

Specification MOA/CV6117 Issue 1 Dated 14th December 1962. To be read in conjunction with K1001	<table> <tr> <th colspan="2">SECURITY</th></tr> <tr> <th>Specification</th><th>Valve</th></tr> <tr> <td>Unclassified</td><td>Unclassified</td></tr> </table>	SECURITY		Specification	Valve	Unclassified	Unclassified
SECURITY							
Specification	Valve						
Unclassified	Unclassified						

*indicates a change

TYPE OF VALVE	- Low modulation noise, S band travelling wave power amplifier
ENVELOPE	- Metal Capsule
PROTOTYPE	- VX3322

MARKING
See K1001/5

RATINGS AND CHARACTERISTICS			
Absolute, non-simultaneous ratings (Notes 1 & 2) (Not for inspection purposes)			
Heater Voltage	(V)	3.5 ± 5%	
Max. Heater Current	(A)	8.0	4
Max. Anode Voltage	(kV)	2.5	3
Max. Anode Current	(mA)	1.5	
Max. Helix Voltage	(kV)	2.5	3
Max. Helix Current	(mA)	1.6	
Max. Collector Voltage	(kV)	3.0	2
Max. Collector Current	(mA)	25	

BASE	
International Octal	
CONNECTIONS	
Pin	Electrode
1	Heater
2	N.C.
3	omitted
4	Anode
5	N.C.
6	Helix
7	omitted
8	Heater - Cathode
Case	Earthed Collector

TYPICAL WORKING CONDITIONS			
Heater Voltage	(V)	3.5 ± 5%	
Heater Current	(A)	3.5 - 4.5	4
Anode Voltage	(kV)	0.8 - 1.4	3
Anode Current	(mA)	0 - 1.0	
Helix Voltage	(kV)	2.15 - 2.45	3
Helix Current	(mA)	0 - 1.5	
Collector Voltage	(kV)	2.4 - 2.6	2
Collector Current	(mA)	22	
V.S.W.F.	-	-	10
Bandwidth	(kMc/s)	2.7 - 3.25	6
Min. gain at an input power of 30mw	(dB)	19	7
Max. Thermal noise figure	(dB)	30	
Min. Isolation	(dB)	80	
Max. Noise Factor	dB/c/s	-156	5,9

DIMENSIONS
See drawing page 8

NOTES

1. Operated in an appropriate solenoid mount Assembly J.S. No. 5950-99-580-0584 as shown on Page 9. The Base end of the mount is centralised and locked by the manufacturer and should not be adjusted. Any focussing necessary for individual tubes should be done with the four screws at the collector end. Adjust for minimum Helix current. Solenoid current is adjusted to 6 amps.
2. All voltages are positive to cathode. The collector is connected to the capsule which is normally earthed. The collector voltage should not under any circumstance be permitted to have a value less than that of the helix voltage.
3. Adjusted in operation.
4. The surge current must not exceed 8 amps.
5. The noise power quoted is that given by a pair of sidebands which may be above or below the carrier frequency.
6. This tube has the specified minimum gain over this bandwidth.
7. The valve is designed for operation without forced air cooling when mounted in a horizontal position at an ambient temperature of 20°C . Cooling is normally effected by Thermal conduction through the base plate, which must be mounted on a suitable heat sink and by Thermal convection from the radiator. When operated in other mounting positions and/or higher ambient temperatures, forced air cooling may be required. The solenoid must be so mounted and cooled that no external part of the Valve Capsule is at a temperature in excess of 140°C .
8. The tube must be operated into an r.f. circuit presenting a v.s.w.r. not greater than 5:1.
9. The noise output is such that the mean sideband to carrier ratio over frequency ranges of $180 \pm 50 \text{ kc/s}$ bandwidth centred $150 \pm 5 \text{ Mc/s}$ and $300 \pm 5 \text{ Mc/s}$ from the carrier, when taken together, does not exceed - 156 db/c/s bandwidth when the valve is operating with an output of $2.25 \pm 0.25 \text{ W}$.
10. The v.s.w.r. of the input and output couplers measured with $I_{\text{coll}} = 0$ is not greater than 2.0 over the band $2.8 - 3.1 \text{ kMc/s}$ and not greater than 3.0 elsewhere in the band $2.7 - 3.25 \text{ kMc/s}$.
11. The Joint Service Catalogue Number is 5960-99-037-3208

