



M506A

X-BAND MAGNETRON

Service Type CV3982

The data should be read in conjunction with the Magnetron Preamble.

ABRIDGED DATA

Fixed frequency pulse magnetron

Frequency range	9360 to 9460	MHz
Typical peak output power	50	kW
Magnet		separate
Output	no. 16 waveguide	
	(0.900 x 0.400 inch internal)	
Coupler	UG-40B/U (5985-99-083-0051)	
Cooling		forced-air

GENERAL

Electrical

Cathode		indirectly heated
Heater voltage (see note 1)	3.0	V
Heater current at 3.0V	3.8	A
Cathode heating time (minimum)	2.0	min

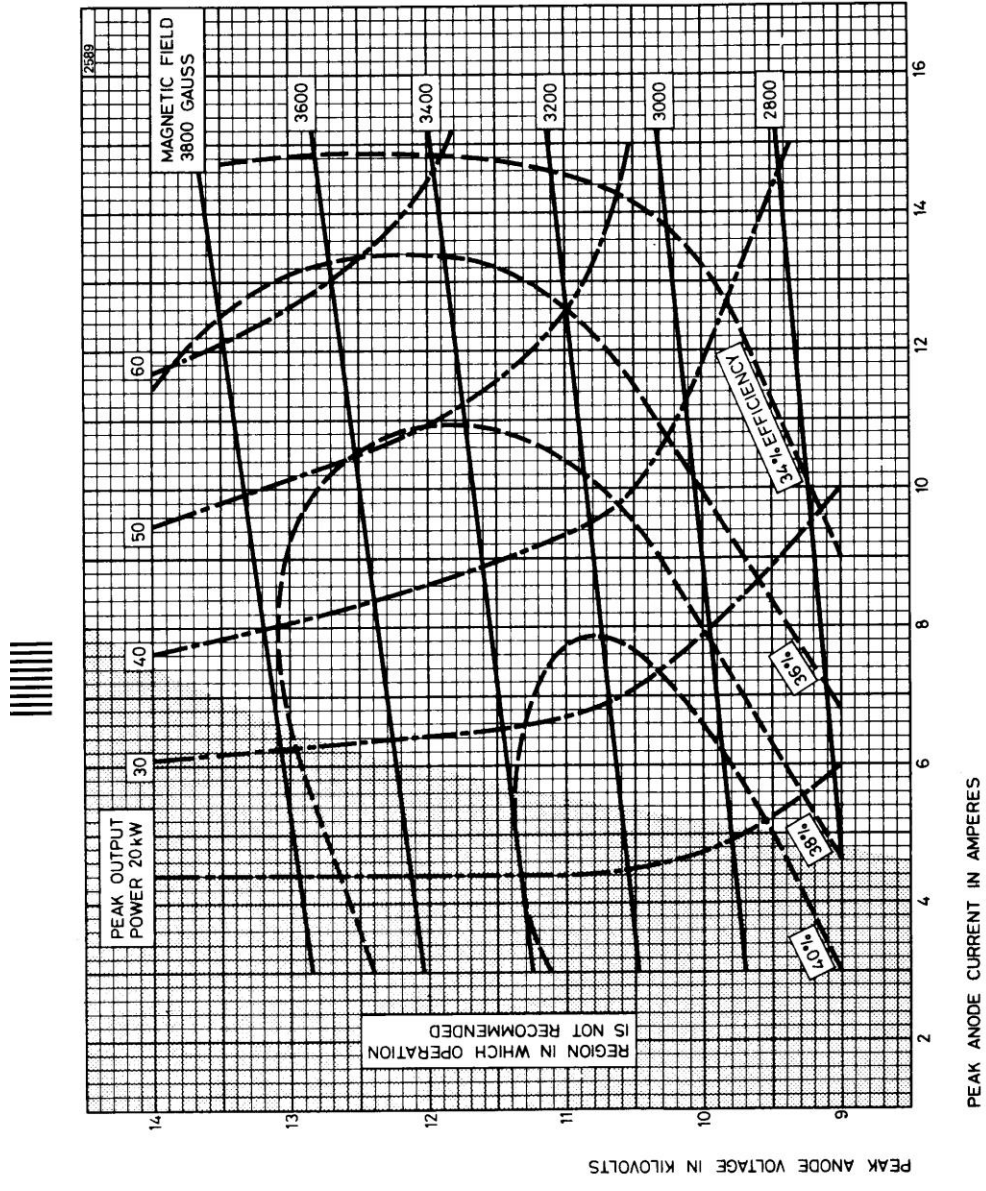
Mechanical

Overall dimensions	6.390 x 6.170 x 4.263 inches max	
	162.3 x 156.7 x 108.3mm max	
Net weight	1¼ pounds (0.8kg) approx	
Mounting position		any

