MINISTRY OF AVIATION - DLRD/RRE

VALVE ELECTRONIC CV6164

Specification MOA/CV6164

Issue 1 Dated 22nd September 1965

To be read in conjuction with K1001, and BS1409

SECURITY

Specification	Valve
Unclassified	Unclassified

→ Indicates a change

TYPE OF VALVE - Cathode Ray Tube
SCREEN AREA - 3" x 1" nom
DEFLECTION - Major Axis Magnetic, Minor Axis-Electrostatic
FOCUS - Electrostatic
BULB - Glass, internal conductive coating (Note A.
SCREEN - GG4
PROTOTYPE - VX5104

MARKING

See K1001/4

BASE

Potted with flying leads

RATINGS AND CHARACTERISTICS

(Absolute, non-simultaneous and not for Inspectorate)

			NOTES
Heater Voltage	(V)	6.3	
Heater Current	(A)	0.095	
Max. Anode1 & 3 Voltage	(kV)	5.0	B
Min. Anode1 & 3 Voltage	(kV)	1.0	B
Max. Anode 2 Voltage	(V)	300	
Min. Anode 2 Voltage	(V)	0	
Max. Heater - Cathode Voltage	(V)	125	
Max. Operating temperature	(°C)	75	

Typical Operating Conditions

Anode 1 & 3 Voltage	(kV)	3.0
Anode 2 Voltage for Focus	(V)	75
Max. Grid Voltage for Cut-off	(V)	60

CONNECTIONS

Lead Colour	Electrode
Yellow	Cathode - k
Pink	Deflection Plate - y1
Black	Deflection Plate - y2
Red	Anode 1&3 - a3
Green	Grid - g
Brown	Heaters - h
Grey	Anode 2 - a2

DIMENSIONS

See drawing on Page 6

NOTES

A. The internal conductive coating permits the tube to be operated with the cathode at earth potential without the danger of spot movement due to face charging.

B. Anode 1 and Anode 3 are internally connected and will be referred to throughout the specification as Anode 3 (a3).

C. NATO Stock Number: 5960-99-037-4384

To be performed in addition to those tests applicable in K1001

Test conditions, unless otherwise stated:

Vh (V)	Va3 (kV)	Va2 (V)
6.3	3.0	Optimum focus

K1001 Ref.	Test	Test Conditions	Insp. Level	Symbol	Limits Min.	Limits Max.	Unit
5A.3.1	(a) General Inspection-Dimensions	No Voltages See Drawing Page 6.	100%				
5A.3.2.1	(b) Loose Particles See Note 5	No Voltages	100%				
	(c) Heater Current	No Voltages except Vh	100%	Ih	0.08	0.12	A
5A.4.1.2	(d) Grid Insulation Leakage Current	Vh = 6.8V Rg = 10M ohm Vg = -100V	100%	Ig	-	10	µA
5A.4.1.3	(e) Heater-Cathode Leakage Current	Vh = 6.3V V_{hk} = ±125V	100%	Ih-k	—	25	µA
5A.4.3	(f) Negative Grid Cut-off Voltage	No deflection fields	100%	-Vg	30	60 Record	V
5A.5.1.1 and 5A.5.2	(g) Grid Drive (i) Minimum negative Vg (ii) Change of value of Vg from that in (f) above.	Adjust raster to cover useful screen area. Adjust Vg to give a light intensity of 0.35 candela.	100%		 1 -	 - 40	 V V
5A.5.7	(h) (i) Line width measured at centre of trace. (ii) Focus Anode - Voltage & Current	Using magnetic deflection, scan along the major (or X) axis with a time base of 50 c/sec nominal, line length 65 mm. Adjust Vg to give I_{a3}= 50 µA. Adjust Va2 for optimum focus. Without re-focusing, repeat on minor (Y) axis using electrostatic deflection with a time base of 10 Kc/s nominal, line length 24 mm. Adjust Vg to give Ia3=15µA.	100%	 Va2 Ia2	— 0 —	0.75 150 15	mm V µA