Supplied by base 1A

TESTS

CV6117

To be performed in addition to those applicable in K1001

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TEST CONDITIONS: unless otherwise specified:								
V _h 3.5V		V _{hel} (Adjust)		V _{coll} 2.4 kV		V _a (adjust)		NOTE 1
K1001	Test	Test Condition	AQL %	Insp. Level	Sym- bol	Limits		Units
						Min.	Max.	
	<u>GROUP A</u>							
	(a) Heater current	No voltages except V _h = 3.5 Note 2		100%		3.5	4.5	A
	(b) Anode Voltage	V _{hel} = 2.3 Increase V _a from zero until I _{coll} = 22mA Notes 1 and 3		100%		0.8	1.4	kV
	(c) Anode current	as in(b) Notes 1 and 3		100%		-	1.0	mA
	(d) Helix current	as in(b) Notes 1 and 3		100%		-	1.5	mA
5j6.7	(e) V _{s.w.f.} (1) Input (2) Output	No voltages. Measured over the frequency ranges (a) 2.7 - 2.8 kMc/s (b) 2.8 - 3.1 kMc/s (c) 3.1 - 3.25 kMc/s		100%		-	3.0 2.0 3.0	ratio
	(f) Helix Voltage	Adjust V _a from zero until I _{coll} = 22mA Apply signal of r.f. power 30 ± 0.5 mW to the input. Frequency 3250 ± 50Mc/s Adjust V _{hel} to give max r.f. power Notes 1 and 3		100%		2.15	2.45	kV

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K1001	Test	Test Conditions	AQL %	Insp. Level	Sym- bol	Limits		Units
						Min.	Max.	
5j6.1 (Meth 1)	(g) r.f. Gain	<p>V_{hel} as obtained in (f)</p> <p>Measured at the following frequencies</p> <p>2700 ± 20 Mc/s</p> <p>3000 ± 20 Mc/s</p> <p>3250 ± 20 Mc/s</p> <p>Notes 1 and 3</p> <p>Adjust V_a from zero until $I_{coll} = 22$ mA</p> <p>Apply a signal of r.f. power 30 ± 0.5 mW to the input</p>		100%			19	dB
	(h) Noise Output as ratio to carrier power	<p>Adjust V_a from zero until $I_{coll} = 22$ mA</p> <p>Apply a signal of r.f. frequency 3045 ± 20 Mc/s to the input. Adjust level of R.F. input signal until an output of 2.25 ± 0.25 W is obtained with V_{hel} adjusted for max. r.f. output at this level.</p> <p>Notes 1, 3, 4 and 9.</p>		100%			-156	dB/ cycle band- width
5j6.5	(j) Isolation	<p>No voltages. Measure insertion loss at 2.7 Mc/s and 3.25 Mc/s, and for each frequency add figure to gain measured in Test (g) at that frequency.</p>		100%			80	dB
5j6.3	(k) Stability	<p>As (g) but with V_{hel} swept ± 50 V about this figure.</p> <p>Tube input connector short circuited. The output line shall be mismatched.</p> <p>Notes 1, 3, 5 and 8</p>		100%				μA

K1001	Test	Test Condition	AQL %	Insp. Level	Sym- bol	Limits		Units
						Min.	Max.	
	(m) Helix Admittance	No voltages Measured at 148.5 ± 2 Mc/s		100%		10 0	70 75	p.f. m.mhos
	GROUPS B and C omitted							
	<u>GROUP D</u> (n) Thermal noise figure at sideband frequencies used in test (h)	As in test (h) but without rf signal - The input connector shall be matched Notes 1 and 3		Note 10 4%			30	dB
	(o) r.f. Gain	As in test (g) but measured at 50 Mc/s interval over frequency range 2.7 - 3.25 k Mc/s commencing at 2700 \pm 20 Mc/s Note 8		10%			3	dB
	<u>GROUP E</u>	Omitted						
	<u>GROUP F</u> (p) <u>LIFE TEST</u> End Point	V _{hel} value as obtained in test (f) Adjust V _a for I _{cell} = 22 mA Notes 1 and 3	Note 11	4%		Note 7		
	<u>GROUP G</u> Electrical tests after a holding period of 14 days r.f. Gain Noise Output	Tests and limits as contained in Group A		100%				

