

P. SPURR

# 4CX5000A

## R.F. POWER TETRODE

Service Type CV8295

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

### ABRIDGED DATA

Forced-air cooled tetrode, coaxial metal-ceramic envelope, for audio, linear single sideband or screen-modulated r.f. amplifiers.

Anode dissipation (class C telegraphy)	5.0	kW max
Anode voltage	7.5	kV max
Frequency for full ratings	30	MHz max
Frequency at reduced ratings	110	MHz max
Output power (class C telegraphy)	16	kW

### GENERAL

#### Electrical

Filament	thoriated tungsten	
Filament voltage (see note 1)	7.5	V
Filament current	75	A
Grid-screen amplification factor ( $V_a = 2.0kV$ , $V_{g2} = 750V$ , $I_a = 1.0A$ )	4.5	

Inter-electrode capacitances:	Grounded Filament		Grounded Grid and Screen		
	Min	Max	Min	Max	
input	108	122	48	58	pF
output	18	23	18	23	pF
feedback	—	1.0	—	0.16	pF

#### Mechanical

Overall length	9.125 inches (232mm) max
Overall diameter	4.940 inches (125.5mm) max
Net weight	9.5 pounds (4.3kg) approx
Mounting position	vertical, either way up

#### COOLING

Sufficient air must be passed over the concentric base terminals and through the radiator fins to maintain the temperatures of the ceramic to metal seals and the radiator core below the maximum rated value of 250°C. It is recommended that an air distribution socket MA87 and chimney type MA104 be used with the tube (see pages 10, 11 and 12).

The air flows required with the recommended air socket and chimney to maintain the seal temperatures at 200°C in an ambient temperature of 50°C at sea level and with an operating frequency of less than 30MHz are given



below. At higher ambient temperatures, altitudes or frequencies the rate of flow must be adjusted to give equivalent cooling and should be determined individually in each case. An allowance of 1000 watts for the power dissipated by the filament and grids has been made in the values given.

Anode dissipation (kW)	Air flow		Water pressure drop	
	ft <sup>3</sup> /min	m <sup>3</sup> /min	inches	mm
2.0	75	2.1	0.4	10.2
3.0	105	3.0	0.7	17.8
4.0	145	4.1	1.1	28
5.0	190	5.4	1.5	38
6.0	230	6.5	2.0	51

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

**MAXIMUM RATINGS (Absolute values)**

Anode voltage	7.5	kV max
Anode current	4.0	A max
Anode dissipation	6.0	kW max
Screen voltage	1.5	kV max
Screen dissipation	250	W max
Grid dissipation	75	W max

**TYPICAL OPERATING CONDITIONS (Class AB1, two valves)**

Anode voltage	4.0	5.0	6.0	7.0	kV
Screen voltage	1.25	1.25	1.25	1.25	kV
Grid voltage	-270	-280	-310	-325	V
Peak a.f. voltage, grid to grid	250	240	270	235	V
Anode current (zero signal)	1.25	1.00	0.83	0.70	A
Anode current (max. signal)	5.10	4.40	4.25	3.65	A
Screen current (zero signal)	0	0	0	0	A
Screen current (max. signal)	0.35	0.33	0.30	0.24	A
Anode dissipation (maximum signal)	4.2	4.2	4.2	4.2	kW
Effective load (anode to anode)	1.5	2.37	2.94	4.10	kΩ
Nominal driving power (maximum signal)	0	0	0	0	W
Output power (max. signal)	11.5	13.5	17	17.5	kW



## RADIO FREQUENCY LINEAR AMPLIFIER

(Class AB1) (See Note 2)

### MAXIMUM RATINGS (Absolute values)

Anode voltage . . . . .	7.5	kV max
Anode current . . . . .	4.0	A max
Anode dissipation . . . . .	6.0	kW max
Screen voltage . . . . .	1.5	kV max
Screen dissipation . . . . .	250	W max
Grid dissipation . . . . .	75	W max

### TYPICAL OPERATING CONDITIONS

(Peak envelope or modulation crest conditions, below 30MHz)

