

MINISTRY OF SUPPLY - D.L.R.D. (A)/R.A.E.

Specification MOS(A)/CV 4068				SECURITY	
Issue 1 Dated 8.10.56				Specification	Valve
To be read in conjunction with B.S.448, B.S.1409 and K.1001				UNCLASSIFIED	UNCLASSIFIED
TYPE OF VALVE - Reliable Double Triode CATHODE - Indirectly heated ENVELOPE - Glass PROTOTYPE - CV2212, VX7124 R.E.T.M.A. DESIGNATION - 6156				MARKING K1001/4 Additional Marking:- 6158 BASE B.S.448/B9A	
RATING (All limiting values are absolute)			Note	CONNECTIONS	
				Pin	Electrode
Heater Voltage (parallel)	(V)	6.3	D	1	Anode (2) a"
Heater Current (parallel)	(A)	0.6		2	Grid (2) g"
Heater Voltage (series)	(V)	12.6	D	3	Cathode (2) k"
Heater Current (series)	(A)	0.3		4	Heater h
Max. Operating Anode Voltage	(V)	300	A	5	Heater h
Max. Anode Voltage ($I_a = 0$)	(V)	550	A	6	Anode (1) a'
Max. Anode Dissipation	(W)	5	A	7	Grid (1) g'
Max. Heater - Cathode Voltage	(V)	200	A	8	Cathode (1) k'
Max. Peak Cathode Current	(mA)	35	A	9	Heater CT h (ct)
Max. Negative Grid Voltage	(V)	-75		DIMENSIONS See B.S.448/B9A/2.1 Size Ref. No. 2	
Max. Grid Resistor (fixed bias)	(MΩ)	0.25			
Max. Grid Resistor (cathode bias)	(MΩ)	1.5		Dimensions (mm) Min. Max. A seated height - 49.0 C diameter 19.0 22.2 D overall length - 56.0	
Max. Bulb Temperature	(°C)	250	D		
Max. Shock (short duration)	(g)	500		MOUNTING POSITION	
Max. Acceleration (continuous operation)	(g)	2.5			
Mutual Conductance	(mA/V)	2.3	B	Any	
Amplification Factor		32	B		
CAPACITANCES (pF)					
C in (nom.)		2.2	A,C		
C out (nom.)		2.0	A,C		
C _{a,g} (nom.)		1.9	A,C		
C _{a',a''}		0.46	A,C		
NOTES					
A. Per Section.					
B. At $V_a = 250V$; $V_g = -4.6V$; $R_k = 0$. ($I_a = 6.0$ mA).					
C. With close fitting metal screen.					
D. <u>Caution to Electronic Equipment Design Engineers:</u> Special attention should be given to the temperature of valves to be operated in aircraft. Reliability will be seriously impaired if the maximum bulb temperature is exceeded. The life expectancy may be reduced if conditions other than those specified for life tests are imposed on the valve and will be reduced appreciably if absolute maximum ratings are exceeded. Both reliability and performance will be jeopardised if heater voltage ratings are exceeded: life and reliability performance are directly related to the degree that regulation of the heater voltage is maintained at its centre-rated value.					

To be performed in addition to those applicable in K1001

To be performed in the specified order unless otherwise agreed with the Inspecting Authority

