

CV6052  
CV6053  
CV6054

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MINISTRY OF AVIATION, DLRD/RRE.

VALVE ELECTRONIC

|                                                                                                                  |                                                              |                              |
|------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------|------------------------------|
| Specification MOA/CV6052-4<br><br>Issue 2A, Dated 12th December 1963<br><br>To be read in connection with K1006. | <u>SECURITY</u>                                              |                              |
|                                                                                                                  | <u>SPECIFICATION</u><br><b>UNCLASSIFIED</b><br>(See Note 13) | <u>VALVE</u><br>UNCLASSIFIED |

→ Indicates change

|                                                                                                                    |                        |       |      |       |                                                                 |                    |
|--------------------------------------------------------------------------------------------------------------------|------------------------|-------|------|-------|-----------------------------------------------------------------|--------------------|
| TYPE OF VALVE: PULSE MAGNETRON, 5 MW Nominal Peak<br>Power <b>water cooled, used in</b><br><b>electro- magnet.</b> |                        |       |      |       | <u>MARKING</u><br><br>K1001/4. ALSO SERIAL NO.                  |                    |
| CATHODE: UNIPOTENTIAL                                                                                              |                        |       |      |       |                                                                 |                    |
| ENVELOPE: GLASS AND METAL.                                                                                         |                        |       |      |       | <u>CONNECTIONS AND DIMENSIONS</u><br><br>See Pages:- 8,9,10, 11 |                    |
| ABSOLUTE NON-SIMULTANEOUS RATINGS (NOTE A)<br><br>NOT FOR INSPECTION PURPOSES                                      |                        |       |      |       | <u>JOINT SERVICES CATALOGUE</u><br><u>NUMBERS</u>               |                    |
| PARAMETER                                                                                                          | SYMBOL<br>AND<br>UNITS | MAX.  | MIN. | NOTES | CV NO.                                                          | CAT. NO.           |
| Heater Voltage                                                                                                     | Ef, volts              | 50.4  | 45.6 | B     | 6052                                                            | 5960-99-037 - 2233 |
| Heater Current (surge)                                                                                             | If, Amps               | 40    | -    | C     | 6053                                                            | " " " - 2234       |
| Cathode warm-up time                                                                                               | tk, secs               | -     | 480  | B     | 6054                                                            | " " " - 2235       |
| VSWR of R/F Load                                                                                                   | VSWR ratio             | 1.3   | -    | K     |                                                                 |                    |
| Rate of rise of voltage                                                                                            | rrv,kv/usec            | 100   | 75   | F     |                                                                 |                    |
| Peak Anode Current                                                                                                 | ib, Amps               | 250   | 200  | -     |                                                                 |                    |
| Cathode Temperature                                                                                                | °C                     | 150   | -    | D     |                                                                 |                    |
| Waveguide Pressure                                                                                                 | psi ABS                | 35    | 25   | -     |                                                                 |                    |
| Duty Cycle                                                                                                         | Du, ratio              | .0025 | -    | -     |                                                                 |                    |
| Air flow for window                                                                                                | cu.ft./min             | -     | 3    | H     |                                                                 |                    |
| Air Inlet Temperature                                                                                              | °C                     | 70    | -    | -     |                                                                 |                    |
| Magnetic Field                                                                                                     | Oersteds               | 800   | 750  | E     |                                                                 |                    |
| Water Outlet Temp.                                                                                                 | °C                     | 75    | -    | J     |                                                                 |                    |
| <u>DESIGN RATINGS</u>                                                                                              |                        |       |      |       |                                                                 |                    |
| PARAMETER                                                                                                          | SYMBOL<br>AND<br>UNITS | MAX.  | MIN. | NOTES |                                                                 |                    |
| Heater Voltage                                                                                                     | See Note B             |       |      |       |                                                                 |                    |
| Input Power                                                                                                        | Pi, kw                 | 30    | -    | G     |                                                                 |                    |
| Pulse Width                                                                                                        | tp, usec               | 10    | -    |       |                                                                 |                    |

(190442)

CV6052-4/2A/1

RATING NOTES

- A. These ratings cannot be used simultaneously and no individual rating should be exceeded. The requirements of K1006, (MIL-E-1c) para 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 48 volts to the heater for at least ten minutes. The heater voltage must not exceed 50.4 volts for longer than five minutes. The heater voltage should be reduced, after application of anode voltage, according to the table below.

| <u>Mean Input Power (KW)</u> | <u>Max. heater volts</u> | <u>Min. heater volts</u> |
|------------------------------|--------------------------|--------------------------|
| Zero                         | 50.4                     | 45.6                     |
| 0 - 5                        | 48                       | 43                       |
| 5 - 10                       | 43                       | 38                       |
| 10 - 15                      | 38                       | 32                       |
| 15 - 20                      | 32                       | 25                       |
| 20 - 24                      | 25                       | 15                       |
| 24 - 30                      | 15                       | 0                        |

The valve heater shall be protected against arcing by a capacitance of 8.0  $\mu$ f (minimum), placed directly across the magnetron heater terminals, as shown on page 10.

