

BR/BW/BY194 Series

R.F. POWER
TRIODES

The data should be read in conjunction with the Power Triode Preamble.

ABRIDGED DATA

Three r.f. power triodes differing only in the method of anode cooling and in anode dissipation. The tubes have grid terminals suitable for cathode drive operation.

Anode cooling:

BR194	forced-air
BW194	water; separate jacket
BY194	vapour; separate boiler unit

Anode dissipation:

BR194	40	kW max
BW194, BY194	50	kW max
Anode voltage	15	kV max
Frequency for full ratings	5.0	MHz max
Frequency at reduced ratings	30	MHz max
Typical output power (class C telegraphy)	115	kW

GENERAL

Electrical

Filament	thoriated tungsten
Filament voltage (see note 1)	13 V
Filament current	240 A
Surge filament current (peak) (see note 2)	600 A max
Filament cold resistance	6.0 mΩ
Peak usable cathode current	100 A
Perveance	2.17 mA/V ^{3/2}
Amplification factor ($V_a = 7.5\text{kV}$, $I_a = 3.0\text{A}$)	34
Mutual conductance ($V_a = 9.0\text{kV}$, $I_a = 4.0\text{A}$)	43 mA/V
Inter-electrode capacitances:	
grid to anode	60 pF
grid to filament	95 pF
anode to filament	1.5 pF

Mechanical

Overall dimensions	see outline drawings
Net weight:	
BR194	64 pounds (29kg) approx
BW194	28 pounds (12.8kg) approx
BY194	88 pounds (40kg) approx
Mounting position	vertical, filament pins up

Accessories

Filament leads	MA130
Grid connector	MA66
Water jacket for BW194	BW4027
Sealing ring (supplied with BW194)	MA254
Single boiler unit, integral condenser, for BY194	BY4039
Single boiler unit, separate condenser required, for BY194	BY4049
Sealing ring (supplied with BY194)	MA255

COOLING

Anode

The radiator of the BR194 is designed for use in conjunction with a specially designed air duct ensuring correct distribution of cooling air. The required quantity of air is indicated on the graphs (pages 9 and 10) and this must be supplied not only during but also before the application of any voltages to the valve.

The anode of the BW194 must be fitted into a water jacket for cooling, the recommended jacket being type BW4027. A flow of water of 20 to 25 imp. gal/min (91 to 114 l./min) is required; the temperature of the cooling water at the outlet must not exceed 65°C, nor should the temperature rise across the jacket exceed 15°C.

The BY194 is vapour cooled and may be operated either in boiler unit BY4039 or BY4049. In BY4039, the steam generated by the anode is condensed by means of an internal water cooled condenser. The steam produced in BY4049 is led away by suitably insulated tubing for condensation at some convenient point external to the boiler unit.

Filament and Grid Seals

The temperature of the filament and grid seals must not exceed 140°C. A flow of air of 20 to 30ft³/min (0.57 to 0.85m³/min) directed into the filament header via a 1-inch (25mm approx) diameter nozzle before and during the application of any voltages is usually adequate for limiting the temperature of these seals.

Anode Seal and Bulb

The anode seal and bulb temperatures must not exceed 180°C.

R.F. POWER AMPLIFIER AND OSCILLATOR
(Class C Telegraphy, key down conditions, one valve)

MAXIMUM RATINGS (Absolute values)

Anode voltage	15	kV max
Anode current	10	A max
Anode dissipation:		
BR194	40	kW max
BW194, BY194	50	kW max
Grid dissipation	1.8	kW max
Operating frequency (for full ratings)	5.0	MHz max

TYPICAL OPERATING CONDITIONS (For amplifier)

Anode voltage	10	15	kV
Grid voltage	-900	-900	V
Peak r.f. grid drive voltage	1620	1620	V
Anode current	8.8	9.6	A
Grid current (approx)	1.2	1.2	A
Anode dissipation	18	26	kW
Grid dissipation	870	850	W
Output power	70	115	kW
Efficiency	78	80	%

RANGE OF CHARACTERISTICS FOR EQUIPMENT DESIGN

	Min	Max	
Filament current at filament voltage 13V	225	255	A
Amplification factor ($V_a = 7.5\text{kV}$, $I_a = 3.0\text{A}$)	31	37	
Mutual conductance ($V_a = 9.0\text{kV}$, $I_a = 4.0\text{A}$)	38	48	mA/V
Grid voltage (negative value) ($V_a = 10\text{kV}$, $I_a = 3.0\text{A}$)	173	195	V
Grid voltage (negative value) ($V_a = 10\text{kV}$, $I_a = 0.1\text{A}$)	—	345	V
Anode current ($V_a = 2.0\text{kV}$, $V_g = +200\text{V}$)	7.0	11	A
Anode current ($V_a = 4.0\text{kV}$, $V_g = +400\text{V}$)	22	32	A
Grid current ($V_a = 2.0\text{kV}$, $V_g = +200\text{V}$)	-0.15	+0.25	A
Grid current ($V_a = 4.0\text{kV}$, $V_g = +400\text{V}$)	-2.0	+0.5	A
Inter-electrode capacitances:			
grid to anode	60	78	pF
grid to filament	84	96	pF
anode to filament	—	2.0	pF

