

TRIODE

Application: R.F. industrial heating.
Power output: 39kW continuous rating.
Frequency: 30Mc/s at full rating.
Construction: External anode, forced air-cooled.

TY12-20A

PRELIMINARY DATA

This data should be read in conjunction with GENERAL OPERATIONAL RECOMMENDATIONS – TRANSMITTING VALVES included in this volume of the handbook.

FILAMENT Thoriated tungsten

V_f	8.0	V
I_f	130	A

The filament current must never exceed a surge value of 280A at any time during the warming up period. The filament has been designed to accept temporary voltage fluctuations of $\begin{matrix} +5\% \\ -10\% \end{matrix}$

MOUNTING POSITION

Vertical, anode down

CAPACITANCES

C_{a-g}	23.5	pF
C_{g-f}	42.5	pF
C_{a-f}	0.9	pF

CHARACTERISTICS (measured at $V_a = 12kV$, $I_a = 2A$)

g_m	25	mA/V
g_m (at $V_a = 1kV$, $I_a = 20A$)	30	mA/V
μ	21	

COOLING

Forced air-cooling

Max. temperature of seals	220	°C
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In order to keep within the temperature limits it may be necessary to direct a flow of air on to the seals. 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 housing are given overleaf.

Anode dissipation P_a	Height above sea-level h		Inlet temperature T_{in}	Min. rate of flow of air per minute		Pressure difference between inlet and outlet
(kW)	(km)	(ft)	(°C)	(m ³)	(ft ³)	(mm of H ₂ O)
7.0	0	0	35	6.6	235	10
7.0	0	0	45	7.7	270	13
7.0	1.5	4920	35	7.9	280	12
7.0	3.0	9840	25	8.3	295	12
10	0	0	35	10.5	370	23
10	0	0	45	12.3	435	31
10	1.5	4920	35	12.6	445	28
10	3.0	9840	25	13.2	465	27
15	0	0	35	18.1	640	60
15	0	0	45	21.2	750	79
15	1.5	4920	35	21.7	765	73
15	3.0	9840	25	22.8	805	70

CLASS 'C' OSCILLATOR

Anode supply from three-phase full-wave rectifier without smoothing filter

Limiting values (absolute ratings)

f max.	30	Mc/s
V_a max.	13	kV
I_a max.	4.8	A
V_g max.	-2.0	kV
I_g max.	1.5	A
P_a max.	15	kW
R_{g-f} max.	10	kΩ
P_g max.	1.1	kW

Operating conditions

f	30	30	30	Mc/s
$V_{tr(r.m.s.)}$	8.9	7.4	6.0	kV
V_a	12	10	8.0	kV
I_a	4.5	4.5	4.5	A
I_g	0.9	0.9	0.9	A
P_a	15	13.7	12.8	kW
η_a	72.5	70	64.5	%
R_{g-f}	1.1	1.0	0.9	kΩ
R_a	1500	1200	700	Ω
Feedback ratio	0.16	0.18	0.22	
P_{out}	39	31.3	23.2	kW
* P_{load}	33	26.6	19.7	kW

*0.85 ($P_{out} - P_{drive}$)



