SPECIFICATION CV.4015. ISSUE 2 dated 6.12.55

AMENDMENT NO. 1

(1) <u>Group B.</u> <u>Screen Current Test.</u>

   <u>Delete</u> the figures of 1.8 and 0.9 in the LAL and
   ALD columns respectively.

(2) <u>Group D.</u> <u>Capacitance Test</u>

   <u>Amend</u> the Inspection Level to read IC.

   g^3 Control Test.

   <u>Amend</u> the minimum limit to 55 (from 50) and the
   maximum figure to 125 (from 95).

ELECTRONIC VALVE SPECIFICATIONS

SPECIFICATION CV.4015

ISSUE 2 - DATED 6th DECEMBER, 1955

AMENDMENT NO. 2.

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:-

K.1001 Ref.	Test	Test Conditions	AQL %	INSP. LEVEL	Symbol	LIMITS						
						MIN	LAL	BOGEY	UAL	MAX	AID	UNITS
	ELECTRODE	Vg1 to all = -100V	4.0		R	50	-	-	-	-	-	M Ω
	INSULATION	Vg2 to all = -300V			R	50	-	-	-	-	-	M Ω
		Vg3 to all = -300V			R	50	-	-	-	-	-	M Ω
		Va to all -300V			R	50	-	-	-	-	-	M Ω

Test Point (1000 hrs)

Delete all reference to Heater Current Test
Add at the end of the Group the following:-

K.1001 Ref.	Test	Test Conditions	AQL %	INSP. LEVEL	Symbol	LIMITS						
						MIN	LAL	BOGEY	UAL	MAX	AID	UNITS
	ELECTRODE	Vg1 to all = -100V	6.5		R	30	-	-	-	-	-	M Ω
	INSULATION	Vg2 to all = -300V			R	30	-	-	-	-	-	M Ω
		Vg3 to all = -300V			R	30	-	-	-	-	-	M Ω
		Va to all = -300V			R	30	-	-	-	-	-	M Ω

AMENDMENT NO. 3

Page 2 GROUP B.

Anode Current. Variables test V2.

Limits	Column				
LAL	Delete	7.6	Insert	7.43
UAL	"	8.9	"	9.07
ALD	"	2.2	"	1.85

Mutual Conductance. Variables test V2.

Limits	Column				
LAL	Delete	2.25	Insert	2.21
UAL	"	2.65	"	2.69
ALD	"	0.65	"	0.53

January, 1962. Royal Radar Establishment
(9165)

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

VALVE ELECTRONIC

CV4015

Specification MOS(A)/CV.4015 Issue 2 Dated 6.12.55 To be read in conjunction with B.S.448, B.S.1409 and K.1001	SECURITY	
	Specification	Valve
	UNCLASSIFIED	UNCLASSIFIED

TYPE OF VALVE	— Reliable Miniature Variable μ H.F. Pentode	**MARKING**
CATHODE	— Indirectly Heated	K.1001/4 Additional Marking:- 6065
ENVELOPE	— Glass	
PROTOTYPE	— CV131	**BASE**
R.E.T.M.A. DESIGNATION — 6065		B.S.448/B7G

RATING			Note		CONNECTIONS	
				Pin	**Electrode**	
Heater Voltage	(V)	6.3	C	1	g1	
Heater Current	(A)	0.2		2	k	
Max. Heater-Cathode Voltage	(V)	±150	A	3	h	
Max. Operating Anode Voltage	(V)	300	A	4	h	
Max. Anode Voltage (Ia = 0)	(V)	500	A,E	5	a	
Max. Anode Dissipation	(W)	3.0	A	6	g3 + s	
Max. Operating Screen Voltage	(V)	300	A	7	g2	
Max. Screen Voltage (Ig2 = 0)	(V)	300	A,E			
Max. Screen Dissipation	(W)	0.7	A			
Mutual Conductance	(mA/V)	2.45	B	**DIMENSIONS**		
Inner Amplification Factor (μg1 g2)		30	B	See B.S.448/B7G/2.1		
Max. Grid 1 - Cathode Resistance for Cathode Bias	(MΩ)	0.5		Size Ref. No. 2		
Max. Grid 1 - Cathode Resistance for Fixed Bias	(MΩ)	0.1				
Max. Bulb Temperature	(°C)	200	C			
Max. Shock (short duration)	(g)	500				
Max. Acceleration (continuous operation)	(g)	2.5				

Dimensions (mm)	Min.	Max.
A Seated height	–	47.5
C Diameter	16.0	19.0
D Overall length	–	54.5

CAPACITANCES (pF)			
C in (nom.)	4.5	D	
C out (nom.)	7.0	D	
Ca,g1 (max.)	0.01	D	

MOUNTING POSITION

Any.

