

E2V Technologies

CY1170J

RF Power Tetrode

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

ABRIDGED DATA

Vapour cooled tetrode with integral boiler, coaxial metal-ceramic envelope, for audio amplifiers, RF linear amplifiers or class C amplifiers or oscillators.

Anode dissipation	75	kW max
Anode voltage	15	kV max
Frequency for full ratings	30	MHz max
Output power (class C telegraphy)	82.5	kW

GENERAL

Electrical

Filament	thoriated tungsten
Filament voltage (see note 1)	10 V
Filament current	300 A
Peak usable cathode current	120 A
Grid-screen amplification factor	4.5
Inter-electrode capacitances, grounded filament:	
grid to anode	2.4 pF
input	465 pF
output	55 pF

Mechanical

Overall length	490.7 mm max
Overall diameter	254.8 mm max
Net weight	27 kg approx
Mounting position	vertical, anode up

Accessories

Socket (see page 7)	MA166B
Clamping device to secure tube in socket (optional)	MA233
Final seal flare protector	MA2298A

COOLING

The CY1170J has an integral boiler for vapour cooling. The steam generated when the tube is operating is ejected from the top of the boiler and passed through an insulated tube to a separate condenser. The condensate is returned to an inlet on the side of the boiler.

Sufficient air must be passed over the base terminals to maintain the temperatures of the ceramic to metal seals below the maximum rated value of 250 °C. Using socket type MA166B, 1.70 to 2.83 m³/min of air will be required for base cooling, blown horizontally through the socket from two diametrically opposed nozzles. It is also necessary to direct 0.06 m³/min of air into the centre hole of the socket.

AUDIO FREQUENCY POWER AMPLIFIER AND MODULATOR (Class AB1) (See Note 2)

MAXIMUM RATINGS (Absolute values)

Anode voltage	15	kV
Anode current	15	A
Anode dissipation	75	kW
Screen voltage	2.5	kV
Screen dissipation	1750	W
Grid dissipation	500	W
Grid circuit resistance	0.1	MΩ

TYPICAL OPERATING CONDITIONS (Class AB1, two tubes)

Anode voltage	10	12	15	kV
Screen voltage	1.5	1.5	1.5	kV
Grid voltage	-290	-450	-340	V
Peak AF grid voltage	270	320	310	V
Anode current (zero signal)	4.0	1.0	2.0	A
Anode current (maximum signal)	17.4	8.6	15.1	A
Screen current (zero signal)	0	0	0	A
Screen current (maximum signal)	0.77	0.50	0.62	A
Anode dissipation per tube (maximum signal)	33.0	19.0	30.5	kW
Effective load (anode to anode)	1.15	2.86	2.56	kΩ
Nominal driving power (maximum signal)	0	0	0	W
Output power (maximum signal)	110	65	165	kW

**RADIO FREQUENCY LINEAR AMPLIFIER
(Class AB1) (See Note 2)**

MAXIMUM RATINGS (Absolute values)

Anode voltage	15	kV
Anode current	15	A
Anode dissipation	75	kW
Screen voltage	2.5	kV
Screen dissipation	1750	W
Grid dissipation	500	W
Grid circuit resistance	0.1	MΩ

**TYPICAL OPERATING CONDITIONS
(Peak envelope or modulation crest
conditions, below 30 MHz)**

Anode voltage	10	15	kV
Screen voltage	1.5	1.5	kV
Grid voltage (see note 3)	-290	-340	V
Peak RF grid voltage	270	310	V
Anode current (zero signal)	2.0	1.0	A
Anode current (maximum signal)	8.7	7.55	A
Screen current (maximum signal)	0.385	0.310	A
Anode dissipation	33	30.5	kW
Nominal driving power	0	0	W
Output power (see note 4)	55.0	82.5	kW

**ANODE MODULATED RF POWER
AMPLIFIER**

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

MAXIMUM RATINGS (Absolute values)

Anode voltage	12.5	kV
Anode current	15	A
Anode dissipation (see note 5)	50	kW
Screen voltage	2.0	kV
Screen dissipation	1750	W
Grid dissipation	500	W

**TYPICAL OPERATING CONDITIONS
(below 30 MHz)**

Anode voltage	7.5	10	kV
Screen voltage	750	750	V
Grid voltage	-460	-520	V
Peak AF screen voltage (for 100% modulation)	640	675	V
Peak RF grid voltage	630	680	V
Anode current	7.0	6.6	A
Screen current	1.200	0.985	A
Grid current	0.375	0.370	A
Anode dissipation	10.5	11.0	kW
Nominal driving power	235	250	W
Output power	42	55	kW

