

The characteristics and curves published in this Handbook are based upon the average of readings taken on a number of valves, and the performance figures given under "Typical Operating Data" are values to be expected when average valves are used under appropriate conditions. The conditions selected are those under which the power delivered and the efficiency are as high as possible compatible with good valve life.

Amplification Factor

The amplification factors quoted for pentodes and tetrodes are those of g_1 with respect to g_2 .

Drive Power

The value given is the power actually absorbed at the grid of the driven valve. The previous stage should be capable of delivering from twice to three times this power to allow for circuit losses.

Input Voltage

The value quoted is the peak value (v_{pk}) unless otherwise stated. For push-pull stages the grid-to-grid value is given.

Output Power

The value given is the total output delivered by the valve. The useful power will be somewhat less, dependent upon circuit losses.

Mercury Vapour Rectifiers

The maximum peak inverse voltage figure applies up to a maximum supply frequency of 150 c/s. At 500 c/s this value must be reduced by 15% and at 800 c/s by 25%.

By "D.C. Output Voltage" is meant the mean value of the unsmoothed rectified voltage, i.e., the voltage input to the filter.

(D)

(E)

(F)

(G)

■

The following recommendations should be interpreted in conjunction with British Standard Code of Practice No. CP1005: Part 7: 1954, 'The Use of Electronic Valves', upon which these notes have, in part, been based.

GENERAL

The published characteristics and curves are based upon the average of readings taken on a number of valves and the operating conditions given are those which result in optimum power output and efficiency without over-running the valve. Failure to observe the various recommendations may seriously reduce the life of the valve and in some instances result in catastrophic failure.

LIMITING VALUES

The limiting values are absolute. It is important that none of these limits are ever exceeded and such variations as mains fluctuations, component tolerances and switching surges, must be taken into account in deciding the nominal valve operating conditions.

In some instances, such as pulse operation or intermittent service, it may be permitted to exceed the absolute values but, to ensure the validity of the guarantee, the desired operating conditions must be agreed with Mullard Limited, (Industrial Technical Service Department).

TYPICAL OPERATING CONDITIONS

Typical operating conditions are shown for various modes of operation, e.g. 'r.f. power amplifier class C telegraphy' or 'telephony', etc. Some of the typical operating conditions for a particular mode of operation may incorporate one or more of the absolute ratings; in such cases the designer should take precautionary steps to ensure that these ratings are never exceeded.

FILAMENT OR HEATER SUPPLY

Either a.c. or d.c. supply may be used for filament heating. The published negative grid bias voltages are based upon a.c. heating. When d.c. heating is employed for directly heated valves the grid bias should be reduced by one-half of the filament voltage and when the anode current is greater than 5% of the filament current the h.t. return should be taken to a centre point resistor or to a reversing switch. When a.c. is employed the h.t. return should be taken to the centre tap of the filament transformer.

Measurements of the filament or heater voltage should always be

made after the valve and supply transformer have attained their working temperature, and should be taken at the valve pins or terminals.

(a) Oxide-coated Filaments and Cathodes

To obtain maximum life the filament or heater voltage must be within $\pm 2.5\%$ of the nominal value and temporary fluctuations should not exceed $\pm 10\%$.

With valves specially designed for use in mobile transmitters, emergency operation of the filament or heater down to the specified voltage is allowed.

(b) Thoriated Tungsten Filaments

To obtain maximum life the filament voltage must be within $\pm 1\%$ of the nominal value and temporary fluctuations should not exceed $\pm 5\%$.

(c) Pure Tungsten Filaments

It is essential, when using valves with pure tungsten filaments, that the recommended filament operating conditions are never exceeded. The filament voltage marked on such valves is that which provides the rated total emission (i.e. 90% of the saturation emission) when the valve is new. In order to maintain this emission over the whole life of the valve, the filament voltage must be increased progressively to a total maximum of 105%. When less than the rated total emission is required for a particular application, the life can be extended by operating the filament at a reduced voltage.

(d) Filament Switching

It may be necessary with some valves to limit the filament current when switching on the supply. Information on this will generally be included on individual data sheets but in cases of doubt Mullard Limited, (Industrial Technical Service Department) should be consulted.

COOLING

(a) General

With radiation-cooled valves the maximum base, seal and envelope temperatures are given in the published data. To avoid exceeding these it may sometimes be necessary to provide artificial cooling.

In the development stage of an equipment the various temperatures should be measured with due regard to the ultimate environmental conditions. Special paints and lacquers are available for this purpose but any other suitable method can be used.

In some cases the filament and grid seals of water-cooled, forced-air-cooled and silica valves require cooling and guidance is given on individual data sheets.

Where additional cooling is necessary for safe operation precautionary steps must be taken to switch off all supply voltages in the event of failure or reduction of the cooling medium.

(b) *Water-Cooling*

A water-cooled valve should always be used with the recommended type of water jacket. The circulating cooling water should be as free as possible from all solid matter and the dissolved oxygen content should be low. Whenever possible a closed water system using distilled or demineralised water should be employed. In general, the resistivity of the cooling water should not be less than $3.3\text{k}\Omega/\text{c.c}$ and the inorganic solid content should not exceed 3 parts in 10^5 , but for some applications and some types of valves it may be desirable for the resistivity to be considerably higher and the solid content to be less. If desired, Mullard Limited, (Industrial Technical Service Department) will undertake to analyse the available water supply.

The temperature limits given in the individual data sheets should in no circumstances be exceeded and it is essential to insert an automatic device in the water outlet to switch off the supply voltages in the event of the failure or reduction of the water supply.

(c) *Forced-Air Cooling*

The temperature limits laid down in the data sheets should in no circumstance be exceeded and precautions should be taken to switch off all supply voltages in the event of a fault in the air circulating system.

The use of an inlet filter in the air supply is recommended particularly in dusty or dirty locations to avoid clogging the radiator air ducts.

(d) *Auxiliary Air and Water-Cooling*

Where auxiliary cooling is specified, e.g. for grid seals, precautionary steps must be taken to switch off all supply voltages in the event of the failure or reduction of these auxiliaries.

VALVES IN R.F. HEATING APPLICATIONS

The service conditions associated with r.f. heating, i.e. induction heating, dielectric-loss heating and short wave diathermy, can be more severe than those associated with communication service.

These severe conditions are mainly due to the wide variations in load impedance usually encountered which, in turn, produce large variations in grid current, anode current, grid dissipation and anode dissipation. The risk of exceeding the valve ratings is, therefore, increased.

For valves recommended for r.f. heating applications, the data sheets include ratings and typical operating conditions calculated to provide margins of safety against variations of load and supply voltage. Since it is not possible to anticipate the degree of protection which a designer may wish to incorporate, these data generally give two sets of operating conditions:

- (a) for the valve fed from an unsmoothed d.c. supply and where no protection is incorporated in the equipment against valve over-load, under-drive or inefficient operation, and;
- (b) for the valve fully protected; this offers a performance only slightly less than that allowed for maximum 'class C telegraphy.'

The designer may choose an operating condition between these extremes depending upon the degree of protection which he decides to incorporate in the equipment. However, no limiting values may be exceeded during the work cycle.

It may sometimes be desired to use a valve for which no industrial ratings are given. The following table considers five methods of operation of triodes and indicates the factors by which the maximum 'class C telegraphy' should be multiplied in order to arrive at a safe rating, and designers are strongly recommended to give due consideration to these factors:

Method 1. Equipments fitted with effective automatic mains voltage stabilisation and effective automatic protection against valve over-load and over-drive and in which the power supply is derived from a filtered source containing not more than 5% ripple. (Three-phase full-wave and six-phase half or full-wave rectifier systems whether filtered or unfiltered, may be taken as meeting this requirement.)

Method 2. D.C. smoothed but unprotected.

Method 3. Equipment supplied by unsmoothed full-wave biphas rectifier but not fitted with automatic regulation or over-load protection.

Method 4. Self-rectifying equipment half-wave operation.

Method 5. Self-rectifying equipment full-wave operation without smoothing choke.

TRANSMITTING
VALVES

GENERAL OPERATIONAL
RECOMMENDATIONS

FACTORS APPLICABLE TO EACH VALVE

Method	1	2	3	4	5
Anode voltage r.m.s.	—	—	—	0.8	0.8
Anode voltage d.c.	0.95	0.8	0.7	—	—
Anode current	0.95	0.8	0.7	0.4	0.4
Power input	0.9	0.65	0.6	0.3	0.3
Anode dissipation	0.95	0.6	0.6	0.6	0.6
Control-grid current	0.9	0.8	0.7	0.4	0.4
Control-grid dissipation	0.9	0.7	0.7	0.7	0.7

Should it be desired to use tetrodes for r.f. heating applications Mullard Limited, (Industrial Technical Service Department) should be consulted.

To avoid damage to the valve in the event of an overload it is recommended that the minimum protection incorporated in industrial heating equipment should include a rapid action device to cut off the h.t. when the anode or grid current exceeds the maximum rating. If the anode dissipation at zero grid bias exceeds the limiting value, then grid under-current protection is also recommended in case oscillation ceases while the h.t. is applied. Further, where water or forced-air cooling of the valve is used, protection against failure of the cooling system is necessary.

MOUNTING

It is strongly recommended that all valves be mounted vertically. It is, however, permissible to mount some of the smaller valves horizontally provided that, for directly heated valves, the plane of the filament is vertical or, for indirectly heated valves, the plane of the major axis of the first grid is vertical. Recommendations on mounting are given on the data sheets when necessary.

Leads having sufficient flexibility to allow for thermal expansion and other movements should be employed for the external connections to those valves whose construction is such that stress might otherwise be set up in the seals.

When designing a mounting for an r.f. valve, it is important to avoid closed circuits of conducting material in regions of strong r.f. fields, otherwise considerable loss of output may result. It is always preferable to keep the quantity of any material in the r.f. field to a minimum.

Where a valve with an internal anode (e.g. silica valve TYS5-3000) is mounted in a clamp, any large metal parts of the clamp which are located in the region of the anode should be connected to anode terminal. This will prevent heating of the glass or silica which would



otherwise result from the r.f. potential gradient between the anode and the clamp.

Clamps used for supporting silica valves should be designed in such a way as to accommodate the usual envelope tolerances and thus avoid undue pressure being applied to the envelope.

DRIVE POWER

The value of grid current stated on the data sheets is intended only as a guide, and in making adjustments to the circuit the important factor to note is the grid driving voltage. Either over-driving or under-driving will result in a reduction in efficiency.

At low radio frequencies the drive power required for 'class C' operation can be calculated from the expression

$$P_{\text{drive}} = 0.9 \times v_{\text{in (pk)}} \times I_{\text{g1 (d.c.)}}$$

at higher frequencies more drive power is required due to input damping. The value given for the symbol $P_{\text{load(driver)}}$ is the power which must be available from the driver stage to provide for valve drive, input damping and circuit losses. It may be necessary to allow more for a circuit designed for a wide tuning range.

POWER OUTPUT

The valve output figures (P_{out}), represent the power which the valve will deliver to the circuit and load; a figure of load power (P_{load}) allowing for a typical circuit transfer efficiency for the type of service under consideration is stated.

When it is desired to operate power valves at frequencies so high that the efficiency is falling the input must be reduced.

REDUCED OPERATING LEVELS

- (a) When it is desired to operate valves at reduced power levels at h.f. the valve conversion efficiency can be kept at the maximum by decreasing the input current rather than the voltage.
- (b) When operating above about 100Mc/s however, circuit losses are higher and it is preferable to keep the input current high and reduce the voltage, thus minimising the circuit loss and obtaining a better load power.
- (c) When the frequency of operation is so high that the efficiency is decreased the input power must be reduced in order to avoid excessive electrode dissipations. This should be achieved by reducing the anode voltage, see frequency/voltage characteristic in the individual data sheets.

POWER DISSIPATED IN VALVE ELECTRODES

Dissipation in the screen-grid is given by the product of d.c. voltage and current

$$P_{g2} = V_{g2} \times I_{g2}$$

Power in the control-grid for 'class C' operation at low radio frequencies can be closely approximated from the peak positive value of drive voltage and the d.c. grid current. (The peak positive voltage is the drive voltage less the magnitude of the bias voltage.)

$$P_{g1} = I_{g1} [0.9 V_{in(pk)} - |V_{g1}|]$$

At higher radio frequencies the grid dissipation will be somewhat higher due to the increased capacitive current in the electrode.

In many radiation-cooled types the anode becomes visibly hot when near full dissipation and the temperature can be measured by a pyrometer. The temperature for full rated dissipation is usually given in the data sheets but any other loading may be checked by making comparative measurements with d.c. power, under non-oscillatory conditions.

For valves whose anodes are cooled by circulated water or by forced-air, the anode dissipation can be assessed by measuring the rise of temperature and flow of the cooling medium.

Radiation-cooled valves which do not colour may be assessed by covering with an insulating hood, vented to produce a reasonable equilibrium temperature and provided with some form of thermometer. The measured temperature under normal operating conditions may then be checked by making comparative measurements with d.c. power, under non-oscillatory conditions.

CLASS 'B' LOW FREQUENCY APPLICATIONS

The performance shown on the data sheets is based on an ideal circuit with no transformer losses, a resistive load, constant supply voltages and a sinusoidal input voltage. Allowances should be made for these factors in assessing the actual useful output power.

To reduce distortion due to the flow of grid current the impedance of the circuit supplying the input to the valve must be low. The use of a cathode follower driver stage is recommended, but an input transformer with a low output impedance or with a low damping resistance may be used.

The type of driver valve chosen must be able to deliver sufficient power to overcome the circuit losses in addition to providing the actual valve drive power.

STORAGE AND INSTALLATION

(a) *Mounting*

All large valves should be mounted with the filament vertical. The recommendation contained in individual data sheets as to the accuracy of the mounting should be complied with, otherwise the filament may sag towards the grid under its own weight.

In mobile or portable equipment, and in fixed installations subject to vibration, care should be exercised to ensure that the valve supports or chassis are suitably designed to protect the valve from mechanical shock and vibration.

(b) *Corona Effects*

Metal parts (particularly sharp points or edges), which might cause intense electrostatic fields, should not be located in the vicinity of valves operating at high voltages, since corona discharge may occur and cause damage to the valve. On installation, filament and other flexible leads should be kept well clear of the bulb and adjacent conductors.

(c) *Storage and Transit*

Valves not installed in equipment should be stored in their original packing or in racks. Any rack employed should be designed to protect the valve from excessive shaking or vibration and be so constructed that no stresses are imposed on the seals or the envelope.

Normal good storage conditions should be provided to prevent deterioration, such as corrosion of contacts or impairment of electrical insulation.

Valves should always be transported in the original packing designed for the purpose.

CONDITIONING

After transit or a period of storage it is recommended that power valves should be operated for not less than 15 minutes with the filaments only energised before being put into full service. In addition, with valves having anode voltages in excess of 5kV, the anode voltage and input power should be increased gradually or in several steps for a further period of 15 minutes, or longer, until normal operation is achieved. This treatment will clean-up traces of gases which may be present and which could cause premature failure of the valve.

Where valves are being held in store for an indefinite period it is recommended that periodic conditioning and testing is carried out as a safeguard against deterioration of vacuum. The interval of testing will, of course, depend upon the size and type of valve, and users are invited to contact Mullard Limited, (Industrial Technical Service Department) for details of treatment of individual valves.

LIST OF SYMBOLS

These symbols are based on British Standard Specification No. 1409 : 1950,
" Letter Symbols for Electronic Valves "

1. SYMBOLS FOR ELECTRODES

Anode	a	Fluorescent Screen or Target...	t
Cathode	k	External Metallisation	M
Grid	g	Internal Metallisation	m
Heater	h	Deflector Electrodes	x or y
Filament	f	Internal Shield	s
Beam Plates	bp	Resonator	Res ←

NOTE 1. In valves having more than one grid, the grids are distinguished by numbers— $g_1, g_2,$ etc., g_1 being the grid nearest the cathode.

NOTE 2. In multiple valves, electrodes of the different sections may be distinguished by adding one of the following letters:

Diode	d	Hexode	} h
Triode... ..	t	Heptode	
Tetrode	q	Octode	
Pentode	p	Rectifier	r

Thus, the grid of the triode section of a triode-hexode is denoted by g_1 .

NOTE 3. Two or more similar electrodes which cannot be distinguished by any of the above means may be denoted by adding one or more primes to indicate to which electrode system the electrode forms a part.

Thus, the anode of the first diode in a double diode valve is denoted a' .

2. SYMBOLS FOR ELECTRIC MAGNITUDES

Voltages

Direct Voltage	V
Alternating Voltage (r.m.s.)	$V_{r.m.s.}$
Alternating Voltage (mean)	V_{av}
Alternating Voltage (peak)	V_{pk}
Peak Inverse Voltage	P.I.V.

Current

Direct Current	I
Alternating Current (r.m.s.)	$I_{r.m.s.}$
Alternating Current (mean)	I_{av}
Alternating Current (peak)	I_{pk}
No Signal Current	I_0

Miscellaneous

Frequency	f	Anode Efficiency	η
Amplification Factor	μ	Sensitivity	S
Mutual Conductance	g_m	Brightness	B
Conversion Conductance... ..	g_c	Temperature	T
Distortion	D	Time	t



LIST OF SYMBOLS

	Inside Valve	Outside Valve
Resistance	r	R
Reactance	x	X
Impedance	z	Z
Admittance	y	Y
Mutual Inductance	m	M
Capacitance	c	C
Capacitance at Working Temperature	c _w	
Power	p	P

3. AUXILIARY SYMBOLS

Battery or other source of supply	b
Inverse (Voltage or Current)	inv
Ignition (Voltage)	ign
Extinction (Voltage)	ext
No Signal	o
Input	in
Output	out
Total	tot
Centre Tap	ct

4. COMPLEX SYMBOLS

Symbols in Sections 1 and 3 above may be used as subscripts to symbols in Section 2, to denote such magnitudes as Anode Current, Grid Volts, etc., e.g.:-

Anode Voltage ...	V _a	Anode Current (A.C. r.m.s.)	I _{a(r.m.s.)}
Control-Grid Voltage	V _{g1}	No Signal Anode Current ...	I _{a(o)}
Anode Supply Voltage	V _{a(b)}	Control-Grid Current ...	I _{g1}
Filament Voltage ...	V _f	Total Distortion	D _{tot}
Heater Voltage ...	V _h	3rd Harmonic Distortion ...	D ₃
Anode Dissipation ...	p _a	Equivalent Noise	
Output Power ...	P _{out}	Resistance	R _{eq}
Drive Power ...	P _{drive}	Limiting Resistor	R _{lim}
Anode Current (D.C.)	I _a	Cathode Bias Resistor	R _k

	Internal	External
Anode Resistance	r _a	R _a
Insulation Resistance (heater to cathode)	r _{h-k}	
Resistance between Control-Grid and Cathode	r _{g1-k}	R _{g1-k}
Capacitance (cold)—		
Anode to all other electrodes		C _{a-all}
Anode to control-grid		C _{a-g1}
Control-grid to cathode at working temperature		C _{g1-k(w)}
Control-grid to all other electrodes except anode (Input Capacitance)		C _{in}
Anode to all other electrodes except control-grid (Output Capacitance)		C _{out}
Inner Amplification Factor		μ _{g1-g2}

PRESENTATION OF VALVE DATA

The symbols component and base references incorporated in the data are in accordance with the following British Standards:—

- | | |
|---------------------------------|---|
| 1409: 1950 | Letter symbols for electronic valves. |
| 1991: Part I: 1954 | Letter symbols, signs and abbreviations. |
| 530: 1948
(with supplements) | Graphical symbols for telecommunications. |
| 448: 1953 | Electronic valve bases, caps and holders. |

○

○

○

○

■

R.F. POWER TRIODE

TX10-4000

Power triode in silica envelope, rated for a maximum anode dissipation of 4 kW. Primarily intended as self-excited oscillator in R.F. heating equipment but may also be used for communications purposes.

PRELIMINARY DATA

FILAMENT

Pure tungsten suitable for A.C. or D.C. heating
 Marked V_f 21.3 ± 1.0 V
 I_f (approx.) 47.0 A
 (Marked volts give 6.0 amps emission at 90% saturation)

CAPACITANCES

C_{g-f} 13.5 $\mu\mu\text{F}$
 C_{a-f} 4.0 $\mu\mu\text{F}$
 C_{a-g} 21.0 $\mu\mu\text{F}$

CHARACTERISTICS

At $V_a = 10$ kV $I_a = 0.32$ A
 g_m 4.5 mA/V
 μ 55
 r_a 12 k Ω

LIMITING VALUES

* V_a max. (at 7 Mc/s) 12 kV
 * V_a max. (at 10 Mc/s) 10 kV
 * V_a max. (at 20 Mc/s) 7 kV
 P_a max. 4.0 kW
 I_k max. 1.6 A
 I_g max. 350 mA
 V_g max. -700 V
 R_{c-f} max. 3 k Ω
 f max. 20 Mc/s

TYPICAL OPERATING CONDITIONS

As Class "C" C.W. oscillator at $f = 3.5$ Mc/s
 V_a 12 kV
 V_g -500 V
 I_a 1.1 A
 I_g 0.2 A
 V_{drive} (pk) 1,100 V
 P_{drive} 220 W
 P_{out} 9.7 kW
 P_a 3.5 kW
 η 73.5 %

*Figure quoted does not include ripple and H.T. regulation which should not exceed 25%.

WEIGHT

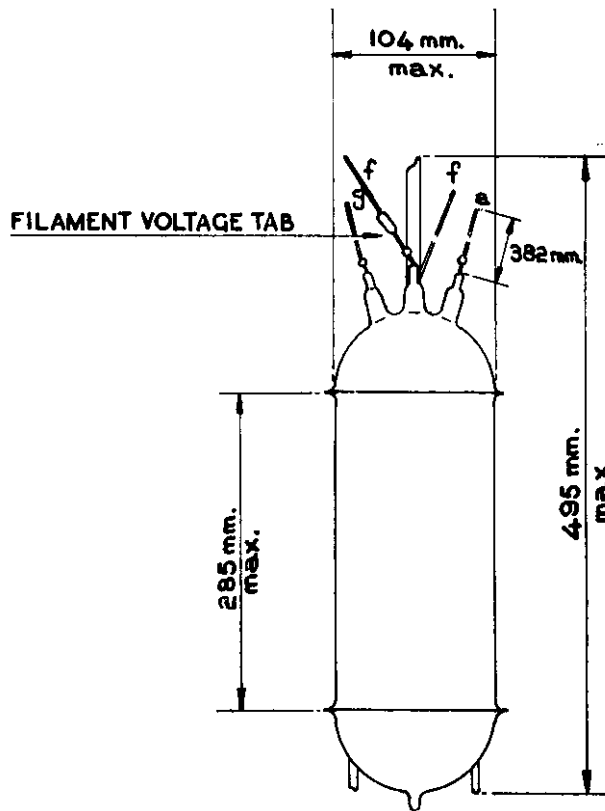
Valve only

2 lb. 8 oz. (1.14 kg.)

TX10-4000

R.F. POWER TRIODE

Power triode in silica envelope, rated for a maximum anode dissipation of 4 KW. Primarily intended as self-excited oscillator in R.F. heating equipment but may also be used for communications purposes.

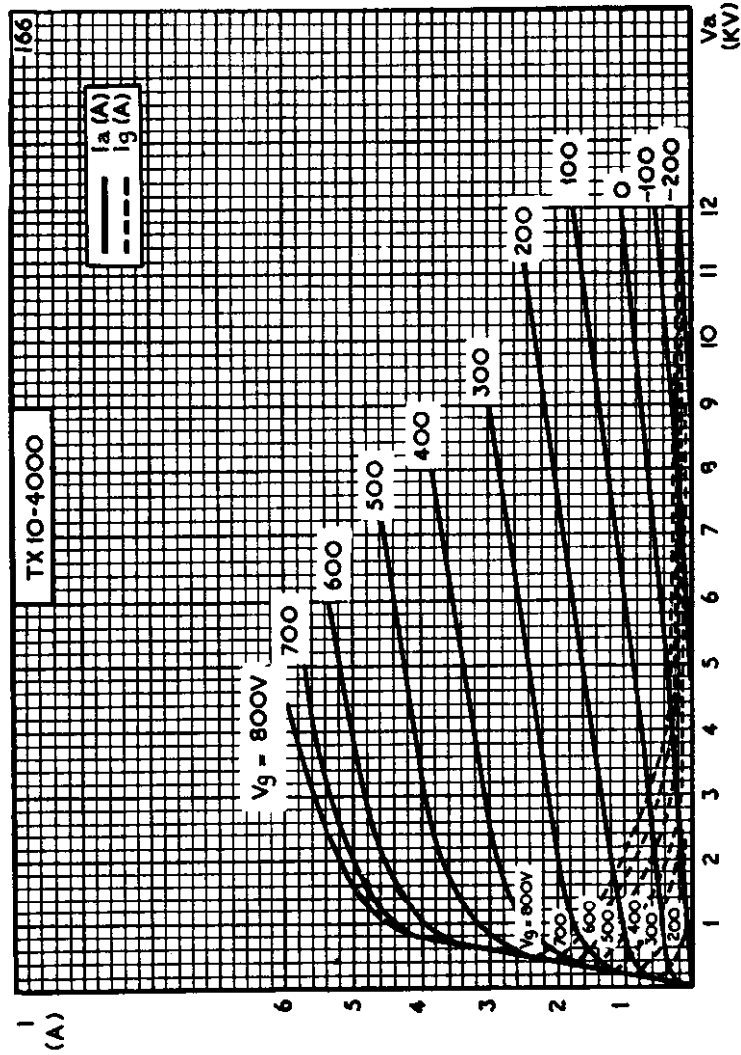


R.F. POWER TRIODE

TX10-4000

Power triode in silica envelope, rated for a maximum anode dissipation of 4 KW.

Primarily intended as self-excited oscillator in R.F. heating equipment but may also be used for communications purposes.

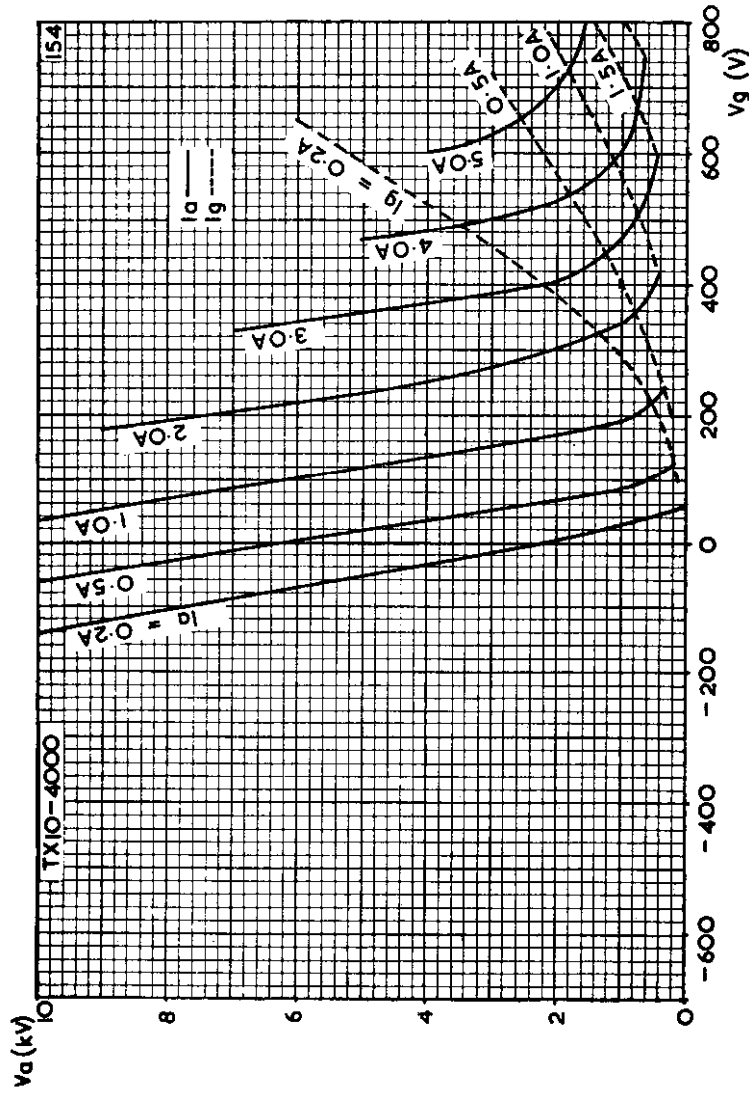


ANODE CURRENT PLOTTED AGAINST ANODE VOLTS
GRID CURRENT PLOTTED AGAINST ANODE VOLTS

TX10-4000

R.F. POWER TRIODE

Power triode in silica envelope, rated for a maximum anode dissipation of 4 KW. Primarily intended as self-excited oscillator in R.F. heating equipment but may also be used for communications purposes.



CONSTANT CURRENT CURVES



WATER-COOLED R.F. TRIODE TX12-12W

High-power water-cooled triode, intended for R.F. heating applications.

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

FILAMENT

Pure Tungsten, suitable for a.c. or d.c. operation.

Marked V_f 19 ± 1.0 V
 I_f (approx.) 72 A

(Marked volts give 10 amps emission for 90% saturation.)

CAPACITANCES (Measured without water jacket)

C_{g-f} 25 $\mu\mu\text{F}$
 C_{a-f} 2.2 $\mu\mu\text{F}$
 C_{a-g} 30 $\mu\mu\text{F}$

CHARACTERISTICS (At $V_a = 10$ KV, $V_g = 0$ V)

g_m 9.0 mA/V
 μ 45
 r_a 5.0 k Ω

LIMITING VALUES

* V_a max. ($f = 15$ Mc/s) 12 kV
 p_a max. 12 kW
 p_g max. 350 W
 I_g max. 30 A
 Min. rate of flow of water 3.0 gal/min
 Max. water outlet temperature 65 $^{\circ}\text{C}$

*At higher frequencies the permissible anode voltage is reduced to the following percentages of the maximum:

f	20	25	40	Mc/s
% of V_a max.	85	65	35	%

MAXIMUM OPERATING CONDITIONS AS SINGLE VALVE R.F. POWER OSCILLATOR

V_a	8.0	10	12	kV
V_g	-290	-460	-375	V
I_a	2.4	2.5	2.6	A
I_g (approx.)	250	130	140	mA
V_{in} (pk)	1.3	1.5	1.4	kV
P_{drive} (approx.)	320	200	200	W
R_a	1.6	1.9	2.3	k Ω
P_{out}	13	16.7	21.5	kW
p_a	6.2	8.3	9.7	kW



TX12-12W WATER-COOLED R.F. TRIODE

*High-power water-cooled triode, intended for
R.F. heating applications.*

R.F. HEATING APPLICATIONS

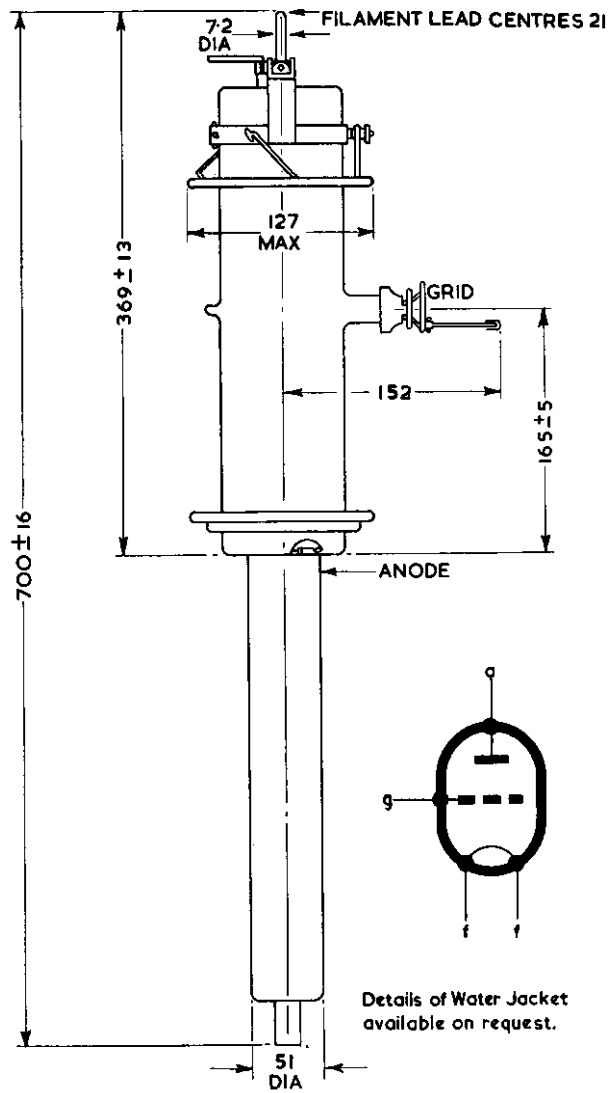
For these applications, individual requirements should be discussed with Industrial Technical Service Department, Mullard Limited.

OPERATING NOTES

- (a) It is essential that the filament seal be cooled with a blast of air. All cooling supplies should commence before the application of any voltage.
- (b) The resistance of the filament when cold is 0.021Ω . The filament current must never be allowed to exceed 105 amps. If the valve is operated for periods greater than 15 minutes without the applied anode voltage, the filament voltage must be reduced to one half its normal value during the stand-by period.

WATER-COOLED R.F. TRIODE TX12-12W

High-power water-cooled triode, intended for R.F. heating applications.

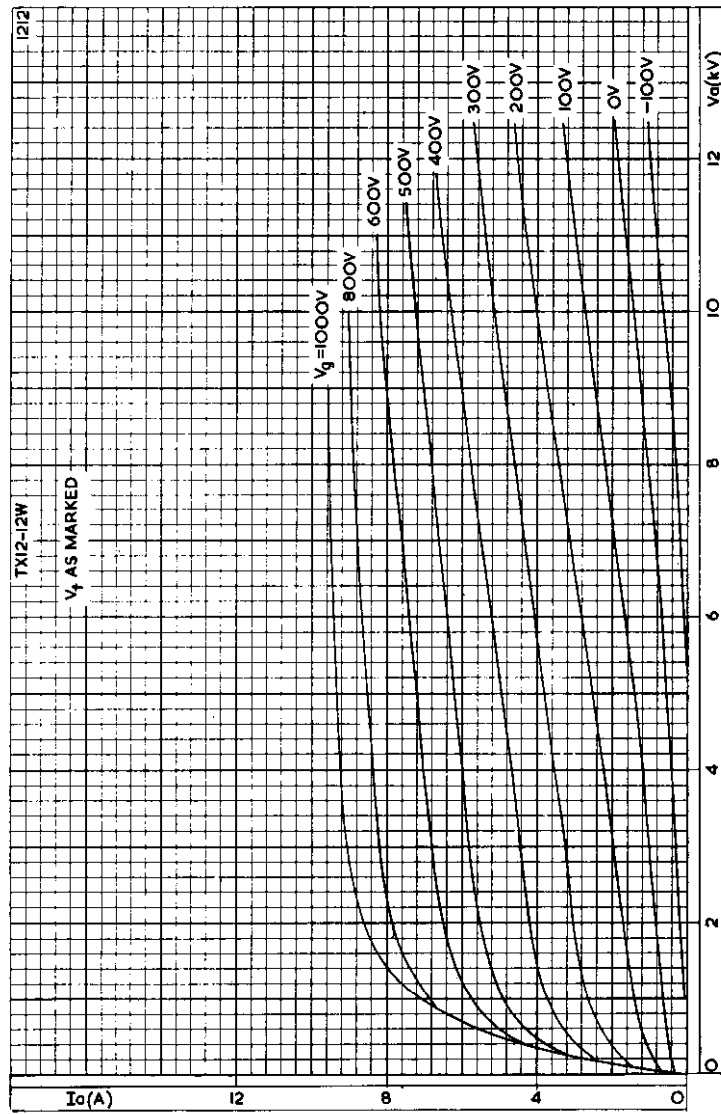


All dimensions in mm.

1211

TX12-12W WATER-COOLED R.F. TRIODE

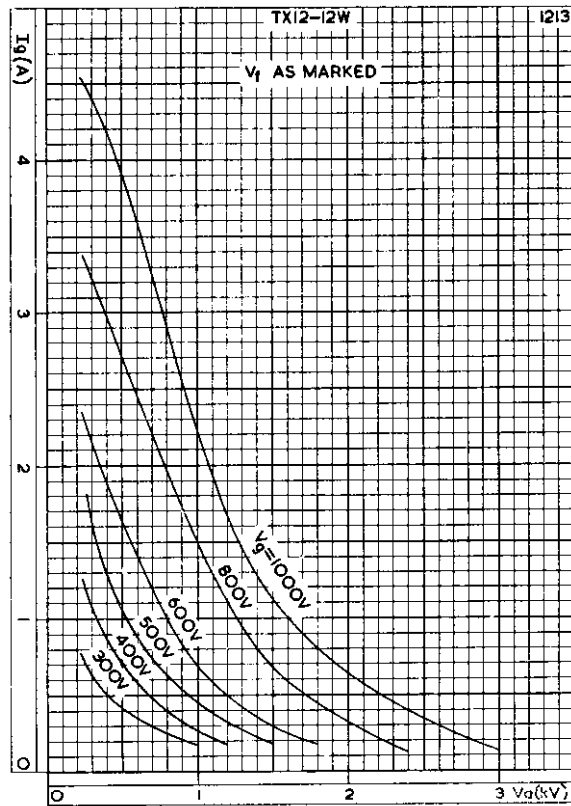
High-power water-cooled triode, intended for R.F. heating applications.



ANODE CURRENT PLOTTED AGAINST ANODE VOLTAGE WITH GRID VOLTAGE AS PARAMETER

WATER-COOLED R.F. TRIODE TX12-12W

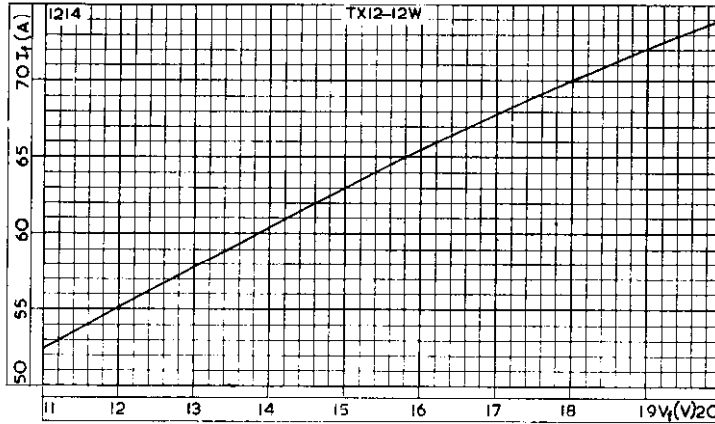
High-power water-cooled triode, intended for R.F. heating applications.



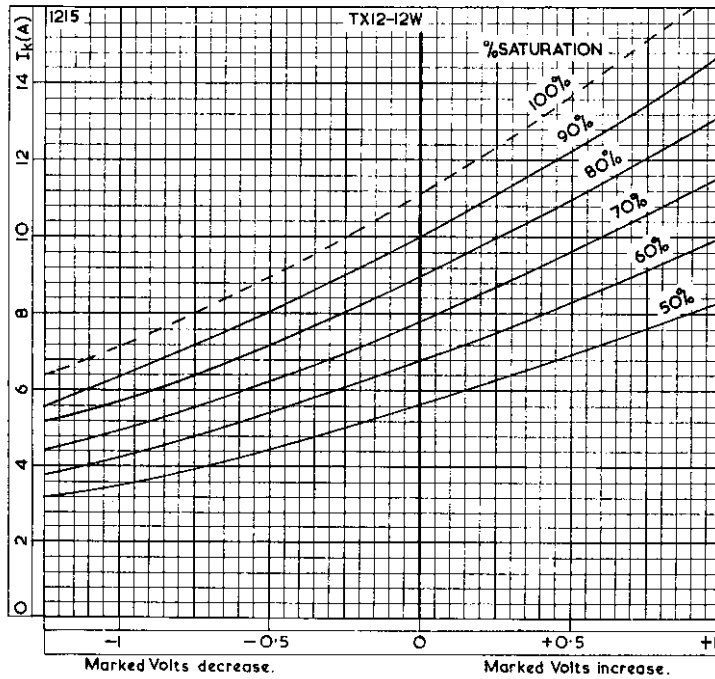
GRID CURRENT PLOTTED AGAINST ANODE VOLTAGE WITH GRID VOLTAGE AS PARAMETER

TX12-12W WATER-COOLED R.F. TRIODE

High-power water-cooled triode, intended for R.F. heating applications.



VARIATION OF FILAMENT CURRENT WITH FILAMENT VOLTAGE



VARIATION OF CATHODE EMISSION WITH DEVIATION OF FILAMENT VOLTAGE FROM MARKED VALUE SHOWING VARIOUS DEGREES OF SATURATION



WATER-COOLED R.F. TRIODE **TX12-20W**

High-power water-cooled triode, primarily intended for use in the output stage of communications transmitters, also suitable for R.F. heating purposes.

FILAMENT

Pure tungsten, suitable for a.c. or d.c. operation.

Marked V_f	18.5 ± 0.5	V
I_f (approx.)	85	A

(Marked volts give 10 amps emission for 90% saturation).

CAPACITANCES

C_{g-f}	28	$\mu\mu\text{F}$
C_{a-f}	1.5	$\mu\mu\text{F}$
C_{a-g}	26	$\mu\mu\text{F}$

CHARACTERISTICS (At $V_a = 12$ kV $I_a = 1.0$ A)

g_m	11	mA/V
μ	38	
r_a	3.5	k Ω

LIMITING VALUES

V_a max.	12	kV
I_k max.	3.0	A
I_g max.	0.5	A
P_a max.	18	kW
f max.	20	Mc/s
Min. water flow rate	4.5	gal/min
Max. water temp. rise	14	$^{\circ}\text{C}$
Max. water outlet temp.	60	$^{\circ}\text{C}$

TYPICAL OPERATING CONDITIONS AS CLASS "C" C.W. AMPLIFIER (At $f = 1$ Mc/s)

V_a	12	kV
V_g	-900	V
I_a	2.63	A
I_g	0.37	A
V_{drive} (pk)	1.85	kV
P_{drive}	700	W
P_{out}	22	kW
P_a	9.5	kW
η	70	%

TYPICAL OPERATING CONDITIONS AS CLASS "B" AMPLIFIER WITH MODULATED INPUT (At $f = 1$ Mc/s)

V_a	12	kV	
V_g	-300	V	
(Carrier) (Peak values for 100% mod.)			
I_a	1.1	2.5	A
I_g	-	0.2	A
V_{drive} (pk)	430	860	V
P_{drive}	-	160	W
P_{out}	4.25	19	kW
P_a	9.0	11	kW
η	32	63.5	%



WATER-COOLED R.F. TRIODE **TX12-20W**

High-power water-cooled triode, primarily intended for use in the output stage of communications transmitters, also suitable for R.F. heating purposes.

FILAMENT

Pure tungsten, suitable for a.c. or d.c. operation.

Marked V_f	18.5 ± 0.5	V
I_f (approx.)	85	A

(Marked volts give 10 amps emission for 90% saturation).

CAPACITANCES

C_{g-f}	28	$\mu\mu\text{F}$
C_{a-f}	1.5	$\mu\mu\text{F}$
C_{a-g}	26	$\mu\mu\text{F}$

CHARACTERISTICS (At $V_a = 12$ kV $I_a = 1.0$ A)

g_m	11	mA/V
μ	38	
r_a	3.5	k Ω

LIMITING VALUES

V_a max.	12	kV
I_k max.	3.0	A
I_g max.	0.5	A
P_a max.	18	kW
f max.	20	Mc/s
Min. water flow rate	4.5	gal/min
Max. water temp. rise	14	$^{\circ}\text{C}$
Max. water outlet temp.	60	$^{\circ}\text{C}$

TYPICAL OPERATING CONDITIONS AS CLASS "C" C.W. AMPLIFIER (At $f = 1$ Mc/s)

V_a	12	kV
V_g	-900	V
I_a	2.63	A
I_g	0.37	A
V_{drive} (pk)	1.85	kV
P_{drive}	700	W
P_{out}	22	kW
P_a	9.5	kW
η	70	%

TYPICAL OPERATING CONDITIONS AS CLASS "B" AMPLIFIER WITH MODULATED INPUT (At $f = 1$ Mc/s)

V_a	12	kV	
V_g	-300	V	
(Carrier) (Peak values for 100% mod.)			
I_a	1.1	2.5	A
I_g	-	0.2	A
V_{drive} (pk)	430	860	V
P_{drive}	-	160	W
P_{out}	4.25	19	kW
P_a	9.0	11	kW
η	32	63.5	%

(D)

(D)

(D)

(D)

■

V.H.F. POWER TRIODE

TY2-125

All-glass triode rated for a maximum anode dissipation of 135 W and suitable for use at frequencies up to 200 Mc/s.

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

FILAMENT Thoriated tungsten

V_f	6.3	V
I_f	5.4	A

MOUNTING POSITION Vertical only, base up or down.

CAPACITANCES

C_{a-g}	5.5	pF
C_{g-f}	5.5	pF
C_{a-f}	0.1	pF

CHARACTERISTICS (Measured at $V_a=2.5$ kV; $I_a=44$ mA)

g_m	2.8	mA/V
μ	25	

COOLING

T_{pins} max.	180	°C
$T_{anode\ seal}$ max.	220	°C

When the valve is operated at near maximum ratings it is possible that the maximum temperature limits may be exceeded, in which case an air flow of up to 5 cu. ft. (150 litres) per minute must be directed towards the centre of the valve base.

An anode terminal connector having a large area is necessary in order to keep the anode seal cool.

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

Limiting Values

V_a max.	2.5	kV
p_a max. (corresponding to an anode temperature of 850°C i.e. red heat)	135	W
p_g max.	16	W
I_k max.	250	mA
$i_{k(pk)}$ max.	1.6	A
R_{g-f} max. (fixed bias)	100	k Ω
R_{g-f} max. (automatic bias)	200	k Ω

TY2-125

V.H.F. POWER TRIODE

All-glass triode rated for a maximum anode dissipation of 135W and suitable for use at frequencies up to 200 Mc/s.

Typical Operating Conditions

	≤ 150	≤ 150	≤ 150	≤ 200	Mc/s
V_a	1.5	2.0	2.5	2.0	kV
V_g	-45	-67	-87	-67	V
I_a	120	97	77	97	mA
$V_{in(pk)}$	100	100	100	100	V
P_a	121	130	128	134	W
P_{out}	59	64	65	60	W
η	33	33	34	31	%
* P_{load}	47	51	52	48	W
For 100% Modulation					
I_g	52	28	20	28	mA
P_{drive}	9.4	5.1	3.6	8.0	W

*With a circuit Transfer Efficiency of 80%

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

Limiting Values

V_a max.	2.5	kV
P_a max. (corresponding to an anode temperature of 850°C i.e. red heat)	135	W
P_g max.	16	W
I_g max.	250	mA
$i_{k(pk)}$ max.	1.6	A
R_{g-f} max. (fixed bias)	100	k Ω
R_{g-f} max. (automatic bias)	200	k Ω

Typical Operating Conditions

	≤ 150	≤ 150	≤ 150	≤ 150	≤ 200	Mc/s
V_a	1.0	1.5	2.0	2.5	2.0	kV
V_g	-80	-110	-150	-200	-150	V
I_a	205	205	205	205	175	mA
I_g	40	40	40	40	35	mA
$V_{in(pk)}$	260	300	340	390	300	V
P_a	79	98	115	122	105	W
P_{drive}	10	11	13	14	20	W
P_{out}	126	210	295	390	245	W
η	61.5	68	72	76	70	%
* P_{load}	100	168	236	312	196	W

*With a circuit Transfer Efficiency of 80%

V.H.F. POWER TRIODE

TY2-125

All-glass triode rated for a maximum anode dissipation of 135W and suitable for use at frequencies up to 200 Mc/s.

OPERATING CONDITIONS FOR TWO VALVES AS R.F. POWER AMPLIFIER (CLASS "C" ANODE MODULATION)

Limiting Values

V_a max.	2.0	kV
p_a max. (corresponding to an anode temperature of 850°C i.e. red heat)	135	W
p_g max.	16	W
I_k max.	250	mA
$i_{k(pk)}$ max.	2.5	A
R_{g-f} max. (fixed bias)	100	kΩ
R_{g-f} max. (automatic bias)	200	kΩ

Typical Operating Conditions

	≤ 150	≤ 150	≤ 150	≤ 200	Mc/s
V_a	1.0	1.5	2.0	1.5	kV
V_g	-130	-180	-225	-180	V
I_a	2×127	2×127	2×127	2×127	mA
I_g	2×40	2×40	2×40	2×40	mA
$V_{in(g-g)pk}$	640	740	830	740	V
P_{drive}	2×11.5	2×13.5	2×15	2×21	W
p_a	2×32	2×38	2×51	2×41	W
P_{out}	190	306	408	300	W
η	74	80	80	78	%
* P_{load}	152	245	325	240	W
For 100% Modulation					
P_{mod}	126	191	255	191	W

*With a circuit Transfer Efficiency of 80%

OPERATING CONDITIONS FOR TWO VALVES AS GROUNDED GRID R.F. POWER AMPLIFIER (CLASS "C" TELEGRAPHY OR F.M. TELEPHONY)

Limiting Values

V_a max.	2.5	kV
p_a max. (corresponding to an anode temperature of 850°C i.e. red heat)	135	W
p_g max.	16	W
I_k max.	250	mA
$i_{k(pk)}$ max.	1.6	A
R_{g-f} max. (fixed bias)	100	kΩ
R_{g-f} max. (automatic bias)	200	kΩ

TY2-125

V.H.F. POWER TRIODE

All-glass triode rated for a maximum anode dissipation of 135W and suitable for use at frequencies up to 200 Mc/s.

Typical Operating Conditions at $f \leq 150$ Mc/s

V_a	1.0	1.5	2.0	2.5	kV
V_g	-80	-110	-150	-200	V
I_a	2×205	2×205	2×205	2×205	mA
I_g	2×40	2×40	2×40	2×40	mA
$V_{(a-g)pk}$	520	600	680	780	V
P_{drive}	2×50	2×59	2×68	2×79	W
p_a	2×79	2×97	2×115	2×122	W
* P_{out}	252 ± 80	420 ± 96	590 ± 110	780 ± 130	W
† η	61.5	68	72	76	%
‡ P_{load}	265	410	560	730	W

*Includes power transferred from driver stage.

†Valve efficiency.

‡With a Circuit Transfer Efficiency of 80%.

OPERATING CONDITIONS FOR TWO VALVES IN PUSH-PULL AS CLASS "B" A.F. POWER AMPLIFIER OR MODULATOR (With I_{g1})

Limiting Values

V_a max.	2.5	kV
p_a max.	135	W
p_g max.	16	W
I_k max.	250	mA
$i_{k(pk)}$ max.	1.6	A
R_{g-t} max. (fixed bias)	100	k Ω
R_{g-t} max. (automatic bias)	200	k Ω

Typical Operating Conditions

V_a	1.0	1.5	2.0	2.5	kV
V_g	-23	-46	-65	-86	V
$I_{b(o)}$	2×30	2×30	2×30	2×30	mA
I_a (max.sig.)	2×210	2×210	2×208	2×178	mA
I_g	2×40	2×40	2×42	2×42	mA
$V_{(a-g) r.m.s.}$	210	240	280	295	V
P_{drive}	2×7.5	2×6.0	2×7.5	2×8.0	W
p_a	2×73	2×90	2×101	2×95	W
P_{out}	274	450	630	700	W
R_{a-a}	5.0	8.5	12	18.2	k Ω
τ_i	65	71.5	76	78.5	%
D_{tot}	2.2	2.9	3.7	5.0	%

V.H.F. POWER TRIODE

TY2-125

All-glass triode rated for a maximum anode dissipation of 135W and suitable for use at frequencies up to 200 Mc/s.

INDUSTRIAL RATINGS

Limiting Values (Absolute Ratings)

f max.	150	Mc/s
$V_{a(d.c.)}$ max.	2.5	kV
$V_{a(pk)}$ a. c. max.	4.0	kV
I_a max.	200	mA
$i_{a(pk)}$ a. c. max.	260	mA
p_a max.	135	W
I_g max. (at p_a max.)	40	mA
I_g max. (at 25% p_a max.)	50	mA
R_{g-f} max.	15	k Ω

DIELECTRIC HEATER WITHOUT PROTECTION

Recommended rated operating condition for a dielectric heater employing single phase, full wave rectification (unsmoothed) for the anode supply.

f	150	Mc/s
$V_{tr(r.m.s.)}$	2500-0-2500	V
V_a	2.24	kV
P_{in}	310	W
I_a	112	mA
I_g	33	mA
R_{g-f}	6.0	k Ω
p_a (at 72% η)	87	W
P_{out} (less P_{drive})	203	W
* P_{load}	162	W

*With a circuit transfer efficiency of 80%.

DIELECTRIC HEATER WITH PROTECTION

Operating condition for a dielectric heater employing single-phase full wave rectification (unsmoothed) for the anode supply and incorporating the maximum protection for the valve against over load, under drive and inefficient operation.

f	150	Mc/s
$V_{tr(r.m.s.)}$	2500-0-2500	V
V_a	2.24	kV
P_{in}	480	W
I_a	173	mA
I_g	36	mA
R_{g-f}	5.5	k Ω
p_a (at 72% η)	135	W
P_{out} (less P_{drive})	325	W
* P_{load}	260	W

*With a circuit transfer efficiency of 80%.

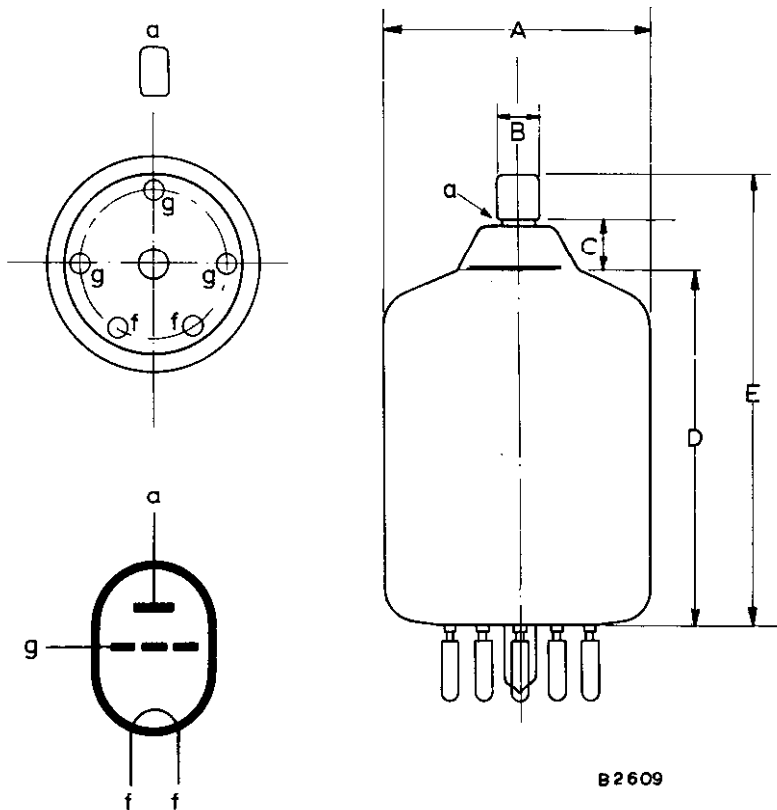
WEIGHT

Valve only	{ 4	oz
	{ 110	g

TY2-125

V.H.F. POWER TRIODE

All-glass triode rated for a maximum anode dissipation of 135W and suitable for use at frequencies up to 200 Mc/s.



DIMENSIONS

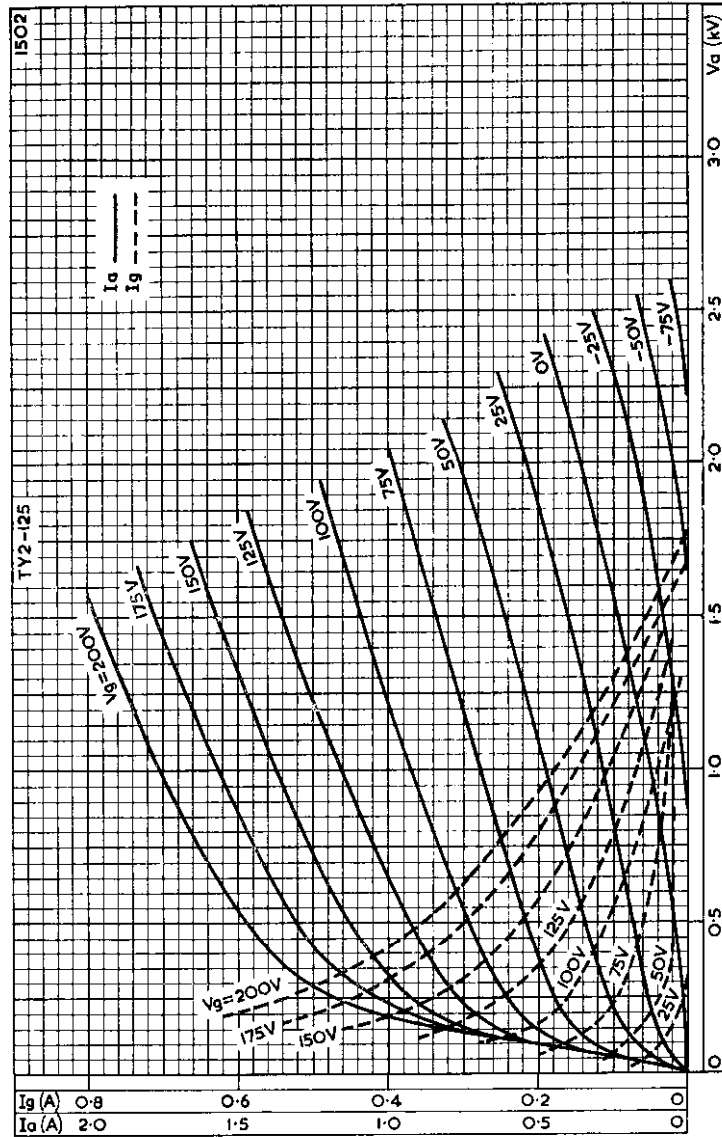
	Inches	Millimetres	
A	2.362 ± 0.020	60 ± 0.5	
B	0.354 ± 0.004	9.0 ± 0.1	
C	0.354	9.0	min
D	3.189 ± 0.079	81 ± 2.0	
E	4.173 ± 0.157	106 ± 4.0	

Inch dimensions derived from original millimetre dimensions.

V.H.F. POWER TRIODE

TY2-125

All-glass triode rated for a maximum anode dissipation of 135 W and suitable for use at frequencies up to 200 Mc/s.

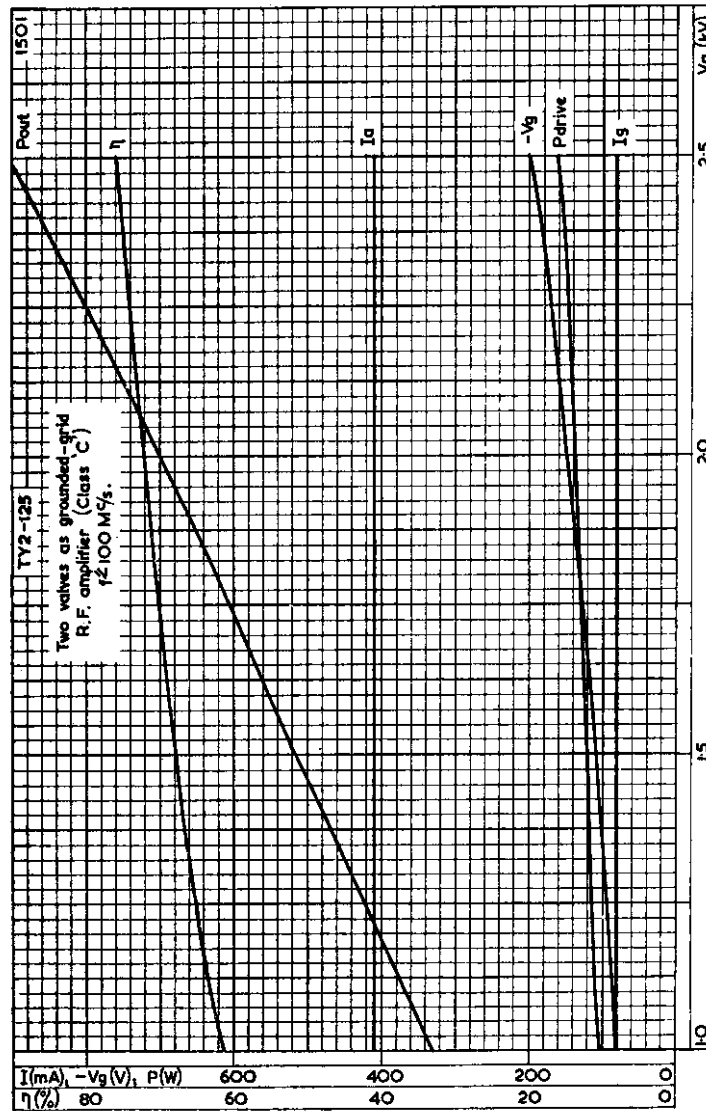


ANODE AND GRID CURRENT PLOTTED AGAINST ANODE VOLTAGE

TY2-125

V.H.F. POWER TRIODE

All-glass triode rated for a maximum anode dissipation of 135 W and suitable for use at frequencies up to 200 Mc/s.

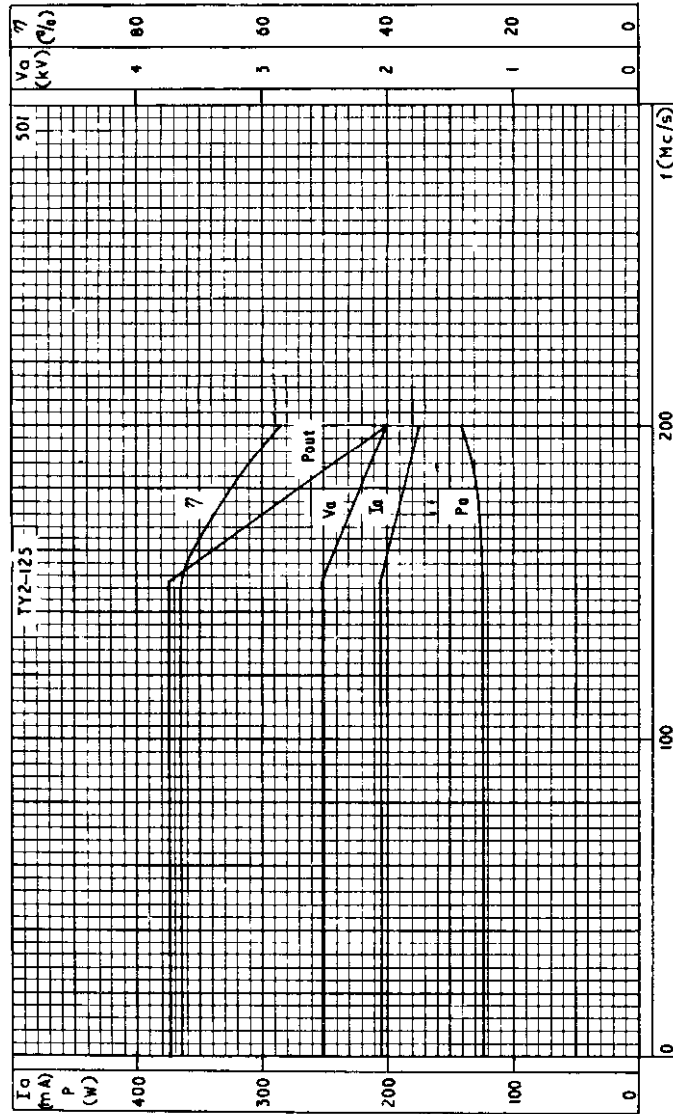


TWO VALVES AS CLASS "C" GROUNDED-GRID R.F. AMPLIFIER

V.H.F. POWER TRIODE

TY2-125

All-glass triode rated for a maximum anode dissipation of 135 W and suitable for use at frequencies up to 200 Mc/s.

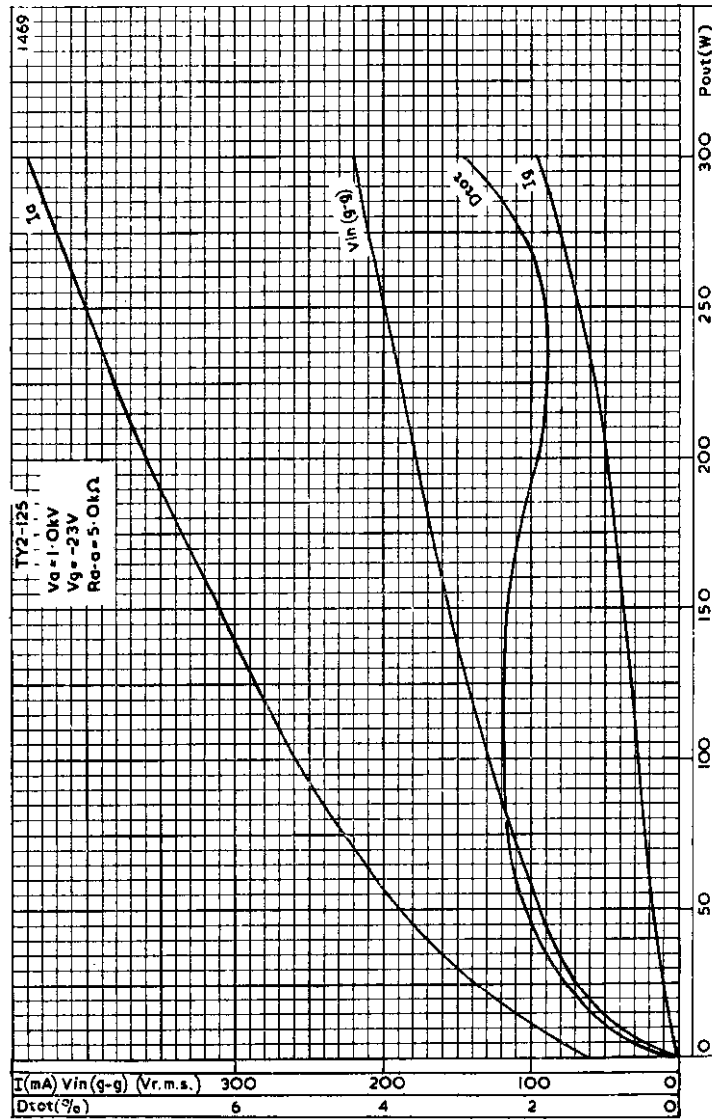


FREQUENCY CHARACTERISTICS

TY2-125

V.H.F. POWER TRIODE

All-glass triode rated for a maximum anode dissipation of 135 W and suitable for use at frequencies up to 200 Mc/s.



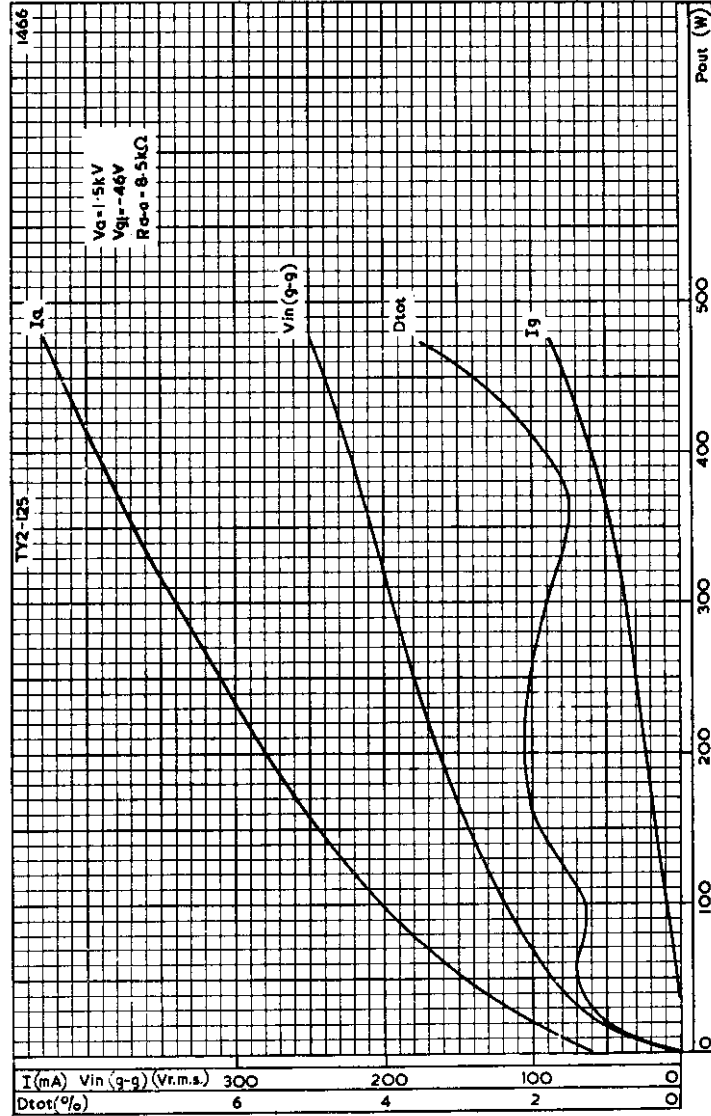
TWO VALVES AS CLASS "B" A.F. AMPLIFIER $V_R = 1.0 \text{ kV}$



V.H.F. POWER TRIODE

TY2-125

All-glass triode rated for a maximum anode dissipation of 135 W and suitable for use at frequencies up to 200 Mc/s.

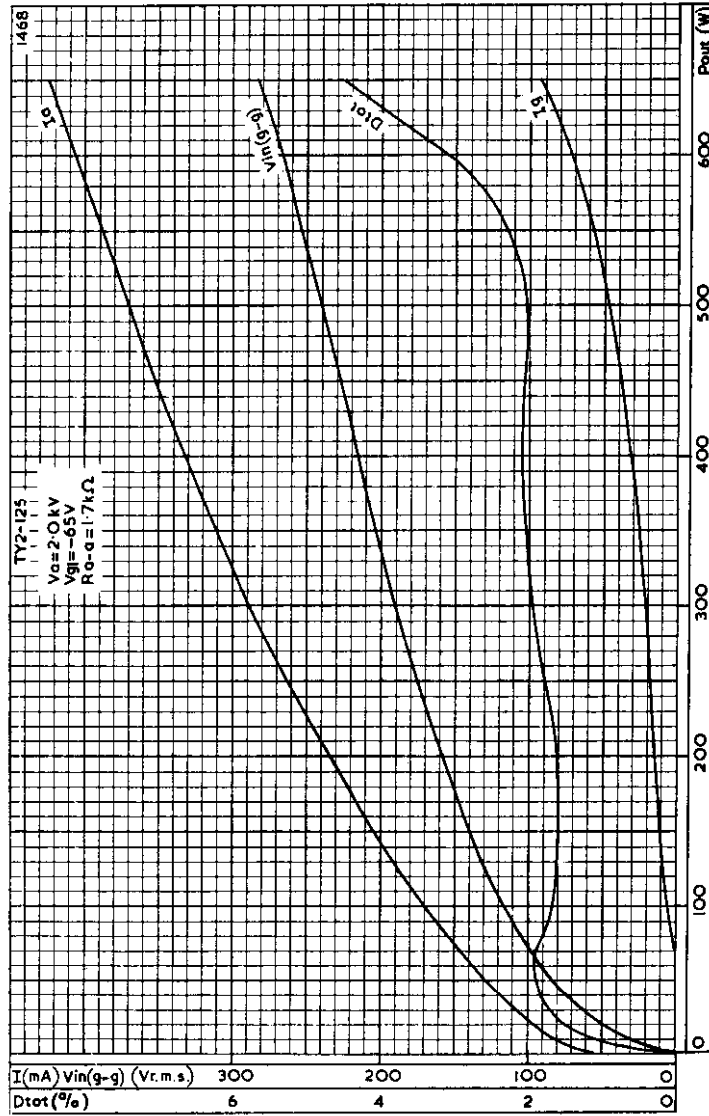


TWO VALVES AS CLASS "B" A.F. AMPLIFIER. $V_a = 1.5 \text{ kV}$

TY2-125

V.H.F. POWER TRIODE

All-glass triode rated for a maximum anode dissipation of 135 W and suitable for use at frequencies up to 200 Mc/s.



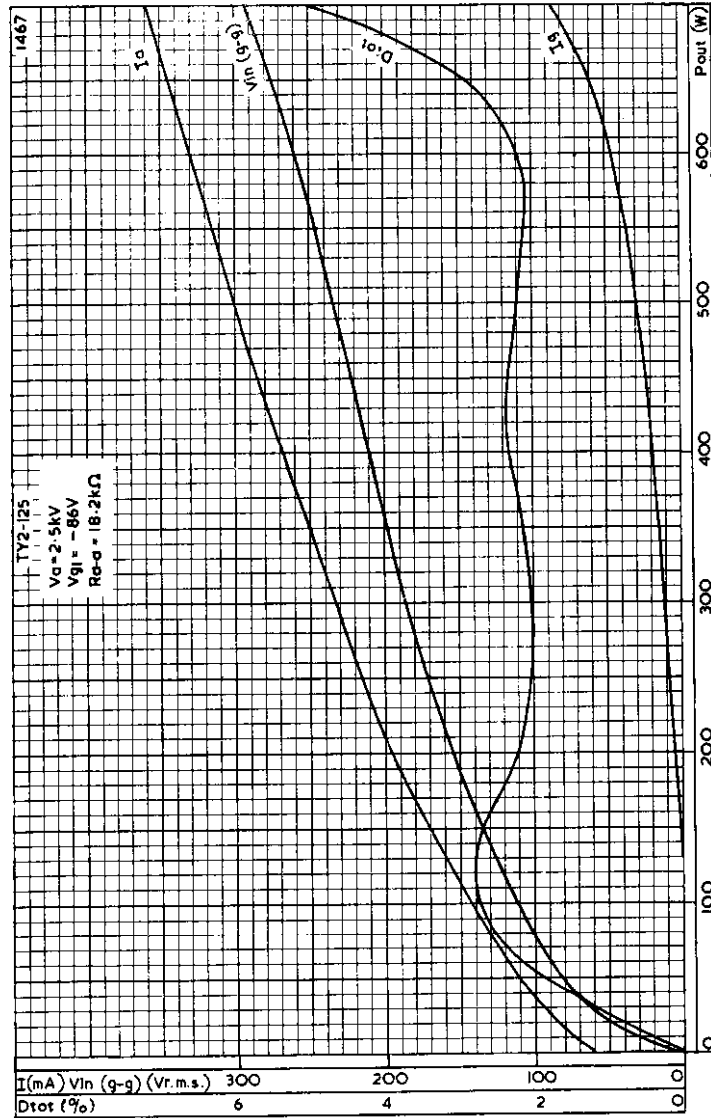
TWO VALVES AS CLASS "B" A.F. AMPLIFIER. $V_a = 2.0 \text{ kV}$



V.H.F. POWER TRIODE

TY2-125

All-glass triode rated for a maximum anode dissipation of 135 W and suitable for use at frequencies up to 200 Mc/s.



TWO VALVES AS CLASS "B" A.F. AMPLIFIER. $V_a = 2.5 \text{ kV}$

①

②

③

④

■

V.H.F. POWER TRIODE

TY4-350

All-glass triode rated for a maximum anode dissipation of 400W, and suitable for use at frequencies up to 75Mc/s.

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	10	V
	I_f	10	A

MOUNTING POSITION

Vertical - with filament connectors up or down.

Horizontal - with plane of electrodes vertical.

CAPACITANCES

	C_{a-g}	6.3	pF
	C_{g-f}	12.3	pF
	C_{a-f}	8.5	pF

CHARACTERISTICS (measured at $I_a = 200\text{mA}$)

	g_m	4.0	mA/V
	μ	35	

COOLING

	$T_{\text{anode seal max.}}$	145	°C
--	------------------------------	-----	----

It is necessary to keep the temperature of the dome between the anode and grid seals below 145°C and under some conditions of operation an air flow of up to 40 cu.ft./min. from a 2-in. diameter nozzle directed at this area may be necessary.

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

Limiting Values

	Forced air cooling	Natural cooling	
V_a max.	4.0	3.0	kV
p_a max.	400	300	W
$-V_g$ max.	500	500	V
I_g max.	100	100	mA
p_g max.	20	20	W
I_k max.	600	600	mA
$i_{R(pk)}$ max.	3.0	3.0	A
R_{g-f} max.	15	15	kΩ

TY4-350

V.H.F. POWER TRIODE

All-glass triode rated for a maximum anode dissipation of 400W, and suitable for use at frequencies up to 75Mc/s.

Typical Operating Conditions

	Forced air cooling		Natural cooling	
				Mc/s
f	<20		<30	
V _a	4.0		3.0	kV
V _g	-200		-200	V
I _a	450		415	mA
V _{in(pk)}	375		360	V
I _k	75		55	mA
P _a	360		245	W
P _{out}	1.44		1.0	kW
P _{load(driver)}	35		33	W
η	80		80	%
*P _{load}	1152		800	W

*With a circuit transfer efficiency of 80%.

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

Limiting Values (carrier condition for modulation factor of 1)

	Forced air cooling		Natural cooling	
V _a max.	3.0		2.5	kV
p _a max.	270		200	W
-V _g max.	500		500	V
I _g max.	100		100	mA
p _g max.	20		20	W
I _k max.	550		500	mA
I _{k(pk)} max.	2.7		2.5	A
R _{g-f} max.	15		15	kΩ

Typical Operating Conditions

	Forced air cooling		Natural cooling	
				Mc/s
f	<20		<30	
V _a	3.0		2.5	kV
V _g	-300		-300	V
I _a	415		335	mA
I _g	85		75	mA
V _{in(pk)}	490		460	V
P _a	245		200	W
P _{load(driver)}	50		50	W
η	80		76	%
P _{out}	1000		635	W
*P _{load}	800		508	W
For 100% modulation				
P _{mod}	622		420	W

*With a circuit transfer efficiency of 80%.

V.H.F. POWER TRIODE

TY4-350

All-glass triode rated for a maximum anode dissipation of 400W, and suitable for use at frequencies up to 75Mc/s.

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

Limiting Values

	<i>Forced air cooling</i>	<i>Natural cooling</i>	
V_a max.	4.0	3.0	kV
p_a max.	400	300	W
I_g max.	100	100	mA
I_k max.	600	600	mA
$i_{k(pk)}$ max.	2.0	2.0	A

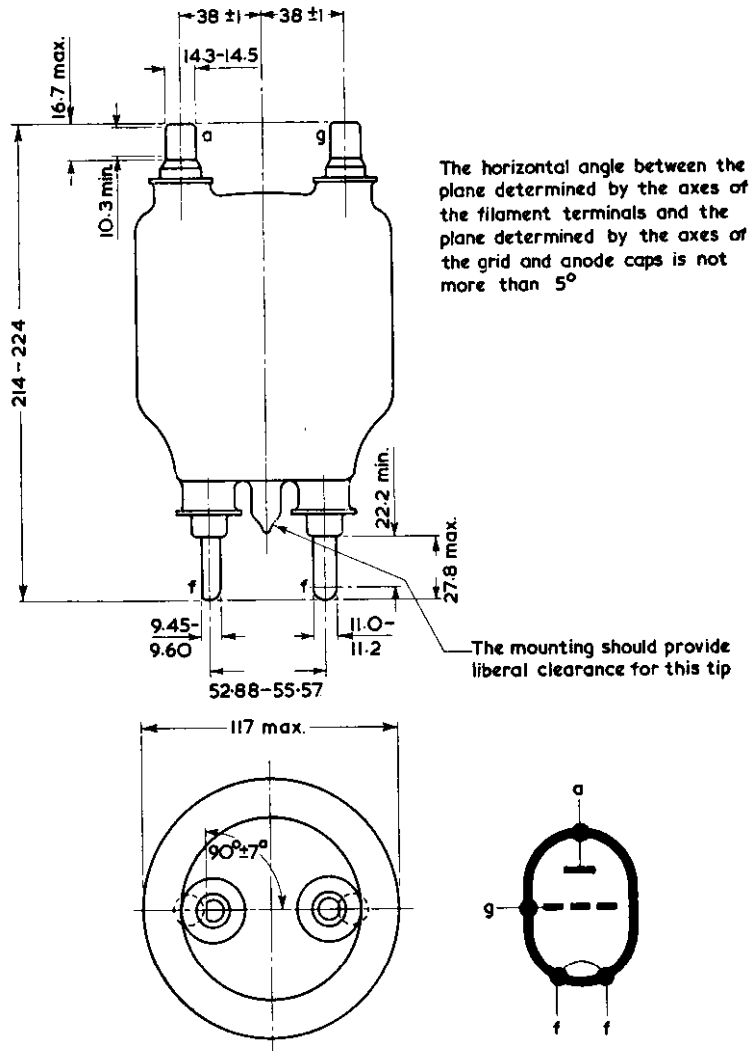
Typical Operating Conditions for two Valves in Push-Pull (with I_g)

	<i>Forced air cooling</i>	<i>Natural cooling</i>	
V_a	4.0	3.0	kV
V_g	-100	-70	V
$I_{a(o)}$	2×50	2×50	mA
I_a (max. sig.)	2×400	2×375	mA
$V_{1\Omega(g-g)r.m.s.}$	336	280	V
I_g	2×67	2×56	mA
R_{a-a}	12	9.5	k Ω
P_{out}	2.4	1.65	kW

TY4-350

V.H.F. POWER TRIODE

All-glass triode rated for a maximum anode dissipation of 400W, and suitable for use at frequencies up to 75Mc/s.



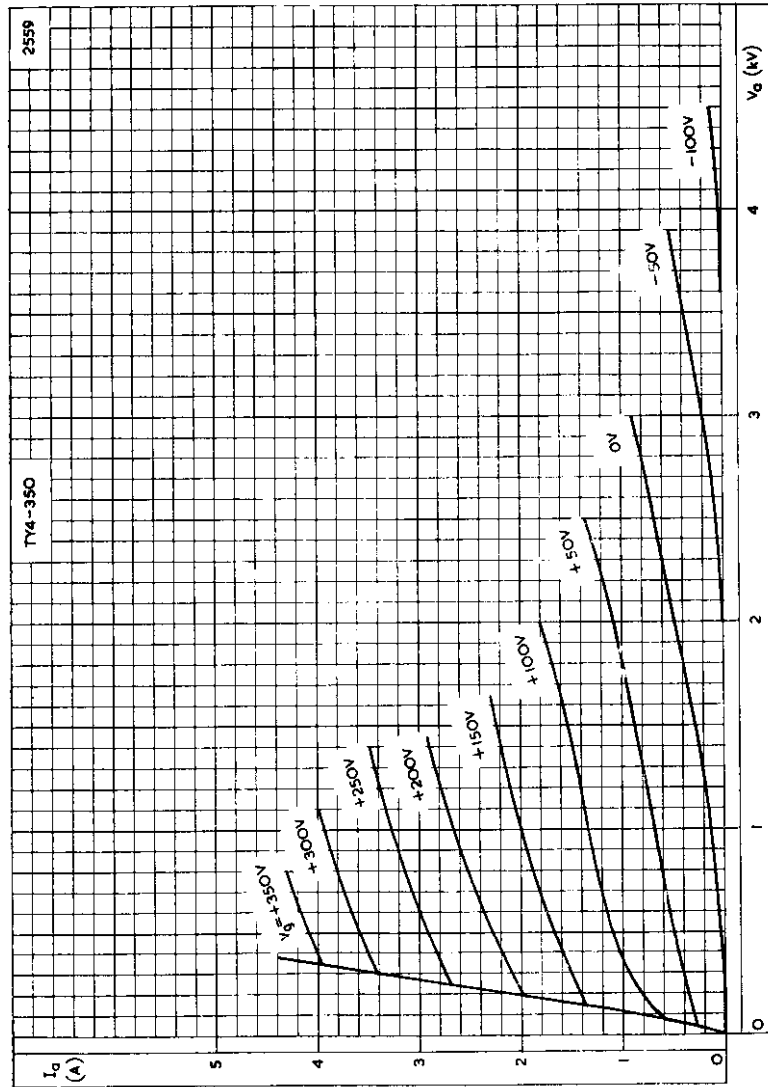
2597

All dimensions in mm

V.H.F. POWER TRIODE

TY4-350

All glass triode rated for a maximum anode dissipation of 400W, and suitable for use at frequencies up to 75Mc/s.



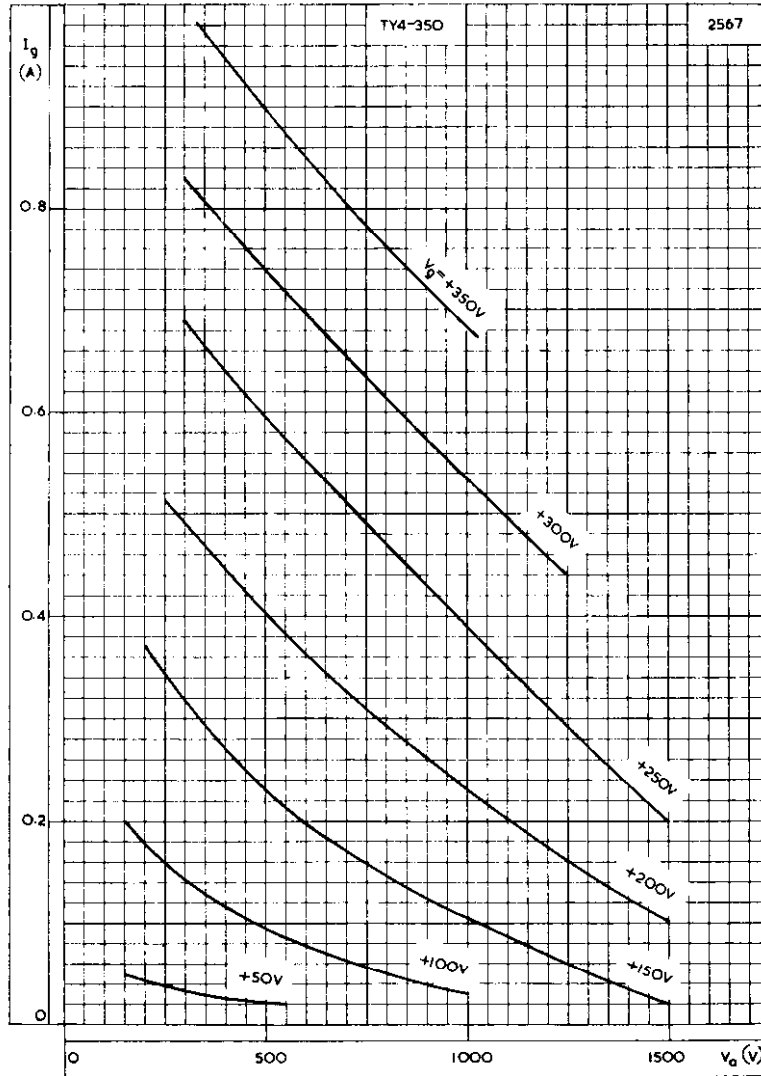
ANODE CURRENT PLOTTED AGAINST ANODE VOLTAGE



TY4-350

V.H.F. POWER TRIODE

All-glass triode rated for a maximum anode dissipation of 400W, and suitable for use at frequencies up to 75Mc/s.



GRID CURRENT PLOTTED AGAINST ANODE VOLTAGE



INDUSTRIAL TRIODE

TY4-400

QUICK REFERENCE DATA

All glass triode suitable for use as an R.F. industrial oscillator, amplifier, or A.F. power amplifier.

	Industrial heating	Class 'B' A.F. (2 valves)	Class 'C' Telegraphy	
f	100	-	100	MHz
P _{out}	1.1	2×0.77	1.2	kW
f max.	150	-	100	MHz
V _a max.	4.0	4.0	4.0	kV
P _a max.	350	350	350	W

To be read in conjunction with

GENERAL OPERATIONAL RECOMMENDATIONS - TRANSMITTING VALVES

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

OPERATING CONDITIONS

f	100	100	100	100	100	MHz
P _{out}	1200	840	750	585	425	W
P _{load}	1050	715	640	500	365	W
η _a	79	77	75	73	71	%
V _a	4.0	3.0	2.5	2.0	1.5	kV
I _a	380	363	400	400	400	mA
-V _g	350	250	200	150	120	V
I _g	80	69	69	80	80	mA
R _{g-f}	43.8	36.3	29	18.7	15	kΩ
P _{drive}	40	27	23.5	23	21.5	W
P _a	320	250	250	215	175	W



OPERATING CONDITIONS (Grounded grid) Two valves in push-pull.

f	100	100	100	100	MHz
P _{out}	1.68+256	1.50+247	1.17+204	0.85+190*	kW
P _{load} (at 85%)	1.65	1.5	1.15	0.88	kW
η _a	77	75	73	71	%
V _a	3.0	2.5	2.0	1.5	kV
I _a	726	800	800	800	mA
-V _g	250	200	150	120	V
I _g	138	138	160	160	mA
P _a	500	500	430	350	W

*Power transferred from driving stage included.

INDUSTRIAL HEATING, CLASS 'C'

OPERATING CONDITIONS

(Single phase full-wave rectified without smoothing filter)

f	50	50	MHz
P _{out}	1.1	0.685	kW
P _{load} (at 85%)	900	560	W
η _a	78	73	%
V _a	3.5	2.25	kV
I _a	325	340	mA
R _g	4.5	3.3	kΩ
I _g	65	60	mA
P _a	300	250	W
P _{in}	1400	935	W



INDUSTRIAL TRIODE

TY4-400

AMPLIFIER AND MODULATOR, CLASS 'B'

OPERATING CONDITIONS (Two valves in push-pull)

V_a	4.0		3.0		2.5	kV	
$-V_g$	135		102		77.5	V	
R_{a-a}	20		14.5		12	k Ω	
P_{out}	-	1.55	-	1.36	-	1.14	kW
P_{in}	2x350	2x1080	2x180	2x370	2x225	2x750	W
V_{g-g}	0	485	0	750	0	400	V
I_a	2x88	2x270	2x60	2x290	2x90	2x300	mA
I_g	-	2x30	-	2x60	-	2x55	mA
P_a	2x350	2x305	2x180	2x190	2x225	2x180	W
P_{drive}	-	2x7	-	2x13	-	2x10	W
η_a	-	71.7	-	78	-	76	%
d_{tot}	-	<2.5	-	<2.5	-	<2.5	%

RATINGS (ABSOLUTE MAXIMUM SYSTEM)

	Class 'C' Telegraphy or F.M. Telephony	Industrial Heating (Unsmoothed supply)	Class 'B' A.F.		
$f_{max.}$	100	100	-	MHz	
$V_a_{max.}$	4.0	3.8*	2.7**	4.0	kV
$-V_g_{max.}$	500	500	500		V
$I_g_{max.}$	90	90	90		mA
$I_k_{max.}$	500	450	500		mA
$P_a_{max.}$	350	350	350		W
R_{g-f}	100	100	100		k Ω
$P_g_{max.}$	40	40	40		W

*at $f = 50\text{MHz}$, **at $f = 100\text{MHz}$

CATHODE

Directly heated, thoriated tungsten

V_f	5.0	V
I_f	14.1	A



CAPACITANCE

c_{a-g}	5.0	pF
c_{g-f}	6.3	pF
c_{a-f}	0.16	pF

CHARACTERISTICS (Measured at $V_a = 3.0kV$, $I_a = 90mA$).

g_m	5.0	mA/V
μ	25	

MOUNTING POSITION

Vertical, with base up or down

COOLING

Temperatures

Bulb	max.	350	$^{\circ}C$
Anode seal	max.	220	$^{\circ}C$
Base pin seals	max.	180	$^{\circ}C$

Below 30MHz radiation and convection cooling may be sufficient but an anode terminal connector of large volume and surface area is necessary in order to keep the anode seal cool.

Above 30MHz or with high ambient temperatures it may be necessary to direct a flow of cool air to the anode seal and base of the valve using the accessories outlined below:-

ACCESSORIES

Air system socket	40211/01
Anode connector clip	40624
Air system chimney	40666

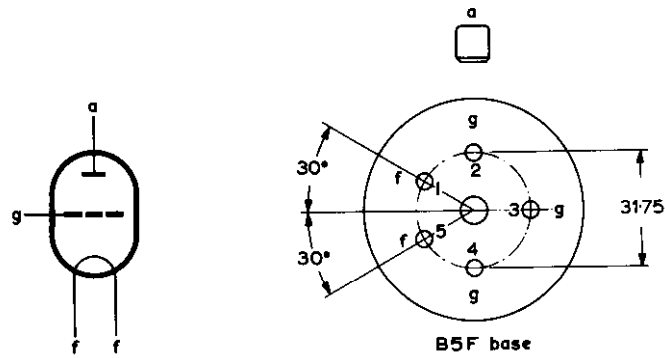
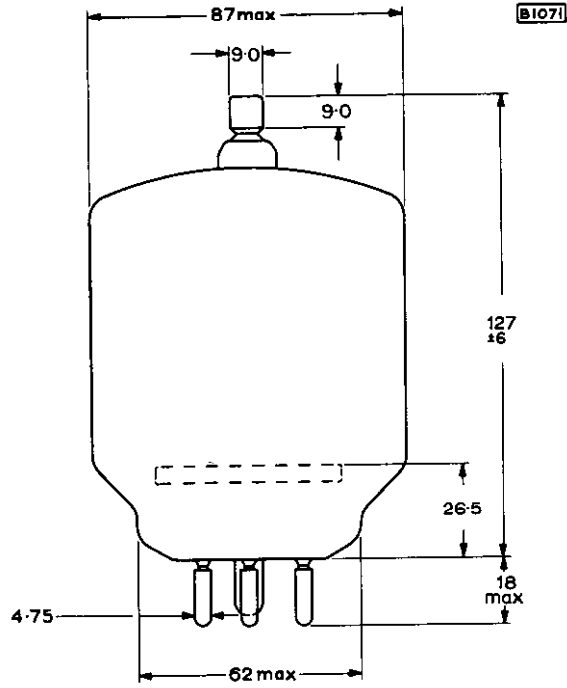
PHYSICAL DATA

Weight of valve	190	g
-----------------	-----	---



INDUSTRIAL TRIODE

TY4-400



All dimensions in mm

(

(

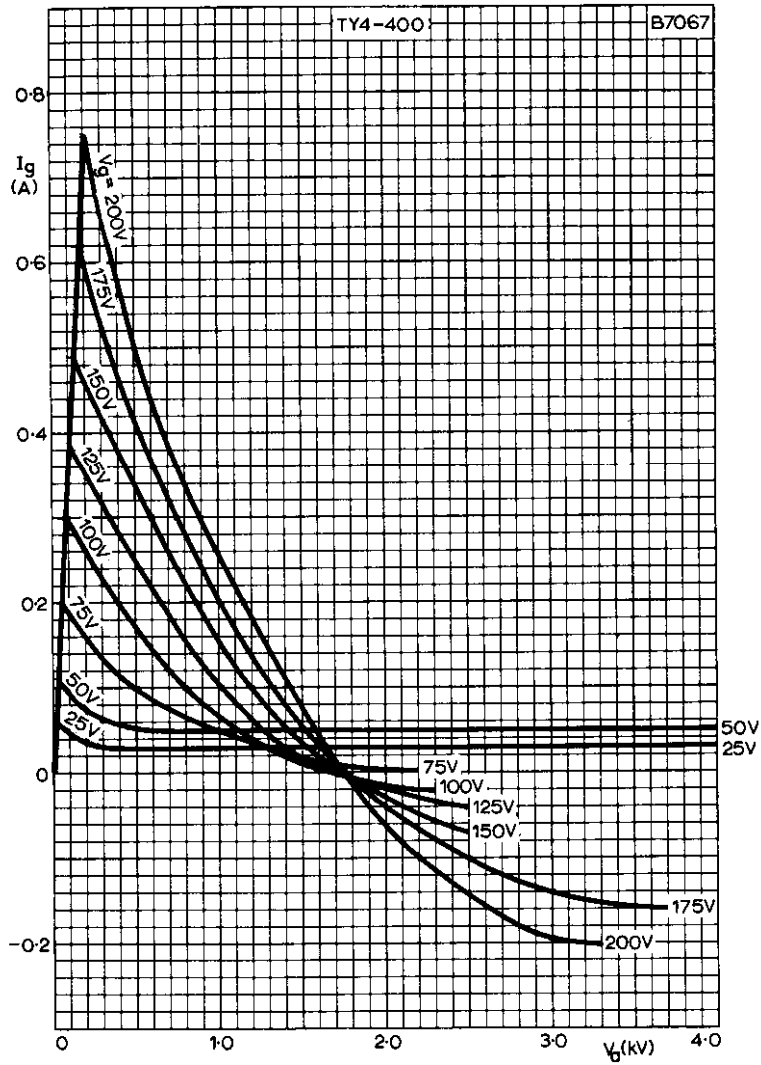
(

(

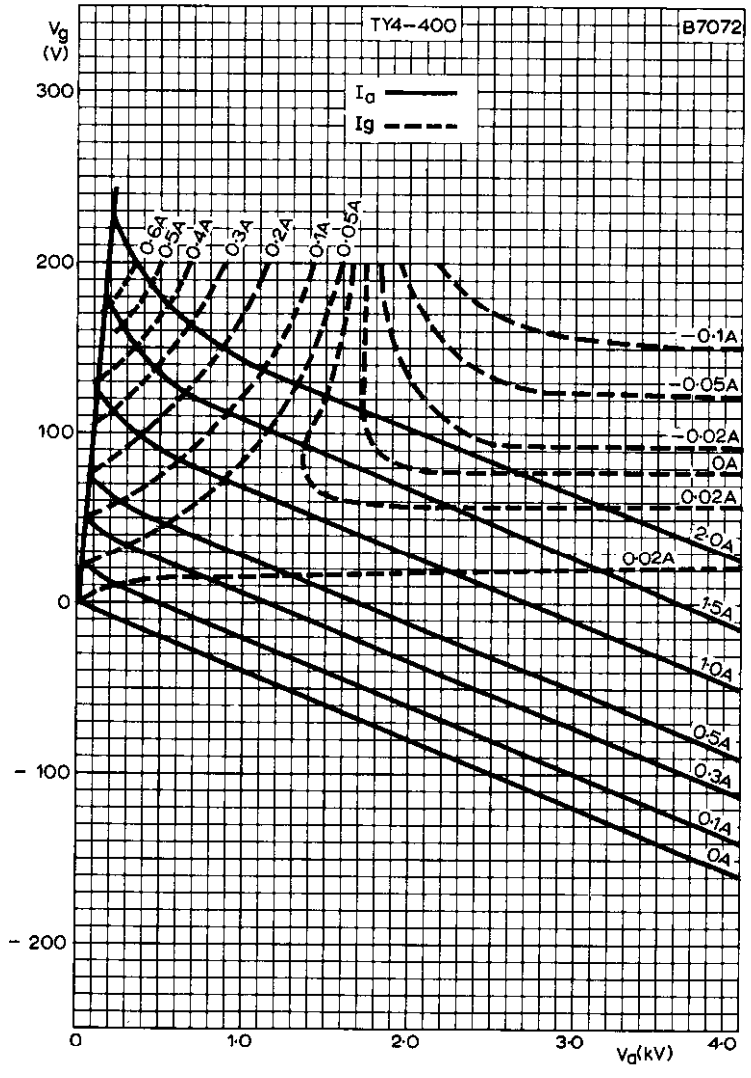
■

INDUSTRIAL TRIODE

TY4-400



GRID CURRENT PLOTTED AGAINST ANODE VOLTAGE
WITH GRID VOLTAGE AS PARAMETER

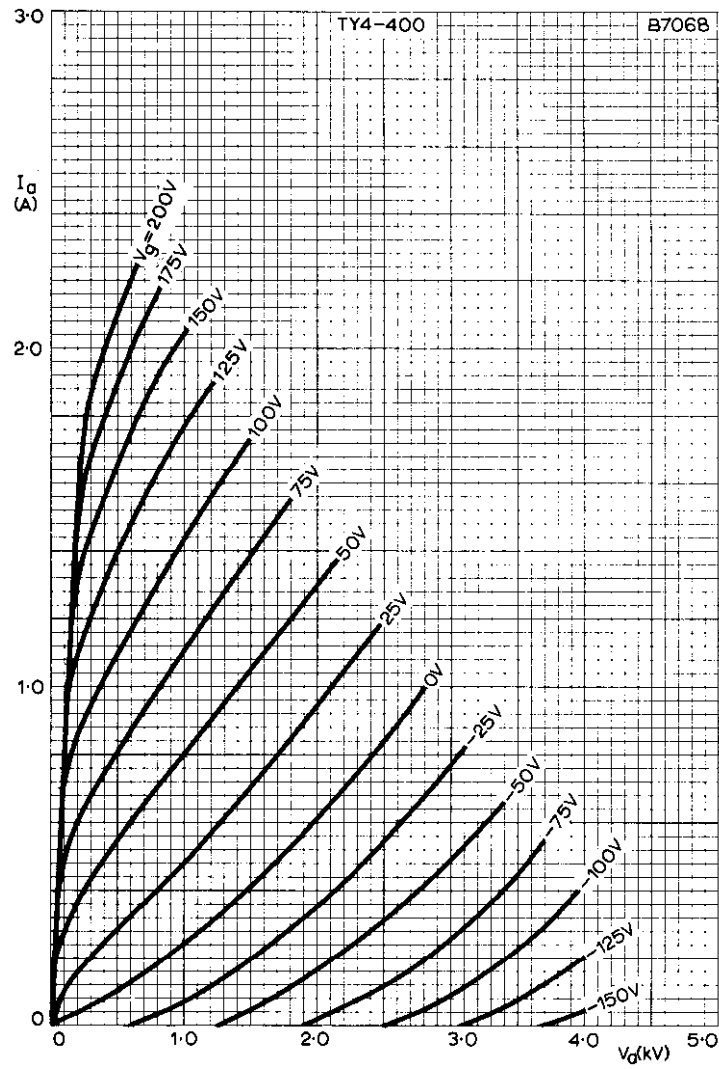


CONSTANT CURRENT CHARACTERISTICS



INDUSTRIAL TRIODE

TY4-400



ANODE CURRENT PLOTTED AGAINST ANODE VOLTAGE
WITH GRID VOLTAGE AS PARAMETER

(

(

(

(

■

V.H.F. POWER TRIODE

TY4-500

QUICK REFERENCE DATA

Radiation cooled triode intended for use as r.f. amplifier or oscillator or a.f. amplifier.

	Class 'C' telegraphy	Class 'C' industrial oscillator	Class 'B' A.F.	
f max.	120	100	—	Mc/s
V _a max.	4.0	4.0	4.0	kV
p _a max.	450	450	450	W
Performance				
f	100	100	—	Mc/s
P _{out}	1.69	1.14	2.44	kW

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	10	V
I _f	9.9	A

MOUNTING POSITION

Vertical only, base up or down

CAPACITANCES

C _{u-g}	7.0	pF
C _{g-r}	8.0	pF
C _{a-r}	170	mpF

CHARACTERISTICS

g _m (I _a = 125mA)	4.5	mA/V
μ	28	

COOLING

Max. temperature of base pins	180	°C
Max. temperature of anode seal	220	°C

In order to keep within the temperature limits it may be necessary to direct a low velocity flow of air on to the anode seal and the base of the valve when operated at maximum ratings at frequencies above 50Mc/s. The air stream on to the base should be directed so that it also passes over the envelope. Below 50Mc/s, radiation cooling from the envelope is sufficient but an anode terminal connector of large surface area is necessary in order to keep the anode seal cool.



TY4-500

V.H.F. POWER TRIODE

CLASS 'C' TELEGRAPHY OR F.M. TELEPHONY

Absolute maximum ratings

V_a max.		4.0	kV
p_a max.		450	W
p_g max.		50	W
I_g max.		115	mA
I_k max.		650	mA
$i_{k(pk)}$ max.		5.0	A

Typical operating conditions, grounded cathode

f	100	100	100	100	Mc/s
V_a	2.5	3.0	3.5	4.0	kV
V_g	-200	-250	-300	-350	V
I_a	535	535	535	535	mA
I_g	115	115	115	115	mA
$v_{in(pk)}$	405	460	520	580	V
P_{drive}	42	48	54	60	W
p_a	390	425	450	450	W
P_{out}	950	1175	1430	1690	W
P_{load}	760	940	1144	1350	W
η_a	71	73.5	76	79	%

Typical operating conditions, grounded grid (two valves)

f	100	100	100	100	Mc/s
V_a	2.5	3.0	3.5	4.0	kV
V_g	-200	-250	-300	-350	V
I_a	2 × 535	2 × 535	2 × 535	2 × 535	mA
I_g	2 × 115	2 × 115	2 × 115	2 × 115	mA
$v_{in(g-g) pk}$	810	920	1040	1160	V
P_{drive}	2 × 212	2 × 248	2 × 274	2 × 320	W
p_a	2 × 390	2 × 425	2 × 450	2 × 450	W
* P_{out}	1900 + 340	2350 + 400	2860 + 440	3380 + 520	W
P_{load}	1.79	2.2	2.64	3.12	kW
η_a	71	73.5	76	79	%

*Includes power transferred from driver stage.

