

BR/BW1162 Series

R.F. POWER
TRIODES

Service Type (BR1162) CV5239

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

ABRIDGED DATA

Three r.f. power triodes intended for transmitter and industrial applications. They differ only in the method of anode cooling.

Anode cooling:

BR1162	forced-air
BW1162	water, separate jacket
BW1162J3	water; integral jacket

Anode dissipation 6.0 kW max

Anode voltage 7.2 kV max

Operating frequency:

class C telegraphy 30 MHz max

class C industrial oscillator 85 MHz max

Output power:

class B audio, per valve 10 kW

class C telegraphy 10 kW

class C industrial oscillator 8.6 kW

GENERAL

Electrical

Filament thoriated tungsten

Filament voltage (see note 1) 12.6 V

Filament current 33 A

Peak usable cathode current 14 A

Amplification factor ($V_a = 6.0\text{kV}$, $I_a = 1.0\text{A}$) 32

Mutual conductance ($V_a = 6.0\text{kV}$, $I_a = 1.0\text{A}$) 15 mA/V

Inter-electrode capacitances:

grid to anode 11 pF

grid to filament 16 pF

anode to filament 0.3 pF

Mechanical

Overall dimensions see outline drawings

Net weight:

BR1162 10.1 pounds (4.6kg) approx

BW1162 1 pound (0.45kg) approx

BW1162J3 1.8 pounds (0.7kg) approx

Mounting position:

BR1162, BW1162J3 vertical, either way up

BW1162 vertical, filament pins up

Accessories

Filament connectors MA146A

Centre-tap dissipating connector MA146B

Grid connector (above 30MHz) MA147A

Grid connector (below 30MHz) MA148A

Insulating pedestal for BR1162 MA149A

Water jacket for BW1162 BW4088A

Sealing ring (supplied with BW1162) MA314

COOLING

Anode

The air cooling requirements for BR1162 are given in the following table. The air flow should be delivered immediately before and during the application of any voltages.

Anode dissipation (kW)	Height above sea level (m)	Inlet tempera- ture (max) (°C)	Rate of flow of air (min) (m ³ /min)	Pressure drop (mm water)
2.0	0	35	4.8	20
2.0	0	45	5.7	25
2.0	1500	35	5.7	23
2.0	3000	25	6.1	23
3.5	0	35	6.2	32
3.5	0	45	7.3	42
3.5	1500	35	7.3	36
3.5	3000	25	7.8	36
6.0	0	35	9.2	68
6.0	0	45	10.7	91
6.0	1500	35	11.2	81
6.0	3000	25	11.7	80

The BW1162 anode must be fitted into a water jacket for cooling, the recommended jacket being type BW4088A. The water cooling requirements are given in the following table.

Anode dissipation (kW)	Inlet tempera- ture (°C)	Rate of flow of water		Pressure drop across jacket (atm)
		l./min	gal/min	
1.0	20	2.5	0.55	0.08
1.0	50	5.0	1.10	0.10
2.0	20	2.5	0.55	0.08
2.0	50	5.0	1.10	0.10
4.0	20	4.0	0.88	0.18
4.0	50	9.0	1.98	0.90
6.0	20	6.0	1.32	0.4
6.0	50	14	3.08	2.5

The BW1162J3 has an integral water jacket. Minimum water cooling requirements are shown on page 11; higher rates of flow should be used where possible. A thermal fuse may be fitted (see page 15).

Filament, Grid and Anode Seals

It may be necessary to direct a flow of air on to the filament and grid seals in order to maintain their temperatures within the following limits.

Temperature of filament seals	210	°C max
Temperature of grid and anode seals	180	°C max

Filament Centre-tap Pin

A heat dissipating connector such as MA146B must be used on the filament centre-tap pin.

AUDIO FREQUENCY POWER AMPLIFIER OR MODULATOR (Class B)

MAXIMUM RATINGS (Absolute values)

Anode voltage	7.2	kV max
Anode current	2.2	A max
Anode input power	14	kW max
Anode dissipation	6.0	kW max
Grid dissipation	250	W max
Grid circuit resistance	15	kΩ max
Cathode current (peak)	10	A max

TYPICAL OPERATING CONDITIONS (Class B, 2 valves)

Anode voltage	4.0	5.0	5.0	7.0	kV
Grid voltage	-120	-145	-145	-210	V
Peak a.f. grid drive voltage (per valve)	445	342	415	605	V
Anode current (zero signal)	2 x 0.10	2 x 0.15	2 x 0.15	2 x 0.20	A
Anode current (maximum signal)	2 x 1.25	2 x 1.10	2 x 1.25	2 x 2.00	A
Grid current (maximum signal)	2 x 0.32	2 x 0.22	2 x 0.35	2 x 0.56	A
Effective load (anode to anode)	3.8	5.5	4.8	4.15	k Ω
Nominal driving power (maximum signal)	2 x 140	2 x 65	2 x 130	2 x 310	W
Anode dissipation	2 x 1.45	2 x 1.50	2 x 1.70	2 x 4.00	kW
Output power (maximum signal)	7.1	8.0	9.0	20	kW
Efficiency	71	72.5	72.5	71.5	%

ANODE MODULATED R.F. POWER AMPLIFIER

(Class C Telephony, carrier conditions per valve for use with a maximum modulation factor of 1.0)

MAXIMUM RATINGS (Absolute values)

Anode voltage	5.5	kV max
Anode current	1.8	A max
Anode dissipation	4.0	kW max
Grid voltage (negative value)	1.25	kV max
Grid current	0.6	A max
Grid dissipation	250	W max
Cathode current (peak)	12	A max
Frequency for above ratings	30	MHz max

TYPICAL OPERATING CONDITIONS (frequency 30MHz)

