V.H.F. POWER TRIODE

TY6-5000W

High power water cooled triode rated for a maximum anode dissipation of 6kW. Primarily intended for use in v.h.f. transmitters.

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	12.6	V
I_f	33	A

The connection f_{ct} is intended for use as the cathode current return and is not an electrical centre tap and must not be used for filament current supply. At frequencies above 30Mc/s all three filament pins should be interconnected with suitable capacitors.

The connections to the filament pins and to the supply bus-bars must be securely made and have negligible contact resistance.

MOUNTING POSITION

Vertical, with anode downwards

CAPACITANCES

C_{in}	16	pF
C_{out}	0.3	pF
C_{a-g}	11	pF

CHARACTERISTICS (measured at V_a=4kV, I_a=1.0A)

g_m	17	mA/V
μ	32	

COOLING

Maximum temperature of anode and grid seals	180	°C
Maximum inlet temperature of water	50	°C

TY6-5000W

V.H.F. POWER TRIODE

High power water cooled triode rated for a maximum anode dissipation of 6kW. Primarily intended for use in v.h.f. transmitters.

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 in the following table.

Anode dissipation p_a (kW)	Inlet temperature T_{in} (°C)	Rate of flow of water (litres/min)	Pressure difference between inlet and outlet (atm)
1.0	20	2.5	0.08
1.0	50	3.0	0.1
2.0	20	2.5	0.08
2.0	50	5.0	0.3
4.0	20	4.0	0.18
4.0	50	9.0	0.9
6.0	20	6.0	0.4
6.0	50	14	2.5

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 at frequencies above 30Mc/s. The air flow should be started at the application of filament voltage.

The characteristics, operating conditions, and limiting values are identical with those given for TY6-5000A but for the following differences.

OPERATION AS R.F. AMPLIFIER, CLASS 'B' TELEPHONY, CLASS 'C' TELEGRAPHY CLASS 'C' TELEVISION, (GRID MODULATION NEGATIVE SYNCHRONISATION), CLASS 'B' A.F. AMPLIFIER.

p_a max. 6.0 kW

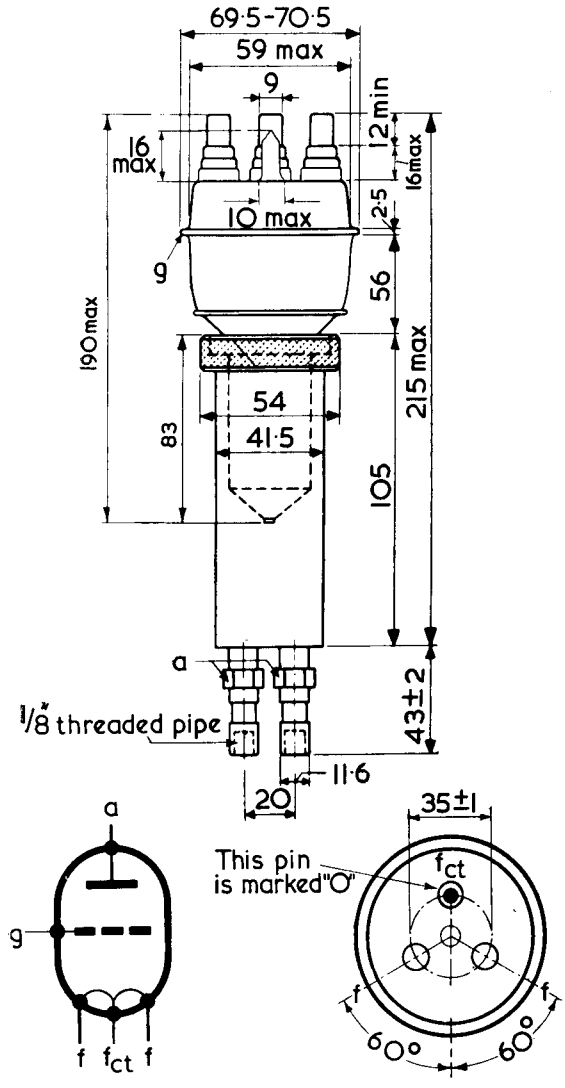
OPERATION AS R.F. POWER AMPLIFIER, CLASS 'C' ANODE MODULATION.

p_a max. 4.0 kW

V.H.F. POWER TRIODE

TY6-5000W

High power water cooled triode rated for a maximum anode dissipation of 6kW. Primarily intended for use in v.h.f. transmitters.



3385

All dimensions in mm.

V.H.F. POWER TRIODE

TY6-5000A

Application: *V.H.F. Power amplifier*
Power Output: *6.9kW continuous rating*
Frequency: *75Mc/s at full ratings*
Construction: *External anode, forced-air cooled*

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	12.6	V
I_f	33	A

The connection f_{ct} is intended for use as the cathode current return and is not an electrical centre tap and must not be used for filament current supply. At frequencies above 30Mc/s all three filament pins should be interconnected with suitable capacitors.

The connections to the filament pins and to the supply bus-bars must be securely made and have negligible contact resistance.

MOUNTING POSITION

Vertical, base up or down.

CAPACITANCES

C_{in}	16	pF
C_{out}	0.3	pF
C_{a-g}	11	pF

CHARACTERISTICS (measured at V_a=4.0kV, I_a=1.0A)

g_m	17	mA/V
μ	32	

COOLING

Forced-air		
Max. temperature of anode and grid seals	180	°C
Max. temperature of pin 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 of the housing are given in the following table.

TY6-5000A

V.H.F. POWER TRIODE

Anode dissipation	Height above sea-level		Inlet temperature	Rate of flow of air per minute		Pressure difference between inlet and outlet
p_a (kW)	h (km)	(ft)	T_{in} (°C)	(m^3)	(ft^3)	(mm of H_2O)
1.0	0	0	35	3.0	105	8.0
1.0	0	0	45	3.1	110	8.0
1.0	1.5	4920	35	3.7	130	9.0
1.0	3.0	9840	25	4.1	145	10
3.0	0	0	35	5.2	185	23
3.0	0	0	45	6.1	215	29
3.0	1.5	4920	35	6.2	220	26
3.0	3.0	9840	25	6.6	235	26
5.0	0	0	35	9.2	325	68
5.0	0	0	45	10.7	380	90
5.0	1.5	4920	35	11.2	395	81
5.0	3.0	9840	25	11.6	410	79

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

Limiting values

V_a max.	6.0	kV
p_a max.	5.0	kW
I_k max.	1.85	A
$i_{k(pk)}$ max.	8.5	A
I_g max.	350	mA
$-V_g$ max.	1.0	kV
p_g max.	120	W

Typical operating conditions at f = 75Mc/s

V_a	4.0	5.0	6.0	kV
V_g	−200	−300	−400	V
I_a	1.37	1.5	1.5	A
I_g	350	330	310	mA
$v_{in(pk)}$	500	640	740	V
$P_{load(driver)}$	190	240	275	W
p_a	1.5	1.9	2.1	kW
P_{out}	4.0	5.6	6.9	kW
η	73	75	76.5	%
*P_{load}	3.2	4.5	5.5	kW

*With a circuit transfer efficiency of 80%

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

Limiting values (carrier conditions for a modulation factor of 1)

V_a max.	6.0	kV
p_a max.	5.0	kW
I_k max.	1.45	A
$i_{k(pk)}$ max.	4.6	A
p_g max.	120	W

Typical operating conditions at f = 75Mc/s

V_a	5.0	6.0	kV
V_g	−145	−180	V
I_a	900	990	mA
$v_{in(pk)}$	225	250	V
p_a	3.0	4.0	kW
P_{out}	1.45	1.9	kW
η_t	32	32	%
*P_{load}	1.16	1.52	kW
For 100% modulation			
I_g	320	300	mA
$P_{load(driver)}$	160	170	W

*With a circuit transfer efficiency of 80%

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

Limiting values (carrier conditions for a modulation factor of 1)

V_a max.	5.0	kV
p_a max.	3.4	kW
$-V_g$ max.	1.0	kV
I_k max.	1.65	A
$i_{k(pk)}$ max.	7.5	A
I_g max.	350	mA
p_g max.	120	W

Typical operating conditions at f = 75Mc/s

V_a	3.0	3.5	4.0	4.5	5.0	kV
*V_g	−250	−300	−300	−350	−400	V
I_a	1.0	1.2	1.2	1.2	1.2	A
I_g	300	300	300	300	300	mA
$v_{in(pk)}$	510	600	600	650	690	V
$P_{load\ (driver)}$	170	205	205	230	205	W
p_a	0.8	1.2	1.3	1.3	1.3	kW
P_{out}	2.2	3.0	3.5	4.1	4.7	kW
η	73	71.5	73	76	78	%
**P_{load}	1.76	2.4	2.8	3.3	3.75	kW
For 100% modulation						
P_{mod}	1.5	2.1	2.4	2.7	3.0	kW

*This bias voltage is partially obtained by the use of a grid resistor.
**With a circuit transfer efficiency of 80%

TY6-5000A

V.H.F. POWER TRIODE

OPERATION AS GROUNDED GRID R.F. POWER AMPLIFIER (CLASS "C" TELEGRAPHY OR F.M. TELEPHONY)

Limiting values (per valve)

V_a max.	6.0	kV
p_a max.	5.0	kW
V_{f-g} max.	1.0	kV
I_k max.	1.85	A
$i_{k(pk)}$ max.	8.5	A
I_g max.	350	mA
p_g max.	120	W

Typical operating conditions for two valves

f	75	110	110	220	Mc/s
V_a	6.0	4.0	5.0	4.0	kV
V_{f-g}	400	200	300	200	V
I_a	2×1.5	2×1.37	2×1.5	2×1.25	A
I_g	2×310	2×350	2×330	2×200	mA
$v_{in(f-f)pk}$	1480	1000	1280	900	V
$P_{load\ (driver)}$	2×1190	2×705	2×965	2×395	W
p_a	2×2.1	2×1.7	2×2.2	2×2.5	kW
*P_{out}	13.8+1.82	7.6+1.0	10.6+1.46	5.0+0.6	kW
**η	76.5	69	71	50	%
***P_{load}	12.5	6.9	9.6	4.5	kW

*Includes power transferred from driver stage

**Valve efficiency

***With a circuit transfer efficiency of 80%

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

Limiting values (each valve)

V_a max.	6.0	kV
p_a max.	5.0	kW
I_k max.	1.8	A
$i_{k(pk)}$ max.	5.7	A
p_g max.	120	W
R_{g-f} max.	15	kΩ

Typical operating conditions for two valves in push-pull

V_a	3.0	3.5	4.0	4.5	5.0	6.0	kV
V_g	−90	−100	−112	−125	−138	−165	V
$I_{a(o)}$	2×65	2×75	2×100	2×100	2×110	2×125	mA
I_a(max. sig.)	2×800	2×950	2×940	2×920	2×910	2×1500	mA
I_g	2×200	2×180	2×190	2×190	2×140	2×280	mA
$V_{in(g-g)r.m.s.}$	400	440	450	465	470	645	V
R_{a-a}	4.4	4.2	4.9	6.1	6.4	4.9	kΩ
$P_{load\ (driver)}$	2×52	2×50	2×54	2×27	2×42	2×115	W
p_a	2×0.75	2×1.0	2×1.1	2×1.15	2×1.25	2×2.35	kW
P_{out}	3.3	4.6	5.3	6.0	6.6	13.3	kW
D_{tot}	3.3	2.9	2.6	3.7	3.3	4.3	%
η	69	70	71	72	73	74	%

OPERATION AS R.F. AMPLIFIER CLASS "C" GRID-MODULATION FOR TELEVISION SERVICE (with positive modulation and negative synchronisation)

Limiting values (each valve)

V_a max.	5.0	kV
p_a (peak white) max.	5.0	kW
$-V^g$ max.	1.0	kV
P_{in} (peak white) max.	9.5	kW
p_g (peak white) max.	120	W
I_k (peak white) max.	2.2	A
$i_{k(pk)}$ (peak white) max.	10	A

Typical operating conditions for two valves in push-pull

f	48 to 75	Mc/s
*Bandwidth (–1.5dB)	5.25	Mc/s
*Bandwidth (–3.0dB)	8.0	Mc/s
V_a	5.0	kV
V_g (peak white)	–200	V
V_g (black)	–460	V
V_g (sync.)	–580	V
$v_{in(g-g)pk}$	1.0	kV
I_a (peak white)	2×1.9	A
I_a (black)	2×400	mA
I_g (peak white)	2×250	mA
I_g (black)	0	mA
**$P_{load\ (driver)}$ (peak white)	250	W
P_{out} (peak white)	9.0	kW
P_{out} (black)	600	W
***P_{load} (peak white)	6.3	kW

*Bandwidth based on a single LC circuit.

