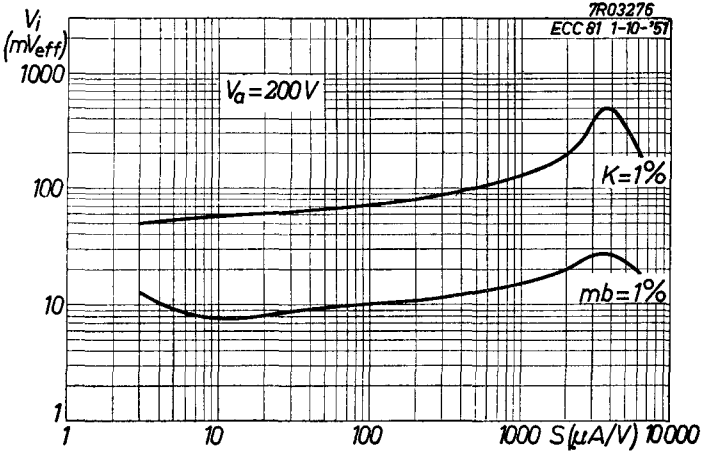
PHILIPS



H


7R03275
ECC81 1-10-51
Vi (mVeff)
1000
100
10
1
Va = 100V
K=1%
mb=1%
1
10
100
1000 S (µA/V) 10000


Vi (mVeff)
1000
100
10
1
Va=170V
K=1%
mb=1%
1
10
100
1000 S (µA/V) 10000


7R03275
ECC 81 1-10-'57
V_i (mV_{eff})
1000
100
10
1
V_a = 200 V
K = 1%
mb = 1%
1
10
100
1000 S (μA/V) 10000

PHILIPS

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1	1	1956.01.01
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3	A	1954.01.01
4	B	1954.01.01
5	C	1954.01.01
6	D	1954.01.01
7	E	1954.01.01
8	F	1954.01.01
9	G	1954.01.01
10	H	1954.01.01
11	I	1954.01.01
12	J	1954.01.01
13	FP	2000.06.13

R.F. DOUBLE TRIODE

Double triode intended for use as R.F. amplifier and self oscillating mixer.

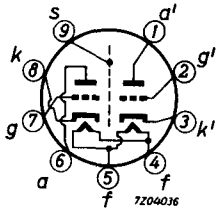
QUICK REFERENCE DATA			
Anode current	I_a	10	mA
Transconductance	S	6.7	mA/V
Amplification factor	μ	48	-

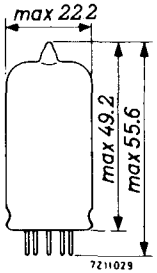
HEATING: Indirect by A.C. or D.C.; series supply

Heater current	I_f	100	mA
Heater voltage	V_f	26	V

DIMENSIONS AND CONNECTIONS Dimensions in mm

Base: Noval





CAPACITANCES (each unit unless otherwise specified)

Anode to grid	C_{ag}	1.5	pF
Anode to cathode	C_{ak}	0.18	pF
Anode to cathode + heater + screen	$C_{a/kfs}$	1.2	pF
Grid to cathode + heater + screen	$C_{g/kfs}$	3.1	pF
Anode to cathode + heater + screen (measured with external screen of 22.5 mm diam.)	$C_{a/kfs}$	1.8	pF
Anode to anode other unit	$C_{aa'}$	max. 0.04	pF
Anode to anode other unit (measured with external screen of 22.5 mm diam.)	$C_{aa'}$	max. 0.008	pF
Grid to grid other unit	$C_{gg'}$	max. 0.003	pF
Anode to grid other unit	$C_{ag'}$	max. 0.008	pF
Anode to grid other unit	$C_{a'g}$	max. 0.008	pF
Anode to cathode other unit	$C_{ak'}$	max. 0.008	pF
Grid to cathode other unit	$C_{gk'}$	max. 0.003	pF
Anode to cathode other unit	$C_{a'k}$	max. 0.008	pF
Grid to cathode other unit	$C_{g'k}$	max. 0.003	pF

TYPICAL CHARACTERISTICS (each unit)

Anode voltage	V_a	100	170	200	V
Grid voltage	V_g	-1.2[1])	-1.75	-2.4	V
Anode current	I_a	4.5	10	10	mA
Transconductance	S	4.8	6.7	6	mA/V
Amplification factor	μ	46	48	46	-

[1]) In this case grid current may occur. If this is not permissible, a condition with a bias of -1.5 V should be chosen.

OPERATING CHARACTERISTICS

As R.F. amplifier (unit a, g, k)

Supply voltage	V_b	170	170	100	V
Anode resistor	R_a	1.3	1.5	1.5	kΩ
Anode voltage	V_a	161	155	91	V
Cathode resistor	R_k	330	150	138	Ω
Grid voltage	V_g	−2.2	−1.5	−0.8	V
Anode current	I_a	6.6	9.8	5.7	mA
Transconductance	S	5.1	6.7	5.9	mA/V
Internal resistance	R_i	8.5	7	8	kΩ
Grid input resistance (f = 100 MHz)	r_g	5.2	3.8	2.8	kΩ
Equivalent noise resistance	R_{eq}	0.82	0..55	0.61	kΩ

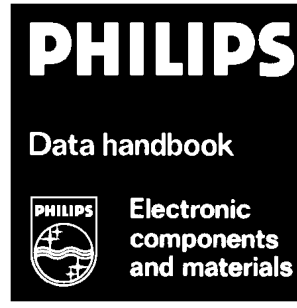
As self oscillating additive mixer (each unit)

Anode supply voltage	V_b	100	170	200	V
Anode resistor	R_a	4.7	4.7	8.2	kΩ
Grid resistor	R_g	1	1	1	MΩ
Oscillator voltage	$V_{osc.}$	1.8	2.8	2.8	V_{RMS}
Anode current	I_a	2.7	5.5	6	mA
Conversion conductance	S_c	2.2	2.8	2.9	mA/V
Internal resistance	R_i	19	15	14	kΩ
Grid input resistance (f = 100 MHz)	r_g		15		kΩ

LIMITING VALUES (each unit) (Design centre rating system)

Anode voltage	V_{a_o}	max.	550	V
	V_a	max.	250	V
Anode dissipation	W_a	max.	2.5	W
Anode dissipation, total	W_a+W_a'	max.	4.5	W
Cathode current	I_k	max.	15	mA
Cathode to heater voltage	V_{kf}	max.	90	V
Grid voltage (negative)	$-V_g$	max.	100	V
Grid resistor	R_g	max.	1	MΩ

For curves please refer to type PCC85



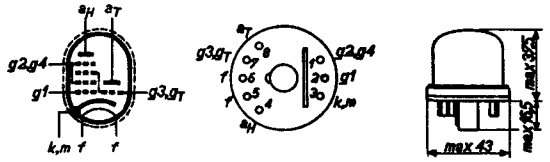
UCC85

page	sheet	date
1	1	1969.12
2	2	1969.01
3	3	1969.01
4	FP	1999.07.29

TRIODE-HEXODE for use as frequency converter
TRIODE-HEXODE pour utilisation comme changeuse de fréquence
TRIODE-HEXODE zur Verwendung als Mischröhre

Heating: indirect by A.C. or D.C.; series supply
Chauffage: indirect par C.A. ou C.C.; alimentation en série — Vf = 20 V, If = 0,100 A
Heizung: indirekt durch Wechsel- oder Gleichstrom; Serienspeisung

Dimensions in mm
Dimensions en mm
Abmessungen in mm



Capacities Capacités Kapazitäten	Hexode section Partie hexode Hexodenteil		Triode section Partie triode Triodenteil	
	Ca =	9 pF	Ca =	4,2 pF
	Cag1 <	0,001 pF	CgT+g3 =	9,2 pF
	Cg1 =	6 pF	C(gT+g3)aT =	1,5 pF
	Cg1f <	0,001 pF	C(gT+g3)f <	0,3 pF

Between hexode and triode section
Entre les parties hexode et triode
Zwischen Hexoden- und Triodenteil

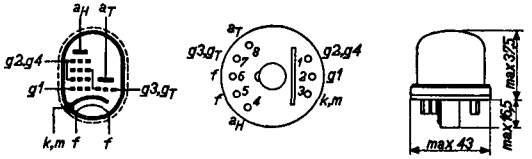
C(gT+g3)g1H < 0,2 pF
C(gT+g3)aH < 0,04 pF
CaTaH < 0,02 pF
CaTg1H < 0,05 pF

TRIODE-HEXODE

Heating : indirect by A.C. or D.C. series supply
Chauffage: indirect par C.A. ou C.C. alimentation- série
Heizung : indirekt durch Wechsel- oder Gleichstrom Serienspeisung

V_f = 20 V
If = 100 mA

Dimensions in mm
Dimensions en mm
Abmessungen in mm



Base, culot, Sockel: Y

Capacitances
Capacités
Kapazitäten

C_{aH}	= 9 pF	C_{aT}	= 4,2 pF
C_{aH-g1}	< 0,001 pF	$C_{gT,g3}$	= 9,2 pF
C_{g1}	= 6 pF	$C_{gT,g3-aT}$	= 1,5 pF
C_{g1f}	< 0,001 pF	$C_{gT,g3-f}$	< 0,3 pF
$C_{gT,g3-g1}$	< 0,2 pF	C_{aT-aH}	< 0,02 pF
$C_{gT,g3-aH}$	< 0,04 pF	C_{aT-g1}	< 0,05 pF

Operating characteristics of the triode section as oscillator
Caractéristiques d'utilisation de la partie triode en oscillatrice
Betriebsdaten des Triodenteiles als Oszillator

V_b	= 100	200 V
R_a	= 30	30 kΩ
V_a	= 60	115 V
I_a	= 1,4	2,8 mA
$R_{gT,g3}$	= 50	50 kΩ
$I_{gT,g3}$	= 100	160 µA
V_{osc}	= 4	7 Veff

Operating characteristics of the hexode section
Caractéristiques d'utilisation de la partie hexode
Betriebsdaten des Hexodenteiles

Va =Vb	=	100			200		V
Rg2+g4	=	40			40		kΩ
Rk	=	240			240		Ω
RgT+g3	=	50			50		kΩ
μg2g1	=	22			22		
IgT+g3	=	100			160		μA
V_{osc}	=	4			7		V_{eff}
Vg1	=	-1	-11,7	-15	-2	-18	-24 V
Vg2+g4	=	40	-	100	80	-	200 V
Ia	=	1,2	-	-	2,5	-	- mA
Ig2+g4	=	1,5	-	-	3	-	- mA
Sc	=	450	4,5	1,1	750	7,5	1,9 μA/V
Ri	=	0,6	>1,0	>5,0	1	>0,3	>0,5 MΩ

Typical characteristics of the triode section
Caractéristiques typiques de la partie triode
Kenndaten des Triodenteiles

Va	=	150 V
VgT+g3	=	0 V
Ia	=	19 mA
S	=	3,2 mA/V
μ	=	17

Operating characteristics of the triode section as oscillator
Caractéristiques d'utilisation de la partie triode comme oscillatrice
Betriebsdaten des Triodenteiles als Oszillator

Vb	=	100	200	V
Ra	=	30	30	kΩ
Va	=	60	115	V
Ia	=	1,4	2,8	mA
RgT+g3	=	50	50	kΩ
IgT+g3	=	100	160	μA
V_{osc}	=	4	7	V_{eff}

Operating characteristics of the hexode section
Caractéristiques d'utilisation de la partie hexode
Betriebsdaten des Hexodenteiles

$V_a=V_b$ =		100			200		V
$R_{g2,g4}$=		40			40		kΩ
R_k =		240			240		Ω
$R_{gT,g3}$=		50			50		kΩ
μ_{g2g1} =		22			22		
$I_{gT,g3}$=		100			160		µA
Vosc =		4			7		Veff
V_{g1} =	-1	-11,7	-15	-2	-18	-24	V
$V_{g2,g4}$=	40	-	100	80	-	200	V
I_a =	1,2	-	-	2,5	-	-	mA
$I_{g2,g4}$=	1,5	-	-	3	-	-	mA
S_c =	450	4,5	1,1	750	7,5	1,9	µA/V
R_i =	0,6	>1,0	>5,0	1	>0,3	>0,5	MΩ

Limiting values of the hexode section
Caractéristiques limites de la partie hexode
Grenzdaten des Hexodenteiles

V_{a_o}	= max. 550 V
V_a	= max. 250 V
W_a	= max. 1,5 W
$V_{g2,g4_o}$	= max. 550 V
$V_{g2,g4}$(Ia < 1mA)	= max. 250 V
$V_{g2,g4}$(Ia = 2,5 mA)	= max. 125 V
$W_{g2,g4}$	= max. 0,5 W
I_k	= max. 15 mA
V_{g1} (I_{g1}=+0,3µA)	= max. -1,3 V
$V_{gT,g3}$ ($I_{gT,g3}$=+0,3µA)	= max. -1,3 V
R_{g1}	= max. 3 MΩ
R_{kf}	= max. 20 kΩ
V_{kf}	= max. 200 V

Limiting values of the triode section
Caractéristiques limites de la partie triode
Grenzdaten des Triodenteiles

V_{a_o} = max.550 V
V_a = max.150 V
W_a = max. 1 W
$V_{gT,g3}$($I_{gT,g3}$=+0,3µA) = max.-1,3 V
$R_{gT,g3}$ = max. 0,1 MΩ

PHILIPS

Electronic Tube

HANDBOOK

UCH11

page	sheet	date
1	1	1948.09.17
2	1	1953.12.12
3	2	1948.09.17
4	2	1953.12.12
5	FP	2000.06.13

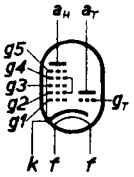
"Miniwatt"

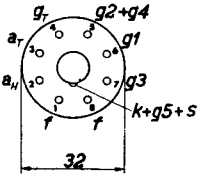
UCH 21

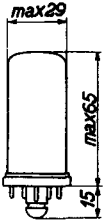
TRIODE-HEPTODE for use as frequency converter, H.F., I.F. and L.F. amplifier and phase inverter
TRIODE-HEPTODE pour utilisation comme changeuse de fréquence, amplificatrice H.F., M.F. et B.F. et comme tube inverseur de phase
TRIODE-HEPTODE zur Verwendung als Mischröhre, H.F.-, Z.F.- und N.F. Verstärker und als Phasenumkehrröhre

Heating:	indirect by A.C. or D.C.; series supply	
Chauffage:	indirect par C.A. ou C.C.; alimentation en série	Vf= 20 V If=0,100 A
Heizung:	indirekt durch Wechsel- oder Gleichstrom; Serienspeisung	

Dimensions in mm
Dimensions en mm
Abmessungen in mm





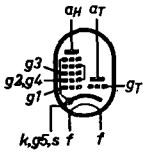


Capacities Capacités Kapazitäten	Heptode section Partie heptode Heptodenteil	Triode section Partie triode Triodenteil
	Cgl = 6,5 pF	Cg = 3,8 pF
	Ca = 8 pF	Ca = 3,1 pF
	Cagl <0,002 pF	Cag = 1,1 pF
	Cg3 = 8 pF	Cgk = 2,7 pF
	Cglg3 < 0,3 pF	Cak = 1,6 pF
	Cglf <0,007 pF	Cgf < 0,1 pF

TRIODE-HEPTODE for use as frequency changer, R.F., I.F. or A.F. amplifier and phase inverter
TRIODE-HEPTODE pour utilisation en changeuse de fréquence, amplificatrice H.F., M.F. ou B.F. et comme tube inverseur de phase
TRIODE-HEPTODE zur Verwendung als Mischröhre, HF-, ZF- oder NF-Verstärker und als Phasenumkehrröhre

Heating : indirect; series supply	V_f = 20 V
Chauffage: indirect; alimentation- série	I_f =100 mA
Heizung : indirekt; Serienspeisung	

Dimensions in mm
Dimensions en mm
Abmessungen in mm



Base, culot, Sockel: Loctal 8p.

Capacitances Capacités Kapazitäten	Heptode section Partie heptode Heptodenteil	Triode section Partie triode Triodenteil
	C_{g1} = 6,5 pF	C_g = 3,8 pF
	C_a = 8 pF	C_a = 3,1 pF
	C_{ag1} <0,002 pF	C_{ag} = 1,1 pF
	C_{g3} = 8 pF	C_{gk} = 2,7 pF
	C_{g1g3} < 0,3 pF	C_{ak} = 1,6 pF
	C_{g1f} <0,007 pF	C_{gf} < 0,1 pF

Between heptode and triode sections
Entre les parties heptode et triode
Zwischen Heptoden- und Triodenteil

C_{gTg1H}	< 0,1 pF
C_{gT+g3}	= 12,3 pF
$C_{(gT+g3)g1H}$	< 0,35 pF
$C_{(gT+g3)aH}$	< 0,1 pF

UCH 21

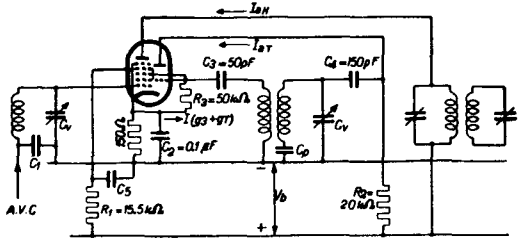
"Miniwatt"

Capacities Capacités Kapazitäten	Between heptode and triode sections Entre les parties heptode et triode Zwischen Heptoden- und Triodenteil

CgTg1H	< 0,1 pF
CgT+g3	= 12,3 pF
C(gT+g3)g1H	< 0,35 pF
C(gT+g3)aH	< 0,1 pF

Operating characteristics of the heptode section as frequency converter (g3 connected to gT)
Caractéristiques d'utilisation de la partie heptode comme changeuse de fréquence (g3 reliée à gT)
Betriebsdaten des Heptodenteiles als Mischröhre (g3 verbunden mit gT)

Va=Vb	=	100		200		V
Rg2+g4	=	15,5		15,5		kΩ
Rk	=	150		150		Ω
Rg3+gT	=	50		50		kΩ
Ig3+gT	=	95		190		µA
Vg1	=	-1	-14	-2	-28	V
Vg2+g4	=	53	100	100	200	V
Ia	=	1,5	-	3,5	-	mA
Ig2+g4	=	3	-	6,5	-	mA
Sc	=	580	5,8	750	7,5	µA/V
Ri	=	1,0	> 10	1,0	> 10	MΩ
Req	=	40	-	55	-	kΩ



Operating characteristics of the heptode section as frequency changer (g3 connected to gT)
Caractéristiques d'utilisation de la partie heptode en changeuse de fréquence (g3 reliée à gT)
Betriebsdaten des Heptodenteiles als Mischröhre (g3 verbunden mit gT)

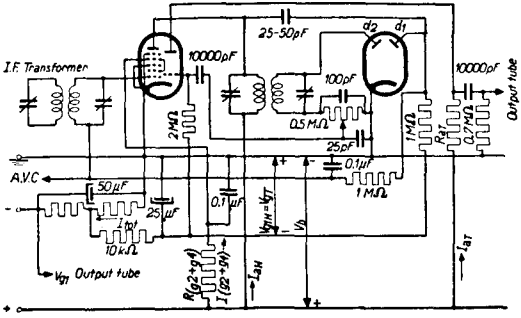
$V_a=V_b$	=	100		200		V
$R_{g2,g4}$	=	15,5		15,5		kΩ
R_k	=	150		150		Ω
R_{g3+gT}	=	50		50		kΩ
I_{g3+gT}	=	95		190		µA
V_{g1}	=	-1	-14	-2	-28	V
$V_{g2,g4}$	=	53	100	100	200	V
I_a	=	1,5	-	3,5	-	mA
$I_{g2,g4}$	=	3	-	6,5	-	mA
S_c	=	580	5,8	750	7,5	µA/V
R_i	=	1,0	>10	1,0	>10	MΩ
R_{eq}	=	40	-	55	-	kΩ

Operating characteristics of the heptode section as I.F. amplifier (g3 disconnected from gT)
Caractéristiques d'utilisation de la partie heptode en amplificatrice M.F. (g3 non reliée à gT)
Betriebsdaten des Heptodenteiles als ZF-Verstärker (g3 frei von gT)

$V_a = V_b$	=	100			200		V
V_{g3}	=	0			0		V
$R_{g2,g4}$	=	30			30		kΩ
V_{g1}	=	-1,0	-15	-20	-2,0	-28	-36	V
$V_{g2,g4}$	=	50	-	98	94	-	200	V
I_a	=	2,6	-	-	5,2	-	-	mA
$I_{g2,g4}$	=	1,9	-	-	3,5	-	-	mA
S	=	2000	20	2,0	2200	22	2,2	µA/V
R_i	=	0,7	>10	>10	0,7	>10	>10	MΩ
μ_{g2g1}	=	19	-	-	19	-	-	
R_{eq}	=	4,9	-	-	9	-	-	kΩ

Operating characteristics of the heptode section as I.F. amplifier (g3 disconnected from gT)
Caractéristiques d'utilisation de la partie heptode comme amplificatrice M.F. (g3 non reliée à gT)
Betriebsdaten des Heptodenteiles als Z.F.Verstärker (g3 frei von gT)

Va=Vb	=		100			200		V
Vg3	=		0			0		V
Rg2+g4	=		30			30		kΩ
Vg1	=	-1,0	-15	-20	- 2,0	-28	-36	V
Vg2+g4	=	50	-	98	94	-	200	V
Ia	=	2,6	-	-	5,2	-	-	mA
Ig2+g4	=	1,9	-	-	3,5	-	-	mA
S	=	2000	20	2,0	2200	22	2,2	µA/V
Ri	=	0,7	>10	>10	0,7	>10	>10	MΩ
µg2g1	=	19	-	-	19	-	-	
Req	=	4,9	-	-	9	-	-	kΩ



Typical characteristics of the triode section
Caractéristiques typiques de la partie triode
Kenndaten des Triodenteiles

Va	=	100	V
Vg	=	0	V
Ia	=	12	mA
S	=	3,2	mA/V
µ	=	19	

Typical characteristics of the triode section
Caractéristiques types de la partie triode
Kenndaten des Triodenteiles

V_a	=	100 V
V_g	=	0 V
I_a	=	12 mA
S	=	3,2 mA/V
μ	=	19

Operating characteristics of the triode section as oscillator (g3 connected to gT)
Caractéristiques d'utilisation de la partie triode en oscillatrice (g3 reliée à gT)
Betriebsdaten des Triodenteiles als Oszillator (g3 verbunden mit gT)

V_b	=	100	200 V
R_a	=	20	20 kΩ
R_{gT+g3}	=	50	50 kΩ
I_{gT+g3}	=	95	190 µA
I_a	=	1,9	4,1 mA
Seff	=	0,44	0,45 mA/V

Operating characteristics of the triode section as A.F. amplifier with resistance coupling (gT disconnected from g3)
Caractéristiques d'utilisation de la partie triode en amplificatrice B.F. avec couplage à résistances (gT non reliée à g3)
Betriebsdaten des Triodenteiles als NF-Verstärker mit Widerstandskopplung (gT frei von g3)

V_b (V)	R_a (MΩ)	V_g (V)	I_a (mA)	Vo (Veff)	$\frac{V_o}{V_i}$	d_{tot} (%)
200	0,2	-2	0,8	7,5	10	2,8
100	0,2	-1	0,37	7,5	10	6,0
200	0,1	-2	1,5	7,5	10,5	2,8
100	0,1	-1	0,68	7,5	10,5	5,8
200	0,05	-2	2,8	7,5	11	2,2
100	0,05	-1	1,3	7,5	11	5,4

Operating characteristics of the triode section as oscillator (g3 connected to gT)
Caractéristiques d'utilisation de la partie triode comme oscillatrice (g3 reliée à gT)
Betriebsdaten des Triodenteiles als Oszillator (g3 verbunden mit gT)

Vb	=	100	200 V
Ra	=	20	20 kΩ
RgT+g3	=	50	50 kΩ
IgT+g3	=	95	190 µA
Ia	=	1,9	4,1 mA
S_{eff}	=	0,44	0,45 mA/V

Operating characteristics of the triode section as L.F. amplifier with resistance coupling (gT disconnected from g3)
Caractéristiques d'utilisation de la partie triode comme amplificatrice B.F. avec couplage à résistances (gT non reliée à g3)
Betriebsdaten des Triodenteiles als N.F. Verstärker mit Widerstandskopplung (gT frei von g3)

Vb (V)	Ra (MΩ)	Vg (V)	Ia (mA)	Vo (V_{eff})	Vo / Vi	d_{tot} (%)
200	0,2	-2	0,8	7,5	10	2,8
100	0,2	-1	0,37	7,5	10	6,0
200	0,1	-2	1,5	7,5	10,5	2,8
100	0,1	-1	0,68	7,5	10,5	5,8
200	0,05	-2	2,8	7,5	11	2,2
100	0,05	-1	1,3	7,5	11	5,4

Characteristics for operation as phase inverter for modulating a push-pull amplifier
Caractéristiques d'utilisation comme tube inverseur de phase pour la modulation d'un amplificateur push-pull
Daten zur Verwendung als Phasenumkehrröhre zur Aussteuerung eines Gegentaktverstärkers

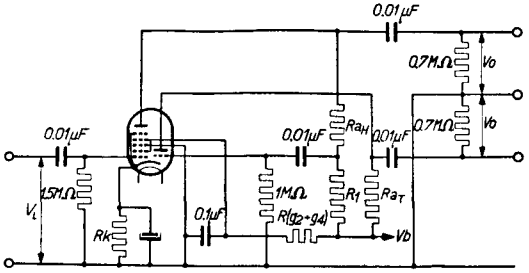
A. Without negative feedback
Sans couplage inverse
Ohne Gegenkopplung

Limiting values of the heptode section
Caractéristiques limites de la partie heptode
Grenzdaten des Heptodenteiles

V_{a_o}	= max.	550	V
V_a	= max.	250	V
W_a	= max.	1,5	W
$V_{g2,g4_o}$	= max.	550	V
$V_{g2,g4}$ (I_a=3mA)	= max.	100	V
$V_{g2,g4}$ (I_a<1mA)	= max.	250	V
$W_{g2,g4}$	= max.	1	W
I_k	= max.	15	mA
V_{g1} (I_{g1}=+0,3µA)	= max.	-1,3	V
V_{g3} (I_{g3}=+0,3µA)	= max.	-1,3	V
R_{g1}	= max.	3	MΩ
R_{g3}	= max.	3	MΩ
R_{kf}	= max.	20	kΩ
V_{kf}	= max.	150	V

Limiting values of the triode section
Caractéristiques limites de la partie triode
Grenzdaten des Triodenteiles

V_{a_o}	= max.	550	V
V_a	= max.	175	V
W_a	= max.	0,5	W
V_g (I_g = +0,3µA)	= max.	-1,3	V
R_g	= max.	3	MΩ



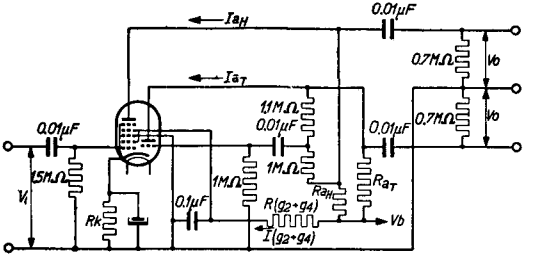
1) Rk = 750Ω; RaH = 0,2MΩ; R1 = 16kΩ; RaT = 0,1MΩ; Rg2+g4 = 0,2MΩ

Vb (V)	IaH+IaT (mA)	Ig2+g4 (mA)	Vo (V_{eff})	Vo/Vi	d_{tot} (%)
200	2,0	0,75	10	90	1,4
100	1,0	0,38	10	70	6,0

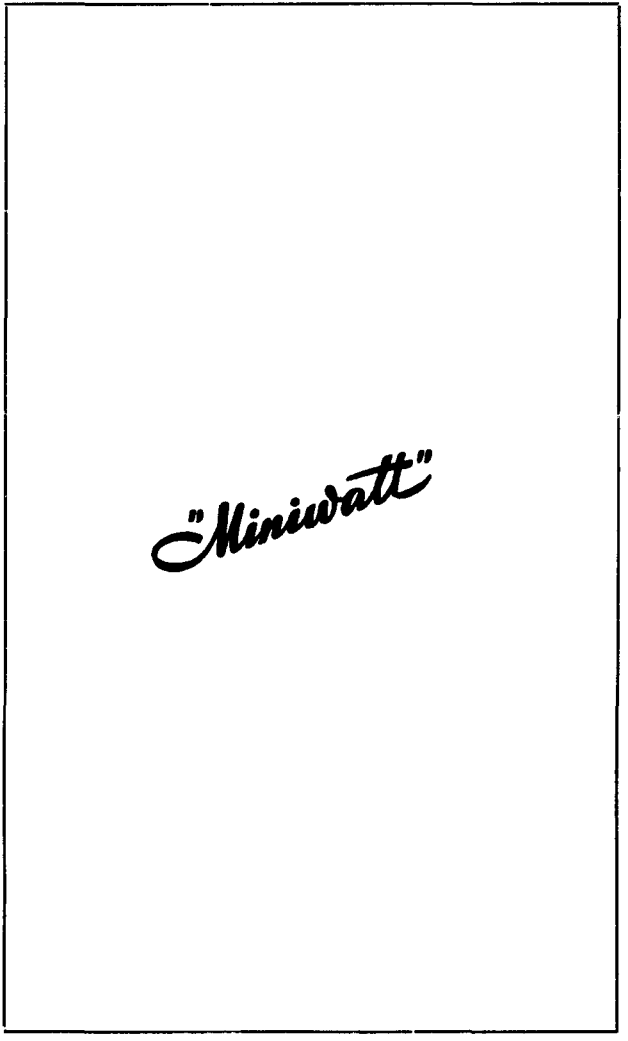
2) Rk = 500Ω; RaH = 0,1MΩ; R1 = 8kΩ; RaT = 0,1 MΩ; Rg2+g4 = 0,1MΩ

Vb (V)	IaH+IaT (mA)	Ig2+g4 (mA)	Vo (V_{eff})	Vo/Vi	d_{tot} (%)
200	2,7	1,36	10	80	1,4
100	1,2	0,66	10	60	4,5

B. With negative feedback
Avec couplage inverse
Mit Gegenkopplung



UCH 21



12.10.1943

1) Rk = 700 Ω; RaH = 0,2 MΩ; Rg2+g4 = 0,18 MΩ; RaT = 0,1 MΩ

Vb (V)	IaH+IaT (mA)	Ig2+g4 (mA)	Vo (V_{eff})	$\frac{Vo}{Vi}$	d_{tot} (%)
200	2,1	0,8	10	75	2,5
100	1,1	0,4	10	65	3,1

2) Rk = 500 Ω; RaH = 0,1 MΩ; Rg2 + g4 = 0,1 MΩ; RaT = 0,1 MΩ

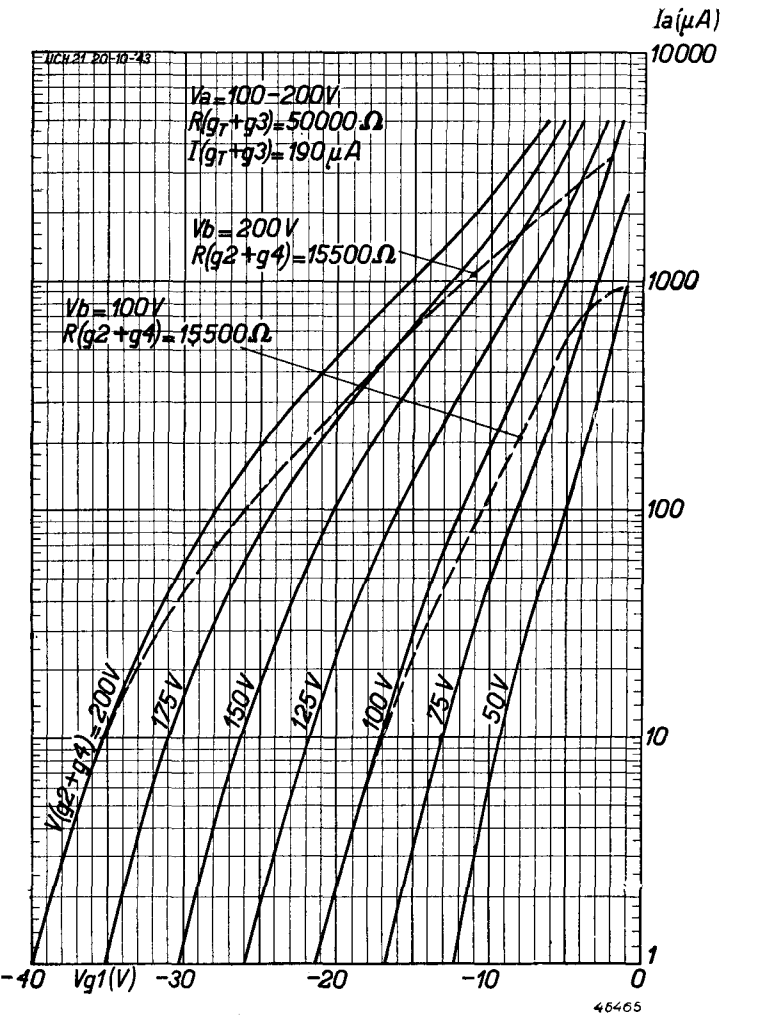
Vb (V)	IaH+IaT (mA)	Ig2+g4 (mA)	Vo (V_{eff})	$\frac{Vo}{Vi}$	d_{tot} (%)
200	2,7	1,3	10	70	2,3
100	1,3	0,65	10	55	2,4

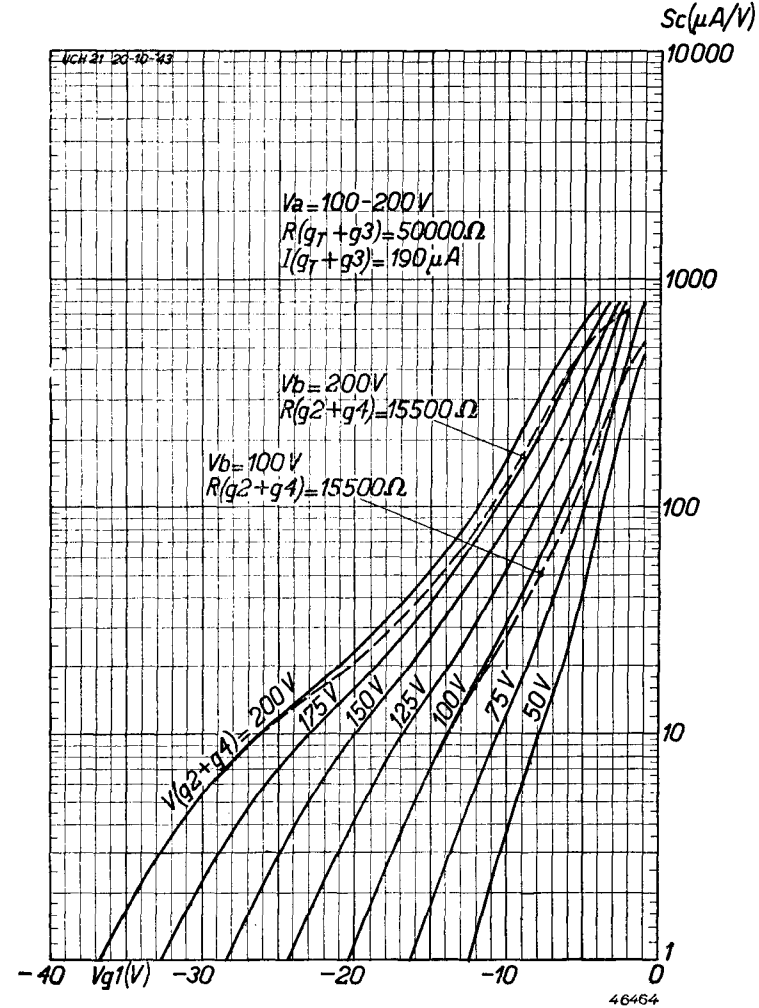
Limiting values of the heptode section
Caractéristiques limites de la partie heptode
Grenzdaten des Heptodenteiles

Va_o = max. 550 V	$V(g2+g4)_o$	= max.	550 V
Va = max. 250 V	Vg2+g4 (Ia=3mA)	= max.	100 V
Wa = max. 1,5 W	Vg2+g4 (Ia<1mA)	= max.	250 V
Rg1 = max. 3 MΩ	Wg2+g4	= max.	1 W
Rg3 = max. 3 MΩ	Vg1 (Ig1=+0,3µA)	= max.	-1,3 V
Rfk = max. 20 kΩ	Vg3 (Ig3=+0,3µA)	= max.	-1,3 V
Vfk = max. 150 V	Ik	= max.	15 mA

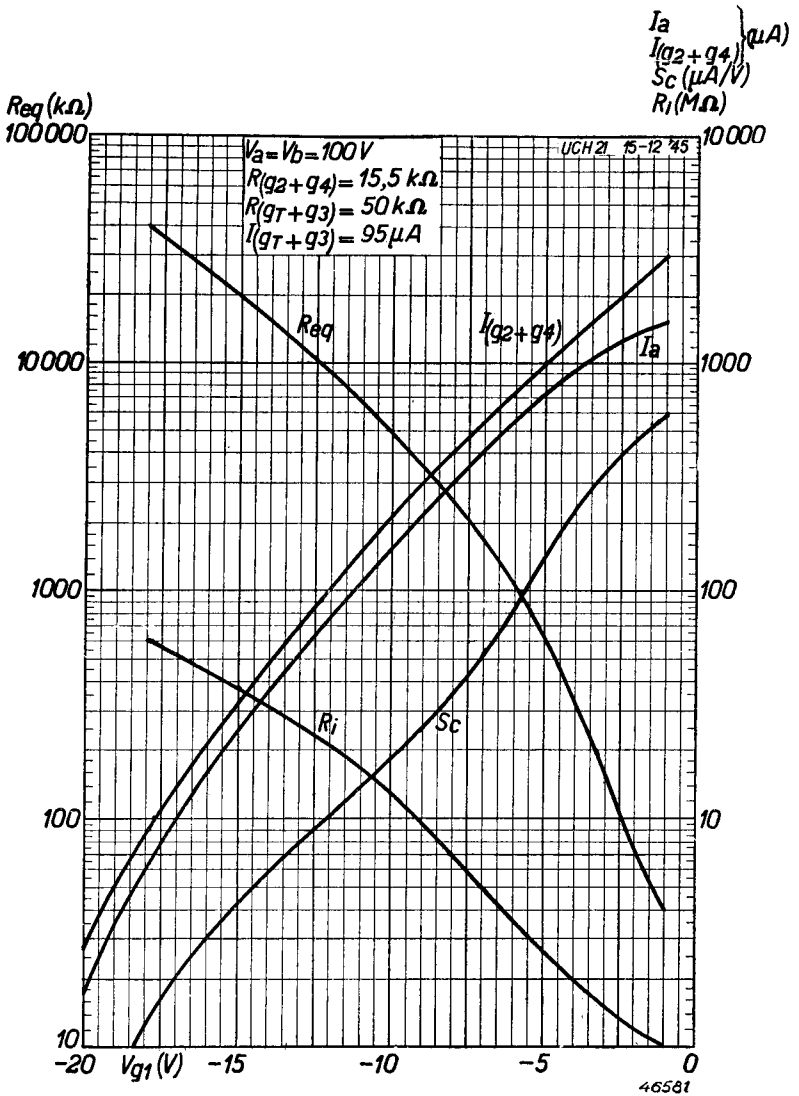
Limiting values of the triode section
Caractéristiques limites de la partie triode
Grenzdaten des Triodenteiles

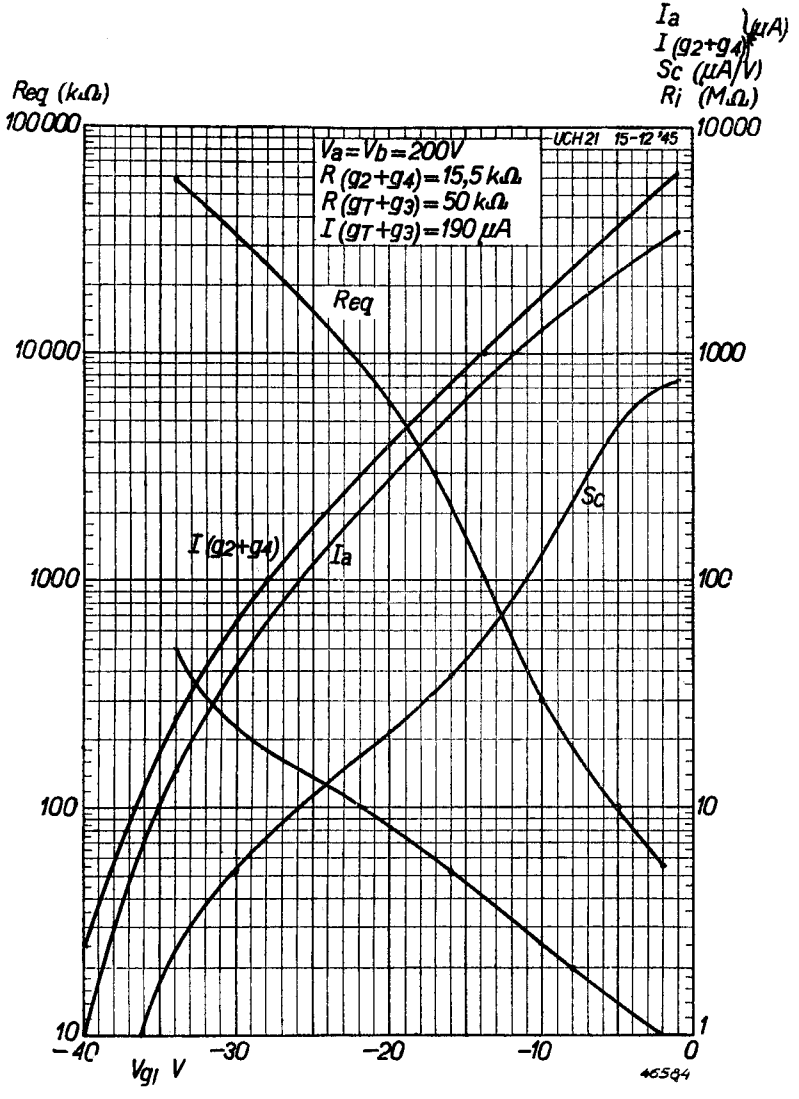
Va_o	= max.	550 V
Va	= max.	175 V
Wa	= max.	0,5 W
Vg (Ig = +0,3µA)	= max.	-1,3 V
Rg	= max.	3 MΩ


Ia(μA)
10000
1000
100
10
1
UCH 21 20-10-43
Va=100-200V
R(g1+g3)=50000Ω
I(g1+g3)=190μA
Vb=200V
R(g2+g4)=15500Ω
Vb=100V
R(g2+g4)=15500Ω
V(g2+g4)=200V
125V
150V
125V
100V
75V
50V
-40
Vg1(V)
-30
-20
-10
0
46465


Sc(μA/V)
UCH 21 20-10-43
10000
1000
100
10
1
Va=100-200V
R(g1+g3)=50000Ω
I(g1+g3)=190μA
Vb=200V
R(g2+g4)=15500Ω
Vb=100V
R(g2+g4)=15500Ω
V(g2+g4)=200V
175V
150V
125V
100V
75V
50V
-40
Vg1(V)
-30
-20
-10
0
46464

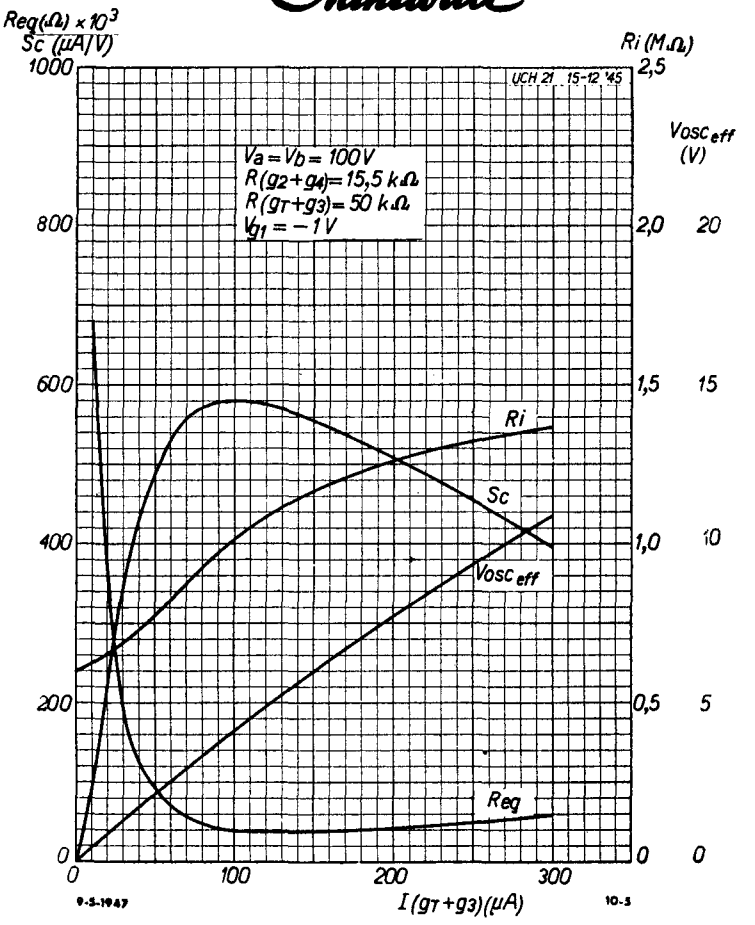
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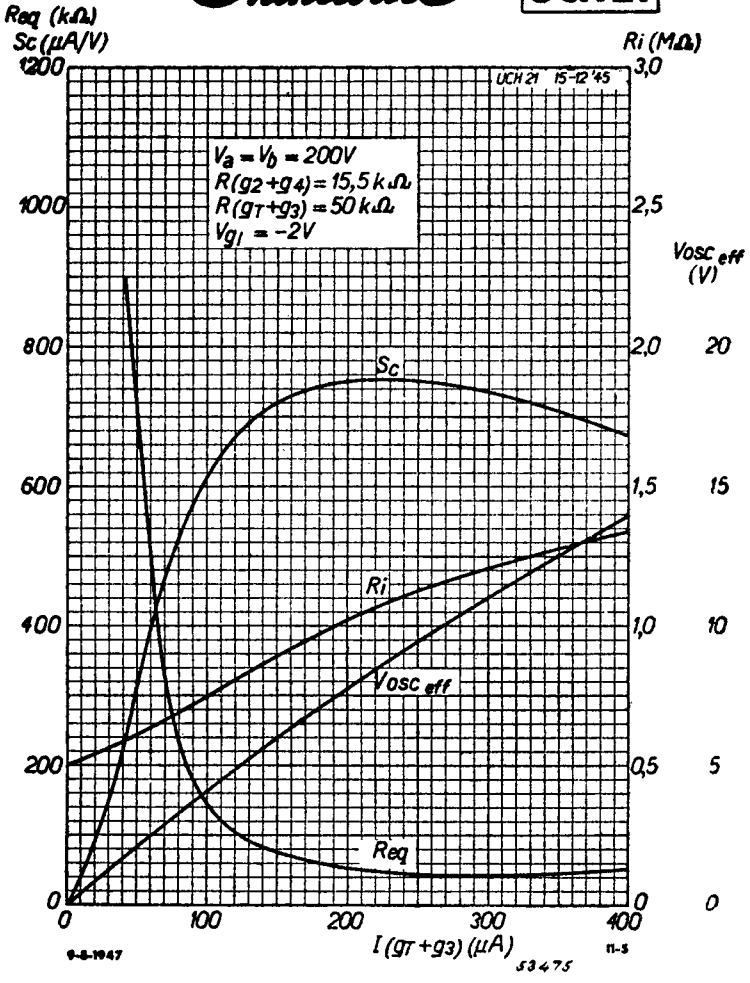

Ia (μA)
I (g2+g4) (μA)
Sc (μA/V)
Ri (MΩ)
Req (kΩ)
UCH21 15-12'45
Va=Vb=200V
R (g2+g4)=15,5 kΩ
R (gT+g3)=50 kΩ
I (gT+g3)=190 μA
Req
Sc
I (g2+g4)
Ia
100000
10000
1000
100
10
10000
1000
100
10
1
−40
−30
−20
−10
0
Vg1 V
46584

UCH 21

"Miniwatt"

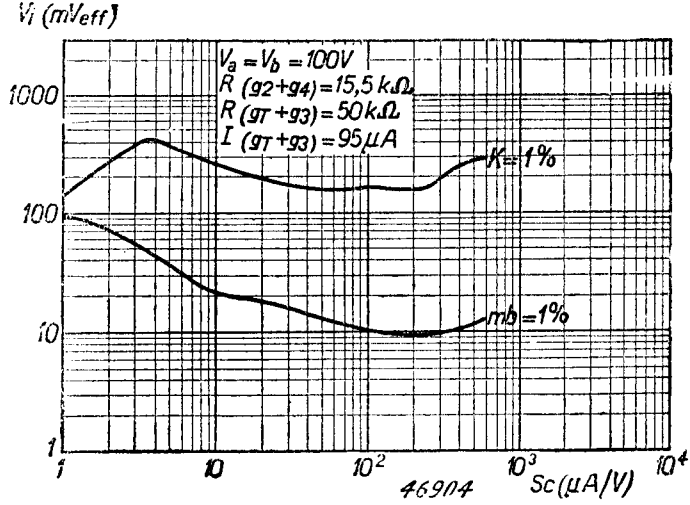


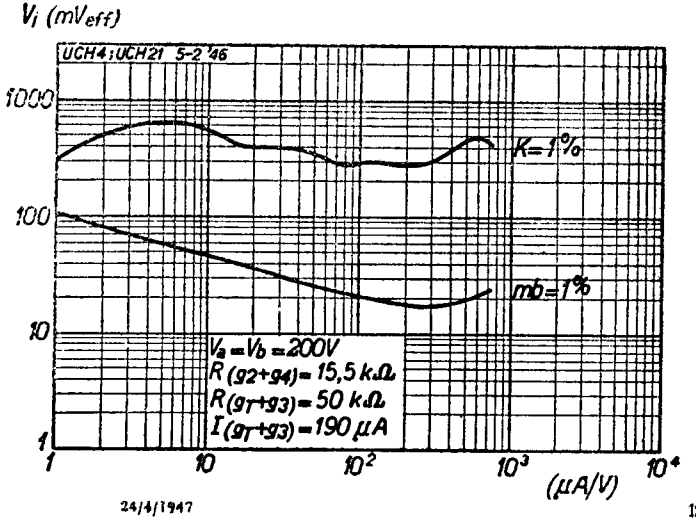
"Miniwatt" UCH 21

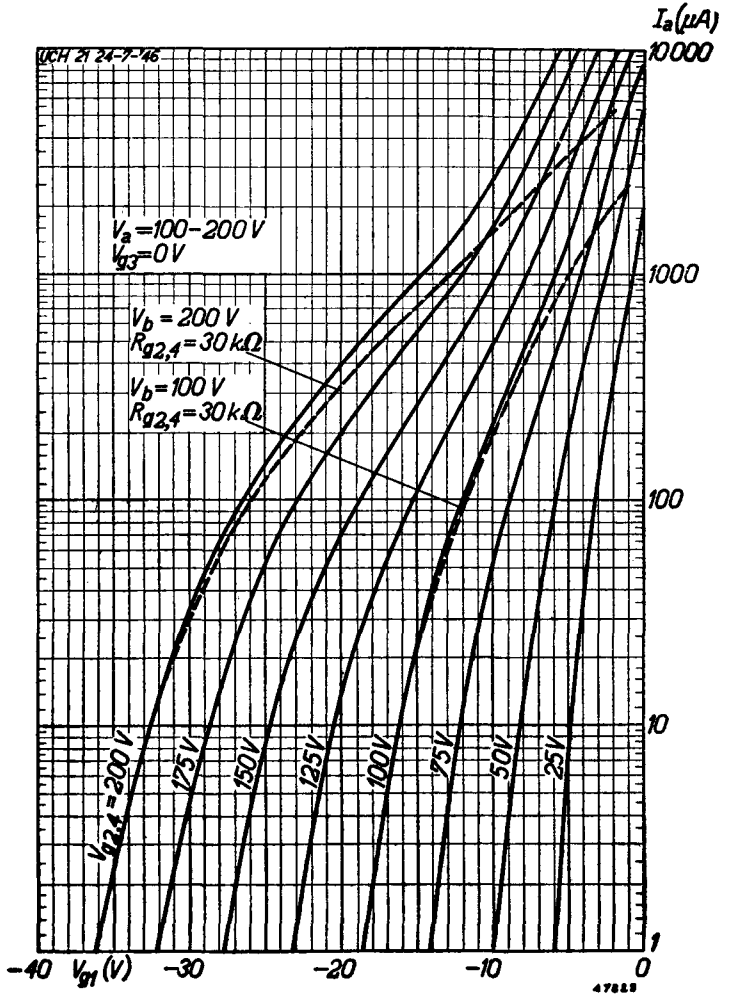


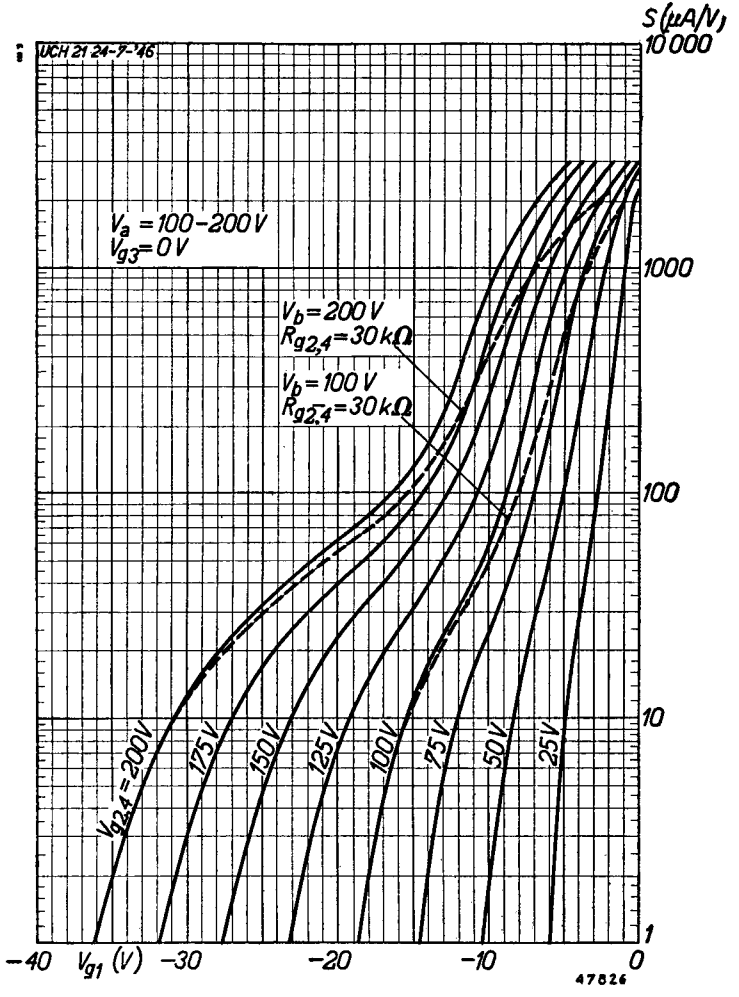
UCH21

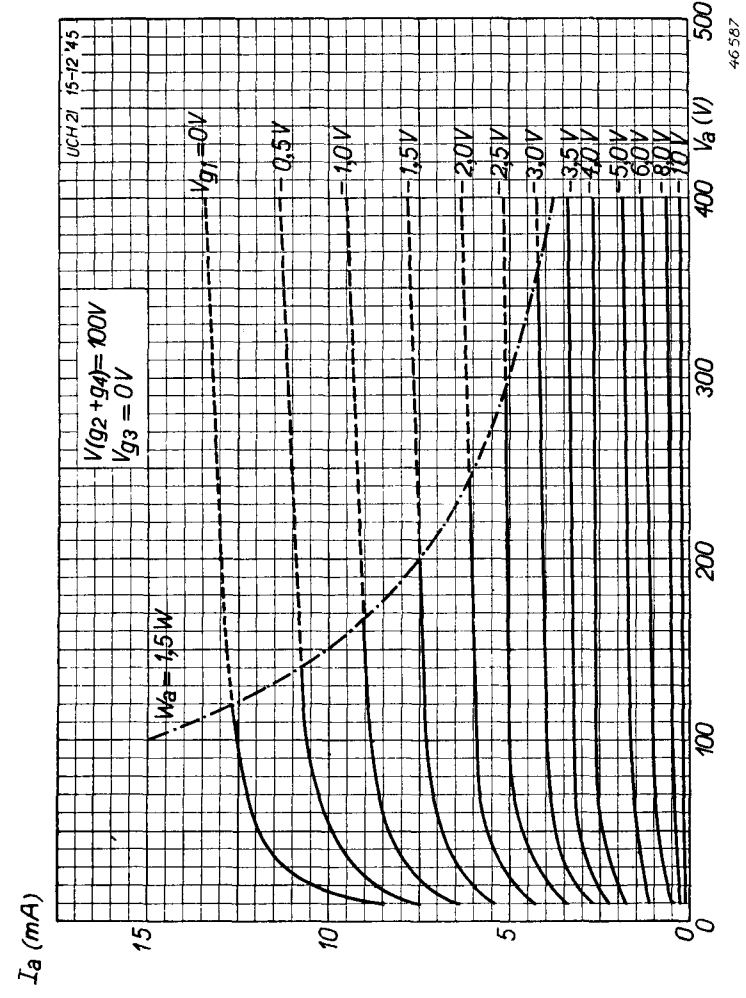
"Miniwatt"



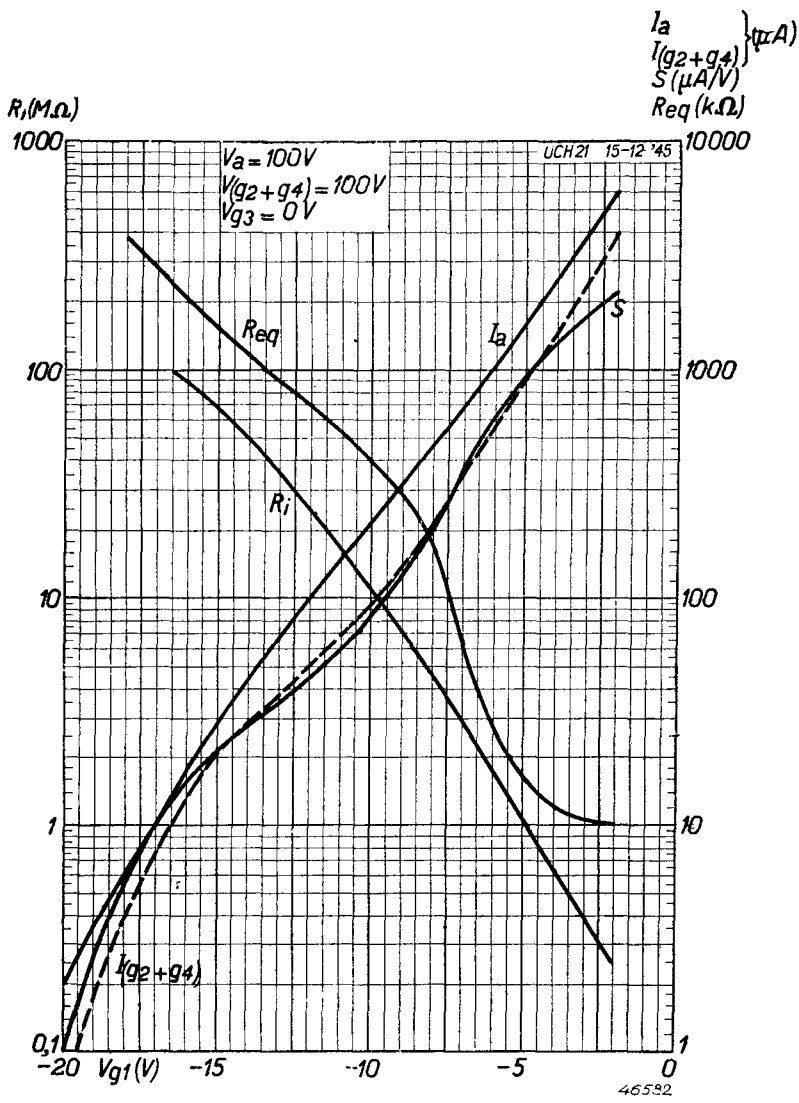


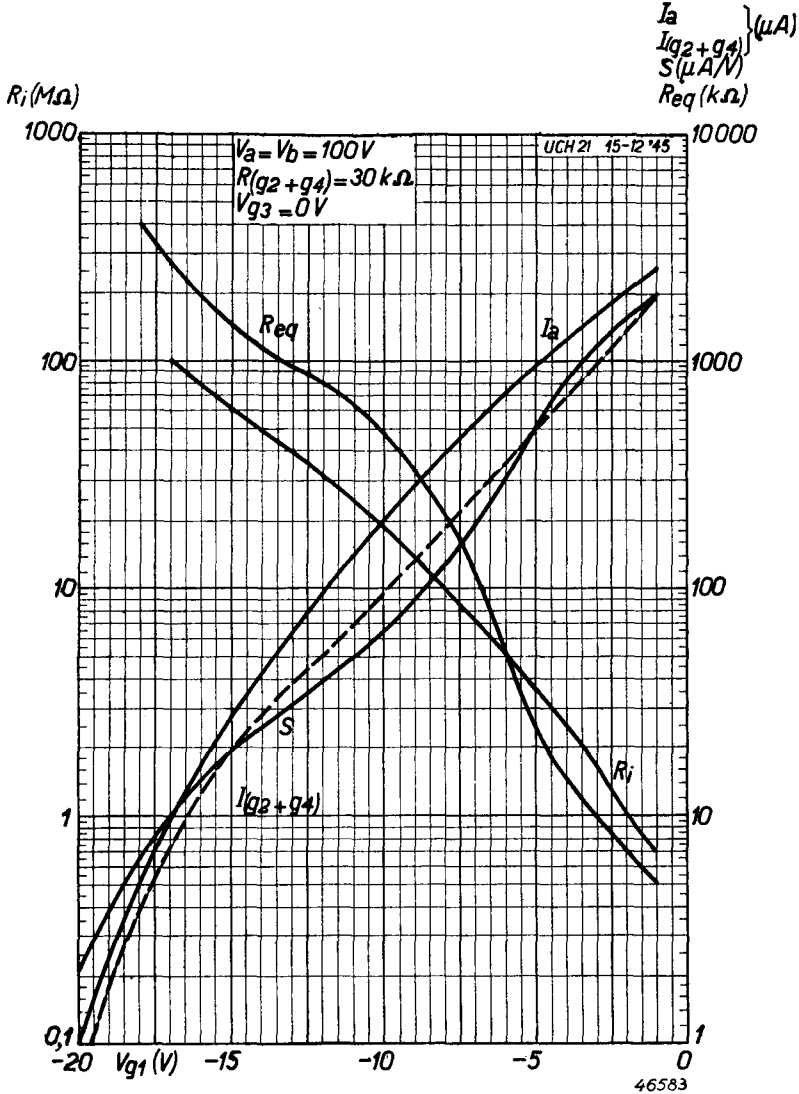

UCH 21 24-7-46
I_a(μA)
10000
1000
100
10
1
V_a = 100 – 200 V
V_{g3} = 0 V
V_b = 200 V
$R_{g2,4}$ = 30 kΩ
V_b = 100 V
$R_{g2,4}$ = 30 kΩ
$V_{g2,4}$ = 200 V
125 V
150 V
125 V
100 V
75 V
50 V
25 V
–40
V_{g1} (V)
–30
–20
–10
0
47888

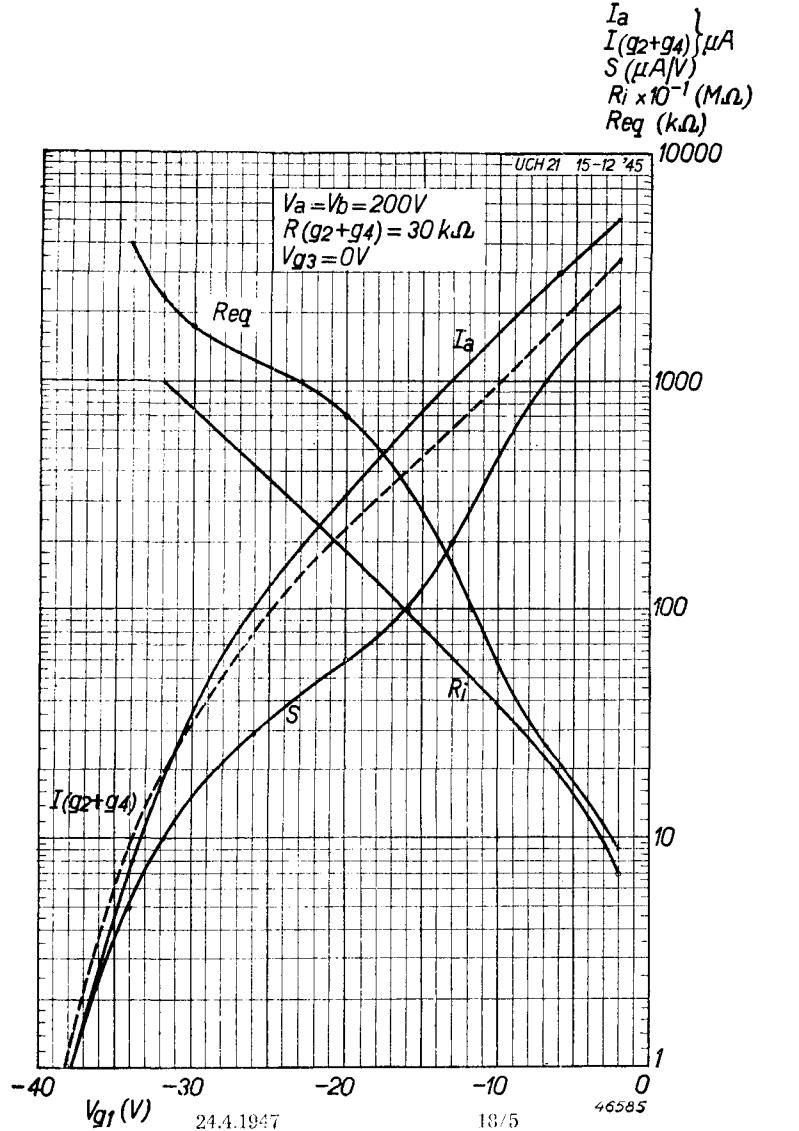

S (µA/V)
10 000
1000
100
10
1
UCH 21 24-9-'46
V_a = 100–200 V
V_{g3} = 0 V
V_b = 200 V
$R_{g2,4}$ = 30 kΩ
V_b = 100 V
$R_{g2,4}$ = 30 kΩ
$V_{g2,4}$ = 200V
175V
150V
125V
100V
75V
50V
25V
−40
V_{g1} (V)
−30
−20
−10
0
47826

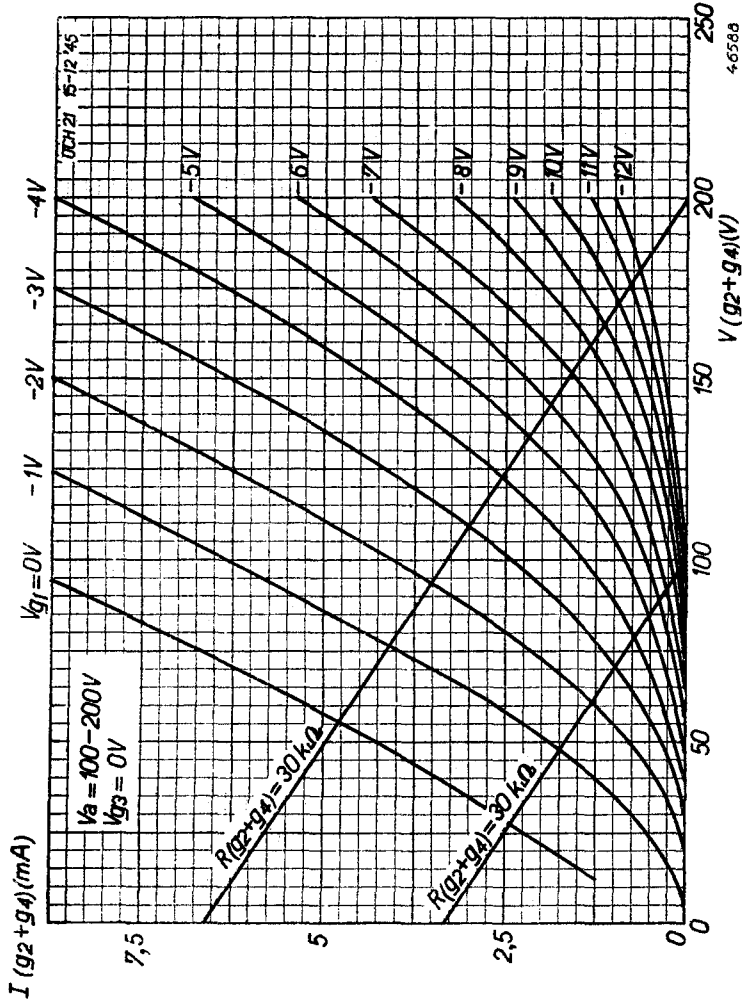

UCH 21 15-12 '45
46587
V_{g1}=0V
-0,5V
-1,0V
-1,5V
-2,0V
-2,5V
-3,0V
-3,5V
-4,0V
-5,0V
-6,0V
-8,0V
-10V
$V_{(g2+g4)}$= 100V
V_{g3} = 0V
W_a= 1,5W
I_a (mA)
V_a (V)
0
5
10
15
100
200
300
400
500

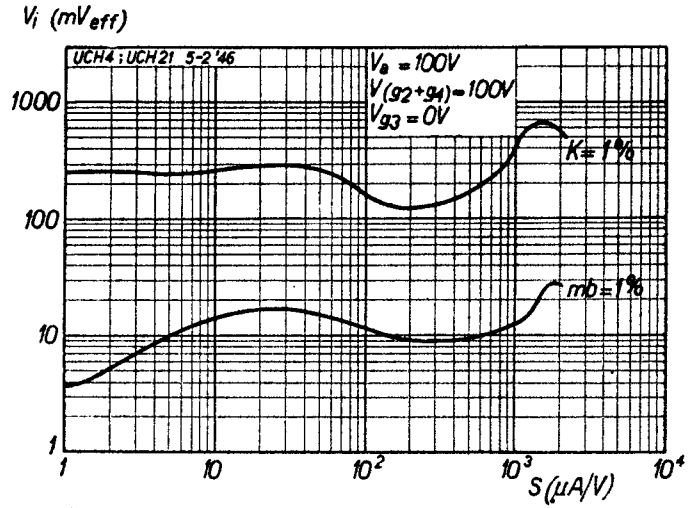
UCH 21 "Miniwatt"

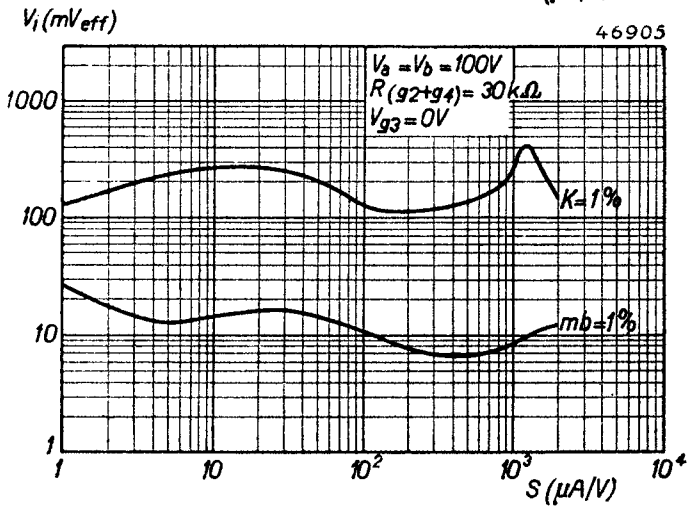


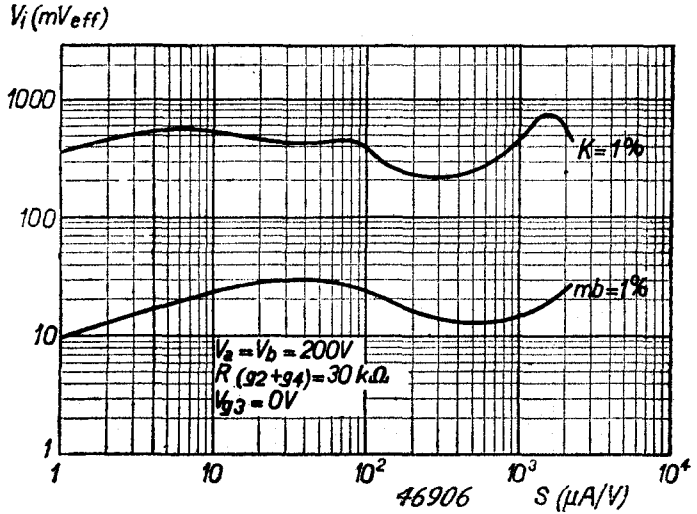

Ia
Ig2+g4 } (μA)
S (μA/V)
Req (kΩ)
Ri (MΩ)
1000
100
10
1
0,1
10000
1000
100
10
1
UCH 21 15-12-45
Va = Vb = 100 V
R(g2+g4) = 30 kΩ
Vg3 = 0 V
Req
Ia
S
Ig(2+g4)
Ri
-20
Vg1 (V)
-15
-10
-5
0
46583


Ia
I(g2+g4) } µA
S (µA/V)
Ri x 10⁻¹ (MΩ)
Req (kΩ)
UCH 21 15-12 '45
Va = Vb = 200V
R (g2+g4) = 30 kΩ
Vg3 = 0V
Req
Ia
Ri
S
I(g2+g4)
10000
1000
100
10
1
-40
-30
-20
-10
0
Vg1 (V)
46585

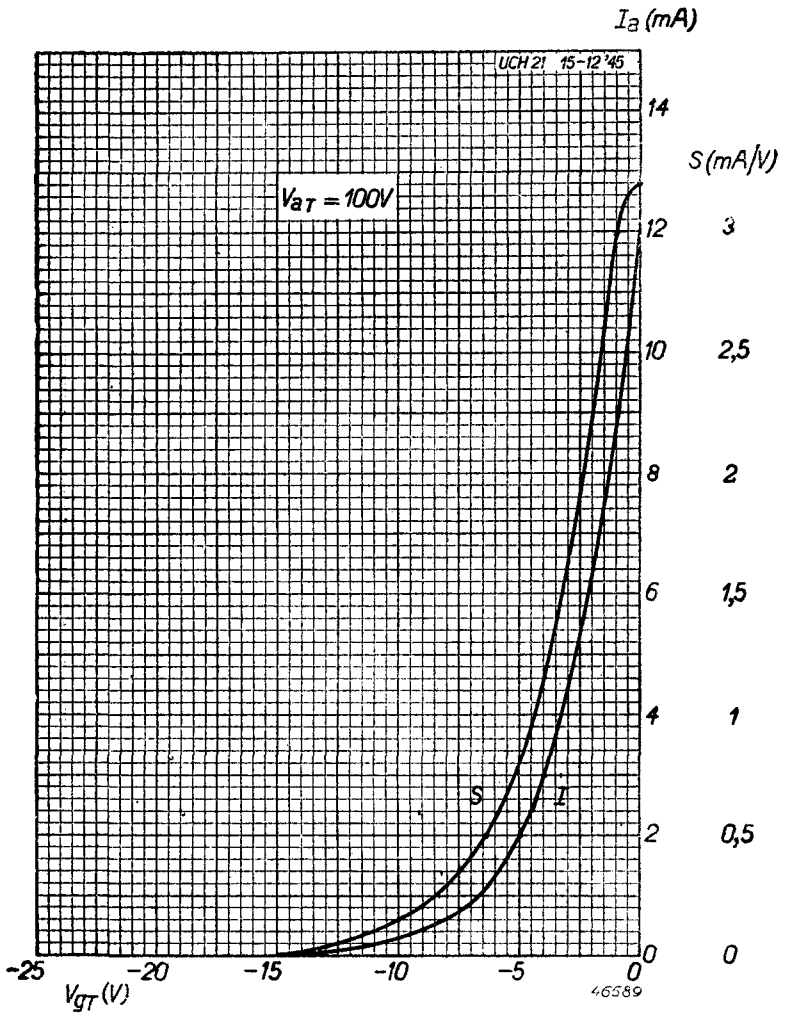

UCH 21 15-12'45
4588
I (g2+g4)(mA)
V (g2+g4)(V)
Va = 100–200V
Vg3 = 0V
Vg1=0V
-1V
-2V
-3V
-4V
-5V
-6V
-7V
-8V
-9V
-10V
-11V
-12V
R(g2+g4)=30 kΩ
R(g2+g4)=30 kΩ
7,5
5
2,5
0
0
50
100
150
200
250

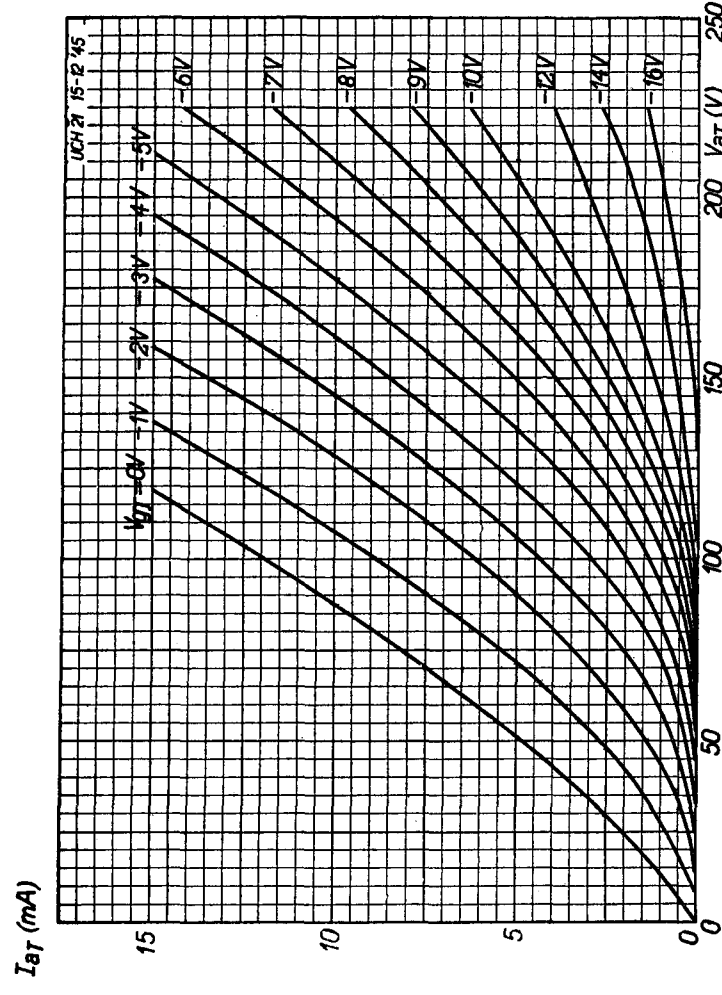

V_i (mV$_{eff}$)
UCH4 ; UCH21 5-2'46
V_a = 100V
$V_{(g2+g4)}$ = 100V
V_{g3} = 0V
K = 1%
mb = 1%
1000
100
10
1
1
10
10^2
10^3
10^4
S (µA/V)


V_i (mV$_{eff}$)
46905
V_a = V_b = 100V
$R_{(g2+g4)}$ = 30 kΩ
V_{g3} = 0V
K = 1%
mb = 1%
1000
100
10
1
1
10
10^2
10^3
10^4
S (µA/V)

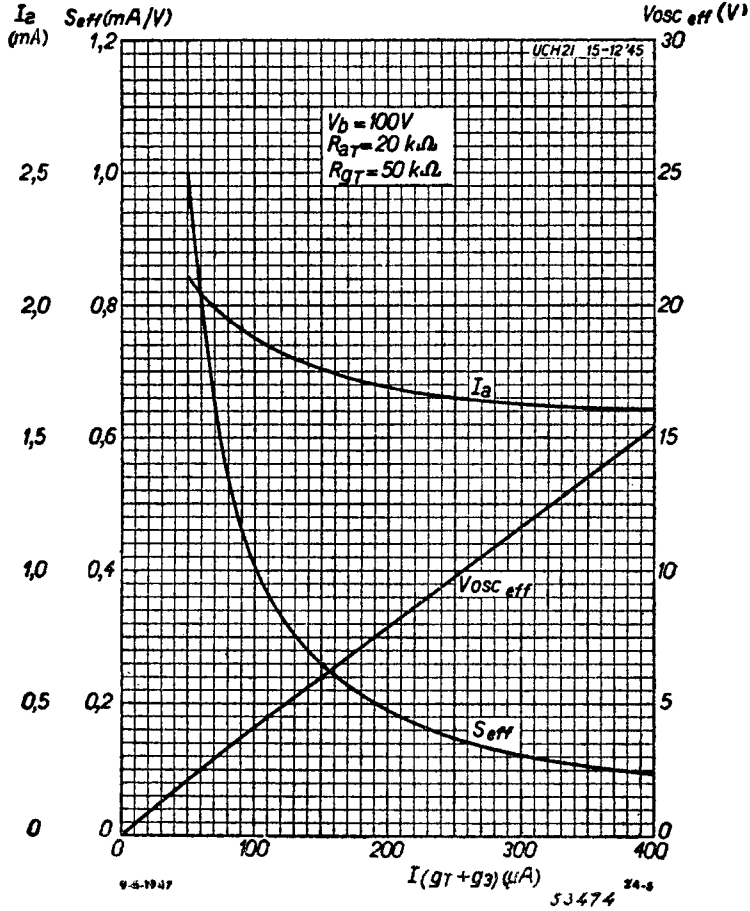

Vi (mVeff)
1000
100
10
1
1
10
10²
10³
10⁴
K=1%
mb=1%
Va = Vb = 200V
R (g2+g4)=30 kΩ
Vg3 = 0V
46906
S (μA/V)

UCH 21 *"Miniwatt"*

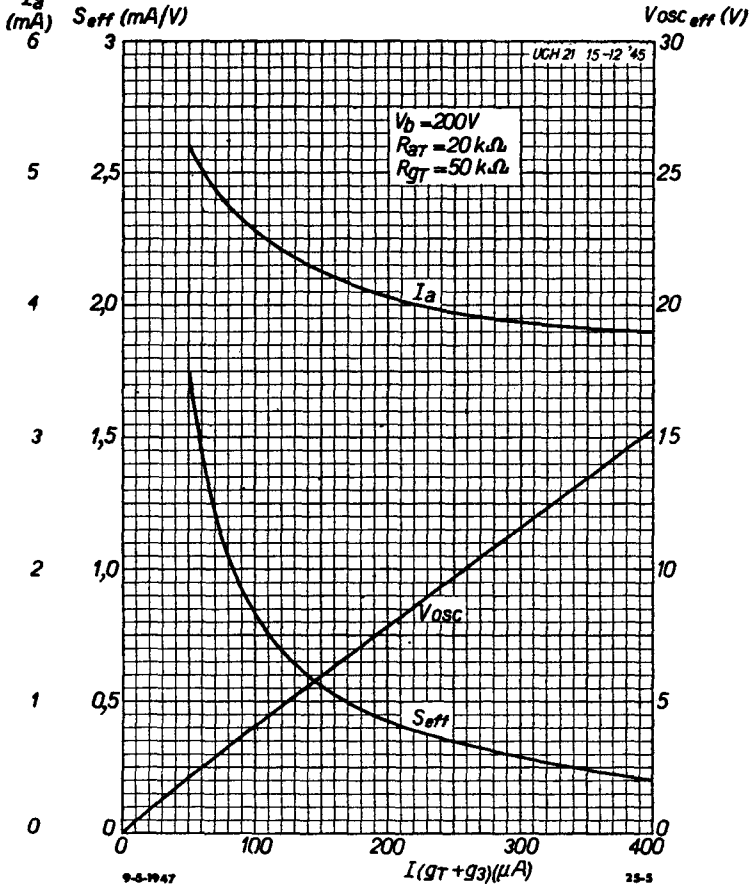



UCH 21 15-12-45
46590
I_{aT} (mA)
V_{aT} (V)
0
5
10
15
50
100
150
200
250
V_{gT} = 0V -1V -2V -3V -4V -5V
-6V
-7V
-8V
-9V
-10V
-12V
-14V
-16V

UCH 21 "Miniwatt"



"Miniwatt" **UCH 21**



PHILIPS

Electronic Tube

HANDBOOK

UCH21

page	sheet	date
1	1	1948.08.18
2	1	1953.12.12
3	2	1948.08.18
4	2	1953.12.12
5	3	1948.08.18
6	3	1953.12.12
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8	4	1953.12.12
9	5	1948.08.18
10	-	1948.10.12
11	5a	1948.08.18
12	6	1948.10.12
13	7	1947.04.24
14	8	1947.04.24
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16	10	1947.05.09
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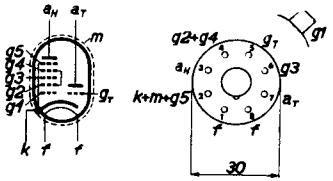
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32, 33	FP	2000-07-01

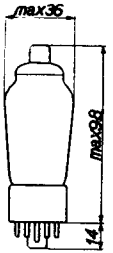
PHILIPS UCH 4

TRIODE-HEPTODE with variable mutual conductance for use as frequency converter, H.F., I.F. and L.F. amplifier and as phase inverter
TRIODE-HEPTODE à pente variable pour utilisation comme changeuse de fréquence, amplificatrice H.F., M.F. et B.F. et comme tube inverseur de phase
TRIODE-HEPTODE mit veränderlicher Steilheit zur Verwendung als Mischröhre, H.F., Z.F. und N.F. Verstärker und als Phasenumkehrröhre

Heating:	indirect by A.C. or D.C.; series supply	
Chauffage:	indirect par C.A. ou C.C.; alimentation en série	Vf = 20 V If = 0.100 A
Heizung:	indirekt durch Wechsel- oder Gleichstrom; Serienspeisung	

Dimensions in mm
Dimensions en mm
Abmessungen in mm





Capacities Capacités Kapazitäten	Heptode section Partie heptode Heptodenteil		Triode section Partie triode Triodenteil	
	Ca =	8,0 pF	Ca =	5,2 pF
	Cag1 <	0,002 pF	Cag =	2,1 pF
	Cg1 =	4,8 pF	Cg =	5,9 pF
	Cg3 =	9,1 pF	Cgf <	0,3 pF
	Cg1g3 <	0,2 pF		
	Cg1f <	0,0015 pF		

Capacities Capacités Kapazitäten	Between heptode and triode section Entre les parties heptode et triode Zwischen Heptoden- und Triodenteil		
		CgTg1H	< 0,1 pF
		CgT+g3	=12,5 pF
		C(gT+g3)g1H	<0,25 pF
		C(gT+g3)aH	< 0,1 pF

For further technical data, refer to type UCH 21
Pour les autres détails techniques voir type UCH 21
Für übrige technischen Daten siehe Typ UCH 21



UCH4

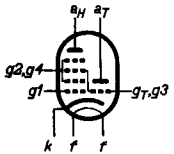
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3	FP	2000.06.13

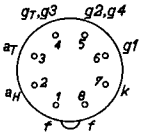
UCH 41

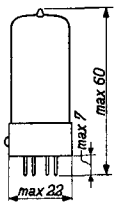
TRIODE-HEXODE for use as frequency changer
TRIODE-HEXODE pour l'utilisation comme changeuse de fréquence
TRIODE-HEXODE zur Verwendung als Mischröhre

Heating:	indirect by A.C. or D.C.; series supply	
Chauffage:	indirect par C.A. ou C.C.; alimentation en série	Vf = 14 V If = 0,100 A
Heizung:	indirekt durch Wechsel- oder Gleichstrom; Serienspeisung	

Dimensions in mm
Dimensions en mm
Abmessungen in mm







Capacities Capacités Kapazitäten	Hexode section Partie hexode Hexodenteil	Triode section Partie triode Triodenteil
	Ca = 6,0 pF	CgT+g3 = 4,9 pF
	Cg1 = 3,4 pF	Ca = 1,5 pF
	Cag1 < 0,1 pF	C(gT+g3)a = 1,2 pF
	Cg1f < 0,15 pF	

Between hexode and triode sections
Entre les parties hexode et triode
Zwischen Hexoden- und Triodenteil

CglH-(gT+g3) < 0,35 pF
CaH-(gT+g3) < 0,2 pF

TRIODE-HEXODE

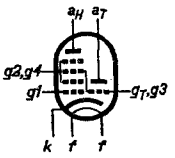
Heating : indirect; series supply V_f = 14 V
Chauffage : indirect; alimentation- série I_f =100 mA
Heizung : indirekt; Serienspeisung

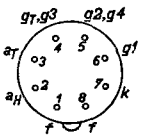
Base, culot, Sockel: RIMLOCK

Overall length: 60 mm
See pages 203 and 252

Hauteur totale: 60 mm
Voir pages 203 et 252

Gesamthöhe : 60 mm
Siehe S. 203 und 252





Capacitances	C_{g1}	= 3,4 pF	$C_{gT,g3}$	=	4,9 pF
Capacités	C_{aH}	= 6,0 pF	C_{aT}	=	1,5 pF
Kapazitäten	C_{aH-g1}	< 0,1 pF	$C_{aT-gT,g3}$	=	1,2 pF
	C_{g1f}	< 0,15 pF	$C_{g1-gT,g3}$	<	0,35 pF
			$C_{aH-gT,g3}$	<	0,2 pF

Operating characteristics of the triode section as oscillator
Caractéristiques d'utilisation de la partie triode en oscillatrice
Betiebsdaten des Triodenteiles als Oszillator

V_b	= 100	170	200	V
R_a	= 10	10	20	kΩ
I_a	= 2,8	4,9	4,6	mA
$R_{gT,g3}$	= 20	20	20	kΩ
$I_{gT,g3}$	= 200	320	360	µA
Vosc	= 4	7	8	Veff
Seff	= 0,56	0,6	0,5	mA/V

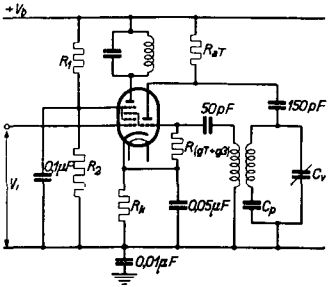
Limiting values of the triode section
Caractéristiques limites de la partie triode
Grenzdaten des Triodenteiles

V_{a_o}	= max. 550 V	I_k	= max. 5,5 mA
V_a	= max. 175 V	$V_g(I_g=+0,3\mu A)$	= max. -1,3 V
W_a	= max. 0,75 W	R_g	= max. 3 MΩ

UCH 41

"Miniwatt"

Operating characteristics of the hexode section as frequency converter(Vg2+g4 through a potentiometer)
Données caractéristiques de la partie hexode comme changeuse de fréquence (Vg2 + g4 par potentiomètre)
Betriebsdaten des Hexodenteiles als Mischröhre (Vg2+g4 über einen Spannungsteiler)



Va=Vb	=	100		170		200		V
R1	=	22		22		22		kΩ
R2	=	47		47		47		kΩ
Rk	=	200		200		225		Ω
RgT+g3	=	20		20		20		kΩ
IgT+g3	=	200		320		360		µA
Vg1	=	-1,0	-14	-1,8	-22	-2,2	-27	V
Vg2+g4	=	53	68	87	116	105	136	V
Ia	=	1,0	-	2,2	-	3,0	-	mA
Ig2+g4	=	1,0	-	1,9	-	2,1	-	mA
Sc	=	320	3,2	450	4,5	500	5	µA/V
Ri	=	1,4	> 5	1,2	> 5	1,0	> 5	MΩ
Req	=	115	-	145	-	220	-	kΩ

Operating characteristics of the hexode section as frequency changer(screen-grid supply through a potentiometer R1,R2)
Caractéristiques d'utilisation de la partie hexode en changeuse de fréquence(alimentation de la grille-écran à travers un potentiomètre R1,R2)
Betriebsdaten des Hexodenteiles als Mischröhre(Schirmgitterspannung über einen Spannungsteiler R1,R2)

$V_a=V_b$	=	100		170		200	V
R_1	=	22		22		22	kΩ
R_2	=	47		47		47	kΩ
R_k	=	200		200		225	Ω
$R_{gT,g3}$	=	20		20		20	kΩ
$I_{gT,g3}$	=	200		320		360	µA
V_{g1}	=	-1,0	-14	-1,8	-22	-2,2	-27 V
$V_{g2,g4}$	=	53	68	87	116	105	136 V
I_a	=	1,0	-	2,2	-	3,0	- mA
$I_{g2,g4}$	=	1,0	-	1,9	-	2,1	- mA
S_c	=	320	3,2	450	4,5	500	5 µA/V
R_i	=	1,4	>5	1,2	>5	1,0	>5 MΩ
R_{eq}	=	115	-	145	-	220	- kΩ

Limiting values of the hexode section
Caractéristiques limites de la partie hexode
Grenzdaten des Hexodenteiles

V_{a_o}	= max.	550 V
V_a	= max.	250 V
W_a	= max.	0,8 W
$V_{g2,g4_o}$	= max.	550 V
$V_{g2,g4}$	= max.	125 V
$W_{g2,g4}$	= max.	0,3 W
I_k	= max.	7 mA
$V_{g1}(I_{g1}=+0,3\mu A)$	= max.	-1,3 V
R_{g1}	= max.	3 MΩ
R_{g3}	= max.	3 MΩ
R_{kf}	= max.	20 kΩ
V_{kf}	= max.	150 V

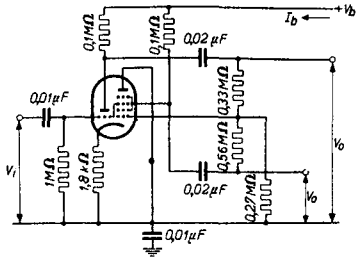
Operating characteristics of the triode section as oscillator
Caractéristiques d'utilisation de la partie triode comme oscillatrice
Betriebsdaten des Triodenteiles als Oszillator

Vb	=	100	170	200	V
Ra	=	10	10	20	kΩ
Ia	=	2,8	4,9	4,6	mA
Rgf+g3	=	20	20	20	kΩ
Igf-g3	=	200	320	360	µA
Vosc	=	4	7	8	V_{eff}
S_{eff}	=	0,56	0,6	0,5	mA/V

Typical characteristics of the triode section
Caractéristiques typiques de la partie triode
Kenndaten des Triodenteiles

Va	= 100	V
Vg	= 0	V
Ia	= 8,5	mA
S	= 1,9	mA/V
µ	= 19	

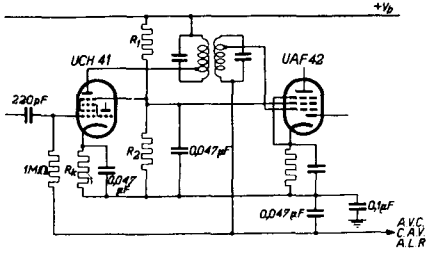
Operating characteristics as phase inverter
Caractéristiques d'utilisation comme tube inverseur de phase
Betriebsdaten als Phasenumkehrröhre



UCH 41 "Miniwatt"

Vb (V)	Ib (mA)	Vo/Vi	d_{tot} (%) (Vo=5V_{eff})	d_{tot} (%) (Vo=10V_{eff})
100	1,2	10	1,5	
170	2,0	10	1,6	1,8

Operating characteristics of the hexode section as frequency changer(screen grids of UCH 41 and UAF 42 fed from a common potentiometer)
Caractéristiques d'utilisation de la partie hexode comme changeuse de fréquence(grilles-écran des tubes UCH41 et UAF42 connectées à un potentiomètre commun)
Betriebsdaten des Hexodenteiles als Mischröhre (die Schirmgitter der Röhren UCH 41 und UAF 42 verbunden mit einem gemeinsamen Spannungsteiler)



Va=Vb	=	100		170		V
R1	=	12		12		kΩ
R2	=	27		27		kΩ
Rk	=	200		200		Ω
RgT+g3	=	20		20		kΩ
IgT+g3	=	200		320		µA
Vg1	=	-1,0	-10,5	-1,8	-18	V
Vg2+g4	=	53	69	87	117	V
Ia	=	1,0	-	2,2	-	mA
Ig2+g4	=	1,0	-	1,9	-	mA
Sc	=	320	10	450	11	µA/V
Ri	=	1,4	-	1,2	-	MΩ
Req	=	115	-	145	-	kΩ

Operating characteristics of the hexode section as frequency changer(screen grids of UCH 41 and UF 41 fed from a common potentiometer)
Caractéristiques d'utilisation de la partie hexode comme changeuse de fréquence(grilles-écran des tubes UCH41 et UF41 connectées à un potentiomètre commun)
Betriebsdaten des Hexodenteiles als Mischröhre (die Schirmgitter der Röhren UCH 41 und UF 41 verbunden mit einem gemeinsamen Spannungsteiler)

Va=Vb	=	100		170	V
R1	=	12		12	kΩ
R2	=	27		27	kΩ
Rk	=	200		200	Ω
RgT+g3	=	20		20	kΩ
IgT+g3	=	200		320	µA
Vg1	=	-1,0	-12	-1,8	-20	V
Vg2+g4	=	53	69	87	117	V
Ia	=	1,0	-	2,2	-	mA
Ig2+g4	=	1,0	-	1,9	-	mA
Sc	=	320	5,5	450	7	µA/V
Ri	=	1,4	>5	1,2	>5	MΩ
Req	=	115	-	145	-	kΩ

Limiting values of the hexode section
Caractéristiques limites de la partie hexode
Grenzdaten des Hexodenteiles

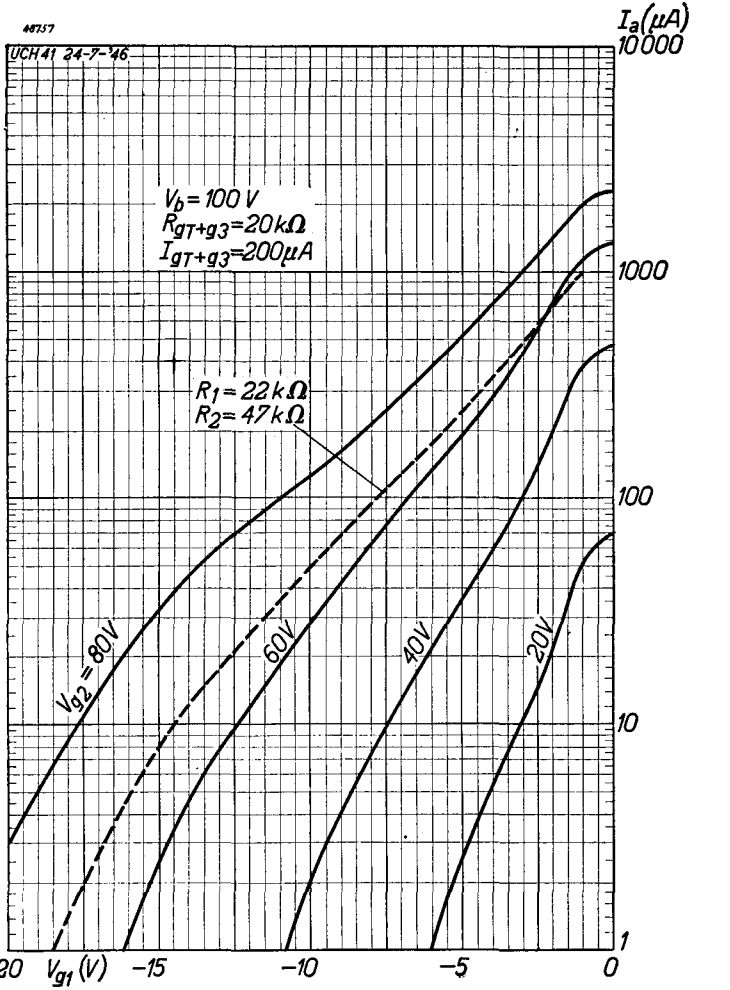
Va_o = max. 550 V	$V(g2+g4)_o$	= max.	550 V
Va = max. 250 V	Vg2+g4	= max.	125 V
Wa = max. 0,8 W	Wg2+g4	= max.	0,3 W
Ik = max. 7 mA	Vg1 (Ig1=+0,3µA)	= max.	-1,3 V
Rg1 = max. 3 MΩ	Rfk	= max.	20 kΩ
Rg3 = max. 3 MΩ	Vfk	= max.	150 V

Limiting values of the triode section
Caractéristiques limites de la partie triode
Grenzdaten des Triodenteiles

Va_o = max. 550 V	Vg (Ig =+0,3 µA)	= max.	-1,3 V
Va = max. 175 V	Rg	= max.	3 MΩ
Wa = max.0,75 W	Rfk	= max.	20 kΩ
Ik = max. 5,5 mA	Vfk	= max.	150 V

UCH 41

"Miniwatt"





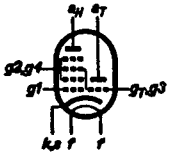
UCH41

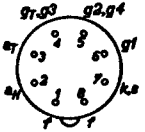
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3	2	1948.09.01
4	2	1953.12.12
5	3	1949.04.20
6	3a	1949.04.20
7	3b	1949.11.11
8	4	1949.11.11
9	FP	1999.10.12

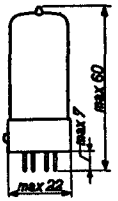
TRIODE-HEXODE for use as frequency changer and phase inverter
TRIODE-HEXODE pour l'utilisation comme changeuse de fréquence et comme tube inverseur de phase
TRIODE-HEXODE zur Verwendung als Mischröhre und Phasenumkehrröhre

Heating:	indirect by A.C. or D.C.; series supply	
Chauffage:	indirect par C.A. ou C.C.; alimentation en série	Vf = 14 V If = 0,1 A
Heizung:	indirekt durch Wechsel- oder Gleichstrom; Serienspeisung	

Dimensions in mm
Dimensions en mm
Abmessungen in mm







Capacities Capacités Kapazitäten	Hexode section Partie hexode Hexodenteil	Triode section Partie triode Triodenteil
	Cgl = 3,8 pF	C(gT+g3) = 5,5 pF
	Ca = 9,2 pF	Ca = 2,3 pF
	Cagl < 0,1 pF	Ca(gT+g3) = 1,2 pF
	Cglf < 0,15 pF	

Between hexode and triode sections
Entre les parties hexode et triode
Zwischen Hexoden- und Triodenteil

C(gT+g3)glH < 0,35 pF
C(gT+g3)aH < 0,2 pF

PHILIPS UCH 42

TRIODE-HEXODE for use as frequency changer and phase inverter
TRIODE-HEXODE pour utilisation en changeuse de fréquence et comme tube inverseur de phase
TRIODE-HEXODE zur Verwendung als Mischröhre und Phasenumkehrröhre

Heating : indirect; series supply
Chauffage: indirect; alimentation- série
Heizung : indirekt; Serienspeisung

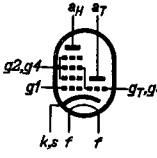
V_f = 14 V
I_f = 100 mA

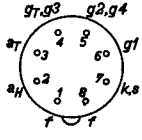
Base, culot, Sockel: RIMLOCK

Overall length: 60 mm
See pages 203 and 252

Hauteur totale: 60 mm
Voir pages 203 et 252

Gesamthöhe : 60 mm
Siehe S.203 und 252





Capacitances Capacités Kapazitäten	C_{g1}	= 4,0 pF	$C_{gT,g3}$	= 5,9 pF
	C_a	= 9,4 pF	C_{aT}	= 2,4 pF
	C_{aH-g1}	< 0,1 pF	$C_{aT-gT,g3}$	= 1,3 pF
	C_{g1f}	<0,15 pF	$C_{g1-gT,g3}$	< 0,35 pF
			$C_{aH-gT,g3}$	< 0,2 pF

Triode section;Partie triode;Triodenteil

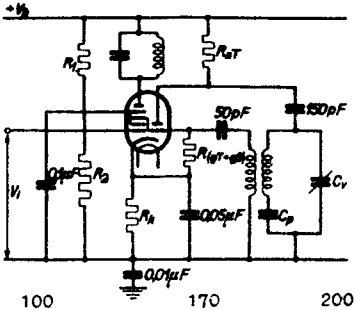
Typical characteristics
Caractéristiques types
Kenndaten

V_a = 100 V
V_g = 0 V
I_a = 10 mA
S = 2,8 mA/V
μ = 16

Operating characteristics as oscillator
Caractéristiques d'utilisation en oscillatrice
Betriebsdaten als Oszillator

V_b	=	100		170		200	V
R_a	=	10		10		22	kΩ
Vosc	=	4		8		8	Veff
$R_{gT,g3}$	=	22	47	22	47	22	47	kΩ
$I_{gT,g3}$	=	175	100	350	200	350	200	µA
I_a	=	3,4	3,1	6,5	5,7	5,5	5,2	mA
Seff	=	0,7	0,6	0,75	0,65	0,65	0,55	mA/V

Operating characteristics of the hexode section as frequency changer
Caractéristiques d'utilisation de la partie hexode comme changeuse de fréquence
Betriebsdaten des Hexodenteiles als Mischröhre

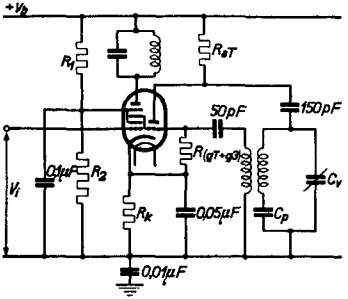


Va=Vb =	100		170		200		V
R1 =	18		18		18		kΩ
R2 =	27		27		27		kΩ
Rk =	180		180		180		Ω
RgT+g3=	22		22		22		kΩ
IgT+g3=	175[1]		350[1]		350[1]		µA
Vg1 =	-1,0	-13,5	-1,85	-25	-2	-27,5	V
Vg2+g4=	43	57	70	100	85	119	V
Ia =	1,2	-	2,1	-	3,0	-	mA
Ig2+g4=	1,46	-	2,6	-	3,0	-	mA
Sc =	530	5,3	670	6,7	750	7,5	µA/V
Ri =	>1	>5	>1	>5	>1	>5	MΩ
Req =	60	-	65	-	75	-	kΩ

[1]) If RgT+g3 is chosen to 47 kΩ, IgT+g3 has to be adjusted to 200 µA at Va = 200 V or 170 V and to 100 µA at Va = 100 V
Si RgT+g3 est choisie 47 kΩ, IgT+g3 doit être réglé à 200 µA avec Va = 200 V ou 170 V et à 100 µA avec Va = 100 V.
Wenn RgT+g3 zu 47 kΩ gewählt wird, soll IgT+g3 auf 200 µA eingestellt werden wenn Va = 200V oder 170V und auf 100 µA wenn Va = 100 V

Hexode section;Partie hexode;Hexodenteil

Operating characteristics as frequency changer(screen-grid supply through a potentiometer R_1,R_2)
Caractéristiques d'utilisation en changeuse de fréquence (alimentation de la grille-écran à travers un potentiomètre R_1,R_2)
Betriebsdaten als Mischröhre(Schirmgitterspannung über einen Spannungsteiler R_1,R_2)



$V_a=V_b$ =	100		170		200		V
R_1 =	18		18		18		kΩ
R_2 =	27		27		27		kΩ
R_k =	180		180		180		Ω
$R_{gT,g3}$=	22		22		22		kΩ
$I_{gT,g3}$=	175[1]		350[1]		350[1]		µA
V_{g1} =	-1,0	-13,5	-1,85	-25	-2	-27,5	V
$V_{g2,g4}$=	43	57	70	100	85	119	V
I_a =	1,2	-	2,1	-	3,0	-	mA
$I_{g2,g4}$=	1,46	-	2,6	-	3,0	-	mA
S_c =	530	5,3	670	6,7	750	7,5	µA/
R_i =	>1	>5	>1	>5	>1	>5	MΩ
R_{eq} =	60	-	65	-	75	-	kΩ

[1])For $R_{gT,g3}$=47 kΩ, $I_{gT,g3}$ should be adjusted to 200 µA at V_a=200 V or 170 V and to 100 µA at V_a = 100 V

Pour $R_{gT,g3}$=47 kΩ, $I_{gT,g3}$ sera réglé à 200 µA avec V_a=200 V ou 170 V et à 100 µA avec V_a=100 V

Für $R_{gT,g3}$=47 kΩ,ist $I_{gT,g3}$ auf 200µA einzustellen wenn V_a=200V oder 170V und auf 100µA wenn V_a=100 V

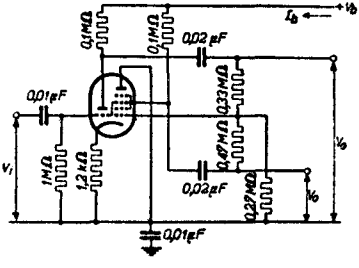
Typical characteristics of the triode section
Caractéristiques typiques de la partie triode
Kenndaten des Triodenteiles

Va	=	100 V
Vg	=	0 V
Ia	=	10 mA
S	=	2,8 mA/V
μ	=	22

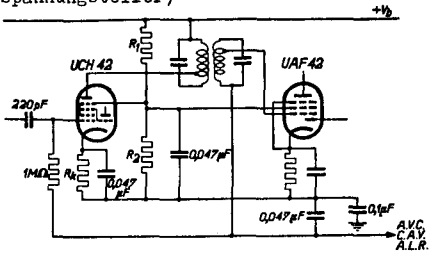
Operating characteristics of the triode section as oscillator
Caractéristiques d'utilisation de la partie triode comme oscillatrice
Betriebsdaten des Triodenteiles als Oszillator

Vb	=	100		170		200	V
Ra	=	10		10		22	kΩ
V_{osc}	=	4		8		8	V_{eff}
RgT+g3	=	22	47	22	47	22 47	kΩ
IgT+g3	=	175	100	350	200	350 200	μA
Ia	=	3,4	3,1	6,5	5,7	5,5 5,2	mA
S_{eff}	=	0,7	0,6	0,75	0,65	0.65 0,55	mA/V

Operating characteristics as phase inverter
Caractéristiques d'utilisation comme tube inverseur de phase
Betriebsdaten als Phasenumkehrröhre



Operating characteristics as frequency changer(screen grids of UCH 42 and UAF 42 fed from a common potentiometer)
Caractéristiques d'utilisation changeuse de fréquence (grilles-écran des tubes UCH 42 et UAF 42 connectées à un potentiomètre commun)
Betriebsdaten als Mischröhre (die Schirmgitter der Röhren UCH 42 und UAF 42 verbunden mit einem gemeinsamen Spannungsteiler)



$V_a=V_b$	=	170	100		V
R_1	=	15	15		kΩ
R_2	=	22	22		kΩ
R_k	=	180	180		Ω
$R_{gT,g3}$	=	22	22		kΩ
$I_{gT,g3}$	=	350[1])	175[1])		µA
V_{g1}	=	-1,8 -15,5	-1	-9,6	V
$V_{g2,g4}$	=	70 99	43	58	V
I_a	=	2,1 -	1,2	-	mA
$I_{g2,g4}$	=	2,6 -	1,46	-	mA
S_c	=	670 20	530	14	µA/V
R_i	=	>1 >4	>1	>2	MΩ
R_{eq}	=	66 -	60	-	kΩ

[1]) For $R_{gT,g3}$=47 kΩ, $I_{gT,g3}$ should be adjusted to 200 µA at V_a=200 V or 170 V and to 100 µA at V_a = 100 V

Pour $R_{gT,g3}$=47 kΩ, $I_{gT,g3}$ sera réglé à 200 µA avec V_a=200 V ou 170 V et à 100 µA avec V_a=100 V

Für $R_{gT,g3}$=47 kΩ, ist $I_{gT,g3}$ auf 200 µA einzustellen wenn V_a=200 V oder 170 V und auf 100 µA wenn V_a=100 V

Limiting values of the hexode section
Caractéristiques limites de la partie hexode
Grenzdaten des Hexodenteiles

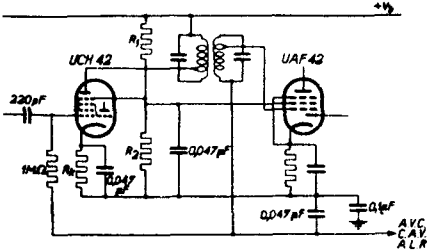
V_{a_o}	= max.	550	V
V_a	= max.	250	V
W_a	= max.	1,5	W
$V_{g2,g4_o}$	= max.	550	V
$V_{g2,g4}$ (I_a = 3 mA)	= max.	125	V
$V_{g2,g4}$ (I_a < 1 mA)	= max.	250	V
$W_{g2,g4}$	= max.	0,3	W
V_{g1} (I_{g1} = +0,3 µA)	= max.	-1,3	V
I_k	= max.	10	mA
R_{g1}	= max.	3	MΩ
R_{g3}	= max.	3	MΩ
R_{kf}	= max.	20	kΩ
V_{kf}	= max.	150	V

Limiting values of the triode section
Caractéristiques limites de la triode
Grenzdaten des Triodenteiles

V_{a_o}	= max.	550	V
V_a	= max.	175	V
W_a	= max.	0,8	W
V_g (I_g = +0,3 µA)	= max.	-1,3	V
I_k	= max.	6	mA
R_g	= max.	3	MΩ

Vb (V)	Ib (mA)	Vo / VI	d_{tot} (%) ($Vo=5V_{eff}$)	d_{tot} (%) ($Vo=10V_{eff}$)
100	1,4	11	1,9	
165	2,4	11	1,5	1,6

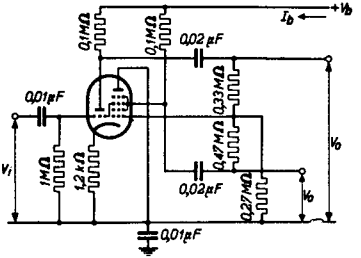
Operating characteristics of the hexode section as frequency changer (screen grids of UCH 42 and UAF 42 fed from a common potentiometer)
Caractéristiques d'utilisation de la partie hexode comme changeuse de fréquence(grilles-écran des tubes UCH42 et UAF42 connectées à un potentiomètre commun)
Betriebsdaten des Hexodenteiles als Mischröhre (die Schirmgitter der Röhren UCH 42 und UAF 42 verbunden mit einem gemeinsamen Spannungsteiler)



Va=Vb	=	170		100		V
R1	=	15		15		kΩ
R2	=	22		22		kΩ
Rk	=	180		180		Ω
RgT+g3	=	22		22		kΩ
IgT+g3	=	350 [2]		175 [2]		µA
Vg1	=	-1,8	-15,5	-1	-9,6	V
Vg2+g4	=	70	99	43	58	V
Ia	=	2,1	-	1,2	-	mA
Ig2+g4	=	2,6	-	1,46	-	mA
Sc	=	670	20	530	14	µA/V
Ri	=	>1	>4	>1	>2	MΩ
Req	=	66	-	60	-	kΩ

[2]) See note [1]) on page 2; voir la note [1]) feuille 2; siehe Fussnote[1]) Seite 2

Operating characteristics as phase inverter
Caractéristiques d'utilisation comme tube inverseur
Betriebsdaten als Phasenumkehrröhre



V_b (V)	I_b (mA)	$\frac{V_o}{V_i}$	d_{tot} (%) (V_o=5Veff)	d_{tot} (%) (V_o=10Veff)
100	1,4	11	1,9	
165	2,4	11	1,5	1,6

Limiting values of the hexode section
Caractéristiques limites de la partie hexode
Grenzdaten des Hexodenteiles

V_{a_o}	= max.	550 V
V_a	= max.	250 V
W_a	= max.	1,5 W
$V_{g2,g4_o}$	= max.	550 V
$V_{g2,g4}(I_a$=3mA)	= max.	125 V
$V_{g2,g4}(I_a$<1mA)	= max.	250 V
$W_{g2,g4}$	= max.	0,3 W
$V_{g1}(I_{g1}$=+0,3µA)	= max.	-1,3 V
I_k	= max.	10 mA
R_{g1}	= max.	3 MΩ
R_{g3}	= max.	3 MΩ
R_{kf}	= max.	20 kΩ
V_{kf}	= max.	150 V

Limiting values of the triode section
Caractéristiques limites de la partie triode
Grenzdaten des Triodenteiles

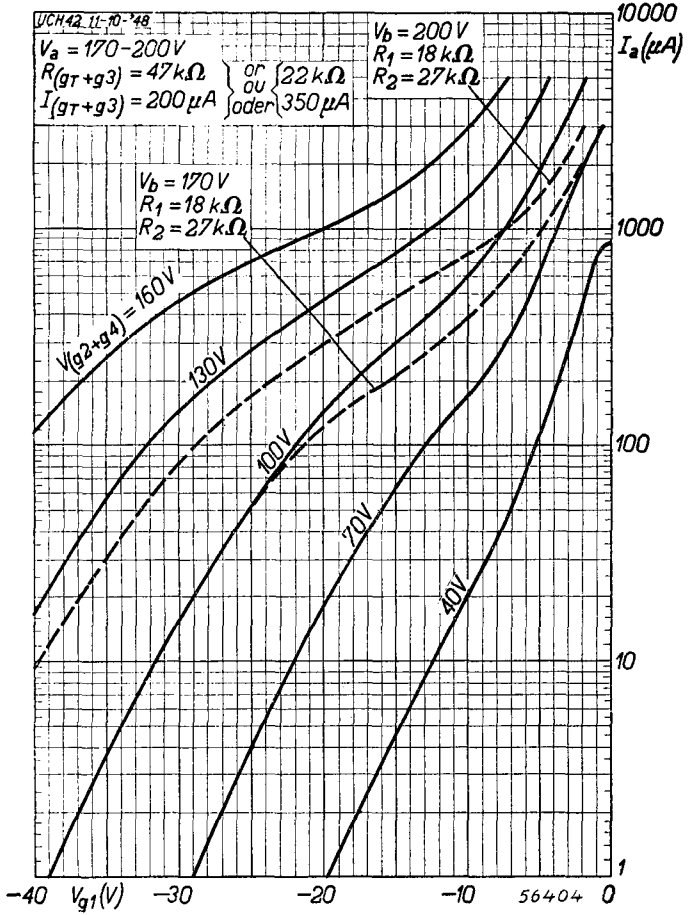
V_{a_o}	= max. 550 V	$V_g(I_g$=+0,3µA)	= max. -1,3 V
V_a	= max. 175 V	I_k	= max. 6 mA
W_a	= max. 0,8 W	R_g	= max. 3 MΩ

Limiting values of the hexode section
Caractéristiques limites de la partie hexode
Grenzdaten des Hexodenteiles

Va_o	= max.	550	V
Va	= max.	250	V
Wa	= max.	1,5	W
$V(g2+g4)_o$	= max.	550	V
Vg2+g4 (Ia = 3 mA)	= max.	125	V
Vg2+g4 (Ia < 1 mA)	= max.	250	V
Wg2+g4	= max.	0,3	W
Vg1 (Ig1 = +0,3 µA)	= max.	-1,3	V
Ik	= max.	7	mA
Rg1	= max.	3	MΩ
Rg3	= max.	3	MΩ
Rfk	= max.	20	kΩ
Vfk	= max.	150	V

Limiting values of the triode section
Caractéristiques limites de la partie triode
Grenzdaten des Triodenteiles

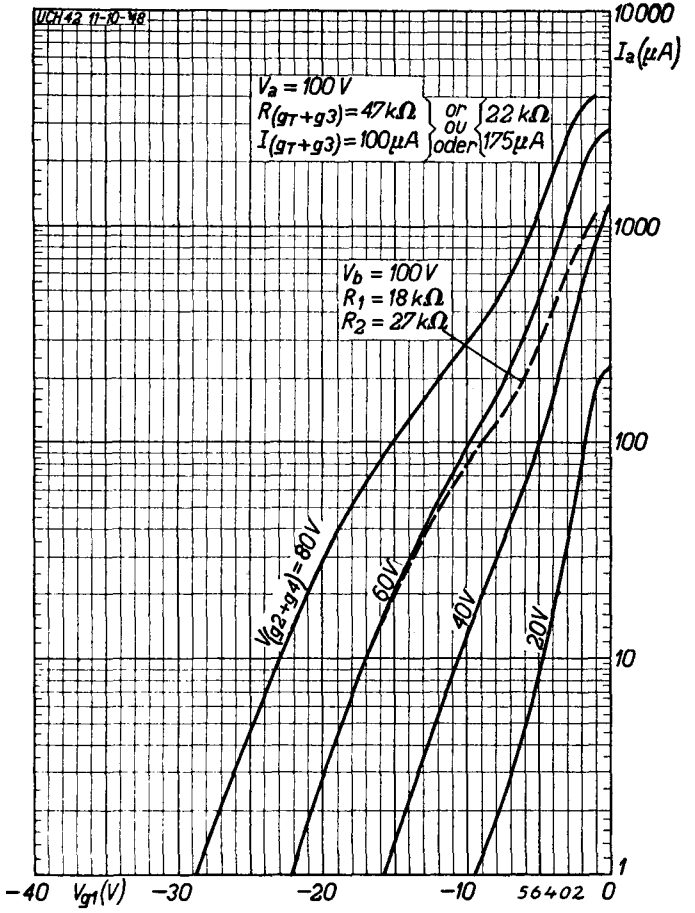
Va_o	= max.	550	V
Va	= max.	175	V
Wa	= max.	0,8	W
Vg (Ig = +0,3 µA)	= max.	-1,3	V
Ik	= max.	6	mA
Rg	= max.	3	MΩ
Rfk	= max.	20	kΩ
Vfk	= max.	150	V

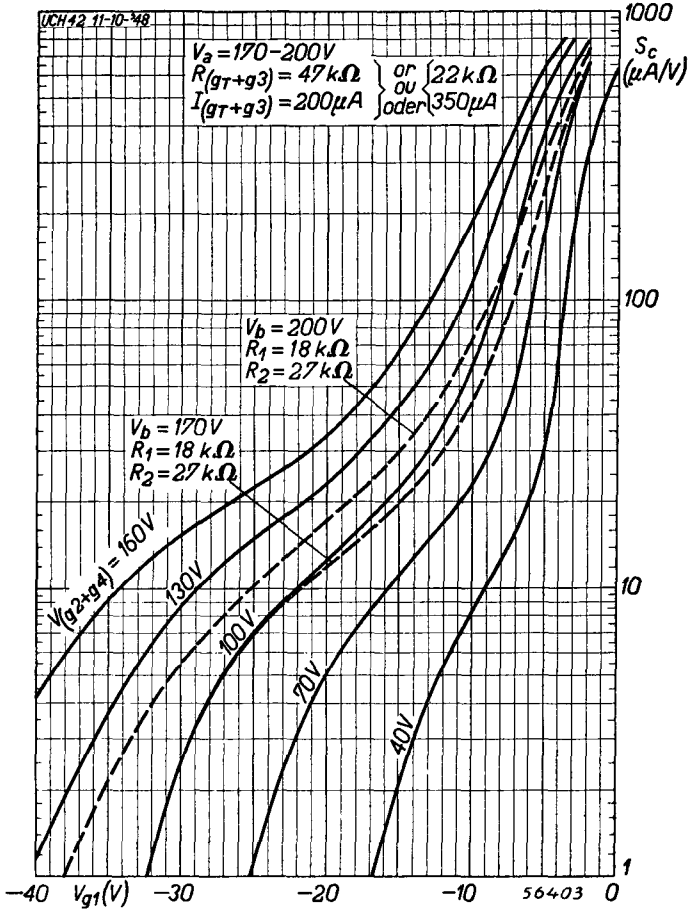

UCH42 11-10-'48
V_a = 170-200V
$R_{(g_T+g3)}$ = 47kΩ
$I_{(g_T+g3)}$ = 200µA
or / ou / oder
22kΩ
350µA
V_b = 200V
R_1 = 18kΩ
R_2 = 27kΩ
V_b = 170V
R_1 = 18kΩ
R_2 = 27kΩ
$V_{(g2+g4)}$ = 160V
130V
100V
70V
40V
10000
1000
100
10
1
I_a(µA)
−40
V_{g1}(V)
−30
−20
−10
0
56404

25.1.1949

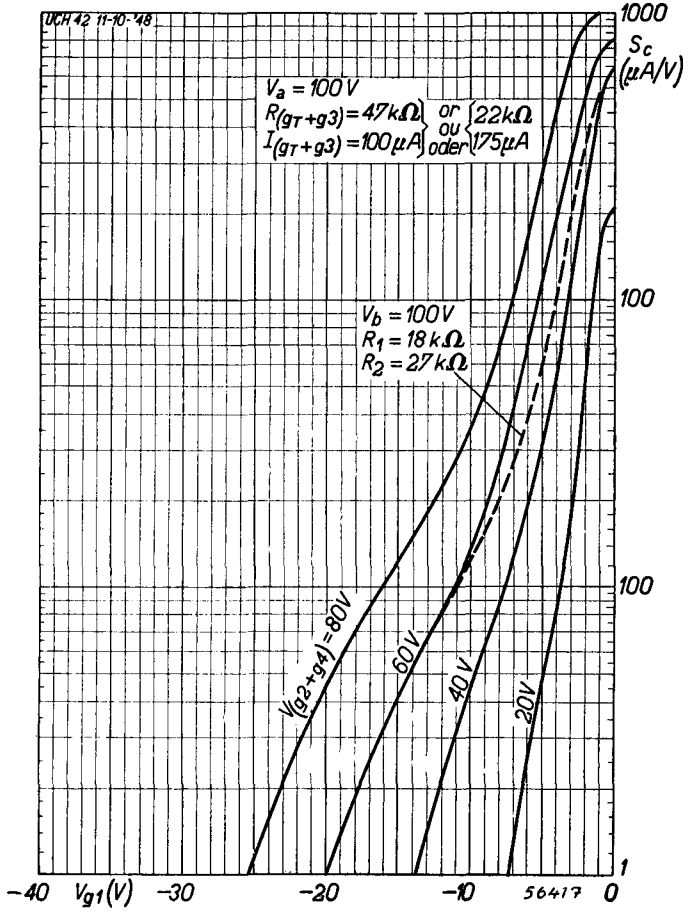
A

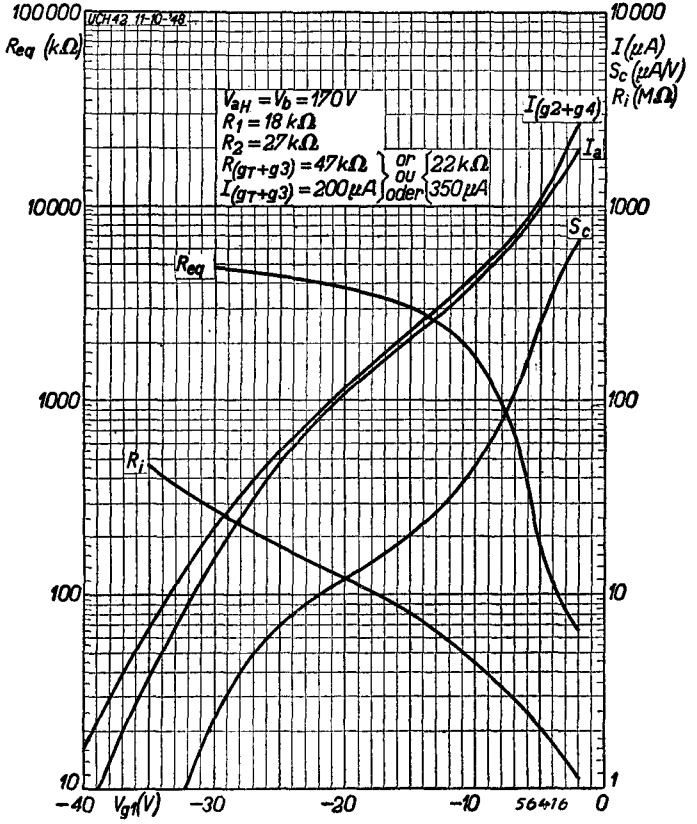
UCH 42 PHILIPS

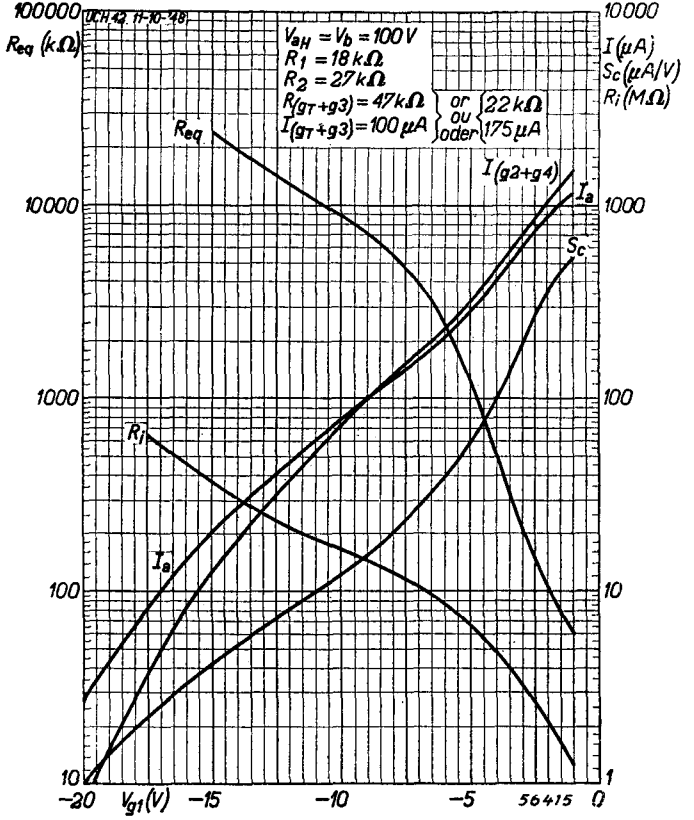


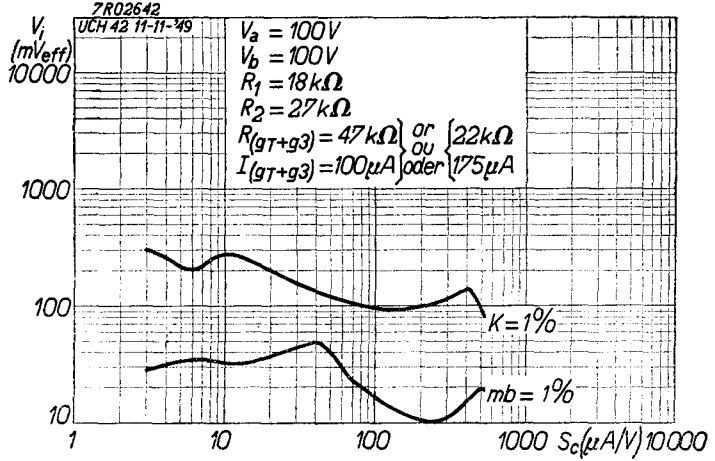

UCH42 11-10-48
V_a = 170–200V
$R_{(g_T+g3)}$ = 47kΩ or 22kΩ
$I_{(g_T+g3)}$ = 200μA oder 350μA
V_b = 200V
R_1 = 18kΩ
R_2 = 27kΩ
V_b = 170V
R_1 = 18kΩ
R_2 = 27kΩ
$V_{(g2+g4)}$ = 160V
130V
100V
70V
40V
1000
100
10
1
S_c (μA/V)
−40
V_{g1}(V)
−30
−20
−10
56403
0

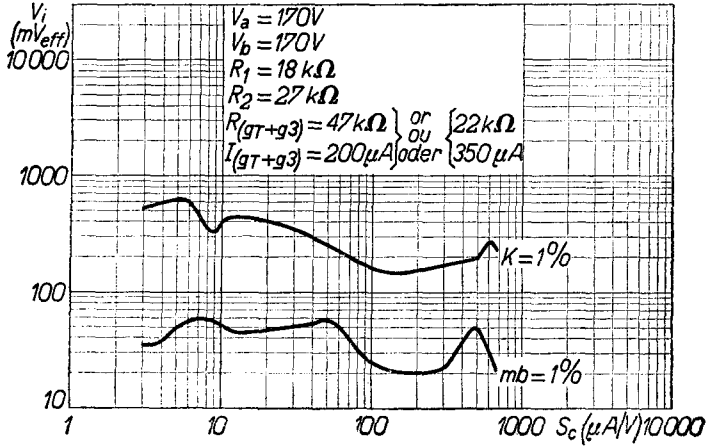
UCH 42 PHILIPS




UCH42 11-10-48
Req (kΩ)
I (μA)
Sc (μA/V)
Ri (MΩ)
VaH = Vb = 170V
R1 = 18 kΩ
R2 = 27 kΩ
R(g1+g3) = 47 kΩ or ou oder 22 kΩ
I(g1+g3) = 200 μA 350 μA
I(g2+g4)
Ia
Sc
Req
Ri
100000
10000
1000
100
10
10000
1000
100
10
1
−40
Vg1(V)
−30
−20
−10
0
56416

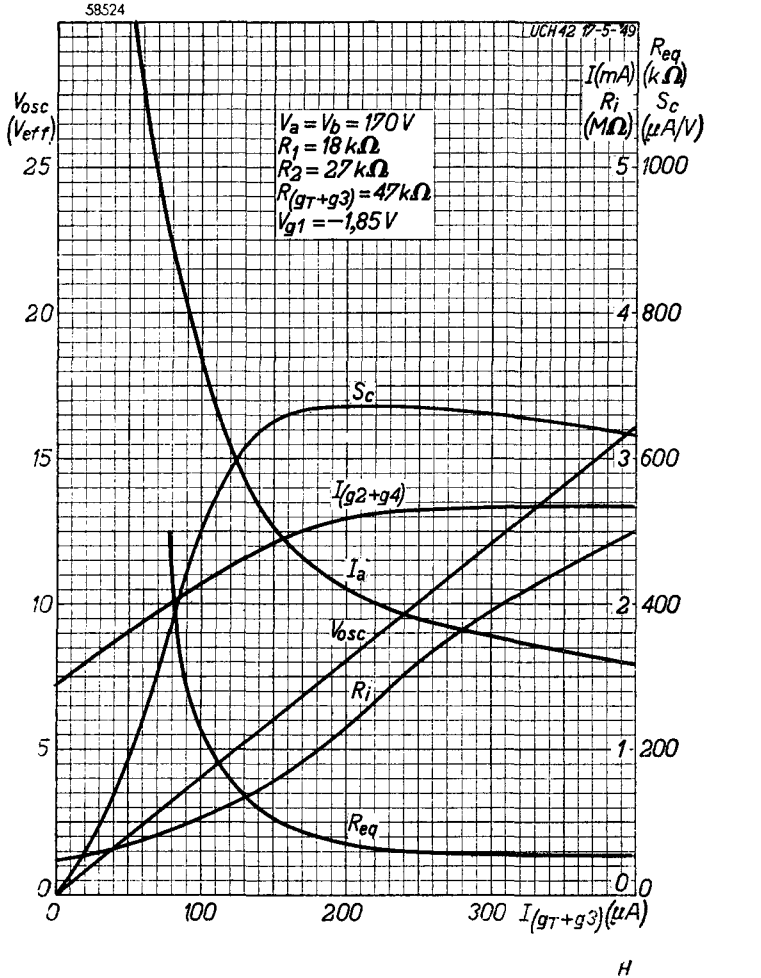

UCH 42 11-10-48
$V_{aH} = V_b = 100\,V$
$R_1 = 18\,k\Omega$
$R_2 = 27\,k\Omega$
$R_{(g_T+g3)} = 47\,k\Omega$ or ou oder $22\,k\Omega$
$I_{(g_T+g3)} = 100\,\mu A$ $175\,\mu A$
R_{eq} ($k\Omega$)
I (μA)
S_c ($\mu A/V$)
R_i ($M\Omega$)
$I_{(g2+g4)}$
I_a
S_c
R_i
I_a
100000
10000
1000
100
10
10000
1000
100
10
1
−20
V_{g1} (V)
−15
−10
−5
56415
0


7R02642
UCH 42 11-11-'49
V_i (mV_{eff})
10000
1000
100
10
1
10
100
1000
S_c ($\mu A/V$)
10000
$V_a = 100V$
$V_b = 100V$
$R_1 = 18k\Omega$
$R_2 = 27k\Omega$
$R_{(gT+g3)} = 47k\Omega$ or ou oder 22kΩ
$I_{(gT+g3)} = 100\mu A$ oder 175μA
K = 1%
mb = 1%

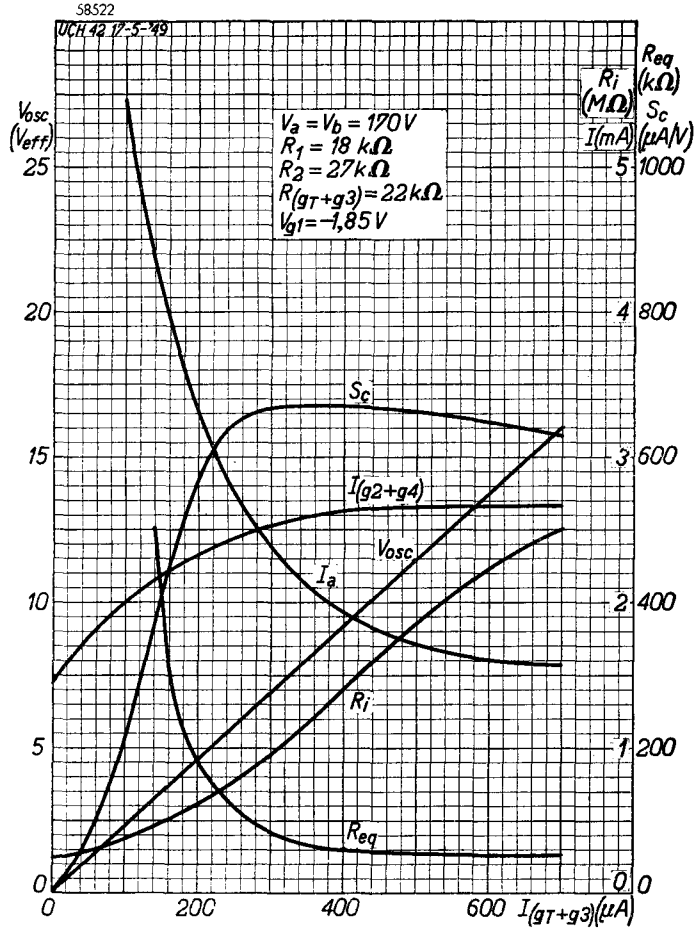

V_i (mV_{eff})
10000
1000
100
10
1
10
100
1000
S_c ($\mu A/V$)
10000
$V_a = 170V$
$V_b = 170V$
$R_1 = 18k\Omega$
$R_2 = 27k\Omega$
$R_{(gT+g3)} = 47k\Omega$ or ou oder 22kΩ
$I_{(gT+g3)} = 200\mu A$ oder 350μA
K = 1%
mb = 1%

UCH 42

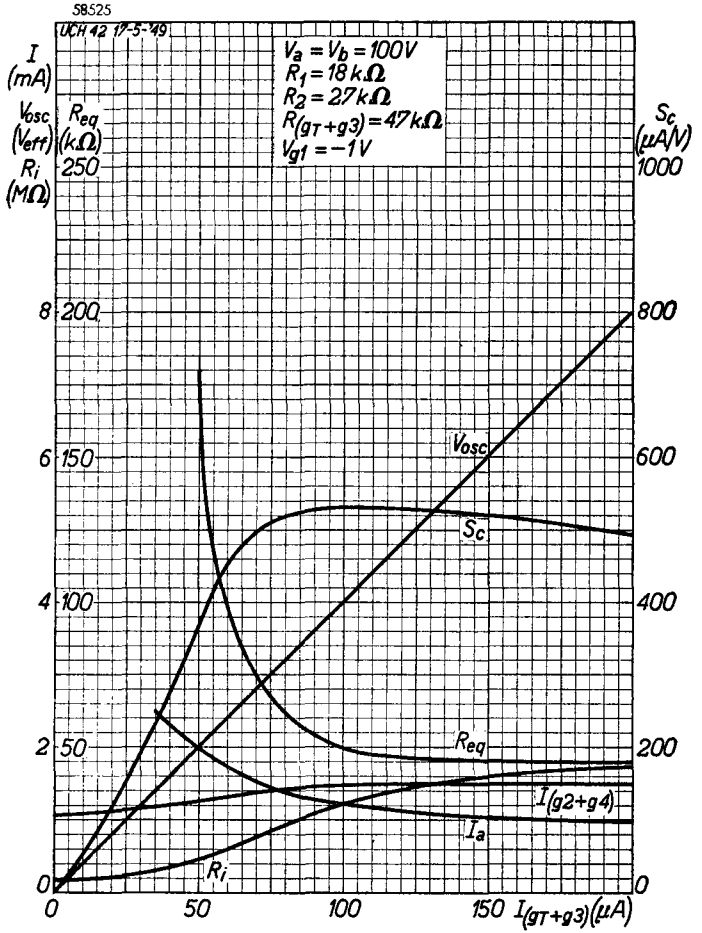
PHILIPS

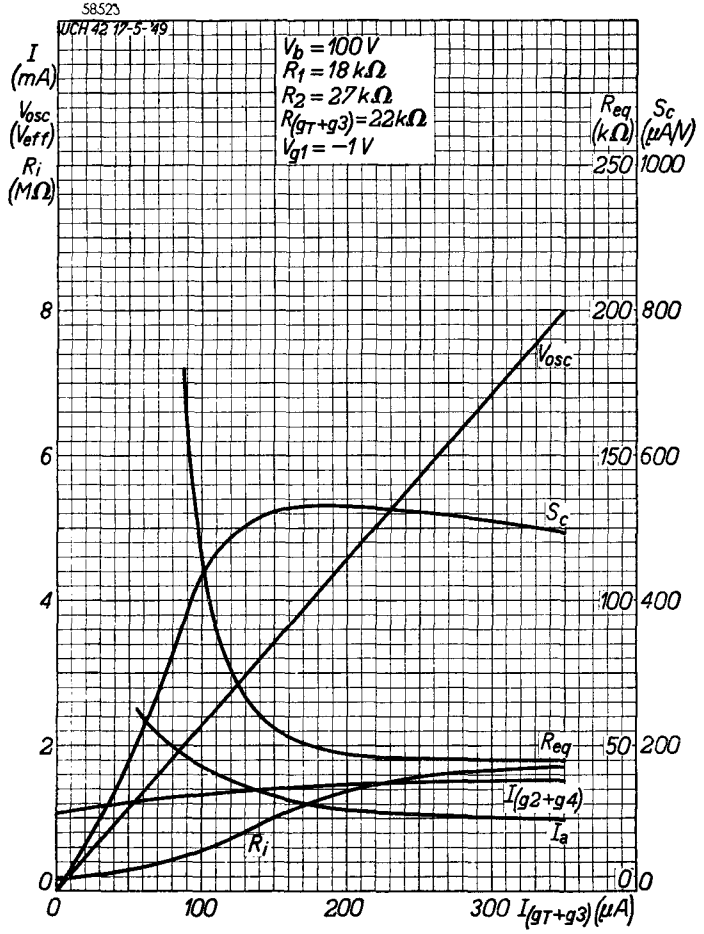


H

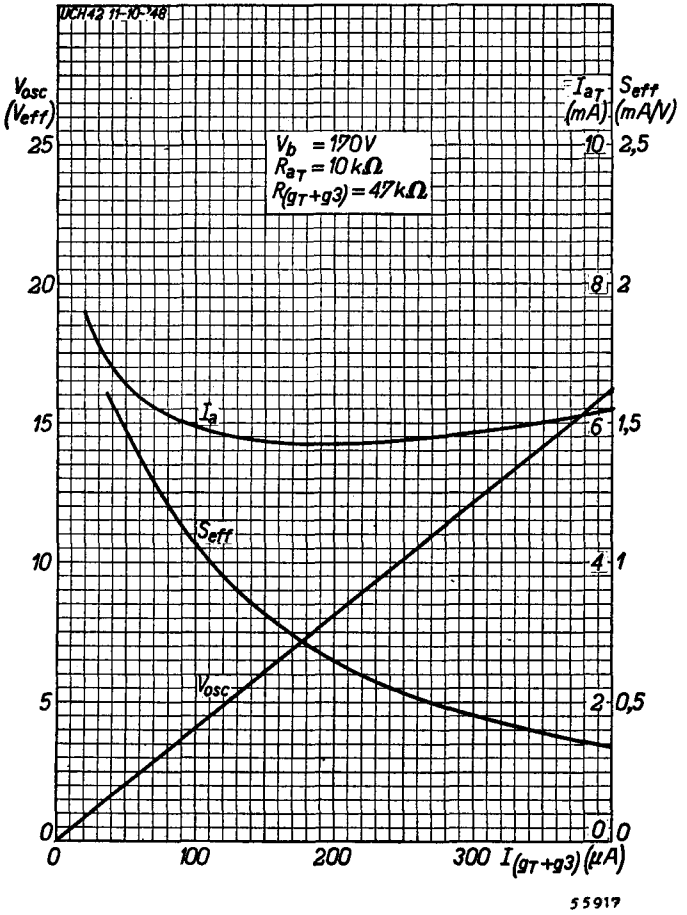

58522
UCH 42 17-5-'49
$V_a = V_b = 170V$
$R_1 = 18\ k\Omega$
$R_2 = 27k\Omega$
$R_{(g_T+g3)} = 22k\Omega$
$V_{g1} = -1{,}85\ V$
V_{osc} (V_{eff})
R_{eq} ($k\Omega$)
R_i ($M\Omega$)
S_c ($\mu A/V$)
I (mA)
S_c
$I_{(g2+g4)}$
V_{osc}
I_a
R_i
R_{eq}
$I_{(g_T+g3)}$ (μA)

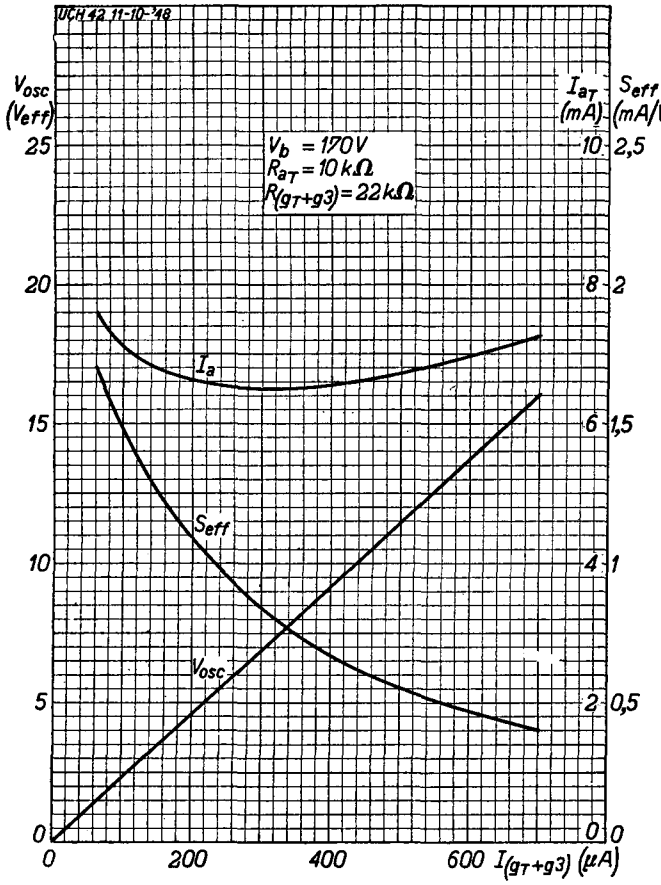
UCH 42 PHILIPS




58523
UCH 42 17-5-49
$V_b = 100\,V$
$R_1 = 18\,k\Omega$
$R_2 = 27\,k\Omega$
$R_{(g_T+g3)} = 22k\Omega$
$V_{g1} = -1\,V$
I (mA)
V_{osc} (V_{eff})
R_i ($M\Omega$)
R_{eq} ($k\Omega$)
S_c ($\mu A/V$)
V_{osc}
S_c
R_{eq}
$I_{(g2+g4)}$
I_a
R_i
$I_{(g_T+g3)}$ (μA)
0
2
4
6
8
100
200
300
50
150
250
400
600
800
1000

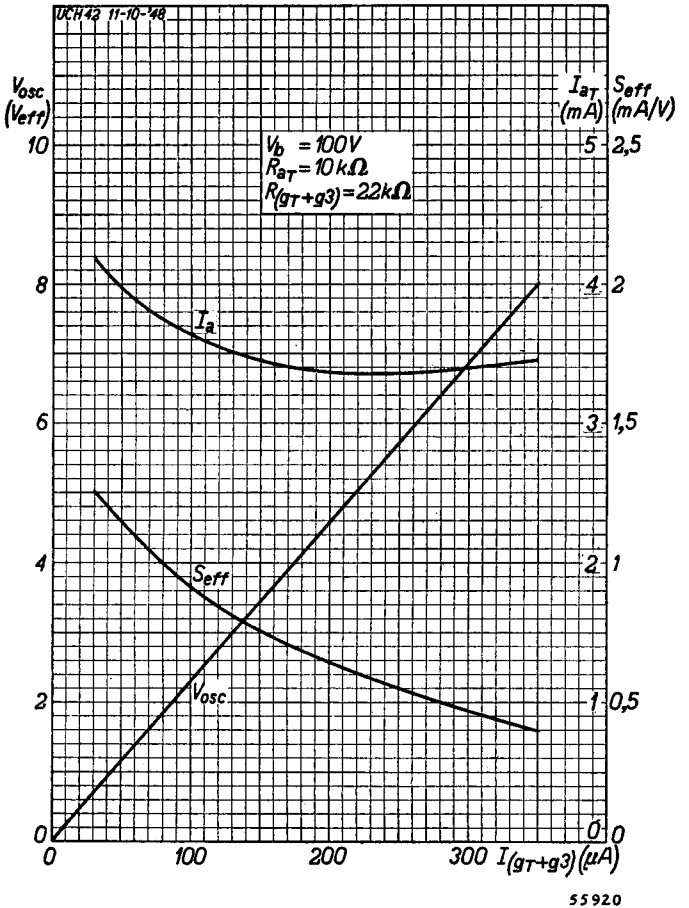
6.6.1947 K


UCH42 11-10-48
V_{osc} (V_{eff})
$-I_{aT}$ (mA)
S_{eff} (mA/V)
V_b = 170V
R_{aT} = 10 kΩ
$R_{(gT+g3)}$ = 47 kΩ
I_a
S_{eff}
V_{osc}
25
20
15
10
5
0
10
8
6
4
2
0
2,5
2
1,5
1
0,5
0
0
100
200
300
$I_{(gT+g3)}$ (μA)
55917


UCH 42 11-10-'48
V_{osc} (V_{eff})
I_{aT} (mA)
S_{eff} (mA/V)
V_b = 170 V
R_{aT} = 10 kΩ
$R_{(g_T+g3)}$ = 22 kΩ
I_a
S_{eff}
V_{osc}
25
20
15
10
5
0
10
8
6
4
2
0
2,5
2
1,5
1
0,5
0
0
200
400
600
$I_{(g_T+g3)}$ (μA)
55918

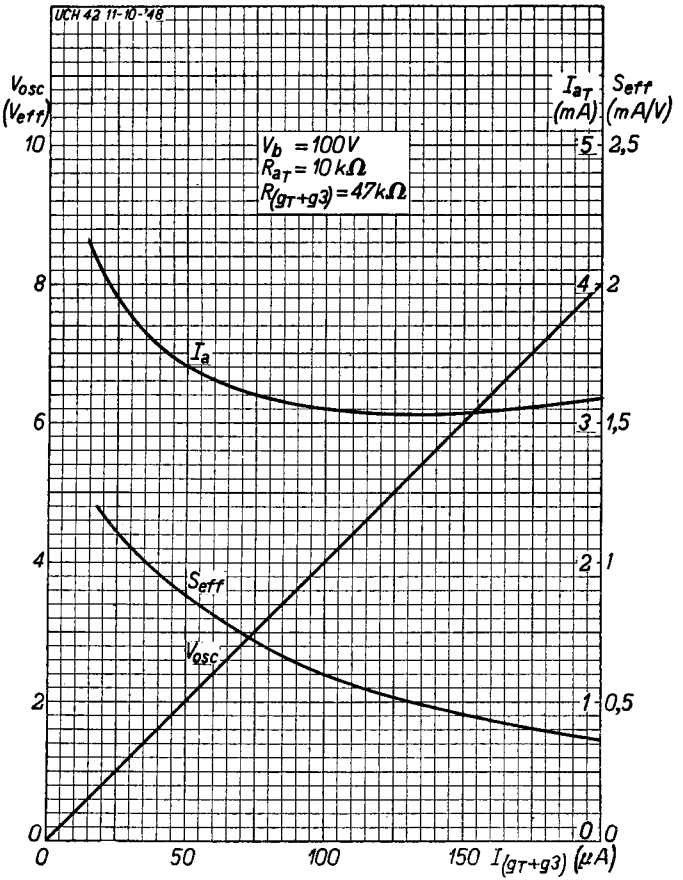
12.11.1948 M

UCH 42 PHILIPS

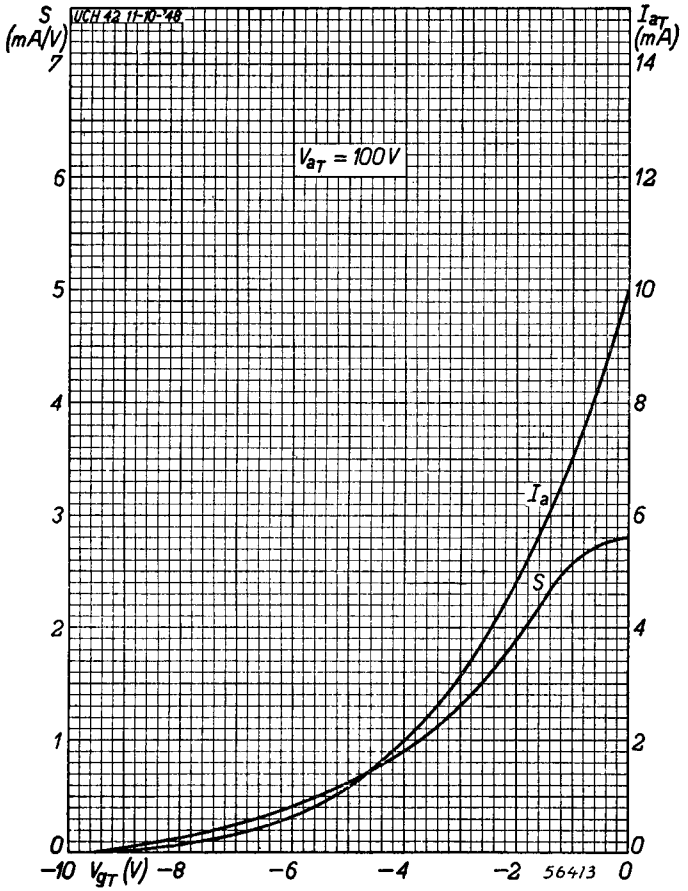


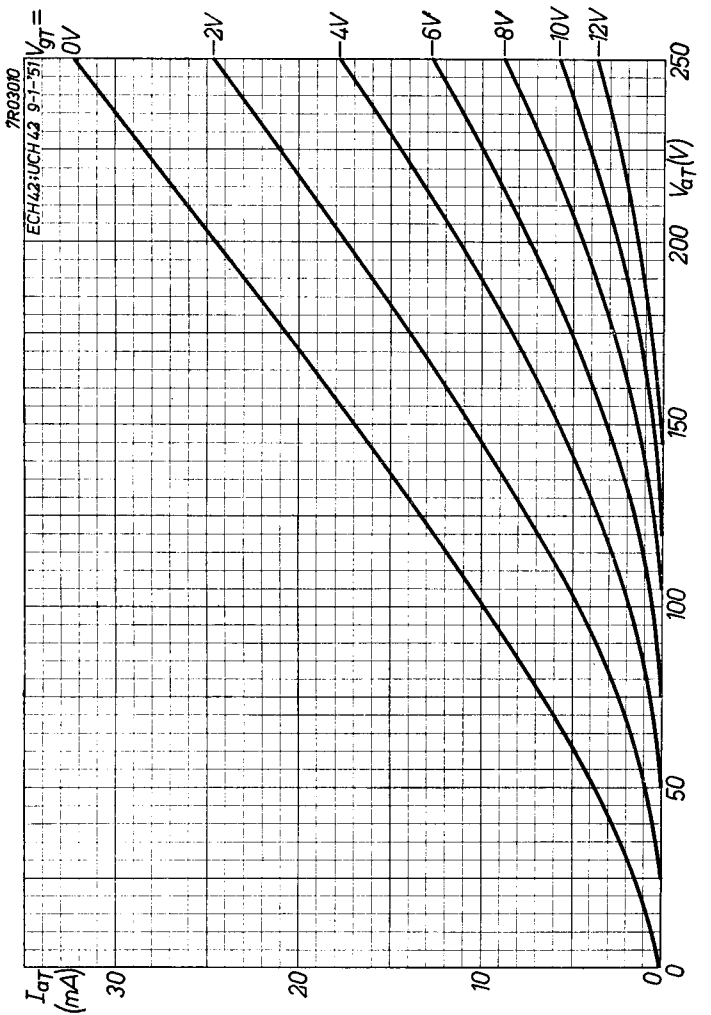
12.11.1948

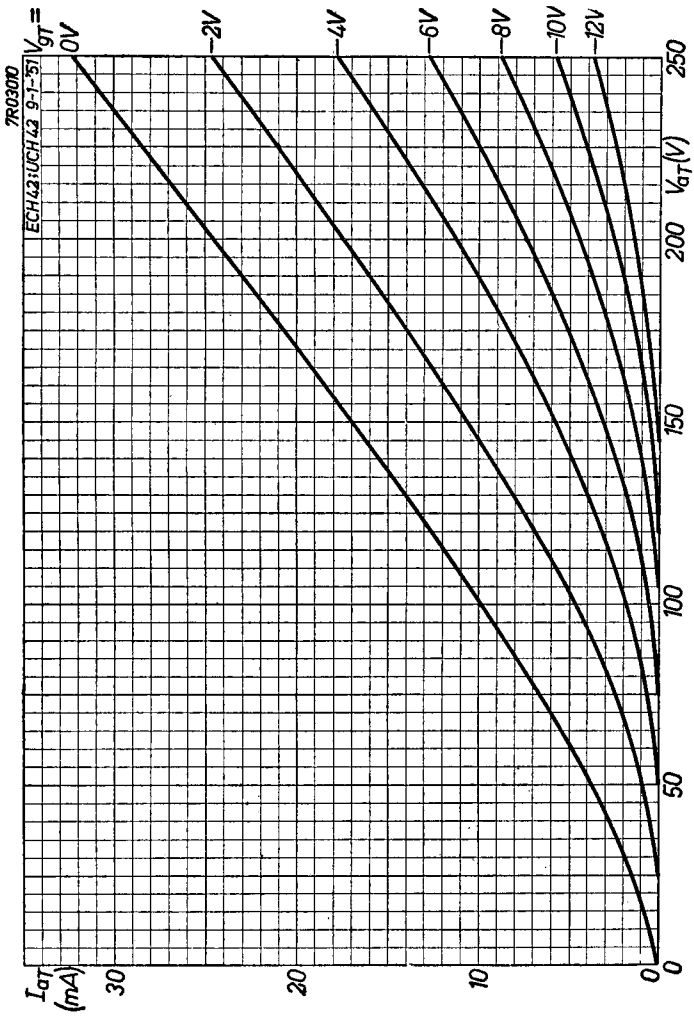
N


UCH 42 11-10-'48
V_{osc} (V_{eff})
I_{aT} (mA)
S_{eff} (mA/V)
V_b = 100 V
R_{aT} = 10 kΩ
$R_{(gT+g3)}$ = 4,7 kΩ
I_a
S_{eff}
V_{osc}
10
8
6
4
2
0
5
4
3
2
1
0
2,5
2
1,5
1
0,5
0
0
50
100
150
$I_{(gT+g3)}$ (μA)
55919

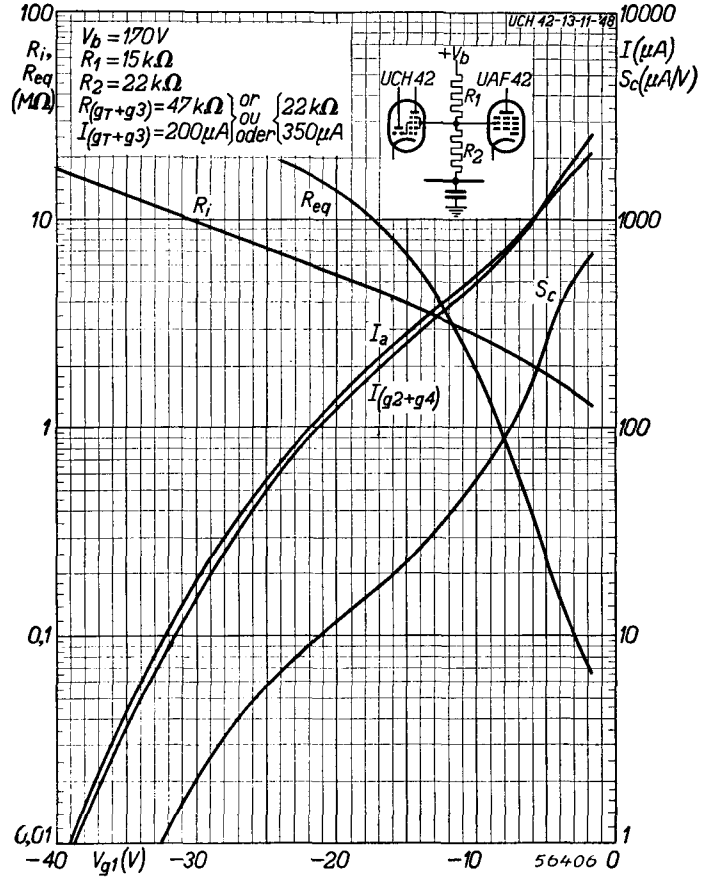
UCH 42 PHILIPS



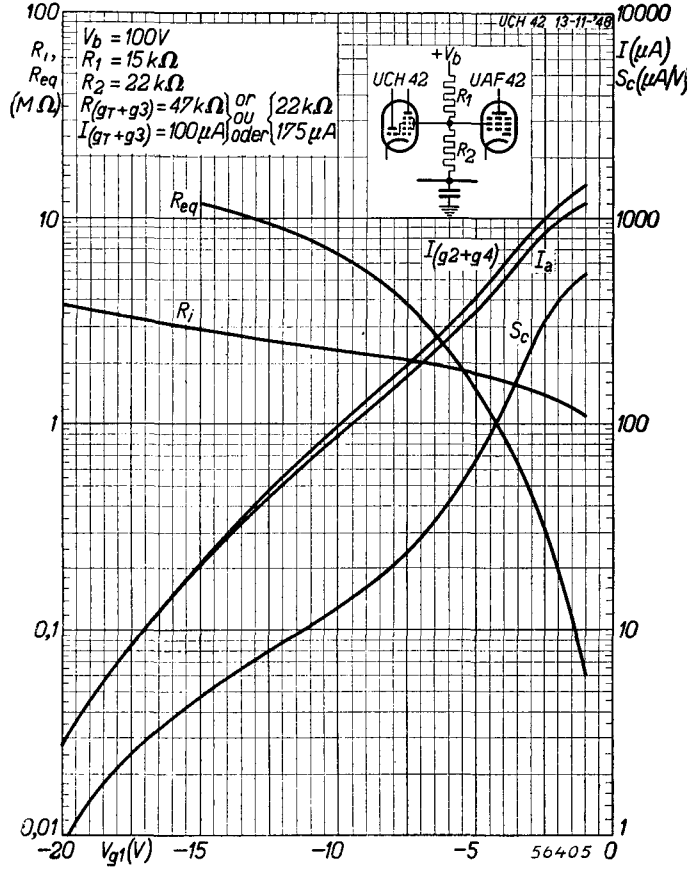

7R03010
ECH42:UCH42 9-1-'51
V_{gT} =
0V
-2V
-4V
-6V
-8V
-10V
-12V
I_{aT} (mA)
30
20
10
0
0
50
100
150
200
250
V_{aT}(V)


7R0300
ECH42;UCH42 9-1-'57
V_{gT} =
0V
-2V
-4V
-6V
-8V
-10V
-12V
I_{aT} (mA)
30
20
10
0
0
50
100
150
200
250
V_{aT}(V)

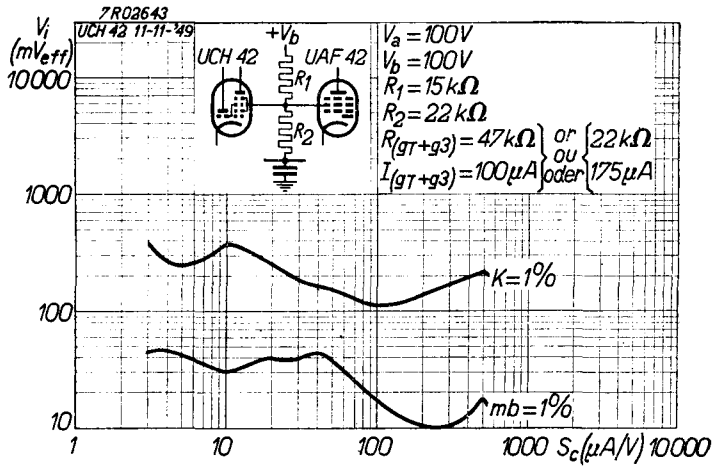
UCH 42 "Miniwatt"

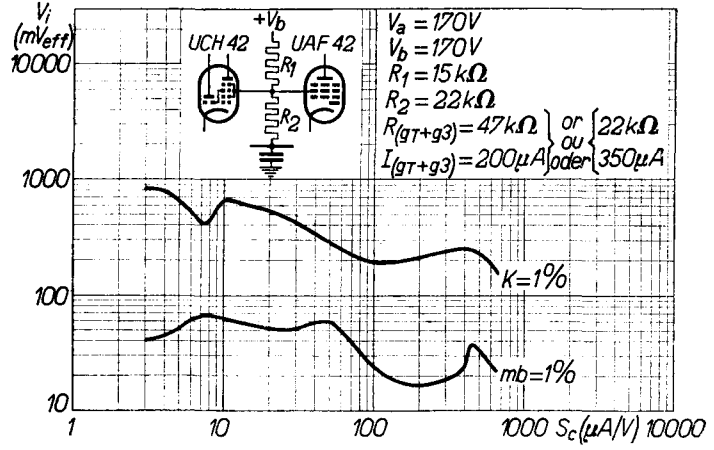


R


UCH 42 13-11-48
V_b = 100V
R_1 = 15 kΩ
R_2 = 22 kΩ
$R_{(g_T+g3)}$ = 47 kΩ or ou oder 22 kΩ
$I_{(g_T+g3)}$ = 100 µA oder 175 µA
+V_b
UCH 42
UAF42
R_1
R_2
R_{eq}
R_i
$I_{(g2+g4)}$
I_a
S_c
100
10
1
0,1
0,01
R_i, R_{eq} (MΩ)
10000
1000
100
10
1
I (µA)
S_c (µA/V)
−20
V_{g1} (V)
−15
−10
−5
0
56405

UCH 42 "Miniwatt"





T

PHILIPS

Electronic Tube

HANDBOOK

UCH42

page	sheet	date
1	1	1949.01.25
2	1	1953.12.12
3	2	1949.01.25
4	2	1953.12.12
5	3	1949.01.25
6	3	1953.12.12
7	3	1960.10.10
8	4	1949.01.25
9	4	1953.12.12
10	5	1949.01.25
11	A	1949.01.25
12	B	1949.01.25
13	C	1949.01.25
14	D	1949.01.25
15	E	1949.01.25
16	F	1949.01.25
17	G	1949.11.11
18	H	1949.11.11
19	I	1949.06.06

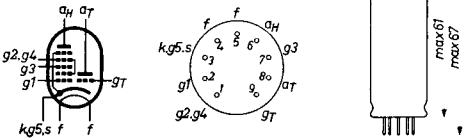
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22	L	1947.06.06
23	M	1948.12.12
24	N	1948.12.12
25	O	1949.01.25
26	P	1949.01.25
27	Q	1951.02.02
28	Q	1957.10.10
29	R	1951.02.02
30	S	1951.02.02
31	T	1951.02.02
32, 33	FP	2000.06.18

TRIODE-HEPTODE for various purposes in F.M., AM/FM, A.M. and television receivers
TRIODE-HEPTODE pour applications diverses dans des récepteurs F.M., A.M./F.M., A.M. et de télévision
TRIODE-HEPTODE für mehrere Anwendungen in F.M., A.M./F.M.-, A.M.- und Fernsehempfängern

Heating : Indirect by A.C. or D.C.; series supply
Chauffage: indirect par C.A. ou C.C.; alimentation en série
Heizung : indirekt durch Wechsel- oder Gleichstrom; Serienspeisung

I_f = 100 mA
V_f = 19 V

Dimensions in mm
Dimensions en mm
Abmessungen in mm



Base, culot, Sockel: NOVAL

Capacitances; Capacités; Kapazitäten

Triode section Partie triode Triodenteil		Heptode section Partie heptode Heptodenteil	
C_g = 2,6 pF	C_{g1} =	4,8 pF	C_{g1g3} < 0,3 pF
C_a = 2,1 pF	C_a =	7.9 pF	C_{g1f} <0,017 pF
C_{ag} = 1,0 pF	C_{ag1} <	0,006 pF	C_{g3f} < 0,06 pF
C_{gf} < 0,02 pF	C_{g3} =	6,0 pF	

Between triode and heptode sections
Entre les parties triode et heptode
Zwischen Trioden- und Heptodenteil

C_{aH-aT} = 0,20 pF [1]	C_{g1H-gT} < 0,170 pF
C_{aH-gT} < 0,090 pF	$C_{g1H-(gT+g3)}$ < 0,450 pF
C_{g1H-aT} < 0,060 pF	$C_{aH-(gT+g3)}$ < 0,350 pF

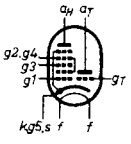
[1] See page 5; voir page 5; siehe Seite 5.

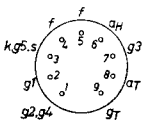
TRIODE-HEPTODE for use in A.M., F.M., AM/FM and television receivers
TRIODE-HEPTODE pour applications dans des récepteurs A.M., F.M., AM/FM et de télévision
TRIODE-HEPTODE zur Verwendung in AM-, FM-, AM/FM- und Fernsehempfängern

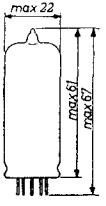
Heating : indirect by A.C. or D.C. series supply
Chauffage: indirect par C.A. ou C.C. alimentation série
Heizung : indirekt durch Wechsel- oder Gleichstrom; Serienspeisung

If = 100 mA
Vf = 19 V

Dimensions in mm
Dimensions en mm
Abmessungen in mm







Base, culot, Sockel: NOVAL

Capacitances; Capacités; Kapazitäten

Triode section Partie triode Triodenteil		Heptode section Partie heptode Heptodenteil			
C_g = 2,6 pF	C_{g1} = 4,8 pF	C_{g1g3}	< 0,3 pF
C_a = 2,1 pF	C_a = 7,9 pF	C_{g1f}	< 0,17 pF
C_{ag} = 1,0 pF	C_{ag1} < 0,06 pF	C_{g3f}	< 0,06 pF
C_{gf} < 0,02 pF	C_{g3} = 6,0 pF		

Between triode and heptode sections
Entre les parties triode et heptode
Zwischen Trioden- und Heptodenteil

C_{aH-aT} = 0,20 pF[1])	C_{g1H-gT}	< 0,170 pF
C_{aH-gT} < 0,090 pF	$C_{g1H-(gT+g3)}$	< 0,450 pF
C_{g1H-aT} < 0,060 pF	$C_{aH-(gT+g3)}$	< 0,350 pF

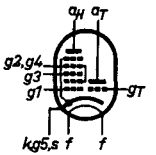
[1])See page 5; voir page 5; siehe Seite 5

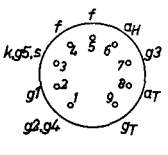
TRIODE-HEPTODE for use in A.M., F.M. and AM/FM receivers
TRIODE-HEPTODE pour applications dans des récepteurs A.M., F.M. et AM/FM
TRIODE-HEPTODE zur Verwendung in AM-, FM- und AM/FM Empfängern

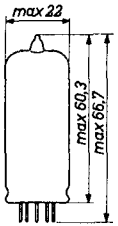
Heating : indirect by A.C. or D.C. series supply
Chauffage: indirect par C.A. ou C.C. alimentation série
Heizung : indirekt durch Wechsel- oder Gleichstrom; Serienspeisung

If = 100 mA
Vf = 19 V

Dimensions in mm
Dimensions en mm
Abmessungen in mm







Base, culot, Sockel: NOVAL

Capacitances; Capacités; Kapazitäten

Triode section Partie triode Triodenteil		Heptode section Partie heptode Heptodenteil	
C_g = 2,6 pF	C_{g1} = 4,8 pF	C_{g1g3}	< 0,3 pF
C_a = 2,1 pF	C_a = 7,9 pF	C_{g1f}	< 0,17 pF
C_{ag} = 1,0 pF	C_{ag1} < 0,006 pF	C_{g3f}	< 0,06 pF
C_{gf} < 0,02 pF	C_{g3} = 6,0 pF		

Between triode and heptode sections
Entre les parties triode et heptode
Zwischen Trioden- und Heptodenteil

C_{aH-aT}	= 0,20 pF[1])	C_{g1H-gT}	< 0,170 pF
C_{aH-gT}	< 0,090 pF	$C_{g1H-(gT+g3)}$	< 0,450 pF
C_{g1H-aT}	< 0,060 pF	$C_{aH-(gT+g3)}$	< 0,350 pF

[1])See page 5; voir page 5; siehe Seite 5

Operating characteristics of the heptode section for use as mixer
Caractéristiques d'utilisation de la partie heptode comme tube mélangeur
Betriebsdaten des Heptodenteiles als Mischröhre

$V_a=V_b$	=	200			V
R_{g2+g4}	=	10			kΩ
R_{gI+g3}	=	47			kΩ
I_{gI+g3}	=	230			µA
R_k	=	150			Ω
V_{g1}	=	-2,6	-28		V
V_{g2+g4}	=	119	250		V
I_a	=	3,7	-		mA
I_{g2+g4}	=	8,1	-		mA
S_c	=	775	7,75		µA/V
R_i	=	1	> 3		MΩ
R_{eq}	=	75	-		kΩ

$V_a=V_b$	=	170		100		V
R_{g2+g4}	=	10		10		kΩ
R_{gI+g3}	=	47		47		kΩ
I_{gI+g3}	=	200		115		µA
R_k	=	150		150		Ω
V_{g1}	=	-2,2	-24	-1,2	-14,5	V
V_{g2+g4}	=	102	-	63	-	V
I_a	=	3,2	-	1,7	-	mA
I_{g2+g4}	=	6,8	-	3,7	-	mA
S_c	=	750	7,5	620	6,2	µA/V
R_i	=	0,9	3	0,8	> 3	MΩ
R_{eq}	=	70	-	62	-	kΩ

Operating characteristics of the heptode section for use as mixer
Caractéristiques d'utilisation de la partie heptode comme tube mélangeur
Betriebsdaten des Heptodenteiles als Mischröhre

$V_a=V_b$	=	200		V
R_{g2+g4}	=	10		kΩ
R_{gT+g3}	=	47		kΩ
I_{gT+g3}	=	230		µA
R_k	=	150		Ω
V_{g1}	=	-2,6	-28	V
V_{g2+g4}	=	119	250	V
I_a	=	3,7	-	mA
I_{g2+g4}	=	8,1	-	mA
S_c	=	775	7,75	µA/V
R_i	=	1	> 3	MΩ
R_{eq}	=	75	-	kΩ

$V_a=V_b$	=	170		100		V
R_{g2+g4}	=	10		10		kΩ
R_{gT+g3}	=	47		47		kΩ
I_{gT+g3}	=	200		115		µA
R_k	=	150		150		Ω
V_{g1}	=	-2,2	-24	-1,2	-14,5	V
V_{g2+g4}	=	102	-	63	-	V
I_a	=	3,2	-	1,7	-	mA
I_{g2+g4}	=	6,8	-	3,7	-	mA
S_c	=	750	7,5	620	6,2	µA/V
R_i	=	0,9	3	0,8	> 3	MΩ
R_{eq}	=	70	-	62	-	kΩ

Operating characteristics of the heptode section for use as mixer
Caractéristiques d'utilisation de la partie heptode comme tube mélangeur
Betriebsdaten des Heptodenteiles als Mischröhre

$V_a = V_b$	=		200		V
R_{g2+g4}	=		10		kΩ
R_{gT+g3}	=		47		kΩ
I_{gT+g3}	=		230		µA
R_k	=		150		Ω
V_{g1}	=	-2,6		-28	V
V_{g2+g4}	=	119		250	V
I_a	=	3,7		-	mA
I_{g2+g4}	=	8,1		-	mA
S_c	=	775		7,75	µA/V
R_i	=	1		> 3	MΩ
R_{eq}	=	75		-	kΩ

$V_a = V_b$	=	170			100		V
R_{g2+g4}	=	10			10		kΩ
R_{gT+g3}	=	47			47		kΩ
I_{gT+g3}	=	200			115		µA
R_k	=	150			150		Ω
V_{g1}	=	-2,2	-24	-1,2		-14,5	V
V_{g2+g4}	=	102	-	63		-	V
I_a	=	3,2	-	1,7		-	mA
I_{g2+g4}	=	6,8	-	3,7		-	mA
S_c	=	750	7,5	620	6,2		µA/V
→ R_i	=	0,9	> 3	0,8	> 3		MΩ
R_{eq}	=	70	-	62		-	kΩ

Operating characteristics of the heptode section as R.F. or I.F. amplifier
Caractéristiques d'utilisation de la partie heptode en amplificatrice H.F. ou M.F.
Betriebsdaten des Heptodenteiles als H.F.-oder Z.F. Verstärker

$V_a=V_b$	=		200		V
V_{g3}	=		0		V
R_{g2+g4}	=		18		kΩ
R_k	=		220		Ω
V_{g1}	=	-2,6		-33	V
V_{g2+g4}	=	123		-	V
I_a	=	7,6		-	mA
I_{g2+g4}	=	4,3		-	mA
S	=	2,4		0,024	mA/V
R_i	=	0,6		> 10	MΩ
μ_{g2g1}	=	20		-	
R_{eq}	=	9,7		-	kΩ

$V_a=V_b$	=	170		100			V
V_{g3}	=	0		0			V
R_{g2+g4}	=	18		18			kΩ
R_k	=	220		220			Ω
V_{g1}	=	-2,2	-28	-1,2	-16,5		V
V_{g2+g4}	=	102	-	60	-		V
I_a	=	6,2	-	3,4	-		mA
I_{g2+g4}	=	3,8	-	2,2	-		mA
S	=	2,3	0,023	2,0	0,020		mA/V
R_i	=	0,6	> 10	0,5	> 10		MΩ
μ_{g2g1}	=	20	-	20	-		-
R_{eq}	=	8,8	-	5,8	-		kΩ

Typical characteristics of the triode section
Caractéristiques limites de la partie triode
Kenndaten des Triodenteiles

V_a	=	100	V
V_g	=	0	V
I_a	=	13,5	mA
S	=	3,7	mA/V
μ	=	22	

Operating characteristics of the triode section as oscillator
Caractéristiques d'utilisation de la partie triode en oscillatrice
Betriebsdaten des Triodenteiles als Oszillator

V_b	=	200	170	100	V
R_a	=	15	15	15	kΩ
R_{gT+g3}	=	47	47	47	kΩ
I_{gT+g3}	=	240	200	120	µA
I_a	=	5,4	4,5	2,5	mA
S_{eff}	=	0,58	0,58	0,53	mA/V

Operating characteristics for use as A.F. amplifier
Caractéristiques d'utilisation en amplificatrice B.F.
Betriebsdaten als N.F. Verstärker

The heptode section of this valve can be used without special precautions against microphonic effect in circuits in which the input voltage $V_i \geq 50mV$ for an output of 50 mW of the output valve. For the triode section the corresponding value is 25 mV.

La partie heptode de ce tube peut être utilisée sans précautions spéciales contre l'effet microphonique dans des circuits dont la tension d'entrée $V_i \geq 50mV$ pour une puissance de 50 mW du tube de sortie. La valeur correspondante pour la partie triode est de 25 mV.

Der Heptodenteil dieser Röhre darf ohne spezielle Massnahmen gegen Mikrophonie verwendet werden in Schaltungen die für eine Eingangsspannung $V_i \geq 50mV$ eine Leistung von 50 mW ergeben. Der entsprechende Wert für den Triodenteil ist 25 mV.

Limiting values of the triode section
Caractéristiques limites de la partie triode
Grenzdaten des Triodenteiles

V_{a_c}	= max.	550	V
V_a	= max.	250	V
W_a	= max.	0,8	W
I_k	= max.	6,5	mA
R_g	= max.	3	MΩ
R_{kf}	= max.	20	kΩ
V_{kf}	= max.	100	V
V_g (I_g = +0,3 µA)	= max.	-1,3	V

Limiting values of the heptode section
Caractéristiques limites de la partie heptode
Grenzdaten des Heptodenteiles

V_{ao}	= max.	550 V
V_a	= max.	250 V
W_a	= max.	1,7 W
$V_{(g2+g4)o}$	= max.	550 V
V_{g2+g4} (I_a = 7,6 mA)	= max.	125 V
V_{g2+g4} (I_a < 1 mA)	= max.	250 V
W_{g2+g4}	= max.	1 W
I_k	= max.	12,5 mA
R_{g1}	= max.	3 MΩ
R_{g3} [2])	= max.	3 MΩ
R_{kf}	= max.	20 kΩ
V_{kf}	= max.	100 V
V_{g1} (I_{g1} = + 0,3 µA)	= max.	-1,3 V
V_{g3} (I_{g3} = + 0,3 µA)	= max.	-1,3 V

[2]) When in AM/FM receivers the connections to the valve are switched over during operation and g_3 and g_T have not been connected by ohmic resistance, R_{g3} = max. 20 kΩ.
En cas que dans des appareils AM/FM les connexions au tube soient commutées pendant l'opération et g_3 n'ait pas été connecté à g_T par l'intermédiaire d'une résistance ohmique, R_{g3} = max. 20 kΩ.
Wenn in AM/FM-Empfängern die Verbindungen zu der Röhre während des Betriebs umgeschaltet werden und g_3 nicht mittels eines ohmischen Widerstandes mit g_T verbunden ist, ist R_{g3} = max. 20 kΩ.

Page 1, Seite 1.

[1]) σ = 0.015 which means that for 68% of a great number of valves 0.20 - 0.015 pF < C_{aH-aT} < 0.20 + 0.015 pF and for 94% 0.20 - 0.03 pF < C_{aH-aT} < 0.20 + 0.03 pF.

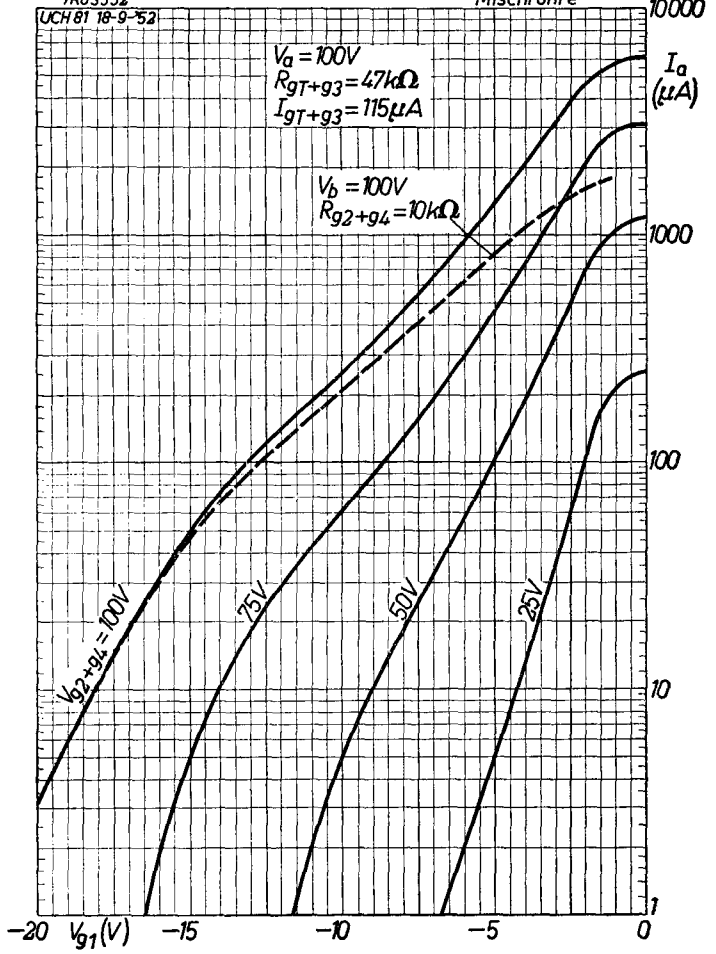
σ = 0,015 cequi signifie que 0,20-0,015 pF< C_{aH-aT} < 0,20 + 0,015 pF pour 68% d'un grand nombre de tubes et 0,20-0,03 pF < C_{aH-aT} < 0,20 + 0,03 pF pour 94%

σ = 0,015 was heisst dass für 68% einer grossen Anzahl Röhren 0,20 - 0,015 pF < C_{aH-aT} < 0,20 + 0,015 pF und für 94% 0,20 - 0,03 pF <C_{aH-aT} < 0,20 + 0,03 pF.

PHILIPS

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Frequency changer; Tube mélangeur; Mischröhre



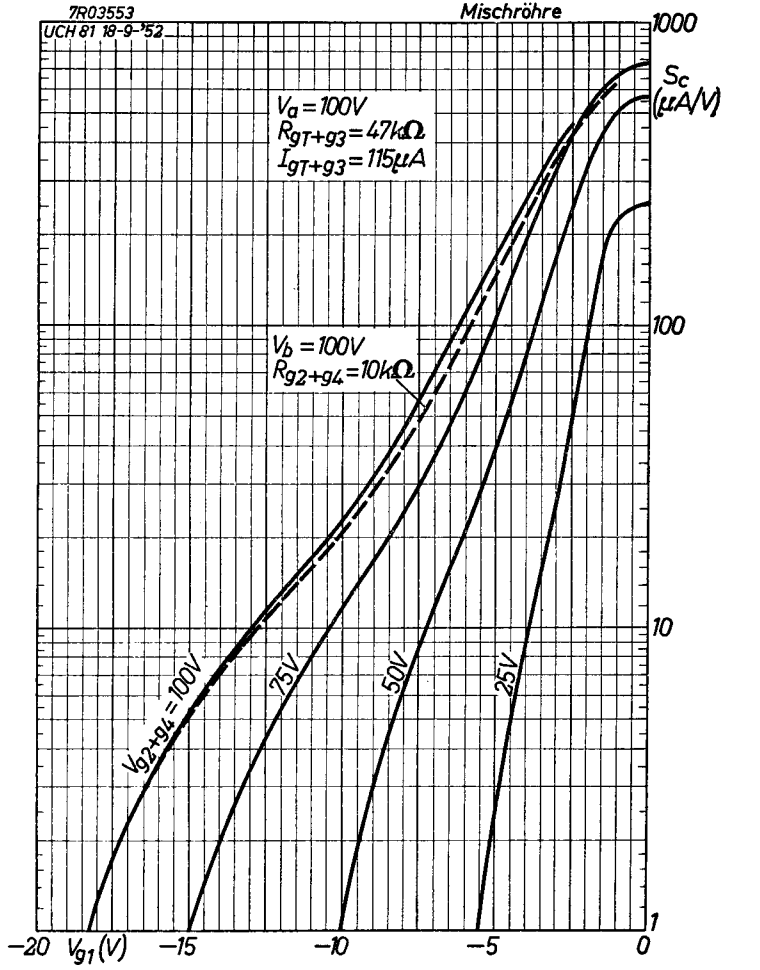
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A

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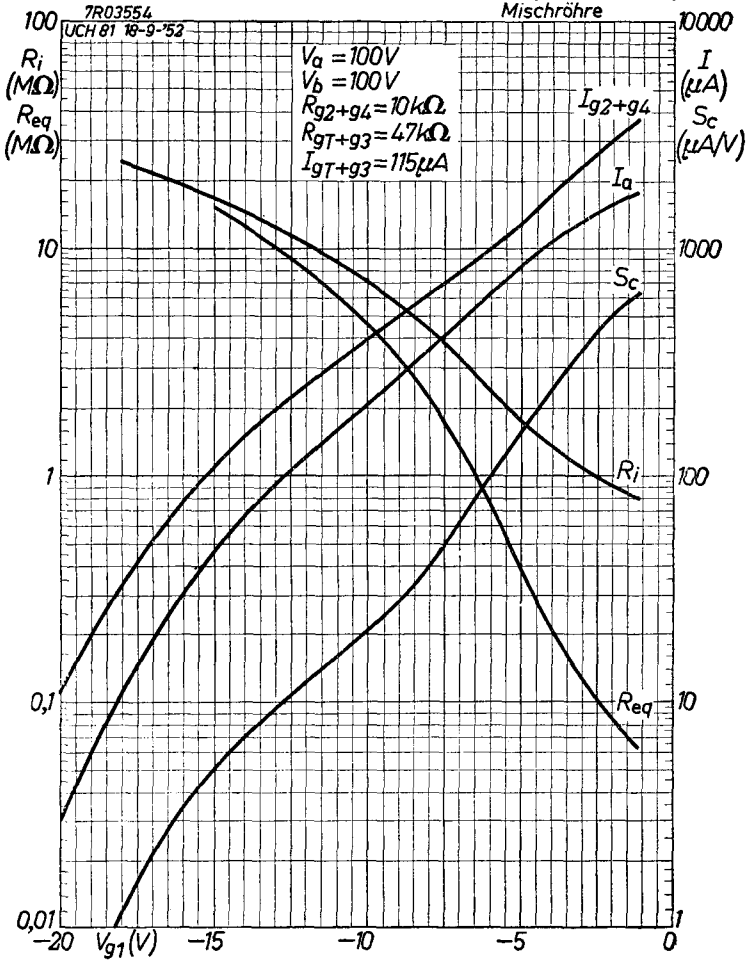
Frequency changer; Tube mélangeuse; Mischröhre



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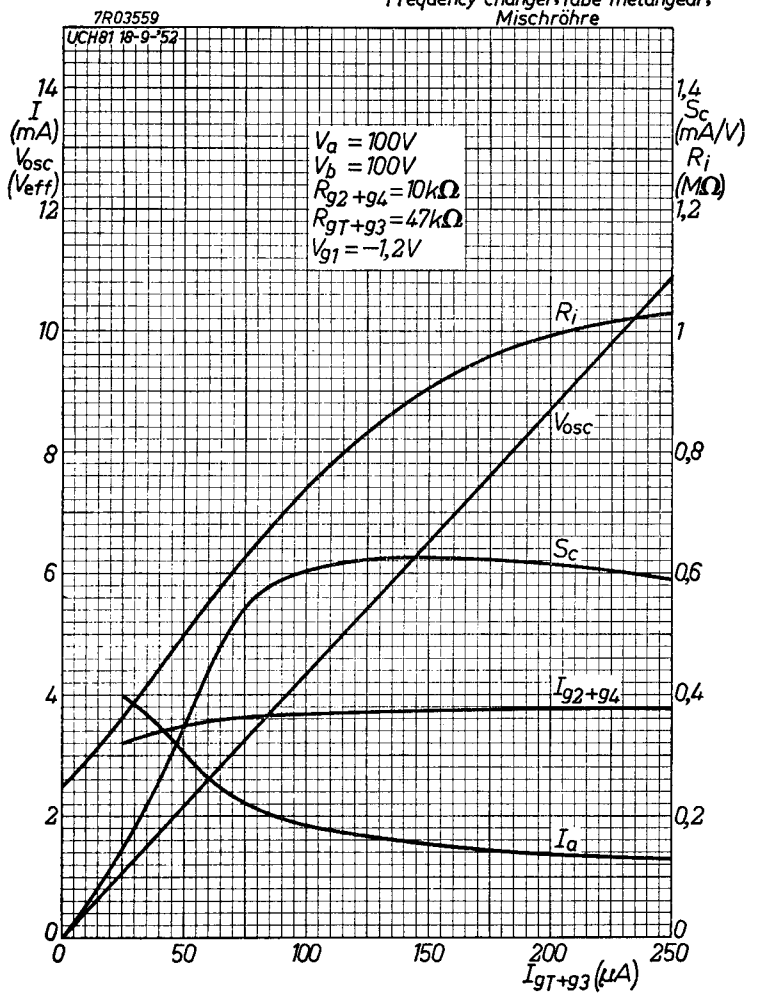
Frequency changer; Tube mélangeur; Mischröhre



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C

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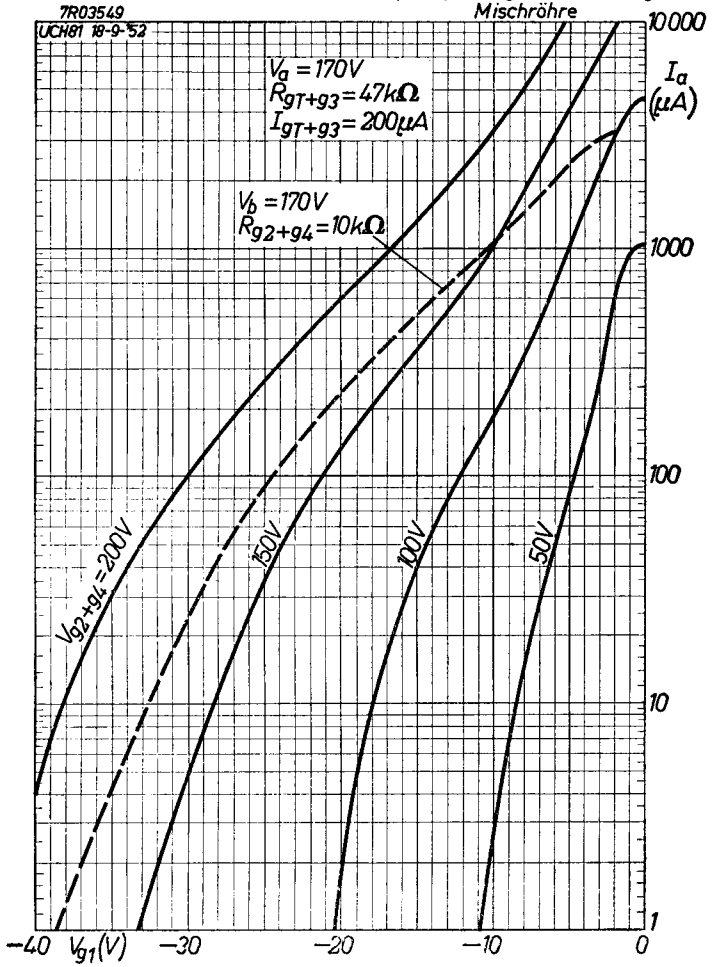


D

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UCH 81

Frequency changer; Tube mélangeur; Mischröhre



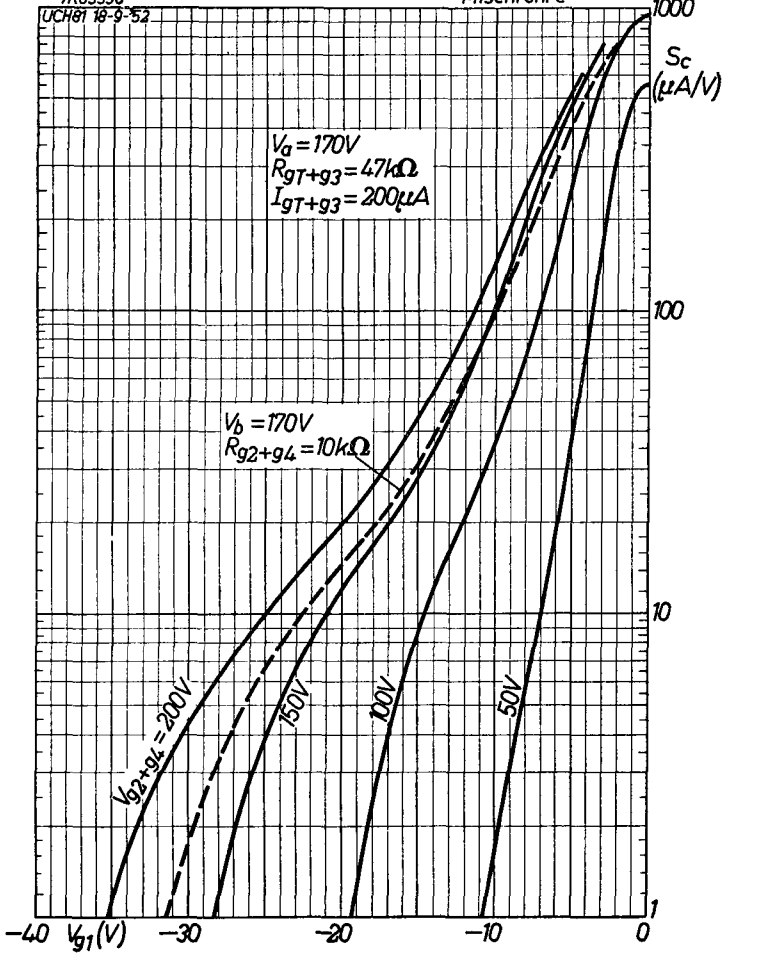
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E

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Frequency changer; Tube mélangeur; Mischröhre

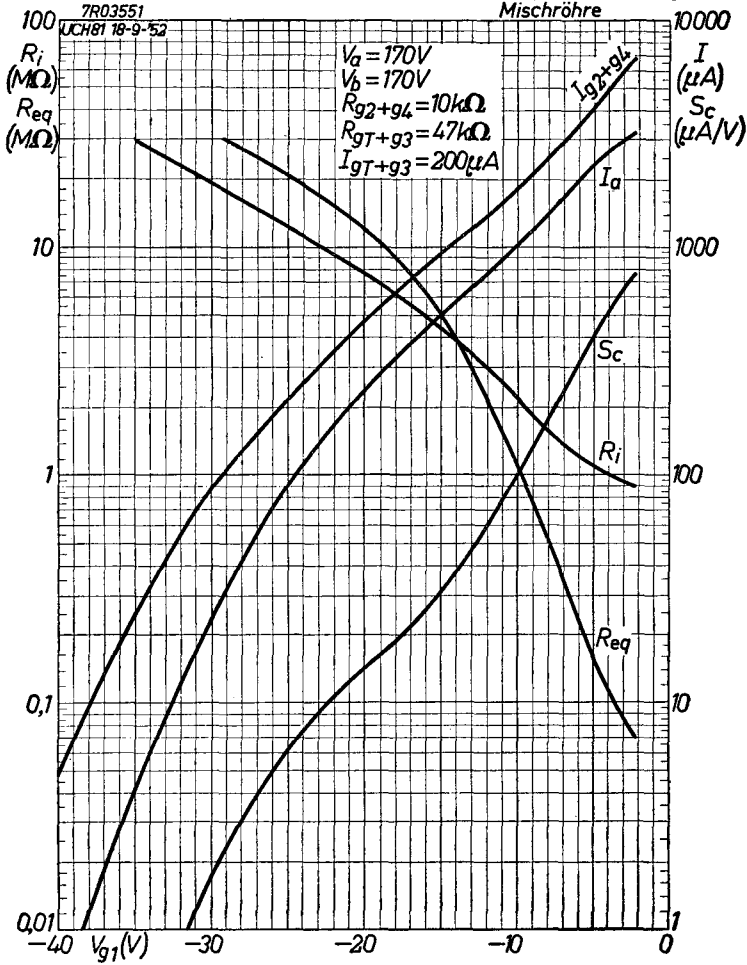


F

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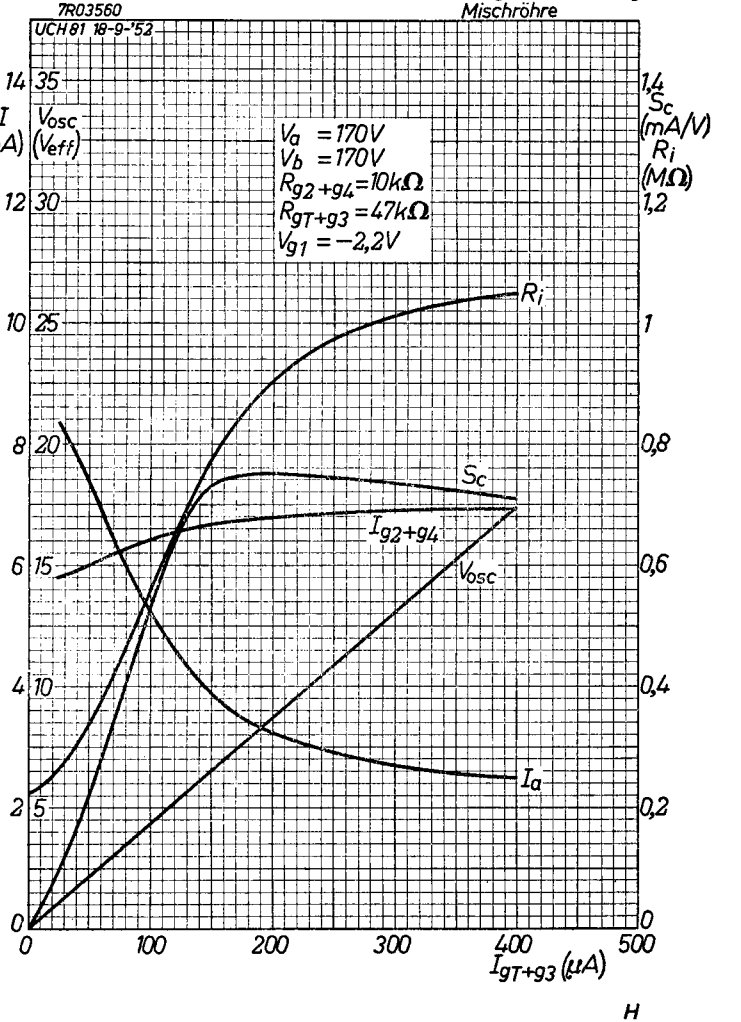
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Frequency changer; Tube mélangeur; Mischröhre



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Frequency changer; Tube mélangeur; Mischröhre

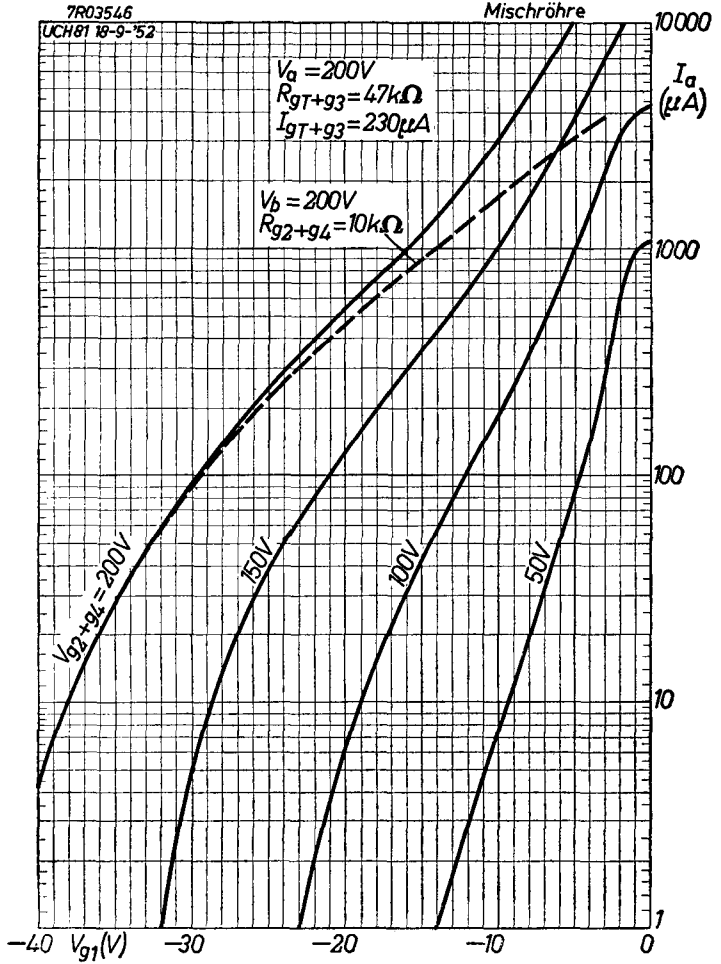


H

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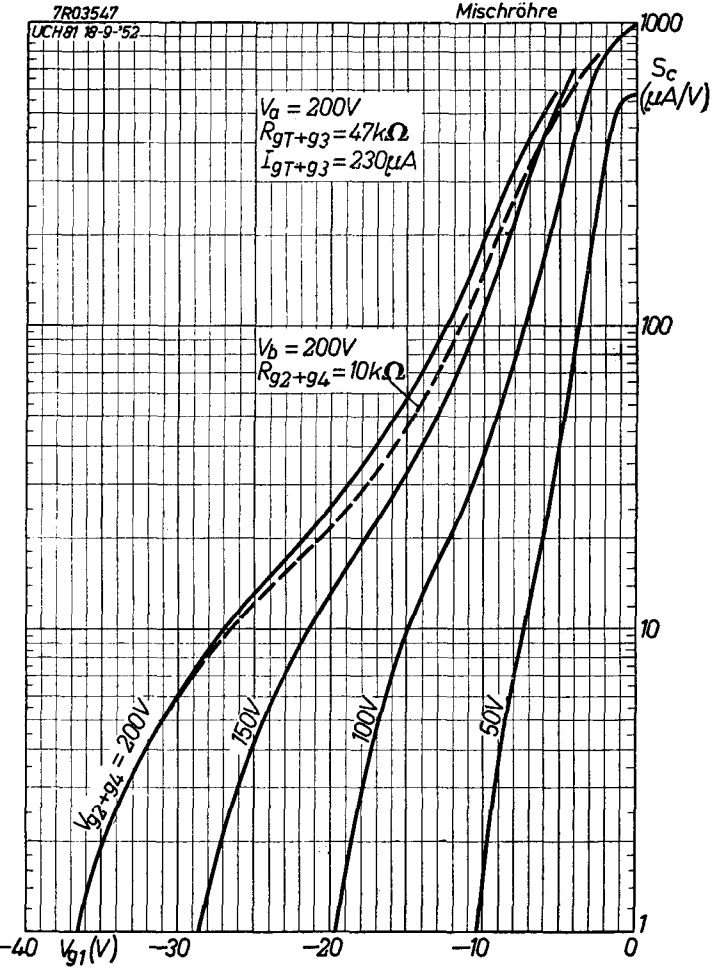
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Frequency changer; Tube mélangeur; Mischröhre



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Frequency changer; Tube mélangeur; Mischröhre

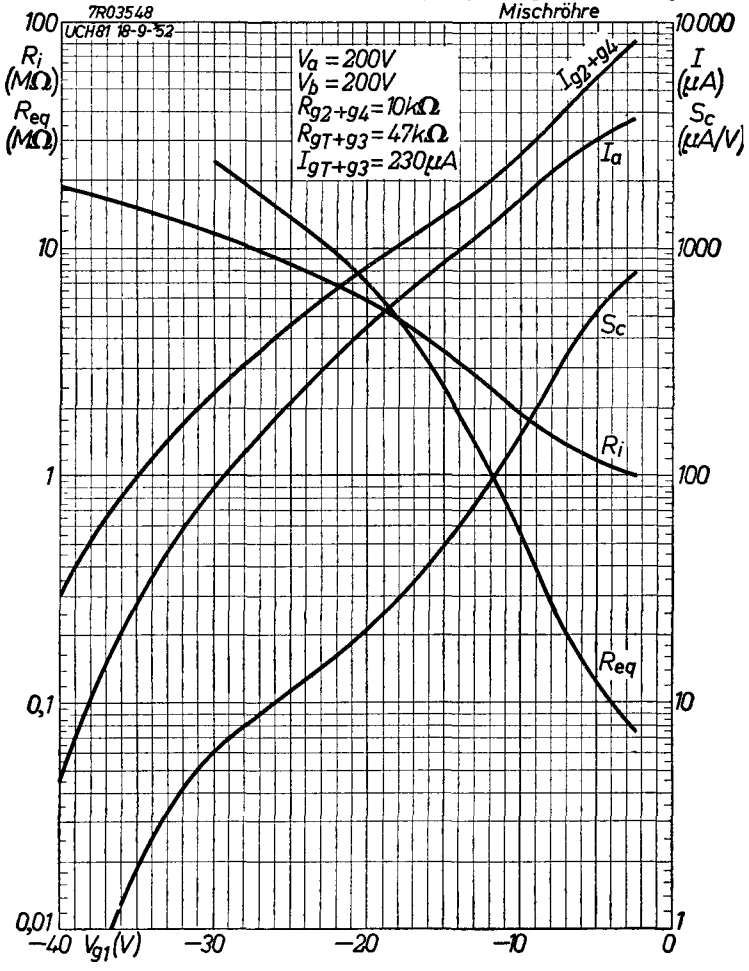


J

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UCH 81

Frequency changer; Tube mélangeur; Mischröhre

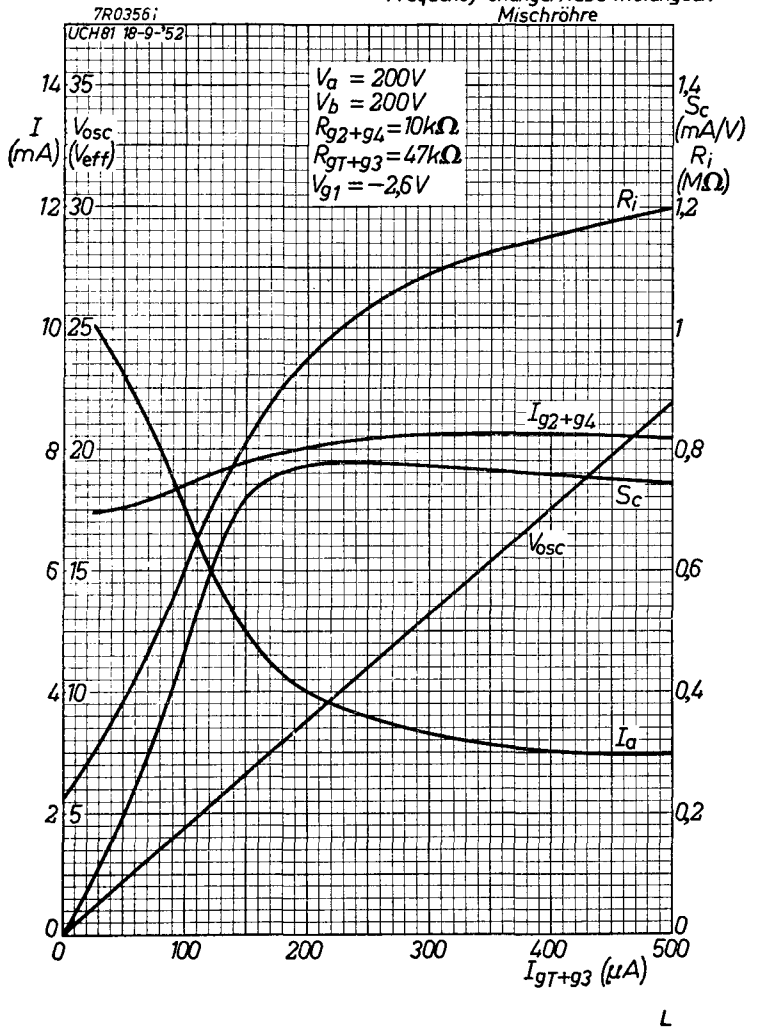


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K

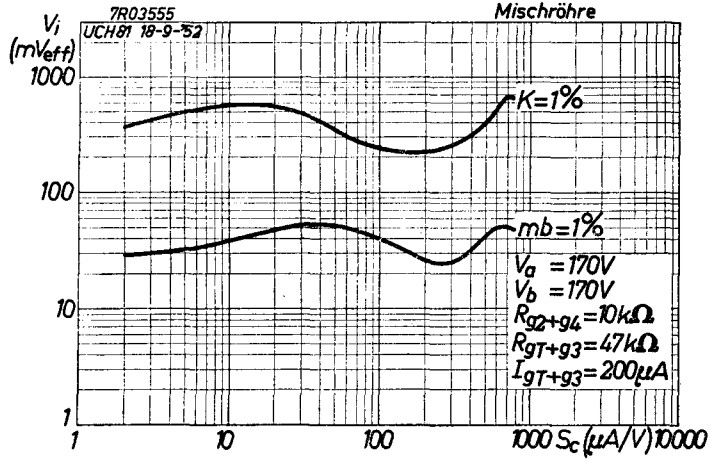
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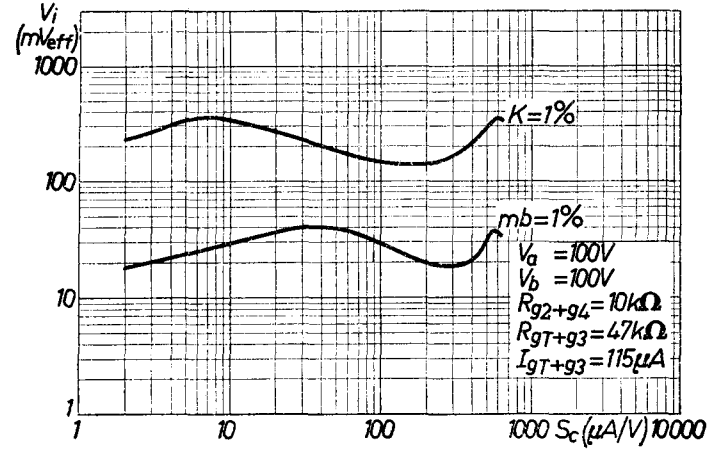
Frequency changer; Tube mélangeur; Mischröhre



L

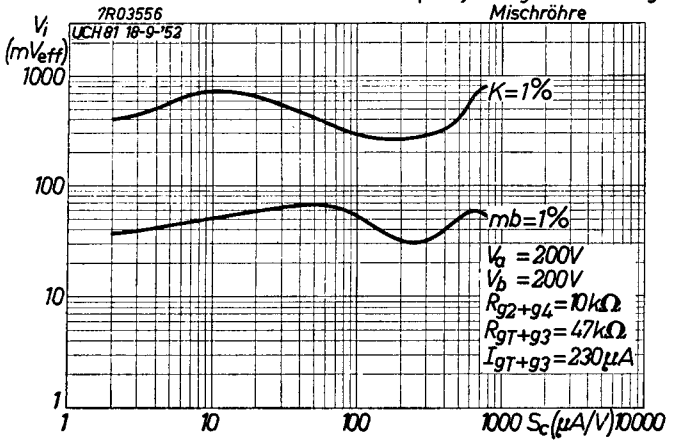
Frequency changer; Tube mélangeur; Mischröhre





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Frequency changer; Tube mélangeur; Mischröhre

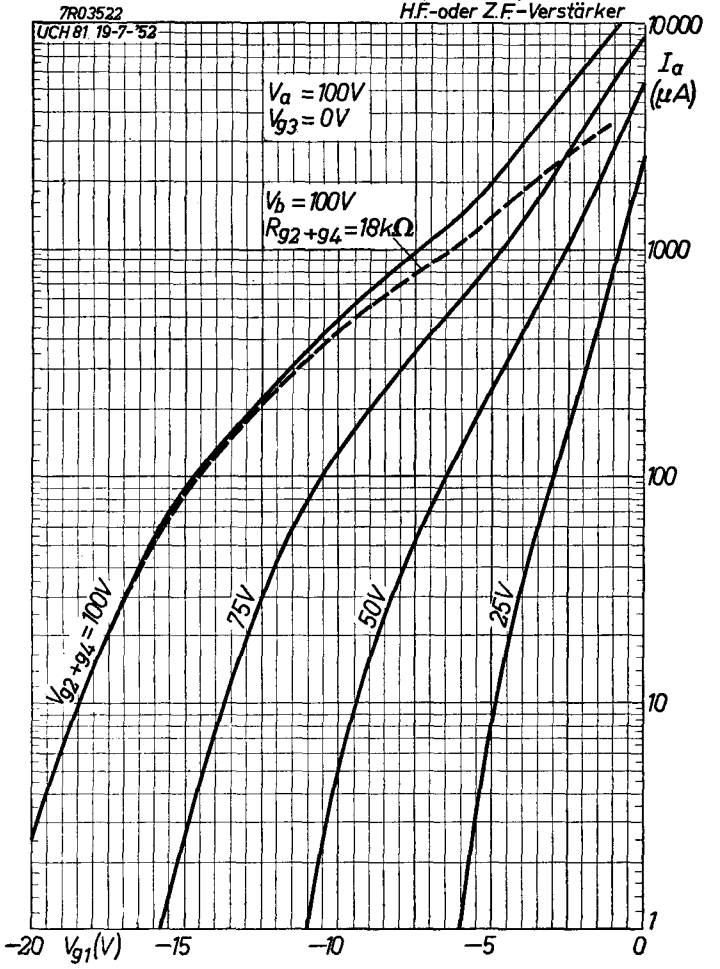


N

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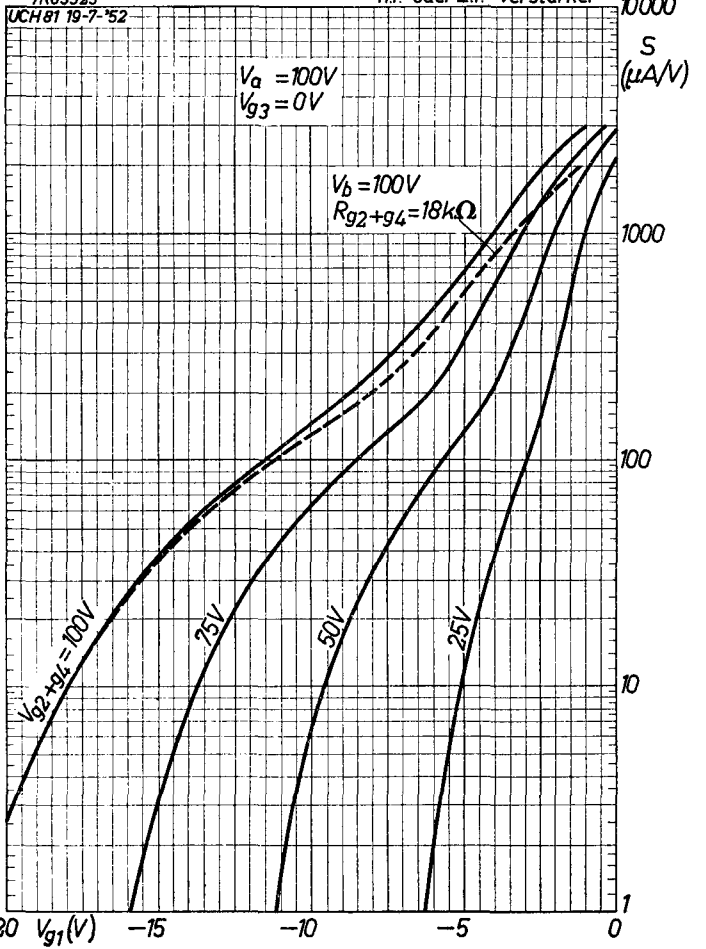
R.F. or I.F. amplifier; Amplificateur H.F. ou M.F.; H.F.-oder Z.F.-Verstärker



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R.F. or I.F. amplifier; Amplificateur H.F. ou M.F.; H.F.-oder Z.F.-Verstärker

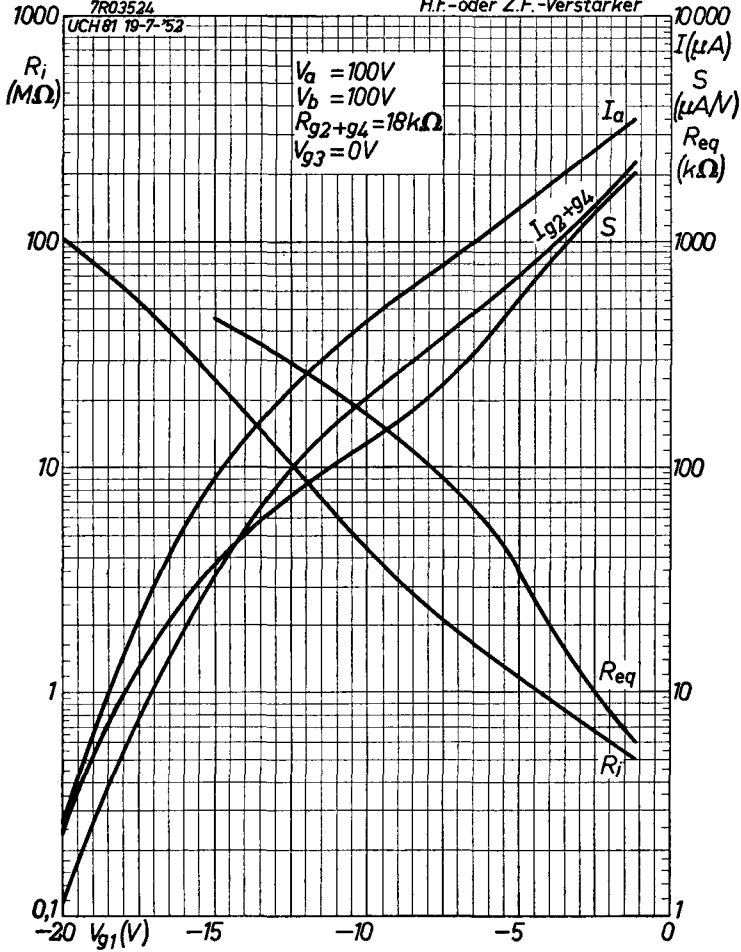


P

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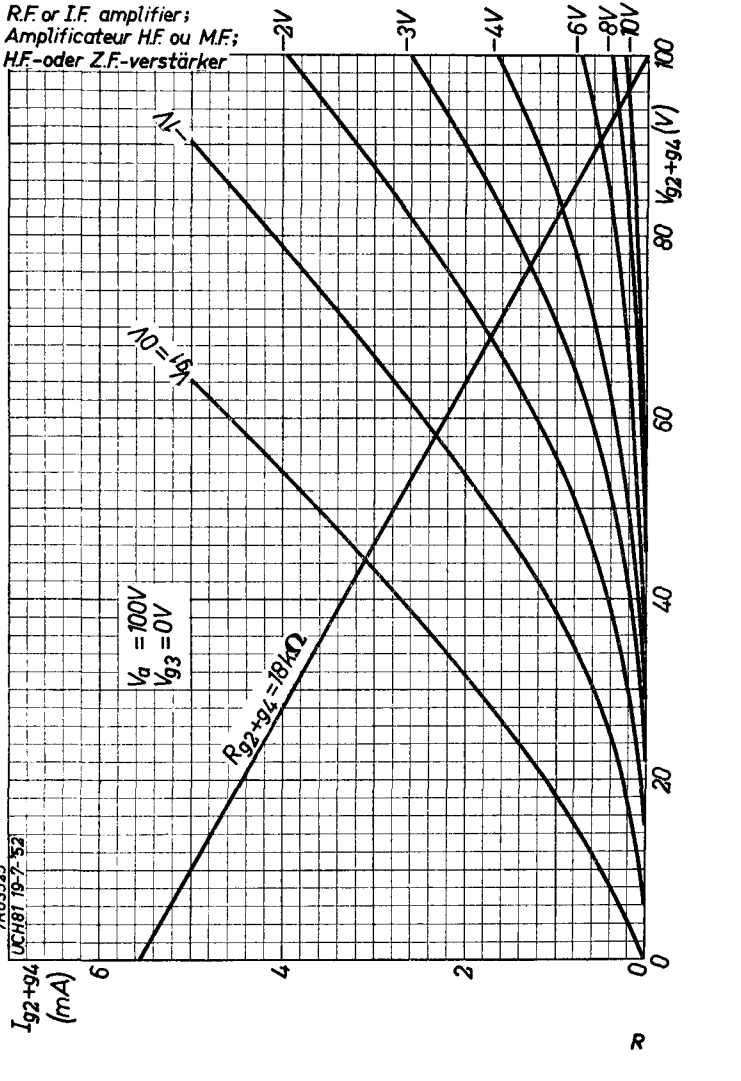
R.F. or I.F. amplifier; Amplificateur H.F. ou M.F.; H.F.- oder Z.F.-Verstärker



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Q

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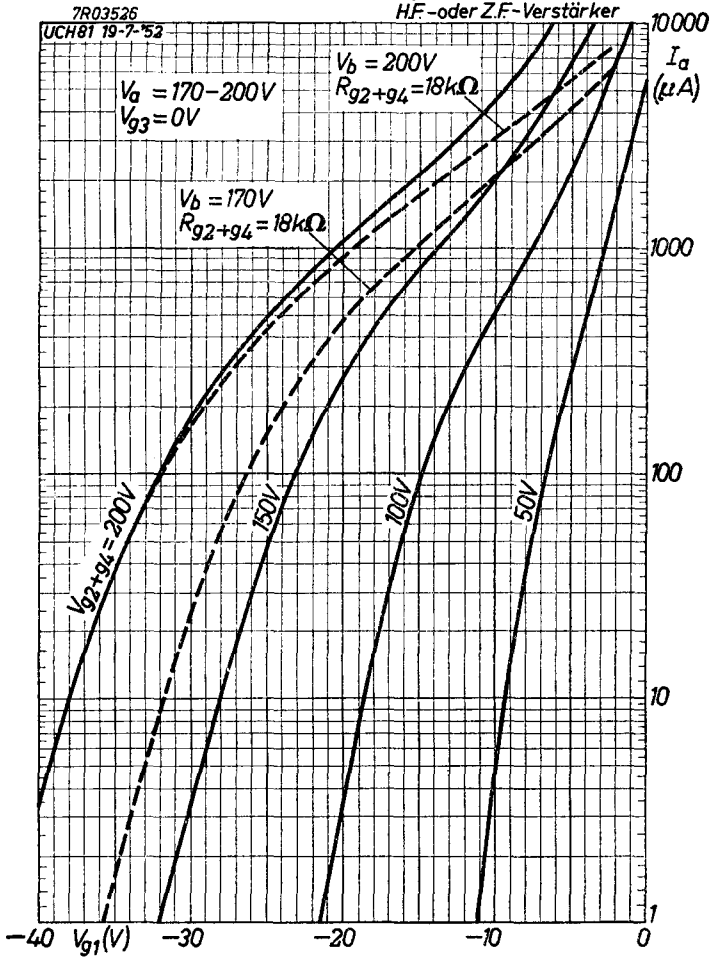


R

PHILIPS

UCH 81

R.F. or I.F. amplifier; Amplificateur H.F. ou M.F.; H.F.-oder Z.F.-Verstärker



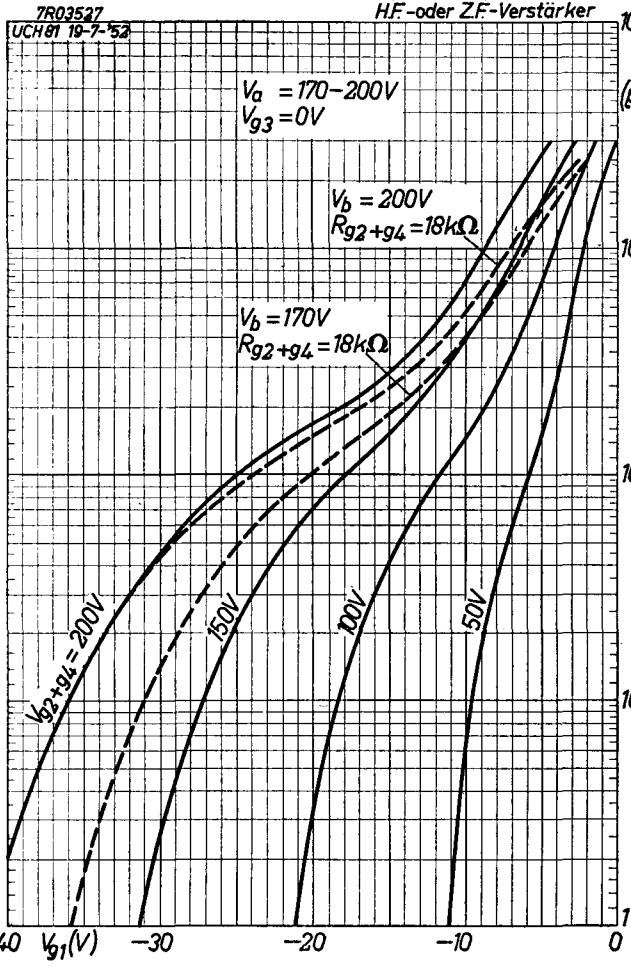
9.9.1952

S

UCH 81

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R.F. or I.F. amplifier; Amplificateur H.F. ou M.F.;
H.F.-oder Z.F.-Verstärker