Anode voltage	4.0	5.0	5.0	kV
Grid voltage	-300	-400	-400	V
Peak r.f. grid drive voltage	680	730	800	V
Anode current	1.6	1.4	1.6	A
Grid current	0.6	0.5	0.5	A
Nominal driving power	367	328	432	W
Anode dissipation	1.4	1.4	1.6	kW
Output power	5.0	5.6	6.4	kW
Efficiency	78	80	80	%

RADIO FREQUENCY POWER AMPLIFIER

(Class C Telegraphy, key down conditions, or F.M. Telephony, one valve)

MAXIMUM RATINGS (Absolute values)

Anode voltage	7.2	kV max
Anode current	2.2	A max
Anode input power	14	kW max
Anode dissipation	6.0	kW max
Grid voltage (negative value)	1250	V max
Grid current	0.6	A max
Grid dissipation	250	W max
Cathode current (peak)	14	A max
Frequency for above ratings	30	MHz max

TYPICAL OPERATING CONDITIONS (frequency 30MHz)

Anode voltage	5.0	6.0	6.5	kV
Grid voltage	-300	-400	-450	V
Peak r.f. grid drive voltage	700	820	850	V
Anode current	2.0	2.0	2.0	A
Grid current	0.6	0.6	0.6	A
Nominal driving power	378	443	460	W
Anode dissipation	2.7	2.8	3.0	kW
Output power	7.3	9.2	10	kW
Efficiency	73	76.7	77	%

RADIO FREQUENCY POWER OSCILLATOR

(Class C, anode supply from unfiltered three phase half-wave rectifier)

MAXIMUM RATINGS (Absolute values)

Anode voltage	7.0	kV max
Anode current	1.8	A max
Anode input power	11	kW max
Anode dissipation	6.0	kW max
Grid voltage (negative value)	1250	V max
Grid current (unloaded)	0.7	A max
Grid current (loaded)	0.5	A max
Grid dissipation	250	W max
Grid circuit resistance	10	k Ω max
Cathode current (peak)	11	A max
Operating frequency for full ratings	55	MHz max
Anode voltage for operation at 85MHz max	6.5	kV max

TYPICAL OPERATING CONDITIONS

Frequency	55	85	85	MHz
Output voltage (r.m.s.) from transformer	5.55	5.13	4.27	kV
Anode voltage	6.5	6.0	5.0	kV
Anode current	1.7	1.5	1.7	A
Grid current (unloaded)	0.7	0.7	0.7	A
Grid current (loaded)	0.5	0.4	0.45	A
Anode dissipation	2.4	2.5	2.4	kW
Anode load resistance	2.0	2.3	1.6	k Ω
Grid resistor	0.9	1.0	0.85	k Ω
Feedback ratio (see note 2)	0.15	0.15	0.19	
Nominal drive power	350	300	350	W
Output power	8.6	6.5	6.1	kW
Effective output power to load (see note 3)	7.0	5.5	5.0	kW
Efficiency	78	72	72	%

NOTES

1. The valve must be operated at the stated filament voltage. Fluctuation in filament voltage must not exceed +5% or -10%. The centre-tap pin may be used for the anode current return but must not be used for the filament current supply. At frequencies above 30MHz, all three filament pins should be interconnected with suitable capacitors.

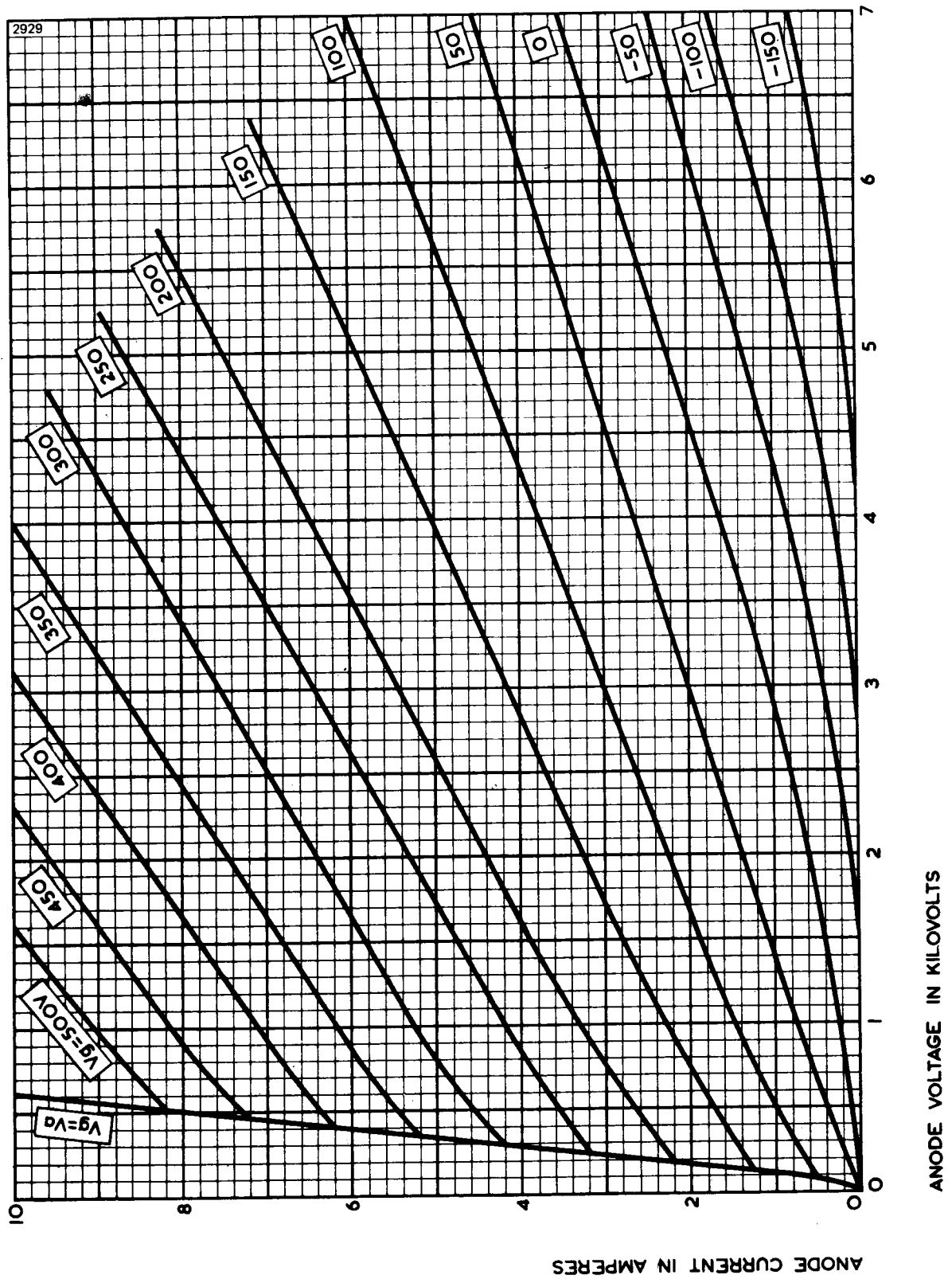
2. The feedback ratio is defined as $\frac{V_g(\text{pk})}{V_a(\text{pk})}$