**Includes power dissipated in circuit and loading resistors.

***With a circuit transfer efficiency of 70%.

OPERATION AS R.F. POWER AMPLIFIER CLASS "C" GRID-MODULATION FOR TELEVISION SERVICE (with negative modulation and positive synchronisation)

Limiting values (each valve)

f max.	75	220	Mc/s
V_a max.	5.0	4.0	kV
p_a (sync.) max.	5.0	4.0	kW
P_{in} (sync.) max.	9.5	6.5	kW
p_g (sync.) max.	120	120	W
$-V_g$ max.	1.0	1.0	kV
I_k (sync.) max.	2.2	1.8	A
$i_{k(pk)}$ (sync.) max.	10	8.1	A

Typical operating conditions for two valves in push-pull

f	48 to 75	170 to 220	Mc/s
*Bandwidth (–1.5dB)	5.25	6.5	Mc/s
*Bandwidth (–3.0dB)	8.0	10	Mc/s
V_a	5.0	4.0	kV
V_g (sync.)	–200	–150	V
V_g (black)	–300	–225	V
V_g (white)	–550	–500	V
$v_{in\ (g-g)pk}$ (sync.)	1.0	1.0	kV
I_a (sync.)	2×1.9	2×1.6	A
I_a (black)	2×1.3	2×1.3	A
I_g (sync.)	2×250	2×200	mA
I_g (black)	2×175	2×110	mA
**$P_{load\ (driver)}$ (sync.)	250	350 to 450	W
P_{out} (sync.)	9.0	6.0	kW
P_{out} (black)	5.35	3.37	kW
***P_{load} (sync.)	6.3	4.2	kW

*Bandwidth based on a single LC circuit.

**Includes power dissipated in circuit and loading resistors.

***With a circuit transfer efficiency of 70%.

OPERATION AS LINEAR POWER AMPLIFIER FOR TELEVISION SERVICE (with negative modulation and positive synchronisation)

Limiting values (each valve)

f max.	75	220	Mc/s
V_a max.	5.0	4.0	kV
P_{in} (sync.) max.	9.5	6.5	kW
p_a(sync.) max.	5.0	4.0	kW
p_g (sync.) max.	120	120	W
I_k (sync.) max.	2.2	1.8	A
$i_{k(pk)}$ (sync.) max.	10	8.1	A

Typical operating conditions for two valves in push-pull

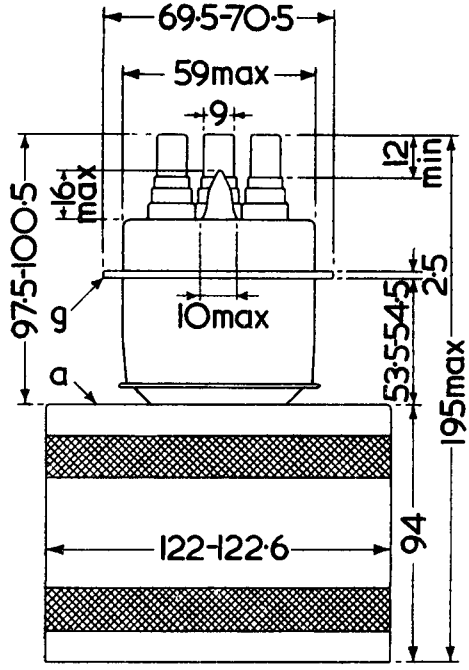
f	48 to 75	170 to 220	Mc/s
*Bandwidth (–1.5dB)	5.25	6.5	Mc/s
*Bandwidth (–3.0dB)	8.0	10	Mc/s
V_a	5.0	4.0	kV
V_g	–200	–150	V
$v_{in(g-g)pk}$ (sync.)	1.0	1.0	kV
$v_{in(g-g)pk}$ (black)	800	750	V
$v_{in(g-g)pk}$ (white)	100	200	V
I_a (sync.)	2×1.9	2×1.6	A
I_a (black)	2×1.5	2×1.3	A
I_a (white)	2×100	2×100	mA
I_g (sync.)	2×250	2×200	mA
I_g (black)	2×110	2×110	mA
I_g (white)	0	0	mA
**$P_{load\ (driver)}$ (sync.)	250	350 to 450	W
P_{out} (sync.)	9.0	6.0	kW
P_{out} (black)	5.35	3.37	kW
***P_{load} (sync.)	6.3	4.2	kW

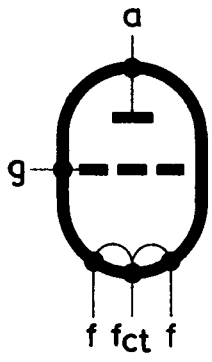
*Bandwidth based on a single LC circuit.

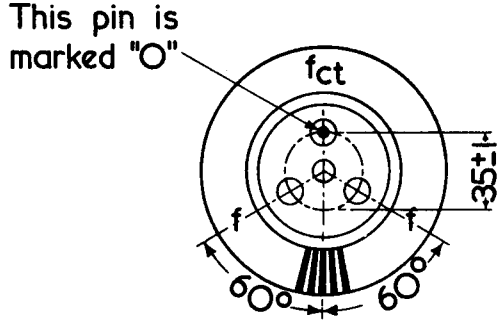
**Includes power dissipated in circuit and loading resistors.

***With a circuit transfer efficiency of 70%.

TY6-5000A







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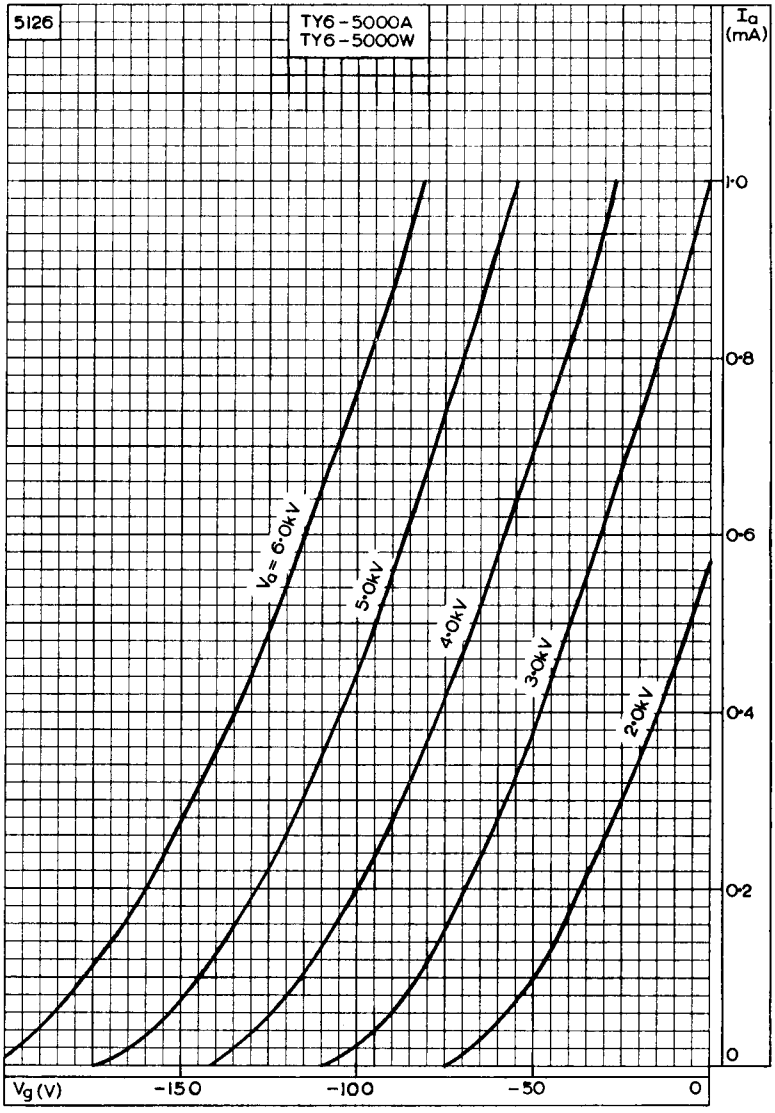
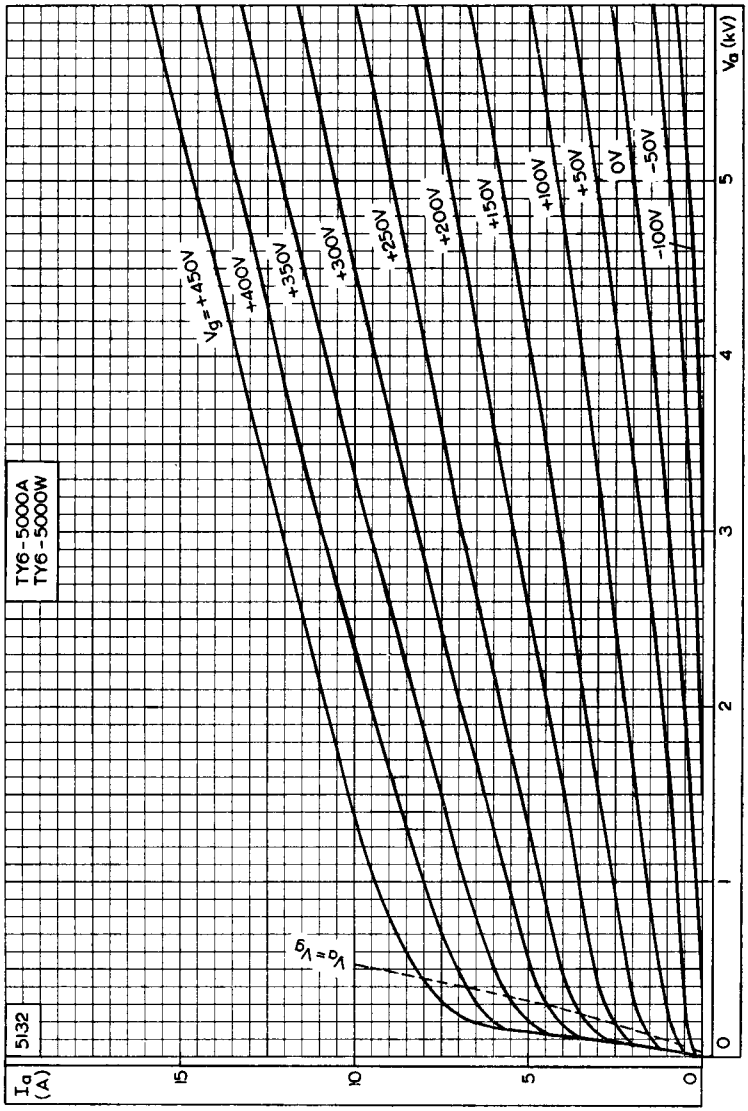
All dimensions in mm

