BR/BW189
BY189A

R.F. POWER TRIODES

Service Type (BR189) CV5218

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

ABRIDGED DATA

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

Anode cooling:		
BR189	forced-air	
BW189	water; separate jacket	
BY189A	vapour; separate boiler unit	
Anode dissipation:		
BR189	27	kW max
BW189, BY189A	35	kW max
Anode voltage	15	kV max
Frequency for full ratings	5.0	MHz max
Frequency at reduced ratings	50	MHz max
Output power (class C telegraphy)	80	kW

GENERAL

Electrical

Filament	thoriated tungsten	
Filament voltage (see note 1)	9.0	V
Filament current	240	A
Surge filament current (peak) (see note 2)	600	A max
Filament cold resistance	4.6	mΩ
Peak usable cathode current	70	A
Perveance	1.6	$mA/V^{3/2}$
Amplification factor (V_a = 9.0kV, I_a = 2.0A)	34	
Mutual conductance (V_a = 9.0kV, I_a = 2.0A)	27.5	mA/V
Inter-electrode capacitances:		
grid to anode	61	pF
grid to filament	68	pF
anode to filament	1.5	pF

Mechanical

Overall dimensions	see outline drawings
Net weights:	
BR189	109 pounds (50kg) approx
BW189	23 pounds (10.5kg) approx
BY189A	70 pounds (32kg) approx
Mounting position	vertical, filament end up

Accessories

Filament leads	MA130
Grid connector	MA66
Water jacket for BW189	BW4050
Sealing ring (supplied with BW189)	MA254
Single boiler unit, separate condenser required, for BY189A	BY4037A
Single boiler unit, integral condenser, for BY189A	BY4038
Double boiler unit, integral condenser, for BY189A	BY4038A
Sealing ring (supplied with BY189A)	MA255
Thermal fuse, 2 supplied with BY189A	MA85C

COOLING

Anode

The BR189 air cooling requirements are shown on pages 10 and 11. The required air flow should be delivered through the radiator before and during the application of any voltages. Filament power, anode power and air flow may be removed simultaneously.

The anode of the BW189 must be fitted into a water jacket for cooling, the recommended jacket being type BW4050. A flow of water of 10 to 15imp.gal/min (45 to 68 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 BY189A is vapour cooled and may be operated either singly in boiler unit BY4037A or BY4038, or in pairs in boiler unit BY4038A. In BY4038 and BY4038A, the steam generated by the anode is condensed by means of an internal water cooled condenser. The steam produced in BY4037A is led away by suitably insulated tubing for condensation at some convenient point external to the boiler unit.

Two thermal fuses (part number MA85C) are provided with each BY189A to give protection against anode overheating; only one fuse at a time need be used. Alternative positions for mounting the thermal fuse are provided by four threaded holes equally spaced round the top surface of the anode ring. It should be screwed into the desired position and connected by a non-

conducting cord passing over the anode corona ring to a suitable switching device; a tension of about 1 lb (450g) should be applied to the fuse via the cord. If the temperature exceeds a safe limit, the fuse core is pulled outwards; this should actuate the switching device and remove all electrical supplies from the valve. Replacement fuses can be supplied to order.

Filament and Grid Seals

The temperature of the filament and grid seals must not exceed 140°C. A flow of air of 20ft^3/min (0.57m^3/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. The BW189 anode seal requires cooling and this may be done via holes in a corona ring fitted to the water jacket, when an air pressure of 1-inch (25mm) water gauge should provide sufficient flow.

