

R.F. POWER TRIODE

TY12-50A

High-power forced-air cooled triode, rated for a maximum anode dissipation of 45 kW and suitable for use at frequencies up to 30 Mc/s.

PRELIMINARY DATA

This data should be read in conjunction with "Operating Notes, Part 1—Power Valves" included in this volume of the Handbook.

FILAMENT Thoriated tungsten.

V_f	17.5	V
I_f	196	A

The total filament current is shared between three terminals and it is important to ensure that the connections to these terminals and to the supply bus-bars are securely made and have negligible contact resistance. The filament limbs are internally connected in parallel and a faulty external connection could cause a high current in the other terminals leading to excessive heating of the glass seals.

MOUNTING POSITION

Vertical, with anode down.

CAPACITANCES

C_{a-k}	3.4	$\mu\mu\text{F}$
C_{g-k}	116	$\mu\mu\text{F}$
C_{a-g}	86	$\mu\mu\text{F}$

CHARACTERISTICS (Measured at $V_a=10$ kV, $I_a=5$ A)

g_m	50	mA/V
μ	27	
g_m max. (at $V_a=3$ kV, $I_a=50$ A)	92	mA/V

COOLING

Maximum temperature of seals 180 °C

The amount of forced-air cooling required for this valve depends upon the anode dissipation and the height above sea-level. Typical values of input temperature, rate of flow of air, and pressure difference between the inlet and outlet of the housing are given in the following table.

Anode Dissipation	Height above sea-level	Maximum Inlet Temperature	Minimum rate of flow of air	Pressure Difference between inlet and outlet
P_a (kW)	h (m)	T_{In} (°C)	(m ³ /min)	(mm of H ₂ O)
30	0	35	35	114
30	0	45	40	143
30	1500	35	42	136
30	3000	25	44	132
45	0	35	54	275
45	0	45	62.5	335
45	1500	35	64.5	322
45	3000	25	68	319

TY12-50A

R.F. POWER TRIODE

High-power forced-air cooled triode, rated for a maximum anode dissipation of 45 kW and suitable for use at frequencies up to 30 Mc/s.

When operated at frequencies above 6 Mc/s, special attention must be given to the temperatures of the anode and grid-seals. They are cooled by air flowing through the slots provided at the top of the cooler housing. In certain cases, particularly at low anode dissipations and when cooling with the minimum quantity of air, the flow of air to the seals will not be sufficient to maintain the seal temperatures below the maximum permitted value at frequencies above 6 Mc/s. In these cases, a larger quantity of air must be supplied.

When using the special filament connectors, together with connecting leads of adequate cross-section, it is not, as a rule, necessary to provide additional air cooling of the filament terminals. In order to ensure uniform distribution of current, care must be taken to ensure firm contact with the filament terminals.

R.F. HEATING APPLICATIONS

For these applications, individual requirements should be discussed with the Industrial Technical Service Dept., Mullard Limited.

OPERATING CONDITIONS AS A SINGLE VALVE R.F. POWER OSCILLATOR OR AMPLIFIER (CLASS "C" TELEGRAPHY OR F.M. TELEPHONY)

Limiting Values

V_a max. ($f < 4$ Mc/s)	15	kV
V_a max. ($f < 15$ Mc/s)	13.5	kV
$-V_g$ max.	1.2	kV
I_k max.	15	A
$i_{k(pk)}$ max.	75	A
I_g max.	3.0	A
p_a max.	45	kW

Typical Operating Conditions

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	2.0	1.6	1.5	1.4	A
$v_{ln(pk)}$	1.7	1.65	1.45	1.35	1.3	kV
P_{drive}	3.5	3.0	2.1	1.9	1.7	kW
p_a	36	31.5	23.5	20	17	kW
P_{out}	108	94.5	70	59	50	kW
* P_{load}	86.4	75.6	56	47.2	40	kW
η	75	75	75	75	75	%

*With a circuit transfer efficiency of 80%.

OPERATION AS R.F. POWER AMPLIFIER (CLASS "C" ANODE MODULATION)

Limiting Values

V_a max.	10	kV
$-V_g$ max.	1.2	kV
I_k max.	12	A
$i_{k(pk)}$ max.	120	A
I_g max.	3.0	A
p_a max.	30	kW

R.F. POWER TRIODE

TY12-50A

High-power forced-air cooled triode, rated for a maximum anode dissipation of 45 kW and suitable for use at frequencies up to 30 Mc/s.

Typical Operating Conditions

f	15	20	25	27.5	30	Mc/s
V _a	10	10	9.0	8.5	8.0	kV
V _g	-1050	-1050	-925	-900	-850	V
I _a	8.5	7.0	6.2	5.7	5.25	A
I _g	2.6	2.0	2.0	1.9	1.8	A
V _{in(pk)}	1.75	1.65	1.5	1.45	1.4	kV
P _{drive}	4.1	3.0	2.7	2.5	2.3	kW
P _a	20	17.5	15	13.5	12	kW
P _{out}	65	52.5	41	35	30	kW
*P _{load}	52	42	32.8	28	24	kW
η	76.5	75	73.5	72	71.5	%
For 100% modulation						
P _{mod.}	42.5	35	28	24.5	21	kW

*With a circuit transfer efficiency of 80%.

OPERATION AS CLASS "B" A.F. AMPLIFIER OR MODULATOR

Limiting Values

V _a max.	15	kV
I _k max.	16	A
i _{k(pk)} max.	50	A
P _a max.	45	kW
R _{g-f} max.	20	k Ω

TYPICAL OPERATING CONDITIONS FOR TWO VALVES IN PUSH-PULL

V _a	12	10	10	9.0	8.5	8.0	kV
V _g	-450	-375	-400	-350	-325	-300	V
R _{a-a}	1.2	1.7	2.06	2.08	2.12	2.21	k Ω
I _{a(o)}	2 × 650	2 × 500	2 × 200	2 × 250	2 × 250	2 × 250	mA
I _a (max. sig.)	2 × 12	2 × 6.6	2 × 5.4	2 × 4.8	2 × 4.4	2 × 4.1	A
I _g	2 × 2.5	2 × 0.9	2 × 0.7	2 × 0.65	2 × 0.55	2 × 0.4	A
V _{in(g-g)} (r.m.s.)	1457	1047	1033	920	849	792	V
P _{drive}	2 × 2.4	2 × 0.6	2 × 0.5	2 × 0.4	2 × 0.3	2 × 0.25	kW
P _a	2 × 43	2 × 19.5	2 × 15.5	2 × 12.2	2 × 10.4	2 × 9.4	kW
P _{out}	202	93	77	62	54	46.8	kW
η	70	71	71	72	72	71	%

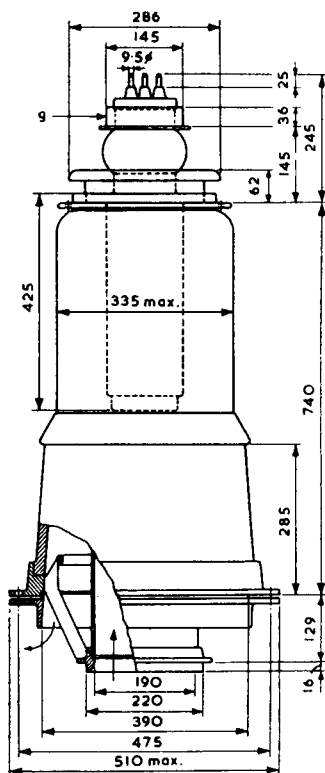
WEIGHT

Valve only	30 Kg (66 lb)
Cooler housing	90 Kg (200 lb)

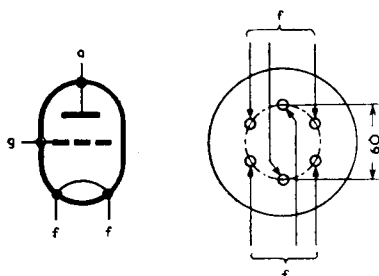
TY12-50A

R.F. POWER TRIODE

High-power forced-air cooled triode, rated for a maximum anode dissipation of 45 kW and suitable for use at frequencies up to 30 Mc/s.



Valve mounted in cooler housing.



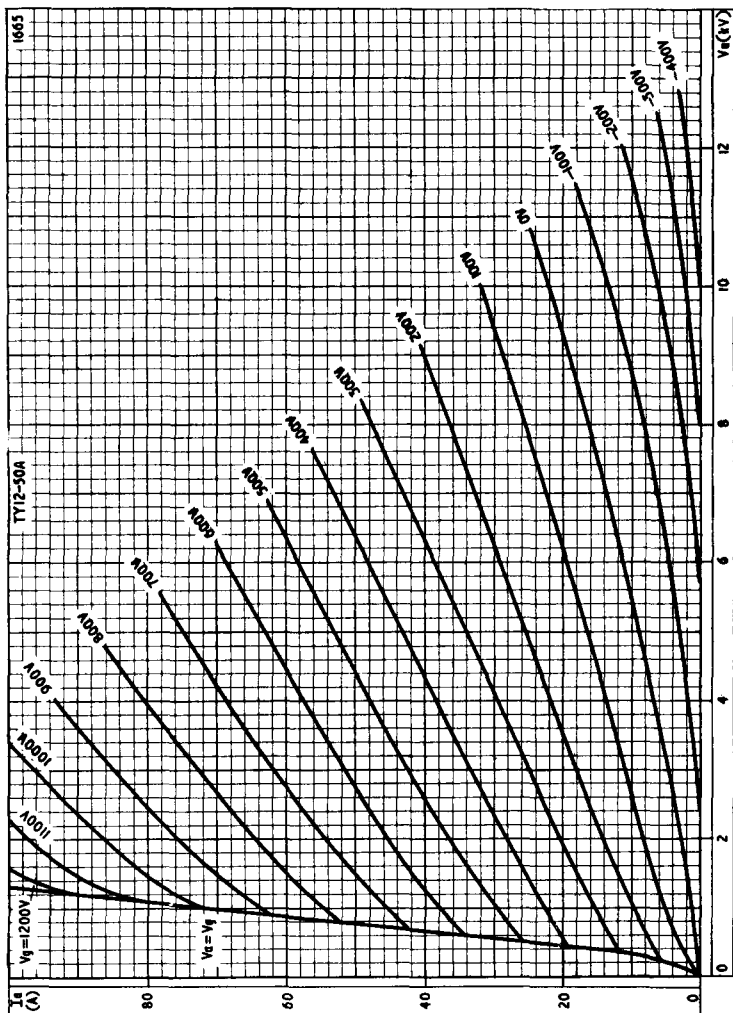
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All dimensions in mm.

R.F. POWER TRIODE

High-power forced-air cooled triode, rated for a maximum anode dissipation of 45 kW and suitable for use at frequencies up to 30 Mc/s.