**ANODE AND SCREEN MODULATED RF
POWER AMPLIFIER**

**(Class D Tyler high efficiency circuit,
carrier conditions per tube for use with a
maximum modulation factor of 1.0)**

MAXIMUM RATINGS (Absolute values)

Anode voltage	13.5	kV
Anode current	15	A
Anode dissipation (see note 5)	50	kW
Screen voltage	2.0	kV
Screen dissipation	1750	W
Grid dissipation	500	W

**TYPICAL OPERATING CONDITIONS
(below 3 MHz)**

Anode voltage	12	kV
Screen voltage (see note 6)	750	V
Grid voltage (see note 7)	-600	V
Peak RF grid voltage	750	V
Anode current	10.3	A
Screen current	1.6	A
Grid current	0.7	A
Anode dissipation	19	kW
Nominal driving power	520	W
Output power	105	kW
Anode efficiency	85	%

**RF POWER AMPLIFIER OR OSCILLATOR
(Class C Telegraphy, key down conditions,
one tube)**

MAXIMUM RATINGS (Absolute values)

Anode voltage	15	kV
Anode current	15	A
Anode dissipation	75	kW
Screen voltage	2.5	kV
Screen dissipation	1750	W
Grid dissipation	500	W

**TYPICAL OPERATING CONDITIONS
(below 30 MHz)**

Anode voltage	10	15	kV
Screen voltage	750	750	V
Grid voltage	-425	-480	V
Peak RF grid voltage	575	640	V
Anode current	6.70	6.45	A
Screen current	0.925	0.810	A
Grid current	0.320	0.355	A
Anode dissipation	12	14	kW
Nominal driving power	185	225	W
Output power	55	82.5	kW

NOTES

1. The tube must be operated at the stated filament voltage. Fluctuations in filament voltage must not exceed $\pm 5\%$.
2. Grid current does not flow during any part of the drive cycle.
3. The grid voltage is adjusted to obtain the specified zero-signal anode current.
4. The peak envelope or RF output power at the crest of the modulation envelope.
5. This corresponds to 75 kW anode dissipation at 100% sine wave modulation.
6. Derived via a series resistor of 470 Ω from a 1500 V HT line which is modulated by means of a tertiary winding on the anode modulation transformer.
7. The bias is obtained from a -400 V supply and 270 Ω grid resistor.

HEALTH AND SAFETY HAZARDS

E2V Technologies electronic devices are safe to handle and operate, provided that the precautions stated are observed. E2V Technologies does not accept responsibility for damage or injury resulting from the use of electronic devices it produces. Equipment manufacturers and users must ensure that adequate precautions are taken. Appropriate warning labels and notices must be provided on equipments incorporating E2V Technologies devices and in operating manuals.



High Voltage

Equipment must be designed so that personnel cannot come into contact with high voltage circuits. All high voltage circuits and terminals must be enclosed and fail-safe interlock switches must be fitted to disconnect the primary power supply and discharge all high voltage capacitors and other stored energy before allowing access. Interlock switches must not be bypassed to allow operation with access doors open.



RF Radiation

Personnel must not be exposed to excessive RF radiation. A properly designed equipment cabinet with good RF electrical connection between panels will normally provide sufficient protection.



X-Ray Radiation

This device, when operating at voltages above 5 kV, produces progressively more dangerous X-rays as the voltage is increased; the radiation varies greatly during life. The device envelope provides only limited protection and further shielding may be required. A metal equipment cabinet with overlapping joints will usually provide sufficient shielding, but if there is any doubt an expert in this field should perform an X-ray survey of the equipment.