- C. Surge current
- D. To be measured at the point specified on the outline drawing.
- E. The axial magnetic field shall be measured at one point within  $\frac{1}{8}$ " spherical radius of the magnetic field reference point specified on page 8 and shall be 800 oersteds. After the measurement, the probe shall be moved parallel to the axis and the axial magnetic field shall reach its maximum value within  $\frac{1}{8}$ " of movement on each side of the initial measurement position. The axial magnetic field shall decrease monotonically as the probe is moved parallel to the axis, to points  $4.000" \pm 0.005"$  on each side of the initial measurement position, and the axial magnetic field at these two positions must be within 700 - 720 oersteds.
- F. The rate of rise of voltage (rrv) shall be expressed in kilovolts per micro-second defined by the steepest tangent to the leading edge of the voltage pulse above 80% amplitude.
- G. The parameters are related by the formula  $P_i = i_b \times D_u \times 48 \text{ kV}$ .
- H. Free air volume.
- J. Normal distilled water should be used. During operation a water flow of at least three gallons per minute is recommended.
- After all the power is removed from the magnetron, a water flow of at least  $1\frac{1}{2}$  gallons per minute must be maintained for at least fifteen minutes to remove stored heat, otherwise damage may occur.
- K. The VSWR presented to the magnetron should not exceed 2:1 over a frequency range:-  $f_o + 90$  to  $f_o + 170 \text{ mc/s}$ , where  $f_o$  is the centre frequency of the appropriate band, and should not exceed 5:1 over a frequency range 1530 to 1650 mc/s.

TESTS

For miscellaneous requirements, see para 3.3, Inspection Instructions for Electron Tubes. Note 12

| K1006<br>Ref. | Test                                | Conditions                                                                                          | Min.                       | Max.           | Units                   |
|---------------|-------------------------------------|-----------------------------------------------------------------------------------------------------|----------------------------|----------------|-------------------------|
| 4.5           | (a) Holding period                  | All valves shall be subjected to these tests (except life) for acceptance.<br>$t = 672$ hours (min) |                            |                |                         |
| 4.9.2         | (b) Dimensions                      | Per outline drawing page 10.                                                                        |                            |                |                         |
| 4.10.8        | (c) Heater Current                  | $E_f = 48.0$ volts A.C.<br>$t_k = 600$ secs (min)                                                   | 13.0                       | 15.0           | A                       |
| 4.16.3        | (d) Oscillation (1)                 | Notes 1 and 2                                                                                       |                            |                |                         |
| -             | (e) Magnet                          | Valve fitted in specified electromagnet and launching section.                                      |                            |                |                         |
| -             | (f) Pressurizing<br>(Oscillation 1) | Waveguide pressure 25 lb/sq.in. absolute max. Note 3                                                |                            |                |                         |
| -             | (g) Air Leakage                     | Note 6                                                                                              |                            | 0.01           | lb.wt/hr                |
| -             | (h) Window Cooling                  | 3 cu.ft/min max. Note 3                                                                             |                            |                |                         |
| -             | (j) Water Cooling                   | 3-5 gal/minute Inlet temp. 15 - 45 °C                                                               |                            |                |                         |
| 4.16.3.1      | (k) Magnetic Field(1)               | 800 gauss, Note 9                                                                                   |                            |                |                         |
| 4.16.3.2      | (l) Heater                          | $E_f = 48.0$ volts for<br>$t_k = 480$ secs (max)<br>$E_f = 0$ volts for test.                       |                            |                |                         |
| 4.16.3.3      | (m) Pulse Characteristics           | $t_p = 10.0 \pm 1.0$<br>$D_u = 0.0025$<br>$r_{rv} = 100$ kv/ $\mu$ sec (min)<br>Notes 5 and 7.      |                            |                |                         |
| 4.16.3.4      | (n) Average Anode (1) Current       | Notes 8 and 14                                                                                      |                            |                |                         |
| 4.16.3.5      | (p) Pulse Voltage                   | CV6052 epy<br>CV6053 epy<br>CV6054 epy                                                              | 45<br>46<br>47             | 49<br>50<br>51 | kv<br>kv<br>kv          |
| 4.16.3.6      | (q) Power Output                    | CV6052 $P_o$<br>CV6053 $P_o$<br>CV6054 $P_o$                                                        | 10,000<br>10,000<br>10,000 |                | watts<br>watts<br>watts |
| 4.10.7.3      | (r) Frequency Code                  | CV6052<br>CV6053<br>CV6054<br>Note 13 Drawing Note No. 12                                           | Red<br>Yellow<br>Blue      |                |                         |

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TESTS (Contd.)

