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| Specification MOS/CV2495 Issue 1, Dated 20. 2. 59 To be read in conjunction with K1006 Issue 2, Note D. | <u>Security</u> | |
| | <u>Specification</u> Unclassified | <u>Valve</u> Unclassified |

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|---|--|
| <u>Type of Valve</u> Pulse Magnetron with integral magnets. Fixed frequency <u>Prototype</u> VX5065 VX9141 <u>Cathode</u> Unipotential, indirectly heated. <u>Cooling</u> Forced Air <u>Climatic</u> Non Tropical <u>Weight</u> 10lbs approx. <u>Packing</u> For Temperate zones only | MARKINGS See K1001/4 Additional Markings:- SERIAL No. MOUNTING POSITION Any MOUNTING SUPPORT Face Plate DIMENSIONS AND CONNECTIONS See Pages:- 7 & 8 |
|---|--|

| <u>RATINGS</u> Absolute, non-simultaneous values. | | | | | |
|---|--------------|----------------|-------------|-------------|--------------|
| | <u>Units</u> | <u>Symbol</u> | <u>Max.</u> | <u>Min.</u> | <u>Notes</u> |
| Heater Voltage | Volts | E _f | 7.0 | 5.7 | A |
| Heater Current (Surge) | Amps | I _f | 15 | - | |
| Warm up time | Seconds | t _k | | 180 | A |
| Pulse length | uSec | t _p | .25 | | |
| Mean input power | Watts | P _i | 100 | | |
| Peak input power t _p = .2uS | KW | p _i | 230 | | |
| Rate of rise of anode voltage | KV/uS | r.r.v. | 150 | 100 | B |
| Voltage reflection coefficient of load | ratio | | 0.2 | | |
| Anode Temperature | °Cent | T | 150° | -55° | C |
| Cathode stalk temperature | °Cent | T | 165 | -55° | C |
| Altitude | Feet | | 10,000 | | |

NOTE A. On switching on the H.T. the heater voltage shall be reduced as in the following table:-

| I _b (mA) | E _f (volts) |
|---------------------|------------------------|
| 3 | 4.0 |
| 4 | 4.0 |
| 5 | 3.5 |
| 6 | 3.5 |
| 7 | 3.0 |
| 8 | 3.0 |

± .6 volts

NOTE B. The rate of rise of the pulse voltage (r.r.v) is defined as the maximum instantaneous value $\left(\frac{dv}{dt} \max\right)$ measured at pulse voltages which are in excess of 80% of the operating pulse voltage of the magnetron.

NOTE C. The anode shall be forced air cooled so that the maximum permitted temperature is not exceeded.

NOTE D. Refers to K1006, Issue 2, and Inspection Instructions for use with K1006, Issue 2, Paragraph 60.1.1. "Correlation Tolerances", of the Inspection Instructions shall be excluded. These documents are available from: The Secretary, The Ministry of Supply, Castlewood House, 77-91, New Oxford Street, London W.C.1. MIL)STD-105A which is required in conjunction with the MIL documents is also obtainable from the same source.

TESTS

To be performed in addition to those in K1006 (Issue 2), used in conjunction with Inspection Instructions for use with K1006 (Issue 2) (See also note D on rating page).

All values are absolute

Conditions for Oscillation Tests

| Ref. | Feature | Note | Symbol | Value Osc. 1 | Units |
|-------------------------|------------------------|------|--------|-----------------|---------------------|
| 4.16.3.2 | R.F. Load | 1 | | Z 830018 | |
| | Coupler | | | WG22 | |
| | Waveguide | | | .025 Max | |
| 4.16.3.2 | Heater | | | | Volts " Secs. |
| | Start | | Ef | 5.7 (Max) | |
| | Run | | Ef | 3.5 (Max) | |
| 4.16.3.3 | Warm up time | | tk | 180 (Max) | |
| | Pulse Characteristics | 2 | tp | .2 ± .02 | uSecs. Ratio |
| | Pulse Width | | Du | .0004 ± 10% | |
| | Duty cycle | 3 | r.r.v. | 150 | kv/μS |
| Rate of rise of voltage | | | | | |
| 4.16.3.4 | Impedance of Modulator | 2 | Zo | 700-1050 | Ohms |
| | Mean Anode Current | | Ib | 6 ± 5% | m/A |

