

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 INSULATION	Vh = 6.3V Note 6											
		Vg1 = all = -100V	6.5		R	30	-	-	-	-	-	-	MJL
		Vg2 = all = -300V			R	30	-	-	-	-	-	-	MJL
		Va = all = -300V			R	30	-	-	-	-	-	-	MJL

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T.V.C.

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

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

—————→ Indicates a change

TYPE OF VALVE			- Reliable H.F. Pentode		MARKING See K1001/4 Additional Marking:- 6064			
CATHODE			- Indirectly heated					
ENVELOPE			- Glass					
PROTOTYPE			- CV138		BASE B.S.448/57G			
R.A.E.T.M.A. DESIGNATION - 6064								
RATING (All limiting values are absolute)				Note		CONNECTIONS		
						Pin	Electrode	
Heater Voltage (V)				6.3	B	1	Grid g1	
Heater Current (A)				0.3		2	Cathode k	
Max. Heater - Cathode Voltage (V)				± 150		3	Heater h	
Max. Anode Voltage (Va = 3.0) (V)				300		4	Heater h	
Max. Anode Voltage (Ia = 0) (V)				550		5	Anode a	
Max. Anode Dissipation (W)				3.0		6	Supp. Sh. g3 + s	
Max. Screen Voltage (Vg2 = 0.9) (V)				300		7	Screen g2	
Max. Screen Voltage (Ig2 = 0) (V)				450				
Max. Screen Dissipation (W)				0.9	A	DIMENSIONS See B.S.448/57G/2.1 Size Ref. No.2		
Max. Grid 1 - Cathode Resistance (MΩ)				0.5	B			
Max. Bulb temperature (°C)				200		Dimension (mm)	Min.	Max.
Max. Shock (short duration) (g)				500		A seated height	-	47.5
Max. Acceleration (continuous operation) (g)				2.5		C diameter	16.0	19.0
Typical Operating Conditions						D overall length	-	54.5
Measured at Va = Vg2 = 250V; Vg1 = -2V; Vg3 = 0						MOUNTING POSITION ANY		
Anode Current (mA)				10				
Screen Current (mA)				2.5				
Mutual Conductance (mA/V)				7.6				
Inner Amplification Factor (μi, g2)				75				
CAPACITANCES (pF)								
C in (nom.)				7.6	C			
C out (nom.)				3.25	C			
Cn, g1 (max.)				0.01	C			

NOTES

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

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(μ F)	
6.3		250		0		250		0		160		1000	
K1001 Ref.	Test	Test Conditions	AQL %	Insp. Level	Symbol	Limits						Units	
						Min.	LAL	Bogus	UAL	Max.	ALD		
7.1	Glass Strain	No Voltages	6.5	I									
	<u>GROUP A</u>												
	Electrode	Vh = 6.3V Note 6											MΩ
	Insulation	Vg1-all = -100V Vg2-all = -300V Va-all = -300V	100% 100% 100%		R R R	100 100 100	- - -	- - -	- - -	- - -	- - -	MΩ MΩ MΩ	
	Reverse Grid Current	Rg1 = 500k max.	100%		Ig1	-	-	-	-	0.5	-	μA	
	<u>GROUP B</u>												
		Combined AQL	1.0	II									
	Heater Current		0.65	II	Ih	275	-	-	-	325	-	mA	
	Heater-Cathode Leakage Current	Vhk = 2100V Note 5 Vhk = -100V Cathode Positive	0.65	II	Ihk Ihk	- -	- -	- -	- 2	10 -	- -	μA μA	
	Anode Current		0.65	II	Ia V2	7.5 -	- 8.7	- 9.85	- 11.0	12.2 -	- 2.60	mA mA	
	Screen Current		0.65	II	Ig2 V2	1.8 -	- -	- 2.6	- 3.0	3.4 -	- -	mA mA	
	Mutual Conductance		0.65	II	gm V2	6.0 -	- 6.8	- 7.62	- 8.43	9.25 -	- 1.8	mA/V mA/V	
	<u>GROUP C</u>												
		Combined AQL	6.5	I									
	Anode Current	Vg1 = -5V	2.5	I	Ia	-	-	-	-	100	-	μA	
	Reverse Grid Current	Vg1 = -50V	2.5	I	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	-	-	-	-	15 75 mV RMS	-	mVrms	