CLASS 'C' ANODE MODULATION

Absolute maximum ratings (carrier condition for a modulation factor of 1)

V_a max.		3.0	kV
p_a max.		300	W
p_g max.		50	W
I_g max.		115	mA
I_k max.		550	mA
$i_{k(pk)}$ max.		5.0	A



V.H.F. POWER TRIODE

TY4-500

Typical operating conditions at $f \leq 100\text{Mc/s}$

V_a	3.0	kV
V_g	-375	V
I_a	450	mA
I_g	85	mA
$V_{in(pk)}$	580	V
P_{drive}	42	W
P_a	300	W
P_{out}	1.05	kW
P_{load}	840	W
η_a	78	%
For 100% modulation		
P_{mod}	675	W

CONTINUOUS INDUSTRIAL OPERATION AS CLASS 'C' OSCILLATOR ←

Absolute maximum ratings

f max.	100	Mc/s
V_a max.	4.0	kV
P_a max.	450	W
P_g max.	50	W
I_k max.	650	mA
$i_{k(pk)}$ max.	5.0	A
I_g (loaded) max.	115	mA
I_g (unloaded) max.	150	mA

Typical operating conditions

Supply	F.W. rectification unsmoothed	
f	100	Mc/s
$V_{tr(r.m.s.)}$	3.5-0-3.5	kV
V_a	3.15	kV
I_a	415	mA
I_g	120	mA
R_{g-f}	3.0	k Ω
R_a	1.4	k Ω
Feedback ratio $\frac{V_{in(pk)}}{V_a(pk)}$	0.2	
P_{drive}	60	W
P_a	420	W
P_{out} (less P_{drive})	1.14	kW
η_a	74	%
P_{load}	950	W



TY4-500

V.H.F. POWER TRIODE

INTERMITTENT OPERATION FOR DIELECTRIC WELDING

Absolute maximum ratings

f max.	100	Mc/s
Duty factor max.	0.5	
Averaging time max.	10	s
V _a max.	4.0	kV
p _a max.	700	W
p _g max.	72	W
I _g (loaded) max.	160	mA
I _k max.	900	mA
I _{k(pk)} max.	5.0	A

Typical operating conditions

Supply	Smoothed d.c.	F.W. rectification unsmoothed	
f	100	100	Mc/s
Duty factor	0.5	0.5	
Averaging time	10	10	s
V _{t(r.m.s.)}	—	3.5-0-3.5	kV
V _a	3.5	3.15	kV
I _a	750	675	mA
I _g (loaded)	140	125	mA
R _{g-r}	2.2	2.2	kΩ
R _a	2.2	2.2	kΩ
Feedback ratio $\frac{V_{in(pk)}}{V_{a(pk)}}$	0.2	0.2	
P _{drive}	75	75	W
P _{out} (less P _{drive})	1.86	1.86	kW
p _a	690	690	W
η _a	74	74	%
P _{load}	1.5	1.5	kW

CLASS 'B' A.F.

Limiting values

V _a max.	4.0	kV
p _a max.	450	W
p _g max.	50	W
I _g max.	140	mA
I _k max.	700	mA
I _{k(pk)} max.	2.2	A

Typical operating conditions

V _a	2.5	3.0	3.5	4.0	kV
V _g	-75	-94	-114	-135	V
I _{a(o)}	2 × 70	2 × 70	2 × 70	2 × 70	mA
I _a (max. sig.)	2 × 555	2 × 500	2 × 442	2 × 368	mA
I _g	2 × 127	2 × 130	2 × 115	2 × 93	mA
V _{in(g-g) (r.m.s.)}	378	400	402	404	V
p _a	2 × 375	2 × 380	2 × 330	2 × 329	W
R _{a-a}	5.2	7.5	10.2	14.5	kΩ
P _{out}	2.0	2.31	2.44	2.21	kW
η _a	72	77	78.8	77.5	%
D _{tot}	3.5	5.0	5.0	5.0	%

V.H.F. POWER TRIODE

TY4-500

WEIGHT

Valve only	{ 14.8	oz
	{ 420	g
Valve plus carton	{ 3.1	lb
	{ 1.4	kg

CIRCUIT NOTES

To ensure equal distribution of the currents through the seals the grid leads should be strapped together at the valve holder and the circuit connections joined to the midpoint of the strap. This should not be allowed to impair the free flotation of individual contacts.

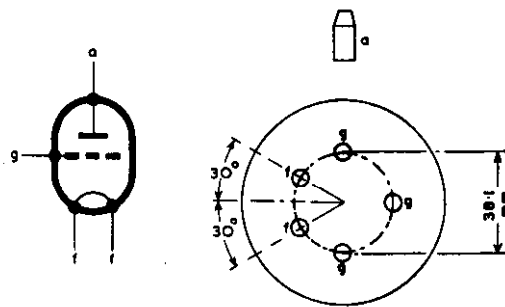
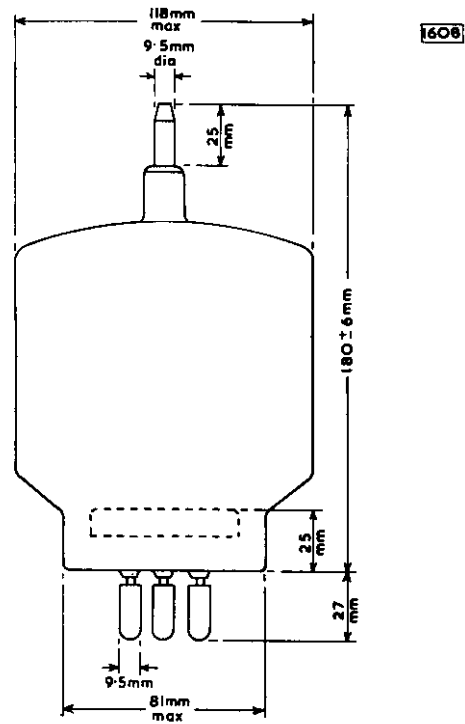
ACCESSORIES

Socket	40216
Anode clip	40626



TY4-500

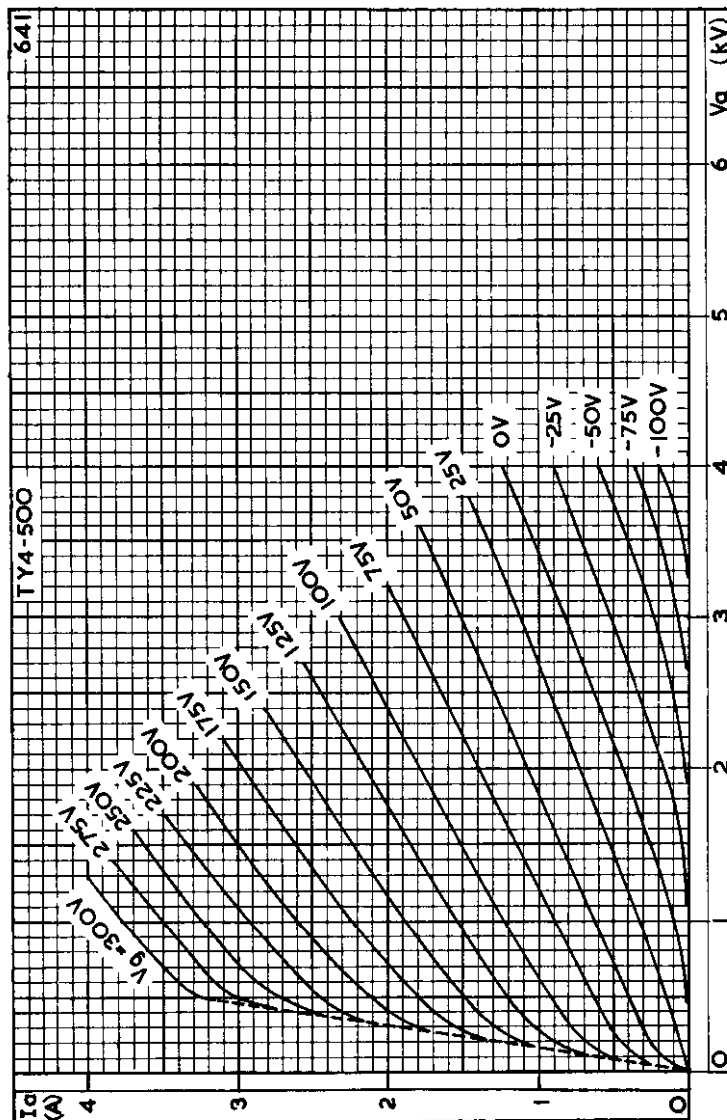
V.H.F. POWER TRIODE



B5K Base

V.H.F. POWER TRIODE

TY4-500

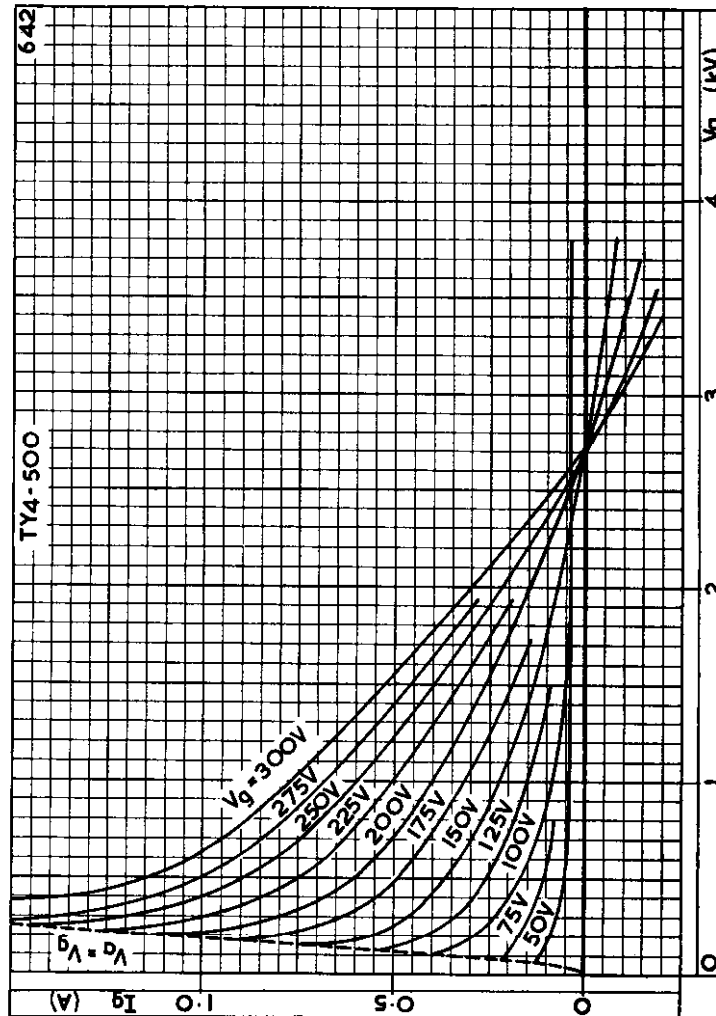


ANODE CURRENT PLOTTED AGAINST ANODE VOLTAGE



TY4-500

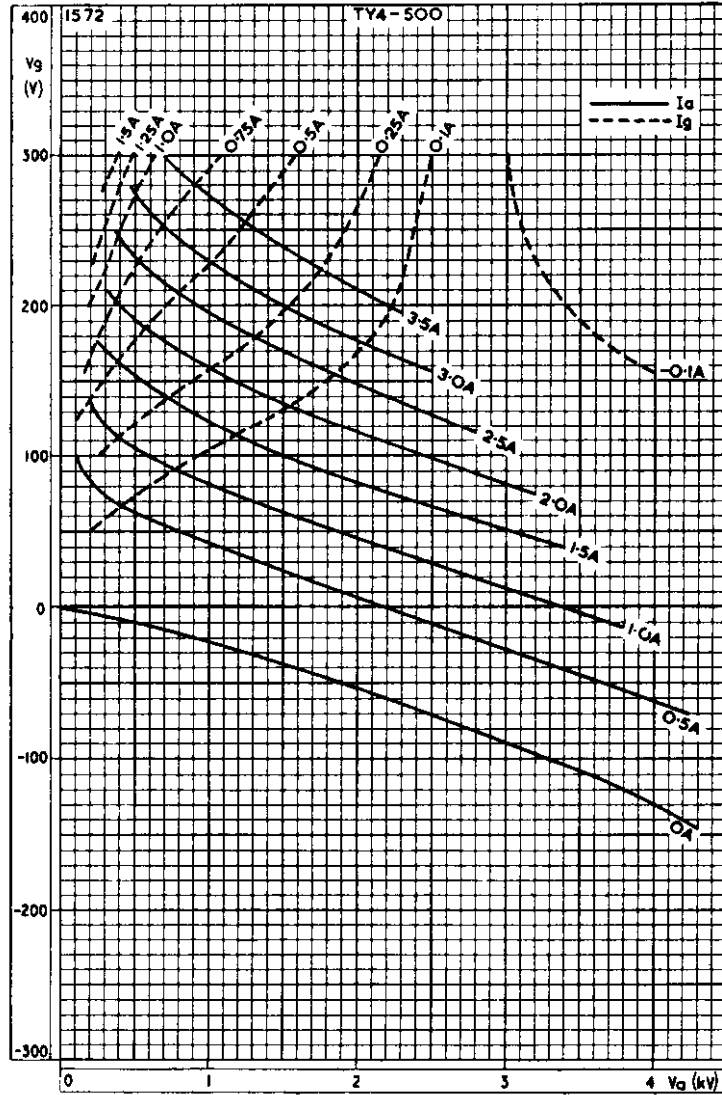
V.H.F. POWER TRIODE



GRID CURRENT PLOTTED AGAINST ANODE VOLTAGE

V.H.F. POWER TRIODE

TY4-500

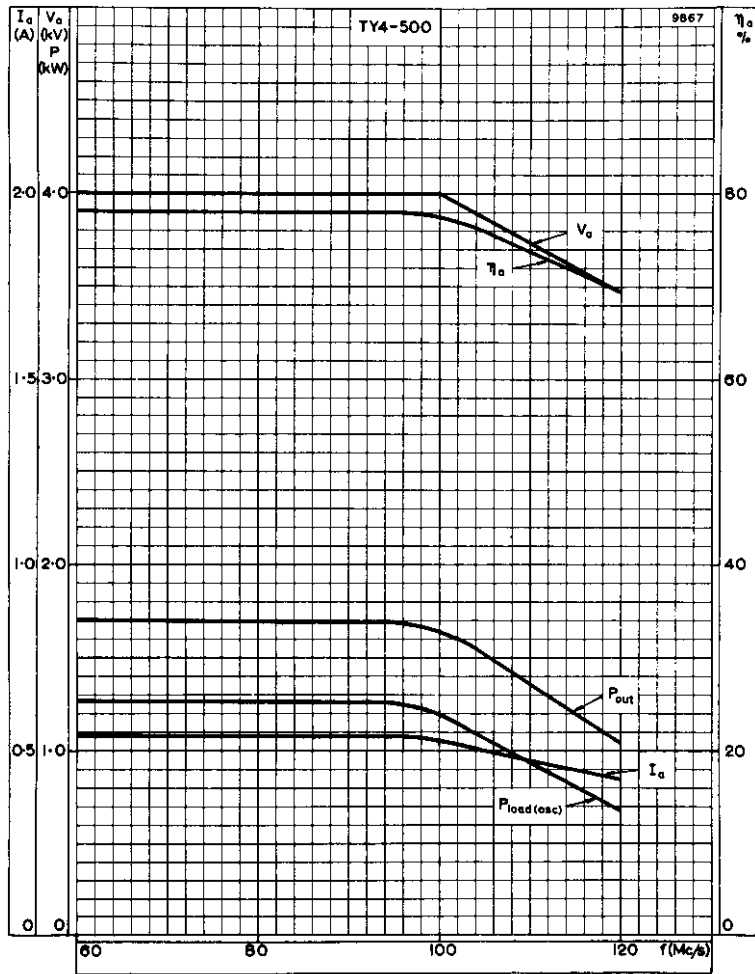


CONSTANT CURRENT CURVES



TY4-500

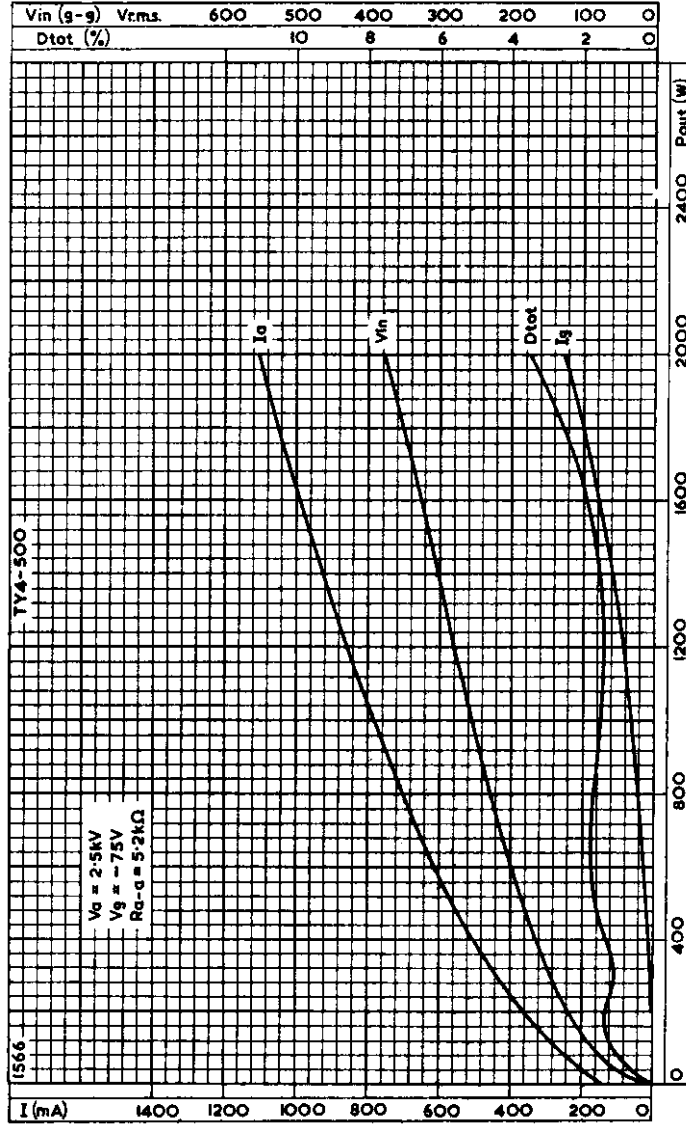
V.H.F. POWER TRIODE



FREQUENCY CHARACTERISTICS, SINGLE VALVE AS CLASS 'C' AMPLIFIER AND OSCILLATOR

V.H.F. POWER TRIODE

TY4-500

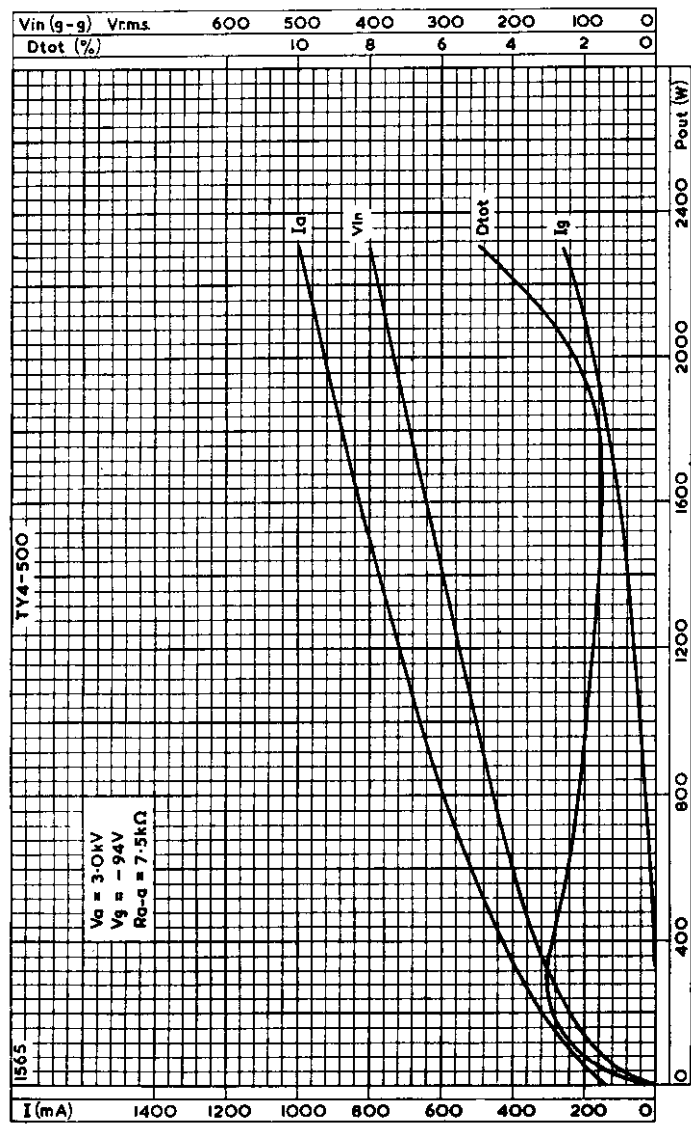


TWO VALVES AS CLASS "B" A.F. AMPLIFIER. $V_s = 2.5 kV$



TY4-500

V.H.F. POWER TRIODE

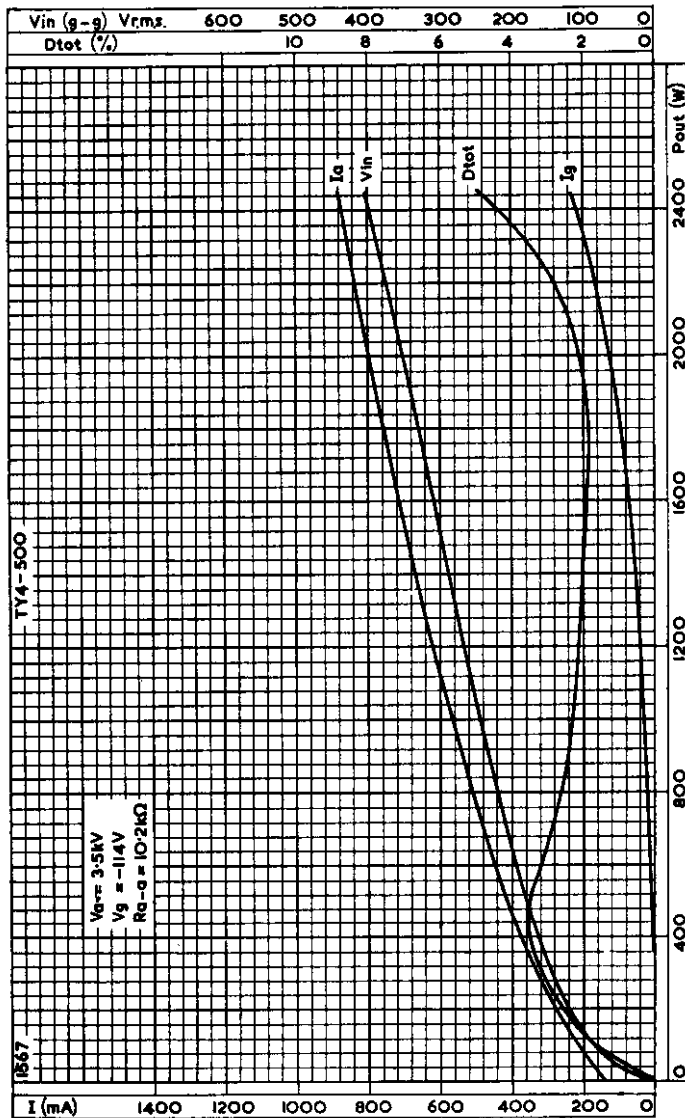


TWO VALVES AS CLASS "B" A.F. AMPLIFIER. $V_a = 3.0 kV$



V.H.F. POWER TRIODE

TY4-500

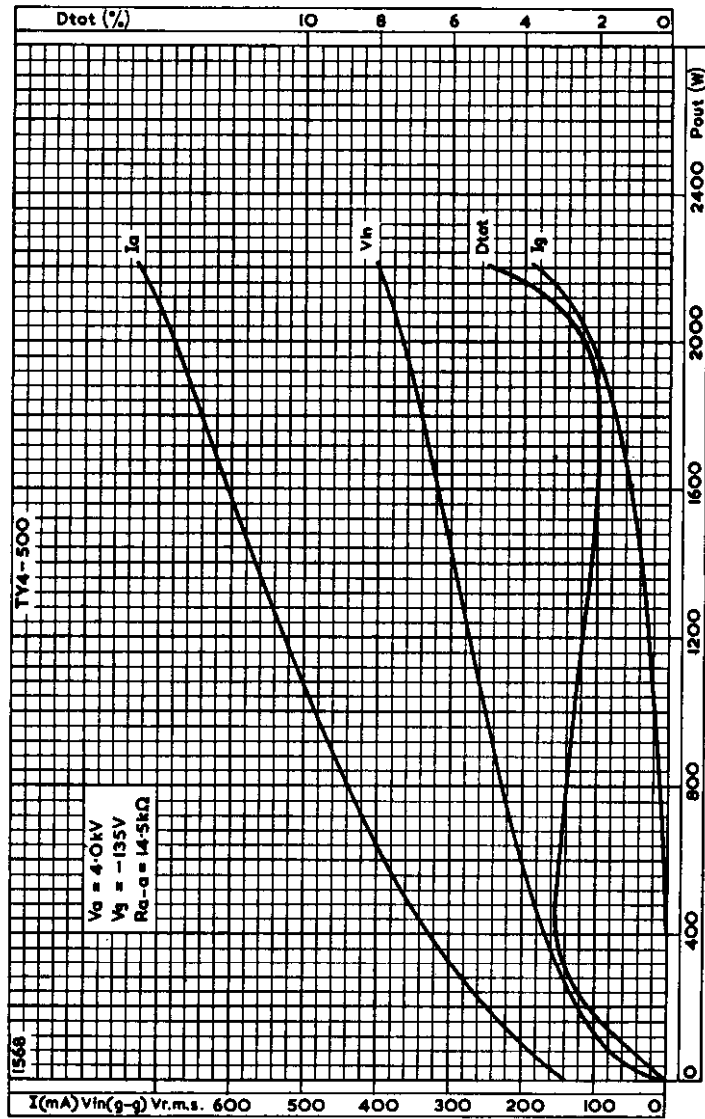


TWO VALVES AS CLASS "B" A.F. AMPLIFIER. $V_a = 3.5 kV$



TY4-500

V.H.F. POWER TRIODE



TWO VALVES AS CLASS "B" A.F. AMPLIFIER. $V_a = 4.0 \text{ kV}$



TRIODE

TY5-500

Application: R.F. industrial heating.
Power output: 1.6kW continuous rating.
Frequency: 50Mc/s at full rating.
Construction: Glass; radiation cooled anode.

PRELIMINARY DATA

This data should be read in conjunction with GENERAL OPERATIONAL RECOMMENDATIONS--TRANSMITTING VALVES preceding this section of the handbook.

FILAMENT Thoriated tungsten

*V _f	5.0	V
I _f	32.5	A

*The filament has been designed to accept temporary fluctuations $\begin{matrix} +5\% \\ -10\% \end{matrix}$

MOUNTING POSITION

Vertical only, base down

CAPACITANCES

C _{a-g}	5.1	pF
C _{g-r}	9.2	pF
C _{a-r}	0.2	pF

CHARACTERISTICS (measured at V_a = 4kV, I_a = 120mA)

g _m	3.3	mA/V
g _m (at V _a = 1.0kV, I _a = 2.3A)	10	mA/V
μ	21	

COOLING

Normally	Low velocity air flow
*At reduced input or with intermittent ratings	Natural
T _{seals} max.	220 °C
T _{bulb} max.	350 °C

*See examples in typical data.

ACCESSORIES

Socket	B8.700.51
Anode clip	40626

TY5-500

TRIODE

CLASS 'C' OSCILLATOR

With d.c. anode supply

LIMITING VALUES (absolute ratings)

f max.			50	Mc/s
V _a max.			5.0	kV
V _g max.			-1.25	kV
R _{g-t} max.			15	kΩ
Duty factor max.	1	0.5	0.2	
Averaging time max.	—	10	5.0	s
p _a max.	500	700	1000	W
I _a max.	560	780	1100	mA
p _g max.	85	95	110	W
I _g max. (at p _a max.)	210	290	420	mA

OPERATING CONDITIONS

Cooling	Additional	Natural		Mc/s
		≦ 50	≦ 50	
f	≦ 50	≦ 50	≦ 50	
Duty factor	1	0.5	0.2	
t _{on}	—	5.0	1.0	s
t _{off}	—	5.0	4.0	s
V _a	4.0	4.0	4.0	kV
I _a	490	650	825	mA
I _g	140	190	240	mA
p _a	450	630	900	W
η _a	77	76	73	%
R _{g-t}	2.7	2.0	1.7	kΩ
R _a	4.7	3.4	2.7	kΩ
Feedback ratio $\frac{V_{in(pk)}}{V_a(pk)}$	0.2	0.22	0.24	
P _{out}	1.5	2.0	2.4	kW
*P _{load}	1.2	1.6	1.9	kW

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

TRIODE

TY5-500

CLASS 'C' OSCILLATOR

Anode supply single phase, full wave rectifier without smoothing filter.

LIMITING VALUES (absolute ratings)

f max.			50	Mc/s
V _a max.			4.5	kV
V _g max.			850	V
R _{g-t} max.			15	kΩ
Duty factor max.	1.0	0.5	0.2	
Averaging time max.	—	10	5.0	s
p _a max.	500	700	1000	W
I _a max.	450	630	900	mA
p _g max.	85	95	110	W
I _g max. (at p _a max.)	190	195	380	mA

OPERATING CONDITIONS

Cooling	Additional	Natural		Mc/s
		≤ 50	≤ 50	
f	≤ 50	≤ 50	≤ 50	
Duty factor	1.0	0.5	0.2	
t _{on}	—	5.0	1.0	s
t _{off}	—	5.0	4.0	s
V _{tr(r.m.s.)}	4.5	4.5	4.5	kV
V _a	4.05	4.05	4.05	kV
I _a	400	530	675	mA
I _g	125	165	210	mA
p _a	450	630	900	W
γ _a	77	76	73	%
R _{g-t}	2.7	2.2	1.7	kΩ
R _a	5.9	4.3	3.5	kΩ
Feedback ratio $\frac{V_{in(pk)}}{V_a(pk)}$	0.16	0.17	0.18	
P _{out}	1.53	2.0	2.46	kW
*P _{load}	1.25	1.5	2.0	kW
*0.85 (P _{out} - P _{drive})				

TY5-500

TRIODE

CLASS 'C' OSCILLATOR

Anode supply from three phase half-wave rectifier.

LIMITING VALUES (absolute ratings)

f max.			50	Mc/s
V _a max.			5.0	kV
V _g max.			-1.25	kV
R _{g-t} max.			15	kΩ
Duty factor max.	1.0	0.5	0.2	
Averaging time max.	—	10	5.0	s
p _a max.	500	700	1000	W
I _a max.	560	780	1100	mA
p _g max.	85	95	110	mA
I _g max. (at p _a max.)	210	290	420	mA

OPERATING CONDITIONS

Cooling	Additional	Natural		Mc/s
		≤ 50	≤ 50	
f	≤ 50	≤ 50	≤ 50	Mc/s
Duty factor	1	0.5	0.2	
t _{on}	—	5.0	1.0	s
t _{off}	—	5.0	4.0	s
V _{tr(r.m.s.)}	3.4	3.4	3.4	kV
V _a	4.0	4.0	4.0	kV
I _a	480	640	820	mA
I _g	140	190	240	mA
p _a	450	630	900	W
η _a	77	76	73	%
R _{g-t}	2.7	2.0	1.7	kΩ
R _a	4.7	3.4	2.7	kΩ
Feedback ratio $\frac{V_{in(pk)}}{V_a(pk)}$	0.2	0.22	0.24	
P _{out}	1.5	2.0	2.4	kW
*P _{load}	1.2	1.6	1.9	kW
*0.85 (P _{load} - P _{drive})				

TRIODE

TY5-500

CLASS 'C' OSCILLATOR

Anode supply from transformer without intermediate rectifier.

LIMITING VALUES (absolute ratings)

f max.			50	Mc/s
$V_{tr(r.m.s.)}$ max.			5.0	kV
V_g max.			-850	V
R_{g-f} max.			15	k Ω
Duty factor max.	1	0.5	0.2	
Averaging time max.	—	10	5.0	s
p_a max.	500	700	1000	W
I_a max.	320	450	640	mA
p_g max.	85	95	110	W
I_g max. (at p_a max.)	110	155	220	mA

OPERATING CONDITIONS

Cooling	Additional	Natural		Mc/s
		≤ 50	≤ 50	
f	≤ 50	≤ 50	≤ 50	
Duty factor	1.0	0.5	0.2	
t_{on}	—	5.0	1.0	s
t_{off}	—	5.0	4.0	s
$V_{tr(r.m.s.)}$	4.5	4.5	4.5	kV
* I_a	280	420	600	mA
* I_g	80	120	170	mA
P_a	380	500	800	W
η_a	77	76	73	%
R_{g-f}	2.7	1.8	1.3	k Ω
R_a	4.3	2.9	2.0	k Ω
Feedback ratio $\frac{V_{in(pk)}}{V_a(pk)}$	0.18	0.22	0.25	
P_{out}	1.08	1.6	2.2	kW
** P_{load}	0.9	1.3	1.7	kW

*Averaged over one cycle of supply frequency.

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

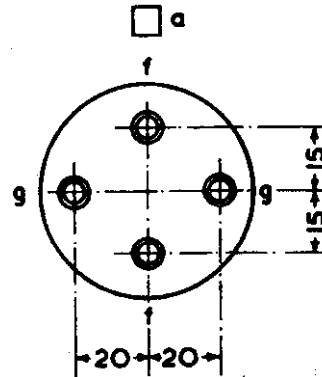
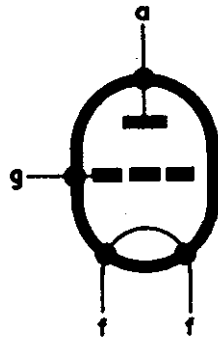
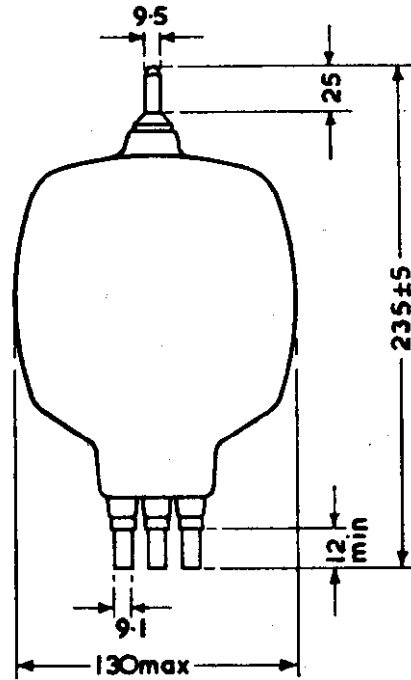


5

TRIODE

TY5-500

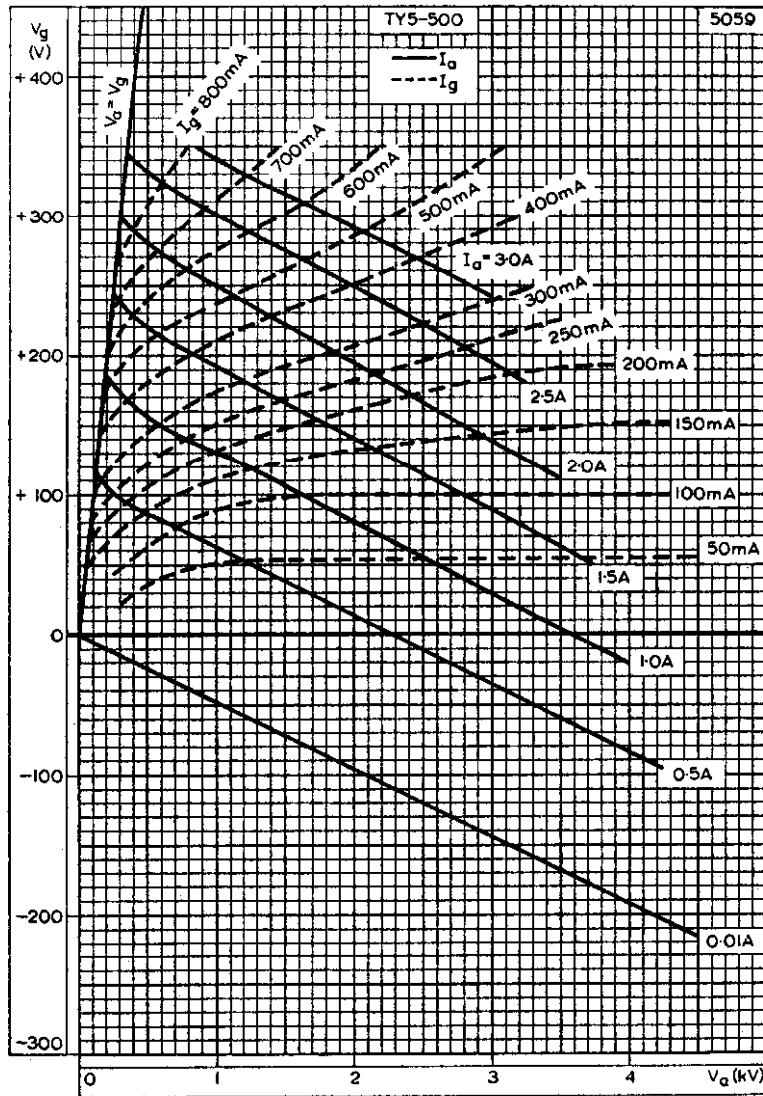
5082



All dimensions in mm

TY5-500

TRIODE



CONSTANT CURRENT CURVES



TRIODE

TY6-I2A

Application: V.H.F. power amplifier
Power output: 17kW continuous rating
Frequency: 110Mc/s at full ratings, 220Mc/s at reduced ratings
Construction: External anode, forced-air cooled

PRELIMINARY DATA

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

FILAMENT Directly heated, thoriated tungsten

V_f	6.3	V
* I_f	154	A
r_f (cold)	0.0054	Ω

*The filament current must never exceed a surge value of 500A at any time during the warming-up period.

MOUNTING POSITION Vertical only, base up or down

CAPACITANCES

C_{a-g}	29	pF
C_{g-t}	65	pF
C_{a-t}	600	mpF

CHARACTERISTICS

V_a	4.0	kV
I_a	1.0	A
g_m	60	mA/V
μ	60	

COOLING

Forced air		
Maximum temperature of anode and grid seals	180	$^{\circ}\text{C}$

In order to keep below the specified temperature limit, it may be necessary to direct an air flow on the seals as indicated on page D5. At 220Mc/s, for example, an air flow of 21ft.³ (0.6m³) per minute should be directed on each seal.

The amount of forced-air cooling required for this valve depends upon the anode dissipation and the height above sea level.

TY6-I2A

TRIODE

Typical values of inlet temperature, rate of air flow and pressure difference between the inlet and outlet of the housing are given in the following table:—

Anode dissipation P_a (kW)	Height above sea-level h		Max. inlet temperature T_{in} (°C)	Min. rate of air flow (per min.)		Pressure difference between inlet and outlet (mm of water)
	(km)	(ft)		(m ³)	(ft ³)	
5.5	0	0	35	5.0	177	16
5.5	1.5	4900	35	5.9	208	16
5.5	3.0	9800	25	5.7	201	16
8.0	0	0	35	7.7	272	35
8.0	1.5	4900	35	9.0	318	40
8.0	3.0	9800	25	9.0	318	36
10	0	0	35	11	388	65
10	1.5	4900	35	13	459	75
10	3.0	9800	25	13	459	66

CLASS 'C' TELEGRAPHY OR F.M. TELEPHONY

Limiting values (absolute ratings)

f max.	110	Mc/s
V_a max.	5.5	kV
P_a max.	10	kW
$-V_g$ max.	500	V
I_g max.	1.5	A
I_k max.	7.5	A
$i_{k(pk)}$ max.	40	A
P_{in} max.	30	kW

Typical operation

f	110	Mc/s
V_a	5.0	kV
V_g	-300	V
I_a	4.8	A
I_g	1.2	A
$V_{in(pk)}$	520	V
$P_{load(driver)}$	2.75	kW
P_a	9.0	kW
η_a	62.5	%
* P_{out}	15+2	kW
$P_{load} (\eta \text{ transfer} = 85\%)$	14.5	kW

*Includes power transferred from driver stage.

TRIODE

TY6-12A

LINEAR GROUNDED GRID POWER AMPLIFIER FOR TELEVISION SERVICE (with positive modulation and negative synchronisation)

Limiting values

f max.	88	220	Mc/s
V _a max.	5.5	4.5	kV
p _a (peak white) max.	10	10	kW
I _a (peak white) max.	6.0	6.0	A
I _g (peak white) max.	1.2	1.2	A
P _{in} (peak white) max.	25	22	kW

Typical operation (at centre frequency of the resonance curve)

f	40 to 88	170 to 220	Mc/s
Bandwidth (-3.0dB)	6.0	12	Mc/s
V _a	5.0	4.0	kV
V _g	-90	-75	V
V _{in(pk)}			
peak white	270	255	V
black	110	95	V
I _a			
peak white	4.8	4.8	A
black	1.45	1.45	A
I _g			
peak white	1.0	1.0	A
black	200	200	mA
P _{load(driver)}			
peak white	1.4	1.3	kW
*P _{out}			
peak white	17	12	kW
black	1.7	1.2	kW
P _{load}			
peak white (η transfer=70%)	11.9	8.4	kW

*Includes power transferred from driver stage.

CLASS 'B' LINEAR GROUNDED GRID POWER AMPLIFIER FOR TELEVISION SERVICE (with negative modulation and positive synchronisation)

Limiting values (absolute ratings)

f max.	88	220	Mc/s
V _a max.	5.5	4.5	kV
p _a (sync.) max.	10	10	kW
I _a (sync.) max.	6.0	6.0	A
I _g (sync.) max.	1.2	1.2	A
P _{in} (sync.) max.	25	22	kW

TY6-I2A

TRIODE

Typical operation (at centre frequency of the resonance curve)

	40 to 88	170 to 220	Mc/s
f	—	7.0	Mc/s
Bandwidth (-1.5dB)	6.0	12	Mc/s
Bandwidth (-3.0dB)	5.0	4.0	kV
V _a	-90	-75	V
V _g	270	255	V
V _{in(pk)}	200	180	V
sync.			
black			
I _a	4.8	4.8	A
sync.			
black	3.6	3.6	A
I _g	1.0	1.0	A
sync.			
black	350	350	mA
P _{load(driver)}	1.4	1.3	kW
sync.			
*P _{out}	17	12	kW
sync.			
black	9.6	6.75	kW
P _{load}	11.9	8.4	kW
sync. ($\eta_{transfer}=70\%$)			

*Includes power transferred from driver stage.

WEIGHT

Valve only	20 lb	15oz
		9.5kg

ACCESSORIES

Insulating pedestal	40654
Anode connector	40651
Grid connector	40651
Inner filament connector	40652
Outer filament connector	40653

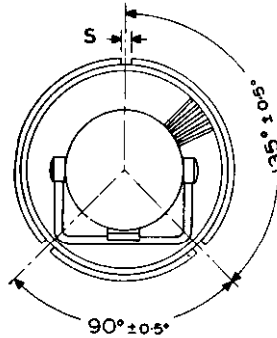
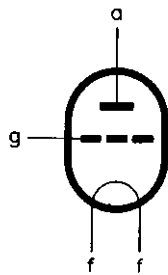
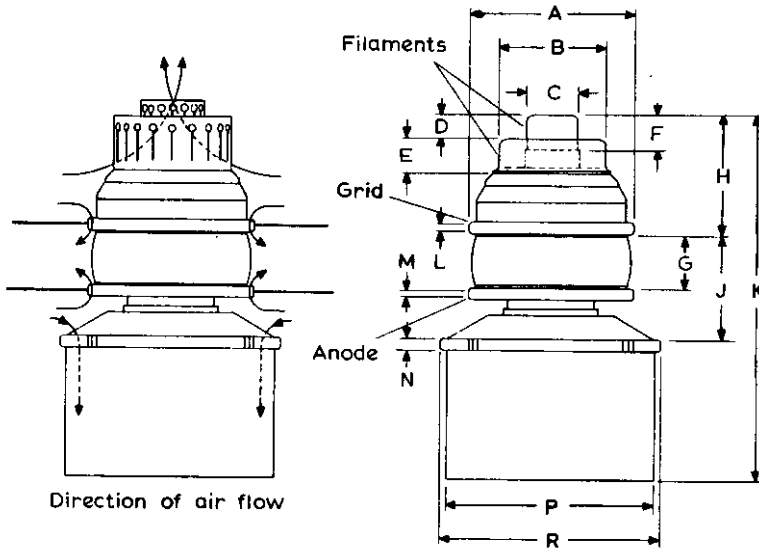
DIMENSIONS

	Inches	Millimetres		Inches	Millimetres
A	5.000-0.039	127-1.0	J	3.051±0.039	77.5±1.0
B	3.228+0.019	82±0.5	K	10.847±0.059	275.5±1.5
C	1.595+0.019	40.5±0.5	L	0.217	5.5
D	0.709±0.039	18±1.0	M	0.217	5.5
E	0.984±0.039	25±1.0	N	0.315±0.012	8.0±0.3
F	1.024±0.039	26±1.0	P	6.260±0.028	159±0.7
G	1.595±0.039	40.5±1.0	R	6.654±0.019	169±0.5
H	3.543±0.039	90±1.0	S	0.354+0.019	9.0+0.5



TRIODE

TY6-12A



7577



○

()

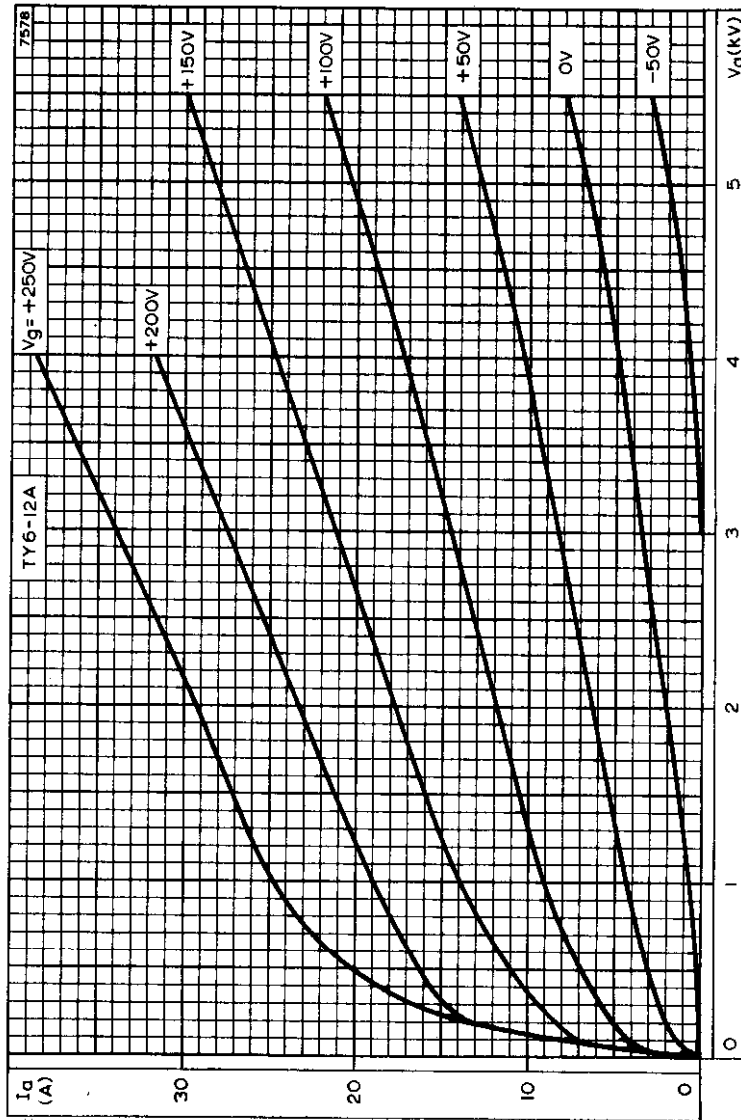
()

()



TRIODE

TY6-12A

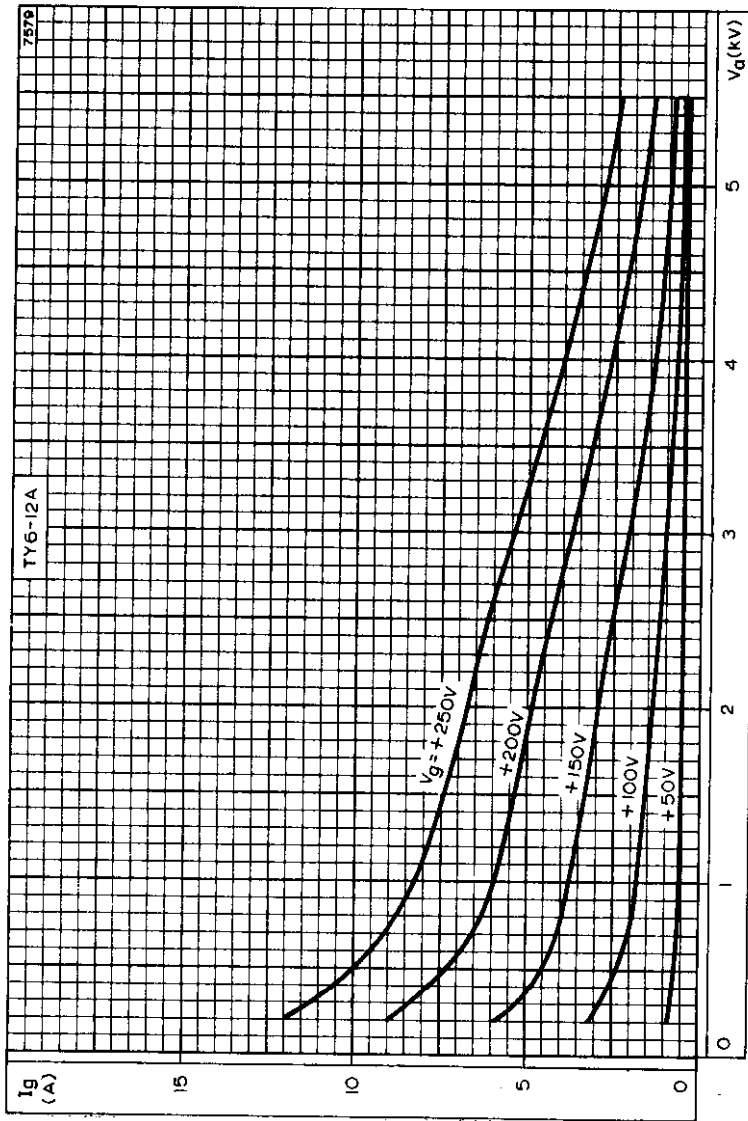


ANODE CURRENT PLOTTED AGAINST ANODE VOLTAGE WITH GRID VOLTAGE AS PARAMETER



TY6-12A

TRIODE

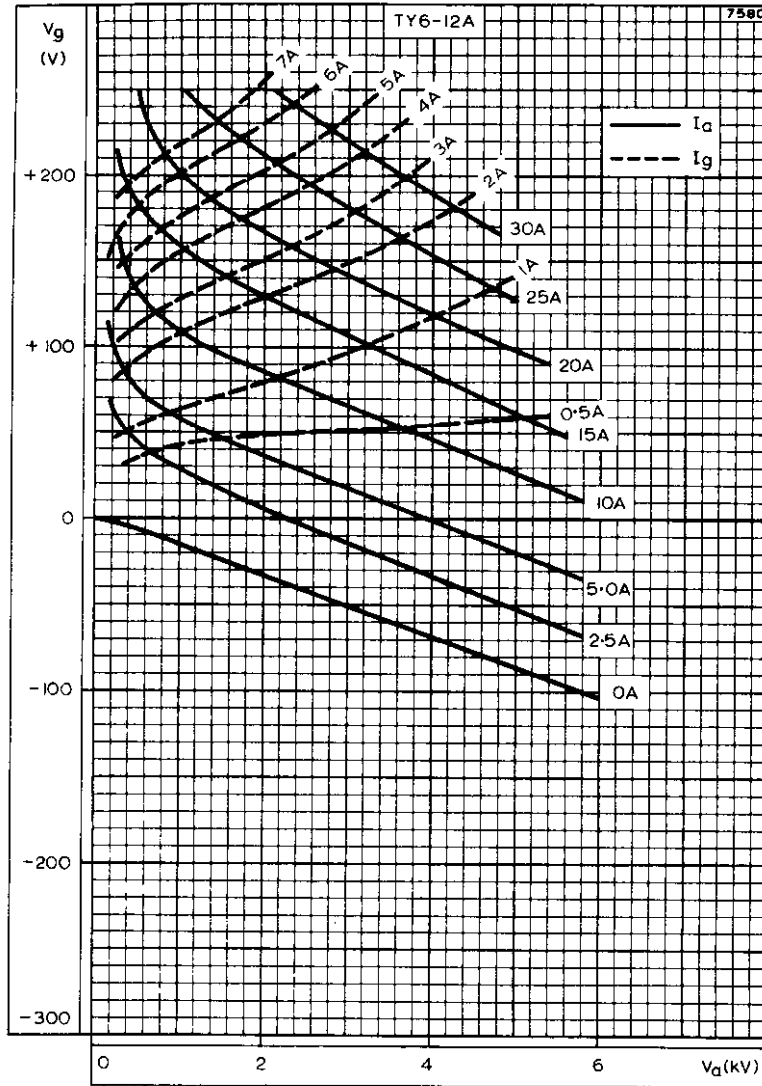


GRID CURRENT PLOTTED AGAINST ANODE VOLTAGE WITH GRID VOLTAGE AS PARAMETER



TRIODE

TY6-12A

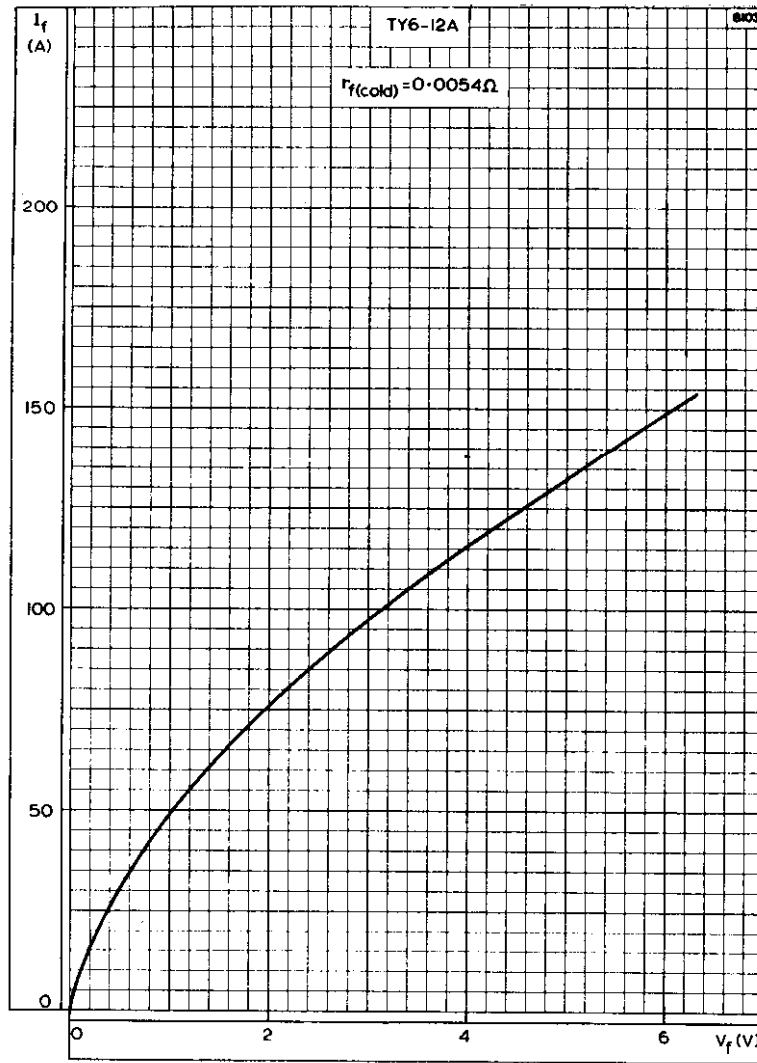


CONSTANT CURRENT CURVES



TY6-12A

TRIODE



FILAMENT CURRENT PLOTTED AGAINST FILAMENT VOLTAGE



TRIODE

TY6-800

Application: R.F. Industrial heating.
Power Output: 2.7kW continuous rating.
Frequency: 50Mc/s max. at full ratings.
Construction: Glass, radiation cooled anode.

PRELIMINARY DATA

This data should be read in conjunction with GENERAL OPERATIONAL RECOMMENDATIONS - TRANSMITTING VALVES preceding this section of the handbook.

FILAMENT Thoriated tungsten

* V_f	6.3	V
I_f	32.5	A

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

MOUNTING POSITION

Vertical only, base down

CAPACITANCES

C_{a-g}	6.2	pF
C_{g-f}	10.5	pF
C_{a-f}	0.25	pF

CHARACTERISTICS (measured at $V_a = 4kV$, $I_a = 190mA$)

\bar{g}_m	5.1	mA/V
g_m (at $V_a = 1.0kV$, $I_a = 3.0A$)	9.0	mA/V
μ	22	

COOLING

Normally Low velocity air flow
*At reduced input or intermittent ratings Natural

Maximum temperature of seals	220	°C
Maximum bulb temperature	350	°C

*See examples in typical data.

ACCESSORIES

Socket	B8.700.51
Anode clip	40626

TY6-800

TRIODE

CLASS 'C' POWER OSCILLATOR

With d.c. anode supply.

LIMITING VALUES

f max.			50	Mc/s
V _a max.			6.0	kV
V _g max.			-1.25	kV
R _{g-r} max.			10	kΩ
Duty factor max.	1.0	0.5	0.2	
Averaging time max.	—	10	5.0	s
p _a max.	800	1200	1500	W
I _a max.	750	1100	1400	mA
p _g max.	120	150	175	W
I _g max. (at p _a max.)	300	375	400	mA

OPERATING CONDITIONS

Cooling	Additional		Natural		Mc/s
	≤ 50	≤ 50	≤ 50	≤ 50	
f					
Duty factor	1.0	1.0	0.2	0.5	
t _{on}	—	—	1	5.0	s
t _{off}	—	—	4	5.0	s
V _a	3.0	5.0	5.0	5.0	kV
I _a	700	700	1200	960	mA
I _g	240	225	310	240	mA
p _a	546	788	1380	1100	W
η _a	74	77.5	77	77	%
R _{g-r}	1.5	2.5	2.0	2.2	kΩ
R _a	2.0	3.8	2.2	2.8	kΩ
Feedback ratio $\frac{V_{in(pk)}}{V_{a(pk)}}$	0.3	0.2	0.23	0.22	
P _{out}	1.55	2.7	4.6	3.7	kW
*P _{load}	1.2	2.1	3.6	3.0	kW

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

TRIODE

TY6-800

CLASS 'C' POWER OSCILLATOR

Anode supply single phase, full wave rectifier without smoothing filter.

LIMITING VALUES

f max.			50	Mc/s
V _a max.			5.4	kV
V _g max.			-1.25	kV
R _{g-r} max.			10	kΩ
Duty factor max.	1.0	0.5	0.2	
Averaging time max.	—	10	5.0	s
p _a max.	800	1200	1500	W
I _a max.	670	1000	1250	mA
p _g max.	120	150	175	W
I _g max. (at p _a max.)	270	400	500	mA

OPERATING CONDITIONS

Cooling	Additional		Natural		Mc/s
	≤ 50	≤ 50	≤ 50	≤ 50	
f	≤ 50	≤ 50	≤ 50	≤ 50	
Duty factor	1.0	1.0	0.5	0.2	
t _{on}	—	—	5.0	1.0	s
t _{off}	—	—	5.0	4.0	s
V _a	3.15	4.5	4.5	4.5	kV
I _a	600	600	760	870	mA
I _g	180	150	220	240	mA
p _a	620	750	1100	1400	W
η _a	73	77	74	72	%
R _{g-r}	1.5	2.5	1.7	1.6	kΩ
R _a	2.5	3.8	3.3	2.6	kΩ
Feedback ratio $\frac{V_{in(pk)}}{V_{a(pk)}}$	0.2	0.17	0.2	0.2	
P _{out}	1.7	2.55	3.13	3.6	kW
*P _{load}	1.4	2.2	2.6	3.0	kW
*0.85(P _{out} -P _{drive})					

TY6-800

TRIODE

CLASS 'C' POWER OSCILLATOR

Anode supply from three phase half-wave rectifier.

LIMITING VALUES

f max.			50	Mc/s
V _a max.			6.0	kV
V _g max.			-1.25	kV
R _{g-f} max.			10	kΩ
Duty factor max.	1.0	0.5	0.2	
Averaging time max.	—	10	5.0	s
p _a max.	800	1200	1500	W
I _a max.	750	1100	1400	mA
p _g max.	120	150	175	W
I _g max. (at p _a max.)	300	450	560	mA

OPERATING CONDITIONS

Cooling	Additional	Natural		Mc/s
		≤50	≤50	
f	≤50	≤50	≤50	
Duty factor	1.0	0.5	0.2	
t _{on}	—	5.0	1.0	s
t _{off}	—	5.0	4.0	s
V _{tr(r.m.s.)} max.	4.25	4.25	4.25	kV
V _a	5.0	5.0	5.0	kV
I _a	700	740	900	mA
I _g	160	170	210	mA
p _a	780	960	1200	W
γ _a	78	74	73	%
R _{g-f}	2.5	2.4	1.9	kΩ
R _a	3.8	3.4	2.4	kΩ
Feedback Ratio $\frac{V_{in(pk)}}{V_{a(pk)}}$	0.16	0.17	0.17	
P _{out}	2.7	2.74	3.3	kW
*P _{load}	2.3	2.2	2.7	kW
*0.85(P _{out} -P _{drive})				

TRIODE

TY6-800

CLASS 'C' POWER OSCILLATOR

Anode supply from transformer without intermediate rectifier.

LIMITING VALUES

f max.			50	Mc/s
$V_{tr(r.m.s.)}$ max.			5.6	kV
V_g max.			-1.25	kV
R_{g-f} max.			10	k Ω
Duty factor max.	1.0	0.5	2.0	
Averaging time max.	—	10	5.0	s
p_a max.	800	1200	1500	W
* I_a max.	400	600	750	mA
p_g max.	120	150	175	W
* I_g max. (at p_a max.)	160	240	300	mA

OPERATING CONDITIONS

Cooling	Additional	Natural		Mc/s
		≤ 50	≤ 50	
f	≤ 50	≤ 50	≤ 50	
Duty factor	1.0	0.5	0.2	
t_{on}	—	5.0	1.0	s
t_{off}	—	5.0	4.0	s
$V_{tr(r.m.s.)}$	5.2	5.2	5.2	kV
* I_a	360	540	675	mA
* I_g	100	150	190	mA
p_a	520	870	1170	W
η_a	75	72	70	%
R_{g-f}	1800	1200	950	Ω
R_a	3.2	2.2	1.7	k Ω
Feedback Ratio $\frac{V_{in(pk)}}{V_{a(pk)}}$	0.15	0.2	0.23	
P_{out}	1.56	2.24	2.73	kW
** P_{total}	1.3	1.85	2.26	kW

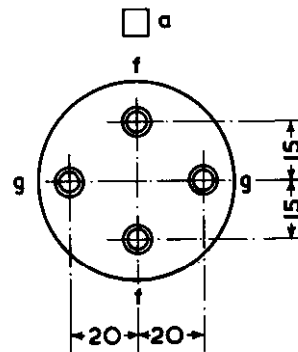
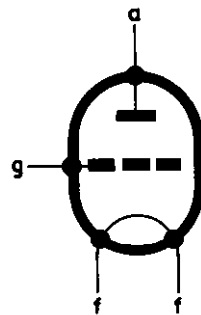
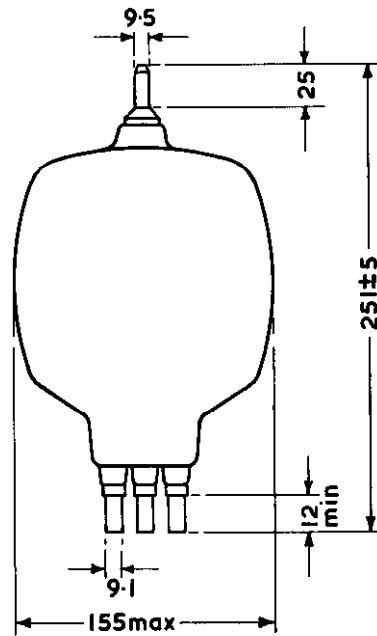
*Averaged over one cycle of supply frequency.

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

TY6-800

TRIODE

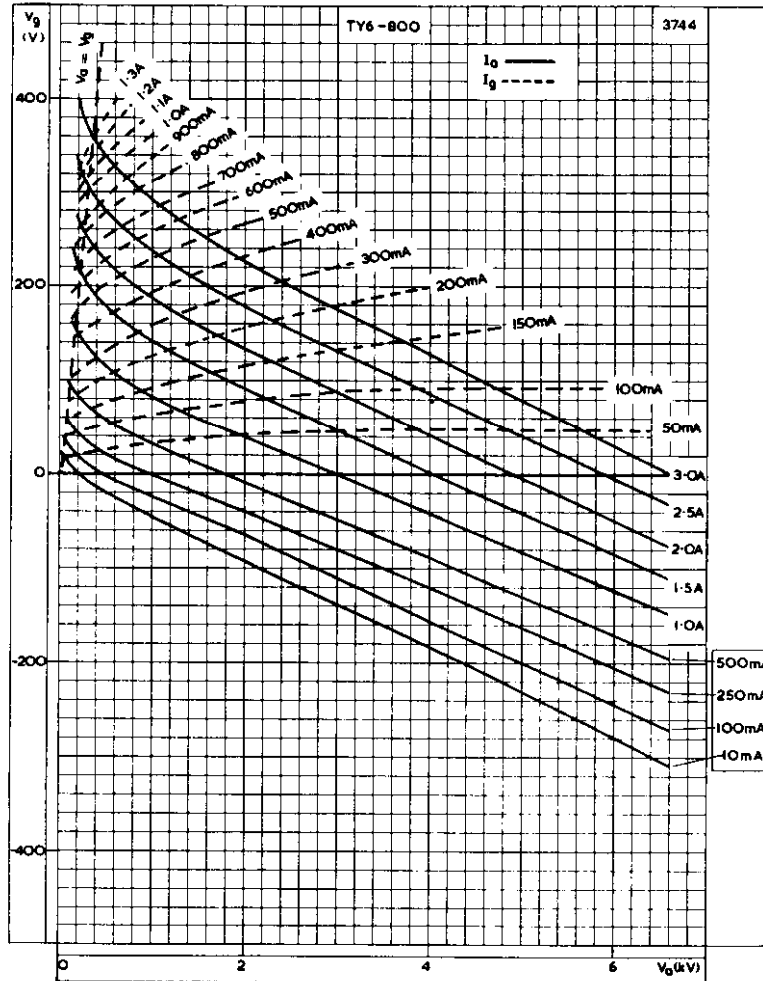
B2794



All dimensions in mm

TRIODE

TY6-800



CONSTANT CURRENT CHARACTERISTICS

()

()

()

()



R.F. POWER TRIODE

TY6-I250A

Application: R.F. industrial oscillator
Power output: 4.1kW continuous rating
Frequency: 50Mc/s at full ratings
Construction: External anode, forced-air cooled

PRELIMINARY DATA

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

FILAMENT Directly heated, thoriated tungsten

* V_f	6.3	V
I_f	65	A

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

MOUNTING POSITION Vertical only, anode up or down

CAPACITANCES

C_{a-g}	7.2	pF
C_{g-t}	13	pF
C_{a-t}	< 500	mpF

CHARACTERISTICS (measured at $V_a=6kV$, $I_a=240mA$)

g_m	7.0	mA/V
μ	23	

COOLING

Forced air		
$T_{seals\ max.}$	200	°C
$T_{anode\ max.}$	270	°C

An airflow should be directed to anode and seals in order to keep the temperature below the specified limits.

At sea level and at a temperature of 35°C an airflow of 70ft³(2m³) per minute is sufficient for cooling the anode in continuous operation at maximum anode dissipation.

At higher altitudes and/or higher inlet temperatures a correspondingly greater amount of air should be applied.

The filament and grid seals require an airflow of 11ft³(0.3m³) per minute.

The airflow should be directed on the valve as indicated in Fig. 1. To keep the anode seal, opposite the nozzle, below the maximum temperature a deflection plate as indicated in Fig. 1 should be used. This should be made of a suitable insulating material such as p.t.f.e. This deflection plate can be clipped on the anode or mounted on the valve socket or on the chassis.

TY6-I250A

R.F. POWER TRIODE

CLASS 'C' OSCILLATOR

Anode supply from 3-phase rectifier without smoothing filter
continuous operation.

Limiting values (absolute ratings)

f max.	50	Mc/s
V_a max.	7.0	kV
I_k max.	2.0	A
$i_{k(pk)}$ max.	12	A
p_a max.	1.3	kW
$-V_g$ max.	1.25	kV
I_g max.	400	mA
R_{g-t} max.	10	k Ω

Typical operation

f	50	Mc/s
$V_{tr(r.m.s.)}$	5.1	kV
V_a	6.0	kV
I_a	900	mA
I_g	280	mA
p_a	1.3	kW
η_a	76	%
R_{g-t}	2.0	k Ω
R_a	3.3	k Ω
Feedback ratio $\frac{V_{in(pk)}}{V_a(pk)}$	0.16	
P_{out}	4.1	kW
* P_{load}	3.3	kW
*0.85 ($P_{out} - P_{drive}$)		

R.F. POWER TRIODE

TY6-I250A

CLASS 'C' OSCILLATOR

Anode supply from 3-phase rectifier without smoothing filter, intermittent operation.

Limiting values (absolute ratings)

f max.	50	Mc/s
V _a max.	7.0	kV
P _a max.	2.1	kW
I _k max.	2.3	A
i _{k(pk)} max.	14	A
-V _g max.	1.25	kV
I _g max.	400	mA
R _{g-t} max.	10	kΩ

Typical operation

Duty cycle }
t_{on}

see page C4

f	50	Mc/s
V _{tr(r.m.s.)}	5.1	kV
V _a	6.0	kV
I _a	1.33	A
I _g	380	mA
P _a	2.1	kW
η _a	74	%
R _{g-t}	1.45	kΩ
R _a	2.2	kΩ
Feedback ratio $\frac{V_{in(pk)}}{V_a(pk)}$	0.17	
P _{out}	5.9	kW
*P _{load}	4.75	kW
*0.85 (P _{out} -P _{drive})		

WEIGHT

Valve only	{ 1 lb 13oz
	{ 800 g
Shipping weight	{ 3 lb 10oz
	{ 1.6 kg

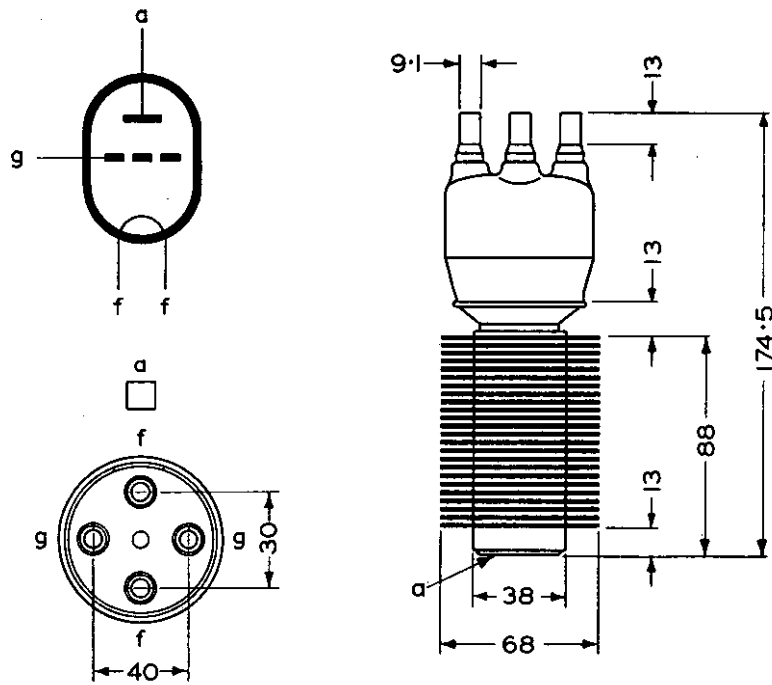
ACCESSORIES

Socket	B8.700.51
--------	-----------



TY6-I250A

R.F. POWER TRIODE

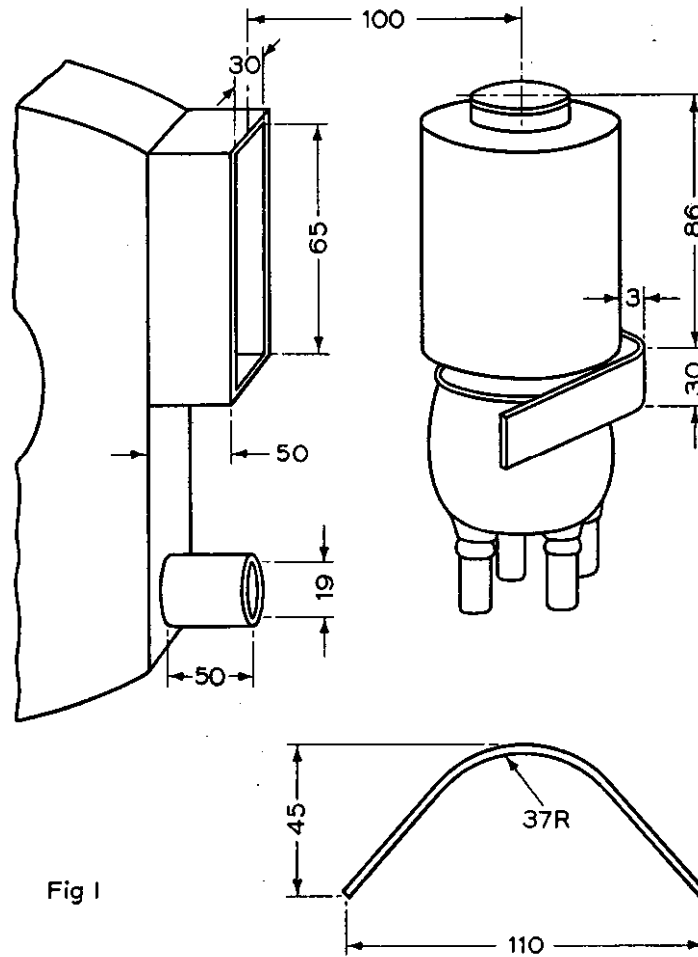


All dimensions in mm

7452

R.F. POWER TRIODE

TY6-I250A



All dimensions in mm

7461

FIG. 1. COOLING ARRANGEMENT

(1)

(1)

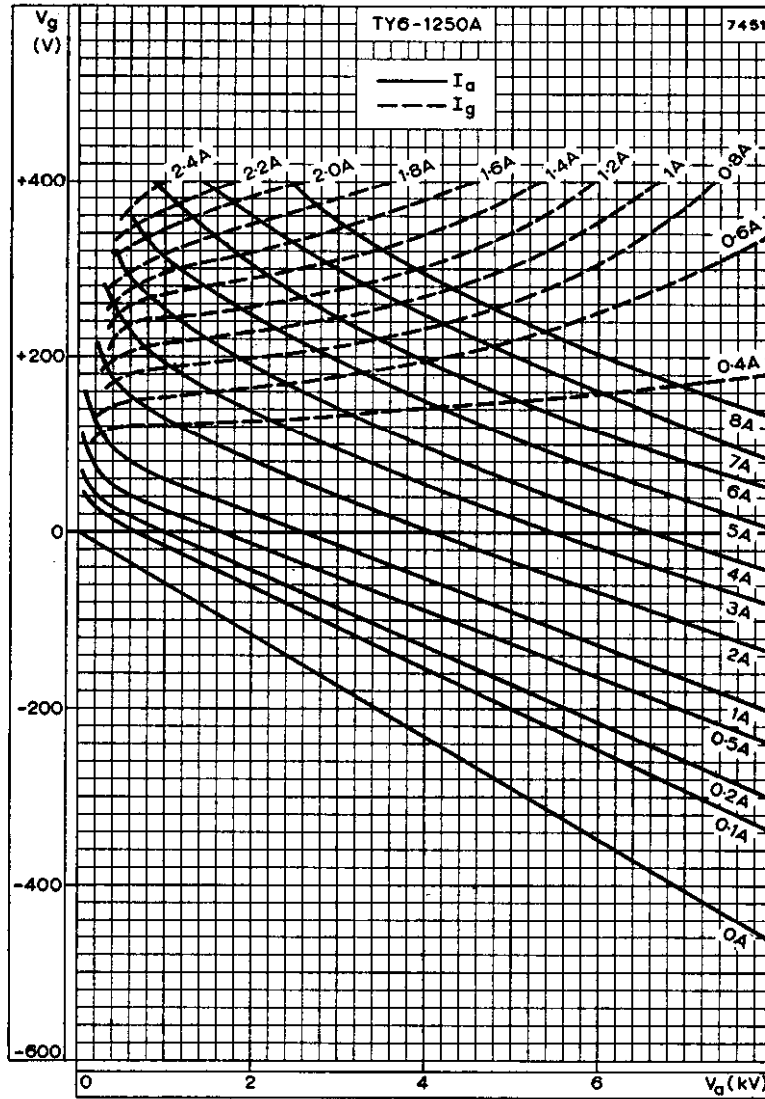
(1)

(1)



R.F. POWER TRIODE

TY6-1250A

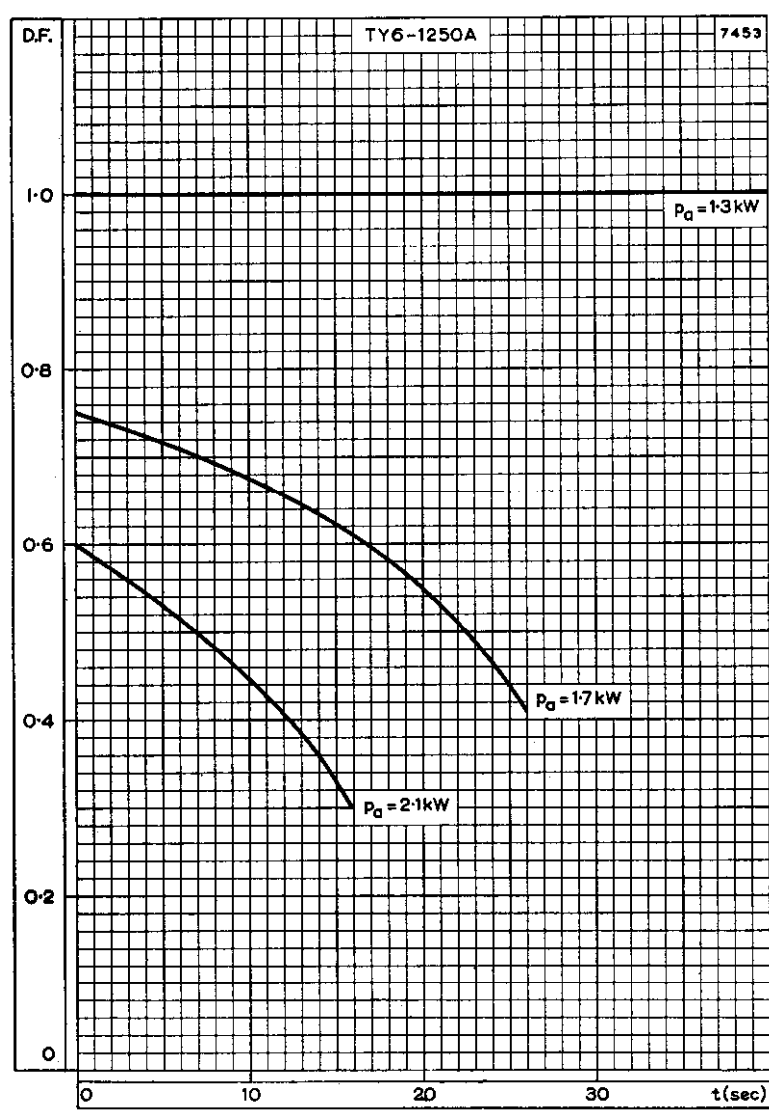


CONSTANT CURRENT CURVES



TY6-1250A

R.F. POWER TRIODE



DUTY FACTOR PLOTTED AGAINST TIME FOR INTERMITTENT OPERATION



**V.H.F. INDUSTRIAL
TRIODE**

TY6-3000A

QUICK REFERENCE DATA

Forced-air cooled triode intended for use as Class 'C' industrial oscillator.

f	30	Mc/s
P _{out}	7.6	kW
f max.	150	Mc/s
V _a max.	6.0	kV
p _a max.	3.0	kW

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

INDUSTRIAL OSCILLATOR, CLASS 'C'

OPERATING CONDITIONS

f	30	30	Mc/s
P _{out}	5.8	7.6	kW
P _{load}	5.0	6.7	kW
Duty factor	1.0	1.0	
η _a	77	78	%
V _a	5.0	6.0	kV
I _a	1.5	1.63	A
-V _g	300	350	V
I _g	300	310	mA
R _{g-f}	1.0	1.13	kΩ
Feedback ratio $\frac{v_{in(pk)}}{v_{a(pk)}}$	0.125	0.12	
P _{drive}	157	180	W
p _a	1.7	2.2	kW
p _g	76	84	W



RATINGS (ABSOLUTE MAXIMUM SYSTEM)

f max.	150	Mc/s
V_a max.	7.0	kV
$-V_g$ max.	1.0	kV
I_g max.	350	mA
I_k max.	2.5	A
$i_{k(pk)}$ max.	15	A
p_a max.	3.0	kW
p_g max.	110	W
R_{g-f} max.	10	k Ω

CATHODE

Directly heated, thoriated tungsten

V_f	12.6	V
I_f	33	A

CAPACITANCES

c_{a-g}	24	pF
c_{out}	0.5	pF
c_{in}	21	pF

CHARACTERISTICS (measured at $V_a = 2.5kV$, $I_a = 0.9A$)

g_m	22	mA/V
μ	26	

MOUNTING POSITION

Vertical, with base up or down

**V.H.F. INDUSTRIAL
TRIODE**

TY6-3000A

COOLING

Forced-air cooled (see curves on pages C4 and C5)

Maximum temperatures

Anode and grid seals	180	°C
Filament seals	210	°C

The amount of forced-air cooling required for the anode of this valve depends upon the anode dissipation and temperature and pressure of inlet air.

PHYSICAL DATA

	lb	kg
Weight of valve	8.4	3.8

DIMENSIONS

	Inches	Millimetres	
A	8.46	215	max.
B	6.075 ± 0.059	154.3 ± 1.5	()
C	3.406 ± 0.039	86.5 ± 1.0	
D	4.252 ± 0.078	108 ± 2.0	
E	3.425 ± 0.039	88 ± 1.0	
F	1.378 ± 0.039	35 ± 1.0	
G	0.866 ± 0.078	20 ± 2.0	
H	2.500	63.5	max.
J	0.315 ± 0.019	8.0 ± 0.5	
K	4.567 ± 0.019	116 ± 0.5	dia.
L	1.969 ± 0.008	50 ± 0.2	dia.
M	5.929 ± 0.039	150.6 ± 1.0	dia. ()
N	0.063 ± 0.007	1.6 ± 0.2	
P	0.178 ± 0.008	4.5 ± 0.2	
Q	0.145 ± 0.002	3.70 ± 0.05	
R	4 x 0.010	4 x 0.25	
S	0.78	20	max.
U	6.512 ± 0.019	165.4 ± 0.5	
V	6.256 ± 0.019	158.9 ± 0.5	
W	0.182 ± 0.004	4.62 ± 0.1	
Z	0.205 ± 0.008	5.20 ± 0.20	

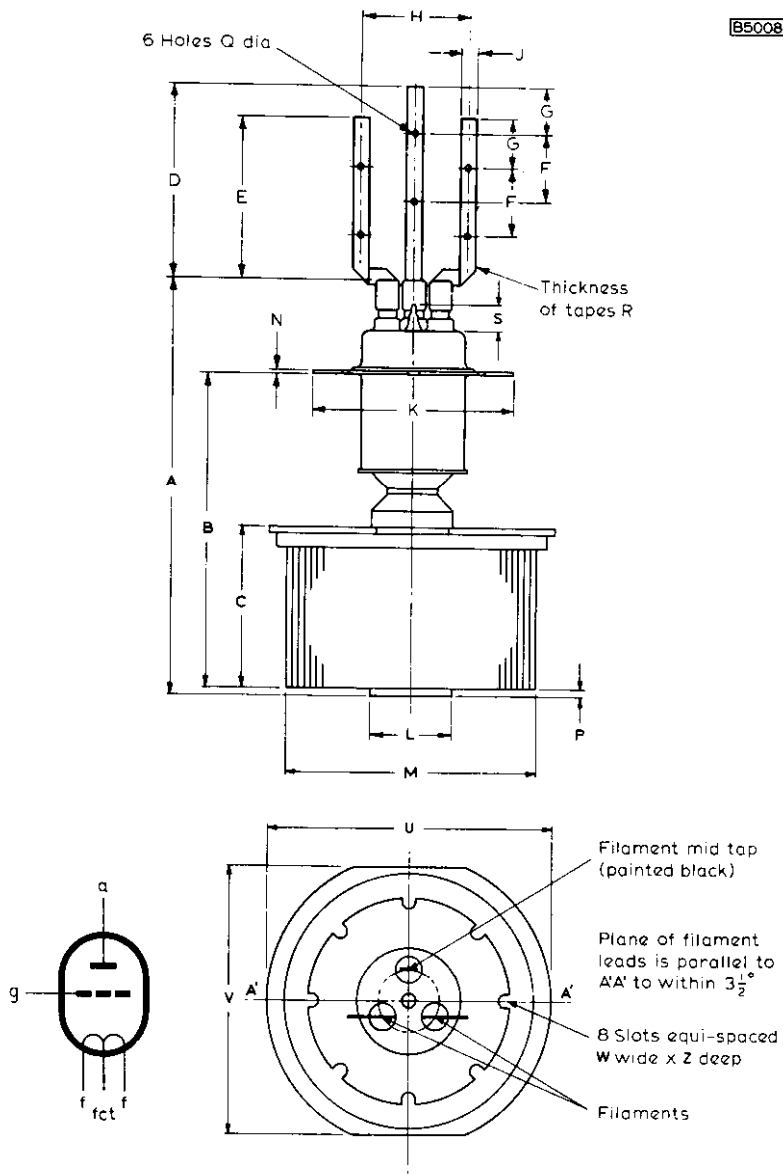
Inch dimensions derived from original millimetre dimensions



V.H.F. INDUSTRIAL
TRIODE

TY6-3000A

B5008



1.

(

(

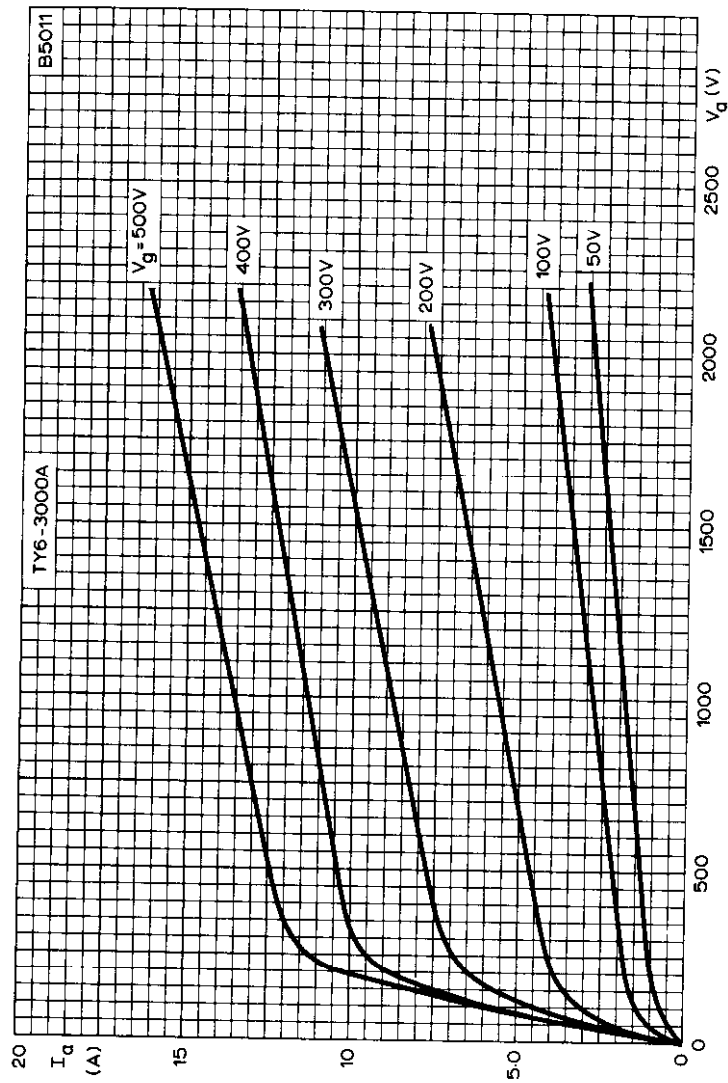
(

(

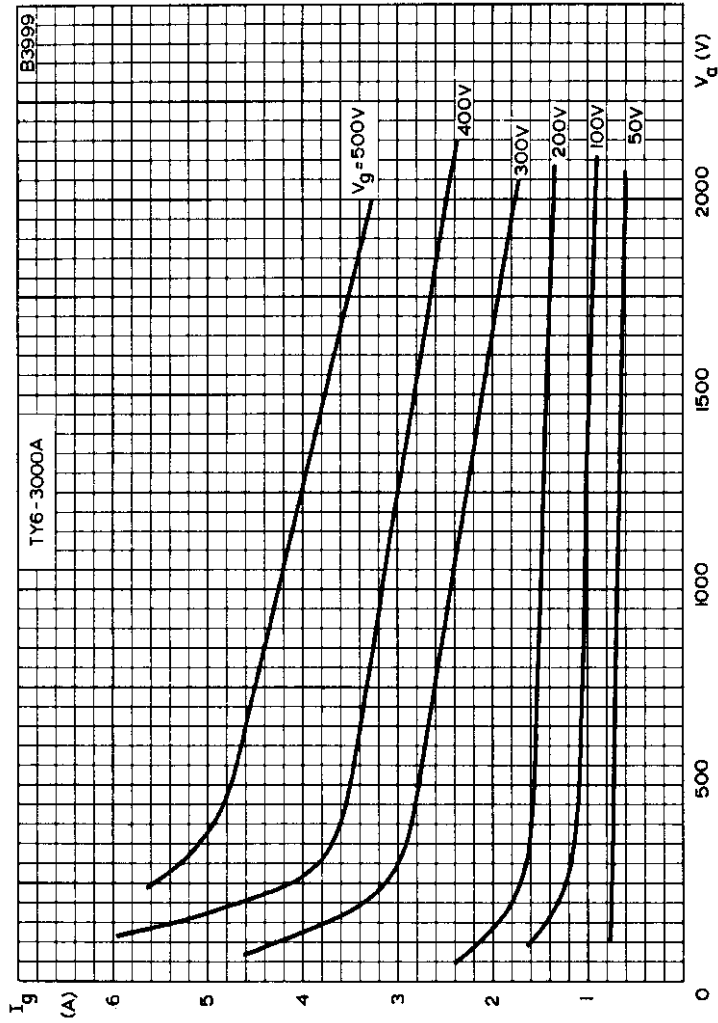


V.H.F. INDUSTRIAL
TRIODE

TY6-3000A



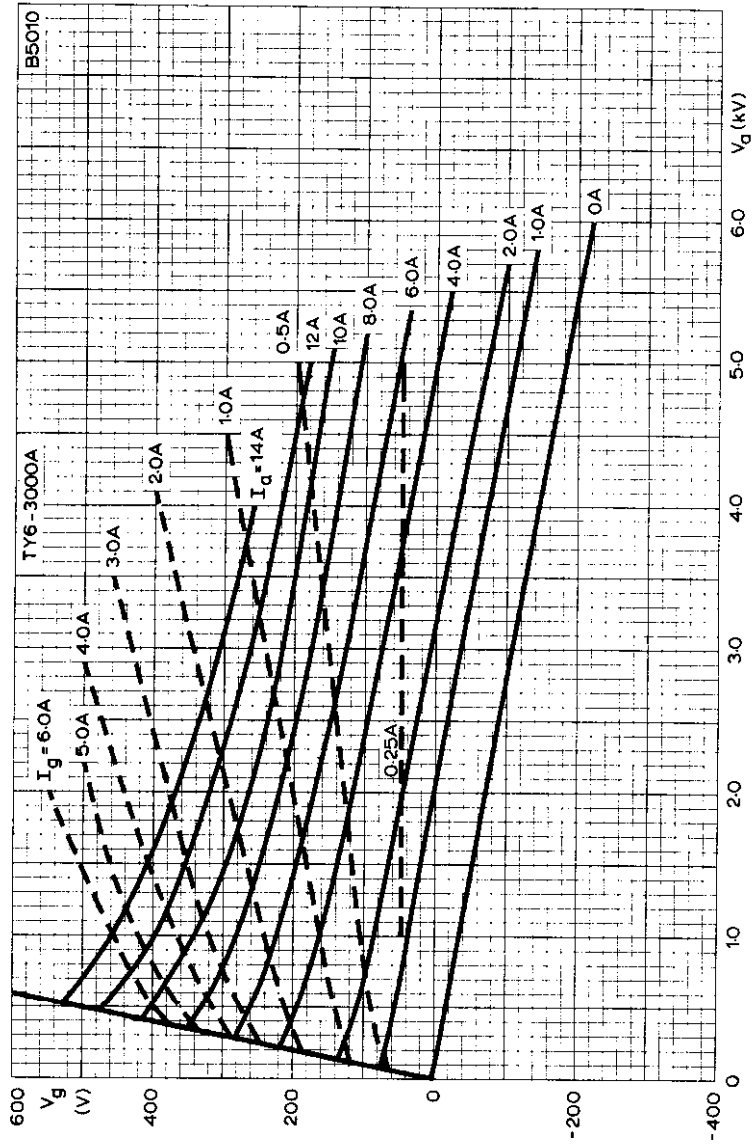
ANODE CURRENT PLOTTED AGAINST ANODE VOLTAGE WITH
GRID VOLTAGE AS PARAMETER



GRID CURRENT PLOTTED AGAINST ANODE VOLTAGE WITH GRID VOLTAGE AS PARAMETER

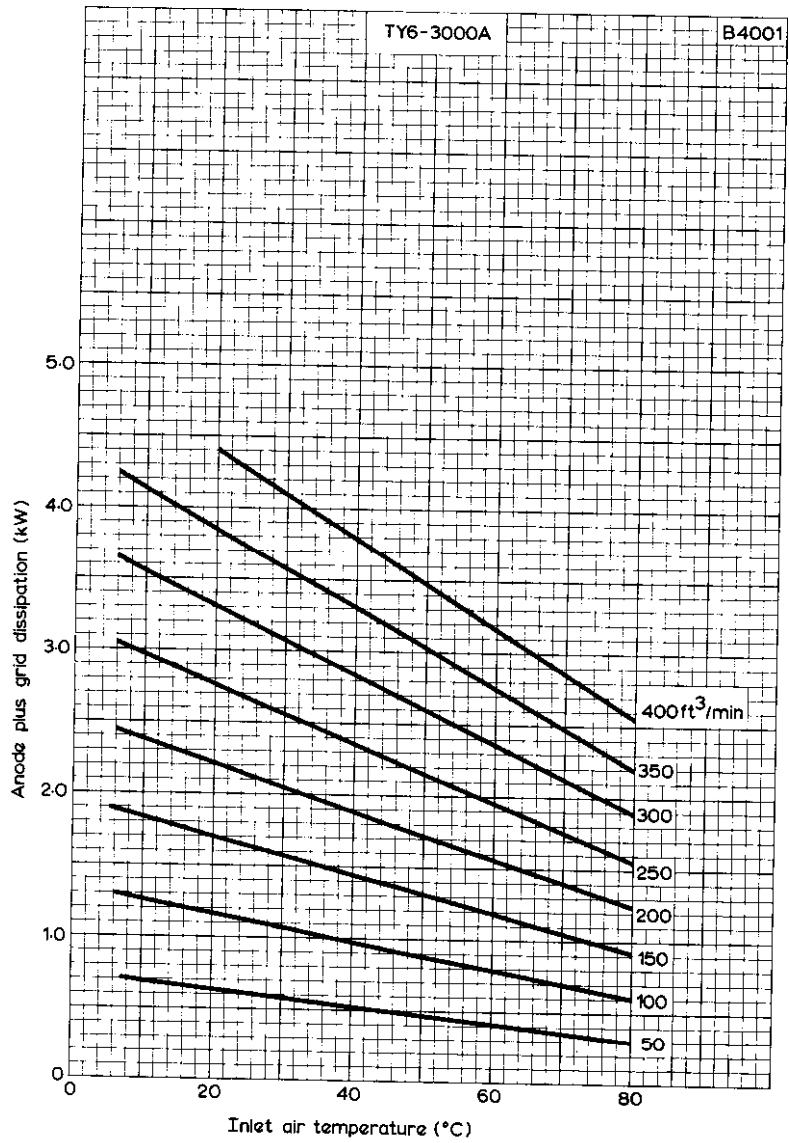
V.H.F. INDUSTRIAL
TRIODE

TY6-3000A



CONSTANT CURRENT CHARACTERISTICS



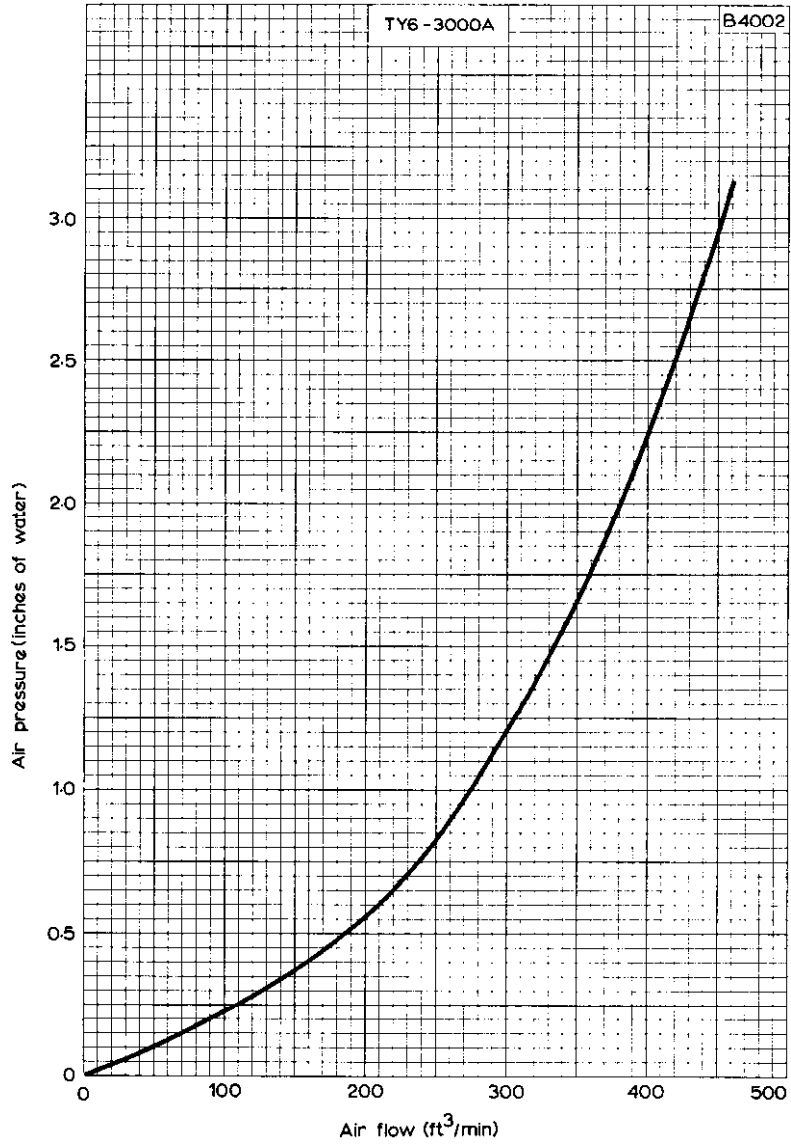


AIR COOLING CHARACTERISTICS



V.H.F. INDUSTRIAL
TRIODE

TY6-3000A



AIR FLOW CHARACTERISTICS



10

(1)

(2)

(3)

(4)

■

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	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 Modulation		Linear Power Amplifier	
	Negative Synchronisation	Positive Synchronisation	Positive Synchronisation	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

V.H.F. POWER TRIODE

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

TELEPHONY, ANODE MODULATION, CLASS 'C'

OPERATING CONDITIONS (Carrier conditions for 100% modulation)

	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)

	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



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	%

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 Modulation		Linear Power Amplifier		
	Negative Synchronisation	Positive Synchronisation	Positive Synchronisation	Negative Synchronisation	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

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	$^{\circ}C$
Pin seals	210	$^{\circ}C$

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:



Anode dissipation (kW)	Height above sea level		Inlet temperature (°C)	Rate of flow of air per minute (m ³) (ft ³)		Pressure difference between inlet and outlet (mm H ₂ O)
	(km)	(ft)				
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 (kW)	Inlet temperature (°C)	Rate of flow of water per minute (litres) (gal)		Pressure difference between inlet and outlet (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°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.

