ADMIRALTY SURFACE WEAPONS ESTABLISHMENT

VALVE ELECTRONIC CV4051

Specification AD/CV4051 Issue No. 3 dated 20.7.62. To be read in conjunction with K1001 BS.448 and BS.1409	SECURITY Specification: Unclassified Valve: Unclassified

→ Indicates a change

→ TYPE OF VALVE:- Reliable D.C. Stable Double Triode with flexible leads } Note A

CATHODE:- Indirectly heated.
ENVELOPE:- Glass
PROTOTYPE:- VX7115

MARKING
K1001/4

BASE
B9A/F
BS.448

→ RATINGS
(All limiting values are absolute)

			Note
Heater Voltage	(V)	6.3	B,E
Heater Current	(A)	0.6	B,E
Heater Voltage	(V)	12.6	C,E
Heater Current	(A)	0.3	C,E
Max. Anode Voltage	(V)	300	D
Max. Anode Dissipation	(W)	1.0	D
Anode Current	(mA)	1.5	F
Mutual Conductance	(mA/V)	1.3	F
Amplification Factor		31	F
Bulb Temperature (Max.)	(°C)	120	
Max. Altitude	(ft.)	60,000	
Max. Acceleration (continuous operation)	(g)	2.5	A,D
Max. Shock	(g)	500	A,D

CONNECTIONS

Pin	Electrode	
1	Anode	a"
2	Grid	g"
3	Cathode	k"
4	Heater	h
5	Heater	h
6	Anode	a'
7	Grid	g'
8	Cathode	k'
9	Heater CT	hct

CAPACITANCES (pF)

Ca, a"	.46	G
Ca, g	1.9	G
C in	2.2	G
C out	2.5	G

DIMENSIONS
See K1001/A.1/D11

Dimensions (mm)	Min.	Max.
A. Seated Height	-	49
B. Diameter	19	22.2
D. Length of leads	38.0	-

MOUNTING POSITION
Any

NOTES

→ A. This valve is specifically intended for D.C. amplifier operation in a cathode coupled circuit. The limit stability performance is as in test in Group F. Some improvement on this figure will generally be obtained particularly after a period of life. This assumes a heater voltage stability of at least 0.5%. The stability against changes of heater voltage is about 1 mV for a heater change of 1.5% over a period of 10 hours.

B. Operated with heaters connected in parallel.

C. Operated with heaters connected in series.

D. The rated stability is the drift between grids over a 10 hour period. Vibration and shock have an adverse effect on stability and should be avoided as far as possible. Shelf life may have an adverse effect on stability but the valve should become stable in a few hours, running under rated conditions.

E. For rated stability (max. variation) tolerance on heater voltage should be 0.5%.

→ F. Measured at Va = 150V, Vg1 = -3.75V.

G. Measured in a 1.0 Mc/s bridge in a fully shielded socket with an external screen

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:-

Vh (V)	Va (V)	Vg (V)	Rk (ohms)	Ck (μF)	Vhk (V)	
12.6	150	0	2700	2000	0	Note 1

K1001	TEST	TEST CONDITIONS	AQL %	Insp. Level	Sym-bol	LIMITS Min.	LAL	Bog.	UAL	MAX	ALD	UNITS
	Group A											
7.1	Glass Strain. Insulation.	No voltages Vg-all = -100V	6.5	I 100%	R	100	-	-	-	-	-	Meg-ohms
		Va-all = -300V		100%	R	100	-	-	-	-	-	Meg-ohms
	Group B	Combined AQL Note 2	1.0									
	Heater Current	Note 3	0.65	II	Ih	0.275	-	0.300	-	0.325	-	A
	Heater/Cathode Leakage Current	Vhk = ±100V	0.65	II	Ihk	-	-	-	-	10	-	μA
	Anode Current		0.65	II	Ia	1.1	-	1.4	-	1.7	-	mA
				V2	Ia	-	1.29	-	1.51	-	0.25	mA
	Grid Current	Rg=500 k-ohms	0.65	II	Ig1	-	-	-	-	0.05	-	μA
	Mutual Conductance		0.65	II	gm	1.0	-	1.25	-	1.5	-	mA/V
	Mutual Conductance			V2	gm	To be added later						mA/V
	Group C	Combined AQL	6.5									
	Change in Mutual Conductance	Note 4 Vh=11.4V	2.5	I	Δgm	-	-	-	-	15	-	%
	Cut-off	Vg1= -10V	2.5	I	Ia	-	-	-	-	20	-	μA
11.1	Vibration Noise	Va(b) = 250V RL = 50 k-ohms Notes 3 and 5	2.5		VaAc	-	-	-	-	7	-	mV r.m.s.
	Difference in Anode Current between triodes		2.5	I	ΔIa	-	-	-	-	0.25	-	mA