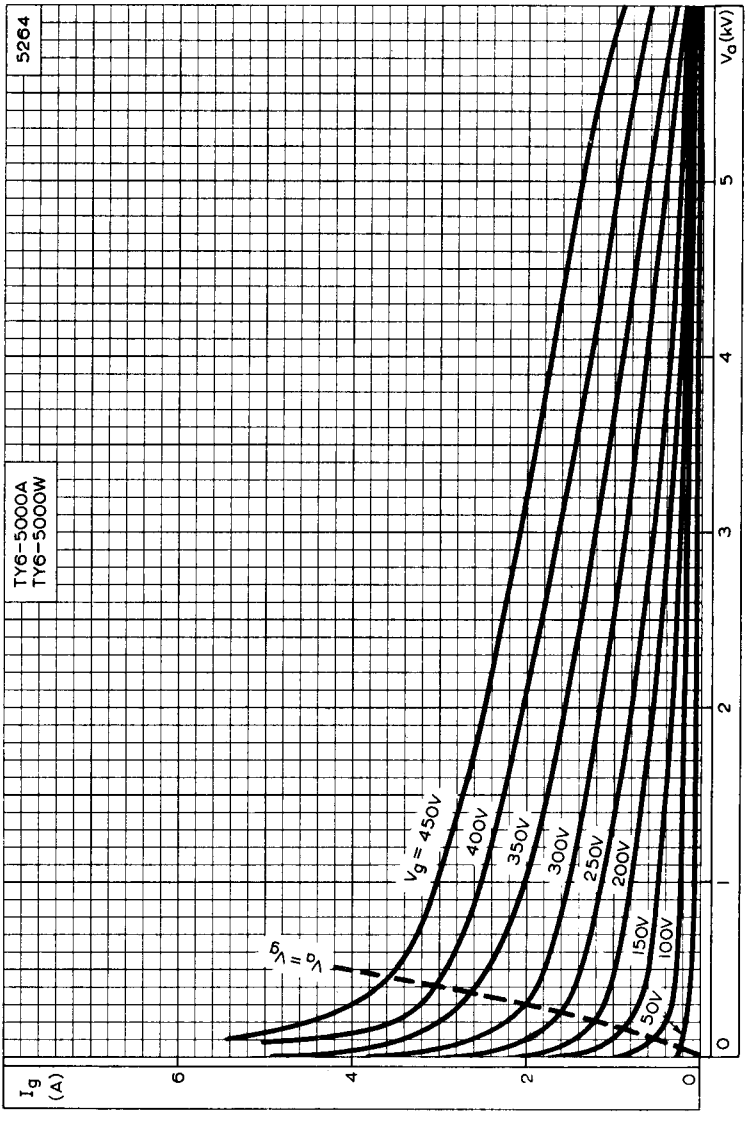


ANODE CURRENT PLOTTED AGAINST GRID VOLTAGE

TY6-5000A

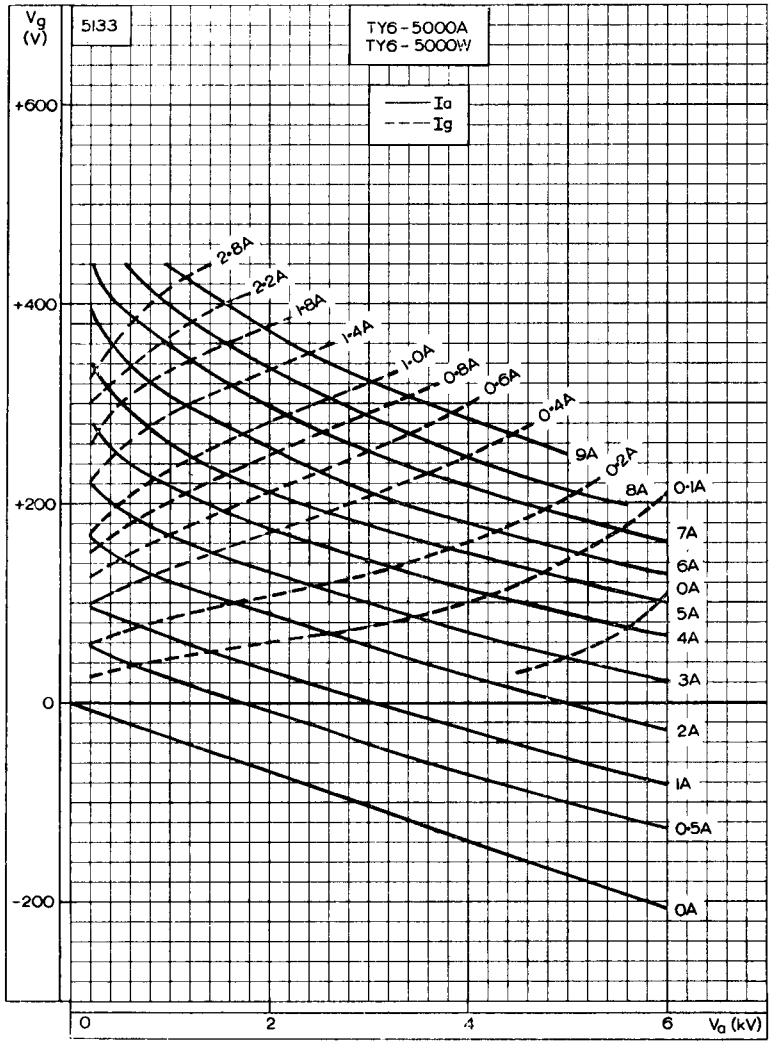


ANODE CURRENT PLOTTED AGAINST ANODE VOLTAGE

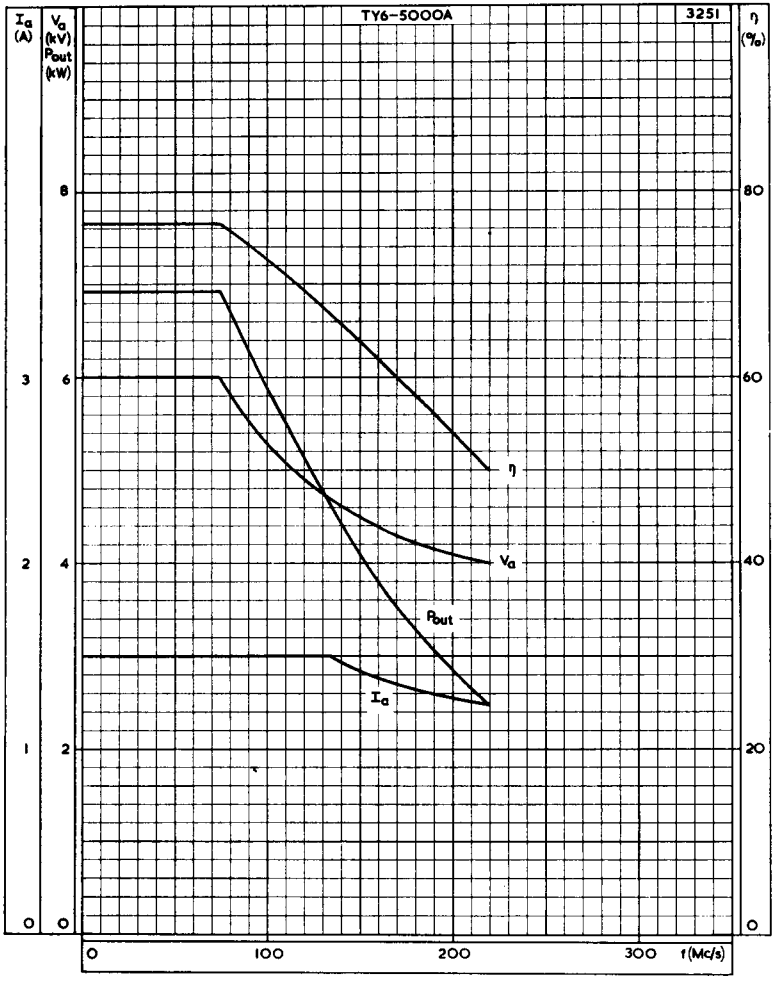


GRID CURRENT PLOTTED AGAINST ANODE VOLTAGE

TY6-5000A



CONSTANT CURRENT CURVES



FREQUENCY CHARACTERISTICS

V.H.F. POWER TRIODE

TY6-5000A
TY6-5000W
TY6-5000H

QUICK REFERENCE DATA

External anode triode, intended for use as v.h.f. amplifier or oscillator or a.f. amplifier.

The TY6-5000A is forced-air cooled.
The TY6-5000W is water cooled by means of a water jacket.
The TY6-5000H is water cooled by means of an integral helical water cooler.

	Class 'C' Telegraphy or F.M. Telephony		Class 'C' Telephony Anode Modulation	Class 'B' Telephony	Class 'B' A.F.	
f	75	75	75	75	-	Mc/s
P_{out}	6.9	*13.8	4.7	1.9	13.3	kW
f max	75		75	75	-	Mc/s
V_a max	6.0		5.0	6.0	6.0	kV
p_a max	5.0		3.4	5.0	5.0	kW

*Grounded grid configuration

Class 'C' Amplifier T.V. Service

	Positive modulation Negative synchronisation	Negative modulation Positive synchronisation		Linear Power Amplifier		
f	48 to 75	48 to 75	170 to 220	48 to 75	170 to 220	Mc/s
P_{out}	9.0	9.0	6.0	9.0	6.0	kW
f max	75	75	220	75	220	Mc/s
V_a max	5.0	5.0	4.0	5.0	4.0	kV
p_a max	5.0	5.0	4.0	5.0	4.0	kW

Unless otherwise shown, data is applicable to all types

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

CLASS 'C' TELEGRAPHY OR F.M. TELEPHONY

Typical operating conditions

f	75	75	75	Mc/s
P_{out}	4.0	5.6	6.9	kW
P_{load}	3.2	4.5	5.5	kW
η_a	73	75	77	%
V_a	4.0	5.0	6.0	kV
I_a	1.37	1.5	1.5	A
$-V_g$	200	300	400	V
I_g	350	330	310	mA
$v_{in(pk)}$	500	640	740	V
$P_{load\ (driver)}$	190	240	275	W
p_a	1.5	1.9	2.1	kW

Typical operating conditions for two valves in grounded grid configuration

f	75	110	110	220	Mc/s
*P_{out}	13.8 + 1.82	7.6 + 1.0	10.6 + 1.46	5.0 + 0.6	kW
P_{load}	12.5	6.9	9.6	4.5	kW
η	77	69	71	50	%
V_a	6.0	4.0	5.0	4.0	kV
I_a	2 x 1.5	2 x 1.37	2 x 1.5	2 x 1.25	A
V_{f-g}	400	200	300	200	V
I_g	2 x 310	2 x 350	2 x 330	2 x 200	mA
$v_{in(f-f)\ pk}$	1.48	1.0	1.28	0.9	kV
$P_{load\ (driver)}$	2 x 1.19	2 x 0.705	2 x 0.965	2 x 0.395	kW
p_a	2 x 2.1	2 x 1.7	2 x 2.2	2 x 2.5	kW

*Includes power transferred from driver stage.