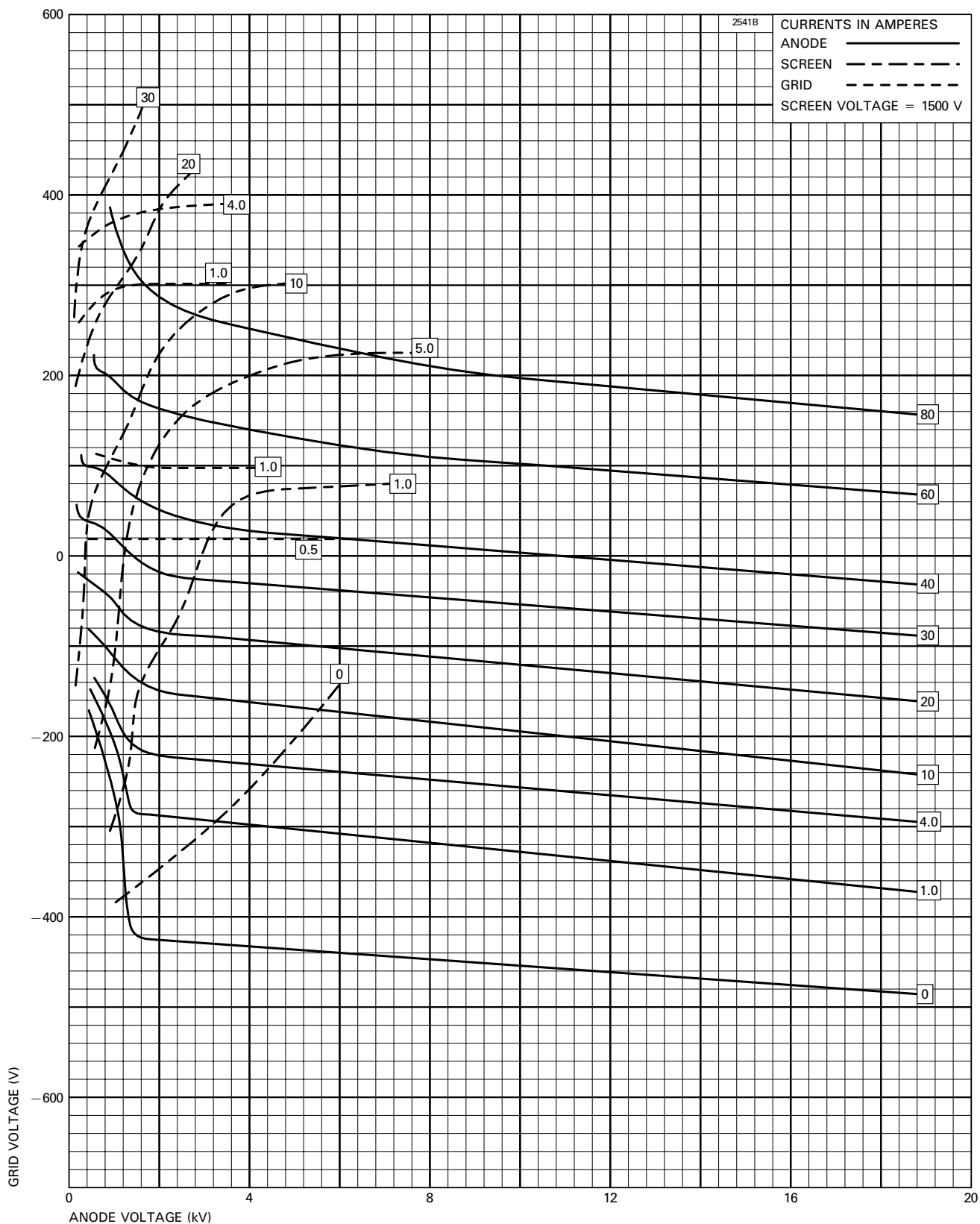
Implosion

This tube stores potential energy by virtue of its vacuum. The energy level is low, but there is some hazard from flying fragments if the tube is dropped or subjected to violent impact. The tube must be stored and transported in its approved pack. During installation or replacement the tube must not be scratched or damaged in any way likely to reduce the strength of the ceramic envelope.

