VALVE ELECTRONIC

ADMIRALTY SURFACE WEAPONS ESTABLISHMENT

CV6187

Specification AD/CV6187 Issue 1 Dated 1-7-66 To be read in conjunction with K1001	SECURITY Specification: Unclassified Valve: Unclassified

TYPE OF VALVE: Grid controlled Mercury Pool Modulator CATHODE: Mercury Pool ENVELOPE: Steel and Glass PROTOTYPE: VX9258	MARKING See K1001/4 Add Serial No.

CONNECTIONS AND DIMENSIONS	PACKAGING	MOUNTING
See Drawings, Pages 6 and 8	See K1005	Vertical within ± 15°. Note J

RATINGS

All limiting values are absolute

			Notes
Max. mean input power	(kW)	32	
Max. P.R.F. at 32 kW mean input power, T_p = 3 µS	(p.p.s.)	400	
Ignition and Excitation Anodes			
Ignition solenoid supply voltage	(V)	110 ± 10 DC	A
Ignition solenoid supply current	(A)	5	
Excitation & Ignition Anodes supply voltage	(V)	100 ± 20 DC	B
Excitation anode current	(A)	8 to 10	
Ignition Anode current. Available during starting	(A)	4 to 8	
Max. continuous Ignition Anode current	(A)	1.5	A
Grid Supply			
D.C. negative bias voltage:- Max. No. load	(V)	600	
Working	(V)	400 to 500	
Drive pulses (3 to 10 µsecs. duration)	(V)	800 to 1000	C
Grid stopper resistance	(ohms)	1000 to 2000	
Low Voltage Anodes			
Max. normal working hold off voltage	(V)	2000	
Max. working inverse voltage	(V)	1000	
Max. fault voltages	(V)	± 4000	
Max. peak current per anode (for half-sine wave current pulse of 650 µsecs. max. duration)	(A)	250	D H
Normal pulse duration	(µsec)	650	E
High Voltage Anodes			
Max. working hold-off voltage	(kV)	28	F
Max. inverse voltage	(kV)	3	E G
Max. peak anode current	(A)	1400	E
Max. rate of rise of anode current	(A/µS)	8000	
Operating Temperatures	°C	15-55	D H

NOTES

A. The solenoid supply shall be applied momentarily (for not less than 0.6 secs) to leads 1 and 3 and then with 100 ohms in series, momentarily (for not less than 0.05 secs) to leads 1 and 2.

A sensing circuit should be connected to the ignition anode which will remove power from the valve if the normal working ignition anode to cathode voltage exceeds 12 volts.

B. The excitation anode series stabilising choke shall not be less than 0.05 Henry. The excitation current shall not fall below 7.5 amps due to supply ripple.

C. Source impedance for drive pulse shall not exceed 1000 ohms. The H.V. Grid pulse must be applied when the L.V. anode current is falling and has reached a value between 60% and 33% of its maximum amplitude.

D. The low voltage current shall be equally shared between the two L.V. anodes. The maximum permissible starting current per anode is related to the valve temperature and is 125A peak at 15°C, 250A peak at 25°C.

E. These figures refer to a typical application in a d.c. transformation circuit with output pulses of Tp = 2.8 $\pm$ 0.2 μsecs and P.R.F. 400 p.p.s.

F. The valve shall hold off 28 kV peak at maximum working temperature.

G. The inverse voltage shall not exceed 500 volts for at least 10 μsecs and shall not exceed 3 kV until at least 1½ millisecs after the H.V. current pulse.

H. The temperature shall be measured by a suitable thermocouple on the valve tank immediately below the H.V. anode at the point marked X on drawing.

The valve shall be cooled by an air stream at 15°C to 25°C directed vertically upwards on to its base. The air stream and the diameter of the opening through which it emerges to impinge on the valve shall be such that 550 to 600 cubic feet of air shall emerge per minute at a velocity of 4000-4500 feet per minute.

J. The steel envelope of the valve must be insulated from earth.

K. The Joint Service Catalogue Number is 5960-99-037-4726

CV6187

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.