| Qualification Approval Tests | | | | | | |
|------------------------------|--|--|-------------------------|--------|-----------|---------------|
| Ref. | Test | Conditions | Symbol | Limits | | Units |
| | | | | Min. | Max. | |
| 3. 1. | Qualification Approval Required for CV Markings. | | | | | |
| | Altitude | Osc. 1. Pressure 500m.m. (max) of Mercury Abs. Note 4. | | | | |
| | Corona. | Atmospheric pressure, Note 4 Test Voltage 25KV, $t_p = \frac{1}{4}$ uSec. $D_u = .0004$. | | | | |
| 4.16.1 | Cooling | $P_p = 160$ Watts | T_p | 55° | | °Cent. |
| | Input Capacitance | | C(in) | 8 | 14 | pfs |
| 4.9.15 | Low Temperature operation. | $E_f = 5.7$ $t_f = 180$ (max) Stability (Osc.1) at -55°C Note 6. | M.P. | .25 | | % |
| 4.9.14 | Thermal Factor | Osc.1. Measured at any reference point between 70° and 100° | $\Delta F / \Delta T_p$ | | 1 | Mc/s/°C |
| | Linear Acceleration. | No pulse voltages. | | 15g | | Accel. |
| | Shock | No pulse voltages. Acceleration 25g Min. Duration 10m.s. | | | | |
| | Carton drop Note 6, 13 | In Carton, to relevant specification | Drop | 4'-6" | | |
| | Shelf Life Note 7 | Post, Linear Acon. Shock, Carton drop, Shelf life, test end points. (1) 100% Acceptance Tests, same limits (2) Pulse voltage. (3) Wavelength, Osc.1 $T_p = 70^\circ - 100^\circ\text{C}$ | | 90 | | days |
| 4.16.7.2 | | | Δe_{py} | | 1 | KV |
| 4.16.7.3 | | | $\Delta \lambda$ | | $\pm .05$ | M.M. |
| | Stability Notes 8,9,10 | Refl. Coeff = 0.13(Min) Osc.1. All values between π 150-230KW r.r.v. 100-150KV/uS | | | 0.25% | |
| | Pushing Figure | Osc.1. Over range $i_b =$ 10-18 Amps Note 11 | | | 2 | Mc/s/ Amp. |

| Acceptance Tests | | | | | | | |
|------------------|---|--|-------------|---------|-----------------------|-------------------|-------------|
| Ref | Test | Conditions | Insp. Level | Symbol | Limits Min. Max. | | Units |
| 4.10.8 | Heater Current | Ef = 6.3 tk = 180(min) | 100% | If | 4.0 | 5.0 | Amps |
| 4.17.7.3 | Holding Period | | 100% | t | 168 | | Hrs. |
| 4.16.7.2 | Stability Note 8, 9, 10 | Osc. 1 (a) pi = 230 (min) r.r.v. = 150 (min) Refl. Coeff. = 0.13 (min) | 100% | M.P. | | .25 | % |
| | Information Stability Note 8, 9, 10 | Osc. 1. pi = 230KW (Min) r.r.v. = 300kv/uS (Min) refl. coeff = 0.13 (min) | 100% | M.P. | to be recorded. | | |
| 4.16.5 | Pulling Figure | Osc. 1, Refl. Coeff. 0.13 (min) | 100% | | | 60 | Mc/s |
| 4.16.3.5 | Pulse Voltage Note 12 | Osc. 1. | 100% | epy | 13.0 | 16.0 | KV |
| | Power Output | Osc. 1. | 100% | Po | 14 | | Watts |
| | Wavelength | Osc. 1. Anode Temperature between 40° - 70°C | | | 8.51 | 8.69 | m. m. |
| 4.16.3.7 | Spectrum I. | Osc. 1 I _b 4-6m/A Refl. coeff = 0.13 (min) (a) R/F bandwidth (b) Minor lobes Parameters observed over current range and each phase of reflection. MAX BW and MIN ratio of Minor Lobes to be recorded. | | | 6 | 2.2 ^{tp} | Mc/s Dbs |
| | Pressurising | 45p.s.i. Abs (min) | 100% | | | .005 | Lbs/WI/HR |
| | Dimensions | As per outline | 100% | | | | |
| | Information Life Test intermittent Note 14 | Group D Osc. 1. OFF Period 8 minutes | | | | 250 | Hrs |
| | Information Life tests end points | Osc. 1. (a) Power (b) Wavelength | | Po λ | 10 8.46 | 8.74 | M. M. |

