MINISTRY OF SUPPLY - DEC/ARS

VALVE ELCTRONIC **CV4010**

Specification MOS/CV4010 Issue 5 Dated 6 Mar.'57 To be read in conjunction with K1001 ,BS448 and BS1409	SECURITY Specification: UNCLASSIFIED Valve: UNCLASSIFIED

→ Indicates a change.

TYPE OF VALVE - Reliable RF Pentode, Sharp Cut-off

CATHODE - Indirectly-heated

ENVELOPE - Glass

PROTOTYPE - VX8100

RETMA DESIGNATION - 565J/6AK5W/6096

Nearest equivalent American Specification - MIL-E-1/236

MARKING

See K1001/4

(See also Note D)

BASE

See BS448/B7G/1.1

RATING

All limiting values are absolute

			Note
Heater Voltage	(V)	6.3	C
Heater Current	(A)	0.175	
Max. Anode Voltage	(V)	200	
Max. Cathode Current	(mA)	20	E
Max. Anode Dissipation	(W)	1.65	
Max. Screen Voltage	(V)	155	
Max. Screen Dissipation	(W)	0.55	
Max Heater - Cathode Voltage	(V)	±130	
Mutual Conductance	(mA/V)	5.0	A
Anode Impedance	(megohm)	0.34	A
Max. Operating Frequency	(Mc/s)	400	
Max. Bulb Temperature	(°C)	165	C
Max. Shock (short duration)	(g)	500	
Max. Acceleration (continuous operation)	(g)	2.5	

CAPACITANCES (pF)

Cagl	(max.)	0.02	B
Cac	(nom.)	2.85	B
Cge	(nom.)	4.0	B

CONNECTIONS

Pin	Electrode
1	Grid 1
2	Cathode - Grid 3
3	Heater
4	Heater
5	Anode
6	Grid 2
7	Cathode - Grid 3

DIMENSION

See BS448/B7G/2.1
size ref. No. 1.

Dimensions (mm)	MIN.	MAX.
A Seated height	-	38.0
C Diameter	16.0	17.0
D Overall length	-	45.0

MOUNTING POSITION

any

NOTES

A. Measured at Va = Vg2 = 120V, Vg1 = -2V.

B. Measured with a close-fitting metal can.

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 indicated altitude may be exceeded at reduced ratings. The life expectancy may be reduced if conditions other than those specified for life test 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. In addition to the requirements of K1001/4, the RETMA designation shall also be clearly and indelibly marked on the valve.

E. Difficulty may be encountered if this valve is operated for long periods at very low values of cathode current.

TESTS

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)	Vg2(V)	Vg1(V)
6.3	120	120	-2

K1001	Test	Test Conditions	AQL %	Insp. Level	Symbol	Limits Min	LAL	Bogey	UAL	Max	ALD	Units
→ 7.1	Glass Strain	No voltages	6.5	I								
	GROUP A											
	Insulation	Vg1 -all= -100V DC		100%	R	100						M
		Vg2 -all= -300V DC		100%	R	100						M
		Va -all= -300V DC		100%	R	100						M
→	Reverse Grid Current	Rg1 = 500k max.		100%	Ig1	-	-	-	-	0.1	-	µA
	GROUP B	Combined AQL	1.0	II								
	Heater Current		0.65	II	Ih	160	-	175	-	190		mA
	H-C Leakage Current	Vhk = ± 100V	0.65	II	Ihc	-	-	-	-	10		µA
	Anode Current		0.65	II	Ia	5.0	-	-	-	11.0		mA
				V2	Ia		6.5	7.5	8.5		2.5	mA
	Screen Grid Current		0.65	II	Ig2	0.8	-	-	-	4.0		mA
				V2	Ig2	-	1.8	2.5	3.2	-	1.5	mA
	Mutual Conductance		0.65	II	gm	4.0	-	-	-	6.25		mA/V
				V2	gm	-	4.525	5.0	5.475		1.025	mA/V
	GROUP C	Combined AQL	6.5	I								
	Anode Current	Vg1 = -10V	2.5	I	Ia	-	-	-	-	200		µA
	Anode Current	Vg1 = -5.5V	2.5	I	Ia	5	-	-	-	-		µA
	Change in Mutual Conductance	Vh = 5.7V Note 1	2.5	I	Δgm	-	-	-	-	15		%
	Reverse Grid Current	Note 5 Vh = 7.0V; Rg1 = 100K	2.5	I	Ig1	-	-	-	-	0.5		µA
	Noise and Microphony	Va(b) = 200V; Vg1 = 0 Rk = 1000; Rl = 100K Rg2 = 500k Ck = 1000 µF Cg2 = 2 µF	2.5	I	Va AC	-	-	-	-	100		mV RMS
	or alternatively											
11.1	Vibration Noise	Vht = 135V RL = 2000 Rg1 = 100k Rg2 = 10k Cg2 = 2 µF	2.5	I	V AC	-	-	-	-	45		mV RMS
	GROUP D											
7.2	Base Strain		6.5	IA								
	Capacitances	Measured on 1 Mc/s Bridge and the valve mounted in a fully screened socket, with shielding can.	6.5	IA	Cag	-	-	-	-	0.02		pF
					Cge	3.4	-	-	-	4.6		pF
					Cae	2.45	-	-	-	3.25		pF
→	Noise Factor	Note 2	4.0	I	NF		-	-	-	2.5		db

TESTS (Contd.)