WEIGHT

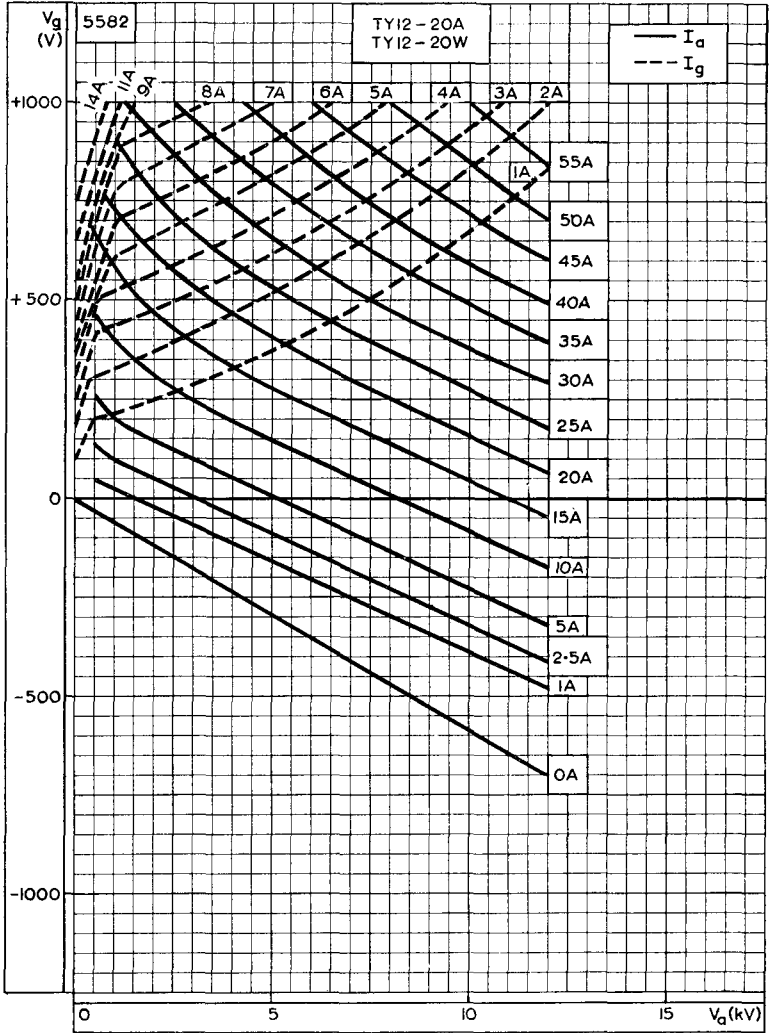
Valve only	{ 36	lbs
	{ 16.5	kg
Insulating pedestal	{ 20	lbs
	{ 9.0	kg
Shipping weight	{ 186	lbs
	{ 84.5	kg

ACCESSORIES

Insulating pedestal	40648
Grid connector	40663
Filament clips with lead	40662

TY12-20A

TRIODE



CONSTANT CURRENT CURVES



TRIODE

TY12-20A

Application: R.F. industrial heating.
Power output: 39kW continuous rating.
Frequency: 30Mc/s at full rating.
Construction: External anode, forced-air cooled.

This data should be read in conjunction with GENERAL OPERATIONAL RECOMMENDATIONS—TRANSMITTING VALVES which precede this section of the handbook.

FILAMENT Thoriated tungsten

V_f	8.0	V
I_f	130	A

The filament current must never exceed a surge value of 280A at any time during the warming up period. The filament has been designed to accept temporary voltage fluctuations of $\begin{smallmatrix} +5\% \\ -10 \end{smallmatrix}$

MOUNTING POSITION

Vertical, anode down

CAPACITANCES

C_{a-g}	23.5	pF
C_{g-f}	45	pF
C_{a-f}	900	mpF

CHARACTERISTICS (measured at $V_a = 12kV$, $I_a = 2A$)

g_m	25	mA/V
g_m (at $V_a = 1kV$, $I_a = 20A$)	30	mA/V
μ	21	

COOLING

Forced-air cooling		
Max. temperature of seals	220	°C

In order to keep within the temperature limits it may be necessary to direct a flow of air on to the seals. 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 housing are given overleaf.

Anode dissipation P_a	Height above sea-level h		Inlet temperature T_{in}	Min. rate of flow of air per minute		Pressure difference between inlet and outlet
(kW)	(km)	(ft)	(°C)	(m ³)	(ft ³)	(mm of H ₂ O)
7.0	0	0	35	6.6	235	10
7.0	0	0	45	7.7	270	13
7.0	1.5	4920	35	7.9	280	12
7.0	3.0	9840	25	8.3	295	12
10	0	0	35	10.5	370	23
10	0	0	45	12.3	435	31
10	1.5	4920	35	12.6	445	28
10	3.0	9840	25	13.2	465	27
15	0	0	35	18.1	640	60
15	0	0	45	21.2	750	79
15	1.5	4920	35	21.7	765	73
15	3.0	9840	25	22.8	805	70

CLASS 'C' OSCILLATOR

Anode supply from three-phase full-wave rectifier without smoothing filter

Absolute maximum ratings

f max.	30	Mc/s
V_a max.	13	kV
I_a max.	5.0	A
V_g max.	-2.0	kV
I_g max.	1.5	A
P_a max.	20	kW ←
R_{g-f} max.	10	kΩ
P_g max.	1.1	kW

Operating conditions

f	30	30	30	Mc/s
$V_{tr(r.m.s.)}$	8.9	7.4	6.0	kV
V_a	12	10	8.0	kV
I_a	4.5	4.5	4.5	A
I_g	0.9	0.9	0.9	A
P_a	15	13.7	12.8	kW
η_a	72.5	70	64.5	%
R_{g-f}	1.1	1.0	0.9	kΩ
R_a	1450	1100	800	Ω
Feedback ratio	0.16	0.19	0.24	
P_{out}	39	31.2	23.2	kW
P_{load}	33	26.6	19.7	kW

CLASS 'B' A.F.