Anode voltage . . . . .	7.5	kV
Screen voltage . . . . .	1.25	kV
Grid voltage (see note 3) . . . . .	-300	V
Peak r.f. grid voltage . . . . .	300	V
Anode current (zero signal) . . . . .	0.5	A
Anode current (maximum signal) . . . . .	1.9	A
Screen current (maximum signal) . . . . .	0.2	A
Anode dissipation . . . . .	4.2	kW
Nominal driving power . . . . .	0	W
Output power (see note 4) . . . . .	10	kW

## SCREEN 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 . . . . .	7.5	kV max
Anode current . . . . .	3.0	A max
Anode dissipation . . . . .	5.0	kW max
Screen voltage . . . . .	750	V max
Grid dissipation . . . . .	75	W max



### TYPICAL OPERATING CONDITIONS (below 30MHz)

Anode voltage . . . . .	7.5	7.5	kV
Screen voltage . . . . .	350	350	V
Grid voltage . . . . .	-300	-300	V
Peak a.f. screen voltage for 100% modulation . . . . .	550	550	V
Peak r.f. grid voltage . . . . .	350	375	V
Anode current . . . . .	0.9	1.14	A
Screen current (see note 5) . . . . .	-10	-10	mA
Grid current . . . . .	15	30	mA
Anode dissipation . . . . .	4.0	5.0	kW
Effective load . . . . .	2.0	1.6	k $\Omega$
Nominal driving power . . . . .	7.0	11	W
Output power . . . . .	2.75	3.55	kW

### 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 . . . . .	5.0	kV max
Anode current . . . . .	2.5	A max
Anode dissipation (see note 6) . . . . .	3.5	kW max
Screen voltage . . . . .	1.0	kV max
Screen dissipation . . . . .	250	W max
Grid dissipation . . . . .	75	W max

### TYPICAL OPERATING CONDITIONS (below 30MHz)

Anode voltage . . . . .	5.0	kV
Screen voltage . . . . .	500	V
Grid voltage . . . . .	-400	V
Peak a.f. voltage (for 100% modulation) . . . . .	450	V
Peak r.f. grid voltage . . . . .	520	V
Anode current . . . . .	1.4	A
Screen current . . . . .	0.26	A
Grid current . . . . .	0.05	A
Anode dissipation . . . . .	1.1	kW
Nominal driving power . . . . .	25	W
Output power . . . . .	5.8	kW



## R.F. POWER AMPLIFIER OR OSCILLATOR

(Class C Telegraphy, key down conditions, one valve)

### MAXIMUM RATINGS (Absolute values)

	Up to 30MHz	30–60MHz	60–110MHz	
Anode voltage . . . . .	7.5	7.0	6.5	kV max
Anode current . . . . .	3.0	2.8	2.6	A max
Anode dissipation . . . . .	5.0	5.0	5.0	kW max
Screen voltage . . . . .	1.5	1.5	1.5	kV max
Screen dissipation . . . . .	250	250	250	W max
Grid dissipation . . . . .	75	75	75	W max

