

ELECTRONIC VALVE SPECIFICATION

SPECIFICATION CV.4004

ISSUE 3 - DATED 11th SEPTEMBER 1956.

AMENDMENT No.1.

GROUP F.

Intermittent Life Test Point (1000 hrs)

Delete all reference to Heater Current Test

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

K.1001 Ref.	Test	Test Conditions	AQL %	INSP. LEVEL	Symbol	LIMITS						
						MIN	LAL	BOGEY	UAL	MAX	AID	UNITS
	ELECTRODE	Vg -all = -100V	6.5	-	R	30	-	-	-	-	-	MΩ
	INSULATION	Va -all = -300V			R	30	-	-	-	-	-	MΩ

December, 1957

T.V.C.

SPECIFICATION MOS/CV4004

ISSUE 3 DATED 11.9.56

AMENDMENT NO.3

Page 1 Under the heading "RATING" add the following new rating:-
"Maximum Peak Negative Grid Voltage (V)/200/H"

Under the heading "NOTES" add new NOTE H as follows:-

"H. This rating applies provided the following conditions are not exceeded. Pulse 800 μ secs long not more frequently than once in every 20 milliseconds. Duty ratio not more than 5%".

Specification H.O.S./CV 4004 Issue 3 Dated 11.9.56. To be read in conjunction with K1001, B.S.448 and B.S.1409	<u>SECURITY</u>	
	<u>Specification</u>	<u>Valve</u>
	UNCLASSIFIED	UNCLASSIFIED

Indicates a change →

TYPE OF VALVE - Reliable High Impedance Double Triode CATHODE - Indirectly heated ENVELOPE - Glass PROTOTYPE - CV492 - 12AX7	<u>MARKING</u> K1001/4
	<u>BASE</u> See B.S.448/B9A/1.1

<u>RATING</u>				<u>CONNECTIONS</u>		
All limiting values are absolute					<u>Pin</u>	<u>Electrode</u>
Heater Voltage	(V)	12.6	Note A,F	1	Anode 2	a ^a
Heater Current	(A)	0.15		2	Grid 2	g ^a
Max. Anode Voltage	(V)	330	C	3	Cathode 2	k ^w
Max. No-load Anode Voltage	(V)	550	C	4	Heater	h
Max. Anode Dissipation	(W)	1.1	C	5	Heater	h
Max. Heater-Cathode Voltage	(V)	200	C	6	Anode 1	a ^a
Max. Cathode Current	(mA)	20	C,E	7	Grid 1	g ^l
Mutual Conductance	(mA/V)	1.6	C,D	8	Cathode 1	k ^l
Amplification Factor		95	C,D	9	Heater CT	hot.
Anode Impedance	(ohms)	59,000	C,D			
Max. Bulb Temperature	(°C)	200	F			
Max. Shock (short duration)	(g)	500				
Max. Acceleration (continuous operation)	(g)	2.5				
→ Max. Negative Grid Voltage	(V)	55	C			
<u>CAPACITANCES</u> (pF)					<u>DIMENSIONS</u>	
Ca, g (nom)		1.7	C,G		B.S.448/B9A/2.1 Size ref. No.2	
C in (nom)		1.6	C,G		Dimensions (mm)	Min. Max.
C out ^a (nom)		0.46	G		A. Seated height	- 49.0
C out ^b (nom)		0.34	G		C. Diameter	19.0 22.2
					D. Overall length	- 56.0
					<u>MOUNTING POSITION</u>	
					Any	

NOTES

- A. Centre-tapped heater: for operation on 6.3V, connections should be made to pins 4 & 5 strapped together and to pin 9.
- C. Each section.
- D. Measured at Va = 250V; Vg = -2V; Ia = 1.0 mA (approx.)
- E. Difficulty may be encountered if this valve is operated for long periods of time with very small values of cathode current.
- F. 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 specific for life test 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.
- G. Measured without metal screen.