V.H.F. POWER TRIODE

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

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

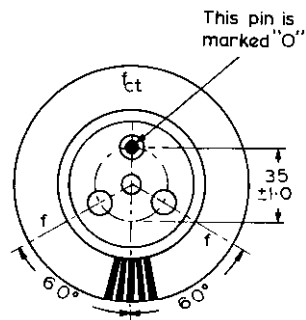
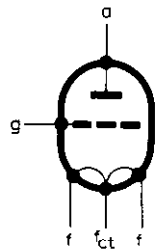
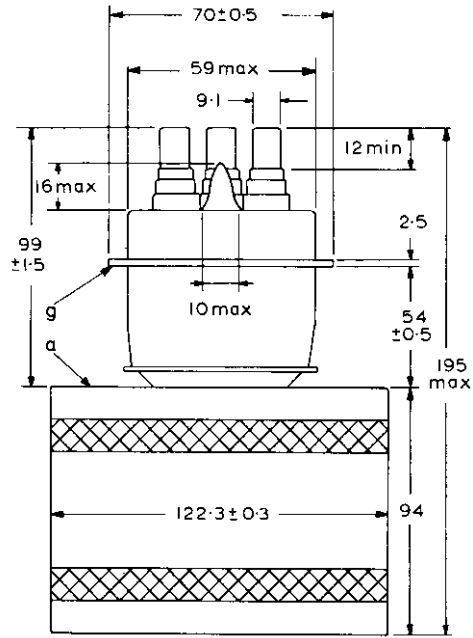
	TY6-5000A	TY6-5000W	TY6-5000H	
Weight of valve	10.1	1.0	1.8	lb
	4.6	0.45	0.8	kg
Weight of valve plus carton	17.9	2.6	3.7	lb
	8.1	1.2	1.7	kg
Weight of insulating pedestal	4.6	-	-	lb
	2.1	-	-	kg
Weight of insulating pedestal plus carton	6.8	-	-	lb
	3.1	-	-	kg
Weight of water jacket	-	1.1	-	lb
	-	0.52	-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



This pin is marked "O"

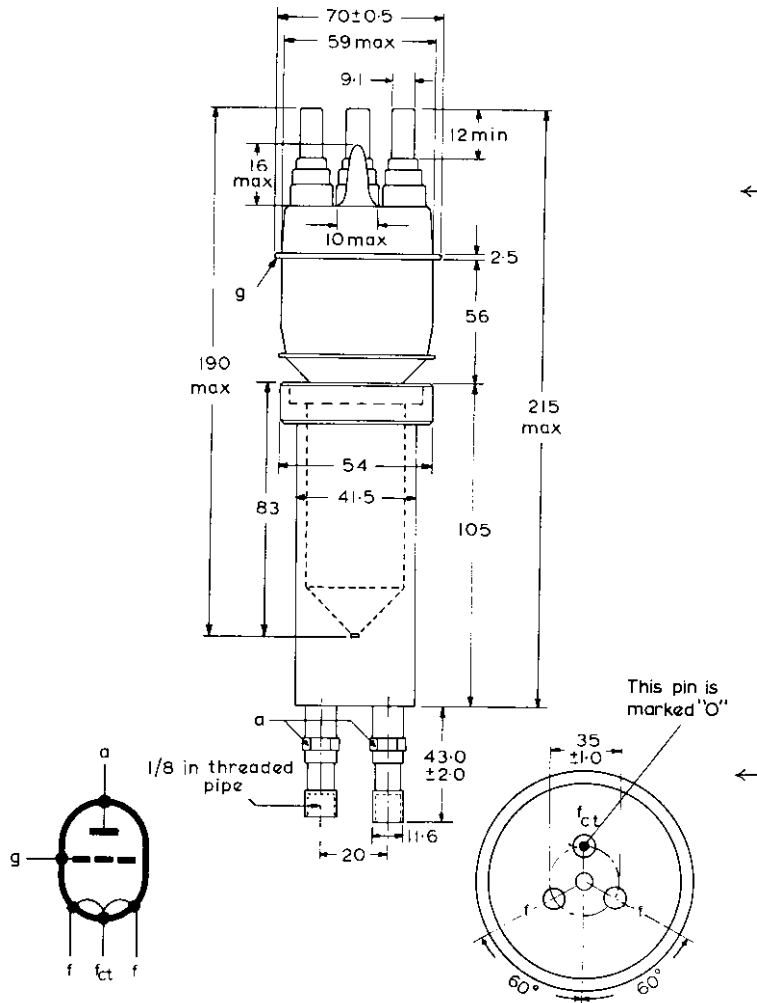
All dimensions in mm

B 5523

V.H.F. POWER TRIODE

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

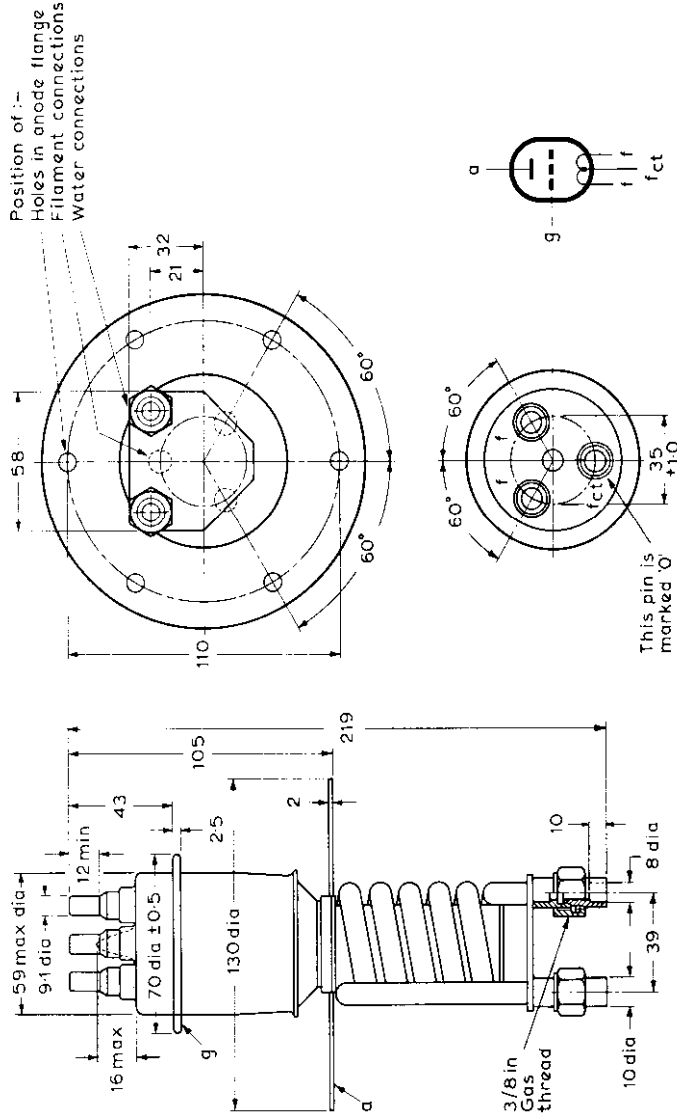
OUTLINE DRAWING OF TY6-5000W MOUNTED IN WATER JACKET K713



All dimensions in mm

B5522

OUTLINE DRAWING OF TY6-5000H



The use of wing nuts should be avoided

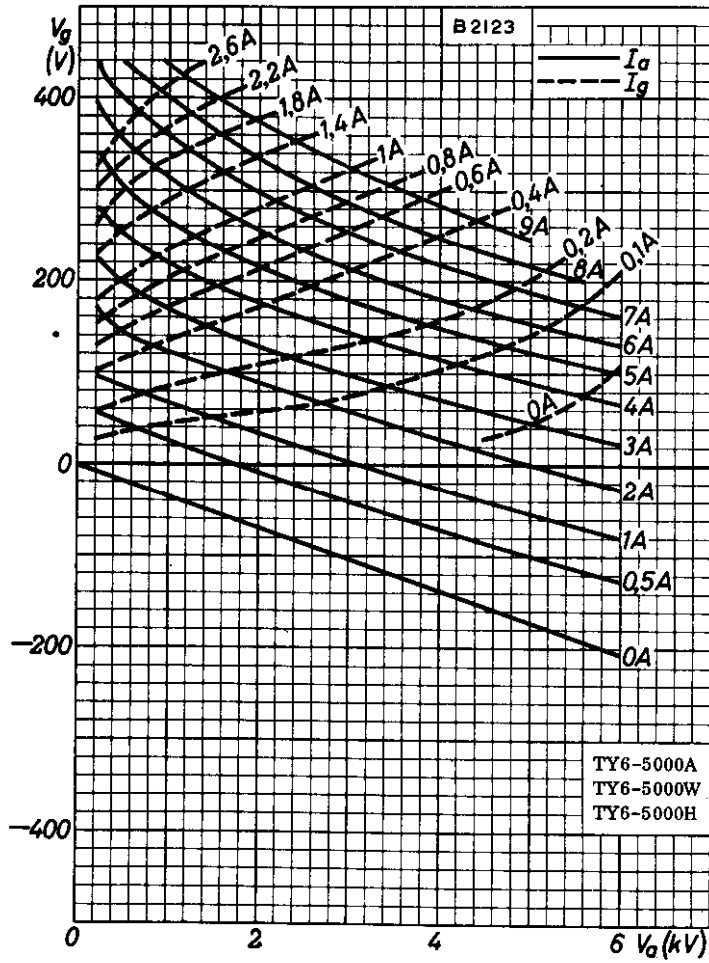
All dimensions in mm

B5558



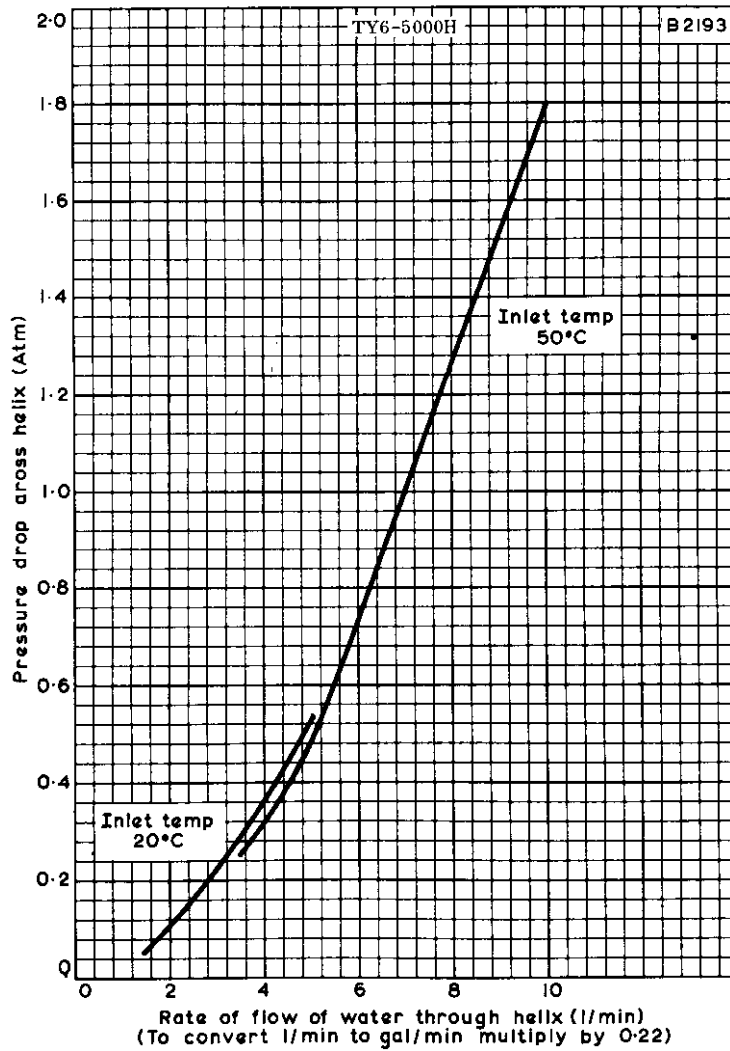
V.H.F. POWER TRIODE

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



CONSTANT CURRENT CHARACTERISTICS

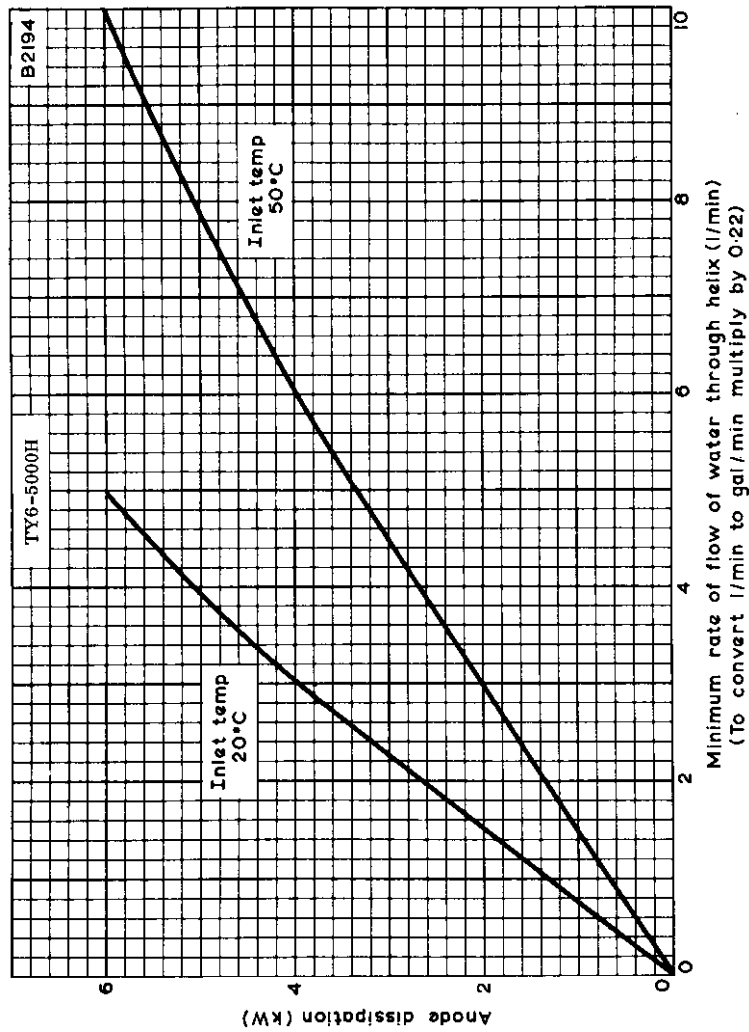




PRESSURE DROP ACROSS HELIX PLOTTED AGAINST RATE OF FLOW OF WATER THROUGH HELIX FOR INLET TEMPERATURES OF 20 AND 50°C.

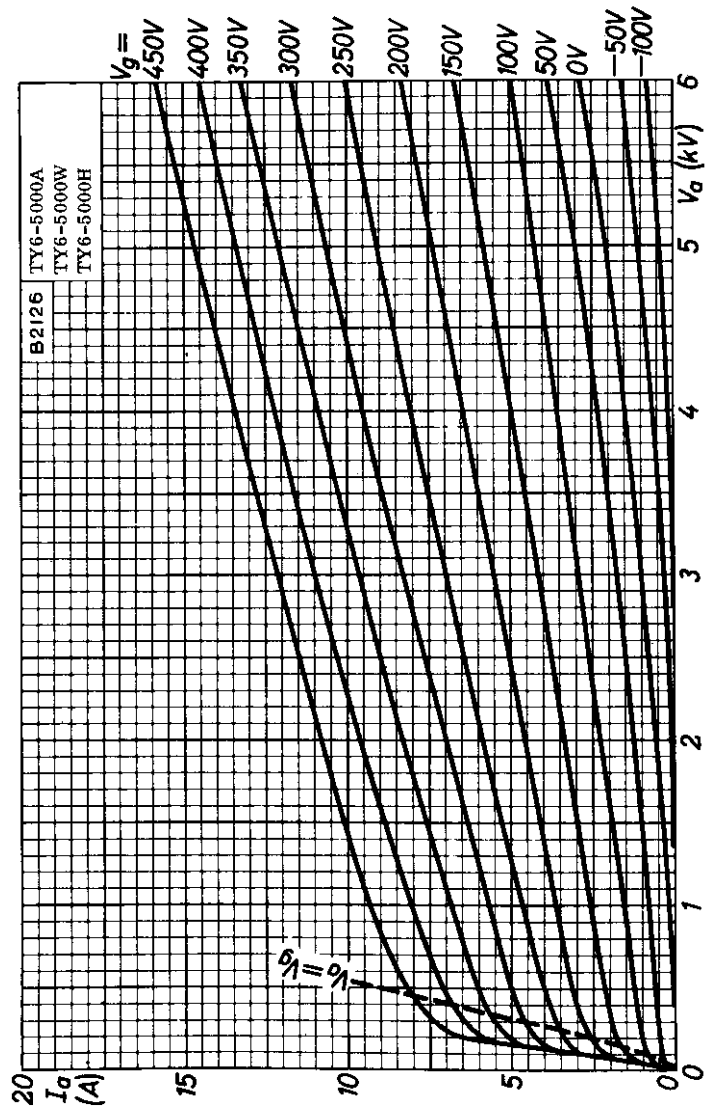
V.H.F. POWER TRIODE

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



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



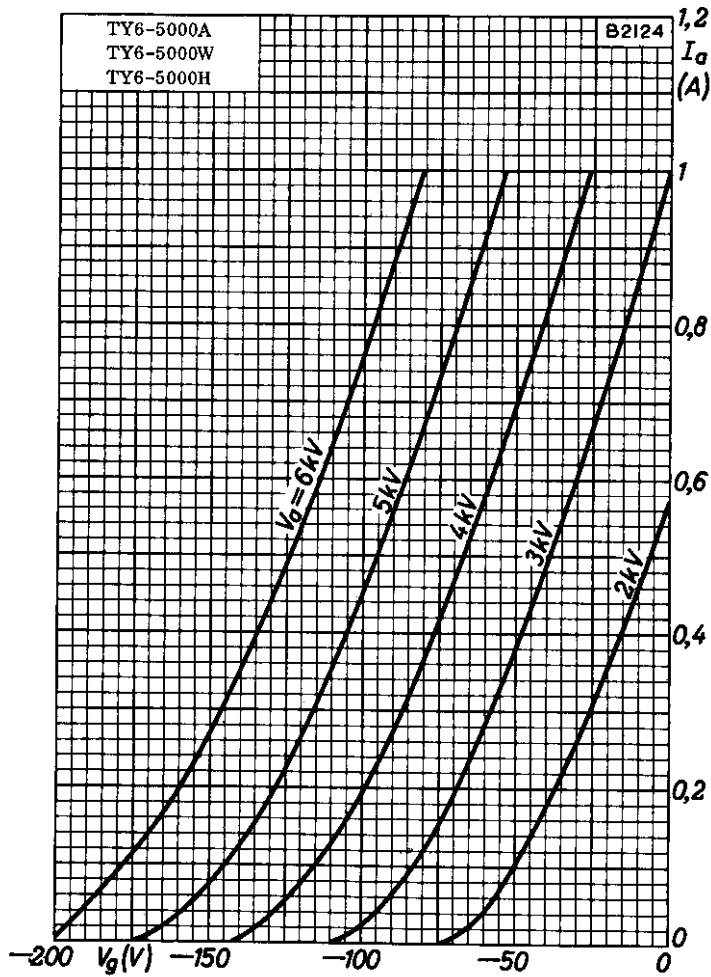


ANODE CURRENT PLOTTED AGAINST ANODE VOLTAGE
WITH GRID VOLTAGE AS PARAMETER



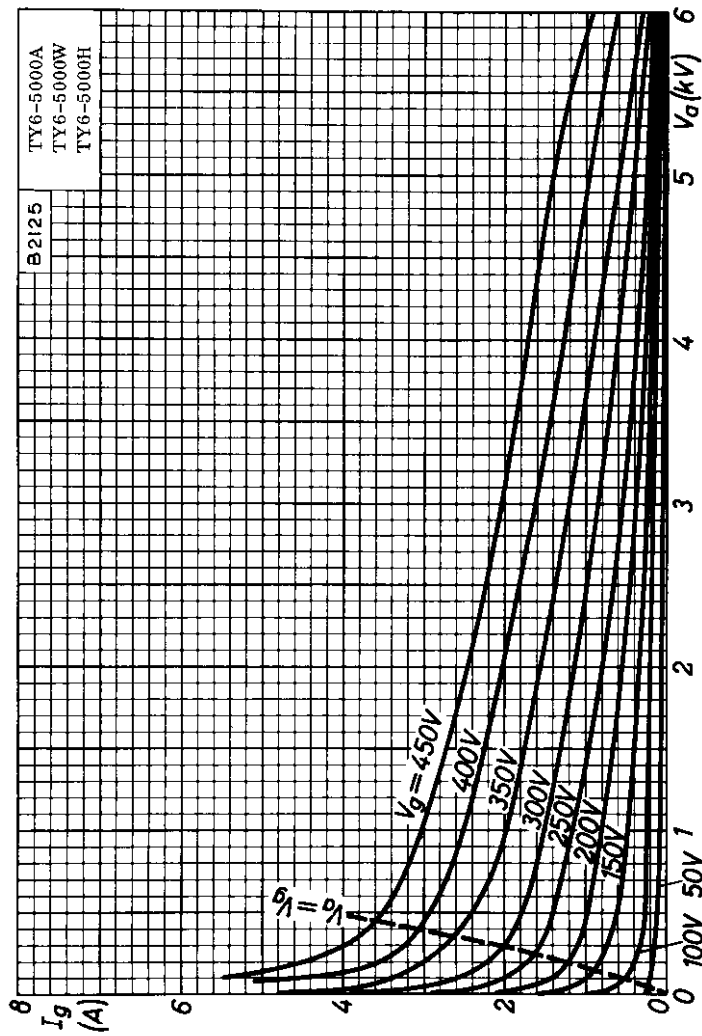
V.H.F. POWER TRIODE

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



ANODE CURRENT PLOTTED AGAINST GRID VOLTAGE
WITH ANODE VOLTAGE AS PARAMETER





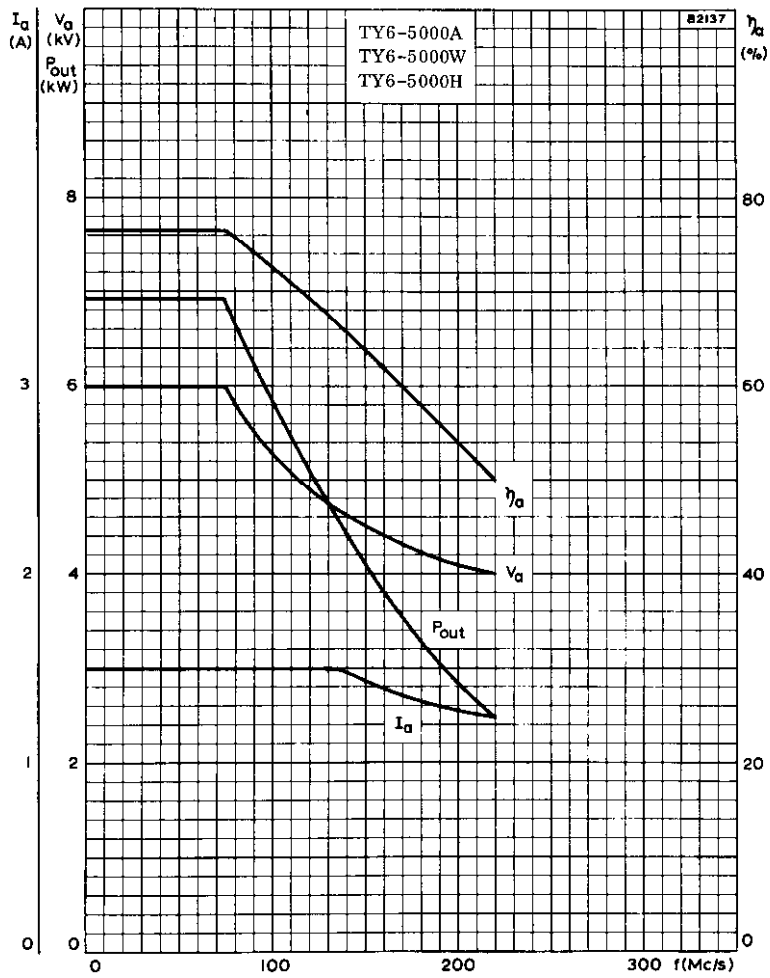
B2125
 TY6-5000A
 TY6-5000W
 TY6-5000H

GRID CURRENT PLOTTED AGAINST ANODE VOLTAGE
 WITH GRID VOLTAGE AS PARAMETER



V.H.F. POWER TRIODE

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



FREQUENCY CHARACTERISTICS



()

()

()

()



V.H.F. POWER TRIODE

TY6-5000B

TENTATIVE DATA

QUICK REFERENCE DATA

Forced air cooled triode intended for use as oscillator or amplifier

	Class 'B' Audio amplifier	Class 'C' Television	Class 'C' Telephony	Class 'C' Telegraphy or F.M. Telephony	
f	-	220	75	110	Mc/s
P _{out}	13.3	4.0	4.7	4.8	kW
f max.	-	220	220	220	Mc/s
V _a max.	6.0	5.0	5.0	6.2	kV
p _a max.	5.0	5.0	3.4	5.0	kW

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

CLASS 'C' TELEGRAPHY OR F.M. TELEPHONY

Maximum operating conditions

	30	30	30	110	*220	Mc/s
f	30	30	30	110	*220	Mc/s
P _{out}	4.0	5.6	6.9	4.8	2.65	kW
P _{load}	3.2	4.5	5.5	3.9	2.15	kW
η_a	73	75	76.5	70	70	%
V _a	4.0	5.0	6.0	5.0	3.0	kV
I _a	1.37	1.5	1.5	1.25	1.25	A
-V _g	200	300	400	300	160	V
I _g	300	330	310	300	250	mA
P _{load} (driver)	190	240	275	250	510	W
p _a	1.5	1.9	2.1	1.45	1.6	kW

*Grounded grid configuration



CLASS 'C' ANODE MODULATION

Maximum operating conditions
(Carrier conditions for 100% modulation)

f	75	110	Mc/s
P _{out}	4.7	2.8	kW
P _{load}	3.75	2.25	kW
η_a	78.5	75	%
V _a	5.0	4.0	kV
I _a	1.2	0.93	A
-V _g	400	350	V
I _g	300	240	mA
P _{load (driver)}	205	130	W
p _a	1.3	0.92	kW

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

Negative modulation, positive synchronisation
Maximum operating conditions

f	48-75	Mc/s
P _{out (sync)}	9.0	kW
P _{load (sync)}	6.3	kW
Bandwidth (-3.0 dB)	8.0	Mc/s
V _a	5.0	kV
-V _{g sync}	200	V
black	300	V
white	550	V
I _{a sync}	1.9	A
black	1.3	A
I _{g sync}	250	mA
black	175	mA
P _{load (driver) sync}	250	W

V.H.F. POWER TRIODE

TY6-5000B

CLASS 'B' AUDIO AMPLIFIER

Maximum operating conditions for two valves in push-pull

P_{out}	13.3	kW
D_{tot}	4.3	%
R_{a-a}	4.9	$k\Omega$
V_a	6.0	kV
$I_{a(o)}$	2 x 125	mA
I_a (max. sig.)	2 x 1.5	A
$-V_g$	165	V
I_g	2 x 280	mA
$V_{in (g-g)}$ r. m. s.	645	V
P_{load} (driver)	2 x 115	W
p_a	2 x 2.35	kW
η_a	74	%

ABSOLUTE MAXIMUM RATINGS

	Class 'B' Audio	Class 'C' T. V.	Class 'C' Telephony	Class 'C' Telegraphy	
V_a max. (f = 220Mc/s)	-	4.0	3.2	4.0	kV
(f \leq 75Mc/s)	6.0	5.0	5.0	6.2	kV
$-V_g$ max.	-	*1.0	1.0	1.0	kV
I_k max.	1.8	*1.8	1.65	1.85	A
p_a max.	5.0	*4.0	3.4	5.0	kW
I_g max.	-	-	350	350	mA
p_g max.	120	*120	120	120	W

*(sync) level

CATHODE

Directly heated, thoriated tungsten

V_f	12.6	A
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 leads should be interconnected with suitable capacitors.

CAPACITANCES

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

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

ξ_m	17	mA/V
μ	32	

MOUNTING POSITION

Vertical, base up or down.

COOLING Forced-air cooled

Maximum temperatures

$T_{anode\ seals}$	180	$^{\circ}C$
$T_{grid\ seals}$	180	$^{\circ}C$
$T_{pin\ seals}$	220	$^{\circ}C$

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.

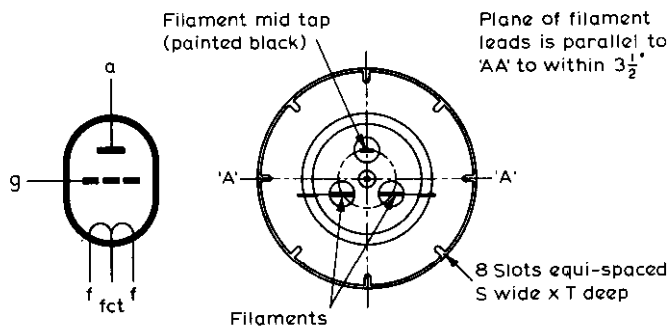
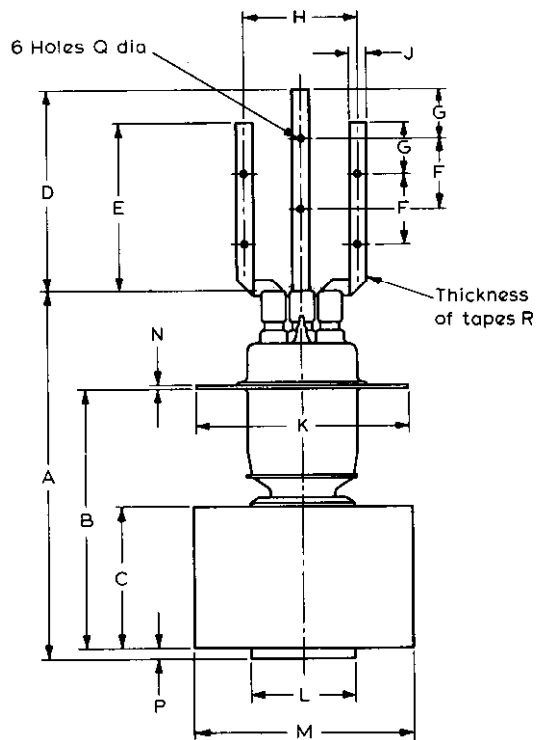


**V.H.F. POWER
TRIODE**

TY6-5000B

Anode dissipation	Height above sea-level		Inlet Temperature	Rate of flow of air per minute	Pressure difference between inlet and outlet
	pa (kW)	h (km) (ft)			
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





B2013

**V.H.F. POWER
TRIODE**

TY6-5000B

Dimensions

	Inches	millimetres	
A	9.626	193.68	max
B	2.252 ± 3.2	133.4 ± 3.2	
C	2.874	73	max
D	4.252 ± 0.079	108 ± 2	
E	3.504 ± 0.039	89 ± 1	
F	1.378 ± 0.079	35 ± 2	
G	0.866 ± 0.079	22 ± 2	
H	2.500	63.5	max
J	0.315 ± 0.020	8.0 ± 0.5	
K	4.567 ± 0.020	116 ± 0.5	
L	2.250	57.15	max
M	4.626 ± 0.063	117.5 ± 1.6	
N	0.063 ± 0.008	1.6 ± 0.2	
P	0.189	4.8	max
Q	0.164 ± 0.002	3.7 ± 0.05	
R	4 x 0.010	4 x 0.25	nom
S	0.182 ± 0.004	4.62 ± 0.1	
T	0.205 ± 0.008	5.20 ± 0.2	←

Inch dimensions derived from original millimetre dimensions.



()

()

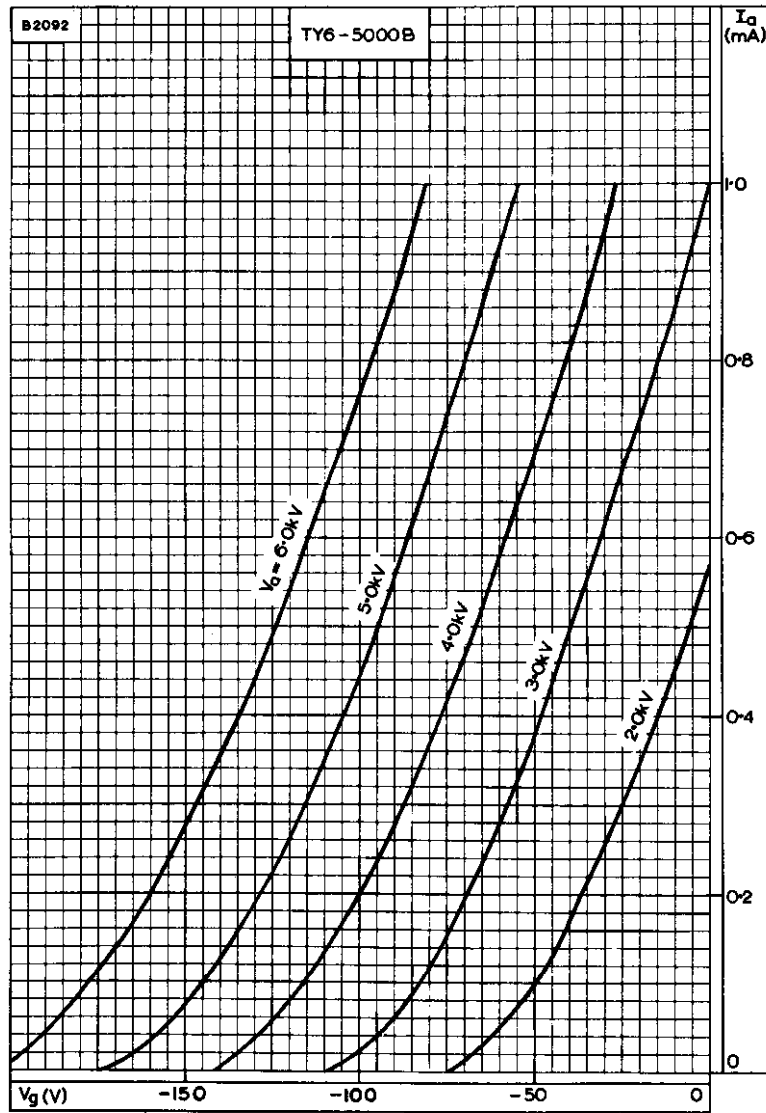
()

()



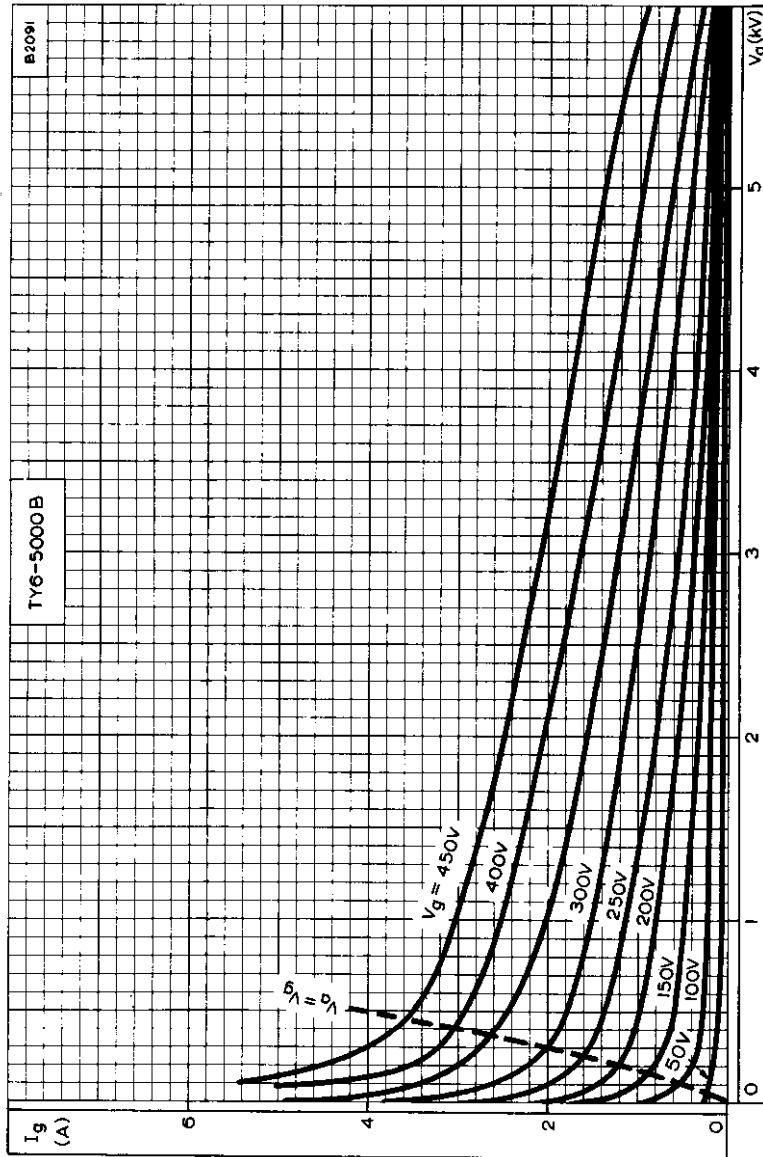
V.H.F. POWER
TRIODE

TY6-5000B



ANODE CURRENT PLOTTED AGAINST GRID VOLTAGE
WITH ANODE VOLTAGE AS PARAMETER



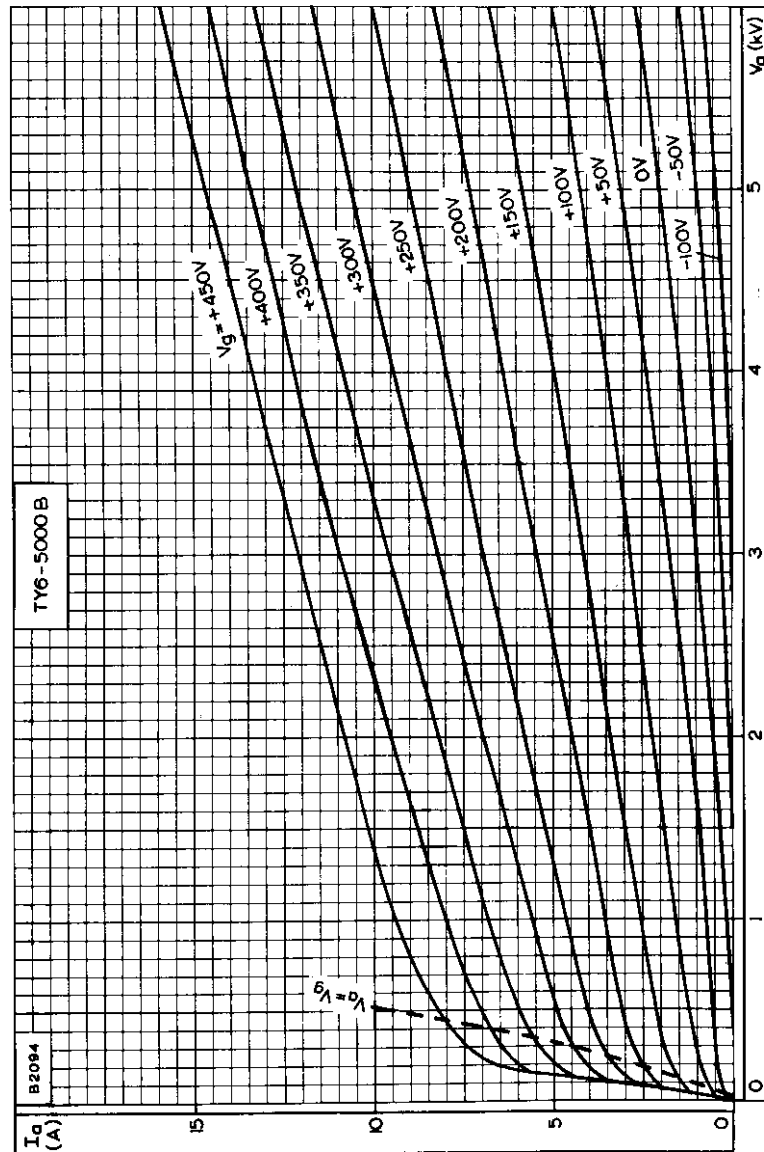


GRID CURRENT PLOTTED AGAINST ANODE VOLTAGE
WITH GRID VOLTAGE AS PARAMETER



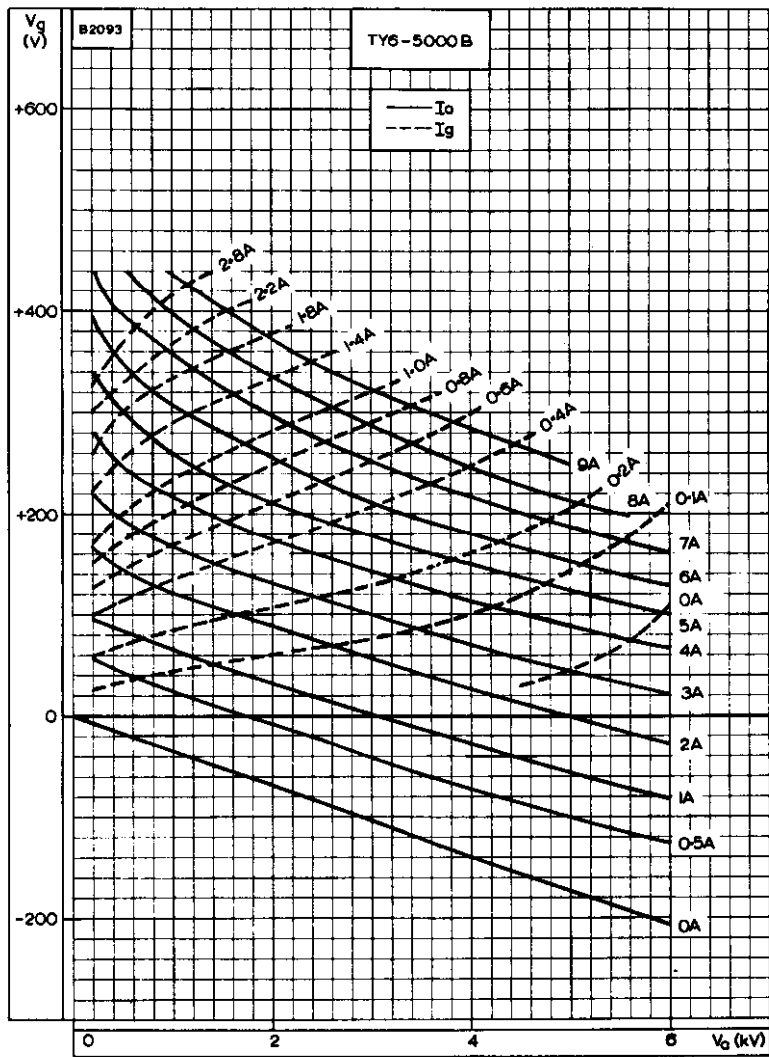
V.H.F. POWER
TRIODE

TY6-5000B



ANODE CURRENT PLOTTED AGAINST ANODE VOLTAGE
WITH GRID VOLTAGE AS PARAMETER





CONSTANT CURRENT CURVES



V.H.F. POWER TRIODE

TY7-6000A
TY7-6000W
TY7-6000H

QUICK REFERENCE DATA

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

The TY7-6000A is forced air cooled.

The TY7-6000W is water cooled by means of a water jacket.

The TY7-6000H is water cooled by means of an integral helical water cooler.

	Class 'C' Telegraphy or F.M. Telephony	Class 'C' Industrial Oscillator	Class 'B' Audio Amplifier	
f	30	55	-	MHz
P _{out}	10	8.25	20	kW
f max.	30	85	-	MHz
V _a max.	7.2	7.0	7.2	kV
p _a max.	6.0	6.0	6.0	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	30	30	30	30	30	30	MHz
P _{out}	7.1	7.3	8.5	9.2	9.5	10	kW
P _{load}	5.7	5.8	7.0	7.4	7.6	8.0	kW
η_a	71	73	71	77	73	77	%
V _a	5.0	5.0	6.0	6.0	6.5	6.5	kV
I _a	2.0	2.0	2.0	2.0	2.0	2.0	A
-V _g	300	300	400	400	450	450	V
I _g	500	600	500	600	500	600	mA
v _{in(pk)}	660	700	780	820	820	850	V
P _{load(driver)}	297	378	350	443	370	460	W
p _a	2.9	2.7	3.5	2.8	3.5	3.0	kW



TELEPHONY, ANODE MODULATION, CLASS 'C'

OPERATING CONDITIONS (Carrier conditions for 100% modulation)

f	30	30	30	MHz
P _{out}	5.0	5.6	6.4	kW
P _{load}	4.0	4.5	5.1	kW
η_a	78	80	80	%
V _a	4.0	5.0	5.0	kV
I _a	1.6	1.4	1.6	A
-V _g	300	400	400	V
I _g	600	500	500	mA
v _{in(pk)}	680	730	800	V
P _{load(driver)}	367	328	432	W
P _a	1.4	1.4	1.6	kW
For 100% modulation				
P _{mod}	3.2	3.5	4.0	kW

AUDIO AMPLIFIER, CLASS 'B'

OPERATING CONDITIONS (two valves in push-pull)

P _{out}	7.1	8.0	9.0	20	kW
R _{a-a}	3.8	5.5	4.8	4.15	k Ω
V _a	4.0	5.0	5.0	7.0	kV
-V _g	135	165	165	250	V
I _{a(o)}	2 \times 100	2 \times 150	2 \times 150	2 \times 200	mA
I _a (max.sig.)	2 \times 1.25	2 \times 1.1	2 \times 1.25	2 \times 2.0	A
I _g	2 \times 360	2 \times 220	2 \times 330	2 \times 530	mA
V _{in(g-g)r.m.s.}	630	483	588	854	V
P _{load(driver)}	2 \times 140	2 \times 65	2 \times 130	2 \times 310	W
P _a	2 \times 1.45	2 \times 1.5	2 \times 1.7	2 \times 4.0	kW
η_a	71	72.5	72.5	71.5	%



V.H.F. POWER TRIODE

TY7-6000A
TY7-6000W
TY7-6000H

INDUSTRIAL OSCILLATOR, CLASS 'C'

Anode supply from three-phase halfwave rectifier without filter

OPERATING CONDITIONS

f	55	50	85	MHz
P _{out}	8.6	6.3	6.1	kW
P _{out} (less P _{drive})	8.25	6.0	5.75	kW
P _{load}	7.0	5.5	5.0	kW
η _a	78	67	72	%
V _{tr} (r.m.s.)	5.55	5.13	4.27	kV
V _a	6.5	6.0	5.0	kV
I _a	1.7	1.5	1.7	A
I _g (loaded)	500	400	450	mA
(unloaded)	700	700	700	mA
Feedback ratio $\frac{v_{in(pk)}}{v_{out(pk)}}$	0.15	0.15	0.19	
P _{load} (driver)	350	300	350	W
p _a	2.4	2.7	2.4	kW
R _{g-f}	900	1000	850	Ω
R _a	2.0	2.3	1.6	kΩ

RATINGS (ABSOLUTE MAXIMUM SYSTEM)

	Class 'C' Telegraphy	Class 'C' Telephony	Class 'B' A.F.	Class 'C' Oscillator	
V _a max. (f=30MHz)	7.2	5.5	7.2	-	kV
(f=55MHz)	-	-	-	7.0	kV
(f=85MHz)	-	-	-	6.5	kV
-V _g max.	1.25	1.25	-	1.25	kV
I _k max.	2.8	2.4	2.8	2.5	A
i _{k(pk)} max.	14	12	10	11	A
p _a max.	6.0	4.0	6.0	6.0	kW
I _g max. (loaded)	600	600	-	500	mA
(unloaded)	-	-	-	700	mA
p _g max.	250	250	250	250	W
R _{g-f} max.	-	-	15	10	kΩ



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 and +10%.

The connection f_{ct} is not an electrical centre tap and must not be used for filament current supply. At frequencies above 30MHz all three filament pins should be interconnected with suitable capacitors.

CAPACITANCE

c_{a-g}	11	pF
c_{g-f}	16	pF
c_{a-f}	300	mpF

CHARACTERISTICS (measured at $V_a = 6.0kV$, $I_a = 1.0A$)

g_m	15	mA/V
μ	32	

MOUNTING POSITION

Vertical, with anode up or down.

COOLING

The valve must not be operated without a heat dissipating connector on pin f_{ct} .

TY7-6000A Forced-air cooled

Temperatures

Filament seals	210	$^{\circ}C$
Anode and grid seals	180	$^{\circ}C$

In order to keep within the temperature limits it may be necessary to direct a flow of air on to the filament and grid seals.

V.H.F. POWER TRIODE

TY7-6000A
TY7-6000W
TY7-6000H

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		Max. inlet temperature	Min. rate of flow of air per minute		Pressure difference between inlet and outlet	
	P_a (kW)	h (m) (ft)		T_{in} (°C)	(m ³) (ft ³)	(mmH ₂ O) (in H ₂ O)	
2.0	0	0	35	4.8	169	20	0.79
2.0	0	0	45	5.7	201	25	0.98
2.0	1500	4921	35	5.7	201	23	0.90
2.0	3000	9842	25	6.1	215	23	0.90
3.5	0	0	35	6.2	219	32	1.26
3.5	0	0	45	7.3	258	42	1.65
3.5	1500	4921	35	7.3	258	36	1.42
3.5	3000	9842	25	7.8	275	36	1.42
6.0	0	0	35	9.2	325	68	2.68
6.0	0	0	45	10.7	378	91	3.58
6.0	1500	4921	35	11.2	396	81	3.19
6.0	3000	9842	25	11.7	413	80	3.15



TY7-6000W Water cooled anode and low velocity air flow on seals.

Temperatures

Filament seals	210	°C
Anode and grid seals	180	°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
		(litres)	(gal)	
p_a (kW)	T_{in} (°C)			(atmospheres)
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

In order to keep within the temperature limits it may be necessary to direct a flow of air on to the seals. Air cooling will in general not be necessary at frequencies ≤ 30 MHz and a maximum ambient temperature of 35°C. At frequencies between 30 and 50MHz or at higher ambient temperatures, a low velocity air flow to the grid and filament seals will be necessary.



V.H.F. POWER TRIODE

TY7-6000A
TY7-6000W
TY7-6000H

TY7-6000H Water cooled anode and low velocity air flow on seals.

Temperatures

Filament seals	210	°C
Anode and grid seals	180	°C
Water inlet	50	°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 30MHz and at ambient temperatures above 35°C both grid and filament seals should be cooled by a low velocity air flow.

PHYSICAL DATA

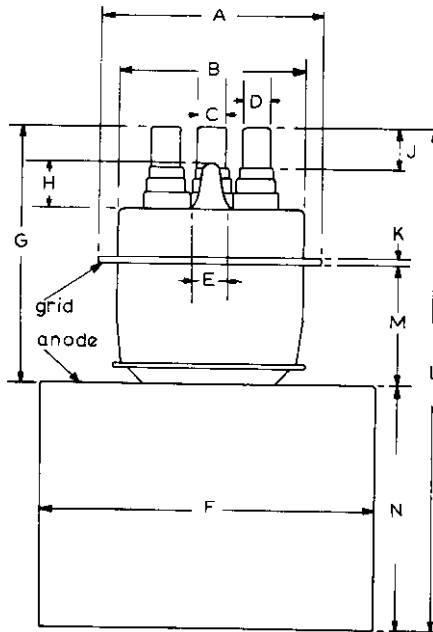
	TY7-6000A	TY7-6000W	TY7-6000H	
Weight of valve	10.1	1.0	1.8	lb
	4.6	0.45	0.8	kg
Weight of valve plus carton	17.8	2.6	3.7	lb
	8.1	1.2	1.7	kg
Weight of insulating pedestal	5.1	-	-	lb
	2.1	-	-	kg
Weight of insulating pedestal plus carton	7.1	-	-	lb
	3.1	-	-	kg
Weight of water jacket	-	1.1	-	lb
	-	0.52	-	kg
Weight of water jacket plus carton	-	1.6	-	lb
	-	0.75	-	kg

ACCESSORIES

Filament clips × 2	40634
Filament centre-pin clip × 1	40649
Grid connector f >30MHz f <30MHz	40622
	40650
Insulating pedestal (TY7-6000A)	40630
Water jacket (TY7-6000W)	K713



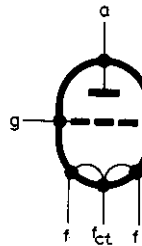
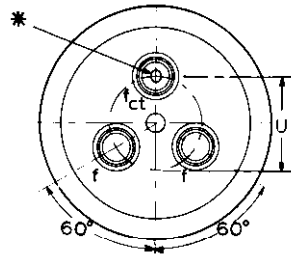
OUTLINE DRAWING OF TY7-6000A



Dimensions of TY7-6000A

	Inches	Millimetres
A	2.756 ± 0.020	70 ± 0.5
B	2.323 dia. max.	59 dia. max.
C	0.413	10.5
D	0.358	9.1
E	0.394 max.	10 max.
F	4.815 ± 0.012	122.3 ± 0.3
G	3.898 ± 0.059	99 ± 1.5
H	0.630 max.	16 max.
J	0.472 min.	12 min.
K	0.098	2.5
L	7.677 max.	195 max.
M	2.126 ± 0.020	54 ± 0.5
N	3.701	94
U	1.378 ± 0.039	35 ± 1.0 dia.

Inch dimensions derived from original millimetre dimensions



* Stamped zero (0)
to denote centre tap

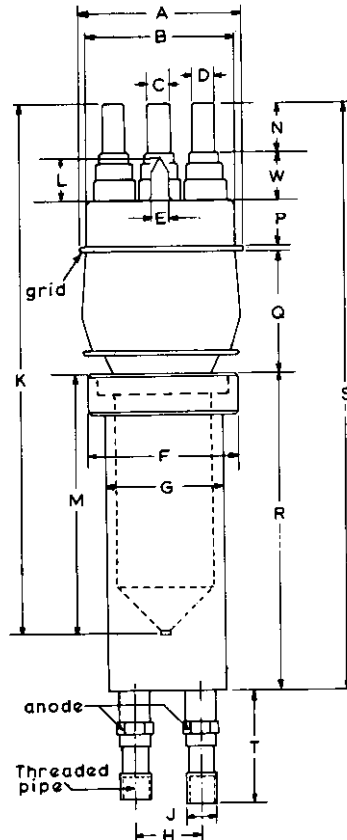
B7116

V.H.F. POWER TRIODE

TY7-6000A
TY7-6000W
TY7-6000H

OUTLINE DRAWING OF TY7-6000W

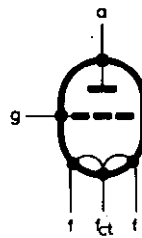
Mounted in water jacket K713



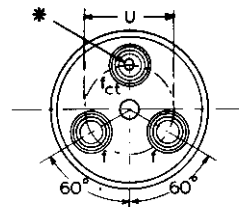
Dimensions of TY7-6000W

	Inches	Millimetres
A	2.756 ± 0.020	70 ± 0.5
B	2.323 dia. max.	59 dia. max.
C	0.413	10.5
D	0.358	9.1
E	0.394 max.	10 max.
F	2.126	54
G	1.634	41.5
H	0.788	20
J	0.457	11.6
K	7.480 max.	190 max.
L	0.630 max.	16 max.
M	3.268	83
N	0.472 min.	12 min.
P	0.098	2.5
Q	2.205	56
R	4.130	105
S	8.485 max.	215 max.
T	1.713 ± 0.079	43 ± 2.0
U	1.378 ± 0.039	35 ± 1.0 dia.

Inch dimensions derived from original millimetre dimensions

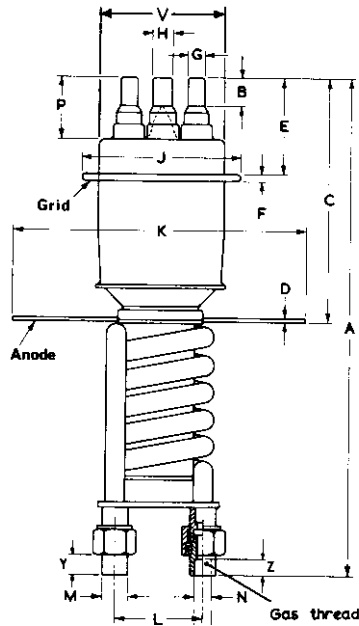


* Stamped zero (0) to denote centre tap



B7117

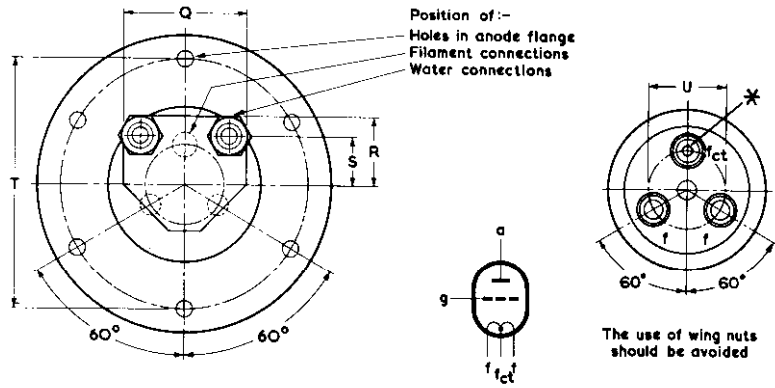
OUTLINE DRAWING OF TY7-6000H



Dimensions of TY7-6000H

	Inches	Millimetres
A	8.622	219
B	0.472 min.	12 min.
C	4.134	105
D	0.079	2.0
E	1.693	43
F	0.098	2.5
G	0.358 dia.	9.1 dia.
H	0.413 dia.	10.5 dia.
J	2.756 dia.	70 ± 0.5 dia.
K	5.118 dia.	130 dia.
L	1.535	39
M	0.394 dia.	10 dia.
N	0.315 dia.	8.0 dia.
P	0.630 max.	16 max.
Q	2.283	58
R	1.260	32
S	0.827	21
T	4.331	110
U	1.378 ± 0.039	35 ± 1.0 dia.
V	2.323 dia. max.	59 dia. max.
Z	0.394	10

Inch dimensions derived from original millimetre dimensions



The use of wing nuts should be avoided

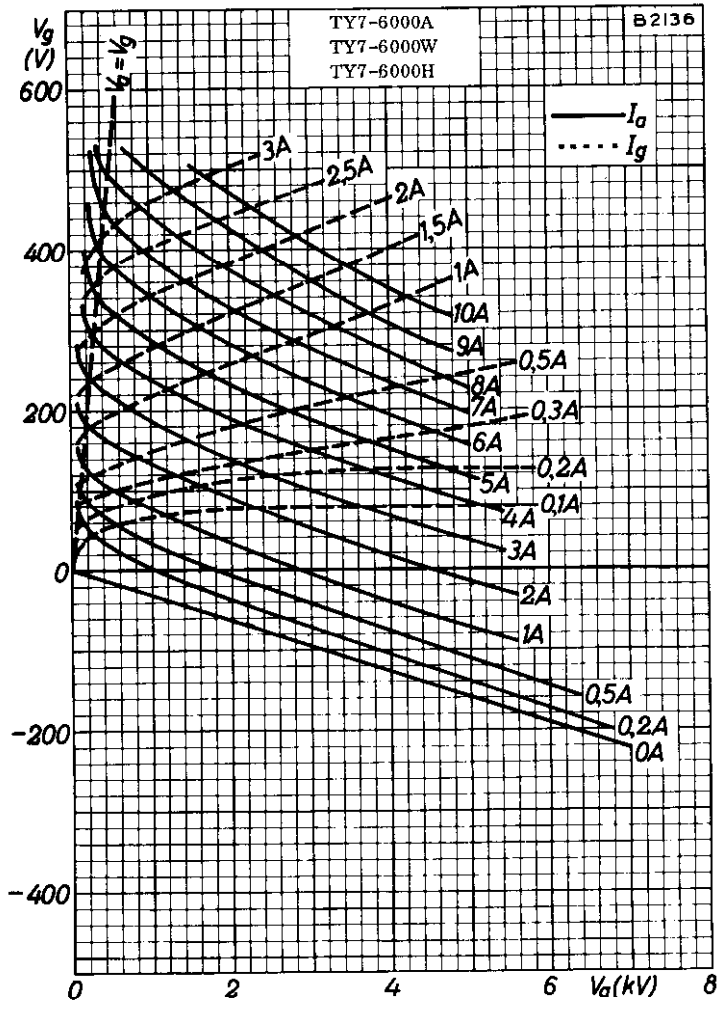
* Stamped zero (0) to denote centre tap

B7149



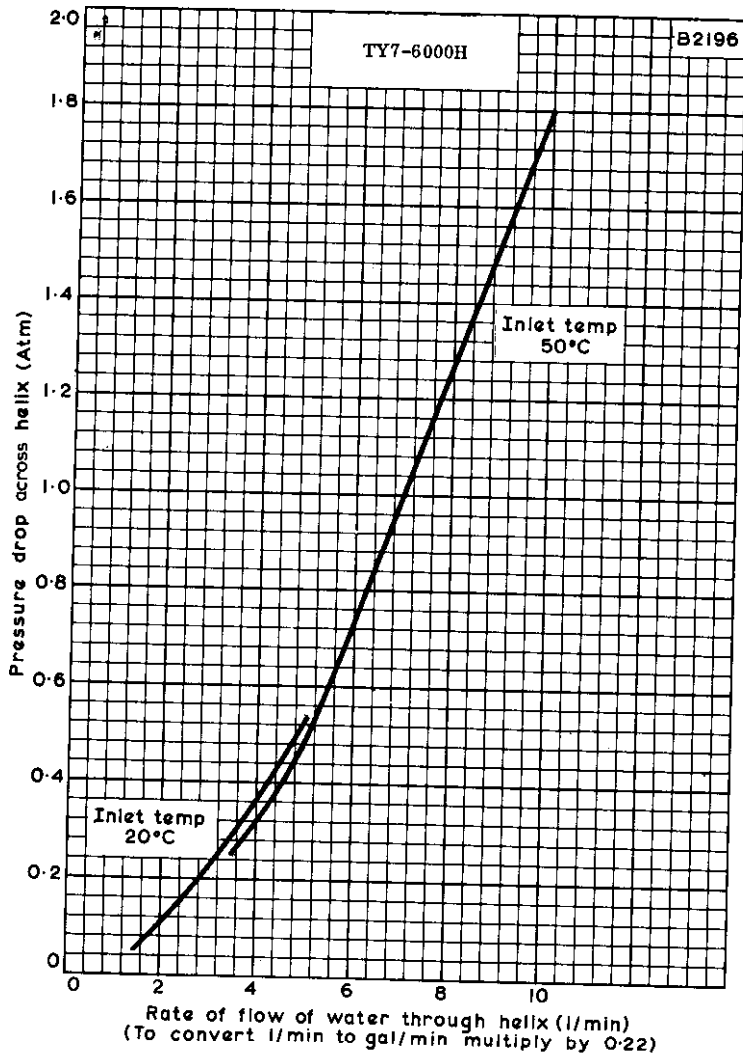
V.H.F. POWER TRIODE

TY7-6000A
 TY7-6000W
 TY7-6000H



CONSTANT CURRENT CHARACTERISTICS



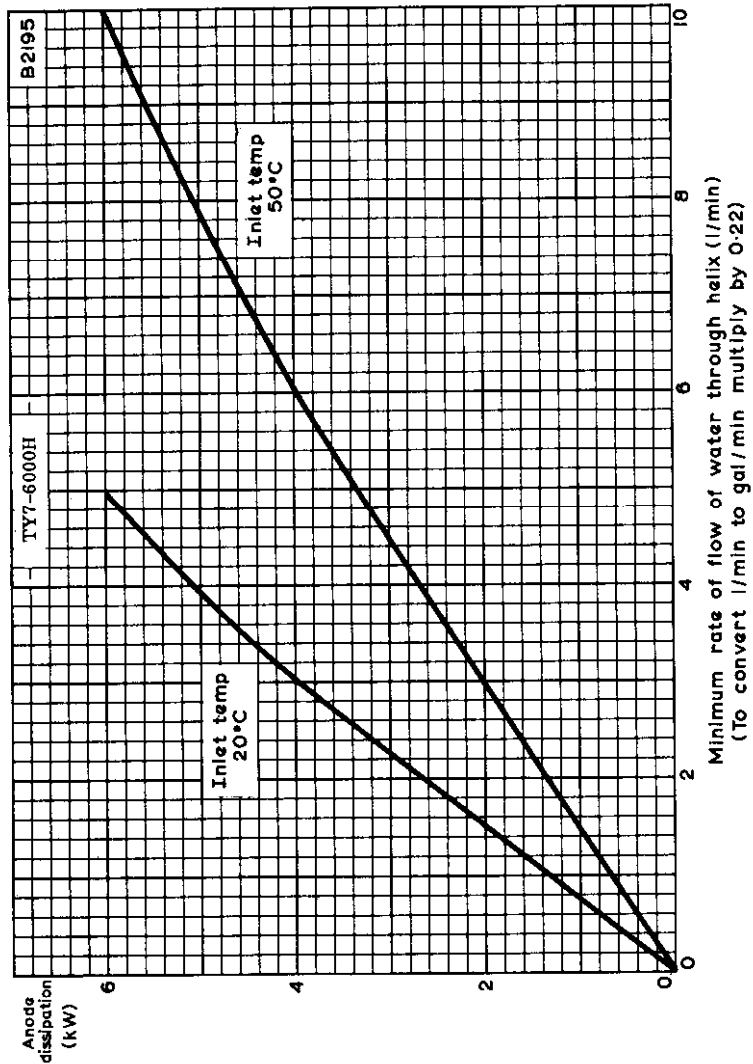


PRESSURE DROP ACROSS HELIX PLOTTED AGAINST RATE OF FLOW OF WATER THROUGH HELIX FOR INLET TEMPERATURES OF 20 AND 50°C.



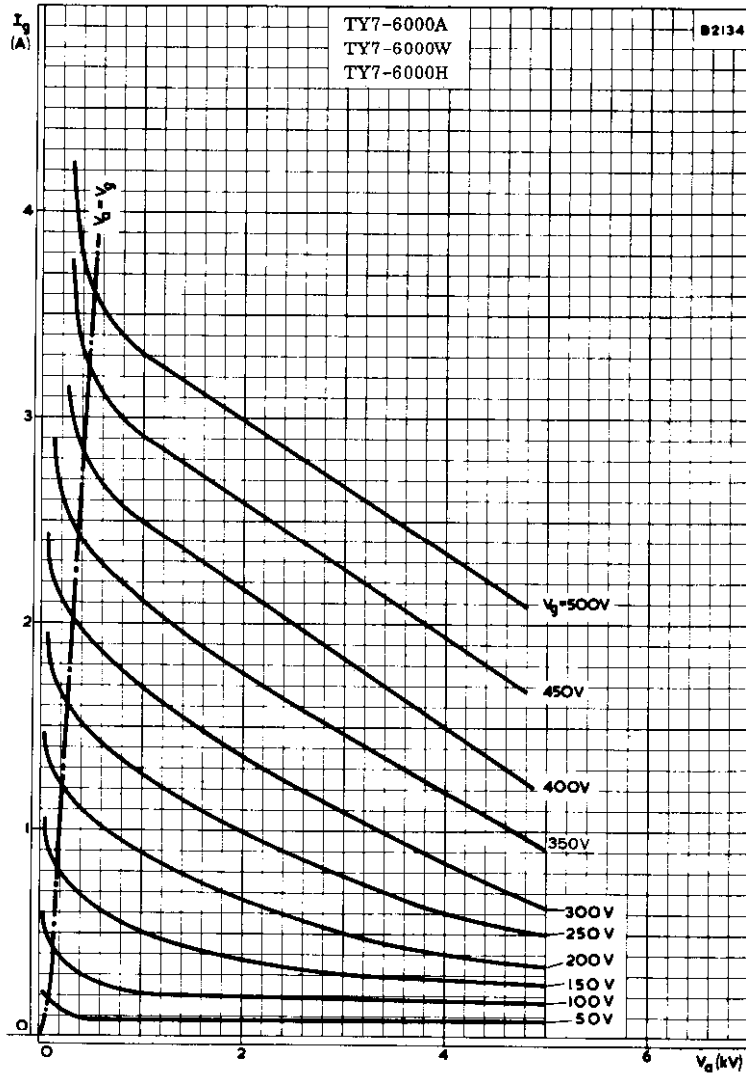
V.H.F. POWER TRIODE

TY7-6000A
 TY7-6000W
 TY7-6000H



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



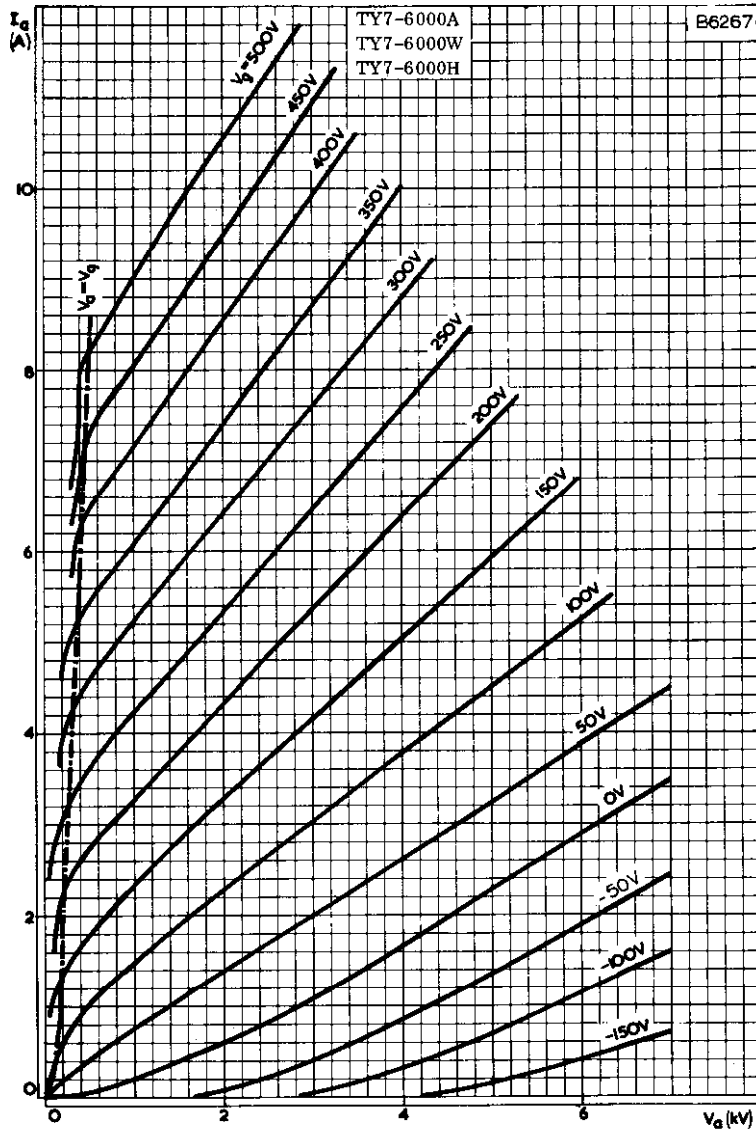


GRID CURRENT PLOTTED AGAINST ANODE VOLTAGE
 WITH GRID VOLTAGE AS PARAMETER



V.H.F. POWER TRIODE

TY7-6000A
 TY7-6000W
 TY7-6000H



ANODE CURRENT PLOTTED AGAINST ANODE VOLTAGE
 WITH GRID VOLTAGE AS PARAMETER



(

(

(

(

■

TRIODE

TY8-15A

Application: R.F. industrial heating.
 Power output: 14kW continuous ratings.
 Frequency: 30Mc/s at full ratings.
 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

Directly heated, thoriated tungsten

V_f 6.3 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 fluctuations of $+5\%$ to -10% .

MOUNTING POSITION

Vertical, anode down

CAPACITANCES

C_{a-g} 33.5 pF
 C_{g-f} 44.5 pF
 C_{a-f} 1.2 pF

CHARACTERISTICS

(measured at $V_a = 6kV$, $I_a = 2.5A$)

g_m 23 mA/V
 g_m (at $V_a = 500V$, $I_a = 14A$) 28 mA/V
 μ 17.5

COOLING

Forced air

Max. temperature of seals 220 °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 air flow and pressure difference between the inlet and outlet of the housing are given in the following table:

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 ₂ O)
	(kW)	(km) (ft)		(m ³)	(ft ³)	
5.0	0	0	45	5.9	210	15
5.0	0	0	35	5.2	185	12
5.0	1.5	4920	35	6.2	220	14
5.0	3.0	9840	25	6.6	235	15
7.5	0	0	45	9.0	320	34
7.5	0	0	35	8.0	285	27
7.5	1.5	4920	35	9.5	335	32
7.5	3.0	9840	25	10.2	360	34
10	0	0	45	12.3	435	63
10	0	0	35	11	390	50
10	1.5	4920	35	13	460	59
10	3.0	9840	25	14	495	64

TY8-15A

TRIODE

CLASS 'C' OSCILLATOR

Anode supply from three-phase half-wave rectifier without smoothing filter.

Limiting values (absolute ratings)

f max.		30	Mc/s
V _a max.		8.0	kV
-V _g max.		1.6	kV
R _{g-f} max.		10	kΩ
p _a max.		10	kW
I _a max.		4.0	A ←
I _g max.		1.5	A
p _g max.		800	W

Typical operation

f	30	30	Mc/s
V _{tr} (r.m.s.)	5.9	5.1	kV
V _a	7.0	6.0	kV
I _a	3.5	3.3	A
I _g	950	800	mA
p _a	6.8	5.5	kW
η _a	72	72	%
R _{g-f}	0.95	1.0	kΩ
R _a	1.0	0.87	kΩ
Feedback ratio $\frac{V_{in(pk)}}{V_{a(pk)}}$	0.25	0.26	
P _{out}	17.7	14.3	kW
*P _{load}	14	11	kW
*0.85 (P _{out} -P _{drive})			

WEIGHT

Valve only	{ 9	lb
	{ 3.8	kg
Shipping weight	{ 70	lb
	{ 31.8	kg

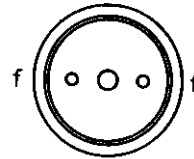
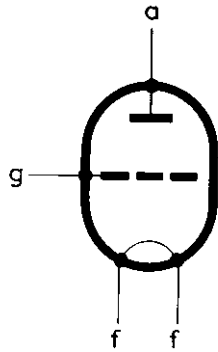
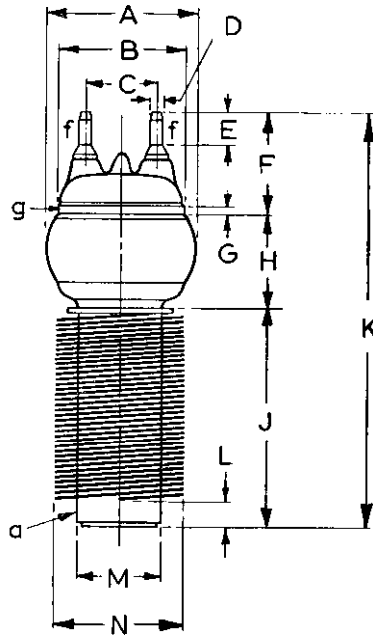
ACCESSORIES

Filament clip	40662
Grid connector	40664
Insulating pedestal	K508

TRIODE

TY8-15A

7593



DIMENSIONS

	<i>Inches</i>	<i>Millimetres</i>	
A	4.528	115	
B	3.780	96	
C	2.126	54	
D	0.374	9.5	
E	0.984	25	
F	3.071	78	←
G	0.335	8.5	
H	2.992	76	←
J	6.220	158	max.←
K	12.402	315	max.←
L	0.709	18	
M	2.520	64	
N	3.976	101	max.←



()

()

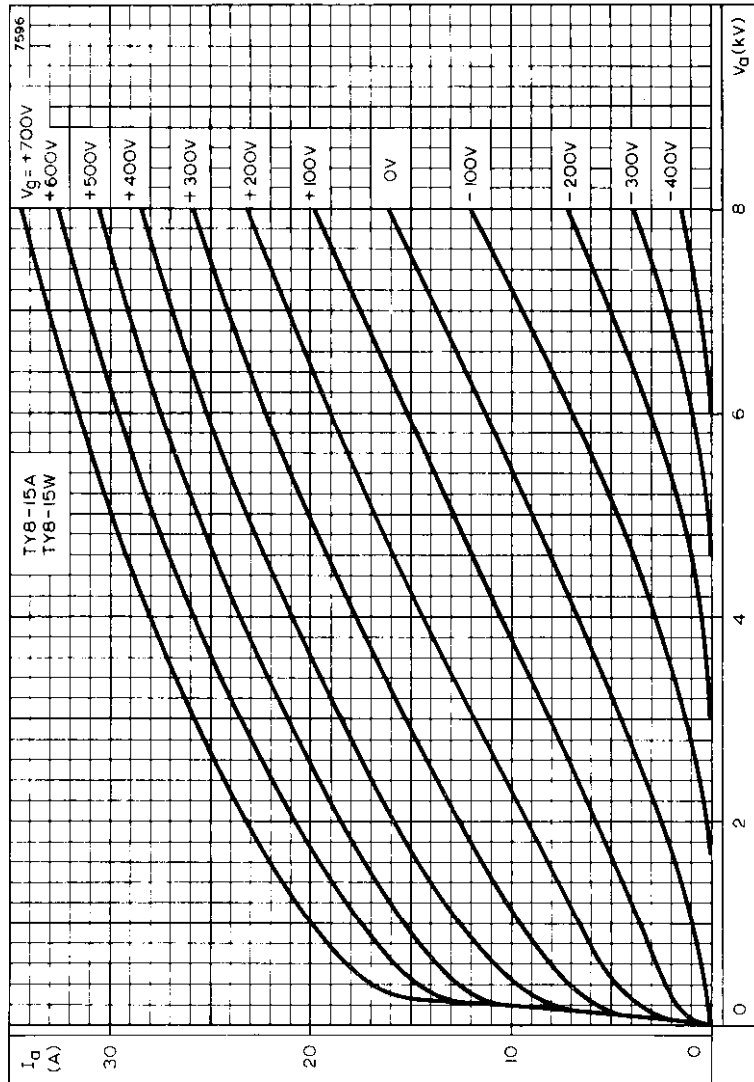
()

(

■

TRIODE

TY8-15A

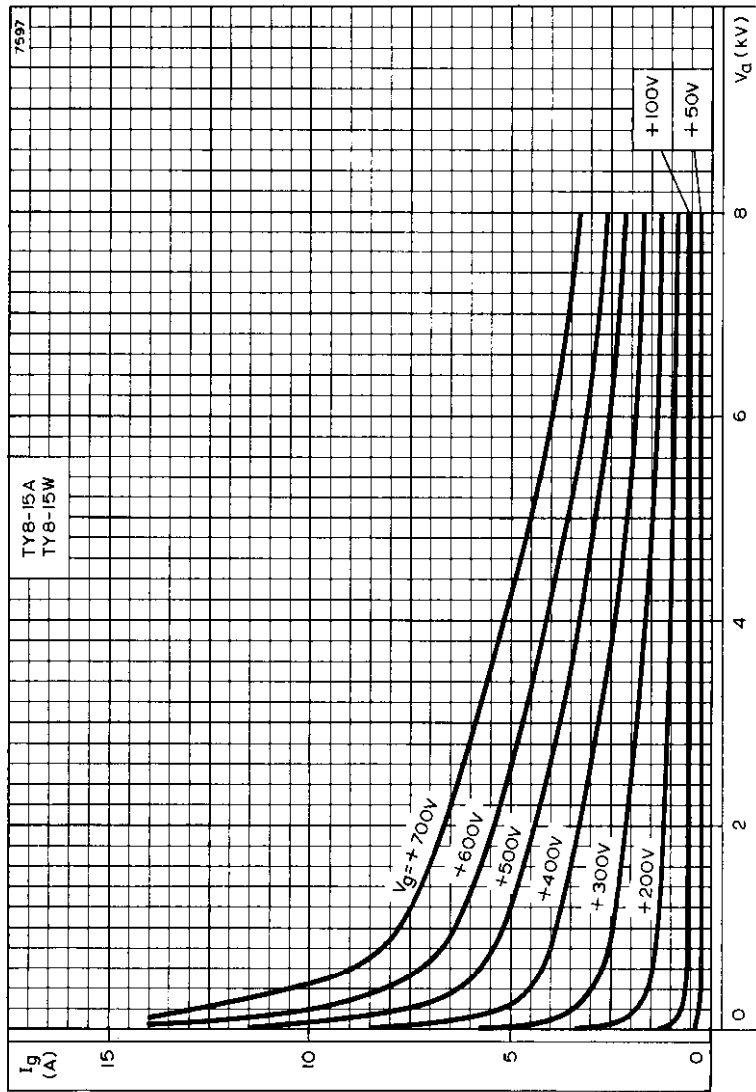


ANODE CURRENT PLOTTED AGAINST ANODE VOLTAGE WITH GRID VOLTAGE AS PARAMETER



TY8-15A

TRIODE

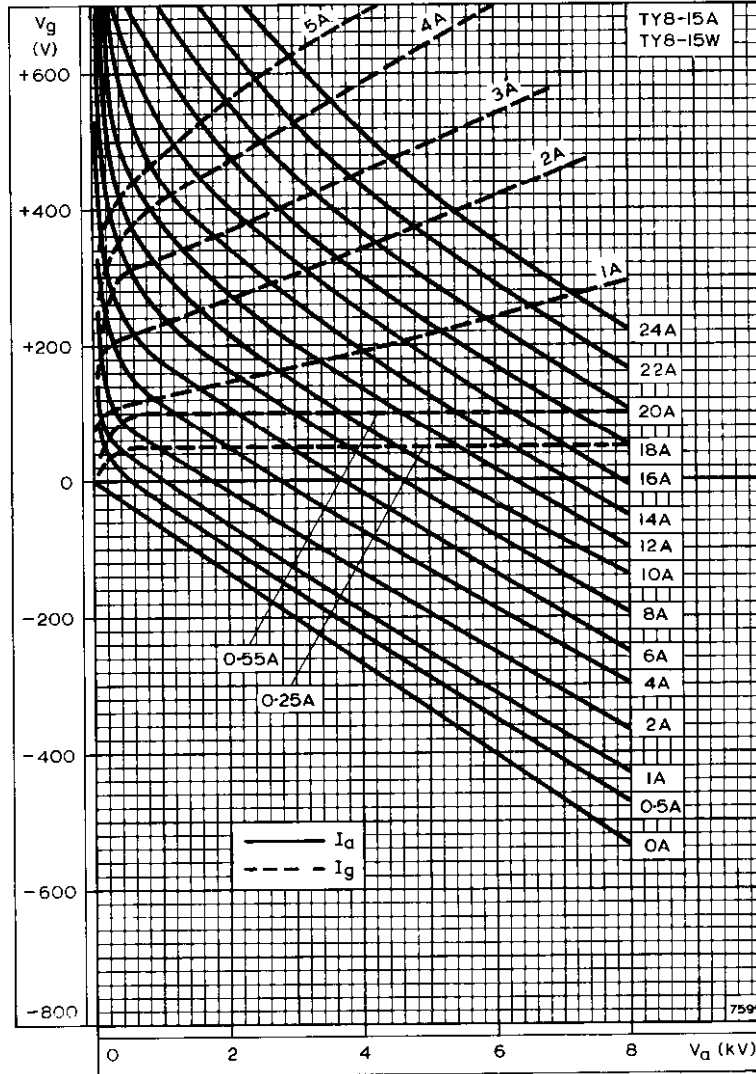


GRID CURRENT PLOTTED AGAINST ANODE VOLTAGE WITH GRID VOLTAGE AS PARAMETER



TRIODE

TY8-15A

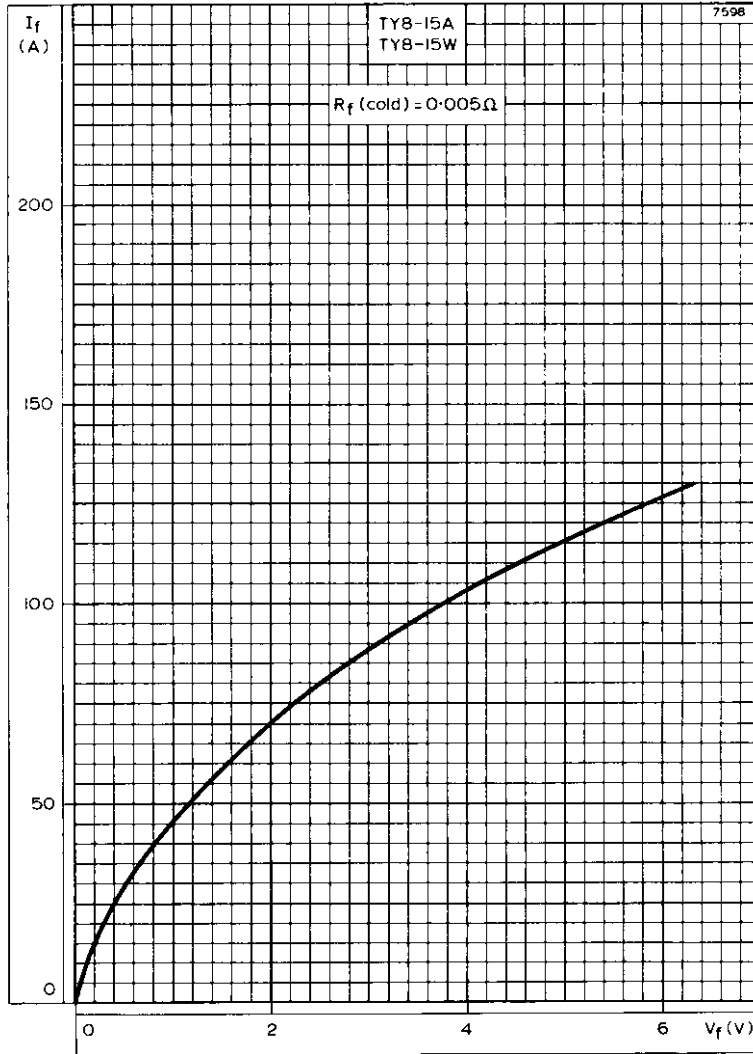


CONSTANT CURRENT CHARACTERISTICS



TY8-15A

TRIODE



FILAMENT CURRENT PLOTTED AGAINST FILAMENT VOLTAGE



R. F. POWER TRIODE

TY8-15H

PRELIMINARY DATA

QUICK REFERENCE DATA

Water-cooled triode, with fixed helix heat exchanger for r.f. industrial heating-applications.

f max.	30	Mc/s
Va max.	8.0	kV
pa max.	15	kW

Performance

f	30	Mc/s
Pout	17.7	kW

This data should be read in conjunction with GENERAL OPERATING RECOMMENDATIONS - TRANSMITTING VALVES.

INDUSTRIAL OPERATION AS CLASS 'C' OSCILLATOR

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

Absolute maximum ratings

f max.	30	Mc/s
Va max.	8.0	kV
-Vg max.	1.6	kV
Rg-f max.	10	kΩ
pa max.	15	kW
Ia max.	4.0	A
Ig max.	1.5	A
pg max.	800	W

Typical operating conditions

f	30	30	Mc/s
Va	7.0	6.0	kV
Ia	3.5	3.3	A
Ig	950	800	mA
pa	6.8	5.5	kW
ηa	72	72	%
Rg-f	0.95	1.0	kΩ
Ra	1.0	0.87	kΩ
Feedback ratio $\frac{v_{in}(pk)}{v_a(pk)}$	0.25	0.26	
Pout	17.7	14.3	kW
*Pload	14	11	kW

*0.85 (Pout-Pdrive)



FILAMENT

Directly heated, thoriated tungsten

Vf	6.3	V
*If	130	A
rf (cold)	0.005	Ω

*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%.

CAPACITANCES

ca-g	33.5	pF
cg-f	44.5	pF
ca-f	1.2	pF

CHARACTERISTICS

(Measured at $V_a = 6kV$, $I_a = 2.5A$)

gm	23	mA/V
μ	17.5	

(Measured at $V_a = 500V$, $I_a = 14A$)

gm	28	mA/V
----	----	------

MOUNTING POSITION

Vertical, anode down

COOLING

Water cooled

Tseals max.	220	$^{\circ}C$
-------------	-----	-------------

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 C5. The minimum rate of flow of water through helix required can be found from the curves on page C6.

PHYSICAL DATA

Weight of valve	6.7	lb
	3.0	kg
Weight of valve plus carton	67	lb
	30.5	kg

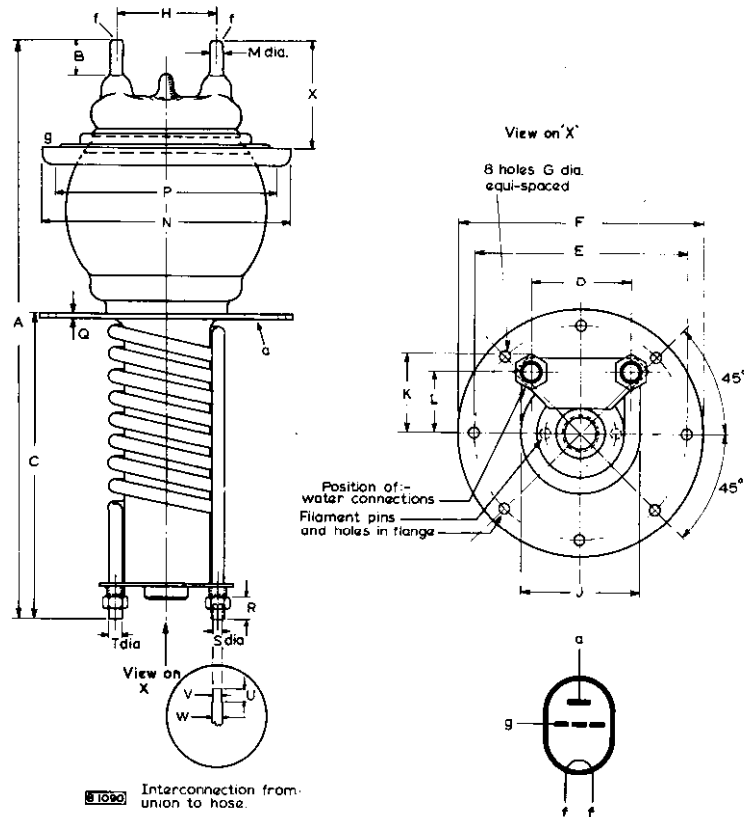
ACCESSORIES

Filament clip	40662
Grid connector	40664



R. F. POWER TRIODE

TY8-15H



DIMENSIONS

	Inches	Millimetres		Inches	Millimetres
A	13.819	351	M	0.374	9.5
B	0.984	25	N	6.417	163
C	7.677	195	P	5.827	148
D	2.953	75	Q	0.118	3
E	6.378	162	R	0.472	12
F	7.283	185	S	0.472	12
G	0.276	7	T	0.630	16
H	2.126	54	U	1.000	25.4
J	3.406	86.5	V	0.472	12
K	2.205	56	W	0.5	12.7
L	1.654	42			

Inch dimensions derived from original millimetre dimensions.



(1)

(1)

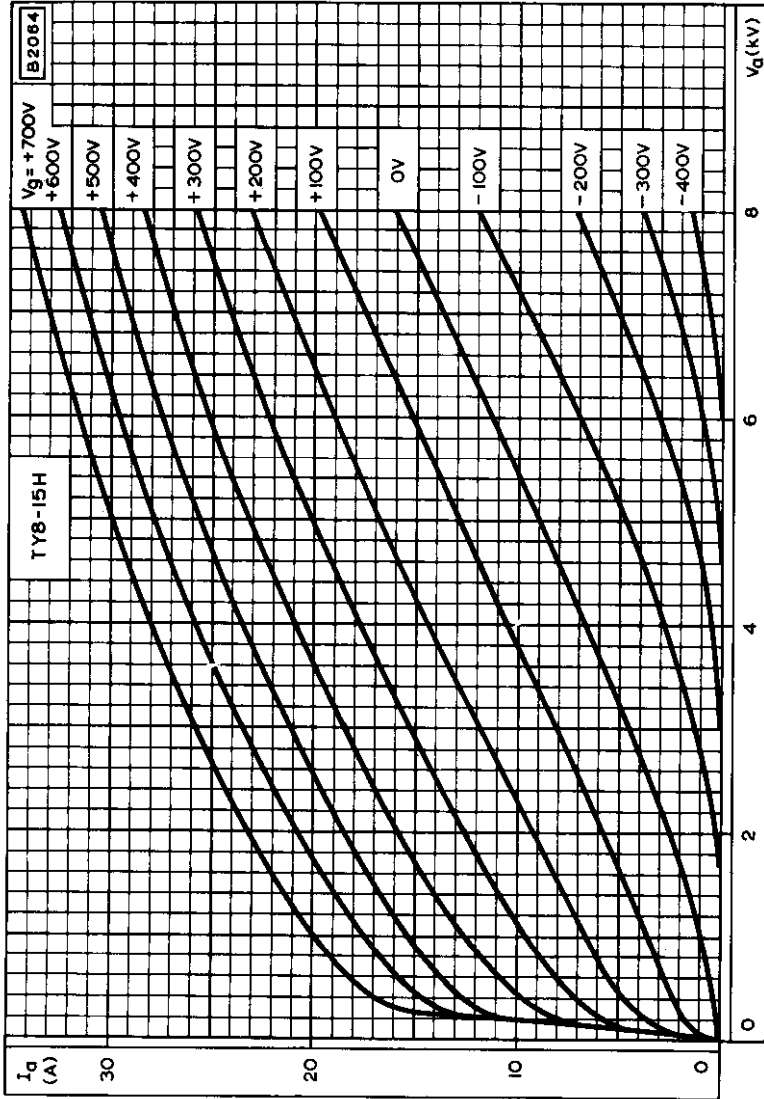
(1)

(1)

■

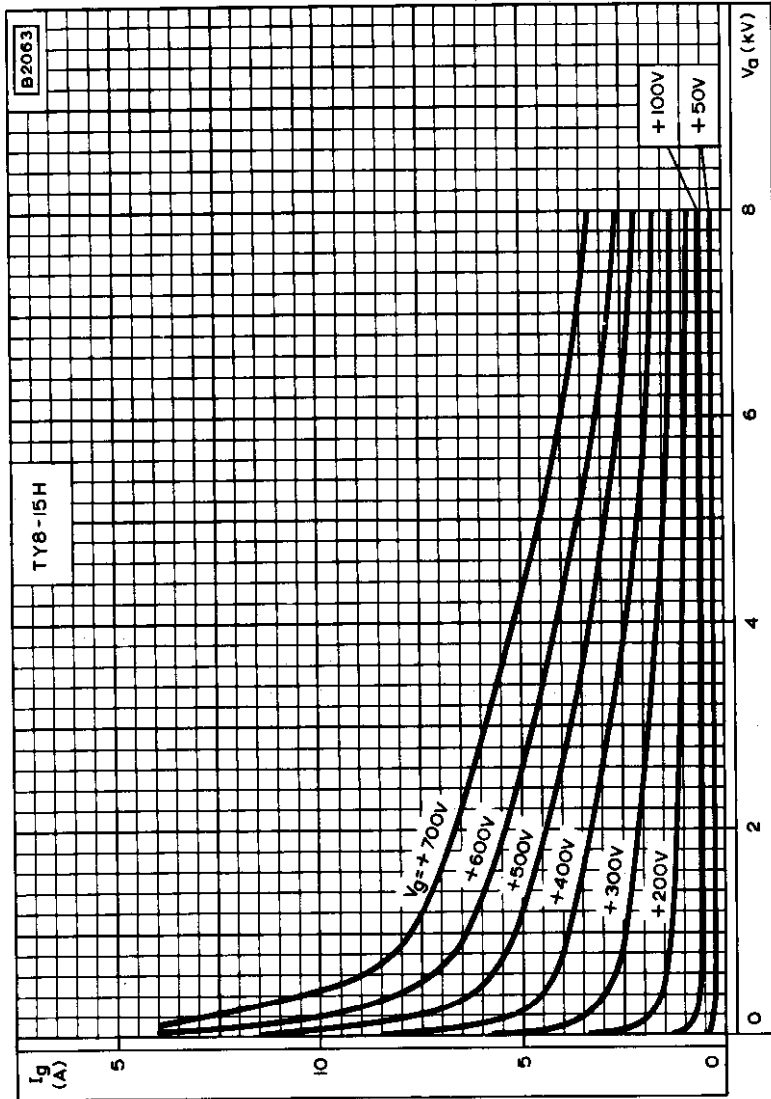
R. F. POWER TRIODE

TY8-15H



ANODE CURRENT PLOTTED AGAINST ANODE VOLTAGE WITH GRID VOLTAGE AS PARAMETER



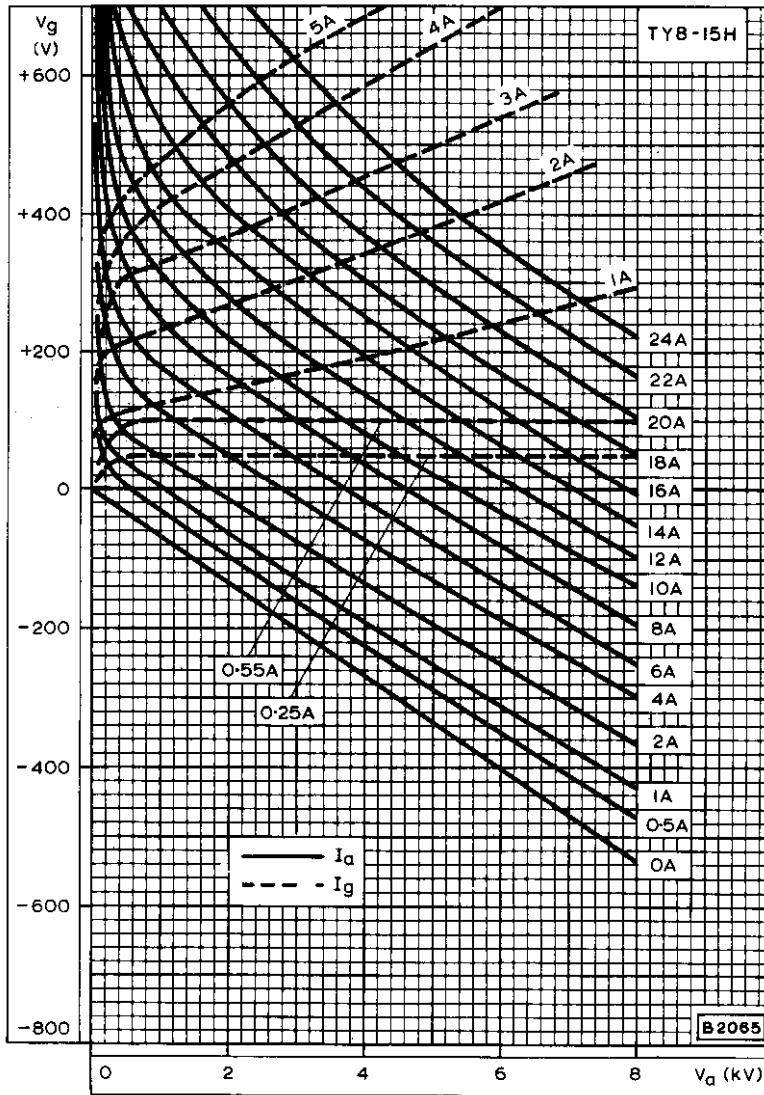


GRID CURRENT PLOTTED AGAINST ANODE VOLTAGE WITH GRID VOLTAGE AS PARAMETER

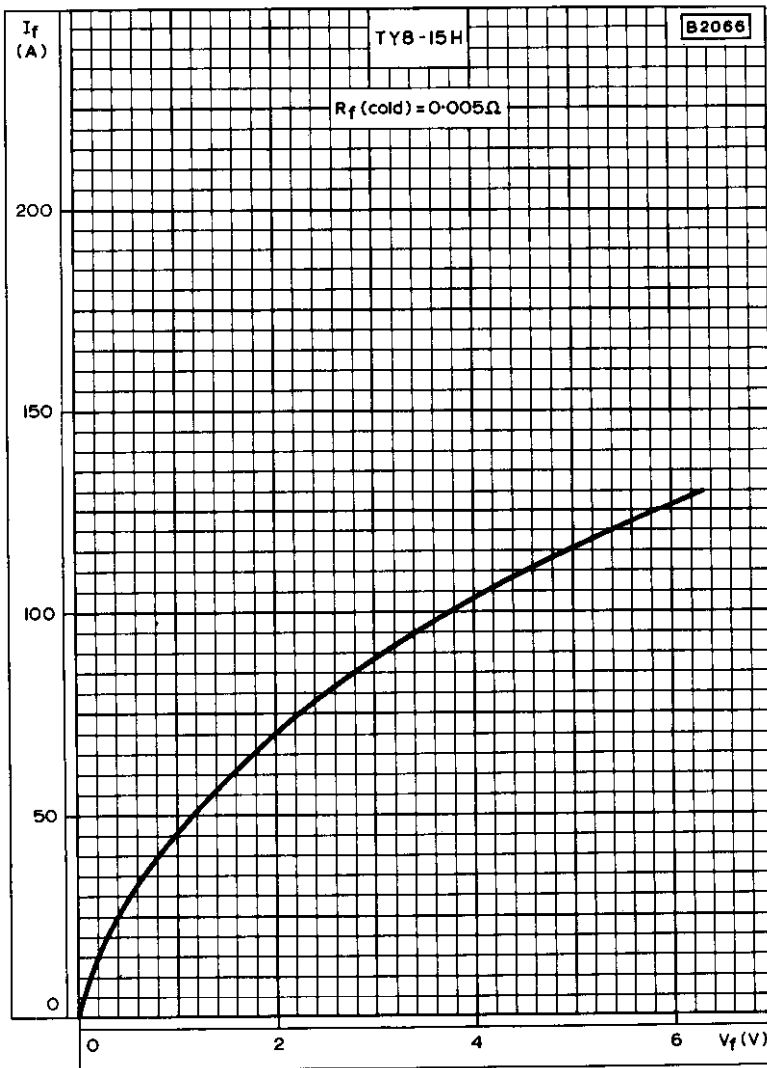


R. F. POWER TRIODE

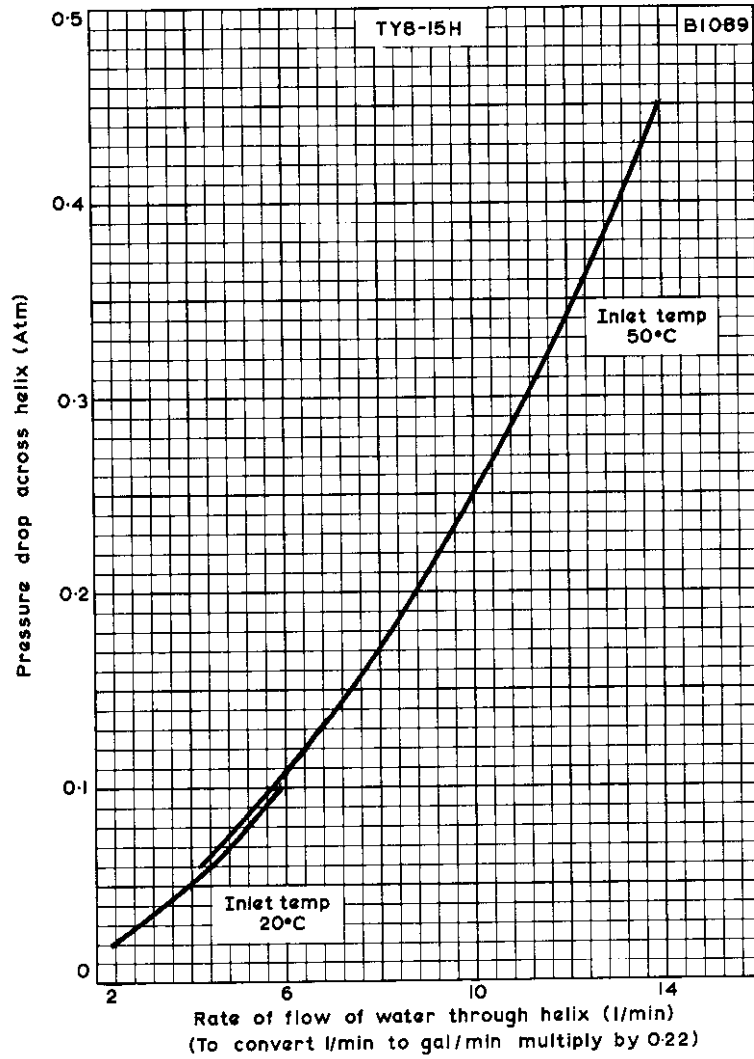
TY8-15H



CONSTANT CURRENT CHARACTERISTICS

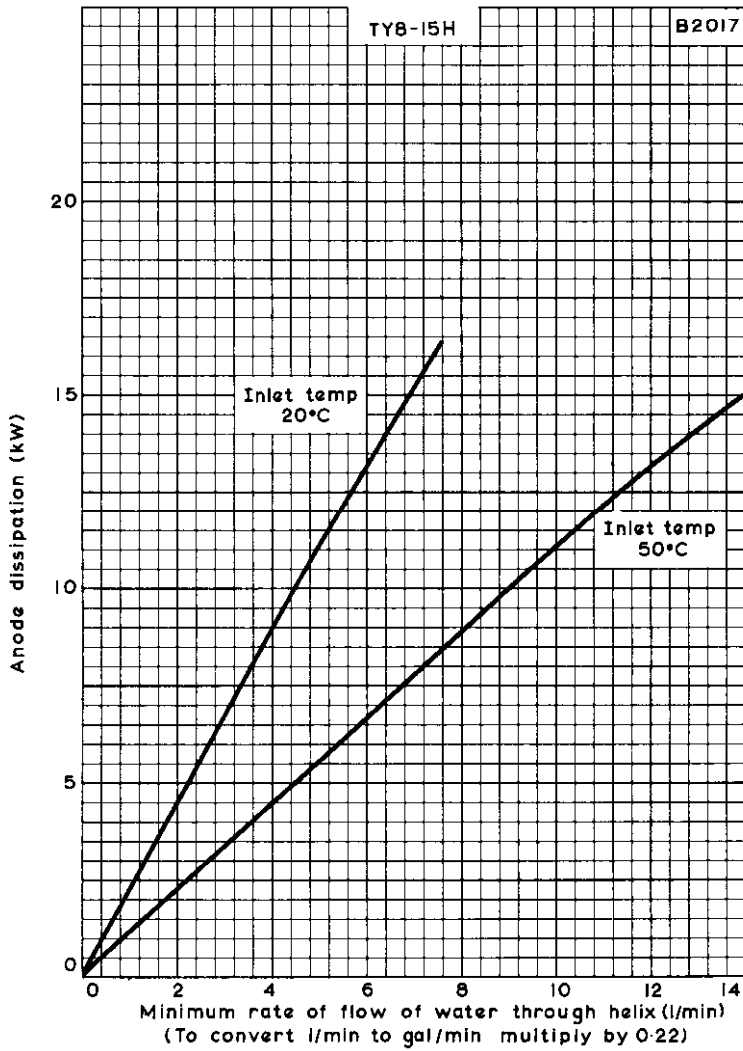


FILAMENT CURRENT PLOTTED AGAINST FILAMENT VOLTAGE



PRESSURE DROP ACROSS HELIX PLOTTED AGAINST RATE OF FLOW OF WATER THROUGH HELIX





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



TRIODE**TY8-15W**

Application: R.F. industrial heating.
 Power output: 14kW continuous rating.
 Frequency: 30Mc/s at full ratings.
 Construction: External anode, water cooled.