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| K1006<br>Ref. | Test                          | Conditions                                                                           | Min. | Max. | Units |
|---------------|-------------------------------|--------------------------------------------------------------------------------------|------|------|-------|
| 4.16.5        | (s) Pulling Figure            | VSWR = 1.3/1 $\Delta F$                                                              | -    | 2.25 | Mc    |
|               | (t) Stability (4)             | Note 4 M.P.                                                                          |      | 0.5  | %     |
| (u)           | Stability (2)                 | VSWR = 1.3 min M.P.<br>Notes 4, 16.                                                  |      | 0.5  | %     |
| 4.16.3.7      | (v) Bandwidth (1)             | VSWR = 1.3/1 min $\Delta F$<br>Note 11                                               |      | 0.25 | Mc    |
| 4.16.3        | (w) Oscillation (2)           | Notes 1 and 2                                                                        |      |      |       |
| -             | (x) Magnet                    | Valve to be fitted in specified electromagnet and launching section.                 |      |      |       |
| 4.16.3.1      | (y) Magnetic Field(2)         | 750 gauss, Note 10.                                                                  |      |      |       |
| 4.16.3.2      | (z) Heater                    | Ef = 48.0 volts for<br>tk = 480 secs (max)<br>Ef = 0 volts for test.                 |      |      |       |
| 4.16.3.3      | (aa) Pulse Characteristics    | tp = 10.0 $\pm$ 1.0<br>Du = 0.0025<br>rrv = 70 kv/ $\mu$ sec (max)<br>Notes 5 and 7. |      |      |       |
| 4.16.3.4      | (bb) Average Anode(2) Current | Note 15.                                                                             |      |      |       |
| -             | (cc) Stability(3)             | Note 4 M.P.                                                                          |      | 0.5  | %     |
| -             | (dd) Bandwidth(2)             | $\Delta F$                                                                           |      | 0.25 | Mc    |

NOTES

- The modulator shall be such that the pulse energy delivered to the magnetron, following an arcing pulse, shall not be less than, and cannot greatly exceed the normal energy per pulse.
- 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.
- There shall be no evidence of breakdown in the output waveguide during this test.
- Stability shall be measured in terms of the average number of output pulses missing, expressed as a percentage 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.

Missing pulses shall be counted during any five minute interval of a ten-minute test period.

NOTES (Contd.)

5. 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 r.f. oscillations.
6. Leakage shall be measured in a sealed chamber. See page 9, and note 3 on that page.
7. The value of rrv to be at the discretion of the manufacturer, provided it satisfies the specified limit.
8. A figure shall be marked on the cathode terminal cover equal to the current stipulated for oscillation 1 plus 15 mA.
9. The axial magnetic field shall be measured at one point within  $\frac{1}{8}$ " spherical radius of the magnetic field reference point specified on page 8 and shall be 800 oersteds. After the measurement, the probe shall be moved parallel to the axis and the axial magnetic field shall reach its maximum value within  $\frac{1}{8}$ " of movement on each side of the initial measurement position. The axial magnetic field shall decrease monotonically as the probe is moved parallel to the axis, to points  $4.000" \pm 0.005"$  on each side of the initial measurement position, and the axial magnetic field at these two positions must be within 700-720 oersteds.
10. Similar to Note 9, but with a value of 750 oersteds at the specified point, and a value of between 655 and 675 oersteds at points four inches away.
11. VSWR = 1.3/1 MIN for all phases, the phase to be varied and the spectrum checked continuously.
12. The value of each parameter is at the discretion of the manufacturer providing it satisfies the specified limits.
13. Reference to be made to classified document entitled "Appendix for use with Electronic Valve Specification CV6052-4", note 1
14. The valve shall be tested at a current stipulated by the manufacturer, and which shall be between 500 - 585 mA. The power shall be greater than 10kW into a matched load, and the pulling figure and bandwidth requirements shall be met. The bandwidth requirement shall also be met at the stipulated current plus 30mA.
15. The current for oscillation (2) shall be 1.125 times the current stipulated for oscillation (1).
16. The phase of the VSWR is to be shifted through  $180^\circ$  and set to the position of maximum instability. At this point the stability shall be observed and recorded.