To be performed in addition to those applicable in K1001

Tests to be performed in the specified order unless otherwise agreed with the Inspection Authority.

Test Conditions - unless otherwise specified													
		Vh (V)	Va (V)	Vg (V)	Vhk (V)	Note 1							
		12.6	250	-2	0								
K1001	Test	Test Conditions	AQL %	Insp. Level	Symbol	Limits						Units	
						Min	LAL	Bogey	UAL	Max	ALD		
→	7.1	Glass Strain	No voltages	6.5	I								
→		<u>GROUP A</u>	Note 2										
→		Insulation	Vg-all = -100V Va-all = -300V	100%	R	100	-	-	-	-		MΩ	
→		Reverse Grid Current	Rg = 500 k Max	100%	Ig	-	-	-	-	0.5		μA	
		<u>GROUP B</u>	Combined AQL	1.0	II								
		Heater Current		0.65	II	Ih	138	-	150	-	162	mA	
		Heater Cathode Leakage Current	Vhk = ± 100V Note 3	0.65	II	Ihk	-	-	-	-	10	μA	
					II	V2	Ihk	-	-	2	-	μA	
		Anode Current		0.65	II	Ia	0.75	-	-	-	1.75	mA	
					II	V2	Ia	-	1.00	1.25	1.50	0.55	mA
		Anode Tail Current	Vg = -4V	0.65	II	Ia	-	-	-	-	35	μA	
		Mutual Conductance		0.65	II	gm	1.25	-	-	-	2.05	mA/V	
					II	V2	gm	-	1.425	1.60	1.775	0.39	mA/V
		<u>GROUP C</u>	Combined AQL	6.5	I								
		AC Amplification	Va(b) = 100V Vg = 0 RL = 0.5MΩ Rg = 10MΩ Signal input = 0.2 V rms Frequency = 400 c/s nominal	2.5	I	Va(AC)	8.4	-	-	-		V rms	
		Anode Current difference between sections		2.5	I	Ia	-	-	-	-	0.6	mA	
		Mutual Conductance	Vh = 11.4V Note 4	2.5	I	Δgm	-	-	-	-	15	%	
		Noise and Microphony	Va(b) = 300V RL = 100kΩ Vg = 0 Note 5	2.5	I	Va AC	-	-	-	-	100	mV rms	
		or alternatively											
→	11.1	Vibration Noise	Va(b) = 250V RL = 2kΩ Note 5	2.5	I	Va AC	-	-	-	-	25	mV rms	

K1001	Test	Test Conditions	AQL	Insp. Level	Symbol	Limits						Units
						Min	LAL	Bogey	UAL	Max	ALD	
→	GROUP D											
	Amplification Factor		6.5	IA	μ	75	-	95	-	115		
	Grid Emission	Vh = 14.0V Rg = 500 k Max Note 6	6.5	IA	Ig	-	-	-	-	1.5		μ A
	7.2 Base Strain Capacitances	No voltages Measured on 1 Mc/s bridge with the valve mounted in a fully screened socket, No shield	6.5 6.5	IA IC	Cag C in C out C out	1.27 1.20 0.22 0.18	- - - -	1.70 1.60 0.46 0.34	- - - -	2.12 2.0 0.7 0.6		PF PF PF PF
→	GROUP E											
	11.2 Resonance Search	RL = 2k Ω Va(b) = 250V Frequency 25-500 c/s	2.5	IC	Va AC f	- 200	- -	- -	- -	Record -		mV rms c/s
	11.3 Fatigue	Vh = 14.0V switched 1 min. on and 3 mins. off. Va = 0. Vg = 0 Frequency = 170 c/s. Min. peak Acceleration = 5g Duration = 30, 39, 30 hrs.		IA								
	<u>Post Fatigue Tests</u>	Combined AQL	6.5									
	11.1 Vibration Noise	Note 8	2.5		Va AC	-	-	-	-	40		mV rms
	Heater Cathode Leakage Current	Vhk = \pm 100 V Note 3	2.5		Ihk	-	-	-	-	30		μ A
	Reverse Grid Current	Rg = 500 k Max	2.5		Ig	-	-	-	-	1.5		μ A
	11.4 Shock	Hammer angle = 30° No voltages		IA								
	<u>Post Shock Tests</u>	Combined AQL	6.5									
	11.1 Vibration Noise	Note 8	2.5		Va AC	-	-	-	-	40		mV rms
Heater Cathode Leakage Current	Vhk = \pm 100 V Note 3	2.5		Ihk	-	-	-	-	30		μ A	
Reverse Grid Current	Rg = 500 k Max	2.5		Ig	-	-	-	-	1.5		μ A	