CLASS 'C' TELEPHONY ANODE MODULATION

Typical operating conditions (Carrier conditions for 100% modulation)

f	75	75	75	75	75	Mc/s
P_{out}	2.2	3.0	3.5	4.1	4.7	kW
P_{load}	1.76	2.4	2.8	3.3	3.75	kW
η_a	73	72	73	76	78	%
V_a	3.0	3.5	4.0	4.5	5.0	kV
I_a	1.0	1.2	1.2	1.2	1.2	A
*$-V_g$	250	300	300	350	400	V
I_g	300	300	300	300	300	mA
$v_{in(pk)}$	510	600	600	650	690	V
$P_{load\ (driver)}$	170	205	205	230	205	W
p_a	0.8	1.2	1.3	1.3	1.3	kW
For 100% modulation						
P_{mod}	1.5	2.1	2.4	2.7	3.0	kW

*This bias voltage is partially obtained by the use of a grid resistor.

CLASS 'B' TELEPHONY

Typical operating conditions (Carrier conditions for 100% modulation)

f	75	75	Mc/s
P_{out}	1.45	1.9	kW
P_{load}	1.16	1.52	kW
η_a	32	32	%
V_a	5.0	6.0	kV
I_a	900	990	mA
$-V_g$	145	180	V
$v_{in(pk)}$	225	250	V
p_a	3.0	4.0	kW
For 100% modulation			
I_g	320	300	mA
$P_{load(driver)}$	160	170	W

CLASS 'B' AUDIO AMPLIFIER OR MODULATOR

Typical operating conditions for two valves in push-pull

P_{out}	3.3	4.6	5.3	6.0	6.6	13.3	kW
D_{tot}	3.3	2.9	2.6	3.7	3.3	4.3	%
R_{a-a}	4.4	4.2	4.9	6.1	6.4	4.9	kΩ
V_a	3.0	3.5	4.0	4.5	5.0	6.0	kV
$-V_g$	90	100	112	125	138	165	V
$I_{a(o)}$	2 x 65	2 x 75	2 x 100	2 x 100	2 x 110	2 x 125	mA
I_a (max. sig.)	2 x 800	2 x 950	2 x 940	2 x 920	2 x 910	2 x 1500	mA
I_g	2 x 200	2 x 180	2 x 190	2 x 190	2 x 140	2 x 280	mA
$V_{in\ (g-g)}$ r.m.s.	400	440	450	465	470	645	V
$P_{load\ (driver)}$	2 x 52	2 x 50	2 x 54	2 x 27	2 x 42	2 x 115	W
p_a	2 x 0.75	2 x 1.0	2 x 1.1	2 x 1.15	2 x 1.25	2 x 2.35	kW
η_a	69	70	71	72	73	74	%

CLASS 'C' AMPLIFIER FOR TELEVISION SERVICE COMMON CATHODE, BIAS MODULATED

Positive modulation, negative synchronisation

Typical operating conditions for two valves in push-pull

f	48 to 75	Mc/s
Bandwidth (-1.5dB)	5.25	Mc/s
Bandwidth (-3.0dB)	8.0	Mc/s
P_{out} (white)	9.0	kW
P_{load} (white)	6.3	kW
V_a	5.0	kV
$-V_g$ (white)	200	V
(black)	460	V
(sync)	580	V
I_a (white)	2 x 1.9	A
(black)	2 x 400	mA
I_g (white)	2 x 250	mA
(black)	0	mA
$V_{in\ (g-g)\ pk}$ (white)	1.0	kV
$P_{load\ (driver)}$ white	250	W

CLASS 'C' AMPLIFIER FOR TELEVISION SERVICE
COMMON CATHODE, BIAS MODULATED

Negative modulation, positive synchronisation

Typical operating conditions for two valves in push-pull

f	48 to 75	170 to 220	Mc/s
Bandwidth (-1.5dB)	5.25	6.5	Mc/s
Bandwidth (-3.0dB)	8.0	10	Mc/s
P_{out} (sync)	9.0	6.0	kW
P_{load} (sync)	6.3	4.2	kW
V_a	5.0	4.0	kV
$-V_g$ (sync)	200	250	V
(black)	300	225	V
(white)	550	500	V
I_a (sync)	2 x 1.9	2 x 1.6	A
(black)	2 x 1.3	2 x 1.3	A
I_a (sync)	2 x 250	2 x 200	mA
(black)	2 x 175	2 x 110	mA
$v_{in\ (g-g)\ pk}$ (sync)	1.0	1.0	kV
$P_{load\ (driver)}$ sync	250	350 to 450	W

CLASS 'C' LINEAR POWER AMPLIFIER
COMMON CATHODE, BIAS MODULATED

Negative modulation, positive synchronisation

Typical operating conditions for two valves in push-pull

f	48 to 75	170 to 220	Mc/s
Bandwidth (-1.5dB)	5.25	6.5	Mc/s
Bandwidth (-3.0dB)	8.0	10	Mc/s
P_{out} (sync)	9.0	6.0	kW
P_{load} (sync)	6.3	4.2	kW
V_a	5.0	4.0	kV
$-V_g$	200	150	V
I_a (sync)	2 x 1.9	2 x 1.6	A
(black)	2 x 1.5	2 x 1.3	A
(white)	2 x 100	2 x 100	mA
I_g (sync)	2 x 250	2 x 200	mA
(black)	2 x 110	2 x 110	mA
(white)	0	0	mA
$v_{in\ (g-g)\ pk}$ (sync)	1.0	1.0	kV
(black)	800	750	V
(white)	100	100	V
$P_{load\ (driver)}$ sync	250	350 to 450	W

ABSOLUTE MAXIMUM RATINGS

	Class 'C' Telegraphy	Class 'C' Telephony	Class 'B' Telephony	Class 'C' A.F.	
V_a max.	6.0	5.0	6.0	6.0	kV
$-V_g$ max.	*1.0	1.0	-	-	kV
I_k max.	1.85	1.65	1.45	1.8	A
$i_{k(pk)}$ max.	8.5	7.5	4.6	5.7	A
p_a max.	5.0	3.4	5.0	5.0	kW
I_g max.	350	350	-	-	mA
p_g max.	120	120	120	120	W
R_{g-f} max.	-	-	-	15	kΩ

*V_{f-g} in grounded grid configuration

	CLASS 'C' AMPLIFIER			T.V. SERVICE		
	Positive modulation Negative synchronisation	Negative modulation Positive synchronisation		Linear Power Amplifier Negative Modulation Positive synchronisation		
f max.	-	75	220	75	220	Mc/s
V_a max.	5.0	5.0	4.0	5.0	4.0	kV
$-V_g$ max.	1.0	1.0	1.0	-	-	kV
I_k max..	2.2	2.2	1.8	2.2	1.8	A
$i_{k(pk)}$ max.	10	10	8.1	10	8.1	A
p_a max.	5.0	5.0	4.0	5.0	4.0	kW
p_g max.	120	120	120	120	120	W
P_{in} max.	9.5	9.5	6.5	9.5	6.5	kW

CATHODE

Directly heated, thoriated tungsten

*V_f	12.6	V
I_f	33	A

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

The connection f_{ct} is intended for use as the cathode current return and is not an electrical centre tap and must not be used for filament current supply. At frequencies above 30Mc/s all three filament pins should be interconnected with suitable capacitors.

CAPACITANCES

C_{a-g}	11	pF
C_{out}	300	mpF
C_{in}	16	pF

CHARACTERISTICS (measured at V_a = 4.0kV, I_a = 1.0A)

g_m	17	mA/V
μ	32	

MOUNTING POSITION

Vertical, with base up or down

COOLING

TY6-5000A

Forced-air cooled

Maximum temperatures

Anode and grid seals	180	°C
Pin seals	210	°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 of the housing are given in the following table.

Anode dissipation	Height above sea level		Inlet temperature	Rate of flow of air per minute		Pressure difference between inlet and outlet
P_a (kW)	h (km)	(ft)	T_{in} (°C)	(m^3)	(ft^3)	(mm of H_2O)
1.0	0	0	35	3.0	105	8.0
1.0	0	0	45	3.1	110	8.0
1.0	1.5	4920	35	3.7	130	9.0
1.0	3.0	9840	25	4.1	145	10
3.0	0	0	35	5.2	185	23
3.0	0	0	45	6.1	215	29
3.0	1.5	4920	35	6.2	220	26
3.0	3.0	9840	25	6.6	235	26
5.0	0	0	35	9.2	325	68
5.0	0	0	45	10.7	380	90
5.0	1.5	4920	35	11.2	395	81
5.0	3.0	9840	25	11.6	410	79

TY6-5000W

Water cooled anode, low velocity air flow on seals

Maximum temperatures

Anode and grid seals	180	°C
Water inlet	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 in the following table.

Anode dissipation	Inlet temperature	Rate of flow of water per minute		Pressure difference between inlet and outlet
P_a (kW)	T_{in} (°C)	(litres)	(gal)	(atm)
1.0	20	2.5	0.55	0.08
1.0	50	5.0	1.10	0.1
2.0	20	2.5	0.55	0.08
2.0	50	5.0	1.10	0.3
4.0	20	4.0	0.88	0.18
4.0	50	9.0	1.98	0.9
6.0	20	6.0	1.32	0.4
6.0	50	14	3.08	2.5

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 at frequencies above 30Mc/s. The air flow should be started at the application of filament voltage.

TY6-5000H

Water cooled anode, low velocity air flow on seals

Maximum temperatures.

Water inlet	50	°C
Filament seals	210	°C
Anode and grid seals	180	°C

The amount of water cooling required for this valve depends on the anode dissipation and the temperature of the water.

Typical values of rate of flow of water through helix and pressure loss in the helix are given in the curve on page C2. The minimum rate of flow of

water through helix required can be found from the curves on page C3. At frequencies above 30Mc/s and at ambient temperatures above 35°C both grid and filament seals should be cooled by a low velocity air flow.