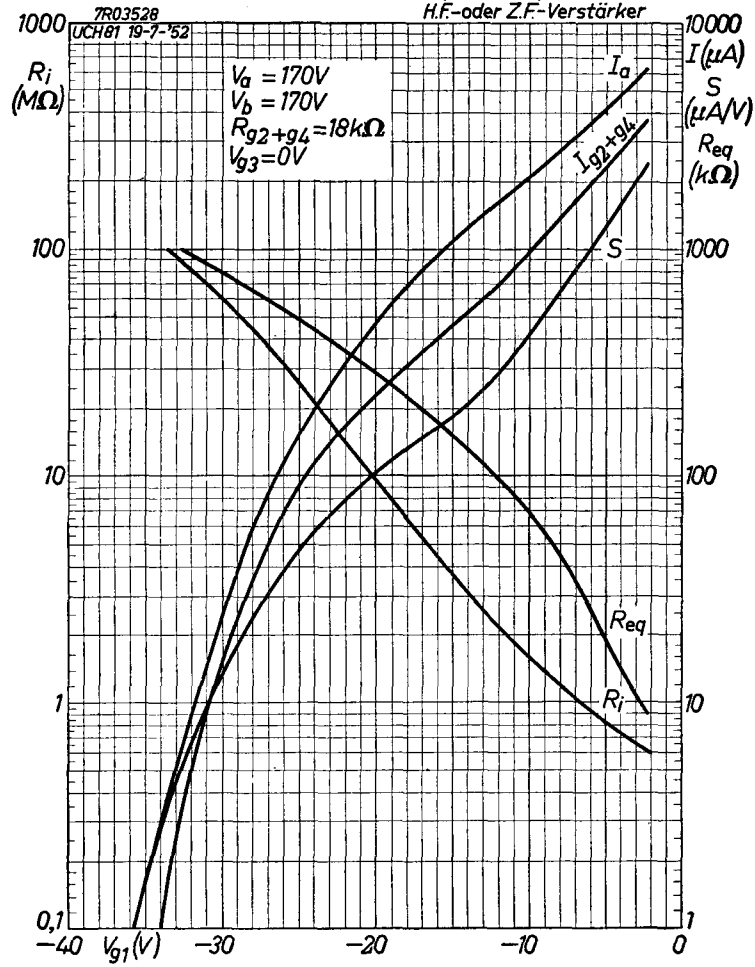


T

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R.F. or I.F. amplifier; Amplificateur H.F. ou M.F.; H.F.- oder Z.F.-Verstärker

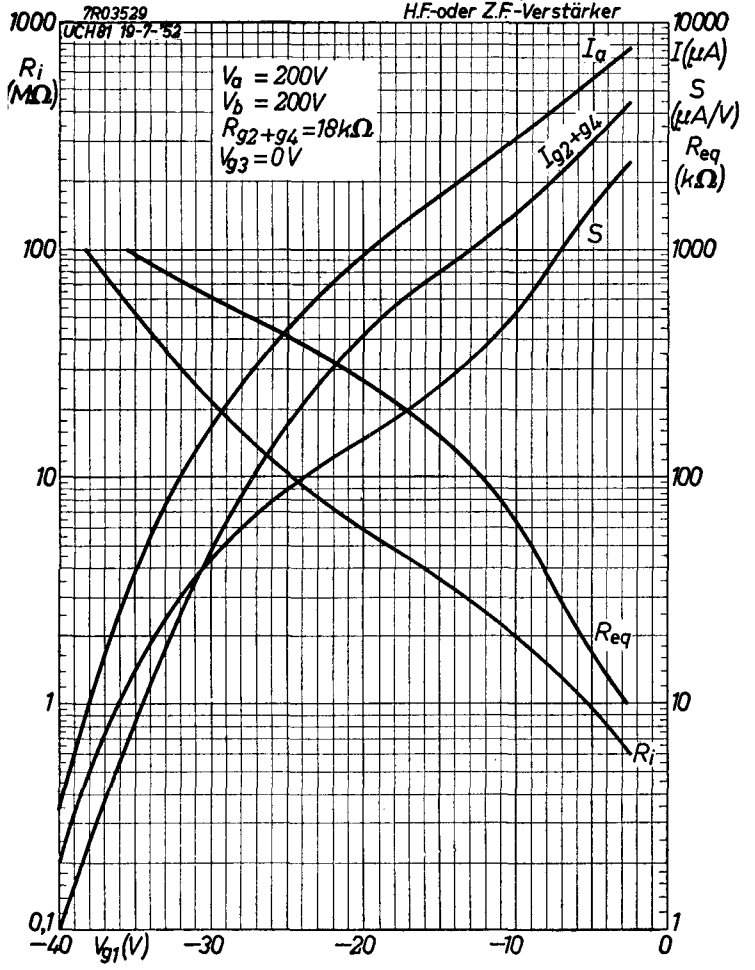


9.9.1952

U

UCH 81 PHILIPS

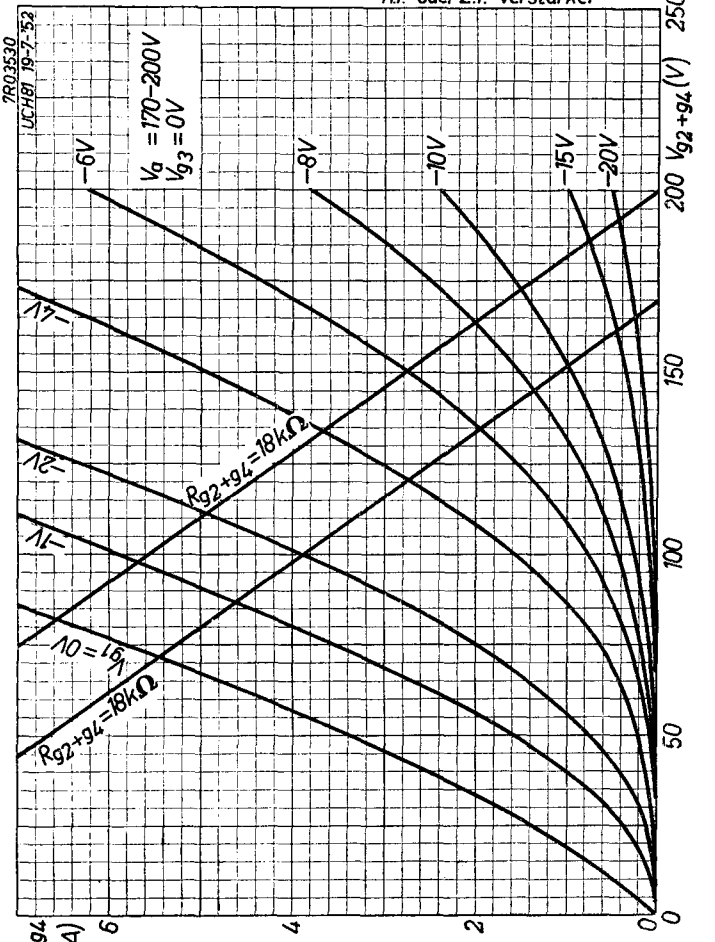
R.F. or I.F. amplifier; Amplificateur H.F. ou M.F.; H.F.-oder Z.F.-Verstärker



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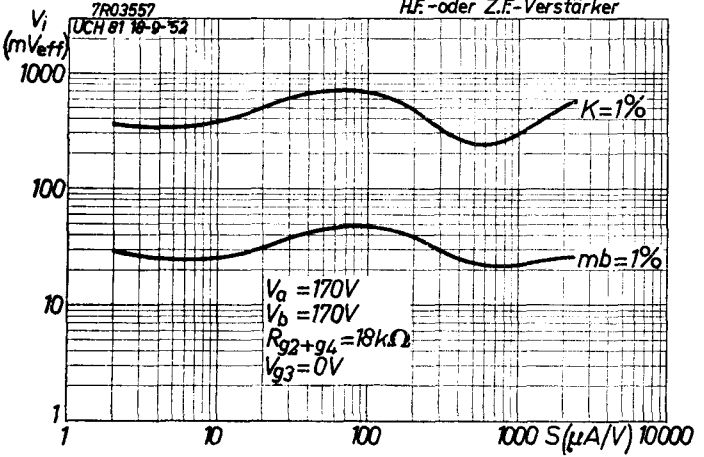
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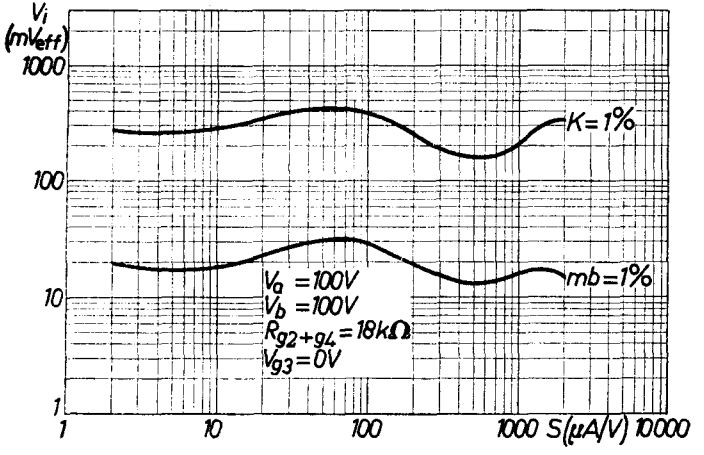


9.9.1952

W

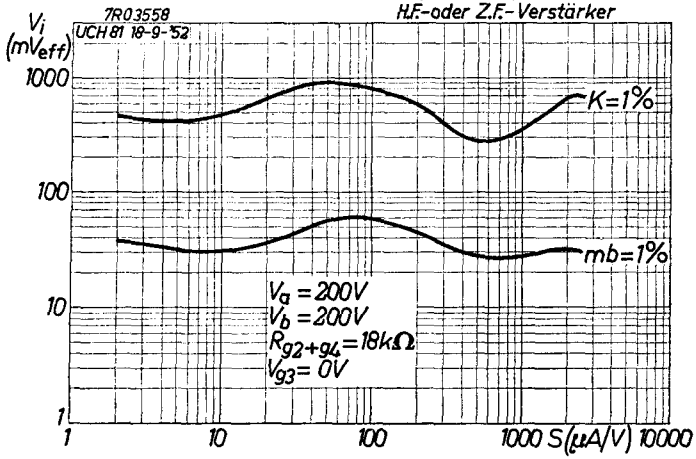
R.F. or I.F. amplifier; Amplificateur H.F. ou M.F.; H.F.-oder Z.F.-Verstärker





x

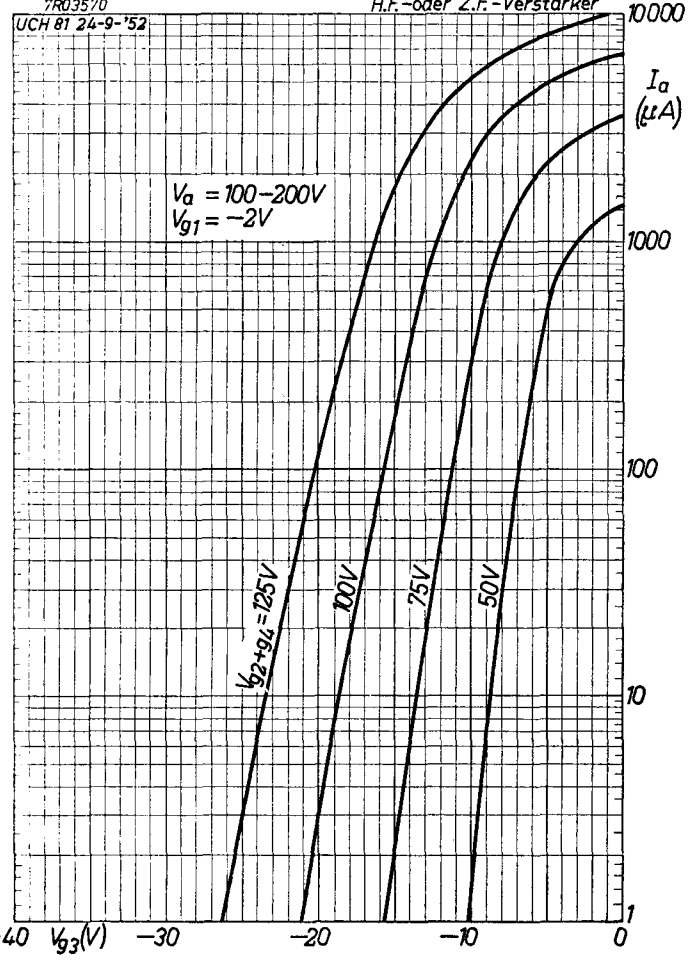
R.F. or I.F. amplifier; Amplificateur H.F. ou M.F.; H.F.-oder Z.F.-Verstärker



UCH 81

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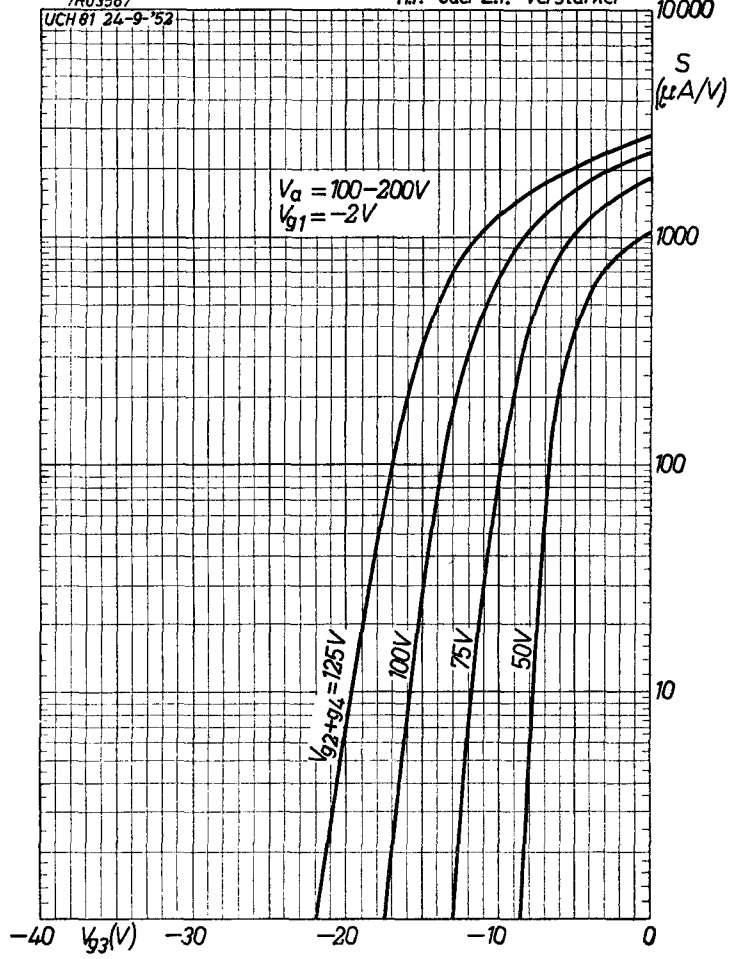
R.F. or I.F. amplifier; Amplificateur H.F. ou M.F.;
H.F.-oder Z.F.-Verstärker



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R.F. or I.F. amplifier; Amplificateur H.F. ou M.F.; H.F.- oder Z.F.-Verstärker



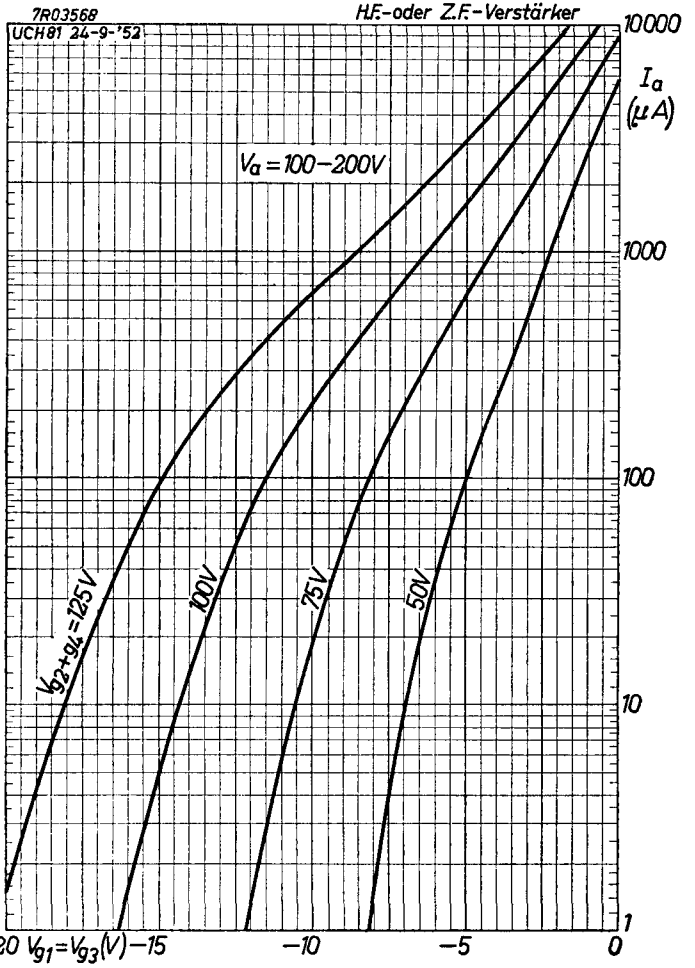
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AA

UCH 81

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R.F. or I.F. amplifier; Amplificateur H.F. ou M.F.; H.F.- oder Z.F.-Verstärker

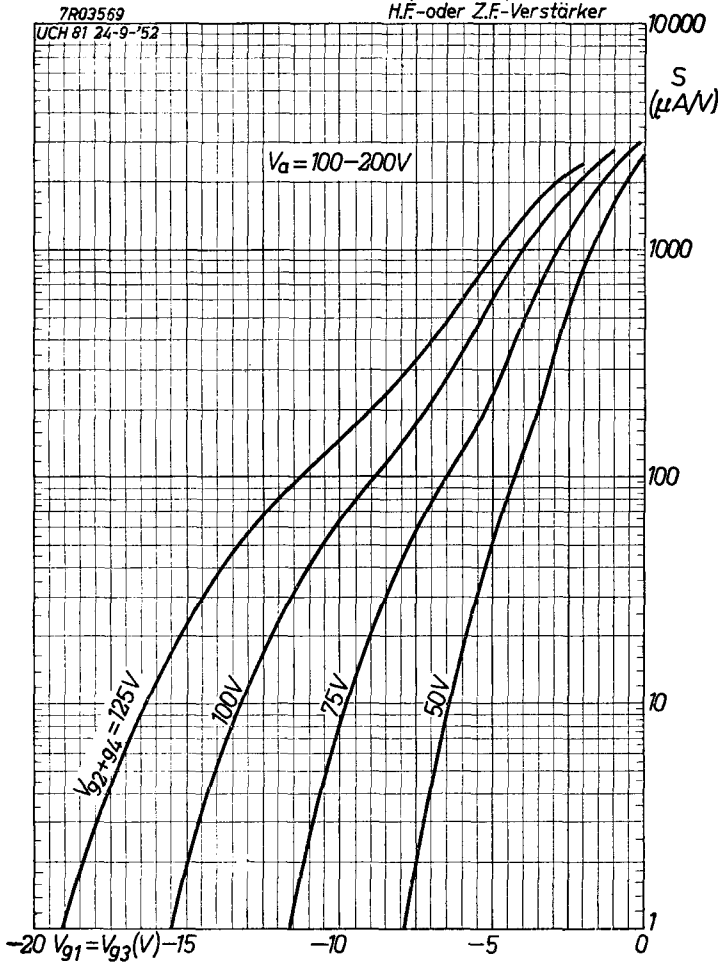


AB

PHILIPS

UCH 81

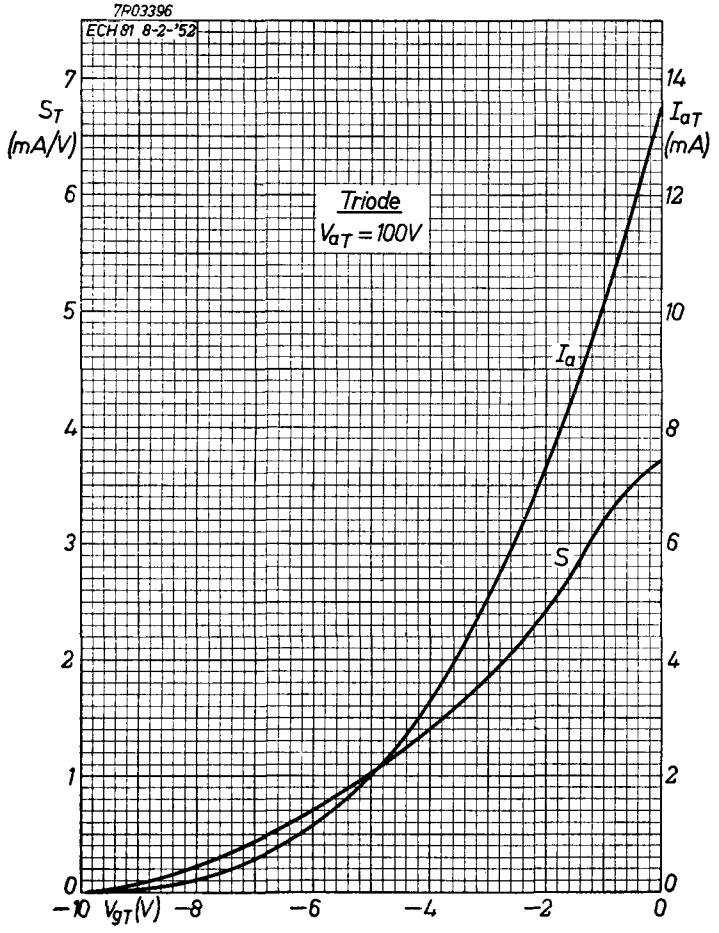
R.F. or I.F. amplifier; Amplificateur H.F. ou M.F.; H.F.-oder Z.F.-Verstärker



9.9.1952

AC

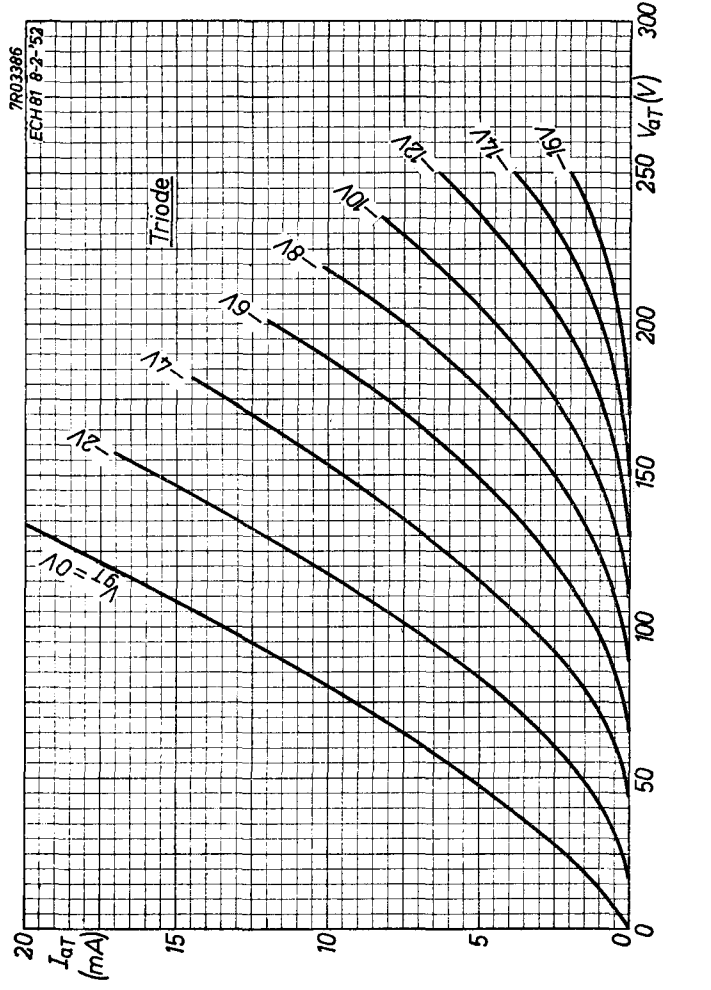
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AD

PHILIPS

UCH 81

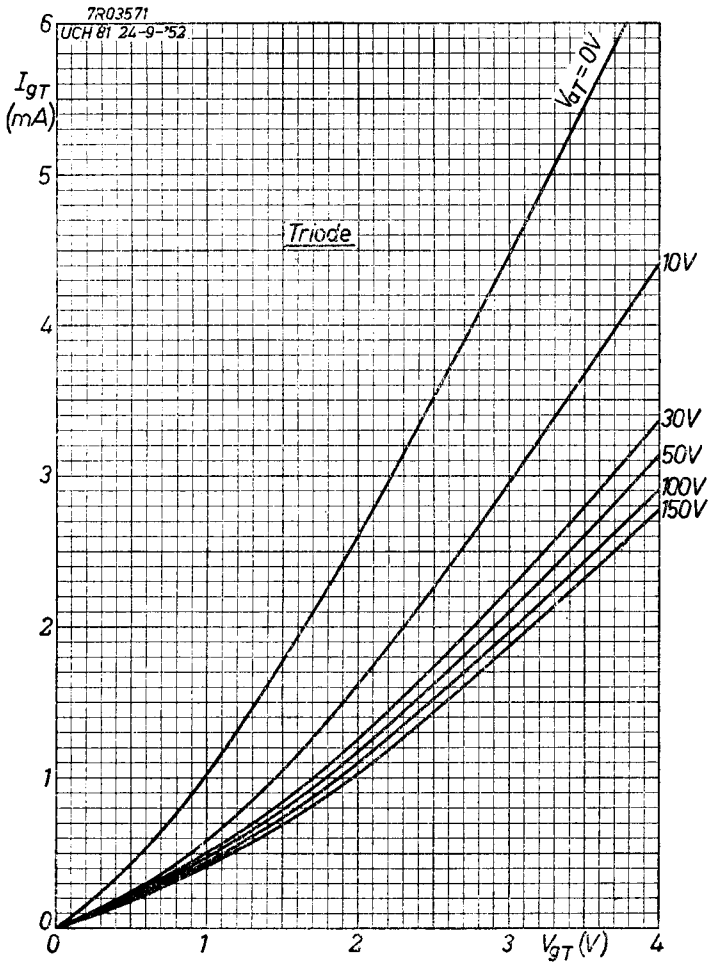


9.9.1952

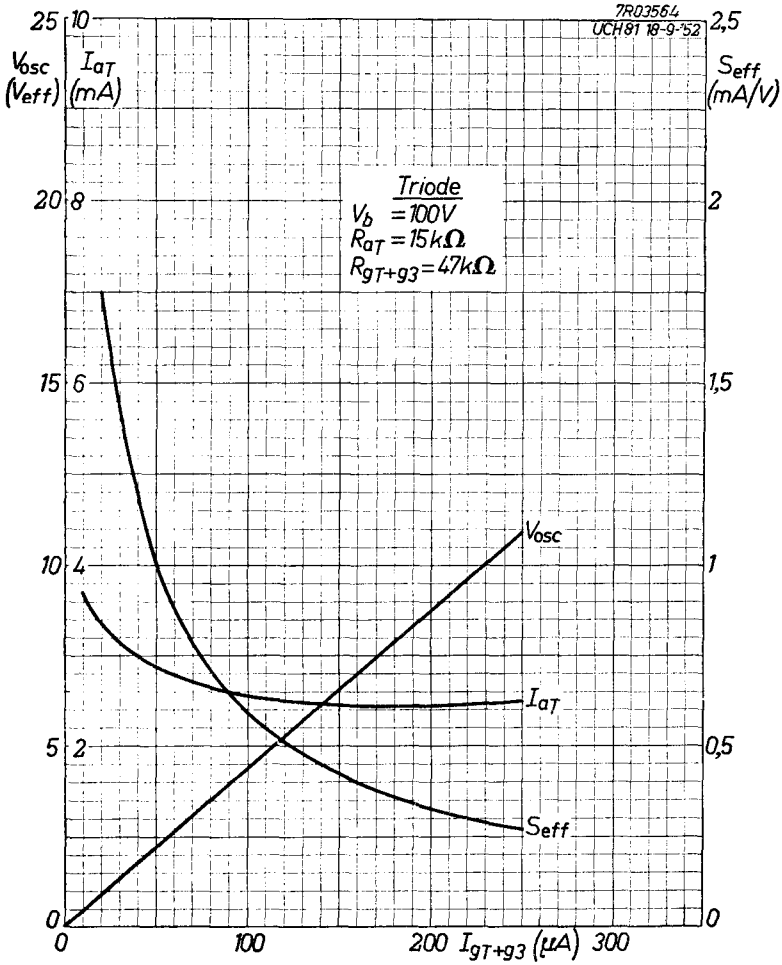
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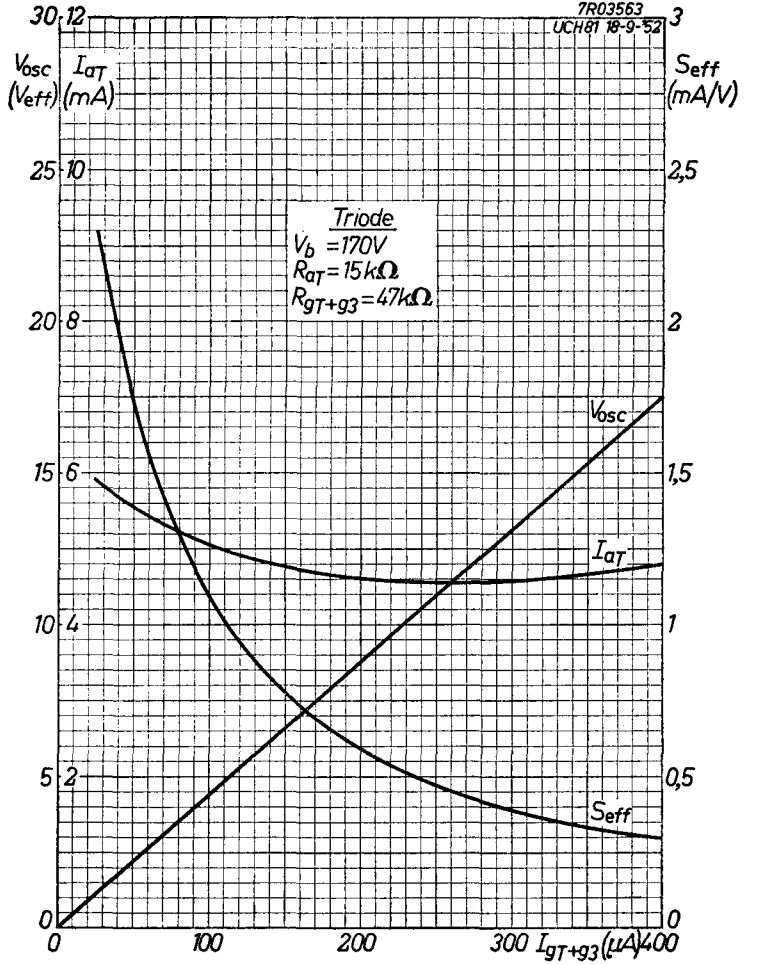
AF


7R03564
UCH81 18-9-52
V_{osc} (V_{eff})
I_{aT} (mA)
S_{eff} (mA/V)
Triode
V_b = 100V
R_{aT} = 15kΩ
R_{gT+g3} = 47kΩ
V_{osc}
I_{aT}
S_{eff}
I_{gT+g3} (μA)
25
20
15
10
5
0
10
8
6
4
2
0
2,5
2
1,5
1
0,5
0
100
200
300

9.9.1952

AG

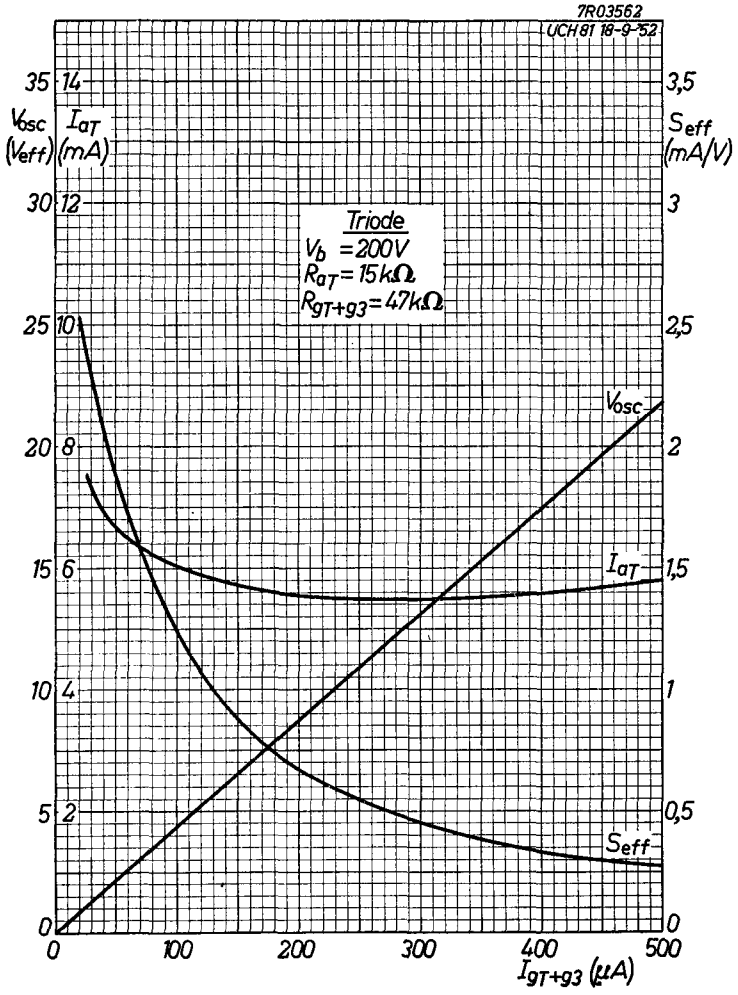
UCH 81 **PHILIPS**



AH

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UCH 81

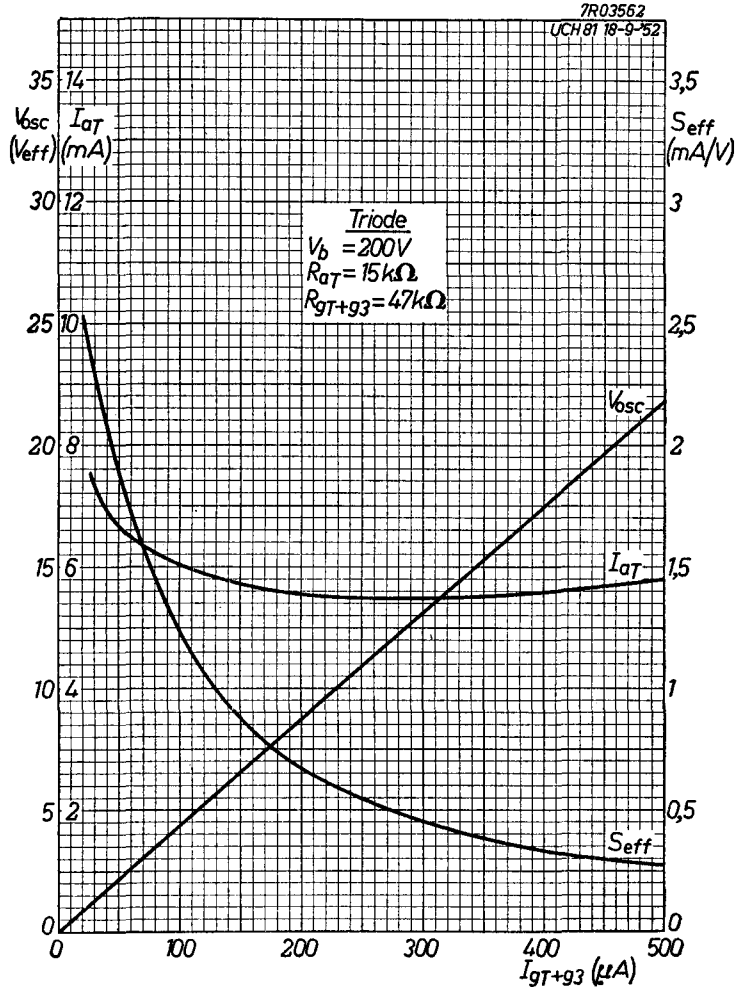


12.12.1953

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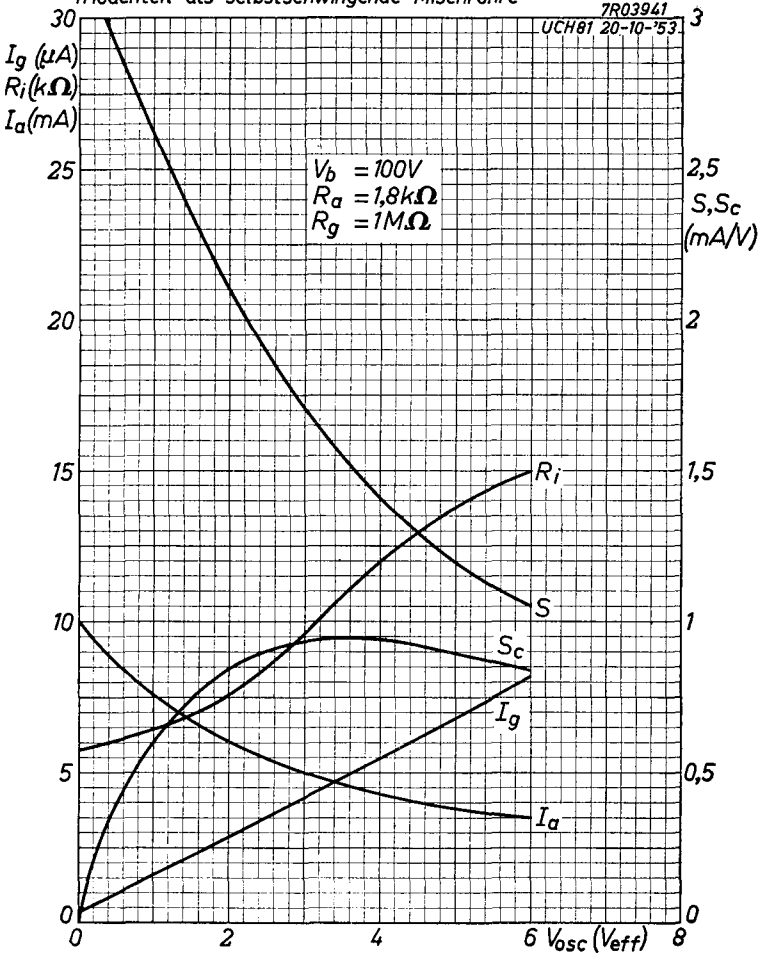
10.10.1957

AI

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Triode section as self-oscillating frequency changer
Partie triode en montage changeuse de fréquence à auto-oscillation
Triodenteil als selbstschwingende Mischröhre

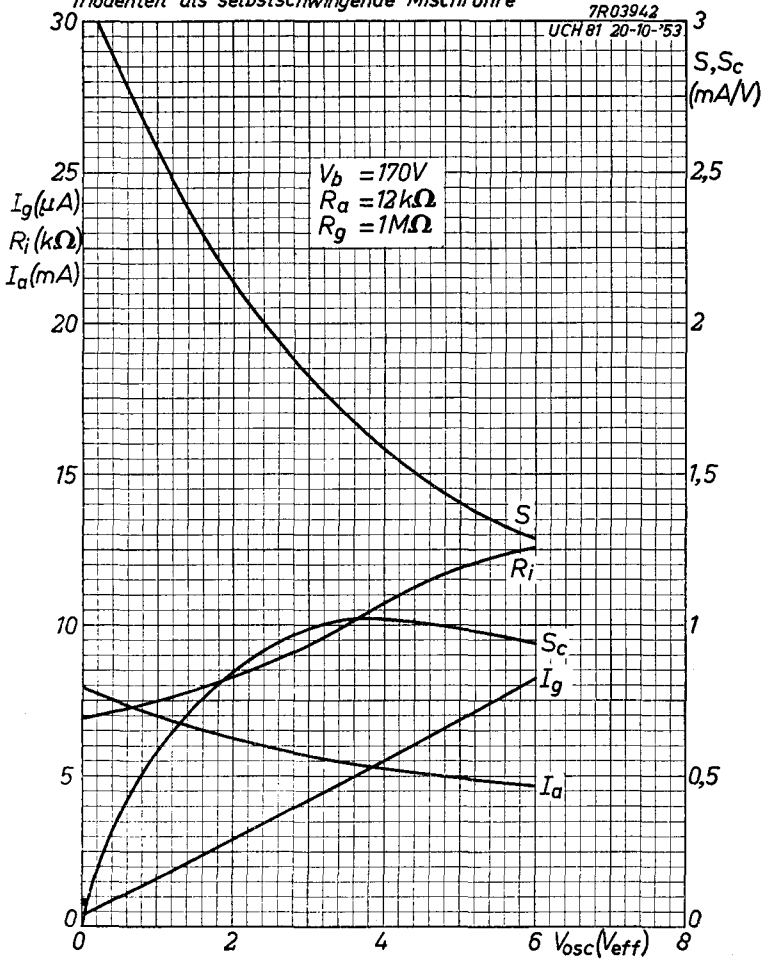


AJ

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Triode section as self-oscillating frequency changer
Partie triode en montage changeuse de fréquence à auto-oscillation
Triodenteil als selbstschwingende Mischröhre



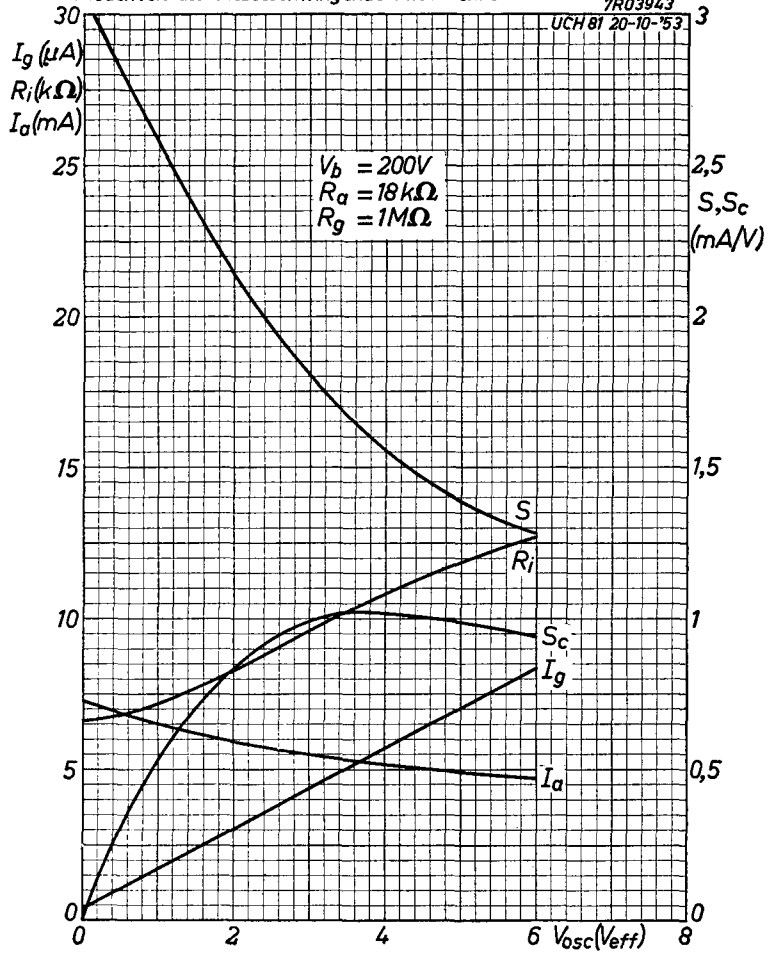
12.12.1953

AK

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Triode section as self-oscillating frequency changer
Partie triode en montage changeuse de fréquence à auto-oscillation
Triodenteil als selbstschwingende Mischröhre



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HANDBOOK

UCH81

page	sheet	date
1	1	1953.03.03
2	1	1954.04.04
3	1	1055.05.05
4	2	1953.03.03
5	2	1954.04.04
6	2	1055.05.05
7	3	1953.03.03
8	4	1953.03.03
9	5	1953.03.03
10	A	1952.09.09
11	B	1952.09.09
12	C	1952.09.09
13	D	1952.09.09
14	E	1952.09.09
15	F	1952.09.09
16	G	1952.09.09
17	H	1952.09.09
18	I	1952.09.09
19	J	1952.09.09

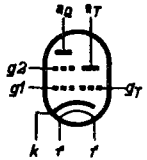
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26	Q	1952.09.09
27	R	1952.09.09
28	S	1952.09.09
29	T	1952.09.09
30	U	1952.09.09
31	V	1952.09.09
32	W	1952.09.09
33	X	1952.09.09
34	Y	1952.09.09
35	Z	1952.09.09
36	AA	1952.09.09
37	AB	1952.09.09
38	AC	1952.09.09
39	AD	1952.09.09
40	AE	1952.09.09
41	AF	1952.09.09
42	AG	1952.09.09
43	AH	1952.09.09
44	AI	1953.12.12
45	AI	1957.10.10
46	AJ	1953.12.12
47	AK	1953.12.12
48	AL	1953.12.12
49, 50	FP	2000.06.25

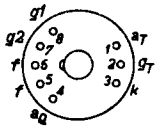
PHILIPS UCL 11

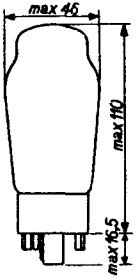
TRIODE-TETRODE, triode for use as L.F. amplifier and tetrode for output valve
TRIODE-TETRODE, triode pour utilisation comme amplificatrice B.F. et tétrode comme tube de sortie
TRIODE-TETRODE, Triode zur Verwendung als N.F. Verstärker und Tetrode als Endröhre

Heating:	indirect by A.C. or D.C.; series supply	
Chauffage:	indirect par C.A. ou C.C.; alimentation en série	Vf = 60 V If = 0,100 A
Heizung:	indirekt durch Wechsel- *oder Gleichstrom* Serienspeisung	

Dimensions in mm
Dimensions en mm
Abmessungen in mm







Capacities Capacités Kapazitäten	Triode section Partie triode Triodenteil	Tetrode section Partie tétrode Tetrodenteil
	Ca = 4,6 pF	Cag1 < 0,9 pF
	Cag = 1,4 pF	
	Cg = 5,3 pF	
	Cgf < 0,02 pF	

Between triode and tetrode section
Entre les parties triode et tétrode
Zwischen Trioden- und Tetrodenteil

CgTg1Q < 0,1 pF

Typical characteristics of the triode section
Caractéristiques typiques de la partie triode
Kenndaten des Triodenteiles

Va	= 200 V
Vg	= -2 V
Ia	= 2 mA
S	= 2,1 mA/V
Ri	= 30 kΩ
μ	= 65

Operating characteristics of the tetrode section
Caractéristiques d'utilisation de la partie tétrode
Betriebsdaten des Tetrodenteiles

Va	= 200 V	μg2g1	= 14
Vg2	= 200 V	Ri	= 18 kΩ
Vg1	= -8,5 V	Ra	= 4,5 kΩ
Ia	= 45 mA	Wo (d_{tot} = 10%)	= 4 W
Ig2	= 6 mA	Vi (d_{tot} = 10%)	= 5 V_{eff}
S	= 9 mA/V	Vi (Wo = 50 mW)	= 0,4 V_{eff}

Limiting values of the triode section
Caractéristiques limites de la partie triode
Grenzdaten des Triodenteiles

Va_o	= max. 550 V	Rg	= max. 1,7 MΩ
Va	= max. 250 V	Vg (Ig = +0,3 μA)	= max.-1,3 V
Wa	= max. 0,6 W		

Limiting values of the tetrode section
Caractéristiques limites de la partie tétrode
Grenzdaten des Tetrodenteiles

Va_o	= max. 550 V	Wg2 (Vi = 0 V)	= max. 1,5 W
Va	= max. 250 V	Wg2 (Wo = max.)	= max. 3 W
Wa	= max. 9 W	Vg1 (Ig1=+0,3 μA)	= max.-1,3 V
$Vg2_o$	= max. 550 V	Rg1	= max. 0,7 MΩ
Vg2	= max. 250 V	Rfk	= max. 5 kΩ
Ik	= max. 75 mA	Vfk	= max. 125 V

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UCL11

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1	1	1948.09.17
2	2	1948.09.17
3	FP	2000.06.30

TRIODE-OUTPUT PENTODE

The triode section is intended for use as A.F. amplifier.
The pentode section is intended for use as A.F. power amplifier.

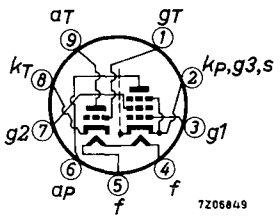
QUICK REFERENCE DATA			
Triode section			
Anode current	I_a	3.5	mA
Transconductance	S	2.2	mA/V
Amplification factor	μ	70	-
Pentode section			
Anode current	I_a	41	mA
Transconductance	S	7.5	mA/V
Amplification factor	$\mu_{g_2g_1}$	9.5	-
Output power	W_o	3.3	W

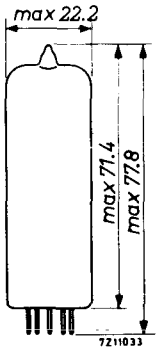
HEATING: Indirect by A.C. or D.C.; series supply

Heater current	I_f	100	mA
Heater voltage	V_f	50	V

DIMENSIONS AND CONNECTIONS Dimensions in mm

Base: Noval





CAPACITANCES

Triode section				
Anode to all except grid	$C_{a(g)}$		4.3	pF
Grid to all except anode	$C_{g(a)}$		2.7	pF
Anode to grid	C_{ag}		4.4	pF
Grid to heater	C_{gf}	max.	0.02	pF
Pentode section				
Anode to all except grid No.1	$C_{a(g_1)}$		8.0	pF
Grid No.1 to all except anode	$C_{g_1(a)}$		9.3	pF
Anode to grid No.1	C_{ag_1}	max.	0.3	pF
Grid No.1 to heater	C_{g_1f}	max.	0.3	pF
Between triode and pentode sections				
Anode triode to grid No.1 pentode	$C_{a_Tg_{1P}}$	max.	0.02	pF
Grid triode to anode pentode	$C_{g_Ta_P}$	max.	0.02	pF
Grid triode to grid No.1 pentode	$C_{g_Tg_{1P}}$	max.	0.025	pF
Anode triode to anode pentode	$C_{a_Ta_P}$	max.	0.25	pF

TYPICAL CHARACTERISTICS

Triode section			
Anode voltage	V_a	100	V
Grid voltage	V_g	0	V
Anode current	I_a	3.5	mA
Transconductance	S	2.2	mA/V
Amplification factor	μ	70	-
Pentode section			
Anode voltage	V_a	170	V
Grid No.2 voltage	V_{g_2}	170	V
Grid No.1 voltage	V_{g1}	-11.5	V
Anode current	I_a	41	mA
Grid No.2 current	I_{g_2}	9	mA
Transconductance	S	7.5	mA/V
Amplification factor	$\mu_{g_2g_1}$	9.5	-
Internal resistance	R_i	16	kΩ

OPERATING CHARACTERISTICS

Triode section as A.F. amplifier

A)	Signal source resistance	R_S			0.22	MΩ
	Grid resistor	R_g			3	MΩ
	Grid resistor of next stage	R_g'			0.68	MΩ
	Supply voltage	V_b		170	100	V
	Cathode resistor	R_k		2.7	2.7	kΩ
	Anode resistor	R_a		220	220	kΩ
	Anode current	I_a		0.43	0.23	mA
	Voltage gain	V_o/V_i [1]		51	47	-
	Max. output voltage	$V_{o\,max}$		25	15	V_{RMS}
	Distortion	d_{tot} [2]		2.3	4.0	%

B)	Signal source resistance	R_S		0.22			MΩ
	Grid resistor	R_g		22			MΩ
	Grid resistor of next stage	R_g		0.68			MΩ
	Supply voltage	V_b	170	170	100	100	V
	Cathode resistor	R_k	0	0	0	0	Ω
	Anode resistor	R_a	100	220	100	220	kΩ
	Anode current	I_a	0.86	0.50	0.37	0.22	mA
	Voltage gain	V_o/V_i [1]	49	53	42	46	-
	Max. output voltage	$V_{o\,max}$	19	20	8	9	V_{RMS}
	Distortion	d_{tot}	1.4 [3]	1.4 [3]	1.3 [2]	1.5 [2]	%

Microphony and hum

The triode section can be used without special precautions against microphony and hum in circuits in which an input voltage of minimum 10 mV_{RMS} is required for an output of 50 mW of the output stage, Z_g (f = 50 Hz) = 0.25 MΩ and without A.C. voltage between pin 4 and cathode.

1) Measured at small input voltage.

2) At lower output voltages the distortion is proportionally lower.

3) At lower output voltages down to 5 V_{RMS} the distortion is approximately constant. At values below 5 V_{RMS} the distortion is approximately proportional to V_o.

OPERATING CHARACTERISTICS

Pentode section

Class A (Measured with V_k constant)

Supply voltage	$V_{ba} = V_{bg_2}$	100			170			V
Cathode resistor	R_k	170			200			Ω
Load resistance	$R_{a\sim}$	3.0			3.25			kΩ
Grid No.1 driving voltage	V_i	0	0.7	3.75	0	0.61	5.9	V_{RMS}
Anode current	I_a	26	–	27	42	–	44	mA
Grid No.2 current	I_{g_2}	5.8	–	8.6	9.2	–	15.5	mA
Output power	W_o	0	0.05	1.0	0	0.05	3.2	W
Distortion	d_{tot}	–	–	10	–	–	10	%

Supply voltage	$V_{ba} = V_{bg_2}$	200			V
Grid No.2 series resistor (non-decoupled)	R_{g_2}	470			Ω
Cathode resistor	R_k	330			Ω
Load resistance	$R_{a\sim}$	4.5			kΩ
Grid No.1 driving voltage	V_i	0	0.66	6.7	V_{RMS}
Anode current	I_a	35	–	37	mA
Grid No.2 current	I_{g_2}	7.8	–	13.3	mA
Output power	W_o	0	0.05	3.3	W
Distortion	d_{tot}	–	–	10	%

LIMITING VALUES (Design centre rating system)

Triode section				
Anode voltage	V_{a_o}	max.	550	V
	V_a	max.	250	V
Anode dissipation	W_a	max.	1	W
Cathode current	I_k	max.	15	mA
Grid resistor				
for fixed bias	R_g	max.	1	MΩ
for automatic bias	R_g	max.	3	MΩ
Grid impedance at 50 Hz	Z_g	max.	0.5	MΩ
Cathode to heater voltage	V_{kf}	max.	200	V
Pentode section				
Anode voltage	V_{a_o}	max.	550	V
	V_a	max.	250	V
Grid No.2 voltage	$V_{g_{2o}}$	max.	550	V
	V_{g_2}	max.	250	V
Anode dissipation	W_a	max.	7	W
Grid No.2 dissipation				
average	W_{g_2}	max.	2	W
peak	$W_{g_{2p}}$	max.	3.2	W
Cathode current	I_k	max.	50	mA
Grid No.1 resistor				
for fixed bias	R_{g_1}	max.	1	MΩ
for automatic bias	R_{g_1}	max.	2	MΩ
Cathode to heater voltage	V_{kf}	max.	200	V

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Data handbook

Electronic components and materials

UCL82

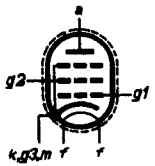
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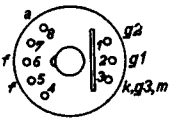
"Miniwatt" UF 11

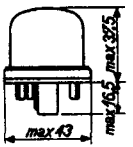
PENTODE with variable mutual conductance for use as H.F., I.F. or L.F. amplifier
PENTHODE à pente variable pour utilisation comme amplificatrice H.F., M.F. ou B.F.
PENTHODE mit veränderlicher Steilheit zur Verwendung als H.F., Z.F. oder N.F. Verstärker

Heating:	indirect by A.C. or D.C.; series supply	
Chauffage:	indirect par C.A. ou C.C.; alimentation en série	Vf = 15 V If = 0,100 A
Heizung:	indirekt durch Wechsel- oder Gleichstrom; Serienspeisung	

Dimensions in mm
Dimensions en mm
Abmessungen in mm







Capacities Capacités Kapazitäten		
	Ca =	6,5 pF
	Cag1 <	0,002 pF
	Cg1 =	7 pF
	Cg1f <	0,005 pF

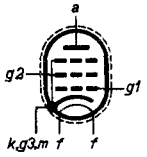
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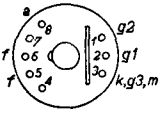
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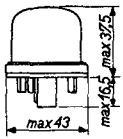
PENTODE with variable mutual conductance for use as R.F., I.F. or A.F. amplifier
PENTHODE à pente variable pour utilisation en amplificatrice H.F., M.F. ou B.F.
PENTODE mit veränderlicher Steilheit zur Verwendung als HF-, ZF- oder NF-Verstärker

Heating : indirect;series supply — V_f = 15 V
Chauffage: indirect;alimentation série — I_f = 100 mA
Heizung : indirekt;Serienspeisung

Dimensions in mm
Dimensions en mm
Abmessungen in mm







Base, culot, Sockel: Y

Capacitances
Capacités
Kapazitäten

C_a = 6,5 pF
C_{g1} = 7 pF
C_{ag1} < 0,002 pF
C_{g1f} < 0,005 pF

Operating characteristics as H.F. or I.F. amplifier
Caractéristiques d'utilisation en amplificatrice H.F. ou M.F.
Betriebsdaten als HF- oder ZF-Verstärker

V_a	=	100			200			V
R_{g2}	=	70			70			kΩ
R_k	=	260			260			Ω
μ_{g2g1}	=	12			12			
V_{g1}	=	-1	-22	-25	-2	-42	-48	V
V_{g2}	=	40	-	100	80	-	200	V
I_a	=	2,8	-	-	6	-	-	mA
I_{g2}	=	0,95	-	-	1,7	-	-	mA
S	=	1800	18	6	2200	22	5,5	µA/V
R_i	=	1,1	>10	>10	1,5	>10	>10	MΩ

Operating characteristics as H.F. or I.F. amplifier
Caractéristiques d'utilisation comme amplificatrice H.F. ou M.F.
Betriebsdaten als H.F. oder Z.F. Verstärker

Va	=	100			200		V
Rg2	=	70			70		kΩ
Rk	=	260			260		Ω
μg2g1	=	12			12		
Vg1	=	-1	-22	-25	-2	-42	-48 V
Vg2	=	40	-	100	80	-	200 V
Ia	=	2,8	-	-	6	-	- mA
Ig2	=	0,95	-	-	1,7	-	- mA
S	=	1800	18	6	2200	22	5,5 μA/V
Ri	=	1,1	>10	>10	1,5	>10	>10 MΩ

Operating characteristics as L.F. amplifier
Caractéristiques d'utilisation comme amplificatrice B.F.
Betriebsdaten als N.F. Verstärker

A. Vb = 200 V; Ra = 0,2 MΩ; Rg2 = 0,6 MΩ; Rk = 2 kΩ

$-V_R$ (V)	Ia (mA)	Ig2 (mA)	$\frac{Vo}{Vi}$	d_{tot} (%) (Vo=3 V_{eff})	d_{tot} (%) (Vo=5 V_{eff})
0	0,76	0,26	77	1,0	1,7
5	0,66	0,21	33	0,65	1,1
10	0,56	0,17	21	0,80	1,3
18	0,42	0,12	14	1,10	1,8
25	0,27	0,07	8,1	2,10	3,5

B. Vb = 200 V; Ra= 0,1 MΩ; Rg2= 0,4 MΩ; Rk = 1,4 kΩ

$-V_R$ (V)	Ia (mA)	Ig2 (mA)	$\frac{Vo}{Vi}$	d_{tot} (%) (Vo=3 V_{eff})	d_{tot} (%) (Vo=5 V_{eff})
0	1,18	0,37	69	0,9	1,5
5	0,98	0,28	27	1,0	1,6
10	0,77	0,22	16	1,2	2,0
18	0,53	0,13	9,7	1,6	2,7
25	0,34	0,08	5,5	2,4	4,0

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Operating characteristics as A.F. amplifier
Caractéristiques d'utilisation en amplificatrice B.F.
Betriebsdaten als NF-Verstärker

A. V_b = 200 V; R_a = 0,2 MΩ; R_{g2} = 0,6 MΩ; R_k = 2 kΩ

$-V_R$ (V)	I_a (mA)	I_{g2} (mA)	$\frac{V_o}{V_i}$	d_{tot} (%) (V_o=3 V_{eff})	d_{tot} (%) (V_o=5 V_{eff})
0	0,76	0,26	77	1,0	1,7
5	0,66	0,21	33	0,65	1,1
10	0,56	0,17	21	0,80	1,3
18	0,42	0,12	14	1,10	1,8
25	0,27	0,07	8,1	2,10	3,5

B. V_b = 200 V; R_a=0,1 MΩ; R_{g2} = 0,4 MΩ; R_k= 1,4 kΩ

$-V_R$ (V)	I_a (mA)	I_{g2} (mA)	$\frac{V_o}{V_i}$	d_{tot} (%) (V_o=3 V_{eff})	d_{tot} (%) (V_o=5 V_{eff})
0	1,18	0,37	69	0,9	1,5
5	0,98	0,28	27	1,0	1,6
10	0,77	0,22	16	1,2	2,0
18	0,53	0,13	9,7	1,6	2,7
25	0,34	0,08	5,5	2,4	4,0

C. V_b = 100 V; R_a = 0,2 MΩ; R_{g2} = 0,6 MΩ; R_k = 2 kΩ

$-V_R$ (V)	I_a (mA)	I_{g2} (mA)	$\frac{V_o}{V_i}$	d_{tot} (%) (V_o=3 V_{eff})	d_{tot} (%) (V_o=5 V_{eff})
0	0,37	0,12	66	2,4	4,0
2,5	0,31	0,10	30	1,1	1,8
5	0,26	0,09	18	2,0	3,3
9	0,20	0,06	11	2,4	4,0
12,5	0,13	0,03	6,9	3,6	6,0

Limiting values
Caractéristiques limites
Grenzdaten

V_{a_o} = max. 550 V
V_a = max. 300 V
W_a = max. 2 W
R_{g1} = max. 3 MΩ
R_{kf} = max. 20 kΩ
V_{kf} = max. 200 V

V_{g2_o} = max. 550 V
V_{g2} (I_a < 3 mA) = max. 300 V
V_{g2} (I_a = 6 mA) = max. 125 V
W_{g2} = max. 0,3 W
I_k = max. 10 mA
V_{g1} (I_{g1}=+0,3μA) = max. -1,3 V

C. Vb = 100 V; Ra = 0,2 MΩ; Rg2 = 0,6 MΩ; Rk = 2 kΩ

$-V_R$ (V)	Ia (mA)	Ig2 (mA)	$\frac{Vo}{Vi}$	d_{tot} (%) (Vo=3 V_{eff})	d_{tot} (%) (Vo=5 V_{eff})
0	0,37	0,12	66	2,4	4,0
2,5	0,31	0,10	30	1,1	1,8
5	0,26	0,09	18	2,0	3,3
9	0,20	0,06	11	2,4	4,0
12,5	0,13	0,03	6,9	3,6	6,0

D. Vb = 100 V; Ra= 0,1 MΩ; Rg2= 0,4 MΩ; Rk = 1,4 kΩ

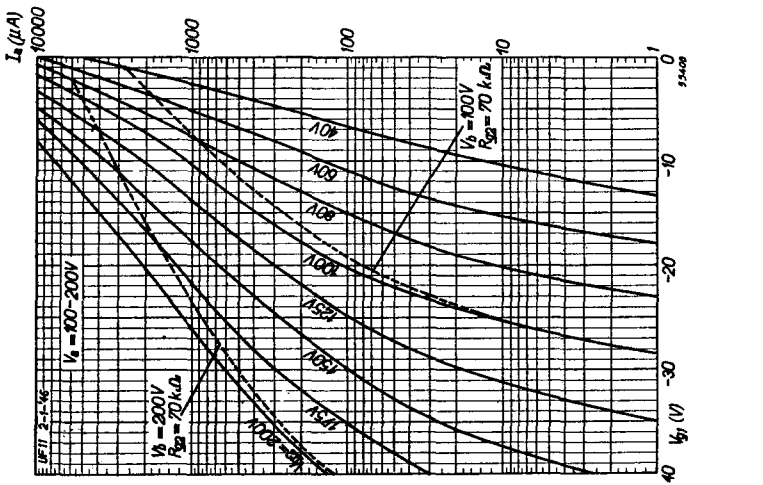
$-V_R$ (V)	Ia (mA)	Ig2 (mA)	$\frac{Vo}{Vi}$	d_{tot} (%) (Vo=3 V_{eff})	d_{tot} (%) (Vo=5 V_{eff})
0	0,58	0,18	65	1,3	2,2
2,5	0,45	0,13	45	2,2	3,7
5	0,36	0,11	14	3,7	4,5
9	0,25	0,07	7,7	3,6	6,0
12,5	0,17	0,04	4,7	5,4	9,0

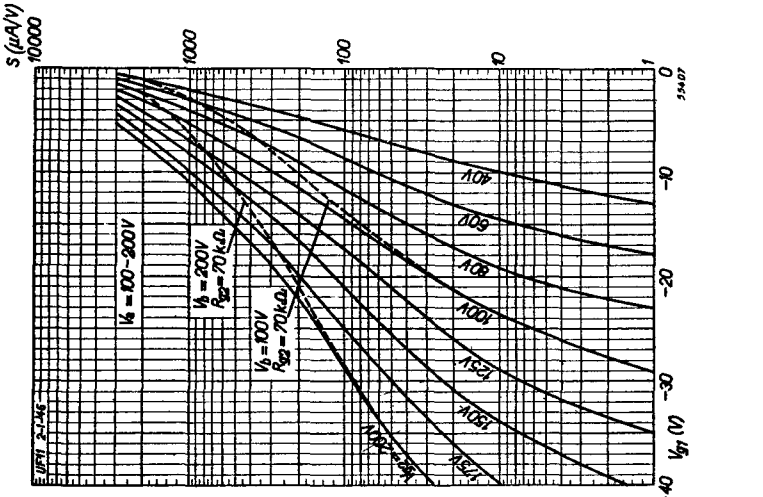
Limiting values
Caractéristiques limites
Grenzdaten

Va_o	= max.	550 V
Va	= max.	300 V
Wa	= max.	2 W
$Vg2_o$	= max.	550 V
Vg2 (Ia < 3 mA)	= max.	300 V
Vg2 (Ia = 6 mA)	= max.	125 V
Wg2	= max.	0,3 W
Ik	= max.	10 mA
Vg1 (Ig1 = +0,3 µA)	= max.	-1,3 V
Rg1	= max.	3 MΩ
Rfk	= max.	20 kΩ
Vfk	= max.	200 V

UF 11

"Miniwatt"





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Electronic Tube

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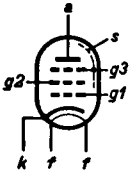
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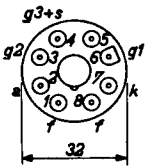
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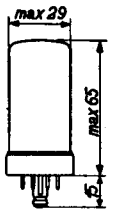
PENTODE with variable mutual conductance for use as H.F., I.F. and L.F. amplifier
PENTHODE à pente variable pour l'utilisation comme amplificatrice H.F., M.F. et B.F.
PENTHODE mit veränderlicher Steilheit zur Verwendung als H.F.-, Z.F.- und N.F. Verstärker

Heating:	indirect by A.C. or D.C.; series supply	
Chauffage:	indirect par C.A. ou C.C.; alimentation en série	Vf = 12,6 V If = 0,100 A
Heizung:	indirekt durch Wechsel- oder Gleichstrom; Serienspeisung	

Dimensions in mm
Dimensions en mm
Abmessungen in mm







Capacities
Capacités
Kapazitäten

Cag1	< 0,002 pF
Ca	= 6,6 pF
Cg1	= 5,6 pF
Cg1f	< 0,006 pF

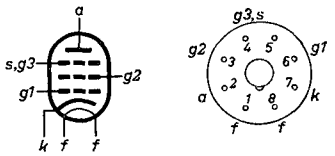
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UF 21

PENTODE with variable mutual conductance for use as R.F., I.F. or A.F. amplifier
PENTHODE à pente variable pour utilisation en amplificatrice H.F., M.F. ou B.F.
PENTODE mit veränderlicher Steilheit zur Verwendung als HF-, ZF- oder NF-Verstärker

Heating : indirect;series supply	V_f	=12,6 V
Chauffage: indirect;alimentation- série	I_f	= 100 mA
Heizung : indirekt;Serienspeisung		

Dimensions in mm
Dimensions en mm
Abmessungen in mm



Base, culot, Sockel: Loctal p.

Capacitances
Capacités
Kapazitäten

C_{ag1}	<	0,002 pF
C_a	=	6,6 pF
C_{g1}	=	5,6 pF
C_{g1f}	<	0,006 pF

Operating characteristics as R.F. or I.F. amplifier
Caractéristiques d'utilisation en amplificatrice H.F ou M.F.
Betriebsdaten als HF- oder ZF-Verstärker

V_a	=	100			200		V
V_{g3}	=	0			0		V
R_{g2}	=	60			60		kΩ
R_k	=	325			325		Ω
V_{g1}	=	-1,3	-19	-23	-2,5	-37	-46 V
V_{g2}	=	50	-	100	100	-	200 V
I_a	=	3,2	-	-	6	-	- mA
I_{g2}	=	0,85	-	-	1,7	-	- mA
S	=	2000	20	5	2200	22	4,5 µA/V
R_i	=	1,0	>10	>10	1,0	>10	>10 MΩ
R_{eq}	=	4,0	-	-	6,2	-	- kΩ

Operating characteristics as H.F. or I.F. amplifier
Caractéristiques d'utilisation comme amplificatrice H.F. ou M.F.
Betriebsdaten als H.F. oder Z.F. Verstärker

A. With fixed screen grid voltage
Avec tension de la grille-écran fixe
Mit fester Schirmgitterspannung

Va	=		100			200		V
Vg3	=		0			0		V
Vg2	=		100			100		V
Rk	=		325			325		Ω
Vg1	=	-2,5	-19	-22	-2,5	-19	-22	V
Ia	=	6	-	-	6	-	-	mA
Ig2	=	1,7	-	-	1,7	-	-	mA
S	=	2200	22	7	2200	22	7	µA/V
Ri	=	0,4	>10	>10	1,0	>10	>10	MΩ
µg2g1	=	17	-	-	17	-	-	
Req	=	6,2	-	-	6,2	-	-	kΩ

B. With sliding screen grid voltage
Avec tension de la grille-écran glissante
Mit gleitender Schirmgitterspannung

Va	=		100			200		V
Vg3	=		0			0		V
Rg2	=		60			60		kΩ
Rk	=		325			325		Ω
Vg1	=	-1,3	-19	-23	-2,5	-37	-46	V
Vg2	=	50	-	100	100	-	200	V
Ia	=	3,2	-	-	6	-	-	mA
Ig2	=	0,85	-	-	1,7	-	-	mA
S	=	2000	20	5	2200	22	4,5	µA/V
Ri	=	1,0	>10	>10	1,0	>10	>10	MΩ
Req	=	4,0	-	-	6,2	-	-	kΩ

Operating characteristics for use as A.F. amplifier with resistance coupling and with control of amplification on grid 1
Caractéristiques d'utilisation en amplificatrice B.F. avec couplage à résistances et avec réglage de l'amplification sur la grille 1
Betriebsdaten zur Verwendung als NF-Verstärker mit Widerstandskopplung und Regelung auf Gitter 1

A. V_b = 200 V; R_a = 0,2 MΩ; R_{g2} = 0,8 MΩ; R_k = 2500 Ω

$-V_R$ (V)	I_a (mA)	I_{g2} (mA)	$\frac{V_o}{V_i}$	d_{tot} (%) (V_o=3Veff)	d_{tot} (%) (V_o=5Veff)	d_{tot} (%) (V_o=8Veff)
0	0,65	0,17	88	0,75	1,3	2,0
5	0,54	0,14	35	1,2	2,0	3,2
10	0,46	0,11	22	1,4	2,3	3,7
15	0,38	0,08	15	1,7	2,8	4,5
20	0,31	0,06	11	1,8	3,0	4,8
25	0,25	0,05	8	2,3	3,8	5,8

B. V_b = 100 V; R_a = 0,2 MΩ; R_{g2} = 0,8 MΩ; R_k = 2500 Ω

$-V_R$ (V)	I_a (mA)	I_{g2} (mA)	$\frac{V_o}{V_i}$	d_{tot} (%) (V_o=3Veff)
0	0,33	0,08	82	0,85
2,5	0,26	0,06	37	2,3
5	0,21	0,05	21	3,4
7,5	0,18	0,03	13	4,1
10	0,14	0,02	9	4,3
12,5	0,12	0,02	7	5,1

Limiting values
Caractéristiques limites
Grenzdaten

V_{a_o}	= max. 550 V	V_{g2_o}	= max. 550 V
V_a	= max. 250 V	V_{g2}(I_a < 3 mA)	= max. 250 V
W_a	= max. 2 W	V_{g2}(I_a = 6 mA)	= max. 150 V
I_k	= max. 10 mA	W_{g2}	= max. 0,3 W
R_{kf}	= max. 20 kΩ	V_{g1}(I_{g1}=+0,3μA)	= max. -1,3 V
V_{kf}	= max. 150 V	R_{g1}	= max. 3 MΩ

Operating characteristics for use as L.F. amplifier with resistance coupling and with control of amplification on grid 1
Caractéristiques d'utilisation comme amplificatrice B.F. avec couplage à résistances et avec réglage de l'amplification sur la grille 1
Betriebsdaten zur Verwendung als N.F.Verstärker mit Widerstandskopplung und Regelung auf Gitter 1

A. Vb = 200 V; Ra = 0,2 MΩ;Rg2 = 0,8 MΩ;Rk = 2500 Ω

$-V_R$ (V)	Ia (mA)	Ig2 (mA)	$\frac{Vo}{Vi}$	d_{tot} (%) ($Vo=3V_{eff}$)	d_{tot} (%) ($Vo=5V_{eff}$)	d_{tot} (%) ($Vo=8V_{eff}$)
0	0,65	0,17	88	0,75	1,3	2,0
5	0,54	0,14	35	1,2	2,0	3,2
10	0,46	0,11	22	1,4	2,3	3,7
15	0,38	0,08	15	1,7	2,8	4,5
20	0,31	0,06	11	1,8	3,0	4,8
25	0,25	0,05	8	2,3	3,8	5,8

B. Vb = 200 V; Ra = 0,1 MΩ;Rg2 = 0,4 MΩ;Rk = 1300 Ω

$-V_R$ (V)	Ia (mA)	Ig2 (mA)	$\frac{Vo}{Vi}$	d_{tot} (%) ($Vo=3V_{eff}$)	d_{tot} (%) ($Vo=5V_{eff}$)	d_{tot} (%) ($Vo=8V_{eff}$)
0	1,20	0,35	78	0,75	1,3	2,0
5	0,96	0,28	33	1,2	2,0	3,2
10	0,78	0,22	20	1,6	2,7	4,3
15	0,62	0,16	13	2,0	3,3	5,3
20	0,48	0,12	8	2,2	3,7	5,9
25	0,36	0,09	6	3,4	5,7	9,0

C. Vb = 100 V; Ra = 0,2 MΩ;Rg2 = 0,8 MΩ;Rk = 2500 Ω

$-V_R$ (V)	Ia (mA)	Ig2 (mA)	$\frac{Vo}{Vi}$	d_{tot} (%) ($Vo=3V_{eff}$)
0	0,33	0,08	82	0,85
2,5	0,26	0,06	37	2,3
5	0,21	0,05	21	3,4
7,5	0,18	0,03	13	4,1
10	0,14	0,02	9	4,3
12,5	0,12	0,02	7	5,1

UF 21

"Miniwatt"

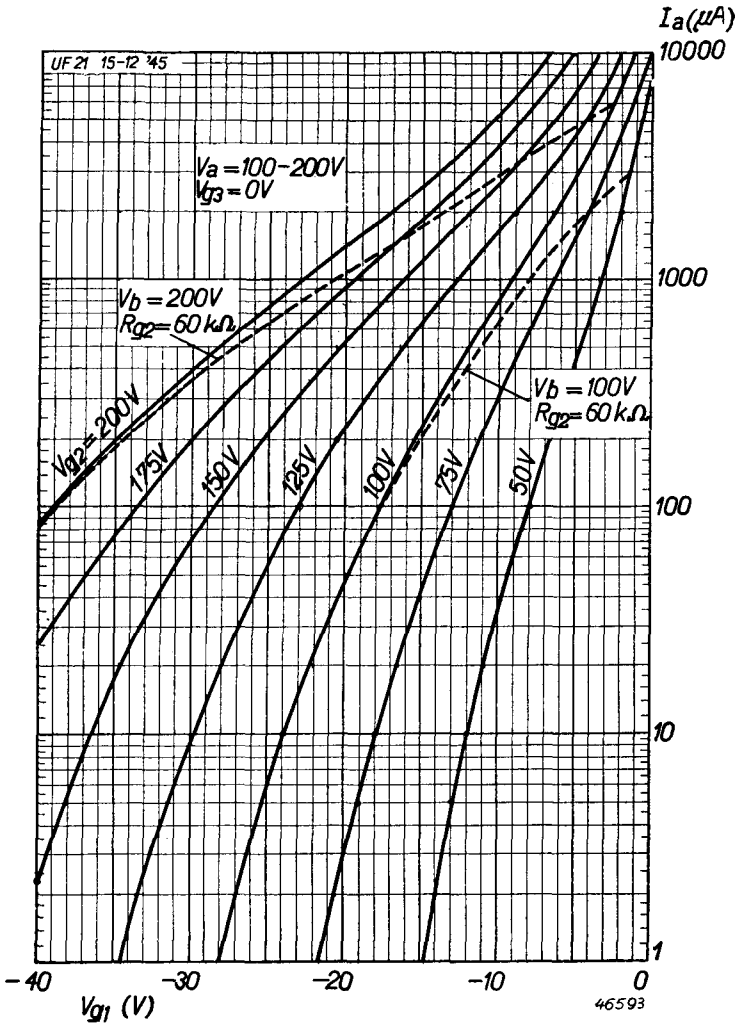
12.10.1948

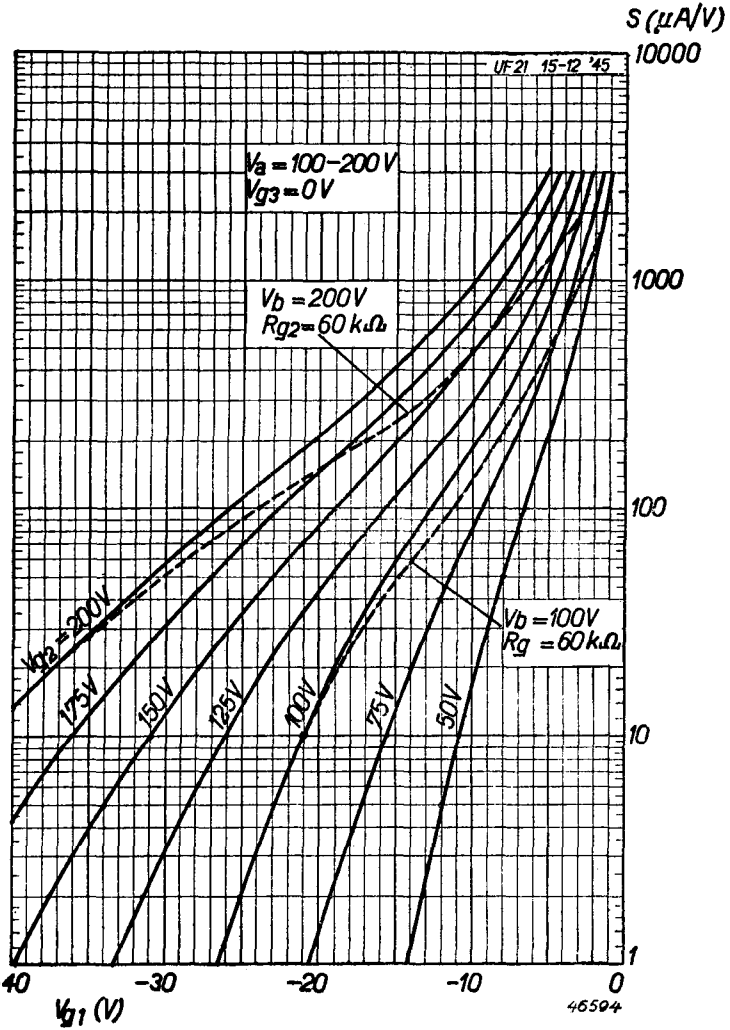
D. Vb = 100 V; Ra = 0,1 MΩ; Rg2 = 0,4MΩ; Rk = 1300 Ω

$-V_R$ (V)	Ia (mA)	Ig2 (mA)	$\frac{Vo}{Vi}$	d_{tot} (%) ($Vo=3V_{eff}$)
0	0,61	0,15	72	0,85
2,5	0,47	0,13	35	2,3
5	0,37	0,10	20	3,5
7,5	0,29	0,06	12	4,3
10	0,22	0,05	7	5,3
12,5	0,17	0,04	6	6,2

Limiting values
Caractéristiques limites
Grenzdaten

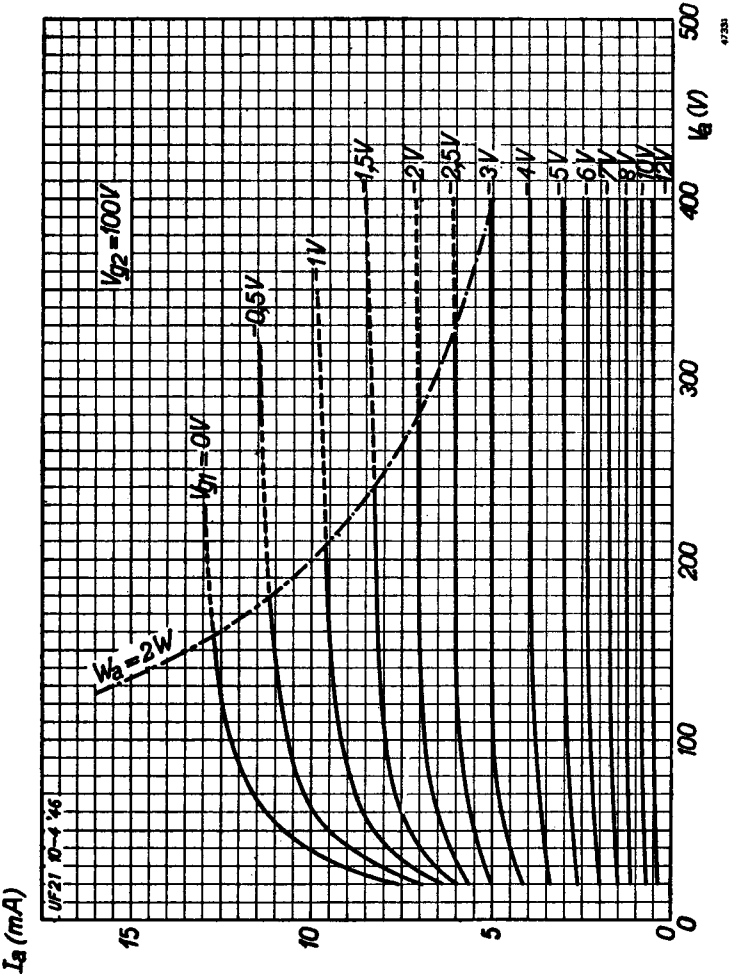
Va_o	= max.	550 V
Va	= max.	250 V
Wa	= max.	2 W
$Vg2_o$	= max.	550 V
Vg2 (Ia < 3 mA)	= max.	250 V
Vg2 (Ia = 6 mA)	= max.	150 V
Wg2	= max.	0,3 W
Ik	= max.	10 mA
Vg1 (Ig1 = +0,3 µA)	= max.	-1,3 V
Rg1	= max.	3 MΩ
Rfk	= max.	20 kΩ
Vfk	= max.	150 V

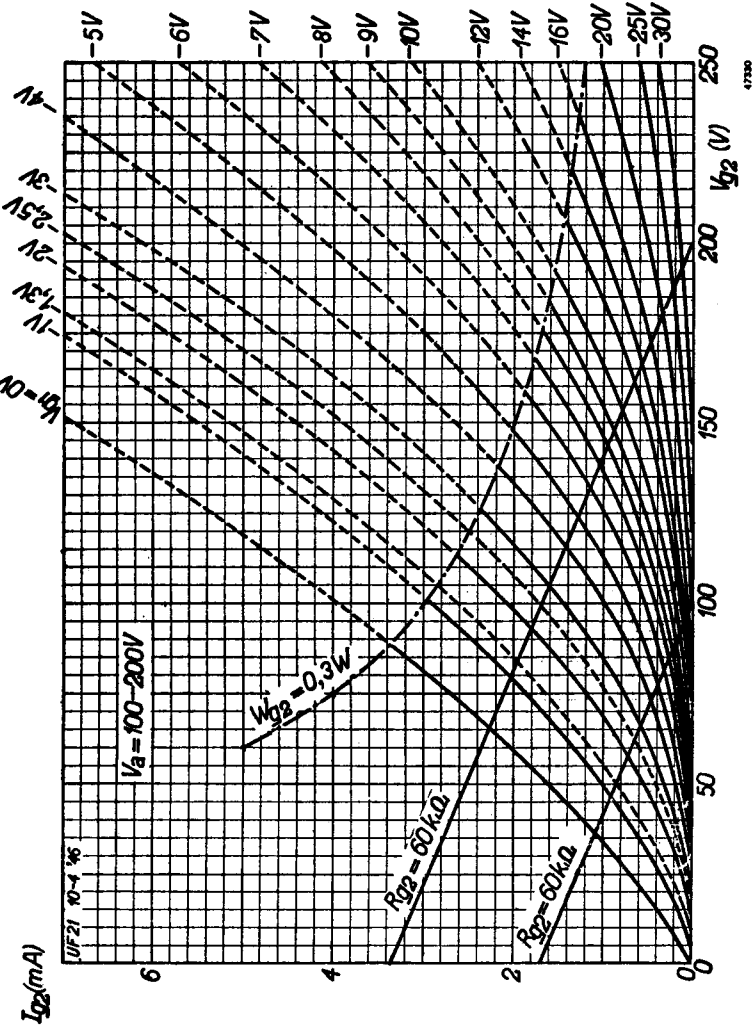

I_a(μA)
10000
1000
100
10
1
UF 21 15-12 45
V_a = 100-200V
V_{g3} = 0V
V_b = 200V
R_{g2} = 60 kΩ
V_b = 100V
R_{g2} = 60 kΩ
V_{g2} = 200V
175V
150V
125V
100V
75V
50V
-40
-30
-20
-10
0
V_{g1} (V)
46593


S (μA/V)
10000
1000
100
10
1
UF21 15-12 '45
Va = 100–200 V
Vg3 = 0 V
Vb = 200 V
Rg2 = 60 kΩ
Vb = 100 V
Rg = 60 kΩ
Vg2 = 200 V
175 V
150 V
125 V
100 V
75 V
50 V
-40
-30
-20
-10
0
Vg1 (V)
46594

UF 21

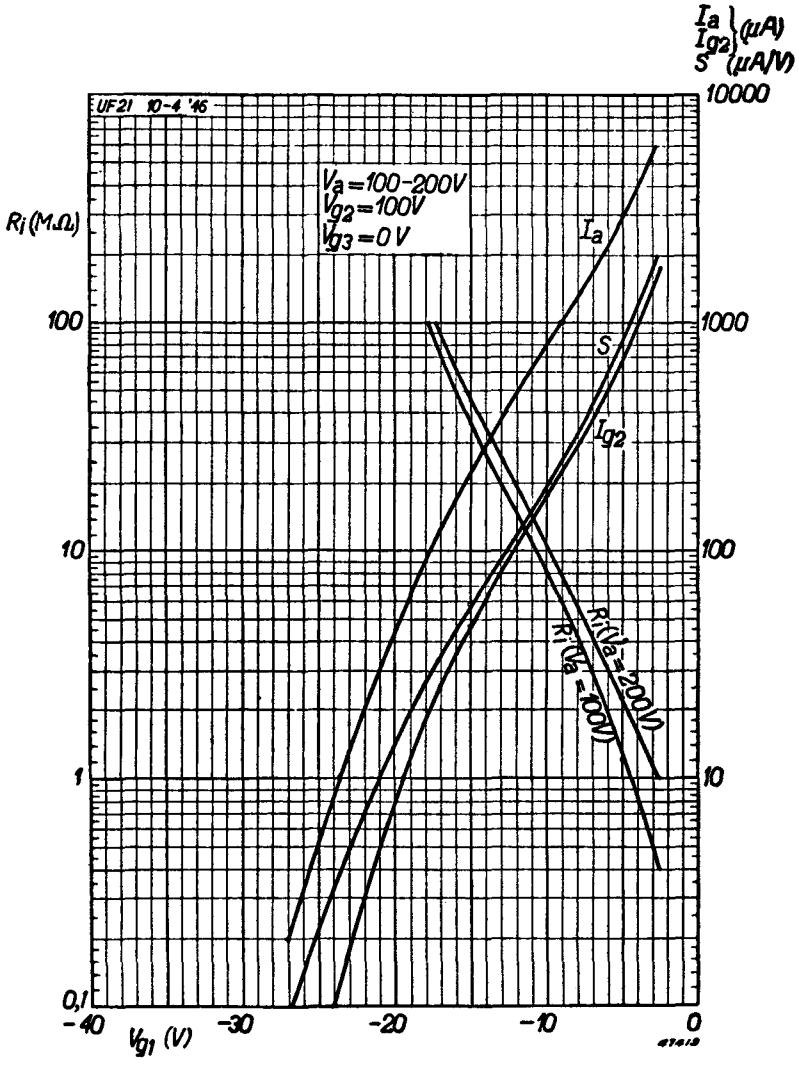
"Miniwatt"

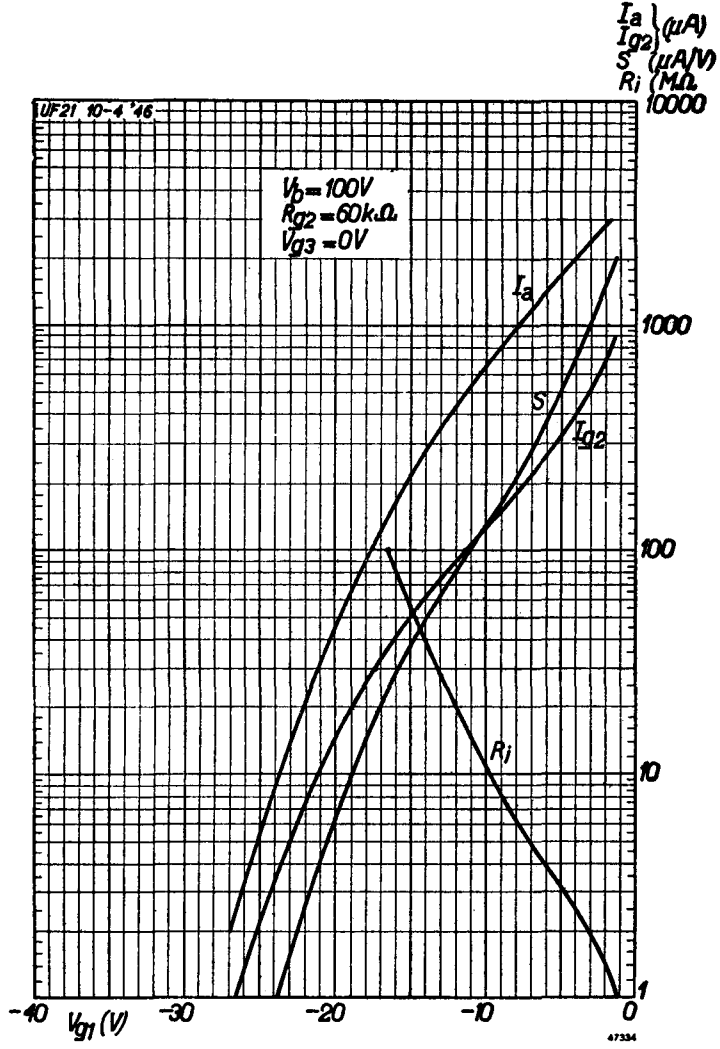



-5V
-6V
-7V
-8V
-9V
-10V
-12V
-14V
-16V
-20V
-25V
-30V
250
200
150
100
50
0
V_{g2} (V)
17330
V_a=100-200V
W_{g2}=0,3W
R_{g2}=60kΩ
R_{g2}=60kΩ
UF21 10-4 46
6
4
2
0
I_{g2}(mA)

UF 21

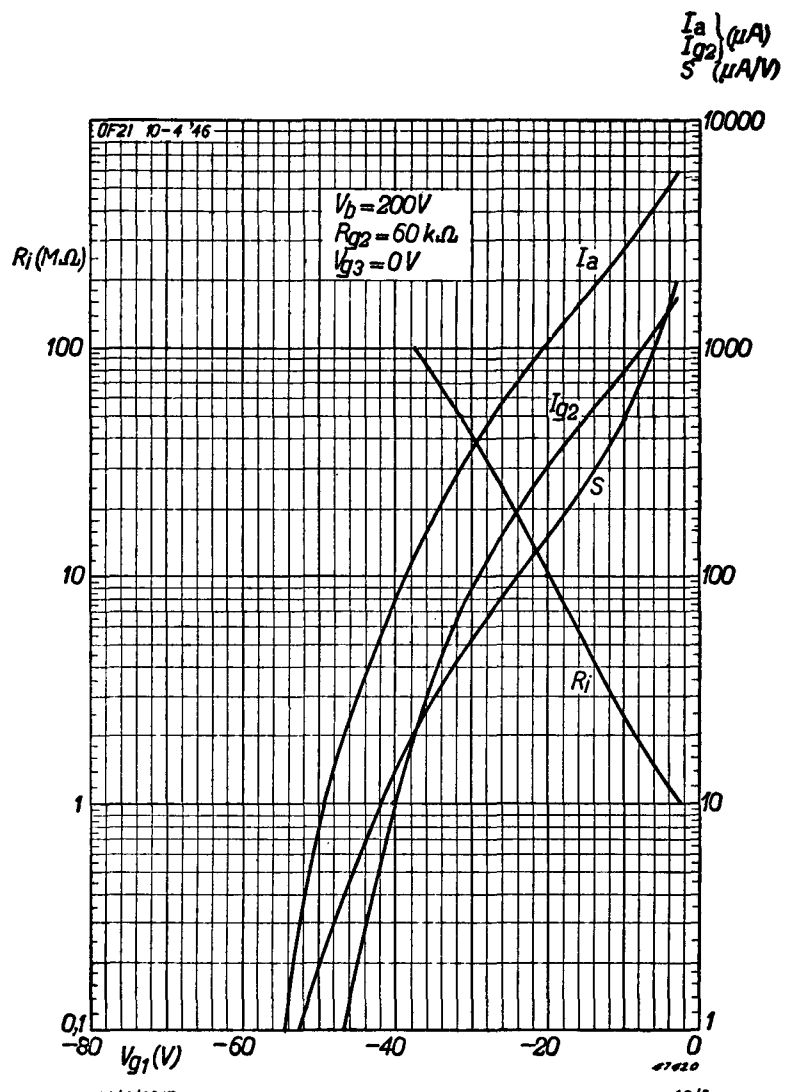
„Miniwatt"



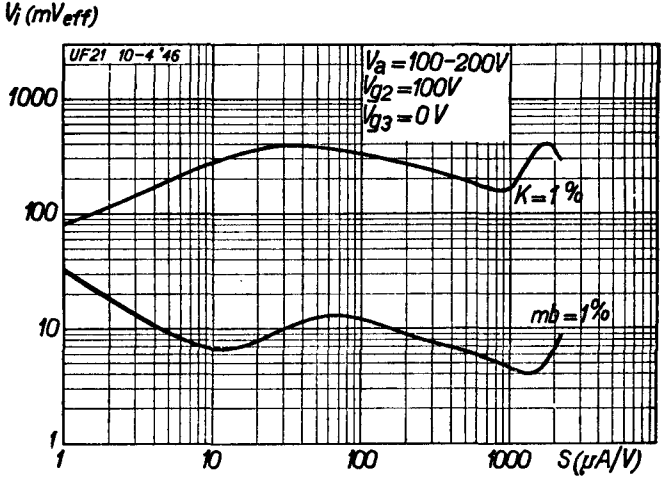

Ia
Ig2 (μA)
S (μA/V)
Ri (MΩ)
UF21 10-4 '46
Vb = 100V
Rg2 = 60kΩ
Vg3 = 0V
Ia
S
Ig2
Ri
10000
1000
100
10
1
-40
-30
-20
-10
0
Vg1 (V)
47334

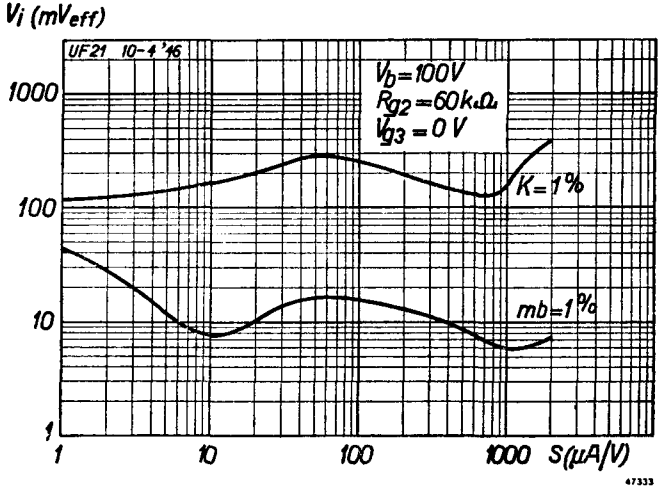
UF 21

"Miniwatt"



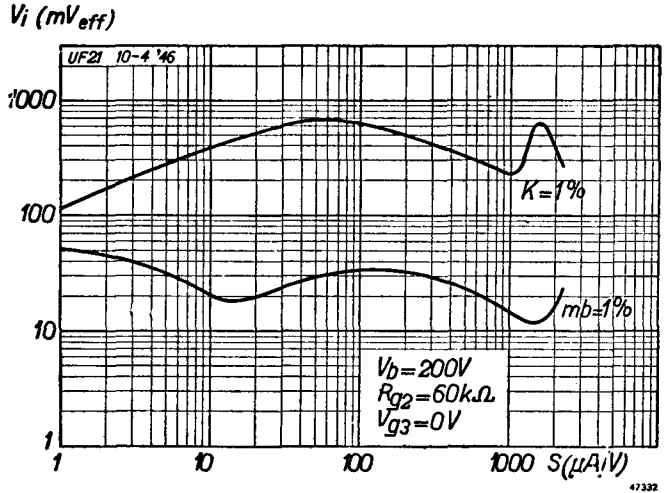
14/4/1947


V_i (mV_{eff})
UF21 10-4'46
V_a = 100-200V
V_{g2} = 100V
V_{g3} = 0 V
K = 1%
mb = 1%
1000
100
10
1
1
10
100
1000
S(μA/V)


V_i (mV_{eff})
UF21 10-4'46
V_b = 100V
R_{g2} = 60 kΩ
V_{g3} = 0 V
K = 1%
mb = 1%
1000
100
10
1
1
10
100
1000
S(μA/V)
47333

UF 21

"Miniwatt"





UF21

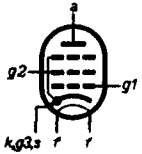
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6		1948.10.12
7	3a	1948.08.19
8	4	1948.10.12
9	5	1947.04.14
10	6	1947.04.14
11	7	1947.04.14
12	8	1947.04.14
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17	FP	2000.07.09

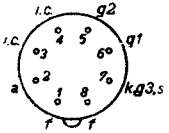
"Miniwatt" UF 41

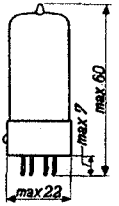
PENTODE with variable mutual conductance for use as H.F. and I.F. amplifier
PENTHODE à pente variable pour l'utilisation comme amplificatrice H.F. ou M.F.
PENTHODE mit veränderlicher Steilheit zur Verwendung als H.F.- und Z.F. Verstärker

Heating:	indirect by A.C. or D.C.; series supply	
Chauffage:	indirect par C.A. ou C.C.; alimentation en série	Vf = 12,6 V If = 0,1 A
Heizung:	indirekt durch Wechsel- oder Gleichstrom; Serienspeisung	

Dimensions in mm
Dimensions en mm
Abmessungen in mm







Capacitances
Capacités
Kapazitäten

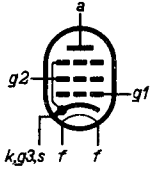
Ca	=	7,0 pF
Cg1	=	9,0 pF
Cag1	<	0,002 pF
Cg1f	<	0,05 pF

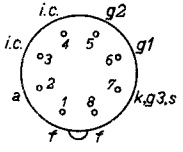
PENTODE with variable mutual conductance for use as R.F. or I.F. amplifier
PENTHODE à pente variable pour utilisation en amplificatrice H.F. ou M.F.
PENTODE mit veränderlicher Steilheit zur Verwendung als HF- und ZF-Verstärker

Heating : indirect; series supply — V_f=12,6 V
Chauffage: indirect; alimentation- série — I_f= 100 mA
Heizung : indirekt; Serienspeisung

Base, culot, Sockel: RIMLOCK

Overall length: 60 mm
See pages 203 and 252
Hauteur totale: 60 mm
Voir pages 203 et 252
Gesamthöhe : 60 mm
Siehe S. 203 und 252





Capacitances
Capacités
Kapazitäten

C_a	=	5,7 pF
C_{g1}	=	4,9 pF
C_{ag1}	<	0,002 pF
C_{g1f}	<	0,1 pF

Operating characteristics as R.F. or I.F. amplifier
Caractéristiques d'utilisation en amplificatrice H.F. ou M.F.
Betriebsdaten als HF- oder ZF-Verstärker

A. With sliding V_{g2}
Avec V_{g2} glissante
Mit gleitender V_{g2}

V_a=V_b	=	100		170		200	V
R_{g2}	=	40		40		40	kΩ
R_k	=	325		325		325	Ω
V_{g1}	=	-1,4	-17	-2,5	-28	-3	-34 V
I_a	=	3,3	-	6,0	-	7,2	- mA
I_{g2}	=	1,0	-	1,75	-	2,1	- mA
S	=	1900	19	2200	22	2300	23 µA/V
R_i	=	0,8	>10	1,0	>10	1,0	>10 MΩ
μ_{g2g1}	=	18	-	18	-	18	-
R_{eq}	=	5,5	-	6,5	-	7,0	- kΩ

UF 41

"Miniwatt"

Operating characteristics as H.F. or I.F. amplifier
Caractéristiques d'utilisation comme amplificatrice H.F. ou M.F.
Betriebsdaten als H.F.- oder Z.F. Verstärker

A. with sliding Vg2
avec Vg2 glissante
mit gleitender Vg2

Va=Vb=	100		170		200		V
Rg2 =	40		40		40		kΩ
Rk =	325		325		325		Ω
Vg1 =	-1,4	-17	-2,5	-28	-3	-34	V
Ia =	3,3	-	6,0	-	7,2	-	mA
Ig2 =	1,0	-	1,75	-	2,1	-	mA
S =	1900	19	2200	22	2300	23	µA/V
Ri =	0,8	>10	1,0	>10	1,0	>10	MΩ
µg2g1=	18	-	18	-	18	-	
Req =	5,5	-	6,5	-	7,0	-	kΩ

B. with fixed Vg2
avec Vg2 fixe
mit fester Vg2

Va =	100			V
Vg2 =	100			V
Rk =	325			Ω
Vg1 =	-2,5	-16,5		V
Ia =	6,0	-		mA
Ig2 =	1,75	-		mA
S =	2200	22		µA/V
Ri =	0,6	> 10		MΩ
µg2g1=	18	-		
Req =	6,5	-		kΩ

B. With fixed V_{g2}
Avec V_{g2} fixe
Mit fester V_{g2}

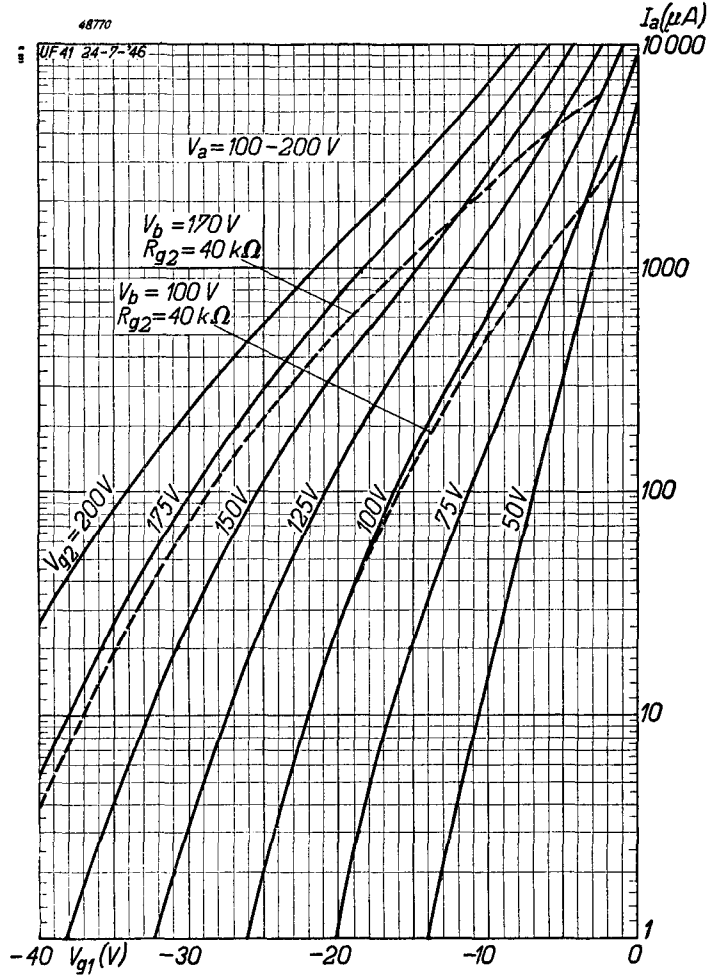
$V_a=V_b$	=	100	V
V_{g2}	=	100	V
R_k	=	325	Ω
V_{g1}	=	-2,5 -16,5	V
I_a	=	6,0 -	mA
I_{g2}	=	1,75 -	mA
S	=	2200 22	μA/V
R_i	=	0,6 >10	MΩ
μ_{g2g1}	=	18 -	
R_{eq}	=	6,5 -	kΩ

Limiting values
Caractéristiques limites
Grenzdaten

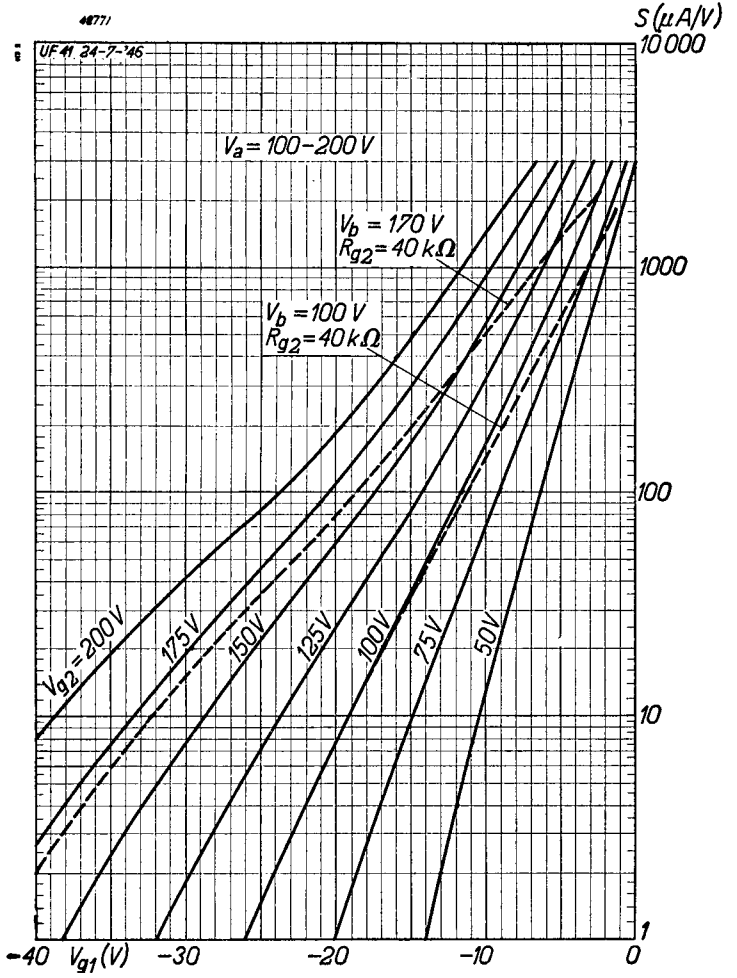
V_{a_o}	= max.	550	V
V_a	= max.	250	V
W_a	= max.	2	W
V_{g2_o}	= max.	550	V
$V_{g2}(I_a$ < 7 mA)	= max.	250	V
$V_{g2}(I_a$ =7,2 mA)	= max.	150	V
W_{g2}	= max.	0,3	W
I_k	= max.	10	mA
$V_{g1}(I_{g1}$=+0,3μA)	= max.	-1,3	V
R_{g1}	= max.	3	MΩ
R_{kf}	= max.	20	kΩ
V_{kf}	= max.	150	V

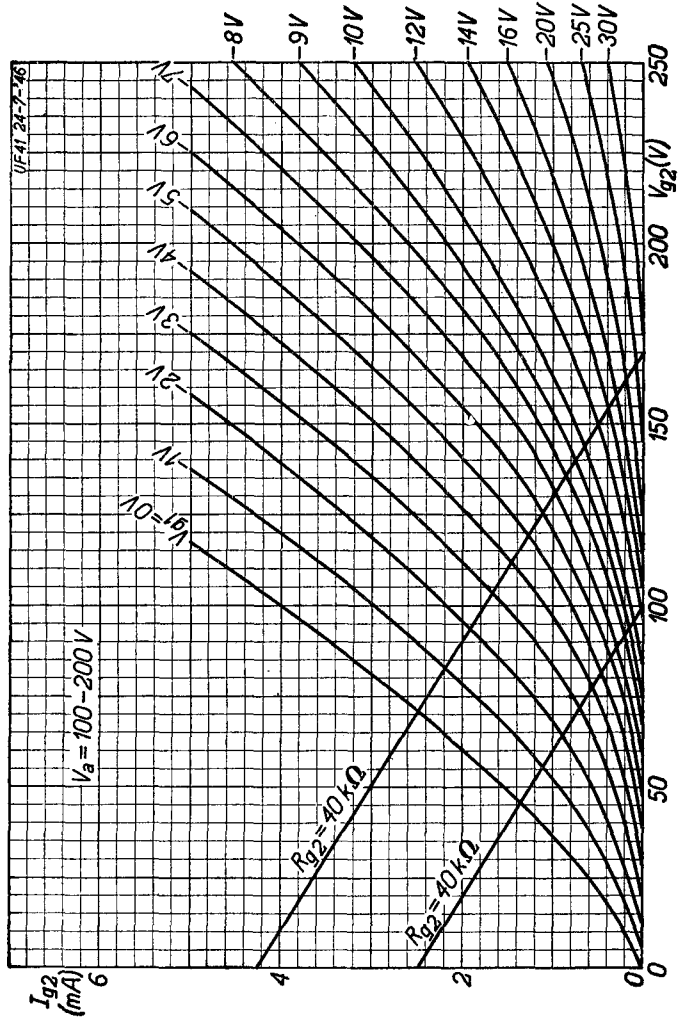
Limiting values
Caractéristiques limites
Grenzdaten

Va_o	= max.	550	V
Va	= max.	250	V
Wa	= max.	2	W
$Vg2_o$	= max.	550	V
Vg2 (Ia < 4 mA)	= max.	250	V
Vg2 (Ia =7,2 mA)	= max.	150	V
Wg2	= max.	0,3	W
Ik	= max.	10	mA
Vg1(Ig1 = +0,3 µA)	= max.	-1,3	V
Rg1	= max.	3	MΩ
Rfk	= max.	20	kΩ
Vfk	= max.	150	V


48770
UF 41 24-7-'46
$I_a(\mu A)$
10000
1000
100
10
1
$V_a = 100 - 200\ V$
$V_b = 170\ V$
$R_{g2} = 40\ k\Omega$
$V_b = 100\ V$
$R_{g2} = 40\ k\Omega$
$V_{g2} = 200V$
175V
150V
125V
100V
75V
50V
-40
$V_{g1}(V)$
-30
-20
-10
0

UF 41 PHILIPS



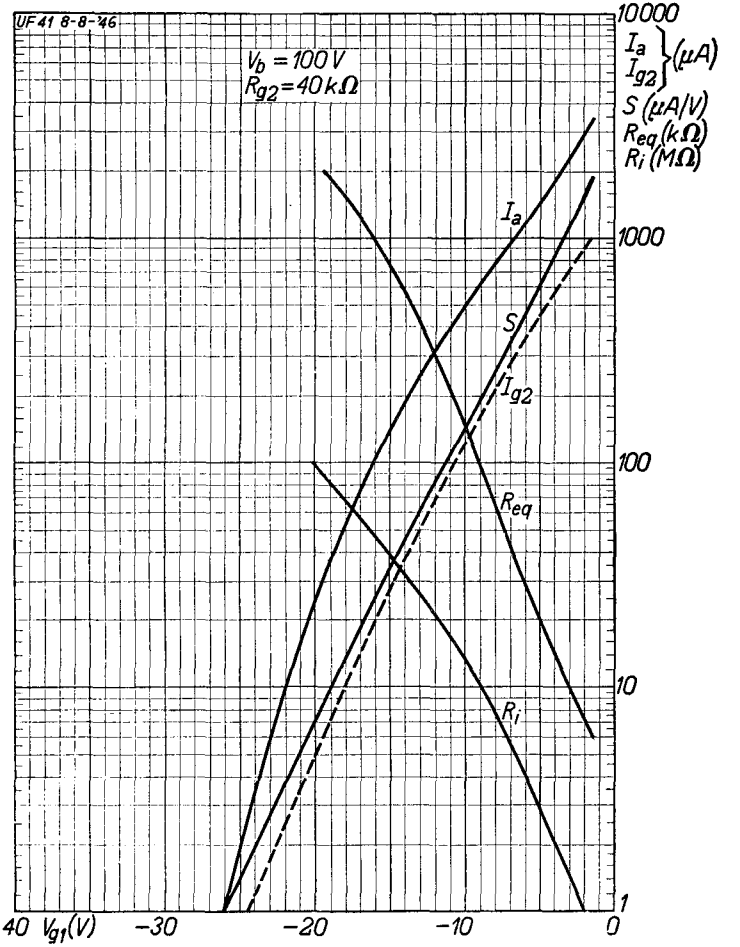

48772
(UF41 24-7-46)
-8 V
-9 V
-10 V
-12 V
-14 V
-16 V
-20 V
-25 V
-30 V
-1V
-0,5V
-0V
-1V
-2V
-3V
-4V
-5V
-6V
-7V
-8V
-9V
-10=Vg1
Va = 100-200 V
Rg2 = 40 kΩ
Rg2 = 40 kΩ
Ig2 (mA)
6
4
2
0
0
50
100
150
200
250
Vg2 (V)

C

18.3.1947

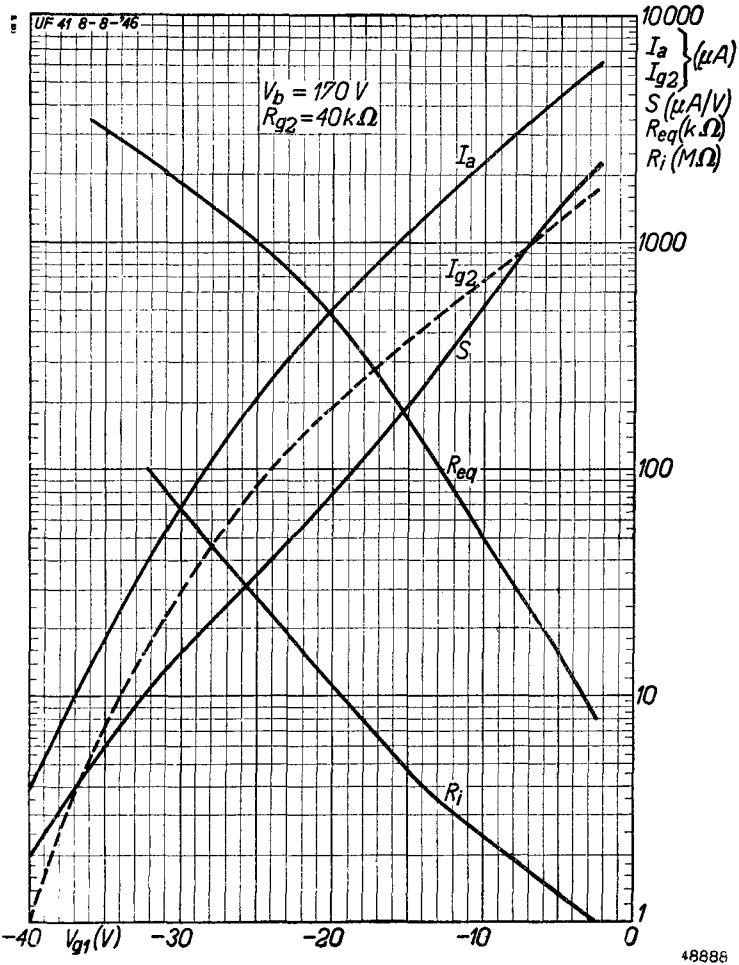
UF 41 PHILIPS

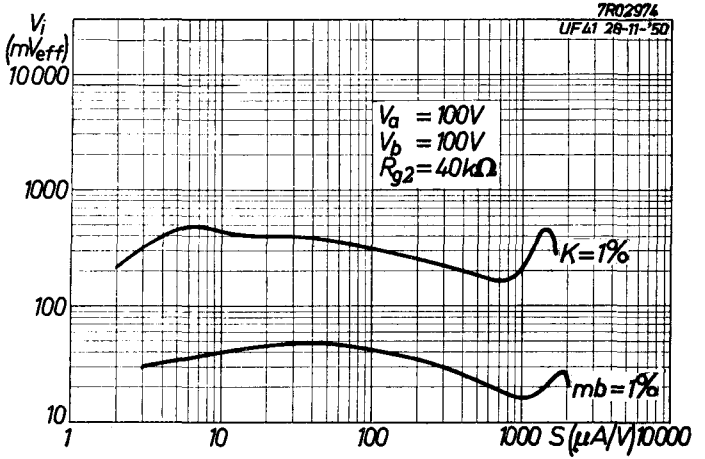
48773

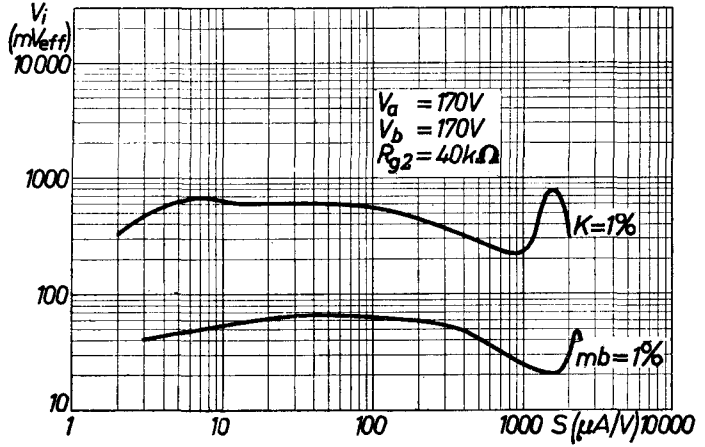


18.3.1947

D


UF 41 8-8-46
V_b = 170 V
R_{g2} = 40 kΩ
I_a
I_{g2}
S
R_{eq}
R_i
10000
1000
100
10
1
I_a } (μA)
I_{g2} }
S (μA/V)
R_{eq} (kΩ)
R_i (MΩ)
−40
V_{g1} (V)
−30
−20
−10
0
48888


7R02974
UF41 28-11-'50
V_i (mV_{eff})
10000
1000
100
10
V_a = 100V
V_b = 100V
R_{g2} = 40kΩ
K=1%
mb=1%
1
10
100
1000 S (μA/V) 10000


V_i (mV_{eff})
10000
1000
100
10
V_a = 170V
V_b = 170V
R_{g2} = 40kΩ
K=1%
mb=1%
1
10
100
1000 S (μA/V) 10000

PHILIPS

Electronic Tube

HANDBOOK

UF41

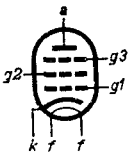
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4	2	1953.12.12
5	3	1949.01.25
6	A	1947.03.18
7	B	1947.03.18
8	C	1947.03.18
9	D	1947.03.18
10	E	1950.12.12
11	F	1950.12.12
12	FP	2000.07.09

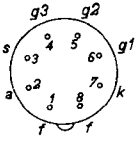
PHILIPS UF 42

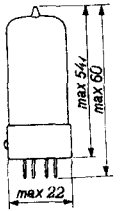
R.F. PENTODE for use as wide-band amplifier
PENTHODE H.F. pour utilisation en amplificatrice à large bande
H.F.PENTODE zur Verwendung als Breitbandverstärker

Heating:	indirect by A.C. or D.C.; series supply		
Chauffage:	indirect par C.A. ou C.C.; alimentation en série	I_f	= 100 mA
Heizung:	indirekt durch Wechsel- oder Gleichstrom; Serienspeisung	V_f	= 21 V

Dimensions in mm
Dimensions en mm
Abmessungen in mm







Base, culot, Sockel: RIMLOCK

Capacitances
Capacités
Kapazitäten

C_a	=	4,3 pF
C_{g1}	=	8,6 pF
C_{ag1}	<	0,006 pF
C_{g1f}	<	0,2 pF

Typical characteristics
Caractéristiques types
Kenndaten

V_a	=	170 V
V_{g3}	=	0 V
V_{g2}	=	170 V
V_{g1}	=	-2 V
I_a	=	10 mA
I_{g2}	=	2,8 mA
S	=	8 mA/V
μ_{g2g1}	=	52
R_i	=	0,3 MΩ
R_{eq}	=	1060 Ω

Operating characteristics
Caractéristiques d'utilisation
Betriebsdaten

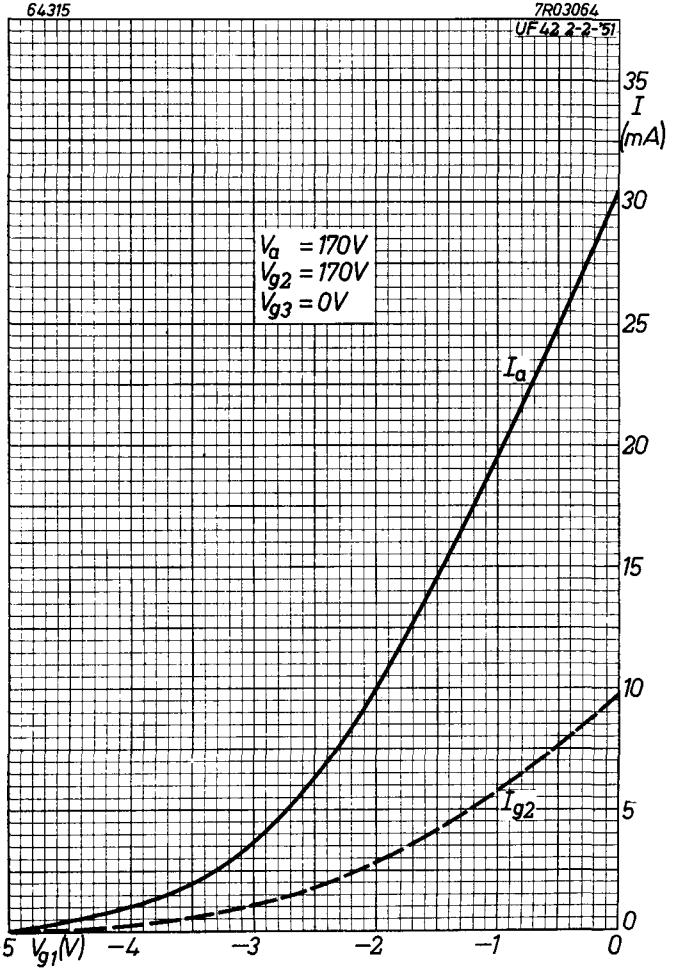
V_a	=	170	V
V_{g3}	=	0	V
V_{g2}	=	170	V
I_a	=	10	mA
f	=	100	Mc/s
Bandwidth Largeur de bande Bandbreite	=	0,8	Mc/s
G	=	1000	

Limiting values
Caractéristiques limites
Grenzdaten

V_{a_o}		= max.	550	V
V_a		= max.	250	V
W_a		= max.	2	W
V_{g2_c}		= max.	550	V
V_{g2}		= max.	250	V
W_{g2}		= max.	0,5	W
I_k		= max.	15	mA
$-V_{g1}$		= max.	100	V
V_{g1}	(I_{g1}=+0,3μA)	= max.	-1,3	V
R_{g1}		= max.	1	MΩ[1])
V_{kf}		= max.	150	V
R_{kf}		= max.	20	kΩ

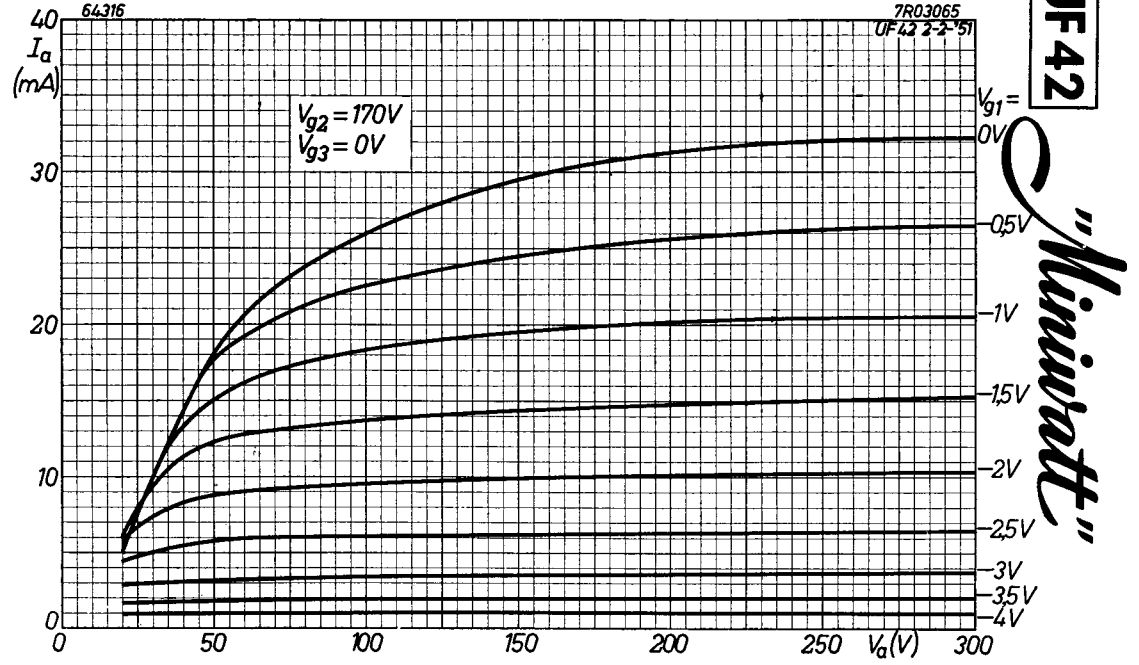
[1]) With automatic grid bias
A polarisation négative automatique
Mit automatischer negativer Gittervorspannung

"Miniwatt" UF 42



2.2.1951

A


64316
7R03065
(UF42 2-2-51)
UF42
"Miniwatt"
I_a (mA)
40
30
20
10
0
$V_{g2} = 170V$
$V_{g3} = 0V$
V_{g1} =
0V
-0,5V
-1V
-1,5V
-2V
-2,5V
-3V
-3,5V
-4V
0
50
100
150
200
250
V_a(V)
300

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UF42

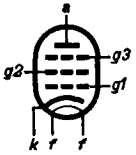
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2	2	1950.12.12
3	A	1951.02.02
4	B	1951.02.02
5	FP	2000.07.09

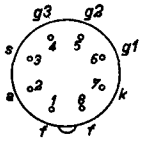
PHILIPS UF 43

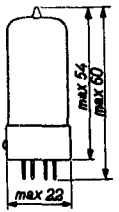
R.F. PENTODE with variable mutual conductance for use as wide-band amplifier
PENTHODE H.F. à pente variable pour utilisation en amplificatrice à large bande
H.F. PENTODE mit veränderlicher Steilheit zur Verwendung als Breitbandverstärker

Heating:	indirect by A.C. or D.C.; series supply		
Chauffage:	indirect par C.A. ou C.C.; alimentation en série	Vf =	21 V
Heizung:	indirekt durch Wechsel- oder Gleichstrom; Serienspeisung	If =	100 mA

Dimensions in mm
Dimensions en mm
Abmessungen in mm







Base, culot, Sockel: RIMLOCK

Capacitances	Ca =	4,5 pF
Capacités	Cg1 =	9,5 pF
Kapazitäten	Cag1 <	0,006 pF

Operating characteristics for use as R.F. or I.F. amplifier
Caractéristiques d'utilisation en amplificatrice H.F. ou M.F.
Betriebsdaten als H.F.- oder Z.F.-Verstärker

Va=Vb	=	100		170		V
Vg3	=	0		0		V
Rg2	=	10		10		kΩ
Rk	=	105		105		Ω
Vg1	=	-1,05	-11	-2,0	-19	V
Vg2	=	75	-	135	-	V
Ia	=	7,5	-	15	-	mA
Ig2	=	2,5	-	3,5	-	mA
S	=	5,8	0,058	6,3	0,063	mA/V
Ri	=	0,3	>10	0,3	>10	MΩ
Req	=	1,5	-	1,8	-	kΩ

$V_a=V_b$	=	200		V
V_{g3}	=	0		V
R_{g2}	=	18		kΩ
R_k	=	105		Ω
V_{g1}	=	-2	-22	V
V_{g2}	=	135	-	V
I_a	=	15	-	mA
I_{g2}	=	3,5	-	mA
S	=	6,4	0,064	mA
R_i	=	0,4	>10	MΩ
R_{eq}	=	1,7	-	kΩ

Limiting values
Caractéristiques limites
Grenzdaten

V_{a_o}	= max.	550	V
V_a	= max.	300	V
W_a	= max.	3,75	W
V_{g2o}	= max.	550	V
V_{g2}	= max.	250	V
W_{g2}	= max.	0,7	W
I_k	= max.	20	mA
$V_{g1}(I_g = 0,3\mu A)$	= max.	-1,3	V
R_{g1}	= max.	1	MΩ
R_{kf}	= max.	20	kΩ
V_{kf}	= max.	150	V

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page	sheet	date
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2	2	1952.05.05
3	FP	2000.07.09

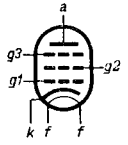
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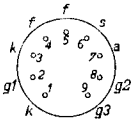
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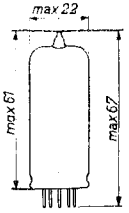
PENTODE for use as R.F. and I.F. amplifier
PENTHODE pour l'utilisation en amplificatrice H.F. et M.F.
PENTODE zur Verwendung als HF- und ZF-Verstärker

Heating:	indirect by A.C. or D.C.; series supply	
Chauffage:	indirect par C.A. ou C.C.; alimentation série	Vf = 19 V
Heizung:	indirekt durch Wechsel- oder Gleichstrom; Serienspeisung	If = 100 mA

Dimensions in mm
Dimensions en mm
Abmessungen in mm







Base, culot, Sockel: Noval

Capacitances
Capacités
Kapazitäten

C_{g1}	=	7,5 pF
C_a	=	3,3 pF
C_{ag1}	<	0,007 pF
C_{ak}	<	0,012 pF
C_{g2}	=	5,4 pF
C_{g1g2}	=	2,6 pF
C_{g1f}	<	0,15 pF

Operating characteristics as R.F. amplifier
Caractéristiques d'utilisation en amplificatrice H.F.
Betriebsdaten als HF-Verstärker

V_a	=	170 V
V_{g3}	=	0 V
V_{g2}	=	170 V
V_{g1}	=	-2,0 V
I_a	=	10 mA
I_{g2}	=	2,5 mA
S	=	7,4 mA/V
R_i	=	0,4 MΩ
μ_{g2g1}	=	50
R_{eq}	=	1000 Ω
r_{g1} [1]	=	10 kΩ

Limiting values
Caractéristiques limites
Grenzdaten

V_{ao} = max. 550 V	I_k	= max.	15 mA
V_a = max. 250 V	V_{g1} (I_{g1} = +0,3 µA)	= max.	-1,3 V
W_a = max. 2,5 W	R_{g1}	= max.	1 MΩ [2]
V_{g2o} = max. 550 V	R_{g1}	= max.	0,5 MΩ [3]
V_{g2} = max. 250 V	R_{kf}	= max.	20 kΩ
W_{g2} = max. 0,7 W	V_{kf}	= max.	150 V

[1] Input resistance at 50 Mc/s; pin 1 connected to pin 3
Résistance d'entrée à 50 Mc/s; broche 1 connectée à broche 3
Eingangswiderstand bei 50 MHz; Stift 1 verbunden mit Stift 3

[2] With automatic grid bias
Avec polarisation négative automatique
Mit automatischer negativer Gittervorspannung

[3] With fixed grid bias
Avec polarisation négative fixe
Mit fester negativer Gittervorspannung

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2	2	1953.11.11
3	FP	2000.07.09

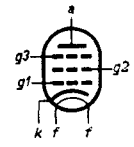
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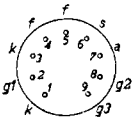
UF 85

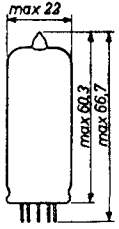
R.F. PENTODE with variable mutual conductance for use as I.F. amplifier in A.M. receivers and as R.F. or I.F. amplifier in F.M. receivers or broadband amplifiers
PENTHODE H.F. à pente variable pour utilisation en amplificatrice M.F. dans des récepteurs A.M. et en amplificatrice H.F. ou M.F. dans des récepteurs F.M. ou des amplificateurs à large bande
H.F.PENTODE mit veränderlicher Steilheit zur Verwendung als ZF-Verstärker in AM-Empfängern und als HF- oder ZF-Verstärker in FM-Empfängern oder Breitbandverstärkern

Heating	: indirect by A.C. or D.C. series supply	
Chauffage	: indirect par C.A. ou C.C. alimentation en série	V_f = 19 V
Heizung	: indirekt durch Wechsel- oder Gleichstrom; Serienspeisung	I_f = 100 mA

Dimensions in mm
Dimensions en mm
Abmessungen in mm







Base, culot, Sockel: NOVAL

Capacitances Capacités Kapazitäten			
	C_a	=	3,7 pF
	C_{g1}	=	7,2 pF
	C_{ag1}	<	0,007 pF
	C_{g1f}	<	0,15 pF

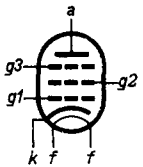
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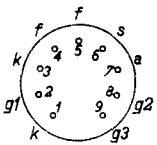
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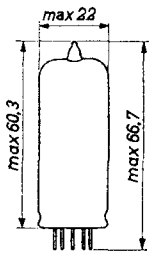
R.F. PENTODE with variable mutual conductance for use as I.F. amplifier in A.M. receivers and as R.F. or I.F. amplifier in F.M. receivers or broadband amplifiers
PENTHODE H.F. à pente variable pour utilisation en amplificatrice M.F. dans des récepteurs A.M. et en amplificatrice H.F. ou M.F. dans des récepteurs F.M. ou des amplificateurs à large bande
H.F.PENTODE mit veränderlicher Steilheit zur Verwendung als ZF-Verstärker in AM-Empfängern und als HF- oder ZF-Verstärker in FM-Empfängern oder Breitbandverstärkern

Heating : indirect by A.C. or D.C. series supply		
Chauffage: indirect par C.A. ou C.C. alimentation en série	V_f =	19 V
Heizung : indirekt durch Wechsel- oder Gleichstrom; Serienspeisung	I_f =	100 mA

Dimensions in mm
Dimensions en mm
Abmessungen in mm







Base, culot, Sockel: NOVAL

Capacitances Capacités Kapazitäten		
	C_a =	3,2 pF
	C_{g1} =	6,9 pF
	C_{ag1} <	0,007 pF
	C_{g1f} <	0,15 pF

11.11.1954

Operating characteristics for use as R.F. or I.F. amplifier
Caractéristiques d'utilisation en amplificatrice H.F. ou M.F.
Betriebsdaten als HF- oder ZF-Verstärker

$V_a=V_b$	=	100		170		200		V
V_{g3}	=	0		0		0		V
R_{g2}	=	27		27		27		kΩ
R_k	=	160		160		160		Ω
V_{g1}	=	-1,1	-14	-2	-24	-2,3	-28	V
V_{g2}	=	58	-	100	-	116	-	V
I_a	=	5,5	-	9,7	-	11,4	-	mA
I_{g2}	=	1,6	-	2,6	-	3,1	-	mA
S	=	4900	49	5800	58	6100	61	µA/V
R_i	=	0,15	>5	0,2	>5	0,2	>5	MΩ
R_{eq}	=	1,1	-	1,4	-	1,5	-	kΩ
r_{g1} [1])	=	1,4	-	1,8	-	2	-	kΩ

Limiting values
Caractéristiques limites
Grenzdaten

V_{a_o}	= max.	550	V
V_a	= max.	250	V
W_a	= max.	2,5	W
V_{g2_o}	= max.	550	V
V_{g2}	= max.	250	V
W_{g2}	= max.	0,65	W
I_k	= max.	15	mA
V_{g1} (I_{g1}=+0,3µA)	= max.	-1,3	V
R_{g1}	= max.	3	MΩ [2])
R_{kf}	= max.	20	kΩ
V_{kf}	= max.	150	V

[1]) Input resistance at 100 Mc/s
Résistance d'entrée à 100 Mc/s
Eingangswiderstand bei 100 MHz

[2]) When the tube is used at or near maximum ratings it is advisable to take the value of R_{g1} as low as possible.
Si le tube est utilisé aux ou presqu'aux valeurs limites il est recommandé de choisir une valeur de R_{g1} aussi petite que possible.
Wenn die Röhre bei oder fast bei den Grenzdaten verwendet wird, wird es empfohlen einen möglichst niedrigen Wert von R_{g1} zu wählen.

Operating characteristics for use as R.F. or I.F. amplifier
Caractéristiques d'utilisation en amplificatrice H.F. ou M.F.
Betriebsdaten als HF- oder ZF-Verstärker

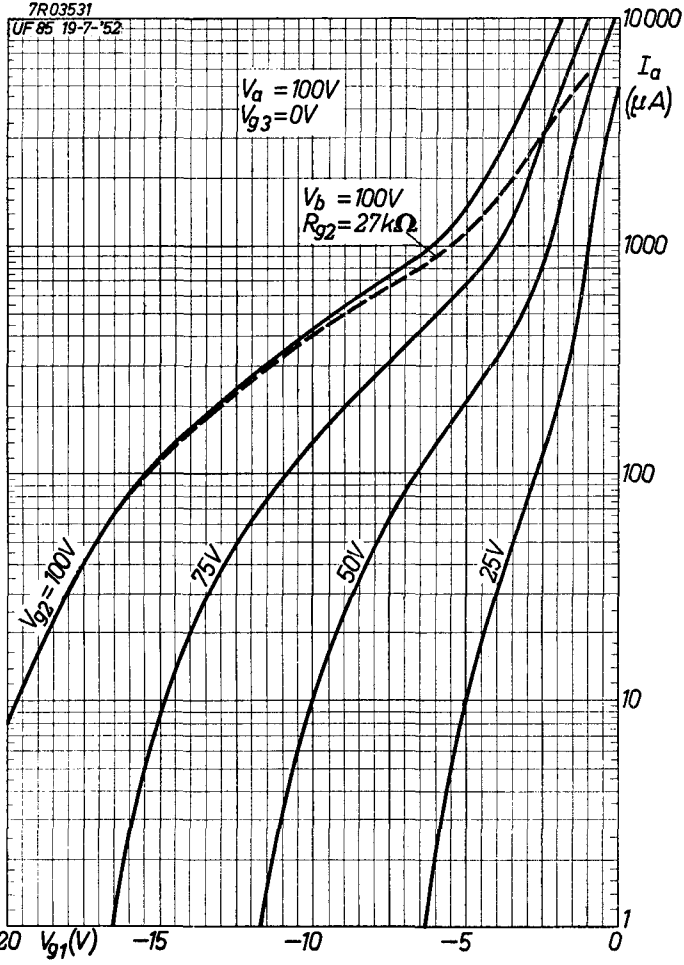
$V_a=V_b$	=	100		170		200	V
V_{g3}	=	0		0		0	V
R_{g2}	=	27		27		27	kΩ
V_{g1}	=	-1,1	-14	-2	-24	-2,3	-28	V
V_{g2}	=	57	-	100	-	116	-	V
I_a	=	5,5	-	9,7	-	11,4	-	mA
I_{g2}	=	1,6	-	2,6	-	3,1	-	mA
S	=	5000	50	5900	59	6100	61	µA/V
R_i	=	0,25	> 5	0,3	> 5	0,35	> 5	MΩ
R_{eq}	=	1,1	-	1,4	-	1,5	-	kΩ
r_{g1} [1]	=	5,6	-	7,6	-	8	-	kΩ

Limiting values
Caractéristiques limites
Grenzdaten

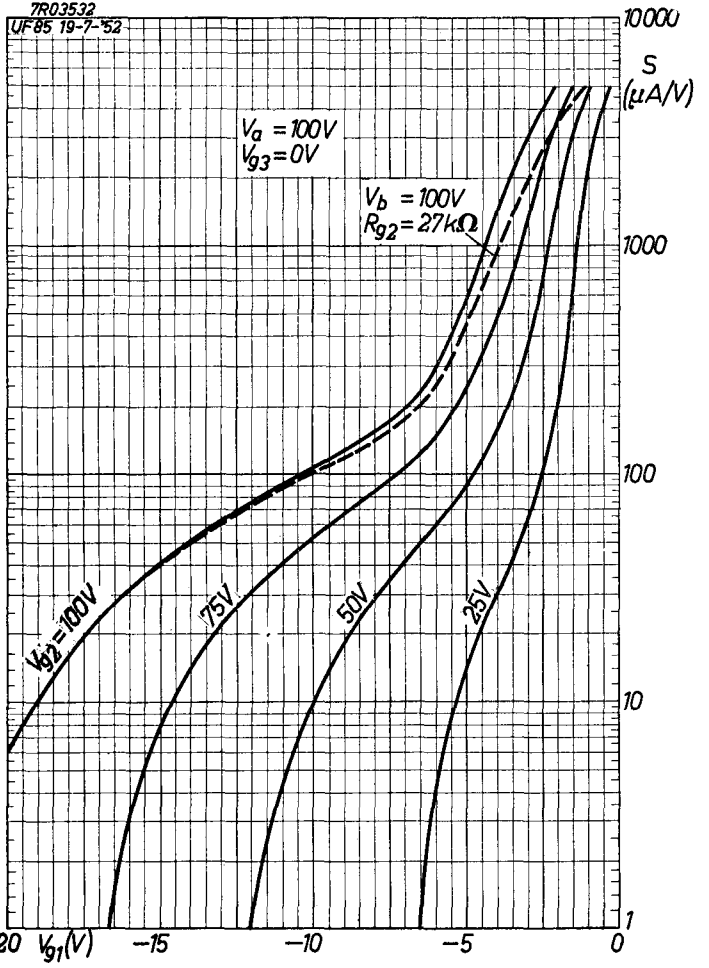
V_{a_o}	= max.	550	V
V_a	= max.	250	V
W_a	= max.	2,5	W
V_{g2_o}	= max.	550	V
V_{g2}	= max.	250	V
W_{g2}	= max.	0,65	W
I_k	= max.	15	mA
$-V_{g1}(I_{g1}=+0,3\mu A)$	= max.	1,3	V
R_{g1}	= max.	3	MΩ [2]
R_{kf}	= max.	20	kΩ
V_{kf}	= max.	150	V

[1] f = 50 Mc/s

[2] When the tube is used at or near maximum ratings it is advisable to take the value of R_{g1} as low as possible.
Si le tube est utilisé aux ou presqu'aux valeurs limites il est recommandé de choisir une valeur de R_{g1} aussi petite que possible.
Wenn die Röhre bei oder fast bei den Grenzdaten verwendet wird, wird es empfohlen einen möglichst niedrigen Wert von R_{g1} zu wählen.

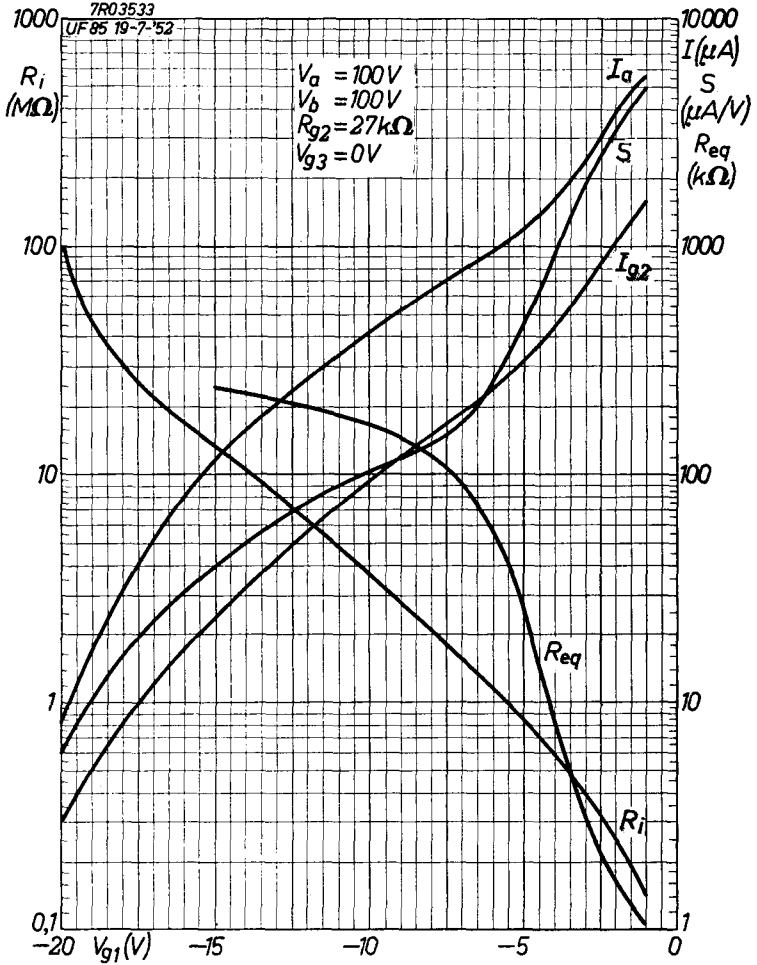

7R03531
UF 85 19-7-'52
V_a = 100V
V_{g3} = 0V
V_b = 100V
R_{g2} = 27kΩ
V_{g2} = 100V
75V
50V
25V
I_a (μA)
10000
1000
100
10
1
−20
V_{g1} (V)
−15
−10
−5
0

UF 85 **PHILIPS**



B

"Miniwatt" UF 85

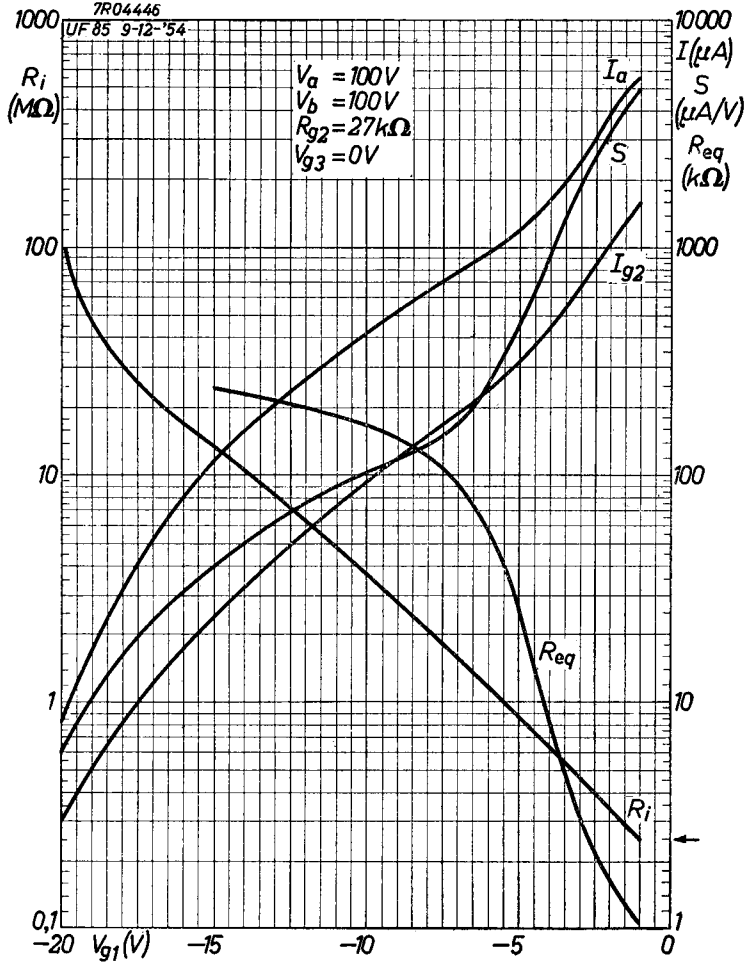


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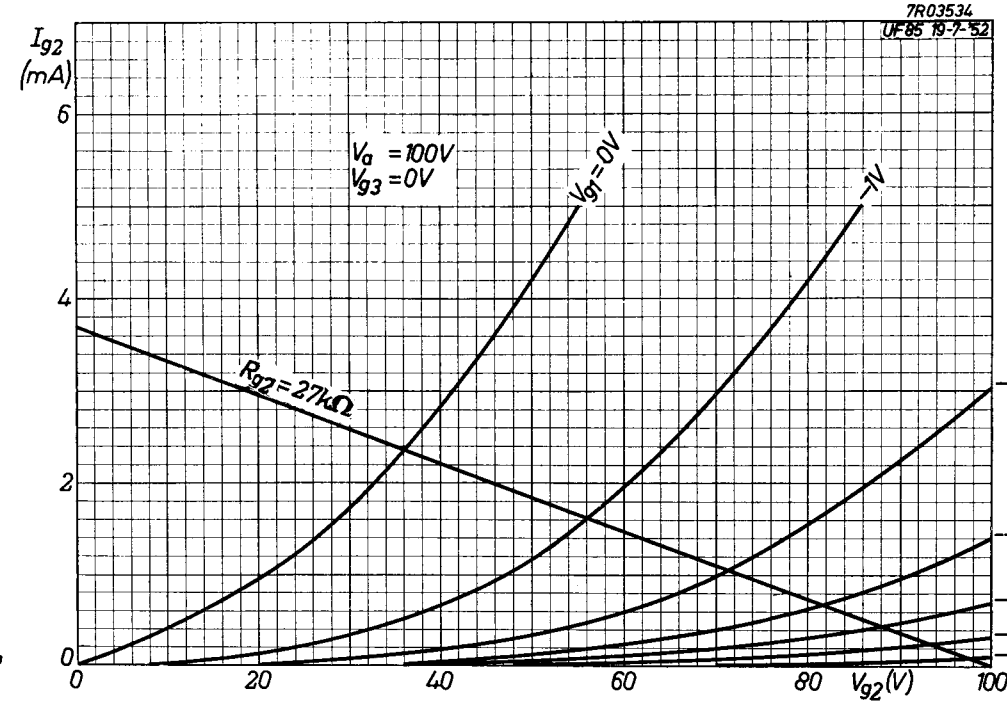
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UF85

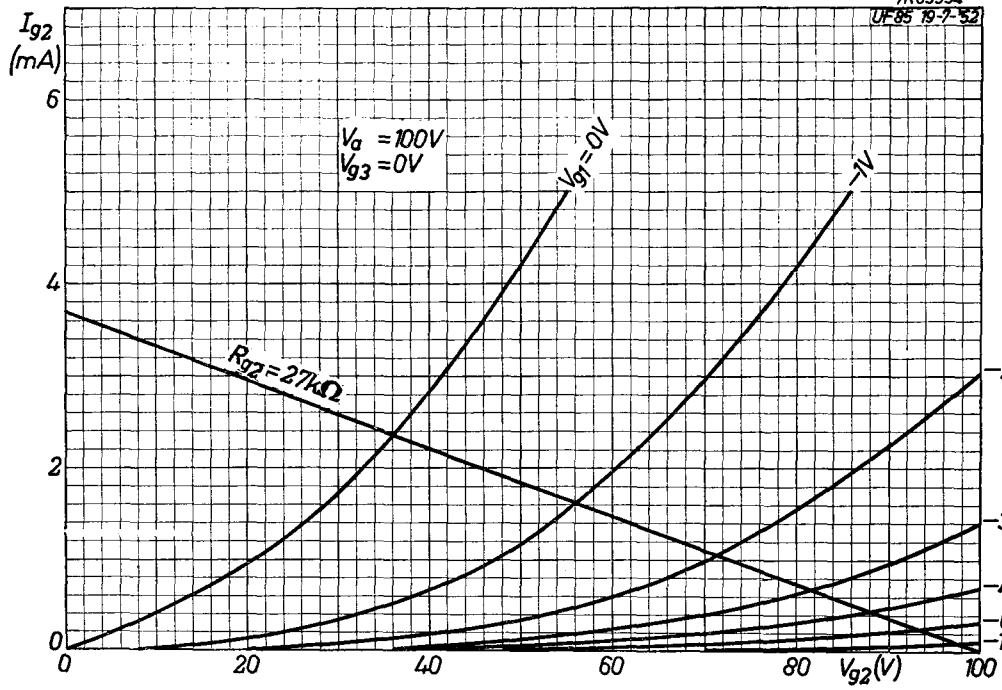


12.12.1954

C

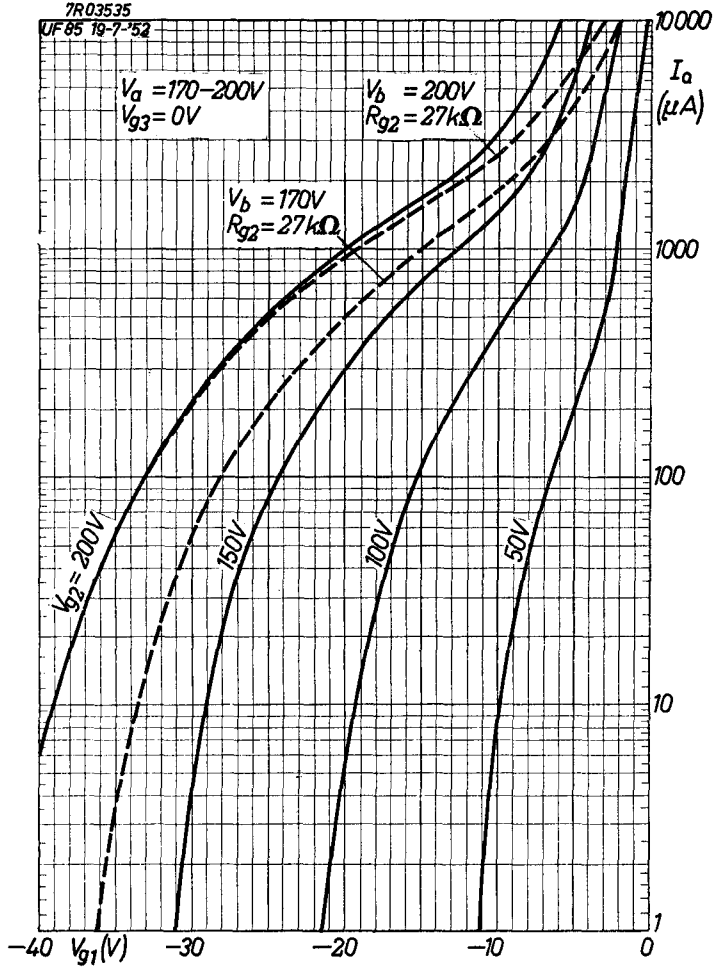


UF85 "Miniwatt"


7R03534
UF85 19-7-52
I_{g2} (mA)
6
4
2
0
V_a = 100V
V_{g3} = 0V
V_{g1} = 0V
-1V
-2V
-3V
-4V
-6V
-10V
R_{g2} = 27kΩ
0
20
40
60
80
100
V_{g2}(V)

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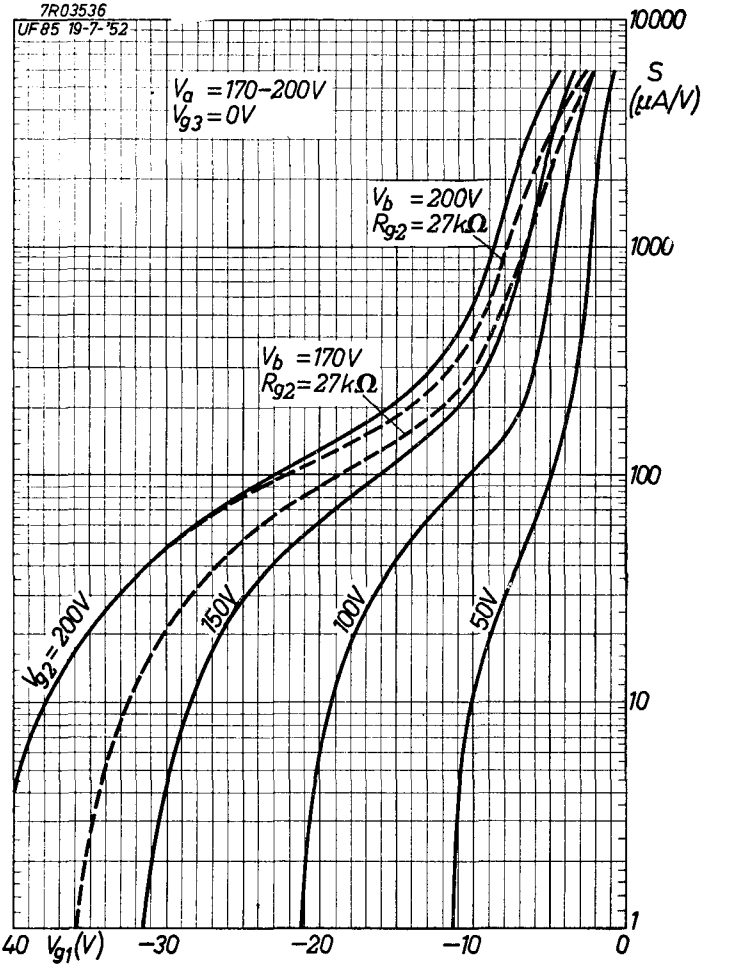
UF 85



8.8.1952

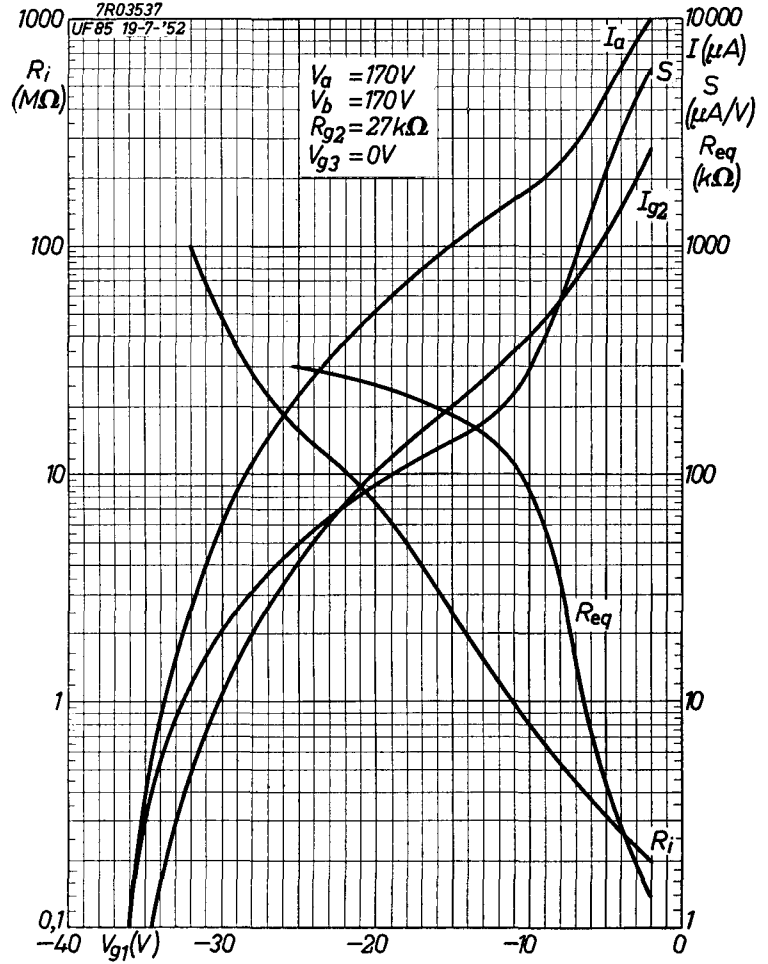
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UF85 **PHILIPS**



F

"Miniwatt" UF85

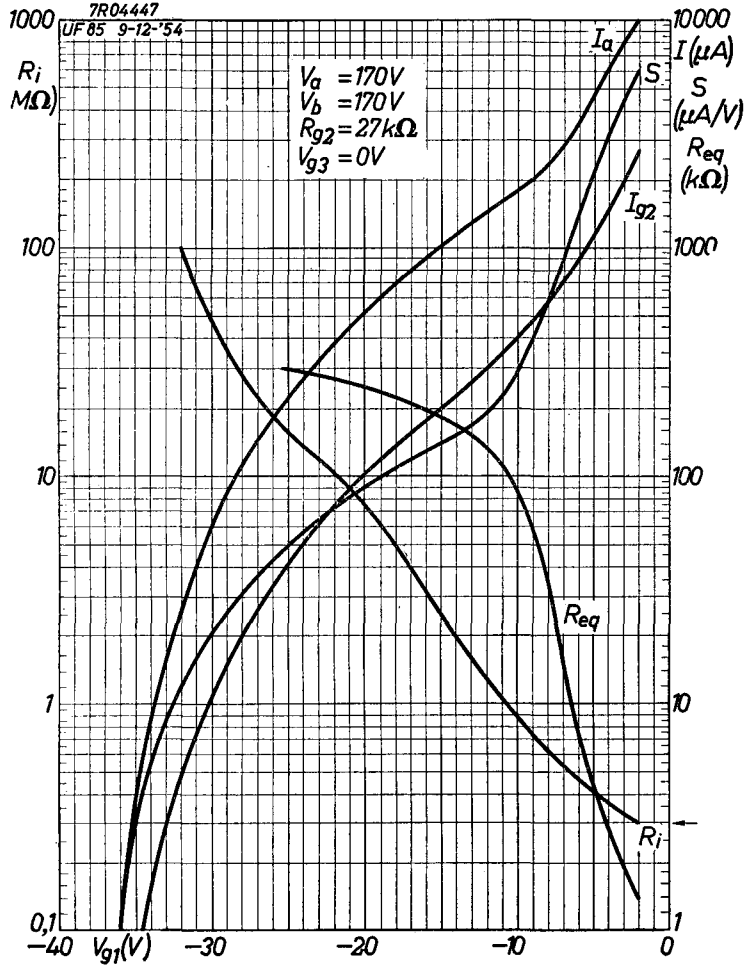


8.8.1952

G

PHILIPS

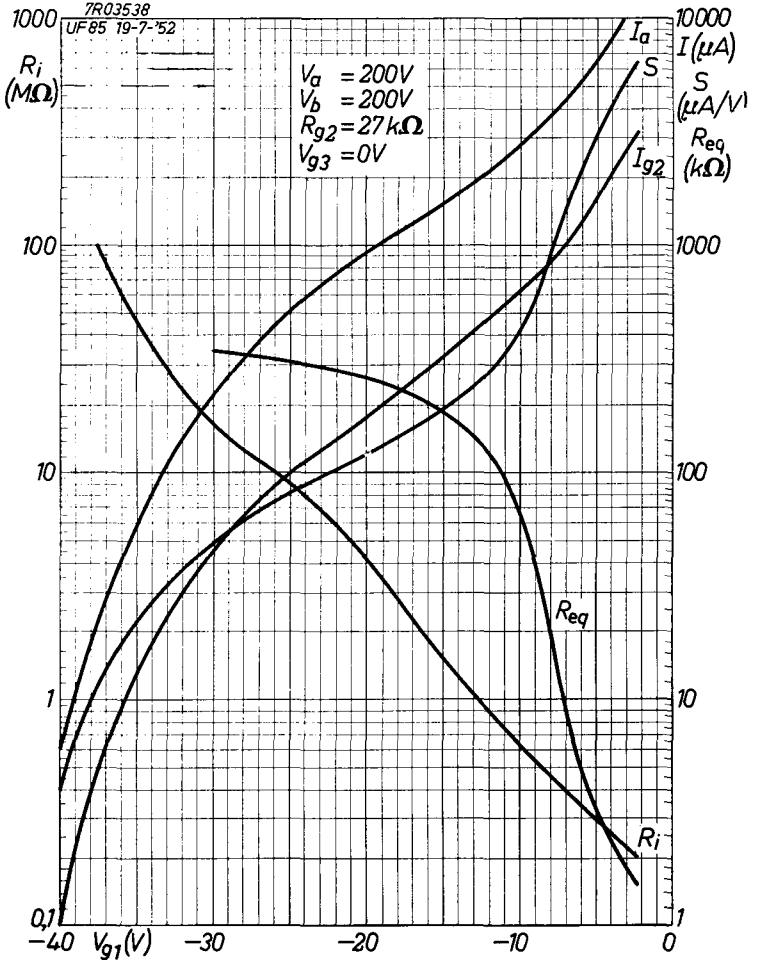
UF85



12.12.1954

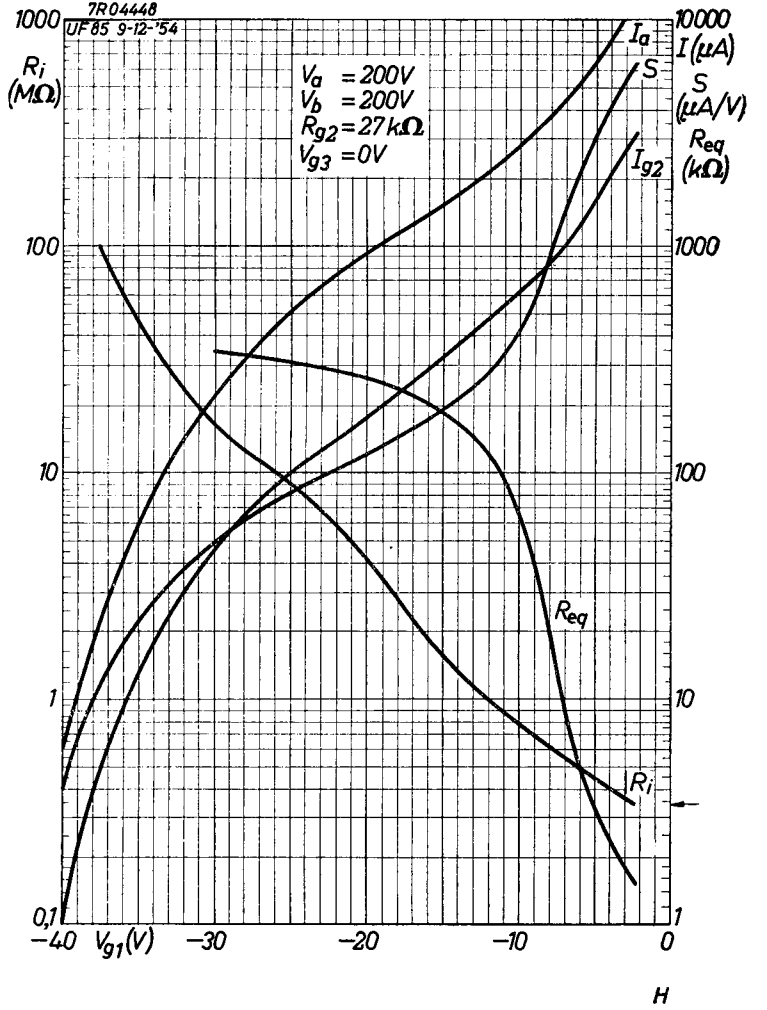
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UF85 "Miniwatt"

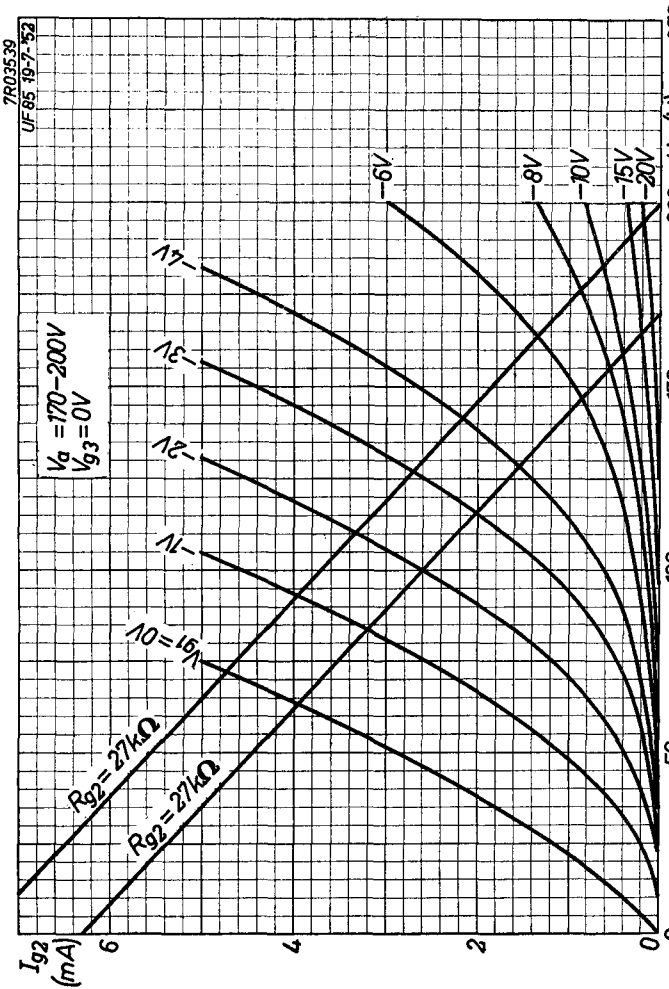


H

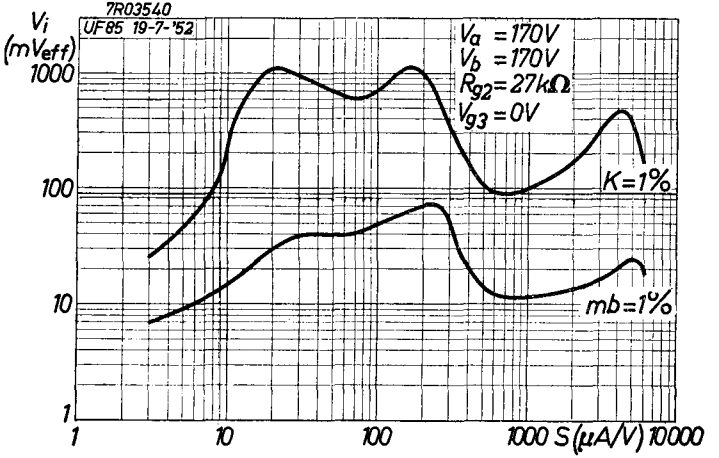
UF85 **PHILIPS**

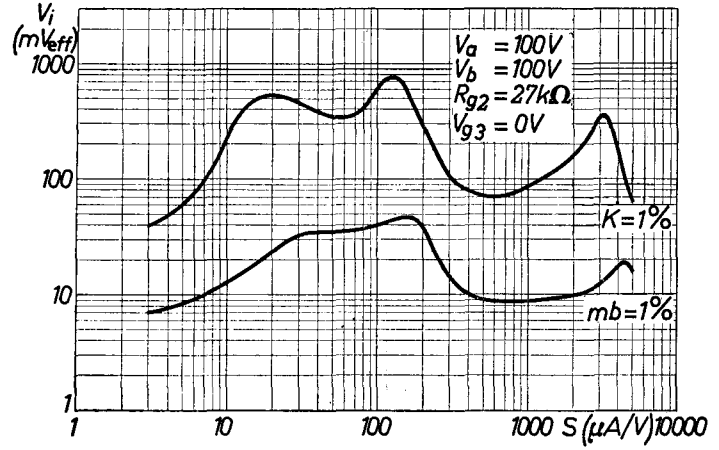


H

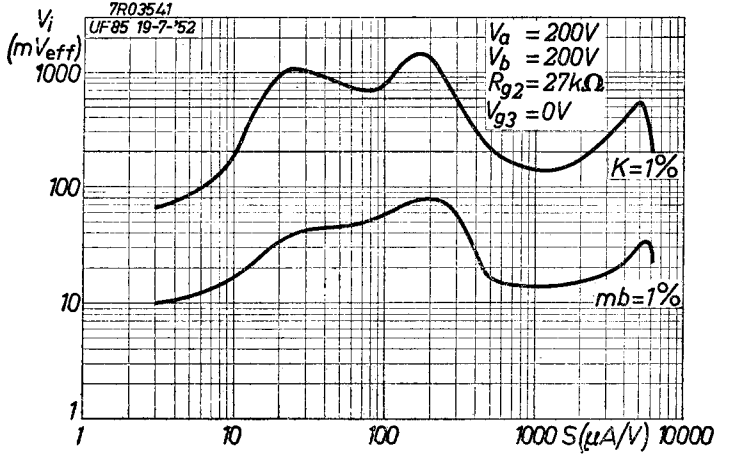

7R03539
UF85 19-7-'52
V_a = 170–200V
V_{g3} = 0V
V_{g1} = 0V
R_{g2} = 27kΩ
R_{g2} = 27kΩ
-1V
-2V
-3V
-4V
-6V
-8V
-10V
-15V
-20V
I_{g2} (mA)
V_{g2} (V)
0
2
4
6
0
50
100
150
200
250

UF85 PHILIPS





J


7R03541
UF85 19-7-'52
V_i
(mV_{eff})
1000
100
10
1
V_a = 200V
V_b = 200V
R_{g2} = 27kΩ
V_{g3} = 0V
K=1%
mb=1%
1
10
100
1000 S(μA/V) 10000

8.8.1952

K

PHILIPS

Electronic Tube

HANDBOOK

UF85

page	sheet	date
1	1	1954.04.04
2	1	1954.11.11
3	2	1954.04.04
4	2	1954.11.11
5	A	1952.08.08
6	B	1952.08.08
7	C	1952.08.08
8	C	1954.12.12
9	D	1952.08.08
10	D	1954.12.12
11	E	1952.08.08
12	F	1952.08.08
13	G	1952.08.08
14	G	1954.12.12
15	H	1952.08.08
16	H	1954.12.12
17	I	1952.08.08
18	J	1952.08.08
19	K	1952.08.08

R.F. PENTODE

Pentode with variable transconductance intended for use as R.F. or I.F. amplifier.

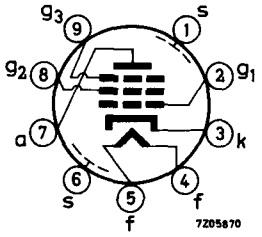
QUICK REFERENCE DATA			
Anode current	I_a	12	mA
Transconductance	S	4.4	mA/V
Amplification factor	$\mu_{g_2g_1}$	21	
Internal resistance	R_i	400	kΩ

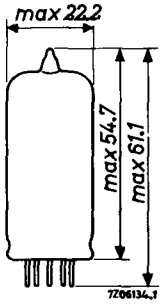
HEATING: Indirect by A.C. or D.C.; series supply

Heater current	I_f	100	mA
Heater voltage	V_f	12.6	V

DIMENSIONS AND CONNECTIONS Dimensions in mm

Base: Noval





CAPACITANCES

Anode to all except grid No.1	$C_{a(g_1)}$	5.1	pF
Grid No.1 to all except anode	$C_{g_1(a)}$	5.5	pF
Anode to grid No.1	C_{ag_1}	max. 0.002	pF
Grid No.1 to heater	C_{g_1f}	0.05	pF

TYPICAL CHARACTERISTICS

Anode voltage	V_a	170	V
Grid No.2 voltage	V_{g_2}	100	V
Grid No.3 voltage	V_{g_3}	0	V
Anode current	I_a	12	mA
Grid No.1 voltage	V_{g_1}	-1.2	V [1]
Grid No.2 current	I_{g_2}	4.4	mA
Transconductance	S	4.4	mA/V
Internal resistance	R_i	0.4	MΩ
Amplification factor	$\mu_{g_2g_1}$	21	

OPERATING CHARACTERISTICS

Anode voltage, supply voltage	$V_a = V_b$	200		170		V
Grid No.3 voltage	V_{g_3}	0		0		V
Grid No.2 resistor	R_{g_2}	24		15		kΩ
Cathode resistor	R_k	130		130		Ω
Grid No.1 voltage	V_{g_1}	-1.95	-20	-1.95	-20	V
Anode current	I_a	11.1	-	11.0	-	mA
Grid No.2 current	I_{g_2}	3.8	-	3.9	-	mA
Transconductance	S	3.85	0.16	3.8	0.11	mA/V
Internal resistance	R_i	550	-	450	-	kΩ
Equivalent noise resistance	R_{eq}	4.2	-	4.5	-	kΩ
Input conductance f = 50 MHz	g	102	-	102	-	μA/V

[1]) In this case control grid current may occur. If this is not permissible, the negative grid bias should be increased to a value of 1.5 V at least.

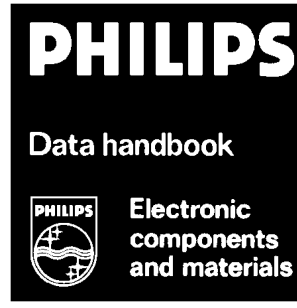
TYPICAL CHARACTERISTICS AND OPERATING CHARACTERISTICS

(continued)

Anode voltage, supply voltage	$V_a = V_b$	100		100		V
Grid No.3 voltage	V_{g3}	0		0		V
Grid No.2 resistor	R_{g2}	15		0		kΩ
Cathode resistor	R_k	130		160		Ω
Grid No.1 voltage	V_{g1}	−1.05	−10	−1.9	−10	V
Anode current	I_a	6.0	–	8.6	–	mA
Grid No.2 current	I_{g2}	2.1	–	3.1	–	mA
Transconductance	S	3.2	0.15	3.3	0.16	mA/V
Internal resistance	R_i	475	–	300	–	kΩ
Equivalent noise resistance	R_{eq}	3.5	–	4.7	–	kΩ
Input conductance f = 50 MHz	g	120	–	102	–	μA/V

LIMITING VALUES (Design centre rating system)

Anode voltage	V_{a_o}	max. 550	V
	V_a	max. 250	V
Anode dissipation	W_a	max. 2.25	W
Grid No.2 voltage	V_{g2_o}	max. 550	V
	V_{g_2}	max. 250	V
Grid No.2 dissipation	W_{g_2}	max. 0.45	W
Cathode current	I_k	max. 16.5	mA
Grid No.1 resistor	R_{g_1}	max. 3	MΩ
Grid No.3 resistor	R_{g_3}	max. 10	kΩ
Cathode to heater voltage	V_{kf}	max. 150	V



UF89

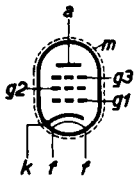
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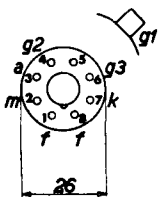
"Miniwatt" UF 9

PENTODE with variable mutual conductance for use as H.F., I.F. and L.F. amplifier
PENTHODE à pente variable pour l'utilisation comme amplificatrice H.F., M.F. et B.F.
PENTHODE mit veränderlicher Steilheit zur Verwendung als H.F., Z.F. und N.F. Verstärker

Heating:	indirect by A.C. or D.C.; series supply	
Chauffage:	indirect par C.A. ou C.C.; alimentation en série	Vf= 12,6 V If= 0,100 A
Heizung:	indirekt durch Wechsel- oder Gleichstrom; Serienspeisung	

Dimensions in mm
Dimensions en mm
Abmessungen in mm







Capacities Capacités Kapazitäten	
	Cagl < 0,002 pF
	Ca = 7,5 pF
	Cgl = 4,9 pF
	Cglf < 0,005 pF

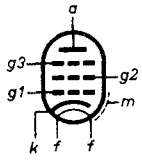
PHILIPS

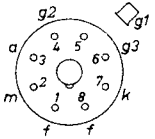
UF 9

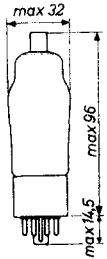
PENTODE with variable mutual conductance for use as R.F., I.F. or A.F. amplifier
PENTHODE à pente variable pour utilisation en amplificatrice H.F., M.F. ou B.F.
PENTODE mit veränderlicher Steilheit zur Verwendung als HF-, ZF- und NF-Verstärker

Heating : indirect; series supply — V_f = 12,6 V
Chauffage: indirect; alimentation série — I_f = 100 mA
Heizung : indirekt; Serienspeisung

Dimensions in mm
Dimensions en mm
Abmessungen in mm







Base, culot, Sockel: Loctal 8p.

Capacitances
Capacités
Kapazitäten

C_a	=	7,5 pF
C_{g1}	=	4,9 pF
C_{ag1}	<	0,002 pF
C_{g1f}	<	0,005 pF

Operating characteristics as R.F. or I.F. amplifier
Caractéristiques d'utilisation en amplificatrice H.F. ou M.F.
Betriebsdaten als HF- oder ZF-Verstärker

V_a =	100		200		100		V
V_{g3} =	0		0		0		V
R_{g2} =	0		60		60		kΩ
R_k =	325		325		325		Ω
V_{g1} =	-2,5	-19,5	-2,5	-39	-1,3	-20	V
V_{g2} =	100	100	100	200	50	100	V
I_a =	6	-	6	-	3,2	-	mA
I_{g2} =	1,7	-	1,7	-	0,85	-	mA
S =	2200	7	2200	5,5	2000	5	µA/V
R_i =	0,4	>10	1,2	>10	1	>10	MΩ

Operating characteristics as H.F. or I.F. amplifier
Caractéristiques d'utilisation comme amplificatrice H.F. ou M.F.
Betriebsdaten als H.F. oder Z.F. Verstärker

A. With fixed screen grid voltage
Avec tension de la grille-écran fixe
Mit fester Schirmgitterspannung

Va =	100			200			V
Vg3 =	0			0			V
Vg2 =	100			100			V
Rk =	325			325			Ω
Vg1 =	-2,5	-16	-19,5	-2,5	-16	-19,5	V
Ia =	6	-	-	6	-	-	mA
Ig2 =	1,7	-	-	1,7	-	-	mA
S =	2200	22	7	2200	22	7	µA/V
Ri =	0,4	>10	>10	1,2	>10	>10	MΩ

B. With sliding screen grid voltage
Avec tension de la grille-écran glissante
Mit gleitender Schirmgitterspannung

Va =	100			200			V
Vg3 =	0			0			V
Rg2 =	60			60			kΩ
Rk =	325			325			Ω
Vg1 =	-1,3	-16,5	-20	-2,5	-32	-39	V
Vg2 =	50	-	100	100	-	200	V
Ia =	3,2	-	-	6	-	-	mA
Ig2 =	0,85	-	-	1,7	-	-	mA
S =	2000	20	5	2200	22	5,5	µA/V
Ri =	1	>10	10	1,2	>10	>10	MΩ
µg2g1 =	18	-	-	18	-	-	

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Operating characteristics for use as A.F. amplifier
Caractéristiques d'utilisation en amplificatrice B.F.
Betriebsdaten als NF-Verstärker

A. V_b = 200 V; R_a = 0,2 MΩ; R_{g2} = 0,8 MΩ; R_k = 2,5 Ω

$-V_R$ (V)	I_a (mA)	I_{g2} (mA)	$\frac{V_o}{V_i}$	d_{tot} (%) (V_o=3Veff)	d_{tot} (%) (V_o=5Veff)	d_{tot} (%) (V_o = 8 Veff)
0	0,65	0,17	88	0,75	1,2	2,0
5	0,52	0,13	32	1,3	2,2	3,5
10	0,42	0,10	17	1,6	2,8	4,3
15	0,33	0,07	12	1,8	3,0	4,8
20	0,25	0,05	8	2,2	3,7	5,9

B. V_b = 200 V; R_a = 0,1 MΩ; R_{g2} = 0,4 MΩ; R_k = 1,3 kΩ

$-V_R$ (V)	I_a (mA)	I_{g2} (mA)	$\frac{V_o}{V_i}$	d_{tot} (%) (V_o=3Veff)	d_{tot} (%) (V_o=5Veff)	d_{tot} (%) (V_o = 8 Veff)
0	1,22	0,35	78	0,75	1,3	2,0
5	0,91	0,26	29	1,3	2,2	3,5
10	0,70	0,19	16	1,9	3,1	5,0
15	0,51	0,13	9	2,1	3,5	5,6
20	0,36	0,09	6	3,4	5,6	9,0

Limiting values
Caractéristiques limites
Grenzdaten

V_{a_o}	= max.	550 V
V_a	= max.	250 V
W_a	= max.	2 W
V_{g2}	= max.	550 V
V_{g2} (I_a=6mA)	= max.	125 V
V_{g2} (I_a<3mA)	= max.	250 V
W_{g2}	= max.	0,3 W
I_k	= max.	10 mA
V_{g1} (I_{g1}=+0,3μA)	= max.	−1,3 V
R_{g1}	= max.	3 MΩ
V_{kf}	= max.	150 V
R_{kf}	= max.	20 kΩ

Operating characteristics for use as L.F. amplifier with resistance coupling and with control of amplification on grid 1
Caractéristiques d'utilisation comme amplificatrice B.F. avec couplage à résistances et avec réglage de l'amplification sur la grille 1
Betriebsdaten zur Verwendung als N.F.Verstärker mit Widerstandskopplung und Regelung auf Gitter 1

A. Vb = 200 V; Ra = 0,2 MΩ; Rg2 = 0,8 MΩ; Rk = 2,5kΩ

$-V_R$ (V)	Ia (mA)	Ig2 (mA)	$\frac{Vo}{Vi}$	d_{tot} (%) ($Vo=3V_{eff}$)	d_{tot} (%) ($Vo=5V_{eff}$)	d_{tot} (%) ($Vo=8\ V_{eff}$)
0	0,65	0,17	88	0,75	1,2	2,0
5	0,52	0,13	32	1,3	2,2	3,5
10	0,42	0.10	17	1,6	2,8	4,3
15	0,33	0,07	12	1,8	3,0	4,8
20	0,25	0,05	8	2,2	3,7	5,9

B. Vb = 200 V; Ra = 0,1 MΩ; Rg2 = 0,4 MΩ; Rk = 1,3 kΩ

$-V_R$ (V)	Ia (mA)	Ig2 (mA)	$\frac{Vo}{Vi}$	d_{tot} (%) ($Vo=3V_{eff}$)	d_{tot} (%) ($Vo=5V_{eff}$)	d_{tot} (%) ($Vo=8\ V_{eff}$)
0	1,22	0,35	78	0,75	1,3	2,0
5	0,91	0,26	29	1,3	2,2	3,5
10	0,70	0,19	16	1,9	3,1	5,0
15	0,51	0,13	9	2,1	3,5	5,6
20	0,36	0,09	6	3,4	5,6	9,0

C. Vb = 100 V; Ra = 0,2 MΩ; Rg2 = 0,8 MΩ; Rk = 2,5 kΩ

$-V_R$ (V)	Ia (mA)	Ig2 (mA)	$\frac{Vo}{Vi}$	d_{tot} (%) ($Vo=3V_{eff}$)
0	0,33	0,08	82	0,83
2,5	0,25	0,06	31	2,6
5	0,20	0,04	16	3,9
7,5	0,15	0,03	10	4,2
10	0,12	0,02	7	5,1

D. Vb = 100 V; Ra = 0,1 MΩ; Rg2 = 0,4 MΩ; Rk = 1,3 kΩ

$-V_R$ (V)	Ia (mA)	Ig2 (mA)	$\frac{Vo}{Vi}$	d_{tot} (%) ($Vo=3V_{eff}$)
0	0,61	0,15	72	0,83
2,5	0,44	0,12	29	2,7
5	0,33	0,09	15	3,8
7,5	0,24	0,06	8	5,0
10	0,17	0,04	6	6,2

Limiting values
Caractéristiques limites
Grenzdaten

Va_o	= max.	550 V
Va	= max.	250 V
Wa	= max.	2 W
Vg2	= max.	550 V
Vg2 (Ia = 6 mA)	= max.	125 V
Vg2 (Ia < 3 mA)	= max.	250 V
Wg2	= max.	0,3 W
Ik	= max.	10 mA
Vg1 (Ig1 = 0,3 uA)	= max.	-1,3 V
Rg1k	= max.	3 MΩ
Vfk	= max.	150 V
Rfk	= max.	20 kΩ

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HANDBOOK

UF9

page	sheet	date
1	1	1948.08.20
2	1	1954.03.03
3	2	1948.08.20
4	2	1954.03.03
5	3	1948.08.20
6	3a	1948.08.20
7	FP	2000.07.09

OUTPUT PENTODE
PENTHODE DE SORTIE
ENDPENTODE

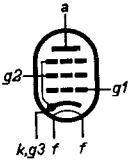
Heating : indirect; series supply — V_f = 45 V
Chauffage: indirect; alimentation- série — I_f = 100 mA
Heizung : indirekt; Serienspeisung

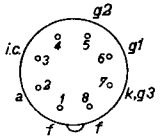
Base, culot, Sockel: RIMLOCK

Overall length: 76 mm
See pages 203 and 252

Hauteur totale: 76 mm
Voir pages 203 et 252

Gesamthöhe : 76 mm
Siehe S. 203 und 252





Capacitances
Capacités
Kapazitäten

C_a = 8,3 pF
C_{g1} = 11 pF
C_{ag1} < 1 pF
C_{g1f} < 0,1 pF

Operating characteristics class A
Caractéristiques d'utilisation classe A
Betriebsdaten Klasse A

V_a	=	100	110	170 V
V_{g2}	=	100	110	170 V
V_{g1}	=	-5,7	-6,4	-10,4 V
I_a	=	29	32	53 mA
I_{g2}	=	5,5	6,0	10 mA
S	=	8,0	8,5	9,5 mA/V
R_i	=	18	18	20 kΩ
$R_{a\sim}$	=	3	3	3 kΩ
μ_{g2g1}	=	10	10	10
W_o(dtot=10%)	=	1,35	1,7	4,25 W
V_i(dtot=10%)	=	3,75	4,2	6,0 Veff
W_o(I_{g1}=+0,3µA)	=	1,35	1,7	4,9 W
V_i(W_o = 50 mW)	=	0,55	0,55	0,5 Veff

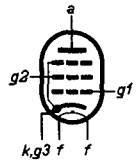
PHILIPS

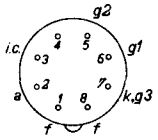
UL 41

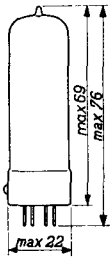
OUTPUT PENTODE
PENTHODE DE SORTIE
ENDPENTODE

Heating : indirect; series supply — V_f = 45 V
Chauffage: indirect; alimentation série — I_f = 100 mA
Heizung : indirekt; Serienspeisung

Dimensions in mm
Dimensions en mm
Abmessungen in mm







Base, culot, Sockel: RIMLOCK

Capacitances Capacités Kapazitäten			
	C_a	=	8,3 pF
	C_{g_1}	=	11 pF
	C_{ag_1}	<	1 pF
	$C_{g_1 f}$	<	0,1 pF

Typical characteristics class A
Caractéristiques d'utilisation classe A
Betriebsdaten Klasse A

V_a	=	100	170 V
V_{g_2}	=	100	170 V
V_{g_1}	=	-5,7	-10,4 V
I_a	=	29	53 mA
I_{g_2}	=	5,5,	10 mA
S	=	8,0	9,5 mA/V
R_i	=	18	20 kΩ
R_a	=	3	3 kΩ
$\mu_{g_2 g_1}$	=	10	10
W_o (dtot = 10%)	=	1,25	4,0 W
V_i (dtot = 10%)	=	3,8	6,0 Veff
V_i (W_o = 50 mW)	=	0,55	0,5 Veff

Operating characteristics class AB
Caractéristiques d'utilisation classe AB
Betriebsdaten Klasse AB

V_a	=	100		170		V
V_{g2}	=	100		170		V
R_k	=	100		100		Ω
$R_{aa\sim}$	=	4,0		4,0		kΩ
V_i	=	0	4,6	0	9,3	V_{eff}
I_a	=	2x24	2x27	2x44	2x49	mA
I_{g2}	=	2x4,6	2x6,8	2x8,8	2x16,5	mA
W_o	=	0	2,2	0	9	W
d_{tot}	=	-	3,5	-	4,0	%

Limiting values
Caractéristiques limites
Grenzdaten

V_{a_o}	= max.	550	V
V_a	= max.	250	V
W_a	= max.	9	W
V_{g2_o}	= max.	550	V
V_{g2}	= max.	250	V
$W_{g2}(V_i = 0)$	= max.	1,75	W
$W_{g2}(W_o = max.)$	= max.	4,0	W
I_k	= max.	75	mA
$V_{g1}(I_{g1}=+0,3\mu A)$	= max.	-1,3	V
$R_{g1}(R_k = 165\ \Omega)$	= max.	1	MΩ
R_{kf}	= max.	20	kΩ
V_{kf}	= max.	150	V

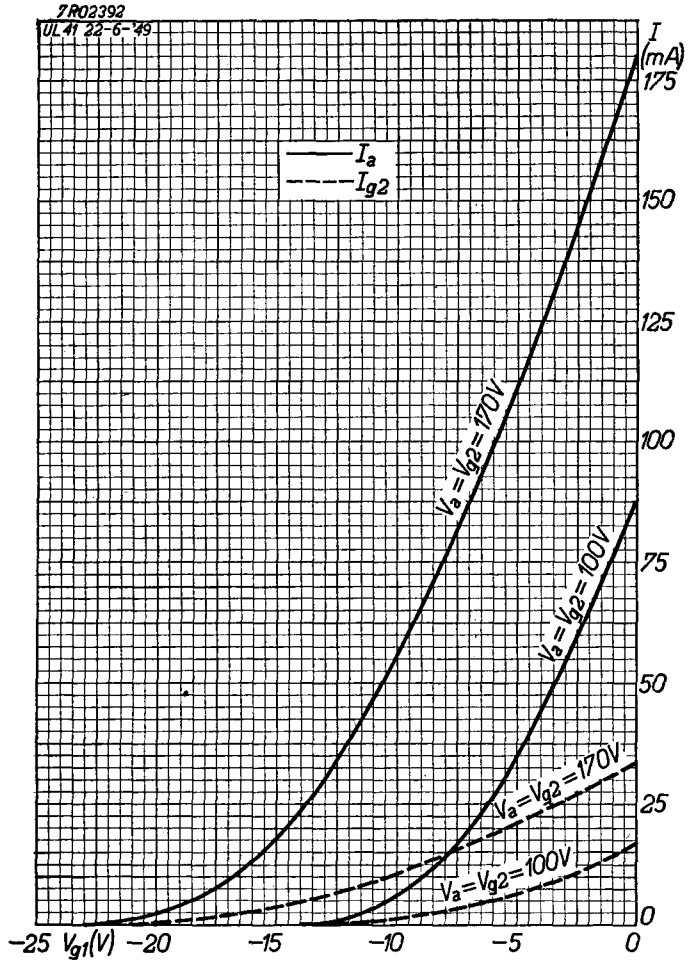
Operating characteristics class AB
Caractéristiques d'utilisation classe AB
Betriebsdaten Klasse AB

V_a	=	100		170		V
V_{g_2}	=	100		170		V
R_k	=	100		100		Ω
R_{aa}	=	4,0		4,0		kΩ
V_i	=	0	4,6	0	9,3	V_{eff}
I_a	=	2x25	2x27	2x46	2x49	mA
I_{g_2}	=	2x5,0	2x6,8	2x9,0	2x16,5	mA
W_o	=	0	2,2	0	9	W
d_{tot}	=	-	4,0	-	5,0	%

Limiting values
Caractéristiques limites
Grenzdaten

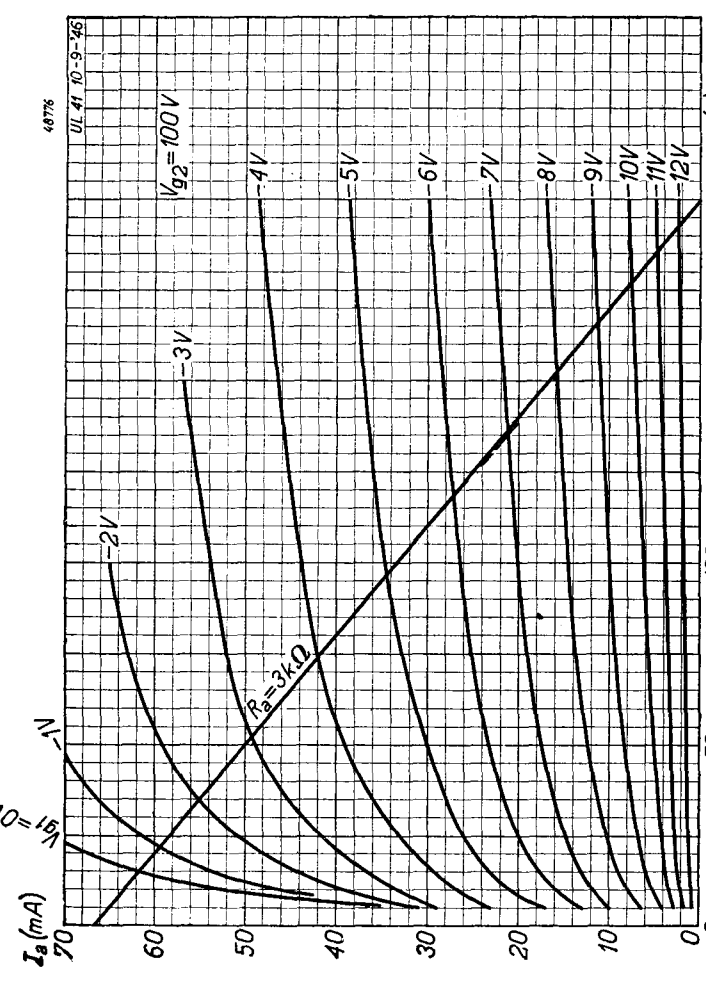
V_{a_o}	= max.	550	V
V_a	= max.	250	V
W_a	= max.	9	W
$V_{g_{2o}}$	= max.	550	V
V_{g_2}	= max.	250	V
W_{g_2}	= max.	2,5	W
I_k	= max.	75	mA
V_{g_1} (I_{g_1}=+0,3 μA)	= max.	-1,3	V
R_{g_1}	= max.	1	MΩ [1]
R_{kf}	= max.	20	kΩ
V_{kf}	= max.	150	V

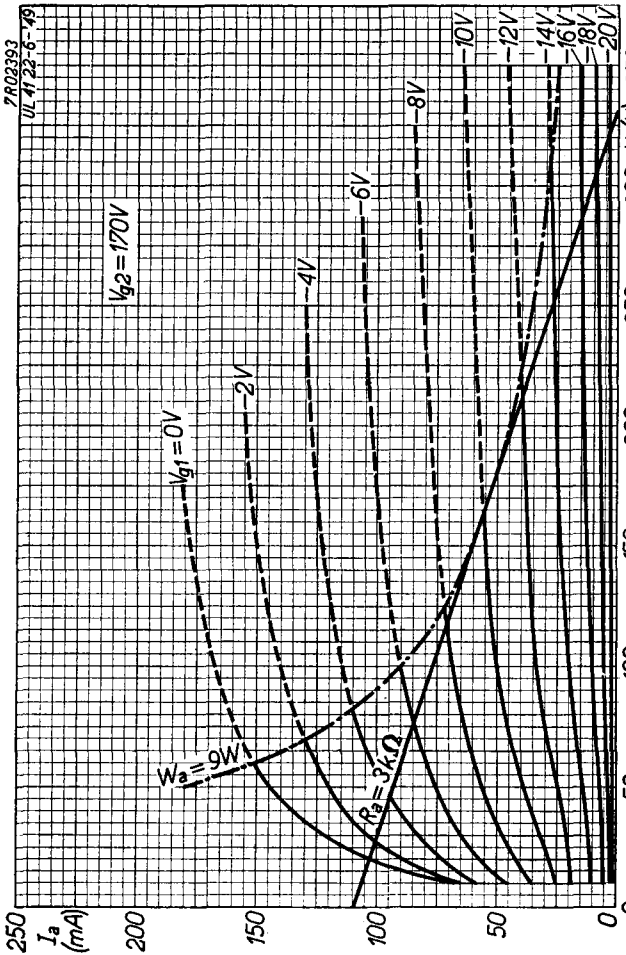
[1] With automatic bias
Avec polarisation automatique
Mit automatischer Gittervorspannung


7R02392
UL41 22-6-49
I (mA)
175
150
125
100
75
50
25
0
I_a
I_{g2}
$V_a = V_{g2} = 170V$
$V_a = V_{g2} = 100V$
$V_a = V_{g2} = 170V$
$V_a = V_{g2} = 100V$
−25 V_{g1}(V) −20 −15 −10 −5 0

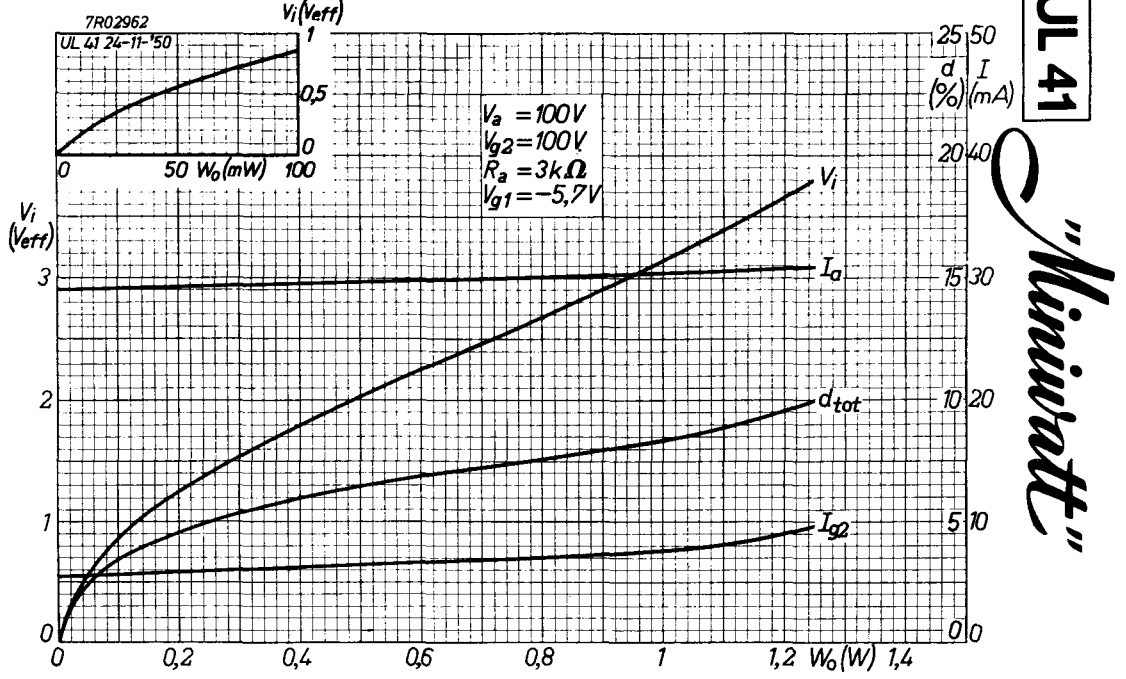
UL 41

"Miniwatt"




7R02393
UL 41 23-6-49
V_{g2} = 170V
V_{g1} = 0V
-2V
-4V
-6V
-8V
-10V
-12V
-14V
-16V
-18V
-20V
W_a = 9W
R_a = 3kΩ
I_a (mA)
250
200
150
100
50
0
V_a (V)
0
50
100
150
200
250
300
350

12.12.1950 C.



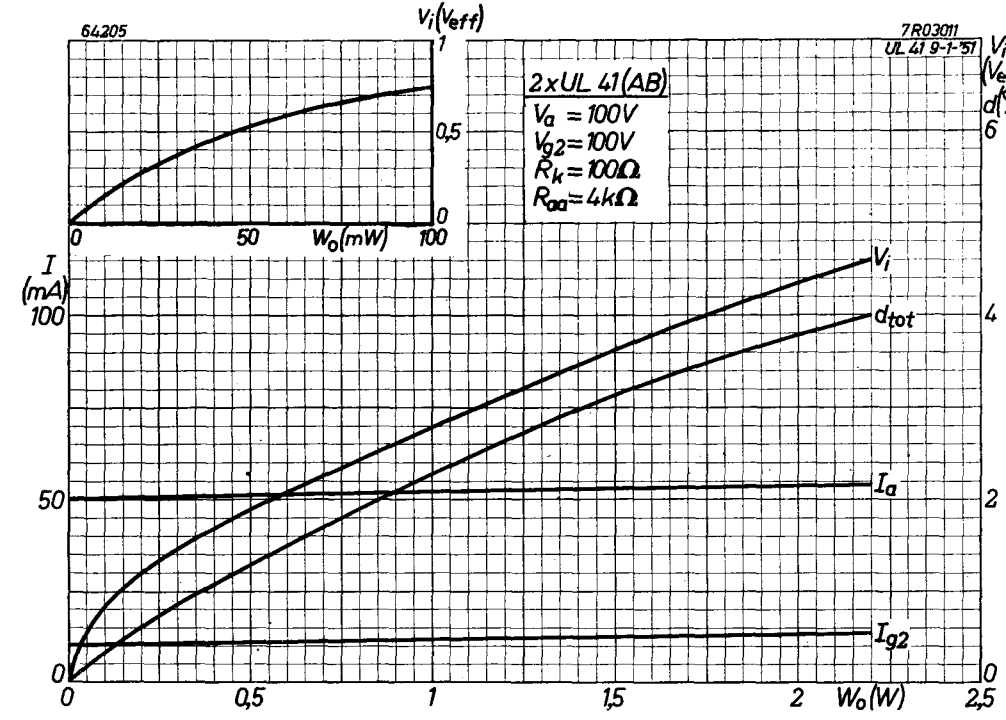
UL 41

"Miniwatt"

"Miniwatt" UL 41

12.12.1950

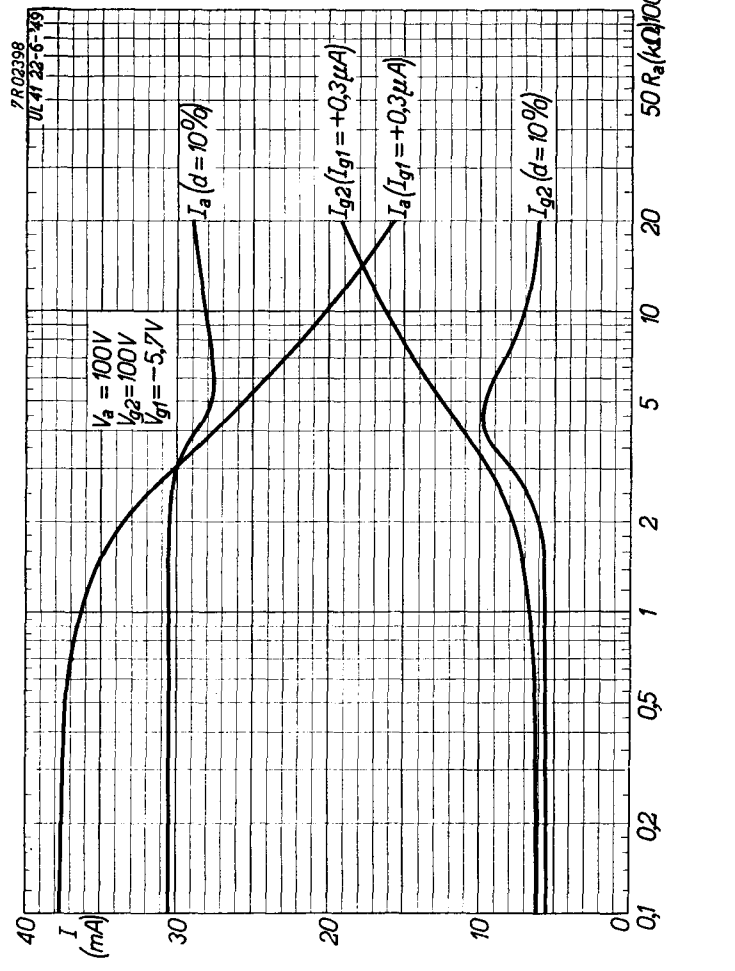
E

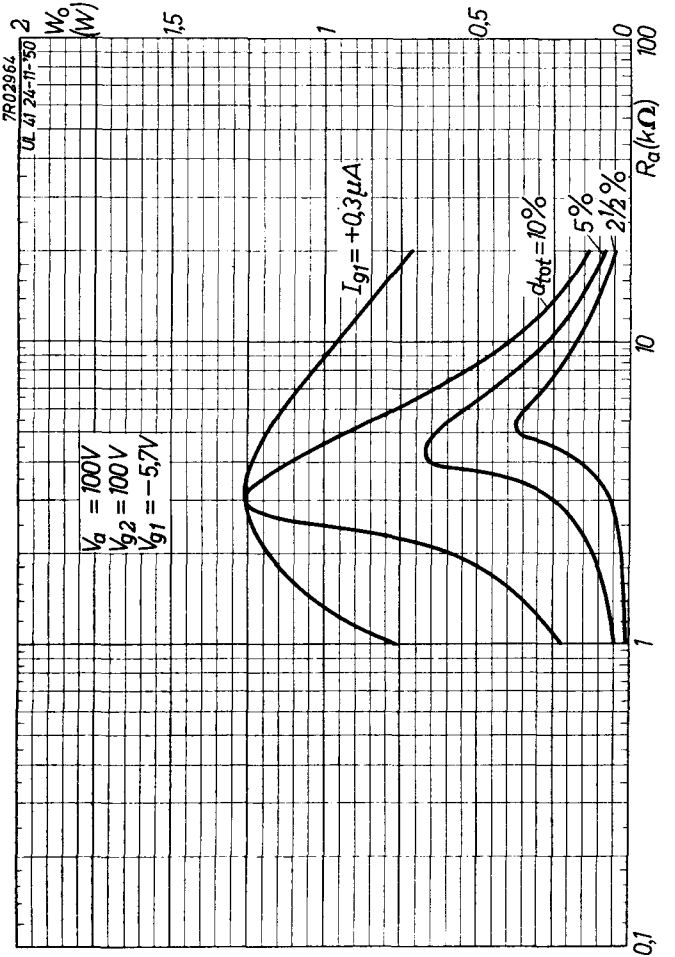


UL 41 "Miniwatt"

7R03012
UL 41 9-1-51
2 x UL 41 (AB)
Va = 170V
Vg2 = 170V
Rk = 100Ω
Raa = 4kΩ
Vi (Veff)
d (%)
Ia
Vi
dtot
Ig2
I (mA)
Wo (W)
Wo (mW)
64206

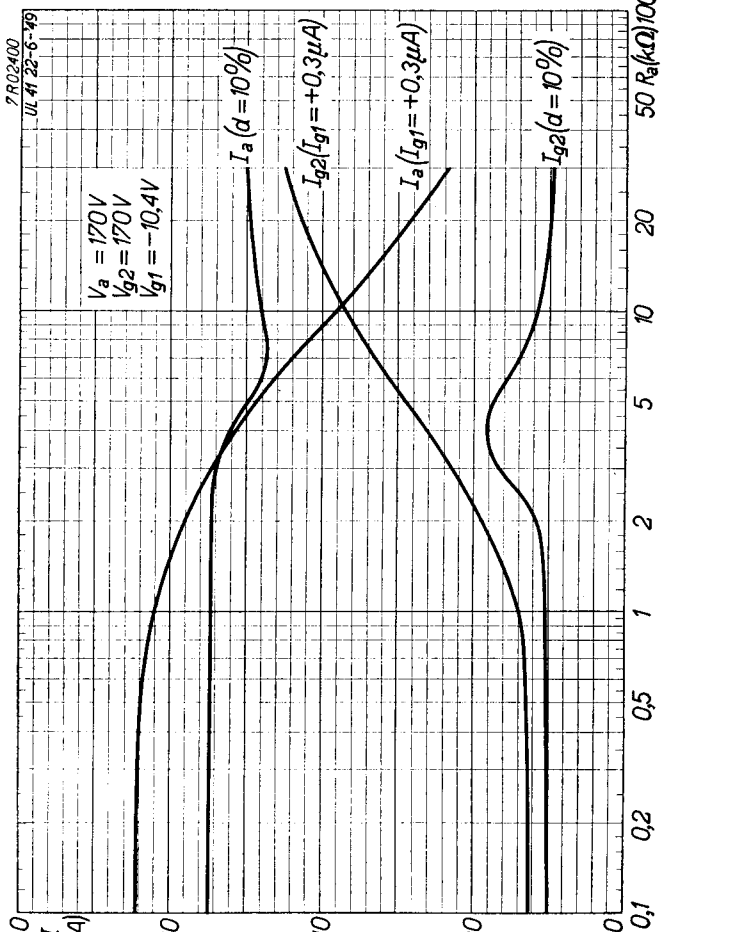
UL 41 "Miniwatt"

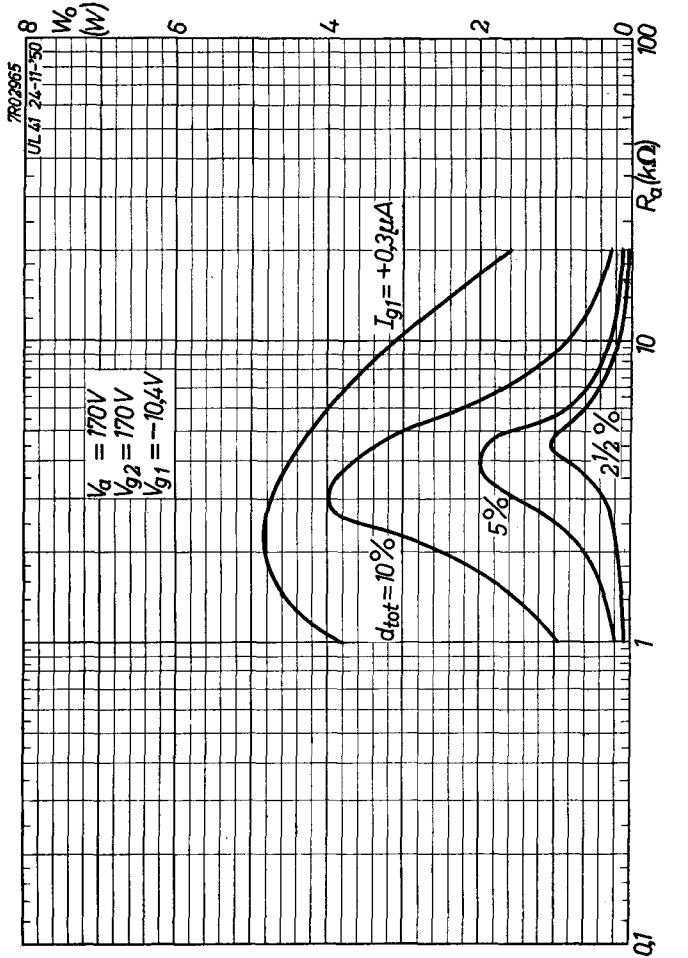



7R02964
UL 41 24-11-50
W_o (W)
2
1,5
1
0,5
0
100
10
1
0,1
R_a(kΩ)
I_{g1} = +0,3μA
d_{tot} = 10%
5%
2½%
V_a = 100V
V_{g2} = 100V
V_{g1} = −5,7V

UL 41

"Miniwatt"




7802965
UL 41 24-11-50
W_o (W)
8
6
4
2
0
100
10
1
0,1
R_a (kΩ)
V_a = 170V
V_{g2} = 170V
V_{g1} = −10,4V
I_{g1} = +0,3μA
d_{tot} = 10%
5%
2½ %



UL41

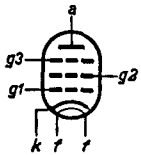
page	sheet	date
1	1	1953.12.12
2	1	1955.05.05
3	2	1953.12.12
4	2	1955.05.05
5	A	1949.07.07
6	B	1949.07.07
7	C	1950.12.12
8	D	1950.12.12
9	E	1950.12.12
10	F	1950.12.12
11	G	1951.02.02
12	H	1951.02.02
13	I	1950.12.12
14	J	1950.12.12
15	K	1950.12.12
16	FP	1999.10.12

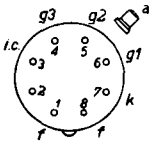
PENTODE for use in television line time base circuits
PENTHODE pour utilisation dans les circuits de base de temps de ligne de télévision
PENTHODE zur Verwendung in Fernseh-Zeilenzeitbasis-Schaltungen

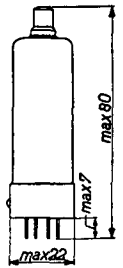
Heating: indirect by A.C. or D.C.; series supply
Chauffage: indirect par C.A. ou C.C.; alimentation en série
Heizung: indirekt durch Wechsel- oder Gleichstrom; Serienspeisung

Vf = 45 V
If = 0,1 A

Dimensions in mm
Dimensions en mm
Abmessungen in mm







Capacitances
Capacités
Kapazitäten

Ca	=	8,3 pF
Cg1	=	12,4 pF
Cag1	=	1,0 pF
Cg1f	=	0,1 pF

Typical characteristics
Caractéristiques typiques
Kenndaten

Va	=	175 V
Vg3	=	0 V
Vg2	=	175 V
Vg1	=	-13,5 V
Ia	=	28,5 mA
Ig2	=	4,7 mA
S	=	7 mA/V
μg2g1	=	11 -

Limiting values
Caractéristiques limites
Grenzdaten

Va_o (peak value / valeur de crête / Spitzenwert)	= max.	3000 V[1]
Va	= max.	300 V
Wa	= max.	5 W
$Vg2_o$	= max.	550 V
Vg2	= max.	300 V
Wg2	= max.	3,5 W
Ik	= max.	80 mA
Vg1(Ig1 = +0,3 µA)	= max.	-1,3 V
Rg1	= max.	0,5 MΩ
Vfk	= max.	150 V
Rfk	= max.	20 kΩ

1) admissible impulse time: 15% of the duration of a cycle with a maximum of 15 µsec.
temps d'impulsion admissible: 15% de la durée d'une période avec un maximum de 15 µsec.
zulässige Impulszeit: 15% von der Dauer einer Periode mit einem Maximum von 15 µsec.