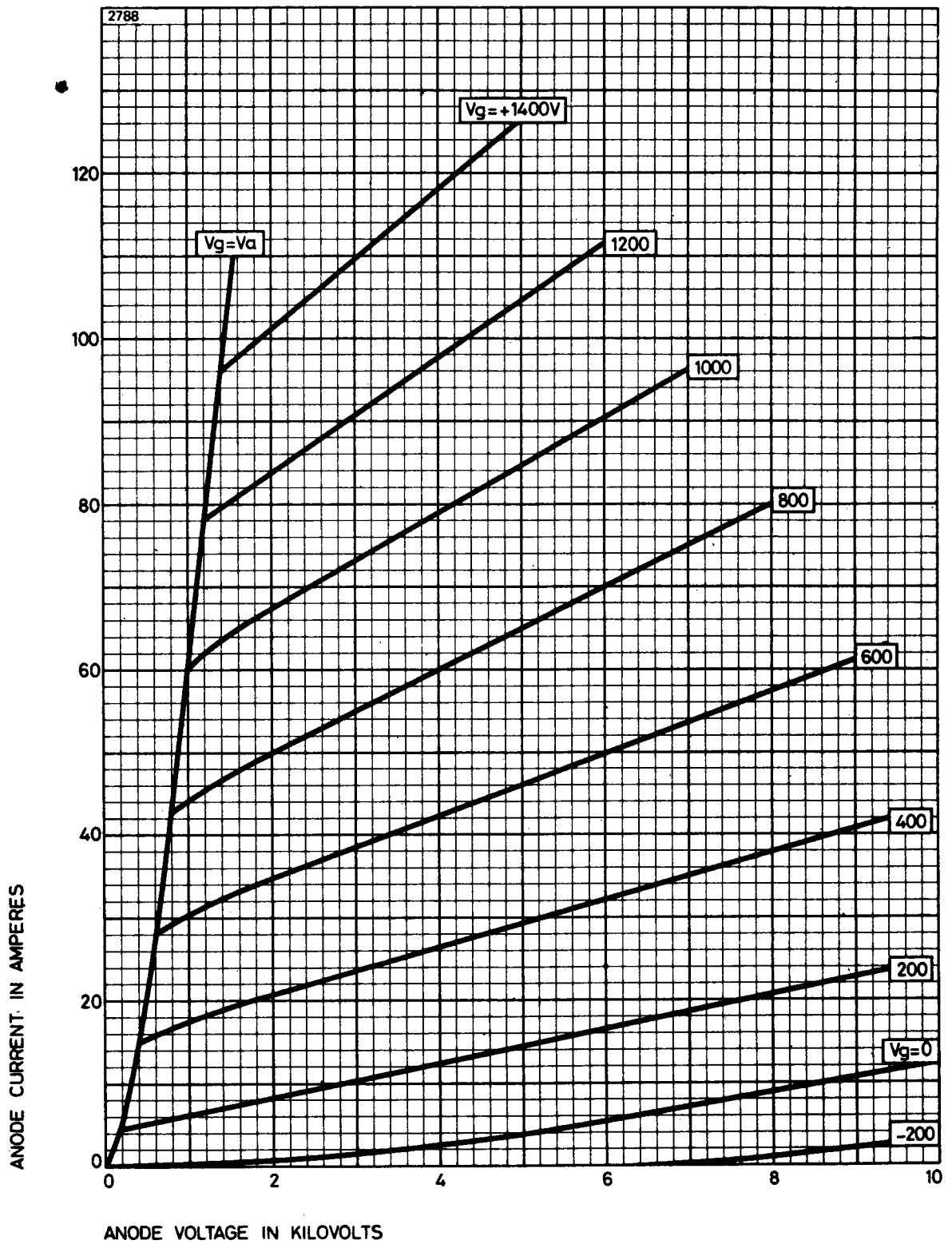
MAXIMUM ANODE VOLTAGE AGAINST FREQUENCY

Operating frequency (MHz)	Max anode voltage c.w. (kV)	Max anode voltage with anode modulation (kV)
5	15	12
30	10	8.0

