

Specification MOB(Δ)CV-4070	SECURITY	
Issue 1 Dated 8.1.57.	<u>Specification</u>	<u>Valve</u>
To be read in conjunction with B.S.448, B.S.1409 and K.1001	UNCLASSIFIED	UNCLASSIFIED

TYPE OF VALVE - Reliable Miniature Grounded Grid Triode CATHODE - Indirectly Heated ENVELOPE - Glass PROTOTYPE - CV-417 R.E.T.M.A. DESIGNATION - 6AQ4	MARKING																	
	K1001/4																	
	Additional Markings:-																	
	6AQ4																	
	BASE																	
	BS.448/B70																	
	CONNECTIONS																	
	Note																	
Heater Voltage (V) 6.3 Heater Current (A) 0.3 Max. Anode Voltage (Ia = 0) (V) 550 Max. Operating Anode Voltage (V) 275 Max. Anode Dissipation (W) 3.0 Max. Mean Cathode Current (mA) 17 Max. Heater - Cathode Voltage (V) 2150 Max. Grid - Cathode Voltage (V) 100 Max. Operating Frequency (Mc/s) 250 Max. Bulb Temperature (°C) 165 Max. Shock (short duration) (g) 500 Max. Acceleration (continuous operation) (g) 2.5 Min. Grid Voltage to ensure cut off to a slope of 100μA/V (V) -8.0 Mutual Conductance (mA/V) 8.5 Amplification Factor 100	C	<table border="1"> <thead> <tr> <th>Pin</th> <th>Electrode</th> </tr> </thead> <tbody> <tr><td>1</td><td>Grid</td></tr> <tr><td>2</td><td>Cathode</td></tr> <tr><td>3</td><td>Heater</td></tr> <tr><td>4</td><td>Heater</td></tr> <tr><td>5</td><td>Cathode</td></tr> <tr><td>6</td><td>Grid</td></tr> <tr><td>7</td><td>Anode</td></tr> </tbody> </table>	Pin	Electrode	1	Grid	2	Cathode	3	Heater	4	Heater	5	Cathode	6	Grid	7	Anode
Pin	Electrode																	
1	Grid																	
2	Cathode																	
3	Heater																	
4	Heater																	
5	Cathode																	
6	Grid																	
7	Anode																	
	C	DIMENSIONS																
	A	See BS.448/B70/2.1 Size Ref.No. 2																
		<table border="1"> <thead> <tr> <th>Dimensions (mm)</th> <th>Min.</th> <th>Max.</th> </tr> </thead> <tbody> <tr> <td>A seated height</td> <td>-</td> <td>47.5</td> </tr> <tr> <td>C diameter</td> <td>16.0</td> <td>19.0</td> </tr> <tr> <td>D overall length</td> <td>-</td> <td>54.5</td> </tr> </tbody> </table>	Dimensions (mm)	Min.	Max.	A seated height	-	47.5	C diameter	16.0	19.0	D overall length	-	54.5				
Dimensions (mm)	Min.	Max.																
A seated height	-	47.5																
C diameter	16.0	19.0																
D overall length	-	54.5																
		MOUNTING POSITION																
		Any																
		CAPACITANCES (pF)																
Cg, kh (nom.) 5.25 Ca, kh (max.) 0.2 Ca, g (nom.) 3.8 Ck, gh (nom.) 8.5	B B B B																	

NOTES

A At $V_a = 250V$; $V_g = -1.5V$; ($I_a = 10 mA$)

B Measured with a close fitting metal screen connected to grid.

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.

