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

VALVE ELECTRONIC CV4059

Specification MOS(A)/CV.4059	SECURITY	
	Specification	Valve
Issue 1 Dated 2.5.56		
To be read in conjunction with BS.448, BS.1409 and K.1001	UNCLASSIFIED	UNCLASSIFIED

TYPE OF VALVE - Reliable Miniature Diode-Triode

CATHODE - Indirectly heated

ENVELOPE - Glass

PROTOTYPE - CV.137

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

MARKING

K.1001/4

BASE

BS.448/B7G

RATING			Note
Heater Voltage	(V)	6.3	D
Heater Current	(A)	0.3	
TRIODE			
Max. Operating Anode Voltage	(V)	300	A
Max. Anode Dissipation	(W)	2.0	A
Max. Mean Cathode Current	(mA)	11.0	A
Amplification Factor		31.0	B
Mutual Conductance	(mA/V)	2.5	B
Max. Operating Frequency	(Mc/s)		
(a) As Frequency changer		300	
(b) As Oscillator		600	
Max. Heater - Cathode Voltage	(V)	±150	A
Max. Anode Voltage (Ia = 0)	(V)	550	A
DIODE			
Max. Peak Anode Current	(mA)	55.0	A
Max. Mean Anode Current	(mA)	5.5	A
Max. Heater - Cathode Voltage	(V)	±150	A
Max. Peak Inverse Voltage	(V)	400	A
DIODE TRIODE			
Max. Shock (Short duration)	(g)	500	
Max. Acceleration (continuous operation)	(g)	2.5	
Max. Bulb Temperature	(°C)	165	D

CONNECTIONS

Pin	Electrode
1	ad
2	kd
3	h
4	h
5	kt
6	gt
7	at

DIMENSIONS

See B.S.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

MOUNTING POSITION

Any

CAPACITANCES (pF)		
C in (nom.)	1.85	C
C out (nom.)	1.15	C
C at, g (nom.)	1.6	C
C at, ad (max.)	0.2	C
C ad, kd (nom.)	1.7	C
C ad, h (max.)	0.5	C

NOTES

A. Absolute value.

B. Measured at Va = 200V; Vg = -4V (Ia = 5.5 mA).

C. Measured with a close fitting metal screen.

D. 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.

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)	Vg(V)
Diode	6.3	0	
Triode	6.3	200	-4.0

K1001 Ref.	Test	Test Conditions	AQL %	Insp. Level	Symbol	Limits Min.	LAL	Bogey	UAL	Max.	ALD	Units
11.1	Vibration	No Voltages		100%								
7.1	Glass Strain	No Voltages	2.5	I								
	GROUP A											
	Electrode Insulation	Vh = 6.3V Note 1										
		Vad to all = -100V		100%	R	200	-	-	-	-	-	MΩ
		Vg to all = -100V		100%	R	100	-	-	-	-	-	MΩ
		Vat to all = -300V		100%	R	100	-	-	-	-	-	MΩ
	Reverse Grid Current	Vg = -1.5V Rg = 100kΩ max.		100%	Ig	-	-	-	-	-	0.5	μA
	GROUP B											
		Combined AQL	1.0	II								
	Heater Current		0.65	II	Ih	275	-	-	-	325	-	mA
5.3	hk Leakage Current	Vhk = ± 100V Note 2	0.65	II	Ihk	-	-	-	-	10	-	μA
		Vhk = -100V Cathode Positive		V2	Ihk	-	-	-	3	-	-	μA
	Diode Emission	Vad = +10V	0.65	II	Id	34	-	-	-	-	-	mA
	Anode Current (Triode)		0.65	II	Ia	3.0	-	-	-	8.0	-	mA
				V2	Ia	-	4.58	5.5	6.42	-	2.06	mA
	Mutual Conductance		0.65	II	gm	1.95	-	-	-	3.05	-	mA/V
				V2	gm	-	2.30	2.5	2.70	-	0.45	mA/V
	GROUP C											
		Combined AQL	6.5	I								
	Change of Diode Emission	Vh = 5.7V Vad = +10V Note 3	2.5	I	Δ Id	-	-	-	-	15	-	%
	Diode Current	Vad = -0.2V	2.5	I	Id	5.0	-	-	-	-	-	μA
	Diode Current	Vad = -1.0V	2.5	I	Id	-	-	-	-	5.0	-	μA
	Anode Current (Triode)	Vg = -10V	2.5	I	Ia	-	-	-	-	0.5	-	mA
	Change of Mutual Conductance	Vh = 5.7V Note 4	2.5	I	Δgm	-	-	-	-	15	-	%
11.1	Vibration Noise (Triode)	RL = 2kΩ Diode strapped to Triode Cathode. Note 6	2.5	I	VAC	-	-	-	-	5	-	mVrms

TESTS (Cont'd)

