VALVE ELECTRONIC **CV6092**

ADMIRALTY SURFACE WEAPONS ESTABLISHMENT

Specification AD/CV6092 Issue 1 Dated 24.11.61 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: VX1048

MARKING
See K1001/4

BASE
See K1001 A IV/D13.3
Medium Edison Screw
B.S.98 E27/25

RATING

(All limiting values are absolute)

All Applications			Note
Heater Voltage	(V)	6.3	A, G
Heater Current	(A)	2.0	
Min. H.T. Switching Delay	(secs)	60	
Max. R.M.S. Anode Current	(mA)	220	
Min. Perveance	(μP)	150	H
Max. Anode Dissipation	(W)	40	J
Max. Operating Anode Seal Temperature	(°C)	225	B
Max. Full Load Peak Inverse Voltage	(kV)	16	
Max. No Load Peak Inverse Voltage	(kV)	18	D
Max. Peak Inverse Voltage with direct switching	(kV)	8	K
Max. D.C. Current with direct switching	(mA)	50	K
Max. Shock (Short Duration)	(g)	500	
Max. Acceleration (Continuous Vibration)	(g)	2	C
Rectifier Application			
Max. Peak Anode Current	(mA)	600	D
Max. d.c. Anode Current	(mA)	100	D
Min. Limiting Resistance	(ohms)	4000	D
Inverse Diode Application			
Max. Pulse Anode Current (Normal operation)	(A)	7.5	E
Max. Pulse Anode Current, (Fault condition)	(A)	14	E, F

CONNECTIONS

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

TOP CAP
See K1001 A I/D5.1
B.S.448/CT2

DIMENSIONS

	Min.	Max.
Overall length:	-	105 mm
Diameter (over cooler)	-	40 mm

MOUNTING POSITION
Any
See Note C.

NOTES

See page 2

NOTES

A. Heater volts are to be held to 6.3V ± 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. operation with 0.25 μF capacitor.

E. Under these conditions the max. pulse time constant is 5.0 μsecs. with a max. 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 $i/V_2^{\frac{3}{2}}$ where i = amps. and V = volts.

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

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

K. The max. 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 Joint Services Catalogue Number is: 5960-99-037-2498.

CV6092

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)	I_a (mA d.c.)
6.3	200

A Heater "warm-up" time of at least 60 secs. must be allowed before any of these tests are carried out.

Test	Test Conditions	AQL %	Insp. Level	Sym-bol	Limits Min.	Limits Max.	Units
Group A							
Heater Current			100%	I_h	1.8	2.2	A
Anode Voltage, d.c.			100%	V_a	100	140	V
Anode Voltage Pulse	Adjust V_a for I_a peak = 14A Tp = 2.5 µsecs. P.R.R. = 50 p.p.s.		100%	V_apK	-	3.5	kV
Rectifier Circuit Test	Half wave circuit - Input Voltage = 6kV r.m.s. Frequency = 50 c/s Reservoir Capacitor = 0.25 µF Source Resistance = 4k ohms Load Current = 100 mA nom.		100%				
Vibration	(Notes 1 and 3)						
Change in Heater Current after vibration.	Vibrate for 1 min. at 5g 50 c/s normal to axis.		100%			5	%
Groups B, C & D omitted							
Group E							
11.2 Resonance Search Test	Frequency range = 10 c/s to 2 kc/s Acceleration = 2g Valve to be vibrated on axis and normal to axis. I_a (mA d.c.) = 100 R_L = 1000 ohms Modulation of Anode Current.	Record	IA			1	mA pk to pk
Functional Vibration Test	Frequency range = 10 c/s to 500 c/s Max. rate of change of frequency = 1 octave/min. During the test the valve will be operated as for Rectification in Group A.		T.A.				