where $v_g(\text{pk})$ = peak r.f. grid voltage in volts

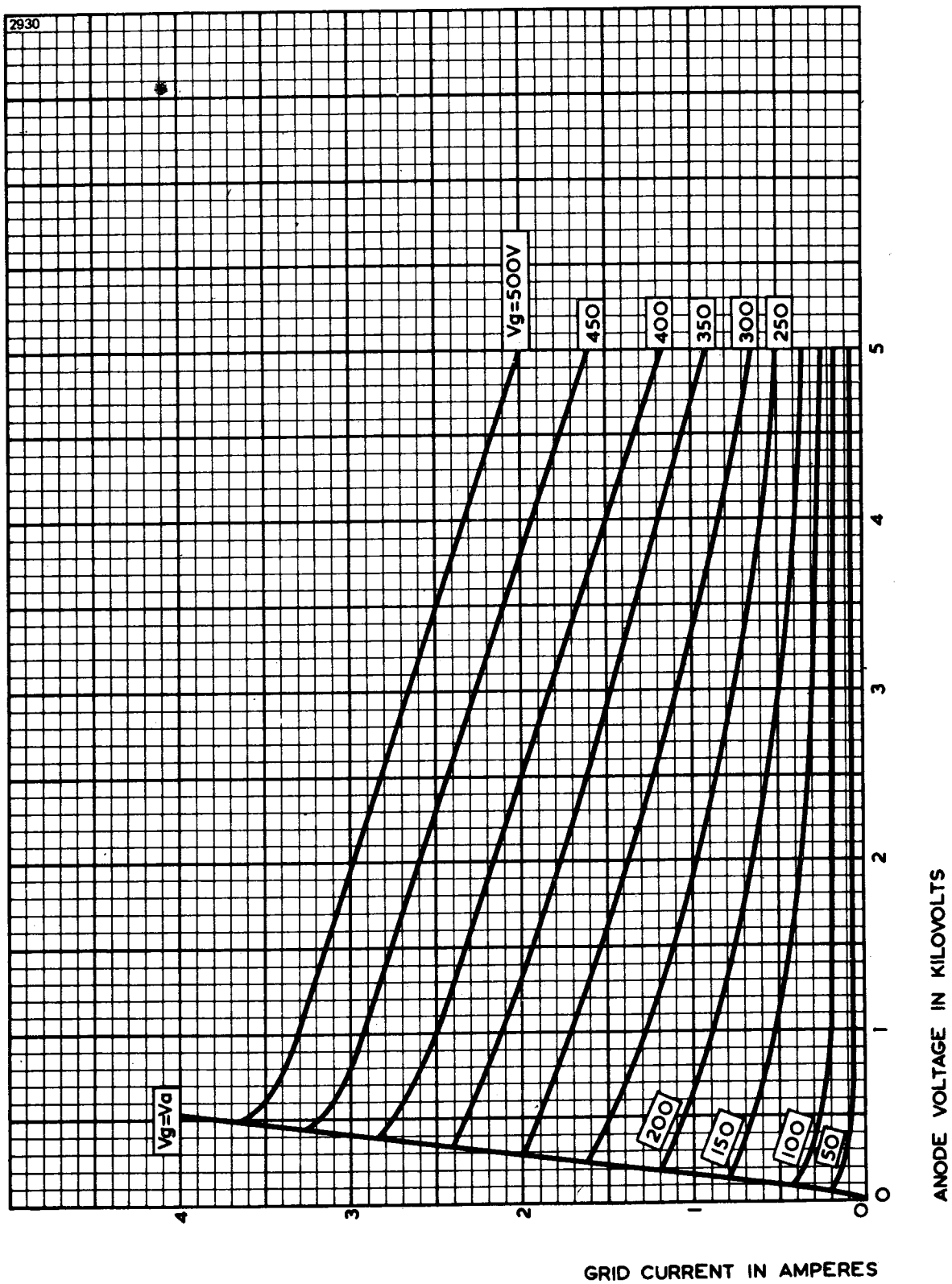
and $v_a(\text{pk})$ = peak r.f. anode voltage in volts.

3. Effective output power to load = $\eta_a (P_{\text{out}} - P_{\text{drive}})$
 where η_a = efficiency of anode circuit = 85% (typical value)
 P_{out} = output power of valve to anode circuit
 P_{drive} = drive power fed back to grid circuit.

