



M537A

X-BAND MAGNETRON

Service Type CV6108

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

ABRIDGED DATA

Fixed frequency pulse magnetron

| | | |
|---------------------------|-----------------------------|---|
| Frequency range | 8770 to 8830 | MHz |
| Typical peak output power | 9.0 | kW |
| Magnet | | integral |
| 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) | 6.3 | V |
| Heater current at 6.3V | 0.5 | A |
| Heater starting current, peak value, not to be exceeded | 3.0 | A max |
| Cathode heating time (minimum) (see note 2) | 2 | min |

Mechanical

| | |
|--------------------|---|
| Overall dimensions | 5.375 x 4.468 x 3.562 inches max 136.5 x 113.5 x 90.47mm max |
| Net weight | 3¼ pounds (1.5kg) approx |
| Mounting position | any |

A minimum clearance of 2 inches (50mm) must be maintained between the magnet and any magnetic materials.

| | |
|----------------------|------------|
| Cooling (see note 7) | forced-air |
|----------------------|------------|

MAXIMUM AND MINIMUM RATINGS (Absolute values)

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

| | Min | Max | |
|--|-----|--------|--------------|
| Heater voltage | 5.7 | 7.0 | V |
| Heater starting current (peak) | — | 3.0 | A |
| Anode voltage (peak) | — | 6.0 | kV |
| Anode current (peak) | 3.5 | 5.5 | A |
| Input power (peak) | — | 33 | kW |
| Input power (mean) (see note 3) | — | 82.5 | W |
| Duty cycle (see note 4) | — | 0.0025 | |
| Pulse length (see note 4) | — | 2.5 | μ s |
| Rate of rise of voltage pulse (at 4.5A peak anode current) (see note 6) | — | 75 | kV/ μ s |
| Anode temperature (see note 7) | — | 140 | $^{\circ}$ C |
| V.S.W.R. at the output coupler | — | 1.5:1 | |
| Altitude | — | 10 000 | ft |
| | — | 3.05 | km |

TYPICAL OPERATION

Operational Conditions

| | | |
|---------------------------------|------|---------|
| Heater voltage | 5.4 | V |
| Anode current (peak) | 4.5 | A |
| Pulse length | 1.0 | μ s |
| Pulse repetition rate | 1000 | p.p.s. |

Typical Performance

| | | |
|--------------------------------|-----|----|
| Anode voltage (peak) | 5.5 | kV |
| Output power (peak) | 9.0 | kW |
| Output power (mean) | 9.0 | W |

TEST CONDITIONS AND LIMITS

The valve is tested to comply with the following electrical specification

Test Conditions

| | Oscillation | | |
|--|-------------|--------|-------|
| | 1 | 2 | |
| Heater voltage (for test) | 4.5 | 6.3 | V |
| Anode current (mean) | 9.0 | 4.5 | mA |
| Duty cycle | 0.002 | 0.001 | |
| Pulse length (see note 5) | 1.0 | 2.0 | μs |
| V.S.W.R. at the output coupler (maximum) | 1.05:1 | 1.05:1 | |
| Rate of rise of voltage pulse (see note 6) | 75 | 75 | kV/μs |

Limits

| | Min | | Max | | |
|--------------------------------------|------|------|-----|------|-------------|
| | Min | Max | Min | Max | |
| Anode voltage (peak) | 5.3 | 5.7 | — | — | kV |
| Output power (mean) | 16 | — | — | — | W |
| Frequency (see note 8) | 8770 | 8830 | — | — | MHz |
| R.F. bandwidth (see note 9) | — | 2.5 | — | 1.25 | MHz |
| Frequency pulling (see note 10) | — | 15 | — | — | MHz |
| Stability (see note 11) | — | 0.25 | — | 0.25 | % |
| Cold impedance | | | | | 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 2 Test Conditions above. 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 Oscillations 1 and 2)

| | Oscillation | | |
|--|-------------|-----|---------|
| | 1 | 2 | |
| Output power (mean) | 12.5 | — | W min |
| R.F. bandwidth at ¼ power (anode current 7.5mA mean) | 3.0 | — | MHz max |
| Frequency: must be within Test Limits above, Oscillation 1 | | | |
| Stability | — | 1.0 | % max |

NOTES

1. With no anode input power.

For average pulse input powers greater than 25 watts the heater voltage shall be reduced within 3 seconds after the application of h.t. according to the following schedule:

$$V_h = 6.3 \left[1 - \frac{P_i}{180} \right] \pm 0.6 \text{ volts}$$

where P_i = mean input power in watts.

