

MINISTRY OF SUPPLY - DLRD/RRE

VALVE ELECTRONIC

CV 4004

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

Indicates a change →

TYPE OF VALVE - Reliable High Impedance Double Triode				MARKING	
CATHODE - Indirectly heated				K1001/4	
ENVELOPE - Glass				BASE	
PROTOTYPE - CV492 - 12AX7				See B.S.448/B9A/1.1	
RATING				CONNECTIONS	
All limiting values are absolute					
Heater Voltage	(V)	12.6	Note A, F	Pin 1	Electrode Anode 2 a ⁺
Heater Current	(A)	0.15		2	Grid 2 g ⁺
Max. Anode Voltage	(V)	330	C	3	Cathode 2 k ⁺
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 ⁺
Max. Cathode Current	(mA)	20	C, E	7	Grid 1 g ⁺
Mutual Conductance	(mA/V)	1.6	C, D	8	Cathode 1 k ⁺
Amplification Factor		95	C, D	9	Heater CT hot.
Anode Impedance	(ohms)	59,000	C, D		
Max. Bulb Temperature	(°C)	200	F	DIMENSIONS	
Max. Shock (short duration)	(g)	500		B.S.448/B9A/2.1 Size ref. No.2	
Max. Acceleration (continuous operation)	(g)	2.5			
* Max. Negative Grid Voltage	(V)	55	C		
Max. Peak Negative Grid Voltage	(V)	200	U		
CAPACITANCES (pF)					
Ca, g (nom)		1.7	C, G		
C in (nom)		1.6	C, G		
C out ¹ (nom)		0.46	G		
C out ² (nom)		0.34	G		
				MOUNTING POSITION	
				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 $V_a = 250V$; $V_g = -2V$; $I_a = 1.0$ 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.
- A. This rating applies provided the following conditions are not exceeded. Pulse 800µs max long not more frequently than once in every 20 milliseconds. Duty ratio not more than 5%.

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					
						Min	LAL	Bogey	UAL	Max	Units
→ 7.1	Glass Strain	No voltages	6.5	I							
→	GROUP A	Note 2									
→	Insulation	Vg-all = -100V	100%	R	R	100	-	-	-	-	MΩ
→		Va-all = -300V	100%	R	R	100	-	-	-	-	MΩ
→	Reverse Grid Current	Rg = 500 k Max	100%	Ig	Ig	-	-	-	-	0.5	μA
	GROUP B	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
					V2	Ihk	-	-	2	-	μA
	Anode Current		0.65	II	Ia	0.75	-	-	-	1.75	mA
					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
					V2	gm	-	1.425	1.60	1.775	0.39 mA/V
	GROUP C	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	
	<u>GROUP D</u>											
	Amplification Factor		6.5	IA	μ	75	-	95	-	115		
	Grid Emission	$V_h = 14.0V$ $R_g = 500\text{ k Max}$ Note 6	6.5	IA	I_g	-	-	-	-	1.5		μA
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	C_{ag} 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
	<u>GROUP E</u>											
11.2	Resonance Search	$RL = 2k\Omega$ $V_a(b) = 250V$ Frequency 25-500 c/s	2.5	IC	$V_a AC$ f	- 200	- -	- -	- -	Record -		mV rms c/s
11.3	Fatigue	$V_h = 14.0V$ switched 1 min. on and 3 mins. off. $V_a = 0$ $V_g = 0$ Frequency = 170 c/s. Min. peak Acceleration = 5g Duration = 30, 39, 30 hrs.		IA								
	<u>Post Fatigue Tests</u>	<u>Combined AQL</u>	6.5									
11.1	Vibration Noise	Note 8	2.5		$V_a AC$	-	-	-	-	40		mV rms
	Heater Cathode Leakage Current	$V_{hk} = \pm 100 V$ Note 3	2.5		I_{hk}	-	-	-	-	30		μA
	Reverse Grid Current	$R_g = 500\text{ k Max}$	2.5		I_g	-	-	-	-	1.5		μA
11.4	Shock	Hammer angle = 30° No voltages		IA								
	<u>Post Shock Tests</u>	<u>Combined AQL</u>	6.5									
11.1	Vibration Noise	Note 8	2.5		$V_a AC$	-	-	-	-	40		mV rms
	Heater Cathode Leakage Current	$V_{hk} = \pm 100 V$ Note 3	2.5		I_{hk}	-	-	-	-	30		μA
	Reverse Grid Current	$R_g = 500\text{ k Max}$	2.5		I_g	-	-	-	-	1.5		μA

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

No page 4 to amend. AKS

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%".

April, 1959
N.54676/D

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

✓AAS 9.7.59