

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

Specification MOS(A)/CV4067 Issue 1 Dated 17.10.56 To be read in conjunction with B.S.1409 and K.1001	<u>SECURITY</u>	
	<u>Specification</u>	<u>Valve</u>
	UNCLASSIFIED	UNCLASSIFIED

TYPE OF VALVE	- Reliable Beam Power Amplifier with Flying Leads			<u>MARKING</u> K1001/4		
CATHODE	- Indirectly heated			<u>BASE</u> B7G/P		
ENVELOPE	- Glass					
PROTOTYPE	- CV.471, VX.7131, VX.8167					
<u>RATING</u> (All limiting values are absolute)				<u>CONNECTIONS</u>		
				Lead	Electrode	
				Note		
Heater Voltage	(V)	6.3	C	1	Grid 1	g1
Heater Current	(A)	0.45		2	Cathode and BP	k, bp
Max. Anode Voltage (Ia = 0)	(V)	550		3	Heater	h
Max. Screen Voltage (I _{g2} = 0)	(V)	550		4	Heater	h
Max. Operating Anode Voltage	(V)	250		5	Anode	a
Max. Operating Screen Voltage	(V)	250		6	Grid 2	g2
Max. Anode Dissipation	(W)	5.5		7	Cathode and BP	k, bp
Max. Screen Dissipation	(W)	1.1		<u>DIMENSIONS</u> See K.1001/AI/D11		
Max. Heater - Cathode Voltage	(V)	175				
Max. Cathode Current	(mA)	55		Dimensions (mm) Min. Max.		
Max. Grid - Cathode Resistance (fixed bias)	(Ω)	0.1				
Max. Grid - Cathode Resistance (Cathode bias)	(Ω)	0.5		A. seated height	-	47.5
Max. Bulb Temperature	(°C)	210	C	B. diameter	16.0	19.0
Max. Shock (short duration)	(g)	500		D. lead length	38	-
Max. Acceleration (continuous operation)	(g)	2.5		<u>MOUNTING POSITION</u> Any		
Max. Operating Frequency	(Mc/s)	50				
Mutual Conductance	(mA/V)	4.8	A			
Inner Amplification Factor (μg _{1g2})		5.5	A, D			
<u>CAPACITANCES (pF)</u>						
C in (nom.)		7.0	B			
C out (nom.)		8.75	B			
C _{a, g1} (max.)		0.1	B			
<u>NOTES</u>						
A. Measured at V _i = V _{g2} = 120V; V _{g1} = 0; R _k = 250 Ω. (I _a = 35 mA, I _{g2} = 4.0 mA).						
B. Measured with close fitting metal screen.						
C. <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 these 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. The value for Inner Amplification Factor may fall anywhere between 3 and 8.						

CV4067/1/1

Z.13004.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)	Vg1(V)	Va(V)	Vg2(V)	Rk(chms)	Ck(μF)							
6.3	0	120	120	250 ±5%	1000 min.							
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								
	<u>GROUP A</u>											
	Electrode Insulation	Vh = 6.3V. Note 8 Va-all = -300V Vg2-all = -300V Vg1-all = -100V	100% 100% 100%	R R R	R	100	-	-	-	-	-	MΩ
	Reverse Grid Current	Rg1 = 500 kΩ max.	100%	Ig1	Ig1	-	-	-	-	1.0	-	μA
	<u>GROUP B</u>											
	Heater Current	Combined AQL	1.0	II								
5.3	hk Leakage Current	Vhk = ±100V. Note 1 Vhk = -100V Cathode positive	0.65	II	Ihk	410	-	450	-	490	-	mA
	Anode Current		0.65	II	Ia	28	-	35.0	-	42	-	mA
	Screen Current		0.65	II	Ig2	-	-	-	-	5.2	-	mA
	Mutual Conductance		0.65	II	gm	3.8	-	4.8	-	5.8	-	mA/V
	<u>GROUP C</u>											
	Change of Mutual Conductance	Vh = 5.7V Notes 6 & 7	2.5	I	Δgm	-	-	-	-	15	-	%
	Anode Current	Vg1 = -40V	2.5	I	Ia	-	-	-	-	200	-	μA
	Reverse Grid Current	Vh = 6.9V Note 4	2.5	I	Ig1	-	-	-	-	1.5	-	μA
11.1	Vibration Noise	Va = Vg2 = 120V; Rk = 500Ω RL = 2kΩ Note 2	2.5	I	Va AC	-	-	-	-	35	-	mV rms