NOTES

1. The valve shall be tested in an approved standard mount equivalent to that shown on page 9. The solenoid current shall be adjusted to a value of 6 amp. All measurements of voltage and current shall be made to the accuracy provided by B.S. 89 Industrial grade instrument.
2. The surge current shall not exceed 8 amps.
3. During adjustment and test the helix current must not exceed 1.6mA
4. The pair of sidebands measured may be above or below the carrier frequency at the option of the manufacturer.
5. The tube input short circuit shall be fixed. The output from the tube shall be coupled via a 20 db directive feed to a short circuit having a 1 db pad in front of it. To increase the sensitivity of measurement an amplifier valve CV5362 shall be fitted in the secondary arm of the directive feed leading to the detector.

The output from the detector shall be indicated on a galvanometer.

A calibration curve of the sensitivity of the system over the frequency range 2.7 to 3.3 kMc/s shall be plotted for a constant 150 μ w against galvanometer deflection. The power shall be fed into the cable normally connected to the output of the tube under test.

The galvanometer reading at the point of lowest sensitivity shall indicate the rejection limit. No spurious output or oscillation shall give a greater deflection.

Before each batch of tubes to be tested, the calibration shall be checked by feeding in a signal of 150 μ w at 3 kMc/s and adjusting the galvanometer sensitivity to give the correct reading as indicated on the curve.

The sensitivity of the system over the full range of 2.7 to 3.3 kMc/s shall be checked after each 20 valves tested.

6. Measurement to be taken after ten minutes.

7. End of Life Conditions

- The life test end point shall be 1000 hours or
- (a) When the valve fails test (b) contained in Group A. or
 - (b) When the gain at 2.0 watts output falls below 18 dB at the specified frequencies given in test (g) contained in Group A. or
 - (c) When the noise output is more than 3 dB worse than the specified limit given in test (h) contained in Group A.

Where the life test is terminated because of either (a) (b) or (c) above the number of hours over which the valve operated satisfactorily shall be recorded.

8. Expressed as variation in gain obtained over the specified frequency band. The variation in gain over any measured 100 Mc/s shall not exceed 1.5 dB.
9. Measured as mean sideband to carrier ratio over frequency ranges of 180 ± 50 kc/s bandwidth centred 150 ± 5 Mc/s and 300 ± 5 Mc/s from the carrier, when taken together.

NOTES

10. The tests contained in Group D shall be performed on a sampling basis consisting of the specified percentage of the contract requirement (taken to the nearest whole number in excess of the percentage value) and spread evenly over the production period. Samples used shall be taken from those values in current production at the time of commencement of the test.

In the case of test (o) r.f. Gain the sample size shall be 10% or one per month whichever is the greater.

During continuous production (which for the purpose of this specification shall be considered as being production which has not been interrupted for a period in excess of six calendar months) the criterion of acceptance shall be based on not more than one failure in any ten consecutive samples tested and shipment of valves may be permitted from the commencement of a contract provided that rejection of earlier production lots had not occurred.

Following a six months non-production period, shipment may be permitted after the first sample satisfies the specified tests, but in the event of an early failure, before the criterion of acceptance can be applied, the Manufacturer shall test at least two further samples made at the time of the failure.

If neither samples fail acceptance then shipment is permitted, but in event of an additional failure 100% Inspection shall be instituted and the Approval Authority informed. Where 100% Inspection has been incurred the results of all valves tested shall be supplied to the Approval Authority and shall continue until the Authority is satisfied that the cause of failure has been removed.