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	7.0	A max
Anode dissipation:		
BR189	27	kW max
BW189, BY189A	35	kW max
Grid dissipation	1.25	kW max
Operating frequency (for full ratings)	5.0	MHz max

TYPICAL OPERATING CONDITIONS (For amplifier)

Anode voltage	12	15	kV
Grid voltage	−900	−900	V
Peak r.f. grid drive voltage	1650	1650	V
Anode current	6.4	6.6	A
Grid current (approx)	0.83	0.7	A
Anode dissipation	15	18	kW
Grid dissipation	640	530	W
Driving power	1370	1150	W
Output power	62	80	kW
Efficiency	80	80	%

RANGE OF CHARACTERISTICS FOR EQUIPMENT DESIGN

	Min	Max	
Filament current at filament voltage 9.0V	217	256	A
Amplification factor (V_a = 9.0kV, I_a = 2.0A)	30	38	
Mutual conductance (V_a = 9.0kV, I_a = 2.0A)	22.5	29.5	mA/V
Grid voltage (negative value) (V_a = 10kV, I_a = 0.1A)	—	380	V
Grid voltage (negative value) (V_a = 9.0kV, I_a = 2.0A)	125	193	V
Anode current (V_a = 4.0kV, V_g = +400V)	18	24	A
Grid current (V_a = 4.0kV, V_g = +400V)	−1.2	—	A

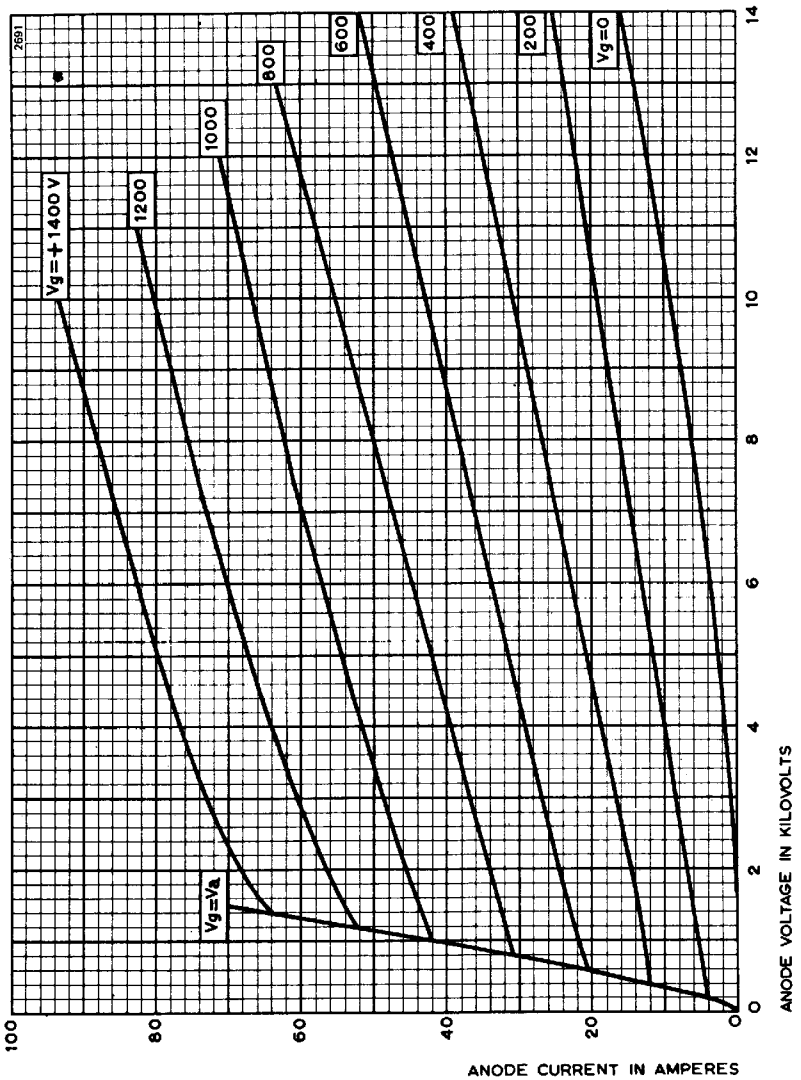
MAXIMUM ANODE VOLTAGE AGAINST FREQUENCY

Operating frequency (MHz)	Max anode voltage c.w. (kV)	Max anode voltage with anode modulation (kV)
5	15	13.5
30	13.5	12
50	8.0	6.5

