MINISTRY OF SUPPLY - DLRD/RRE

VALVE ELECTRONIC

CV2346

Specification MOS/CV2346 Issue 3 Dated 1.3.57. To be read in conjunction with K1006, except where otherwise stated.	SECURITY	
	Specification	Valve
	UNCLASSIFIED	UNCLASSIFIED

TYPE OF VALVE - Velocity Modulated Oscillator for use with external cavity resonator.

CATHODE - Indirectly heated

PROTOTYPE - VX 5028

RATING

		Absolute Maximum	Normal	Minimum	Note
→ Heater Voltage	E_f (V)	6.9	6.3	5.7	A
→ Heater Current	If (A)	-	0.65	-	
→ Resonator Voltage	E_{rs} (V)	350	300	-	A,B,D
→ Resonator Dissipation	P_{rs} (W)	16	9	-	A,D
→ Reflector Voltage	E_r (V)	-500	-100 to -300	-50	B,C
→ R.F. Power Output	P_o (mW)	75	50	30	E
→ Frequency Range	F (kMc/s)	11.5	8.0-10.0	4.0	F
Total Impedance in reflector to cathode circuit	R_r (Megohm)	0.25	-	-	G
Electronic Tuning Range	ΔF (Mc/s)	-	15	-	E

MARKING

See K1001/4

BASE

B7G

See BS.448 : B7G/1.1.

CONNECTIONS

Pin	Electrode
1	Internally connected
2	Cathode
3	Internally connected
4	Internally connected
5	Heater
6	Cathode Screen (Note H)
7	Heater
TC	Reflector
Discs	Resonator

TOP CAP

CT1

See BS.448 : 6/1.1.

DIMENSIONS

See Drawing on Page 5

MOUNTING POSITION

Any

NOTES

A. For maximum life operating conditions E_{rs} = 300V, Ef = 5.8 ± 0.1V are recommended. E_{rs} = 350V will usually give increased power output with about 25% reduction in average life.

B. The voltages quoted in this Specification are relative to cathode. The valve is normally operated with resonator at earth potential. One side of the heater should preferably be connected to cathode.

C. For the band 8.5-10.0 kMc/s the 4½ cycle reflector mode is used. In this band the reflector voltage is given by the formula

$$Er = SF - 335 \text{ volts},$$

where F = frequency (kMc/s) and the constant S has a mean value of 55.5. The reflector voltage adjustment should allow for ± 30V variation from valve to valve. See page 6 for typical reflector characteristics.

D. The temperature of the valve envelope should not at any point exceed 200°C, nor should that of the external metal parts at any point exceed 150°C. Forced air cooling may be needed if the valve is mounted in a confined space.

E. With Ers = 300V and 4½ cycle reflector mode in the band 8.5-10.0 kMc/s. The electronic tuning range ΔF is measured between the half power points of the mode, using a ¾λ radial-line resonator.

F. The valve is designed to plug into an external resonator. The frequency coverage and other properties may be modified considerably by the resonator design. Frequencies of 3.0 to 12.0 kMc/s may be obtained, but tests are confined to the band 8.5 to 10.0 kMc/s. For details of the mechanical design and of the valve seating and contact arrangement see Page 5.

G. If a high impedance reflector supply is used the circuit must include a diode to prevent Er becoming positive.

H. The cathode screen (g1) should normally be connected to cathode. By applying a negative bias of 100-200V to this electrode it is usually possible to prevent oscillation, but factory tests do not guarantee this; there may be appreciable leakage resistance between this electrode and cathode.

CV2346

ELECTRON TUBE, KLYSTRON, SEPARATE CAVITY, TYPE
CV2346

This specification sheet is to be read in conjunction with K1006

Ratings:	Ef V	Ec1 Vdc	Ec2/Ec3 Vdc	Er Vdc	Pi W	TE °C	Alt. ft.
Absolute maximum	6.9	0	350	-500	16	200	10,000
Normal	6.3	0	300	-100 to -300	9		
Absolute minimum	5.7	-200		-50			

Dimensions: As per outline. Cathode: Coated unipotential.
Base: B7G. See BS.448:B7G/1.1.