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

FILAMENT Directly heated, thoriated tungsten

V_f	6.3	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 fluctuations of $+5\%$ to -10%

MOUNTING POSITION

Vertical, anode down

CAPACITANCES

C_{a-g}	33.5	pF
C_{g-t}	44.5	pF
C_{a-t}	1.2	pF

CHARACTERISTICS (measured at $V_a = 6kV$, $I_a = 2.5A$)

g_m	23	mA/V
g_m (at $V_a = 500V$, $I_a = 14A$)	28	mA/V
μ	17.5	

COOLING

Water cooled

Max. temperature of seals	220	°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 water flow and pressure loss in the jacket are given in the following table:

Anode dissipation P_a (kw)	Inlet temperature T_{in} (°C)	Minimum rate of water flow per minute		Pressure loss in jacket (atm)
		(litres)	(gal)	
5.0	20	4.5	1.0	0.03
	50	12	2.6	0.2
10	20	9.5	2.0	0.15
	50	22	5.0	0.6
15	20	15	3.5	0.3
	50	34	7.5	1.4

At inlet temperatures between 20 and 50°C the required quantity of water can be found by linear interpolation.

TY8-15W

TRIODE

CLASS 'C' OSCILLATOR

Anode supply from three-phase half-wave rectifier without smoothing filter.

Limiting values (absolute ratings)

f max.		30	Mc/s
V _a max.		8.0	kV
-V _g max.		1.6	kV
R _{g-f} max.		10	kΩ
p _a max.		15	kW
I _a max.		4.0	A
I _g max.		1.5	A
p _g max.		800	W

Typical operation

f	30	30	Mc/s
V _{tr(r.m.s.)}	5.9	5.1	kV
V _a	7.0	6.0	kV
I _a	3.5	3.3	A
I _g	950	800	mA
p _a	6.8	5.5	kW
η _a	72	72	%
R _{g-f}	0.95	1.0	kΩ
R _a	1.0	0.87	kΩ
Feedback ratio $\frac{V_{in(pk)}}{V_{a(pk)}}$	0.25	0.26	
P _{out}	17.7	14.3	kW
*P _{load}	14	11	kW

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

WEIGHT

Valve only	{ 6 lb	{ 2.5 kg
Shipping weight	{ 67 lb	{ 30.5 kg

ACCESSORIES

Filament clip	40662
Grid connector	40664
Water jacket	K720

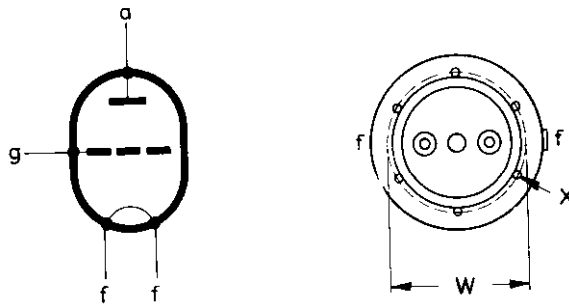
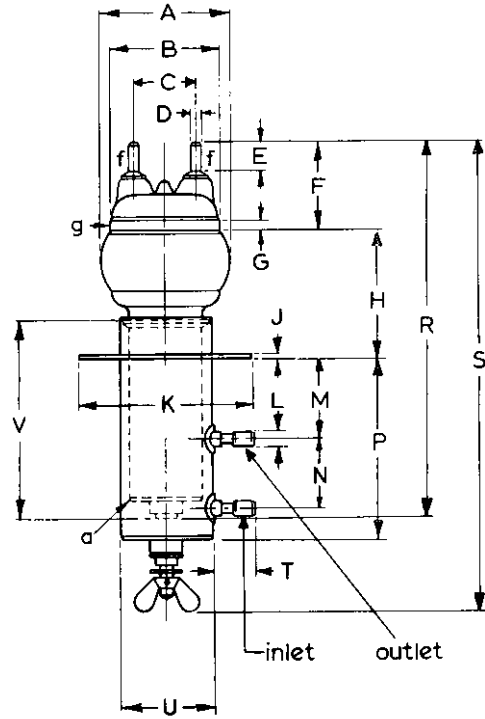
DIMENSIONS

	Inches	Millimetres		Inches	Millimetres
A	4.528	115	M	2.717	69
B	3.780	96	N	1.969	50
C	2.126	54	P	6.024	153
D	0.374	9.5	R	12.992	330 max.
E	0.984	25	S	16.339	415 max.
F	3.071	78	T	1.535	39
G	0.335	8.5	U	3.150	80
H	4.370	111	V	6.890	175
J	0.197	5.0	W	4.724	120
K	5.906	150	X	0.295	7.5
L	0.551	14			



TRIODE

TY8-15W



7571

()

()

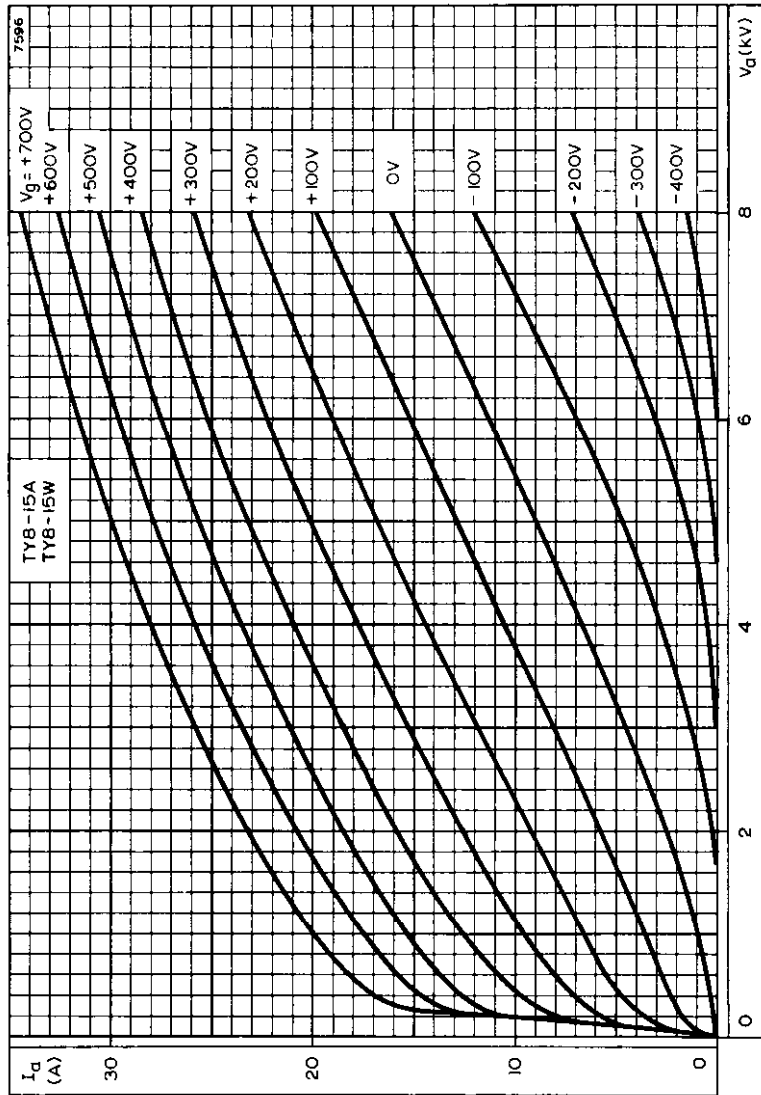
()

(

■

TRIODE

TY8-15W

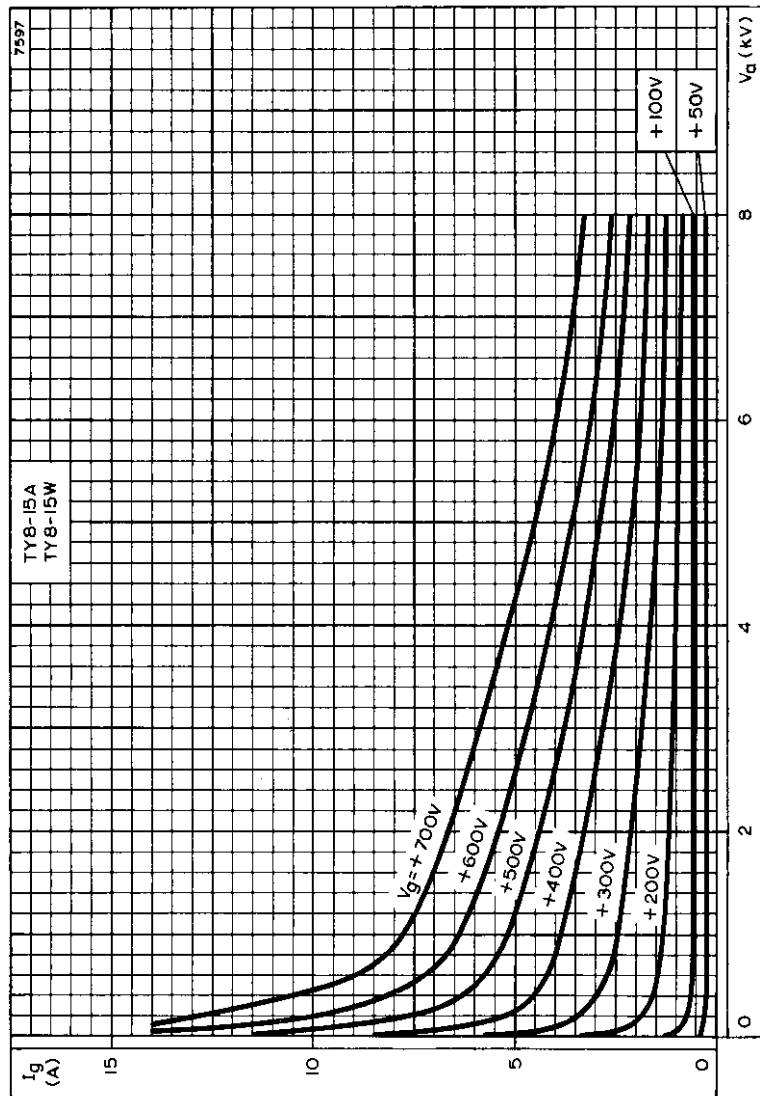


ANODE CURRENT PLOTTED AGAINST ANODE VOLTAGE
WITH GRID VOLTAGE AS PARAMETER



TY8-15W

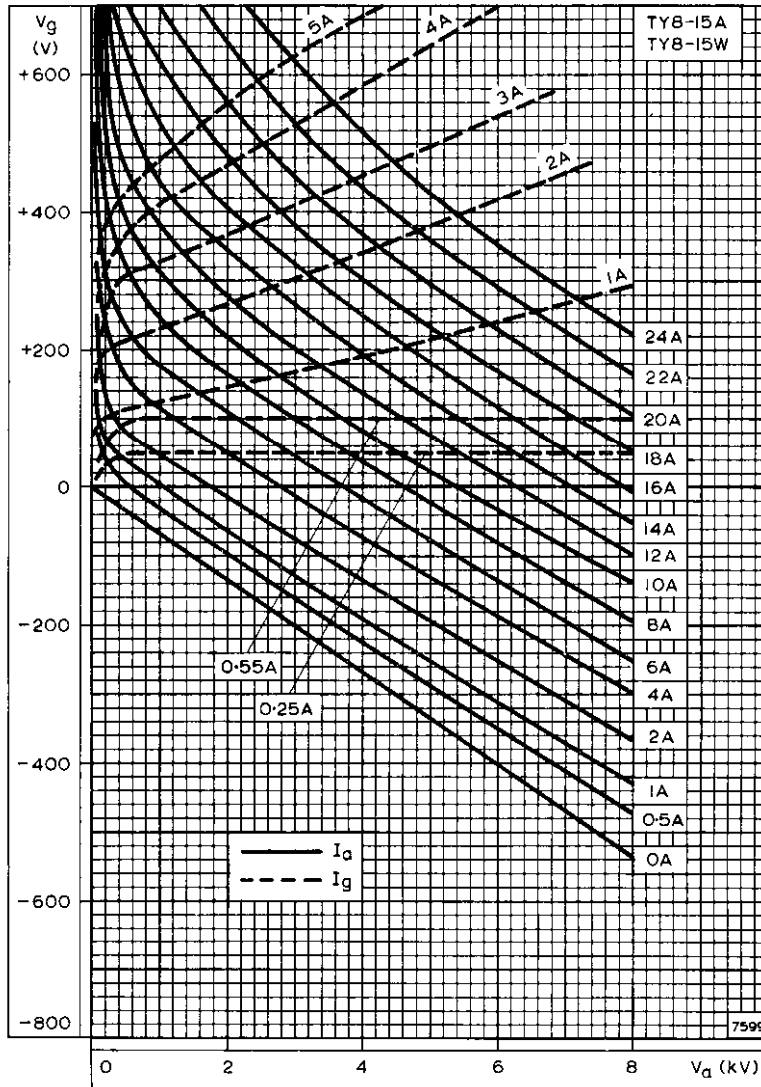
TRIODE



GRID CURRENT PLOTTED AGAINST ANODE VOLTAGE
WITH GRID VOLTAGE AS PARAMETER

TRIODE

TY8-15W

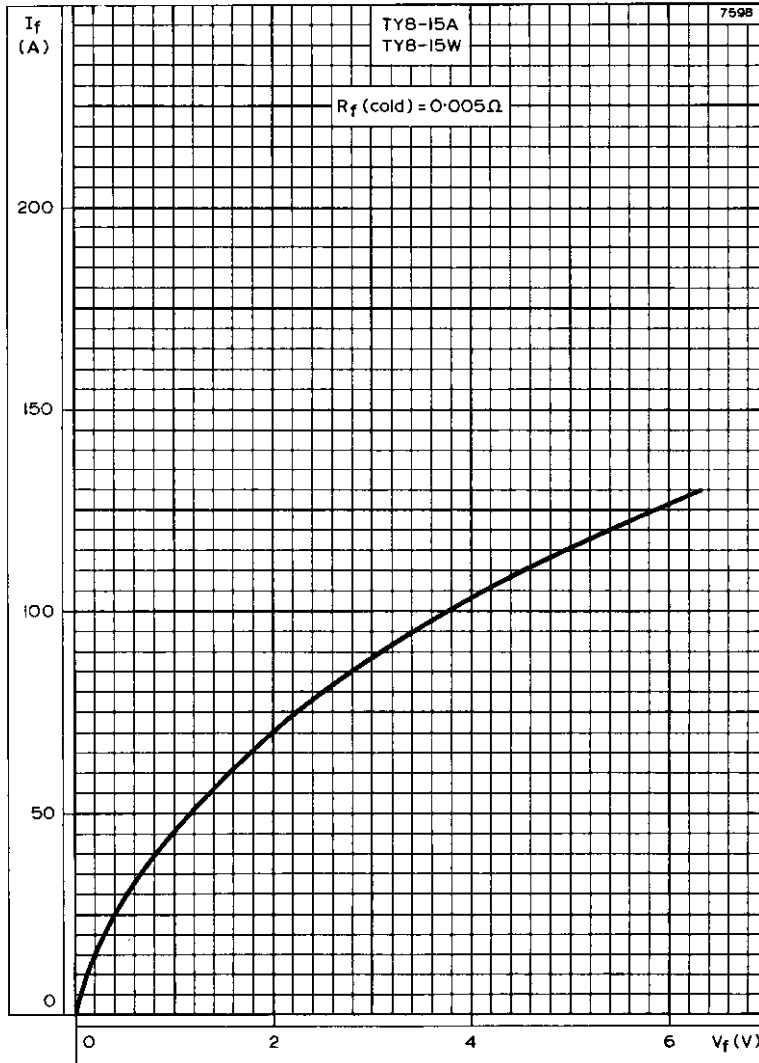


CONSTANT CURRENT CHARACTERISTICS



TY8-15W

TRIODE



FILAMENT CURRENT PLOTTED AGAINST FILAMENT VOLTAGE



V.H.F. POWER TRIODE

TY8-6000A
TY8-6000W
TY8-6000H

TENTATIVE DATA

QUICK REFERENCE DATA

External anode triode, intended for use as industrial Class 'C' oscillator

The TY8-6000A is forced-air cooled.

The TY8-6000W is water cooled by means of a water jacket.

The TY8-6000H is water cooled by means of an integral helical water cooler.

f	50	Mc/s
P_{out} (less P_{drive})	7.2	kW
f max.	50	Mc/s
V_a max.	8.0	kV
p_a max.	6.0	kW

Unless otherwise shown data is applicable to all types

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

INDUSTRIAL OPERATION AS CLASS 'C' OSCILLATOR

Anode supply from three-phase halfwave rectifier

Typical operating conditions

f	50	50	Mc/s
P_{out}	7.5	6.2	kW
P_{out} (less P_{drive})	7.2	5.9	kW
P_{load}	6.1	5.0	kW
η_a	70	71	%
V_{tr} (r. m. s.) per phase	6.15	5.3	kV
V_a	7.2	6.2	kV
I_a (loaded)	1.5	1.4	A
I_a (unloaded)	370	400	mA
I_g (loaded)	360	370	mA
I_g (unloaded)	470	470	mA
Feedback ratio $\frac{v_{in(pk)}}{v_{out(pk)}}$	0.17	0.17	
p_a	3.3	2.5	kW
R_{g-f}	1.85	1.5	k Ω
R_a	2.3	2.1	k Ω



Absolute maximum ratings

f max.	50	Mc/s
V_a max.	8.0	kV
$-V_g$ max.	1.25	kV
I_a max.	1.8	A
p_a max.	6.0	kW
I_g (loaded) max.	400	mA
I_g (unloaded) max.	500	mA
R_{g-f} max.	10	k Ω

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 and -10%.

CAPACITANCES

c_{a-g}	7.9	pF
c_{out}	1.0	pF
c_{in}	14.2	pF

CHARACTERISTICS (measured at $V_a = 6.0kV$, $I_a = 1.0A$)

g_m	12	mA/V
μ	24	

MOUNTING POSITION

Vertical, with anode down.

V.H.F. POWER TRIODE

COOLING

TY8-6000A
 Forced-air cooled
 Maximum temperatures
 Seals

TY8-6000A
TY8-6000W
TY8-6000H

220 °C

The amount of forced-air cooling required for this valve depends on the height above sea level and the anode dissipation.

Typical values for continuous operation of inlet temperature, rate of flow of air and pressure difference between the inlet and the outlet of the housing are given in the following table.

For intermittent operation see the curve on page C4.

Anode dissipation P_a (kW)	Height above sea level h		Inlet temperature T_{in} °C	Minimum rate of flow of air per minute		Pressure difference between inlet and outlet	
	(km)	(ft)		(m ³)	(ft ³)	(mm of H ₂ O)	(in of H ₂ O)
2.0	0	0	35	4.8	170	20	0.8
2.0	0	0	45	5.7	200	25	1.0
2.0	1.5	4920	35	5.7	200	23	0.9
2.0	3.0	9840	25	6.1	215	23	0.9
4.0	0	0	35	6.8	240	38	1.5
4.0	0	0	45	7.9	280	49	1.9
4.0	1.5	4920	35	7.8	275	42	1.7
4.0	3.0	9840	25	8.4	300	42	1.7
6.0	0	0	35	9.2	325	68	2.7
6.0	0	0	45	10.7	380	90	3.5
6.0	1.5	4920	35	11.2	395	81	3.2
6.0	3.0	9840	25	11.7	415	81	3.2



TY8-6000W

Water cooled anode, low velocity air flow on seals.

Maximum temperatures

Seals	220	°C
Water inlet	50	°C

The amount of forced-air cooling required for this valve depends on 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 P_a (kW)	Inlet temperature T_{in} (°C)	Minimum rate of water flow per minute		Pressure loss in jacket (atm)
		(litres)	(gal)	
2.0	20	2.5	0.55	0.06
	50	5.0	1.1	0.2
4.0	20	4.0	0.88	0.14
	50	9.0	1.98	0.7
6.0	20	6.0	1.32	0.3
	50	14.0	3.08	1.9

At inlet temperatures between 20 and 50°C the required quantity of water can be found by linear interpolation.



V.H.F. POWER TRIODE

TY8-6000A
TY8-6000W
TY8-6000H

TY8-6000H

Water cooled anode, low velocity air flow on seals.

Maximum temperatures

Seals	220	°C
Water inlet	50	°C

The amount of water cooling required for this valve depends on the anode dissipation and 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. To avoid excessive temperatures at frequencies above 4Mc/s both grid terminals should be connected in parallel and care should be taken to distribute the R. F. current evenly between them and a low velocity air flow should be directed on the seals.

PHYSICAL DATA

	TY8-6000A	TY8-6000W	TY8-6000H	
Weight of valve	9.7	1.8	2.2	lb
	4.4	0.8	1.0	kg
Weight of valve plus carton	22	3.6	4.2	lb
	10	1.6	1.9	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

TY8-6000A		
Grid and filament connectors x 4		40634
Insulating pedestal x 1		40630
TY8-6000W		
Grid and filament connectors x 4		40634
Water jacket x 1		K721
TY8-6000H		
Grid and filament connectors x 4		40634



Dimensions of TY8-6000A

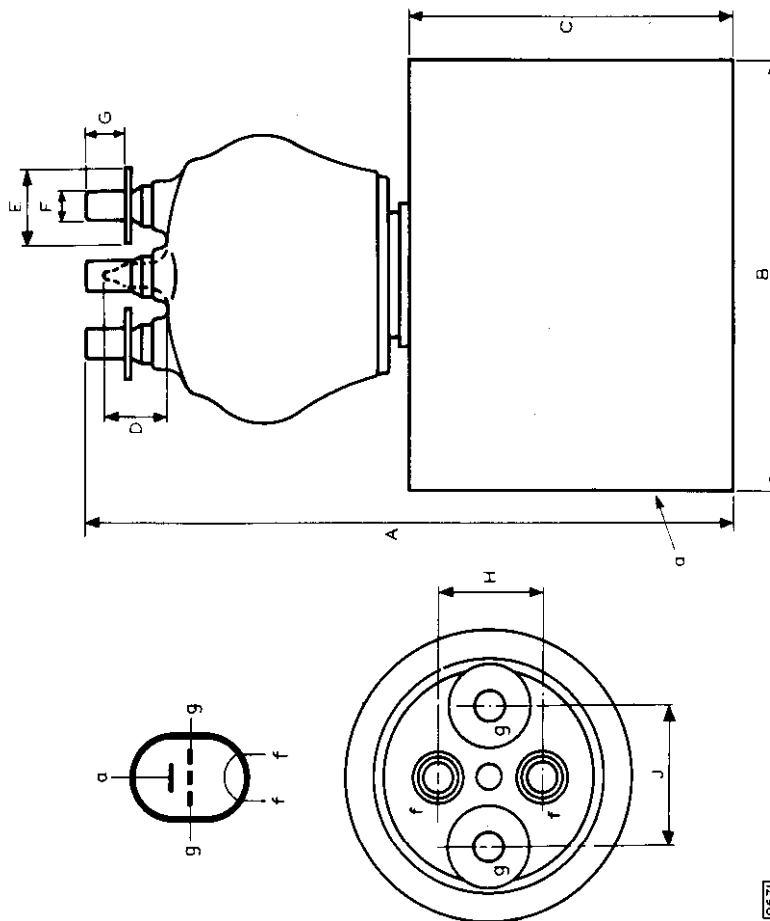
	Inches	Millimetres	
A	0.732	186	max
B	4.815 ± 0.012	122.3 ± 0.3	dia
C	3.70	94	
D	0.71	18	max
E	0.87	22	dia
F	0.358	9.1	dia
G	0.43	11	min
H	1.18	30	
J	1.57	40	

Inch dimensions derived from original millimetre dimensions.

V.H.F. POWER TRIODE

TY8-6000A
TY8-6000W
TY8-6000H

OUTLINE DRAWING OF TY8-6000A



1791



Dimensions of TY8-6000W

	Inches	Millimetres	
A	8.62	224	max
B	2.05	52	dia
C	4.37	111	
D	0.650	16.5	
E	2.24	57	
F	0.453	11.5	dia
G	2.146	54.5	
H	0.71	18	max
J	0.358	9.1	dia
K	0.43	11	min
L	0.87	22	
M	1.18	30	
N	1.57	40	
P	0.24	6.0	dia
Q	2.76	70	
R	3.228 ± 0.008	82 ± 0.2	

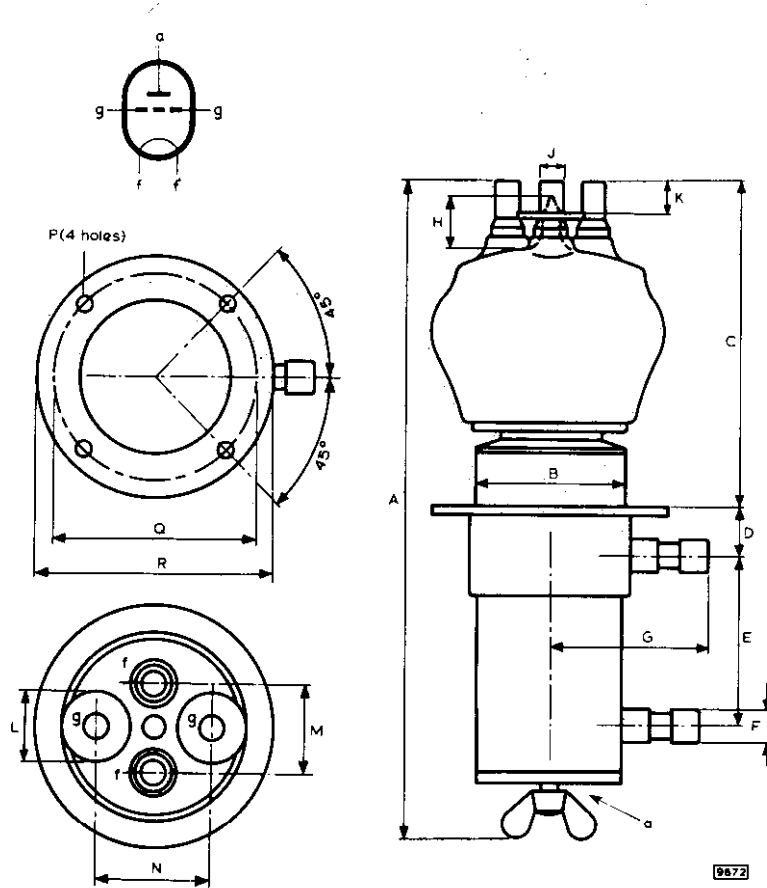
Inch dimensions derived from original millimetre dimensions.



V.H.F. POWER TRIODE

TY8-6000A
TY8-6000W
TY8-6000H

OUTLINE DRAWING OF TY8-6000W



Dimensions of TY8-6000H

	Inches	millimetres	
A	8.287	210.5	
B	4.882	124	
C	0.394	10	
D	0.079	2	
E	0.433	11	min
F	0.358	9.1	dia
G	3.386	86	dia. max.
H	1.811	46	
J	0.394	10	dia
K	0.315	8	dia
L	0.709	18	max
M	2.559	65	
N	5.118	130	
P	4.831	110	
Q	0.276	7	dia
R	1.339	34	
S	0.906	23	
T	1.575	40	
U	1.181	30	

Inch dimensions derived from original millimetre dimensions.

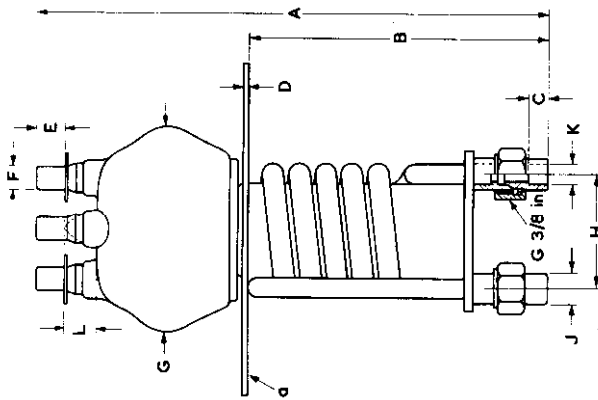
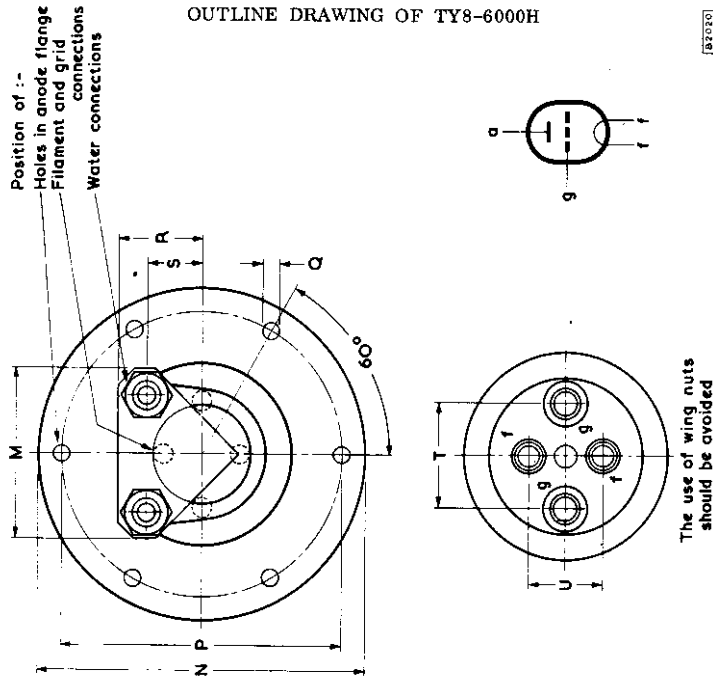


V.H.F. POWER TRIODE

TY8-6000A
 TY8-6000W
 TY8-6000H

OUTLINE DRAWING OF TY8-6000H

B2030



()

()

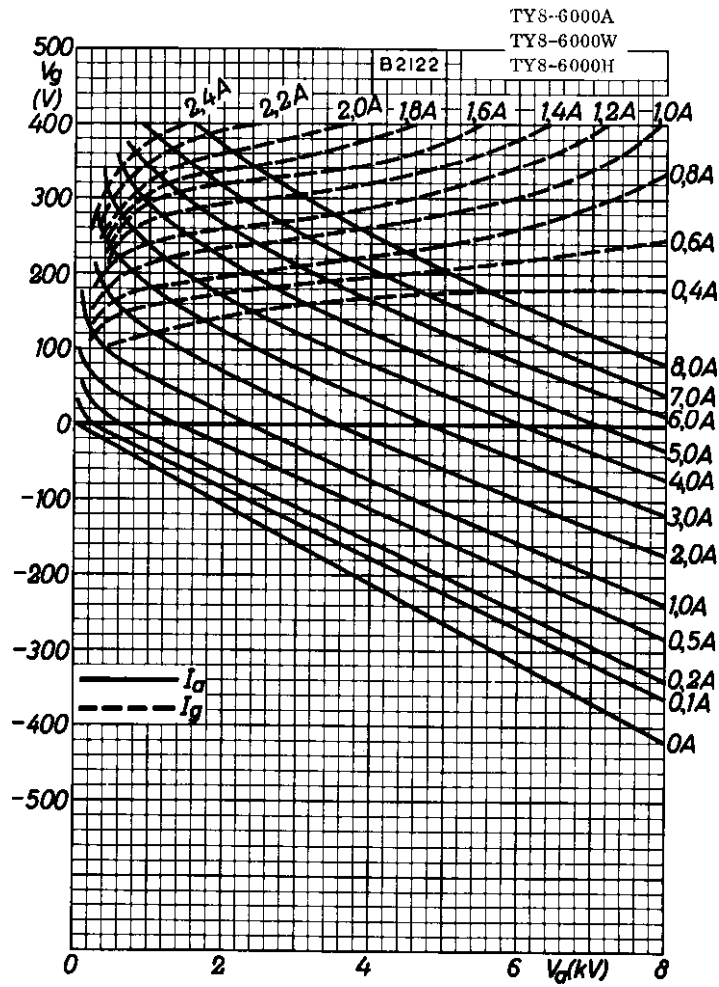
()

()



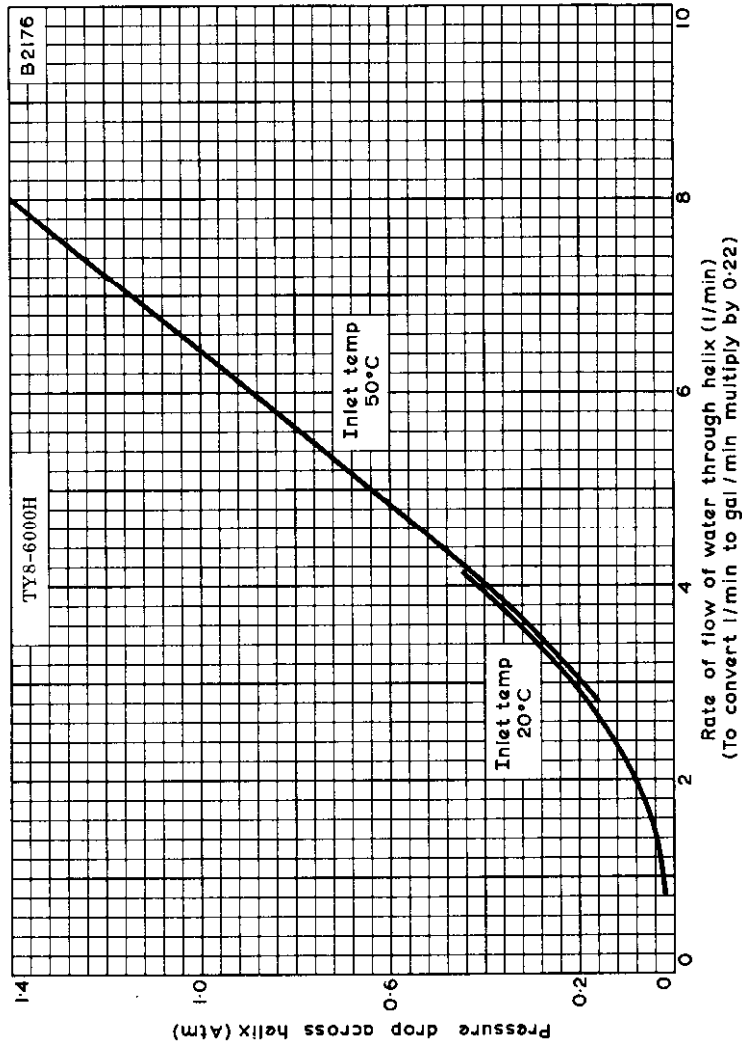
V.H.F. POWER TRIODE

TY8-6000A
TY8-6000W
TY8-6000H



CONSTANT CURRENT CHARACTERISTICS



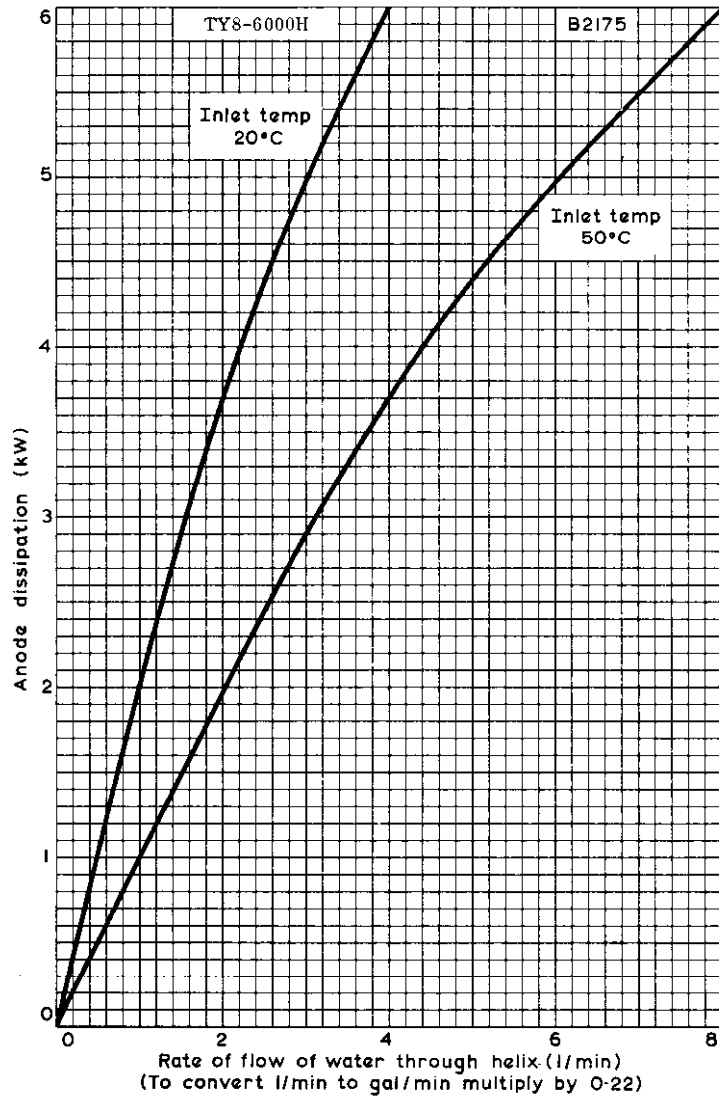


PRESSURE DROP ACROSS HELIX PLOTTED AGAINST RATE OF FLOW OF WATER THROUGH HELIX FOR INLET TEMPERATURES OF 20 AND 50°C.



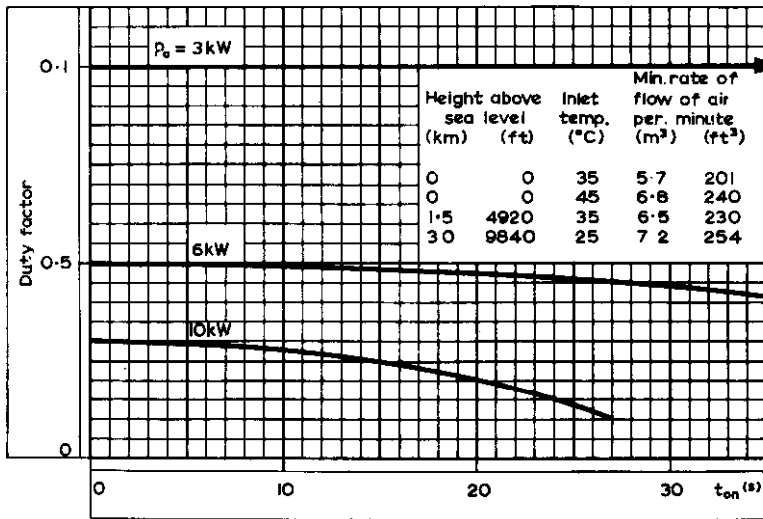
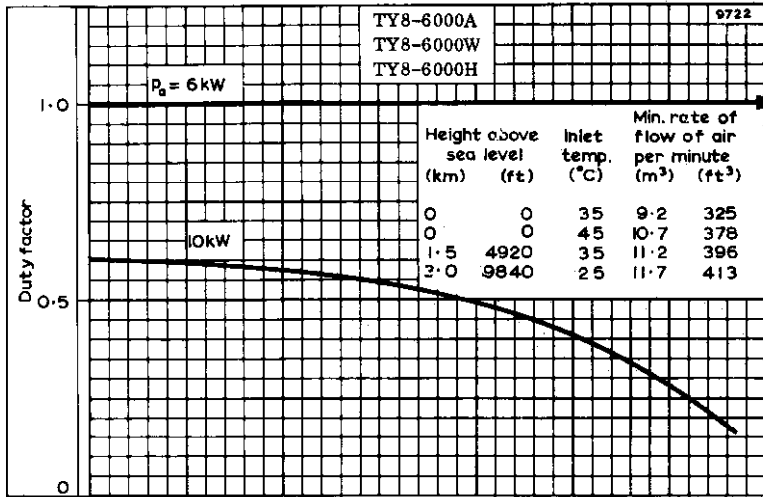
V.H.F. POWER TRIODE

TY8-6000A
TY8-6000W
TY8-6000H



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





TRIODE

TY12-15A

QUICK REFERENCE DATA

External anode, forced-air cooled triode for use as r.f. power amplifier, oscillator or a.f. power amplifier.

	Class 'C' telegraphy	Class 'C' anode modulation	Class 'B' A.F.	
f max.	30	30	—	Mc/s
V _a max.	13	10	13	kV
p _a max.	15	10	15	kW
Performance				
f	30	30	—	Mc/s
P _{out}	41	27.5	40	kW

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.

MOUNTING POSITION

Vertical, anode down

CAPACITANCES

C _{a-g}	27	pF
C _{g-f}	45	pF
C _{a-f}	600	mpF

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

μ	33	
g _m	25	mA/V
g _m (at V _a = 2kV, I _a = 22A)	40	mA/V



TY12-15A

TRIODE

COOLING

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 of the housing are given in the following table.

Anode dissipation P_a (kW)	Height above sea-level h		Inlet temperature T_{in} (°C)	Min. rate of flow of air per minute		Pressure difference between inlet and outlet (mm of H ₂ O)
	(km)	(ft.)		(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	12.2	430	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	22.3	790	70

CLASS 'C' TELEGRAPHY

Absolute maximum ratings

f max.	30	Mc/s
V_a max.	13	kV
I_k max.	5.8	A
$I_{k(pk)}$ max.	28	A
V_g max.	-1.5	kV
I_g max.	1.0	A
P_a max.	15	kW
P_g max.	750	W
R_g r max.	10	k Ω

Operating conditions

f	30	Mc/s
V_a	12	kV
I_a	4.5	A
V_g	-1.0	kV
I_g	800	mA
$V_{in(pk)}$	1.6	kV
P_{load} (driver)	1.25	kW
P_a	13	kW
η_a	76	%
P_{out}	41	kW
P_{load}	34.8	kW

TRIODE

TY12-15A

CLASS 'C' ANODE MODULATION

Absolute maximum ratings (carrier condition for a modulation factor of 1)

f max.	30	Mc/s
V _a max.	10	kV
I _k max.	4.8	A
i _{k(pk)} max.	42	A
V _g max.	-1.5	kV
I _g max.	1.0	A
p _a max.	10	kW
P _g max.	750	W
R _{g-r} max.	10	kΩ

Operating conditions

f	30	Mc/s
V _a	10	kV
I _a	3.5	A
V _g	-1.0	kV
I _g	800	mA
V _{in(pk)}	1.5	kV
P _{load driver}	1.2	kW
p _a	7.5	kW
γ _a	78.5	%
P _{out}	27.5	kW
P _{load}	23.5	kW
For 100% modulation		
P _{mod}	17.5	kW

CLASS 'B' A.F.

Absolute maximum ratings

V _a max.	13	kV
I _k max.	4.5	A
i _{k(pk)} max.	14	A
p _a max.	15	kW
R _{g-r} max.	10	kΩ

Operating conditions (two valves)

V _a	10	10	8.0	kV
I _{a(0)}	2 × 100	2 × 500	2 × 500	mA
I _a (max. sig.)	2 × 2.0	2 × 3.3	2 × 4.2	A
V _g	-290	-270	-220	V
V _{in(g-g)r.m.s.}	325	440	430	V
I _g	2 × 143	2 × 875	2 × 800	mA
P _{load driver}	2 × 55	2 × 360	2 × 300	W
p _a	2 × 8.0	2 × 12.8	2 × 13.6	kW
γ _a	60	61	59.5	%
R _{a-a}	5.5	4.4	2.3	kΩ
P _{out}	24	40	40	kW
P _{load}	22	36	36	kW



TY12-15A

TRIODE

WEIGHT

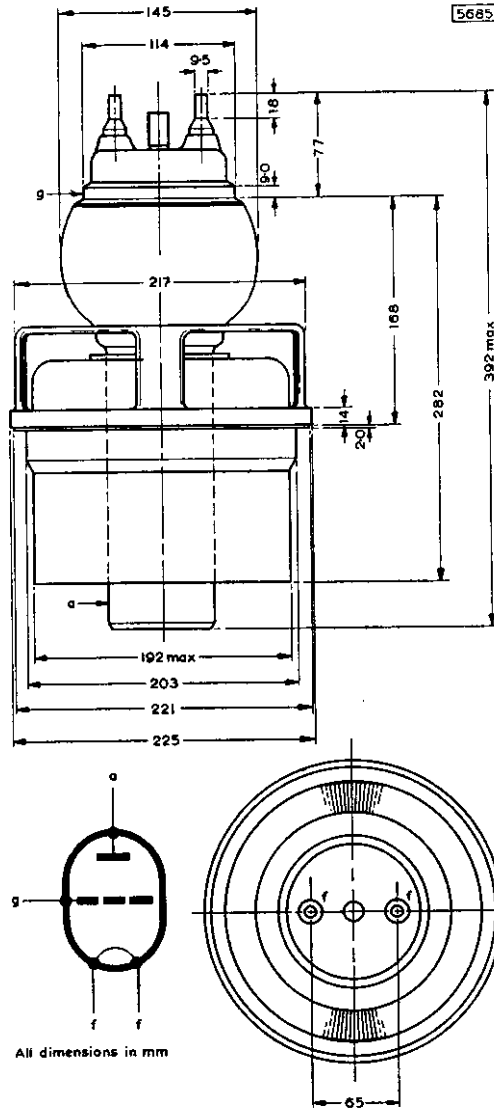
Valve only	{	42	lb
		19	kg
Shipping weight	{	186	lb
		84.5	kg

ACCESSORIES

Insulating pedestal	40648
Grid connector	40663
Filament clips with lead	40662

TRIODE

TY12-15A



()

()

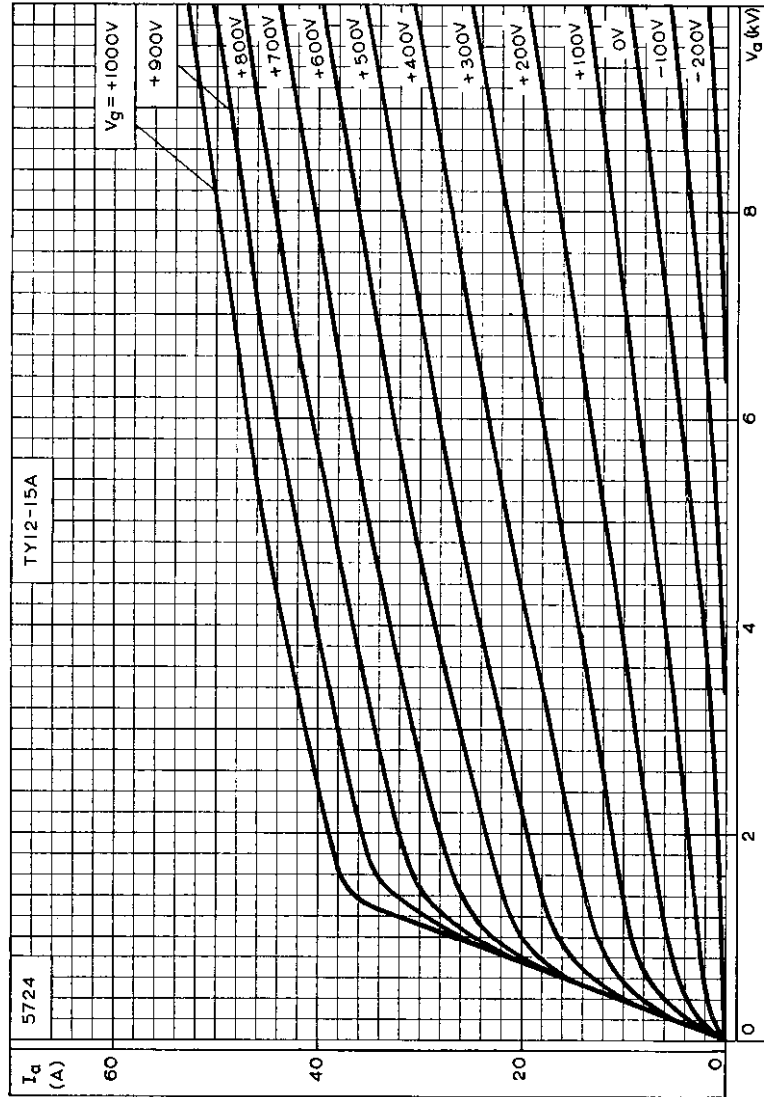
()

()



TRIODE

TY12-15A

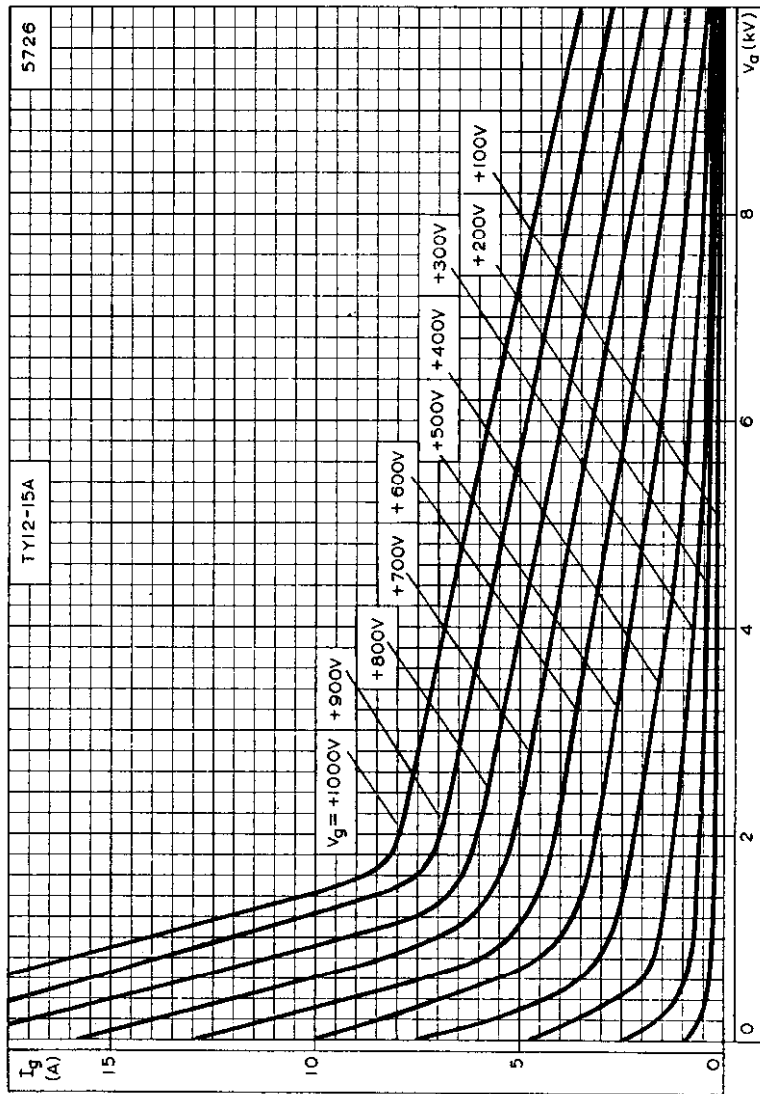


ANODE CURRENT PLOTTED AGAINST ANODE VOLTAGE WITH CONTROL-GRID VOLTAGE AS PARAMETER



TY12-15A

TRIODE

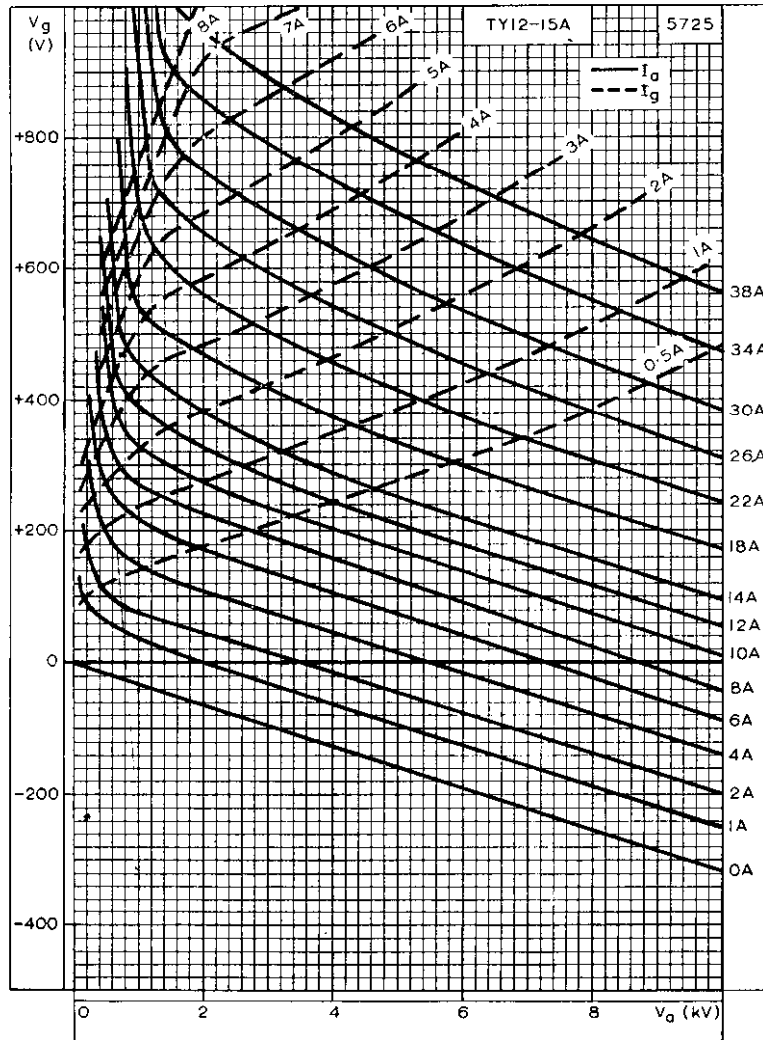


CONTROL-GRID CURRENT PLOTTED AGAINST ANODE VOLTAGE WITH CONTROL-GRID VOLTAGE AS PARAMETER



TRIODE

TY12-15A



CONSTANT CURRENT CURVES



—

(P)

()

()

(

■

R.F. POWER TRIODE

TY12-20A TY12-20W

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 _f max.	2.0	kV
I _g max.	1.5	A
p _a max.	20	kW
R _{g-t} max.	10	kΩ
p _g max.	1.1	kW

Typical operating conditions

	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-t}	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-r} max.	10	k Ω

Typical operating conditions

V_a	8.0	10	12	kV
$I_{a(o)}$	2 × 350	2 × 400	2 × 450	mA
I_a (max. signal)	2 × 4.2	2 × 4.2	2 × 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 × 825	2 × 700	2 × 630	mA
$P_{load(driver)}$	2 × 680	2 × 640	2 × 610	W
P_s	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

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-r}	42.5	pF
C_{a-r}	0.9	pF

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

g_m	25	mA/V
μ	21	
g_{m0} (Measured at $V_a = 1kV$, $I_a = 20A$)	30	mA/V

R.F. POWER TRIODE

TY12-20A
TY12-20W

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)
		(litres)	(gal)	
5.0	20	6.0	1.5	0.02
	50	15	3.5	0.22
10	20	11	2.5	0.1
	50	25	5.5	0.7
15	20	16	3.5	0.25
	50	37	8.0	1.3
20	20	22	5.0	0.5
	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

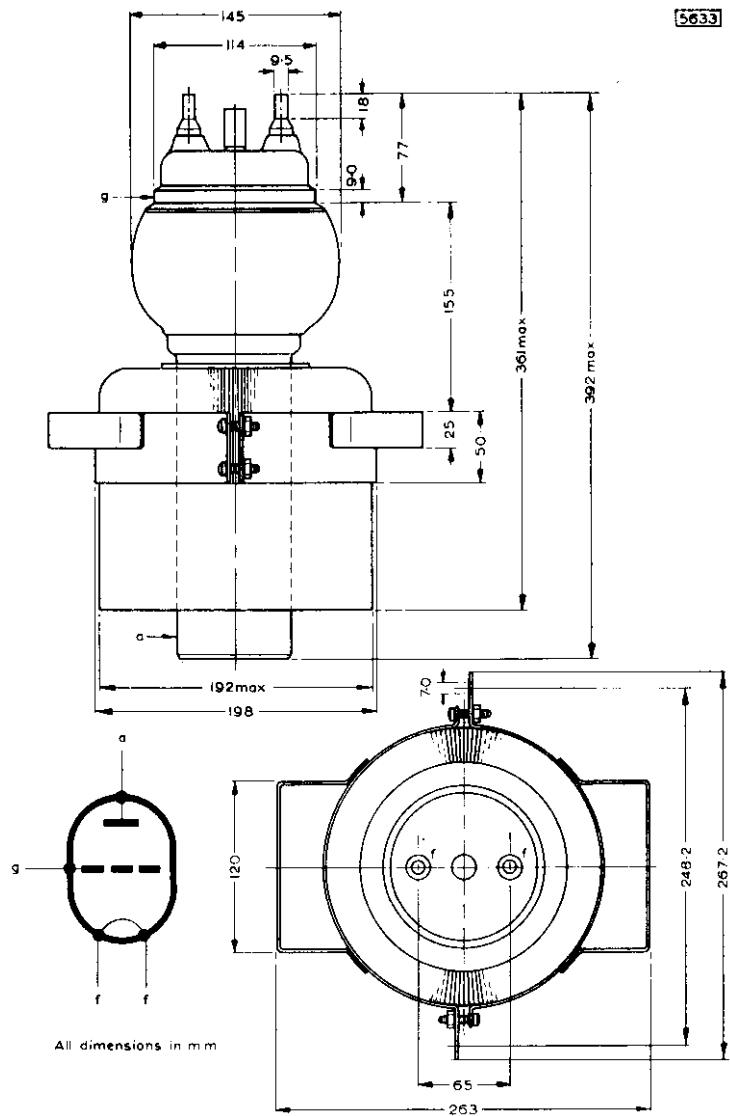
ACCESSORIES

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

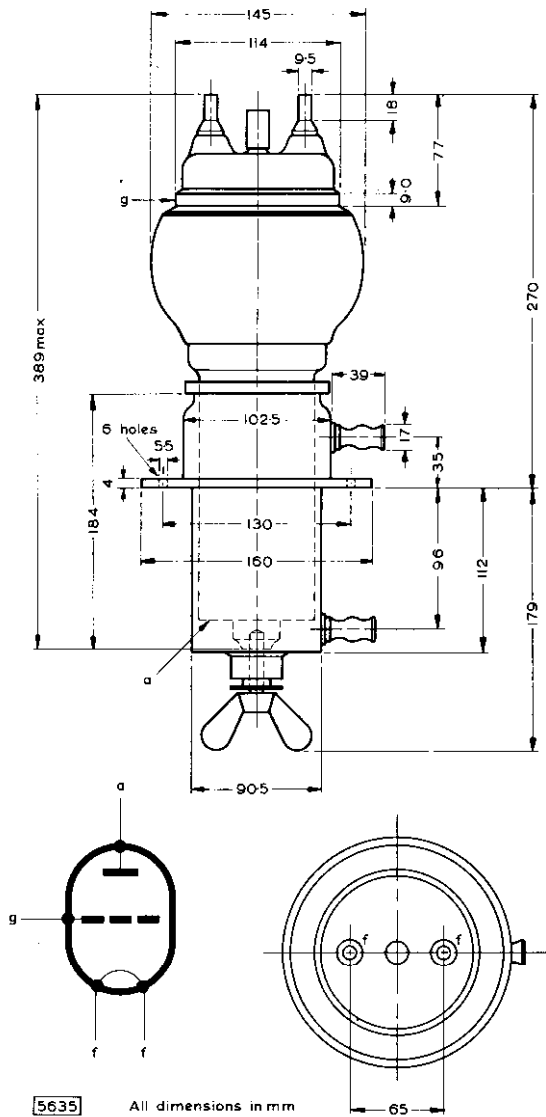
TY12-20A



TY12-20A TY12-20W

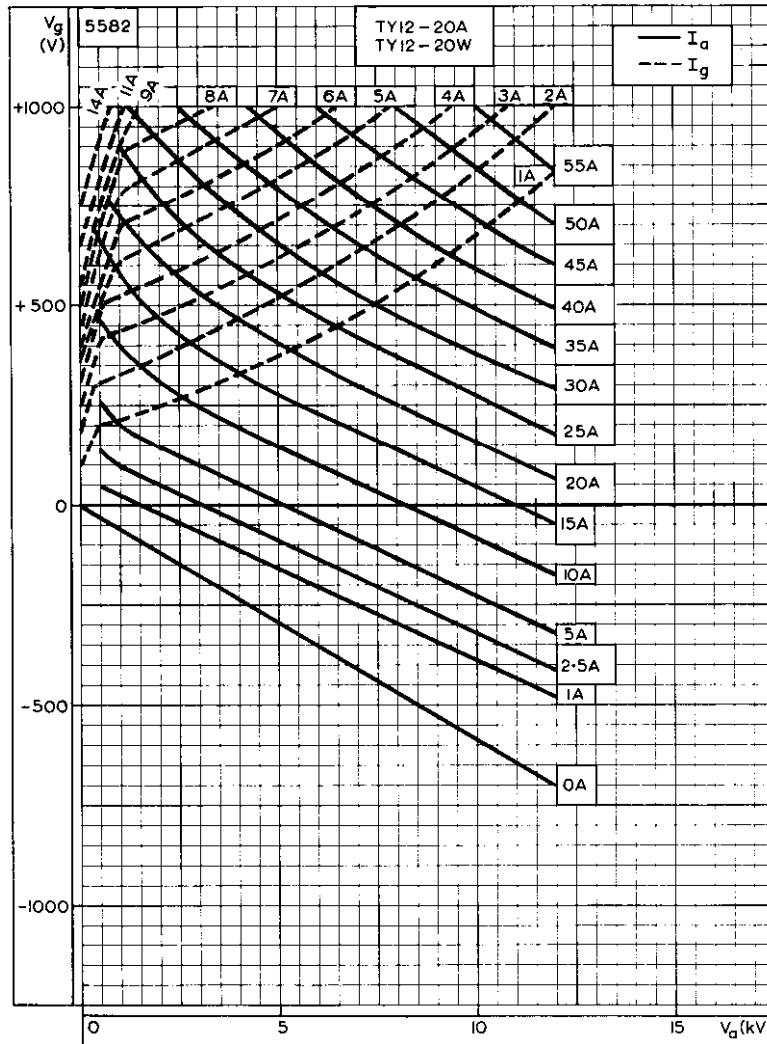
R.F. POWER TRIODE

TY12-20W



R.F. POWER TRIODE

TY12-20A TY12-20W



CONSTANT CURRENT CURVES



□

()

()

()

()

■

TRIODE

TY12-25A

Application: R.F. Industrial heating.
 Power Output: 37.5kW continuous rating.
 Frequency: 30Mc/s max. at full rating
 Construction: External anode, forced-air 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
$*I_f$	98	A

*The filament current must never exceed a surge value of 210A at any time during the warming-up period.

MOUNTING POSITION Vertical, with anode down.

CAPACITANCES

C_{a-g}	28	pF
C_{a-f}	0.3	pF
C_{g-f}	33	pF

CHARACTERISTICS

g_m (measured at $V_a=2kV$, $I_a=13A$)	30	mA/V
g_m (measured at $V_a=12kV$, $I_a=2A$)	20	mA/V
μ (measured at $I_a=4A$)	34	

COOLING

Forced-air

Max. temperature of seals 180 °C

The amount of forced-air cooling required for this valve depends on the height above sea level and the anode dissipation.

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	Max. inlet temperature	Min. rate of flow of air	Pressure difference between inlet and outlet
P_a (kW)	h (m)	T_{ia} (°C)	(m ³ /min)	(mm of H ₂ O)
7.0	0	35	6.6	10
7.0	0	45	7.7	13
7.0	1500	35	7.9	12
7.0	3000	25	8.3	12
10	0	35	10.5	23
10	0	45	12.3	31
10	1500	35	12.6	28
10	3000	25	13.2	27
15	0	35	18.1	60
15	0	45	21.2	79
15	1500	35	21.7	73
15	3000	25	22.8	70

TY12-25A

TRIODE

OPERATION AS SINGLE VALVE R.F. OSCILLATOR (CLASS 'C')

Limiting values (absolute ratings)

f max.	30	Mc/s
V _a max.	13	kV
I _a max.	4.8	A
-V _g max.	1.5	kV
I _g max.	800	mA
p _a max.	15	kW
R _{g-r} max.	10	kΩ

Maximum operating conditions

f	30	30	30	30	Mc/s
V _{transformer} (r.m.s.)	6.0*	7.4*	8.9*		kV
V _a	8.0	10	12		kV
I _a	4.5	4.5	4.5		A
I _g	800	800	800		mA
R _{g-r}	0.75	1.0	1.25		kΩ
P _{in}	36	45	54		kW
p _a	13	13.9	15		kW
P _{out}	22	30	37.5		kW
η	61.2	66.7	69.5		%
**P _{load}	18.7	25.5	32		kW

Typical operating conditions

f	30	30	30	30	Mc/s
V _{transformer} (r.m.s.)	5.1†	6.0*	7.4*	8.9*	kV
V _a	6.0	8.0	10	12	kV
I _a	3.0	3.2	3.2	3.2	A
I _g	600	550	500	500	mA
R _{g-r}	0.67	1.1	1.6	2.0	kΩ
P _{in}	18	25.6	32	38.4	kW
p _a	6.0	7.7	8.7	9.4	kW
P _{out}	11.3	17.1	22.4	28	kW
η	63	67	70	73	%
**P _{load}	9.6	14.5	19	24	kW

*Anode voltage obtained from a 3 phase full-wave rectifier without filter.

†Anode voltage obtained from a 3 phase half-wave rectifier without filter.

**At 85% transfer efficiency.

TRIODE

TY12-25A

OPERATING NOTE

To ensure a uniform r.f. current distribution in the grid seal, especially at higher frequencies, the grid lead should be connected to the middle wing nut of the grid bracket.

ACCESSORIES

Information on these items can be obtained from the Government and Industrial Valve Division, Mullard Limited.

WEIGHT

Valve only	{ 17.5	kg
	{ 38.5	lb
Shipping weight	{ 85.5	kg
	{ 188	lb



○

○

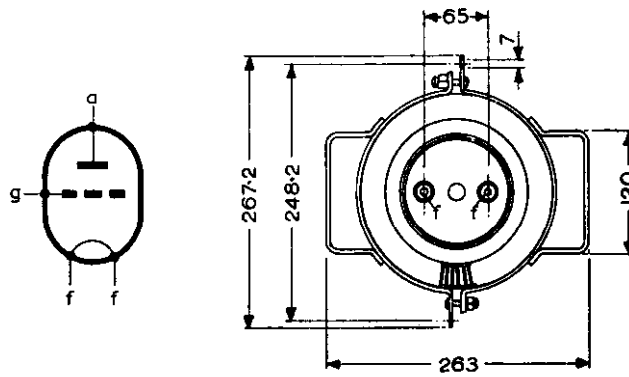
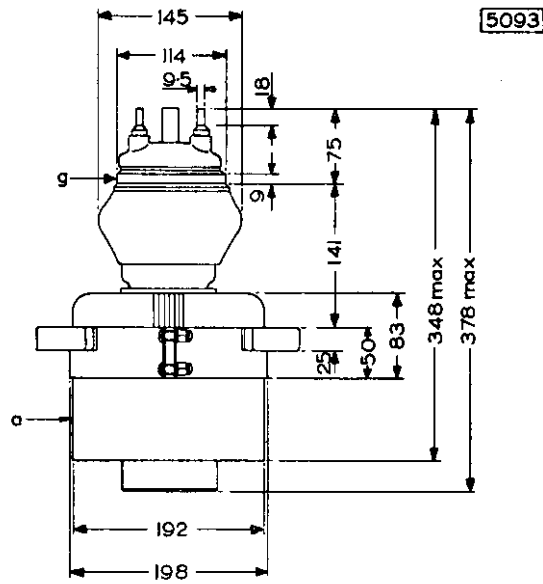
○

○

■

TRIODE

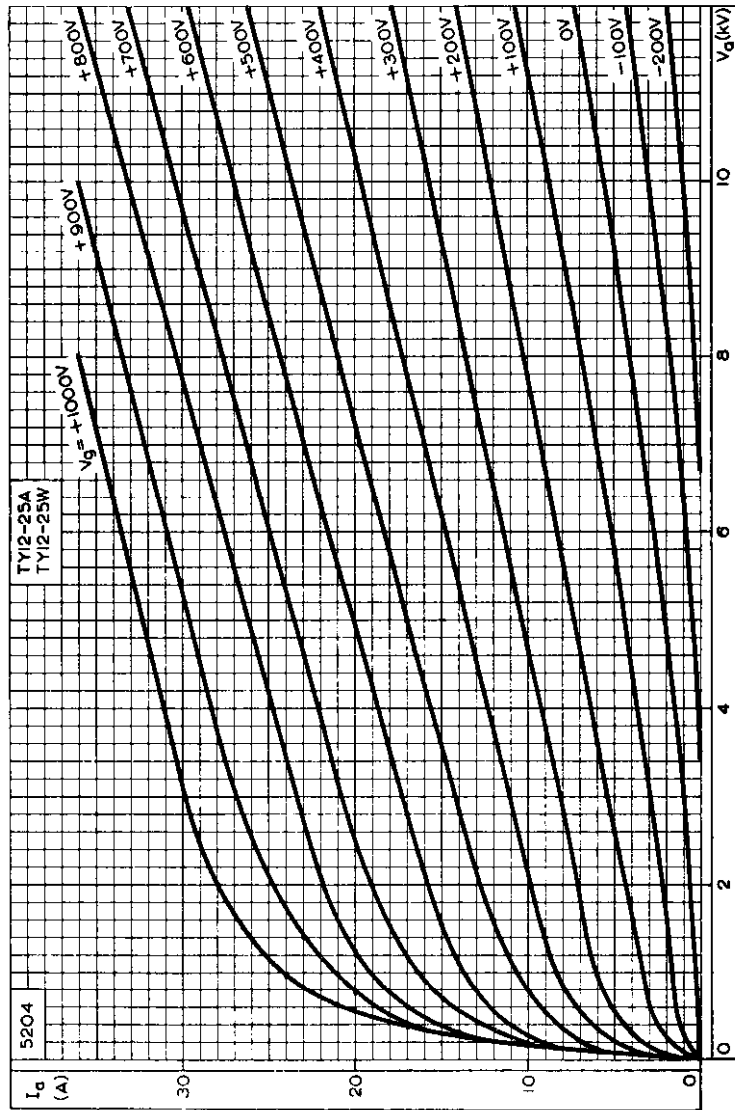
TY12-25A



All dimensions in mm

TY12-25A

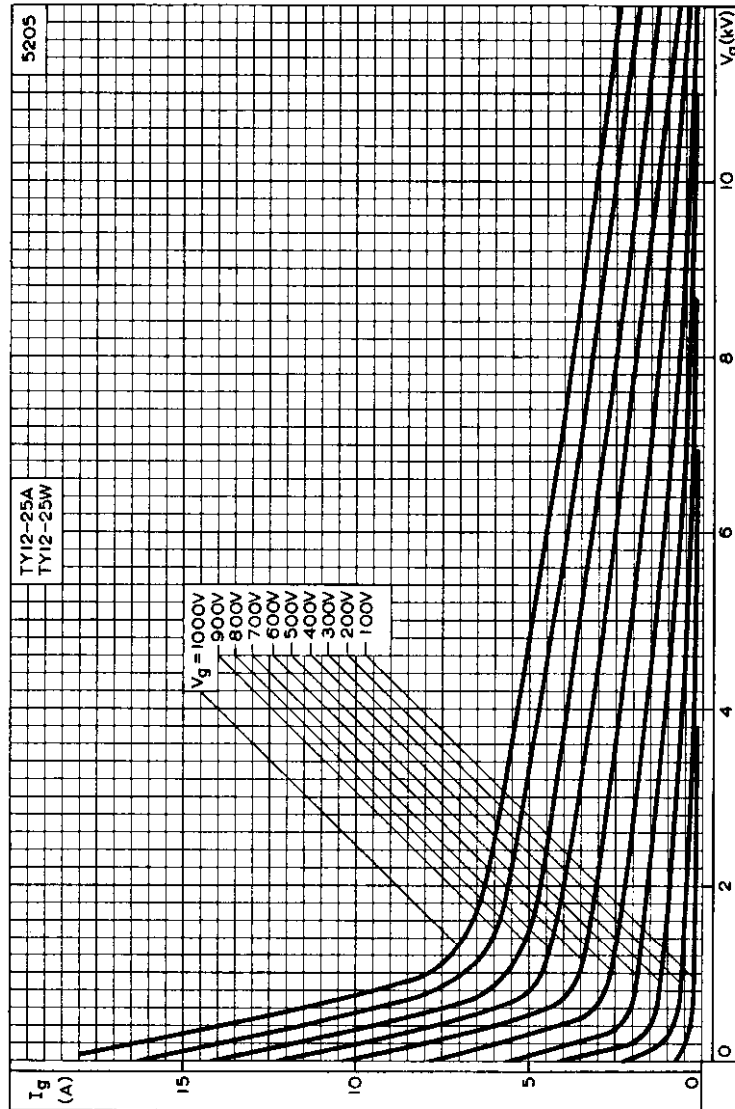
TRIODE



ANODE CURRENT PLOTTED AGAINST ANODE VOLTAGE WITH CONTROL-GRID VOLTAGE AS PARAMETER

TRIODE

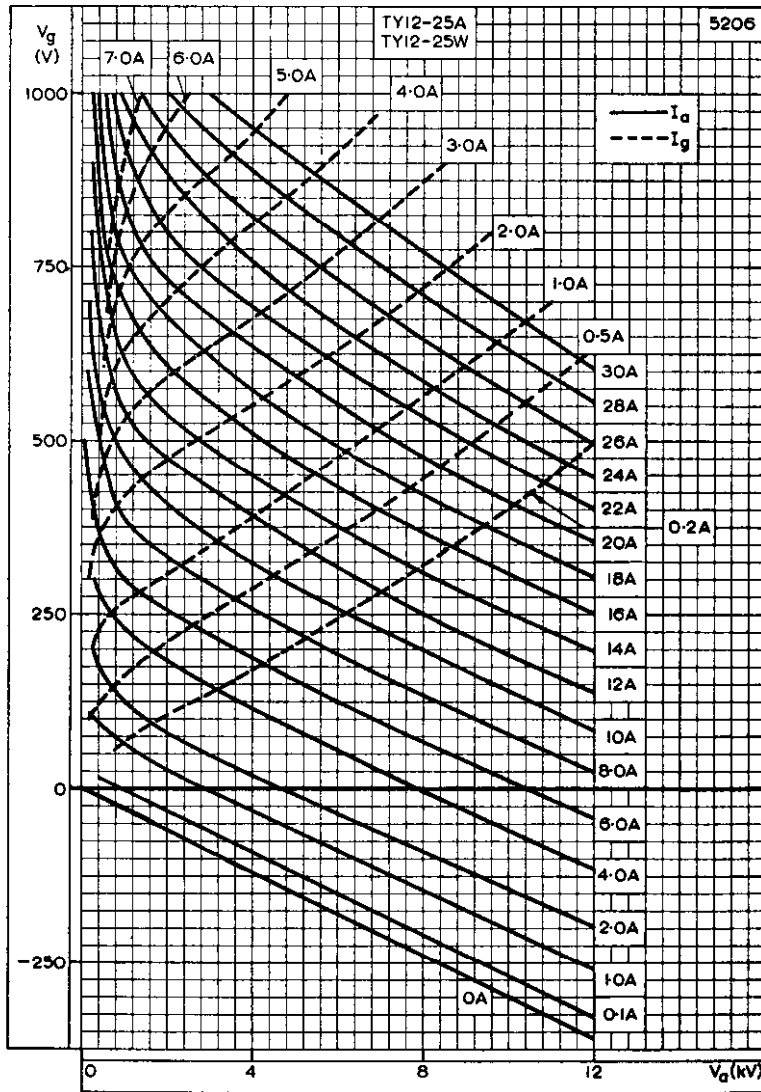
TY12-25A



CONTROL-GRID CURRENT PLOTTED AGAINST ANODE VOLTAGE WITH CONTROL-GRID VOLTAGE AS PARAMETER

TY12-25A

TRIODE



CONSTANT CURRENT CURVES



R. F. POWER TRIODE

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

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' (TY12-50W) (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

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 < 4Mc/s	15	15	-	15	kV
f < 15Mc/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	-	-	-	kΩ

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 = 10kV, I_a = 5A)

g _m	50	mA/V
μ	27	
g _m max. (at V _a = 3kV, I _a = 50A)	92	mA/V

MOUNTING POSITION

Vertical, anode down

R. F. POWER TRIODE

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

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 (kW)	Height above sea level (m)	Maximum inlet temperature (°C)	Minimum rate of air flow per minute (ft ³ (m ³))		Pressure difference between inlet and outlet (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.

TY12-50W and TY12-50H

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 (atm)
		(l/min)	(gal/min)	
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

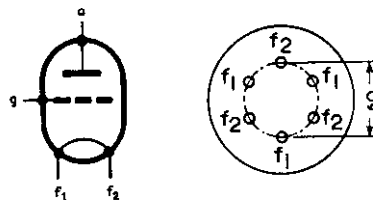
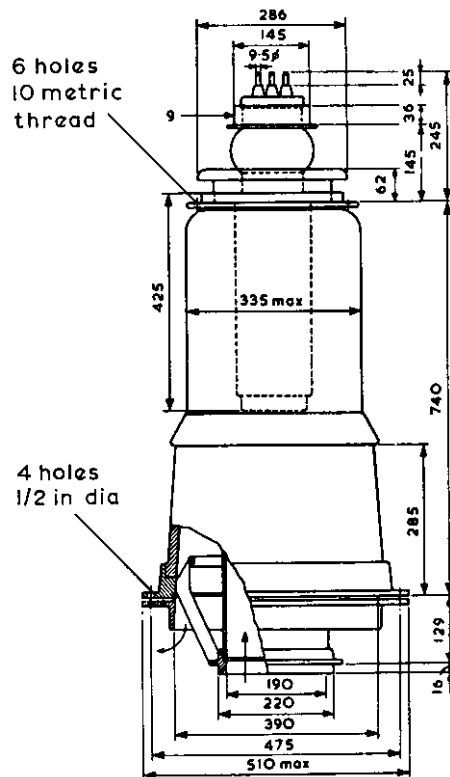
	TY12-50A	TY12-50W	TY12-50H	
Weight of valve	63	31	42	lb
	28.5	14	19	kg
Weight of water jacket	-	45	-	lb
	-	20.5	-	kg
Weight of cooler housing	159	-	-	lb
	72	-	-	kg
Weight of valve plus carton	214	180	-	lb
	97	82	-	kg

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



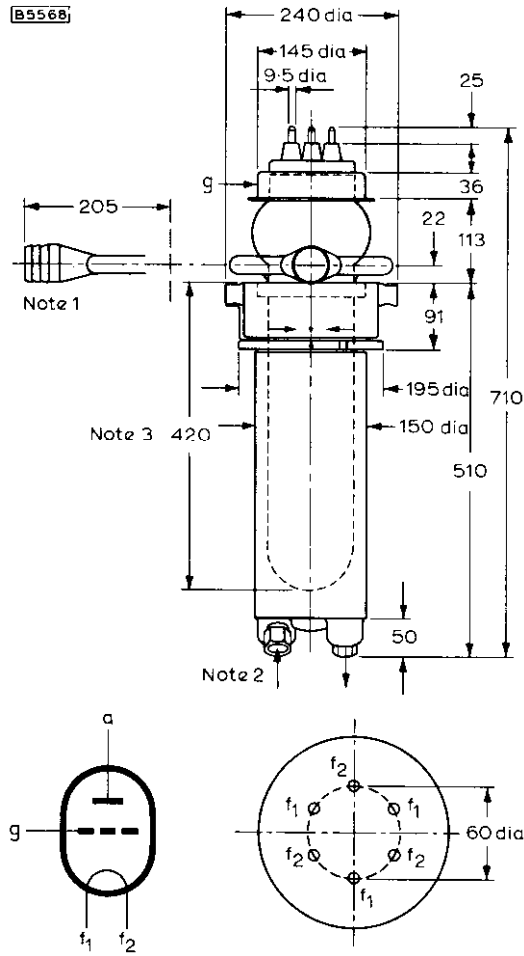
All dimensions in mm

B5619

R. F. POWER TRIODE

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

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

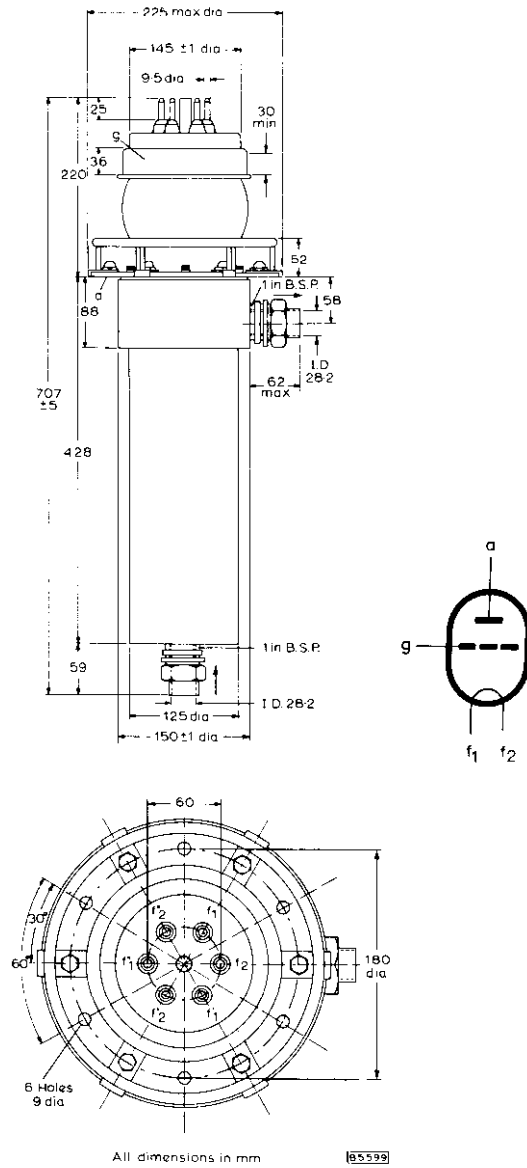


All dimensions in mm

Notes

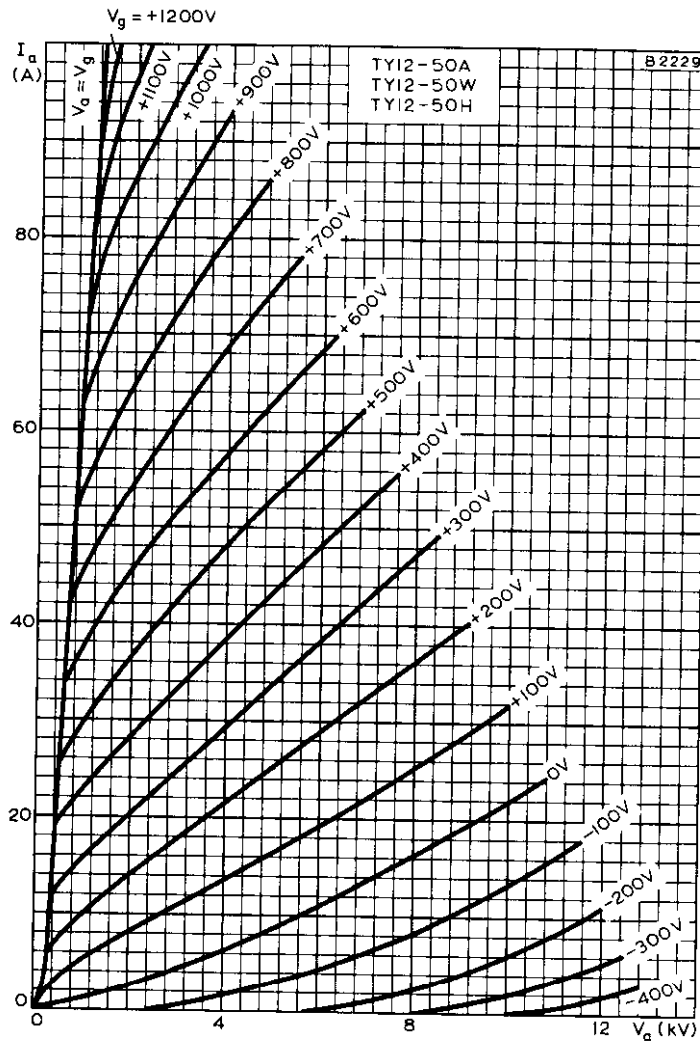
1. A connecting hose with an inner diameter of 44.5mm (1.75in) is required.
2. Coupling for metal tubing with an outer diameter of 28mm (1.10in).
3. To remove the valve from its water jacket a free height of 420mm (16.54in) above the valve is required.

OUTLINE DRAWING OF TY12-50H

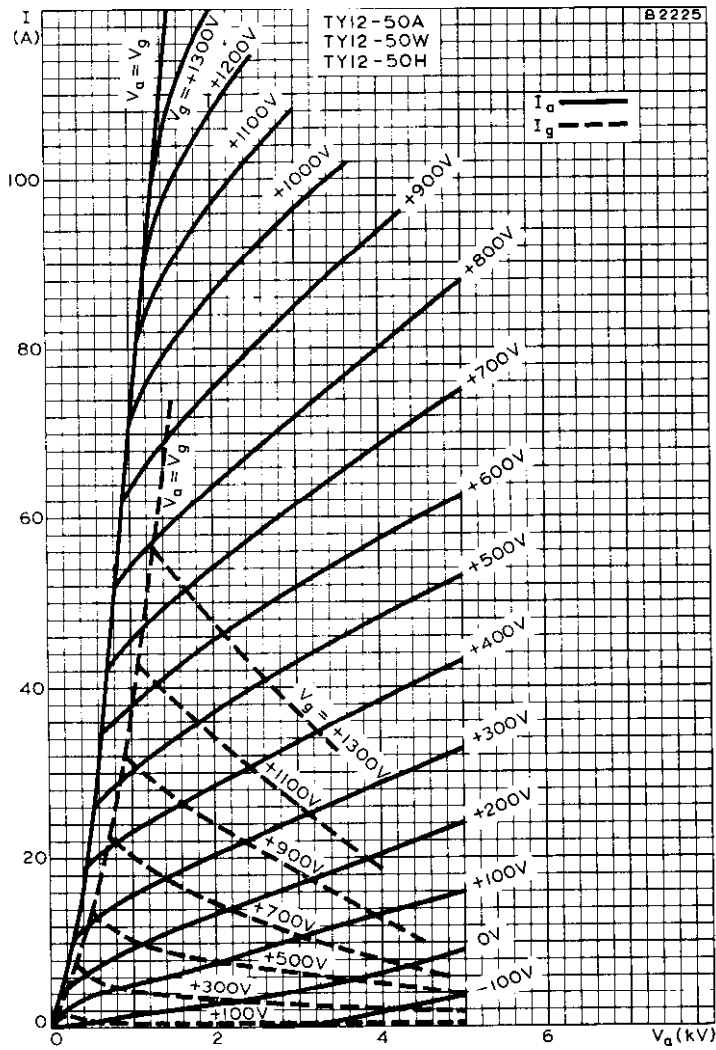


R. F. POWER TRIODE

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



ANODE CURRENT PLOTTED AGAINST ANODE VOLTAGE
WITH GRID VOLTAGE AS PARAMETER

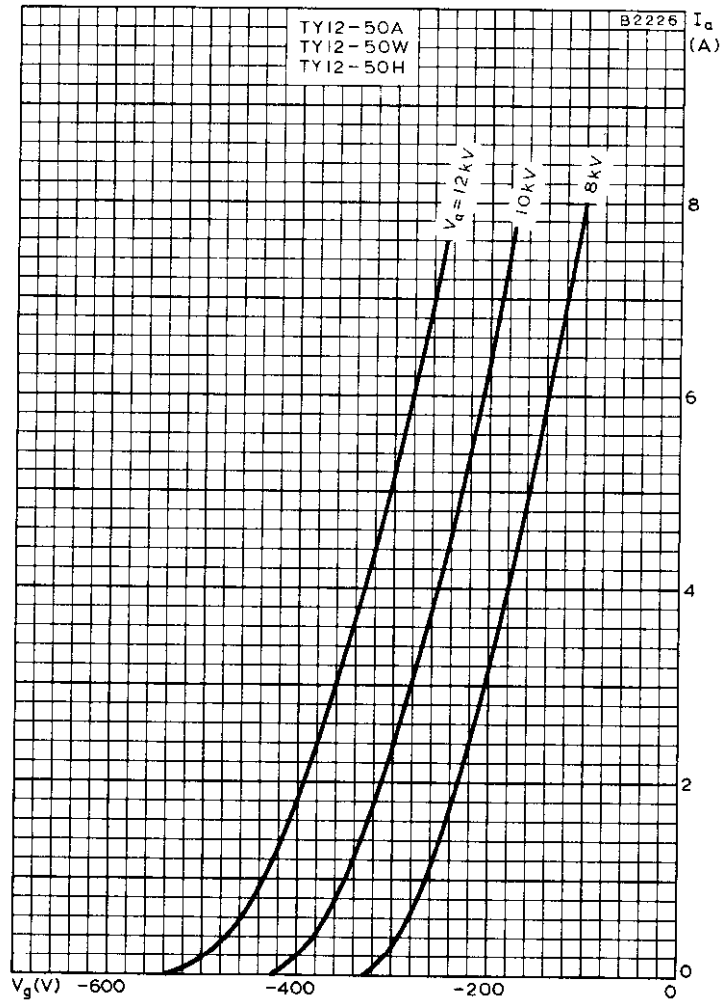


ANODE AND GRID CURRENT PLOTTED AGAINST ANODE VOLTAGE
 WITH GRID VOLTAGE AS PARAMETER



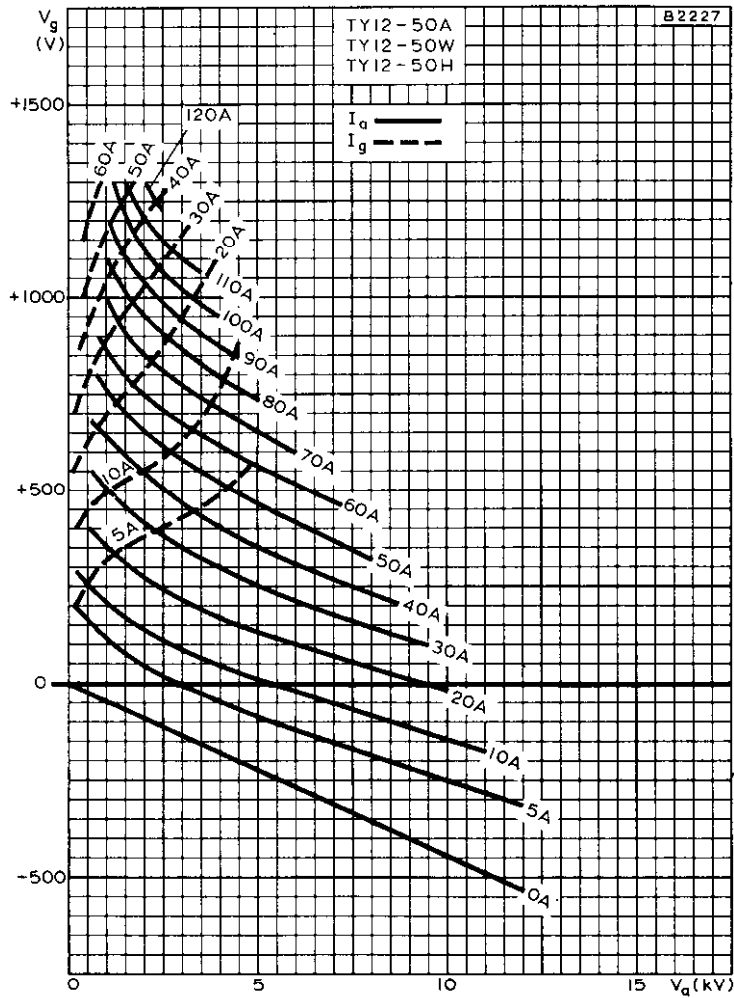
R. F. POWER TRIODE

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



ANODE CURRENT PLOTTED AGAINST GRID VOLTAGE
WITH ANODE VOLTAGE AS PARAMETER



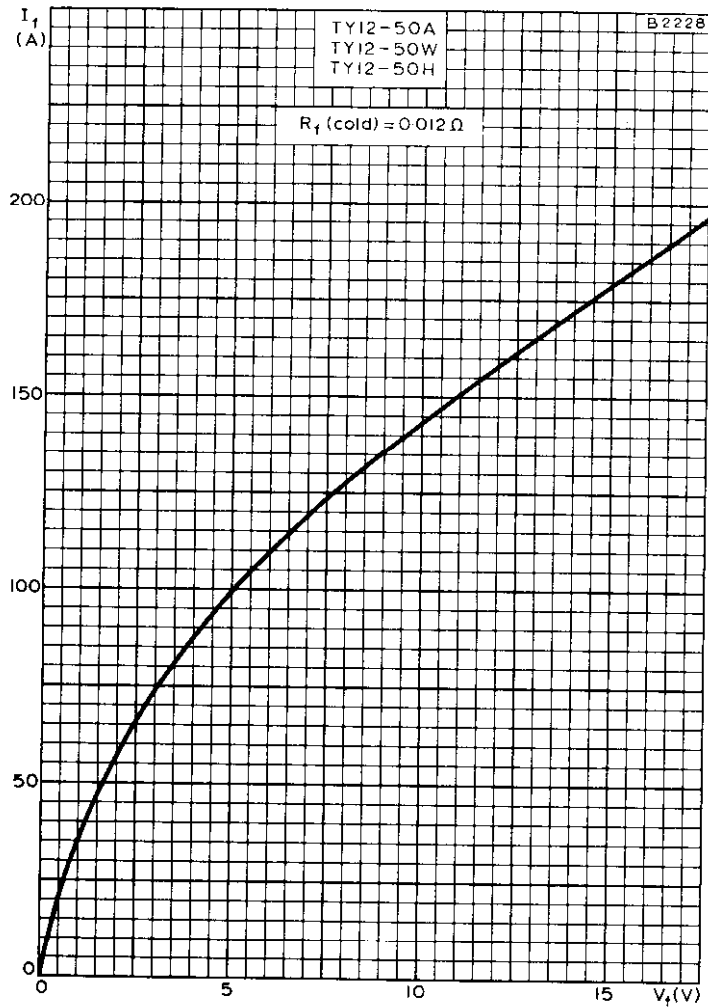


CONSTANT CURRENT CHARACTERISTICS



R. F. POWER TRIODE

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



FILAMENT CURRENT PLOTTED AGAINST FILAMENT VOLTAGE



()

()

(

(



R.F. POWER TRIODE

TY12-120W

PRELIMINARY DATA

QUICK REFERENCE DATA

External anode, water cooled triode for use as r.f. power amplifier or oscillator or a.f. power amplifier.

	Class 'C' telegraphy	Class 'C' industrial oscillator	Class 'B' A.F.	
f max.	30	30	—	Mc/s
V _a max.	15	15	12	kV
p _a max.	120	120	120	kW
Performance				
f	10	10	—	Mc/s
P _{out}	360	324	450	kW

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	18	V
I _f	280	A

MOUNTING POSITION

Vertical, anode down

CAPACITANCES

C _{a-g}	120	pF
C _{g-r}	240	pF
C _{a-r}	7.5	pF

CHARACTERISTICS

V _a	4.0	kV
I _a	5.0	A
g _m	130	mA/V
μ	55	

COOLING

Water cooled

T _{seals} max.	220	°C
-------------------------	-----	----



TY12-120W

R.F. POWER TRIODE

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 water flow and pressure loss in the jacket are given in the following table:

Anode dissipation P_a (kW)	Inlet temperature T_{in} (°C)	Minimum rate of water flow per minute		Pressure loss in jacket (atm)
		(litres)	(gal)	
30	20	28	6.2	0.02
30	50	41	9.0	0.04
60	20	56	12.3	0.07
60	50	82	18.0	0.14
90	20	86	19.0	0.16
90	50	128	28.2	0.32
120	20	120	26.4	0.28
120	50	179	41.6	0.59

At inlet temperatures between 20 and 50°C the required quantity of water can be found by linear interpolation.

CLASS 'C' TELEGRAPHY OR F.M. TELEPHONY

Absolute maximum ratings

f max.	30	10	Mc/s
V_a max.	12	15	kV
I_k max.	—	40	A
$i_{k(pk)}$ max.	—	150	A
$-V_g$ max.	—	1.2	kV
P_a max.	—	120	kW
P_E max.	—	4.0	kW

Typical operation, grounded cathode

f	10	10	30	30	Mc/s
V_a	15	15	12	12	kV
V_g	-520	-800	-480	-720	V
I_a	29.3	24.7	29.3	24.7	A
I_g	5.4	5.2	5.9	5.5	A
$V_{in(pk)}$	1.09	1.37	1.05	1.29	kV
$P_{load(driver)}$	5.5	6.6	5.7	6.6	kW
P_a	80	61	68	51	kW
η_a	81.8	83.5	80.8	82.6	%
P_{out}	360	310	285	245	kW
P_{load}	306	264	242	208	kW

R.F. POWER TRIODE

TY12-120W

Typical operation, grounded grid

f	10	10	30	30	Mc/s
V _a	15	15	12	12	kV
V _g	-520	-800	-480	-720	V
I _a	29.3	24.7	29.3	24.7	A
I _g	5.4	5.2	5.9	5.5	A
V _{in(pk)}	1.09	1.37	1.05	1.29	kV
P _{load(driver)}	5.5 + 27.5	6.6 + 29.7	5.7 + 26.5	6.6 + 28	kW
P _a	80	61	68	51	kW
η _a	81.8	83.5	80.8	82.6	%
P _{out}	360 + 27.5	310 + 29.7	285 + 26.5	245 + 28	kW
P _{load}	330	289	264	232	KW

CLASS 'C' ANODE MODULATION

Absolute maximum ratings carrier condition for a modulation factor of 1

f max.	30	Mc/s
V _a max.	11	kV
I _k max.	30	A
I _{k(pk)} max.	190	A
-V _g max.	1.0	kV
P _a max.	120	kW
P _g max.	4.0	kW

Typical operation, grounded cathode

f	30	30	30	Mc/s
V _a	11	10	8.0	kV
V _g (fixed)	-170	-140	-100	V
R _g	40	44	33	Ω
I _a	19	17.3	18	A
I _g	7.4	6.9	7.6	A
V _{in(pk)}	1000	930	855	V
P _a	44	38	34	kW
P _{load(driver)}	7.1	6.0	6.0	kW
P _{out}	165	135	110	kW
η _a	79	78	76.5	%
P _{load}	140	115	93.5	kW
For 100% modulation				
P _{mod}	105	87	72	kW



TY12-120W

R.F. POWER TRIODE

Typical operation, grounded grid

f	30	30	30	Mc/s
V _a	11	10	8.0	kV
V _g (fixed)	-170	-140	-100	V
R _k	40	44	33	Ω
I _a	19	17.3	18	A
I _g	7.4	6.9	7.6	A
V _{in(pk)}	1000	930	855	V
P _a	44	38	34	kW
P _{load(driver)}	7.1+15.1	6.0+17.7	6.0+12	kW
P _{out}	165+15.1	135+12.7	110+12	kW
η _a	79	78	76.5	%
P _{load}	153	128	104	kW
For 100% modulation				
P _{mod}	114	95	80	kW

INDUSTRIAL OPERATION AS CLASS 'C' OSCILLATOR

Absolute maximum ratings

f max.	30	10	Mc/s
V _a max.	12	15	kV
V _g max.		1.2	kV
I _k max.		40	A
I _{k(pk)} max.		150	A
P _a max.		120	kW
P _g max.		4.0	kW

Typical operation

f	30	10	10	Mc/s
V _a	11	14	15	kV
I _a	26	22	26	A
I _g	5.5	5.0	5.0	A
R _{g-t}	91	160	140	Ω
R _a	255	343	322	Ω
Feedback ratio $\frac{V_{in(pk)}}{V_a(pk)}$	0.1	0.1	0.09	
P _{drive}	6.0	6.7	5.8	kW
P _a	58	52	66	kW
P _{out}	228	256	324	kW
P _{out} (less P _{drive})	222	249	318	kW
η _a	80	83	83	%
P _{load}	200	225	280	kW

R.F. POWER TRIODE

TY12-120W

CLASS 'B' A.F.