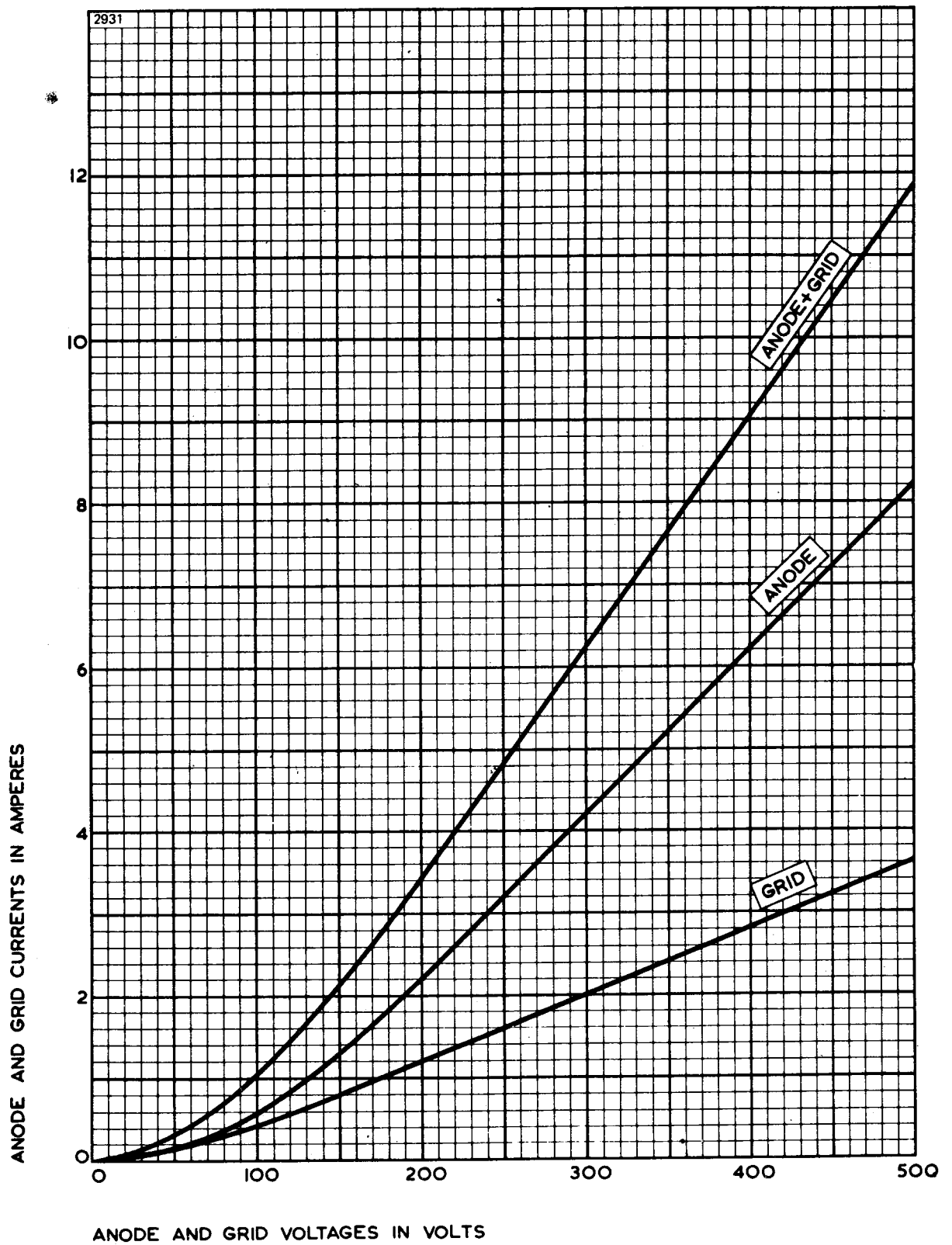
TYPICAL ANODE CHARACTERISTICS



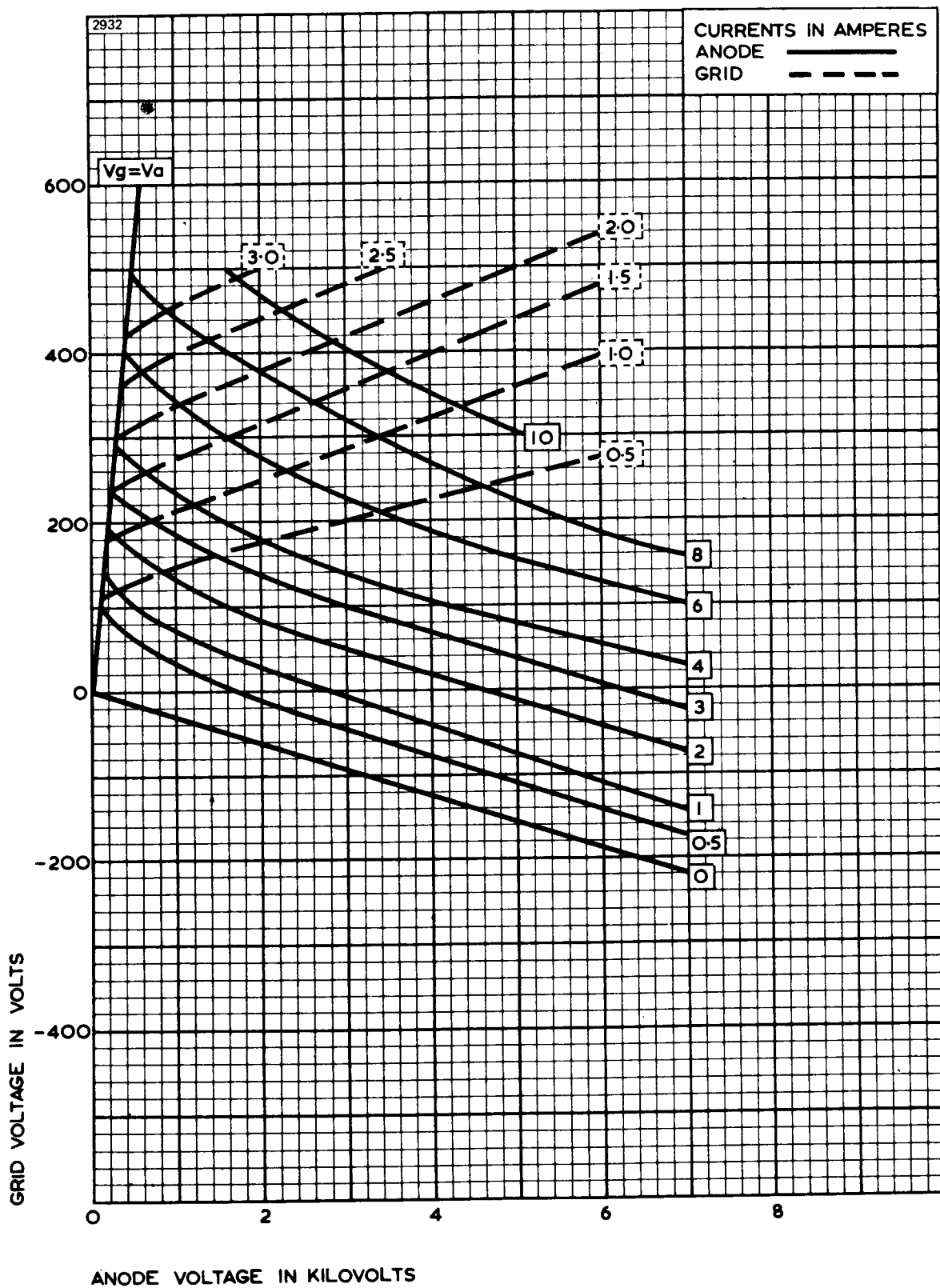
TYPICAL GRID CHARACTERISTICS



