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

VALVE ELECTRONIC

CV4063

Specification MOS(A) CV4063	SECURITY	
	Specification	Valve
Issue 1 Dated 5.4.56		
To be read in conjunction with BS.448 BS.1409 and K1001	UNCLASSIFIED	UNCLASSIFIED

TYPE OF VALVE - Reliable Miniature H.F. Pentode	MARKING K1001/4 Additional Marking:- 6516
CATHODE - Indirectly heated	
ENVELOPE - Glass	
PROTOTYPE - CV.136	BASE BS.448/B7G
R.E.T.M.A. DESIGNATION - 6516	

RATING

			Note
Heater Voltage	(V)	6.3	C
Heater Current	(A)	0.2	
Max. Heater - Cathode Voltage	(V)	±150	A
Max. g1-g2 Voltages D.C.	(V)	300	
Max. g1 - Cathode Voltage D.C.	(V)	100	
Max. Operating Anode Voltage	(V)	300	A
Max. Anode Voltage (Ia = 0)	(V)	550	A
Max. Anode Dissipation	(W)	4.75	A,D
Max. Operating Screen Voltage	(V)	275	A
Max. Screen Voltage (Ig2 = 0)	(V)	550	A
Max. Screen Dissipation	(W)	0.8	A,D
Max. Mean g1 current	(mA)	3.3	
Max. Mean Cathode Current	(mA)	23	
Max. Grid 1 - Cathode Resistance for Cathode Bias	(kΩ)	680	
Max. Grid 1 - Cathode Resistance Fixed Bias	(kΩ)	220	
Max. Bulb Temperature	(°C)	180	C
Max. Shock (short duration)	(g)	500	
Max. Acceleration (continuous operation)	(g)	2.5	
Max. Operating Frequency	(Mc/s)	100	
Inner Amplification Factor (μg1, g2)		12	
Mutual Conductance	(mA/V)	2.55	B
Anode Impedance	(MΩ)	0.2	B

CAPACITANCES (pF)

C in (nom.)	4.25	D
C out (nom.)	6.5	D
Ca, g1 (max.)	0.3	D

CONNECTIONS

Pin	Electrode
1	g1
2	k+g3
3	h
4	h
5	a
6	NC
7	g2

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. Absolute value.

B. Measured at Va(b) = 250V; Vg2 = 250V; Vg1 = -13.5V (Ia = 16mA; Ig2 = 2.25mA.)

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.

D. Measured with a close fitting metal screen.

Z.11641.R.

CV4063

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(b)(V)	Vg1(V)	Vg2(V)	Rk(ohms)	Ck(μF)
6.3	250	0	250	740	1000

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	6.5	I								
	GROUP A											
	Electrode Insulation	Vh = 6.3V Note 6 Vg1 to all = -100V Vg2 to all = -300V Va to all = -300V		100% 100% 100%	R R R	100 100 100	-	-	-	-	-	MΩ MΩ MΩ
	Reverse Grid Current			100%	Ig1	-	-	-	-	0.5	-	μA
	GROUP B											
		Combined AQL	1.0	II								
	Heater Current		0.65	II	Ih	184	-	-	-	216	-	mA
5.3	hk Leakage Current	Vhk = ±100V Note 1 Vhk = -100V cathode positive	0.65	II V2	Ihk Ihk	- -	- -	- -	- 3	10 -	- -	μA μA
	Anode Current		0.65	II V2	Ia Ia	12 -	- 13.9	- 15.0	- 16.1	18 -	- 2.47	mA mA
	Screen Current		0.65	II V2	Ig2 Ig2	1.3 -	- 1.74	- 2.0	- 2.26	2.7 -	- 0.575	mA
	Mutual Conductance		0.65	II V2	gm gm	1.95 -	- ~~2.44~~ 2.33	- 2.55	- ~~2.66~~ 2.77	3.15 -	- 0.493	mA/V mA/V
	GROUP C											
		Combined AQL	6.5	I								
	Change of Mutual Conductance	Vh = 5.7V Note 5	2.5	I	Δgm	-	-	-	-	15	-	%
	Anode Current	Vg1 = -50V	2.5	I	Ia	-	-	-	-	50	-	μA
	Reverse Grid Current	Vh = 6.9V; Va = 300V; Vg2 = 235V. Note 4	2.5	I	Ig1	-	-	-	-	1.0	-	μA
11.1	Vibration Noise	RL = 2kΩ or with fixed bias Vg1 = -13.5V Note 2	2.5	I	Va AC	-	-	-	-	~~2.5~~ 15	-	mV rms

TESTS (Cont'd)