NOTES

1. Details of waveguides are given in RCL351 (Waveguide) obtainable from Radio Components Standardisation Committee, 77-91, New Oxford Street, London W.C.1.
2. For all oscillation tests the magnetron shall be pulsed using a modulator of the network discharge type. The output impedance of the modulator, including all externally connected measuring devices and other loads shall

2. (Cont'd)

be between the values specified for Osc. tests. The network charging circuit shall be such that immediately following either a single or a group of arcs in the magnetron such as to present a complete short circuit to the modulator, the peak voltage on the pulse forming network prior to the generation of succeeding pulses shall not be less than in normal operation.

3. The Rate of Rise of Voltage of the test modulator shall be determined by the method given below.
The value obtained for the Rate of Rise of Voltage must not be less than the value specified. A modulator will be accepted as having suitable characteristics in respect of Rate of Rise of Voltage if the instantaneous value of the rate of rise of voltage measured with the modulator adjusted to give the specified operating conditions with the magnetron under test and with the magnetron then replaced by a capacitor of value equal to the nominal input capacitance of the magnetron where specified and otherwise equal to the average value for the type of magnetron submitted, the measurement being made over the interval between the point where the voltage first equals 80% and the point where the voltage first equals 105% of the Pulse Voltage of the magnetron under test, measured under the conditions obtaining during the test, does not fall after the maximum in this interval to less than 95% of its maximum value nor has a value less than 90% of its maximum at any point in the interval.
Measurement of Rate of Rise of Voltage. The Rate of Rise of Voltage is defined as the maximum instantaneous value of the rate of rise of voltage measured across the magnetron under Test after the voltage first exceeds 80% of the Pulse Voltage of the magnetron under test measured under the conditions specified for the test.
4. (i) There shall be no evidence of corona when operating under the required test conditions at a pressure of 500 m.m. (max) of mercury.
(ii) With the cathode cold, and at atmospheric pressure, the magnetron shall withstand the required test voltage with the required pulse characteristics from a source of approximately 1000ohms impedance for five minutes without suffering damage due to external discharges. If necessary this test may be carried out with magnetrons with dummy magnets.
5. 4.9.15 of K1006 shall be read as -55°C. When the block reached -55°C, the heater, at the specified voltage, shall be applied for $t_k = 180$ secs. (max.) A stability test shall be carried out under the required test conditions.
6. Drop onto four faces and two corners. The sealing envelope nearest the magnetron shall remain undamaged.
7. With or without pack at the discretion of the manufacturer.
8. Stability shall be measured in terms of the number of output pulses missing, expressed as a percent of the number of input pulses applied during the period of observation. The missing pulses (M.P.) due to any cause are considered to be missing if the r.f. energy is less than 70% of the normal energy level within the wavelength range 8.46-8.74 m.m. Visual evidence will be accepted until a missing pulse counter is available.

