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

VALVE ELECTRONIC

CV 4012

Specification MOS/CV4012	SECURITY	
	SPECIFICATION	VALVE
Issue 2. Dated 20.11.57.		
To be read in conjunction with BS.448, BS.1409 and K1001.	UNCLASSIFIED	UNCLASSIFIED

→ Denotes a change.

TYPE OF VALVE - Reliable Miniature Heptode	MARKING
CATHODE - Indirectly Heated	See K1001/4
ENVELOPE - Glass	Additional Markings:- 5750/6BE6W
PROTOTYPE - 6BE6 CV453	BASE
NEAREST AMERICAN SPECIFICATION - MIL-E-1/9. 5750/6BE6W.	BS.448/B7G
R.E.T.M.A. DESIGNATION - 5750/6BE6W	

RATING

			Note
Heater Voltage	(V)	6.3	C
Heater Current	(A)	0.3	
Max. Heater - Cathode Voltage	(V)	±100	A
Max. Operating Anode Voltage	(V)	330	A
Max. Operating Grid 2 and 4 Voltage	(V)	110	A
Max. Grid 2 and 4 Supply Voltage	(V)	330	A
Max. Anode Dissipation	(W)	1.1	A
Max. Grid 2 and 4 Dissipation	(W)	1.1	A
Max. Mean Cathode Current	(mA)	15.5	A
Max. Grid 1 Current	(mA)	0.5	A
Conversion Conductance	(mA/V)	0.47	B
Conversion Conductance at Vg3 = -30V	(μA/V)	10.0	
Anode Impedance	(MΩ)	1.0	B
Max. Bulb Temperature	(°C)	165	C
Max. Shock (Intermittent Operation)	(g)	500	
Max. Acceleration (continuous operation)	(g)	2.5	

CONNECTIONS

Pin	Electrode
1	g1 (osc)
2	k + g5
3	h
4	h
5	a
6	g2 + g4
7	g3 (Sig)

DIMENSIONS

See BS.448/B7G/2.1

Size Ref. No.2

Dimension (mm)	Min.	Max.
A seated height	-	47.5
C diameter	16.0	19.0
D Overall length	-	54.5

CAPACITANCES (pF)

C in (nom.)	7.5	D
C out (nom.)	13.5	D
Ca, g3 (max.)	0.35	D

MOUNTING POSITION

Any

NOTES

A. Absolute Value.

B. Measured at Va = 250V; Vg2 = Vg4 = 100V; Vg1 = 0; Vg3 = -1.5V (Ia = 3mA; Ig2 + g4 = 7.5 mA)

C. Caution to Electronic Equipment Design Engineers: 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.

D. Measured with a close fitting metal screen.

Z.16250.R.