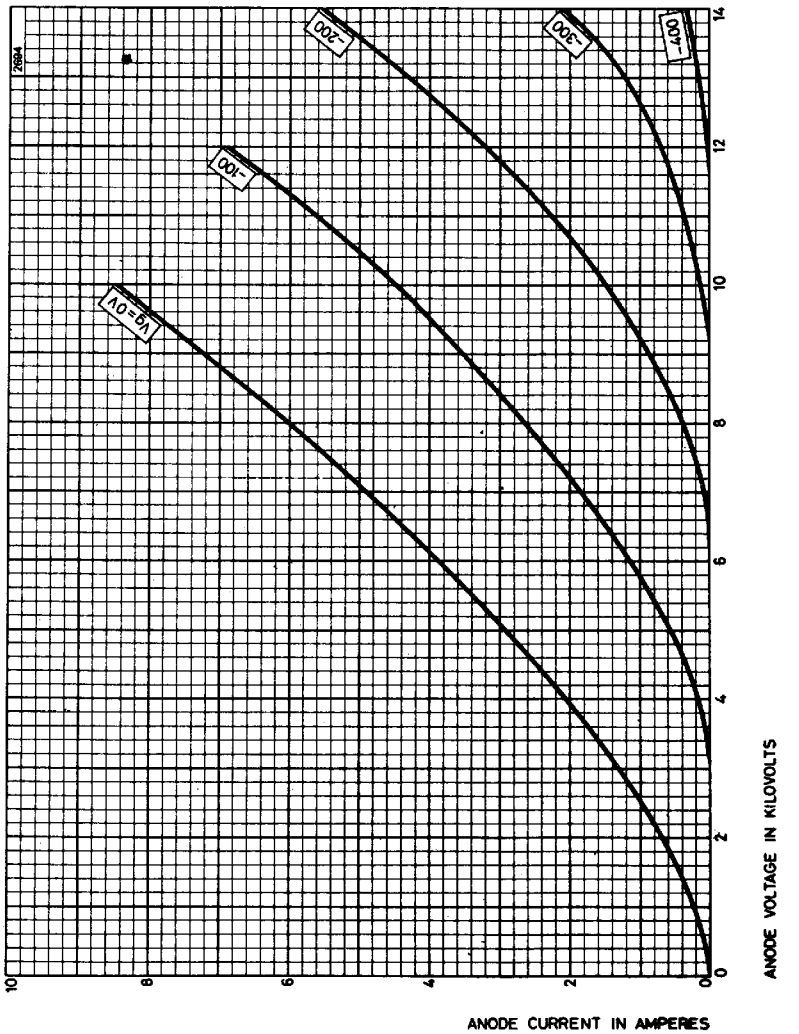
NOTES

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

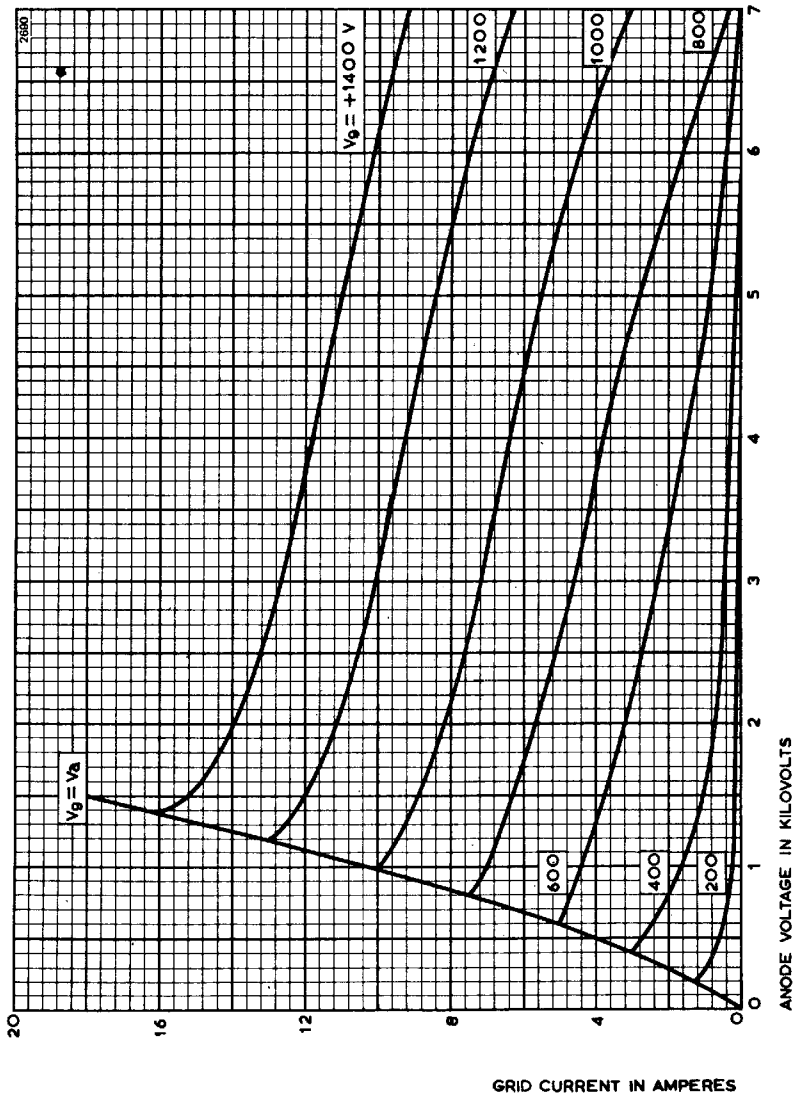