TY I 2-50A

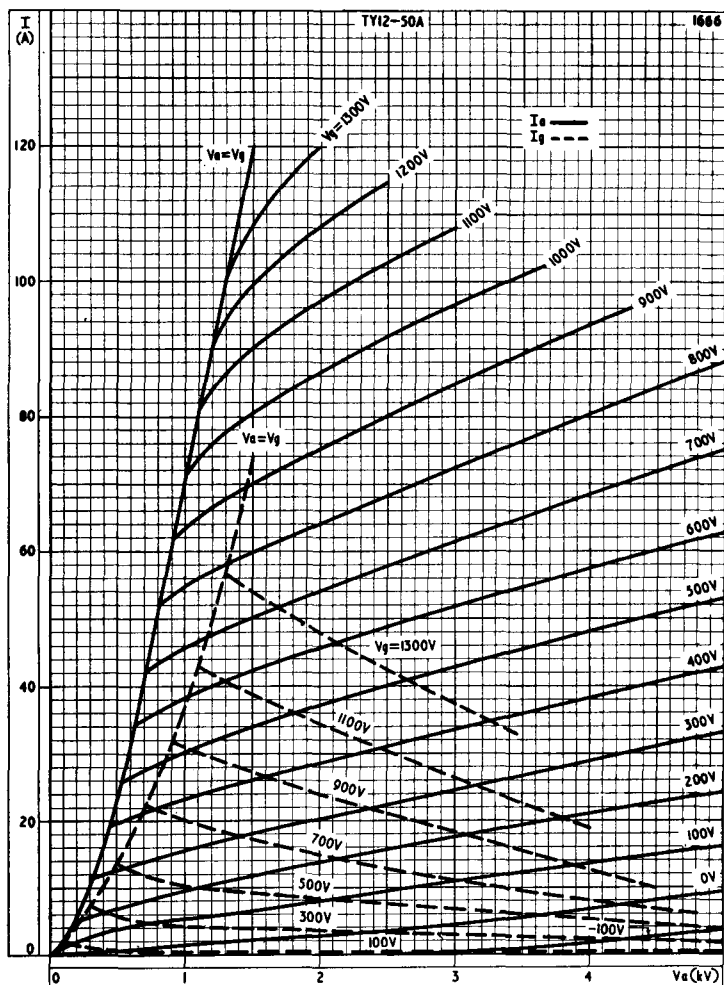


ANODE CURRENT PLOTTED AGAINST ANODE VOLTAGE

TY12-50A

R.F. POWER TRIODE

High-power forced-air cooled triode, rated for a maximum anode dissipation of 45 kW and suitable for use at frequencies up to 30 Mc/s.

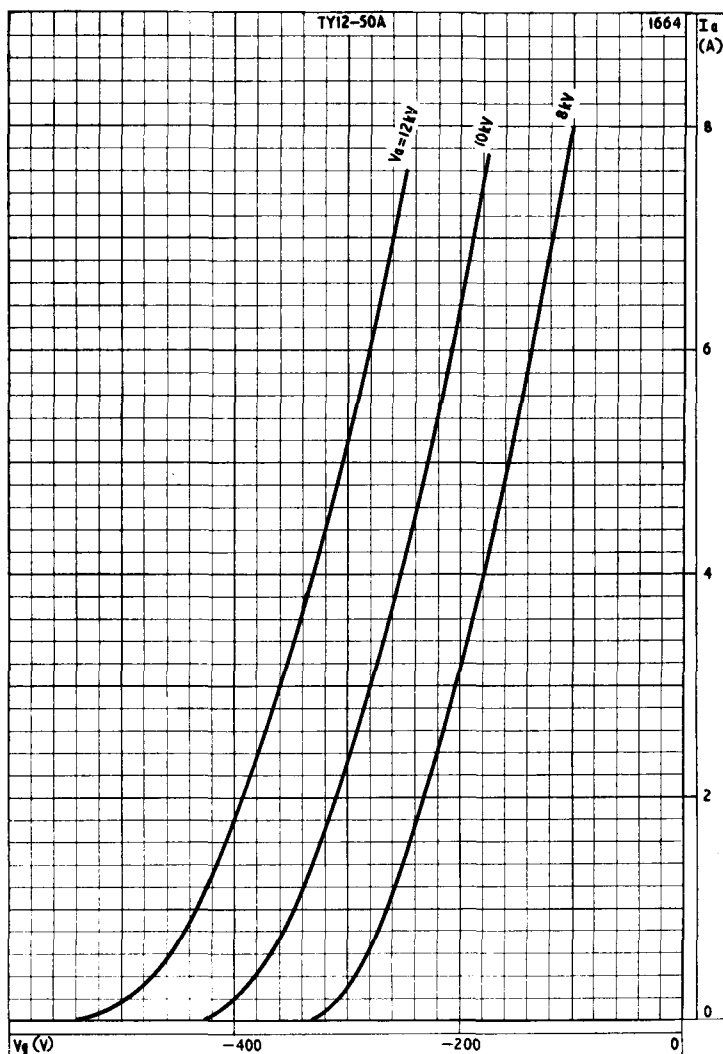


ANODE AND GRID CURRENT PLOTTED AGAINST ANODE VOLTAGE

R.F. POWER TRIODE

TY12-50A

High-power forced-air cooled triode, rated for a maximum anode dissipation of 45 kW and suitable for use at frequencies up to 30 Mc/s.

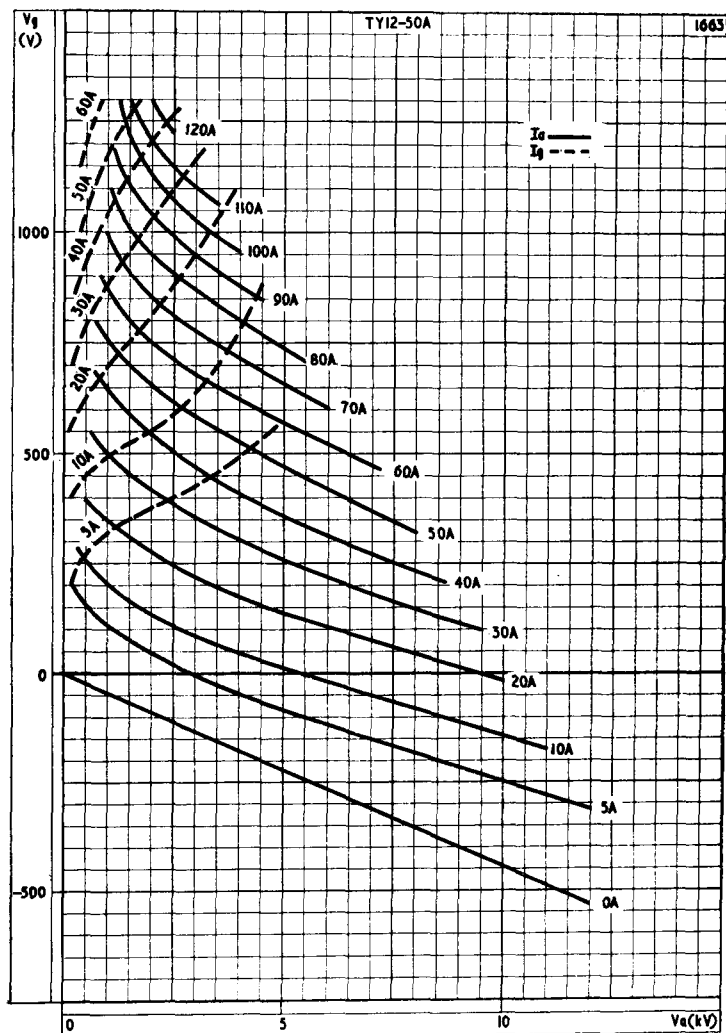


ANODE CURRENT PLOTTED AGAINST GRID VOLTAGE

TY12-50A

R.F. POWER TRIODE

High-power forced-air cooled triode, rated for a maximum anode dissipation of 45 kW and suitable for use at frequencies up to 30 Mc/s.

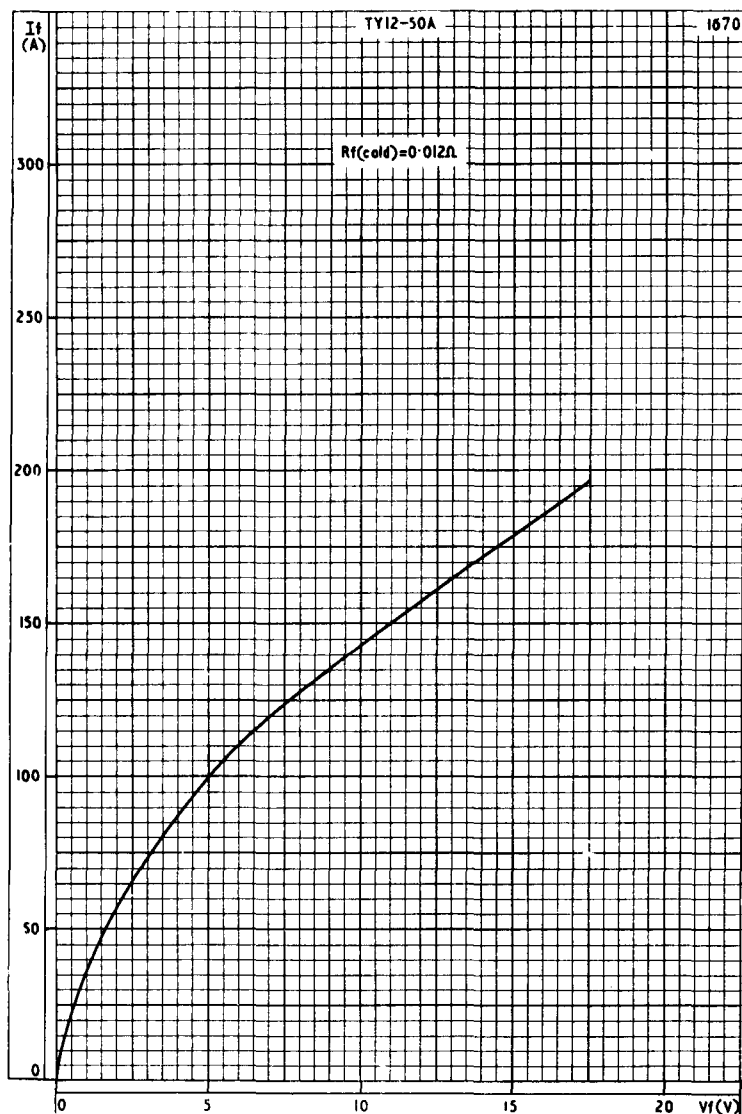


CONSTANT CURRENT CURVES

R.F. POWER TRIODE

TY12-50A

High-power forced-air cooled triode, rated for a maximum anode dissipation of 45 kW and suitable for use at frequencies up to 30 Mc/s.



FILAMENT CURRENT PLOTTED AGAINST FILAMENT VOLTAGE

R.F. POWER TRIODE

TY12-50W

High-power water-cooled triode, rated for a maximum anode dissipation of 50 kW and suitable for use at frequencies up to 30 Mc/s.

PRELIMINARY DATA

This data should be read in conjunction with "Operating Notes, Part 1—Power Valves" included in this volume of the Handbook.

FILAMENT Thoriated tungsten.

V_f	17.5	V
I_f	196	A

The total filament current is shared between three terminals and it is important to ensure that the connections to these terminals and to the supply bus-bars are securely made and have negligible resistance. The filament limbs are internally connected in parallel and a faulty external connection could cause a high current in the other terminals leading to excessive heating of the glass seals.

MOUNTING POSITION Vertical, with anode down.

CAPACITANCES

C_{a-k}	3.4	$\mu\mu\text{F}$
C_{g-k}	116	$\mu\mu\text{F}$
C_{a-g}	86	$\mu\mu\text{F}$

CHARACTERISTICS (measured at $V_a=10$ kV, $I_a=5$ A)

g_m	50	mA/V
μ	27	
g_m max. ($V_a=3$ kV, $I_a=50$ A)	92	mA/V

COOLING

The amount of water-cooling required for this valve depends upon the anode dissipation and the temperature of the water. Typical values of rate of flow of water and pressure lost in the jacket are given in the following table.

Anode Dissipation	Maximum Inlet Temperature	Minimum* rate of flow of water	Pressure loss in jacket
P_a (kW)	T_{in} (°C)	(Litres/Min.)	(atm)
30	20	25	0.15
30	50	45	0.45
50	20	32	0.25
50	50	65	0.85
100	20	55	0.6
100	50	120	3.0

*Rate of flow of water for temperatures intermediate between 20 and 50°C can be determined by linear interpolation.

TY12-50W

R.F. POWER TRIODE

High-power water-cooled triode, rated for a maximum anode dissipation of 50 kW and suitable for use at frequencies up to 30 Mc/s.

Max. inlet temperature of water	50	°C
Max. temperature of seals	180	°C

In order to ensure that the max. temperature (180°C) of the seals is not exceeded it may be necessary to divert a stream of air upon the seals. This flow of air must commence upon or before the application of the filament voltage.