Tests other than the life test are to be performed after a holding period of not less than one month. Except where stated the number of valves tested shall be 100%.
See Note 1.

	Test	Test Conditions	Limits		Units
			Min.	Max.	
a	Hold-off and Vacuum	The steel envelope shall be regarded as an electrode for this test.			
	(i) H.V. Anode	Apply 23 kV r.m.s. 50 c/s a.c. between H.V. Anode and all other electrodes connected together.			
		After a maximum cleaning-up period of 10 mins. the number of breakdowns in the next two minutes shall be:-		0	
	(ii) L.V. Anodes	Apply 10 kV r.m.s. 50 c/s a.c. between each L.V. Anode in turn and all other electrodes connected together.			
		After a maximum cleaning-up period of 10 mins. the number of breakdowns in the next two minutes shall be:-		0	
b	Excitation Arc Voltage	Form excitation arc with circuit shown on page 6. Ignition and excitation anodes supply voltage 80V d.c.			
		Ignition solenoid supply voltage 90V d.c.			
		Excitation arc current 7A.			
		Measure excitation arc voltage after 20 secs.	20	28	V
c	Ignition and Excitation Arc Formation	Repeat the procedure for the formation of the excitation arc 20 times at approx. 10 sec. intervals under conditions of test (b) above.			
		Number of failures to form arc.		0	

	Test	Test Conditions	Limits		Units
			Min.	Max.	
d	Insulation	Using "Megger" at 1 kV measure resistance between			
		(i) Each L.V. Anode and the associated grid.	20		MΩ
		(ii) Each grid and envelope.	20		MΩ
		(iii) Excitation anode and envelope.	20		MΩ
		(iv) Ignition solenoid and envelope.	20		MΩ
		(v) Cathode and envelope.	20		MΩ
e	Flashover	Apply 2 kV r.m.s. 50 c/s a.c. between electrodes as in clause (d) above.			
		Internal or external flashovers.		0	
f	Modulator Performance	Circuit as shown on page 7. Supply voltage to Ignition, Excitation and Solenoid Circuits 110V d.c. Cooling, See Note 2.			
		Mean d.c. input power 32 kW, P.R.F. 400 p.p.s. Operate for 3 hours. Number of breakdowns in final 2 hours. Note 3.		0	
		On completion of this test the power shall be switched off and then re-applied within 20 seconds at 20 kW, being restored to full load within 6 secs. There shall be no failure to operate.			
g	Vibration	Notes 4 and 6.			
h	Shock	Notes 5 and 6.			
j	Life Test	As for test (f).	500		hrs.
		Breakdowns per 24 hours due to valve malfunction. Note 7.		2	

NOTES

1. These tests shall be carried out at an ambient temperature between 15°C and 25°C.

2. The valve shall be cooled by an air stream at a temperature of 26-28°C directed vertically upwards on to its base. 550 to 600 cubic feet of air shall impinge on the valve per minute at a velocity of 4000-4500 feet per minute.