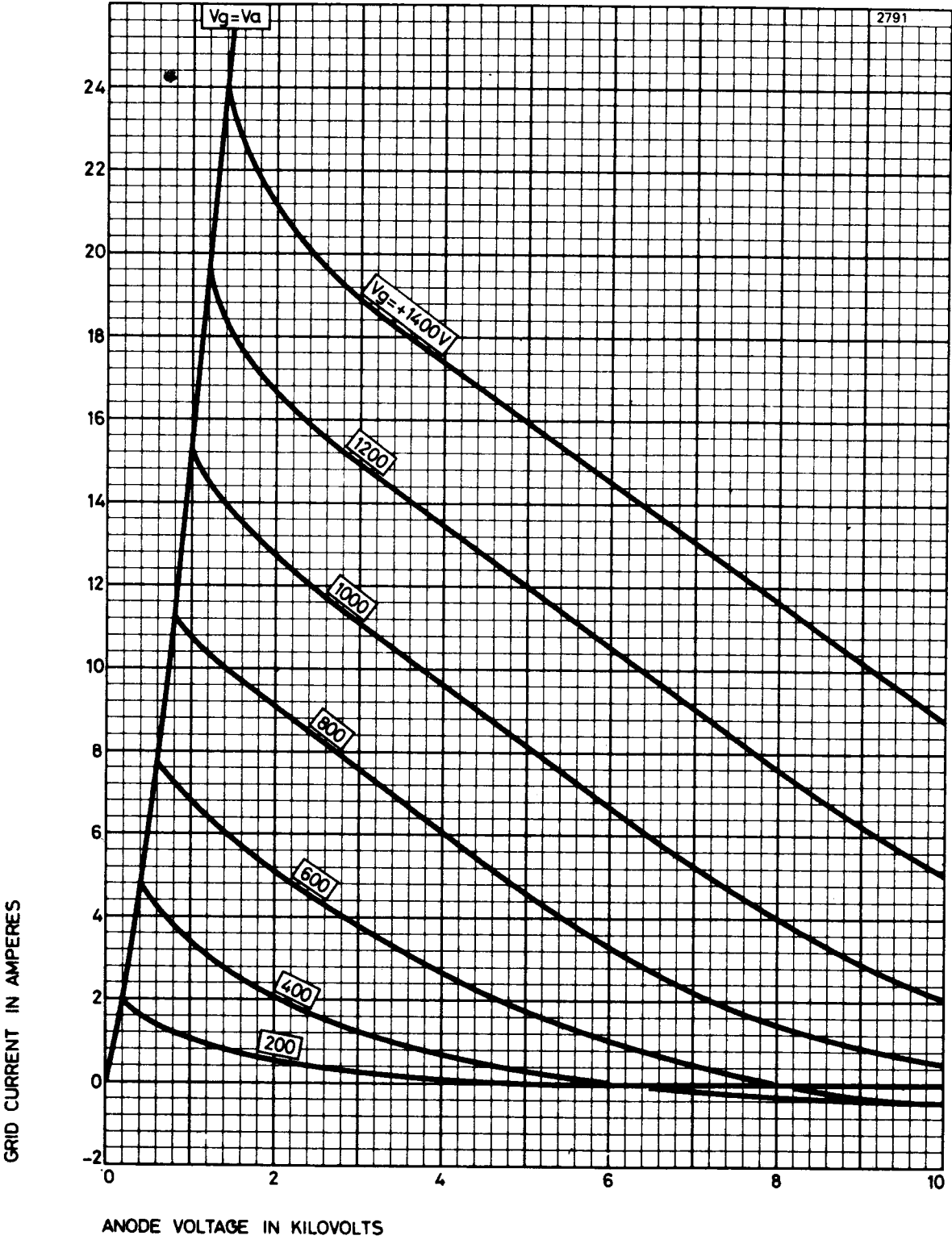
NOTES

1. The valve must be operated at the stated filament voltage. Fluctuations in filament voltage must not exceed $\pm 5\%$.
2. The filament current must not exceed 600A, even momentarily, at any time.