Anode and grid-seals may 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, air cooling will not normally be necessary. Above 6 Mc/s, air cooling must be used in order to prevent overheating of the anode- and grid-seals. At the maximum frequency (30 Mc/s) and the published operating conditions at least 2.5m³ (95 ft³) per minute is required with a pressure loss of about 500 mm (20 in) water column.

When using the special filament connectors together with connecting leads of adequate cross-section, it is not, as a rule, necessary to provide additional air cooling of the filament terminals. In order to ensure uniform distribution of current, care should be taken to ensure firm contact with the filament terminals.

R.F. HEATING APPLICATIONS

For these applications, individual requirements should be discussed with the Industrial Technical Service Department, Mullard Ltd.

OPERATION AS A SINGLE VALVE R.F. POWER OSCILLATOR OR AMPLIFIER (CLASS "C" TELEGRAPHY OR F.M. TELEPHONY)

Limiting Values

V_a max. ($f < 4$ Mc/s)	15	kV
V_a max. ($f < 15$ Mc/s)	13.5	kV
$-V_g$ max.	1.2	kV
I_k max.	15	A
$i_{k(pk)}$ max.	75	A
I_g max.	3.0	A
p_a max.	50	kW

Typical Operating Conditions

	15	20	25	27.5	30	Mc/s
f	12	12	11	10.5	10	kV
V_a	-1000	-1000	-900	-850	-800	V
V_g	12	10.5	8.5	7.5	6.7	A
I_a	2.25	2.0	1.6	1.5	1.4	A
I_g	1.7	1.65	1.45	1.35	1.3	kV
$v_{in(pk)}$	3.5	3.0	2.1	1.9	1.7	kW
P_{drive}	36	31.5	23.5	20	17	kW
p_a	108	94.5	70	59	50	kW
P_{out}	86.4	75.6	56	47.2	40	kW
* P_{load}	75	75	75	75	75	%
η						

*With a circuit transfer efficiency of 80%.



R.F. POWER TRIODE

TY12-50W

High-power water-cooled triode, rated for a maximum anode dissipation of 50 kW and suitable for use at frequencies up to 30 Mc/s.

OPERATION AS R.F. POWER AMPLIFIER (CLASS "C" ANODE MODULATION)

Limiting Values

V_a max.	10	kV
$-V_g$ max.	1.2	kV
I_k max.	12	A
$i_{k(pk)}$	120	A
I_g max.	3.0	A
p_a max.	33	kW

Typical Operating Conditions

f	15	20	25	27.5	30	Mc/s
V_a	10	10	9.0	8.5	8.0	kV
V_g	-1050	-1050	-925	-900	-850	V
I_a	8.5	7.0	6.2	5.7	5.25	A
I_g	2.6	2.0	2.0	1.9	1.8	A
$v_{in(pk)}$	1.75	1.65	1.5	1.45	1.4	kV
P_{drive}	4.1	3.0	2.7	2.5	2.3	kW
p_a	20	17.5	15	13.5	12	kW
P_{out}	65	52.5	41	35	30	kW
* P_{load}	52	42	32.8	28	24	kW
η	76.5	75	73.5	72	71.5	%
For 100% modulation						
P_{mod}	42.5	35	28	24.5	21	kW

*With a circuit transfer efficiency of 80%.

OPERATION AS R.F. AMPLIFIER (CLASS "B" TELEPHONY)

Limiting Values

V_a max. ($f < 4$ Mc/s)	15	kV
V_a max. ($f < 15$ Mc/s)	13.5	kV
I_k max.	20	A
$i_{k(pk)}$ max.	60	A
p_a max.	100	kW

Typical Operating Conditions

f	15	Mc/s
V_a	12	kV
V_g	-420	V
I_a	12.2	A
$v_{in(pk)}$	700	V
p_a	94.5	kW
P_{out}	51.5	kW
* P_{load}	41.2	kW
η	35	%
For 100% modulation		
I_g	4.5	A
P_{drive}	5.7	kW

*With a circuit transfer efficiency of 80%.

TY12-50W

R.F. POWER TRIODE

High-power water-cooled triode, rated for a maximum anode dissipation of 50 kW and suitable for use at frequencies up to 30 Mc/s.

OPERATION AS CLASS "B" A.F. AMPLIFIER OR MODULATOR

Limiting Values

V_a max.	15	V
I_k max.	16	A
$i_{k(pk)}$ max.	50	A
p_a max.	50	kW
R_{g-f} max.	20	kΩ

Typical Operating Conditions for 2 Valves in Push-Pull

V_a	12	10	10	9.0	8.5	8.0	kV
V_g	-450	-375	-400	-350	-325	-300	V
R_{a-a}	1.2	1.7	2.06	2.08	2.12	2.21	kΩ
$I_{a(o)}$	2×650	2×500	2×200	2×250	2×250	2×250	mA
I_a (max. sig.)	2×12	2×6.6	2×5.4	2×4.8	2×4.4	2×4.1	A
I_g	2×2.5	2×0.9	2×0.7	2×0.65	2×0.55	2×0.4	A
$V_{in(g-g)}$ (r.m.s.)	1457	1047	1033	920	849	792	V
P_{drive}	2×2.4	2×0.6	2×0.5	2×0.4	2×0.3	2×0.25	kW
P_a	2×43	2×19.5	2×15.5	2×12.2	2×10.4	2×9.4	kW
P_{out}	202	93	77	62	54	46.8	kW
η	70	71	71	72	72	71	%

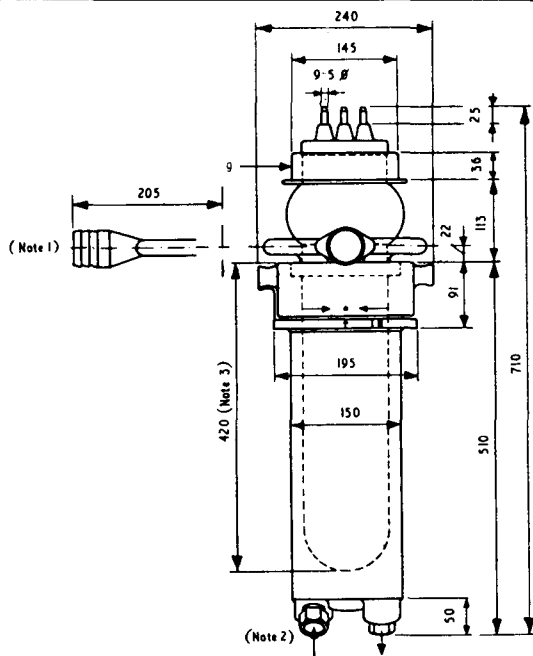
WEIGHT

Valve only	14 kg (31 lb)
Water jacket	19.5 kg (43 lb)

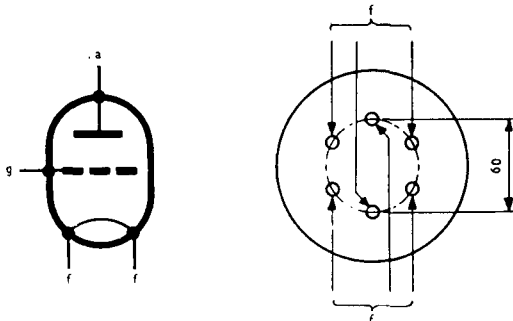
R.F. POWER TRIODE

TY12-50W

High-power water-cooled triode, rated for a maximum anode dissipation of 50 kW and suitable for use at frequencies up to 30 Mc/s.



Valve mounted in water jacket.



1703

All dimensions in mm.

Note 1.—A connecting hose with an inner diameter of 1.75 in. is required.

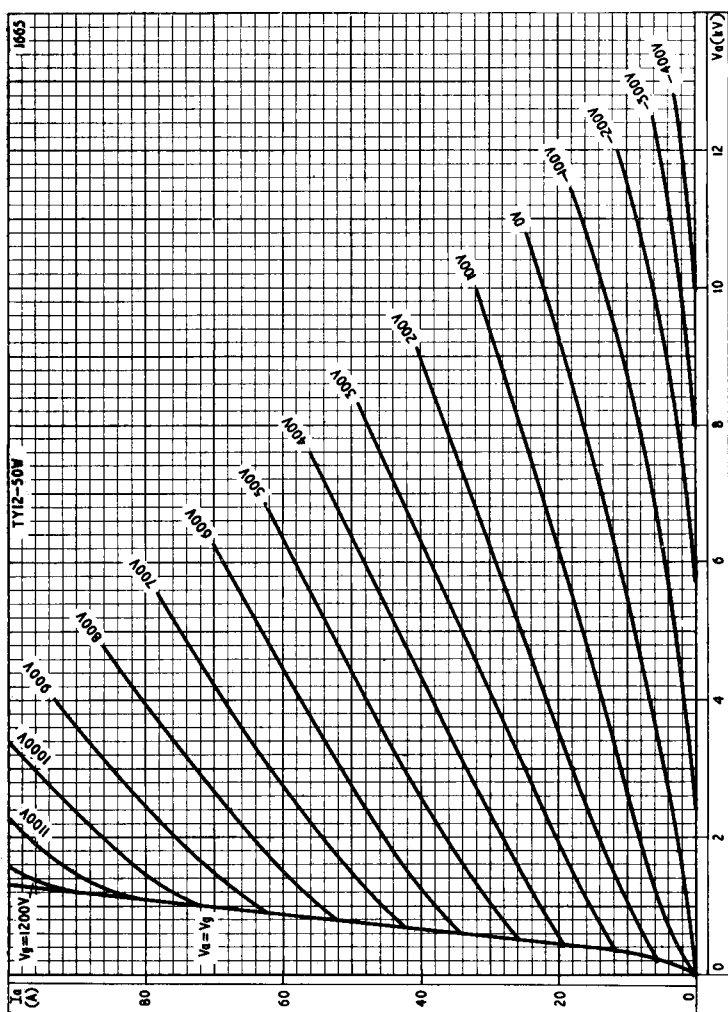
Note 2.—Coupling for metal tubing with an outer diameter of 28 mm.

Note 3.—To remove the valve from its water-jacket a free height of 420 mm above the valve is required.

TY12-50W

R.F. POWER TRIODE

High-power water-cooled triode, rated for a maximum anode dissipation of 50 kW and suitable for use at frequencies up to 30 Mc/s.

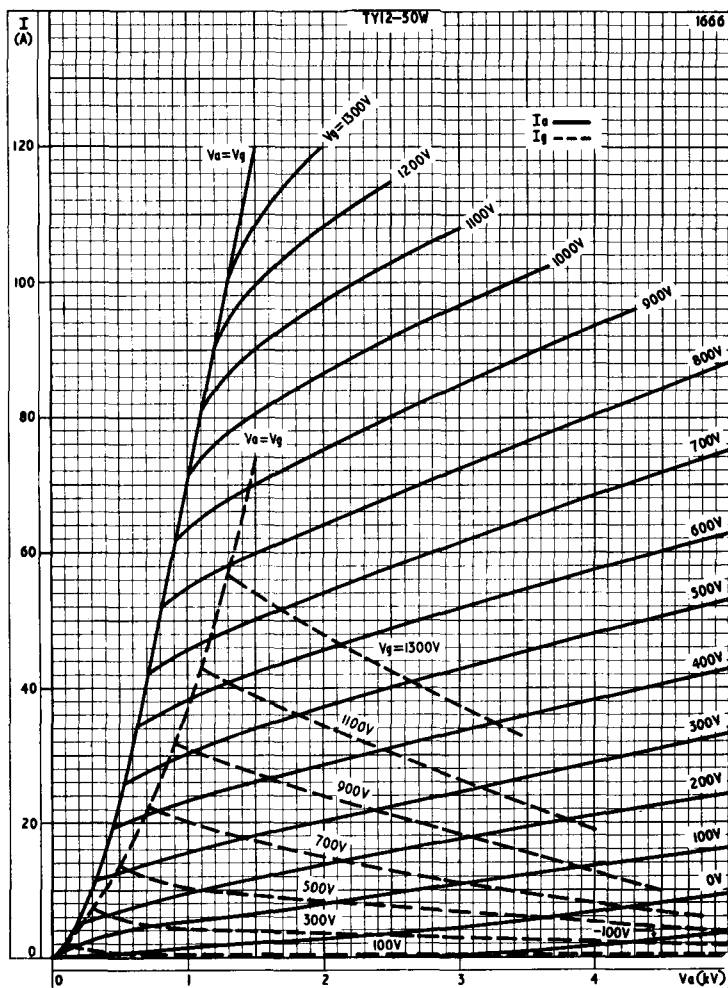


ANODE CURRENT PLOTTED AGAINST ANODE VOLTAGE

R.F. POWER TRIODE

High-power water-cooled triode, rated for a maximum anode dissipation of 50 kW and suitable for use at frequencies up to 30 Mc/s.