References

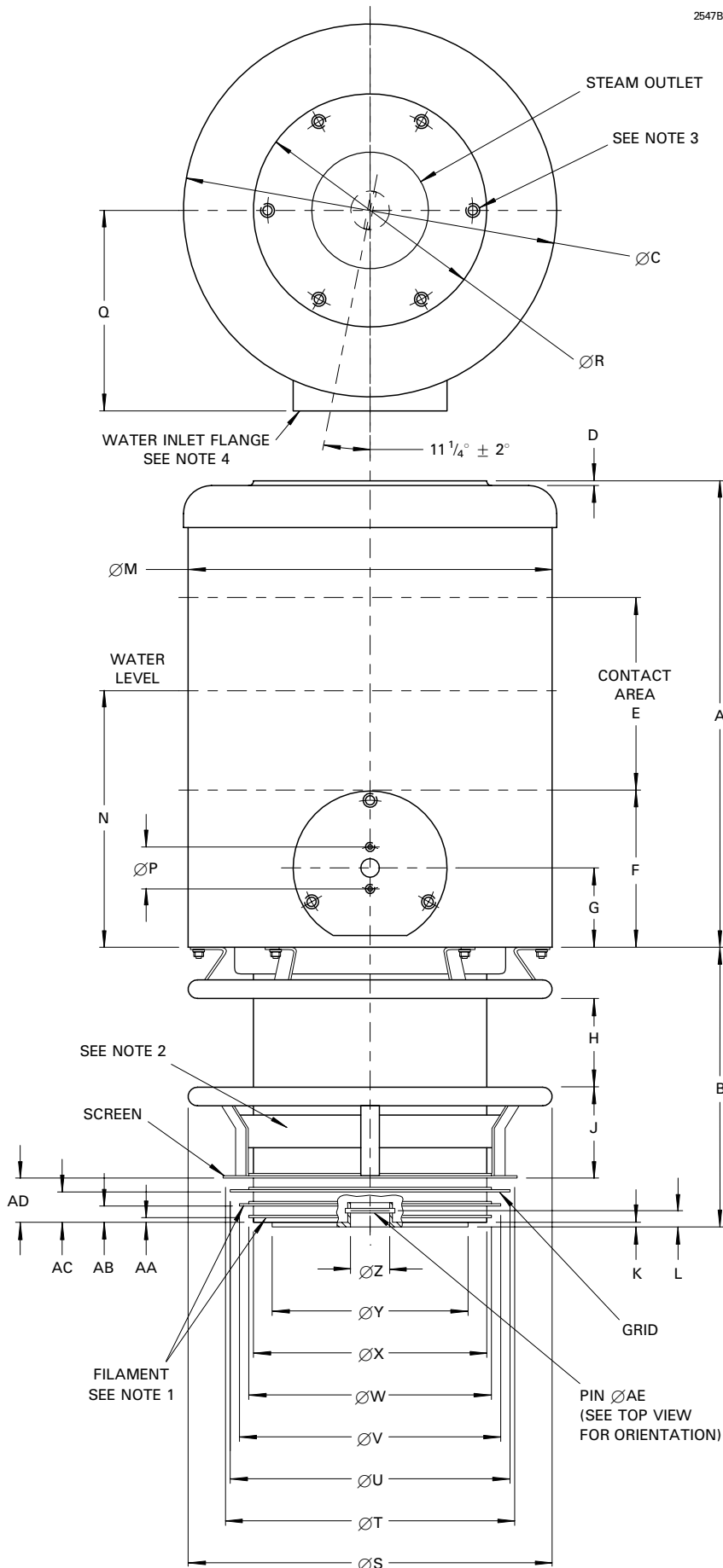
1. BS 3192. Specification for safety requirements for radio (including television) transmitting apparatus.
2. TEPAC Publication no. 181. Recommended practice for measurement of X-radiation from power tubes.

TYPICAL CONSTANT CURRENT CHARACTERISTICS



OUTLINE (All dimensions without limits are nominal)

2547B

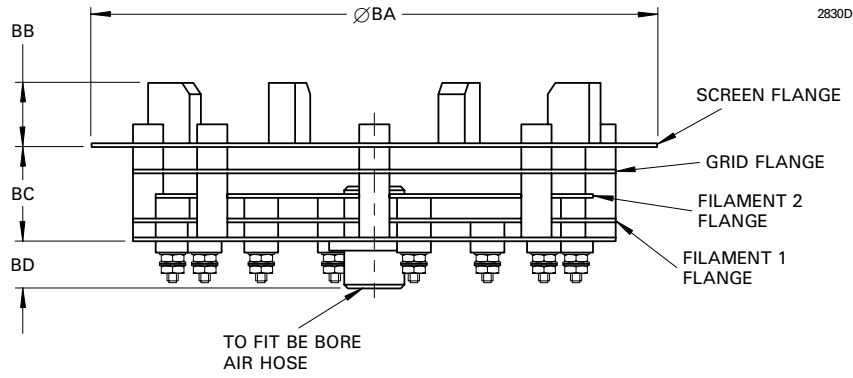


Ref	Millimetres
A	304.8 ± 3.2
B	179.5 ± 3.2
C	239.7
D	3.18
E	127.0
F	101.6
G	50.80 ± 1.57
H	50.8
J	50.8
K	1.9 max
L	12.95 ± 0.50
M	235.0
N	165.1 nom
P	114.3 min
Q	25.4
R	128.60 ± 1.57
S	152.4
T	203.1 ± 0.5
U	190.5 ± 0.5
V	177.8 ± 0.5
W	165.86 ± 0.50
X	152.4 ± 0.5
Y	127.0 ± 0.5
Z	32.00 ± 0.25
AA	3.5 ± 0.6
AB	17.6 ± 0.8
AC	30.8 ± 1.0
AD	44.0 ± 1.0
AE	3.4
AF	9.53 min
AG	133.4
AH	12.7
AJ	9.53 min
AK	85.73
AL	6.35