TYPICAL STRAPPED CHARACTERISTICS

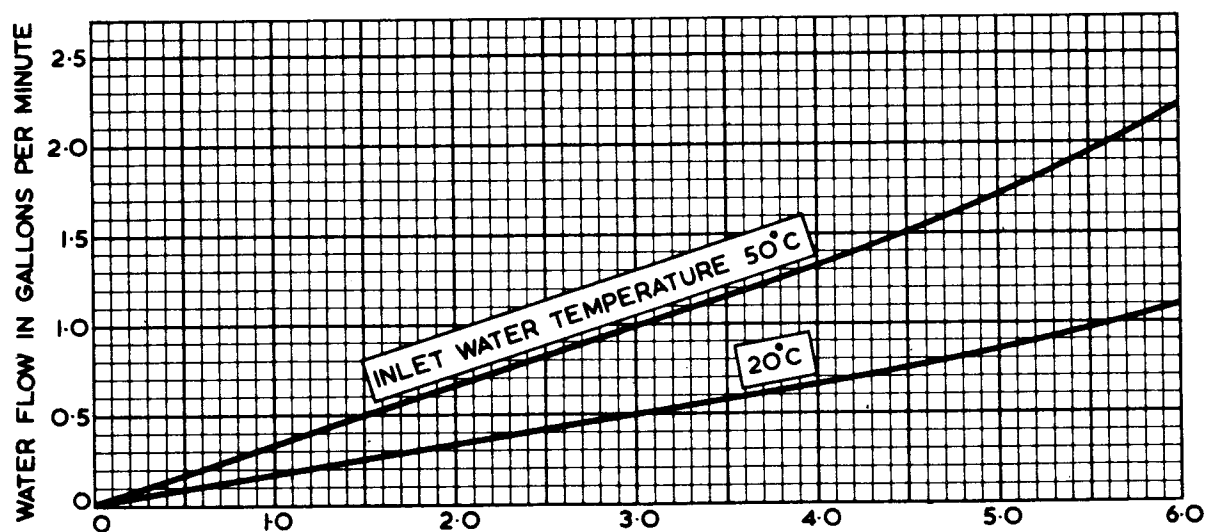
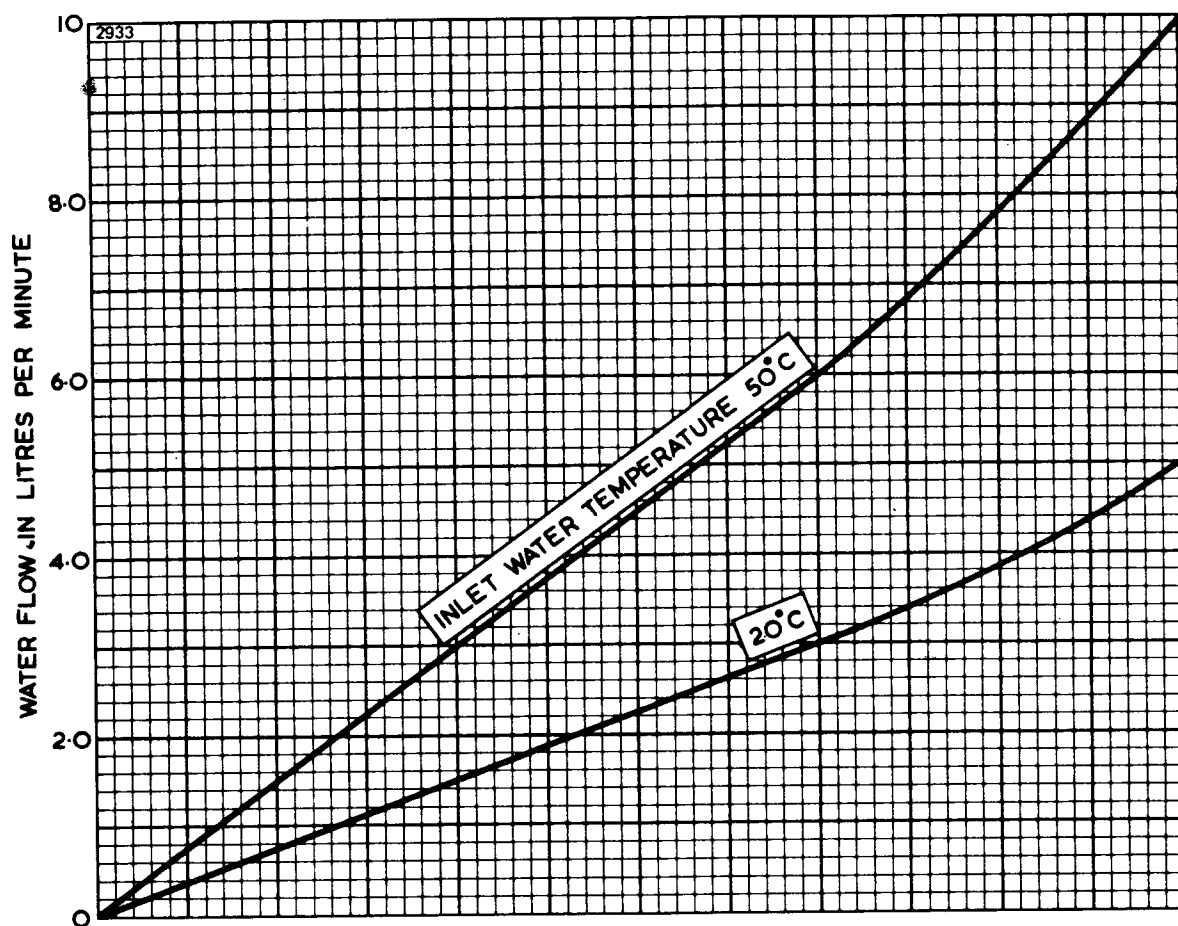