Absolute maximum ratings

V_a max.	12	kV
I_k max.	35	A
$I_{k(pk)}$ max.	120	A
$-V_g$ max.	800	V
P_a max.	120	kW
P_g max.	4.0	kW

Typical operation for two valves in push-pull

V_a	6.0	8.0	10	12	kV
V_g	-82	-115	-150	-180	V
R_{a-a}	268	338	410	552	Ω
$I_{a(r)}$	2×1.4	2×1.6	2×1.8	2×2.0	A
I_a (max. sig.)	2×25	2×27	2×28	2×26	A
$V_{ln(g-g)}$ r.m.s.	990	1110	1205	1210	V
P_a	2×50	2×66	2×80	2×87	kW
η_a	67	69.5	71.4	72	%
P_{out}	200	300	400	450	kW

PHYSICAL DATA

Weight of valve	$\left. \begin{matrix} 32.5 \\ 72 \end{matrix} \right\}$	kg lb
Weight of valve plus carton	$\left. \begin{matrix} 71 \\ 157 \end{matrix} \right\}$	kg lb
Dimensions of carton	$\left\{ \begin{matrix} 875 \times 840 \times 1500 \\ 34.4 \times 33.1 \times 59.1 \end{matrix} \right.$	mm in

ACCESSORIES

Water jacket	K723
Filament clips	40667
Grid connector	40668
Support	40669

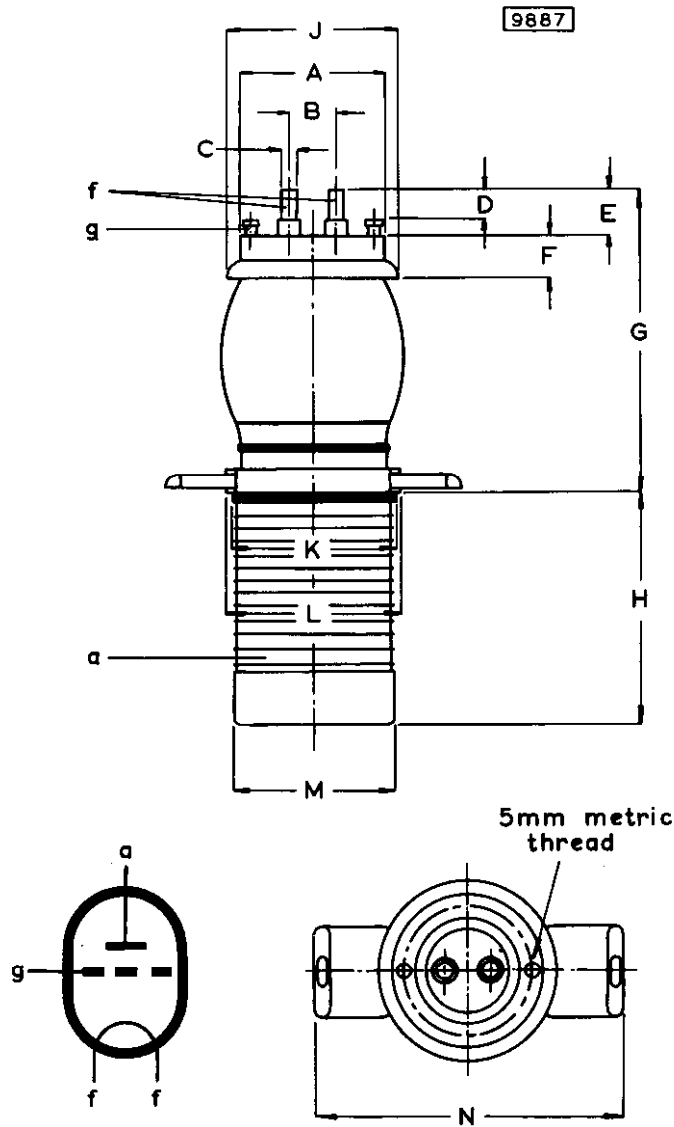
DIMENSIONS

	Inches	Millimetres
A	7.05	179
B	1.97	50
C	0.79	20
D	1.38	35
E	1.97	50
F	1.77	45
G	14.02 ± 0.39	356 ± 10
H	11.22 ± 0.20	285 ± 5
J	8.27	210
K	7.68	195
L	8.58	218
M	7.36	187
N	14.6	370



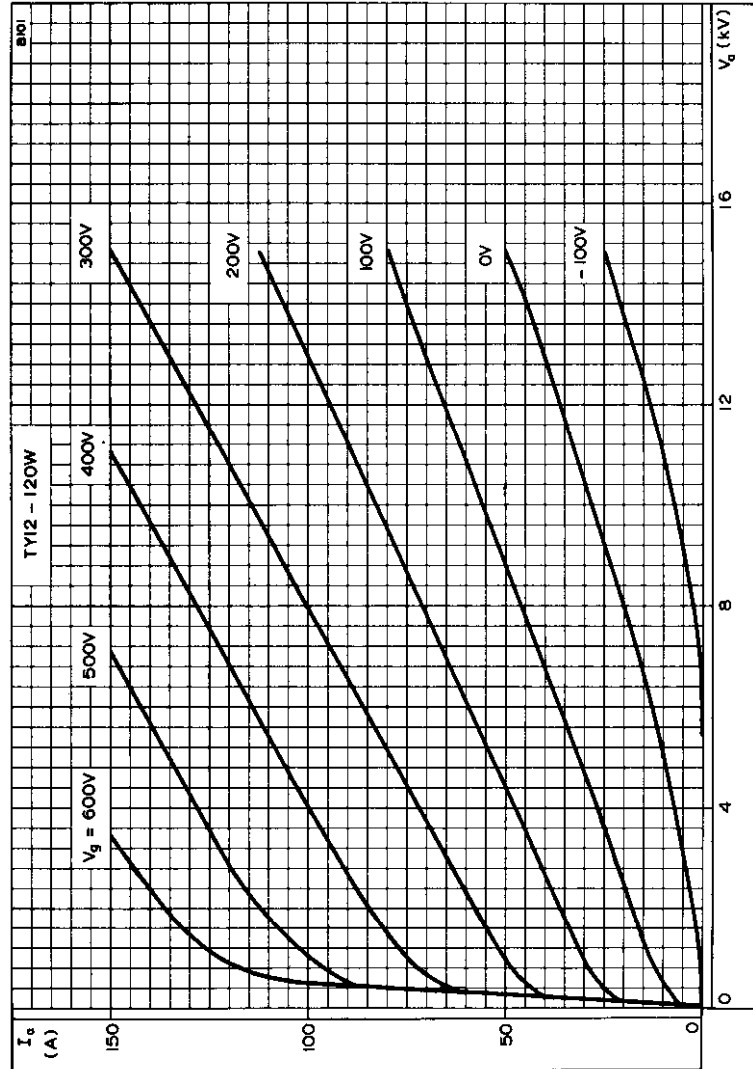
TY12-120W

R.F. POWER TRIODE



R.F. POWER TRIODE

TY12-120W

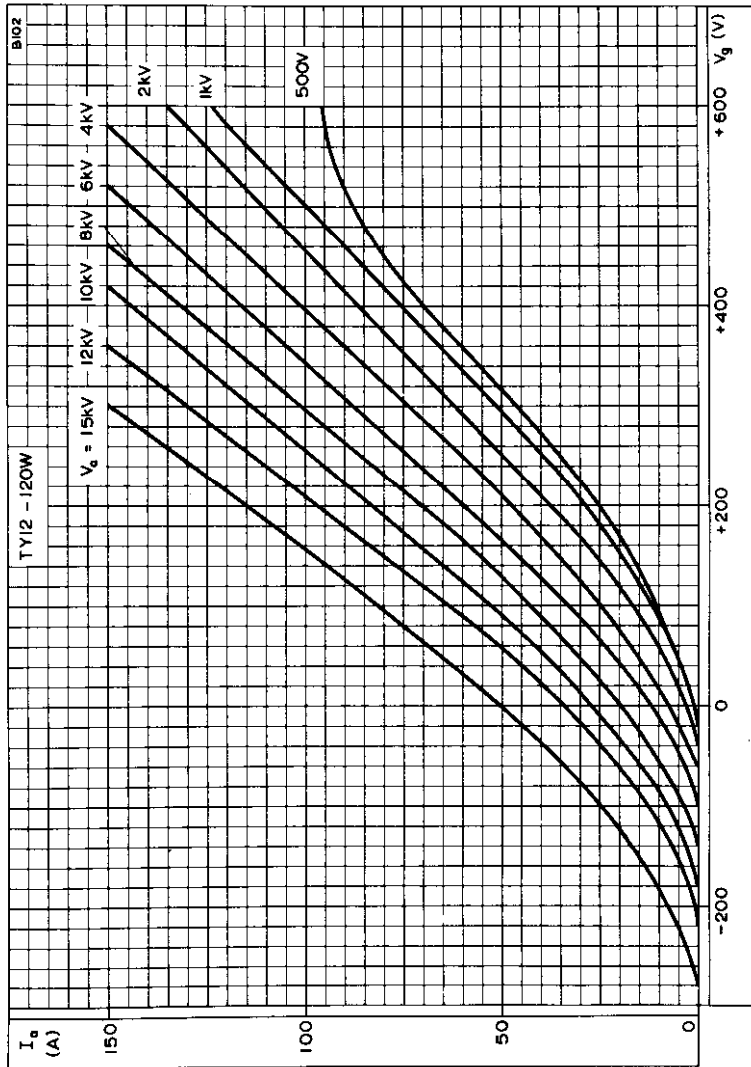


ANODE CURRENT PLOTTED AGAINST ANODE VOLTAGE



TY12-120W

R.F. POWER TRIODE

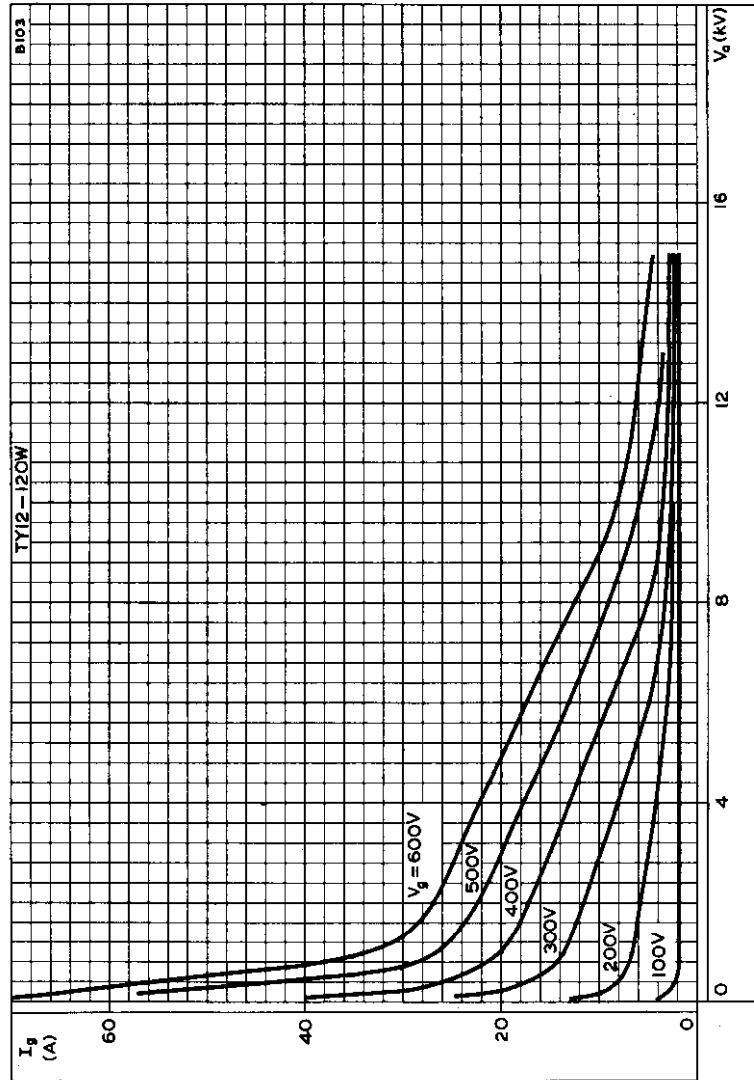


ANODE CURRENT PLOTTED AGAINST GRID VOLTAGE



R.F. POWER TRIODE

TY12-120W

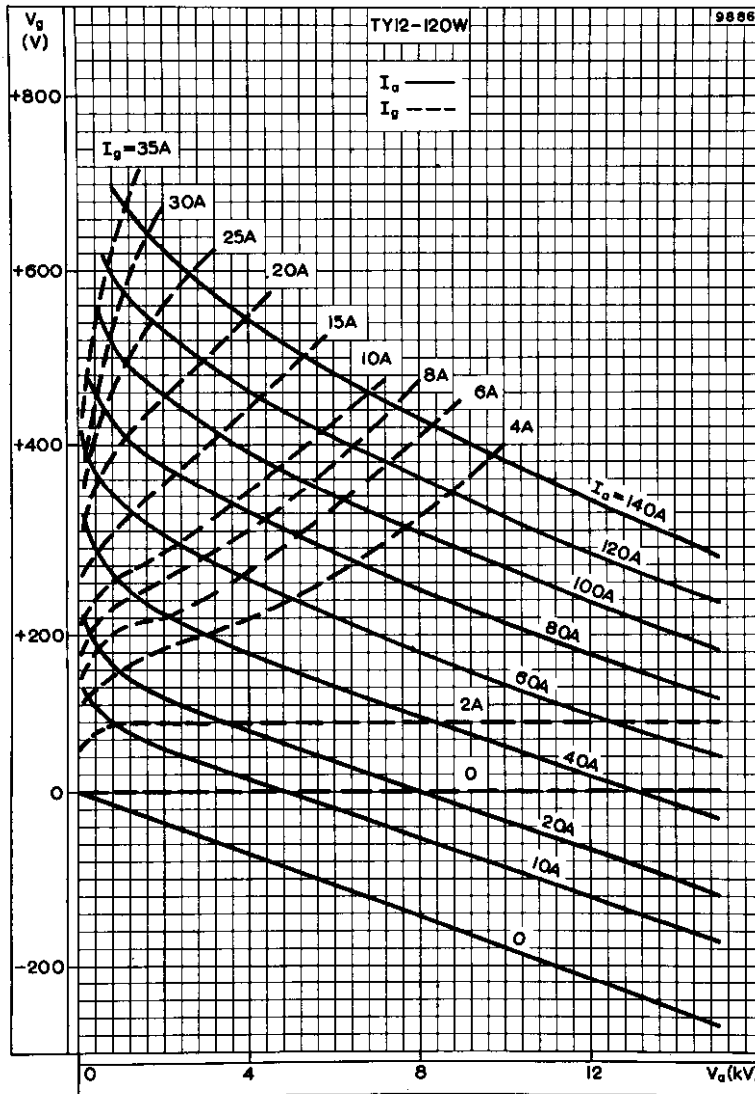


GRID CURRENT PLOTTED AGAINST ANODE VOLTAGE



TY12-120W

R.F. POWER TRIODE



CONSTANT CURRENT CURVES



R.F. POWER TRIODE

TYS5-3000

R.F. power triode in silica envelope, rated for an anode dissipation of 3.5 kW. Primarily intended as a self-excited oscillator in R.F. heating equipment, but also suitable for use as R.F. amplifier in transmitting or industrial equipment.

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

FILAMENT

Thoriated tungsten suitable for use on a.c. or d.c. supply.

V_f	20.5	V
I_f (approx.)	26	A

MOUNTING POSITION

This valve must be operated in the vertical position with the filament leads downward.

CAPACITANCES

C_{a-g}	35	$\mu\mu\text{F}$
C_{a-f}	3.5	$\mu\mu\text{F}$
C_{g-f}	25	$\mu\mu\text{F}$

CHARACTERISTICS (At $V_a = 5.0\text{kV}$; $I_a = 800\text{mA}$)

g_m	15	mA/V
μ	32	
r_a	2.1	$\text{k}\Omega$

LIMITING VALUES (Absolute Ratings)

V_a max. (natural cooling of seals)	6.0	kV
p_a max.	3.5	kW
I_g max. (at max. p_a)	400	mA
I_k max.	2.8	A
f max. for above ratings	12	Mc/s
* V_a max. (at 20 Mc/s with natural cooling)	4.0	kV
T_a max. (at hottest part of anode)	950	$^{\circ}\text{C}$

*A small fan directed towards the terminals will allow this voltage to be raised to its maximum value.

LIMITING CONDITIONS AS CLASS "C" AMPLIFIER WITH NATURAL COOLING

f	3.0	Mc/s
V_a	6.0	kV
V_g	-550	V
I_a	2.33	A
I_g	350	mA
$V_{in(pk)}$	1.1	kV
η	75	%
p_a	3.5	kW
P_{out}	10.5	kW

TYS5-3000

R.F. POWER TRIODE

R.F. power triode in silica envelope, rated for an anode dissipation of 3.5 kW. Primarily intended as a self-excited oscillator in R.F. heating equipment, but also suitable for use as R.F. amplifier in transmitting or industrial equipment.

RECOMMENDED OPERATING CONDITIONS AS CLASS "C" SELF-EXCITED OSCILLATOR FOR A DIELECTRIC HEATER

A ventilating fan providing some cooling of the anode seals and a non-regulated supply are assumed.

f	20	Mc/s
V_a	6.0	kV
I_a	1.5	A
R_{g-r}	2.2	k Ω
I_g	250	mA
$V_{in(pk)}$	950	V
η	70	%
P_a	2.7	kW
P_{out}	6.3	kW
* P_{load}	5.0	kW

*Assuming a circuit transfer efficiency of approximately 85%.

RECOMMENDED OPERATING CONDITIONS AS CLASS "C" SELF-EXCITED OSCILLATOR IN AN INDUCTION HEATER

This is suitable for repetition work on a short duty cycle and with a non-regulated supply.

f	450	kc/s
V_a	6.0	kV
I_a	2.0	A
R_{g-r}	1.7	k Ω
I_g	320	mA
$V_{in(pk)}$	1.0	kV
η	76	%
P_a	2.9	kW
P_{out}	9.1	kW
* P_{load}	7.0	kW

*Assuming a circuit transfer efficiency of approximately 80%.

WEIGHT

Valve only

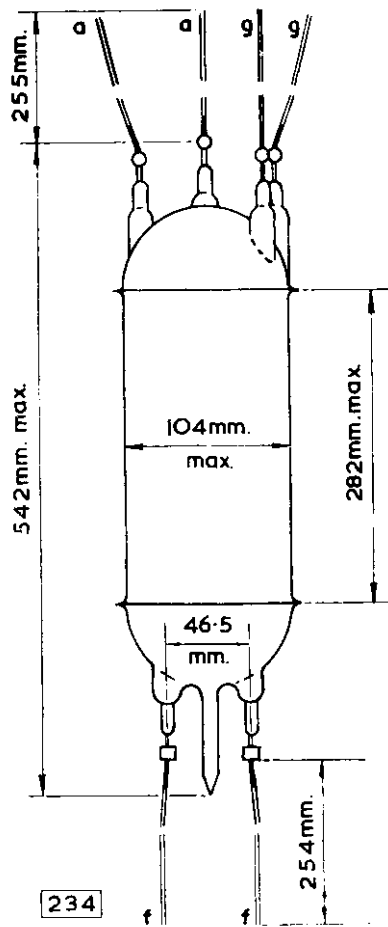
{ 2 lb. 14 oz.
1.3 kg.



R.F. POWER TRIODE

TYSS-3000

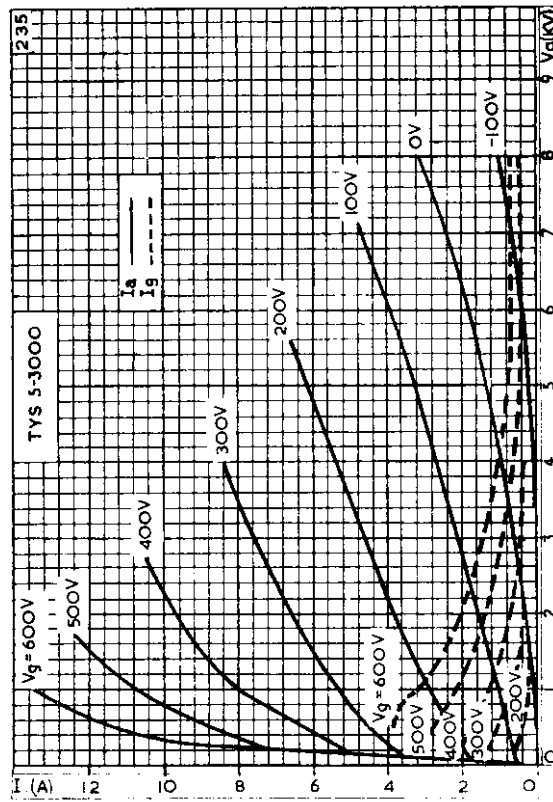
R.F. power triode in silica envelope, rated for an anode dissipation of 3.5 kW. Primarily intended as a self-excited oscillator in R.F. heating equipment, but also suitable for use as R.F. amplifier in transmitting or industrial equipment.



TYS5-3000

R.F. POWER TRIODE

R.F. power triode in silica envelope, rated for an anode dissipation of 3.5 kW. Primarily intended as a self-excited oscillator in R.F. heating equipment, but also suitable for use as R.F. amplifier in transmitting or industrial equipment.

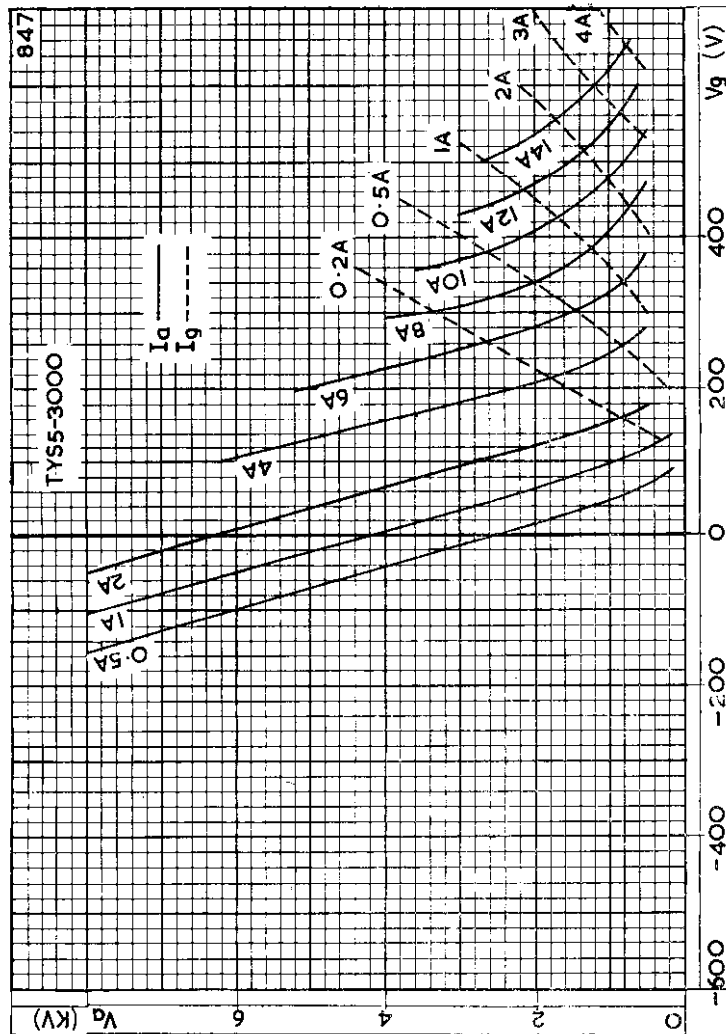


ANODE AND GRID CURRENT PLOTTED AGAINST ANODE VOLTAGE

R.F. POWER TRIODE

R.F. power triode in silica envelope, rated for an anode dissipation of 3.5 kW. Primarily intended as a self-excited oscillator in R.F. heating equipment, but also suitable for use as R.F. amplifier in transmitting or industrial equipment.

TY55-3000



CONSTANT CURRENT CURVES.

1

(D)

(D)

(D)

(D)

■

V.H.F. INDUSTRIAL TRIODES

YD1150
YD1151
YD1152

QUICK REFERENCE DATA

External anode triodes of ceramic-metal construction, intended for use as industrial oscillators.

The YD1150 is forced-air cooled.

The YD1151 is water-cooled by means of a separate jacket.

The YD1152 has an integral helical water cooler.

f	160	27.12	MHz
P _{out} (less P _{drive})	3.55	4.57	kW
f max.	160		MHz
V _a max.		7.2	kV
p _a max.	2.5		kW

Unless otherwise shown, data is applicable to all types

To be read in conjunction with

GENERAL OPERATIONAL RECOMMENDATIONS - TRANSMITTING VALVES

INDUSTRIAL OSCILLATOR, CLASS 'C'

OPERATING CONDITIONS

f	160	27.12	27.12	MHz
P _{out}	3.9	4.9	4.0	kW
P _{out} (less P _{drive})	3.55	4.57	3.75	kW
P _{load}	3.1	3.7	3.3	kW
Duty factor	1.0	1.0	1.0	
η_a	78	82	80	%
V _a	5.0	6.0	5.0	kV
I _a	1.0	1.0	1.0	A
-V _g	520	625	520	V
I _g	260	250	260	mA
R _{g-f}	2.0	2.5	2.0	k Ω
Feedback ratio $v_{in(pk)}/v_{a(pk)}$	0.17	0.17	0.17	
P _{drive}	350	330	250	W
p _a	1.1	1.1	1.0	kW
p _g	120	110	100	W
V _f	6.0	6.3	6.3	V



RATINGS (ABSOLUTE MAXIMUM SYSTEM)

f max.	85	160	MHz
V_a max.	7.2	6.0	kV
$-V_g$ max.	1.0	1.0	kV
I_g max. on load	280	280	mA
I_g off load	400	400	mA
I_k max.	1.4	1.4	A
$i_{k(pk)}$ max.	7.5	7.5	A
P_{in} max.	6.5	6.0	kW
p_a max.	2.5	2.5	kW
p_g max.	150	150	W
R_{g-f} max.	20	20	k Ω

CATHODE

Directly heated, thoriated tungsten

V_f (≤ 120 MHz)	6.3	V
V_f (> 120 MHz)	6.0	V
I_f (measured at 6.3V)	33	A

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

CAPACITANCES

c_{a-g}	14	pF
c_{a-f}	400	mpF
c_{g-f}	17	pF

CHARACTERISTICS (measured at $V_a = 2.0$ kV, $I_a = 0.5$ A)

g_m	10	mA/V
μ	20	

MOUNTING POSITION - YD1150, YD1152 Vertical, anode up or down
 - YD1151 Vertical, anode down

COOLING

Maximum temperature of ceramic-metal seals 220 °C

YD1150 - Forced-air cooled. See curves on page C4

YD1151 - Anode water cooled using jacket type K713

Seals - low velocity air flow may be required

See curves on page C5

YD1152 - Anode water cooled with integral helical cooler

Seals - low velocity air flow may be required

See curves on page C6



V.H.F. INDUSTRIAL TRIODES

YD1150
YD1151
YD1152

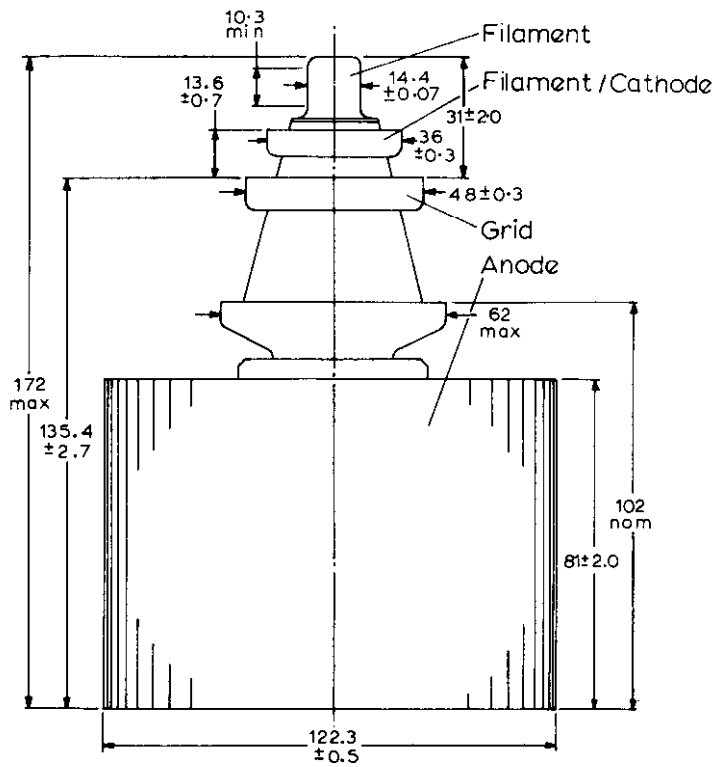
PHYSICAL DATA

	YD1150	YD1151	YD1152	
Weight of valve	6.6	1.4	1.9	lb
	3.0	0.65	0.85	kg

ACCESSORIES

Filament clip	40688
Filament/cathode clip	40689
Grid connector (f < 30MHz)	40686
Insulating pedestal (YD1150)	40630
Water jacket (YD1151)	K713





All dimensions in mm

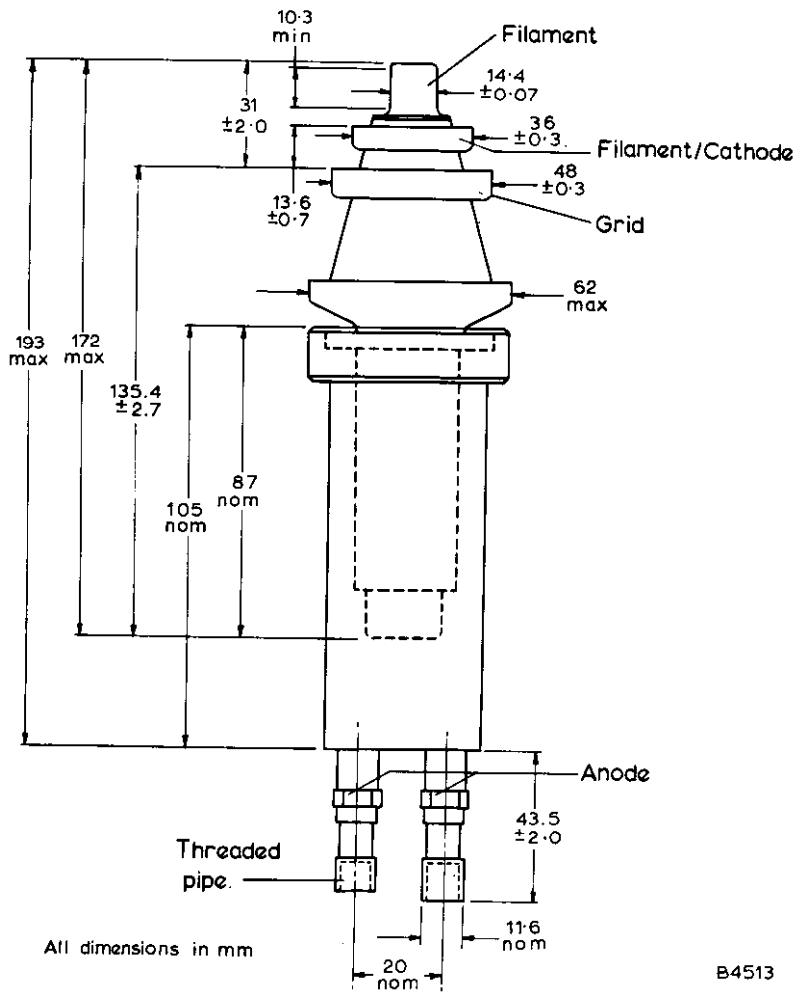
B6713

OUTLINE DRAWING OF YD1150

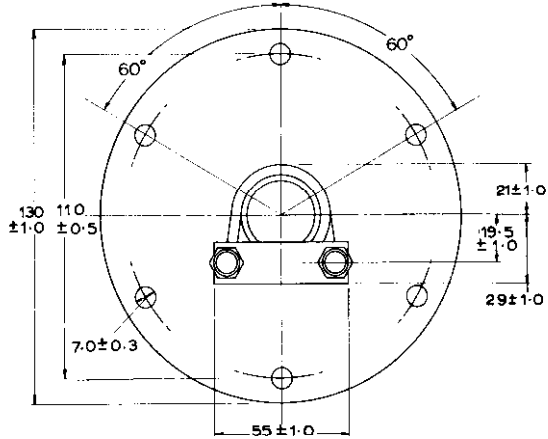
**V.H.F. INDUSTRIAL
TRIODES**

**YD1150
YD1151
YD1152**

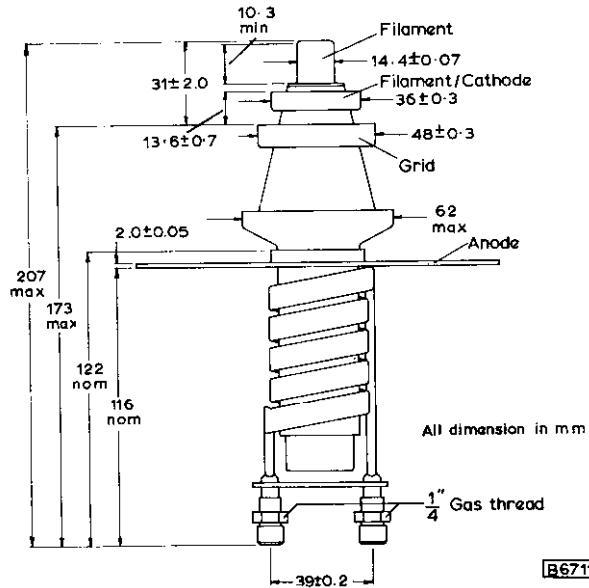
OUTLINE DRAWING OF YD1151 MOUNTED IN WATER JACKET K713



OUTLINE DRAWING OF YD1152

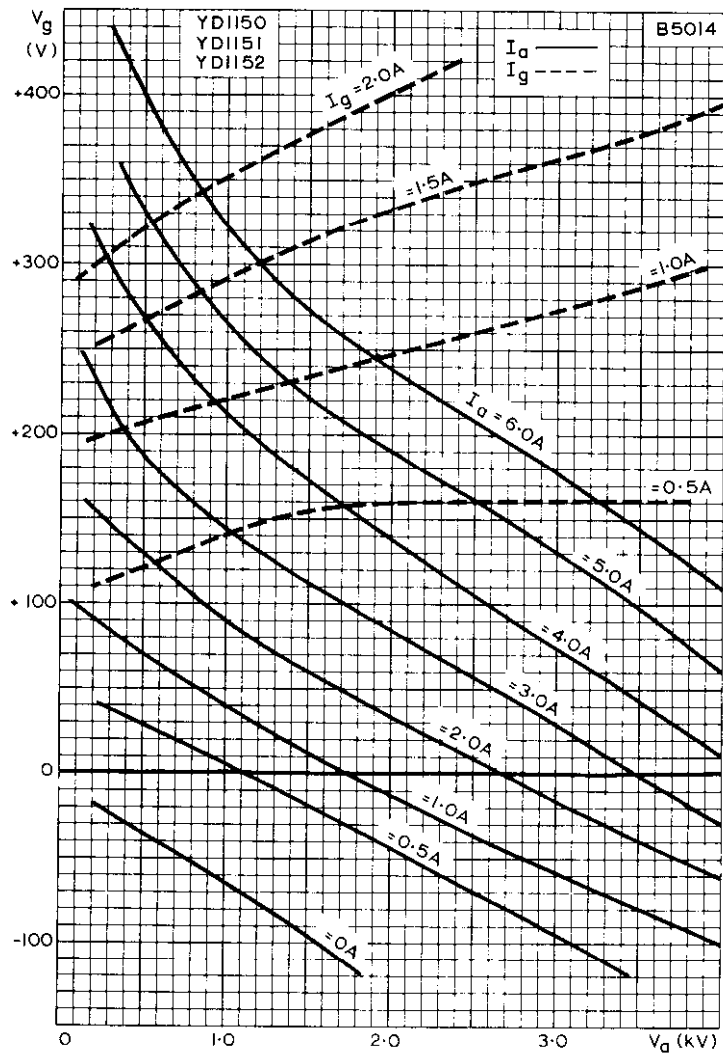


The use of wing nuts
should be avoided



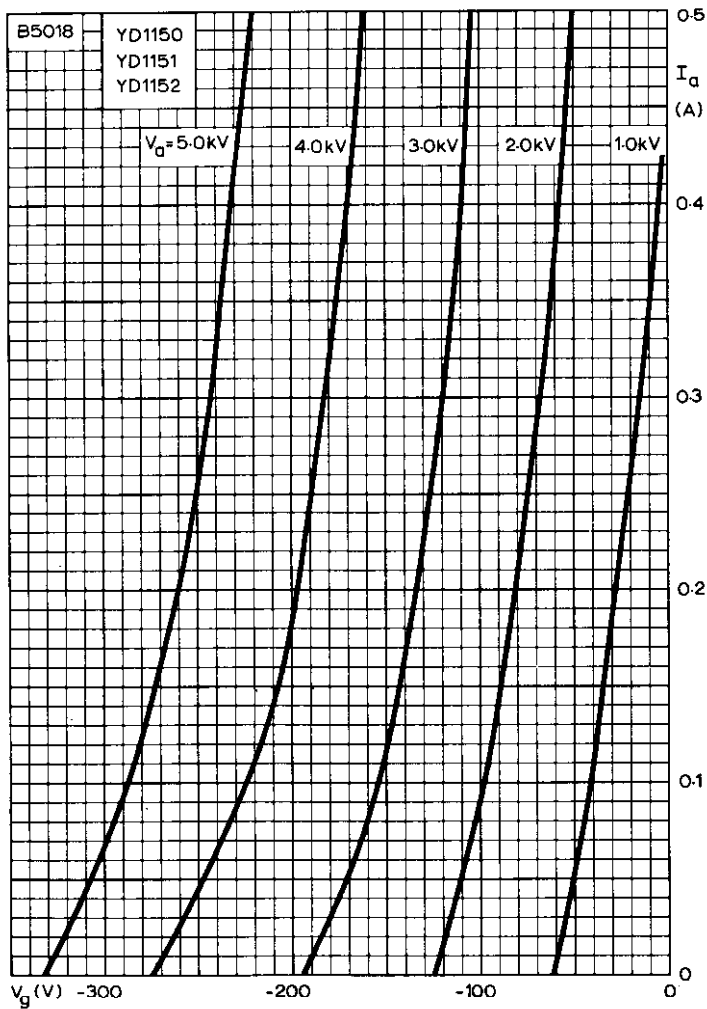
**V.H.F. INDUSTRIAL
TRIODES**

**YD1150
YD1151
YD1152**



CONSTANT CURRENT CHARACTERISTICS



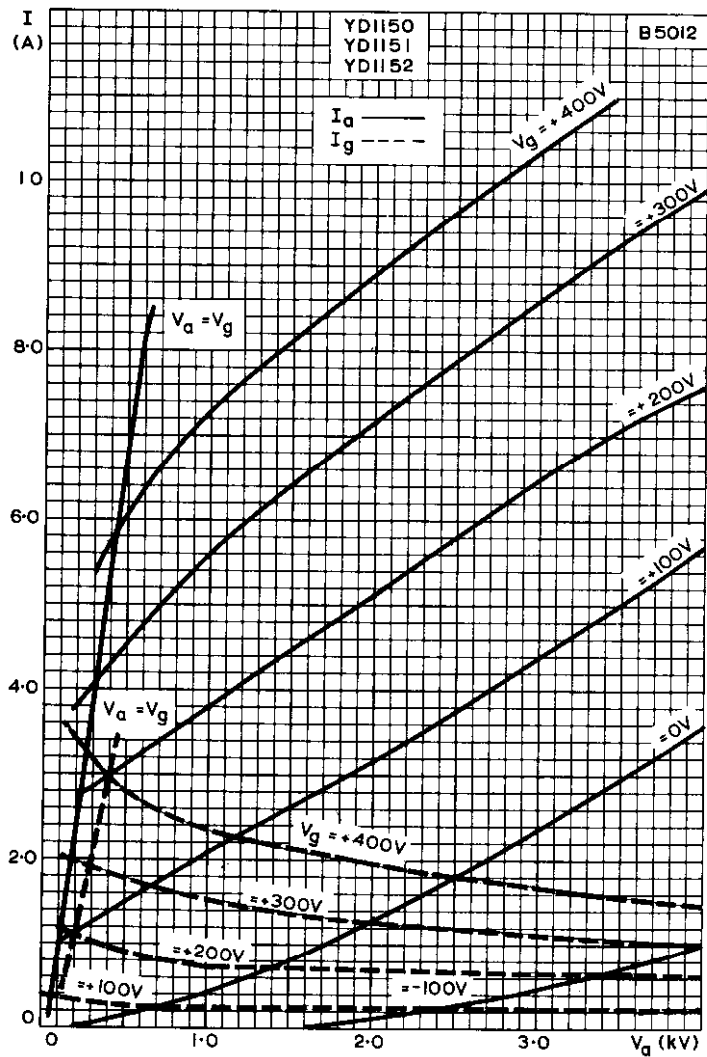


ANODE CURRENT PLOTTED AGAINST GRID VOLTAGE WITH ANODE VOLTAGE AS PARAMETER



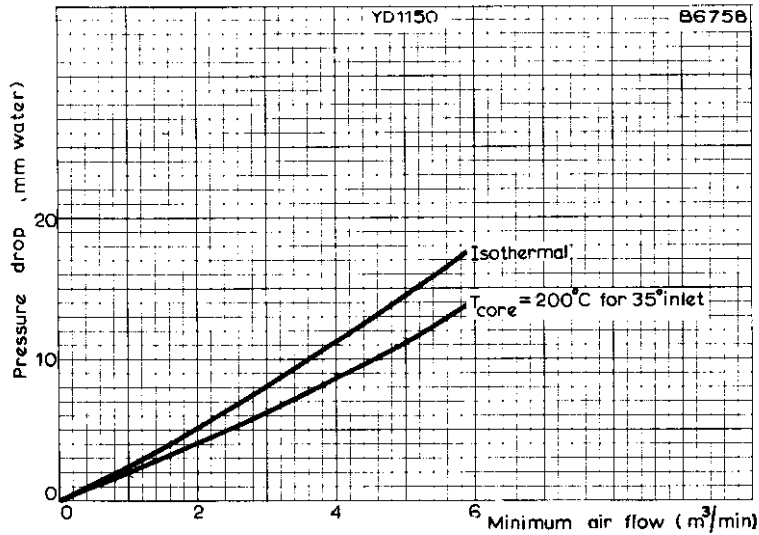
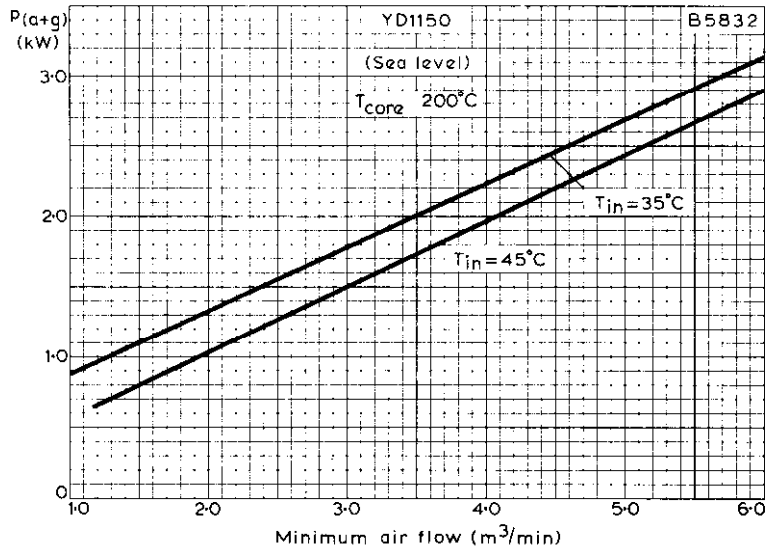
**V.H.F. INDUSTRIAL
TRIODES**

**YD1150
YD1151
YD1152**



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



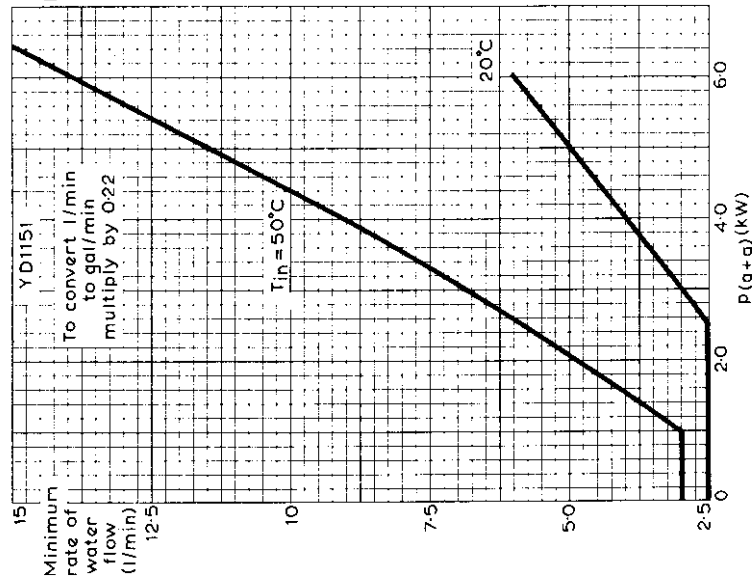
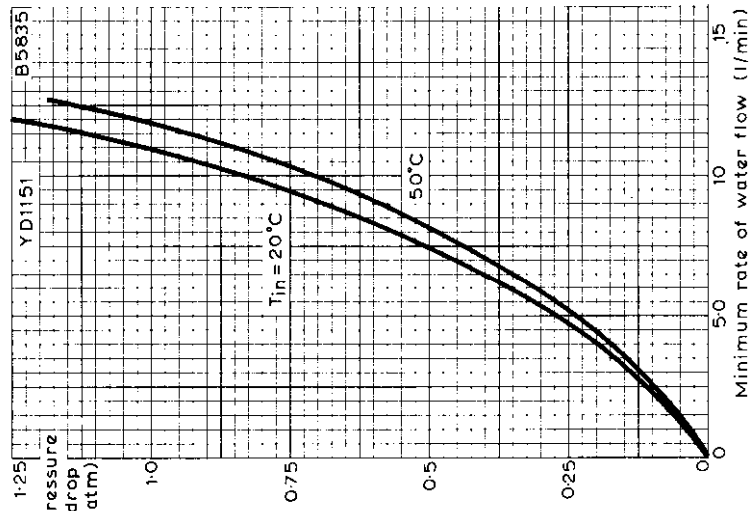


MINIMUM COOLING REQUIREMENTS AT SEA LEVEL WITH AIR INLET TEMPERATURES OF 35 AND 45°C AND A CORE TEMPERATURE OF 200°C

PRESSURE DROP PLOTTED AGAINST MINIMUM AIR FLOW FOR AN ISOTHERMAL CONDITION AND FOR A RISE IN CORE TEMPERATURE OVER INCOMING AIR OF 165°C

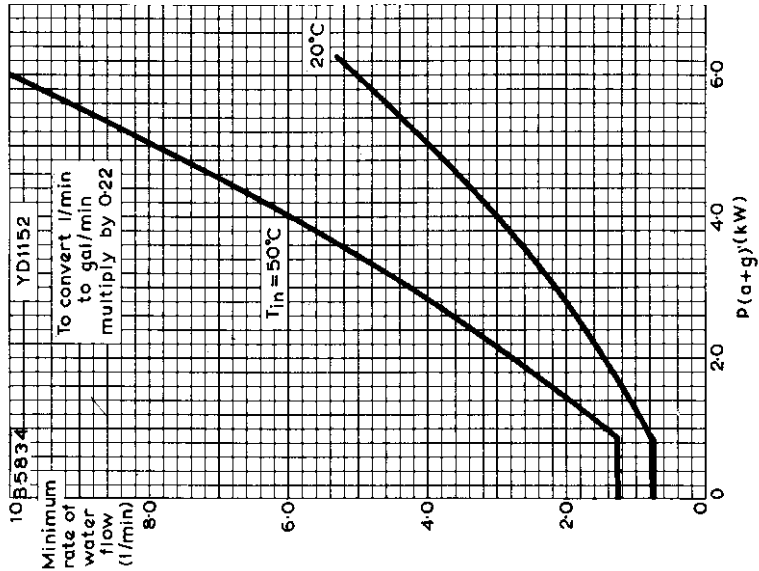
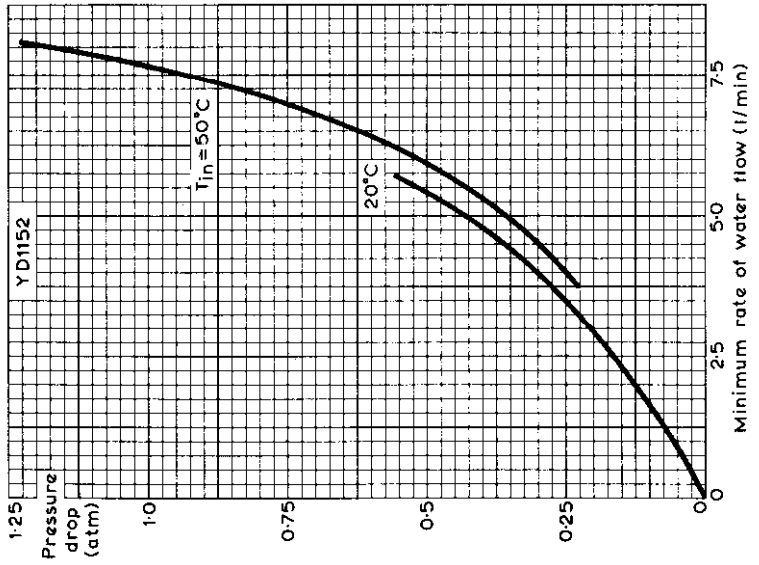
**V.H.F. INDUSTRIAL
TRIODES**

**YD1150
YD1151
YD1152**



MINIMUM RATE OF WATER FLOW PLOTTED AGAINST ANODE AND GRID
DISSIPATION FOR $T_{in} = 20$ AND 50°C
PRESSURE DROP PLOTTED AGAINST MINIMUM RATE OF WATER FLOW
FOR $T_{in} = 20$ AND 50°C





MINIMUM RATE OF WATER FLOW PLOTTED AGAINST ANODE AND GRID DISSIPATION FOR $T_{in} = 20$ AND $50^{\circ}C$
 PRESSURE DROP PLOTTED AGAINST MINIMUM RATE OF WATER FLOW FOR $T_{in} = 20$ AND $50^{\circ}C$



V.H.F. INDUSTRIAL TRIODES

YD1160
YD1161
YD1162

QUICK REFERENCE DATA

External anode triode, ceramic-metal construction, intended for use as class 'C' industrial oscillator.

The YD1160 is forced-air cooled.

The YD1161 is water cooled by means of a separate jacket.

The YD1162 has an integral helical water cooler.

f	27.12	150	MHz
P _{out} (less P _{drive})	8.8	7.15	kW
f max.	150		MHz
V _a max.	7.2		kV
p _a max.	5.0		kW

Unless otherwise shown, data is applicable to all types

To be read in conjunction with

GENERAL OPERATIONAL RECOMMENDATIONS - TRANSMITTING VALVES

INDUSTRIAL OSCILLATOR, CLASS 'C'

f	27.12	27.12	150	MHz
P _{out}	7.9	9.2	7.5	kW
P _{out} (less P _{drive})	7.5	8.8	7.15	kW
P _{load}	6.4	7.5	6.4*	kW
Duty factor	1.0	1.0	1.0	
η_a	82.5	78.5	75.5	%
V _a	6.0	6.5	5.0	kV
I _a	1.6	1.8	2.0	A
-V _g	615	690	480	V
I _g on load	480	430	480	mA
off load	600	580	650	mA
R _{g-f}	1.3	1.6	1.0	k Ω
Feedback ratio $v_{in(pk)}/v_{a(pk)}$	0.15	0.16	0.15	
P _{drive}	400	400	350	W
P _a	1.7	2.5	2.45	kW
P _g	120	110	100	W
V _f	6.3	6.3	5.8	V

*In typical cavity circuit.



RATINGS (ABSOLUTE MAXIMUM SYSTEM)

	≤85	≤150	MHz
f			
V _a max.	7.2	6.0	kV
P _{in} max.	12.5	11.0	kW
-V _g max.	1.0	1.0	kV
I _g max. on load	550	550	mA
off load	750	750	mA
I _k max.	2.8	2.8	A
i _{k(pk)} max.	15	15	A
p _a max.	5.0	5.0	kW
p _g max.	250	250	W
R _{g-f} max.	20	20	kΩ

CATHODE

Directly heated, thoriated tungsten

*V _f		6.3	V
I _f		66	A

*It is recommended that the filament voltage be reduced to 5.8V at 150MHz operating frequency.

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

CAPACITANCES

c _{a-g}		19	pF
c _{a-f}		0.5	pF
c _{g-f}		16	pF

CHARACTERISTICS (measured at V_a = 2.0kV, I_a = 1.0A)

g _m		22	mA/V
μ		20	

MOUNTING POSITION - YD1160, YD1162
 - YD1161

Vertical, anode up or down
Vertical, anode down ←

COOLING

Maximum temperature of ceramic-metal seals 220 °C

YD1160 - Forced air cooled. See curves on pages C4 and C5

YD1161 - Anode - water cooled using jacket type K713

Seals - low velocity air flow may be required

See curves on page C6

YD1162 - Anode - water cooled with integral helical cooler

Seals - low velocity air flow may be required

See curves on page C7



**V.H.F. INDUSTRIAL
TRIODES**

**YD1160
YD1161
YD1162**

PHYSICAL DATA

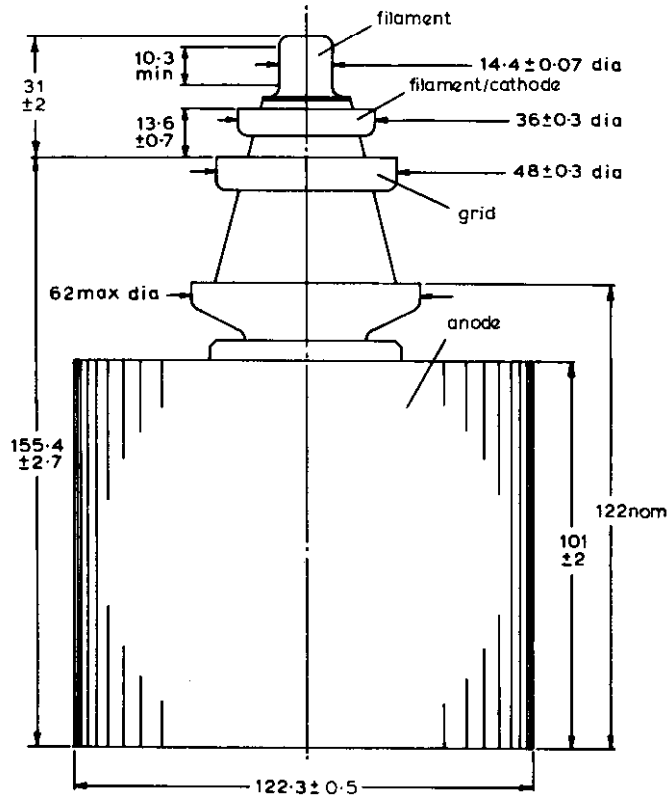
	YD1160	YD1161	YD1162	
Weight of valve	8.5	1.5	2.3	lb
	3.9	0.66	1.03	kg
Weight of insulating pedestal	4.6	-	-	lb
	2.1	-	-	kg
Weight of insulating pedestal plus carton	6.8	-	-	lb
	3.1	-	-	kg
Weight of water jacket	-	1.6	-	lb
	-	0.73	-	kg

ACCESSORIES

Filament connector	40688
Filament/cathode connector (f < 30MHz)	40689
Grid connector (f ≈ 30MHz)	40686
(f > 30MHz)	40687 ←
Insulating pedestal × 1 (YD1160)	40630
Water jacket × 1 (YD1161)	K726

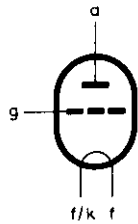


OUTLINE DRAWING OF YD1160



All dimensions in mm

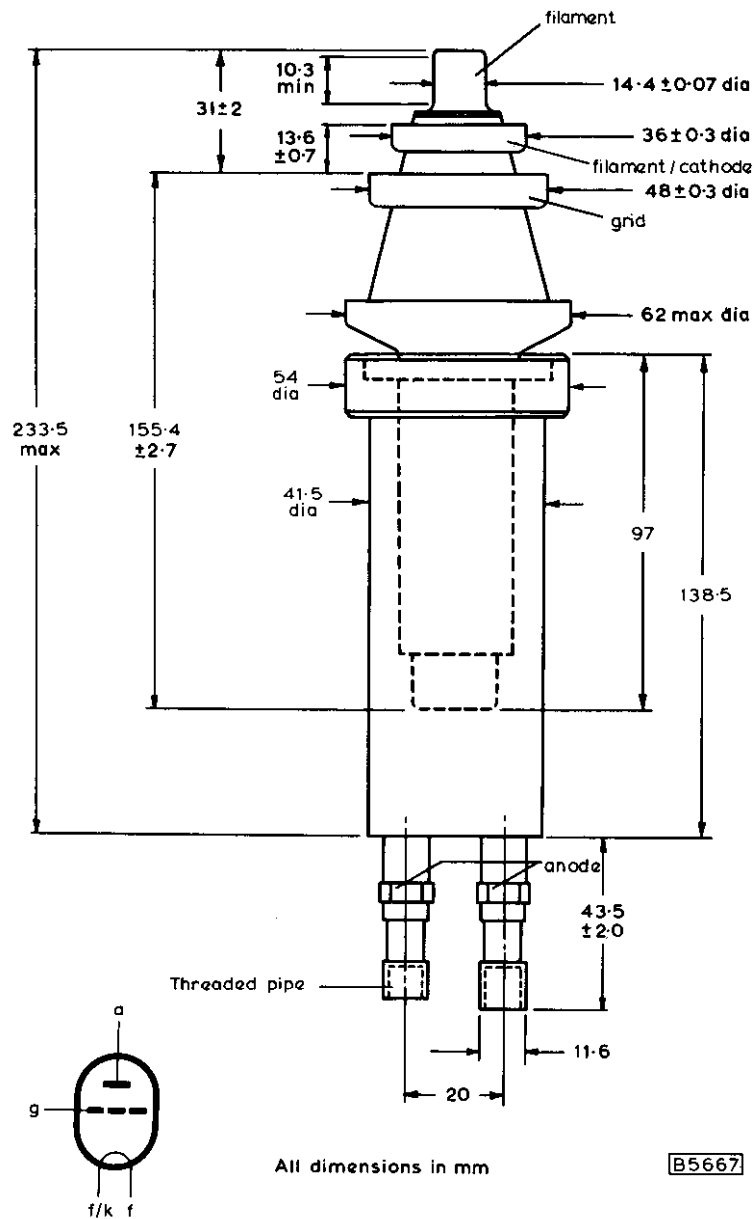
B5632



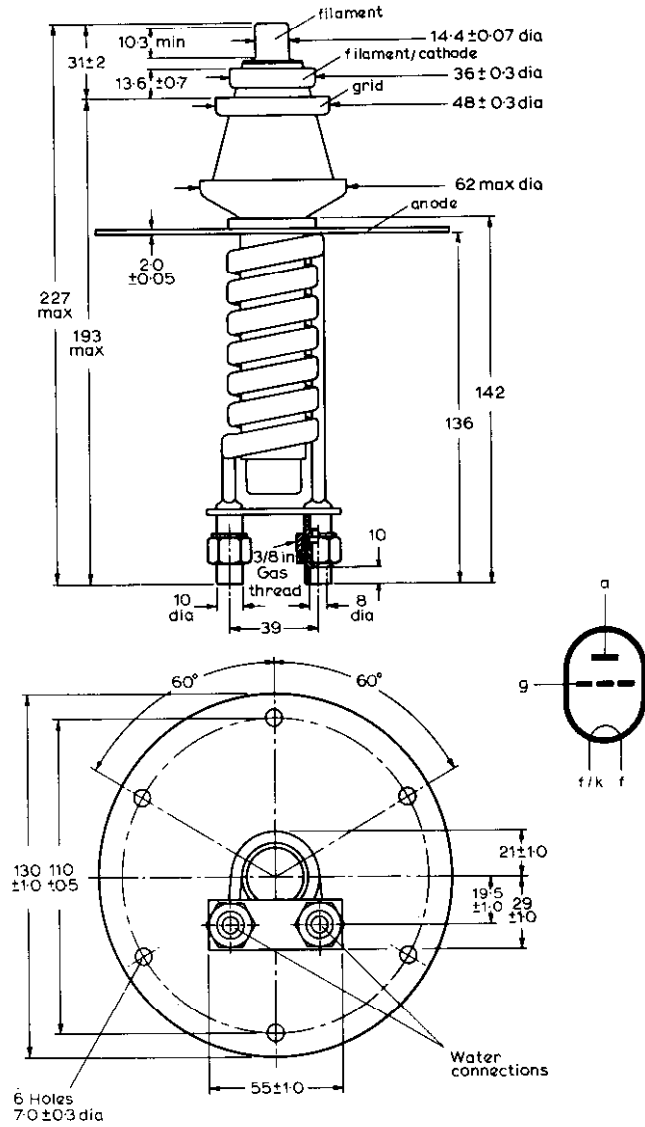
**V.H.F. INDUSTRIAL
TRIODES**

**YD1160
YD1161
YD1162**

OUTLINE DRAWING OF YD1161 MOUNTED IN WATER JACKET K726



OUTLINE DRAWING OF YD1162



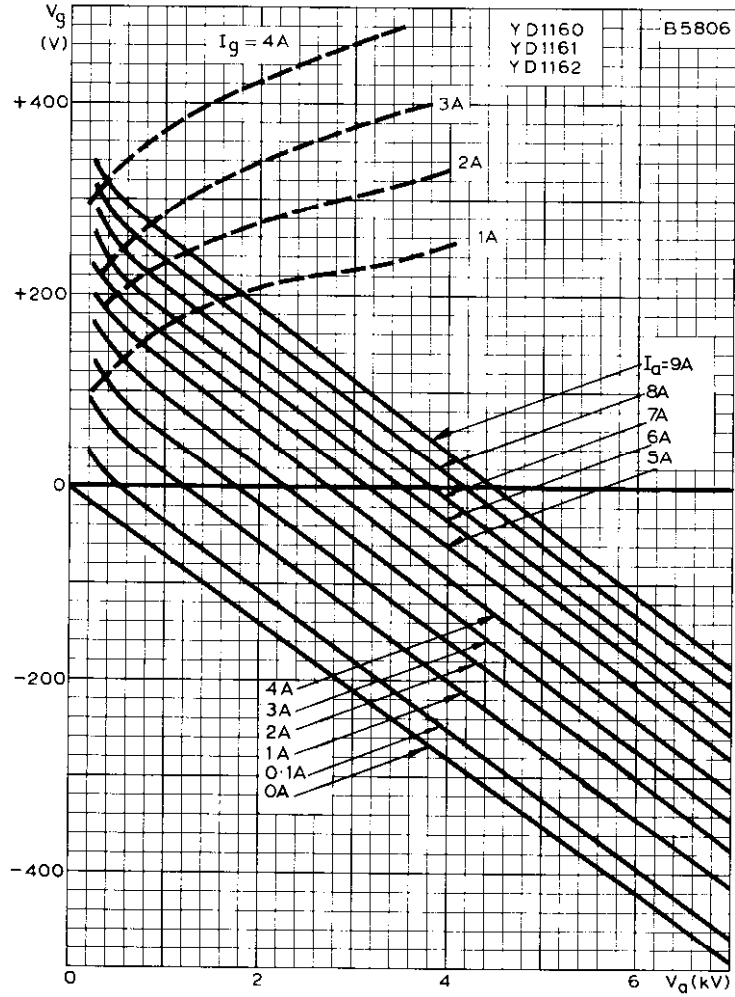
All dimensions in mm

85664



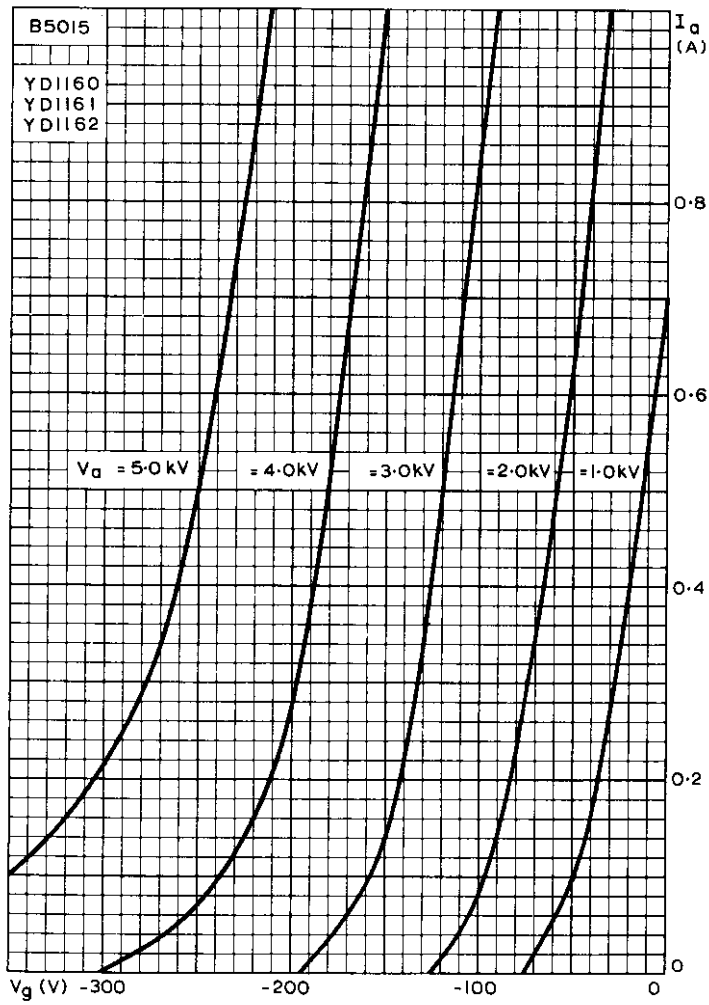
**V.H.F. INDUSTRIAL
TRIODES**

**YD1160
YD1161
YD1162**



CONSTANT CURRENT CHARACTERISTICS

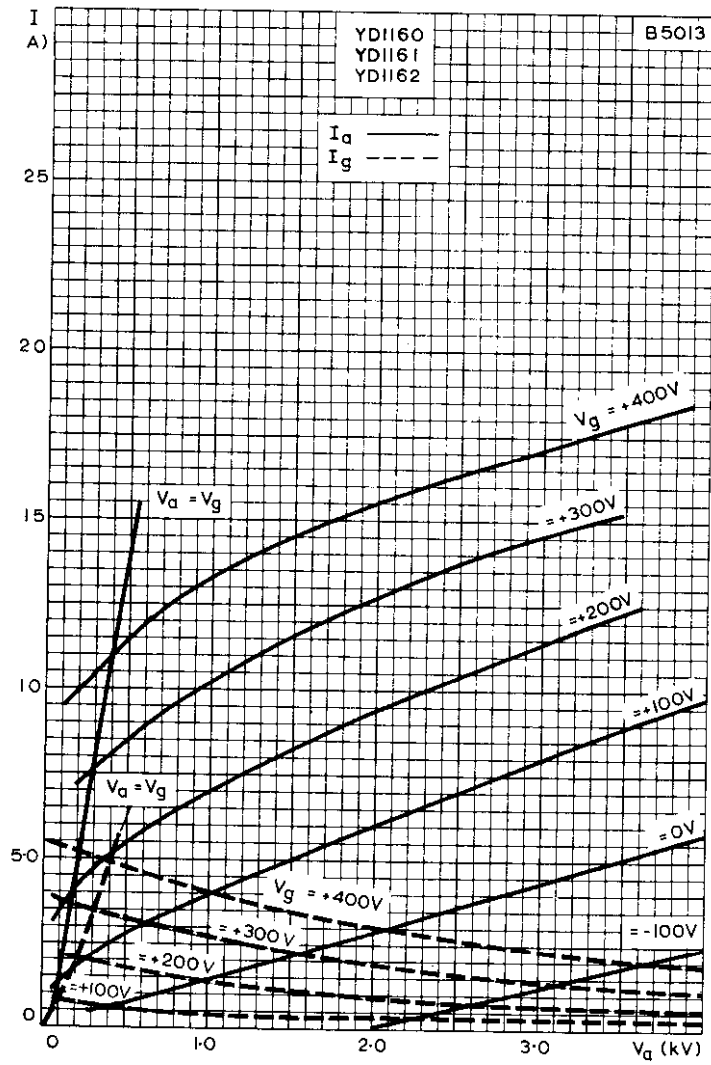




ANODE CURRENT PLOTTED AGAINST GRID VOLTAGE
WITH ANODE VOLTAGE AS PARAMETER

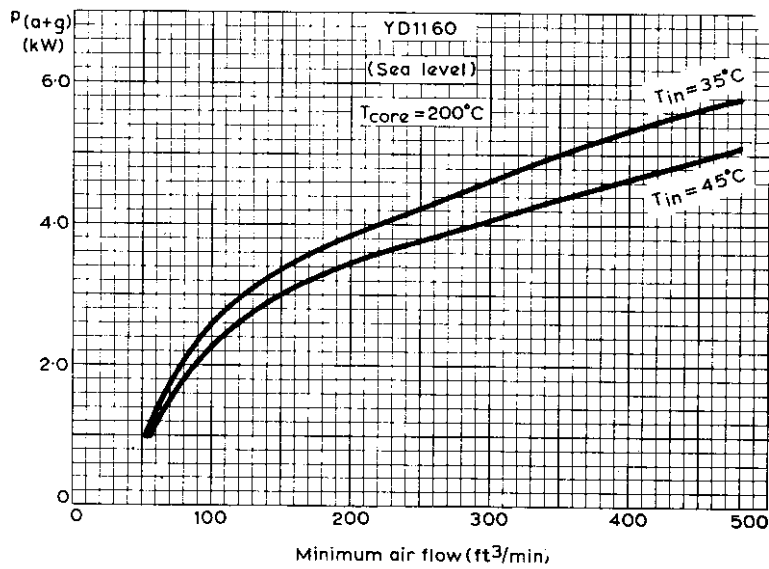
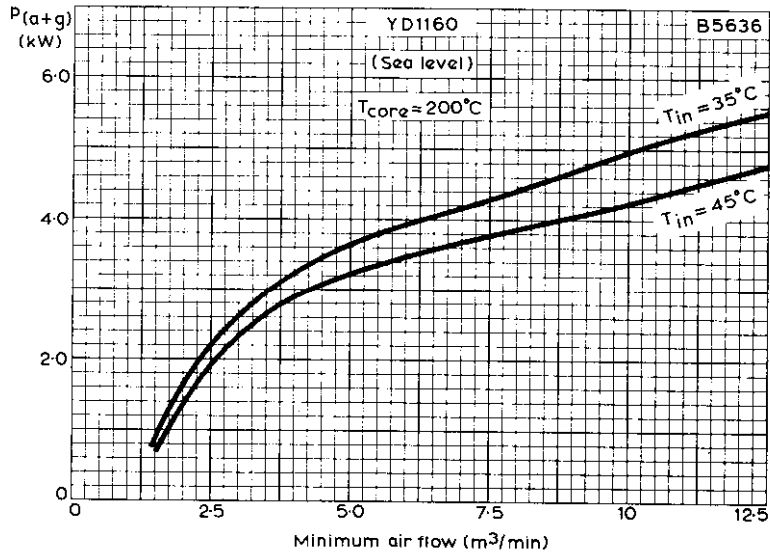
V.H.F. INDUSTRIAL
TRIODES

YD1160
YD1161
YD1162



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



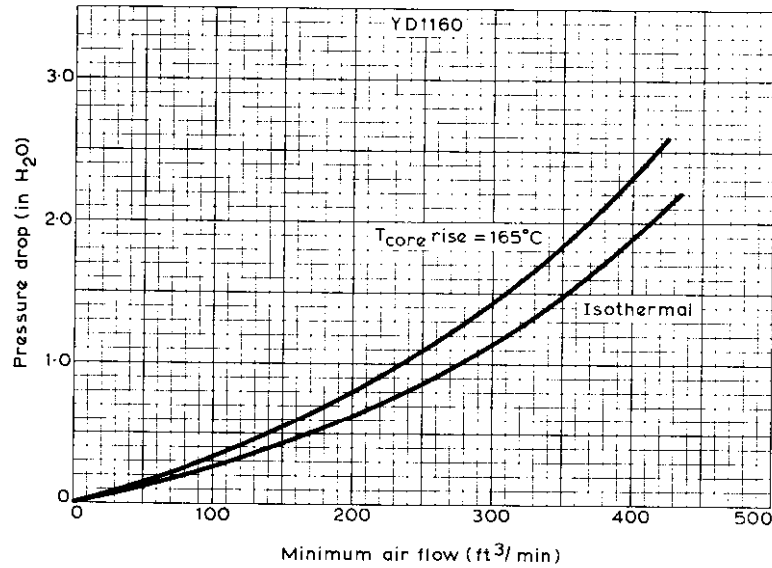
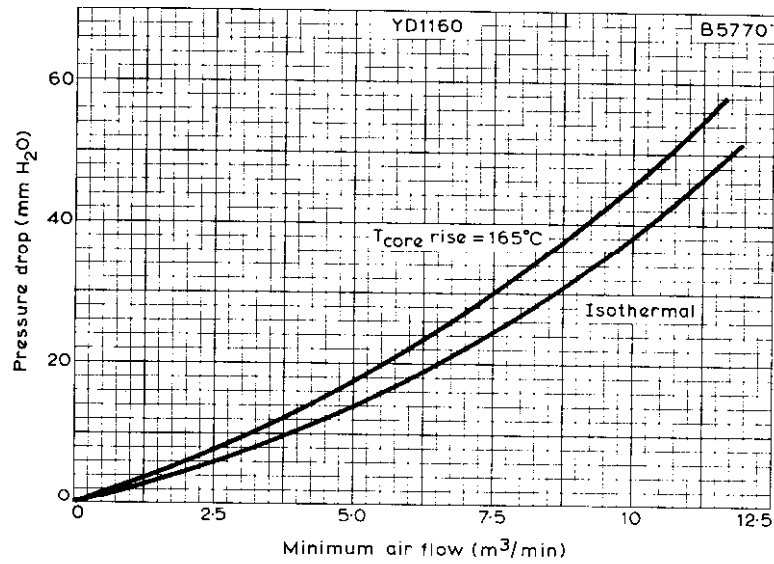


MINIMUM COOLING REQUIREMENTS WITH AIR INLET TEMPERATURES OF 35 AND 45°C AT SEA LEVEL, RADIATOR CORE TEMPERATURE = 200°C

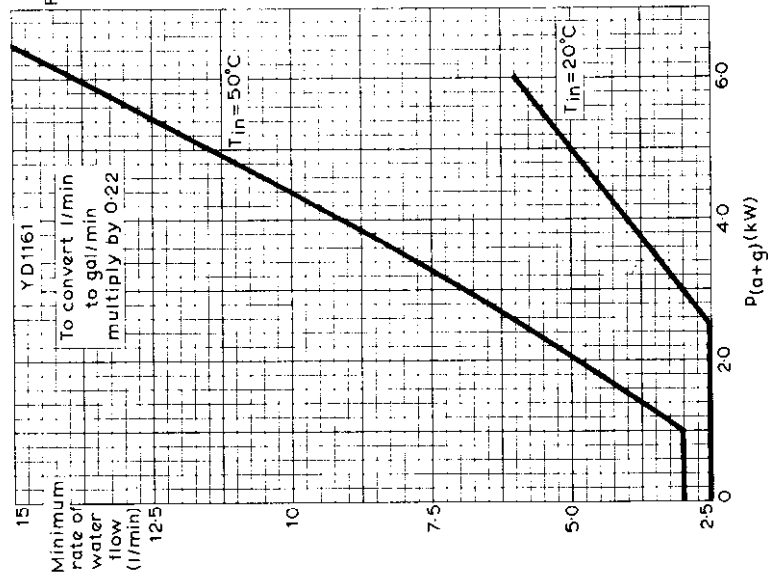
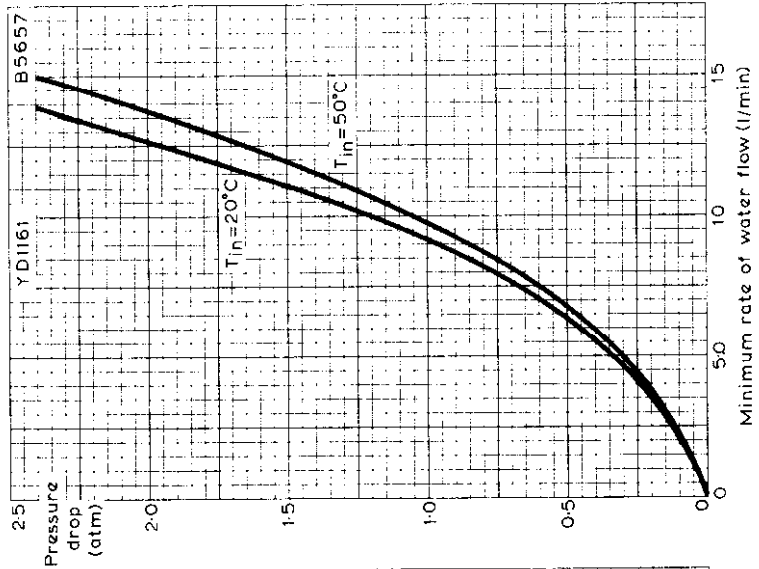


**V.H.F. INDUSTRIAL
TRIODES**

**YD1160
YD1161
YD1162**



PRESSURE DROP PLOTTED AGAINST MINIMUM AIR FLOW FOR AN ISOTHERMAL CONDITION AND FOR A RISE IN CORE TEMPERATURE OVER INCOMING AIR OF 165°C

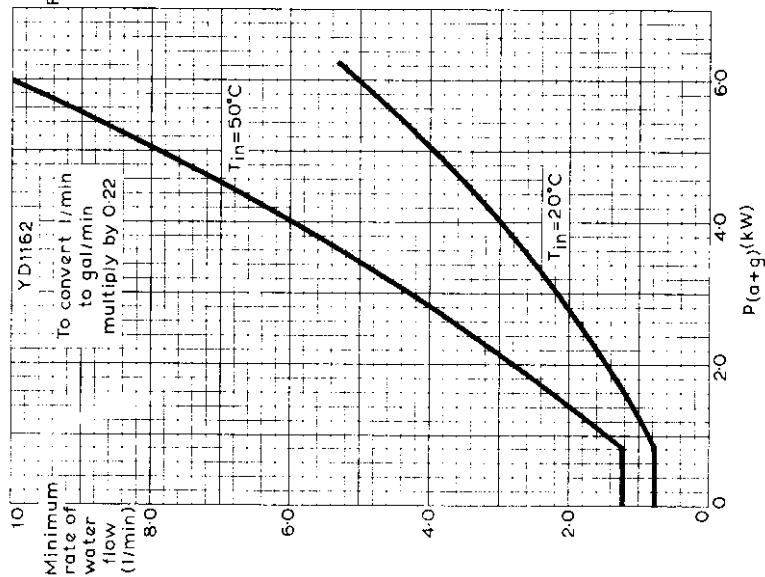
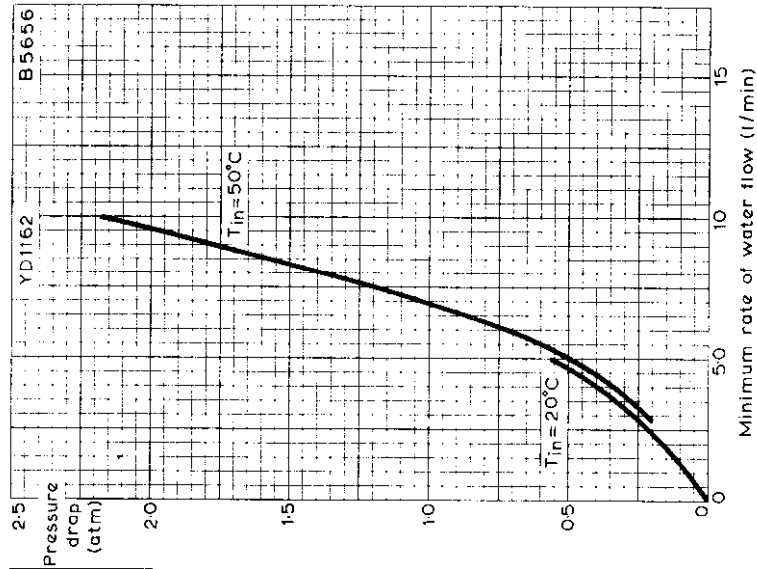


MINIMUM RATE OF WATER FLOW PLOTTED AGAINST ANODE AND GRID DISSIPATION FOR $T_{in} = 20$ AND 50°C
 PRESSURE DROP PLOTTED AGAINST MINIMUM RATE OF WATER FLOW FOR $T_{in} = 20$ AND 50°C



**V.H.F. INDUSTRIAL
TRIODES**

**YD1160
YD1161
YD1162**



MINIMUM RATE OF WATER FLOW PLOTTED AGAINST ANODE AND GRID DISSIPATION FOR $T_{in} = 20$ AND $50^{\circ}C$
PRESSURE DROP PLOTTED AGAINST MINIMUM RATE OF WATER FLOW FOR $T_{in} = 20$ AND $50^{\circ}C$

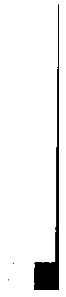


()

()

()

()



**V.H.F. INDUSTRIAL
TRIODES**

**YD1170
YD1171
YD1172**

TENTATIVE DATA

QUICK REFERENCE DATA

External anode triode, of ceramic to metal construction, intended for use as an industrial oscillator at frequencies up to 120 MHz. .
The YD1170 is forced-air cooled.
The YD1171 is water cooled by means of a separate water jacket.
The YD1172 has an integral helical water cooler.

f	120	MHz
P _{out} (less P _{drive})	15.4	kW
f max.	120	MHz
V _a max.	7.2	kV
p _a max.	10	kW

Unless otherwise stated, data is applicable to all types

To be read in conjunction with
GENERAL OPERATIONAL RECOMMENDATIONS - TRANSMITTING VALVES
INDUSTRIAL OSCILLATOR, CLASS 'C'

OPERATING CONDITIONS

f	120	MHz
P _{out}	16.2	kW
P _{out} (less P _{drive})	15.4	kW
P _{load}	13.5*	kW
Duty factor	1.0	
η _a	79.4	%
V _a	6.0	kV
I _a	3.4	A
-V _g	460	V
I _g on load	920	mA
I _g off load	1.35	A
R _{g-f}	500	Ω
Feedback ratio v _{in(pk)} /v _{a(pk)}	0.13	
p _a	4.2	kW
P _g	275	W

*Cavity circuit, 90% transfer.



RATINGS (ABSOLUTE MAXIMUM SYSTEM)

f max.	120	MHz
P_{in} max.	24	kW
V_a max.	7.2	kV
$-V_g$ max.	1.5	kV
I_a max.	4.0	A
I_g max. on load	1.0	A
off load	1.5	A
I_k max.	4.8	A
$i_{k(pk)}$ max.	25	A
p_a max.	10	kW
R_{g-f} max.	10	k Ω

CATHODE

Directly heated, thoriated tungsten

V_f <100MHz	5.8	V
100-120MHz	5.5	V
I_f	130	A
$i_{f(pk)}$ max. (starting)	800	A
r_f (cold)	0.0056	Ω

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

CAPACITANCES

c_{a-g}	24	pF
c_{g-f}	47	pF
c_{a-f}	0.6	pF

CHARACTERISTICS (at $V_a = 6.0kV$, $I_a = 2.0A$)

g_m	33	mA/V
μ	29	

MOUNTING POSITION - YD1170, YD1172
 YD1171

Vertical, anode up or down
Vertical, anode down



V.H.F. INDUSTRIAL TRIODES

YD1170
YD1171
YD1172

COOLING

YD1170

Anode - Forced-air cooled

Seals - At the higher values of anode dissipation and at the highest operating frequencies additional cooling is required.

Temperatures

All seals max.	200	°C
Envelope max.	200	°C
Air inlet max.	45	°C

Anode dissipation (kW)	Height above sea level (km)	Inlet temperature (°C)	Outlet temperature (°C)	Rate of air flow per minute (m ³) (ft ³)	Pressure difference between inlet and outlet (mm H ₂ O)
10	0	35	94	9.5 335	55
8.0	0	35	105	6.5 229	28
6.0	0	35	113	4.5 159	15
4.0	0	35	117	3.0 106	8.0
10	0	45	98	11.0 388	69
8.0	0	45	108	7.6 265	35
6.0	0	45	115	5.2 184	19
4.0	0	45	119	3.5 123	10
10	1.5	35	94	11.4 405	63
8.0	1.5	35	105	7.8 273	32
6.0	1.5	35	113	5.4 194	17
4.0	1.5	35	117	3.6 131	9.0
10	3.0	25	90	12 424	62
8.0	3.0	25	102	8.2 291	32
6.0	3.0	25	111	5.7 203	17
4.0	3.0	25	116	3.8 138	9.0



YD1171

Anode - Water cooled (separate water jacket)

Seals - For frequencies >4 MHz air cooling is required.

Temperatures

All seals max.	200	°C
Envelope max.	200	°C
Water inlet max.	50	°C

Anode dissipation	Inlet temperature	Outlet temperature	Rate of water flow per minute		Pressure difference between inlet and outlet
(kW)	(°C)	(°C)	(litres)	(gal)	(atm)
10	20	36	10	2.2	0.6
8.0	20	37	7.8	1.72	0.38
6.0	20	38	5.7	1.25	0.22
10	50	61	15	3.3	1.25
8.0	50	62	11.3	2.49	0.75
6.0	50	62	8.2	1.80	0.42

For inlet temperatures between 20 and 50°C the required water flow can be found by linear interpolation.

YD1172

Anode - Water cooled (integral cooler)

Seals - For frequencies >4 MHz air cooling is required.

Temperatures

All seals max.	200	°C
Envelope max.	200	°C
Water inlet max.	50	°C

Anode dissipation	Inlet temperature	Outlet temperature	Rate of water flow per minute		Pressure difference between inlet and outlet
(kW)	(°C)	(°C)	(litres)	(gal)	(atm)
10	20	46	6.0	1.32	0.25
8.0	20	49	4.5	0.99	0.15
6.0	20	53	3.0	0.66	0.07
10	50	67	9.0	1.98	0.52
8.0	50	69	6.7	1.47	0.31
6.0	50	72	4.5	0.99	0.15

For inlet temperatures between 20 and 50°C the required water flow can be found by linear interpolation.



V.H.F. INDUSTRIAL TRIODES

YD1170
YD1171
YD1172

PHYSICAL DATA

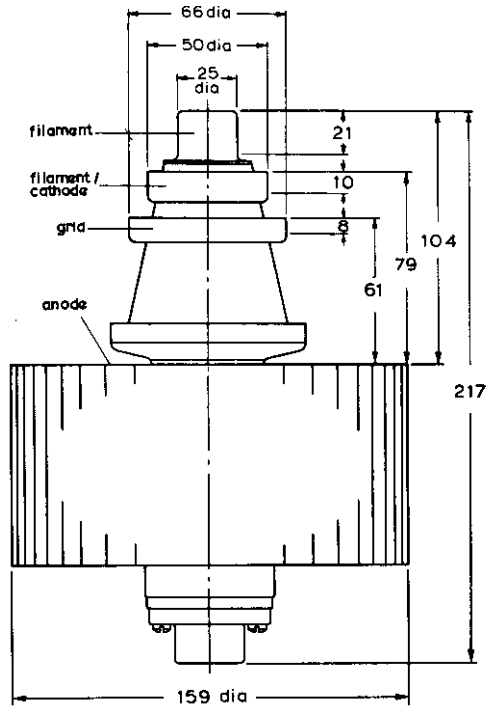
	YD1170	YD1171	YD1172	
Weight of valve	7.5	1.5	2.0	kg
	16.5	3.3	4.4	lb
Weight of insulating pedestal	4.25	-	-	kg
	9.4	-	-	lb
Weight of water jacket	-	2.0	-	kg
	-	4.4	-	lb

ACCESSORIES

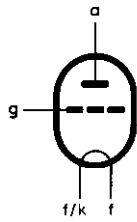
Filament connector	40692
Filament/cathode connector	40693
Grid connector ($f \leq 4.0$ MHz)	40690
Grid connector ($f > 4.0$ MHz)	40691
Filament cables $\times 2$	40715
Insulating pedestal (YD1170)	40654
Water jacket (YD1171)	K727



OUTLINE DRAWING OF YD1170



All dimensions in mm



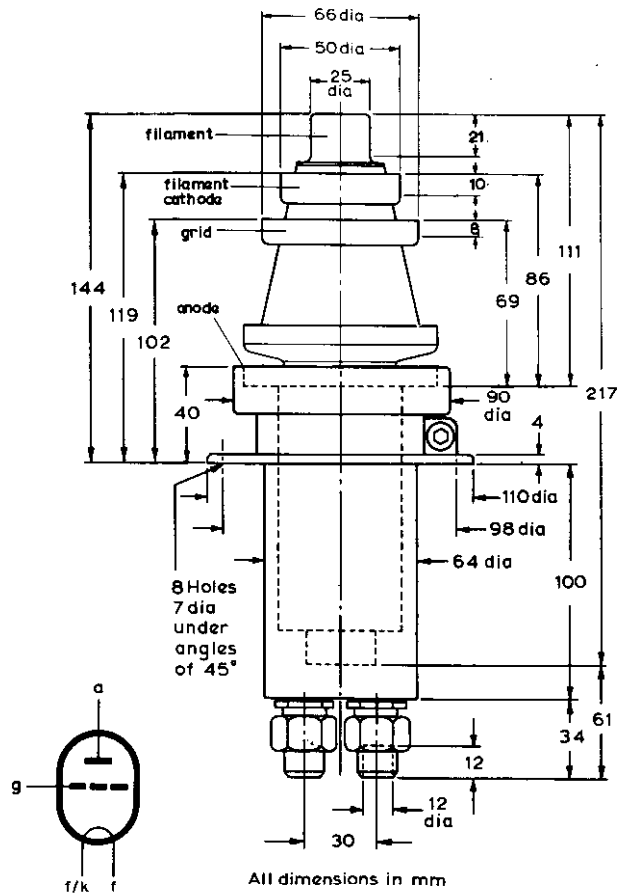
85767



**V.H.F. INDUSTRIAL
TRIODES**

**YD1170
YD1171
YD1172**

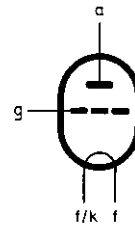
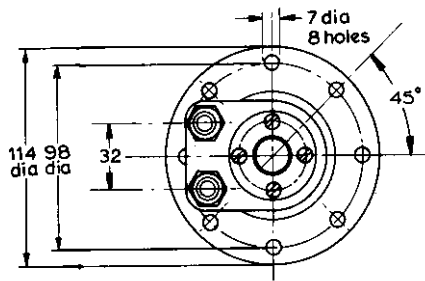
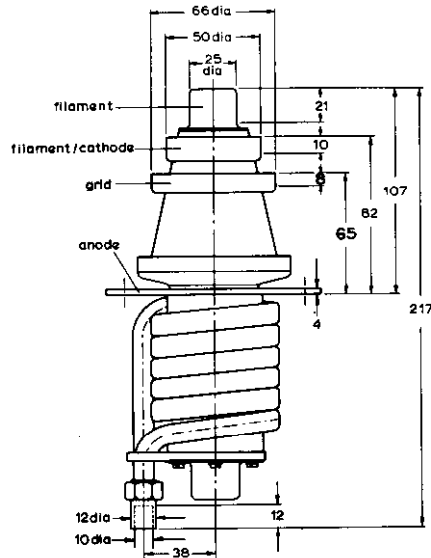
OUTLINE DRAWING OF YD1171 MOUNTED IN WATER JACKET K727



1957-51



OUTLINE DRAWING OF YD1172

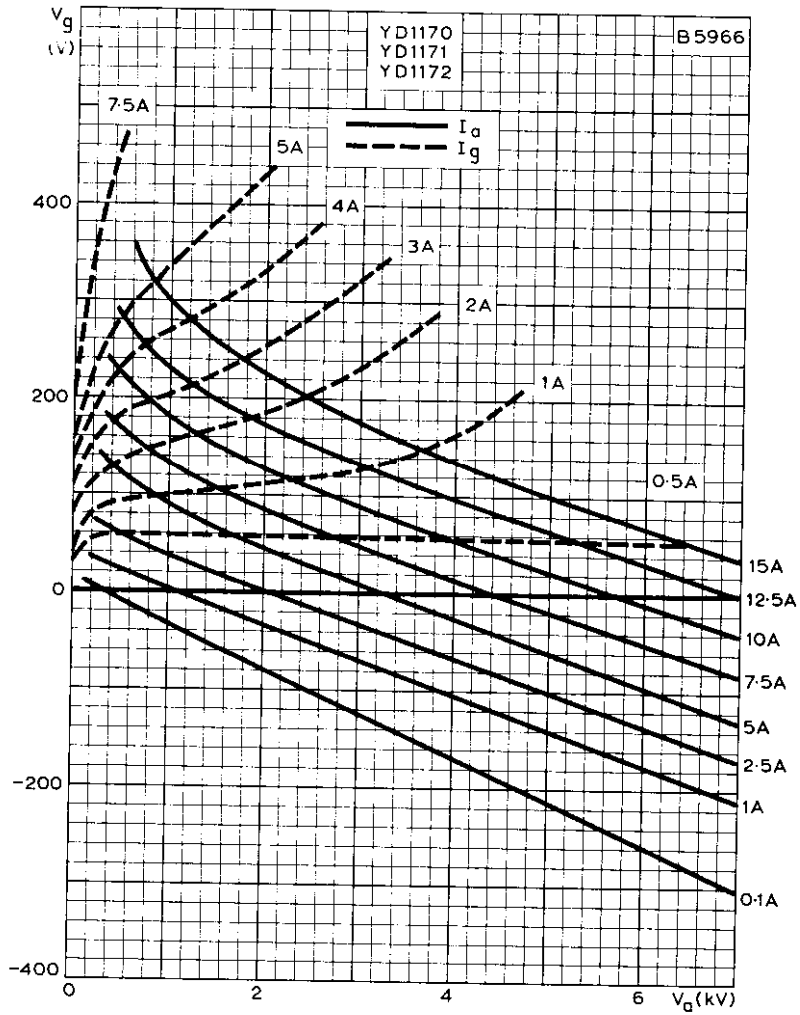


All dimensions in mm

B6734

**V.H.F. INDUSTRIAL
TRIODES**

**YD1170
YD1171
YD1172**



CONSTANT CURRENT CHARACTERISTICS



()

()

()

()

|



R.F. INDUSTRIAL TRIODE

YD1182

TENTATIVE DATA

QUICK REFERENCE DATA

External anode triode of ceramic-metal construction, water cooled by means of an integral water cooler, intended for use as a class 'C' industrial oscillator.

f	≤80	MHz
P _{out} (less P _{drive})	30	kW
f max.	80	MHz
V _a max.	9.0	kV
p _a max.	20	kW

To be read in conjunction with
GENERAL OPERATIONAL RECOMMENDATIONS - TRANSMITTING VALVES
INDUSTRIAL OSCILLATOR, CLASS 'C'

OPERATING CONDITIONS

f	≤80	MHz
P _{out}	32.4	kW
P _{out} (less P _{drive})	30	kW
P _{load}	25.5	kW
Duty factor	1.0	
η _a	80	%
V _a	7.5	kV
I _a	5.4	A
-V _g	653	V
I _g	1.45	A
R _{g-f}	450	Ω
Feedback ratio $v_{in(pk)}/v_{a(pk)}$	0.17	
P _{drive}	2.4	kW
P _a	8.1	kW



RATINGS (ABSOLUTE MAXIMUM SYSTEM)

f max.	80	MHz
V_a max.	9.0	kV
$-V_g$ max.	1.5	kV
I_g max. on load	1.6	A
off load	2.4	A
I_k max.	7.5	A
$i_{k(pk)}$ max.	40	A
P_{in} max.	45	kW
p_a max.	20	kW
R_{g-f} max.	10	k Ω

CATHODE

Directly heated, thoriated tungsten

V_f	7.0	V
I_f	175	A
$i_{f(pk)}$ max. (starting)	1.0	kA
r_f (cold)	0.0042	Ω

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

CAPACITANCES

c_{a-g}	32	pF
c_{a-f}	1.0	pF
c_{g-f}	61	pF

CHARACTERISTICS (measured at $V_a = 7.0kV$, $I_a = 3.5A$)

g_m	60	mA/V
μ	34	

MOUNTING

Vertical, anode up or down

R.F. INDUSTRIAL TRIODE

YD1182

COOLING

Anode - water cooled with integral cooler.

Seals - low velocity air flow at frequencies >4MHz

Temperatures

Anode seal max.	200	°C
Grid seal max.	200	°C
Filament seals max.	200	°C
Envelope max.	200	°C
Water inlet max.	50	°C

WATER COOLING CHARACTERISTICS

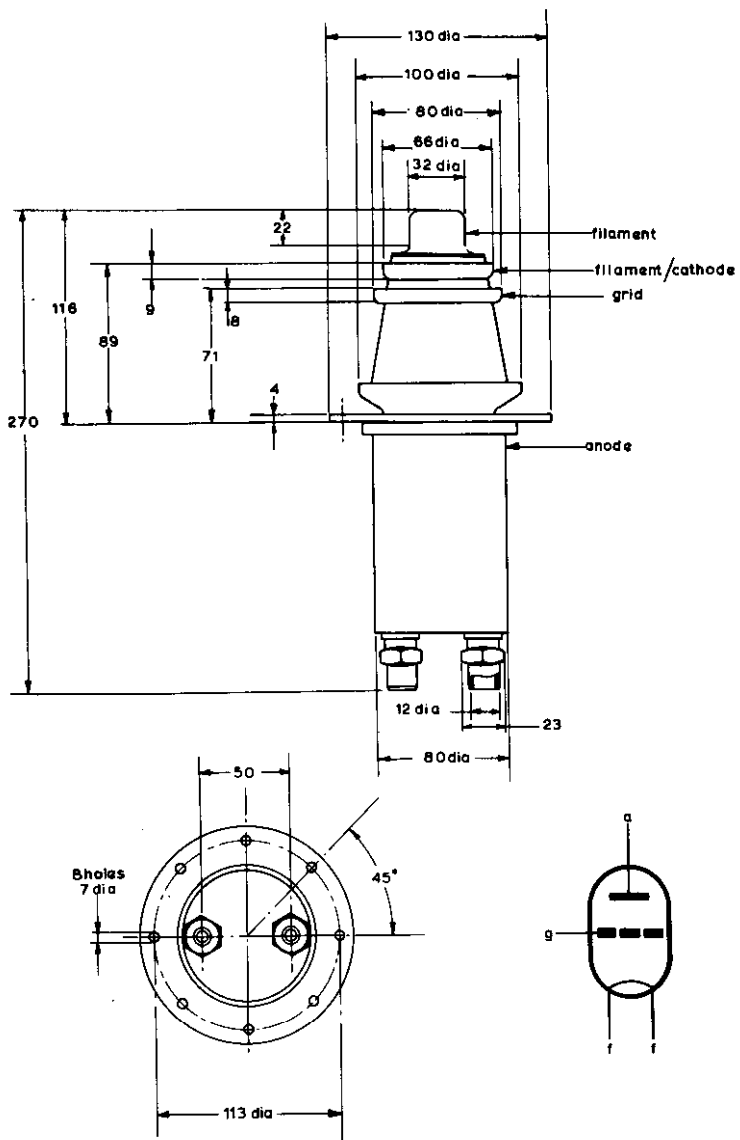
Anode Dissipation (kW)	Inlet Temperature (°C)	Rate of flow (l/min)	Inlet Pressure (Atm)	Outlet Temperature (°C)
20	20	15	0.7	40

ACCESSORIES

Grid connector f ≤4.0MHz	40710
f >4.0MHz	40711
Filament connectors (both types required)	40708
	and 40709
Filament cables (× 2)	40720



OUTLINE DRAWING OF YD1182

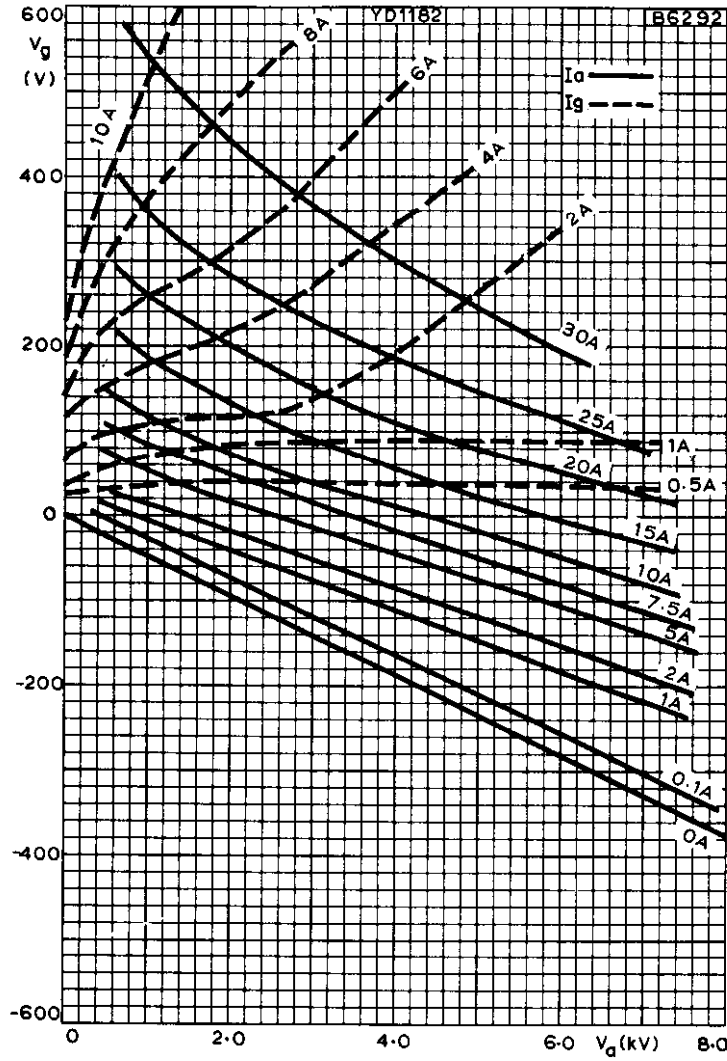


All dimensions in mm. B6295



**R.F. INDUSTRIAL
TRIODE**

YD1182



CONSTANT CURRENT CHARACTERISTICS

1.

(1)

(2)

(3)

(4)

(5) ■

R.F. INDUSTRIAL TRIODE

YD1192

TENTATIVE DATA

QUICK REFERENCE DATA

External anode triode of ceramic-metal construction, water cooled by means of an integral water cooler, intended for use as a class 'C' industrial oscillator.

f	30	MHz
P_{out} (less P_{drive})	60	kW
$f_{max.}$	30	MHz
V_a max.	9.6	kV
p_a max.	40	kW

To be read in conjunction with

GENERAL OPERATIONAL RECOMMENDATIONS - TRANSMITTING VALVES
INDUSTRIAL OSCILLATOR, CLASS 'C'

OPERATING CONDITIONS

f	30	MHz
P_{out}	62.3	kW
P_{out} (less P_{drive})	60	kW
P_{load}	55	kW
Duty factor	1.0	
η_a	78	%
V_a	8.0	kV
I_a	10	A
$-V_g$	675	V
$I_{g \text{ on load}}$	2.25	A
off load	3.3	A
R_{g-f}	300	Ω
Feedback ratio $v_{in(pk)}/v_{a(pk)}$	0.14	
P_{drive}	2.3	kW
P_a	17.7	kW



RATINGS (ABSOLUTE MAXIMUM SYSTEM)

f max.	30	MHz
V_a max.	9.6	kV
P_{in} max.	96	kW
$-V_g$ max.	1.5	kV
I_g max. on load	2.5	A
I_g off load	3.5	A
I_k max.	14.5	A
$i_{k(pk)}$ max.	68	A
p_a max.	40	kW
R_{g-f} max.	10	k Ω

CATHODE

Directly heated, thoriated tungsten

$*V_f$	8.4	V
I_f	235	A
$i_{f(pk)}$ max. (starting)	1.0	kA
r_f (cold)	0.0039	Ω

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

CAPACITANCES

c_{a-g}	45	pF
c_{a-f}	1.7	pF
c_{g-f}	100	pF

CHARACTERISTICS (measured at $V_a = 8.0kV$, $I_a = 6.0A$)

g_m	110	mA/V
μ	31	

MOUNTING POSITION

Vertical, anode up or down

R.F. INDUSTRIAL TRIODE

YD1192

COOLING

Anode - water cooled with integral cooler

Seals - low velocity air flow at frequencies >4MHz

Temperatures

Anode seal max.	200	°C
Grid seal max.	200	°C
Filament seals max.	200	°C
Envelope max.	200	°C
Water inlet max.	50	°C

WATER COOLING CHARACTERISTICS

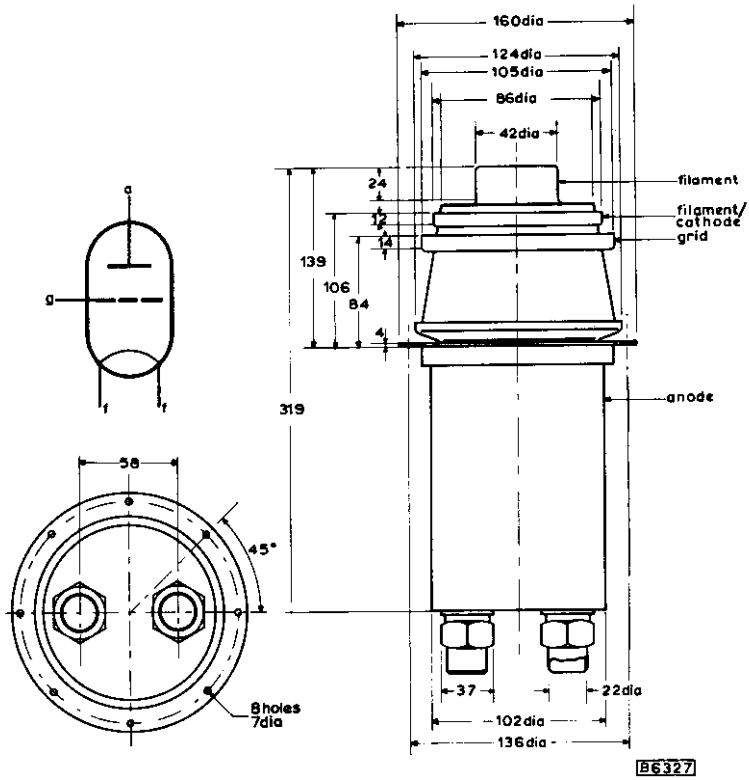
Anode Dissipation (kW)	Inlet Temperature (°C)	Rate of flow (l/min)	Inlet Pressure (Atm)	Outlet Temperature (°C)
40	20	30	0.7	40

ACCESSORIES

Grid connector ($f \leq 4.0\text{MHz}$)	40707
Filament connectors (both types required)	40705
	and 40706
Filament cables	40718
	and 40719

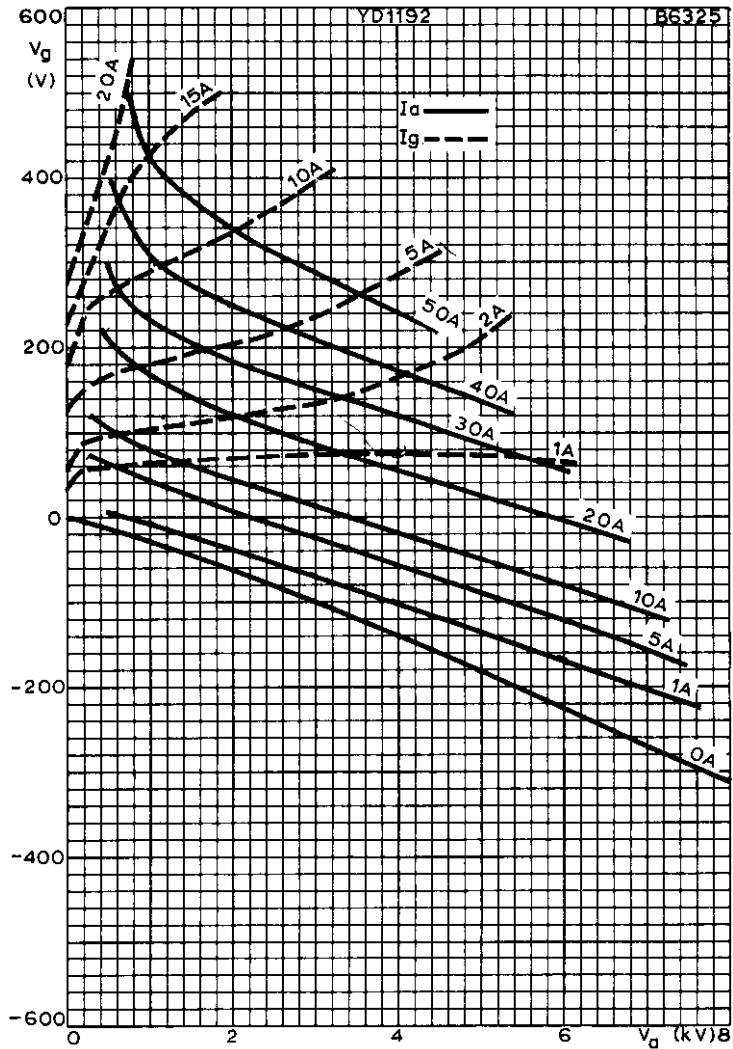


OUTLINE DRAWING OF YD1192



R.F. INDUSTRIAL
TRIODE

YD1192



CONSTANT CURRENT CHARACTERISTICS



()

()

()

()



R.F. INDUSTRIAL TRIODE

YD1212

QUICK REFERENCE DATA

External anode triode of ceramic-metal construction, water cooled by means of an integral cooler, intended for use as a class 'C' industrial oscillator.

f	≤30	MHz
P _{out} (less P _{drive})	240	kW
f max.	30	MHz
V _a max.	16.8	kV
p _a max.	120	kW

To be read in conjunction with

GENERAL OPERATIONAL RECOMMENDATIONS - TRANSMITTING VALVES

INDUSTRIAL OSCILLATOR, CLASS 'C'

OPERATING CONDITIONS

f	30	MHz
P _{out}	247.5	kW
P _{out} (less P _{drive})	240	kW
P _{load}	215*	kW
Duty factor	1.0	
η _a	75.2	%
V _a	14	kV
I _a	23.5	A
-V _g	810	V←
I _g on load	6.0	A
off load	8.0	A←
R _{g-f}	135	Ω←
Feedback ratio v _{in(pk) / v_{a(pk)}}	0.11	
P _{drive}	7.5	kW
p _a	81.5	kW

*Cavity circuit, 90% transfer

RATINGS (ABSOLUTE MAXIMUM SYSTEM)

f max.	30	MHz
V _a max.	16.8	kV
P _{in} max.	375	kW
-V _g max.	2.0	kV
I _g max. on load	7.0	A
off load	8.5	A
I _k max.	34	A
i _{k(pk)} max.	160	A
p _a max.	120	kW
p _g max.	3.0	kW
R _{g-f} max.	10	kΩ

CATHODE

Directly heated, thoriated tungsten

*V _f	12.6	V
I _f	380	A
i _{f(pk)} max. (starting)	2.0	kA ←
r _f (cold)	0.0036	Ω

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

CAPACITANCES

c _{a-g}	60	pF
c _{a-f}	3.0	pF
c _{g-f}	185	pF

CHARACTERISTICS (measured at V_a = 14kV, I_a = 10A)

g _m	160	mA/V ←
μ	33	

MOUNTING POSITION

Vertical, anode up or down

With anode uppermost inlet and outlet water connections should be reversed. ←



R.F. INDUSTRIAL TRIODE

YD1212

COOLING

Anode - water cooled with integral cooler

Seals - low velocity air flow or water cooled connectors

Temperatures

All seals absolute max. 240 °C ←

Water inlet max. 50 °C

WATER COOLING CHARACTERISTICS

*Anode Dissipation (kW)	Inlet Temperature (°C)	Rate of flow (l/min)	Inlet Pressure (atm)	Outlet Temperature (°C)
120	20	60	0.7	49
120	50	90	1.3	69
80	20	34	0.3	54
80	50	54	0.55	72
40	20	15	0.07	59
40	50	24	0.13	75

Cooling the seals can be accomplished by low velocity air flow or water cooling of the filament connectors. In the latter case care should be taken to have proper electrical insulation between the filament connectors and the grid connector. The cooling circuits of the filament connectors may be connected in series. A water flow of approximately 0.5 litre/min will be sufficient.