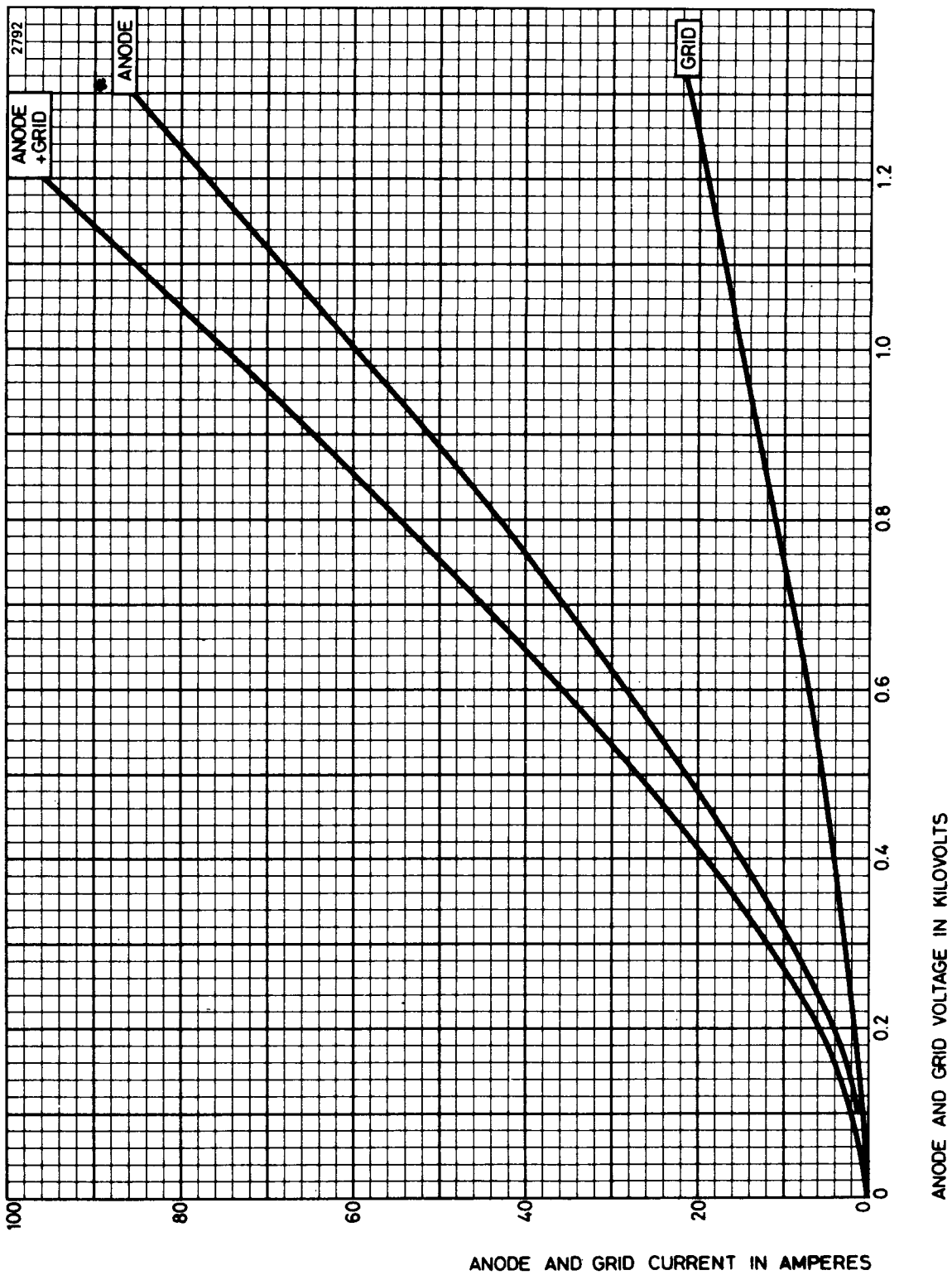
TYPICAL ANODE CHARACTERISTICS



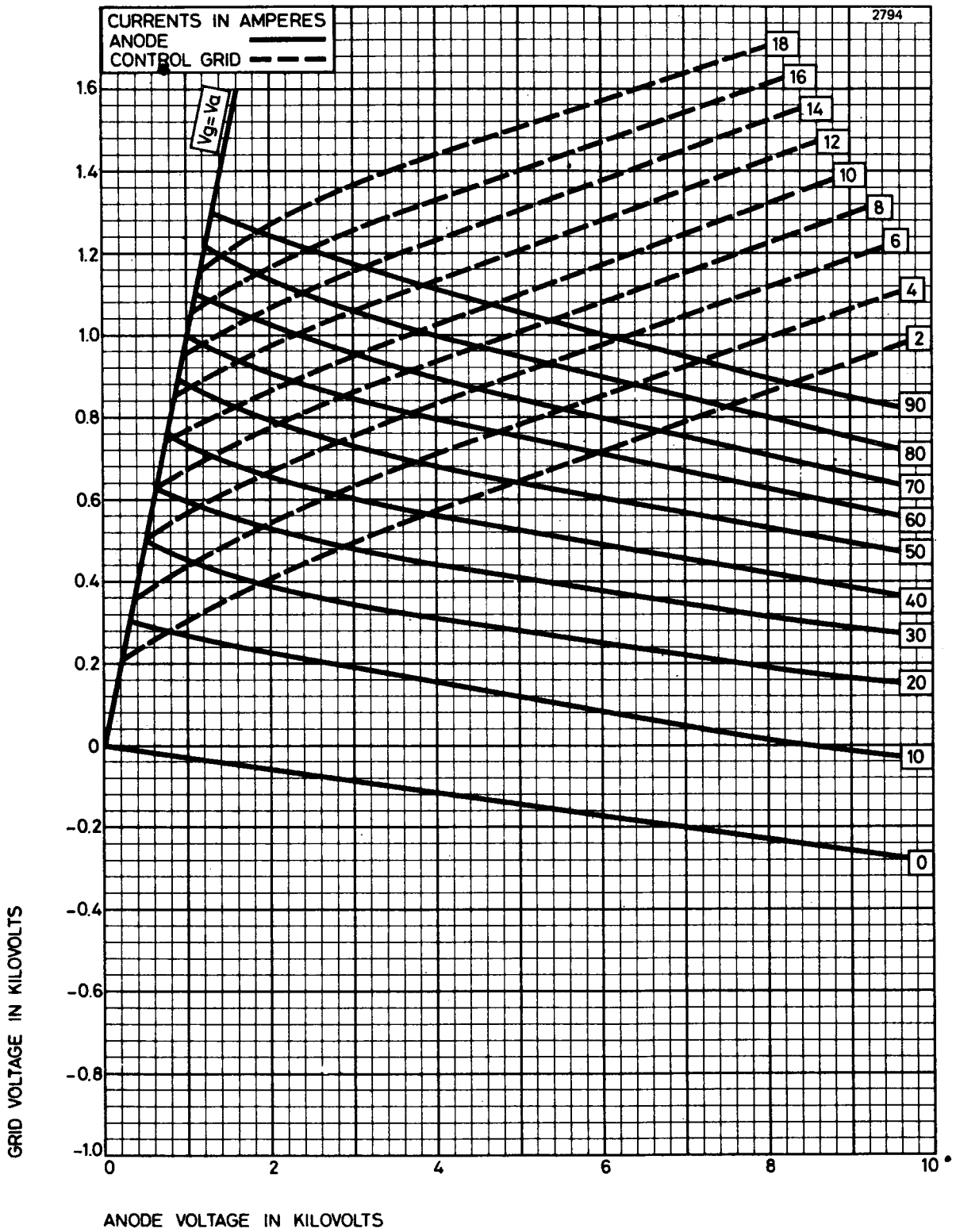