### TYPICAL OPERATING CONDITIONS

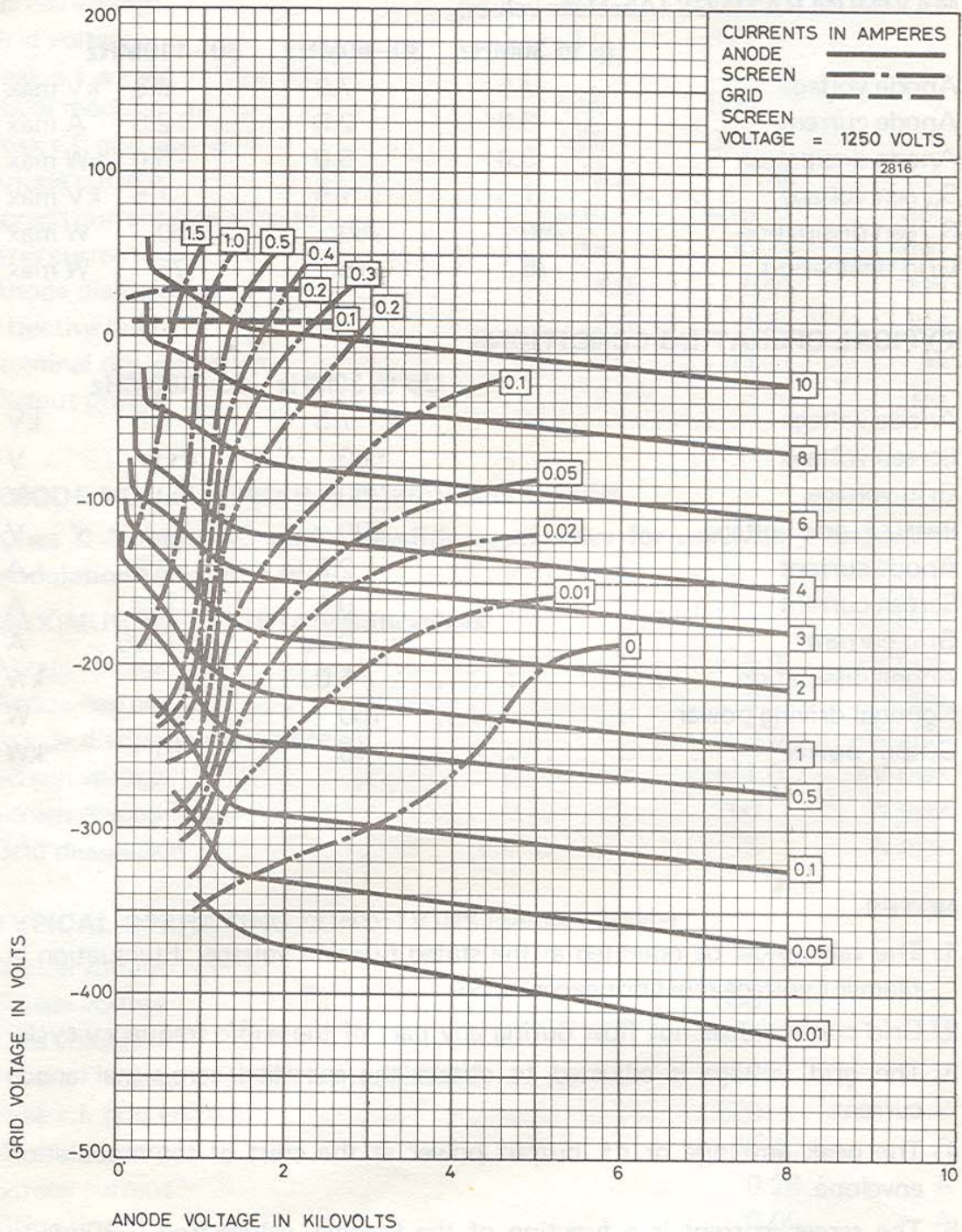
	Up to 30MHz	88–108MHz	
Anode voltage . . . . .	7.5	6.5	kV
Screen voltage . . . . .	500	750	V
Grid voltage . . . . .	–350	–350	V
Peak r.f. grid voltage . . . . .	590	–	V
Anode current . . . . .	2.8	2.3	A
Screen current . . . . .	0.5	0.2	A
Grid current . . . . .	0.25	0.05	A
Anode dissipation . . . . .	5.0	–	kW
Nominal driving power . . . . .	150	25	W
Output power . . . . .	16	10	kW

### NOTES

1. The valve must be operated at the stated filament voltage. Fluctuation in filament voltage must not exceed  $\pm 5\%$ .
2. Grid current does not flow during any part of the audio frequency cycle.
3. The grid voltage is adjusted to obtain the specified zero-signal anode current.
4. The peak envelope or r.f. output power at the crest of the modulation envelope.
5. The screen current is a function of the loading; values from  $-20\text{mA}$  to  $+20\text{mA}$  may be considered typical at carrier level.
6. This corresponds to  $5.0\text{kW}$  anode dissipation at 100% sine wave modulation.