Test Conditions - unless otherwise specified												
Vh(V) 12.6		Va(V) 250		Vg(V) -4.6		Rk(ohms) 0		Ck(pF) 0		Vhk(V) 0		Note 1
K1001 Ref.	Test	Test Conditions	AQL %	Insp. Level	Symbol	Limits						Units
						Min.	LAL	Begay	HAL	Max.	ALD	
7.1	Glass Strain	No Voltages	6.5	I								
	<u>GROUP A</u>											
	Electrode Insulation	Vh = 6.3V. Note 10 Vg-all = -100V Va-all = -300V	100% 100%	R R	R R	100 100	- -	- -	- -	- -	- -	MΩ MΩ
	Reverse Grid Current	Rg = 500k max.	100%	Ig	Ig	-	-	-	-	0.7	-	μA
	<u>GROUP B</u>											
	Heater Current	Combined AQL	1.0	II	Ih	275	-	300	-	325	-	mA
5.3	hk Leakage Current	Vhk = ±100V. Notes 2 and 3. Vhk = -100V. Cathode Positive	0.65	II	Ihk	-	-	-	-	10	-	μA
				V2	Ihk	-	-	-	2	-	-	μA
	Anode Current		0.65	II	Ia	3.5	-	6.0	-	8.5	-	mA
				V2	To be recorded and agreed later							
	Anode Current	Vg = -10V	0.65	II	Ia	-	-	-	-	500	-	μA
	Mutual Conductance		0.65	II	gm	1.7	-	2.35	-	3.0	-	mA/V
				V2	To be recorded and agreed later							
	<u>GROUP C</u>											
	Change of Mutual Conductance	Combined AQL Vh = 11.4V Notes 6 and 7	6.5 2.5	I I	Δgm	-	-	-	-	15	-	%
11.1	Vibration Noise	Va(b) = 250V. RL = 2kΩ Notes 2 and 8	2.5	I	Va AC	-	-	-	-	25	-	mV rms
	<u>GROUP D</u>											
7.2	Base Strain	No Voltages	6.5	IA								
5.9	Capacitances	Note 9	6.5	IC	C in C out Ca, g Ca', a"	1.4 1.3 1.2 -	- - - -	2.2 2.0 1.9 0.46	- - - -	3.0 2.7 2.6 1.0	- - - -	pF pF pF pF
	Amplification Factor		6.5	IA	μ	27	-	32	-	37	-	

K1001 Ref.	Test	Test Conditions	AQL %	Insp. Level	Symbol	Limits						Units
						Min.	LAL	Bogey	UAL	Max.	ALD	
11.2	<u>GROUP E</u> Resonance Search	Va(b) = 250V RL = 2k Ω Frequency:- (1) 25-200 c/s (2) 200-500 c/s (3) 500-2500 c/s	2.5	IC	Va AC Va AC Va AC	To be recorded and agreed later						mV rms mV rms mV rms
11.3	Fatigue	Vh = 14V. Note 4		IA								
		<u>Post Fatigue Tests</u>										
5.3	hk Leakage Current	Combined AQL Vhk = $\pm 100V$ Note 2 and 3	4.0 2.5		Ihk	-	-	-	-	20	-	μA
	Reverse Grid Current	Rg = 500k Ω max.	2.5		Ig	-	-	-	-	1.5	-	μA
	Mutual Conductance		2.5		gm	1.6	-	-	-	3.0	-	mA/V
11.1	Vibration Noise	As in Group C	2.5		Va AC	-	-	-	-	40	-	mV rms
11.4	Shock	No Voltages Hammer Angle = 30°		IA								
		<u>Post Shock Tests</u>										
5.3	hk Leakage Current	Combined AQL Vhk = $\pm 100V$ Notes 2 and 3	4.0 2.5		Ihk	-	-	-	-	20	-	μA
	Reverse Grid Current	Rg = 500k Ω max.	2.5		Ig	-	-	-	-	1.5	-	μA
	Mutual Conductance		2.5		gm	1.6	-	-	-	3.0	-	mA/V
11.1	Vibration Noise	As in Group C	2.5		Va AC	-	-	-	-	40	-	mV rms
AVI/5	<u>GROUP F</u> Life	Vhk = 170V rms Rg = 500k Ω										
AVI/5.1	<u>Stability Life (1 hour)</u>			I								
	Change in Mutual Conductance		1.0		Δgm	-	-	-	-	10	-	%
AVI/5.3	<u>Intermittent Life</u>			IA								
	<u>Test Point 500 hrs.</u>	Combined AQL	6.5									
AVI/5.6	Inoperatives		2.5									
	Heater Current		2.5		Ih	275	-	-	-	325	-	mA
	hk Leakage Current	Vhk = $\pm 100V$ Note 2 and 3	2.5		Ihk	-	-	-	-	20	-	μA