Absolute maximum ratings

V_a max.	13	kV
I_a max.	4.8	A
p_a max.	20	kW
R_{g-f} max.	10	k Ω

Operating conditions

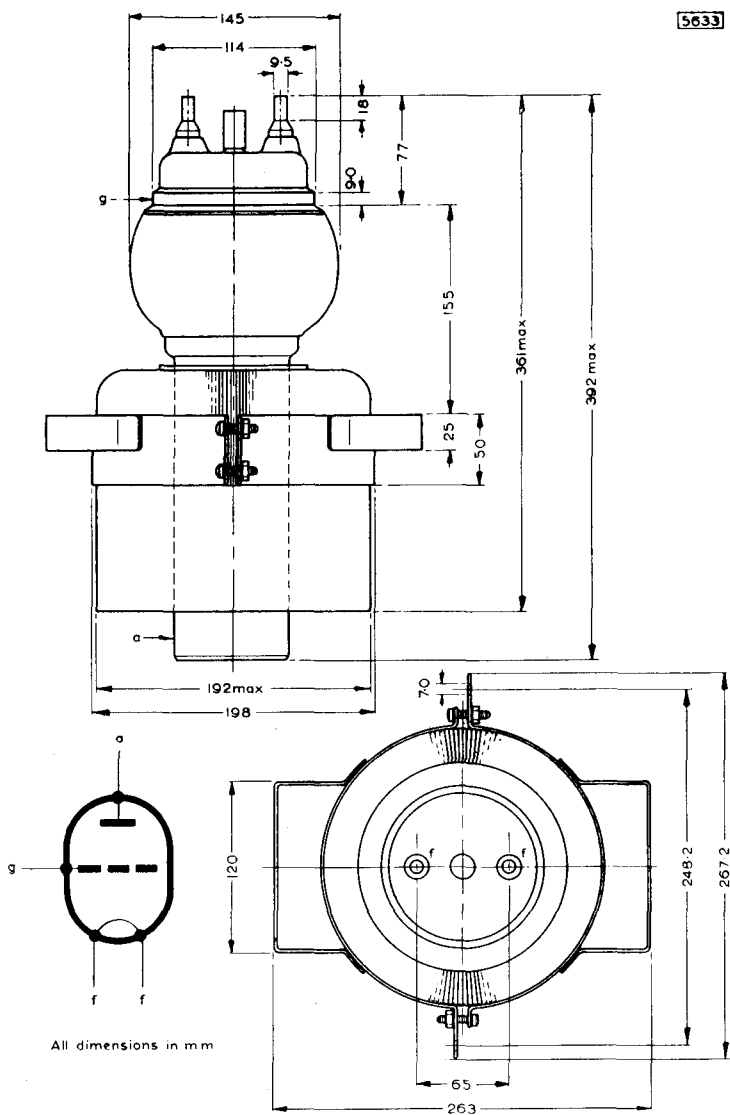
V_a	8.0	10	12	kV
$I_{a(n)}$	2 $\times$ 350	2 $\times$ 400	2 $\times$ 450	mA
I_a (max. sig.)	2 $\times$ 4.2	2 $\times$ 4.2	2 $\times$ 3.8	A
V_g	-420	-500	-550	V
$V_{in(g-g)}$ (r.m.s.)	1.24	1.32	1.35	kV
I_g	2 $\times$ 825	2 $\times$ 700	2 $\times$ 630	mA
P_{load} (driver)	2 $\times$ 680	2 $\times$ 640	2 $\times$ 610	W
p_a	12.6	14.8	14.9	kW
η_a	62	65	67	%
R_{a-a}	2.07	2.6	3.73	k Ω
P_{out}	42	54.5	61.5	kW