PHYSICAL DATA

	TY6-5000A	TY6-5000W	TY6-5000H	
Weight of valve	9.7	1.8	1.8	lb
	4.4	0.8	0.8	kg
Weight of valve plus carton	22	3.6	3.7	lb
	10	1.6	1.7	kg
Weight of insulating pedestal	4.6	-	-	lb
	2.1	-	-	kg
Weight of insulating pedestal plus carton	6.8	-	-	lb
	3.1	-	-	kg
Weight of water jacket	-	1.7	-	lb
	-	0.76	-	kg
Weight of water jacket plus carton	-	2.0	-	lb
	-	0.9	-	kg

ACCESSORIES

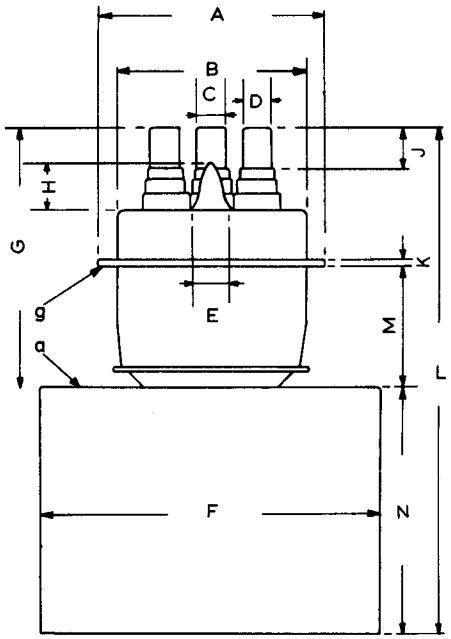
Filament clips x 2	40634
Filament centre clip x 1	40649
Grid connector x 1 >30Mc/s	40622
Grid connector x 1 <30Mc/s	40650
Insulating pedestal x 1 (TY6-5000A)	40630
Water jacket x 1 (TY6-5000W)	K721

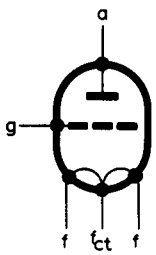
Dimensions of TY6-5000A

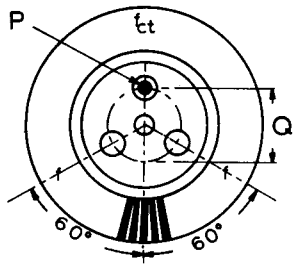
	Inches	Millimetres	
A	2.756 ± 0.020	70 ± 0.5	
B	2.323	59	max
C	0.413	10.5	
D	0.354	9.0	
E	0.394	10	max
F	4.815 ± 0.012	122.3 ± 0.3	
G	3.898 ± 0.059	99 ± 1.5	
H	0.630	16	max
J	0.472	12	min
K	0.098	2.5	
L	7.677	195	max
M	2.126 ± 0.020	54 ± 0.5	
N	3.701	94	
P	0.413	10.5	dia
Q	1.378 ± 0.039	35 ± 1.0	

Inch dimensions derived from original millimetre dimensions.

OUTLINE DRAWING OF TY6-5000A







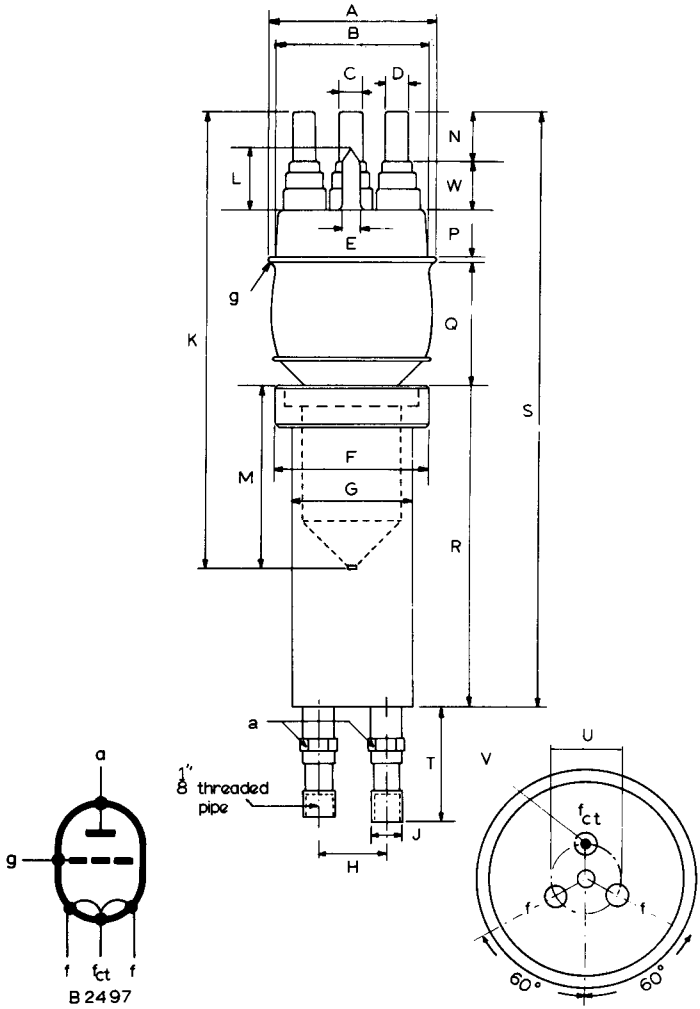
B 2495

Dimensions of TY6-5000W

	Inches	Millimetres	
A	2.756 ± 0.020	70 ± 0.5	
B	2.323	59	max
C	0.413	10.5	
D	0.354	9.0	
E	0.394	10	max
F	2.126	54	
G	1.634	41.5	
H	0.788	20	
J	0.457	11.6	
K	7.480	190	max
L	0.630	16	max
M	3.268	83	
N	0.472	12	min
P	0.098	2.5	
Q	2.205	56	
R	4.130	105	
S	8.465	215	max
T	1.713 ± 0.079	43.5 ± 2.0	
U	1.378 ± 0.039	35 ± 1.0	
V	0.413	10.5	dia
W	0.630	16	max

Inch dimensions derived from original millimetre dimensions.

OUTLINE DRAWING OF TY6-5000W

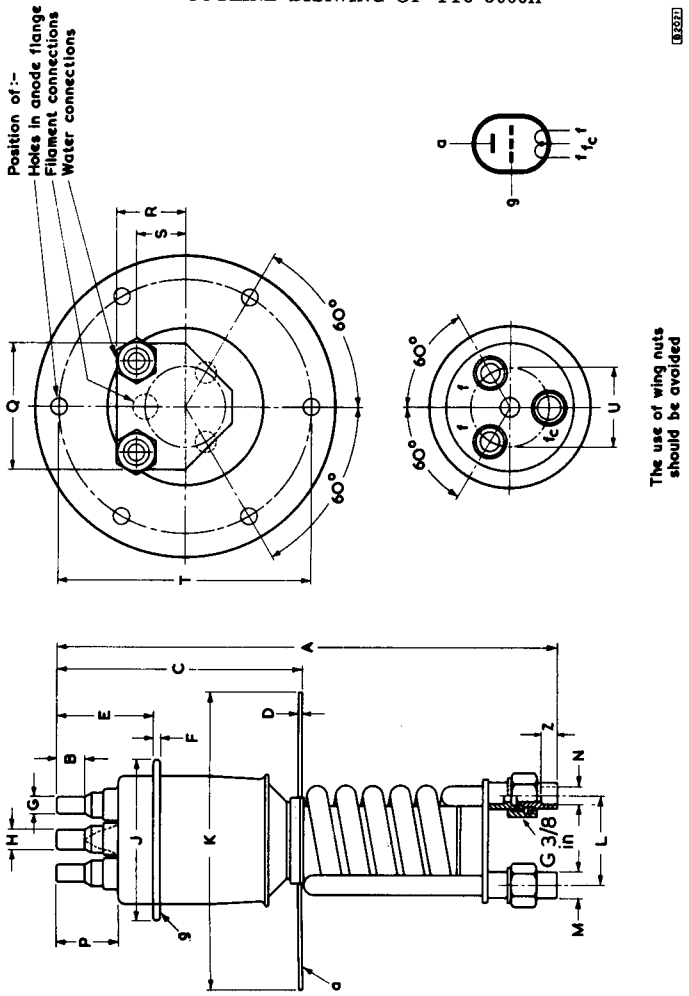


Dimensions of TY6-5000H

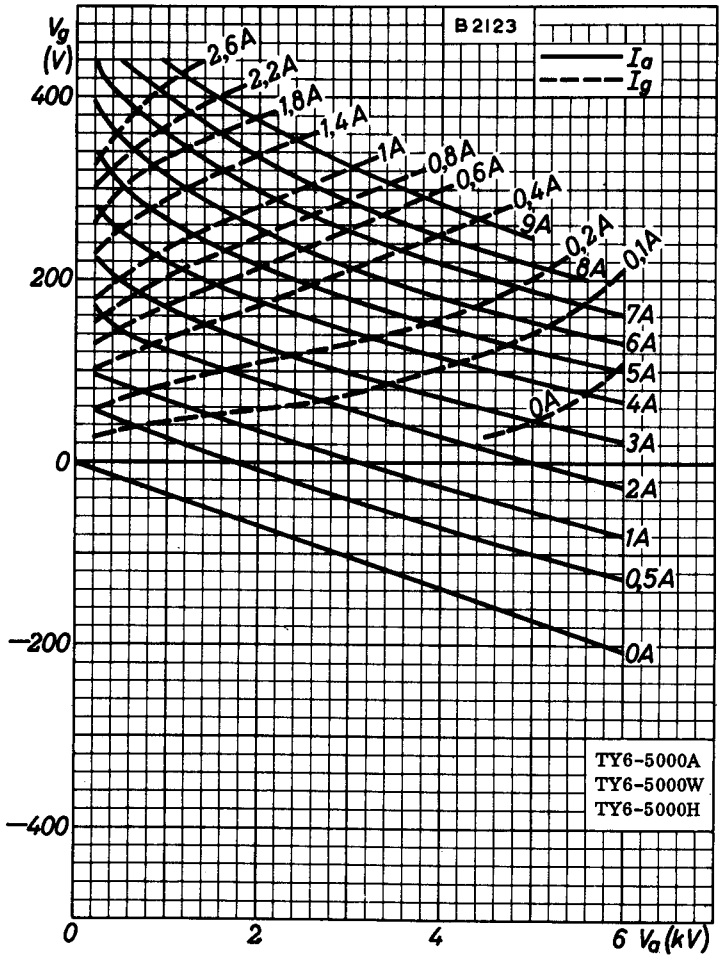
	Inches	Millimetres	
A	8.622	219	
B	0.472	12	min.
C	4.134	105	
D	0.079	2	
E	1.693	43	
F	0.098	2.5	
G	0.358	9.1	dia.
H	0.413	10.5	dia.
J	2.756	70	dia.
K	5.118	130	dia.
L	1.535	39	
M	0.394	10	dia.
N	0.315	8	dia.
P	0.630	16	max.
Q	2.283	58	
R	1.260	32	
S	0.827	21	
T	4.331	110	
U	1.378	35	
Z	0.394	10	

Inch dimensions derived from original millimetre dimensions.

