MINISTRY OF AVIATION - DLRD/RRE

VALVE ELECTRONIC **CV6080 -83**

Specification MOA/CV.6080-3

Issue 2 dated 12th July, 1962

To be read in conjunction with K1006

SECURITY	
Specification	Valve
UNCLASSIFIED See Note 17	UNCLASSIFIED

TYPE OF VALVE - PULSE MAGNETRON, 2.5 Mw Nominal Peak Power used in water cooled electro-magnet. (S Band)

CATHODE - Unipotential

ENVELOPE - Glass and Metal

PROTOTYPES - VX2592, VX2570, CV2448, VX9128

MARKING

K1001/4, Also Serial No.

Frequency: See note 16.

CONNECTIONS AND DIMENSIONS

See Pages 9, 10, 11.

ABSOLUTE NON-SIMULTANEOUS RATINGS (Note A)

PARAMETER	SYMBOL AND UNITS	MAX.	MIN.	NOTES
Heater voltage	Ef,Volts	15.0	11.4	B
Heater current(surge)	If,Amps	40	-	C
Cathode warm-up time	tk,secs	-	180	B
VSWR of R/F load	VSWR,ratio	1.5	-	D
Rate of rise of voltage	rrv,kv/µsec	150	100	G
Anode temperature	°C	150	-	E
Waveguide presure	psi ABS	65	35	-
Duty Cycle	Du,ratio	.0015	-	-
Pulse recurrence rate	PRF, c/s	600	-	-
Air flow for window	cu.ft./min.	-	3	J
Air inlet temperature	°C	70	-	-
Magnetic field	Oersteds	1640	1520	F

DESIGN RATINGS

PARAMETER	SYMBOL AND UNITS	MAX.	MIN.	NOTES
Heater Voltage	See Note B			
Input power	Pi, kW	8.5	-	
Pulse width	tp, usec	5.0		
Peak anode current	ib amps			
CV6080		175	120	
CV6081		175	120	
CV6082		175	120	
CV6083		170	115	

JOINT SERVICES CATALOGUE NUMBERS

Cat.No.	CV. No.
5960-99-037-2404	6080
5960-99-037-2405	6081
5960-99-037-2406	6082
5960-99-037-2407	6083

NOTES

A. These ratings cannot be used simultaneously and no individual rating should be exceeded. The requirements of K1006, MIL-E-1 paragraph 6.5 apply.

B. Prior to the application of anode voltage, the cathode shall be heated to the required initial temperature by the application of 12.0 volts to the heater for at least four minutes or by the application of 15.0 volts for three minutes. The heater voltage must not exceed 12.6 volts for longer than five minutes. The heater voltage shall be reduced after the application of anode voltage according to the formulae:-

$$Ef = 12.0 - 0.0010\ Pi$$

for values of Pi less than 6000 watts

and

$$Ef = 30.0 - 0.0040\ Pi$$

for values of Pi greater than 6000 watts to within 5%

The valve heater shall be protected against arcing by a minimum capacitance of 0.5 μF placed directly across the magnetron heater terminals.

C. Surge Current.

D. The maximum standing wave ratio at the oscillating frequency is 1.5 : 1. The standing wave ratio between the frequencies F + 200 Mc/s and F + 300 Mc/s must not exceed 2.0 : 1, where F is the oscillation frequency. A phase shifter should be incorporated in the waveguide immediately before the magnetron and adjusted to give a satisfactory spectrum.

E. To be measured at the point specified on the outline drawing.

F. To be measured at the point specified on the magnet drawing. The axial magnetic field shall not differ by more than $\pm$ 4% from the value at the specified point, over a distance of two inches from the specified point in either direction along the axis of the valve. The sense of the magnetic field shall be such that a north-seeking pole placed at the specified point is attracted towards the cathode terminal of the magnetron.

G. The rate of rise of voltage (rrv) shall be expressed in kilovolts per microsecond defined by the steepest tangent to the leading edge of the voltage pulse above 80% amplitude.

H. The parameters are related by the formula

CV6080 - 6082 $Pi = ib \times Du \times 38.5$ kv

CV6083 $Pi = ib \times Du \times 40$ kv

J. Free air volume.

K. Any lubricants used on the anode shall be sulphur free.

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For miscellaneous requirements, see paragraph 3.3, Inspection Instructions for Electron Tubes.