Cooling		forced-air
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TYPICAL PERFORMANCE CHART



MAXIMUM AND MINIMUM RATINGS (Absolute values)

These ratings cannot necessarily be used simultaneously, and no individual rating should be exceeded.

	Min	Max	
Heater voltage (see note 1)	2.7	3.3	V
Anode voltage (peak)	10	15	kV
Anode current (peak)	—	12	A
Input power (peak)	—	150	kW
Input power (mean) (see note 2)	—	150	W
Duty cycle	—	0.001	
Pulse length	—	2.0	μ s
Rate of rise of voltage pulse (see note 3)	—	200	kV/ μ s
Anode temperature (see note 4)	—	140	$^{\circ}$ C
V.S.W.R. at the output coupler	—	1.5:1	

TYPICAL OPERATION

Operational Conditions

Heater voltage	2.5	1.5	V
Magnetic field (see note 5)	3800	3250	gauss
Anode current (peak)	12	12	A
Pulse length	0.4	1.0	μ s
Pulse repetition rate	1100	1000	p.p.s.
Rate of rise of voltage pulse (see note 3)	200	150	kV/ μ s

Typical Performance

Anode voltage (peak)	14.2	11.5	kV
Output power (peak)	50	50	kW
Output power (mean)	22	50	W



TEST CONDITIONS AND LIMITS

The valve is tested to comply with the following electrical specification

Test Conditions

	Oscillation 1	Oscillation 2	Oscillation 3	
Magnetic field (see note 5)	3250	3250	3800	gauss
Heater voltage (for test)	1.5	1.5	2.5	V
Anode current (peak)	12	12	12	A
Duty cycle	0.001	0.001	0.00044	
Pulse length (see note 6)	1.0	1.0	0.4	μ s
V.S.W.R. at the output coupler	1.05:1	1.5:1	1.05:1	
Rate of rise of voltage pulse (see note 3)	150	150	200	kV/ μ s

Limits

	Min	Max	Min	Max	Min	Max	
Anode voltage (peak)	10.5	12.5	—	—	13	15.5	kV
Output power (mean)	35	—	—	—	20	—	W
Efficiency	27	—	—	—	—	—	%
Frequency (see note 7)	9360	9460	—	—	—	—	MHz
R.F. bandwidth at ¼ power (see note 8)	—	—	—	3.0	—	7.5	MHz
Frequency pulling	—	—	—	15	—	—	MHz
Frequency pushing (see note 9)	—	5.0	—	—	—	—	MHz
Missing pulse count (see note 10)	—	—	—	0.25	—	—	%
Cold impedance							see note 11
Mode change							see note 12
Heater current							see note 13
Temperature coefficient of frequency							see note 14

LIFE TEST

The quality of all production is monitored by the random selection of valves which are then life-tested under Oscillation 3 conditions. If the valve is to be operated under conditions other than those specified herein, English Electric Valve Company Ltd. should be consulted to verify that the life of the valve will not be impaired.

End of Life Criteria (under Test Conditions Oscillation 1)

Output power (mean)	28	W min
R.F. bandwidth at ¼ power (Oscillation 2)	3.0	MHz max
Frequency	9360 to 9460	MHz

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NOTES

1. With no anode input power.

On the application of anode power, the heater voltage must be reduced according to the following schedule.

Mean input power (W)	Heater voltage (V)
up to 30	3.0
31 to 80	2.5
81 to 120	2.0
121 to 150	1.5

The valve heater must be protected against arcing by the use of a minimum capacitance of 4000pF shunted across the heater directly at the input terminals; in some cases a capacitance as high as 2 μ F may be necessary depending on the equipment design. For further details see the preamble to this section.

The M506A has been tested for satisfactory operation with sinusoidal heater voltages of 50, 1100 and 2000Hz. English Electric Valve Co. Ltd. should be consulted if other supply frequencies are to be used.