K1001 Ref.	Test	Test Conditions	AQL %	Insp. Level	Symbol	Limits						Units
						Min.	L&L	Begey	UAL	Max.	ALD	
AVI/5.6	Reverse Grid Current	Rg = 500k Ω max.	2.5		Ig	-	-	-	-	1.0	-	μ A
	Mutual Conductance		2.5		gm	1.5	-	-	-	3.0	-	mA/V
	Average Change in Mutual Conductance				Δ gm	-	-	-	-	15	-	%
	Electrode Insulation	Vh = 6.3V, Note 10 Vg-all = -100V Va-all = -300V	4.0		R	50	-	-	-	-	-	M Ω
					R	50	-	-	-	-	-	M Ω
	Test Point (1000 Hrs.)	Combined AQL	10.0									
	Inoperatives		4.0									
	Heater Current		4.0		Ih	275	-	-	-	325	-	mA
	5.3 hk Leakage Current	Vhk = \pm 100V Note 2 and 3	4.0		Ihk	-	-	-	-	20	-	μ A
	Reverse Grid Current	Rg = 500k Ω max.	4.0		Ig	-	-	-	-	1.5	-	μ A
AIX/2.4	Mutual Conductance	Vh = 6.3V, Note 10 Vg-all = -100V Va-all = -300V	4.0		gm	1.4	-	-	-	3.0	-	mA/V
	Electrode Insulation		4.0		R	30	-	-	-	-	-	M Ω
					R	30	-	-	-	-	-	M Ω
	GROUP C				R	30	-	-	-	-	-	M Ω
AVI/8.6	Electrical Re-Test after 28 days holding period			100%								
AVI/8.6	Inoperatives		0.5									
	Reverse Grid Current	Rg = 500k Ω max.	0.5		Ig	-	-	-	-	0.7	-	μ A

NOTES

- Test each section separately with the elements of the opposite section connected to the cathode of the section under test.
- Test with the sections connected in parallel, (Vh = 6.3V).
- Heater positive and negative successively.
- Valves shall be vibrated in each of the three required planes for not less than 30 hours and not less than 100 hours total. Heater switched 1 minute on 3 minutes off. No other voltages applied. Min. peak acceleration = 5g; frequency = 170 \pm 5 c/s.
- The valve shall be mounted so that the direction of vibration is parallel to the minor axis of the electrode structure. Vibration frequency = any fixed frequency in the range 25-100 c/s. Max. peak acceleration = 2.5g. The test shall be of sufficient duration to obtain a steady reading of noise output.
- The change of mutual conductance is expressed:-

$$\frac{(gm \text{ at } 12.6V) - (gm \text{ at } 11.4V)}{(gm \text{ at } 12.6V)} \times 100\%$$
- Preheat the valves for 5 minutes at Vh = 11.4V; Va = 250V; Vg = -4.6V before testing. Preheat with both sections operating.
- Strap cathodes together and connect to earth through Rk = 390 Ω ; Ck = 1000 μ F. Connect grids to earth. Parasitic suppressors of 50 Ω max. permissible.
- Measured on a 1 Mc/s bridge with the valve mounted in a fully shielded holder, with the valve screen connected to the cathode of the section under test.
- Heaters connected in parallel, strapped to cathode and considered as a single electrode.

ELECTRONIC VALVE SPECIFICATIONS

SPECIFICATION CV.4068

ISSUE 1. DATED 8.10.56.

AMENDMENT No. 1.

GROUP F. INTERMITTENT LIFE. TEST POINT (1000 hours).

Delete Heater Current test and add at the end of this group (after Mutual Conductance test) the following:

K1001 Ref.	Test	Test Conditions	AQL %	Insp. Level	Symbol	Limits						Units
						Min	LAL	Bogey	UAL	Max.	ALD	
	Electrode Insulation	Vh = 6.3. Note 10. Vg - all = -100v. Va - all = -300v.	6.5		R	30	-	-	-	-	-	MT
					R	30	-	-	-	-	-	MT

FINAL GROUP - beginning "Electrical Re-test" should read Group "G".

Director,
Royal Aircraft Establishment.

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