K1001 Ref.	Test	Test Conditions	AQL %	Insp. Level	Symbol	LIMITS						Units
						Min.	LAL	Bogey	UAL	Max.	ALD	
GROUP D												
5.12	Lead Fragility		6.5	IA								
5.9	Capacitance	Measured on 1 Mc/s bridge with valve mounted in a fully shielded holder. Valve screened	6.5	IC	C in C out C _{a,g1}	6.0 7.5 -	- - -	7.0 8.75 -	- - -	8.0 10.0 0.1	- - -	pF pF pF
	Power Oscillation	Note 5	6.5	IC	PO	5.0	-	-	-	-	-	W
GROUP E												
11.2	Resonance Search	V _a (b) = 120V; V _{g2} = 120V; R _k = 500 Ω; R _L = 2k Ω C _k = 1000 μF Frequency:- (1) 25-200 c/s (2) 200-500 c/s (3) 500-2500 c/s	2.5	IC								
					V _a AC							mV rms
					V _a AC							mV rms
					V _a AC							mV rms
11.3	Fatigue	V _h = 6.9V Note 3		IA								
		<u>Post Fatigue Tests</u>										
		Combined AQL	4.0									
5.3	hk Leakage Current	V _{hk} = ±100V Note 1	2.5		I _{hk}	-	-	-	-	20	-	μA
	Reverse Grid Current	R _{g1} = 500k Ω	2.5		I _{g1}	-	-	-	-	1.5	-	μA
	Mutual Conductance		2.5		g _m	3.4	-	-	-	5.8	-	mA/V
11.1	Vibration Noise	As in Group C	2.5		V _a AC	-	-	-	-	50	-	mV rms
11.4	Shock	Hammer Angle = 30° No voltages		IA								
		<u>Post Shock Tests</u>										
		Combined AQL	4.0									
5.3	hk Leakage Current	V _{hk} = ±100V Note 1	2.5		I _{hk}	-	-	-	-	20	-	μA
	Reverse Grid Current	R _{g1} = 500 k Ω max.	2.5		I _{g1}	-	-	-	-	1.5	-	μA
	Mutual Conductance		2.5		g _m	3.4	-	-	-	5.8	-	mA/V
11.1	Vibration Noise	As in Group C	2.5		V _a AC	-	-	-	-	50	-	mV rms

cv4067/113

Ref.	Test	Test Conditions	%	Level	Symbol	Min.	LAL	Bogey	UAL	Max.	ALD	Units
	<u>GROUP F</u>											
A VI/5	Life	Vhk = 150V D.C. Heater positive. Va = Vg2 = 120V; Rk = 250 Ω ±10% Rg1 = 100k Ω ±20%										
	<u>Stability Life (1 hour)</u>			I								
	Change in Mutual Conductance		1.0		Δgm	-	-	-	-	10	-	%
	<u>Intermittent Life</u>			IA								
	<u>Test Point 500 hours</u>	Combined AQL	6.5									
AVI/5.6	Inoperatives		2.5									
5.3	hk Leakage Current	Vhk = ±100V Note 1	2.5		Ihk	-	-	-	-	20	-	μA
	Heater Current		2.5		Ih	410	-	450	-	490	-	mA
	Reverse Grid Current		2.5		Ig1	-	-	-	-	1.5	-	μA
	Mutual Conductance		2.5		gm	3.3	-	-	-	5.8	-	mA/V
	Average Change in Mutual Conductance				Δgm	-	-	-	-	15	-	%
	Anode Current		4.0		Ia	24	-	-	-	42	-	mA
	Electrode Insulation <i>SEE NOTE 8</i>	Va-all = -300V Vg2-all = -300V Vg1-all = -100V	4.0		R	50	-	-	-	-	-	MΩ
					R	50	-	-	-	-	-	MΩ
					R	50	-	-	-	-	-	MΩ
	<u>Test Point 1000 Hours</u>	Combined AQL	10.0	IA								
AVI/5.6	Inoperatives		4.0									
5.3	hk Leakage Current	Vhk = ±100V Note 1	4.0		Ihk	-	-	-	-	20	-	μA
	Heater Current		4.0		Ih	410	-	450	-	490	-	mA
	Reverse Grid Current	Rg1 = 500 kΩ max.	4.0		Ig1	-	-	-	-	1.5	-	μA
	Mutual Conductance		4.0		gm	3.1	-	-	-	5.8	-	mA/V
	Anode Current		6.5		Ia	22	-	-	-	42	-	mA