TYPICAL ANODE CHARACTERISTICS



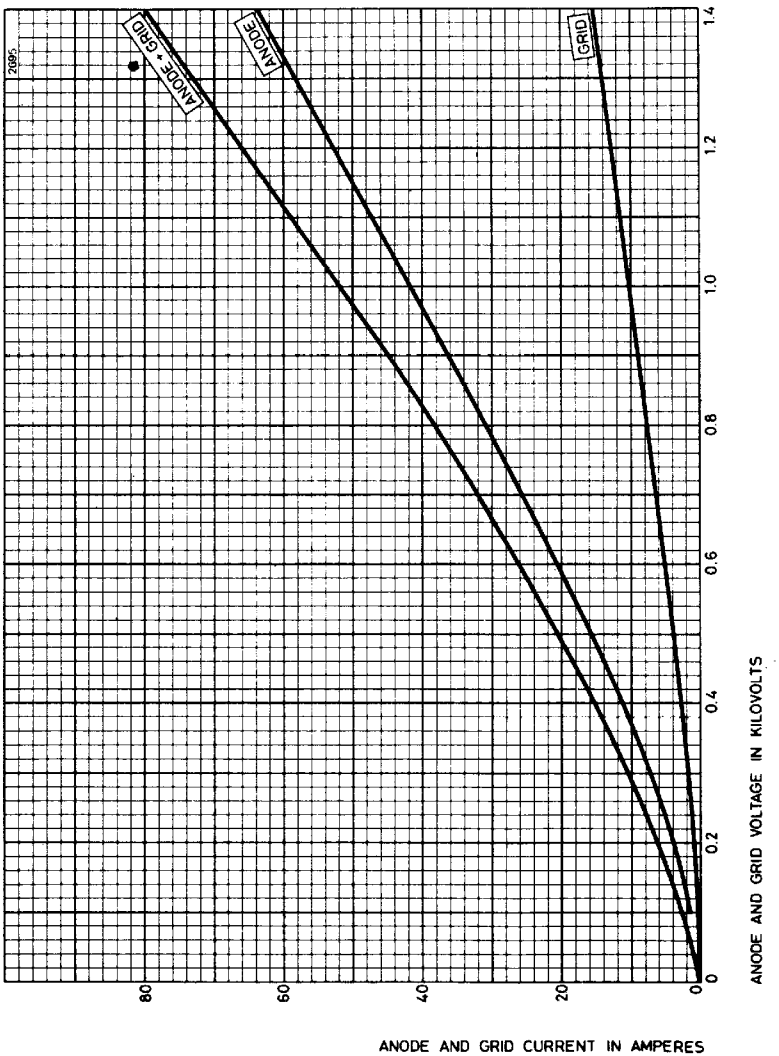
TYPICAL ANODE CHARACTERISTICS (Negative Grid)