TYPICAL CONSTANT CURRENT CHARACTERISTICS



MINIMUM WATER COOLING REQUIREMENTS FOR BW1162J3

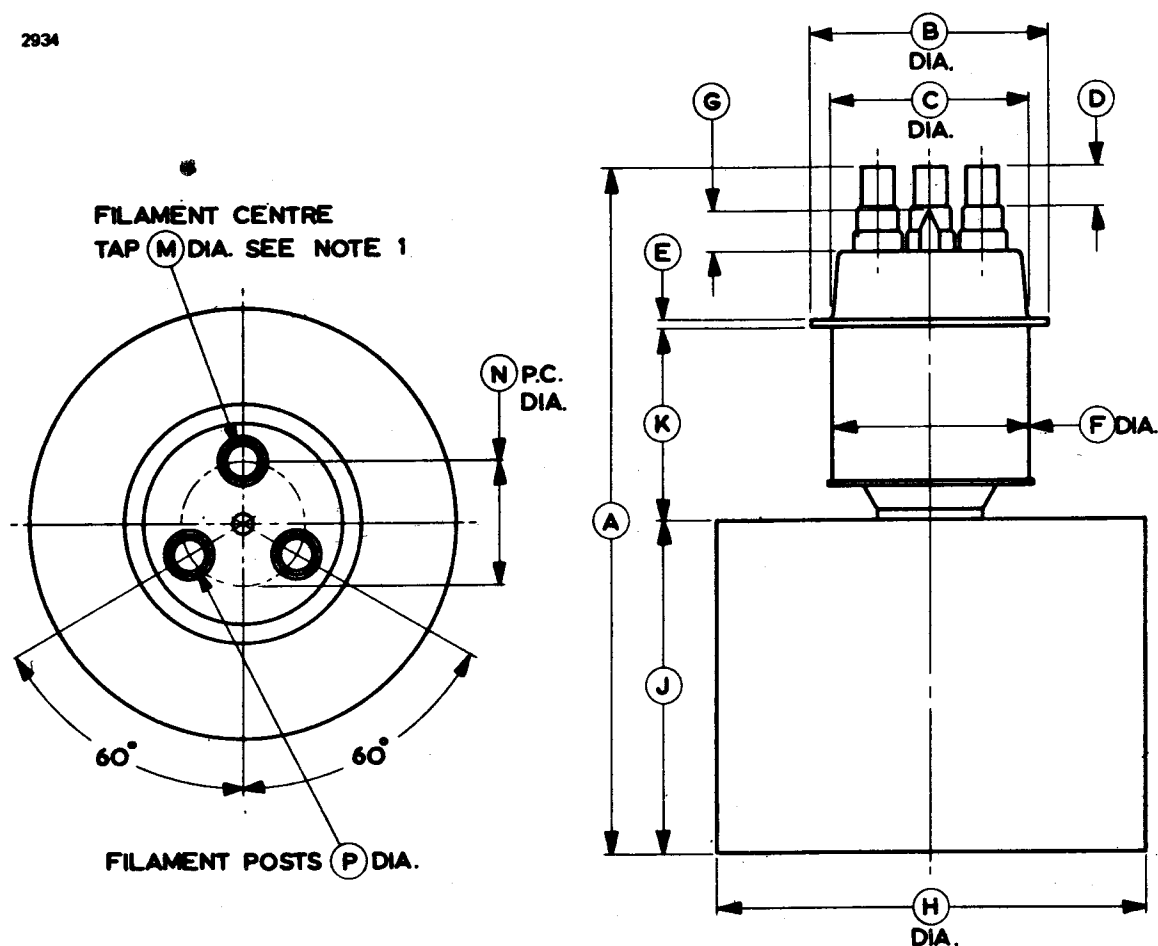
Higher rates of flow should be used where possible.