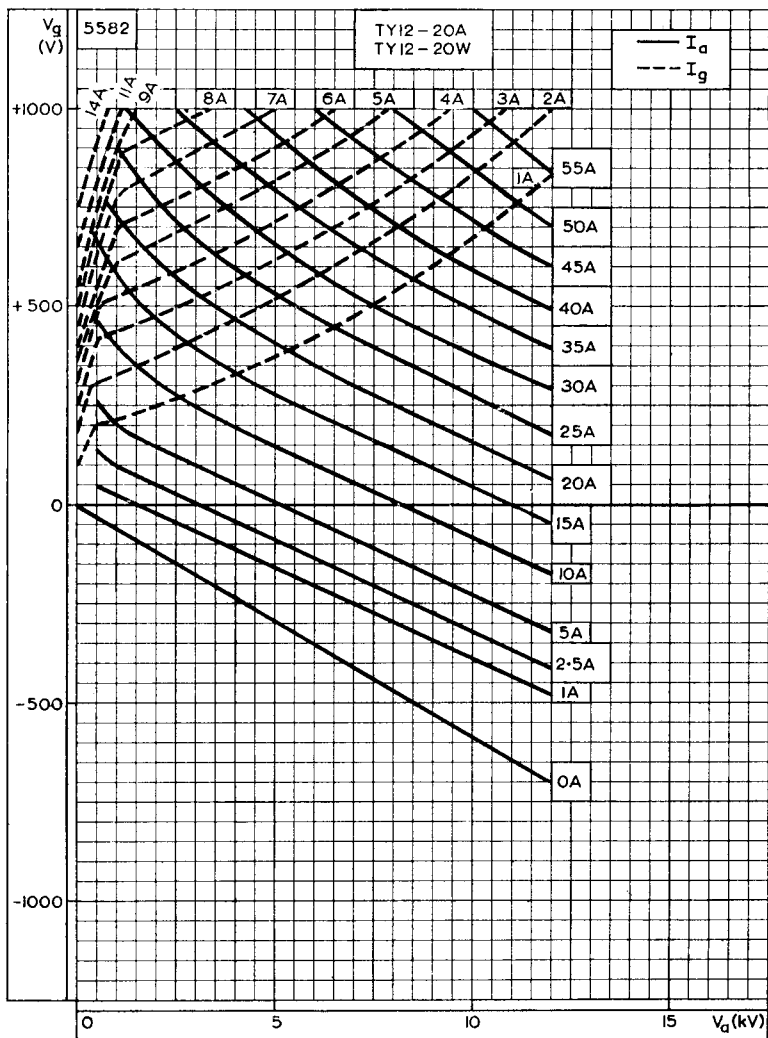
WEIGHT

Weight of valve	{ 35.5	lb
	{ 16.1	kg
Weight of valve plus carton	{ 121.5	lb
	{ 55.1	kg
Weight of insulating pedestal	{ 15.8	lb
	{ 7.15	kg
Weight of insulating pedestal plus carton	{ 21.2	lb
	{ 9.6	kg

ACCESSORIES

Insulating pedestal	40648
Grid connector	40663
Filament clips with lead	40662





CONSTANT CURRENT CURVES

TRIODE

TY12-20W

Application: R.F. industrial heating.
Power Output: 39kW continuous rating.
Frequency: 30Mc/s at full rating.
Construction: External anode, water-cooled.

PRELIMINARY DATA

This data should be read in conjunction with GENERAL OPERATIONAL RECOMMENDATIONS—TRANSMITTING VALVES included in this volume of the handbook.

FILAMENT Thoriated tungsten

V_f	8.0	V
I_f	130	A

The filament current must never exceed a surge value of 280A at any time during the warming up period. The filament has been designed to accept temporary voltage fluctuations of $\begin{smallmatrix} +5\% \\ -10\% \end{smallmatrix}$

MOUNTING POSITION

Vertical, anode down

CAPACITANCES

C_{a-g}	23.5	pF
C_{g-f}	42.5	pF
C_{a-f}	0.9	pF

CHARACTERISTICS (measured at $V_a = 12\text{kV}$, $I_a = 2\text{A}$)

g_m	25	mA/V
g_m (at $V_a = 1.0\text{kV}$, $I_a = 20\text{A}$)	30	mA/V
μ	21	

COOLING

Water cooling

Max. temperature of seals	220	°C
Max. inlet temperature of water	50	°C

Typical values of inlet temperature, rate of flow of water, and pressure difference between the inlet and outlet housing at various anode dissipations are given overleaf.