Ref.	TEST	CONDITIONS	MIN.	MAX.	UNIT
3.1	Qualification Approval				
4.5	Holding period	t = 672 hrs. (min.)			
4.9.2	Dimensions	Per outline drawing			
4.9.18.1.8	Carton drop				
4.9.19.1	✱ Vibration Test ✱✱ Shock Test	No voltages No voltages, Note 1.			
4.9.13	✱ Pressure Test	60 - 65 lb./sq.in. absolute, in specified chamber, Leakage - see Note 13.		0.005	lb/wt/hr
4.10.8	Heater Current	Ef = 12.0 volts A.C. If tk = 360 sec. (Min.)	13.0	15.0	A
4.16.3	Oscillation (1)	Notes 2 and 3			
-	Magnet	Valve fitted in specified electromagnet and launching section.			
-	Pressurizing	Waveguide pressure 35 lb./sq.in. absolute max. Note 4.			
-	Window Cooling	3 cu.ft./minute (max.) Note J.			
-	Water Cooling	0.75 - 1.25 gal./min. inlet temp. 15 - 35°C.			
4.46.3.1	Magnetic Field	Magnetic field = 1580 oersteds.			
4.16.3.2	Heater	Ef = 12.0 volts for tk = 360 sec (max) Ef = 0 volts for test			
4.16.3.3	Pulse Characteristics	tp = 2.5 ± 0.25 μsec. Du = 0.0015 rrv = 90 kv/μsec.(max) Notes 10 and 14			

REF.	TEST	CONDITIONS	SYM-BOL	MIN.	MAX.	UNIT
4.16.3.4	Average Anode Current	CV.No. Ib 6080-82 218 mA 6083 210 mA				
4.16.3.5	Pulse Voltage	CV6080-82 CV6083	epy	36.5 38	40.5 42	kv
4.16.3.6	Power Output		Po	3375		Watts
4.10.7.3	Frequency	CV6080 Notes 16 and 17 CV6081 CV6082 CV6083	F			
4.16.5	Pulling Factor		Δ F		7.0	Mc/s
4.16.6	Pushing Factor	CV.No. Range Ib 6080-82 203-233 mA 6083 195-225 mA The current to be rapidly varied between the above limits with a period not exceeding 5 secs.				
-	Stability	Notes 6, 7, 8 and 9	MP		0.5	%
4.16.3.7	Bandwidth	Notes 11 and 12	Δ F		1.0	Mc/s
4.16.3	Oscillation(2)	Notes 2, 6 and 15				
-	Magnet	Valve to be fitted in specified electromagnet and launching section.				
4.16.3.1	Magnetic Field	Magnetic field = 1580 oersteds				
4.16.3.2	Heater	Ef = 12.0 volts for tk = 360 sec (max.) Ef = 0 volts for test.				
4.16.3.3	Pulse	tp = 5.0 $\pm$ 0.5 μsec Du = 0.0010 rrv = 160 kv/ μsec(Min.) Notes 5, 10 and 14.				
4.16.3.4	Average Anode Current	CV.No. Ib 6080-82 186 and 114 mA 6083 180 and 108 mA				
-	Stability	Notes 6, 7 and 8	MP		0.5	%
-	Bandwidth	Note 11	Δ F		0.5	Mc/s

REF.	TEST	CONDITIONS	SYM-BOL	MIN.	MAX.	UNIT
4.16.3	Oscillation (3)	Note 15				
-	Magnet	Valve to be fitted in specified electromagnet and launching section				
4.16.3.1	Magnetic Field	Magnetic field = 1485 oersteds				
4.16.3.2	Heater	Ef = 12.0 volts for tk = 360 sec.(max) Ef = 0 volts for test				
4.16.3.3	Pulse Characteristics	tp = 5.0 ± 0.5 /usec. Du = 0.001$\overline{5}$ rrv = 113 kv/ /usec(min) Notes 10 and 14				
4.16.3.4	Average Anode Current	CV.No. Ib 6080-82 230 mA 6083 222 mA				
	* Stability	Notes 6, 7 and 8	MP		0.5	%
	* Bandwidth	Note 11	ΔF		0.5	Mc/s
4.16.3	Oscillation (4)	Note 15				
-	Magnet	Valve to be fitted in specified electromagnet and launching section				
4.16.3.1	Magnetic Field	Magnetic field = 1675 oersteds				
4.16.3.2	Heater	Ef = 12.0 volts for tk = 360 sec.(max) Ef = 0 volts for test				
4.16.3.3	Pulse Characteristics	tp = 5.0 ± 0.5 /usec Du = 0.001$\overline{5}$ rrv = 113 kv/ /usec(min) Notes 10 and 14				
4.16.3.4	Average Anode	CV.No. Ib 6080-82 183 mA 6083 177 mA				
	* Stability	Notes 6, 7 and 8	MP		0.5	%
	* Bandwidth	Note 11	ΔF		0.5	%