PHILIPS

Electronic Tube

HANDBOOK

UL44

page	sheet	date
1	1	1948.11.04
2	2	1948.11.04
3	FP	2000.07.09

PHILIPS

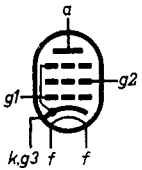
UL 84

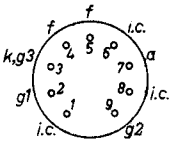
OUTPUT PENTODE
PENTHODE DE SORTIE
ENDPENTODE

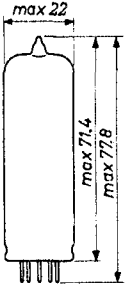
Heating : indirect by A.C. or D.C. series supply
Chauffage: indirect par C.A. ou C.C. alimentation série
Heizung : indirekt durch Wechsel- oder Gleichstrom; Serienspeisung

V_f = 45 V
I_f = 100 mA

Dimensions in mm
Dimensions en mm
Abmessungen in mm







Base, culot, Sockel: NOVAL

Capacitances
Capacités
Kapazitäten

C_a	=	6,0 pF
C_{g_1}	=	12,0 pF
C_{ag_1}	<	0,6 pF
$C_{g_1 f}$	<	0,25 pF

Typical characteristics
Caractéristiques types
Kenndaten

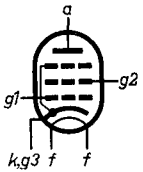
V_a	=	100	170 V
V_{g_2}	=	100	170 V
V_{g_1}	=	-6,7	-12,5 V
I_a	=	43	70 mA
I_{g_2}	=	3	5 mA
S	=	9	10 mA/V
μ	=	8	8
R_i	=	23	23 kΩ

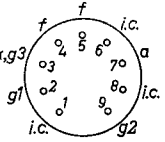
OUTPUT PENTODE
PENTHODE DE SORTIE
ENDPENTODE

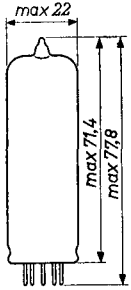
Heating : indirect by A.C. or D.C. series supply
Chauffage: indirect par C.A. ou C.C. alimentation série
Heizung : indirekt durch Wechsel- oder Gleichstrom; Serien-speisung

V_f = 45 V
I_f = 100 mA

Dimensions in mm
Dimensions en mm
Abmessungen in mm







Base, culot, Sockel: NOVAL

Capacitances
Capacités
Kapazitäten

C_a	=	6,0 pF
C_{g_1}	=	12,0 pF
C_{ag_1}	<	0,6 pF
$C_{g_1 f}$	<	0,25 pF

→ Typical characteristics
Caractéristiques types
Kenndaten

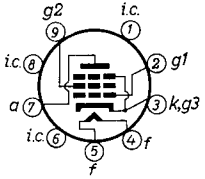
V_a	=	100	170	200 V
V_{g2}	=	100	170	- V
V_{bg2}	=	-	-	200 V
R_{g2}	=	-	-	470 Ω
V_{g_1}	=	-6,7	-12,5	-17,3 V
I_a	=	43	70	60 mA
I_{g2}	=	3	5	4,1 mA
S	=	9	10	8,8 mA/V
μ	=	8	8	8 -
R_1	=	23	23	28 kΩ

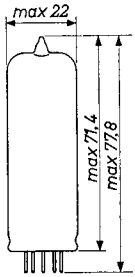
A.F. OUTPUT PENTODE
PENTODE DE SORTIE B.F.
NF-ENDPENTODE

Heating : indirect by A.C. or D.C. series supply
Chauffage: indirect par C.A. ou C.C. alimentation série
Heizung : indirekt durch Wechsel- oder Gleichstrom; Serienspeisung

I_f = 100 mA
V_f = 45 V

Dimensions in mm
Dimensions en mm
Abmessungen in mm





Base, culot, Sockel: NOVAL

Capacitances
Capacités
Kapazitäten

C_a	=	6,8 pF
C_{g1}	=	13 pF
C_{ag1}	<	0,6 pF
C_{g1f}	<	0,25 pF

Typical characteristics
Caractéristiques types
Kenndaten

V_a	=	170 V
V_{g2}	=	170 V
V_{g1}	=	-12,5 V
I_a	=	70 mA
I_{g2}	=	3,5 mA
S	=	11 mA/V
μ_{g2g1}	=	8
R_i	=	26 kΩ

Operating characteristics class A
Caractéristiques d'utilisation classe A
Betriebsdaten Klasse A

V_a	=		100			170		V
V_{g2}	=		100			170		V
V_{g1}	=		-6,7			-12,5		V
$R_{a\sim}$	=		2,4			2,4		kΩ
V_i	=	0	0,55	4,3	0	0,5	7,0	V_{eff}
I_a	=	43	-	43	70	-	70	mA
I_{g2}	=	3	-	11	5	-	22	mA
W_o	=	-	0,05	1,9	-	0,05	5,6	W
d_t	=	-	-	10	-	-	10	%

Operating characteristics class B, two tubes
Caractéristiques d'utilisation classe B, deux tubes
Betriebsdaten Klasse B, zwei Röhren

V_a	=		100			170		V
V_{g2}	=		100			170		V
V_{g1}	=		-11,4			-20,5		V
$R_{aa'\sim}$	=		3,5			3,5		kΩ
V_i	=	0	0,95	7,9	0	0,92	14,6	V_{eff}
I_a	=	2x10	-	2x30,5	2x15	-	2x57,5	mA
I_{g2}	=	2x0,55	-	2x7,1	2x0,7	-	2x20,5	mA
W_o	=	-	0,05	3,7	-	0,05	13,5	W
d_t	=	-	-	2,8	-	-	4,8	%

Operating characteristics class AB, two tubes
Caractéristiques d'utilisation classe AB, deux tubes
Betriebsdaten Klasse AB, zwei Röhren

V_a	=		100			170		V
V_{g2}	=		100			170		V
R_k	=		135			120		Ω
$R_{aa\sim}$	=		3,5			3,5		kΩ
V_i	=	0	0,54	7,0	0	0,45	13,1	V_{eff}
I_a	=	2x29	-	2x31	2x56,5	-	2x57,5	mA
I_{g2}	=	2x1,6	-	2x7	2x3,0	-	2x20,5	mA
W_o	=	-	0,05	3,6	-	0,05	13,0	W
d_t	=	-	-	3	-	-	4,5	%

Operating characteristics class A
Caractéristiques d'utilisation classe A
Betriebsdaten Klasse A

V_a	=		100			170		V
V_{g2}	=		100			170		V
V_{g1}	=		-6,7			-12,5		V
$R_{a\sim}$	=		2,4			2,4		kΩ
V_i	=	0	0,55	4,3	0	0,5	7,0	V_{eff}
I_a	=	43	-	43	70	-	70	mA
I_{g2}	=	3	-	11	5	-	22	mA
W_o	=	-	0,05	1,9	-	0,05	5,6	W
d_t	=	-	-	10	-	-	10	%

V_a	=		200		V
V_{bg2}	=		200		V
R_{g2}	=		470		Ω +)
V_{g1}	=		-17,3		V
$R_{a\sim}$	=		2,4		kΩ
V_i	=	0	0,55	7,8	V_{eff}
I_a	=	60	-	62,5	mA
I_{g2}	=	4,1	-	12,5	mA
W_o	=	-	0,05	5,2	W
d_t	=	-	-	10	%

Operating characteristics class B, two tubes
Caractéristiques d'utilisation classe B, deux tubes
Betriebsdaten Klasse B, zwei Röhren

V_a	=		100			170		V
V_{g2}	=		100			170		V
V_{g1}	=		-11,4			-20,5		V
$R_{aa\sim}$	=		3,5			3,5		kΩ
V_i	=	0	0,95	7,9	0	0,92	14,6	V_{eff}
I_a	=	2x10	-	2x30,5	2x15	-	2x57,5	mA
I_{g2}	=	2x0,55	-	2x7,1	2x0,7	-	2x20,5	mA
W_o	=	-	0.05	3,7	-	0,05	13,5	W
d_t	=	-	-	2,8	-	-	4,8	%

+)Non by-passed; ne pas shuntée; nicht entkoppelt

PHILIPS

Operating characteristics, class A, one tube
Caractéristiques d'utilisation, classe A, un tube
Betriebsdaten, Klasse A, eine Röhre

V_b	=		100			170		V
R_k	=		130			130		Ω[1]
$R_{a\sim}$	=		2,1			2,0		kΩ
V_i	=	0	0,55	3,8	0	0,47	6,1	V_{eff}
I_a	=	41	-	42	75	-	76	mA
I_{g2}	=	2,6	-	8,6	4,0	-	16,5	mA
W_o	=	0	0,05	1,55	0	0,05	5,1	W
d_{tot}	=	-	-	10	-	-	10	%

V_b	=		200		V
R_{g2}	=		470		Ω[2]
R_k	=		215		Ω[1]
$R_{a\sim}$	=		2,5		kΩ
V_i	=	0	0,52	7,0	V_{eff}
I_a	=	65	-	64	mA
I_{g2}	=	3,2	-	11,4	mA
W_o	=	0	0,05	5,3	W
d_{tot}	=	-	-	10	%

---

[1]) During measurement V_k is kept constant
Pendant la mesure V_k est tenue constante
Während der Messung wird V_k konstant gehalten

[2]) Not bypassed
Non découplée
Nicht entkoppelt

Operating characteristics in triode connection, class A
(Screen grid connected to anode)
Caractéristiques d'utilisation en montage triode, classe A (Grille-écran reliée à l'anode)
Betriebsdaten in Triodenschaltung, Klasse A
(Schirmgitter verbunden mit Anode)

V_a	=		100			170		V
V_{g_1}	=		-8			-15,1		V
$R_{a\sim}$	=		1,2			1,2		kΩ
V_i	=	0	1,8	5,7	0	1,75	10,8	Veff
I_a	=	30	-	36,1	50	-	62	mA
W_o	=	-	0,05	0,52	-	0,05	2,1	W
d_t	=	-	-	10	-	-	10	%

Operating characteristics two tubes class AB in triode connection (Screen grid connected to anode)
Caractéristiques d'utilisation deux tubes en classe AB en montage triode (Grille-écran reliée à l'anode)
Betriebsdaten zwei Röhren in Klasse AB in Triodenschaltung (Schirmgitter verbunden mit Anode)

V_a	=		100			170		V
R_k	=		270			270		Ω
$R_{aa'\sim}$	=		3,5			3,5		kΩ
V_i	=	0	1,54	7,3	0	1,45	13,4	V_{eff}
I_a	=	2x18	-	2x20	2x32,5	-	2x36	mA
W_o	=	-	0,05	1,0	-	0,05	3,9	W
d_t	=	-	-	3,2	-	-	3,8	%

Operating characteristics class AB, two tubes
Caractéristiques d'utilisation classe AB, deux tubes
Betriebsdaten Klasse AB, zwei Röhren

V_a	=		100			170		V
V_{g2}	=		100			170		V
R_K	=		135			120		Ω
R_{aa} ~	=		3,5			3,5		kΩ
V_i	=	0	0,54	7,0	0	0,45	13,1	V_{eff}
I_a	=	2x29	-	2x31	2x56,5	-	2x57,5	mA
I_{g2}	=	2x1,6	-	2x7	2x3,0	-	2x20,5	mA
W_o	=	-	0,05	3,6	-	0,05	13,0	W
d_t	=	-	-	3	-	-	4,5	%

Operating characteristics in triode connection, class A
(Screen grid connected to anode)
Caractéristiques d'utilisation en montage triode, classe A (Grille-écran reliée à l'anode)
Betriebsdaten in Triodenschaltung, Klasse A
(Schirmgitter verbunden mit Anode)

V_a	=		100			170		V
V_{g1}	=		-8			-15,1		V
R_{aa} ~	=		1,2			1,2		kΩ
V_i	=	0	1,8	5,7	0	1,75	10,8	V_{eff}
I_a	=	30	-	36,1	50	-	62	mA
W_o	=	-	0,05	0,52	-	0,05	2,1	W
d_t	=	-	-	10	-	-	10	%

Operating characteristics two tubes class AB in triode connection, (Screen grid connected to anode)
Caractéristiques d'utilisation deux tubes en classe AB en montage triode (Grille-écran reliée à l'anode)
Betriebsdaten zwei Röhren in Klasse AB in Triodenschaltung (Schirmgitter verbunden mit Anode)

V_a	=		100			170		V
R_K	=		270			270		Ω
R_{aa} ~	=		3,5			3,5		kΩ
V_i	=	0	1,54	7,3	0	1,45	13,4	V_{eff}
I_a	=	2x18	-	2x20	2x32,5	-	2x36	mA
W_o	=	-	0,05	1,0	-	0,05	3,9	W
d_t	=	-	-	3,2	-	-	3,8	%

Operating characteristics, class AB, two tubes
Caractéristiques d'utilisation, classe AB, deux tubes
Betriebsdaten, Klasse AB, zwei Röhren

V_b	=		200		V
R_k	=		120		Ω[1])
$R_{aa\sim}$	=		3		kΩ
V_i	=	0	0,47	14,3	V_{eff}
I_a	=	2x60	-	2x64,5	mA
I_{g2}	=	2x3,0	-	2x18,5	mA
W_o	=	0	0,05	14,3	W
d_{tot}	=	-	-	3,8	%

Limiting values
Caractéristiques limites
Grenzdaten

V_{ao}	= max.	550	V
V_a	= max.	250	V
W_a	= max.	12	W
V_{g2o}	= max.	550	V
V_{g2}	= max.	200	V
W_{g2}	= max.	1,75	W
W_{g2p}	= max.	6	W
I_k	= max.	100	mA
R_{g1}	= max.	1	MΩ[1])
V_{kf}	= max.	200	V
R_{kf}	= max.	20	kΩ

[1]) Common cathode resistor
Résistance cathodique commune
Gemeinsamer Katodenwiderstand

[2]) Automatic bias
Polarisation automatique
Automatische Gittervorspannung

Limiting values
Caractéristiques limites
Grenzdaten

V_{a_o}	= max.	550	V
V_a	= max.	250	V
W_a	= max.	12	W
$V_{g_{2o}}$	= max.	550	V
V_{g_2}	= max.	200	V
W_{g_2}	= max.	1,75	W
$W_{g_{2p}}$	= max.	6	W
I_k	= max.	100	mA
R_{g_1}	= max.	1	MΩ [1]
V_{kf}	= max.	200	V
R_{kf}	= max.	20	kΩ

[1] With automatic grid bias
Avec polarisation automatique
Mit automatischer Gittervorspannung

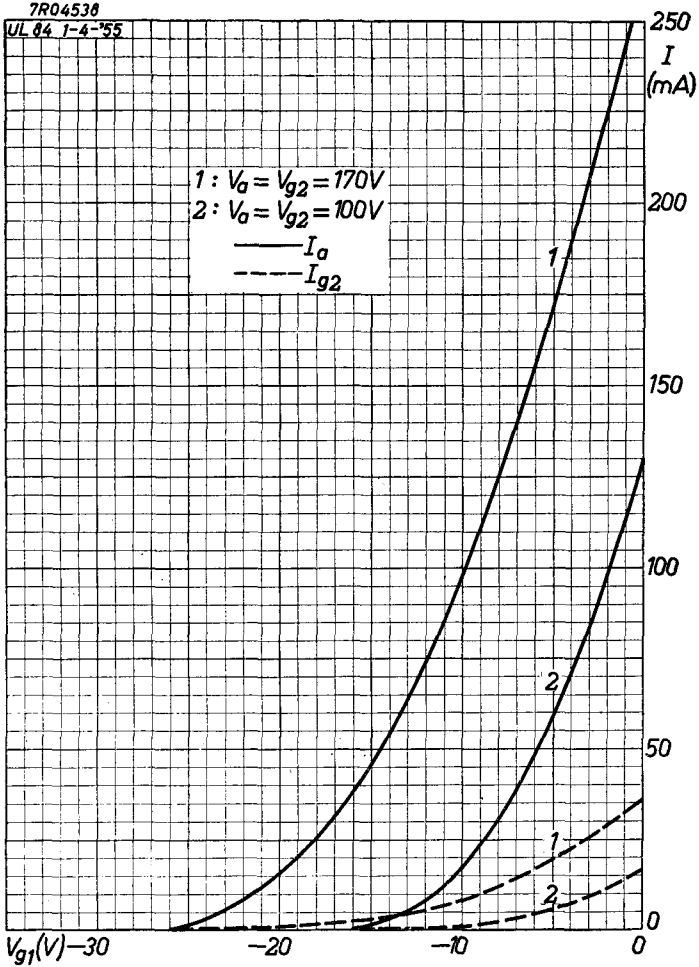
Limiting values
Caractéristiques limites
Grenzdaten

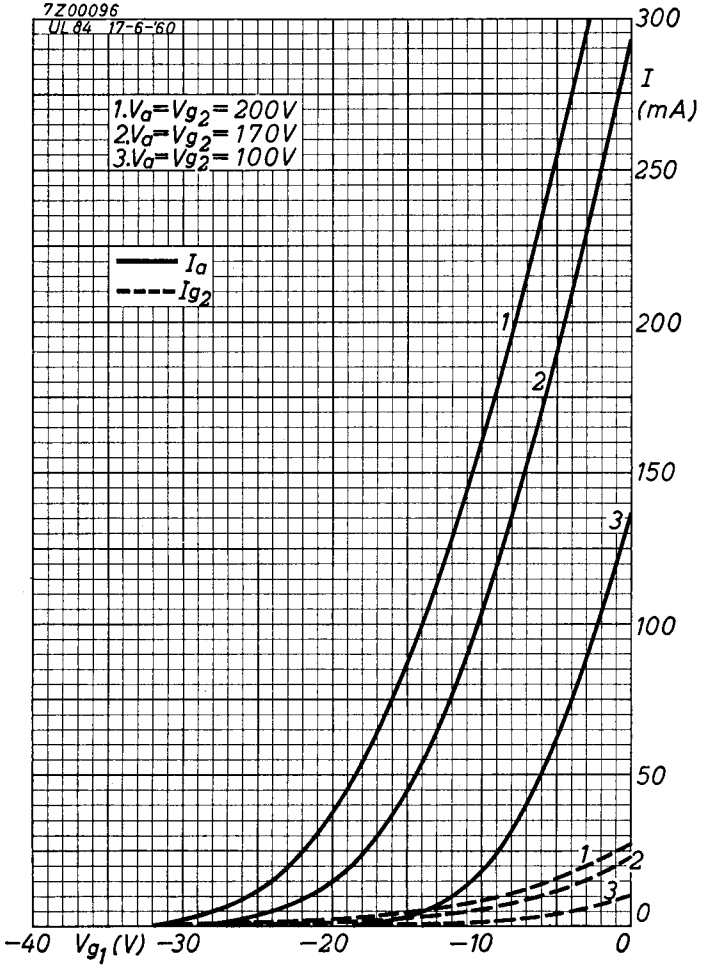
V_{a_o}	= max.	550	V
V_a	= max.	250	V
W_a	= max.	12	W
V_{g2_o}	= max.	550	V
V_{g2}	= max.	200	V
W_{g2}	= max.	1,75	W
W_{g2_p}	= max.	6	W
I_k	= max.	100	mA
R_{g1}	= max.	1	MΩ [1]
V_{kf}	= max.	200	V
V_{kf_p} (k pos; f neg.) [2]	= max.	300	V [3]
R_{kf}	= max.	20	kΩ

[1] With automatic grid bias
Avec polarisation automatique
Mit automatischer Gittervorspannung

[2] For single-ended push-pull applications
Pour des applications push-pull sans transformateur
Bei Verwendung in transformatorlosen Gegentaktendstufen

[3] D.C. component max. 150 V
La composante continue 150 V au max.
Gleichspannungskomponente max. 150 V

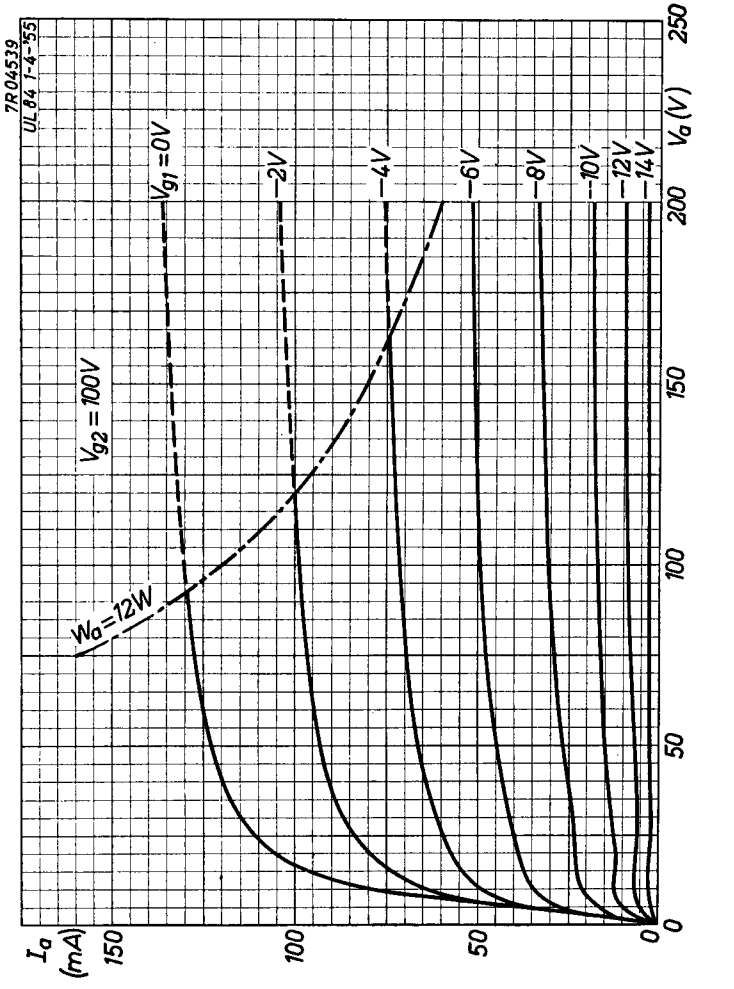

7R04538
UL 84 1-4-'55
1 : $V_a = V_{g2} = 170V$
2 : $V_a = V_{g2} = 100V$
I_a
I_{g2}
250
I
(mA)
200
150
100
50
0
1
2
1
2
V_{g1}(V) −30
−20
−10
0

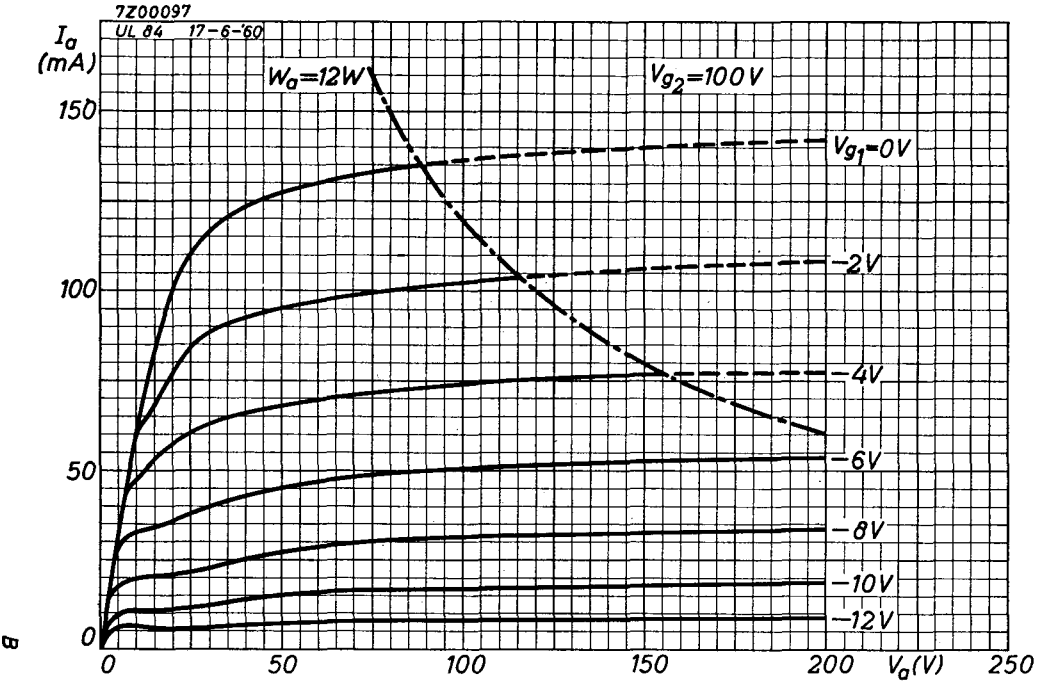

7Z00096
UL 84 17-6-60
1. $V_a = Vg_2 = 200V$
2. $V_a = Vg_2 = 170V$
3. $V_a = Vg_2 = 100V$
I_a
Ig_2
I (mA)
300
250
200
150
100
50
0
1
2
3
1
2
3
−40 V_{g_1} (V) −30 −20 −10 0

6.6.1960 A

UL 84

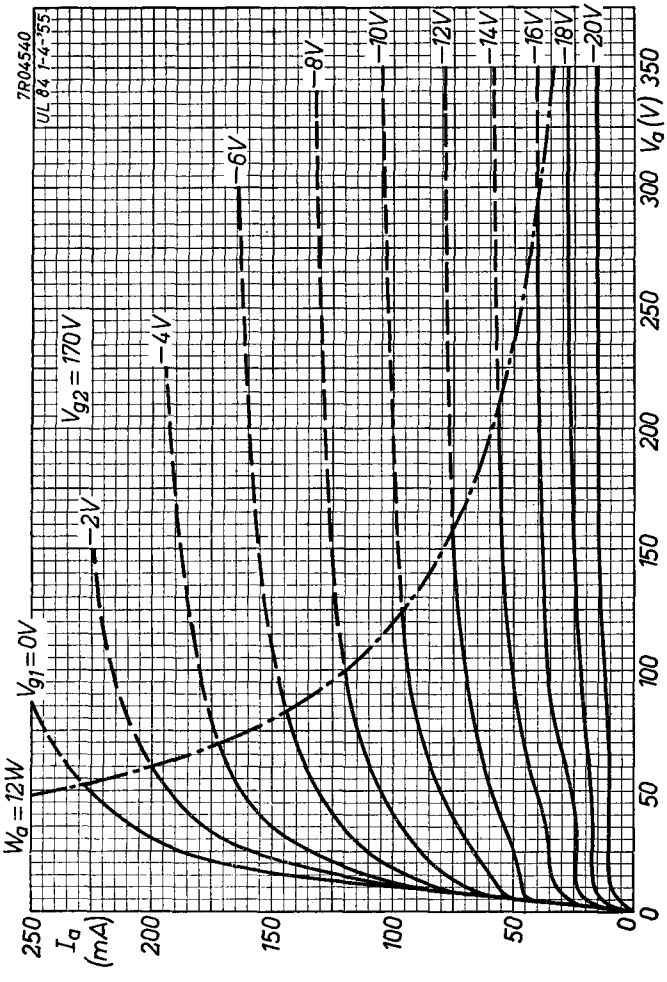
PHILIPS

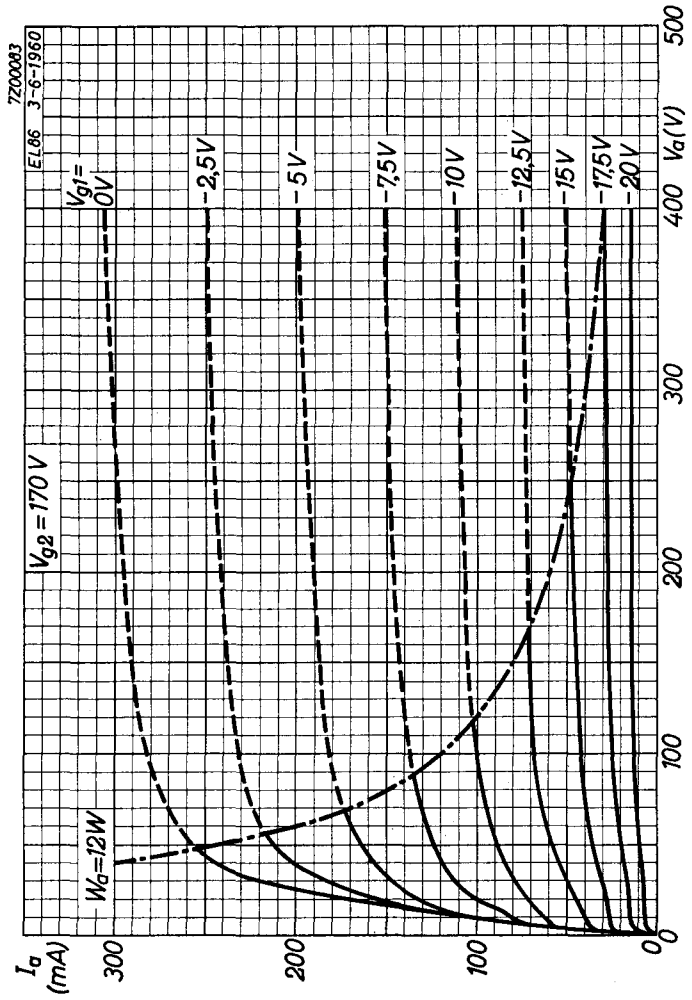


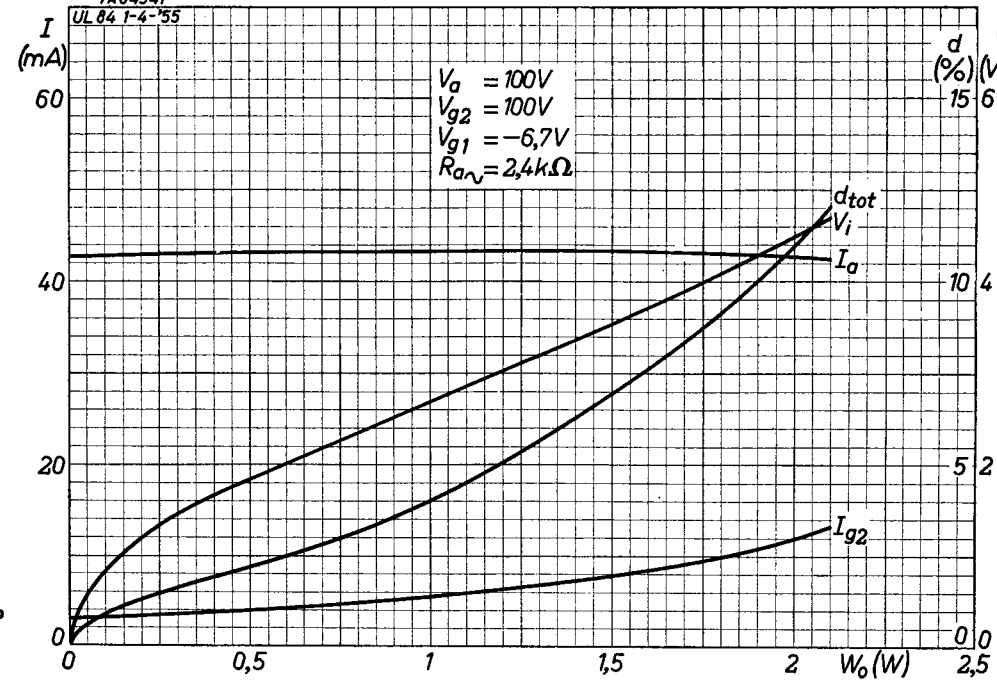


UL84

PHILIPS


7R04540
UL 84 1-4-55
V_{g2} = 170 V
V_{g1} = 0V
W_a = 12W
−2V
−4V
−6V
−8V
−10V
−12V
−14V
−16V
−18V
−20V
I_a (mA)
250
200
150
100
50
0
0
50
100
150
200
250
300
350
V_a (V)


7Z00083
3-6-1960
EL86
V_{g1}=
0V
-2,5V
-5V
-7,5V
-10V
-12,5V
-15V
-17,5V
-20V
V_{g2} = 170 V
W_a=12W
I_a (mA)
300
200
100
0
0
100
200
300
400
500
V_a(V)



UL 84

PHILIPS

UL 84 PHILIPS

PHILIPS **UL 84**

10.10.1955

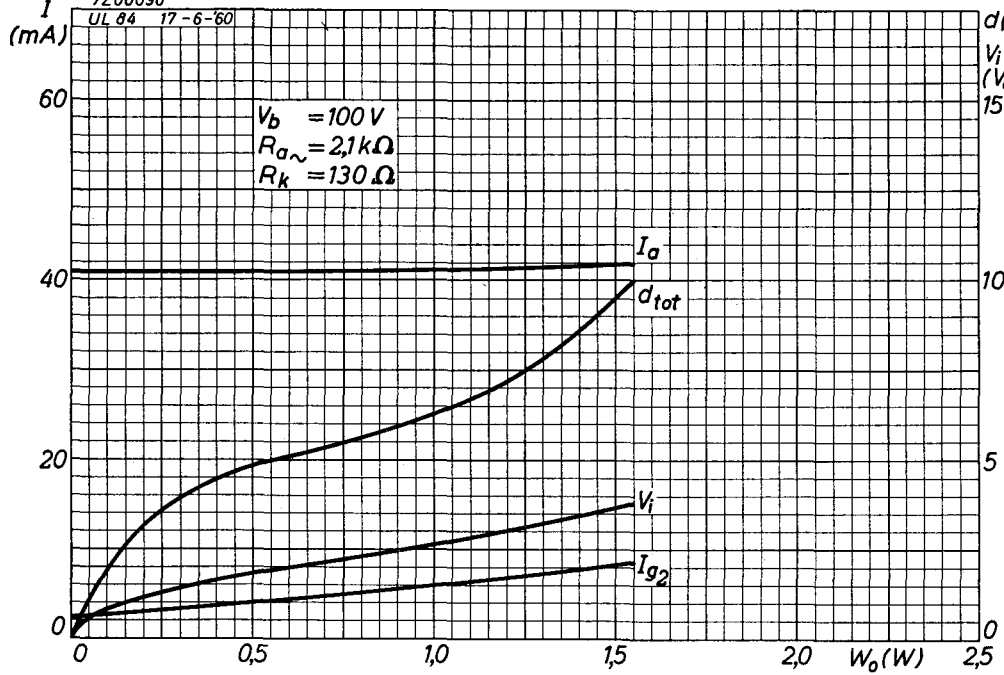
E

Vi (Veff)
d (%)
I (mA)
Wo (W)
dtot
Vi
Ia
Ig2
Va = 100V
Vg2 = 100V
Vg1 = −6,7V
Ra~ = 2,4kΩ
7R04541
UL 84 1-4-'55

PHILIPS **UL 84**

9.9.1957

E

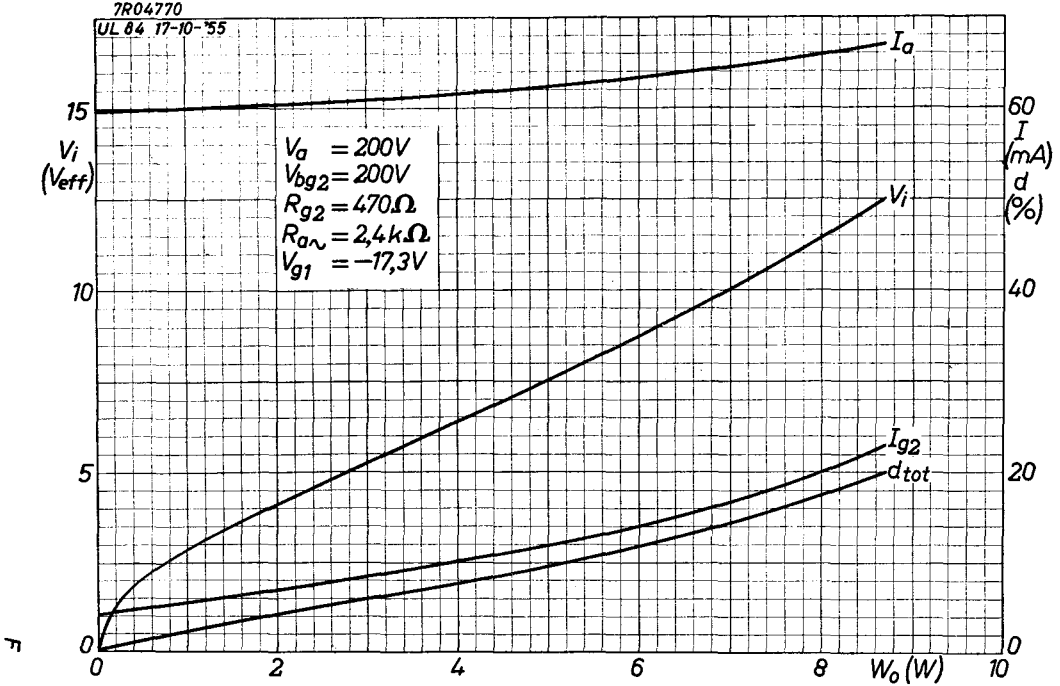


6.6.1960

E

PHILIPS

UL 84


7R04770
UL 84 17-10-'55
V_a = 200V
V_{bg2} = 200V
R_{g2} = 470Ω
$R_{a\sim}$ = 2,4kΩ
V_{g1} = −17,3V
I_a
V_i
I_{g2}
d_{tot}
V_i (V_{eff})
I (mA)
d (%)
W_o (W)
0
5
10
15
20
40
60
2
4
6
8

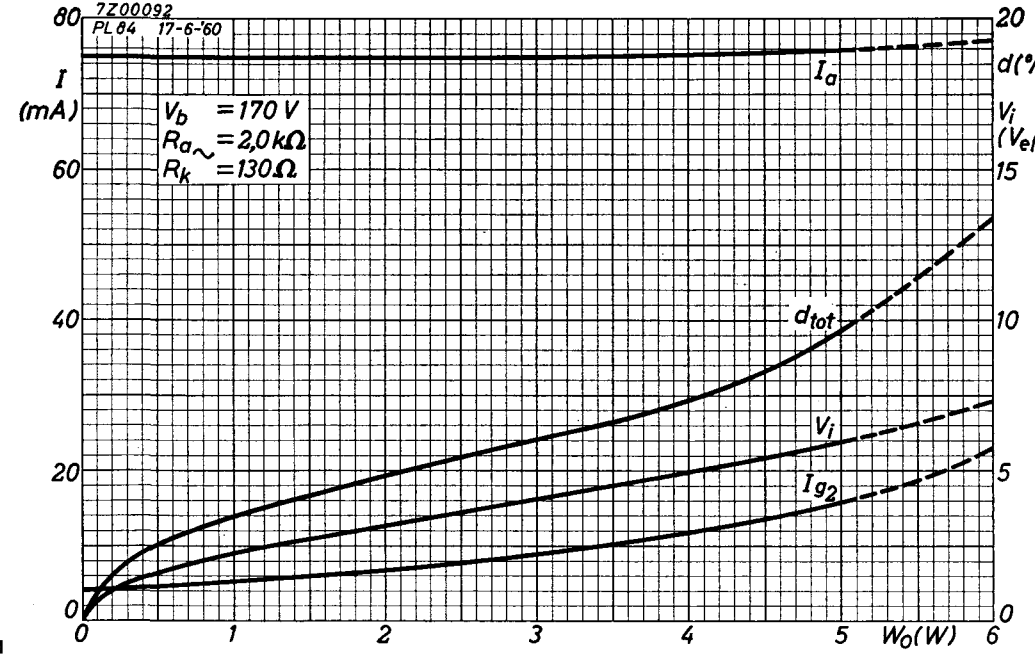
UL 84 PHILIPS

F

UL 84

PHILIPS

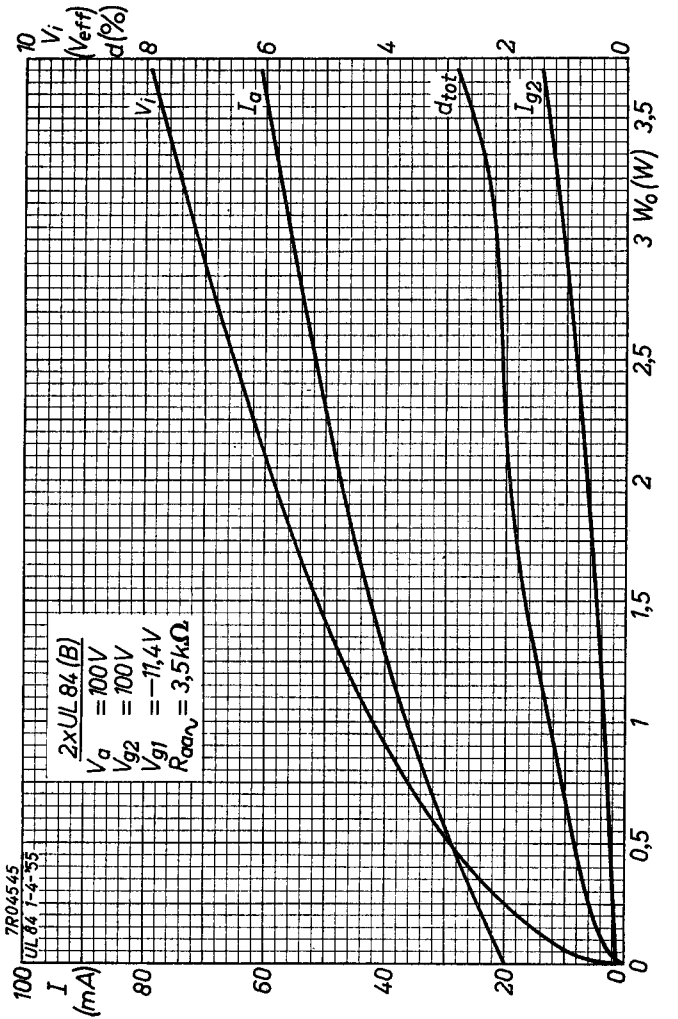
F



UL 84

PHILIPS

E

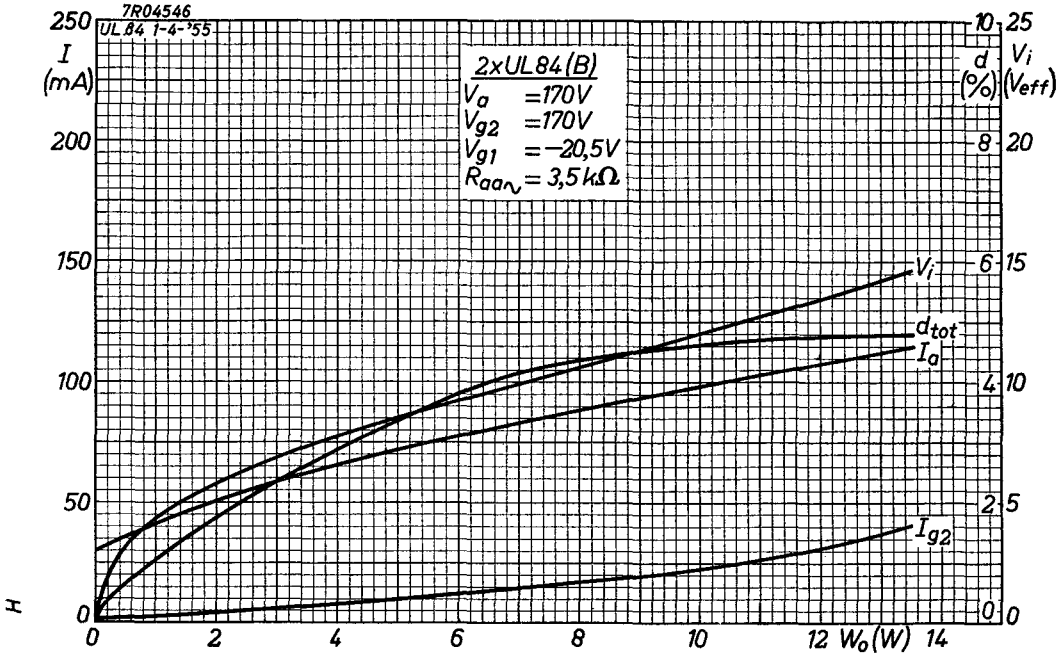

2xUL 84 (B)
Va = 100V
Vg2 = 100V
Vg1 = −11,4V
Raan~ = 3,5kΩ
Vi
Ia
dtot
Ig2
I (mA)
Vi (Veff)
d(%)
Wo(W)
7R04545
UL 84 1-4-55

PHILIPS

UL 84

6.6.1960

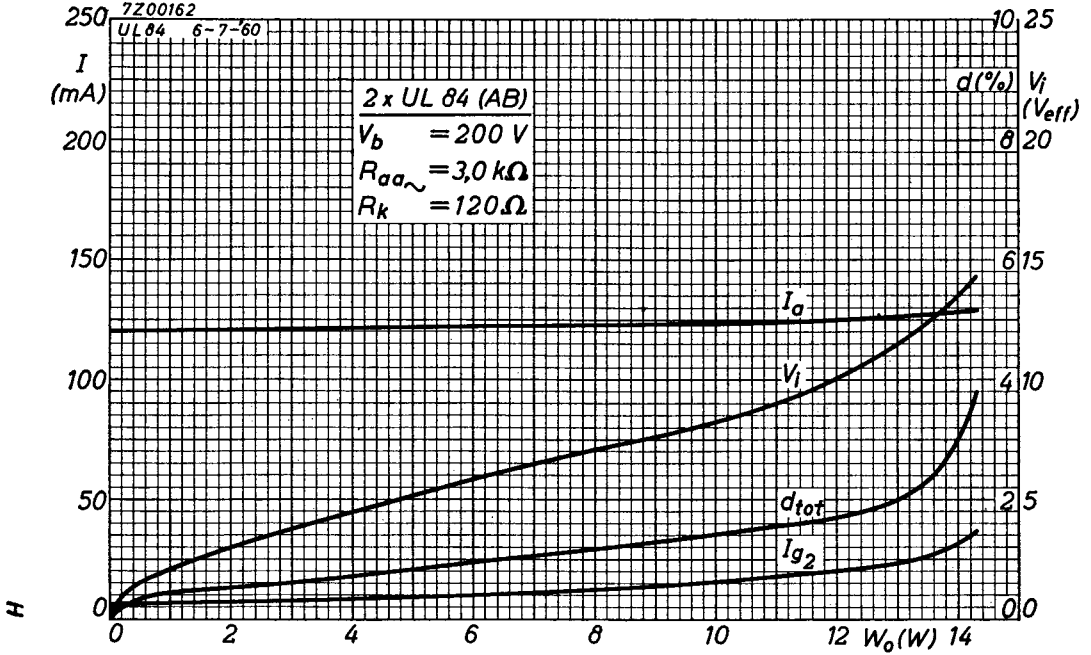
G



H

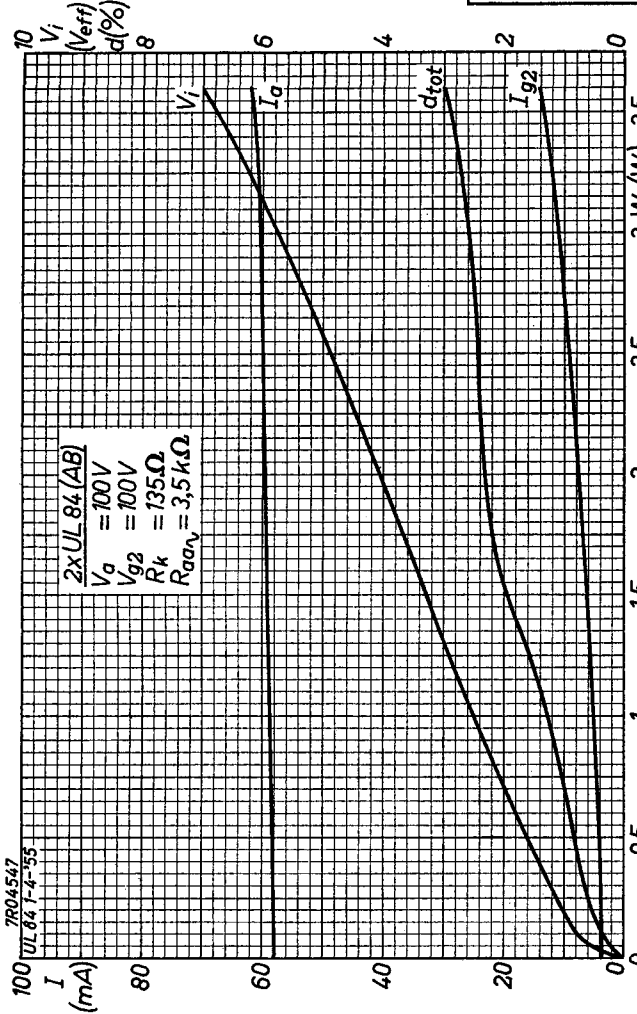
UL 84

PHILIPS



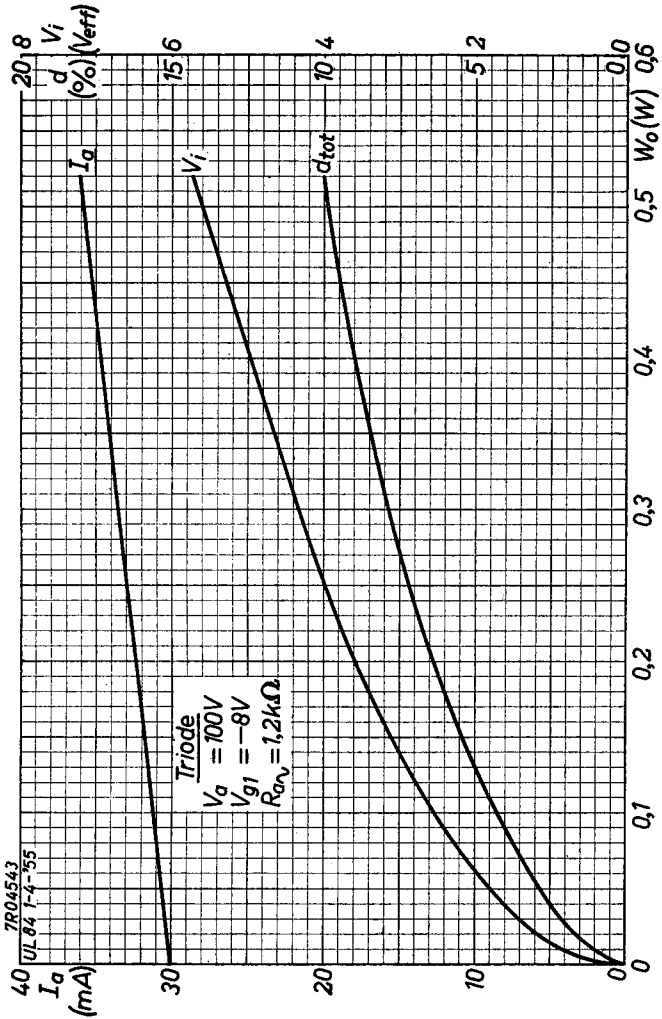
UL84

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2x UL 84 (AB)
V_a = 100V
V_{g2} = 100V
R_k = 135Ω
R_{aan} = 3,5kΩ
V_i
I_a
d_{tot}
I_{g2}
I (mA)
V_i (V_{eff})
d(%)
W_o(W)
7R04547
UL 84 1-4-55

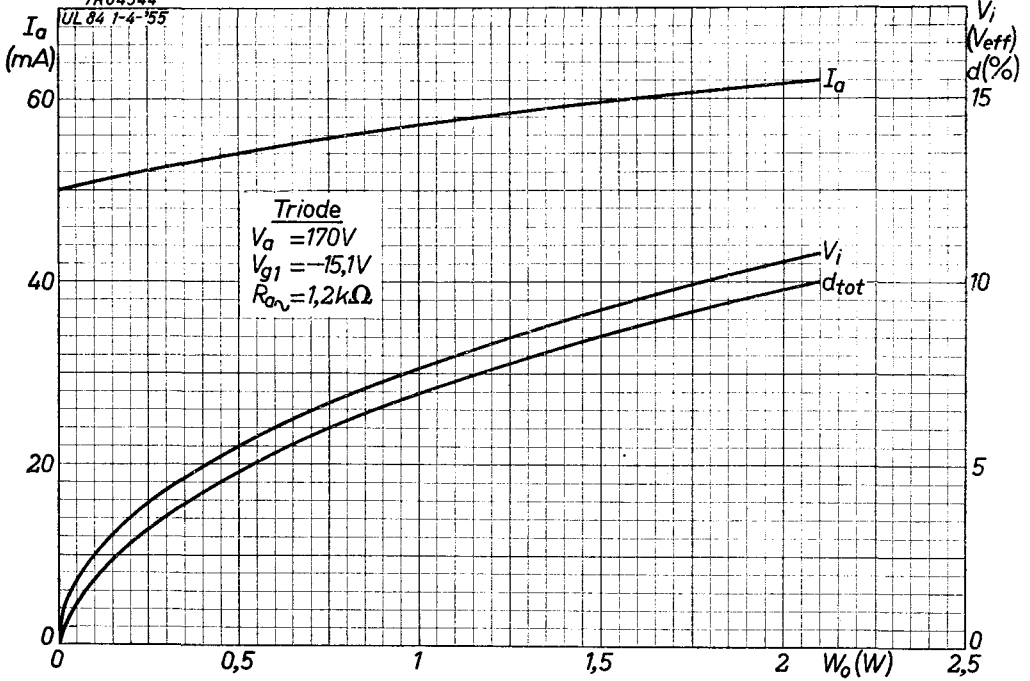
UL 84

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I_a (mA)
40
30
20
10
0
V_i (Veff)
8
6
4
2
0
d (%)
20
15
10
5
0
W_o (W)
0,6
0,5
0,4
0,3
0,2
0,1
0
I_a
V_i
d_{tot}
Triode
V_a = 100V
V_{g1} = −8V
R_{an} = 1,2kΩ
7R04543
UL 84 1-4-55

2x UL 84 (AB)
Va = 170 V
Vg2 = 170 V
Rk = 120 Ω
Raa~ = 3,5 kΩ
Vi
Ia
atot
Ig2
I (mA)
d (%)
Vi (Veff)
Wo (W)
7R04548
UL 84 1-4-55

2×UL 84 (AB)
Va = 170 V
Vg2 = 170 V
Rk = 120 Ω
Raa~ = 3,5 kΩ
Vi
Ia
dtot
Ig2
I (mA)
d (%)
Vi (Veff)
Wo (W)
7R04548
UL 84 7-4-55

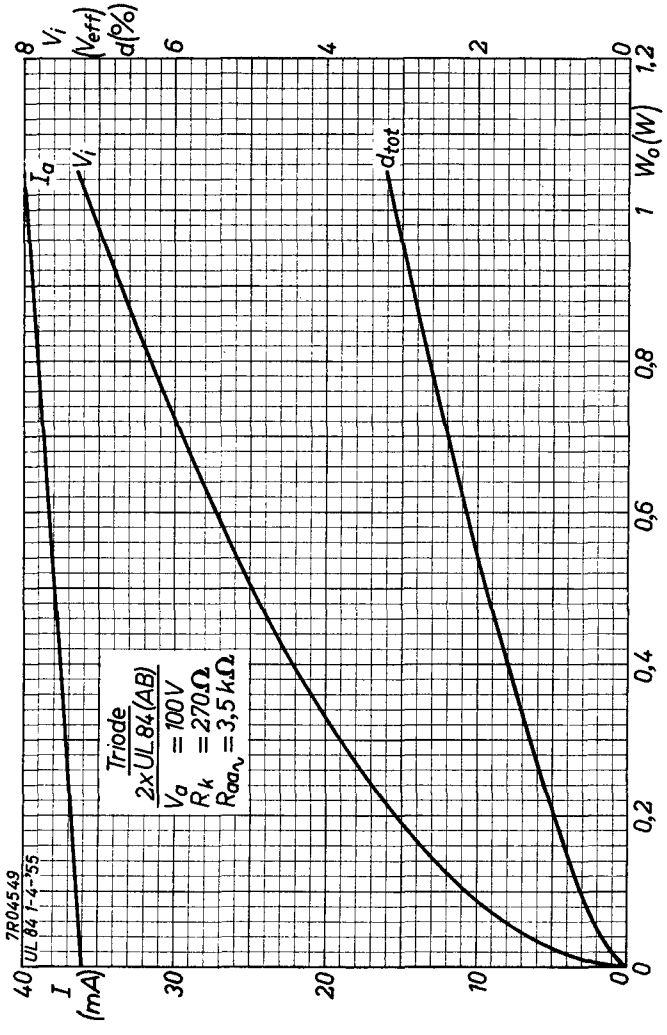


UL 84

PHILIPS

UL 84 **PHILIPS**

PHILIPS **UL 84**

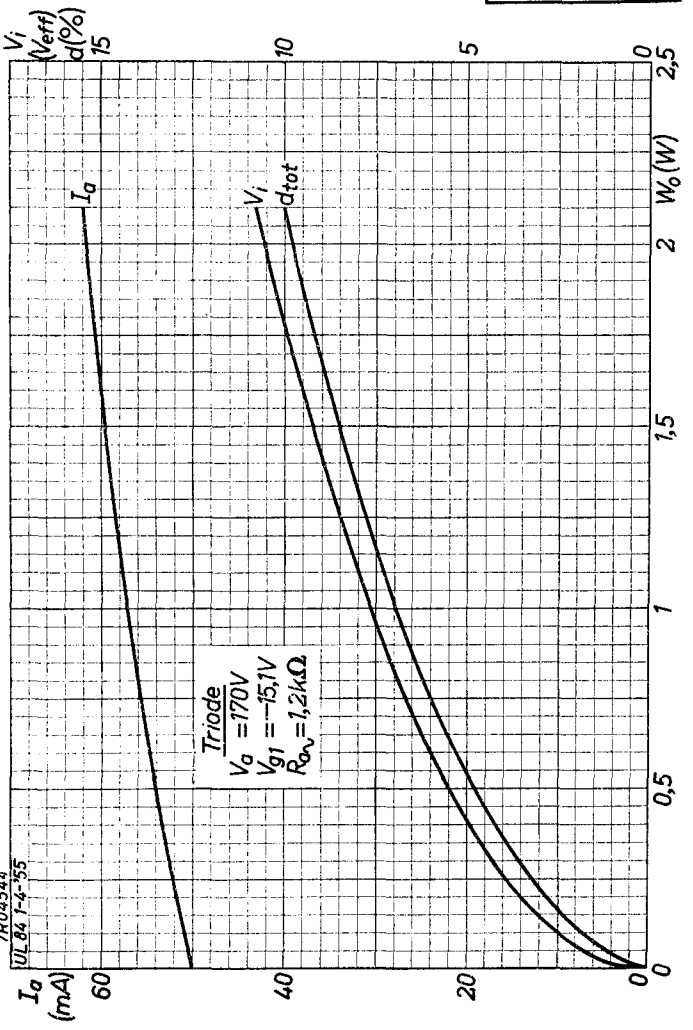


10.10.1955

M

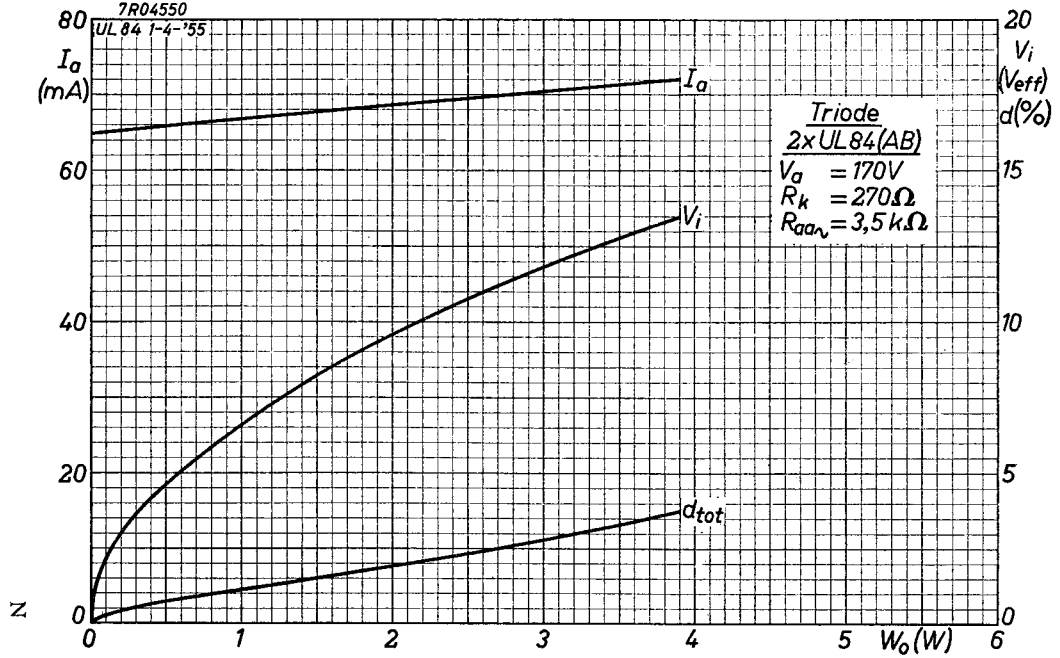
PHILIPS

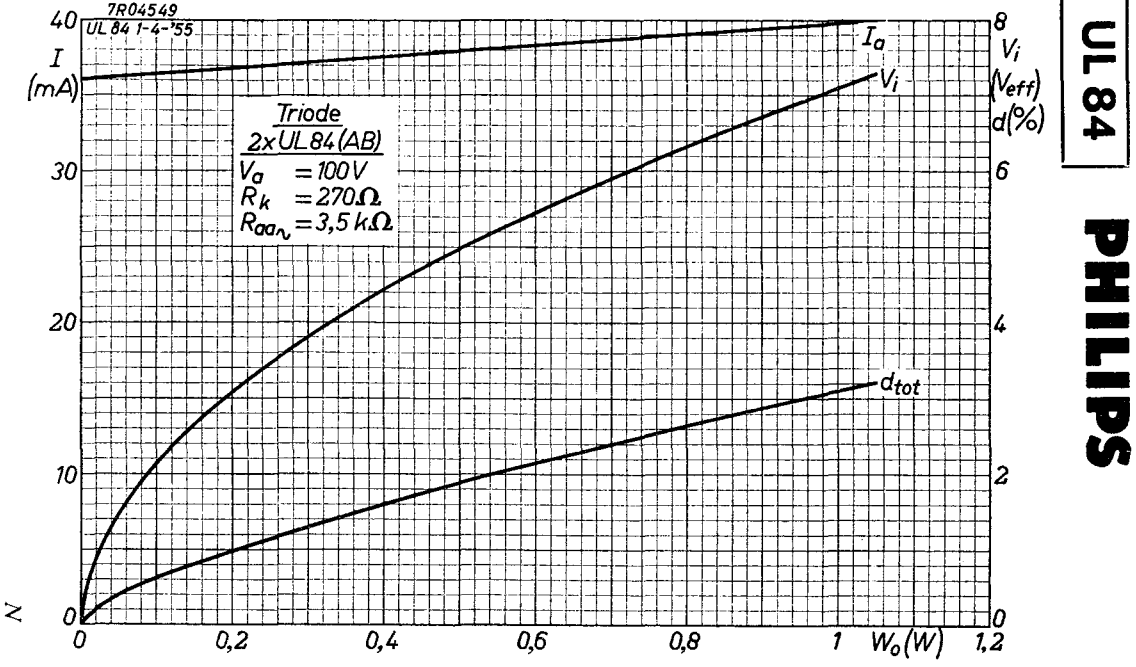
UL 84



4.4.1956

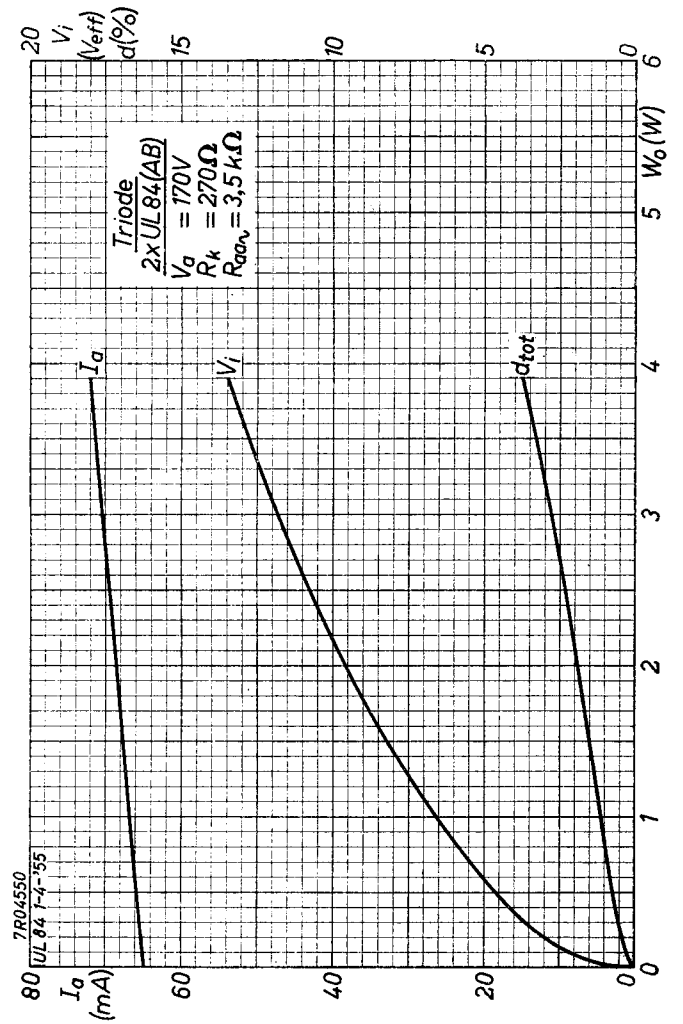
M


7R04550
UL 84 1-4-'55
I_a (mA)
80
60
40
20
0
V_i (V_{eff}) d(%)
20
15
10
5
0
I_a
V_i
d_{tot}
Triode
2x UL 84(AB)
V_a = 170V
R_k = 270Ω
$R_{aa\sim}$ = 3,5 kΩ
0
1
2
3
4
5
6
W_o (W)



UL 84

PHILIPS


Triode
2x UL 84(AB)
Va = 170V
Rk = 270Ω
Raan = 3,5 kΩ
Ia
Vi
dtot
Ia (mA)
Vi (Veff)
d(%)
Wo (W)
0
20
40
60
80
0
5
10
15
20
0
1
2
3
4
5
6
7R04550
UL 84 1-4-'55



UL84

page	sheet	date
1	1	1956.04.04
2	1	1957.08.08
3	1	1960.06.06
4	2	1956.04.04
5	2	1957.08.08
6	2	1960.06.06
7	3	1956.04.04
8	3	1957.08.08
9	3	1960.06.06
10	4	1956.04.04
11	4	1957.08.08
12	A	1955.04.04
13	A	1960.06.06
14	B	1955.04.04
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18	D	1955.04.04
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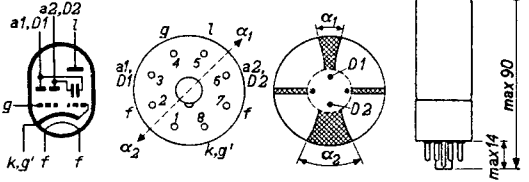
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26	F	1957.09.09
27	F	1960.06.06
28	G	1955.10.10
29	G	1960.06.06
30	H	1955.10.10
31	H	1960.06.06
32	I	1955.10.10
33	J	1955.10.10
34	K	1955.10.10
35	K	1956.04.04
36	K	1957.10.10
37	L	1955.10.10
38	L	1956.04.04
39	M	1955.10.10
40	M	1956.04.04
41	N	1955.10.10
42	N	1956.04.04
43	O	1956.04.04
44, 45	FP	2000.07.09

TUNING INDICATOR with two systems of different sensitivity
INDICATEUR D'ACCORD avec deux systèmes de sensibilité différente
ABSTIMMANZEIGEROHRE mit zwei Systemen von verschiedener Empfindlichkeit

Heating: indirect by A.C. or D.C.; series supply
Chauffage: indirect par C.A. ou C.C.; alimentation en série
Heizung: indirekt durch Wechsel- oder Gleichstrom; Serienspeisung

V_f = 12,6 V
I_f = 100 mA

Dimensions in mm; Dimensions en mm
Abmessungen in mm



Base, culot, Fuss: Octal

Operating characteristics
Caractéristiques d'utilisation
Betriebsdaten

$V_b=V_l$	=	100	200 V
$R_{a1} = R_{a2}$	=	1,0	1,0 MΩ
I_l (V_g = 0 V)	= approx.	0,4	1,4 mA
V_g ($\alpha_1=\alpha_2=90^o$)	=	0	0 V
V_g (α_1 = min.)	=	-2,5	-4,2 V
V_g (α_2 = min.)	=	-8	-12,5 V

Limiting values
Caractéristiques limites
Grenzdaten

V_{a1_o}	= max. 550 V	V_l	= max. 250 V
V_{a1}	= max. 250 V	V_g (I_g=+0,3μA)	= max.-1,3 V
V_{a2_o}	= max. 550 V	R_g	= max. 3 MΩ
V_{a2}	= max. 250 V	R_{kf}	= max. 20 kΩ
V_{l_o}	= max. 550 V	V_{kf}	= max. 150 V

PHILIPS

PROGRAM
EM4-EM34 7-3-30
I_1 (mA)
1,2
1
0,8
0,6
0,4
0,2
0
σ%
100
80
60
40
20
0
V_b (V)
−8
−6
−4
−2
0
V_b = 100V
V_1 = 100V
R_{a1} = 1MΩ
R_{a2} = 1MΩ
I_1
σ_1
σ_2
R_{a1}
R_{a2}
I_{a1}
I_{a2}
I_1
V_b
PROGRAM
EM4-EM34 7-3-30
I_1 (mA)
3
2,5
2
1,5
1
0,5
0
σ%
100
80
60
40
20
0
V_b (V)
−20
−15
−10
−5
0
V_b = 200V
V_1 = 200V
R_{a1} = 1MΩ
R_{a2} = 1MΩ
I_1
σ_1
σ_2
R_{a1}
R_{a2}
I_{a1}
I_{a2}
I_1
V_b

PHILIPS

Electronic Tube

HANDBOOK

UM34

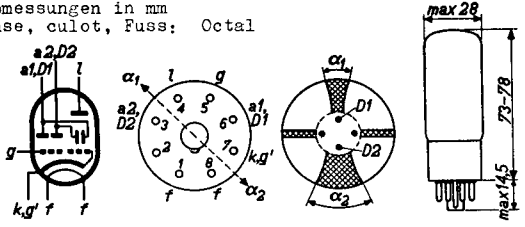
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1	1	1950.11.11
2	A	1950.11.11
3	FP	2000.07.09

TUNING INDICATOR with two systems of different sensitivity
INDICATEUR D'ACCORD avec deux systèmes de sensibilité différente
ABSTIMMANZEIGERÖHRE mit zwei Systemen von verschiedener Empfindlichkeit

Heating: indirect by A.C. or D.C.; series supply
Chauffage: indirect par C.A. ou C.C.; alimentation en série
Heizung: indirekt durch Wechsel- oder Gleichstrom; Serienspeisung

V_f = 12,6 V
I_f = 0,100 A

Dimensions in mm; Dimensions en mm; Abmessungen in mm
Base, culot, Fuss: Octal

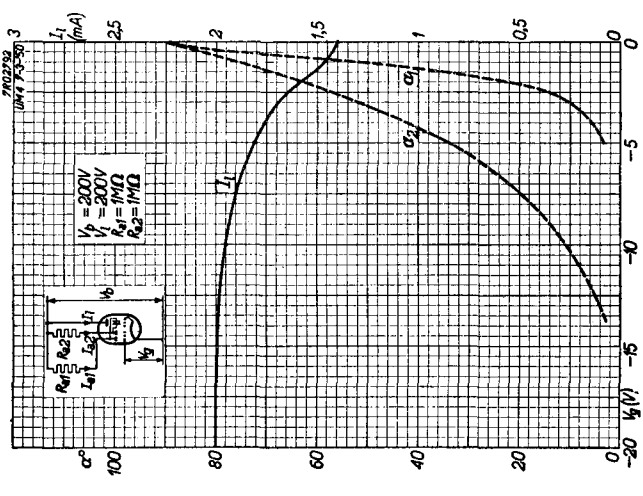


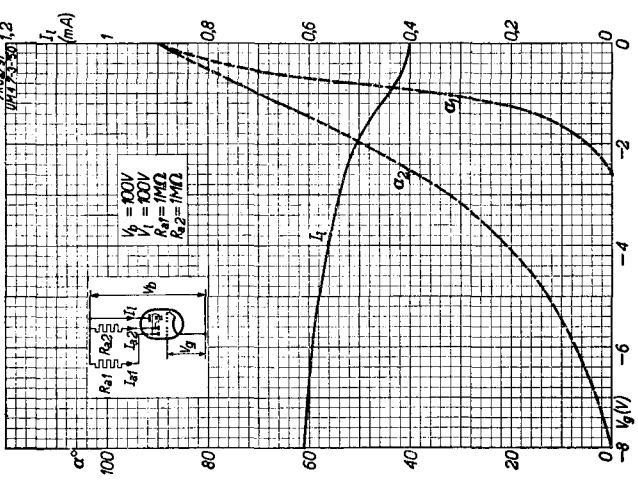
Operating characteristics
Caractéristiques d'utilisation
Betriebsdaten

$V_b = V_\ell$ =	100	200	V
$R_{a1} = R_{a2}$ =	1	1	MΩ
I_ℓ (V_g = 0 V) =	approx. 0,4	1,4	mA
V_g ($\alpha_1 = \alpha_2 = 90^o$) =	0	0	V
V_g (α_1 = min.) =	-2,5	-4,2	V
V_g (α_2 = min.) =	-8	-12,5	V

Limiting values
Caractéristiques limites
Grenzdaten

V_{a1_o} = max.	550 V	V_ℓ	= max. 250 V
V_{a1} = max.	250 V	V_g (I_g=+0,3µA)	= max. -1,3 V
V_{a2_o} = max.	550 V	R_g	= max. 3 MΩ
V_{a2} = max.	250 V	R_{kf}	= max. 20 kΩ
V_{ℓ_o} = max.	550 V	V_{kf}	= max. 150 V


7102792
UM4 7-3-50 3
I_1 (mA)
2,5
2
1,5
1
0,5
0
$\alpha°$
100
80
60
40
20
0
I_1
σ_1
σ_2
V_b = 200V
V_1 = 200V
R_{a1} = 1MΩ
R_{a2} = 1MΩ
R_{a1} R_{a2} I_{a1} I_{a2} V_1 V_b V_g
0 −5 −10 −15 −20 V_g(V)


7102791
UM4 7-3-50 1,2
I_1 (mA)
1
0,8
0,6
0,4
0,2
0
$\alpha°$
100
80
60
40
20
0
I_1
σ_1
σ_2
V_b = 100V
V_1 = 100V
R_{a1} = 1MΩ
R_{a2} = 1MΩ
R_{a1} R_{a2} I_{a1} I_{a2} V_1 V_b V_g
0 −2 −4 −6 −8 V_g(V)

A



UM4

page	sheet	date
1	1	1950.03.03
2	A	1950.03.03
3	FP	2000.07.09

PHILIPS

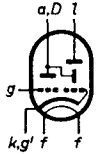
UM80

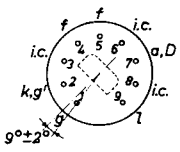
TUNING INDICATOR for A.M. receivers
INDICATEUR D'ACCORD pour des récepteurs A.M.
ABSTIMMANZEIGERÖHRE für AM-Empfänger

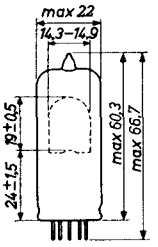
Heating : indirect by A.C. or D.C. series supply
Chauffage: indirect par C.A. ou C.C. alimentation série
Heizung : indirekt durch Wechsel- oder Gleichstrom; Serienspeisung

V_f = 19 V
I_f = 100 mA

Dimensions in mm
Dimensions en mm
Abmessungen in mm







Operating characteristics
Caractéristiques d'utilisation
Betriebsdaten

V_b	=	200		170		100		V
V_l	=	200		170		100		V
R_a	=	0,5		0,5		0,5		MΩ
R_g	=	3		3		3		MΩ
V_g	=	-1	-14	-1	-12	-1	-7	V
β	=	4	50	5	50	8	50	°
I_l	=	5,7	7,0	4,5	5,7	2,1	2,5	mA
I_a	=	0,35	0,01	0,3	0,01	0,18	0,01	mA

PHILIPS

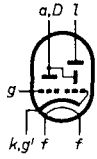
UM80

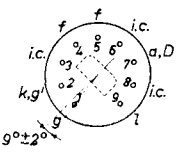
TUNING INDICATOR for A.M. receivers
INDICATEUR D'ACCORD pour des récepteurs A.M.
ABSTIMMANZEIGERÖHRE für AM-Empfänger

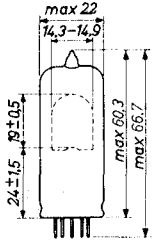
Heating : indirect by A.C. or D.C. series supply
Chauffage: indirect par C.A. ou C.C. alimentation série
Heizung : indirekt durch Wechsel- oder Gleichstrom; Serienspeisung

V_f = 19 V
I_f = 100 mA

Dimensions in mm
Dimensions en mm
Abmessungen in mm







Operating characteristics
Caractéristiques d'utilisation
Betriebsdaten

V_b	=	200		170		100		V
V_l	=	200		170		100		V
R_a	=	0,5		0,5		0,5		MΩ
R_g	=	3		3		3		MΩ
V_g	=	-1	-14	-1	-12	-1	-7	V
β	=	4	50	5	50	8	50	°
I_l	=	5,7	7,0	4,5	5,7	2,1	2,5	mA
I_a	=	0,35	0,01	0,3	0,01	0,18	0,01	mA

Limiting values
Caractéristiques limites
Grenzdaten

V_{a_o}	= max.	550	V
V_a	= max.	250	V
W_a	= max.	0,2	W
V_{kf}	= max.	150	V
V_{ℓ_o}	= max.	550	V
V_ℓ	= max.	250	V
V_ℓ	= min.	90	V
I_k	= max.	10	mA
$-V_g(I_g=+0,3\mu A)$	= max.	1,3	V
R_g	= max.	3	MΩ
R_{kf}	= max.	20	kΩ

Remark : The tube is to be mounted in such a tube-holder that the frontside of the tube can be placed against the station name dial.

Observation: Le tube sera placé dans tel support que la face du tube peut être montée contre le cadran d'accord

Bemerkung : Die Röhre soll mit einer derartigen Fassung gebraucht werden dass die Vorderseite der Röhre gegen die Abstimmskala montiert werden kann

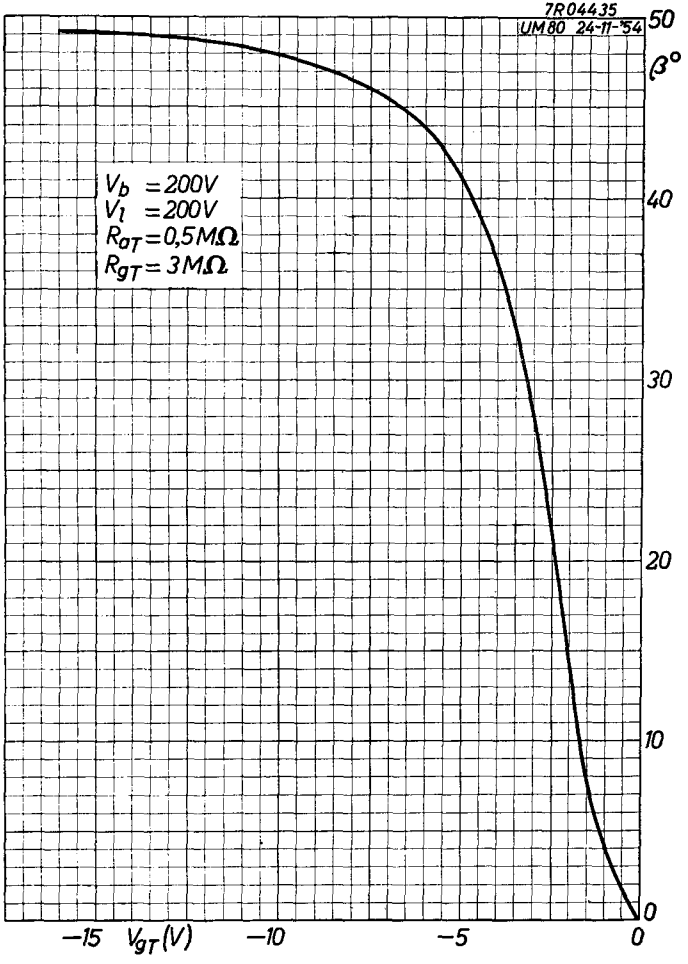
Limiting values
Caractéristiques limites
Grenzdaten

V_{a_o}	= max.	550 V
V_a	= max.	250 V
W_a	= max.	0,2 W
V_{kf}	= max.	150 V
V_{f_o}	= max.	550 V
V_f	= max.	250 V
V_f	= min.	90 V
I_k	= max.	10 mA
$-V_g(I_g=+0,3\mu A)$	= max.	1,3 V
R_g	= max.	3 MΩ
R_{kf}	= max.	20 kΩ

Remark : The tube is to be mounted in such a tube-holder that the frontside of the tube can be placed against the station name dial.

Observation: Le tube sera placé dans tel support que la face du tube peut être montée contre le cadran d'accord

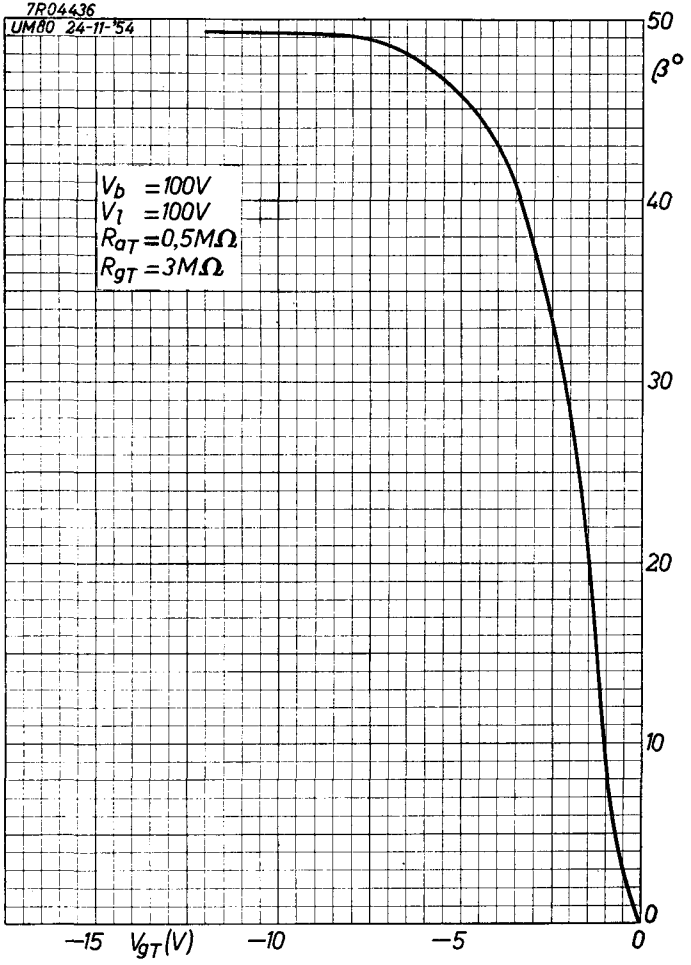
Bemerkung : Die Röhre soll mit einer derartigen Fassung gebraucht werden dass die Vorderseite der Röhre gegen die Abstimmskala montiert werden kann


7R04435
UM80 24-11-'54
50
β°
40
30
20
10
0
V_b = 200V
V_l = 200V
R_{aT} = 0,5MΩ
R_{gT} = 3MΩ
−15
V_{gT}(V)
−10
−5
0

12.12.1954

A

UM 80 PHILIPS



B

PHILIPS

Electronic Tube

HANDBOOK

UM80

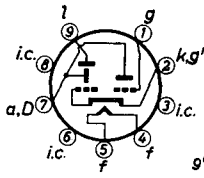
page	sheet	date
1	1	1954.11.11
2	1	1956.04.04
3	2	1954.11.11
4	2	1956.04.04
5	A	1954.12.12
6	B	1954.12.12
7	FP	2000.07.09

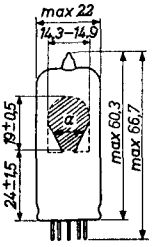
TUNING INDICATOR
INDICATEUR DE SYNTONISATION
ABSTIMMANZEIGERÖHRE

Heating : indirect by A.C. or D.C. series supply
Chauffage: indirect par C.A. ou C.C. alimentation série
Heizung : indirekt durch Wechsel- oder Gleichstrom; Serienspeisung

I_f = 100 mA
V_f = 19 V

Dimensions in mm
Dimensions en mm
Abmessungen in mm





Base, culot, Sockel: NOVAL

Operating characteristics
Caractéristiques d'utilisation
Betriebsdaten

V_b	=	200		170		100	V
V_l	=	200		170		100	V
R_a	=	0,5		0,5		0,5	MΩ
R_g	=	3		3		3	MΩ
V_g	=	0	-14	0	-12	0	-7 V
α	=	90	0	90	0	85	0 °
I_a	=	0,4	0,04	0,3	0,04	0,2	0,02 mA
I_l	=	5,7	7	4,5	5,6	2	2,5 mA

Limiting values
Caractéristiques limites
Grenzdaten

V_{a_o}	= max.	550	V
V_a	= max.	250	V
W_a	= max.	0,2	W
V_{l_o}	= max.	550	V
V_l	= max.	200	V
V_l	= min.	100	V
I_k	= max.	10	mA
V_{kf}	= max.	150	V
$-V_g$ (I_g = +0,3 µA)	= max.	1,3	V
R_g	= max.	3	MΩ

Remark

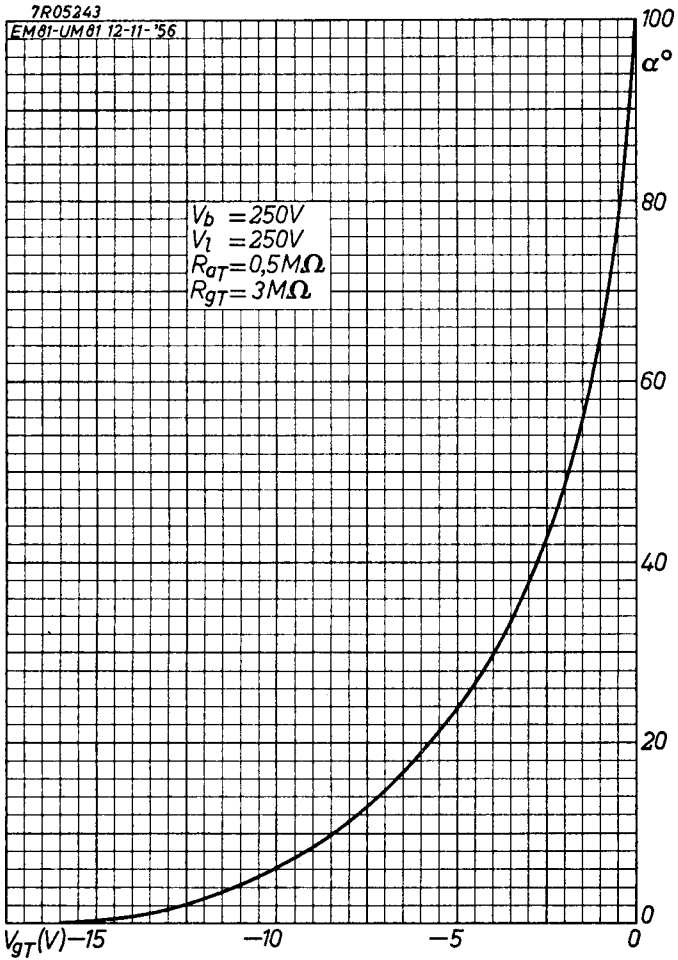
The tube is to be mounted in such a tube holder that the frontside of the tube can be placed against the station name dial

Observation

Le tube sera placé dans un support tel que la face du tube peut être montée contre le cadran d'aacord

Bemerkung

Die Röhre soll mit einer derartigen Fassung gebraucht werden dass die Vorderseite der Röhre gegen die Abstimmskala montiert werden kann


7R05243
EM81-UM81 12-11-'56
V_b = 250V
V_l = 250V
R_{aT} = 0,5MΩ
R_{gT} = 3MΩ
100
α°
80
60
40
20
0
V_{gT}(V) −15
−10
−5
0

11.11.1956

A

PHILIPS

Electronic Tube

HANDBOOK

UM81

page	sheet	date
1	1	1956.08.08
2	2	1956.08.08
3	A	1956.11.11
4	FP	2000.07.09

PHILIPS

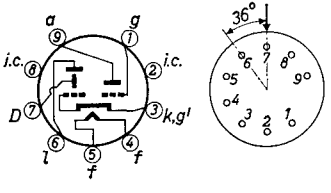
UM 84

INDICATOR TUBE with amplifying triode for use as tuning indicator or for modulation control
TUBE INDICATEUR avec triode amplificatrice pour utilisation comme indicateur de syntonisation ou pour contrôler la modulation
ANZEIGERÖHRE mit Verstärkertriode zur Verwendung als Abstimmanzeigeröhre oder für Aussteuerungskontrolle

Heating : indirect by A.C. or D.C. series supply
Chauffage: indirect par C.A. ou C.C. alimentation série
Heizung : indirekt durch Wechsel- oder Gleichstrom; Serienspeisung

I_f = 100 mA
V_f = 12 V

Dimensions in mm
Dimensions en mm
Abmessungen in mm



Base, culot, Sockel: NOVAL

Operating characteristics (D connected with a)
Caractéristiques d'utilisation (D relié à l'anode)
Betriebsdaten (D mit a Verbunden)

V_b	=	170	V
V_l	=	170	V
$R_{a,D}$	=	470	kΩ
R_g	=	3	MΩ
V_{bg}	=	0 / -15	V
I_{a+D}	=	0,3 / 0,04	mA
I_l	=	0,6 / 1,05	mA
a	=	20±5 [1] / 0	mm

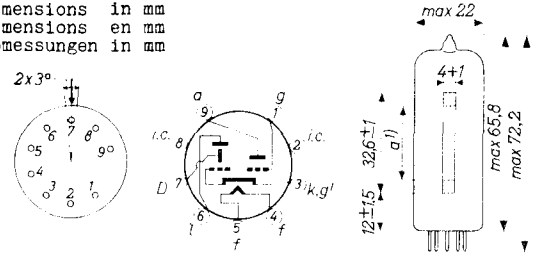
[1]) Shadow length
Longueur d'ombre
Schattenlänge

INDICATOR TUBE with amplifying triode for use as tuning indicator or for modulation control
TUBE INDICATEUR avec triode amplificatrice pour utilisation comme indicateur de syntonisation ou pour contrôler la modulation
ANZEIGERÖHRE mit Verstärkertriode zur Verwendung als Abstimmanzeigeröhre oder für Aussteuerungskontrolle

Heating : indirect by A.C. or D.C. series supply
Chauffage: indirect par C.A. ou C.C. alimentation série
Heizung : indirekt durch Wechsel- oder Gleichstrom Serienspeisung

If = 100 mA
Vf = 12 V

Dimensions in mm
Dimensions en mm
Abmessungen in mm



Base, culot, Sockel: NOVAL

The arrow near pin 7 indicates the viewing direction
La flèche près de la broche 7 indique le sens d'observation
Der Pfeil bei Stift 7 bezeichnet die Blickrichtung

Operating characteristics (D connected to a)
Caractéristiques d'utilisation (D relié à l'anode)
Betriebsdaten (D mit a Verbunden)

V_b	=	170	V
V_g	=	170	V
$R_{a,D}$	=	470	kΩ
R_g	=	3	MΩ
V_{bg}	=	0 -15	V
I_{a+D}	=	0,3 0,04	mA
I_g	=	0,6 1,05	mA
a	=	20±5[1]) 0	mm

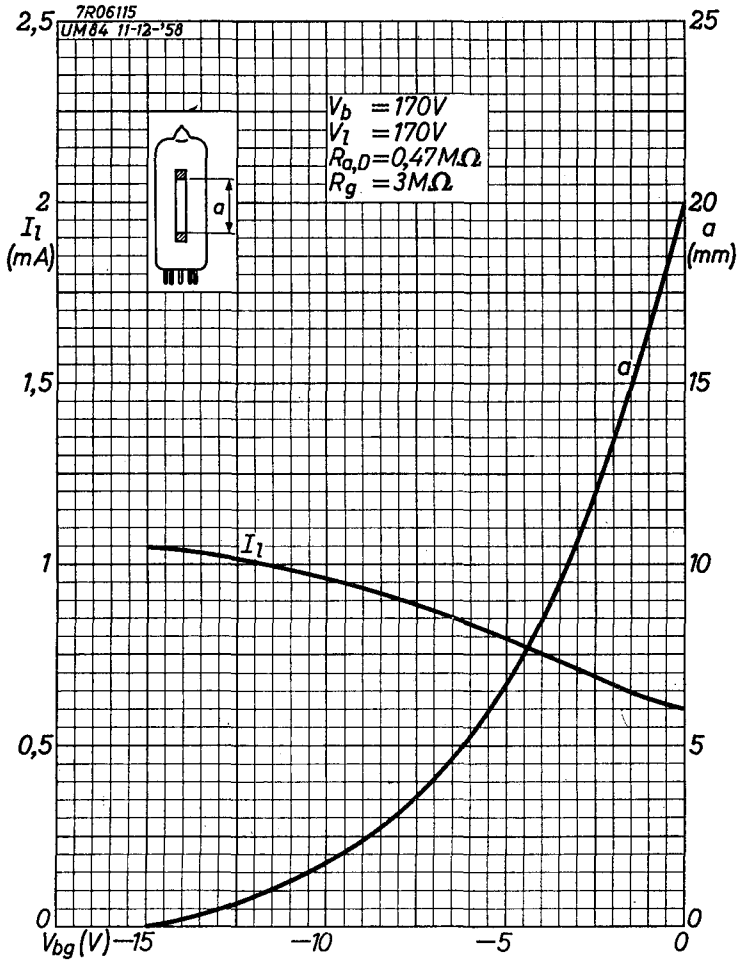
[1]) Shadow length; longueur d'ombre; Schattenlänge

Limiting values
Caractéristiques limites
Grenzdaten

V_{a_o}	=	max. 550 V
V_a	=	max. 250 V
W_a	=	max. 0,5 W
V_{D_o}	=	max. 550 V
V_D	=	max. 250 V
V_{ℓ_o}	=	max. 550 V
V_ℓ	=	max. 250 V min. 170 V
I_k	=	max. 3,0 mA
R_g	=	max. 3 MΩ
V_{kf} (k pos.; f neg.)	=	max. 250 V
V_{kf} (k neg.; f pos.)	=	max. 50 $V_{\overline{\overline{\ }}}$ + max. 200 $V_\sim$
R_{kf}	=	max. 20 kΩ
t_{bulb}	=	max. 120 °C
$-V_g$ (I_g = + 0,3 μA)	=	max. 1,3 V

Limiting values
Caractéristiques limites
Grenzdaten

V_{a_o}	=	max. 550 V
V_a	=	max. 250 V
W_a	=	max. 0,5 W
V_{D_o}	=	max. 550 V
V_D	=	max. 250 V
V_{ℓ_o}	=	max. 550 V
V_ℓ	=	max. 250 V min. 170 V
I_k	=	max. 3,0 mA
R_g	=	max. 3 MΩ
V_{kf} (k pos.; f neg.)	=	max. 250 V
V_{kf} (k neg.; f pos.)	=	max. 50 $V_{\overline{\sim}}$ + max. 200 $V_\sim$
R_{kf}	=	max. 20 kΩ
t_{bulb}	=	max. 120 °C
$-V_g$ (I_g = + 0,3 μA)	=	max. 1,3 V


7R06115
UM84 11-12-'58
V_b = 170V
V_l = 170V
$R_{a,0}$ = 0,47MΩ
R_g = 3MΩ
a
I_l
I_l (mA)
a (mm)
2,5
2
1,5
1
0,5
0
25
20
15
10
5
0
V_{bg} (V) −15
−10
−5
0

12.12.1958

A

PHILIPS

Electronic Tube

HANDBOOK

UM84

page	sheet	date
1	1	1959.02.02
2	1	1962.05.05
3	2	1959.02.02
4	2	1962.05.05
5	A	1958.12.12
6	FP	2000.01.15

UY 1 (N) Eenfasige gelijkrichtbuis

De UY 1 (N) is een indirect verhitte eenfasige gelijkrichtbuis voor gelijkstroom-wisselstroomtoestellen met in serie geschakelde gloeidraden en een gloeistroomketen van 100 mA. De inwendige weerstand van deze buis is zeer laag, zoodat het spanningverlies in de buis slechts gering is; dit is van groot voordeel bij aansluiting op netten van 110 V. De UY 1 (N) is een nieuwe uitvoering van de UY 1 en verschilt van de UY 21 uitsluitend door de huls.

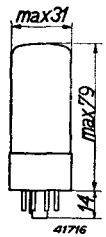


Fig. 1
Afmetingen in mm.

GLOEIDRAADGEGEVENS

Gloeidraadvoeding: indirect, met gelijk- of wisselstroom; serievoeding

Gloeispanning	V_f	= 50	V
Gloeistroom	I_f	= 0,100	A

GRENSWAARDEN

Anodewisselspanning	V_{treff}	= max. 250	V
Geleverde gelijkstroom	I_o	= max. 140	mA
Spanning tusschen gloeidraad en kathode (piekwaarde)	V_{fk}	= max. 500	V
Capaciteit over den ingang van het afvlakfilter	C	= max. 60	μF[1])



[1]) In den anodekring van deze buis moet ter bescherming een weerstand worden opgenomen, waarvan de minimum waarde in de onderstaande tabel is aangegeven:

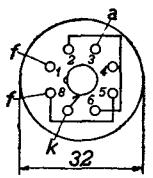


Fig. 2
Rangschikking van de electroden en aansluitingen van de huls.

Netspanning	Capaciteit van den afvlakcondensator	Weerstand ter bescherming van de buis
max. 250 V	60 μF	min. 175 Ω
max. 250 V	32 μF	min. 125 Ω
max. 250 V	16 μF	min. 75 Ω
max. 250 V	8 μF	min. 0 Ω
max. 170 V	60 μF	min. 100 Ω
max. 170 V	32 μF	min. 75 Ω
max. 170 V	16 μF	min. 30 Ω
max. 127 V	60 μF	0 Ω

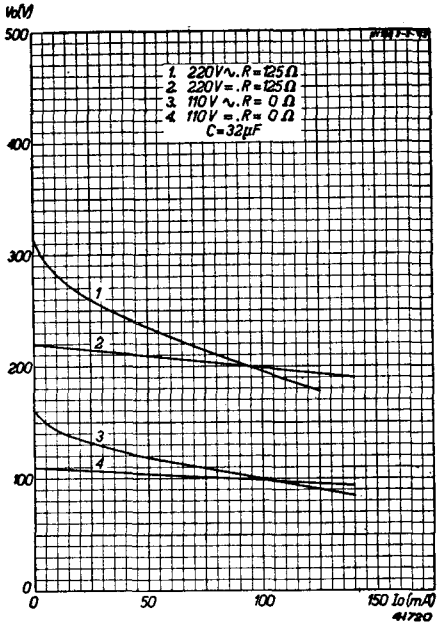


Fig. 3
Belastingkrommen van de gelijkrichtbuis UY 1 (N).

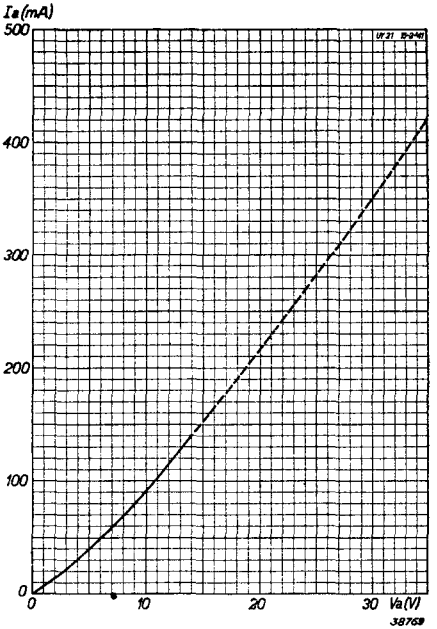


Fig. 4
Stroom als functie van de aangelegde gelijkspanning.

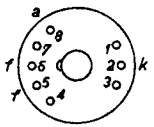
High-vacuum HALF-WAVE RECTIFIER
TUBE REDRESSEUR MONOPLAQUE à vide poussé
Hochvakuum EINWEGGLEICHRICHTERROHRE

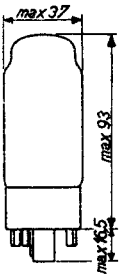
Heating: indirect by A.C. or D.C.; series supply
Chauffage: indirect par C.A. ou C.C.; alimentation en série
Heizung: indirekt durch Wechsel- oder Gleichstrom; Serienspeisung

Vf = 50 V
If = 0,100 A

Dimensions in mm
Dimensions en mm
Abmessungen in mm







Operating characteristics and limiting values
Caractéristiques d'utilisation et caractéristiques limites
Betriebs- und Grenzdaten

Vi = max. 250 V_{eff}
Io = max. 140 mA
Vfk = max. 550 V [1]
C = max. 60 µF [2]

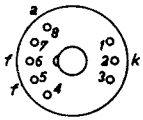
1) Peak value; valeur de crête; Scheitelwert
2) See page 2; voyez 2nd feuille; siehe Seite 2

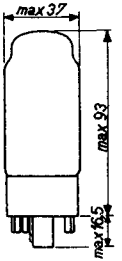
High-vacuum HALF-WAVE RECTIFYING VALVE
TUBE REDRESSEUR MONOPLAQUE à vide poussé
Hochvakuum EINWEGGLEICHRICHTERROHRE

Heating:	indirect by A.C. or D.C.; series supply	
Chauffage:	indirect par C.A. ou C.C.; alimentation en série	Vf = 50 V If = 0,100 A
Heizung:	indirekt durch Wechsel- oder Gleichstrom; Serienspeisung	

Dimensions in mm
Dimensions en mm
Abmessungen in mm







Base, culot, Sockel: Y

Operating characteristics and limiting values
Caractéristiques d'utilisation et caractéristiques limites
Betriebs- und Grenzdaten

Vi	= max.	250 V_{eff}
Io	= max.	140 mA
Vfk	= max.	550 V [1]
C	= max.	60 µF [2]

1) Peak value; valeur de crête; Scheitelwert
2) See page 2; voir page 2; siehe Seite 2

2) With this tube a protective resistance must be inserted in the anode circuit, the value of which is indicated in the table below.
Avec ce tube on insérera dans le circuit d'anode une résistance de protection dont la valeur est indiquée dans le tableau ci-dessous.
Bei dieser Röhre muss in den Anodenkreis ein Schutzwiderstand geschaltet werden, dessen Minimalwert in der untenstehenden Tabelle angegeben ist.

Vi (V)	C filt (µF)	Rt (Ω)
250	60	min. 175
250	32	min. 125
250	16	min. 75
250	8	0
170	60	min. 100
170	32	min. 75
170	16	min. 30
170	8	0
127	60	0

2) With this tube a protective resistance must be inserted in the anode circuit, the value of which is indicated in the table below.
Avec ce tube on insérera dans le circuit d'anode une résistance de protection dont la valeur est indiquée dans le tableau ci-dessous.
Bei dieser Röhre muss in den Anodenkreis ein Schutzwiderstand geschaltet werden, dessen Minimalwert in der untenstehenden Tabelle angegeben ist.

Vi (V)	C filt (µF)	Rt (Ω)
250	60	min. 175
250	32	min. 125
250	16	min. 75
250	8	0
170	60	min. 100
170	32	min. 75
170	16	min. 30
170	8	0
127	60	0



UY11

page	sheet	date
1	1	1948.09.20
2	1	1954.03.03
3	2	1948.09.20
4	2	1954.03.03
5	FP	2000.07.09

PHILIPS

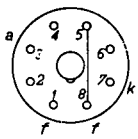
UY 1 N

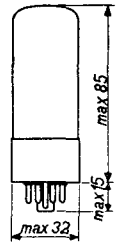
High vacuum HALF WAVE RECTIFIER
REDRESSEUR MONOPLAQUE à vide poussé
Hochvakuum EINWEGGLEICHRICHTERRÖHRE

Heating:	indirect by A.C. or D.C.; series supply	
Chauffage:	indirect par C.A. ou C.C.; alimentation en série	Vf= 50 V If=0,100 A
Heizung:	indirekt durch Wechsel- oder Gleichstrom; Serienspeisung	

Dimensions in mm
Dimensions en mm
Abmessungen in mm







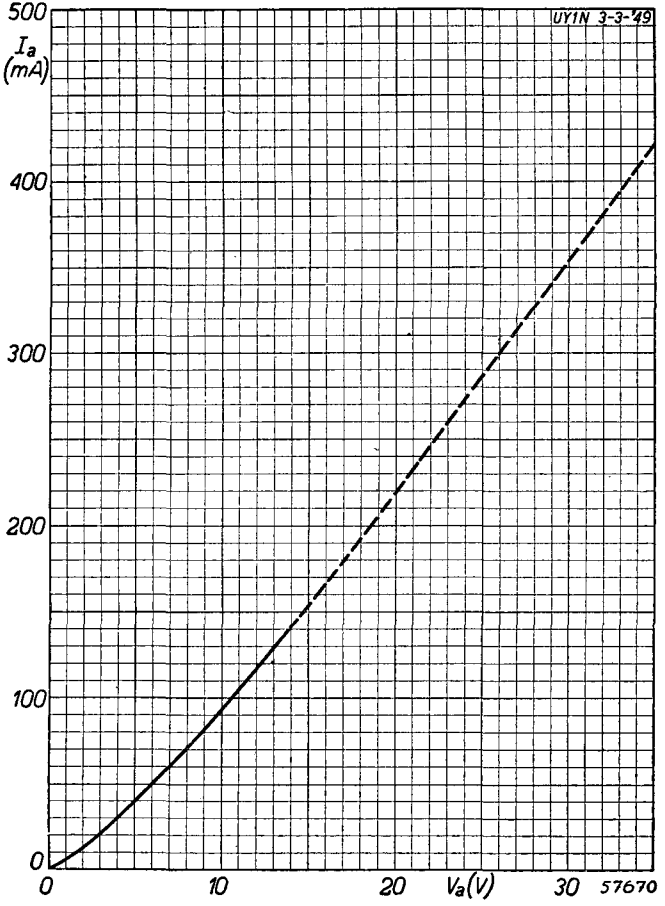
Limiting values
Caractéristiques limites
Grenzdaten

Vi	= max.	250 V_{eff}
Io	= max.	140 mA
Vfk	= max.	500 V [1]
C	= max.	60 µF [2]

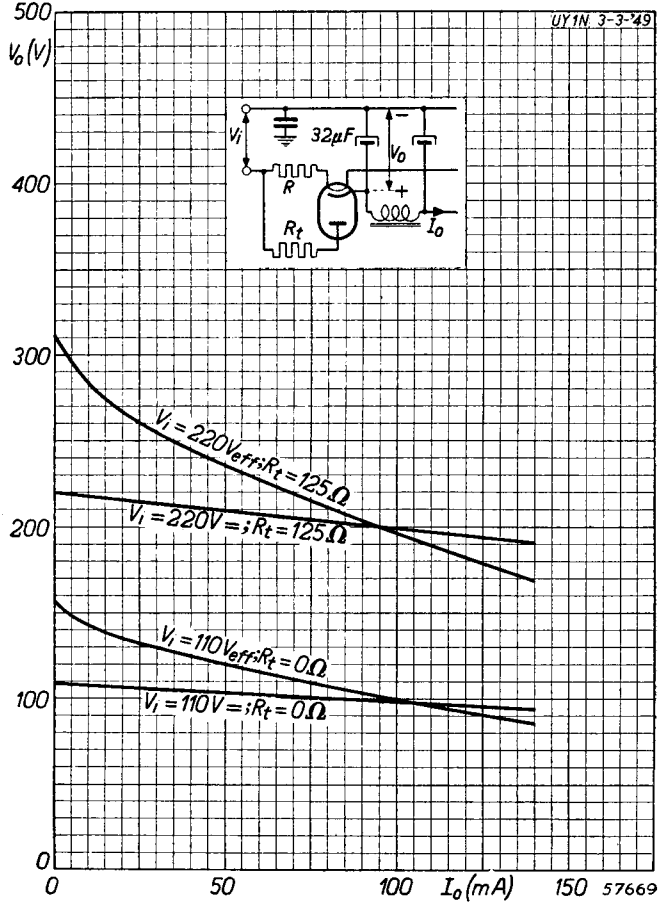
[1] Peak value; valeur de crête, Scheitelwert
[2] See page 2; voir pag. 2; siehe Seite 2

A series protective resistance must be inserted in the anode circuit. The required values are indicated in the table below
On insérera dans le circuit d'anode une résistance de protection dont la valeur est indiquée dans le tableau
Es muss in den Anodenkreis ein Schutzwiderstand geschaltet werden, dessen kleinster Wert in der Tabelle angegeben ist

Vi	C	Rt
max. 250 V	60 µF	min. 175 Ω
	32 µF	min. 125 Ω
	16 µF	min. 75 Ω
	8 µF	0 Ω
max. 170 V	60 µF	min. 100 Ω
	32 µF	min. 75 Ω
	16 µF	min. 30 Ω
	8 µF	0 Ω
max. 127 V	60 µF	0 Ω


UY1N 3-3-'49
500
I_a (mA)
400
300
200
100
0
0
10
20
V_a(V)
30
57670

UY1N **PHILIPS**



PHILIPS

Electronic Tube

HANDBOOK

UY1N

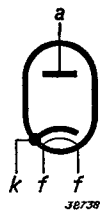
page	sheet	date
1	1	1948.08.23
2	2	1948.08.23
3	A	1949.03.25
4	B	1949.03.25
5	FP	2000.07.09

UY 21 Enkelfasige gelijkrichtbuis



Fig. 1
Afmetingen in mm.

De UY 21 is een indirect verhitte hoogvacuum gelijkrichtbuis voor gelijkstroom-wisselstroomtoestellen met een gloeistroomketen van 100 mA. Bij de constructie van deze buis werd naar een compromis gestreefd tusschen een zoo groot mogelijken anodestroom en een zoo gering mogelijke gloeidraadenergie. De eerstgenoemde eisch houdt verband met de toepassing van een enkele buis in een gelijkrichter voor toestellen met een groot uitgangsvermogen (balanseindtrappen); de tweede eisch wordt gesteld om bij een bepaalde netspanning een grooter aantal gloeidraden van andere buizen in serie met het gloeilichaam van de UY 21 te kunnen schakelen. Als gunstigste compromis werd een maximum gelijkstroom in den anodekring van 140 mA bij een gloeispanning van 50 V gevonden. Met een gelijkstroom van 140 mA zal men vrijwel elk toestel kunnen voeden, zelfs indien twee in balans geschakelde eindbuizen EBL 21 worden toegepast.



GLOEIDRAADGEGEVENS

Gloeidraadvoeding: indirect, met gelijk- of wisselstroom; serievoeding.

Gloeispanning	V_f	= 50 V
Gloeistroom	I_f	= 0,100 A

GRENSWAARDEN

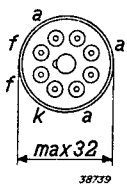


Fig. 2
Rangschikking en aansluitingen van de electroden.

Anodewisselspanning aan de buis	V_{treff}	= max. 250 V
Geleverde gelijkstroom	I_a	= max. 140 mA
Spanning tusschen gloeidraad en kathode	V_{fk}	= max. 550 V
Ingangscapaciteit van het afvlakfilter	C	= max. 60 µF

Indien de netspanning hoog is en afvlakcondensatoren van groote capaciteit worden gebruikt, moet in de anodeketen een beschermingsweerstand worden opgenomen; de minimum waarde hiervan is in onderstaande tabel opgenomen.

Netspanning	Afvlakcondensator	Serieweerstand
170—250 V	60 µF 32 µF 16 µF 8 µF	min. 175 Ω min. 125 Ω min. 75 Ω 0
127—170 V	60 µF 32 µF 16 µF	min. 100 Ω min. 75 Ω min. 30 Ω
Ten hoogste 127 V	60 µF	0

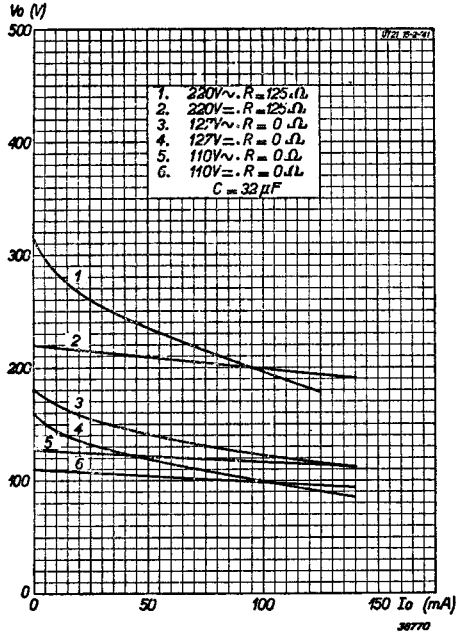


Fig. 3
Belastingkrommen van de buis UY 21

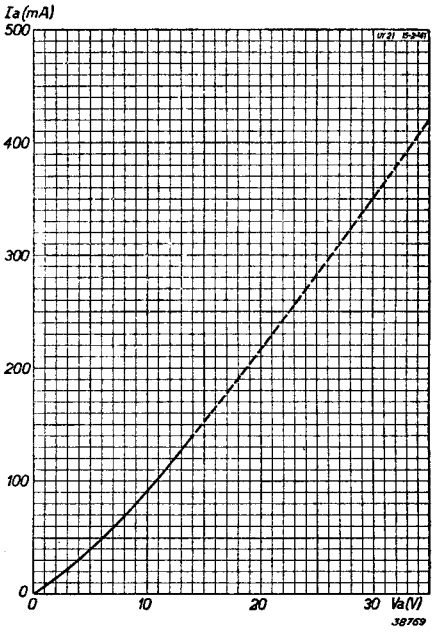


Fig. 4
Anodestroom als functie van de gelijkspanning aan de buis.

UY 41 Half-wave rectifying valve

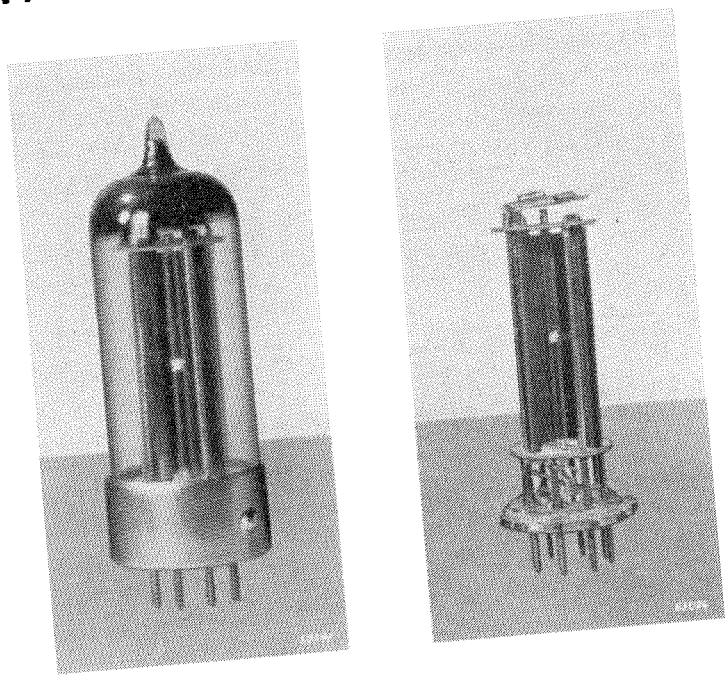


Fig. 1
The UY 41, showing the electrode system (approximately actual size).

The UY 41 is a high-vacuum, indirectly heated half-wave rectifying valve capable of delivering a maximum of 100 mA direct current. A simple receiver employing the UCH 42, 2×UAF 42 and the UL 41 for 220 V mains operation would require a total current of roughly 80 mA, so that a single UY 41 will provide enough reserve current for an R.F. valve and a tuning indicator (UM 4).

At a low mains voltage (127 V) the anode current of a receiver of this type would be about 50 mA, and in this case the reserve of current of the UY 41 admits of the design of high-performance receivers with a push-pull output stage, of which the total anode current would be about 80 mA.

A suitable circuit for the UY 41 is shown in Fig. 2; here the smoothing filter consists of the electrolytic capacitors C_1 and C_2 with a 1200 ohm resistor. The anode voltage of the output valve is derived from C_1, the other anode and screen grid voltages from C_2. As a rule, a filter of this kind provides ample smoothing in a small receiver fitted with a loudspeaker giving moderate bass response, but in sets of higher quality it is advisable to incorporate a hum-bucking coil in the output transformer.

If a choke is used in place of the resistor in the smoothing filter, it must

be remembered that the voltage drop across this choke will be roughly 10 V for a total anode current of 80 mA and a D.C. resistance of 125 ohms, assuming that the anode voltage of the output valve is taken from C_2.
If the receiver is operated on 220 V mains, the voltage across C_1 is about 198 V, and that across C_2 188 V; with the smoothing resistor shown in Fig. 2 these values will be 198 V and 166 V respectively. As the maximum permissible anode dissipation of the valves is not to be exceeded, this increase in voltage must be taken into account when a choke is used, e.g. by adding a resistor in series, or by increasing the value of the limiting resistor in the anode circuit of the UY 41. On 200 to 220 V mains, a 160 ohm resistor would be needed for this purpose (see Fig. 2); on mains of less than 130 V the limiting resistor can be omitted, whilst for intermediate voltages the correct resistance value can be computed by linear interpolation. It should be noted that these are minimum resistance values (this is important when resistors with large tolerances are used).
In determining the wattage of the limiting resistor it is essential to take into account the ripple component of the current flowing through this resistor. Generally, the resultant wattage is about three times as high as that computed only from the D.C. component.
On mains of more than 220 V, or when a choke is used for the smoothing filter, the maximum permissible anode dissipation of the output valve is usually exceeded unless special measures are taken to prevent this. This can be suitably effected by increasing the limiting resistor.
Any parasitic R.F. currents flowing through the valve UY 41 may undergo modulation by the mains frequency, resulting in audible hum in the speaker, but a capacitor of 0.022 μF in parallel with the valve (see Fig. 2) will prevent this.

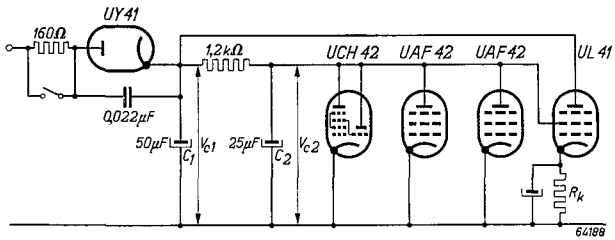


Fig. 2
Rectifier section of an A.C./D.C. receiver employing the UY 41 with a smoothing resistor. For details see text.

TECHNICAL DATA OF THE HALF-WAVE RECTIFIER UY 41

Heater data

Heating : indirect, A.C. or D.C., series feed

Heater current	I_f	=	100 mA
Heater voltage	V_f	=	31 V

Operating characteristics and limiting values

Mains voltage	V_i	=	127		220 max.	250	V_{RMS}
Rectified current . . .	I_o	=	max. 100	max.	100 max.	100	mA
Limiting resistor . . .	R_t	=	0	min.	160 min.	210	Ω
Input capacitance, smoothing filter. . .	C_{filt}	=	max. 50	max.	50 max.	50	μF
Peak voltage between heater and cathode . .	V_{fk}	=	max. 550	max.	550 max.	550	V

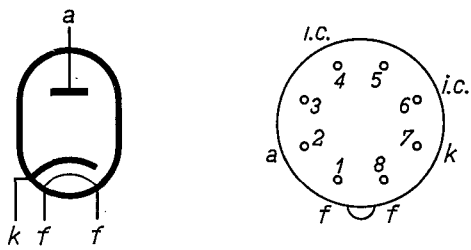


Fig. 3
Electrode arrangement, electrode connections and maximum dimensions in mm of the UY 41.

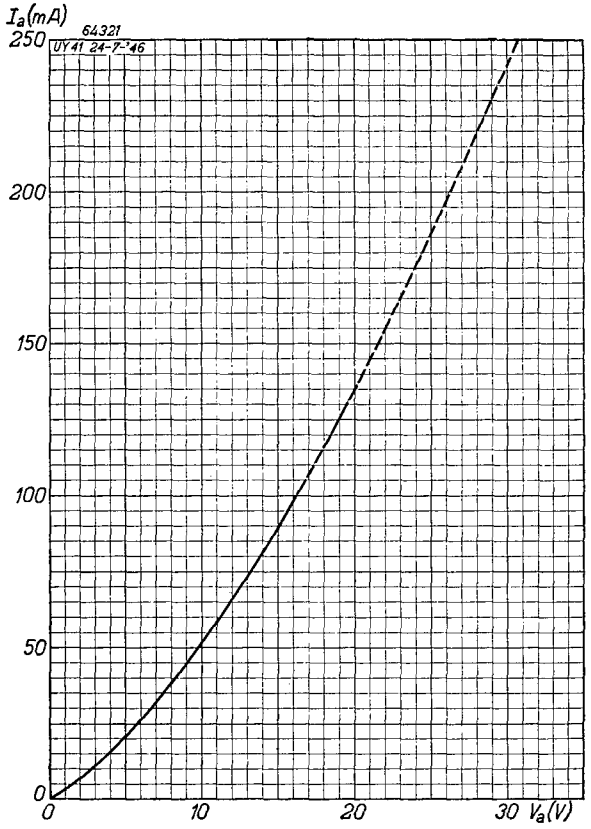


Fig. 4
Anode current (I_a) of the UY 41 as a function of the applied direct voltage (V_a).

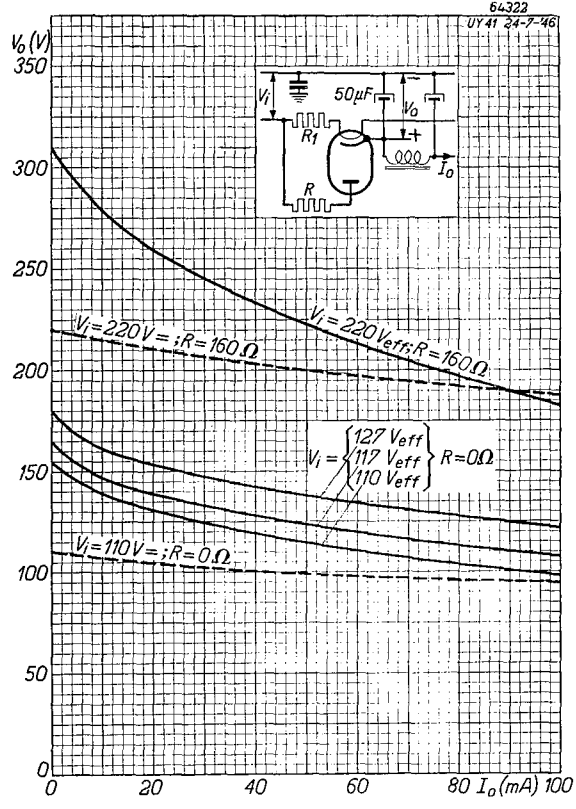


Fig. 5
Regulation of the UY 41 (output voltage V_o as a function of the direct current output I_o). Unbroken lines : valve operating on A.C. mains. Dotted lines : valve operating on D.C. mains.

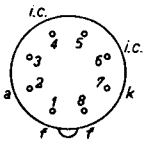
"Miniwatt" UY 42

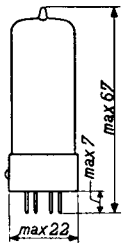
High vacuum HALF-WAVE RECTIFIER for 110 V mains
TUBE REDRESSEUR MONOPLAQUE à vide poussé pour des réseaux à 110 V
Hochvakuum EINWEGGLEICHRICHTERROEHRE für 110V Netze

Heating:	indirect by A.C. or D.C.; series supply	
Chauffage:	indirect par C.A. ou C.C.; alimentation en série	Vf = 31 V If = 0,100 A
Heizung:	indirekt durch Wechsel- oder Gleichstrom; Serienspeisung	

Dimensions in mm
Dimensions en mm
Abmessungen in mm





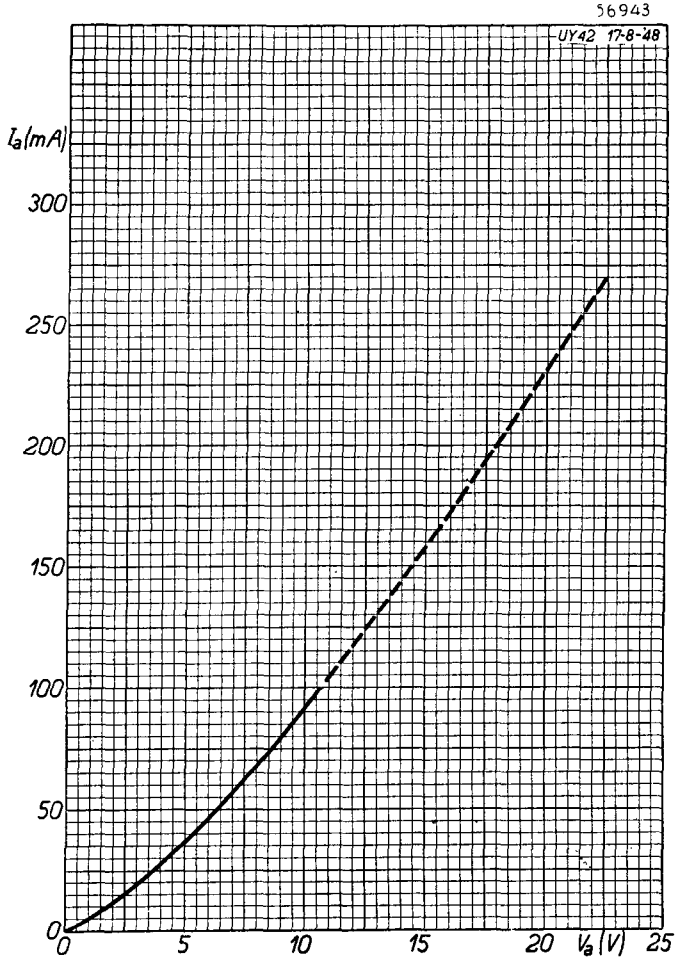


Operating characteristics and limiting values
Caractéristiques d'utilisation et caractéristiques limites
Betriebs- und Grenzdaten

Vi	= max.	110 V_{eff}
Io	= max.	100 mA
C_{filt}	= max.	50 µF
Rt	=	0 Ω
Vfk	= max.	350 V [1]

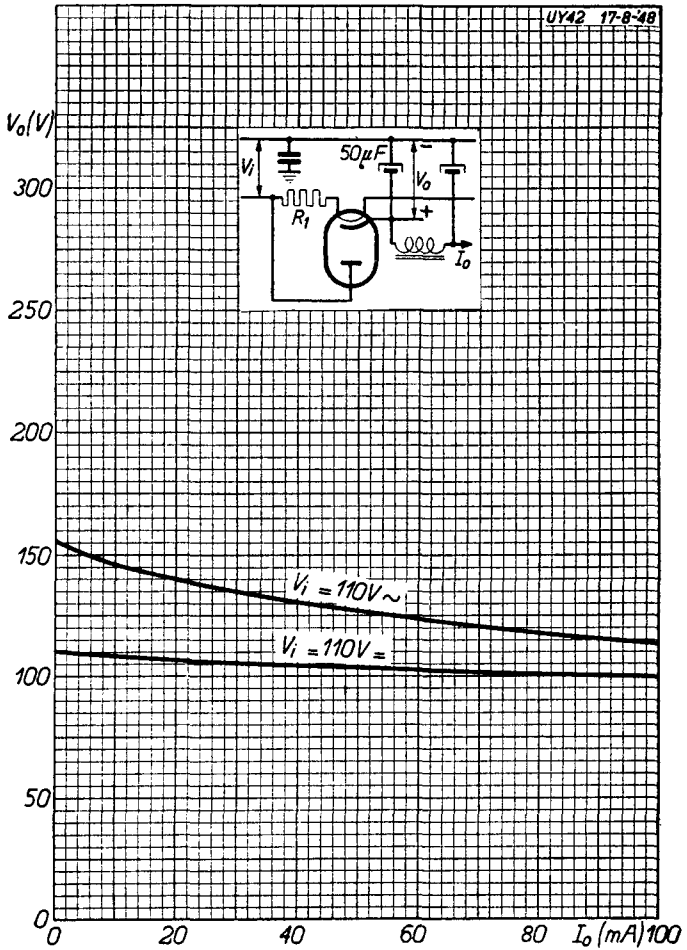
1) Peak value; valeur de crête; Scheitelwert

UY 42 "Miniwatt"



A

56944


UY42 17-8-48
V_o(V)
300
250
200
150
100
50
0
0
20
40
60
80
I_o(mA)100
V_i
50µF
R_1
V_o
I_o
V_i = 110V~
V_i = 110V=

PHILIPS

Electronic Tube

HANDBOOK

UY42

page	sheet	date
1	1	1949.01.25
2	A	1949.01.25
3	B	1949.01.25
4	FP	1999.10.12

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UY 82

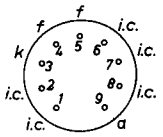
High-vacuum single-anode RECTIFYING TUBE
TUBE REDRESSEUR monoplaque à vide poussée
Einanodige hochvakuum GLEICHRICHTERRÖHRE

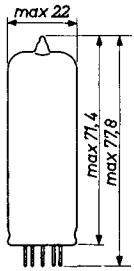
Heating : indirect by A.C. or D.C. series supply
Chauffage: indirect par C.A. ou C.C. alimentation série
Heizung : indirekt durch Wechsel- oder Gleichstrom; Serienspeisung

V_f = 55 V
I_f = 100 mA

Dimensions in mm
Dimensions en mm
Abmessungen in mm







Base, culot, Sockel: NOVAL

Operating characteristics
Caractéristiques d'utilisation
Betriebsdaten

V_{tr}	=	250	240	220	200	127 V_{eff}
C_{filt}	=	60	60	60	60	60 µF
R_t	=	125	105	65	30	0 Ω
I_o	=	180	180	180	180	180 mA
V_o		195	195	195	195	127 V

PHILIPS UY 82

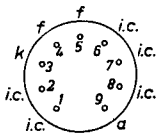
High-vacuum single-anode RECTIFYING TUBE
TUBE REDRESSEUR monoplaque à vide poussée
Einanodige hochvakuum GLEICHRICHTERRÖHRE

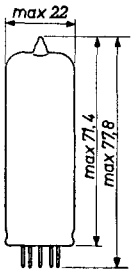
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Chauffage: indirect par C.A. ou C.C. alimentation série
Heizung : indirekt durch Wechsel- oder Gleichstrom; Serienspeisung

V_f = 55 V
I_f = 100 mA

Dimensions in mm
Dimensions en mm
Abmessungen in mm







Base, culot, Sockel: NOVAL

Operating characteristics
Caractéristiques d'utilisation
Betriebsdaten

V_{tr}	=	250	240	220	200	127 V_{eff}
C_{filt}	=	60	60	60	60	60 µF
R_t	=	125	105	65	30	0 Ω
I_o	=	180	180	180	180	180 mA
V_o		195	195	195	195	127 V

Limiting values
Caractéristiques limites
Grenzdaten

V_{tr}	= max.	250 Veff
$V_{a\ inv_p}$	= max.	700 V
I_o	= max.	180 mA
V_{kf_p}	= max.	550 V [1]
C_{filt}	= max.	60 µF [2]
I_{k_p}	= max.	1100 mA

V_{tr}	=	250	240	220	200	127 V_{eff}
R_t	= min.	100	80	40	30	0 Ω

[1] Max. 220 V_{eff} A.C. voltage + max. 250 V D.C. voltage
Cathode positive with respect to the heater

220 Veff tension alternative au maximum + 250 V tension directe au maximum
Cathode positive par rapport au filament

Max. 220 V_{eff} Wechselspannung + max. 250 V Gleichspannung
Katode positiv in Bezug auf den Heizfaden

[2] When two tubes are placed in parallel, C_{filt} = max.100 µF
The resistor R_t must be inserted in the anode lead of each tube

Si deux tubes sont connectés en parallèle, C_{filt} = 100 µF au max. Il faut insérer la résistance R_t dans le circuit anodique de chaque tube

Wenn zwei Röhren parallel geschaltet sind ist C_{filt} = max. 100 µF. Der Widerstand R_t muss in der Anodenleitung jeder Röhre aufgenommen werden

Limiting values
Caractéristiques limites
Grenzdaten

V_{tr}	= max.	250 Veff
$V_{a\ inv_p}$	= max.	700 V
I_o	= max.	180 mA
V_{kf_p}	= max.	550 V [1]
C_{filt}	= max.	60 µF [2]
I_{k_p}	= max.	1100 mA

V_{tr}	=	250	240	220	200	127 V_{eff}
R_t	= min.	100	80	40	30	0 Ω

[1] Max. 220 V_{eff} A.C. voltage + max. 250 V D.C. voltage
Cathode positive with respect to the heater

220 Veff tension alternative au maximum + 250 V tension directe au maximum
Cathode positive par rapport au filament

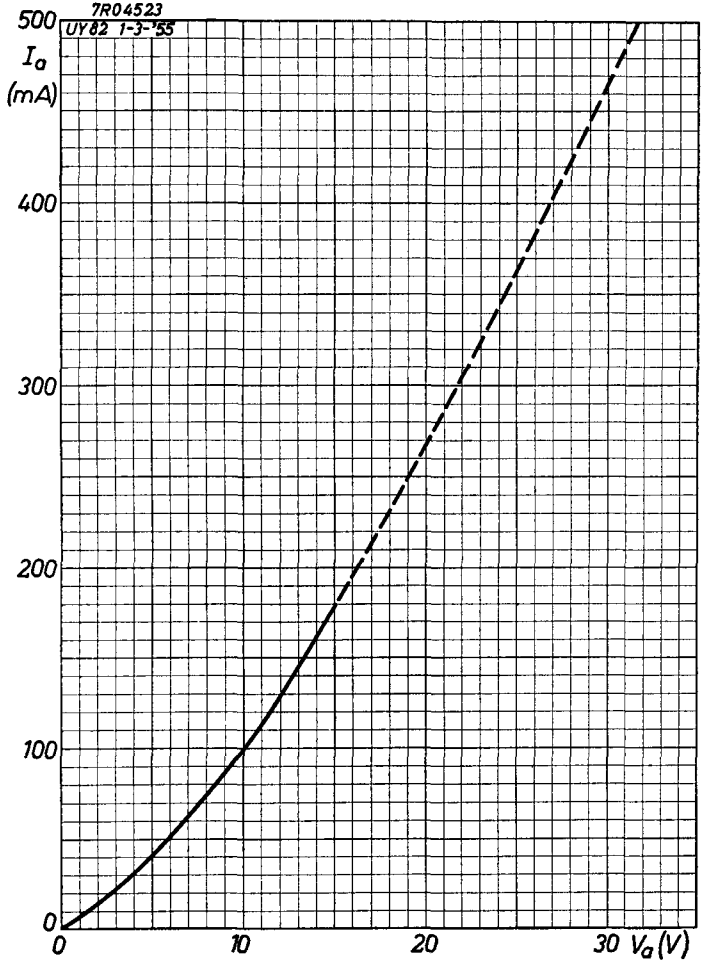
Max. 220 V_{eff} Wechselspannung + max. 250 V Gleichspannung
Katode positiv in Bezug auf den Heizfaden

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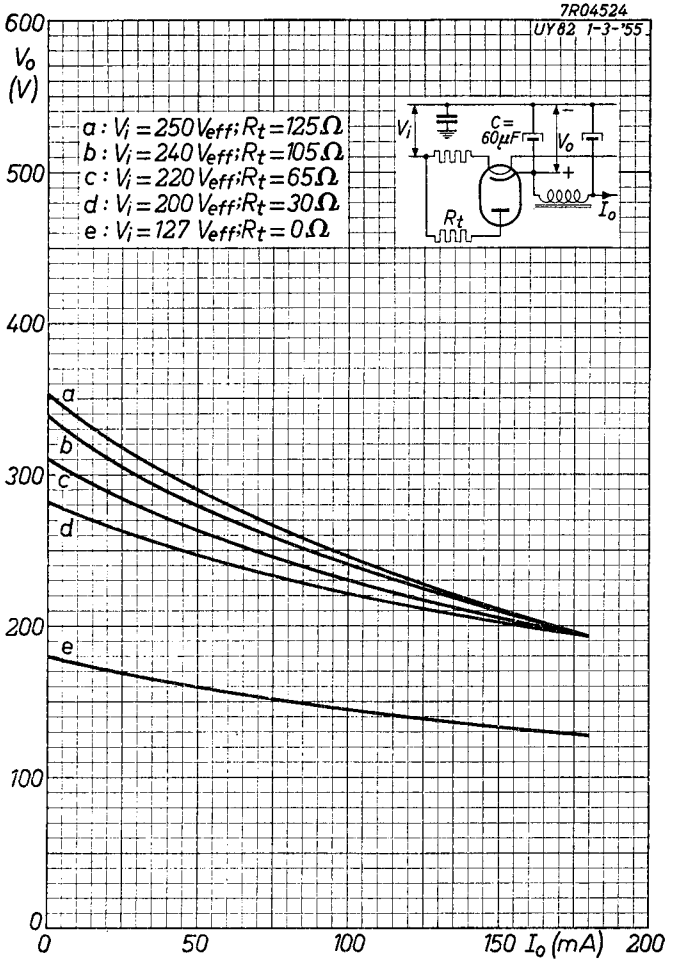
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Wenn zwei Röhren parallel geschaltet sind ist C_{filt} = max. 100 µF. Der Widerstand R_t muss in der Anodenleitung jeder Röhre aufgenommen werden

←


7R04523
UY82 1-3-'55
500
I_a
(mA)
400
300
200
100
0
0
10
20
30 V_a (V)

UY 82 PHILIPS





UY82

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1	1	1955.04.04
2	1	1956.04.04
3	2	1955.04.04
4	2	1956.04.04
5	A	1955.03.03
6	B	1955.03.03
7	FP	2000.07.09

SINGLE ANODE RECTIFYING TUBE

Single anode high vacuum rectifying tube.

QUICK REFERENCE DATA			
Transformer voltage	V_{tr}	250	V_{RMS}
D.C. current	I_o	110	mA

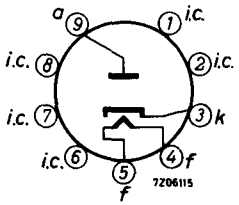
HEATING: Indirect by A.C. or D.C.; series supply

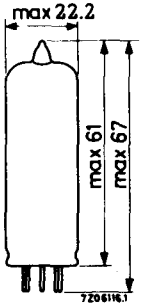
Heater current	I_f	100	mA
Heater voltage	V_f	38	V

DIMENSIONS AND CONNECTIONS

Dimensions in mm

Base: Noval



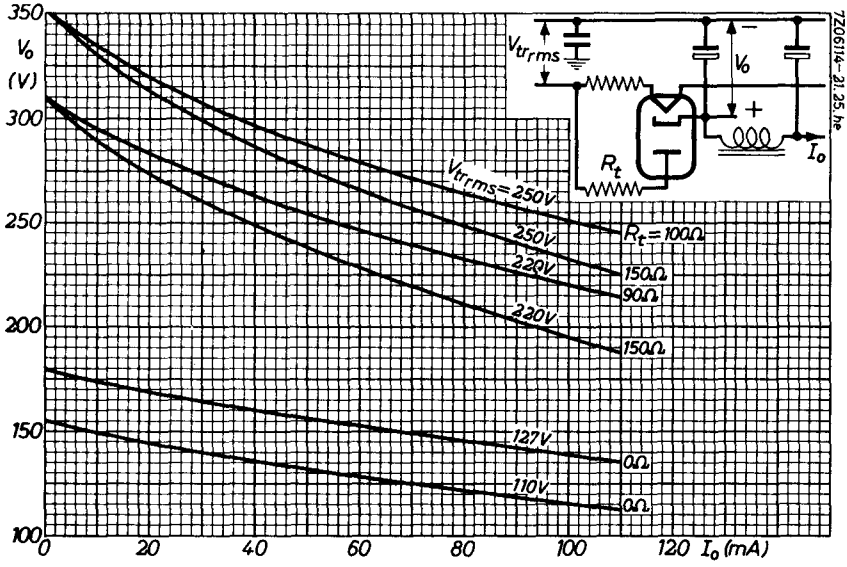


OPERATING CHARACTERISTICS as single-phase half-wave rectifier

Transformer voltage	V_{tr}	250	220	127	110	V_{RMS}
D.C. output voltage	V_o	245	215	135	112	V
D.C. current	I_o	110	110	110	110	mA
Protecting resistance	R_t	100	90	0	0	Ω
Input capacitor of smoothing filter	C_{filt}	100	100	100	100	μF

LIMITING VALUES (Design centre rating system)

Anode voltage, peak inverse	$V_{a\,inv_p}$				max.	700	V
D.C. current	I_o				max.	110	mA
Anode peak current	I_{a_p}				max.	660	mA
Cathode to heater voltage, peak, k pos.	V_{kfp}				max.	550	V
Input capacitor of smoothing filter	C_{filt}				max.	100	μF
Protecting resistance	R_t	min. 100	90	0	0	Ω	
at transformer voltage	V_{tr}	250	220	127	110	V_{RMS}	



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Data handbook

Electronic components and materials

UY85

page	sheet	date
1	1	1970.01
2	2	1970.01
3	FP	1999.07.29

SINGLE ANODE RECTIFYING TUBE

Single anode high vacuum rectifying tube.

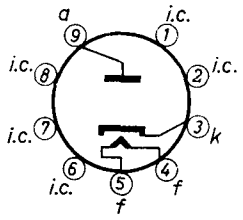
QUICK REFERENCE DATA			
Transformer voltage	V_{tr}	250	V
D.C. current	I_o	100	mA

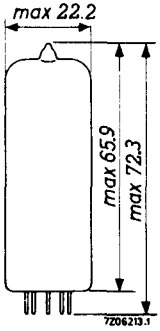
HEATING: Indirect by A.C. or D.C.; series supply

Heater current	I_f	100	mA
Heater voltage	V_f	31	V

DIMENSIONS AND CONNECTIONS Dimensions in mm

Base: Noval





OPERATING CHARACTERISTICS as single-phase half-wave rectifier.

Transformer voltage	V_{tr}	250	220	127	110	V_{RMS}
D.C. output voltage	V_o	205	188	135	113	V
D.C. current	I_o	100	100	100	100	mA
Protecting resistance	R_t	210	160	0	0	Ω
Input capacitor of smoothing filter	C_{filt}	50	50	50	50	μF

LIMITING VALUES (Design centre rating system)

Anode voltage, peak inverse	$V_{a_{invp}}$	max.			700		V
D.C. current	I_o	max.			100		mA
Anode current, peak	I_{a_p}	max.			600		mA
Heater to cathode voltage, peak, k pos.	V_{kf_p}	max.			550		V
Protecting resistance	R_t	min.	210	160	0	0	Ω
at transformer voltage	V_{tr}		250	220	127	110	V_{RMS}

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Data handbook

Electronic components and materials

UY89

page	sheet	date
1	1	1969.12
2	2	1969.01
3	FP	1999.07.29

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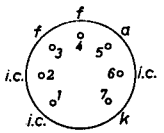
High-vacuum single-anode RECTIFIER
TUBE REDRESSEUR monoplaque à vide poussé
Einanodige hochvakuum GLEICHRICHTERRÖHRE

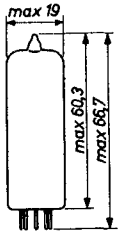
Heating : indirect by A.C. or D.C. series supply
Chauffage: indirect par C.A. ou C.C. alimentation série
Heizung : indirekt durch Wechsel- oder Gleichstrom; Serienspeisung

V_f = 26 V
I_f = 100 mA

Dimensions in mm
Dimensions en mm
Abmessungen in mm







Base, culot, Sockel: MINIATURE

Operating characteristics
Caractéristiques d'utilisation
Betriebsdaten

V_i	=	145	127	117	110	V_{eff}
Cfilt	=	100	100	100	100	µF
R_t	=	0	0	0	0	Ω
I_o	=	70	70	70	70	mA
V_o	=	160	137	124	115	V

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UY 92

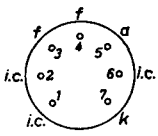
High-vacuum single-anode RECTIFIER
TUBE REDRESSEUR monoplaque à vide poussé
Einanodige hochvakuum GLEICHRICHTERRÖHRE

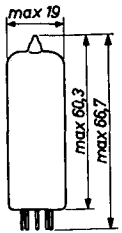
Heating : indirect by A.C. or D.C. series supply
Chauffage: indirect par C.A. ou C.C. alimentation série
Heizung : indirekt durch Wechsel- oder Gleichstrom; Serienspeisung

V_f = 26 V
I_f = 100 mA

Dimensions in mm
Dimensions en mm
Abmessungen in mm







Base, culot, Sockel: MINIATURE

Operating characteristics
Caractéristiques d'utilisation
Betriebsdaten

V_i	=	145	127	117	110	Veff
C_{filt}	=	100	100	100	100	µF
R_t	=	0	0	0	0	Ω
I_o	=	70	70	70	70	mA
V_o	=	160	137	124	115	V

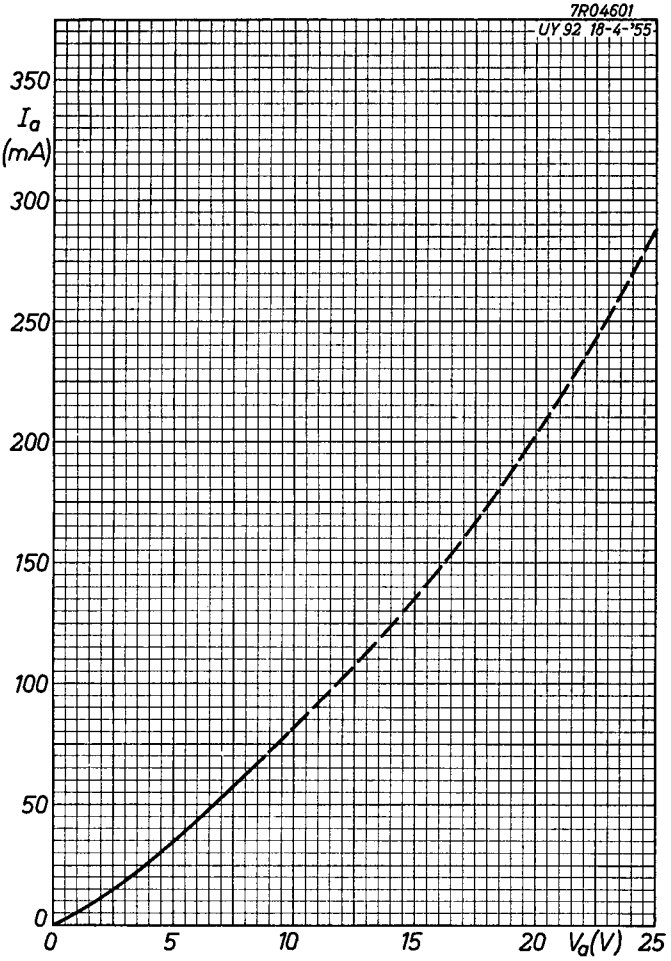
Limiting values
Caractéristiques limites
Grenzdaten

V_i	=	max.	145 V
V_a inv$_p$	=	max.	400 V
I_o	=	max.	70 mA
I_{k_p}	=	max.	450 mA
V_{kf_p}(k pos.; f neg.)	=	max.	400 V
Cfilt	=	max.	100 µF

Limiting values
Caractéristiques limites
Grenzdaten

V_1	=	max.	145 V
V_a inv_p	=	max.	400 V
I_o	=	max.	70 mA
I_{k_p}	=	max.	450 mA
V_{kf_p}(k pos.; f neg.)	=	max.	400 V
Cfilt	=	max.	100 µF

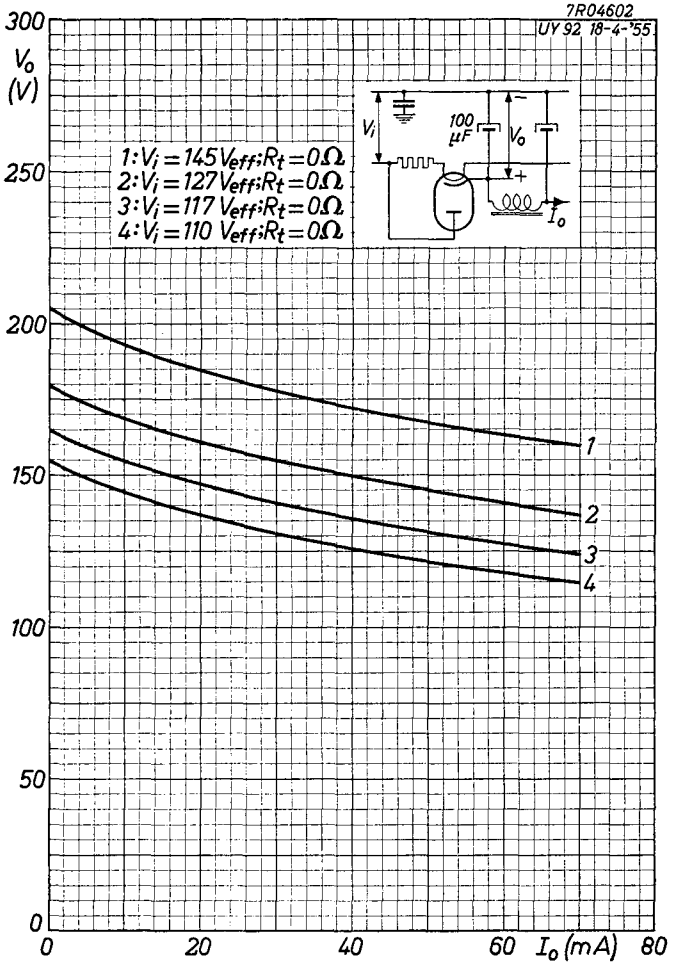
PHILIPS UY 92



5.5.1955

A

UY 92 PHILIPS



B

PHILIPS

Electronic Tube

HANDBOOK

UY92

page	sheet	date
1	1	1955.05.05
2	1	1958.01.01
3	2	1955.05.05
4	2	1958.01.01
5	A	1955.05.05
6	B	1955.05.05
7	FP	2000.07.09

VIBRATING CAPACITOR

Vibrating membrane capacitor in evacuated envelope to be driven by a high-frequency electric field.

Application: D.C. to A.C. converter, e.g. in dosemeters, pH meters and electrometer equipment, where a very high input resistance is of paramount importance.

Equipment measuring currents of 500 electrons per second have been realised.

QUICK REFERENCE DATA		
Contact potential	−50 to +50	mV
Short term drift of contact potential	< 100	μV
Insulation	$> 10^{15}$	Ω
Outline dimensions:		
overall length	max. 64.7	mm
diameter	max. 30.2	mm

MECHANICAL DATA

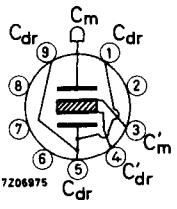
Dimensions in mm

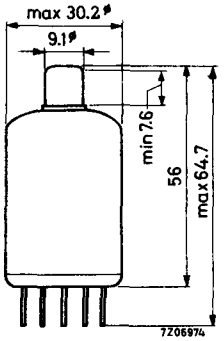
Base: Magnoval, gold plated pins

C_m = measuring capacitor

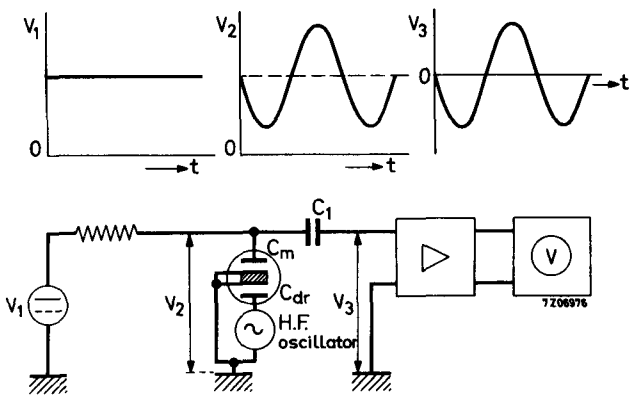
C_{dr} = driving capacitor

Operating position: any





PRINCIPLE OF OPERATION



The D.C. voltage to be measured is connected to capacitor C_m. The earthed membrane vibrates in its own resonance frequency as a result of an H.F. electrical field between the electrodes of capacitor C_{dr}. So the D.C. voltage on capacitor C_m is modulated in the resonance frequency of the membrane. Capacitor C_1 insulates the D.C. source from the A.C. amplifier.

LIMITING VALUES (Absolute max. rating system)

D.C. voltage on C_m	max. 25 V
Conversion efficiency $\frac{\text{R.M.S. output voltage}}{\text{D.C. input voltage}}$	max. 40 % [1]

ELECTRICAL DATA

Contact potential over C_m	−50 to +50	mV
Short term drift (within 1 day)	0.1	mV
Long term drift (within 1 month)	1	mV
Temperature dependance	20	μV/°C

Conversion efficiency:
At a certain driving voltage the conversion efficiency will show a max. spread of ±60% (1 : 4)

[1]) Above 40 % it is possible that two capacitor plates will touch each other and will be damaged.

ELECTRICAL DATA (continued)

Driving voltage:

There can always be found a value of the H.F. driving voltage at which all capacitors have a conversion efficiency between 10% and 40%. [1])

Insulation resistance between any two capacitor terminals		$> 10^{15}$	Ω [2])
Resonance frequency of the membrane		5.3 to 6.3	kHz
Drift		1.5	%
Temperature dependance		$\pm$ 1	Hz/°C
Capacitances of C_m and C_{dr}		35	pF
Temperature dependance between −10 and +60 °C	ΔC	1	pF

SHOCK AND VIBRATION RESISTANCE

The following test conditions are applied to assess the mechanical quality of the tube. These conditions are not intended to be used as normal operating conditions.

Shock

The tube is subjected 5 times in each of 4 positions to an acceleration of 500 g supplied by an NRL shock machine with the hammer lifted over an angle of 30°.

Vibration

The tube is subjected to a vibration of 15 to 1500 Hz with an acceleration of 2.5 g.

APPLICATION NOTES

The capacitive drive opens the possibility to use as driving signal for the membrane a high frequency signal amplitude-modulated with the resonance frequency of the vibrating membrane.
Since in that case there is a great difference between the frequency of the driving signal and the modulation frequency of the voltage to be measured, the stray influences of the driving signal can easily be kept away from the measuring amplifier. In addition, a high frequency drive simplifies design and execution of the driving oscillator.

---

1) For instance in an apparatus realised with the circuit shown in Fig.2, it turned out that all capacitors have a conversion efficiency between 10 and 40% at a voltage over L_1 of 1 V_{RMS}.

2) Under standard atmospheric conditions as defined in I.E.C. publication 68-1, i.e. any combination of temperature, humidity and pressure within the following limits:

Temperature	+15 to +35	°C
Relative humidity	45 to 75	%
Air pressure	860 to 1060	mbar

EXAMPLE OF A DRIVING OSCILLATOR

Operating principle

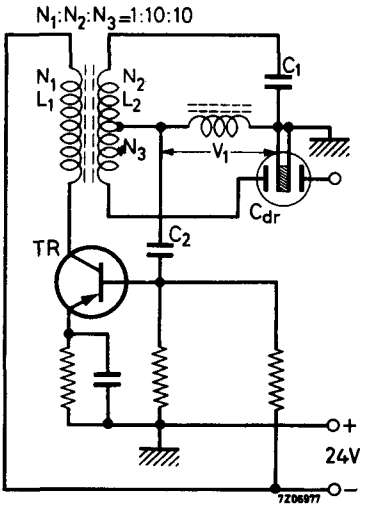


Fig.1

The driving capacitor (C_{dr}) is incorporated in an impedance bridge that determines the feedback to the amplifier transistor. Capacitance C_1 has been given a slightly larger value than that of capacitor C_{dr} in its quiescent state. Due to this the fed-back A.C. voltage V_1 has the proper phase and amplitude to cause the circuit to oscillate in a frequency that is mainly determined by the circuit L_2 C_1 C_{dr}.

The electric attractive force between the capacitor plates of C_{dr} makes the membrane move towards the fixed plate of C_{dr} as a result of which its capacitance increases, the transistor receives less feedback and the oscillator voltage decreases.

The phases and amplitudes of the electrical and the mechanical forces on the membrane and of the feedback factor are such that the membrane begins to vibrate in its resonance frequency, while the H.F. voltage is modulated in amplitude with this frequency.

Since it is very difficult to realize this circuit in such a way that a stable operation is ensured, it is advisable to add some components for automatical adjustment of the capacitance C_1.

See the following circuit.

EXAMPLE OF A DRIVING OSCILLATOR (continued)

Practical circuit

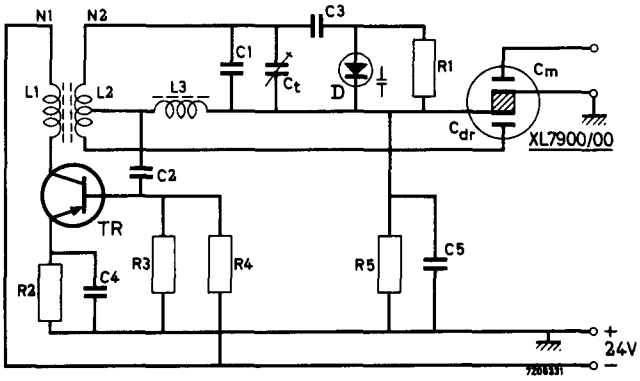


Fig. 2

C_1 = 12 pF mica
C_2 = 1500 pF
C_3 = 10 pF mica
C_4 = 2200 pF
C_5 = 0.1 μF
C_t = 25 pF max.

R_1 = 68 kΩ
R_2 = 3.3 kΩ
R_3 = 4.7 kΩ
R_4 = 1 kΩ
R_5 = 1 MΩ

L_2 = 1.3 mH
L_3 = 1.3 mH R.F. choke
N_2/N_1 = 20
TR = BCY70
D = BA102

PHILIPS

Data handbook

Electronic components and materials

XL7900

page	sheet	date
1	1	1968.12
2	2	1968.12
3	3	1968.12
4	4	1968.12
5	5	1970.01
6	FP	2001.05.18

10 STAGE PHOTOMULTIPLIER TUBE

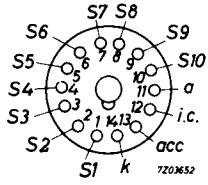
The tube is intended for use in applications such as infra-red telecommunication and ranging and in optical instruments operating in the far red and near infra-red region.

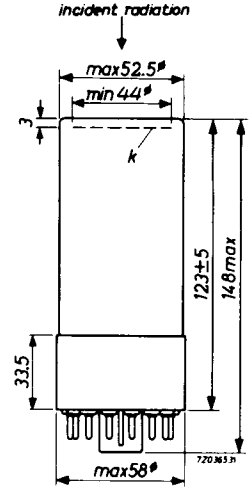
QUICK REFERENCE DATA	
Spectral response	type C (S1)
Useful diameter of the photocathode	44 mm
Anode sensitivity (at 1800 V)	100 A/lm

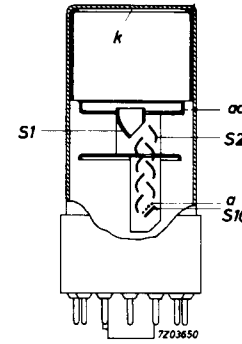
DIMENSIONS AND CONNECTIONS

Dimensions in mm

Base: 14-pin (Jedec B14-38)







ACCESSORIES

Socket	type FE1001
Mu-metal shield	type 56128

GENERAL

Photocathode

Description		semi-transparent, head-on, flat surface		
Cathode material		Ag-O-Cs		
Minimum useful diameter			44	mm
Spectral response curve [1]		type C (S1)		
Wavelength at maximum response		8000 ± 1000		Å
Luminous sensitivity [2]	N_k	av. min.	20 15	μA/lm μA/lm
Infra-red luminous sensitivity [3]	N_k	av. min.	3 1.4	μA/lm μA/lm
Radiant sensitivity at 8000 Å			2	mA/W

Multiplier system

Number of stages			10	
Dynode material		Ag-Mg-O-Cs		

Capacitances

Anode to final dynode	$C_{a/S_{10}}$		3	pF
Anode to all other electrodes	C_a		5	pF

TYPICAL CHARACTERISTICS

With voltage divider A

Anode sensitivity at V_b = 1800 V	N_a	av. min.	100 20	A/lm A/lm
Anode dark current at N_a = 20 A/lm [4]	I_{a_o}	max.	10	μA
Linearity between anode pulse amplitude and input light pulse		up to	5	mA

---

[1]) See spectral response curve in front of this section

[2]) Measured with a tungsten ribbon lamp having a colour temperature of 2854 °K

[3]) The infra-red lumen is the flux resulting from one lumen yielded by a tungsten ribbon lamp (colour temperature 2854 °K) going through an infra-red filter Corning CS94 No. 2540, fusion 1613 thickness 2.61

[4]) At an ambient temperature of 25 °C

TYPICAL CHARACTERISTICS (continued)

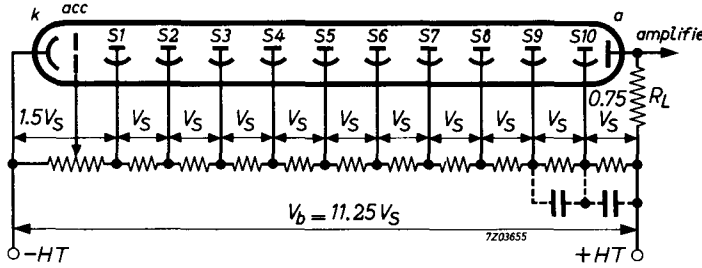
With voltage divider B

Linearity between anode pulse amplitude and input light pulse	up to	10	mA
Anode pulse rise time at V_b = 1500 V [1])		4	ns
Anode pulse width at half height at V_b = 1500 V [1])		12	ns
Transit time difference between the centre of the photocathode and the edge at V_b = 1500 V		4	ns
Total transit time at V_b = 1500 V [1])		40	ns

LIMITING VALUES (Absolute max. rating system)

Supply voltage	V_b	max.	1800	V
Continuous anode current	I_a	max.	30	μA
Voltage between cathode and first dynode	V_{k/S_1}	max.	500	V
		min.	120	V
Voltage between consecutive dynodes	$V_{S_n/S_{n+1}}$	max.	300	V
		min.	80	V
Voltage between anode and final dynode [2])	$V_{a/S_{10}}$	max.	300	V
		min.	80	V

RECOMMENDED CIRCUITS

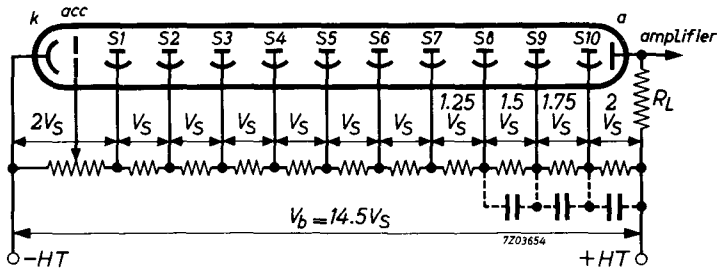


Voltage divider type A

[1]) For an infintely short light pulse, fully illuminating the photocathode.

[2]) When calculating the anode voltage, the voltage drop in the load resistance should not be overlooked.

RECOMMENDED CIRCUITS (continued)



Voltage divider type B

k = cathode
acc = accelerating electrode
S_n = dynode No.n
a = anode

OPERATIONAL CONSIDERATIONS

To achieve a stability of about 1% the ratio of the current through the voltage-divider bridge to that through the heaviest loaded stage of the tube should be approx. 100.

For moderate intensities of radiation a bridge current of approx. 0.5 mA will be sufficient.

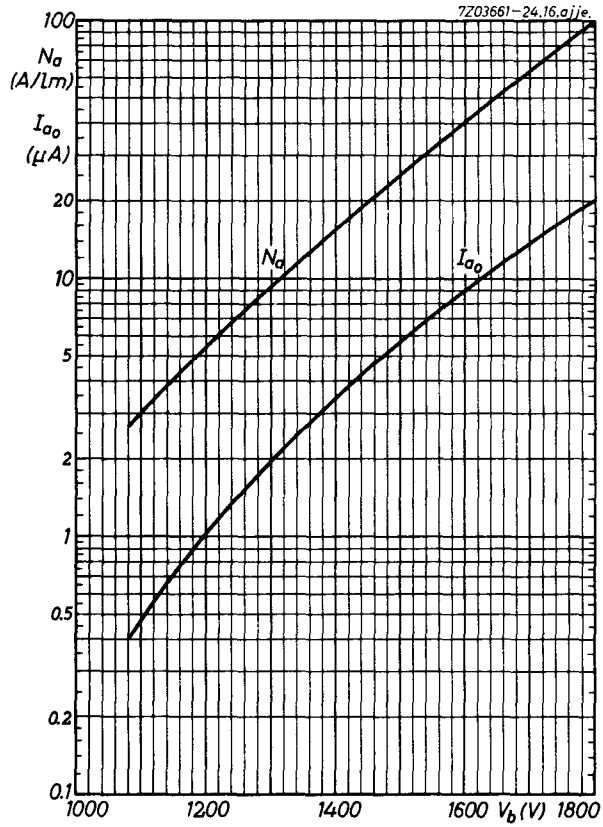
Different kinds of voltage dividers are possible. A circuit of type A results in the highest gain of the tube at a given total voltage; a circuit of type B gives a higher current output with better time characteristics, but the total gain is less at the same total voltage.

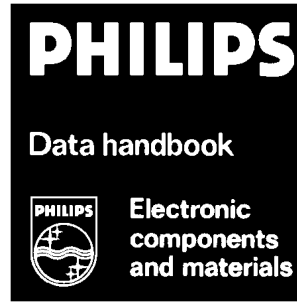
The accelerating electrode has a separate external connection to allow adjustment for optimum photoelectron collection on the first dynode.

When pulses with high amplitudes are taken from the anode, it is useful to decouple the last stages as indicated in the circuit by means of capacitors of a few hundred pF, to avoid a voltage drop between these stages.

When the tube has been exposed to full daylight just before mounting, it will probably show an increased dark current, which will be back at its normal value after several hours of operation.

It is advisable to screen the tube with a mu-metal cylinder against the influence of magnetic fields.


7Z03661-24.16.ajje
100
N_a (A/lm)
I_{a_o} (μA)
20
10
5
2
1
0.5
0.2
0.1
N_a
I_{a_o}
1000
1200
1400
1600
V_b (V)
1800



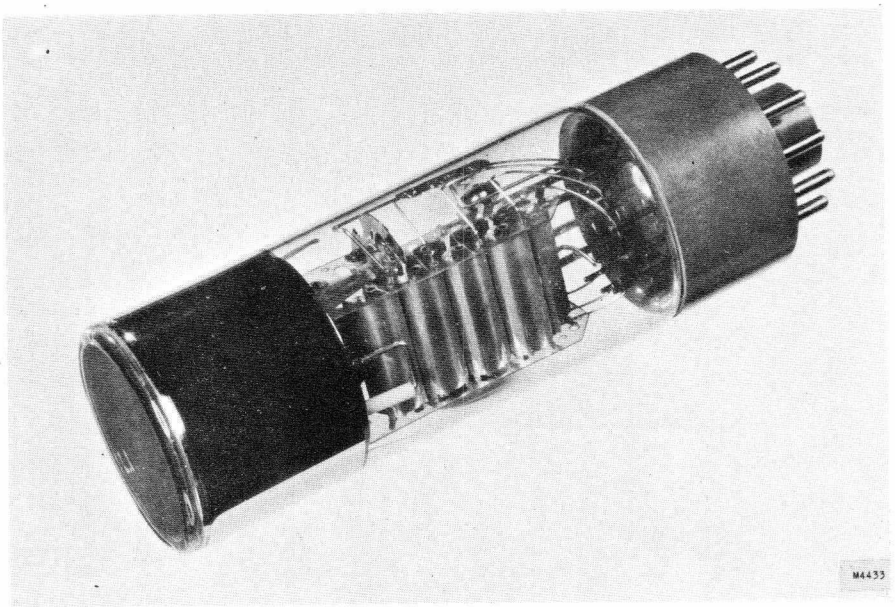
XP1005

page	sheet	date
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2	2	1969.04
3	3	1970.03
4	4	1968.03
5	5	1968.03
6	FP	1999.09.09

PHILIPS

XP1010

PHOTOMULTIPLIER

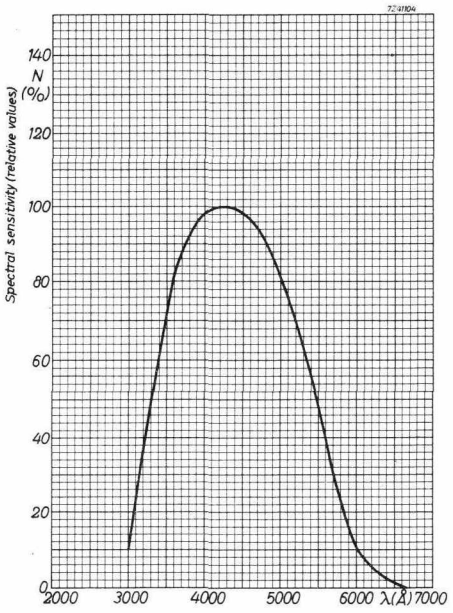


The XP1010 is a 10-stage photomultiplier tube provided with a caesium-antimony, semi-transparent flat cathode, which has a diameter of 32 mm.

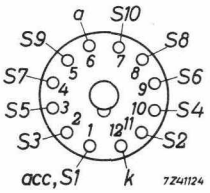
The sensitive uniform photocathode has a typical sensitivity of 60 μA/lm and a spectral response that lies mainly in the visible region, with its maximum at 4200 Å, as shown in the spectral response curve.

The tube is intended for use in applications such as X- and γ-ray spectrometry. With a 1" x 1" NaJ crystal the tube measures the Mn,K_α line (5.9 keV) with a plateau length of at least 70 V and a plateau slope of less than 8 % per 100 V (with the discriminator bias set at 0.2 V and at a counting rate of about 2500 c/s in the middle of the plateau). The background in the middle of the plateau is less than 50 c/s. As a rule the tube has an energy resolution of about 50 % for Cu,K_α (8 keV).

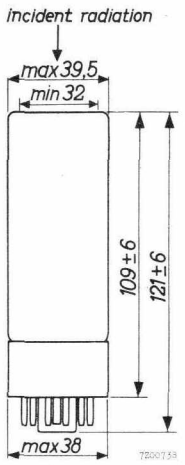
JANUARY 1962 PHILIPS' ELECTRON TUBE DIVISION



Spectral response



12-pins socket
type No. B8 700 42



Dimensions (in mm) and
electrode connections

μ-metal screening cylinder type No. 56127			
length	90	± 1	mm
diameter	42	+ 1 − 0	mm

PHOTOCATHODE

Semi-transparent, head-on, flat surface

Cathode material		SbCs	
Minimum useful diameter		32	mm
Wavelength at max. response		4200±300	Å
Luminous sensitivity [1]		avg. 60 min. 35	μA/lm μA/lm
Radiant sensitivity [2]		avg. 50	mA/W
Dark current (at room temperature)		10^{-15}	A/cm²

MULTIPLIER SYSTEM

Number of stages		10	
Dynode material		AgMgOCs	
Capacitance between anode and final dynode	C_{a-S10} =	3	pF
Capacitance between anode and all other electrodes	C_a =	5	pF

[1]) Measured with a tungsten ribbon lamp with a colour temperature of 2850 °K.

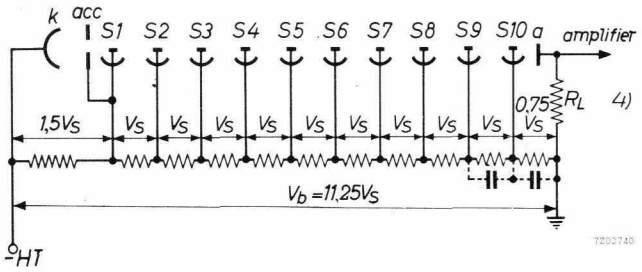
[2]) At a wavelength of 4200 Å.

TYPICAL CHARACTERISTICS (voltage divider type A)

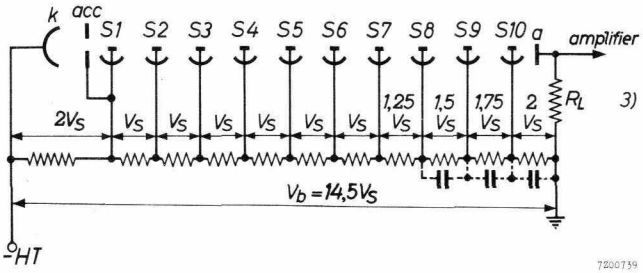
Anode sensitivity (at a total voltage of 1800 V)	N_a =	avg. 1250	A/lm
		min. 100	A/lm
Anode dark current (at N_a = 60 A/lm)		max. 0.05	µA
Plateau length (Mn,K_α line 5.9 keV)[3])		min. 70	V
Plateau slope [3])		max. 8 % per 100	V
Background in middle of plateau [3])		avg. 30	c/s
		max. 50	c/s
Linearity between anode pulse amplitude and input-light flux:			
- with voltage divider type A		up to 30	mA
- with voltage divider type B		up to 100	mA

OPERATING CONDITIONS

Voltage divider type A



Voltage divider type B



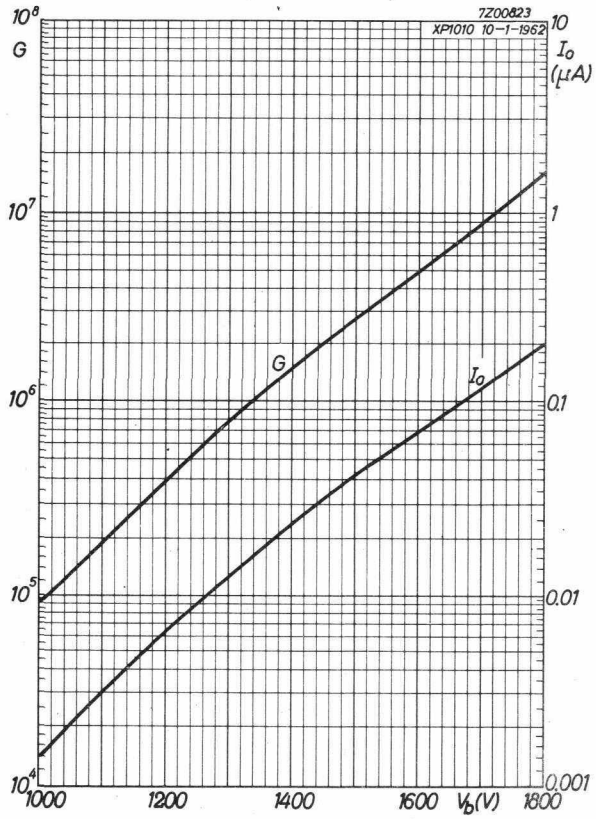
k = cathode
acc = accelerating electrode
S_n = dynode No. **n**
a = anode

LIMITING VALUES

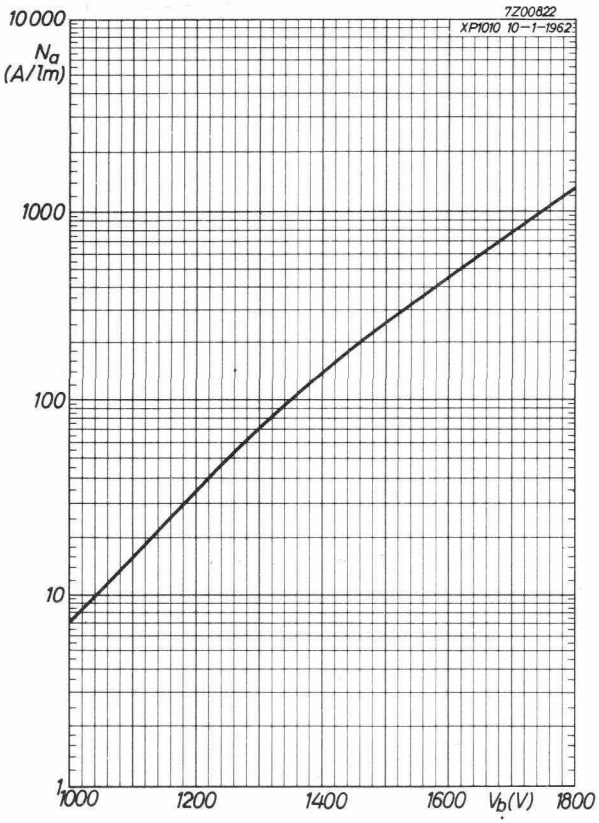
Total voltage	V_b =	max.	1800	V
Anode current at continuous operation (in order not to overload the tube)	I_a =	max.	1	mA
Anode dissipation	W_a =	max.	0.5	W
Voltage between cathode and first dynode	V_{k-S1} =	min.	120	V
		max.	500	V
Voltage between two consecutive dynodes	$V_{Sn-Sn+1}$ =	min.	80	V
		max.	300	V
Voltage between S_{10} and anode	V_{a-S10} =	min.	80	V [4])
		max.	300	V

[3]) Measured with a 1" x 1" NaJ crystal, at a counting rate of about 2500 c/s in the middle of the plateau, and with the discriminator bias set at 0.2 V.

[4]) When calculating the anode voltage the voltage drop in the load resistance R_L should not be overlooked.



Gain and dark current



Overall sensitivity

OPERATIONAL CONSIDERATIONS

To achieve a stability of about 1 % the ratio of the current through the voltage-divider bridge to that through the heaviest loaded stage of the tube should be approx. 100.

For moderate intensities of radiation a bridge current of approx. 0.5 mA will be sufficient.

Different kinds of voltage dividers are possible. A circuit of type A results in the highest gain of the tube at a given total voltage; a circuit of type B gives higher currents in the last stages, but the total gain is less at the same total voltage.

When pulses with high amplitudes are taken from the anode, it is useful to decouple the last stages as indicated in the circuit by means of capacitors of a few hundred pF, to avoid a voltage drop between these stages.

When the tube has been exposed to full daylight just before mounting, it will probably show an increased dark current, which will be back at its normal value after several hours of operation.

It is advisable to screen the tube with a mu-metal cylinder against the influence of magnetic fields.

Printed in Holland 23/035/B/E

CAMERA TUBE

Small size vidicon television camera tube with low heater consumption, separate mesh construction, electrostatic focusing and magnetic deflection. Overall length 108 mm (4¼ in) and diameter 17,7 mm (2/3 in).
The XQ1272 is intended for use in ultra compact TV cameras for industrial and consumer applications in which a minimum of size, weight and power consumption is essential.

QUICK REFERENCE DATA

Separate mesh	
Focusing	electrostatic
Deflection	magnetic
Diameter	17,7 mm
Length	108 mm
Heater	6,3 V, 95 mA
Resolution	⩾ 400 TV lines

OPTICAL

Diagonal of quality rectangle on photoconductive layer (aspect ratio 3 : 4) — max. 11 mm

Orientation of image on photoconductive layer:
The direction of the horizontal scan should be essentially parallel to the plane defined by the gap between the pins 1 and 7 and the longitudinal axis of the tube, unless rotation of the tube is found necessary to minimize the number of blemishes in the picture.

Photoconductive layer	type A
Spectral response, max. response at	approx. 550 nm

HEATING

Indirect by a.c. or d.c.; parallel or series supply

Heater voltage	V_f	6,3 V ± 10%
Heater current, at V_f = 6,3 V	I_f	95 mA

When the tube is used in a series heater chain, the heater voltage must not exceed an r.m.s. value of 9,5 V when the supply is switched on.

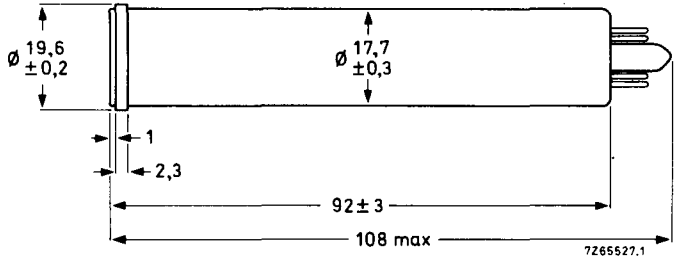
CAPACITANCES

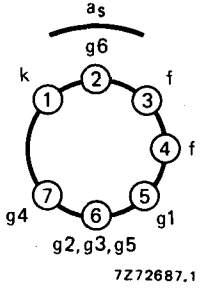
Signal electrode to all C_{as} 2 pF

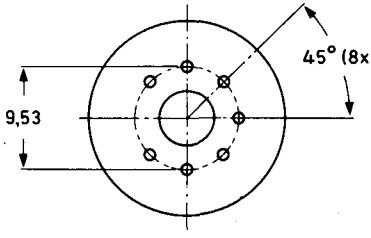
This capacitance, which is effectively the output impedance of the tube, increases when the tube is inserted into the deflection coil unit.

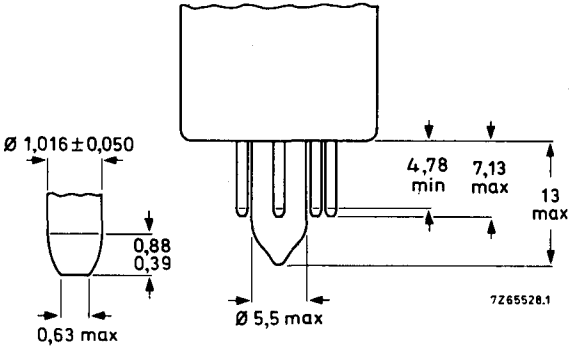
MECHANICAL DATA

Dimensions in mm









Base: Small button miniature 7-pin (IEC 67-I-10a, JEDEC E7-1) with pumping stem.

Mounting positions: any

Net mass: ≈ 23 g

ACCESSORIES

Socket	special miniature 7-pin, type 56049 or equivalent
Deflection coil unit	KV19G or equivalent

DEFLECTION magnetic

FOCUSING electrostatic

LIMITING VALUES

(Absolute maximum rating system) for scanned area of 6,6 mm x 8,8 mm.

"Full-size scanning" i.e. scanning of a 6,6 mm x 8,8 mm area of the photoconductive layer should always be applied. Underscanning, i.e. scanning of an area smaller than 6,6 mm x 8,8 mm, may cause permanent damage to the specified full-size area.

Signal electrode voltage	V_{as}	max.	80	V
Grid 5 and grid 6 voltage	$V_{g5,g6}$	max.	600	V
Grid 4 (beam focus electrode) voltage	V_{g4}	max.	350	V
Grid 5, grid 3 and grid 2 voltage	$V_{g5,g3,g2}$	max.	350	V
Grid 1 voltage,				
negative	$-V_{g1}$	max.	125	V
positive	V_{g1}	max.	0	V
Cathode-to-heater voltage,				
peak positive	V_{kfp}	max.	125	V
peak negative	$-V_{kfp}$	max.	10	V
Dark current, peak	I_{dp}	max.	0,15	μA
Output current, peak	I_{asp}	max.	0,5	μA *
Faceplate illumination	E	max.	5000	lx
Faceplate temperature, storage and operation	T	max.	70	°C **
Cathode heating time before drawing cathode current	t_h	min.	1	min

* Video amplifiers should be capable of handling signal-electrode currents of this magnitude without overloading the amplifier or distorting the picture.

** Under difficult environmental conditions a flow of cooling air directed at the faceplate is recommended. When televising flames and furnaces, appropriate infrared absorbing filters should be used.

OPERATING CONDITIONS AND PERFORMANCE

For a scanned area of 6,6 mm x 8,8 mm and a faceplate temperature of 30 ± 2 °C.

CONDITIONS				notes
Grid 5 and grid 6 voltage	$V_{g5,g6}$	500	V	
Grid 4 voltage	V_{g4}	35 to 55	V	1
Grid 5, grid 3 and grid 2 voltage	$V_{g5,g3,g2}$	300	V	
Grid 1 voltage	V_{g1}	adjusted for sufficient beam-current to stabilize highlights		
Blanking voltage, peak-to-peak				
when applied to grid 1		50	V	
when applied to the cathode		20	V	
Field strength of adjustable alignment magnets (KV19G)	H	0 to 320	A/m	
Deflection				2

PERFORMANCE

		min.	typ.	max.		
Signal electrode voltage for dark current of 20 nA (see Fig. 1)	V_{as}	10	25	40	V	
Signal current faceplate illumination 8 lx c.t. 2856 K, dark current 20 nA	I_s	80	150		nA	3
Decay: residual signal current 200 ms after cessation of the illumination (8 lx, c.t. 2856 K)			10		%	
Limiting resolution in picture centre		500	550		TV lines	4
Grid 1 voltage for picture cut-off with no blanking applied	V_{g1}	−20	−60	−80	V	
Average γ of transfer characteristic for signal currents between 0,02 and 0,2 μA (see Fig. 2)			0,7			
Spurious signals (spots and blemishes)						5

Notes see next page.

NOTES

1. Adjusted for optimal beam focus.
2. The deflection circuits must provide sufficiently linear scanning for good black-level reproduction. The output current being proportional to the velocity of scanning, any change in this velocity will produce non-uniformity.
3. Signal current is defined as the component of the output current after the dark current has been subtracted.
4. Measured with a video amplifier system having an appropriate bandwidth, 8 lx on specified target area, target voltage adjusted for a dark current of 20 nA, beam set for correct stabilization.
5. Conditions:
   The camera focused on a uniformly illuminated two-zone test pattern, the diameter of the centre zone (1) being equal to the raster height. Zone (2) being defined as the remainder of the scanned area. Signal electrode voltage adjusted for a dark current of 20 nA, illumination on target 8 lx (c.t. 2856 K).

   Scanning amplitudes of the monitor adjusted to obtain a raster aspect ratio of 3 : 4.

   Monitor set-up and contrast control adjusted for faint raster when lens of camera is capped, and for non-blooming bright raster when lens of camera is uncapped.

   Under the above conditions the number and size of the spots visible in the monitor picture will not exceed the limits stated below. Both black and white spots must be counted, unless the amplitude is less than 50% of the peak white signal.

Spot size in % of raster height	Maximum number of spots zone 1	zone 2
> 1	none	none
$\leqslant 1$ to 0,8	none	1
0,8 to 0,6	2	2
0,6 to 0,3	2	3
$\leqslant 0{,}3$	*	*

* Do not count spots of this size unless concentration causes a smudgy appearance.

a) Minimum separation between any 2 spots greater than 0,4% of raster height is limited to a distance equivalent to 4% of raster height.

b) Tubes are rejected for smudge, lines, streaks, mottled, grainy or uneven background having contrast ratios greater than 1,5 to 1.

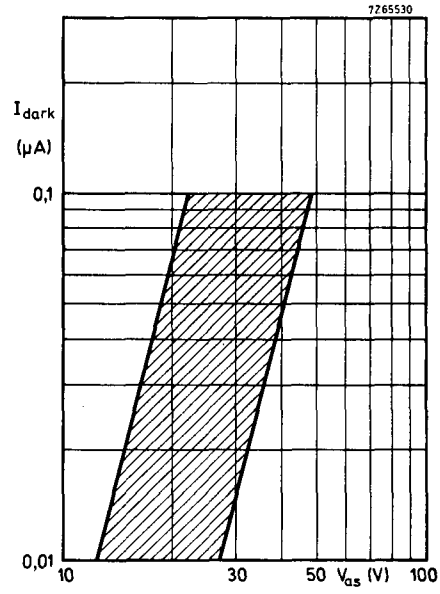


Fig. 1 Dark current range. Scanned area 6,6 mm x 8,8 mm. Faceplate temperature ≈ 30 °C.

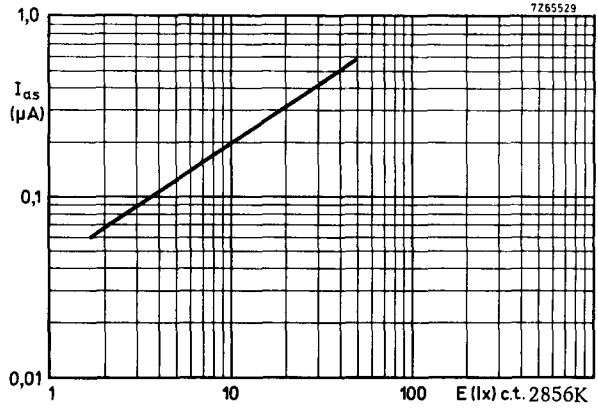


Fig. 2 Typical light transfer characteristic. Scanned area 6,6 mm x 8,8 mm. Faceplate temperature ≈ 30 °C.

WATER COOLED R.F. POWER TRIODE

QUICK REFERENCE DATA								
Frequency (MHz)	C telegraphy		C anode mod.		RF class B		AF class B Two tubes	
	V_a (kV)	W_o (kW)	V_a (kV)	W_o (kW)	V_a (kV)	W_o (kW)	V_a (kV)	W_o (kW)
10	15	120			15	110	12	78
30	12	90	11	66	12	110	10	78

HEATING: direct by A.C. or D.C.; filament thoriated tungsten

Filament voltage	V_f	=	12.6	V
Filament current	I_f	=	160	A

CAPACITANCES

Grid to filament	C_{gf}	=	120	pF
Anode to filament	C_{af}	=	1.4	pF
Anode to grid	C_{ag}	=	50	pF

TYPICAL CHARACTERISTICS

Anode voltage	V_a	=	3	kV
Anode current	I_a	=	1	A
Amplification factor	μ	=	58	
Mutual conductance	S	=	60	mA/V

TEMPERATURE LIMITS (Absolute limits)

Bulb temperature	t	= max.	220	°C
Seal temperature	t	= max.	220	°C

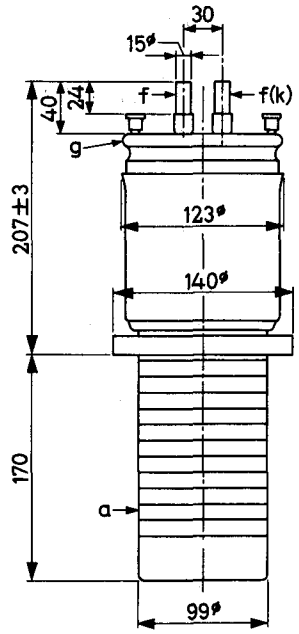
COOLING

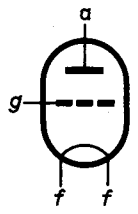
For cooling data see cooling curves.
For water inlet temperatures between 20 °C and 50 °C the required quantity of water can be found by proportional interpolation.
At frequencies higher than 10 MHz a low velocity air flow should be directed to the grid and filament seals.

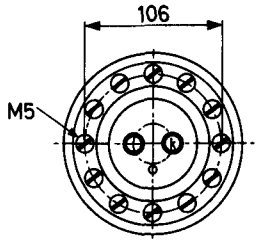
MECHANICAL DATA

Dimensions in mm

Net weight: 6.2 kg







Mounting position: vertical with anode down

ACCESSORIES

Water jacket	K724
Filament connector	40670
Grid connector	40671

R.F. CLASS C TELEGRAPHY or F.M. TELEPHONY

LIMITING VALUES (Absolute limits)

Frequency	f		up to 10	up to 30	MHz
Anode voltage	V_a	=	max. 16	max. 12.5	kV
Anode dissipation	W_a	=	max. 45	max. 45	kW
Negative grid voltage	$-V_g$	=	max. 1000	max. 1000	V
Grid dissipation	W_g	=	max. 1.3	max. 1.3	kW
Anode current	I_a	=	max. 13	max. 13	A
Grid current	I_g	=	max. 3.3	max. 3.3	A

OPERATING CONDITIONS

Frequency	f	=	10	30	30	30	MHz
Anode voltage	V_a	=	15	12	10	8	kV
Grid voltage	V_g	=	-600	-550	-500	-450	V
Anode current	I_a	=	9.75	9.25	9.0	8.75	A
Grid current	I_g	=	2.2	2.2	2.1	1.85	A
Peak grid driving voltage	V_{gp}	=	1000	940	875	810	V
Grid driving power	W_{dr}	=	2.1	1.9	1.7	1.55	kW
Anode input power	Wi_a	=	146	111	90	70	kW
Anode dissipation	W_a	=	26	21	18	15	kW
Output power	W_o	=	120	90	72	55	kW
Efficiency	η	=	82	81	80	78.5	%

R.F. CLASS B AMPLIFIER

LIMITING VALUES (Absolute limits)

Frequency	f		up to 10	up to 30	MHz
Anode voltage	V_a	=	max. 16	max. 12.5	kV
Anode dissipation	W_a	=	max. 45	max. 45	kW
Negative grid voltage	$-V_g$	=	max. 1000	max. 1000	V
Grid dissipation	W_g	=	max. 1.3	max. 1.3	kW
Anode current	I_a	=	max. 13	max. 13	A
Grid current	I_g	=	max. 3.3	max. 3.3	A

OPERATING CONDITIONS

Frequency	f	=	10	10	30	30	MHz
Anode voltage	V_a	=	15	15	12	12	kV
Grid voltage	V_g	=	-260	-260	-210	-210	V
Anode current	I_a	=	10.1	7.75	12.7	9.85	A
Grid current	I_g	=	2.0	1.3	3.0	1.9	A
Peak grid driving voltage	V_{g_p}	=	600	520	650	520	V
Grid driving power	W_{dr}	=	1080	610	1770	880	W
Anode input power	W_{i_a}	=	151	116.3	153	118	kW
Anode dissipation	W_a	=	41	31.3	43	33	kW
Output power	W_o	=	110	85	110	85	kW
Efficiency	η	=	73	73	72	72	%

R.F. CLASS C ANODE MODULATION

LIMITING VALUES (Absolute limits)

Frequency	f		up to	30	MHz
Anode voltage	V_a	=	max.	11.5	kV
Anode dissipation	W_a	=	max.	30	kW
Negative grid voltage	$-V_g$	=	max.	1000	V
Grid dissipation	W_g	=	max.	1.3	kW
Anode current	I_a	=	max.	9	A
Grid current	I_g	=	max.	3.3	A

OPERATING CONDITIONS

Frequency	f	=	30	30	MHz
Anode voltage	V_a	=	11	10	kV
Grid voltage	Vg	=	-480	-440	V [1])
Anode current	I_a	=	7.6	6.9	A
Grid current	I_g	=	3.1	3.1	A
Grid resistor	R_g	=	90	80	Ω
Peak grid driving voltage	V_{g_p}	=	880	810	V
Grid driving power	W_{dr}	=	2.7	2.4	kW
Anode input power	Wi_a	=	83.6	69	kW
Anode dissipation	W_a	=	17.6	14	kW
Output power	W_o	=	66	55	kW
Efficiency	η	=	79	79	%
Modulation depth	m	=	100	100	%
Modulation power	W_{mod}	=	41.8	34.5	kW

[1]) Partially obtained by the grid resistor and grid current.

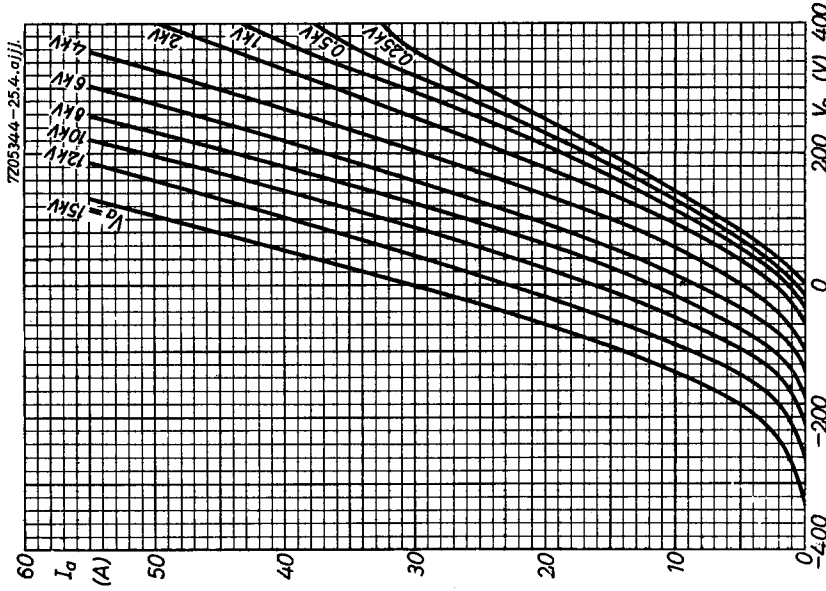
A.F. CLASS B AMPLIFIER AND MODULATOR

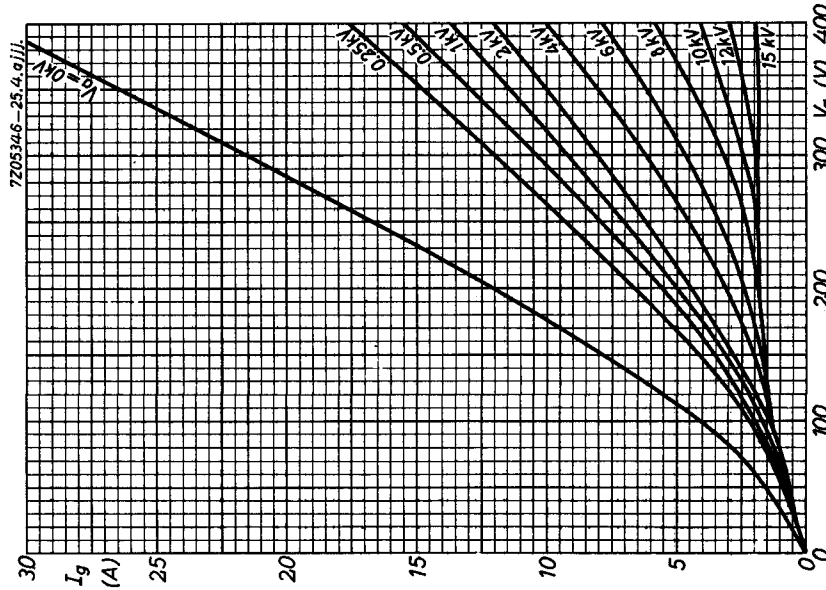
LIMITING VALUES (Absolute limits)

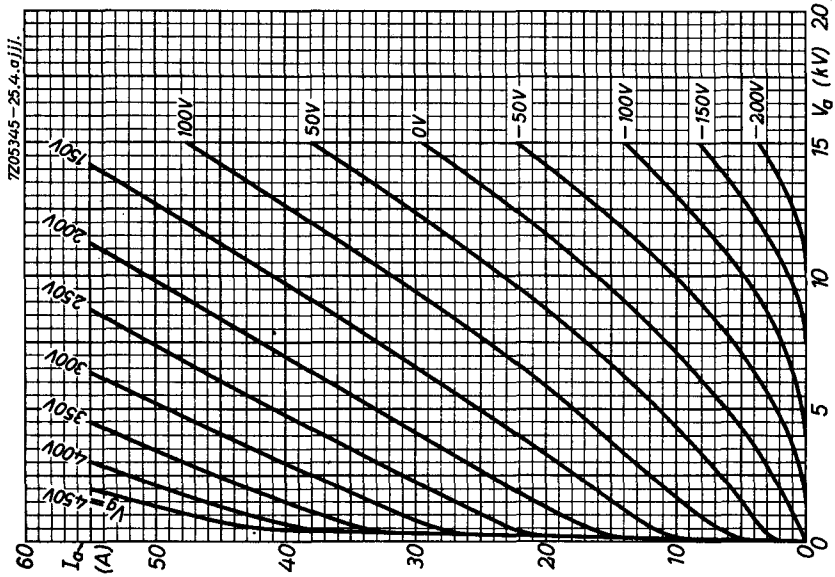
Anode voltage	V_a	= max.	12	kV
Anode dissipation	W_a	= max.	45	kW
Negative grid voltage	$-V_g$	= max.	1000	V
Grid dissipation	W_g	= max.	1.3	kW
Anode current	I_a	= max.	13	A
Grid current	I_g	= max.	3.3	A

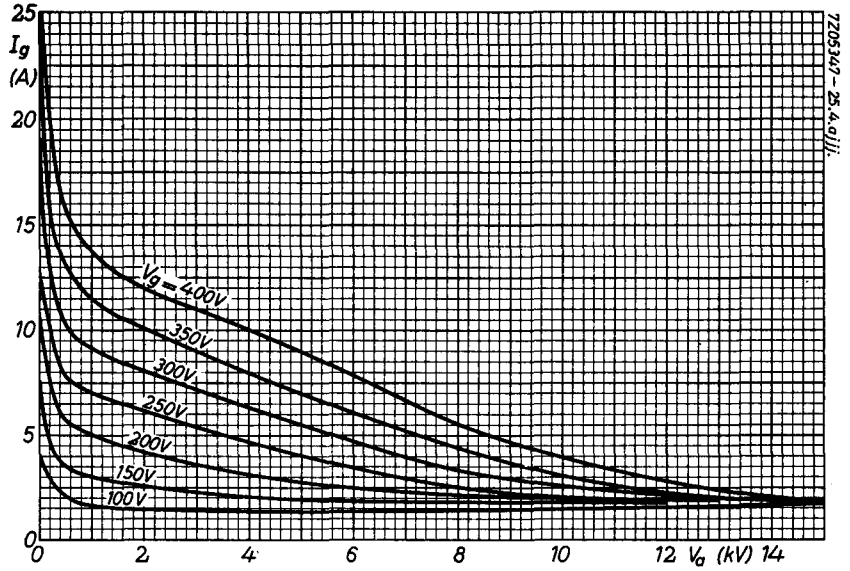
OPERATING CONDITIONS (two tubes in push-pull)

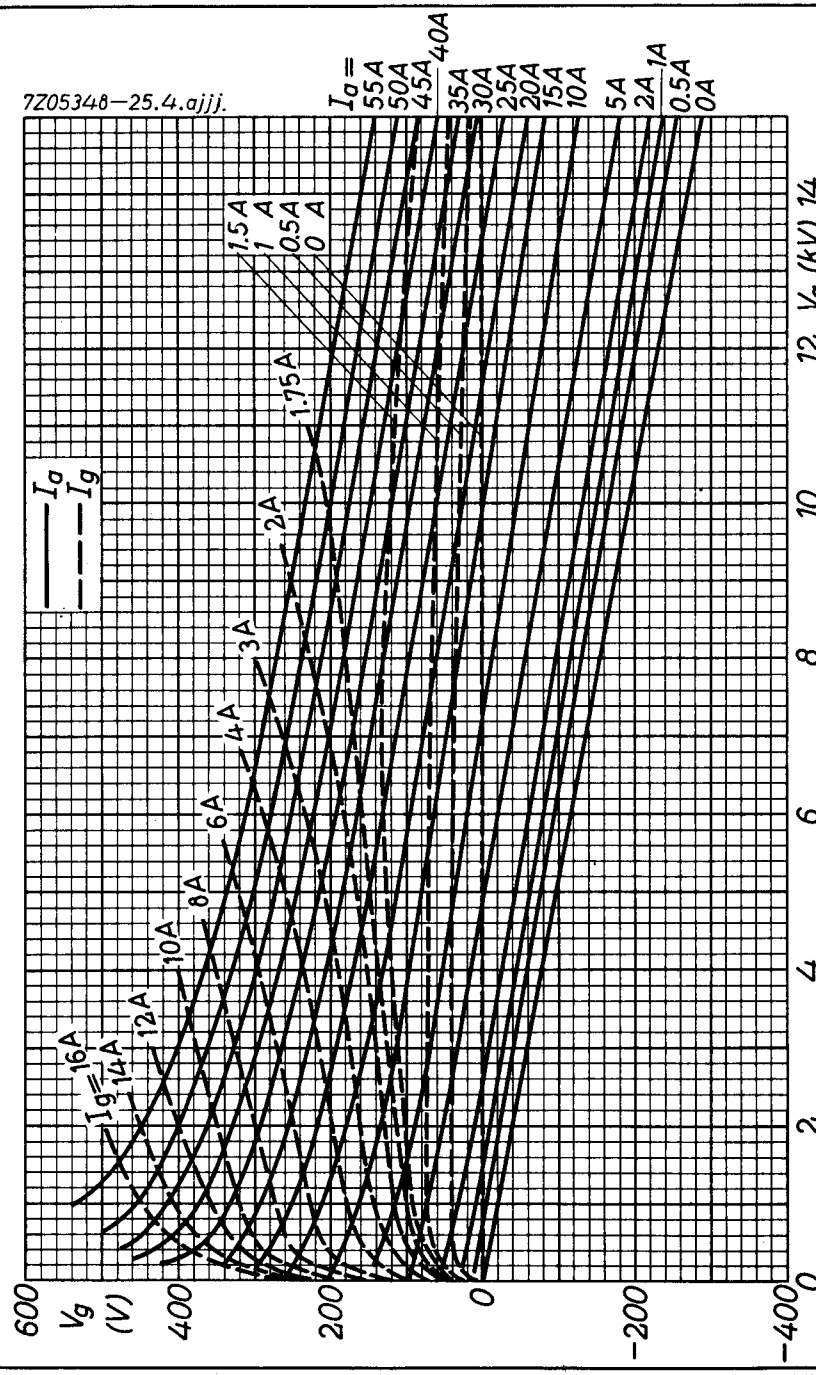
Anode voltage	V_a	=	12		10		kV
Grid voltage	V_g	=	−205		−170		V
Load resistance	$R_{aa\sim}$	=	2720		1810		Ω
Peak grid driving voltage	V_{ggp}	=	0	710	0	710	V
Anode current	I_a	=	2x0.4	2x4.75	2x0.4	2x5.75	A
Average grid current	I_g	=	0	2x0.45	0	2x0.72	A
Peak grid current	I_{gp}	=	0	2x2.9	0	2x4.0	A
Grid driving power	W_{dr}	=	0	2x150	0	2x235	W
Anode input power	Wi_a	=	2x4.0	2x57	2x4.0	2x57.5	kW
Anode dissipation	W_a	=	2x4.0	2x18	2x4.0	2x18.5	kW
Output power	W_o	=	0	78	0	78	kW
Efficiency	η	=	–	68.5	–	68	%

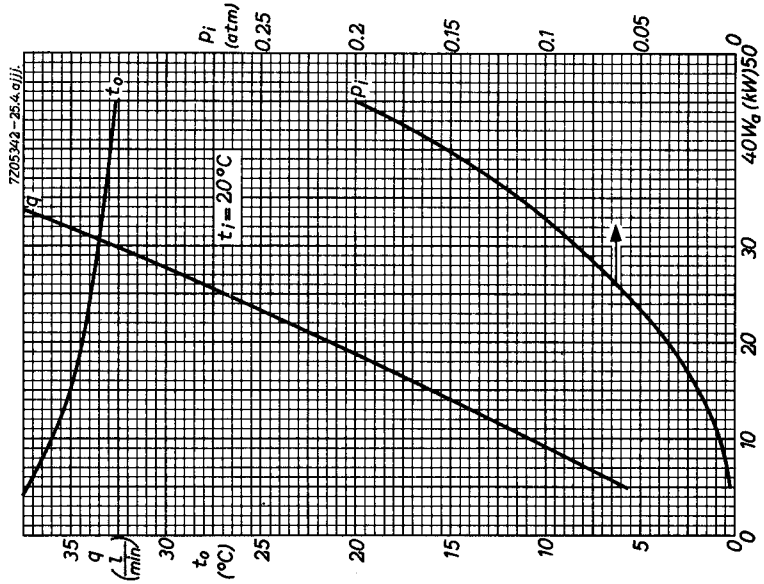

7205344-25.4.ojjj
Va = 15kV
12kV
10kV
8kV
6kV
4kV
2kV
1kV
0.5kV
0.25kV
Ia (A)
60
50
40
30
20
10
0
Vg (V)
400
200
0
-200
-400

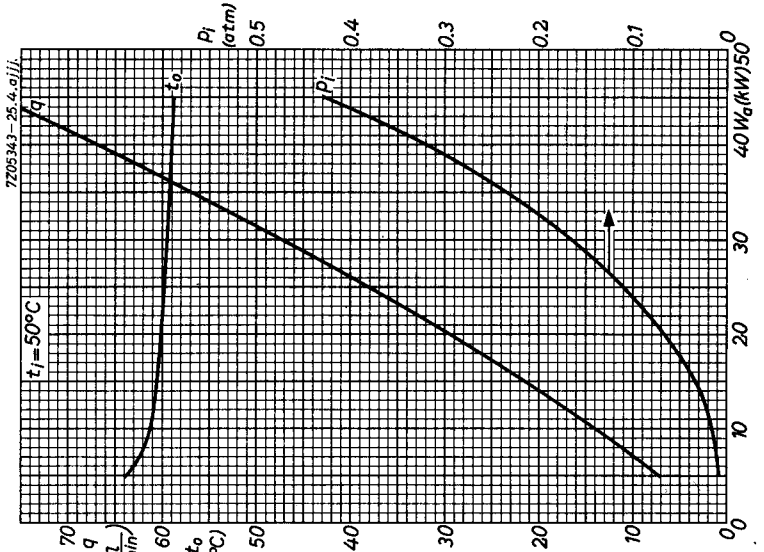

7205346-25.4.ojjj
Va = 0kV
0.25kV
0.5kV
1kV
2kV
4kV
6kV
8kV
10kV
12kV
15kV
Ig (A)
30
25
20
15
10
5
0
Vg (V)
400
300
200
100
0


7Z05345-25.4.ojjj.
100V
50V
0V
−50V
−100V
−150V
−200V
150V
200V
250V
300V
350V
400V
V_g = 450V
60
I_a (A)
50
40
30
20
10
0
15
V_a (kV) 20
5
10


25
I_g
(A)
20
15
10
5
0
V_g = 400V
350V
300V
250V
200V
150V
100V
0
2
4
6
8
10
12 V_a (kV) 14
7Z05340-25.4.ojjj.


7Z05348—25.4.ajjj.
Ia
Ig
Ia =
55A
50A
45A
40A
35A
30A
25A
20A
15A
10A
5A
2A
1A
0.5A
0A
1.5A
1A
0.5A
0A
1.75A
2A
3A
4A
6A
8A
10A
12A
14A
16A
Ig=
600
400
200
0
−200
−400
Vg (V)
0
2
4
6
8
10
12
14
Va (kV)


7205342-25.4.ajjj
t_i = 20°C
q
t_o
p_i (atm)
0.25
0.2
0.15
0.1
0.05
0
$40W_o$ (kW)50
30
20
10
0
p_i
35
30
25
20
15
10
5
0
q $(\frac{l}{min})$
t_o (°C)


7205343-25.4.ajjj
t_i = 50°C
q
t_o
p_i (atm)
0.5
0.4
0.3
0.2
0.1
0
$40W_o$(kW)50
30
20
10
0
p_i
70
60
50
40
30
20
10
0
q $(\frac{l}{min})$
t_o (°C)

AIR COOLED R.F. POWER TRIODE

QUICK REFERENCE DATA								
Frequency (MHz)	C telegraphy		C anode mod.		RF class B		AF class B Two tubes	
	V_a (kV)	W_o (kW)	V_a (kV)	W_o (kW)	V_a (kV)	W_o (kW)	V_a (kV)	W_o (kW)
10	15	120			15	110	12	78
30	12	90	11	66	12	110	10	78

HEATING: direct by A.C. or D.C.; filament thoriated tungsten

Filament voltage	V_f	=	12.6	V
Filament current	I_f	=	160	A

CAPACITANCES

Grid to filament	C_{gf}	=	120	pF
Anode to filament	C_{af}	=	1.4	pF
Anode to grid	C_{ag}	=	50	pF

TYPICAL CHARACTERISTICS

Anode voltage	V_a	=	3	kV
Anode current	I_a	=	1	A
Amplification factor	μ	=	58	
Mutual conductance	S	=	60	mA/V

TEMPERATURE LIMITS (Absolute limits)

Bulb temperature	t	= max.	220	°C
Seal temperature	t	= max.	220	°C

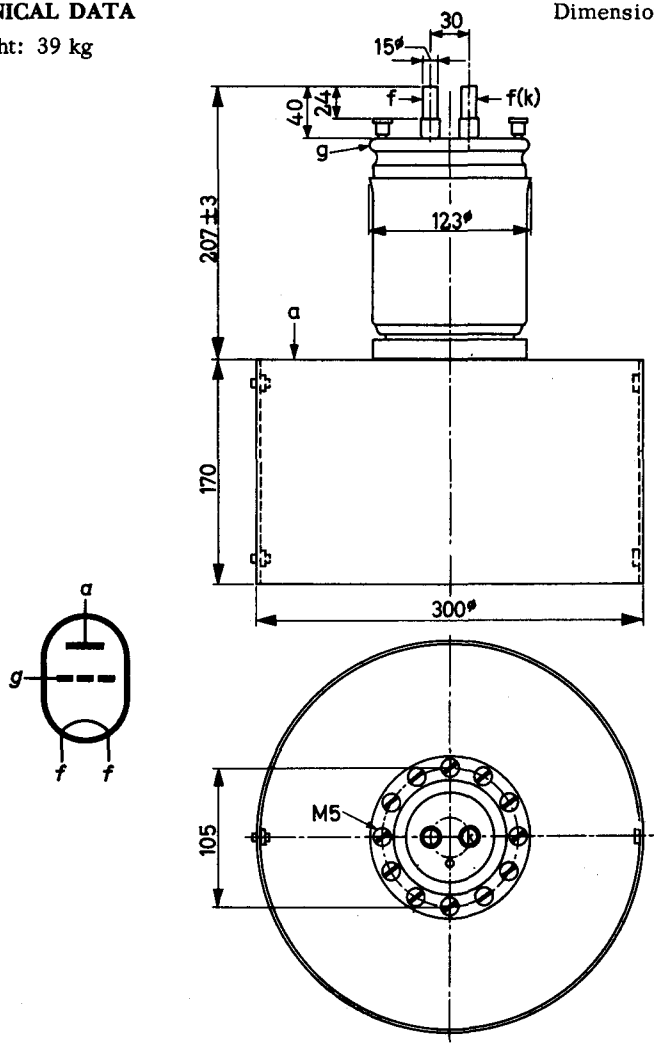
COOLING

For cooling data see cooling curves. These curves are for an air inlet temperature of 25 °C.
At lower temperatures the amount of air should be the same.
At higher temperatures the amount of air should be increased so that the outlet air temperature is not higher than at t_i = 25 °C.
At frequencies higher than 10 MHz a low velocity air flow should be directed to the grid and filament seals.

MECHANICAL DATA

Net weight: 39 kg

Dimensions in mm



ACCESSORIES

Insulating pedestal	40672	Mounting position: vertical with anode down
Filament connector	40670	
Grid connector	40671	

R.F. CLASS C TELEGRAPHY or **F.M. TELEPHONY**

LIMITING VALUES (Absolute limits)

Frequency	f		up to	10	up to	30	MHz
Anode voltage	V_a	=	max.	16	max.	12.5	kV
Anode dissipation	W_a	=	max.	35	max.	35	kW
Negative grid voltage	$-V_g$	=	max.	1000	max.	1000	V
Grid dissipation	W_g	=	max.	1.3	max.	1.3	kW
Anode current	I_a	=	max.	13	max.	13	A
Grid current	I_g	=	max.	3.3	max.	3.3	A

OPERATING CONDITIONS

Frequency	f	=	10	30	30	30	MHz
Anode voltage	V_a	=	15	12	10	8	kV
Grid voltage	V_g	=	-600	-550	-500	-450	V
Anode current	I_a	=	9.75	9.25	9.0	8.75	A
Grid current	I_g	=	2.2	2.2	2.1	1.85	A
Peak grid driving voltage	V_{gp}	=	1000	940	875	810	V
Grid driving power	W_{dr}	=	2.1	1.9	1.7	1.55	kW
Anode input power	Wi_a	=	146	111	90	70	kW
Anode dissipation	W_a	=	26	21	18	15	kW
Output power	W_o	=	120	90	72	55	kW
Efficiency	η	=	82	81	80	78.5	%

R.F. CLASS B AMPLIFIER

LIMITING VALUES (Absolute limits)

Frequency	f		up to	10	up to	30	MHz
Anode voltage	V_a	=	max.	16	max.	12.5	kV
Anode dissipation	W_a	=	max.	35	max.	35	kW
Negative grid voltage	$-V_g$	=	max.	1000	max.	1000	V
Grid dissipation	W_g	=	max.	1.3	max.	1.3	kW
Anode current	I_a	=	max.	13	max.	13	A
Grid current	I_g	=	max.	3.3	max.	3.3	A

OPERATING CONDITIONS

Frequency	f	=	10	10	30	30	MHz
Anode voltage	V_a	=	15	15	12	12	kV
Grid voltage	V_g	=	-260	-260	-210	-210	V
Anode current	I_a	=	10.1	7.75	12.7	9.85	A
Grid current	I_g	=	2.0	1.3	3.0	1.9	A
Peak grid driving voltage	V_{g_p}	=	600	520	650	520	V
Grid driving power	W_{dr}	=	1080	610	1770	880	W
Anode input power	W_{i_a}	=	151	116.3	153	118	kW
Anode dissipation	W_a	=	41	31.3	43	33	kW
Output power	W_o	=	110	85	110	85	kW
Efficiency	η	=	73	73	72	72	%

R.F. CLASS C ANODE MODULATION

LIMITING VALUES (Absolute limits)

Frequency	f		up to	30	MHz
Anode voltage	V_a	=	max.	11.5	kV
Anode dissipation	W_a	=	max.	30	kW
Negative grid voltage	$-V_g$	=	max.	1000	V
Grid dissipation	W_g	=	max.	1.3	kW
Anode current	I_a	=	max.	9	A
Grid current	I_g	=	max.	3.3	A

OPERATING CONDITIONS

Frequency	f	=	30	30	MHz
Anode voltage	V_a	=	11	10	kV
Grid voltage	V_g	=	-480	-440	V [1]
Anode current	I_a	=	7.6	6.9	A
Grid current	I_g	=	3.1	3.1	A
Grid resistor	R_g	=	90	80	Ω
Peak grid driving voltage	V_{gp}	=	880	810	V
Grid driving power	W_{dr}	=	2.7	2.4	kW
Anode input power	W_{i_a}	=	83.6	69	kW
Anode dissipation	W_a	=	17.6	14	kW
Output power	W_o	=	66	55	kW
Efficiency	η	=	79	79	%
Modulation depth	m	=	100	100	%
Modulation power	W_{mod}	=	41.8	34.5	kW

[1]) Partially obtained by the grid resistor and grid current.

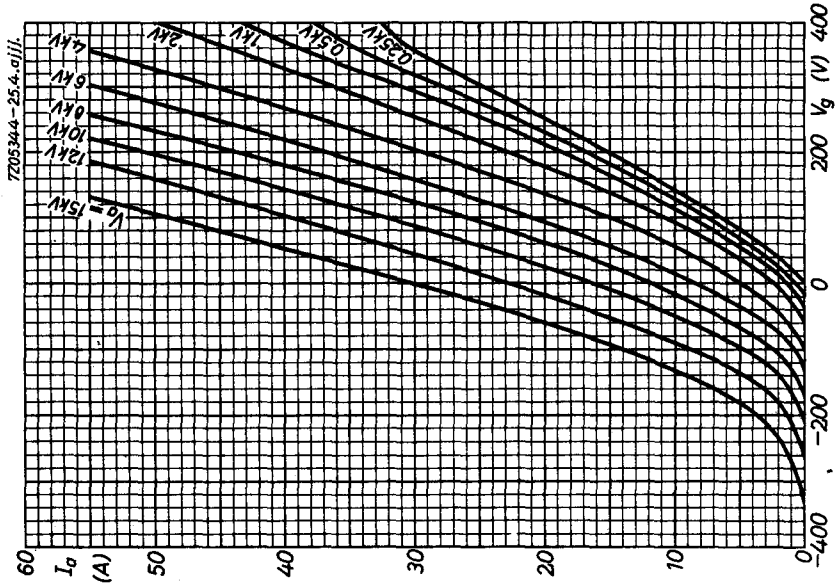
A.F. CLASS B AMPLIFIER AND MODULATOR

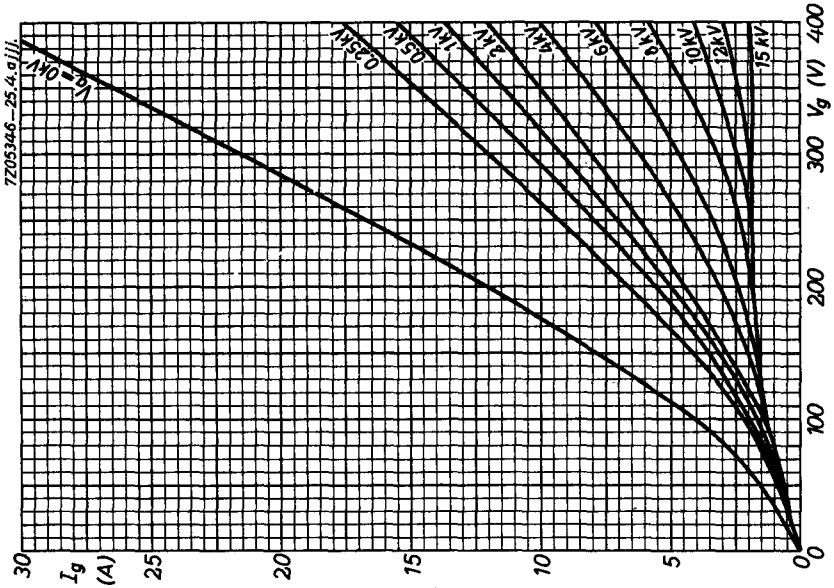
LIMITING VALUES (Absolute limits)

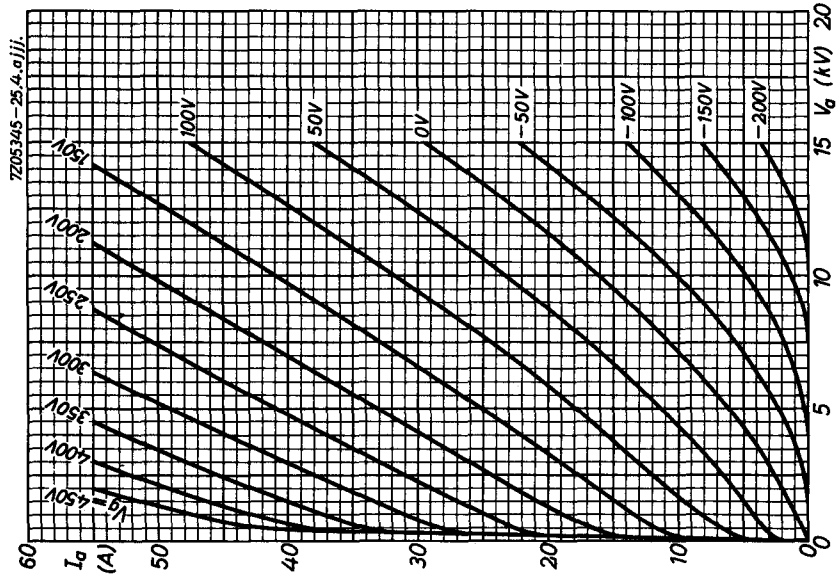
Anode voltage	V_a	= max.	12	kV
Anode dissipation	W_a	= max.	35	kW
Negative grid voltage	$-V_g$	= max.	1000	V
Grid dissipation	W_g	= max.	1.3	kW
Anode current	I_a	= max.	13	A
Grid current	I_g	= max.	3.3	A

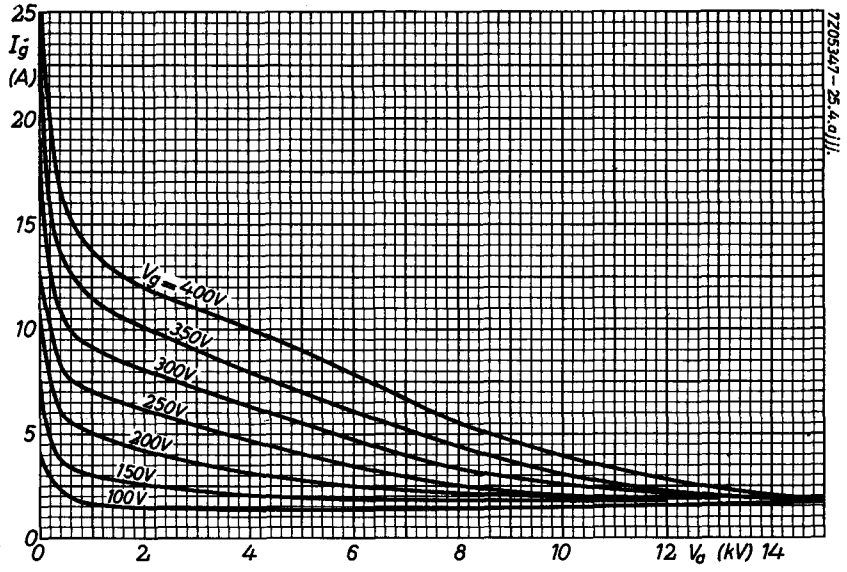
OPERATING CONDITIONS (two tubes in push-pull)

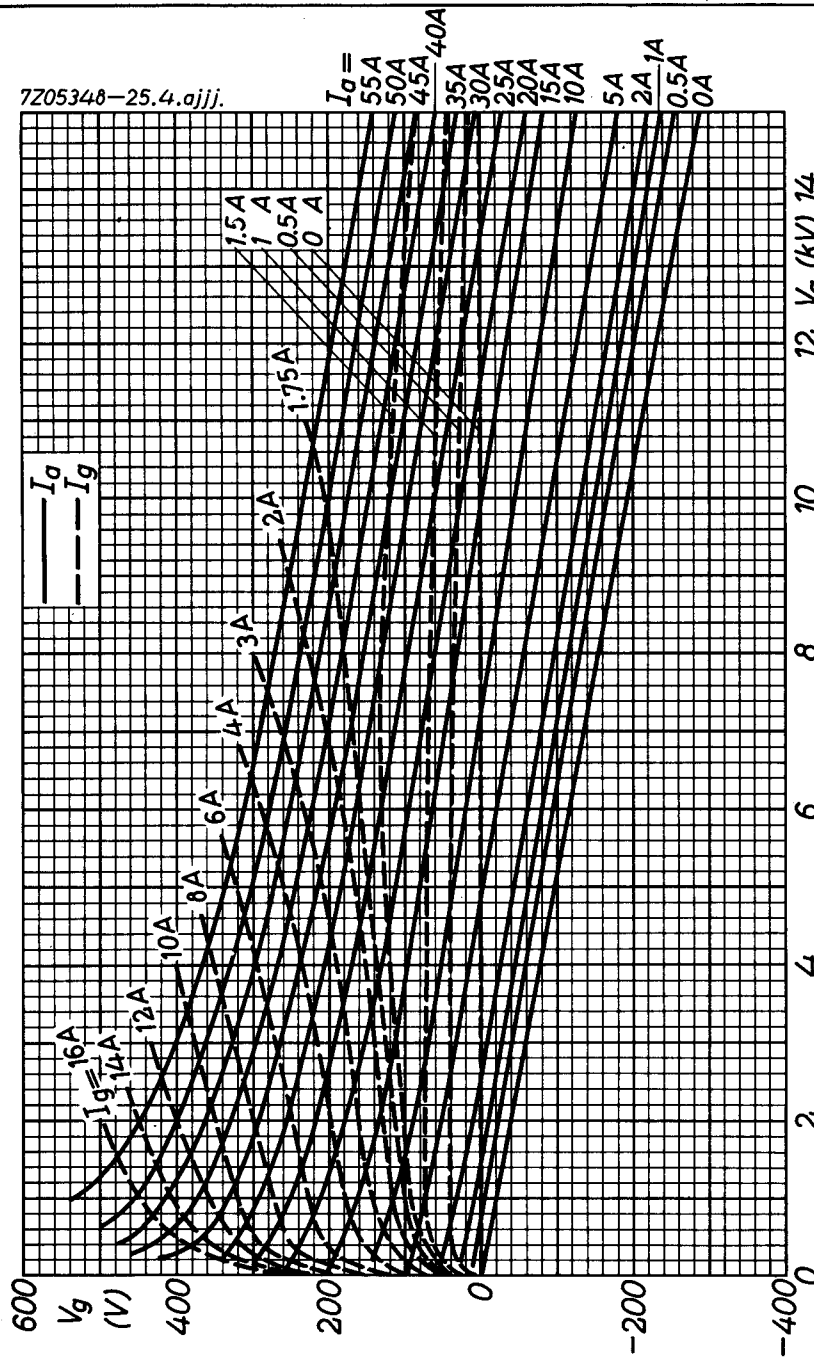
Anode voltage	V_a	=	12		10		kV
Grid voltage	V_g	=	−205		−170		V
Load resistance	$R_{aa\sim}$	=	2720		1810		Ω
Peak grid driving voltage	V_{ggp}	=	0	710	0	710	V
Anode current	I_a	=	2x0.4	2x4.75	2x0.4	2x5.75	A
Average grid current	I_g	=	0	2x0.45	0	2x0.72	A
Peak grid current	I_{gp}	=	0	2x2.9	0	2x4.0	A
Grid driving power	W_{dr}	=	0	2x150	0	2x235	W
Anode input power	W_{i_a}	=	2x4.0	2x57	2x4.0	2x57.5	kW
Anode dissipation	W_a	=	2x4.0	2x18	2x4.0	2x18.5	kW
Output power	W_o	=	0	78	0	78	kW
Efficiency	η	=	–	68.5	–	68	%

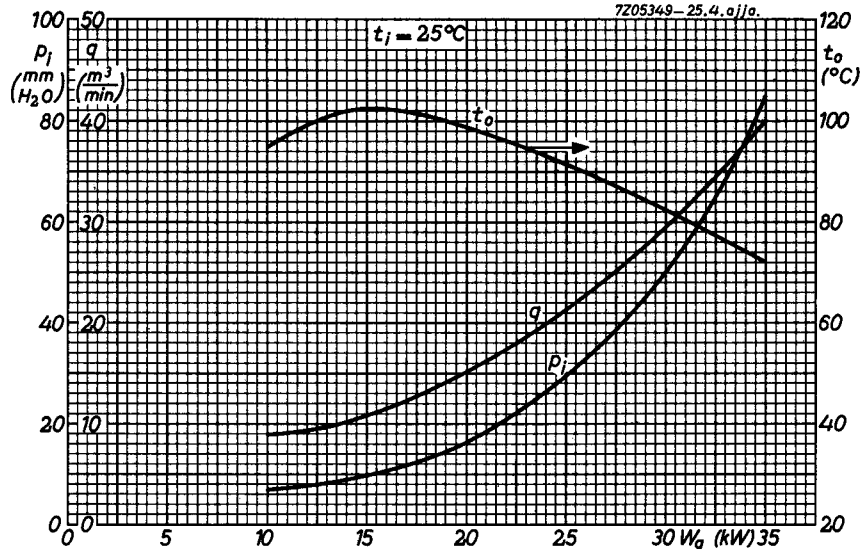

7205344-25.4.ai
I_a (A)
60
50
40
30
20
10
0
-400
-200
0
200
400
V_g (V)
V_a = 15kV
12kV
10kV
8kV
6kV
4kV
2kV
1kV
0.5kV
0.25kV


7205346-25.4.ai
I_g (A)
30
25
20
15
10
5
0
100
200
300
400
V_g (V)
V_a = 0kV
0.25kV
0.5kV
1kV
2kV
4kV
6kV
8kV
10kV
12kV
15kV


7Z05345-25.4.ai/i.
150V
100V
50V
0V
-50V
-100V
-150V
-200V
V_g = 450V
400V
350V
300V
250V
200V
150V
I_a (A)
60
50
40
30
20
10
0
V_a (kV)
20
15
10
5
0


7Z05347-25.4.ai/i.
I_g (A)
25
20
15
10
5
0
V_g = 400V
350V
300V
250V
200V
150V
100V
0
2
4
6
8
10
12 V_a (kV) 14


7Z05348—25.4.ajjj.
I_a =
55A
50A
45A
40A
35A
30A
25A
20A
15A
10A
5A
2A
1A
0.5A
0A
1.5A
1 A
0.5A
0 A
1.75A
2A
3A
4A
6A
8A
10A
12A
14A
16A
I_g
I_a
I_g
V_g (V)
600
400
200
0
−200
−400
0
2
4
6
8
10
12
V_a (kV) 14


7Z05349-25.4.ajja.
$t_i = 25°C$
p_i (mm H_2O)
q (m^3/min)
t_o (°C)
t_o
q
p_i
W_a (kW)
100
50
120
80
40
100
60
30
80
40
20
60
20
10
40
0
0
20
0
5
10
15
20
25
30
35

VAPOUR COOLED R.F. POWER TRIODE

QUICK REFERENCE DATA								
Frequency (MHz)	C telegraphy		C anode mod.		RF class B		AF class B Two tubes	
	V_a (kV)	W_o (kW)	V_a (kV)	W_o (kW)	V_a (kV)	W_o (kW)	V_a (kV)	W_o (kW)
10	15	120			15	110	12	78
30	12	90	11	66	12	110	10	78

HEATING: direct by A.C. or D.C.; filament thoriated tungsten

Filament voltage	V_f	=	12.6	V
Filament current	I_f	=	160	A

CAPACITANCES

Grid to filament	C_{gf}	=	120	pF
Anode to filament	C_{af}	=	1.4	pF
Anode to grid	C_{ag}	=	50	pF

TYPICAL CHARACTERISTICS

Anode voltage	V_a	=	3	kV
Anode current	I_a	=	1	A
Amplification factor	μ	=	58	
Mutual conductance	S	=	60	mA/V

TEMPERATURE LIMITS

Bulb temperature	t	= max.	220	°C
Seal temperature	t	= max.	220	°C

COOLING

Cooling data for anode dissipation W_a = 60 kW

Total dissipation to be transferred by cooling system

	$(W_a + W_g + 0.8\ W_f)$	=	63	kW
	equivalent to		900	kcal/min

Volume of produced vapour

at back flow water temperature of 20 °C	2.5	m^3/min
at back flow water temperature of 90 °C	2.8	m^3/min

COOLING (continued)

Amount of back flowing water

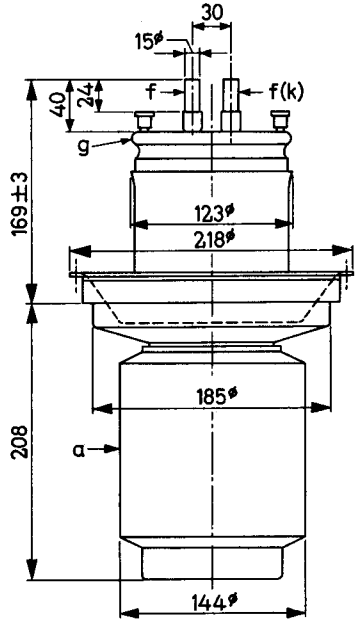
at back flow water temperature of 20 °C	1.5	l/min
at back flow water temperature of 90 °C	1.7	l/min

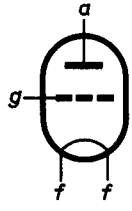
At frequencies higher than 10 MHz a low velocity air flow should be directed to the grid and filament seals.