Anode dissipation P_a	Inlet temperature T_{in}	Rate of flow of water per minute		Pressure difference between inlet and outlet
(kW)	(°C)	(litres)	(gal)	(atm)
5.0	20	6.0	1.5	0.02
5.0	50	15	3.5	0.22
10	20	11	2.5	0.1
10	50	25	5.5	0.7
15	20	16	3.5	0.25
15	50	37	8.0	1.3
20	20	22	5.0	0.5
20	50	49	10.5	2.3

At inlet temperatures between 20 and 50°C the required quantity of water can be found by linear interpolation. In order to keep within the temperature limits it is necessary to direct a flow of air on to the seals. The air flow should be started at the application of filament voltage.

WEIGHT

Valve only	{ 7.0 lbs 3.0 kg
Shipping weight	{ 83 lbs 37.7 kg
Water jacket	{ 4.5 lbs 2.1 kg

ACCESSORIES

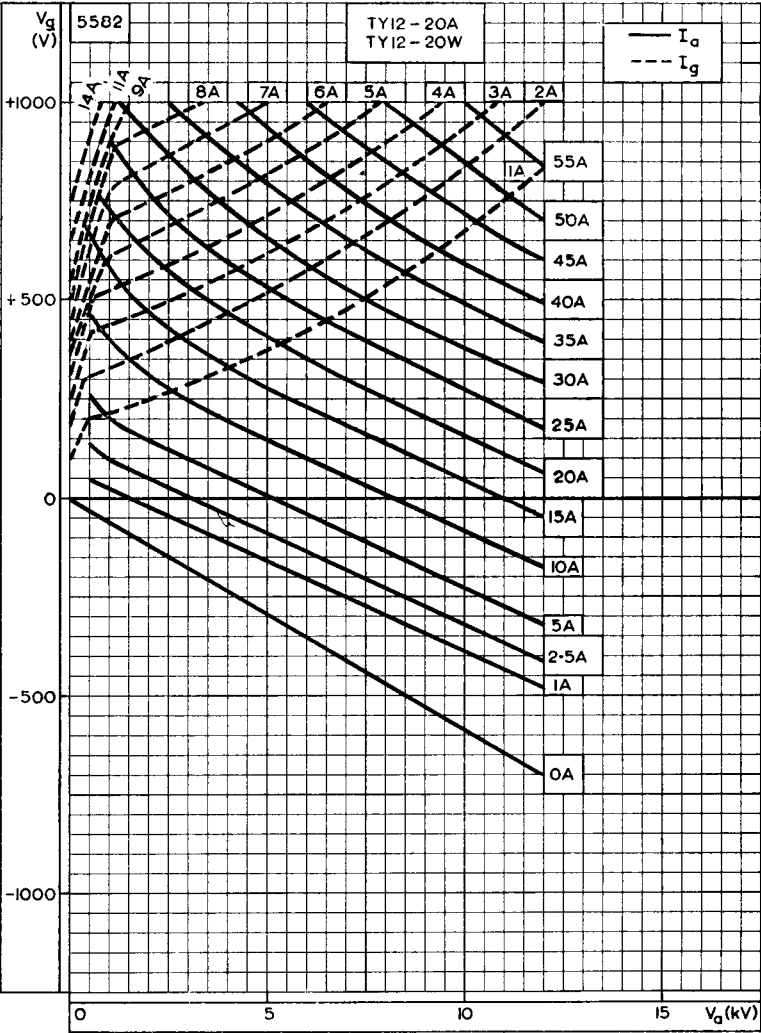
Water jacket	K717
Grid connector	40663
Filament clips with lead	40662

The characteristics, operating conditions, limiting values and curves are identical with those given for the TY12-20A but for the following difference:

P_a max. 20 kW

TY12-20W

TRIODE



CONSTANT CURRENT CURVES



QUICK REFERENCE DATA

External anode triodes intended for use as r.f. oscillators or a.f. power amplifiers.

The TY12-20A is forced-air cooled, and the TY12-20W is water cooled.

	Class 'C' industrial oscillator	Class 'B' A.F.	
f max.	30	—	Mc/s
V _a max.	13	13	kV
p _a max.	20	20	kW
Performance			
f	30	—	Mc/s
P _{out}	39	61.5	kW

Unless otherwise shown, data is applicable to both types

This data should be read in conjunction with GENERAL OPERATIONAL RECOMMENDATIONS—TRANSMITTING VALVES which precede this section of the handbook.