TY12-50W

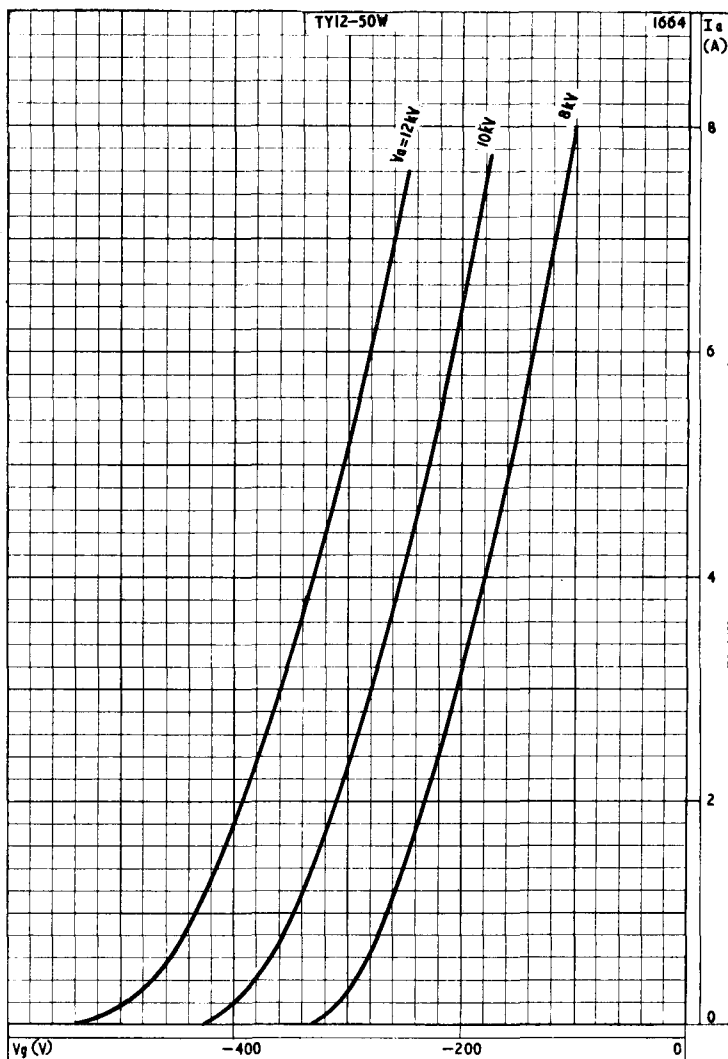


ANODE AND GRID CURRENT PLOTTED AGAINST ANODE VOLTAGE

TY12-50W

R.F. POWER TRIODE

High-power water-cooled triode, rated for a maximum anode dissipation of 50 kW and suitable for use at frequencies up to 30 Mc/s.

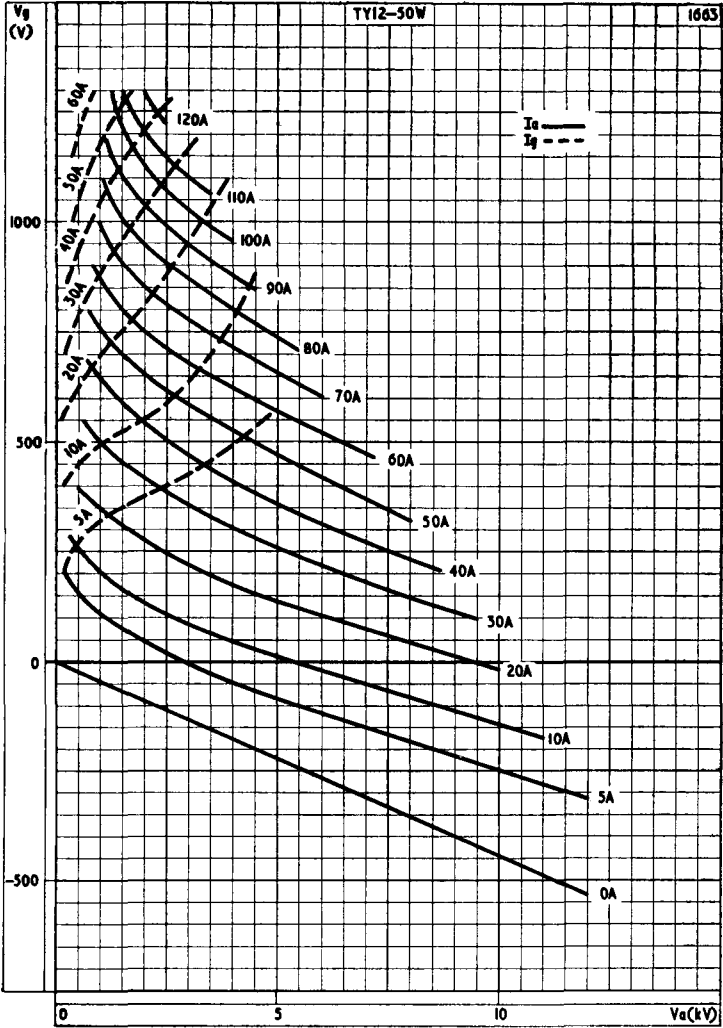


ANODE CURRENT PLOTTED AGAINST GRID VOLTAGE

R.F. POWER TRIODE

TY12-50W

High-power water-cooled triode, rated for a maximum anode dissipation of 50 kW and suitable for use at frequencies up to 30 Mc/s.



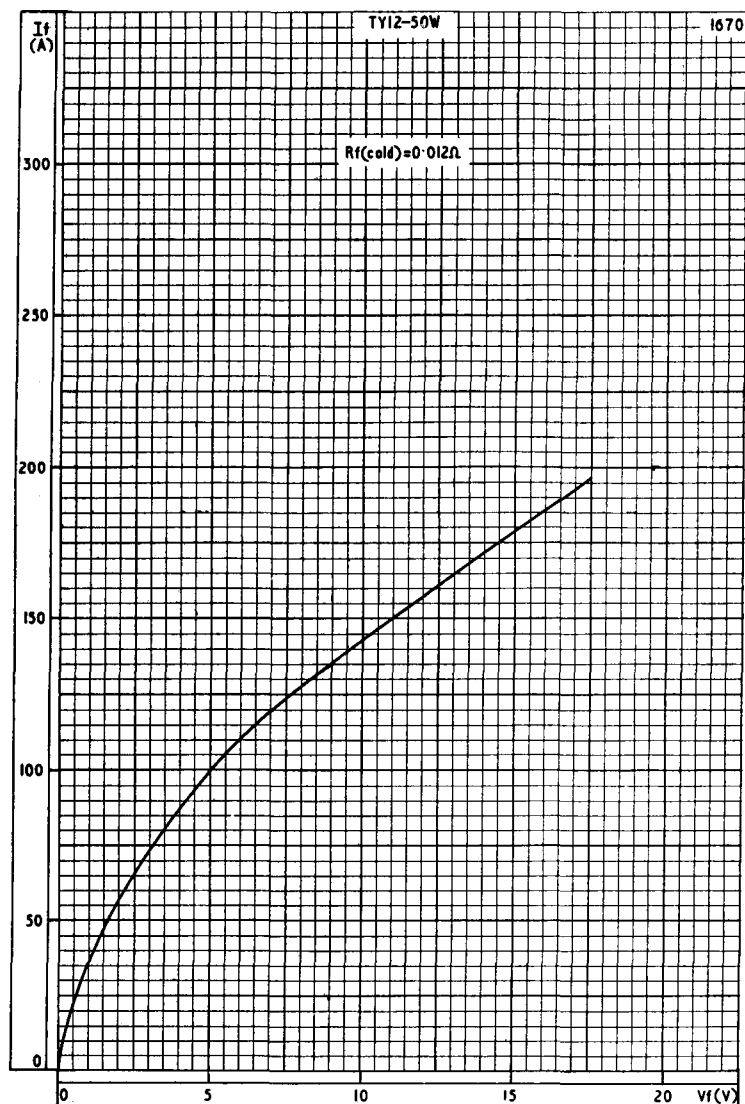
CONSTANT CURRENT CURVES



TY12-50W

R.F. POWER TRIODE

High-power water-cooled triode, rated for a maximum anode dissipation of 50 kW and suitable for use at frequencies up to 30 Mc/s.



FILAMENT CURRENT PLOTTED AGAINST FILAMENT VOLTAGE

QUICK REFERENCE DATA

Water cooled r.f. power triode

	Class 'B' Audio Amplifier or Modulator	Class 'B' Telephony	Class 'C' Anode and Screen grid Modulation	Class 'C' Telegraphy or F.M. Telephony	
f	-	15	30	30	Mc/s
P _{out}	202	51.5	30	50	kW
f max.	-	30	30	30	Mc/s
V _a max. (f < 4Mc/s)	15	15	10	15	kV
(f < 15Mc/s)	-	13.5	-	13.5	kV
p _a max.	50	100	33	50	kW

To be read in conjunction with GENERAL OPERATIONAL RECOMMENDATIONS - TRANSMITTING VALVES.

CLASS 'C' TELEGRAPHY OR F.M. TELEPHONY

Maximum operating conditions

f	15	20	25	27.5	30	Mc/s
P _{out}	108	94.5	70	59	50	kW
P _{load}	86.4	75.6	56	47.2	40	kW
η_a	75	75	75	75	75	%
V _a	12	12	11	10.5	10	kV
I _a	12	10.5	8.5	7.5	6.7	A
-V _{g1}	1000	1000	900	850	800	V
I _{g1}	2.25	2.0	1.6	1.5	1.4	A
v _{in(pk)}	1.7	1.65	1.45	1.35	1.3	kV
P _{load(driver)}	3.5	3.0	2.1	1.9	1.7	kW
p _a	36	31.5	23.5	20	17	kW

CLASS 'C' ANODE AND SCREEN GRID MODULATION

Maximum operating conditions

Carrier conditions for 100% modulation

f	15	20	25	27.5	30	Mc/s
P _{out}	65	52.5	41	35	30	kW
P _{load}	52	42	32.8	28	24	kW
η_a	76.5	75	73.5	72	71.5	%
V _a	10	10	9.0	8.5	8.0	kV
I _a	8.5	7.0	6.2	5.7	5.25	A
-V _{g1}	1050	1050	925	900	850	V
I _{g1}	2.6	2.0	2.0	1.9	1.8	A
v _{in(pk)}	1.75	1.65	1.5	1.45	1.4	kV
P _{load(driver)}	4.1	3.0	2.7	2.5	2.3	kW
p _a	20	17.5	15	13.5	12	kW

For 100% modulation

P _{mod}	42.5	35	28	24.5	21	kW
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CLASS 'B' TELEPHONY

Maximum operating conditions

f	15	Mc/s
P _{out}	51.5	kW
P _{load}	41.2	kW
η_a	35	%
V _a	12	kV
I _a	12.2	A
-V _{g1}	420	V
v _{in(pk)}	700	V
p _a	94.5	kW