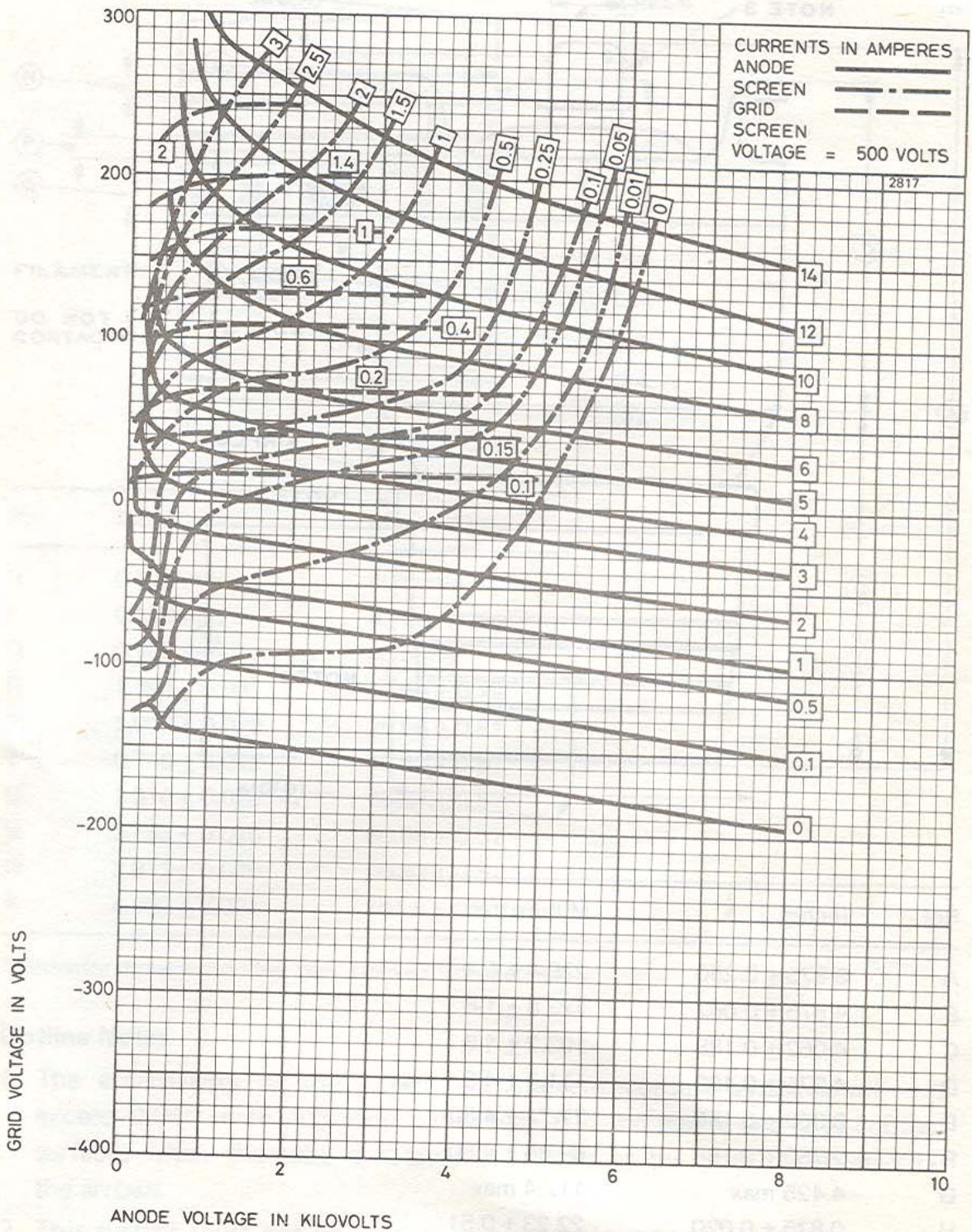


# TYPICAL CONSTANT CURRENT CHARACTERISTICS



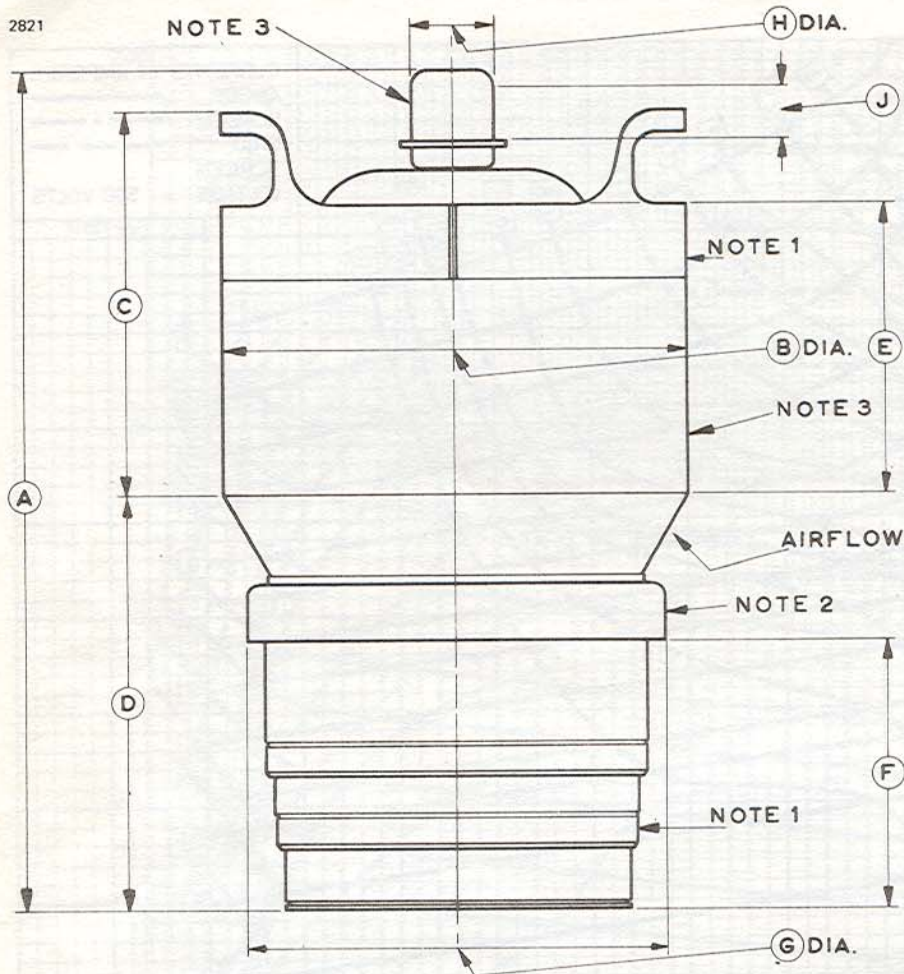


# TYPICAL CONSTANT CURRENT CHARACTERISTICS





# OUTLINE



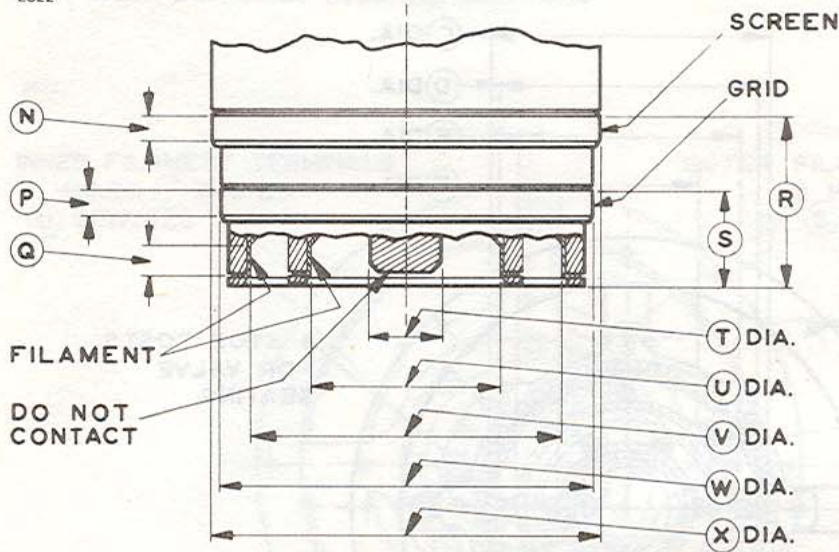
Ref	Inches	Millimetres
A	$8.875 \pm 0.250$	$225.4 \pm 6.4$
B	$4.875 \pm 0.062$	$123.8 \pm 1.6$
C	$4.062 \pm 0.188$	$103.2 \pm 4.8$
D	$4.375 \pm 0.188$	$111.1 \pm 4.8$
E	$3.062 \pm 0.188$	$77.77 \pm 4.80$
F	$2.750 \pm 0.188$	$69.85 \pm 4.80$
G	4.425 max	112.4 max
H	$0.875 \pm 0.020$	$22.23 \pm 0.51$
J	0.375 min	9.53 min

Millimetre dimensions have been derived from inches.



