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

VALVE ELECTRONIC

CV4014

Specification MOS(A)/CV4014 Issue 4 Dated 5.11.56 To be read in conjunction with B.S.448, B.S.1409 and K.1001	SECURITY Specification: UNCLASSIFIED Valve: UNCLASSIFIED

→ Indicates a change

TYPE OF VALVE - Reliable H.F. Pentode

CATHODE - Indirectly heated

ENVELOPE - Glass

PROTOTYPE - CV138

R.E.T.M.A. DESIGNATION - 6064

MARKING

See K1001/4

Additional Marking:-
6064

BASE

B.S.448/B7G

RATING

(All limiting values are absolute)

			Note
Heater Voltage	(V)	6.3	B
Heater Current	(A)	0.3	
Max. Heater - Cathode Voltage	(V)	± 150	
Max. Anode Voltage (Wa = 3.0)	(V)	300	
Max. Anode Voltage (Ia = 0)	(V)	550	
Max. Anode Dissipation	(W)	3.0	
Max. Screen Voltage (Wg2 = 0.9)	(V)	300	
Max. Screen Voltage (Ig2 = 0)	(V)	450	
Max. Screen Dissipation	(W)	0.9	
Max. Grid 1 - Cathode Resistance	(MΩ)	0.5	A
Max. Bulb Temperature	(°C)	200	B
Max. Shock (short duration)	(g)	500	
Max. Acceleration (continuous operation)	(g)	2.5	

Typical Operating Conditions

Measured at Va = Vg2 = 250V; Vg1 = -2V; Vg3 = 0

Anode Current	(mA)	10	
Screen Current	(mA)	2.5	
Mutual Conductance	(mA/V)	7.6	
Inner Amplification Factor (μg1, g2)		75	

CAPACITANCES (pF)

C in (nom.)		7.6	C
C out (nom.)		3.25	C
Ca,g1 (max.)		.01	C

CONNECTIONS

Pin	Electrode	
1	Grid	g1
2	Cathode	k
3	Heater	h
4	Heater	h
5	Anode	a
6	Supp. Sh.	g3 + s
7	Screen	g2

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

NOTES

A. For cathode bias. Max. value for fixed bias operation = 100 kΩ.

B. Caution to Electronic Equipment Design Engineers: 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.

C. Measured with a close fitting metal screen.

Z.13070.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)	Va(V)	Vg1(V)	Vg2(V)	Vg3(V)	Rk(Ohms)	Ck(μF)
6.3	250	0	250	0	160	1000

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								
	GROUP A											
	Electrode Insulation	Vh = 6.3V Note 6										
		Vg1-all = -100V		100%	R	100	-	-	-	-	-	MΩ
		Vg2-all = -300V		100%	R	100	-	-	-	-	-	MΩ
		Va-all = -300V		100%	R	100	-	-	-	-	-	MΩ
	Reverse Grid Current	Rg1 = 500k max.		100%	Ig1	-	-	-	-	0.5	-	μA
	GROUP B											
		Combined AQL	1.0	II								
	Heater Current		0.65	II	Ih	275	-	-	-	325	-	mA
→	Heater-Cathode Leakage Current	Vhk = ±100V Note 5	0.65	II	Ihk	-	-	-	-	10	-	μA
		Vhk = -100V Cathode Positive		V2	Ihk	-	-	-	2	-	-	μA
	Anode Current		0.65	II	Ia	7.5	-	-	-	12.2	-	mA
				V2	Ia	-	8.7	9.85	11.0	-	2.60	mA
→	Screen Current		0.65	II	Ig2	1.8	-	-	-	3.4	-	mA
				V2	Ig2	-	-	2.6	3.0	-	-	mA
	Mutual Conductance		0.65	II	gm	6.0	-	-	-	9.25	-	mA/V
				V2	gm	-	6.81	7.62	8.43	-	1.8	mA/V
	GROUP C											
		Combined AQL	6.5	I								
	Anode Current	Vg1 = -8V	2.5	I	Ia	-	-	-	-	100	-	μA
	Reverse Grid Current	Vg1 = -50V	2.5	I	~~Ig1~~ Ig1	-	-	-	-	1.0	-	μA
	Change of Mutual Conductance	Vh = 5.7V Notes 1 and 4	2.5	I	gm	-	-	-	-	15	-	%
	Reverse Grid Current	Vh = 6.9V, Rk = 250Ω Va = Vg2 = 300V Note 2	2.5	I	Ig1	-	-	-	-	1.0	-	μA
11.1	Vibration Noise	RL = 2K Va(b) = 250V Vg1 = -2V Rk = 0	2.5	I	Va AC	-	-	-	-	~~40~~ ~~15~~ 15	-	mVrms