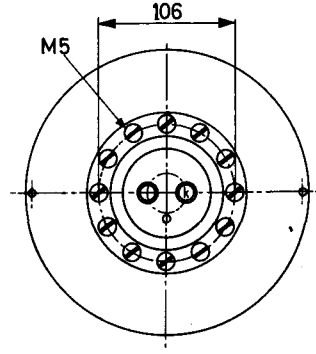
MECHANICAL DATA

Net weight: 17 kg

Dimensions in mm







Mounting position: vertical
with anode down

ACCESSORIES

Vapour cooling system	K728
Filament connectors with cable	40670
Grid connector	40671

R.F. CLASS C TELEGRAPHY or **F.M. TELEPHONY**

LIMITING VALUES (Absolute limits)

Frequency	f		up to	10	up to	30	MHz
Anode voltage	V_a	=	max.	16	max.	12.5	kV
Anode dissipation	W_a	=	max.	60	max.	60	kW
Negative grid voltage	$-V_g$	=	max.	1000	max.	1000	V
Grid dissipation	W_g	=	max.	1.3	max.	1.3	kW
Anode current	I_a	=	max.	13	max.	13	A
Grid current	I_g	=	max.	3.3	max.	3.3	A

OPERATING CONDITIONS

Frequency	f	=	10	30	30	30	MHz
Anode voltage	V_a	=	15	12	10	8	kV
Grid voltage	V_g	=	-600	-550	-500	-450	V
Anode current	I_a	=	9.75	9.25	9.0	8.75	A
Grid current	I_g	=	2.2	2.2	2.1	1.85	A
Peak grid driving voltage	V_{gp}	=	1000	940	875	810	V
Grid driving power	W_{dr}	=	2.1	1.9	1.7	1.55	kW
Anode input power	W_{ia}	=	146	111	90	70	kW
Anode dissipation	W_a	=	26	21	18	15	kW
Output power	W_o	=	120	90	72	55	kW
Efficiency	η	=	82	81	80	78.5	%

R.F. CLASS B AMPLIFIER

LIMITING VALUES (Absolute limits)

Frequency	f		up to	10	up to	30	MHz
Anode voltage	V_a	=	max.	16	max.	12.5	kV
Anode dissipation	W_a	=	max.	60	max.	60	kW
Negative grid voltage	$-V_g$	=	max.	1000	max.	1000	V
Grid dissipation	W_g	=	max.	1.3	max.	1.3	kW
Anode current	I_a	=	max.	13	max.	13	A
Grid current	I_g	=	max.	3.3	max.	3.3	A

OPERATING CONDITIONS

Frequency	f	=	10	10	30	30	MHz
Anode voltage	V_a	=	15	15	12	12	kV
Grid voltage	V_g	=	-260	-260	-210	-210	V
Anode current	I_a	=	10.1	7.75	12.7	9.85	A
Grid current	I_g	=	2.0	1.3	3.0	1.9	A
Peak grid driving voltage	V_{gp}	=	600	520	650	520	V
Grid driving power	W_{dr}	=	1080	610	1770	880	W
Anode input power	W_{i_a}	=	151	116.3	153	118	kW
Anode dissipation	W_a	=	41	31.3	43	33	kW
Output power	W_o	=	110	85	110	85	kW
Efficiency	η	=	73	73	72	72	%

R.F. CLASS C ANODE MODULATION

LIMITING VALUES (Absolute limits)

Frequency	f		up to	30	MHz
Anode voltage	V_a	=	max.	11.5	kV
Anode dissipation	W_a	=	max.	30	kW
Negative grid voltage	$-V_g$	=	max.	1000	V
Grid dissipation	W_g	=	max.	1.3	kW
Anode current	I_a	=	max.	9	A
Grid current	I_g	=	max.	3.3	A

OPERATING CONDITIONS

Frequency	f	=	30	30	MHz
Anode voltage	V_a	=	11	10	kV
Grid voltage	V_g	=	-480	-440	V [1]
Anode current	I_a	=	7.6	6.9	A
Grid current	I_g	=	3.1	3.1	A
Grid resistor	R_g	=	90	80	Ω
Peak grid driving voltage	V_{gp}	=	880	810	V
Grid driving power	W_{dr}	=	2.7	2.4	kW
Anode input power	Wi_a	=	83.6	69	kW
Anode dissipation	W_a	=	17.6	14	kW
Output power	W_o	=	66	55	kW
Efficiency	η	=	79	79	%
Modulation depth	m	=	100	100	%
Modulation power	W_{mod}	=	41.8	34.5	kW

[1]) Partially obtained by the grid resistor and grid current.

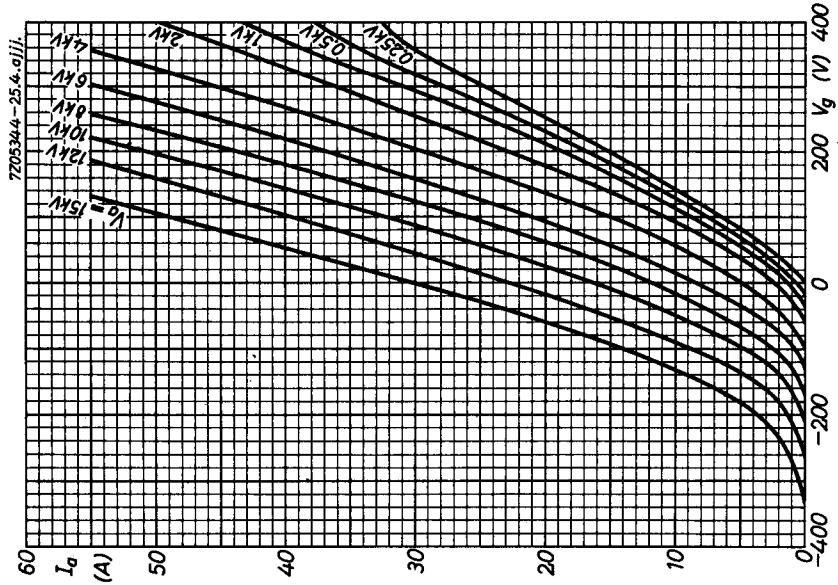
A.F. CLASS B AMPLIFIER AND MODULATOR

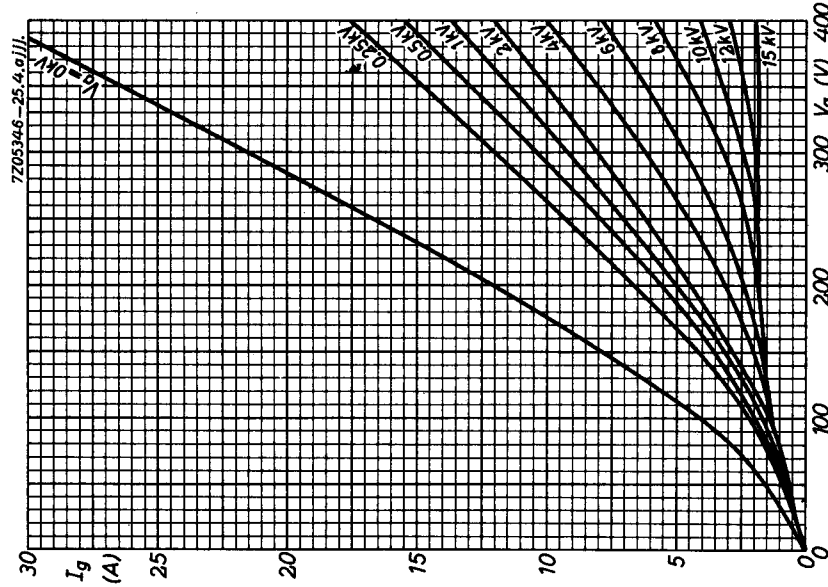
LIMITING VALUES (Absolute limits)

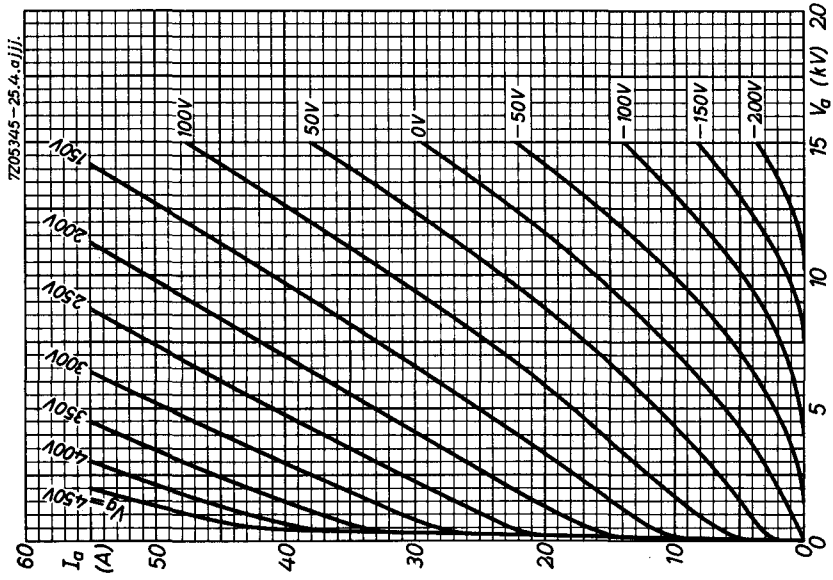
Anode voltage	V_a	=	max.	12	kV
Anode dissipation	W_a	=	max.	60	kW
Negative grid voltage	$-V_g$	=	max.	1000	V
Grid dissipation	W_g	=	max.	1.3	kW
Anode current	I_a	=	max.	13	A
Grid current	I_g	=	max.	3.3	A

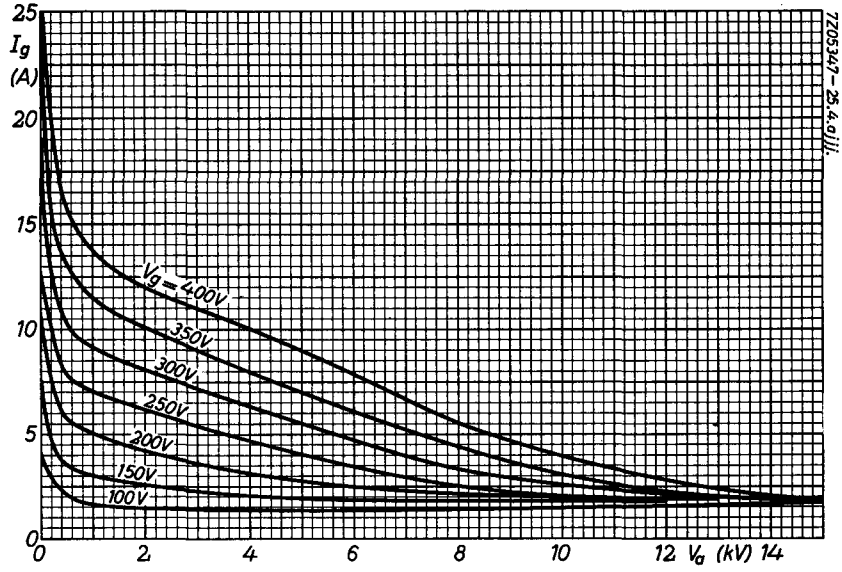
OPERATING CONDITIONS (two tubes in push-pull)

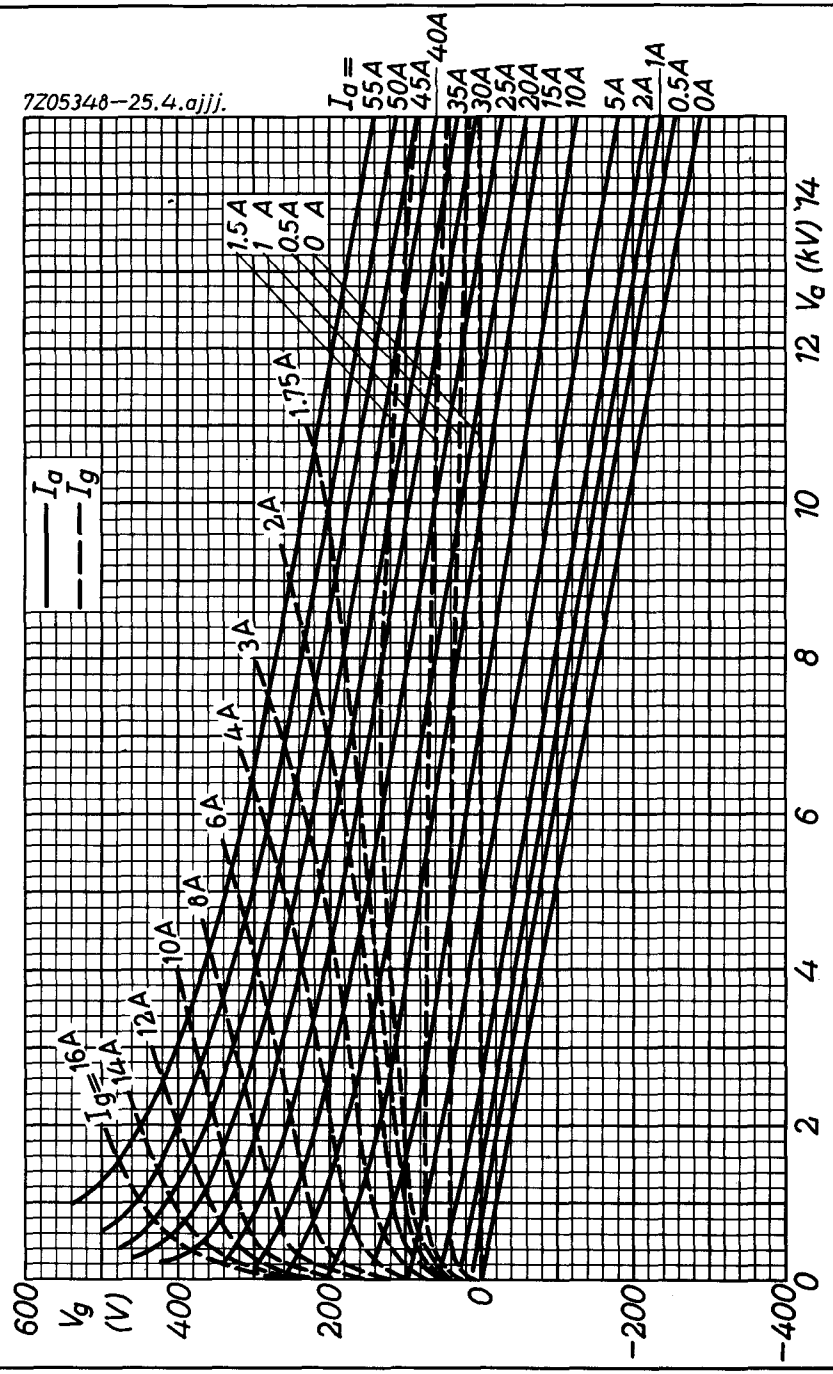
Anode voltage	V_a	=	12		10		kV
Grid voltage	V_g	=	−205		−170		V
Load resistance	$R_{aa\sim}$	=	2720		1810		Ω
Peak grid driving voltage	V_{ggp}	=	0	710	0	710	V
Anode current	I_a	=	2x0.4	2x4.75	2x0.4	2x5.75	A
Average grid current	I_g	=	0	2x0.45	0	2x0.72	A
Peak grid current	I_{gp}	=	0	2x2.9	0	2x4.0	A
Grid driving power	W_{dr}	=	0	2x150	0	2x235	W
Anode input power	W_{i_a}	=	2x4.0	2x57	2x4.0	2x57.5	kW
Anode dissipation	W_a	=	2x4.0	2x18	2x4.0	2x18.5	kW
Output power	W_o	=	0	78	0	78	kW
Efficiency	η	=	–	68.5	–	68	%


7205344-25.4.ai
I_a (A)
V_g (V)
V_a = 15kV
12kV
10kV
8kV
6kV
4kV
2kV
1kV
0.5kV
0.25kV


7205346-25.4.ai
I_g (A)
V_g (V)
V_a = 0kV
0.25kV
0.5kV
1kV
2kV
4kV
6kV
8kV
10kV
12kV
15kV


7Z05345-25.4.ajjj.
100V
50V
0V
-50V
-100V
-150V
-200V
Vg = 450V
400V
350V
300V
250V
200V
60
Ia (A)
50
40
30
20
10
0
0
5
10
15
20
Va (kV)


7Z05347-25.4.ajjj.
25
Ig (A)
20
15
10
5
0
Vg = 400V
350V
300V
250V
200V
150V
100V
0
2
4
6
8
10
12 Va (kV) 14


7Z05348–25.4.ajjj.
I_a =
55A
50A
45A
40A
35A
30A
25A
20A
15A
10A
5A
2A
1A
0.5A
0A
1.5A
1 A
0.5A
0 A
1.75A
2A
3A
4A
6A
8A
10A
12A
14A
16A
I_g =
I_a
I_g
V_g (V)
600
400
200
0
−200
−400
0
2
4
6
8
10
12
14
V_a (KV)

WATER COOLED R.F. POWER TRIODE

QUICK REFERENCE DATA								
Frequency (MHz)	C telegr.		B teleph.		C an.mod.		A.F.class B [1])	
	V_a (kV)	W_o (kW)	V_a (kV)	W_o (kW)	V_a (kV)	W_o (kW)	V_a (kV)	W_o (kW)
10	15	360					12	450
30	12	285	10	60	11	165	10	400
			8	50	10	135	8	300
			6	35	8	110	6	200

HEATING : direct by AC or DC; filament thoriated tungsten

Filament voltage	V_f	= 18	V
Filament current	I_f	= 280	A

CAPACITANCES

Anode to filament	C_{af}	= 7.5	pF
Grid to filament	C_{gf}	= 240	pF
Anode to grid	C_{ag}	= 120	pF

TYPICAL CHARACTERISTICS

Anode voltage	V_a	= 4	kV
Anode current	I_a	= 5	A
Amplification factor	μ	= 55	
Mutual conductance	S	= 130	mA/V

[1]) Two tubes

TEMPERATURE LIMITS (Absolute limits)

Bulb temperature = max. 180 °C

Seal temperature = max. 180 °C

COOLING CHARACTERISTICS . See also cooling curves

W_a (kW)	t_i (°C)	q_{min} (l/min)	p_i (atm)
10	20	12	0.003
	50	17	0.005
40	20	37	0.03
	50	54	0.07
80	20	75	0.12
	50	112	0.26
120	20	120	0.3
	50	179	0.6

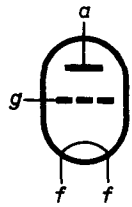
For inlet temperatures t_i between 20 °C and 50 °C the required quantity of water can be found by proportional interpolation.
At frequencies higher than 10 MHz a low velocity air flow should be directed to the seals of grid and filament.

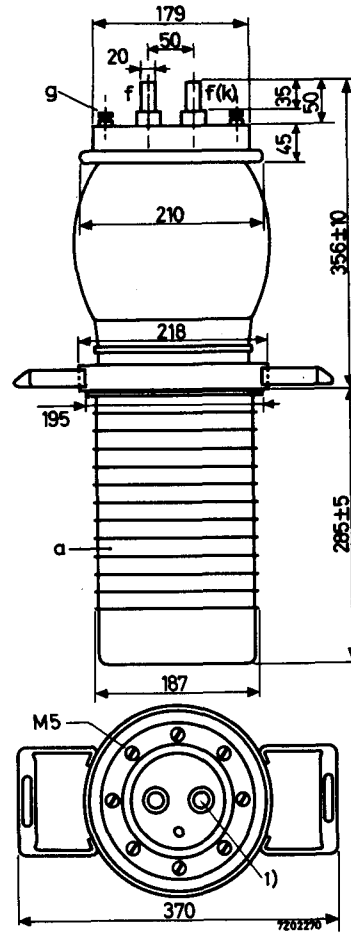
MECHANICAL DATA

Dimensions in mm

Net weight of tube : 32.5 kg

Net weight of water jacket: 30.5 kg





Mounting position: vertical with anode down

ACCESSORIES

Water jacket : K723

Filament connectors with cable: 40667

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[1]) This pin should be used for connecting the anode return lead.

R.F. CLASS C TELEGRAPHY

LIMITING VALUES (Absolute limits)

Frequency	f		up to 10	up to 30	MHz
Anode voltage	V_a	= max.	15	12	kV
Anode dissipation	W_a	= max.	120	120	kW
Negative grid voltage	$-V_g$	= max.	1200	1200	V
Grid dissipation	W_g	= max.	4	4	kW
Anode current	I_a	= max.	33	33	A
Grid current	I_g	= max.	8	8	A

OPERATING CONDITIONS

Frequency	f	=	10	10	30	30	MHz
Anode voltage	V_a	=	15	15	12	12	kV
Grid voltage	V_g	=	-520	-800	-480	-720	V
Anode current	I_a	=	29.3	24.7	29.3	24.7	A
Grid current	I_g	=	5.4	5.2	5.9	5.5	A
Peak driving voltage	V_{gp}	=	1090	1370	1050	1290	V
Driving power	W_{dr}	=	5.5	6.6	5.7	6.6	kW
Anode input power	W_{ia}	=	440	371	353	296	kW
Anode dissipation	W_a	=	80	61	68	51	kW
Output power	W_o	=	360	310	285	245	kW
Efficiency	η	=	81.8	83.5	80.8	82.6	%

R.F. CLASS C ANODE MODULATION

LIMITING VALUES (Absolute limits)

Frequency		f		up to 30	MHz
Anode voltage		V_a	= max.	11	kV
Anode dissipation		W_a	= max.	80	kW
Negative grid voltage		$-V_g$	= max.	1000	V
Grid dissipation		W_g	= max.	4	kW
Anode current		I_a	= max.	22	A
Grid current		I_g	= max.	8	A

OPERATING CONDITIONS

Frequency	f	=	30	30	30	MHz
Anode voltage	V_a	=	11	10	8	kV
Grid voltage	V_g	=	-170	-140	-100	V
Grid resistor	R_g	=	40	44	33	Ω
Anode current	I_a	=	19	17.3	18	A
Grid current	I_g	=	7.4	6.9	7.6	A
Peak driving voltage	V_{gp}	=	1000	930	855	V
Driving power	W_{dr}	=	7.1	6	6	kW
Anode input power	W_{ia}	=	209	173	144	kW
Anode dissipation	W_a	=	44	38	34	kW
Output power	W_o	=	165	135	110	kW
Efficiency	η	=	79	78	76.5	%
Modulation depth	m	=	100	100	100	%
Modulation power	W_{mod}	=	105	87	72	kW

R.F. CLASS B TELEPHONY

LIMITING VALUES (Absolute limits)

Frequency	f		up to 10	up to 30	MHz
Anode voltage	V_a	= max.	15	12	kV
Anode dissipation	W_a	= max.	120	120	kW
Negative grid voltage	$-V_g$	= max.	800	800	V
Grid dissipation	W_g	= max.	4	4	kW
Anode current	I_a	= max.	27	27	A
Grid current	I_g	= max.	8	8	A

OPERATING CONDITIONS

Frequency	f	=	30	30	30	MHz
Anode voltage	V_a	=	10	8	6	kV
Grid voltage	V_g	=	-150	-115	-82	V
Anode current	I_a	=	17	18.2	17.9	A
Grid current	I_g	=	0.8	1.2	1.5	A
Peak driving voltage	V_{gp}	=	338	338	321	V
Driving power	W_{dr}	=	0.25	0.36	0.43	kW
Anode input power	W_{ia}	=	170	146	108	kW
Anode dissipation	W_a	=	110	96	73	kW
Output power	W_o	=	60	50	35	kW
Efficiency	η	=	35.3	34.3	32.6	%
Modulation depth	m	=	100	100	100	%
Grid current	I_g	=	5.9	6.8	7.2	A
Driving power	W_{dr}	=	3.6	4.1	4.1	kW

A.F. CLASS B AMPLIFIER

LIMITING VALUES (Absolute limits)

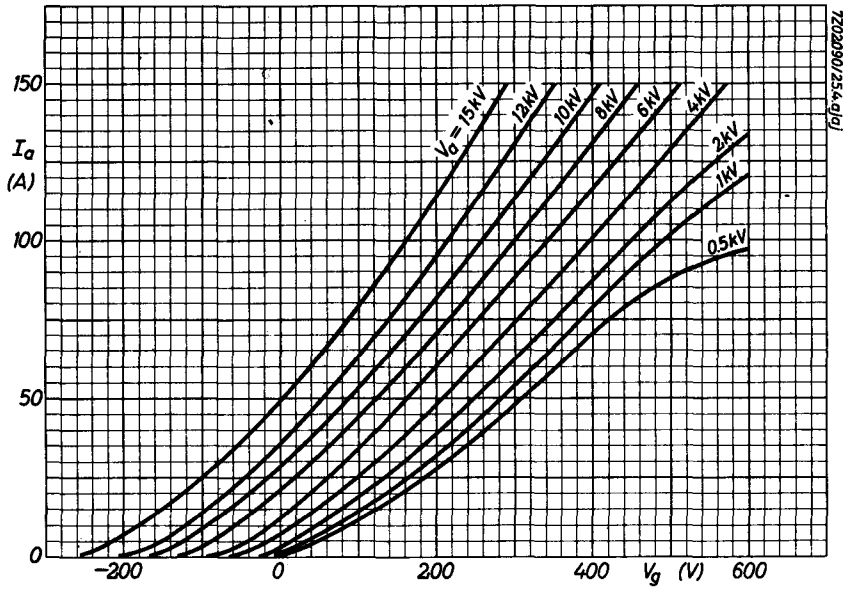
Anode voltage	V_a	= max.	12	kV
Anode dissipation	W_a	= max.	120	kW
Negative grid voltage	$-V_g$	= max.	800	V
Grid dissipation	W_g	= max.	4	kW
Anode current	I_a	= max.	33	A
Grid current	I_g	= max.	8	A

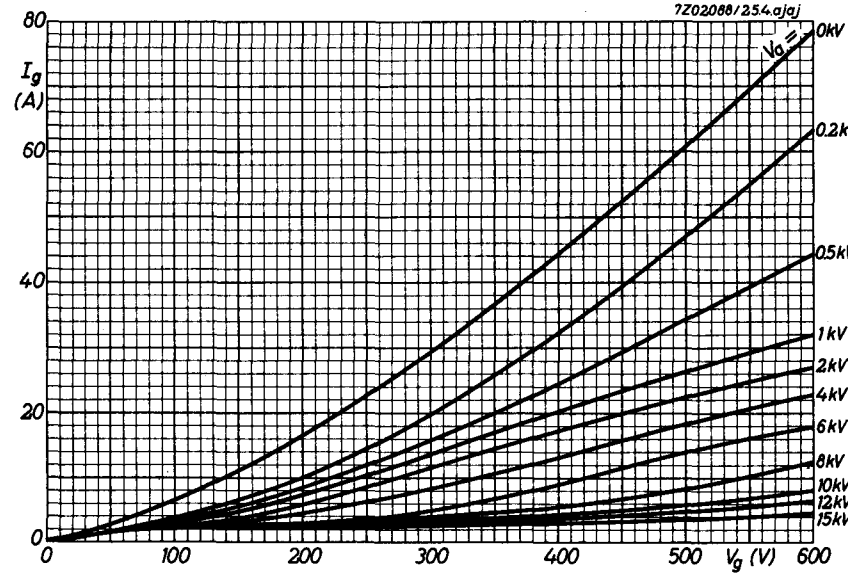
OPERATING CONDITIONS, two tubes in push-pull

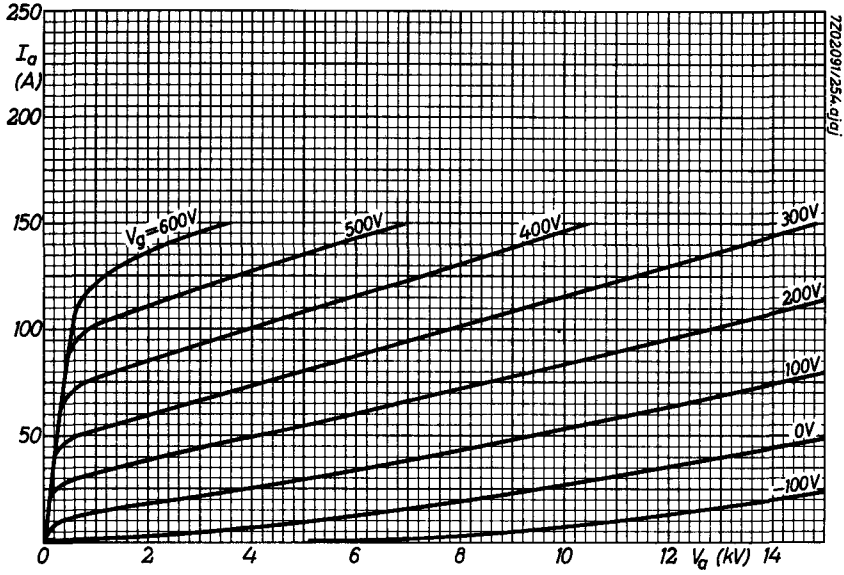
Anode voltage	V_a	=	12		10		kV
Grid voltage	V_g	=	-180		-150		V
Load resistance	$R_{aa\sim}$	=	552		410		Ω
Peak driving voltage	V_{ggp}	=	0	1210	0	1205	V
Anode current	I_a	=	2x2	2x26	2x1.8	2x28	A
Grid current	I_g	=	0	2x4.4	0	2x4.8	A
Peak grid current	$I_{g\,p}$	=	0	2x23	0	2x24	A
Driving power	W_{dr}	=	0	2x2.4	0	2x2.6	kW
Anode input power	W_{ia}	=	2x24	2x312	2x18	2x280	kW
Anode dissipation	W_a	=	2x24	2x87	2x18	2x80	kW
Output power	W_o	=	0	450	0	400	kW
Efficiency	η	=	-	72	-	71.4	%

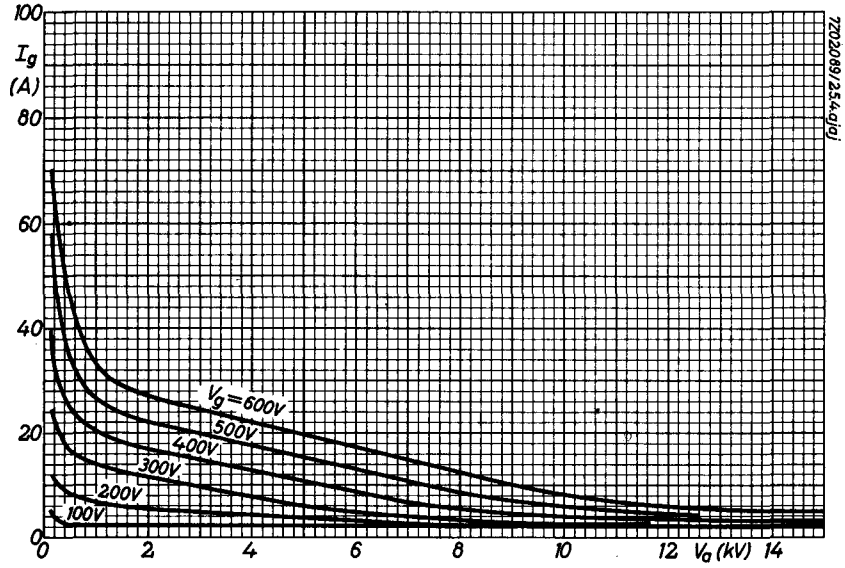
OPERATING CONDITIONS, two tubes in push-pull (continued)

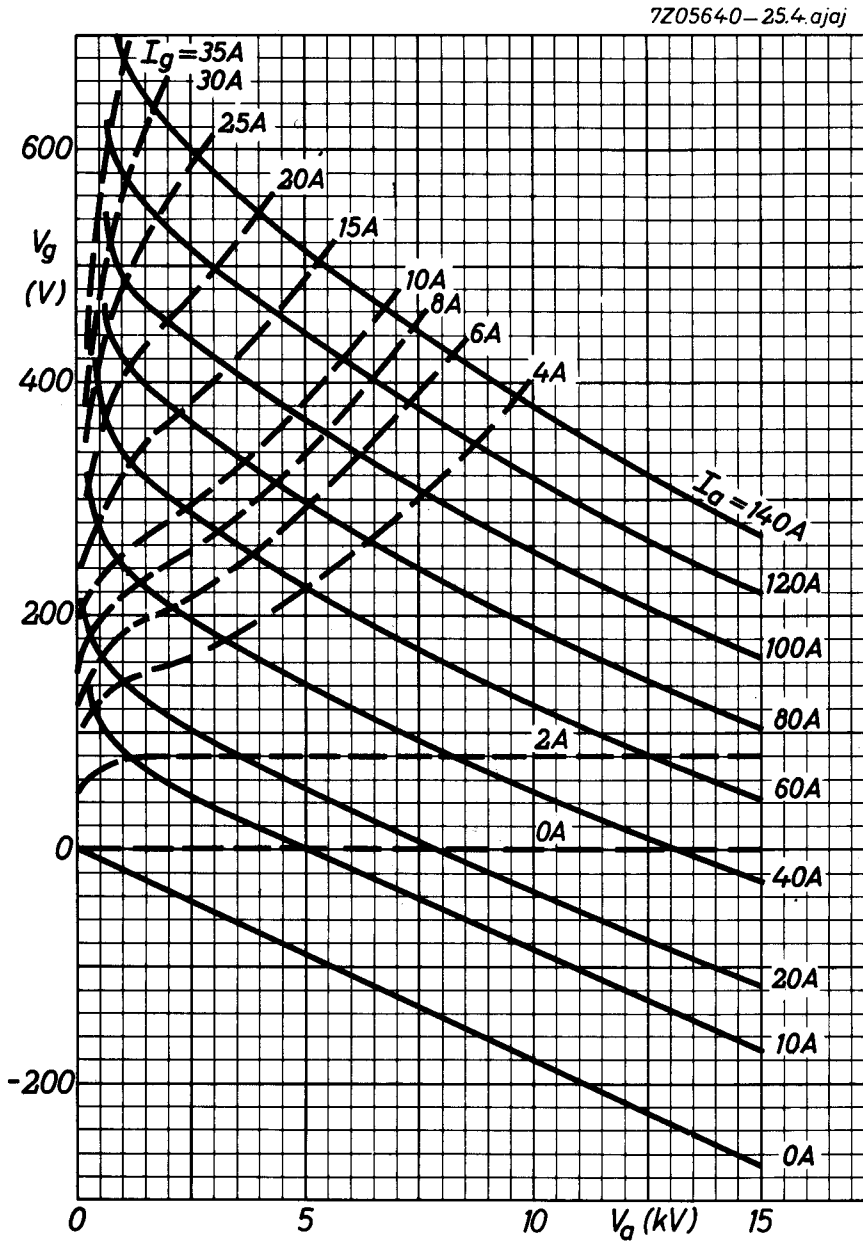
Anode voltage	V_a	=	8		6		kV
Grid voltage	V_g	=	-115		-82		V
Load resistance	$R_{aa\sim}$	=	338		268		Ω
Peak driving voltage	V_{ggp}	=	0	1110	0	990	V
Anode current	I_a	=	2x1.6	2x27	2x1.4	2x25	A
Grid current	I_g	=	0	2x5	0	2x4.9	A
Peak grid current	I_{gp}	=	0	2x24	0	2x22	A
Driving power	W_{dr}	=	0	2x2.5	0	2x2.2	kW
Anode input power	W_{ia}	=	2x12.8	2x216	2x8.4	2x150	kW
Anode dissipation	W_a	=	2x12.8	2x66	2x8.4	2x50	kW
Output power	W_o	=	0	300	0	200	kW
Efficiency	η	=	-	69.5	-	67	%

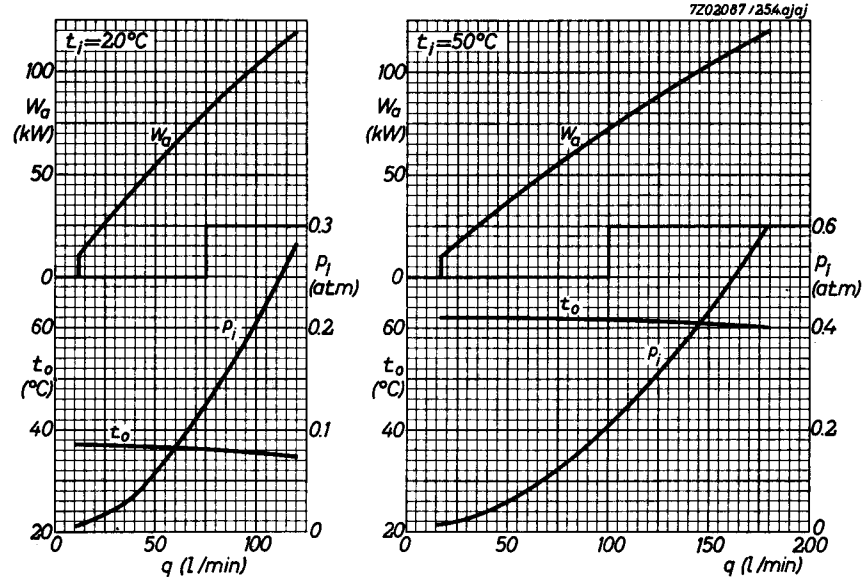

7Z02090/254.ajaj
150
I_a
(A)
100
50
0
V_a = 15kV
12kV
10kV
8kV
6kV
4kV
2kV
1kV
0.5kV
−200
0
200
400
V_g (V)
600


7Z02088/254.ajaj
80
I_g
(A)
60
40
20
0
V_a =
0kV
0.2kV
0.5kV
1kV
2kV
4kV
6kV
8kV
10kV
12kV
15kV
0
100
200
300
400
500
V_g (V)
600


250
I_a
(A)
200
150
100
50
0
2
4
6
8
10
12
14
V_a (kV)
V_g=600V
500V
400V
300V
200V
100V
0V
-100V
7Z02091/254.ajaj


100
I_g
(A)
80
60
40
20
0
2
4
6
8
10
12
14
V_a (kV)
V_g=600V
500V
400V
300V
200V
100V
7Z02089/254.ajaj


7Z05640—25.4.ajaj
I_g=35A
30A
25A
20A
15A
10A
8A
6A
4A
I_a=140A
120A
100A
80A
60A
2A
0A
40A
20A
10A
0A
600
400
200
0
-200
V_g
(V)
0
5
10
15
V_a (kV)


7Z02087/254.ajaj
t_i=20°C
W_a (kW)
100
50
0
60
40
20
t_o (°C)
W_a
P_i
t_o
0.3
0.2
0.1
0
P_i (atm)
0
50
100
q (l/min)
t_i=50°C
W_a (kW)
100
50
0
60
40
20
t_o (°C)
W_a
t_o
P_i
0.6
0.4
0.2
0
P_i (atm)
0
50
100
150
200
q (l/min)

VAPOUR COOLED R.F. POWER TRIODE

QUICK REFERENCE DATA								
Frequency (MHz)	C telegraphy		C anode mod.		B telephony		AF class B Two tubes	
	V_a (kV)	W_o (kW)	V_a (kV)	W_o (kW)	V_a (kV)	W_o (kW)	V_a (kV)	W_o (kW)
10	15	360					12	450
30	12	285	11	165	10	60	10	400
			10	135	8	50	8	300
			8	110	6	35	6	200

HEATING: direct by A.C. or D.C.; filament thoriated tungsten

Filament voltage	V_f	=	18	V
Filament current	I_f	=	280	A

CAPACITANCES

Grid to filament	C_{gf}	=	240	pF
Anode to filament	C_{af}	=	7.5	pF
Anode to grid	C_{ag}	=	120	pF

TYPICAL CHARACTERISTICS

Anode voltage	V_a	=	4	kV
Anode current	I_a	=	5	A
Amplification factor	μ	=	55	
Mutual conductance	S	=	130	mA/V

TEMPERATURE LIMITS (Absolute limits)

Bulb temperature	t	=	max. 180	°C
Seal temperature	t	=	max. 180	°C

COOLING

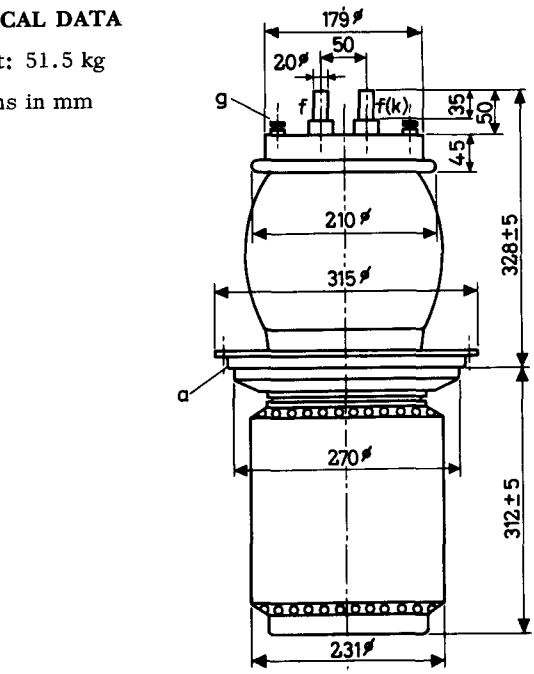
Cooling data for anode dissipation W_a = 180 kW

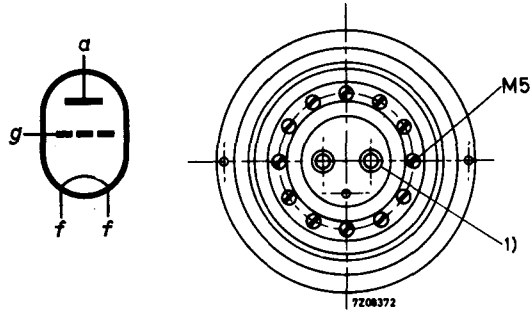
Total dissipation to be transferred by cooling system ($W_a + W_g + 0.8\ W_f$)	188	kW
equivalent to	2700	k cal/min
Volume of produced vapour		
at back flow water temperature of 20 °C	7.3	m^3/min
at back flow water temperature of 90 °C	8.3	m^3/min
Amount of back flowing water		
at back flow water temperature of 20 °C	4.4	l/min
at back flow water temperature of 90 °C	5.1	l/min

MECHANICAL DATA

Net weight: 51.5 kg

Dimensions in mm





Mounting position: vertical with anode down

ACCESSORIES

Vapour cooling system	K729
Filament connectors with cable	40667

1) This pin should be used for connecting the anode return lead

R.F. CLASS C TELEGRAPHY

LIMITING VALUES (Absolute limits)

Frequency	f		up to	10	up to	30	MHz
Anode voltage	V_a	=	max.	15		12	kV
Anode dissipation	W_a	=	max.	180		180	kW
Negative grid voltage	$-V_g$	=	max.	1200		1200	V
Grid dissipation	W_g	=	max.	4		4	kW
Anode current	I_a	=	max.	33		33	A
Grid current	I_g	=	max.	8		8	A

OPERATING CONDITIONS

Frequency	f	=	10	10	30	30	MHz
Anode voltage	V_a	=	15	15	12	12	kV
Grid voltage	V_g	=	-520	-800	-480	-720	V
Anode current	I_a	=	29.3	24.7	29.3	24.7	A
Grid current	I_g	=	5.4	5.2	5.9	5.5	A
Peak driving voltage	V_{gp}	=	1090	1370	1050	1290	V
Driving power	W_{dr}	=	5.5	6.6	5.7	6.6	kW
Anode input power	W_{i_a}	=	440	371	353	296	kW
Anode dissipation	W_a	=	80	61	68	51	kW
Output power	W_o	=	360	310	285	245	kW
Efficiency	η	=	81.8	83.5	80.8	82.6	%

R.F. CLASS C ANODE MODULATION

LIMITING VALUES (Absolute limits)

Frequency		f		up to	30	MHz
Anode voltage		V_a	=	max.	11	kV
Anode dissipation		W_a	=	max.	120	kW
Negative grid voltage		$-V_g$	=	max.	1000	V
Grid dissipation		W_g	=	max.	4	kW
Anode current		I_a	=	max.	22	A
Grid current		I_g	=	max.	8	A

OPERATING CONDITIONS

Frequency	f	=	30	30	30	MHz
Anode voltage	V_a	=	11	10	8	kV
Grid voltage	V_g	=	−170	−140	−100	V
Grid resistor	R_g	=	40	44	33	Ω
Anode current	I_a	=	19	17.3	18	A
Grid current	I_g	=	7.4	6.9	7.6	A
Peak driving voltage	V_{gp}	=	1000	930	855	V
Driving power	W_{dr}	=	7.1	6.0	6.0	kW
Anode input power	W_{i_a}	=	209	173	144	kW
Anode dissipation	W_a	=	44	38	34	kW
Output power	W_o	=	165	135	110	kW
Efficiency	η	=	79	78	76.5	%
Modulation depth	m	=	100	100	100	%
Modulation power	W_{mod}	=	105	87	72	kW

R.F. CLASS B TELEPHONY

LIMITING VALUES (Absolute limits)

Frequency	f		up to 10	up to 30	MHz
Anode voltage	V_a	=	max. 15	12	kV
Anode dissipation	W_a	=	max. 180	180	kW
Negative grid voltage	$-V_g$	=	max. 800	800	V
Grid dissipation	W_g	=	max. 4	4	kW
Anode current	I_a	=	max. 27	27	A
Grid current	I_g	=	max. 8	8	A

OPERATING CONDITIONS

Frequency	f	=	30	30	30	MHz
Anode voltage	V_a	=	10	8	6	kV
Grid voltage	V_g	=	-150	-115	-82	V
Anode current	I_a	=	17	18.2	17.9	A
Grid current	I_g	=	0.8	1.2	1.5	A
Peak driving voltage	V_{gp}	=	338	338	321	V
Driving power	W_{dr}	=	0.25	0.36	0.43	kW
Anode input power	W_{i_a}	=	170	146	108	kW
Anode dissipation	W_a	=	110	96	73	kW
Output power	W_o	=	60	50	35	kW
Efficiency	η	=	35.3	34.3	32.6	%
Modulation depth	m	=	100	100	100	%
Grid current	I_g	=	5.9	6.8	7.2	A
Driving power	W_{dr}	=	3.6	4.1	4.1	kW

A.F. CLASS B AMPLIFIER AND MODULATOR

LIMITING VALUES (Absolute limits)

Anode voltage	V_a	=	max. 12	kV
Anode dissipation	W_a	=	max. 180	kW
Negative grid voltage	$-V_g$	=	max. 800	V
Grid dissipation	W_g	=	max. 4	kW
Anode current	I_a	=	max. 33	A
Grid current	I_g	=	max. 8	A

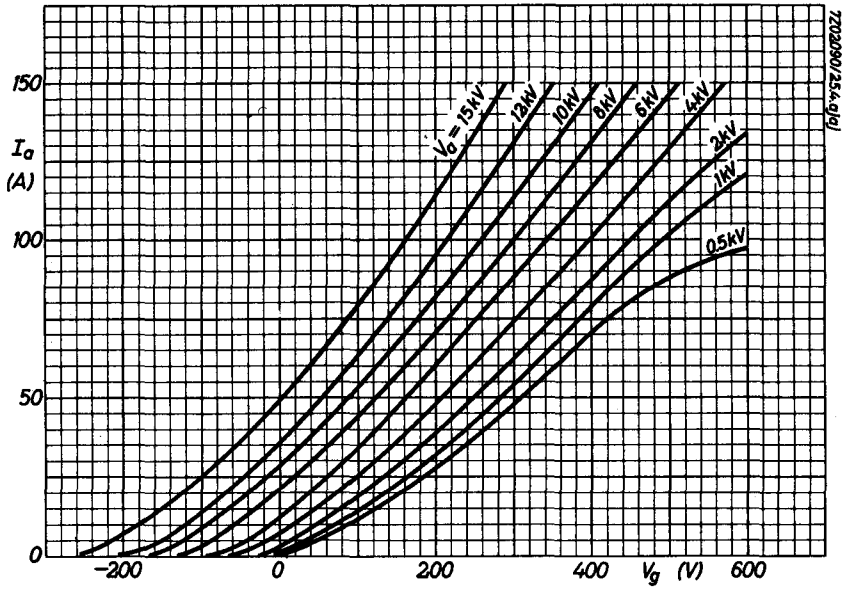
OPERATING CONDITIONS (Two tubes in push-pull)

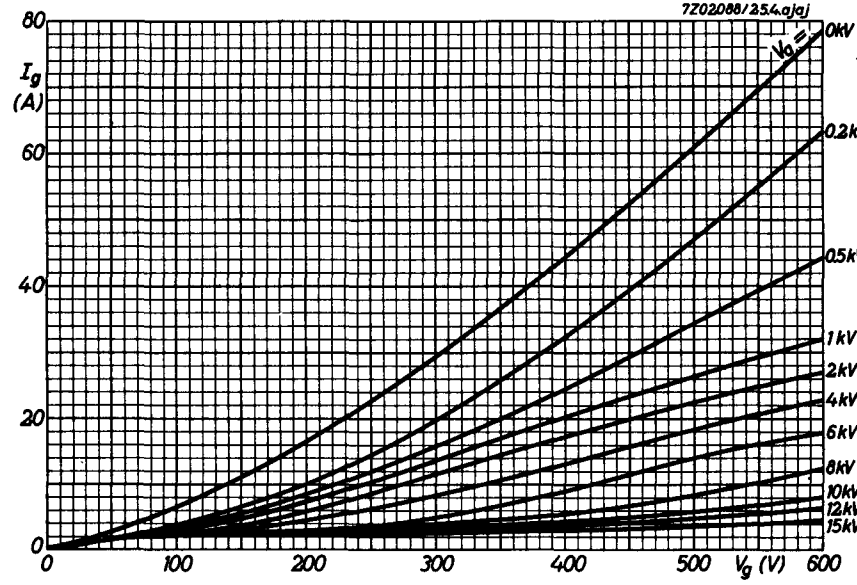
Anode voltage	V_a	=	12		10		kV
Grid voltage	V_g	=	-180		-150		V
Load resistance	$R_{aa\sim}$	=	552		410		Ω
Peak driving voltage	V_{ggp}	=	0	1210	0	1205	V
Anode current	I_a	=	2x2.0	2x26	2x1.8	2x28	A
Average grid current	I_g	=	0	2x4.4	0	2x4.8	A
Peak grid current	I_{gp}	=	0	2x23	0	2x24	A
Driving power	W_{dr}	=	0	2x2.4	0	2x2.6	kW
Anode input power	W_{i_a}	=	2x24	2x312	2x18	2x280	kW
Anode dissipation	W_a	=	2x24	2x87	2x18	2x80	kW
Output power	W_o	=	0	450	0	400	kW
Efficiency	η	=	-	72	-	71.4	%

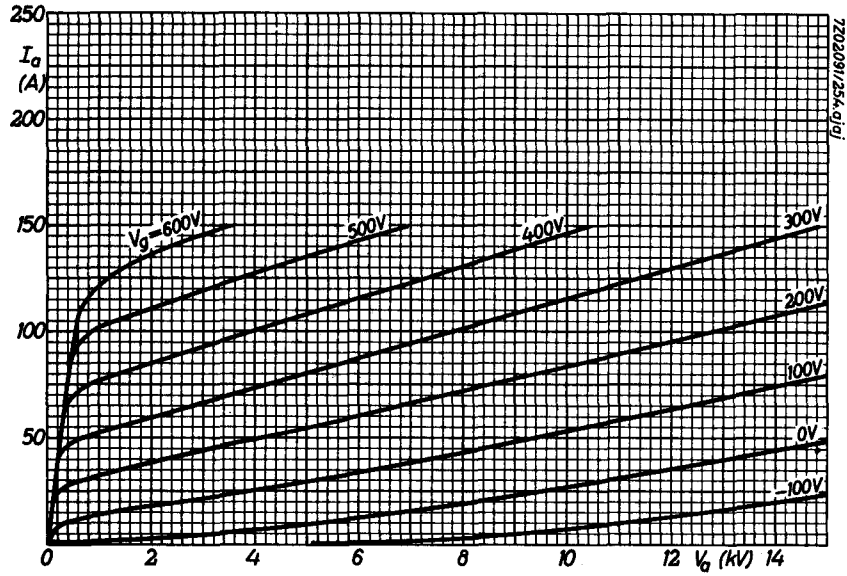
A.F. CLASS B AMPLIFIER AND MODULATOR

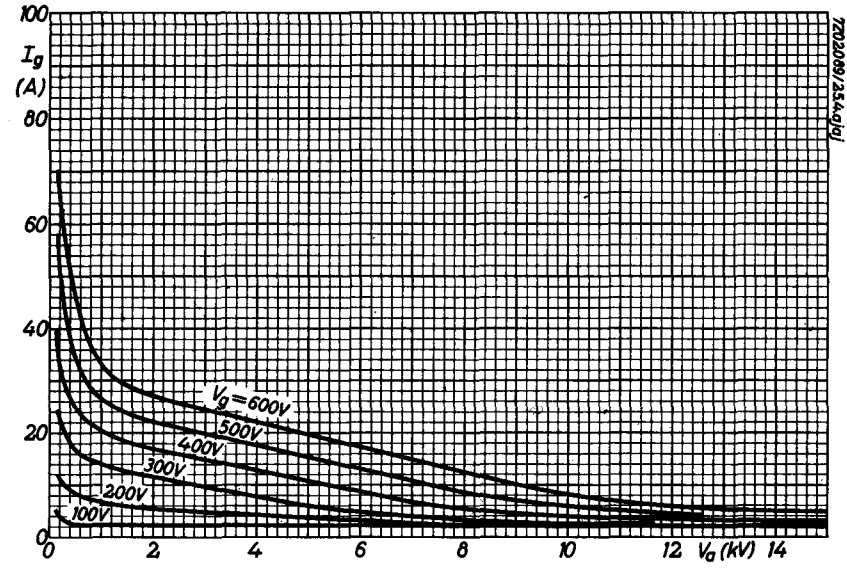
OPERATING CONDITIONS (Two tubes in push-pull; continued)

Anode voltage	V_a	=	8		6		kV
Grid voltage	V_g	=	−115		−82		V
Load resistance	$R_{aa\sim}$	=	338		268		Ω
Peak driving voltage	V_{ggp}	=	0	1110	0	990	V
Anode current	I_a	=	2x1.6	2x27	2x1.4	2x25	A
Average grid current	I_g	=	0	2x5.0	0	2x4.9	A
Peak grid current	I_{gp}	=	0	2x24	0	2x22	A
Driving power	W_{dr}	=	0	2x2.5	0	2x2.2	kW
Anode input power	W_{i_a}	=	2x12.8	2x216	2x8.4	2x150	kW
Anode dissipation	W_a	=	2x12.8	2x66	2x8.4	2x50	kW
Output power	W_o	=	0	300	0	200	kW
Efficiency	η	=	-	69.5	-	67	%

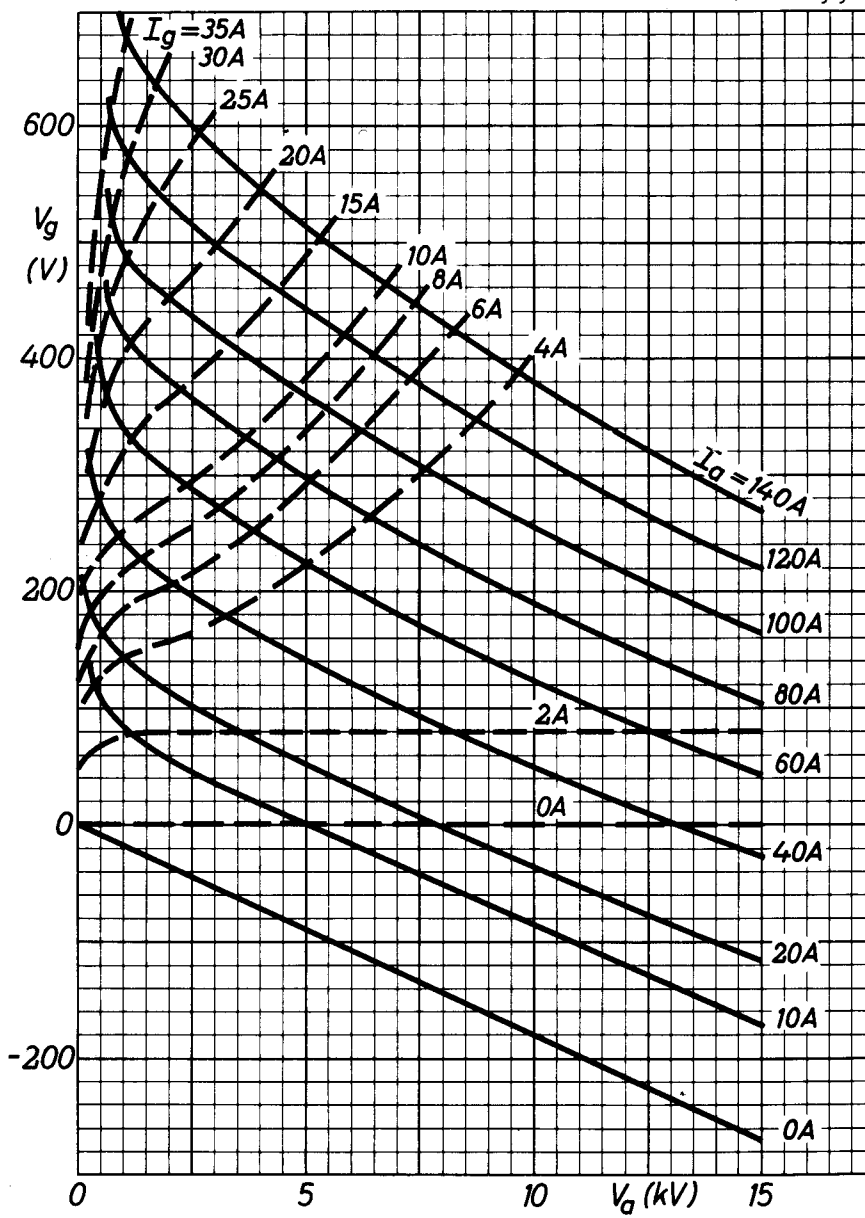

7Z02090/254.ajaj
150
I_a
(A)
100
50
0
V_a = 15kV
12kV
10kV
8kV
6kV
4kV
2kV
1kV
0.5kV
−200
0
200
400
V_g (V)
600


7Z02088/254.ajaj
80
I_g
(A)
60
40
20
0
V_a =
0kV
0.2kV
0.5kV
1kV
2kV
4kV
6kV
8kV
10kV
12kV
15kV
0
100
200
300
400
500
V_g (V)
600


250
I_a
(A)
200
150
100
50
0
2
4
6
8
10
12
14
V_a (kV)
V_g=600V
500V
400V
300V
200V
100V
0V
-100V
7Z02091/254.g/oj


100
I_g
(A)
80
60
40
20
0
2
4
6
8
10
12
14
V_a (kV)
V_g=600V
500V
400V
300V
200V
100V
7Z02069/254.g/oj

7Z05640-25.4.ajaj



AIR COOLED R.F. POWER TRIODE

QUICK REFERENCE DATA								
Frequency (MHz)	C telegraphy		C anode mod.		C television Two tubes		AF class B Two tubes	
	V_a (kV)	W_o (kW)	V_a (kV)	W_o (kW)	V_a (kV)	W_o (kW)	V_a (kV)	W_o (kW)
30	4	4.0					6	13.3
	5	5.6						
	6	6.9						
75			5	4.7				
110	5	4.8	4	2.8				
220	3	2.65						
48 to 75					5	9.5		

HEATING: direct; filament thoriated tungsten

Filament voltage	V_f	=	12.6	V
Filament current	I_f	=	33	A

The connection f_c is intended for use as cathode return. It is not an electrical centre tap and must not be used for filament current supply. At frequencies above 30 MHz the three filament leads should be interconnected by suitable capacitors.

CAPACITANCES

Anode to filament	C_{af}	=	0.3	pF
Grid to filament	C_{gf}	=	16	pF
Anode to grid	C_{ag}	=	11	pF

TYPICAL CHARACTERISTICS

Anode voltage	V_a	=	4.0	kV
Anode current	I_a	=	1.0	A
Amplification factor	μ	=	32	
Mutual conductance	S	=	17	mA/V

TEMPERATURE LIMITS (Absolute limits)

Temperature of anode and grid seals	t	= max.	180	°C
Temperature of pin seals	t	= max.	220	°C
Air inlet temperature	t_i	= max.	45	°C

AIR COOLING CHARACTERISTICS

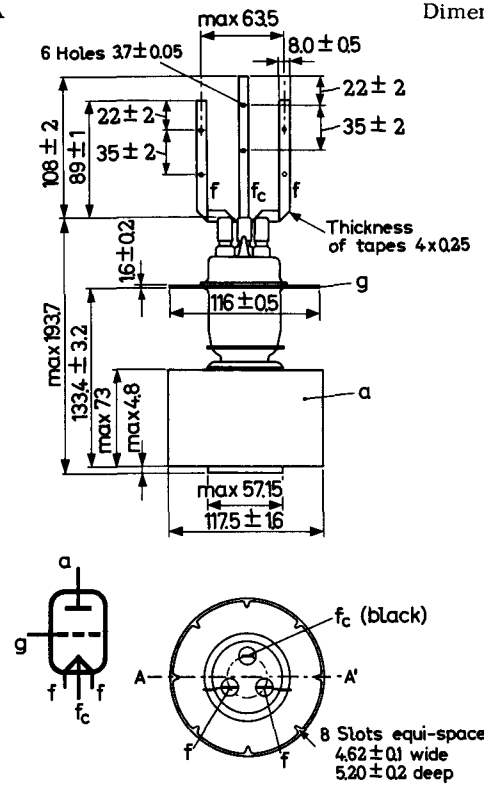
W_a (kW)	h (m)	t_i (°C)	q_{min} (m^3/min)	p_i (mm H_2O)
1	0	35	3.0	8
	0	45	3.1	8
	1500	35	3.7	9
	3000	25	4.1	10
3	0	35	5.2	23
	0	45	6.1	29
	1500	35	6.2	26
	3000	25	6.6	26
5	0	35	9.2	68
	0	45	10.7	90
	1500	35	11.2	81
	3000	25	11.6	79

It may be necessary to direct an air flow to the seals to keep them within the temperature limits.

MECHANICAL DATA

Dimensions in mm

Net weight: 3.4 kg



The plane of the filament is parallel to AA' to within $3\frac{1}{2}^{o}$

Mounting position: vertical with base up or down

R.F. CLASS C TELEGRAPHY or F.M. TELEPHONY

LIMITING VALUES (Absolute limits)

Frequency		f		up to 75	110	220	MHz
Anode voltage		V_a	= max.	6.2	5.5	4.0	kV
Anode current		I_a	= max.	1.5	1.5	1.5	A
Anode input power		W_{i_a}	= max.	9.3	8.2	6.0	kW
Anode dissipation		W_a	= max.	5.0	5.0	5.0	kW
Negative grid voltage		$-V_g$	= max.	1000	1000	1000	V
Grid current		I_g	= max.	350	350	350	mA

OPERATING CONDITIONS

Frequency	f	=	30	30	30	110	220[1])	MHz
Anode voltage	V_a	=	6.0	5.0	4.0	5.0	3.0	kV
Grid voltage	V_g	=	-400	-300	-200	-300	-160	V
Anode current	I_a	=	1.5	1.5	1.37	1.25	1.25	A
Grid current	I_g	=	310	330	300	300	250	mA
Driver output power	W_{dr}	=	275	240	190	250	510	W
Anode input power	W_{i_a}	=	9.0	7.5	5.5	6.25	3.75	kW
Anode dissipation	W_a	=	2.1	1.9	1.5	1.45	1.6	kW
Output power	W_o	=	6.9	5.6	4.0	4.8	2.65	kW
Tube efficiency	η	=	76.5	75	73	77	70	%
Output power in the load	W_ℓ	=	5.5	4.5	3.2	3.9	2.15	kW

[1]) In grounded grid circuit

R.F. CLASS C ANODE MODULATION

LIMITING VALUES (Absolute limits)

Frequency	f		up to	75	110	220	MHz
Anode voltage	V_a	=	max.	5.0	4.5	3.2	kV
Anode current	I_a	=	max.	1.3	1.3	1.3	A
Anode input power	W_{i_a}	=	max.	6.5	5.8	4.0	kW
Anode dissipation	W_a	=	max.	3.4	3.4	3.4	kW
Negative grid voltage	$-V_g$	=	max.	1000	1000	1000	V
Grid current	I_g	=	max.	350	350	350	mA

OPERATING CONDITIONS

Frequency	f	=	75	110	MHz
Anode voltage	V_a	=	5.0	4.0	kV
Grid voltage	V_g	=	-400	-350	V
Anode current	I_a	=	1.2	0.93	A
Grid current	I_g	=	300	240	mA
Driver output power	W_{dr}	=	205	130	W
Anode input power	W_{i_a}	=	6.0	3.72	kW
Anode dissipation	W_a	=	1.3	0.92	kW
Output power	W_o	=	4.7	2.8	kW
Tube efficiency	η	=	78.5	75	%
Output power in the load	W_ℓ	=	3.75	2.25	kW
Modulation depth	m	=	100	100	%
Modulation power	W_{mod}	=	2.4	1.4	kW

R.F. CLASS C AMPLIFIER FOR TELEVISION SERVICE ; negative modulation, positive synchronisation

LIMITING VALUES (Absolute limits)

Frequency	f	up to 75	up to 220	MHz
Anode voltage	V_a =	max. 5.0	max. 4.0	kV
Anode current	I_a sync =	max. 2.0	max. 1.6	A
Anode input power	Wi_a =	max. 10	max. 6.4	kW
Anode dissipation	W_a sync =	max. 4.0	max. 4.0	kW
Negative grid voltage	$-V_g$ sync =	max. 1000	max. 1000	V
Grid dissipation	W_g sync =	max. 120	max. 120	W

OPERATING CONDITIONS (Two tubes in push-pull, common cathode bias modulated)

Frequency	f	=	48 to 75	MHz
Bandwidth (– 3 dB)	B	=	8.0	MHz
Anode voltage	V_a	=	5.0	kV
Grid voltage	V_g sync	=	–200	V
	V_g black	=	–300	V
	V_g white	=	–550	V
Anode current	I_a sync	=	2x1.9	A
	I_a black	=	2x1.3	A
Grid current	I_g sync	=	2x250	mA
	I_g black	=	2x175	mA
Driver output power	W_{dr} sync	=	250	W
Output power	W_o sync	=	9.5	kW
Output power in the load	W_ℓ sync	=	6.3	kW

A.F. CLASS B AMPLIFIER AND MODULATOR

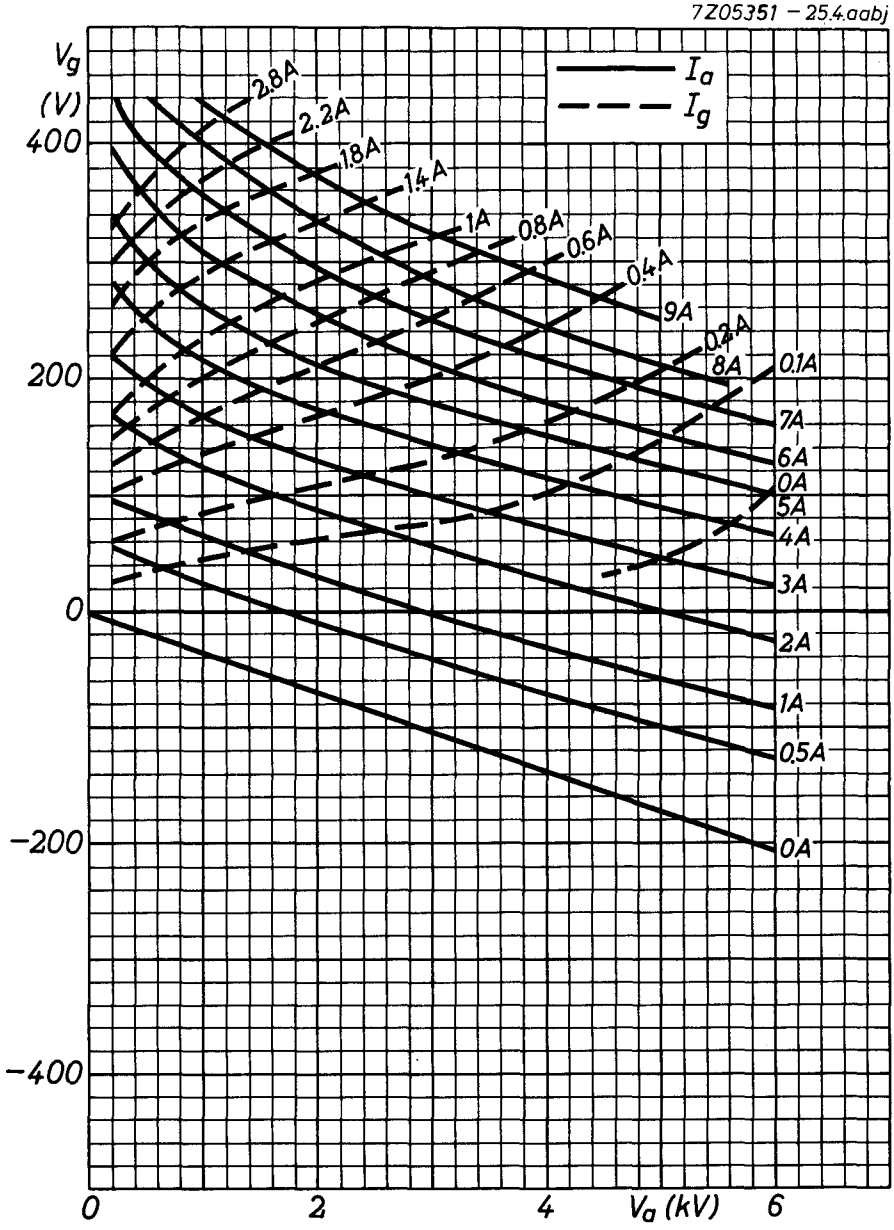
LIMITING VALUES (Absolute limits)

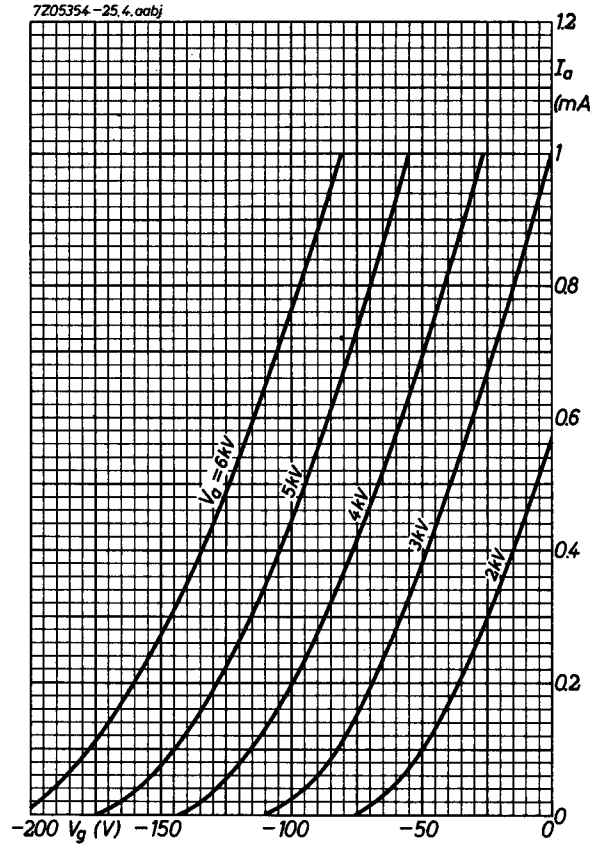
Anode voltage	V_a	=	max.	6.0	kV
Anode current	I_a	=	max.	1.8	A
Anode input power	W_{i_a}	=	max.	10.5	kW
Anode dissipation	W_a	=	max.	5.0	kW

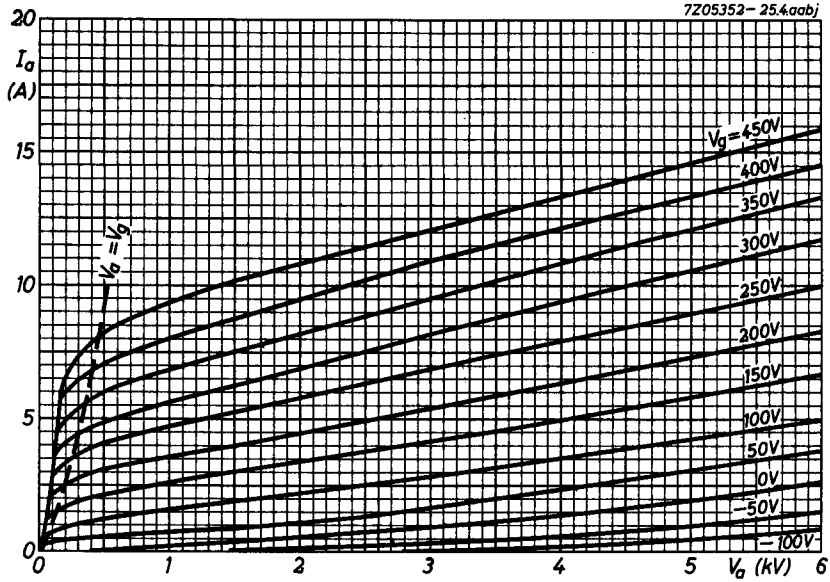
OPERATING CONDITIONS (Two tubes in push-pull)

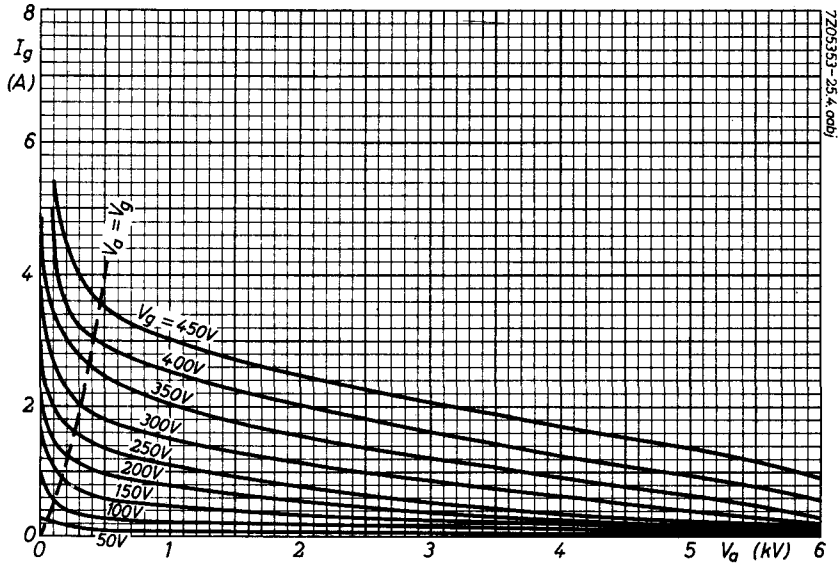
Anode voltage	V_a	=	6.0		kV
Grid voltage	V_g	=	-165		V [1]
Load resistance	$R_{aa\sim}$	=	4.9		kΩ
Grid driving voltage	V_{gg}	=	0	645	V(RMS)
Anode current	I_a	=	2x125	2x1500	mA
Grid current	I_g	=	0	2x280	mA
Driving power	W_{dr}	=	0	2x115	W
Anode input power	W_{i_a}	=	2x0.75	2x9.0	kW
Anode dissipation	W_a	=	2x0.75	2x2.35	kW
Output power	W_o	=	0	13.3	kW
Efficiency	η	=	-	74	%
Total harmonic distortion	d_{tot}	=	-	4.3	%

1) To be adjusted for zero signal anode current of 125 mA.


7Z05351 – 25.4.aabj
V_g (V)
400
200
0
−200
−400
I_a
I_g
2.8A
2.2A
1.8A
1.4A
1A
0.8A
0.6A
0.4A
9A
0.2A
8A
0.1A
7A
6A
0A
5A
4A
3A
2A
1A
0.5A
0A
0
2
4
V_a (kV)
6


7205354-25.4.aabj
1.2
I_a
(mA)
1
0.8
0.6
0.4
0.2
0
V_a = 6kV
5kV
4kV
3kV
2kV
-200 V_g (V) -150
-100
-50
0


7Z05352-25.4aabj
20
I_a
(A)
15
10
5
0
0
1
2
3
4
5
V_a (kV)
6
$V_g = V_a$
V_g = 450V
400V
350V
300V
250V
200V
150V
100V
50V
0V
−50V
−100V


7Z05353-25.4.aabj
8
I_g
(A)
6
4
2
0
0
50V
1
2
3
4
5
V_a (kV)
6
$V_g = V_a$
V_g = 450V
400V
350V
300V
250V
200V
150V
100V

R.F. POWER TRIODE

R.F. zero bias power triode intended for use as linear S.S.B. amplifier and A.F. class B amplifier

QUICK REFERENCE DATA				
Class B SSB			B mod. Two tubes	
Frequency (MHz)	V_a (V)	W_{load} (PEP) (W)	V_a (V)	W_o (W)
30	2500	580	3000	1310

HEATING: direct by A.C. or D.C.; filament thoriated tungsten

Filament voltage	V_f	= 5.0	V
Filament current	I_f	= 14.1	A

CAPACITANCES

Anode to filament	C_{af}	=	0.033	pF
Grid to filament	C_{gf}	=	8.0	pF
Anode to grid	C_{ag}	=	5.0	pF

TYPICAL CHARACTERISTICS

Anode voltage	V_a	=	5	kV
Anode current	I_a	=	80	mA
Mutual conductance	S	=	11	mA/V
Amplification factor	μ	=	350	

TEMPERATURE LIMITS (Absolute limits)

Anode seal temperature	t	=	max. 220	°C
Pin seal temperature	t	=	max. 180	°C
Bulb temperature	t	=	max. 350	°C

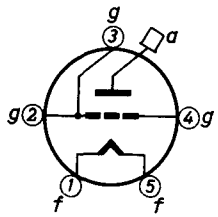
COOLING

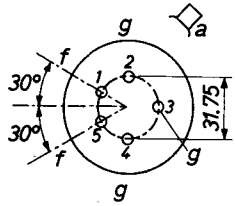
Radiation and low velocity air flow

MECHANICAL DATA

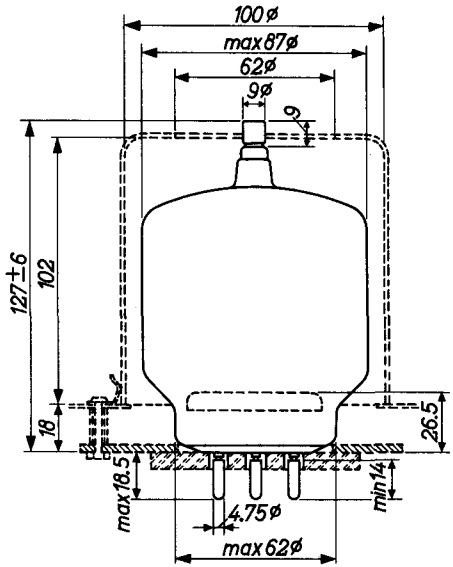
Net weight: 210 g

Base : Giant 5p.





Dimensions in mm



Mounting suggestion of tube with chimney

Mounting position: vertical with base up or down

In order to prevent overheating of the grid pins by high-frequency current it is recommended to include the three grid socket connections in the circuit.

ACCESSORIES

Anode connector	40624
Socket	2422 512 01001
Chimney	40666

R. F. CLASS B LINEAR POWER AMPLIFIER SINGLE SIDE BAND
suppressed carrier, zero bias, grounded grid

LIMITING VALUES (Absolute limits)

Frequency		f	up to 110	MHz
Anode voltage		V_a	= max. 3000	V
Anode input power		W_{i_a}	= max. 1200	W
Anode dissipation		W_a	= max. 400	W
Anode current		I_a	= max. 400	mA
Grid dissipation		W_g	= max. 20	W

OPERATING CHARACTERISTICS

Frequency	f	=		30		MHz
Anode voltage	V_a	=		2500		V
Grid voltage	V_g	=		0		V
			zero signal	single tone signal	double tone signal	
Peak cathode driving voltage	V_{k_p}	=	0	91	91	V
Anode current	I_a	=	72	400	270	mA
Grid current	I_g	=	–	140	80	mA
Driver output power	W_{dr}	=	–	35	35 (PEP)	W
Anode input power	W_{i_a}	=	180	1000	675	W
Anode dissipation	W_a	=	180	385	368	W
Output power	W_o	=	0	640[1])	640 (PEP)[2])	W
Output power in load	W_{load}	=	0	580	580 (PEP)	W[3])
Overall efficiency	η	=	–	58	43	%
Intermodulation distortion						
of the 3rd order	d_3	=	–	–	–29	dB[4])
of the 5th order	d_5	=	–	–	–34	dB[4])

1) Inclusive 25 W feedthrough power
2) Inclusive 25 W peak envelope feedthrough power
3) Measured in a circuit having an efficiency of 91 %
4) Maximum distortion level encountered at any driving level up to full drive, referred to the amplitude of either of the two tones in a double tone test signal at full drive.

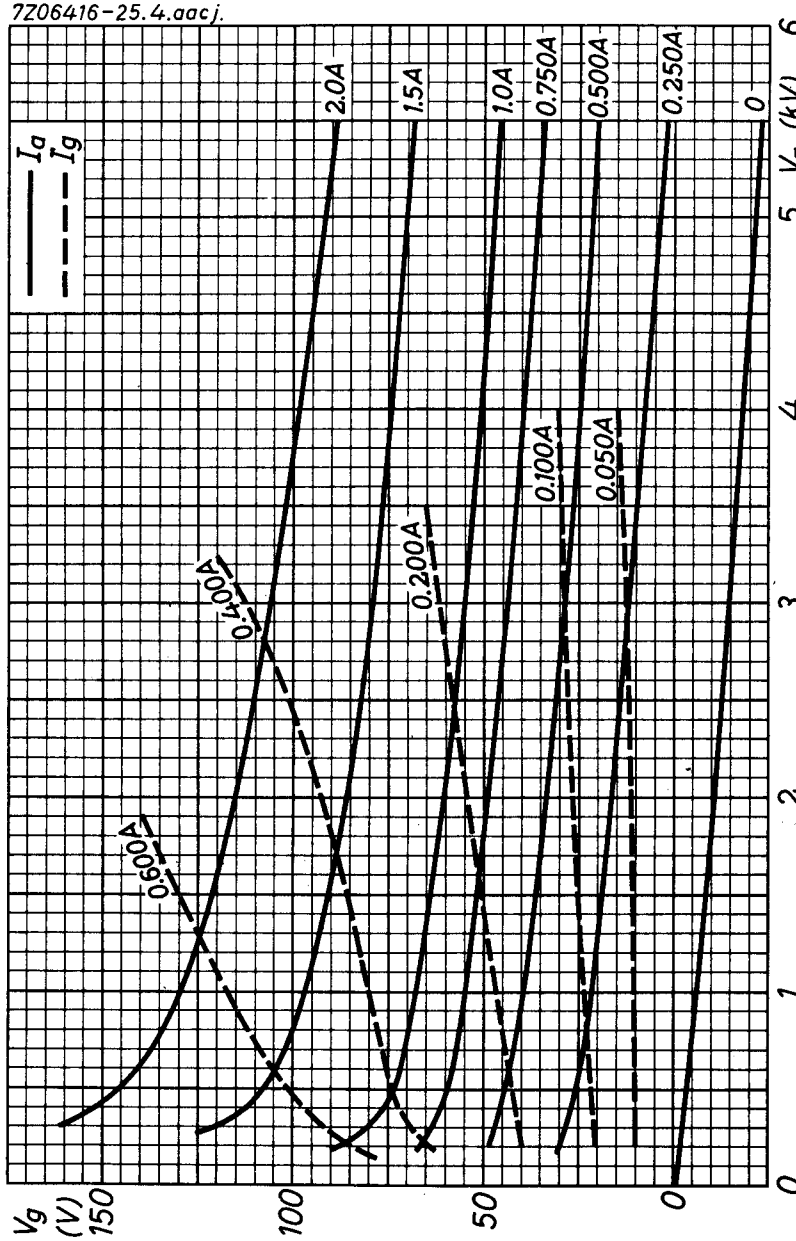
A.F. CLASS B AMPLIFIER AND MODULATOR

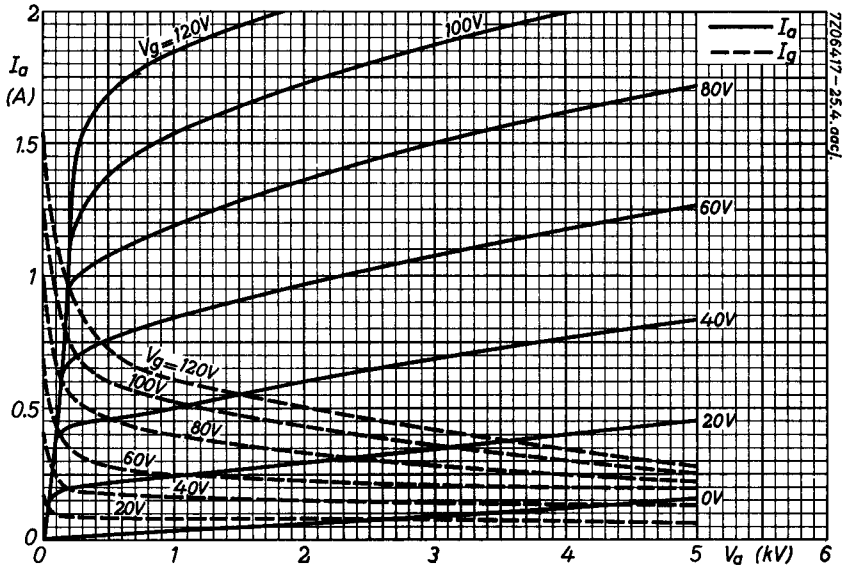
LIMITING VALUES (Absolute limits)

Anode voltage	V_a	=	max. 3000	V
Anode input power	W_{i_a}	=	max. 1200	W
Anode dissipation	W_a	=	max. 400	W
Anode current	I_a	=	max. 400	mA
Grid dissipation	W_g	=	max. 20	W

OPERATING CONDITIONS Class B, two tubes in push-pull

Anode voltage	V_a	=	3000		V
Load resistance	$R_{aa\sim}$	=	9500		Ω
Peak grid driving voltage	V_{ggp}	=	0	176	V
Anode current	I_a	=	2x90	2x333	mA
Grid current	I_g	=	0	2x120	mA
Driving power	W_{dr}	=	0	26	W
Anode input power	W_{i_a}	=	2x270	2x1000	W
Anode dissipation	W_a	=	2x270	2x345	W
Output power	W_o	=	0	1310	W
Efficiency	η	=	–	65	%


7Z06416-25.4.aacj.
Ia
Ig
2.0A
1.5A
1.0A
0.750A
0.500A
0.250A
0
0.100A
0.050A
0.200A
0.400A
0.600A
Va (kV)
0
1
2
3
4
5
6
Vg (V)
150
100
50
0


I_a (A)
2
1.5
1
0.5
0
0
1
2
3
4
5
V_a (kV)
6
I_a
I_g
V_g=120V
100V
80V
60V
40V
20V
0V
V_g=120V
100V
80V
60V
40V
20V
7Z06417-25.4.ocsl.

WATER COOLED R.F. POWER TRIODE

QUICK REFERENCE DATA								
Freq. (MHz)	C telegr.		C an. mod.		C industr. osc.		B mod [1])	
	V_a (kV)	W_o (kW)	V_a (kV)	W_o (kW)	V_a (kV)	W_o (kW)	V_a (kV)	W_o (kW)
30	12	108	10	83	12	124	10	106
	10	75	10	58	12	108	10	64
					10	75		

HEATING: direct; filament thoriated tungsten

Filament voltage	V_f	=	17.5	V
Filament current	I_f	=	196	A
Filament peak current	I_{fp}	max.	420	A
Cold filament resisrance	R_{fo}	=	0.012	Ω

CAPACITANCES

Anode to all other elements except grid	C_a	=	2.2	pF
Grid to all other elements except anode	C_g	=	122	pF
Anode to grid	C_{ag}	=	75	pF

TYPICAL CHARACTERISTICS

Anode voltage	V_a	=	3	10	kV
Anode current	I_a	=	50	5	A
Amplification factor	μ	=	25	25	
Mutual conductance	S	=	140	60	mA/V

[1]) Two tubes

TEMPERATURE LIMITS (Absolute limits)

Water inlet temperature	t_i	= max. 50	°C
Temperature of seals		= max. 180	°C

WATER COOLING CHARACTERISTICS ; see also cooling curves

W_a (kW)	t_i (°C)	q_{min} (l/min)	p_i (atm)
30	20	25	0.15
	50	45	0.45
50	20	32	0.25
	50	65	0.85
100	20	55	0.6
	50	120	3.0

At water inlet temperatures between 20 and 50 °C the required quantity of water can be found by linear interpolation.

At frequencies below 6 MHz forced air cooling of the seals will, as a rule, not be necessary. Above 6 MHz air cooling must be used to keep the anode and grid seal temperatures below 180 °C. The seals can be cooled by connecting a blower of suitable size to the air inlet of the anti-corona ring, attached to the tube.
At maximum frequency (30 MHz) and published operating conditions an air flow of 2.5 m^3/minute with a pressure loss of about 500 mm H_2O will in general be sufficient. The air flow must be started upon or before the application of filament voltage.

When using the special filament connectors type No. 40628, together with connecting leads of adequate cross-section, additional air cooling of the filament terminals is, as a rule, not necessary.

Care should be taken to ensure firm contact of the filament terminals in order to obtain equal distribution of current over these terminals.

MECHANICAL DATA Dimensions in mm

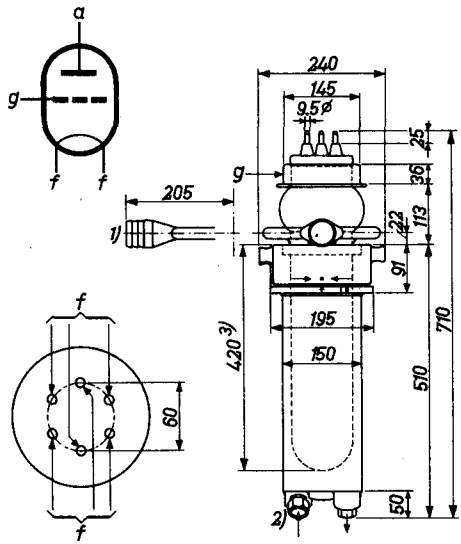
Water-jacket : K714

Filament connectors: 40628

O-ring : 2622 080 30916

Net weight of tube : 14 kg

Net weight of water-jacket: 20.5 kg



Mounting position: vertical with anode down

When connecting the filament the three pins of each group must be joined.

1) Use connecting hose with an inner diameter of 1 3/4".

2) Coupling for metal tubing with an outer diameter of 28 mm.

3) For removing the tube from its water-jacket the free height above the tube must be at least 420 mm.

R.F. CLASS C TELEGRAPHY

LIMITING VALUES (Absolute limits)

Frequency	f		up to	4	15	30	MHz
Anode voltage	V_a	=	max.	15	13.5	12.5	kV
Anode current	I_a	=	max.	12.5	12.5	12.5	A
Anode input power	W_{ia}	=	max.	165	165	150	kW
Anode dissipation	W_a	=	max.	100	100	100	kW
Negative grid voltage	$-V_g$	=	max.	1200	1200	1200	V
Grid current	I_g	=	max.	1.2	1.2	1.2	A

OPERATING CONDITIONS

Frequency	f	=	30	30	MHz
Anode voltage	V_a	=	12	10	kV
Grid voltage	V_g	=	-1000	-800	V
Grid driving voltage	V_{gp}	=	1500	1200	V
Anode current	I_a	=	12	10	A
Grid current	I_g	=	0.75	0.75	A
Anode input power	W_{ia}	=	144	100	kW
Anode dissipation	W_a	=	36	25	kW
Driving power	W_{dr}	=	1100	850	W
Output power	W_o	=	108	75	kW
Efficiency	η	=	75	75	%

R.F. CLASS C ANODE MODULATION

LIMITING VALUES (Absolute limits)

Frequency					
	f		up to	30	MHz
Anode voltage	V_a	=	max.	10.5	kV
Anode current	I_a	=	max.	10.5	A
Anode input power	W_{i_a}	=	max.	110	kW
Anode dissipation	W_a	=	max.	66	kW
Negative grid voltage	$-V_g$	=	max.	1200	V
Grid current	I_g	=	max.	1.3	A

OPERATING CONDITIONS

Frequency	f	=	30	30	MHz
Anode voltage	V_a	=	10	10	kV
Grid voltage	V_g	=	-1050	-1050	V [1]
Grid driving voltage	V_{g_p}	=	1550	1450	V
Anode current	I_a	=	10.5	7.4	A
Grid current	I_g	=	1.1	0.8	A
Anode input power	W_{i_a}	=	105	74	kW
Anode dissipation	W_a	=	22	16	kW
Driving power	W_{dr}	=	1650	1100	W
Output power	W_o	=	83	58	kW
Efficiency	η	=	79	79	%
Modulation depth	m	=	100	100	%
Modulation power	W_{mod}	=	53	37	kW

[1]) Grid bias partly obtained by a grid resistor

R.F. CLASS C OSCILLATOR for industrial use with anode voltage from three-phase rectifier without filter

LIMITING VALUES (Absolute limits)

Frequency		f	up to	30	MHz
Anode voltage		V_a	= max.	13	kV
Anode current		I_a	= max.	15	A
Anode input power		W_{i_a}	= max.	180	kW
Anode dissipation		W_a	= max.	100	kW
Negative grid voltage		$-V_g$	= max.	1600	V
Grid current, loaded		I_g	= max.	1.0	A
Grid current, unloaded		I_g	= max.	1.4	A
Grid circuit resistance		R_g	= max.	10	kΩ

OPERATING CONDITIONS

Frequency	f	=	30	30	30	MHz
Anode voltage	V_a	=	12	12	10	kV
Anode current	I_a	=	14	12	10	A
Grid current	I_g	=	0.9	0.75	0.75	A
Grid circuit resistance	R_g	=	1100	1350	1100	Ω
Feedback ratio	$V_{g\sim}/V_{a\sim}$	=	15	14	14	%
Anode input power	W_{i_a}	=	168	144	100	kW
Anode dissipation	W_a	=	44	36	25	kW
Output power	W_o	=	124	108	75	kW
Efficiency	η	=	74	75	75	%
Output power in the load	W_ℓ	=	104	91	63	kW[1])

1) Useful power in the load measured in a circuit having an efficiency of 85%.

A.F. CLASS B AMPLIFIER AND MODULATOR

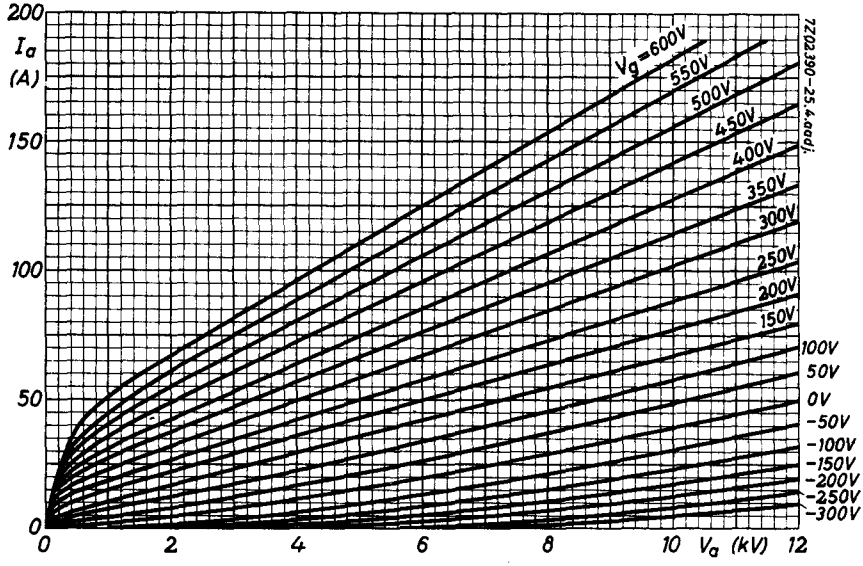
LIMITING VALUES (Absolute limits)

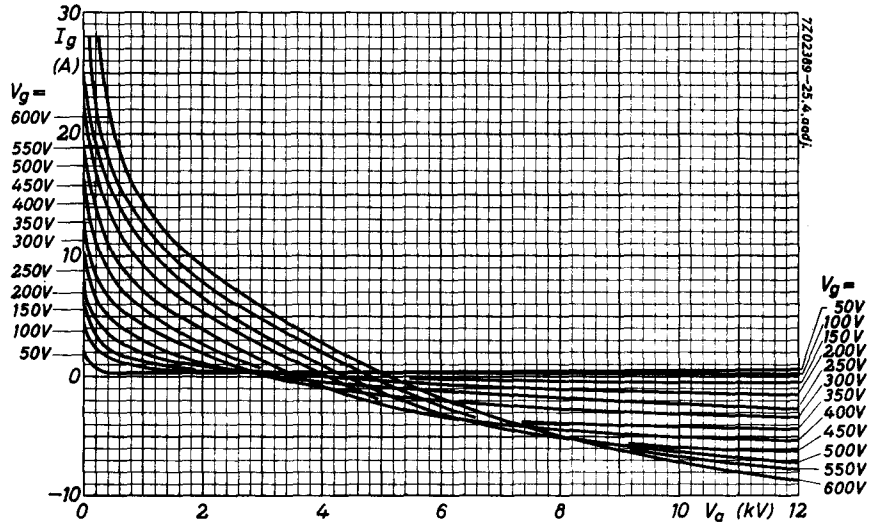
Anode voltage	V_a	= max.	15	kV
Anode current	I_a	= max.	12	A
Anode input power	W_{i_a}	= max.	162	kW
Anode dissipation	W_a	= max.	100	kW
Negative grid voltage	$-V_g$	= max.	1200	V
Grid current	I_g	= max.	1.2	A

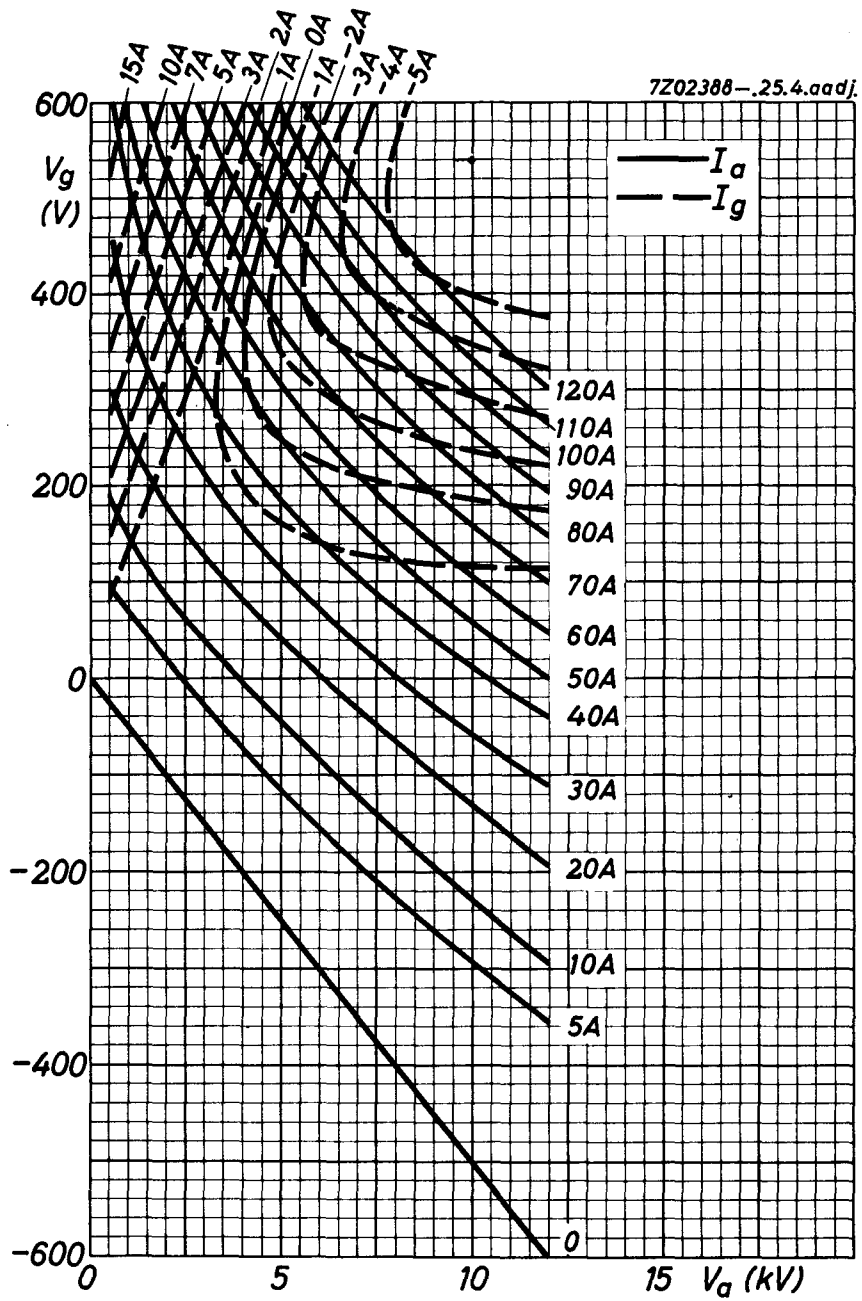
OPERATING CONDITIONS, two tubes in push-pull

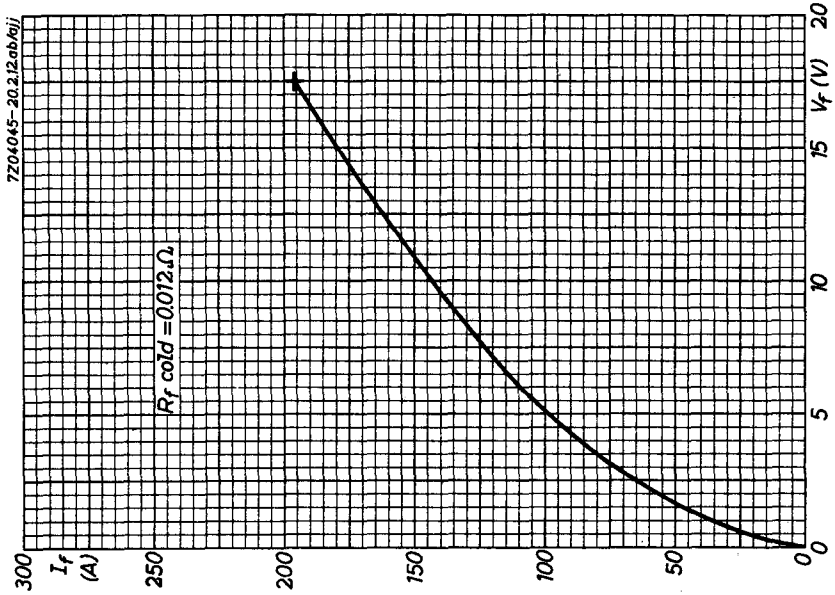
Anode voltage	V_a	=	10		10		kV
Grid voltage	V_g	=	-540		-540		V [1]
Load resistance	$R_{aa\sim}$	=	1360		1440		Ω
Driving voltage	V_{gg_p}	=	0	1550	0	1300	V
Anode current	I_a	=	2x0.3	2x8	2x0.3	2x5.8	A
Grid current	I_g	=	0	2x0.2	0	2x0.15	A
Anode input power	W_{i_a}	=	2x3	2x80	2x3	2x58	kW
Anode dissipation	W_a	=	2x3	2x27	2x3	2x26	kW
Driving power	W_{dr}	=	0	2x150	0	2x100	W
Output power	W_o	=	0	106	0	64	kW
Efficiency	η	=	-	67	-	56	%

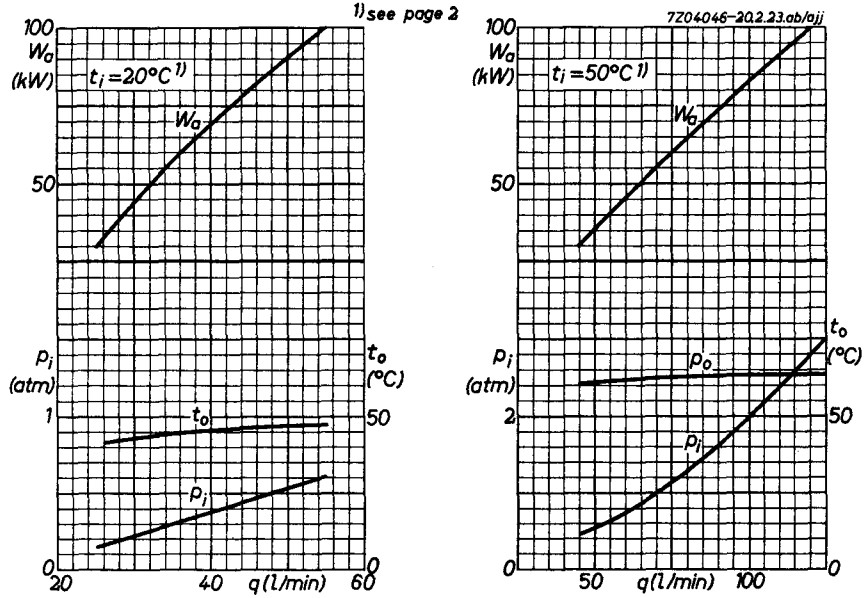
1) To be adjusted for a zero signal anode current of 0.3 A


200
I_a
(A)
150
100
50
0
0
2
4
6
8
10
V_a (kV)
12
V_g=600V
550V
500V
450V
400V
350V
300V
250V
200V
150V
100V
50V
0V
-50V
-100V
-150V
-200V
-250V
-300V
7Z02390-25.4.aad/j


30
I_g
(A)
V_g=
600V
20
550V
500V
450V
400V
350V
300V
10
250V
200V
150V
100V
50V
0
-10
0
2
4
6
8
10
V_a (kV)
12
V_g=
50V
100V
150V
200V
250V
300V
350V
400V
450V
500V
550V
600V
7Z02389-25.4.aad/j


7Z02388—.25.4.aadj.
15A
10A
7A
5A
3A
2A
1A
0A
-1A
-2A
-3A
-4A
-5A
600
400
200
0
-200
-400
-600
V_g (V)
I_a
I_g
120A
110A
100A
90A
80A
70A
60A
50A
40A
30A
20A
10A
5A
0
0
5
10
15
V_a (kV)


7Z04045-20.2.12.ab/ajj
R_f cold = 0.012 Ω
I_f (A)
V_f (V)
300
250
200
150
100
50
0
5
10
15
20


1) see page 2
7Z04046-20.2.23.ab/ajj
W_o (kW)
t_i = 20°C 1)
t_i = 50°C 1)
W_o
p_i (atm)
t_o (°C)
t_o
p_i
p_o
100
50
1
2
0
20
40
60
50
100
q (l/min)

AIR COOLED R.F. POWER TRIODE

QUICK REFERENCE DATA								
Freq. (MHz)	C telegr.		C an. mod.		C industr. osc.		B mod [1])	
	V_a (kV)	W_o (kW)	V_a (kV)	W_o (kW)	V_a (kV)	W_o (kW)	V_a (kV)	W_o (kW)
30	12	108	10	83	12	124	10	106
	10	75	10	58	12	108	10	64
					10	75		

HEATING: direct; filament thoriated tungsten

Filament voltage	V_f	=	17.5	V
Filament current	I_f	=	196	A
Filament peak current	I_{fp}	max.	420	A
Cold filament resistance	R_{fo}	=	0.012	Ω

CAPACITANCES

Anode to all other elements except grid	C_a	=	2.2	pF
Grid to all other elements except anode	C_g	=	122	pF
Anode to grid	C_{ag}	=	75	pF

TYPICAL CHARACTERISTICS

Anode voltage	V_a	=	3	10	kV
Anode current	I_a	=	50	5	A
Amplification factor	μ	=	25	25	
Mutual conductance	S	=	140	60	mA/V

[1]) Two tubes

TEMPERATURE LIMITS (Absolute limits)

Temperature of all seals = max. 180 °C

AIR COOLING CHARACTERISTICS ; see also cooling curves

W_a (kW)	h (m)	t_i (°C)	q_{min} (m^3/min)	p_i (mm H_2O)
30	0	35	35	114
	0	45	40	143
	1500	35	42	136
	3000	25	44	132
45	0	35	54	275
	0	45	62.5	335
	1500	35	64.5	322
	3000	25	68	319

When the tube is used at frequencies above 6 MHz special attention must be paid to the anode and grid seal temperatures. For frequencies below 20 MHz cooling of these seals can be effected by air flowing through the slots at the top of the cooler. In certain cases, e.g. at low dissipation and cooling with the minimum quantity of air (according to the cooling curves), the air flow to the seals will not be sufficient to maintain the seal temperatures below 180 °C. In these cases and also if it is preferred to close the slots, cooling of the seals should be effected by a separate air flow to the seals.

When using the filament connectors type 40628, together with connecting leads of adequate cross-section, additional air cooling of the filament terminals is, as a rule, not necessary.

Care should be taken to ensure firm contact of the filament terminals in order to obtain equal distribution of current over these terminals.

MECHANICAL DATA

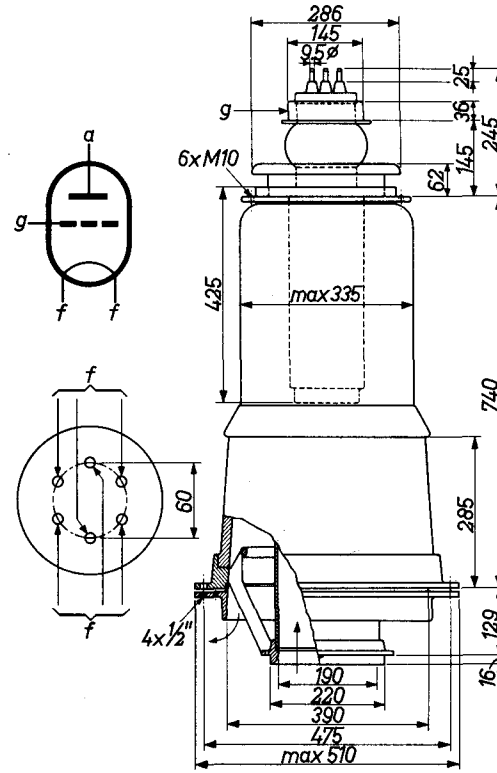
Dimensions in mm

Filament connectors: 40628

Cooler housing : K506

Net weight of tube : 28.5 kg

Net weight of K506 : 72 kg



Tube mounted in cooler housing type K 506

Mounting position: vertical with anode down

When connecting the filament the three pins of each group must be joined.

R.F. CLASS C TELEGRAPHY

LIMITING VALUES (Absolute limits)

Frequency	f		up to	4	15	30	MHz
Anode voltage	V_a	=	max.	15	13.5	12.5	kV
Anode current	I_a	=	max.	12.5	12.5	12.5	A
Anode input power	W_{i_a}	=	max.	165	165	150	kW
Anode dissipation	W_a	=	max.	45	45	45	kW
Negative grid voltage	$-V_g$	=	max.	1200	1200	1200	V
Grid current	I_g	=	max.	1.2	1.2	1.2	A

OPERATING CONDITIONS

Frequency	f	=	30	30	MHz
Anode voltage	V_a	=	12	10	kV
Grid voltage	V_g	=	-1000	-800	V
Grid driving voltage	V_{g_p}	=	1500	1200	V
Anode current	I_a	=	12	10	A
Grid current	I_g	=	0.75	0.75	A
Anode input power	W_{i_a}	=	144	100	kW
Anode dissipation	W_a	=	36	25	kW
Driving power	W_{dr}	=	1100	850	W
Output power	W_o	=	108	75	kW
Efficiency	η	=	75	75	%

R.F. CLASS C ANODE MODULATION

LIMITING VALUES (Absolute limits)

Frequency					
	f		up to	30	MHz
Anode voltage	V_a	= max.		10.5	kV
Anode current	I_a	= max.		10.5	A
Anode input power	W_{i_a}	= max.		110	kW
Anode dissipation	W_a	= max.		30	kW
Negative grid voltage	$-V_g$	= max.		1200	V
Grid current	I_g	= max.		1.3	A

OPERATING CONDITIONS

Frequency	f	=	30	30	MHz
Anode voltage	V_a	=	10	10	kV
Grid voltage	V_g	=	-1050	-1050	V [1]
Grid driving voltage	V_{g_p}	=	1550	1450	V
Anode current	I_a	=	10.5	7.4	A
Grid current	I_g	=	1.1	0.8	A
Anode input power	W_{i_a}	=	105	74	kW
Anode dissipation	W_a	=	22	16	kW
Driving power	W_{dr}	=	1650	1100	W
Output power	W_o	=	83	58	kW
Efficiency	η	=	79	79	%
Modulation depth	m	=	100	100	%
Modulation power	W_{mod}	=	53	37	kW

[1]) Grid bias partly obtained by a grid resistor

R.F. CLASS C OSCILLATOR for industrial use with anode voltage from three-phase rectifier without filter

LIMITING VALUES (Absolute limits)

Frequency		f	up to	30	MHz
Anode voltage		V_a	= max.	13	kV
Anode current		I_a	= max.	15	A
Anode input power		W_{i_a}	= max.	180	kW
Anode dissipation		W_a	= max.	45	kW
Negative grid voltage		$-V_g$	= max.	1600	V
Grid current, loaded		I_g	= max.	1.0	A
Grid current, unloaded		I_g	= max.	1.4	A
Grid circuit resistance		R_g	= max.	10	kΩ

OPERATING CONDITIONS

Frequency	f	=	30	30	30	MHz
Anode voltage	V_a	=	12	12	10	kV
Anode current	I_a	=	14	12	10	A
Grid current	I_g	=	0.9	0.75	0.75	A
Grid circuit resistance	R_g	=	1100	1350	1100	Ω
Feedback ratio	$V_{g\sim}/V_{a\sim}$	=	15	14	14	%
Anode input power	W_{i_a}	=	168	144	100	kW
Anode dissipation	W_a	=	44	36	25	kW
Output power	W_o	=	124	108	75	kW
Efficiency	η	=	74	75	75	%
Output power in the load	W_ℓ	=	104	91	63	kW[1])

[1]) Useful power in the load measured in a circuit having an efficiency of 85%

A.F. CLASS B AMPLIFIER AND MODULATOR

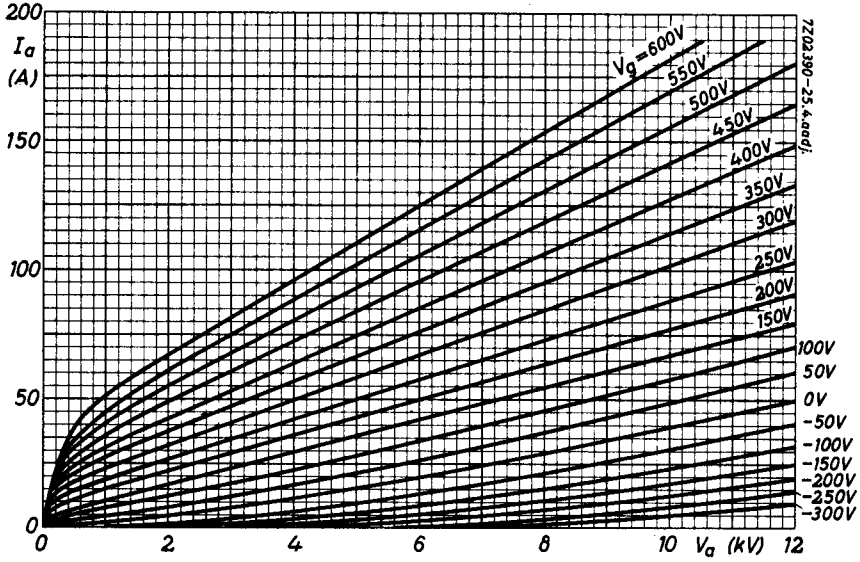
LIMITING VALUES (Absolute limits)

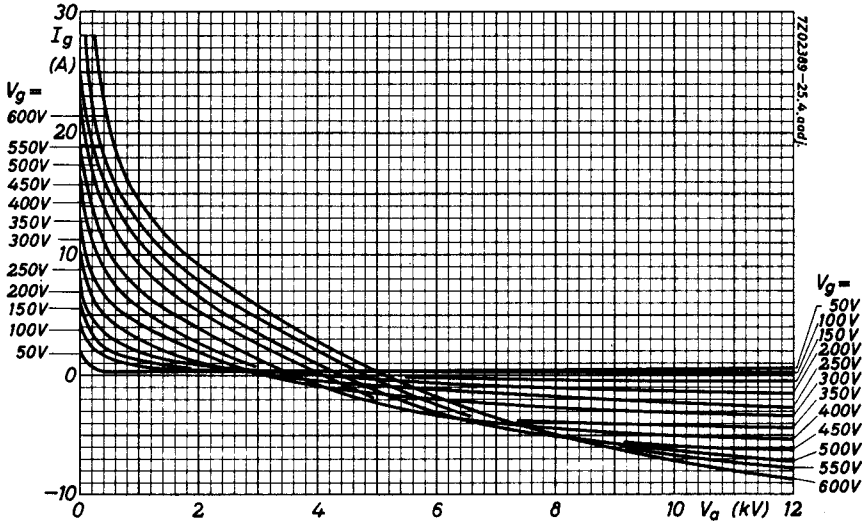
Anode voltage	V_a	= max.	15	kV
Anode current	I_a	= max.	12	A
Anode input power	W_{i_a}	= max.	162	kW
Anode dissipation	W_a	= max.	45	kW
Negative grid voltage	$-V_g$	= max.	1200	V
Grid current	I_g	= max.	1.2	A

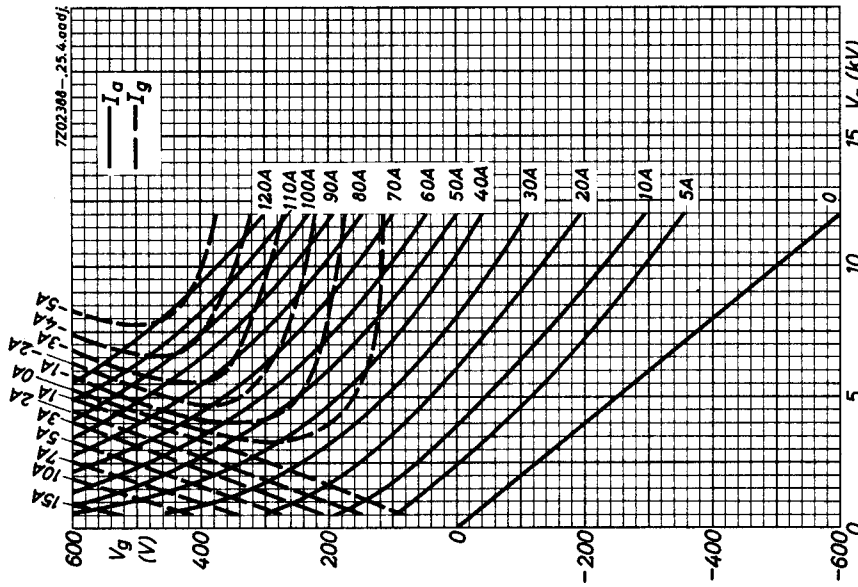
OPERATING CONDITIONS, two tubes in push-pull

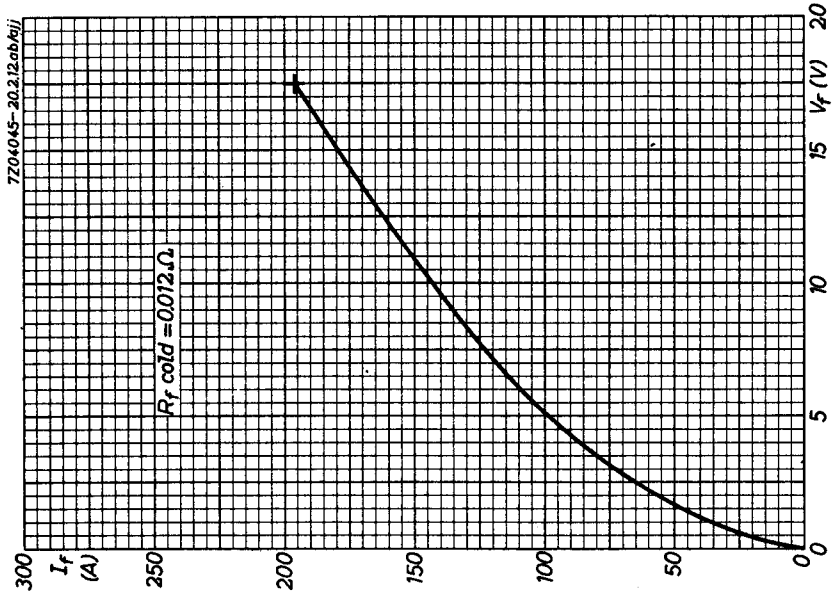
Anode voltage	V_a	=	10		10		kV
Grid voltage	V_g	=	-540		-540		V [1]
Load resistance	$R_{aa\sim}$	=	1360		1440		Ω
Driving voltage	V_{ggp}	=	0	1550	0	1300	V
Anode current	I_a	=	2x0.3	2x8	2x0.3	2x5.8	A
Grid current	I_g	=	0	2x0.2	0	2x0.15	A
Anode input power	W_{i_a}	=	2x3	2x80	2x3	2x58	kW
Anode dissipation	W_a	=	2x3	2x27	2x3	2x26	kW
Driving power	W_{dr}	=	0	2x150	0	2x100	W
Output power	W_o	=	0	106	0	64	kW
Efficiency	η	=	-	67	-	56	%

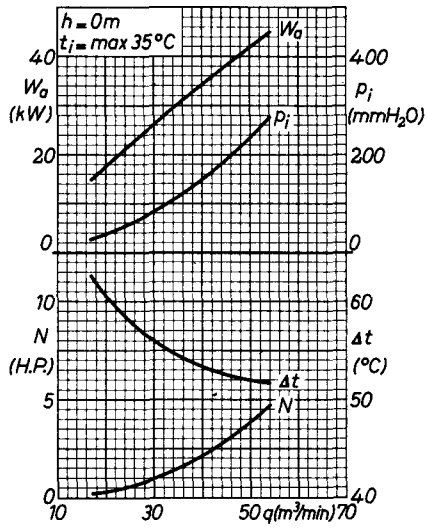
[1]) To be adjusted for a zero signal anode current of 0.3 A

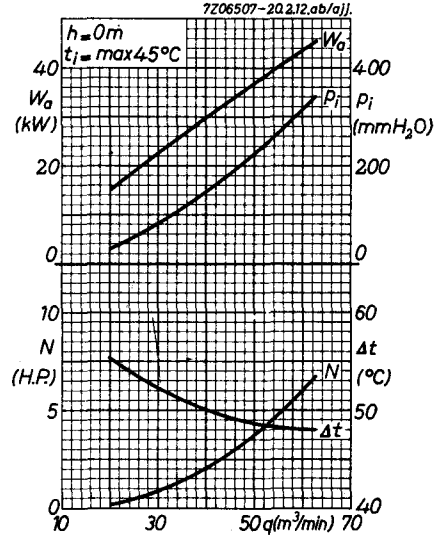

200
Ia
(A)
150
100
50
0
0
2
4
6
8
10 Va (kV) 12
Vg=600V
550V
500V
450V
400V
350V
300V
250V
200V
150V
100V
50V
0V
-50V
-100V
-150V
-200V
-250V
-300V
7Z02390-25.4.aadj.

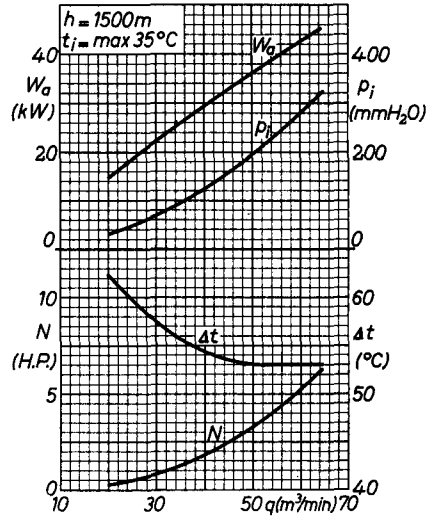

30
Ig
(A)
Vg=
600V
20
550V
500V
450V
400V
350V
300V
10
250V
200V
150V
100V
50V
0
-10
0
2
4
6
8
10 Va (kV) 12
Vg=
50V
100V
150V
200V
250V
300V
350V
400V
450V
500V
550V
600V
7Z02389-25.4.aadj.

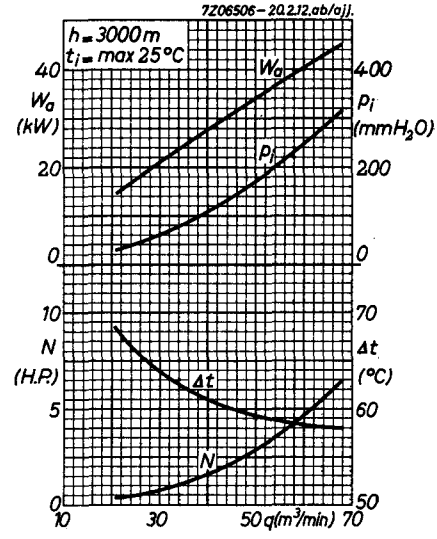

7202388-25.4.aadj
Ia
Ig
120A
110A
100A
90A
80A
70A
60A
50A
40A
30A
20A
10A
5A
0
15A
10A
7A
5A
3A
2A
1A
0A
-1A
-2A
-3A
-4A
-5A
600
400
200
0
-200
-400
-600
Vg (V)
15
10
5
0
Va (kV)


7204045-20.2.12.aabtjj
Rf cold = 0.012 Ω
300
250
200
150
100
50
0
If (A)
20
15
10
5
0
Vf (V)


h = 0m
t_i = max 35°C
W_a
p_i
Δt
N
W_a (kW)
p_i (mmH$_2$O)
N (H.P.)
Δt (°C)
40
20
0
10
5
400
200
60
50
10
30
50 q(m^3/min) 70


7Z06507-20.2.12.ab/ajj.
h = 0m
t_i = max 45°C
W_a
p_i
N
Δt
W_a (kW)
p_i (mmH$_2$O)
N (H.P.)
Δt (°C)
40
20
0
10
5
400
200
60
50
10
30
50 q(m^3/min) 70


h = 1500m
t_i = max 35°C
W_a
p_i
Δt
N
W_a (kW)
p_i (mmH$_2$O)
N (H.P.)
Δt (°C)
40
20
0
10
5
400
200
60
50
10
30
50 q(m^3/min) 70


7Z06506-20.2.12.ab/ajj.
h = 3000m
t_i = max 25°C
W_a
p_i
Δt
N
W_a (kW)
p_i (mmH$_2$O)
N (H.P.)
Δt (°C)
40
20
0
10
5
400
200
70
60
10
30
50 q(m^3/min) 70

RF POWER TRIODE

Triode in metal-ceramic construction, intended for use as industrial oscillator.
The tube is forced-air cooled, with integral cooler.

QUICK REFERENCE DATA

Oscillator output power ($W_o - W_{feedb}$), typical	W_{osc}		4,75 kW
Frequency for full ratings	f	max.	85 MHz

To be read in conjunction with "General Operational Recommendations".

RF CLASS C OSCILLATOR FOR INDUSTRIAL USE

OPERATING CONDITIONS

Frequency	f	30	30 MHz
Filament voltage	V_f	6,3	6,3 V
Oscillator output power ($W_o - W_{feedb}$)	W_{osc}	4,7	3,8 kW
Anode voltage	V_a	6	5 kV
Anode current	I_a	1	1 A
Anode input power	W_{ia}	6	5 kW
Anode dissipation	W_a	1,1	1,0 kW
Anode output power	W_o	4,9	4 kW
Anode efficiency	η_a	81,5	80 %
Oscillator efficiency	η_{osc}	78	76 %
Feedback ratio	V_{gp}/V_{ap}	17,6	19,4 %
Grid resistor	R_g	3,1	2,75 kΩ
Grid current, on load	I_g	205	200 mA
Grid voltage, negative	$-V_g$	640	550 V
Grid dissipation	W_g	60	60 W
Grid resistor dissipation	W_{Rg}	130	110 W

LIMITING VALUES (Absolute maximum rating system)

Frequency	f	up to	85 MHz *
Anode voltage	V_a		7,2 kV
Anode current	I_a		1,1 A
Anode input power	W_{ia}		6,5 kW
Anode dissipation	W_a		2,5 kW
Grid voltage	$-V_g$		1 kV
Grid current, on load	I_g		250 mA
off load	I_g		350 mA
Grid dissipation	W_g		140 W
Grid circuit resistance	R_g		20 kΩ
Cathode current, mean	I_k		1,4 A
peak	I_{kp}		7,5 A
Envelope temperature	T_{env}		240 °C

HEATING: direct; thoriated tungsten filament

Filament voltage	V_f	6,3 V
Filament current at V_f = 6,3 V	I_f	33 A

The filament is designed to accept temporary fluctuations of + 5% and −10%.

It is extremely important that the filament be properly decoupled. This should be done so that the resonance of the circuit formed by the filament and the decoupling elements remain below the fundamental oscillator frequency. In grounded-grid circuits this resonance should be below the grid-cathode resonance. For further information please see Application Book "Tubes for RF Heating" or contact the manufacturer.

CAPACITANCES

Anode-to-filament	C_{af}	0,4 pF
Grid to filament	C_{gf}	15 pF
Anode to grid	C_{ag}	12 pF

CHARACTERISTICS measured at V_a = 2,0 kV, I_a = 0,5 A

Transconductance	S	10 mA/V
Amplification factor	μ	17

* For operation above 85 MHz the tube manufacturer should be consulted.

COOLING

To obtain optimum life, the temperature of the seals and the envelope should, under normal operating conditions, be kept below 200 °C.

Table 1 Air cooling characteristics with insulating pedestal type 40630

anode + grid dissipation $W_a + W_g$ kW	altitude h m	inlet temperature T_i °C	rate of flow q_{min} m^3/min	pressure drop ΔP Pa*	max. outlet temperature T_o °C
1	0	35	1,5	35	80
	0	45	1,9	50	81
1,5	0	35	2,7	83	70
	0	45	3,1	85	75
2,5	0	35	5,0	140	65
	0	45	5,4	160	73

ACCESSORIES

Filament connector	type 40688
Filament/cathode connector	type 40689
Grid connector	type 40686
Insulating pedestal	type 40630

* 1 Pa ≈ 0,1 mm H_2O.

MECHANICAL DATA

Dimensions in mm

Mounting position: vertical with anode up or down

Net mass: 2,6 kg

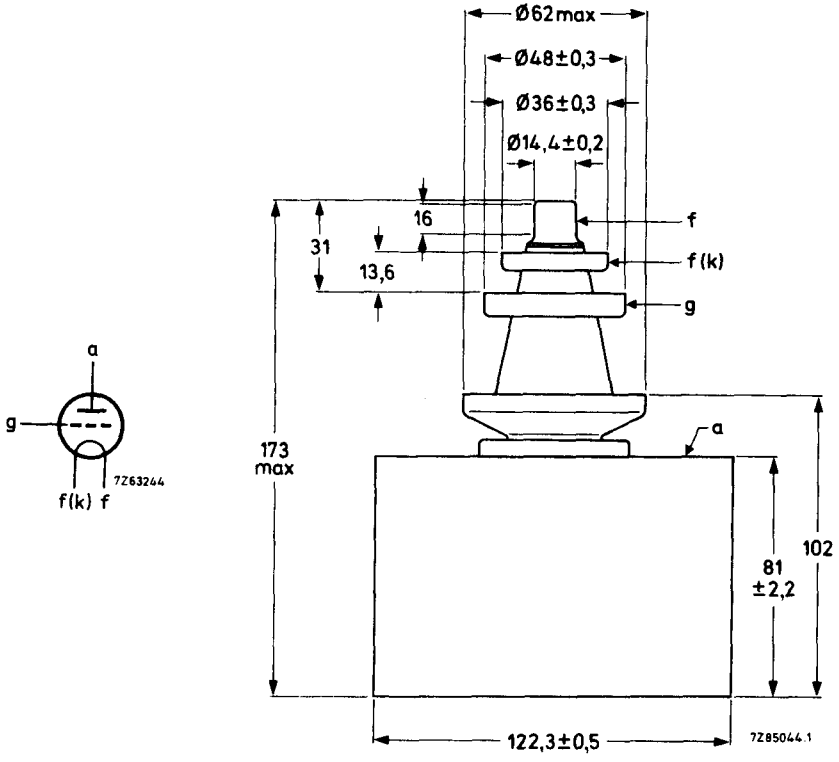


Fig. 1 Mechanical outline.

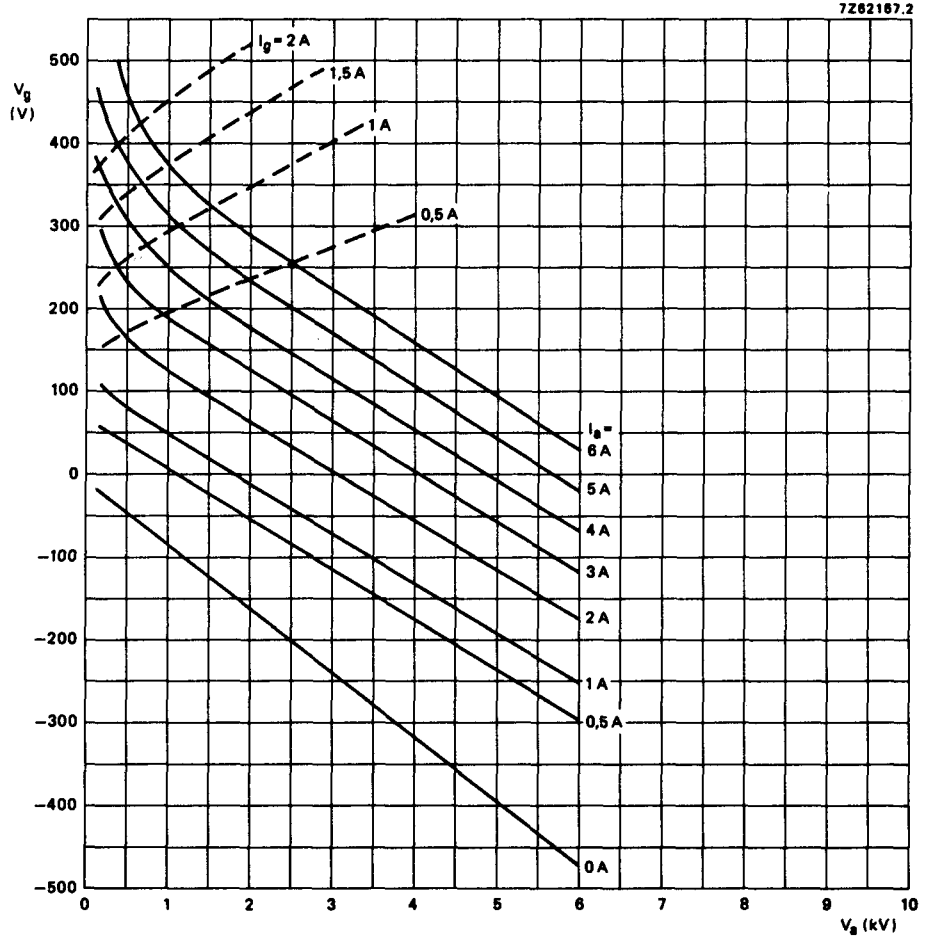


Fig. 2 Constant current characteristics.

PHILIPS

Data handbook

Electronic components and materials

YD1150A

page	sheet	date
1	177	1988.02
2	178	1988.02
3	179	1988.02
4	180	1988.02
5	181	1988.02
6	FP	2000.08.24

RF POWER TRIODE

Triode in metal-ceramic construction, intended for use as industrial oscillator.
The tube has an integral water cooler.

QUICK REFERENCE DATA

Oscillator output power ($W_o - W_{feedb}$), typical	W_{osc}		4,75 kW
Frequency for full ratings	f	max.	85 MHz

To be read in conjunction with "General Operational Recommendations".

RF CLASS C OSCILLATOR FOR INDUSTRIAL USE

OPERATING CONDITIONS

Frequency	f	160	27,12	27,12	MHz
Filament voltage	V_f	6,0	6,3	6,3	V
Oscillator output power ($W_o - W_{feedb}$)	W_{osc}	3,75	4,75	3,85	kW
Anode voltage	V_a	5	6	5	kV
Anode current	I_a	1	1	1	A
Anode input power	W_{ia}	5	6	5	kW
Anode dissipation	W_a	1,03	1,0	0,93	kW
Anode output power	W_o	3,97	5,0	4,07	kW
Anode efficiency	η_a	79,4	83,3	81,4	%
Oscillator efficiency	η_{osc}	75,0	79,1	77,0	%
Feedback ratio	V_{gp}/V_{ap}	19	17	19	%
Grid resistor	R_g	2,0	2,5	2,0	kΩ
Grid current, on load	I_g	260	250	260	mA
Grid voltage, negative	$-V_g$	520	625	520	V
Grid dissipation	W_g	80	90	80	W
Grid resistor dissipation	W_{Rg}	135	156	135	W

LIMITING VALUES (Absolute maximum rating system)

Frequency	f	up to	160	85 MHz
Anode voltage	V_a		6,0	7,2 kV
Anode current	I_a		1,1	1,1 A
Anode input power	W_{ia}		6,0	6,5 kW
Anode dissipation	W_a		2,5	2,5 kW
Grid voltage	$-V_g$		1	1 kV
Grid current, on load	I_g		280	280 mA
off load	I_g		400	400 mA
Grid dissipation	W_g		150	150 W
Grid circuit resistance	R_g		20	20 kΩ
Cathode current, mean	I_k		1,4	1,4 A
peak	I_{kp}		7,5	7,5 A
Envelope temperature	T_{env}		240	240 °C

HEATING: direct; thoriated tungsten filament

Filament voltage (< 120 MHz)	V_f	6,3 V
(> 120 MHz)	V_f	6,0 V
Filament current at V_f = 6,3 V	I_f	33 A

The filament is designed to accept temporary fluctuations of +5% and −10%.

It is extremely important that the filament be properly decoupled. This should be done so that the resonance of the circuit formed by the filament and the decoupling elements remain below the fundamental oscillator frequency. In grounded-grid circuits this resonance should be below the grid-cathode resonance. For further information please see Application Book "Tubes for RF Heating" or contact the manufacturer.

CAPACITANCES

Anode-to-filament	C_{af}	0,4 pF
Grid to filament	C_{gf}	17 pF
Anode to grid	C_{ag}	14 pF

CHARACTERISTICS measured at V_a = 2,0 kV, I_a = 0,5 A

Transconductance	S	10 mA/V
Amplification factor	μ	20

COOLING

To obtain optimum life, the temperature of the seals and of the envelope should, under normal operating conditions, be kept below 200 °C.

Table 1 Water cooling characteristics

anode + grid dissipation $W_a + W_g$ kW	inlet temperature T_i °C	rate of flow q_{min} l/min	pressure drop ΔP kPa*	outlet temperature T_o °C
1	20	0,9	5	40
	50	1,4	6	62
2	20	1,6	10	40
	50	2,8	15	61
3	20	2,2	14	40
	50	4,1	27	61

Absolute max. water inlet temperature	T_i	max.	50 °C
Absolute max. water pressure	P	max.	600 kPa

ACCESSORIES

Filament connector	type 40688
Filament/cathode connector	type 40689
Grid connector	type 40686

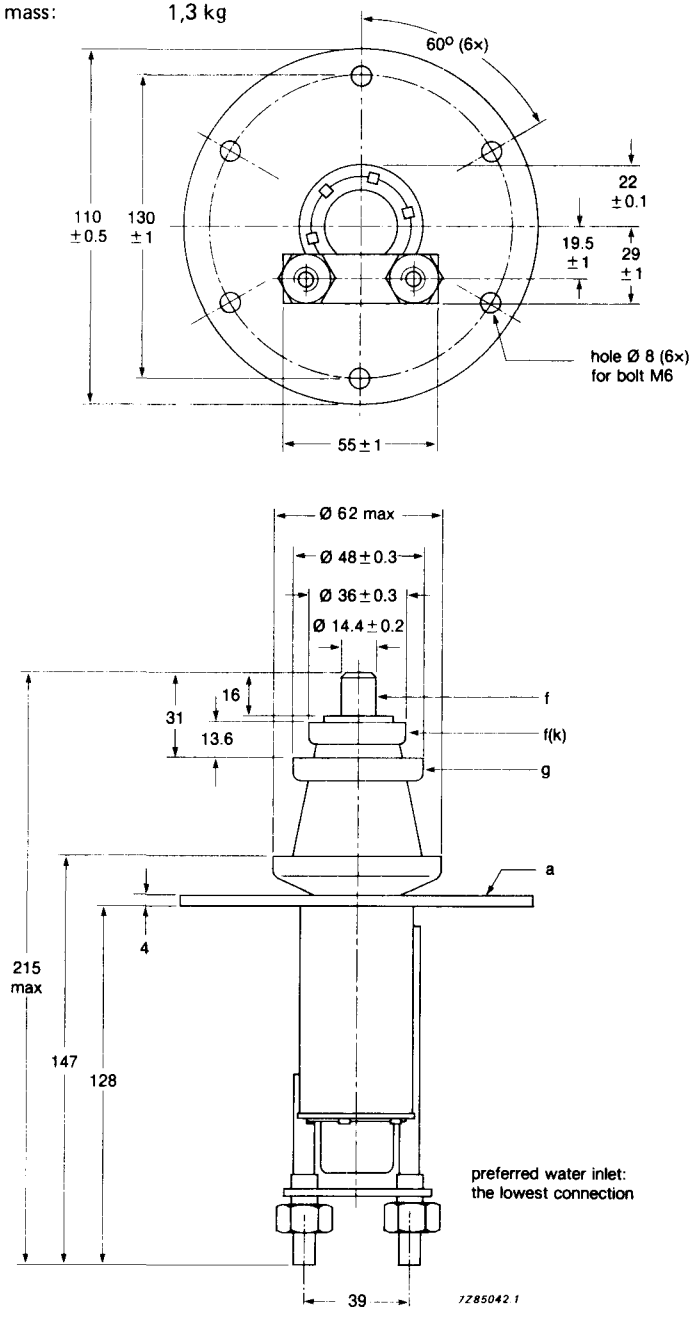
* 100 kPa ≈ 1 at

MECHANICAL DATA

Dimensions in mm

Mounting position: vertical with anode down

Net mass: 1,3 kg



Thread of water connections BSP 1/4 in.

Fig. 1 Mechanical outline.

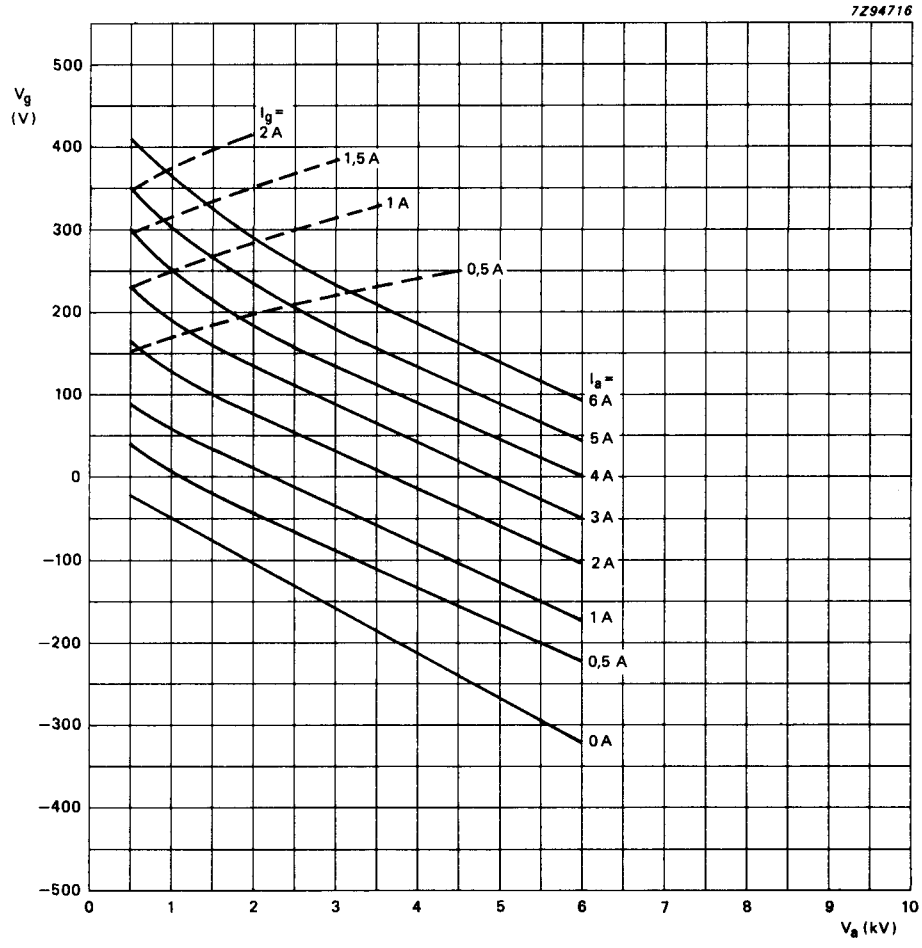


Fig. 2 Constant current characteristics.

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1	183	1988.02
2	184	1988.02
3	185	1988.02
4	186	1988.02
5	187	1988.02
6	FP	2000.08.26

RF POWER TRIODE

Forced air cooled triode of metal-ceramic construction with integral cooler intended for use as an industrial oscillator.

QUICK REFERENCE DATA

Oscillator output power (W_o–W_{feedb}), typical	W_{osc}		2,73	kW
Frequency for full ratings	f	max.	50	MHz

To be read in conjunction with chapter "General Operational Recommendations".

RF CLASS C OSCILLATOR FOR INDUSTRIAL USE

with anode voltage from a three-phase rectifier

OPERATING CONDITIONS, continuous service

Frequency	f	50	50	50	50	MHz
Oscillator output power (W_o–W_{feedb})	W_{osc}	2,73	2,61	2,04	1,44	kW
Anode voltage	V_a	6	5	4	3	kV
Anode current	I_a	600	700	700	700	mA
Anode input power	W_{ia}	3600	3500	2800	2100	W
Anode dissipation	W_a	760	780	640	540	W
Anode output power	W_o	2840	2720	2160	1560	W
Anode efficiency	η_a	79	78	77	74	%
Oscillator efficiency	η_{osc}	76	75	73	69	%
Feedback ratio	V_{gp}/V_{ap}	13	17	20	25	%
Grid resistor	R_g	3	2,5	2	1,5	kΩ
Grid current, on load	I_g	150	160	180	200	mA
Grid voltage, negative	$-V_g$	450	400	360	300	V
Grid dissipation	W_g	43	46	55	60	W
Grid resistor dissipation	W_{Rg}	67	64	65	60	W

Note

For other operating conditions contact the manufacturer.

LIMITING VALUES (Absolute maximum rating system)

Frequency for full ratings	f	up to	50	MHz
Anode voltage	V_a	max.	7	kV
Anode current	I_a	max.	750	mA
Anode input power	W_{ia}	max.	4000	W
Anode dissipation	W_a	max.	800	W
Grid voltage	$-V_g$	max.	1250	V
Grid current, on load	I_g	max.	300	mA
off load	I_g	max.	400	mA
Grid dissipation	W_g	max.	150	W
Grid circuit resistance	R_g	max.	10	kΩ
Cathode current, mean	I_k	max.	1,2	A
peak	I_{kp}	max.	4,3	A
Envelope temperature	T_{env}	max.	240	°C

HEATING: direct; filament thoriated tungsten

Filament voltage	V_f	6,3 V
Filament current	I_f	33 A

The filament is designed to accept temporary fluctuations of + 5% and −10%.

CAPACITANCES

Anode to filament	C_{af}	0.3 pF
Grid to filament	C_{gf}	17 pF
Anode to grid	C_{ag}	11,3 pF

CHARACTERISTICS measured at V_a = 4 kV, I_a = 190 mA

Transconductance	S	5 mA/V
Amplification factor	μ	22

COOLING

To obtain optimum life, the temperature of the seals and the envelope should, under normal operating conditions, be kept below 200 °C.

Rate of airflow q min = 1 m^3 at $W_g + W_a$ 800 W

ACCESSORIES

Filament connector	type 40688
Filament/cathode connector	type 40689
Grid connector	type 40686

MECHANICAL DATA

Mounting position: vertical with anode up or down

Net mass: 1,3 kg

Dimensions in mm

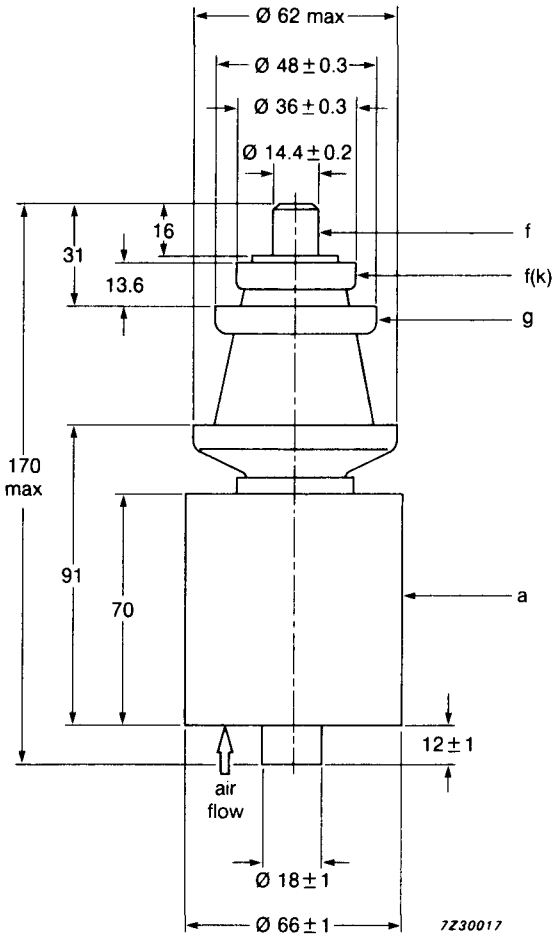


Fig. 1 Mechanical outline.

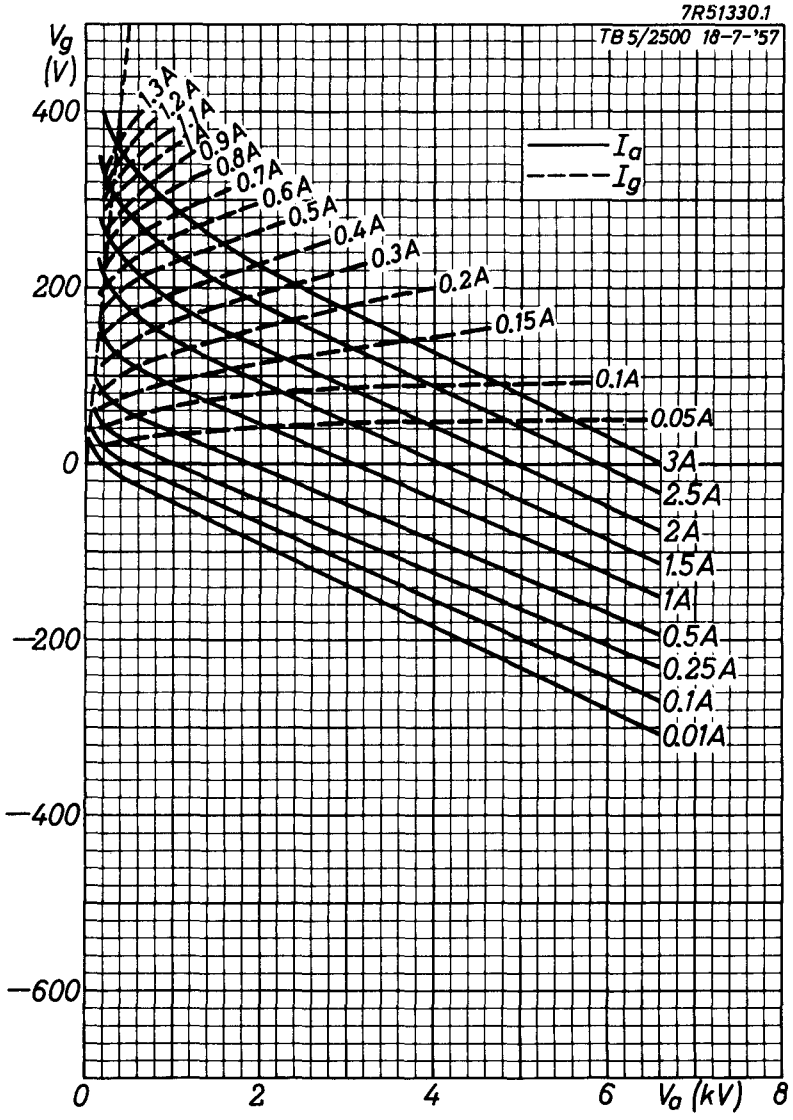


Fig. 1 Constant current characteristics.

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1	189	198802
2	190	198802
3	191	198802
4	192	198802
5	193	198802
6	FP	2000.08.26

RF POWER TRIODE

Triodes in metal-ceramic construction intended for use as industrial oscillators.
The YD1160 is forced-air cooled, with integral cooler.
The YD1162 has an integral water cooler.

QUICK REFERENCE DATA

Oscillator output power ($W_o - W_{feedback}$), typical	W_{osc}		8,8	kW
Frequency for full ratings	f	max.	85	MHz

To be read in conjunction with "General Operational Recommendations".

RF CLASS C OSCILLATOR FOR INDUSTRIAL USE

OPERATING CONDITIONS

Frequency	f	150	27,12	27,12	MHz
Filament voltage	V_f	5,8	6,3	6,3	V
Oscillator output power (W_o-W_{feedb})	W_{osc}	7,15	8,8	7,5	kW
Anode voltage	V_a	5,0	6,5	6,0	kV
Anode current	I_a	2,0	1,8	1,6	A
Anode input power	W_{ia}	10,0	11,7	9,6	kW
Anode dissipation	W_a	2,45	2,5	1,7	kW*
Anode output power	W_o	7,55	9,2	7,9	kW
Anode efficiency	η_a	75,5	78,6	82,3	%
Oscillator efficiency	η_{osc}	71,5	75,2	78,1	%
Feedback ratio	V_{gp}/V_{ap}	15	16	15	%
Grid resistor	R_g	1,0	1,6	1,3	kΩ
Grid current, on load	I_g	480	430	480	mA
Grid voltage, negative	$-V_g$	480	688	624	V
Grid dissipation	W_g	100	110	120	W
Grid resistor dissipation	W_{Rg}	230	296	300	W

LIMITING VALUES (Absolute maximum rating system)

Frequency	f	up to	85	150 MHz
Anode voltage	V_a	max.	7,2	6,0 kV
Anode current	I_a	max.	2,2	2,2 A
Anode input power	W_{ia}	max.	12,5	11 kW
Anode dissipation	W_a	max.	5	5 kW
Grid voltage	$-V_g$	max.	1	1 kV
Grid current				
on load	I_g	max.	550	550 mA
off load	I_g	max.	750	750 mA
Grid dissipation	W_g	max.	250	250 W
Grid circuit resistance	R_g	max.	20	20 kΩ
Cathode current				
mean	I_k	max.	2,8	2,8 A
peak	I_{kp}	max.	15	15 A
Envelope temperature	T_{env}	max.	240	240 °C

HEATING: direct; filament thoriated tungsten

Filament voltage		
(f = 150 MHz)	V_f	5,8 V
(f < 150 MHz)	V_f	6,3 V
Filament current at V_f = 6,3 V	I_f	66 A

The filament is designed to accept temporary fluctuations of +5% and −10%.

It is extremely important that the filament be properly decoupled. This should be done so that the resonance of the circuit formed by the filament and the decoupling elements remain below the fundamental oscillator frequency. In grounded-grid circuits this resonance should be below the grid-cathode resonance. For further information please see Application Book "Tubes for RF heating" or contact the manufacturer.

CAPACITANCES

Anode to filament	C_{af}	0,5 pF
Grid to filament	C_{gf}	19 pF
Anode to grid	C_{ag}	14,5 pF

CHARACTERISTICS measured at V_a = 2 kV, I_a = 1 A.

Transconductance	S	22 mA/V
Amplification factor	μ	20

COOLING

To obtain optimum life, the seal/envelope temperature under normal operating conditions should be kept below 200 °C.

Table 1 Air cooling characteristics

YD1160

anode + grid dissipation $W_a + W_g$ kW	*inlet* temperature T_i °C	*rate of flow* q_{min} m^3/min	*pressure* drop ΔP Pa*	*outlet* temperature T_o °C
3	35	3,6	90	82
3	45	4,2	110	87

Table 2 Water cooling characteristics

YD1162

anode + grid dissipation $W_a + W_g$ kW	*inlet* temperature T_i °C	*rate of flow* q_{min} ℓ/min	*pressure* drop ΔP kPa**	*max. outlet* temperature T_o °C
3	20	2,2	18	42
	50	4,3	38	61
5	20	4,0	40	40
	50	8,0	140	60

Absolute max. water inlet temperature	T_i	max.	50 °C
Absolute max. water pressure	P	max.	600 kPa(abs)

A low velocity air flow may be required for cooling of the seals

* 1 Pa ≈ 0,1 mm H_2O.

** 100 kPa ≈ 1 at

ACCESSORIES

Filament connector	type	40688
Filament/cathode connector	type	40689
Grid connector	type	40686
Insulating pedestal (YD1160 only)	type	40630

MECHANICAL DATA

Dimensions in mm

YD1160

Mounting position: vertical, with anode up or down

Net mass: approx. 3,5 kg

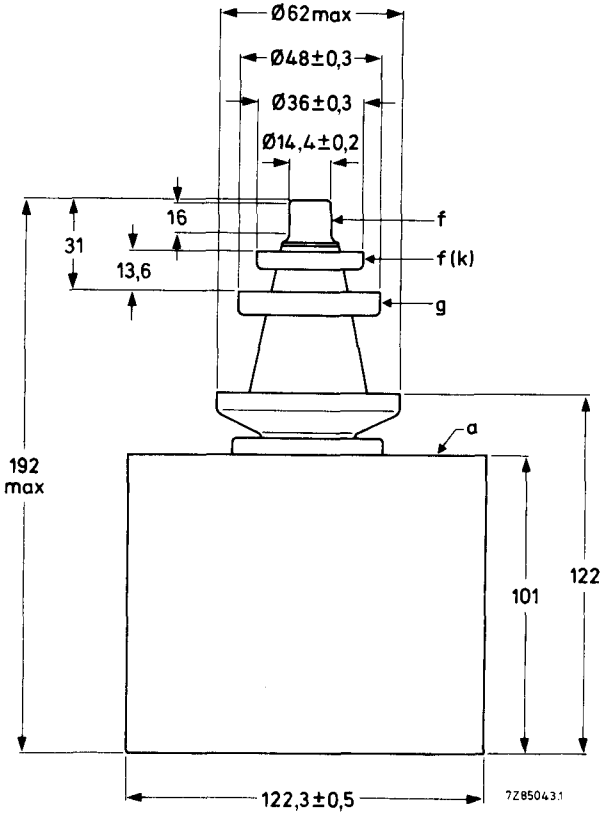


Fig. 1 Mechanical outline – YD1160.

YD1162

Mounting position: vertical with anode down

Net mass: approx. 1,6 kg

Dimensions in mm

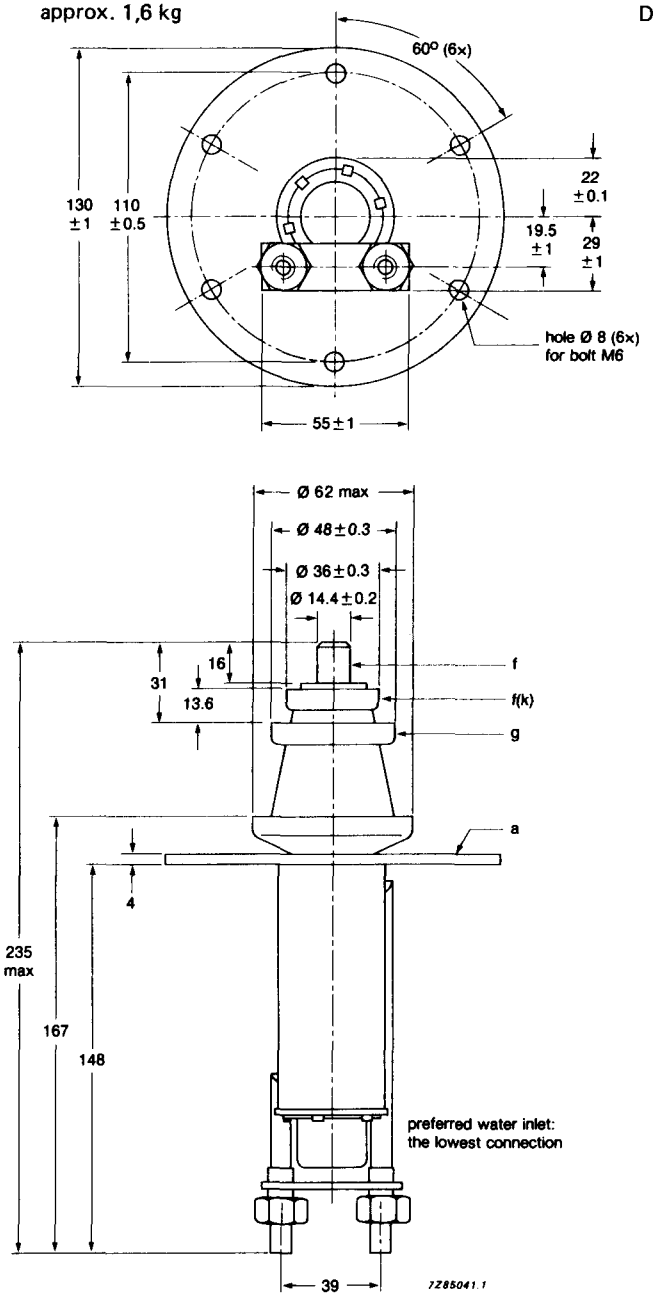


Fig. 2 Mechanical outline – YD1162.

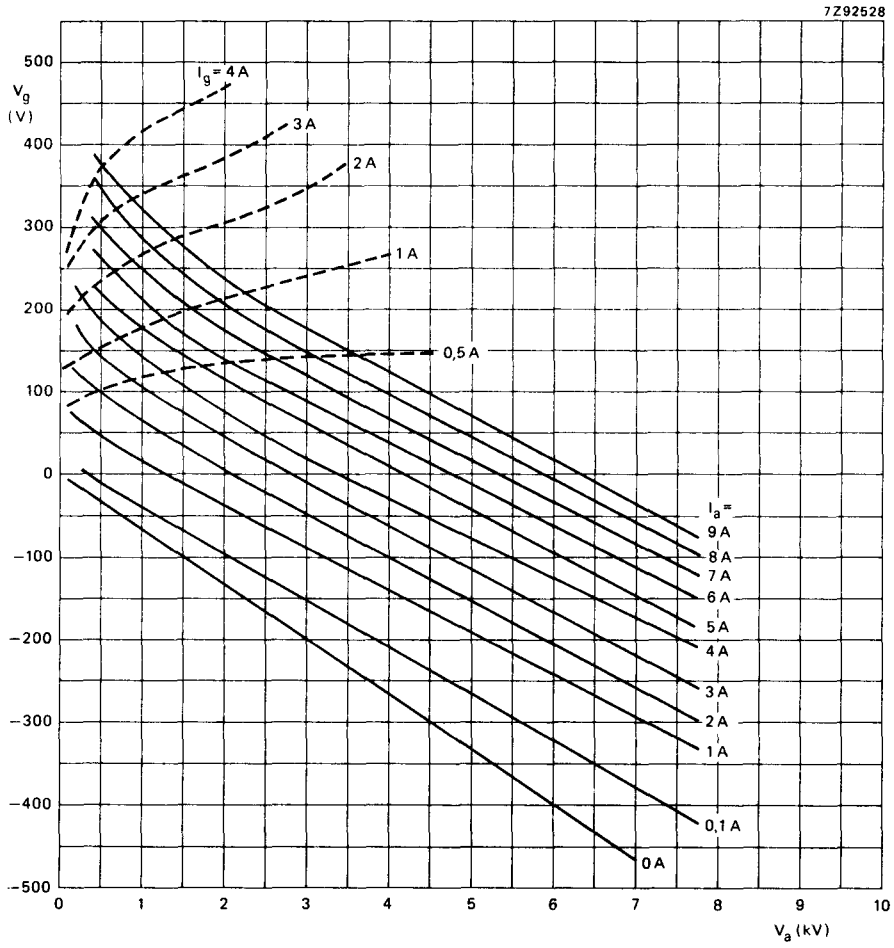


Fig. 3 Constant current characteristics.

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1	195	1988.02
2	196	1988.02
3	197	1988.02
4	198	1988.02
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6	200	1988.02
7	FP	2000.08.26

RF POWER TRIODE

Triodes in metal-ceramic construction intended for use as industrial oscillators. The YD1170 is forced-air cooled. The YD1172 has an integral helical water cooler.

QUICK REFERENCE DATA

Oscillator output power ($W_o - W_{feedback}$), typical	W_{osc}		15,4 kW
Frequency for full ratings	f	max.	120 MHz

To be read in conjunction with "General Operational Recommendations Transmitting Tubes for Communication; Tubes for R.F. Heating".

RF CLASS C OSCILLATOR FOR INDUSTRIAL USE

OPERATING CONDITIONS

Frequency	f	120 MHz
Filament voltage	V_f	5,8 V
Oscillator output power ($W_o - W_{feedback}$)	W_{osc}	15,4 kW
Anode voltage	V_a	6 kV
Anode current	I_a	3,4 A
Anode input power	W_{ia}	20,4 kW
Anode dissipation	W_a	4,3 kW
Anode output power	W_o	16,1 kW
Anode efficiency	η_a	78,9 %
Oscillator efficiency	η_{osc}	75,5 %
Feedback ratio	V_{gp}/V_{ap}	15,5 %
Grid resistor	R_g	500 Ω
Grid current, on load	I_g	920 mA
Grid voltage, negative	$-V_g$	460 V
Grid dissipation	W_g	280 W
Grid resistor dissipation	W_{Rg}	423 W

LIMITING VALUES (Absolute maximum rating system)

Frequency for full ratings	f	up to	120 MHz
Anode voltage	V_a	max.	7,2 kV
Anode current	I_a	max.	4 A
Anode input power	W_{ia}	max.	24 kW
Anode dissipation	W_a	max.	10 kW
Grid voltage	$-V_g$	max.	1,5 kV
Grid current			
on load	I_g	max.	1 A
off load	I_g	max.	1,5 A
Grid dissipation	W_g	max.	350 W
Grid circuit resistance	R_g	max.	10 kΩ
Cathode current			
mean	I_k	max.	5 A
peak	I_{kp}	max.	25 A
Envelope temperature	T_{env}	max.	240 °C

HEATING: direct; thoriated tungsten filament

Filament voltage	V_f		5,8 V
Filament current	I_f		130 A
Peak filament starting current	I_{fp}	max.	800 A
Cold filament resistance	R_{fo}		5,6 mΩ

The filament is designed to accept temporary fluctuations of + 5% and −10%.

To ensure that the cathode temperature remains constant irrespective of the operating frequency, it may be necessary to reduce the filament voltage at higher frequencies. When doing so it must be borne in mind that the filament voltage-to-current ratio measured with only the filament voltage applied should remain constant under all operating conditions.

It is extremely important that the filament be properly decoupled. This should be done so that the resonance of the circuit formed by the filament and the decoupling elements remain below the fundamental oscillator frequency. In grounded-grid circuits this resonance should be below the grid-cathode resonance. For further information please see Application Book "Tubes for RF heating" or contact the manufacturer.

CAPACITANCES

Anode to filament	C_{af}	0,8 pF
Grid to filament	C_{gf}	47 pF
Anode to grid	C_{ag}	25 pF

CHARACTERISTICS measured at V_a = 6 kV, I_a = 2 A

Transconductance	S	40	mA/V
Amplification factor	μ	30	

COOLING

To obtain optimum life, the temperature of the seals and of the envelope should, under normal operating conditions, be kept below 200 °C.

To maintain these temperatures additional cooling may be necessary. At frequencies higher than about 4 MHz cooling of the seals becomes mandatory.

YD1170

Table 1 Air cooling characteristics

anode + grid dissipation $W_a + W_g$ kW	altitude h m	inlet temperature T_i °C	rate of flow q_{min} m³/min	pressure drop ΔP P_a*	outlet temperature T_o °C
10	0	35	9,5	550	94
8	0	35	6,5	280	105
6	0	35	4,5	150	113
4	0	35	3,0	80	117
10	0	45	11,0	690	98
8	0	45	7,6	350	108
6	0	45	5,2	190	115
4	0	45	3,5	100	119
10	1500	35	11,4	630	94
8	1500	35	7,8	320	105
6	1500	35	5,5	170	113
4	1500	35	3,6	90	117
10	3000	25	12,0	620	90
8	3000	25	8,2	320	102
6	3000	25	5,7	170	111
4	3000	25	3,8	90	116

Absolute max. air inlet temperature	T_i	max. 45 °C
Direction of air flow		arbitrary

* 1 Pa ≈ 0,1 mm H_2O.

YD1172

Table 2 Water cooling characteristics

anode + grid dissipation $W_a + W_g$ kW	inlet temperature T_i °C	rate of flow q_{min} ℓ/min	pressure drop ΔP kPa*	outlet temperature T_o °C
10	20	6,0	25	46
	50	9,0	52	67
8	20	4,5	15	49
	50	6,7	31	69
6	20	3,0	7	53
	50	4,5	15	72

Absolute max. water inlet temperature	T_i	max.	50 °C
Absolute max. water pressure	P	max.	600 kPa

ACCESSORIES

Filament connector with cable	40692A
Filament/cathode connector with cable	40693A
Grid connector $f \leqslant 4$ MHz	40690
$f > 4$ MHz	40691
Insulating pedestal (YD1170 only)	40654

* 100 kPa ≈ 1 at

MECHANICAL DATA

YD1170

Mounting position: vertical with anode up or down

Net mass approx. 7 kg

Dimensions in mm

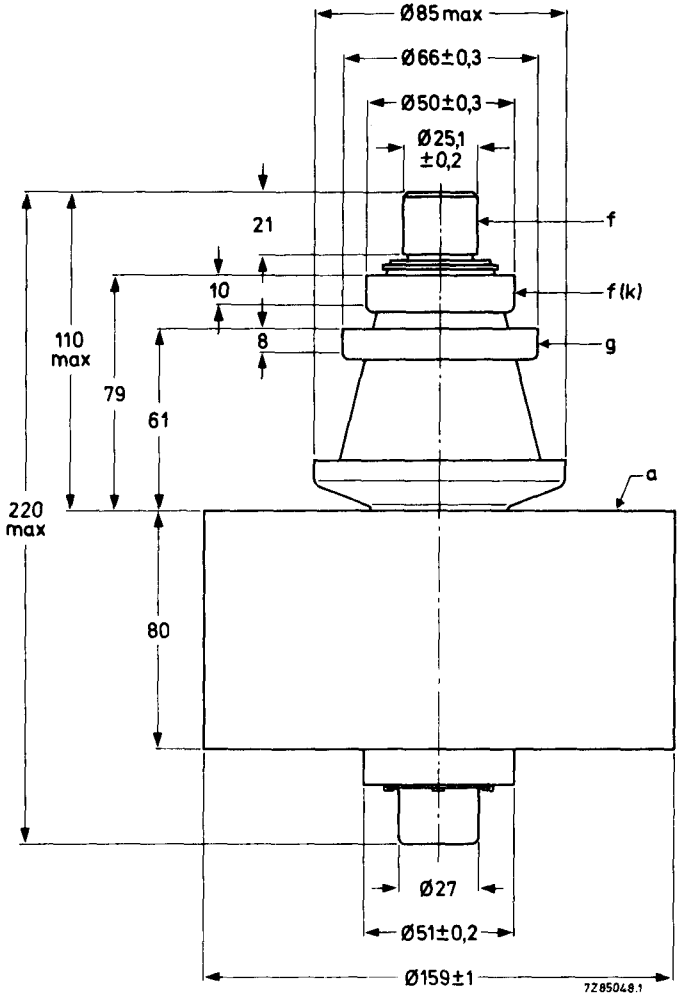


Fig. 1 Mechanical outline – YD1170.

YD1172

Mounting position: vertical with anode up or down

Net mass: approx. 1,85 kg

Dimensions in mm

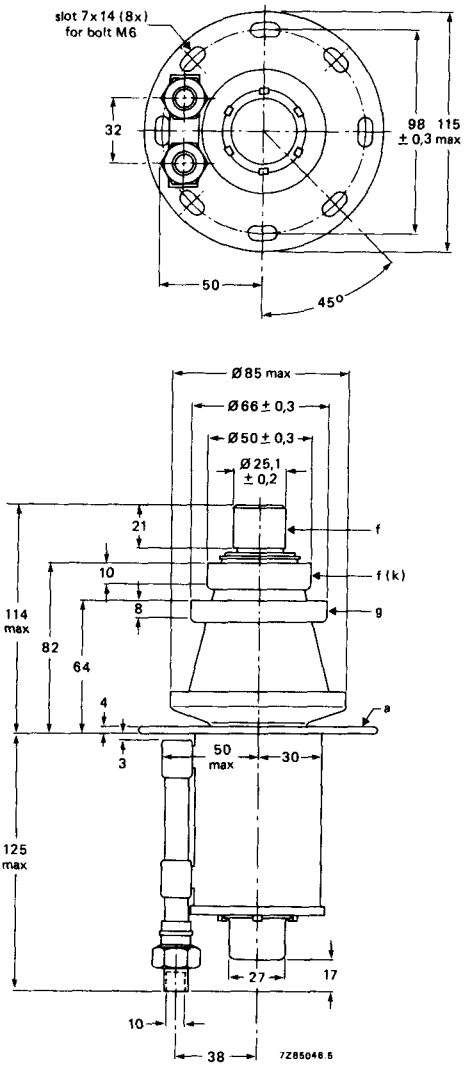


Fig. 2 Mechanical outline – YD1172.

Preferred water inlet
the lowest connections

Thread of water connections BSP 3/8 in

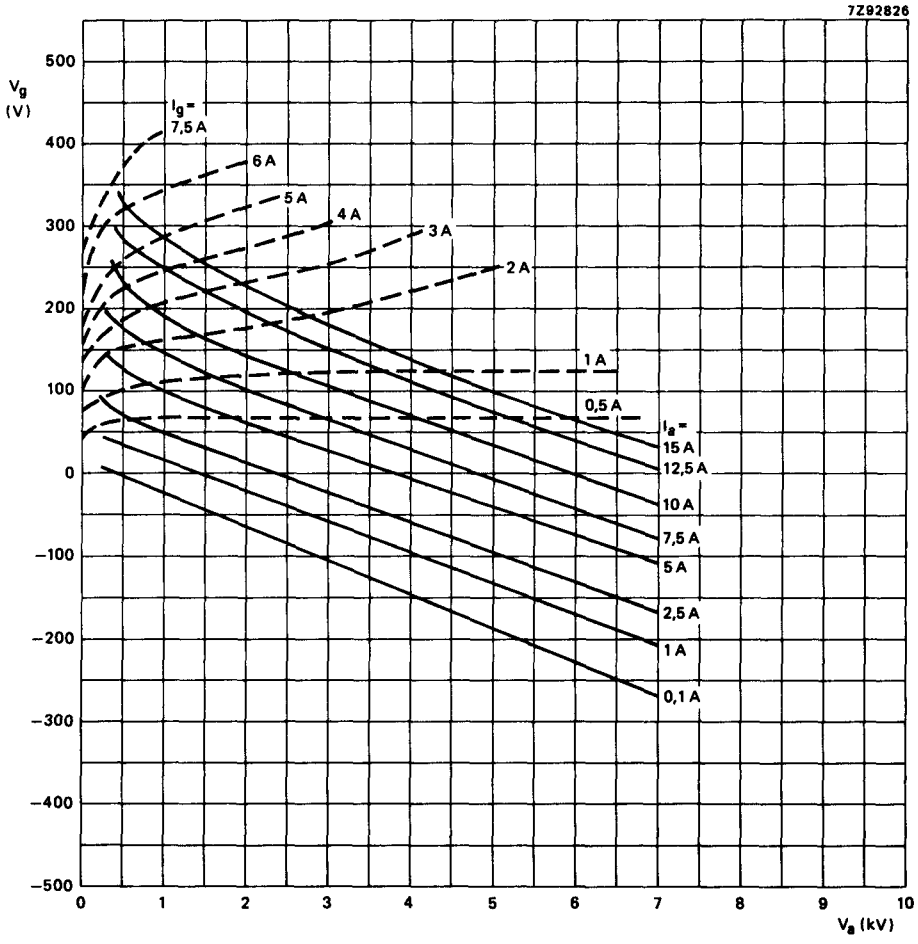


Fig. 3 Constant current characteristics.

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1	201	1988.02
2	202	1988.02
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6	206	1988.02
7	207	1988.02
8	FP	2000.08.27

RF POWER TRIODE

Forced air cooled triode of metal-ceramic construction with integral cooler intended for use as an industrial oscillator.

QUICK REFERENCE DATA			
Oscillator output power (W_o-W_{feedb}), typical	W_{osc}	13.22	kW
Frequency fur full ratings	f max.	50	MHz

To be read in conjunction with "General Operational Recommendations".

RF CLASS C OSCILLATOR FOR INDUSTRIAL USE

OPERATING CONDITIONS

Frequency	f	50	MHz
Oscillator output power (W_o-W_{feedb})	W_{osc}	13.22	kW
Anode voltage	V_a	10.0	kV
Anode current	I_a	1.75	A
Anode input power	W_{ia}	17.5	kW
Anode dissipation	W_a	3.8	kW
Anode output power	W_o	13.7	kW
Anode efficiency	η_a	78.3	%
Oscillator efficiency	η_{osc}	75.6	%
Feedback ratio	V_{gp}/V_{ap}	12.0	%
Grid resistor	R_g	1.5	kΩ
Grid current, on load	I_g	450	mA
Grid voltage, negative	$-V_g$	675	V
Grid dissipation	W_g	180	W
Grid resistor dissipation	W_{Rg}	304	W

LIMITING VALUES (Absolute max. rating system)

Frequency for full ratings	f	up to	50	MHz
Anode voltage	V_a	max.	12	kV
Anode current	I_a	max.	2.0	A
Anode input power	W_{ia}	max.	20	kW
Anode dissipation	W_a	max.	10	kW
Grid voltage	$-V_g$	max.	1.5	kV
Grid current, on load	I_g	max.	0.6	A
off load	I_g	max.	0.8	A
Grid dissipation	W_g	max.	300	W
Grid circuit resistance	R_g	max.	10	kΩ
Cathode current, mean	I_k	max.	2.5	A
peak	I_{kp}	max.	10	A
Envelope temperature	T_{env}	max.	240	°C

HEATING : direct; filament thoriated tungsten

Filament voltage	V_f		5.4	V
Filament current	I_f		65	A
Peak filament starting current	I_{fp}	max.	400	A
Cold filament resistance	R_{fo}		10	mΩ

The filament is designed to accept temporary fluctuations of +5 % and −10 %.

It is extremely important that the filament be properly decoupled. This should be done so that the resonance of the circuit formed by the filament and the decoupling elements remain below the fundamental oscillator frequency. In grounded-grid circuits this resonance should be below the grid-cathode resonance. For further information please see Application Book "Tubes for RF heating" or contact the manufacturer.

CAPACITANCES

Anode to filament	C_{af}	0.4	pF
Grid to filament	C_{gf}	42	pF
Anode to grid	C_{ag}	17	pF

CHARACTERISTICS measured at V_a = 10 kV, I_a = 1 A

Transconductance	S	22	mA/V
Amplification factor	μ	45	

COOLING

Table 1 Air cooling characteristics

With insulating pedestal type 40654.

Anode + grid dissipation $W_a + W_g$ (kW)	Altitude h (m)	Inlet temperature T_i (°C)	Rate of flow qmin (m^3/min)	Pressure drop ΔP (Pa)*	Outlet temperature T_o (°C)
10	0	35	9,5	550	94
8	0	35	6,5	280	105
6	0	35	4,5	150	113
4	0	35	3,0	80	117
10	0	45	11	690	98
8	0	45	7,6	350	108
6	0	45	5,2	190	115
4	0	45	3,5	100	119
10	1500	35	11,4	630	94
8	1500	35	7,8	320	105
6	1500	35	5,5	170	113
4	1500	35	3,6	90	117
10	3000	25	12	620	90
8	3000	25	8,2	320	102
6	3000	25	5,7	170	111
4	3000	25	3,8	90	116

To obtain optimum life, the temperatures of the seals and of the envelope should, under normal operating conditions, be kept below 200 °C.

ACCESSORIES

Filament connector with cable	type	40692A	net mass	450	g
Filament/cathode connector with cable	type	40693A	net mass	490	g
Grid connector $f \leq 4$ MHz	type	40690	net mass	55	g
$f > 4$ MHz	type	40691	net mass	240	g
Insulating pedestal	type	40654	net mass	4,25	kg

* 1 Pa ≈ 0,1 mm H_2O.

MECHANICAL DATA

Mounting position : vertical with anode up or down

Net mass : approx. 7 kg

Dimensions in mm

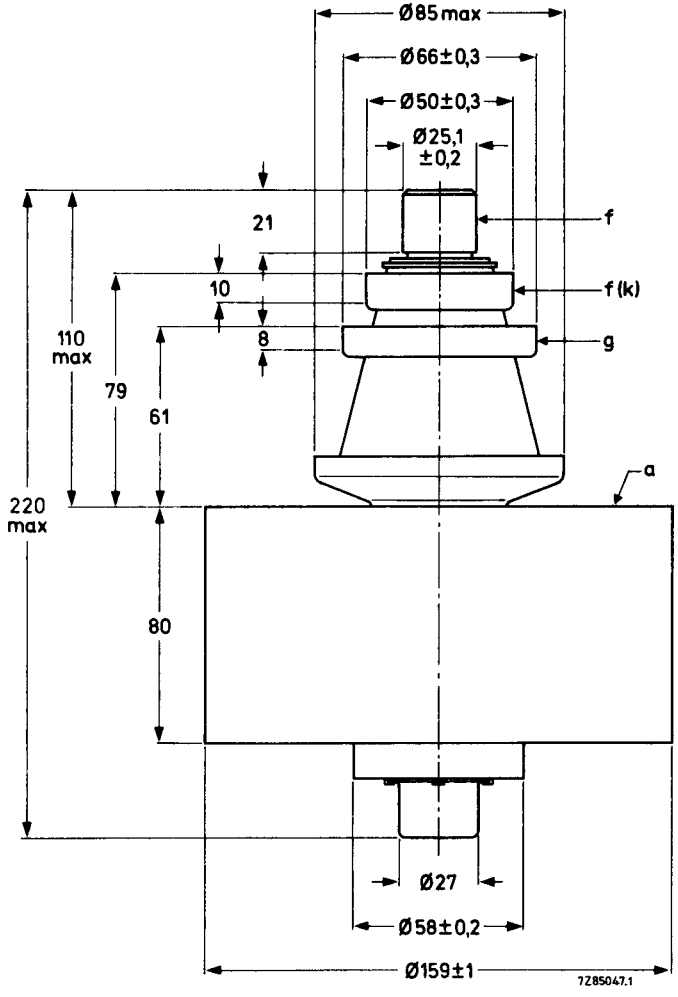


Fig. 1 Mechanical outline.

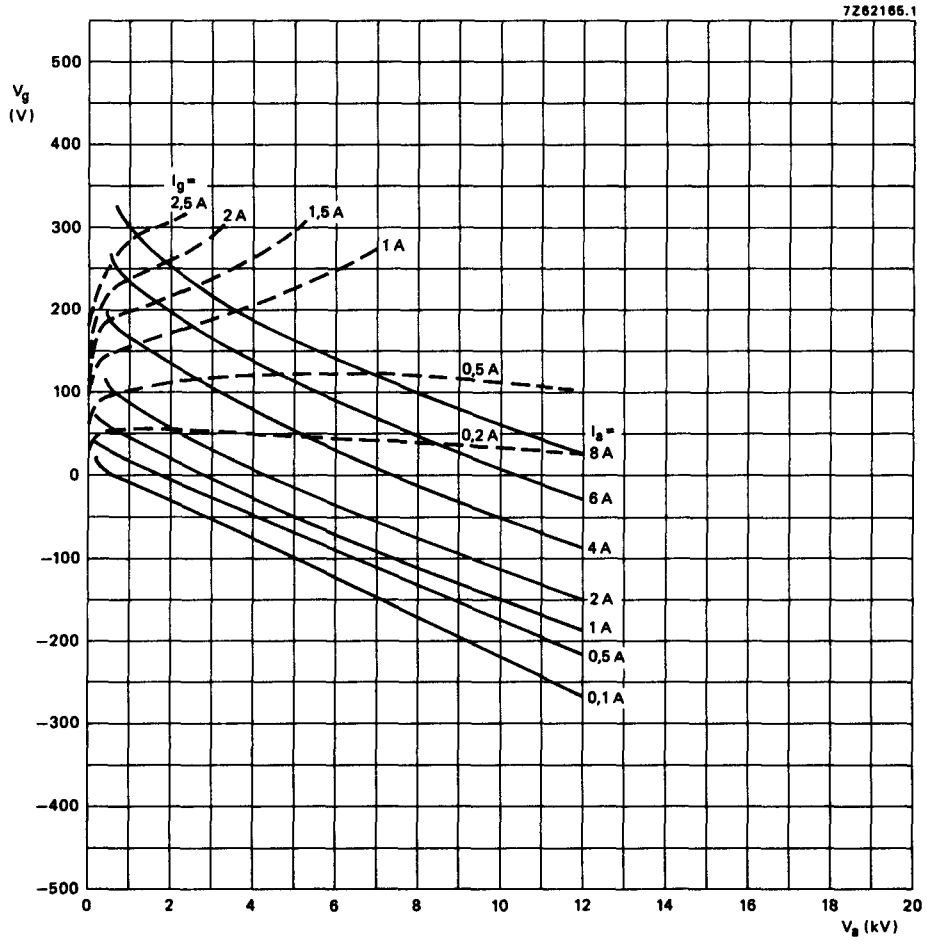


Fig. 2 Constant current characteristics.

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YD1173

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RF POWER TRIODE

Triodes in metal-ceramic construction with flying leads intended for use as industrial oscillators. The YD1174 is forced-air cooled. The YD1178 has an integral water cooler.

QUICK REFERENCE DATA

Oscillator output power ($W_o - W_{feedb}$)	W_{osc}		30 kW
Frequency for full ratings	f	max.	50 MHz

To be read in conjunction with "General Operational Recommendations".

RF CLASS C OSCILLATOR FOR INDUSTRIAL USE
OPERATING CONDITIONS

Frequency	f	30	30	MHz
Oscillator output power ($W_o - W_{feedb}$)	W_{osc}	25,7	30,3	kW
Anode voltage	V_a	10	10	kV
Anode current	I_a	3,4	4,0	A
Anode input power	W_{ia}	34	40	kW
Anode dissipation	W_a	7,6	9,2	kW
Anode output power	W_o	26,4	30,8	kW
Anode efficiency	η_a	77,6	77,0	%
Oscillator efficiency	η_{osc}	75,6	75,8	%
Feedback ratio	V_{gp}/V_{ap}	12	10	%
Grid resistor	R_g	1440	900	Ω
Grid current, on load	I_g	600	690	mA
Grid voltage, negative	$-V_g$	864	621	V
Grid dissipation	W_g	150	180	W
Grid resistor dissipation	W_{Rg}	518	428	W

LIMITING VALUES (Absolute maximum rating system)

Frequency	f	up to	120	MHz*
Anode voltage	V_a	max.	12	kV
Anode current	I_a	max.	5	A
Anode dissipation	W_a	max.	10	kW
Grid voltage	$-V_g$	max.	1,8	kV
Grid current, on load	I_g	max.	1	A
off load	I_g	max.	1,5	A
Grid dissipation	W_g	max.	300	W
Grid circuit resistance	R_g	max.	10	kΩ
Cathode current, mean	I_k	max.	6	A
peak	I_{kp}	max.	25	A
Envelope temperature	T_{env}	max.	240	°C

HEATING: direct; thoriated tungsten filament

Filament voltage	V_f		5,8	V
Filament current	I_f		130	A
Peak filament starting current	I_{fp}	max.	800	A
Cold filament resistance	R_{fo}		5,6	mΩ

The filament is designed to accept temporary fluctuations of + 5% and −10%.

To ensure that the cathode temperature remains constant irrespective of the operating frequency, it may be necessary to reduce the filament voltage at higher frequencies. When doing so it must be borne in mind that the filament voltage-to-current ratio measured with only the filament voltage applied should remain constant under all operating conditions.

It is extremely important that the filament be properly decoupled. This should be done so that the resonance of the circuit formed, by the filament and the decoupling elements remain below the fundamental oscillator frequency. In grounded-grid circuits this resonance should be below the grid-cathode resonance. For further information please see Application Book "Tubes for RF heating" or contact the manufacturer.

CAPACITANCES

Anode to filament	C_{af}	1	pF
Grid to filament	C_{gf}	47	pF
Anode to grid	C_{ag}	25	pF

* When the tube is to be used at frequencies above 50 MHz the manufacturer should be consulted for more detailed information.

CHARACTERISTICS measured at V_a = 6 kV, I_a = 2 A

Transconductance	S	55 mA/V
Amplification factor	μ	24

COOLING

To obtain optimum life, the temperature of the seals and of the envelope should, under normal operating conditions, be kept below 200 °C.

To maintain these temperatures additional cooling may be necessary. At frequencies higher than about 4 MHz cooling of the seals becomes mandatory.

Table 1 Cooling parameters – YD1174

anode + grid dissipation $W_a + W_g$ kW	altitude h m	inlet temperature T_i °C	rate of flow q_{min} m³/min	pressure drop ΔP Pa*	max. outlet temperature T_o °C
10	0	35	9,5	550	94
8	0	35	6,5	280	105
6	0	35	4,5	150	113
4	0	35	3,0	80	117
10	0	45	11,0	690	98
8	0	45	7,6	350	108
6	0	45	5,2	190	115
4	0	45	3,5	100	119
10	1500	35	11,4	630	94
8	1500	35	7,8	320	105
6	1500	35	5,5	170	113
4	1500	35	3,6	90	117
10	3000	25	12,0	620	90
8	3000	25	8,2	320	102
6	3000	25	5,7	170	111
4	3000	25	3,8	90	116

Absolute max. air inlet temperature	T_i max. 45 °C
Direction of airflow	arbitrary

* 1 Pa ≈ 0,1 mm H_2O.

Table 2 Cooling parameters – YD1178

anode + grid dissipation $W_a + W_g$ kW	inlet temperature T_i °C	rate of flow q_{min} ℓ/min	pressure drop ΔP kPa*	outlet temperature T_o °C
10	20	6,0	25	46
	50	9,0	52	67
8	20	4,5	15	49
	50	6,7	31	69
6	20	3,0	7	53
	50	4,5	15	72

Absolute max. water inlet temperature	T_i	max.	50 °C
Absolute max. water pressure	P	max.	600 kPa*

ACCESSORY

Insulating pedestal (YD1174 only)	type 40654

* 100 kPa ≈ 1 at

Mounting position: vertical with anode up or down

Net mass: approx. 7,3 kg

Dimensions in mm

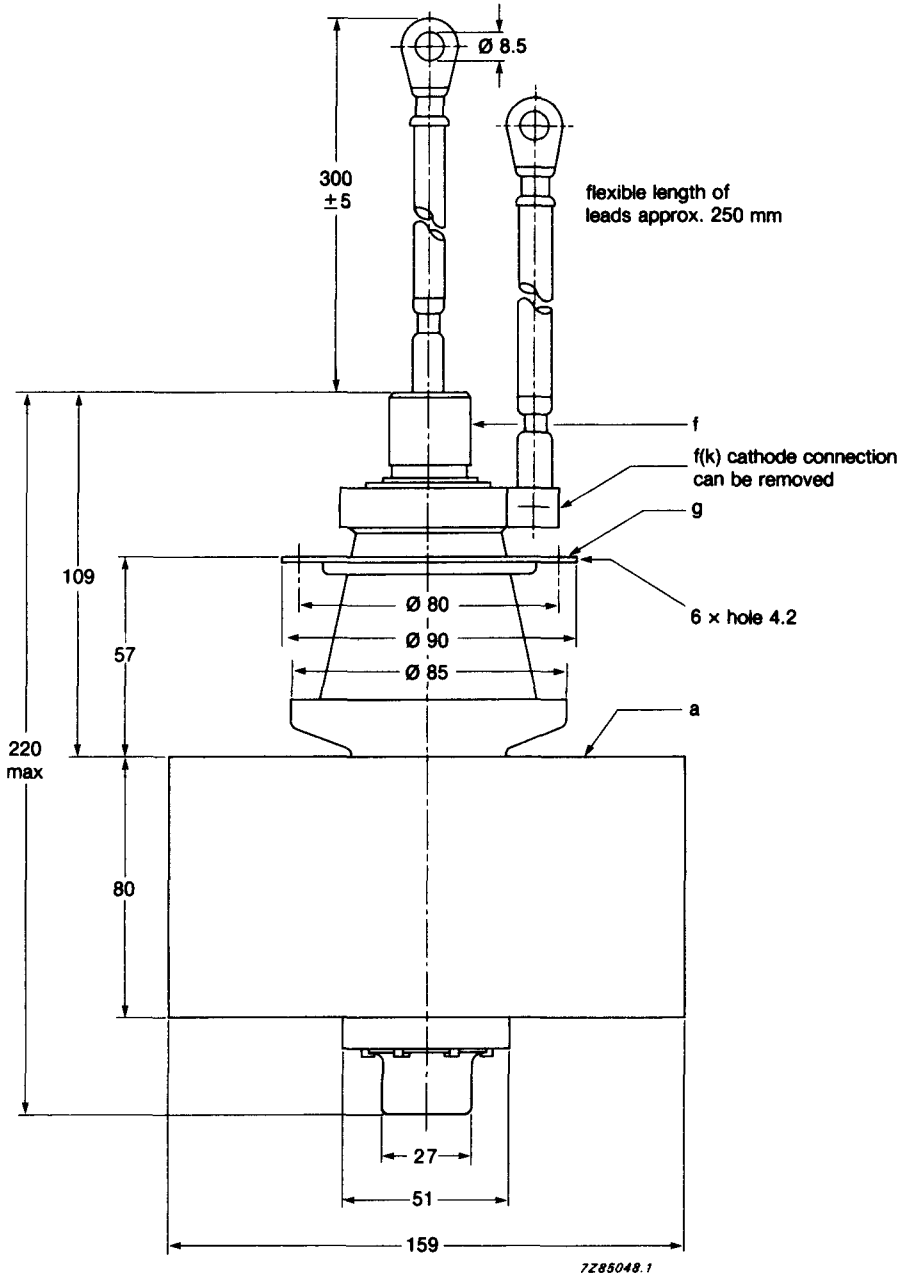


Fig. 1 Mechanical outline – YD1174.

Mounting position: vertical with anode up or down

Net mass: approx. 2,2 kg

Dimensions in mm

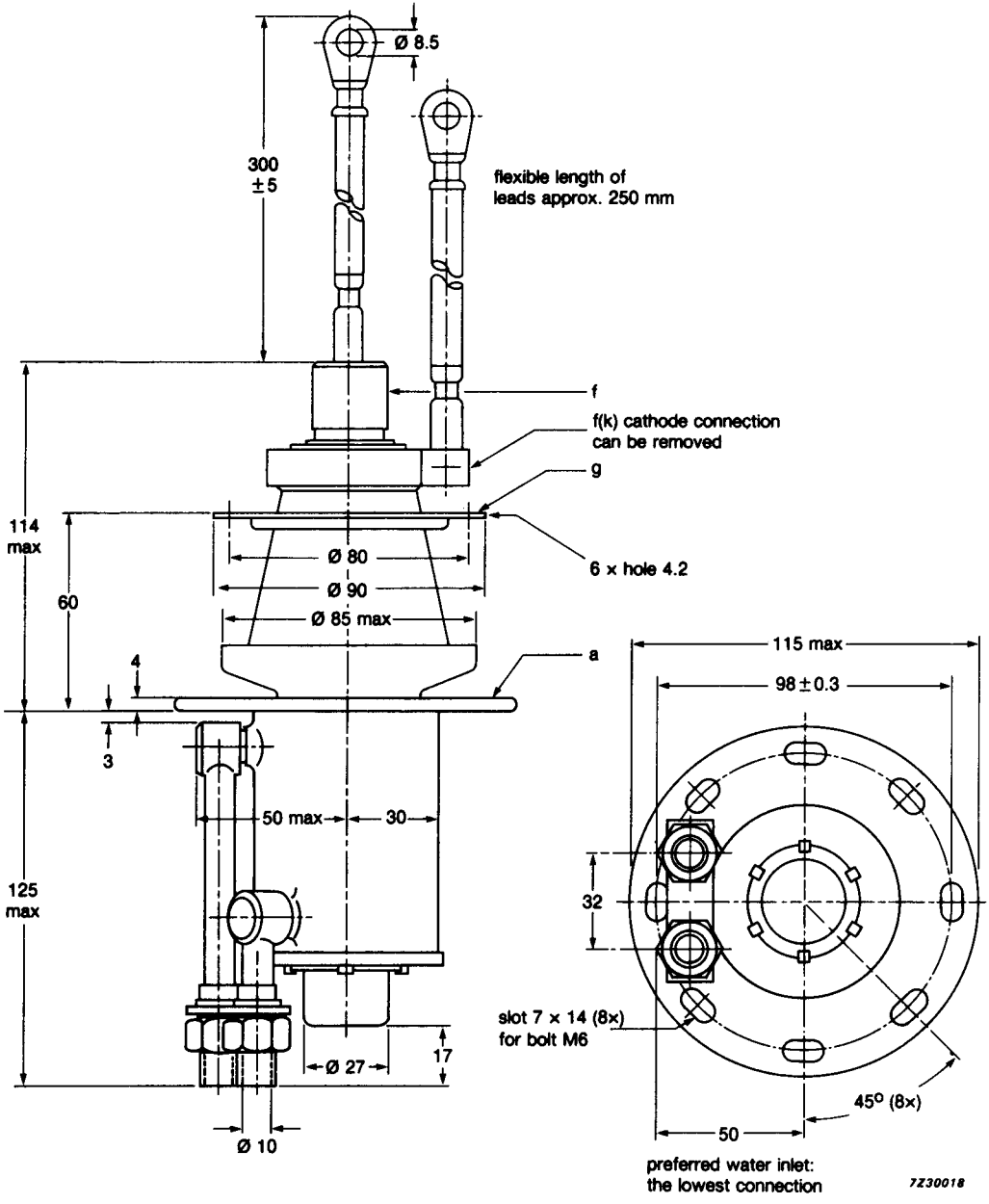


Fig. 2 Mechanical outline — YD1178.

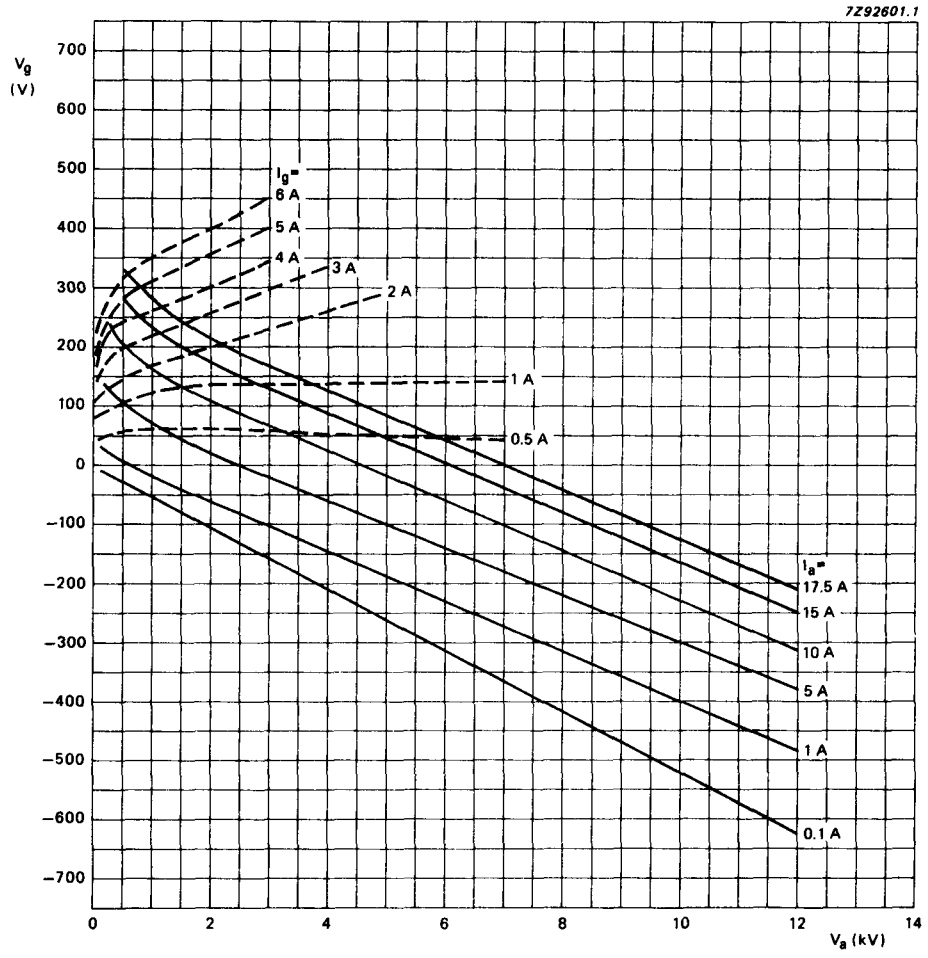


Fig. 3 Constant current characteristics.

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RF POWER TRIODE

Triodes in metal-ceramic construction intended for use as industrial oscillators.
The YD1175 is forced-air cooled.
The YD1177 has an integral water cooler.

QUICK REFERENCE DATA

Oscillator output power (W_o–W_{feedb}), typical	W_{osc}	26,5	kW
Frequency for full ratings	f max	120	MHz

To be read in conjunction with "General Operational Recommendations".

RF CLASS C OSCILLATOR FOR INDUSTRIAL USE

Operating conditions

Frequency	f	120	120	120	MHz
Oscillator output power (W_o–W_{feedb})	W_{osc}	15,6	22,0	26,5	kW
Anode voltage	V_a	6	8	10	kV
Anode current	I_a	3,6	3,6	3,4	A
Anode input power	W_{ia}	21,6	28,8	34,0	kW
Anode dissipation	W_a	5,4	6,1	6,8	kW
Anode output power	W_o	16,2	22,7	27,2	kW
Anode efficiency	η_a	75	78,8	80	%
Oscillator efficiency	η_{osc}	72,2	76,3	78,0	%
Feedback ratio	Vg_p/Va_p	12	10	9	%
Grid resistor	R_g	300	400	560	Ω
Grid current, on load	I_g	1,0	1,0	0,9	A
Grid voltage, negative	$-V_g$	300	400	500	V
Grid dissipation	W_g	290	290	240	W
Grid resistor dissipation	W_{Rg}	300	400	450	W

LIMITING VALUES (Absolute maximum rating system)

Frequency for full ratings		f	up to	120	MHz*
Anode voltage		V_a	max.	12	kV
Anode current		I_a	max.	4	A
Anode input power		W_{ia}	max.	40	kW
Anode dissipation	YD1175	W_a	max.	10	kW
	YD1177	W_a	max.	15	kW
Grid voltage		$-V_g$	max.	1,5	kV
Grid current, on load		I_g	max.	1,1	A
off load		I_g	max.	1,6	A
Grid dissipation		W_g	max.	350	W
Grid circuit resistance		R_g	max.	10	kΩ
Cathode current, mean		I_k	max.	5	A
peak		I_{kp}	max.	25	A
Envelope temperature		T_{env}	max.	240	°C

HEATING: direct; filament thoriated tungsten

Filament voltage	V_f		5,8	V
Filament current	I_f		130	A
Peak filament starting current	I_{fp}	max.	800	A
Cold filament resistance	R_{fo}		5,6	mΩ

The filament is designed to accept temporary fluctuations of + 5% and −10%.

To ensure that the cathode temperature remains constant irrespective of the operating frequency it may be necessary to reduce the filament voltage at higher frequencies. When doing so it must be borne in mind that the filament voltage-to-current ratio, as measured with only the filament voltage applied, should remain constant under all operating conditions.

It is extremely important that the filament be properly decoupled. This should be done so that the resonance of the circuit formed by the filament and the decoupling elements remain below the fundamental oscillator frequency. In grounded-grid circuits this resonance should be below the grid-cathode resonance. For further information please see Application Book "Tubes for RF heating" or contact the manufacturer.

* When the tubes are to be used at frequencies above 30 MHz the manufacturer should be consulted for more detailed information.

CAPACITANCES

Anode to filament	C_{af}	0,4 pF
Grid to filament	C_{gf}	47 pF
Anode to grid	C_{ag}	17 pF

CHARACTERISTICS measured at V_a = 8 kV, I_a = 1,2 A

Transconductance	S	35 mA/V
Amplification factor	μ	45

COOLING

To obtain optimum life, the temperatures of the seals and of the envelope should, under normal operating conditions, be kept below 200 °C.

To maintain these temperatures additional cooling may be necessary. At frequencies higher than about 4 MHz, cooling of the seals becomes mandatory.

YD1175

Table 1 Air cooling characteristics

anode + grid dissipation $W_a + W_g$ kW	altitude h m	inlet temperature T_i °C	rate of flow q_{min} m³/min	pressure drop ΔP Pa*	max. outlet temperature T_o °C
10	0	35	9,5	550	94
8	0	35	6,5	280	105
6	0	35	4,5	150	113
4	0	35	3,0	80	117
10	0	45	11,0	690	98
8	0	45	7,6	350	108
6	0	45	5,2	190	115
4	0	45	3,5	100	119
10	1500	35	11,4	630	94
8	1500	35	7,8	320	105
6	1500	35	5,5	170	113
4	1500	35	3,6	90	117
10	3000	25	12,0	620	90
8	3000	25	8,2	320	102
6	3000	25	5,7	170	111
4	3000	25	3,8	90	116

Absolute max. air inlet temperature T_i max. 45 °C

Direction of airflow: arbitrary.

* 1 Pa ≈ 0,1 mm H_2O.

YD1177

Table 2 Water cooling characteristics

anode + grid dissipation $W_a + W_g$ kW	inlet temperature T_i °C	rate of flow q_{min} ℓ/min	pressure drop ΔP kPa*	max. outlet temperature T_o °C
15	20	7,5	50	50
	50	11,0	100	71
10	20	5,0	24	51
	50	7,2	47	72
5	20	2,5	7	53
	50	3,7	17	73

Absolute max. water inlet temperature	$T_{i\ max.}$ 50 °C
Absolute max. water pressure	P_{max} 600 kPa*

ACCESSORIES

Filament connector with cable	type 40692A
Filament/cathode connector with cable	type 40693A
Grid connector $f \leqslant 4$ MHz	type 40690
$f > 4$ MHz	type 40691
Insulating pedestal (YD1175 only)	type 40654

* 100 kPa ≈ 1 at

MECHANICAL DATA

Dimensions in mm

YD1175

Mounting position: vertical with anode up or down

Net mass: 7,5 kg

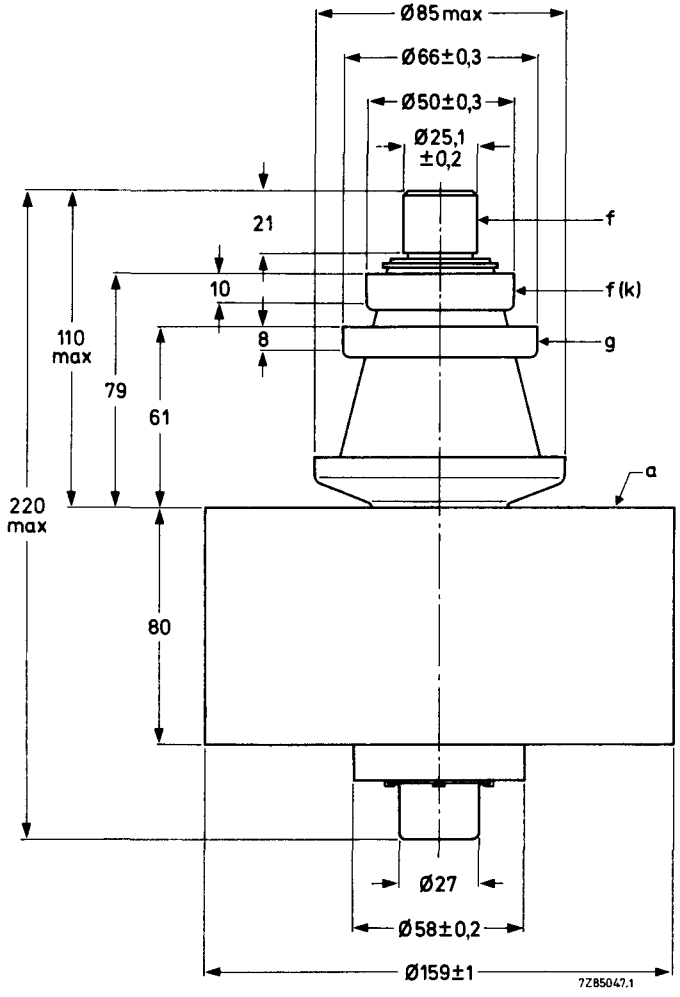


Fig. 1 Mechanical outline – YD1175.

YD1177

Mounting position: vertical with anode up or down

Net mass: approx. 2,4 kg

Dimensions in mm

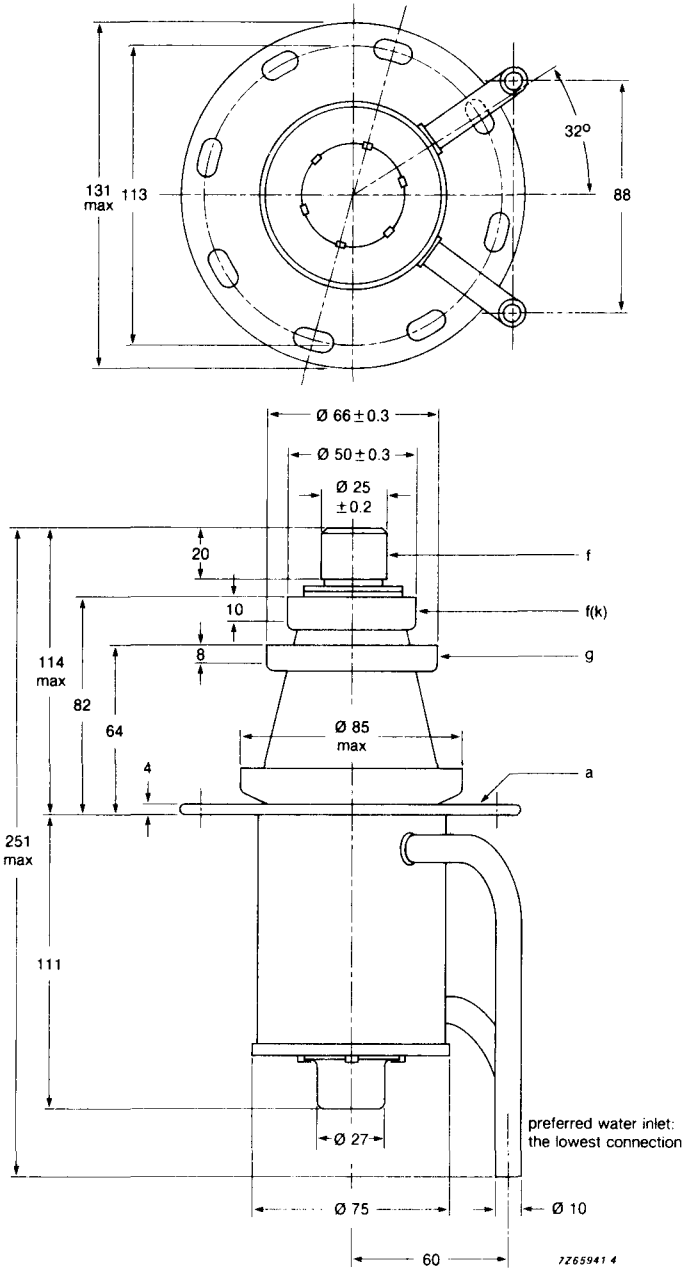


Fig. 2 Mechanical outline – YD1177.

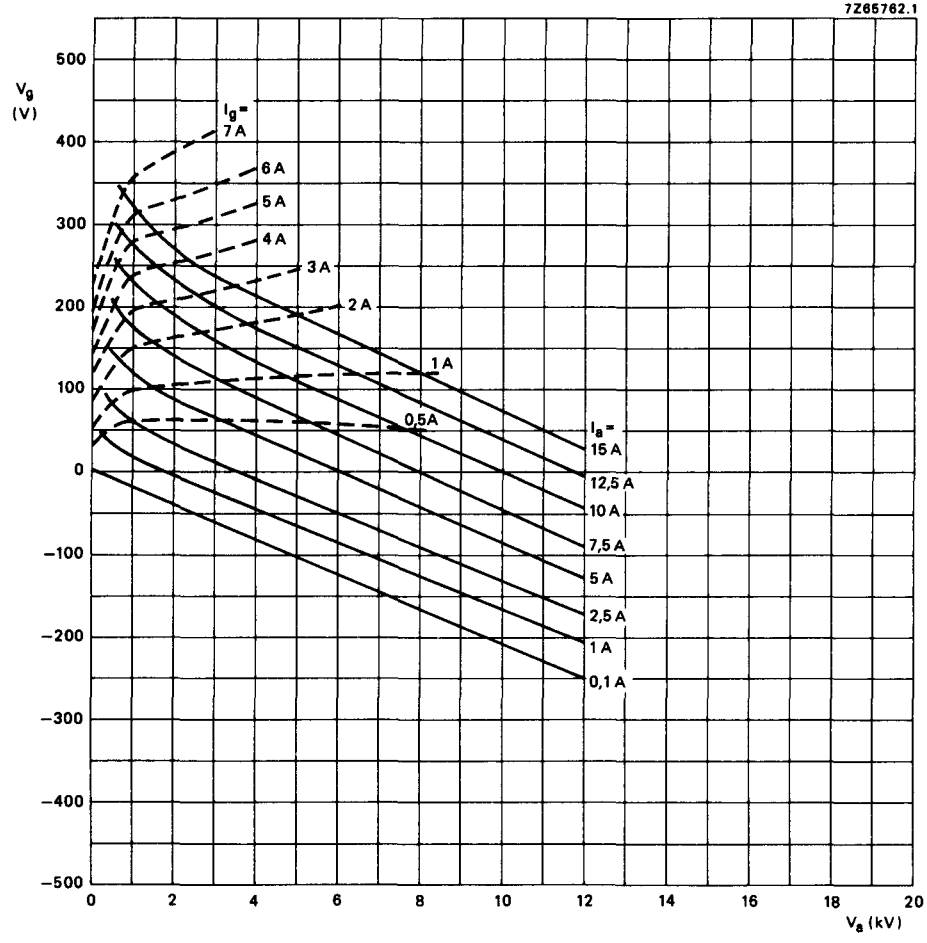


Fig. 3 Constant current characteristics.

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8	FP	2000.08.27

RF POWER TRIODE

Triodes in metal-ceramic construction intended for use as industrial oscillators.

The YD1180 is forced-air cooled
The YD1182 is water cooled by an integral cooler.

QUICK REFERENCE DATA				
Oscillator output power (W_o-W_{feedb}), typical	W_{osc}		31,6	kW
Frequency for full ratings	f	max.	100	MHz

To be read in conjunction with "General Operational Recommendations".

RF CLASS C OSCILLATOR FOR INDUATRIAL USE
OPERATING CONDITIONS

Frequency	f	90	MHz
Oscillator output power (W_o-W_{feedb})	W_{osc}	31,6	kW
Anode voltage	V_a	7,5	kV
Anode current	I_a	5,4	A
Anode input power	W_{ia}	40,5	kW
Anode dissipation	W_a	7,5	kW
Anode output power	W_o	33	kW
Anode efficiency	η_a	81,5	%
Oscillator efficiency	η_{osc}	78	%
Feedback ratio	V_{gp}/V_{ap}	14,8	%
Grid resistor	R_g	450	Ω
Grid current, on load	I_g	1,45	A
Grid voltage, negative	$-V_g$	652	V
Grid dissipation	W_g	450	W
Grid resistor dissipation	W_{Rg}	946	W

LIMITING VALUES (Absolute max. rating system)

Frequency		f	up to	100	MHz
Anode voltage		V_a	max.	9	kV
Anode current		I_a	max.	6	A
Anode input power		W_{ia}	max.	45	kW
Anode dissipation: continuous service	(YD1180)*	W_a	max.	15	kW
	(YD1182)		max.	20	kW
Grid voltage		$-V_g$	max.	1,5	kV
Grid current, on load		I_g	max.	1,6	A
of load		I_g	max.	2,4	A
Grid dissipation		W_g	max.	500	W
Grid circuit resistance		R_g	max.	10	kΩ
Cathode current, mean		I_k	max.	7,5	A
peak		I_{kp}	max.	40	A
Envelope temperature		t_{env}	max.	240	°C

HEATING : direct; thoriated tungsten filament, mesh construction

Filament voltage	V_f		7	V
Filament current	I_f		175	A
Peak filament starting current	I_{fp}	max.	1000	A
Cold filament resistance	R_{fo}		4,2	mΩ

The filament is designed to accept temporary fluctuations of +5% and −10%. To ensure that the cathode temperature remains constant irrespective of the operating frequency, it may be necessary to reduce the filament voltage at higher frequencies. When doing so it must be borne in mind that the filament voltage-to-current ratio measured with only the filament voltage applied should remain constant under all operating conditions.

It is extremely important that the filament be properly decoupled. This should be done so that the resonance of the circuit formed by the filament and the decoupling elements remain below the fundamental oscillator frequency. In grounded-grid circuits this resonance should be below the grid-cathode resonance. For further information please see Application Book "Tubes for RF heating" or contact the manufacturer.

CAPACITANCES

Anode to filament	C_{af}	1	pF
Grid to filament	C_{gf}	66	pF
Anode to grid	C_{ag}	32	pF

* See Fig. 4.

CHARACTERISTICS measured at V_a = 7 kV, I_a = 2,4 A

Transconductance	S	40	mA/V
Amplification factor	μ	33	

COOLING

To obtain optimum life, the temperature of the seals and of the envelope should, under normal operating conditions, be kept below 200 °C.

To maintain these temperatures additional cooling may be necessary.
At frequencies higher than about 4 MHz cooling of the seals becomes mandatory.

YD1180

Direction of airflow: see outline drawing.

See also cooling curves

With insulating pedestal type 40648

Table 1 Air cooling characteristics

Anode+grid dissipation W_a+W_g (kW)	Altitude h (m)	Inlet temperature T_i (°C)	Rate of flow qmin (m^3/min)	Pressure drop ΔP (Pa*)	Outlet temperature T_o (°C)
15	0	35	15	850	92
10	0	35	9,3	320	99
8	0	35	7	200	104
15	0	45	17,3	1060	98
10	0	45	10,7	400	104
8	0	45	8,1	250	108
15	1500	35	18	970	93
10	1500	35	11,2	460	100
8	1500	35	8,4	230	104
15	3000	25	19	950	90
10	3000	25	11,8	450	95
8	3000	25	8,9	230	99

* 1 Pa ≈ 0,1 mm H_2O

YD1182

Table 2 Water cooling characteristics

Anode + grid dissipation Wa + Wg (kW)	Inlet temperature t_i (°C)	Rate of flow q_{min} (ℓ/min)	Pressure drop p_i (kPa*)	Outlet temperature t_o (°C)
20	20	10	40	51
	50	15	80	71
15	20	7,5	22	54
	50	10,5	43	73
10	20	4,5	10	58
	50	6,7	20	75

Absolute max. water inlet temperature	T_i	max.	50	°C
Absolute max. water pressure	P	max.	600	kPa(abs)

ACCESSORIES

Filament connector with cable	type 40708A	net mass	600	g
Filament /cathode connector with cable	type 40709A	net mass	640	g
Grid connector f ≤ 4 MHz	type 40710	net mass	60	g
f > 4 MHz	type 40711	net mass	310	g
Insulating pedestal (YD1180 only)	type 40648	net mass	7,15	kg

* 100 kPa ≈ 1 at.

MECHANICAL DATA

Dimensions in mm

YD1180

Mounting position : vertical with anode up or down

Net mass : approx. 12 kg

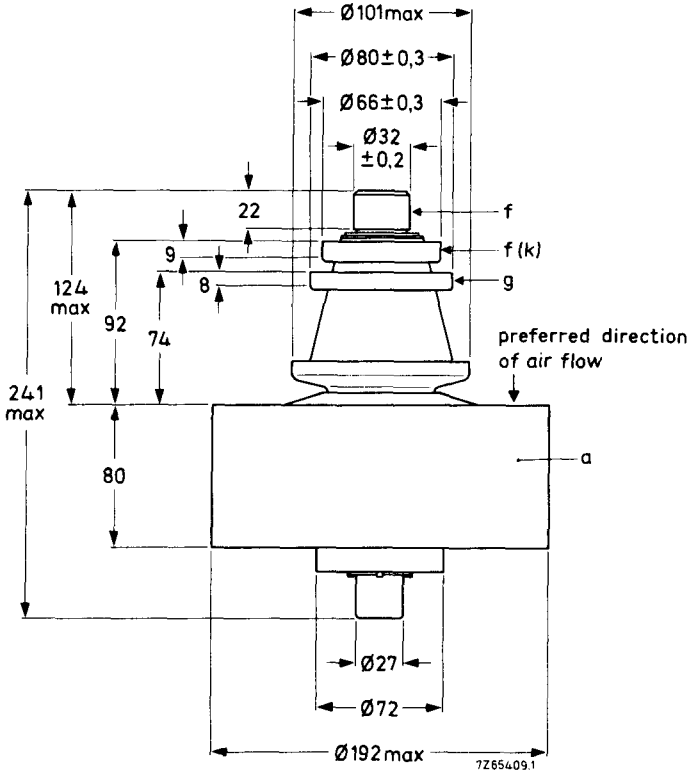


Fig. 1 Mechanical outline.

YD1182

Mounting position : vertical with anode up or down

Net mass : approx. 3,5 kg

Dimensions in mm

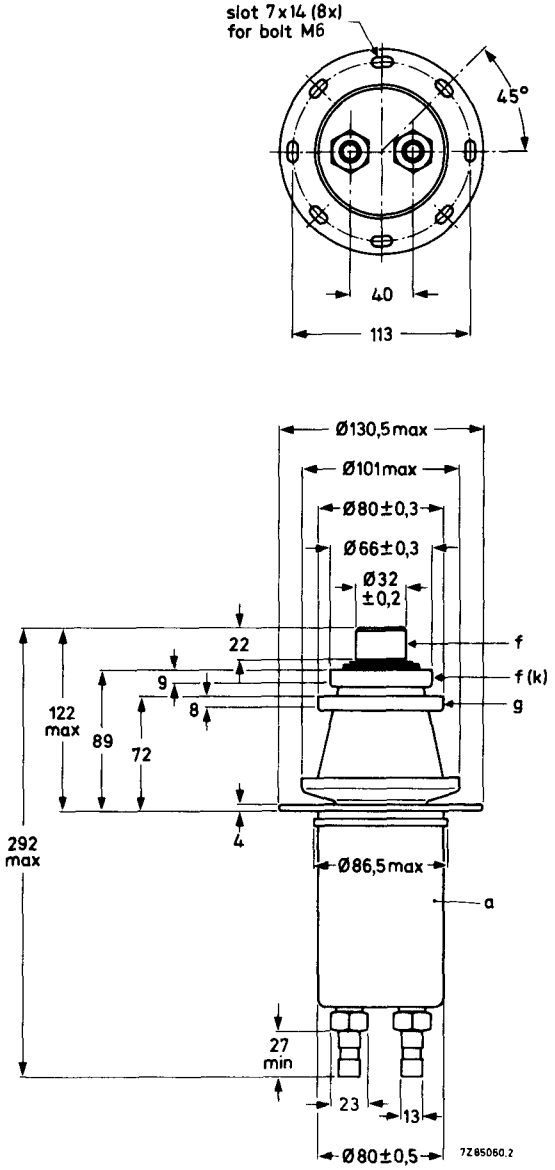


Fig. 2 Mechanical outline – YD1182.

Thread of water connections BSP 1/2 in

With anode up the inlet and outlet connections should be interchanged.

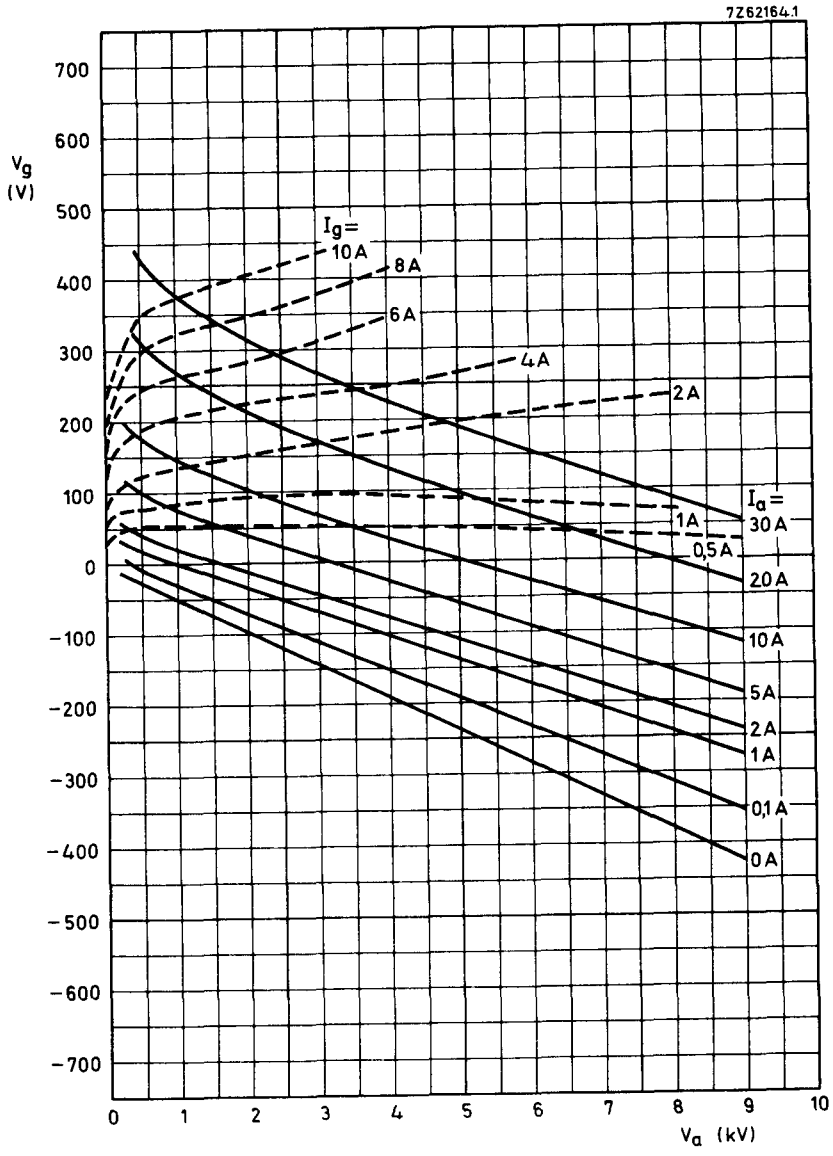
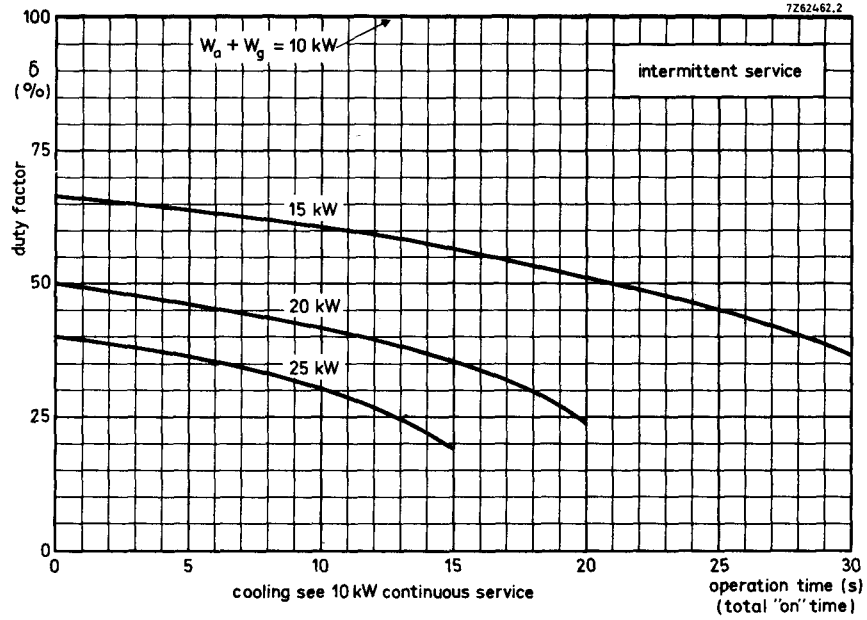
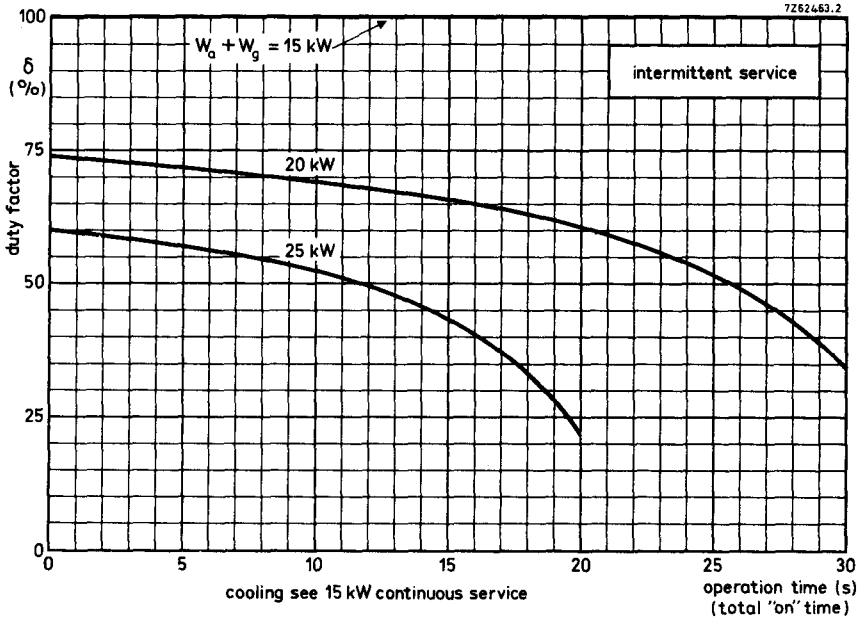


Fig. 3 Constant current characteristics.