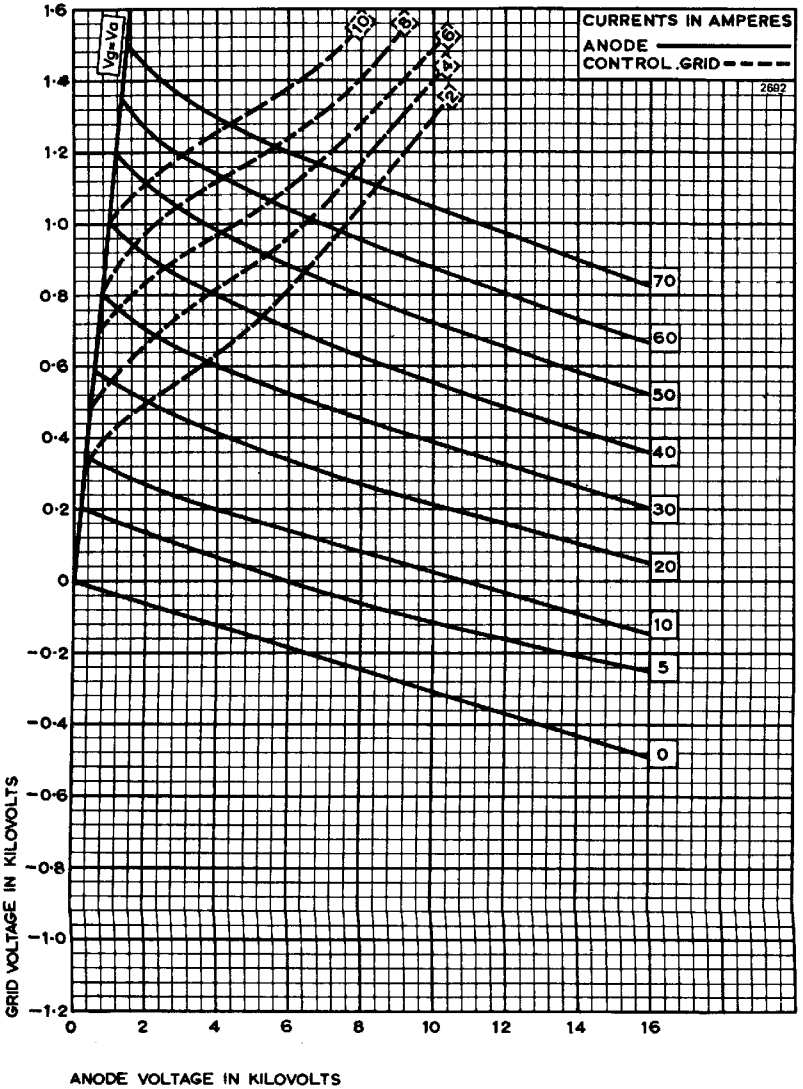
TYPICAL GRID CHARACTERISTICS



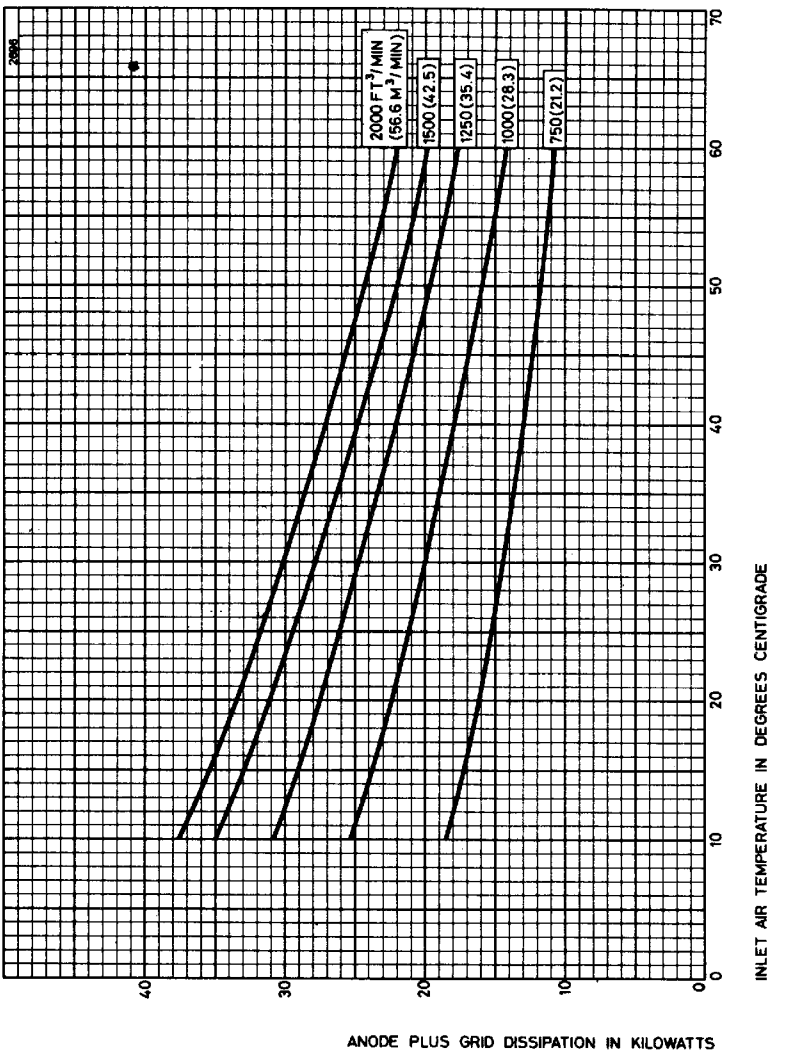