TYPICAL GRID CHARACTERISTICS



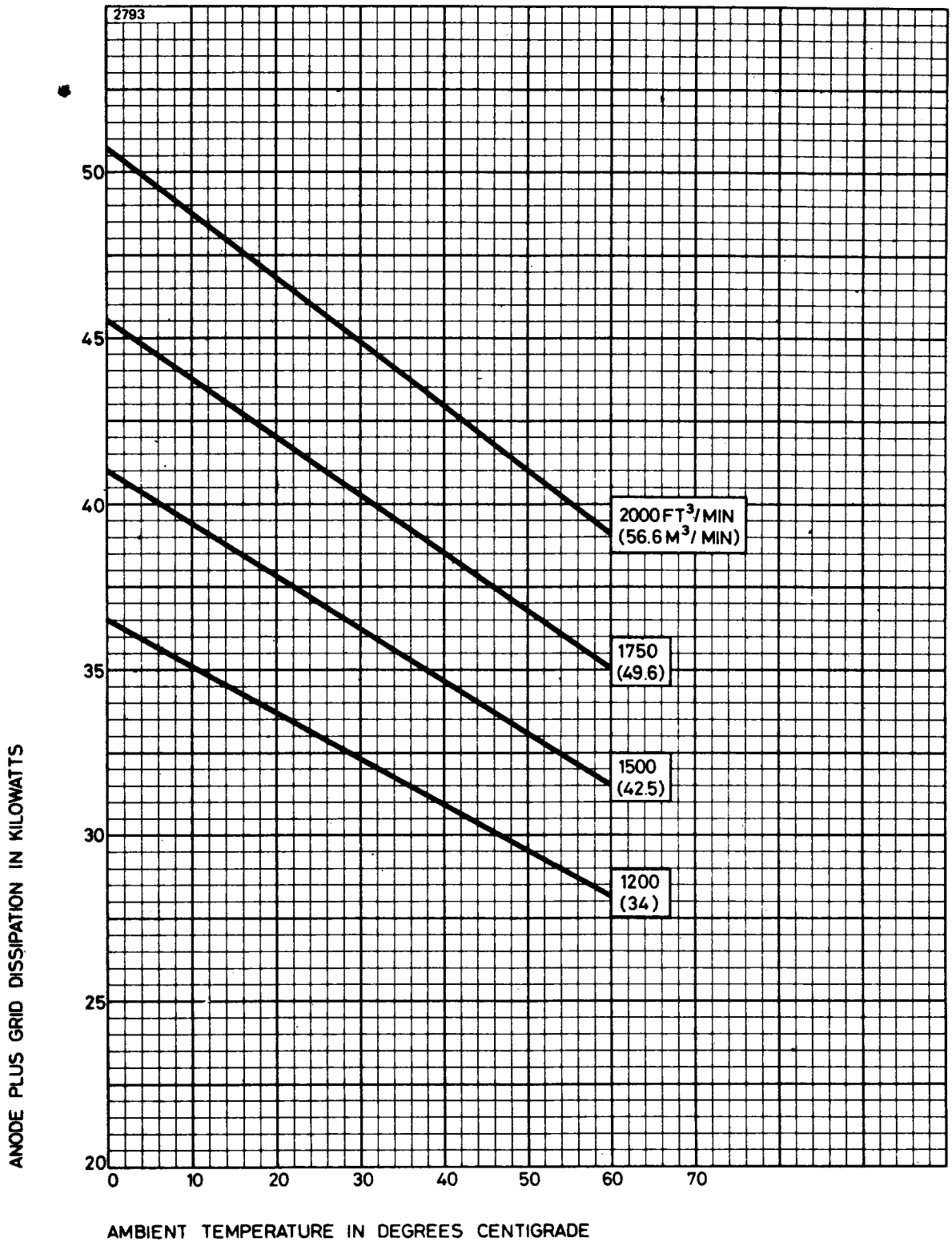
TYPICAL STRAPPED CHARACTERISTICS