NOTES

A. Absolute Value.

B. Measured at Va = 250V; Vg2 = 200V; Vg3 = 0; Vg1 = 2.5V; Ia = 8.25 mA approx; Ig2 = 2.1 mA approx.

C. Caution to Electronic Equipment Design Engineers: Special attention should be given to the tempera-
ture 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.

E. With 5 kΩ resistor in series with the anode and 20 kΩ resistor in series with the screen grid.

CV4015

To be performed in addition to those applicable in K.1001

Test shall be performed in the specified order unless otherwise agreed with the Inspecting Authority

Test Conditions – unless otherwise specified					
Vh (V) 6.3	Va (V) 200	Vg1 (V) −2.5	Vg2 (V) 200	Vg3 (V) 0	

K.1001 Ref.	Test	Test Conditions	AQL %	Insp. Level	Symbol	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										
		Vg1 to all = −100V		100%	R	100	-	-	-	-	-	MΩ
		Vg2 to all = −300V		100%	R	100	-	-	-	-	-	MΩ
		Vg3 to all = −300V		100%	R	100	-	-	-	-	-	MΩ
		Va to all = −300V		100%	R	100	-	-	-	-	-	MΩ
	Reverse Grid Current	Rg1 = 500 kΩ max.		100%	Ig1	-	-	-	-	0.5	-	μA
	GROUP B											
		Combined AQL	1.0	II								
	Heater Current		0.65	II	Ih	184	-	-	-	216	-	mA
	hk Leakage Current	Vhk = ±100V. Note 2	0.65	II	Ihk	-	-	-	-	10	-	μA
		Vhk = −100V Cathode Positive		V2	Ihk	-	-	-	3	-	-	μA
	Anode Current		0.65	II	Ia	6.0	-	-	-	10.5	-	mA
				V2	Ia	-	7.6	8.25	8.9	-	2.2	mA
	Screen Current		0.65	II	Ig2	1.2	-	-	-	3.0	-	mA
				V2	Ig2	-	1.8	2.1	2.4	-	0.9	mA
	Mutual Conductance		0.65	II	gm	1.8	-	-	-	3.1	-	mA/V
				V2	gm	-	2.25	2.45	2.65	-	0.65	mA/V
	GROUP C											
		Combined AQL	6.5	I								
	Change of Mutual Conductance	Vh = 5.7V Note 7	2.5	I	Δgm	-	-	-	-	15	-	%
	Mutual Conductance	Vg1 = −26V	2.5	I	gm	4.0	-	-	-	60	-	μA/V
	Reverse Grid Current	Vg1 = −50V	2.5	I	Ig1	-	-	-	-	1.0	-	μA
	Reverse Grid Current	Vh = 6.9V;adjust Vg1; Va = 300V; Vg2 = 200V Note 5.	2.5	I	Ig1	-	-	-	-	1.0	-	μA
11.1	Vibration Noise	RL = 2 kΩ Note 3	2.5	I	Va AC		-	-	-	15	-	mV rms
	GROUP D											
7.2	Base Strain	No Voltages	6.5	IA								

TESTS (Continued)