TYPICAL STRAPPED CHARACTERISTICS



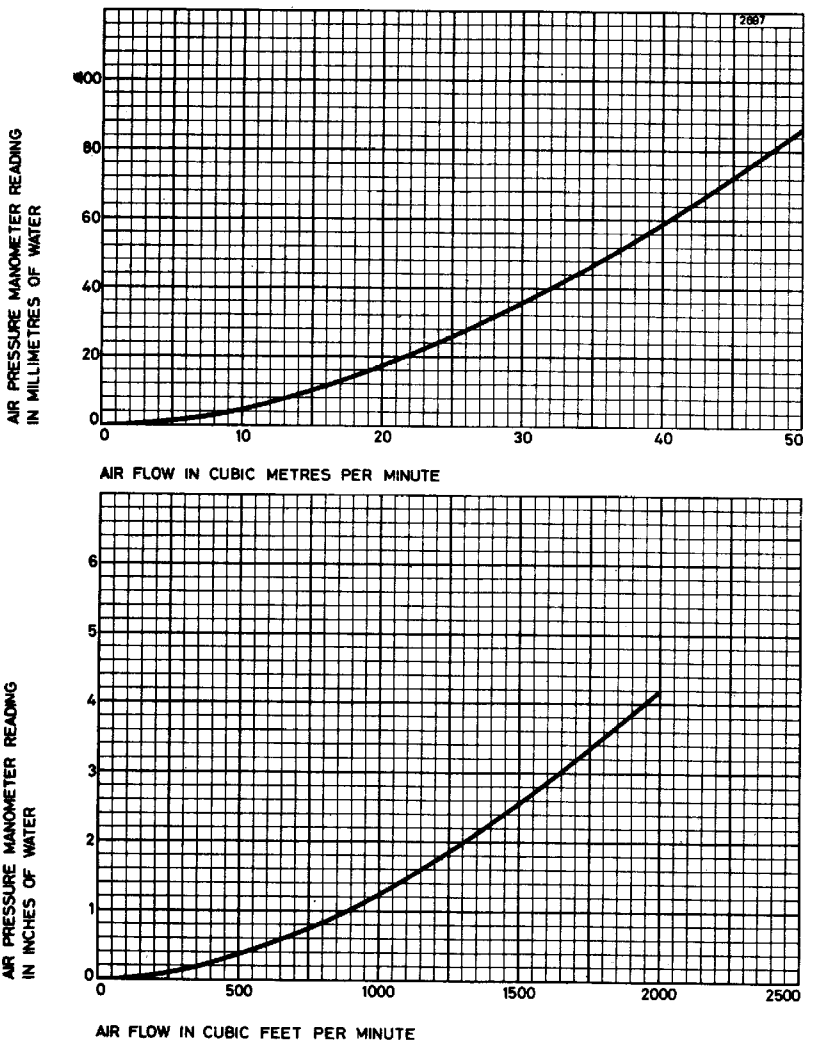
TYPICAL CONSTANT CURRENT CHARACTERISTICS