Fig. 4 (YD1180 only). Intermittent service. Limits of anode dissipation and cooling.

YD1180





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6	236	1984.08
7	237	1988.02
8	238	1988.02
9	FP	2000.09.09

RF POWER TRIODE

Triodes in metal-ceramic construction intended for use as industrial oscillators.
The YD1185 is forced-air cooled
The YD1187 is water cooled by an integral cooler.

QUICK REFERENCE DATA				
Oscillator output power (W_o-W_{feedb}), typical	W_{osc}		50	kW
Fequency for full ratings	f	max.	100	MHz

To be read in conjunction with "General Operational Recommendations".

RF CLASS C OSCILLATOR FOR INDUSTRIAL USE

OPERATING CONDITIONS

Frequency	f	90	90	90	MHz
Oscillator output power (W_o-W_{feedb})	W_{osc}	33,4	40	50	kW
Anode voltage	V_a	8,5	10	12	kV
Anode current	I_a	5,4	5,33	5,33	A
Anode input power	W_{ia}	45,9	53,3	64	kW
Anode dissipation	W_a	11,4	12,1	12,8	kW
Anode output power	W_o	34,5	41,2	51,2	kW
Anode efficiency	η_a	75,1	77,3	80,0	%
Oscillator efficiency	η_{osc}	72,7	75,0	78,1	%
Feedback ratio	V_{gp}/V_{ap}	11	10,2	9	%
Grid resistor	R_g	330	400	430	Ω
Grid current, on load	I_g	1,5	1,45	1,4	A
Grid voltage, negative	$-V_g$	495	580	600	V
Grid dissipation	W_g	400	380	360	W
Grid resistor dissipation	W_{Rg}	740	840	840	W

LIMITING VALUES (Absolute max. rating system)

Frequency for full ratings	f	up to	100	MHz
Anode voltage	V_a	max.	14,4	kV
Anode current	I_a	max.	6	A
Anode input power	W_{ia}	max.	72	kW
Anode dissipation, continuous service (YD1185)*	W_a	max.	15	kW
(YD1187)	W_a	max.	20	kW
Grid voltage	$-V_g$	max.	1,5	kV
Grid current, on load	I_g	max.	1,6	A
off load	I_g	max.	2,4	A
Grid dissipation	W_g	max.	500	W
Grid circuit resistance	R_g	max.	10	kΩ
Cathode current, mean	I_k	max.	7,5	A
peak	I_{kp}	max.	40	A
Envelope temperature	T_{env}	max.	240	°C

HEATING : direct; thoriated tungsten filament, mesh construction

Filament voltage	V_f		7	V
Filament current	I_f		175	A
Peak filament staring current	I_{fp}	max.	1000	A
Cold filament resistance	R_{f_o}		4,2	mΩ

The filament is designed to accept temporary fluctuations of +5% and -10%.

To ensure that the cathode temperature remains constant irrespective of the operating frequency, it may be necessary to reduce the filament voltage at higher frequencies. When doing so it must be borne in mind that the filament voltage-to-current ratio measured with only the filament voltage applied should remain constant under all operating conditions

It is extremely important that the filament be properly decoupled. This should be done so that the resonance of the circuit formed by the filament and decoupling elements remain below the fundamental oscillator frequency. In grounded-grid circuits this resonance should be below the grid-cathode resonance. For further information please see Application Book "Tubes for RF heating" or consult the manufacturer.

CAPACITANCES

Anode to filament	C_{af}	0,8	pF
Grid to filament	C_{gf}	66	pF
Anode to grid	C_{ag}	22	pF

* See Fig. 4.

CHARACTERISTICS measured at V_a = 11 kV, I_a = 1,5 A

Transconductance	S	40	mA/V
Amplification factor	μ	50	

COOLING

To obtain optimum life, the temperature of the seals and of the envelope should, under normal operating conditions, be kept below 200 °C.

To maintain these temperatures additional cooling may be necessary.
At frequencies higher than about 4 MHz cooling of the seals becomes mandatory.

YD1185

Table 1 Air cooling characteristics

With insulating pedestal type 40648

Anode + grid dissipation $W_a + W_g$ (kW)	Altitude h (m)	Inlet temperature T_i (°C)	Rate of flow q_{min} (m^3/min)	Pressure drop ΔP (Pa *)	Outlet temperature T_o (°C)
15	0	35	15	850	92
10	0	35	9,3	350	99
8	0	35	7	220	104
15	0	45	17,3	1060	98
10	0	45	10,7	440	104
8	0	45	8,1	270	108
15	1500	35	18	970	93
10	1500	35	11,2	400	100
8	1500	35	8,4	250	104
15	3000	25	19	950	90
10	3000	25	11,8	390	95
8	3000	25	8,9	250	99

* 1 Pa ≈ 0,1 mm H_2O

YD1187

Table 2 Water cooling characteristics

Anode + grid dissipation $W_a + W_g$ (kW)	Inlet temperature T_i (°C)	Rate of flow qmin (ℓ/min)	Pressure drop ΔP (kPa*)	Outlet temperature T_o (°C)
20	20	10	40	51
	50	15	80	71
15	20	7	22	54
	50	10, 5	43	73
10	20	4, 5	10	58
	50	6, 7	20	75

Absolute max. water inlet temperature	T_i	50	°C
Absolute max. water pressure	P	600	kPa* (abs)

ACCESSORIES

Filament connector with cable	type	40708A	net mass	600	g
Filament/cathode connector with cable	type	40709A	net mass	640	g
Grid connector ⩽ 4 MHz	type	40710	net mass	60	g
Grid connector > 4 MHz	type	40711	net mass	310	g
Insulating pedestal (YD1185 only)	type	40648	net mass	7, 15	kg

* 100 kPa ≈ 1 at.

MECHANICAL DATA

YD1185

Mounting position: vertical with anode up or down

Net mass: approx. 12 kg

Dimensions in mm

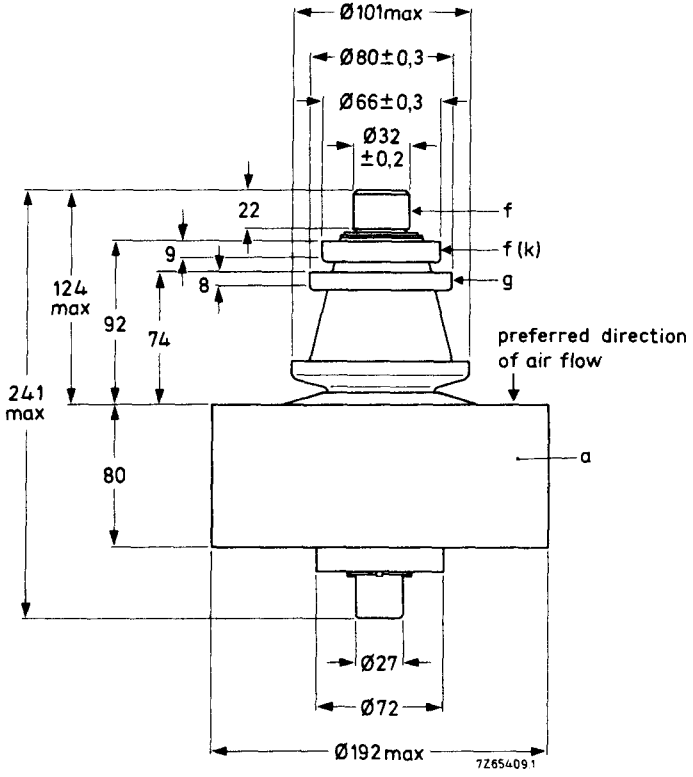


Fig. 1 Mechanical outline – YD1185.

YD1187

Mounting position : vertical, with anode up or down

Net mass : approx. 3,4 kg

Dimensions in mm

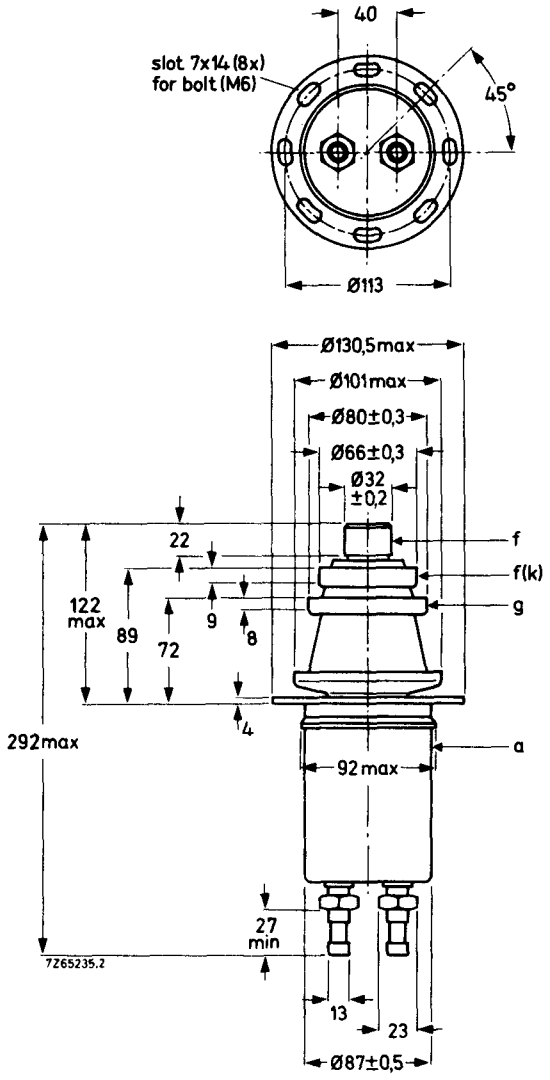


Fig. 2 Mechanical outline – YD1187.

Thread of water connections BSP 1/2 in

With the anode up the inlet and outlet connections should be interchanged.

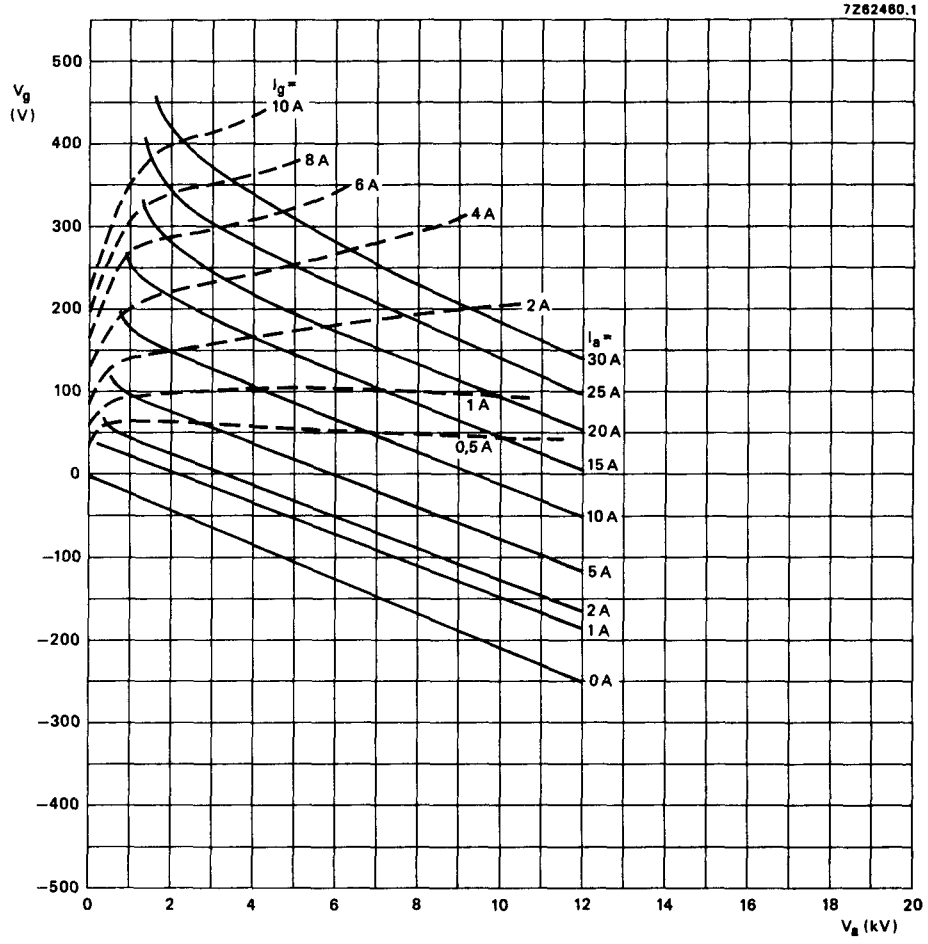


Fig. 3 Constant current characteristics.

YD1185

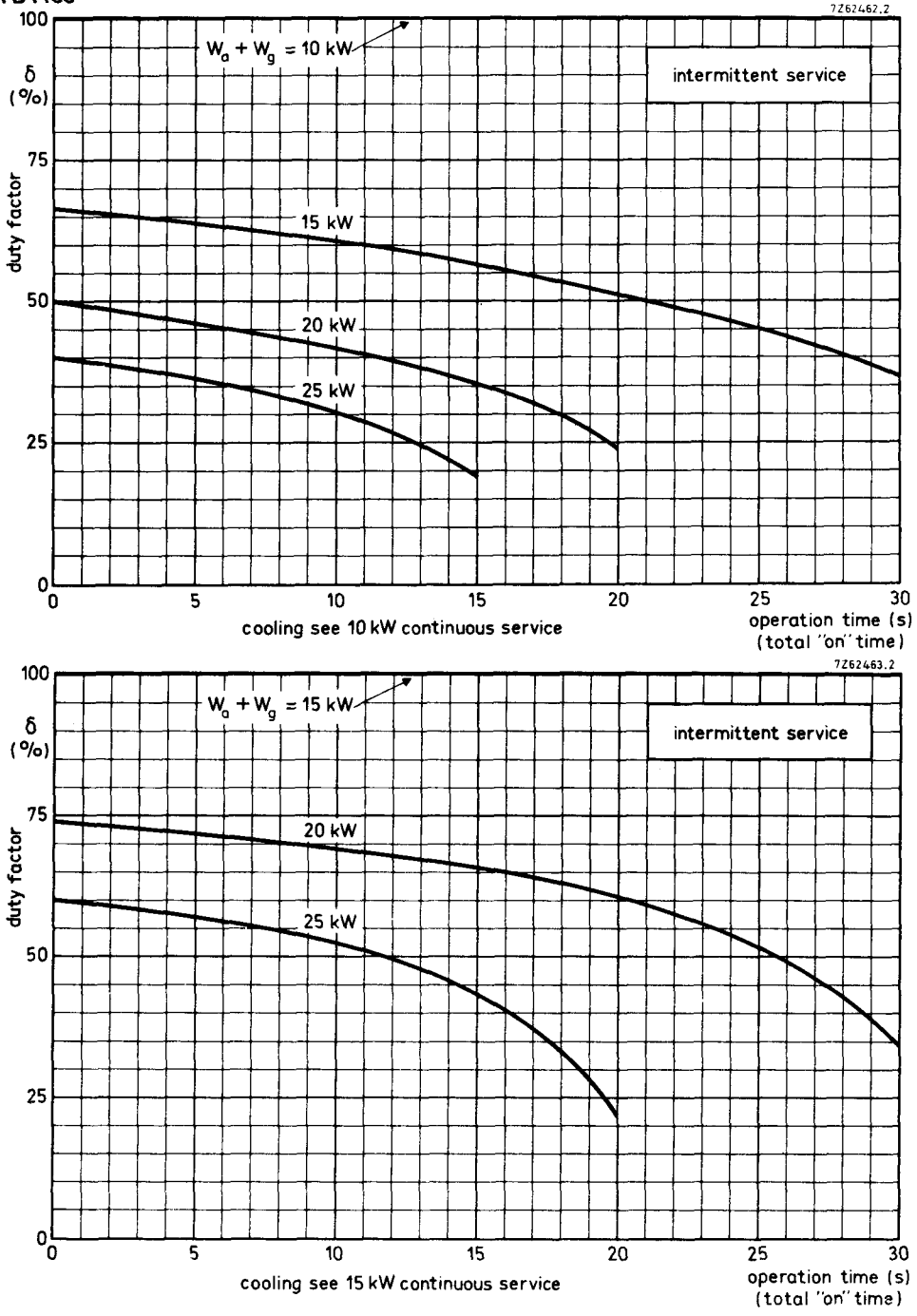


Fig. 4 (YD1185 only). Intermittent service. Limits of anode dissipation and cooling.

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YD1185 YD1187

page	sheet	date
1	239	1988.02
2	240	1988.02
3	241	1988.02
4	242	1988.02
5	243	1988.02
6	244	1988.02
7	245	1984.11
8	246	1988.02
9	FP	2000.09.09

RF POWER TRIODE

Forced-air-cooled triode in metal-ceramic construction intended for use as industrial oscillator.

QUICK REFERENCE DATA

Oscillator output power (W_o–W_{feedb}), typical	W_{osc}		50 kW
Frequency for full ratings	f	max.	100 MHz

To be read in conjunction with "General Operational Recommendations".

RF CLASS C OSCILLATOR FOR INDUSTRIAL USE

OPERATING CONDITIONS

Frequency	f	90	90	90	MHz
Oscillator output power (W_o-W_{feedb})	W_{osc}	33	40	50	kW
Anode voltage	V_a	8,5	10	12	kV
Anode current	I_a	5,4	5,4	5,4	A
Anode input power	W_{ia}	45,9	54,0	64,8	kW
Anode dissipation	W_a	11,6	12,5	13,2	kW
Anode output power	W_o	34,4	41,5	51,6	kW
Anode efficiency	η_a	75	77	80	%
Oscillator efficiency	η_{osc}	72	74	77	%
Feedback ratio	V_{gp}/V_{ap}	17	16	14	%
Grid resistor	R_g	700	900	1100	Ω
Grid current, on load	I_g	1,2	1,1	1,0	A
Grid voltage, negative	$-V_g$	840	1000	1100	V
Grid dissipation	W_g	360	340	320	W
Grid resistor dissipation	W_{Rg}	1000	1100	1200	W

LIMITING VALUES (Absolute maximum rating system)

Frequency for full ratings	f	up to	100 MHz
Anode voltage	V_a	max.	14,5 kV
Anode current	I_a	max.	7 A
Anode input power	W_{ia}	max.	72 kW
Anode dissipation, continuous service *	W_a	max.	15 kW
Grid voltage	$-V_g$	max.	2 kV
Grid current			
on load	I_g	max.	1,2 A
off load	I_g	max.	1,6 A
Grid dissipation	W_g	max.	400 W
Grid circuit resistance	R_g	max.	15 kΩ
Cathode current			
mean	I_k	max.	8 A
peak	I_{kp}	max.	40 A
Envelope temperature	T_{env}	max.	240 °C

HEATING: direct; thoriated tungsten filament, mesh construction

Filament voltage	V_f		7 V
Filament current	I_f		175 A
Peak filament staring current	I_{fp}	max.	1000 A
Cold filament resistance	R_{fo}		4,2 mΩ

The filament is designed to accept temporary fluctuations of +5% and −10%.

To ensure that the cathode temperature remains constant irrespective of the operating frequency, it may be necessary to reduce the filament voltage at higher frequencies. When doing so it must be borne in mind that the filament voltage-to-current ratio measured with only the filament voltage applied should remain constant under all operating conditions.

It is extremely important that the filament be properly decoupled. This should be done so that the resonance of the circuit formed by the filament and the decoupling elements remain below the fundamental oscillator frequency. In grounded-grid circuits this resonance should be below the grid-cathode resonance. For further information please see Application Book "Tubes for RF Heating" or consult the manufacturer.

CAPACITANCES

Anode to filament	C_{af}	0,8 pF
Grid to filament	C_{gf}	60 pF
Anode to grid	C_{ag}	21 pF

* See Fig. 3.

CHARACTERISTICS measured at V_a = 11 kV, I_a = 1,5 A

Transconductance	S	22 mA/V
Amplification factor	μ	24

COOLING

To obtain optimum life, the temperature of the seals and of the envelope should, under normal operating conditions, be kept below 200 °C.

To maintain these temperatures additional cooling may be necessary. At frequencies higher than about 4 MHz cooling of the seals becomes mandatory.

Table 1 Air cooling characteristics

If used with insulating pedestal type 40648:

Anode + grid dissipation $W_a + W_g$ kW	Altitude h m	Inlet temperature T_i °C	Rate of flow q_{min} m^3/min	Pressure drop ΔP Pa *	Outlet temperature T_o °C
15	0	35	15	850	92
10	0	35	9,3	350	99
8	0	35	7	220	104
15	0	45	17,3	1060	98
10	0	45	10,7	440	104
8	0	45	8,1	270	108
15	1500	35	18	970	93
10	1500	35	11,2	400	100
8	1500	35	8,4	250	104
15	3000	25	19	950	90
10	3000	25	11,8	390	95
8	3000	25	8,9	250	99

* 1 Pa ≈ 0,1 mm H_2O.

MECHANICAL DATA

Dimensions in mm

Mounting position: vertical with anode up or down

Net mass: approx. 12 kg

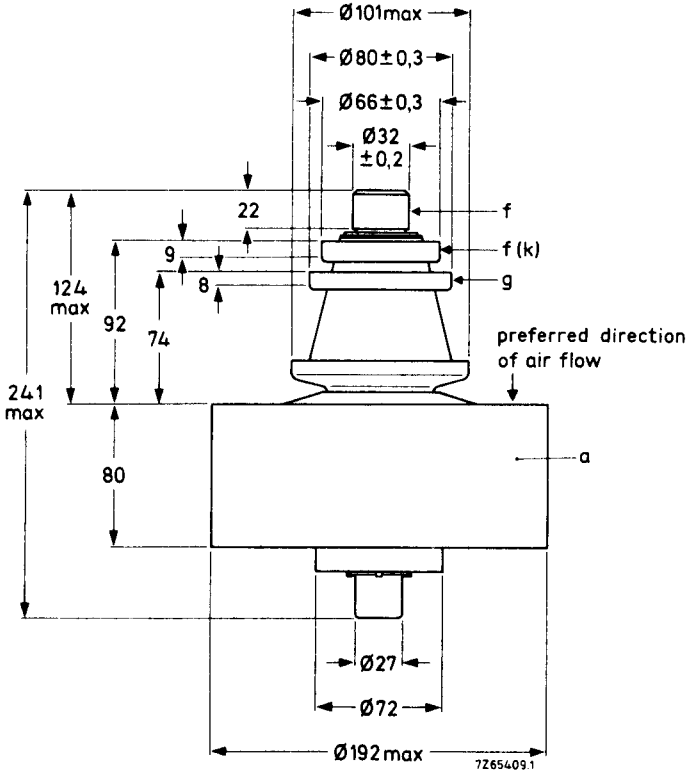


Fig. 1 Mechanical outline.

ACCESSORIES

Filament connector with cable	type	40708A
Filament/cathode connector with cable	type	40709A
Grid connector ⩽ 4 MHz	type	40710
Grid connector > 4 MHz	type	40711
Insulating pedestal	type	40648

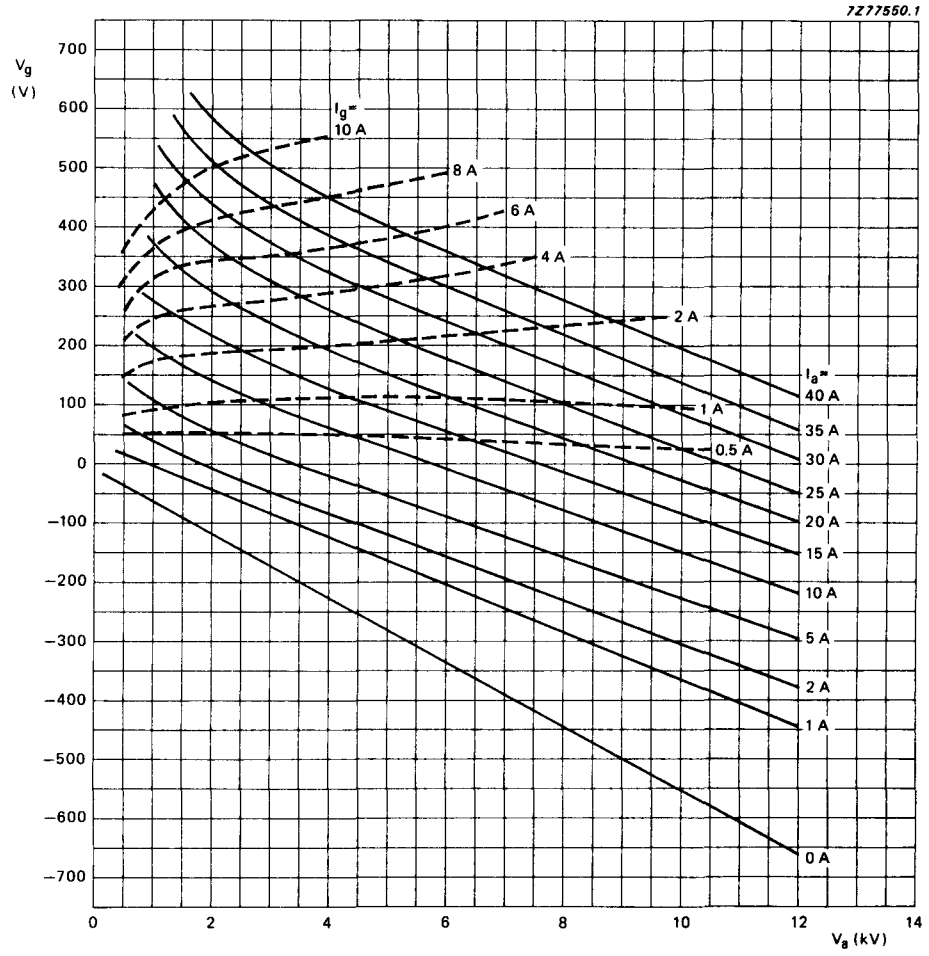


Fig. 2 Constant current characteristics.

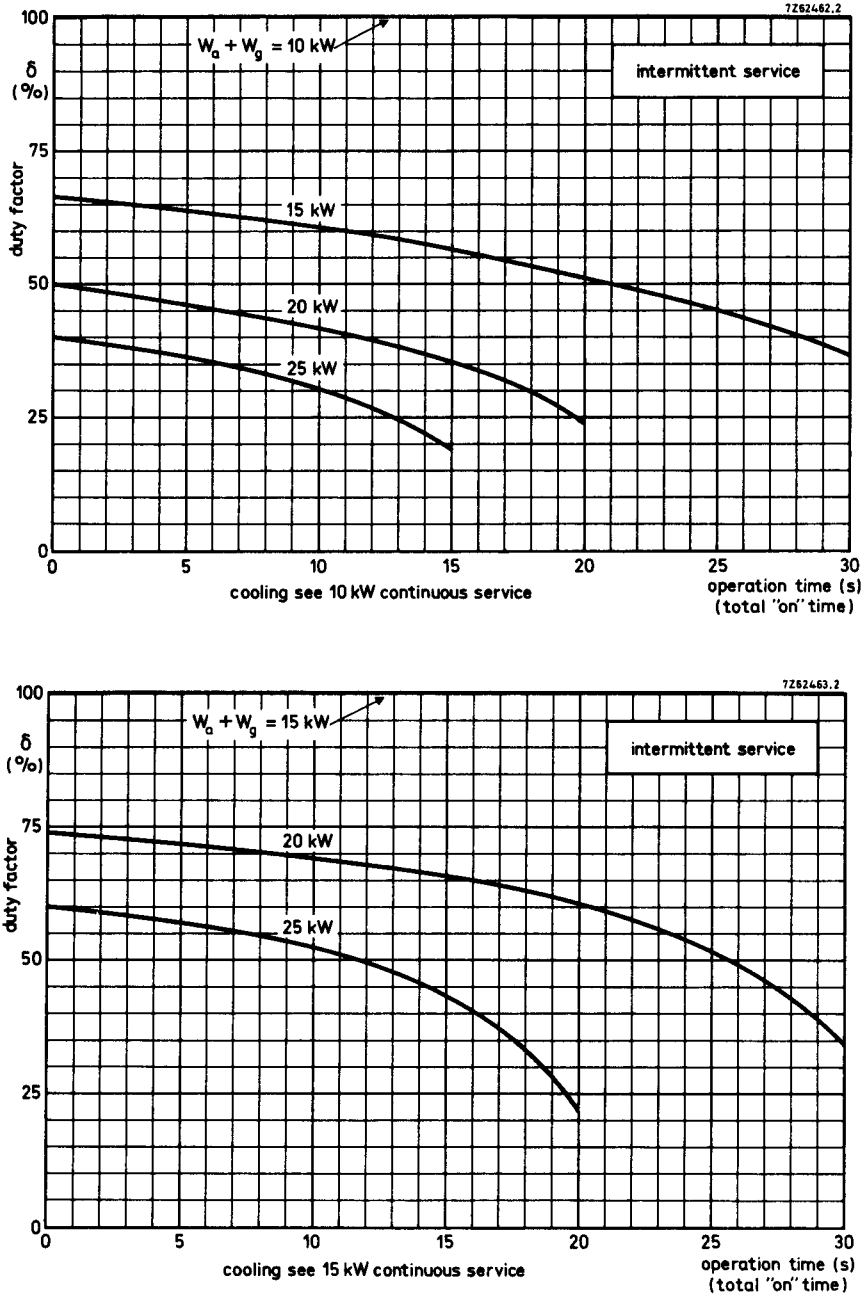


Fig. 3 Intermittent service. Limits of anode dissipation and cooling.

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Electronic components and materials

YD1186

page	sheet	date
1	247	1988.02
2	248	1988.02
3	249	1988.02
4	250	1988.02
5	251	1988.02
6	252	1988.02
7	FP	2000.09.09

RF POWER TRIODE

Triodes in metal-ceramic construction intended for use as industrial oscillators.
The YD1190 is forced-air cooled.
The YD1192 has an integral water cooler.

QUICK REFERENCE DATA

Oscillator output power (W_o–W_{feedb}), typical	YD1190	W_{osc}		96	kW
	YD1192	W_{osc}		110	kW
Frequency for full ratings		f	max.	30	MHz

RF CLASS C OSCILLATOR FOR INDUSTRIAL USE

OPERATING CONDITIONS		YD1190/YD1192			YD1192	
Frequency	f	30	30	30	30	MHz
Oscillator output power (W_o–W_{feedb})	W_{osc}	62,7	84	96	110	kW
Anode voltage	V_a	8	10	12	12	kV
Anode current	I_a	10	11	10	12	A
Anode input power	W_{ia}	80	110	120	144	kW
Anode dissipation	W_a	15	23,4	22	31	kW
Anode output power	W_o	65	86,6	98	113	kW
Anode efficiency	η_a	81,2	78,7	81,7	78,5	%
Oscillator efficiency	η_{osc}	78,4	76,4	80	76,4	%
Feedback ratio	V_{gp}/V_{ap}	14,6	13,5	11	11,8	%
Grid resistor	R_g	300	333	400	364	Ω
Grid current, on load	I_g	2,25	2,25	2	2,2	A
Grid voltage, negative	$-V_g$	675	750	800	800	V
Grid dissipation	W_g	750	810	676	814	W
Grid resistor dissipation	W_{Rg}	1,52	1,7	1,6	1,76	kW

LIMITING VALUES (Absolute maximum rating system)

Frequency		f	up to	100	MHz*
Anode voltage		V_a	max.	13	kV
Anode current		I_a	max.	14	A
Anode input power	YD1190	W_{ia}	max.	144	kW
	YD1192	W_{ia}	max.	150	kW
Anode dissipation, continuous service	YD1190	W_a	max.	30	kW
Anode dissipation	YD1192	W_a	max.	50	kW
Grid voltage		$-V_g$	max.	1,5	kV
Grid current, on load		I_g	max.	2,8	A
Grid current, off load		I_g	max.	3,8	A
Grid dissipation		W_g	max.	1	kW
Grid circuit resistance		R_g	max.	10	kΩ
Cathode current, mean		I_k	max.	17,5	A
Cathode current, peak		I_{kp}	max.	70	A
Envelope temperature**		T_{env}	max.	240	°C

HEATING: direct; thoriated tungsten filament, mesh construction

Filament voltage	V_f		8,4	V
Filament current	I_f		235	A
Peak filament starting current	I_{fp}	max.	1500	A
Gold filament resistance	R_{fo}		3,9	mΩ

The filament is designed to accept temporary fluctuations of + 5% and −10%.

* When the tubes are to be used at frequencies above 30 MHz the manufacturer should be consulted for more detailed information.

** To obtain optimum life, the temperature of the seals and the envelope should, under normal operating conditions, be kept below 200 °C.

To ensure that the cathode temperature remains constant irrespective of the operating frequency it may be necessary to reduce the filament voltage at higher frequencies. When doing so it must be borne in mind that the filament voltage-to-current ratio measured with only the filament voltage applied should remain constant under all operating conditions.

It is extremely important that the filament be properly decoupled. This should be done so that the resonance of the circuit formed by the filament and the decoupling elements remain below the fundamental oscillator frequency. In grounded-grid circuits this resonance should be below the grid-cathode resonance. For further information please see Application Book "Tubes for RF heating" or contact the manufacturer.

CAPACITANCES

Anode to filament	C_{af}	1,3 pF
Grid to filament	C_{gf}	100 pF
Anode to grid	C_{ag}	45 pF

CHARACTERISTICS measured at V_a = 8 kV, I_a = 6 A

Transconductance	S	90 mA/V
Amplification factor	μ	30

COOLING

Table 1 Air cooling characteristics

YD1190

anode + grid dissipation $W_a + W_g$ kW	altitude h m	inlet temperature T_i °C	rate of flow q_{min} m³/min	pressure drop ΔP Pa*	outlet temperature T_o °C
30	0	35	34	1200	84
25	0	35	27,2	780	87
20	0	35	21,4	480	89
30	0	45	38	1500	91
25	0	45	30,4	980	93
20	0	45	23,9	600	95
30	1500	35	41	1380	84
25	1500	35	32,7	900	87
20	1500	35	25,7	550	89
30	3000	25	43	1350	79
25	3000	25	34,4	880	83
20	3000	25	27	540	85

The above cooling conditions apply to the air flow direction as indicated in the ouline drawing. In case of reversed flow direction a larger air volume will be required to keep the anode temperature below the limiting value.

* 1 Pa ≈ 0,1 mm H_2O.

Table 2 Water cooling characteristics

YD1192

anode + grid dissipation $W_a + W_g$ kW	inlet temperature T_i °C	rate of flow q_{min} ℓ/min	pressure drop ΔP kPa*	outlet temperature T_o °C
50	20	26	60	49
	50	39	123	69
40	20	20	40	51
	50	30	80	71
30	20	14	21	53
	50	21	43	72
20	20	9	10	56
	50	13,5	20	74

Absolute maximum water inlet temperature	T_i	max.	50 °C
Absolute maximum water pressure	P	max.	600 kPa

To obtain optimum life, the temperature of the seals and the envelope should, under continuously loaded conditions, be kept below 200 °C.

At low frequencies the seals are sufficiently cooled when the filament connectors are water cooled with a flow of about 0,5 ℓ/min. At higher frequencies, however, an additional air flow of about 1 m^3/min must be led along the seals from a 30 mm diameter nozzle positioned at a distance of 200 mm from the tube header.

ACCESSORIES

Filament connector with cable	type 40705A
Filament/cathode connector with cable	type 40706A
Grid connector, $f > 4$ MHz	type 40736
$f \leqslant 4$ MHz	type 40707
Insulating pedestal (YD1190 only)	type 40729

* 100 kPa ≈ 1 at.

YD1190

MECHANICAL DATA

Dimensions in mm

Mounting position: vertical with anode up or down

Net mass: approx. 20 kg

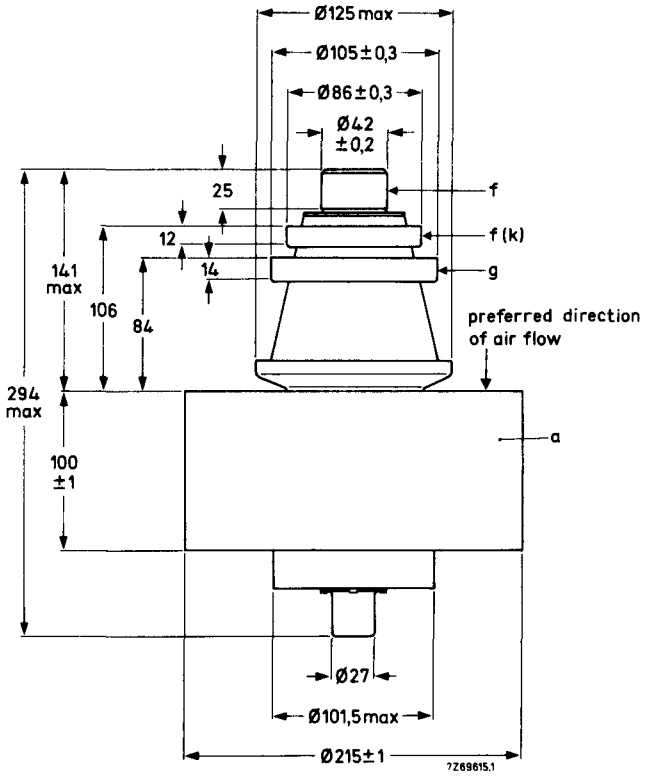


Fig. 1 Mechanical outline – YD1190.

YD1192

MECHANICAL DATA

Dimensions in mm

Mounting position: vertical with anode up or down

Net mass: ≈ 5,8 kg

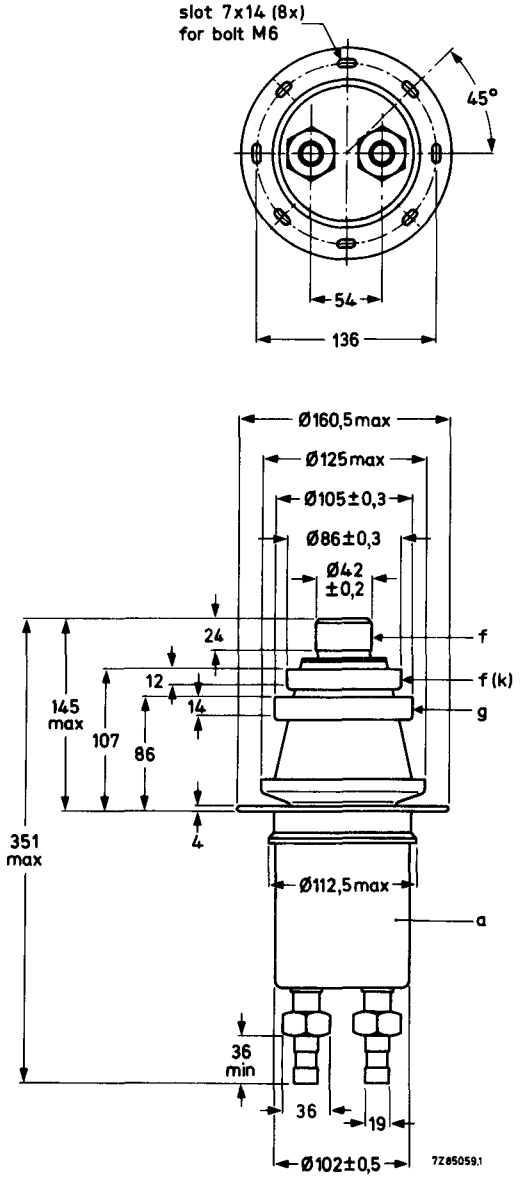


Fig. 2 Mechanical outline – YD1192.

Thread of water connections BSP 1 in

With anode up the inlet and outlet connections should be interchanged.

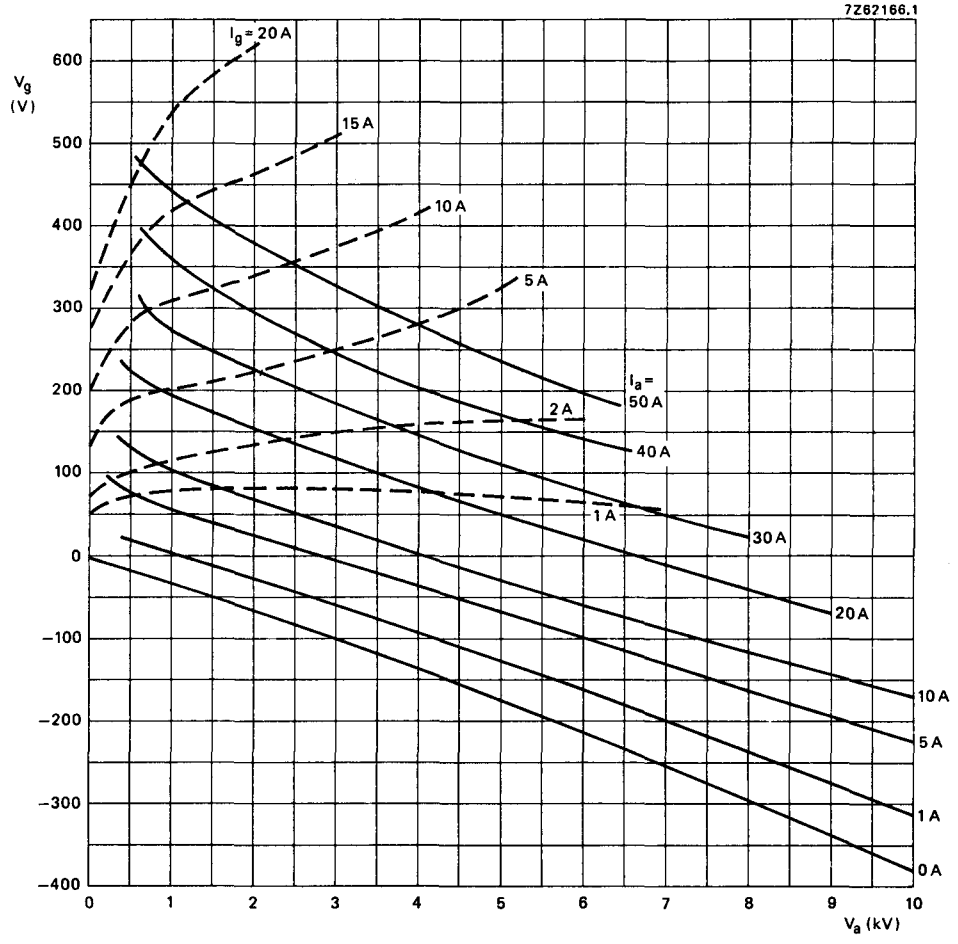


Fig. 3 Constant current characteristics.

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Data handbook

Electronic components and materials

YD1190 YD1192

page	sheet	date
1	253	1988.02
2	254	1988.02
3	255	1988.02
4	256	1988.02
5	257	1988.02
6	258	1988.02
7	259	1988.02
8	FP	2000.09.09

VAPOUR COOLED R.F. INDUSTRIAL TRIODE

Vapourcooled triode of metal-ceramic construction intended for use as an industrial oscillator.

QUICK REFERENCE DATA				
Oscillator output power (W_o- W_{feedb}), typical	W_{osc}		62.7	kW
Frequency for full ratings	f	max.	100	MHz

To be read in conjunction with "General Recommendations Transmitting tubes, Tubes for R.F. heating".

R.F. CLASS C OSCILLATOR FOR INDUSTRIAL USE

OPERATING CONDITIONS

Frequency	f	30	MHz
Oscillator output power (W_o-W_{feedb})	W_{osc}	62.7	kW
Anode voltage	V_a	8.0	kV
Anode current	I_a	10	A
Anode input power	W_{ia}	80	kW
Anode dissipation	W_a	15	kW
Anode output power	W_o	65	kW
Anode efficiency	η_a	81.2	%
Oscillator efficiency	η_{osc}	78.4	%
Feedback ratio	V_{gp}/V_{ap}	14.6	%
Grid resistor	R_g	300	Ω
Grid current, on load	I_g	2.25	A
Grid voltage, negative	$-V_g$	675	V
Grid dissipation	W_g	750	W
Grid resistor dissipation	W_{Rg}	1.52	kW

LIMITING VALUES (Absolute max. rating system)

Frequency for full ratings	f	up to	100	MHz[1]
Anode voltage	V_a	max.	9.6	kV
Anode current	I_a	max.	12	A
Anode input power	W_{ia}	max.	96	kW
Anode dissipation	W_a	max.	40	kW
Grid voltage	$-V_g$	max.	1.5	kV
Grid current, on load	I_g	max.	2.5	A
off load	I_g	max.	3.5	A
Grid dissipation	W_g	max.	1	kW
Grid circuit resistance	R_g	max.	10	kΩ
Cathode current, mean	I_k	max.	14	A
peak	I_{kp}	max.	70	A
Envelope temperature	t_{env}	max.	240	°C

HEATING : direct; filament thoriated tungsten

Filament voltage	V_f		8.4	V
Filament current	I_f		235	A
Peak filament starting current	I_{fp}	max.	1500	A
Cold filament resistance	R_{fo}		3.9	mΩ

The filament is designed to accept temporary fluctuations of +5 % and −10 %.

CAPACITANCES

Anode to filament	C_{af}	1.3	pF
Grid to filament	C_{gf}	100	pF
Anode to grid	C_{ag}	45	pF

CHARACTERISTICS measured at V_a = 8 kV, I_a = 6 A

Transconductance	S	90	mA/V
Amplification factor	μ	35	

1) When the tube has to be used at frequencies above 30 MHz the manufacturer should be consulted for more detailed information.

COOLING

See also cooling curves
With integrated boiler-condensor type K735.

Anode + grid dissipation $W_a + W_g$ (kW)	Inlet temperature t_i (^oC)	Rate of flow q_{min} (ℓ/min)	Pressure drop p_i (atm)	Outlet temperature t_o (^oC)
40	20	11	0.05	74
	35	15	0.07	74
	50	25	0.16	74
30	20	8	0.03	76
	35	11	0.05	76
	50	17	0.09	76
20	20	5	0.02	80
	35	6.7	0.03	80
	50	10	0.04	80

Air-cooling of seals is required.

To obtain optimum life, the seal/envelope temperature under continuously loaded conditions should be kept at or lower than 200 ^oC.

ACCESSORIES

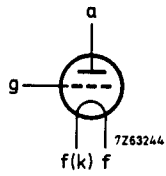
Filament connector	type	40706	net weight	390	g
Filament/cathode connector	type	40705	net weight	330	g
Filament cables (both required)	type	40718	net weight	460	g
	and				
	type	40719	net weight	475	g
Grid connector	type	40736	net weight	450	g
Boiler condenser	type	K735	net weight	70	kg

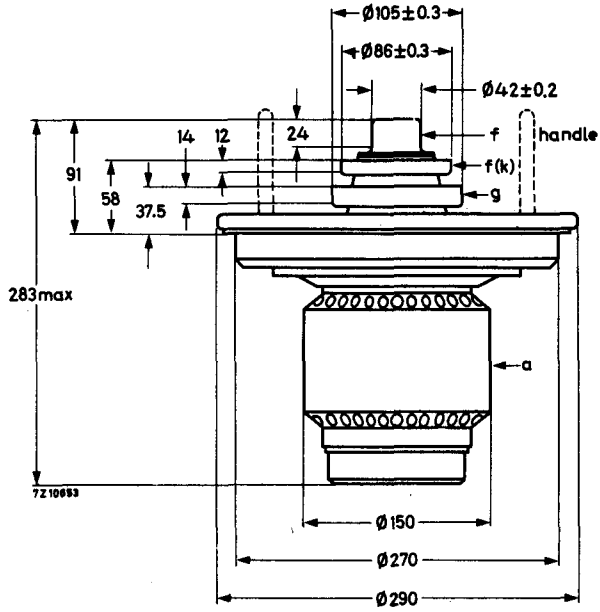
MECHANICAL DATA

Dimensions in mm

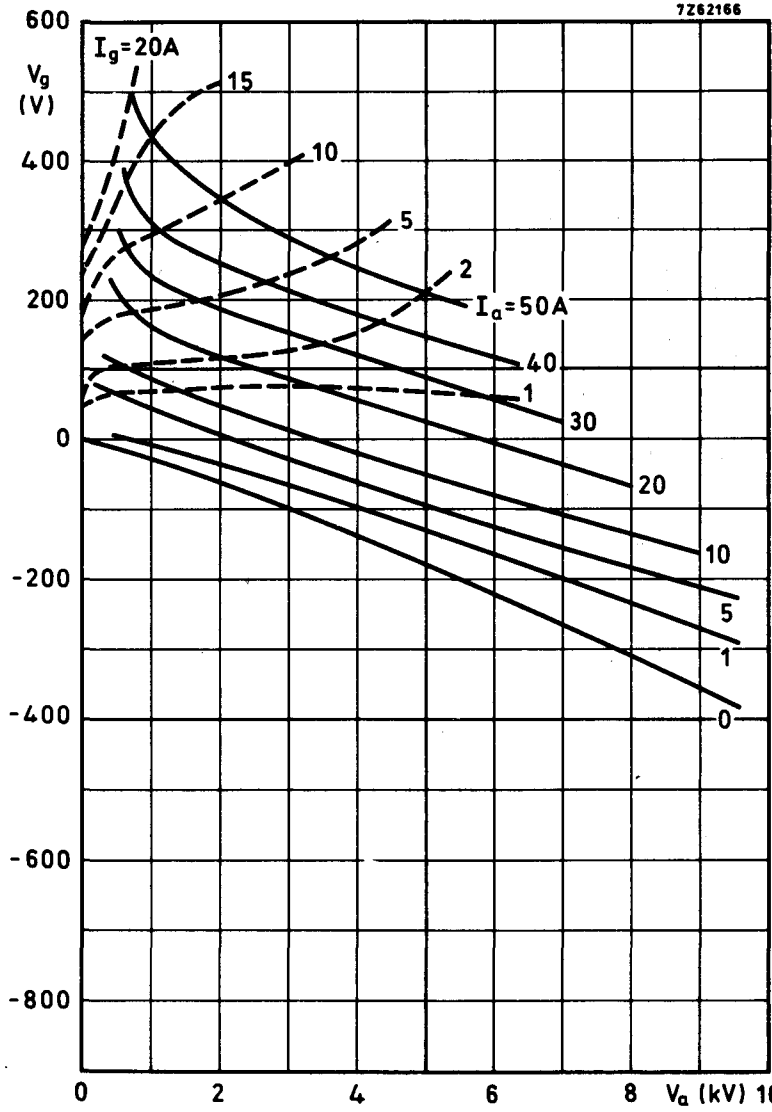
Mounting position: vertical with anode down

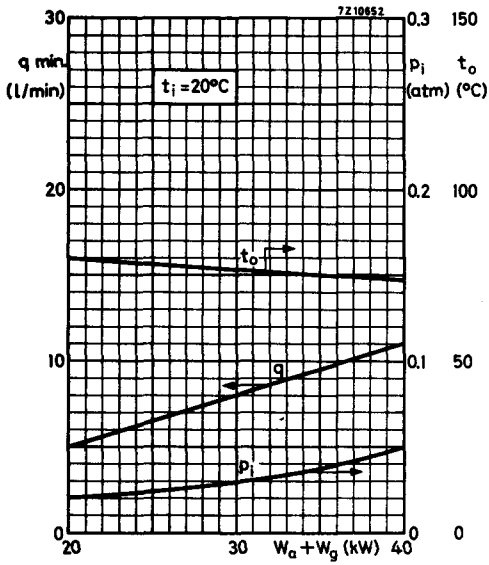
Net weight: approx 15.7 kg

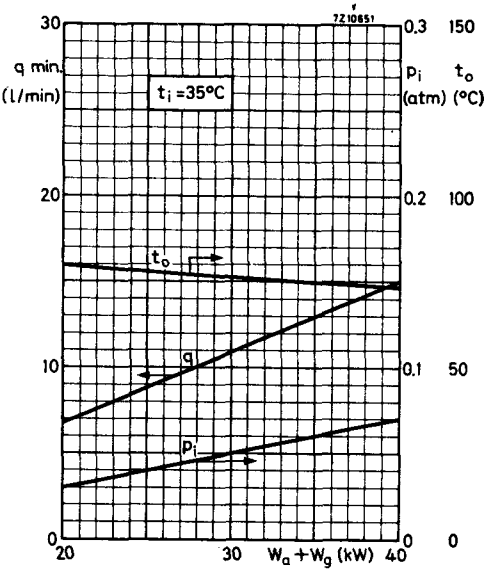


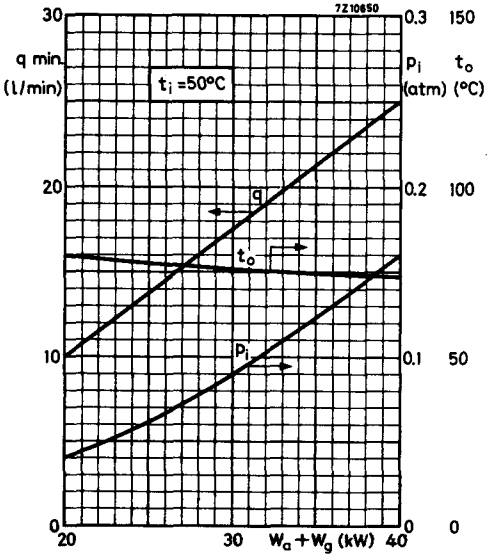


Note: The handles should be removed before switching on the tube.


7Z62166
600
400
200
0
-200
-400
-600
-800
V_g (V)
I_g=20A
15
10
5
2
I_a=50A
40
1
30
20
10
5
1
0
0
2
4
6
8
V_a (kV) 10


7Z10652
q min.
(l/min)
t_i =20°C
p_i (atm)
t_o (°C)
t_o
q
p_i
W_a+W_g (kW)


7Z10651
q min.
(l/min)
t_i =35°C
p_i (atm)
t_o (°C)
t_o
q
p_i
W_a+W_g (kW)


7Z10650
q min.
(l/min)
t_i =50°C
p_i (atm)
t_o (°C)
q
t_o
p_i
W_a+W_g (kW)

RF POWER TRIODE

Triodes in metal-ceramic construction intended for use as industrial oscillators.
The YD1195 is forced-air cooled.
The YD1197 has an integral water cooler.

QUICK REFERENCE DATA					
Oscillator output power (W_o-W_{feedb}), typical	YD1195	W_{osc}		90	kW
	YD1197	W_{osc}		107,6	kW
Frequency for full ratings		f	max.	30	MHz

RF CLASS C OSCILLATOR FOR INDUSTRIAL USE

OPERATING CONDITIONS		YD1195/YD1197			YD1197	
Frequency	f	30	30	30	30	MHz
Oscillator output power (W_o-W_{feedb})	W_{osc}	60,6	74	90	107,6	kW
Anode voltage	V_a	8,5	10	12	12	kV
Anode current	I_a	10	10	9,75	12	A
Anode input power	W_{ia}	85	100	117	144	kW
Anode dissipation	W_a	22,4	24	24,9	34	kW
Anode output power	W_o	62,6	76	92,1	110	kW
Anode efficiency	η_a	73,6	76	78,8	76,4	%
Oscillator efficiency	η_{osc}	71,2	74	77	74,7	%
Feedback ratio	V_{gp}/V_{ap}	12,5	10,9	9,4	11	%
Grid resistor	R_g	210	240	260	230	Ω
Grid current, on load	I_g	2,4	2,3	2,3	2,6	A
Grid voltage, negative	$-V_g$	500	550	600	600	V
Grid dissipation	W_g	760	730	720	840	W
Grid resistor dissipation	W_{Rg}	1,2	1,27	1,38	1,56	kW

LIMITING VALUES (Absolute max. ratings system)

Frequency		f	up to	100	MHz[1])
Anode voltage		V_a	max.	14,4	kV
Anode current		I_a	max.	15	A
Anode input power	YD1195	W_{ia}	max.	144	kW
	YD1197	W_{ia}	max.	150	kW
Anode dissipation, continuous service	YD1195	W_a	max.	30	kW
intermittent service	YD1195 *				
Anode dissipation	YD1197	W_a	max.	50	kW
Grid voltage		$-V_g$	max.	1,5	kV
Grid current, on load		I_g	max.	2,8	A
off load		I_g	max.	3,8	A
Grid dissipation		W_g	max.	1	kW
Grid circuit resistance		R_g	max.	10	kΩ
Cathode current, mean		I_k	max.	17,5	A
peak		I_{kp}	max.	70	A
Envelope temperature		T_{env}	max.	240	°C

HEATING : direct: thoriated tungsten filament, mesh construction

Filament voltage	V_f		8,4	V
Filament current	I_f		235	A
Peak filament starting current	I_{fp}	max.	1500	A
Cold filament resistance	R_{fo}		3,9	mΩ

The filament is designed to accept temporary fluctuations of +5% and −10%.

* See Fig. 4.

1) When the tubes are to be used at frequencies above 30 MHz the manufacturer should be consulted for more detailed information.

To ensure that the cathode temperature remains constant irrespective of the operating frequency it may be necessary to reduce the filament voltage at higher frequencies. When doing so it must be borne in mind that the filament voltage-to-current ratio measured with only the filament voltage applied should remain constant under all operating conditions.

It is extremely important that the filament be properly decoupled. This should be done so that the resonance of the circuit formed by the filament and the decoupling elements remain below the fundamental oscillator frequency. In grounded-grid circuits this resonance should be below the grid-cathode resonance. For further information please see Application Book "Tubes for RF heating" or contact the manufacturer.

CAPACITANCES

Anode to filament	C_{af}	1,2	pF
Grid to filament	C_{gf}	100	pF
Anode to grid	C_{ag}	33	pF

CHARACTERISTICS measured at V_a = 12 kV, I_a = 3 A

Transconductance	S	80	mA/V
Amplification factor	μ	50	

COOLING

Table 1 Air cooling characteristics

YD1195

Anode + grid dissipation $W_a + W_g$ kW	Altitude h m	Inlet temperature T_i °C	Rate of flow q_{min} m^3/min	Pressure drop ΔP Pa*	Outlet temperature T_o °C
30	0	35	34	1200	84
25	0	35	27,2	780	87
20	0	35	21,4	480	89
30	0	45	38	1500	91
25	0	45	30,4	980	93
20	0	45	23,9	600	95
30	1500	35	41	1380	84
25	1500	35	32,7	900	87
20	1500	35	25,7	550	89
30	3000	25	43	1350	79
25	3000	25	34,4	880	83
20	3000	25	27	540	85

* 1 Pa ≈ 0,1 mm H_2O.

The above cooling conditions apply to the air flow direction as indicated in the outline drawing. In case of reversed flow direction a larger air volume will be required to keep the anode temperature below the limiting value.

To obtain optimum life, the temperature of the seals and the envelope should, under normal operating conditions, be kept below 200 °C.

YD1197

Table 2 Water cooling characteristics

Anode + grid dissipation $W_a + W_g$ kW	Inlet temperature t_i °C	Rate of flow qmin ℓ/min	Pressure drop p_i kPa	Outlet temperature t_i °C
50	20	26	60	49
	50	39	123	69
40	20	20	40	51
	50	30	80	71
30	20	14	24	53
	50	21	43	72
20	20	9	10	56
	50	13,5	20	74

Absolute max. water inlet temperature	T_i	max.	50	°C
Absolute max. water pressure	p	max.	600	kPa(abs)

To obtain optimum life, the temperature of the seals and the envelope should, under continuously loaded conditions, be kept belwo 200 °C.

At low frequencies the seals are sufficiently cooled when the filament connectors are water cooled with a flow of about 0,5 ℓ/min. At higher frequencies, however, an additional air flow of about 1 m^3/min must be led along the seals from a 30 mm diameter nozzle positioned at a distance of 200 mm from the tube header.

ACCESSORIES

Filament connector with cable	type	40705A
Filament/cathode connector with cable	type	40706A
Grid connector, f > 4 MHz	type	40736
f ≤ 4 MHz	type	40707
Insulating pedestal (YD1195 only)	type	40729

*100 kPa ≈ 1 at.

YD1195

MECHANICAL DATA

Dimensions in mm

Mounting position : vertical with anode up or down

Net mass : approx. 20 kg

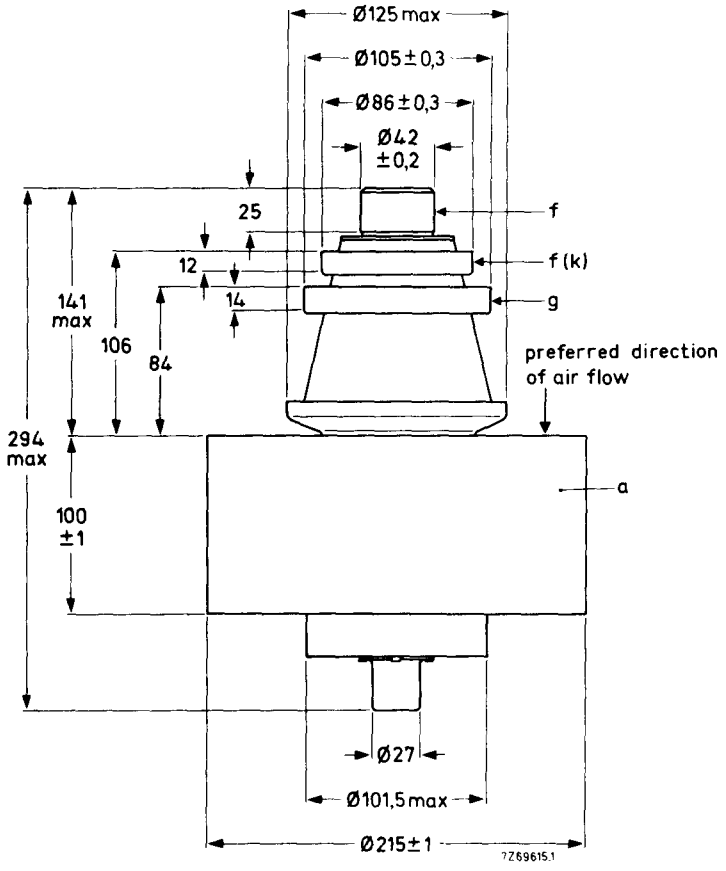


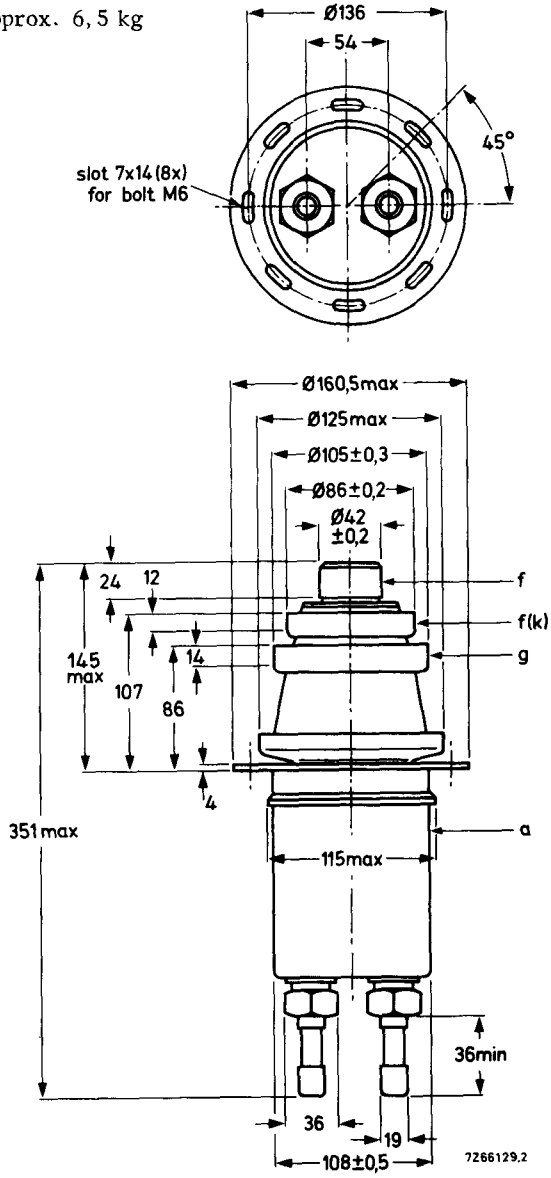
Fig. 1 Mechanical outline – YD1195.

YD1197

MECHANICAL DATA Dimensions in mm

Mounting position : vertical with anode up or down

Net mass : approx. 6,5 kg



Thread of water connections BSP 1 in.

Fig. 2 Mechanical outline – YD1197.

With the anode up the water connections should be interchanged.

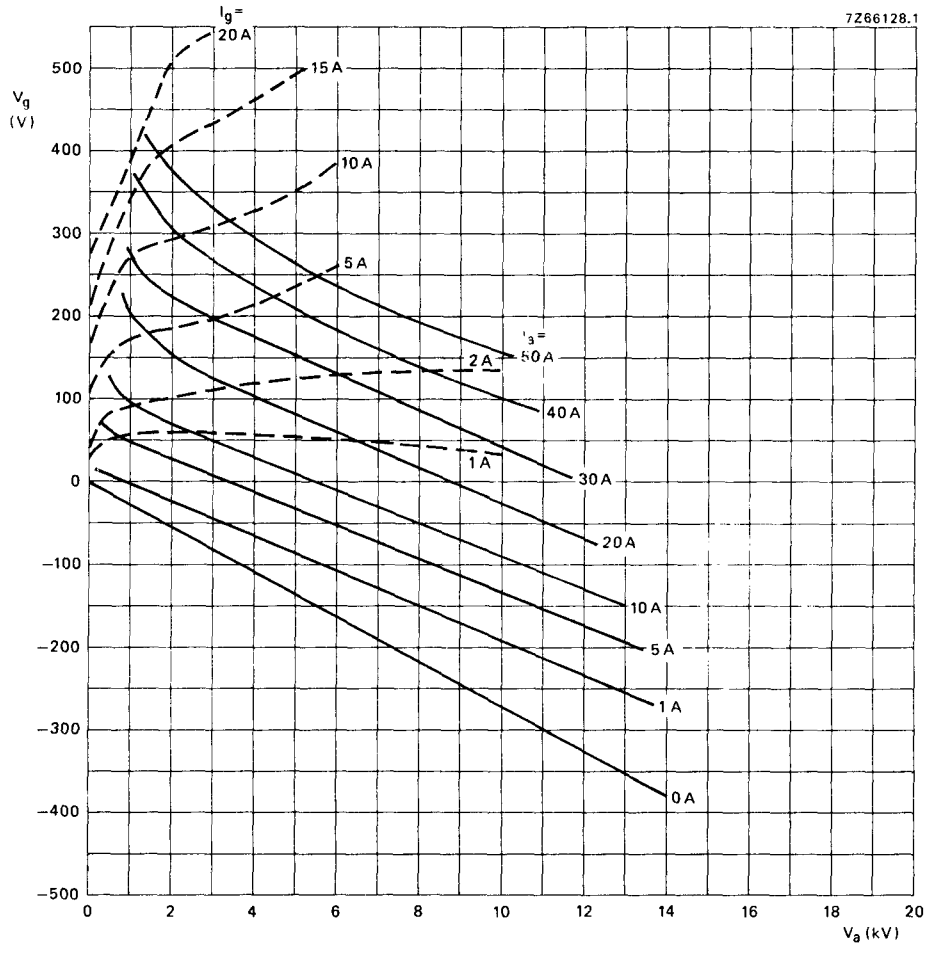


Fig. 3 Constant current characteristics.

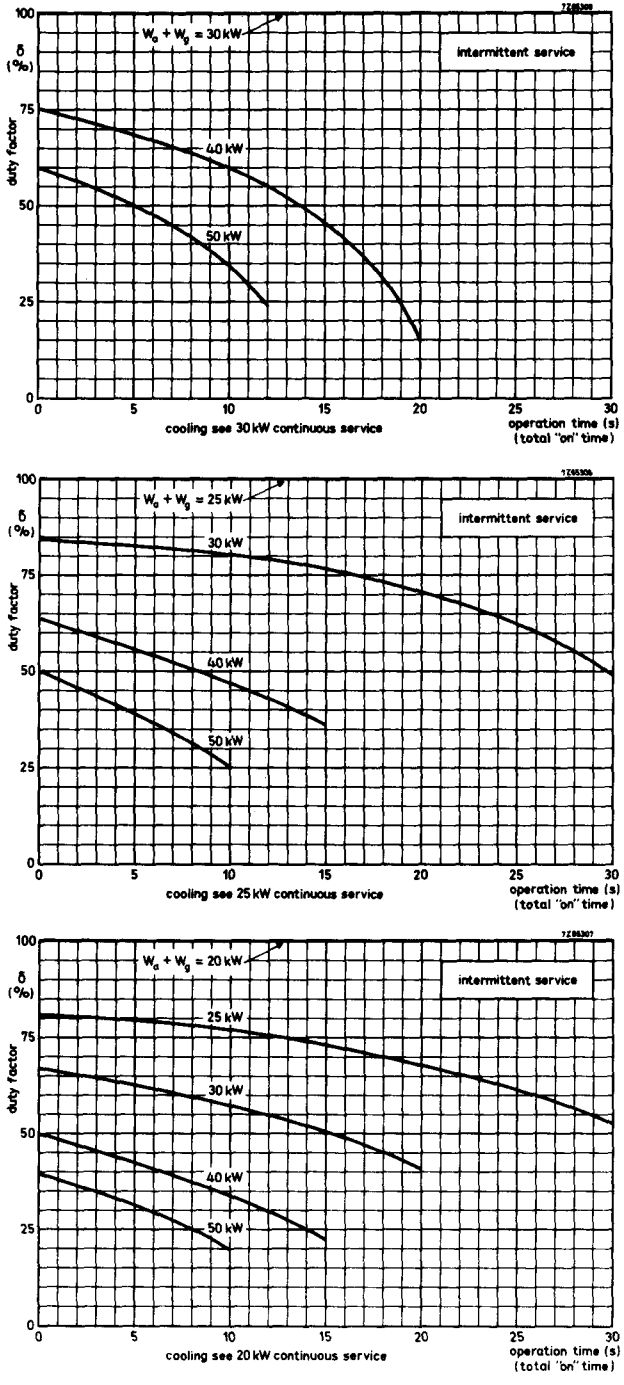


Fig. 4 Intermittent service. Limits of anode dissipation and cooling.

PHILIPS

Data handbook

Electronic components and materials

YD1195 YD1197

page	sheet	date
1	261	1988.02
2	262	1988.02
3	263	1988.02
4	264	1988.02
5	265	1988.02
6	266	1988.02
7	267	1988.02
8	268	1988.02
9	FP	2000.09.09

RF POWER TRIODE

Triode in metal-ceramic construction intended for use as industrial oscillator. The YD1202 has an integral water cooler.

QUICK REFERENCE DATA

Oscillator output power ($W_o - W_{feedb}$), typical	W_{osc}		163 kW
Frequency for full ratings	f	max	30 MHz

To be read in conjunction with "General Operational Recommendations Transmitting Tubes for Communication, Tubes for R.F. Heating".

RF CLASS C OSCILLATOR FOR INDUSTRIAL USE

OPERATING CONDITIONS

Frequency	f	30	30 MHz
Oscillator output power ($W_o - W_{feedb}$)	W_{osc}	120	163 kW
Anode voltage	V_a	10	12 kV
Anode current	I_a	16	18 A
Anode input power	W_{ia}	160	216 kW
Anode dissipation	W_a	36	47 kW
Anode output power	W_o	124	169 kW
Anode efficiency	η_a	77,5	78 %
Oscillator efficiency	η_{osc}	75	75,4 %
Feedback ratio	V_{gp}/V_{ap}	11,5	12,5 %
Grid resistor	R_g	200	225 Ω
Grid current, on load	I_g	3,5	4 A
Grid voltage, negative	$-V_g$	700	900 V
Grid dissipation	W_g	1,5	2 kW
Grid resistor dissipation	W_{Rg}	2,45	3,6 kW

LIMITING VALUES (Absolute maximum rating system)

Frequency	f	up to	100	MHz*
Anode voltage	V_a	max	15	kV
Anode current	I_a	max	19	A
Anode input power	W_{ia}	max	220	kW
Anode dissipation	W_a	max	80	kW
Grid voltage	$-V_g$	max	2	kV
Grid current, on load	I_g	max	5	A
Grid current, off load	I_g	max	7	A
Grid dissipation	W_g	max	2,5	kW
Grid circuit resistance	R_g	max	10	kΩ
Cathode current, mean	I_k	max	24	A
Cathode current, peak	I_{kp}	max	110	A
Envelope temperature	T_{env}	max	240	°C

HEATING: direct; thoriated tungsten filament

Filament voltage	V_f		12,2	V
Filament current	I_f		250	A
Peak filament starting current	I_{fp}	max	1500	A
Cold filament resistance	R_{fo}		5,3	mΩ

The filament is designed to accept temporary fluctuations of +5% and −10%.

To ensure that the cathode temperature remains constant irrespective of the operating frequency, it may be necessary to reduce the filament voltage at higher frequencies. When doing so it must be borne in mind that the filament voltage-to-current ratio measured with only the filament voltage applied should remain constant under all operating conditions.

It is extremely important that the filament be properly decoupled. This should be done so that the resonance of the circuit formed by the filament and the decoupling elements remain below the fundamental oscillator frequency. In grounded-grid circuits this resonance should be below the grid-cathode resonance. For further information please see Application Book "Tubes for RF heating" or contact the manufacturer.

* When the tubes are to be used at frequencies above 30 MHz the manufacturer should be consulted for more detailed information.

CAPACITANCES

Anode to filament	C_{af}	2,4	pF
Grid to filament	C_{gf}	160	pF
Anode to grid	C_{ag}	57	pF

CHARACTERISTICS measured at V_a = 10 kV, I_a = 8 A

Transconductance	S	140	mA/V
Amplification factor	μ	36	

COOLING

To obtain optimum life, the temperature of the seals and the envelope should, under continuously loaded conditions, be kept below 200 °C.

At frequencies up to about 4 MHz the seals are sufficiently cooled if the filament connectors are water-cooled by a flow of about 0,5 ℓ/min.
At higher frequencies however, an additional airflow of about 4 m^3/min must be led along the seals from a 50 mm diameter nozzle positioned at a distance of 250 mm from the tube header.

Table 1 Water cooling characteristics

anode + grid dissipation $W_a + W_g$ kW	inlet temperature T_i °C	rate of flow q_{min} ℓ/min	pressure drop ΔP kPa*	outlet temperature T_o °C
100	20	52	55	49
	50	78	105	69
80	20	39	32	51
	50	60	65	70
60	20	29	19	52
	50	42	32	72
40	20	18	8	54
	50	27	15	73

Absolute maximum water inlet temperature	T_i	max	50	°C
Absolute maximum water pressure	P	max	600	kPa

ACCESSORIES

Filament connector with cable	type 40695A
Filament/cathode connector with cable	type 40696A
Grid connector f > 4 MHz	type 40737
f ≤ 4 MHz	type 40694

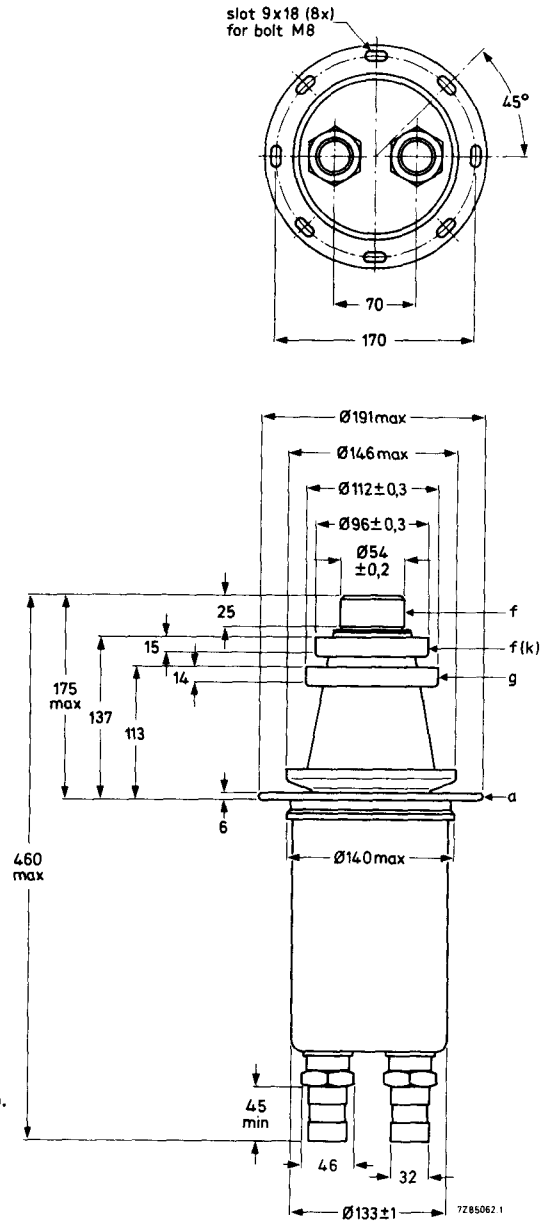
* 100 kPa ≈ 1 at.

MECHANICAL DATA

Dimensions in mm

Mounting position: vertical, anode up or down

Net mass: approx. 11,5 kg



Thread of water connections 1¼ in.

Fig. 1 Mechanical outline.

With the anode up the water inlet and outlet connections should be interchanged.

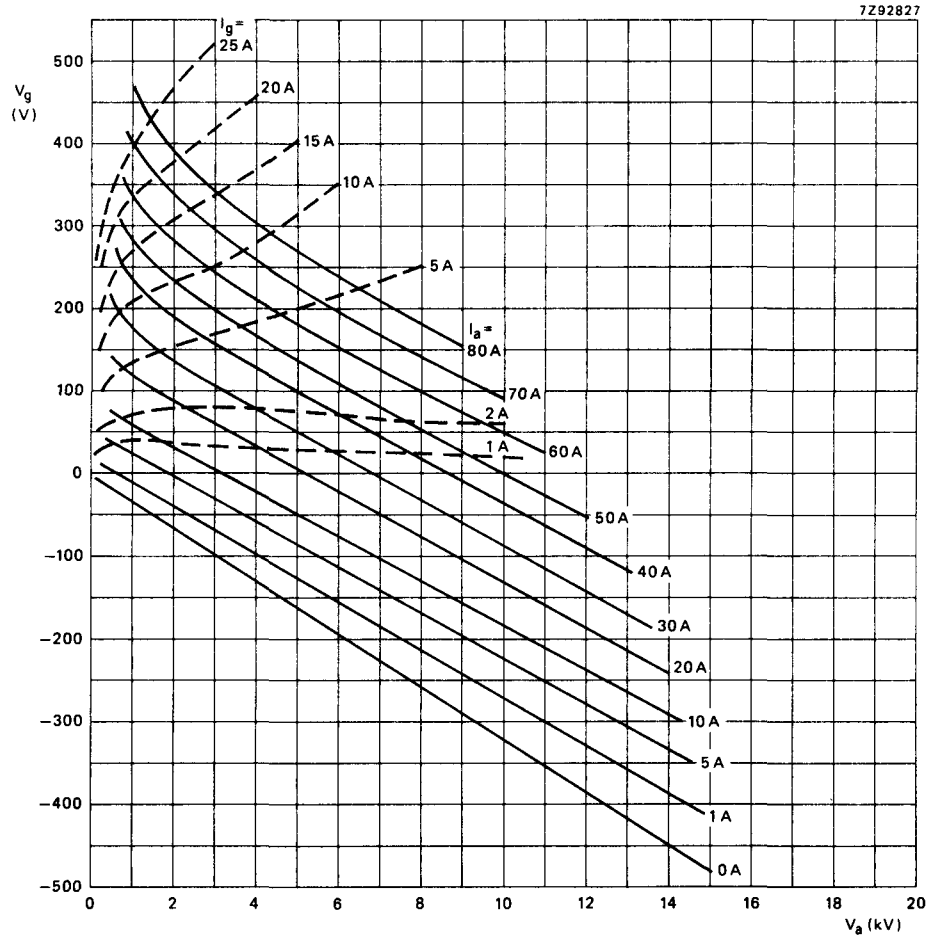


Fig. 2 Constant current characteristics.

PHILIPS

Data handbook

Electronic components and materials

YD1202

page	sheet	date
1	269	1988.02
2	270	1988.02
3	271	1988.02
4	272	1988.02
5	273	1988.02
6	FP	2000.09.09

VAPOUR COOLED R.F. INDUSTRIAL TRIODE

Vapour cooled triode of metal-ceramic construction intended for use as an industrial oscillator.

QUICK REFERENCE DATA				
Oscillator output power (W_o-W_{feedb}), typical	W_{osc}		120	kW
Frequency for full ratings	f	max.	100	MHz

To be read in conjunction with "General Recommendations Transmitting tubes, Tubes for heating."

R.F. CLASS C OSCILLATOR FOR INDUSTRIAL USE

OPERATING CONDITIONS

Frequency	f	30	30	MHz
Oscillator output power (W_o-W_{feedb})	W_{osc}	120	120	kW
Anode voltage	V_a	10	12	kV
Anode current	I_a	16.0	13.0	A
Anode input power	W_{ia}	160	156	kW
Anode dissipation	W_a	36.0	32.5	kW
Anode output power	W_o	124	123.5	kW
Anode efficiency	η_a	77.5	79.2	%
Oscillator efficiency	η_{osc}	75	77	%
Feedback ratio	V_{gp}/V_{ap}	12.8	11.6	%
Grid resistor	R_g	200	330	Ω
Grid current, on load	I_g	3.5	2.7	A
Grid voltage, negative	$-V_g$	700	891	V
Grid dissipation	W_g	1.5	1.1	kW
Grid resistor dissipation	W_{Rg}	2.45	2.4	kW

LIMITING VALUES (Absolute max. rating system)

Frequency for full ratings	f	up to	100	MHz
Anode voltage	V_a	max.	14.4	kV
Anode current	I_a	max.	18	A
Anode input power	W_{ia}	max.	220	kW
Anode dissipation	W_a	max.	80	kW
Grid voltage	$-V_g$	max.	2.0	kV
Grid current, on load	I_g	max.	4	A
off load	I_g	max.	5.5	A
Grid dissipation	W_g	max.	2.0	kW
Grid circuit resistance	R_g	max.	10	kΩ
Cathode current, mean	I_k	max.	22	A
peak	I_{kp}	max.	100	A
Envelope temperature	tenv	max.	240	°C

HEATING: direct; filament thoriated tungsten

Filament voltage	V_f		12.2	V
Filament current	I_f		255	A
Peak filament starting current	I_{fp}	max.	1500	A
Cold filament resistance	R_{fo}		5.3	mΩ

The filament is designed to accept temporary fluctuations of +5 % and −10 %.

CAPACITANCES

Anode to filament	C_{af}	2.7	pF
Grid to filament	C_{gf}	170	pF
Anode to grid	C_{ag}	55	pF

CHARACTERISTICS measured at V_a = 10 kV, I_a = 8A

Transconductance	S	150	mA/V
Amplification factor	μ	30	

1) When the tubes are to be used at frequencies above 30 MHz the manufacturer should be consulted for more detailed information.

COOLING

See also cooling curves

With integrated boiler condenser type K735

Anode + grid dissipation $W_a + W_g$ (kW)	Inlet temperature t_i (°C)	Rate of flow q min (ℓ/min)	Pressure drop p_i (atm)	Outlet temperature t_o (°C)
80	20	29	0.20	60
	35	48	0.51	59
60	20	16	0.08	75
	35	24	0.14	72
	50	45	0.45	70
40	20	10	0.04	80
	35	13.5	0.06	80
	50	20	0.10	80

Absolute max. water inlet temperature t_i max. 50 °C

Cooling of the seals can be accomplished by a low velocity air flow or by watercooling of the filament connectors . The cooling circuit of these accessories may be connected in series. A water flow of approximately 0.5 l/min. will be sufficient.

To obtain optimum life, the seal/anode temperature under continuously loaded conditions should be kept at or below 200°C.

ACCESSORIES

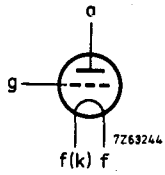
Filament connector	type	40695	net weight	710	g
Filament / cathode connector	type	40696	net weight	860	g
Filament cables (both required)	type	40716	net weight	975	g
	and				
	type	40717	net weight	980	g
Grid connector	type	40694	net weight	270	g
Boiler condenser	type	K735	net weight	≈ 70	kg

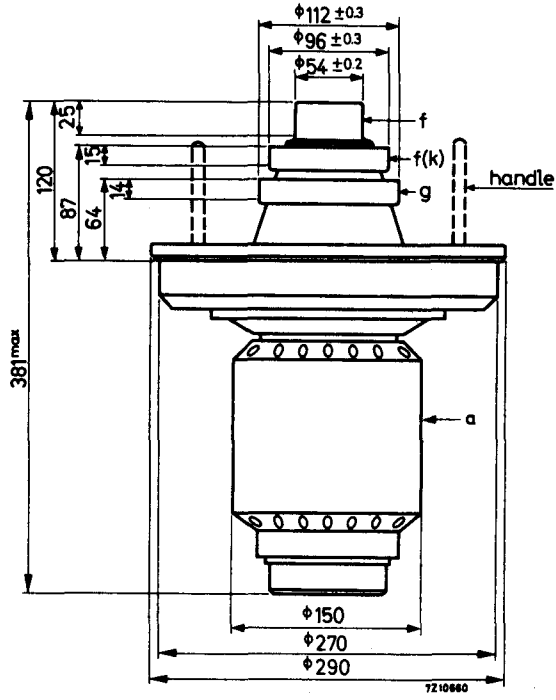
MECHANICAL DATA

Dimensions in mm

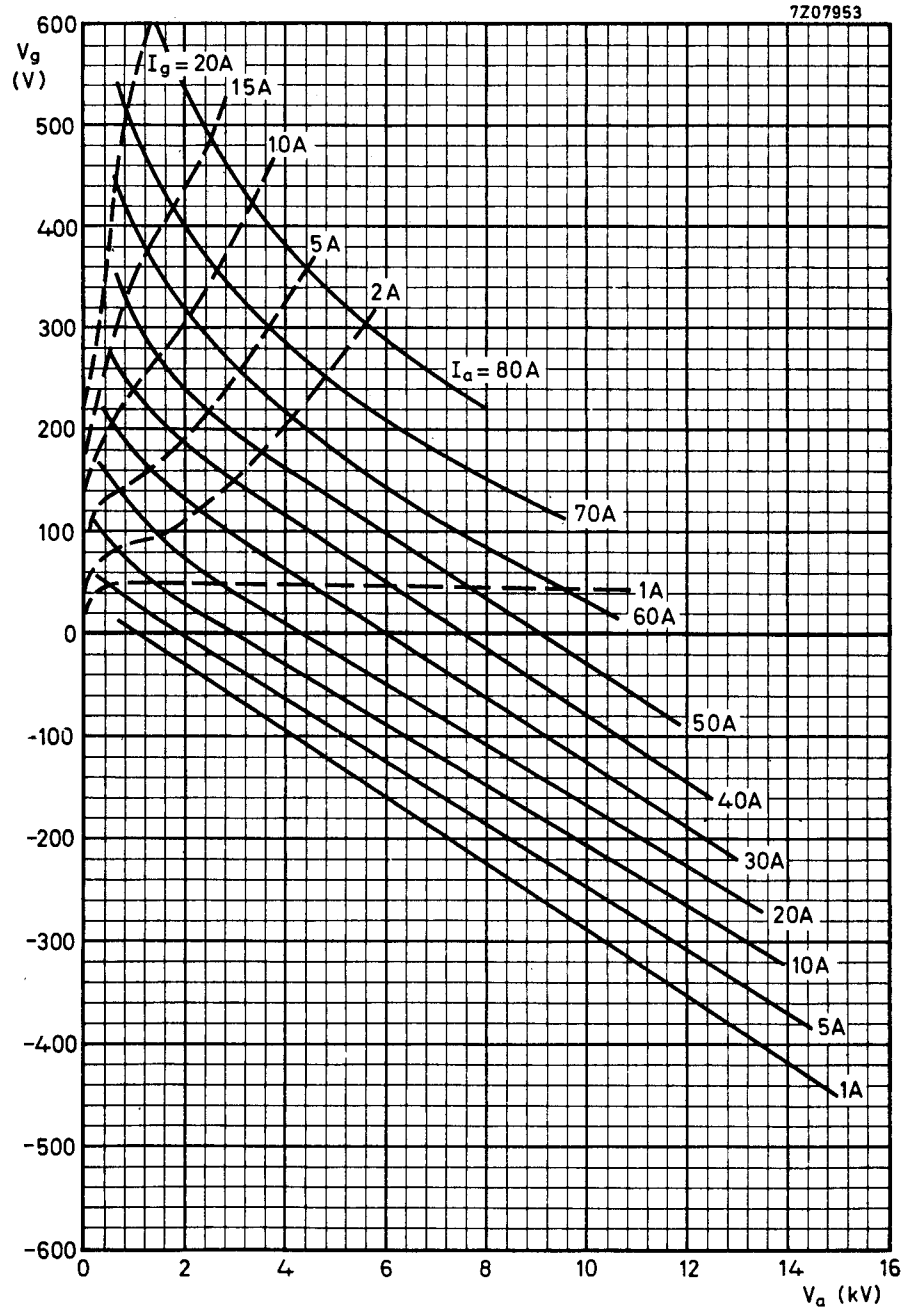
Mounting position: vertical with anode down

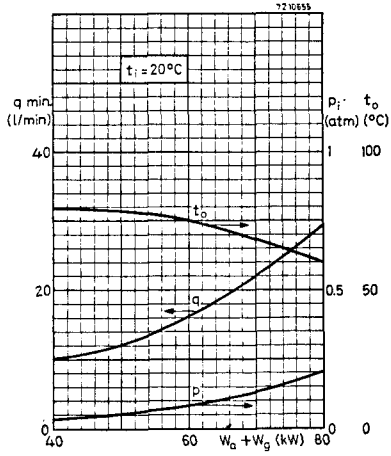
Net weight: approx. 16.7 kg

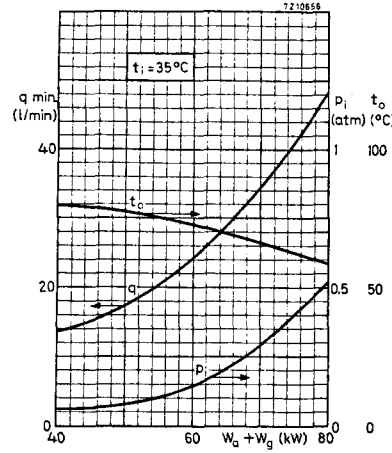


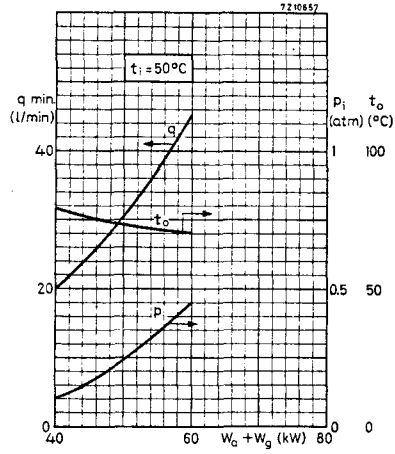


Note: The handles should be removed before switching on the tube.


7Z07953
600
500
400
300
200
100
0
-100
-200
-300
-400
-500
-600
V_g (V)
I_g = 20A
15A
10A
5A
2A
I_a = 80A
70A
1A
60A
50A
40A
30A
20A
10A
5A
1A
0
2
4
6
8
10
12
14
16
V_a (kV)


7Z10655
t_i = 20°C
q min.
(l/min)
p_i
(atm)
t_o
(°C)
40
20
0
1
0.5
0
100
50
0
t_o
q
p_i
40
60
$W_a + W_g$ (kW)
80


7Z10656
t_i = 35°C
q min.
(l/min)
p_i
(atm)
t_o
(°C)
40
20
0
1
0.5
0
100
50
0
t_o
q
p_i
40
60
$W_a + W_g$ (kW)
80


7Z10657
t_i = 50°C
q min.
(l/min)
p_i
(atm)
t_o
(°C)
40
20
0
1
0.5
0
100
50
0
q
t_o
p_i
40
60
$W_a + W_g$ (kW)
80

RF POWER TRIODE

Triode in metal-ceramic construction intended for use as industrial oscillator. The YD1212 has an integral water cooler.

QUICK REFERENCE DATA

Oscillator output power (W_o - W_{feedb}), typical	W_{osc}	240	kW
Frequency for full ratings	f max.	30	MHz

To be read in conjunction with "General Operational Recommendations Transmitting Tubes for Communication, Tubes for R.F. Heating".

RF CLASS C OSCILLATOR FOR INDUSTRIAL USE

OPERATING CONDITIONS

Frequency	f	30	MHz
Oscillator output power (W_o - W_{feedb})	W_{osc}	240	kW
Anode voltage	V_a	14	kV
Anode current	I_a	23,5	A
Anode input power	W_{ia}	329	kW
Anode dissipation	W_a	81,5	kW
Anode output power	W_o	247,5	kW
Anode efficiency	η_a	75,2	%
Oscillator efficiency	η_{osc}	73	%
Feedback ratio	V_{gp}/V_{ap}	10,4	%
Grid resistor	R_g	135	Ω
Grid current, on load	I_g	6	A
Grid voltage, negative	V_g	−810	V
Grid dissipation	W_g	2,6	kW
Grid resistor dissipation	W_{Rg}	4,86	kW

LIMITING VALUES (Absolute maximum rating system)

Frequency	f	up to	100	MHz*
Anode voltage	V_a	max.	16,8	kV
Anode current	I_a	max.	25	A
Anode input power	W_{ia}	max.	375	kW
Anode dissipation	W_a	max.	120	kW
Grid voltage	$-V_g$	max.	2	kV
Grid current				
on load	I_g	max.	7	A
off load	I_g	max.	8,5	A
Grid dissipation	W_g	max.	3	kW
Grid circuit resistance	R_g	max.	10	kΩ
Cathode current				
mean	I_k	max.	31	A
peak	I_{kp}	max.	175	A
Envelope temperature	T_{env}	max.	240	°C

HEATING: direct; filament thoriated tungsten

Filament voltage	V_f		12,6	V
Filament current	I_f		380	A
Peak filament starting current	I_{fp}	max.	2000	A
Cold filament resistance	R_{fo}		3,6	mΩ

The filament is designed to accept temporary fluctuations of + 5% and −10%.

To ensure that the cathode temperature remains constant irrespective of the operating frequency, it may be necessary to reduce the filament voltage at higher frequencies. When doing so it must be borne in mind that the filament voltage-to-current ratio measured with only the filament voltage applied should remain constant under all operating conditions.

It is extremely important that the filament be properly decoupled. This should be done so that the resonance of the circuit formed by the filament and the decoupling elements remain below the fundamental oscillator frequency. In grounded-grid circuits this resonance should be below the grid-cathode resonance. For further information please see Application Book "Tubes for RF heating" or contact the manufacturer.

CAPACITANCES

Anode to filament	C_{af}	3	pF
Grid to filament	C_{gf}	185	pF
Anode to grid	C_{ag}	60	pF

* When the tubes are to be used at frequencies above 30 MHz the manufacturer should be consulted for more detailed information.

CHARACTERISTICS measured at V_a = 14 kV, I_a = 10 A

Transconductance	S	190 mA/V
Amplification factor	μ	40

COOLING

To obtain optimum life, the seal/envelope temperature under normal operating conditions should be kept below 200 °C.

At low frequencies the seals are sufficiently cooled if the filament connectors are water-cooled by a flow of about 0,5 ℓ/min. At higher frequencies, however, an additional air flow of about 4 m^3/min must be led along the seals from a 50 mm diameter nozzle positioned at a distance of 250 mm from the tube header.

Table 1 Air cooling characteristics

anode + grid dissipation $W_a + W_g$ kW	inlet temperature T_i °C	rate of flow q_{min} ℓ/min	pressure drop ΔP kPa*	outlet temperature T_o °C
120	20	60	70	50
	50	90	130	70
80	20	34	30	56
	50	54	55	72
40	20	15	7	63
	50	24	13	77

Absolute max. water inlet temperature	T_i	50 °C
Absolute max. water pressure	P	600 kPa*

ACCESSORIES

Filament connector with cable	type	40695A
Filament/cathode connector with cable	type	40696A
Grid connector		
$f \leqslant 4$ MHz	type	40694
$f > 4$ MHz	type	40737

* 100 kPa ≈ 1 at

MECHANICAL DATA

Dimensions in mm

Mounting position: vertical with anode up or down

Net mass: approx. 15,6 kg

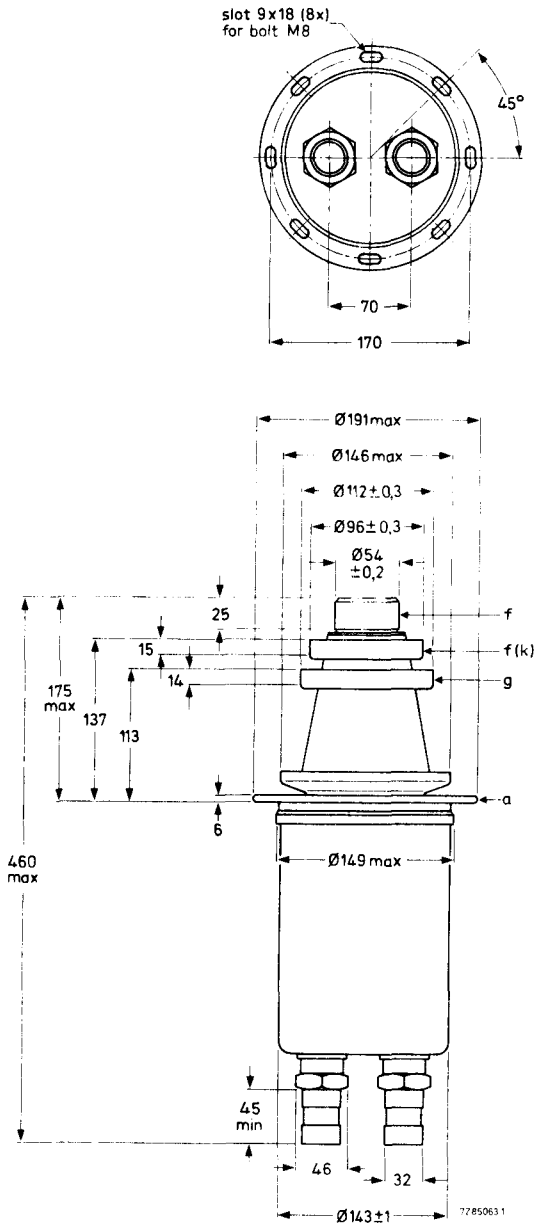


Fig. 1 Mechanical outline.

Thread of water connections BSP 1¼ in.

With anode up the water inlet and outlet connections should be interchanged.

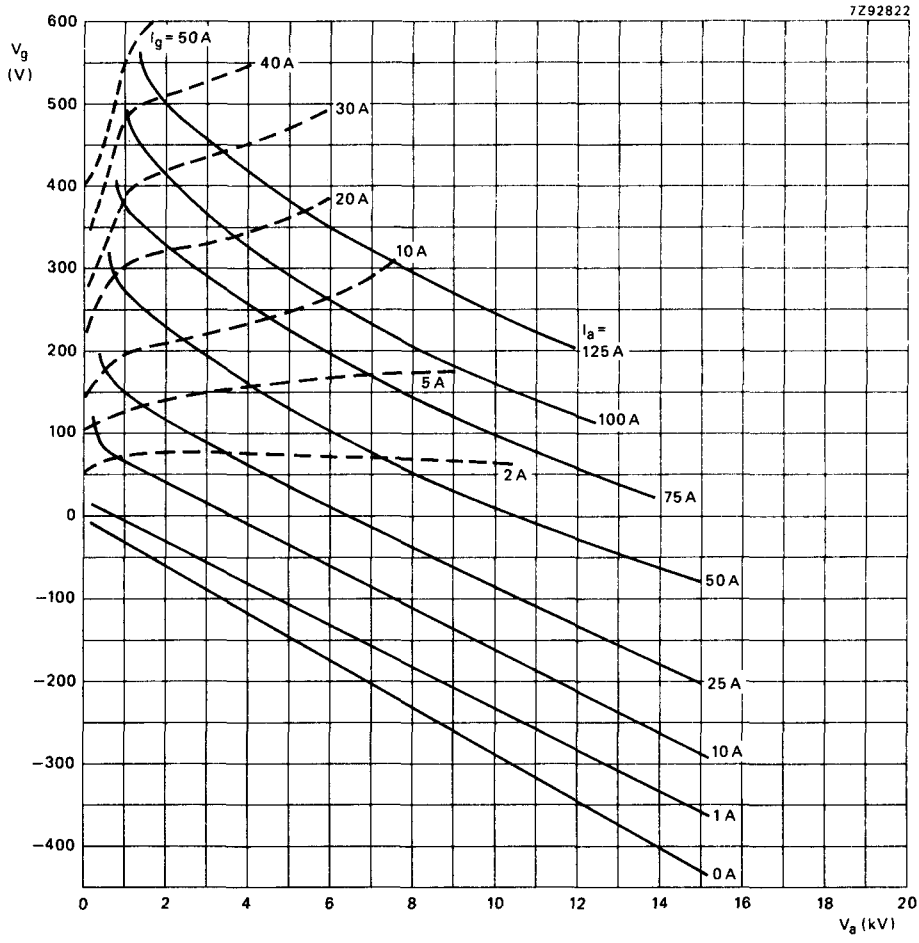


Fig. 2 Constant current characteristics.

PHILIPS

Data handbook

Electronic components and materials

YD1212

page	sheet	date
1	275	1988.02
2	276	1988.02
3	277	1988.02
4	278	1988.02
5	279	1988.02
6	FP	2000.09.09

VAPOUR COOLED R.F. INDUSTRIAL TRIODE

Vapour cooled triode of metal-ceramic construction intended for use as an industrial oscillator.

QUICK REFERENCE DATA				
Oscillator output power (W_o-W_{feedb}), typical	W_{osc}		240	kW
Frequency for full ratings	f	max.	100	MHz

To be read in conjunction with "General Recommendations Transmitting tubes, Tubes for R.F. heating."

R.F. CLASS C OSCILLATOR FOR INDUSTRIAL USE

OPERATING CONDITIONS

Frequency	f	30	MHz
Oscillator output power (W_o- W_{feedb})	W_{osc}	240	kW
Anode voltage	V_a	14	kV
Anode current	I_a	23.5	A
Anode input power	W_{ia}	329	kW
Anode dissipation	W_a	81.5	kW
Anode output power	W_o	247.5	kW
Anode efficiency	η_a	75.2	%
Oscillator efficiency	η_{osc}	73	%
Feedback ratio	V_{gp}/V_{ap}	10.4	%
Grid resistor	R_g	135	Ω
Grid current, on load	I_g	6	A
Grid voltage, negative	$-V_g$	810	V
Grid dissipation	W_g	2.6	kW
Grid resistor dissipation	W_{Rg}	4.86	kW

LIMITING VALUES (Absolute max. rating system)

Frequency for full ratings	f	up to	100	MHz[1]
Anode voltage	V_a	max.	16.8	kV
Anode current	I_a	max.	25	A
Anode input power	W_{ia}	max.	375	kW
Anode dissipation	W_a	max.	120	kW
Grid voltage	$-V_g$	max.	2	kV
Grid current, on load	I_g	max.	7	A
off load	I_g	max.	8.5	A
Grid dissipation	W_g	max.	3.0	kW
Grid circuit resistance	R_g	max.	10	kΩ
Cathode current, mean	I_k	max.	31	A
peak	I_{kp}	max.	175	A
Envelope temperature	t_{env}	max.	240	°C

HEATING : direct; filament thoriated tungsten

Filament voltage	V_f		12.6	V
Filament current	I_f		380	A
Peak filament starting current	I_{fp}	max.	2000	A
Cold filament resistance	R_{fo}		3.6	mΩ

The filament is designed to accept temporary fluctuations of +5 % and −10 %.

CAPACITANCES

Anode to filament	C_{af}	3.0	pF
Grid to filament	C_{gf}	185	pF
Anode to grid	C_{ag}	60	pF

CHARACTERISTICS measured at V_a = 14 kV, I_a = 10 A

Transconductance	S	190	mA/V
Amplification factor	μ	41	

1) When the tubes are to be used at frequencies above 30 MHz the manufacturer should be consulted for more detailed information.

COOLING

See also cooling curves

With integrated boiler condenser type K733

Anode + grid dissipation $W_a + W_g$ (kW)	Inlet temperature t_i (°C)	Rate of flow q min (ℓ/min)	Pressure drop p_i (atm)	Outlet temperature t_o (°C)
120	20	59	0.84	50
80	20	29	0.20	61
	35	48	0.51	61
40	20	10	0.04	81
	35	13.5	0.06	81
	50	20	0.10	81

At frequencies below 4 MHz cooling of the metal-ceramic seals can be accomplished by a low-velocity air flow, or by watercooling of the filament connectors. A water flow of approximately 0.5 l/min will be sufficient. At frequencies above 4 MHz it is recommended to cool the seals by means of an air flow of approximately 4 m^3/min from a 50 mm diameter nozzle placed at a distance of 250 mm from the tube header.

To obtain optimum life, the seal/envelope temperature under continuous loaded conditions should be kept at or below 200 °C.

ACCESSORIES

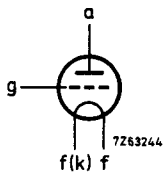
Filament connector	type	40695	net weight	710	g
Filament/cathode connector	type	40696	net weight	860	g
Filament cables (both required)	type	40716	net weight	975	g
	and				
	type	40717	net weight	980	g
Grid connector	type	40694	net weight	270	g
Boiler condenser	type	K733	net weight ≈	70	kg

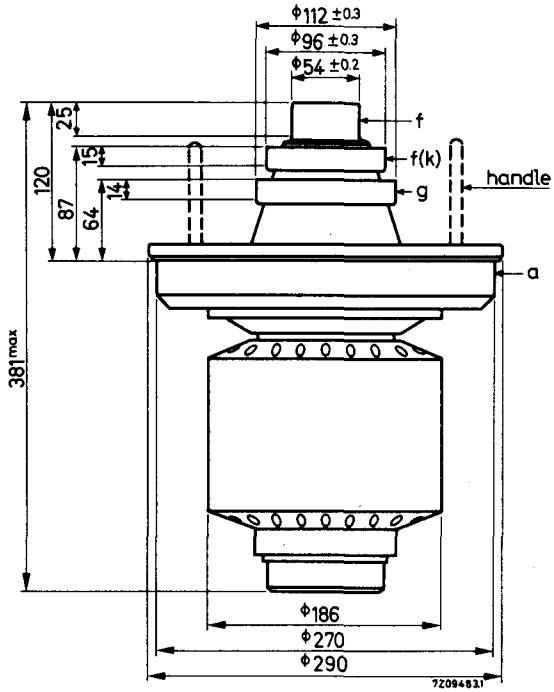
MECHANICAL DATA

Dimensions in mm

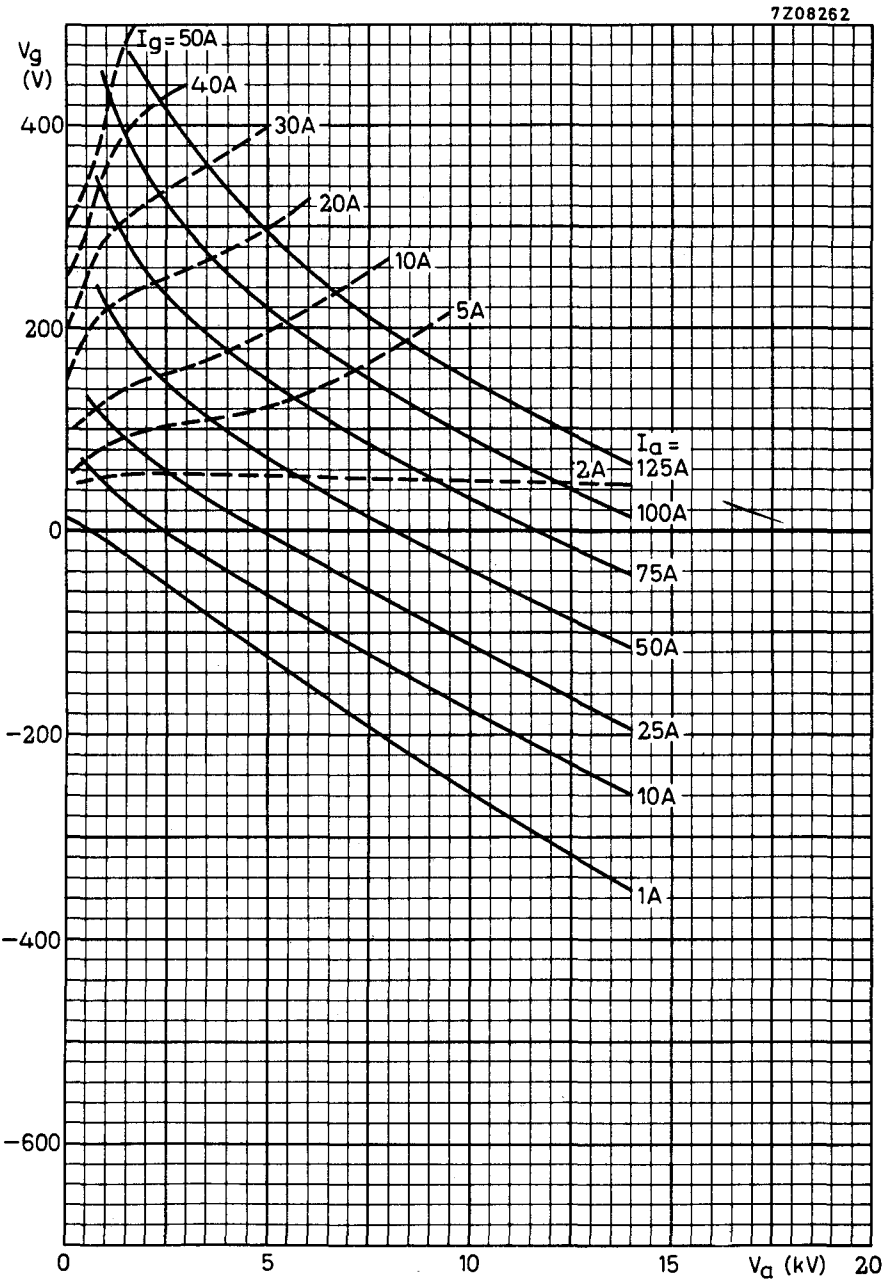
Mounting position: vertical with anode down

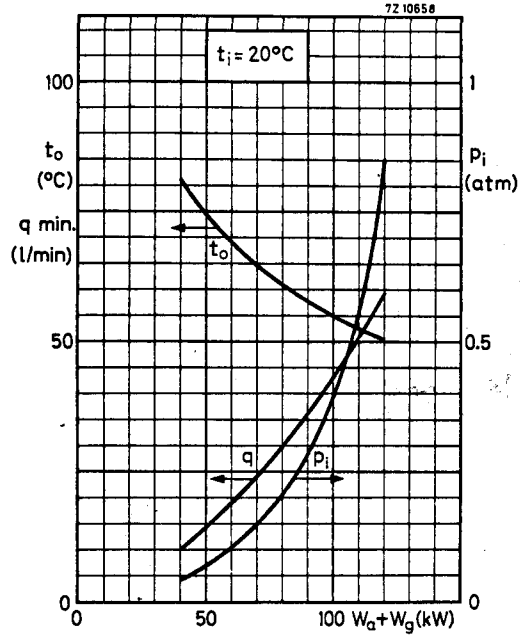
Net weight: approx. 27 kg

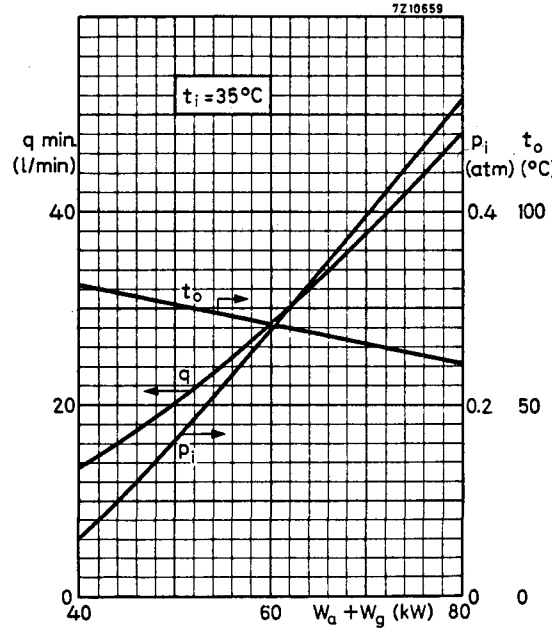




The handles should be removed before switching on the tube.


7Z08262
V_g (V)
400
200
0
−200
−400
−600
I_g = 50A
40A
30A
20A
10A
5A
2A
I_a =
125A
100A
75A
50A
25A
10A
1A
0
5
10
15
V_a (kV)
20


7Z 10658
t_i = 20°C
100
t_o (°C)
q min. (l/min)
50
0
0
50
100 W_a+W_g(kW)
1
p_i (atm)
0.5
0
t_o
q
p_i


7Z 10659
t_i = 35°C
q min. (l/min)
40
20
0
40
60
W_a+W_g (kW)
80
p_i (atm)
0.4
0.2
0
t_o (°C)
100
50
0
t_o
q
p_i

RF POWER TRIODE

Air-cooled triodes of metal-ceramic construction with integral cooler intended for use as industrial oscillators.

QUICK REFERENCE DATA

Oscillator output power (W_o-W_{feedb}), typical	W_{osc}		2,67 kW
Frequency for full ratings	f	max.	250 MHz*

To be read in conjunction with "General Operational Recommendations".

RF CLASS C OSCILLATOR FOR INDUSTRIAL USE

OPERATING CONDITIONS

Frequency	f	160	27,12 MHz
Filament voltage	V_f	6,0	6,3 V
Oscillator output power (W_o-W_{feedb})	W_{osc}	2,22	2,67 kW
Anode voltage	V_a	4,5	5,0 kV
Anode current	I_a	700	750 mA
Anode input power	W_{ia}	3,15	3,75 kW
Anode dissipation	W_a	0,75	0,83 kW
Anode output power	W_o	2,4	2,9 kW
Anode efficiency	η_a	76	78 %
Oscillator efficiency	η_{osc}	71	71 %
Feedback ratio	V_{gp}/V_{ap}	17	17 %
Grid resistor	R_g	2,2	2,2 kΩ
Grid current, on load	I_g	225	235 mA
Grid voltage, negative	$-V_g$	495	517 V
Grid dissipation	W_g	70	80 W
Grid resistor dissipation	W_{Rg}	111	121 W

* When used at frequencies above 160 MHz consult the manufacturer for more detailed information.

LIMITING VALUES (Absolute maximum rating system)

Frequency for full ratings	f	up to	250 MHz
Anode voltage	V_a		5,5 kV
Anode current	I_a		1,1 A
Anode input power	W_{ia}		6,0 kW
Anode dissipation	W_a		1,5 kW
Grid voltage	$-V_g$		1,0 kV
Grid current			
on load	I_g		280 mA
off load	I_g		400 mA
Grid dissipation	W_g		150 W
Grid circuit resistance	R_g		20 kΩ
Cathode current			
mean	I_k		1,4 A
peak	I_{kp}		8 A
Envelope temperature	T_{env}		240 °C

HEATING: direct; filament thoriated tungsten

Filament voltage		
f ⩽ 120 MHz	V_f	6,3 V
f > 120 MHz	V_f	6,0 V
Filament current at V_f = 6,3 V	I_f	33 A

The filament is designed to accept temporary fluctuations of + 5% and −10%.

It is extremely important that the filament be properly decoupled. This should be done so that the resonance of the circuit formed by the filament and the decoupling elements remain below the fundamental oscillator frequency. In grounded-grid circuits this resonance should be below the grid-cathode resonance. For further information please see Application Book "Tubes for RF heating" or contact the manufacturer.

CAPACITANCES

Anode to filament	C_{af}	0,4 pF
Grid to filament	C_{gf}	17 pF
Anode to grid	C_{ag}	14 pF

CHARACTERISTICS measured at V_a = 2,0 kV, I_a = 0,5 A

Transconductance	S	10 mA/V
Amplification factor	μ	20

COOLING

See cooling curves.

A low velocity air flow directed to the seals may be required.

To obtain optimum life, the temperature of the seals and of the envelope should, under normal operating conditions, be kept below 200 °C.

To maintain these temperatures additional cooling may be necessary. At frequencies higher than about 4 MHz cooling of the seals becomes mandatory.

ACCESSORIES

Filament connector	type 40688
Filament/cathode connector	type 40689
Grid connector	type 40686

MECHANICAL DATA

Dimensions in mm

YD1240

Mounting position: vertical with anode up or down

Net mass: approx. 1,3 kg

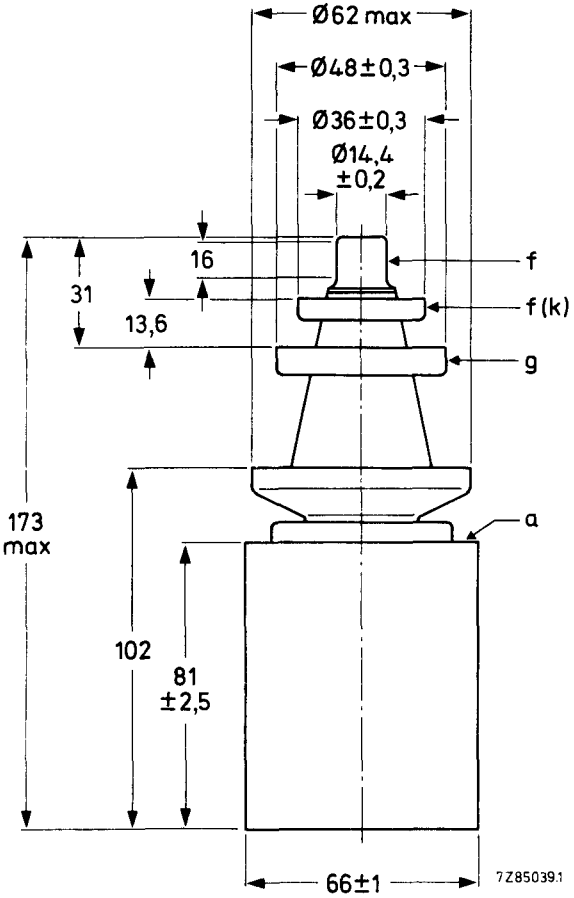


Fig. 1 Mechanical outline – YD1240.

YD1244

Dimensions in mm

Mounting position: vertical with anode up or down

Net mass: approx. 1,4 kg

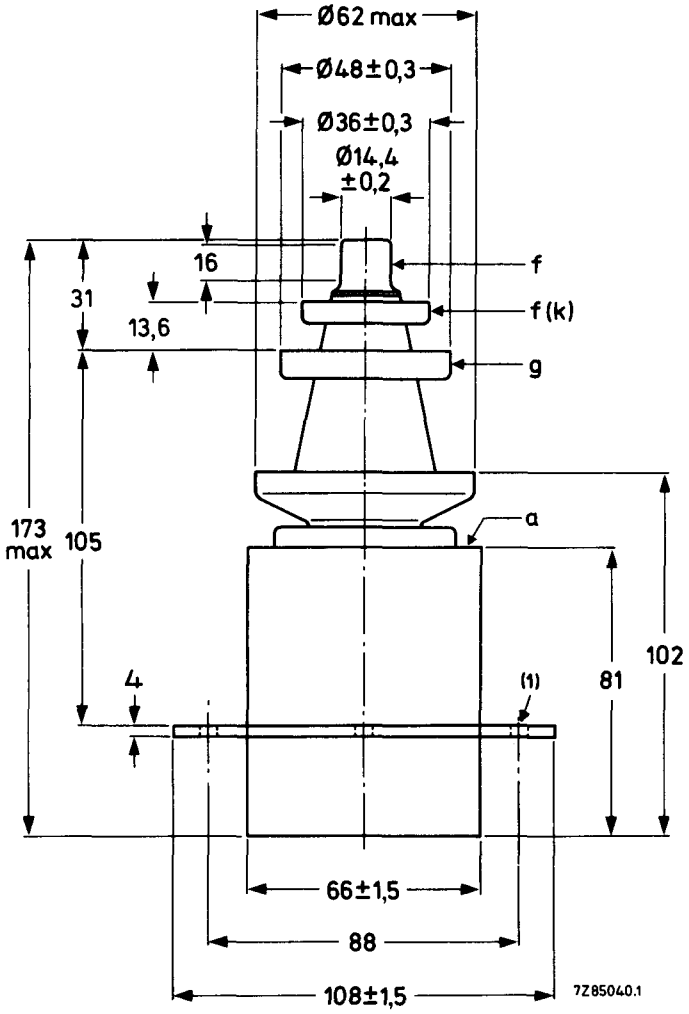


Fig. 2 Mechanical outline – YD1244.

(1) 4 x 5 mm ϕ holes.

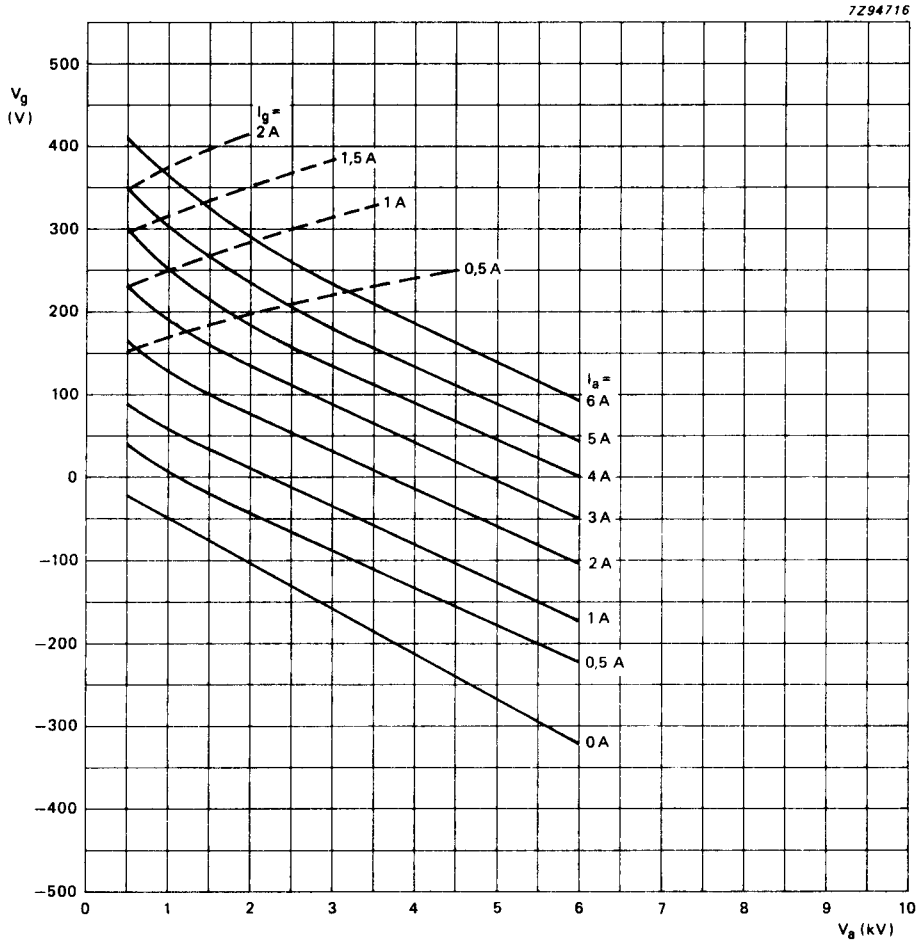


Fig. 3 Constant current characteristics.

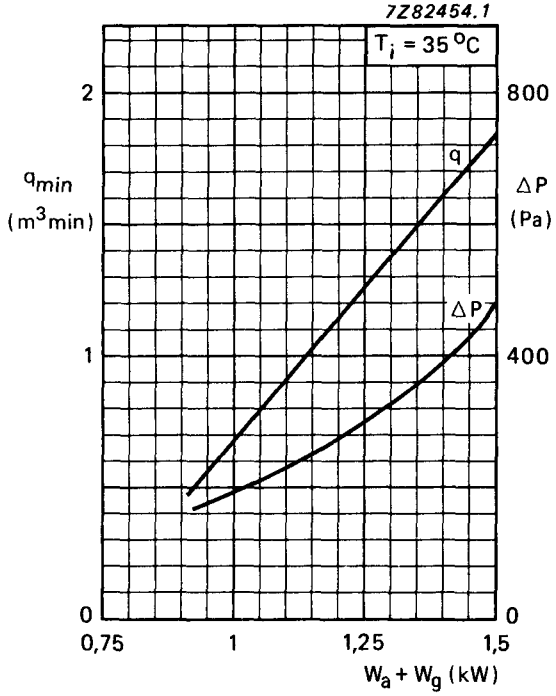


Fig. 4 Cooling curves.

PHILIPS

Data handbook

Electronic components and materials

YD1240 YD1244

page	sheet	date
1	281	1988.02
2	282	1988.02
3	283	1988.02
4	284	1988.02
5	285	1988.02
6	286	1988.02
7	FP	2000.09.09

AIR COOLED R.F. POWER TRIODE

Forced-air cooled coaxial power triode in metal-ceramic construction primarily intended for use as a R.F. class AB linear broad-band amplifier in TV transposer service at frequencies up to 1000 MHz.

QUICK REFERENCE DATA					
Transposer service (combined sound and vision)					
Frequency	f	470	to	860	MHz
Anode voltage	V_a			1700	V
Output power in load	W_ℓ			35	W
Power gain	G			20	dB
Vision amplifier					
Frequency	f	470	to	860	MHz
Anode voltage	V_a			1700	V
Output power in load	W_ℓ			35	W
Power gain	G			20	dB

HEATING : indirect by a.c. or d.c. ; oxide coated cathode.

Heater voltage	V_f	5	V±5% [1]
Heater current	I_f	2,1	A
Cathode heating time	T_h min.	120	s

CAPACITANCES

Anode to grid	C_{ag}	3,5	pF
Grid to cathode and heater	$C_{g/kf}$	17	pF
Anode to cathode and heater	$C_{a/kf}$	0,05	pF

TYPICAL CHARACTERISTICS

Anode voltage	V_a	1700	V
Anode current	I_a	170	mA
Transconductance	S	55	mA/V
Amplification factor	μ	200	

[1]) For optimum transposer performance (linearity) ±2%.

TEMPERATURE LIMITS

Absolute max. anode and seal temperature t max. 150 °C

COOLING

Forced air

W_a (W)	t_i (°C)	q_{min} (l/min)	p_i (mm H_2O)
300	up to	550	85
250	45	400	52

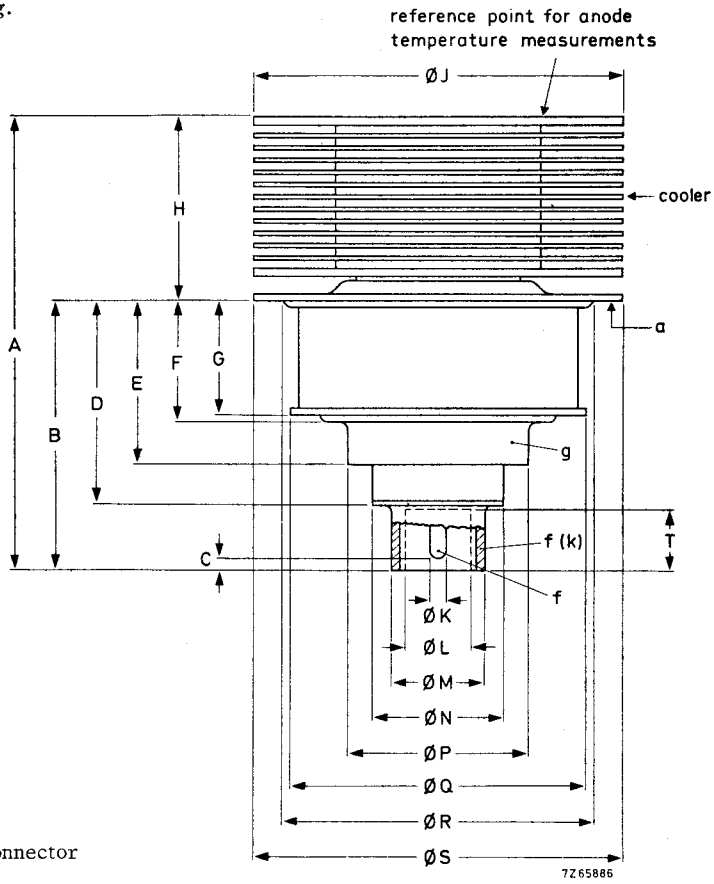
Recommended air duct see page 4.

MECHANICAL DATA

Dimensions in mm

Net weight: approx. 180 g.

	min.	max.
A	52,2	55,2
B	32,2	34,2
C	0,9	2,3
D	25,0	26,4
E	19,9	21,9
F	14	15
G	13,5	14,5
H	20	21
J	44,6	45,4
K	1,9	2,1
L[1])	8	
M	11,3	11,7
N	15,8	16,4
P	22,6	23,0
Q	35,8	36,2
R	38	39
S	44,6	45,4
T[1])	7,5	



[1]) Available for heater connector

R.F. CLASS AB AMPLIFIER FOR TV TRANSPOSER SERVICE, grounded grid

LIMITING VALUES (Absolute max. rating system)

Frequency	f	up to	1000	MHz
Anode voltage	V_a	max.	2000	V
Grid voltage	$-V_g$	max.	50	V
Anode dissipation	W_a	max.	300	W
Grid current	I_g	max.	5	mA
Cathode current	I_k	max.	200	mA

OPERATING CONDITIONS, grounded grid

		CCIR standard L [1]	CCIR standard G [2]	
Frequency	f	470 to 860	470 to 860	MHz
Bandwidth (-1 dB)	B	9	9	MHz
Anode voltage	V_a	1700	1700	V
Grid voltage [3]	V_g	-5,8	-5,8	V
Grid current	I_g	≈0	≈0	mA
Anode current, no signal	I_a	120	120	mA
Anode current at c.w. output power = 35 W	I_a	170	170	mA
Driving power (peak white) (sync)	W_{dr}	0,35	0,35	W
Output power in load (peak white) (sync)	W_l	35	35	W
Power gain	G	20	20	dB
Intermodulation products [4]	d	-	⩽ -52	dB
Differential phase		⩽ 2	[5] ⩽ 2	°
Differential gain		⩾ 96	[5] ⩾ 96	%

[1] Positive modulation, negative synchronization, sound and vision separate.

[2] Negative modulation, positive synchronization, combined sound and vision.

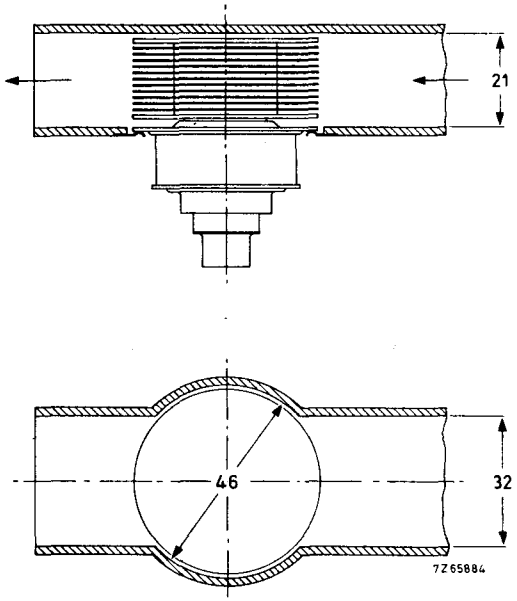
[3] To be adjusted for the stated no-signal anode current.

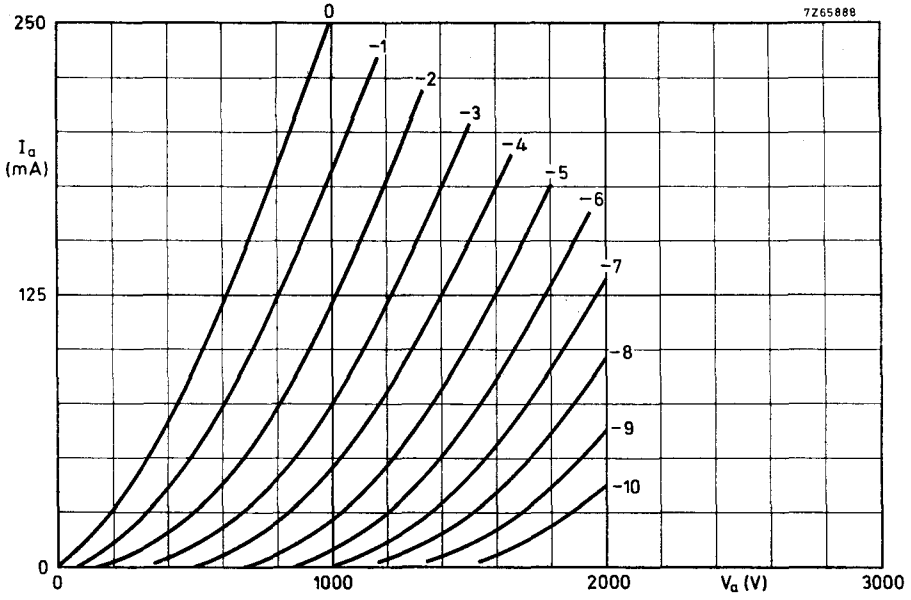
[4] Three-tone test method (vision carrier -8 dB, sound carrier -7 dB, sideband signal -16 dB with respect to the sum signal amplitude of the composite signal).
Stated figure applies to a vision-to-sound power ratio of 5:1.
For a vision-to sound power ratio of 10:1: IM products ⩽ -55 dB.

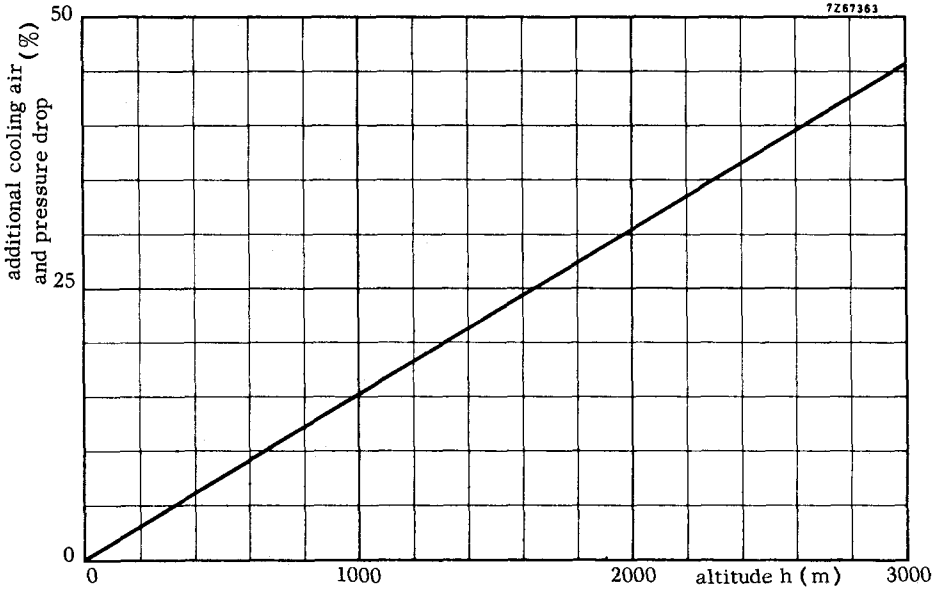
[5] Measured with a saw-tooth amplitude running from 17 % to 75 % of the peak sync value, with superimposed a 4,43 MHz sinewave with a 10 % peak-to-peak value.

Recommended air duct

Dimensions in mm






7Z67363
50
25
0
additional cooling air (%)
and pressure drop
0
1000
2000
altitude h (m)
3000

AIR COOLED R.F. POWER TRIODE

Forced air cooled coaxial power triode in metal-ceramic construction primarily intended for use as R.F. class AB linear broad-band amplifier in T.V. transposer service at frequencies up to 1000 MHz.

QUICK REFERENCE DATA			
Frequency	Transposer service (combined sound and vision)		
	V_a	W_ℓ	Power
(MHz)	(V)	(W)	gain (dB)
470 to 1000	1700	50	18

HEATING : indirect; oxide coated cathode

Heater voltage	V_f	5	V ± 2%
Heater current	I_f	2.1	A
Cathode heating time	T_h	min. 120	s

CAPACITANCES

Anode to grid	C_{ag}	3.5	pF
Grid to cathode and heater	Cg/kf	15	pF
Anode to cathode and heater	Ca/kf	0.04	pF

TYPICAL CHARACTERISTICS

Anode voltage	V_a	1700	V
Anode current	I_a	170	mA
Transconductance	S	50	mA/V
Amplification factor	μ	200	

TEMPERATURE LIMITS

Absolute max. seal temperature	t	max. 225	°C

Data based on pre-production tubes.

COOLING

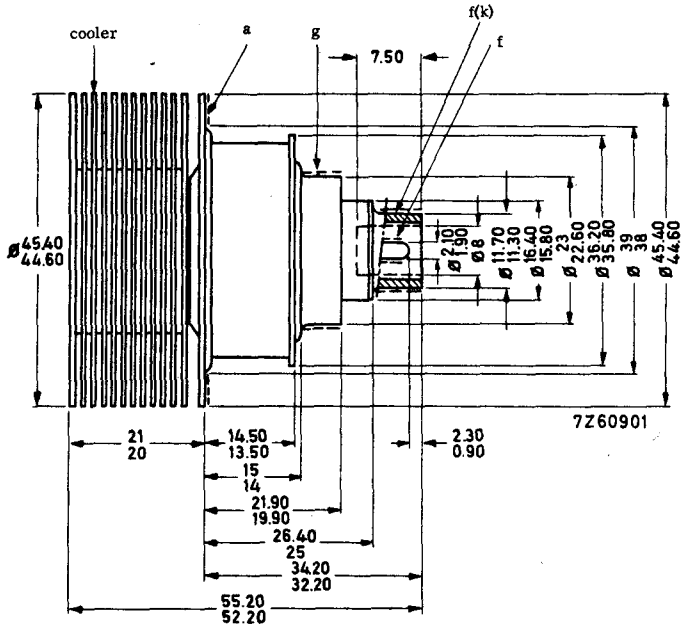
Forced air

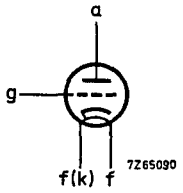
W_a (W)	t_i (°C)	q_{min} (l_{min})	p_i (mm H_2O)
300	20	450	26

MECHANICAL DATA

Dimensions in mm

Net weight: approx. 180 g





R.F. CLASS AB AMPLIFIER FOR TELEVISION TRANSPOSER SERVICE

Unless otherwise specified the voltages are given with respect to cathode.

LIMITING VALUES (Absolute max. rating system)

Frequency	f	up to	1000	MHz
Anode voltage	V_a	max.	1800	V
Grid voltage	$-V_g$	max.	5 50	V
Anode current	I_a	max.	200	mA
Anode dissipation	W_a	max.	300	W

OPERATING CONDITIONS , grounded grid — CCIR Standard G 1)

Frequency	f	780	MHz
Bandwidth (0 dB)	B	8	MHz
(-1 dB)	B	11	MHz
Anode voltage	V_a	1700	V
Grid voltage	V_g	-5	V 2)
Anode current, no-signal condition	I_a	120	mA
Anode current	I_a	185	mA 3)
Driving power (sync)	W_{dr}	0.8	W
Output power in load (sync)	W_l	50	W
Power gain	G	18	dB
Intermodulation products	d	-52	dB 4)

1) Negative modulation, positive synchronisation, combined sound and vision.

2) To be adjusted for the stated no-signal anode current.

3) I_a at zero dB level = 50 W (0 dB level corresponding with peak sync).

4) In-band intermodulation products with reference to peak sync level, measured with a three-tone test method (vision carrier -8 dB, sound carrier -7 dB, side-band signal -17 dB with respect to the sum signal amplitude of the composite signal corresponding to zero dB level.).

AIR COOLED R.F. POWER TRIODE

Forced-air cooled coaxial power triode in metal-ceramic construction primarily intended for use as a R.F. class AB linear broadband amplifier in TV transposer service at frequencies up to 1000 MHz.

QUICK REFERENCE DATA			
Transposer service (combined sound and vision)			
Frequency	f	470 to 860	MHz
Anode voltage	V_a	1900	V
Output power in load (sync)	W_ℓ	55	W
Power gain	G	19	dB

HEATING : indirect by a.c. or d.c.; oxide coated cathode.

Heater voltage	V_f	5	V±5% [1]
Heater current	I_f	2,1	A
Cathode heating time	T_h min.	120	s

CAPACITANCES

Anode to grid	C_{ag}	3,5	pF
Grid to cathode and heater	$C_{g/kf}$	17	pF
Anode to cathode and heater	$C_{a/kf}$	0,05	pF

TYPICAL CHARACTERISTICS

Anode voltage	V_a	1900	V
Anode current	I_a	180	mA
Transconductance	S	60	mA/V
Amplification factor	μ	200	

TEMPERATURE LIMITS

Absolute max. seal temperature	t_s max.	150	°C
Absolute max, anode temperature at reference point	t_a max.	100	°C

[1]) For optimum transposer performance (linearity) ±2%.

COOLING

Forced air

W_a (W)	t_i (^oC)	q_{min} (l/min)	p_i (mm H_2O)
325	up to	550	56
275	45	400	33

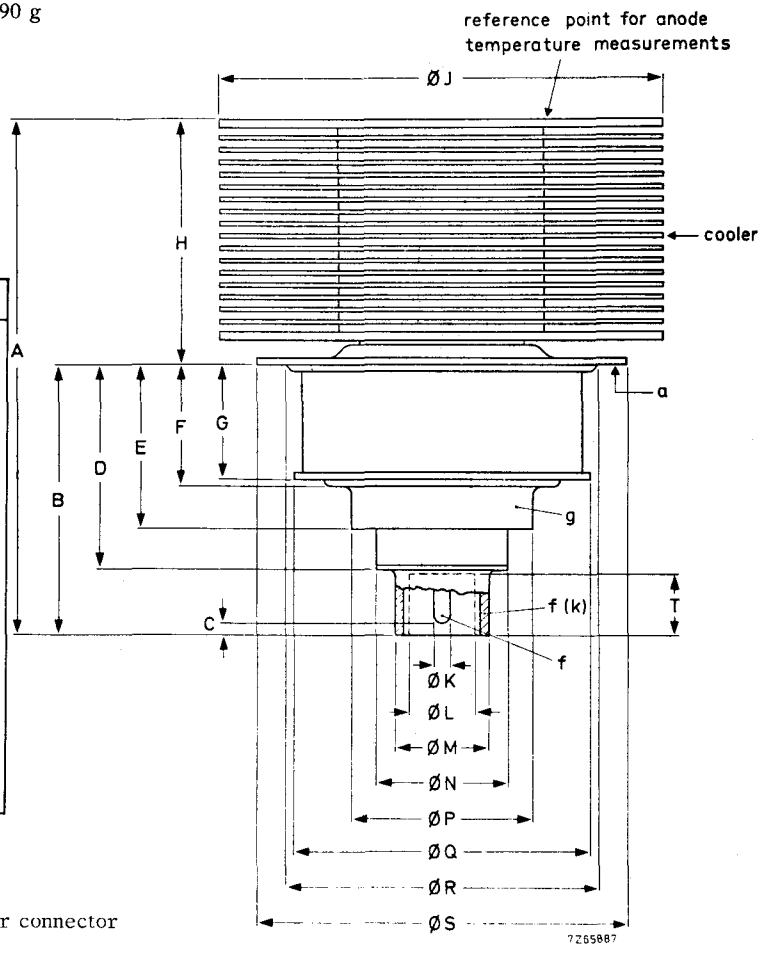
Recommended airduct see page 4.

MECHANICAL DATA

Dimensions in mm

Net weight : approx. 290 g

	min.	max.
A	61,2	64,2
B	32,2	34,2
C	0,9	2,3
D	25,0	26,4
E	19,9	21,9
F	14	15
G	13,5	14,5
H	29	30
J	53,9	54,1
K	1,9	2,1
L[1])	8	
M	11,3	11,7
N	15,8	16,4
P	22,6	23,0
Q	35,8	36,2
R	38	39
S	44,6	45,4
T[1])	7,5	



[1]) Available for heater connector

R.F. CLASS AB AMPLIFIER FOR TV TRANSPOSER SERVICE, grounded grid

LIMITING VALUES (Absolute max. rating system)

Frequency	f	up to	1000	MHz
Anode voltage	V_a	max.	2000	V
Grid voltage	$-V_g$	max.	50	V
Anode dissipation	W_a	max.	325	W
Grid current	I_g	max.	5	mA
Cathode current	I_k	max.	250	mA

OPERATING CONDITIONS, grounded grid

		CCIR standard G [1]	
Frequency	f	470 to 860	MHz
Bandwidth (-1 dB)	B	9	MHz
Anode voltage	V_a	1900	V
Grid voltage [2]	V_g	-6,6	V
Grid current	I_g	≈ 0	mA
Anode current, no signal	I_a	130	mA
Anode current at zero dB level (vision carrier)	I_a	180	mA
Driving power (sync)	W_{dr}	0,7	W
Output power in load	W_ℓ	55	W
Power gain	G	19	dB
Intermodulation products [3]	d	-54	dB
Differential phase [4]		2	°
Differential gain [4]		96	%

[1]) Negative modulation, positive synchronization, combined sound and vision.

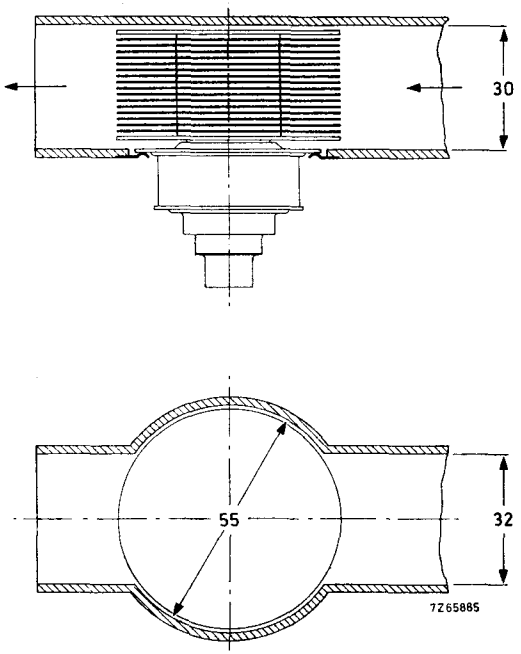
[2]) To be adjusted for the stated no-signal anode current.

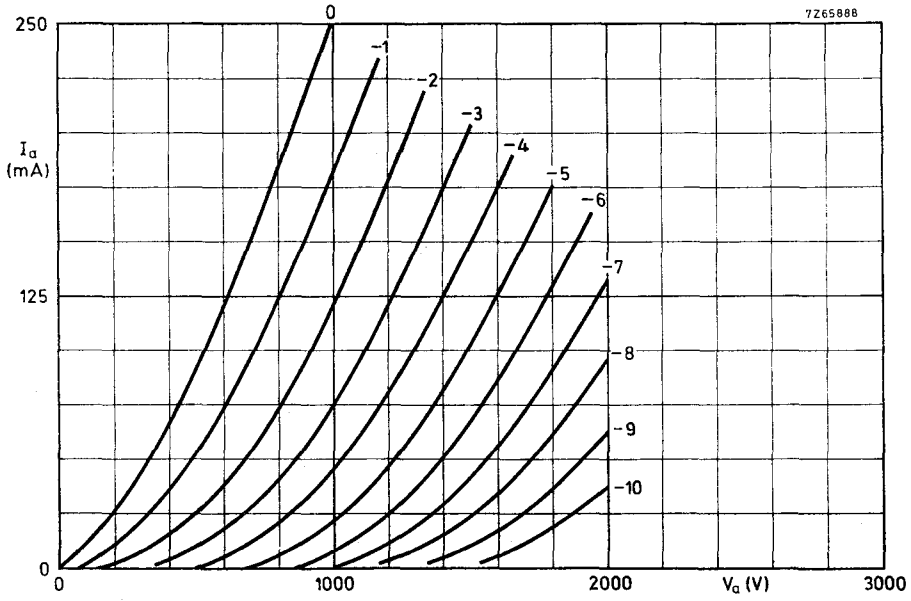
[3]) Three-tone test method (vision carrier -8 dB, sound carrier -7 dB, sideband signal -16 dB with respect to the sum signal amplitude of the composite signal).
Stated figure applies to a vision to sound power ratio of 5 : 1.
For a vision to sound power ratio of 10 : 1 : IM products ≤ -56 dB.

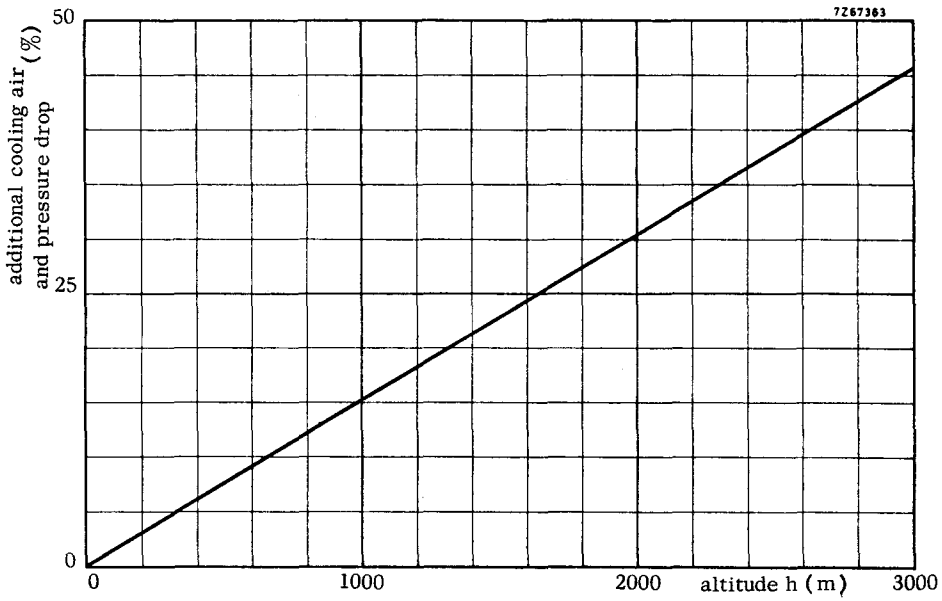
[4]) Measured with a saw-tooth amplitude running from 17 % to 75 % of the peak sync value, with superimposed a 4,43 MHz sinewave with a 10 % peak-to-peak value.

Recommended airduct

Dimensions in mm






7Z67363
50
25
0
additional cooling air and pressure drop (%)
0
1000
2000
3000
altitude h (m)

AIR COOLED R.F. POWER TRIODE

Forced air cooled coaxial power triode in metal-ceramic construction primarily intended for use as R.F. class AB linear broad-band amplifier in T.V. transposer service at frequencies up to 960 MHz.

QUICK REFERENCE DATA						
Frequency	Transposer service (combined sound and vision)			Vision amplifier		
	V_a	W_ℓ (sync)	Power gain	V_a	W_ℓ (sync)	Power gain
(MHz)	(V)	(W)	(dB)	(V)	(W)	(dB)
470 to 860	3000	220	16	2500	250	15

HEATING indirect by A.C. (50 Hz to 400 Hz) or D.C.; oxide coated cathode.

Heater voltage For transposer application a heater voltage deviation within ± 2% is recommended.	V_f	6.3	V ± 5%
Heater current	I_f	6.5	A
Cathode heating time	T_h	min. 120	s

CAPACITANCES

Anode to grid	C_{ag}	8.5	pF
Grid to cathode and heater	$C_{g/kf}$	28	pF
Anode to cathode and heater	$C_{a/kf}$	0.15	pF

TYPICAL CHARACTERISTICS

Anode voltage	V_a	2	kV
Anode current	I_a	400	mA
Transconductance	S	50	mA/V
Amplification factor	μ	110	

TEMPERATURE LIMITS

Absolute max. temperature measured at reference point	t	max. 250	°C

Data based on pre-production tubes.

COOLING

Anode: forced air

W_a (W)	t_i (^oC)	q_{min} (m^3/min)	p_i (mmH_2O)
1800	25	2	20

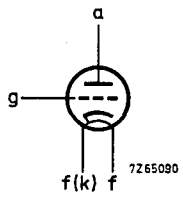
Other terminals: low velocity air flow.
When only the heater voltage is applied the heater and heater/cathode terminals should also be cooled.
Cooling air and voltages may be switched off simultaneously.

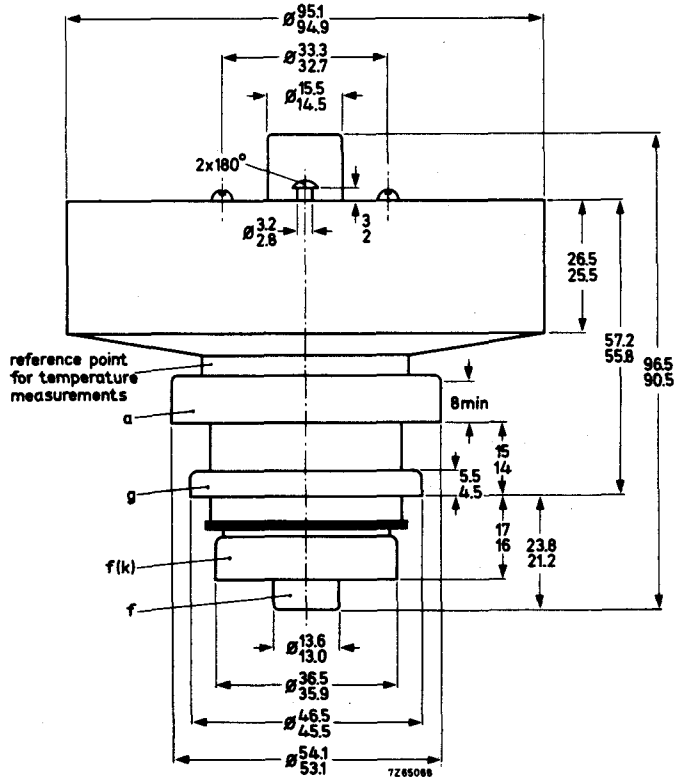
MECHANICAL DATA

Dimensions in mm

Net weight: approx.

Mounting position: any





R.F. CLASS AB AMPLIFIER FOR TELEVISION TRANSPOSER SERVICE grounded grid.

LIMITING VALUES (Absolute max. rating System)

Frequency	f	up to 960	MHz
Anode voltage	V_a	max. 3500	V
Grid voltage	$-V_g$	max. 200	V
Anode dissipation	W_a	max. 1800	W
Grid dissipation	W_g	max. 0.5	W
Cathode current	I_k	max. 700	mA

OPERATING CONDITIONS, grounded grid CCIR standard G[1)]

Frequency	f	470 to 860	MHz
Anode voltage	V_a	3000	V
Grid voltage [2)]	V_g	-19	V
Anode current, no signal condition	I_a	420	mA
Anode current [3)]	I_a	510	mA
Grid current	I_g	0 to -2	mA
Driving power (sync)	W_{dr}	5	W
Output power in load	W_ℓ	220	W
Power gain	G	$\approx$ 16	dB
Intermodulation products [4)]	d	$\leq$ -52	dB

1) Negative modulation, positive synchronization, combined sound and vision.
2) To be adjusted for the stated no-signal anode current. Range values -15 V to -22 V
3) Average anode current measured with a three tone test signal (see 4).
4) Three tone test method (vision carrier - 8 dB, sound carrier - 7 dB, sideband signal - 17 dB with respect to the sum signal amplitude of the composite signal).

OPERATING CONDITIONS AS VISION AMPLIFIER , grounded grid

Frequency	f	470 to 860	MHz
Anode voltage	V_a	2500	V
Grid voltage [1]	V_g	-20	V
Anode current, no-signal condition	I_a	250	mA
Anode current [2]	I_a	500	mA
Grid current	I_g	0	mA
Driving power (sync)	W_{dr}	8	W
Output power in load	W_l	250	W
Power gain	G	≈15	dB

1) To be adjusted for the stated no-signal anode current.
Range values: -10 V to -30 V.

2) I_a at C.W. output power = 250 W.

AIR COOLED R.F. POWER TRIODE

Forced air cooled coaxial power triode in metal-ceramic construction primarily intended for use as R.F. class AB linear broad-band amplifier in T.V. transposer service at frequencies up to 960 MHz.

QUICK REFERENCE DATA			
Frequency	Transposer service (combined sound and vision)		
	V_a	W_ℓ(sync)	Power gain
(MHz)	(V)	(W)	(dB)
470 - 860	2000	100	16

HEATING: indirect by A.C. (50 Hz to 400 Hz) or D.C.; oxide coated cathode.

Heater voltage For transposer application a heater voltage deviation within ± 2% is recommended	V_f	6.3	V ± 5%
Heater current	I_f	5.4	A
Cathode heating time	T_h	min. 180	s

CAPACITANCES

Anode to grid	C_{ag}	7.8	pF
Grid to cathode and heater	$C_{g/kf}$	27	pF
Anode to cathode and heater	$C_{a/kf}$	0.15	pF

TYPICAL CHARACTERISTICS

Anode voltage	V_a	2	kV
Anode current	I_a	250	mA
Transconductance	S	70	mA/V
Amplification factor	μ	80	

TEMPERATURE LIMITSTS

Absolute max. temperature measured at reference point	t	250	°C

Data based on pre-production tubes.

COOLING

Anode: forced air

W_a (W)	t_i (^oC)	q_{min} (m^3/min)	p_i (mmH_2O)
900	25	1.5	50

Other terminals: low velocity air-flow.

When only the heater voltage is applied the heater and heater/cathode terminals should also be cooled.

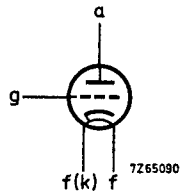
Cooling air and voltages may be switched of simultaneously.

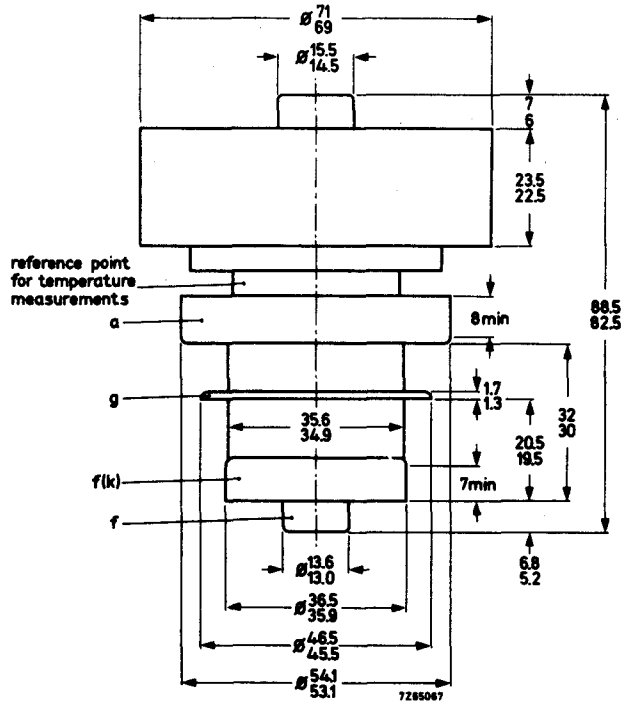
MECHANICAL DATA

Dimensions in mm

Net weight: approx.

Mounting position: any





R.F. CLASS AB AMPLIFIER FOR TELEVISION TRANSPOSER SERVICE grounded *grid*

LIMITING VALUES (Absolute max. rating system)

Frequency	f	up to	960	MHz
Anode voltage	V_a	max.	3500	V
Grid voltage	$-V_g$	max.	200	V
Anode dissipation	W_a	max.	900	W
Grid dissipation	W_g	max.	0.5	W
Cathode current	I_k	max.	550	mA

OPERATING CONDITIONS grounded grid — CCIR Standard G [1]

Frequency	f	470 to	860	MHz
Anode voltage	V_a	2000		V
Grid voltage [2]	V_g	-20		V
Anode current, no-signal condition	I_a	250		mA
Anode current	I_a	410		mA
Grid current	I_g	0		mA
Driving power (sync)	W_{dr}	2.5		W
Output power in load (sync)	W_l	100		W
Power gain	G	16		dB
Intermodulation products [3]	d	$\leq$ 56		dB

1) Negative modulation, positive synchronisation, combined sound and vision.
2) To be adjusted for the stated no-signal anode current.
Range values -10 V to -30 V.
3) Three tone test method (vision carrier -8 dB, sound carrier -10 dB, sideband signal - 16 dB with respect to the sum signal amplitude of the composite signal).

AIR COOLED R.F. POWERTRIODE

Forced-air cooled coaxial power triode in metal-ceramic construction primarily intended for use as R.F. class AB linear broadband amplifier in TV transposer service at frequencies up to 1000 MHz.

QUICK REFERENCE DATA			
Transposer service (combined sound and vision)			
Frequency	f	470 to 860	MHz
Anode voltage	V_a	2500	V
Output power in the load (sync)	W_ℓ	110	W
Power gain	G	16,5	dB

HEATING : indirect, by a.c. (50 Hz to 400 Hz) or d.c.; oxide coated cathode.

Heater voltage	V_f	6,0 to 6,3	V ±5% [1]
Heater current	I_f	4,8 to 5,8	A
Cathode heating time	T_h	min. 180	s

CAPACITANCES

Anode to grid	C_{ag}	6,8 to 8	pF
Grid to cathode and heater	$C_{g/kf}$	20 to 30	pF
Anode to cathode and heater	$C_{a/kf}$	90 to 180	fF

TYPICAL CHARACTERISTICS

Anode voltage	V_a	2	kV
Anode current	I_a	400	mA
Transconductance	S	70	mA/V
Amplification factor	μ	90	

TEMPERATURE LIMITS

Absolute max. temperature measured at reference points	t	max. 250	°C

To obtain optimum life, this temperature should not exceed 200 °C.

1) The heater voltage must be adjusted between 6,0 and 6,3 V.
For optimum performance (linearity) the voltage set must be maintained within ±2% for transposer service, or ±5% for other applications.

COOLING

Anode: forced air

W_a (W)	t_i (^oC)	q_{min} (m^3/min)	p_i (mm H_2O)
1000	25	0,7	2

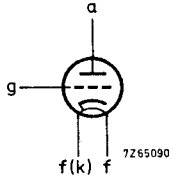
Other terminals: low velocity air flow.
When only the heater voltage is applied, the heater and heater/cathode terminals should also be cooled.
Cooling air and voltages may be switched off simultaneously.

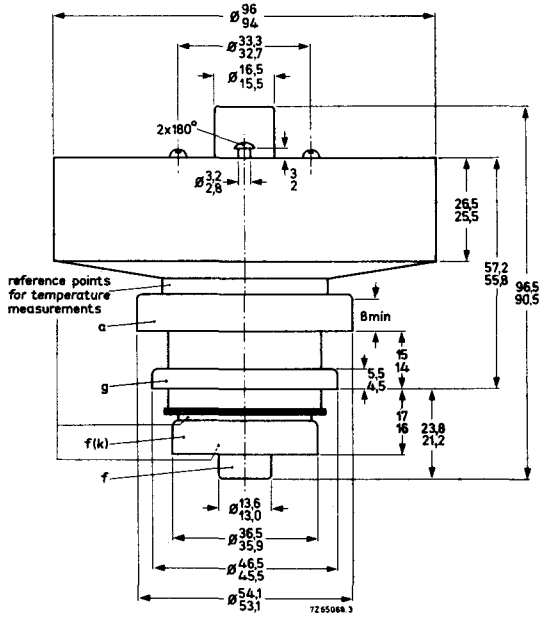
MECHANICAL DATA

Dimensions in mm

Net weight: approx. 1000 g

Mounting position: any





The radiator and the terminals are situated within concentric cylinders of the following dimensions:

Radiator	97,0 dia
Anode terminal	55,1 dia
Grid terminal	47,0 dia
Heater/cathode terminal	37,0 dia
Heater terminal	14,5 dia

R.F. CLASS AB AMPLIFIER FOR TV TRANSPOSER SERVICE grounded grid

LIMITING VALUES (Absolute max. rating system)

Frequency	f	up to	1000	MHz
Anode voltage	V_a	max.	3500	V
Grid voltage	$-V_g$	max.	200	V
Anode dissipation	W_a	max.	1800	W
Grid current	I_g	max.	± 5	mA
Cathode current	I_k	max.	550	mA [1]

OPERATING CONDITIONS , grounded grid [2][3]

Standard		CCIR-G	
Frequency	f	470 to 860	MHz
Anode voltage	V_a	2500	V
Grid voltage [4]	V_g	−25	V
Anode current, no signal [4]	I_a	200 to 300	mA
Anode current at zero dB level (vision carrier)	I_a	420 (<500)	mA
Grid current	I_g	≈ 0	mA
Driver output power (sync)	W_{dr}	4	W
Output power in load (sync)	W_l	110	W
Power gain	G	16,5	dB
Intermodulation products	d	−60	dB
		< −58	dB

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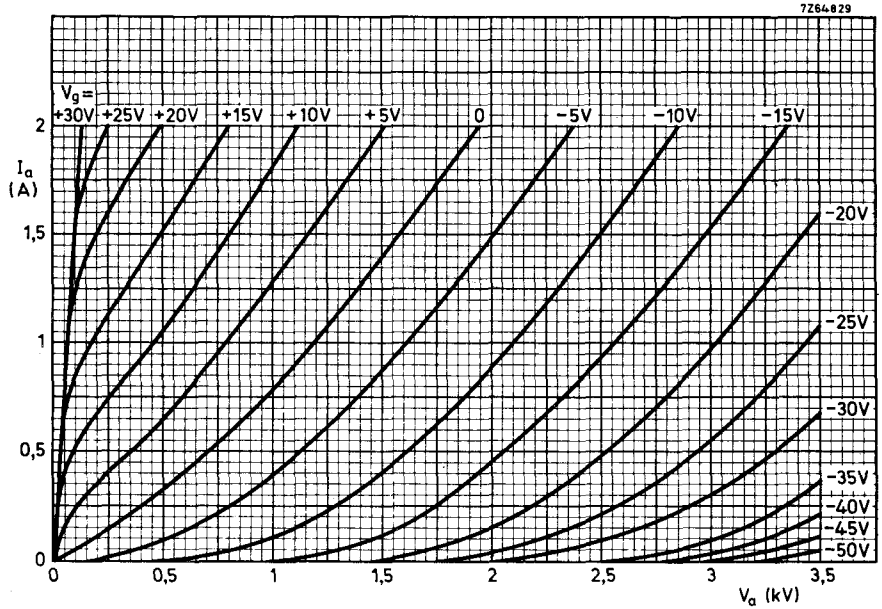
[1]) During a short period, for adjustment of the transmitter, I_k max. = 700 mA.

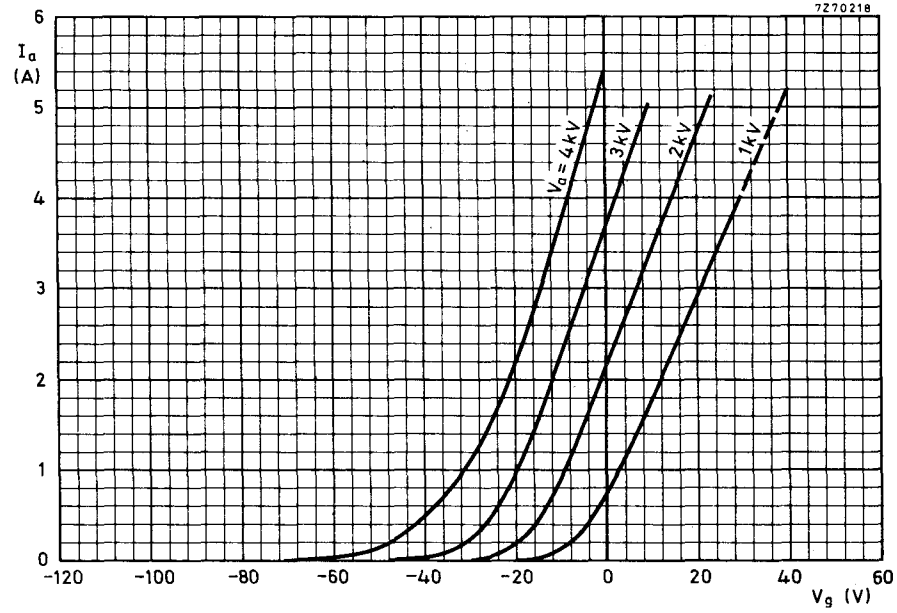
[2]) Negative modulation, positive synchronization, combined sound and vision.

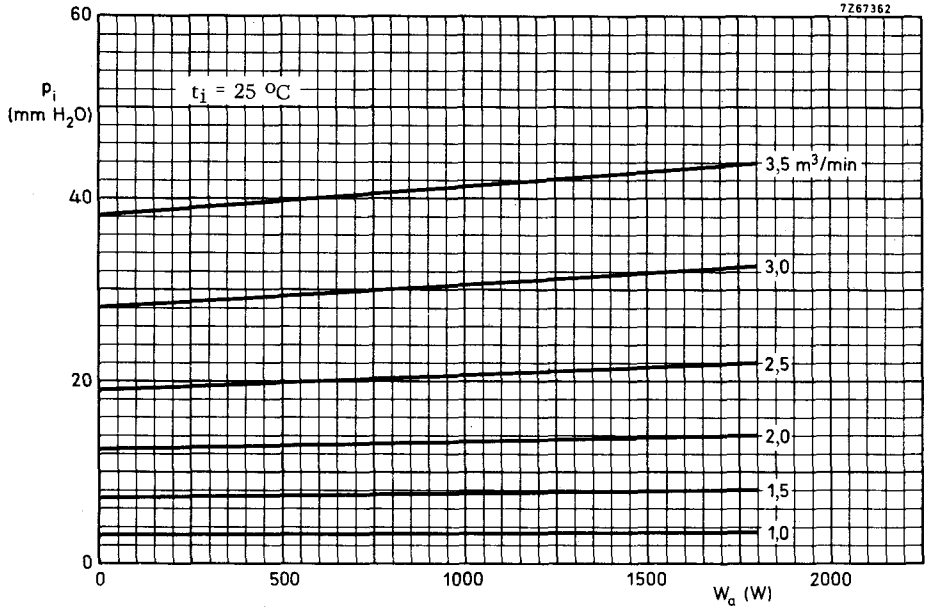
[3]) R.F. driving power should be applied after the heater and electrode voltages.

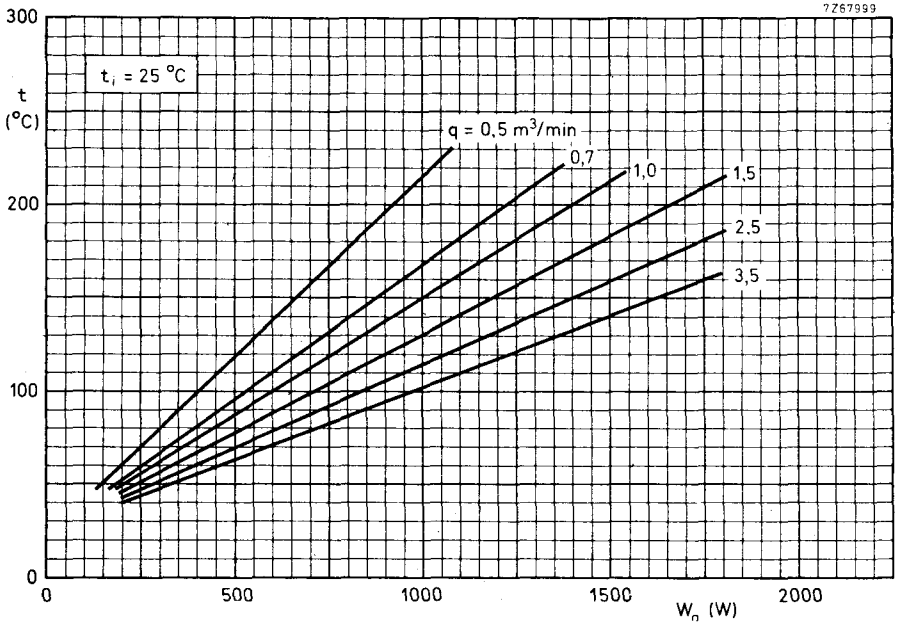
[4]) To be adjusted for the zero-signal anode current stated on the measuring report supplied with each tube.
Range values for equipment design −10 to −40 V.
The stated no-signal anode current results in optimum linearity.

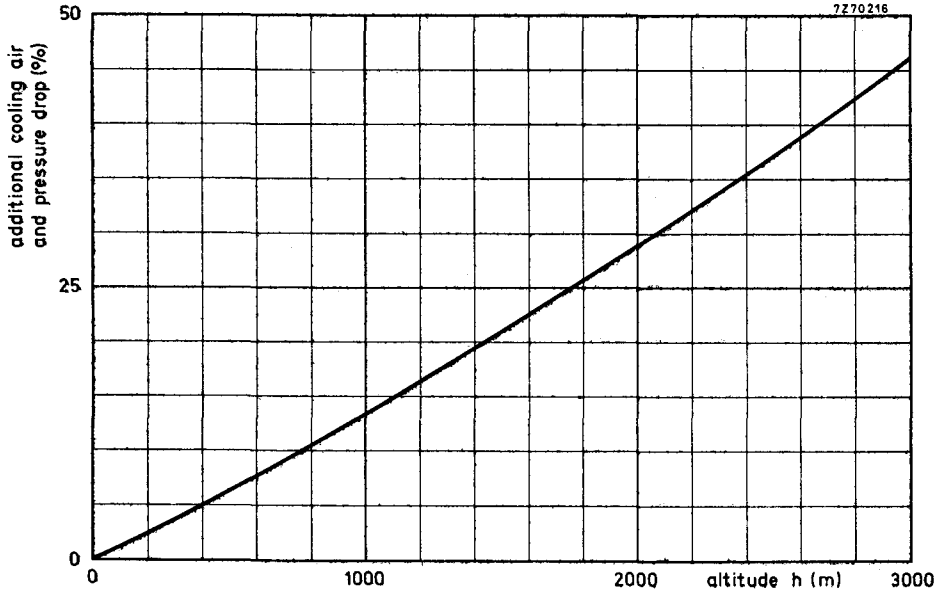
[5]) Three-tone method (vision carrier −8 dB, sound carrier −10 dB, sideband signal −16 dB with respect to peak sync level = 0 dB).

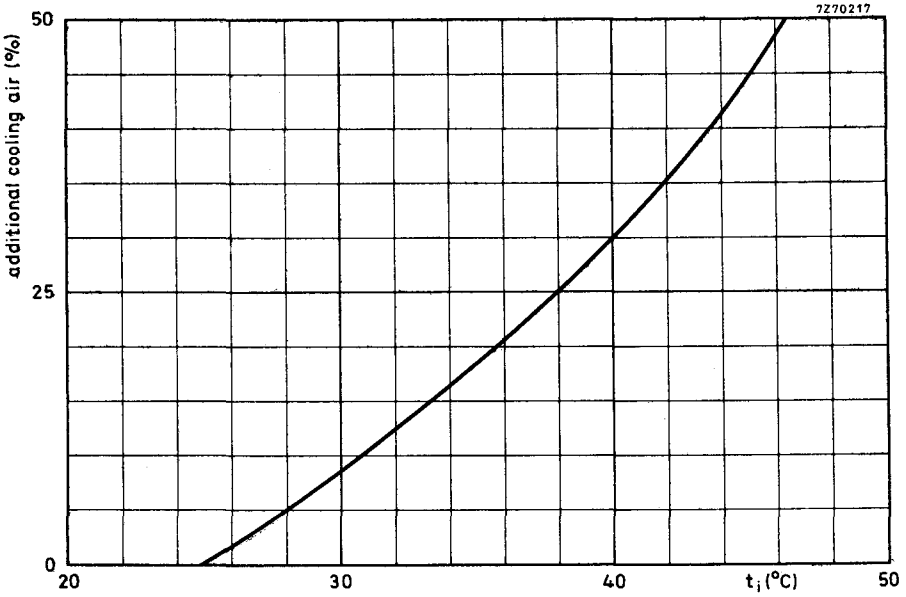

7Z64829
V_g =
+30V
+25V
+20V
+15V
+10V
+5V
0
-5V
-10V
-15V
-20V
-25V
-30V
-35V
-40V
-45V
-50V
I_a (A)
0
0,5
1
1,5
2
2,5
3
3,5
V_a (kV)


7Z70218
I_a (A)
0
1
2
3
4
5
6
V_a = 4kV
3kV
2kV
1kV
-120
-100
-80
-60
-40
-20
0
20
40
60
V_g (V)


7Z67362
60
40
20
0
p_i
(mm H_2O)
t_i = 25 °C
3,5 m³/min
3,0
2,5
2,0
1,5
1,0
0
500
1000
1500
2000
W_a (W)


7Z67999
300
200
100
0
t
(°C)
t_i = 25 °C
q = 0,5 m³/min
0,7
1,0
1,5
2,5
3,5
0
500
1000
1500
2000
W_a (W)


7Z70216
additional cooling air and pressure drop (%)
50
25
0
0
1000
2000
altitude h (m)
3000


7Z70217
additional cooling air (%)
50
25
0
20
30
40
t_j (°C)
50

AIR COOLED R.F. POWER TRIODE

Forced-air cooled coaxial power triode in metal-ceramic construction primarily intended for use as R.F. class AB linear broadband amplifier in TV sound and vision service at frequencies up to 1000 MHz.

QUICK REFERENCE DATA			
Frequency	f	470 to 860	MHz
Anode voltage	V_a	3500	V
Output power in the load (sync - CCIR-G)	W_ℓ	550	W
(peak white - CCIR-L)	W_ℓ	550	W
Power gain	G	15	dB

HEATING : indirect by a.c. (50 Hz to 400 Hz) or d.c.; oxide coated cathode.

Heater voltage	V_f	6,0 to 6,3	V ± 5%[1]
Heater current	I_f	4,8 to 5,8	A
Cathode heating time	T_h	min. 180	s

CAPACITANCES

Anode to grid	C_{ag}	6,8 to 8	pF
Grid to cathode and heater	$C_{g/kf}$	20 to 30	pF
Anode to cathode and heater	$C_{a/kf}$	90 to 180	fF

TYPICAL CHARACTERISTICS

Anode voltage	V_a	3	kV
Anode current	I_a	400	mA
Transconductance	S	70	mA/V
Amplification factor	μ	90	

TEMPERATURE LIMITS

Absolute max. temperature measured at reference points	t	max. 250	°C

To obtain optimum life this temperature should not exceed 200 °C.

[1]) For optimum performance as TV broadband amplifier (linearity) the voltage set must be maintained within ± 2 %.

Data based on pre-production tubes.

COOLING

Anode: forced air

W_a (W)	t_i (°C)	q_{min} (m^3/min)	p_i (mm H_2O)
1800	25	2,5	22

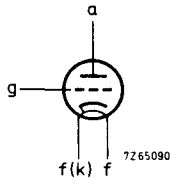
Other terminals: low velocity air flow.
When only the heater voltage is applied, the heater and heater/cathode terminals should also be cooled.
Cooling air and voltages may be switched off simultaneously.

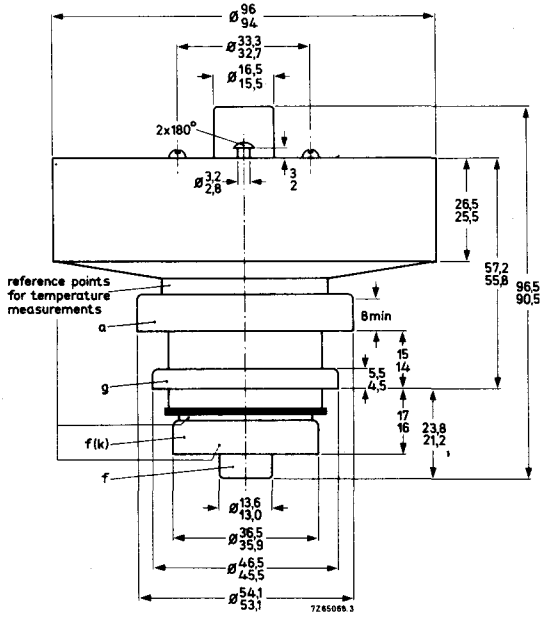
MECHANICAL DATA

Dimensions in mm

Net weight: approx. 1000 g

Mounting position: any





The radiator and the terminals are situated within concentric cylinders of the following dimensions:

Radiator	97,0 dia
Anode terminal	55,1 dia
Grid terminal	47,0 dia
Heater/cathode terminal	37,0 dia
Heater terminal	14,5 dia

R.F. CLASS AB AMPLIFIER FOR TELEVISION SERVICE , grounded grid

LIMITING VALUES (Absolute max. rating system)

Frequency	f	up to	1000	MHz
Anode voltage	V_a	max.	3800	V
Grid voltage	$-V_g$	max.	200	V
Anode dissipation	W_a	max.	1900	W [1]
Grid current	I_g	max.	± 5	mA
Cathode current	I_k	max.	700	mA [1]

OPERATING CONDITIONS grounded grid [2]

Standard		CCIR-G	CCIR-L	
Frequency	f	470 to 860	470 to 860	MHz
Anode voltage	V_a	3500	3500	V
Grid voltage [3]	V_g	-38	-38	V
Anode current, no signal	I_a	250	250	mA
Anode current at average grey level	I_a	≈ 500	≈ 500	mA
Grid current	I_g	≈ 0	≈ 0	mA
Driver output power, sync	W_{dr}	21		W
peak white	W_{dr}		21	W
Output power in load, sync	W_ℓ	550		W
peak white	W_ℓ		550	W
Power gain	G	15	15	dB
Differential gain		95	95	% [4]

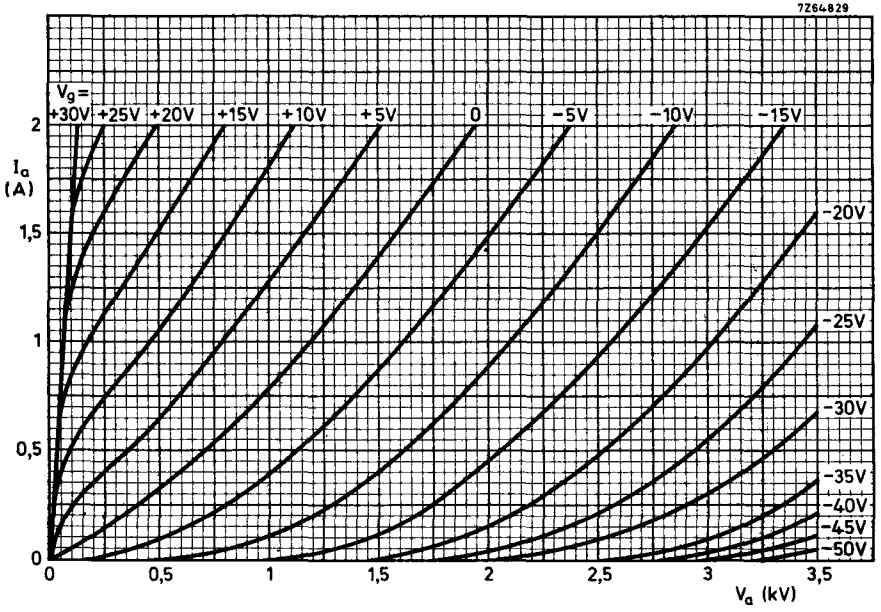
[1] During a short period, for adjustment of the transmitter, W_a = max. 2200 W, and I_k = max. 800 mA.

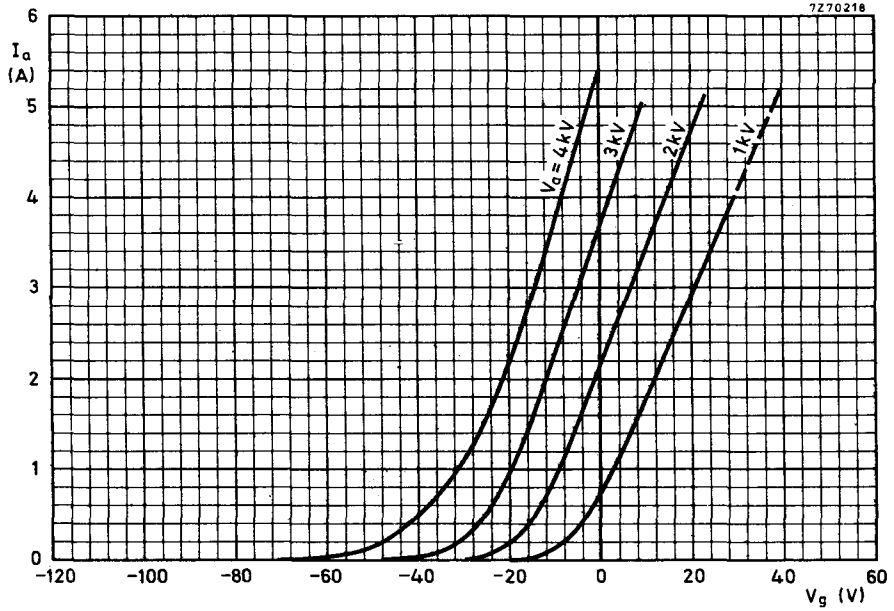
[2] R.F. driving power should be applied after the heater and electrode voltages.

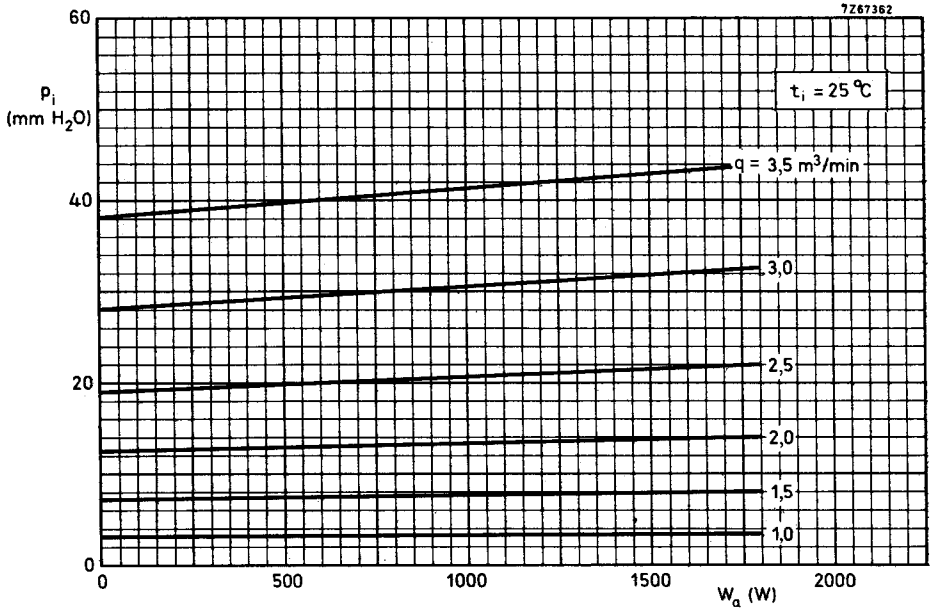
[3] To be adjusted for the stated no-signal anode current. Range values for equipment design -20 to -50 V.

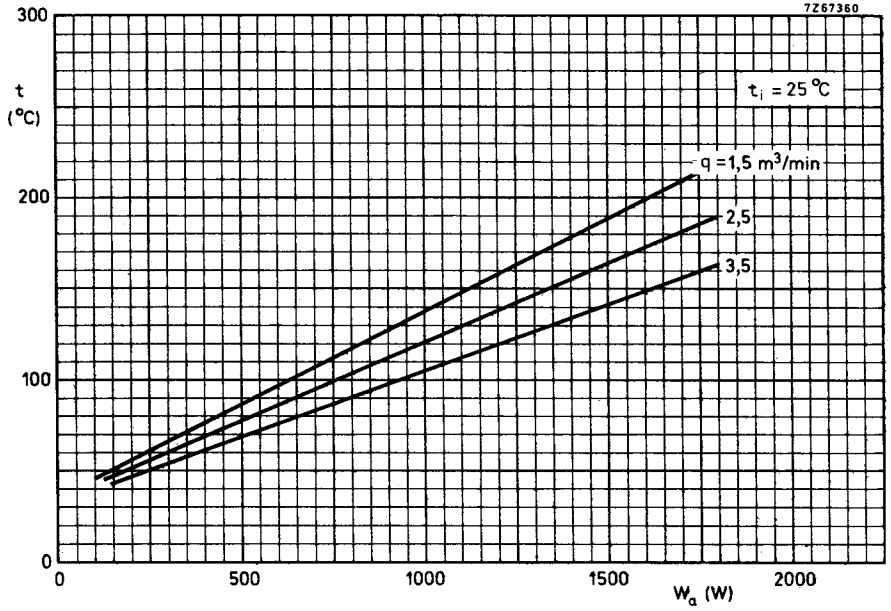
[4] Standard CCIR-G: Measured with a saw-tooth drive of 15% to 80% of peak sync amplitude with a superimposed 4,43 MHz signal with a peak-to-peak value of 10% of the peak sync amplitude adjusted at picture white level.

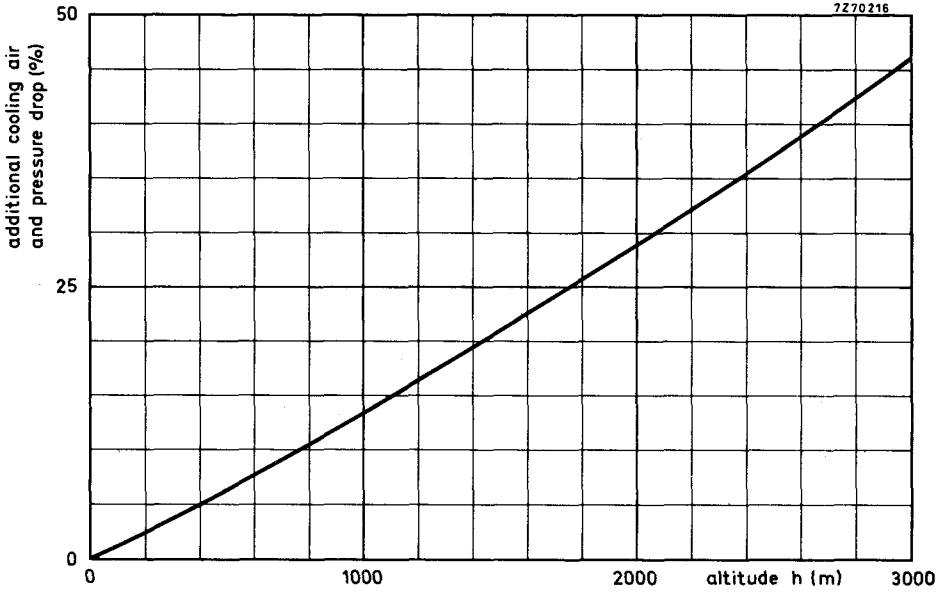
Standard CCIR-L: Measured on white level with a sawtooth drive of 30% to 100% of peak white amplitude with a superimposed 3 MHz signal with a peak-to-peak value of 30% of the picture white amplitude.

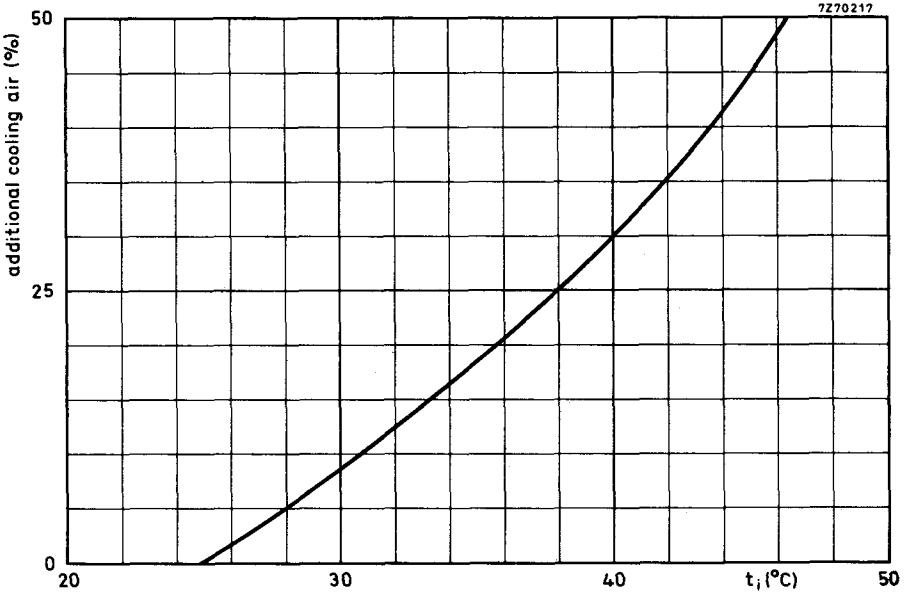

7Z64829
V_g =
+30V
+25V
+20V
+15V
+10V
+5V
0
-5V
-10V
-15V
-20V
-25V
-30V
-35V
-40V
-45V
-50V
I_a (A)
V_a (kV)


7Z70218
I_a (A)
V_a = 4kV
3kV
2kV
1kV
V_g (V)


7Z67362
60
40
20
0
P_i
(mm H_2O)
t_i = 25 °C
q = 3,5 m^3/min
3,0
2,5
2,0
1,5
1,0
0
500
1000
1500
2000
W_a (W)


7Z67360
300
200
100
0
t
(°C)
t_i = 25 °C
q =1,5 m^3/min
2,5
3,5
0
500
1000
1500
2000
W_a (W)


7Z70216
additional cooling air and pressure drop (%)
50
25
0
0
1000
2000
altitude h (m)
3000


7Z70217
additional cooling air (%)
50
25
0
20
30
40
t_i (°C)
50

AIR COOLED R.F. POWER TRIODE

Forced-air cooled coaxial power triode in metal-ceramic construction primarily intended for use as R.F. class AB linear broadband amplifier in TV transposer service at frequencies up to 1000 MHz.

QUICK REFERENCE DATA			
Transposer service (combined sound and vision)			
Frequency	f	470 to 860	MHz
Anode voltage	V_a	3000	V
Output power in the load (sync)	W_ℓ	220	W
Power gain	G	16,5	dB

HEATING : indirect, by a.c. (50 Hz to 400 Hz) or d.c.; oxide coated cathode.

Heater voltage	V_f	6,0 to 6,3	V ± 5% [1]
Heater current	I_f	4,8 to 5,8	A
Cathode heating time	T_h min.	180	s

CAPACITANCES

Anode to grid	C_{ag}	6,8 to 8	pF
Grid to cathode and heater	$C_{g/kf}$	20 to 30	pF
Anode to cathode and heater	$C_{a/kf}$	90 to 180	fF

TYPICAL CHARACTERISTICS

Anode voltage	V_a	3	kV
Anode current	I_a	400	mA
Transconductance	S	70	mA/V
Amplification factor	μ	90	

TEMPERATURE LIMITS

Absolute max. temperature measured at reference points	t	max.	250	°C

To obtain optimum life, this temperature should not exceed 200 °C.

[1]) The heater voltage must be adjusted between 6,0 and 6,3 V.
For optimum performance (linearity) the voltage set must be maintained within ± 2% for transposer service, or ± 5% for other applications.

COOLING

Anode: forced air

W_a (W)	t_i (^oC)	q_{min} (m^3/min)	p_i (mm H_2O)
1800	25	2,5	22

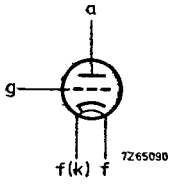
Other terminals: low velocity air flow.
When only the heater voltage is applied, the heater and heater/cathode terminals should also be cooled.
Cooling air and voltages may be switched off simultaneously.

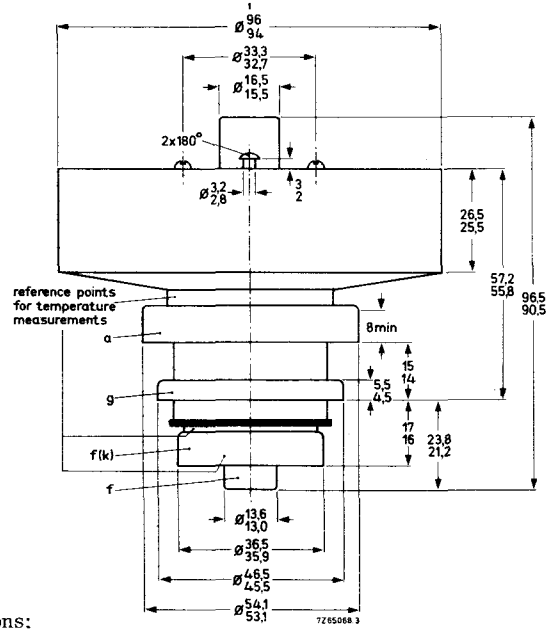
MECHANICAL DATA

Dimensions in mm

Net weight : approx. 1000 g

Mounting position: any





The radiator and the terminals are situated within concentric cylinders of the following dimensions:

Radiator	97,0 dia
Anode terminal	55,1 dia
Grid terminal	47,0 dia
Heater/cathode terminal	37,0 dia
Heater terminal	14,5 dia

R.F. CLASS AB AMPLIFIER FOR TV TRANSPOSER SERVICE grounded grid

LIMITING VALUES (Absolute max. rating system)

Frequency	f	up to	1000	MHz
Anode voltage	V_a	max.	3500	V
Grid voltage	$-V_g$	max.	200	V
Anode dissipation	W_a	max.	1800	W
Grid current	I_g	max.	± 5	mA
Cathode current	I_k	max.	550	mA [1]

OPERATING CONDITIONS, grounded grid [2][3]

Standard		C.C.I.R-G	C.C.I.R-G	C.C.I.R-I	
Frequency	f	470 to 860	470 to 860	470 to 860	MHz
Anode voltage	V_a	3000	3000	3000	V
Grid voltage [4]	V_g	−30	−30	−30	V
Anode current, no signal	I_a	420	350	420	mA
Anode current at zero dB level (vision carrier)	I_a	650	550	650	mA
Grid current	I_g	≈ 0	≈ 0	≈ 0	mA
Driver output power (sync)	W_{dr}	7	8	7	W
Output power in load (sync)	W_ℓ	220	220	220	W
Output power at $I_g = 0$	W_o	≥ 390	≥ 390	≥ 390	W
Power gain	G	16,5	16,0	16,5	dB
Intermodulation products	d	-57 [5] < -55	-56 [5] < -54	-55 [6] < -53	dB

[1] During a short period, for adjustment of the transmitter, I_k max. = 700 mA

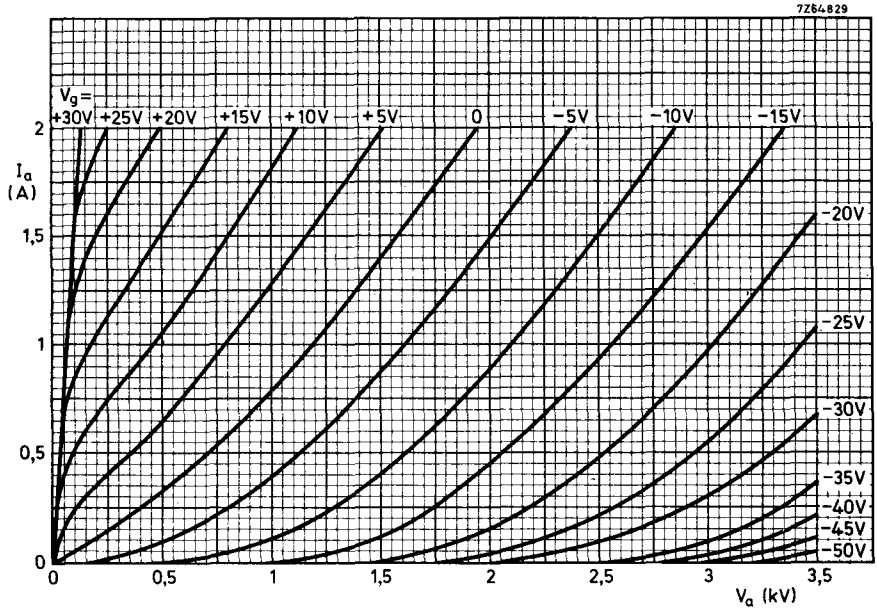
[2] Negative modulation, positive synchronization, combined sound and vision.

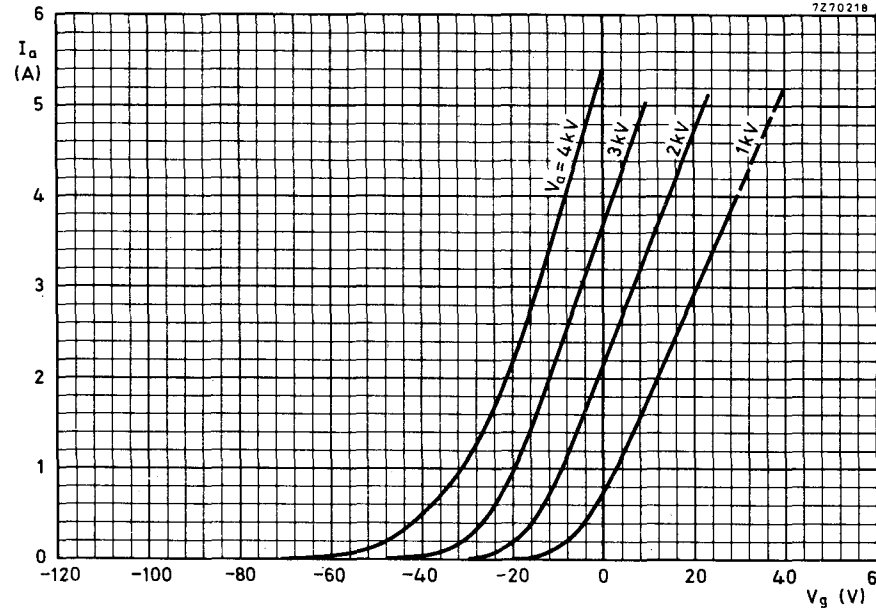
[3] R.F. driving power should be applied after the heater and electrode voltages.

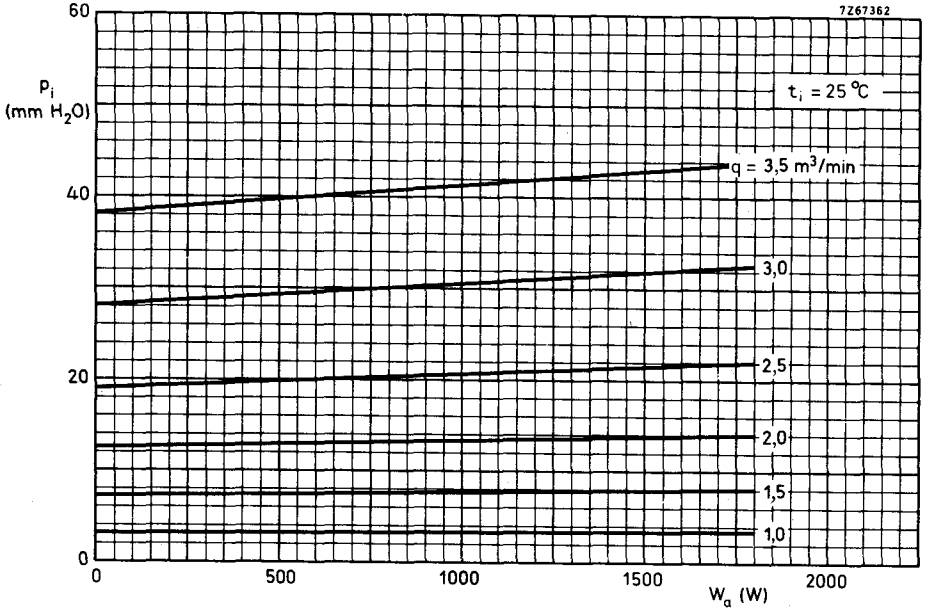
[4] To be adjusted for the stated no signal anode current. Range values for equipment design −15 to −45 V.

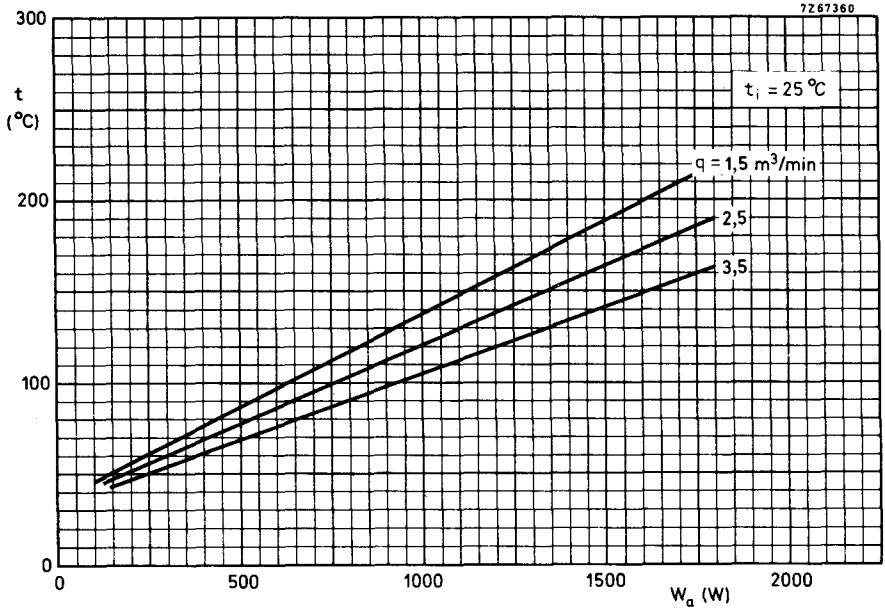
[5] Three-tone test method (vision carrier -8 dB, sound carrier -10 dB, sideband signal -16 dB with respect to peak sync level = 0 dB.).

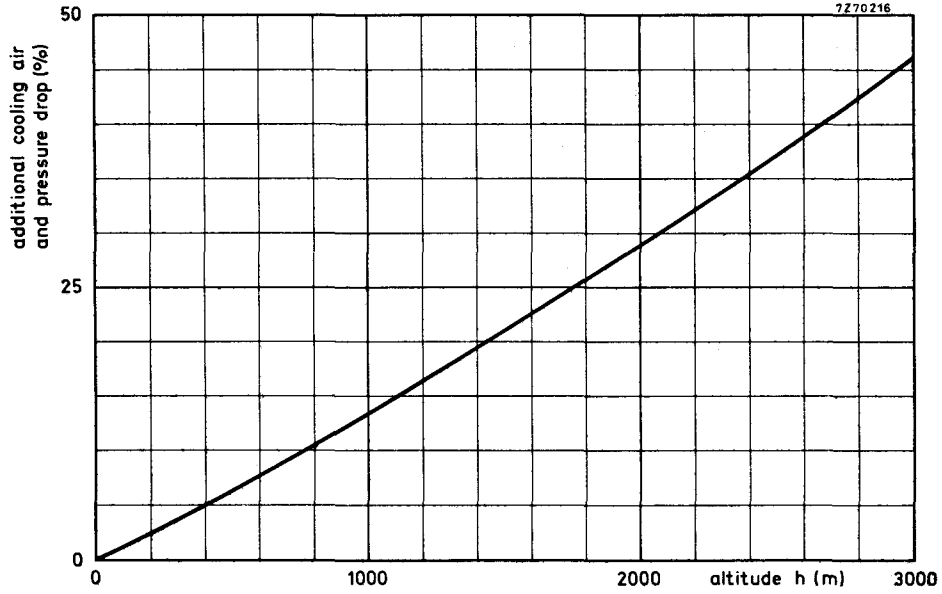
[6] Three-tone test method (vision carrier - 8 dB, sound carrier -7 dB, sideband signal -17 dB with respect to peak sync level = 0 dB).

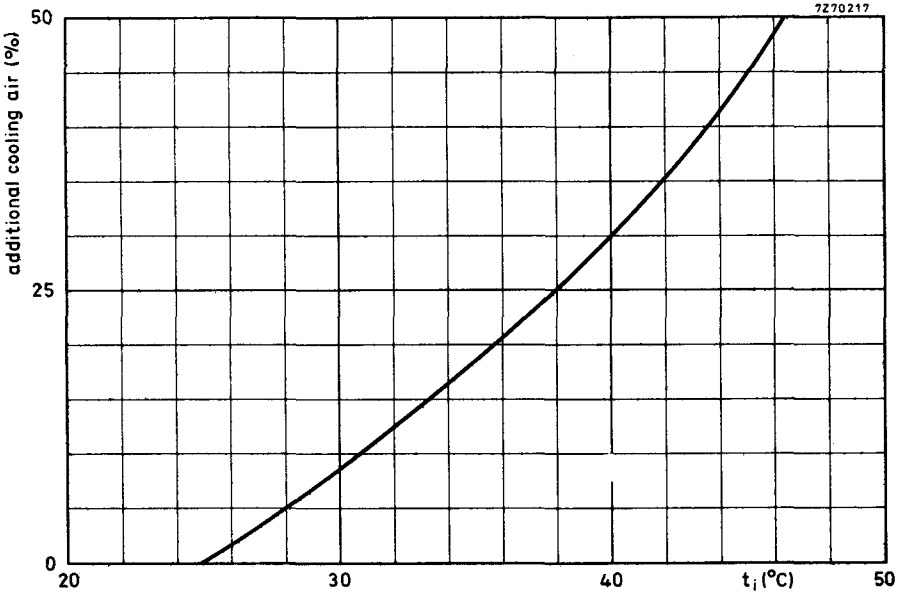

7Z64829
V_g=
+30V
+25V
+20V
+15V
+10V
+5V
0
-5V
-10V
-15V
-20V
-25V
-30V
-35V
-40V
-45V
-50V
I_a (A)
V_a (kV)


7Z70218
I_a (A)
V_a=4kV
3kV
2kV
1kV
V_g (V)


7Z67362
60
40
20
0
p_i
(mm H_2O)
t_i = 25 °C
q = 3,5 m^3/min
3,0
2,5
2,0
1,5
1,0
0
500
1000
1500
2000
W_a (W)


7Z67360
300
200
100
0
t
(°C)
t_i = 25 °C
q = 1,5 m^3/min
2,5
3,5
0
500
1000
1500
2000
W_a (W)


7Z70216
additional cooling air and pressure drop (%)
50
25
0
0
1000
2000
altitude h (m)
3000


7Z70217
additional cooling air (%)
50
25
0
20
30
40
t_i (°C)
50

RF POWER TRIODE

Triode in metal-ceramic construction intended for use as industrial oscillator. The YD1342 has an integral water cooler.

QUICK REFERENCE DATA

Oscillator output power ($W_o - W_{feedb}$)	W_{osc}		530 kW
Frequency for full ratings	f.	max.	30 MHz

To be read in conjunction with "General Operational Recommendations"

RF CLASS C OSCILLATOR FOR INDUSTRIAL USE

OPERATING CONDITIONS

Frequency	f	30	30	30 MHz
Oscillator output power ($W_o - W_{feedb}$)	W_{osc}	355	440	530 kW
Anode voltage	V_a	12	14	16 kV
Anode current	I_a	39,1	41	43,5 A
Anode input power	W_{ia}	470	574	696 kW
Anode dissipation	W_a	106	125	156 kW
Anode output power	W_o	364	449	540 kW
Anode efficiency	η_a	77,4	78,2	77,6 %
Oscillator efficiency	η_{osc}	75,5	76,6	76,1 %
Feedback ratio	V_{gp}/V_{ap}	10	9,5	9,3 %
Grid resistor	R_g	65	79	97 Ω
Grid current, on load	I_g	8,4	8,2	7,7 A
Grid voltage, negative	$-V_g$	550	650	750 V
Grid dissipation	W_g	3,8	3,8	3,8 kW
Grid resistor dissipation	W_{Rg}	4,6	5,3	5,8 kW

LIMITING VALUES

(Absolute maximum rating system)

Frequency for full ratings	f	up to	30 MHz
Anode voltage	V_a	max.	18 kV
Anode current	I_a	max.	45 A
Anode input power	W_{ia}	max.	750 kW
Anode dissipation	W_a	max.	240 kW
Grid voltage	$-V_g$	max.	2,5 kV
Grid current, on load	I_g	max.	9 A
Grid current, off load	I_g	max.	11 A
Grid dissipation	W_g	max.	6 kW
Grid circuit resistance	R_g	max.	10 kΩ
Cathode current, mean	I_k	max.	55 A
Cathode current, peak	I_{kp}	max.	250 A
Envelope temperature	T_{env}	max.	240 °C
HEATING; direct; thoriated tungsten filament, mesh construction			
Filament voltage	V_f		14 V
Filament current	I_f		555 A
Peak filament starting current	I_{fp}	max.	3500 A
Cold filament resistance	R_{fo}		2,6 mΩ

The filament is designed to accept temporary fluctuations of + 5% and − 10%.

It is extremely important that the filament be properly decoupled. This should be done so that the resonance of the circuit formed by the filament and the decoupling elements remain below the fundamental oscillator frequency. In grounde-grid circuits this resonance should be below the grid-cathode resonance. For further information please see Application Book "Tubes for RF heating" or contact the manufacturer.

CAPACITANCES

Anode to filament	C_{af}	4,5 pF
Grid to filament	C_{gf}	250 pF
Anode to grid	C_{ag}	70 pF

CHARACTERISTICS

Measured at V_a = 16 kV, I_a = 18 A

Transconductance	S	230 mA/V
Amplification factor	μ	35

COOLING

To obtain optimum life, the temperature of the seals and of the envelope should, under normal operating conditions, be kept below 200 °C.

At low frequencies the seals are sufficiently cooled if the filament connectors are water-cooled by a flow of about 1 l/min. At high frequencies, however, an additional air flow of about 6 m^3/min must be led along the seals from a 60 mm diameter nozzle positioned at a distance of 300 mm from the tube header.

Table 1 Water cooling characteristics

anode + grid dissipation $W_a + W_g$ kW	inlet temperature T_i °C	rate of flow q_{min} l/min	pressure drop ΔP kPa*	outlet temperature T_o °C
240	20	120	100	50
	50	180	180	70
200	20	95	65	52
	50	144	120	71
160	20	72	42	54
	50	110	75	72
110	20	47	23	56
	50	73	44	73

Absolute max. water inlet temperature	T_i	max. 50 °C
Absolute max. water pressure	P	max. 600 kPa

ACCESSORIES

Filament connector with cable	type 40695A
Filament/cathode connector with cable	type 40696A
Grid connector	
$f \leqslant 4$ MHz	type 40694
$f > 4$ MHz	type 40737

* 100 kPa ≈ 1 at

MECHANICAL DATA

Dimensions in mm

Mounting position vertical with anode up or down

Net mass approx. 30 kg

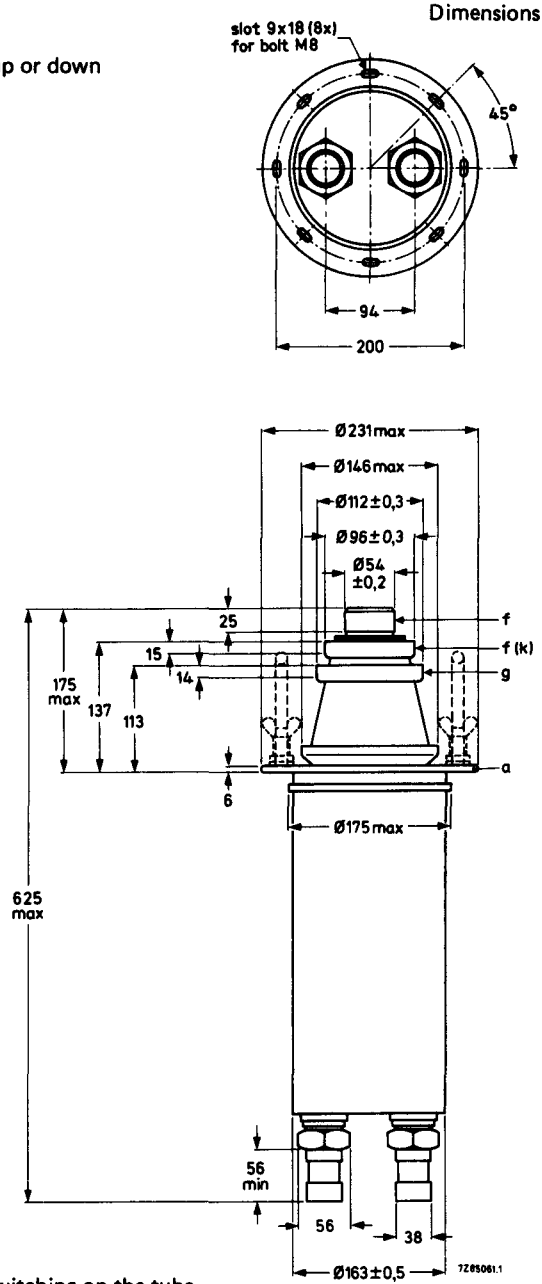


Fig. 1 Mechanical outline.

The handles should be removed before switching on the tube.

When using the tube in the anode up position the input and output water connections should be reversed.

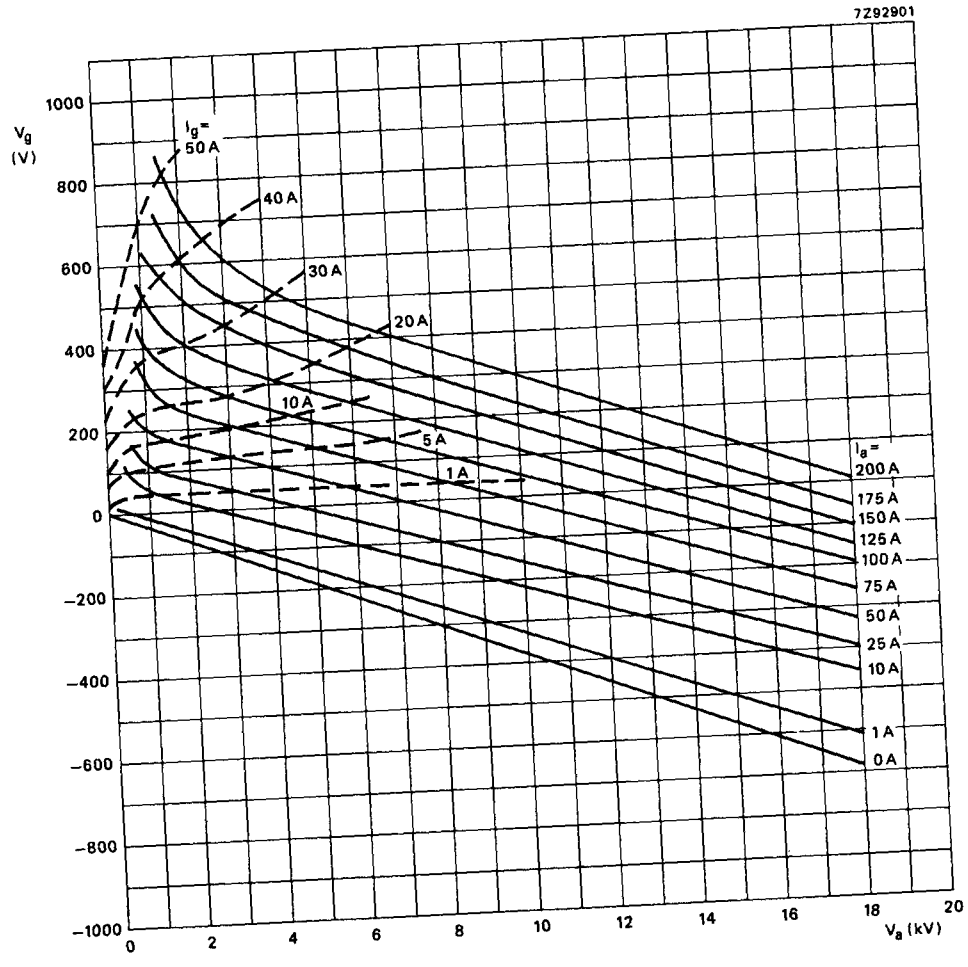


Fig. 2 Constant current characteristics.

PHILIPS

Data handbook

Electronic components and materials

YD1342

page	sheet	date
1	287	1986.11
2	288	1988.02
3	289	1988.02
4	290	1988.02
5	291	1988.02
6	FP	2000.09.09

WATER-COOLED MAGNETICALLY BEAMED INDUSTRIAL R.F. TRIODE

Water-cooled magnetically focused triode of metal-ceramic construction with integral water jacket intended for use as industrial oscillator.

QUICK REFERENCE DATA				
Oscillator output power (W_o-W_{feedb}), typical	W_{osc}		3	kW
Frequency for full ratings	f	max.	5	MHz

To be read in conjunction with "General Operational Recommendations Transmitting Tubes for Communication, Tubes for R.F. Heating".

R.F. CLASS C OSCILLATOR FOR INDUSTRIAL USE

Anode voltage single phase, full-wave rectified, unfiltered

OPERATING CONDITIONS

Frequency	f	5	MHz
Oscillator output power (W_o-W_{feedb})	W_{osc}	3094	W
Transformer voltage	$V_{tr\ rms}$	5000	V
Anode voltage, mean	V_a	4500	V
Anode current, mean	I_a	720	mA
Anode input power	W_{ia}	4000	W
Anode dissipation	W_a	900	W
Anode output power	W_o	3100	W
Anode efficiency	η_a	78	%
Oscillator efficiency	η_{osc}	77,4	%
Feedback ratio	V_{gp}/V_{ap}	33	%
Grid resistor	R_g	80	kΩ
Grid current, on load	I_g	4,5	mA
off load	I_g	9,0	mA
Grid voltage, negative	$-V_g$	360	V[1]
Grid dissipation	W_g	4,4	W
Grid resistor dissipation	W_{Rg}	1,6	W

1) Max. -565 V.

LIMITING VALUES (Absolute max. rating system)

Frequency for full ratings	f	max.	5	MHz
Anode voltage, mean	V_a	max.	4500	V
Anode current, mean	I_a	max.	725	mA
Anode input power	W_{ia}	max.	4	kW
Anode dissipation	W_a	max.	2	kW
Grid voltage	V_g	max.	2400	V
Grid current	I_g	max.		see 1)
Grid dissipation	W_g	max.	25	W
Grid circuit resistance	R_g	max.	88	kΩ
Cathode current, mean	I_k	max.	730	mA
Seal temperature	t	max.	200	°C

HEATING : indirect; nickel-oxide cathode, dispenser type

Heater voltage	V_f	5	V
Heater current	I_f	6,1	A
Waiting time	$T_{w\ min.}$	2	min.

The filament is designed to accept temporary fluctuations of +10 % and −10 %.

CAPACITANCES

Anode to cathode	C_{ak}	0,3	pF
Grid to cathode	C_{gk}	9,8	pF
Anode to grid	C_{ag}	11,5	pF

CHARACTERISTICS measured at V_a = 3 kV, I_a = 500 mA

Transconductance	S		4	mA/V
Amplification factor	μ		25	
Magnetic flux density	B	min.	115 (= 1150	mT Gs)

Care should be taken that the magnetic flux density is not influenced by external magnetic materials.

1) Limited by W_g max. and I_k max.

COOLING

Anode + grid dissipation $W_a + W_g$ (kW)	Inlet temperature t_i (°C)	Rate of flow q min (ℓ/min)	Pressure drop p_i (kPa*)
2	20	3, 8	31
	50	5, 7	62

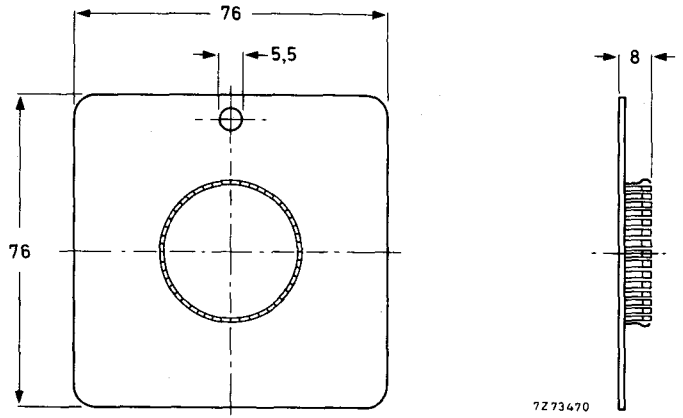
The water flow must be maintained for at least 1 minute after anode power is removed. Additional air cooling of the seals may be necessary to keep the temperature below the limiting value. The direction of the water flow must be such that the inflow is below the outlet for either of the two vertical mounting positions.

ACCESSORIES

Magnet assembly (magnetic nest) type 40765 net mass 2, 3 kg

Grid connector 40766

Dimensions in mm



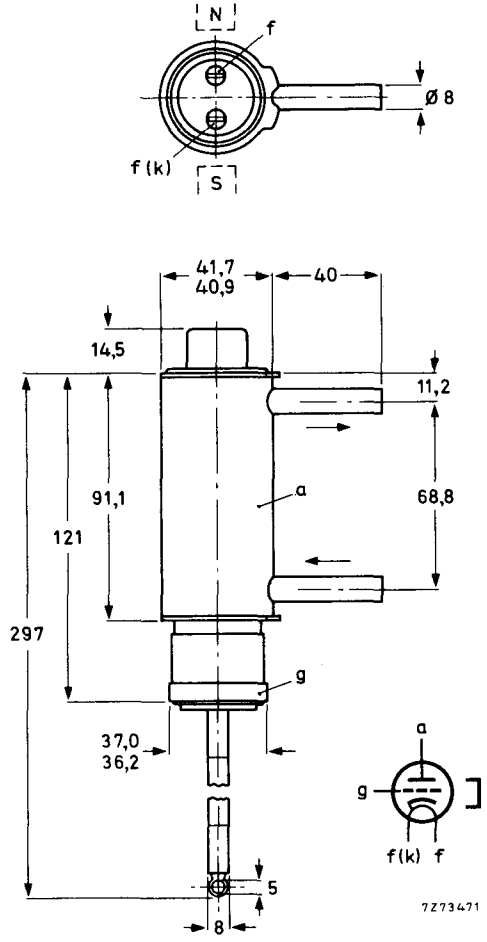
Grid connector 40766

* 100 Pa ≈ 1 at.