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

Test Conditions:- unless otherwise specified														
		Vh(V)	Va(V)	Rk(ohms)	Ck		Limits					Units		
		6.3	250	150	Note 6		Min	LAL	Boge	UAL	Max	ALD		
K1001 Ref.	Test	Test Conditions			AQL %	Insp. Level	Symbol							
7.1	Glass strain	No Voltages			6.5	I								
	<u>GROUP A</u>													
	Electrode Insulation	Vh = 6.3V, Note 5 Vg to all = -100V Va to all = -300V			100%		R	100	-	-	-	-	MΩ	
	Reverse Grid Current				100%		Ig	-	-	-	0.5	-	μA	
5.3	<u>GROUP B</u>													
	Heater Current	Combined AQL			1.0	II								
	Heater - Cathode Leakage Current	Vhk = ±100V, Note 1 Vhk = -100V, Cathode positive			0.65	II	Ihk	270	-	300	-	330	-	mA
	Anode Current				0.65	II	Ia	8.0	-	-	-	12.0	-	mA
	Mutual Conductance				0.65	II	gm	7.0	-	-	-	10.0	-	mA/V
						V2	Ihk	-	-	-	3.0	-	μA	
						V2	Ia	9.26	10.0	10.74	-	1.65	mA	
						V2	gm	-	7.9	8.5	9.1	-	1.24	mA/V
11.1	<u>GROUP C</u>													
	Change of Mutual Conductance	Vh = 5.7V, Note 4			2.5	I	Δgm	-	-	-	15	-	%	
	Anode Current	Vg = -5V			2.5	I	Ia	-	-	-	0.75	-	mA	
	Vibration Noise	Va(b) = 250V; RL = 2kΩ; Rg = 100kΩ; Vg = 1.5V. Cathode bias may be used Rk = 150Ω, Note 2			2.5	I	VaAC	-	-	-	10.0	-	mVrms	
7.2	<u>GROUP D</u>													
	Base Strain	No Voltages			6.5	IA								
	Equivalent Noise Resistance with grid earthed				6.5	IA	Req	-	-	-	400	-	Ω	

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Ref.	Test	Test Conditions	%	Level	bol	Min	LAL	Bogey	UAL	Max	ALD	
5.9	Capacitances	Measured on 1 Mc/s bridge with valve mounted in a fully shielded socket; valve screen connected to grid	6.5	IC	Cg, kh	3.9	-	5.25	-	6.6	-	DF
	Ca, kh				-	-	-	-	0.2	-	DF	
					Ca, g	3.1	-	3.8	-	4.5	-	DF
					Ck, gh	7.0	-	8.5	-	10.0	-	DF
	Amplification Factor		6.5	IA		85	-	-	-	115	-	
GROUP E												
11.2	Resonance Search	Va = 250V; RL = 2k Ω Frequency:- (1) 25 - 200 c/s (2) 200-500 c/s (3) 500-2500 c/s	2.5	IC	VaAC	-	-	-	-	10	-	mVrms
					VaAC	-	-	-	-	50	-	mVrms
					VaAC	-	-	-	-	150	-	mVrms
11.3	Fatigue	Vh = 6.9. Note 3		IA								
<u>Post Fatigue Tests</u>												
		Combined AQL	4.0									
5.3	Heater - Cathode Leakage Current	Vhk = 100V. Note 1	2.5		Ihk	-	-	-	-	20	-	μ A
	Reverse Grid Current		2.5		Ig	-	-	-	-	1.0	-	μ A
	Mutual Conductance		2.5		gm	6.0	-	-	-	10.0	-	mA/V
11.1	Vibration Noise	As in Group C	2.5		VaAC	-	-	-	-	25	-	mVrms
11.4	Shock Test	Hammer Angle = 30 $^{\circ}$ No Voltages		IA								
<u>Post Shock Tests</u>												
		Combined AQL	4.0									
5.3	Heater - Cathode Leakage Current	Vhk = 100V. Note 1	2.5		Ihk	-	-	-	-	20	-	μ A
	Reverse Grid Current		2.5		Ig	-	-	-	-	1.0	-	μ A
	Mutual Conductance		2.5		gm	6.0	-	-	-	10.0	-	mA/V
11.1	Vibration Noise	As Group C	2.5		VaAC	-	-	-	-	25	-	mVrms
GROUP F												
AV1/5	Life Test	Va = 250V; Rk = 150 Vhk = 150V D.C. Rg = 100k Ω Heater positive										
		<u>Stability Life (1 hour)</u>										
	Change in Mutual Conductance		1.0	I	gm	-	-	-	-	10.0	-	%