TESTS (Cont'd)

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KOO1 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								
	Capacitances	Measured on 1 Mc/s bridge with valve mounted in a fully shielded socket. Valve screened	6.5	IC	C in	6.5	-	-	-	8.7	-	pF
					C out	2.75	-	-	-	3.75	-	pF
					Ca,g1	-	-	-	-	.01	-	pF
	g3 Negative Cut off voltage	Vg1 = 3.5V Ia = 50µA	6.5	IA	-Vg3	70	-	-	-	120	-	V
	Inner Amplification Factor	Max. grid swing 1V	6.5	IA	µ g1g2	60	-	75	-	89	-	
	GROUP E											
11.2	Resonance Search	RL = 2k Va(b)=250V 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 - 2,500 c/s			Va AC	-	-	-	-	500	-	mV rms
11.3	Fatigue	Vh = 6.9V Note 3		IA								
	POST FATIGUE TESTS											
		Combined AQL	4.0									
	Heater-Cathode Leakage Current	Vhk = ±100V	2.5		Ihk	-	-	-	-	20		µA
	Reverse Grid Current	Rg1 = 500k Ω max.	2.5		Ig1	-		-	-	1.0	-	µA
	Mutual Conductance		2.5		gm	5.5	-	-	-	9.25	-	mA/V
11.1	Vibration Noise	As in Group C	2.5		Va AC	-	-	-	-	~~25~~ ~~75~~ 25	-	mV rms
11.4	Shock	Hammer Angle = 30° No voltages		IA								
	POST SHOCK TESTS											
		Combined AQL	4.0									
	Heater-Cathode Leakage Current	Vhk ± 100V	2.5		Ihk	-	-	-	-	20	-	µA
	Reverse Grid Current	Rg1 = 500k Ω max.	2.5		Ig1	-	-	-	-	1.0	-	µA
	Mutual Conductance		2.5		gm	5.5	-	-	-	9.25	-	mA/V
11.1	Vibration Noise	As in Group C	2.5		VA AC	-	-	-	-	~~25~~ ~~75~~ 25	-	mV rms

Tube recorded accepted Cullen

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TESTS (Cont'd)