REF.	TEST	CONDITIONS	SYM-BOL	MIN.	MAX.	UNIT
4.11	Life Test	Group D. Oscillation (1) except Pulse characteristics tp = 5.0 ± 0.5 /usec Du = 0.0015 rrv = 113 kv/ /usec(min) Notes 10 and 14 Water inlet temp. 50°C min. Air inlet temp. 60°C min. One cycle to consist of the following:- Condition ib Ef Duration Preheat 0 12.0 Vac 6 mins Oscillation 0 Vac 23 hrs max Off 0 0 54 mins min	Life	250		hrs.
4.11.4	Life Test, End Points	Oscillation (1)				
		Power Output	Po	2700		Watts
		Frequency see Note 17 CV6080 CV6081 CV6082 CV6083	F			
	Stability	Notes 6, 7, 8 and 9.	MP		1.0	%
	Bandwidth	Notes 11 and 12.	ΔF		1.0	Mc/s

NOTES

1. The valve is to be subjected to six shocks of value 12g in a direction parallel to its axis, and six shocks of value 6g in any one direction perpendicular to this axis.

2. The modulator shall be such that the pulse energy delivered to the magnetron, following an arcing pulse, cannot greatly exceed the normal energy per pulse.

3. The load termination of the magnetron during this test shall be a waveguide with a VSWR of less than 1.10 at the oscillation frequency F, and less than 1.5 between frequencies F + 200 Mc/s and F + 300 Mc/s, unless otherwise specified.

4. There shall be no evidence of breakdown in the output waveguide during this test

5. The rate of rise of voltage shall be measured at the higher specified current level.

NOTES (CONTD)

6. The valve shall be terminated by a mismatch giving a standing wave ratio of at least 1.5 : 1 at the oscillating grequency F_1. The mismatch shall be such that when the position of a voltage maximum is set to coincide with the launching section reference plane (page 11) at F_1, the position of the voltage minimum at a frequency $F_2 = F_1 + 250$ Mc/s shall lie between $\pm$ 1.0 cm from the reference plane.

7. Stability shall be measured in terms of the average number of output pulses missing, expressed as a precentage of the number of input pulses applied during the period of observation. The missing pulses (M.P.) due to any causes are considered to be missing if the r.f. energy is less than 70% of the normal energy level, within the appropriate frequency band of the valve, extended at each end by 15 Mc/s.

   Missing pulses shall be counted during any 5 minute interval of a 10 minute test period.

8. The valve shall pass either of the following tests:-

   (a) Using missing pulse ratio meter

   The stability as indicated on a ratio meter shall be not worse than 0.25% while the mismatch is slowly varied in phase over a range of $\lambda g/4$. The stability shall also be not worse than 0.25% when the valve is terminated by a load of VSWR less than 1.1 : 1.

   (b) Using missing pulse counter

   The stability shall be within the specified limit at two phases of the mismatch $\lambda g/4$ apart.

9. The valve shall pass either of the following tests:-

   For each test the mismatch shall be reduced so that the VSWR is not less than 1.2 : 1.

   (a) Using missing pulse ratio meter

   The stability as indicated on a ratio meter shall be not worse than 0.25% while the mismatch is slowly varied through all phases.

   (b) Using missing pulse counter

   The stability shall be within the specified limits when the phase of the mismatch is set for the position of worst stability. To demonstrate that the worst phase was selected it may be necessary to measure the stability at one adjacent phase on each side of the selected phase.

   These tests are valueless and shall be omitted if the maximum reading at any phase of the mismatch under Note 6 conditions is less than the limit specified for the test.

NOTES (CONTD)

10. The rate of rise of voltage (rrv) shall be expressed in kilovolts per microsecond, and shall be the value of dv/dt at the onset of RF oscillations.

11. The width of the spectrum shall be within the specified limited at 1/4 power points under all conditions at which the stability is significant for the tests in Note 8.

12. The width of the spectrum shall be within the specified limited at 1/4 power points under all conditions at which the stability is significant for the tests in Note 9.

13. For the pressure test, the valve shall be placed in a chamber such that it is sealed by an "O" ring to Ref. Plane A (see page 10 .)

14. The value of rrv to be at the discretion of the Manufacturer, provided that it staisfied the specified limit.

15. Window cooling, waveguide pressure, and water cooling shall not be less than specified for Oscillation (1).

16. This note refers to the Frequency tests on Page 4. Each valve shall have its operating frequency marked on the top surface of the cathode terminal, as the difference in megacycles from the lower limit of the band, to the nearest 3 Mc/s.