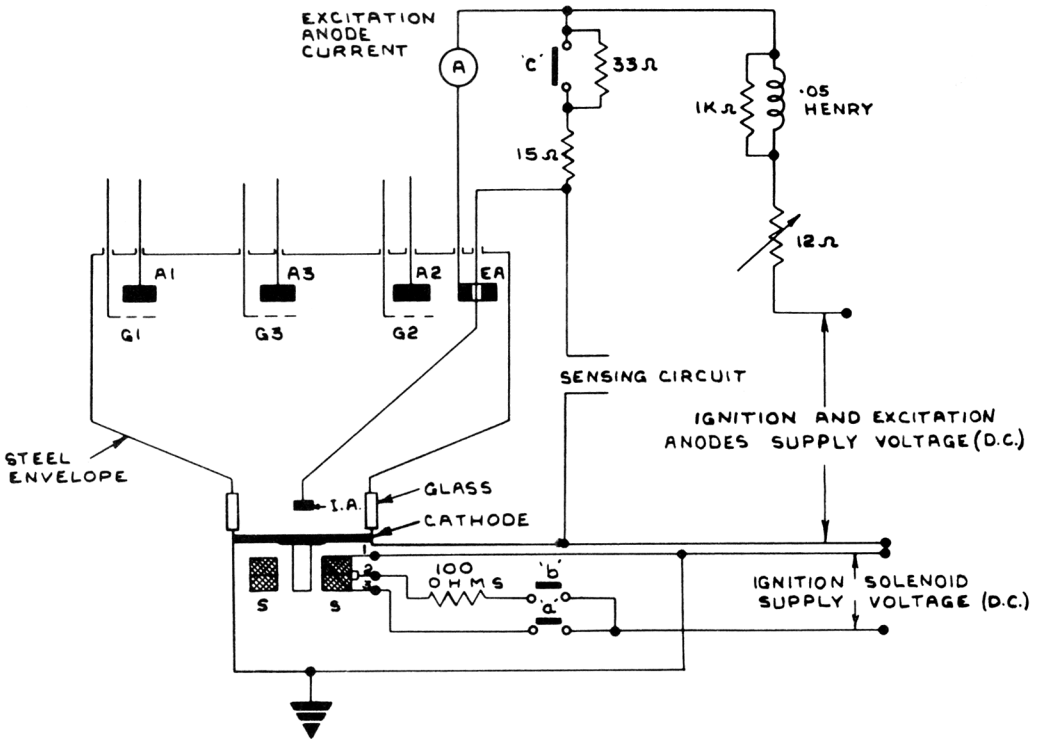
3. If a breakdown due to valve malfunction occurs during the final two hours operation may be re-started and continued for two hours during which there shall be no further breakdown.

4. With the valve mounted in an approved cradle vibration shall be applied along the vertical axis. The frequency shall be swept from 3 c/s to 15 c/s in ten minutes with amplitude 0.04 ins. peak-to-peak. This shall be followed by a similar sweep with decreasing frequency. After this test the valve shall be capable of operation up to full power under the conditions of test (f).

5. With the valve mounted in an approved cradle a shock of 12g shall be applied upwards along the vertical axis. Horizontal shocks of 6g shall then be applied, one parallel to the line through two opposite mounting lugs and one at 45° to this direction. After this test the valve shall be capable of operation up to full power under the conditions of test (f).

6. These tests shall be performed for Qualification Approval only.

7. One valve per batch shall be tested unless otherwise agreed. In the event of a breakdown rate greater than 2 per 24 hours reference shall be made to the Specification Authority.