Z1001	Test	Test Conditions	AQL %	Insp. Level	Sym-bol	Limits					Units
						Min	LAL	Boqey	UAL	Max	
	<u>GROUP F</u>										
A VI/ 5	Life	Vhk = 135V heater positive to cathode Rg = 0.5MΩ Max									
A VI/ 5.1	<u>Stability Life Test</u> Change in Mutual Conductance		1.0	I	Δgm	-	-	-	-	10	%
A VI/ 5.3	<u>Intermittent Life Test</u>	See above		IA							
	<u>Life Test End- Point - 500 hrs</u>	Combined AQL	6.5								
	<u>Inoperatives Heater Current</u>		2.5		Th	138	-	-	-	162	mA
	Heater Cathode Leakage Current	Vhk = ± 100V Note 3	2.5		Ihk	-	-	-	-	20	μA
	Reverse Grid Current	Rg = 500 k Max	2.5		Ig	-	-	-	-	0.5	μA
	Mutual Conductance do. Average Change		2.5		gm	1.15	-	-	-	2.05	mA/V
	Anode Current		4.0		Δcm	-	-	-	-	15	%
	Insulation	Vg-all = -100V Va-all = -300V	4.0		Ia	0.65	-	-	-	1.75	mA
			4.0		R	50	-	-	-	-	MΩ
			4.0		R	50	-	-	-	-	MΩ
	<u>Life Test End- Point - 1000 hrs</u>	Combined AQL	10.0								
	<u>Inoperatives Heater Current</u>		4.0		Th	138	-	-	-	162	mA
	Heater Cathode Leakage Current	Vhk = ± 100V Note 3	4.0		Ihk	-	-	-	-	20	μA
	Reverse Grid Current	Rg = 500 k Max	4.0		Ig	-	-	-	-	0.5	μA
	Mutual Conductance		4.0		gm	1.12	-	-	-	2.05	mA/V
	Anode Current		6.5		Ia	0.6	-	-	-	1.75	mA
	<i>See Amendment I</i>										
A IX/ 2.5	<u>Re-test after 28 days holding period</u>			100%							
A VI/ 5.6	<u>Inoperatives Reverse Grid Current</u>	Rg = 500 k Max	0.5		Ig	-	-	-	-	0.5	μA

NOTES

- Test each section separately with the elements of the opposite section earthed, except where otherwise stated.
- At least one test in Group A shall be performed with the heaters of both sections connected in parallel and connected to a 6.3 volt supply.
- Test with the sections connected together.
- Pre-heat the valves for 5 minutes at Vh = 11.4V; Va = 250V; Vg = -2V; before testing. Pre-heat with both sections operating separately but test with the elements of the opposite section connected to earth.
- Test with the sections connected in parallel; parasitic suppressors of 50 ohms maximum permissible. Connect cathodes together and connect to earth through 1500 ohms, Ck = 100μF. Connect the grids to earth.
- Pre-heat the valves for 5 minutes at Vh = 14.0V; Va = 250V; Vg = -2V; before testing. Pre-heat with both sections operating but test with the elements of the opposite section connected to earth. The maximum time between pre-heating and test shall be 2 seconds.

~~7. Deleted.~~

- The test conditions specified for the Vibration Noise test in Group C shall apply.
- The test conditions specified for the AC Amplification test in Group B shall apply.