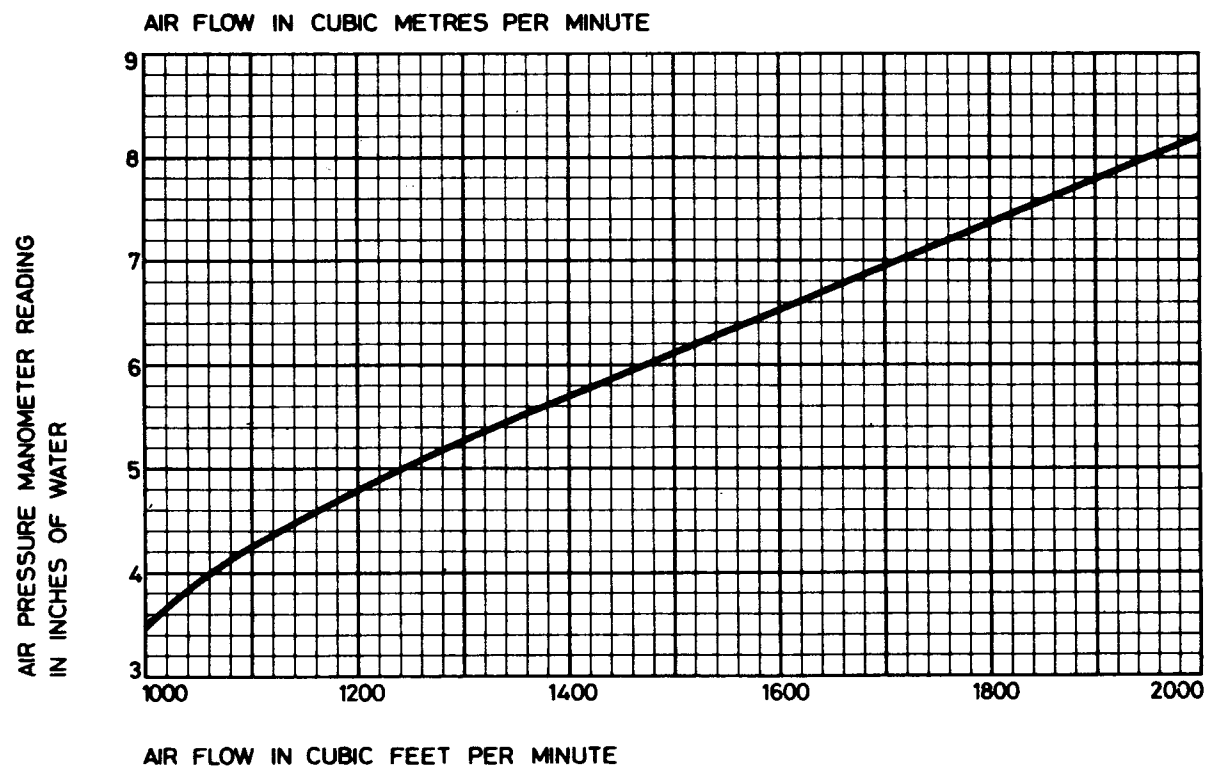
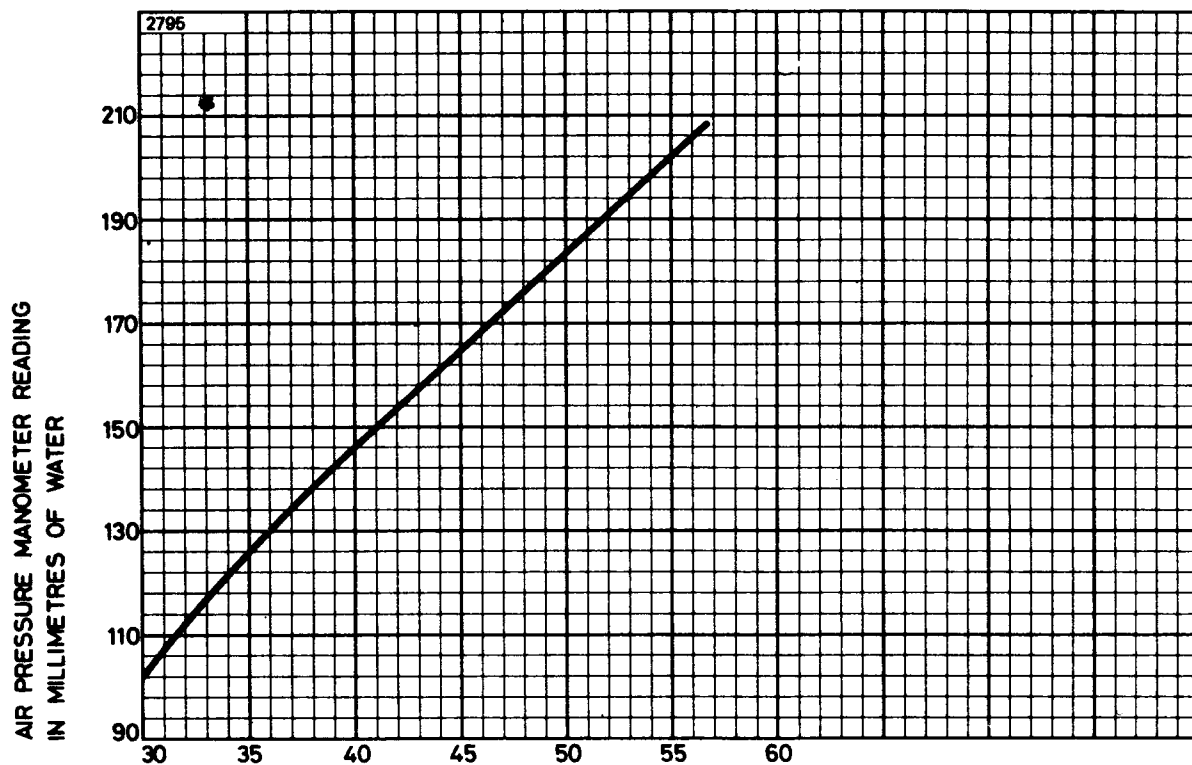
TYPICAL CONSTANT CURRENT CHARACTERISTICS