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K1001 Ref.	Test	Test Conditions	AQL %	Insp. Level	Symbol	Limits Min.	LAL	Bogey	UAL	Max.	ALD	Units
	GROUP D											
7.2	Base strain	No Voltages	6.5	IA								
5.9	Capacitances	Measured on 1 Mc/s bridge mounted in a fully shielded socket Valve screened	6.5	IC	Cin	1.6	-	-	-	2.1	-	pF
					Cout	0.9	-	-	-	1.4	-	pF
					Cat,g	1.4	-	-	-	1.8	-	pF
					Cat,ad	-	-	-	-	0.2	-	pF
					Cad,kd	1.2	-	-	-	2.2	-	pF
					Cad,h	-	-	-	-	0.5	-	pF
	Amplification Factor	Max. Grid Swing = 1V	6.5	IA	μ	26	-	31	-	36	-	
	Ia Cross Current	Vat = 300V; Vg = -30V; Vad = 0. Note 8	6.5	IC	Ia	-	-	-	-	10	-	μA
	GROUP E											
11.2	Resonance Search (Triode only)	Vat = 200V; RL = 2kΩ Frequency	2.5	IC								
		25 - 500 c/s			Va AC	-	-	-	-	150	-	mVrms
		500 - 2500 c/s			Va AC	-	-	-	-	150	-	mVrms
	Fatigue	Vh = 6.9V Note 5		IA								
	Post Fatigue Tests											
		Combined AQL	4.0									
11.1	Vibration Noise (Triode)	As Group C	2.5		Va AC	-	-	-	-	8	-	mVrms
11.1	Vibration Noise (Diode)	Notes 6 and 7	2.5		Va AC	-	-	-	-	4	-	mVrms
5.3	hk Leakage Current	Vhk = ± 100V Note 2	2.5		Ihk	-	-	-	-	20	-	μA
	Reverse Grid Current	Vg = -1.5V; Rg = 100kΩ max.	2.5		Ig	-	-	-	-	1.0		μA
	Mutual Conductance		2.5		gm	1.8	-	-	-	-	-	mA/V
	Diode Emission	Vad = +10V	2.5		Id	30	-	-	-	-	-	mA
11.4	Shock	Hammer Angle = 30° No Voltages		IA								
	Post Shock Tests											
		Combined AQL	4.0									
11.1	Vibration Noise (Triode)	As Group C	2.5		Va AC		-	-	-	8	-	mVrms
11.1	Vibration Noise (Diode)	Notes 6 and 7	2.5		Va AC		-	-	-	4	-	mVrms
5.3	hk Leakage Current	Vhk = ± 100V Note 2	2.5		Ihk	-	-	-	-	20	-	μA
	Reverse Grid Current	Vg = -1.5V Rg = 100kΩ max.	2.5		Ig	-	-	-	-	1.0	-	μA
	Mutual Conductance		2.5		gm	1.80	-	-	-	3.05	-	mA/V
	Diode Emission	Vad = +10V			Id	30	-	-	-	-	-	mA

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K1001 Ref.	Test	Test Conditions	AQL %	Insp. Level	Symbol	Limits						Units
						Min.	LAL	Bogey	UAL	Max.	ALD	
	GROUP F											
AVI/5	Life	Vat = 200V; Vg = -4 Vhk = 135V; Rg = 100kΩ RL diode = 40kΩ										
AVI/5.1	Stability Life (1 hour)			I								
	Change in Mutual Conductance		1.0		Δ gm	-	-	-	-	10	-	%
	Survival Rate Life (100 hours)			II								
AVI/5.6	Inoperatives		0.65									
	Intermittent Life			IA								
	Test Point 500 hrs.	Combined AQL	6.5									
AVI/5.6	Inoperatives		2.5									
5.3	hk Leakage Current	Vhk = ± 100V Note 2	2.5		Ihk	-	-	-	-	10	-	μA
	Reverse Grid Current	Vg = -1.5V Rg = 100kΩ max.	2.5		Ig					0.5	-	μA
	Mutual Conductance		2.5		gm	1.85	-	-	-	3.05	-	mA/V
	Average change in Mutual Conductance				Δ gm	-	-	-	-	15	-	%
	Anode Current		4.0		Iat	2.5	-	-	-	8.0	-	mA
	Diode Emission	Vad = +10V	4.0		Id	30	-	-	-	-	-	mA
	Electrode Insulation	Vad to all -100V	4.0		R	100	-	-	-	-	-	MΩ
		Vg to all -100V	4.0		R	50	-	-	-	-	-	MΩ
		Vat to all -300V	4.0		R	50	-	-	-	-	-	MΩ
	Test Point 1000 hrs.	Combined AQL	10									
AVI/5.6	Inoperatives		4.0									
5.3	hk Leakage Current	Vhk = ± 100V Note 2	4.0		Ihk	-	-	-	-	10	-	μA
	Reverse Grid Current	Vg = -1.5V Rg = 100kΩ max.	4.0		Ig	-	-	-	-	0.5	-	μA
	Mutual Conductance		4.0		gm	1.75	-	-	-	3.05	-	mA/V
	Anode Current		6.5		Iat	2.0	-	-	-	8.0	-	mA
	Diode Emission	Vad = +10V	6.5		Id	25	-	-	-	-	-	mA
	Electrode Insulation	Vad to all = -100V	6.5		R	100	-	-	-	-	-	MΩ
		Vg to all = -100V	6.5		R	50	-	-	-	-	-	MΩ
		Vat to all = -300V	6.5		R	50	-	-	-	-	-	MΩ
	GROUP G											
AIX/2.5	Electrical Re-test after 28 days holding period			100%								
AVI/5.6	Inoperatives		0.5									
	Reverse Grid Current	Vg = -1.5V Rg = 100kΩ max.	0.5		Ig1	-	-	-	-	0.5	-	μA

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NOTES

1. Heater and cathodes strapped, and considered as a single electrode.

2. Heater positive and negative successively. Triode and diode cathode strapped together.

3. The value of emission change shall apply to individual valves and is expressed:

$$\frac{(\text{Id at } 6.3\text{V}) - (\text{Id at } 5.7\text{V})}{(\text{Id at } 6.3\text{V})} \times 100\%$$

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. 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 min. on 3 min. off. No other voltages. Min. peak acceleration = 5g; frequency 170 $\pm$ 5c/s.

6. 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 = 2g.
The test shall be of sufficient duration to obtain a steady reading of noise output.

7. Diode noise test conditions.
Va = 62V; Rk = 4.7kΩ. Noise measured on cathode.
Triode section connected to earth.

8. Diode anode and both cathodes connected to H.T. negative and earth.