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K1001 Ref.	Test	Test Conditions	AQL %	Insp. Level	Symbol	Limits						Units
						Min.	LAL	Bogey	UAL	Max.	ALD	
	GROUP D											
7.2	Base Strain	No Voltages	6.5	IA								
5.9	Capacitances	Measured on 1 Mc/s bridge with valve mounted in a fully shielded socket. Valve screened.	~~2.5~~ 6.5	IC	C in	3.5	-	4.25	-	5.0	-	pF
					C out	5.8	-	6.5	-	7.2	-	pF
					Ca g1	-	-	-	-	0.3	-	pF
	Inner Amplification Factor	Vary Vg1. Ia = 16 mA Grid swing IV. max.	6.5	IA	μg1 g2	10	-	12	-	14	-	
	GROUP E											
11.2	Resonance Search	Va = 250V; RL = 2kΩ Frequency:-	2.5	IC								
		(1) 25 - 200 c/s			Va AC	-	-	-	-	20	-	mV rms
		(2) 200 - 500 c/s			Va AC	-	-	-	-	100	-	mV rms
		(3) 500 - 2500 c/s			Va AC	-	-	-	-	500	-	mV rms
11.3	Fatigue	Vh = 6.9V Note 3		IA								
	Post Fatigue Tests											
		Combined AQL	4.0									
5.3	hk Leakage	Vhk = ± 100V Note 1	2.5		Ihk	-	-	-	-	20	-	μA
	Reverse Grid Current		2.5		Ig1	-	-	-	-	1.0	-	μA
	Mutual Conductance		2.5		gm	1.8	-	-	-	3.2	-	mA/V
11.1	Vibration Noise	As in Group C	2.5		Va AC	-	-	-	-	25	-	mV
11.4	Shock	Hammer Angle = 30° No Voltages		IA								
	Post Shock Tests											
		Combined AQL	4.0									
5.3	hk Leakage Current	Vhk = ± 100V Note 1	2.5		Ihk	-	-	-	-	20	-	μA
	Reverse Grid Current		2.5		Ig1	-	-	-	-	1	-	μA
	Mutual Conductance		2.5		gm	1.8	-	-	-	3.2	-	mA/V
11.1	Vibration Noise	As in Group C	2.5		Va AC	-	-	-	-	25	-	MV rms

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K1001 Ref.	Test	Test Conditions	AQL %	Insp. Level	Symbol	Limits Min.	LAL	Bogey	UAL	Max.	ALD	Units
	GROUP F											
AVI/5	Life	Rg1 = 100kΩ ± 20% Rk = 740Ω ± 10% Vhk = 150V D.C. Heater Positive										
AVI/5.1	Stability Life (1 hour)			I								
	Change in Mutual Conductance		1.0		Δgm	-	-	-	-	10	-	%
AVI/5.2	~~Survival Rate Life (100 hrs.)~~			~~H~~								
AVI/5.6	~~Inoperatives~~		~~0.65~~									
AVI/5.3	Intermittent Life			IA								
	Test Point 500 hrs.	Combined AQL	6.5									
AVI/5.6	Inoperatives		2.5									
	Heater Current		2.5		Ih	184	-	-	-	216	-	mA
5.3	hk Leakage Current	Vhk = ±100V Note 1	2.5		Ihk	-	-	-	-	30	-	µA
	Reverse Grid Current		2.5		Ig1	-	-	-	-	1.0	-	µA
	Mutual Conductance		2.5		gm	1.7	-	-	-	3.2	-	mA/V
	Average Change of Mutual Conductance				Δgm	-	-	-	-	15	-	%
	Electrode Insulation	Vh = 6.3 Note 6 Vg1-all = -100V Vg2-all = -300V Va-all = -300V	4.0 ~~4.0~~ ~~4.0~~		R R R	50 50 50	- - -	- - -	- - -	- - -	- - -	MΩ MΩ MΩ
AVI/5.3	Test Point 1000 hrs.	Combined AQL	10.0									
AVI/5.6	Inoperatives		4.0									
	Heater Current		4.0		Ih	184	-	-	-	216	-	mA
5.3	hk Leakage Current	Vhk = ±100V Note 1	4.0		Ihk	-	-	-	-	30	-	µA
	Reverse Grid Current		4.0		Ig1	-	-	-	-	1.0	-	µA
	Mutual Conductance		4.0		gm	1.6	-	-	-	3.2	-	mA/V
	✱ Dynamic Life Test (100 hrs.)		2.5	IA								
	Valve operated as tripler Change of output power.	Note 7			ΔP out	-	-	-	-	20	-	%
	GROUP G											
AIX/2.5	Electrical Retest after 28 days holding period			100%								
AVI/5.6	Inoperatives		0.5									
	Reverse Grid Current		0.5		Ig1	-	-	-	-	0.75	-	µA

NOTES See Overleaf

CV4063/1/4 ✱ Add Electrode Insulation Test. Cond^ns as at 500hrs. Limits AQL 6.5. R=30MΩ min in each case

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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 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.