INDUSTRIAL OPERATION AS CLASS 'C' OSCILLATOR

Absolute maximum ratings

f max.	30	Mc/s
V _a max.	13	kV
I _a max.	5.0	A
-V _g max.	2.0	kV
I _g max.	1.5	A
p _a max.	20	kW
R _g max.	10	kΩ
p _g max.	1.1	kW

Typical operating conditions

f	30	30	30	Mc/s
V _a	12	10	8.0	kV
V _{tr} (r.m.s.)	8.9	7.4	6.0	kV
I _a	4.5	4.5	4.5	A
I _g	0.9	0.9	0.9	A
p _a	15	13.7	12.8	kW
η _a	72.5	70	64.5	%
R _g -f	1.1	1.0	0.9	kΩ
R _a	1450	1100	800	Ω
Feedback ratio $\frac{V_{in(pk)}}{V_{a(pk)}}$	0.16	0.19	0.24	
P _{out}	39	31.3	23.2	kW
P _{load}	33	26.6	19.7	kW

TY12-20A TY12-20W

R.F. POWER TRIODE

CLASS 'B' A.F.

Absolute maximum ratings

V_a max.	13	kV
I_a max.	4.8	A
P_a max.	20	kW
R_{g-f} max.	10	k Ω

Typical operating conditions

V_a	8.0	10	12	kV
$I_{a(o)}$	2 $\times$ 350	2 $\times$ 400	2 $\times$ 450	mA
I_a (max. signal)	2 $\times$ 4.2	2 $\times$ 4.2	2 $\times$ 3.8	A
$-V_g$	420	500	550	V
$V_{in(g-g)r.m.s.}$	1.24	1.32	1.35	kV
I_g	2 $\times$ 825	2 $\times$ 700	2 $\times$ 630	mA
$P_{load(driver)}$	2 $\times$ 680	2 $\times$ 640	2 $\times$ 610	W
P_a	12.6	14.8	14.9	kW
η_a	62	65	67	%
K_{a-a}	2.07	2.6	3.73	k Ω
P_{out}	42	54.5	61.5	kW

CATHODE

Thoriated tungsten

** V_f	8.0	V
* I_f	130	A

*The filament current must never exceed a surge value of 280A at any time during the warming-up period.

**The filament has been designed to accept temporary variations in supply voltage of +5% and -10%.

MOUNTING POSITION

Vertical, anode down

CAPACITANCES

C_{a-g}	23.5	pF
C_{g-f}	42.5	pF
C_{a-f}	0.9	pF

CHARACTERISTICS (Measured at $V_a = 12$ kV, $I_a = 2$ A)

g_m	25	mA/V
μ	21	
g_m (Measured at $V_a = 1$ kV, $I_a = 20$ A)	30	mA/V

COOLING**TY12-20A**

Forced-air cooling

 $T_{\text{seals max.}}$

220 °C

In order to keep within the temperature limits it may be necessary to direct a flow of air on to the seals. 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 housing are given below.

Anode dissipation P_a	Height above sea-level h		Inlet temperature T_{in}	Min. rate of flow of air per minute		Pressure difference between inlet and outlet (mm of H_2O)
(kW)	(km)	(ft)	(°C)	(m^3)	(ft^3)	
7.0	0	0	35	6.6	235	10
7.0	0	0	45	7.7	270	13
7.0	1.5	4920	35	7.9	280	12
7.0	3.0	9840	25	8.3	295	12
10	0	0	35	10.5	370	23
10	0	0	45	12.3	435	31
10	1.5	4920	35	12.6	445	28
10	3.0	9840	25	13.2	465	27
15	0	0	35	18.1	640	60
15	0	0	45	21.2	750	79
15	1.5	4920	35	21.7	765	73
15	3.0	9840	25	22.8	805	70

TY12-20A TY12-20W

R.F. POWER TRIODE

TY12-20W

Water cooling

$T_{\text{seals max.}}$

220 °C

$T_{\text{inlet max.}}$

50 °C

Typical values of inlet temperature, rate of flow of water, and pressure difference between the inlet and outlet housing at various anode dissipations are given below.