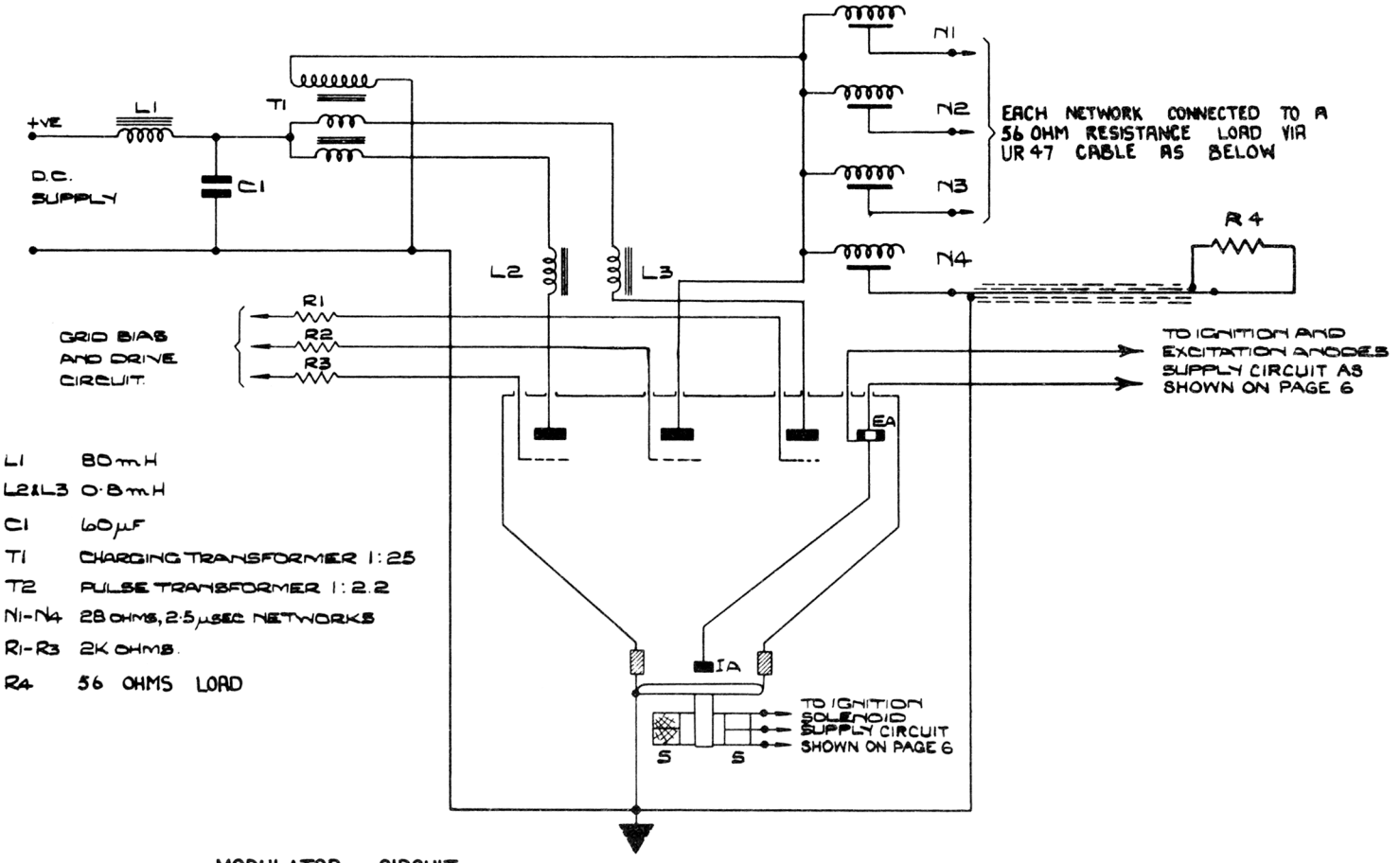


A1 A2	**LOW** VOLTAGE ANODES
G1 G2	**LOW** VOLTAGE GRIDS
A3	HIGH VOLTAGE ANODE
G3	HIGH VOLTAGE GRID
EA	EXCITATION ANODE
IA	IGNITION ANODE
S	IGNITION SOLENOID COIL

NOTE

TO FORM THE EXCITATION ARC, CONTACTS 'a' AND 'c' ARE CLOSED MOMENTARILY (FOR NOT LESS THAN 0·5 SECS.) AFTER 'a' AND 'c' OPEN, CONTACT 'b' IS CLOSED MOMENTARILY (FOR NOT LESS THAN 0·05 SECS.) TO ASSIST THE RETURN OF THE PLUNGER TO ITS ORIGINAL POSITION.