For 100% modulation

P _{drive}	5.7	kW
I _{g1}	4.5	A

CLASS 'B' AUDIO AMPLIFIER OR MODULATOR

Maximum operating conditions

P_{out}	202	93	77	kW
R_{a-a}	1.2	1.7	2.06	k Ω
V_a	12	10	10	kV
$I_{a(o)}$	2 x 650	2 x 500	2 x 200	mA
I_a (max. sig.)	2 x 12	2 x 6.6	2 x 5.4	A
$-V_{gl}$	450	375	400	V
I_{gl}	2 x 2.5	2 x 0.9	2 x 0.7	A
$V_{in(g-g)}$ r.m.s.	1457	1047	1033	V
$P_{load(driver)}$	2 x 2.4	2 x 0.6	2 x 0.5	kW
p_a	2 x 43	2 x 19.5	2 x 15.5	kW
η_a	70	71	71	%

P_{out}	62	54	46.8	kW
R_{a-a}	2.08	2.12	2.21	k Ω
V_a	9.0	8.5	8.0	kV
$I_{a(o)}$	2 x 250	2 x 250	2 x 250	mA
I_a (max. sig.)	2 x 4.8	2 x 4.4	2 x 4.1	A
$-V_{gl}$	350	325	300	V
I_{gl}	2 x 0.65	2 x 0.55	2 x 0.4	A
$V_{in(g-g)}$ r.m.s.	920	849	792	V
$P_{load(driver)}$	2 x 0.4	2 x 0.3	2 x 0.25	kW
p_a	2 x 12.2	2 x 10.4	2 x 9.4	kW
η_a	72	72	71	%

ABSOLUTE MAXIMUM RATINGS

	Class 'B' A. F.	Class 'B' Telephony	Class 'C' Telephony	Class 'C' Telegraphy	
V_a max. ($f < 15\text{Mc/s}$)	15	15	10	15	kV
($f < 15\text{Mc/s}$)	-	13.5	-	13.5	kV
$-V_g$ max.	-	-	1.2	1.2	kV
I_k max.	16	20	12	15	A
p_a max.	50	100	33	50	kW
I_g max.	-	-	3.0	3.0	A
R_{g-f} max.	20	-	-	-	k Ω

CATHODE

Directly heated, thoriated tungsten

V_f	17.5	V
I_f	196	A

The total filament current is shared between three terminals and it is important to ensure that the connections to these terminals and to the supply bus-bars are securely made and have negligible contact resistance. The filament limbs are internally connected in parallel and a faulty external connection could cause a high current in the other terminals leading to excessive heating of the glass seals.

CAPACITANCES

c_{a-k}	3.4	pF
c_{g-k}	116	pF
c_{a-g}	86	pF

CHARACTERISTICS (measured at $V_a = 10\text{kV}$, $I_a = 5\text{A}$)

g_m	50	mA/V
μ	27	
g_m max. (at $V_a = 3\text{kV}$, $I_a = 50\text{A}$)	92	mA/V

MOUNTING POSITION

Vertical, anode down

COOLING

Water cooled

Maximum temperatures

Seals	180	°C
Water inlet	50	°C

The amount of water-cooling required for this valve depends upon the anode dissipation and the temperature of the water. Typical values of rate of flow of water and pressure lost in the jacket are given in the following table.

Anode Dissipation	Maximum Inlet Temperature	*Minimum rate of flow of water	Pressure loss in jacket
P_a (kW)	T_{in} (°C)	(Litres/Min)	(atm)
30	20	25	0.15
30	50	45	0.45
50	20	32	0.25
50	50	65	0.85
100	20	55	0.6
100	50	120	3.0

*Rate of flow of water for temperatures intermediate between 20 and 50°C can be determined by linear interpolation.

In order to ensure that the max. temperature (180°C) of the seals is not exceeded it may be necessary to divert a stream of air upon the seals. This flow of air must commence upon or before the application of the filament voltage.

Anode and grid-seals may 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 6Mc/s, air cooling will not normally be necessary. Above 6Mc/s, air cooling must be used in order to prevent overheating of the anode- and grid-seals. At the maximum frequency (30Mc/s) and the published operating conditions at least 2.5m³ (95ft³) per minute is required with a pressure loss of about 500mm (20in) water column.

When using the special filament connectors together with connecting leads of adequate cross-section, it is not, as a rule, necessary to provide additional air cooling of the filament terminals. In order to ensure uniform distribution of current, care should be taken to ensure firm contact with the filament terminals.



PHYSICAL DATA

Weight of valve	31	lb
	14	kg
Weight of water jacket	45	lb
	20.5	kg
Weight of valve plus carton	180	lb
	82	kg

ACCESSORIES

Water jacket	K714
Filament clips x 6	40628

DIMENSIONS

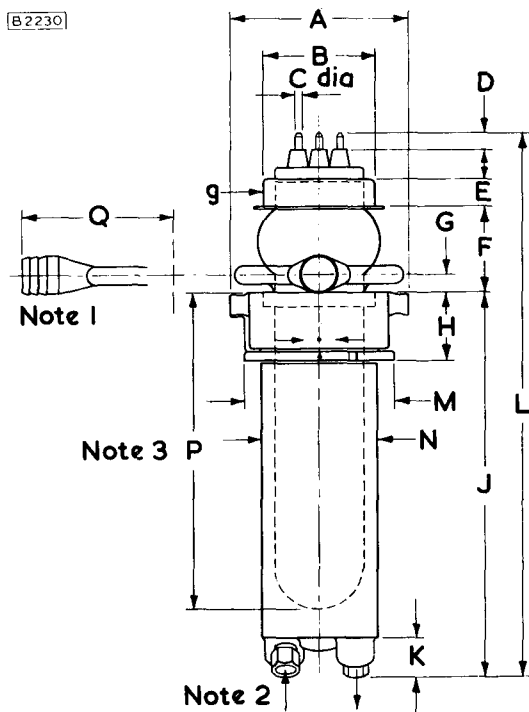
	Inches	Millimetres
A	9.45	240
B	5.71	145
C	0.37	9.5
D	0.98	25
E	1.42	36
F	4.45	113
G	0.87	22
H	3.58	91
J	20.08	510
K	1.97	50
L	27.95	710
M	7.68	195
N	5.91	150
P	16.54	420
Q	8.07	205
R	2.36	60

Inch dimensions derived from original millimetre dimensions.

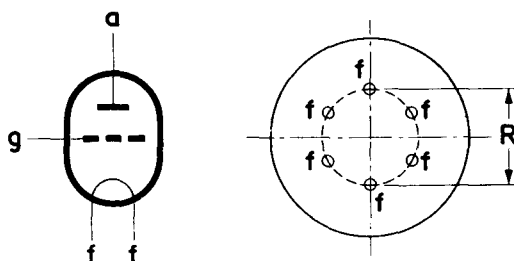
Note 1 A connecting hose with an inner diameter of 44.5mm (1.75in) is required.

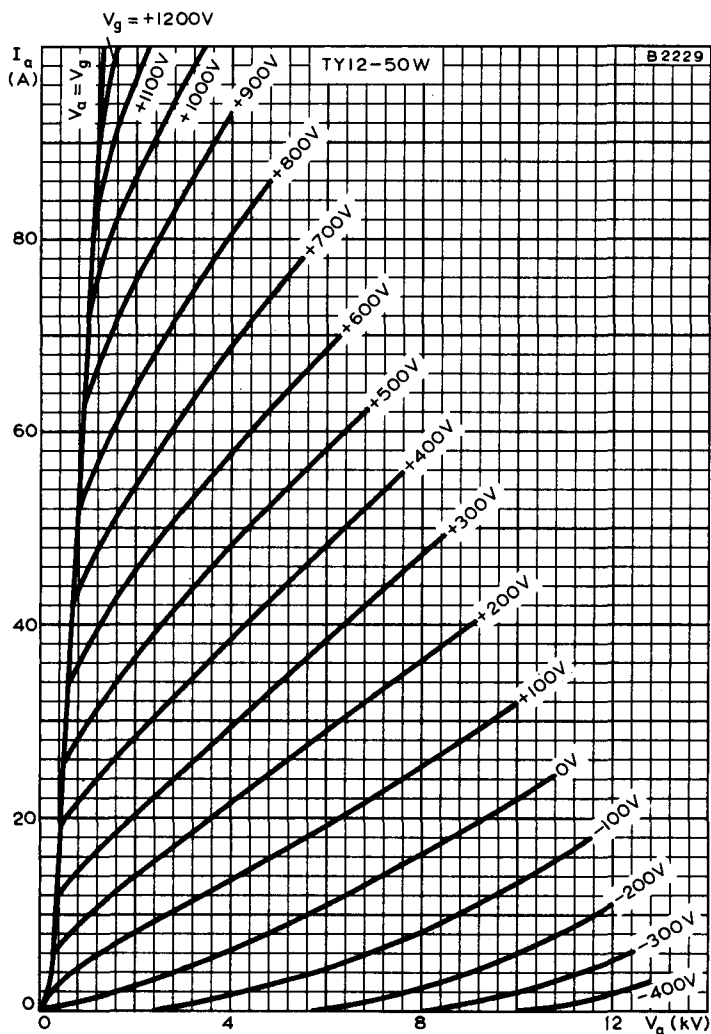
Note 2 Coupling for metal tubing with an outer diameter of 28mm (1.10in).

Note 3 To remove the valve from its water jacket a free height of 420mm (16.54in) above the valve is required.