	Test	Test Conditions	AQL %	Insp. Level	Sym-bol	Limits Min.	Limits Max.	Units
	Group E (Cont'd) 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 5g. 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 2g. 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	V_h = 6.6V switched 1 min. on and 3 mins. off. V_a = 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 = 5g.						
	Post Fatigue Test (Rectification)	Conditions as for Rectifier Circuit Test in Group A.	Record	IA				
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 (Rectification)	Conditions as for Rectifier Circuit Test in Group A.						

TESTS (Cont'd)

	Test	Test Conditions	AQL %	Insp. Level	Symbol	Limits Min.	Limits Max.	Units
	Low Temperature Functional Test	Ambient and valve Temperature before test = -40°C. The valve shall be operated under conditions as Rectification in Group A for a sufficient time for the electrode temperature to stabilise. The test shall be repeated four further times.		T.A.				
	Post Low Temperature Functional Test (Rectification)	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 17000 ft. (400 ± 5 mm H_g). The valve shall be operated under conditions as for Rectification 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 (Rectification)	Half-wave Rectifier. Input voltage = 6 kV r.m.s. Frequency = 50 c/s Reservoir Capacitor = 0.25 µF Source Resistance = 4k ohms Load Current = 100 mA nom. Note 3.		I.D.				

TESTS (Cont'd.)

	Test	Test Conditions	AQL %	Insp. Level	Sym-bol	Limits Min.	Limits Max.	Units
	Life Test End Point 500 hours	Anode voltage (d.c) as in Group A and other conditions as for Rectifier Circuit Test in Group A.	Record					
	Life Test End Point 1000 hours	Conditions as in above Test	Record					
	Life Test (Inverse Diode) (Intermittent Fault Rating)	Thyratron modulator P.I.V. = 16kV p.f.n. = 1 /usec. pulse duration. Z_o = 80 ohms R_{load} (Normal) = 62 ohms ± 5% R_{load} (fault) = 35 ohms ± 5% R_{diode} = 620 ohms ± 5% Pulse current normal 8A peak. Pulse current fault 14A peak. Time constant Fault condition switched 2 secs. every 30 mins. P.R.F. 1000 p.p.s. Note 4		T.A.				
	Life Test End Point 1000 hours (Inverse Diode)	Conditions as in above test.						
	Group G							
AIX/ 2.5.	Re-test after 28 days holding period	Conditions as for Anode Voltage in Group A.	Record	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 valves shall be subjected to one complete frequency traverse (both directions of change of frequency). If the rate of flash-overs does not exceed one per five minutes, the valve shall be accepted. If the rate of flash-overs exceeds one per five minutes the valves shall be subjected to two further traverses. If, during these traverses, not more than four flash-overs occur, the valves shall be accepted.

3. The rectifier test equipment shall incorporate a sensitive trip circuit as indicated on page 8, 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:-

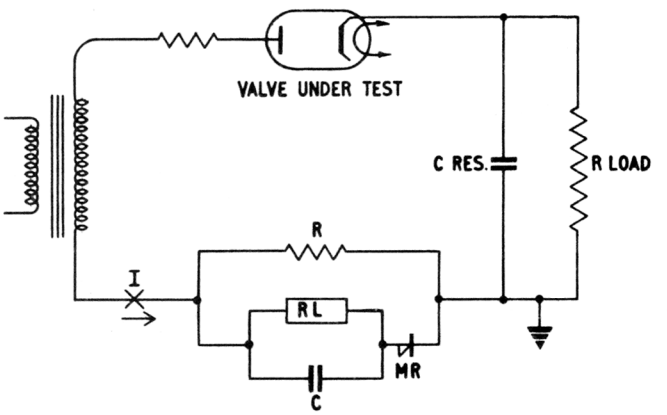
   RL: Type 3000 relay, 6500 ohms.

   C: 8 μF

   MR: 5D72

   R: Adjusted so that RL is energised when I exceeds 200 mA.

4. The circuit constants for this test have been chosen so that the valve is subjected to the pulse anode current levels given under "Ratings" on page 1, when applied to a new valve.



TEST CIRCUIT FOR CV