2. The various parameters are related by the following formula:

$$P_i = i_{apk} \times v_{apk} \times D_u$$

where P_i = mean input power in watts

i_{apk} = peak anode current in amperes

v_{apk} = peak anode voltage in volts

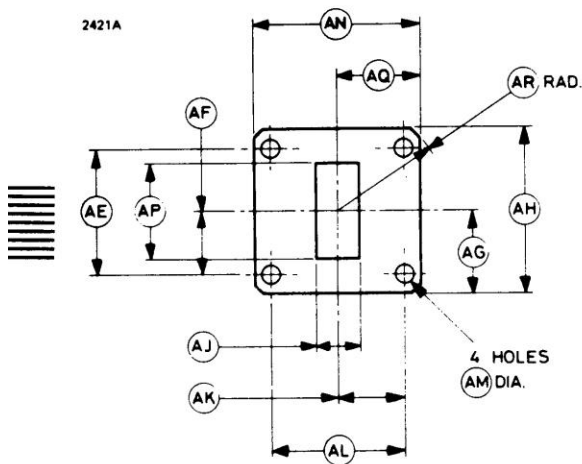
and D_u = duty cycle.

3. Defined as the slope of the steepest tangent to the leading edge of the voltage pulse above 80% amplitude. Any capacitance in the viewing system must not exceed 6.0pF.
4. The anode temperature must be kept below the limit specified by means of a suitable flow of air over the anode fins.
5. Tolerance ± 50 gauss at 3250 gauss and ± 100 gauss at 3800 gauss. The north pole of the magnet must be adjacent to the cathode terminal.
6. Tolerance $\pm 10\%$.
7. At anode temperature 25°C.
8. The maximum bandwidth in MHz is given by 3.0/(pulse length in μ s).
9. Mean anode current varied between 12 and 14mA.
10. The mismatch is varied through all phases during a 30 second period while the count is taken. Missing pulses are expressed as a percentage of the number of input pulses applied during this 30 second period. Pulses are defined as missing when the r.f. energy level is less than 70% of the normal energy level in the frequency range 9350 to 9470MHz.



11. When a signal of the same frequency as the valve operating frequency is fed into the valve, a standing wave is produced in the feeder system. The v.s.w.r. is tested to be greater than 6:1 and its phase such that a position of standing wave minimum is 16.5 to 22.5mm from the flange toward the anode.
12. Over the range 8 to 15mA, no pulses shall be missing when viewed with a spectrum analyser, nor double traces of voltage or current observed on the oscilloscope.
13. Measured with heater voltage of 3.0V and no anode input power, the heater current limits are 3.5A minimum, 4.0A maximum.
14. Design test only. The maximum frequency change with anode temperature change (after warming) is $-0.25\text{MHz}/^{\circ}\text{C}$.