OUTLINE DIMENSIONS

All dimensions in inches

| DIMENSION | VALUE                   | REMARKS                   |
|-----------|-------------------------|---------------------------|
| A         | 18.594                  | Nominal                   |
| B         | 8.250                   | Maximum                   |
| C         | 11.900                  | Nominal                   |
| D         | 11.125                  | Nominal                   |
| E         | 1.125                   | $\pm .020$                |
| F         | 0.437                   | $\pm .010$                |
| G         | 10.250                  | $\pm .015$ Dia.           |
| H         | 7.240                   | Maximum                   |
| J         | 7.000                   | $\pm .000$<br>- .040      |
| K         | 10.250                  | Nominal                   |
| L         | 1.937                   | Nominal                   |
| M         | 0.375                   | $\pm .000$<br>- .020      |
| N         | 10.750                  | $\pm .125$                |
| P         | 1.062                   | $\pm .062$                |
| Q         | 0.391                   | $\pm .004$<br>- .000 Dia. |
| R         | $22\frac{1}{2}^{\circ}$ | Nominal                   |
| S         | $45^{\circ}$            | Nominal                   |
| T         | 1.500                   | Maximum                   |
| U         | 4.032                   | Nominal Inside            |
| V         | 5.500                   | Maximum                   |
| W         | 0.500                   | Position of V             |
| X         | 6.000                   | Maximum                   |
| Y         | 3.125                   | Position of X             |
| Z         | 1.093                   | Nominal                   |
| AA        | 1.247                   | Nominal                   |
| AB        | 0.093                   | Nominal                   |
| AC        | 0.577                   | $\pm .020$                |
| AD        | 0.452                   | $\pm .010$                |

DRAWING NOTES

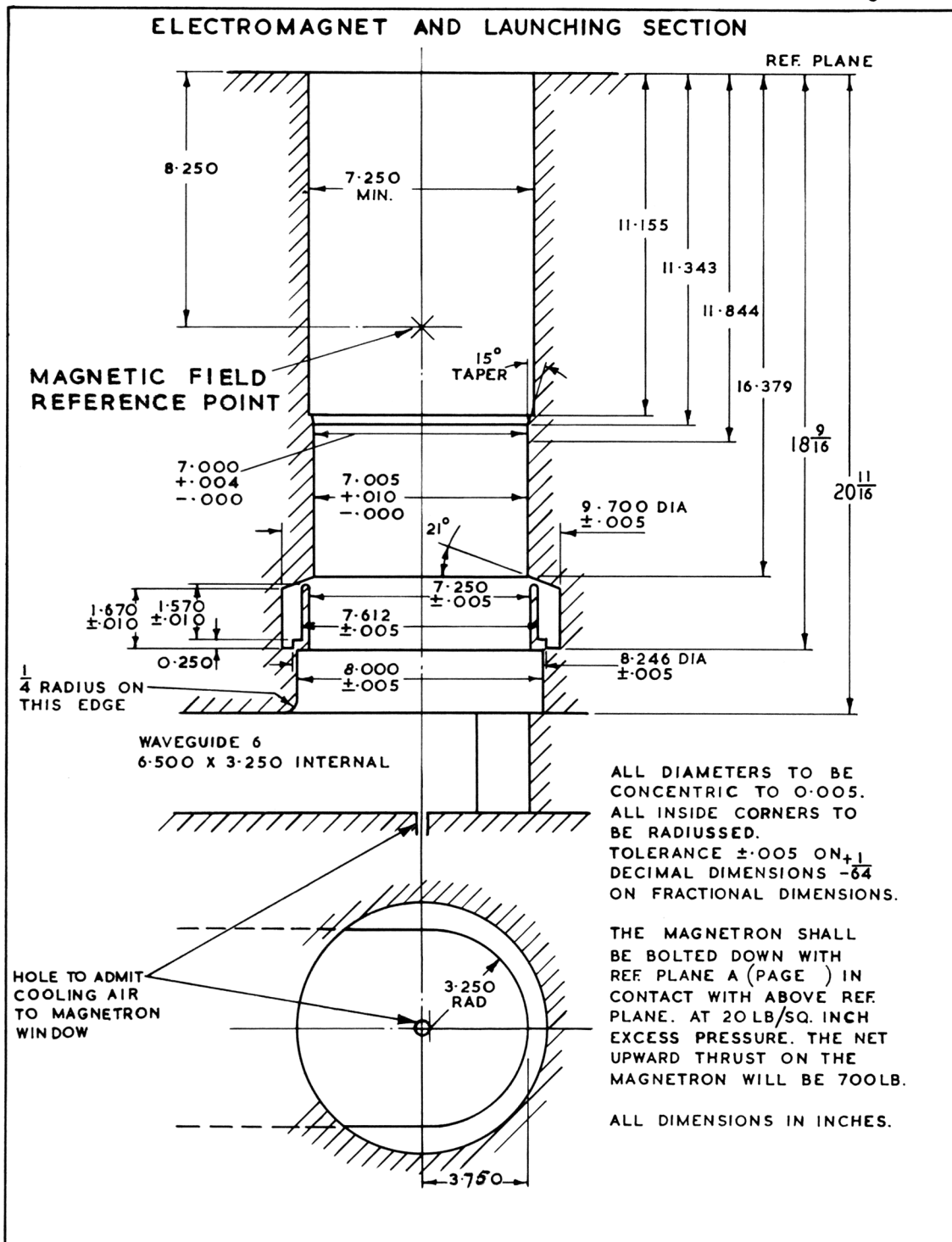
1. Reference Plane A.
2. 8 Holes  $0.312 \pm .004$  Dia. Spacing and P.C.D. to suit gauge.
3. 'O' Sealing Ring 6.475 I/Dia : 0.275 Section Diameter 0.S.67 (B.S.1806:1951).  
Neoprene Rubber - 60° Shore. *Ring, Sealing, Toroidal, NATO Stock No 5330-99-954-8782*