K1001 Ref.	Test	Test Conditions	AQL %	Insp. Level	Symbol	Limits Min.	LAL	Bogey	UAL	Max.	ALD	Units
	GROUP F											
A VI/5	Life	Note 7										
A VI/5.1	Stability Life (1 hour)											
	Change in Mutual Conductance		1.0	I	Δg_m	-	-	-	-	10	-	%
A VI/5.3	Intermittent Life											
	Test Point 500 hrs.	Combined AQL	6.5	IA								
A VI/5.6	Inoperatives		2.5									
	Heater Current		2.5		Ih	275	-	-	-	325	-	mA
→	Heater-Cathode Leakage Current	Vhk = ± 100V	2.5		Ihk	-	-	-	-	20	-	µA
	Reverse Grid Current	Rg1 = 500k max.	2.5		Ig1	-	-	-	-	0.75	-	µA
	Mutual Conductance		2.5		gm	5.2	-	-	-	9.25	-	mA/V
	Average Change of Mutual Conductance				Δg_m	-	-	-	-	15 10	-	%
	Anode Current		4.0		Ia	6.8	-	-	-	12.2	-	mA
	Electrode Insulation	Vh = 6.3V 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.	Combined AQL	10.0	IA								
A VI/5.6	Inoperatives		4.0									
	~~Heater Current~~		~~4.0~~		~~Ih~~	~~275~~	~~-~~	~~-~~	~~-~~	~~325~~	~~-~~	~~mA~~
→	Heater-Cathode Leakage Current	Vhk = ± 100V	4.0		Ihk	-	-	-	-	20	-	µA
	Reverse Grid Current	Rg1 = 500kΩ max.	4.0		Ig1	-	-	-	-	1.0	-	µA
	Mutual Conductance		4.0		gm	4.9	-	-	-	9.25	-	mA/V
	Anode Current		6.5		Ia	5.25	-	-	-	-	-	mA
	Electrode Insulation	Vh = 6.3V Note 6 Vg1-all = -100V Vg2-all = -300V Va-all = -300V	6.5		R R R	30 30 30	-	-	-	-	-	MΩ MΩ MΩ
	GROUP G											
A IX2.4	Electrical Re-test after 28 days holding period			100%								
A VI/5.6	Inoperatives		0.5									
	Reverse Grid Current	Rg1 = 500kΩ max.	0.5		Ig1	-	-	-	-	0.75	-	µA

NOTES

1. The change of mutual conductance is expressed:

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

2. Prior to 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.

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. Preheat the valves for five minutes under the test conditions before making the test.

5. Heater positive and negative successively.

6. Heater strapped to cathode and considered as a single electrode.

7. Rg1 = 100K Ω±20%; Rk = 180Ω ± 10%; Vhk = 100V D.C. heater positive Or 150V A.C. 50 c/s r.m.s.

Specification CV4014, Issue 4, Dated 5/11/56

Amendment 1 (Temporary)

Page 2

Group C	Vibration Noise	
Amend	"Limits" to read "40 mV r.m.s. max."	

Page 3

Group E	Resonance Search	
Delete	All "Limits" in max. column (20, 100 and 500 mV r.m.s.)	
Insert	"To be recorded and agreed later".	

N.50469R.

PAGE 2.

Post Fatigue and Post Shock

Vibration Noise

Amend	"Limits" to read "75 mV r.m.s. max."

T.V.C. Office
for Royal Aircraft Establishment.

November, 1956.

ELECTRONIC VALVE SPECIFICATIONS

SPECIFICATION CV.4014

ISSUE 4 DATED 5.11.56

AMENDMENT NO.2

Page 2 Group C

Vibration Noise

DELETE in "Limits" column 40mV (inserted by Amendment No.1) and Substitute 15mV.

Page 3 Group E Post Fatigue and Post Shock Tests

Vibration Noise

DELETE in "Limits" column 75mV (inserted by Amendment No.1) and Substitute 25mV.

Page 4 Group F Intermittent Life. Test Point 500 hours

Average Change of Mutual Conductance

DELETE Limit of 15% and Substitute 10%.

Director,
Royal Aircraft Establishment.

25th April, 1957

N87708R

ELECTRONIC VALVE SPECIFICATION

SPECIFICATION CV 4014

ISSUE 4 DATED 5th NOVEMBER, 1956.

AMENDMENT No.3.

GROUP F.

Intermittent Life Test Point (1000hrs)

Delete all reference to Heater Current Test

Add at the end of this Group (after Anode Current) the following:-

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

December 1957 T.V.C.

Amendment No. 4

To issue 4 dated 5th November, 1956

of Specification Valve Electronic CV.4014

Page 2

Near bottom of page, under heading of GROUP C:-

Amend The Symbol in sixth column against first entry of Reverse Grid Current to "Igl".

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

May, 1958.

N.25475/R