## OUTLINE DETAILS

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Ref	Inches	Millimetres
N	0.188 min	4.78 min
P	0.188 min	4.78 min
Q	0.188 min	4.78 min
R	$1.795 \pm 0.031$	$45.59 \pm 0.79$
S	$1.018 \pm 0.032$	$25.86 \pm 0.81$
T	$0.740 \pm 0.020$	$18.80 \pm 0.51$
U	$1.916 \pm 0.020$	$48.67 \pm 0.51$
V	$3.153 \pm 0.020$	$80.09 \pm 0.51$
W	$3.812 \pm 0.020$	$96.82 \pm 0.51$
X	$4.000 \pm 0.020$	$101.6 \pm 0.5$

Millimetre dimensions have been derived from inches.

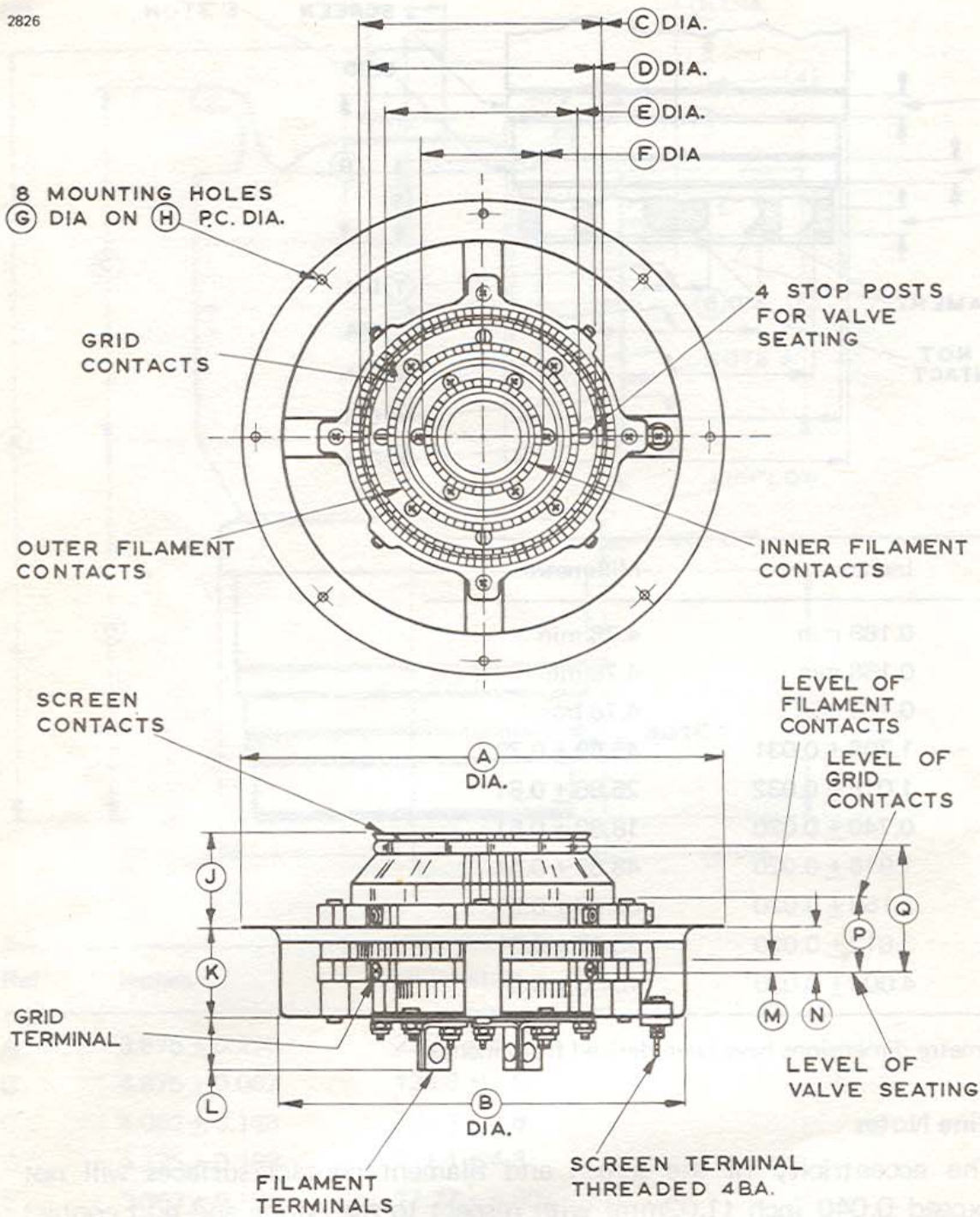