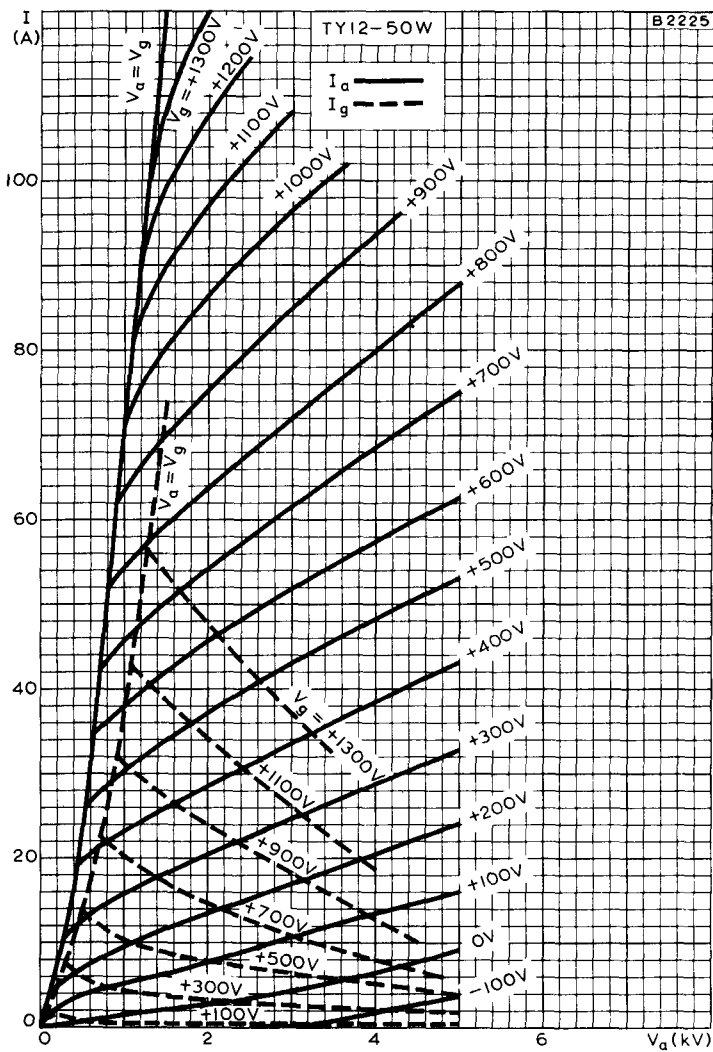


Valve mounted in water jacket

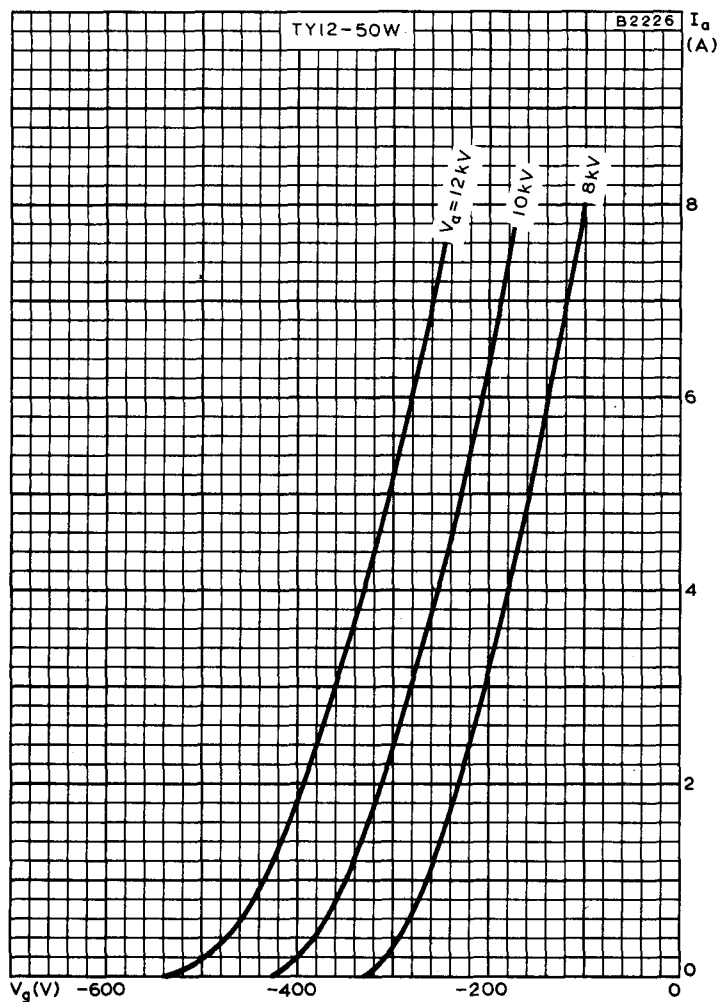




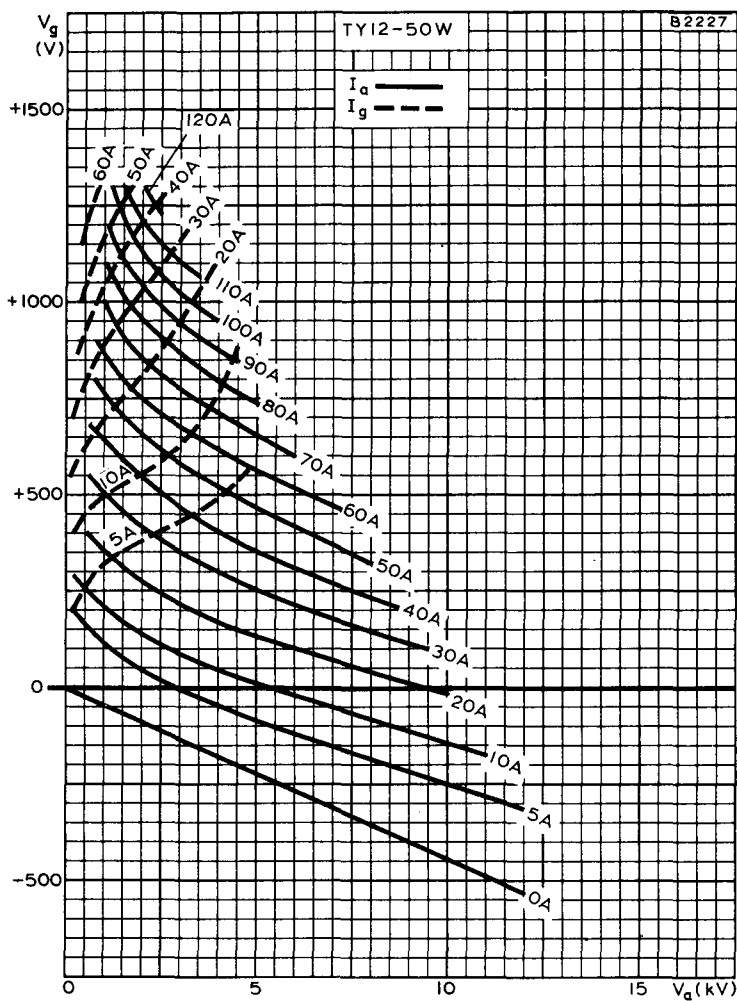
ANODE CURRENT PLOTTED AGAINST ANODE VOLTAGE
WITH GRID VOLTAGE AS PARAMETER



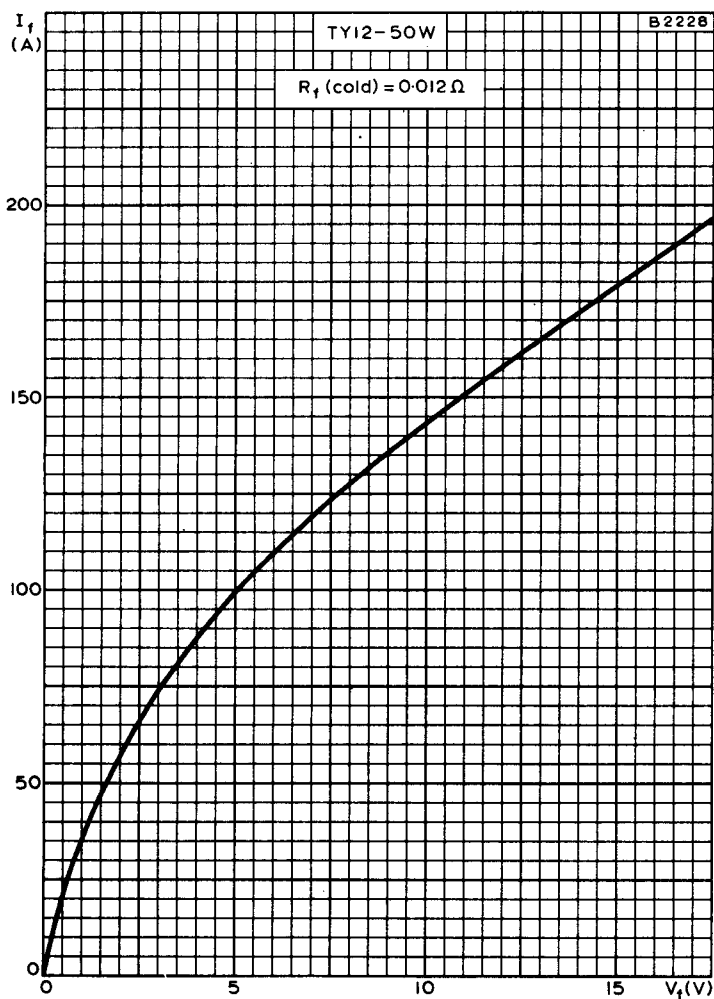
ANODE AND GRID CURRENT PLOTTED AGAINST ANODE VOLTAGE
WITH GRID VOLTAGE AS PARAMETER



ANODE CURRENT PLOTTED AGAINST GRID VOLTAGE
WITH ANODE VOLTAGE AS PARAMETER



CONSTANT CURRENT CHARACTERISTICS



FILAMENT CURRENT PLOTTED AGAINST FILAMENT VOLTAGE

QUICK REFERENCE DATA

Triode for use as r.f. or a.f. power amplifier or oscillator.
The TY12-50A is forced-air cooled.
The TY12-50W is water cooled by means of a separate jacket.
The TY12-50H has an integral helical water cooler.

	Audio Amplifier or Modulator, Class 'B'	Telephony Class 'B' (TY12-50H)	Anode Modulation Class 'C'	Telegraphy or F.M. Telephony, Class 'C'	
f	-	15	30	30	Mc/s
P _{out}	202	51.5	31	50	kW
f max.	-	30	30	30	Mc/s
V _a max.					
f < 4Mc/s	15	15	-	15	kV
f < 15Mc/s	-	13.5	10	13.5	kV
p _a max.					
TY12-50A	45	-	30	45	kW
TY12-50W/H	50	100	30	50	kW

Unless otherwise stated, data is applicable to all types

To be read in conjunction with

GENERAL OPERATIONAL RECOMMENDATIONS - TRANSMITTING VALVES

TELEGRAPHY OR F.M. TELEPHONY, CLASS 'C'

OPERATING CONDITIONS

f	15	20	25	27.5	30	Mc/s
P _{out}	108	94.5	70	59	50	kW
P _{load}	86.4	75.6	56	47.2	40	kW
η_a	75	75	75	75	75	%
V _a	12	12	11	10.5	10	kV
I _a	12	10.5	8.5	7.5	6.7	A
-V _{g1}	1000	1000	900	850	800	V
I _{g1}	2.25	2.0	1.6	1.5	1.4	A
v _{in(pk)}	1.7	1.65	1.45	1.35	1.3	kV
P _{load(driver)}	3.5	3.0	2.1	1.9	1.7	kW
p _a	36	31.5	23.5	20	17	kW

ANODE MODULATION, CLASS 'C'

OPERATING CONDITIONS (Carrier conditions for 100% modulation)

f	15	20	25	27.5	30	Mc/s
P _{out}	68	54.5	42.5	36.5	31	kW
P _{load}	52	42	32.8	28	24	kW
η_a	80	78	76	75	74	%
V _a	10	10	9.0	8.5	8.0	kV
I _a	8.5	7.0	6.2	5.7	5.25	A
-V _{g1}	1050	1050	925	900	850	V
I _{g1}	2.6	2.0	2.0	1.9	1.8	A
v _{in(pk)}	1.75	1.65	1.5	1.45	1.4	kV
P _{load(driver)}	4.1	3.0	2.7	2.5	2.3	kW
p _a	17	15.5	13.5	12	11	kW

For 100% modulation

P _{mod}	42.5	35	28	24.5	21	kW
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TELEPHONY, CLASS 'B'

OPERATING CONDITIONS for TY12-50W and TY12-50H

f	15	Mc/s
P _{out}	51.5	kW
P _{load}	41.2	kW
η_a	35	%
V _a	12	kV
I _a	12.2	A
-V _{g1}	420	V
v _{in(pk)}	700	V
p _a	94.5	kW

For 100% modulation

P _{drive}	5.7	kW
I _{g1}	4.5	A

R. F. POWER TRIODE

TY12-50A
TY12-50W
TY12-50H

AUDIO AMPLIFIER OR MODULATOR, CLASS 'B'

OPERATING CONDITIONS (2 valves in push-pull)

P_{out}	202	116	77	kW
R_{a-a}	1.2	1.5	2.06	k Ω
V_a	12	10	10	kV
$I_{a(o)}$	2×650	2×500	2×200	mA
$I_{a(max.sig.)}$	2×12	2×7.9	2×5.4	A
$-V_{g1}$	450	375	400	V
I_{g1}	2×2.5	2×1.9	2×0.7	A
$V_{in(g-g) r.m.s.}$	1457	1189	1033	V
$P_{load(driver)}$	2×2.4	2×1.44	2×0.5	kW
p_a	2×43	2×21	2×15.5	kW
η_a	70	75	71	%

P_{out}	62	54	46.8	kW
R_{a-a}	2.08	2.12	2.21	k Ω
V_a	9.0	8.5	8.0	kV
$I_{a(o)}$	2×250	2×250	2×250	mA
$I_{a(max.sig.)}$	2×4.8	2×4.4	2×4.1	A
$-V_{g1}$	350	325	300	V
I_{g1}	2×0.65	2×0.55	2×0.4	A
$V_{in(g-g)r.m.s.}$	920	849	792	V
$P_{load(driver)}$	2×0.4	2×0.3	2×0.25	kW
p_a	2×12.2	2×10.4	2×9.4	kW
η_a	72	72	71	%

RATINGS (ABSOLUTE MAXIMUM SYSTEM)

	A.F. Class 'B'	Telephony Class 'B'	Telephony Class 'C'	Telegraphy Class 'C'	
	TY12-50W/H				
f max.	-	30	30	30	Mc/s
V_a max.					
$f < 4\text{Mc/s}$	15	15	-	15	kV
$f < 15\text{Mc/s}$	-	13.5	10	13.5	kV
$-V_g$ max.	-	-	1.2	1.2	kV
I_a max.	12	12.5	10.5	12	A
p_a max.					
TY12-50A	45	-	30	45	kW
TY12-50W/H	50	100	30	50	kW
I_g max.	-	-	3.5	3.0	A
R_{g-f} max.	20	-	-	-	k Ω

CATHODE

Directly heated, thoriated tungsten.