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

4. Adjust Vg1 to give Ia = 15 mA. For this test the valve shall be preheated for five minutes under the test conditions. Ig1 shall not be rising or out of limit after a total of 10 minutes.

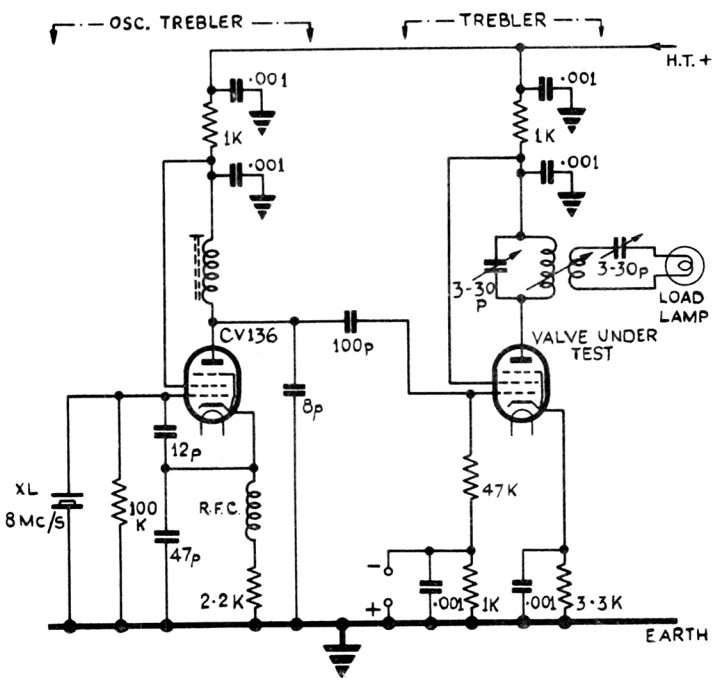
5. The change of mutual conductance is expressed:

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

6. Heater and Cathode strapped and considered as a single electrode.

7. Tripler Final stage conditions:-

Va = Vg2 = 300V; Ia plus Ig2 = 20 mA approximately. Ig1 = 1.6 mA; RL = 1kΩ; output frequency = 70 to 75 Mc/s. Power output = 0.9W.
A suitable circuit for carrying out this test is shown below.



ELECTRONIC VALVE SPECIFICATION

SPECIFICATION CV.4063

ISSUE 1 - DATED 5th APRIL, 1956.

AMENDMENT NO.1.

GROUP F.

Intermittent Life Test Point (500 hrs)

Electrode Insulation

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

K1001 Ref.	Test	Test Conditions	AQL %	INSP. LEVEL	Symbol	LIMITS						
						MIN	LAL	BOGEY	UAL	MAX	AID	UNITS
	ELECTRODE INSULATION	Vh = 6.3. Note 6 Vg1 -all = -100V Vg2 -all = -300V Va -all = -300V	4.0		R R R	50 50 50	-	-	-	-	-	MΩ MΩ MΩ

Test Point (1000 hrs)

Delete all reference to Heater Current Test

Add at the end of this Group the following:-

K1001 Ref.	Test	Test Conditions	AQL %	INSP. LEVEL	Symbol	LIMITS						
						MIN	LAL	BOGEY	UAL	MAX	AID	UNITS
	ELECTRODE INSULATION	Vh = 6.3.Note 6. Vg1 -all = -100V Vg2 -all = -300V Va -all = -300V	6.5		R R R	30 30 30	-	-	-	-	-	MΩ MΩ MΩ

December, 1957. T.V.C.

Z.16179.R.

ELECTRONIC VALVE SPECIFICATIONS.

SPECIFICATION MOS(A) CV4063
ISSUE 1 DATED 5.4.56.

AMENDMENT NO. 2

Page 2. GROUP B Mutual Conductance.

Amend Limits to the following:-

Min.	LAL.	Bogey	UAL	Max.	ALD
1.95	2.33	2.55	2.77	3.15	0.493

GROUP C Vibration Noise.

Amend Max. Limit to 15mV rms.

Page 3 GROUP D Capacitance

Amend AQL's to 6.5

January, 1960
N.12553

TVC for R.R.E.

26/4/60