IGNITION AND EXCITATION SUPPLY CIRCUITS



L1 80 m.H

L2&L3 0·8 m.H

C1 60 μF

T1 CHARGING TRANSFORMER 1:25

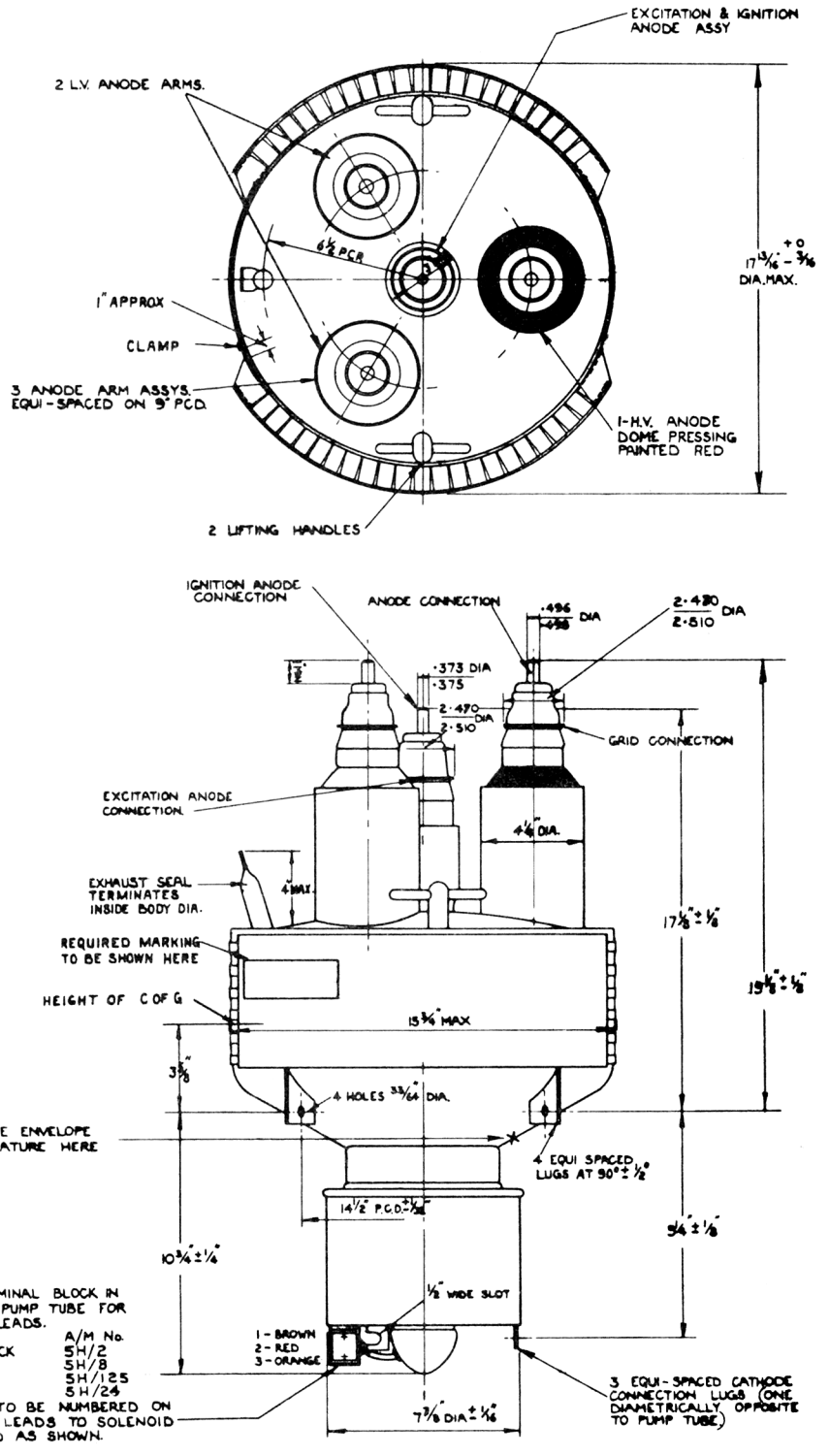
T2 PULSE TRANSFORMER 1:2.2

N1-N4 28 OHMS, 2·5 μSEC NETWORKS

R1-R3 2K OHMS.

R4 56 OHMS LOAD

MODULATOR CIRCUIT



3 WAY TERMINAL BLOCK IN LINE WITH PUMP TUBE FOR SOLENOID LEADS.

ITEM	A/M No.
TERMINAL BLOCK	5H/2
COVER	5H/8
SOCKET	5H/125
FERRULE	5H/24

CONTACTS TO BE NUMBERED ON BLOCK AND LEADS TO SOLENOID TO BE CODED AS SHOWN.

OUTLINE