17. Reference classified "Appendix for CV6080-3 specification".

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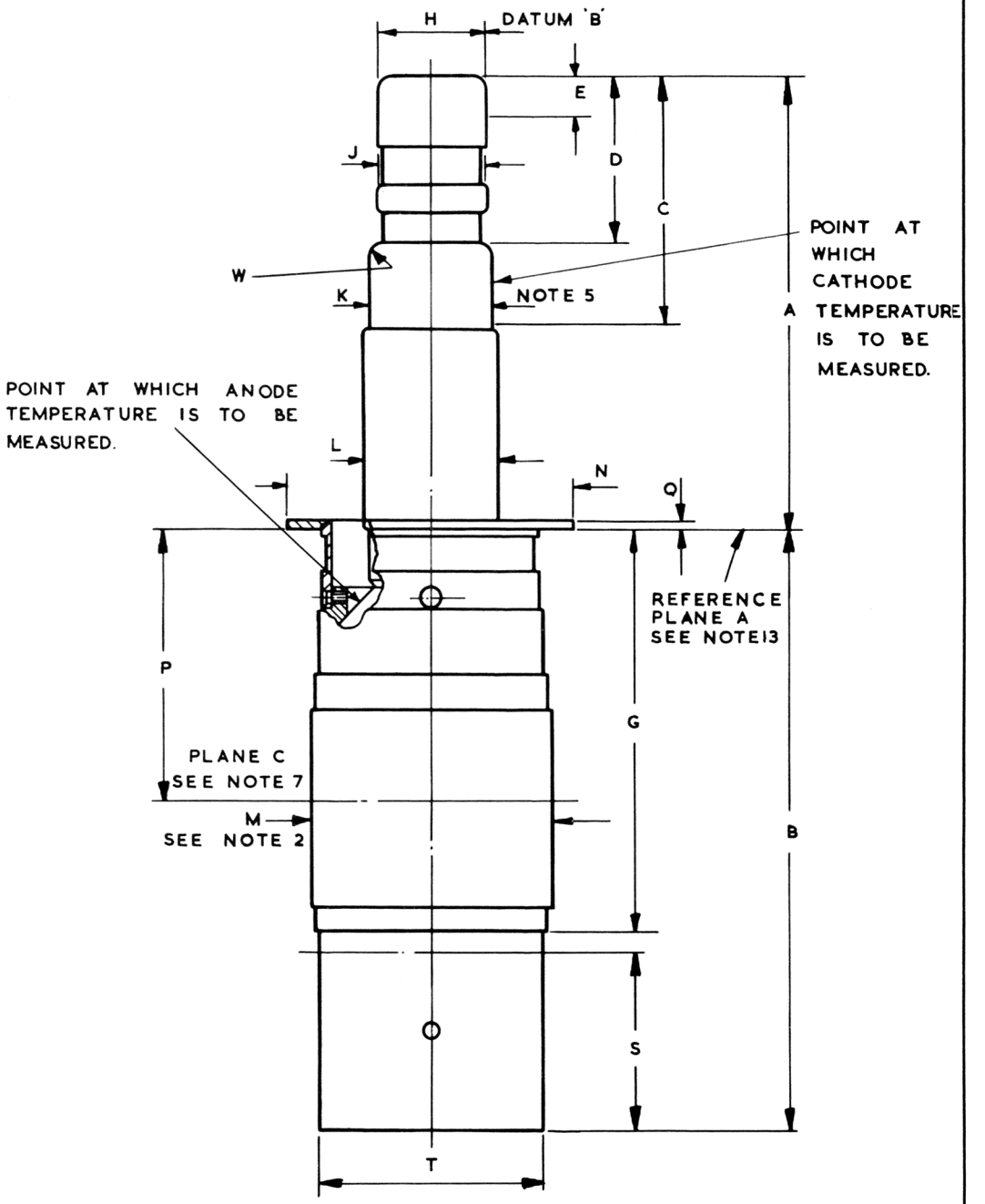
OUTLINE DRAWING NOTES

1. All metal surfaces to be silver or nickel plated or black finish.
2. This surface to be silver or nickel plated.
3. This plane to be square to axis of diameter M to within 10'.
4. Limits include angular as well as lateral deviations.
5. Concentric tolerance 0.050" Dia. DATUM - Dia. B.
6. All dimensions in inches.
7. Reference Plane 'C' shall be the plane at which the magnetic field is measured. The magnetic field shall be within the specified limits for an axial distance of ± 2.000" from the plane 'C' and the valve shall fit into a water cooled cylinder, Diameter 3.252 - 3.254" which extends for ± 2.000" from plane 'C'.