The valve heater shall 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 $2\mu\text{F}$ may be necessary depending on the equipment design. For further details see the preamble to this section.

2. For ambient temperatures above 0°C . For ambient temperatures between 0 and -55°C the cathode heating time is 3 minutes minimum.
3. 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.

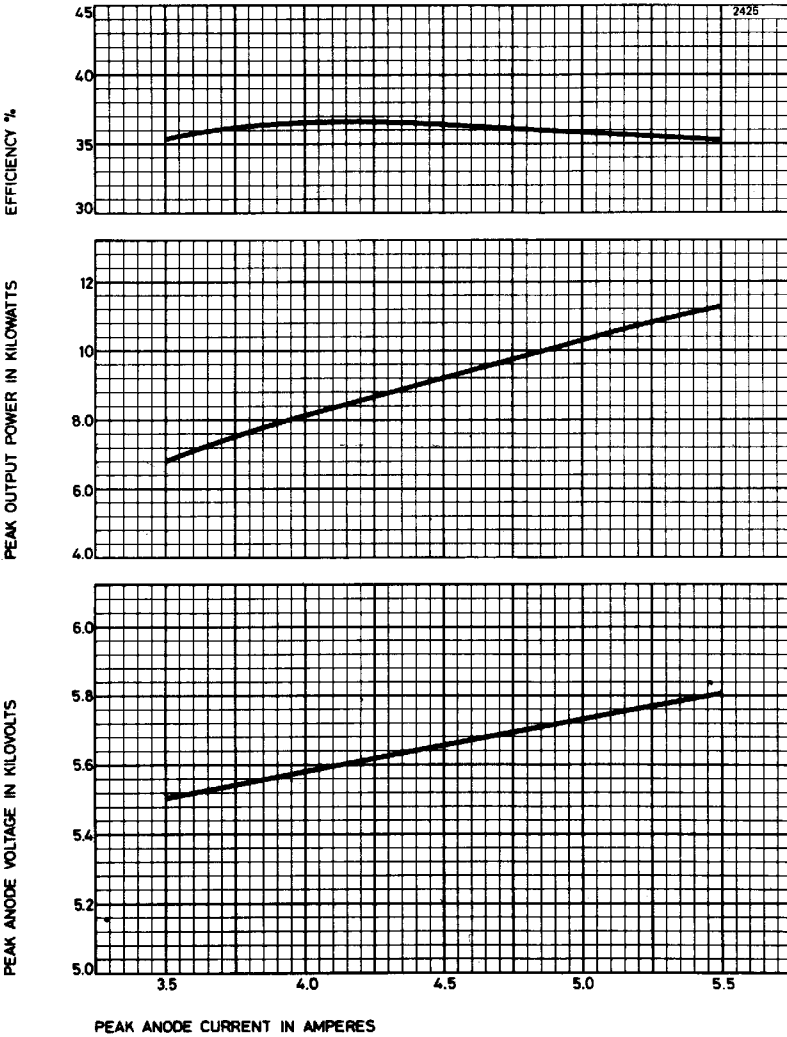
4. These ratings apply only for equally spaced pulses.
5. Tolerance $\pm 10\%$.
6. Defined as the slope of the steepest tangent to the leading edge of the voltage pulse above 80% amplitude. Any capacitance in the viewing system must not exceed 6.0pF.
7. The anode temperature measured at the point indicated on the outline drawing must be kept below the limit specified by means of a suitable flow of air over the anode body and waveguide attachment brackets which serve as cooling fins.
8. With anode temperature $40^\circ\text{C} \pm 10^\circ\text{C}$ measured at the point indicated on the outline drawing.
9. The bandwidth is measured at $\frac{1}{4}$ power points. The side lobes will be at least 6db down.
10. Measured with a v.s.w.r. greater than 1.5:1 in all phases of the mis-

match. Frequency pulling is the maximum variation in frequency as the mismatch is varied through all phases.