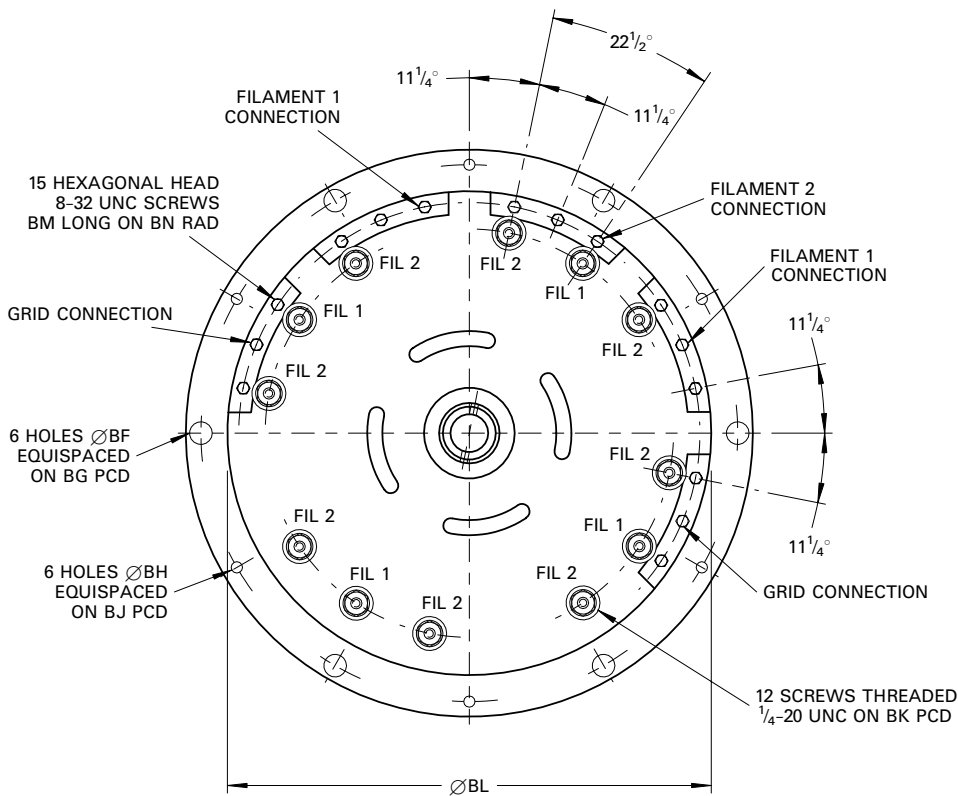
Outline Notes

1. The eccentricity of the filament, grid and screen contact surfaces will not exceed 3.18 mm with respect to dimension Z with the tube mounted on the bottom ceramic.
2. This surface must not be used for electrical contact and must not be clamped in any way.
3. 6 holes threaded $\frac{5}{16}$ - 24 UNF by AF deep equispaced on AG PCD to suit 76.2 mm diameter Q.V.F. 'Quickfit' glass tube PS3 and flange CF3.
4. Water inlet ØAH.
3 holes threaded $\frac{5}{16}$ - 24 UNF by AJ deep equispaced on AK PCD to suit 38.1 mm diameter Q.V.F. 'Quickfit' glass tube PS 1 1/2 and flange CF 1 1/2.
2 holes threaded 6-32 UNC by AL deep equispaced on P PCD.

OUTLINE OF SOCKET MA166B (All dimensions without limits are nominal)



2830D



Ref	Millimetres
BA	304.8 ± 0.4
BB	31.75 ± 3.96
BC	50.80 ± 0.51
BD	25.40 ± 0.51
BE	31.75
BF	11.10
BG	285.8
BH	5.80
BJ	285.8
BK	216.7
BL	257.2 ± 0.8
BM	9.53
BN	122.3

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