Dimension	Nominal	Maximum	Minimum	Remarks
A		6.427		
B	8.514			
C			3.563	
D		3.063		
E			0.375	
F				
G	5.689			
H	1.500	1.510	1.490	Dia.
J		1,550		Dia.
K	1.750	1.760	1.740	Dia.
L		1.937		Dia.
M		3.251		Dia.
N		4.000	3.990	
P	3.939			
Q		0.130	0.120	
R				
S			2.500	
T		3.210	3.190	Dia.
U				
V				
W			0.100	Rad.

OUTLINE DRAWING



FOR DRAWING NOTES SEE PAGE 9

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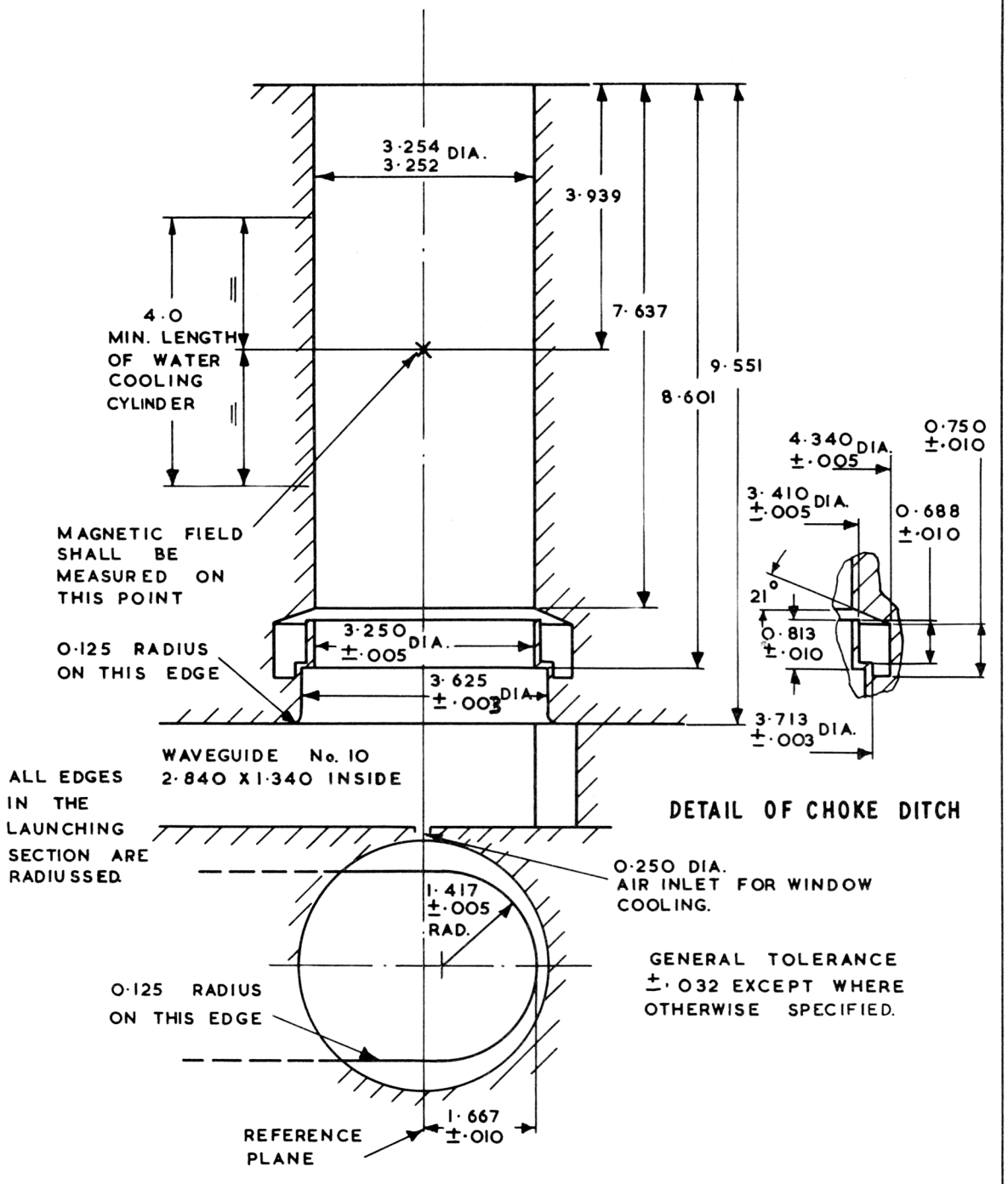
ELECTROMAGNET AND LAUNCHING SECTION



ALL DIMENSIONS IN INCHES.