ANODE PLUS GRID DISSIPATION IN KILOWATTS

OUTLINE FOR BR1162 (All dimensions without limits are nominal)

2834



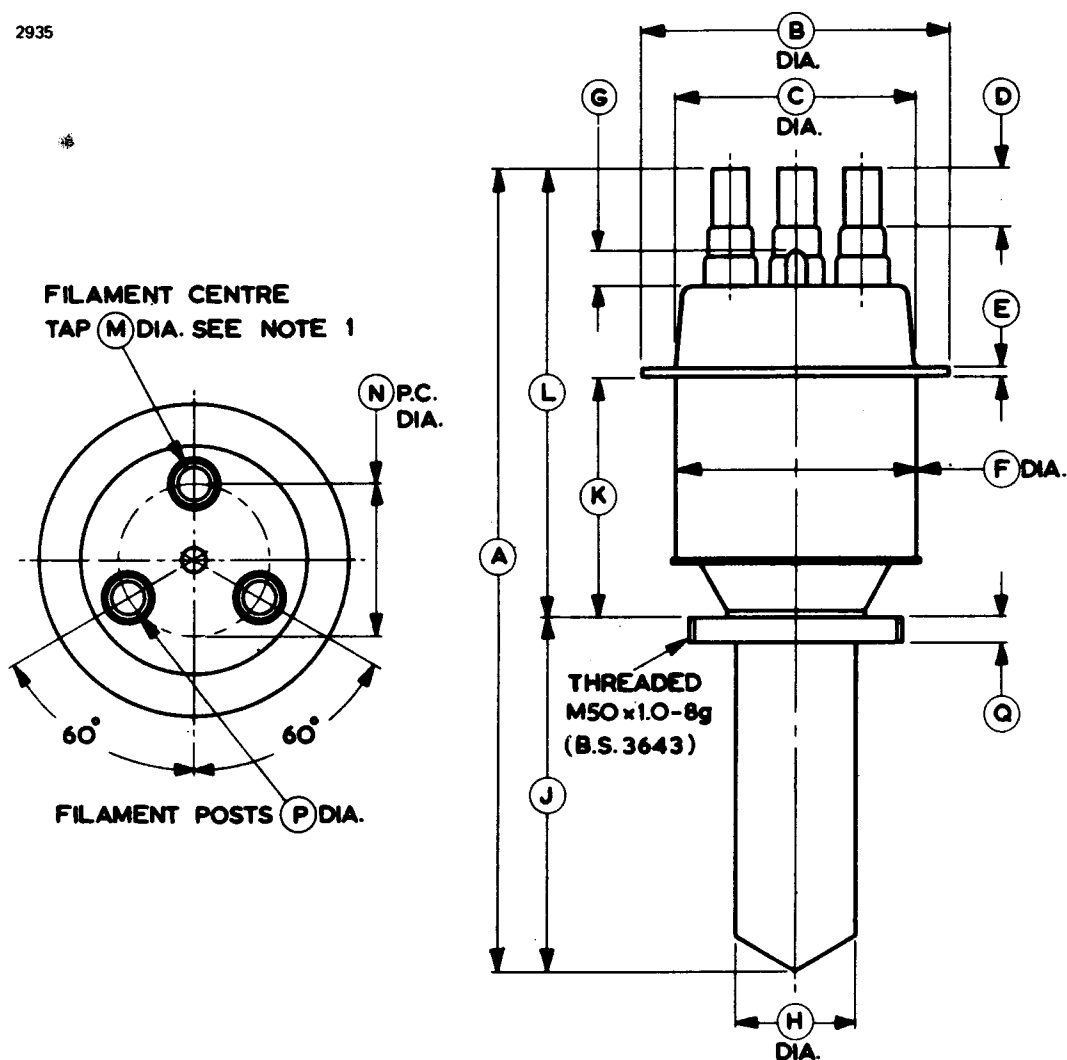
Ref	Millimetres	Inches
A	195.0 max	7.677 max
B	70.00 $\pm$ 0.50	2.756 $\pm$ 0.020
C	59.00 max	2.323 max
D	12.00 min	0.472 min
E	2.50	0.098
F	64.00 max	2.520 max
G	20.00 max	0.787 max
H	122.3 $\pm$ 0.5	4.815 $\pm$ 0.020
J	94.00	3.701
K	54.00 $\pm$ 0.50	2.126 $\pm$ 0.020
M	10.50	0.413
N	35.00 $\pm$ 1.00	1.378 $\pm$ 0.040
P	9.10	0.358

Inch dimensions have been derived from millimetres.

Note The filament centre tap pin is marked O.

OUTLINE FOR BW1162 (All dimensions without limits are nominal)