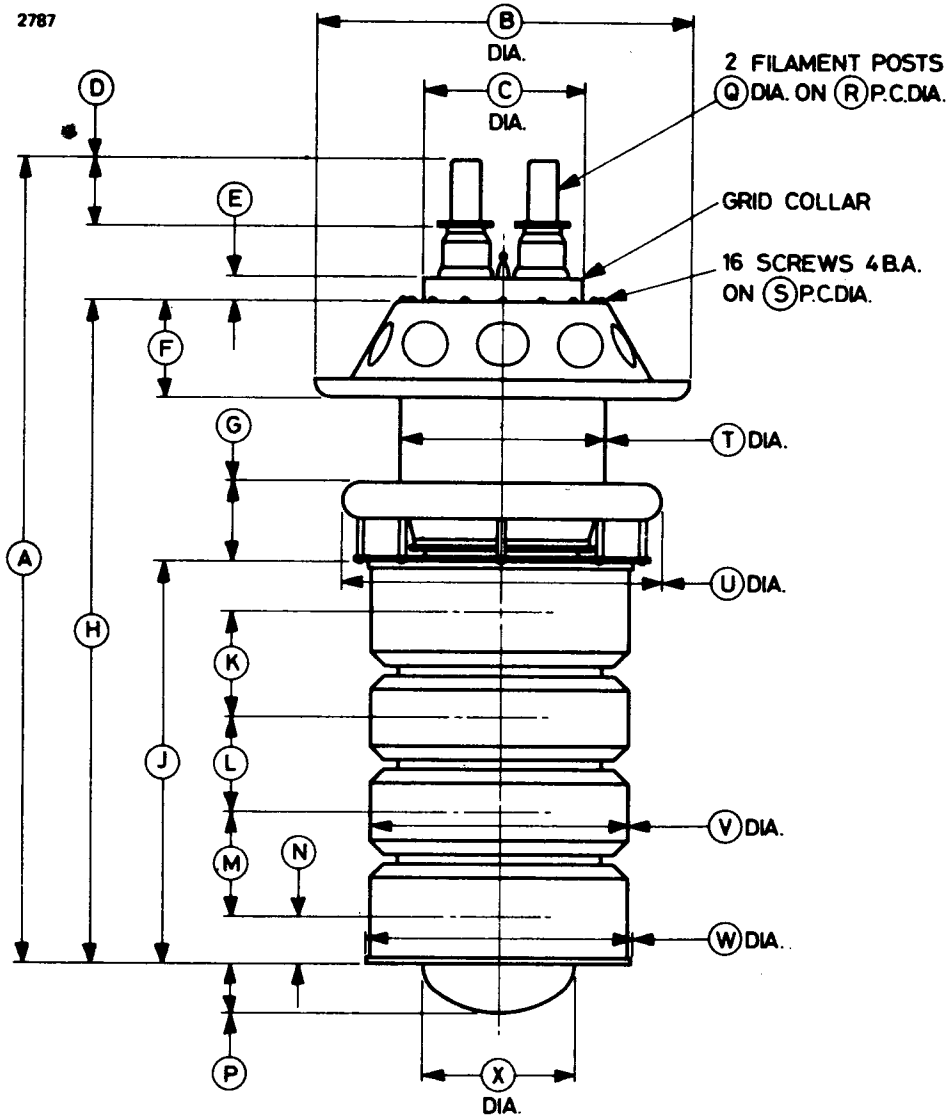
AIR COOLING REQUIREMENTS FOR BR194



TYPICAL AIR FLOW CHARACTERISTIC FOR BR194



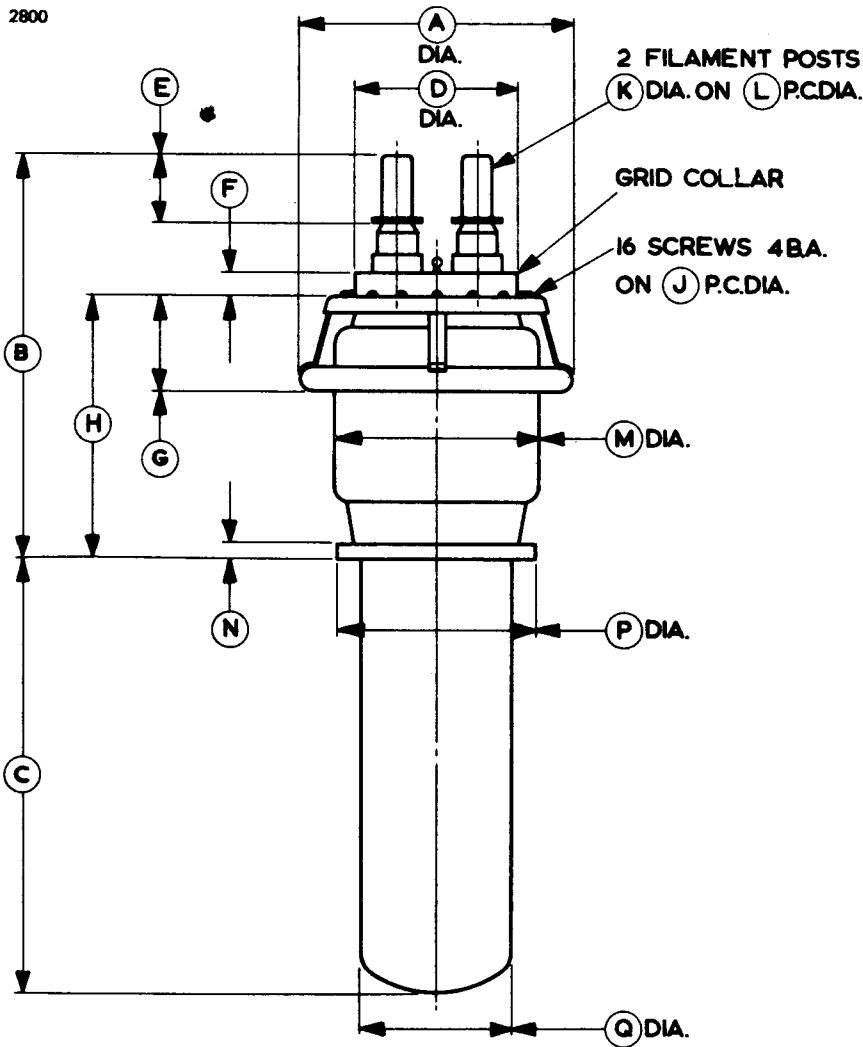
OUTLINE FOR BR194 (All dimensions without limits are nominal)



Ref	Inches	Millimetres	Ref	Inches	Millimetres
A	24.125 max	612.8 max	M	3.091 ± 0.062	78.51 ± 1.57
B	11.000 max	279.4 max	N	1.432 ± 0.062	36.37 ± 1.57
C	4.703	119.5	P	1.437 max	36.50 max
D	2.000	50.80	Q	0.875	22.23
E	0.687	17.45	R	2.250	57.15
F	2.906 max	73.81 max	S	5.375	136.5
G	2.298	58.37	T	6.000 max	152.4 max
H	20.000 max	508.0 max	U	9.385 max	238.4 max
J	11.893 ± 0.187	302.1 ± 4.75	V	7.666 ± 0.031	194.7 ± 0.8
K	3.091 ± 0.062	78.51 ± 1.57	W	7.750 ± 0.031	196.9 ± 0.8
L	2.786 ± 0.062	70.76 ± 1.57	X	4.531 max	115.1 max

Millimetre dimensions have been derived from inches.