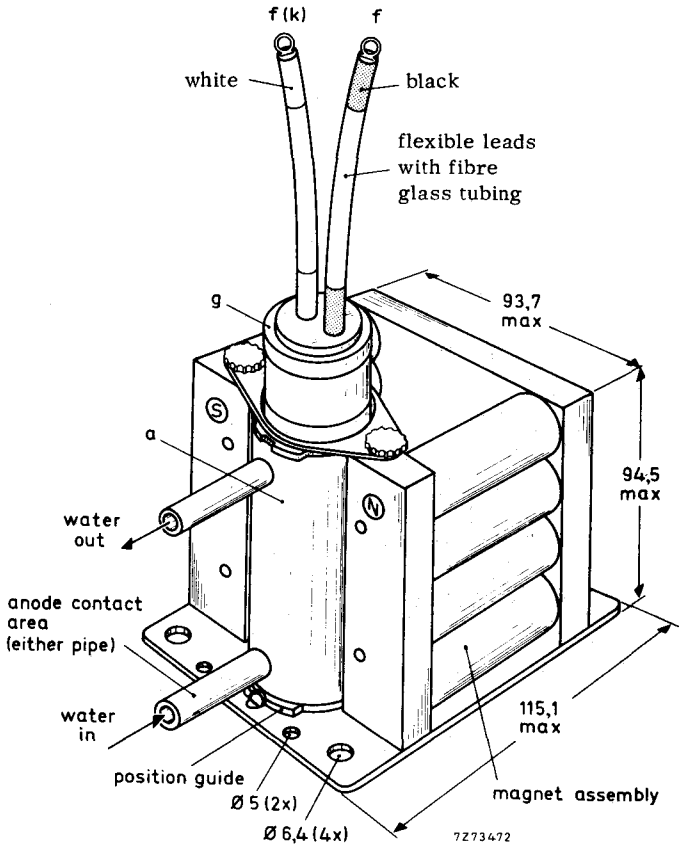
MECHANICAL DATA

Dimensions in mm

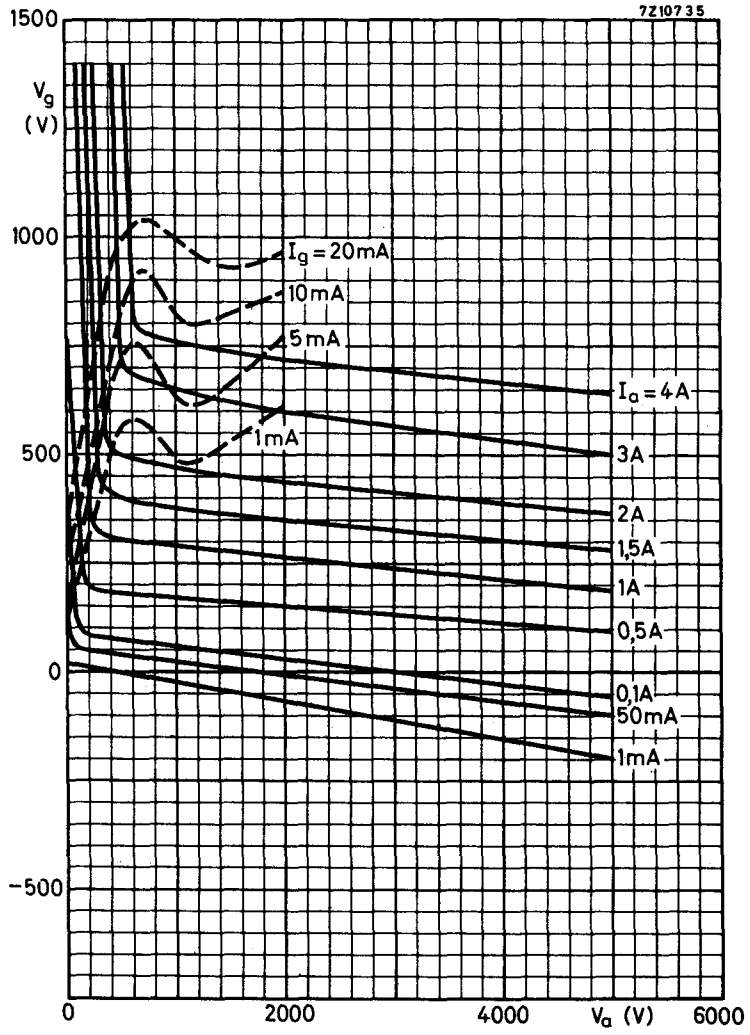
Mounting position : vertical
Net mass : approx. 0,45 kg



Due to the very rugged construction of this type, generally it can be shipped mounted in the equipment.



Tube mounted in magnet assembly 40765


7Z10735
1500
V_g (V)
1000
500
0
−500
I_g = 20mA
10mA
5mA
1mA
I_a = 4A
3A
2A
1,5A
1A
0,5A
0,1A
50mA
1mA
0
2000
4000
V_a (V)
6000

PHILIPS

YJ1000

Packaged MAGNETRON for use as pulsed oscillator, operating at a fixed frequency in the X-band between the limits of 9190 and 9320 Mc/s and capable of delivering a peak output power of min. 2.5 kW. The output system has been designed for coupling to a standard rectangular waveguide RG-52/U (EIA designation WR90) with outside dimensions 1/2" x 1"

HEATING

Indirect. Heater voltage	V_f	=	6.3 V ± 5 %
Heater current at 6.3V	$I_f(V_f=6.3\ V)$ =		0.5 A

At ambient temperatures above 0 °C the cathode must be heated for at least 2 minutes before the application of high voltage. Below this temperature the heating time must be increased to at least 3 minutes.

TYPICAL CHARACTERISTICS

Frequency	f = between 9190 and 9320 Mc/s		
Negative temperature coefficient	$-\frac{\Delta f}{\Delta t}$	= max.	0.25 Mc/s°C
Pulling figure at voltage standing wave ratio = 1.5	$\Delta f_p(VSWR=1.5)$	= max.	18 Mc/s
Pushing figure	$\frac{\Delta f}{\Delta I a_p}$	= max.	2.5 Mc/sA
Distance of voltage standing wave minimum from face of mounting plate into magnetron	d	=	3 - 9 mm
Peak anode voltage at peak anode current = 3A	$V_{ap}(I_{ap} = 3\ A)$	=	3.2-3.6 kV
Input capacitance	C_{ak}	= max.	9 pF

COOLING

Naturel

MAGNETRON OUTPUT

To fasten the magnetron base plate to the RG-52/U waveguide the bolted flange choke coupling joint, services type 5985-99-0830051 should be used.

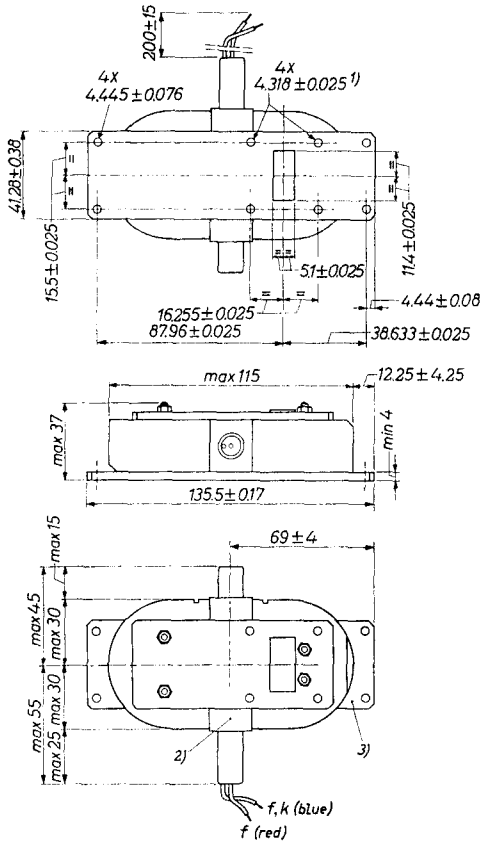
MOUNTING POSITION

Any

NET WEIGHT

1 kg Shipping weight 2.3 kg

Dimensions in mm



1) Holes for locating pins, depth 4 mm
2) Point for temperature measurement
3) The anode is terminated at the base plate

LIMITING VALUES (Absolute limits)

Each limiting value should be regarded independently of other values, so that under no circumstances it is permitted to exceed a limiting value whichsoever.

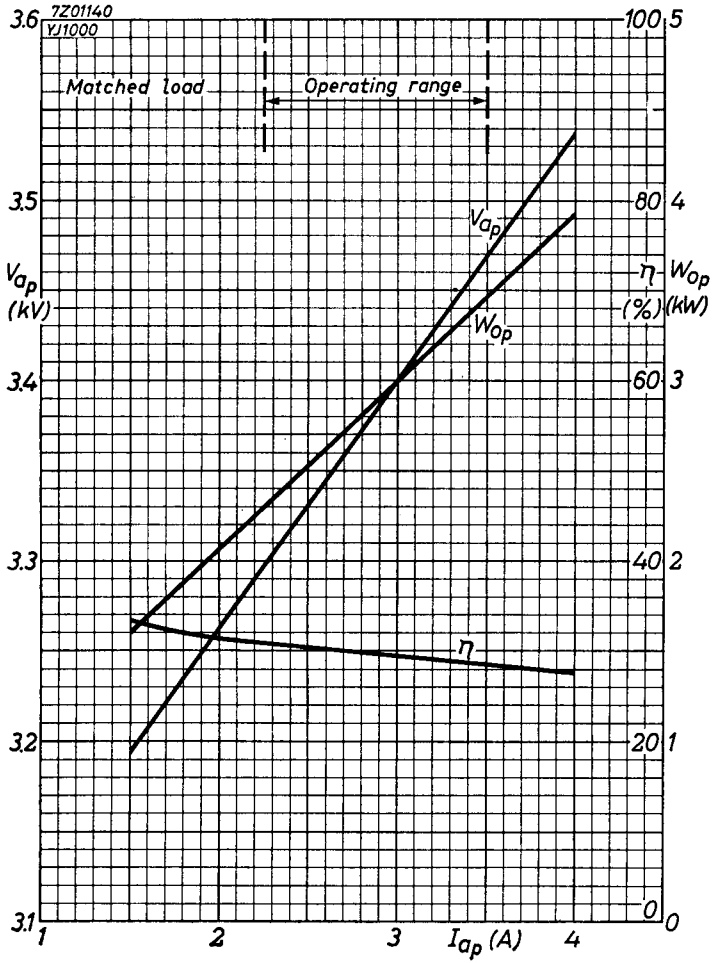
Pulse duration	T_{imp}	= max. = min.	1 µsec 0.02 µsec
Duty factor	δ	= max.	0.001
Peak anode current	I_{ap}	= max. = min.	3.5 A 2.25 A
Average input power	W_i	= max.	13 W
Rate of rise of anode voltage	$\frac{\Delta V}{\Delta T_{rv}}$	= max.	60 kV/µsec
Voltage standing wave ratio	V.S.W.R.	= max.	1.5
Temperature of anode block (See note 2) page 2)	t_a	= max.	120 °C

OPERATING CHARACTERISTICS

Heater voltage	V_f	=	6.3 V
Pulse duration	T_{imp}	=	0.1 µsec
Duty factor	δ	=	0.0002
Pulse repetition rate	f_{imp}	=	2000 c/s
Peak anode voltage	V_{ap}	=	3.4 kV
Rate of rise of anode voltage	$\frac{\Delta V_a}{\Delta T_{rv}}$	=	50 kV/µsec
Average anode current	I_a	=	600 µA
Peak anode current	I_{ap}	=	3 A
Average output power	W_o	=	0.6 W
Peak output power	W_{op}	=	3 kW
Pulling figure at voltage standing wave ratio = 1.5	Δf_p(VSWR=1.5)	=	15 Mc/s

PHILIPS

YJ1000



11.11.1962

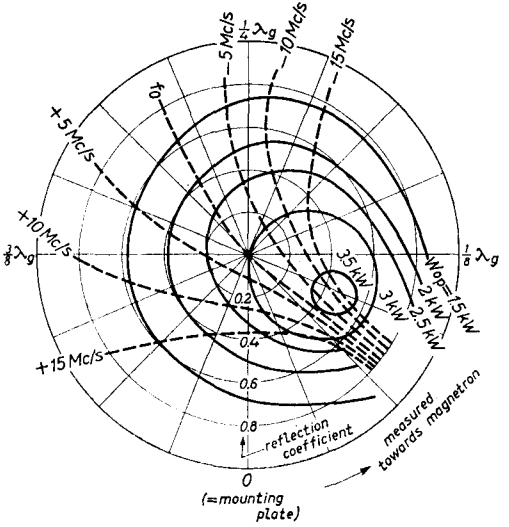
A

YJ1000 **PHILIPS**

LOAD DIAGRAM of average magnetron

Measured at:

Peak anode current	I_{ap} = 3.0 A
Frequency	f_o = 9245 Mc/s
Pulling figure	Δf_p = 15 Mc/s





YJ1000

page	sheet	date
1	1	1962.11.11
2	2	1962.11.11
3	3	1962.11.11
4	A	1962.11.11
5	B	1962.11.11
6	FP	1999.12.24

DOUBLE TETRODE for use as R.F. amplifier, oscillator, frequency multiplier and modulator. The tube is internally neutralized.

CATHODE: oxide coated

HEATING: indirect by A.C. or D.C.

Heater voltage	V_f =	6.3 V	12.6 V
Heater current	I_f =	1.8 A	0.9 A
Pins		5-(1+7)	1-7

CAPACITANCES (each system, the elements of the other system being earthed)

Anode to all other elements except grid No.1	C_a	= 3.2 pF
Grid No.1 to all other elements except anode	C_{g_1}	= 10.5 pF
Anode to grid No.1	C_{ag_1}	< 0.09 pF

For internal neutralization (C_n,C_n') please refer to electrode connections page 2.

TYPICAL CHARACTERISTICS (each system)

Anode current	I_a	= 30 mA
Mutual conductance	S	= 4.5 mA/V
Amplification factor of grid No.1 with respect to grid No.2	$\mu_{g_2g_1}$	= 8.2

Freq.	C telegr.				C_{ag_2} mod.			
	C.C.S.		I.C.A.S.		C.C.S.		I.C.A.S.	
(Mc/s)	V_a (V)	W_ℓ [1] (W)	V_a (V)	W_ℓ [1] (W)	V_a (V)	W_ℓ [1] (W)	V_a (V)	W_ℓ [1] (W)
175	900	132	1000	163	750	85	800	107

[1]) Useful power in the load

COOLING: radiation

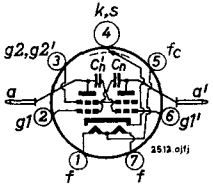
When the tube is used near its limiting values it may be necessary to direct an air flow on the bulb and the anode seals. In general an air flow of approximately 0.56 m³/min. will be sufficient.

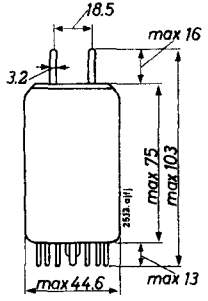
TEMPERATURE LIMITS (Absolute limits)

Temperature of bulb and anode seals = max. 250 °C

Temperature of base pin seals = max. 180 °C

Dimensions in mm





Base	Septar
Socket	40202
Anode connector clips	40681

Mounting position: Vertical with base up or down or horizontal with the anode pins in a horizontal plane

Net weight 71 g

H.F. class C telegraphy, two systems in push-pull

LIMITING VALUES (continuous service; absolute limits)

			C.C.S.	
Frequency	f	up to	175	Mc/s
Anode voltage	V_a	= max.	1000	V
Anode current	I_a	= max.	2x110	mA
Anode dissipation	W_a	= max.	2x30	W
Anode input power	Wi_a	= max.	2x100	W
Grids No.2 voltage	$V_{g_2,g_2'}$	= max.	300	V
Grids No.2 dissipation	$W_{g_2,g_2'}$	= max.	7	W
Negative grid No.1 voltage	$-V_{g_1}$	= max.	175	V
Grid No.1 current	I_{g_1}	= max.	2x5	mA
Grid No.1 circuit resistance	R_{g_1}	= max.	50	kΩ[1])
Heater to cathode voltage	V_{kf}	= max.	100	V

OPERATING CONDITIONS (continuous service)

			C.C.S.		
Frequency	f	=	175	175	Mc/s
Anode voltage	V_a	=	1000	900	V
Grids No.2 voltage	$V_{g_2,g_2'}$	=	230	245	V
Grid No.1 voltage	V_{g_1}	=	-85	-90	V
Common grids No.1 resistor	$R_{g_1,g_1'}$	=	15	15	kΩ
Anode current	I_a	=	2x100	2x110	mA
Grids No.2 current	$I_{g_2,g_2'}$	=	11.2	12.5	mA
Grids No.1 current	$I_{g_1,g_1'}$	=	5.7	5.9	mA
Anode input power	Wi_a	=	200	198	W
Anode dissipation	W_a	=	2x27	2x25	W
Grids No.2 dissipation	$W_{g_2,g_2'}$	=	2.5	3.0	W
Driver output power	W_{dr}	=	3.5	3.5	W
Output power	W_o	=	146	150	W
Efficiency	η	=	73	75	%
Useful power in the load	W_l	=	125	132	W

[1]) Each section

H.F. class C telegraphy, two systems in push-pull (continued)

LIMITING VALUES (Intermittent service; absolute limits)

			I.C.A.S.	
Frequency	f	up to	175	Mc/s
Anode voltage	V_a	= max.	1000	V
Anode current	I_a	= max.	2x120	mA
Anode dissipation	W_a	= max.	2x34	W
Anode input power	W_{i_a}	= max.	2x120	W
Grids No.2 voltage	$V_{g_2,g_2'}$	= max.	300	V
Grids No.2 dissipation	$W_{g_2,g_2'}$	= max.	8	W
Negative grid No.1 voltage	$-V_{g_1}$	= max.	175	V
Grid No.1 current	I_{g_1}	= max.	2x5	mA
Grid No.1 circuit resistance	R_{g_1}	= max.	50	kΩ[1])
Heater to cathode voltage	V_{kf}	= max.	100	V

OPERATING CONDITIONS (Intermittent service)

			I.C.A.S.		
Frequency	f	=	175	175	Mc/s
Anode voltage	V_a	=	1000	900	V
Grids No.2 voltage	$V_{g_2,g_2'}$	=	260	260	V
Grid No.1 voltage	V_{g_1}	=	-85	-85	V
Common grids No.1 resistor	$R_{g_1,g_1'}$	=	15	15	kΩ
Anode current	I_a	=	2x120	2x120	mA
Grids No.2 current	$I_{g_2,g_2'}$	=	16.5	17.0	mA
Grids No.1 current	$I_{g_1,g_1'}$	=	5.7	5.7	mA
Anode input power	W_{i_a}	=	240	216	W
Anode dissipation	W_a	=	2x30	2x25	W
Grids No.2 dissipation	$W_{g_2,g_2'}$	=	4.3	4.5	W
Driver output power	W_{dr}	=	3.5	3.5	W
Output power	W_o	=	180	166	W
Efficiency	η	=	75	77	%
Useful power in the load	W_ℓ	=	163	147	W

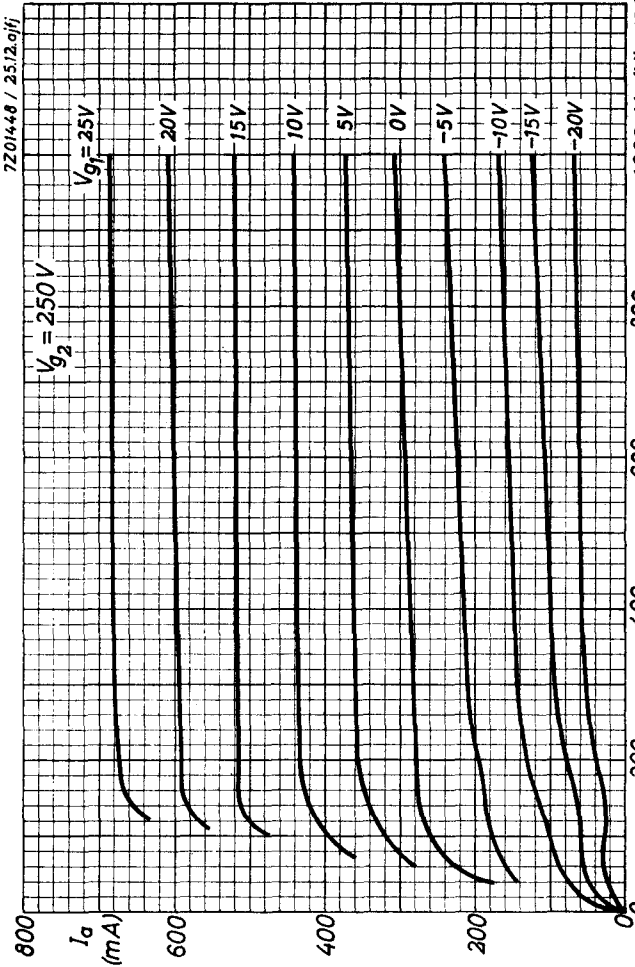
[1]) Each section

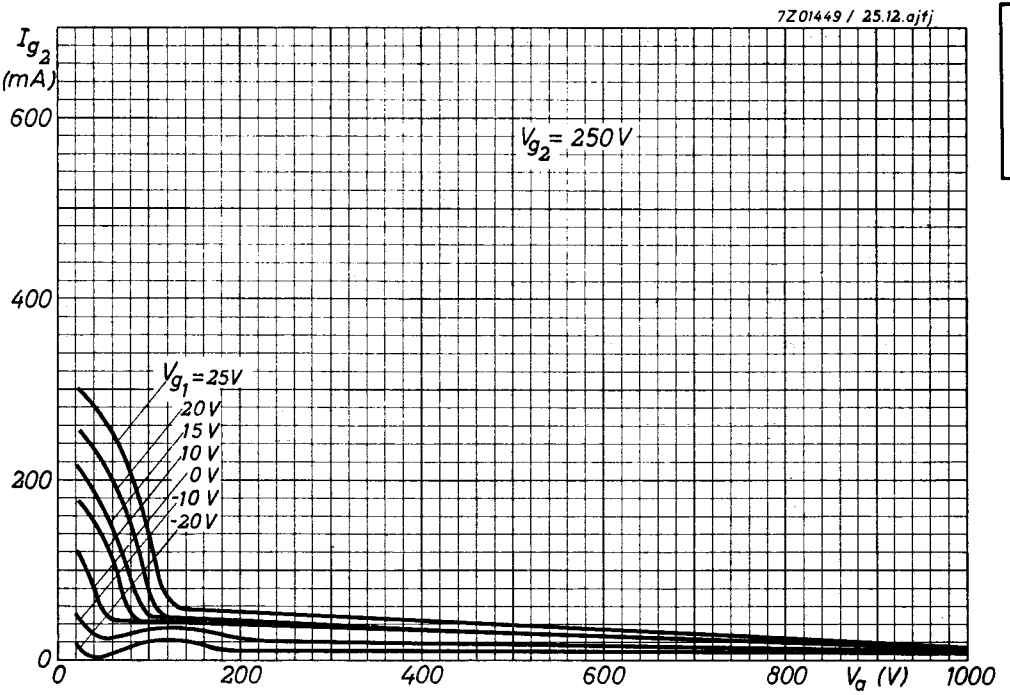
H.F. class C anode and screen grid modulation, two systems in push-pull

LIMITING VALUES (Absolute limits)			C.C.S.	I.C.A.S.	
Frequency	f		up to 175	175	Mc/s
Anode voltage	V_a	= max.	800	800	V
Anode current	I_a	= max.	2x90	2x100	mA
Anode dissipation	W_a	= max.	2x21	2x23.5	W
Anode input power	W_{ia}	= max.	140	160	W
Grids No.2 voltage	$V_{g_2,g_2'}$	= max.	250	250	V
Grids No.2 dissipation	$W_{g_2,g_2'}$	= max.	5.0	5.5	W
Negative grid No.1 voltage	$-V_{g_1}$	= max.	175	175	V
Grid No.1 current	I_{g_1}	= max.	2x5	2x5	mA
Grid No.1 circuit resistance	R_{g_1}	= max.	50	50	kΩ[1]
Heater to cathode voltage	V_{kf}	= max.	100	100	V

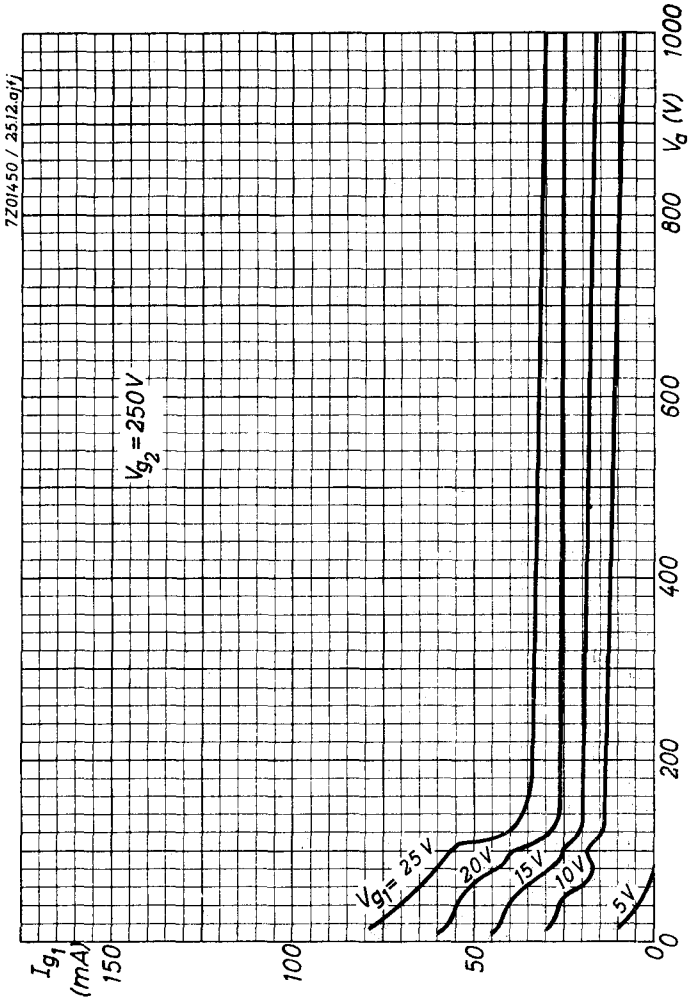
OPERATING CONDITIONS			C.C.S.	I.C.A.S.	
Frequency	f	=	175	175	Mc/s
Anode voltage	V_a	=	750	800	V
Grids No.2 voltage	$V_{g_2,g_2'}$	=	250	225	V
Grid No.1 voltage	V_{g_1}	=	-66	-75	V
Common grids No.1 resistor	$R_{g_1,g_1'}$	=	15	15	kΩ
Anode current	I_a	=	2x90	2x100	mA
Grids No.2 current	$I_{g_2,g_2'}$	=	10.2	8.8	mA
Grids No.1 current	$I_{g_1,g_1'}$	=	4.4	5.0	mA
Anode input power	W_{ia}	=	135	160	W
Anode dissipation	W_a	=	2x19	2x21	W
Grids No.2 dissipation	$W_{g_2,g_2'}$	=	2.6	2.0	W
Driver output power	W_{dr}	=	3.4	3.0	W
Output power	W_o	=	97	122	W
Efficiency	η	=	72	74	%
Useful power in the load	W_ℓ	=	85	107	W
Modulation depth	m	=	100	100	%
Peak grids No.2 modulation voltage	$V_{g_2,g_2'p}$	=	90	80	V
Modulation power	W_{mod}	=	68	80	W

[1]) Each section


7Z01448 / 25.12.61fj
V_{g_2} = 250 V
V_{g_1} = 25V
20V
15V
10V
5V
0V
-5V
-10V
-15V
-20V
I_a (mA)
800
600
400
200
0
0
200
400
600
800
1000 V_a (V) 1200


7Z01449 / 25.12.ajtj
I_{g_2} (mA)
600
400
200
0
V_{g_2} = 250 V
V_{g_1} = 25 V
20 V
15 V
10 V
0 V
-10 V
-20 V
0
200
400
600
800
V_a (V)
1000

B

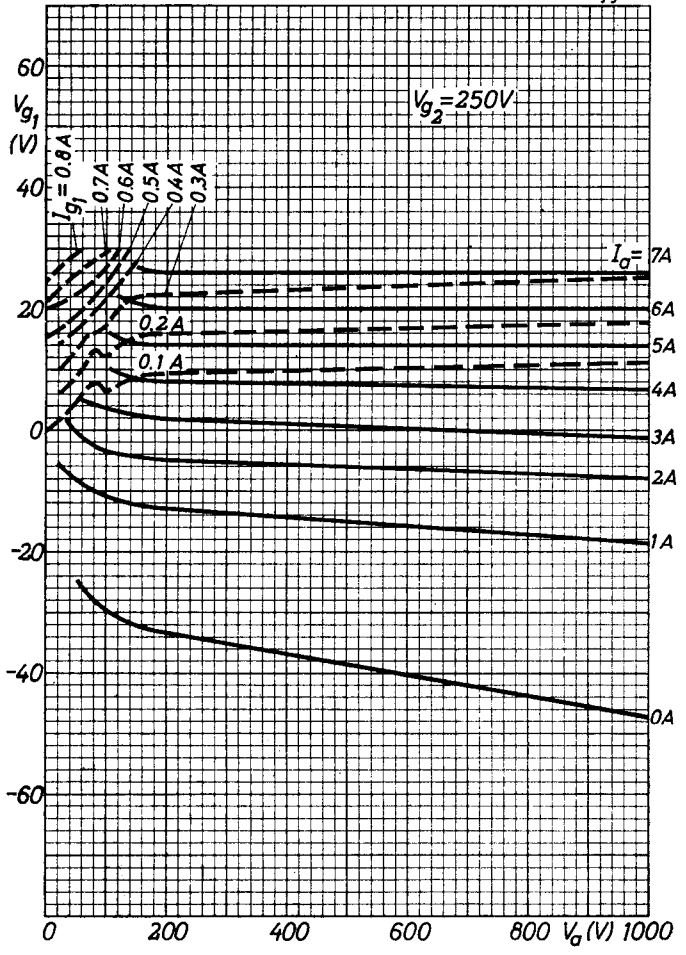

7Z01450 / 2512.a/tj
$V_{g_2} = 250V$
$V_{g_1} = 25V$
20V
15V
10V
5V
I_{g_1} (mA)
150
100
50
0
0
200
400
600
800
1000
V_g (V)

12.12.1962

C

YL1060 **PHILIPS**

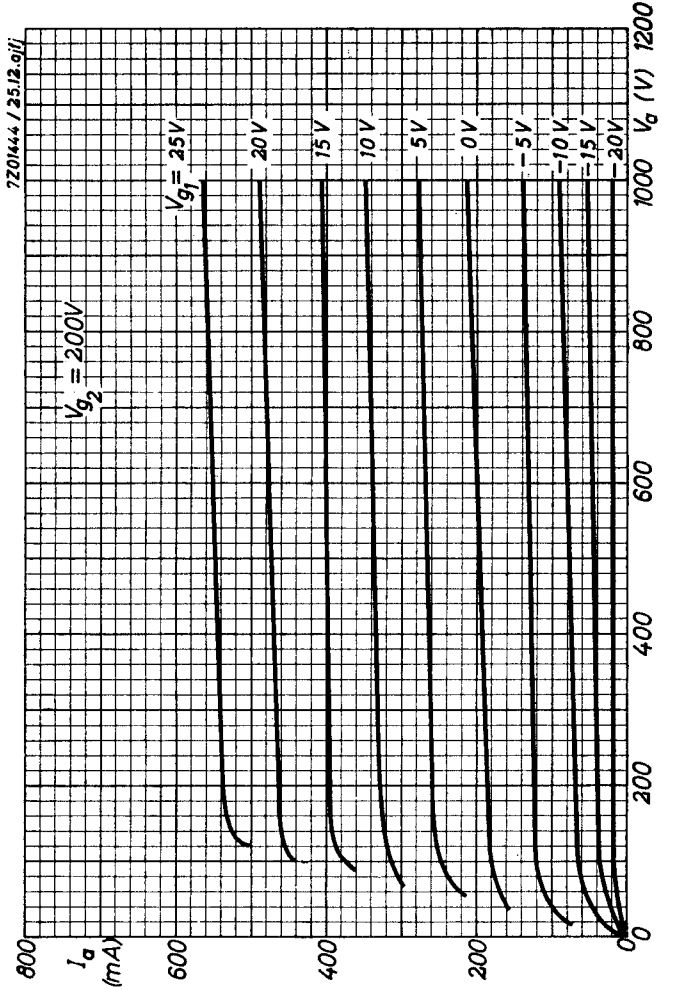
7Z01451 / 25.12.ajtj



D

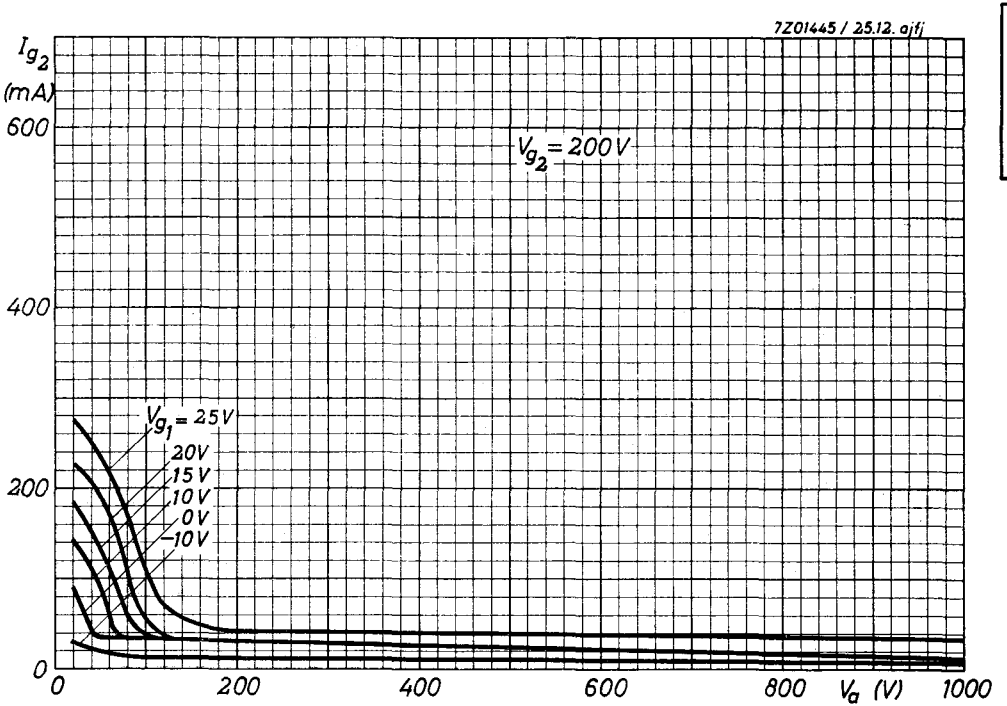
PHILIPS

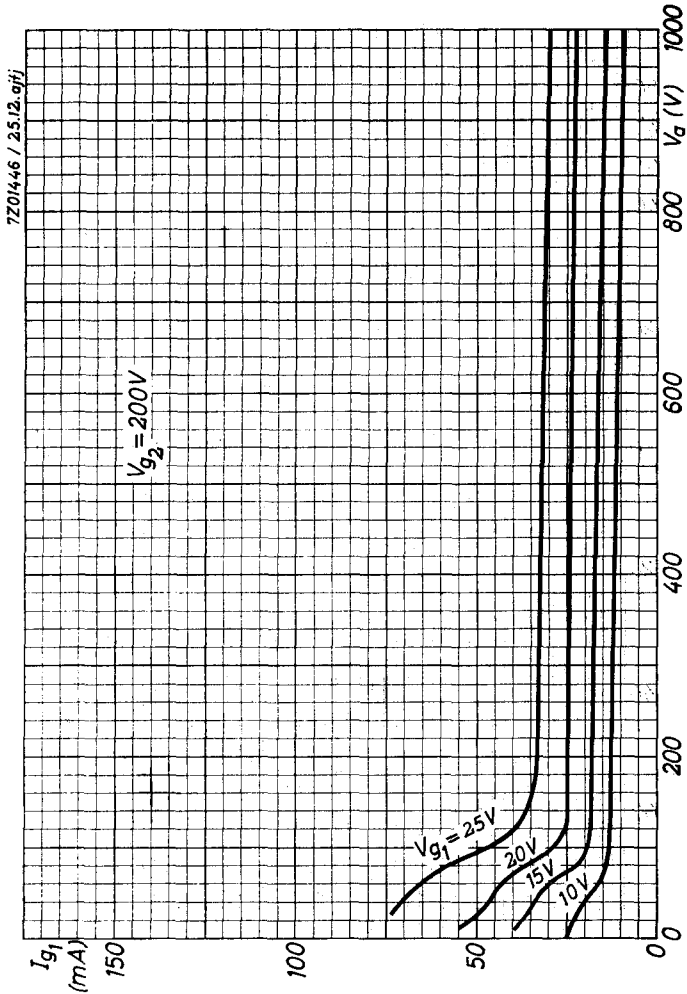
YL1060



12.12.1962

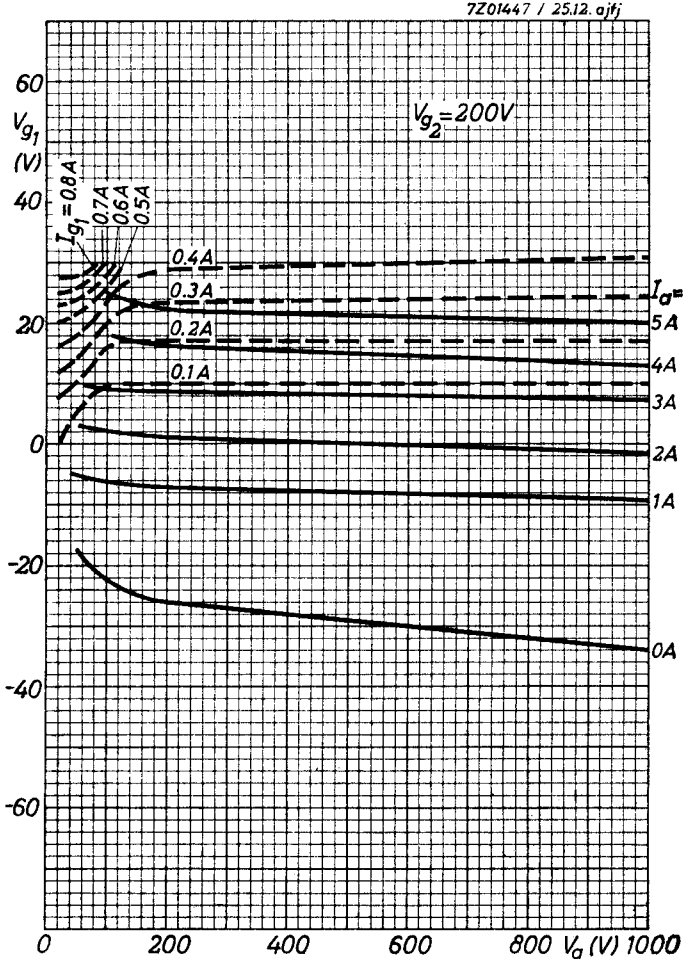
E


7Z01445 / 25.12. ajfj
I_{g_2}
(mA)
600
400
200
0
V_{g_2} = 200 V
V_{g_1} = 25 V
20 V
15 V
10 V
0 V
−10 V
0
200
400
600
800
V_a (V)
1000


7Z01446 / 25.12.gif
V_{g_2} = 200V
V_{g_1} = 25V
20V
15V
10V
I_{g_1} (mA)
150
100
50
0
0
200
400
600
800
1000
V_a (V)

YL1060 **PHILIPS**

7Z01447 / 25.12. ajfj



H

PHILIPS

Electronic Tube

HANDBOOK

YL1060

page	sheet	date
1	1	1962.12.12
2	2	1962.12.12
3	3	1962.12.12
4	4	1962.12.12
5	5	1962.12.12
6	A	1962.12.12
7	B	1962.12.12
8	C	1962.12.12
9	D	1962.12.12
10	E	1962.12.12
11	F	1962.12.12
12	G	1962.12.12
13	H	1962.12.12
14	FP	1999.12.24

DOUBLE TETRODES

Double tetrodes for use as linear single side band amplifier.

The YL1071 is electrically identical to the YL1070 except for the heater, and has been designed to fit into heatsink cooling equipment.

QUICK REFERENCE DATA				
	AB1 linear S.S.B. amplifier, sections in parallel			
Freq. (Mc/s)	C.C.S.		I.C.A.S.	
	V_a (V)	W_{OPEP} (W)	V_a (V)	W_{OPEP} (W)
7	1000	141	1000	158

HEATING:

Indirect by A.C. or D.C.; parallel supply; oxide coated cathode

		Pins	5-(1+7)	1-7	
YL1070:	Heater voltage	V_f =	6.3	12.6	V
	Heater current	I_f =	1.8	0.9	A
YL1071:	Heater voltage	V_f =	13.25	26.5	V
	Heater current	I_f =	0.866	0.433	A

CAPACITANCES (each section)

Anode to all other elements except grid No.1	C_a	=	3.15	pF
Grid No.1 to all other elements except anode	C_{g_1}	=	10.6	pF
Anode to grid No.1	C_{ag_1}	<	0.09	pF

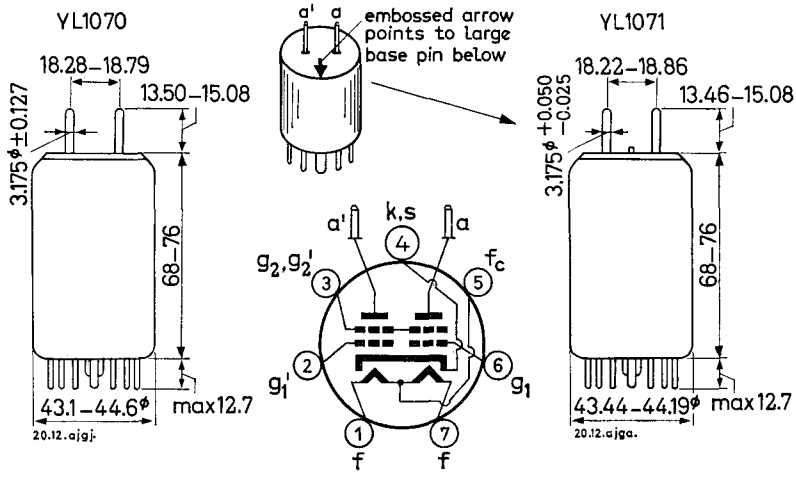
7Z2 2883

TYPICAL CHARACTERISTICS (each section)

Anode voltage	V_a	=	600	V
Grid No.2 voltage	V_{g_2}	=	250	V
Anode current	I_a	=	40	mA
Amplification factor of grid No.2 with respect to grid No.1	$\mu_{g_2g_1}$	=	7	

MECHANICAL DATA

Dimensions in mm



Base:	Septar	
Accessories:	Anode connector clip	40681
	Socket	40202
Mounting position:	Vertical with base up or down Horizontal with anode pins in a horizontal plane	
Net weight:	70 g	

COOLING: Radiation and convection

When the tube is used at maximum permissible values it may be necessary to direct an air flow of approx. 0.6 m^3/min to the bulb and to the anode seals. The YL1071 has a calibrated bulb held to close tolerances. This permits an accurate fit into heatsink cooling equipment. 7Z2 2884

TEMPERATURE LIMITS (Absolute limits)

Temperature of bulb and all seals max. 250 °C

R.F. CLASS C TELEGRAPHY AND F.M. TELEPHONY

LIMITING VALUES (Absolute limits) (each section)

Frequency	f		up to 60	up to 175	Mc/s
Anode voltage	V_a	=	max. 850	max. 750	V
Anode input power	W_{ia}	=	max. 90	max. 75	V
Anode dissipation	W_a	=	max. 30	max. 30	W
Anode current	I_a	=	max. 110	max. 110	mA
Grid No.2 voltage	V_{g_2}	=	max. 300	max. 300	V
Grid No.2 dissipation	W_{g_2}	=	max. 7	max. 7	W
Negative grid No.1 voltage	$-V_{g_1}$	=	max. 175	max. 175	V
Grid No.1 current	I_{g_1}	=	max. 5	max. 5	mA
Cathode to heater voltage	V_{kf}	=	max. 100	max. 100	V

R. F. CLASS AB1 LINEAR S. S. B. AMPLIFIER suppressed carrier

LIMITING VALUES (Absolute limits) (each section)

Frequency	f		up to 60		Mc/s
			C.C.S.	I.C.A.S.	
Anode voltage	V_a	=	max. 1000	max. 1000	V
Anode input power	W_{ia}	=	max. 100	max. 110	W
Anode dissipation	W_a	=	max. 30	max. 34	W
Anode current	I_a	=	max. 110	max. 110	mA
Grid No.2 voltage	V_{g_2}	=	max. 360	max. 360	V
Grid No.2 dissipation	W_{g_2}	=	max. 3.5	max. 4	W
Negative grid No.1 voltage	$-V_{g_1}$	=	max. 175	max. 175	V
Grid No.1 current	I_{g_1}	=	max. 5	max. 5	mA
Cathode to heater voltage	V_{kf}	=	max. 100	max. 100	V

7Z2 2885

OPERATING CONDITIONS (two sections in parallel)

Table A			C.C.S.			
Frequency	f	=		7		Mc/s
Anode voltage	V_a	=		1000		V
Grid No.2 voltage	V_{g_2}	=		250		V
Grid No.1 voltage	V_{g_1}	=		-34		V [1]
Load resistance	$R_{a\sim}$	=		3100		Ω
			zero signal	single tone	two tone	
Peak grid No.1 driving voltage	$V_{g_{1\sim p}}$	=	0	34	34	V
Anode current	$I_{a+a'}$	=	50	195	131	mA
Grid No.2 current	$I_{g_2+g_2'}$	=	1.2	26	11.5	mA
Grid No.1 current	$I_{g_1+g_1'}$	=	0	0.01	0.01	mA
Anode input power	$W_{ia+a'}$	=	50	195	131	W
Anode dissipation	$W_{a+a'}$	=	50	54	61	W
Output power	W_o	=	–	141	141 [2]	W
Intermodulation distortion						
of the third order	d_{i_3}	=	–	–	< -30	dB [3]
of the fifth order	d_{i_5}	=	–	–	< -45	dB [3]

[1]) Adjust to obtain the stated zero signal anode current.

[2]) Peak envelope power value.

[3]) Distortion level, referred to the amplitude of either of the tones, at full drive; also highest distortion encountered at any driving level up to full drive.

7Z2 2886

OPERATING CONDITIONS (two sections in parallel) (continued)

Table B

Frequency	f	=		7		Mc/s
Anode voltage	V_a	=		800		V
Grid No.2 voltage	V_{g_2}	=		250		V
Grid No.1 voltage	V_{g_1}	=		−34		V [1]
Load resistance	R_a	=		2300		Ω
			zero signal	single tone	two tone	
Peak grid No.1 driving voltage	$V_{g_{1\sim p}}$	=	0	34	34	V
Anode current	$I_{a+a'}$	=	50	197	130	mA
Grid No.2 current	$I_{g_2+g_2'}$	=	1.2	26	12.5	mA
Grid No.1 current	$I_{g_1+g_1'}$	=	0	0.01	0	mA
Anode input power	$W_{ia+a'}$	=	40	158	104	W
Anode dissipation	$W_{a+a'}$	=	40	46	43	W
Output power	W_o	=	–	112	112 [2]	W
Intermodulation distortion						
of the third order	d_{i_3}	=	–	–	< −30	dB [3]
of the fifth order	d_{i_5}	=	–	–	< −45	dB [3]

[1]) Adjust to obtain the stated zero signal anode current.

[2]) Peak envelope power value

[3]) Distortion level, referred to the amplitude of either of the tones, at full drive; also highest distortion encountered at any driving level up to full drive.

7Z2 2887

OPERATING CONDITIONS (two sections in parallel) (continued)

Table C			C.C.S.			
Frequency	f	=		7		Mc/s
Anode voltage	V_a	=		600		V
Grid No.2 voltage	V_{g_2}	=		250		V
Grid No.1 voltage	V_{g_1}	=		−32.5		V [1]
Load resistance	R_a	=		1410		Ω
			zero signal	single tone	two tone	
Peak grid No.1 driving voltage	$V_{g_{1\sim p}}$	=	0	32.5	32.5	V
Anode current	$I_{a+a'}$	=	60	212	144	mA
Grid No.2 current	$I_{g_2+g_2'}$	=	1.9	25	13.5	mA
Grid No.1 current	$I_{g_1+g_1'}$	=	0	0.01	0	mA
Anode input power	$W_{ia+a'}$	=	36	127	86	W
Anode dissipation	$W_{a+a'}$	=	36	88	48	W
Output power	W_o	=	–	76	76 [2]	W
Intermodulation distortion						
of the third order	d_{i_3}	=	–	–	< −30	dB [3]
of the fifth order	d_{i_5}	=	–	–	< −45	dB [3]

[1]) Adjust to obtain the stated zero signal anode current.

[2]) Peak envelope power value.

[3]) Distortion level, referred to the amplitude of either of the tones, at full drive; also highest distortion encountered at any driving level up to full drive.

7Z2 2888

OPERATING CONDITIONS (two sections in parallel) (continued)

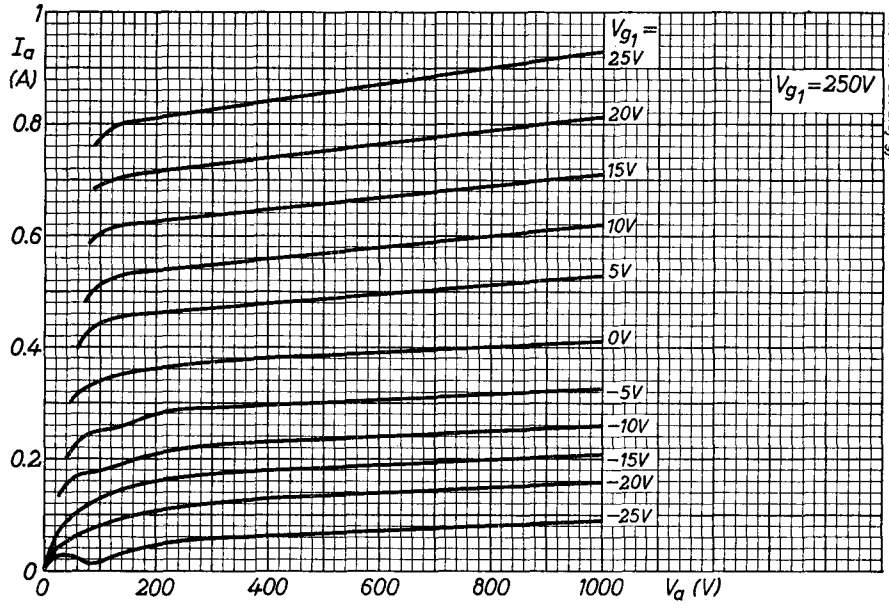
Table D			I.C.A.S.			
Frequency	f	=	7			Mc/s
Anode voltage	V_a	=	1000			V
Grid No.2 voltage	V_{g_2}	=	250			V
Grid No.1 voltage	V_{g_1}	=	−36			V [1]
Load resistance	R_a	=	3000			Ω
			zero signal	single tone	two tone	
Peak grid No.1 driving voltage	$V_{g_{1\sim p}}$	=	0	36	36	V
Anode current	$I_{a+a'}$	=	55	216	144	mA
Grid No.2 current	$I_{g_2+g_2'}$	=	1	25	13	mA
Grid No.1 current	$I_{g_1+g_1'}$	=	0	0.05	0.02	mA
Anode input power	$W_{ia+a'}$	=	55	216	144	W
Anode dissipation	$W_{a+a'}$	=	55	58	65	W
Output power	W_o	=	–	158	158 [2]	W
Intermodulation distortion						
of the third order	d_{i_3}	=	–	–	< −30	dB [3]
of the fifth order	d_{i_5}	=	–	–	< −45	dB [3]

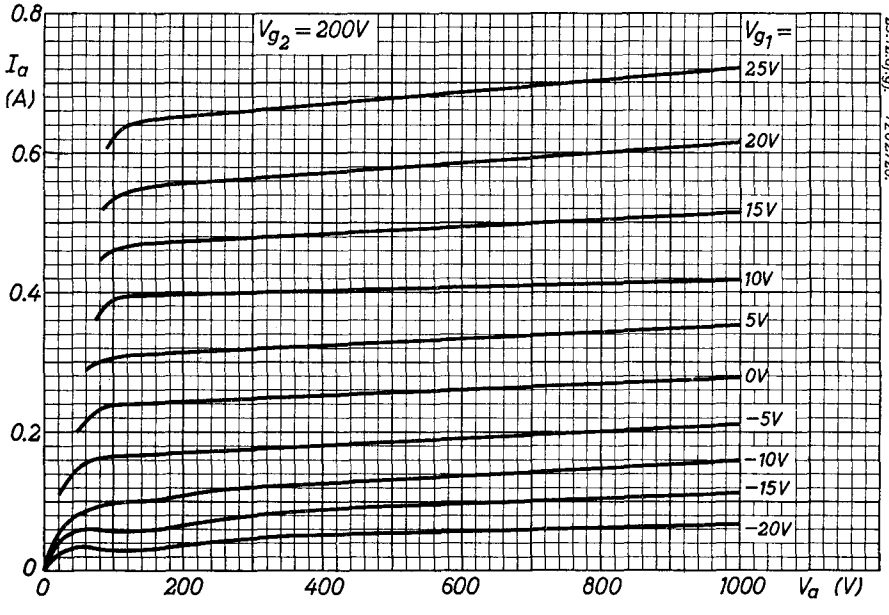
[1]) Adjust to obtain the stated zero signal anode current.

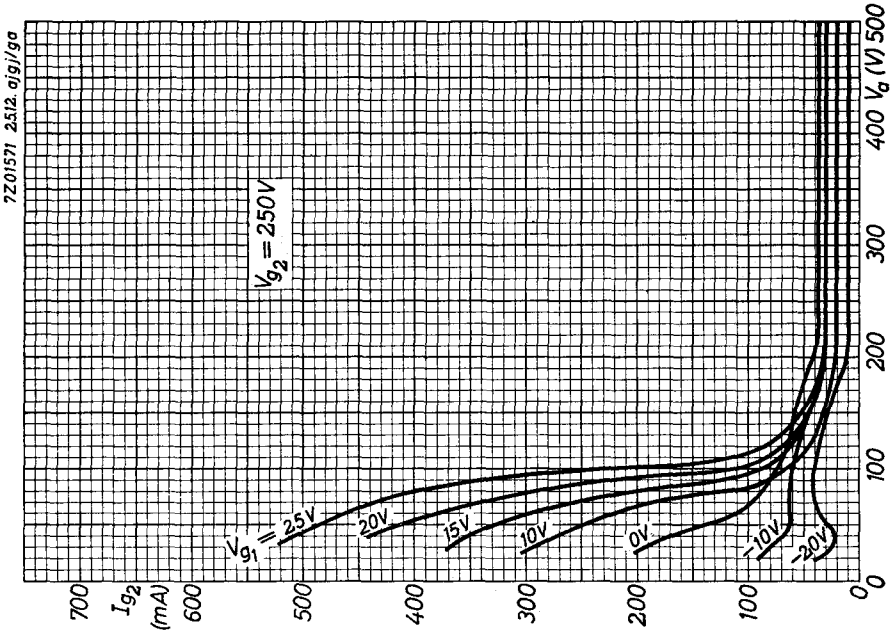
[2]) Peak envelope power value.

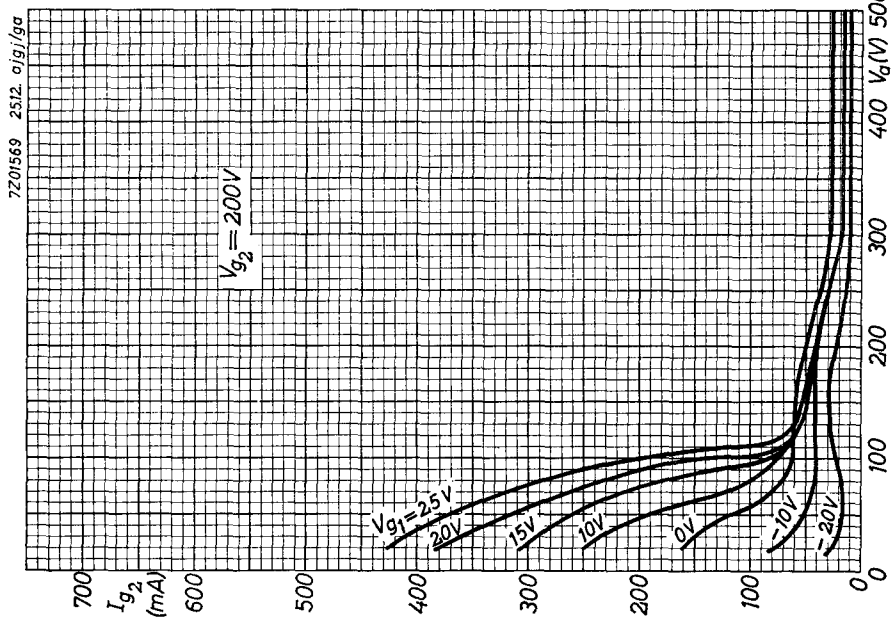
[3]) Distortion level, referred to the amplitude of either of the tones, at full drive; also highest distortion encountered at any driving level up to full drive.

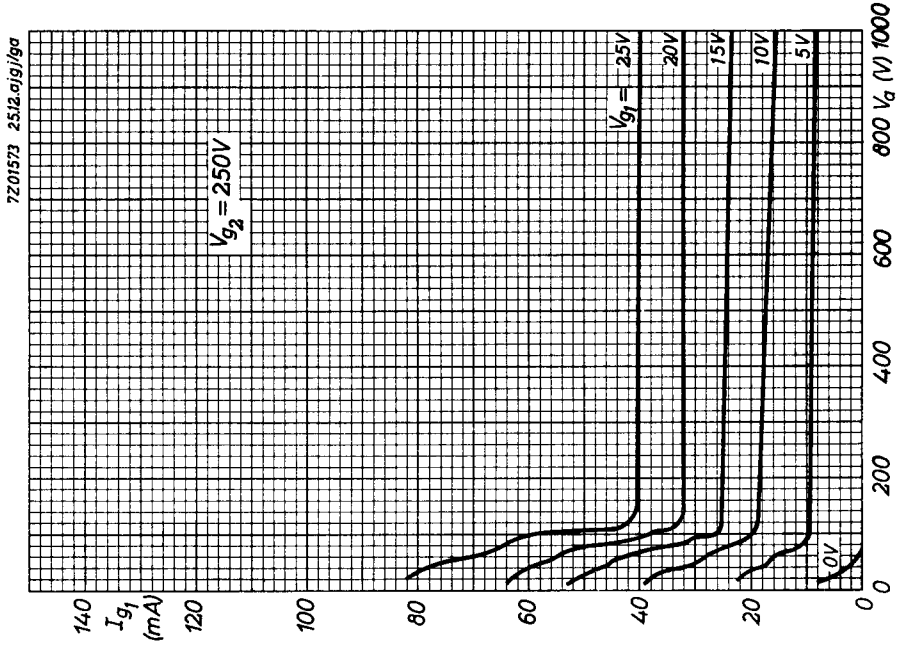
7Z2 2889

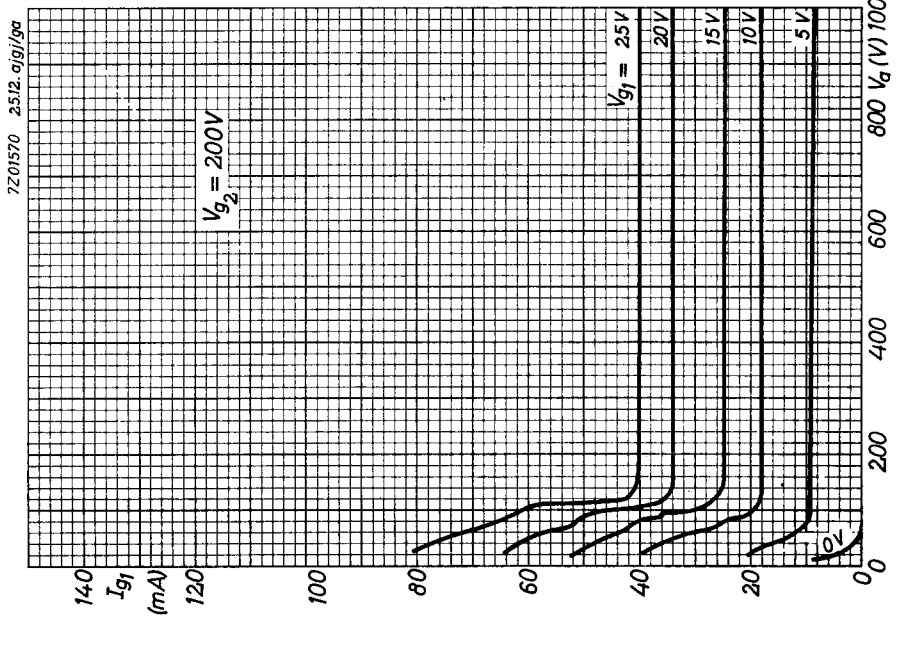

I_a (A)
1
0.8
0.6
0.4
0.2
0
0
200
400
600
800
1000
V_a (V)
V_{g_1} =
25V
20V
15V
10V
5V
0V
−5V
−10V
−15V
−20V
−25V
V_{g_1} = 250V
7202719-25.12.oj.gj.

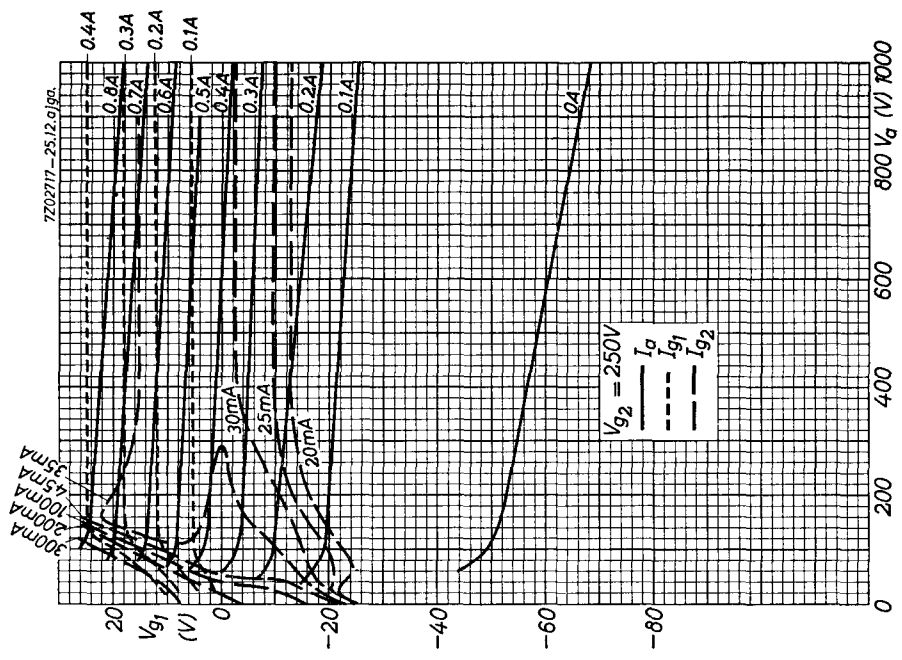

I_a (A)
0.8
0.6
0.4
0.2
0
0
200
400
600
800
1000
V_a (V)
V_{g_2} = 200V
V_{g_1} =
25V
20V
15V
10V
5V
0V
−5V
−10V
−15V
−20V
25.12.oj.gj. — 7202720.

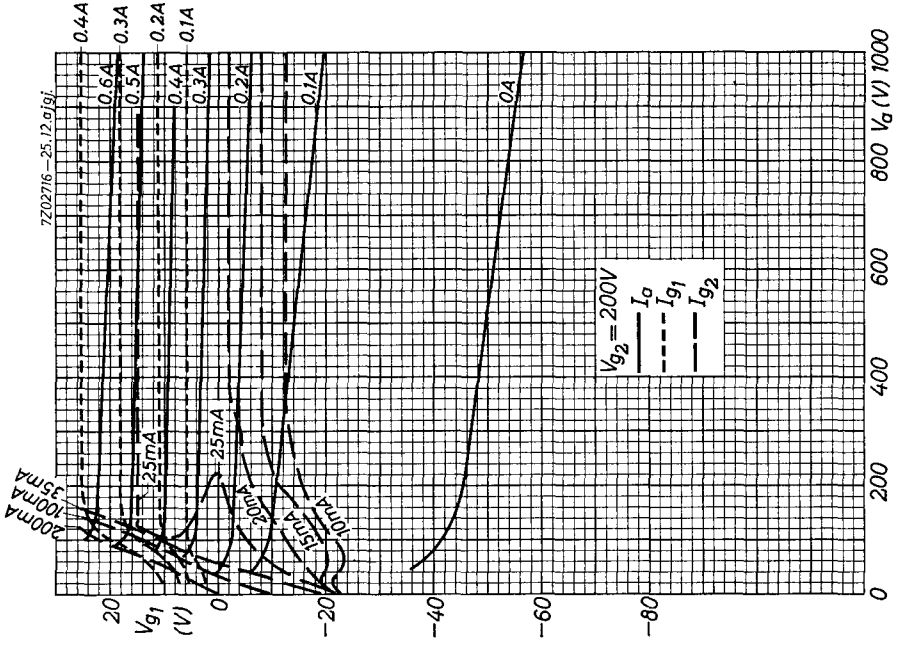

7Z01571 2512. ojgj/ga
V_{g_2} = 250V
V_{g_1} = 2.5V
20V
15V
10V
0V
-10V
-20V
I_{g_2} (mA)
700
600
500
400
300
200
100
0
0
100
200
300
400 V_a (V) 500

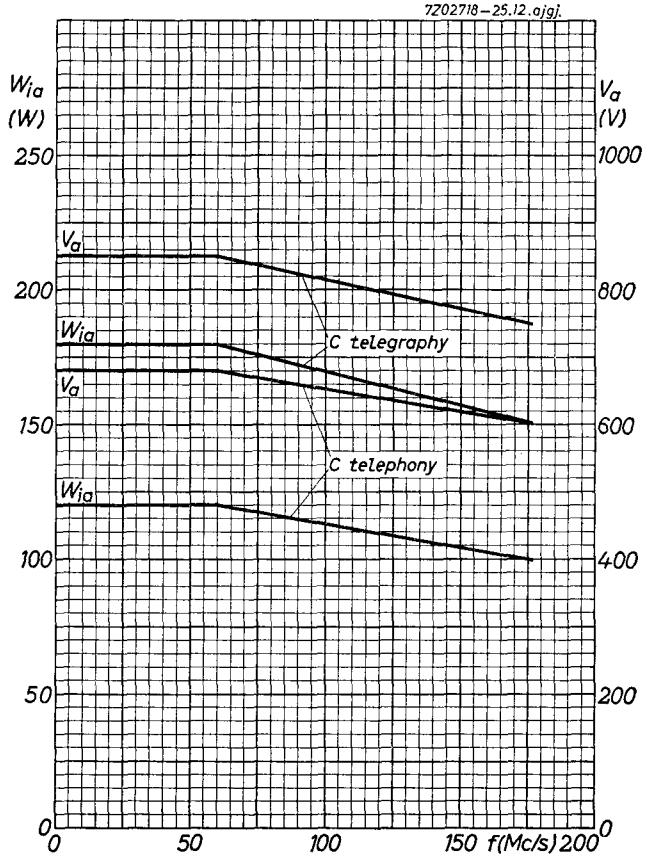

7Z01569 2512. ojgj/ga
V_{g_2} = 200V
V_{g_1} = 2.5V
20V
15V
10V
0V
-10V
-20V
I_{g_2} (mA)
700
600
500
400
300
200
100
0
0
100
200
300
400 V_a (V) 500


7Z01573 25.12.ojgi/ga
V_{g_2} = 250V
V_{g_1} = 25V
20V
15V
10V
5V
0V
I_{g_1} (mA)
140
120
100
80
60
40
20
0
0
200
400
600
800 V_a (V) 1000


7Z01570 25.12. ojgi/ga
V_{g_2} = 200V
V_{g_1} = 25V
20V
15V
10V
5V
0V
I_{g_1} (mA)
140
120
100
80
60
40
20
0
0
200
400
600
800 V_a (V) 1000


7Z02717 – 25.12.ojgo
0.4A
0.3A
0.2A
0.1A
0.6A
0.5A
0.4A
0.3A
0.2A
0.1A
0A
300mA
200mA
100mA
45mA
35mA
30mA
25mA
20mA
V_{g_2} = 250V
I_a
I_{g_1}
I_{g_2}
20
0
−20
−40
−60
−80
V_{g_1} (V)
0
200
400
600
800
1000
V_a (V)


7Z02716 – 25.12.ojgi
0.4A
0.3A
0.2A
0.1A
0.6A
0.5A
0.4A
0.3A
0.2A
0.1A
0A
200mA
100mA
35mA
25mA
20mA
15mA
10mA
V_{g_2} = 200V
I_a
I_{g_1}
I_{g_2}
20
0
−20
−40
−60
−80
V_{g_1} (V)
0
200
400
600
800
1000
V_a (V)


7Z02718–25.12.ajgj.
W_{ia} (W)
V_a (V)
250
200
150
100
50
0
1000
800
600
400
200
0
V_a
W_{ia}
V_a
W_{ia}
C telegraphy
C telephony
0
50
100
150 f(Mc/s) 200

PHILIPS

Data handbook

Electronic components and materials

YL1070 YL1071

page	sheet	date
1	1	1965.01.01
2	2	1965.01.01
3	3	1965.01.01
4	4	1965.01.01
5	5	1965.01.01
6	6	1965.01.01
7	7	1965.01.01
8	A	1965.01.01
9	B	1965.01.01
10	C	1965.01.01
11	D	1965.01.01
12	E	1965.01.01
13	FP	2001.04.21

AIR COOLED V.H.F. POWER TETRODE

Forced air cooled coaxial power tetrode in metal-ceramic construction primarily intended for use as a linear broad-band amplifier in T V transmitters in the bands I and III. This type is also very suitable for A.M. and F.M. broadcast, A.F. modulator applications and in T V transposer service.

QUICK REFERENCE DATA			
Class AB linear amplifier (vision)			
Frequency	f	175, 25	MHz
Anode voltage	V_a	5	kV
Output power in load	W_ℓ	8, 6	kW
Power gain	G	24	
Class B amplifier			
Frequency	f	260	MHz
Anode voltage	V_a	7	kV
Output power in load	W_ℓ	10, 5	kW
Power gain	G	32	
R.F. Class C telegraphy or F.M. telephony			
Frequency	f	260	MHz
Anode voltage	V_a	7	kV
Output power in load	W_ℓ	11	kW
Power gain	G	32	
TV transposer service			
Frequency	f	175 to 225	MHz
Anode voltage	V_a	4	kV
Output power in load	W	2, 5	kW
Power gain	G	30	

HEATING: direct; filament thoriated tungsten, mesh type

Filament voltage	V_f	6, 3	V ± 5%
Filament current	I_f	120	A
Filament peak starting current	I_{fp}	max. 750	A
Cold filament resistance	R_{fo}	6	mΩ
Waiting time	T_w	min. 1	s

TYPICAL CHARACTERISTICS

Anode voltage	V_a	5	kV
Grid No. 2 voltage	V_{g2}	600	V
Anode current	I_a	1, 45	A
Transconductance	S	30	mA/V
Amplification factor	μ_{g2g1}	7, 5	

CAPACITANCES

	(grounded cathode)		(grounded grid)		
Input	$C_{g1(a)}$	90	$C_{f(a)}$	48	pF
Output	$C_{a(g1)}$	16	$C_{a(f)}$	16, 4	pF
Anode to grid No. 1	C_{ag1}	0, 55			pF
Anode to filament			C_{af}	0, 15	pF

TEMPERATURE LIMITS

Absolute max. envelope temperature	t_{env}	max.	240	°C
Recommended max. seal temperature	t	max.	200	°C

COOLING

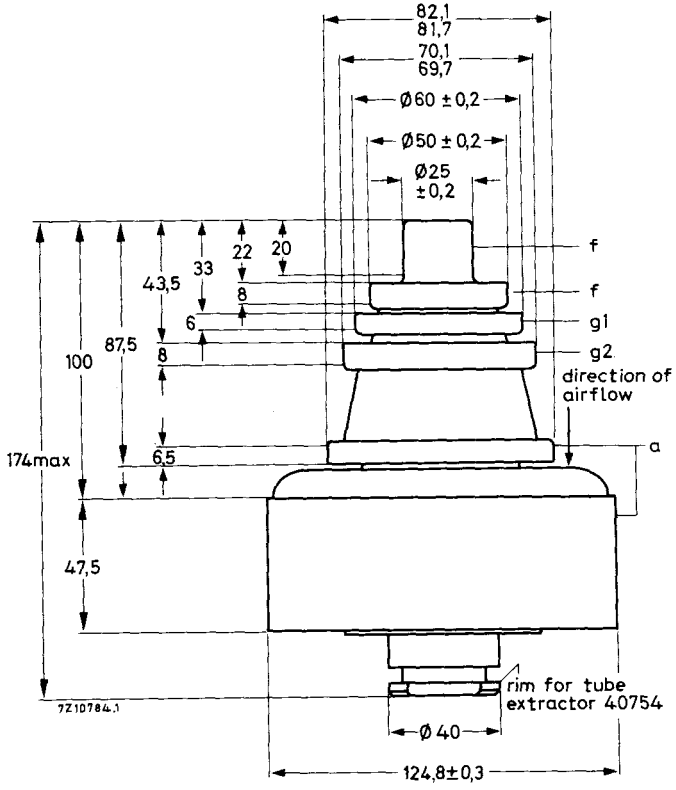
See curves
Direction of air flow: see drawing.

ACCESSORIES

Band I amplifier circuit assembly (vision)	type 40757
Band I amplifier circuit assembly (sound)	type 40758
Band III amplifier circuit assembly (vision)	type 40745
Band III amplifier circuit assembly (sound)	type 40746

MECHANICAL DATA Dimensions in mm

Net weight: approx. 3, 1 kg
Mounting position: Vertical with anode up or down.



R.F. CLASS B SERVICE

Unless otherwise stated the voltages are specified with respect to cathode

LIMITING VALUES (Absolute max. rating system)

Frequency	f	up to	260	MHz
Anode voltage	V_a	max.	8,5	kV
Grid no. 2 voltage	V_{g2}	max.	1	kV
Grid no. 1 voltage	$-V_{g1}$	max.	500	V
Anode current	I_a	max.	4	A
Anode input power	W_{ia}	max.	18,5	kW
Anode dissipation	W_a	max.	6	kW
Grid no. 2 dissipation	W_{g2}	max.	80	W
Grid no. 1 dissipation	W_{g1}	max.	40	W
Cathode current	I_k	max.	4,5	A

OPERATING CONDITIONS : grounded grid

Frequency	f	up to	260	MHz
Anode voltage	V_a		7	kV
Grid no. 2 voltage	V_{g2}		600	V
Grid no. 1 voltage	V_{g1}		-120	V [1]
Anode current, no signal condition	I_a		0,2	A
Anode current	I_a		2,2	A
Grid no.2 current	I_{g2}		80	mA
Grid no. 1 current	I_{g1}		125	mA
Anode input power	W_{ia}		15,4	kW
Anode dissipation	W_a		4,3	kW
Output power in load	W_ℓ		10,5	kW
Efficiency, total	η		68	%
Driving power	W_{dr}		325	W
Power gain	$\frac{W_\ell}{W_{dr}}$		32	

Note see page 8

R.F. CLASS AB AMPLIFIER FOR TELEVISION SERVICE +

Negative modulation, positive synchronization (C.C.I.R. system)
Unless otherwise stated the voltages are specified with respect to the cathode.

LIMITING VALUES (Absolute max. rating system)

Frequency	f	up to	260	MHz
Anode voltage	V_a	max.	6,5	kV
Grid no. 2 voltage	V_{g2}	max.	1	kV
Anode current, black	$I_{a\ black}$	max.	2,25	A
Anode input power, black	$W_{ia\ black}$	max.	12	kW
Anode dissipation	W_a	max.	6	kW
Grid no. 2 dissipation	W_{g2}	max.	80	W
Grid no. 1 dissipation	W_{g1}	max.	40	W
Cathode current	I_k	max.	4,5	A

OPERATING CONDITIONS , grounded grid

Frequency of vision carrier	f	175,25	175,25	MHz	
Bandwidth (−1 dB)	B	7	7	MHz	2)
Anode voltage	V_a	5	4	kV	
Grid no. 2 voltage	V_{g2}	600	600	V	
Grid no. 1 voltage	V_{g1}	−75	−65	V	1)
Anode current, no signal condition	I_a	650	750	mA	
Anode current, black	I_{abl}	2,1	1,9	A	3)
Grid no. 2 current, black	I_{g2bl}	20	30	mA	3)
Grid no. 1 current, black	I_{g1bl}	75	55	mA	3)
Output power in load, sync	$W_{\ell\ sync}$	8,6	6,25	kW	
black	$W_{\ell\ black}$	5,15	3,75	kW	
Driving power, sync	$W_{dr\ sync}$	350	260	W	
black	$W_{dr\ black}$	200	140	W	
Gain, sync	G_{sync}	24	24		2)
black	G_{black}	25,8	26,7		
Sync compression	sync in/out	27/25	29/25		4)
Differential phase		< 3	< 3	o	5)
Differential gain		≥ 85	≥ 85	%	5)
Anode resistance	R_a	1100	900	Ω	2)

Notes see page 8

+ Detailed information on definitions of terms and application suggestions are available on request.

OPERATING CONDITIONS (continued)

Frequency of vision carrier	f	83, 25	55, 25	MHz	
Bandwidth (−1 dB)	B	7	7	MHz	2)
Anode voltage	V_a	4	4	kV	
Grid no. 2 voltage	V_{g2}	600	600	V	
Grid no. 1 voltage	V_{g_1}	−65	−65	V	1)
Anode current, no signal condition	I_a	750	750	mA	
Anode current, black	I_{ab1}	2, 1	2, 3	A	3)
Grid no. 2 current, black	I_{g2b1}	45	45	mA	3)
Grid no. 1 current, black	I_{g1b1}	75	85	mA	3)
Output power in load, sync	W_ℓ sync	6, 25	6, 25	kW	
black	W_ℓ black	3, 75	3, 75	kW	
Driving power, sync	W_{dr} sync	340	385	W	
black	W_{dr} black	180	210	W	
Gain, sync	G sync	18, 5	16		2)
black	G black	21, 5	18		2)
Sync compression	sync in/out	30/25	29/25		4)
Differential phase		< 3	< 3	o	5)
Differential gain		≥ 85	≥ 85	%	5)
Anode resistance	$R_{a\sim}$	810	690	Ω	2)

R.F. CLASS AB AMPLIFIER FOR TELEVISION TRANSPOSER SERVICE, grounded grid

LIMITING VALUES

see page 5

OPERATING CONDITIONS , grounded grid

Negative modulation, positive synchronization, combined sound and vision (CCIR standard G)

Frequency	f	175 to 225	MHz
Bandwidth (−1 dB)	B	8	MHz
Anode voltage	V_a	4	kV
Grid no. 2 voltage	V_{g2}	700	V
Grid no. 1 voltage 1)	V_{g1}	−65	V
Anode current, no signal condition	I_a	1	A
Anode current 6)	I_a	1, 65	A
Grid no. 2 current 6)	I_{g2}	25	mA
Grid no. 1 current 6)	I_{g1}	10	mA
Driving power, sync	W_{dr}	85	W
Output power in load, sync	W_ℓ	2, 5	kW
Power gain	G	30	-
Intermodulation products 7)	d	−52	dB

Notes: see page 8

R.F. CLASS C TELEGRAPHY or F.M. TELEPHONY

LIMITING VALUES (Absolute max. rating system)

Frequency	f	up to	260	MHz
Anode voltage	V_a	max.	8,5	kV
Grid no. 2 voltage	V_{g_2}	max.	1	kV
Grid no. 1 voltage	$-V_{g_1}$	max.	500	V
Anode current	I_a	max.	4	A
Anode input power	W_{ia}	max.	18,5	kW
Anode dissipation	W_a	max.	6	kW
Grid no. 2 dissipation	W_{g_2}	max.	80	W
Grid no. 1 dissipation	W_{g_1}	max.	40	W
Cathode current	I_k	max.	4,5	A

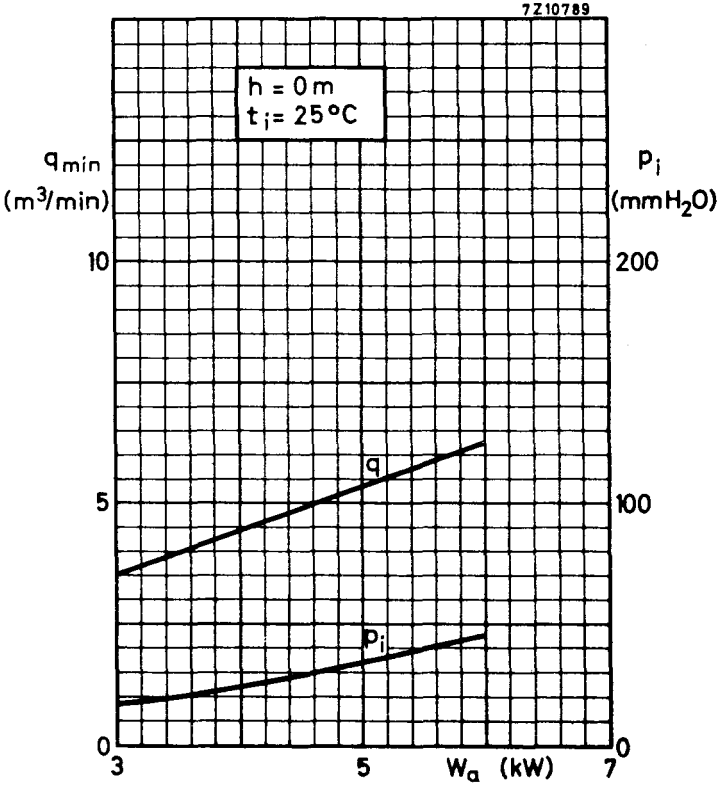
OPERATING CONDITIONS

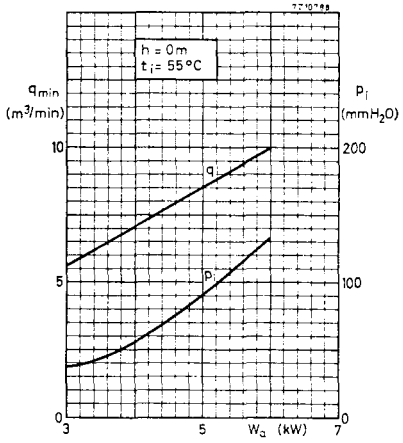
Frequency	f	260	MHz
Anode voltage	V_a	7	kV
Grid no. 2 voltage	V_{g_2}	600	V
Grid no. 1 voltage	V_{g_1}	-120	V [1]
Anode current, no signal condition	I_a	200	mA
Anode current	I_a	2,3	A
Grid no. 2 current	I_{g_2}	80	mA
Grid no. 1 current	I_{g_1}	150	mA
Anode input power	W_{ia}	16,1	kW
Anode dissipation	W_a	5	kW
Output power in load	W_ℓ	11	kW
Efficiency, total	η	68	%
Driving power	W_{dr}	325	W
Power gain	$\frac{W_\ell}{W_{dr}}$	32	

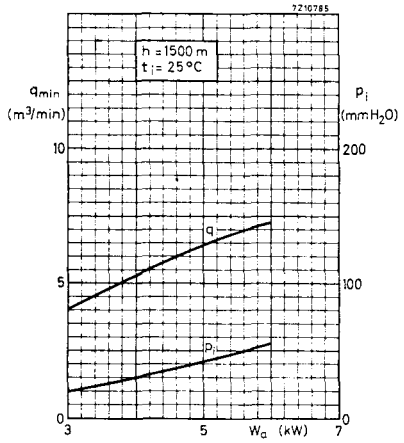
[1]) See page 8

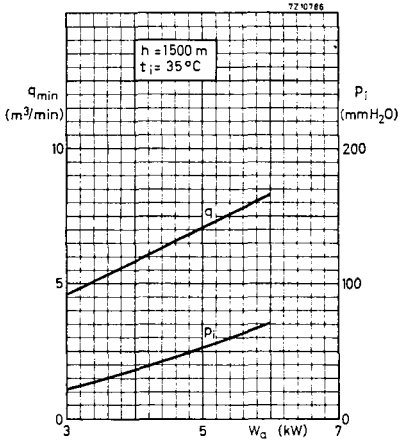
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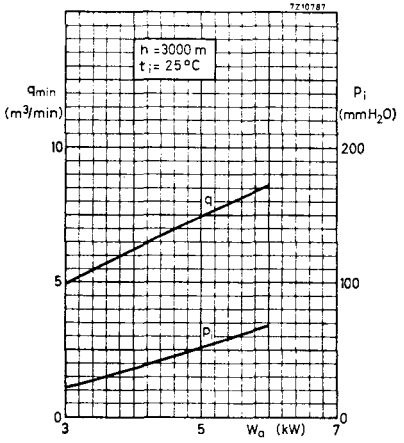
1) To be adjusted for the stated no signal anode current.
2) With double tuned circuit.
3) Black signal including line sync pulses
4) A picture/sync ratio of 75/25 for the outgoing signal requires a ratio of max. 70/30 for the incoming signal in which case the sync compression sync in/out = 30/25.
5) Measured with a saw tooth amplitude, running from 17% to 75% of the peak sync value, with superimposed a 4,43 MHz sine wave with a 10% peak to peak value.
6) At c.w. output power = 2,5 kW
7) Three-tone test method (vision carrier −8 dB, sound carrier −7 dB, sideband signal −17 dB with respect to peak sync = 0 dB).

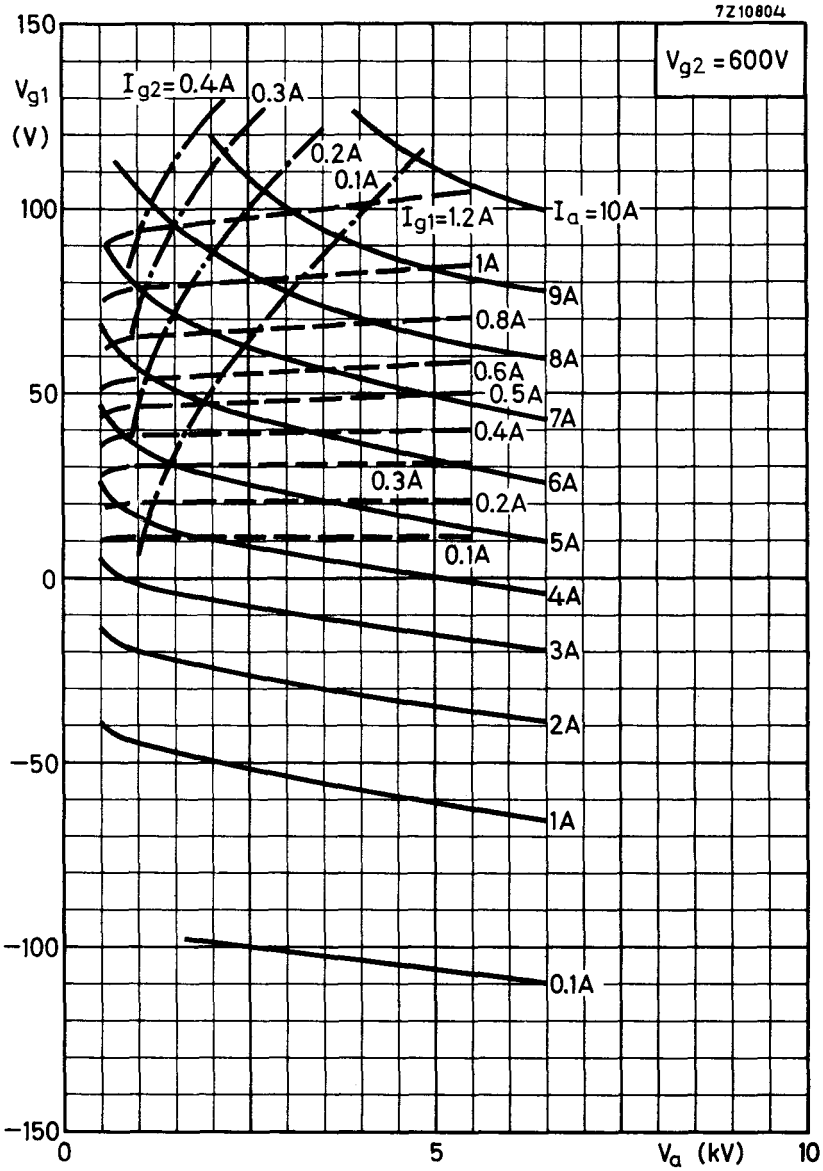


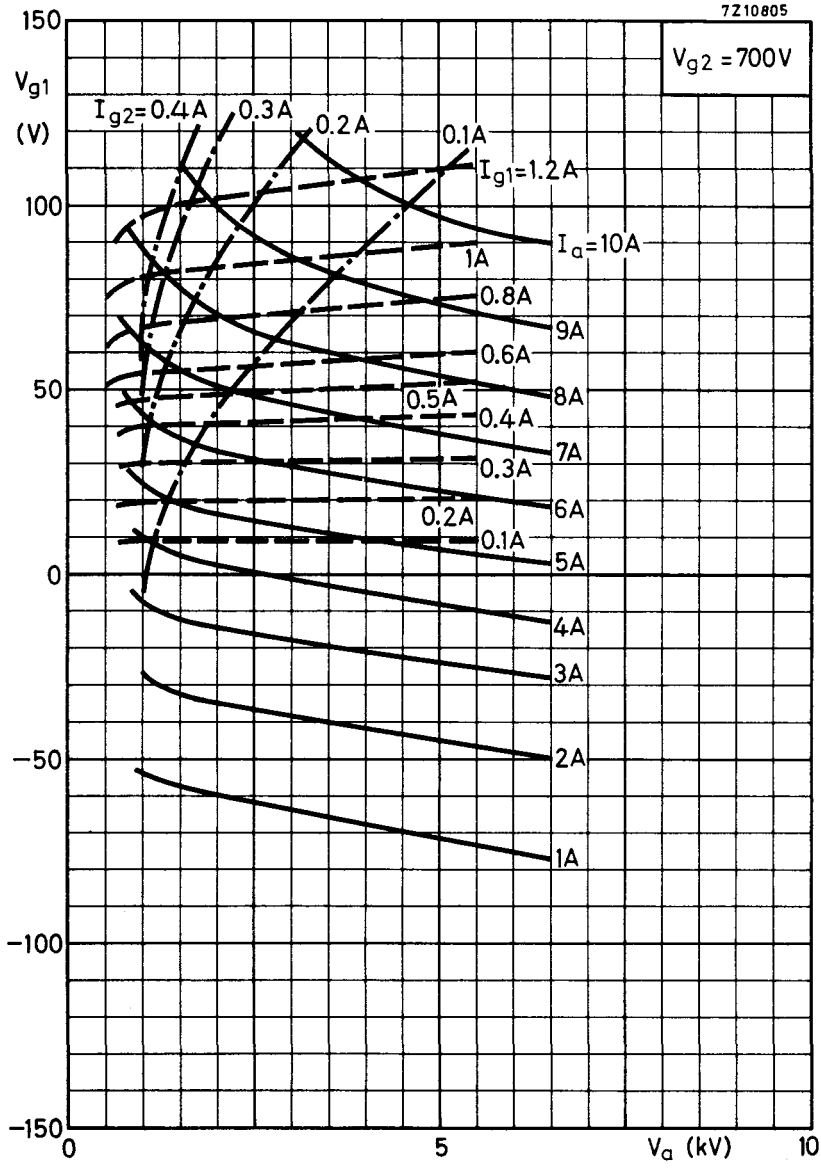

7Z10788
h = 0 m
t_i = 55 °C
q_{min} (m^3/min)
p_i (mmH_2O)
10
5
0
200
100
0
q_i
p_i
3
5
W_a (kW)
7

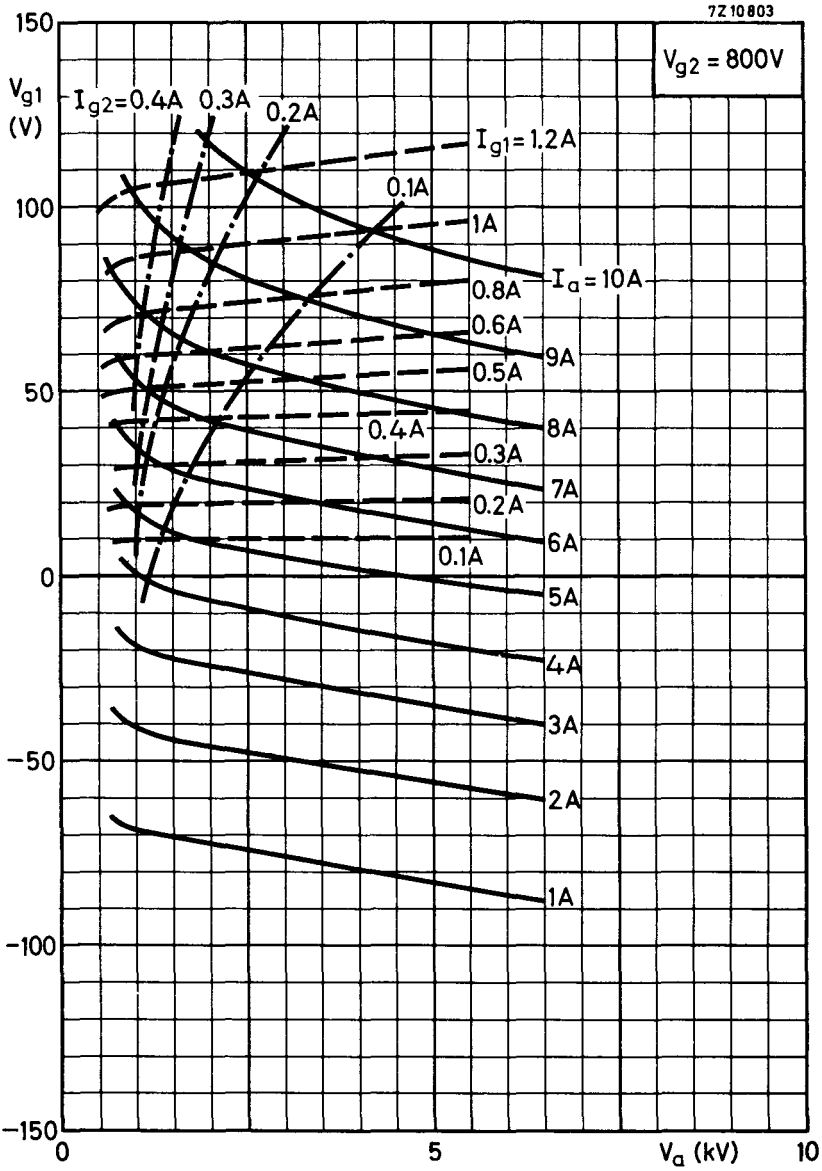

7Z10785
h = 1500 m
t_i = 25 °C
q_{min} (m^3/min)
p_i (mmH_2O)
10
5
0
200
100
0
q
p_i
3
5
W_a (kW)
7


7Z10786
h = 1500 m
t_i = 35 °C
q_{min} (m^3/min)
p_i (mmH_2O)
10
5
0
200
100
0
q
p_i
3
5
W_a (kW)
7


7Z10787
h = 3000 m
t_i = 25 °C
q_{min} (m^3/min)
p_i (mmH_2O)
10
5
0
200
100
0
q
p_i
3
5
W_a (kW)
7


7Z10804
V_{g2} = 600V
V_{g1} (V)
150
100
50
0
−50
−100
−150
0
5
10
V_a (kV)
I_{g2}=0.4A
0.3A
0.2A
0.1A
I_{g1}=1.2A
I_a=10A
1A
9A
0.8A
8A
0.6A
0.5A
7A
0.4A
6A
0.3A
0.2A
5A
0.1A
4A
3A
2A
1A
0.1A


7Z10805
V_{g2} = 700V
V_{g1} (V)
150
100
50
0
−50
−100
−150
0
5
10
V_a (kV)
I_{g2}=0.4A
0.3A
0.2A
0.1A
I_{g1}=1.2A
I_a=10A
1A
0.8A
9A
0.6A
0.5A
8A
0.4A
7A
0.3A
6A
0.2A
0.1A
5A
4A
3A
2A
1A


7Z10803
V_{g2} = 800V
V_{g1} (V)
150
100
50
0
−50
−100
−150
I_{g2}=0.4A
0.3A
0.2A
0.1A
I_{g1}= 1.2A
1A
0.8A
0.6A
0.5A
0.4A
0.3A
0.2A
0.1A
I_a = 10A
9A
8A
7A
6A
5A
4A
3A
2A
1A
0
5
10
V_a (kV)

AIR COOLED V.H.F. POWER TETRODE

Forced air cooled coaxial power tetrode in metal-ceramic construction primarily intended for use as a linear broad-band amplifier in T V transmitters in the bands I and III. This type is also very suitable for A.M. and F.M broadcast, A.F. modulator applications, and in T V transposer service.

QUICK REFERENCE DATA			
Frequency	f	175, 25	MHz
Anode voltage	V_a	7	kV
Output power in load	W_ℓ	18, 4	kW
Power gain	G	25	
Class B amplifier			
Frequency	f	260	MHz
Anode voltage	V_a	7, 5	kV
Output power in load	W_ℓ	13	kW
Power gain	G	32, 5	
R.F. Class C telegraphy or F.M. telephony			
Frequency	f	260	MHz
Anode voltage	V_a	8	kV
Output power in load	W_ℓ	18	kW
Power gain	G	30	
TV transposer service			
Frequency	f	175 to 225	MHz
Anode voltage	V_a	6	kV
Output power in load	W_ℓ	7	kW
Power gain	G	32	

HEATING : direct; filament thoriated tungsten, mesh type.

Filament voltage	V_f		8	V ± 5%
Filament current	I_f		120	A
Filament peak starting current	I_{fp}	max.	750	A
Cold filament starting current	R_{fo}		7, 5	mΩ
Waiting time	T_w	min.	1	s

TYPICAL CHARACTERISTICS

Anode voltage	V_a	6	kV
Grid no. 2 voltage	V_{g2}	650	V
Anode current	I_a	2,4	A
Transconductance	S	45	mA/V
Amplification factor	μ_{g2g1}	8,5	

CAPACITANCES

	grounded cathode		grounded grid		
Input	$C_{g1(a)}$	110	$C_{f(a)}$	55	pF
Output	$C_{a(g1)}$	17,5	$C_{a(f)}$	18	pF
Anode to grid no. 1	C_{ag1}	0,7			pF
Anode to filament			C_{af}	0,2	pF

TEMPERATURE LIMITS

Absolute max. envelope temperature	t_{env}	max.	240	°C
Recommended max. seal temperature	t	max.	200	°C

COOLING

See curves.
Direction of air flow: see drawing.

ACCESSORIES

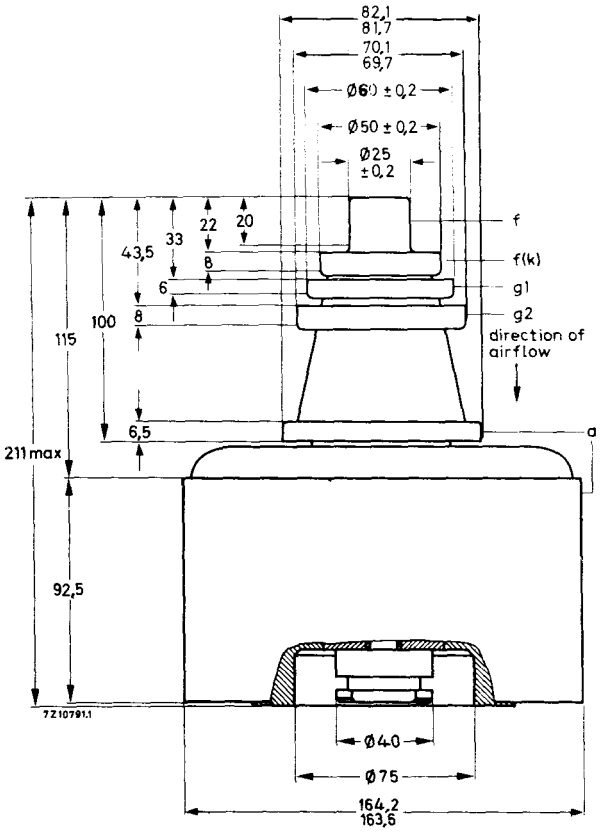
Band I amplifier circuit assembly (vision)	type 40759
Band II amplifier circuit assembly (sound)	type 40760
Band III amplifier circuit assembly (vision)	type 40747
Band III amplifier circuit assembly (sound)	type 40748

MECHANICAL DATA

Dimensions in mm

Net weight: approx. 11 kg

Mounting position: vertical with anode up or down



R.F. CLASS B SERVICE

Unless otherwise stated the voltages are specified with respect to cathode

LIMITING VALUES (Absolute max. rating system)

Frequency	f	up to	260	MHz
Anode voltage	V_a	max.	9	kV
Grid no. 2 voltage	V_{g2}	max.	1	kV
Grid no. 1 voltage	$-V_{g1}$	max.	500	V
Anode current	I_a	max.	5	A
Anode input power	W_{ia}	max.	24	kW
Anode dissipation	W_a	max.	12	kW
Grid no. 2 dissipation	W_{g2}	max.	100	W
Grid no. 1 dissipation	W_{g1}	max.	50	W
Cathode current	I_k	max.	6	A

OPERATING CONDITIONS , grounded grid

Frequency	f	up to	260	MHz
Anode voltage	V_a		7,5	kV
Grid no. 2 voltage	V_{g2}		650	V
Grid no. 1 voltage	V_{g1}		-125	V [1]
Anode current, no signal condition	I_a		0,1	A
Anode current	I_a		2,5	A
Grid no. 2 current	I_{g2}		80	mA
Grid no. 1 current	I_{g1}		90	mA
Anode input power	W_{ia}		18,75	kW
Anode dissipation	W_a		5	kW
Output power in load	W_ℓ		13	kW
Efficiency, total	η		69,3	%
Driving power	W_{dr}		400	W
Power gain	$\frac{W_\ell}{W_{dr}}$		32,5	

Note see page 9

R.F. CLASS AB LINEAR AMPLIFIER FOR TELEVISION SERVICE +

Negative modulation, positive synchronization (C.C.I.R. system)
Unless otherwise specified the voltages are given with respect to the cathode.

LIMITING VALUES (Absolute max. rating system)

Frequency	f	up to	260	MHz
Anode voltage	V_a	max.	9	kV
Grid no. 2 voltage	V_{g2}	max.	1	kV
Grid no. 1 voltage	$-V_{g1}$	max.	500	V
Anode current, black	$I_{a\ black}$	max.	3,5	A
Anode input power, black	$W_{ia\ black}$	max.	24	kW
Anode dissipation	W_a	max.	12	kW
Grid no. 2 dissipation	W_{g2}	max.	100	W
Grid no. 1 dissipation	W_{g1}	max.	50	W
Cathode current	I_k	max.	6	A

OPERATING CONDITIONS , grounded grid

Frequency of vision carrier	f		175,25	MHz	
Bandwidth (−1 dB)	B	7	7	MHz	2)
Anode voltage	V_a	7	6	kV	
Grid no. 2 voltage	V_{g2}	700	650	V	
Grid no. 1 voltage	V_{g1}	−85	−70	V	1)
Anode current, no signal condition	I_a	750	900	mA	
Anode current, black	I_{ab1}	2,9	2,5	A	3)
Grid no. 2 current, black	I_{g2b1}	45	25	mA	3)
Grid no. 1 current, black	I_{g1b1}	170	90	mA	3)
Output power in load, sync	$W_{\ell\ sync}$	18,4	12,5	kW	
black	$W_{\ell\ black}$	11	7,5	kW	3)
Driving power, sync	$W_{dr\ sync}$	720	415	W	
black	$W_{dr\ black}$	370	225	W	2)
Gain, sync	G_{sync}	25	30		
black	G_{black}	29,7	33		
Sync compression	sync in/out	30/25	28/25		4)
Differential phase		< 3	< 3	°	5)
Differential gain		≥ 85	≥ 85	%	5)
Anode resistance	$R_{a\sim}$	1050	1050	Ω	2)

Notes see page 9

+Detailed information on definitions of terms and application suggestions are available on request.

OPERATING CONDITIONS (continued)

Frequency of vision carrier	f		83,25	MHz	
Bandwidth (−1 dB)	B		7	MHz	2)
Anode voltage	V_a		5,5	kV	
Grid no. 2 voltage	V_{g2}		700	V	
Grid no. 1 voltage	V_{g1}		−72	V	1)
Anode current, no signal condition	I_a		900	mA	
Anode current, black	I_{abl}		3,2	A	3)
Grid no. 2 current, black	I_{g2bl}		55	mA	3)
Grid no. 1 current, black	I_{g1bl}		165	mA	3)
Output power in load, sync	W_ℓ sync		13,2	kW	
black	W_ℓ black		7,9	kW	3)
Driving power, sync	W_{dr} sync		660	W	
black	W_{dr} black		350	W	2)
Gain, sync	G_{sync}		20		
black	G_{black}		22		
Sync compression	sync in/out		30/25		4)
Differential phase			< 3	o	5)
Differential gain			≥ 85	%	5)
Anode resistance	$R_{a\sim}$		740	Ω	2)
Frequency of visions carrier	f		55,25	MHz	
Bandwidth (−1 dB)	B	7	7	MHz	2)
Anode voltage	V_a	4	5,5	kV	
Grid no. 2 voltage	V_{g2}	700	700	V	
Grid no. 1 voltage	V_{g1}	−70	−72	V	1)
Anode current, no signal condition	I_a	800	900	mA	
Anode current, black	I_{abl}	2,4	3,4	A	3)
Grid no. 2 current, black	I_{g2bl}	55	45	mA	3)
Grid no. 1 current, black	I_{g1bl}	60	175	mA	3)
Output power in load, sync	W_ℓ sync	6,4	13,2	kW	
black	W_ℓ black	3,8	7,9	kW	3)
Driving power, sync	W_{dr} sync	352	733	W	
black	W_{dr} black	190	390	W	2)
Gain, sync	G_{sync}	18	18		
black	G_{black}	20	20		
Sync compression	sync in/out	28/25	30/25		4)
Differential phase		< 3	< 3	o	5)
Differential gain		≥ 85	≥ 85	%	5)
Anode resistance	$R_{a\sim}$	650	670	Ω	2)

Notes: see page 9

R.F. CLASS AB AMPLIFIER FOR TELEVISION TRANSPOSER SERVICE , grounded grid

LIMITING VALUES

See page 5

OPERATING CONDITIONS , grounded grid

Negative modulation, positive synchronization, combined sound and vision (CCIR standard G)

Frequency		f	175 to 225	MHz
Bandwidth (−1 dB)		B	8	MHz
Anode voltage		V_a	6	kV
Grid no. 2 voltage		V_{g2}	800	V
Grid no. 1 voltage	[1]	V_{g1}	−80	V
Anode current, no signal condition		I_a	1,2	A
Anode current	6)	I_a	2,5	A
Grid no. 2 current	6)	I_{g2}	30	mA
Grid no. 1 current	6)	I_{g1}	50	mA
Driving power, sync		W_{dr}	220	W
Output power in load, sync		W_f	7	kW
Power gain		G	32	
Intermodulation products	7)	d	−52	dB

Notes: see page 9

R.F. CLASS C TELEGRAPHY or F.M. TELEPHONY

LIMITING VALUES (Absolute max. rating system)

Frequency	f	up to	260	MHz
Anode voltage	V_a	max.	9,5	kV
Grid no. 2 voltage	V_{g2}	max.	1	kV
Grid no. 1 voltage	$-V_{g1}$	max.	500	V
Anode current	I_a	max.	5	A
Anode input power	W_{ia}	max.	30	kW
Anode dissipation	W_a	max.	12	kW
Grid no. 2 disipation	W_{g2}	max.	100	W
Grid no. 1 dissipation	W_{g1}	max.	50	W
Cathode current	I_k	max.	6	A

OPERATING CONDITIONS

Frequency	f	260	MHz
Anode voltage	V_a	8	kV
Grid no. 2 voltage	V_{g2}	700	V
Grid no. 1 voltage	V_{g1}	−115	V [1]
Anode current, no signal condition	I_a	300	mA
Anode current	I_a	3.5	A
Grid no. 2 current	I_{g2}	100	mA
Grid no. 1 current	I_{g1}	300	mA
Anode input power	W_{ia}	28	kW
Anode dissipation	W_a	10	kW
Output power in load	W_ℓ	18	kW
Efficiency, total	η	64,3	%
Driving power	W_{dr}	600	W
Power gain	$\frac{W_\ell}{W_{dr}}$	30	

[1]) see page 9

NOTES

1) To be adjusted for the stated no signal anode current.

2) With double tuned circuit.

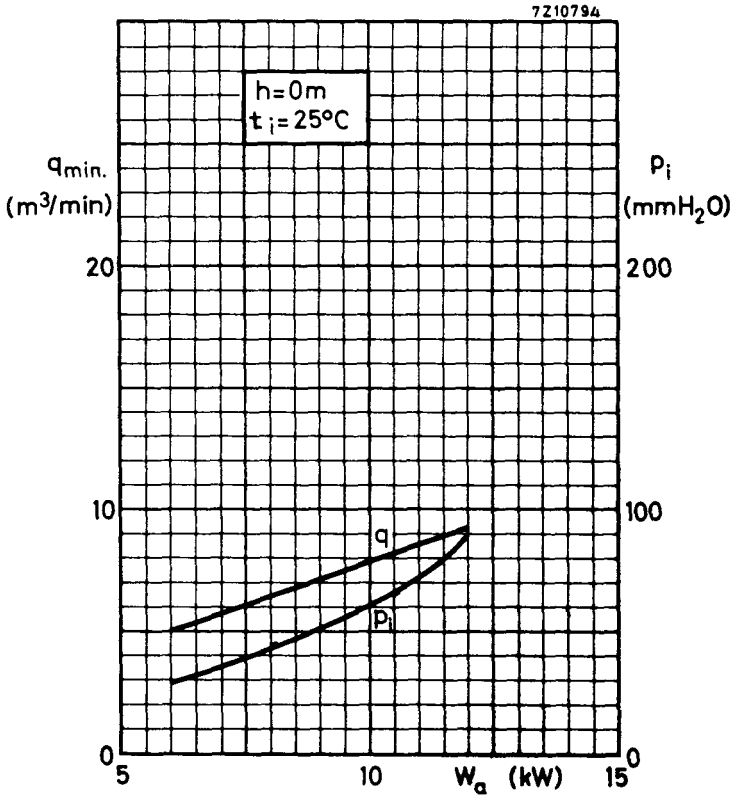
3) Black signal including line sync pulses.

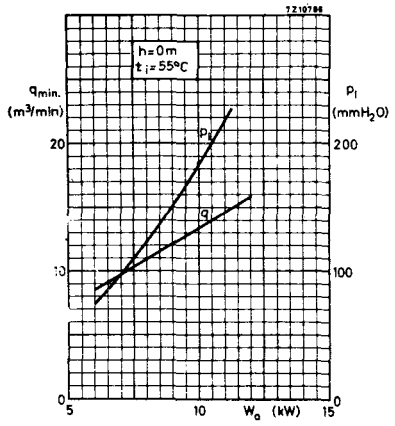
4) A picture/sync ratio of 72/25 for the outgoing signal requires a ratio of max. 70/30 for the incoming signal in which case the sync compression sync in/out = 30/25.

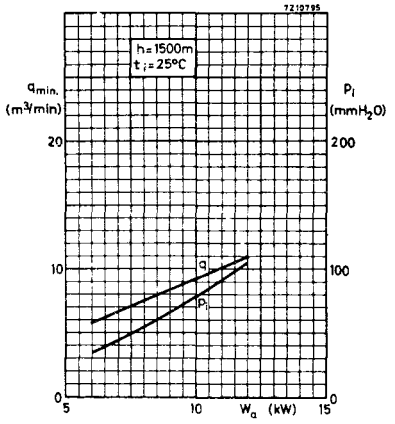
5) Measured with a saw tooth amplitude, running from 17 % to 75 % of the peak sync value, with superimposed a 4,43 MHz sine wave with a 10 % peak to peak value.

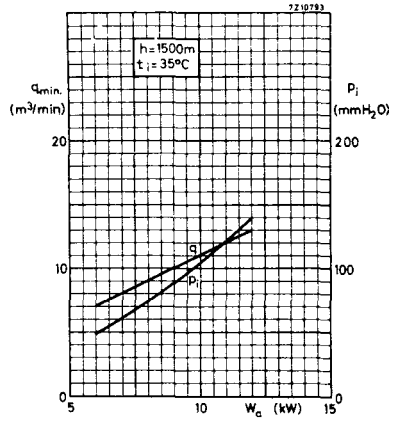
6) At c.w. output power = 7 kW

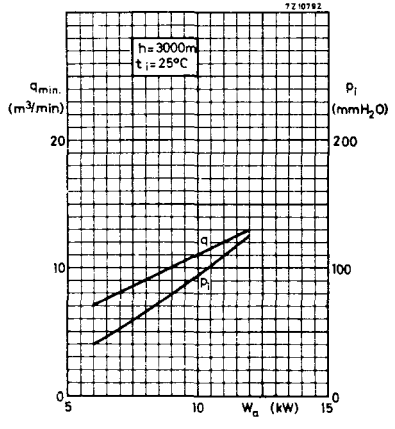
7) Three-tone test method (vision carrier −8 dB, sound carrier −7 dB, sideband signal −17 dB with respect to peak sync = 0 dB).

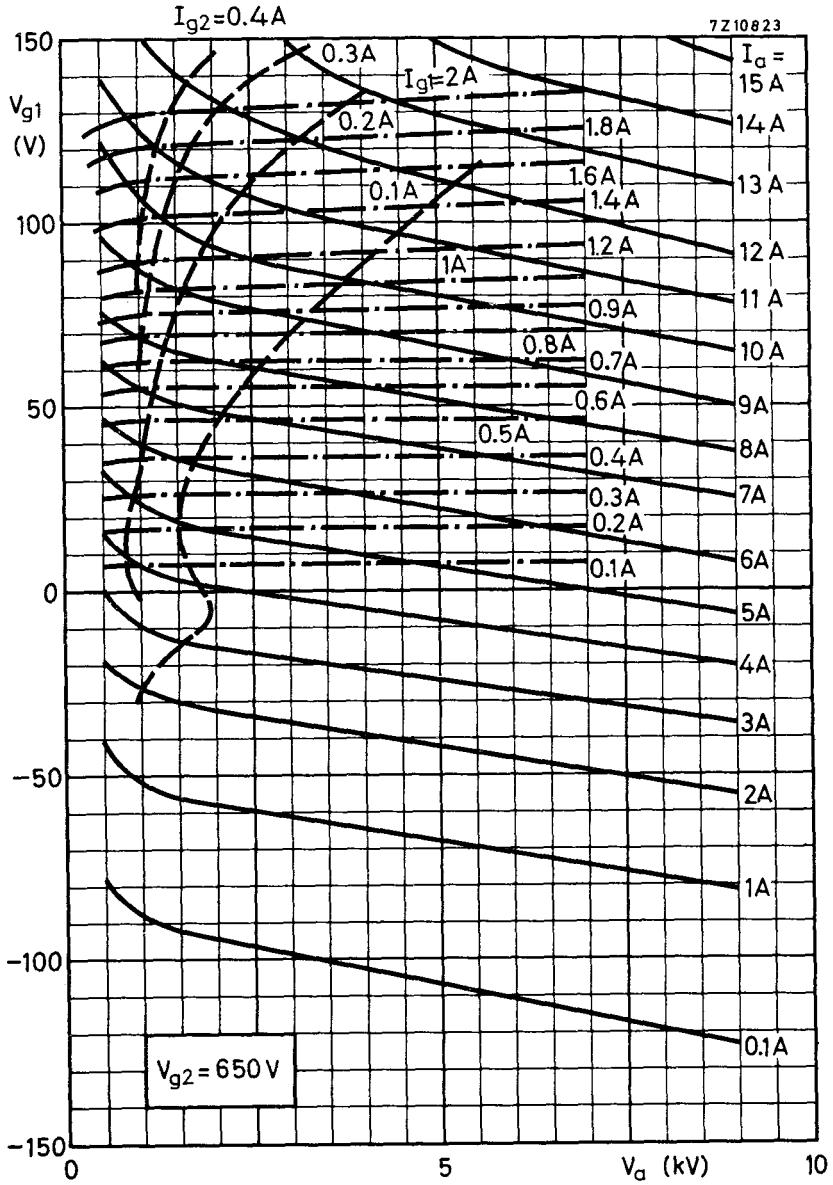


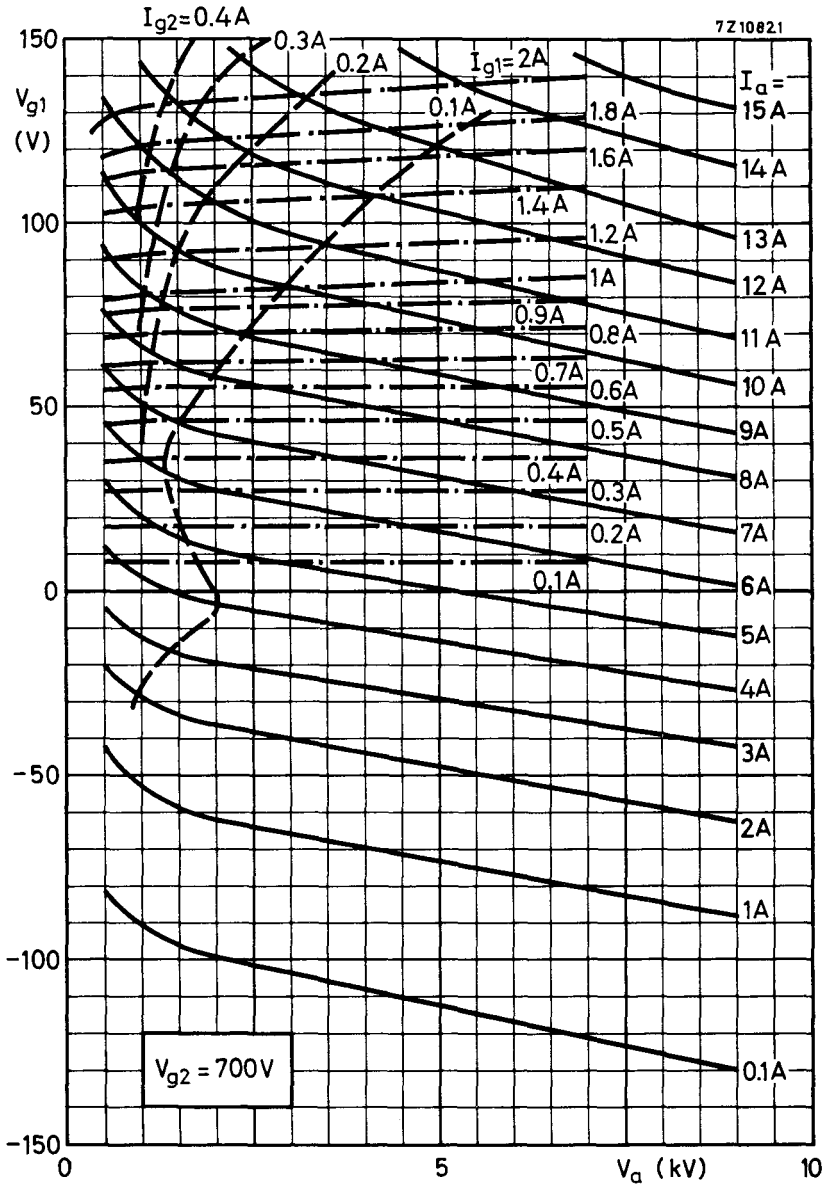

7Z10788
h=0m
t_i=55°C
$q_{min.}$ (m^3/min)
p_i (mmH_2O)
20
10
0
200
100
0
5
10
15
W_a (kW)
p_i
q

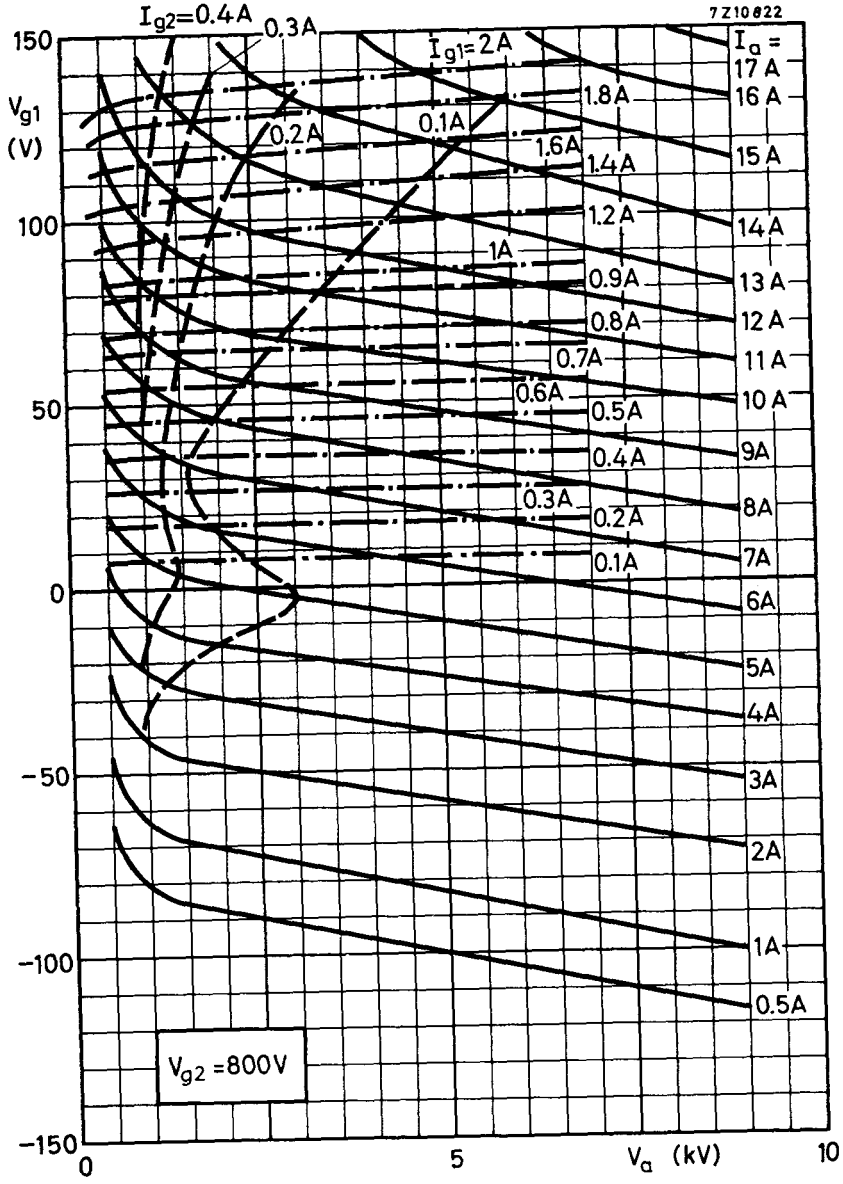

7Z10795
h=1500m
t_i=25°C
$q_{min.}$ (m^3/min)
p_i (mmH_2O)
20
10
0
200
100
0
5
10
15
W_a (kW)
q
p_i


7Z10793
h=1500m
t_i=35°C
$q_{min.}$ (m^3/min)
p_i (mmH_2O)
20
10
0
200
100
0
5
10
15
W_a (kW)
q
p_i


7Z10792
h=3000m
t_i=25°C
$q_{min.}$ (m^3/min)
p_i (mmH_2O)
20
10
0
200
100
0
5
10
15
W_a (kW)
q
p_i


I_{g2}=0.4A
7Z10823
150
100
50
0
−50
−100
−150
V_{g1} (V)
0
5
10
V_a (kV)
I_a =
15 A
14 A
13 A
12 A
11 A
10 A
9A
8A
7A
6A
5A
4A
3A
2A
1A
0.1A
I_{g1}=2A
0.3A
0.2A
0.1A
1A
1.8A
1.6A
1.4A
1.2A
0.9A
0.8A
0.7A
0.6A
0.5A
0.4A
0.3A
0.2A
0.1A
V_{g2} = 650 V


7Z10821
I_{g2}=0.4A
0.3A
0.2A
I_{g1}=2A
0.1A
1.8A
1.6A
1.4A
1.2A
1A
0.9A
0.8A
0.7A
0.6A
0.5A
0.4A
0.3A
0.2A
0.1A
I_a =
15A
14A
13A
12A
11A
10A
9A
8A
7A
6A
5A
4A
3A
2A
1A
0.1A
V_{g1} (V)
150
100
50
0
-50
-100
-150
V_{g2} = 700V
0
5
V_a (kV)
10


7Z10822
I_{g2}=0.4A
0.3A
I_{g1}=2A
0.2A
0.1A
1.8A
1.6A
1.4A
1.2A
1A
0.9A
0.8A
0.7A
0.6A
0.5A
0.4A
0.3A
0.2A
0.1A
I_a =
17 A
16 A
15 A
14A
13 A
12 A
11 A
10 A
9A
8A
7A
6A
5A
4A
3A
2A
1A
0.5A
V_{g1} (V)
150
100
50
0
−50
−100
−150
V_{g2} =800V
0
5
V_a (kV)
10

AIR COOLED V.H.F. POWER TETRODE

Forced air cooled coaxial power tetrode in metal-ceramic construction primarily intended for use as a linear broad-band amplifier in T V transmitters in the bands I and III. This type is also very suitable for A.M. and F.M. broadcast, A.F. modulator applications, and in T V transposer service.

QUICK REFERENCE DATA			
Class AB linear amplifier (vision)			
Frequency	f	175, 25	MHz
Anode voltage	V_a	3	kV
Output power in load	W_ℓ	1, 55	kW
Power gain	G	26	
Class B amplifier			
Frequency	f	260	MHz
Anode voltage	V_a	3, 5	kV
Output power in load	W_ℓ	2, 4	kW
Power gain	G	26	
TV transposer service			
Frequency	f	175 to 225	MHz
Anode voltage	V_a	2, 5	kV
Output power in load	W_ℓ	0, 55	kW
Power gain	G	30	

HEATING: direct; filament thoriated tungsten, mesh type.

Filament voltage	V_f	4, 2	V ± 5%
Filament current	I_f	53	A
Filament peak starting current	I_{fp} max.	300	A
Cold filament resistance	R_{f_o}	8, 5	mΩ
Waiting time	T_w min.	1	s

TYPICAL CHARACTERISTICS

Anode voltage	V_a	4	kV
Grid no. 2 voltage	V_{g2}	500	V
Anode current	I_a	0, 4	A
Transconductance	S	25	mA/V
Amplification factor	μ_{g2g1}	16	

CAPACITANCES

	grounded cathode		grounded grid		
Input	$C_{g1(a)}$	47	$C_{f(a)}$	24	pF
Output	$C_{a(g1)}$	9	$C_{a(f)}$	9	pF
Anode to grid no. 1	C_{ag1}	0,1			pF
Anode to filament			C_{af}	< 0,1	pF

TEMPERATURE LIMITS

Absolute max. envelope temperature	t_{env}	max.	240	°C
Recommended max. seal temperature	t	max.	200	°C

COOLING

See curves
Direction of air flow: see drawing.

ACCESSORIES

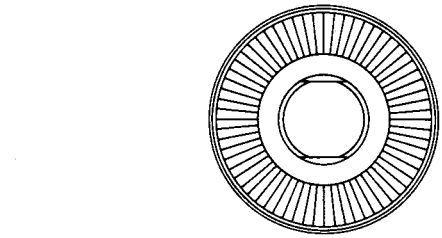
Band I amplifier circuit assembly (vision)	type 40755
Band I amplifier circuit assembly (sound)	type 40756
Band III amplifier circuit assembly (vision)	type 40743
Band III amplifier circuit assembly (sound)	type 40744

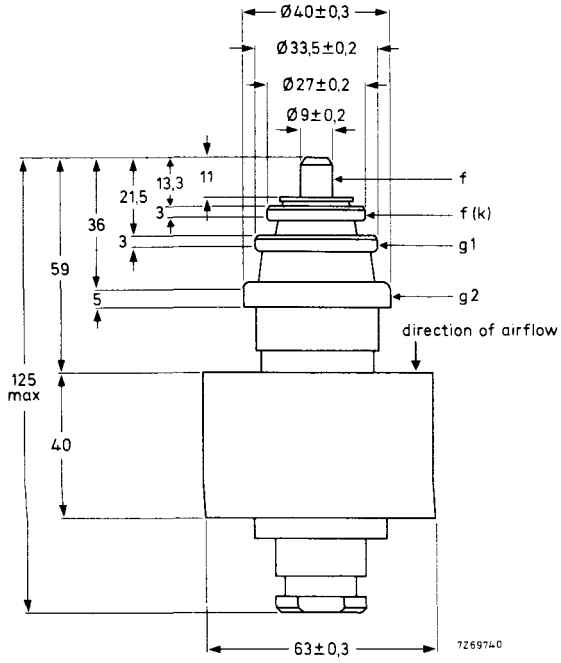
MECHANICAL DATA

Dimensions in mm

Net mass : approx. 0,55 kg

Mounting position: vertical with anode up or down.





R.F. CLASS B SERVICE

Unless otherwise specified the voltages are given with respect to the cathode.

LIMITING VALUES (Absolute max. rating system)

Frequency	f	up to	260	MHz
Anode voltage	V_a	max.	4	kV
Grid no. 2 voltage	V_{g2}	max.	700	V
Grid no. 1 voltage	$-V_{g1}$	max.	100	V
Anode current	I_a	max.	1, 2	A
Anode input power	W_{i_a}	max.	4	kW
Anode dissipation	W_a	max.	1, 5	kW
Grid no. 2 dissipation	W_{g2}	max.	50	W
Grid no. 1 dissipation	W_{g1}	max.	30	W
Cathode current	I_k	max.	1, 5	A
Grid no. 1 circuit resistance	R_{g1}	max.	10	kΩ

OPERATING CONDITIONS grounded grid

Frequency	f	up to	260	MHz
Anode voltage	V_a		3, 5	kV
Grid no. 2 voltage	V_{g2}		600	V
Grid no. 1 voltage	V_{g1}		-30	V [2]
Anode current, no signal condition	I_a		100	mA
Anode current	I_a		980	mA
Grid no. 2 current	I_{g2}		70	mA
Grid no. 1 current	I_{g1}		120	mA
Anode input power	W_{i_a}		3, 43	kW
Anode dissipation	W_a		0, 9	kW
Output power in load	W_ℓ		2, 4	kW
Efficiency, total	η		70	%
Driving power	W_{dr}		90	W
Power gain	$\frac{W_\ell}{W_{dr}}$		≈ 26	

[2]) See page 8

R.F. CLASS AB LINEAR AMPLIFIER FOR TELEVISION SERVICE

Negative modulation, positive synchronization (C.C.I.R. system).
Unless otherwise specified the voltages are given with respect to the cathode.

LIMITING VALUES (Absolute max. rating system)

Frequency	f	up to	260	MHz
Anode voltage	V_a	max.	4	kV
Grid no. 2 voltage	V_{g2}	max.	700	V
Grid no. 1 voltage	$-V_{g1}$	max.	100	V
Anode current, black	$I_{a\ black}$	max.	1	A
Anode input power, black	$W_{ia\ black}$	max.	4	kW
Anode dissipation	W_a	max.	1,5	kW
Grid no. 2 dissipation	W_{g2}	max.	50	W
Grid no. 1 dissipation	W_{g1}	max.	30	W
Cathode current	I_k	max.	1,5	A
Grid no. 1 circuit resistance	R_{g1}	max.	10	kΩ

OPERATING CONDITIONS grounded grid.

Frequency of vision carrier	f		175,25	MHz	
Bandwidth (-1 dB)	B	7	8	MHz	1)
Anode voltage	V_a	3	2,5	kV	
Grid no. 2 voltage	V_{g2}	500	500	V	
Grid no. 1 voltage	V_{g1}	-23	-14	V	2)
Anode current, no signal condition	I_a	200	400	mA	
Anode current, black	$I_{a\ black}$	700	600	mA	3)
Grid no. 2 current, black	$I_{g2\ black}$	50	40	mA	3)
Grid no. 1 current, black	$I_{g1\ black}$	60	30	mA	3)
Output power in load, sync	$W_{\ell\ sync}$	1550	700	W	
black	$W_{\ell\ black}$	930	420	W	3)
Driving power, sync	$W_{dr\ sync}$	60	30	W	
black	$W_{dr\ black}$	32,5	17	W	
Gain, sync	G_{sync}	26	23		
black	G_{black}	28,6	24,7		
Sync compression	sync in/out	28/25	27/25		4)
Diferential phase		< 3	< 3	°	5)
Differential gain		≥ 85	≥ 85	%	
Anode resistance	$R_{a\sim}$	1,8	1,6	kΩ	1)

Notes: see page 8
+ Detailed information on definitions of terms and application suggestions are available on request.

OPERATING CONDITIONS (continued)

Frequency of vision carrier	f		55,25		MHz	
Bandwidth (−1 dB)	B	7	7	6	MHz	1)
Anode voltage	V_a	2,5	2	2,5	kV	
Grid no. 2 voltage	V_{g2}	600	600	600	V	
Grid no. 1 voltage	V_{g1}	−21	−20	−21	V	2)
Anode current, no signal condition	I_a	200	200	200	mA	
Anode current, black	$I_{a\ black}$	820	650	900	mA	3)
Grid no. 2 current, black	$I_{g2\ black}$	45	40	50	mA	3)
Grid no. 1 current, black	$I_{g1\ black}$	80	50	90	mA	3)
Output power in load, sync	W_ℓ sync	1170	670	1500	W	
black	W_ℓ black	700	400	900	W	3)
Driving power, sync	$W_{dr\ sync}$	83	42	94	W	
black	$W_{dr\ black}$	46	24	50	W	
Gain, sync	G_{sync}	14	16	16		
black	G_{black}	15,2	16,6	18		
Sync compression	sync in/out	28/25	27/25	30/25		4)
Differential phase		< 3	< 3	< 3	o	5)
Differential gain		≥ 85	≥ 85	≥ 85	%	
Anode resistance	$R_{a\sim}$	0,9	0,9	1,05	kΩ	1)
Frequency of vision carrier	f		83,25		MHz	
Bandwidth (−1 dB)	B	7		7	MHz	1)
Anode voltage	V_a	2,5		2	kV	
Grid no. 2 voltage	V_{g2}	600		600	V	
Grid no. 1 voltage	V_{g1}	−21		−20	V	2)
Anode current, no signal condition	I_a	200		200	mA	
Anode current, black	$I_{a\ black}$	900		610	mA	3)
Grid no. 2 current, black	$I_{g2\ black}$	50		45	mA	3)
Grid no. 1 current, black	$I_{g1\ black}$	90		45	mA	3)
Output power in load, sync	W_ℓ sync	1500		670	W	
black	W_ℓ black	900		400	W	3)
Driving power, sync	$W_{dr\ sync}$	94		39	W	
black	$W_{dr\ black}$	50		22	W	
Gain, sync	G_{sync}	16		17		
black	G_{black}	18		18		
Sync compression	sync in/out	30/25		28/25		4)
Differential phase		< 3		< 3	o	5)
Differential gain		≥ 85		≥ 85	%	
Anode resistance	$R_{a\sim}$	1,05		1,05	kΩ	1)

Notes: see page 8

R.F. CLASS AB AMPLIFIER FOR TELEVISION TRANSPOSER SERVICE , grounded grid

LIMITING VALUES

See page 5

OPERATING CONDITIONS , grounded grid

Negative modulation, positive synchronization, combined sound and vision (CCIR standard G)

Frequency	f	175 to 225	MHz
Bandwidth (−1 dB)	B	8	MHz
Anode voltage	V_a	2,5	kV
Grid no. 2 voltage	V_{g2}	600	V
Grid no. 1 voltage [2]	V_{g1}	−13,5	V
Anode current, no signal condition	I_a	550	mA
Anode current [6]	I_a	730	mA
Grid no. 2 current [6]	I_{g2}	50	mA
Grid no. 1 current [6]	I_{g1}	35	mA
Driving power, sync	W_{dr}	18	W
Output power in load, sync	W_f	0,55	kW
Power gain	G	30	-
Intermodulation products [7]	d	−52	dB

Notes: see page 8

NOTES

1) With double tuned circuit.

2) To be adjusted for the stated no signal anode current.

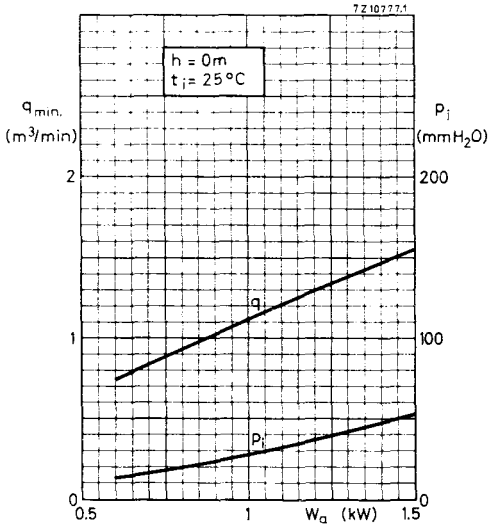
3) Black signal including line sync pulses.

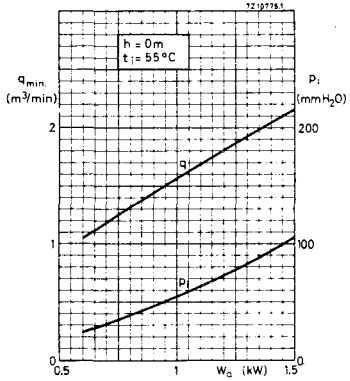
4) A picture/sync ratio of 75/25 for the outgoing signal requires a ratio of max. 70/30 for the incoming signal in which case the sync compression sync in/out = 30/25.

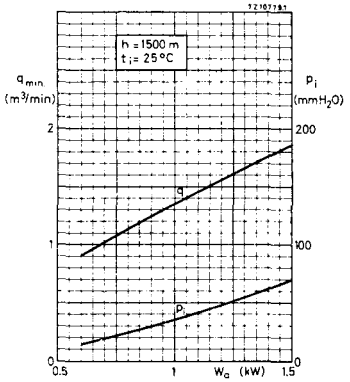
5) Measured with a saw tooth amplitude, running from 17 % to 75 % of the peak sync value, with superimposed a 4,43 MHz sine wave with a 10 % peak to peak value.

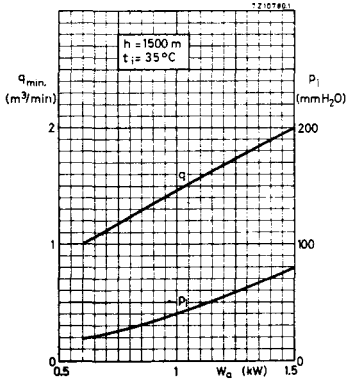
6) At c.w. output power = 550 W

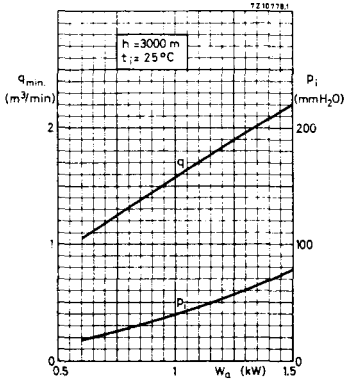
7) Three-tone test method (vision carrier −8 dB, sound carrier −7 dB, sideband signal −17 dB with respect to peak sync = 0 dB).

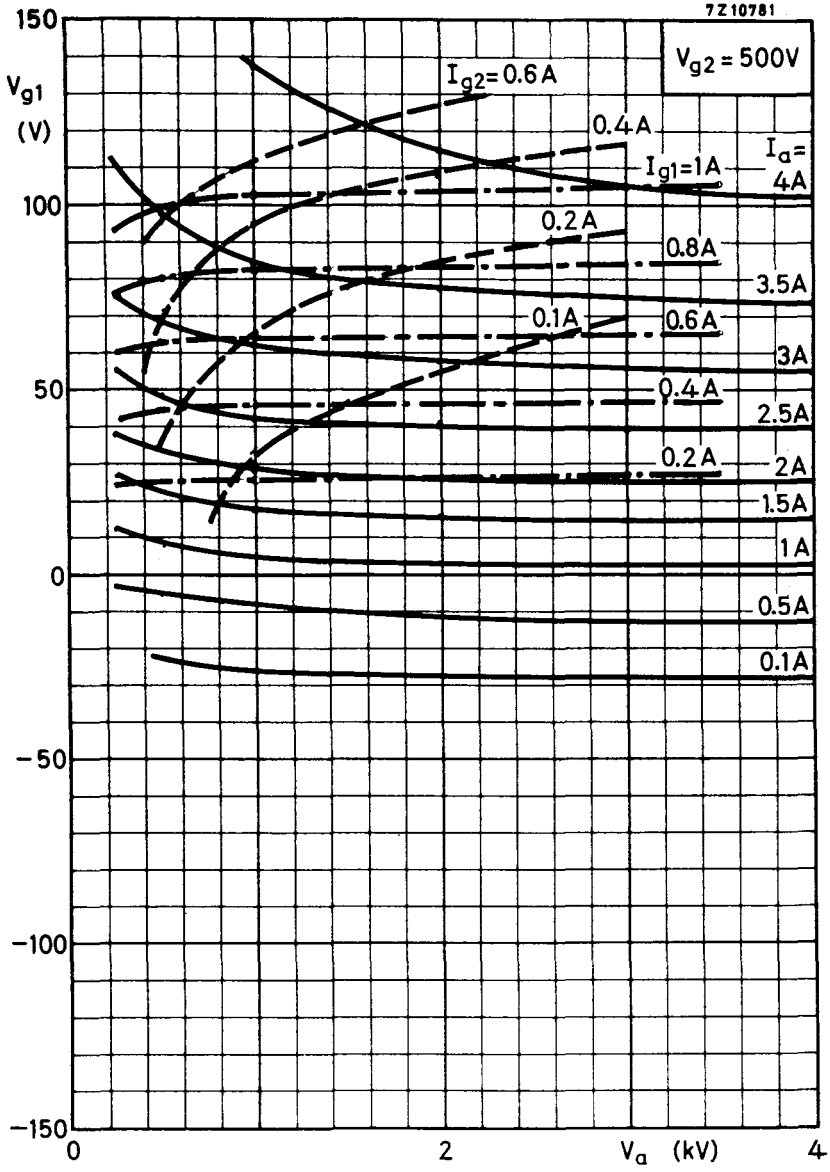


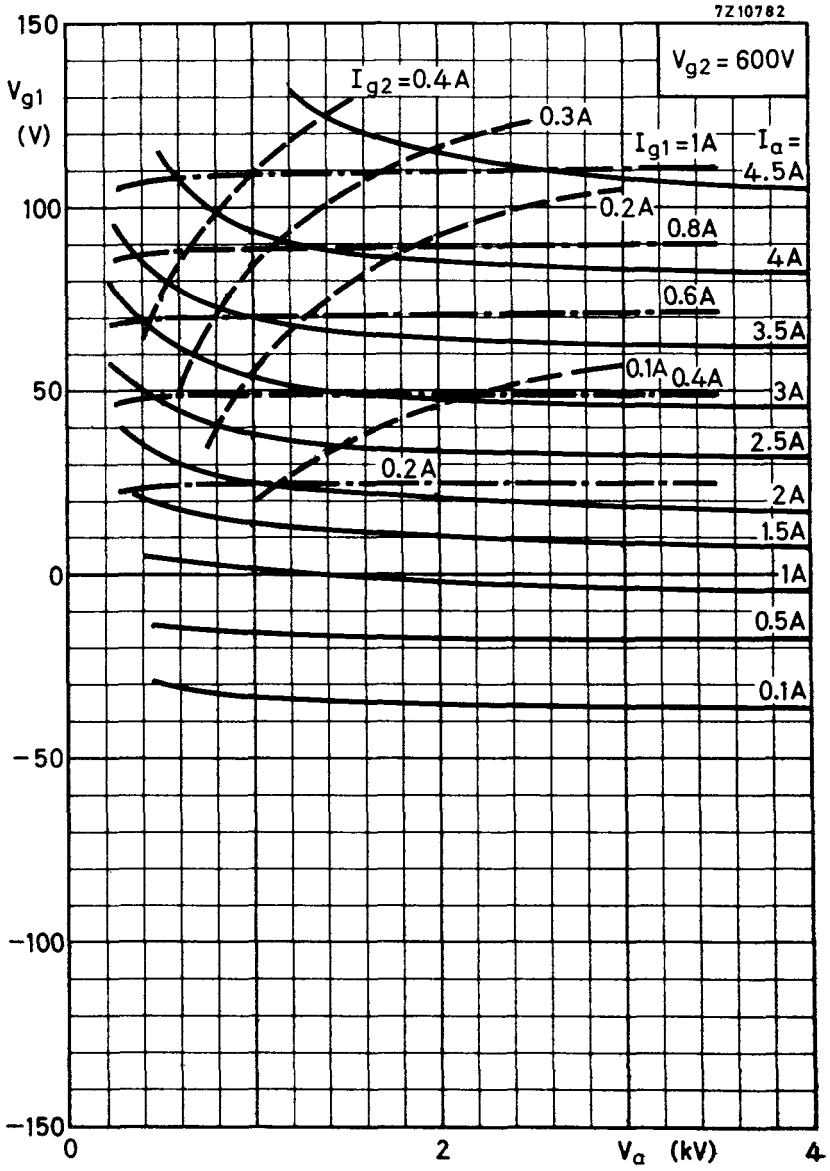

h = 0m
t_i = 55°C
q_min. (m³/min)
P_i (mmH₂O)
q
P_i
W_a (kW)
0.5
1
1.5
2
200
100
0

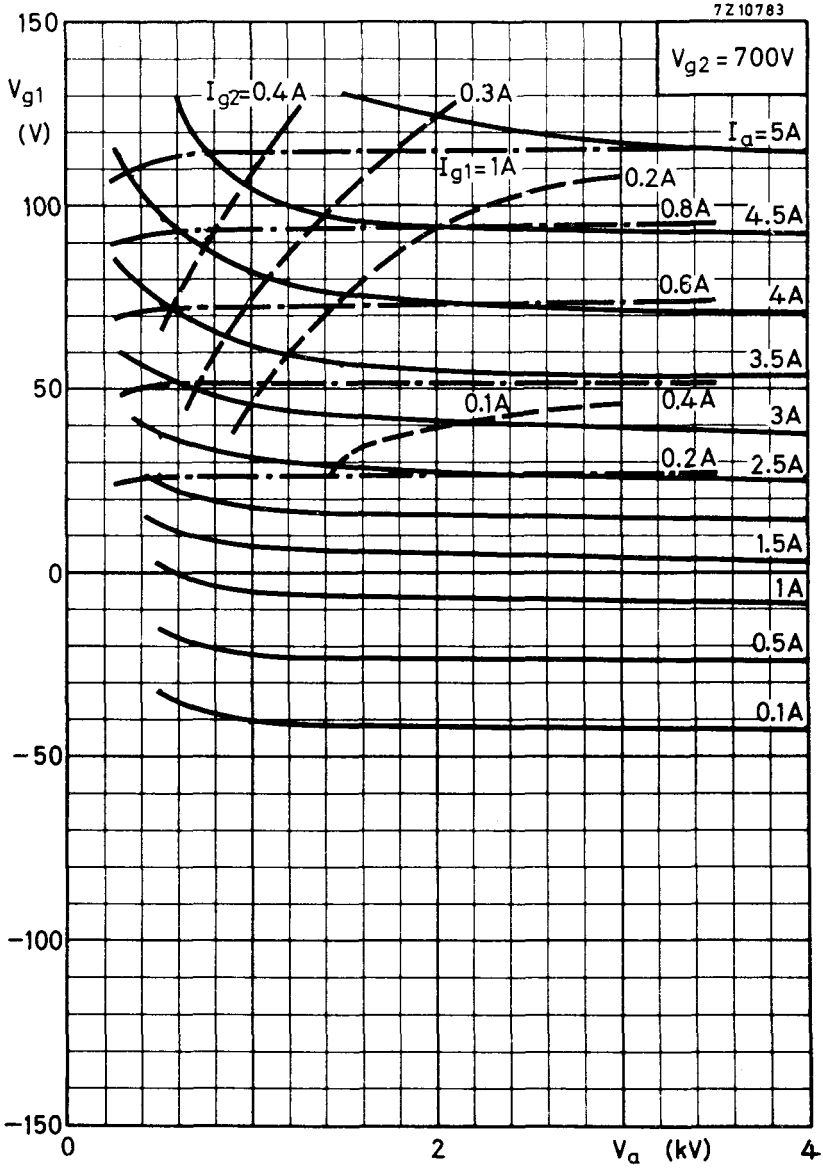

h = 1500 m
t_i = 25°C
q_min. (m³/min)
P_i (mmH₂O)
q
P_i
W_a (kW)
0.5
1
1.5
2
200
100
0


h = 1500 m
t_i = 35°C
q_min. (m³/min)
P_i (mmH₂O)
q
P_i
W_a (kW)
0.5
1
1.5
2
200
100
0


h = 3000 m
t_i = 25°C
q_min. (m³/min)
P_i (mmH₂O)
q
P_i
W_a (kW)
0.5
1
1.5
2
200
100
0


7Z10781
V_{g2} = 500V
I_{g2}= 0.6A
0.4A
I_{g1}=1A
I_a= 4A
0.2A
0.8A
3.5A
0.1A
0.6A
3A
0.4A
2.5A
0.2A
2A
1.5A
1A
0.5A
0.1A
V_{g1} (V)
150
100
50
0
−50
−100
−150
0
2
V_a (kV)
4


7Z10782
V_{g2} = 600V
I_{g2} = 0.4A
0.3A
0.2A
0.1A
I_{g1} = 1A
0.8A
0.6A
0.4A
0.2A
I_a =
4.5A
4A
3.5A
3A
2.5A
2A
1.5A
1A
0.5A
0.1A
V_{g1} (V)
150
100
50
0
−50
−100
−150
0
2
4
V_a (kV)


7Z10783
V_{g2} = 700V
V_{g1} (V)
150
100
50
0
−50
−100
−150
0
2
4
V_a (kV)
I_{g2}=0.4A
0.3A
I_{g1}=1A
0.2A
0.8A
I_a=5A
4.5A
0.6A
4A
3.5A
0.1A
0.4A
3A
0.2A
2.5A
1.5A
1A
0.5A
0.1A

AIR COOLED V.H.F. POWER TETRODE

Forced air cooled coaxial power tetrode in metal-ceramic construction primarily intended for use as a linear broad-band amplifier in T V transmitters in the bands I and III. This type is also very suitable for A.M. and F.M. broadcast and A.F. modulator applications, and in T V transposer service.

QUICK REFERENCE DATA			
Class AB linear amplifier (vision)			
Frequency	f	175, 25	MHz
Anode voltage	V_a	8	kV
Output power in load	W_ℓ	27, 5	kW
Power gain	G	28, 5	
Class C telegraphy or F.M. telephony			
Frequency	f	260	MHz
Anode voltage	V_a	8, 5	kV
Output power in load	W_ℓ	25	kW
Power gain	G	31	
Television transposer service			
Frequency	f	175 to 225	MHz
Anode voltage	V_a	8	kV
Output power in load	W	10, 5	kW
Power gain	G	42	

HEATING : direct; filament thoriated tungsten, mesh type.

Filament voltage	V_f	11, 5	V ± 5 %
Filament current	I_f	120	A
Filament peak starting current	If_p max.	750	A
Cold filament resistance	R_{f_0}	10, 5	mΩ
Waiting time	T_w min.	1	s

TYPICAL CHARACTERISTICS

Anode voltage	V_a	8	kV
Grid no. 2 voltage	V_{g_2}	700	V
Anode current	I_a	2,4	A
Transconductance	S	60	mA/V
Amplification factor	μ	8,5	

CAPACITANCES

	grounded cathode		grounded grid		
Input	$C_{g_1(a)}$	135	$C_{f(a)}$	69	pF
Output	$C_{a(g_1)}$	23	$C_{a(f)}$	23	pF
Anode to grid no. 1	C_{ag_1}	0,85			pF
Anode to filament			C_{af}	0,25	pF

TEMPERATURE LIMITS

Absolute max. envelope temperature	t_{env}	max.	240	°C
Recommended max. seal temperature	t	max.	200	°C

COOLING

See cooling curves.
Direction of airflow: see outline drawing.

→ ACCESSORIES

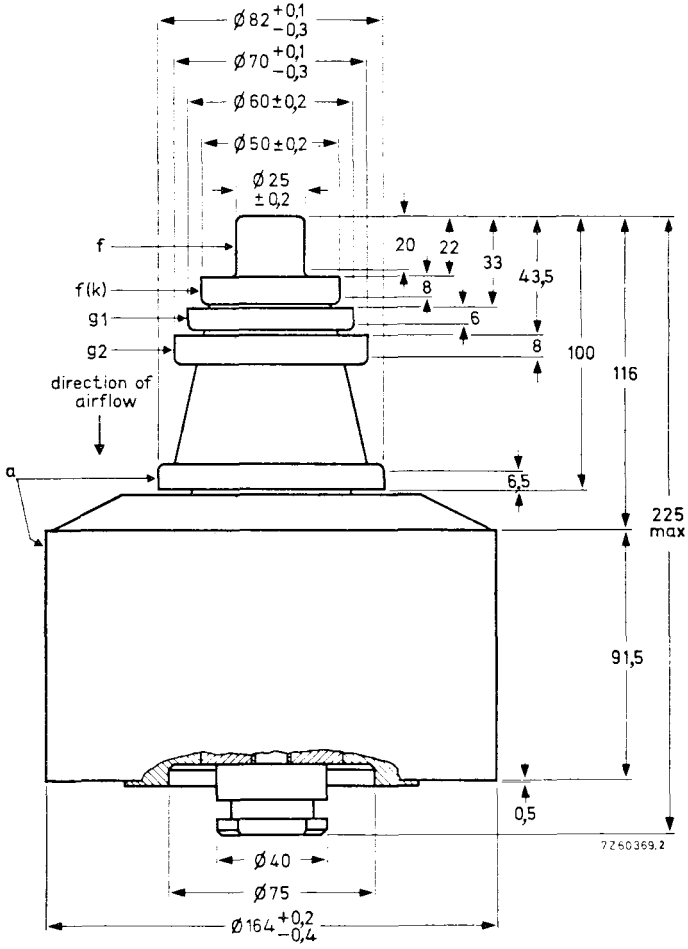
Band I amplifier circuit assembly (vision)	type	40759
Band I amplifier circuit assembly (sound)	type	40760
Band III amplifier circuit assembly (vision)	type	40768
Band III amplifier circuit assembly (sound)	type	40769

MECHANICAL DATA

Dimensions in mm

Net weight : approx. 11 kg

Mounting position : vertical with anode up or down



R.F. CLASS-AB LINEAR AMPLIFIER FOR TELEVISION SERVICE +

Negative modulation, positive synchronization (C.C.I.R. system)
Unless otherwise specified the voltages are given with respect to the cathode.

LIMITING VALUES (Absolute max. rating system)

Frequency	f	up to	260	MHz
Anode voltage	V_a	max.	9	kV
Grid no. 2 voltage	V_{g2}	max.	1	kV
Grid no. 1 voltage	$-V_{g1}$	max.	500	V
Anode current, black	$I_{a\ black}$	max.	7	A
Anode input power, black	$W_{ia\ black}$	max.	40	kW
Anode dissipation	W_a	max.	18	kW
Grid no. 2 dissipation	W_{g2}	max.	100	W
Grid no. 1 dissipation	W_{g1}	max.	50	W
Cathode current	I_k	max.	9	A

OPERATING CONDITIONS , grounded grid

Frequency of vision carrier	f	175,25	MHz	
Bandwidth (−1 dB)	B	7,5	MHz	2)
Anode voltage	V_a	8	kV	
Grid no. 2 voltage	V_{g2}	700	V	
Grid no. 1 voltage	V_{g1}	−84	V	1)
Anode current, no-signal condition	I_a	900	mA	
Anode current, black	$I_{a\ black}$	3,9	A	3)
Grid no. 2 current, black	$I_{g2\ black}$	55	mA	3)
Grid no. 1 current, black	$I_{g1\ black}$	180	mA	3)
Output power in load, sync	$W_{\ell\ sync}$	27,5	kW	
black	$W_{\ell\ black}$	16,5	kW	3)
Anode dissipation, black	$W_{a\ black}$	14	kW	
Driving power, sync	Wdr_{sync}	965	W	
black	Wdr_{black}	520	W	2)
Gain, sync	G_{sync}	28,5		
black	G_{black}	31,6		
Sync compression	sync in/out	30/25		4)
Differential phase		< 3	deg	5)
Differential gain		≥ 85	%	5)
Anode resistance	$R_{a\sim}$	920	Ω	

Notes see page 5.

+ Detailed information on defenitions of terms and application suggestions are available on request.

OPERATING CONDITIONS (continued)

Frequency of vision carrier	f	83, 25	55, 25	MHz	
Bandwidth (−1 dB)	B	7	7	MHz	2)
Anode voltage	V_a	6, 5	6, 5	kV	
Grid no. 2 voltage	V_{g2}	700	700	V	
Grid no. 1 voltage	V_{g1}	−88	−88	V	1)
Anode current, no signal condition	I_a	900	900	mA	
Anode current, black	$I_{a\ black}$	4, 1	4, 5	A	3)
Grid no. 2 current, black	$I_{g2\ black}$	55	45	mA	3)
Grid no. 1 current, black	$I_{g1\ black}$	160	175	mA	3)
Output power in load, sync	$W_{\ell\ sync}$	20	20	kW	
black	$W_{\ell\ black}$	12	12	kW	3)
Anode dissipation, black	$W_{a\ black}$	14, 6	17, 2	kW	
Driving power, sync	$W_{dr_{sync}}$	835	910	W	
black	$W_{dr_{black}}$	444	520	W	2)
Gain, sync	G_{sync}	24	22		
black	G_{black}	27	23		
Sync compression	sync in/out	30/25	27/25		4)
Differential phase		< 3	< 3	deg	5)
Differential gain	R_a	≥85	≥85	%	5)
Anode resistance	$R_{a\sim}$	720	580	Ω	

NOTES

1) To be adjusted for the stated no signal anode current.

2) With double tuned circuit.

3) Black signal including line sync pulses.

4) A picture/sync ratio of 75/25 for the outgoing signal requires a ratio of max. 70/30 for the incoming signal in which case the sync compression sync in/out = 30/25.

5) Measured with a sawtooth amplitude, running from 17 % to 75 % of the peak sync value, with superimposed a 4, 43 MHz sine wave with a 10 % peak to peak value.

6) At c.w. output power = 10, 5 kW.

7) Three-tone test method (vision carrier −8 dB, sound carrier −7 dB, sideband signal −17 dB with respect to peak sync = 0 dB).

R.F. CLASS AB AMPLIFIER FOR TELEVISION TRANSPOSER SERVICE , grounded grid

LIMITING VALUES

See page 4

OPERATING CONDITIONS , grounded grid

Negative modulation, positive synchronization, combined sound and vision (CCIR standard G)

Frequency		f	175 to 225	MHz
Bandwidth (−1 dB)		B	8	MHz
Anode voltage		V_a	8	kV
Grid no. 2 voltage		V_{g2}	900	V
Grid no. 1 voltage	[1]	V_{g1}	−95	V
Anode current, no signal condition		I_a	1,8	A
Anode current	[6]	I_a	3,3	A
Grid no. 2 current	[6]	I_{g2}	35	mA
Grid no. 1 current	[6]	I_{g1}	20	mA
Driving power, sync		W_{dr}	250	W
Output power in load, sync		W_ℓ	10,5	kW
Power gain		G	42	-
Intermodulation products	[7]	d	−55	dB

Notes : See page 5.

R.F. CLASS C TELEGRAPHY or F.M. TELEPHONY

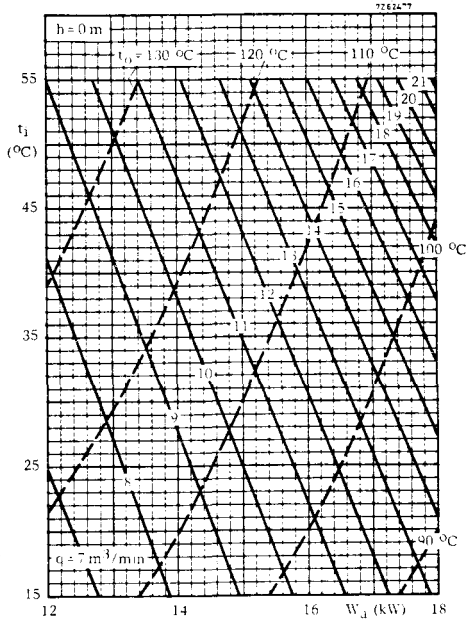
LIMITING VALUES (Absolute max. rating system)

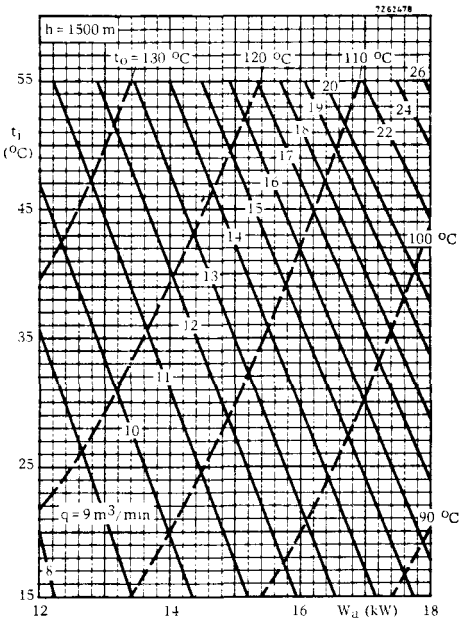
Frequency	f	up to	260	MHz
Anode voltage	V_a	max.	9,5	kV
Grid no. 2 voltage	V_{g2}	max.	1	kV
Grid no. 1 voltage	$-V_{g1}$	max.	500	V
Anode current	I_a	max.	7	A
Anode input power	W_{ia}	max.	42	kW
Anode dissipation	W_a	max.	18	kW
Grid no. 2 dissipation	W_{g2}	max.	100	W
Grid no. 1 dissipation	W_{g1}	max.	50	W
Cathode current	I_k	max.	9	A

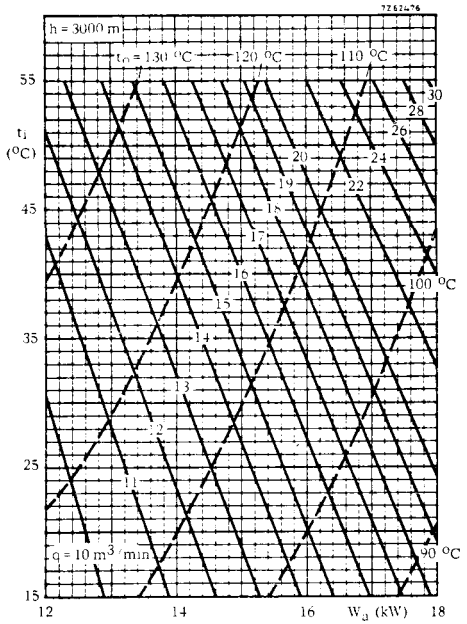
OPERATING CONDITIONS

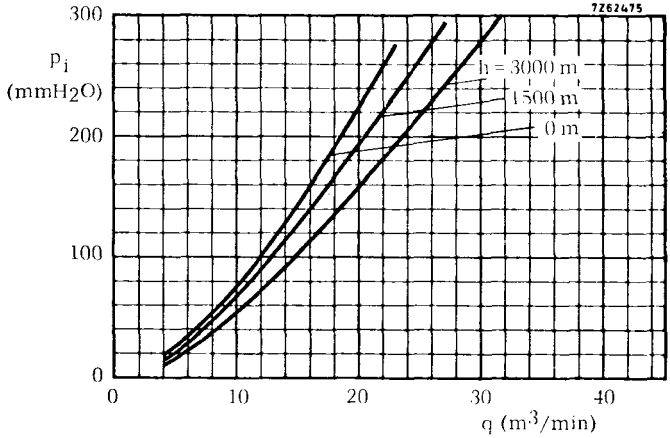
Frequency	f	260	MHz
Anode voltage	V_a	8,5	kV
Grid no. 2 voltage	V_{g2}	700	V
Grid no. 1 voltage	V_{g1}	-106	V [1]
Anode current, no signal condition	I_a	300	mA
Anode current	I_a	4,6	A
Grid no. 2 current	I_{g2}	100	mA
Grid no. 1 current	I_{g1}	325	mA
Anode input power	W_{ia}	39,1	kW
Anode dissipation	W_a	14	kW
Output power in load	W_ℓ	25	kW
Efficiency, total		64	%
Driving power	W_{dr}	800	W
Power gain	$\frac{W_\ell}{W_{dr}}$	31	

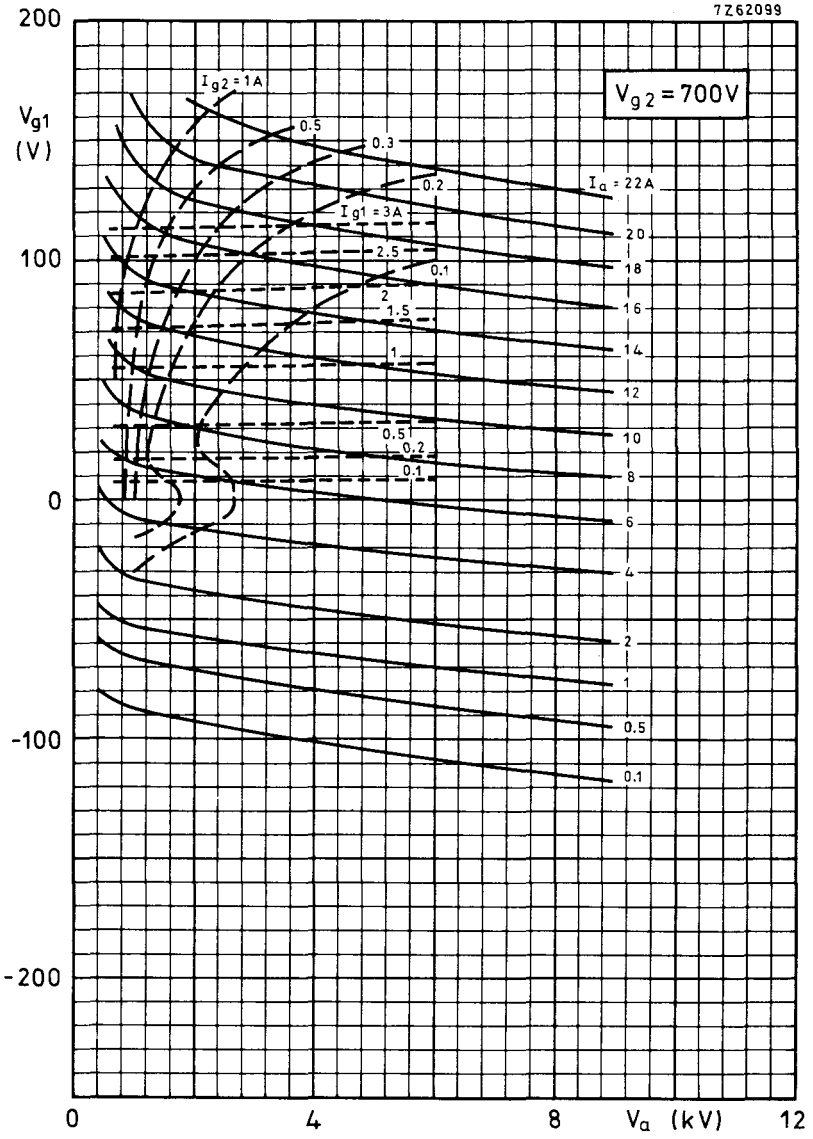
Note : See page 5

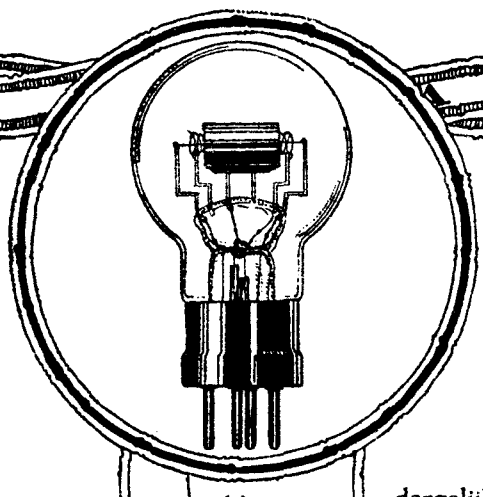

72 62477
h = 0 m
t_o = 130 °C
120 °C
110 °C
100 °C
90 °C
t_i (°C)
55
45
35
25
15
12
14
16
18
W_d (kW)
q = 7 m³/min

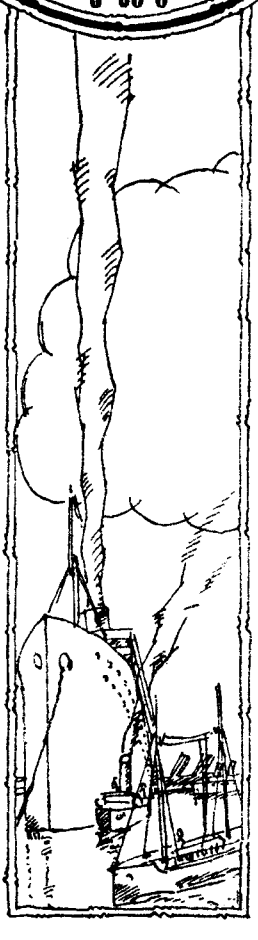

72 62478
h = 1500 m
t_o = 130 °C
120 °C
110 °C
100 °C
90 °C
t_i (°C)
55
45
35
25
15
12
14
16
18
W_d (kW)
q = 9 m³/min


72 62476
h = 3000 m
t_o = 130 °C
120 °C
110 °C
100 °C
90 °C
t_i (°C)
55
45
35
25
15
12
14
16
18
W_d (kW)
q = 10 m³/min


7Z62475
300
p_i
(mmH2O)
200
100
0
0
10
20
30
40
q (m3/min)
h = 3000 m
1500 m
0 m


7Z62099
200
100
0
-100
-200
V_{g1} (V)
V_{g2} = 700V
I_{g2} = 1A
0.5
0.3
0.2
I_{g1} = 3A
2.5
0.1
2
1.5
1
0.5
0.2
0.1
I_a = 22A
20
18
16
14
12
10
8
6
4
2
1
0.5
0.1
0
4
8
12
V_a (kV)





Philips zendlamp Z 1

Het streven van den modernen zendenden amateur is er op gericht om met een zoo gering mogelijke energie een zoo groot mogelijken afstand te overbruggen. Met zeer geringe hulpmiddelen kunnen met korte golven groote resultaten bereikt worden. Voor dergelijke zendproeven met klein vermogen is de Philips zendlamp Z1 bestemd.

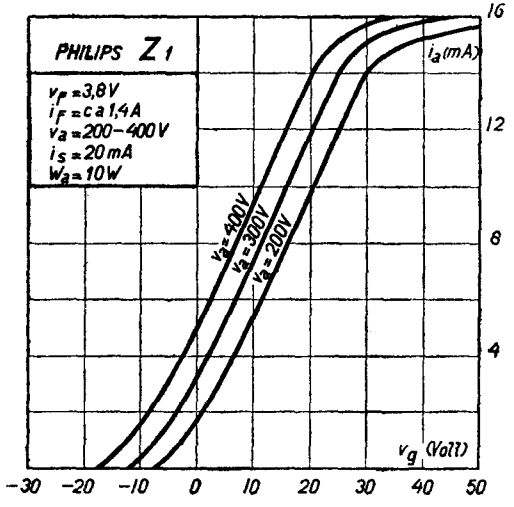
Philips Z1, die met 200 - 400 volt plaatspanning gebruikt moet worden, kan in een goed geconstrueerden zender bij 400 volt plaatspanning ca. 4 watt opnemen.

Door parallelschakeling van eenige dezer zendlampen, kan men desgewenscht het vermogen opvoeren.

Het type Z1 is met de normale Philips huls (huls A) uitgevoerd.

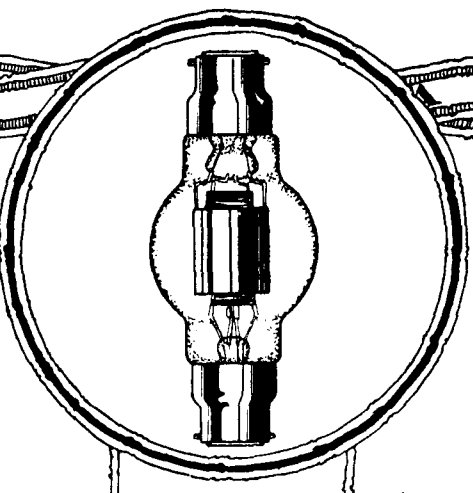
Een niet te onderschatten voordeel is, dat deze zendlamp een tijdelijke kleine overbelasting zonder schade verdragen kan; de prijs is bovendien zoodanig, dat zij binnen ieders bereik komt.

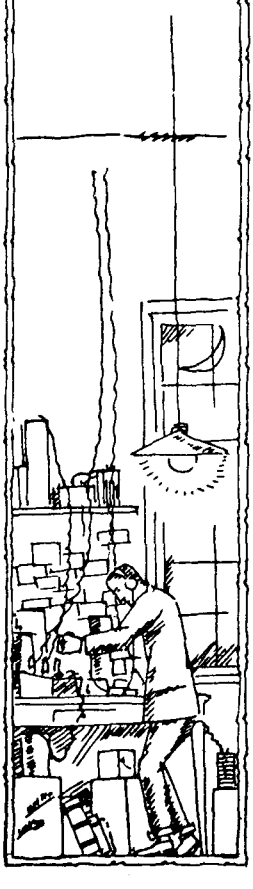
Philips zendlamp Z 1



Gloeispanning	v_f	= 3,8 volt
Gloeistroom	i_f	= ca. 1,4 ampère
Anodespanning	v_a	= 200—400 volt
Verzadigingsstroom . .	i_s	= 20 milliampère
Anodedissipatie (max.)	w_a	= 10 watt
Versterkingsfactor . .	g	= 20
Steilheid (max.)	S_{max}	= 0,4 mA/V
Inwendige weerst. (min.)	Ri_{min}	= 50000 ohm
Grootste diameter . . .	d	= 55 mm
Totale lengte	l	= 105 mm
Huls		A

Prijs f 9,00



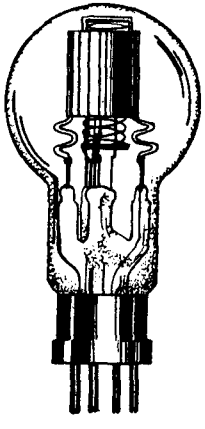


Philips zendlampen Z2A en Z2B

De Philips zendtrioden Z2A en Z2B zijn beide voor eenzelfde vermogen vervaardigd. Het verschil tusschen deze typen is in de montage der leidingen naar plaat en rooster gelegen. *Bij Z2A zijn de toevoerleidingen naar rooster en gloeidraad aan ééne zijde, en die naar de plaat aan de andere zijde naar buiten gevoerd. De capaciteit der lamp is hierdoor tot een minimum gereduceerd; dientengevolge is zij beter geschikt voor het opwekken van korte golven.*

Door middel van de beide Swan-hulzen, waarvan Z2A is voorzien, kunnen de verschillende verbindingen met de plaat eenerzijds en met het rooster anderzijds, tot stand gebracht worden.

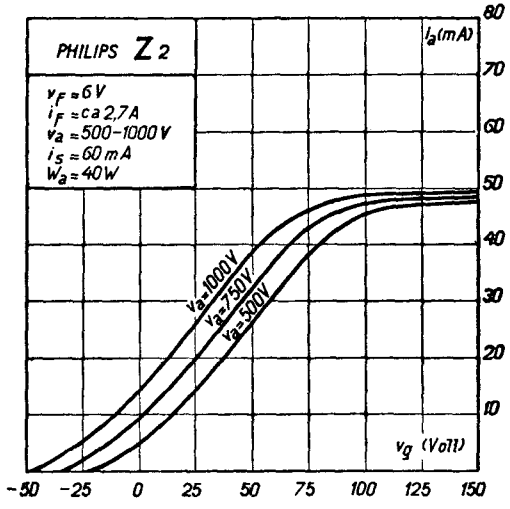
Voor het zenden met langere golven kan Z2B gebruikt worden. Bij deze lamp zijn de leidingen naar plaat, rooster en gloeidraad aan eene zijde uitgevoerd. Z2B wordt met de normale huls A geleverd.



Door de Philips zendlamp van het type Z2 te bezigen in een zender, die op de juiste manier is uitgevoerd, kan men bij een maximale anodespanning van 1000 volt circa 30 watt vermogen aan de lamp toevoeren.

Wanneer men een zoodanige energie ter

beschikking heeft, bestaat de mogelijkheid om over aanzienlijke afstanden verbindingen tot stand te brengen.



Gloeispanning	v_f	= 6 volt
Gloeistroom	i_f	= ca. 2,7 ampère
Anodespanning	v_a	= 500—1000 volt
Verzadigingsstroom . .	i_s	= 60 milliampère
Anodedissipatie (max.)	w_a	= 40 watt
Versterkingsfactor . . .	g	= 22
Steilheid (max.)	S_{max}	= 4,5 mA/V
Inwendige weerst. (min.)	Ri_{min}	= 49000 ohm
Grootste diameter . . .	d	= 60 mm
Totale lengte	l	Z2A = 150 mm
		Z2B 140 mm
Huls		Z2A Swan, Z2B A

GEBRUIKT VOOR KORTE GOLVEN PHILIPS Z2A

Prijs f 20,00

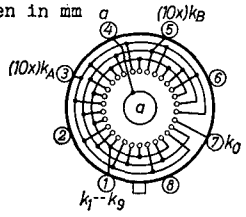
PHILIPS Z303C

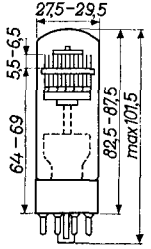
Cold cathode gas-filled BI-DIRECTIONAL DECADE COUNTER TUBE. This tube has ten main cathodes, nine of which are brought out together and one separately. It gives visual indication and operates at speeds up to 4 kc/s.

TUBE COMPTEUR BI-DIRECTIONNEL À DÉCADES avec cathodes froides et remplissage gazeux. Le tube a dix cathodes principales, dont neuf sont sorties simultanément et une séparément. Il donne une indication visuelle et fonctionne à une vitesse jusqu'à 4 kHz.

Gasgefüllte DEKADISCHE ZÄHLRÖHRE FÜR VORWÄRTS- UND RÜCKWÄRTSZÄHLUNG mit kalten Katoden. Die Röhre hat zehn Hauptkatoden, von denen neun gemeinsam und eine separat ausgeführt sind. Sie gibt optische Anzeigung und kann mit Geschwindigkeiten bis zu 4 kHz arbeiten

Dimensions in mm
Dimensions en mm
Abmessungen in mm





Base, culot, Sockel; Octal

Mounting position: any
For visual indication the tube is viewed through the dome of the envelope. k_0 is aligned with pin 6 to within ± 12°

Montage: à volonté
Pour l'indication visuelle le tube est vu à travers le dôme de l'enveloppe. k_0 est alignée à la broche 6 au-dedans de ± 12°.

Einbau: beliebig.
Die Röhre wird durch den Dom der Umhüllung abgelesen. Die Lage von k_0 fällt innerhalb ± 12° mit Stift 6 zusammen

[1]) Page 2; Seite 2
At lower frequencies a lower value can be used down to an absolute minimum of + 18 V.
Aux fréquences plus basses une valeur plus basse peut être utilisée jusqu'à un minimum absolu de +18 V.
Bei niedrigeren Frequenzen kann ein niedrigerer Wert verwendet werden bis zu einem absoluten Minimalwert von +18 V.

Typical characteristics
Caractéristiques types
Kenndaten

Counting rate (sine or pulse drive) Taux de comptage (commande par tension sinusoïdale ou par impulsions) Zählgeschwindigkeit (Steuerung durch Sinus- oder Impulsspannungen)	= max. 4 kc/s
Time difference between two successive input signals Différence de temps entre deux signaux consécutifs Zeitabstand zwischen zwei aufeinanderfolgenden Signale	= min. 250 µsec
V_a (I_k = 300 µA)	= 186-196 V
Pulse required for forced resetting to k_o Impulsion nécessaire pour la remise en position de k_o Impuls für die Rückstellung von k_o	= min. 120 V

Limiting values (Absolute limits)
Caractéristiques limites (Limites absolues)
Grenzdaten (Absolute Grenzwerte)

V_b	≈ min. 350 V
Voltage between any two electrodes (except anode) Tension entre deux électrodes quelconques (sauf l'anode) Spannung zwischen zwei beliebigen Elektroden (mit Ausnahme der Anode)	= max. 140 V
V_{kA} V_{kB} For pulse drive and integrated pulse drive at 4 kc/s Commande par impulsions ou par impulsions intégrées à 4 kHz Bei Impulssteuerung oder integrierter Impulssteuerung bei 4 kHz	= min. +35 V [1]
$-V_{k_o}$	= max. 20 V
Pulse width Largeur des impulsions Breite der Impulsen	= min. 65 µsec
Current of main and auxiliary cathodes Courant des cathodes principales et auxiliaires Strom der Haupt- und Hilfskatoden	= max. 550 µA = min. 250 µA

[1]) See page 1; voir page 1; siehe Seite 1

Operating characteristics
Caractéristiques d'utilisation
Betriebsdaten

V_b	=	475 V
V_{ko}	=	-12 V
R_a	=	820 kΩ
R_{ko}	=	120 kΩ
I_a	=	340 µA
V_{op}	=	35 V

For double pulse drive
Pour commande par impulsion double
Für Steuerung mittels Doppelimpulsen

$V_{kA} = V_{kB}$ = +40 V

Pulse amplitude
Amplitude des impulsions = 100 V
Impulsamplitude

Pulse width
Largeurs des impulsions = 75 µsec
Impulsbreite

For integrated pulse drive (fig. 1)
Pour commande par impulsions intégrées (fig. 1)
Für integrierte Impulssteuerung (Abb. 1)

$V_{kA} = V_{kB}$ = +40 V

Pulse width
Largeur des impulsions = 75 µsec
Impulsbreite

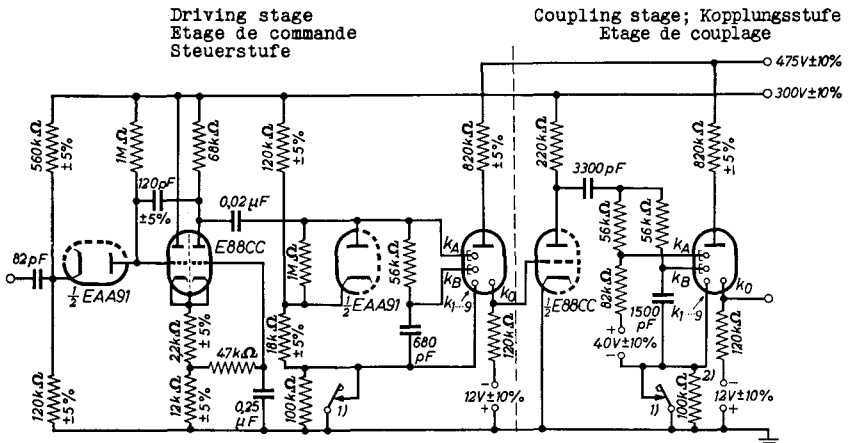


Fig. 1. Integrated pulse circuit
Fig. 1. Circuit pour commande par impulsions intégrées
Abb. 1. Schaltung für integrierte Impulssteuerung

Input pulse ≧ 30 V; rise time: $dV/dT \geq 10^8$ V/sec.
Impulsion d'entrée ≧ 30 V; temps de montée: $dV/dT \geq 10^8$ V/sec.
Eingangsimpuls ≧ 30 V; Anstiegszeit: $dV/dT \geq 10^8$ V/Sek

All components ± 10% unless otherwise stated
Toutes les pièces de ± 10% sauf indication différente
Alle Unterteile ± 10% wenn nicht anders angegeben

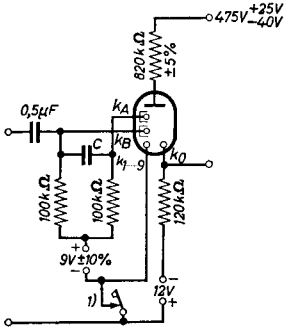
1)2) See page 5
Voir page 5
Siehe Seite 5

Operating characteristics (continued)
Caractéristiques d'utilisation (suite)
Betriebsdaten (Fortsetzung)

For sine wave drive
Pour commande par tension sinusoïdale
Für Steuerung mit Sinusspannung

$V_{kA} = V_{kB} = + 10$ V

Sine wave drive voltage
Tension de commande sinusoïdale = 40-70 V_{eff}
Sinusförmige Steuerspannung



All components ± 10% unless otherwise stated
Toutes les pièces de ± 10% sauf indication différente
Alle Unterteile ± 10% wenn nicht anders angegeben

f(c/s)	50	100	200	500	1000	2000	4000
C(µF)	0,1	0,05	0,02	0,01	0,005	0,002	0,00068

[1]) For resetting to zero these switches should be opened
Pour la remise à zéro il faut ouvrir ces interrupteurs
Für die Rückstellung auf Null müssen diese Schalter geöffnet werden

[2]) This resistor is required only wenn the 40 V bias is obtained from a potential divider across the high tension line
Cette résistance est requise seulement si la polarisation de 40 V est obtenue à l'aide d'un diviseur de potentiel à travers la ligne de haute tension
Dieser Widerstand ist nur erforderlich wenn die 40 V-Vorspannung mittels eines Spannungsteilers über die Hochspannung erhalten wird

PHILIPS

Electronic Tube

HANDBOOK

Z303C

page	sheet	date
1	1	1961.05.05
2	2	1961.05.05
3	3	1961.05.05
4	4	1961.05.05
5	5	1961.05.05
6	FP	1999.12.24

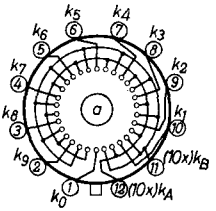
PHILIPS Z502S

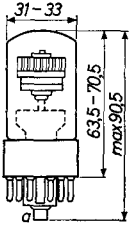
Cold cathode gas-filled BI-DIRECTIONAL DECADE SELECTOR TUBE. This tube has ten main cathodes, which are brought out separately. It gives visual indication and operates at speeds up to 4 kc/s.

TUBE COMPTEUR BI-DIRECTIONNEL À DÉCADES avec cathodes froides et remplissage gazeux. Le tube a dix cathodes, qui ont été sorties séparément. Il donne une indication visuelle et fonctionne à une vitesse jusqu'à 4 kHz

Gasgefüllte DEKADISCHE ZÄHLRÖHRE FÜR VORWÄRTS- UND RÜCKWÄRTSZÄHLUNG mit kalten Katoden. Die Röhre hat zehn Hauptkatoden, die separat ausgeführt sind. Sie gibt optische Anzeigung und kann mit Geschwindigkeiten bis zu 4 kHz betrieben werden

Dimensions in mm
Dimensions en mm
Abmessungen in mm





Base : Duodecal with additional bottom cap (anode)
Culot : Duodecal avec coiffe additionnelle au fond (anode)
Sockel: Duodecal mit zusätzlicher Kappe am Boden (Anode)

Mounting position: arbitrary
For visual indication the tube is viewed through the dome of the envelope. k_1 is aligned with pin 11 to within ± 12°

Montage: à volonté
Pour l'indication visuelle le tube est vu à travers le dôme de l'enveloppe. k_1 est alignée à la broche 11 au-dedans de ± 12°

Einbau: beliebig
Die Röhre wird durch den Dom der Umhüllung abgelesen. Die Lage von k_1 fällt innerhalb ±12° mit stift 11 zusammen

[1]) Page 2; Seite 2

At lower frequencies a lower value can be used down to an absolute minimum of + 18 V.
Aux fréquences plus basses une valeur plus basse peut être utilisée jusqu'à un minimum absolu de + 18 V.
Bei niedrigeren Frequenzen kann ein niedrigerer Wert verwendet werden bis zu einem absoluten Minimalwert von + 18 V.

Typical characteristics
Caractéristiques types
Kenndaten

Counting rate (Sine or pulse drive) Taux de comptage (commande par tension sinusoïdale ou par impulsions) Zählgeschwindigkeit (Steuerung durch Sinus- oder Impulsspannungen)	= max. 4 kc/s
Time difference between two successive input signals Différence de temps entre deux signaux consécutifs Zeitabstand zwischen zwei aufeinanderfolgenden Signale	= min. 250 µsec
V_a (I_k = 300 µA)	= 186-196 V
Pulse required for forced resetting to any main cathode Impulsion nécessaire pour la remise en position d'une cathode quelconque Impuls für die Rückstellung einer beliebigen Katode	= min. 120 V

Limiting values (Absolute limits)
Caractéristiques limites (Limites absolues)
Grenzdaten (Absolute Grenzwerte)

V_b	= min. 350 V
Voltage between any two electrodes (except anode) Tension entre deux électrodes quelconques (sauf l'anode) Spannung zwischen zwei beliebigen Elektroden (mit Ausnahme der Anode)	= max. 140 V
V_{kA} V_{kB} For pulse drive and integrated pulse drive at 4 kc/s Commande par impulsions ou par impulsions intégrées à 4 kHz Bei Impulssteuerung oder integrierter Impulssteuerung bei 4 kHz	= min. +35 V [1]
$-V_{k0}, -V_{k1}, \ldots\ldots -V_{k9}$	= max. 20 V
Pulse width Largeur des impulsions Breite der Impulsen	= min. 65 µsec
Current of main and auxiliary cathodes Courant des cathodes principales et auxiliaires Strom der Haupt- und Hilfskatoden	= max. 550 µA = min. 250 µA

[1]) See page 1; voir page 1; siehe Seite 1

Operating characteristics
Caractéristiques d'utilisation
Betriebsdaten

V_b	=	475 V
V_{ko}	=	-12 V
R_a	=	820 kΩ
R_{ko}	=	120 kΩ
I_a	=	340 µA
V_{op}	=	35 V

For double pulse drive
Pour commande par impulsion double
Für Steuerung mittels Doppelimpulsen

$V_{k_A} = V_{k_B}$ = +40 V

Pulse amplitude
Amplitude des impulsions = 100 V
Impulsamplitude

Pulse width
Largeurs des impulsions = 75 µsec
Impulsbreite

For integrated pulse drive (fig. 1)
Pour commande par impulsions intégrées (fig. 1)
Für integrierte Impulssteuerung (Abb. 1)

$V_{k_A} = V_{k_B}$ = +40 V

Pulse width
Largeur des impulsions = 75 µsec
Impulsbreite

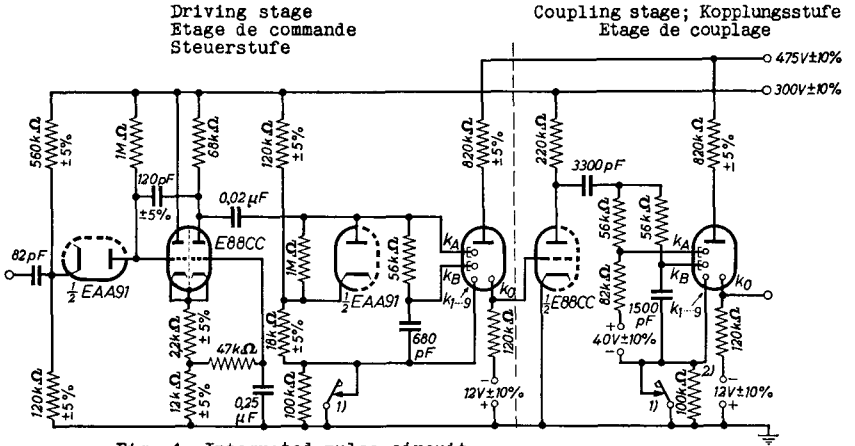


Fig. 1. Integrated pulse circuit
Fig. 1. Circuit pour commande par impulsions intégrées
Abb. 1. Schaltung für integrierte Impulssteuerung

Input pulse ≧ 30 V; rise time: dV/dT ≧ 10^8 V/sec.
Impulsion d'entrée ≧ 30 V; temps de montée: dV/dT ≧ 10^8 V/sec.
Eingangsimpuls ≧ 30 V; Anstiegszeit: dV/dT ≧ 10^8 V/Sek

All components ± 10% unless otherwise stated
Toutes les pièces de ± 10% sauf indication différente
Alle Unterteile ± 10% wenn nicht anders angegeben

1)2) See page 5
Voir page 5
Siehe Seite 5

722 0795

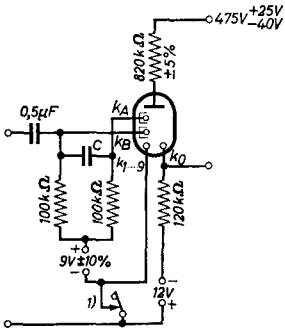
PHILIPS

Operating characteristics (continued)
Caractéristiques d'utilisation (suite)
Betriebsdaten (Fortsetzung)

For sine wave drive
Pour commande par tension sinusoïdale
Für Steuerung mit Sinusspannung

$V_{kA} = V_{kB} =$ + 10 V

Sine wave drive voltage
Tension de commande sinusoïdale = 40-70 V_{eff}
Sinusförmige Steuerspannung



All components ± 10% unless otherwise stated
Toutes les pièces de ± 10% sauf indication différente
Alle Unterteile ± 10% wenn nicht anders angegeben

f(c/s)	50	100	200	500	1000	2000	4000
C(µF)	0,1	0,05	0,02	0,01	0,005	0,002	0,00068

[1]) For resetting to zero these switches should be opened
Pour la remise à zéro il faut ouvrir ces interrupteurs
Für die Rückstellung auf Null müssen diese Schalter geöffnet werden

[2]) This resistor is required only wenn the 40 V bias is obtained from a potential divider across the high tension line
Cette résistance est requise seulement si la polarisation de 40 V est obtenue à l'aide d'un diviseur de potentiel à travers la ligne de haute tension
Dieser Widerstand ist nur erforderlich wenn die 40 V-Vorspannung mittels eines Spannungsteilers über die Hochspannung erhalten wird

PHILIPS

Electronic Tube

HANDBOOK

Z502S

page	sheet	date
1	1	1961.05.05
2	2	1961.05.05
3	3	1961.05.05
4	4	1961.05.05
5	5	1961.05.05
6	FP	1999.12.24

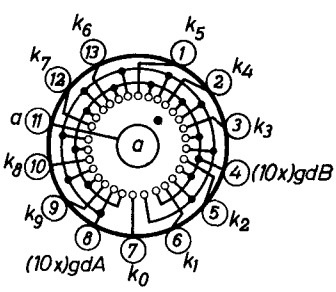
COUNTER AND SELECTOR TUBE

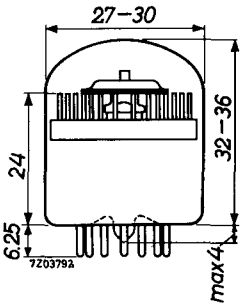
Cold cathode gas-filled bi-directional 10 output selector tube.
The Z504S gives visual indication and operates at speeds up to 5 kHz.

QUICK REFERENCE DATA			
Maximum counting speed		5	kHz
Supply voltage	V_{ba}	475	V
Output, current		340	μA
voltage		35	V
Indication		position of glow; end viewing	

DIMENSIONS AND CONNECTIONS

Base: B13B





K_0 is aligned with pin 7 to within $\pm 3^{o}$

Mounting position: any

This tube has been designed to close tolerances so that no individual adjustment is necessary to align the bulb with the escutcheon.

Accessories

Socket	2422 505 00001
Escutcheon	type 56062

General note

All voltages are referred to the most positive supply potential to which any main cathode (not guide cathode) is returned.

CHARACTERISTIC RANGE VALUES FOR EQUIPMENT DESIGN

(initial and during life)

IGNITION REQUIREMENTS				
Anode supply voltage	V_{ba}		375 to 1000	V
Time constant rise of anode supply voltage when switching on				
V_{ba} < 550 V			1.0	ms [1]
V_{ba} > 550 V			6.0	ms [1]
DISCHARGE AT REST ON A MAIN CATHODE				
Maintaining voltage of anode to main cathode at I_a = 340 µA, V_{gdB} = 25 to 50 V		See also page 8		
maximum	V_m	max.	205	V
minimum	V_m	min.	185	V
Cathode current				
maximum (except during reset)	I_k	max.	525	µA
minimum	I_k	min.	250	µA
recommended	I_k		340	µA
Guide supply voltage				
maximum	$V_{b_{gd}}$	max.	60	V
minimum	$V_{b_{gd}}$	min.	25	V
Resistance between guides and guide supply	R_{gd}	max.	220	kΩ
Cathode potential (except during reset)				
Non conducting cathode	$-V_k$	max.	14	V
Conducting cathode	V_k max. V_{g_d}	min.	10	V [2]
	$-V_k$	max.	0	V

For notes see page 5

STEPPING REQUIREMENTS

See also pages 6 and 7

Discharge dwell time			
main cathode		min. 75	μs
guide A cathode		min. 60	μs
guide B cathode		min. 60	μs
Interval between trailing edge of guide A pulse and leading edge of guide B pulse (double rectangular pulse drive)		max. 3	μs
Negative guide voltage to step the discharge from a main cathode to an adjacent guide cathode		max. 140 min. 45	VminusV_{g_d} V
Voltage difference required to step the discharge from a guide cathode to the adjacent guide cathode		max. 140 min. 45	V V [3]
Positive supply voltage to step the discharge from a guide cathode to the adjacent main cathode		max. 50 min. 25	V V
Main cathode potential			
Non conducting cathodes	$-V_k$	max. 14	V
Conducting cathode	V_k	V_{g_d} minus 10	V [2]
	$-V_k$	max. 0	V

For notes see page 5

RESETTING REQUIREMENTS

	Reset to cathodes					
	7, 8, 9, 0, 1, 2, 3			4, 5, 6		
Main cathode voltage	$-V_k$	max.	240	140		V
pulse duration > 1 ms	$-V_k$	min.	120	120 [4]		V
pulse duration ≥ 200 μs	$-V_k$	min.	130	-		V
Pulse duration		min.	200	-		μs
Reset cathode current	I_k	max.	800	650		μA [5]

LIFE AND RELIABILITY

With this tube an average failure rate of less than 0.5%/1000 h has been obtained. When operated continuously this failure rate applies for a period in excess of 25000 h, but the visual read-out may be impaired after the first 15000 h. These figures have been obtained under the following typical conditions:

Anode current	340	μA
Positive guide supply voltage	40	V
Negative guide voltage for transfer	80	V
Output cathode (k_0) voltage		
non conducting	-12	V
conducting	0	V
Guide A dwell time	110	μs
Guide B dwell time	250 to 650	μs
Counting speed	0.2 p.p.h. to 500	p.p.s.
Ambient temperature	20 ± 5	°C

A typical tube can be expected to count correctly with the above conditions after standing on one main cathode for a period up to 4500 h.

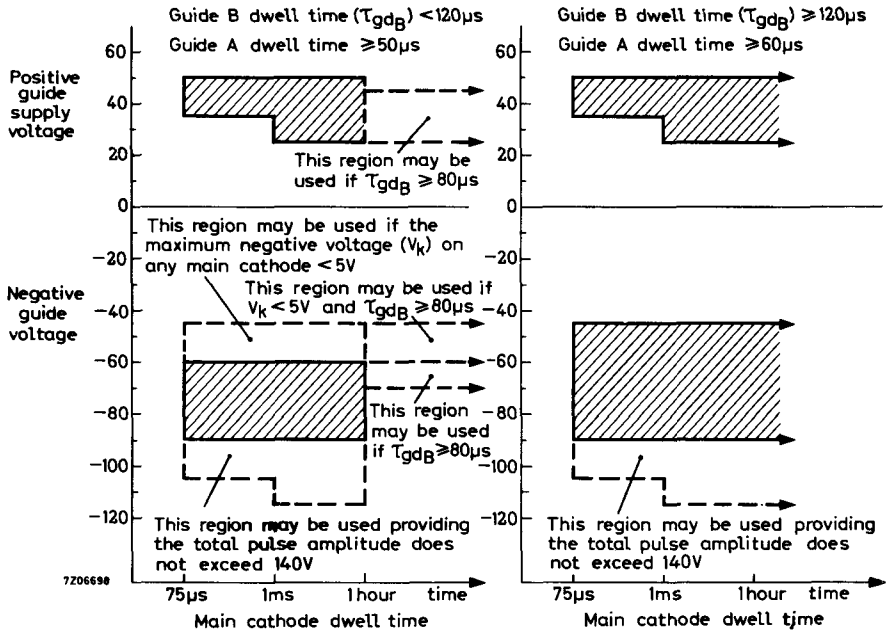
For notes see page 5

LIMITING VALUES (Absolute maximum rating system)

Continuous main cathode current (except during reset)	I_k	max.	525	μA
Reset cathode current				
Cathodes 7, 8, 9, 0, 1, 2, 3	I_k	max.	800	μA [5]
Cathode 4, 5, 6	I_k	max.	650	μA [5]
Voltage between any two main or guide cathodes (except during reset)		max.	140	V
Positive guide supply voltage	$V_{b_{gd}}$	max.	140	V
Ambient temperature, operation and stand-by	t_{amb}	max.	50	°C [6]

NOTES

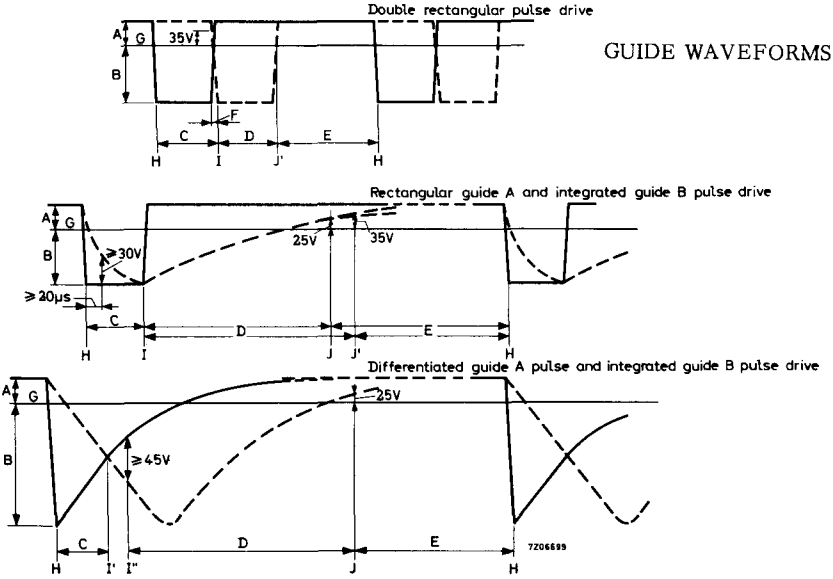
1. If the power supply does not have a suitable time constant as one of its characteristics, it can be conveniently obtained by inserting a resistor in series with the supply voltage and a capacitor to earth (4.7 kΩ and 0.25 μF for 1.0 ms, 6.8 kΩ and 1.0 μF for 6.0 ms).
2. This value should not exceed 40 V.
3. The adjacent guide cathode (the cathode to which the discharge is being transfered) must also be 45 V negative with respect to the most positive main cathode supply voltage.
4. For cathodes 4, 5 and 6, the leading edge of the resetting pulse should have a rate of fall not exceeding 140 V per ms. Resetting will occur within 1 ms after the voltage has reached 120 volts.
5. The high current permitted during reset should not be allowed to flow for more than a few seconds.
6. It is preferable to store the tube as near as possible to room temperature.



GUIDE OPERATING VOLTAGES

The shaded areas represent regions where the tube may be used without restriction initially and during life

GUIDE WAVEFORMS



A Positive guide supply voltage

B Negative guide voltage

C Guide A dwell time

D Guide B dwell time

E Main cathode dwell time

F Interval between trailing edge of guide A pulse and leading edge of guide B pulse

G Potential of most positive main cathode supply voltage

H Discharge transfers from main cathode to guide A cathode

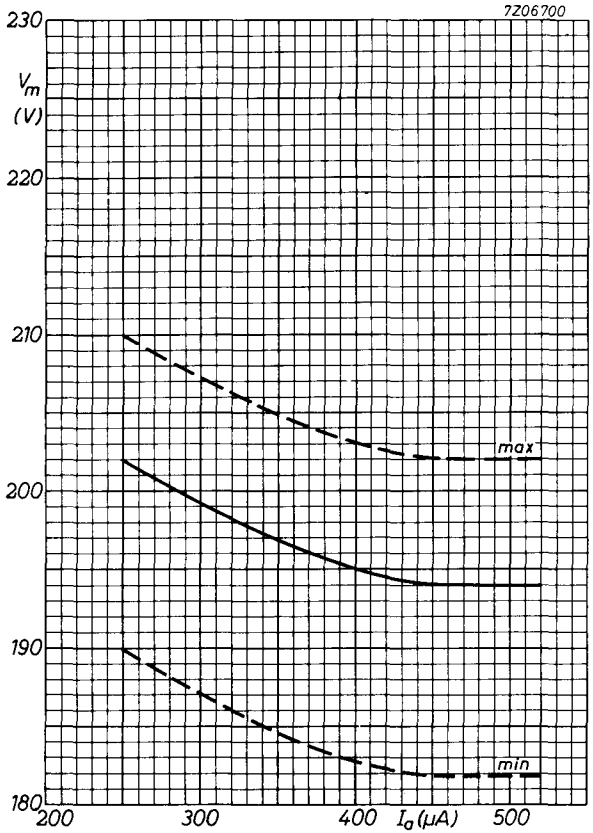
I Discharge transfers from guide A cathode to guide B cathode

I' Earliest instant for discharge transfer from guide A cathode to guide B cathode

I'' Latest instant for discharge transfer from guide A cathode to guide B cathode

J Latest instant for discharge transfer from guide B cathode to main cathode, for a main cathode dwell time > 1 ms

J' Latest instant for discharge transfer from guide B cathode to main cathode dwell time ≤ 1 ms



Anode to main cathode maintaining voltage plotted against anode current

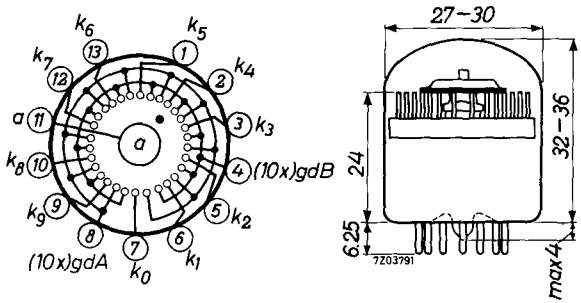
SELECTOR TUBE

Cold cathode gas-filled bi-directional decade selector and counting tube.
This tube has ten main cathodes, all of which are brought out separately.
The Z505S gives visual indication and operates at speeds up to 50 kHz.

QUICK REFERENCE DATA			
Maximum counting speed		50	kHz
Supply voltage	V_{ba}	500	V
Output, current		800	μA
voltage		24	V
Indication		position of glow; end viewing	

DIMENSIONS AND CONNECTIONS

Base: B13B



K_0 is aligned with pin 7 to within $\pm 3^0$

Mounting position: any

This tube has been designed to close tolerances so that no individual adjustment is necessary to align the bulb with the escutcheon.

Accessories

Socket	type 2422 505 00001
Escutcheon	type 55062

General note

All voltages are referred to the most positive supply potential to which any main cathode (not guide cathode) is returned.

CHARACTERISTICS AND RANGE VALUES FOR EQUIPMENT DESIGN

(initial and during life)

Ignition requirements				
Anode supply voltage	V_{ba}	400 to 1000		V
Time constant of rise of anode supply voltage		min.	2	ms [1]
Discharge at rest on a main cathode				
Maintaining voltage of anode to main cathode at I_a = 0.8 mA, V_{bgd} = 55 V				
maximum	V_m	max.	275	V
minimum	V_m	min.	240	V
Cathode current,				
recommended	I_k		0.8	mA
maximum	I_k	max.	1.0	mA
minimum	I_k	min.	0.6	mA
Guide supply voltage				
maximum	V_{bgd}	max.	65	V
minimum	V_{bgd}	min.	40	V
Resistance between guides and guide supply	R_{gd}	max.	22	kΩ
Cathode potential (except during reset)				
non conducting cathode	$-V_k$	max.	14	V
conducting cathode, positive	V_k	max.	28	V [2]
negative	$-V_k$	max.	0	V
Stepping requirements See also page 4				
Discharge dwell time,				
main cathode		min.	8.0	μs
Guide A		min.	6.0	μs
Guide B		min.	6.0	μs
Interval between trailing edge of guide A pulse and leading edge of guide B pulse (double rectangular pulse drive)		max.	0.3	μs
Guide voltage to step the discharge from a main cathode to an adjacent guide cathode	$-V_{gd}$	max. min.	80 30	V V

[1] [2] See page 5

CHARACTERISTICS AND RANGE VALUES FOR EQUIPMENT DESIGN (continued)

Voltage difference required between a guide and the adjacent guide in order to step the discharge	$V_{gd\text{-}gd}$	max. min.	140 30	V V [3]
Guide supply voltage to step the discharge from a guide to the next main cathode	V_{bgd}	max. min.	65 40	V V
Cathode potential				
non conducting cathodes	$-V_k$	max.	14	V
conducting cathode, positive	V_k	max.	28	V [2]
negative	$-V_k$	max.	0	V
Resetting requirements [4]				
Cathode voltage	$-V_k$	max. min.	140 100	V V [5]

LIFE

A typical tube can be expected to count correctly with the following conditions after standing on one main cathode for a period of approximately 4500 hours.

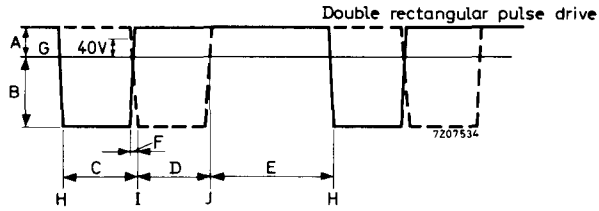
Anode current	I_a	0.8	mA
Guide supply voltage	V_{bgd}	60	V
Guide voltage for transfer	V_{gd}	-50	V
Output cathode (k_o) voltage,			
non conducting	V_o	5.0	V
conducting	V_o	-5.0	V
Guide A dwell time		6.0	μs
Guide B dwell time		6.0	μs
Cathode dwell time		8.0	μs
Temperature		20 ± 5	°C

[2)][3)][4)][5)] See page 5

LIMITING VALUES (Absolute max. rating system)

Anode supply voltage	V_{ba}	max.	1000	V
Cathode current (except during reset)	I_k	max.	1.0	mA
Voltage between any two main or guide cathodes (except during reset)		max.	140	V
Guide supply voltage	V_{bgd}	max.	65	V
Reset voltage, negative		max.	140	V
Ambient temperature	t_{amb}	max.	50	°C [1])

GUIDE WAVEFORMS



A Positive guide supply voltage

B Negative guide voltage

C Guide A dwell time

D Guide B dwell time

E Main cathode dwell time

F Interval between trailing edge of guide A pulse and leading edge of guide B pulse

G Potential of most positive main cathode supply voltage

H Discharge transfers from main cathode to guide A

I Discharge transfers from guide A to guide B

J Latest instant for discharge transfer from guide B to main cathode, dwell time $\leq 500\ \mu s$.

[1]) It is preferable to store the tube as near as possible to room temperature.

NOTES

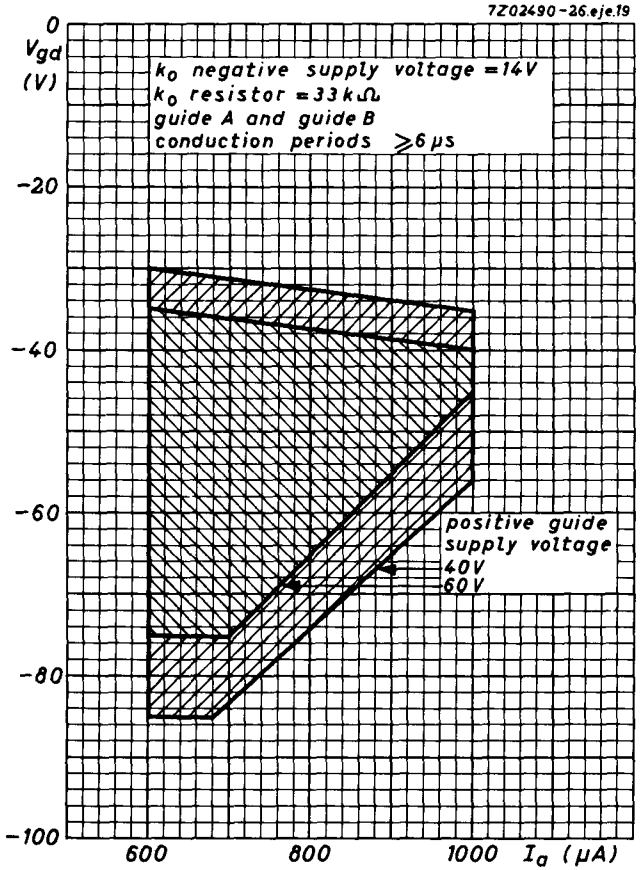
1) If the power supply does not have a time constant of 2 ms as one of its characteristics, it can conveniently be obtained by inserting a resistor in series with the anode supply and a capacitor to the negative return.
(4.7 kΩ and 0.5 μF for 2 ms).

2) The maximum voltage difference between any two main cathodes except during reset must not exceed 28 V.

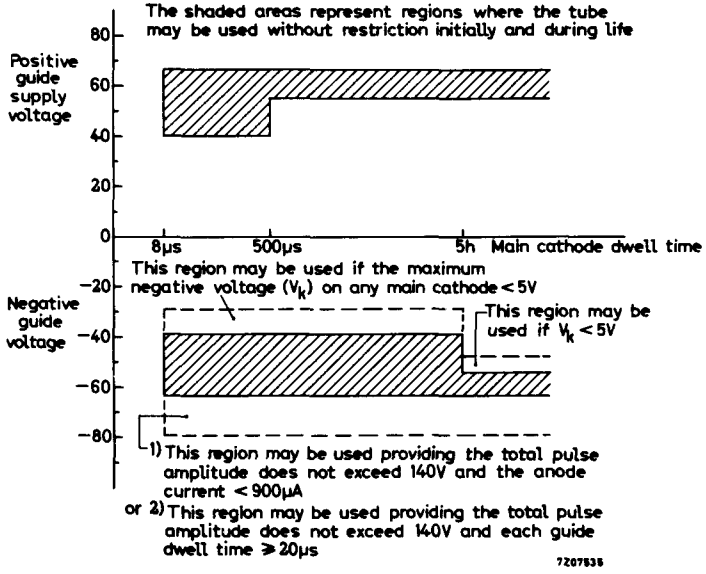
3) The adjacent guide (the cathode to which the discharge is being transferred) must also be 30 V negative with respect to the most positive main cathode supply voltage.

4) The high current which passes during reset should not be allowed to flow more than a few seconds.

5) If the cathode current falls below 0.7 mA when the guide voltage applied to the tube approaches the minimum value of 40 V the negative voltage required for resetting may rise to 110 V.



Guide voltage to ensure stepping.
The area of operation is increased with the use of larger pulse periods

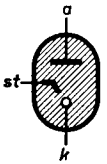


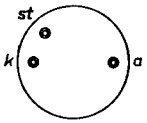
Guide operating voltages

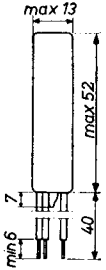
PHILIPS Z 50T

COLD CATHODE TRIGGER TUBE for use as a switching tube for "on-off" control
TUBE A DECLENCHEMENT A CATHODE FROIDE pour utilisation comme tube de commutation pour le réglage "on-off"
TRIGGER-RÖHRE MIT KALTER KATODE zur Verwendung als Schalt-Röhre für "Ein-Aus"-Regelung

Dimensions in mm
Dimensions en mm
Abmessungen in mm







Typical characteristics
Caractéristiques types
Kenndaten

		min.		max.	
V_a ign	=	175	-	-	V
V_{st} ign (V_a = 130 V, C_{k-st} = 56000 pF[1])	=	66[2]	71[2]	80 [2)3)]	V
V_a (I_a = 2-6 mA)	=	54	61	67	V
I_{st} transf (V_a = 130 V)	=	-	50	100	µA
T_{ion}	=	-	-	50	µsec[4)]
T_{dion}	=	-	-	200	µsec[5)]

Limiting values (ABSOLUTE LIMITS)
Valeurs limites (LIMITES ABSOLUES)
Grenzdaten (ABSOLUTWERTE)

I_k	= min.	2 mA	[3)]
I_k	= max.	6 mA	[6)]
I_{kp}	= max.	24 mA	[6)]
t_{amb}	= min.	-40 °C	
t_{amb}	= max.	+60 °C	

[1]) Capacitor between starter and cathode
Condensateur entre starter et cathode
Kondensator zwischen Starter und Katode

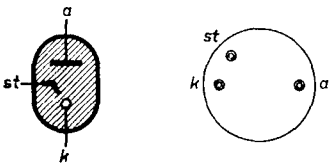
[2]) See page 2; voir page 2; siehe Seite 2
[3][4][5])See page 3; voir page 3; siehe Seite 3
[5][6]) See page 4; voir page 4; siehe Seite 4

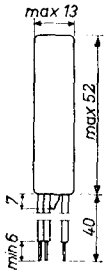
PHILIPS

Z 50T

COLD CATHODE TRIGGER TUBE for use as a switching tube for "on-off" control
TUBE A DECLENCHEMENT A CATHODE FROIDE pour utilisation comme tube de commutation pour le réglage "on-off"
TRIGGER-RÖHRE MIT KALTER KATODE zur Verwendung als Schalt-Röhre für "Ein-Aus"-Regelung

Dimensions in mm
Dimensions en mm
Abmessungen in mm





Typical characteristics
Caractéristiques types
Kenndaten

		min.		max.	
V_a ign	=	175	-	-	V
V_{st} ign (V_a = 130 V, C_{k-st} = 56000 pF[1])	=	66[2]	71[2]	80 [2)3)]	V
V_a (I_a = 2-6 mA)	=	54	61	67	V
I_{st} transf (V_a = 130 V)	=	-	50	100	µA
T_{ion}	=	-	-	50	µsec[4)]
T_{dion}	=	-	-	200	µsec[5)]

Limiting values (ABSOLUTE LIMITS)
Valeurs limites (LIMITES ABSOLUES)
Grenzdaten (ABSOLUTWERTE)

I_k	= min.	2 mA[3)]
I_k	= max.	6 mA[6)]
I_{kp}	= max.	24 mA[6)]
t_{amb}	= min.	-40 °C
t_{amb}	= max.	+60 °C

[1]) Capacitor between starter and cathode
Condensateur entre starter et cathode
Kondensator zwischen Starter und Katode

[2]) See page 2; voir page 2; siehe Seite 2
3)4)5)See page 3; voir page 3; siehe Seite 3
5)6) See page 4; voir page 4; siehe Seite 4

4.4.1956

←

Life expectancy: 6000 hours current life at 6 mA D.C.
Durée de vie prévue: 6000 heures de service à 6 mA C.C.
Erwartete Lebensdauer: 6000 Betriebsstunden bei 6 mA Gleichstrom

Mounting : The tube should be so mounted that ambient light can impinge on the cathode

Tubes must be protected against shock and vibration; therefore it is recommended to use the Rubber Supporting Ring no. 40645. This ring should be mounted in a chassis hole of 15 mm diameter (Thickness of chassis 1 mm)See figure below

Montage : Le tube devra être monté de telle façon que la cathode puisse reçevoir la lumière ambiante

Les tubes doivent être protégés contre chocs et vibrations; il est donc recommandé d'utiliser une Bague de Traversée en caoutchouc no.40645 Cette bague doit être montée sur une ouverture de châssis de 15 mm de diamètre (épaisseur du châssis: 1 mm) Voir la figure au-dessous

Einbau : Die Röhre ist so zu montieren dass Lichteinfall auf die Katode möglich ist

Zum Schutz der Röhren gegen Stösse und Vibrationen empfiehlt es sich den Gummihaltering Nr.40645 zu verwenden.Dieser Ring soll in eine Chassisbohrung von 15 mm Durchmesser montiert werden (Chassisdicke 1 mm) Siehe untenstehende Abbildung



---

[2]) Tube exposed to some light.Full sunlight or complete darkness should be avoided

Tube à exposer à une lumière moyenne. L'on devra éviter la lumière solaire directe et l'obscurité totale

Die Röhre muss einem gewissen Lichteinfall ausgesetzt sein; helles Sonnenlicht oder völliger Dunkelheit sind zu vermeiden

Life expectancy: 6000 hours current life at 6 mA D.C.
Durée de vie prévue: 6000 heures de service à 6 mA C.C.
Erwartete Lebensdauer: 6000 Betriebsstunden bei 6 mA Gleichstrom

Mounting : The tube should be so mounted that ambient light can impinge on the cathode

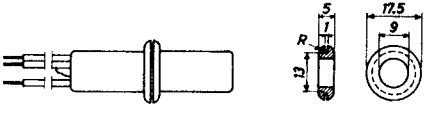
Tubes must be protected against shock and vibration; therefore it is recommended to use the Rubber Supporting Ring no. 40645. This ring should be mounted in a chassis hole of 15 mm diameter (Thickness of chassis 1 mm)See figure below

Montage : Le tube devra être monté de telle façon que la cathode puisse reçevoir la lumière ambiante

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[2]) Tube exposed to some light.Full sunlight or complete darkness should be avoided

Tube à exposer à une lumière moyenne. L'on devra éviter la lumière solaire directe et l'obscurité totale

Die Röhre muss einem gewissen Lichteinfall ausgesetzt sein; helles Sonnenlicht oder völliger Dunkelheit sind zu vermeiden

3) When using circuitry with short anode current pulses with average current < 2 mA (e.g. oscillators, counting circuits), $V_{st\ ign}$ may increase to 95 V

Lors de l'utilisation dans un circuit comportant de courtes impulsions de courant anodique avec un courant moyen inférieur à 2 mA (notamment dans: oscillateurs, circuits de comptage), la tension de rupture du starter peut monter jusqu'à 95 V

In Schaltungen mit kurzfristigen Anodenimpulsen mit einem mittleren Strom < 2 mA (z.B. Oszillatoren, Zählschaltungen), kann sich die Starterzündspannung bis 95 V erhöhen

4) Tube exposed to min. 60 lux
Tube à exposer à 60 lux au min.
Die Röhre muss einem Lichteinfall von min.60 Lux ausgesetzt sein

5) The deionization time is defined as the minimum duration of the negative square step voltage applied to the anode , required for extinguishing the tube (starter and cathode interconnected via a resistor) This time is dependent on the amplitude of the negative step i.e. the voltage on the anode during the extinguishing time, on the anode voltage on the tube after removal of the step voltage and also on the current through the tube before applying the negative step.
200 µsec. deionization time refers to values of 40 V on the anode during the step voltage and 160 V on the anode after removal of the step voltage (voltage on extinguished tube) and 2 mA anode current before applying the step voltage. With values of resp. 0 V and 160 V on the anode and 6 mA the deionization time is about 600 µsec.

La durée de désionisation est definié comme étant la durée minimum de la tension rectangulaire négative appliquée à l'anode, et nécessaire pour l'extinction du tube (starter et cathode reliées par une résistance) La durée de désionisation dépend: 1° de l'amplitude de la tension rectangulaire négative, c.a.d. de la tension sur l'anode pendant la période d'extinction, 2° de la tension anodique sur le tube apres disparition de l'impulsion négative et 3° du courant traversant le tube avant application de l'impulsion négative
Une durée de désionisation de 200 µsec se rapporte à des valeurs de 40 V sur l'anode pendant l'impulsion et de 160 V sur l'anode après disparition de l'impulsion (tension sur le tube une fois éteint), et à un courant anodique de 2 mA avant application de l'impulsion négative. Pour des valeurs de respectivement 0 et 160 V sur l'anode et de 6 mA, la durée de désionisation sera d'environ 600 µsec

3) When using circuitry with short anode current pulses with average current < 2 mA (e.g. oscillators, counting circuits), $V_{st\ ign}$ may increase to 95 V

Lors de l'utilisation dans un circuit comportant de courtes impulsions de courant anodique avec un courant moyen inférieur à 2 mA (notamment dans: oscillateurs, circuits de comptage), la tension de rupture du starter peut monter jusqu'à 95 V

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5) Die Entionisierungszeit wird definiert als die minimale Dauer der negativen Rechteckspannung (angelegt an der Anode) um die Röhren zu löschen (Starter und Katode mittels eines Widerstandes verbunden). Die Entionisierungszeit ist von der Amplitude des negativen Impulses abhängig, also abhängig von der während der Löschzeit an der Anode liegende Spannung und von der an der Röhre nach entfernen des Impulses herrschende Anodenspannung sowie vom Strom der die Röhre vor Anlegen des negativen Impulses durchfliesst
Die Entionisierungszeit von 200 µSek gilt für Spannungswerten von 40 V an der Anode während des Impulses und 160 V an der Anode nach entfernen des Impulses (Spannung an gelöschter Röhre) und einen Anodenstrom von 2 mA vor Anlegen des Impulses. Bei entsprechenden Werten von 0 bzw. 160 V an der Anode und 6 mA ist die Entionisierungszeit etwa 600 µSek.