*A large part of the filament power and grid power is radiated to the anode and increases the temperature of the anode cooling water accordingly.

ACCESSORIES

Grid connector, $f < 4.0\text{MHz}$ 40694

$f > 4.0\text{MHz}$ 40737 ←

Filament connectors (both types required) 40695 and 40696

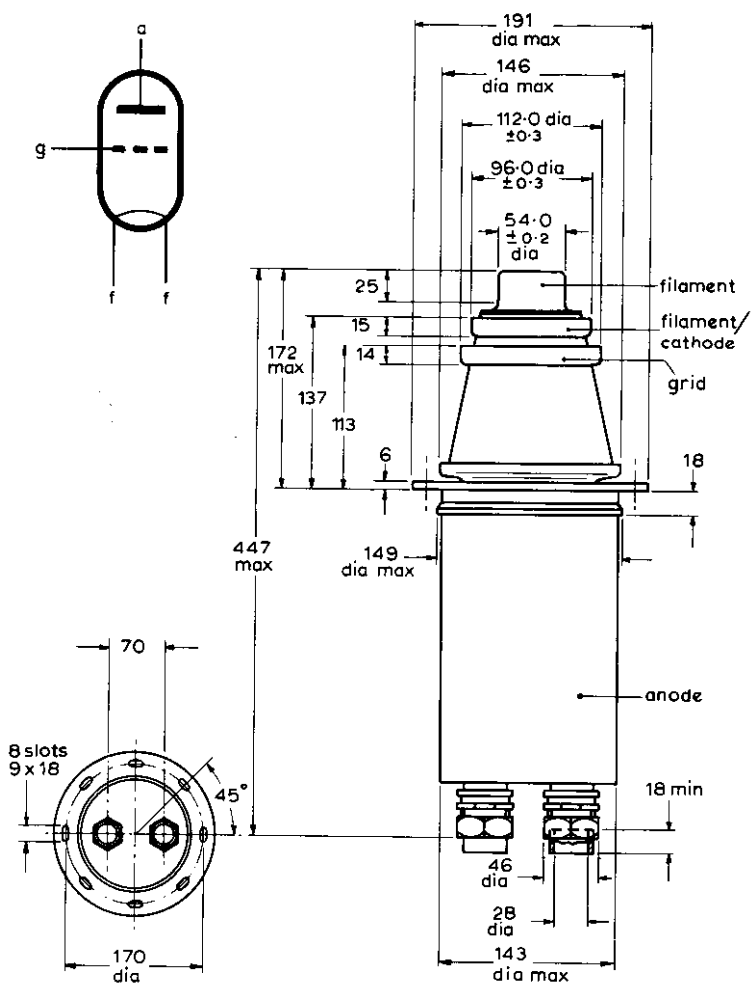
Filament cables (both types required) 40716 and 40717 ←

PHYSICAL DATA

Weight of valve 15.6 kg



OUTLINE DRAWING OF YD1212

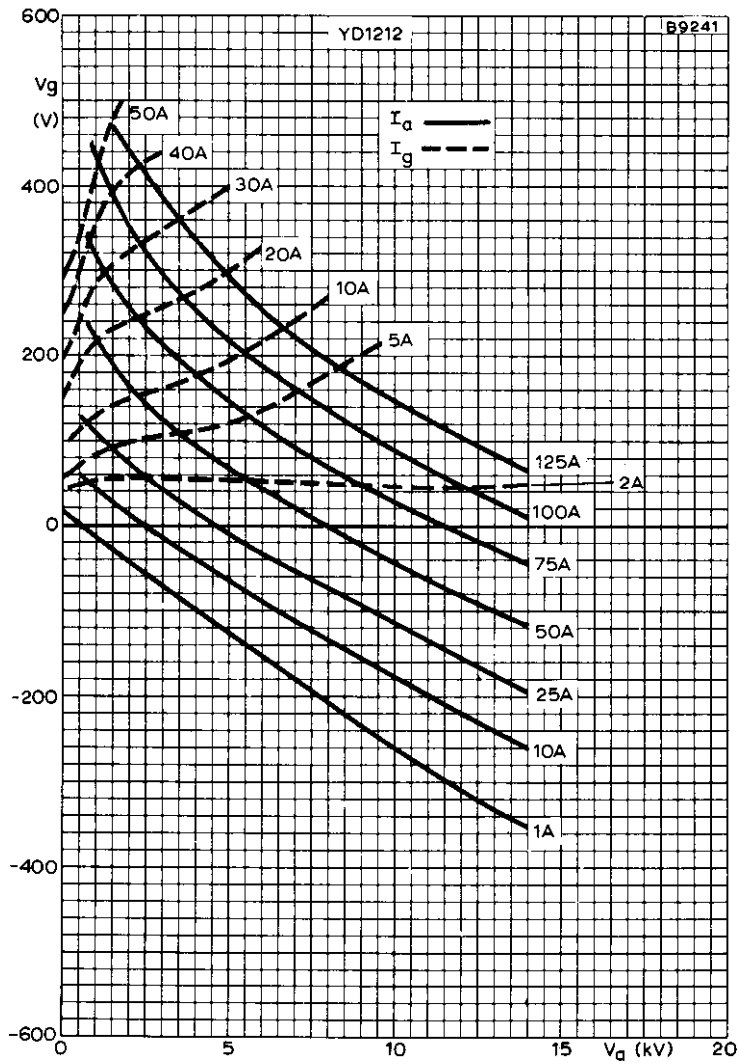


All dimensions in mm



R.F. INDUSTRIAL
TRIODE

YD1212



CONSTANT CURRENT CHARACTERISTICS



()

()

(

()



V.H.F. INDUSTRIAL TRIODE YD1240

QUICK REFERENCE DATA

External anode triode of ceramic-metal construction, intended for use as an industrial oscillator. The YD1240 is forced-air cooled.

f	160	27.12	MHz
P _{out} (less P _{drive})	2.22	2.67	kW
f max.	250		MHz
V _a max.	5.5		kV
p _a max.	1.5		kW

To be read in conjunction with
GENERAL OPERATIONAL RECOMMENDATIONS - TRANSMITTING VALVES
INDUSTRIAL OSCILLATOR, CLASS 'C'

OPERATING CONDITIONS

f	27.12	160	MHz
P _{out}	2.9	2.4	kW
P _{out} (less P _{drive})	2.67	2.22	kW
P _{load}	2.3	2.0	kW
Duty factor	1.0	1.0	
η_a	78	76	%
V _a	5.0	4.5	kV
I _a	750	700	mA
-V _g	520	500	V
I _g	235	225	mA
R _{g-f}	2.2	2.2	k Ω
Feedback ratio $v_{in(pk)}/v_{a(pk)}$	0.17	0.17	
P _{drive}	230	180	W
p _a	830	750	W
p _g	80	70	W
V _f	6.3	6.0	V

RATINGS (ABSOLUTE MAXIMUM SYSTEM)

f max.	250	MHz
V_a max.	5.5	kV
$-V_g$ max.	1.0	kV
I_g max. on load	280	mA
off load	400	mA
I_k max.	1.4	A
$i_{k(pk)}$ max.	7.5	A
P_{in} max.	6.0	kW
p_a max.	1.5	kW
p_g max.	150	W
R_{g-f} max.	20	k Ω

CATHODE

Directly heated, thoriated tungsten

V_f (≤ 120 MHz)	6.3	V
(> 120 MHz)	6.0	V
I_f (measured at 6.3V)	33	A

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

CAPACITANCES

c_{a-g}	14	pF
c_{a-f}	400	mpF
c_{g-f}	17	pF

CHARACTERISTICS (measured at $V_a = 2.0$ kV, $I_a = 0.5$ A)

g_m	10	mA/V
μ	20	

MOUNTING POSITION

Vertical, anode up or down

COOLING

Anode - forced-air cooled. See curves on pages C4 and C5.

Filament and grid seals - convection - low velocity air flow as required.

Temperatures

All ceramic-to-metal seals, max.	220	$^{\circ}$ C
Envelope, max.	220	$^{\circ}$ C



V.H.F. INDUSTRIAL TRIODE YD1240

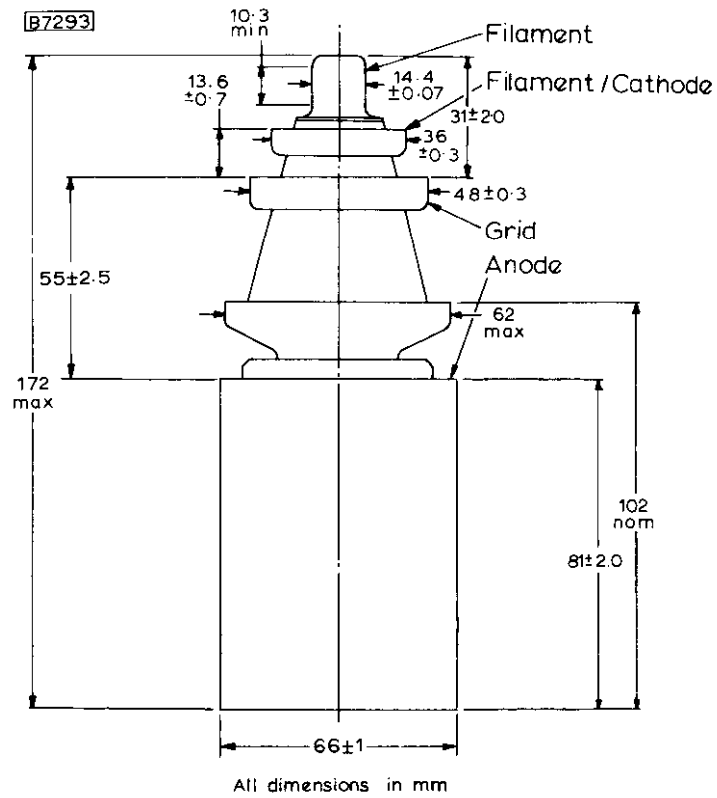
PHYSICAL DATA

Weight of valve	2.5	lb
	1.13	kg

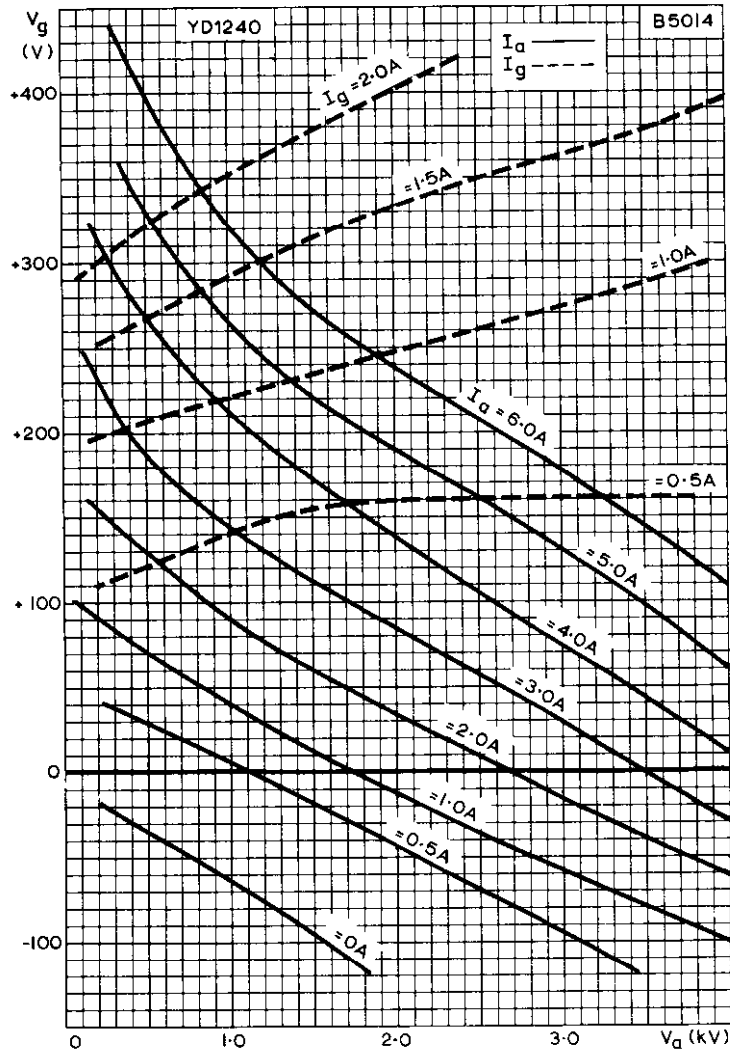
ACCESSORIES

Filament clip	40688
Filament/cathode clip	40689
Grid connector ($f \leq 30\text{MHz}$)	40686
($f > 30\text{MHz}$)	40687

OUTLINE DRAWING OF YD1240

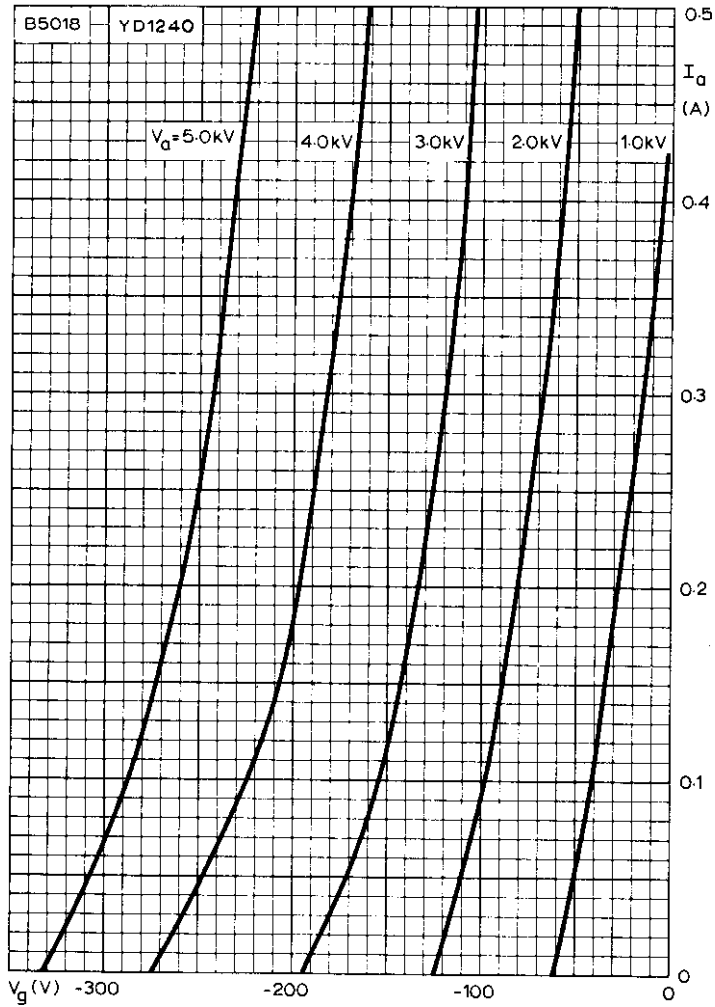


V.H.F. INDUSTRIAL TRIODE YD1240



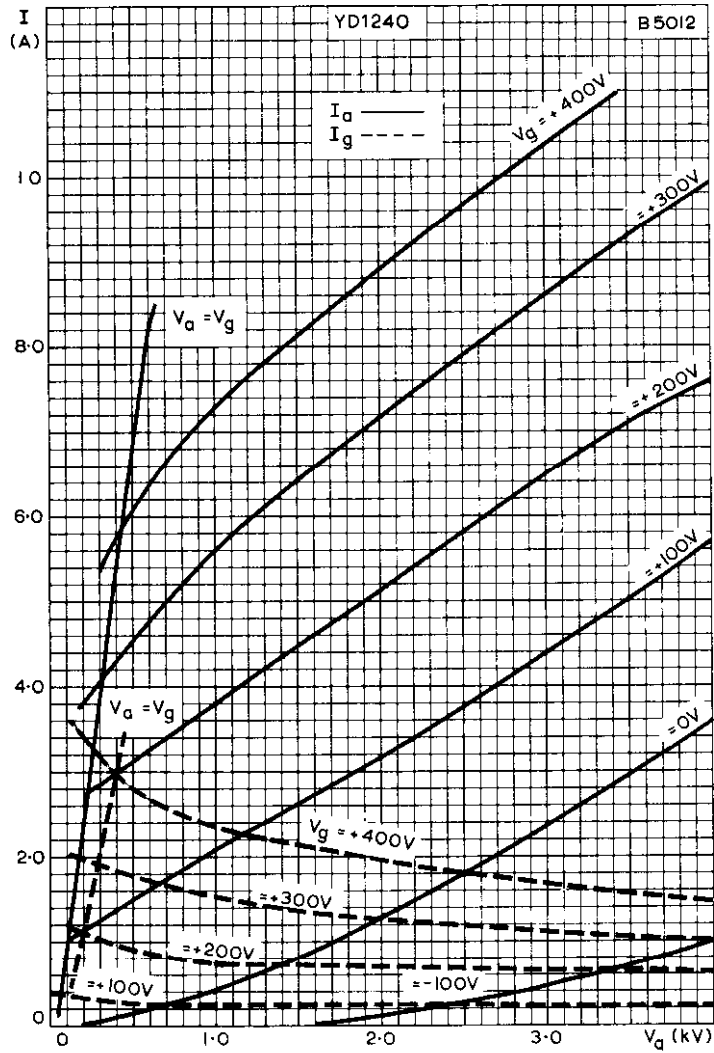
CONSTANT CURRENT CHARACTERISTICS



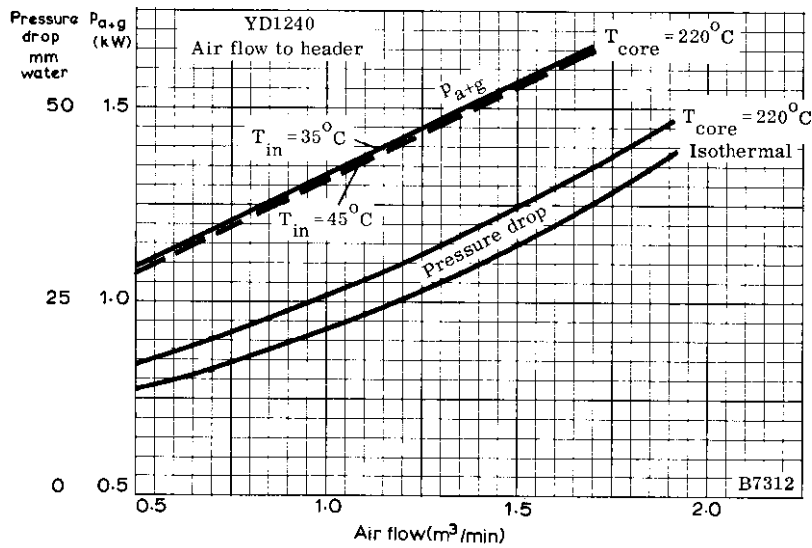
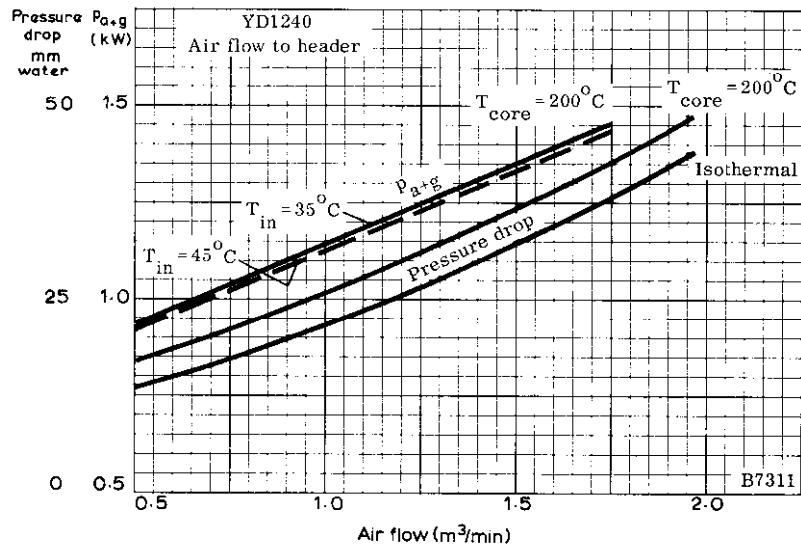


ANODE CURRENT PLOTTED AGAINST GRID VOLTAGE WITH ANODE VOLTAGE AS PARAMETER

V.H.F. INDUSTRIAL TRIODE YD1240



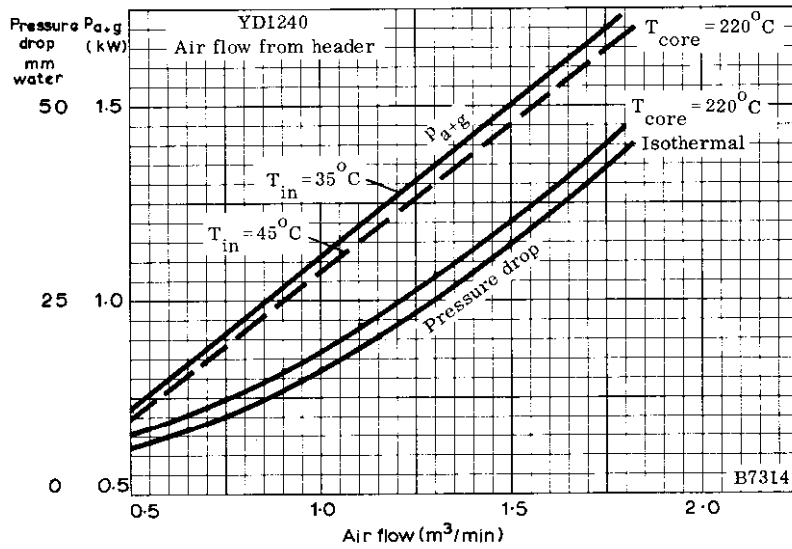
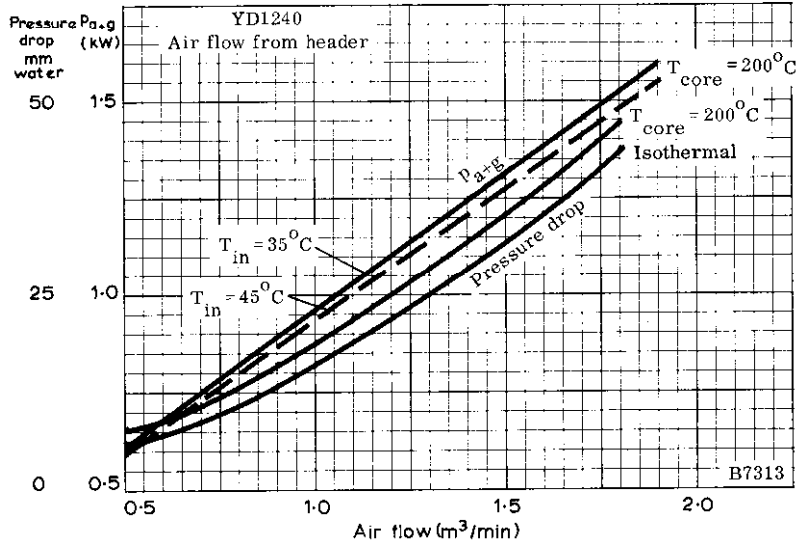
ANODE AND GRID CURRENTS PLOTTED AGAINST ANODE VOLTAGE WITH GRID VOLTAGE AS PARAMETER



COOLING REQUIREMENTS AT SEA LEVEL WITH AIR INLET TEMPERATURES OF 35 and 45°C AND CORE TEMPERATURES OF 200 and 220°C



V.H.F. INDUSTRIAL TRIODE YD1240



COOLING REQUIREMENTS AT SEA LEVEL WITH AIR INLET TEMPERATURES OF 35 and 45°C AND CORE TEMPERATURES OF 200 and 220°C

.....

(

(

(

(

■

V.H.F. TETRODE

YL1430

TENTATIVE DATA

QUICK REFERENCE DATA

Ceramic to metal, air cooled coaxial power tetrode, for use as a linear broad-band amplifier in television transmitters for bands I and III.

	Narrow Band Service Class 'B'	Television Service Class 'AB'	
f	230	175	MHz
P _{out}	13	-	kW
f max.	250	250	MHz
V _a max.	8.0	8.0	kV
p _a max.	12	12	kW

To be read in conjunction with

GENERAL OPERATIONAL RECOMMENDATIONS - TRANSMITTING VALVES

R.F. TELEGRAPHY, CLASS 'B' (Narrow Band)

OPERATING CONDITIONS (Grounded grid)

f	230	MHz
P _{out}	13	kW
P _{load} in coaxial circuit	12	kW
η_a	69.3	%
V _a	7.5	kV
I _{a(0)}	0.1	A
I _a	2.5	A
V _{g2}	650	V
I _{g2}	80	mA
-V _{g1}	125 ^a	V
v _{k(pk)}	200	V
I _{g1}	90	mA
P _{in}	18.75	kW
P _{load(driver)}	400	W

^a see notes page 2



R. F. AMPLIFIER FOR TELEVISION SERVICE, CLASS 'AB'

OPERATING CONDITIONS (Grounded grid)

Negative modulation, positive synchronisation

f	175	MHz
Bandwidth (see Fig.1, page 5)	b	
V _a	5.5	kV
V _{g2}	650	V
-V _{g1}	65 ^a	V
v _{k(pk) black}	140 ^c	V
I _{a(0)}	750	mA
I _{a black}	2.85 ^c	A
I _{g2 black}	40 ^c	mA
I _{g1 black}	115 ^c	mA
P _{load sync}	13	kW
black	7.75 ^c	kW
P _{load(driver) sync}	540	W
Gain at sync level	24 ^b	
R _a	900 ^b	Ω
Sync compression	30/25 ^d	
Differential phase	≤3.0 ^e	deg
Differential gain	≥80	%

NOTES

- a. To be adjusted for I_{a(0)}
- b. With double tuned circuit
- c. Black signal including line sync pulses.
- d. A picture/sync ratio of 75/25 for the outgoing signal requires a ratio of max. 70/30 for the incoming signal.
- e. Measured with a sawtooth amplitude, running from 17% to 75% of the peak sync value, with superimposed a 4.43MHz sine wave with a 10% peak to peak value.

V.H.F. TETRODE

YL1430

RATINGS (ABSOLUTE MAXIMUM SYSTEM)

	Telegraphy Narrow Band Service Class 'B'	Television Service Class 'AB'	
f max.	250	250	MHz
V_a max.	8.0	8.0	kV
V_{g2} max.	1.0	1.0	kV
$-V_{g1}$ max.	500	500	V
I_a max.	5.0	5.0	A
p_a max.	12	12	kW
p_{g2} max.	100	100	W
p_{g1} max.	50	50	W
R_{g1-k} max.	10	10	k Ω

CATHODE

Directly heated, Thoriated tungsten

$*V_f$	8.0	V
I_f	120	A
$i_{f(pk)}$ starting max.	500	A

*The filament has been designed to accept temporary fluctuations of supply voltage of $\pm 5\%$.

CAPACITANCES

	Grounded cathode	Grounded grid	
c_{out}	16.9	17.7	pF
c_{in}	102.7	53.5	pF
c_{a-g1}	0.3	-	pF
c_{a-k}	-	0.1	pF

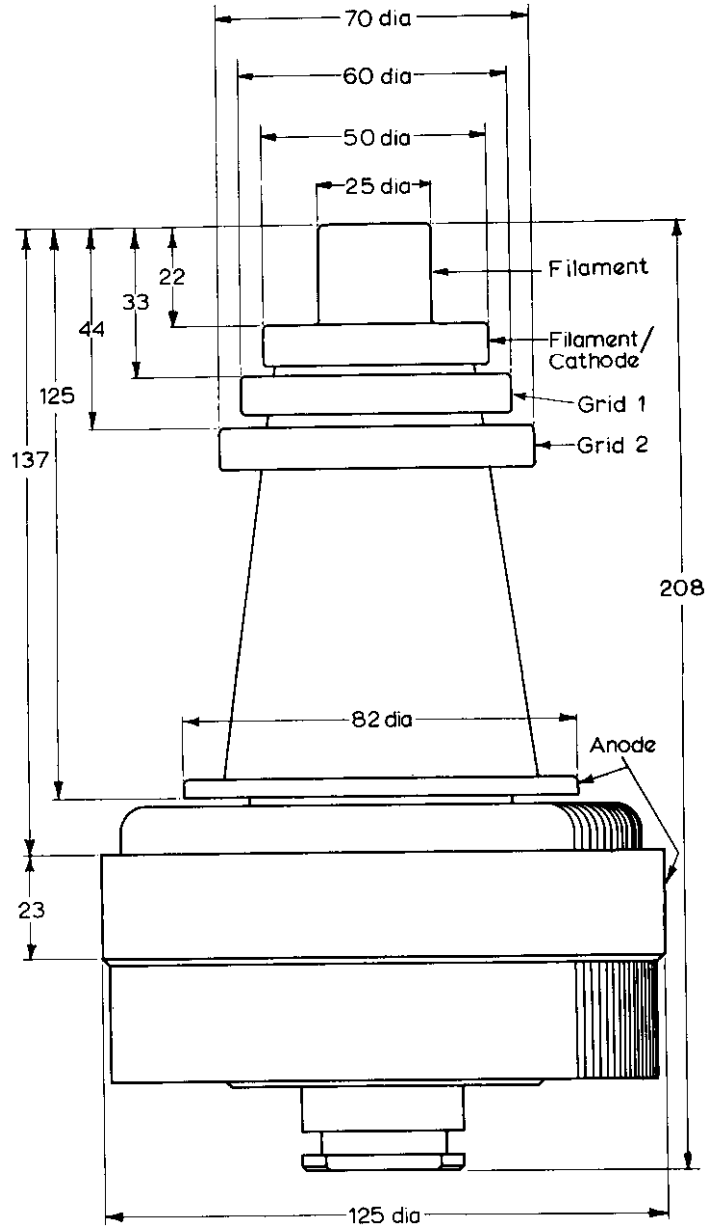
CHARACTERISTICS (Measured at $V_a = 6.0kV$, $V_{g2} = 650V$, $I_a = 2.4A$)

g_m	45	mA/V
μ_{g1-g2}	8.5	



OUTLINE DRAWING

89050

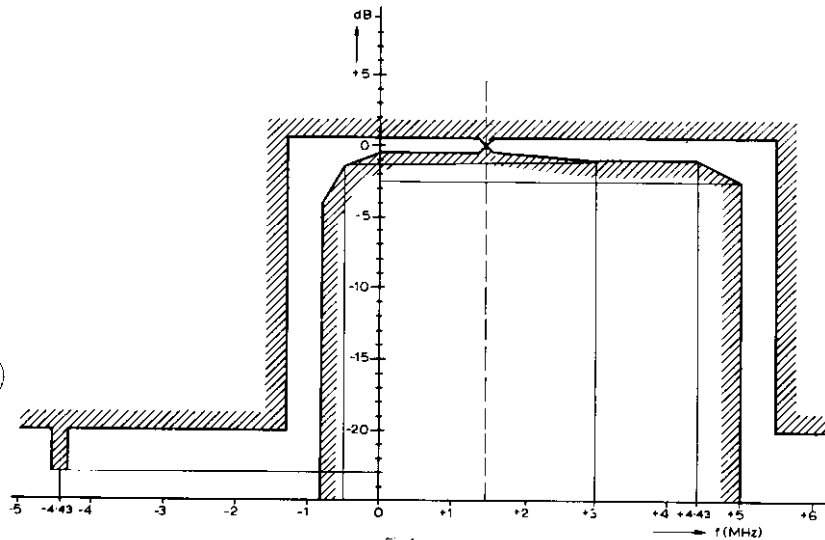


All dimensions in mm.

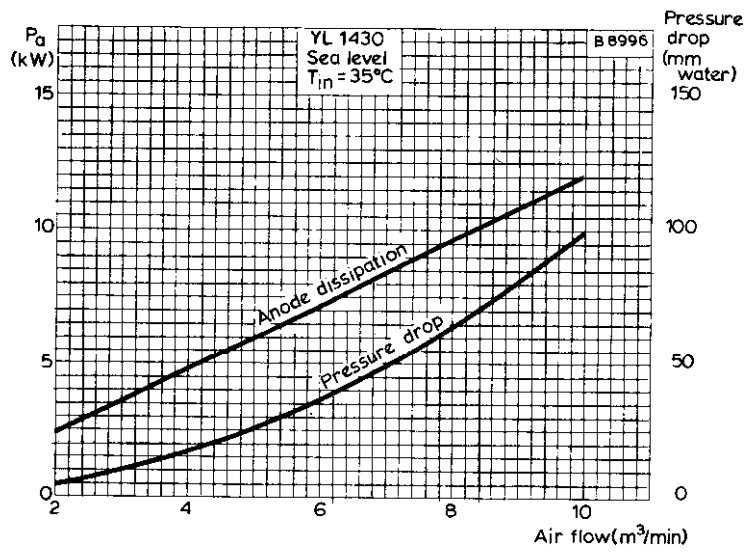


V.H.F. TETRODE

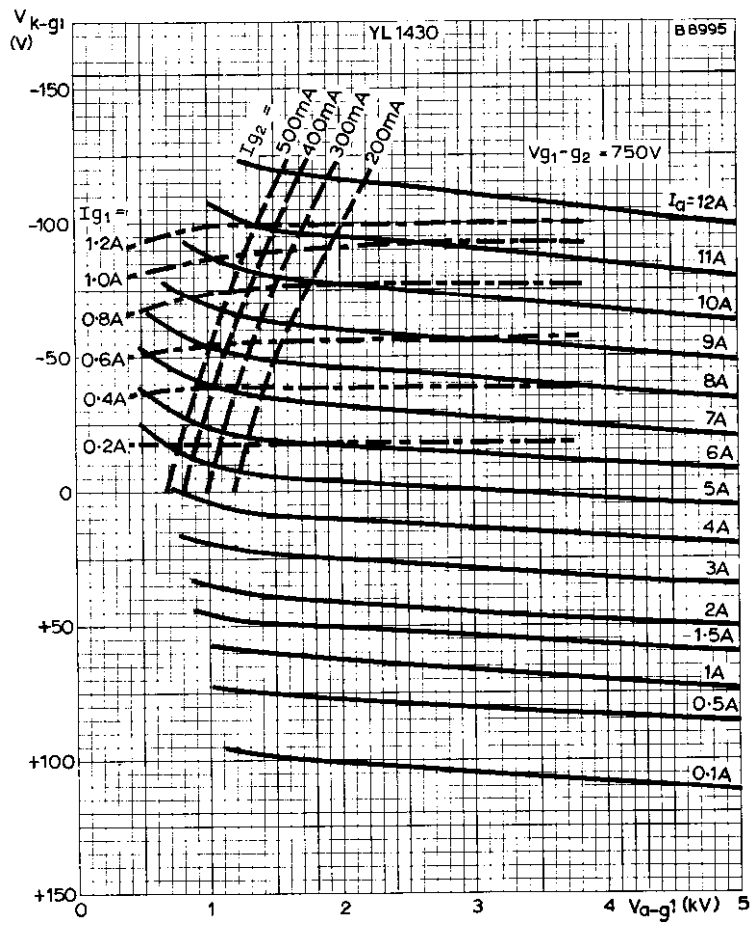
YL1430



BANDWIDTH CHART



COOLING REQUIREMENTS



CONSTANT CURRENT CHARACTERISTICS

V.H.F. POWER PENTODE

YL1000

Directly heated v.h.f. power pentode for use as a power amplifier or frequency multiplier in portable and mobile equipment.

FILAMENT (parallel operation only)

V_f	1.4 ($\pm 15\%$)	V
I_f	880	mA
t_h max. ($P_{out} = 70\%$ of final value)	0.5	s

CAPACITANCES (unshielded)

C_{a-g1}	< 150	mpF
C_{in}	6.0	pF ←
C_{out}	3.5	pF ←
C_{g1-f}	1.5	pF

CHARACTERISTICS

V_a	120	V
V_{g2}	120	V
V_{g1}	-6.5	V
I_a	30	mA
I_{g2}	2.3	mA
g_m	4.3	mA/V
μ_{g1-g2}	7.0	

RATINGS (DESIGN CENTRE SYSTEM)

$V_{a(b)}$ max.	500	V
V_a max.	300	V
P_a max.	5.0	W
$V_{g2(b)}$ max.	500	V
V_{g2} max.	300	V
P_{g2} max.	1.0	W
V_{g1} max.	-100	V
$+V_{g1(pk)}$ max.	25	V
I_k max.	50	mA
R_{g1-f} max.	2.0	M Ω
T_{bulb} max.	200	$^{\circ}$ C
V_f max. (absolute)	1.27	V
V_f min. (absolute)	0.93	V

CLASS 'C' OPERATION F.M. TELEPHONY

Maximum recommended operating conditions

These conditions are based on reaching either the maximum electrode ratings or the point where load efficiency (η_{load}) begins to fall rapidly. The conditions for 175Mc/s were measured in a circuit with a parallel tuned output circuit. If a series tuned output circuit is used at this frequency with the same operating conditions, approx. 10% higher P_{load} figures are obtained.

CLASS 'C' OPERATION F.M. TELEPHONY AT $f = 50\text{Mc/s}$

	V_a (V)	V_{g2} (V)	V_{g1} (V)	I_a max. (mA)
Power amplifier	300	150	-35	40
	250	150	-35	40
	200	150	-35	40
	150	150	-35	32
	100	100	-23	22
Frequency doubler	V_a (V)	V_{g2} (V)	V_{g1} (V)	I_a max. (mA)
	300	150	-90	40
	250	150	-90	40
	200	150	-90	38
	150	150	-90	32
100	100	-60	20	
Frequency trebler	V_a (V)	V_{g2} (V)	V_{g1} (V)	I_a max. (mA)
	300	150	-100	29
	250	150	-100	35
	200	150	-100	32
	150	150	-100	28
100	100	-100	20	

CLASS 'C' OPERATION F.M. TELEPHONY AT $f = 175\text{Mc/s}$

	V_a (V)	V_{g2} (V)	V_{g1} (V)	I_a max. (mA)
Power amplifier	300	150	-35	30
	250	150	-35	37
	200	150	-35	40
	150	150	-35	40
	100	100	-23	28
Frequency doubler	V_a (V)	V_{g2} (V)	V_{g1} (V)	I_a max. (mA)
	300	150	-90	26
	250	150	-90	32
	200	150	-90	38
	150	150	-90	32
100	100	-90	20	
Frequency trebler	V_a (V)	V_{g2} (V)	V_{g1} (V)	I_a max. (mA)
	250	150	-100	27
	200	150	-100	32
	150	150	-100	28
100	100	-100	20	



V.H.F. POWER PENTODE

YL1000

TYPICAL OPERATION CLASS 'C' OPERATION F.M. TELEPHONY

Amplifier at $f = 50\text{Mc/s}$

V_a (V)	V_{g2} (V)	V_{g1} (V)	I_a (mA)	I_{g2} (mA)	I_{g1} (mA)	$+V_{g1(pk)}$ (V)	P_{load} (W)	η_{load} (%)
300	150	-35	10	1.45	0.006	-4.5	1.68	56
			20	2.6	0.045	2.5	3.8	63.3
			30	3.0	0.45	9.0	6.1	67.8
			40	3.5	0.85	14.5	8.0	66.6
250	150	-35	10	1.62	0.008	-2.0	1.5	60
			20	3.1	0.08	3.5	3.3	65
			30	4.0	0.55	10	5.1	68
			40	5.0	0.95	17	6.7	67
200	150	-35	10	1.95	0.025	-1.5	1.3	65
			20	3.8	0.20	5.5	2.75	69
			30	5.0	0.75	12	4.1	68
			40	6.0	1.05	18	5.2	65
150	150	-35	10	2.6	0.038	-1.0	1.0	67
			20	4.3	0.24	6.0	2.05	68
			30	6.0	0.85	13.5	2.95	65.5
100	100	-23	10	2.1	0.09	1.5	0.6	60
			20	3.4	0.7	9.0	1.22	61
			25	4.5	1.2	13	1.45	57.6

Frequency doubler at $f_{out} = 50\text{Mc/s}$

V_a (V)	V_{g2} (V)	V_{g1} (V)	I_a (mA)	I_{g2} (mA)	I_{g1} (mA)	$+V_{g1(pk)}$ (V)	P_{load} (W)	η_{load} (%)
300	150	-90	10	1.38	0.015	0.5	1.58	52.7
			20	2.15	0.28	8.5	3.42	57
			30	2.6	0.73	15	5.15	57.2
			40	3.4	0.95	21	6.62	55.1
250	150	-90	10	1.6	0.024	1.2	1.36	54.4
			20	2.4	0.38	9.5	3.0	60
			30	3.2	0.80	15.5	4.45	59.3
			40	4.2	1.02	22	5.6	56
200	150	-90	10	2.05	0.04	2.0	1.16	58
			20	2.9	0.45	10	2.5	62.5
			30	3.6	0.85	16.5	3.5	58.3
150	150	-90	10	2.4	0.05	2.5	0.86	57.3
			20	3.8	0.56	11	1.8	60
			30	4.5	0.95	18	2.48	55.2
100	100	-60	10	1.95	0.26	6.0	0.53	53
			20	3.1	0.92	13	0.94	47

Frequency trebler at $f_{out} = 50\text{Mc/s}$

V_a (V)	V_{g2} (V)	V_{g1} (V)	I_a (mA)	I_{g2} (mA)	I_{g1} (mA)	$+V_{g1(pk)}$ (V)	P_{load} (W)	η_{load} (%)
300	150	-100	10	1.0	0.01	0.8	1.2	40
			20	1.75	0.26	9.5	2.6	43.3
250	150	-100	10	1.16	0.012	1.0	1.05	42
			20	1.9	0.3	10	2.24	44.8
			30	2.3	0.7	17	3.2	42.7
200	150	-100	10	1.4	0.015	1.3	0.9	45
			20	2.05	0.35	10.5	1.88	47
			30	2.45	0.72	17.5	2.7	45
150	150	-100	10	1.7	0.027	1.9	0.67	44.7
			20	2.35	0.39	11	1.44	48
100	100	-100	10	1.1	0.29	7.5	0.47	47
			20	2.2	1.02	17	0.8	40

Amplifier at $f = 175\text{Mc/s}$

V_a (V)	V_{g2} (V)	V_{g1} (V)	I_a (mA)	I_{g2} (mA)	I_{g1} (mA)	P_{load} (W)	η_{load} (%)
300	150	-35	15	0.9	0	0.98	21.7
			20	1.34	0	1.66	27.7
			25	1.56	0.01	2.48	33.1
			30	2.08	0.07	3.3	36.7
250	150	-35	15	1.0	0	0.91	24.3
			20	1.42	0	1.48	29.4
			25	1.96	0.01	2.17	34.7
			30	2.25	0.1	2.88	38.5
			35	2.42	0.2	3.6	41.1
200	150	-35	15	1.3	0	0.81	27
			20	1.96	0	1.37	32.5
			25	2.12	0.02	1.9	38
			30	2.4	0.11	2.5	41.7
			35	2.64	0.28	3.08	44
150	150	-35	15	1.74	0	0.7	31.1
			20	2.14	0.01	1.14	38
			25	2.5	0.03	1.56	41.7
			30	2.9	0.12	2.0	44.5
			35	3.2	0.3	2.42	46.1
100	100	-23	15	1.28	0.04	0.56	37.3
			20	1.5	0.22	0.89	44.5
			25	1.82	0.54	1.18	47.2

V.H.F. POWER PENTODE

YL1000

Frequency doubler at $f_{out} = 175\text{Mc/s}$

V_a (V)	V_{g2} (V)	V_{g1} (V)	I_a (mA)	I_{g2} (mA)	I_{g1} (mA)	P_{load} (W)	η_{load} (%)
300	150	-90	15	0.84	0	0.82	18.2
			20	1.1	0.12	1.46	24.3
			25	1.22	0.34	2.1	28
250	150	-90	15	0.98	0.02	0.8	21.3
			20	1.26	0.15	1.35	27
			25	1.4	0.4	1.88	30
			30	1.62	0.6	2.4	32
200	150	-90	15	1.2	0.04	0.73	24.3
			20	1.4	0.22	1.2	30
			25	1.6	0.42	1.7	34
			30	1.85	0.66	2.15	35.9
			35	2.0	0.8	2.55	36.5
150	150	-90	15	1.58	0.06	0.66	29.4
			20	1.76	0.26	1.04	34.7
			25	2.07	0.46	1.42	37.9
			30	2.25	0.72	1.78	39.5
			35	2.36	0.88	2.1	40
100	100	-60	15	1.0	0.38	0.54	36
			20	1.36	0.7	0.74	37

Frequency trebler $f_{out} = 175\text{Mc/s}$

V_a (V)	V_{g2} (V)	V_{g1} (V)	I_a (mA)	I_{g2} (mA)	I_{g1} (mA)	P_{load} (W)	η_{load} (%)
250	150	-100	15	0.88	0.04	0.6	16
			20	1.12	0.18	0.95	19
			25	1.26	0.4	1.29	20.7
200	150	-100	15	1.02	0.05	0.55	18.3
			20	1.24	0.22	0.86	21.5
			25	1.42	0.42	1.15	23
			30	1.66	0.6	1.42	23.7
150	150	-100	15	1.26	0.07	0.49	21.8
			20	1.42	0.30	0.76	25.3
			25	1.64	0.44	0.99	26.4
100	100	-100	15	0.94	0.52	0.4	26.7
			20	1.5	0.84	0.5	25

CLASS 'C' A.M. TELEPHONY

**Maximum carrier conditions for 100% modulation
Output tuned circuit**

	Single valve operation			Push-pull operation		
	Parallel	Parallel	Series			
f	50	175	175	50	175	Mc/s
V _a	250	200	200	250	200	V
V _{g2}	150	150	150	150	150	V
V _{g1}	-35	-35	-35	-35	-35	V
I _a	32	31	32	2 × 32	2 × 32	mA
I _{g2}	4.2	2.45	2.5	2 × 4.2	2 × 2.5	mA
I _{g1}	0.62	0.14	0.18	2 × 0.62	2 × 0.18	mA
P _{load}	5.4	2.65	3.05	12	6.2	W
η	67.5	42	47	75	48.5	%
For 100% modulation						
P _{mod}	4.2	3.2	3.3	8.4	6.4	W
v _{g2(pk)}	135	120	120	135	120	V

**Maximum carrier conditions for anode and screen-grid modulation
for various modulation depths. f = 175Mc/s**

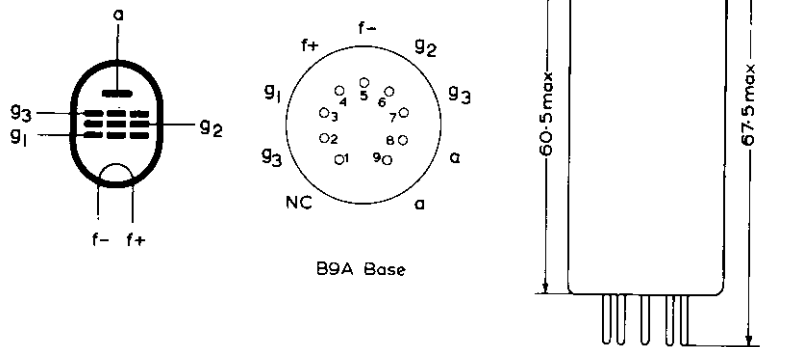
m (%)	V _a (V)	I _a (mA)	P _a (max.) (W)	P _{g2} (max.) (W)	P _{load} * (W)	Output tuned circuit
100	200	31	3.3	0.67	2.65	Parallel
	200	32	3.3	0.67	3.05	Series
	200	64	2 × 3.3	2 × 0.67	6.2	Push-Pull
75	220	34	3.9	0.78	3.2	Parallel
	220	35	3.9	0.78	3.65	Series
	220	70	2 × 3.9	2 × 0.78	7.4	Push-Pull
50	235	35	4.45	0.89	3.47	Parallel
	235	36	4.45	0.89	3.96	Series
	235	72	2 × 4.45	2 × 0.89	8.0	Push-Pull
25	245	37	4.85	0.97	3.82	Parallel
	245	38	4.85	0.97	4.37	Series
	245	76	2 × 4.85	0.97	8.8	Push-Pull
0	250	38	5.0	1.0	4.02	Parallel
	250	39	5.0	1.0	4.55	Series
	250	80	2 × 5.0	2 × 1.0	9.6	Push-Pull

*Estimated value

These conditions may be varied for operation at lower frequencies. Operation at 100% modulation with V_a > 250V, I_a > 32mA is not permitted and the P_a max. and P_{g2} max. limits shown above must never be exceeded.

V.H.F. POWER PENTODE

YL1000



All dimensions in mm

B4662

(

(

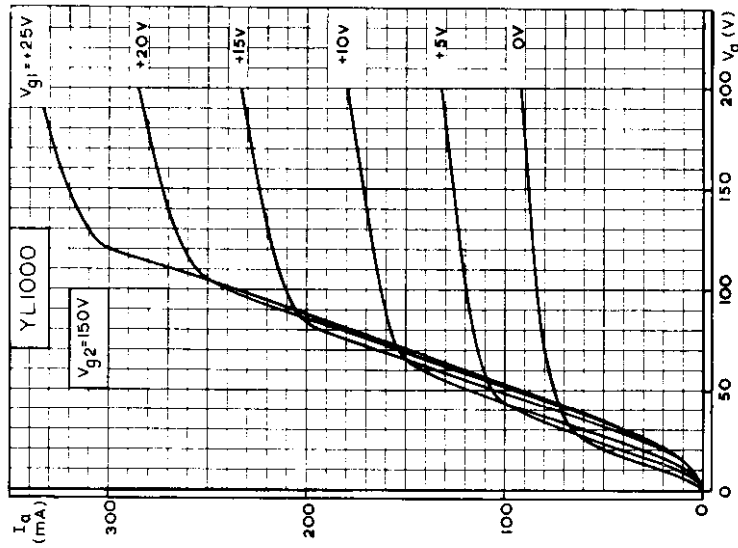
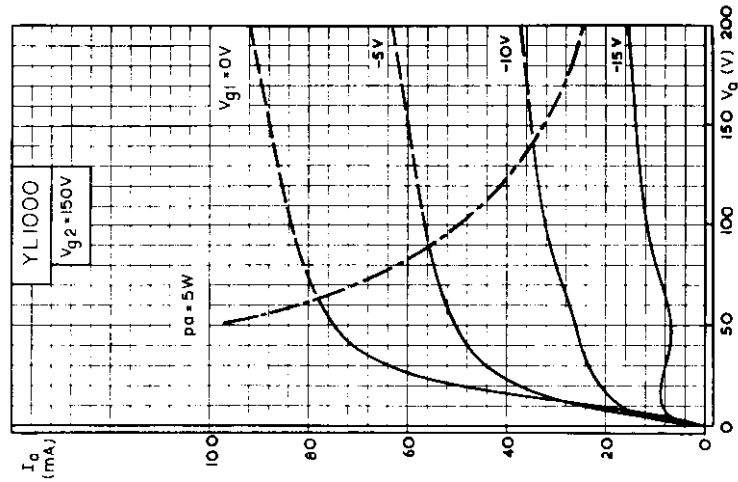
(

(

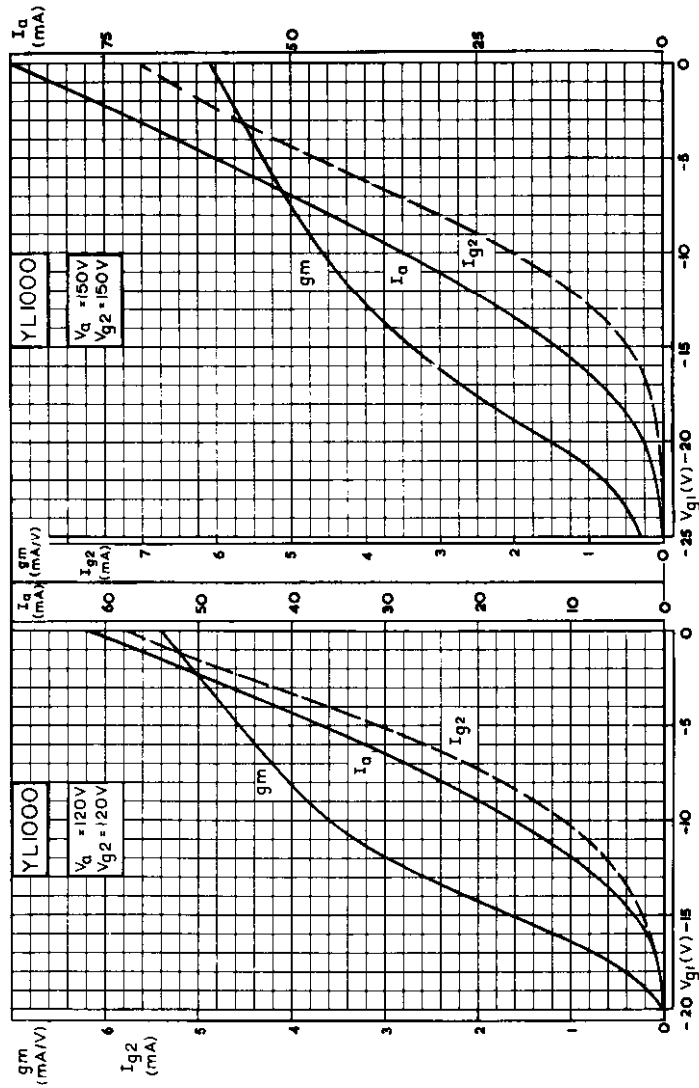


V.H.F. POWER PENTODE

YL1000



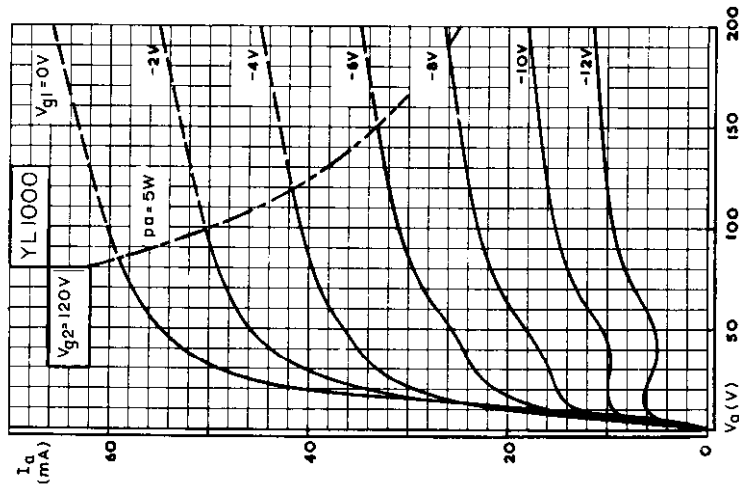
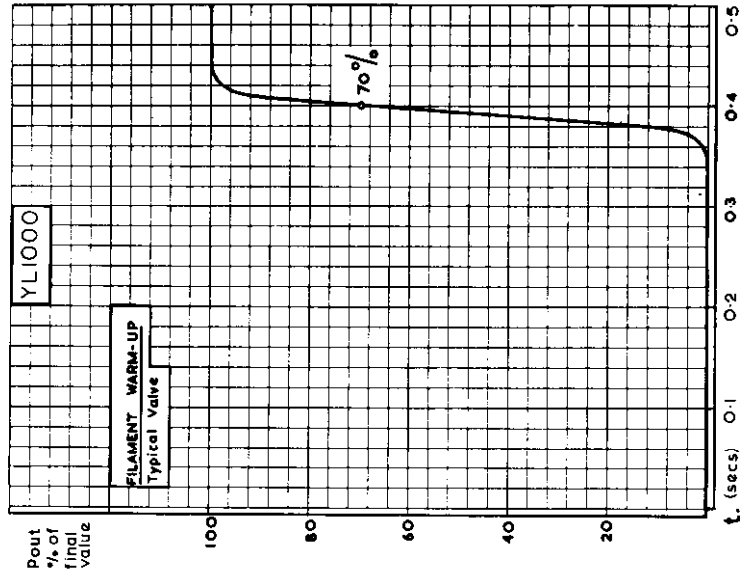
ANODE CURRENT PLOTTED AGAINST ANODE VOLTAGE WITH CONTROL-GRID VOLTAGE AS PARAMETER $V_{g2} = +150V$



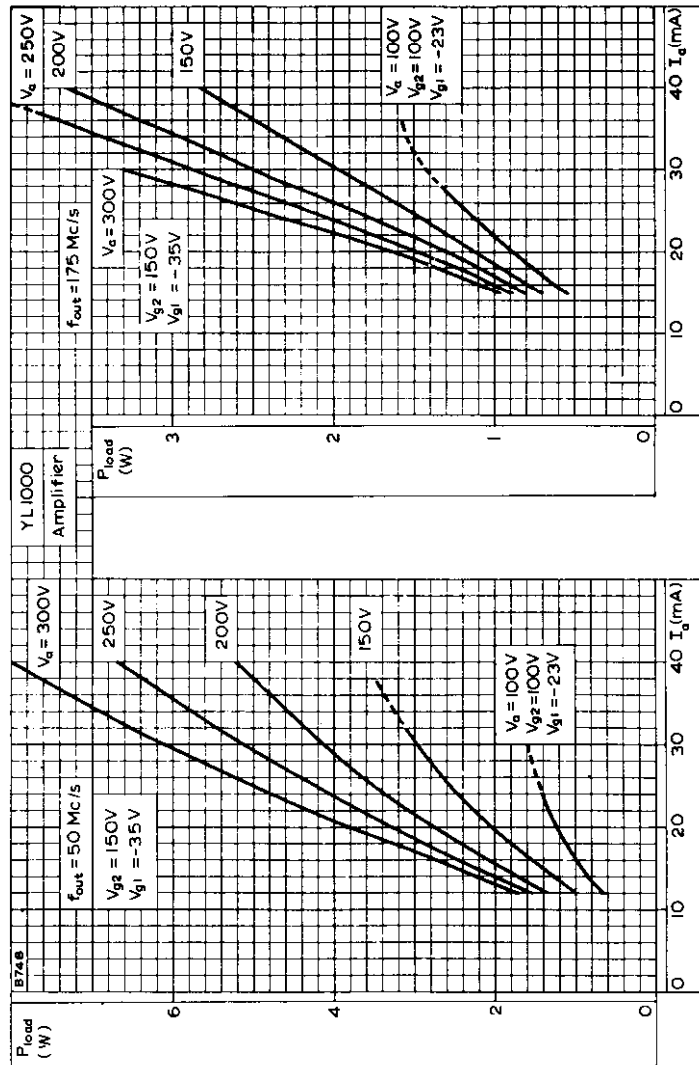
ANODE CURRENT, SCREEN-GRID CURRENT, AND MUTUAL CONDUCTANCE PLOTTED AGAINST CONTROL-GRID VOLTAGE

V.H.F. POWER PENTODE

YL1000



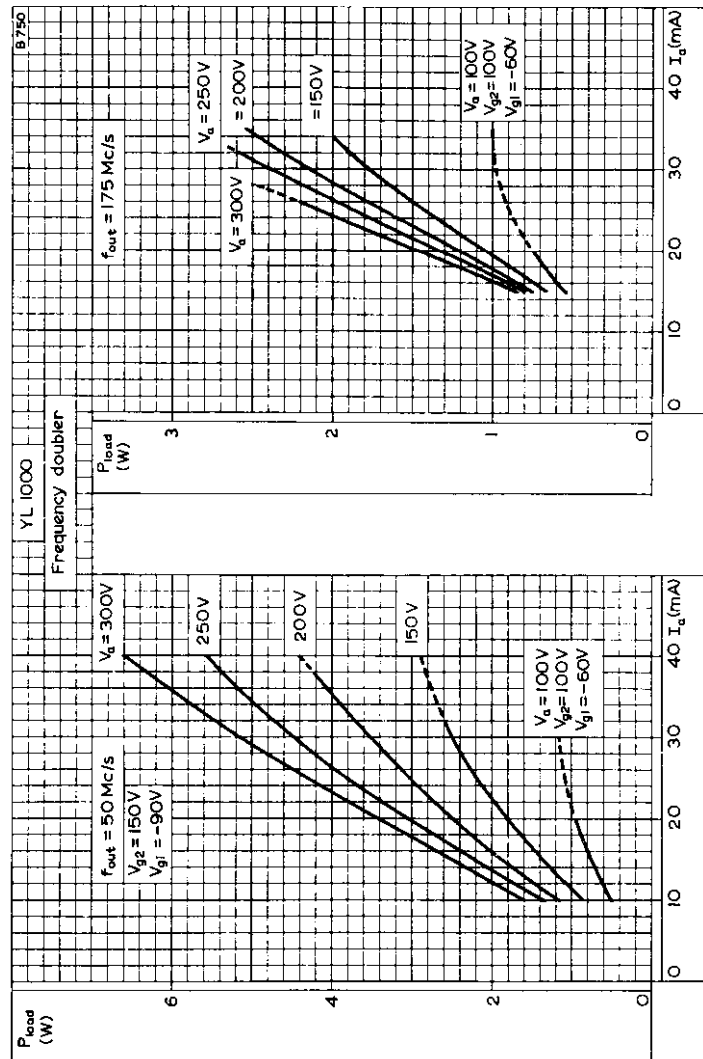
ANODE CURRENT PLOTTED AGAINST ANODE VOLTAGE WITH CONTROL-GRID VOLTAGE AS PARAMETER $V_{g2} = 120V$
FILAMENT WARM-UP TIME



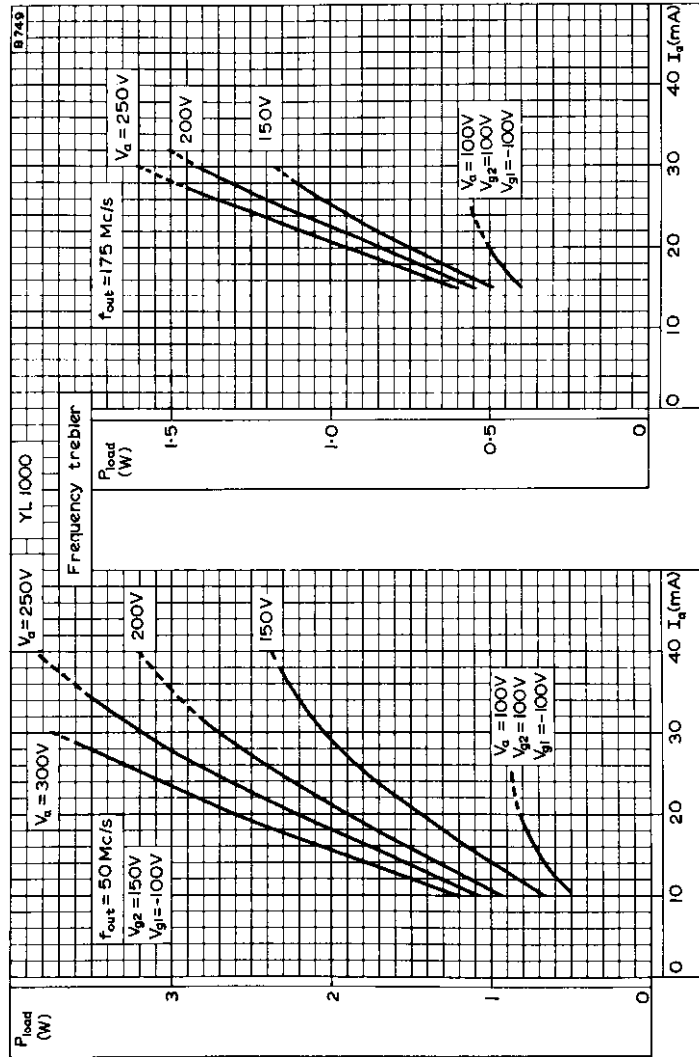
LOAD POWER AS AN AMPLIFIER PLOTTED AGAINST ANODE CURRENT FOR VARIOUS ANODE VOLTAGES

V.H.F. POWER PENTODE

YL1000



LOAD POWER AS A FREQUENCY DOUBLER PLOTTED AGAINST ANODE CURRENT FOR VARIOUS ANODE VOLTAGES



LOAD POWER AS A FREQUENCY TREBLER PLOTTED AGAINST ANODE CURRENT FOR VARIOUS ANODE VOLTAGES

**QUICK HEATING
DOUBLE TETRODE**

**YL1020
QQZ03-20**

QUICK REFERENCE DATA

*Amplifier and frequency multiplier for mobile transmitters.
70% power output in less than 0.5 second.*

	Class 'C' Telegraphy	Frequency Treble	
f max	500	500	Mc/s
V _a max. (f < 200Mc/s)	600	600	V
p _a max.	2 × 10	2 × 10	W
Performance			
f	200	200	Mc/s
P _{out}	45	9.0	W

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

CLASS 'C' TELEGRAPHY OR F.M. TELEPHONY (Intermittent mobile service)

Absolute maximum ratings

f max.	500	Mc/s
V _a max.		
f = 200Mc/s	600	V
f = 500Mc/s	450	V
V _{g2} max.	300	V
-V _{g1} max.	75	V
I _{g1} max.	2 × 2.5	mA
I _k max.	2 × 60	mA
i _{k(pk)} max.	2 × 280	mA
p _a max.	2 × 10	W
p _{g2} max.	2 × 1.5	W
p _{g1} max.	2 × 0.5	W

Typical operating conditions

f	200	200	200	460	Mc/s
V _a	300	400	600	400	V
V _{g2}	250	250	250	250	V
-V _{g1}	40	50	60	50	V
V _{in(pk)}	2 × 58	2 × 68	2 × 78	-	V
I _a	2 × 50	2 × 50	2 × 50	2 × 50	mA
I _{g2}	2 × 4.0	2 × 3.5	2 × 3.0	2 × 3.0	mA
I _{g1}	2 × 1.5	2 × 1.5	2 × 1.0	2 × 0.6	mA
P _{load} (driver)	1.2	1.3	1.5	5.0	W
η _a	63	70	75	52.5	%
p _a	2 × 5.5	2 × 6.0	2 × 7.5	9.5	W
P _{out}	19	28	45	21	W
P _{load}	16	22	35	17	W

YL1020 QQZ03-20

QUICK HEATING DOUBLE TETRODE

ANODE AND SCREEN GRID MODULATED CLASS 'C' AMPLIFIER (Intermittent mobile service)

Absolute maximum ratings

Carrier condition for a modulation factor of 1.

f max.	500	Mc/s
V _a max.		
f = 200Mc/s	500	V
f = 500Mc/s	373	V
V _{g2} max.	300	V
-V _{g1} max.	100	V
I _{g1} max.	2 × 2.5	mA
I _k max.	2 × 55	mA
i _{k(pk)} max.	2 × 220	mA
P _a max.	2 × 7.0	W
P _{g2} max.	2 × 1.2	W
P _{g1} max.	2 × 0.5	W

Typical operating conditions

f	200	200	Mc/s
V _a	300	500	V
V _{g2}	250	250	V
-V _{g1}	50	80	V
V _{in(pk)}	2 × 83	2 × 110	V
I _a	2 × 40	2 × 40	mA
I _{g2}	2 × 3.5	2 × 4.0	mA
I _{g1}	2 × 1.5	2 × 1.5	mA
P _{load} (driver)	1.5	3.0	W
η _a	67	73	%
P _a	2 × 4.0	2 × 5.5	W
P _{out}	16	29	W
P _{load}	13	22	W

OPERATION AS FREQUENCY MULTIPLIER

Absolute maximum ratings

V _a max.	600	V
V _{g2} max.	300	V
-V _{g1} max.	200	V
I _{g1} max.	2 × 4.5	mA
I _k max.	2 × 55	mA
i _{k(pk)} max.	2 × 400	mA
P _a max.	2 × 10	W
P _{g2} max.	2 × 1.5	W
P _{g1} max.	2 × 0.5	W

**QUICK HEATING
DOUBLE TETRODE**

**YL1020
QQZ03-20**

Typical operating conditions

f_{out}	200	460	Mc/s
V_a	300	300	V
V_{g2}	250	250	V
$-V_{g1}$	175	175	V
$V_{in(pk)}$	2×205	2×205	V
I_a	2×45	2×45	mA
I_{g2}	2×4.0	2×3.5	mA
I_{g1}	2×3.0	2×2.5	mA
$P_{load} (driver)$	3.0	5.0	W
η_a	33	26	%
P_a	2×9.0	2×10	W
P_{out}	9.0	7.0	W
P_{load}	7.0	5.5	W

OPERATING NOTE

I_{g1} and I_{g2} will vary from valve to valve, hence the use of fixed resistors R_{g1} and R_{g2} will result in variation of input and output power. It is therefore recommended that R_{g2} be made adjustable.

CATHODE

Quick heating directly heated filament. 70% P_{out} in less than 0.5 second. ←

* V_f d.c. or r.m.s.	1.6	V
I_f	4.25	A
Frequency of filament supply		
Sine wave	max 200	c/s
Square wave	Any	

*The filament has been designed to accept temporary fluctuations of supply voltage of $\pm 15\%$.

CAPACITANCES

C_{out} (two sections in push-pull)	1.5	pF
C_{in} (two sections in push-pull)	4.0	pF

Internally neutralised for push-pull operation.

CHARACTERISTICS (measured at $V_a = 300V$, $V_{g2} = 250V$, $I_a = 40mA$)

g_m	4.0	mA/V
μ_{g1-g2}	9.0	

COOLING

Radiation and Convection cooled

Maximum temperatures		
Base-seals	180	°C
Anode seal	250	°C
Bulb	250	°C

Anode connectors providing a high degree of heat transfer by radiation or conduction should be used.

YL1020 QQZ03-20

QUICK HEATING
DOUBLE TETRODE

MOUNTING POSITION

ANY (but see G.O.R's)

PHYSICAL DATA

Weight of valve	{ 1.8	oz
	{ 50	g
Weight of valve in carton	{ 9.0	oz
	{ 250	g

ACCESSORIES

Anode clips	40623
Socket	40202

DIMENSIONS

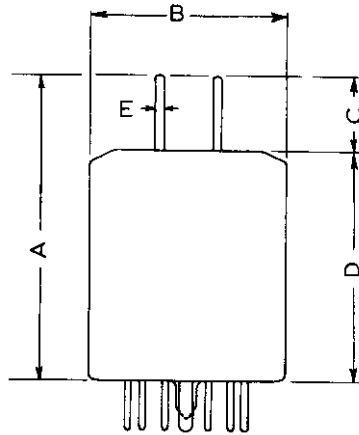
	<i>Inches</i>	<i>Millimetres</i>	
A	2.874	73	max.
B	1.811	46	max.
C	0.650 ± 0.059	16.5 ± 1.5	
D	2.165	55	max.
E	0.079 ± 0.004	2.0 ± 0.1	
F	0.098 ± 0.001	2.5 ± 0.03	
G	0.551 ± 0.001	14 ± 0.03	

Inch dimensions derived from original millimetre dimensions.

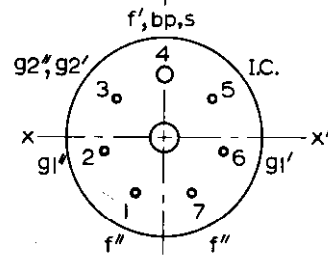
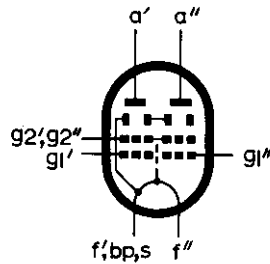
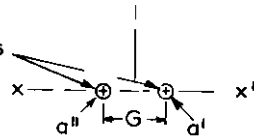


**QUICK HEATING
DOUBLE TETRODE**

**YL1020
QQZ03-20**



Location of
anode pins
within circles
of dia F



B7A Base

Contacts 1 and 7 should be
strapped together externally
to reduce the effective
contact resistance.

B1571

()

(

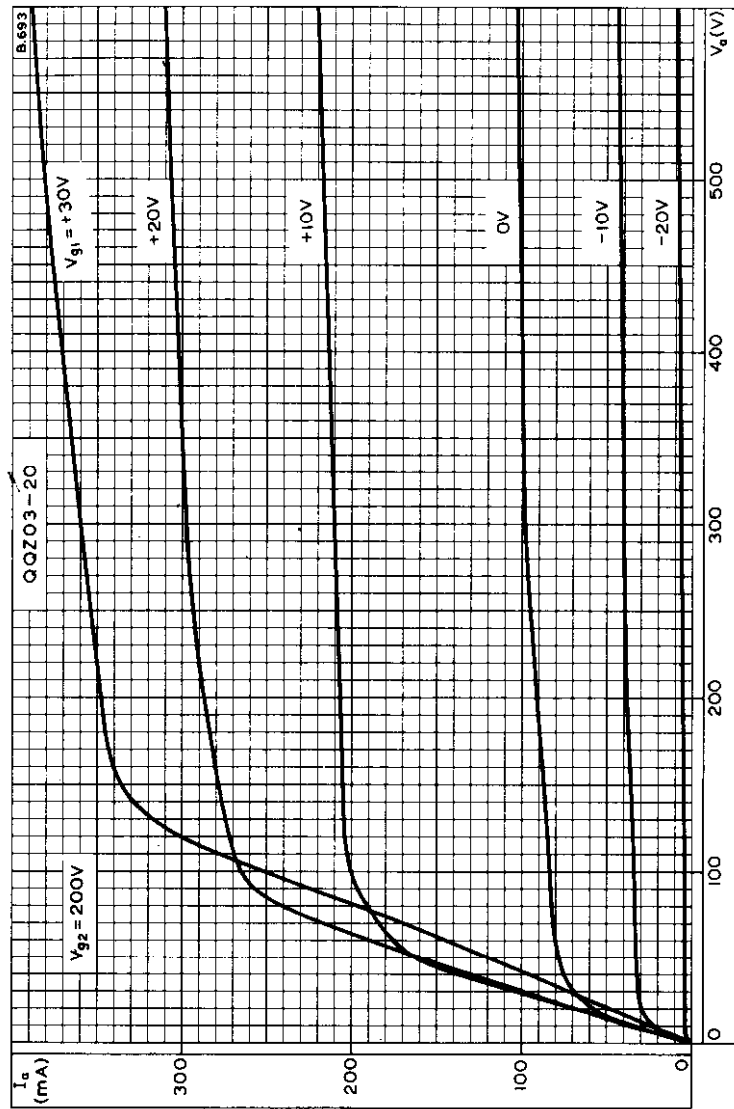
()

()



QUICK HEATING
DOUBLE TETRODE

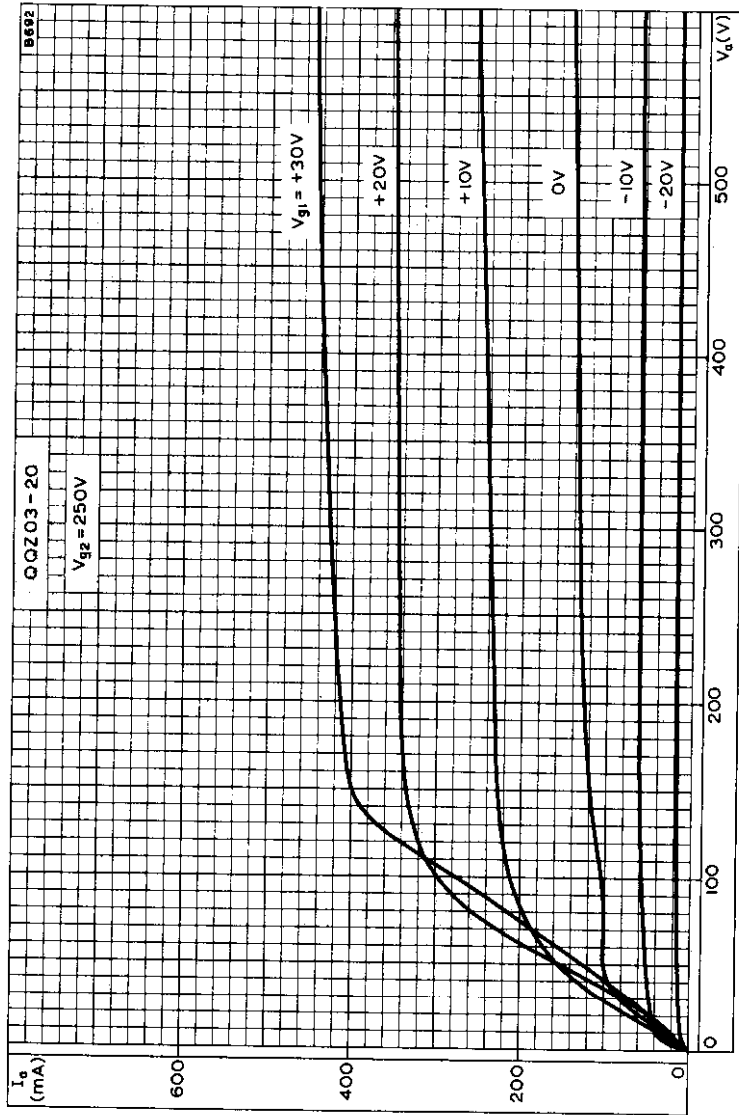
YL1020
QQZ03-20



ANODE CURRENT PLOTTED AGAINST ANODE VOLTAGE WITH CONTROL-
GRID VOLTAGE AS PARAMETER. $V_{g2} = 200V$

YL1020 QQZ03-20

QUICK HEATING
DOUBLE TETRODE

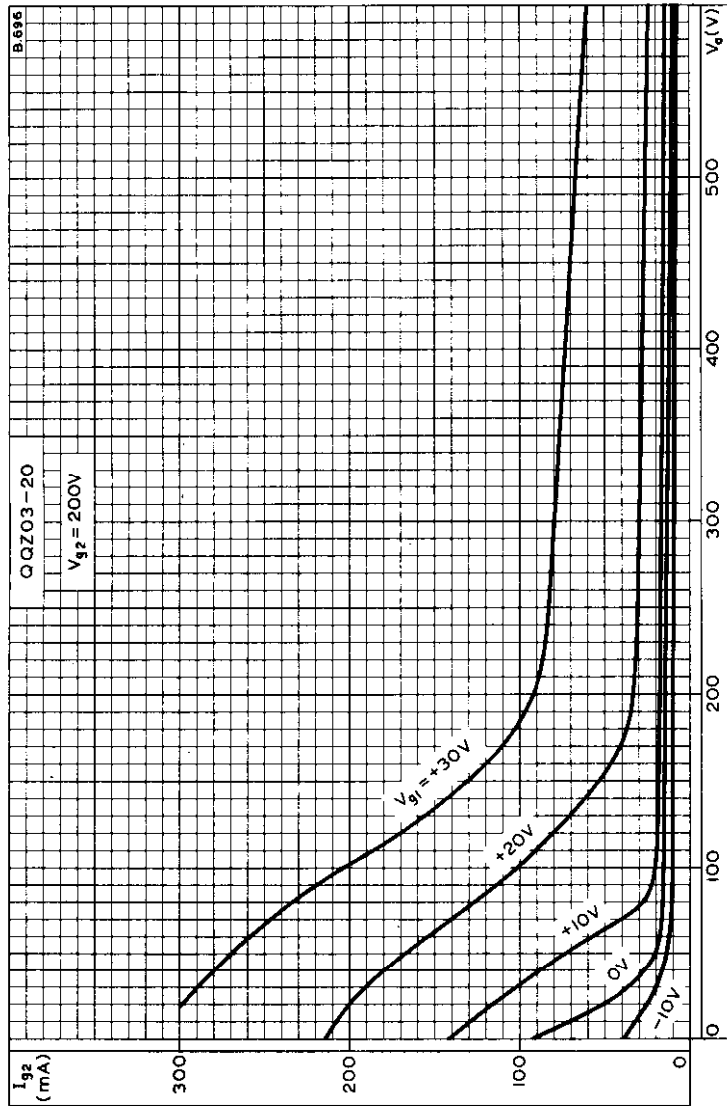


ANODE CURRENT PLOTTED AGAINST ANODE VOLTAGE WITH CONTROL-GRID VOLTAGE AS PARAMETER. $V_{g2} = 250V$



QUICK HEATING
DOUBLE TETRODE

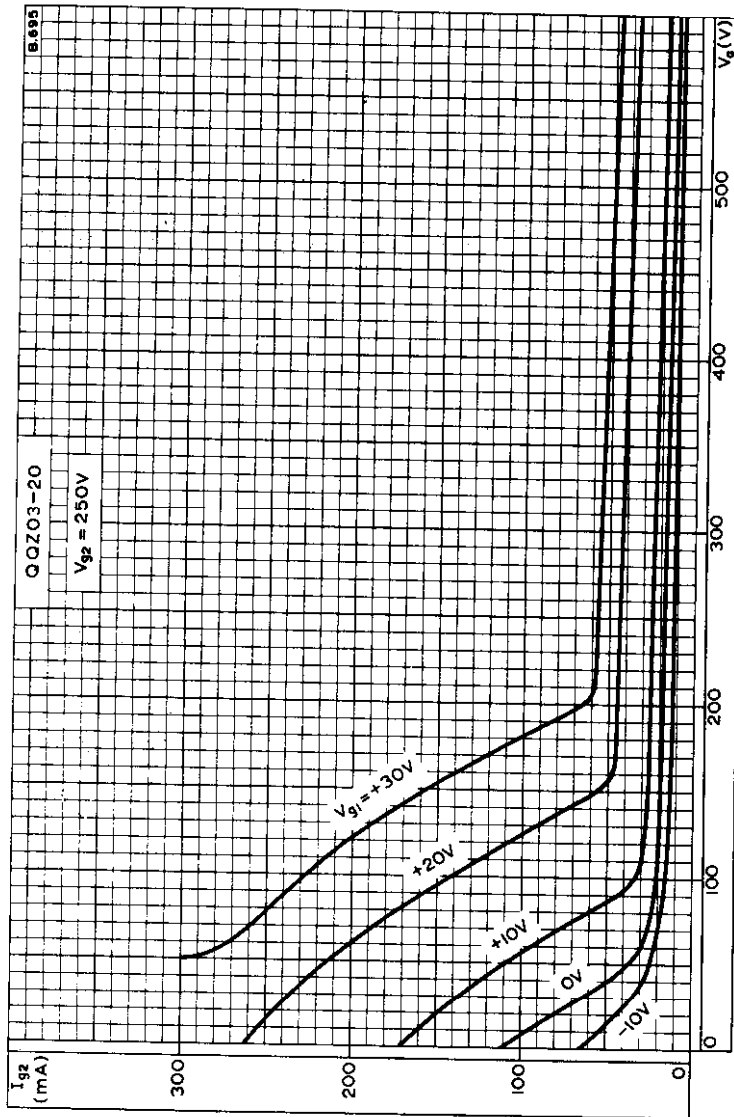
YLI020
QQZ03-20



SCREEN-GRID CURRENT PLOTTED AGAINST ANODE VOLTAGE WITH CONTROL-GRID VOLTAGE AS PARAMETER. $V_{g2} = 200V$

YL1020 QQZ03-20

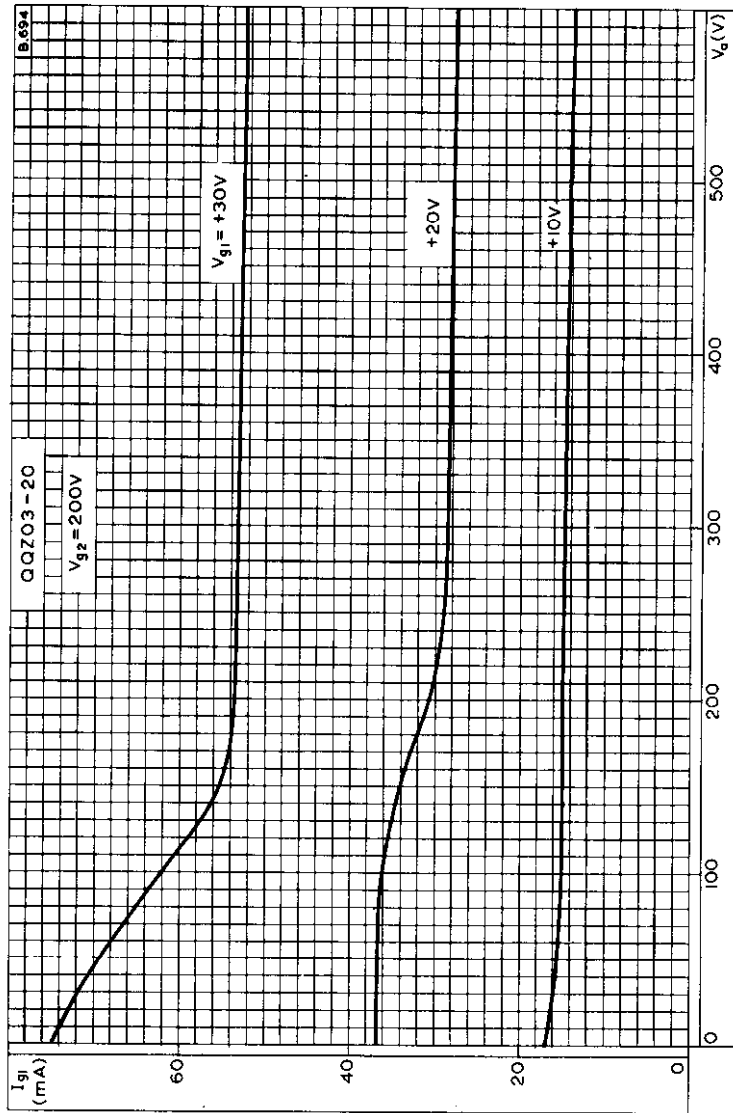
QUICK HEATING
DOUBLE TETRODE



SCREEN-GRID CURRENT PLOTTED AGAINST ANODE VOLTAGE WITH CONTROL-GRID VOLTAGE AS PARAMETER. $V_{g2} = 250V$

QUICK HEATING
DOUBLE TETRODE

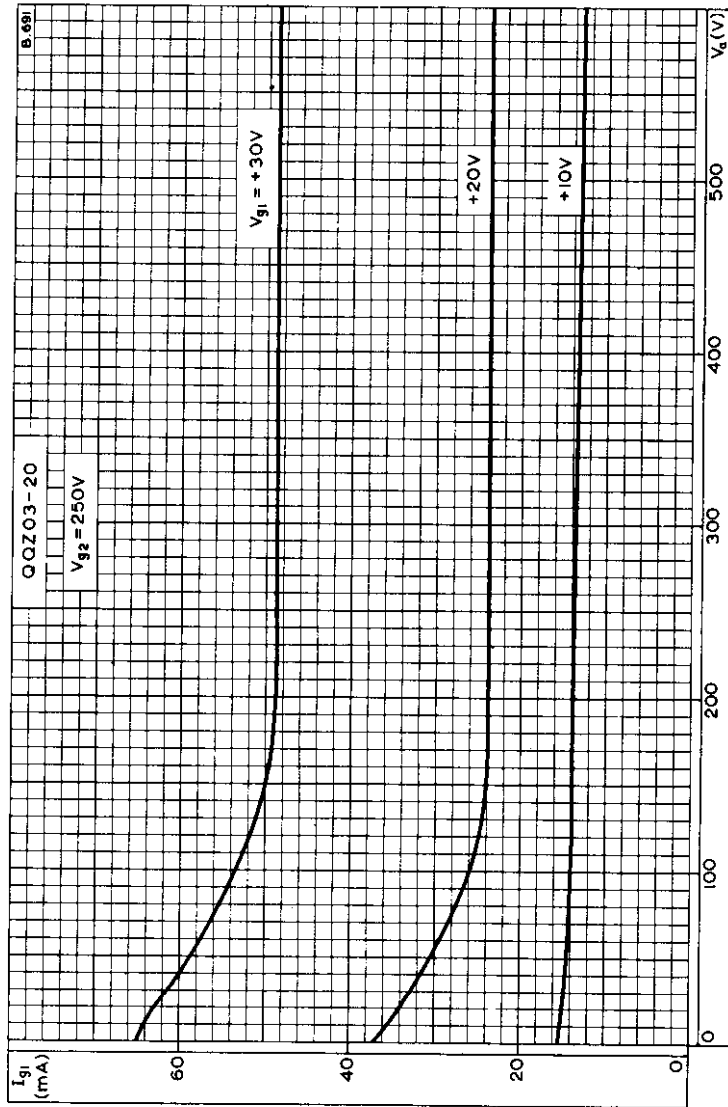
YL1020
QQZ03-20



CONTROL-GRID CURRENT PLOTTED AGAINST ANODE VOLTAGE WITH CONTROL-GRID VOLTAGE AS PARAMETER. $V_{g2} = 200V$

YL1020 QQZ03-20

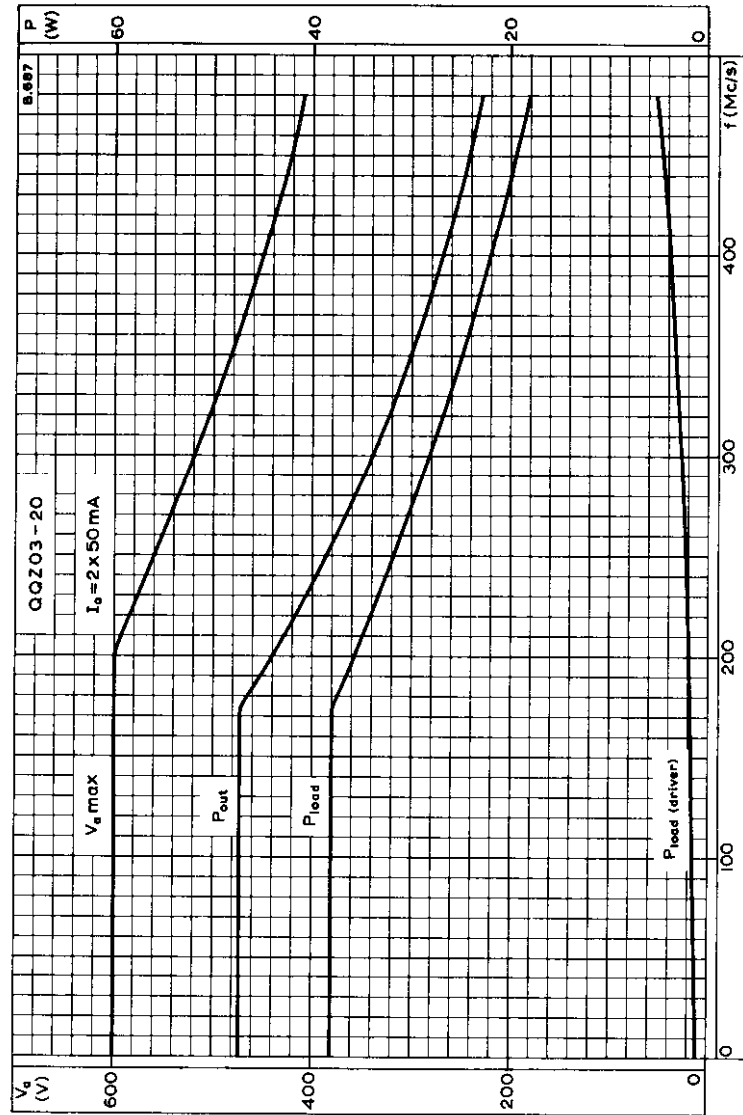
QUICK HEATING
DOUBLE TETRODE



CONTROL-GRID CURRENT PLOTTED AGAINST ANODE VOLTAGE WITH CONTROL-GRID VOLTAGE AS PARAMETER. $V_{g2} = 250V$

QUICK HEATING
DOUBLE TETRODE

YL1020
QQZ03-20

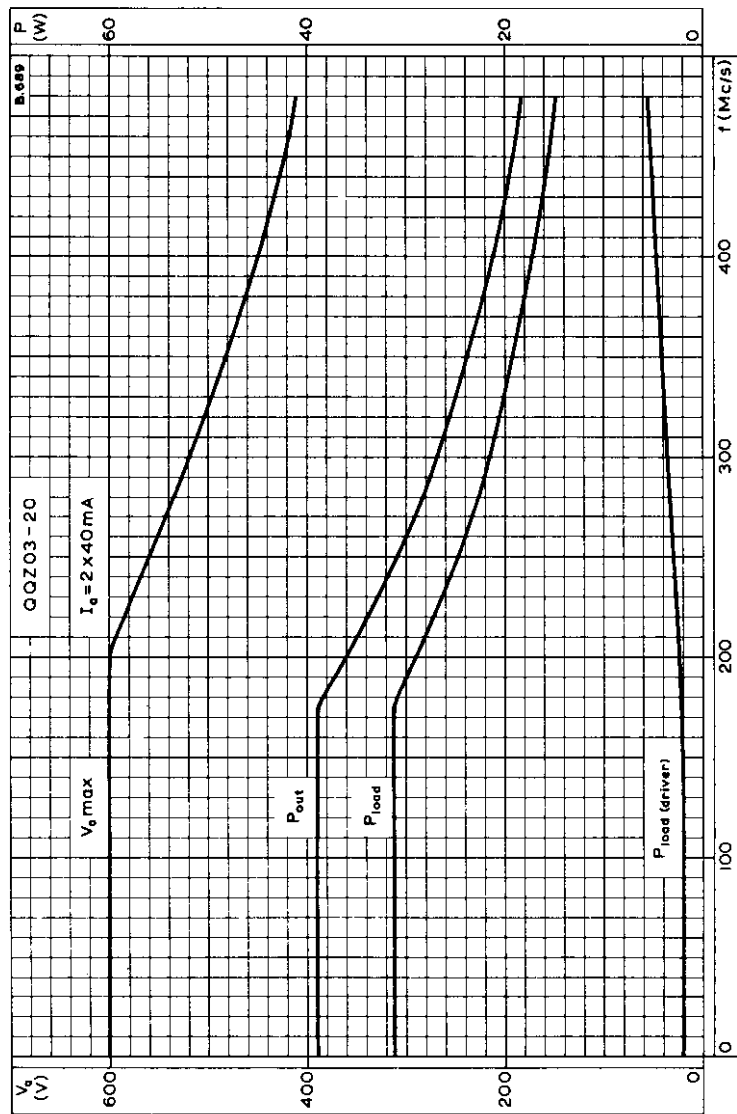


FREQUENCY CHARACTERISTICS AS A PUSH-PULL R.F. POWER AMPLIFIER CLASS 'C' TELEGRAPHY OR F.M. TELEPHONY. $I_a = 2 \times 50 \text{ mA}$



YL1020 QQZ03-20

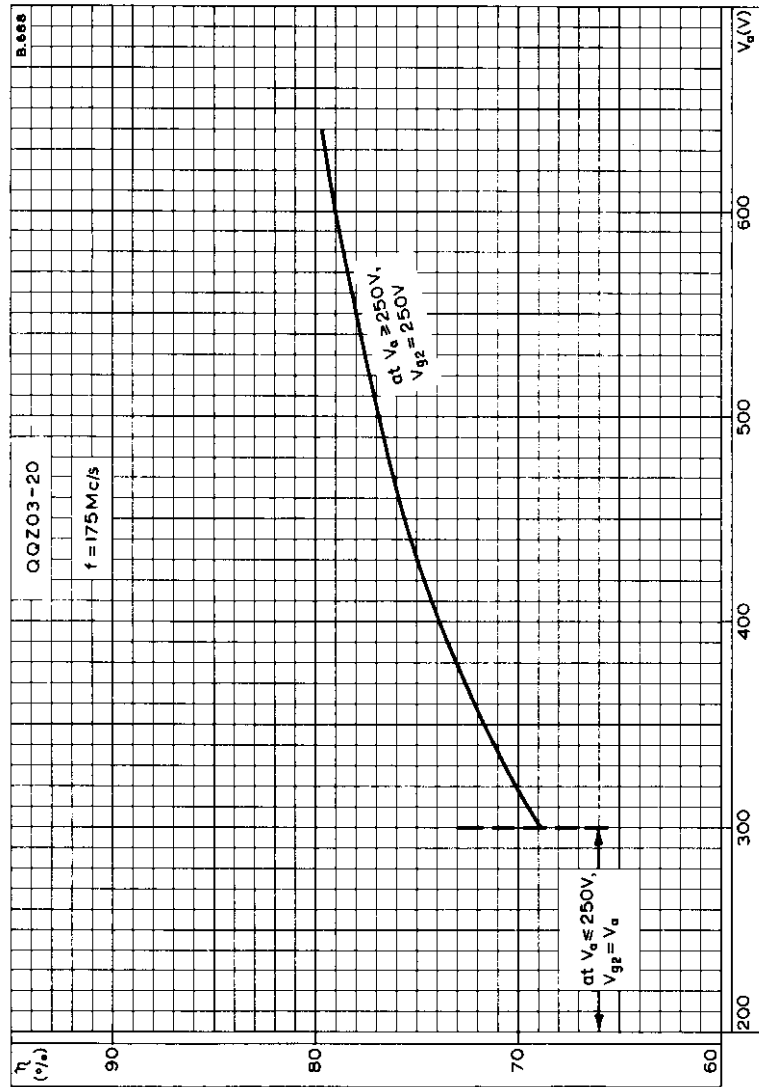
QUICK HEATING
DOUBLE TETRODE



FREQUENCY CHARACTERISTICS AS A PUSH-PULL ANODE AND SCREEN-GRID MODULATED R.F. POWER AMPLIFIER. $I_{a1} = 2 \times 40 \text{ mA}$

QUICK HEATING
DOUBLE TETRODE

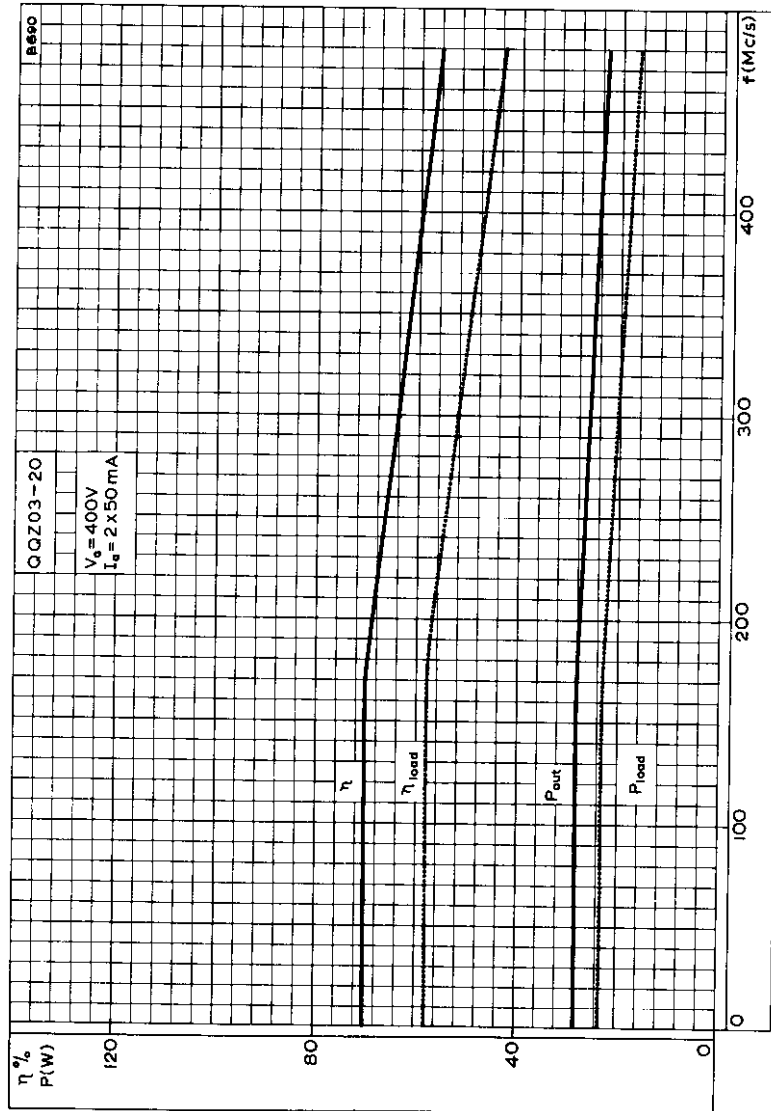
YL1020
QQZ03-20



ANODE EFFICIENCY PLOTTED AGAINST ANODE VOLTAGE FOR CLASS 'C'
PUSH-PULL TELEGRAPHY $f = 175 \text{ Mc/s}$

YL1020 QQZ03-20

QUICK HEATING
DOUBLE TETRODE



FREQUENCY CHARACTERISTICS AS A PUSH-PULL R.F. POWER AMPLIFIER CLASS 'C' TELEGRAPHY OR F.M. TELEPHONY. $V_g = 400V$, $I_a = 2 \times 50mA$



V.H.F. QUICK HEATING DOUBLE TETRODE

YL1030 QQZ06-40

PRELIMINARY DATA

QUICK REFERENCE DATA

Quick heating double tetrode for use as u.h.f. power amplifier or frequency multiplier in mobile transmitters.

70% of normal power output is obtained within 0.5 second.

	Class 'C' Telephony Anode and screen grid modulated	Class 'C' Telegraphy or F.M. Telephony	
f	180	180	Mc/s
P _{out}	64	85	W
f max.	500	500	Mc/s
V _a max.			
	(f = 200 Mc/s)	600	750
	(f = 500 Mc/s)	400	500
p _a max.	2 x 14	2 x 20	W

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

CLASS 'C' TELEGRAPHY OR F.M. TELEPHONY

Maximum operating conditions	Intermittent Mobile Service		
f	180	180	Mc/s
P _{out}	53	85	W
P _{load}	45	75	W
η _a	66	71	%
V _a	400	600	V
I _a	2 x 100	2 x 100	mA
V _{g2}	250	250	V
I _{g2}	2 x 8.0	2 x 9.0	mA
-V _{g1}	60	80	V
I _{g1}	2 x 3.0	2 x 3.5	mA
P _{load (driver)}	3.0	4.0	W
p _a	2 x 13.5	2 x 17.5	W
p _{g2}			W

CLASS 'C' TELEPHONY AND SCREEN-GRID MODULATION

Maximum operating conditions (Carrier conditions for 100% modulation)	Intermittent Mobile Service		
f	180	130	Mc/s
P_{out}	39	64	W
P_{load}	32	53	W
η_a	65	71	%
V_a	400	600	V
I_a	2 x 75	2 x 75	mA
V_{g2}	250	250	V
I_{g2}	2 x 9.0	2 x 9.0	mA
$-V_{g1}$	70	80	V
I_{g1}	2 x 2.0	2 x 2.0	mA
$P_{load} (driver)$	4.0	5.0	W
p_a	2 x 10.5	2 x 13	W
For 100% modulation			
P_{mod}	47	47	W
$v_{g2} (pk)$	185	185	V

FREQUENCY MULTIPLIER

Maximum operating conditions	Intermittent mobile service			
f_{out}/f_{in}	150/50	150/50	470/157	Mc/s
P_{out}	18	20	16	W
P_{load}	14.5	16	12	W
η_a	31	33	31	%
V_a	400	500	400	V
I_a	2 x 72	2 x 60	2 x 65	mA
V_{g2}	250	250	250	V
I_{g2}	2 x 8.0	2 x 5.0	2 x 6.0	mA
$-V_{g1}$	150	150	175	V
I_{g1}	2 x 2.5	2 x 3.0	2 x 2.9	mA
$V_{in(pk)}$	360	360	360	V
$P_{load} (driver)$	9.0	10	8.0	W
p_a	2 x 20	2 x 20	2 x 18	W

V.H.F. QUICK HEATING DOUBLE TETRODE

YL1030 QQZ06-40

ABSOLUTE MAXIMUM RATINGS

	Frequency Multiplier	Class 'C' Telephony	Class 'C' Telegraphy	
V_a max. (f = 200 Mc/s)	750	600	750	V
(f = 500Mc/s)	-	400	500	V
V_{g2} max.	300	300	300	V
$-V_{g1}$ max.	175	175	100	V
I_k max.	2 x 100	2 x 120	2 x 120	mA
p_a max.	2 x 20	2 x 14	2 x 20	W
p_{g2} max.	2 x 3.5	2 x 2.3	2 x 3.5	W
I_{g1} max.	-	2 x 5.0	2 x 5.0	mA
p_{g1} max.	2 x 1.0	2 x 1.0	2 x 1.0	W
R_{g1-k} max. per section. (fixed bias)	50	50	50	k Ω
R_{g1-k} max. per section. (automatic bias)	100	100	100	k Ω
V_{g2} (b) max.	600	600	600	V

CATHODE

Quick heating directly heated filament.