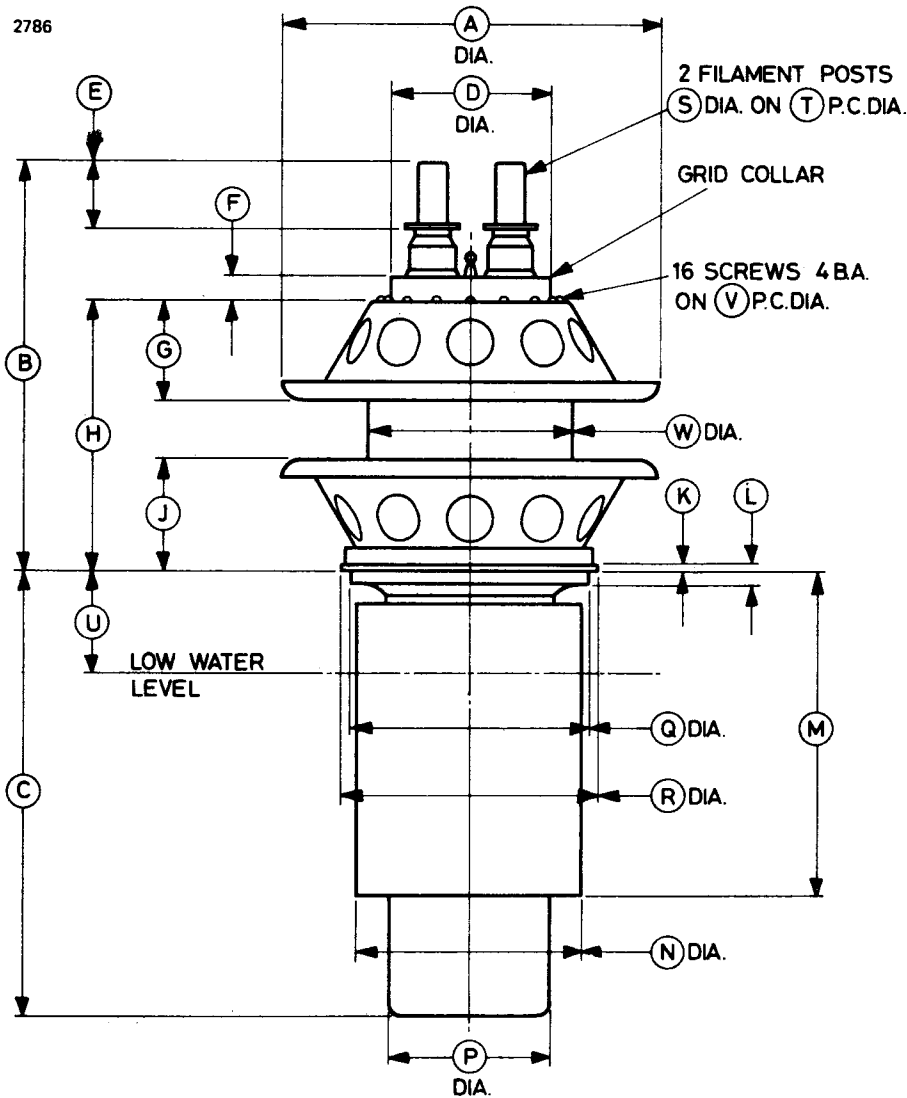
OUTLINE FOR BW194 (All dimensions without limits are nominal)



Ref	Inches	Millimetres	Ref	Inches	Millimetres
A	8.062 max	204.8 max	J	5.375	136.5
B	11.875 max	301.6 max	K	0.875	22.23
C	12.750 max	323.9 max	L	2.250	57.15
D	4.703	119.5	M	6.000	152.4
E	2.000	50.80	N	0.500	12.70
F	0.687	17.45	P	5.760 max	146.3 max
G	2.906 max	73.81 max	Q	4.500	114.3
H	7.750 max	196.9 max			

Millimetre dimensions have been derived from inches.

OUTLINE FOR BY194 (All dimensions without limits are nominal)



Ref	Inches	Millimetres	Ref	Inches	Millimetres
A	11.000 max	279.4 max	M	9.500	241.3
B	12.109 max	307.6 max	N	6.562	166.7
C	13.000 ± 0.062	330.2 ± 1.6	P	4.750	120.7
D	4.703	119.5	Q	6.937	176.2
E	2.000	50.80	R	7.500	190.5
F	0.687	17.45	S	0.875	22.23
G	2.950 max	74.93 max	T	2.250	57.15
H	8.053 max	204.5 max	U	3.000	76.20
J	3.326 max	84.48 max	V	5.375	136.5
K	0.250	6.35	W	6.000	152.4
L	0.625	15.88			

Millimetre dimensions have been derived from inches.