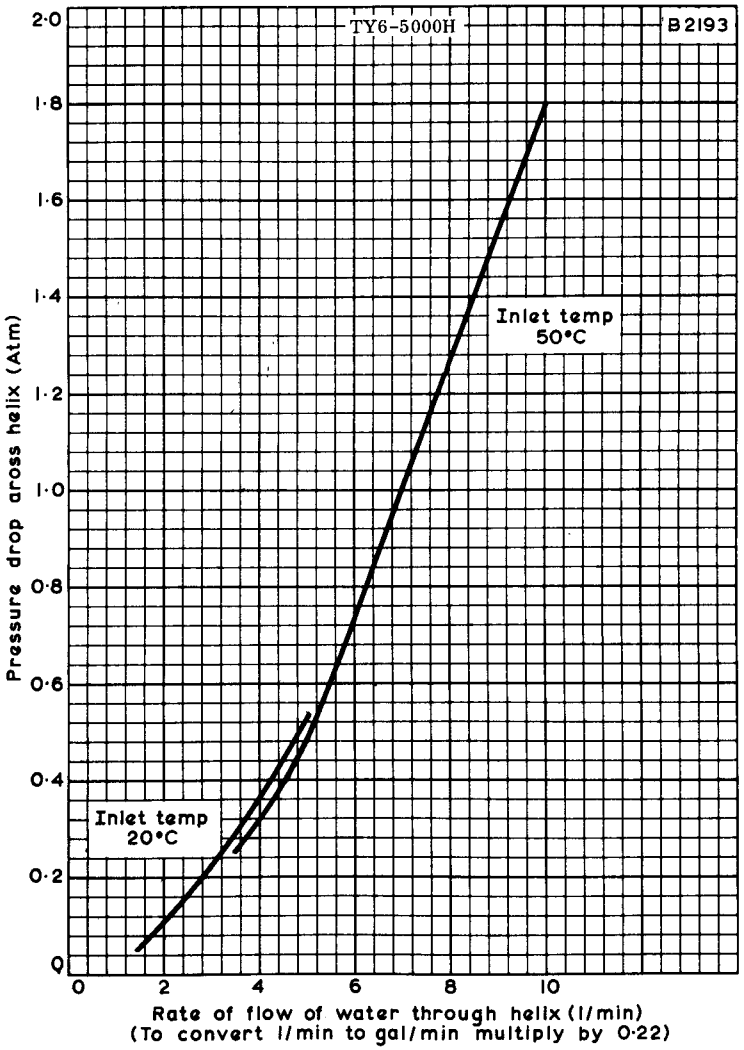
OUTLINE DRAWING OF TY6-5000H



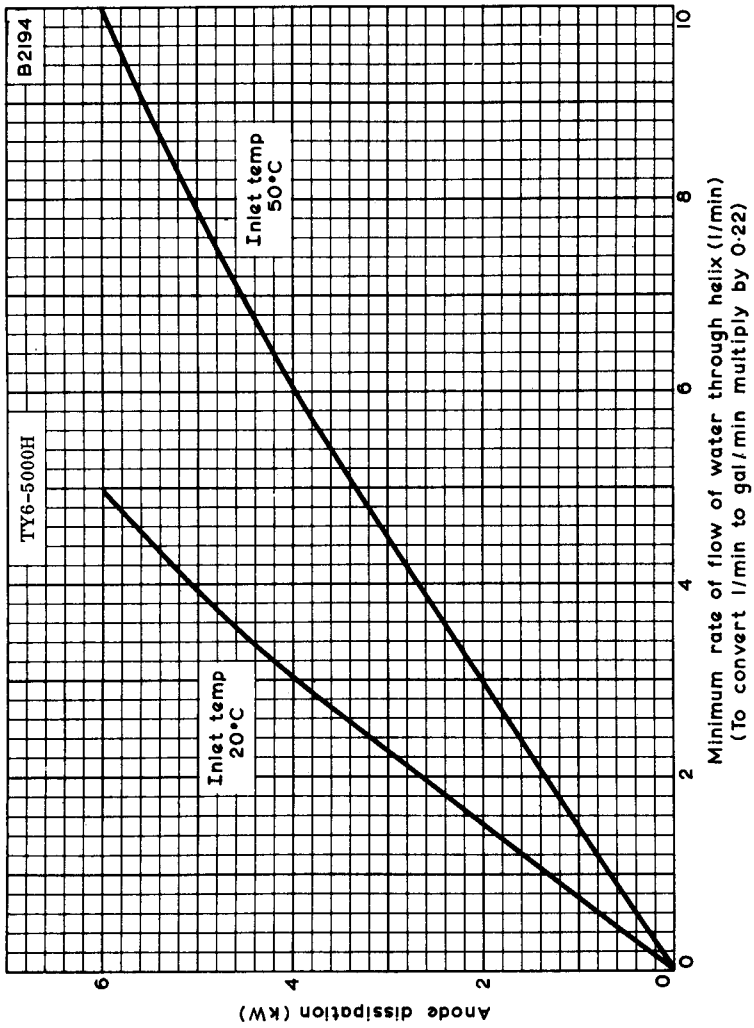
The use of wing nuts should be avoided



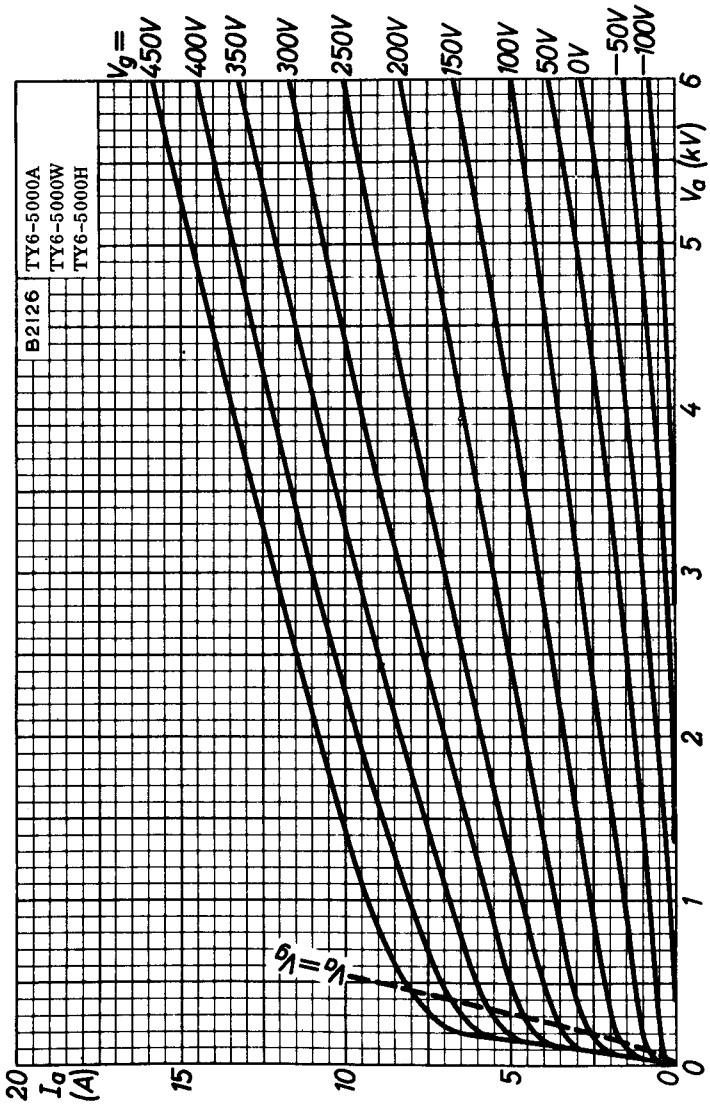
CONSTANT CURRENT CHARACTERISTICS



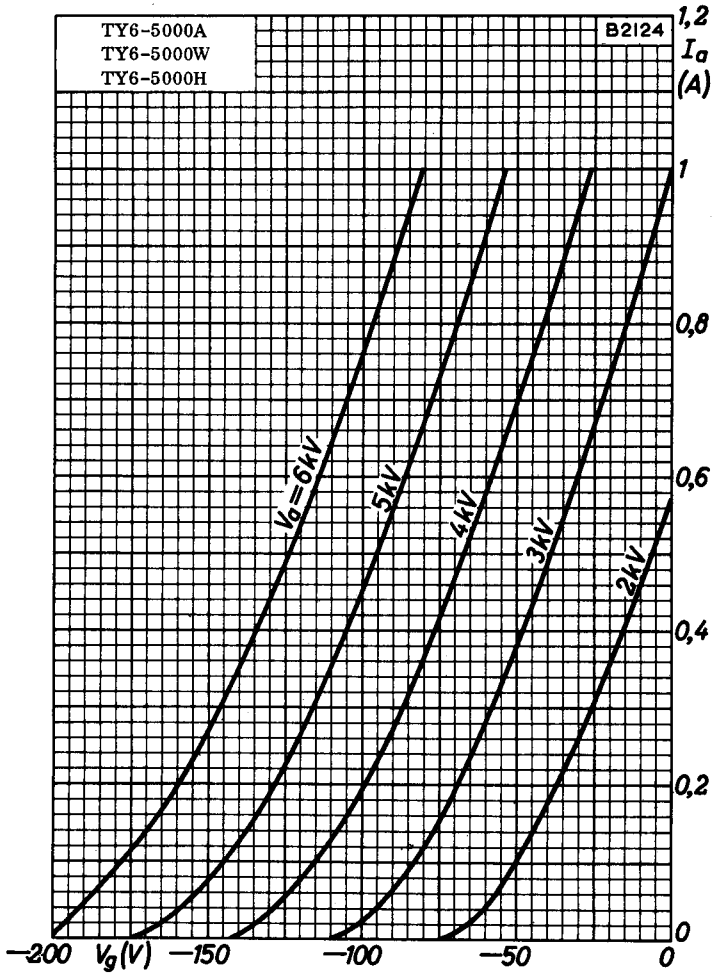
PRESSURE DROP ACROSS HELIX PLOTTED AGAINST RATE OF FLOW OF WATER THROUGH HELIX FOR INLET TEMPERATURES OF 20 AND 50°C.



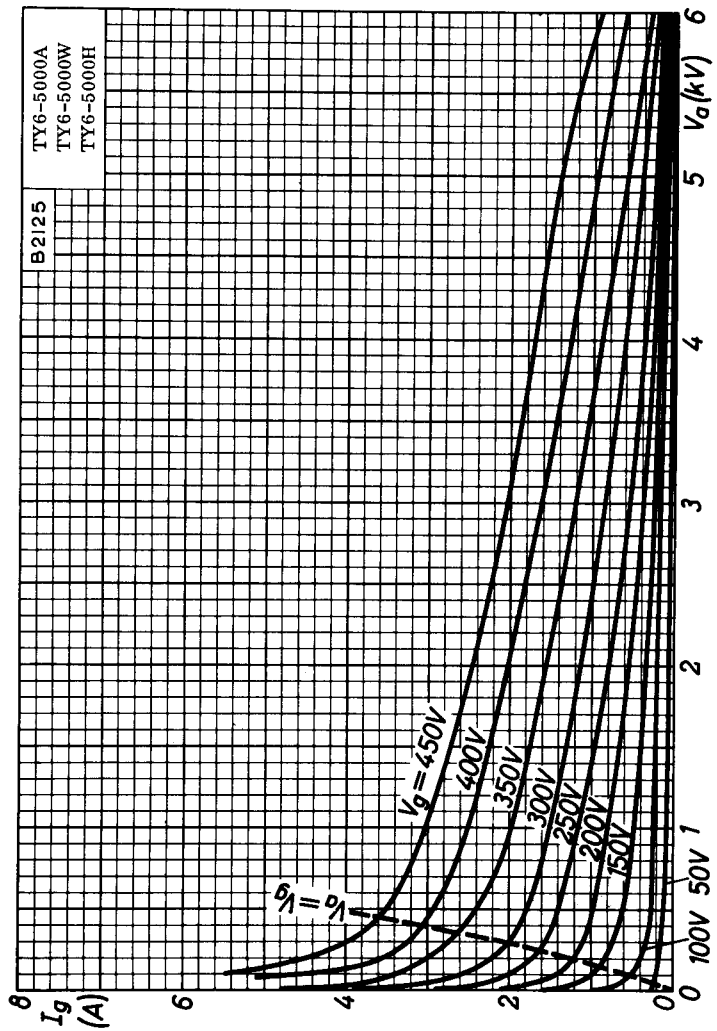
ANODE DISSIPATION PLOTTED AGAINST MINIMUM RATE OF FLOW OF WATER THROUGH HELIX FOR INLET TEMPERATURES OF 20 AND 50°C.