### Outline Notes

1. The eccentricity of the screen and filament contact surfaces will not exceed 0.040 inch (1.02mm) with respect to the anode and grid contact surfaces when the tube is rotated on rollers at the points indicated by the arrows.
2. This surface must not be used as an electrical contact and it must not be clamped in any way.
3. This surface may be used for making electrical contact to the anode.



# OUTLINE OF AIR DISTRIBUTION SOCKET MA87

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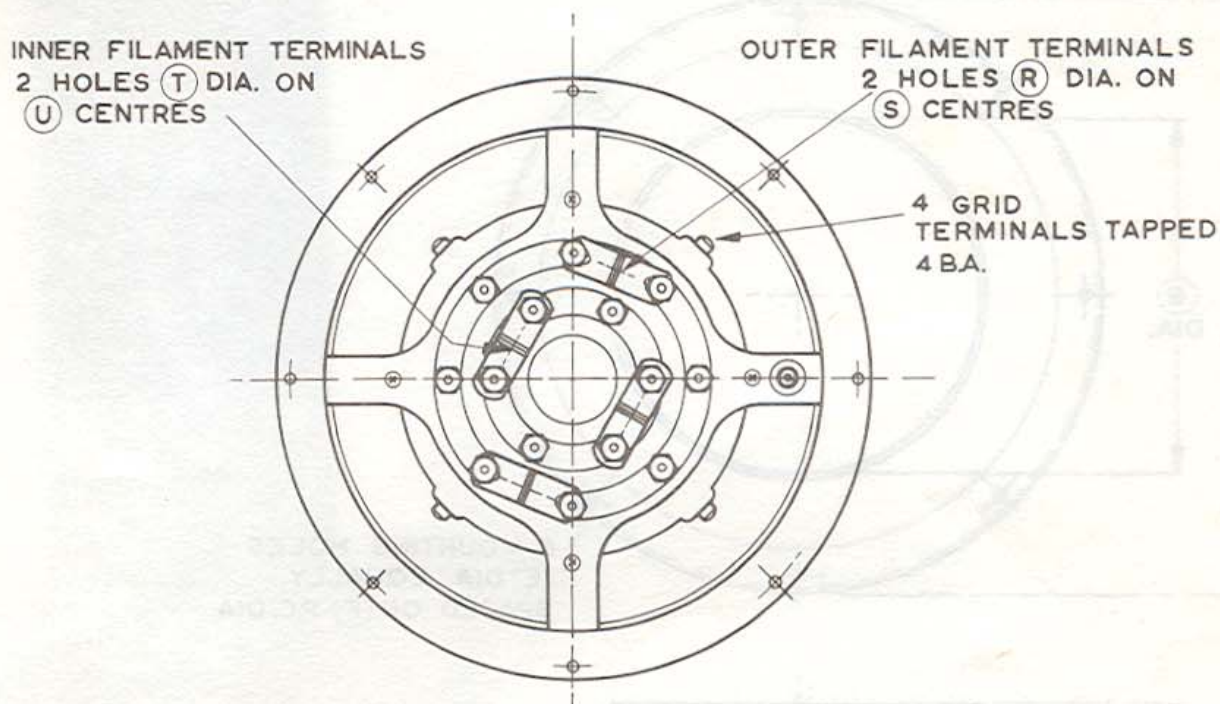