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K1001	Test	Test Conditions	AQL %	Insp. Level	Symbol	Limits Min	LAL	Bogey	UAL	Max	ALD	Units
	GROUP E											
11.2	Resonance Search	RL = 10k Frequency 25-500c/s	2.5	IC	Va AC f	- 200	-	-	-	record -	-	mV RMS c/s
11.3	Fatigue Test	Vh = 6.3V switched 1 min on, 3 mins off Va = Vg1 = Vg2 = 0 Min pk accel. = 5g Duration = 30,39, 30 hrs. Frequency = 170 c/s		IA								
	Post Fatigue Test	Combined AQL	6.5									
	Vibration Noise	Note 6	2.5		Va AC	-	-	-	-	90		mV RMS
	H-C Leakage Current	Vhk = ± 100V	2.5		Ihc	-	-	-	-	30		µA
	Reverse Grid Current	Rg1 = 500k max	2.5		Ig1	-	-	-	-	0.2		µA
	Mutual Conductance		2.5		gm	3.5	-	-	-	-		mA/V
11.5	Shock Test	Hammer angle = 30° No voltages		IA								
	Post Shock Tests	Combined AQL	6.5									
	Vibration Noise	Note 6	2.5		Va AC	-	-	-	-	90		mV RMS
	H-C Leakage Current	Vhk = ± 100V	2.5		Ihc	-	-	-	-	30		µA
	Reverse Grid Current	Rg1 = 500k max.	2.5		Ig1	-	-	-	-	0.2		µA
	Mutual Conductance		2.5		gm	3.5	-	-	-	-		mA/V
	GROUP F											
AVI/5	LIFE TEST	Va = 150V Vg2 = 125V Vg1 = 0 Vhk = 135V, heater positive Rg1 = 100k Rk = 130 ohms										
AVI/5.1	Stability Life Test											
	Change in Mutual Conductance		1.0	I	Δgm	-	-	-	-	10		%
AVI/5.3	Intermittent Life Test	See above										
	Life Test End-Point (500 hours)		6.5	IA								
	Inoperatives		2.5									
	Heater Current		2.5		Ih	0.16	-	-	-	0.19		A
	H-C Leakage Current	Vhk = ± 100V	2.5		Ihc	-	-	-	-	10		µA
	Reverse Grid Current	Rg1 = 500k max	2.5		Ig1	-	-	-	-	0.1		µA
	Mutual Conductance		2.5		gm	3.75	-	-	-	6.25		mA/V
	do Average Change				Δgm	-	-	-	-	15		%
	Anode Current		4.0		Ia	4.5	-	-	-	11.0		mA
	Electrode Insulation	Vg1 - all = -100V	4.0		R	50	-	-	-	-		M
		Vg2 - all = -300V				50	-	-	-	-		M
		Va - all = -300V				50	-	-	-	-		M
	Noise Factor	Note 2	4.0		NF	-	-	-	-	2.7		db

TESTS (Cont'd)

K1001	Test	Test Conditions	AQL %	Insp. Level	Sym-bol.	Limits Min	LAL	Bogey	UAL	Max	ALD	Units
	Life Test End-Point (1000 Hours)		10	I4								
	Inoperatives		4.0			-	-	-	-	-		
	Heater Current		4.0		Ih	0.16	-	-	-	0.19		A
	H-C Leakage Current	Vhk = ± 100V	4.0		Ihc	-	-	-	-	10		μA
→	Reverse Grid Current	Rg1 = 500k max.	4.0		Ig1	-	-	-	-	0.1		μA
	Mutual Conductance		4.0		gm	3.5	-	-	-	6.25		mA/V
	Anode Current		6.5		Ia	4.0	-	-	-	11.0		mA
	Noise Factor	Note 2	6.5		NF	-	-	-	-	2.8		db
	GROUP C											
AIX/ 2.5	Electrical Re-test after 28 days holding period			100%								
	Inoperatives		0.5									
→	Reverse Grid Current	Rg1 = 500k max	0.5		Ig1	-	-	-	-	0.15		μA

NOTES

1. The change in mutual conductance is expressed as:-

$$\frac{gm \text{ at } 6.3V - gm \text{ at } 5.7V}{gm \text{ at } 6.3V} \times 100\%$$

2. The valve shall be tested at a convenient frequency within the range 40 to 50 Mc/s in an approved Head Amplifier - See circuit diagram on Page 5. The Noise Factor of the complete unit shall be measured for a bandwidth not exceeding one Mc/s. The noise contributed by the second stage shall not exceed 3% of the total noise. The input circuit losses measured at the grid shall not exceed an equivalent conductance of 30 micro-mhos at the test frequency. The measuring source shall be transformed to 2000 ohms at the grid. Initially the neutralisation shall be adjusted for an average valve, but the tuning of the input circuit shall be adjusted for each measurement.

3. Deleted

4. Deleted

5. Prior to this test the valve shall be preheated for five (5) minutes under the conditions specified below. Test immediately after pre-heating.

Vh (V)	Vg1 (V)	Rk (ohms)	Rg1 (ohms)	Va (V)	Vg2 (V)
7.0	0	130	100k	150	125

6. The conditions specified for the Vibration Noise Test in Group C shall apply.