K1001 Ref.	Test	Test Conditions	AQL %	Insp. Level	Sym- bol	Min	LAL	Bogey	UAL	Max	ALD	Units
AVI/5.3	<u>Intermittent Life</u>			IA								
	<u>Test Point 500 hours</u>	Combined AQL	6.5									
AVI/5.6	Inoperatives		2.5									
	Heater Current		2.5		Ih	270	-	300	-	330	-	mA
5.3	Heater - Cathode Leakage Current	Vhk = ±100V. Note 1	2.5		Ihk	-	-	-	-	20	-	μA
	Reverse Grid Current		2.5		Ig	-	-	-	-	1.0	-	μA
	Mutual Conductance		2.5		gm	5.7	-	-	-	10.0	-	mA/V
	Average Change of Mutual Conductance				Δgm	-	-	-	-	15	-	%
	Anode Current		4.0		Ia	6.5	-	-	-	11.0 13.0	-	mA
	Electrode Insulation	Vh = 6.3V. Note 5 Vg to all = -100V Va to all = -300V	4.0 4.0		R R	50 50	- -	- -	- -	- -	- -	M Ω M Ω
	<u>Test Point (1000 hrs)</u>	Combined AQL	10.0									
AVI/5.6	Inoperatives		4.0									
	Heater Current		4.0		Ih	270	-	300	-	330	-	mA
5.3	Heater - Cathode Leakage Current	Vhk = ±100V. Note 1	4.0		Ihk	-	-	-	-	20	-	μA
	Reverse Grid Current		4.0		Ig	-	-	-	-	1.0	-	μA
	Mutual Conductance		4.0		gm	5.3	-	-	-	10.0	-	mA/V
	Anode Current		6.5		Ia	6.0	-	-	-	11.0 13.0	-	mA
	<u>GROUP G</u>											
AIX/2.5	Electrical Re-test after 28 days holding period			100%								
AVI/5.6	Inoperatives		0.5									
	Reverse Grid Current		0.5		Ig	-	-	-	-	1.0	-	μA

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NOTES

1. Heater positive and negative successively.
2. The valve shall be mounted so that the direction of vibration is parallel to the electrode structure. Vibration frequency = any fixed frequency in the range 25 - 100 c/s. Min. peak acceleration = 2g. The test should 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 not less than 30 hours and not less than 99 hours (30 + 99 + 30 hrs.) total. Heater switched 1 minute on 3 minutes off. No other voltages. Min. peak acceleration = 5g; frequency = 170 ± 5 c/s.
4. The change of mutual conductance is expressed
$$\frac{(\text{gm at } 6.3\text{V}) - (\text{gm at } 5.7\text{V})}{(\text{gm at } 6.3\text{V})} \times 100\%$$
5. Heater and cathode strapped and considered as a single electrode.
6. Automatic bias to be by-passed by a capacitance sufficiently large to offer an impedance of not more than 3 ohms at the frequency of the grid signal where measurements are carried out dynamically.

SPECIFICATION CV.4070

ISSUE 1. DATED 8.1.57.

APPENDMENT No. 1.

GROUP F. INTERMITTENT LIFE. TEST POINT (500 hours).

Delete the existing Electrode Insulation Test (at end of group) and substitute the following:

K1001 Ref.	Test	Test Conditions	AQL %	Insp. Level	Symbol	Limits					Units
						Min	LAL	Bogey	UAL	Max.	
	Electrode Insulation	Vh = 6.3v. Note 5. Vg - all = -100v. Va - all = -300v.	4.0		R R	50 50	- -	- -	- -	- -	MΩ mΩ

TEST POINT (1000 hours).

Delete all reference to the Heater Current test.

Add at the end of this group (after Anode Current test) the following:

K1001 Ref.	Test	Test Conditions	AQL %	Insp. Level	Symbol	Limits					Units
						Min	LAL	Bogey	UAL	Max.	
	Electrode Insulation	Vh = 6.3v. Note 5. Vg - all = -100v. Va - all = -300v.	6.5		R R	30 30	- -	- -	- -	- -	MΩ MΩ

Z.16136.R.

Director,
Royal Aircraft Establishment.