Anode dissipation P_a (kW)	Inlet temperature T_{in} (°C)	Rate of flow of water per minute		Pressure difference between inlet and outlet (atm)
5.0	20	6.0	1.5	0.02
5.0	50	15	3.5	0.22
10	20	11	2.5	0.1
10	50	25	5.5	0.7
15	20	16	3.5	0.25
15	50	37	8.0	1.3
20	20	22	5.0	0.5
20	50	49	10.5	2.3

At inlet temperatures between 20 and 50°C the required quantity of water can be found by linear interpolation. In order to keep within the temperature limits it is necessary to direct a flow of air on to the seals. The air flow should be started at the application of filament voltage.

PHYSICAL DATA

	TY12-20A	TY12-20W	
Weight of valve	{ 35.5	7.0	lb
	{ 16.1	3.0	kg
Weight of valve plus carton	{ 121.5	83	lb
	{ 55.1	37.7	kg
Weight of insulating pedestal (TY12-20A)		{ 15.8	lb
		{ 7.15	kg
Weight of water jacket (TY12-20W)		{ 4.5	lb
		{ 2.1	kg

ACCESSORIES

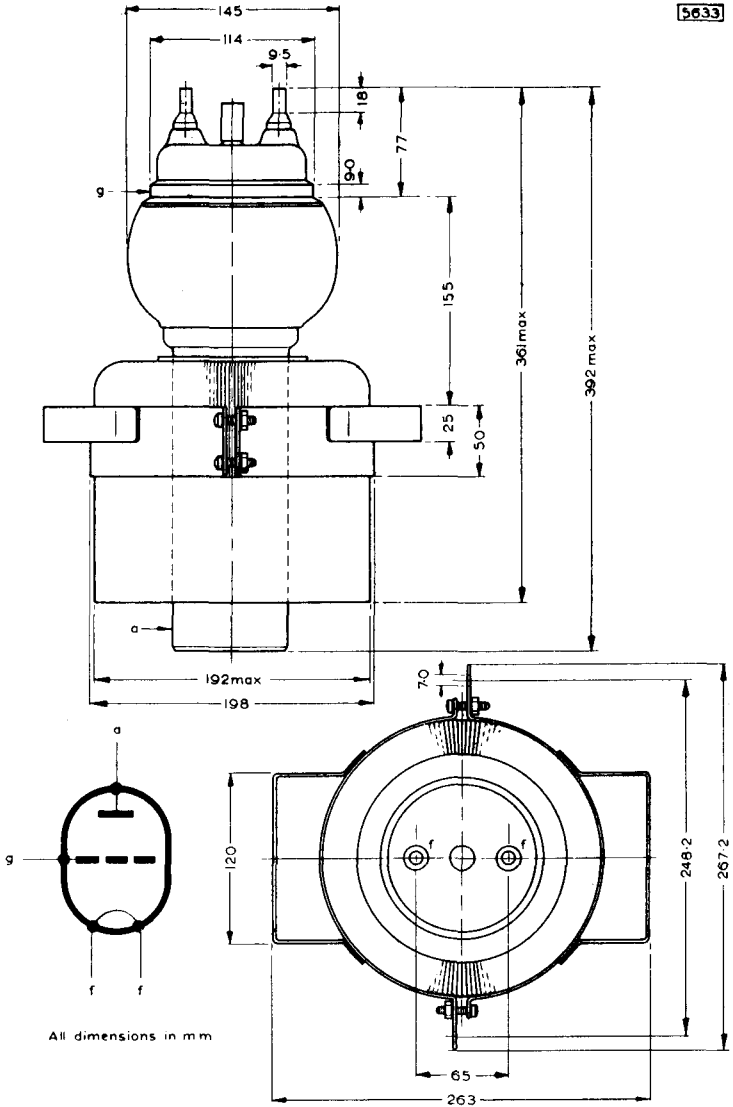
Insulating pedestal (TY12-20A)	40648
Water jacket (TY12-20W)	K722
Grid connector	40663
Filament clips with lead	40662
Rubber gasket	89 039 48