V_f	17.5	V
$*I_f$	196	A
r_f (cold)	0.012	Ω

*The filament current must never exceed a peak value of 420A at any time during the initial energising schedule.

The total filament current is shared between three terminals and it is important to ensure that the connections to these terminals and to the supply busbars are securely made and have negligible contact resistance. The filament limbs are internally connected in parallel and a faulty external connection could cause a high current in the other terminals leading to excessive heating of the glass seals.

When connecting the filament the three pins of each group must be joined.

CAPACITANCES

c_{out}	3.4	pF
c_{in}	116	pF
c_{a-g}	86	pF

CHARACTERISTICS (measured at $V_a = 10\text{kV}$, $I_a = 5\text{A}$)

g_m	50	mA/V
μ	27	
g_m max. (at $V_a = 3\text{kV}$, $I_a = 50\text{A}$)	92	mA/V

MOUNTING POSITION

Vertical, anode down

COOLING

TY12-50A

Forced-air cooled

Maximum seals temperature

180 °C

The amount of forced-air cooling required for this valve depends upon the anode dissipation and the height above sea level. Typical values of inlet temperature, rate of flow of air and pressure difference between the inlet and outlet of the housing are given in the following table:

Anode dissipation	Height above sea level	Maximum inlet temperature	Minimum rate of air flow per minute	Pressure difference between inlet and outlet		
(kW)	(m)	(°C)	(ft ³) (m ³)	(mm H ₂ O)	(in H ₂ O)	
30	0	35	1236 35	114	4.49	
30	0	45	1412 40	143	5.63	
30	1500	35	1483 42	136	5.39	
30	3000	25	1554 44	132	5.20	
45	0	35	1907 54	275	10.83	
45	0	45	2207 62.5	335	13.19	
45	1500	35	2278 64.5	322	12.68	
45	3000	25	2401 68	319	12.56	

When operated at frequencies above 6Mc/s, special attention must be given to the temperatures of the anode and grid seals. They are cooled by air flowing through the slots provided at the top of the cooler housing. In certain cases, particularly at low anode dissipations and when cooling with the minimum quantity of air, the flow of air to the seals will not be sufficient to maintain the seal temperatures below the maximum permitted value at frequencies above 6Mc/s. In these cases, a larger quantity of air must be supplied.

When using the special filament connectors, together with connecting leads of adequate cross-section, it is not, as a rule, necessary to provide additional air cooling of the filament terminals. In order to ensure uniform distribution of current, care must be taken to ensure firm contact with the filament terminals.

Water cooled anode, low velocity air flow on seals.

Maximum temperatures

Seals	180	°C
Water inlet	50	°C

The amount of water cooling required for these valves depends upon the anode dissipation and the temperature of the water. Typical values of rate of flow of water and pressure loss are given in the following table:

Anode dissipation (kW)	Maximum inlet temperature (°C)	*Minimum rate of flow of water		Pressure loss
		(l/min)	(gal/min)	(atm)
30	20	25	5.5	0.15
30	50	45	9.9	0.45
50	20	32	7.0	0.25
50	50	65	14.3	0.85
100	20	55	12.1	0.6
100	50	120	26.4	3.0

*Rate of flow of water for temperatures between 20 and 50°C can be determined by linear interpolation.

In order to ensure that the maximum seals temperature (180°C) is not exceeded it may be necessary to direct a flow of air on to the seals. This flow of air must commence on or before the application of the filament voltage.

Anode and grid seals may 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 6Mc/s, air cooling will not normally be necessary. Above 6Mc/s air cooling must be used in order to prevent overheating of the anode and grid seals. At the maximum frequency (30Mc/s) and the published operating conditions at least 2.5m³(90ft³) per minute is required with a pressure loss of about 500mm (20in) of water.

When using the special filament connectors together with connecting leads of adequate cross-section it is not, as a rule, necessary to provide additional air cooling of the filament terminals. In order to ensure uniform distribution of current, care should be taken to ensure firm contact with the filament terminals.

R. F. POWER TRIODE

TY12-50A
TY12-50W
TY12-50H

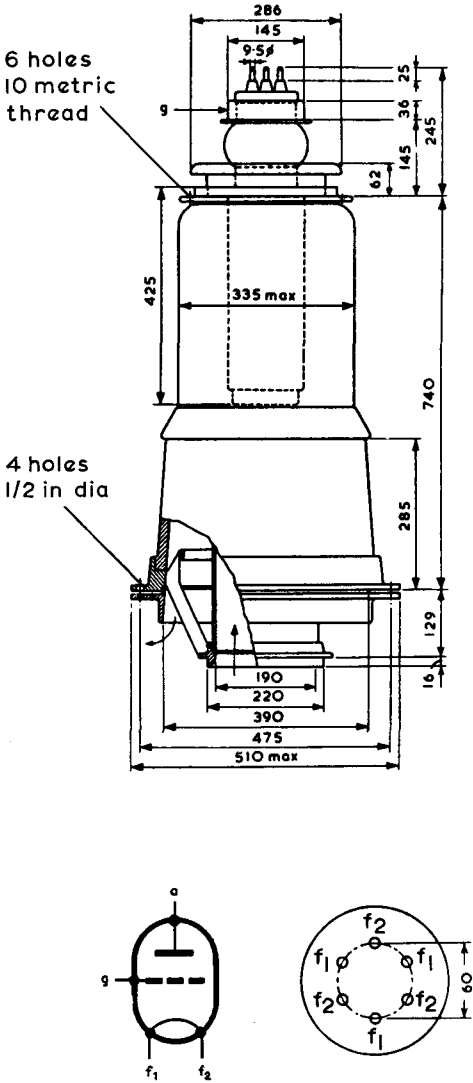
PHYSICAL DATA

	TY12-50A	TY12-50W	TY12-50H	
Weight of valve	63	31	42	lb
	28.5	14	19	kg
Weight of water jacket	-	45	-	lb
	-	20.5	-	kg
Weight of cooler housing	159	-	-	lb
	72	-	-	kg
Weight of valve plus carton	214	180	-	lb
	97	82	-	kg

ACCESSORIES

Cooler housing (TY12-50A)	K506
Water jacket (TY12-50W)	K714
Filament clips × 6	40628