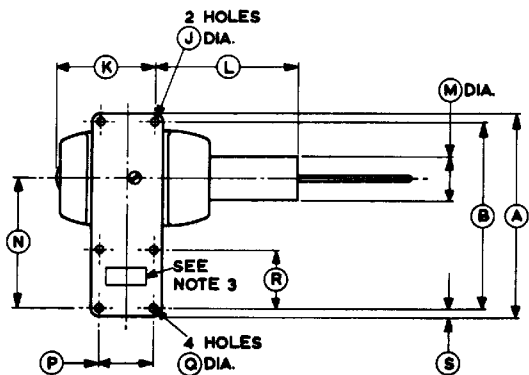
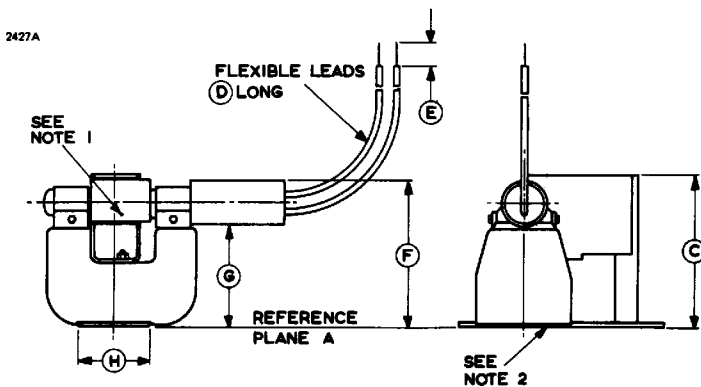
11. Pulses are defined as missing when the r.f. energy level is less than 70% of the normal energy level in the frequency range 8770 to 8830MHz. Missing pulses are expressed as a percentage of the number of input pulses applied during any consecutive 5 minute interval of a 15 minute test period.
12. When a signal of the same frequency as the magnetron 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 8:1.
13. Measured with heater voltage of 6.3V and no anode input power, the heater current limits are 0.43A minimum, 0.60A maximum.
14. Design test only. The maximum frequency change with anode temperature change (after warm-up) is $-0.25\text{MHz}/^{\circ}\text{C}$.



TYPICAL PERFORMANCE CHART



OUTLINE



Lead Connections

| Colour | Element |
|--------|-----------------|
| Yellow | Heater |
| Green | Heater, Cathode |

Outline Dimensions (All dimensions without limits are nominal)

| Ref | Inches | Millimetres |
|-----|-------------------|---------------------|
| A | 4.468 max | 113.5 max |
| B | 4.103 ± 0.004 | 104.216 ± 0.102 |
| C | 3.562 max | 90.47 max |
| D | 6.000 min | 152.4 min |
| E | 0.500 | 12.70 |
| F | 3.325 max | 84.46 max |
| G | 2.225 min | 56.52 min |
| H | 1.640 max | 41.66 max |
| J | 0.175 ± 0.003 | 4.445 ± 0.076 |
| K | 2.390 max | 60.71 max |
| L | 3.187 max | 80.95 max |
| M | 1.250 max | 31.75 max |
| N | 2.937 ± 0.250 | 74.60 ± 6.35 |
| P | 1.220 ± 0.004 | 30.988 ± 0.102 |
| Q | 0.170 ± 0.003 | 4.318 ± 0.076 |
| R | 1.280 ± 0.004 | 32.512 ± 0.102 |
| S | 0.187 max | 4.75 max |

Millimetre dimensions have been derived from inches.

Outline Notes

1. Anode temperature to be measured at this point.
2. The flatness of the mounting plate will be such that with the valve resting on a plane surface a feeler gauge 0.015 inch (0.38mm) thick and 0.125 inch (3.18mm) wide will not enter more than 0.125 inch (3.18mm) at any point.
3. The position of the waveguide and fixing holes will be such that the magnetron operates into coupler type UG-40B/U (5985-99-083-0051).