CV6119

VALVE ELECTRONIC

ADMIRALTY SURFACE WEAPONS ESTABLISHMENT

Specification AD/CV6119 Issue 1 dated 17th October, 1962 To be read in conjunction with K1001	SECURITY Specification: Unclassified Valve: Unclassified

TYPE OF VALVE: High Voltage Half-wave Rectifier and Inverse Diode

CATHODE: Indirectly Heated

ENVELOPE: Ceramic

PROTOTYPE: VX1049C

MARKING
See K1001/4

BASE (See Note L)
See K1001A/ IV/D13.1
Goliath Edison Screw. E40/35
B.S.98
E40/45 modified.

RATING
(All limiting values are absolute)

			Note
ALL APPLICATIONS			
Heater Voltage	(V)	4.0	A, G.
Heater Current	(A)	4.8	
Min. H.T. Switching Delay	(secs)	60	
Max. R.M.S. Anode Current	(mA)	350	
Min. Perveance	(μA/V)	125	H
Max. Anode Dissipation	(W)	100	J
Max. Operating Anode Seal Temp.	(^{o}C)	225	B
Max. Full Load Peak Inverse Voltage	(kV)	22	
Max. "No Load" Peak Inverse Voltage	(kV)	25	D
Max. P.I.V. with direct switching	(kV)	11	K
Max. D.C. Current with direct switching	(mA)	75	K
Max. Shock (Short Duration)	(g)	500	
Max. Acceleration (Continuous Vibration)	(g)	2	C
RECTIFIER APPLICATION			
Max. Peak Anode Current	(mA)	900	D
Max. d.c. Anode Current	(mA)	150	D
Min. Limiting Resistance	(ohms)	1600	D
INVERSE DIODE APPLICATION			
Max. Pulse Anode Current (Normal operation)	(A)	10	E
Max. Pulse Anode Current (Fault condition)	(A)	20	E, F.

CONNECTIONS

CONTACT	ELECTRODE
Button	Heater h
Screw Thread	(Cathode k (Heater h
Top Cap	Anode a

TOP CAP
See K1001 A I/D5.7
B.S.448/CT9

DIMENSIONS

	Min.	Max.
Overall Length	-	161 mm
Diameter	-	57.5 mm

MOUNTING POSITION

Any

See Note C

(152437)

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NOTES

See Page 2.

NOTES

A. Heater volts are to be held to 4.0V ± 5%.

B. Conduction and/or Forced Air Cooling may be required depending on the application and will be necessary when the valve is operated at maximum anode dissipation in an ambient temperature higher than 30°C.

C. When subject to vibration the valve should preferably be mounted vertically with the anode upwards.

D. Ratings apply to 50 c.p.s. with 1.0 μF capacitor.

E. Under these conditions the maximum pulse time constant is 5.0 μsecs. with a maximum duty ratio of 1:200. The pulse shape will normally be exponential and the quoted ratings refer to a pulse of this form.

F. Max. duration of fault not greater than 2 seconds.

G. The valve may be operated with heater supply frequencies in a range 50 c/s to 2500 c/s.

H. Perveance is defined as the ratio $\frac{i}{V^{3/2}}$ where i = amps and V = volts.

J. Approximate anode dissipation may be calculated as follows:-

$$\text{If } i = f(t), \text{ then dissipation} = \frac{1}{TP^{2/3}} \int_0^T \left[f(t)\right]^{5/3} dt.$$

where P is perveance
where T is pulse duration

K. The maximum P.I.V., and d.c. current with direct switching are interim figures only and may be increased when sufficient experience has been gained with production valves.

L. The length of dimension M on drawing 13.1 in K1001, AIV is 35 mm instead of the standard 45 mm.

M. The Joint Services Catalogue Number is 5960-99-037-3180.

CV6119

TESTS

To be performed in addition to those applicable in K1001.

Tests are to be performed in the specified order unless otherwise agreed with the Inspecting Authority.