To be performed in addition to those applicable in K1001

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

Test Conditions - unless otherwise specified

Vh(V)	Va(V)	Vg1(V)	Vg2 + g4(V)	Vg3(V)
6.3	250	0	100	-1.5

K1001 Ref.	Test	Test Conditions	AQL %	Insp. Level	Symbol	Limits						Units
						Min.	LAL	Bogey	UAL	Max.	ALD	
7.1	Glass Strain	No Voltages	6.5	I								
	GROUP A											
	Electrode Insulation	Vh = 6.3V Note 10 Vg1 to all = -100V Vg3 to all = -100V Va to all = -300V		100% 100% 100%	R R R	100 100 100	-	-	-	- - -	-	MΩ MΩ MΩ
	Reverse Grid 3 Current	Vg3 = -2V; Va = 250V Note 4		100%	Ig3	-	-	-	-	1.0	-	µA
	GROUP B											
	Heater Current	Combined AQL	1.0 0.65	II II	Ih	275	-	-	-	325	-	mA
5.3	hk Leakage Current	Vhk = ±100V Note 1 Vhk = -100V Cathode positive	0.65	II V2	Ihk Ihk	- -	-	-	- 2	10 -	-	µA µA
	Anode Current	Note 4	0.65	II V2	Ia Ia	1.9 -	To be recorded -	3.0	-	4.1 -	-	mA mA
	Grid 2 + Grid 4 Current	Note 4	0.65	II V2	Ig2 + g4 Ig2 + g4	5.2 -	To be recorded -	7.5	-	9.8 -	-	mA mA
	Conversion Conductance	Note 4	0.65	II V2	gc gc	280 -	To be recorded -	575	-	750 -	-	µA/V µA/V
	Oscillator Mutual Conductance	Va + g2 + g4 = 100V Note 5	0.65	II V2	gm gm	5.5 -	To be recorded -	7.25	-	9.0 -	-	mA/V mA/V
	GROUP C											
		Combined AQL	6.5	I								
	Conversion Conductance	Vg3 = -6V	2.5	I	gc	40	-	-	-	200	-	µA/V
	Oscillator Mutual Conductance	Vh = 5.7V Va + g2 + g4 = 100V Notes 5, 8.	2.5	I	gm	4.5	-	-	-	-	-	mA/V
	Reverse Grid 1 Current	Vh = 6.9V Va = 330V Vg2 + g4 = 110V Note 6	2.5	I	Ig1	-	-	-	-	3.0	-	µA
11.1	Vibration Noise	Vg1 = Vg3 = -3V; RL = 10kΩ, Note 2	2.5	I	VaAC	-	-	-	-	25	-	mV rms

TESTS (Cont'd)

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K1001 Ref.	Test	Test Conditions	AQL %	Insp. Level	Symbol	Limits						Units
						Min.	LAL	Bogey	UAL	Max.	ALD	
	GROUP D											
7.2	Base Strain	No Voltages	6.5	IA								
5.9	Capacitance	Measured on 1Mc/s Bridge with the valve mounted in a fully shielded socket. Valve screened. Note 7.	6.5	IC	C in	6.0	-	-	-	9.0	-	pF
					C out	11.0	-	-	-	16.0	-	pF
					Ca,g3	-	-	-	-	0.35	-	pF
	Conversion Conductance	Vg3 = -30V	6.5	IA	gc	1.0	-	10	-	50	-	µA/V
	Oscillator Amplification Factor	Va = 100V; Vg3 = 0 Note 5	6.5	IA	µ.	17	-	-	-	25	-	
	Cathode Current	Va = 100V; Vg3 = 0 Note 5	6.5	IA	Ik	16	-	-	-	33	-	mA
	Cathode Current	Va = 100V; Vg1 = -14V Vg3 = 0, Note 5	6.5	IA	Ik	-	-	-	-	50	-	µA
	GROUP E											
11.2	Resonance Search	RL = 10kΩ; Vg1 = Vg3 = -3V Frequency Range	2.5	IC								
		1. 25-200 c/s			VaAC	-	-	-	-	20	-	mV rms
		2. 200-500 c/s			VaAC	-	-	-	-	100	-	mV rms
11.3	Fatigue	Vh = 6.3V Note 3		IA								
	Post Fatigue Tests											
		Combined AQL	4.0									
5.3	hk Leakage Current	Vhk = ±100V Note 1	2.5		Ihk	-	-	-	-	30	-	µA
	Reverse Grid 3 Current	Vg3 = -2V. Note 4	2.5		Ig3	-	-	-	-	2.0	-	µA
	Conversion Conductance	Note 4	2.5		gc	250	-	-	-	-	-	µA/V
11.1	Vibration Noise	As in Group C	2.5		VaAC	-	-	-	-	40	-	mV rms
11.4	Shock	Hammer Angle = 30° No Voltages		IA								
	Post Shock Tests											
		Combined AQL	4.0									
5.3	hk Leakage Current	Vhk = ±100V Note 1	2.5		Ihk	-	-	-	-	30	-	µA
	Reverse Grid 3 Current	Vg3 = -2V Note 4	2.5		Ig3	-	-	-	-	2	-	µA