6) When used at a continuous current of α mA ($\alpha > 6$), tube life will be shortened with a factor of about $(\frac{6}{\alpha})^{3 \text{ to } 4}$

Lorsque le tube sera utilisé sous un courant continu de α mA ($\alpha > 6$), sa durée de vie sera abrégée d'un facteur d'environ $(\frac{6}{\alpha})^{3 \text{ jusqu'à } 4}$

Wird die Röhre mit einem Gleichstrom von α mA betrieben ($\alpha > 6$), so erniedrigt sich die Lebensdauer um einem Faktor von etwa $(\frac{6}{\alpha})^{3 \text{ bis } 4}$

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Wird die Röhre mit einem Gleichstrom von α mA betrieben ($\alpha > 6$), so erniedrigt sich die Lebensdauer um einem Faktor von etwa $(\frac{6}{\alpha})^{3 \text{ bis } 4}$

PHILIPS

Electronic Tube

HANDBOOK

Z50T

page	sheet	date
1	1	1955.09.09
2	1	1956.04.04
3	2	1955.09.09
4	2	1956.04.04
5	3	1955.09.09
6	3	1956.04.04
7	4	1955.09.09
8	4	1956.04.04
9	FP	2000.01.14

PHILIPS

Z 510M

Cold-cathode gas-filled DECADE NUMERICAL INDICATOR TUBE with the figures 0 to 9 in red neon colour
TUBE INDICATEUR DE NUMEROS DECIMAUX à cathode froide et à remplissage de gaz, avec les chiffres de 0 jusqu'à 9 en couleur rouge de neon
Gasgefüllte KALTKATODENRÖHRE ZUR ANZEIGUNG DER DEZIMALEN ZAHLEN, mit den Ziffern von 0 bis 9 in roter Neonfarbe

Typical characteristics
Caractéristiques types
Kenndaten

V_{ign} = max. 160 V

Extinguishing voltage
Tension d'extinction = min. 100 V
Löschspannung

Operating characteristics
Caractéristiques d'utilisation
Betriebsdaten

V_{ba} =	170	250	300	350 V
V_{arc} =	127	127	127	127 V
R_a =	15	56	82	100 kΩ

Note: Optimum life performance is obtained when a constant current circuit is used providing a cathode current between 2.0 and 2.5 mA.
Observation: La durée optimum est obtenue en utilisant un montage à courant constant avec une intensité de courant cathodique entre 2,0 et 2,5 mA.
Bemerkung: Die optimale Lebensdauer wird erhalten indem ein konstanter Stromkreis mit einem Katodenstrom zwischen 2,0 und 2,5 mA verwendet wird.

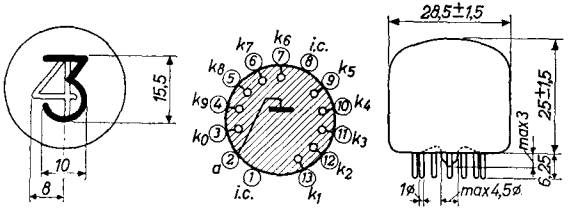
Limiting values (Absolute limits)
Caractéristiques limites (Limites absolues)
Grenzdaten (Absolute Grenzwerte)

I_k (T_{av} = max. 0,02 sec)	= max. 3 mA [1])
I_k	= min. 1,5 mA [1])
I_{kp}	= max. 15 mA [1])
t_{amb}	= -65 °C/+70 °C

[1]) Each digit; chaque chiffre; jede Ziffer

Z 510M PHILIPS

Dimensions in mm; Dimensions en mm; Abmessungen in mm



Diameter of the pitch circle of the base pins 16.65 mm
Diamètre du cercle primitif des broches 16,65 mm
Durchmesser des Teilkreises der Stifte 16,65 mm

The figures may show an inclination of max. 3°
Les chiffres peuvent avoir une inclinaison de 3° au max.
Die Ziffern können eine Neigung von max. 3° zeigen

Socket
Support B8 700 67
Fassung

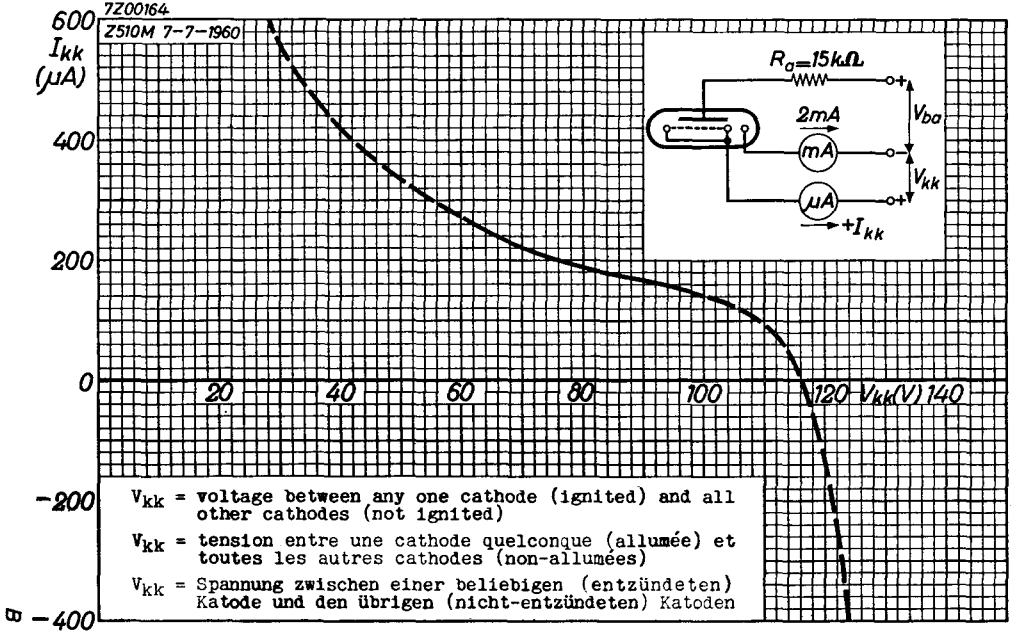
Mounting position: arbitrary
Montage: arbitrairement
Einbau: beliebig

Remark: The current I_{kk} (see page B) shall not exceed 300 µA; otherwise the not ignited cathodes become hazy
Observation: Le courant I_{kk} (voir page B) ne dépassera pas une intensité de 300 µA; sinon les cathodes non-allumées deviennent visibles
Bemerkung: Der Strom I_{kk} (siehe Seite B) soll 300 µA nicht überschreiten, da sonst die nicht-entzündeten Katoden sichtbar werden

ZZ00163
Z510M 7-7-1960
Current limits
Limites de courant
Stromgrenzen
V_o (V)
140
130
120
110
1
1,5
2
2,5
3 I_K(mA)

9.9.1960

A


7Z00164
Z510M 7-7-1960
600
I_{kk} (μA)
400
200
0
−200
−400
20
40
60
80
100
120
V_{kk}(V) 140
R_a=15kΩ
2mA
mA
μA
V_{ba}
V_{kk}
$+I_{kk}$
V_{kk} = voltage between any one cathode (ignited) and all other cathodes (not ignited)
V_{kk} = tension entre une cathode quelconque (allumée) et toutes les autres cathodes (non-allumées)
V_{kk} = Spannung zwischen einer beliebigen (entzündeten) Katode und den übrigen (nicht-entzündeten) Katoden

PHILIPS

Electronic Tube

HANDBOOK

Z510M

page	sheet	date
1	1	1960.09.09
2	2	1960.09.09
3	A	1960.09.09
4	B	1960.09.09
5	FP	1999.12.24

PHILIPS Z520M

Cold-cathode gasfilled DECADE NUMERICAL INDICATOR TUBE with very long life. The figures 0 to 9 light in bright red colour with improved contrast due to filter-coating of the bulb.

TUBE INDICATEUR DE NUMÉROS DÉCIMAUX à cathode froide et à remplissage de gaz de très longue durée. Les chiffres de 0 jusqu'à 9 sont montrés en couleur rouge clair avec contraste amélioré par une couche filtrante à l'ampoule.

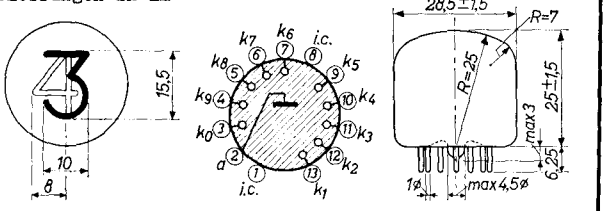
Gasgefüllte KALTKATODENRÖHRE ZUR ANZEIGUNG DER DEZIMALEN ZAHLEN mit sehr langer Lebensdauer. Die Ziffern 0 bis 9 werden in hellroter Farbe mit durch eine Filterschicht am Kolben verbessertem Kontrast gezeigt.

Application: The tube is designed to convert electrical information into optical signals. The figures become visible at the same spot, so making possible "in-line" read-out. The tube can e.g. be used in digital voltmeters, cash registers, calculating machines, etc. It may be controlled by mechanical switches, transistors, cold-cathode trigger tubes, beam switching tubes, photo-conductive devices, etc.

Application: Le tube est conçu pour la transformation d'information électrique en signaux optiques. Les chiffres sont montrés au même endroit, faisant possible une lecture en ligne d'un nombre. Le tube peut être utilisé par exemple dans les voltmètres numériques, les caisses enregistreuses, les machines à calculer, etc. Il peut être commandé par moyen de commutateurs mécaniques, de transistors, de tubes de déclenchement à cathode froide, de tubes commutateurs par faisceau électronique, de cellules photo-conductives, etc.

Anwendung: Die Röhre ist geeignet für die Umwandlung von elektrischen in optische Signale. Die Ziffern werden alle an derselben Stelle gezeigt, so dass eine Zahl geradlinig abgelesen werden kann. Die Röhre kann z.B. in numerischen Voltmetern, Registrierkassen, Rechenmaschinen, u.ä. verwendet werden. Sie kann von mechanischen Schaltern, Transistoren, Relaisröhren, Elektronenstrahl-Schaltröhren, Photoleitern, u.s.w. gesteuert werden.

Dimensions in mm
Dimensions en mm
Abmessungen in mm



Socket; support; Fassung B8 700 67

Mounting position: any. The tube is viewed through the dome of the envelope
Montage: arbitrairement. Le tube est vu à travers le dôme de l'enveloppe
Einbau: willkürlich. Die Röhre wird durch den Dom der Umhüllung abgelesen.

Diameter of the pitch circle of the base pins 16.65 mm
Diametre du cercle primitif des broches 16,65 mm
Durchmesser des Teilkreises der Stifte 16,65 mm

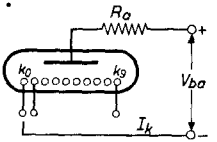
The figures may show an inclination of max. 3°
Les chiffres peuvent avoir une inclinaison de 3° au max.
Die Ziffern können eine Neigung von max. 3° zeigen

Life expectancy (under recommended operating conditions)
Durée prévue (sous les conditions de fonctionnement conseillées)
Lebensdauer (unter den empfohlenen Betriebsbedingungen)

Continuous display of one digit Présentation continue d'un chiffre Fortwährende Anzeige einer Ziffer	min. 5000	hrs. Stunden
Sequentially changing the display from one digit to the others every 100 hrs. or less Changement consécutif d'un chiffre aux autres chaque 100 heures ou moins Jede 100 Stunden oder nach kürzerer Zeit Wechsel der Anzeige von einer Ziffer nach einer der anderen	30000	hrs. Stunden

Operating characteristics
Caractéristiques d'utilisation
Betriebsdaten

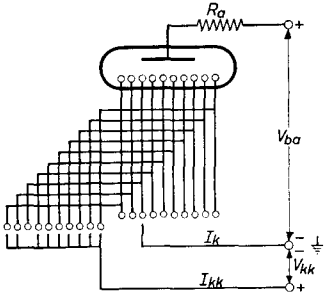
I. Static operation; fonctionnement statique; statischer Betrieb (See also page A; voir aussi page A; siehe auch Seite A).



V_{ba} =	170	250	300	350 V
R_a =	15	56	82	100 kΩ
V_a =	140	140	140	140 V

Operating characteristics (continued)
Caractéristiques d'utilisation (suite)
Betriebsdaten (Fortsetzung)

II. Static operation with cathode bias (See also page B.)
Fonctionnement statique avec polarisation cathodique (*Voir aussi page B*)
Statischer Betrieb mit Katodenvorspannung (Siehe auch Seite B)



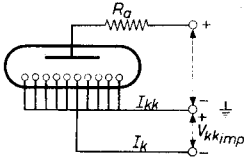
The cathode-bias voltage is the potential difference V_{kk} between the "off" cathodes and the "on" cathode. With low values of V_{kk} the current I_{kk} to the "off" cathodes wil increase and the readability of the "on" cathode will be affected. For this reason V_{kk} should not be lower than 60 V.

La polarisation cathodique est la différence de potentiel V_{kk} entre les cathodes hors circuit et la cathode en circuit. Aux valeurs basses de V_{kk} le courant I_{kk} des cathodes hors circuit augmentera et la lisibilité de la cathode en circuit est diminuée. Pour cette raison la valeur de V_{kk} ne doit pas être plus petite que 60 V.

Die Katodenvorspannung ist der Potentialunterschied V_{kk} zwischen den nicht-gezündeten Katoden und der gezündete Katode. Bei niedrigen Werten von V_{kk} wird der Strom I_{kk} der nicht-gezündeten Katoden grösser werden und die Leserlichkeit der gezündeten Katode slechter. Aus diesem Grunde soll V_{kk} nicht niedriger als 60 V sein.

Operating characteristics (continued)
Caractéristiques d'utilisation (suite)
Betriebsdaten (Fortsetzung)

III. Pulsed operation
Fonctionnement par impulsions
Impulsbetrieb

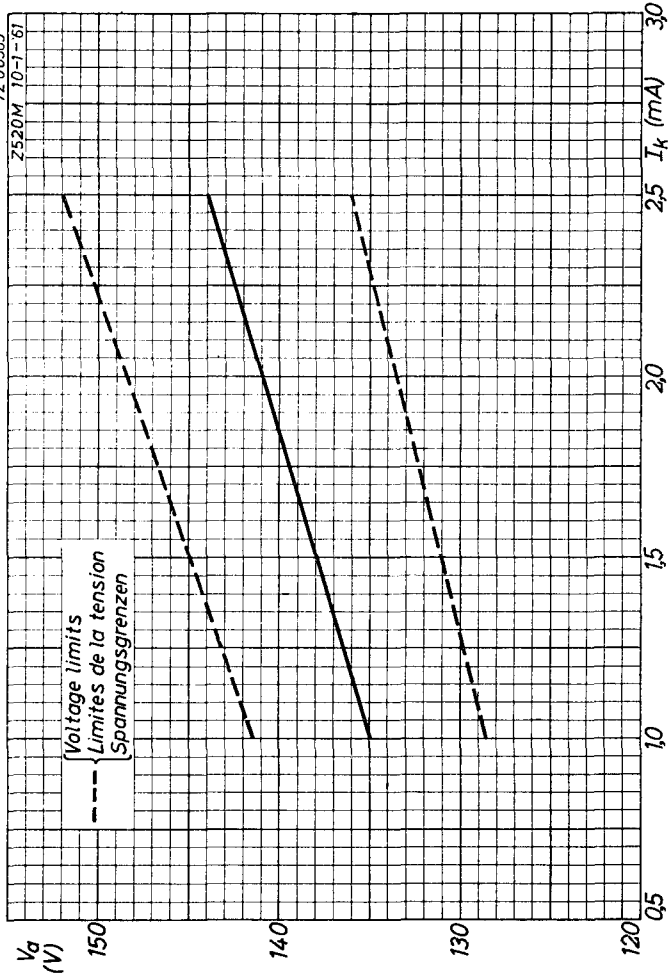


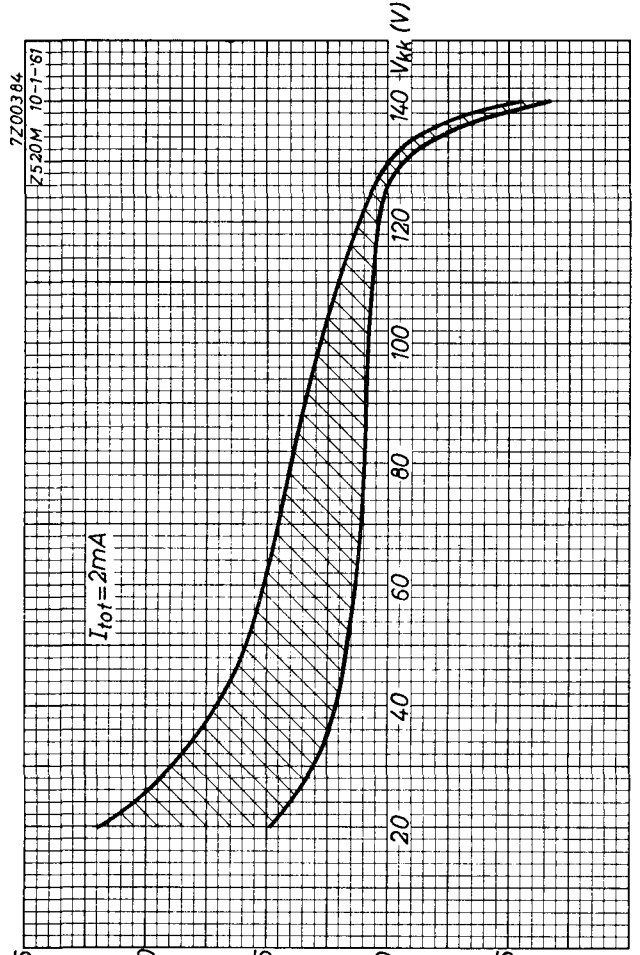
For information please apply to the manufacturer
Pour plus de renseignements prière de s'adresser au fabricant
Für Näheres soll den Hersteller zu Rate gezogen werden

Limiting values (Absolute limits)
Caractéristiques limites (Limites absolues)
Grenzdaten (Absolute Grenzwerte)

Voltage necessary for ignition Tension requise pour l'amorçage Zur Zündung erforderliche Spannung	= min. 160 V
Extinguishing voltage Tension d'extinction Löschspannung	= max. 120 V
I_k Each digit / Chaque chiffre / Jede Ziffer	= max. 2,5 mA [1]
I_k For complete glow of each digit / Pour l'éclairage complet de chaque chiffre / Für völlige Aufleuchtung jeder Ziffer	= min. 1,0 mA [1]
I_{kp}	= max. 15 mA
Voltage between anode and "off" cathodes Tension entre l'anode et les cathodes hors circuit Spannung zwischen der Anode und den nicht-gezündeten Katoden	= max. 120 V
t_{amb}	= max. 75 °C

[1]) T_{av} = max. 0,1 sec


ZZ00385
Z520M 10-1-61
Voltage limits
Limites de la tension
Spannungsgrenzen
V_a (V)
150
140
130
120
0,5
1,0
1,5
2,0
2,5
3,0
I_K (mA)


7Z00384
Z520M 10-1-61
I_{tot}=2mA
I_{kk} (mA)
1,5
1,0
0,5
0
-0,5
-1,0
20
40
60
80
100
120
140
V_{kk} (V)

PHILIPS

Electronic Tube

HANDBOOK

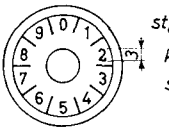
Z520M

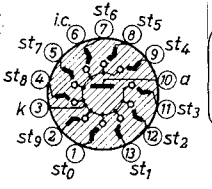
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5	A	1961.06.06
6	B	1961.06.06
7	FP	2000.01.14

PHILIPS Z550M

Cold cathode gas-filled decade NUMERICAL INDICATOR TUBE with figures 0 to 9 in red neon colour
TUBE INDICATEUR DES NUMÉROS DÉCIMAUX à cathodes froides et à remplissage de gaz, avec les chiffres 0 jusqu'à 9 en couleur rouge de néon
Gasgefüllte KALTKATODENRÖHRE ZUR ANZEIGUNG DER DEZIMALEN ZÄHLEN, mit den Ziffern von 0 bis 9 in roter Neonfarbe

Dimensions in mm
Dimensions en mm
Abmessungen in mm





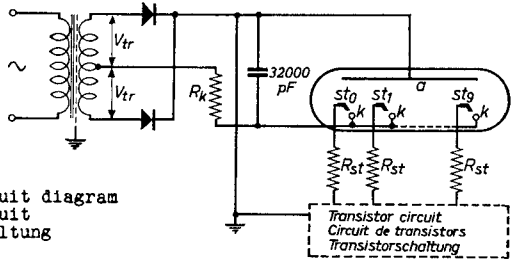
Socket, support, Fassung: B8 700 67

For visual indication the tube is viewed through the dome of the envelope. The numbers will appear upright when the tube is mounted with the line through pins 1 and 8 vertical, pin 1 being uppermost. Number 0 is aligned with pin 1 to within 3°.
Pour l'indication visuelle le tube est vu à travers le dôme de l'enveloppe. Les chiffres se montrent d'aplomb si le tube est monté de manière que le plan des broches 1 et 8 soit vertical, la broche 1 en haut. Le numéro 0 est aligné à la broche 1 au-dedans de 3°.
Die Röhre wird durch den Dom der Umhüllung abgelesen. Die Ziffern stehen aufrecht, wenn die Röhre so eingebaut wird dass die Ebene durch den Stiften 1 und 8 senkrecht steht, Stift 1 oben. Die Lage der Ziffer 0 fällt innerhalb 3° mit Stift 1 zusammen.

Operating characteristics
Caractéristiques d'utilisation
Betriebsdaten

V_{tr}	=	110 V
R_k	=	6,8 kΩ
R_{st}	=	330 kΩ
V_{arc}	=	84 V
I_k	=	4 mA

For circuit diagram see page 2
Pour le circuit voir page 2
Für die Schaltung siehe Seite 2



Circuit diagram
Circuit
Schaltung

The rectified voltage should be free from spikes
La tension redressée doit être exempte d'impulsions de tension
Die gleichgerichtete Spannung soll keine Spannungsstösse haben

To control the indication of a given figure, the potential of the starter of that figure should be raised by a minimum of 5 V with respect to the remaining starters. The common starter bias potential may deviate by a maximum of ± 5 V from the anode potential
Pour la commande de l'indication d'un certain chiffre, le potentiel de l'électrode d'amorçage de ce chiffre doit être élevé de 5 V au minimum par rapport aux autres électrodes d'amorçage. La différence entre la polarisation commune des électrodes d'amorçage et la tension anodique ne doit pas dépasser ± 5 V.
Zur Steuerung der Anzeige einer bestimmten Ziffer soll die Spannung an der betreffenden Zündelektrode in bezug auf die übrigen Zündelektroden um mindestens 5 V erhöht werden. Die gemeinsame Zündelektrodenvorspannung darf um max. ± 5 V von der Anodenspannung abweichen.

Limiting values (Absolute limits)
Caractéristiques limites (Limites absolues)
Grenzdaten (Absolute Grenzwerte)

V_a	= max. 150 V_{eff} [1]	
	= min. 90 V_{eff} [1]	
I_k	= max. 6 mA	
R_{st}	= max. 470 kΩ	
	= min. 100 kΩ	
t_{amb}	= -55 °C/+70 °C	

[1]) Unsmoothed rectified voltage
Tension redressée non-filtrée
Nicht-geglättete, gleichgerichtete Spannung

PHILIPS

Electronic Tube

HANDBOOK

Z550M

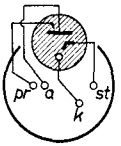
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3	FP	1999.12.24

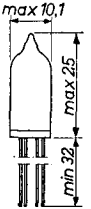
PHILIPS Z 70U

Cold cathode TRIGGER TUBE with positive starter voltage and equipped with priming electrode
TUBE DECLENCHEUR à cathode froide avec tension du déclencheur positive et équipé d'une électrode auxiliaire (primer)
RELAISRÖHRE mit kalter Katode, mit positiver Starterspannung und ausgeführt mit einer Hilfselektrode (Primer)

Application: D.C. counting and switching circuits
Obtainable counting speed 3-5 kc/s
Application: Des circuits de comptage et de commutation C.C.
Vitesse de comptage réalisable 3-5 kHz
Anwendung : Gleichstromzähl- und Schaltkreisen
Erhältliche Zählgeschwindigkeit 3-5 kHz

Dimensions in mm
Dimensions en mm
Abmessungen in mm





Typical characteristics
Caractéristiques types
Kenndaten

$V_{st\ ign}$ (V_a = 250 V)	= 137-153 V[1])
Individual voltage shift of $V_{st\ ign}$ during life Changement individuel de $V_{st\ ign}$ pendant la vie Individuelle Verschiebung von $V_{st\ ign}$ während der Lebensdauer	= max. ±5 V
V_{st} (I_{st} = 50 µA)	= 105 V
V_a (I_a = 3 mA)	= 113-121 V[1])
$V_{a\ ign}$	= min.325 V
$V_{pr-a\ ign}$	= max.210 V
V_{pr-a} (burning voltage) (tension de régime) (Brennspannung)	= 175 V
$I_{st\ transf}$ ($V_{a\ ign}$ = 250 $V_{=}$)	= max. 20 µA$_{=}$

[1]) These limits are valid during life
Ces limites sont valables pendant la durée de vie du tube
Diese Grenzen gelten für die gesamte Lebensdauer

PHILIPS Z70U

Cold cathode TRIGGER TUBE with positive starter voltage and equipped with priming cathode. chiefly intended for use in D.C. supplied circuits

TUBE DÉCLENCHEUR à cathode froide avec tension de déclenchement positive et équipé d'une cathode auxiliaire (primer). Le tube est destiné tout d'abord à l'utilisation dans circuits alimentés par C.C.

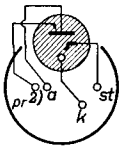
RELAISRÖHRE mit kalter Katode, positiver Starterspannung und ausgeführt mit einer Hilfskatode (Primer), zunächst bestimmt zur Verwendung in Gleichstromkreisen

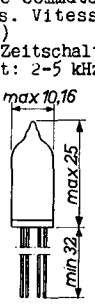
Application: In counting and switching circuits and in timers. Obtainable counting speed: 2-5 kc/s [1])

Application: Dans circuits de comptage et de commutation et dans interrupteurs horaires. Vitesse de comptage réalisable: 2-5 kHz [1])

Anwendung : In Zähl- und Schaltkreisen und in Zeitschaltern. Erhältliche Zählgeschwindigkeit: 2-5 kHz [1])

Dimensions in mm
Dimensions en mm
Abmessungen in mm





Base, culot, Sockel: SUBMINIATURE

Directly soldered connections to the leads of this tube must be at least 5 mm from the seals and any bending of the leads must be at least 2 mm from the seals

Ne pas faire de soudures à moins de 5 mm et ne pas plier les fils de sortie à moins de 2 mm de l'embase

Lötanschlüsse an den Drahtausführungen müssen mindestens 5 mm, etwaige Biegestellen mindestens 2 mm von den Glasdurchführungen entfernt sein

Typical characteristics [3])
Caractéristiques types [3])
Kenndaten

V_{stign} (V_a = 250 V⎓)	=	137 - 153 V [4])
$I_{st\ transf}$ (V_a = 250 V⎓)	= max.	30 µA
V_{st} (I_{st} = 0 -200 µA)	=	[5])
V_a (I_a = 3 mA)	=	113 - 121 V
$V_{a\ ign}$ [6])	= min.	360 V 325 V
$V_{pr-a\ ign}$	= max.	200 V
V_{pr-a} (I_{pr} = 3 µA) [7])	=	155 V

[1])[2])[3])[4])[5])[6])[7]) See page 2; voir page 3; siehe Seite 4

Subminiature cold-cathode TRIGGER TUBE with positive starter voltage, chiefly intended for use in D.C. circuits. In order to obtain a short ignition delay time the tube is equipped with a priming cathode

TUBE DÉCLENCHEUR à cathode froide subminiature avec tension de déclenchement positive, destiné tout d'abord à l'utilisation dans des circuits alimentés par C.C. Afin d'obtenir un temps de déclenchement court le tube est equipé d'une cathode auxiliaire (primer)

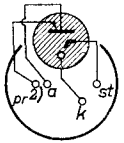
RELAISRÖHRE mit kalter Katode und positiver Starterspannung in Subminiaturtechnik, zur Verwendung in Gleichstromkreisen. Zur Erhaltung kurzer Auslösezeiten ist die Röhre mit einer Hilfskatode (Primer) versehen

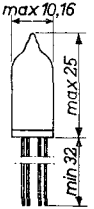
Application: In counting and switching circuits and in timers. Obtainable counting speed: 2-5 kc/s, dependent upon the tolerances of the components and the stability of the supply voltage

Application: Dans des circuits de comptage et de commutation et dans des interrupteurs horaires. Vitesse de comptage réalisable: 2-5 kHz, dépendant des tolérances des éléments de montage et de la stabilité de la tensiond'alimentation

Anwendung: In Zähl- und Schaltkreisen und in Zeitschaltern. Erhältliche Zählgeschwindigkeit: 2-5 kHz, abhängig von den Toleranzen der Schaltungsteile und von der Stabilität der Speisespannung

Dimensions in mm
Dimensions en mm
Abmessungen in mm





Base, culot, Sockel: SUBMINIATURE

Directly soldered connections to the leads of this tube must be at least 5 mm from the seals and any bending of the leads must be at least 2 mm from the seals

Ne pas faire de soudures à moins de 5 mm et ne pas plier les fils de sortie à moins de 2 mm de l'embase

Lötanschlüsse an den Drahtausführungen müssen mindestens 5 mm, etwaige Biegestellen mindestens 2 mm von den Glasdurchführungen entfernt sein

[2]) pr = priming cathode; cathode auxiliaire; Hilfskatode

Subminiature cold cathode TRIGGER TUBE with priming cathode to eliminate breakdown delay. The tube has one starter, which is controlled by a positive potential.
A red neon glow is emitted during conduction.

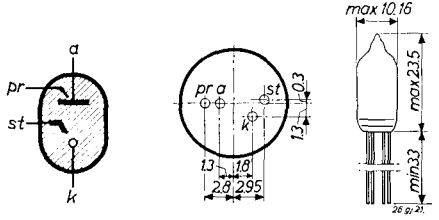
APPLICATION

Counters, scalers, etc. up to 5 kc/s
Logic circuit element in connection with photo-electric devices.
Pulse generators, pulse shapers, pulse amplifiers.
General relay services.
Timers.

QUICK REFERENCE DATA

Anode supply voltage	V_{ba}	=	250 V
Starter breakdown voltage	$V_{st\ ign}$	=	145 V
Starter transfer requirements			
capacitance	C_{st}	=	100 pF
current	I_{st}	=	11 µA
Average cathode current	I_k	=	max. 5 mA
Anode to cathode maintaining voltage	V_{am}	=	116 V

Dimensions in mm



Tinned leads 0.43 mm diameter

Limiting values (ABSOLUTE LIMITS)
Caractéristiques limites (LIMITES ABSOLUES)
Grenzdaten (ABSOLUTE WERTE)

V_{ba}	= max.	310 V
I_k	= max.	3 mA ⎓ [2]
I_{kp}	= max.	12 mA [3]
I_{pr}	= min.	1 µA
	= max.	10 µA

Remarks

a. During operation manual touching should be avoided

b. The tube gives a bright red glow when ignited

c. The working of the tube is independent on lighting conditions

Observations

a. On devra éviter de toucher le tube avec la main en cours de fonctionnement

b. Lorsque le tube est allumé, il donne une lueur rouge brillante

c. Le tube fonctionne dans l'obscurité totale. Son fonctionnement est indépendant des conditions d'éclairage

Bemerkungen

a. Berührung mit den Fingern während des Betriebes ist zu vermeiden

b. Die Röhre zeigt nach Zündung ein hellrotes Glimmlicht

c. Die Röhre arbeitet in völliger Dunkelheit. Die Funktion der Röhre ist unabhängig von den Beleuchtungsumständen

[2] T_{av} = 1 sec.

[3] Higher peak currents may be tolerated in special cases
Dans certains cas particuliers, des valeurs plus élevées sont admissibles
In Sonderfälle sind höhere Werte zulässig

Limiting values (absolute limits)
Caractéristiques limites (limites absolues)
Grenzdaten (Absolutwerte)

V_{ba}	= max.	310 V [3]
I_k ($T_{av} \leq 1$ sec)	= max.	4 mA [8]
I_{kp}	= max.	16 mA [9]

Page 2 in English; page 3 en Français; Seite 4 auf deutsch

Remarks

a. The starter and primer circuit elements should be mounted close to the tube

b. In capacitivetrigger circuits the capacitance should have a value between 50 pF and 1000 pF. The required capacitance value is inversely proportional to the anode voltage. The value of the starter series resistor with priming discharge ignited must not exceed 20 MΩ. Higher resistor values may be tolerated in special cases

c. If a tube is ignited by means of pulses of short duration the total starter voltage (bias + pulse) must exceed 153 V. A typical value with a 100 pF coupling capacitor is 175 V

d. With ignited tube the negative starter current should not exceed 100 µA. When the tube is extinguished negative starter current should be avoided

e. During operation touching with conductive elements should be avoided

f. The operation of the tube is independent of lighting conditions. The tube shows a bright red glow when ignited

---

[1]) Dependent on the tolerances of the components and the stability of the supply voltage

[2]) Priming cathode, giving a short ignition delay time

[3]) Measured with priming discharge ignited and also valid during life

[4]) The individual ignition voltage drift during life is generally less than 3 V

[5]) See curve on page B

[6]) Starter connected to cathode

[7]) Recommended priming cathode resistor 18 MΩ

[8]) The recommended cathode current range with continuous operation is 2-4 mA

[9]) Higher peak currents may be tolerated in special cases

Typical characteristics (D.C. values; with priming discharge ignited; valid during life)
Caractéristiques types (Valeurs de tensions et de courants continus; décharge de la cathode auxiliaire amorcée; valables pendant toute la durée du tube)
Kenndaten (Gleichspannungs- und Gleichstromwerte; mit entzündeter Hilfskatodenentladung; gültig für die gesamte Lebensdauer)

$V_{st\ ign}$ (V_a = 250 V⎓)	= 137-153 V [1]
Temperature coefficient of $V_{st\ ign}$ Coefficient de température de $V_{st\ ign}$ Temperaturkoeffizient von $V_{st\ ign}$	= max. -25 mV/°C
$I_{st\ transf}$ (V_a = 250 V⎓)	= max. 30 µA [2]
V_{st}	= [3]
V_a (I_a = 3 mA)	= 111-121 V [4]
$V_{a\ ign}$ (V_{st} = 0 V)	= 360 V [5] = min. 325 V
$V_{pr-a\ ign}$	= max. 200 V
V_{pr-a} (I_{pr} = 3 µA)	= 155 V
I_k	= 2-4 mA [6]
I_{pr}	= 1-10 µA [6]
R_{pr}	= 18 MΩ [6]

[1]) See fig. 1. The individual ignition voltage drift during life in normal applications is generally less than 3 V. When a tube is ignited for very long periods, drawing negative starter current a greater drift of the ignition voltage may occur. It is therefore advisable to design the circuit for this application for an ignition voltage of 175 V
Voir fig. 1. La déviation individuelle de la tension d'amorçage pendant la vie en applications normales est généralement moins de 3 V. Si un tube est amorcé pendant de très longues périodes à un courant négative de l'électrode d'amorçage, une déviation plus grande de la tension d'amorçage peut se présenter. Dans ce cas il est à conseiller d'étudier le circuit pour une tension d'amorçage de 175 V
Siehe Abb. 1. Der individuelle Verlauf der Zündspannung während der Lebensdauer bei normaler Verwendung ist im allgemeinen weniger als 3 V. Wenn aber eine Röhre während sehr langen Perioden bei negativem Starterstrom gezündet ist, kann gelegentlich ein grösserer Verlauf der Zündspannung auftreten. Es ist deshalb in diesem Falle zu raten die Schaltung für eine Zündspannung von 175 V zu entwickeln

[2]) See fig. 2; voir fig. 2; siehe Abb. 2
[3]) See fig. 3; voir fig. 3; siehe Abb. 3
[4]) See fig. 4; voir fig. 4; siehe Abb. 4
} Page A,B / Seite A,B

[5]) See page C; voir page C; siehe Seite C
[6]) Recommended values; valeurs recommandées;empfohlene Werte

MOUNTING

Directly soldered connections to the leads must be at least 5 mm from the seals and any bending of the leads must be at least 2 mm from the seals.

When soldering into the circuit the heat conducted to the glass-to-metal seals should be kept to a minimum by the use of a thermal shunt.

The leads may be dip soldered to min. 5 mm from the seals at a solder temperature of 240°C during max. 10 sec.

The starter and priming cathode circuit resistors and capacitors should be mounted close to the tube.
Touching the envelope by live components should be avoided. It is recommended to maintain a distance of at least some mm between components and any part of the envelope.

The tube may strike spontaneously when mounted in an electric field, the propability of striking being dependent on the field strength (direction and magnitude) and its rate of change. If necessary an electrostatic shield connected to the cathode can be mounted around the tube.

---

1) The value quoted relates to a tube which has been non-conducting during an appreciable time. The average value for the voltage breakdown depression is 4 V/mA. Normal values for $V_{a\ ign}$ will be restored within 30 sec. after conduction.

2) Almost independent of the anode supply voltage between V_{ba} = 200 V and 300 V. See also page C

3) Almost independent of the cathode current

4) When establishing the electrical characteristics of a large number of tubes, it will be found that for each characteristic at least 95 % of the tubes investigated will meet the figures quoted.

5) To determine the starter current in a particular application (sign and magnitude) a load-line for R_{st} can be drawn on the I_{st}/V_{st} characteristic. See example page A for R_{st} = 1 MΩ and V_{bst} = -100 V.

Observations

a. Les éléments de montage de l'électrode d'amorçage et de l'électrode auxiliaire doivent être montés près du tube

b. Dans circuits déclencheurs capacitifs la capacité aura une valeur entre 50 pF et 1000 pF. La valeur de capacité requise est inversement proportionnelle à la tension anodique. La valeur de la résistance série de l'électrode d'amorçage en décharge amorcée de l'électrode auxiliaire doit rester en deçà de 20 MΩ. En certains cas particuliers des valeurs de résistance plus élévées sont tolérables

c. Si un tube est amorcé par moyen d'impulsions de courte durée, la tension totale de l'électrode d'amorçage (tension de polarisation + tension d'impulsion) doit dépasser 153 V. Une valeur type avec un condensateur de couplage de 100 pF est de 175 V

d. Quand le tube est amorcé le courant négatif de l'électrode d'amorçage doit rester en deçà de 100 µA. Quand le tube est étouffé il faut éviter un courant négatif de l'électrode d'amorçage

e. On devra éviter de toucher le tube avec des objets conductifs en cours de fonctionnement

f. Le fonctionnement du tube est indépendant des conditions d'éclairage. Quand le tube est amorcé une lueur rouge brillante se produit

---

[1]) Dépendant des tolérances des éléments de montage et de la stabilité de la tension d'alimentation

[2]) Cathode auxiliaire (primer) donnant un court temps de retard de l'amorçage

[3]) Mesurées en décharge amorcée de la cathode auxiliaire et aussi valables pendant la durée de vie du tube

[4]) La déviation individuelle de la tension d'amorçage pendant la vie est généralement moins de 3 V

[5]) Voir la courbe sur page B

[6]) L'électrode d'amorçage reliée à la cathode

[7]) La valeur recommandée pour la résistance série de la cathode auxiliaire est de 18 MΩ

[8]) La gamme recommandée du courant cathodique en service continu est de 2-4 mA

[9]) En certains cas particuliers des courants de crête plus élévés sont tolérables

Dynamic characteristics
Caractéristiques dynamiques
Dynamische Kenndaten

$V_{st\ ign}$ (T_{imp} = 20 µsec) = max. 175 V [1])

$V_{imp} + V_{st}$ = 200 V [2])

Anode delay time
Retard anodique = 5 µsec [3])
Anodenauslösezeit

Max. counting frequency
Fréquence de comptage max. = 2-5 kc/s [4])
Max. Zählfrequenz

Typical component values for self quenching pulse forming circuits
Valeurs des pièces de montage pour des circuits de mise en forme des impulsions à autodécoupage
Werte der Schaltelemente für selbstlöschende Impulsformerschaltungen

R	1,8	1,2	0,7	MΩ
C	300	600	2000	pF

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[1]) Circuit fig. 5; circuit fig. 5; Schaltung Abb. 5

[2]) Recommended value; see fig. 5
Valeur recommandée; voir fig. 5
Empfohlener Wert; siehe Abb. 5

[3]) Circuit fig. 6; circuit fig. 6; Schaltung Abb. 6

[4]) See fig. 6; dependent on the component tolerances and the stability of the supply voltage
Voir fig. 6; dépendant des tolérances des éléments de montage et de la stabilité de la tension d'alimentation
Siehe Abb. 6; abhängig von den Toleranzen der Schaltungsteile und der Stabilität der Speisespannung

A. CHARACTERISTICS FOR D.C. IGNITION (with continuous priming discharge)

A.1 Limits applicable to all tubes (initial values)

Anode to cathode breakdown voltage at V_{st} = 0 V	$V_{a\ ign}$	= min. 340 V 1)
Anode to primer breakdown voltage	$V_{pr\ ign}$	= max. 200 V
Starter to cathode breakdown voltage at V_{ba} = 250 V	$V_{st\ ign}$	= 137 to 153 V 2)
Anode to cathode maintaining voltage	V_{am}	= 111 to 121 V 3)

A.2 Typical limits 4) (initial values)

D.C. starter current for anode breakdown at V_{ba}=250 V (See also page B)	I_{st}	= 3 to 25 µA
Starter to cathode maintaining voltage at I_{st} = 30 µA and I_a = 0 mA (See also page A)	V_{stm}	= 105 to 125 V
Temperature coefficient of starter to cathode breakdown voltage averaged over the range t_{bulb} = -55 to +100 °C	$\frac{\Delta V_{st\ ign}}{\Delta t_{bulb}}$	= max. -25 mV/°C

A.3 Typical life performance 4)

(Valid up to 20 000 hours with alternating stand-by and operating periods, within a cathode current range of 2 to 5 mA and with zero or positive starter current. See also page A and note 5) for calculating the starter current)

Drift in starter to cathode breakdown voltage at V_{ba} = 250 V	$\Delta V_{st\ ign}$	= max. 5 V
Anode to cathode maintaining voltage	V_{am}	= max. 122 V
Anode to primer maintaining voltage at I_{pr} = 3 µA. (See also page E)	V_{pr_m}	= 140 to 180 V
Starter to cathode maintaining voltage at I_{pr} = 30 µA, I_a = 0 mA	V_{stm}	= max. 128 V
D.C. starter current for anode breakdown at V_{ba}=250 V	I_{st}	= max. 30 µA

1)2)3)4)5) See page 2

Bemerkungen

a. Die Schaltelemente des Starter- und Hilfselektrodenkreises müssen in der Nähe der Röhre montiert werden

b. In kapazitiven Starterkreisen soll die Kapazität einen Wert zwischen 50 pF und 1000 pF haben. Der benötigte Kapazitätswert ist umgekehrt proportional zu der Anodenspannung. Der Wert des Starter-Serienwiderstandes bei entzündeter Hilfselektrodenentladung muss niedriger als 20 MΩ sein. In Sonderfällen sind höhere Widerstandswerte zulässig

c. Wenn die Röhre mittels kurzdauriger Impulse entzündet wird muss die gesamte Starterspannung (Vorspannung + Impulsspannung) höher als 153 V sein. Ein Kennwert bei einem Kopplungskondensator von 100 pF ist 175 V

d. Bei entzündeter Röhre muss der negative Starterstrom niedriger als 100 µA sein. Bei nicht-entzündeter Röhre ist negativer Starterstrom zu vermeiden

e. Berührung mit leitfähigen Körpern während des Betriebs ist zu vermeiden

f. Die Wirkung der Röhre ist unabhängig von den Beleuchtungsumständen. Nach Entzündung zeigt die Röhre ein hellrotes Glimmlicht

---

1) Abhängig von den Toleranzen der Schaltungsteile und von der Stabilität der Speisespannung

2) Hilfskatode (Primer) zur Erzielung einer kurzen Zündverzögerungszeit

3) Gemessen bei entzündeter Hilfskatodenentladung und auch gültig für die gesamte Lebensdauer

4) Der individuelle Verlauf der Zündspannung während der Lebensdauer ist im allgemeinen weniger als 3 V

5) Siehe Kennlinie auf Seite B

6) Zündelektrode mit der Katode verbunden

7) Der empfohlene Wert für den Hilfskatodenserienwiderstand ist 18 MΩ

8) Der empfohlene Katodenstrombereich bei Dauerbetrieb ist 2-4 mA

9) In Sonderfällen sind höhere Spitzenströme zulässig

Limiting values (Absolute limits)
Caractéristiques limites (Limites absolues)
Grenzdaten (Absolute Grenzwerte)

V_{ba}	= max. 310 V [1] = min. 200 V
I_K (T_{av} = max. 1 sec)	= max. 4 mA [2]
I_{kp}	= max. 16 mA
$-I_{st}$ { tube ignited / tube allumé / gezündete Röhre }	= max. 150 µA
$-I_{st}$ { tube extinguished / tube éteint / gelöschte Röhre }	= max. 0 µA
R_{st}	= max. 20 MΩ
t_{amb}	= max. 70 °C

Negative starter pulse voltage
Tension d'impulsion négative de l'électrode de déclenchement
Negative Impulsspannung der Starterelektrode

$-V_{stimp}$ (V_b = 300 V)	= max. 30 V
$-V_{stimp}$ (V_b = 200 V)	= max. 50 V

Mounting: The starter and priming cathode circuit elements should be mounted close to the tube. As, however, the tube is sensitive to unintentional triggering when touched by conductive elements components, printed circuit tracks, etc. should be kept away at a distance of min. 2 mm from the bulb

Montage: Les éléments de montage du circuit de l'électrode de déclenchement et de la cathode auxiliaire doivent être montés près du tube. Cependant, le tube étant sensible au déclenchement non-intentionnel par suite de contact avec des éléments conductifs, il faut maintenir une distance de 2 mm au moins entre les éléments de montage, les conducteurs des circuits imprimés, etc. et l'ampoule

Einbau: Die Schaltelemente der Starterelektrode und der Hilfskatode müssen nahe an die Röhre montiert werden. Da aber eine Berührung der Röhre mit leitenden Gegenständen zu nicht beabsichteter Zündung führen kann, muss eine Abstand von mindestens 2 mm zwischen der Röhre und den Schaltelementen eingehalten werden

[1]) With priming discharge ignited
Avec décharge allumée de la cathode auxiliaire
Mit gezündeter Hilfskatodenentladung

[2]) Higher peak currents are permissible in pulse forming circuits
Des courants de crête plus élevés sont permis dans des circuits de mise en forme des impulsions
Höhere Spitzenwerte sind erlaubt in Impulsformerschaltungen

B. CHARACTERISTICS FOR PULSED IGNITION (with continuous priming discharge)

B.1 Limits applicable to all tubes (initial values)

Anode to cathode breakdown voltage at Vst = 0 V	$V_{a\ ign}$	= min. 340 V [1]
Anode to primer breakdown voltage	$V_{pr\ ign}$	= max. 200 V
Sum of bias and pulse voltages to ensure ignition at V_{b_a} = 250 V and T_{imp} = 20 µsec (See also page D)	$V_{st\ ign\ p}$	= max. 172 V
Anode to cathode maintaining voltage	V_{am}	= 111-121 V [6]

B.2 Typical limits [4] (initial values)

Temperature coefficient of starter to cathode breakdown voltage averaged over the range t_{bulb} = -55 to +100 °C	$\frac{\Delta V_{st\ ign}}{\Delta t_{bulb}}$	= max. -25 mV/°C
Anode breakdown delay time		= max. 5 µsec [7]
Anode recovery time		= max. 170 µsec [8]

B.3 Typical life performance [4]
(Valid up to 30 000 hours at stand-by or continuous operation within the limiting values)

Sum of bias and pulse voltages to ensure ignition	$V_{st\ ign\ p}$	= see page D
Anode to cathode maintaining voltage	V_{am}	= max. 122 V [6]

[1] [4] See page 2

[6] Almost independent of cathode current. Within a time interval of max. 100 µsec after breakdown an abnormal low maintaining voltage may occur. Possible oscillations are excluded.

[7] The anode breakdown delay time is given under the following conditions: Starter overvoltage = 50 V, R_{st} = 1.2 MΩ, C_{st} = 100 pF, V_{b_a} = 200 to 300 V

[8] The anode recovery time is the time required after interruption of the anode current for the starter to regain control. The value is primarily a function of the anode current, as the extinguishing pulse amplitude as well as its duration both depend on the anode supply voltage. The figure quoted is the value of the time constant RC determining the rate of rise of the anode voltage

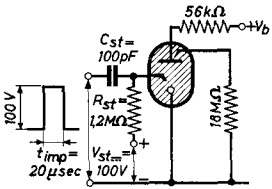


Fig. 5
Abb. 5

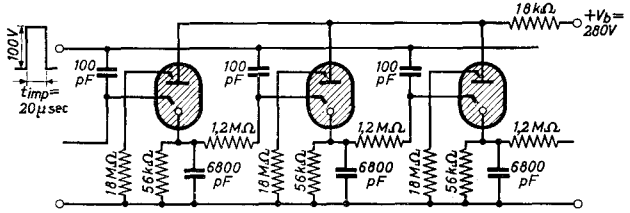


Fig. 6
Abb. 6

If square starter pulses are used, care should be taken for the trailing edge of the pulse at high amplitudes. When using the circuit of fig. 6 with pulses of more than 100 V amplitude, a trailing edge as defined by a time constant of at least 50 µsec must be used. In special cases the tube manufacturer should be consulted

Si l'on utilise des impulsions carrées, il faut faire attention au bord arrière à des amplitudes élevées. En utilisant le circuit de la fig. 6 avec des impulsions d'une amplitude de plus de 100 V, il faut utiliser des impulsions avec un bord arrière défini par une constante de temps de 50 µsec au moins. Dans des cas spéciaux il faut consulter le fabricant du tube

Wenn Rechteckimpulse verwendet werden, muss bei grossen Amplituden die Steilheit am Ende des Impulses speziell beachtet werden. Bei Verwendung der Schaltung gemäss Abb.6 mit Impulsamplituden von mehr als 100 V, müssen Impulse verwendet werden dessen Rückseite durch eine Zeitkonstante von mindestens 50 µSek festgelegt ist. In Spezialfällen soll der Röhrenhersteller zu Rate gezogen werden

→ LIMITING VALUES (Absolute limits)

Anode supply voltage with continuous priming discharge		
with D.C. ignition	V_{ba}	= max. 340 V [1] = min. 200 V
with pulsed ignition	V_{ba}	= max. 310 V = min. 200 V
Peak cathode current (See also page F)	I_{kp}	= max. 200 mA = min. 2 mA
Average cathode current (See also page F)	I_k	= max. 5 mA [2] = min. 2 mA
Positive starter current		
peak value	I_{st_p}	= max. 100 mA
average value	I_{st}	= max. 5 mA [2]
Negative starter current		
with D.C. ignition	$-I_{st}$	= max. 10 µA
with pulsed ignition, anode to cathode gap conducting	$-I_{st}$	= max. 150 µA
with pulsed ignition, anode to cathode gap extinguished	$-I_{st}$	= max. 0 µA
Negative starter pulse voltage		
at V_{ba} = 300 V	$-V_{st_p}$	= max. 30 V
at V_{ba} = 200 V	$-V_{st_p}$	= max. 50 V
Anode to primer voltage	$V_{a\text{-}pr}$	= min. 200 V
Primer current	I_{pr}	= max. 12 µA = min. 1 µA
Envelope temperature	t_{bulb}	= max. 100 °C = min. -55 °C

[1]) The tube may be used with the primer disconnected provided the priming current is delivered by the starter. In this case V_{ba} = min. 180 V

[2]) Averaging time T_{av} = max. 5 sec or = max. 1 cycle, whichever is the shortest

MAXIMUM CIRCUIT VALUES (Absolute limits)

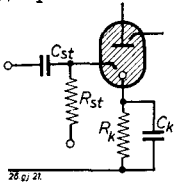
Starter series resistor	R_{st}	= max. 20 MΩ
Starter to cathode capacitor	C_{st-k}	= max. 2000 pF [1]
Starter coupling capacitor	C_{st}	= max. 2000 pF [1] = min. 20 pF
Capacitor which may be charged or discharged through the anode to cathode gap	C	= max. 0.01 µF [1]

TYPICAL COMPONENT VALUES FOR SELF-QUENCHING PULSE FORMING CIRCUITS

The minimum time constant of a self-quenching circuit is 250 µsec. The time constant is the product of the parallel resistance of R_{st} and R_k and C_k

Typical values for R_k and C_k at R_{st} = 1.2 MΩ are:

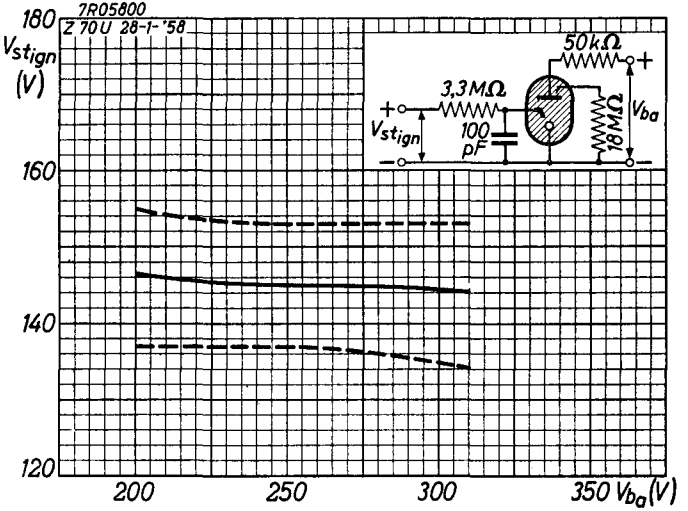
R_k	= 1.8	1.2 MΩ
C_k	= 330	470 pF

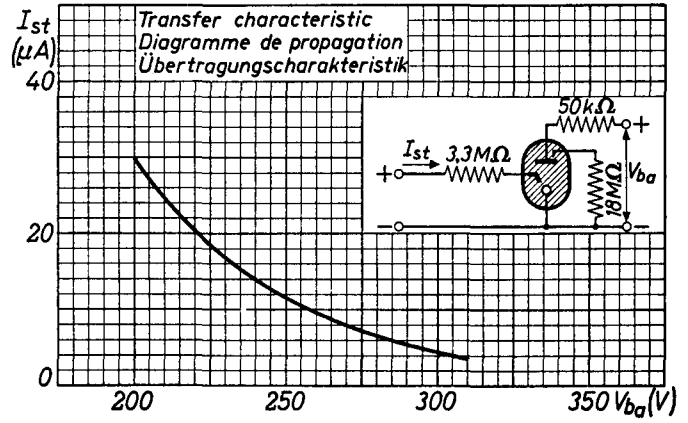


[1]) Higher values of these capacitors are permitted with the use of a resistor in series to limit the peak current to the max. permissible value.

PHILIPS

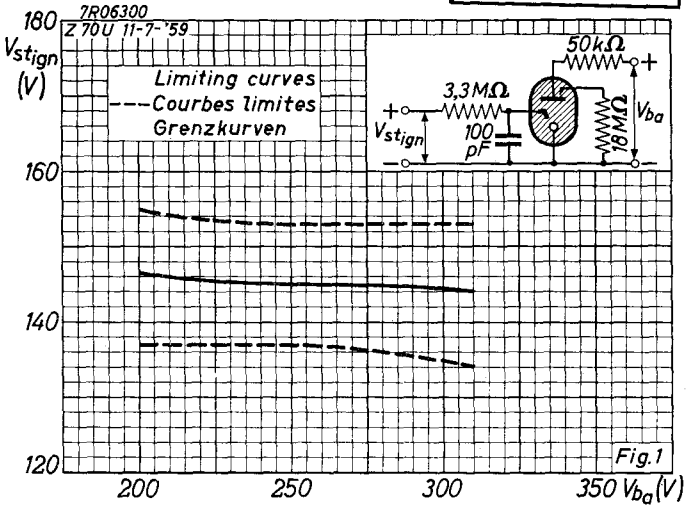
Z70U

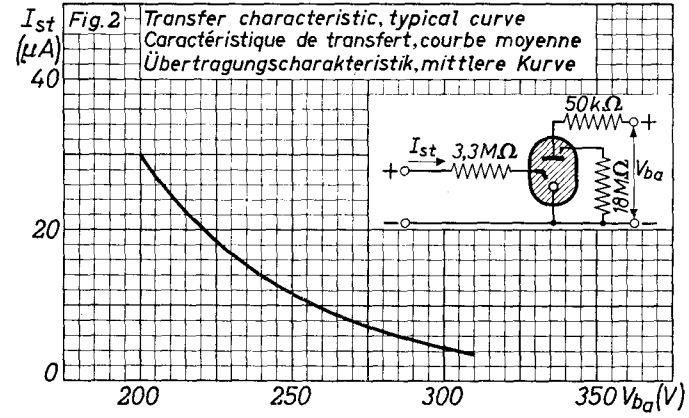




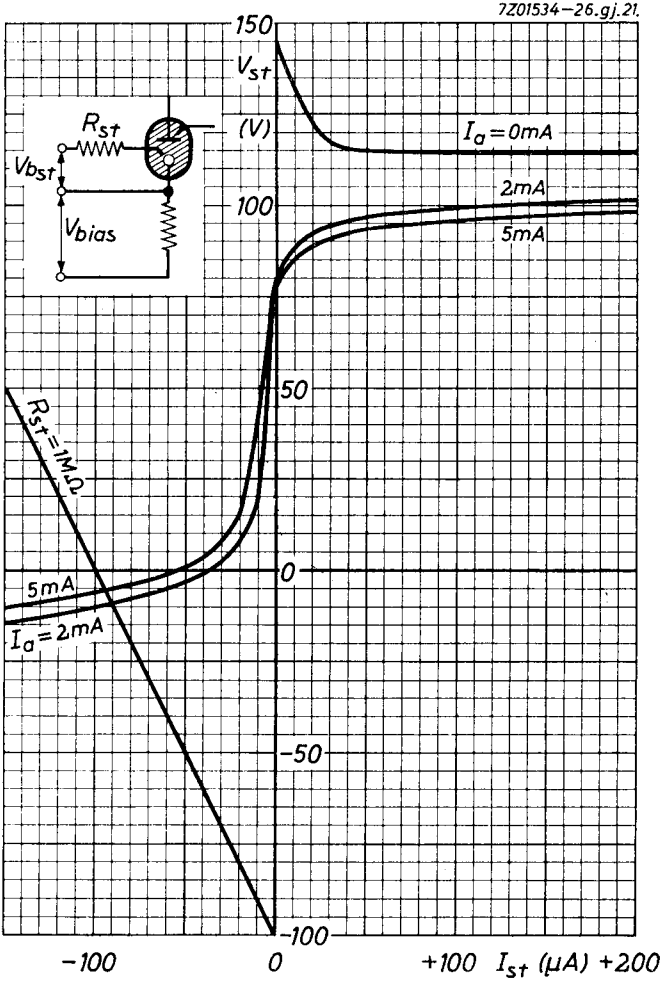
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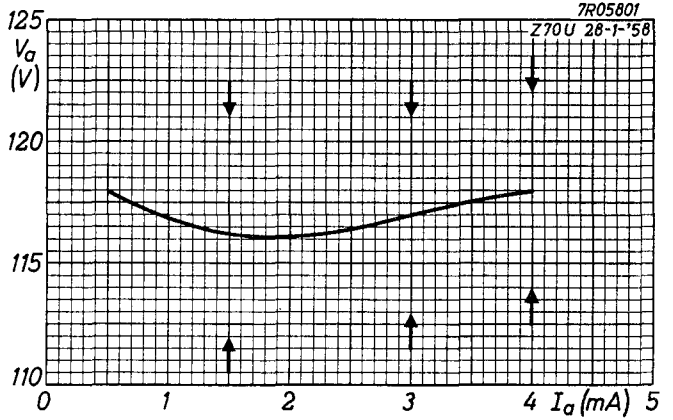
A

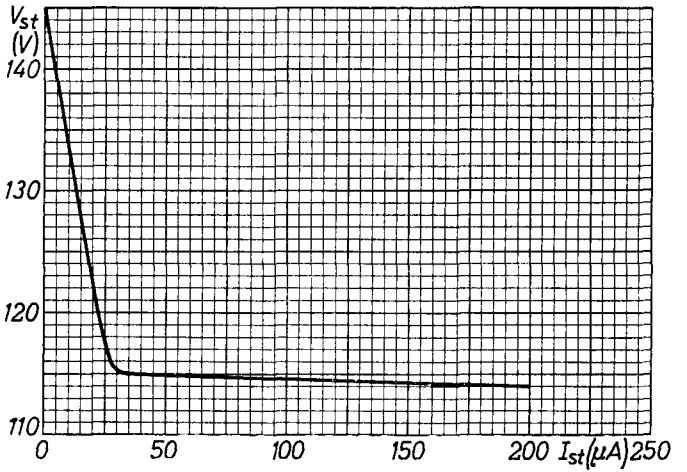

7R06300
Z 70U 11-7-'59
180
V_{stign} (V)
160
140
120
Limiting curves
---Courbes limites
Grenzkurven
50kΩ
3,3MΩ
V_{stign}
100 pF
18MΩ
V_{ba}
200
250
300
350 V_{ba}(V)
Fig.1


I_{st} (μA)
Fig.2 Transfer characteristic, typical curve
Caractéristique de transfert, courbe moyenne
Übertragungscharakteristik, mittlere Kurve
40
20
0
50kΩ
I_{st}
3,3MΩ
18MΩ
V_{ba}
200
250
300
350 V_{ba}(V)

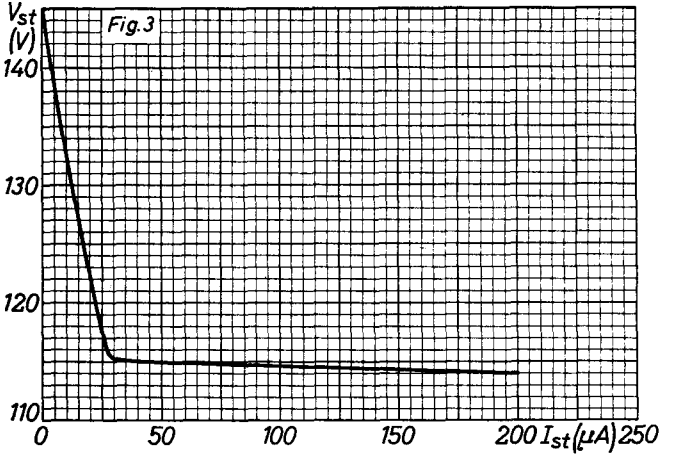
7Z01534-26.gj.21.

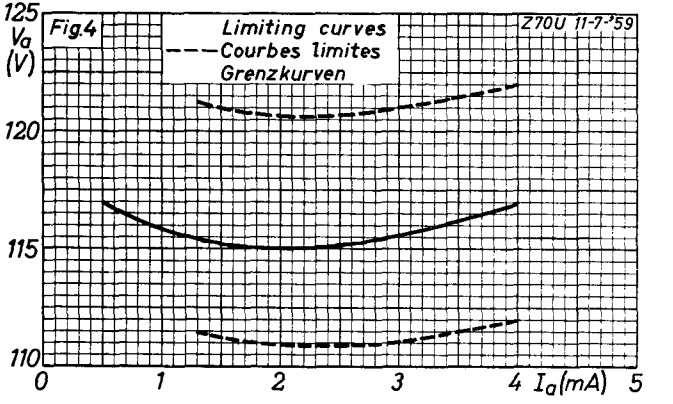



7R05801
Z70U 28-1-'58
125
V_a
(V)
120
115
110
0
1
2
3
4
I_a (mA)
5


V_{st}
(V)
140
130
120
110
0
50
100
150
200
I_{st} (μA)
250

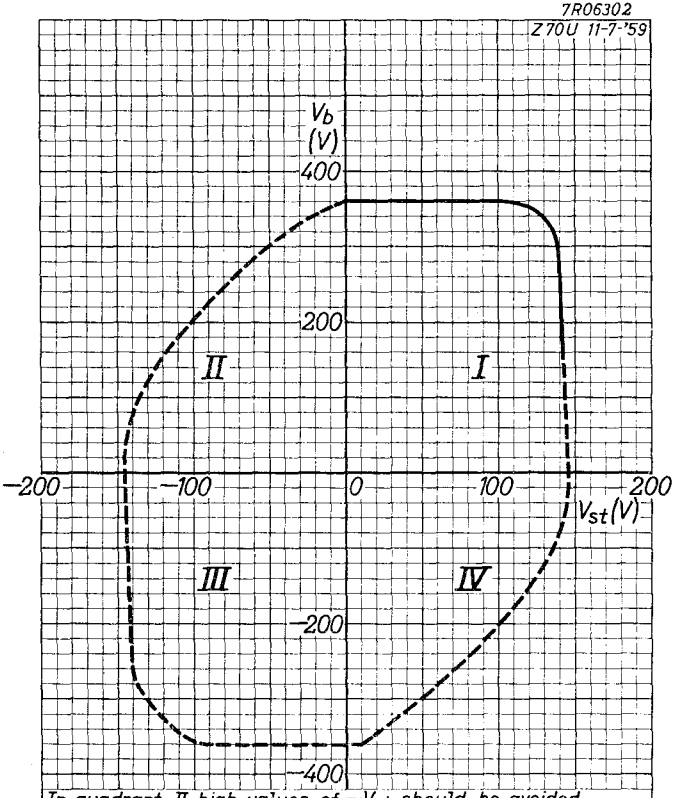
7R06301


Fig.3
V_{st} (V)
140
130
120
110
0
50
100
150
200
I_{st} (μA)
250


Fig.4
Limiting curves
Courbes limites
Grenzkurven
Z70U 11-7-59
125
V_a (V)
120
115
110
0
1
2
3
4
I_a (mA)
5

PHILIPS

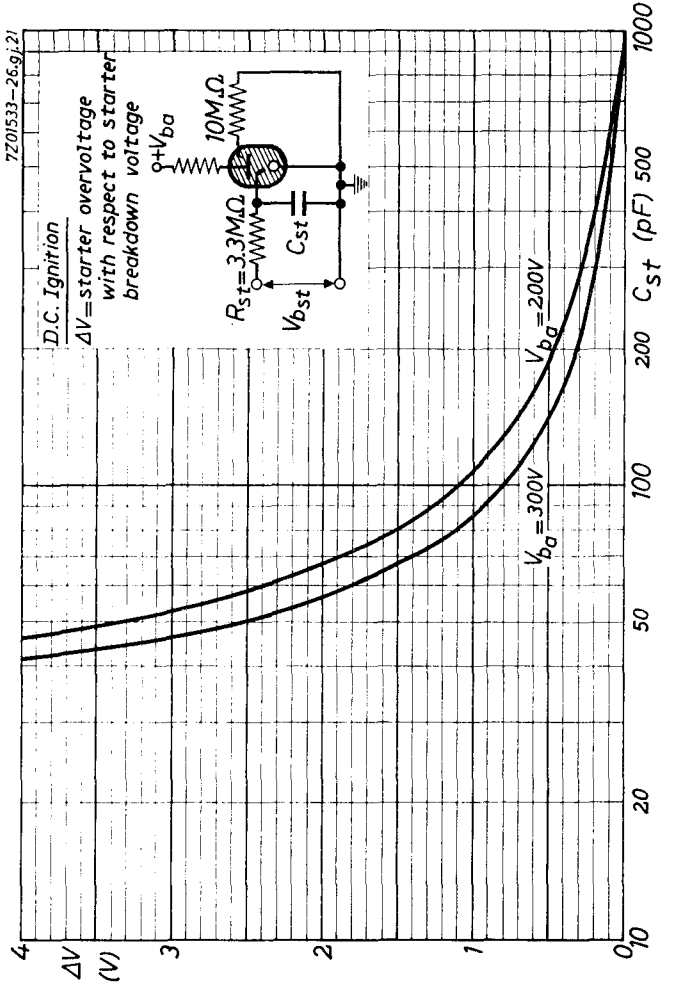
7Z01530-26.g.j.21.
Starter transfer characteristics
Initial values
max
typ
min
I_{st} (μA)
100
80
60
40
20
0
160
180
200
220
240
260
280 V_{ba} (V) 300



In quadrant II high values of $-V_{st}$ should be avoided. Quadrants III and IV should not be used.

Dans le quadrant II des valeurs élevées de $-V_{st}$ doivent être évitées. Les quadrants III et IV ne doivent pas être utilisés.

Im II. Quadrant sollen höhe Werte von $-V_{st}$ vermieden werden. Die Quadranten III und IV sollen nicht verwendet werden.


7Z01533-26.gj.21
D.C. Ignition
ΔV = starter overvoltage with respect to starter breakdown voltage
+Vba
10MΩ
Rst=3.3MΩ
Cst
Vbst
ΔV (V)
4
3
2
1
0
10
20
50
100
200
Cst (pF) 500
1000
Vba=300V
Vba=200V

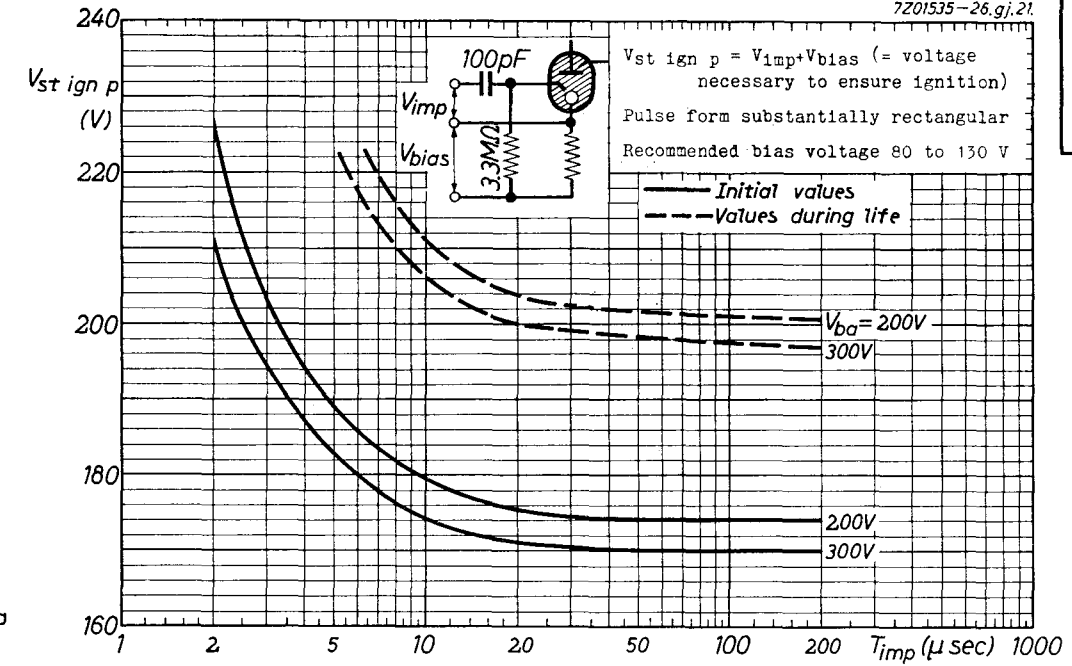
Z70U PHILIPS

7R06303

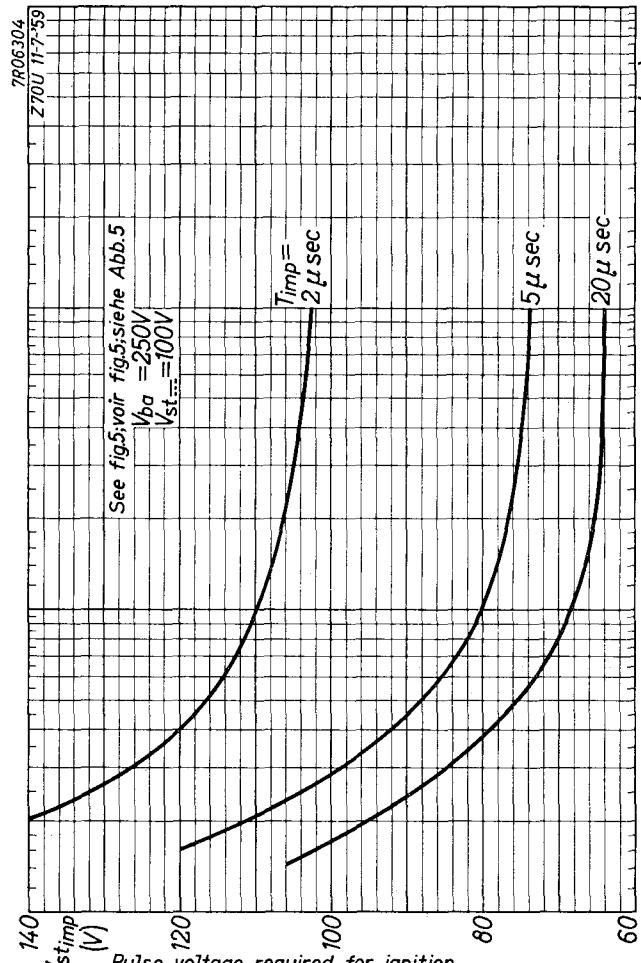
Z70U 11-7-59

Pulse voltage required for ignition
Tension d'impulsion requise pour l'allumage
Zur Zündung erforderliche Impulsspannung

D

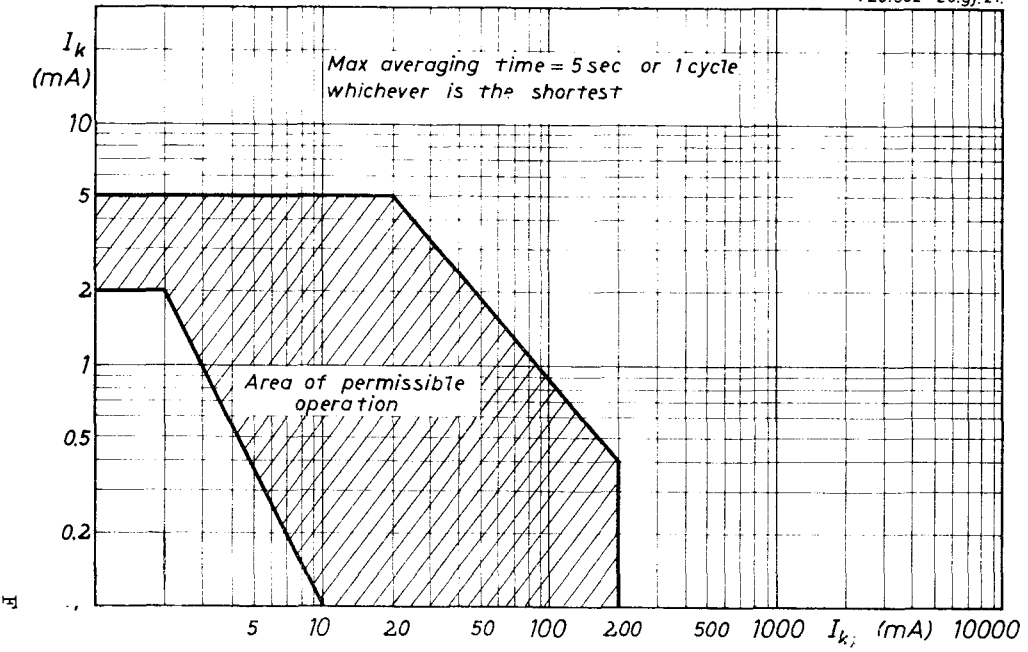

7Z01535-26.gj.21
240
220
200
180
160
$V_{st\ ign\ p}$ (V)
1
2
5
10
20
50
100
200
T_{imp} (μ sec)
1000
100pF
V_{imp}
V_{bias}
3.3MΩ
$V_{st\ ign\ p} = V_{imp} + V_{bias}$ (= voltage necessary to ensure ignition)
Pulse form substantially rectangular
Recommended bias voltage 80 to 130 V
Initial values
Values during life
V_{ba}= 200V
300V
200V
300V

D

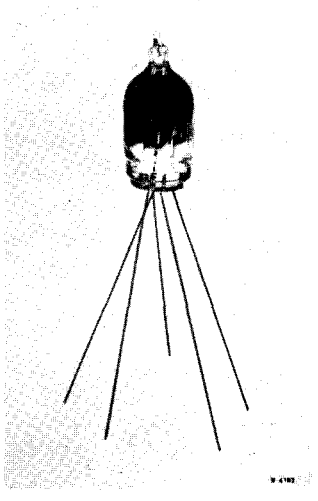


Pulse voltage required for ignition
Tension d'impulsion requise pour l'allumage
Zur Zündung erforderliche Impulsspannung

7201531-26.gif.21.
Primer maintaining voltage
Initial and during life
max
min
200
180
160
140
120
V_{pr} (V)
0
2
4
6
8
10
12
I_{pr} (μA)


7Z01532—26.gj.21.
I_k (mA)
Max averaging time = 5 sec or 1 cycle whichever is the shortest
Area of permissible operation
10
5
2
1
0.5
0.2
5
10
20
50
100
200
500
1000
I_{k_i} (mA)
10000

DESCRIPTION



The Z70W is a subminiature cold-cathode trigger tube with characteristics identical to those of the Z70U. The difference between the two types is that the Z70W is provided with two identical starters, so that the tube can be used in forward and backward counting circuits. Another feature of the two starters is that the second starter can be used for reset of a counter, so that no additional tube is required. In this way a saving in cost and space is obtained.

The geometry in the discharge path of the Z70W differs from the Z70U, which is caused by the influence of the second starter on the electrostatic field. The result is that the maximum starter current for transfer is slightly higher than that of the Z70U, which is the only difference in the characteristics of the two types. As with the Z70U, the life expectancy of the Z70W is longer than 30 000 hrs.

The same operational notes and precautions apply to both types. The circuit of Fig.15*a* is given for ignition with starter pulses of 100 V or higher; for forward and backward counting the circuit of Fig.15*b* may be used.

TYPICAL CHARACTERISTICS

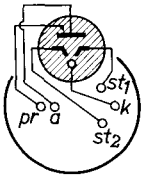
(D.C. values; primer discharge ignited; valid during life)

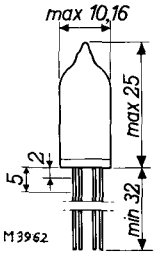
Anode supply voltage		250	V
Starter ignition voltage		137-153	V[1])
Temperature coefficient of the starter ignition voltage	max.	-25	mV/°C
Starter transfer current (see Fig.16*b*)	max.	50	μA
Starter voltage during discharge	see Fig.16c		
Anode burning voltage at 3 mA anode current (see Fig.16*d*)		111-121	V
Anode ignition voltage at zero starter voltage minimum value (see Fig.16e)		325	V
Primer-to-anode ignition voltage	max.	200	V
Primer-to-anode voltage at 3 μA primer current		155	V
Cathode current		2-4	mA
Primer current		1-10	μA
Primer series resistor (recommended value)		18	MΩ

[1]) See Fig.16*a*. The individual ignition voltage drift during life in normal application is generally less than 3 V. When a tube is ignited for very long periods, drawing negative starter current, a greater shift of the ignition voltage may occur. It is therefore advisable to design circuits for such applications for an ignition voltage of 160 V.

Z 70 W

MAXIMUM DIMENSIONS (in mm) AND
BASE CONNECTIONS





DYNAMIC CHARACTERISTICS

Starter ignition voltage (duration of pulse 20 μsec)			175	V[2])
Pulse height plus starter bias voltage (recommended value)			200	V[2])
Anode delay time			5	μsec[3])
Maximum counting frequency			2-5	kc/s[3])
Typical component values for self extinguishing pulse forming circuits		see Fig.16		
Anode resistance	1.8	1.2	0.7	MΩ
Capacitor	300	600	2000	pF

LIMITING VALUES (absolute limits)

Anode supply voltage (with primer ignited)	max.	310	V
	min.	200	V
Cathode current (average time max. 1 sec)	max.	4	mA
Peak cathode current	max.	16	mA[4])
Negative starter current (tube ignited)	max.	150	μA
Negative starter current (tube extinguished)	max.	0	μA
Starter series resistance	max.	20	MΩ
Negative starter pulse voltage at 300 V supply	max.	-30	V
at 200 V supply	max.	-50	V
Ambient temperature	max.	70	°C

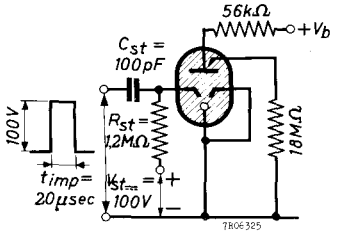


Fig.15a. Recommended circuit with pulse ignition.

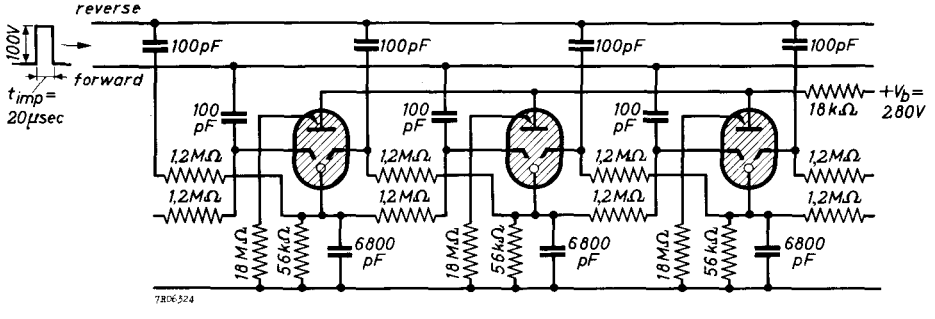


Fig.15b. Recommended circuit for forward and backward counting.

[2]) See Fig.15a.

[3]) See Fig.15b.

[4]) Higher peak currents are permissible in pulse-forming circuits.

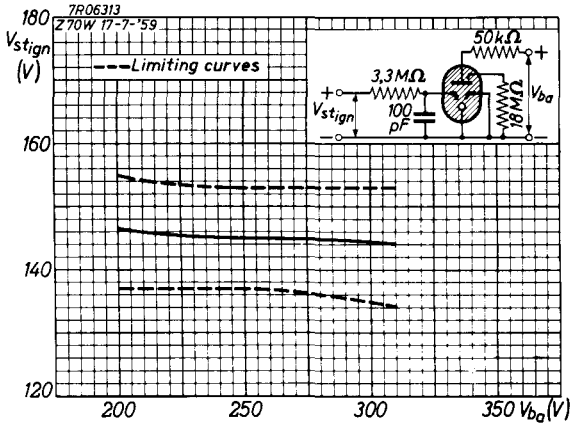


Fig. 16a. Starter breakdown characteristic.

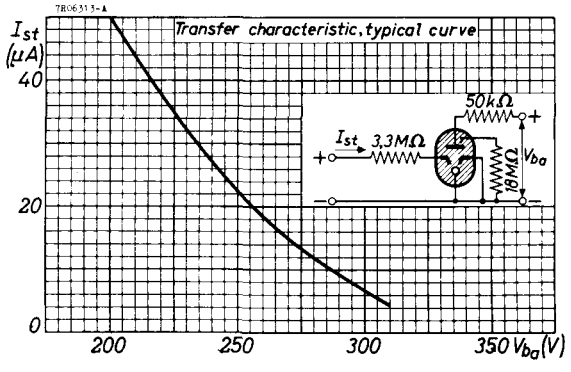


Fig.16b. Transfer characteristic.

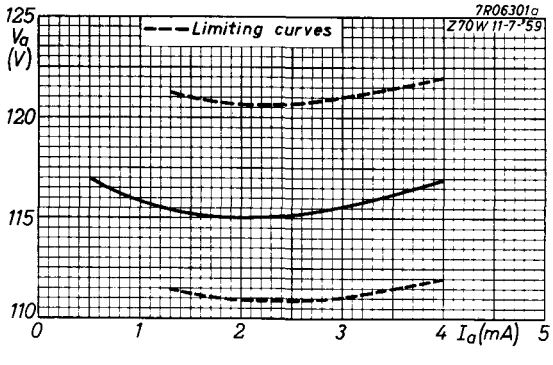


Fig.16c. Anode burning voltage characteristic.

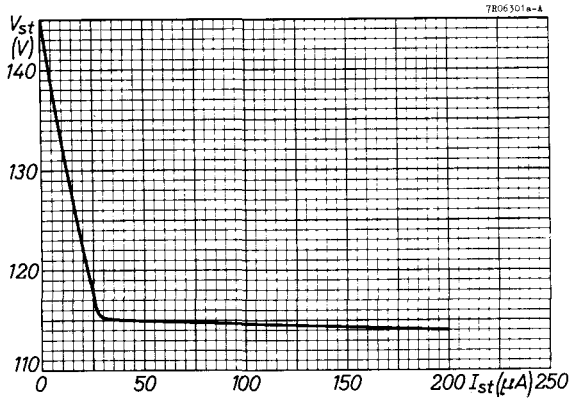


Fig. 16d. Starter burning voltage characteristic.

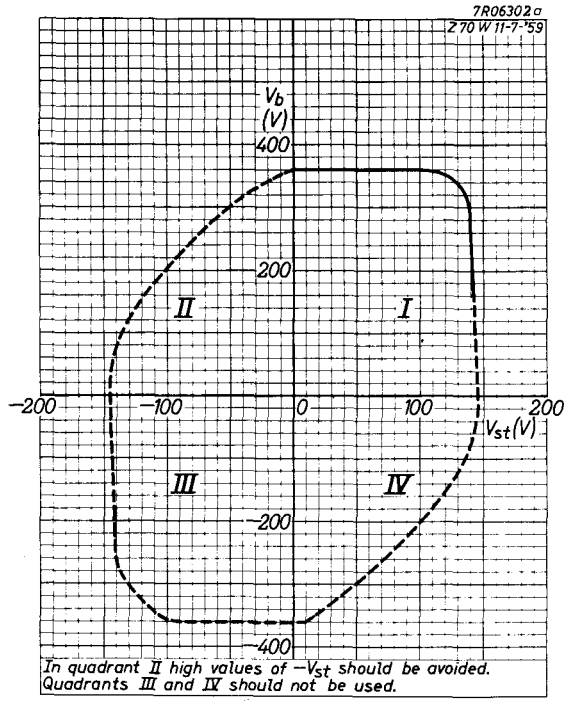


Fig. 16e. Breakdown characteristic.

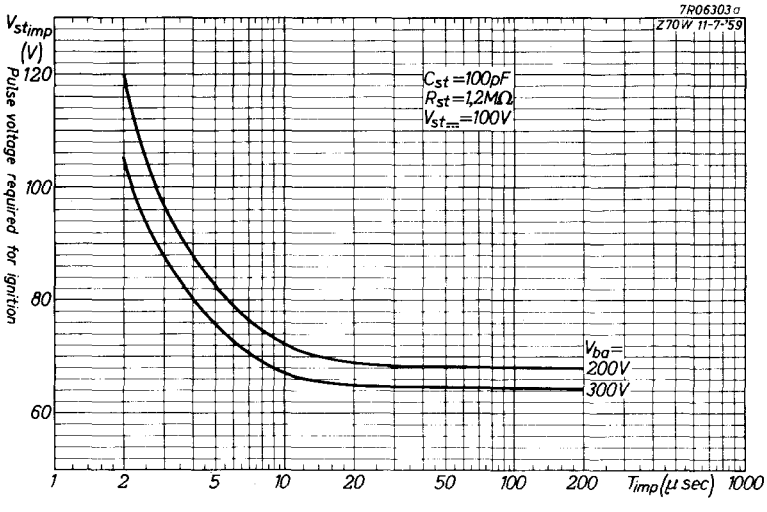


Fig. 16 f. Starter pulse for ignition, as a function of the pulse time, with the anode supply voltage as parameter (see Fig.15a).

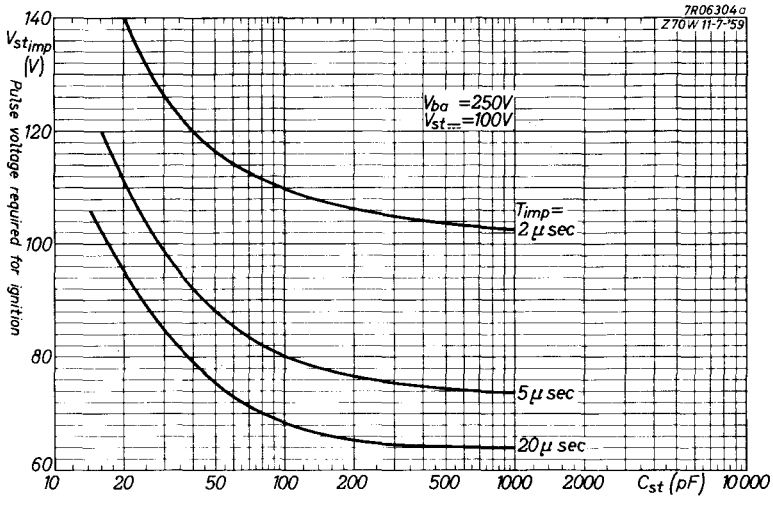


Fig. 16 g. Starter pulse height for ignition, as a function of the starter capacitor with the duration of the pulse as parameter (see Fig. 15a).

PHILIPS Z71U

Subminiature cold-cathode TRIGGER TUBE with two starters operating at a positive voltage, chiefly intended for use in D.C. supplied circuits. The tube has a low impedance for audio frequencies

TUBE DECLENCHEUR subminiature à cathode froide avec deux électrodes d'amorçage fonctionnant à une tension positive Le tube est destiné tout d'abord à l'utilisation dans des circuits alimentés par C.C. et a une faible impédance à B.F.

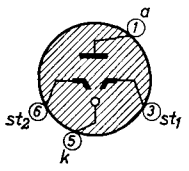
Subminiatur RELAISRÖHRE mit kalter Katode und zwei bei positiver Spannung arbeitenden Zündelektroden. Die Röhre ist zunächst bestimmt zur Verwendung in Gleichstromkreisen und hat eine niedrige Impedanz bei N.F.

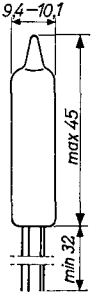
Application: In counting and switching circuits (especially in automatic telephone exchanges) and in timers

Application: Dans des circuits de comptage et de commutation (spécialement dans des bureaux centraux automatiques téléphoniques) et dans des interrupteurs horaires

Anwendung: In Zähl- und Schaltkreisen (speziell in automatischen Telephonämtern) und in Zeitschaltern

Dimensions in mm
Dimensions en mm
Abmessungen in mm





Base, culot, Sockel: SUBMINIATURE

Directly soldered connections to the leads of this tube must be at least 5 mm from the seals and any bending of the leads must be at least 2 mm from the seals

Ne pas faire de soudures à moins de 5 mm et ne pas plier les fils de sortie à moins de 2 mm de l'embase

Lötstellen an den Anschlussdrähten müssen mindestens 5 mm, etwaige Biegestellen mindestens 2 mm vom Pressteller entfernt sein

Typical characteristics
Caractéristiques types
Kenndaten

These values apply only when the tube is exposed to some light (10 lux, 1 footcandle). Direct exposure to bright sunlight may affect the anode hold-off and should be avoided
Ces valeurs sont applicables seulement si le tube est exposé à quelque lumière (10 lux, 1 bougie-pied). Afin de prévenir une diminution de la tension d'amorçage de l'anode, il convient de ne pas exposer le tube à la lumière du soleil
Diese Werte gelten nur wenn eine schwache Beleuchtung (10 lux) anwesend ist. Um eine Verringerung der Anodenzündspannung zu verhüten, muss helles Sonnenlicht vermieden werden

$V_{st\ ign}$ (V_{ba} = 130 $V_{\overline{\sim}}$)	=	73 - 90 V [1]
$I_{st\ transf}$ (V_{ba} = 130 $V_{\overline{\sim}}$)	=	40 µA
	= max.	100 µA
$V_{a\ ign}$ (V_{st} = 0)	=	200 V
	= min.	175 V
V_{ba}	=	125 - 165 V
V_a (I_k = 5 mA)	=	56 - 70 V
I_k	=	3 - 7 mA [2]
I_k	=	7 - 9 mA [1][3]
z_a (I_k = 8 mA; f = 300-3300 c/s)	=	400 Ω
	= max.	1000 Ω

---

[1]) When a tube burns continuously during very long periods with I_k = 7-9 mA, $V_{st\ ign}$ may occasionally increase up to 100 V
Si un tube fonctionne longtemps continuellement à I_k = 7-9 mA, $V_{st\ ign}$ peu augmenter quelquefois jusqu'à 100 V
Wenn eine Röhre langzeitig bei Dauerbetrieb mit I_k = 7-9 mA betrieben wird, kann $V_{st\ ign}$ bis auf 100 V ansteigen

[2]) Continuous service
Service continu
Dauerbetrieb

[3]) Intermittent service. Recommended for use as speech-current passing device
Service intermittent. Recommandé pour l'utilisation comme dispositif de passage de fréquences audibles
Aussetzender Betrieb. Empfohlen zur Verwendung als Vorrichtung zur Übertragung von Sprechströmen

Limiting values (Absolute limits)
Caractéristiques limites (Limites absolues)
Grenzdaten (Absolute Grenzwerte)

V_{ba}	= max. 165 V
I_k (T_{av} = max. 1 sec)	= max. 7 mA [1])
I_{kp}	= max. 12 mA
t_{amb}	= max. 70 °C

Remarks

a. The starter resistors or capacitors should be mounted close to the tube
b. In capacitive trigger circuits the capacitor should have a value between 400 and 3000 pF
c. If a tube is ignited by means of pulses of short duration the total starter voltage (bias + pulse) should exceed 90 V. A recommended minimum value with a 1000 pF coupling capacitor is 120 V (bias approximately 60 V)
d. When the tube is ignited the negative starter current should not exceed 200 µA. When the tube is extinguished negative starter current should be avoided
e. The maximum obtainable frequency in decade counter circuits depends on the tolerances of the components and the supply voltage. The max. frequency is about 2 kc/s. For detailed information please apply to the manufacturer

Observations

a. Les résistances et les condensateurs du circuit de l'électrode d'amorçage doivent être montés près du tube
b. Le condensateur d'un circuit déclencheur doit avoir une capacité entre 400 et 3000 pF
c. Si un tube est amorcé par moyen d'impulsions de courte durée, la tension totale de l'électrode d'amorçage (tension de polarisation + tension d'impulsion) doit dépasser 90 V. Une valeur minimum recommandée avec un condensateur de couplage de 1000 pF est de 120 V (tension de polarisation de 60 V)
d. Dans le cas de tube amorcé le courant négatif de l'électrode d'amorçage doit rester inférieur à 200 µA. Dans le cas de tube éteint il faut éviter un courant négatif de l'électrode d'amorçage
e. La vitesse de comptage maximum réalisable de circuits compteurs décimaux dépend des tolérances des éléments de montage et de la tension d'alimentation. La fréquence maximum est d'environ 2 kHz. Pour des renseignements complémentaires prière de s'adresser au fabricant

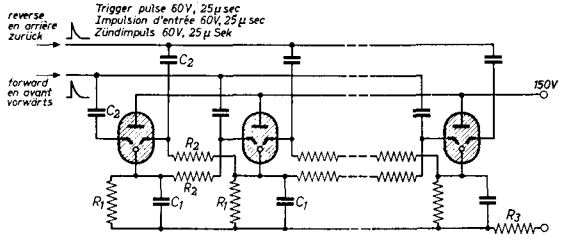
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[1]) Continuous service
Service continu
Dauerbetrieb

Bemerkungen

a. Die Widerstände und Kondensatoren des Zündkreises sollen möglichst dicht an der Röhre eingebaut werden
b. In kapazitiven Zündkreisen soll der Kondensator eine Kapazität zwischen 400 und 3000 pF haben
c. Wenn die Röhre mittels Impulsen kurzer Dauer gezündet wird, soll die Zündelektrodenspannung (Vorspannung + Impulsspannung)mehr als 90 V betragen. Bei einem Koppelkondensator von 1000 pF ist ein empfohlener Mindestwert 120 V (Vorspannung etwa 60 V)
d. Bei entzündeter Röhre soll der negative Zündelektrodenstrom kleiner als 200 µA sein. Bei gelöschter Röhre soll negativer Zündelektrodenstrom vermieden werden
e. Die höchsterzielbare Zählgeschwindigkeit in Dekadenzählschaltungen hängt von den Toleranzen der Einzelteile und der Speisespannung ab. Die Maximalfrequenz ist etwa 2 kHz. Für nähere Aufklärung wird man gebeten sich an den Röhrenhersteller zu wenden

Typical decade counter circuit
Circuit compteur décimal
Dekadische Zählschaltung

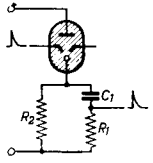


R_1 = 10 kΩ C_1 = 56000 pF

R_2 = 470 kΩ C_2 = 1000 pF

R_3 (V_b = 150 V) = 6,8 kΩ

Typical pulse forming circuit
Circuit de mise en forme d'impulsions
Impulsformerschaltung

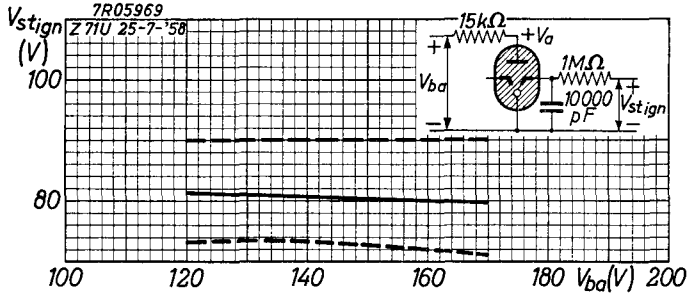


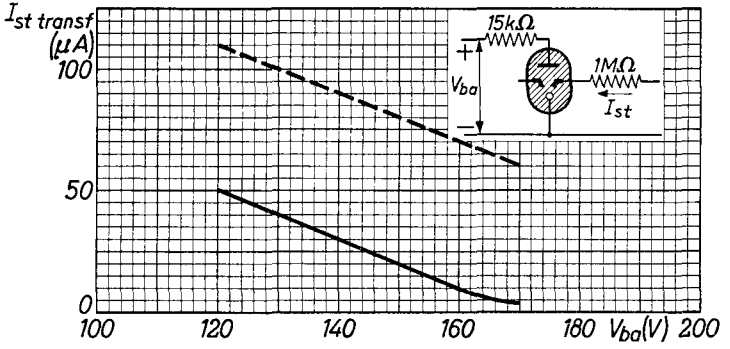
R_1 = 5600 Ω C_1 = 10000 pF

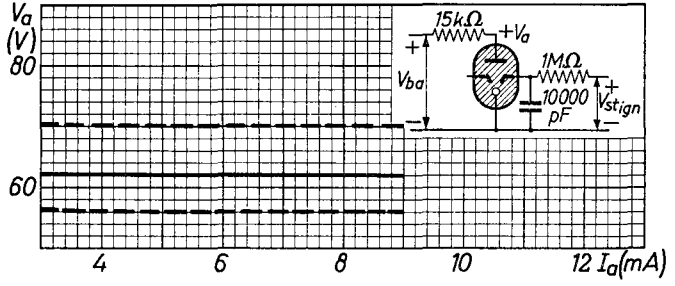
R_2 = 470 kΩ (min. 350 kΩ)

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Electronic Tube

HANDBOOK

Z71U

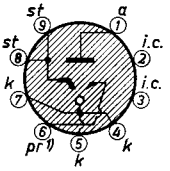
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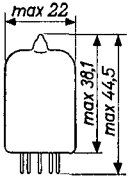
PHILIPS Z 803U

Gas-filled cold-cathode RELAY TUBE with positive starter and anode voltages for voltage control, sensitive relay circuits and timers
TUBE RELAIS à cathode froide et à remplissage de gaz avec tensions de déclencheur et d'anode positives pour le réglage de tensions, les circuits à relais sensible et les minuteries
Gasgefüllte RELAISRÖHRE mit kalter Katode und mit positiven Zündelektroden- und Anodenspannungen für Spannungsregelung, empfindliche Relaisschaltungen und Zeitschalter

The operation of the tube is independent of lighting conditions
Le fonctionnement du tube est indépendant de conditions d'éclairage
Der Betrieb der Röhre ist unabhängig der Beleuchtungsbedingungen

Dimensions in mm
Dimensions en mm
Abmessungen in mm





Base, culot, Sockel: Noval

Typical characteristics and range values for equipment design
Caractéristiques types et gammes de valeurs pour l'étude d'equipements
Kenndaten und Wertbereiche für Gerätentwurf

V_{ba}	=	170-290 V
V_a	=	105 V [2]
$V_{st\ ign}$ (V_a = 280 V)	=	128-137 V
$\Delta V_{st\ ign}$	=	1 % [3]
V_{st}	=	95 V
I_{pr}	=	2,0- 25 µA [4]
R_{pr}	=	10 MΩ [5]
T_{ion} ($V_{st} = V_{st_{ign}} + 0,5$ V)	=	2 msec
T_{ion} ($V_{st} = V_{st_{ign}} + 4,0$ V)	=	0,1 msec
T_{dion} (I_{kp} = 0 - 20 mA)	=	3,5 msec
T_{dion} (I_{kp} = 20-60 mA)	=	16 msec [6]

1)2)3)4)5)6) See page 3; voir page 3; siehe Seite 3

Limiting values (absolute limits)
Caractéristiques limites (Limites absolues)
Grenzdaten (Absolute Grenzwerte)

V_{ba}	= max. 290 V
$V_{b\ st}$ (V_a = 280 V)	= min. 137 V [7]
$I_{st\ p}$	= max. 8 mA
$V_{b\ pr}$	= min. 150 V [7]

Max. I_K and trigger stability
I_K max. et stabilité d'amorçage
Max. I_K und Zündstabilität

	Self extinguishing Auto-coupeur Selbstlöschend	General operation Fonctionnement général Allgemeiner Betrieb	
I_K	= max. 0,8	8	25 mA
I_{kp}	= max. 200	50	100 mA
T_{av}	= max. 0,5	15	15 sec
ΔV_{st} ign/2000h	= max. ± 2	± 2	± 2 %
ΔV_{st} ign/10000h	= < ± 2 [8]	< ± 2 [8]	[9] %
ΔV_{st} ign/20000h	= < ± 2 [8]	-	- %

[7][8][9] See page 3; voir page 3; siehe Seite 3

[1]) Priming anode
Anode de préionisation
Vorionisationsanode

[2]) See page A; voir page A; siehe Seite A

[3]) When V_a is changed from 290 V to 170 V
Quand V_a est changée de 290 V à 170 V
Wenn V_a von 290 V bis zu 170 V geändert wird

[4]) To ensure that the characteristics of the tube are maintained in both light and darkness an I_{pr} of about 10 µA should flow continuously.
Le maintien des caractéristiques du tube, tant à l'obscurité qu'à la lumière, exige un courant I_{pr} permanent d'environ 10 µA
Zur Einhaltung der Röhrendaten sowohl im Dunkeln als auch bei Beleuchtung, ist ein kontinuierlicher Strom I_{pr} von etwa 10 µA erforderlich

[5]) This resistor must be soldered directly to contact 6 of the tube holder. Stray capacitance at the priming anode must be kept to a minimum
Cette résistance doit être soudée directement sur le contact 6 du support de tube. Les capacités parasites de l'électrode de préionisation doivent être réduites au minimum
Dieser Widerstand muss unmittelbar an Kontakt 6 des Röhrenhalters angelötet werden. Streukapazitäten der Vorionisierungselektrode müssen auf ein Minimum beschränkt bleiben

[6]) In self-extinguishing circuits T_{dion} is much shorter
Dans les circuits auto-coupeurs T_{dion} est beaucoup plus court.
In selbstlöschenden Schaltungen ist T_{dion} wesentlich kürzer

[7]) Supply voltage necessary to .nsure ignition
Tension d'alimentation nécessaire pour assurer l'amorçage
Zur Zündung erforderliche Speisespannung

[8]) Typical values
Valeurs normales
Durchschnittswerte

[9]) Over long periods a systematic drift of - 0.7 % per 1000 hours may be expected
Pour de lonques périodes, on peut s'attendre à une variation de - 0,7 % par 1000 heures
Über längere Zeiträume ist eine Verschiebung von - 0,7 % pro 1000 Stunden zu erwarten

TRIGGERING

a. Capacitive triggering (See fig. 1)

Minimum value of C_1		
V_a (V)	R_2 (kΩ)	C_1 (pF)
170-200	< 2.2	> 2700
200-240	< 2.2	> 1000
>240	< 2.2	> 500

Minimum value of R_2	
C_1 (pF)	R_2 (kΩ)
< 4700	> 0
4700-15000	> 2.2
>15000	> 5.6

In circuits in which the starter discharge must be self-extinguishing the minimum value of R_1 is 1 MΩ. If an external extinguishing circuit is provided, such as switch S, R_1 need only be sufficient to limit I_{st} to within its limiting value. If R_1 is made too large, V_{st} will not reach the ignition value, due to a preignition starter current of the order of 4×10^{-8}A, which commences to flow at approximately $V_{st_{ign}}$-100 mV.

Fig. 1

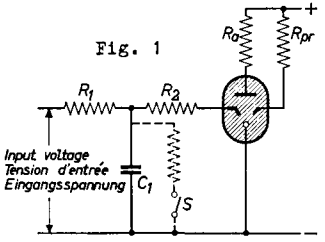
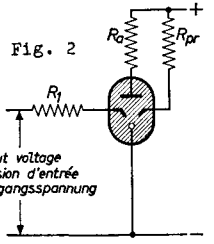


Fig. 2



b. Direct current triggering (See fig. 2 and page B)
Max. transfer current over life at V_a = 240 V is 25 µA

To ensure that anode-cathode conduction occurs when the input voltage reaches $V_{st\ ign}$, $R_1 < \frac{V_{st\ ign} - V_{st}}{I_{transf}}$, where I_{transf} is the D.C. starter current to cause anode conduction at the applied anode voltage. If R_1 is made greater, the input voltage should be accordingly greater.

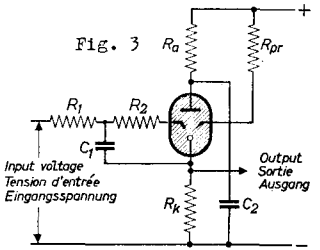
EXTINGUISHING THE TUBE

To extinguish the tube V_a and V_{st} should be preferably reduced below their respective burning voltages for a period longer than the deionisation time. If the tube is extinguished by raising the cathode potential, the priming discharge is extinguished and the duration of the applied pulse should then be less than 10 msec, unless a period of 1 sec is allowed for the priming discharge to be re-established.

CATHODE LOAD

If a load resistor is inserted in the cathode lead, the capacitor C_1 should be connected as shown in fig. 3.
Due to I_{pr} the cathode potential will be slightly positive and thus the starter input voltage must rise by this extra amount to reach V_{st} ign

Fig. 3



HYSTERESIS EFFECT

There is a hysteresis effect associated with $V_{a\ ign}$ and $V_{st\ ign}$. The effect is that $V_{a\ ign}$ and $V_{st\ ign}$ are lowered after a period of conduction and return to their initial values after a recovery period.
The magnitude of the effect is proportional to the duration of the periods of conduction and to the magnitude of I_K during conduction.
Curves showing the maximum depression of $V_{st\ ign}$ for a repeated sequence of "on" and "off" periods are shown on page C as a function of the "off" period. These curves are for constant "on" periods of 10 msec. It takes about 20 sec of repeated cycling to reach this maximum depression.
The depression of $V_{a\ ign}$ is only important in applications in which long "on" periods are followed by relatively short "off" periods. Under these conditions a range of V_{ba} from 170 to 270 V is recommended.

STARTER VOLTAGE DURING ANODE CONDUCTION

During anode conduction V_{st} is held by the discharge at approximately 90 V above the cathode voltage. If this voltage is reduced, starter current flows in the reverse direction, which may harm the tube in any application in which the starter is reset by a relay contact. It is desirable that the contact makes after the main discharge has been extinguished. The effect of reverse starter current is to reduce both the max. anode voltage which can be applied and the starter stability.

NOISE

In this tube oscillations of up to 10 V peak-to-peak are superimposed on the burning voltage. Due to this effect the measured value of the burning voltage will depend on the circuit conditions. These are of no significance in normal applications.

AMORÇAGE DES TUBES

a. Amorçage capacitif (Voir fig. 1)

Valeur minimale de C_1		
V_a (V)	R_2 (kΩ)	C_1 (pF)
170-200	< 2,2	> 2700
200-240	< 2,2	> 1000
>240	< 2,2	> 500

Valeur minimale de R_2	
C_1 (pF)	R_2 (kΩ)
< 4700	> 0
4700-15000	> 2,2
>15000	> 5,6

Dans les circuits exigeant l'auto-extinction de la décharge de l'électrode d'amorçage la valeur minimum de R_1 est limitée à 1 MΩ. Dans les circuits comportant un dispositif d'extinction externe (par exemple, le commutateur S) R_1 a pour seule fonction de limiter I_{st} aux valeurs admises. En prenant pour R_1 une valeur trop élevée, V_{st} ne peut pas atteindre la valeur d'amorçage par suite d'un courant de "préamorçage" de l'ordre de 4×10^{-8} A qui prend naissance à une tension d'environ $V_{st\ ign} - 100$ mV.

Fig. 1

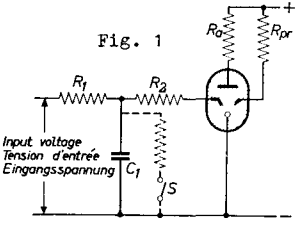
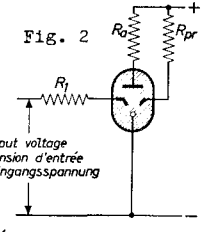


Fig. 2



b. Amorçage par courant continu (Voir fig. 2 et page B)
L'intensité maximale du courant de transfert pendant la durée de vie à V_a = 240 V est de 25 µA.

Pour obtenir avec certitude une décharge anode-cathode dès que la tension d'entrée atteint la valeur $V_{st\ ign}$, il faut que la résistance R_1 soit plus petite que

$\frac{V_{st\ ign} - V_{st}}{I_{transf}}$, dans laquelle I_{transf} est le courant continu de l'électrode d'amorçage pour la tension anodique appliquée. Si l'on donne à R_1 une valeur plus élevée, la tension d'entrée doit être augmentée conformément.

L'EXTINCTION DU TUBE

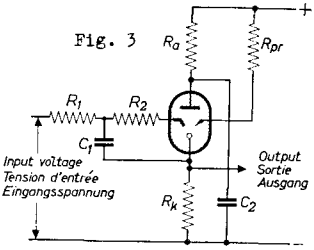
Pour l'extinction du tube il est préférable de réduire V_a et V_{st} à une valeur inférieure à leur tension de fonctionnement pour une période de durée supérieure au temps de désionisation. Si l'extinction du tube a lieu par augmentation du potentiel cathodique, cequi provoque l'extinction de la décharge de préionisation, la durée des impulsions appliquées doit être inférieure à 10 msec à moins

que l'on ait prévu une période de 1 sec pour le rétablissement de la préionisation.

CHARGE CATHODIQUE

Si l'on insère dans le circuit cathodique une résistance de charge, le condensateur C_1 doit être relié comme représenté à la fig. 3.
Par suite de I_{pr} le potentiel cathodique devient légèrement positif, de sorte qu'il faut augmenter la tension d'entrée de l'électrode d'amorçage.

Fig. 3



EFFET D'HYSTERESIS

$V_{a\ ign}$ et $V_{st\ ign}$ sont soumises à un effet d'hystérésis, de sorte que ces tensions ont, après une période de conduction, une valeur inférieure à leur valeur initiale, qu'elles ne reprennent qu'après un certain temps de rétablissement. L'ampleur de cet effet est proportionnelle à la durée de la période de conduction et à la valeur du courant cathodique qui se produit pendant cette période. Les courbes indiquant la diminution maximale de $V_{st\ ign}$ pour une série répétée de périodes de conduction et de blocage ont été représentées à la page C en fonction de la durée de blocage. Ces courbes sont valables pour des périodes de conduction de 10 msec. La diminution maximale est atteinte au bout d'une série de cycles d'une durée totale de 20 sec.
La diminution temporaire de $V_{a\ ign}$ ne joue un rôle que si des périodes de conduction longues sont suivies de périodes de blocage relativement courtes. Dans ces conditions nous conseillons une gamme de V_{ba} de 170 à 270 V.

TENSION DE L'ELECTRODE D'AMORÇAGE PENDANT LA CONDUCTION ANODIQUE

Pendant la conduction anodique V_{st} est maintenue environ 90 V au-dessus du potentiel de la cathode par la décharge. Si l'on diminue cette tension un courant circule dans le sens inverse, ce qui peut entraîner la détérioration du tube dans le cas où l'électrode d'amorçage est commandée par un contact de relais. Il est désirable de ne fermer le courant qu'après la décharge principale a été éteinte. Le courant en sens inverse diminue la tension anodique maximum admissible ainsi que la stabilité d'amorçage.

BRUIT

Dans ce tube des oscillations jusqu'à une tension de 10 V de crête à crête sont superposées à la tension de fonctionnement. Il s'ensuit que la valeur mesurée de la tension de fonctionnement dépend des conditions du circuit. Celles-ci n'ont aucune importance pour des applications normales.

ZÜNDUNG DER RÖHRE

a. Kapazitive Zündung (Siehe Abb. 1)

Mindestwerte für C_1		
V_a (V)	R_2 (kΩ)	C_1 (pF)
170-200	< 2,2	> 2700
200-240	< 2,2	> 1000
>240	< 2,2	> 500

Mindestwerte für R_2	
C_1 (pF)	R_2 (kΩ)
< 4700	> 0
4700-15000	> 2,2
>15000	> 5,6

In Schaltungen, in denen eine Selbstlöschung der Zündentladung gefordert wird, ist der Mindestwert von R_1 auf 1 MΩ begrenzt. In Schaltungen mit äusserer Löscheinrichtung (z.B. der Schalter S) braucht R_1 lediglich den Zündelektrodenstrom innerhalb der zulässigen Grenzen zu begrenzen.
Wird R_1 zu gross gemacht, so kann V_{st} infolge eines Anlaufzündungsstrom in der Grössenordnung von 4×10^{-8} A den Zündwert nicht erreichen. Dieser Anlaufstrom beginnt bei einer Spannung von etwa $V_{st\ ign}$ - 100 mV zu fliessen.

Fig. 1

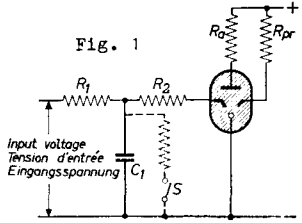
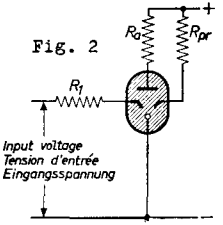


Fig. 2



b. Gleichstromzündung (Siehe Abb. 2 und Seite B)
Max. Zündelektrodenstrom zur Übernahme auf die Hauptentladung während der Lebensdauer bei V_a = 240 V ist 25 µA

Um zu gewährleisten dass eine Anoden-Katodenentladung einsetzt sobald die Eingangsspannung den Wert $V_{st\ ign}$ erreicht, soll R_1 kleiner sein als $\frac{V_{st\ ign} - V_{st}}{I_{transf}}$. Hierin ist Itransf der Gleichstrom der Zündelektrode, der die Anodenentladung bei der angelegten Anodenspannung entzündet. Wählt man für R_1 einen grösseren Wert, so muss die Eingangsspannung entprechend höher sein.

LÖSCHEN DER RÖHRE

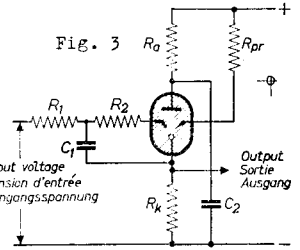
Zum Löschen der Röhre wird empfohlen V_a und V_{st} für eine Periode die länger als die Entionisierungszeit ist, unter ihre entsprechende Brennspannung zu reduzieren. Wird die Röhre durch Erhöhung des Katodenpotentials gelöscht, was die Löschung der Vorionisationsentladung zur Folge hat, so soll die Dauer der angelegten Impulse kürzer als 10 mSek

sein, es sei denn dass man eine Periode von 1 Sek zur Wiederherstellung der Vorionisation vorsieht.

KATODENBELASTUNG

Wird ein Belastungswiderstand in die Katodenleitung eingefügt, so muss der Kondensator C_1 wie in Abb.3 angeschlossen werden. Infolge der Vorionisationsstrom wird das Katodenpotential ein wenig positiv, so dass die Eingangsspannung um diesen zusätzlichen Betrag erhöht werden muss.

Fig. 3



HYSTERESE

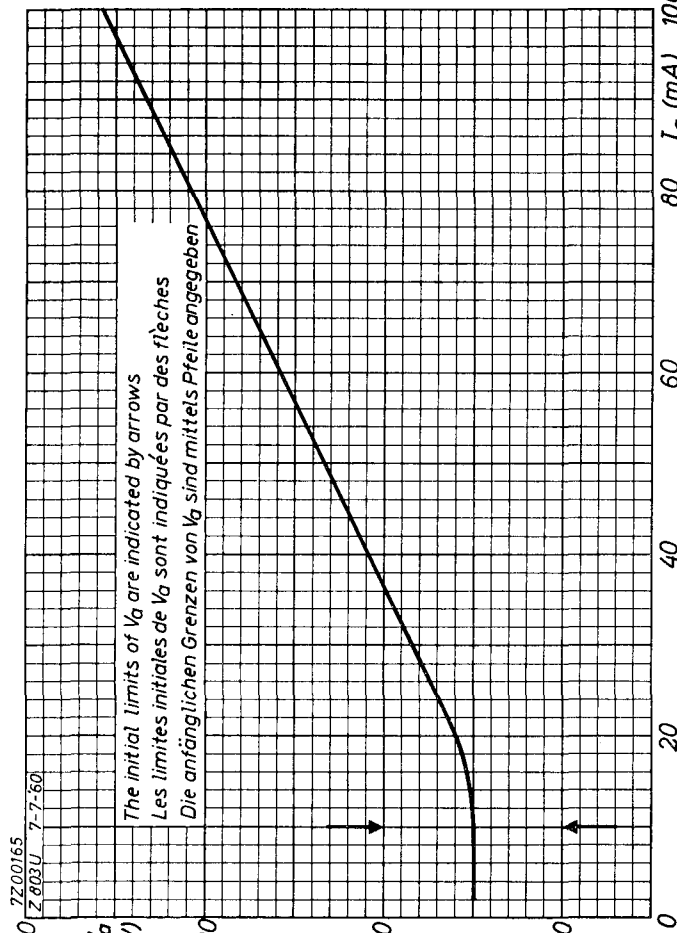
Die Spannungen $V_{a\ ign}$ und $V_{st\ ign}$ zeigen einen Hysterese-Effekt, derart, dass diese Zündspannungen nach einer Stromführenden Periode herabgesetzt sind und ihren Anfangswert erst nach einer gewissen Erholungszeit wieder erreichen. Der Grad dieses Effektes ist der Dauer der stromführenden Periode sowie der Grösse des während dieser Periode auftretenden Katodenstroms proportional.
Kurven aus denen die maximale Verminderung der Zündspannung für eine wiederholte Folge von Ein-Aus-Perioden ersichtlich ist, sind auf Seite C als Funktion der Aus-Periode dargestellt. Diese Kurven gelten für konstante Ein-Perioden von 10 mSek. Die maximale Spannungsverminderung wird nach wiederholten Zyklen von etwa 20 Sek Gesamtdauer erreicht. Die vorübergehende Verminderung der Anodenzündspannung ist nur von Bedeutung wenn lange Ein-Perioden relativ kurze Aus-Perioden folgen. Unter solchen Bedingungen wird ein Anodenspeisespannungsbereich von 170 bis 270 V empfohlen.

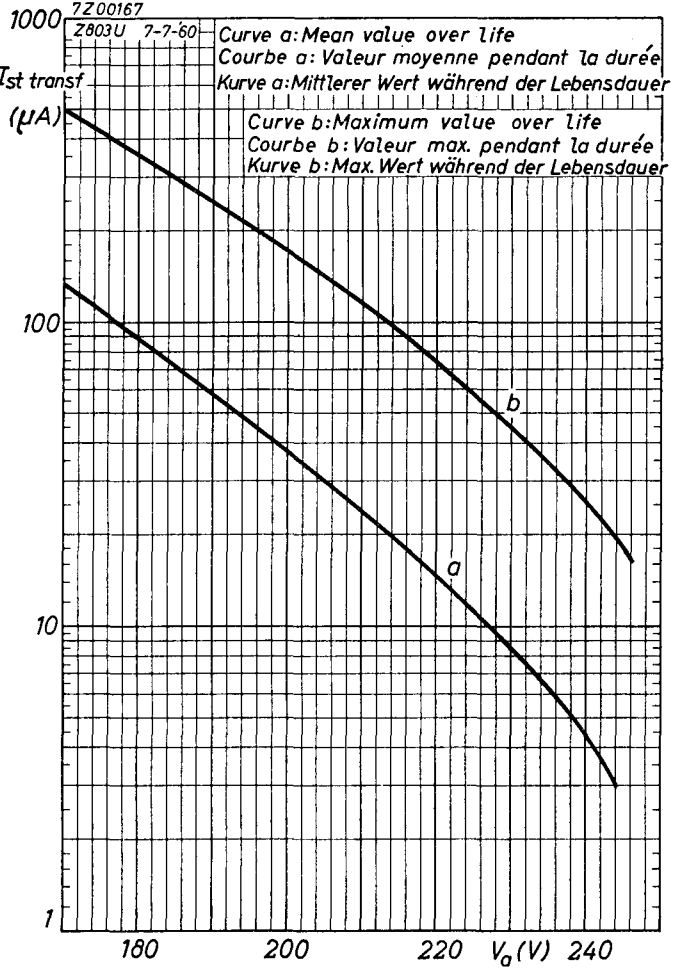
ZÜNDELEKTRODENSPANNUNG WÄHREND DER ANODENLEITUNG

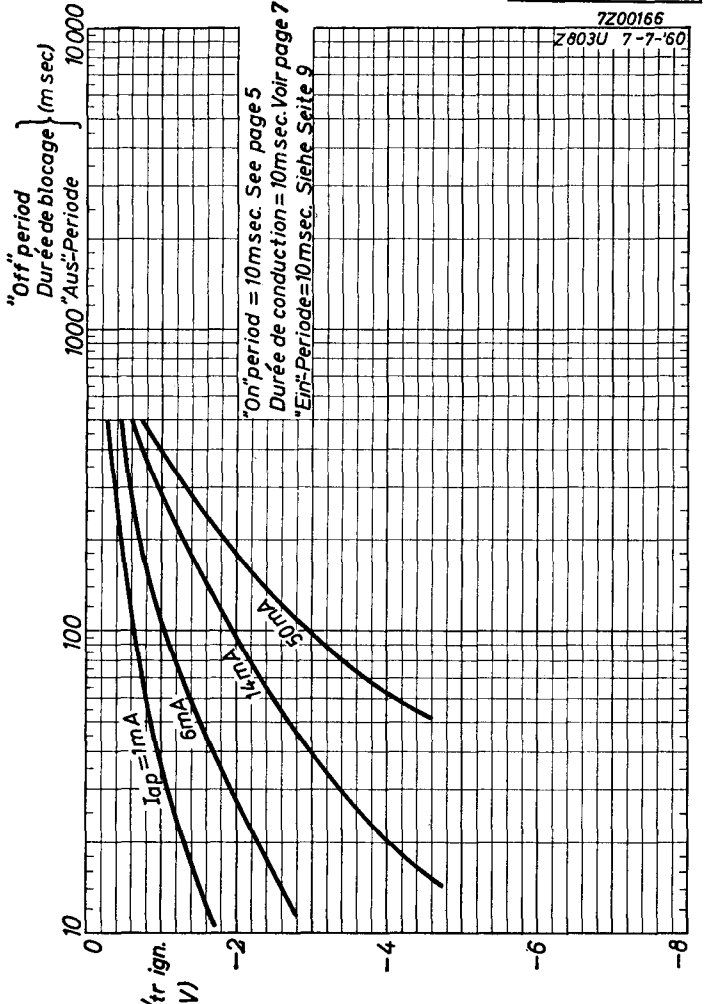
Während der Hauptentladung wird die Zündelektrode durch die Entladung auf einem Potential von etwa 90 V über Katodenpotential gehalten. Wird diese Spannung reduziert, so fliesst ein Strom in der umgekehrten Richtung, was eine Beschädigung der Röhre zur Folge haben kann wenn die Zündelektrode durch einen Relaiskontakt gesteuert wird. Es ist zweckmässig den Kontakt erst dann schliessen zu lassen, nachdem die Hauptentladung verlöscht ist. Der entgegengesetzt fliessende Zündelektrodenstrom vermindert die maximal zulässige Anodenspannung sowie die Stabilität der Zündung.

RAUSCHEN

Der Brennspannung sind Oszillationen bis zu 10 V Spitzen-Spitzenwert überlagert. Infolgedessen hängt der gemessene Wert der Brennspannung von den Schaltungsbedingungen ab. Diese sind bei normalen Anwendungen ohne Bedeutung.


ZZ00165
Z 803U 7-7-60
The initial limits of V_a are indicated by arrows
Les limites initiales de V_a sont indiquées par des flèches
Die anfänglichen Grenzen von V_a sind mittels Pfeile angegeben
V_a (V)
130
120
110
100
0
20
40
60
80
100
I_a (mA)


7Z00167
Z803U 7-7-60
Curve a: Mean value over life
Courbe a: Valeur moyenne pendant la durée
Kurve a: Mittlerer Wert während der Lebensdauer
Curve b: Maximum value over life
Courbe b: Valeur max. pendant la durée
Kurve b: Max. Wert während der Lebensdauer
Ist transf (μA)
1000
100
10
1
180
200
220
Va (V)
240
a
b


7Z00166
Z803U 7-7-'60
"Off" period
Durée de blocage
"Aus"-Periode
(m sec)
10.000
1000
100
10
"On" period = 10m sec. See page 5
Durée de conduction = 10m sec. Voir page 7
"Ein"-Periode = 10m sec. Siehe Seite 9
Iap = 1mA
6mA
14mA
30mA
0
-2
-4
-6
-8
ΔVtr ign. (V)

PHILIPS

Electronic Tube

HANDBOOK

Z803U

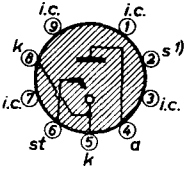
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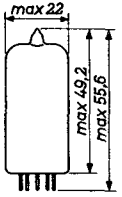
PHILIPS Z 804U

Gasfilled cold-cathode RELAY TUBE with negative starter voltage
TUBE RELAIS à cathode froide et à remplissage de gaz, avec tension du déclencheur négative
Gasgefüllte RELAISRÖHRE mit kalter Katode, mit negativer Zündelektrodenspannung

Application: Relay-service on 220 V A.C. and on D.C.
Application: Service de relais sur 220 V C.A. et sur C.C.
Anwendung: Relaisbetrieb mit 220 V Wechselspannung und mit Gleichspannung

Dimensions in mm
Dimensions en mm
Abmessungen in mm





Base, culot, Sockel: NOVAL

Net weight
Poids net 9 g
Nettogewicht

Typical characteristics
Caractéristiques types
Kenndaten

V_{st} ign (V_a = 180-350 V⎓)	=		-115/-131 V [2])
-I_{st} transf. (V_a = 180 V⎓)	=	max.	50 µA⎓
V_a (I_a = 20 mA)	=		106-115 V [2])
V_{st} (I_{st} = 100 µA)	=		100 V
V_a ign (pos. and neg. / pos. et nég. / pos. und neg.)	=	min.	400 V

Individual shift during life:
Déplacement individuel pendant la vie:
Individuelle Verschiebung während der Lebensdauer:

I	V_{st} ign	= max.	± 5 V
II	Burning voltage V_a / Tension de régime V_a / Brennspannung V_a	= max.	± 3 V

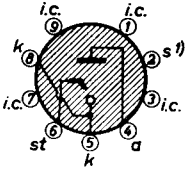
[1])[2])See page 3; voir page 3; siehe Seite 3

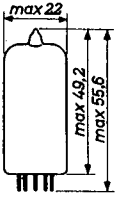
PHILIPS Z 804U

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V_{st} (I_{st} = 100 µA)	=	100 V
V_a ign (pos. and neg. / pos. et nég. / pos. und neg.)	= min.	400 V

Individual shift during life:
Déplacement individuel pendant la vie:
Individuelle Verschiebung während der Lebensdauer:

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II	Burning voltage V_a / Tension de régime V_a / Brennspannung V_a	= max.	± 3 V

[1])[2])See page 3; voir page 3; siehe Seite 3

Limiting values (ABSOLUTE LIMITS)
Caractéristiques limites (LIMITES ABSOLUES)
Grenzdaten (ABSOLUTE WERTE)

	$+I_{st}$	= max.	400 µA[3])
	$-I_{st}$	= max.	400 µA[3])

A.C. operation
Service C.A.
Wechselspannungsbetrieb

Nominal mains voltage Tension du secteur nom. Nom. Netzspannung		= min. = max.	200 Veff 250 Veff
Mains volt. fluctuations Tolérances de la tension du secteur Netzspannungsschwankungen		= max.	+10 % -15 %
f (mains voltage) (tension du secteur) (Netzspannung)		= min. = max.	10 c/s 100 c/s
	I_a	= min. = max.	5 mA 25 mA
	I_{ap}	= max.	125 mA[4])
	T_{av}	= max.	1 cycle Periode

D.C. operation
Service C.C.
Gleichspannungsbetrieb

	V_b	= min. = max.	180 V 350 V
	I_a	= min. = max.	5 mA 40 mA

[3])The starter may be operated on D.C. voltages and on A.C. voltages of mains of audio frequency
L'électrode d'amorçage (starter) peut fonctionner sur tensions C.C. et sur tensions C.A. à la fréquence du secteur et à basse fréquence
Der Starter kann mit Gleich- oder Wechselspannung (Netz- oder NF-Frequenzen) betrieben werden

[4])This peak value applies to normal continuous relay service Higher peak current may be tolerates in special cases
Cette valeur de crête s'applique à un service permanent et normal comme tube relais. Dans certains cas particuliers, des valeurs plus élevées sont admissibles
Dieser Spitzenwert bezieht sich auf normalen Dauerbetrieb als Schaltröhre. In Sonderfälle sind höhere Werte zulässig

Limiting values (ABSOLUTE LIMITS)
Caractéristiques limites (LIMITES ABSOLUES)
Grenzdaten (ABSOLUTE WERTE)

	$+I_{st}$	= max.	400 µA[3]
	$-I_{st}$	= max.	400 µA[3]

A.C. operation
Service C.A.
Wechselspannungsbetrieb

Nominal mains voltage Tension du secteur nom. Nom. Netzspannung		= min. = max.	200 V_{eff} 250 V_{eff}
Mains volt. fluctuations Tolérances de la tension du secteur Netzspannungsschwankungen		= max.	+10 % -15 %
f (mains voltage) (tension du secteur) (Netzspannung)		= min. = max.	10 c/s 100 c/s
	I_a	= min. = max.	5 mA 25 mA
	I_{a_p}	= max.	125 mA[4]
	T_{av}	= max.	1 cycle Periode

D.C. operation
Service C.C.
Gleichspannungsbetrieb

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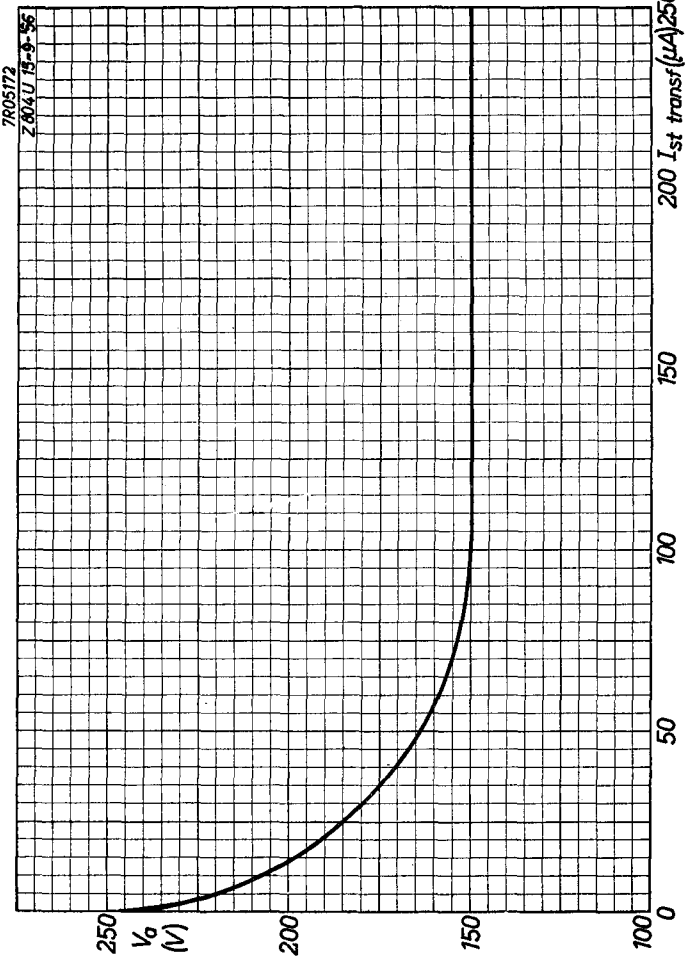
[1])To be connected to the cathode via a 2 MΩ resistor
A connecter à la cathode par moyen d'une résistance de 2 MΩ
Mit der Katode verbinden mittels eines Widerstandes von 2 MΩ

[2])These limits are valid during life
Ces limites sont valables pendant la durée de vie du tube
Diese Grenzen gelten für die gesamte Lebensdauer

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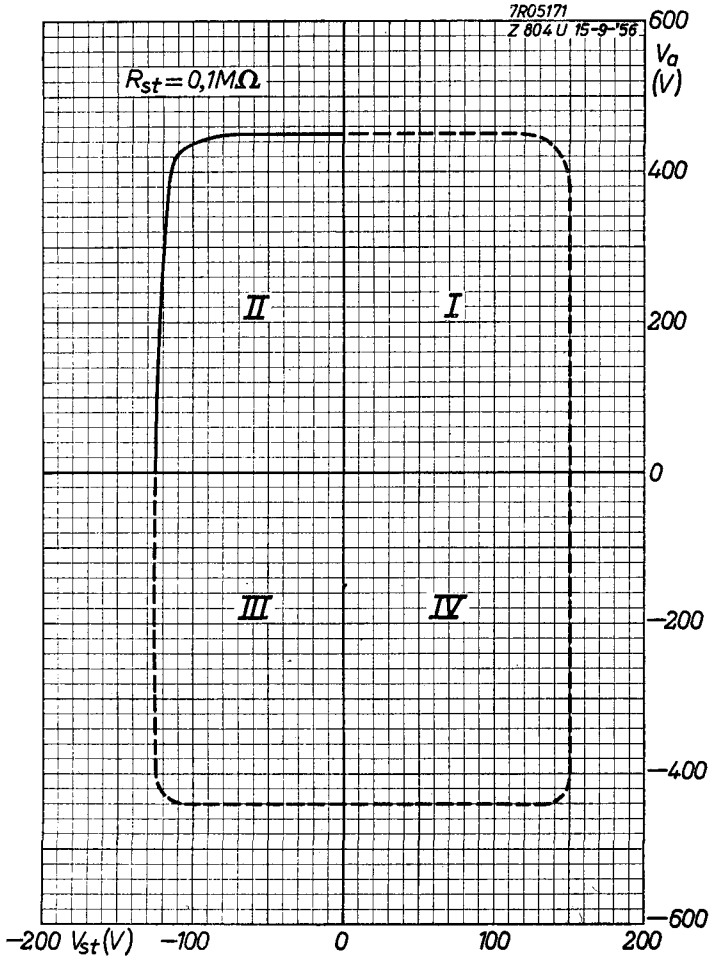
PHILIPS **Z 804U**



11.11.1956

A

Z 804U **PHILIPS**



PHILIPS **Z 804U**

7R05346
Z 804U 29-1-'57

V_a (V)
400
350
300
250
200
150

$V_{st\ ign}$ (V)
140
130
120
110

2.2.1957

C

PHILIPS

Electronic Tube

HANDBOOK

Z804U

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2	1	1958.01.01
3	2	1957.03.03
4	2	1958.01.01
5	3	1957.03.03
6	3	1958.01.01
7	A	1956.11.11
8	B	1956.11.11
9	C	1956.11.11
10	FP	2000.01.14

PHILIPS Z 805 U

Gasfilled cold-cathode RELAY TUBE with positive starter voltage, primarily intended for use in A.C. circuits

TUBE RELAIS à cathode froide et à remplissage de gaz avec tension de déclencheur positive, conçu en premier lieu pour des circuits à courant alternatif

Gasgefüllte RELAISRÖHRE mit kalter Katode und mit positiver Zündelektrodenspannung zur Verwendung in Wechselstromschaltungen

The operation of the tube is independant of lighting conditions.
Two screens connected externally to anode and cathode via resistors, provide for a priming discharge and give the tube excellent high voltage properties and a short ignition delay time

Le fonctionnement du tube est indépendant de conditions d'éclairage.
Deux écrans, connectés extérieurement à l'anode et à la cathode à travers des résistances, donnent lieu à une décharge auxiliaire et pourvoient le tube de propriétés excellentes quant aux tensions élevées et d'un petit retard à l'allumage.

Der Betrieb der Röhre ist unabhängig der Beleuchtungsbedingungen.
Zwei äusserlich über Widerstände mit der Anode und Katode verbundene Schirme bewirken eine Hilfsentladung und erteilen die Röhre eine kleine Zündverzögerung und hervorragende Eigenschaften in Bezug auf hohe Spannungen

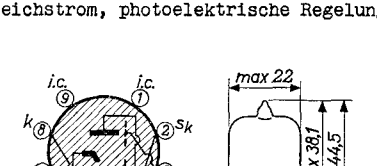
Application: Relay service on A.C. and D.C., D.C. timers, photo-electric control service, etc.

Application: Service de relais à C.A. et C.C., minuteries à C.C., service de commande photo-électrique, etc.

Anwendung: Bedienung von Gleich- und Wechselstromrelais, Zeitschalter für Gleichstrom, photoelektrische Regelung, usw.

Dimensions in mm
Dimensions en mm
Abmessungen in mm

Net weight
Poids net 9 g
Nettogewicht



Base, culot, Sockel: NOVAL

The anode screen s_a should be connected to the anode and the cathode screen s_k to the cathode via resistors of 10 MΩ

L'écran anodique s_a doit être relié à l'anode et l'écran cathodique s_k à la cathode à travers de résistances de 10 MΩ

Die Anoden- und Katodenschirme s_a und s_k sollen über Widerstände von 10 MΩ mit der Anode, bezw. Katode, verbunden werden

PHILIPS Z805U

Gasfilled cold-cathode RELAY TUBE with positive starter voltage, primarily intended for use in A.C. circuits

TUBE RELAIS à cathode froide et à remplissage de gaz avec tension de déclencheur positive, conçu en premier lieu pour des circuits à courant alternatif

Gasgefüllte RELAISRÖHRE mit kalter Katode und mit positiver Zündelektrodenspannung zur Verwendung in Wechselstromschaltungen

The operation of the tube is independant of lighting conditions.
Two screens connected externally to anode and cathode via resistors, provide for a priming discharge and give the tube excellent high voltage properties and a short ignition delay time

Le fonctionnement du tube est indépendant de conditions d'éclairage.
Deux écrans, connectés extérieurement à l'anode et à la cathode à travers des résistances, donnent lieu à une décharge auxiliaire et pourvoient le tube de propriétés excellentes quant aux tensions élevées et d'un petit retard à l'allumage.

Der Betrieb der Röhre ist unabhängig der Beleuchtungsbedingungen.
Zwei äusserlich über Widerstände mit der Anode und Katode verbundene Schirme bewirken eine Hilfsentladung und erteilen die Röhre eine kleine Zündverzögerung und hervorragende Eigenschaften in Bezug auf hohe Spannungen

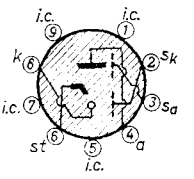
Application: Relay service on A.C. and D.C., D.C. timers, photo-electric control service, etc.

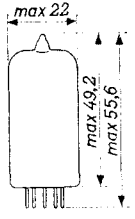
Application: Service de relais à C.A. et C.C., minuteries à C.C., service de commande photo-électrique, etc.

Anwendung: Bedienung von Gleich- und Wechselstromrelais, Zeitschalter für Gleichstrom, photoelektrische Regelung, usw.

Dimensions in mm
Dimensions en mm
Abmessungen in mm

Net weight
Poids net 9 g
Nettogewicht





Base, culot, Sockel: NOVAL

The anode screen s_a should be connected to the anode and the cathode screen s_k to the cathode via resistors of 10 MΩ

L'écran anodique s_a doit être relié à l'anode et l'écran cathodique s_k à la cathode à travers de résistances de 10 MΩ

Die Anoden- und Katodenschirme s_a und s_k sollen über Widerstände von 10 MΩ mit der Anode, bezw. Katode, verbunden werden

Limiting values (Absolute limits)
Caractéristiques limites (Limites absolues)
Grenzdaten (Absolute Grenzwerte)

A.C. OPERATION (Anode and starter supply voltages in phase)
FONCTIONNEMENT À TENSION ALTERNATIVE (Les tensions d'alimentation de l'anode et du déclencheur en phase)
WECHSELSPANNUNGSBETRIEB (Speisespannungen von Anode und Zündelektrode phasengleich)

Mains voltage Tension de réseau Netzspannung	= min. = max.	180 V_{eff} 275 V_{eff}
f	= min. = max.	10 c/s 100 c/s
I_a { Tav = 1 cycle Tav = 1 Période }	= min. = max.	5 mA 25 mA
I_{ap}	= max.	150 mA [1]
t_{amb}	= - 55 °C/+ 70 °C	

Circuit values
Valeurs des éléments de montage
Werte der Schaltungsteile

R_{st}	= min. = max.	0,5 MΩ 10 MΩ
Starter control capacitor Capacité de contrôle du déclencheur Steuerkondensator der Zündelektrode	= min.	100 pF [2]

D.C. OPERATION
FONCTIONNEMENT À TENSION CONTINUE
GLEICHSPANNUNGSBETRIEB

V_{ba}	= min. = max.	250 V 450 V
I_a	= min. = max.	5 mA 25 mA
t_{amb}	= -55 °C/+70 °C	

Circuit values
Valeurs des éléments de montage
Werte der Schaltungsteile

R_{st}	= max.	10 MΩ
Starter control capacitor Capacité de contrôle du déclencheur Steuerkondensator der Zündelektrode	= min. = max.	100 pF 10000 pF [3]

[1] [2] [3] See page 4; Voir page 4; siehe Seite 4

Limiting values (Absolute limits)
Caractéristiques limites (Limites absolues)
Grenzdaten (Absolute Grenzwerte)

A.C. OPERATION (Anode and starter supply voltages in phase)
FONCTIONNEMENT À TENSION ALTERNATIVE (Les tensions d'alimentation de l'anode et du déclencheur en phase)
WECHSELSPANNUNGSBETRIEB (Speisespannungen von Anode und Zündelektrode phasengleich)

Mains voltage Tension de réseau Netzspannung	= min. = max.	180 V_{eff} 275 V_{eff}
f	= min. = max.	10 c/s 100 c/s
I_a { T_{av} = 1 cycle T_{av} = 1 Periode }	= min. = max.	5 mA 25 mA
I_{ap}	= max.	150 mA [1]
t_{amb}	= - 55 °C/+ 70 °C	

Circuit values
Valeurs des éléments de montage
Werte der Schaltungsteile

R_{st}	= min. = max.	0,5 MΩ 10 MΩ
Starter control capacitor Capacité de contrôle du déclencheur Steuerkondensator der Zündelektrode	= min.	100 pF [2]

D.C. OPERATION
FONCTIONNEMENT À TENSION CONTINUE
GLEICHSPANNUNGSBETRIEB

V_{ba}	= min. = max.	250 V 450 V
I_a	= min. = max.	5 mA 25 mA
t_{amb}	= -55 °C/+70 °C	

Circuit values
Valeurs des éléments de montage
Werte der Schaltungsteile

R_{st}	= max.	10 MΩ
Starter control capacitor Capacité de contrôle du déclencheur Steuerkondensator der Zündelektrode	= min. = max.	100 pF 10000 pF [3]

[1] [2] [3] See page 4; Voir page 4; siehe Seite 4

Typical characteristics (with priming discharge ignited; values valid during life)
Caractéristiques types (décharge auxiliaire amorcée; valeurs valables pendant toute la durée du tube)
Kenndaten (mit entzündeter Hilfsentladung; gültig für die gesamte Lebensdauer)

$V_{st-kign}$	(V_{ba} = 250-450 $V_{=}$)	=	137-155 $V_{=}$ [1][2]
$V_{st-kign}$	(V_{ba} = 200-250 V_{eff})		98-110 V_{eff} [2]
$I_{st\ transf}$	(V_a = 250 $V_{=}$)	=	max. 100 µA [3]
V_{st-k}	(I_{st} = 100 µA)	=	110 V [4]
V_{a-k}	(I_a = 20 mA)	=	118-128 V [5]
V_{a-kign}		=	500 V
		=	min. 475 V
$-V_{a-kign}$		=	500 V
		=	min. 475 V

---

[1]) See fig.1; voir fig.1; siehe Abb.1.

[2]) Individual starter to cathode breakdown voltage shift during life in normal applications is generally less than 5 V. When a tube is ignited in D.C. operation for very long periods drawing negative starter current a greater drift of the breakdown voltage may occasionally occur
La déviation individuelle de la tension d'amorçage entre déclencheur et cathode pendant la vie en applications normales est généralement moins de 5 V. Lorsque le tube est amorcé pendant de très longues périodes à un courant négative du déclencheur, une déviation plus grande de cette tension d'amorçage peut se présenter
Der individuelle Verlauf der Zündspannung der Zündelektrode während der Lebensdauer bei normaler Verwendung ist im allgemeinen weniger als 5 V. Wenn aber eine Röhre während sehr langer Perioden bei negativem Starterstrom gezündet ist, kann gelegentlich ein grösserer Verlauf der Zündspannung auftreten

[3]) See fig.2; voir fig.2; siehe Abb.2

[4]) See fig.3; voir fig.3; siehe Abb.3

[5]) See fig.4. Individual anode to cathode burning voltage shift during life max. ± 3 V
Voir fig.4. La déviation individuelle de la tension anode-cathode pendant la vie est de ± 3 V au max.
Siehe Abb.4. Der individuelle Verlauf der Anoden-Katodenspannung während der Lebensdauer ist max. ± 3 V

Page 2; Seite 2.

[1]) Higher peak currents are permissible in pulse-forming circuits
Des valeurs plus élevées sont admissibles dans des circuits de mise en forme d'impulsions
Höhere Werte sind zulässig in Impulsformerschaltungen

[2]) The RC product of the starter circuit should be $\leq$ 1 msec.
Le produit RC du circuit du déclencheur doit être $\leq$ 1 msec.
Das RC-Produkt der Zündelektrodenschaltung soll $\leq$ 1 mSek sein

[3]) At lower D.C. voltages the higher values of the starter control capacitor are to be preferred
À des tensions continues basses il est conseillé de choisir les valeurs élevées de la capacité de contrôle du déclencheur
Bei niedrigeren Gleichspannungen wird der höhere Wert des Steuerkondensators der Zündelektrode empfohlen

PHILIPS

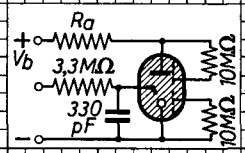
Z 805 U

Limiting curves
Courbes limites
Grenzkurven

7R06526

Fig.1
Abb.1

Z 805 U 9-3-'60



170

V_{stign} (V)

150

130

200 300 400 V_b (V) 500

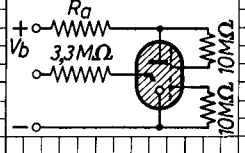


Fig.2
Abb.2

100

I_{st} (μA)

50

0

Transfer characteristic
Caractéristique de transfert
Übertragungscharakteristik

200 300 400 V_b (V) 500

3.3.1960

A

Z805U

PHILIPS

Limiting curves
----Courbes limites
Grenzkurven

7R06527

Fig. 3
Abb. 3

Z805U 9-3-'60

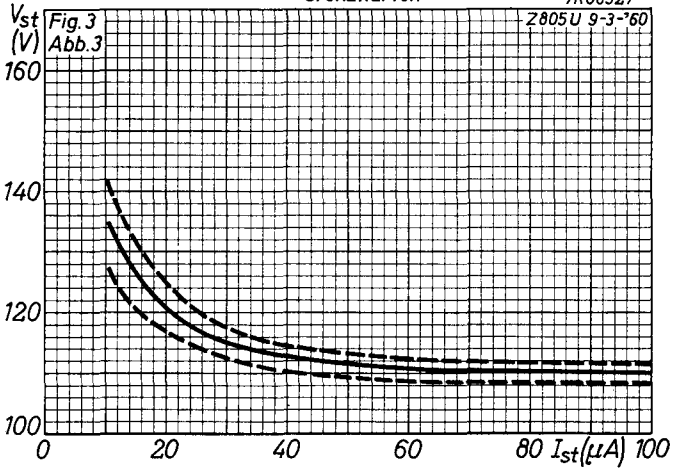
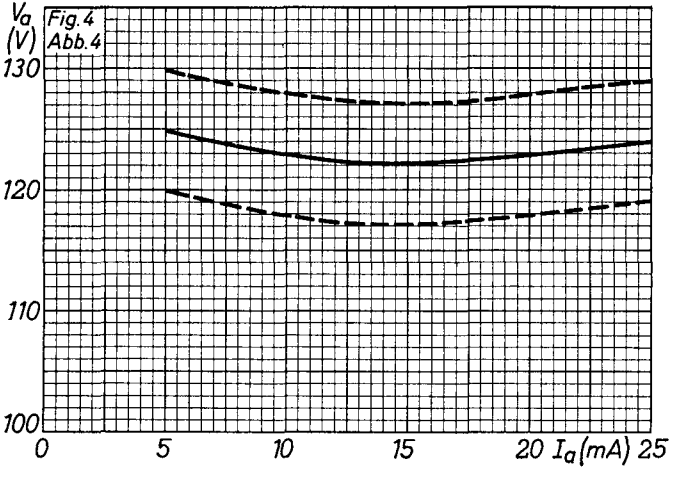


Fig. 4
Abb. 4



SWITCHING AND LIGHT DIODE

Cold cathode neon filled subminiature switching and light diode with a large and stable difference between ignition and maintaining voltage intended for low speed switching and counting e.g. in combination with CdS photo sensitive devices. The tube is shock and vibration resistant.

QUICK REFERENCE DATA			
Ignition voltage	V_{ign}	170	V
Maintaining voltage	V_m	109	V
Cathode current	I_k	3.5	mA

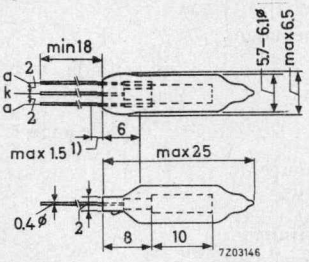
OPERATING PRINCIPLE

The diode contains a rod shaped molybdenum cathode and a concentric gauze anode. By applying a suitable voltage between the electrodes, a glow discharge occurs and its red light is available outside the tube.

DIMENSIONS AND CONNECTIONS

Dimensions in mm

Colour type indication on pinch: red dot.



MOUNTING

The tube may be soldered directly into the circuit but heat conducted to the glass to metal seals should be kept to a minimum by the use of a thermal shunt. The leads may be dip-soldered to a minimum of 5 mm from the seals at a solder temperature of 240 °C during max. 10 s. Care should be taken not to bend the leads nearer than 1.5 mm from the seals.

1) This part of the leads is not tinned.

CHARACTERISTIC RANGE VALUES FOR EQUIPMENT DESIGN

(Valid over the first 15000 hours operation within the preferred current range and at t_{amb} = room. The electrical characteristics are independent of ambient illumination).

Non conduction

Anode voltage below which ignition will not occur in any tube	$V_{ign\ min}$		163	V
Insulation resistance	r_{isol}	>	300	MΩ

Ignition

Anode voltage to ensure ignition	$V_{ign\ max}$		178	V
Ignition delay	See pages C7 and C8			
Typical max. individual variation of ignition voltage during life	ΔV_{ign}	<	5	V
Typical temperature coefficient of ignition voltage, averaged over the range −55 °C to +70 °C	$\frac{\Delta V_{ign}}{\Delta t_{bulb}}$	<	±15	mV/°C

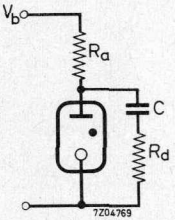
Conduction

Cathode current, average during any conduction period	I_k	>	2.2	mA
average (T_{av} = max. 1 s)	I_k	<	4.5	mA
peak (See "Reliability and life expectancy)	I_{kp}	<	50	mA
Typical rise in bulb temperature	$\frac{\Delta t_{bulb}}{\Delta I_k}$		10	°C/mA
Maintaining voltage	See page C7			
Typical max. individual variation of maintaining voltage during life	ΔV_m	<	$^{+2}_{-4}$	V
Typical max. temperature coefficient of maintaining voltage, averaged over the range −55 °C to +70 °C	$\frac{\Delta V_m}{\Delta t_{bulb}}$	<	±15	mV/°C
Light intensity 1)2)	E	>	20	lux/mA
Typical variation of light intensity	ΔE	<	−3	%/1000 h

1)2) See page C5

Extinction

Typical min. RC components to ensure self extinction at V_b = 250 V for different values of current limiting resistance R_d.



R_d	0	1	10	47	100	kΩ
R_a	1	1	1.5	2	3	MΩ
C	5	22	22	22	22	nF

RELIABILITY AND LIFE EXPECTANCY

Reliability has been assessed in a life test programme totalling 5.10^6 tube hours on 400 tubes. The longest test periode being 15000 hours on 100 tubes. A total of 7 failures result in a failure rate of better than 0.15% per 1000 h. This failure rate is not expected to increase over the next period of 15000 h.
Life expectancy: 30000 operating hours within the preferred current range
or
2.4×10^6 ignitions discharging a capacitor of max. 16 μF with suitable series impedance to limit the peak current to max. 50 mA.

1) Light intensity measured over an angle of 70° at a distance of 3.6 mm from the tube axis opposite the anode cylinder.

2) Measured with a Standard Weston Cell adopted to eye sensitivity.
Because the light emission of the neon discharge is mainly contained in the red region, the illumination resistance of a CdS cell will be 1.5 to 2 times lower than in case of irradiation by a 2700 °K incandescent light source. The exact conversion factor depends on the type of CdS cell used.

LIMITING VALUES (Absolute max. rating system)

Cathode current, average for continuous conduction	I_k	min.	2.2	mA [1]
average (T_{av} = max. 1 s)	I_k	max.	4.5	mA [1]
peak	I_{k_p}	max.	50	mA
Anode voltage, negative peak	$-V_{a_p}$	max.	200	V
Bulb temperature	t_{bulb}	min.	-55	°C
		max.	+70	°C
Altitude	h	max.	24	km

SHOCK AND VIBRATION RESISTANCE

These conditions are solely used to assess the mechanical quality of the tube. *The tube must not be continuously operated under these conditions.*

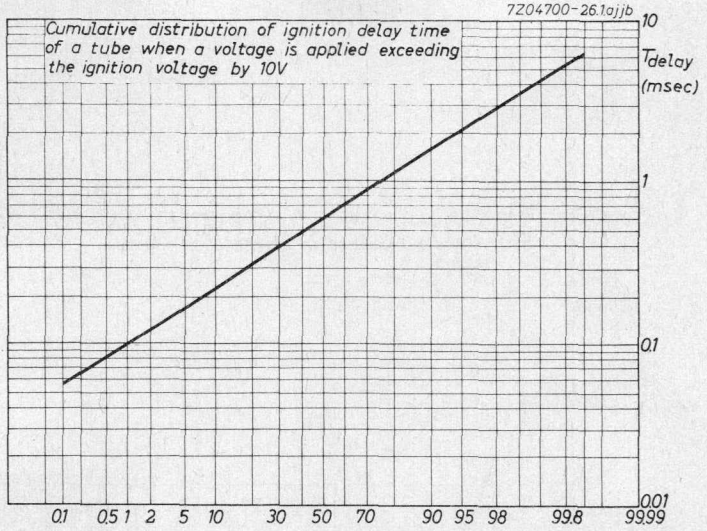
Shock resistance 500 g

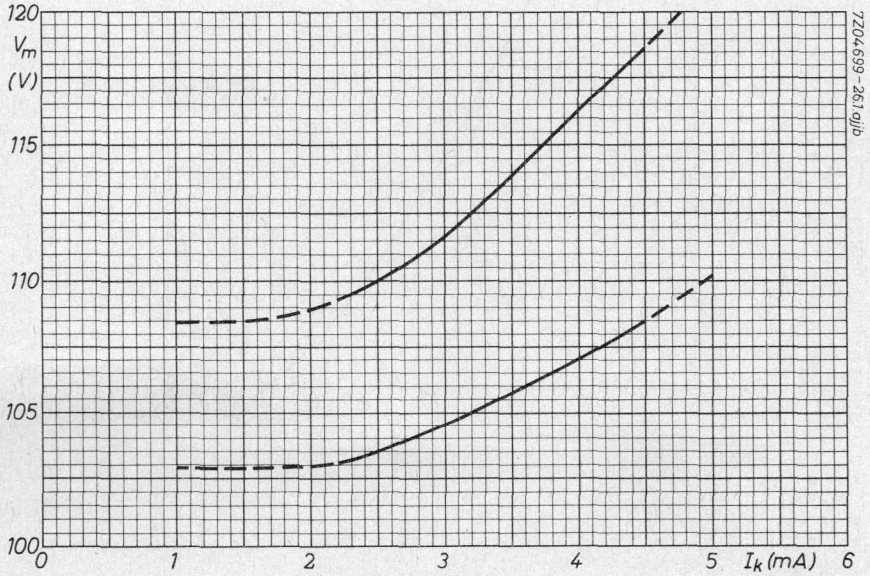
Forces as applied by the NRL impact machine for electronic devices caused by 5 blows of the hammer lifted over an angle of 30° in each of 4 positions of the tube.

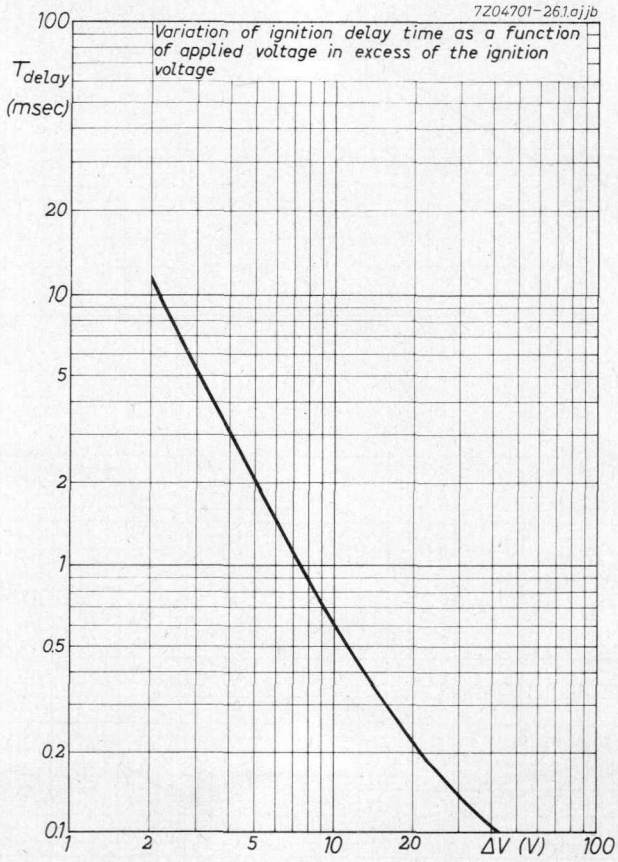
Vibration resistance 2.5 g(peak)

Vibrational forces for a period of 32 hours at a frequency of 50 Hz in each of 3 directions.

[1]) Current excursions down to 1 mA and up to 5 mA are permitted under conditions of e.g. extreme supply voltage variations. The excursion times should preferably be as short as possible but never exceed 24 hours.


7Z04700-26.1ajjb
Cumulative distribution of ignition delay time of a tube when a voltage is applied exceeding the ignition voltage by 10V
10
Tdelay (msec)
1
0.1
0.01
0.1
0.5
1
2
5
10
30
50
70
90
95
98
99.8
99.99


120
Vm (V)
115
110
105
100
0
1
2
3
4
5
Ik (mA)
6
7Z04699-26.1ajjb


7Z04701-261.ajjb
Variation of ignition delay time as a function of applied voltage in excess of the ignition voltage
100
T_{delay}
(msec)
20
10
5
2
1
0.5
0.2
0.1
1
2
5
10
20
ΔV (V)
100

GAS FILLED INDICATOR DIODE

Shock and vibration resistant cold-cathode gas-filled subminiature diode with visible glow-discharge for read-out purposes.
The tube contains two electrodes, a rod shaped molybdenum cathode and a concentric gauze anode.

APPLICATION

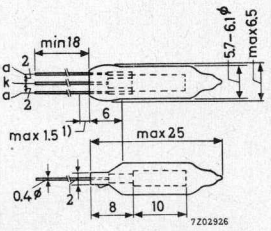
Indicator in low voltage transistor circuits. The diode can be used in combination with CdS photoconductive cells and it can be controlled by voltage signals down to 3 V.

QUICK REFERENCE DATA				
Ignition voltage	V_{ign}	=	90	V
Extinction voltage	V_{ext}	>	83.5	V
Cathode current	I_k	=	1	mA
Light intensity at I_k = 1 mA	E	=	60	lux

MECHANICAL DATA

Dimensions in mm

Type indication on pinch: yellow dot.



MOUNTING

The tube may be soldered directly into the circuit, but heat conducted to the glass-to-metall seals should be kept to a minimum by the use of a thermal shunt.
The leads may be dip-soldered to a minimum of 5 mm from the glass-to-metal seals at a solder temperature of 240 °C during max. 10 seconds.
If the tube is held in its position by the leads only, the connection of both anode leads is recommended.
Care should be taken not to bend the leads nearer than 1.5 mm from the seals.

1) Not tinned

SHOCK AND VIBRATION RESISTANCE

These conditions are solely used to assess the mechanical quality of the tube. The tube must not be continuously operated under these conditions.

Shock resistance 500 g

Forces as applied by the NRL impact machine for electronic devices caused by 5 blows of the hammer lifted over an angle of 30° in each of 4 positions of the tube.

Vibration resistance 2.5 g (peak)

Vibrational forces for a period of 32 hours at a frequency of 50 Hz in each of 3 directions.

CHARACTERISTICS

Valid over 15000 operating hours within the preferred current range and at room temperature unless otherwise stated.
The electrical characteristics are independent of ambient illumination.

Non conduction

Anode voltage below which ignition will not occur in any tube	$V_{ign\,min.}$	=	88	V	
Insulation resistance	r_{isol}	>	300	MΩ	

Ignition

Ignition voltage, upper limit	$V_{ign\,max.}$	=	93	V	1)
individual variation during life	ΔV_{ign}	<	2.5	V	
Ignition delay at V_{ba} = 93 V	T_{delay}	=	0.05	s	2)
Temperature coefficient of ignition voltage	$\frac{\Delta V_{ign}}{\Delta t_{bulb}}$	<	-15	mV/°C	3)
Reignition voltage in case of full wave rectified a.c. supply	V_{reign}	<	101	V	4)
		>	96.5	V	4)

1) The ignition and extinction voltage depression (hysteresis) is max. 0.75 V per mA prior current measured 50 ms after cessation of conduction.
2) Due to the statistical nature of ignition delay values of delay time > 1 s may occasionally occur.
3) Characteristic range value for equipment design.
4) These values apply to 220 V (+10 %, -15 %), 50 Hz to 60 Hz full-wave rectified unsmoothed supply and assume conduction in the course of the preceeding half cycle, so that residual ionization eliminates delay of the following ignition.

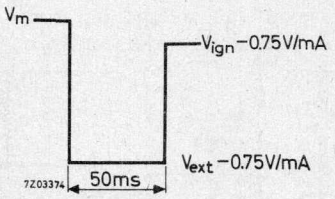
CHARACTERISTICS (continued)

Conduction

Cathode current,					
preferred range	I_k	=	0.4 to 2	mA	5)
peak	I_{kp}	=	3	mA	
Maintaining voltage	V_m	<	86 V + 4.25	V/mA	6)
		>	83 V + 2.5	V/mA	7)
Individual variation during life	ΔV_m	<	1.5	V	
Temperature coefficient of maintaining voltage	$\frac{\Delta V_m}{\Delta t_{bulb}}$	<	-15	mV/°C	3)
Rise in bulb temperature	$\frac{\Delta t_{bulb}}{\Delta I_k}$	=	10	°C/mA	
Light intensity,	E	>	30	lux/mA	8) 9)
individual minimum, measured over an angle of 70° averaged over the full circumference of the tube	E_{av}	>	60	lux/mA	8) 9)

Extinction

Extinction voltage	V_{ext}	>	83.5	V	1)



5) Current excursions during ignition and extinction are not taken into account.
6) Valid within the range 0.1 mA to 3 mA.
7) Valid within the range 0.2 mA to 3 mA. Between 0.05 mA and 0.2 mA $V_{m\,min.} = V_{ext} = 83.5$ V.
8) Light intensity at a distance of 3.6 mm from the tube axis opposite the anode cylinder, measured with a standard Weston cell adopted to eye sensitivity. Because the emission of the neon discharge is mainly contained in the red region the illumination resistance of a CdS cell will be 1.5 to 2 times lower than in case of irradiation by a 2700 °K incandescent light source. The exact conversion factor depends on the type of CdS cell used.
9) At least 90% of the tubes will meet the figure stated.

RELIABILITY AND LIFE EXPECTANCY

The electrical characteristics have been assessed in a life test programme, totalling 3.0×10^6 tube hours with no failures, denoting a failure rate of better than 0.1 % per 1000 hours. The maximum test period was 19000 hours on 22 tubes. This failure rate is not expected to increase over the first 25000 hours of continuous operation within the preferred current range.

LIMITING VALUES (Absolute maximum rating system)

Cathode current, averaging time = 5 s	I_k	= max.	2.5	mA
Cathode current during conduction	I_k	= min.	0.1	mA [1]
Cathode current, peak	I_{kp}	= max.	3	mA
Anode voltage, negative peak	$-V_{ap}$	= max.	70	V
Bulb temperature	t_{bulb}	= min.	-55	°C
		= max.	70 °C + 10	°C/mA
Altitude	h	= max.	24	km

READ-OUT CIRCUIT BISTABLE MULTIVIBRATORS

Principle of operation

The figures 1 and 2 show equivalent circuits for bistable multivibrators, equipped with p-n-p- and n-p-n transistors respectively, to which a read-out circuit has been added. The transistors are replaced by ideal switches, the voltage source V_T represents the available voltage that controls the diodes 2) and R_T is the output resistance as measured at the collector of the cut-off transistor.

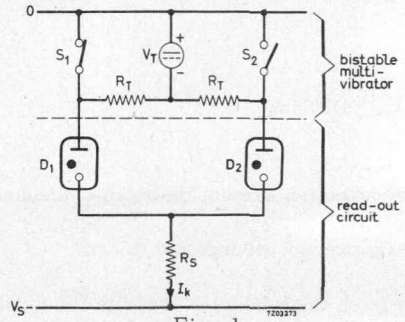


Fig. 1

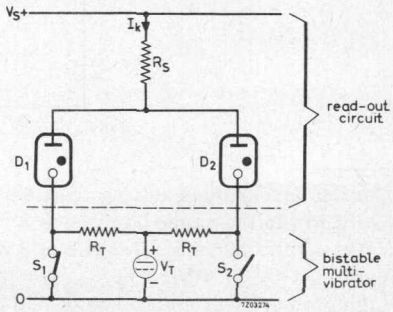


Fig. 2

1) Current excursions down to 50 μA with a duration < 1 s are permitted.

2) $V_T = V_{c.o.} - V_{sat}$ (V) in which

$V_{c.o.}$ = voltage between collector of the cut-off transistor and the common terminal (absolute value).

V_{sat} = voltage across the bottomed transistor (absolute value).

READ-OUT CIRCUIT BISTABLE MULTIVIBRATORS (continued)

Correct read-out is obtained when only the diode corresponding to the bottomed transistor conducts. For this the following conditions must be met: [1])

(I) Ignition of the correct diode, corresponding to the bottomed transistor, when the other diode is conducting.

Thus: $V_{m\,min.} + I_k R_T + V_T > V_{ign\,max}$,

resulting in $I_k > \frac{10 - V_T}{R_T + 2.5} \quad \frac{(V)}{(k\Omega)}$ for $I_k > 0.2$ mA

(II) Extinction of the diode corresponding to the cut-off transistor, when the correct diode is conducting.

Thus: $V_{m\,max.} - V_T < V_{ext\,min}$,

resulting in $I_k < \frac{V_T - 2.5}{5} \quad \frac{(V)}{(k\Omega)}$ for $I_k > 0.1$ mA

(III) Non-ignition of the diode corresponding to the cut-off transistor when the correct diode is conducting.

Thus: $V_{m\,max.} - V_T < V_{ign\,min}$,

resulting in $I_k < \frac{V_T + 2}{5} \quad \frac{(V)}{(k\Omega)}$ for $I_k > 0.1$ mA

These conditions are shown graphically on page A below.

Condensed instructions for designing the read-out circuit. [2])

The following directives are based on the requirement that correct read-out shall be ensured under worst case conditions, after the instant that the bistable circuit has reached its final stationary state. It is irrelevant whether the read-out diodes follow the changes of state of the multivibrator during its dynamic operation or not.

A choice can be made between the following modes of operating the diodes, namely by means of:

(A) a constant direct current

(B) a constant direct current on which a pulse is superimposed prior to reading-out. Three kinds of pulses are possible:
   a) a positive going pulse;
   b) a negative going pulse;
   c) a positive going pulse followed by a negative going one

(C) an unsmoothed current supplied by a full wave rectifier.

[1]) It is assumed that the supply voltage V_s exceeds the ignition voltage of the gas diodes, so that ignition of at least one diode is ensured; the most adverse situation being that only the wrong diode conducts.

[2]) For a detailed analysis of the design procedure please apply to the manufacturer.

READ-OUT CIRCUIT BISTABLE MULTIVIBRATORS (continued)

In fig. 3, schematically representing these waveforms, the required minimum duration of the superimposed pulses is indicated;
t_s denotes the instant at which the bistable circuit reaches its final state.

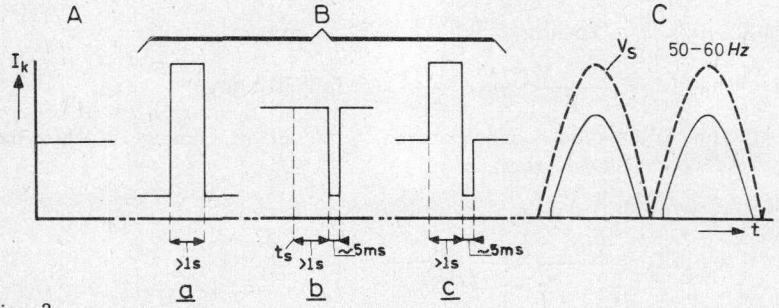


Fig. 3

The conditions to be obeyed by the current I_k are specified in the table below:

Mode of operation		Values of I_k		V_T
		lower limit	upper limit	
(A) constant direct current		(I)	(II)	> 5 V
(B) direct current with superimposed:				
(a) positive going pulses	steady state current	–	(II)	> 4.5 V
	pulse current	(I)	–	
(b) negative going pulses	steady state current	(I)	(III)	> 3 V
	pulse current	–	(II)	
(c) positive and negative going pulses	steady state current	–	(III)	> 3 V
	positive going pulse	(I)	–	
	negative going pulse	–	(II)	
(C) rectified alternating current, peak value of I_k		(I)	(III)	> 4.5 V [1]

This table should be read in conjunction with the specified recommended operating conditions and limiting values.

1) Since both diodes are extinguished at the end of each half cycle of the supply voltage, condition (II) is not required, and is replaced by the condition that only the correct diode will reignite. The lower limit is thus given by the spread of the reignition voltage (e.i. 4.5 V).

READ-OUT CIRCUIT BISTABLE MULTIVIBRATORS (continued)

The minimum available value of V_T being known, the points of intersection with the curves I, II and III on page 8, and hence the limits of I_k (I_{kI}, I_{kII} and I_{kIII}) can be determined. This having been done, the required values of $V_{S\,min}$ and R_S can be evaluated from the following expressions: [1])

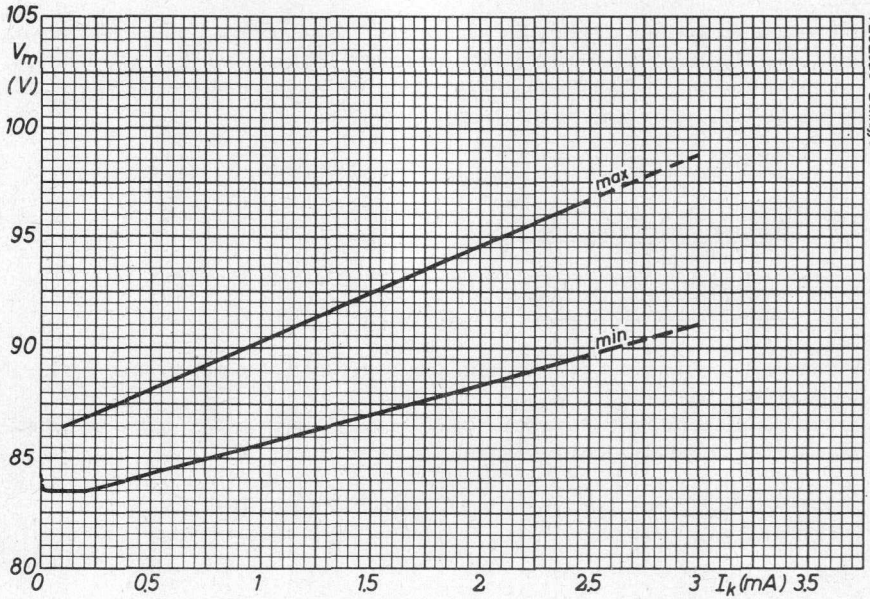
$$\frac{V_{S\,min} - V_{ign\,max}}{R_{S\,max}} = I_{kI} \qquad (1)$$

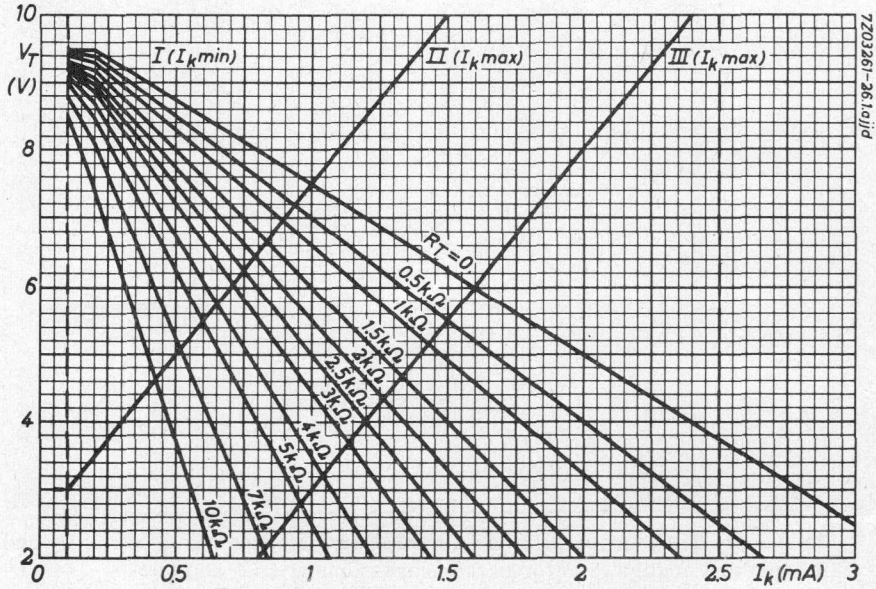
$$\frac{V_{S\,max} - V_{ext\,min} - V_T}{R_{S\,min}} = I_{kII} \qquad (2)$$

$$\frac{V_{S\,max} - V_{ign\,min} - V_T}{R_{S\,min}} = I_{kIII} \qquad (3)$$

In these expressions the suffices min and max denote the worst case limits of the quantities concerned.
For mode of operation (C) the peak value of the supply voltage must be substituted for V_S in the above expressions.

[1]) The use of equivalent circuits for establishing the exact conditions I, II, and III leads to a negligible error in the expressions (1), (2) and (3).


105
V_m
(V)
100
95
90
85
80
0
0.5
1
1.5
2
2.5
3
I_k(mA)
3.5
max
min
7Z02923-26.1a)jd

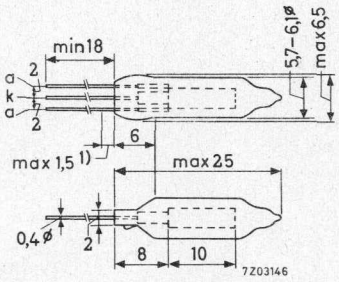

10
V_T
(V)
8
6
4
2
0
0.5
1
1.5
2
2.5
3
I_k(mA)
I ($I_k$min)
II ($I_k$max)
III ($I_k$max)
R_T=0
0.5kΩ
1kΩ
1.5kΩ
2kΩ
2.5kΩ
3kΩ
4kΩ
5kΩ
7kΩ
10kΩ
7Z03261-26.1a)jd

SWITCHING AND LIGHT DIODE

Long-life cold-cathode neon-filled subminiature switching and light diode with a large and stable difference between ignition and maintaining voltage intended for touch control applications e.g. in variable capacitance diode controlled radio or television tuners. The tube is shock and vibration resistant.

QUICK REFERENCE DATA			
Ignition voltage	V_{ign}	172	V
Maintaining voltage	V_m	107	V
Cathode current	I_k	3	mA

DIMENSIONS AND CONNECTIONS Dimensions in mm



MOUNTING

The tube may be soldered directly into the circuit, but heat conducted to the glass to metal seals should be kept to a minimum by using a thermal shunt. The leads may be dip-soldered to a minimum of 5 mm from the seals at a solder temperature of 240 °C during max. 10 s. Care should be taken not to bend the leads closer than 1,5 mm to the seals.

1) This part of the leads is not tinned.

CHARACTERISTICS AND OPERATING CONDITIONS

Valid over life and full temperature range unless otherwise stated.
The electrical characteristics are independent of ambient illumination.

Non conduction				
Anode voltage below which ignition will not occur	$V_{ign_{min.}}$		161	V
Insulation resistance	r_{ins}	>	300	MΩ
Ignition				
Anode voltage to ensure ignition	$V_{ign_{max.}}$		183	V
Ignition delay at V_{ign} + 10 V	T_{delay}	<	50	ms
at V_{ign} + 20 V	T_{delay}	<	20	ms
Typical max. individual variation of ignition voltage during life, within the V_{ign} limits given above	ΔV_{ign}	<	5	V
Conduction				
Cathode current, average during any conduction period	I_k	>	2, 2	mA
average (T_{av} = max. 1 s)	I_k	<	4, 5	mA
Maintaining voltage at I_k = 3 mA	V_m	≥	103	V
		≤	111	V
Typical max. individual variation of maintaining voltage during life, within the V_m limits given above	ΔV_m	<	+2	V
			−4	V
Extinction				
Extinction voltage	V_{ext}	>	100	V

LIMITING VALUES (Absolute max. rating system)

Cathode current, average for				
continuous conduction	I_k	min.	2,2	mA
average (T_{av} = max. 1 s)	I_k	max.	4,5	mA
Anode voltage, negative peak	$-V_{a_p}$	max.	200	V
Bulb temperature	t_{bulb}	min.	-55	°C
		max.	+70	°C

SHOCK AND VIBRATION RESISTANCE

These conditions are solely used to assess the mechanical quality of the tube. The tube must not be continuously operated under these conditions.

Shock resistance 500 g

Forces as applied by NRL impact machine for electronic devices caused by 5 blows of the hammer lifted over an angle of 30° in each of 4 positions of the tube.

Vibration resistance 2,5 $g_{(peak)}$

Vibrational forces for a period of 32 hours at a frequency of 50 Hz in each of 3 directions.

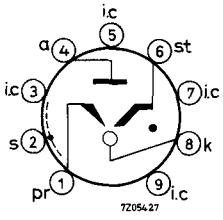
TRIGGER TUBE

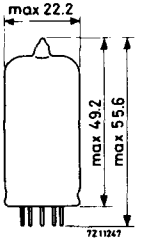
Gas filled cold cathode trigger tube with molybdenum cathode and electrical priming. The tube has been designed to be ignited with positive voltages on starter and anode only and can be fed from a.c. or d.c. anode voltages.

QUICK REFERENCE DATA				
Anode supply voltage	a.c.	V_{ba}	220	V
	d.c	V_{ba}	300	V
Anode maintaining voltage		V_m	112	V
Cathode current, max.		$I_{k\ max.}$	40	mA
Starter to cathode ignition voltage		$V_{st\text{-}ign}$	130	V
Transfer requirements: capacitance		C_{st}	330	pF
	current	I_{st}	200	μA

DIMENSIONS AND CONNECTIONS

Base: Noval





MOUNTING

Mounting position: any

Starter and primer resistances should be mounted directly on the corresponding socket soldering tag to avoid stray capacitances.

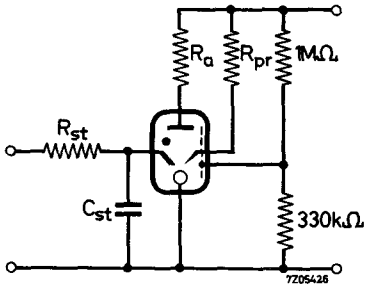
CHARACTERISTIC RANGE VALUES FOR EQUIPMENT DESIGN

The electrical characteristics assume the presence of a priming discharge. This priming discharge can be established by connecting the primer via a 10 MΩ resistor to the anode supply voltage.

A.C. OPERATION

(Anode and starter voltage in phase. When the tube is fed from an alternating supply voltage, the internal shield (s) shall be connected to a voltage divider across the anode supply voltage so that the voltage at s is ±5% of the anode voltage. See fig.1)

Anode voltage	V_a	min. 180 max. 250	V_{RMS} V_{RMS}
Starter ignition voltage	$V_{st\text{-}ign}$	min. 85 max. 100	V_{RMS} V_{RMS}
Transfer requirements			
current	I_{st}	min. 200	μA
capacitance	C_{st}	min. 200 max. 500	pF pF
Cathode current			
average (T_{av} max. 15 s)	I_k	max. 25	mA
average (T_{av} max. 20 ms)	I_k	max. 40	mA
average during any conduction period	I_k	min. 10	mA



CHARACTERISTIC RANGE VALUES FOR EQUIPMENT DESIGN

(continued)

D.C. OPERATION			
Anode voltage	V_a	min. 250 max. 350	V V
Starter ignition voltage	$V_{st\text{-}ign}$	min. 120 max. 140	V V
Transfer requirements			
current	I_{st}	min. 200	μA
capacitance	C_{st}	min. 200	pF
Cathode current			
average (T_{av} max. 15 s)	I_k	max. 25	mA
average during conduction	I_k	min. 15	mA
Maintaining voltage (at I_a = 20 mA)	V_m	min. 106 max. 115	V V

LIMITING VALUES (Absolute max. rating system)

A.C. OPERATION (Anode and starter voltage in phase)

Anode voltage	V_a	max. 250	V_{RMS}
Cathode current			
average (T_{av} max. 15 s)	I_k	max. 25	mA
average (T_{av} max. 20 ms)	I_k	max. 40	mA
peak (f max. 60 Hz)	I_{k_p}	max. 200	mA
average during any conduction period	I_k	min. 10	mA
Negative starter current	$-I_{st}$	max. 200	μA
Voltage at internal shield (in phase with anode voltage)	V_s V_s	min. 45 max. 75	V_{RMS} V_{RMS}
Temperature	t_{bulb} t_{bulb}	min. −55 max. +70	°C °C+2 °C/mA

LIMITING VALUES (Absolute max. rating system) (continued)

D.C. OPERATION

Anode voltage			
positive	V_a	max. 350	V
negative	$-V_a$	max. 100	V
Cathode current			
average (T_{av} max. 15 s)	I_k	max. 25	mA
average during conduction	I_k	min. 15	mA
peak	I_{k_p}	max. 200	mA
surge ($T_{max.}$ 1 ms)	I_{surge}	max. 1	A
Starter to cathode capacitor	C_{st}	max. 10	nF [1]
Negative starter voltage	$-V_{st}$	max. 0	V
Temperature	t_{bulb}	min. -55	°C
	t_{bulb}	max. +70	°C+2 °C/mA

[1]) Higher values of starter capacitor are permitted, provided a current limiting resistor of 1 kΩ to 10 kΩ is used in series with the starter.

TRIGGER TUBE

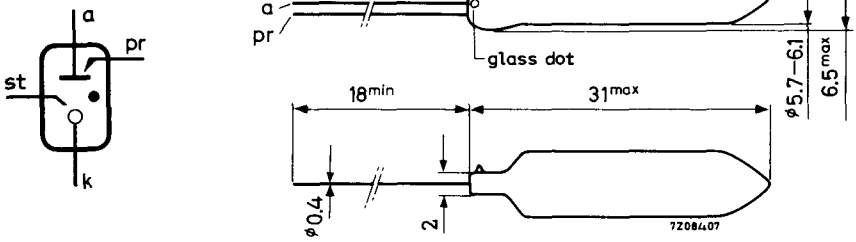
Ruggedized cold cathode trigger tube with pure molybdenum electrodes and very high light-output for use in e.g. shift registers for running-text displays.

QUICK REFERENCE DATA			
Anode supply voltage	V_{b_a}	300	V
Anode maintaining voltage	V_{m_a}	136	V
Cathode current	I_k	2	mA
Starter to cathode ignition voltage	$V_{st_{ign}}$	180	V
Light output	approx.	0.3	lm

DIMENSIONS AND CONNECTIONS

Dimensions in mm

Glass dot indicates anode lead



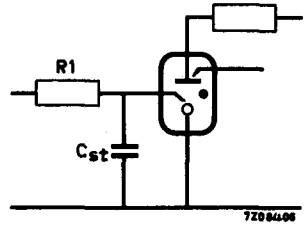
MOUNTING

1. Directly soldered connections to the leads must be at least 5 mm from glass and any bending of the leads must be at least 1.5 mm from the glass.
2. When soldering into the circuit the heat conducted to the glass should be kept to a minimum by the use of a thermal shunt on the leads.
3. The leads may be dip-soldered to minimum 5 mm from the glass at a solder temperature of 240 °C during maximum 10 s.
4. The primer and starter circuit resistors and capacitors should be mounted close to the tube.
5. The tube should not be mounted close to conductors or components which give rise to strong electrical fields.

CHARACTERISTIC RANGE VALUES FOR EQUIPMENT DESIGN

Valid over life and full temperature range unless otherwise stated.
The tube characteristics are independent of ambient light and assume the presence of a priming discharge.

PRIMING CONDITIONS				
Anode to primer supply voltage	$V_{ba\text{-}pr}$	> 265	V	1)
Typical max. ignition delay		0.3	s	
Anode to primer maintaining voltage	$V_{m_{a\text{-}pr}}$	see page 5		
Primer current	I_{pr}	7.5 to 30	μA	
STAND-BY (main gap non-conducting)				
Anode to cathode voltage,				
positive	V_a	< 350	V	1)
negative	$-V_a$	< 100	V	
Anode to starter voltage,				
positive	$V_{a\text{-}st}$	< 350	V	1)
negative	$-V_{a\text{-}st}$	< 100	V	
Starter to cathode voltage to ensure non ignition,				
positive	V_{st}	< 165	V	
negative	$-V_{st}$	< 100	V	
Primer current	I_{pr}	< 30	μA	
IGNITION REQUIREMENTS				
a. D.C. triggering				
Anode to cathode voltage	V_a	> 265	V	1)
Starter to cathode voltage to ensure ignition	$V_{st_{ign}}$	> 200	V	
Starter to cathode capacitor to ensure transfer	C_{st}	> 1	nF	
Starter circuit charging resistance	R_1	> 0.5	MΩ	



b. Bias + pulse triggering

Anode to cathode voltage	V_a	> 265	> 220	V 1)
Starter coupling capacitor	C_{st}	> 1	> 1	nF
Starter to cathode voltage	V_{st}	> 200	> 220	V
Starter series resistance				
at C_{st} = 1 nF	R_{st}	< 3.3		kΩ
at C_{st} = 1.5 nF	R_{st}	< 10		kΩ
Pulse duration	T_p	> 40		μs

MAIN GAP CONDUCTING

Anode maintaining voltage	V_{m_a}	see page 6		
Cathode current range	I_k	1	to 3	mA

EXTINCTION REQUIREMENTS

Anode to cathode voltage at I_a = 3 mA	V_a	see page 7		
Anode to starter voltage at I_a = 3 mA	V_{a-st}	see page 7		

LIMITING VALUES (Absolute max. rating system)

Anode to cathode voltage, negative	$-V_a$	max.	100	V
Starter to cathode voltage, negative	$-V_{st}$	max.	100	V
Cathode current				
average during any conduction period	I_k	min.	1	mA
average (T_{av} = max. 20 ms)	I_k	max.	3	mA
peak	I_{k_p}	max.	10	mA 2)
Envelope temperature	t_{bulb}	max.	70	°C
	t_{bulb}	min.	-55	°C
Altitude	h	max.	20	km

LIFE EXPECTANCY

10 000 operating hours.
The tube is deemed to have reached its end of life when the anode to cathode maintaining voltage V_{m_a} has reached the maximum value indicated on page 6.

WAVELENGTH OF RADIATED LIGHT 580 to 700 nm

1) To avoid spurious ignition the rate of rise of applied anode voltage shall have a minimum time constant as given on page 7.

2) For higher values the manufacturer should be consulted.

ENVIRONMENTAL CONDITIONS

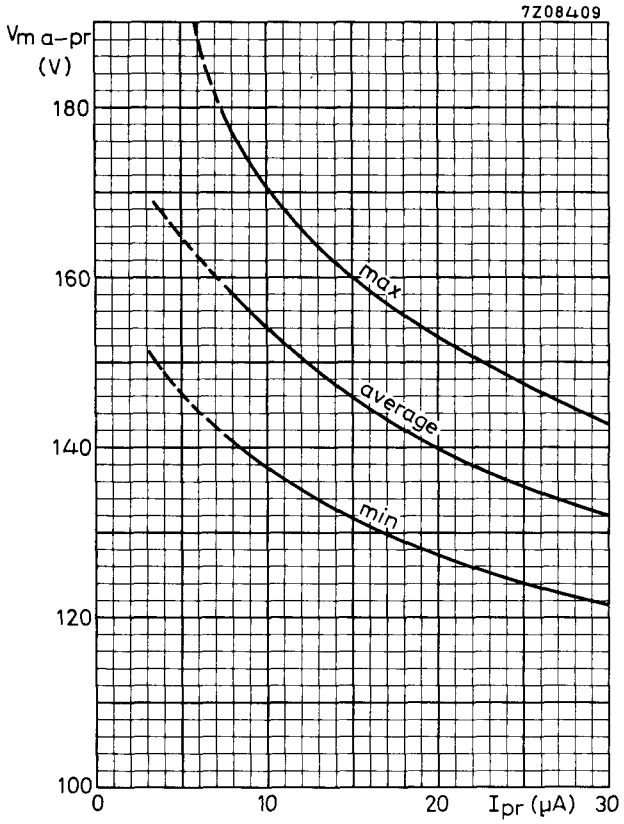
Vibration resistance

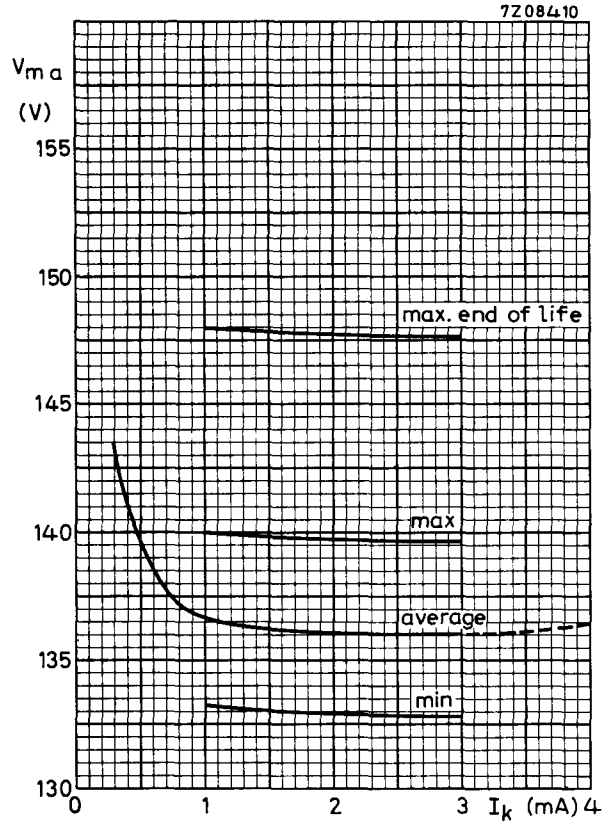
These conditions are solely used to assess the mechanical quality of the tube. The tube must not be continuously operated under these conditions.

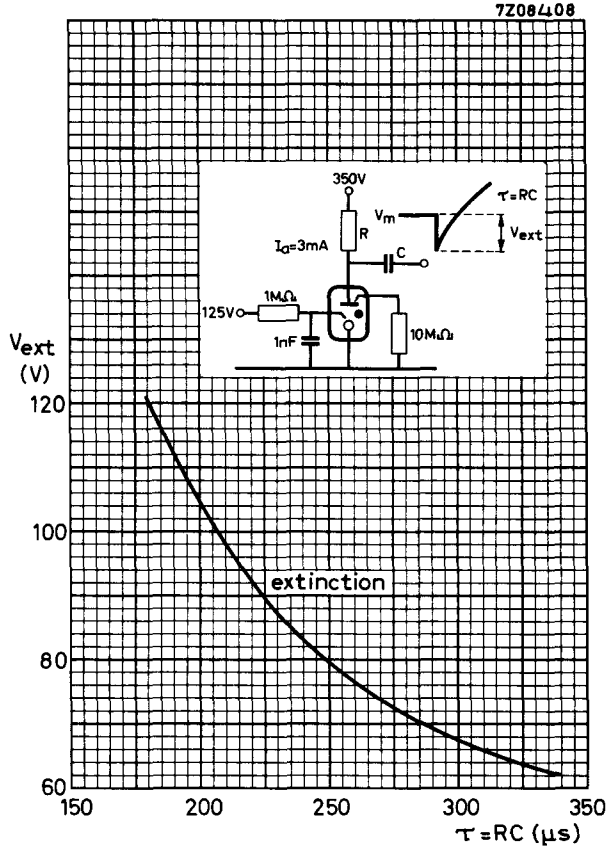
Vibration resistance 2.5 g_{peak}

Vibrational forces for a period of 32 hours at a frequency of 50 Hz in each of three directions.

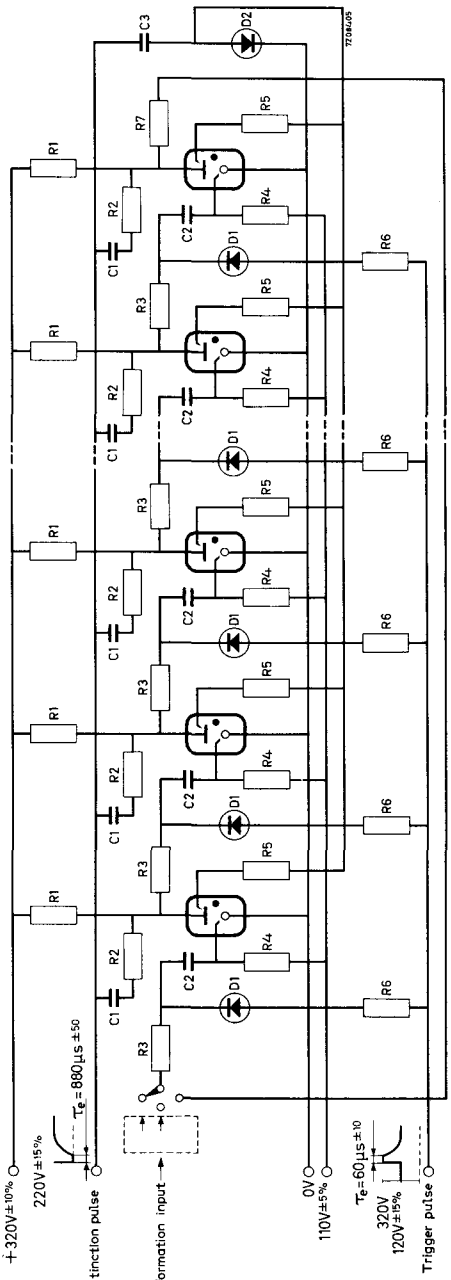
Data based on pilot-production tubes.


7Z08409
Vm a-pr
(V)
180
160
140
120
100
0
10
20
Ipr (μA)
30
max
average
min


7Z08410
$V_{m a}$
(V)
155
150
145
140
135
130
0
1
2
3
I_k (mA) 4
max. end of life
max
average
min


7Z08408
350V
R
V_m
τ=RC
V_{ext}
I_G=3mA
C
1MΩ
125V
1nF
10MΩ
V_{ext}
(V)
120
100
80
60
extinction
150
200
250
300
350
τ=RC (μs)

Application of the ZC1050 in a shift register



R1 = 82 kΩ 5% 0.5 W
R2 = 22 kΩ 5% 0.125 W
R3 = 1 MΩ 5% 0.25 W
R4 = 1 MΩ 5% 0.25 W
R5 = 10 MΩ 10% 0.125 W
R6 = 10 kΩ 5% 0.125 W
R7 = 10 kΩ 5% 0.25 W

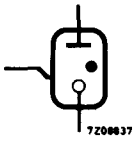
C1 = 2.2 nF 10%
C2 = 2.2 nF 10%
C3 = 100 to 500 nF
D1 = BYX10
D2 = BYX10
V = Cold Cathode Trigger tube ZC1050
Max. shift frequency = 80 p.p.s.

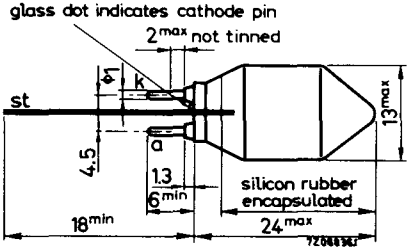
TRIGGER TUBE

Subminiature cold-cathode trigger tube for switching very high peak currents, e.g. in capacitor discharge circuits. The tube contains an internal cathode, an internal anode and an external (capacitive) starter.

QUICK REFERENCE DATA				
Anode voltage	V_a	max.	800	V
	V_a	min.	100	V
Cathode current, peak	I_{kp}	max.	5000	A
average (T_{av} = max. 60 s)	I_k	max.	20	mA
Energy per discharge	E	max.	60	J

DIMENSIONS AND CONNECTIONS Dimensions in mm





MOUNTING

1. Directly soldered connections to the pins must be at least 2 mm from the glass. The cathode and anode pins should not be bent.
2. When soldering the heat conducted to the glass should be kept at a minimum.
3. The distance between the starter electrode lead and the anode or cathode pins should be at least 5 mm. Stray capacitance and leakage current should be kept at a minimum.
4. The tube may ignite spontaneously when mounted in an electric field, the probability of igniting being dependent on the field strength (direction and magnitude) and its rate of change. Touching the envelope by live components should be avoided, and it is recommended to maintain a distance between components or electrostatic shields and any part of the envelope of at least some mm.

CHARACTERISTIC RANGE VALUES FOR EQUIPMENT DESIGN

(during life and over full temperature range)

Stand-by

Insulation resistance between electrodes	r_{ins}	min.	300	MΩ
Anode voltage	V_a	max.	800	V

Ignition

Anode voltage	V_a	min.	100	V

The tube should be triggered by an oscillatory voltage between starter and cathode (see Fig.1)
The oscillator frequency should be 400 kHz to 500 kHz.
The duration (to 10% amplitude) of the trigger pulse train should be > 30 μs.

Trigger voltage	$V_{st_{ignp}}$	min.	3.5	kV
Trigger energy	$E_{st_{ign}}$	min.	1	mJ

Ignition delay,	typical	max.	
at V_a = 100 V	20	50	μs
at V_a = 150 V	5	10	μs
at V_a = 350 to 800 V	1	2	μs

Conduction

Arc voltage	V_{arc}	see page 4		
Impedance	z		30	mΩ

LIMITING VALUES (Absolute max. rating system)

Energy per discharge	E	max.	60	J
Cathode current, peak	I_{k_p}	max.	5000	A
average (T_{av} = max. 60 s)	I_k	max.	20	mA
Envelope temperature	t_{bulb}	max.	125	°C
	t_{bulb}	min.	−55	°C

LIFE EXPECTANCY

Number of discharges with an energy of 60 J	average	10 000
	minimum	5000

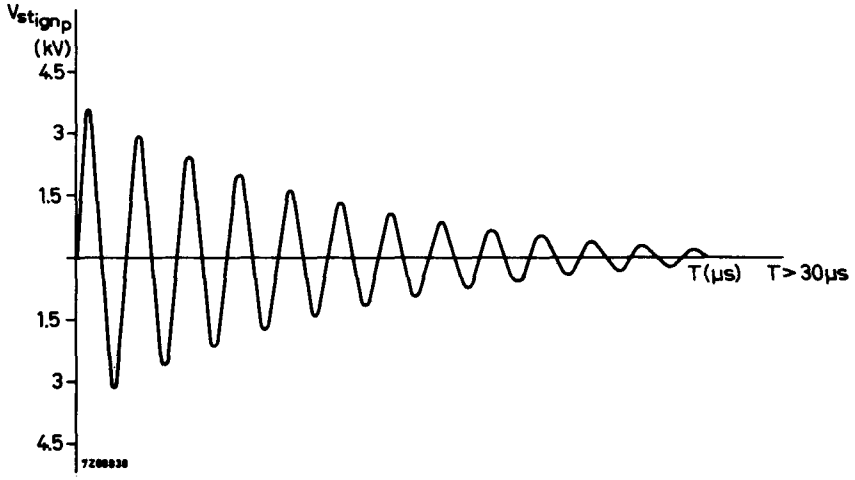
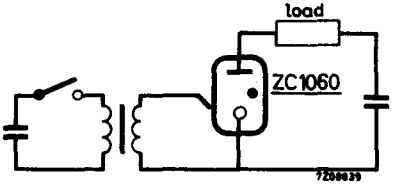
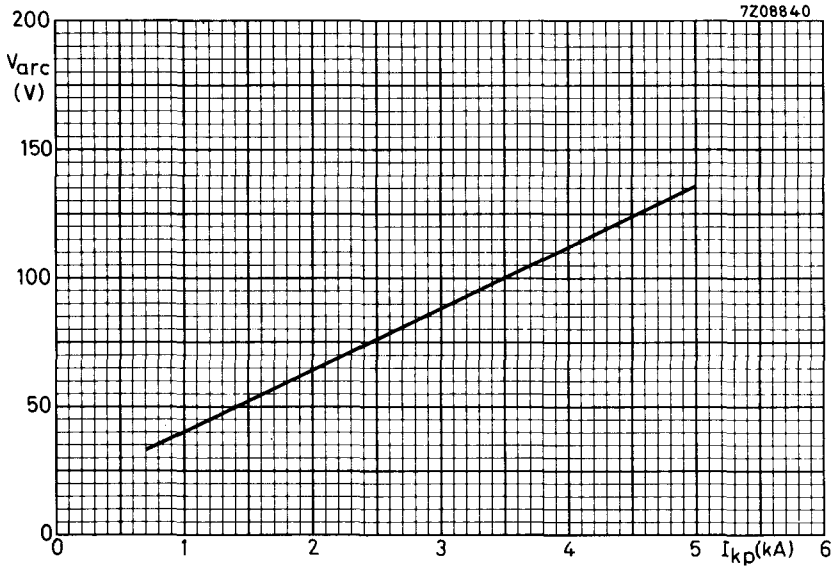


Fig.1

BASIC CIRCUIT




7Z08840
200
V_{arc} (V)
150
100
50
0
0
1
2
3
4
5
I_{kp}(kA)
6

INDICATOR TUBE

Long life cold cathode ten digit indicator tube for side viewing

QUICK REFERENCE DATA				
Numeral height		approx.	14	mm
Numerals		0 1 2 3 4 5 6 7 8 9		
Decimal point		to the left of the numerals		
Supply voltage	V_{b_a}	min.	170	V
Anode current, average	I_a		2.5	mA
peak	I_{a_p}	max.	12	mA

GENERAL

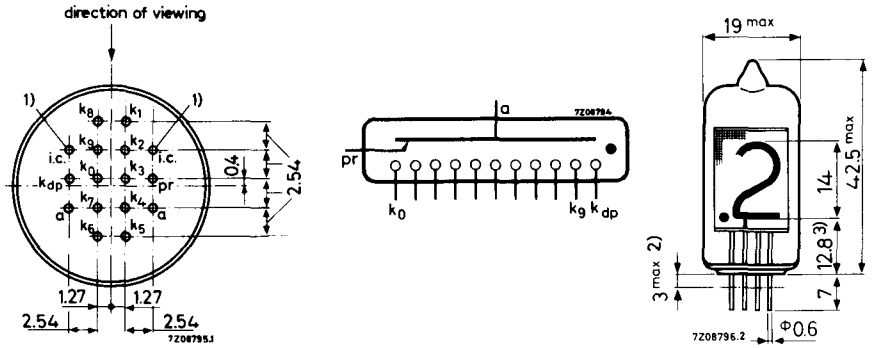
The numerals are 14 mm high and appear on the same base line allowing in-line read out. The ZM1000R is provided with a red contrast filter.

PRINCIPLE OF OPERATION

The tube contains ten cathodes in the form of ten numerals and one in the form of a decimal point; a primer, and one common anode. By applying a suitable voltage between the anode and one of the cathodes the corresponding numeral or the decimal point will be covered by a red neon glow.
The primer allows ionization without delay in strobe type or blanking applications.

DIMENSIONS AND CONNECTIONS

Dimensions in mm



1) Length of i.c. pins max. 2.8 mm.
2) Not tinned.
3) Standard deviation 0.13 mm

The deviations of the axis of the pins with respect to the true geometrical position cover an area of max. 0.3 mm diameter. The pin configuration is compatible with the reference grid for printed wiring according to IEC Publication 97 (0.1 in).

Mounting position: Any

Soldering

The pins may be dip-soldered at a solder temperature of max. 240 °C for maximum 10 seconds up to a point 5 mm from the seals.

Natural frequency

The natural frequencies of the numeral cathodes lie within the range from 300 Hz to 800 Hz.

ACCESSORIES

55701 Printed wiring mounting board (19 x 100 mm) on which the ZM1000 can be soldered; afterwards the combination can be mounted on a vertical printed wiring board carrying, e.g., the drive circuit. Can also be used with the snap-fit tube holder 55703.

55702 Tube socket (for 0.1 in grid). Phenolic. Tinned contacts.

55703 Snap-fit tube holder.

55704 Set of one left-hand and one right-hand end piece to complete the snap-fit indicator tube assembly.

CHARACTERISTICS AND OPERATING CONDITIONS

Ignition voltage	V_{ign}	max. 170	V
Maintaining voltage	V_m	see page 4	
Anode current for coverage	I_a	min. 1.5	mA
(with or without decimal point and $V_{kk} = V_{kk_{min}} - V_{fl}$, see page 5)	I_a	max. 4.5	mA
Cathode selecting voltage	V_{kk}	see page 5	
Cathode resistor, decimal point	R_{dp}	100	kΩ ± 10% [1]
Primer resistor	R_{pr}	10	MΩ ± 10%
Extinction voltage	V_{ext}	min. 118	V

[1] Lower values of this resistor are permitted. The anode current should be increased by the increase of decimal point current resulting from the decrease of this resistor.

Typical operation over full temperature range 0 °C to +70 °C.

D.C. operation see pages 4, 5, 6 and 7.

Pulse operation

Peak currents up to 12 mA can be allowed provided the average current value does not exceed 2.5 mA.
To avoid excessive glow on "off" cathodes, the cathode selecting voltage should exceed 65 V. Minimum pulse duration 100 μs.
For further information consult the manufacturer.

LIFE EXPECTANCY at I_a = 2.5 mA

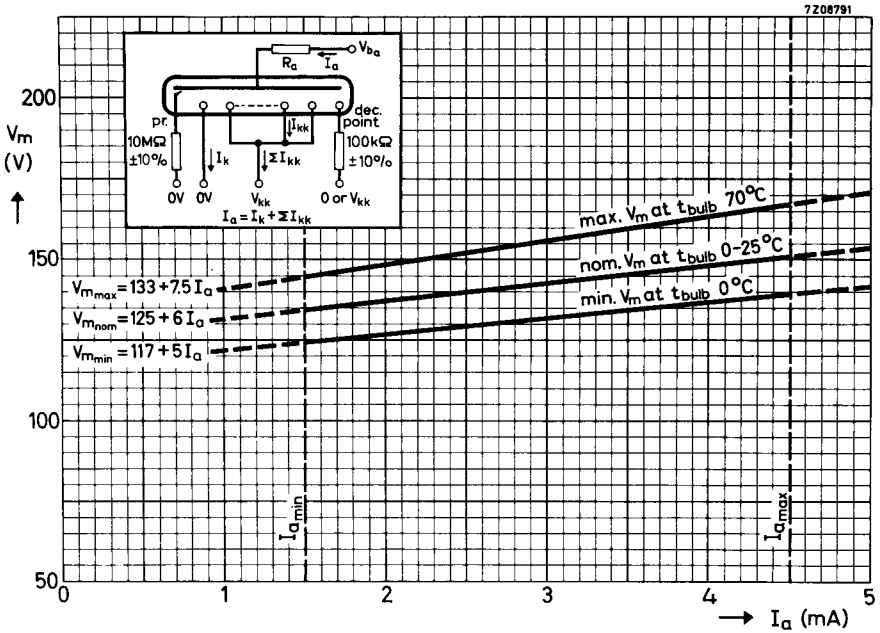
This tube is manufactured on the same physical principles as other tubes in this category and it is expected that the life will be comparable, viz:

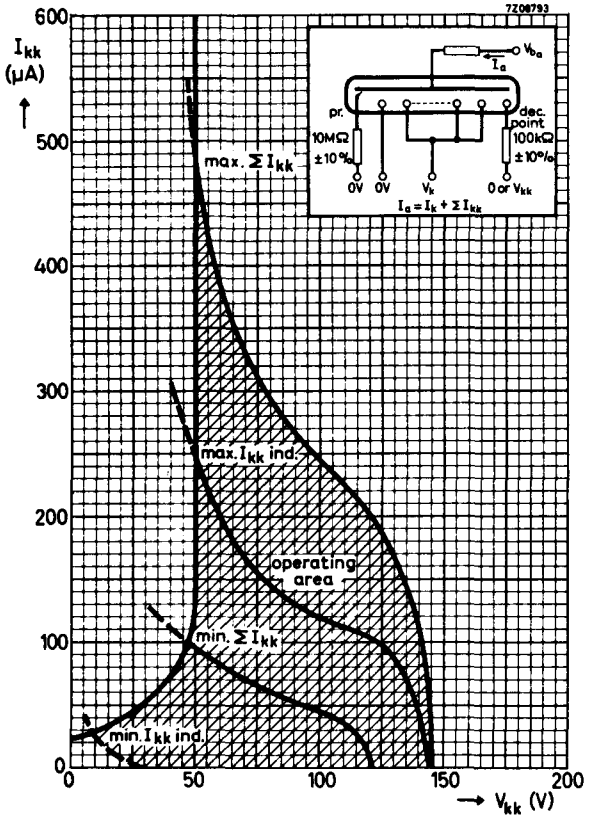
sequentially changing the display from one digit to the others every 1000 h or less		100 000	h
Mean time between failures	min.	200 000	h

LIMITING VALUES (Absolute max. rating system)

Anode voltage necessary for ignition	V_a	min.	170	V
Anode current,				
average during any conduction period	I_a	min.	1.5	mA
average (T_{av} = 20 ms)	I_a	max.	4.5	mA
peak	I_{a_p}	max.	12	mA ←
Cathode selecting voltage	V_{kk}	see page 5		
Bias voltage between anode and "off" cathodes	V_{bias}	max.	$V_{floating}$	
Ambient temperature	t_{amb}	min.	−50	°C [1]
	t_{amb}	max.	+70	°C

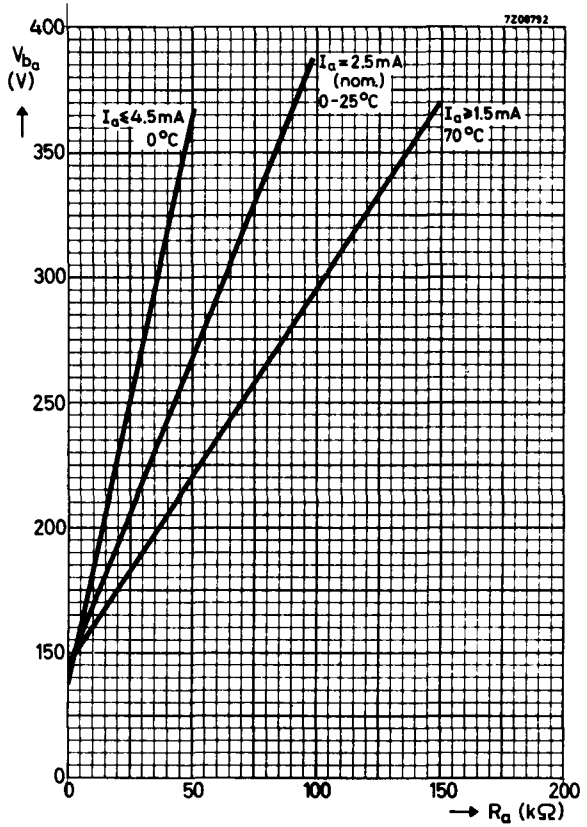
[1] Bulb temperatures below 10 °C result in a reduced life expectancy and changes in characteristics (see page 4).
For equipment to be used over a wide temperature range, "constant current operation" (high supply voltage with a high anode series resistor) is recommended.


7Z08791
V_{ba}
R_a
I_a
pr.
dec. point
10MΩ ±10%
100kΩ ±10%
I_{kk}
I_k
ΣI_{kk}
0V 0V V_{kk} 0 or V_{kk}
$I_a = I_k + \Sigma I_{kk}$
V_m (V)
200
150
100
50
0
1
2
3
4
5
I_a (mA)
$I_{a\,min}$
$I_{a\,max}$
max. V_m at t_{bulb} 70°C
nom. V_m at t_{bulb} 0-25°C
min. V_m at t_{bulb} 0°C
$V_{m_{max}} = 133 + 7.5\,I_a$
$V_{m_{nom}} = 125 + 6\,I_a$
$V_{m_{min}} = 117 + 5\,I_a$

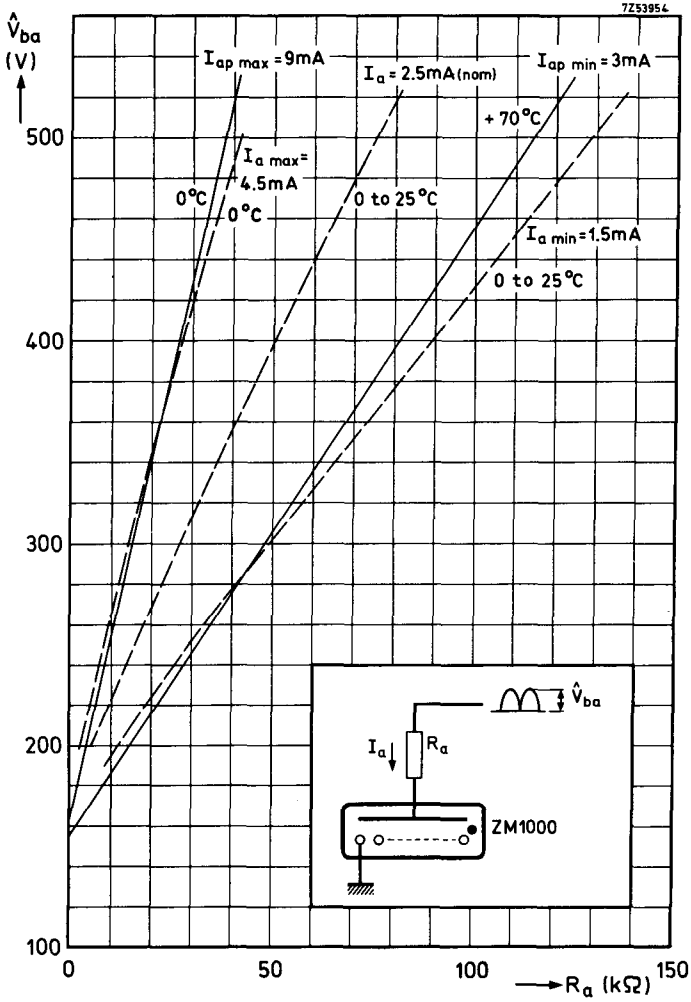


I_{kk} individual and ΣI_{kk} versus cathode selecting voltage V_{kk} at I_a = 2.5 mA.
I_{kk} and ΣI_{kk} are proportional to the anode current within the operating range of I_a and with V_{kk} = 0 V to 100 V.

The curves are valid for instantaneous values and for average values of anode current.



Graph denoting the relationships of D.C. anode supply voltage and required anode resistor to remain within the recommended operating region.


7Z53954
$\hat{V}_{ba}$ (V)
500
400
300
200
100
0
50
100
150
R_a (kΩ)
$I_{ap\ max}$ = 9mA
I_a = 2.5mA (nom)
$I_{ap\ min}$ = 3mA
+ 70 °C
$I_{a\ max}$ = 4.5mA
0 °C
0 °C
0 to 25 °C
$I_{a\ min}$ = 1.5mA
0 to 25 °C
$\hat{V}_{ba}$
I_a
R_a
ZM1000

INDICATOR TUBE

Long-life cold-cathode character indicator tube for side viewing.

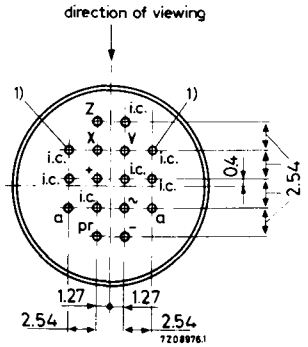
QUICK REFERENCE DATA				
Character height		approx. 10 to 14		mm
Characters	+, −, ~, X, Y, Z			
Supply voltage	V_{ba}	min.	170	V
Anode current	I_a		2.5	mA

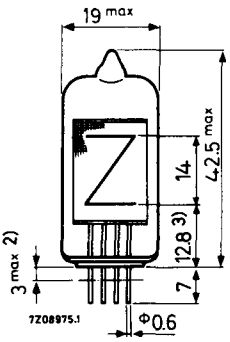
GENERAL

Character indicator tube to be used in conjunction with ZM1000 numerical indicator tube for in-line read-out in e.g. digital instruments or numerical control applications. The ZM1001R is provided with a red contrast filter.

DIMENSIONS AND CONNECTIONS

Dimensions in mm





Mounting and Accessories: see ZM1000

CHARACTERISTICS, OPERATING CONDITIONS AND LIMITING VALUES

These are essential the same as of type ZM1000

---

1) Length of these i.c. pins max. 2.8 mm
2) Not tinned
3) Standard deviation 0.13 mm

INDICATOR TUBE

Long-life cold-cathode character indicator tube for side viewing.

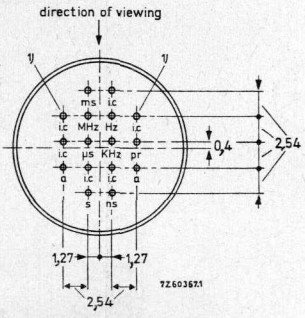
QUICK REFERENCE DATA				
Character height		approx.	9 to 13	mm
Characters		ns, µs, ms, s, Hz, kHz, MHz		
Supply voltage	V_{ba}	min.	170	V
Anode current	I_a		4	mA

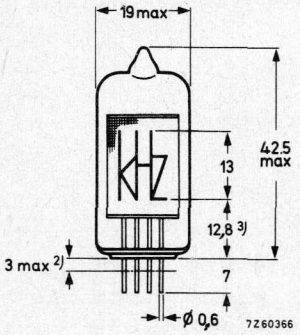
GENERAL

Character indicator tube to be used in conjunction with ZM1000 numerical indicator tube for in-line read-out in e.g. digital instruments such as frequency and time interval measuring apparatus.

DIMENSIONS AND CONNECTIONS

Dimensions in mm





Mounting and Accessories: see ZM1000

1) Length of these i.c. pins max. 2,8 mm.
2) Not tinned.
3) Standard deviation 0,13 mm.

INDICATOR TUBE

Long-life cold-cathode character indicator tube for side-viewing.

QUICK REFERENCE DATA				
Character height		approx.	9 to 14	mm
Characters		℗ 1 - ~		
Supply voltage	V_{ba}	min.	170	V
Anode current	I_a		2.5	mA

PRINCIPLE OF OPERATION

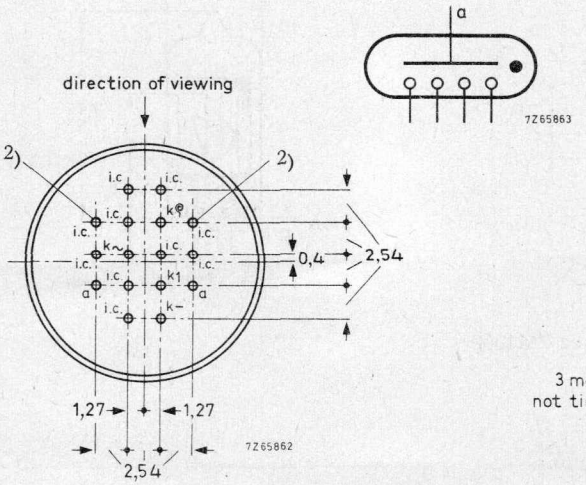
By applying a suitable voltage between the anode and one of the cathodes the corresponding character will be covered by a red neon glow.

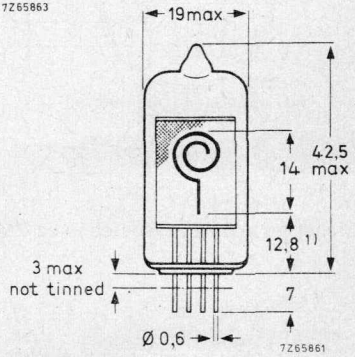
CHARACTERISTICS, OPERATING CONDITIONS AND LIMITING VALUES

These are essentially the same as of type ZM1010.

DIMENSIONS AND CONNECTIONS

Dimensions in mm





1) Standard deviation 0,13 mm.
2) Length of i.c. pins max. 2,8 mm.

INDICATOR TUBE

Long-life cold-cathode ten-digit indicator tube for side viewing.
The tube is designed for time-sharing (pulse) applications.

QUICK REFERENCE DATA				
Numeral height		approx.	14	mm
Numerals	0 1 2 3 4 5 6 7 8 9			
Decimal point	to the left of the numerals			
Supply voltage	$V_{b_a(pulse)}$	min.	170	V
Anode current, peak	I_{a_p}	min.	6	mA
	I_{a_p}	max.	20	mA
average	I_a	max.	2.5	mA

GENERAL

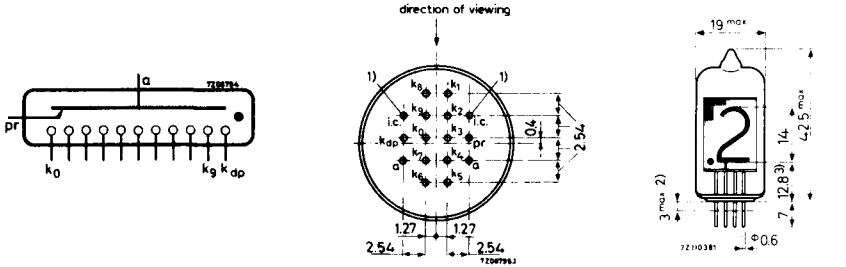
The numerals are 14 mm high and appear on the same base line allowing in-line read-out. The ZM1005R is provided with a red contrast filter. The ZM1005 is identical to the ZM1005R but has no filter.

PRINCIPLE OF OPERATION

The tube contains ten cathodes in the form of ten numerals and one in the form of a decimal point; a primer, and one common anode. By applying a suitable voltage between the anode and one of the cathodes the corresponding numeral or the decimal point will be covered by a red neon glow.
The primer allows ionization without delay in strobe type or blanking applications.

DIMENSIONS AND CONNECTIONS

Dimensions in mm



The deviation of the axes of the pins with respect to the true geometrical position cover an area of 0.3 mm diameter. The pin configuration is compatible with the reference grid for printed wiring according to IEC Publication 97 (0.1 in).

Mounting position: any

Soldering

The pins may be dip-soldered at a solder temperature of max. 240 °C for maximum 10 seconds up to a point 3 mm from the seals.

Natural frequency

The natural frequencies of the numeral cathodes lie within the range from 300 Hz to 800 Hz.

ACCESSORIES

55701 Printed-wiring mounting board (19 mm x 100 mm) on which the ZM1005 can be soldered; afterwards the combination can be mounted on a vertical printed-wiring board carrying, e.g., the drive circuit. Can also be used with the snap-fit tube holder 55703.

55702 Tube socket (for 0.1 in grid). Phenolic. Tinned contacts.

55703 Snap-fit tube holder.

55704 Set of one left-hand and one right-hand end piece to complete the snap-fit indicator tube assembly.

---

1) i.c. pins max. length 2.8 mm
2) Not tinned
3) Standard deviation 0.13 mm

CHARACTERISTICS AND OPERATING CONDITIONS

Ignition voltage	V_{ign}	max.	170	V
Maintaining voltage	V_m	see page 4		
Anode current, average (T_{av} = max. 20 ms)	I_a	max.	2.5	mA
peak	I_{ap}	min.	6	mA
(with or without decimal point)	I_{ap}	max.	20	mA
Pulse duration	T_{imp}	min.	50	μs [1]
Cathode selecting voltage (see also page 4)	V_{kk}	min.	70	V [2]
	V_{kk}	max.	115	V
Cathode resistor, decimal point	R_{dp}		10	k$\Omega\pm$10% [3]
Primer resistor (anode to primer supply voltage min. 170 V)	R_{pr}		10	M$\Omega\pm$10%
Extinguishing voltage	V_{ext}	min.	118	V

LIFE EXPECTANCY at I_a = 2 mA

The life expectancy is dependent on the instantaneous and average values of anode current:

sequentially changing the display from one digit to the others every 100 h or less, I_{ap} = 10 mA		100 000	h
I_{ap} = 20 mA		20 000	h
Mean time between failures		min. 200 000	h

LIMITING VALUES (Absolute max. rating system)

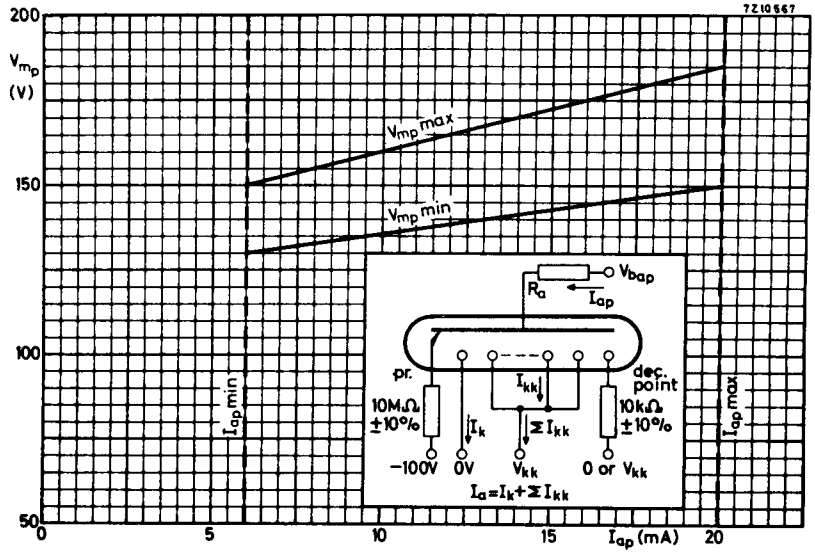
Anode voltage necessary for ignition, pulse	V_{a_p}	min.	170	V
Anode current, average (T_{av} = 20 ms)	I_a	max.	2.5	mA
peak	I_{ap}	min.	6	mA
	I_{ap}	max.	20	mA
Pulse duration	T_{imp}	min.	10	μs
Cathode selecting voltage	V_{kk}	min.	70	V
	V_{kk}	max.	115	V
"Off" anode voltage	$V_{a"off"}$	max.	115	V
Ambient temperature	t_{amb}	min.	-50	°C [4]
	t_{amb}	max.	+70	°C

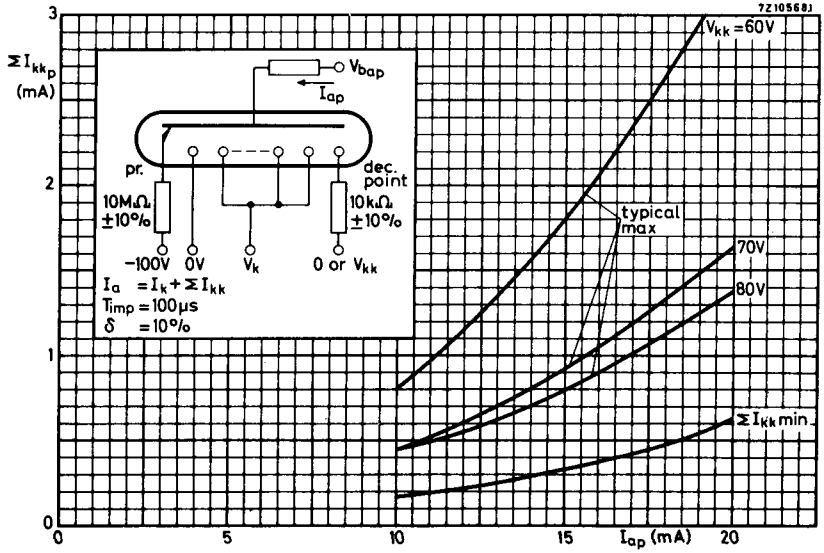
1) Pulse durations down to 10 μs are allowed provided the minimum peak anode current is not less than 10 mA.