9. With the peak power input set to the specified value, the mismatch shall be introduced and the phase adjusted to give maximum anode current. A missing pulse count shall be made over a period of 3 minutes. The phase of the reflector shall then be varied through 360° (one half guide wavelength) and then set to the position showing the maximum missing pulse rate. If the value of phase is less than 45° different from the previous setting and if the previous value of the missing pulse ratio was less than 0.1%, this will be regarded as evidence of satisfactory performance. This part of the test shall be completed within 6 minutes of switching on the H.T. after the specified holding period. If the above two conditions are not satisfied, then the bracketing procedure in 14 shall be used.
10. The following bracketing procedure shall be used. The phase of the mismatch shall be set to the position showing maximum missing pulse ratio, and then the phase altered to two values, one on each side of the previous setting and differing from it by not more than 15° . The missing pulse ratio shall be measured over an interval of not less than one minute in each position. If either of the values of missing pulse ratio found exceeds the value previously obtained, a further measurement shall be made following the same procedure, but in a single position beyond that giving the greater reading. The process shall be repeated until a value of missing pulse ratio is found which is less by at least 0.1% than the highest figure found. This test must terminate within 15 minutes of switching on the H.T. after a holding period.
11. The E.H.T. supply to the modulator shall be modulated so as to cause the magnetron pulse current to vary sufficiently rapidly about a mean value so as to exclude the effects of thermal expansion of the electrodes. As the modulation is increased from zero to the required amount the mean current shall not alter by more than 0.25 mA. The maximum variation in frequency shall be measured on a spectrometer which has been suitably adjusted. The results shall be recorded against the serial number of the magnetron.
12. The requirements of 4.16.3.5. may be waived at the discretion of the manufacturer.
13. The magnetron shall be packed to the requirements of R.R.E. The pack shall not transmit vibrations to the valve which will cause fatigue and failure, and when dropped from 4' - 6" shall reduce the acceleration transmitted to the valve to less than 25g.
14. Type approval will be granted when the average life of a group of not less than 2 tubes equals the required life. The tests shall be carried out for 250hrs. on at least two tubes for information purposes. Copies of the results shall be sent to the Approving Authorities.

Drawing Notes. (See Page:- 8)

The valve is aligned by means of 2 aligning spigots fitting in holes 'A' and 'B' $.375 \pm .001$ "Dia, $3.874 \pm .004$ " between centres.

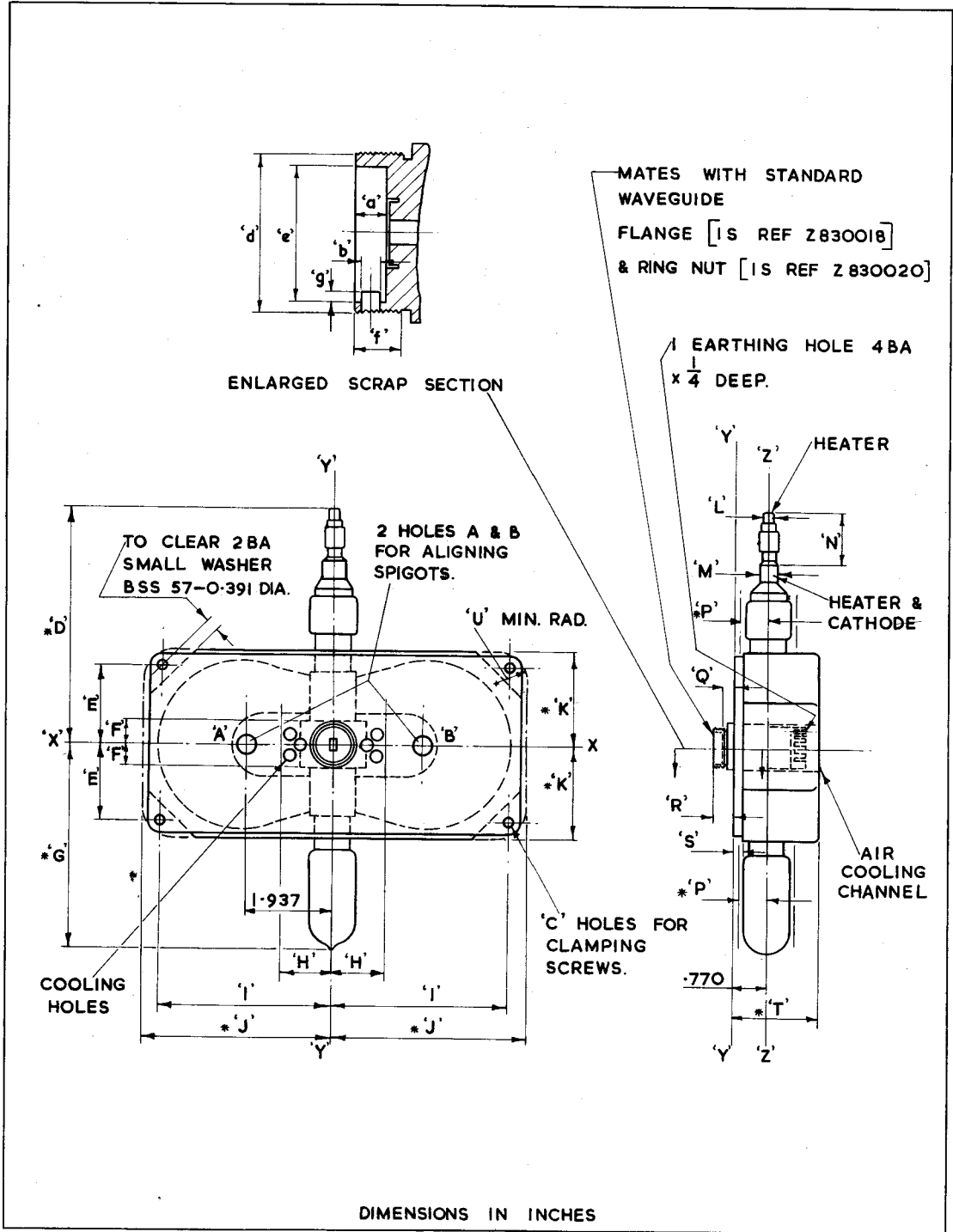
'X-X' 'Y-Y' and 'Z-Z' are reference axes only; 'X-X' passes through the centres of holes 'A' and 'B' (MAX metal cond'n). Centre of hole 'A' is 1.937 " from axis 'Y-Y' (MAX metal cond'n). The plane 'X-Y' is the plane of the mounting surface (see Dim. 'Q'). The plane through 'Y-Y' and 'Z-Z' is perpendicular to the plane 'X-Y', axes 'Y-Y' and 'Z-Z' are $.770$ " apart as shown.