CV40671/4

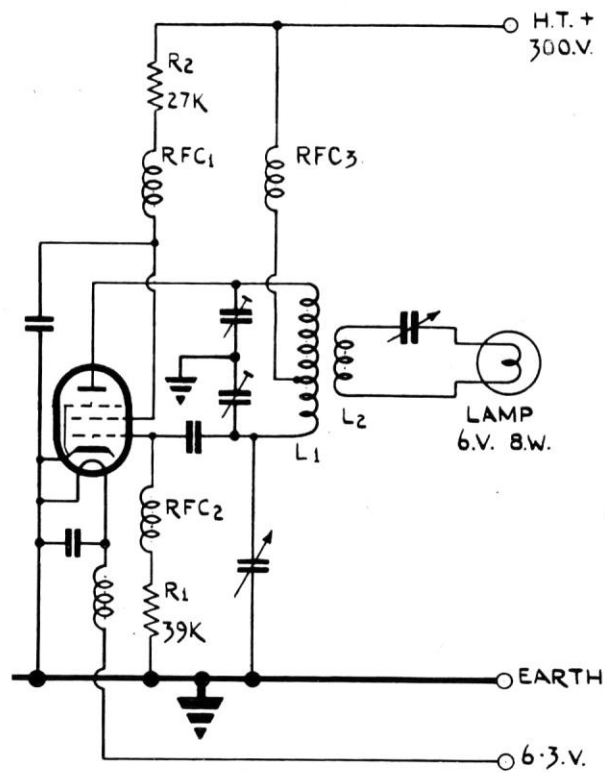
Ref.	Test	Test Conditions	%	Level	Symbol	Limits						Units
						Min.	LAL	Bogey	UAL	Max.	ALD	
AIX/2.4	GROUP C Electrical Re-test after 28 days holding period			100%								
AVI/5.6	Inoperatives		0.5									
	Reverse Grid Current	Rg1 = 500 kΩ max.	0.5		Ig1	-	-	-	-	1.0	-	μA

NOTES

1. Heater positive and negative successively.
2. The valve shall be mounted so that the direction of vibration is parallel to the minor axis of the electrode structure.
Vibration frequency = any fixed frequency in the range 25-100 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 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 ± 5 c/s.
4. Ig1 shall not be rising or out of limit after a total of 10 minutes running.
5. Measured in an approved test circuit with Va(b) = 300V; Rg2 = 27 kΩ; Rg1 = 39 kΩ; Ig1 = 1.1 mA approx.; frequency = 50 Mc/s min. Typical circuit is shown on page 6.
6. The change of Mutual Conductance is expressed as:
$$\frac{(\mu\text{m at } 6.3\text{V}) - (\mu\text{m at } 5.7\text{V})}{(\mu\text{m at } 6.3\text{V})} \times 100\%$$
7. Prior to the test the valve shall be preheated for not less than 10 minutes under the test conditions.
8. Heater and cathode strapped and considered as a single electrode.

K1001 Ref.	Test	Test Conditions	AQL %	Insp. Level	Symbol	Limits						Units
						Min	LAL	Bogey	UAL	Max.	ALD	
	Electrode Insulation	Vh = 6.3v. Note 8.	6.5		R	30	-	-	-	-	-	MΩ
		Vg - all = -300v.		R	30	-	-	-	-	-	MΩ	
		Vg2 - all = -300v. Vg1 - all = -100v.		R	30	-	-	-	-	-	MΩ	

TYPICAL 50 Mc/s. POWER OSCILLATOR CIRCUIT



$R_2 = 27K \pm 5\%$ 5.W. WIRE WOUND

$RFC_{1,2 \text{ \& \ 3}} = 50 \text{ Mc/s CHOKES.}$