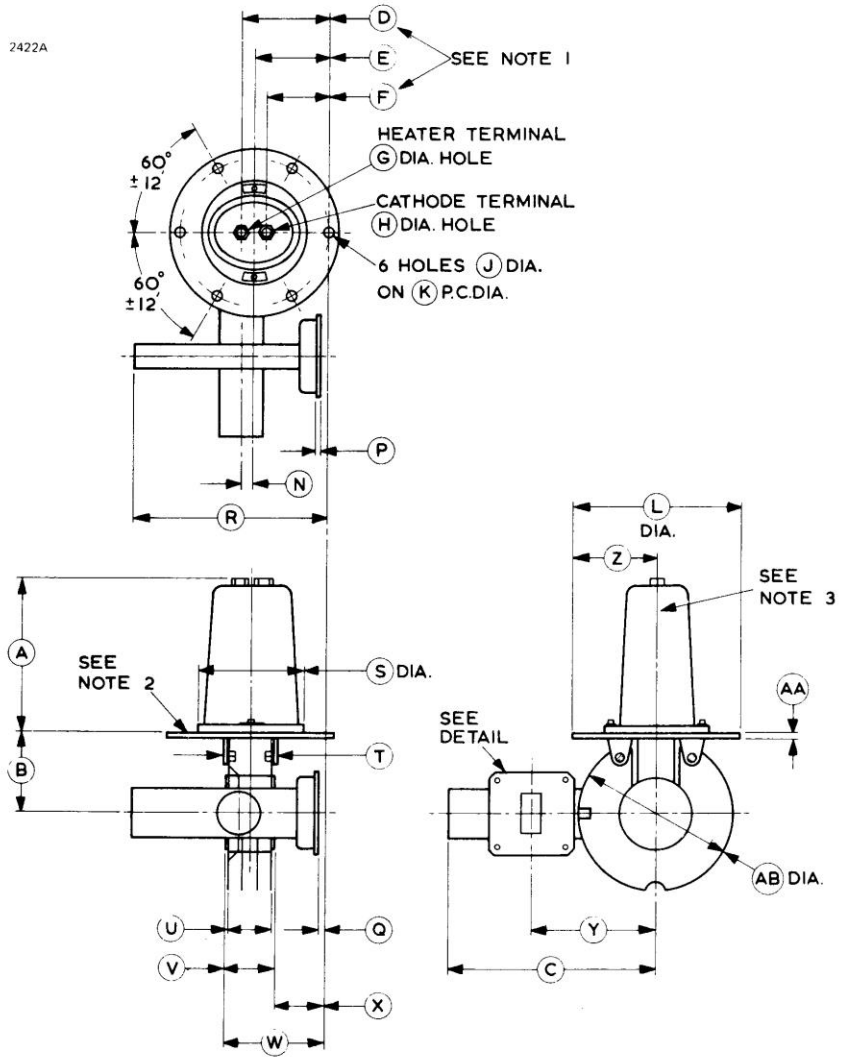
Output Flange (All dimensions without limits are nominal)



Ref	Inches	Millimetres	Ref	Inches	Millimetres
AE	1.220 ± 0.004	30.988 ± 0.102	AL	1.280 ± 0.004	32.512 ± 0.102
AF	0.610	15.49	AM	0.1495 ± 0.003	3.797 ± 0.076
AG	0.812 ± 0.015	20.62 ± 0.38	AN	1.625 ± 0.015	41.28 ± 0.38
AH	1.625 ± 0.015	41.28 ± 0.38	AP	0.900	22.86
AJ	0.400	10.16	AQ	0.812 ± 0.015	20.62 ± 0.38
AK	0.640	16.26	AR	1.062	26.97

Millimetre dimensions have been derived from inches.

OUTLINE (See page 8 for outline dimensions and notes)



Outline Dimensions (All dimensions without limits are nominal)

Ref	Inches	Millimetres	Ref	Inches	Millimetres
A	2.984 ± 0.062	75.79 ± 1.57	Q	0.437 ± 0.020	11.10 ± 0.51
B	1.562 ± 0.020	39.67 ± 0.51	R	4.062 max	103.2 max
C	4.750 max	120.7 max	S	2.218 max	56.34 max
D	1.687	42.85	T	1.107 max	28.12 max
E	1.437	36.50	U	0.8070 ^{+ 0.0050} _{- 0.0045}	20.498 ^{+ 0.127} _{- 0.114}
F	1.187	30.15	V	0.974 max	24.74 max
G	0.169 ± 0.005	4.29 ± 0.13	W	1.938 max	49.23 max
H	0.169 ± 0.005	4.29 ± 0.13	X	0.812 min	20.62 min
J	0.193 ± 0.003	4.902 ± 0.076	Y	2.437 ± 0.015	61.90 ± 0.38
K	2.875 ± 0.006	73.03 ± 0.15	Z	1.625	41.28
L	3.250 ± 0.031	82.55 ± 0.79	AA	0.125	3.18
N	0.219	5.56	AB	3.062 max	77.77 max
P	0.110 ± 0.005	2.79 ± 0.13			

Millimetre dimensions have been derived from inches.



Outline Notes

1. The jack holes will be within a radius of 0.023 inch (0.58mm) of the location specified, but will be spaced 0.500 ± 0.010 inch (12.70 ± 0.25 mm) with respect to each other.
2. With the flange resting on a plane surface, the flatness of the mounting plate 0.500 inch (12.70mm) from the outer edge will be such that a feeler gauge 0.010 inch (0.25mm) thick and 0.125 inch (3.18mm) wide will not enter more than 0.250 inch (6.35mm) at any point.
3. The common cathode connection is indicated by a letter 'C' on this surface.