TESTS Cont'd

K1001 Ref.5A	Test	Test Conditions	Insp. Level	Sym bol	Limits		Units
					Min.	Max.	
5A.6.4.1 and 5A.6.4.2	(j) Spot Displacement, Deviation of undeflected focused spot from geometrical centre of screen.	No deflection fields. Adjust Vg to give Ia3 = 5μA. (may be pulsed if necessary - pulse width approx. 100 μsecs, p.r.f. 50c/sec)	100%		—	3	mm
5A.6.5	(k) Spot Displacement - Leakage	Conditions as in (j) Insert 1 Mohm between each Y plate and a3.	100%		—	2	mm
	(l) Spot shift due to External Charging	Apply 50c/sec time base to X axis to give a line length of approx. 65mm. Adjust Vg to give Ia3 = 1μA. Apply Va3 and earth potential alternately via an electrode to the centre of tube face parallel to the time base. Note 1.	100%		—	0.25	mm
5A.6.1	(m) Deflection Sensitivity- 'Y' axis	Y1 and Y2 are alternately connected to a3. Positive deflecting voltage being applied to the remaining Y plate.	100%		1.6	2.0	V/mm
5A.6.2.2	(n) Orthogonality Angle between mean major axis of tube face and scanned line.	Apply 'Y' scan to deflect over useful screen area.	100%		87°	93°	
5A.6.3	(o) Useful Screen Area Rectangular area free from shadowing about the geometric centre	Focused raster to slightly overscan area. 'X' axis 'Y' axis	100%		 ±32.5 ± 10	 — —	 mm mm
5A.3.5	(p) Blemishes and Screen Defects Blemishes larger than 0.5 mm 0.25mm - 0.5 mm. See Note 2	Scan over useful area with defocused raster.	100%		 — —	 0 5	

K1001 Ref.	Test	Test Conditions	Insp Level	Sym bol	Limits Min.	Limits Max.	Units
	(q) Flashover and Stray Emission	Scan conditions as in test (o) - Symmetrical deflection. Pre-heat the cathode at Vh = 6.3V for at least 2 minutes before applying other voltages. Increase Va3 to 5 kV at the same time increasing Vg to near cut-off. See Note 3.	100%				
	(r) Cathode Quality measured as $K = \frac{Ia3}{Vg\ (cut\ off)^{\frac{3}{2}}}$	Ia3 = 3kV Va2 = 0 Vg = 0 Negative grid cut off voltage as in test (f).	100%	Ia3 K	measure 2.4	 -	µA
5A.4.6	(s) Capacitances	Cg - all Ck - all Cy - all excluding other y plate Measured with lead under test separated from remainder.	5%			15 10 10	pf pf pf
5A.3.7	(t) Holding period - repeat tests (f) and (r)		100%		7	-	days
5A.8	(u) Life - See note 4 for inspection levels. Life end point	Focused raster Ia3 = 40µA Repeat Test (f) Record Vg Apply Grid drive as follows:- If Cut-off voltage exceeds 41 volts apply 40V grid drive. If Cut-off is less than 41 Volts apply drive until Vg equals -1V Measure Ib		 Ib	500 70	- -	hrs µA
5A.7.2	(v) Resistance to External Pressure		QA				