2) Lower values of V_{kk} result in increasing background glow impairing readability.

3) The decimal point cathode may not be operated without extra current limiting resistor unless a numeral cathode is operated simultaneously.

4) Bulb temperatures below 10 °C result in a reduced life expectancy and changes in characteristics.
For equipment to be used over a wide temperature range, "constant current operation" is recommended.


7Z10567
200
V_{mp} (V)
150
100
50
0
5
10
15
I_{ap} (mA)
20
V_{mp} max
V_{mp} min
I_{ap} min
I_{ap} max
V_{bap}
R_a
I_{ap}
pr.
dec. point
I_{kk}
10MΩ ±10%
10kΩ ±10%
I_k
ΣI_{kk}
−100V
0V
V_{kk}
0 or V_{kk}
$I_a = I_k + \Sigma I_{kk}$


7Z10568
3
ΣI_{kkp} (mA)
2
1
0
0
5
10
15
I_{ap} (mA)
20
V_{kk} =60V
70V
80V
typical max
ΣI_{kk} min.
V_{bap}
I_{ap}
pr.
dec. point
10MΩ ±10%
10kΩ ±10%
−100V
0V
V_k
0 or V_{kk}
$I_a = I_k + \Sigma I_{kk}$
T_{imp} = 100µs
δ = 10%

INDICATOR TUBE

Long-life cold-cathode ten-digit indicator tube for side-viewing.

QUICK REFERENCE DATA				
Numeral height		approx.	14	mm
Numerals		0 1 2 3 4 5 6 7 8 9		
Decimal point		to the left of the numerals		
Supply voltage	V_{ba}	min.	170	V
Anode current	I_a		2,5	mA

GENERAL

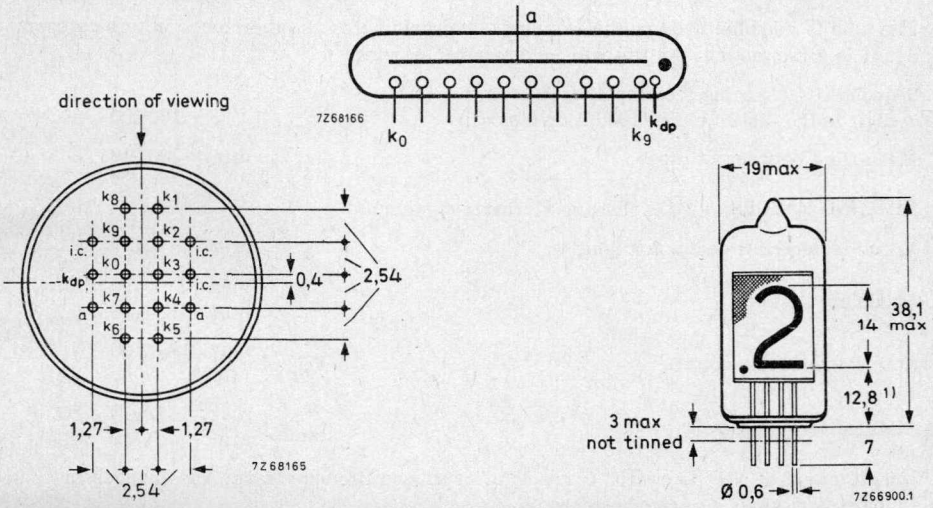
The numerals are 14 mm high and appear on the same base line allowing in-line read out.

PRINCIPLE OF OPERATION

By applying a suitable voltage between the anode and one of the cathodes the corresponding numeral or the decimal point will be covered by a red neon glow.

DIMENSIONS AND CONNECTIONS

Dimensions in mm



1) Standard deviation 0,13 mm.

The deviations of the axis of the pins with respect to the true geometrical position cover an area of max. 0,3 mm diameter. The pin configuration is compatible with the reference grid for printed wiring according to IEC Publication 97 (0,1 in).

Mounting position: Any

Soldering:

The pins may be dip-soldered at a solder temperature of max. 240 °C for maximum 10 s up to a point 5 mm from the seals.

ACCESSORIES

55701 Printed wiring mounting board (19 x 100 mm) on which the tube can be soldered; afterwards the combination can be mounted on a vertical printed wiring board carrying, e.g., the drive circuit.

55702 Tube socket compatible with IEC reference grid for printed wiring (0,1 in). Phenolic. Tinned pins.

CHARACTERISTICS AND OPERATING CONDITIONS

Ignition voltage	V_{ign}	max.	170	V
Maintaining voltage	V_m	see page	4	
Anode current for coverage	I_a	max.	3,5	mA
		min.	1,5	mA
Cathode selecting voltage	V_{kk}	see page	4	
Extinction voltage	V_{ext}	min.	118	V

LIFE EXPECTANCY at I_a = 2,5 mA

The tube is manufactured on the same physical principles as other tubes in this category and it is expected that the life will be comparable, viz:

Sequentially changing the display from one digit to the others every 1000 h or less		100 000	h
Mean time between failures	min.	200 000	h

LIMITING VALUES (Absolute max. rating system)

Anode voltage necessary for ignition	V_a	min.	170	V
Anode current	I_a	max.	3,5	mA
		min.	1,5	mA
Cathode selecting voltage	V_{kk}	max.	100	V
		min.	60	V
Ambient temperature	t_{amb}	max.	+70	°C
		min.	-50	°C

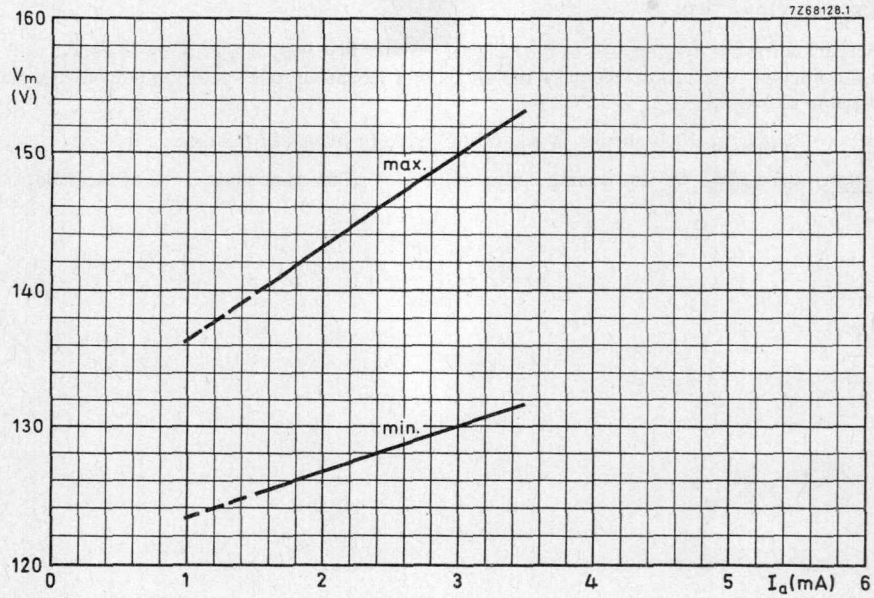
Bulb temperatures below 10 °C result in a reduced life expectancy and changes in characteristics.

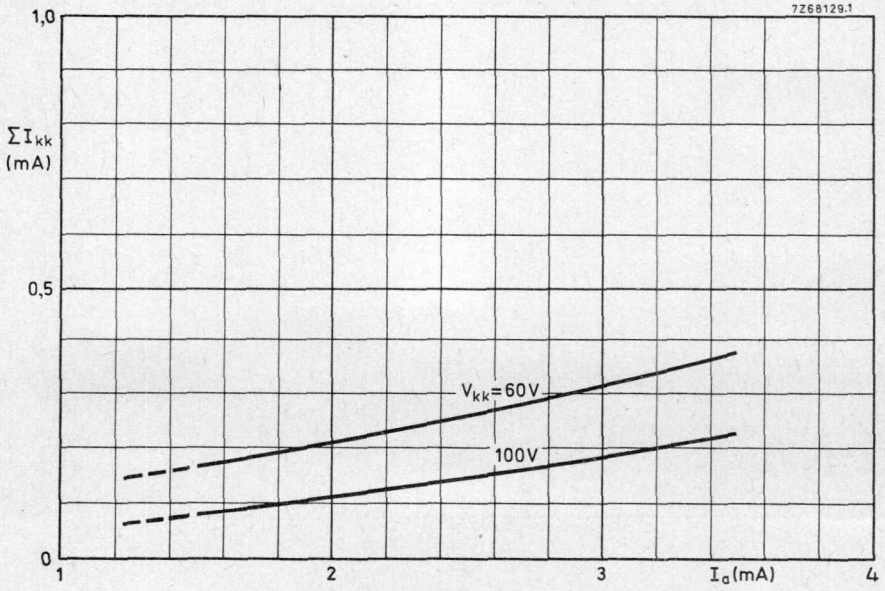
SHOCK AND VIBRATION

An indication for the ruggedness of the tube is the fact that 95% of the items sampled from the normal production line pass the shock and vibration test specified below without perceptible damage.

Shock 25 g_{peak}, 1000 shocks in one of the three positions of the tube.

Vibration 2,5 g_{peak}, 50 Hz, during 32 hours in each of the three positions of the tube.


7Z68128.1
160
V_m
(V)
150
140
130
120
max.
min.
0
1
2
3
4
5
I_a(mA)
6


7Z68129.1
1,0
ΣI_{kk}
(mA)
0,5
0
V_{kk}=60V
100V
1
2
3
I_a(mA)
4

INDICATOR TUBE

Long-life cold-cathode nine-digit indicator tube for side-viewing.

QUICK REFERENCE DATA				
Numeral height		approx.	14	mm
Numerals		0 1 2 3 4 5 6 7 8		
Supply voltage	V_{ba}	min.	170	V
Anode current	I_a		2,5	mA

GENERAL

The numerals are 14 mm high and appear on the same base line allowing in-line read out.

PRINCIPLE OF OPERATION

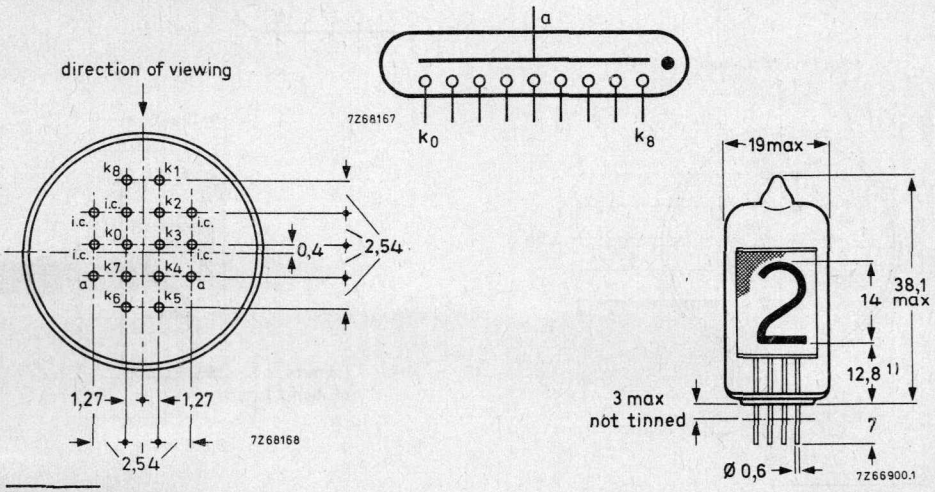
By applying a suitable voltage between the anode and one of the cathodes the corresponding numeral will be covered by a red neon glow.

CHARACTERISTICS, OPERATING CONDITIONS AND LIMITING VALUES

These are essentially the same as of type ZM1010.

DIMENSIONS AND CONNECTIONS

Dimensions in mm



1) Standard deviation 0,13 mm.

INDICATOR TUBE

Long life cold-cathode eight-digit indicator tube for side-viewing.

QUICK REFERENCE DATA				
Numeral height		approx.	14	mm
Numerals		1 2 3 4 5 6 7 8		
Supply voltage	V_{ba}	min.	170	V
Anode current	I_a		2,5	mA

GENERAL

The numerals are 14 mm high and appear on the same base line allowing in-line read out.

PRINCIPLE OF OPERATION

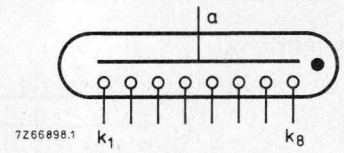
By applying a suitable voltage between the anode and one of the cathodes the corresponding numeral will be covered by a red neon glow.

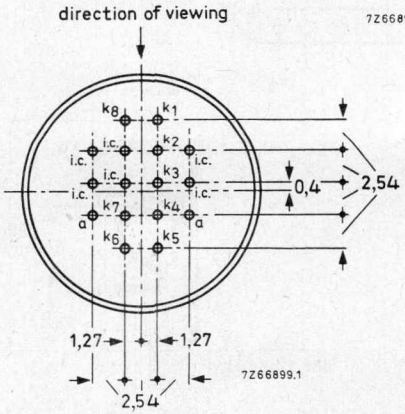
CHARACTERISTICS, OPERATING CONDITIONS AND LIMITING VALUES

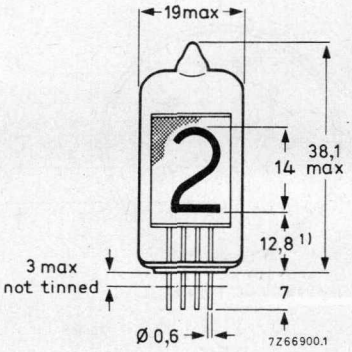
These are essentially the same as of type ZM1010.

DIMENSIONS AND CONNECTIONS

Dimensions in mm







1) Standard deviation 0,13 mm

INDICATOR TUBE

Long-life cold-cathode seven-digit indicator tube for side-viewing.

QUICK REFERENCE DATA			
Numeral height		approx. 14	mm
Numerals		0 1 2 3 4 5 6	
Supply voltage	V_{ba}	min. 170	V
Anode current	I_a	2,5	mA

GENERAL

The numerals are 14 mm high and appear on the same base line allowing in-line read out.

PRINCIPLE OF OPERATION

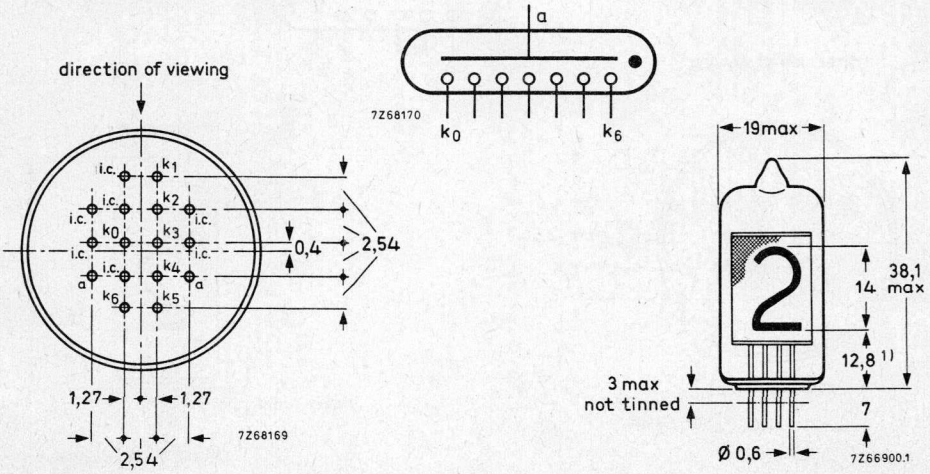
By applying a suitable voltage between the anode and one of the cathodes the corresponding numeral will be covered by a red neon glow.

CHARACTERISTICS, OPERATING CONDITIONS AND LIMITING VALUES

These are essentially the same as of type ZM1010.

DIMENSIONS AND CONNECTIONS

Dimensions in mm



1) Standard deviation 0, 13 mm.

INDICATOR TUBE

Long life cold-cathode six-digit indicator tube for side-viewing

QUICK REFERENCE DATA			
Numeral height		approx. 14	mm
Numerals		1 2 3 4 5 6	
Supply voltage	V_{ba}	min. 170	V
Anode current	I_a	2,5	mA

GENERAL

The numerals are 14 mm high and appear on the same base line allowing in-line read out.

PRINCIPLE OF OPERATION

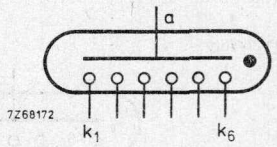
By applying a suitable voltage between the anode and one of the cathodes the corresponding numeral will be covered by a red neon glow.

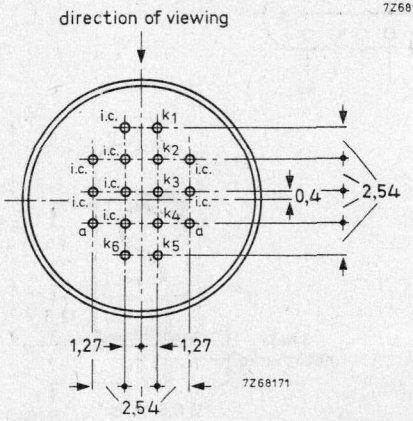
CHARACTERISTICS, OPERATING CONDITIONS AND LIMITING VALUES

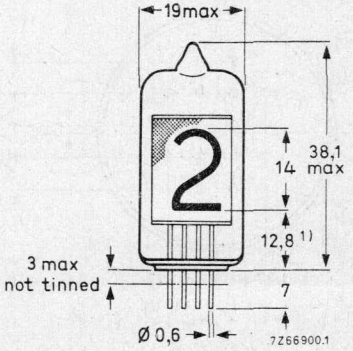
These are essentially the same as of type ZM1010.

DIMENSIONS AND CONNECTIONS

Dimensions in mm







1) Standard deviation 0,13 mm

INDICATOR TUBE

Long-life cold-cathode eight-digit indicator tube for side-viewing.

QUICK REFERENCE DATA				
Numeral height		approx.	14	mm
Numerals		1 2 3 4 5 6 7 8		
Supply voltage	V_{ba}	min.	170	V
Anode current	I_a		2,5	mA

GENERAL

The numerals are 14 mm high and appear on the same base line allowing in-line read out.

PRINCIPLE OF OPERATION

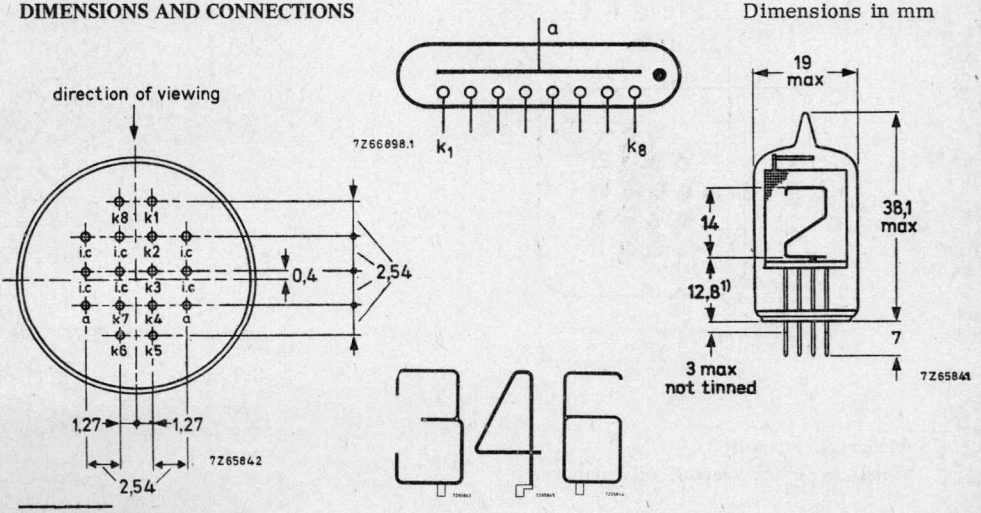
By applying a suitable voltage between the anode and one of the cathodes the corresponding numeral will be covered by a red neon glow.

CHARACTERISTICS, OPERATING CONDITIONS AND LIMITING VALUES

These are essentially the same as of type ZM1010.

DIMENSIONS AND CONNECTIONS

Dimensions in mm



1) Standard deviation 0,13 mm.

INDICATOR TUBE

Long life cold cathode ten digit numeral indicator tube for top viewing.

QUICK REFERENCE DATA			
Numeral height		15	mm
Numerals	1 2 3 4 5 6 7 8 9 0		
Supply voltage	min.	170	V
Anode current		2	mA

GENERAL

The numerals are 15 mm high and appear on the same base line allowing in-line read out. The ZM1020 is provided with a red contrast filter.

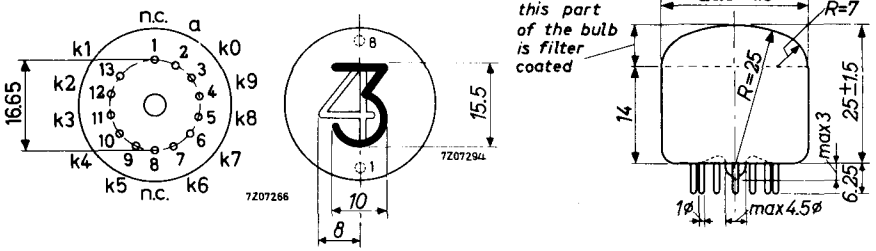
PRINCIPLE OF OPERATION

The tube contains ten cathodes in the form of ten figures and one common anode. By applying a suitable voltage between the anode and one of the ten cathodes the corresponding numeral will be covered by a red neon glow.

DIMENSIONS AND CONNECTIONS

Dimensions in mm

Base: B13B



Mounting position: any

The numerals are viewed through the dome of the envelope. The numerals will appear upright (within 1.5°) when the tube is mounted with the line through pins 1 and 8 vertical, pin 8 being uppermost.

Accessories

Socket	type	2422 505 00001 or 2422 505 00002

CHARACTERISTICS AND OPERATING CONDITIONS

(Valid over life and full temperature range)

Ignition voltage	V_{ign}	max. 170 V
Maintaining voltage	V_m	see sheet 4
Anode current for coverage, averaged during any conduction period	I_a	min. 1 mA
Anode current,		
average (T_{av} = max. 20 ms)	I_a	max. 3 mA
peak	I_{ap}	max. 6 mA
Cathode selecting voltage	V_{kk}	see sheet 5
Extinguishing voltage	V_{ext}	min. 118 V

Typical operation [1])

D.C. operation

See sheets 5 and 6

A.C. operation

See sheets 5 and 7

[1]) Bulb temperatures below 10 °C result in a reduced life expectancy and changes in characteristics (see sheet 4).
In designing equipment to be used over a wide temperature range the use of "constant current operation" (high supply voltage with a high anode series resistor) is recommended.

LIFE EXPECTANCY AND RELIABILITY (at I_a = 2 mA)

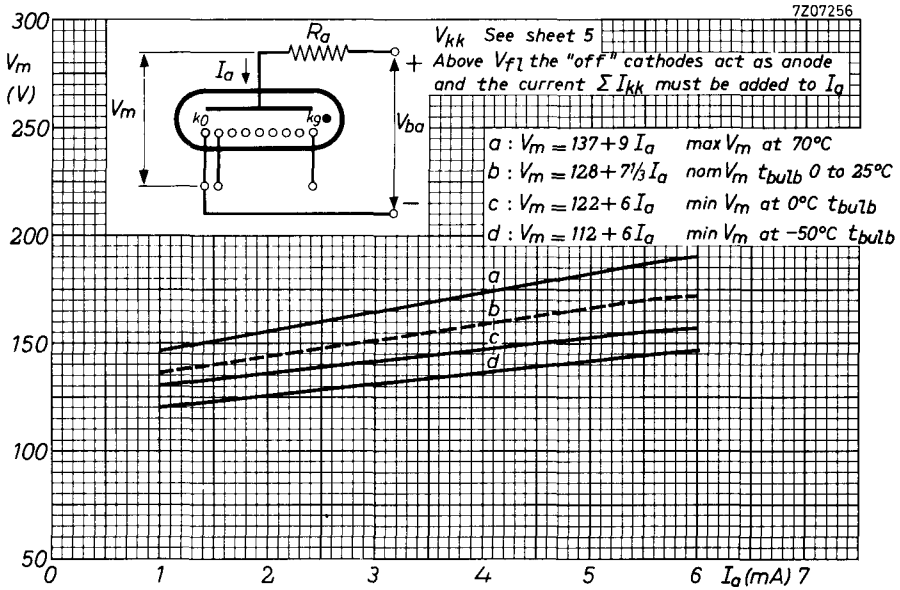
Sequentially changing the display from one digit to the others every 1000 h. or less	100.000 h

The reliability has been assessed in a life test programme totalling 4.5×10^6 tube hours. The longest test period was 50.000 hrs on 47 tubes. No failures have been found. The Mean Time between Failures is better than 10^6 hrs which corresponds with a failure rate of less than 0.1 % per 1000 hrs at a confidence level of 95 %.

LIMITING VALUES (Absolute max. rating system)

Anode voltage necessary for ignition	V_a	min. 170	V
Anode current, D.C.	I_a	min. 1	mA
rectified A.C. and pulse	I_{a_p}	min. 2	mA
average (T_{av} = max. 20 ms)	I_a	max. 3	mA
peak	I_{a_p}	max. 10	mA [1]
Cathode selecting voltage	V_{kk}	see lines N and W on sheet 5	
Bias voltage between anode and "off" cathodes (see sheet 5)	V_{bias}	max.	$V_{floating}$
Ambient temperature	t_{amb}	min. -50 max. +70	°C °C

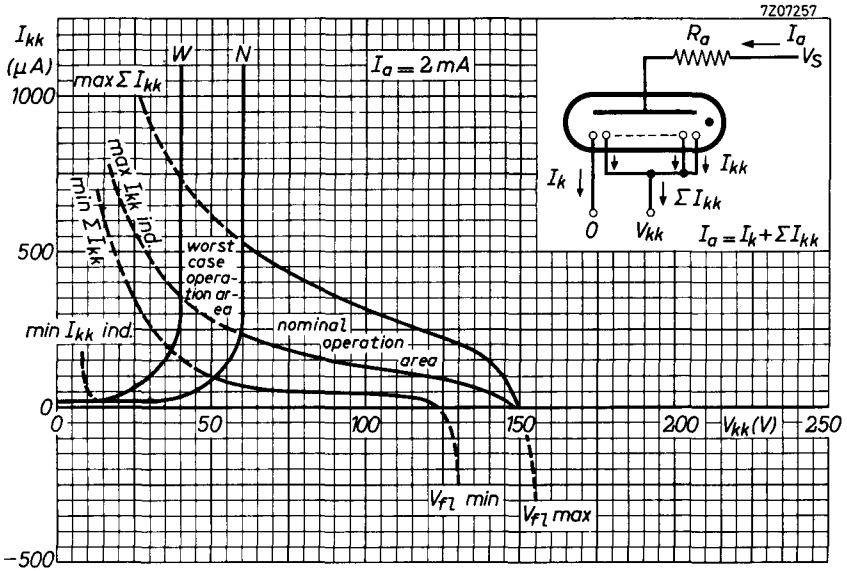
[1]) Above I_a = 6 mA the connecting wires and eyelets may be covered by the glow.


7Z07256
V_m (V)
300
250
200
150
100
50
0
1
2
3
4
5
6
7
I_a (mA)
R_a
I_a
V_m
V_{ba}
+
−
kg
kg
V_{kk} See sheet 5
Above V_{fl} the "off" cathodes act as anode and the current ΣI_{kk} must be added to I_a
a : $V_m = 137 + 9\ I_a$ max V_m at 70°C
b : $V_m = 128 + 7\frac{1}{3}\ I_a$ nom V_m t_{bulb} 0 to 25°C
c : $V_m = 122 + 6\ I_a$ min V_m at 0°C t_{bulb}
d : $V_m = 112 + 6\ I_a$ min V_m at −50°C t_{bulb}
a
b
c
d

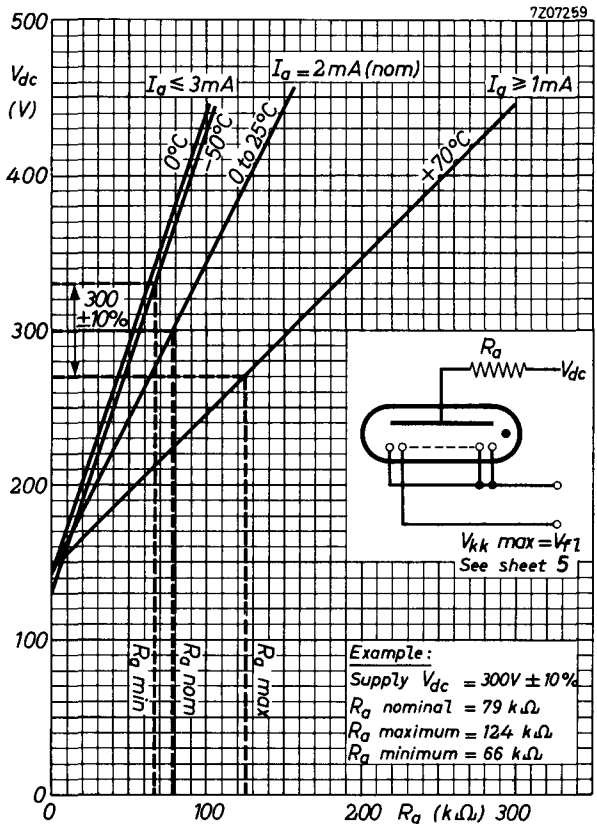
I_{kk} individual and ΣI_{kk} versus cathode selecting voltage V_{kk} at I_a = 2 mA.
I_{kk} and ΣI_{kk} are proportional to anode current in the range V_{kk} = 0 to 100 V.

The range of V_{fl} (I_{kk} = 0) shifts to the right/left at increasing/decreasing anode current (8 V/mA).

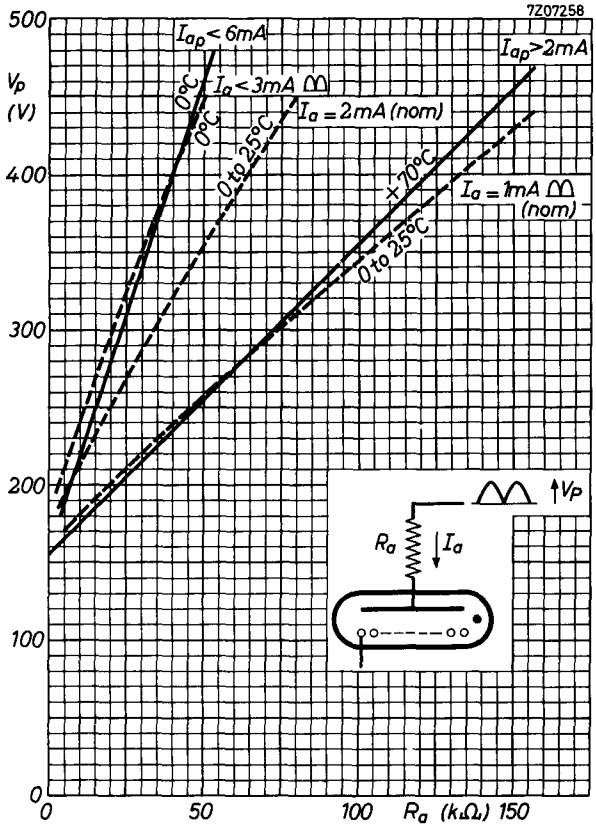
The curves are valid for instantaneous and for average values of anode current.



For low cathode selecting voltages the current I_{kk} to the "off" cathodes will increase and the readability of the "on" cathode will be affected. It is therefore recommended to use a nominal operating point to the right of line N.
Under the worst operating conditions the operating point should never reach the area left of line W.



Graph denoting the relationship of D.C. anode supply voltage and required anode resistor to remain within the recommended operating region.



Graph denoting the relationship of the peak value of full-wave unsmoothed rectified A.C. anode supply voltage and the required anode resistor to remain within the recommended operating area.

INDICATOR TUBE

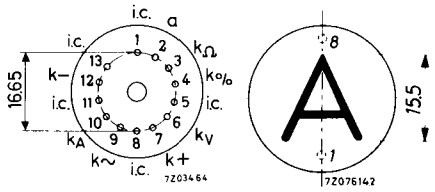
Cold cathode character indicator tube for top viewing.

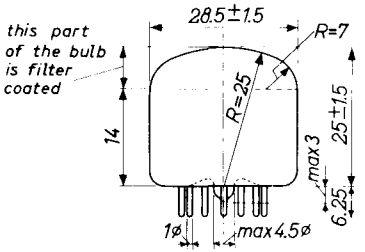
QUICK REFERENCE DATA			
Character height		15	mm
Characters	A, V, Ω, %, , +, -, ~		
Supply voltage	min.	170	V
Anode current		2	mA

DIMENSIONS AND CONNECTIONS

Dimensions in mm

Base: B13B





CHARACTERISTICS, OPERATING CONDITIONS AND LIMITING VALUES

These are essential the same as of type ZM1020.

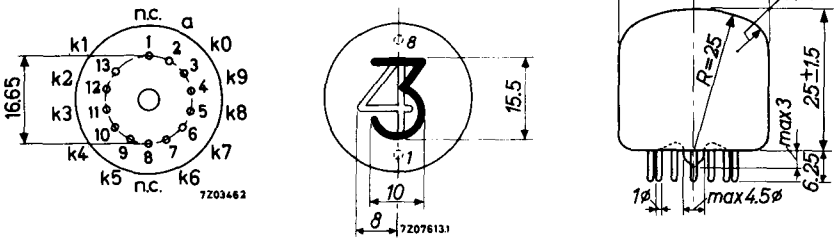
INDICATOR TUBE

The type ZM1022 is electrically identical with type ZM1020 but has no filter coating.
The use of a separate blue absorbing e.g. circular polarized amber filter is recommended.

DIMENSIONS AND CONNECTIONS

Dimensions in mm

Base: B13B



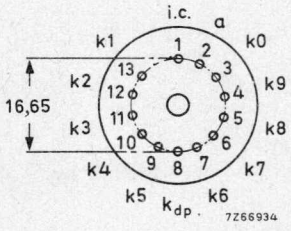
INDICATOR TUBE

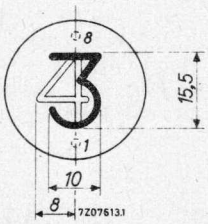
Cold cathode numerical indicator tube for top viewing, electrically identical to type ZM1022 but provided with a decimal point to the left of the numerals.
The use of a separate amber filter (i.e. blue absorbing) is recommended.

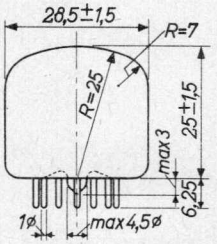
QUICK REFERENCE DATA			
Numeral height		15	mm
Numerals	1 2 3 4 5 6 7 8 9 0		
Decimal point	to the left of the numerals		
Supply voltage	min.	170	V
Anode current, numerals		2	mA
decimal point		0,25	mA

DIMENSIONS AND CONNECTIONS Dimensions in mm

Base: B13B







CHARACTERISTICS, OPERATING CONDITIONS, AND LIMITING VALUES

For the numerals, are essentially the same as those of type ZM1020.

LIMITING VALUES decimal point (Absolute max. rating system)

Anode current, decimal point	max.	0,5	mA
	min.	0,1	mA

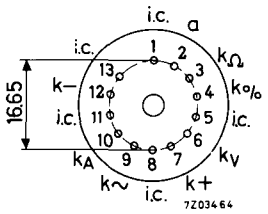
INDICATOR TUBE

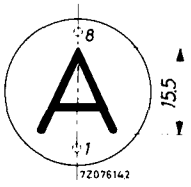
The type ZM1023 is electrically identical with type ZM1021 but has no filter coating.
The use of a separate blue absorbing e.g. circular polarized amber filter is recommended.

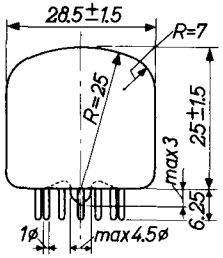
DIMENSIONS AND CONNECTIONS

Dimensions in mm

Base: B13B







INDICATOR TUBE

Cold cathode character indicator tube for top viewing

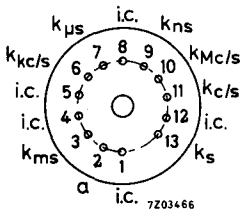
QUICK REFERENCE DATA	
Characters	c/s, Kc/s, Mc/s, μs, ms, ns, s

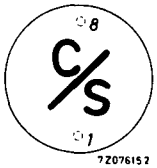
This tube is mechanically compatible with type ZM1020

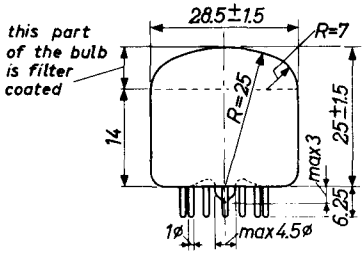
DIMENSIONS AND CONNECTIONS

Dimensions in mm

Base: B13B







CHARACTERISTICS, OPERATING CONDITIONS AND LIMITING VALUES

These are essential the same as of type ZM1020.

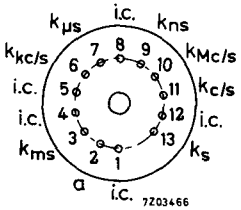
INDICATOR TUBE

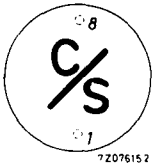
The type ZM1025 is electrically identical with type ZM1024 but has no filter coating.
The use of a separate blue absorbing, e.g. circular polarized, filter is recommended.

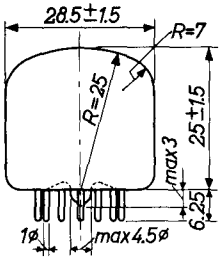
DIMENSIONS AND CONNECTIONS

Dimensions in mm

Base: B13B







INDICATOR TUBE

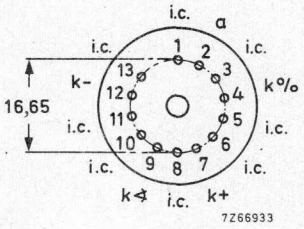
Cold cathode sign indicator tube.
The use of a separate amber filter (i.e. blue absorbing) is recommended.

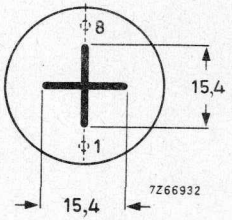
QUICK REFERENCE DATA		
Sign height	15	mm
Signs	✈ % + -	
Supply voltage	min. 170	V
Anode current	2	mA

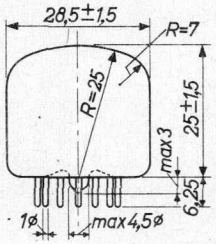
DIMENSIONS AND CONNECTIONS

Dimensions in mm

Base: B13B







CHARACTERISTICS, OPERATING CONDITIONS, AND LIMITING VALUES

These are essentially the same as those of type ZM1020.

INDICATOR TUBE

Cold cathode gas-filled biquinary numerical indicator tube for side viewing.

QUICK REFERENCE DATA			
Numerical height		15.5	mm
Numerals		0 1 2 3 4 5 6 7 8 9	
Supply voltage	V_{ba}	> 170	V
Anode current	I_a	4	mA
Cathode selecting voltage	V_{kk}	50	V
Extinction voltage	V_{ext}	110	V
Screen supply voltage	V_{bs}	50	V
"Off" anode supply voltage	V_{ba} "off"	100	V

GENERAL

The numerals are 15.5 mm high and appear on the same base line allowing in-line read-out. The ZM1030 is provided with a red contrast filter.

PRINCIPLE OF OPERATION

A transparent screen divides the tube into two sections:

- The front section, containing the front- or "odd" anode and the cathode numerals 1-3-5-7-9.
- The rear section, containing the rear- or "even" anode and the cathode numerals 0-2-4-6-8.

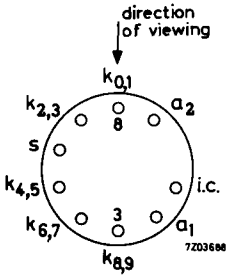
The cathodes are internally connected in pairs: 0-1, 2-3, 4-5, 6-7, 8-9.
By applying a suitable voltage between a cathode pair and the "odd" anode the "odd" cathode of that pair will be covered by a red neon glow.
Switching from one number of a pair to the other of that pair is accomplished by decreasing the voltage on the operating anode and simultaneously increasing the voltage on the other anode. [1])

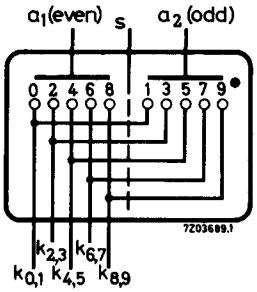
[1]) When mechanical or low speed switching is used, a "make before break" arrangement is preferred. During switching the shield connection and the shield supply should be maintained.

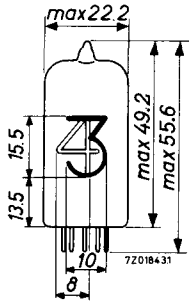
DIMENSIONS AND CONNECTIONS

Dimensions in mm

Base: Noval







Mounting position

When mounted with the base down the viewing direction will coincide with the line from pin 8 thought pin 3 ($\pm 5^{o}$).

CHARACTERISTICS, RANGE VALUES AND OPERATING CONDITIONS

Reference point for all electrode voltages is the "on" cathode.
During operation no electrode should be left floating. See fig.1

Ignition voltage	V_{ign}	< 170	V
Maintaining voltage	V_m	See page 5 and 6	
Anode current for coverage,			
average during any conduction period	I_a	> 3	mA
Anode current,			
average, T_{av} = 20 ms	I_a	< 5	mA
peak, 50 to 60 pps	I_{ap}	< 12	mA
Cathode selecting voltage [1]	V_{kk}	> 40 < 110	V [2] V
"Off" anode supply voltage	V_{ba} "off"	> 85 < 115	V V
Screen voltage	V_s	See page 8	
Extinction voltage	V_{ext}	> 110	V

[1]) The cathode selecting voltage is the voltage difference V_{kk} used for discrimination between the "off" cathodes and the "on" cathode.

[2]) At low values of V_{kk}, the contrast of the display will be reduced due to glow on adjacent numerals. This will not affect the life of the tube.

Operating conditions

D.C. operation	V_{ba} R_a	200 15	220 20	250 27	300 39	V kΩ
A.C. operation half wave rectified 50 to 60 c/s	V_{ba} R_a	170 10	220 18	250 24	300 33	V kΩ
full wave rectified 100 to 120 c/s	V_{ba} R_a	170 15	220 27	250 33	300 47	V kΩ

LIFE EXPECTANCY at I_a = 4 mA

Sequentially changing the display from one digit to another every 500 hours or less — 50 000 hours

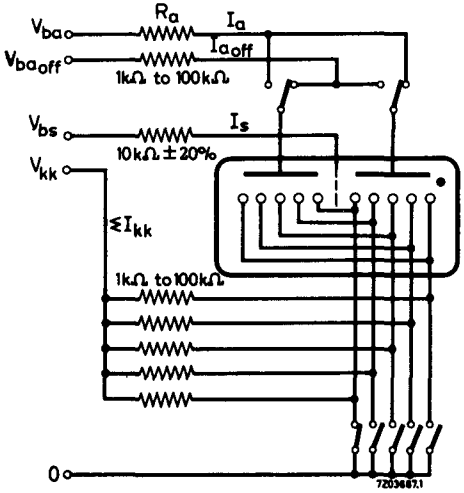


Fig.1

LIMITING VALUES (Absolute max. rating system) See fig.1

Anode voltage necessary for ignition	V_a	min. 170	V [4]
Anode current,			
average during any conduction period	I_a	min. •3	mA
average T_{av} = max. 20 ms	I_a	max. 5	mA
peak	I_{ap}	max. 12	mA
Cathode selecting voltage [1]	V_{kk}	min. 40 max. 110	V [2] V
"Off" anode supply voltage	V_{ba} "off"	min. 85 max. 115	V V
Screen voltage	V_s	min. 40 max. 80	V V
Bulb temperature,			
storage	t_{bulb}	max. +70 min. −55	°C °C
operation	t_{bulb}	max. +70 min. +15	°C °C [3]

REMARK $I_a = I_k + I_{kk} + I_s$

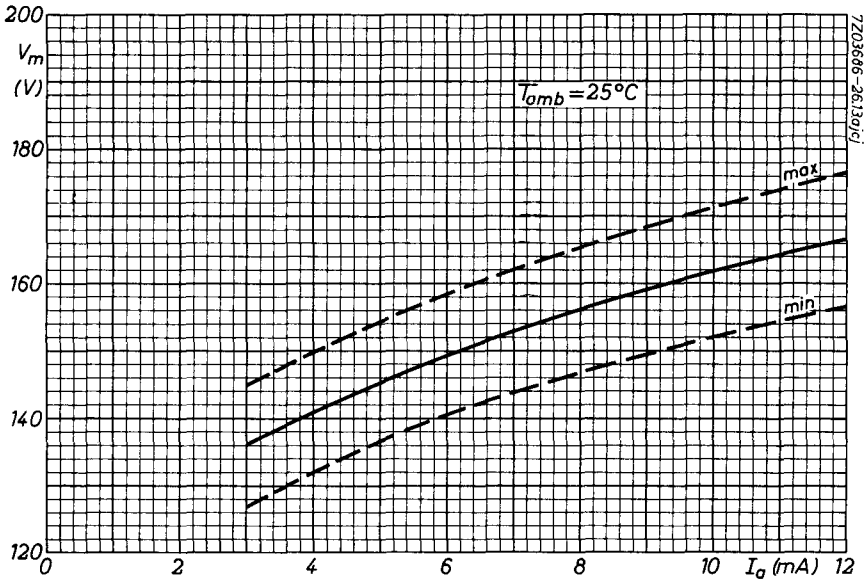
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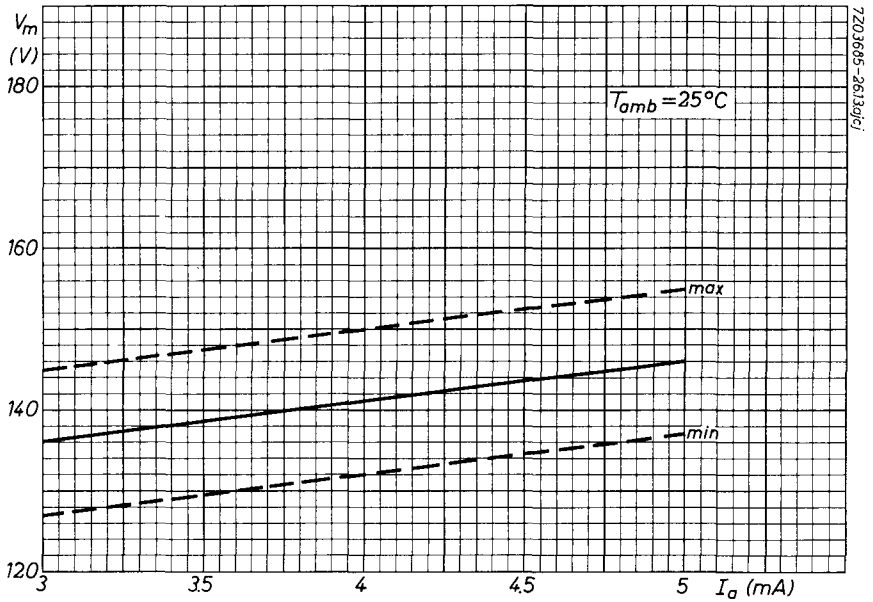
1) The cathode selecting voltage is the voltage difference V_{kk} used for discrimination between the "off" cathodes and the "on" cathode.

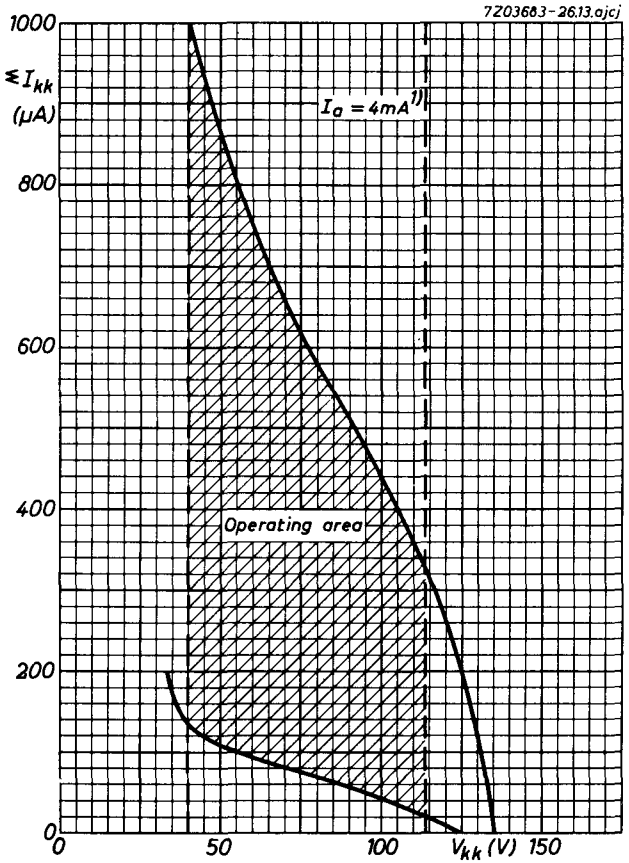
2) At low values of V_{kk}, the contrast of the display will be reduced due to glow on adjacent numerals. This will not affect the life of the tube.

3) Bulb temperatures below 15 °C result in a reduced life expectancy, larger spread and changes in characteristics. See also note 4).

4) The minimum supply voltage should be as stated. However the use of the highest voltage available with the appropriate series resistor to maintain the anode current within the specified limit is recommended. The use of "constant current operation" (high supply voltage with high resistor) is recommended when designing equipment operation over a wide temperature range.

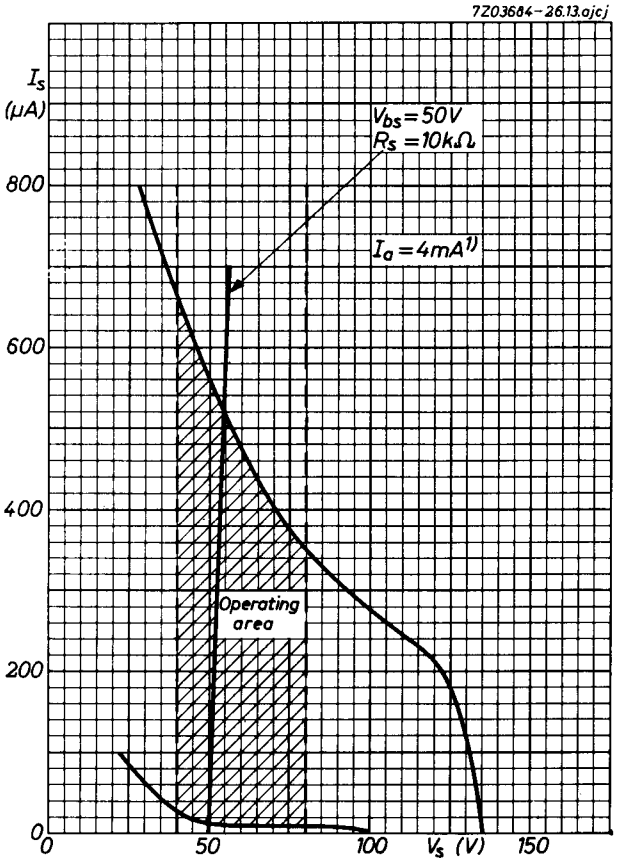

200
V_m
(V)
180
160
140
120
0
2
4
6
8
10
I_a (mA)
12
T_{amb} = 25°C
max
min
7Z03666-2613ajcj


V_m
(V)
180
160
140
120
3
3.5
4
4.5
5
I_a (mA)
T_{amb} = 25 °C
max
min
7Z03695-2613a/ej



The max. value of I_{kk} to any one pair of numbers will be 55% of I_{kk}.

[1]) The values of I_{kk} varies with anode current. Each mA increase or decrease of I_a results in max. 40% increase or decrease respectively of I_{kk}.



[1]) The value of I_S varies with anode current. Each mA increase or decrease of I_a results in max. 30% increase or decrease respectively of I_S.

INDICATOR TUBE

Cold cathode sign indicator tube for side viewing.

QUICK REFERENCE DATA				
Sign height			15	mm
Signs			+ −	
Supply voltage	V_{ba}	min.	170	V
Cathode current	I_k		4	mA

GENERAL

This tube has the same physical dimensions as the biquinary numerical indicator tube ZM1030. The ZM1031 is provided with a red contrast filter.

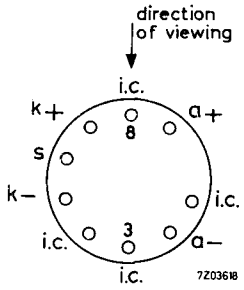
PRINCIPLE OF OPERATION

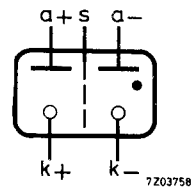
The tube contains two anodes and two cathodes separated by a shield. The rear compartment contains the minus (−) sign and the rear anode, the front compartment contains the plus (+) sign and the front anode.
By applying a suitable voltage between the required sign and the corresponding anode, the sign will be covered by a red neon glow.

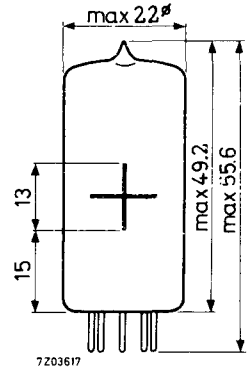
DIMENSIONS AND CONNECTIONS

Dimensions in mm

Base: Noval







Mounting position: any

The signs are viewed through the side of the envelope.

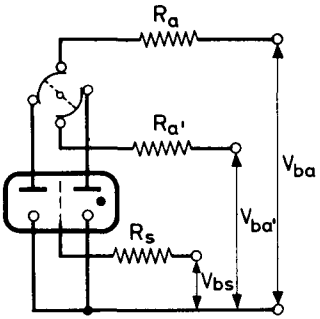
7Z2 5252

CHARACTERISTICS AND OPERATING CONDITIONS

Ignition voltage	V_{ign}	<	170	V
Maintaining voltage at I_k = 4 mA	V_m		140	V
Anode current,				
average during any conduction period for coverage	I_a	>	2	mA
average, T_{av} = 20 ms	I_a	<	5	mA
peak	I_{a_p}	<	10	mA
Incremental resistance	r_a		4.5	kΩ

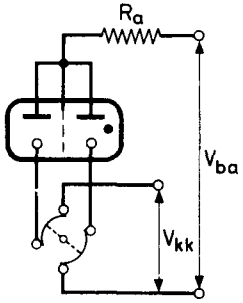
Typical operation at temperatures t_{amb} = 10 to 50 °C

I. with anode switches



Shield supply voltage	V_{bs}	50	V
Shield series resistance	R_s	10	kΩ
"Off" anode voltage	$V_{a'}$	90 to 110	V

II. with cathode switches



Cathode selecting voltage	V_{kk}	40 to 70	V

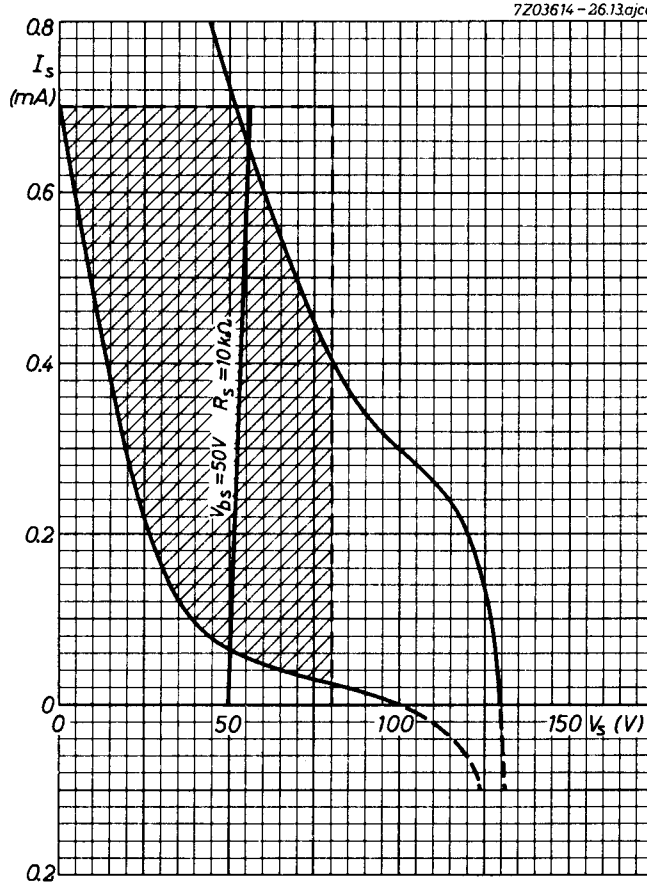
7Z2 5253

LIMITING VALUES (Absolute max. rating system)

Anode voltage necessary for ignition	V_a	min.	170	V
Anode current,				
average during any conduction period	I_a	min.	2	mA
average (T_{av} = 20 ms)	I_a	max.	5	mA
peak	I_{a_p}	max.	10	mA
Bulb temperature	t_{bulb}	min. max.	-55 +70	°C [1] °C

[1]) Below 10 °C the life expectancy is substantially reduced.

7Z2 5254


7Z03614 – 26.13ajca
0.8
I_s
(mA)
0.6
0.4
0.2
0
0.2
0
50
100
150 V_s (V)
R_s = 10 kΩ
V_{bs} = 50 V

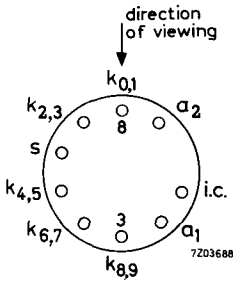
INDICATOR TUBE

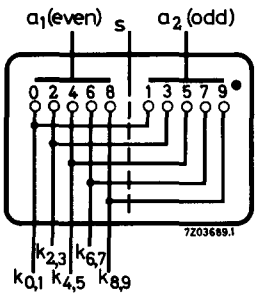
The type ZM1032 is electrically identical with type ZM1030 but has no filter coating. The use of a separate blue absorbing e.g. circular polarized amber filter is recommended.

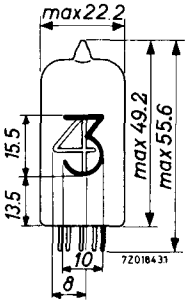
DIMENSIONS AND CONNECTIONS

Dimensions in mm

Base: Noval







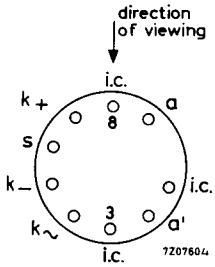
INDICATOR TUBE

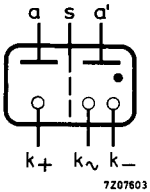
The type ZM1033/01 is electrically identical with type ZM1031/01 but has no filter coating.
The use of a separate bleu absorbing e.g. circular polarized amber filter is recommended.

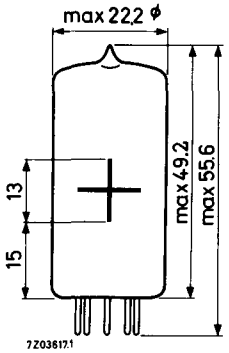
DIMENSIONS AND CONNECTIONS

Dimensions in mm

Base: Noval







INDICATOR TUBE

Cold cathode ten digit numeral indicator tube for side viewing.

QUICK REFERENCE DATA			
Numeral height		30	mm
Numerals	1 2 3 4 5 6 7 8 9 0		
Supply voltage	V_{ba} min.	170	V
Cathode current	I_k	4.5	mA

GENERAL

The numerals are 30 mm high and appear on the same base line allowing in-line read out. The ZM1040 is provided with a red contrast filter.

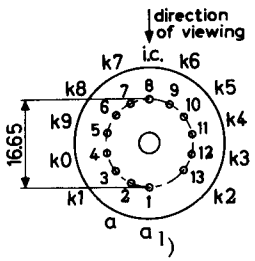
PRINCIPLE OF OPERATION

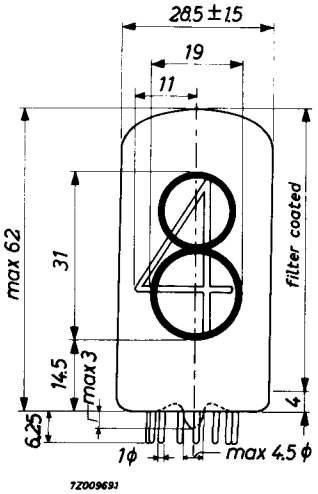
The tube contains ten cathodes in the form of ten figures and one common anode. By applying a suitable voltage between the anode and one of the ten cathodes the corresponding numeral will be covered by a red neon glow.

DIMENSIONS AND CONNECTIONS

Dimensions in mm

Base: B13B





1) Pins 1 and 2 to be interconnected externally.

Mounting position: any

The numerals are viewed through the side of the envelope. The numerals will appear upright (within 1.5°) when the tube is mounted vertically.

Accessories		
Socket	type	2422 505 00001 or 2422 505 00002

CHARACTERISTICS AND OPERATING CONDITIONS

Ignition voltage	V_{ign}	max.	170	V
Maintaining voltage	V_m	see sheet 5		
Cathode current for coverage,				
average, during any conduction period	I_k	min.	3	mA
Cathode current,				
average (T_{av} = 20 ms)	I_k	max.	6	mA
peak	I_{k_p}	max.	20	mA
Cathode selecting voltage	V_{kk}	see sheet 6		
Extinguishing voltage	V_{ext}	min.	120	V

Typical operation at temperatures t_{amb} = 10 to 50 °C

D.C. operation with or without V_{kk}

(See fig.1 and 3 and sheets 5 and 6)

Anode supply voltage	V_{ba}	200	250	300	350	V
Maintaining voltage	V_m	140±10	140±10	140±10	140±10	V
Anode series resistor	R_a	15	27	39	47	kΩ
Cathode selecting voltage	V_{kk}			min.	60	V [1]

A.C. half-wave rectified operation with or without V_{kk}

(See fig.2 and 4 and sheet 5)

Secondary transformer voltage	V_{tr}	170	220	250	300	V
Anode series resistor	R_a	5.6	12	18	27	kΩ
Cathode selecting voltage	V_{kk}			min.	60	V [1]

[1]) With low cathode selecting voltages the current I_{kk} to the "off" cathodes will increase and the readability of the "on" cathode will be affected. It is therefore recommended to use a voltage V_{kk} in excess off the stated minimum value.

LIFE EXPECTANCY at I_k = 4.5 mA

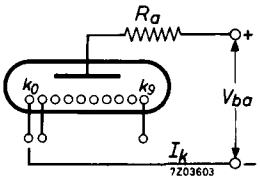
Sequentially changing the display from one digit to the others every 1000 hours or less			100 000	h

LIMITING VALUES (Absolute max. rating system)

Anode voltage necessary for ignition	V_a	min.	170	V
Cathode current,				
average during any conduction period	I_k	min.	3	mA
average (T_{av} = 20 ms)	I_k	max.	6	mA
peak	I_{k_p}	max.	20	mA
Cathode selection voltage	V_{kk}	min.	60	V
Bias voltage between anode and "off" cathodes	V_{bias}	max.	120	V
Bulb temperature	t_{bulb}	min. max.	0 +70	^oC [1] ^oC

[1]) Bulb temperatures below 0 ^oC result in a reduced life expectancy and changes in characteristics (see sheet 7)
In designing equipment to be used over a wide temperature range the use of "constant current operation" (high supply voltage with a high anode series resistor) is recommended.

Fig.1



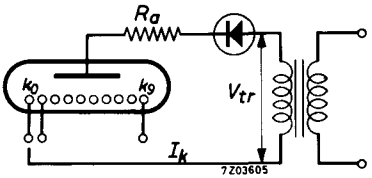


Fig.2

Fig.3

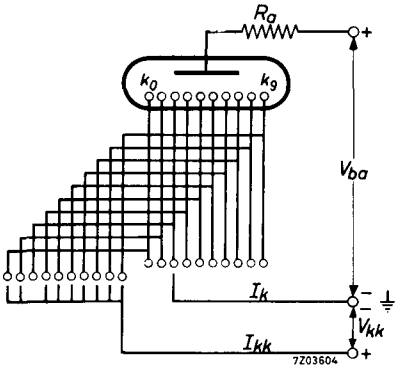
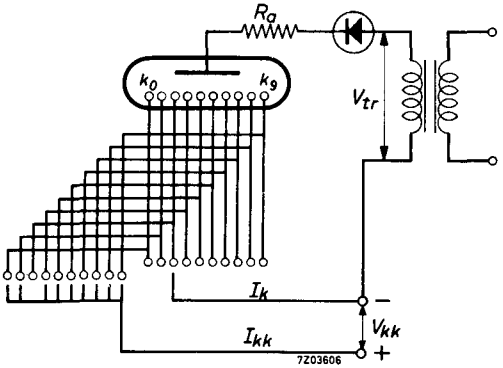
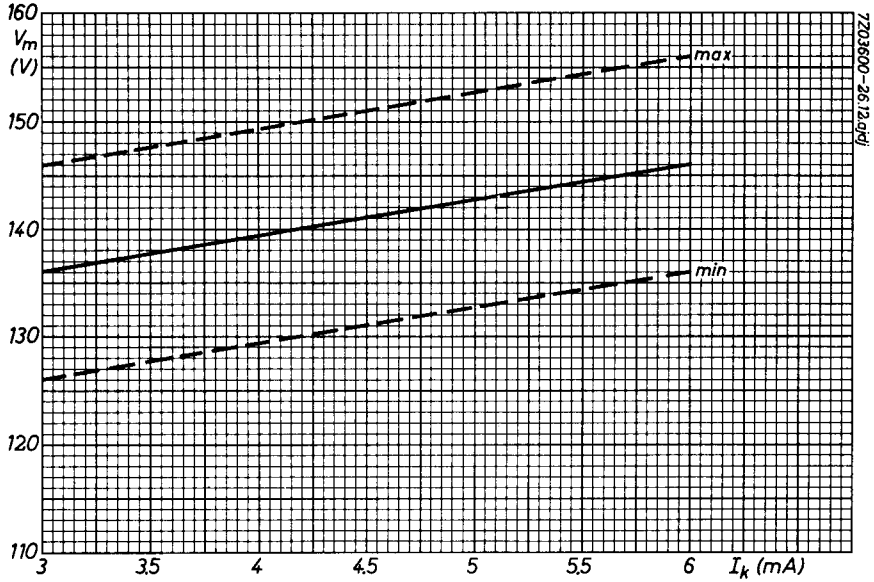
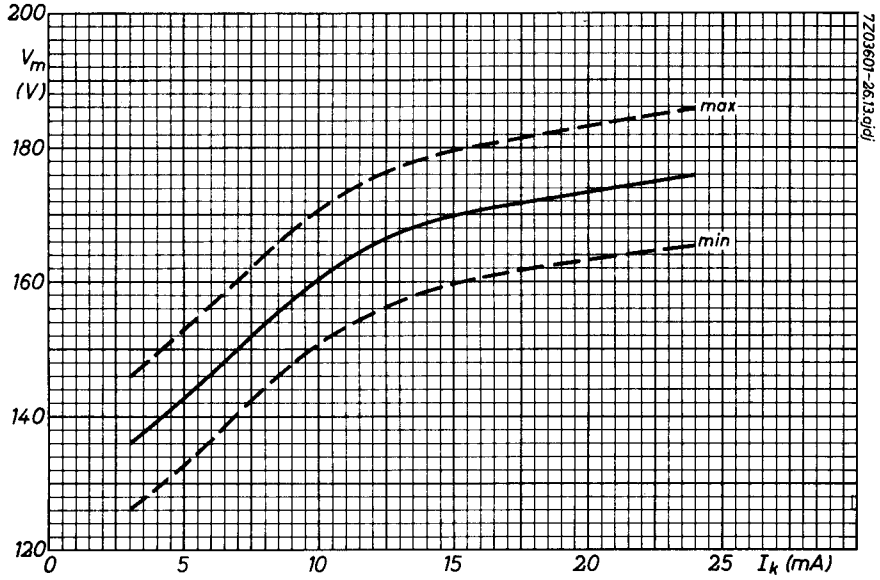
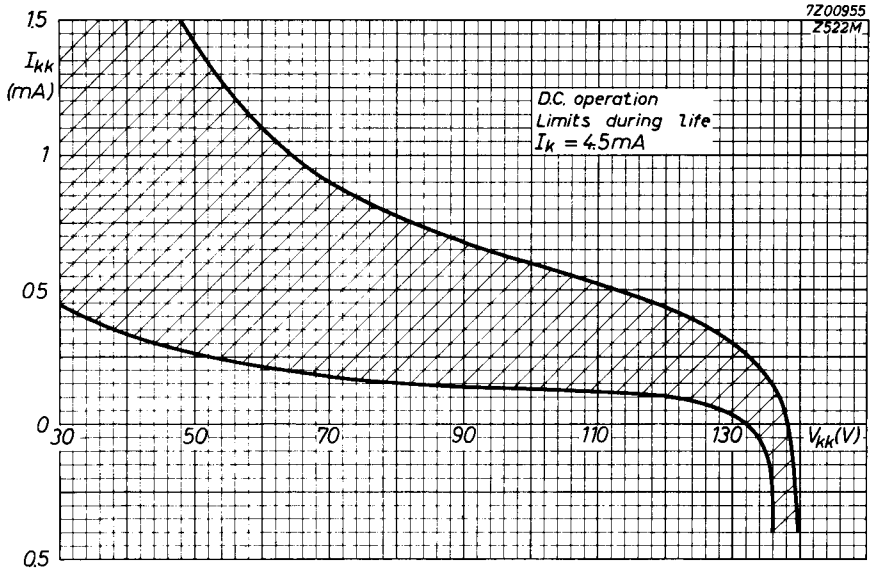


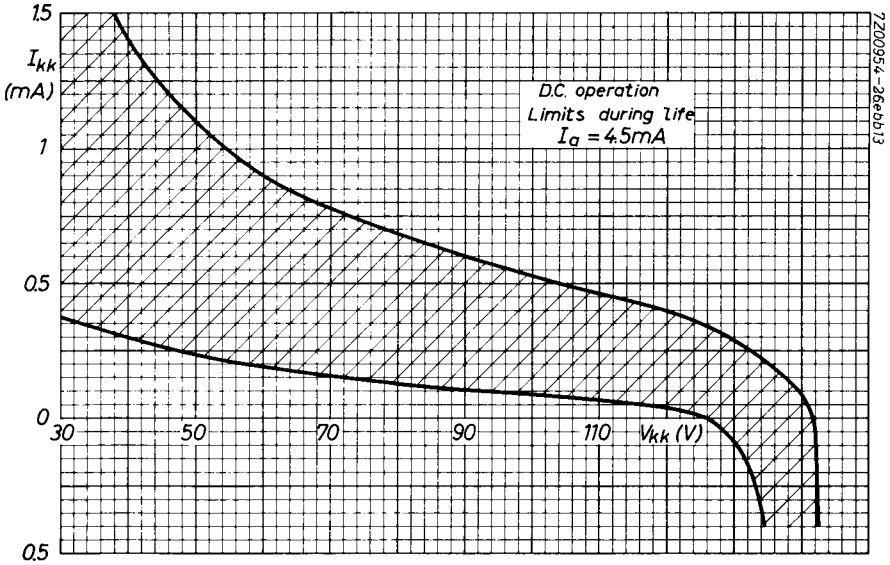
Fig.4

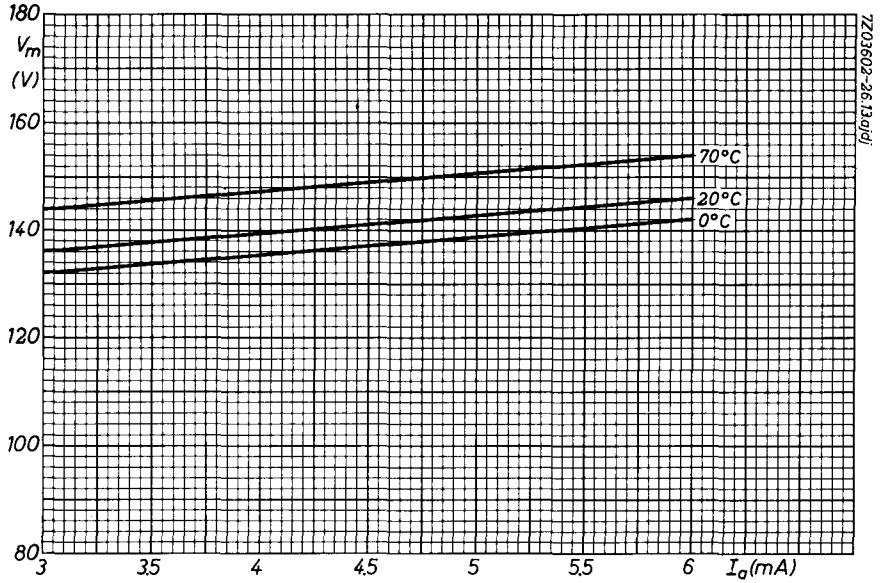



160
V_m
(V)
150
140
130
120
110
3
3.5
4
4.5
5
5.5
6
I_k (mA)
max
min
7Z03600-26.12.gdj


200
V_m
(V)
180
160
140
120
0
5
10
15
20
25
I_k (mA)
max
min
7Z03601-26.13.gidj


7Z00955
Z522M
1.5
I_{kk}
(mA)
1
0.5
0
0.5
30
50
70
90
110
130
V_{kk}(V)
D.C. operation
Limits during life
I_k = 4.5mA


7Z00954-2666613
1.5
I_{kk}
(mA)
1
0.5
0
0.5
30
50
70
90
110
V_{kk} (V)
D.C. operation
Limits during life
I_a = 4.5mA


180
V_m
(V)
160
140
120
100
80
3
3.5
4
4.5
5
5.5
6
I_a(mA)
70°C
20°C
0°C
7Z00602-26.1.1old

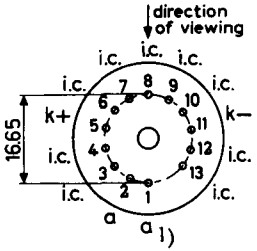
INDICATOR TUBE

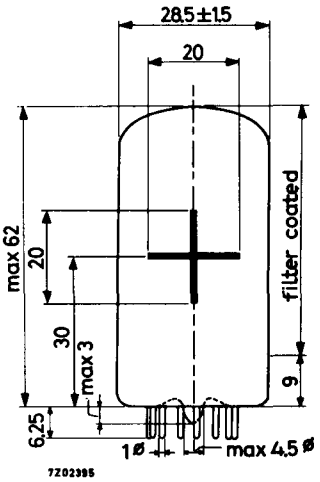
Cold cathode sign indicator tube for side viewing.

QUICK REFERENCE DATA		
Sign height	20	mm
Signs	+ –	
Supply voltage	170	V
Cathode current	4.5	mA

DIMENSIONS AND CONNECTIONS Dimensions in mm

Base: B13B





GENERAL

The tube has the same physical dimensions as the ZM1040 numeral indicator tube. The ZM1041 is provided with a red contrast filter.

1) Pins 1 and 2 to be interconnected externally.

CHARACTERISTICS

Ignition voltage	V_{ign}	max. 170	V
Maintaining voltage	V_m	see sheets 3 and 4	
Extinguishing voltage	V_{ext}	min. 120	V
"Off" cathode probe current characteristic		see sheet 4	

PRINCIPLE OF OPERATION

The tube contains two cathodes, in the form of the signs + and -, and a common anode. By applying a suitable voltage between the anode and one of the cathodes the corresponding sign will be covered by a red neon glow.

ACCESSORIES

Socket 2422 505 00001, 2422 505 00002 or 2422 505 00003

MOUNTING POSITION

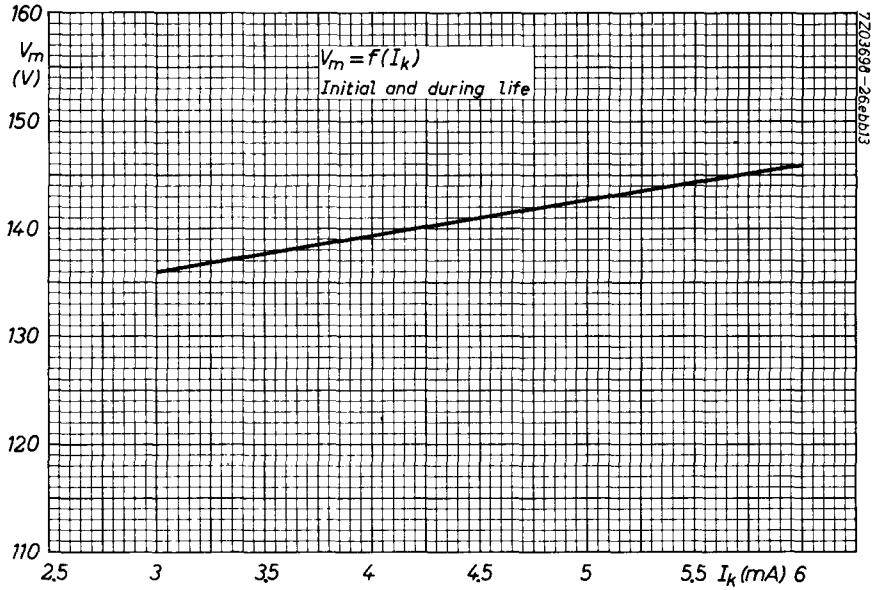
Any

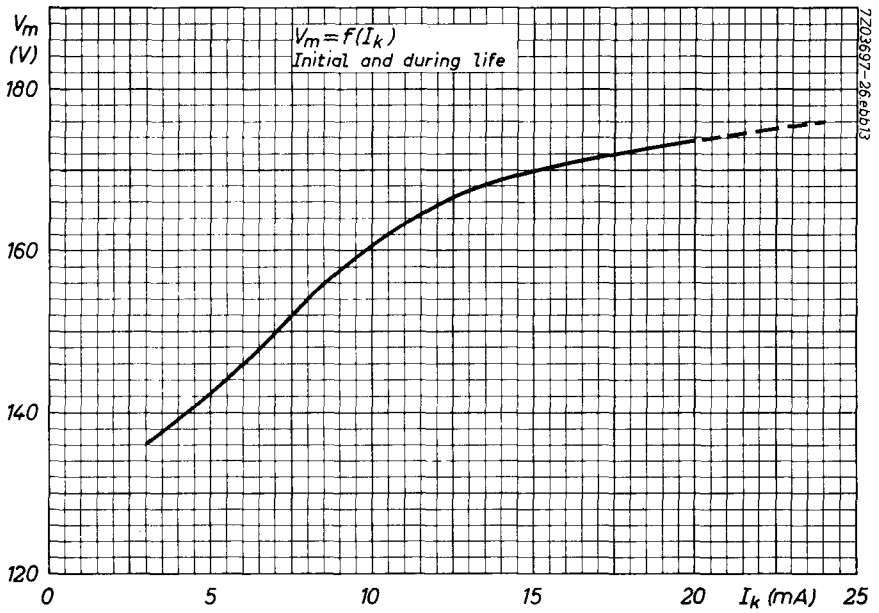
The signs are viewed through the side of the envelope.

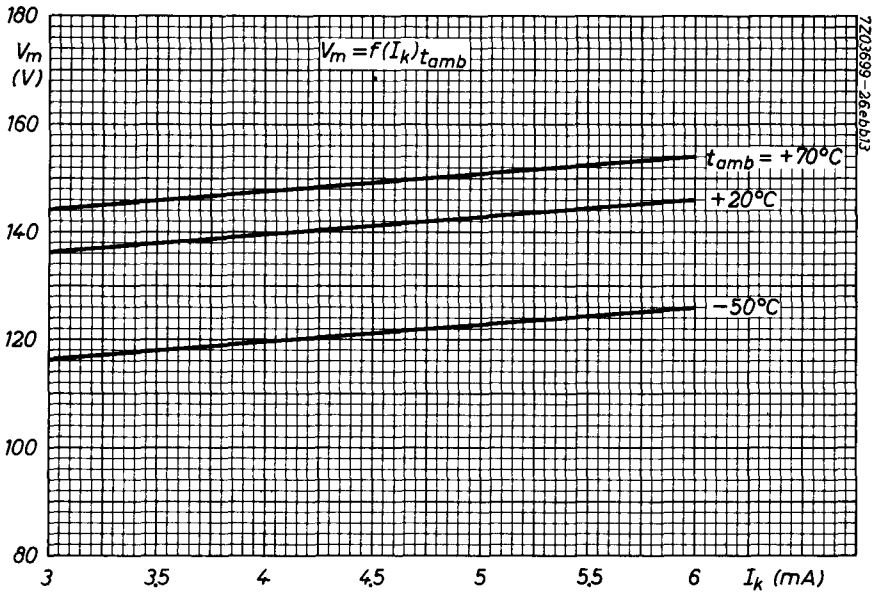
LIMITING VALUES (Absolute max. rating system)

Anode voltage necessary for ignition	V_a	min.	170	V
Cathode current,				
average during any conduction period	I_k	min.	3	mA
average (T_{av} = 20 ms)	I_k	max.	6	mA
peak	I_{kp}	max.	20	mA
Impulse duration	T_{imp}	min.	80	µs
Cathode selecting voltage	V_{kk}	min.	60	V
Bias voltage between anode and "off" cathode	V_{bias}	max.	120	V
Bulb temperature	t_{bulb}	max.	+70 °C	1)
		min.	-50 °C	

1) Bulb temperatures below 10 °C result in a reduced life expectancy and changes in characteristics (see sheet 4).
In designing equipment to be used within a wide temperature range the use of "constant current operation" (high supply voltage with a high anode series resistor) is recommended.


$V_m = f(I_k)$
Initial and during life
7Z03698-26eb13
V_m (V)
160
150
140
130
120
110
2.5
3
3.5
4
4.5
5
5.5
I_k (mA)
6


$V_m = f(I_k)$
Initial and during life
7Z03697-26eb13
V_m (V)
180
160
140
120
0
5
10
15
20
I_k (mA)
25


$V_m = f(I_k)t_{amb}$
V_m (V)
180
160
140
120
100
80
3
3.5
4
4.5
5
5.5
6
I_k (mA)
t_{amb} = +70°C
+20°C
−50°C
ZZ03699-36e6913

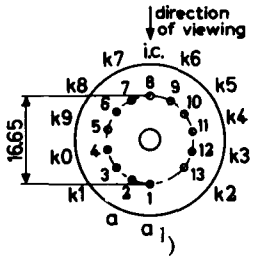
INDICATOR TUBE

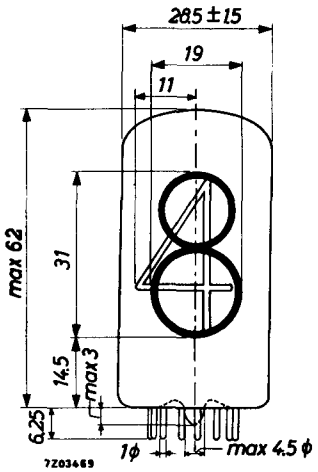
The type ZM1042 is electrically identical with type ZM1040 but has no filter coating.
The use of a separate blue absorbing, e.g. circular polarized amber filter is recommended.

DIMENSIONS AND CONNECTIONS

Dimensions in mm

Base: B13B





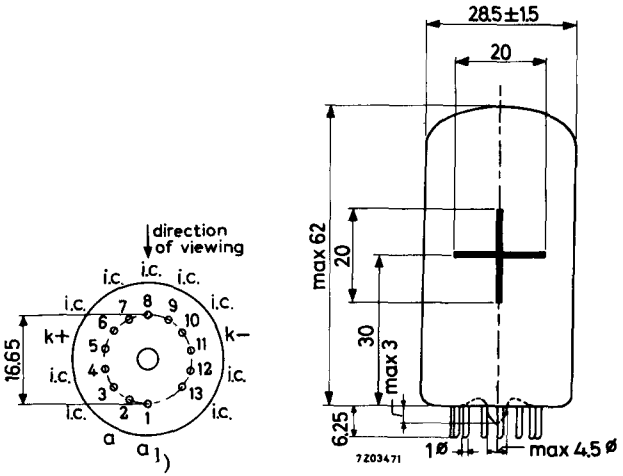
1) Pins 1 and 2 to be interconnected externally.

INDICATOR TUBE

The type ZM1043 is electrically identical with type ZM1041 but has no filter coating. The use of a separate blue absorbing, e.g. circular polarized amber filter is recommended.

DIMENSIONS AND CONNECTIONS Dimensions in mm

Base: B13B



1) Pins 1 and 2 to be interconnected externally.

INDICATOR TUBE

Cold cathode numerical indicator tube for top viewing.

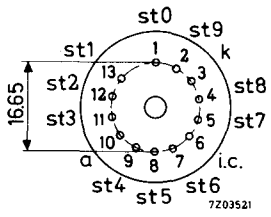
Formely Z550M

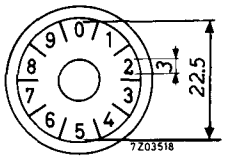
QUICK REFERENCE DATA			
Numeral height		3	mm
Numerals	1 2 3 4 5 6 7 8 9 0		
Supply voltage	V_{ba}	90	Va.c.
Cathode current	I_k	3	mA
Starter selecting voltage		5	V

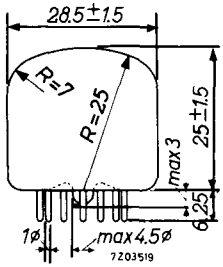
DIMENSIONS AND CONNECTIONS

Dimensions in mm

Base: B13B







GENERAL

The 3 mm high numerals are displayed in radial form.
The tube is primarily intended for use in circuits with transistor control.

PRINCIPLE OF OPERATION

The pulsating d.c. supply voltage (preferably half sine waves) causes one of the ten pure molybdenum cathode positions to glow. This position will be determined by the voltage level of corresponding starter being a few volts above the level of the remaining starters.

ACCESSORIES

Socket 2422 505 00001 or 2422 505 00002

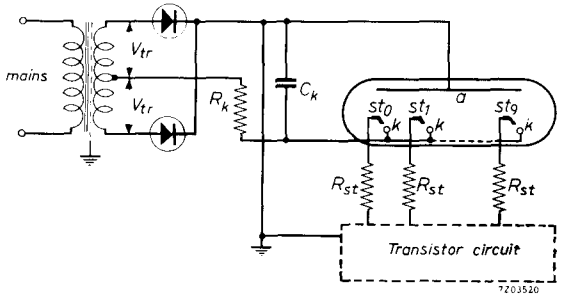
MOUNTING POSITION

Any

The numerals are viewed through the dome of the envelope.
The numerals appear upright when the tube is mounted with the line through pins 1 and 8, vertical pin 1 being uppermost.
Number 0 is aligned with pin 1 to within 3°.

CHARACTERISTICS AND OPERATING CONDITIONS

Recommended circuit



Transformer secondary voltage	V_{tr}	110	V ± 10% [1]
Cathode resistor	R_k	10	kΩ ± 5%
Starter series resistor	R_{st}	330	kΩ [2]
Shunting capacitor	C_k	33	nF [1]
Starter selecting voltage	V_{st-st}	See sheet 4 upper figure and [2] on page 3	
Starter current	I_{st}	50	μA
Maintaining voltage	V_m	84	V
Recommended cathode current	I_k	3	mA

[1] The rectified a.c. voltage should be free from spikes. A shunting capacitor C_k of 33 nF serves this purpose.

[2] This resistor should be mounted close to the tube socket.

LIFE EXPECTANCY at recommended operating conditions and room temperature

Continuous display of one digit		1000	h [1]
Sequentially changing the display from one digit to the others every 100 h or less	min.	20 000	h

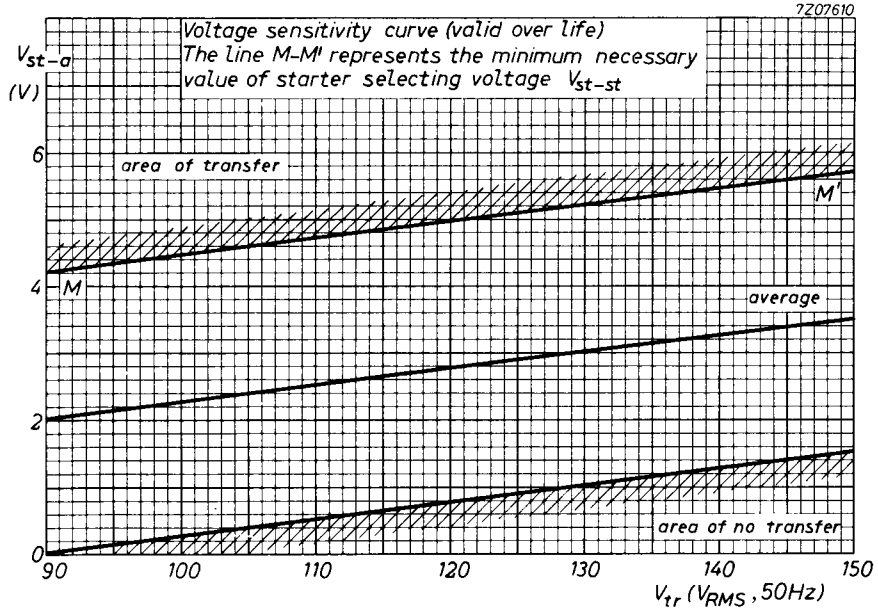
The criterium for the end of life point is given by the minimum value of starter selecting voltage V_{st-st} shown on sheet 4 upper figure.

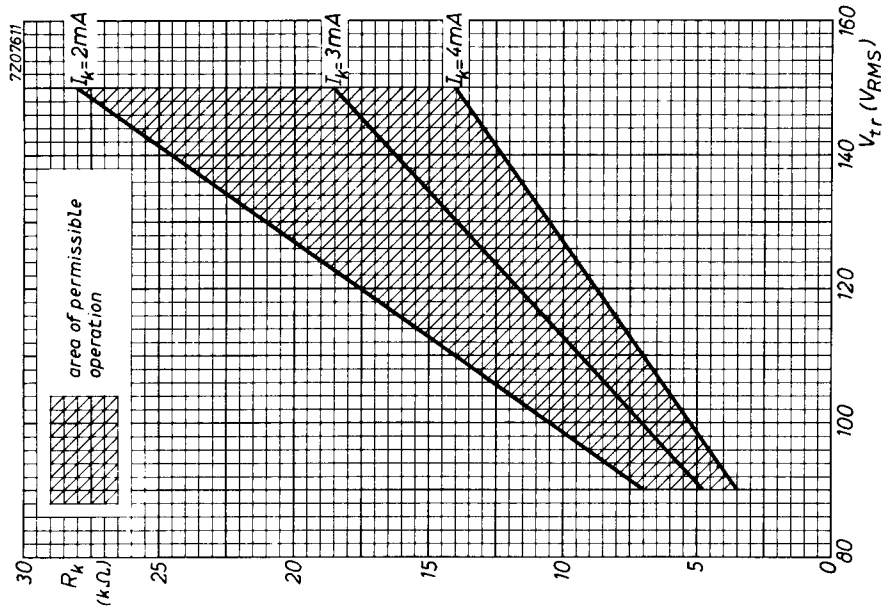
LIMITING VALUES (Absolute max. rating system)

A.C. supply voltage	V_{tr}	min.	90	$V_{r.m.s.}$
See also sheet 4 lower figure	V_{tr}	max.	150	$V_{r.m.s.}$
Frequency of mains supply	f		40 to 100	Hz
Cathode current (average)	I_k	min.	2	mA
		max.	4	mA
Starter selecting voltage	V_{st-st}	min.	see sheet 4 upper figure [2]	
		max.	30	V
Starter circuit resistance	R_{st}	min.	100	kΩ
		max.	470	kΩ
Envelope temperature	t_{bulb}	min.	−55	°C
		max.	+70	°C

[1] Under conditions of longer continuous display on one digit it is recommended to apply a starter selecting voltage V_{st-st} greater than the minimum value, as indicated on sheet 4 upper figure.

[2] The common starter bias potential may deviate by a maximum of ± 5 V from the anode potential.


7Z07610
Voltage sensitivity curve (valid over life)
The line M-M' represents the minimum necessary value of starter selecting voltage V_{st-st}
V_{st-a} (V)
area of transfer
M'
M
average
area of no transfer
0
2
4
6
90
100
110
120
130
140
150
V_{tr} (V_{RMS}, 50Hz)


7Z07611
I_k=2mA
I_k=3mA
I_k=4mA
area of permissible operation
160
140
120
100
80
V_{tr} (V_{RMS})
30
25
20
15
10
5
0
R_k (kΩ)

INDICATOR TUBE

Cold cathode ten digit side viewing numeral indicator tube

QUICK REFERENCE DATA				
Numeral height			13	mm
Numerals	1 2 3 4 5 6 7 8 9 0			
Supply voltage	V_b	min.	170	V
Cathode current	I_k		2	mA
Distance between mounting centres		min.	19	mm

GENERAL

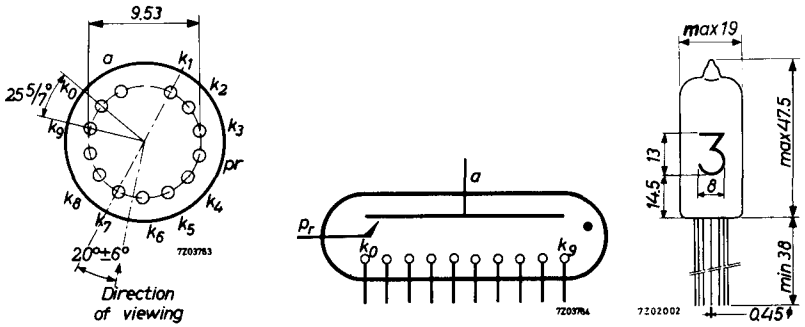
The numerals are 13 mm high and appear on the same base line allowing in-line read out. The ZM1080 is provided with a red contrast filter.
The ZM1082 is identical to the ZM1080 but has no filter.

PRINCIPLE OF OPERATION

The tube contains ten cathodes in the form of ten figures and one common anode. By applying a suitable voltage between the anode and one of the ten cathodes the corresponding figure will be covered by a red neon glow.

DIMENSIONS AND CONNECTIONS

Dimensions in mm



Mounting position: any

The numbers are viewed through the side of the envelope. The numbers will appear upright (within $\pm 3^{o}$) when the tube is mounted vertically.
Care should be taken not to bend the leads nearer than 1.5 mm from the seals. The leads are tinned and may be dip soldered to a minimum of 5 mm from the seals at a solder temperature of 240 °C for a maximum of 10 seconds.
The tube may be soldered directly into the circuit but heat conducted to the glass to metal seals should be kept to a minimum by the use of a thermal shunt.

CHARACTERISTICS AND RANGE VALUES FOR EQUIPMENT DESIGN

Initially and during life at 20 °C to 50 °C unless otherwise stated.

Ignition			
Anode voltage	V_a	> 170	V
Ignition delay time		See page 4	1)
Conduction			
D.C. operation			
Cathode current 1)	I_k	< 3.5	mA
Cathode current for coverage	I_k	> 1.5	mA
Maintaining voltage at I_k = 2 mA (See also page 5)	V_m	140	V
Probe current to individual non-conducting cathodes	I_{kk}	See page 6	
Pulse operation			
Cathode current, peak	I_{kp}	< 12	mA
average, T_{av} = 20 ms	I_k	< 2.5	mA
Average cathode current for satisfactorily display	I_k	> 0.8	mA
Pulse duration	T_{imp}	< 20 > 100	ms μs
Maintaining voltage	V_m	See page 5	
Probe current to individual non-conducting cathodes	I_{kk}	See pages 6 and 7	

EXTINCTION

Anode voltage to ensure extinction	V_a	< 115	V

1) For reduced ignition delay times, a small continuous priming current may be taken from lead 4. This can be obtained from a supply voltage of -180 V with respect to the "on" cathode via a resistor of 18 MΩ.

LIFE EXPECTANCY

Under recommended operating conditions and t_{amb} = room

Continuous display of one digit [1]	>	5000	h
Sequentially changing the display from one digit to another every 100 hours or less	>	30 000	h

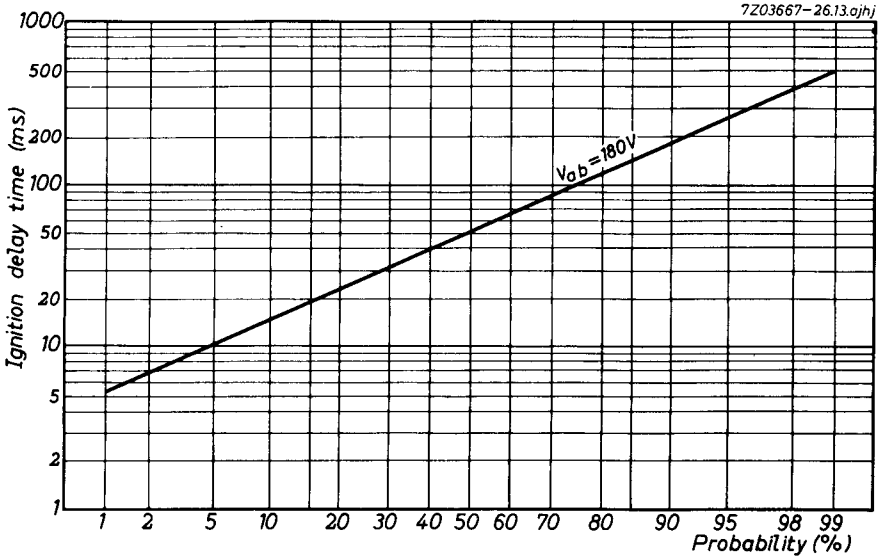
LIMITING VALUES (Absolute max. rating system)

Cathode current (each digit)

average, T_{av} = max. 20 ms	I_k	max.	3.5	mA
peak	I_{kp}	max.	12	mA
average during any conduction period	I_k	min.	1.5	mA
Bulb temperature	t_{bulb}	max.	+70	°C
		min.	−50	°C [2]
Anode voltage necessary for ignition	V_a	min.	170	V

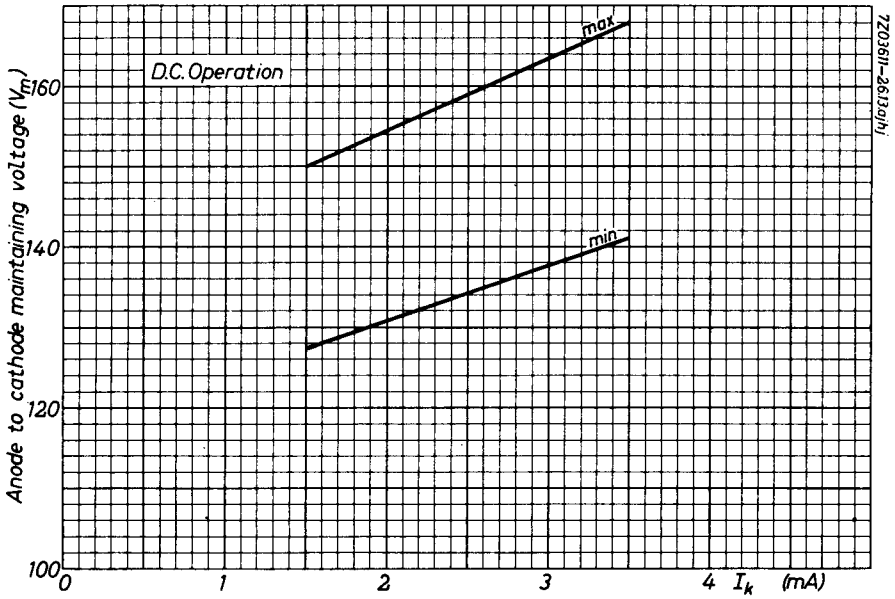
[1] The life expectancy figures given above relate to operation with d.c. cathode currents between 1.5 mA to 2.5 mA and at all permitted pulsed cathode currents.
When a d.c. cathode current range of 1.5 mA to 3.5 mA is used, the life expectancy exceeds 3000 hours with continuous display of one digit.

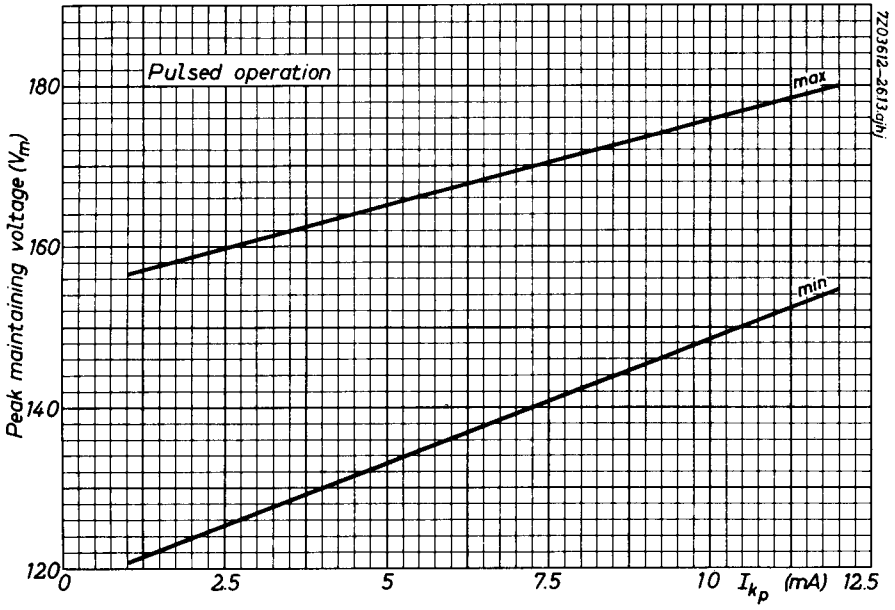
[2] For bulb temperatures below 0 °C the life expectancy of the tube is substantially reduced.

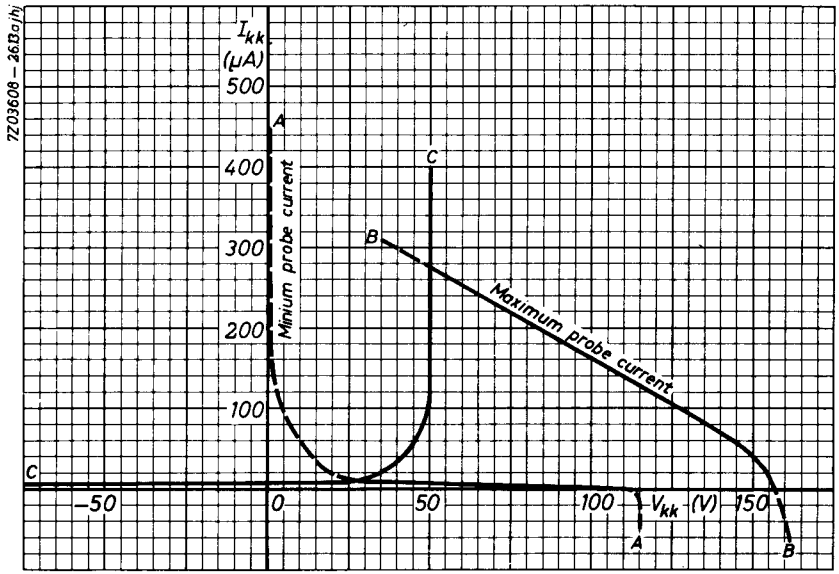


CUMULATIVE DISTRIBUTION OF IGNITION DELAY TIME

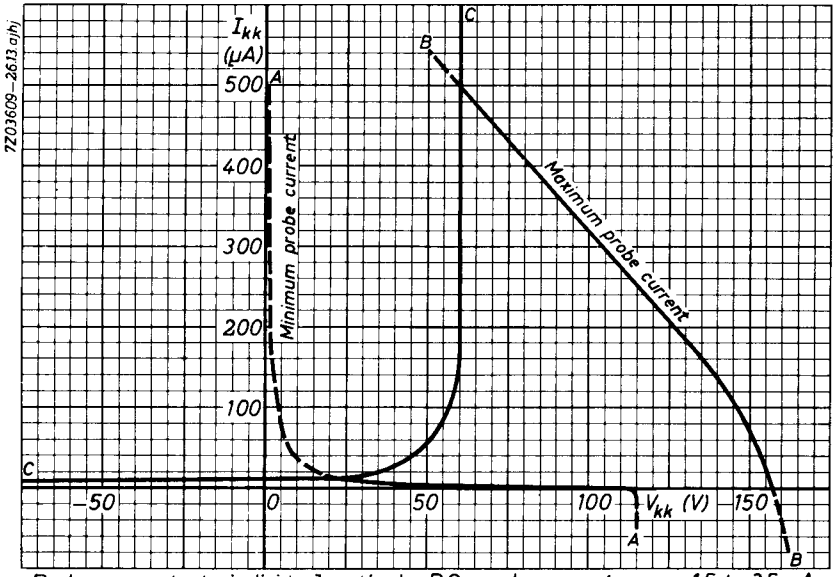
This curve shows the probability that a tube will ignite in less than the time shown after a non-conduction period of a few seconds. The ignition delay time will be appreciably reduced when the interval between conduction periods is less than 100 milliseconds. In general, an increase in the supply voltage will reduce the ignition delay time.


D.C. Operation
max
min
Anode to cathode maintaining voltage (V_m)
160
140
120
100
0
1
2
3
4
I_k (mA)
7Z03611-2613.ghj

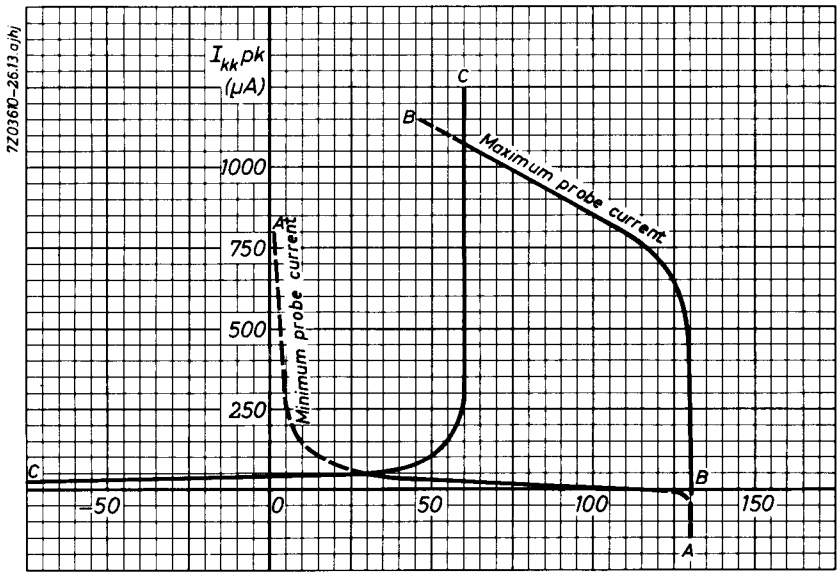

Pulsed operation
max
min
Peak maintaining voltage (V_m)
180
160
140
120
0
2.5
5
7.5
10
I_{kp} (mA)
12.5
7Z03612-2613.ghj



Probe currents to individual cathodes. D.C. anode current range 1.5 to 2.5mA



Probe currents to individual cathodes. D.C. anode current range 1.5 to 3.5mA



Peak probe currents to individual cathodes. Pulsed anode current 10mA Duty factor 01

PROBE CURRENT CURVES

The boundaries A-A and B-B of the graphs represent, for the shown anode current ranges, the range of probe currents to individual non-conducting cathodes plotted against the voltage difference between the non-conducting cathodes and the conducting cathode.

For optimum display, the probe current to any non-conducting cathode should be as low as possible. In addition, reverse probe current should not be permitted.

These conditions can be satisfied in two ways:

(1) With a low impedance voltage source connected to the non-conducting cathodes. For example, when using a current range of 1.5 to 2.5 mA and a voltage between 50 and 115 V is required.

(2) With a separate high impedance connected to each non-conducting cathode and returned to a voltage source of less than 115 V. In this case the load line of the voltage source must lie to the right of boundary C-C.

INDICATOR TUBE

Cold cathode side viewing character indicator tube.

QUICK REFERENCE DATA			
Character height		10.5	mm
Characters		− + ~	
Supply voltage	V_b	min. 170	V
Cathode current	I_k	2	mA

GENERAL

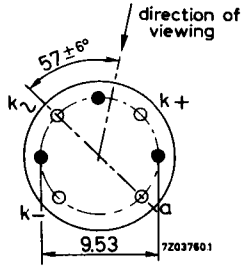
The ZM1081 is provided with a red contrast filter
The ZM1083 is identical to the ZM1081 but has no filter.

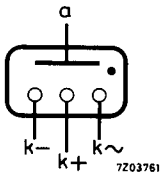
PRINCIPLE OF OPERATION

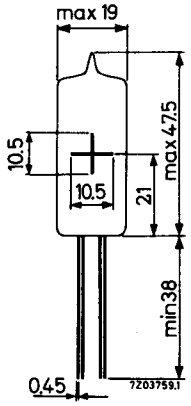
The tube contains 3 cathodes in the form of the characters −, + and ~ and one common anode.
By applying a suitable voltage between the anode and one of the three cathodes the corresponding character will be covered by a red neon glow.

DIMENSIONS AND CONNECTIONS

Dimensions in mm







Mounting position: any

The characters are viewed through the side of the envelope.
The characters will appear upright (within $\pm 2^{o}$) when the tube is mounted vertically.

Care should be taken not to bend the leads nearer than 1.5 mm from the seals.

The leads are turned and may be dip soldered to a minimum of 5 mm from the seals at a solder temperature of 240 °C for a maximum of 10 seconds.

CHARACTERISTICS, OPERATING CONDITIONS AND LIMITING VALUES

These are essential the same as of type ZM1080.

INDICATOR TUBE

Long life cold cathode ten digit numeral indicator tube for top viewing.
The rectangular envelope allows for close tube-to-tube spacing, both in the horizontal and vertical axes.

QUICK REFERENCE DATA				
Numeral height			15.5	mm
Numerals	1 2 3 4 5 6 7 8 9 0			
Supply voltage	V_{ba}	min.	170	V
Cathode current	I_k		2.5	mA
Distance between mounting centres		min.	20	mm
Viewing angle			90	o

GENERAL

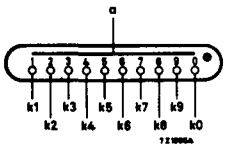
The numerals are 15.5 mm high and appear on the same base line allowing in-line read out.

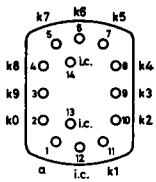
PRINCIPLE OF OPERATING

The tube contains ten cathodes in the form of ten figures and one common anode. By applying a suitable voltage between the anode and one of the ten cathodes the corresponding figure will be covered by a red neon glow.

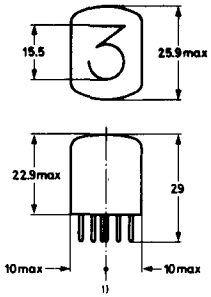
DIMENSIONS AND CONNECTIONS

Dimensions in mm





special 14 pin base



1) Centre line through pins 6 and 12 (Note: distance between centre lines of adjacent tubes must be at least 20 mm)

Mounting position: any

The numerals are viewed through the top of the envelope. The numerals will appear upright (within $\pm 3^0$) when the tube is mounted with the line through pins 6 and 12 vertical, pin 6 uppermost.

Accessory

Socket	type	55705

CHARACTERISTICS AND OPERATING CONDITIONS (at 20 °C to 50 °C)

Ignition voltage	V_{ign}	min. 170	V
Ignition delay		see page 3	
Maintaining voltage		see page 4	
Cathode current, recommended	I_k	2.5	mA
Cathode current for coverage average during any conduction period	I_k	min. 1.5	mA
D.C. operation		see pages 5 to 9	
Extinguishing voltage	V_{ext}	118	V

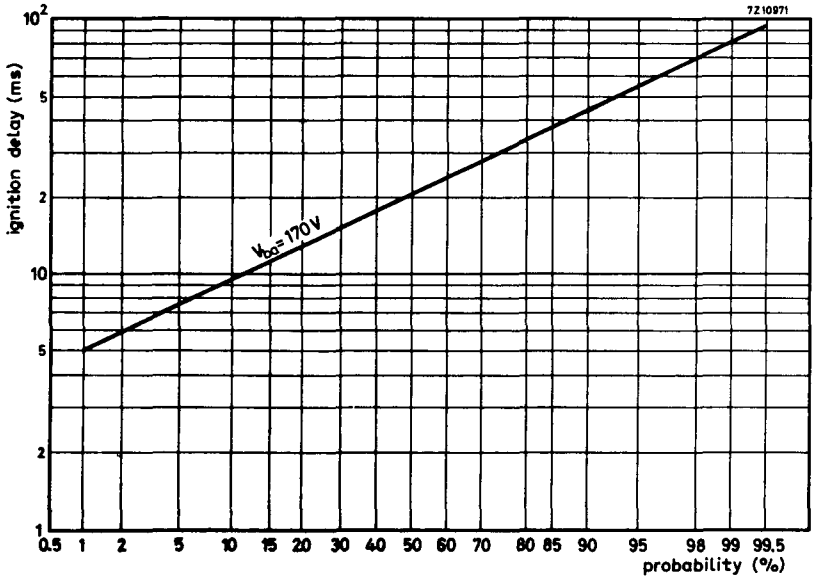
LIFE EXPECTANCY at I_k = 2.5 mA and room temperature 1)

Continuous display of one numeral	>	5 000 h
Sequentially changing the display from one numeral to another, every 100 hrs or less	>	30 000 h

LIMITING VALUES (Absolute max. rating system)

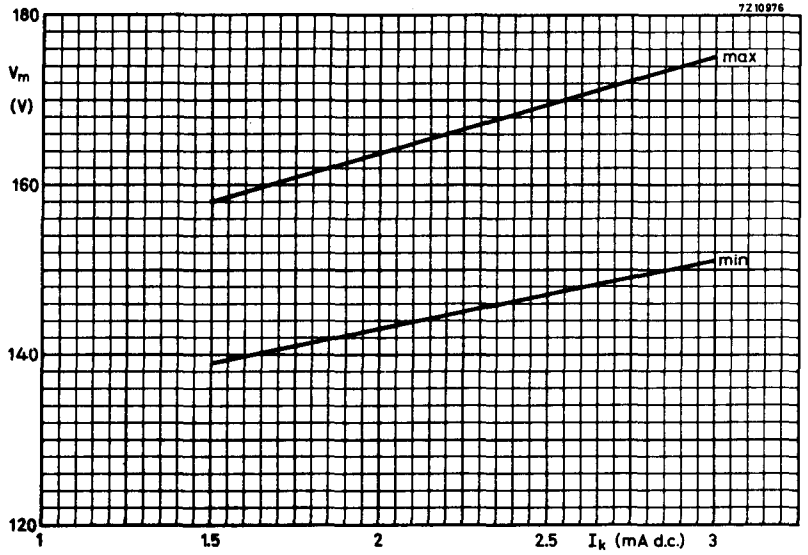
Cathode current (each digit),			
average, T_{av} = max. 20 ms	I_k	max. 3.0	mA
peak	I_{kp}	max. 3.5	mA
average during any conduction period	I_k	min. 1.5	mA
Anode voltage necessary for ignition	V_a	min. 170	V
Bulb temperature	t_{bulb}	max. +70	°C
	t_{bulb}	min. -10	°C 1)

1) For bulb temperatures below +10 °C the life expectancy of the tube is substantially reduced.



CUMULATIVE DISTRIBUTION OF IGNITION DELAY

This curve shows the probability that a tube will ignite in less than the time shown after a non-conduction period of a few seconds. The ignition delay will be appreciably reduced when the interval between conduction periods is less than 100 milliseconds. In general, an increase in the supply voltage will reduce the ignition delay.

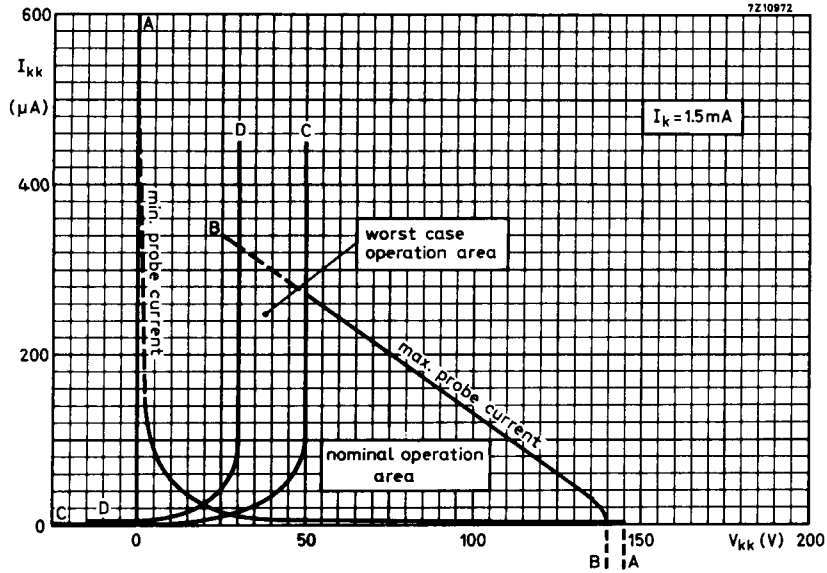


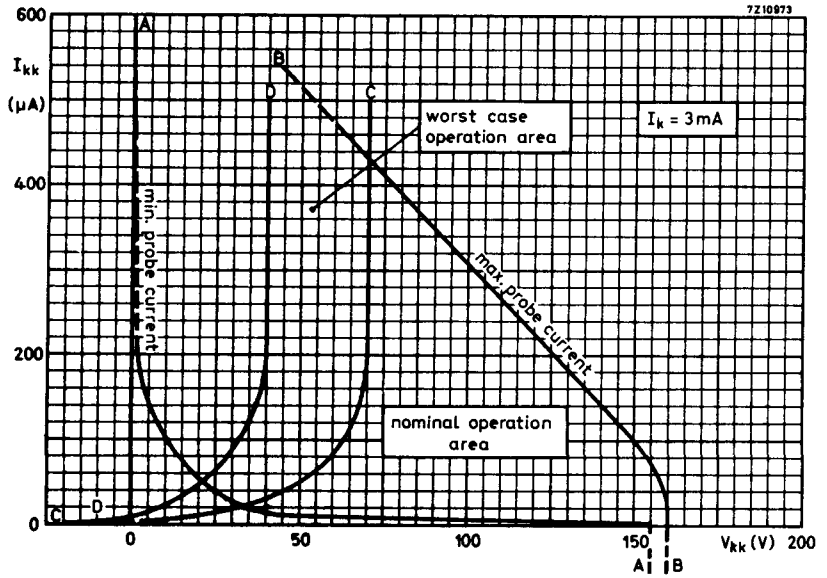
ANODE-TO-CATHODE MAINTAINING VOLTAGE
AS A FUNCTION OF CATHODE CURRENT

NOTE

PROBE CURRENT CURVES

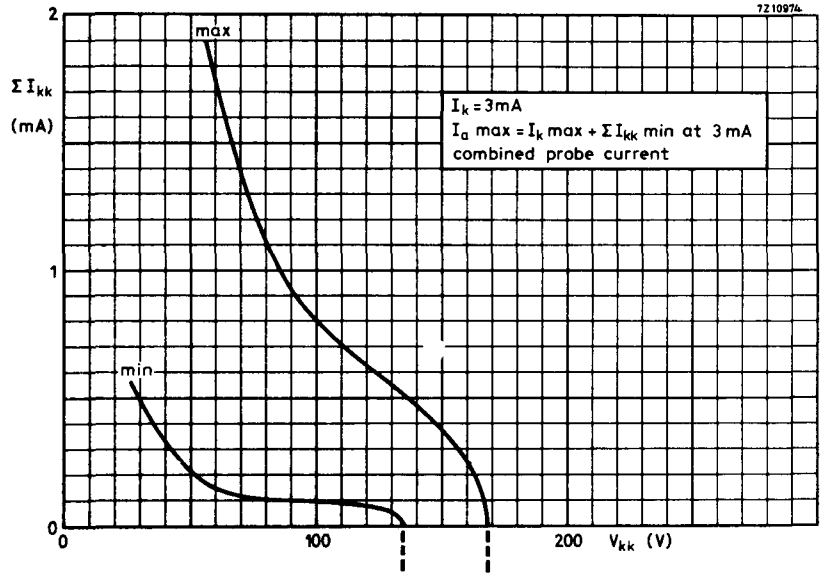
For low cathode selecting voltages (V_{kk}) the current I_{kk} to the non-conducting cathode will increase, and the readability of the conducting cathode will be affected. It is therefore recommended to use a nominal operating point to the right of line C-C. Under the worst operating conditions the operating point should never reach the area left of the line D-D.

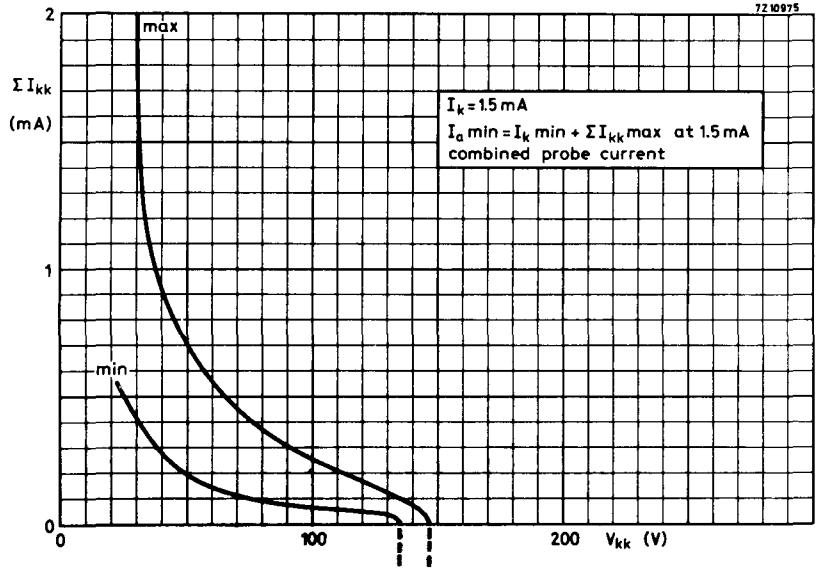




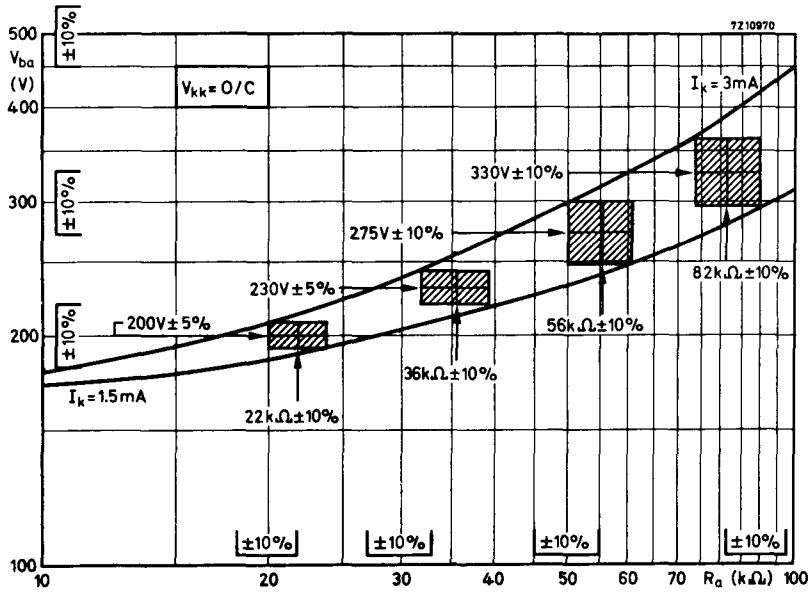
PROBE CURRENTS TO INDIVIDUAL NON-CONDUCTING CATHODES

See note page 4





COMBINED PROBE CURRENT TO ALL NON-CONDUCTING CATHODES



D.C. SUPPLY VOLTAGE AS A FUNCTION OF ANODE LOAD RESISTOR:

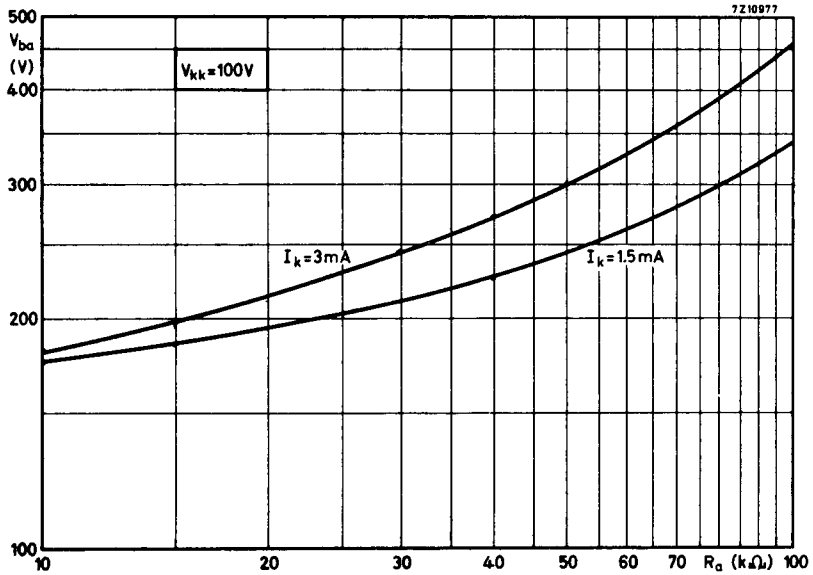
NON-CONDUCTING CATHODES OPEN CIRCUIT

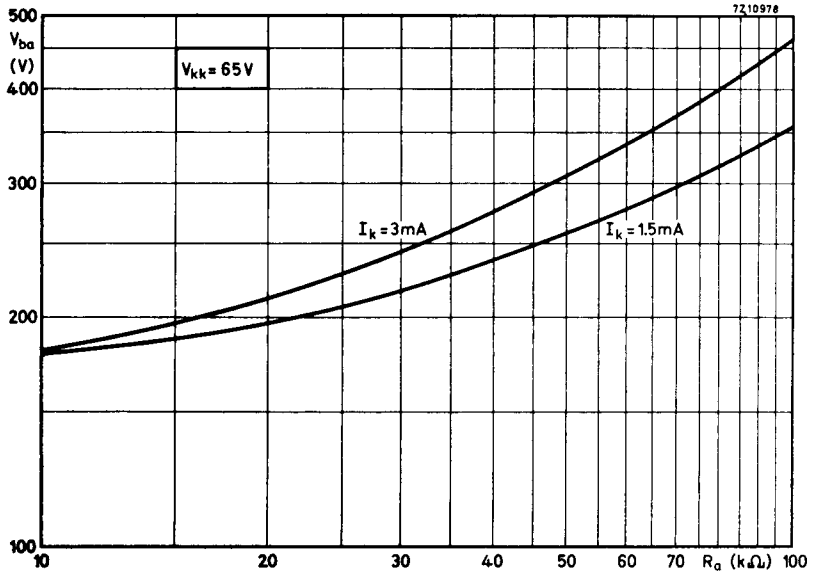
NOTE - SUPPLY VOLTAGE/LOAD RESISTOR

The graphs on pages 7 to 9 give the relationship between the d.c. anode supply voltage and the required anode load resistor for fixed values of V_{kk} (voltage difference between conducting and non-conducting cathodes).

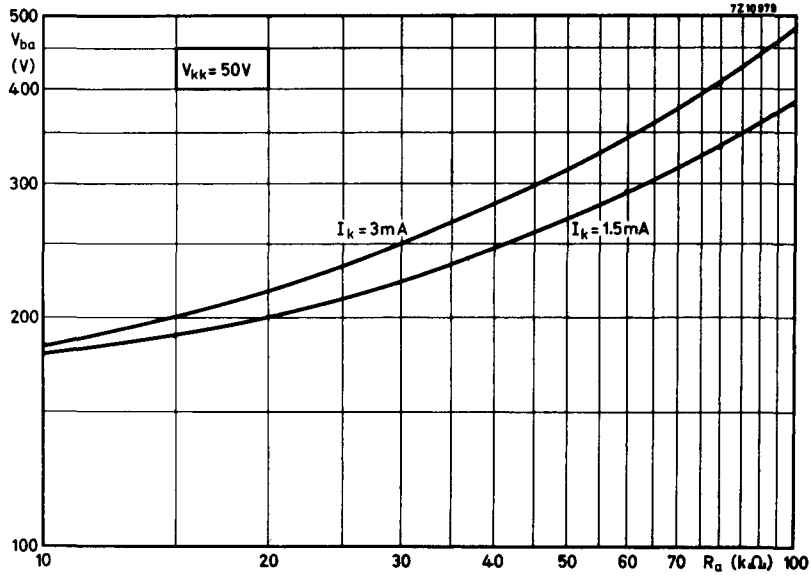
Each graph is plotted on log-log graph paper; therefore a given tolerance expressed as a percentage can be represented as a fixed length at any point on the x and y axis. This is shown on the graph above by taking points on each axis with a fixed tolerance. Examples are shown on the graph above of the supply voltages and load resistors with tolerances expressed as a percentage so as to remain within the recommended operating region.

On page 9 details are given of the method of calculating corresponding values of supply voltage and anode load resistor, for fixed values of V_{kk}.





D.C. SUPPLY VOLTAGE AS A FUNCTION OF ANODE LOAD RESISTOR



D.C. SUPPLY VOLTAGE AS A FUNCTION OF ANODE LOAD RESISTOR

NOTE - The supply voltage/load resistor curves are derived from:

$$V_{ba} = I_a . R_a + V_m \text{ (General formula)}$$

$$V_{ba} = \left[I_k + \Sigma I_{kk}\right] R_a + V_m$$

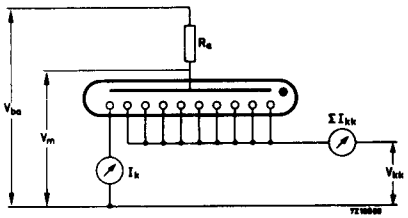
The value of I_{kk} will depend on the bias voltage V_{kk}.

Supply voltage required to work above the minimum value of I_k:

$$V_{ba} = \left[1.5 \text{ mA} + \Sigma I_{kk} \text{ max. at } I_k = 1.5 \text{ mA}\right] R_a + 158 \text{ V}$$

Supply voltage required to work below the maximum value of I_k:

$$V_{ba} = \left[3.0 \text{ mA} + \Sigma I_{kk} \text{ min. at } I_k = 3.0 \text{ mA}\right] R_a + 151 \text{ V}$$



INDICATOR TUBE

Long life cold cathode ten digit numeral indicator tube for side viewing.

QUICK REFERENCE DATA			
Numeral height		15.5	mm
Numerals	1 2 3 4 5 6 7 8 9 0		
Supply voltage	V_{ba}	min. 170	V
Cathode current	I_k	2.5	mA
Distance between mounting centres		min. 19	mm

GENERAL

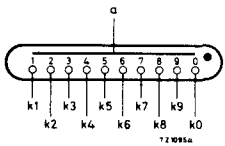
The numerals are 15.5 mm high and appear on the same base line allowing in-line read out. The ZM1170 is provided with a red contrast filter. The ZM1172 is identical to the ZM1170, but has no filter.

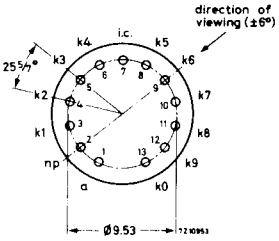
PRINCIPLE OF OPERATION

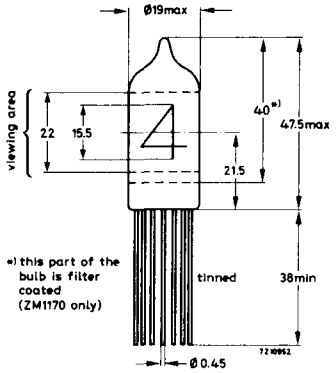
The tube contains ten cathodes in the form of ten figures and one common anode. By applying a suitable voltage between the anode and one of the ten cathodes the corresponding figure will be covered by a red neon glow.

DIMENSIONS AND CONNECTIONS

Dimensions in mm







Mounting position: any

The numerals will apear upright (within $\pm 3^{o}$) when the tube is mounted vertically, base down.

Soldering

The tube may be soldered directly into the circuit, but heat conduction to the glass-to-metal seals should be kept to a minimum by the use of a thermal shunt.
The leads may be dip-soldered to a minimum of 5 mm from the seals at a solder temperature of $240^{o}C$ for a maximum of 10 s.

Note

Care should be taken not to bend the leads nearer than 1.5 mm from the seals.

For electrical data please refer to type ZM1230

INDICATOR TUBE

Long life cold cathode ten digit numeral indicator tube for side viewing.

QUICK REFERENCE DATA			
Numeral height		15.5	mm
Numerals		0 1 2 3 4 5 6 7 8 9	
Decimal point		see "General"	
Supply voltage	min.	170	V
Numeral cathode current		2.5	mA
Decimal point cathode current		0.5	mA
Distance between mounting centres	min.	19	mm

GENERAL

The numerals are 15.5 mm high and appear on the same base line allowing in-line read out. The four types are electrically identical but differ in the position of the decimal point and the inclusion of a red contrast filter.

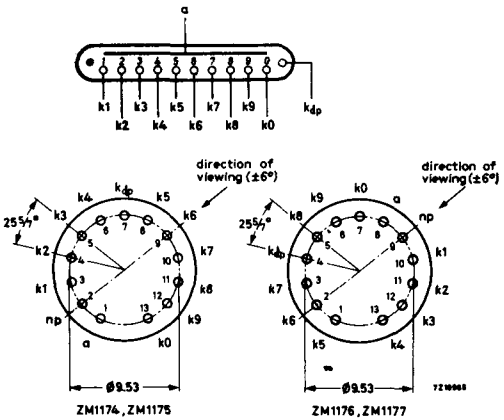
ZM1174 Decimal point on the left hand side. Red contrast filter.
ZM1175 Decimal point on the left hand side. No filter.
ZM1176 Decimal point on the right hand side. Red contrast filter.
ZM1177 Decimal point on the right hand side. No filter.

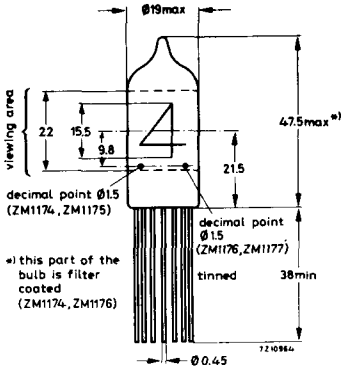
PRINCIPLE OF OPERATION

The tube contains ten cathodes in the form of ten figures and one in the form of a decimal point, and a common anode. By applying a suitable voltage between the anode and one of the cathodes the corresponding figure or decimal point will be covered by a red neon glow.

DIMENSIONS AND CONNECTIONS

Dimensions in mm





Data based on pre-production tubes.

Mounting position: any

The numerals and the decimal point are viewed through the side of the envelope. The numerals will appear upright (within $\pm 3^{o}$) when the tube is mounted vertically, base down.

Soldering

The tube may be soldered directly into the circuit, but heat conduction to the glass-to-metal seals should be kept to a minimum by the use of a thermal shunt.
The leads may be dip-soldered to a minimum of 5 mm from the seals at a solder temperature of 240 °C for a maximum of 10 s.

Note

Care should be taken not to bend the leads nearer than 1.5 mm from the seals.

CHARACTERISTICS AND OPERATING CONDITIONS (at 20 °C to 50 °C)

Ignition voltage	V_{ign}	max.	170	V
Mainting voltage	V_m		see page 3	
Numeral cathode current,				
recommended average	I_k		2.5	mA
average (T_{av} = 10 ms)	I_k	max.	3.5	mA
average, averaged over any conduction period	I_k	min.	1.5	mA 1)
peak	I_{kp}	max.	12	mA
Decimal point cathode current				
recommended average	I_{kdp}		0.5	mA
average, averaged over any conduction period	I_{kdp}	min.	0.05	mA 2)
peak	I_{kdpp}	max.	2.5	mA
Extinguishing voltage	V_{ext}		115	V

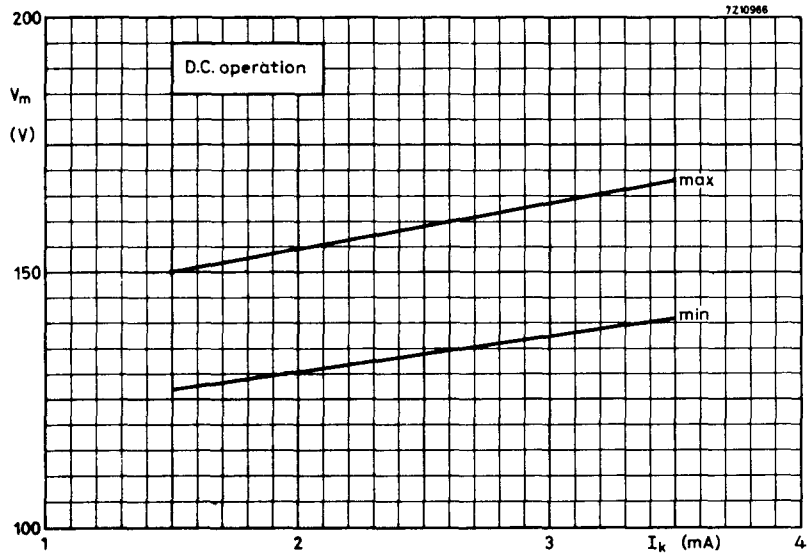
LIFE EXPECTANCY at I_k = 2.5 mA and room temperature. 3)

Continuous display of one numeral	>	5000	h
Sequentially changing the display from one numeral to another, every 100 h or less	>	30 000	h

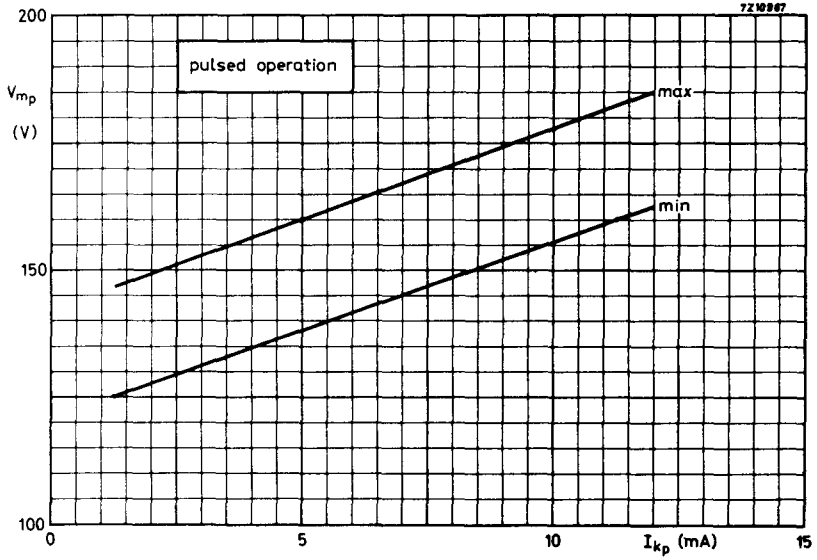
LIMITING VALUES (Absolute max. rating system)

Numeral cathode current				
average, T_{av} = 10 ms	I_k	max.	3.5	mA
peak	I_{kp}	max.	12	mA
average during any conduction period	I_k	min.	1.5	mA
Pulse duration	T_{imp}	min.	100	μs
Bulb temperature	t_{bulb}	max.	+70	°C
	t_{bulb}	min.	-50	°C 3)

1) This value applies, irrespective of wether the decimal point is running or not.
2) These conditions are automatically satisfied when the decimal point is directly connected to the numeral cathode carrying the main discharge. When the decimal point is connected in this way the max. decimal point current is 0.15 mA at a numeral cathode current of 1.5 mA.
3) For bulb temperatures below 0 °C the life expectancy of the tube is substantially reduced.



ANODE-TO-CATHODE MAINTAINING VOLTAGE
AS A FUNCTION OF CATHODE CURRENT



PEAK ANODE-TO-CATHODE MAINTAINING VOLTAGE
AS A FUNCTION OF PEAK CATHODE CURRENT

PANDICON*
INDICATOR TUBE

Long-life, multiple cold-cathode, gas-filled indicator tube for in-line numerical display applications requiring a large number of digits (up to 14) to be displayed on a minimum of space, e.g. in electronic desk-top calculators. To facilitate the reading of large numbers, punctuation marks can be made to appear at suitable places.

QUICK REFERENCE DATA			
Numeral height		10	mm
Numerals		0 1 2 3 4 5 6 7 8 9	
Number of decades		14	
Decimal points		to the lower right of the numerals	
Punctuation marks		to the upper right of the numerals	
Decade pitch		10	mm
Supply voltage, peak	V_{ba_p}	min. 170	V
Anode current, peak	I_{a_p}	9	mA

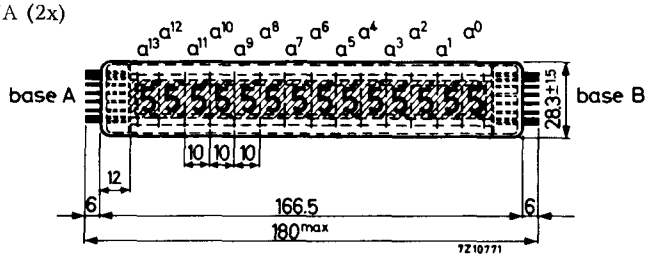
GENERAL

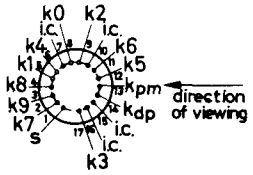
The numerals are 10 mm high and appear on the same base-line allowing in-line read-out.

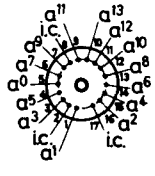
DIMENSIONS AND CONNECTIONS

Dimensions in mm

Base: B17A (2x)







No undue stress should be placed on the base pins.

*Registered Trade Mark for multiple indicator tubes.

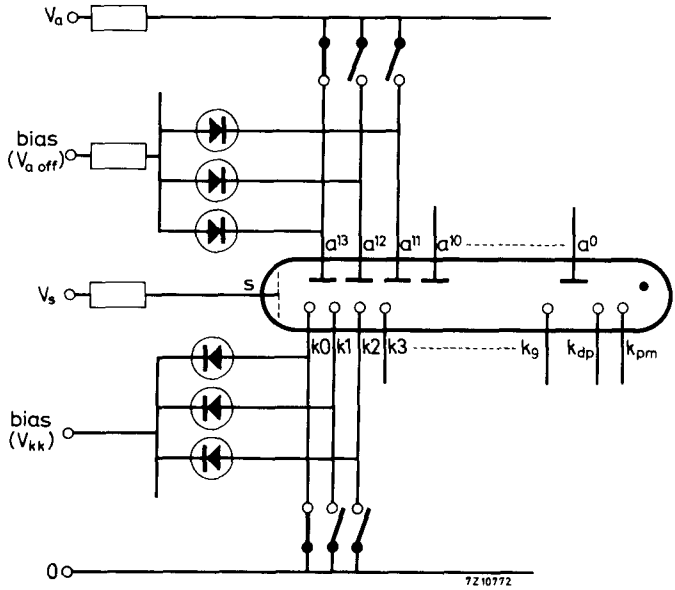
Data based on pre-production tubes.

PRINCIPLE OF OPERATION

The tube contains 10 common numeral cathode rails, one common decimal point cathode rail, one common punctuation-mark cathode rail, a common screen and 14 decade anodes.
The application of a suitable coincidence voltage (pulse) on the cathode rail and on one anode causes the selected numeral to light up in the desired decade. Sequential drive of either the cathode rails or the anodes, whilst simultaneously selecting the corresponding anode or cathode, respectively, with a minimum cycling frequency of approximately 70 Hz allows flicker-free numerical presentation.

In a practical circuit both the "off" anodes and the "off" cathodes are to be kept in the quiescent state by a bias voltage in such a way that they will neither act as cathodes nor as anodes.
The cathode numeral (with or without decimal point and/or punctuation-mark) to be selected is to be driven negative and the anode to be selected positive with respect to the bias.
The screen must be kept at a steady potential during operation to prevent "cross-talk" between the decades. (See basic circuit).

Remark: Because a gas discharge is not current limiting in itself, the electrode currents must be limited to safe values by using resistors or (limited) current sources.



Basic circuit

Pertinent application information is available on request.

CHARACTERISTICS AND OPERATING CONDITIONS

Ignition voltage	V_{ign}	max.	170	V
Ignition delay, first ignition	T_d typ.	max.	0.5	s
subsequent ignitions	T_d		10	μs
Anode current, peak with or without decimal point and/or punctuation mark at T_{imp} = 50 μs	I_{a_p}	min.	6	mA
at T_{imp} = 150 μs	I_{a_p}	min.	5	mA
at T_{imp} = 1000 μs	I_{a_p}	min.	4	mA
	I_{a_p}	max.	12	
Recommended pulse duration	T_{imp}	150 to	500	μs
Maintaining voltage	V_m	see page 5		
Cathode selecting voltage	V_{kk}	min.	70	V 1)
		max.	100	V
"Off" anode voltage	$V_{a_{off}}$	min.	85	V
		max.	115	V
Recommended screen voltage	V_s	10 V below $V_{a_{off}}$		
Decimal point resistor 2)	R_{dp}		10	k$\Omega \pm 10\%$
Punctuation mark resistor 2)	R_{pm}		10	k$\Omega \pm 10\%$

1) At lower values of V_{kk} the contrast of the display will be reduced due to glow on adjacent numerals. This will not affect the life of the tube.
After switching the bias should be restored within 20 μs.

2) The decimal point and/or punctuation mark cathode(s) may not be operated without extra current limiting resistor.

LIFE EXPECTANCY AND RELIABILITY

The life is inversely proportional to the instantaneous value of the peak operating current and on the pulse repetition operating frequency. Due to the extreme longeivity this proportionality is not expected to show within the first three years of operation within the ratings.

Accelerated life tests (high peak current, frequency and duty cycle) have indicated a life expectancy well in excess of 50 000 operating hours in a typical application.

Integration of 14 full decades and the associated interconnections in a single package improves the mechanical reliability by a factor of 7 to 14 compared to a row of 14 individual indicator tubes.

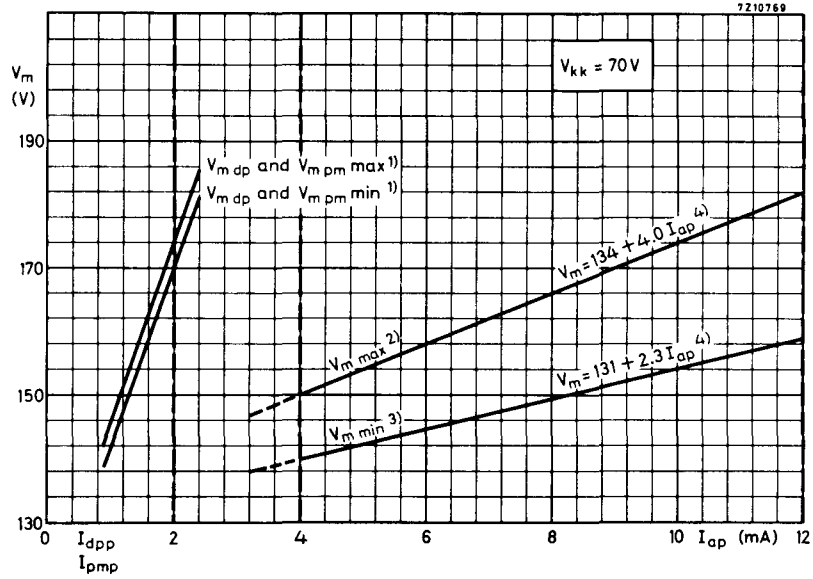
Minimum Mean Time Between Failures is estimated to be 500 000 operating hours.

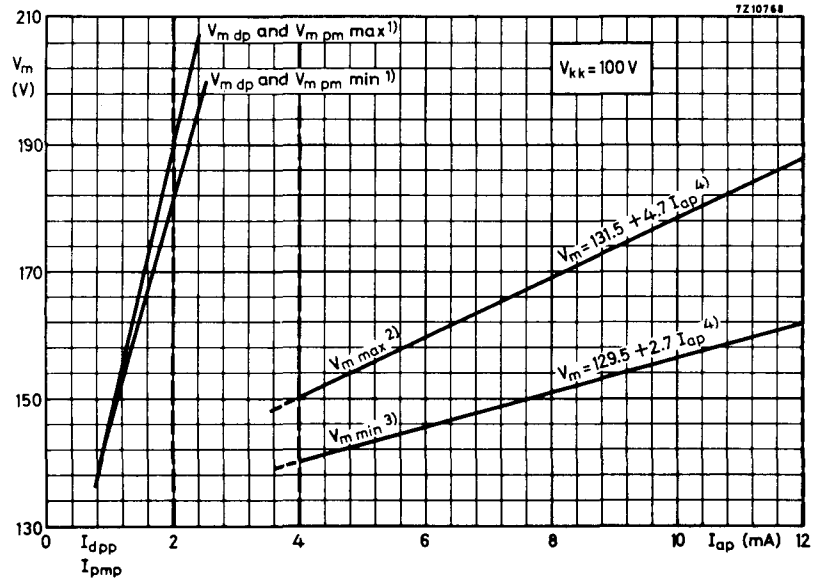
LIMITING VALUES (Absolute max. rating system)

Anode supply voltage	V_{ba}	min.	170	V
		max.	220	V
Anode current, peak				
each anode with or without decimal point				
and/or punctuation mark at T_{imp} = 50 μs	I_{a_p}	min.	6	mA
at T_{imp} = 100 μs		min.	5	mA
at T_{imp} = 1500 μs		min.	4	mA
	I_{a_p}	max.	12	mA
average (T_{av} = 1 s)	I_a	max.	1.5	mA
Anode current, peak; decimal point or	I_{a_p}	min.	0.5	mA
punctuation mark only 2)		max.	2	mA
average (T_{av} = 1 s)	I_a	max.	0.25	mA
Pulse duration	T_{imp}	min.	50	μs
Cathode selecting voltage	V_{kk}	max.	100	V
"Off" anode voltage	$V_{a_{off}}$	min.	85	V
		max.	115	V
Screen voltage	V_s	min.	70	V
		max.	100	V
Voltage between any pair of electrodes (operating anode excluded)	V	max.	120	V
Ambient temperature	t_{amb}	min.	-50	°C 1)
		max.	+70	°C

1) Bulb temperatures below 10 °C result in a reduced life expectancy and changes in characteristics.

2) See page 3.

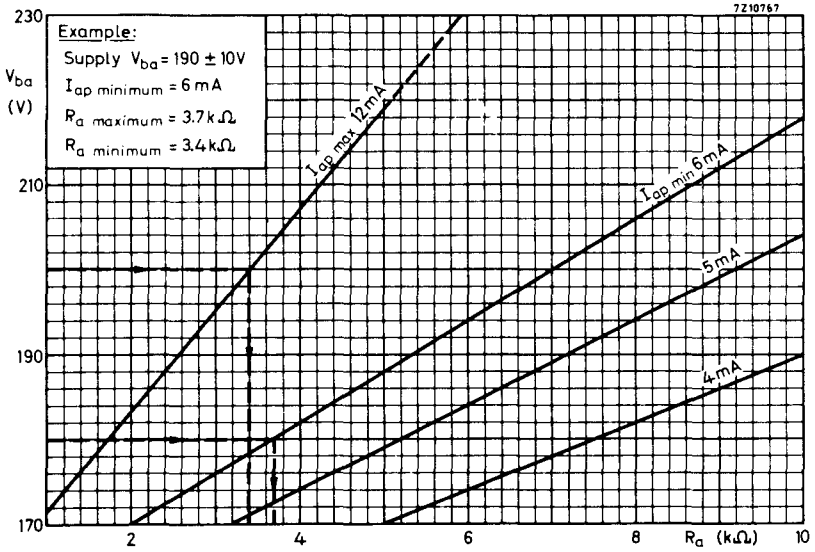




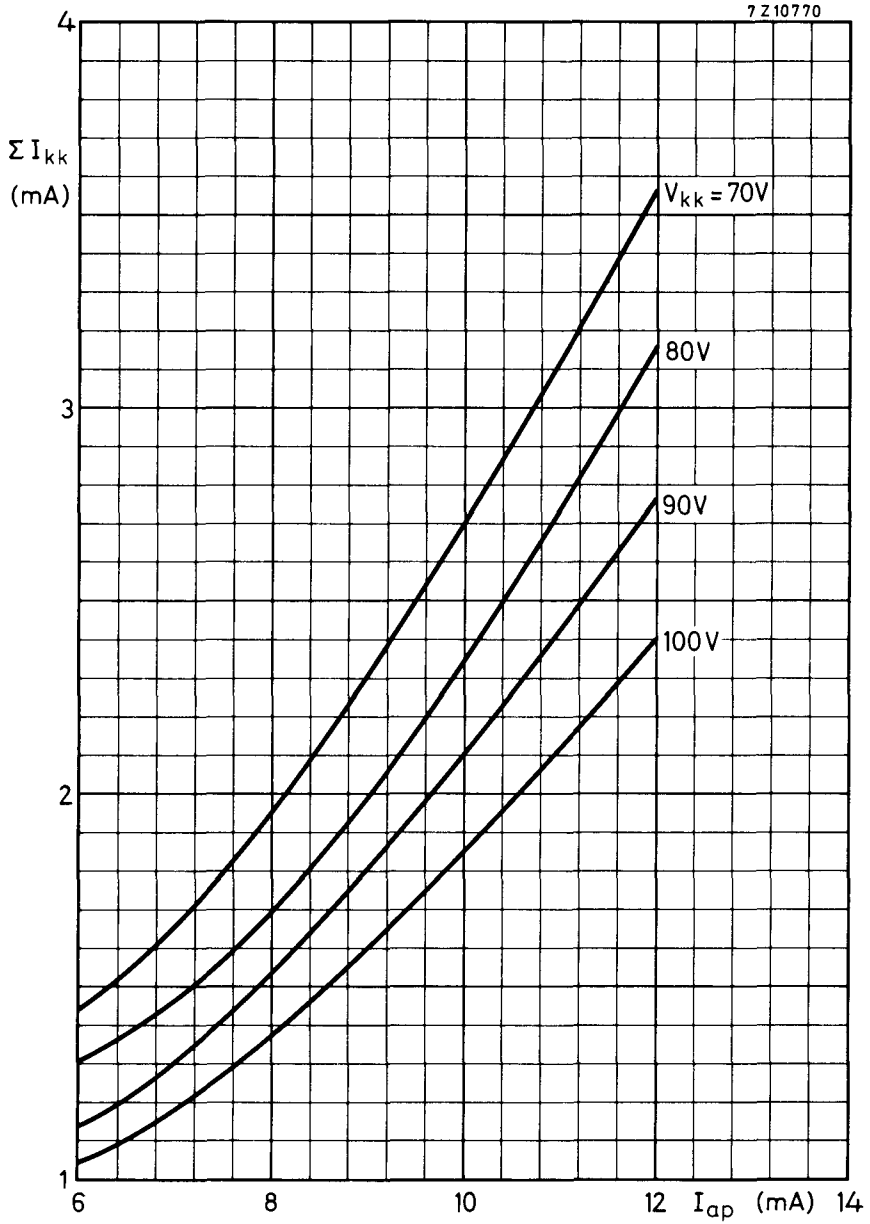
Notes see page 6

Notes to page 5

1) The decimal point maintaining voltage V_{mdp} and the punctuation mark maintaining voltage V_{mpm} include the voltage drop at the 10 kΩ series resistor.
2) V_m max. pertains to the maximum operating temperature and assumes the decimal point or punctuation mark operating.
3) V_m min. pertains to the minimum operating temperature and assumes the decimal point or punctuation mark not operating.
4) The maintaining voltage can be considered as the sum of a constant voltage and a current dependent voltage (V/mA).



Plot of anode supply voltage versus anode resistance required to make the tube operate in a certain region (between 12 mA and 4 mA, or 12 mA and 5 mA, or 12 mA and 6 mA), depending on pulse duration. (See "Characteristics and operating conditions").


7Z10770
4
3
2
1
ΣIkk
(mA)
Vkk = 70V
80V
90V
100V
6
8
10
12
Iap (mA)
14

INDICATOR TUBE

Long life cold cathode ten digit numeral indicator tube for side viewing.

QUICK REFERENCE DATA				
Numeral height			15.5	mm
Numerals	1 2 3 4 5 6 7 8 9 0			
Supply voltage	V_{ba}	min.	170	V
Cathode current	I_k		2.5	mA
Distance between mounting centres		min.	19	mm

GENERAL

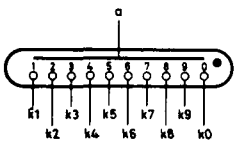
The numerals are 15.5 mm high and appear on the same base line allowing in-line read out. The ZM1230 is provided with a red contrast filter. The ZM1232 is identical to the ZM1230 but has no filter.

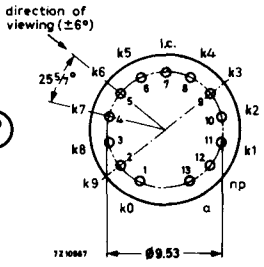
PRINCIPLE OF OPERATION

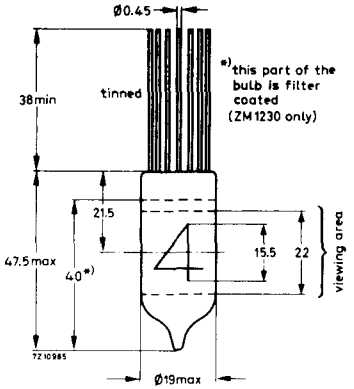
The tube contains ten cathodes in the form of ten figures and one common anode. By applying a suitable voltage between the anode and one of the ten cathodes the corresponding figure will be covered by a red neon glow.

DIMENSIONS AND CONNECTIONS

Dimensions in mm







Mounting position: any

The numerals will appear upright (within $\pm 3^{o}$) when the tube is mounted vertically, base up.

Soldering

The tube may be soldered directly into the circuit, but heat conduction to the glass-to-metal seals should be kept to a minimum by the use of a thermal shunt.
The leads may be dip-soldered to a minimum of 5 mm from the seals at a solder temperature of 240^{o}C for a maximum of 10 s.

Note

Care should be taken not to bend the leads nearer than 1.5 mm from the seals.

CHARACTERISTICS AND OPERATING CONDITIONS (at 20^{o}C to 50^{o}C)

Ignition voltage	V_{ign}	min.	170	V
Ignition delay	see page 3			
Maintaining voltage	see page 4			
Cathode current, recommended	I_k		2.5	mA
Cathode current for coverage, average during any conduction period	I_k	min.	1.5	mA
D.C. operation	see pages 4 to 9			
Pulse operation	see pages 4, 10, 11 and 12			
Extinguishing voltage	V_{ext}		115	V

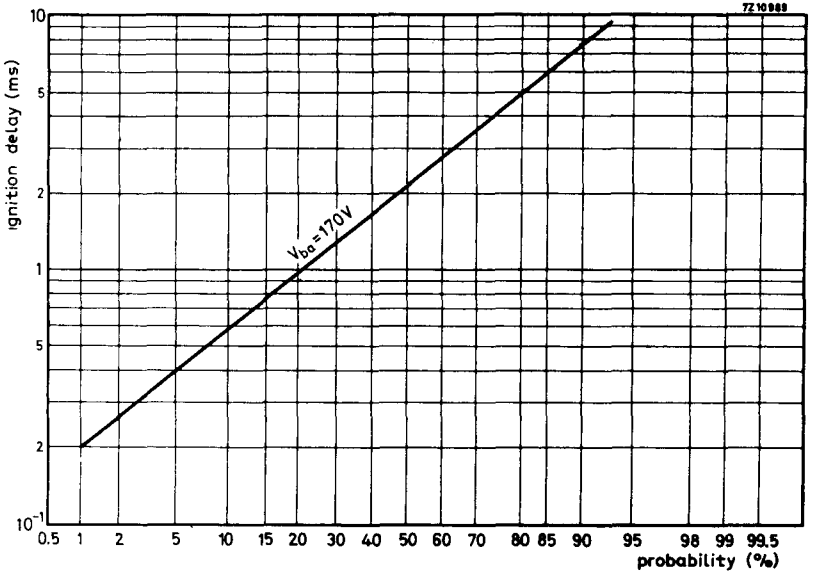
LIFE EXPECTANCY at I_k = 2.5 mA and room temperature [1])

Continuous display of one numeral	>	5 000	h
Sepuentially changing the display from one *numeral to another, every 100 hrs or less*	>	30 000	h

LIMITING VALUES (Absolute max. rating system)

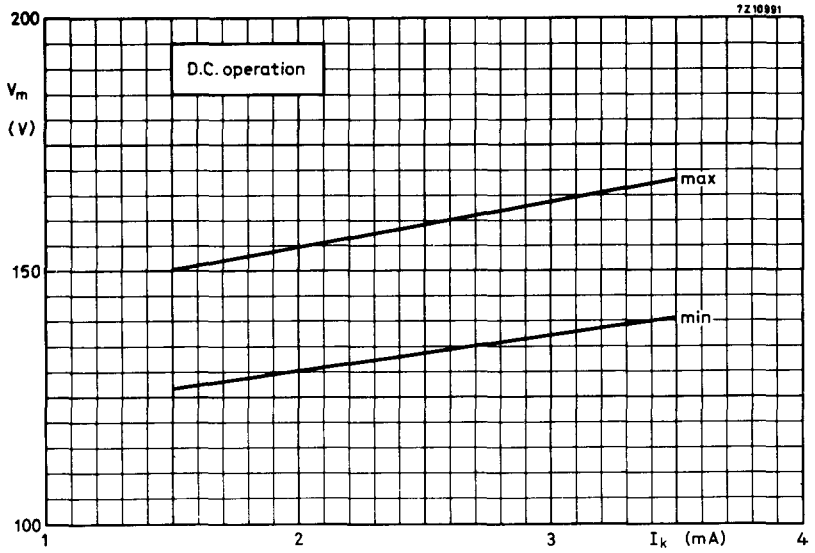
Cathode current (each digit),				
average, T_{av} = max. 10 ms	I_k	max.	3.5	mA
peak	I_{kp}	max.	12	mA
average during any conduction period	I_k	min.	1.5	mA
Anode voltage necessary for ignition	V_a	min.	170	V
Pulse duration	T_{imp}	min.	100	μs
Bulb temperature	t_{bulb}	max.	+70	^{o}C
	t_{bulb}	min.	−50	^{o}C [1])

[1]) For bulb temperatures below 0^{o}C the life expectancy of the tube is substantially reduced.

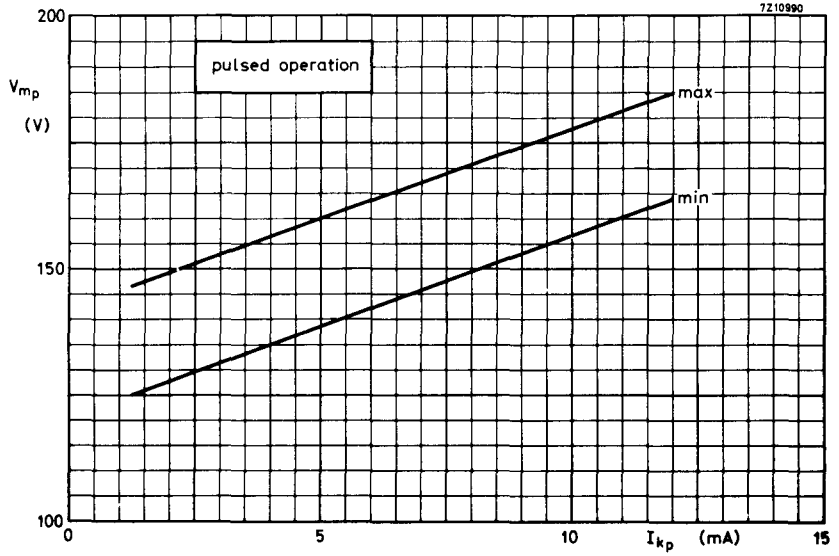


CUMULATIVE DISTRIBUTION OF IGNITION DELAY

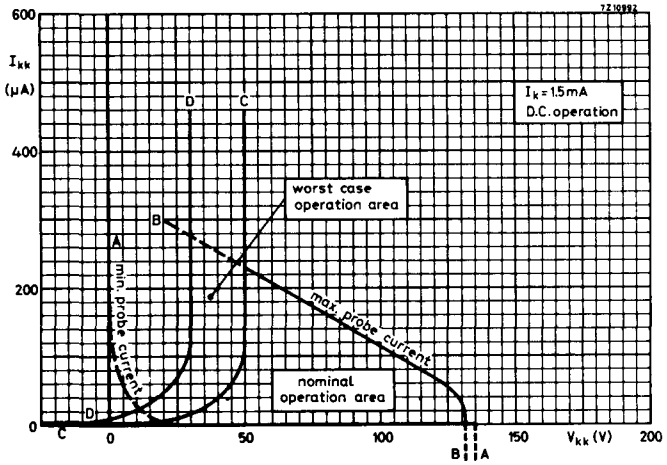
This curve shows the probability that a tube will ignite in less than the time shown after a non-conduction period of a few periods. The ignition delay will be appreciably reduced when the interval between conduction periods is less than 100 milliseconds. In general, an increase in the supply voltage will reduce the ignition delay.

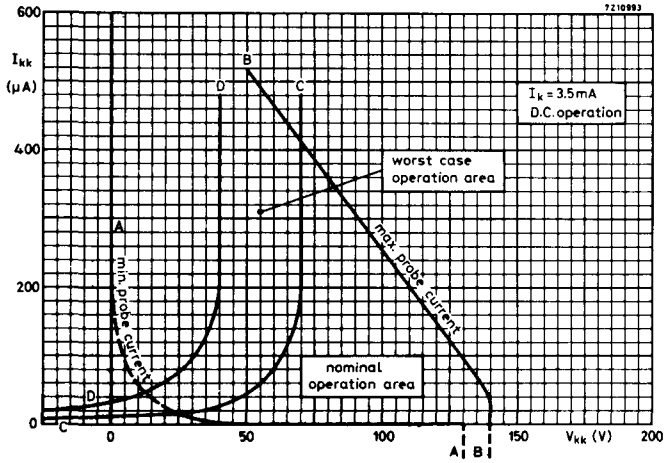


ANODE-TO-CATHODE MAINTAINING VOLTAGE
AS A FUNCTION OF CATHODE CURRENT



PEAK ANODE-TO-CATHODE MAINTAINING VOLTAGE
AS A FUNCTION OF PEAK CATHODE CURRENT





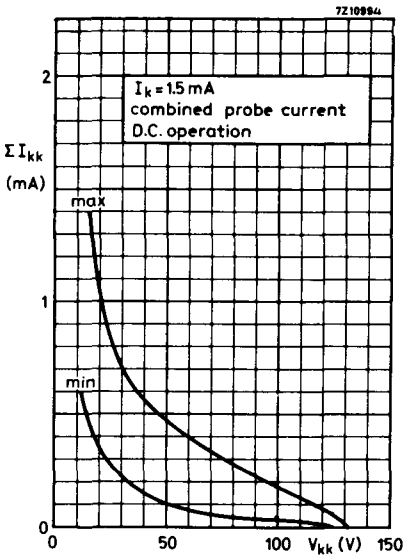
PROBE CURRENT TO INDIVIDUAL NON-CONDUCTING CATHODES

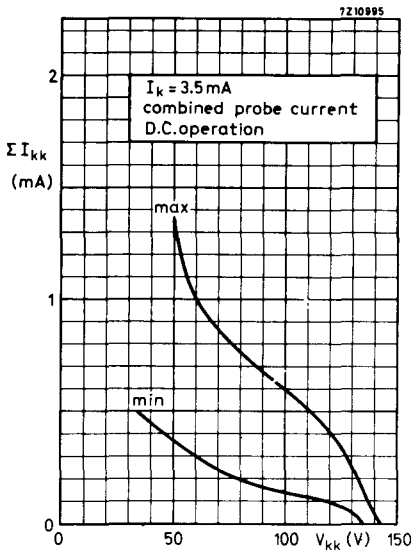
The boundaries A-A and B-B of the graphs represent, for the shown cathode current range, the range of probe current (I_{kk}) to individual non-conducting cathodes plotted against the voltage difference between the non-conducting cathodes and the conducting cathode (V_{kk}).

For low cathode selecting voltages (V_{kk}) the current I_{kk} to the non-conducting cathode will increase, and the readability conducting cathode will be affected.

It is therefore recommended to use a nominal operating point to the right of line C-C.

Under the worst operating conditions the operating point should never reach the area left of the line D-D.





COMBINED PROBE CURRENT TO ALL NON-CONDUCTING CATHODES

Sum of the probe currents to the non-conducting cathodes (I_{kk}) plotted against the voltage difference between the non-conducting cathodes and the conducting cathode (V_{kk}), showing the minimum and maximum values of probe current for a particular cathode current (I_k).

SUPPLY VOLTAGE/LOAD RESISTOR

The graphs on pages 8, 9 and 12 give the relationship between the anode supply voltage and the required anode load resistor for fixed values of V_{kk} (voltage difference between conducting cathode and non-conducting cathodes).

Each graph is plotted on log-log graph paper; therefore a given tolerance expressed as a percentage can be represented as a fixed length at any point on the x and y axes. This is shown on the first graph by taking points on each axis with a fixed tolerance.

Examples are shown on the first graph of the supply voltages and load resistors with tolerance expressed as a percentage so as to remain within the recommended operating region.

The curves are derived from:-

$$V_{ba} = I_a \cdot R_a + V_m$$

$$I_a = I_k + \Sigma I_{kk}$$

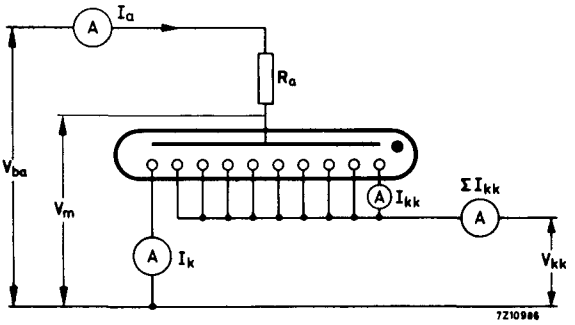
$$V_{ba} = (I_k + \Sigma I_{kk})\, R_a + V_m$$

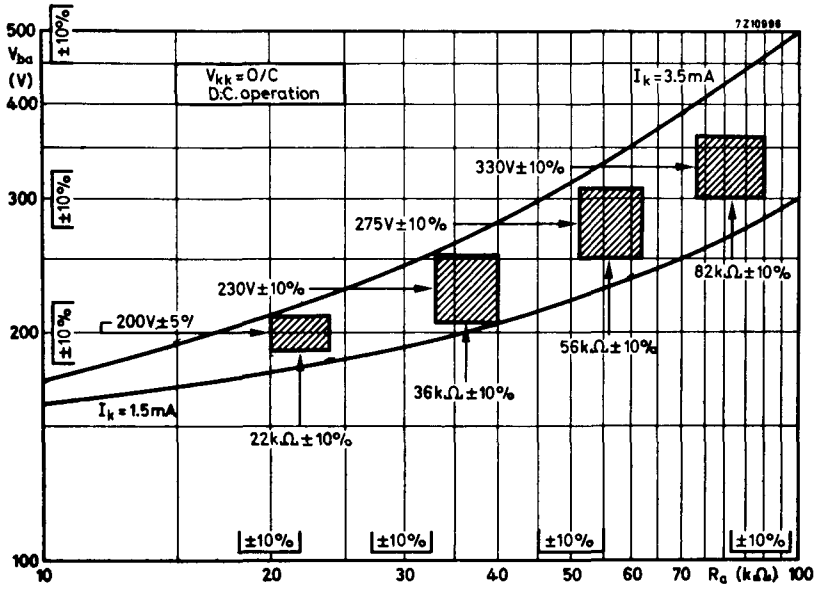
For a given value of R_a, the minimum supply voltage limit to ensure that the cathode current exceeds I_k min. is given by:

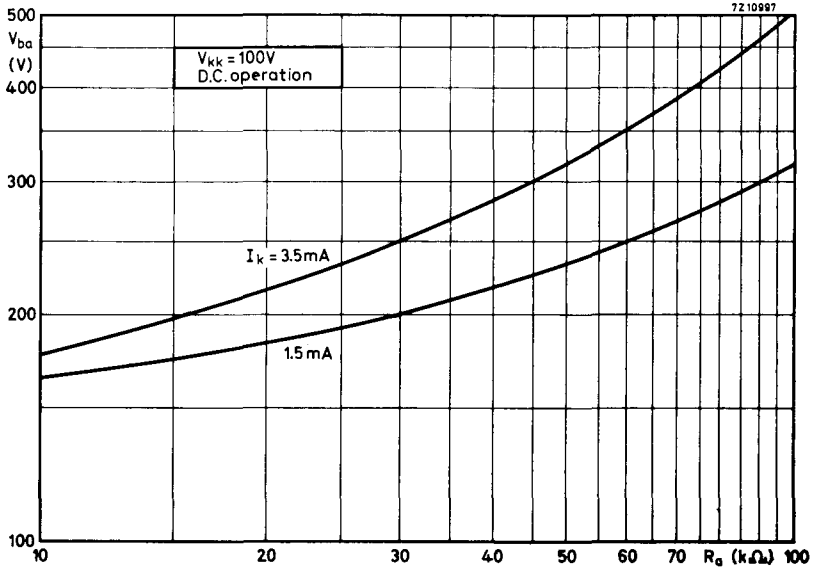
$$V_{ba}\ \text{min.} = \left[I_k\ \text{min.} + \Sigma I_{kk}\ \text{max. (at } I_k\ \text{min.)}\right] R_a + V_m\ \text{max. (at } I_k\ \text{min.)}$$

For the same value of R_a, the maximum supply voltage limit to ensure that the cathode current does not exceed I_k max. is given by:

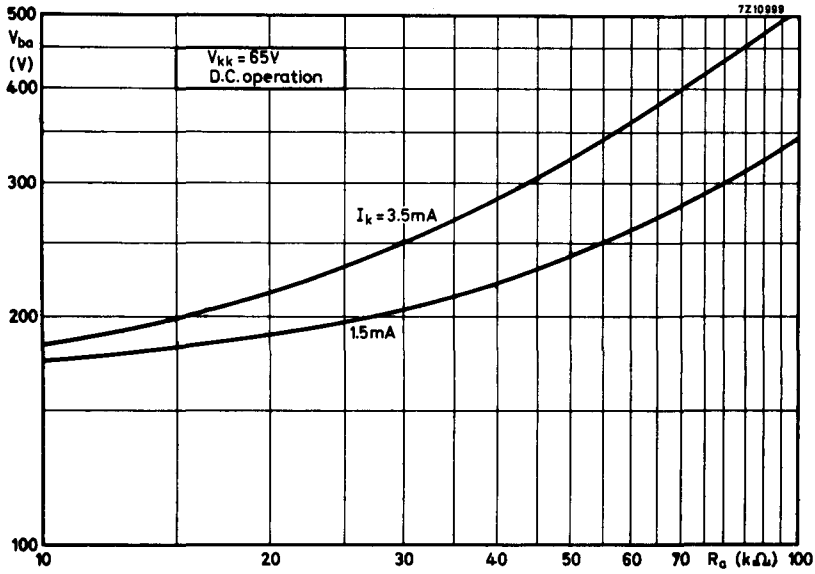
$$V_{ba}\ \text{max.} = \left[I_k\ \text{max.} + \Sigma I_{kk}\ \text{min. (at } I_k\ \text{max.)}\right] R_a + V_m\ \text{min. (at } I_k\ \text{max.)}$$

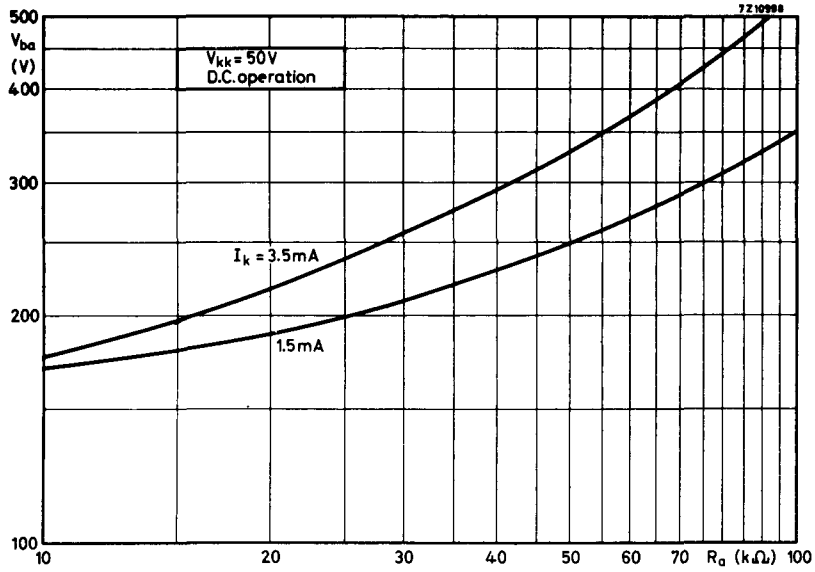




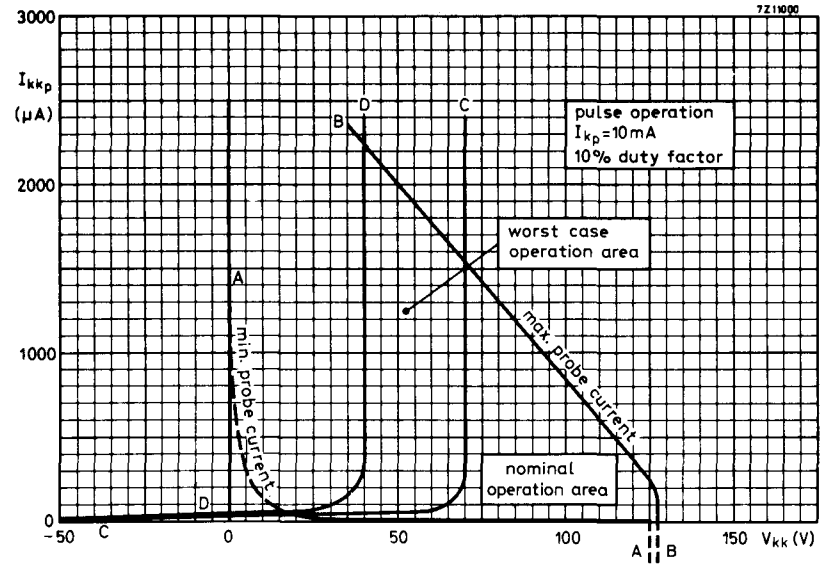


D.C. SUPPLY VOLTAGE PLOTTED AGAINST ANODE LOAD RESISTOR



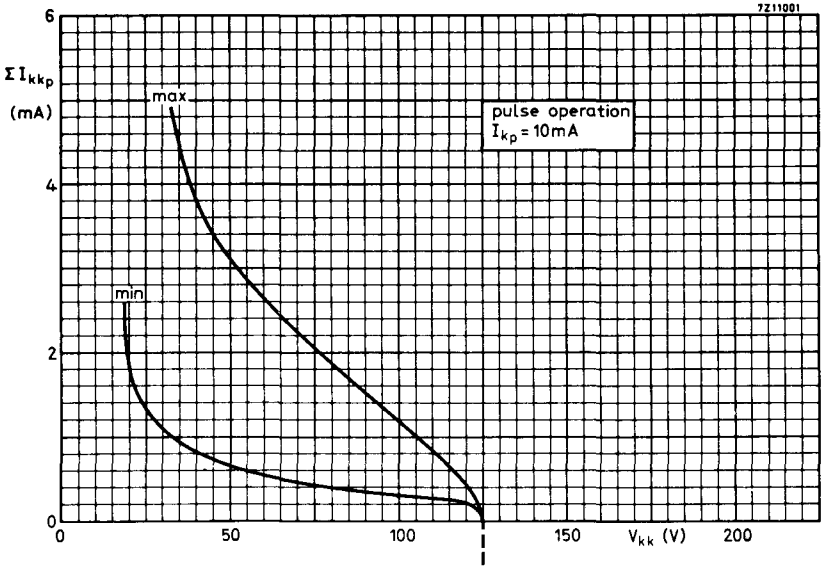


D.C. SUPPLY VOLTAGE AS A FUNCTION OF ANODE LOAD RESISTOR



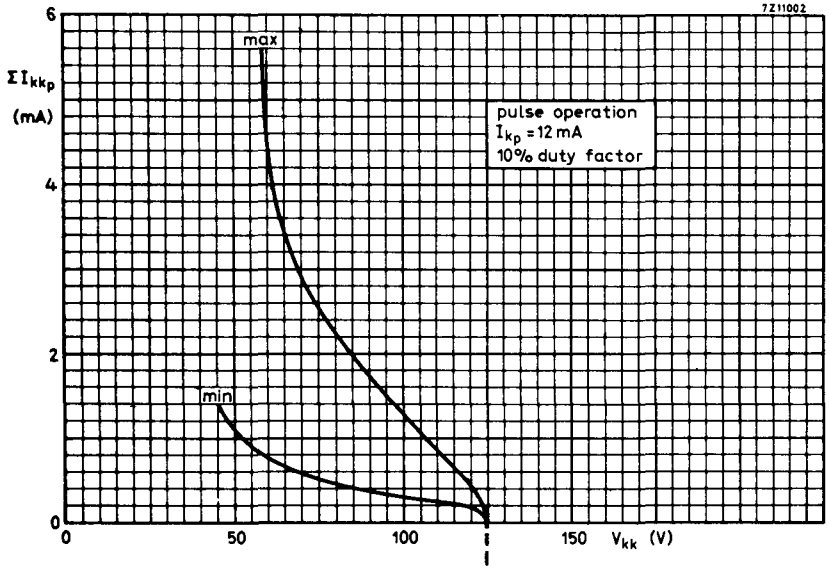
PEAK PROBE CURRENT TO INDIVIDUAL NON-CONDUCTING CATHODES

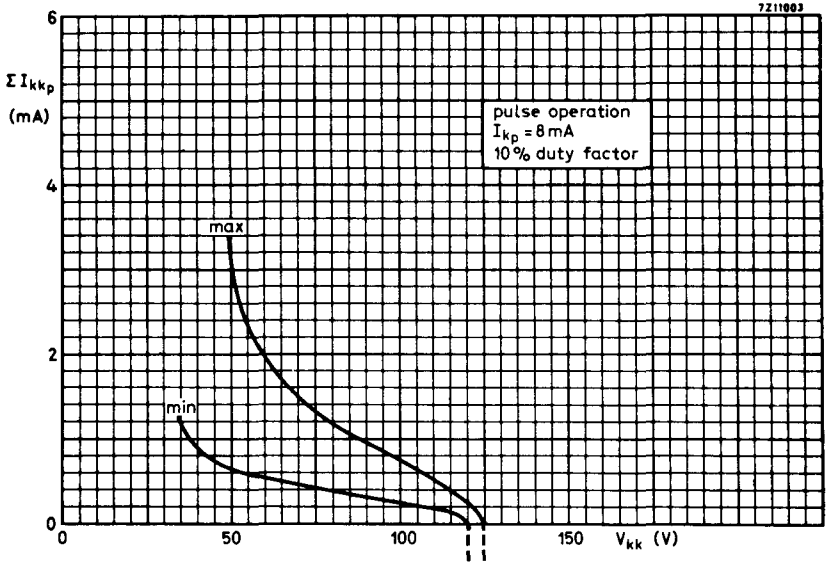
See also page 5



COMBINED PEAK PROBE CURRENT TO ALL NON-CONDUCTING CATHODES

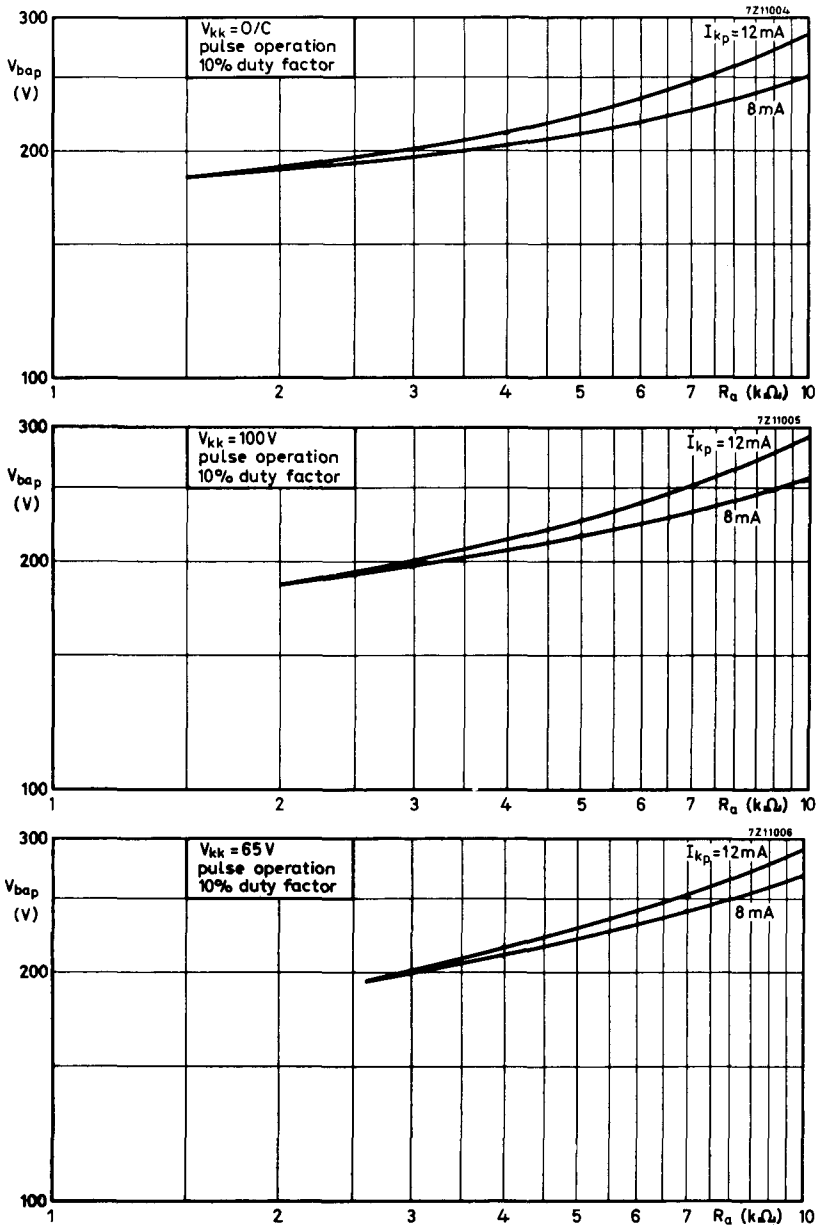
See also page 6





COMBINED PEAK PROBE CURRENT TO ALL NON-CONDUCTING CATHODES

See also page 6



PEAK SUPPLY VOLTAGE AS A FUNCTION OF ANODE LOAD RESISTOR

DUAL 7-SEGMENT INDICATOR TUBE

suitable for direct drive with 30 V ICs

Long-life segmented dual cold-cathode gas-filled indicator tube in a flat envelope for in-line numeric display applications, such as in digital measuring equipment, clocks, cash registers, weighing machines etc. The tube is suitable for soldering into the circuit. Two or more tubes may be stacked horizontally.

QUICK REFERENCE DATA

Character height	15 mm
Characters	formed by 7 segments
Number of decades	2
Decimal point	to the lower right of the characters
Decade pitch (also for stacked tubes)	17,78 mm (0,7 in)

MECHANICAL DATA

Mounting position: any

The tube is provided with dual in-line tinned dip-solder pins for insertion in a printed-wiring board (e = 2,54 mm). It may also be plugged into a socket.

Mechanical strength

The robustness of the pins is tested according to IEC 68–2–21, test 3.4.2.1, method 1.

Soldering

The dip-solder pins may be soldered for 5 s in solder of max. 260 °C.

CHARACTERISTICS

Ignition voltage, first ignition, 25 lx	V_{ign}		< 165	V
Ignition delay, first ignition, V_{ba} = 165 V, 25 lx	T_d	typ.	< 1	s
Ignition voltage, subsequent ignitions within 10 ms	V_{ign}		< 145	V
Primed ignition voltage	$V_{ign\ pr}$		⩽ 140	V *
Maintaining voltage			see graph	
Extinction voltage	V_{ext}		⩾ 120	V
Luminous intensity per segment			10	mcd/mA

* Primed ignition voltage is the minimum anode to cathode voltage to ensure that any selected numeral (including decimal point) is completed after ignition of one segment.

LIMITING VALUES (Absolute maximum rating system)

		segments	decimal points	
Cathode current, d.c.	max.	0,7	max. 0,25	mA
	min.	0,25	min. 0,1	mA
Cathode current, peak	max.	3	max. 1,1	mA
$T_{imp} \geqslant 0{,}2$ ms	min.	0,35	min. 0,1	mA
Cathode current, mean T_{av} = max. 25 ms	max.	0,5	max. 0,2	mA
Voltage between any two segments and/or decimal points	max.	120		V
Voltage between screen and any other electrode (tube ignited)	max.	120		V
Ambient temperature	max.	100		°C *
	min.	−50		°C **

RECOMMENDED OPERATING CONDITIONS

If the tube is used within its limiting values and according to the conditions below, a high-quality display is obtained and interdigit discharges are prevented, even with the worst combination of parameters.

For many applications the worst parameter combination will not occur. In those cases the conditions recommended below may be changed which may result in a cheaper drive circuit. These changes should, however, only be made after consulting the tube manufacturer.

Static operation see Fig. 1

Anode supply voltage	V_{ba}	max.	350	V
		min.	165	V

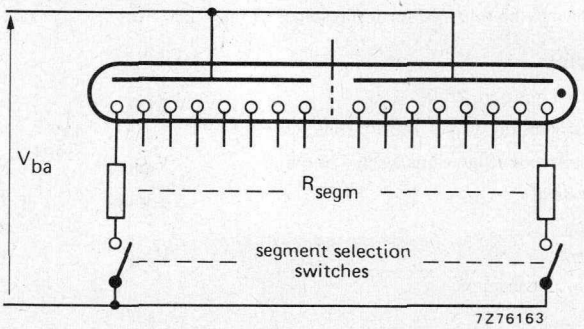


Fig. 1.

* Bulb temperatures above 70 °C result in changes in colour.

** Bulb temperatures below 10 °C result in a reduced life expectancy and changes in characteristics.

Dynamic operation see Fig. 2

Anode supply	V_{ba}	max.	185	V
		min.	165	V
Screen supply voltage ($R_{screen} < 10\ k\Omega$)	V_{bs}	max.	60	V
		min.	50	V
	$V_{ba\ off}$	max.	125	V
		min.	115	V

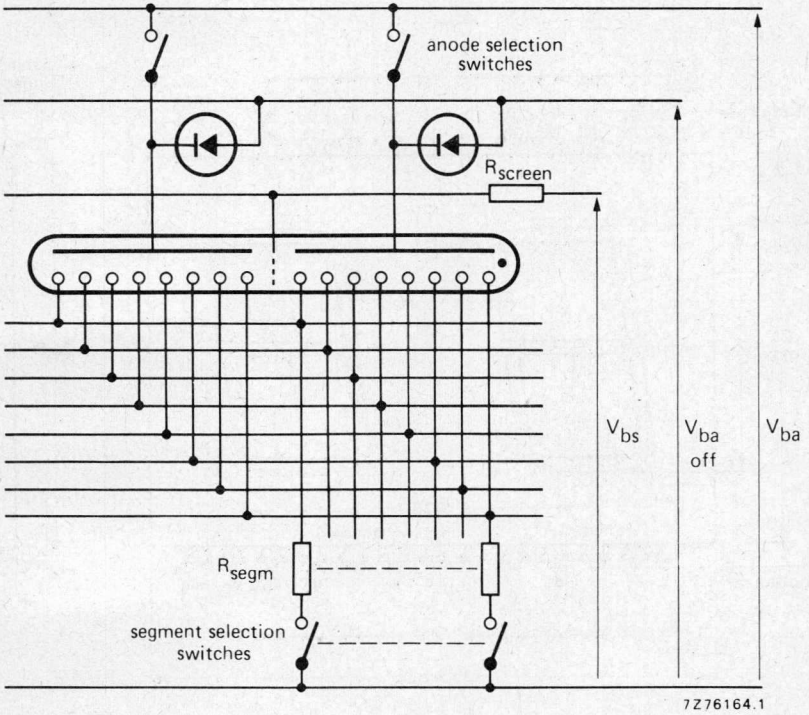


Fig. 2.

Shock and vibration

Samples are taken from the normal production line and are subjected to the following tests:

Shock: 50 g (peak), 1000 shocks in one of the three positions of the tube

Vibration: (−1) 2,5 g (peak), −50 Hz for 2 hours
(−2) 2,5 g (peak), −50 Hz for 96 hours (32 hours in each direction)

Acceptable quality level: 0,65

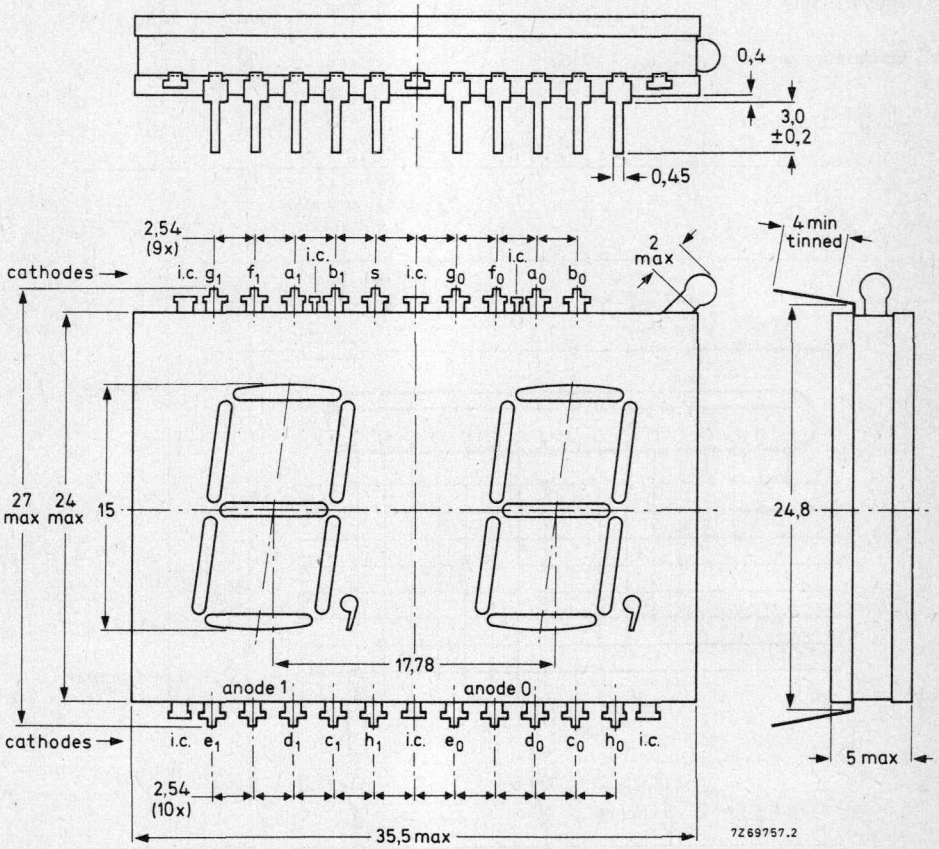
Life expectancy > 50 000 h at max. cathode current

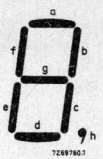
End of life is reached when: (1) the light output is 50% below the initial output, or (2) the min. cover current is 10% higher than the initial min. cover current.

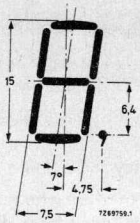
Life with respect to the min. cover current criterion may be reduced for segments not regularly activated. Please consult the manufacturer.

DIMENSIONS AND CONNECTIONS

Dimensions in mm







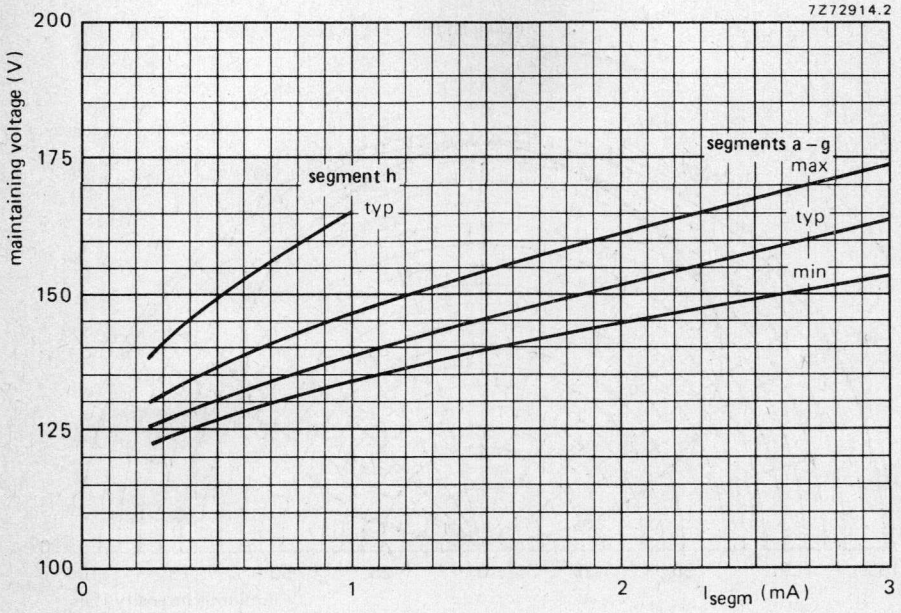


Fig. 4 Maintaining voltage as a function of segment current.

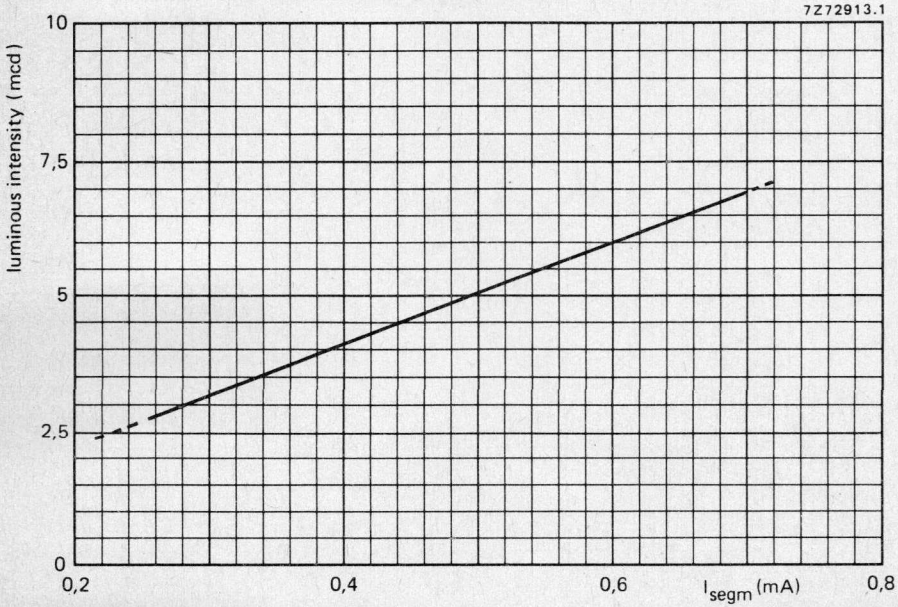


Fig. 5 Luminous intensity as a function of d.c. segment current.

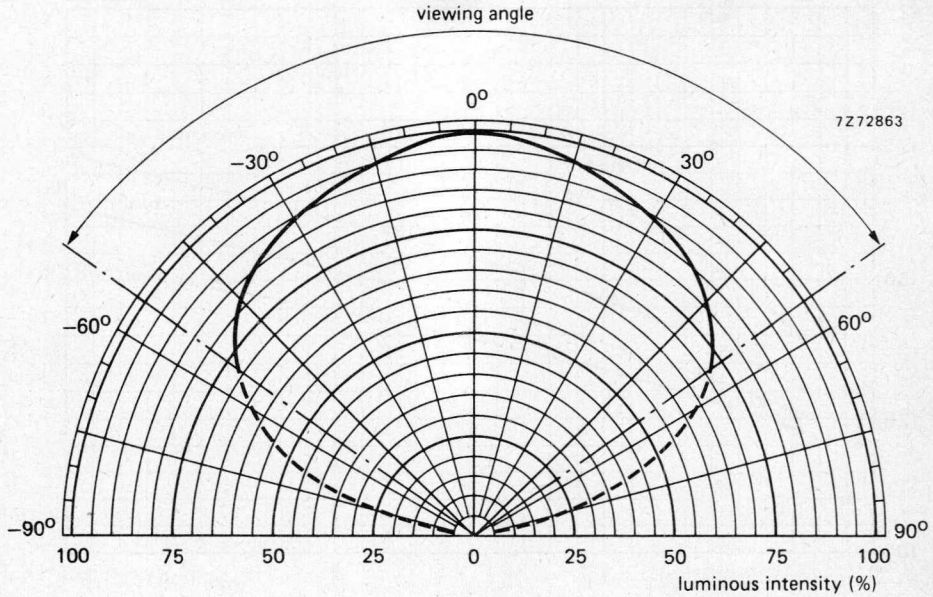


Fig. 6 Relative luminous intensity as a function of the direction of viewing.

7-SEGMENT 1½ DIGIT INDICATOR TUBE

Long-life segmented cold-cathode gas-filled indicator tube in a flat envelope for in-line display applications, such as in digital measuring equipment.
The tube can be stacked with the ZM1550.

QUICK REFERENCE DATA

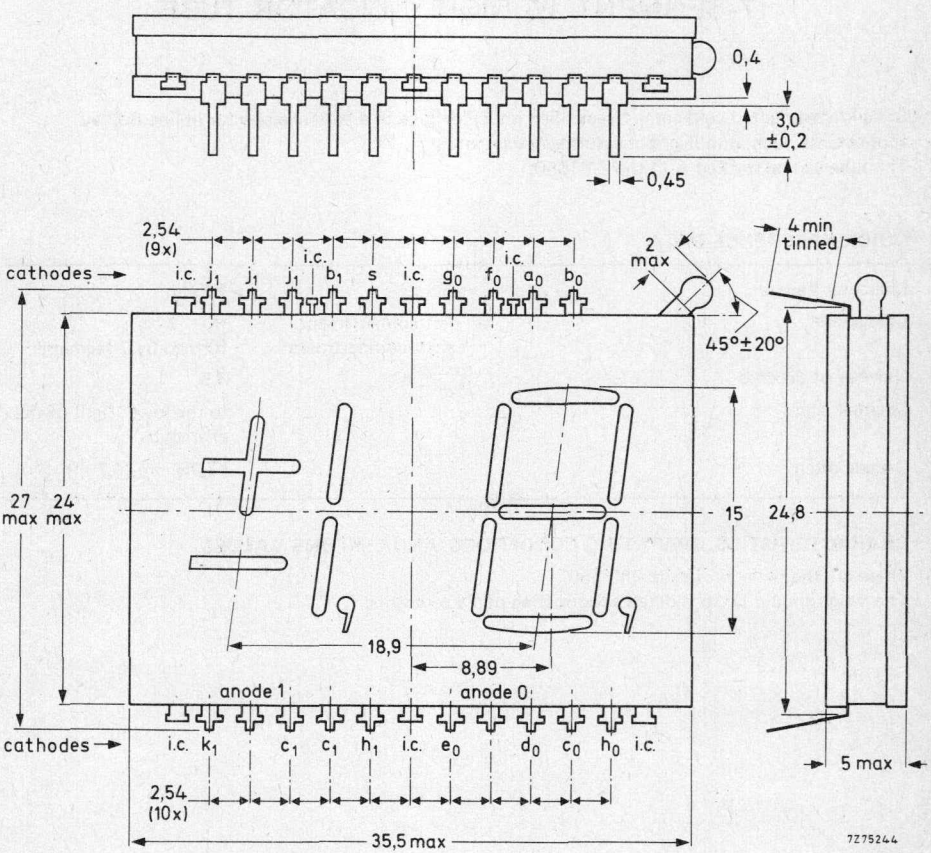
Character height		15 mm
Characters	left compartment right compartment	+ — 1 formed by 7 segments
Number of decades		1,5
Decimal sign		to the lower right of the characters
Decade pitch		17,78 mm (0,7 in)

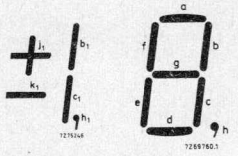
CHARACTERISTICS, OPERATING CONDITIONS, AND LIMITING VALUES

These are the same as of type ZM1550.
The + sign should be considered as consisting of 1½ segments.

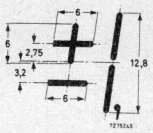
DIMENSIONS AND CONNECTIONS

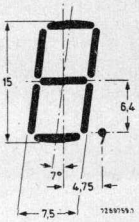
Dimensions in mm





segment designation





DUAL 7-SEGMENT INDICATOR TUBE

suitable for direct drive with 30 V ICs; fast ignition type

The tube is identical to ZM1550 but contains 150 nCi promethium 147. The ignition delay (first ignition) is max. 0,5 s at 0 lx and V_{ba} = 165 V. The tube is marked Pm 147.

7-SEGMENT 1½ DIGIT INDICATOR TUBE

fast ignition type

The tube is identical to ZM1551 but contains 150 nCi promethium 147. The ignition delay (first ignition) is max. 0,5 s at 0 lx and V_{ba} = 165 V. The tube is marked Pm 147.

Grid-controlled MERCURY VAPOUR RECTIFYING TUBE
TUBE REDRESSEUR A VAPEUR DE MERCURE à grille
Gittergesteuerte GLEICHRICHTERRÖHRE MIT QUECKSILBERDAMPF-FÜLLUNG

Filament : oxide-coated
Filament : oxyde
Heizfaden: Oxyd

Heating : direct
Chauffage: direct
Heizung : direkt

V_f = 5 V [1])
I_f = 13 A
T_w = min. 90 sec [2])

[1]) Phase shift of $90^o \pm 30^o$ between V_a and V_f and/or use of a centre-tapped filament transformer are recommended.
Il est conseillé de faire fonctionner le tube avec un décalage de phase entre V_a et V_f de $90^o \pm 30^o$ et/ou d'utiliser un transformateur de chauffage à prise médiane
Eine $90^o \pm 30^o$ Phasenverschiebung zwischen V_a und V_f und/oder die Verwendung eines Heiztransformators mit Mittelanzapfung wird empfohlen

[2]) For average conditions, i.e. temperature within limits and proper distribution of mercury (see page A)
After transport and also after a long interruption of service a longer waiting time is required before anode voltage is applied to ensure proper distribution of the mercury. In general, a time of 60 minutes will be sufficient

Pour les conditions, où les températures se trouvent entre leurs limites et où il existe une bonne répartition du mercure (voir page A)
Après le transport et après une longue interruption de service il faut prévoir un délai d'attente plus long avant que la tension d'anode soit appliquée, afin d'obtenir une propre répartition du mercure. En general, un délai de 60 minutes sera suffisant

Für normale Betriebsverhältnisse, d.h. zwischen den Grenzen liegende Temperaturen und richtige Quecksilberverteilung (siehe Seite A)
Nach Transport oder nach längerer Unterbrechung des Betriebs ist vor der Anlegung der Anodenspannung eine längere Wartezeit einzuhalten, damit das Quecksilber sich richtig verteilt. Im allgemeinen wird eine Anheizzeit von 60 Minuten genügen

PHILIPS

Typical characteristics
Caractéristiques types
Kenndaten

T_{dion}	<	500 µsec
T_{ion}	<	10 µsec
V_{arc} (I_o=3A)	=	12 V

Limiting values (Absolute limits)
Caractéristiques limites (Limites absolues)
Grenzdaten (Absolute Grenzwerte)

$V_{a\ inv_p}$	= max. 21	15	2,5 kV	1)
V_{ap}	= max. 21	15	2,5 kV	
I_o	= max. 2,5	max. 3	max. 5 A	2)
I_{ap}	= max. 10	max. 12	max. 20 A	
I_{surge}	= max. 100	max. 120	max. 200 A	3)
$-V_g$	= max. 300	max. 300	max. 300 V	4)
R_g	= min. 10	min. 10	min. 10 kΩ	5)
	= max. 100	max. 100	max. 100 kΩ	

Temperature limits
Limites de la température
Temperaturgrenzen

$V_{a\ inv_p}$	kV	21	15	10	2,5
t_{Hg} 6)	°C	25-45	25-55	25-60	25-75
t_{amb} 7)	°C	15-30	15-35	15-40	15-55

1) f = max. 150 c/s

2) T_{av} = max. 30 sec

3) T = max. 0,1 sec

4) 5) See page 3; voir page 3; siehe Seite 3.

6) If the equipment is started not more than twice daily it is permitted to apply high tension at a condensed mercury temperature which is 5 °C less than the values mentioned in the table

Si l'équipement n'est mis en circuit que deux fois par jour au max., il est permis d'appliquer la haute tension à une température du mercure condensé qui est de 5 °C moins que les valeurs mentionnées dans la table

Wenn die Anlage nicht mehr als zweimal täglich eingeschaltet wird, ist es erlaubt die Hochspannung bei einer Temperatur des kondensierten Quecksilbers die um 5 °C niedriger ist als die in der Tabelle erwähnten Werte einzuschalten

7) See page 3; voir page 3; siehe Seite 3.

---

[4]) Direct voltage; before conduction
Tension continue; avant l'allumage
Gleichspannung; gelöschte Röhre

[5]) Recommended value 33 kΩ
Valeur conseillée 33 kΩ
Empfohlener Wert 33 kΩ

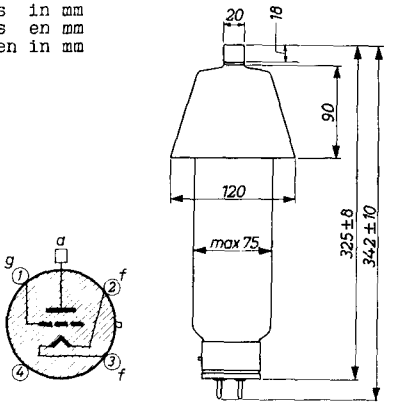
[7]) Approximate values with natural cooling
The ambient temperature is defined as the temperature of the surrounding air and should be measured under the following conditions:
a. normal atmospheric pressure
b. the tube should be adjusted to the worst probable operating conditions
c. the temperature should be measured when thermal equilibrium has been reached
d. the distance of the thermometer from the envelope shall be 75 mm (measured in the plane perpendicular to the main axis of the tube at the height of the condensed mercury boundary)
e. the thermometer shall be shielded to avoid direct heat radiation

Valeurs approchées avec refroidissement naturel
La température ambiante est définie comme la température de l'air ambiant et doit être mesurée sous les conditions suivantes:
a. pression atmosphérique normale
b. le tube doit être ajusté aux conditions de fonctionnement les pires probables
c. la température doit être mesurée quand l'équilibre thermique a été atteint
d. la distance du thermomètre jusqu'à l'enveloppe doit être de 75 mm (mesurée dans le plan perpendiculaire à l'axe principal du tube et au niveau du mercure condensé)
e. le thermomètre doit être blindé contre la radiation thermique directe

Näherungswerte bei natürlicher Kühlung
Die Umgebungstemperatur wird definiert als die Temperatur der umgebenden Luft und soll unter den folgenden Bedingungen gemessen werden:
a. normaler atmosphärischer Druck
b. die Röhre soll bei den ungünstigst wahrscheinlichen Betriebsbedingungen eingestellt werden
c. die Temperatur soll gemessen werden nachdem thermisches Gleichgewicht erreicht ist
d. der Abstand vom Thermometer bis zum Kolben soll 75 mm betragen (gemessen in der Ebene senkrecht zu der Hauptachse der Röhre auf der Höhe des Quecksilberspiegels)
e. das Thermometer muss für direkte Wärmestrahlung abgeschirmt sein

PHILIPS

Dimensions in mm
Dimensions en mm
Abmessungen in mm



Base : Super Jumbo with bayonet
Culot : Super Jumbo à baïonnette
Sockel: Super Jumbo mit Bajonett

Socket
Support 40403
Fassung

Anode connector
Connecteur anodique 40620
Anodenanschluss

Anode cap (delivered with tube)
Chapeau anodique (fourni avec le tube) 40616
Anodenkappe (mit der Röhre geliefert)

This cap must always be mounted on the tube, also during preheating
Ce chapeau doit être monté toujours sur le tube, aussi pendant le préchauffage
Diese Kappe muss immer, auch während der Vorwärmung, auf der Röhre montiert sein

Mounting position: vertical, base down
Montage : vertical, le culot en bas
Einbau : senkrecht mit dem Sockel unten

Net weight		Shipping weight	
Poids net	0,75 kg	Poids brut	2,3 kg
Nettogewicht		Bruttogewicht	

Operating conditions
Caractéristiques d'utilisation
Betriebsdaten

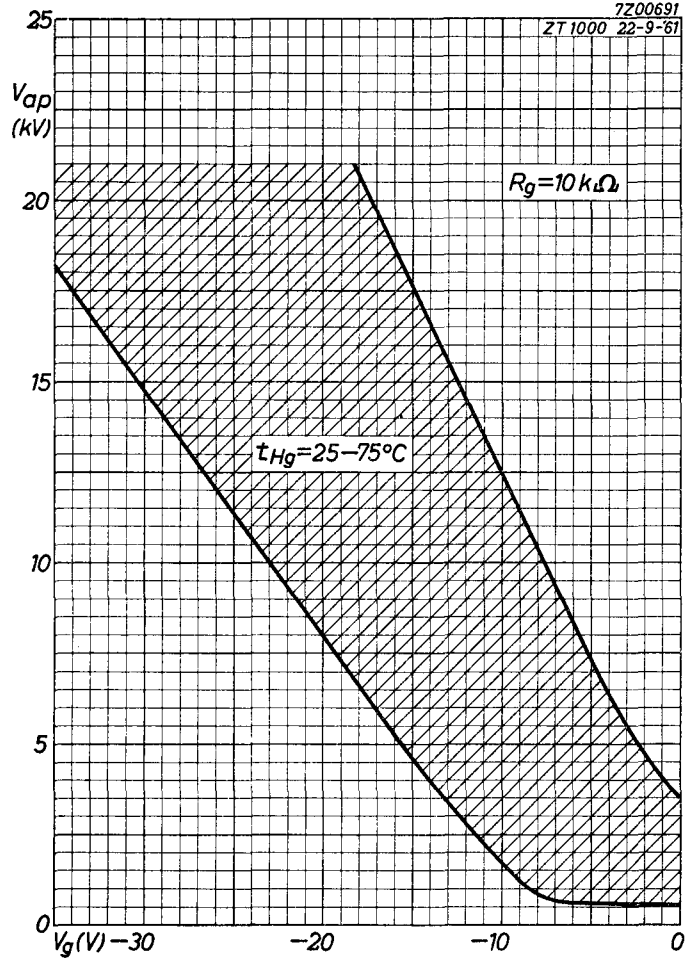
Transformer regulation and voltage drop in the tubes have been neglected
Les chutes de tension dans le transformateur et dans les tubes ont été négligées
Spannungsverluste im Transformator und in den Röhren sind vernachlässigt

V_g (V_a inv_p = 21 kV) = -100 V
V_g (V_a inv_p = 10 kV) = -50 V
I_g = 2 mA

	V_a inv_p = 21 kV			
Circuit [1]) Schaltung	V_{tr} (kV_{eff})	V_o (kV)	I_o (A)	W_o (kW)
a	7,4	6,7	5	33,5
b	14,8	13,4	5	67
c	8,5	10	7,5	75
d	14,8	20	7,5	150

	V_a inv_p = 15 kV			
Circuit [1]) Schaltung	V_{tr} (kV_{eff})	V_o (kV)	I_o (A)	W_o (kW)
a	5,3	4,8	6	28,8
b	10,6	9,6	6	57,6
c	6,1	7,2	9	64,8
d	10,6	14,4	9	130

[1]) See page T 150 in front of this section
Voir page T 150 en tête de ce chapitre
Siehe Seite T 150 am Anfang dieses Abschnitts


7Z00691
ZT 1000 22-9-'61
25
V_{ap} (kV)
20
15
10
5
0
R_g=10 kΩ
t_{Hg}=25–75°C
V_g(V) −30
−20
−10
0

10.10.1961

A

ZT1000

PHILIPS

PHILIPS

Electronic Tube

HANDBOOK

ZT1000

page	sheet	date
1	1	1961.10.10
2	2	1961.10.10
3	3	1961.10.10
4	4	1961.10.10
5	5	1961.10.10
6	A	1961.10.10
7	B	1961.10.10
8	FP	2000.01.14

VOLTAGE REFERENCE TUBE

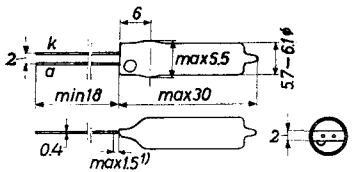
Subminiature 81 volts, long life, shock and vibration resistant, gas filled voltage reference tube.

QUICK REFERENCE DATA		
Preferred cathode current	I_k	= 3.2 mA
Incremental resistance	r_a	= 200 Ω
Temperature coefficient of maintaining voltage		
averaged over the range +20 to +125 °C	$\frac{\Delta V_{am}}{\Delta t_{bulb}}$	= −1.2 mV/°C
averaged over the range −55 to +20 °C	$\frac{\Delta V_{am}}{\Delta t_{bulb}}$	= −3.2 mV/°C

MECHANICAL DATA

Dimensions in mm

The glass dot indicates the anode lead



The tube may be soldered directly into the circuit but heat conducted to the glass to metal seal should be kept to a minimum by the use of a thermal shunt.

The tube may be dip-soldered at a solder temperature of max. 240°C for a maximum of 10 sec up to a point 5 mm from the seal.

Care should be taken not to bend the leads nearer than 1.5 mm from the seal.

1) Not tinned

7Z2 2413

CHARACTERISTICS AND RANGE VALUES at t_{amb} = 20 to 30 °C

Thermal equilibrium is reached within 2 minutes after ignition of the tube.

A. Limits applicable to all tubes (initial values)

Ignition voltage	V_{ign}	< 115 V
Maintaining voltage at I_k = 3.2 mA	V_{a_m}	> 80.1 V < 82.5 V
Incremental resistance at I_k = 3.2 mA	r_a	< 400 Ω

B. Typical limits (initial values)

When establishing the electrical characteristics of a large number of tubes, it will be found that for each characteristic at least 80% of the tubes investigated will meet the figures quoted.

Voltage jumps at I_k = 2 to 4 mA	V_{a_j}	< 100 mV [1]
Breakdown delay in darkness at V_b = 115 V	T_{delay}	< 5 msec
Tube impedance with sinusoidal variation of I_k with 50 c/s from 2.7 to 3.7 mA	z_a	< 400 Ω
Oscillation + random noise voltage at I_k = 2 to 4 mA, B = 10 c/s to 10 kc/s	V_{a_n}	< 1 mV
Vibration noise voltage at I_k = 3.2 mA, g = 2.5 g_p, f = 10 to 50 c/s, B = 1 to 100 c/s	V_{a_n}	< 100 mV
Temperature coefficient of maintaining voltage at I_k = 3.2 mA		
averaged over the range +20 to +125 °C	$-\frac{\Delta V_{a_m}}{\Delta t_{bulb}}$	< 2 mV/°C
averaged over the range −55 to +20 °C	$-\frac{\Delta V_{a_m}}{\Delta t_{bulb}}$	< 4 mV/°C

[1] To avoid voltage jumps over life, current variations around the preferred current should be limited to 0.3 mA.

7Z2 2414

CHARACTERISTICS AND RANGE VALUES (continued)

C. Life performance

When establishing the electrical characteristics of a large number of tubes, it will be found that for each characteristic at least 80% of the tubes investigated will meet the figures quoted.

C1. Typical maximum variation in maintaining voltage with continuous operation at I_k = 3.2 mA and t_{bulb} = 45 °C

0 to 100 hours operation	$\Delta V_{a_m} < 0.3$ V
0 to 2000 hours operation	$\Delta V_{a_m} < 0.7$ V

C2. Typical maximum variation in maintaining voltage during storage and stand-by at t_{bulb} = 25 °C

0 to 2000 hours	$\Delta V_{a_m} < 0.3$ V

SHOCK AND VIBRATION RESISTANCE

These conditions are used solely to assess the mechanical quality of the tube. The tube should not be continuously operated under these conditions.

Shock resistance 500 g

Forces as applied by the NRL impact machine for electronic devices caused by 5 blows of the hammer lifted over an angle of 30° in each of 4 different positions of the tube.

Vibration resistance 2.5 g peak

Vibrational forces for a period of 32 hours at a frequency of 50 c/s in each of 3 directions of the tube.

7Z2 2415

LIMITING VALUES (Absolute limits)

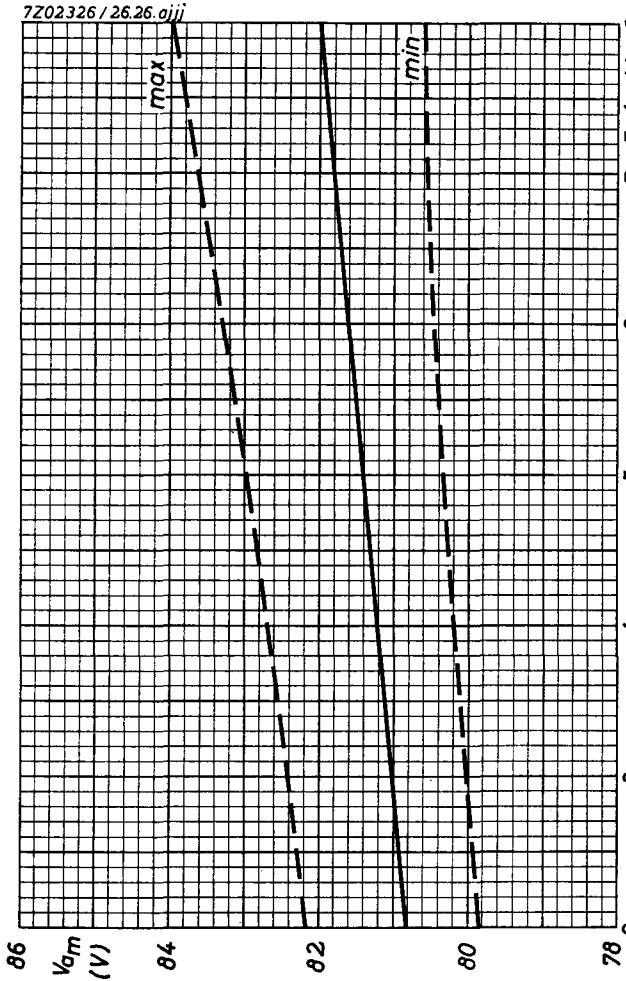
Cathode current	I_k	= max.	4.0 mA[1])
	I_k	= min.	2.0 mA
Starting current. Max. duration 20 sec.	I_{kp}	= max.	20 mA
Peak negative anode voltage	$-V_{ap}$	= max.	100 V
Bulb temperature			
during operation	t_{bulb}	= −55 °C to +125 °C	
during storage and stand-by	t_{bulb}	= −55 °C to +100 °C	

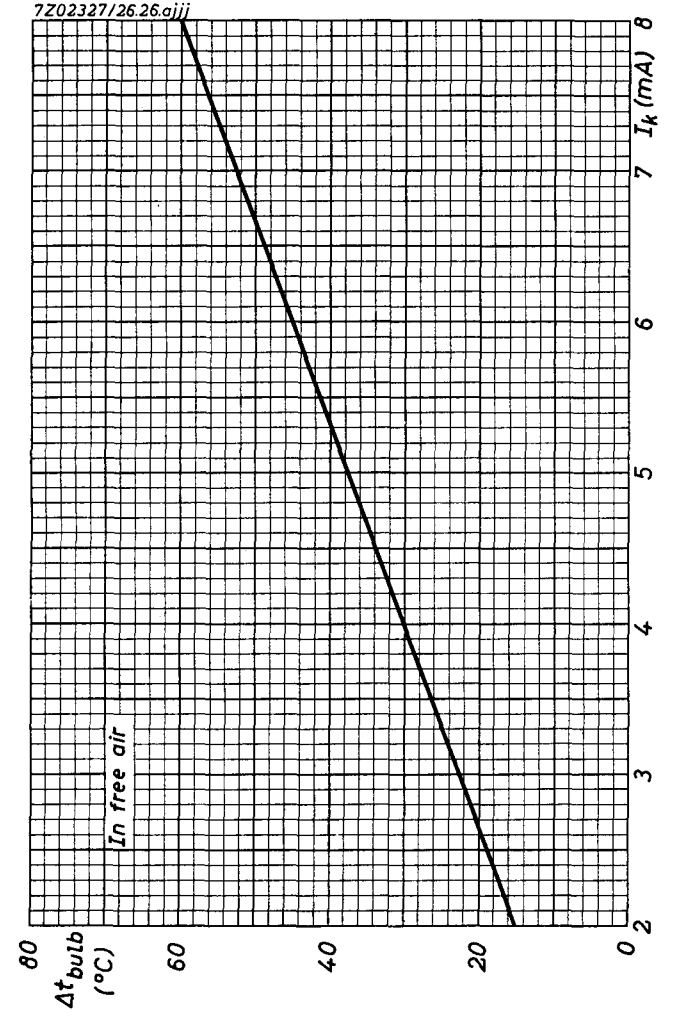
CIRCUIT DESIGN VALUES

Shunt capacitor	C_p	= max.	0.03 μF
Voltage necessary for ignition	V_b	= min.	120 V

[1]) For use as a stabilizer tube I_k = max. 8 mA. At cathode currents between 2 and 8 mA voltage jumps of 0.5 V may occur.

7Z2 2416


7Z02326 / 26.26.ajjj
max
min
I_k (mA)
2
3
4
5
6
7
8
V_{am} (V)
86
84
82
80
78


7Z02327/26.26.ajjj
I_k (mA)
2
3
4
5
6
7
8
Δt_{bulb} (°C)
80
60
40
20
0
In free air



ZZ1000

page	sheet	date
1	1	1964.05.05
2	2	1964.05.05
3	3	1964.05.05
4	4	1964.05.05
5	A	1964.05.05
6	B	1964.05.05
7	FP	2000.01.14