CV4015 A

To be performed in addition to these applicable in K.1001

K.1001 Ref.	Test	Test Conditions	AQL %	Insp. Level	Symbol	Limits						Units
						Min.	LAL	Bogey	UAL	Max.	ALD	
	GROUP D (Contd.)											
	Capacitance	Measured on 1 Mc/s bridge with valve mounted in a fully shielded socket. Valve screened.	6.5	IA	C in C out Ca,g1	3.8 5.8 -	- - -	- - -	- - -	5.2 8.2 0.01	- - -	pF pF pF
	g3 Control	Vg1 = -7V. Ia = 50μA	6.5	IA	-Vg3	50	-	-	-	95	-	V
	Inner Amplification Factor	Max. Grid swing = 1V Vg1 Vary. Ia = 8.0 mA	6.5	IA	μg1g2	23	-	30	-	39	-	
	GROUP E											
11.2	Resonance Search	RL = 2 kΩ Frequency 25 to 500 c/s 500 to 2500 c/s	2.5	IC	Va AC Va AC	- -	- -	- -	- -	90 250	- -	mV rms mV rms
11.3	Fatigue	Vh = 6.9V Note 4		IA								
	Post Fatigue Tests											
5.3	hk Leakage Current	Vhk = ±100V. Note 2	2.5		Ihk	-	-	-	-	20	-	μA
	Reverse Grid Current	Rg1 = 500 kΩ	2.5		Ig1	-	-	-	-	1.0	-	μA
	Mutual Conductance		2.5		gm	1.6	-	-	-	3.1	-	mA/V
11.1	Vibration Noise	RL = 2 kΩ Note 3	2.5		Va AC	-	-	-	-	25	-	mV rms
11.4	Shock	Hammer Angle = 30° No Voltages		IA								
	Post Shock Tests											
5.3	hk Leakage Current	Vhk = ±100V. Note 2	2.5		Ihk	-	-	-	-	20	-	μA
	Reverse Grid Current	Rg1 = 500 kΩ	2.5		Ig1	-	-	-	-	1.0	-	μA
	Mutual Conductance		2.5		gm	1.6	-	-	-	3.1	-	mA/V
	Vibration Noise	RL = 2 kΩ Note 3	2.5		Va AC	-	-	-	-	25	-	mV rms
	GROUP F											
AVI/5	Life	Rg1 = 100 kΩ ±20% Note 6										
WI/5.1	Stability Life (1 hour)			I								
	Change in Mutual Conductance		1.0		Δ gm	-	-	-	-	10	-	%
	Survival Rate Life (100 hours)			II								
WI/5.6	Inoperatives		0.65									

CV4015

K.1001 Ref.	Test	Test Conditions	AQL %	Insp. Level	Symbol	Min.	LAL	Bogey	UAL	Max.	ALD	Units
	Intermittent Life											
	Test Point (500 hrs)											
		Combined AQL	6.5	IA								
AVI/5.6	Inoperatives		2.5									
	Heater Current		2.5		Ih	184	--	--	--	216	--	mA
	hk Leakage Current	Vhk ±100V. Note 2	2.5		Ihk	--	--	--	--	20	--	μA
	Reverse Grid Current	Rg1 = 500 kΩ max.	2.5		Ig1	--	--	--	--	0.75	--	μA
	Mutual Conductance		2.5		gm	1.6	--	--	--	3.1	--	mA/V
	Average Change of Mutual Conductance				Δgm	--	--	--	--	15	--	%
	Electrode Insulation	Vg1 to all = -100V	4.0		R	50	--	--	--	--	--	MΩ
		Vg2 to all = -300V	4.0		R	50	--	--	--	--	--	MΩ
		Vg3 to all = -300V	4.0		R	50	--	--	--	--	--	MΩ
		Va to all = -300V	4.0		R	50	--	--	--	--	--	MΩ
	Test Point (1000 hrs)											
		Combined AQL	10									
AVI/5.6	Inoperatives	*See Amend Sheet 2*	4.0									
	Heater Current		4.0		Ih	184	--	--	--	216	--	mA
	hk Leakage Current	Vhk = ±100V. Note 2	4.0		Ihk	--	--	--	--	30	--	μA
	Reverse Grid Current	Rg1 = 500 kΩ	4.0		Ig1	--	--	--	--	1.0	--	μA
	Mutual Conductance		4.0		gm	1.5	--	--	--	3.1	--	mA/V
	GROUP C											
AIX/2.5	Electrical Re-test after 28 days holding period			100%								
	Inoperatives		0.5									
	Reverse Grid Current	Rg1 = 500 kΩ	0.5		Ig1	--	--	--	--	0.75	--	μA

See Amend. Sheet 2.

NOTES

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

2. Heater positive and negative successively.

3. The valve shall be mounted so that the direction of vibration is parallel to the minor axis of the mounting structure. Vibration frequency = any fixed frequency in the range 25 to 100 c/s. Min. peak acceleration = 2.5 g.
   The test shall be of sufficient duration to obtain a steady reading of noise output.

4. Valves shall be vibrated in each of the three required planes for not less than 33 hours (100 hours total). Heater switched 1 minute on, 3 minutes off. No other voltages. Min. peak acceleration = 5g; frequency 170 ± 5 c/s.

5. Adjust Vg1 to give Ia = 10 mA. Ig1 shall not be rising or out of limit after a total of 10 minutes including pre-heating time. Automatic Bias may be used; Rk = $240 \Omega \pm 5\%$.

6. The initial conditions shall be such that the anode and screen dissipations are not less than 2.4 and 0.56 watts respectively. The grid voltage may be any convenient value. Automatic Bias may be used. Vhk = 135V with heater positive.

7. The change of mutual conductance is expressed:

$$\frac{gm \ at \ 6.3V - gm \ at \ 5.7V}{gm \ at \ 6.3V} \quad x \quad 100\%$$