11. The criterion of acceptance shall be that the average life expectancy at 1000 hours shall be at least 90% where

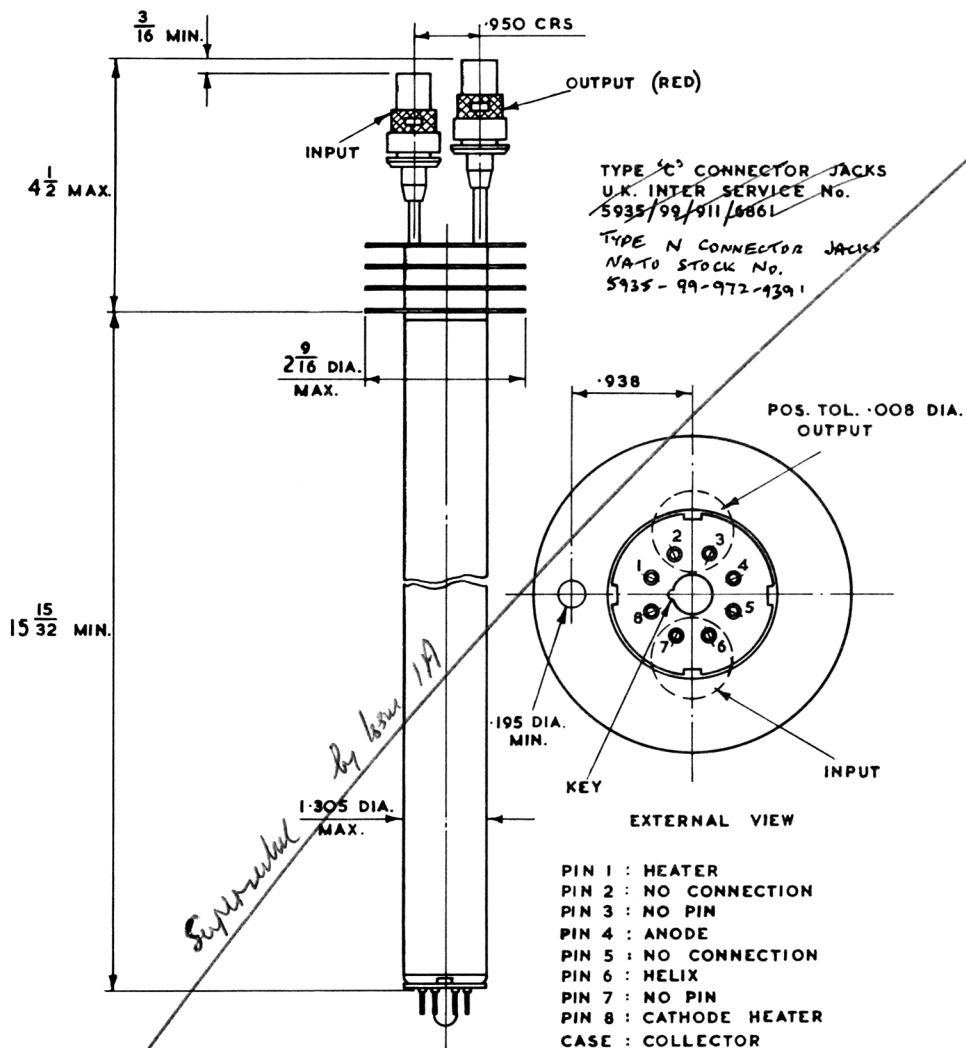
$$\text{Life Expectancy} = \frac{\text{Total hours of life operation}}{\text{Total possible hours}} \times 1000$$

If the life expectancy falls below 90% the Approval Authority shall be informed and the valves made during the relevant period held pending investigation and agreements as to disposal.

In the event of a failure which would incur rejection under this criterion the manufacturer may substitute a further sample from the current production, in which case the Approving Authority shall be informed as to the cause of failure of the replaced valve. Should the second valve fail the valves made during the relevant period shall be held pending investigation.

Superseded by Issue 1A

VALVE OUTLINE



6-PIN OCTAL WAFER VALVE BASE TO BS-0/11
BS 448 (PIN No. 3 & 7 OMITTED)

THIS DRAWING COVERS PRESENT MANUFACTURING PRACTICE.
APPARATUS EMBODYING THIS TYPE MUST BE CONSIDERED IN
THE LIGHT OF POSSIBLE VALVE STOCKS OF EARLIER DESIGN.

DIMENSIONS IN INCHES

SCALE 1:2 & FULL SIZE