2935



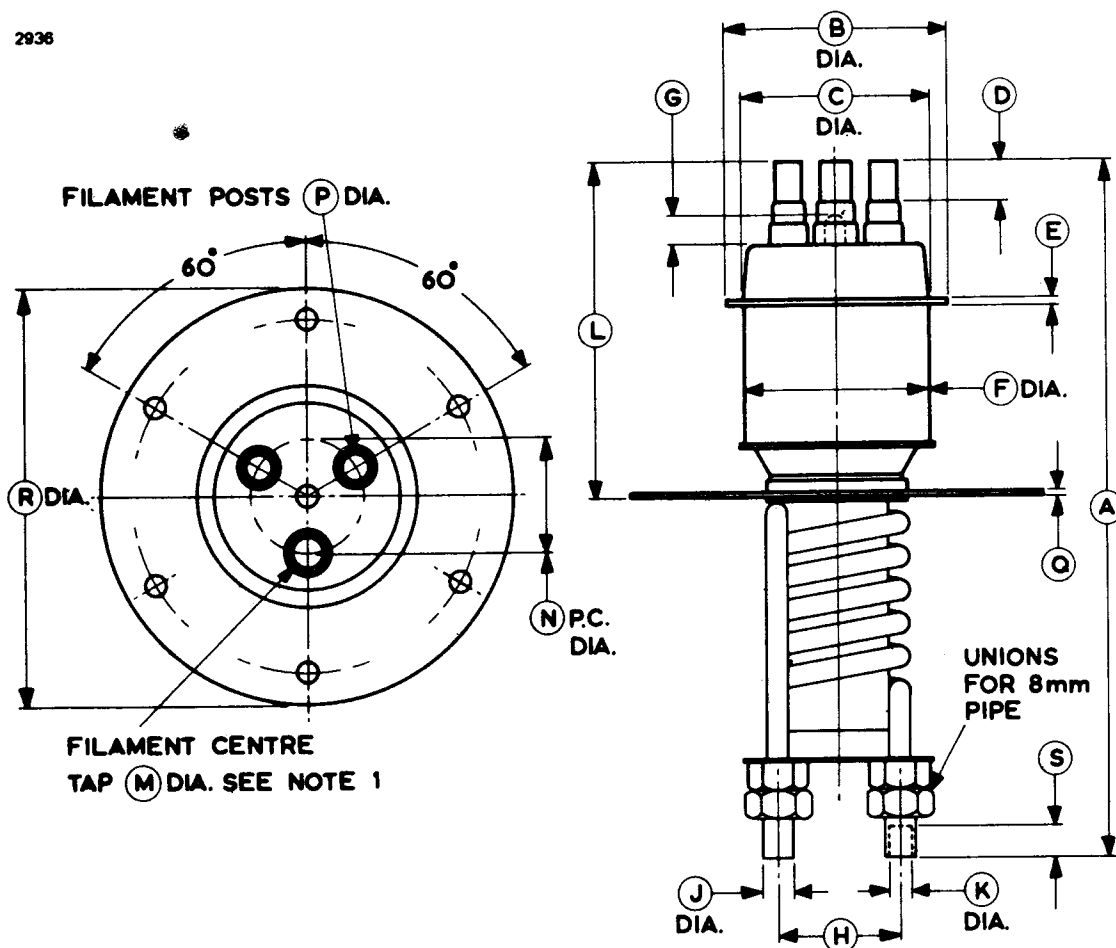
Ref	Millimetres	Inches	Ref	Millimetres	Inches
A	190.0 max	7.480 max	J	83.00 max	3.268 max
B	70.00 ± 0.50	2.756 ± 0.020	K	56.00	2.205
C	59.00 max	2.323 max	L	106.0	4.173
D	12.00 min	0.472 min	M	10.50	0.413
E	2.50	0.098	N	35.00 ± 1.00	1.378 ± 0.040
F	64.00 max	2.520 max	P	9.10	0.358
G	20.00 max	0.787 max	Q	6.25	0.246
H	30.00 max	1.181 max			

Inch dimensions have been derived from millimetres.

Note The filament centre tap pin is marked O.

OUTLINE FOR BW1162J3 (All dimensions without limits are nominal)

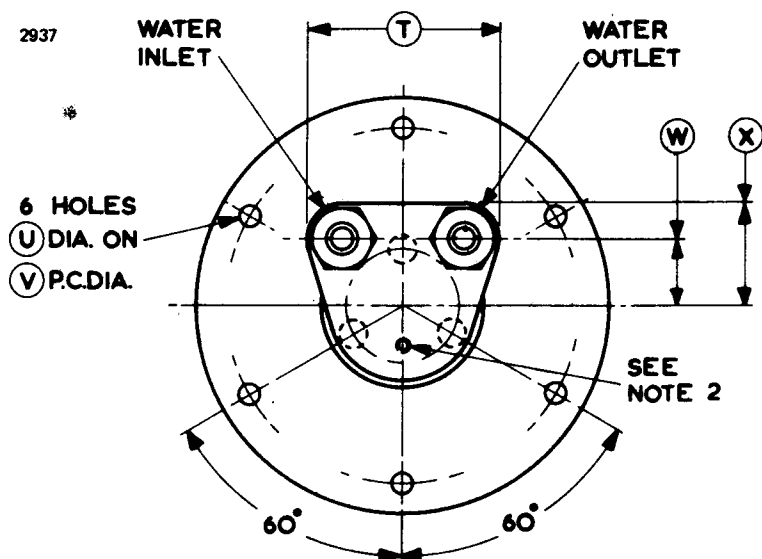
2936



Ref	Millimetres	Inches	Ref	Millimetres	Inches
A	218.0 max	8.583 max	K	8.20	0.323
B	70.00 ± 0.50	2.756 ± 0.020	L	105.0	4.134
C	59.00 max	2.323 max	M	10.50	0.413
D	12.00 min	0.472 min	N	35.00 ± 1.00	1.378 ± 0.040
E	2.50	0.098	P	9.10	0.358
F	64.00 max	2.520 max	Q	2.00	0.079
G	20.00 max	0.787 max	R	130.0 ± 0.5	5.118 ± 0.020
H	39.00	1.535	S	10.0	0.394
J	10.00	0.394			

Inch dimensions have been derived from millimetres.

View of BW1162J3 from below



Ref	Millimetres	Inches
T	61.00 max	2.402 max
U	6.50	0.256
V	110.0 $\pm$ 1.00	4.331 $\pm$ 0.040
W	21.00	0.827
X	32.00	1.260

Inch dimensions have been derived from millimetres.

Outline Notes for BW1162J3

1. The filament centre tap pin is marked O.
2. Hole threaded 4B.A. to accept thermal fuse.