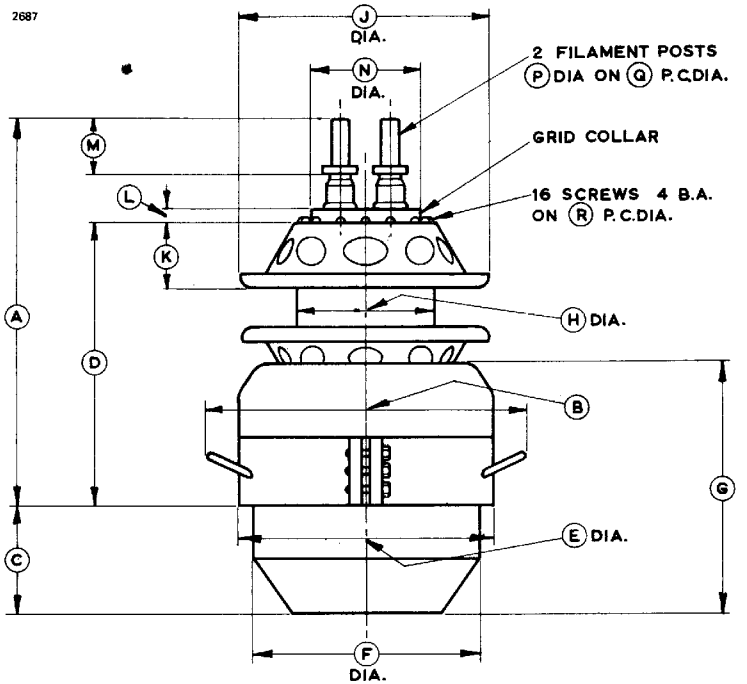
AIR COOLING REQUIREMENTS FOR BR189



AIR FLOW CHARACTERISTIC FOR BR189



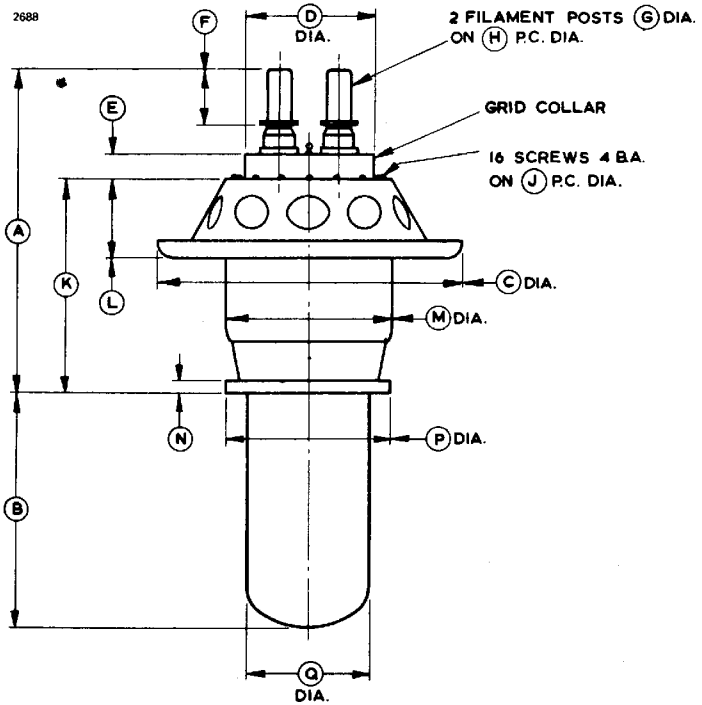
OUTLINE FOR BR189 (All dimensions without limits are nominal)