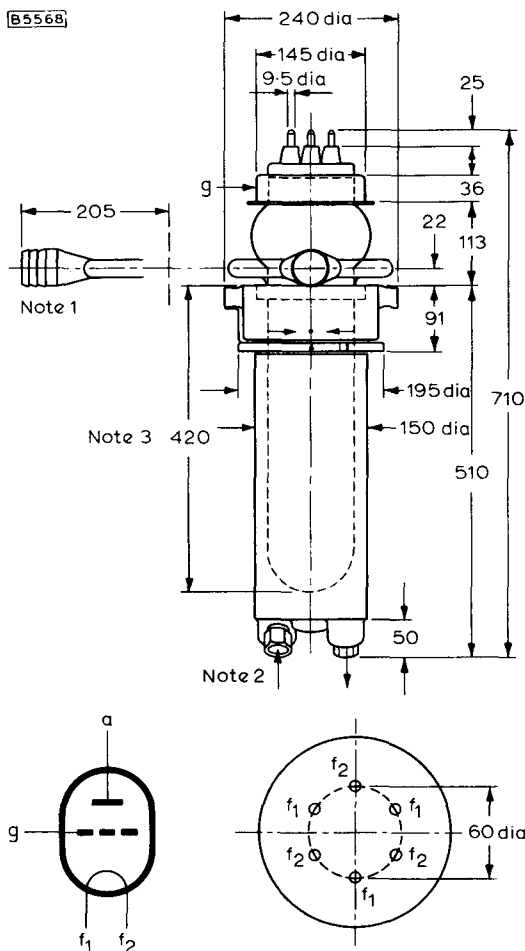
OUTLINE DRAWING OF TY12-50A MOUNTED IN COOLER HOUSING K506



All dimensions in mm

B 5619

OUTLINE DRAWING OF TY12-50W MOUNTED IN WATER JACKET K714

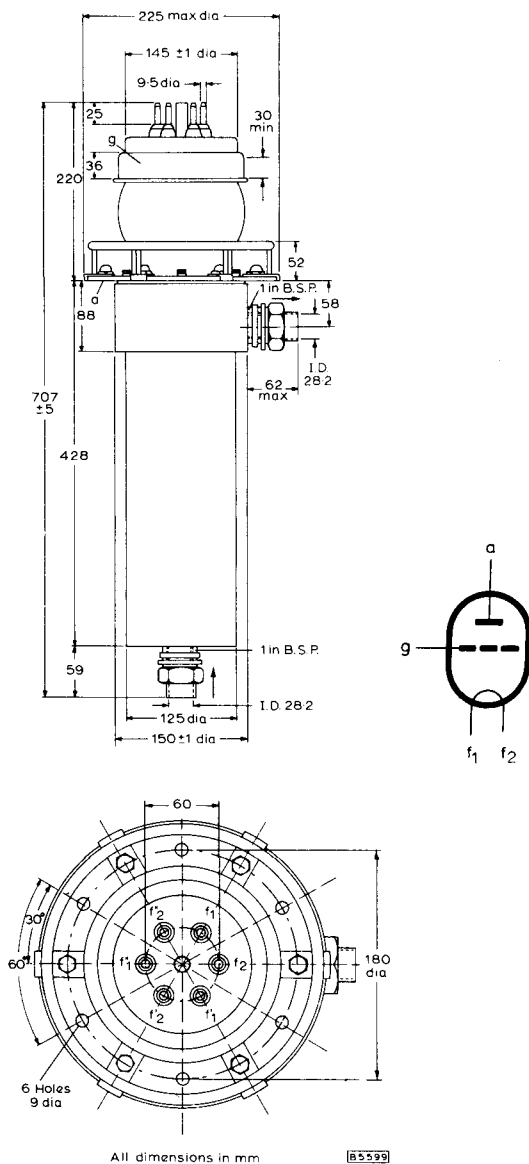


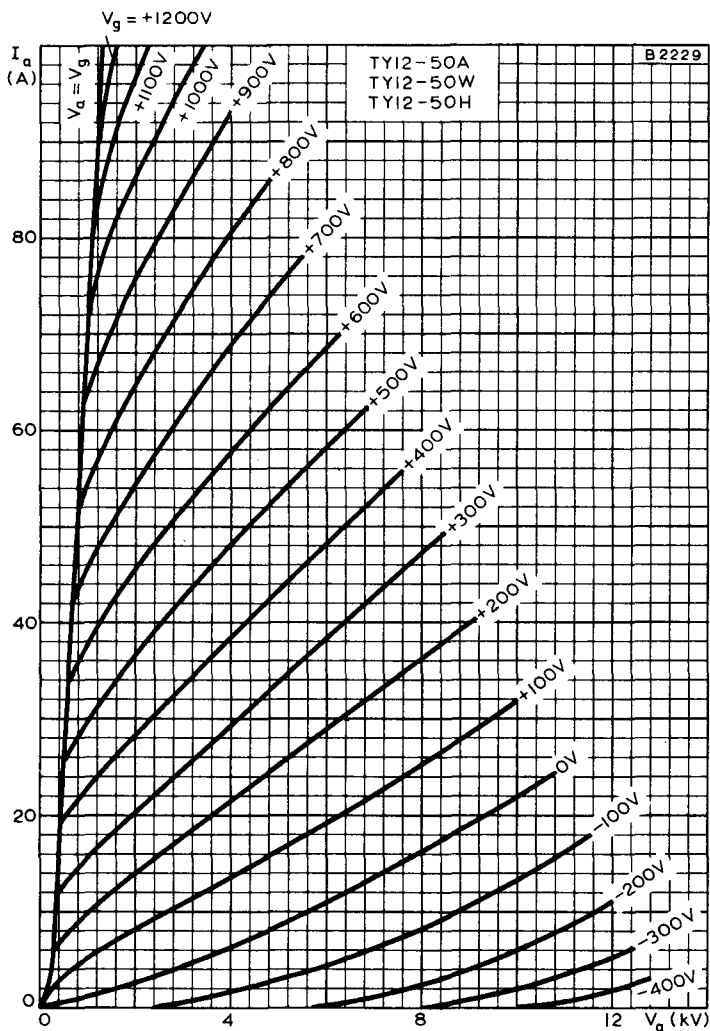
All dimensions in mm

Notes

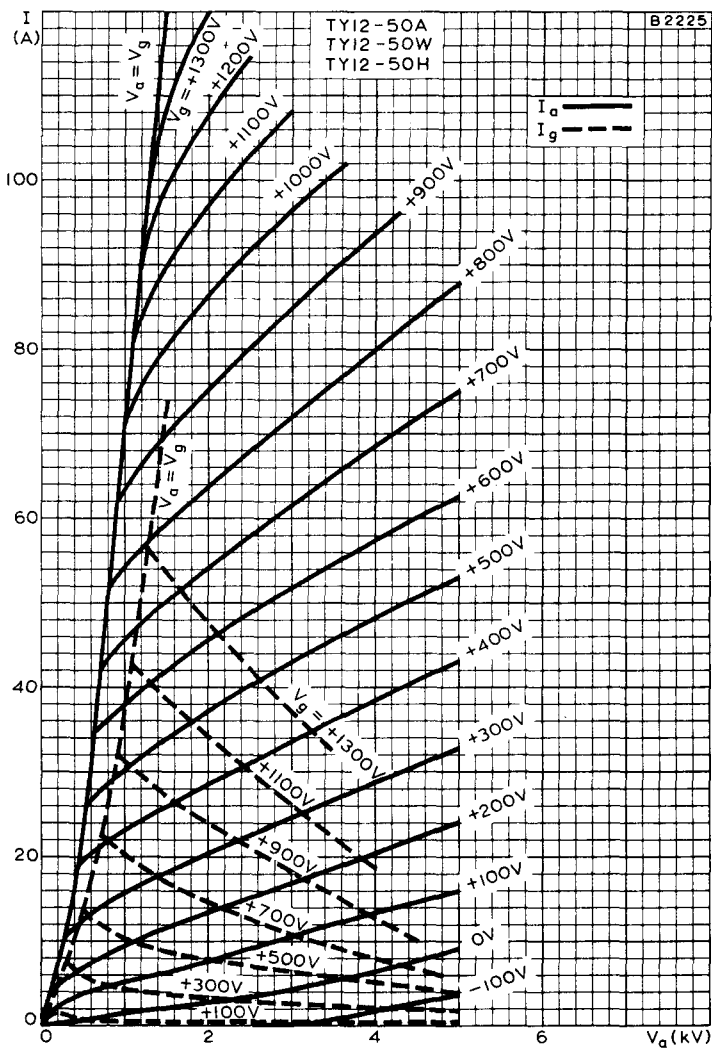
1. A connecting hose with an inner diameter of 44.5mm (1.75in) is required.
2. Coupling for metal tubing with an outer diameter of 28mm (1.10in).
3. To remove the valve from its water jacket a free height of 420mm (16.54in) above the valve is required.

OUTLINE DRAWING OF TY12-50H

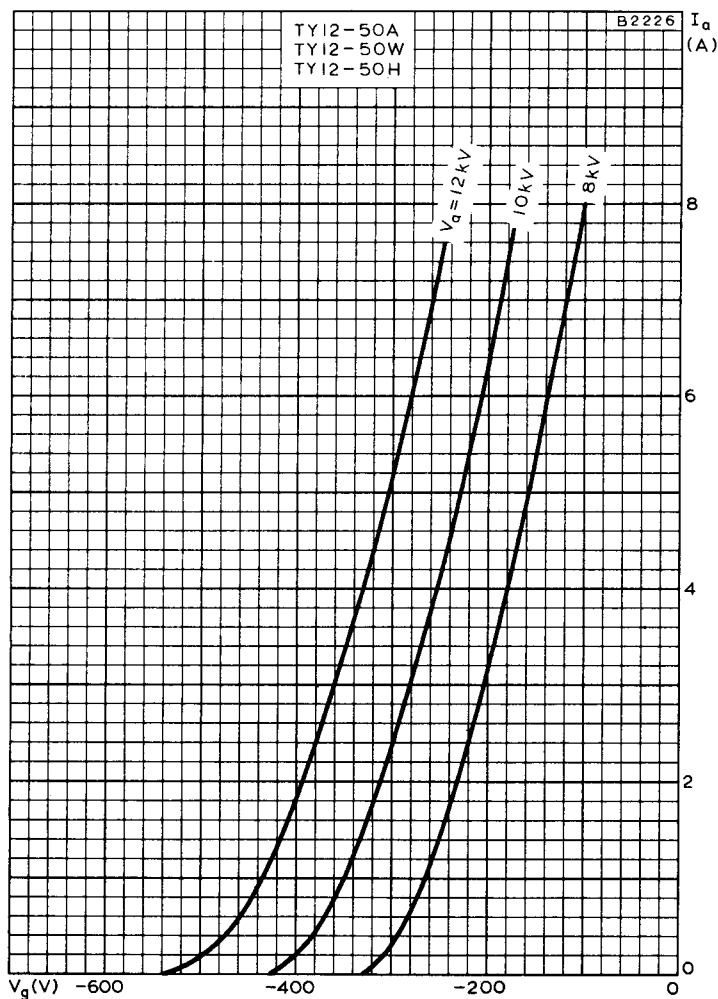




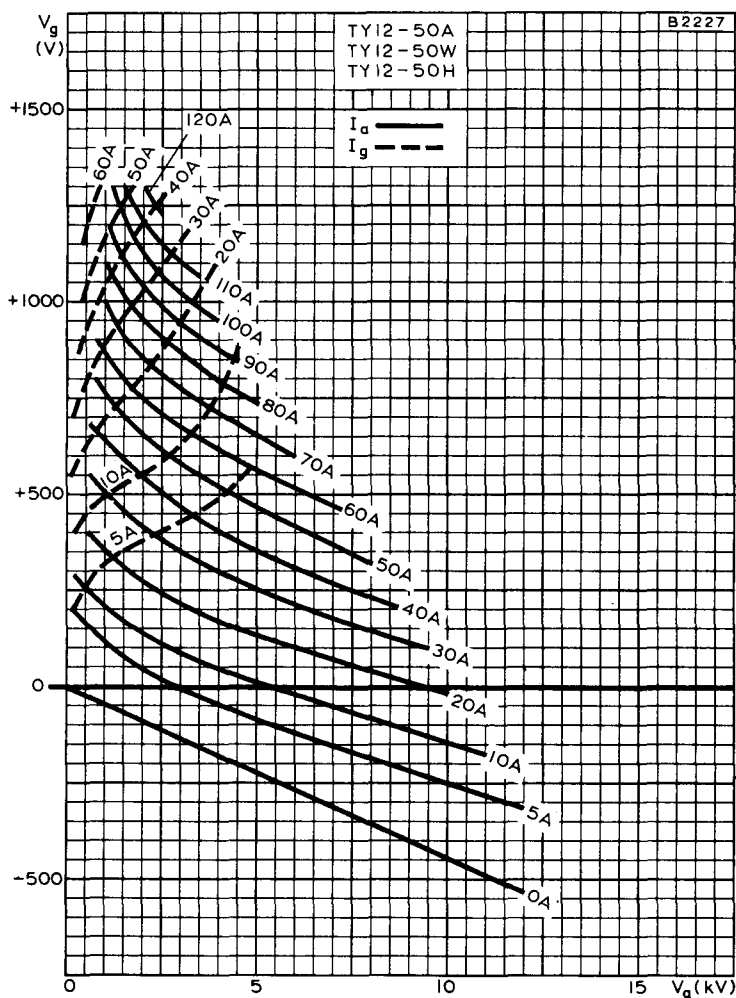
ANODE CURRENT PLOTTED AGAINST ANODE VOLTAGE
WITH GRID VOLTAGE AS PARAMETER



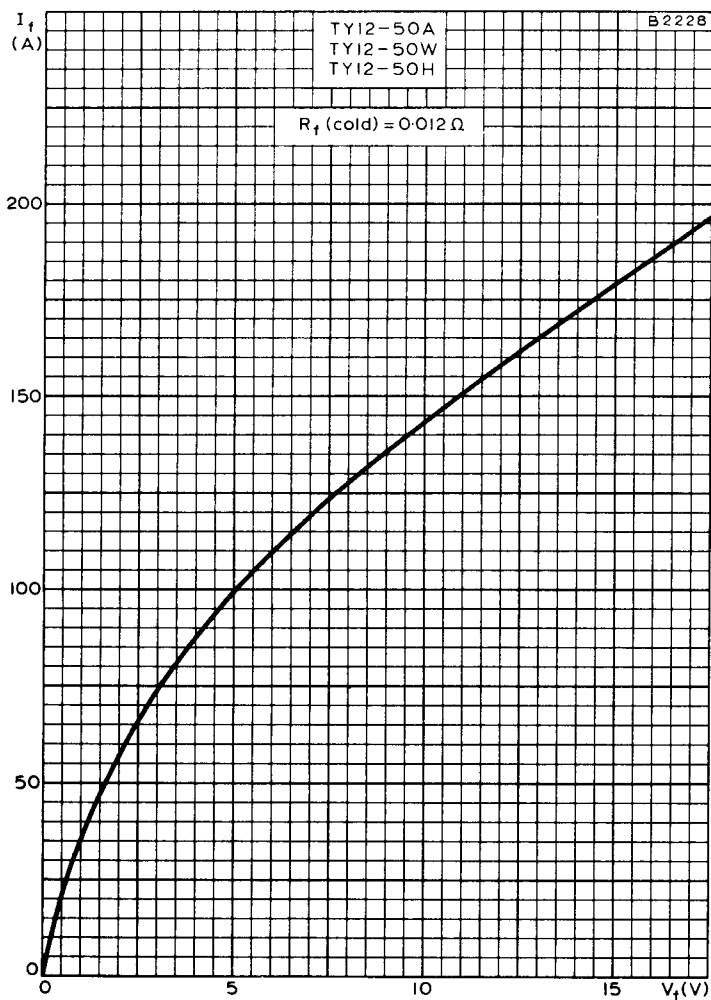
ANODE AND GRID CURRENT PLOTTED AGAINST ANODE VOLTAGE
WITH GRID VOLTAGE AS PARAMETER



ANODE CURRENT PLOTTED AGAINST GRID VOLTAGE
WITH ANODE VOLTAGE AS PARAMETER



CONSTANT CURRENT CHARACTERISTICS



FILAMENT CURRENT PLOTTED AGAINST FILAMENT VOLTAGE