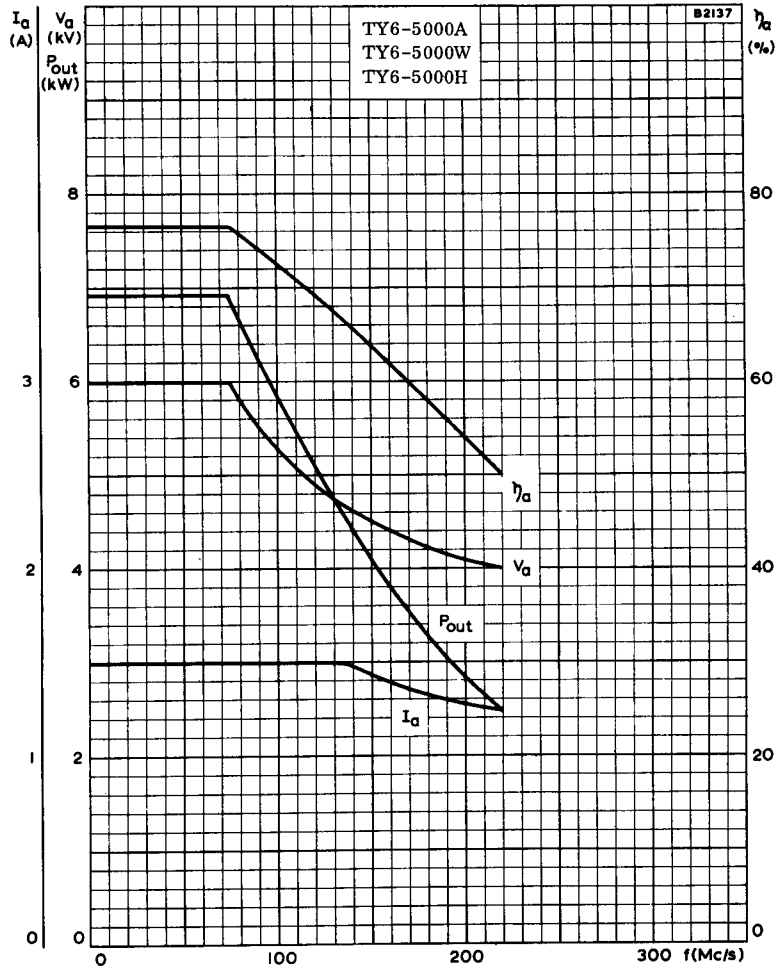
ANODE CURRENT PLOTTED AGAINST ANODE VOLTAGE
WITH GRID VOLTAGE AS PARAMETER



ANODE CURRENT PLOTTED AGAINST GRID VOLTAGE
WITH ANODE VOLTAGE AS PARAMETER



GRID CURRENT PLOTTED AGAINST ANODE VOLTAGE
WITH GRID VOLTAGE AS PARAMETER



FREQUENCY CHARACTERISTICS

V.H.F. POWER TRIODE

TY6-5000A
TY6-5000W
TY6-5000H

QUICK REFERENCE DATA

External anode triode, intended for use as v.h.f. amplifier or oscillator or a.f. amplifier.
The TY6-5000A is forced-air cooled.
The TY6-5000W is water cooled by means of a water jacket.
The TY6-5000H is water cooled by means of an integral helical water cooler.

	Telegraphy or F.M. Telephony, Class 'C'		Telephony, Anode Modulation Class 'C'	Telephony, Class 'B'	Audio Amplifier or Modulator Class 'B'	
f	75	75	75	75	-	Mc/s
P_{out}	6.9	*13.8	4.7	1.9	13.3	kW
f max.	75		75	75	-	Mc/s
V_a max.	6.0		5.0	6.0	6.0	kV
p_a max.						
TY6-5000A	5.0		3.4	5.0	5.0	kW
TY6-5000W/H	6.0		4.0	6.0	6.0	kW ←

*Grounded grid configuration.

Amplifier for Television Service, Class 'C'

	Positive Modulation Negative Synchronisation	Negative Modulation Positive Synchronisation		Linear Power Amplifier		
f	48 to 75	48 to 75	170 to 220	48 to 75	170 to 220	Mc/s
P_{out}	9.0	9.0	6.0	9.0	6.0	kW
f max.	75	75	220	75	220	Mc/s
V_a max.	5.0	5.0	4.0	5.0	4.0	kV
p_a max.						
TY6-5000A	5.0	5.0	4.0	5.0	4.0	kW
TY6-5000W/H	6.0	5.0	4.0	5.0	4.0	kW ←

Unless otherwise shown, 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	75	75	75	Mc/s
P_{out}	4.0	5.6	6.9	kW
P_{load}	3.2	4.5	5.5	kW
η_a	73	75	77	%
V_a	4.0	5.0	6.0	kV
I_a	1.37	1.5	1.5	A
$-V_g$	200	300	400	V
I_g	350	330	310	mA
$v_{in(pk)}$	500	640	740	V
$P_{load(driver)}$	190	240	275	W
p_a	1.5	1.9	2.1	kW

OPERATING CONDITIONS for two valves in grounded grid configuration

f	75	110	110	220	Mc/s
*P_{out}	13.8+1.82	7.6+1.0	10.6+1.46	5.0+0.6	kW
P_{load}	12.5	6.9	9.6	4.5	kW
η_a	77	69	71	50	%
V_a	6.0	4.0	5.0	4.0	kV
I_a	2×1.5	2×1.37	2×1.5	2×1.25	A
V_{f-g}	400	200	300	200	V
I_g	2×310	2×350	2×330	2×200	mA
$v_{in(f-f)pk}$	1.48	1.0	1.28	0.9	kV
$P_{load(driver)}$	2×1.19	2×0.705	2×0.965	2×0.395	kW
p_a	2×2.1	2×1.7	2×2.2	2×2.5	kW

*Includes power transferred from driver stage

TELEPHONY, ANODE MODULATION, CLASS 'C'

OPERATING CONDITIONS (Carrier conditions for 100% modulation)

f	75	75	75	75	75	Mc/s
P_{out}	2.2	3.0	3.5	4.1	4.7	kW
P_{load}	1.76	2.4	2.8	3.3	3.75	kW
η_a	73	72	73	76	78	%
V_a	3.0	3.5	4.0	4.5	5.0	kV
I_a	1.0	1.2	1.2	1.2	1.2	A
*$-V_g$	250	300	300	350	400	V
I_g	300	300	300	300	300	mA
$V_{in(pk)}$	510	600	600	650	690	V
$P_{load(driver)}$	170	205	205	230	205	W
p_a	0.8	1.2	1.3	1.3	1.3	kW
For 100% modulation						
P_{mod}	1.5	2.1	2.4	2.7	3.0	kW

*This bias voltage is partially obtained by the use of a grid resistor.

TELEPHONY, CLASS 'B'

OPERATING CONDITIONS (Carrier conditions for 100% modulation)

f	75	75	Mc/s
P_{out}	1.45	1.9	kW
P_{load}	1.16	1.52	kW
η_a	32	32	%
V_a	5.0	6.0	kV
I_a	900	990	mA
$-V_g$	145	180	V
$V_{in(pk)}$	225	250	V
p_a	3.0	4.0	kW
For 100% modulation			
I_g	320	300	mA
$P_{load(driver)}$	160	170	W

AMPLIFIER FOR TELEVISION SERVICE, GRID MODULATED, CLASS 'C'

Negative modulation, positive synchronisation

OPERATING CONDITIONS for two valves in push-pull

f	48 to 75	170 to 220	Mc/s
Bandwidth (-1.5dB)	5.25	6.5	Mc/s
Bandwidth (-3.0dB)	8.0	10	Mc/s
P_{out} (sync)	9.0	6.0	kW
P_{load} (sync)	6.3	4.2	kW
V_a	5.0	4.0	kV
$-V_g$ (sync)	200	150	V ←
(black)	300	225	V
(white)	550	500	V
I_a (sync)	2 × 1.9	2 × 1.6	A
(black)	2 × 1.3	2 × 1.3	A
I_g (sync)	2 × 250	2 × 200	mA ←
(black)	2 × 175	2 × 110	mA
$v_{in(g-g)pk}$ (sync)	1.0	1.0	kV
$P_{load(driver)}$ sync	250	350 to 450	W

LINEAR POWER AMPLIFIER FOR TELEVISION SERVICE, GRID MODULATED, CLASS 'C'

Negative modulation, positive synchronisation

OPERATING CONDITIONS for two valves in push-pull

f	48 to 75	170 to 220	Mc/s
Bandwidth (-1.5dB)	5.25	6.5	Mc/s
Bandwidth (-3.0dB)	8.0	10	Mc/s
P_{out} (sync)	9.0	6.0	kW
P_{load} (sync)	6.3	4.2	kW
V_a	5.0	4.0	kV
$-V_g$	200	150	V
I_a (sync)	2 × 1.9	2 × 1.6	A
(black)	2 × 1.5	2 × 1.3	A
(white)	2 × 100	2 × 100	mA
I_g (sync)	2 × 250	2 × 200	mA
(black)	2 × 110	2 × 110	mA
(white)	0	0	mA
$v_{in(g-g)pk}$ (sync)	1.0	1.0	kV
(black)	800	750	V
(white)	0	200	V ←
$P_{load(driver)}$ sync	250	350 to 450	W

CATHODE

Directly heated, thoriated tungsten

*V_f	12.6	V
I_f	33	A

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

The connection f_{ct} is intended for use as the cathode current return. It is not an electrical centre tap and must not be used for filament current supply. At frequencies above 30Mc/s all three filament pins should be interconnected with suitable capacitors.