K1001	TEST	TEST CONDITIONS	AQL %	Insp. Level	Sym-bol	LIMITS Min.	LAL	Bog.	UAL	MAX	ALD	UNITS
	Group D											
	Capacitances	Measured on a 1 Mc/s bridge in a fully screened socket with external shield connected to cathode of section under test	6.5	IA	Cg'-a"	-	-	0.46	-	1.0	-	pF
					Ca-g	1.4	-	1.9	-	2.4	-	pF
					Cin	1.7	-	2.2	-	2.7	-	pF
					Cout	1.5	-	2.5	-	3.0	-	pF
	Amplification Factor		6.5	IA	-	26	-	31	-	36		
	Group E											
11.2	Resonance Search	Va(b) = 250V RL=50 kΩ Frequency= 25-1000 c/s	2.5	IC	VaAC	-	-	-	-	~~25~~ To be recorded	-	mV
11.3	Fatigue	Frequency= 170 c/s Min.Peak Acceler-ation = 5g Duration= 3x23 hrs. Vh=12.6V Switched 1 min. on 3 mins. off Va = 0		IA								
	POST FATIGUE TESTS											
	Vibration Noise	Va(b) = 250V RL=50 kΩ Notes 3 & 5			VaAC	-	-	-	-	20	-	mV r.m.s.
	Heater-Cathode Leakage Current	Note 3 Vhk = ±100V			Ihk	-	-	-	-	15	-	µA
	Grid Current	Rg1 = 500 kΩ	2.5		Ig1	-	-	-	-	0.07	-	µA
11.4	Shock	Hammer Angle = 30° No voltages		IA								

K1001	TEST	TEST CONDITIONS	AQL %	Insp. Level	Symbol	LIMITS MIN	LAL	Bog	UAL	MAX	ALD	UNITS
	POST SHOCK TESTS											
→	Vibration Noise	Va(b)=250V, RL = 50 kΩ Notes 3 & 5	2.5		VaAC	-	-	-	-	20	-	mV r.m.s.
	Heater-Cathode Leakage Current	Note 3 Vhk = ±100V	2.5		Ihk	-	-	-	-	15	-	µA
	Grid Current	Rg1 = 500 kΩ			Ig1	-	-	-	-	0.07	-	µA
AV1/5	**Group F**											
	Life	Va = 150V Rg1 = 1.5MΩ Rk = 2.7 kΩ Vhk = Heater connected to cathode through 47 kΩ										
						MIN	LAL	Median	Semi-decile	MAX	ALD	
→	**Stability Test**											
	0-10 hrs.	Notes 6, 7, 9, 10 and 11		V2	ΔVg	-	-	-	20	-	-	mV
	9-10 hrs	Notes 6, 8, 9, 10 and 11		V2	ΔVg	-	-	-	4	-	-	mV
	0-1000 hrs			Q/A on 6 samples	ΔVg				Record			
						MIN	LAL	Bog	UAL	MAX	ALD	
	Intermittent Life Test 500 hrs.											
	Life Test End Points	Combined AQL	10.0	IA								
	Inoperatives		2.5									
→	Heater Current		2.5		Ih	0.275	-	-	-	0.325	-	A
	Reverse Grid Current	Rg1 = 500 kΩ	2.5		Ig1	-	-	-	-	0.1	-	µA
	Average Change in Mutual Conductance				Δgm	-	-	-	-	15	-	%
→	Change in Mutual Conductance				Δgm				Record			%
→	Difference in Δgm between triodes		6.5		$\frac{\Delta gm'}{\Delta gm''}$	-	-	-	-	7.5	-	%

TESTS (Cont'd.)

CV4051

K1001	TEST	TEST CONDITIONS	AQL %	Insp. Level	Sym-bol	LIMITS MIN	LAL	Bog	UAL	MAX	ALD	UNITS	
	Insulation	Va-all = -300V	2.5		R	50	-	-	-	-	-	MΩ	
		Vg-all = -100V	2.5		R	50	-	-	-	-	-	MΩ	
	Life Test End Points 1000 hrs.	Combined AQL	10.0										
	Insulation	Va-all = 300V	6.5		R	50	-	-	-	-	-	MΩ	
		Vg-all = 100V	6.5		R	50	-	-	-	-	-	MΩ	
	Change in Mutual Conductance		6.5		Δgm			Record			-	%	←
	Difference in Δgm between triodes		6.5		$\frac{\Delta gm'}{\Delta gm''}$	-	-	-	-	-	10	%	←
	Difference in Anode Current between Anodes		6.5		ΔIa	-	-	-	-	0.5	-	mA	←
AIX/ 2.5	Group G Electrical re-test after 28 days			100%									
	Inoperatives		0.5										
	Grid Current	Rg = 500 kΩ	0.5		Ig_1	-	-	-	-	0.1	-	μA	←

NOTES

1. Test each section separately with the elements of the opposite section connected to the cathode of the section under test.
2. At least one test in this group shall be carried out with the heaters connected in parallel to a 6.3 volt supply.
3. Connect the two sections in parallel.
4. The change in the mutual conductance shall be:- $\frac{\text{gm at 12.6 Vh - gm at 11.4 Vh}}{\text{gm at 12.6 Vh.}} \times 100\%$
5. Connect cathodes together and connect to earth through Rk = 680 ohms, ck = 1000 μF. Connect grids to earth. Parasitic suppressors of 50 ohms maximum permissible.
6. The stability of a valve is defined as the change in the difference between the grid voltages required to maintain equal anode currents in each triode over a period of time.
7. This test shall be carried out in the specified circuit detailed on Page 6, and the drift measured over 10 hours. The valve shall be operated in the specified circuit for a minimum of 30 minutes and a maximum of 60 minutes before the test period commences.
8. This test shall be carried out in the circuit referred to in Note 7 and the drift measured over the last hour of the 10 hour stability test period.
9. For all stability tests the stability of heater supply must be better than ± 0.5%
10. The figures refer to the total excursion between extremes of drift.
11. Any valves from the sample tested on the 10 hour stability tests which fail to meet the specified semi-de ile limits may, at the discretion of the manufacturer and the Inspecting Officer, be subjected to a further 10 hour stability test period. The stability figures so obtained may be substituted for the initial results in assessing the overall test result. No further aging is permitted before this second test period.

STABILITY TEST CIRCUIT.