Pin No:	1	2	3	4	5	6	7	Lower disc	Upper disc	Cap
Element:	int.con.	K	int.con.	int.con.	h	g1	h	g2	g3	r

Test Conditions - unless otherwise specified.

Ef V.	Eg1 V	Ers V	Er V	Test Cavities Note 1	Load VSWR
6.3	0	300	Adjust for max. Po in 4½ cycle mode		1.05 max. W.G. No. 16

Qualification Approval Tests

Ref.	Test	Conditions	Minimum	Maximum	
3.1	Qualification Approval				
K.1005	Carton Drop:				
4.9.19.2	Vibration:	No voltages.			←
K.1001.10	Humidity:	No voltages.			←
-	Oscillation (1):	Test cavity B.			←
4.15.1	Power output:	Note 2	Po:30	75 mW	←
4.10.7.3.1	Frequency:	Difference of frequency from that marked on test cavity.	ΔFs:-	50 Mc/s	
	Microphony:	Note 3. Frequency modulation.	ΔF:-	0.5 Mc/s	
	Shock:	Note 4. 35G, duration 10 ms minimum. Frequency change.	ΔF: -	3 Mc/s	←
		Power output change	ΔPo: -	10%	
4.15.6	Warm-up Time:	Note 5. To reach Power output of 20 mW min., and frequency within 1 Mc/s of final value.	tw: -	90 s	
4.15.5	Temperature Coefficient:	Temperature range 50°C Difference between observed coefficient and that calculated for test cavity alone.	$\frac{dF}{dT}$: 0	- 0.08 Mc/°C	←
4.14.3.2.1	Excess Noise:	Note 6.	ratio:-	1	
4.11	Life Test:	Eh = 6.3 ± 0.1V Note 7	t:2000	- hrs.	←
4.11.4	Life Test End Point:	Po as percentage of value at start of test.	Po:50	- %	←
	Oscillation (2)				
4.15.1	Upper Frequency Limit:	In approved cavity at frequency 11:5 Mc/s. min. Power Output:	Po: 1	- mW	

CV2346

Acceptance Tests

Ref.	Test	Conditions	Minimum	Maximum
4.10.8	**Heater Current:**		If : 600	700 mA ←
4.10.4.8	Resonator Current:	Er = -100V. Test Cavity A.	Irs: 22	35 mA ←
	Emission:	Er = -100V. Test Cavity A. E varied from 5.8 to 6.8V.	ΔIrs: -	15 %
	Oscillation (2):	Test Cavity A		
4.15.1	Power Output:	Note 2	Po: 30	75 mW ←
4.10.5.4	Reflector Voltage	Note 8	Record Er:-195	-255 V ←
4.10.7.3.1	Frequency:	Difference of frequency from that marked on test cavity.	ΔF: - Record F -	50 Mc/s. - Mc/s.
	Electronic Tuning Rate:	Er range; Note 9	$\frac{dF}{dEr}$: 0.35	0.90 Mc/s/V ←
4.15.1	Power Output:	Er range: Note 9 Compared with max. Po	Po: 50:	- %
4.15.1	Oscillation Sink:	Er = value recorded above. Test cavity A modified to give QL = 600 max. Valve must start oscillating: power output. Note 10.	Po: 1	- mW
4.15.1	Power Output Compared with value at Ers = 300V:	Vary Ers from 290-310V	Po: 80	120 % ←
	Oscillation (3)	Test Cavity C		
4.15.1	Power Output:	Note 2	Po: 30	75 mW ←
4.10.5.4	Reflector Voltage Tracking; Departure from Calculated Value:	Compare with value predicted from formula in Note C, using values of Er and F obtained in Osc. (2) to determine value of parameter S.	ΔEr: -	6 V ←
4.10.6.7.1	Total Reflector Current:		Ir: -	4 μA ←
4.10.7.3.1	Frequency:	Difference of frequency from that marked on Test Cavity	ΔF: -	50 Mc/s.