Test conditions - unless otherwise stated:-

V_h (V)	Ia (mA d.c.)
4.0	300

	Test	Test Conditions	AQL %	Insp. Level	Sym-bol	Limits Min.	Limits Max.	Units
	Group A							
	Heater Current			100%	Ih	4.5	5.0	A
	Anode Voltage (d.c.)			100%	Va	140	180	V
	Anode Voltage Pulse	Adjust Va for Ia Peak = 20A, T_p = 2.5 µsecs. P.R.F. = 50 - 200 pps.		100%	Vapk	-	4.8	kV
	Rectifier Circuit Test	Half-wave circuit - Input Voltage = 9 kV r.m.s. Frequency = 50 c/s Reservoir Capacitor = 1 µF Source Resistance = 1600 ohms Load Current = 150 mA nom. Notes 1 and 3						
	Vibration Change in Heater Current after vibration	Vibrate for 1 min. at 5 g 50 c/s normal to axis		100%		-	5	%
	Groups B, C and D omitted							
	Group E							
11.2	Resonance Search Test	Frequency range = 10 c/s to 2 kc/s Acceleration = 2 g	Re-cord	I.A.		-	1.5	mA pk. to pk.
	Modulation of Anode Current	Valve to be vibrated on axis and normal to axis. I_a = 150 mA d.c. R_L = 1000 ohms						

TESTS (Cont'd)

	Test	Test Conditions	AQL %	Insp. Level	Sym-bol	Limits Min.	Limits Max.	Units
	Group E (Cont'd)							
	Functional Vibration Test	Frequency range = 10c/s to 500 c/s Max. rate of change of frequency = 1 octave/min. During the test the valve will be operated as for Rectifier Circuit Test in Group A (except for Note 1).		T.A.				
	Valve Mounted Vertically	Vibration along valve axis with a sinusoidal motion. In frequency range 30 to 500 c/s amplitude will be varied to give an acceleration of 5 g. In range 10 to 30 c/s the peak velocity will be maintained at a constant value of 10 inches/second. Notes 2 and 3.						
	Valve Mounted Horizontally	Vibration normal to valve axis with a sinusoidal motion. In frequency range 30 to 500 c/s, amplitude will be varied to give an acceleration of 2 g. In range 10 to 30 c/s the peak velocity will be maintained at a constant value of 4 inches/second. Notes 2 and 3.						
	Post Functional Vibration Test	Conditions as for Rectifier Circuit Test in Group A.						
11.3	Fatigue Test	Vh = 4.2V switched 1 min. on and 3 mins. off. Va = 0 The valve shall be vibrated for 100 hours divided equally between the 2 directions along the axis and normal to the axis. Vibration frequency = 170 c/s Vibration level = 5 g.		I.A.				
	Post Fatigue Test	Conditions as for Rectifier Circuit Test in Group A	Record					

TESTS (Cont'd)

	Test	Test Conditions	AQL %	Insp. Level	Sym-bol	Limits Min.	Limits Max.	Units
11.4	Shock Test	Hammer Angle = 30° No voltages. Test to be applied in two directions along the valve axis and in one direction normal to the axis.		T.A.				
	Post Shock Test	Conditions as for Rectifier Circuit Test in Group A.						
	Low Pressure Functional Test	The valve shall be operated at an ambient pressure equivalent to an altitude of 11,500 ft. (500 ± 5 mm Hg). The valve shall be operated under conditions as for the Rectifier Circuit Test in Group A but load current shall be adjusted so that the anode temperature is 225 ± 5°C. The valve shall be mounted vertically anode downwards. No flashover shall occur during this test.		T.A.				
	Group F							
	Life Test	Half-wave Rectifier Input Voltage = 9 kV r.m.s. Frequency = 50 c/s Reservoir Capacitor = 1 µF Source Resistance = 1600 ohms Load Current = 150 mA nom. Note 3		I.A.				
	Life Test End Point (500 hours)	Anode voltage (d.c.) and Rectifier Circuit Test as in Group A.	Re-cord					
	Life Test End Point (1000 hours)	Conditions as in above test.	Re-cord					

TESTS (Cont'd)

	Test	Test Conditions	AQL %	Insp. Level	Sym-bol	Limits Min.	Limits Max.	Units
	Life Test (Inverse Diode) (Intermittent Fault Reading)	Simulated inverse diode operation. P.I.V. = 22 kV P.R.F. = 400 p.p.s. Pulse length = 5 /us min. Fault conditions applied for 5 seconds once per hour. Note 4		T.A.				
	Life Test End Point 1000 hours (Inverse Diode)	As Inverse Diode under above conditions. Anode Voltage Pulse as in Group A.			Vapk	-	7.0	kV
AIX/ 2.5	Group G Re-test after 28 days holding period	Conditions as for Anode Voltage (d.c. and pulse) in Group A.	Re-cord	100%				

NOTES

1. The valve shall be operated for one minute. Switch H.T. supply three times - 5 secs. off and 5 secs. on. The valve shall not flash-over more than once during switching.