Ref	Inches	Millimetres	Ref	Inches	Millimetres
A	16.750 max	425.5 max	J	11.000 max	279.4 max
B	14.000 max	355.6 max	K	2.906 max	73.81 max
C	4.750	120.7	L	0.687	17.45
D	12.875 max	327.0 max	M	2.000	50.80
E	11.000	279.4	N	4.703	119.5
F	10.062 max	255.6 max	P	0.875	22.23
G	11.000	279.4	Q	2.250	57.15
H	6.000	152.4	R	5.375	136.5

Millimetre dimensions have been derived from inches.

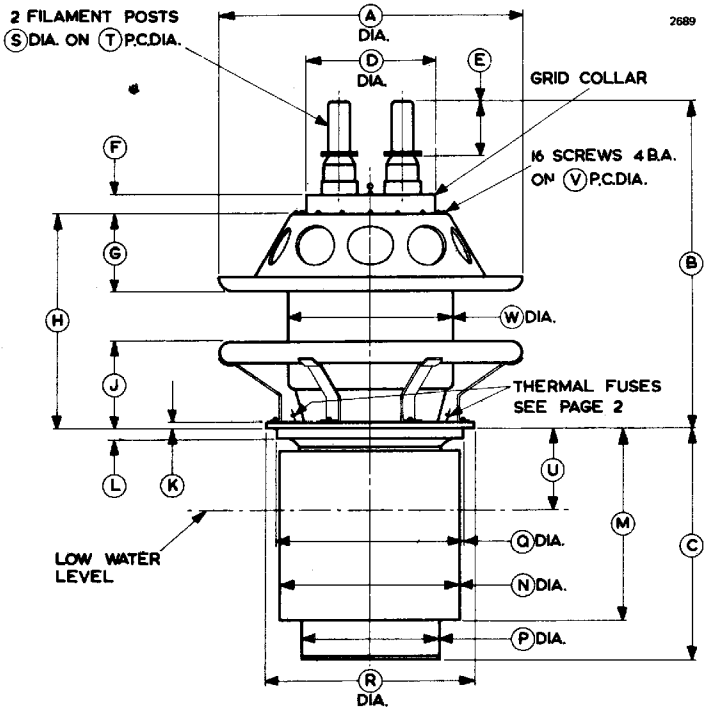
OUTLINE FOR BW189 (All dimensions without limits are nominal)



Ref	Inches	Millimetres	Ref	Inches	Millimetres
A	12.000 max	304.8 max	J	5.375	136.5
B	8.625	219.1	K	7.875 max	200.0 max
C	11.000 max	279.4 max	L	2.906 max	73.81 max
D	4.703	119.5	M	6.000	152.4
E	0.687	17.45	N	0.500	12.70
F	2.000	50.80	P	5.760 max	146.3 max
G	0.875	22.23	Q	4.500	114.3
H	2.250	57.15			

Millimetre dimensions have been derived from inches.

OUTLINE FOR BY189A (All dimensions without limits are nominal)



Ref	Inches	Millimetres	Ref	Inches	Millimetres
A	11.000 max	279.4 max	M	7.000	177.8
B	12.109 max	307.6 max	N	6.562	166.7
C	8.452	214.7	P	5.240	133.1
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	2.906 max	73.81 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	0.375	9.53			

Millimetre dimensions have been derived from inches.