The output coupler must accept a gauge comprising a cylinder $.724$ " dia., with a slot $.103$ " wide, centred on the axis, mounted on a bar with two spigots spaced 3.874 " apart along the axis. One spigot to be 0.375 " dia and spaced 1.937 " from the centre of the cylinder, the other to conform to two intersecting arcs $.1875$ " rad, whose centres are displaced by $.008$ " along the axis. The heater terminals shall be within $.050$ " of the nominal axis 'Z-Z'.

Other dimensions are:-

| | |
|-----|---|
| C | $.213 \pm .005$ " dia. |
| * D | $5/8$ " max. |
| E | $1.687 \pm .003$ " |
| F | $1/2$ " nom. |
| * G | $4 1/2$ " max. |
| H | $1 1/8$ " nom. |
| I | $3.812 \pm .003$ " |
| * J | $4 3/16$ " max. |
| * K | $2 1/16$ " max. |
| L | $.250 \pm .005$ " dia. $3/16$ " nom length. |
| M | $.540 \pm .005$ " dia $3/8$ " nom length. |
| N | $1 \pm 1/8$ " |
| * P | $5/8$ " max. rad. from 'Z-Z' |
| Q | $.218 \pm .015$ " above plane touching outer surface of clamping plate at positions of 3 - fixing holes. The fourth fixing hole being on or below this plane. The plate may flex by a further $\pm .005$ " under vibration. |
| R | $13/32$ " nom. |
| S | $.187$ " |
| * T | $2 1/4$ " max. (including all protrusions) |
| U | $11/16$ " min. rad. |
| a | $.182 \pm .005$ " |
| b | $.092 \pm .001$ " dia. |
| d | $.875$ " ϕ /dia x 28 T.P.I. B.S. 1580-1949 Class 2A |
| e | $.735 \pm .002$ " dia. |
| f | $3/16$ " min. thd. length |
| g | $.045 \pm .005$ " |

dims marked * define the max envelope of the valve and are referred to the appropriate reference axis.



CV 2495/2/8