K001 Ref.	Test	Test Conditions	AQL %	Insp. Level	Symbol	Limits						Units
						Min.	LAL	Bogay	UAL	Max.	ALD	
7.2	<u>GROUP D</u>											
	Base Strain	No voltages	6.5	IA								
	Capacitances	Measured on 1 Mo/s bridge with valve mounted in a fully shielded socket. Valve screened	6.5	IC	C in C out Ca, Gi	6.5 2.75 -	- - -	- - -	- - -	8.7 3.75 .01	- - -	pF pF pF
	g3 Negative Cut off voltage	Vg1 = 3.5V Ia = 50 μ A	6.5	IA	-Vg3	70	-	-	-	120	-	V
	Inner Amplifi- cation Factor	Max. grid swing IV	6.5	IA	μ Gi G2	60	-	75	-	89	-	
11.2 11.3 11.4 11.4 11.4	<u>GROUP E</u>											
	Resonance Search	RL = 2k Va(b)-250V Frequency:- (1) 25 - 200 c/s (2) 200 - 500 c/s (3) 500 - 2,500 c/s	2.5	IC	Va AC Va AC Va AC	- - -	- - -	- - -	- - -	20 100 500	- - -	mV rms mV rms mV rms
	Fatigue	Vh = 6.9V Note 3		IA								
	<u>POST FATIGUE TESTS</u>											
	Heater-Cathode Leakage Current	Combined AQL Vhk = $\pm$ 100V	4.0 2.5		Ihk	-	-	-	-	20	-	μ A
	Reverse Grid Current	Rgi = 500k Ω max.	2.5		Igi	-	-	-	-	1.0	-	μ A
	Mutual Conductance		2.5		gm	5.5	-	-	-	9.25	-	mA/V
	Vibration Noise	As in Group C	2.5		Va AC	-	-	-	-	25	-	mV rms
	Shock	Hammer Angle = 30° No voltages		IA								
	<u>POST SHOCK TESTS</u>											
	Heater-Cathode Leakage Current	Combined AQL Vhk $\pm$ 100V	4.0 2.5		Ihk	-	-	-	-	20	-	μ A
	Reverse Grid Current	Rgi = 500k Ω max.	2.5		Igi	-	-	-	-	1.0	-	μ A
	Mutual Conductance		2.5		gm	5.5	-	-	-	9.25	-	mA/V
	Vibration Noise	As in Group C	2.5		Va AC	-	-	-	-	25	-	mV rms

KQ001 Ref.	Test	Test Conditions	AQL %	Insp. Level	Symbol	Limits						Units
						Min.	LAL	Regr	UAL	Max.	ALD	
A VI/5	<u>GROUP F</u>											
	Life	Note 7										
	<u>Stability Life (1 hour)</u>											
	Change in Mutual Conductance		1.0	I	Δg_m	-	-	-	-	10	-	%
	<u>Intermittent Life</u>											
	<u>Test Point 500 hrs.</u>	Combined AQL	6.5	IA								
	Inoperatives		2.5									
	Heater Current		2.5		Ih	275				385		mA
	Heater-Cathode Leakage Current	$V_{hk} = \pm 100V$	2.5		Ihk	-	-	-	-	20	-	μA
	Reverse Grid Current	$R_g = 500k \Omega \text{ max.}$	2.5		Igi	-	-	-	-	0.75	-	μA
A VI/5.6	Mutual Conductance		2.5		g_m	5.2	-	-	-	9.25	-	mA/V
	Average Change of Mutual Conductance				Δg_m	-	-	-	-	15	-	%
	Anode Current		4.0		Ia	6.8	-	-	-	12.2	-	mA
	Electrode Insulation	$V_h = 6.3V$ Note 6 $V_{g1} \text{ all} = -100V$ $V_{g2} \text{ all} = -300V$ $V_a \text{ all} = -300V$	4.0		R	50	-	-	-	-	-	M Ω
					R	50	-	-	-	-	-	M Ω
					R	50	-	-	-	-	-	M Ω
	<u>Test Point 1000 hrs.</u>	Combined AQL	10.0	IA								
	Inoperatives		4.0									
	Heater Current		4.0		Ih	275	-	-	-	385	-	mA
	Heater-Cathode Leakage Current	$V_{hk} = \pm 100V$	4.0		Ihk	-	-	-	-	20	-	μA
A VI/5.6	Reverse Grid Current	$R_g = 500k \Omega \text{ max.}$	4.0		Igi	-	-	-	-	1.0	-	μA
	Mutual Conductance		4.0		g_m	4.9	-	-	-	9.25	-	mA/V
	Anode Current		6.5		Ia	5.25	-	-	-	-	-	mA
	See Amendment, 3.											
A IIR.4	<u>GROUP G</u>											
	Electrical Re-test after 28 days holding period			100%								
A VI/5.6	Inoperatives		0.5									
	Reverse Grid Current	$R_g = 500k \Omega \text{ max.}$	0.5		Igi	-	-	-	-	0.75	-	μA

NOTES

1. The change of mutual conductance is expressed:

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

2. Prior to this test the valve shall be preheated for five minutes under the test conditions. I_g 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 $\pm$ 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. $R_g = 100K \Omega \pm 20\%$; $R_k = 180 \Omega \pm 10\%$; $V_{hk} = 100V$ D.C. heater positive
Or 150V A.C. 50 c/s r.m.s.