R.F. POWER TRIODE

TY12-20A TY12-20W

TY12-20A

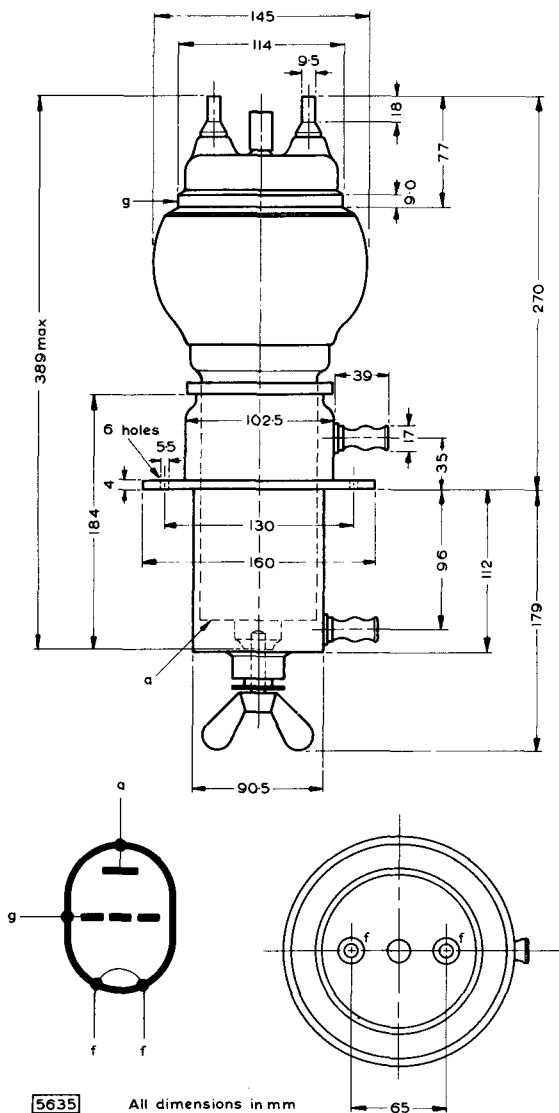
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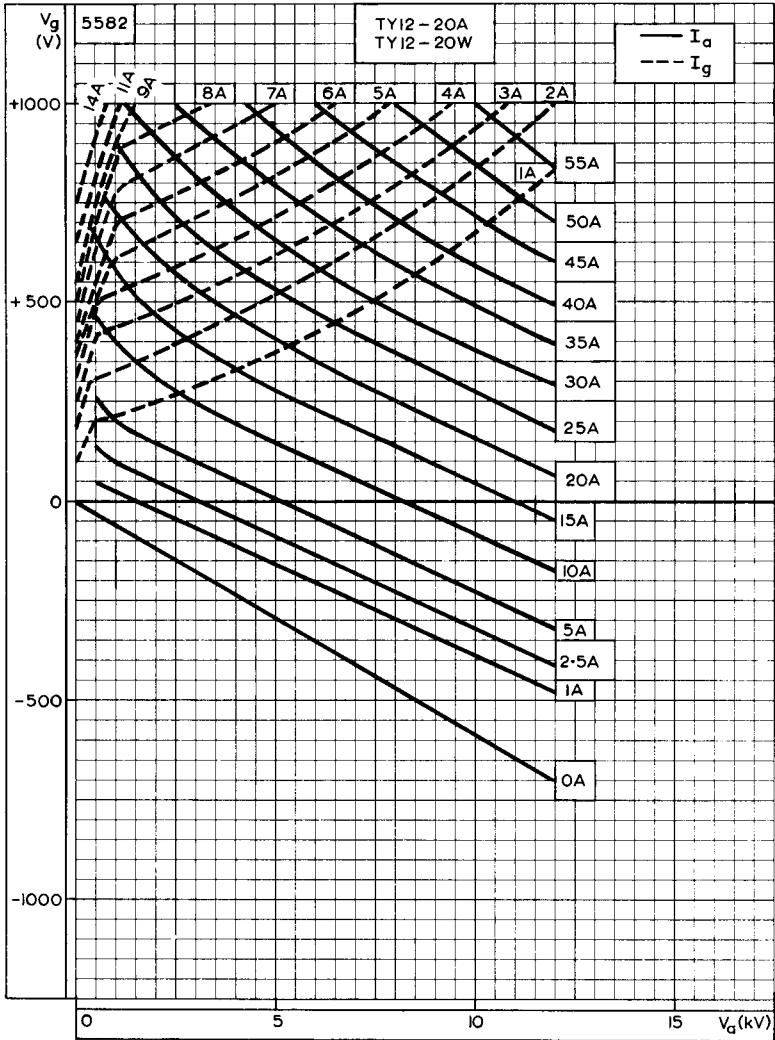
TY12-20A TY12-20W

R.F. POWER TRIODE

TY12-20W



TY12-20A
TY12-20W



CONSTANT CURRENT CURVES