CV2346

Notes

1. The valve shall be tested in fixed-tuned ¾λ radial-line cavities having a fixed iris coupling into waveguide W.G. No. 16. The cavities shall be similar to the reference cavities supplied by the Approving Authority, which shall be used only for testing the performance of the test cavities. The nominal characteristics of the test cavities are:-

Cavity	Frequency, kMc/s	Loaded Q, (QL)
A	10.1	850
B	9.35	670
C	8.5	670

The resonant frequency shall be clearly and indelibly marked on each test cavity and shall not differ by more than 100 Mc/s from the appropriate value above. The frequency shall be determined by measuring the frequency of oscillation of at least four valves in the test cavity and in the appropriate reference cavity; the frequency is defined as the value marked on the reference cavity plus or minus the average difference observed. The measurements shall be made after warming up of the valve and cavity to a frequency within 2 Mc/s of its steady value.

The loaded Q of each cavity shall not differ from that of the appropriate reference cavity by more than 5%. This is verified if the average minimum values of $\frac{dF}{dEr}$ for the sample valves in both test and reference cavities do not differ by more than 3%.

2. Power output limits are defined for a test cavity with an unloaded Q of 2000. The actual limits used shall be corrected according to the formula

$$\text{Revised power limit} = \text{nominal limit} \times \frac{\frac{1}{QL} - \frac{1}{QU}}{\frac{1}{QL} - \frac{1}{2000}}$$

where QL = loaded Q value given in Note 1.

and QU = unloaded Q value for test cavity used.

The unloaded Q values for reference cavities will be given by the Approving Authority. The power limit correction factor for test cavities may be determined by measuring the power output of at least four valves in both the test and an appropriate reference cavity. The average ratio of powers multiplied by the reference cavity correction factor gives the test cavity correction factor.

3. The valve shall be mounted close to the mouth of a moving coil loudspeaker on a 4 ft. square baffle. The loudspeaker shall be driven with 20 watts of noise having a substantially smooth spectrum from 50 to 5000 c/s.

4. The test shall be repeated with the shock directed along the major axis and in two mutually perpendicular directions normal to the major axis. Power output and frequency shall be measured before, during and after impact.

5. The time shall be measured from the application of heater voltage. For the frequency measurement the resonator shall have been in use before the test for a period sufficient to reach thermal equilibrium.

6. The increase in noise temperature ratio due to oscillator noise shall be measured at an intermediate frequency of 45 Mc/s. using an image-matched mixer having a conversion loss of 6 db., operating with an input of 1 mW from the oscillator.

7. The valve to be inserted in a typical cavity in thermal connection with a heat sink and with free air circulation. A sample of at least six valves shall be tested; Qualification Approval may be granted providing the average of the lives is not less than 2000 hours.

8. The reflector voltage limits shall be adjusted at the rate of 1V per 18 Mc/s deviation of the oscillation frequency from 10.1 kMc/s.

9. Vary Er by $\pm$ 12V about the mean of values giving half maximum power. Test limits apply over the full range of $\pm$ 12V. Electronic tuning rate may be measured by dynamic means providing results agree with point-by-point measurements. The value of dF used in measuring $\frac{dF}{dEr}$ shall not exceed 500 Kc/s.

10. A special test cavity may be used with modified coupling iris. Alternatively a stub may be inserted in the coupling section of a test cavity type A, within 3 cms. of the load side of the iris, with dimensions chosen to give the required QL. The value of QL may be checked as in Note 1; the average ratio of the values of $\frac{dF}{dEr}$ obtained with at least four valves shall be not less than $\frac{QL}{600}$, where QL is the value marked on the reference cavity.