2. The valve shall be subjected to one complete frequency traverse (both directions of change of frequency); not more than two flashovers shall occur. If more than two flashovers occur, the valve shall be subjected to two further traverses. During these traverses not more than four flashovers shall occur.

3. The rectifier test equipment shall incorporate a sensitive trip circuit as indicated on Page 8, Fig. 1, and a flash-over is defined as a reverse current flow which is sufficient to operate this circuit. The component values used in this circuit are as follows:-

   RL = Type 3000 relay, 6500 ohms

   C = 8 μF

   MR = Metal Rectifier type 5D72

   R = Adjusted so that RL is energised when the reverse current in the trip circuit exceeds 300 mA.

4. This test is performed in a simulated test equipment, see page 8, figure 2. The component values in this circuit are as given below:-

   Switches S1 and S2 are both closed for normal operation, and open alternately to simulate the fault condition

   L = 2 mH $\pm$ 5%

   C = 1670 pF $\pm$ 5%

   R1, R2 = 160 ohms

   S1, S2 = vacuum relays

   The supply voltage to this equipment is adjusted so that a peak reading volt meter connected across "C" reads the required P.I.V. The above circuit constants have been chosen so that the valve is subjected to the pulse anode current levels given under "Ratings" on page 1 when the test is applied to a new valve.

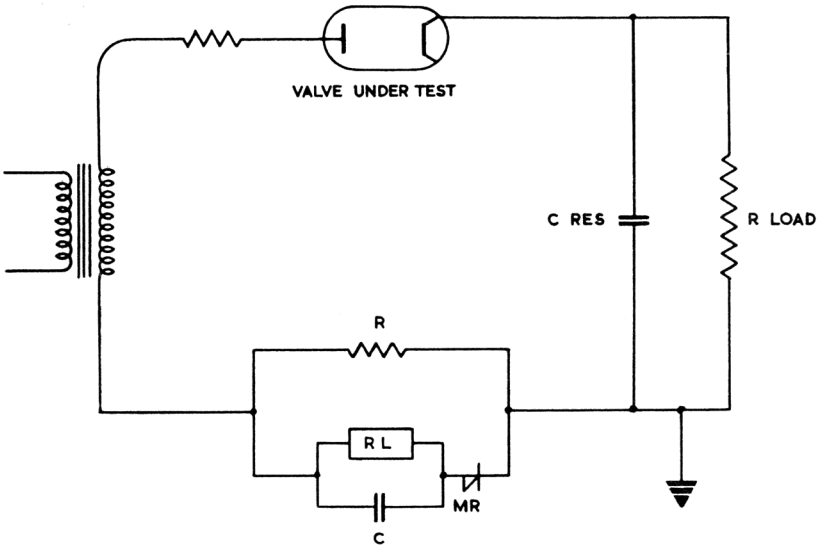
VALVE UNDER TEST
C RES
R LOAD
R
R L
MR
C

FIG. 1

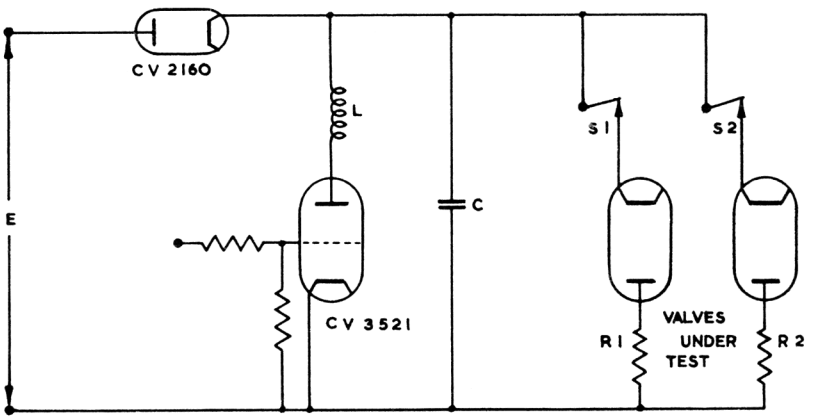
CV 2160
L
E
C
S 1
S 2
CV 3521
VALVES UNDER TEST
R 1
R 2

FIG.2