70% P_{out} in less than 0.5 second.

* V_f	2.1	V
I_f	4.5	A

Frequency of filament supply

Sine wave	max. 200	c/s
Square wave	Any	

* The filament has been designed to accept temporary fluctuations of supply voltage of $\pm 15\%$.

CAPACITANCES

c_{out} (two sections in push-pull)	2.0	pF
c_{in} (two sections in push-pull)	6.0	pF

CHARACTERISTICS (each section) Measured at $I_a = 30 \text{ mA}$

E_m	4.5	mA/V
μ_{g1-g2}	8.0	

MOUNTING POSITION Any

COOLING

Radiation and convection cooled

Maximum temperatures

Seals	250	$^{\circ}\text{C}$
Pins	180	$^{\circ}\text{C}$
Bulb	250	$^{\circ}\text{C}$

Anode connectors providing a high degree of heat transfer by radiation or by conduction should be used.

PHYSICAL DATA

	oz	g
Weight of valve	0.53	16
Weight of valve and carton	0.8	23

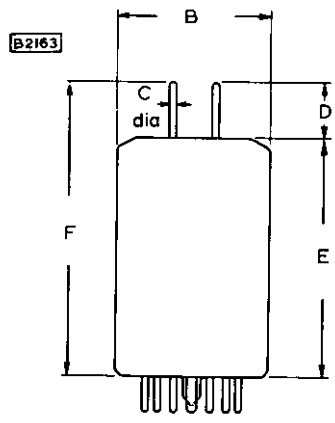
DIMENSIONS

	Inches	millimetres
B	1.811	46 max
C	0.079 ± 0.001	2.0 ± 0.01
D	0.650 ± 0.059	16.5 ± 1.5
E	2.874 ± 0.059	73 ± 1.5
F	3.524 ± 0.118	89.5 ± 3.0
G	0.098 ± 0.001	2.5 ± 0.03
H	0.551 ± 0.001	14 ± 0.03

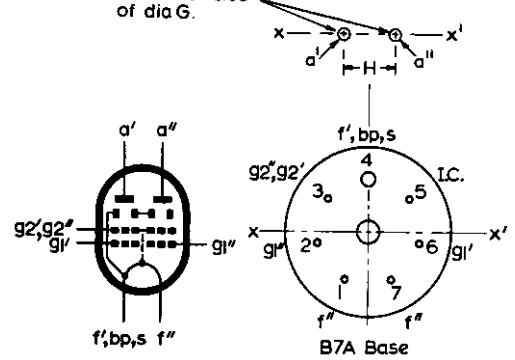
Inch dimensions derived from original millimetre dimensions.

**V.H.F. QUICK HEATING
DOUBLE TETRODE**

**YL1030
QQZ06-40**



Location of
anode pins
within circles
of dia G.



Contacts 1 and 7 should be
strapped together externally
to reduce the effective
contact resistance.



()

()

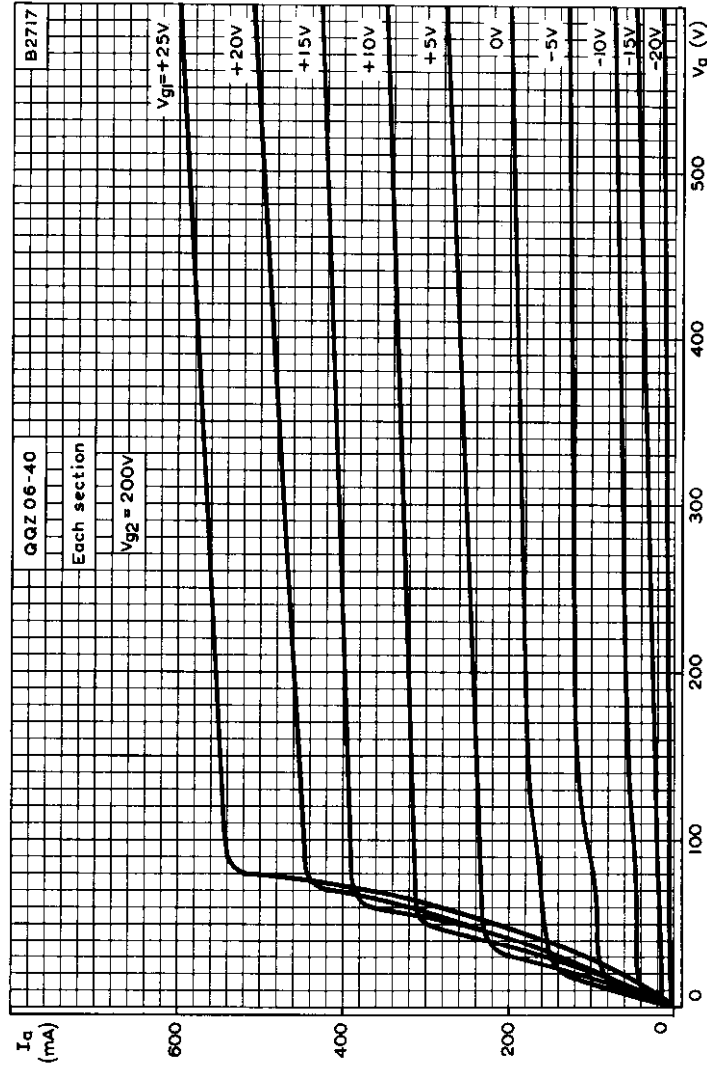
()

()

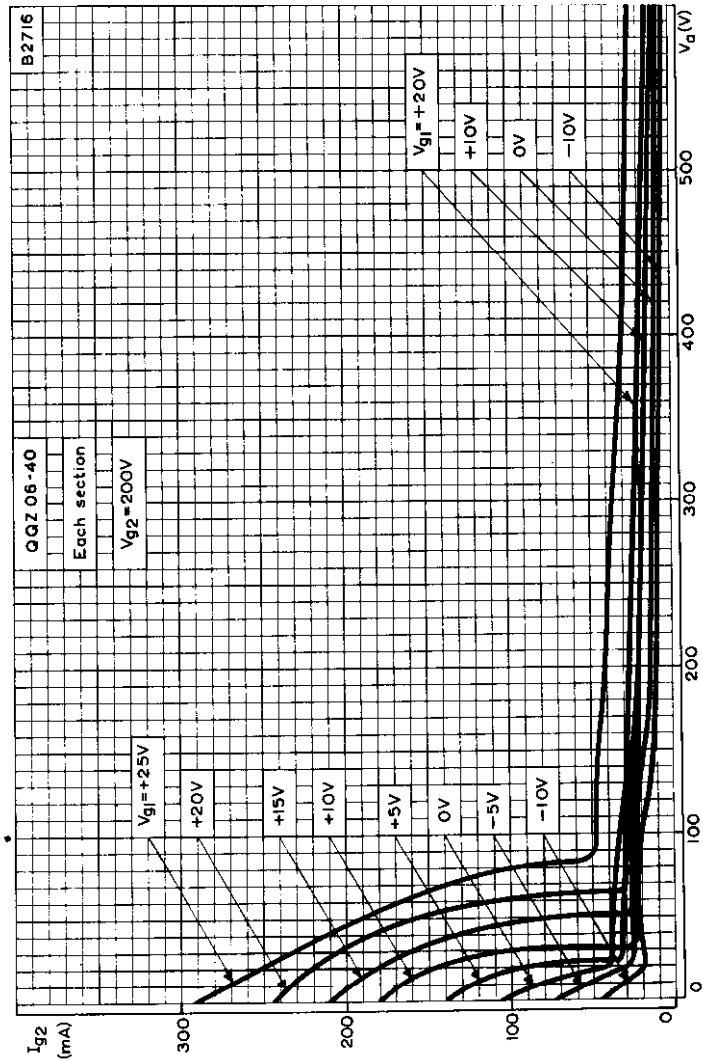


V.H.F. QUICK HEATING
DOUBLE TETRODE

YL1030
QQZ06-40



ANODE CURRENT FOR EACH SECTION PLOTTED AGAINST ANODE VOLTAGE
WITH CONTROL-GRID VOLTAGE AS PARAMETER $V_{g2} = 200V$

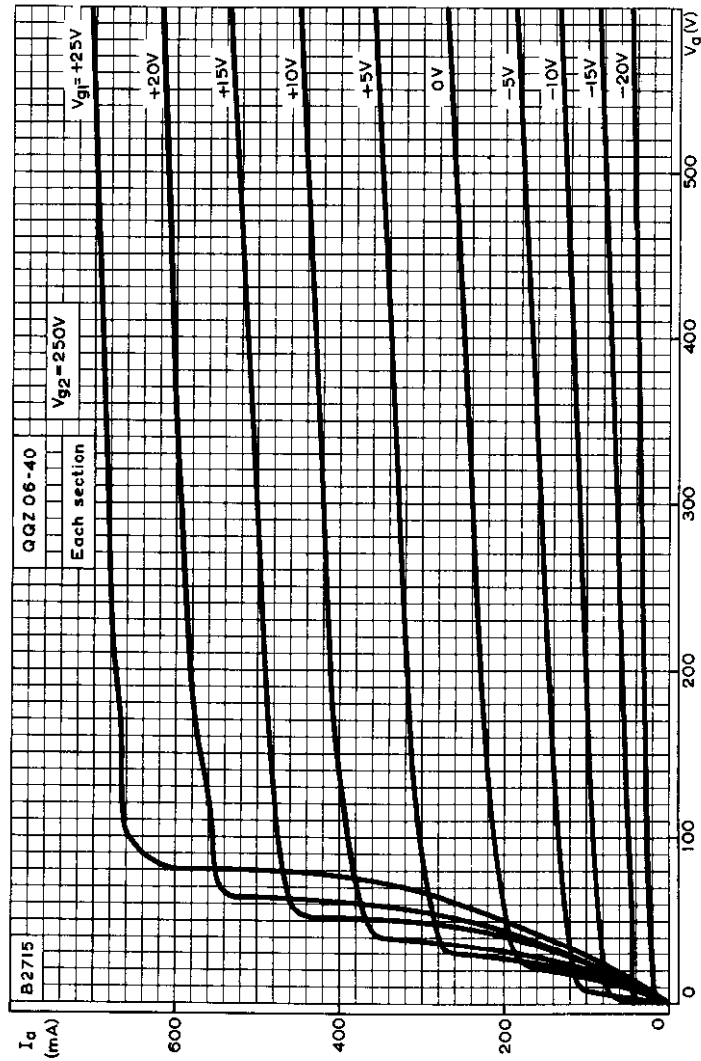


SCREEN-GRID CURRENT FOR EACH SECTION PLOTTED AGAINST ANODE VOLTAGE WITH CONTROL-GRID VOLTAGE AS PARAMETER $V_{g2} = 200V$

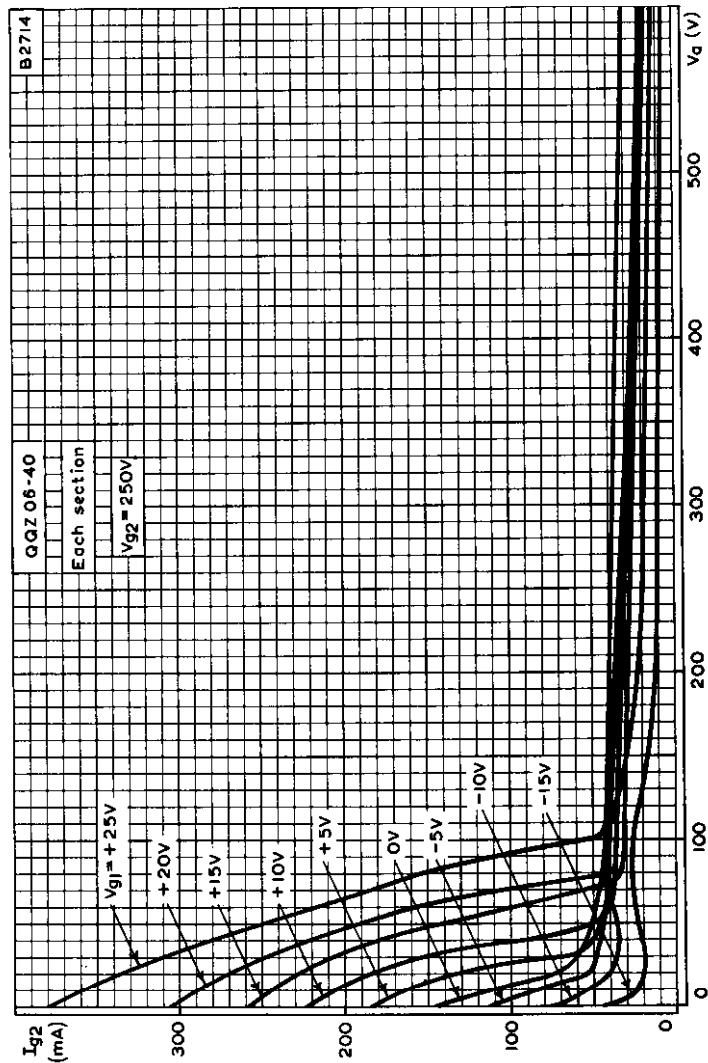


V.H.F. QUICK HEATING
DOUBLE TETRODE

YL1030
QQZ06-40



ANODE CURRENT FOR EACH SECTION PLOTTED AGAINST ANODE VOLTAGE
WITH CONTROL-GRID VOLTAGE AS PARAMETER $V_{g2} = 250V$

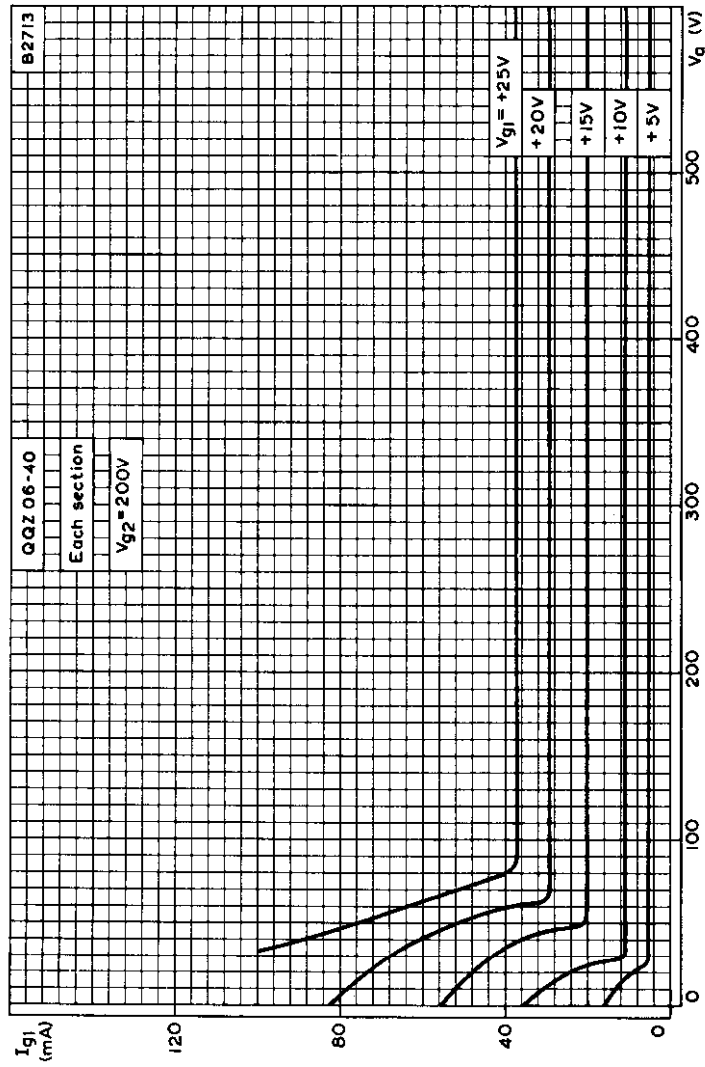


SCREEN-GRID CURRENT FOR EACH SECTION PLOTTED AGAINST ANODE VOLTAGE WITH CONTROL-GRID VOLTAGE AS PARAMETER $V_{g2} = 250V$



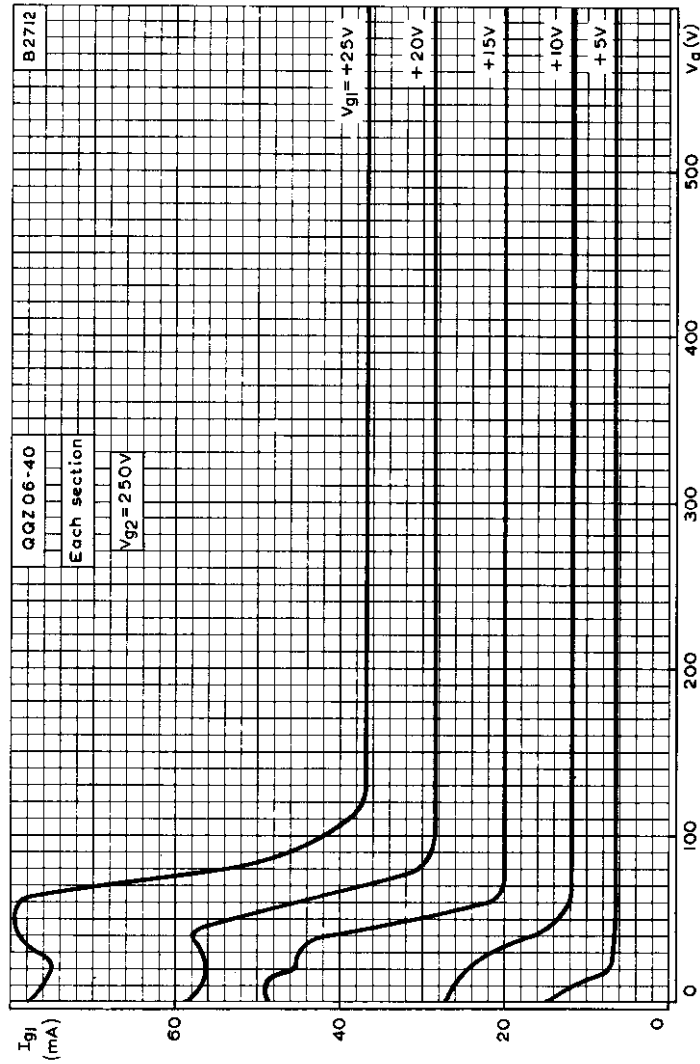
**V.H.F. QUICK HEATING
DOUBLE TETRODE**

**YL1030
QQZ06-40**



CONTROL-GRID CURRENT FOR EACH SECTION PLOTTED AGAINST ANODE VOLTAGE WITH CONTROL-GRID VOLTAGE AS PARAMETER $V_{g2} = 200V$

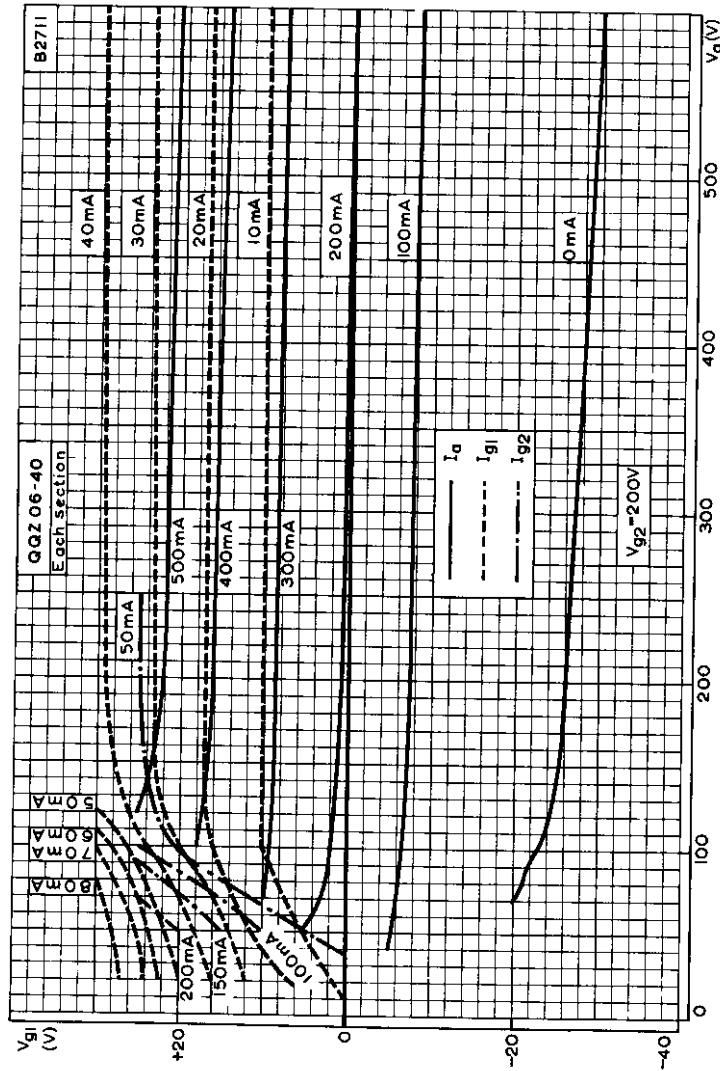




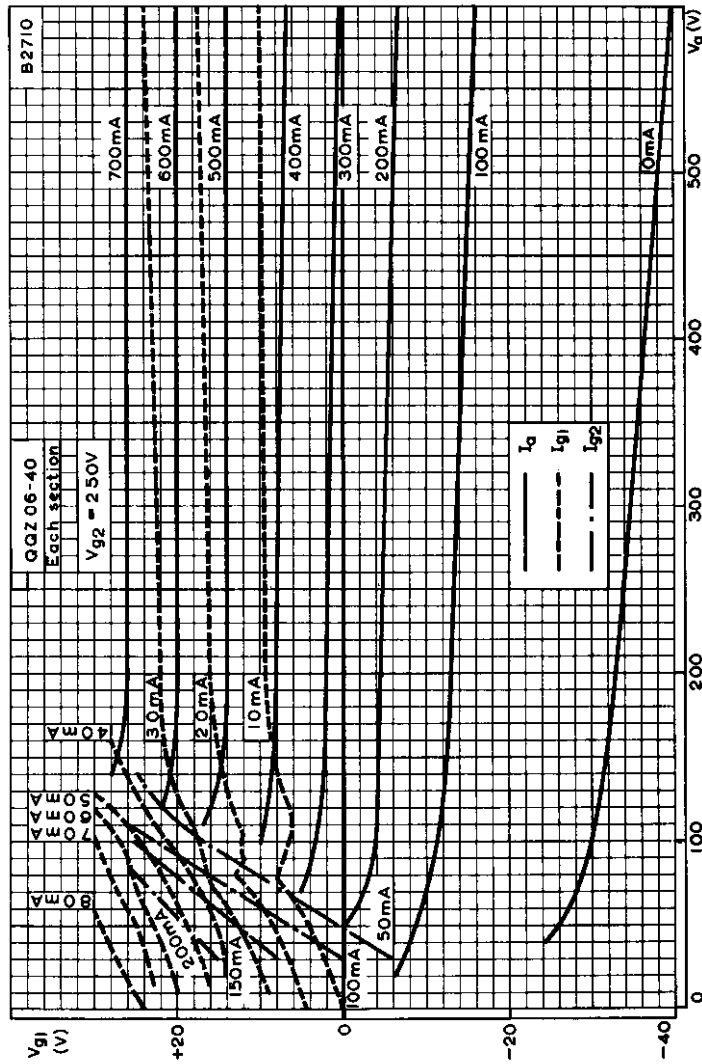
CONTROL-GRID CURRENT FOR EACH SECTION PLOTTED AGAINST ANODE VOLTAGE WITH CONTROL-GRID VOLTAGE AS PARAMETER $V_{g2} = 250V$

V.H.F. QUICK HEATING
DOUBLE TETRODE

YL1030
QQZ06-40



CONSTANT CURRENT CHARACTERISTICS FOR EACH SECTION $V_{g2} = 200V$

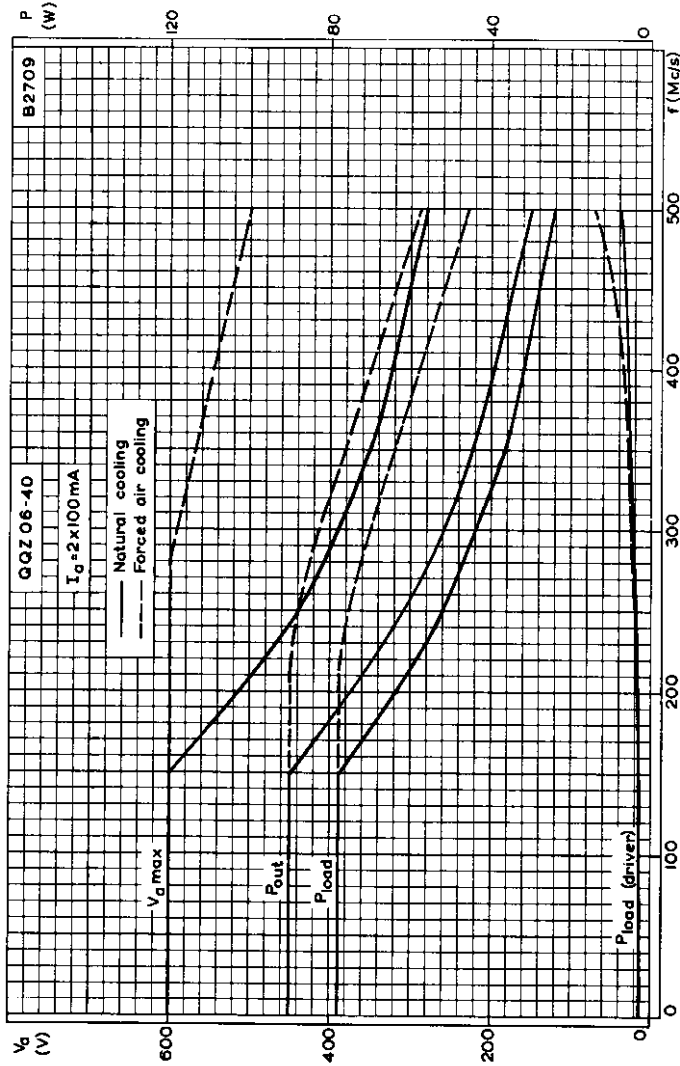


CONSTANT CURRENT CHARACTERISTICS FOR EACH SECTION $V_{g2} = 250V$



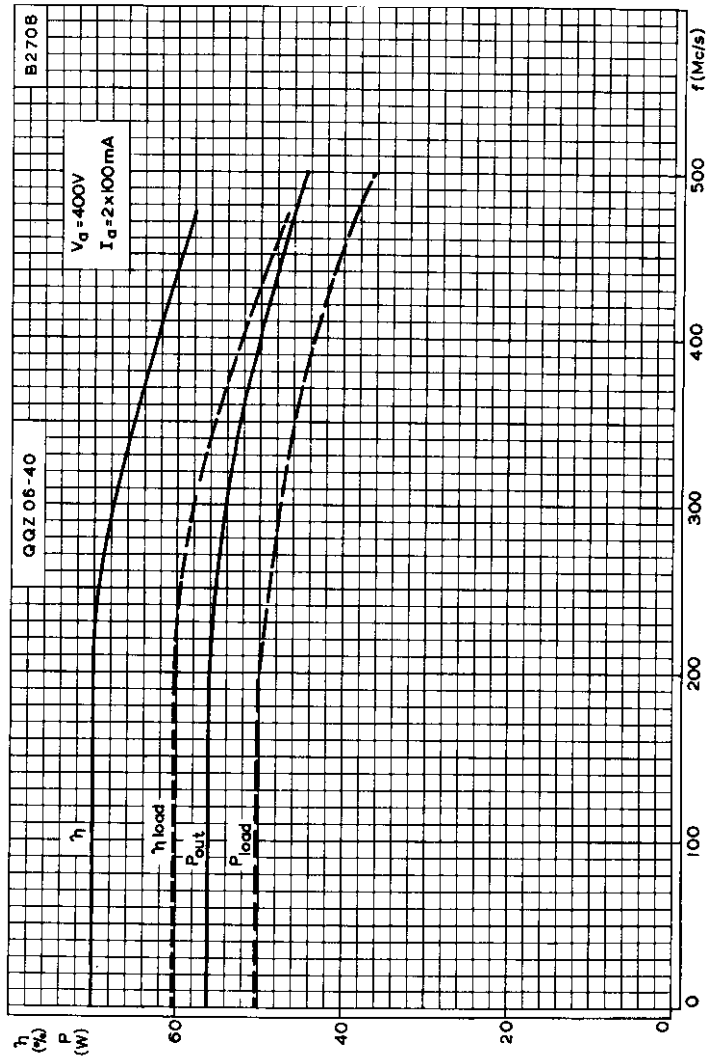
V.H.F. QUICK HEATING
DOUBLE TETRODE

YL1030
QQZ06-40



MAXIMUM OPERATING CONDITIONS FOR A PUSH-PULL R.F. POWER AMPLIFIER (CLASS 'C' TELEGRAPHY OR F.M. TELEPHONY)

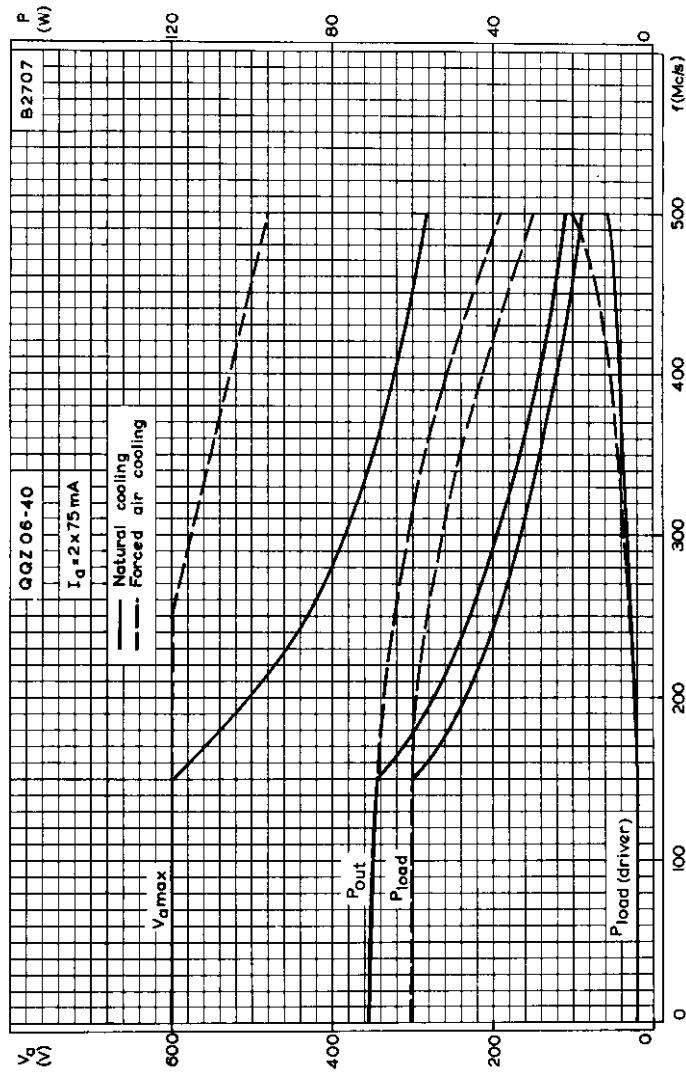




FREQUENCY CHARACTERISTICS FOR OPERATING CONDITIONS AS A
 PUSH-PULL R.F. POWER AMPLIFIER (CLASS 'C' TELEGRAPHY OR
 F.M. TELEGRAPHY)

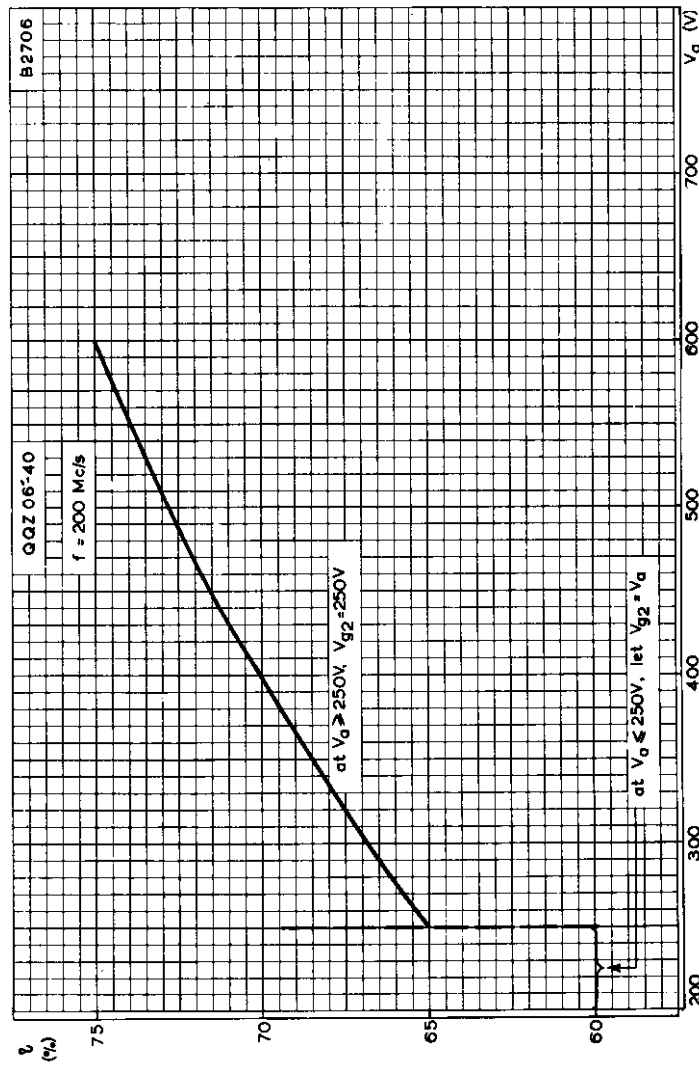
**V.H.F. QUICK HEATING
DOUBLE TETRODE**

**YL1030
QQZ06-40**



MAXIMUM OPERATING CONDITIONS FOR AN ANODE AND SCREEN-GRID
MODULATED R.F. POWER AMPLIFIER (CLASS 'C' TELEPHONY)





ANODE EFFICIENCY PLOTTED AGAINST ANODE VOLTAGE FOR CLASS 'C'
PUSH-PULL TELEGRAPHY

V.H.F. DOUBLE TETRODE

YLI060

TENTATIVE DATA

QUICK REFERENCE DATA

Radiation cooled double tetrode intended for use as a v.h.f. amplifier, oscillator, frequency multiplier and modulator.

	Class 'C' Telephony Anode and Screen Grid Modulation		Class 'C' Telegraphy or F.M. Telephony		Mc/s
	C.C.S.	I.C.A.S.	C.C.S.	I.C.A.S.	
	f	175	175	175	
P _{out}	97	122	150	180	W
f _{max.}	175	175	175	175	Mc/s
V _a max.	800	800	1000	1000	V
p _a max.	2 x 21	2 x 23.5	2 x 30	2 x 34	W

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

CLASS 'C' TELEGRAPHY OR F.M. TELEPHONY

Maximum operating conditions

	C.C.S.		I.C.A.S.		Mc/s
	C.C.S.	I.C.A.S.	C.C.S.	I.C.A.S.	
f	175	175	175	175	
P _{out}	150	146	166	180	W
P _{load}	132	125	147	163	W
η _a	75	73	77	75	%
V _a	900	1000	900	1000	V
I _a	2 x 110	2 x 100	2 x 120	2 x 120	mA
V _{g2}	245	230	260	260	V
I _{g2}	2 x 6.3	2 x 5.6	2 x 8.5	2 x 8.3	mA
-V _{g1}	90	85	85	85	V
I _{g1}	2 x 3	2 x 2.9	2 x 2.9	2 x 2.9	mA
P _{load(driver)}	3.5	3.5	3.5	3.5	W
p _a	2 x 25	2 x 27	2 x 25	2 x 30	W
p _{g2}	2 x 1.5	2 x 1.25	2 x 2.25	2 x 2.15	W



CLASS 'C' TELEPHONY ANODE AND SCREEN GRID MODULATION

Maximum operating conditions. (Carrier conditions for 100% modulation).

	C. C. S.	I. C. A. S.	
f	175	175	Mc/s
P _{out}	97	122	W
P _{load}	85	107	W
η_a	72	74	%
V _a	750	800	V
I _a	2 x 90	2 x 100	mA
V _{g2}	250	225	V
I _{g2}	2 x 5.1	2 x 4.4	mA
-V _{g1}	66	75	V
I _{g1}	2 x 2.2	2 x 2.5	mA
P _{load(driver)}	3.4	3.0	W
P _a	2 x 19	2 x 21	W
P _{g2}	2 x 1.3	2 x 1.0	W
For 100% modulation			
P _{mod.}	68	80	W
v _{g2(pk)}	90	80	V

ABSOLUTE MAXIMUM RATINGS

	Class 'C' Telephony		Class 'C' Telegraphy		
	C. C. S.	I. C. A. S.	C. C. S.	I. C. A. S.	
f max.	175	175	175	175	Mc/s
V _a max.	800	800	1000	1000	V
V _{g2} max.	250	250	300	300	V
-V _{g1} max.	175	175	175	175	V
I _k max.	2 x 105	2 x 115	2 x 125	2 x 135	mA
p _a max.	2 x 21	2 x 23.5	2 x 30	2 x 34	W
P _{g2} max.	2 x 2.5	2 x 2.8	2 x 3.5	2 x 4.0	W
I _{g1} max.	2 x 5.0	2 x 5.0	2 x 5.0	2 x 5.0	mA
R _{g1-k} max. (each unit)	50	50	50	50	k Ω
V _{h-k} max. (each unit)	100	100	100	100	V



V.H.F. DOUBLE TETRODE

YL1060

CATHODE

Indirectly heated, oxide coated

	Parallel	Series	
V_h	6.3	12.6	V
I_h	1.8	0.9	A

CAPACITANCES

c_{a-g1} (each section)		max 90	mpF
c_{out} (two sections in push-pull)		3.2	pF
c_{in} (two sections in push-pull)		10.5	pF

Internally neutralised for push-pull operation

CHARACTERISTICS (measured at $I_a = 30\text{mA}$)

g_m		4.5	mA/V
μ_{g1-g2}		8.2	

MOUNTING POSITION

Vertical with base up or down.

Horizontal with the anode pins in a horizontal plane.

COOLING

Radiation and low velocity air flow

Maximum temperatures

Anode seal	250	$^{\circ}\text{C}$
Bulb	250	$^{\circ}\text{C}$
Base	180	$^{\circ}\text{C}$

When the valve is operated at maximum ratings or with high ambient temperatures it may be necessary to direct an air flow on the bulb and anode seals.

PHYSICAL DATA

Weight of valve only	oz	g
	2.5	71

ACCESSORIES

Socket		40202
--------	--	-------

DIMENSIONS

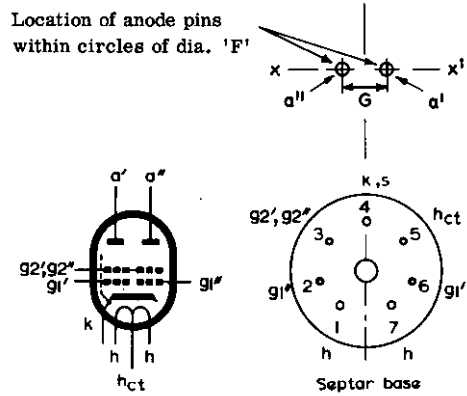
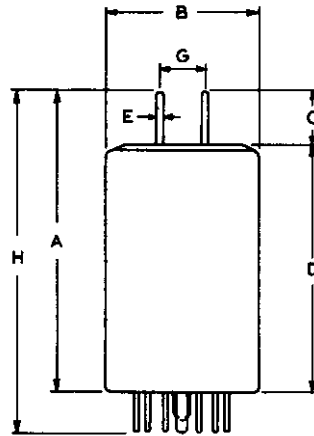
	Inches	Millimetres
A	3.583	91
B	1.756	44.6
C	0.630	16
D	2.953	75
E	0.126	3.2
F	0.200	5.08
G	0.728	18.5
H	4.055	103

Inch dimensions derived from original millimetre dimensions
except dimension 'F'.



**V.H.F. DOUBLE
TETRODE**

YL1060



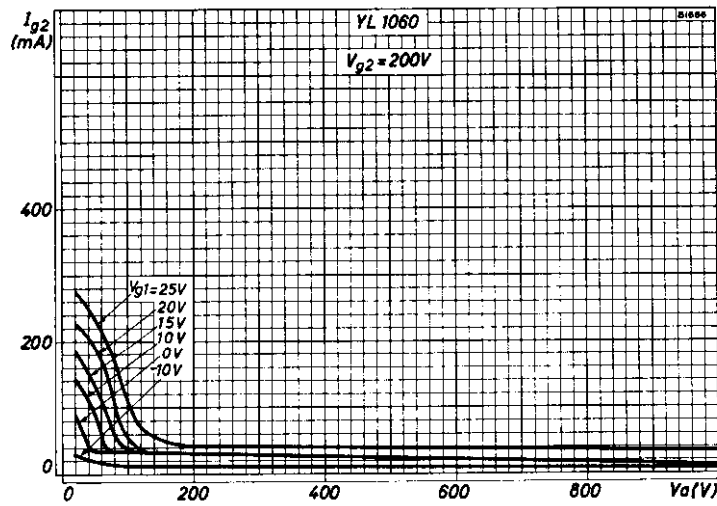
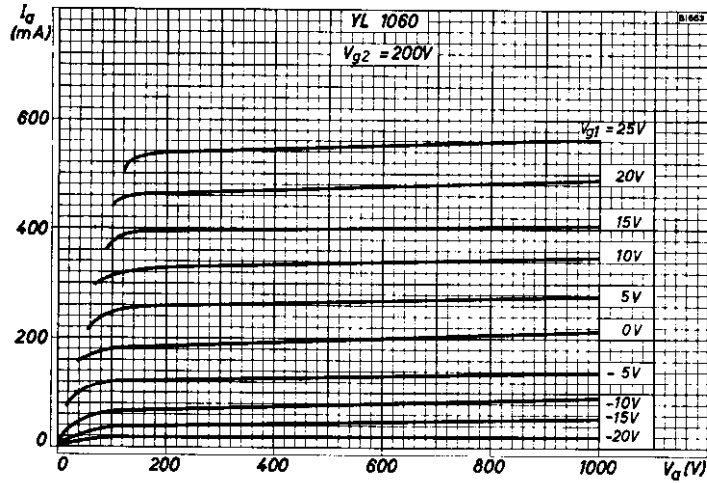
—



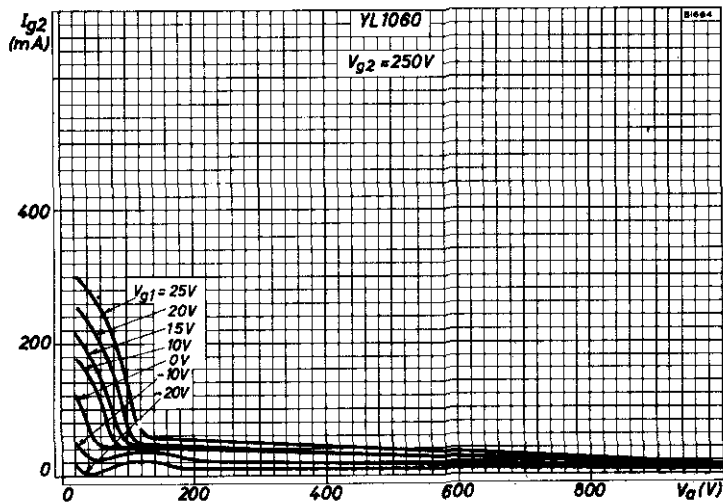
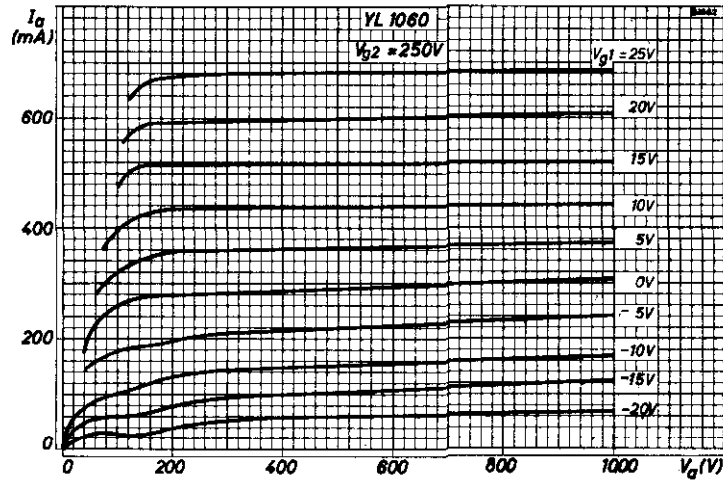
—

**V.H.F. DOUBLE
TETRODE**

YL1060



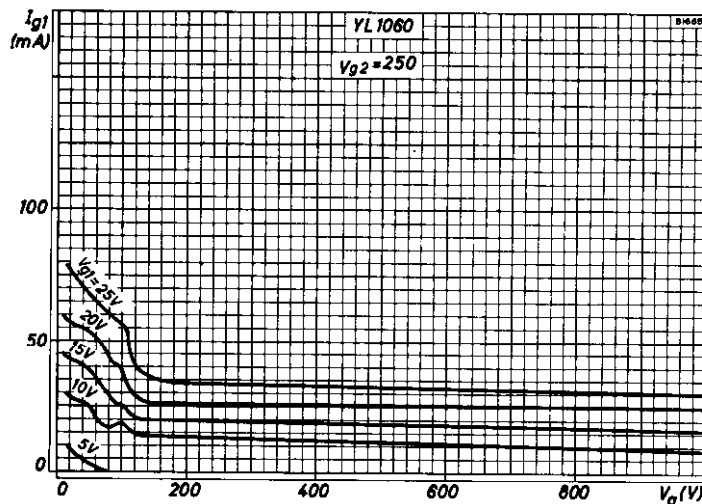
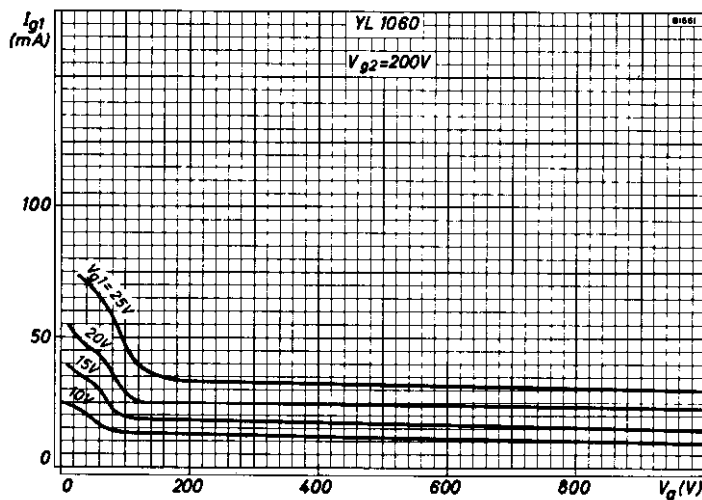
ANODE AND SCREEN-GRID CURRENTS PLOTTED AGAINST ANODE VOLTAGE WITH CONTROL-GRID VOLTAGE AS PARAMETER. $V_{g2} = 200V$.



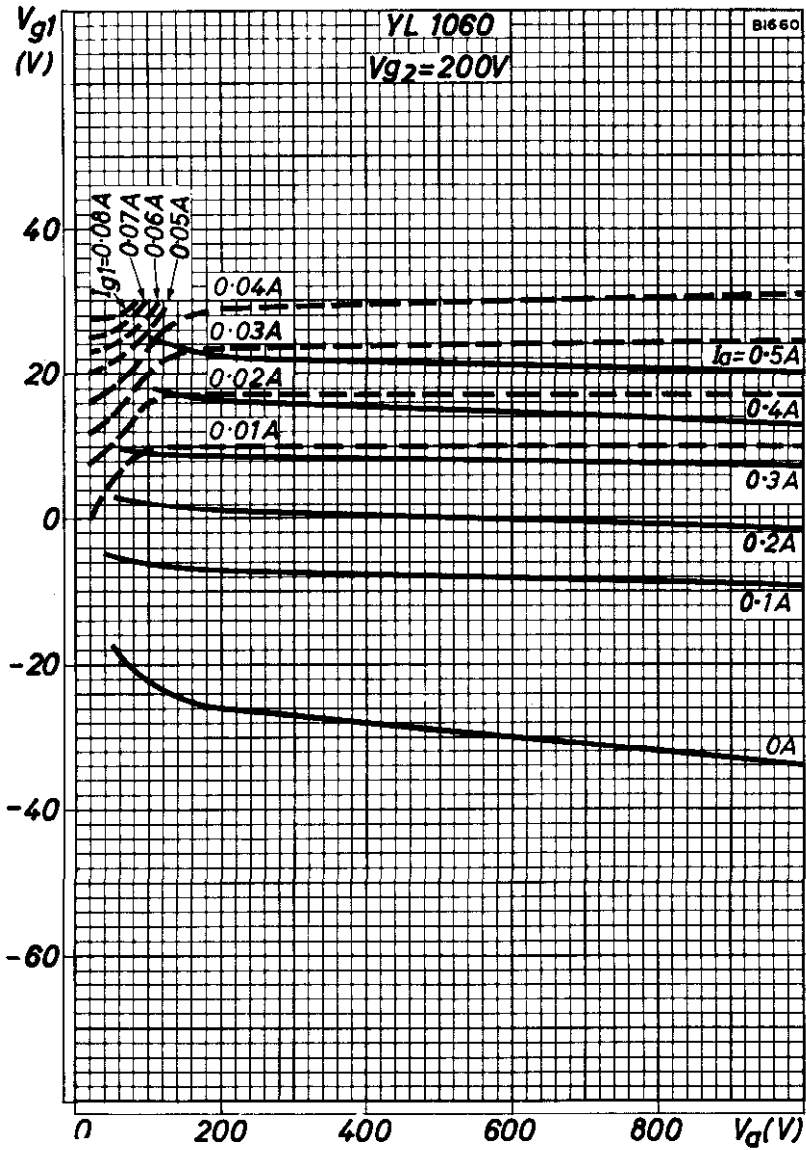
ANODE AND SCREEN-GRID CURRENTS PLOTTED AGAINST ANODE VOLTAGE WITH CONTROL-GRID VOLTAGE AS PARAMETER. $V_{g2} = 250V$.

V.H.F. DOUBLE TETRODE

YL1060



CONTROL-GRID CURRENT PLOTTED AGAINST ANODE VOLTAGE WITH CONTROL-GRID VOLTAGE AS PARAMETER $V_{g2} = 200V$ and $250V$.

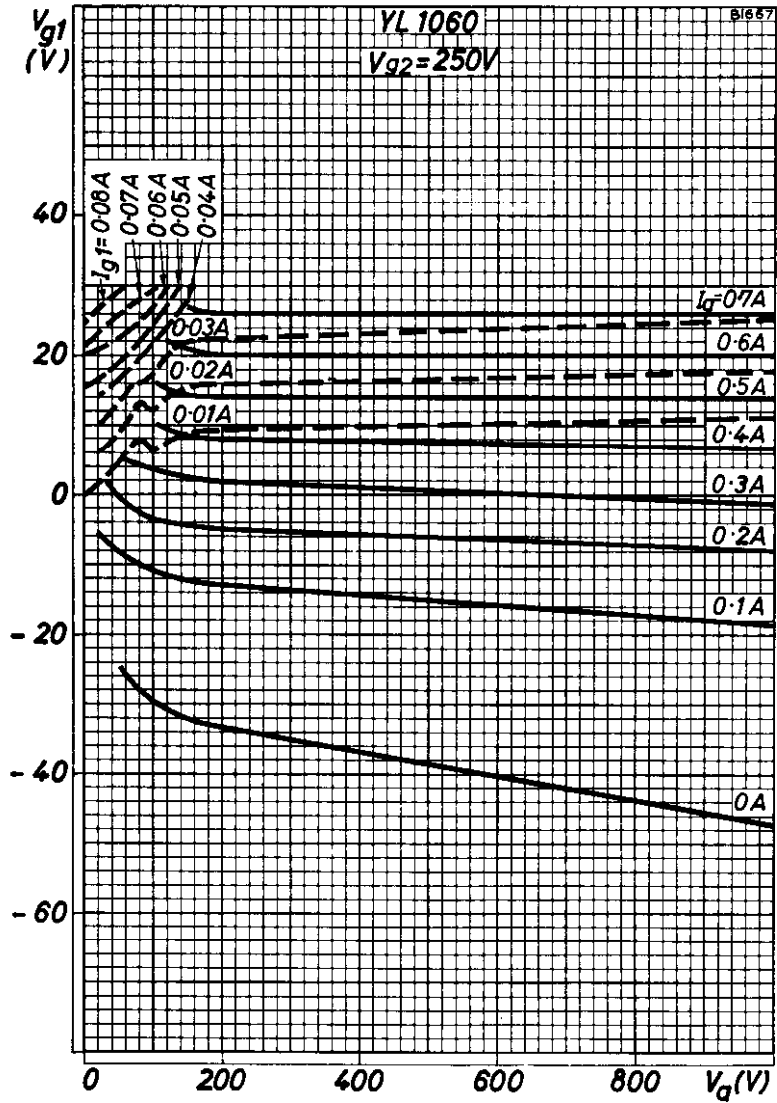


CONSTANT CURRENT CHARACTERISTICS $V_{g2} = 200V$



V.H.F. DOUBLE
TETRODE

YL1060



CONSTANT CURRENT CHARACTERISTICS. V_{g2} = 250V





QUICK HEATING DOUBLE TETRODE

YL1080

PRELIMINARY DATA

QUICK REFERENCE DATA

Quick heating single-ended double tetrode for mobile transmitters.
70 % power output in less than half a second.

	Frequency Trebler	Class 'C' Telegraphy or F.M. Telephony	
f _{out}	200	200	Mc/s
P _{out}	5	14.5	W
f max.	200	200	Mc/s
V _a max.	300	300	V
p _a max.	2 x 5.0	2 x 5.0	W

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

CLASS 'C' TELEGRAPHY OR F.M. TELEPHONY

Absolute maximum ratings

f max.	200	Mc/s
V _a max.	300	V
V _{g2}	200	V
-V _{g1} max.	150	V
I _{g1} max.	2 x 3.0	mA
I _k max.	2 x 50	mA
i _k (pk) max.	2 x 225	mA
p _a max.	2 x 5.0	W
p _{g2} max.	2 x 1.0	W
p _{g1} max.	2 x 0.2	W
R _{g1} - f max.	100	kΩ

Typical operation

f	200	200	200	Mc/s
V _a	300	250	200	V
V _{g2}	170	170	150	V
-V _{g1}	40	40	40	V
v _{in} (g ₁ -g ₁) pk	110	110	115	V
I _a	2 x 37.5	2 x 33.5	2 x 35	mA
I _{g2}	2 x 1.2	2 x 0.9	2 x 1.1	mA
I _{g1}	2 x 0.9	2 x 1.1	2 x 1.4	mA
p _a	2 x 4.0	2 x 2.9	2 x 2.8	W
p _{g2}	2 x 0.2	2 x 0.15	2 x 0.17	W
P _{load} (driver)	1.0	1.0	1.0	W
P _{out}	14.5	11	8.4	W
P _{load}	12	9.0	7.4	W
η _a	65	65	60	%



CLASS 'C' ANODE AND SCREEN-GRID MODULATION

Carrier conditions for a modulation factor of 1.

Absolute maximum ratings

f max.	200	Mc/s
Va max.	240	V
Vg2 max.	200	V
-Vg1 max.	150	V
Ig1 max.	2 x 3.0	mA
Ik max.	2 x 40	mA
ik (pk) max.	2 x 180	mA
pa max.	2 x 3.3	W
pg2 max.	2 x 1.65	W
pg1 max.	2 x 0.2	W
Rg1-k max.	100	kΩ

Typical operation

f	200	Mc/s
Va	200	V
Vg2	130	V
-Vg1	50	V
Ia	2 x 33.5	mA
Ig2	2 x 1.3	mA
Ig1	2 x 0.75	mA
vin(g1-g1)pk	130	V
Pload (driver)	1.0	W
pa	2 x 2.65	W
pg2	0.46	W
Pout	8.0	W
Pload	7.0	W
ηa	60	%
For 100 % modulation		
P mod.	7.0	W
vg2 (pk)	130	V

FREQUENCY TREBLER

Absolute maximum ratings

f max.	200	Mc/s
Va max.	300	V
Vg2 max.	200	V
-Vg1 max.	150	V
Ig1 max.	2 x 2.0	mA
Ik max.	2 x 35	mA
ik(pk) max.	2 x 225	mA
pa max.	2 x 5.0	W
pg2 max.	2 x 1.0	W
pg1 max.	2 x 0.2	W
Rg1 - f max.	100	kΩ

QUICK HEATING DOUBLE TETRODE

YL1080

Typical operation

f_{out}	200	200	200	Mc/s
V_a	300	250	200	V
V_{g2}	160	160	160	V
$-V_{g1}$	100	100	100	V
I_a	2 x 24	2 x 25	2 x 28.5	mA
I_{g2}	2 x 1.0	2 x 0.95	2 x 1.5	mA
I_{g1}	2 x 1.0	2 x 1.0	2 x 1.6	mA
$v_{in}(g1-g1)_{pk}$	230	230	230	V
p_a	2 x 4.7	2 x 4.25	2 x 4.0	W
p_{g2}	2 x 0.15	2 x 0.16	2 x 0.23	W
Pload (driver)	1.0	1.0	2.0	W
P_{out}	5	4	3.5	W
Pload	3.5	3.0	2.8	W
η_a	35	34	31	%

OPERATING NOTE

I_{g1} and I_{g2} will vary from valve to valve, hence the use of fixed resistors (R_{g1} and R_{g2}) will result in variations of input and output power. It is therefore recommended that R_{g2} be made adjustable.

CATHODE

Directly heated, harp type, 70 % P_{out} in less than 0.5 second.

V_f (d. c. or r. m. s.)	1.6	V
I_f	2.5	A

Frequency of filament supply

Sine wave	max. 200	c/s
Square wave	Any	

CAPACITANCES

Internally neutralised for push-pull operation.

c_{a-g1} (each section)	100	mpF
c_{out} (each section)	3.2	pF
c_{in} (each section)	8.5	pF
$c_{a''-g1'}$	100	mpF
$c_{a'-g1''}$	100	mpF
$c_{g1'-g1''}$	2.4	pF
$c_{a'-a''}$	75	mpF

CHARACTERISTICS (measured at $V_a = 200V$, $V_{g2} = 200V$, $I_a = 30mA$)

g_m	3.5	mA/V
μ_{g1-g2}	7.5	



COOLING

Radiation and convection

Tbulb max.

225

°C

Tpins max.

120

°C

MOUNTING POSITION

Any

PHYSICAL DATA

Weight of valve

{

0.6

oz

16

g

Weight of valve plus carton

{

0.8

oz

23

g

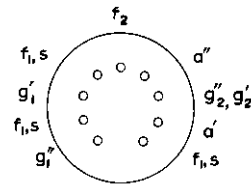
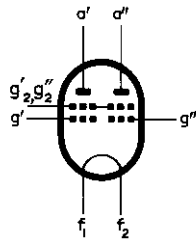
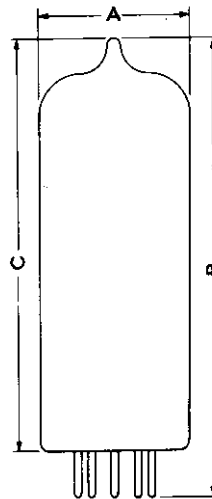


QUICK HEATING DOUBLE TETRODE

YL1080

B1147

Dimensions (max)		
	Inches	Millimetres
A	0.875	22.2
B	3.094	78.5
C	2.813	71.5

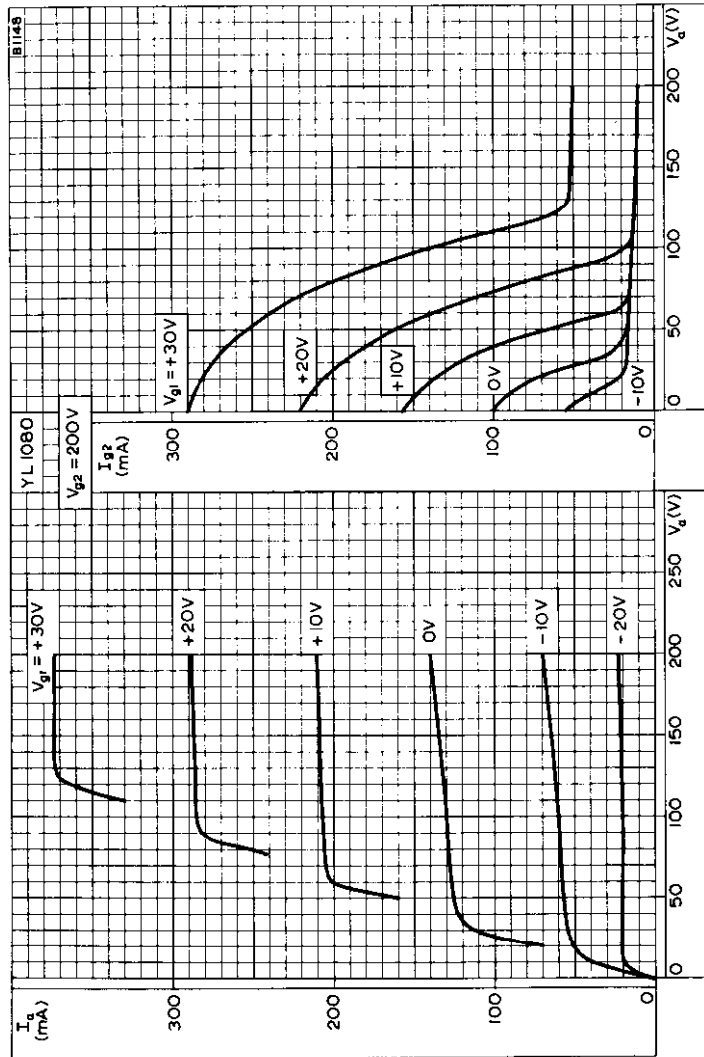


B9A Base



**QUICK HEATING
DOUBLE TETRODE**

YL1080



ANODE AND SCREEN-GRID CURRENT PLOTTED AGAINST ANODE VOLTAGE WITH CONTROL GRID VOLTAGE AS PARAMETER $V_{g2} = 200V$.





**U.H.F. BEAM
POWER TETRODES**

**YL1100 YL1102
YL1101 YL1103**

TENTATIVE DATA

QUICK REFERENCE DATA

Beam power tetrodes intended for use as r.f. power amplifiers in transmitters, oscillators and frequency multipliers at frequencies up to 2000Mc/s.

YL1101 is similar to YL1100 except for heater ratings.

YL1102 and YL1103 are conduction-cooled versions of YL1100 and YL1101 respectively.

	Linear Amplifier for Television Service, Class 'AB ₁ '	Telephony, Anode and Screen Grid Modulation Class 'C'	Telegraphy or F.M. Telephony, Class 'C'		
f	790	400	400	1200	Mc/s
P _{load}	13	45	80	40	W
f max.	1200	1200	1200		Mc/s
V _a max.	1000	800	1000		V
p _a max.	115	75	115		W

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

	Grid Drive		Cathode Drive	Mc/s
	400	1200	1200	
f	400	1200	1200	Mc/s
P _{out}	90	45	45	W
P _{load}	80	40	42*	W
η_a	68	29	29	%
V _a	900	900	900	V
I _a	170	170	170	mA
V _{g2}	300**	300**	300	V
I _{g2}	1.0	1.0	3.2	mA
-V _{g1}	30	22	31	V
I _{g1}	10	4.0	3.4	mA
P _{load(driver)}	3.0	5.0	8.0	W
p _a	43	108	108	W
P _{g2}	0.3	0.3	1.0	W

*Includes power transferred from driver stage.

**Fixed supply or supply derived from the anode supply by means of a voltage divider.

TELEPHONY, ANODE AND SCREEN-GRID MODULATION, CLASS 'C'

OPERATING CONDITIONS (Carrier conditions for 100% modulation)

f	400	Mc/s
P _{out}	50	W
P _{load}	45	W
η_a	54	%
V _a	700	V
I _a	130	mA
V _{g2}	250	V
I _{g2}	10	mA
-V _{g1}	50	V
I _{g1}	10	mA
P _{load(driver)}	3.0	W
p _a	41	W
P _{g2}	2.5	W
For 100% modulation		
P _{mod}	93	W
v _{g2(pk)}	150	V



**U.H.F. BEAM
POWER TETRODES**

**YL1100 YL1102
YL1101 YL1103**

LINEAR AMPLIFIER FOR TELEVISION SERVICE, CLASS 'AB₁'

Sound and vision

OPERATING CONDITIONS for valve in common grid circuit

f	790	Mc/s
Bandwidth (-1dB)	8.0	Mc/s
P _{load(pk)}	13	W
*Intermodulation products	-52	dB
V _{a-g1}	800	V
V _{g2-g1}	365	V
**V _{k-g1}	+15	V
I _{a(0)}	125	mA
I _{a(max.sig.)}	152	mA
I _{g2}	7.0	mA
I _{g1}	0	mA
†P _{load(driver)pk}	1.3	W

*The intermodulation product in the passband of the output signal is measured with reference to peak envelope output.

**Adjust to give the desired value of I_{a(0)}.

†The driver signal consists of three independent r.f. signal voltages.

i.e. Picture carrier	- 8dB	} with respect to the sum signal amplitude of the composite signal.
Sideband signal	- 17dB	
Sound carrier	- 7dB	

CATHODE

Indirectly heated, a.c. or d.c., oxide coated.

	YL1100	YL1101	
	YL1102	YL1103	
V _h	26.5	6.3	V
I _h	0.52	2.1	A
t _{h-k} min.	60	60	s

The heater voltage must be reduced depending on the operating conditions and the frequency



RATINGS (ABSOLUTE MAXIMUM SYSTEM)

	Television Class 'AB ₁ '	Telegraphy Class 'C'	Telephony Class 'C'	
f max.	1200	1200	1200	Mc/s
V _a max.	1000	1000	800	V
V _{g2} max.	300	300	300	V
-V _{g1} max.	100	100	100	V
I _a max.	180	180	150	mA
p _a max.	115	115	75	W
p _{g2} max.	4.5	4.5	3.0	W
I _{g1} max.	-	30	30	mA
R _{g1-k} max.	30	30	30	kΩ

CAPACITANCES

c _{a-g1}	<0.065	pF
c _{g1-k+h}	14	pF
c _{a-k+h}	<0.015	pF
c _{g2-g1}	19	pF
c _{a-g2}	4.4	pF
c _{g2-k+h}	<0.4	pF

CHARACTERISTICS (measured at V_a = 1.0kV, V_{g2} = 250V, I_a = 100mA)

g _m	16	mA/V
μ _{g1-g2}	18	

MOUNTING POSITION

Any

COOLING

YL1100 and YL1101 - Forced-air cooling for radiator and seals.
YL1102 and YL1103 - Heat sink cooling.

Maximum temperature of anode and all seals	250	°C
--	-----	----

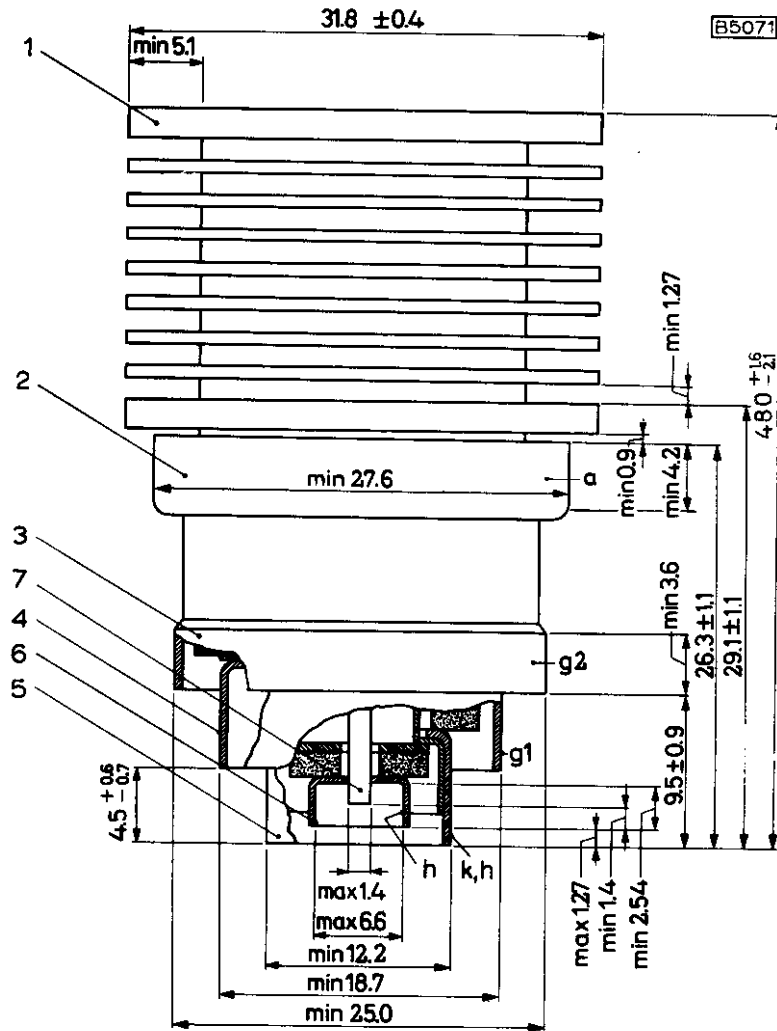
PHYSICAL DATA

	oz	g
Weight of valve	2.0	60

**U.H.F. BEAM
POWER TETRODES**

**YL1100 YL1102
YL1101 YL1103**

OUTLINE DRAWING OF YL1100 AND YL1101



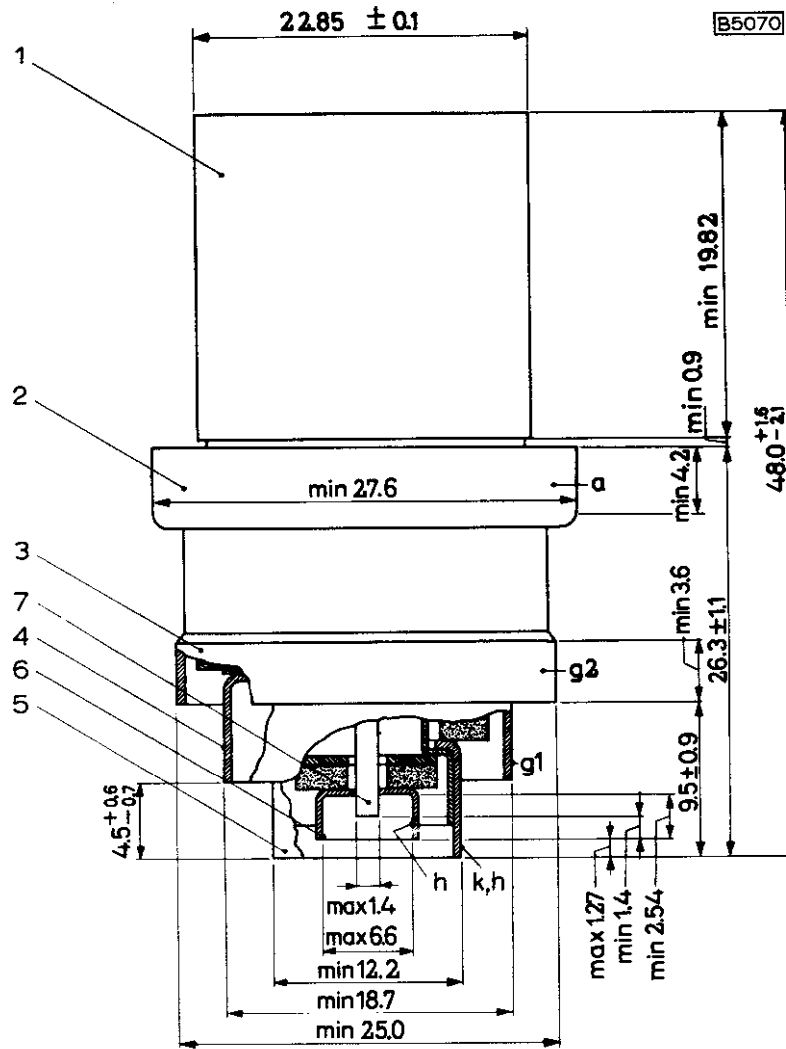
Radiator and terminals lie inside or outside concentric cylinders:

- | | | | |
|-------------------|--------------|---------------------|--------------|
| 1. Radiator | i.d. 33.40mm | 5. Cathode terminal | i.d. 13.16mm |
| 2. Anode terminal | i.d. 28.40mm | 6. Heater terminals | o.d. 6.07mm |
| 3. g_2 terminal | i.d. 25.86mm | 7. Heater terminals | i.d. 1.78mm |
| 4. g_1 terminal | i.d. 19.38mm | | |

All dimensions in mm



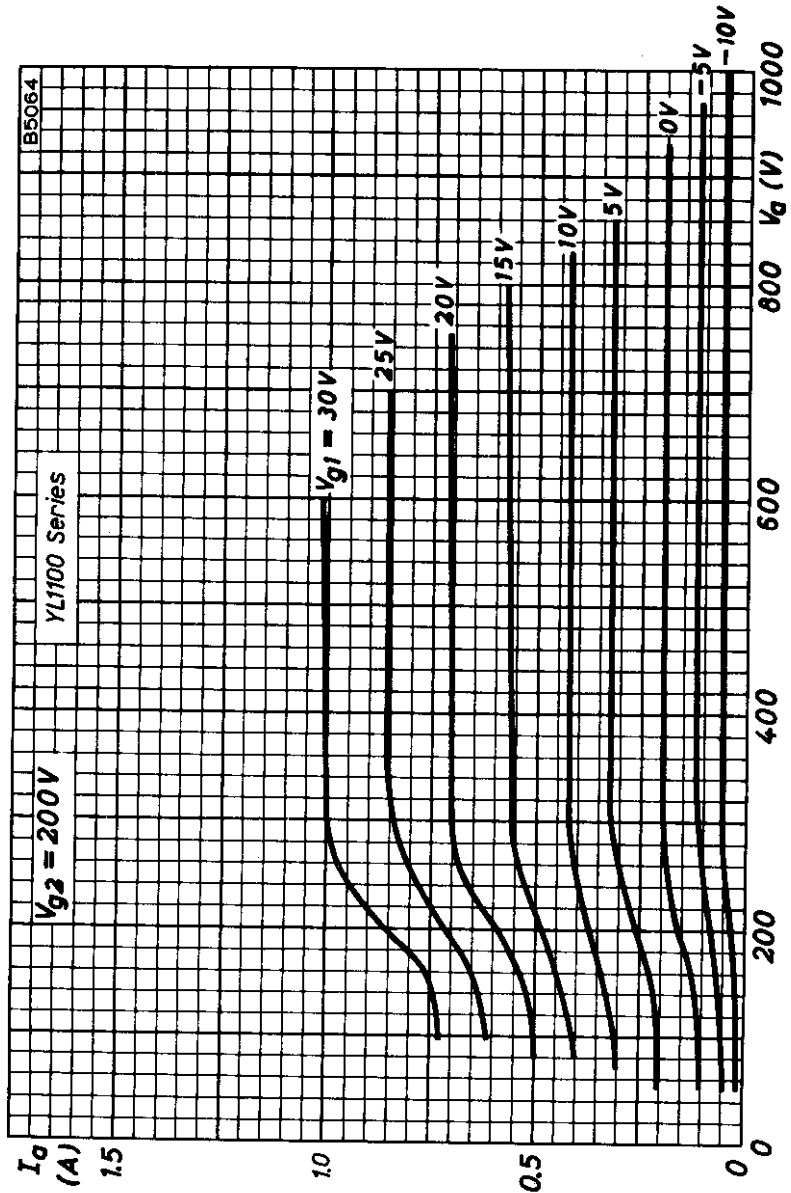
OUTLINE DRAWING OF YL1102 AND YL1103



Cooling cylinder and terminals lie inside or outside concentric cylinders:

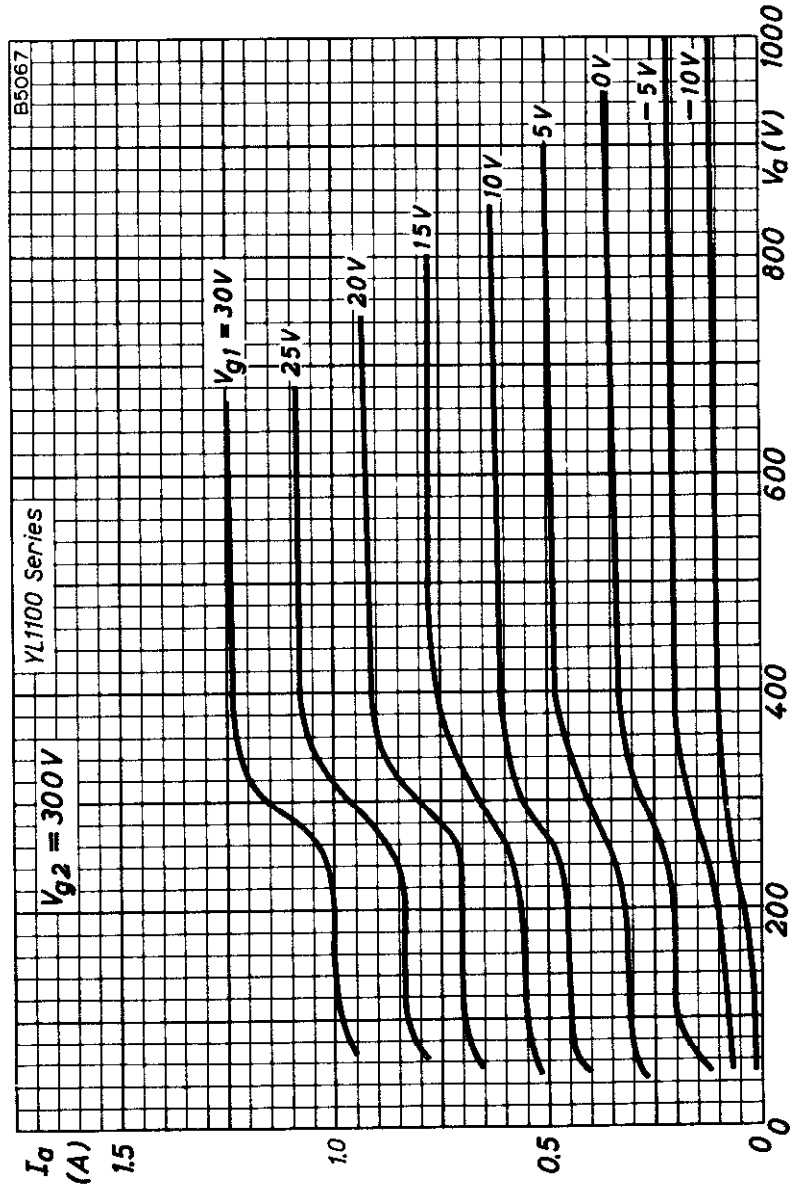
**U.H.F. BEAM
POWER TETRODES**

**YL1100 YL1102
YL1101 YL1103**



ANODE CURRENT PLOTTED AGAINST ANODE VOLTAGE WITH CONTROL-GRID VOLTAGE AS PARAMETER. $V_{g2} = 200V$

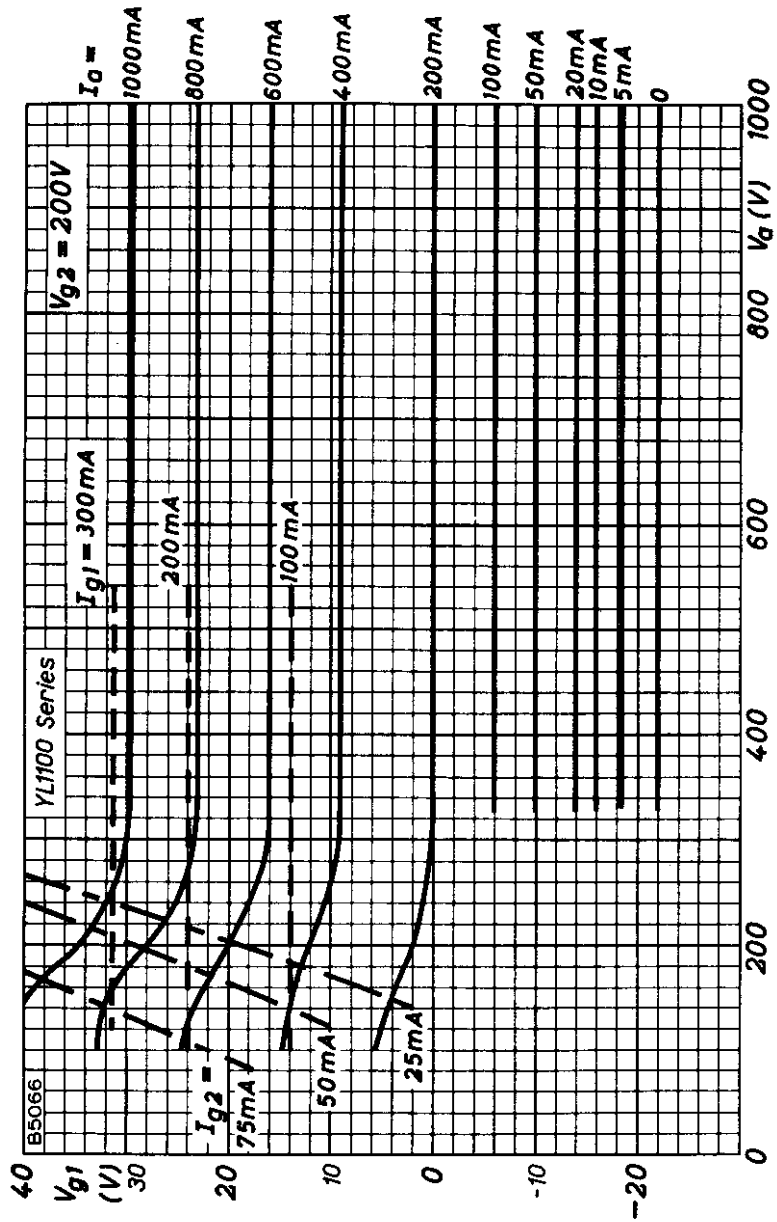




ANODE CURRENT PLOTTED AGAINST ANODE VOLTAGE WITH CONTROL-GRID VOLTAGE AS PARAMETER. $V_{g2} = 300V$

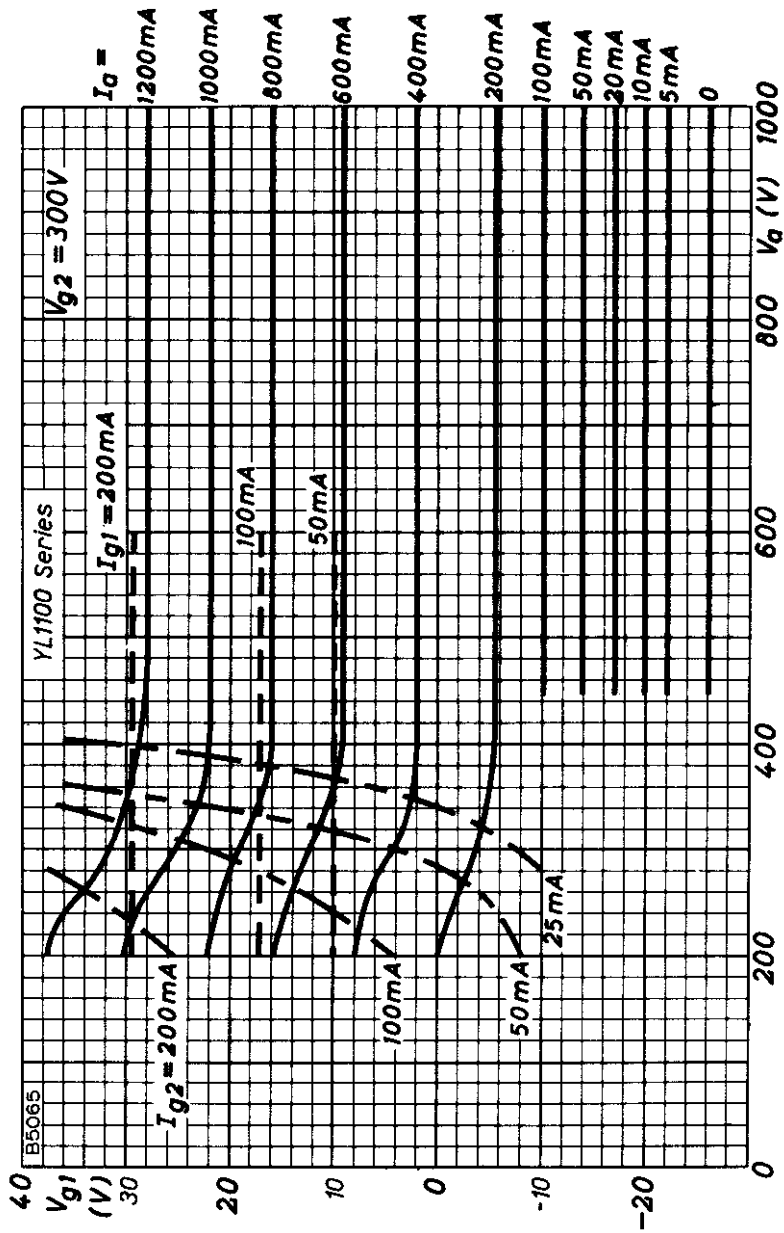
**U.H.F. BEAM
POWER TETRODES**

**YL1100 YL1102
YL1101 YL1103**



CONSTANT CURRENT CHARACTERISTICS. $V_{g2} = 200V$



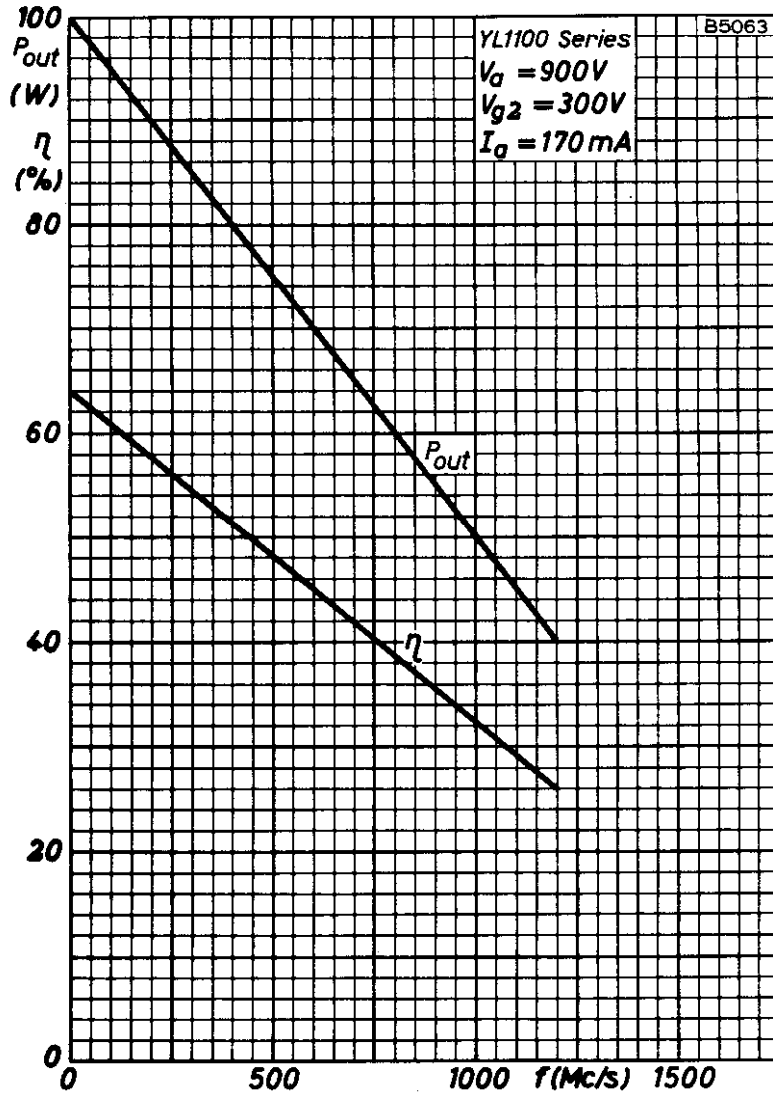


CONSTANT CURRENT CHARACTERISTICS, $V_{g2} = 300V$



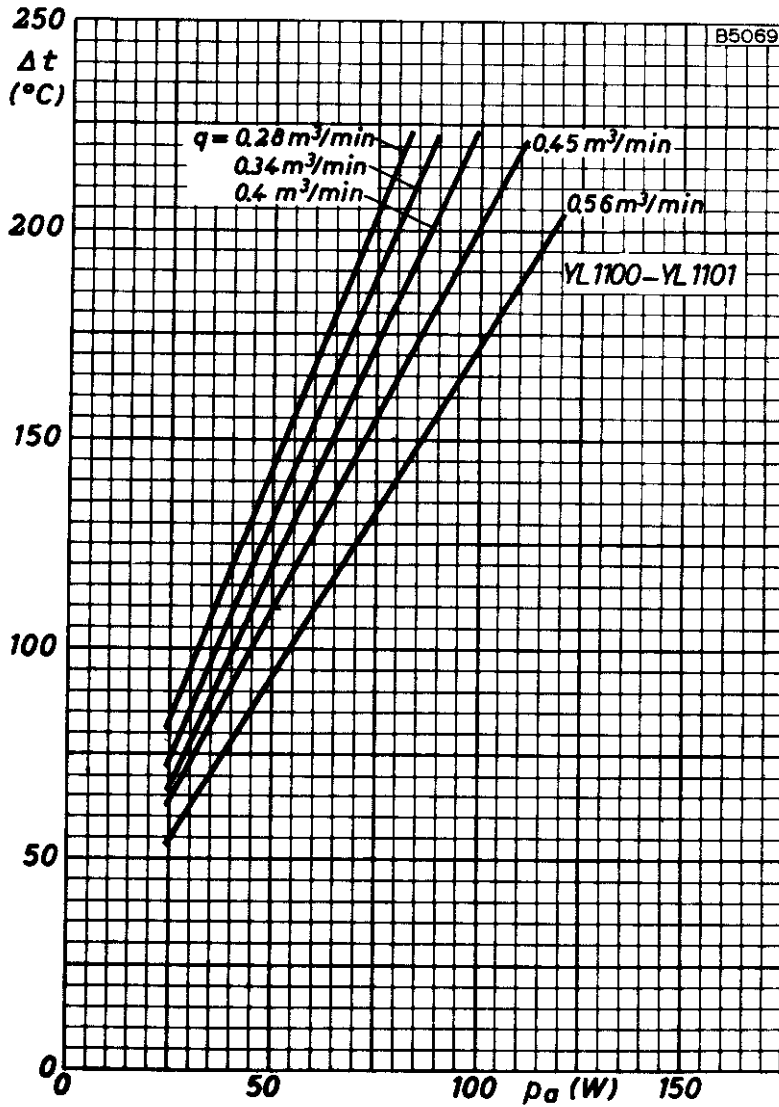
**U.H.F. BEAM
POWER TETRODES**

**YL1100 YL1102
YL1101 YL1103**



FREQUENCY CHARACTERISTICS FOR CLASS 'C' TELEGRAPHY
 OPERATING CONDITIONS $V_a = 900V$, $V_{g2} = 300V$, $I_a = 170mA$



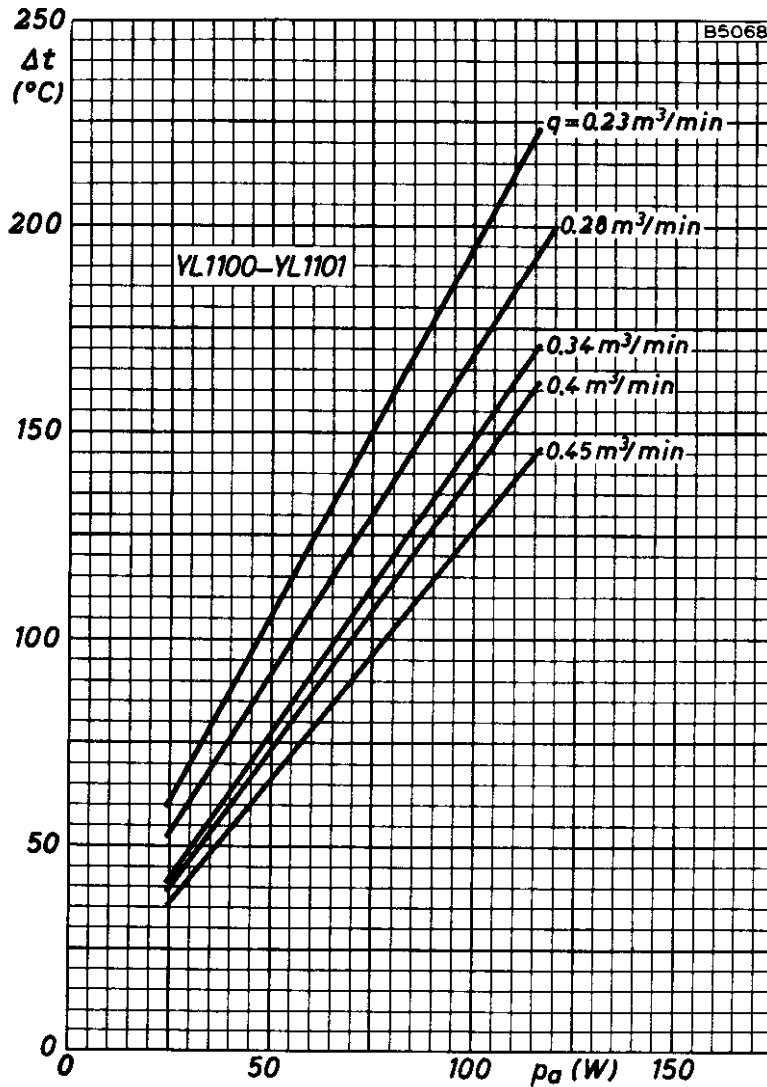


Difference of temperature ($\Delta t = t_{\text{anode terminal}} - t_{\text{incoming air}}$) plotted against anode dissipation with rate of air flow as parameter. Air duct of 25 x 38mm. Distance between air duct opening and radiator is 32mm.

(To convert cubic metres to cubic feet multiply by 35.31)

**U.H.F. BEAM
POWER TETRODES**

**YL1100 YL1102
YL1101 YL1103**



Difference of temperature ($\Delta t = t_{\text{anode terminal}} - t_{\text{incoming air}}$) plotted against anode dissipation with rate of air flow as parameter. Radiator in air duct of 25 x 38mm.

(To convert cubic metres to cubic feet multiply by 35.31)

—



**U.H.F. BEAM
POWER TETRODE**

YL1110

TENTATIVE DATA

QUICK REFERENCE DATA

Forced-air cooled coaxial beam power tetrode intended for use as u.h.f. amplifier or oscillator at frequencies up to 1215Mc/s.

	Amplifier for TV Translator Service, Class 'A'	Telegraphy or F.M. Telephony, Class 'C'	Linear Amplifier S.S.B. Class 'B'	
f	-	790	470	30 Mc/s
P _{out}	**55	590 + 30	765 + 25	*680 W
f max.	1215	1215	1215	Mc/s
V _a max.	2.5	2.5	2.5	kV
p _a max.	600	700	600	W

*P.E.P._{out} **P_{load}

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



LINEAR AMPLIFIER FOR SINGLE SIDEBAND OPERATION, CLASS 'B'

OPERATING CONDITIONS

f	30	Mc/s	
P.E.P _{out}	680	W	
P.E.P _{load}	610	W	
*d ₃	-31	dB	
*d ₅	-36	dB	
V _a	2.5	kV	
V _{g2}	450	V	
**V _{g1}	37	V	
I _{a(o)}	160	mA	
I _{g2(o)}	0	mA	
	Single Tone	Double Tone	
I _a	500	350	mA
I _{g2}	22.5	2.5	mA
I _{g1}	0	0	mA
v _{in(pk)}	36	36	V
P _{load(driver)}	1.0	1.0	W
p _a	530	535	W
η _a	54	39	%

*Maximum values encountered at any level of drive voltage referred to the amplitude of either of the two tones at that level. Third and fifth order intermodulation products.

**Adjust to give the stated values of I_{a(o)}.



U.H.F. BEAM POWER TETRODE

YL1110

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

OPERATING CONDITIONS for valve in common grid circuit.

f	790	470	Mc/s
†P _{out}	590 + 30	765 + 25	W
P _{load}	590	730	W
η _a	47	61	%
V _{a-g1}	2.5	2.5	kV
I _a	500	500	mA
V _{g2-g1}	400	400	V
I _{g2}	7.0	8.0	mA
V _{k-g1}	45	35	V
I _{g1}	10	12	mA
P _{load(driver)}	60	35	W
P _a	660	485	W

†includes power transferred from driver stage.

LINEAR AMPLIFIER FOR TELEVISION TRANSLATOR SERVICE, CLASS 'A'

Sound and vision.

OPERATING CONDITIONS

Bandwidth (-1dB)	> 6.5	Mc/s
P _{load}	55	W
*Intermodulation products	-51	dB
V _a	1.4	kV
V _{g2}	0.4	kV
-V _{g1}	30	V
I _a	400	mA
I _{g2}	-10	mA
P _{load(driver)}	5.0	W

*The intermodulation product in the passband of the output signal is measured with reference to peak envelope output.

TELEPHONY, ANODE AND SCREEN GRID MODULATION, CLASS 'C'

OPERATING CONDITIONS (cathode drive)

f	400	Mc/s	←
†P _{out}	640	W	
P _{load}	600	W	
η _a	64	%	
V _a	2.0	kV	
I _a	500	mA	
V _{g2}	400	V	
I _{g2}	8.0	mA	
-V _{g1}	35	V	
I _{g1}	12	mA	
P _{load(driver)}	35	W	
P _a	360	W	
P _{g2}	3.2	W	
For 100% modulation			
P _{mod}	502	W	

†Includes power transferred from driver stage.

RATINGS (ABSOLUTE MAXIMUM SYSTEM)

	Telephony Class 'C'	Telegraphy Class 'C'	TV Class 'A'	S.S.B. Class 'B'	
V _a max.	2.0	2.5	2.5	2.5	kV
V _{g2} max.	1.2	1.2	1.2	1.2	kV
-V _{g1} max.	250	250	250	250	V
I _a max.	500	500	500	500	mA
P _a max.	400	700	600	600	W
P _{g2} max.	17	25	25	25	W
I _{g1} max.	100	100	100	100	mA
R _{g1-k} max.	15	15	15	15	kΩ

CATHODE

Indirectly heated, oxide coated, matrix type.

V _h	6.3	V
I _h	7.85	A
t _{h-k} min.	120	s

The heater has been designed to accept temporary fluctuations of supply voltage of ±10%.

The heater voltage must be reduced depending on operating conditions and frequency.



U.H.F. BEAM POWER TETRODE

YL1110

CAPACITANCES

c_{a-g1}	<0.11	pF	←
$c_{g1-k+th}$	29	pF	
c_{a-k+th}	<0.011	pF	
c_{g1-g2}	37	pF	
$c_{g2-k+th}$	<1.1	pF	

CHARACTERISTICS

μ_{g1-g2} (measured at $V_a = V_{g2} = 225V, I_a = 100mA$)	13	
g_m (measured at $V_a = 2.5kV, V_{g2} = 400V, I_a = 240mA$)	22	mA/V

MOUNTING POSITION

Any

COOLING

Forced-air cooling will be required for the radiator and ceramic to metal seals.

Maximum temperature of anode and all seals 250 °C

The amount of forced-air cooling of the anode at an air inlet temperature of 25°C is given in the table below:-

Anode dissipation (W)	Minimum rate of air flow (m ³ /min)	(ft ³ /min)	Pressure (mm water)
100	0.06	2.12	2.0
300	0.12	4.24	4.0
600	0.32	11.30	17
700	0.46	16.25	25

A low velocity air flow is required for all other electrodes and seals. ←

PHYSICAL DATA

	oz	g
Weight of valve only	12	340

DIMENSIONS

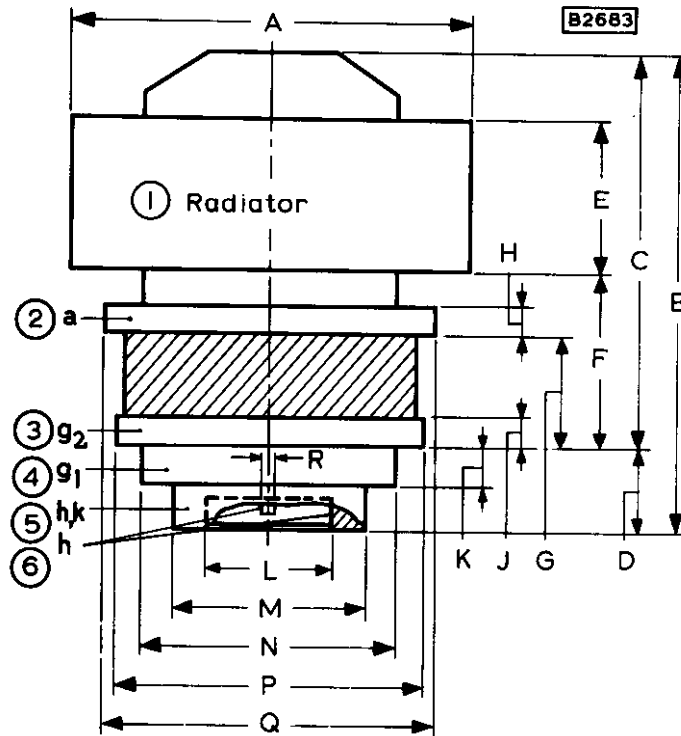
	Inches	Millimetres	
A	2.059 ^{+0.031} -0.027	52.3 ^{+0.8} -0.7	
B	2.399	60.95	max.
C	1.941 ± 0.039	49.3 ± 1.0	
D	0.402 ± 0.020	10.2 ± 0.5	
E	0.756 ± 0.020	19.2 ± 0.5	
F	0.894 ± 0.035	22.7 ± 0.9	
G	0.575 ± 0.020	14.6 ± 0.5	
H	0.146	3.7	min.
J	0.150	3.8	min.
K	0.201 ± 0.020	5.1 ± 0.5	
L	0.66	17	max.
M	0.993	25.2	min.
N	1.292	32.8	min.
P	1.591	40.4	min.
Q	1.744	44.3	min.
R	0.062	1.6	max.