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K1001 Ref.	Test	Test Conditions	AQL %	Insp. Level	Symbol	Limits						Units
						Min.	LAL	Bogey	UAL	Max.	ALD	
	Conversion Conductance	Note 4	2.5		gc	250	-	-	-	-	-	µA/V
	Vibration Noise	As in Group C	2.5		VaAC	-	-	-	-	40	-	mV rms
	GROUP F											
AVI/5	Life	Note 9										
	Stability Life (1 hour)			I								
AVI/5.1	Change in Conversion Conductance	Note 4	1.0		Δgc	-	-	-	-	20	-	%
AVI/5.3	Intermittent Life			IA								
	Test Point 500 hrs.											
		Combined AQL	6.5									
AVI/5.6	Inoperatives		2.5									
	Heater Current		2.5		Ih	275	-	-	-	325	-	mA
5.3	hk Leakage Current	Vhk = ±100V Note 1	2.5		Ihk	-	-	-	-	30	-	µA
	Reverse Grid 3 Current	Vg3 = -2V, Note 4	2.5		Ig3	-	-	-	-	2	-	µA
	Conversion Conductance	Note 4	2.5		gc	250	-	-	-	-	-	µA/V
	Average change of Conversion Conductance				Δgc	-	-	-	-	17	-	%
	Cathode Current	Va = 100V Vg3 = 0 Note 5	4.0		Ik	12	-	-	-	33	-	mA
	Electrode Insulation	Vh = 6.3V. Note 10	4.0									
		Vg1 to all = -100V			R	50	-	-	-	-	-	MΩ
		Vg3 to all = -100V			R	50	-	-	-	-	-	MΩ
		Va to all = -300V			R	50	-	-	-	-	-	MΩ
	Test Point (1000 hrs)											
		Combined AQL	10.0									
AIV/5.6	Inoperatives		4.0									
5.3	hk Leakage Current	Vhk = ±100V, Note 1	4.0		Ihk	-	-	-	-	40	-	µA
	Reverse Grid 3 Current	Note 4	4.0		Ig3	-	-	-	-	2	-	µA
	Conversion Conductance	Note 4	4.0		gc	250	-	-	-	-	-	µA
	Cathode Current	Va = 100V, Vg3 = 0 Note 5	6.5		Ik	12	-	-	-	33	-	mA
	Electrode Insulation	Vh = 6.3V Note 10	6.5									
		Vg1 to all = -100V			R	30	-	-	-	-	-	MΩ
		Vg3 to all = -100V			R	30	-	-	-	-	-	MΩ
		Va to all = -300V			R	30	-	-	-	-	-	MΩ

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TESTS (Cont'd)

K1001 Ref.	Test	Test Conditions	AQL %	Insp. Level	Symbol	Limits						Units
						Min.	LAL	Bogey	UAL	Max.	ALD	
	GROUP G											
AIX/2.5	Electrical Re-test after 28 days holding period.			100%								
	Inoperatives		0.5									
	Reverse Grid 3 Current	Note 4	0.5		Ig3	-	-	-	-	2.0	-	μA

NOTES

1. Heater positive and negative successively.

2. 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 40 to 100 c/s.
Min. peak acceleration = 2.5g.
The test shall be of sufficient duration to obtain a steady reading of noise output.

3. Valves shall be vibrated in each of the three required planes for a period of 99 hours (30 + 30 + 39 hours). Heater switched 1 minute on 3 minutes off. No other voltages.
Min. peak acceleration = 5g; frequency 170 ±5 c/s.

4. Measured with an alternating voltage applied to the oscillator grid via 20,000 ohms with a 6μF by-pass capacitor, such that the average direct grid current is 0.5 mA.

5. Anode and g2 + g4 connected at socket.

6. Adjust Vg1 to give Ik equal to 15.5 mA. Ig1 shall not be rising or out of limit after 10 minutes.

7. Pin Connections:-

Test	HP	LP	E
Cin	7	1,2,3,4,5,6,C.	-
Cout	5	1,2,3,4,6,7,C.	-
Cag3	7	5	1,2,3,4,6,C.

8. Valves shall be pre-heated under the test conditions for 5 minutes before making this test.

9. Life test conditions.
Vg1 = 16.5V 50 c/s rms through 1.0μF; Rg1 = 20kΩ to cathode; Va = 250V; Vg2 + g4 = 100V;
Vg3 = -1.5V through 100kΩ; Vhk = 150V D.C., heater positive.

10. Heater and cathode strapped and considered as a single electrode.