CAPACITANCES

c_{a-g}	11	pF
c_{out}	300	mpF
c_{in}	16	pF

CHARACTERISTICS (measured at V_a = 4.0kV, I_a = 1.0A)

g_m	17	mA/V
μ	32	

MOUNTING POSITION

Vertical, with base up or down

COOLING

TY6-5000A

Forced-air cooled

Maximum temperatures

Anode and grid seals	180	°C
Pin seals	210	°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 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:

RATINGS (ABSOLUTE MAXIMUM SYSTEM)

	Telegraphy Class 'C'	Telephony Class 'C'	Telephony Class 'B'	A.F. Class 'B'	
V_a max.	6.0	5.0	6.0	6.0	kV
$-V_g$ max.	*1.0	1.0	-	-	kV
I_a max.	1.5	1.3	1.1	1.5	A
$i_{k(pk)}$ max.	8.5	7.5	4.6	5.7	A
p_a max.					
TY6-5000A	5.0	3.4	5.0	5.0	kW
TY6-5000W/H	6.0	4.0	6.0	6.0	kW ←
I_g max.	350	350	-	-	mA
p_g max.	120	120	120	120	W
R_{g-f} max.	-	-	-	15	kΩ

*V_{f-g} in grounded grid configuration.

Amplifier for Television Service, Class 'C'

	Positive Modulation Negative Synchronisation	Negative Modulation Positive Synchronisation		Linear Power Amplifier Negative Modulation Positive Synchronisation		
f max.	-	75	220	75	220	Mc/s
V_a max.	5.0	5.0	4.0	5.0	4.0	kV
$-V_g$ max.	1.0	1.0	1.0	-	-	kV
I_a max.	1.9	1.9	1.6	1.9	1.6	A
$i_{k(pk)}$ max.	10	10	8.1	10	8.1	A
p_a max.						
TY6-5000A	5.0	5.0	4.0	5.0	4.0	kW
TY6-5000W/H	6.0	5.0	4.0	5.0	4.0	kW ←
p_g max.	120	120	120	120	120	W
P_{in} max.	9.5	9.5	6.5	9.5	6.5	kW

V.H.F. POWER TRIODE

TY6-5000A
TY6-5000W
TY6-5000H

AMPLIFIER FOR TELEVISION SERVICE, GRID MODULATED, CLASS 'C'

Positive modulation, negative synchronisation

OPERATING CONDITIONS for two valves in push-pull

f	48 to 75	Mc/s
Bandwidth (-1.5dB)	5.25	Mc/s
Bandwidth (-3.0dB)	8.0	Mc/s
P_{out} (white)	9.0	kW
P_{load} (white)	6.3	kW
V_a	5.0	kV
$-V_g$ (white)	200	V
(black)	460	V
(sync)	580	V
I_a (white)	2 × 1.9	A
(black)	2 × 400	mA
I_g (white)	2 × 250	mA
(black)	0	mA
$V_{in(g-g)pk}$ (white)	1.0	kV
$P_{load(driver)}$ white	250	W

AUDIO AMPLIFIER OR MODULATOR, CLASS 'B'

OPERATING CONDITIONS for two valves in push-pull

P_{out}	3.3	4.6	5.3	6.0	6.6	13.3	kW
D_{tot}	3.3	2.9	2.6	3.7	3.3	4.3	%
R_{a-a}	4.4	4.2	4.9	6.1	6.4	4.9	kΩ
V_a	3.0	3.5	4.0	4.5	5.0	6.0	kV
$-V_g$	90	100	112	125	138	165	V
$I_{a(o)}$	2×65	2×75	2×100	2×100	2×110	2×125	mA
$I_{a(max.sig.)}$	2×800	2×950	2×940	2×920	2×910	2×1500	mA
I_g	2×200	2×180	2×190	2×90	2×140	2×280	mA
$V_{in(g-g)r.m.s.}$	400	440	450	465	470	645	V
$P_{load(driver)}$	2×52	2×50	2×54	2×27	2×42	2×115	W
P_a	2×0.75	2×1.0	2×1.1	2×1.15	2×1.25	2×2.35	kW
η_a	69	70	71	72	73	74	%

Anode dissipation	Height above sea level		Inlet temperature	Rate of flow of air per minute		Pressure difference between inlet and outlet
(kW)	(km)	(ft)	(^{o}C)	(m^3)	(ft^3)	(mm H_2O)
1.0	0	0	35	3.0	105	8.0
1.0	0	0	45	3.1	110	8.0
1.0	1.5	4920	35	3.7	130	9.0
1.0	3.0	9840	25	4.1	145	10
3.0	0	0	35	5.2	185	23
3.0	0	0	45	6.1	215	29
3.0	1.5	4920	35	6.2	220	26
3.0	3.0	9840	25	6.6	235	26
5.0	0	0	35	9.2	325	68
5.0	0	0	45	10.7	380	90
5.0	1.5	4920	35	11.2	395	81
5.0	3.0	9840	25	11.6	410	79

TY6-5000W

Water cooled anode, low velocity air flow on seals.

Maximum temperatures

Anode and grid seals	180	^{o}C
Water inlet	50	^{o}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 in the following table:

Anode dissipation	Inlet temperature	Rate of flow of water per minute		Pressure difference between inlet and outlet
(kW)	(^{o}C)	(litres)	(gal)	(atm)
1.0	20	2.5	0.55	0.08
1.0	50	3.0	0.66	0.1
2.0	20	2.5	0.55	0.08
2.0	50	5.0	1.10	0.3
4.0	20	4.0	0.88	0.18
4.0	50	9.0	1.98	0.9
6.0	20	6.0	1.32	0.4
6.0	50	14	3.08	2.5

At inlet temperatures between 20 and 50^{o}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 at frequencies above 30Mc/s. The air flow should be started at the application of filament voltage.

TY6-5000H

Water cooled anode, low velocity air flow on seals

Maximum temperatures

Water inlet	50	°C
Filament seals	210	°C
Anode and grid seals	180	°C

The amount of water cooling required for this valve depends on the anode dissipation and the temperature of the water.
Typical values of rate of flow of water through helix and pressure loss in the helix are given in the curve on page C2. The minimum rate of flow of water through helix required can be found from the curves on page C3. At frequencies above 30Mc/s and at ambient temperatures above 35°C both grid and filament seals should be cooled by a low velocity air flow.

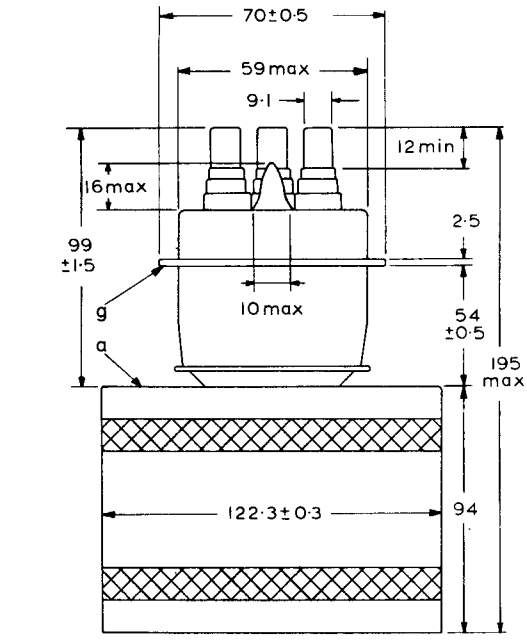
PHYSICAL DATA ←

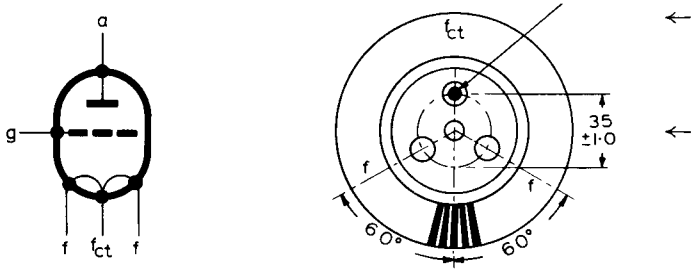
	TY6-5000A	TY6-5000W	TY6-5000H	
Weight of valve	10.1	1.0	1.8	lb
	4.6	0.45	0.8	kg
Weight of valve plus carton	17.9	2.6	3.7	lb
	8.1	1.2	1.7	kg
Weight of insulating pedestal	4.6	-	-	lb
	2.1	-	-	kg
Weight of insulating pedestal plus carton	6.8	-	-	lb
	3.1	-	-	kg
Weight of water jacket	-	1.1	-	lb
	-	0.52	-	kg
Weight of water jacket plus carton	-	1.7	-	lb
	-	0.75	-	kg

ACCESSORIES ←

Filament clips × 3	40634
Grid connector × 1 >30Mc/s	40622
Grid connector × 1 <30Mc/s	40650
Insulating pedestal × 1 (TY6-5000A)	40630
Water jacket × 1 (TY6-5000W)	K713

OUTLINE DRAWING OF TY6-5000A





All dimensions in mm

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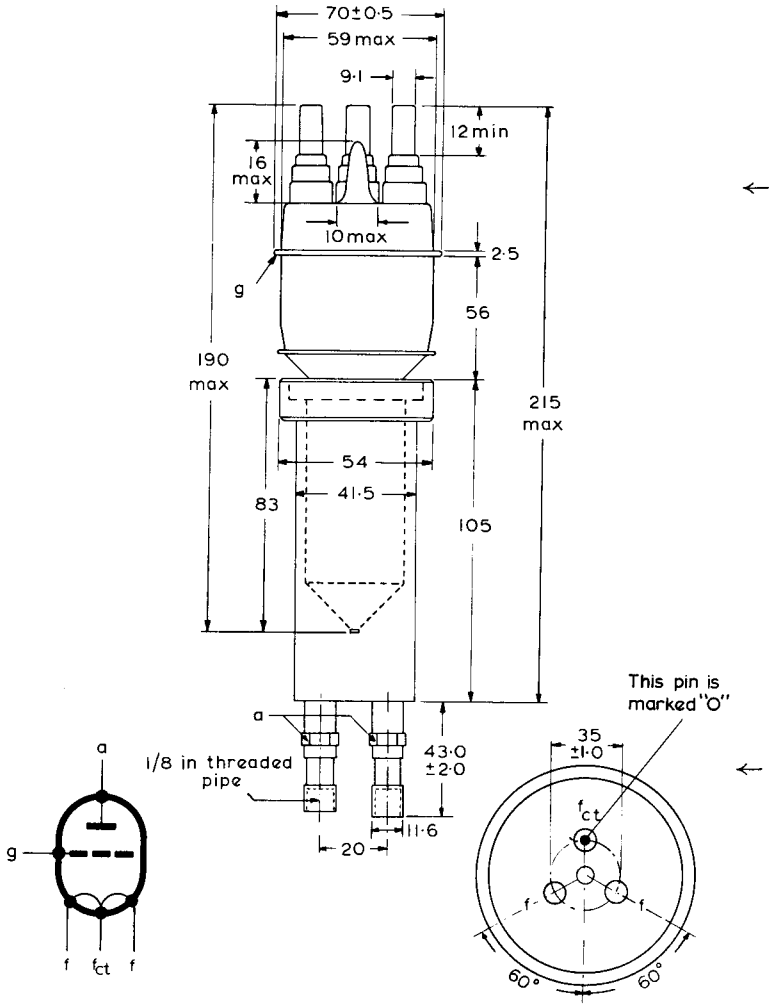
OUTLINE DRAWING OF TY6-5000W MOUNTED IN WATER JACKET K713



All dimensions in mm

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OUTLINE DRAWING OF TY6-5000H