CV2346

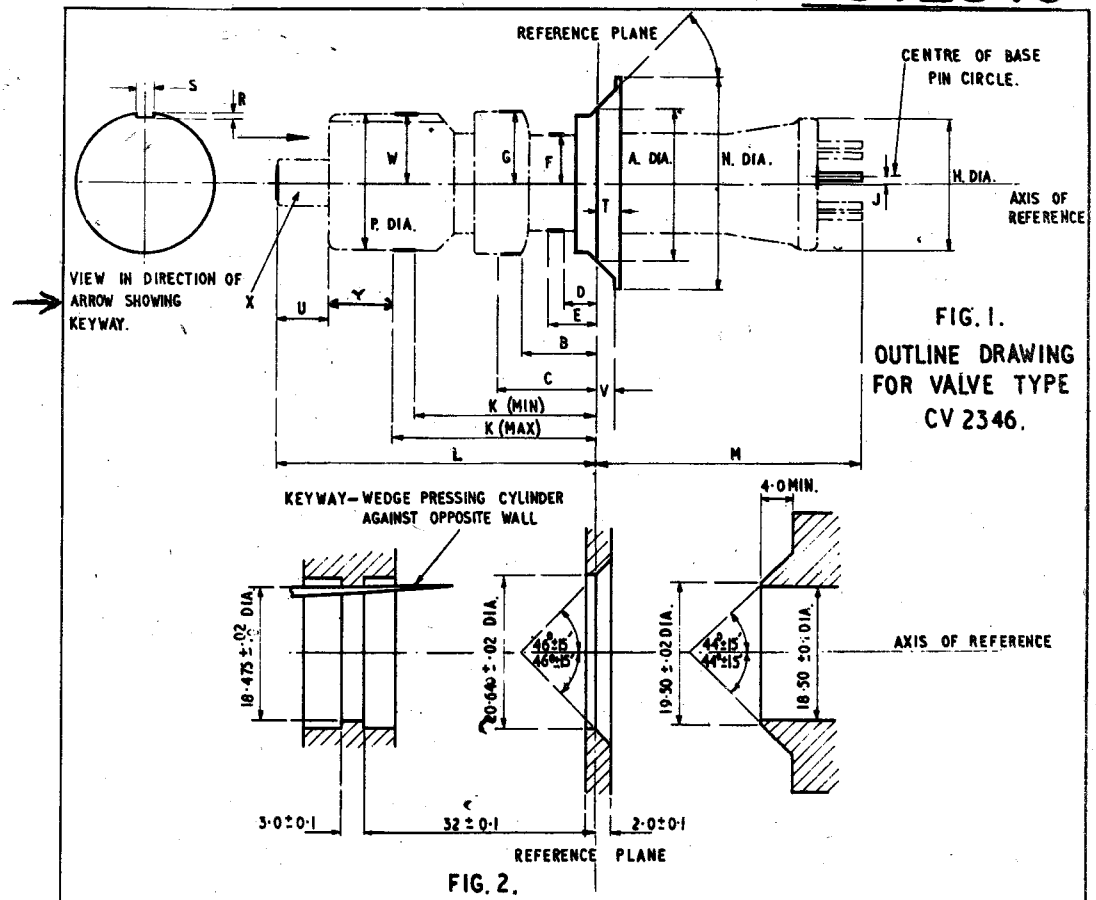


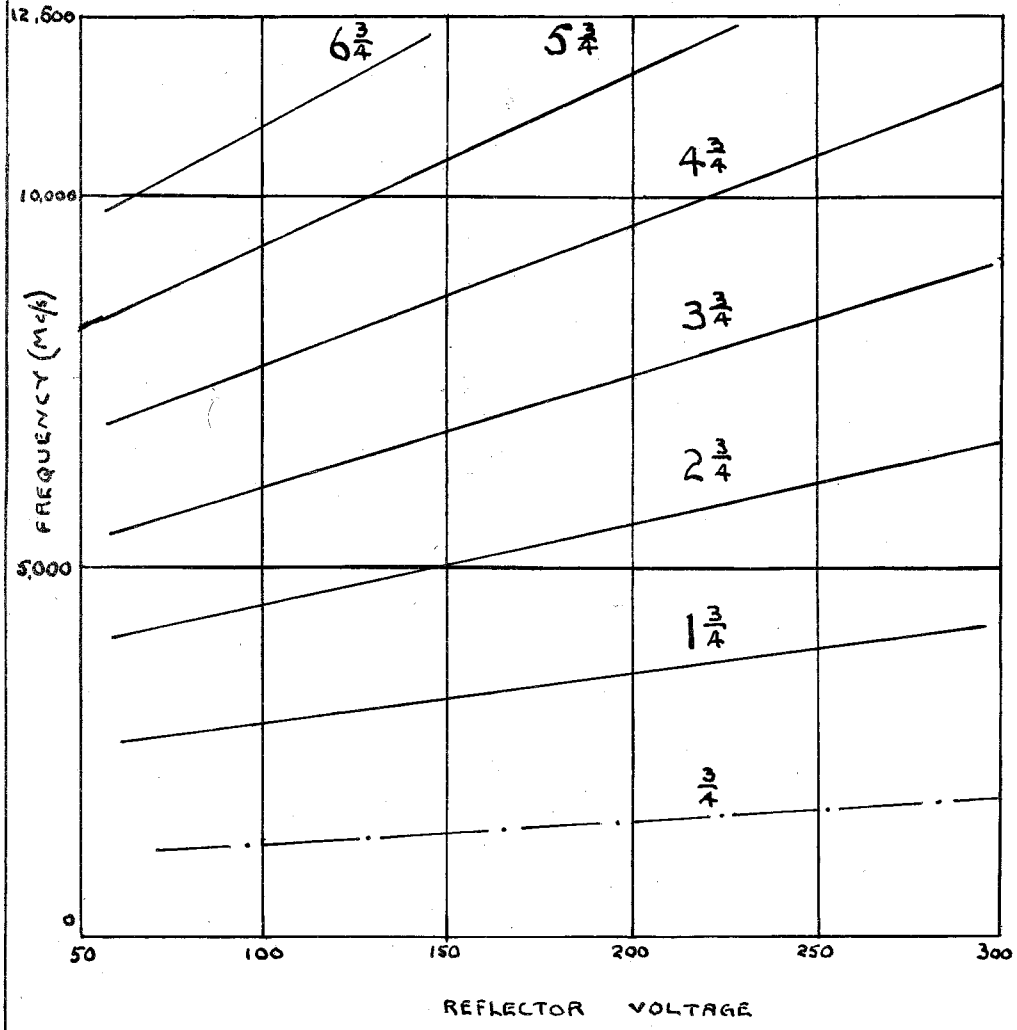
FIG. 1.
OUTLINE DRAWING FOR VALVE TYPE CV 2346.

FIG. 2.
TEST JIG DEFINING REFERENCE PLANE & AXIS.

SYMBOL	DIM. (MM)	TOLER[E].	REMARKS	SYMBOL	DIM. (MM)	TOLER[E].	REMARKS
A	20·64 (·8125")		CIRCLE OF CONTACT BETWEEN CONE AND CAVITY.	P	18·30	+·125 −0	OVER WHOLE LENGTH OF CYLINDER APPLIES OVER Y ONLY
B	10	MAX.		R	·825	±0·1	
C	13·6	MIN.		S	2·25	±0·1	SLOT IN LINE WITH MIDDLE OF GAP IN BASE PINS ±10°
D	4·5	MAX.		T	3·0 3·5	MIN. MAX.	
E	6·5	MIN.		U	7·0 8·0	MIN. MAX.	
F	7·0	MAX.	BETWEEN DIM. D & E.	V	2·25	MIN.	
G	9·34 9·71	MIN. MAX.	BETWEEN DIM. B & C. (SEE ✱ BELOW)	W	9·37	MAX.	
H	18·4	MAX.		X			TOP CAP-CTI- CONFORMS TO BS. 448:1953 SECTION 6/1.1.
J	1·0	MAX	ECCENTRICITY OF CENTRE OF B7G BASE PIN CIRCLE RELATIVE TO AXIS OF REFERENCE.	Y	9·0		
K	25·0 28·0	MIN. MAX.					
L	44·0 47·5	MIN. MAX.		θ	45°		
M	36·5 41·5	MIN. MAX.					
N	28·7	MAX.					

✱ DEFINES RADIAL MOVEMENT REQUIRED OF CONTACT SPRINGS

CV.2346/3/5



REFLECTOR MODES FOR RESONATOR VOLTAGE = 300 V

CV.2346/3/6