# OUTLINE DETAIL OF MA87

View from underside showing terminals

2827



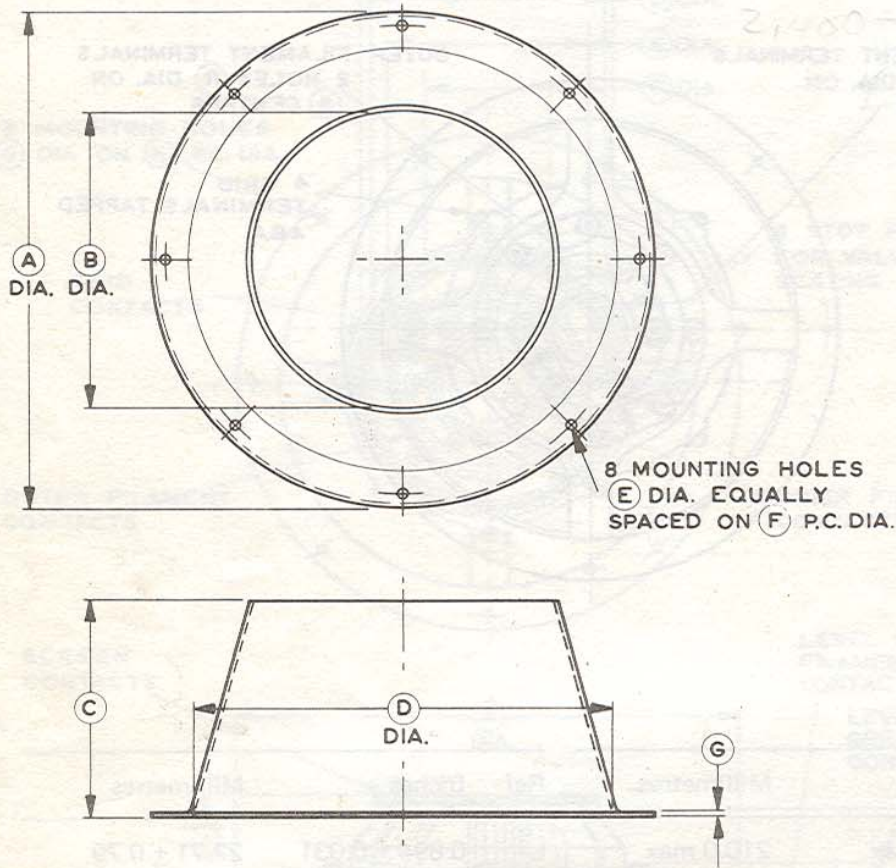
Ref	Inches	Millimetres	Ref	Inches	Millimetres
A	8.266 max	210.0 max	L	0.894 ± 0.031	22.71 ± 0.79
B	6.766 max	171.9 max	M	0.228 ± 0.012	5.79 ± 0.30
C	3.910 ± 0.030	99.31 ± 0.76	N	0.672 ± 0.017	17.07 ± 0.43
D	3.702 ± 0.030	94.03 ± 0.76	P	0.841 ± 0.015	21.36 ± 0.38
E	3.281 ± 0.030	83.34 ± 0.76	Q	1.626 ± 0.031	41.30 ± 0.79
F	2.031 ± 0.030	51.59 ± 0.76	R	0.250 ± 0.015	6.35 ± 0.38
G	0.147	3.73	S	1.562 ± 0.015	39.67 ± 0.38
H	7.750	196.9	T	0.250 ± 0.015	6.35 ± 0.38
J	1.125 ± 0.015	28.58 ± 0.38	U	0.937 ± 0.015	23.80 ± 0.38
K	1.489 ± 0.028	37.82 ± 0.71			

Millimetre dimensions have been derived from inches.



**OUTLINE OF AIR CHIMNEY MA104**  
 (All dimensions without limits are nominal)

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Ref	Inches	Millimetres
A	8.250	209.6
B	4.891 <sup>+ 0.062</sup> - 0.000	124.2 <sup>+ 1.57</sup> - 0.00
C	3.437	87.30
D	6.750	171.5
E	0.157	4.00
F	7.750	196.8
G	0.062	1.57

Millimetre dimensions have been derived from inches except dimension E.