TESTS Cont'd

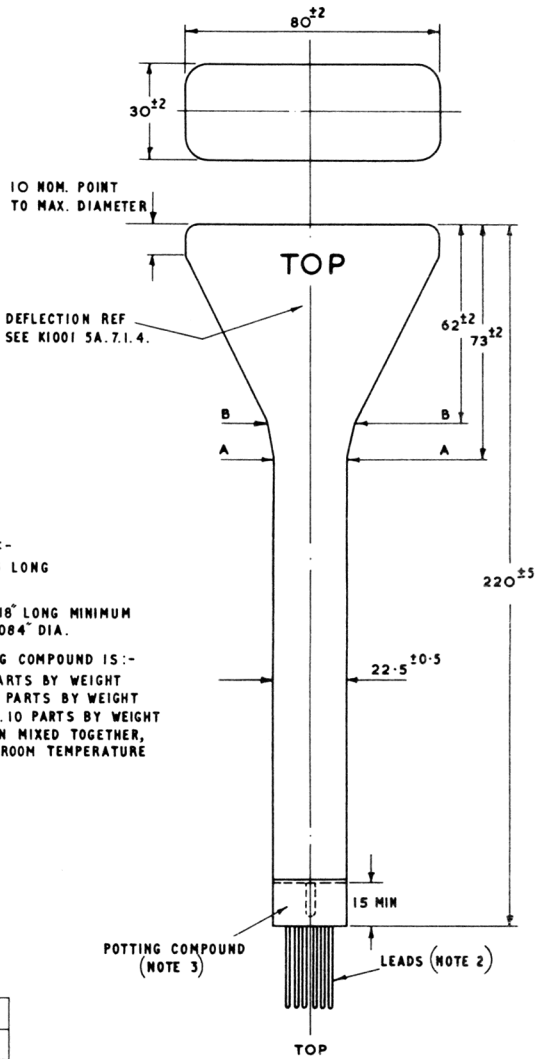
K1001 Ref.	Test	Test Conditions	Insp Level	Sym bol	Limits Min.	Limits Max.	Units
5A.8	(w) Life test - period	Focused raster Ia3 = 40µA	QA		1000	–	hrs
	life test end point	Repeat Test (f). Record V_g Apply Grid drive as follows: If cut-off voltage exceeds 41 Volts apply 40 Volt grid drive. If Cut-off is less than 41 Volts apply drive until Vg = -1V. Measure Ib		Ib	50	-	µA
	(x) Vibration	No deflection fields. Focused spot. Freq. range 20 - 200c/s. Rate of change of freq. 0.2 octaves per minute. Amplitude 4in/sec. or 3.3g, whichever is the lower. Spot enlargement at any point not to exceed 1.5 diameters.	QA				

NOTES

1. A suitable electrode is a metal strip approximate dimensions 1 mm x 60 mm.
2. Blemishes below 0.25 mm shall be ignored, except where the separation between them is less than the maximum dimension of the largest blemish in the group, when they will be considered as a blemish having the mean dimensions of the closely spaced blemishes.
3. The tube shall be held with the screen horizontal and uppermost. It shall be viewed for 15 seconds in a dark box whilst the tube neck is being tapped with an approved forked rubber covered wooden mallet at a minimum rate of 4 taps per second. There shall be no evidence of flashover or stray emission after the first five seconds.
4. The scale of life testing shall be related to the production. For production orders of less than 51, at least one valve shall be life-tested. For production orders of greater than 50, the production shall be divided into batches of 50 and at least one valve from each shall be life-tested. The batch corresponding to the valve undergoing the life test shall not be released until the life test has completed 80% of the required life. At the option of the manufacturer and at his expense any number of additional valves may be life-tested, in which case the average of the lives of these valves shall exceed 80% of the required life before the batch can be released.
   Life Test is considered satisfactory when an accumulated total of 500 hours per sample is reached.
5. Referring to Fig. 5A/1 particles may be present from Groups 1, 2, 3 and 4 and if present must not exceed size A.

OUTLINE DRAWING

(THIRD ANGLE PROJECTION)



NOTES :-

1. STRAIGHTNESS GAUGE :-
   RING GAUGE "A" 23 x 45 LONG
   RING GAUGE "B" 27
2. FLYING LEADS TO BE 18" LONG MINIMUM TO DEF. 12C TYPE 4.0·084" DIA.
3. AN APPROVED POTTING COMPOUND IS :-
   CIBA TYPE My 753. 5 PARTS BY WEIGHT
   SHELL EPICOTE 871. 95 PARTS BY WEIGHT
   CIBA HARDENER Hy 951. 10 PARTS BY WEIGHT
   THESE MATERIALS, WHEN MIXED TOGETHER, ARE LEFT TO SET AT ROOM TEMPERATURE FOR 48 HOURS.

COLOUR	LEAD
YELLOW	CATHODE
PINK	y1
BLACK	y2
RED	a1/a3
GREEN	GRID
BROWN	HEATER
BROWN	HEATER
GREY	a2 FOCUS

ALL DIMENSIONS IN MILLIMETRES