

CV4070

 Avdt
 Avdt
 MINISTRY OF SUPPLY M.O.S. (A) R.A.E.

Valve Electronic

 Specification M0A/CV4070
 M0A/CV4070

Issue 1 Dated 8.1.57.

To be read in conjunction with B.S.448, B.S.1409 and K.1001

SECURITY

Specification

Valve

UNCLASSIFIED

UNCLASSIFIED

TYPE OF VALVE - Reliable Miniature Grounded Grid Triode

CATHODE - Indirectly Heated

ENVELOPE - Glass

PROTOTYPE - CV417

R.E.T.M.A. DESIGNATION - 6AQ4

MARKING

K1001/4

Additional Markings:-

6AQ4

BASE

BS.448/B7G

CONNECTIONS

		Note	
Heater Voltage	(V)	6.3	C
Heater Current	(A)	0.5	
Max. Anode Voltage ($I_a = 0$)	(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)	250	
Max. Grid - Cathode Voltage	(V)	100	
Max. Operating Frequency	(Mc/s)	250	
Max. Bulb Temperature	(°C)	165	C
Max. Shock (short duration)	(g)	500	
Max. Acceleration (continuous operation)	(g)	2.5	
Min. Grid Voltage to ensure cut off to a slope of 100 μ A/V	(V)	-8.0	
Mutual Conductance	(mA/V)	8.5	A
Amplification Factor		100	

CAPACITANCES (pF)

Cg, kh (nom.)

Ca, kh (max.)

Ca, g (nom.)

Ck, gh (nom.)

 5.25 B
 0.2 B
 3.8 B
 8.5 B

DIMENSIONS

 See BS.448/B7G/2.1
 Size Ref. No. 2

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

MOUNTING POSITION

ANY

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.

CV.4070/1/1

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) 6.3		Va(V) 250		Rk(ohms) 150		Ck Note 6						
K1001 Ref.	Test	Test Conditions	AQL %	Insp. Level	Sym- bol	Limits						Units
						Min	LAL	Bogey	UAL	Max	ALD	
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% 100%	R R	R	100 100	- -	- -	- -	- -	- -	MΩ MΩ
	Reverse Grid Current		100%	Ig	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 0.65	II V2	Ih Ihk	270 -	- -	300 -	- 3.0	330 -	- -	mA μA μA
	Anode Current		0.65	II V2	Ia Ia	8.0 9.26	- 10.0	- 10.74	- -	12.0 -	- 1.65	mA mA
	Mutual Conductance		0.65	II V2	gm gm	7.0 7.9	- 8.5	- 9.1	- 10.0	- -	- 1.24	mA/V 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	-	-	-	-	400 550		Ω

K1001 Ref.	Test	Test Conditions	AQL %	Insp. Level	Sym- bol	Limits						Units
						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 Ca,kh Ca,g Ck,gh	3.9 - 3.1 7.0	- - - 6.5	5.25 - 3.8 8.5	- - - -	6.6 0.2 4.5 10.0	- - - -	PF PF PF PF
	Amplification Factor		6.5	IA		-85 75	-	-	-	-115 165	-	
GROUP E												
11.2	Resonance Search	Va = 250V; RL = 2kΩ Frequency:- (1) 25 - 200 c/s (2) 200-500 c/s (3) 500-2500 c/s	2.5	IC	VaAC VaAC VaAC	- - -	- - -	- - -	- - -	10 50 150	- - -	mVrms mVrms 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	-	μA
	Reverse Grid Current		2.5		Ig	-	-	-	-	1.0	-	μA
	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° 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	-	μA
	Reverse Grid Current		2.5		Ig	-	-	-	-	1.0	-	μA
	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 = 100kΩ Heater positive										
		<u>Stability Life (1 hour)</u>										
	Change in Mutual Conductance		1.0	I	agn	-	-	-	-	10.0	-	%

K1001 Ref.	Test	Test Conditions	AQL %	Insp. Level	Sym- bol	Limits						Units
						Min	LAL	Bogey	UAL	Max	ALD	
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	-	-	-	12.0 11.0	-	mA
	Electrode Insulation	Vh = 6.3V. Note 5 Vg to all = -100V Va to all = -300V	4.0 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	Vh = 6.3V Note 5	6.5		Ia	6.0	-	-	-	12.0 11.0	-	mA
	Electrode Insulation	Vg-all = -100V Va-all = -300V	6.5		R R	30 30	- -	- -	- -	- -	- -	M Ω M Ω
	<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

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 + 39 + 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.

ELECTRONIC VALVE SPECIFICATIONS

SPECIFICATION CV.4070

ISSUE 1. DATED 8.1.57.

AMENDMENT 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.	ALD	
	Electrode Insulation	Vh = 6.3v. Note 5. Vg - all = -100v. Va - all = -300v.	4.0		R	50	-	-	-	-	-	MΩ
					R	50	-	-	-	-	-	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.	ALD	
	Electrode Insulation	Vh = 6.3v. Note 5. Vg - all = -100v. Va - all = -300v.	6.5		R	30	-	-	-	-	-	MΩ
					R	30	-	-	-	-	-	mΩ

Z.16136.R.

Director,
Royal Aircraft Establishment.

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ELECTRONIC VALVE SPECIFICATIONS

SPECIFICATION CV4070

ISSUE 1 DATED 8TH JANUARY 1957

AMENDMENT NO.2

Page 1: Under RATING.

Against Amplification Factor, delete 100 and insert 90

Page 3: Under GROUP D.

Against Amplification Factor, amend Limits Min. from
85 to 75 and Limits Max. from 115 to 105.

March 1960
NK16546/D

R.R.E.

/AAS 9/8

ELECTRONIC VALVE SPECIFICATIONS

SPECIFICATION M. O. S. (A) CV 4070

ISSUE 1 DATED 8.1.57.

AMENDMENT NO. 3.

Page 2 GROUP D At bottom of page

<u>Against</u>	"Equivalent Noise Resistance with grid earthed"	<u>Amend</u>	figure in column headed "Limits Max" from "400" to "550" ohms
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May 1960
R.17176/D

T.V.C. for R.R.E. *Ans 1/11/60*

ELECTRONIC VALVE SPECIFICATIONS
SPECIFICATION MOS(A)/CV 4070 ISSUE NO.1. DATED 8.1.57
AMENDMENT NO.4

- (i) Page 1. (Top of Page) Amend "Ministry of Supply M.O.S.(A) R.A.E." to read "Ministry of Aviation - DLRD/RRE".
- (ii) Page 1. Specification Title Amend "Specification MOS(A)CV.4070" to read "Specification MOA/CV4070".
- (iii) Page 3 Group D. Capacitance

Against 'Ck,gh' in the column headed "Limits, Min.", delete "7.0" and substitute "6.5".

November, 1964

T.V.C. for R.R.E.

(222410)

KAS 12/65

ELECTRONIC VALVE SPECIFICATIONS

SPECIFICATION M.O.A./CV.4070 ISSUE 1. DATED 8th JANUARY 1957

AMENDMENT NO.5

Page 4. Group F. Test Point (500 hrs.).

Against Anode Current in Max. Limits column amend "11.0" mA to read "12.0"mA.

Page 4. Group F. Test Point (1,000 hrs.).

Against Anode Current in Max. Limits column amend "11.0"mA to read "12.0"mA.

March, 1965.

T.V.C. for R.R.E.

~~14/12/65~~
29/6/65