Inch dimensions derived from original millimetre dimensions



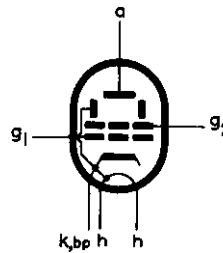
**U.H.F. BEAM
POWER TETRODE**

YL1110



The radiator and connections lie inside or outside concentric circles with the following diameters

1.	2.108 in	53.54 mm	inside
2.	1.799 in	45.69 mm	inside
3.	1.609 in	40.87 mm	inside
4.	1.319 in	33.50 mm	inside
5.	1.019 in	25.88 mm	inside
6.	0.619 in	15.72 mm	outside
	0.099 in	2.51 mm	inside

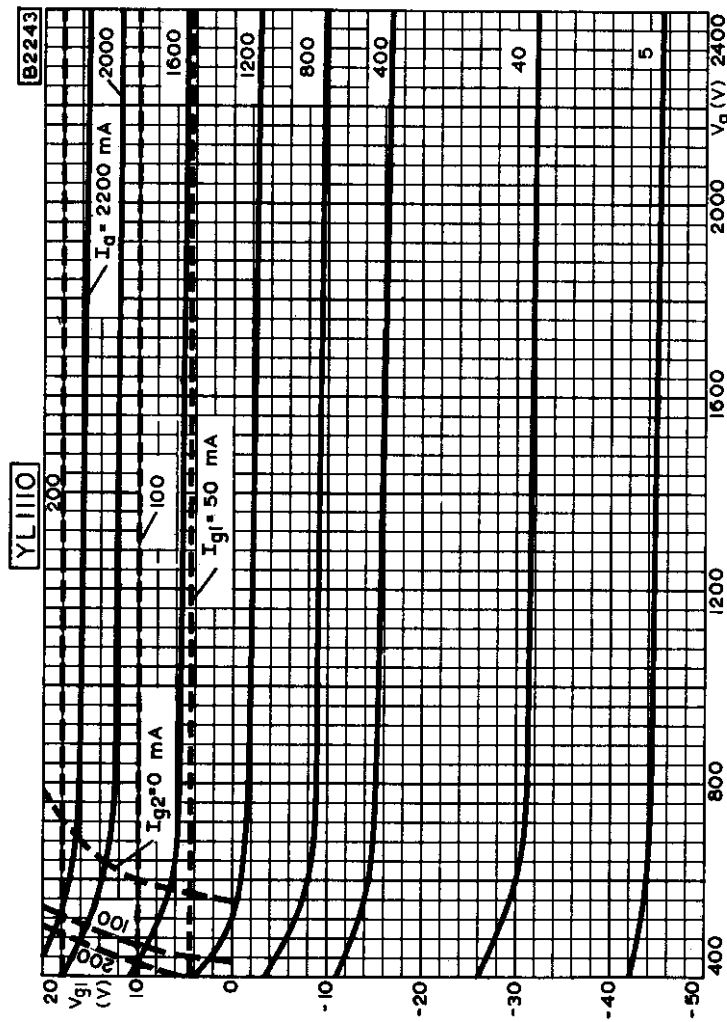


—



**U.H.F. BEAM
POWER TETRODE**

YL1110



CONSTANT CURRENT CHARACTERISTICS



—



V.H.F. POWER TETRODES

YL1121
YL1122

TENTATIVE DATA

QUICK REFERENCE DATA

Ceramic beam tetrode for use as a linear amplifier in s.s.b. applications.

YL1121 is forced-air cooled.

YL1122 is water cooled with integral water jacket.

	Linear amplifier for s.s.b. operation Class 'AB1'	Anode modulation Class 'B'	
f	1.0	1.0	MHz
P _{out}	6.0	5.1	kW
f max.	30	60	MHz
V _a max.	5.5	5.5	kV
p _a max.	4.0	2.6	kW

Unless otherwise shown, data is applicable to all types

To be read in conjunction with

GENERAL OPERATIONAL RECOMMENDATIONS - TRANSMITTING VALVES

LINEAR AMPLIFIER FOR SINGLE SIDEBAND OPERATION, CLASS 'AB1'

OPERATING CONDITIONS

	Zero signal	Single tone	Double tone	
f			1.0	MHz
V _a			5.0	kV
V _{g2}			650	V
*-V _{g1}			185	V
P.E.P. _{out}	0	6.0	6.0	kW
P.E.P. _{load}	0	5.7	5.7	kW
**d ₃	-	-	-40	dB
**d ₅	-	-	-40	dB
I _a	0.7	1.85	1.3	A
I _{g2}	-10 to +10	140	40	mA
I _{g1}	0	0	0	mA
V _{in(pk)}	-	160	160	V
p _a	3.5	3.25	3.5	kW
η _a	-	65	46	%



OPERATING CONDITIONS

f		30	MHz
V _a		5.0	kV
V _{g2}		650	V
*-V _{g1}		185	V
	Zero signal	Single tone	Double tone
P. E. P. _{out}	0	5.9	5.9 kW
P. E. P. _{load}	0	5.0	5.0 kW
**d ₃	-	-	-38 dB
**d ₅	-	-	-40 dB
I _a	0.7	1.85	1.3 A
I _{g2}	-10 to +10	140	40 mA
I _{g1}	0	< 5.0	< 5.0 mA
V _{in(pk)}	0	160	160 V
p _a	3.5	3.35	3.55 kW
η _a	-	64	45 %

*Adjust to give the stated value of I_{a(0)}

**Maximum values encountered at any level of drive voltage referred to the amplitude of either of the two tones at that level. Third and fifth order inter-modulation products.

ANODE MODULATION, CLASS 'B'

OPERATING CONDITIONS

f		1.0	MHz
P _{out}		5.1	kW
P _{load}		4.6	kW
η _a		70	%
V _a		5.0	kV
I _a		1.46	A
V _{g2}		600	V
I _{g2}		100	mA
-V _{g1}		230	V
I _{g1}		0	mA
p _a		2.2	kW
p _{g2}		60	W
P _{mod} (100% modulation)		3.65	kW

V.H.F. POWER TETRODES

YL1121 YL1122

RATINGS (ABSOLUTE MAXIMUM SYSTEM)

	Linear amplifier Class 'AB1'	Anode modulation Class 'B'	
f max.	30	60	MHz
V _a max.	5.5	5.5	kV
V _{g2} max.	1.0	0.8	kV
-V _{g1} max.	250	250	V
I _a max.	2.0	1.6	A
p _a max.	4.0	2.6	kW
p _{g2} max.	140	140	W
R _{g1-k} max.	10	10	kΩ

CATHODE

Indirectly heated, oxide coated

V _h	12.6	V
I _h	14.5	A
t _{h-k} min.	600	s

CAPACITANCES

c _{g-all}	156	pF
c _{a-all}	33	pF
c _{a-g1}	0.16	pF

CHARACTERISTICS

g _m (at V _a = 1.0kV, V _{g2} = 650V, I _a = 6.0A)	45	mA/V
μ _{g1-g2} (at V _a = 5.0V, V _{g2} = 650V, I _a = 0.7A)	3.0	

MOUNTING POSITION

Vertical, anode up or down

COOLING

YL1121 Forced-air cooled
Seals should be cooled by a low velocity air flow

Temperatures

Envelope and seals max. 200 °C
Air inlet max. 45 °C

Air flow requirements

Anode dissipation (kW)	Inlet temperature (°C)	Air flow per minute		Pressure difference Inlet and outlet	
		(m ³)	(ft ³)	(mm water)	(in water)
4.0	45	5.0	213	23	0.8

Air flow required on socket 0.55 m³/min
at pressure drop of 16 mm water

YL1122 Water cooled with integral water jacket
Seals should be cooled by a low velocity air flow

Temperatures

Envelope and seals max. 200 °C
Water inlet max. 20 °C

Water flow requirements

Anode dissipation (kW)	Inlet temperature (°C)	Water flow per minute		Pressure difference Inlet and outlet (atm)
		(litres)	(gals)	
4.0	20	2.5	0.55	0.15

Air flow required on socket 0.5 m³/min
at pressure drop of 20 mm water

PHYSICAL DATA

	YL1121	YL1122	
Weight of valve	5.8	4.3	kg

ACCESSORIES

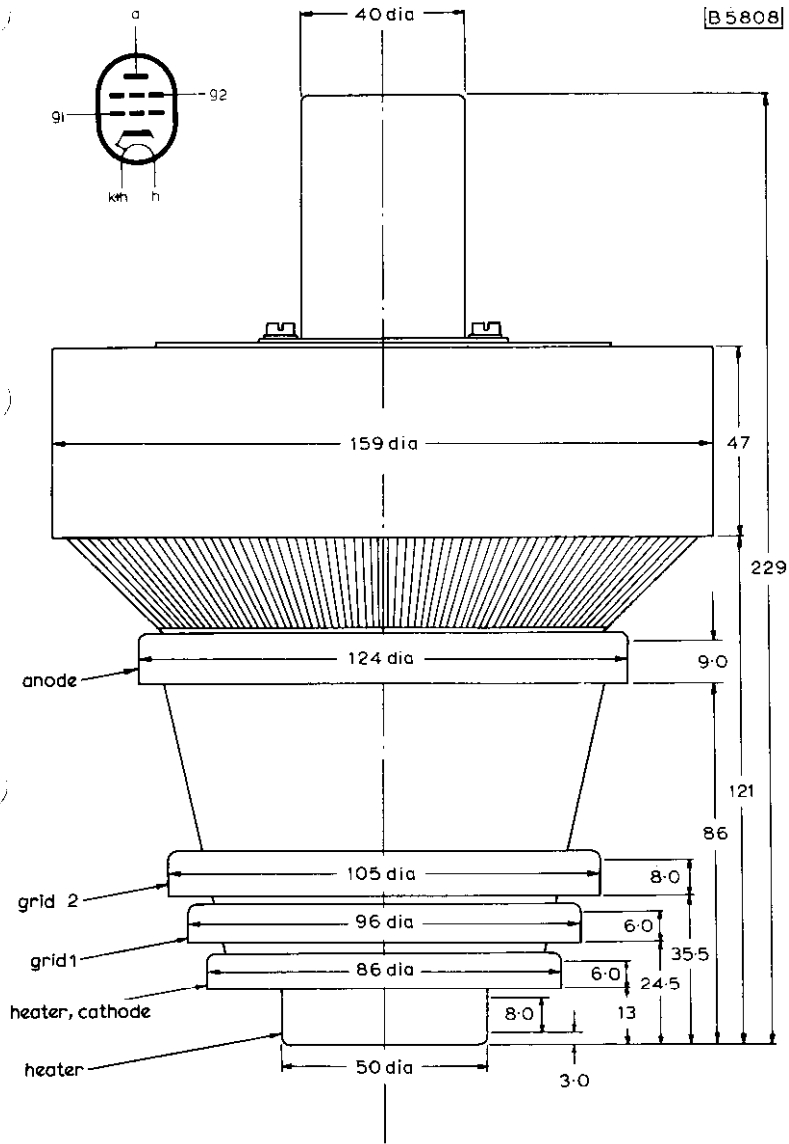
	YL1121	YL1122
Socket	40699	40699
Chimney	40683	-



V.H.F. POWER TETRODES

YL1121
YL1122

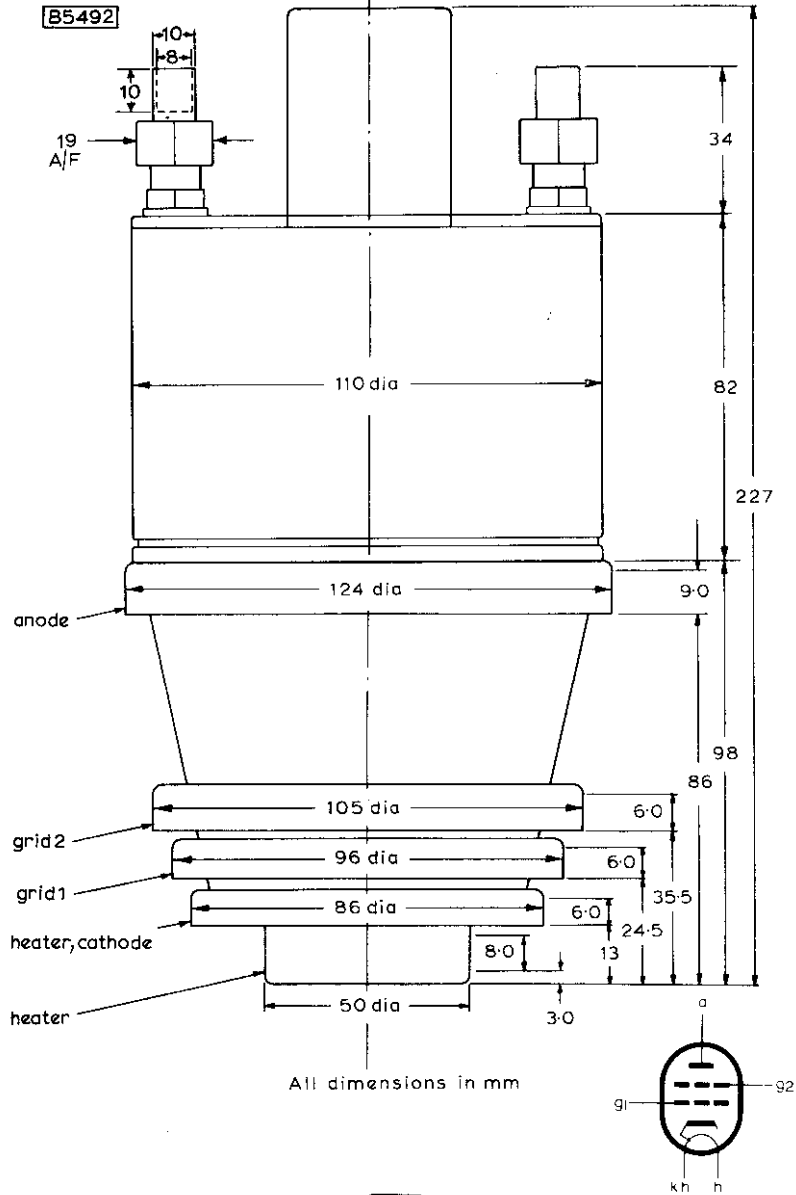
OUTLINE DRAWING OF YL1121



All dimensions in mm

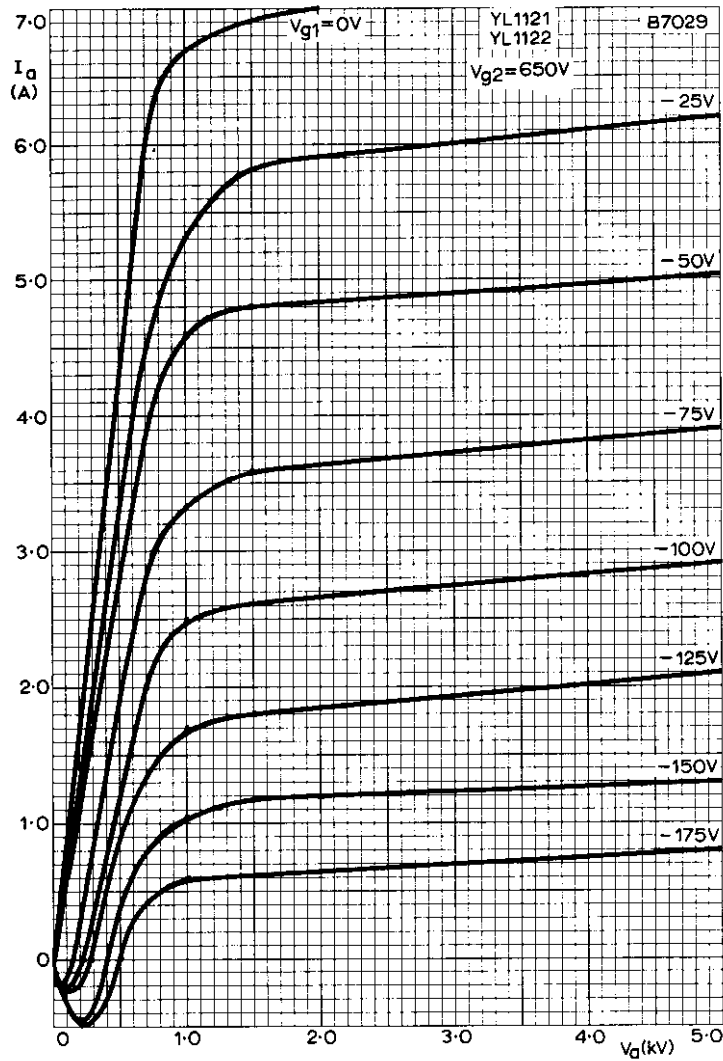


OUTLINE DRAWING OF YL1122



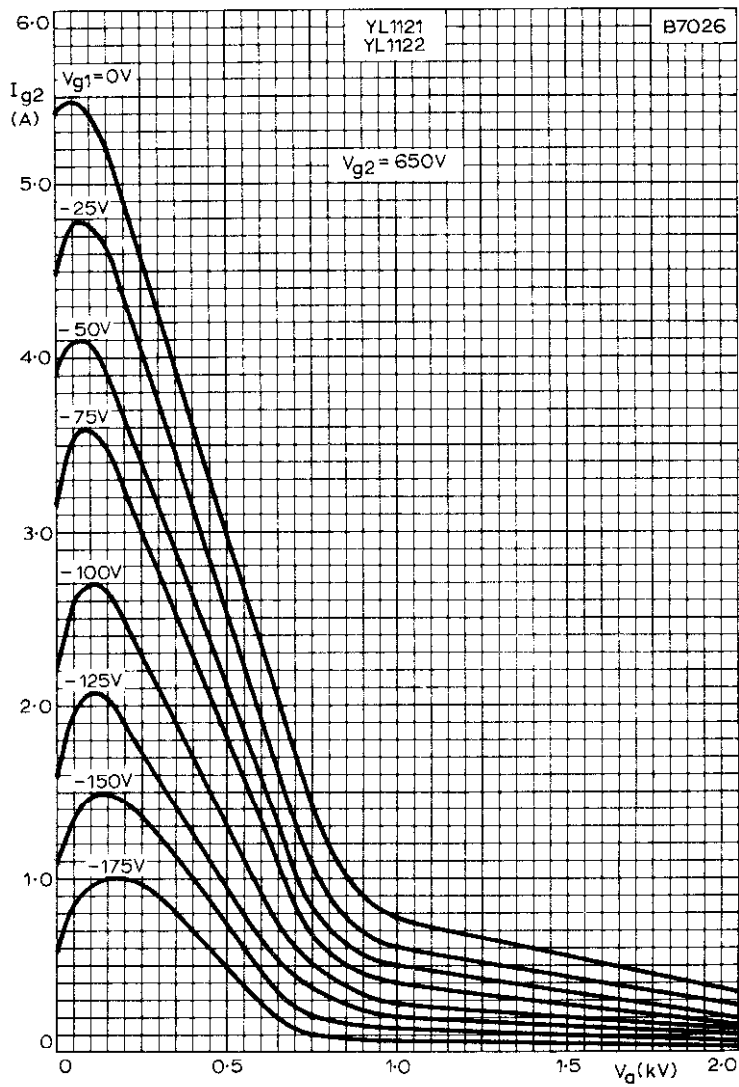
V.H.F. POWER TETRODES

YL1121
YL1122



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





SCREEN GRID CURRENT PLOTTED AGAINST ANODE VOLTAGE
WITH CONTROL GRID VOLTAGE AS PARAMETER

QUICK HEATING DOUBLE TETRODE

YL1130

QUICK REFERENCE DATA

Amplifier and frequency multiplier for intermittent use in mobile transmitters. 70% power output in less than 0.5 seconds.

	Frequency Treble	Telephony, Anode and Screen Grid Modulation, Class 'C'		Telegraphy or F.M. Telephony, Class 'C'		
f	500/167	200	500	200	500	Mc/s
P _{out}	3.5	9.4	6.6	16	8.0	W
f max.	500	500		500		Mc/s
V _a max.						
(f=200Mc/s)	-	240		300		V
(f=500Mc/s)	200	200		200		V
p _a max.	2×4.0	2×2.6		2×4.0		W

To be read in conjunction with
GENERAL OPERATIONAL RECOMMENDATIONS - TRANSMITTING VALVES
TELEGRAPHY OR F.M. TELEPHONY, CLASS 'C'

OPERATING CONDITIONS

	200	500	Mc/s
f			
P _{out}	16	8.0	W
P _{load}	13	6.5	W
η _a	68	57	%
V _a	275	175	V
I _a	2×42.5	2×40	mA
V _{g2}	175	175	V
I _{g2}	2×7.0	2×6.0	mA
-V _{g1}	20	22	V
I _{g1}	2×1.3	2×1.2	mA
v _{in(g1-g1)pk}	65	65	V
P _{load(driver)}	0.7	1.5	W
p _a	2×3.5	2×3.0	W
P _{g2}	2×1.2	2×1.0	W



TELEPHONY, ANODE AND SCREEN-GRID MODULATION, CLASS 'C'

OPERATING CONDITIONS (Carrier conditions for 100% modulation).

	200	500	Mc/s
f			
P _{out}	9.4	6.6	W
P _{load}	8.0	5.0	W
η_a	67	59	%
V _a	220	175	V
I _a	2 x 32	2 x 32	mA
V _{g2}	175	175	V
I _{g2}	2 x 4.0	2 x 3.5	mA
-V _{g1}	35	30	V
I _{g1}	2 x 1.2	2 x 1.2	mA
v _{in(g1-g1)pk}	105	100	V
P _{load(driver)}	0.6	1.5	W
p _a	2 x 2.4	2 x 2.3	W
p _{g2}	2 x 0.8	2 x 0.8	W

For 100% modulation

P _{mod}	8.0	6.5	W
v _{g2(pk)}	125	125	V

FREQUENCY TREBLER

OPERATING CONDITIONS

	500/167	Mc/s
f _{out} /f _{in}		
P _{out}	3.5	W
P _{load}	2.0	W
η_a	33	%
V _a	175	V
I _a	2 x 30	mA
V _{g2}	175	V
I _{g2}	2 x 4.5	mA ←
-V _{g1}	75	V
I _{g1}	2 x 1.2	mA ←
v _{in(g1-g1)pk}	175	V
P _{load(driver)}	1.5	W ←
p _a	2 x 3.5	W
p _{g2}	2 x 0.8	W

QUICK HEATING DOUBLE TETRODE

YL1130

RATINGS (ABSOLUTE MAXIMUM SYSTEM)

	Frequency Treble	Telephony, Class 'C'	Telephony, Class 'C'	Telegraphy, Class 'C'	Telegraphy, Class 'C'	
f max.	500	200	500	200	500	Mc/s
V _a max.	200	240	200	300	200	V
V _{g2} max.	200	200	200	200	200	V
-V _{g1} max.	150	150	150	150	150	V
I _k max.	2 x 40	2 x 40	2 x 40	2 x 60	2 x 60	mA
p _a max.	2 x 4.0	2 x 2.6	2 x 2.6	2 x 4.0	2 x 4.0	W
p _{g2} max.	2 x 1.3	2 x 1.0	2 x 1.0	2 x 1.5	2 x 1.5	W
I _{g1} max.	2 x 3.0	2 x 3.0	2 x 3.0	2 x 5.0	2 x 5.0	mA
p _{g1} max.	2 x 0.2	2 x 0.2	2 x 0.2	2 x 0.2	2 x 0.2	W
R _{g1-f} max. (per section)	100	100	100	100	100	kΩ

CATHODE

Quick heating directly heated filament. 70% P_{out} in less than 0.5 second.

*V_f 1.1 V

I_f 2.9 A ←

Frequency of filament supply

Sine wave max. 200 c/s

Square wave Any

*The filament has been designed to accept temporary fluctuations of supply voltage of ±15%.

CAPACITANCES

c_{in} (two sections in push-pull) 4.1 pF

c_{out} (two sections in push-pull) 1.2 pF

Internally neutralised for push-pull operation.

CHARACTERISTICS (measured at $V_a = V_{g2} = 175V$, $I_a = 40mA$)

g_m	7.0	mA/V
μ_{g1-g2}	22	←

MOUNTING POSITION

Any

If the valve is mounted horizontally it is recommended that pins 3 and 7 be in the vertical plane.

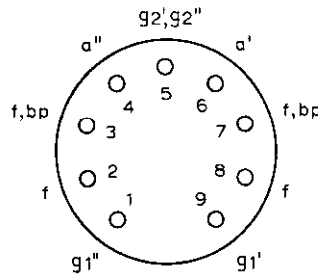
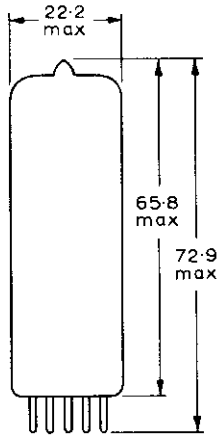
COOLING

Radiation and convection

Maximum bulb temperature	230	$^{\circ}C$
--------------------------	-----	-------------

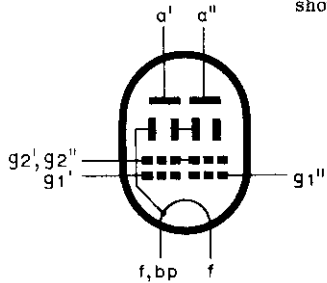
PHYSICAL DATA

	oz	g
Weight of valve	0.6	16



B9A Base

Filament connections (pins 3, 7 and 2, 8) should be connected in parallel on the socket.



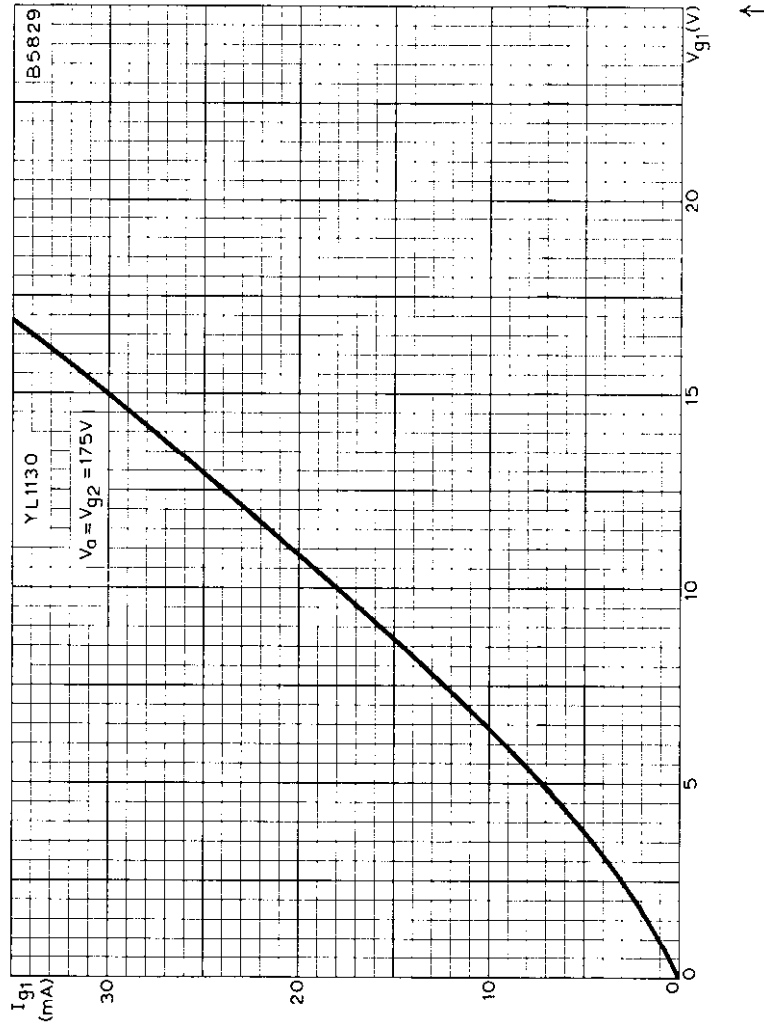
All dimensions in mm

B5826



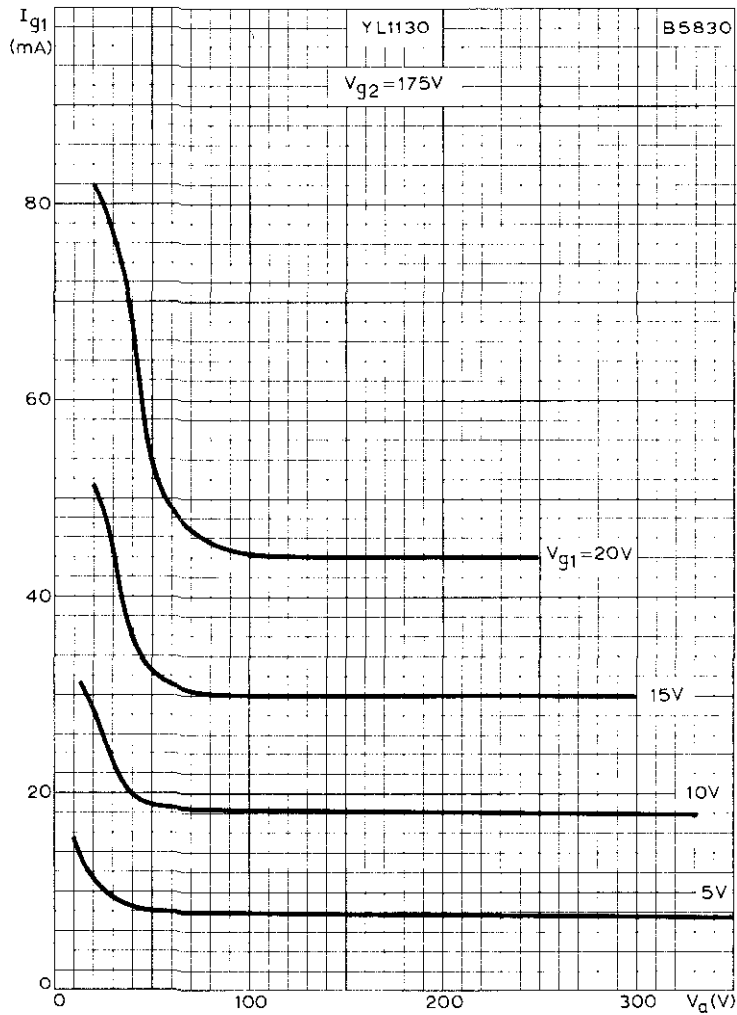
**QUICK HEATING
DOUBLE TETRODE**

YL1130



CONTROL-GRID CURRENT PLOTTED AGAINST CONTROL-GRID VOLTAGE.
 $V_a = V_{g2} = 175V$ (EACH SECTION)

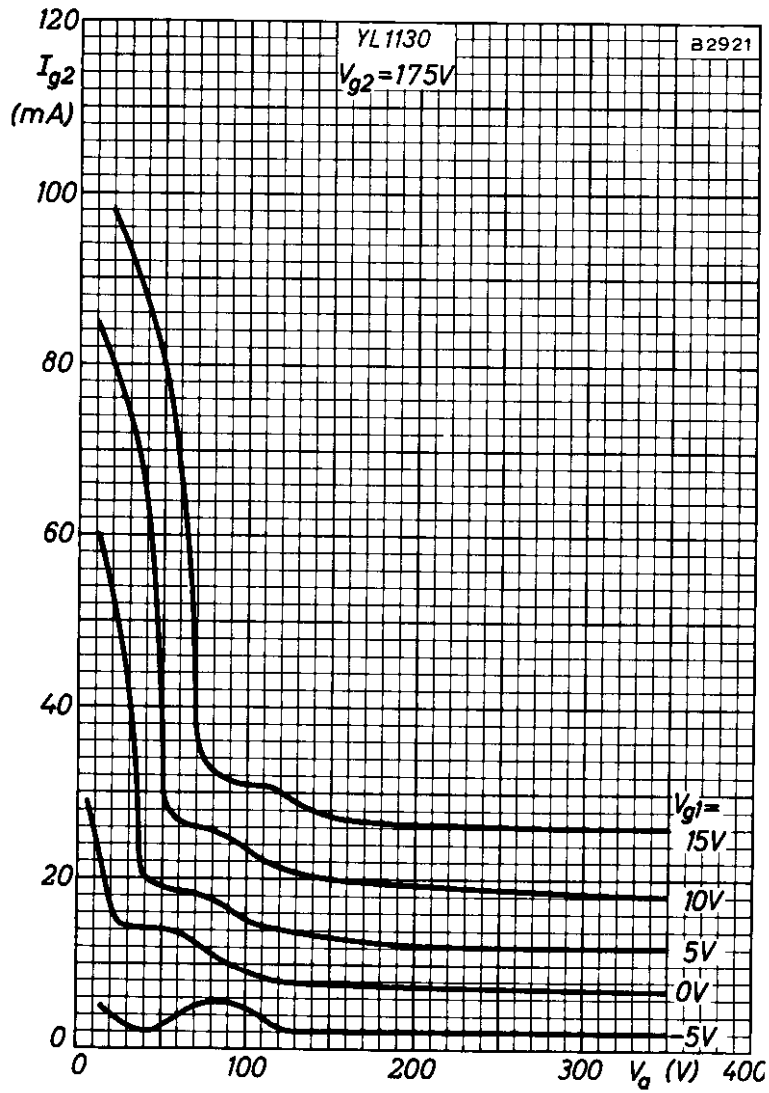




CONTROL-GRID CURRENT PLOTTED AGAINST ANODE VOLTAGE WITH
 CONTROL-GRID VOLTAGE AS PARAMETER
 $V_{g2} = 175V$ (EACH SECTION)

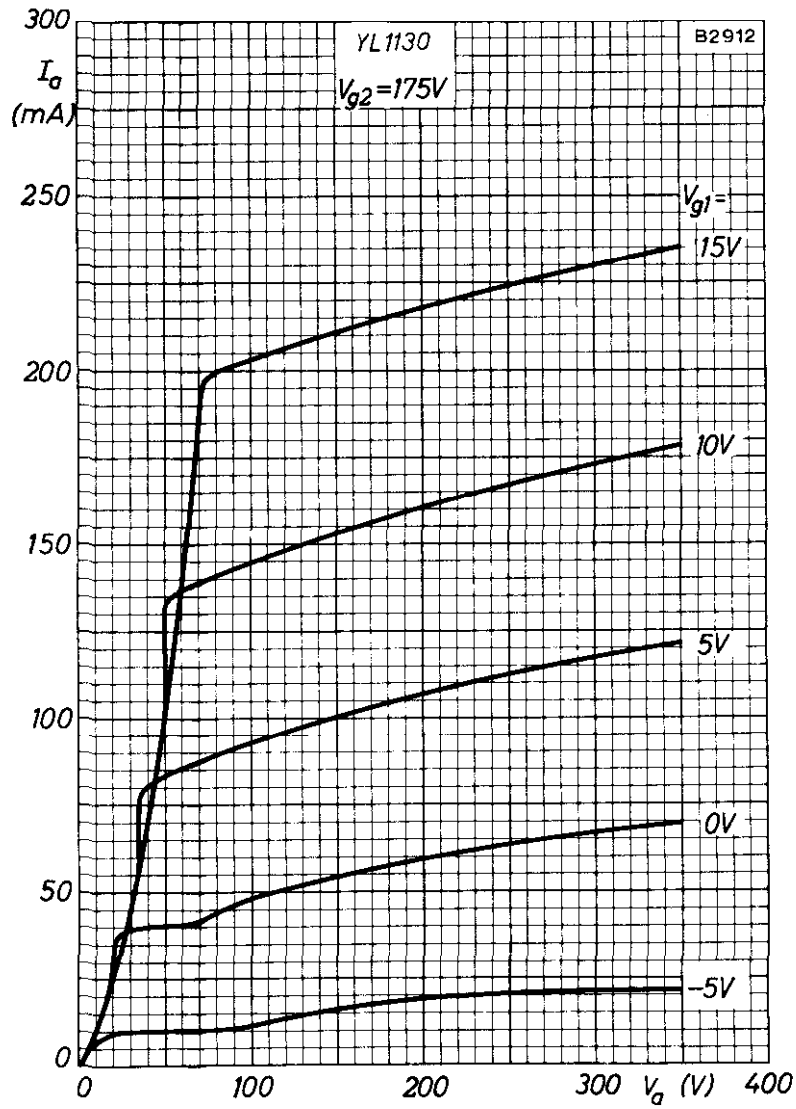
**QUICK HEATING
DOUBLE TETRODE**

YL1130



SCREEN-GRID CURRENT PLOTTED AGAINST ANODE VOLTAGE WITH
CONTROL-GRID VOLTAGE AS PARAMETER
 $V_{g2} = 175V$ (EACH SECTION)





ANODE CURRENT PLOTTED AGAINST ANODE VOLTAGE WITH
 CONTROL-GRID VOLTAGE AS PARAMETER
 $V_{g2} = 175V$ (EACH SECTION)

V.H.F. BEAM POWER TETRODE

YL1150

TENTATIVE DATA

QUICK REFERENCE DATA

Beam power tetrode primarily intended for use as a linear v.h.f. amplifier in single sideband transmitters.

	Linear Amplifier for S.S.B. Operation, Class 'AB'	A.F. Amplifier and Modulator, Class 'AB'	
f	30	-	MHz
P _{out}	124 (P.E.P.)	2 x 100	W
f max.	60	-	MHz
V _a max.	750	750	V
p _a max.	75	75	W

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

AUDIO AMPLIFIER AND MODULATOR, CLASS 'AB' (Two valves in push-pull)

OPERATING CONDITIONS

P _{out}	200	W
*D _{tot}	~2	% ←
R _{a-a}	2.8	kΩ
V _a	600	V
V _{g2}	250	V
**V _{g1}	50	V
I _{a(o)}	2 x 100	mA
I _{g2(o)}	2 x 3.0	mA
I _{a(max.sig.)}	2 x 260	mA
I _{g2(max.sig.)}	2 x 24	mA
I _{g1}	0	mA
V _{in(g1-g1)r.m.s.}	71	V
p _a	2 x 56	W
p _{g2}	2 x 6.0	W
η _a	64	%

*Total distortion encountered at maximum output.

**Adjust to give the desired value of I_{a(o)}.

LINEAR AMPLIFIER FOR SINGLE SIDEBAND OPERATION, CLASS 'AB'

OPERATING CONDITIONS

f	30	MHz	
P. E. P _{out}	124	W	
P. E. P _{load}	110	W	
*d ₃	<30	dB ←	
*d ₅	<40	dB ←	
V _a	600	V	
V _{g2}	250	V	
**V _{g1}	50	V	
I _{a(o)}	100	mA	
I _{g2(o)}	3.0	mA	
	Single Tone	Double Tone	
I _a	325	220	mA
I _{g2}	22	12	mA
I _{g1}	0	0	mA
v _{in(pk)}	50	50	V
P _{load(driver)}	2.0	2.0	W
p _a	71	70	W
p _{g2}	7.0	3.5	W
η _a	57	42	%

*Third and fifth order intermodulation products. Maximum values encountered at any level of drive voltage referred to the amplitude of either of the two tones at that level.

Relative to the peak envelope power these figures will be increased by 6dB.

**Adjust to give the desired value of I_{a(o)}.

CATHODE

Indirectly heated, oxide coated

	Parallel	Series	
V _h	6.3	12.6	V
I _h	1.62	0.81	A
t _{h-k} min.	30		s

V.H.F. BEAM POWER TETRODE

YL1150

RATINGS (ABSOLUTE MAXIMUM SYSTEM)

	S.S.B. Class 'AB'	A.F. Amplifier Class 'AB'	
f max.	60	-	MHz
V _a max.	750	750	V
V _{g2} max.	300	300	V
-V _{g1} max.	100	100	V
I _a max.	350	350	mA
p _a max.	75	75	W
p _{g2} max.	7.5	7.5	W
I _{g1} max.	10	10	mA
p _{g1} max.	0.5	0.5	W
R _{g1-k} max.	10	10	kΩ

CAPACITANCES

c _{a-g1}	0.2	pF
c _{out}	10.7	pF
c _{in}	22	pF

CHARACTERISTICS

g _m (at V _a = 600V, V _{g2} = 250V, I _a = 100mA)	10	mA/V
μ _{g1-g2} (at V _a = 600V, V _{g2} = 250V, I _a = 100mA)	4.7	

MOUNTING POSITION

Any

COOLING

Radiation and convection cooling

Temperatures

Bulb max.	250	°C ←
Base pin seal max.	180	°C
Anode seal max.	220	°C

PHYSICAL DATA

Weight of valve	110	g	oz
			3.9



ACCESSORIES

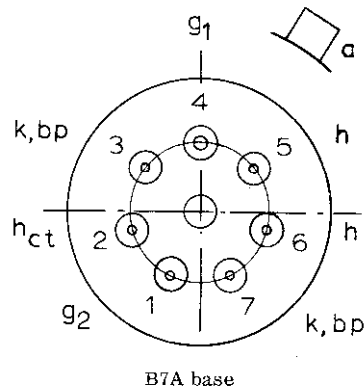
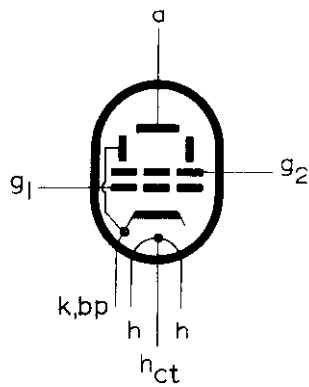
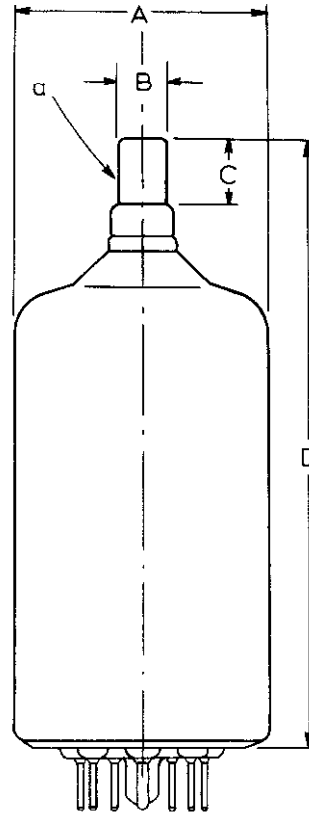
Socket	40202
Anode connector	40634

DIMENSIONS

	Millimetres	Inches
A	50	1.97
B	9.1	0.358
C	13	0.51
D	120	4.65

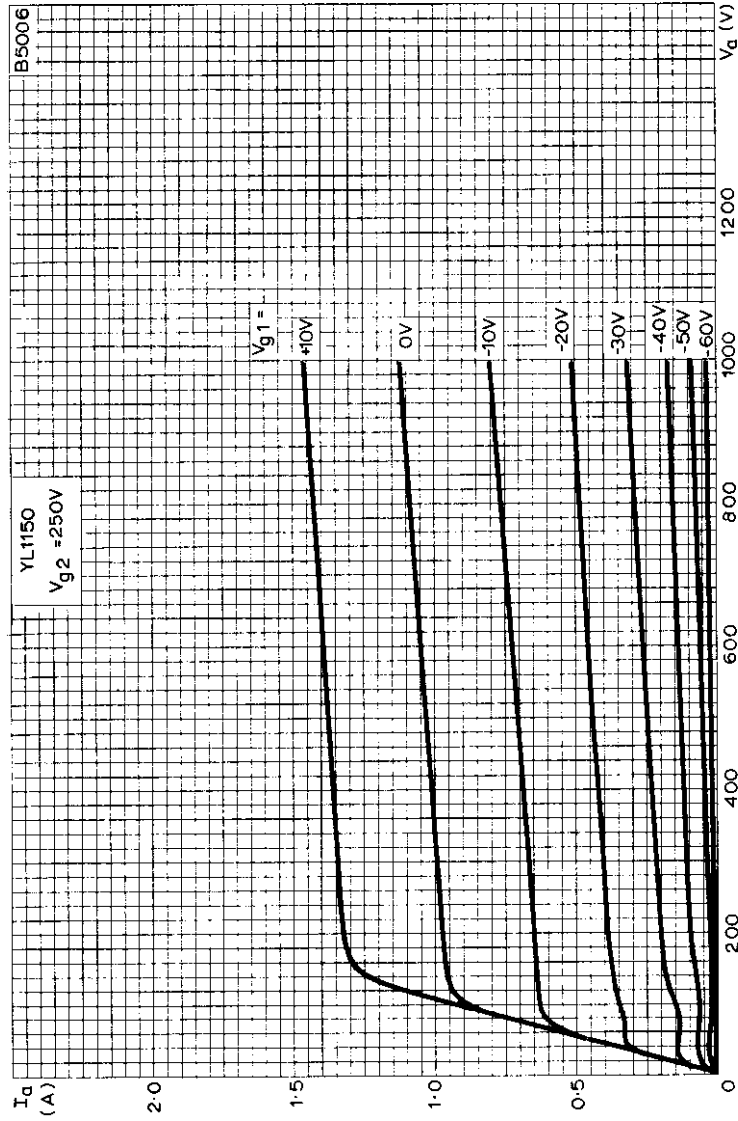
Inch dimensions derived from original millimetre dimensions.

B5482



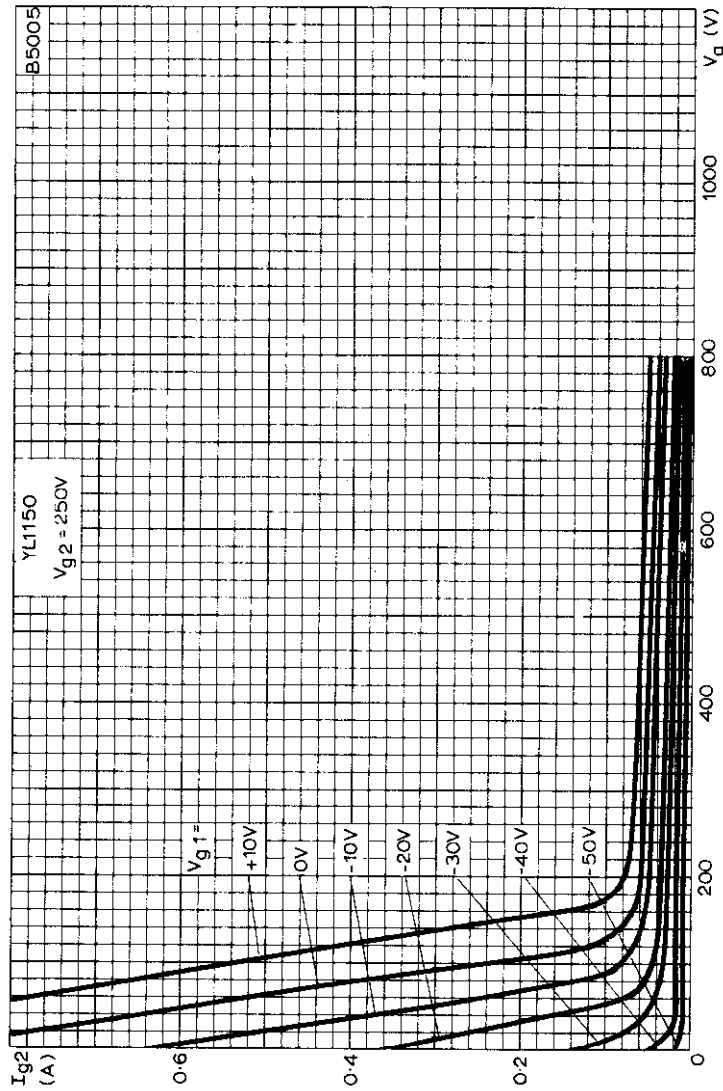
V.H.F. BEAM
POWER TETRODE

YL1150



ANODE CURRENT PLOTTED AGAINST ANODE VOLTAGE WITH
CONTROL-GRID VOLTAGE AS PARAMETER.





SCREEN-GRID CURRENT PLOTTED AGAINST ANODE VOLTAGE WITH CONTROL-GRID VOLTAGE AS PARAMETER.

QUICK HEATING DOUBLE TETRODE

YLI 190

TENTATIVE DATA

QUICK REFERENCE DATA					
Amplifier and frequency multiplier for mobile transmitters					
	Frequency Treble	Telephony, Anode and Screen Grid Modulation, Class 'C'	Telegraphy or F.M. Telephony Class 'C'		
f	500/167	175	200	500	Mc/s
P _{out}	6.5	19	33	19	W
f max.	500	500	500		Mc/s
V _a max.					
(f=200Mc/s)	-	330	400		V
(f=500Mc/s)	300	250	300		V
p _a max.	2 x 8.0	2 x 5.5	2 x 8.0		W

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

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

OPERATING CONDITIONS

f	200	500	Mc/s
P _{out}	33	19	W
†P _{load}	26	14	W
η _a	67	52	%
V _a	350	260	V
I _a	2 x 70	2 x 70	mA
V _{g2}	140	175	V
I _{g2}	23.5	20	mA
-V _{g1}	13	22.5	V
I _{g1}	2 x 6.5	2 x 3.25	mA
v _{in(g1-g1)pk}	85	65	V
P _{load(driver)}	1.0	2.5	W
p _a	2 x 8.0	2 x 8.0	W
p _{g2}	3.1	2.7	W

†With a circuit transfer efficiency of 80%.



FREQUENCY TREBLER

OPERATING CONDITIONS

f_{out}/f_{in}	500/167	Mc/s
P_{out}	6.5	W
P_{load}	3.0	W
η_a	29	%
V_a	250	V
I_a	2 x 45	mA
V_{g2}	250	V
I_{g2}	14	mA
$-V_{g1}$	70	V
I_{g1}	2 x 2.5	mA
$v_{in(g1-g1)pk}$	170	V
$P_{load(driver)}$	2.2	W
p_a	2 x 8.0	W
p_{g2}	2.4	W

TELEPHONY, ANODE AND SCREEN-GRID MODULATION, CLASS 'C'
(Two sections in push-pull)

OPERATING CONDITIONS (Carrier conditions for 100% modulation)

f	175	Mc/s
P_{out}	19	W
P_{load}	15	W
η_a	72	%
V_a	280	V
I_a	2 x 50	mA
V_{g2}	150	V
I_{g2}	19	mA
$-V_{g1}$	35	V
I_{g1}	2 x 4.0	mA
$v_{in(g1-g1)pk}$	50	V
$P_{load(driver)}$	1.5	W
p_a	2 x 4.5	W
p_{g2}	2 x 1.4	W
p_{g1}	2 x 0.18	W
For 100% modulation		
P_{mod}	16	W
$v_{g2(pk)}$	120	V

QUICK HEATING DOUBLE TETRODE

YL1190

RATINGS (ABSOLUTE MAXIMUM SYSTEM)

	Frequency Treble	Telephony Class 'C'	Telephony Class 'C'	Telephony Class 'C'	
$f_{max.}$	500	200	500	200	500 Mc/s
V_a max.	300	330	250	400	300 V
V_{g2} max.	200	200	200	200	200 V
$-V_{g1}$ max.	150	150	100	150	100 V
I_a max.	2 x 50	2 x 56		2 x 75	mA
p_a max.	2 x 8.0	2 x 5.5		2 x 8.0	W
p_{g2} max.	3.5	2 x 1.5		3.5	W
I_{g1} max.	2 x 3.0	2 x 5.0		2 x 7.0	mA
R_{g1-f} max.	100	100		100	k Ω

CATHODE

Quick heating directly heated filament 70% P_{out} in less than 0.5 seconds.

$*V_f$	1.1	V
I_f	3.8	A

Frequency of filament supply

Sine wave	max. 200	c/s
Square wave	Any	

*The filament has been designed to accept temporary fluctuations of supply voltage of $\pm 15\%$.

CAPACITANCES

c_{out} (two sections in push-pull)	1.2	pF
c_{in} (two sections in push-pull)	4.7	pF
Internally neutralised for push-pull operation up to 500Mc/s.		

CHARACTERISTICS (measured at $V_a = 150V$, $V_{g2} = 150V$, $I_a = 45mA$)

E_m	9.5	mA/V
μ_{g1-g2}	22	



MOUNTING POSITION

Any

If the valve is mounted with its main axis horizontal it is recommended that pins 3 and 7 be in a horizontal plane.

COOLING

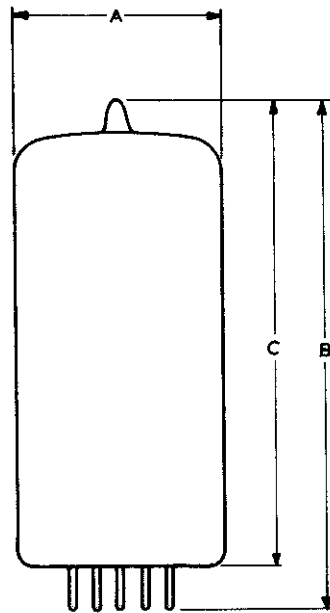
Radiation and convection cooling

Maximum temperatures

Bulb 230 °C

PHYSICAL DATA

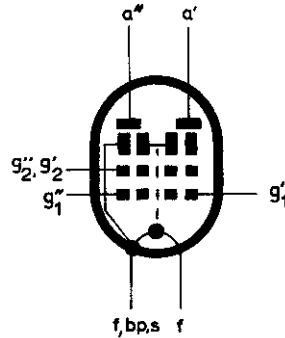
	oz	g
Weight of valve	1.0	27



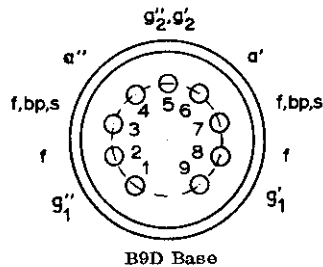
DIMENSIONS

	Inches	Millimetres
A	1.189	30.2 max.
B	2.909	73.9 max.
C	2.591	65.8 max.

Inch dimensions derived from original millimetre dimensions.



E5061

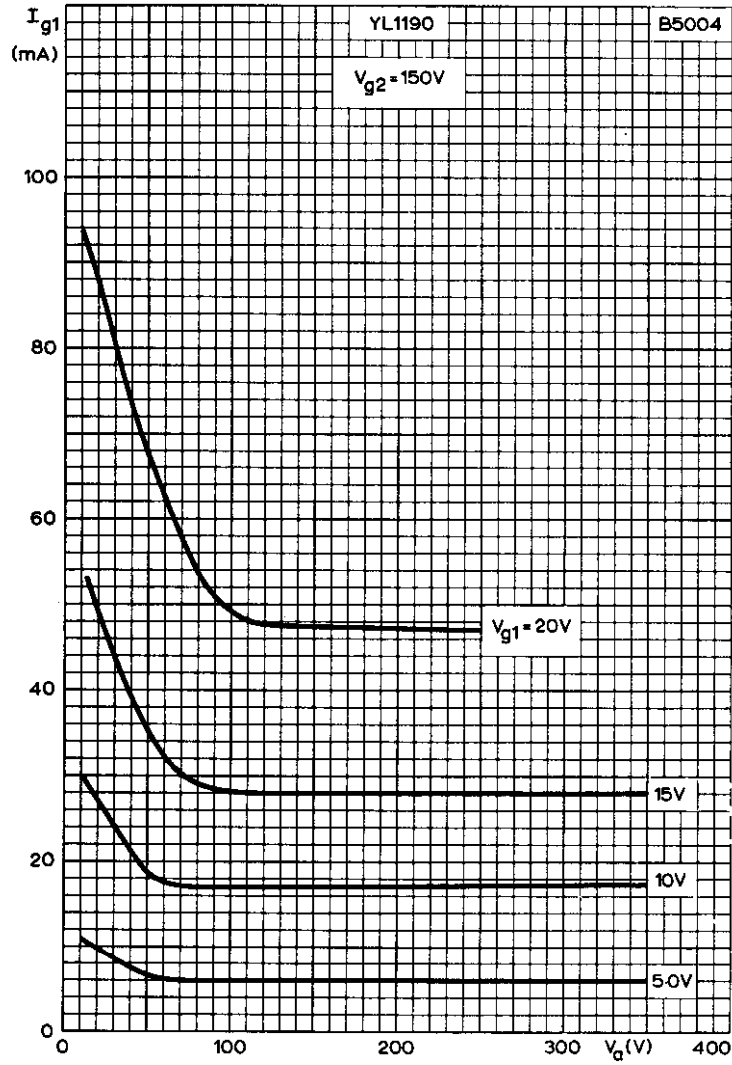


Filament connections (pins 3, 7 and 2, 8) should be connected in parallel on the socket.



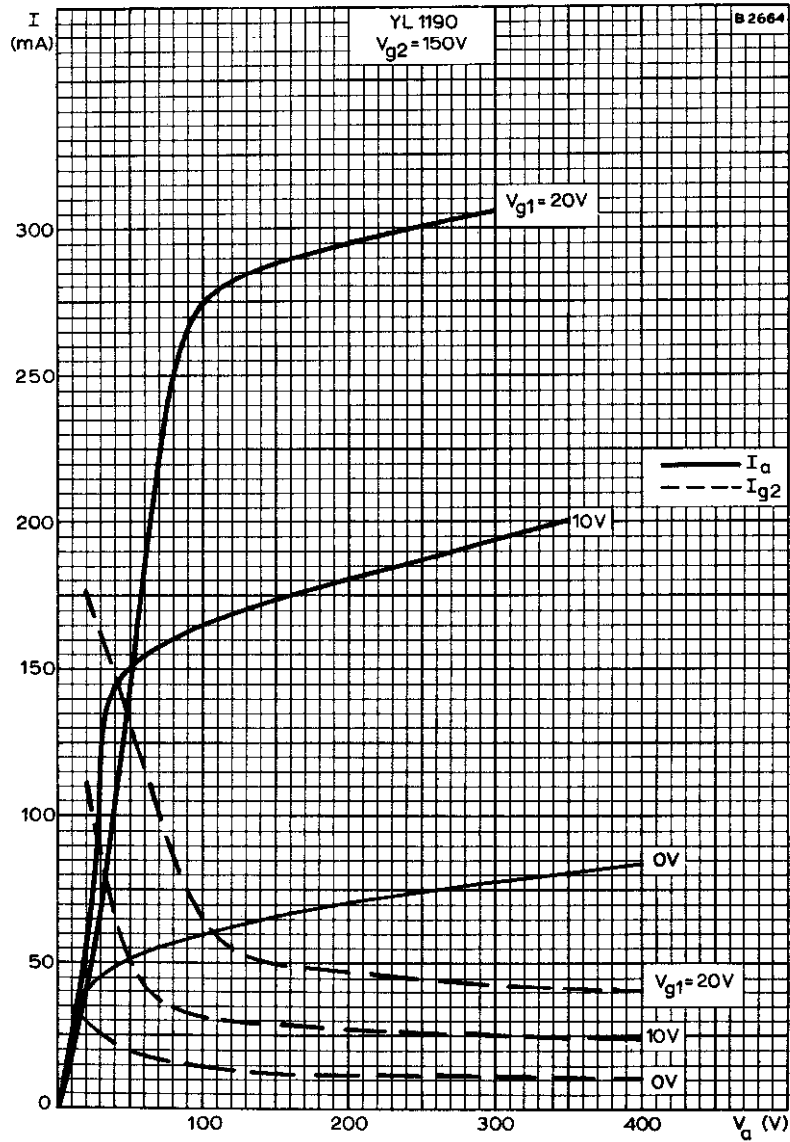
QUICK HEATING DOUBLE TETRODE

YL1190



CONTROL-GRID CURRENT PLOTTED AGAINST ANODE VOLTAGE WITH CONTROL-GRID VOLTAGE AS PARAMETER. $V_{g2} = 150V$.





ANODE AND SCREEN-GRID CURRENTS PLOTTED AGAINST ANODE VOLTAGE WITH CONTROL-GRID VOLTAGE AS PARAMETER, $V_{g2} = 150V$.

V.H.F. TETRODE

YL1230

TENTATIVE DATA

QUICK REFERENCE DATA

Air cooled ceramic tetrode intended for s.s.b. and v.h.f. applications			
	Amplifier Class 'B'	S.S.B. Amplifier Class 'AB1'	
f	≤220	≤30	MHz
P _{out}	1.2	1.1	kW
f max.	220	60	MHz
V _a max.	3.5	3.5	kV
p _a max.	1.5	1.5	kW

To be read in conjunction with
GENERAL OPERATIONAL RECOMMENDATIONS - TRANSMITTING VALVES
AMPLIFIER FOR S.S.B., CLASS 'AB1'

OPERATING CONDITIONS

f		≤30	MHz
V _a		3.0	kV
V _{g2}		550	V
-V _{g1}		55	V
	Zero signal	Single tone	Double tone
P.E.P. _{out}	0	1.1	1.1 kW
P.E.P. _{load}	0	1.0	1.0 kW
P _{in}	1.14	2.25	1.71 kW
P _a	1.14	1.15	1.16 kW
I _a	380	750	570 mA
I _{g2}	-10	0	-25 mA
I _{g1}	0	0	0 mA
R _{g1}	2.0	2.0	2.0 kΩ
P.E.P. _{load(driver)}	0	5.0	5.0 W
*d ₃ at f=1.0MHz	-	-	<-38 dB
at f=30MHz	-	-	<-36 dB
*d ₅ at f=1.0MHz	-	-	<-38 dB
at f=30MHz	-	-	<-36 dB

*Maximum values encountered at any level of drive voltage referred to the amplitude of either of the two tones at that level.



AMPLIFIER, Class 'B'

OPERATING CONDITIONS

f	220	MHz
V _a	2.8	kV
V _{g2}	450	V
-V _{g1}	60	V
P _{out}	1.2	kW
P _{load}	1.0	kW
P _a	1.2	kW
I _{a(0)}	150	mA
I _a	850	mA
I _{g2}	-20	mA
I _{g1}	3.0	mA
P _{load} (driver)	40	W
η _a	50	%

RATINGS (ABSOLUTE MAXIMUM SYSTEM)

	Amplifier Class 'B'	S.S.B. Amplifier Class 'AB1'	
f max.	220	60	MHz
V _a max.	3.5	3.5	kV
V _{g2} max.	1.0	1.0	kV
-V _{g1} max.	300	300	V
p _a max.	1.5	1.5	kW
p _{g2} max.	50	50	W
I _a max.	1.0	1.0	A
I _{g2} max.	50	50	mA
I _{g1} max.	10	-	mA
R _{g1-k} max.	5.0	5.0	kΩ

CATHODE

Indirectly heated, oxide coated

V _h	5.0±3%	V
I _h	18	A
t _{h-k} min.	300	s

V.H.F. TETRODE

YL1230

CAPACITANCES

c_{a-k+h}	< 0.08	pF
c_{a-g1}	< 0.1	pF
c_{a-g2}	13 to 17	pF
c_{g1-k+h}	33 to 42	pF
c_{g1-g2}	48 to 64	pF
c_{g2-k+h}	< 1.7	pF

COOLING

Anode - forced-air cooled. See page C1.

Ceramic-to-metal seals - low velocity air flow

Temperatures

Ceramic-to-metal seals max. 250 °C

Air inlet max. 45 °C

A typical value of air flow for anode dissipation is given in the following table:-

Anode dissipation (kW)	Height above sea level (m)	Inlet temperature (°C)	Rate of air flow (l/min)	Pressure difference Inlet and Outlet (mm of water)
1.2	0	45	1550	25.4

MOUNTING POSITION

Any

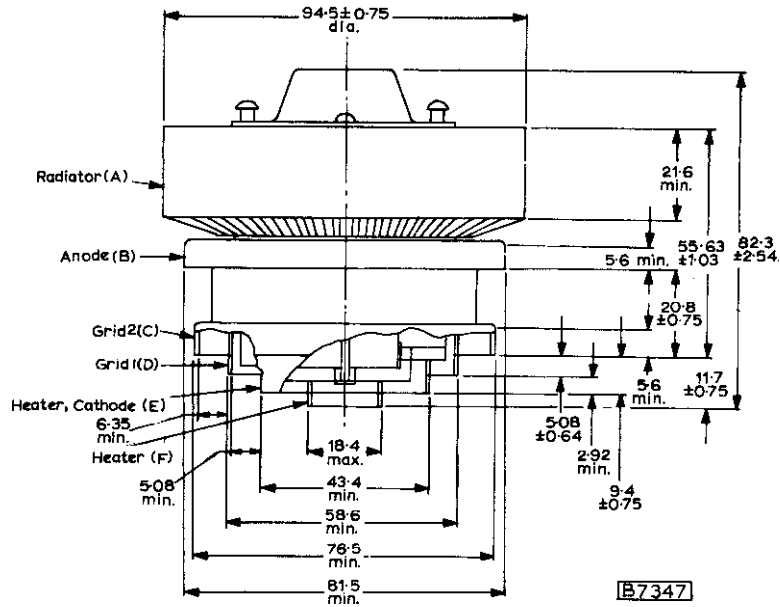
PHYSICAL DATA

Weight of valve

900 g
2.0 lb



OUTLINE DRAWING OF YL1230



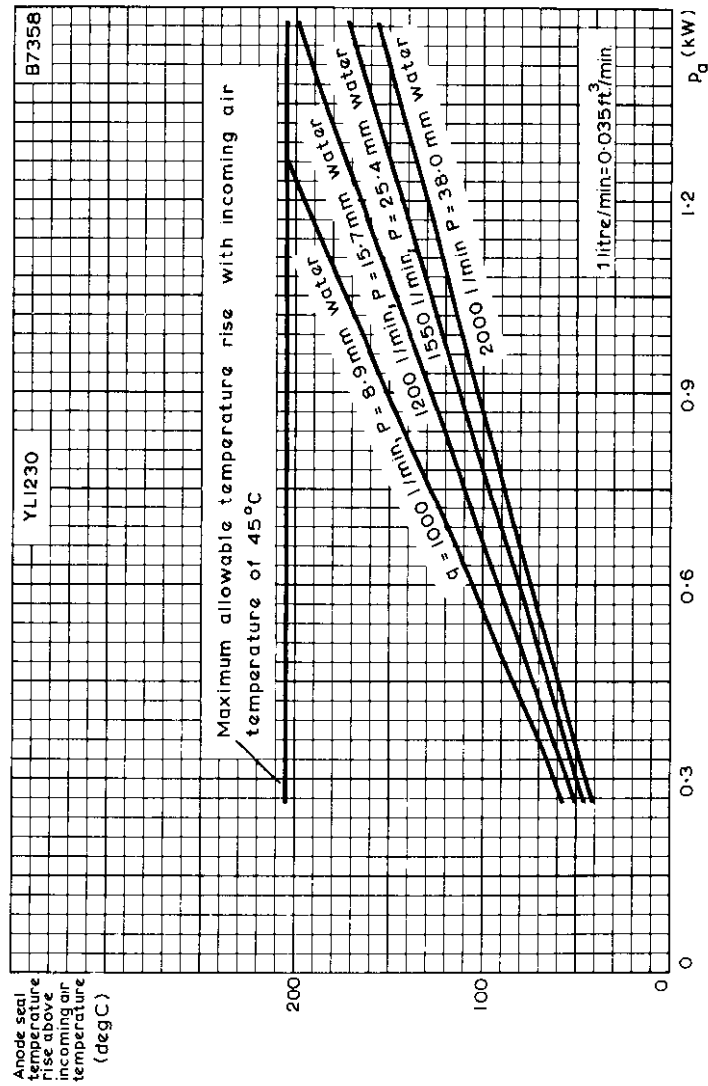
The radiator and the connections lie inside or outside concentric circles with the following dimensions:

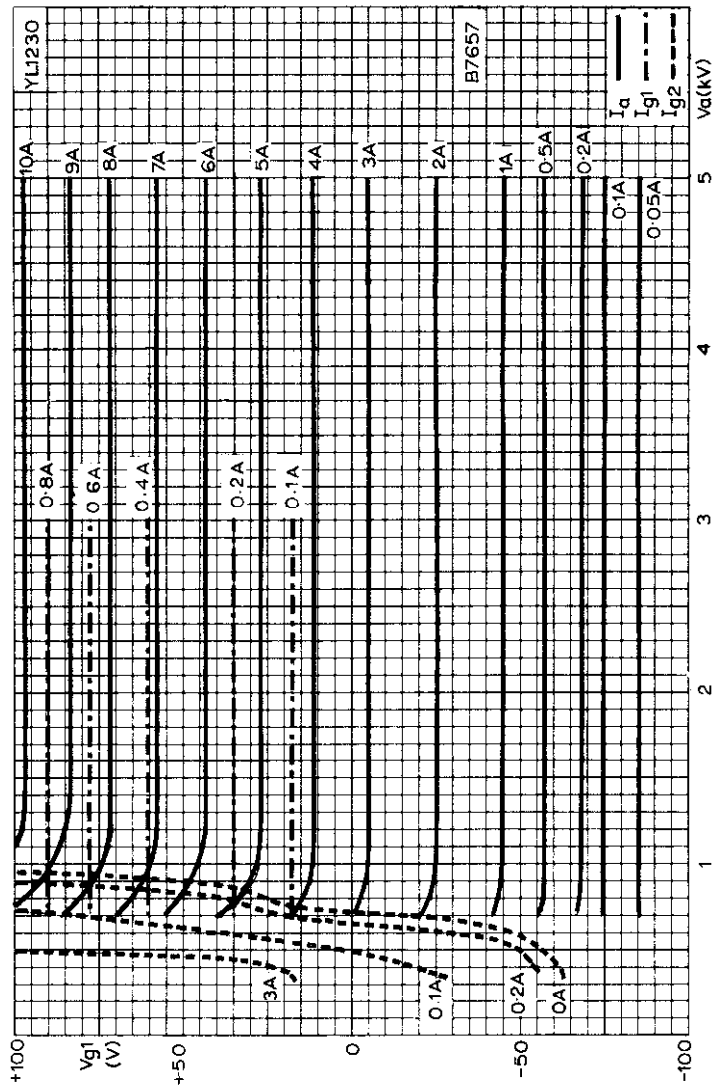
Radiator	A	96.00	inside
Anode	B	82.79	inside
Grid 2 connection	C	77.71	inside
Grid 1 connection	D	59.35	inside
Cathode and heater connection	E	44.28	inside
Heater connection	F	17.67	outside

All dimensions in mm

V.H.F. TETRODE

YL1230



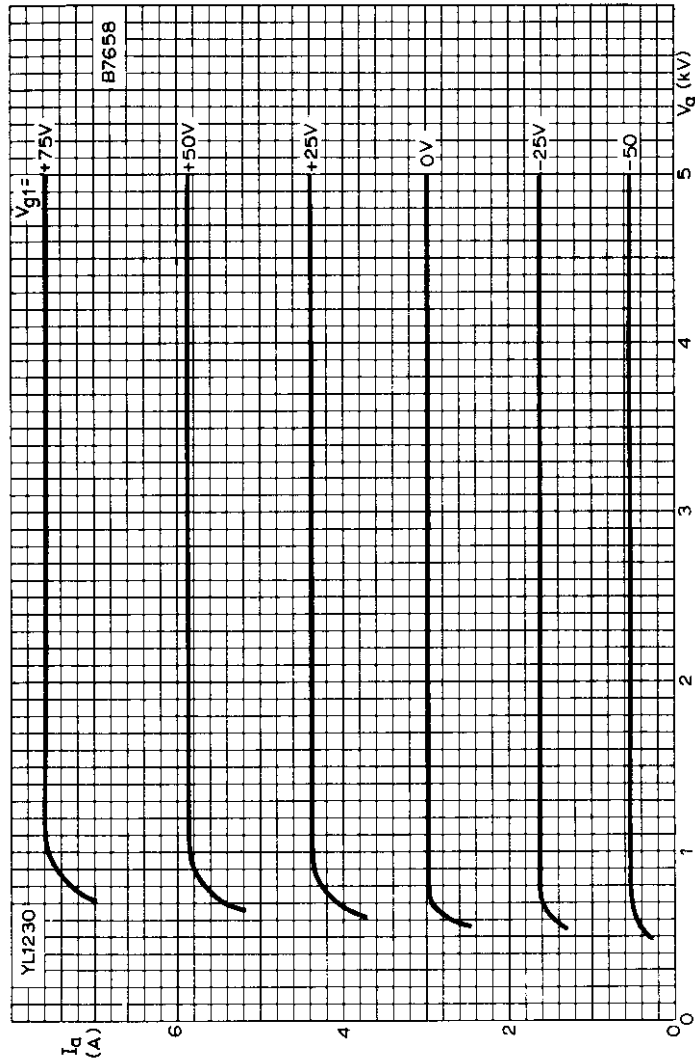


CONSTANT CURRENT CHARACTERISTICS



V.H.F. TETRODE

YL1230



ANODE CURRENT PLOTTED AGAINST ANODE VOLTAGE WITH GRID VOLTAGE AS PARAMETER

—



V.H.F. DOUBLE TETRODE

YL1240

TENTATIVE DATA

QUICK REFERENCE DATA

Single ended double tetrode intended for mobile service as Class 'C' amplifier, oscillator or frequency multiplier.

	Frequency Treble		Class 'C' Telegraphy or F.M. Telephony		
	C.C.S.	I.C.A.S.	C.C.S.	I.C.A.S.	
f	-	174/58	200	200	Mc/s
P _{out}	-	12	22	33	W
f max.	200	200	200	200	Mc/s
V _a max.	400	450	400	450	V
p _a max.	2 x 7.5	2 x 10	2 x 7.5	2 x 10	W

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

CLASS 'C' TELEGRAPHY OR F.M. TELEPHONY

Maximum operating conditions

	C.C.S.	I.C.A.S.		
f	200	200	200	Mc/s
P _{out}	22	31	33	W
P _{load}	20	28	30	W
η _a	64	70	67	%
V _a	400	400	450	V
I _a	2 x 43	2 x 55	2 x 55	mA
V _{g2}	155	200	200	V
I _{g2}	2 x 1.2	2 x 2.0	2 x 2.0	mA
-V _{g1}	59	50	50	V
I _{g1}	2 x 1.6	2 x 1.6	2 x 1.6	mA
P _{load(driver)}	1.0	1.2	1.2	W
p _a	2 x 6.0	2 x 6.5	2 x 8.5	W
R _{g1-k}	19	16	16	kΩ



FREQUENCY TREBLER

Maximum operating conditions

	I. C. A. S.	
f_{out}/f_{in}	174/58	Mc/s
P_{out}	12	W
P_{load}	10	W
η_a	40	%
V_a	350	V
I_a	2 x 43	mA
V_{g2}	165	V
I_{g2}	2 x 2.5	mA
$-V_{g1}$	150	V
I_{g1}	2 x 2.2	mA
$P_{load(driver)}$	2.0	W
p_a	2 x 10	W
R_{g1-k}	34	k Ω

ABSOLUTE MAXIMUM RATINGS

	Frequency Trebler		Class 'C' Telegraphy		
	C. C. S.	I. C. A. S.	C. C. S.	I. C. A. S.	
V_a max.	400	450	400	450	V
V_{g2} max.	200	200	200	200	V
$-V_{g1}$ max.	150	150	150	150	V
I_k max.	2 x 32	2 x 47	2 x 48	2 x 59	mA
p_a max.	2 x 7.5	2 x 10	2 x 7.5	2 x 10	W
p_{g2} max.	2 x 1.0	2 x 1.0	2 x 1.0	2 x 1.0	W
I_{g1} max.	2 x 3.0	2 x 4.0	2 x 3.0	2 x 4.0	mA
p_{g1} max.	2 x 0.2	2 x 0.2	2 x 0.2	2 x 0.2	W
V_{h-k} max.	100	100	100	100	V



V.H.F. DOUBLE TETRODE

YL1240

CATHODE

Indirectly heated, oxide coated

	Parallel	Series	
V_h	6.75	13.5	V
I_h	0.76	0.38	A

CAPACITANCES

c_{a-g1} (each section)	max. 0.1	pF
c_{in} (each section)	6.8	pF
c_{out} (each section)	3.2	pF
c_{in} (two section in push-pull)	5.4	pF
c_{out} (two sections in push-pull)	1.7	pF

CHARACTERISTICS (measured at $I_a = 30mA$)

g_m	3.3	mA/V
μ_{g1-g2}	7.5	

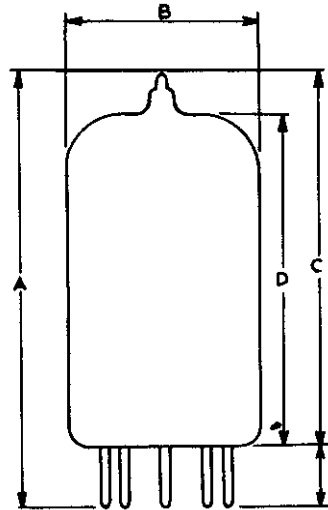
MOUNTING POSITION Any

COOLING

Radiation and convection

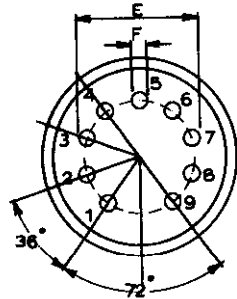
Maximum temperatures

Bulb	225	°C
Pin seal	120	°C

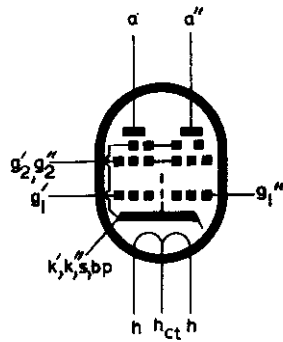


Dimensions	Inches	Millimetres	
A	3.110	79	max.
B	1.185	30.1	max.
C	2.732	69.4	max.
D	2.303±0.091	58.5±2.3	
E	0.687	17.45	
F	0.039	1.0	dia.

Inch dimensions derived from original millimetre dimensions



Pin No.	Electrode
1	g_1''
2	k'', k', s, bp
3	g_1'
4	h
5	h
6	a''
7	g_2'', g_2'
8	a'
9	h_{ct}



B2803

INDUSTRIAL TETRODE

YL1320

QUICK REFERENCE DATA

Ceramic to metal construction, conduction cooled tetrode for R.F. amplifier service up to 500MHz.

f	175	470	MHz
P _{out}	270	280	W
f max.	500	500	MHz
V _a max.	2.0	2.0	kV
p _a max.	(250)*	(250)*	W

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

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

OPERATING CONDITIONS

f	175	470	MHz
P _{out}	270	280	W
P _{load}	250	250**	W
η_a	67.5	58	%
V _a	2.0	2.0	kV
I _a	200	250	mA
V _{g2}	200	300	V
I _{g2}	8.0	-4 to +10	mA
-V _{g1}	90	90	V
I _{g1}	16	1.0	mA
p _a	130	220	W
P _{load} (driver)	4.0	12	W
P _{in}	400	500	W

*See Operating Notes page D4.

**In cavity circuit.



RATINGS (ABSOLUTE MAXIMUM SYSTEM)

f max.	500	MHz
V_a max.	2.2	kV
V_{g2} max.	350	V
$-V_{g1}$ max.	250	V
I_a max.	260	mA
p_a max.	(250)*	W
p_{g2} max.	12	W
p_{g1} max.	2.0	W
R_{g1-k} max.	27	k Ω
V_{h-k} max.	150	V

CATHODE

Indirectly heated, oxide coated

V_h	6.0	V
I_h	2.6	A
V_h (at $f = 470\text{MHz}$)	5.0	V
t_{h-k} min.	30	s

CAPACITANCES

C_{in}	17	pF
C_{out}	4.6	pF
C_{g-a}	0.04	pF

CHARACTERISTICS (measured at: $V_{g2} = 300\text{V}$, $I_{g2} = 50\text{mA}$)

g_m	8.0	mA/V
μ	5.2	

MOUNTING POSITION

Any

*See Operating Notes page D4

INDUSTRIAL TETRODE

YL1320

COOLING

Conduction cooled

Temperatures

Metal to ceramic seals max.	250	°C
Thermal resistance, seal to thermal contact area	0.03	degC/W
Thermal contact area	320	mm ²

See Operating Notes below.

PHYSICAL DATA

Weight of valve	230	g
-----------------	-----	---

ACCESSORIES

Socket	40222
--------	-------

OPERATING NOTES

1. SAFETY PRECAUTIONS

The following precautions must be adopted when dealing with the Beryllia insulator used when coupling the anode to its heatsink.

The block is entirely safe provided its component parts or finish are not tampered with. The dust of Beryllia is toxic. Care should be taken to ensure all those who may handle, use or dispose of the block are aware of its nature and the necessary safety precautions applicable to Beryllia. In particular, it should never be disposed of with general, industrial or domestic waste.

Disposal Service

Formed Beryllia or devices incorporating Beryllia requiring disposal may be returned to Mullard Service Department. They must be separately and securely packed and clearly identified. If the block or device is damaged or broken IT MUST NOT be sent through the post. In such a case advice is available from the Service Department.



2. CONSIDERATIONS OF ANODE COOLING

The Beryllia block and thermal compounds, used to reduce the heat resistance between the anode and heatsink, are referred to as the thermal system. The anode dissipation rating is applied over the entire thermal system, the thermal resistance of which may be found by the equation:-

$$K_{\text{max}} = \frac{T_{\text{s max}} (^{\circ}\text{C}) - T_{\text{amb}} (^{\circ}\text{C})}{P_{\text{d}} \text{ (Watts)}}$$

Where $T_{\text{s max}}$ = Maximum seal temperature
 T_{amb} = Ambient temperature
 P_{d} = Power to be dissipated
 K = Total thermal resistance from seal to ambient

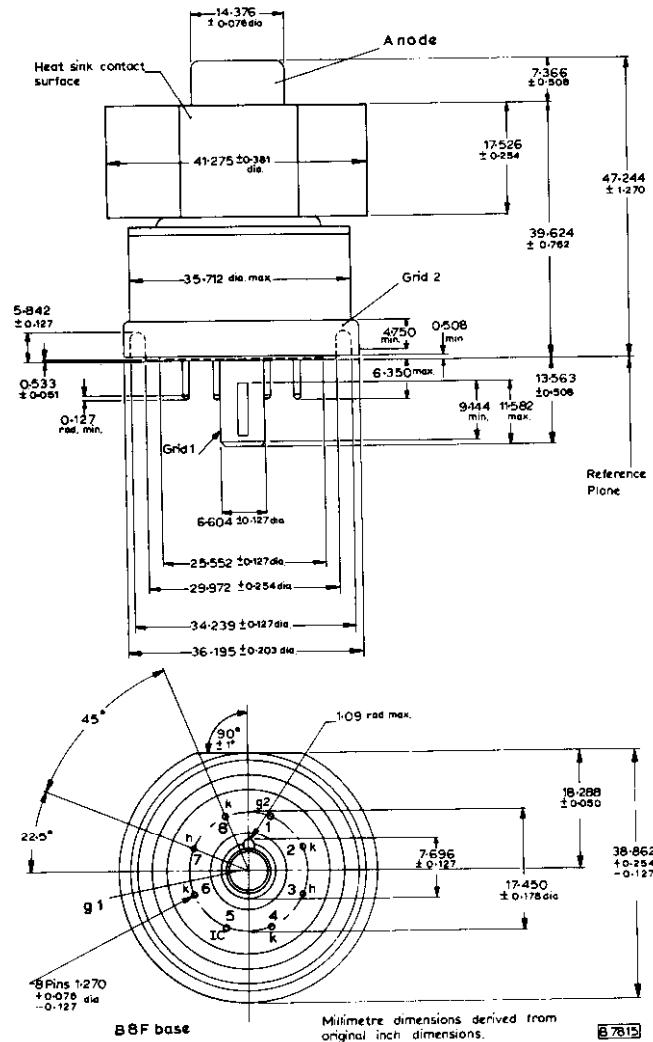
Page C1 gives a plot of this equation.

In order to assure a good thermal contact with the heatsink, it is necessary to apply a force of approximately 11.5kg to the side of the valve opposite the heatsink. See Detail A page D6.

INDUSTRIAL TETRODE

YL1320

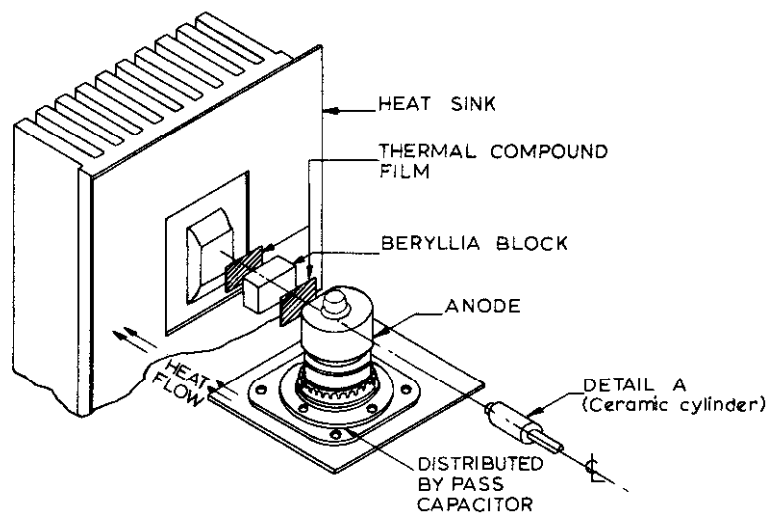
OUTLINE DRAWING



Milimetre dimensions derived from original inch dimensions.

87813

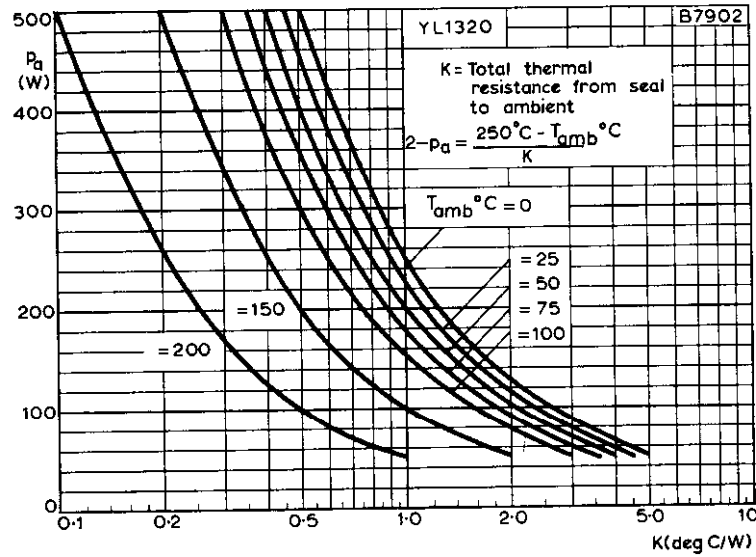




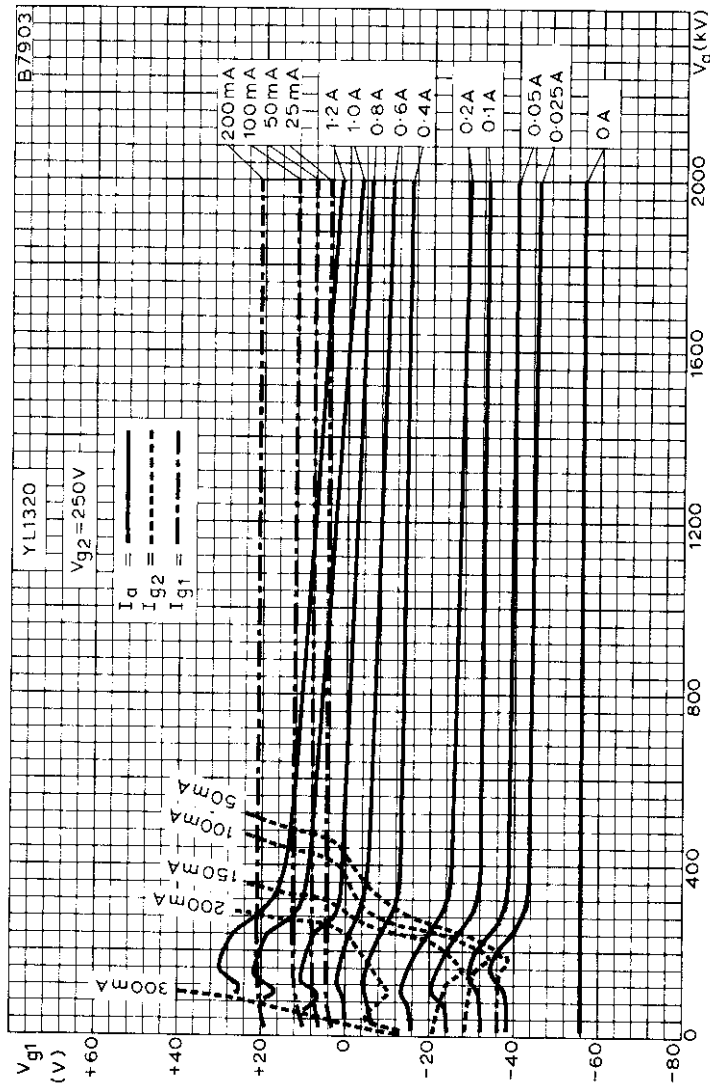
POSITIONING OF COMPONENTS BETWEEN ANODE AND HEAT SINK FOR EFFICIENT CONDUCTION

INDUSTRIAL TETRODE

YL1320



THERMAL RESISTANCE PLOTTED
AGAINST ANODE DISSIPATION

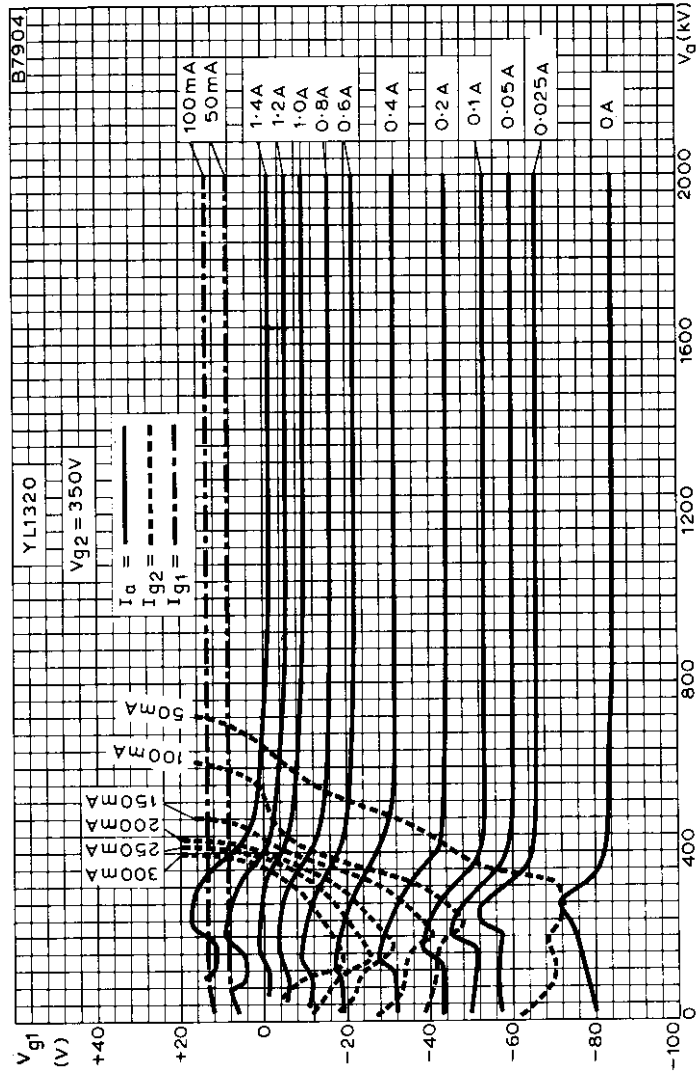


CONSTANT CURRENT CHARACTERISTICS



INDUSTRIAL TETRODE

YL1320



CONSTANT CURRENT CHARACTERISTICS



—



V.H.F. TETRODE

YL1420

TENTATIVE DATA

QUICK REFERENCE DATA			
Ceramic to metal, air cooled coaxial power tetrode, for use as a linear broad-band amplifier in television transmitters for bands I and III.			
	Narrow Band Service Class 'B'	Television Service Class 'AB'	
f	230	175	MHz
f max.	250	250	MHz
V _a max.	6.0	6.0	kV
P _a max.	6.0	6.0	kW

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

R.F. NARROW BAND SERVICE CLASS 'B'

OPERATING CONDITIONS (Grounded grid)

f	230	MHz
P _{load}	6.3	kW
η _{load}	67	%
V _a	5.5	kV
I _{a(0)}	0.1	A
I _a	1.7	A
V _{g2}	600	V
I _{g2}	70	mA
-V _{g1}	115 ^a	V
v _{g1(pk)}	150	V
i _{g1}	25	mA
P _{in}	9.35	kW
P _{drive}	190	W



R. F. AMPLIFIER FOR TELEVISION SERVICE, CLASS 'AB'

OPERATING CONDITIONS (Grounded grid)

Negative modulation, positive synchronisation.

f		175.25	MHz
Bandwidth (3db) (see page 6, fig.1)		6.0 ^b	MHz
V _a		3.75	kV
V _{g2}		600	V
-V _{g1}		65 ^a	V
v _{g1(pk)}	black	120 ^c	V
I _{a(0)}		750	mA
I _a	black	2.2 ^c	A
I _{g2}	black	30 ^c	mA
I _{g1}	black	65 ^c	mA
P _{load}	sync	6.25	kW
	black	3.75 ^c	kW
P _{load (driver)}	sync	285	W
Gain		22 ^b	
R _a		800 ^b	Ω
Sync compression		28/25 ^d	
Differential phase		≤3.0 ^e	deg
Differential gain		≥80 ^e	%

NOTES

- To be adjusted for I_{a(0)}.
- With double tuned circuit.
- Black signal including line sync pulses.
- A picture/sync ratio of 75/25 for the outgoing signal requires a ratio of max. 70/30 for the incoming signal.
- Measured with a sawtooth amplitude, running from 17% to 75% of the peak sync value, with superimposed a 4.43MHz sine wave with a 10% peak to peak value.

V.H.F. TETRODE

YL1420

RATINGS (ABSOLUTE MAXIMUM SYSTEM)

	Narrow Band Service Class 'B'	Television Service Class 'AB'	
f max.	≤250	≤250	MHz
V _a max.	6.0	6.0	kV
V _{g2} max.	1.0	1.0	kV
-V _{g1} max.	500	500	V
I _a max.	4.0	4.0	A
p _a max.	6.0	6.0	kW
p _{g2} max.	80	80	W
p _{g1} max.	40	40	W
R _{g1-k} max.	10	10	kΩ

CATHODE

Directly heated. Thoriated tungsten.

*V _f	6.3	V
I _f	120	A
i _{f(pk)} starting	500	A

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

CAPACITANCES

	Grounded cathode	Grounded grid	
c _{out}	15.3	15.8	pF
c _{a-g1}	0.48	-	pF
c _{a-f}	-	0.16	pF
c _{in}	90	48	pF

CHARACTERISTICS (Measured at V_a = 5kV, V_{g2} = 600V, I_a = 1.45A)

g _m	30	mA/V
μ _{g1-g2}	7.5	



MOUNTING POSITION

Vertical, anode up or down

COOLING

Forced-air. See page 8.

Temperatures

Seal max.	200	°C
Envelope max.	240	°C
Air inlet max.	35	°C

PHYSICAL DATA

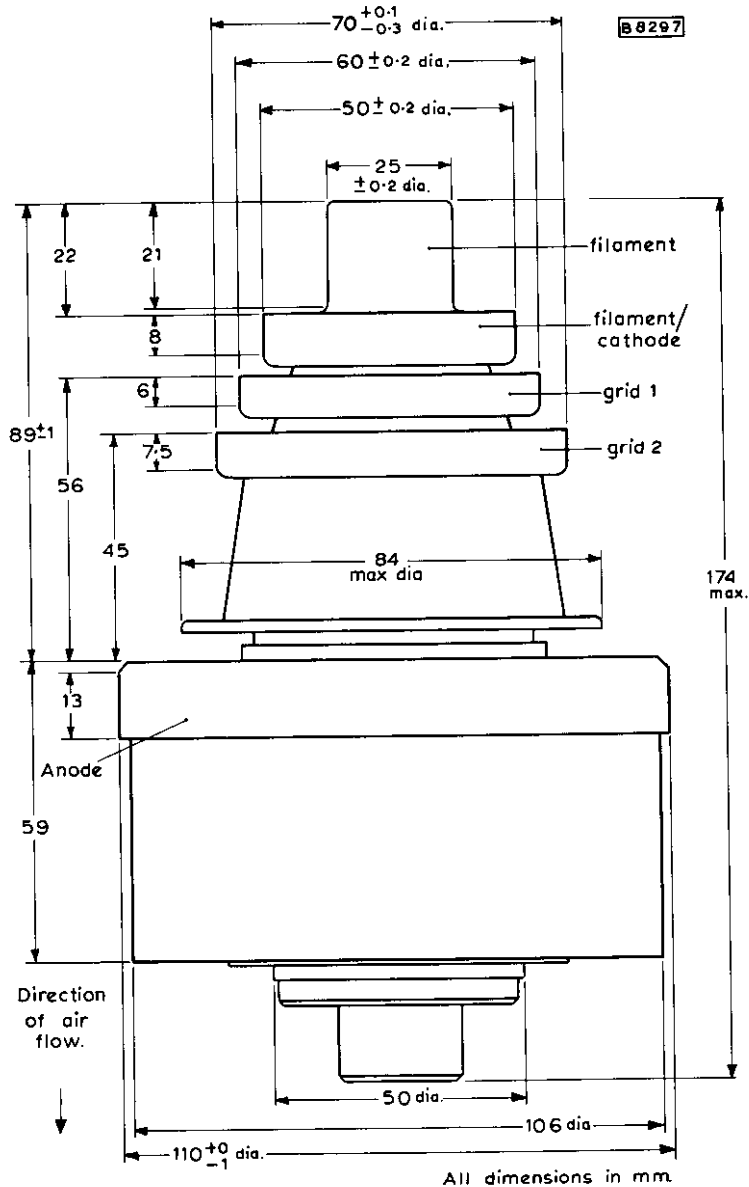
Weight of valve	2.8	kg
-----------------	-----	----



V.H.F. TETRODE

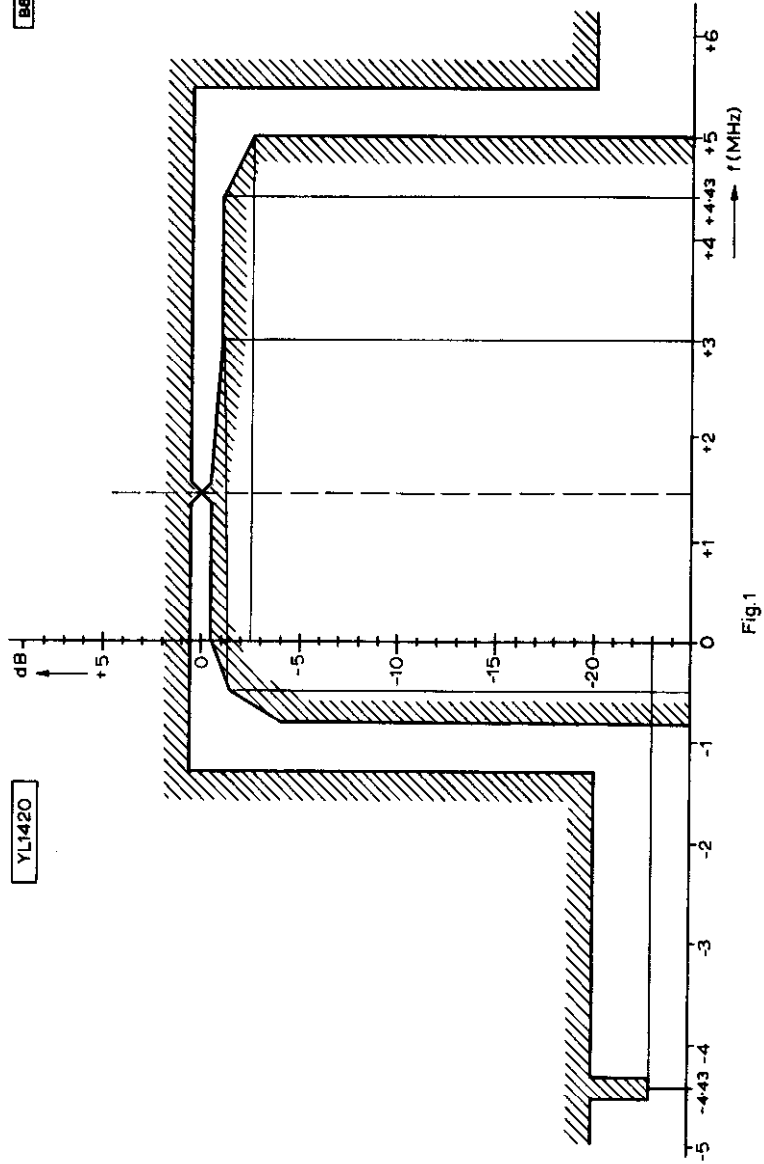
YL1420

OUTLINE DRAWING



BA325

YL1420

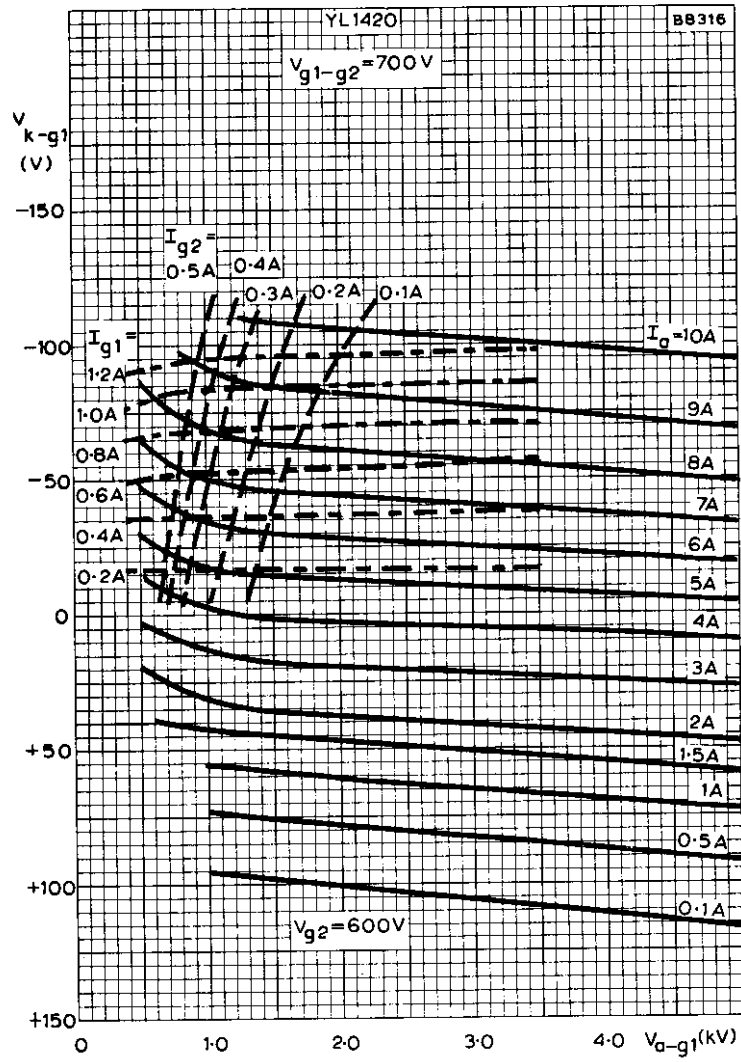


BANDWIDTH CHART

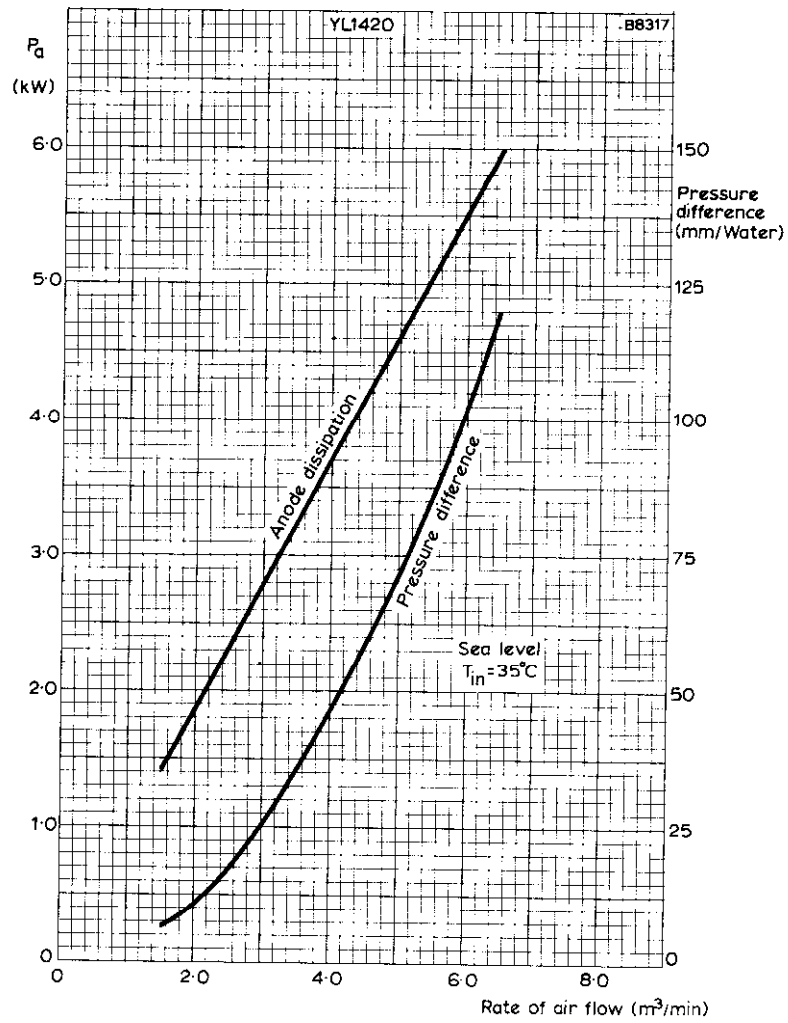


V.H.F. TETRODE

YL1420



CONSTANT CURRENT CHARACTERISTICS



COOLING CHARACTERISTICS