DRAWING NOTES Cont'd.

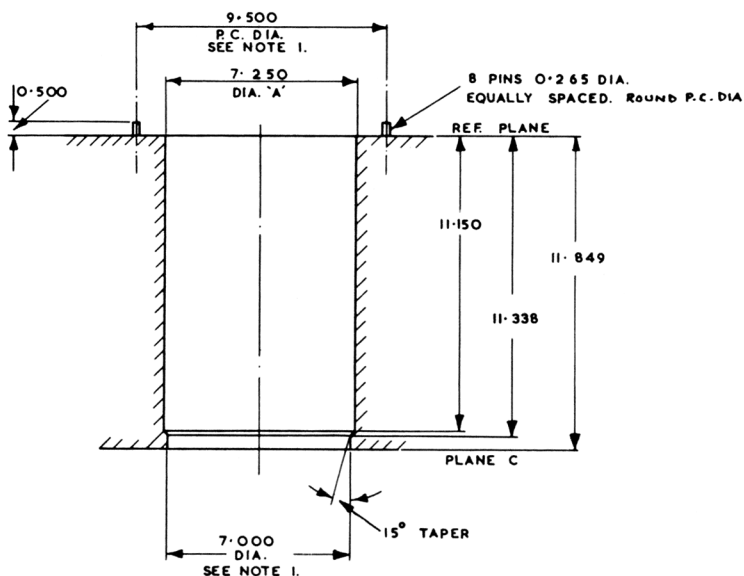
4. Water Connections -  $\frac{1}{2}$ " B.S. Screwed Pipe to B.S. 2051 Part 2. The final union dimensions after plating shall conform to the limits defined in BS 2779.
5. Heater Cathode Coaxial Connector:- ~~The Joint Services Cat. No is 5935-99-940-1839~~ See also drg on page 11. *Amult.1*
6. Bush threaded 1-12 UNF-2B (American thread). Brass Silver plated.
7. Inside width of lifting handles.
8. Dimension F shall apply only within circles 0.625" Dia. centred on each of the eight 0.312" Dia. holes.
9. All parts mounted on the flange shall lie within a 13" Dia. cylinder.
10. 0.187 Rad. Domed contact, brass - silver plated
11. Leaf spring to provide positive contact through dimension range 0.540 to 0.600.
12. A notice shall be printed prominently on this surface "DANGER, X-RADIATION HAZARD". Reference should also be made to classified document entitled "Appendix for use with Electronic Valve Specification CV6052- 54", note 2. and also to Note 8, page 5.

5. The U.K. NATO Stock No for the Heater Cathode Coaxial Socket is 5960-99-932-5870

The U.K. NATO Stock No. for the free plug mating with the above socket is 5960-99-940-1839. *Amult.1*



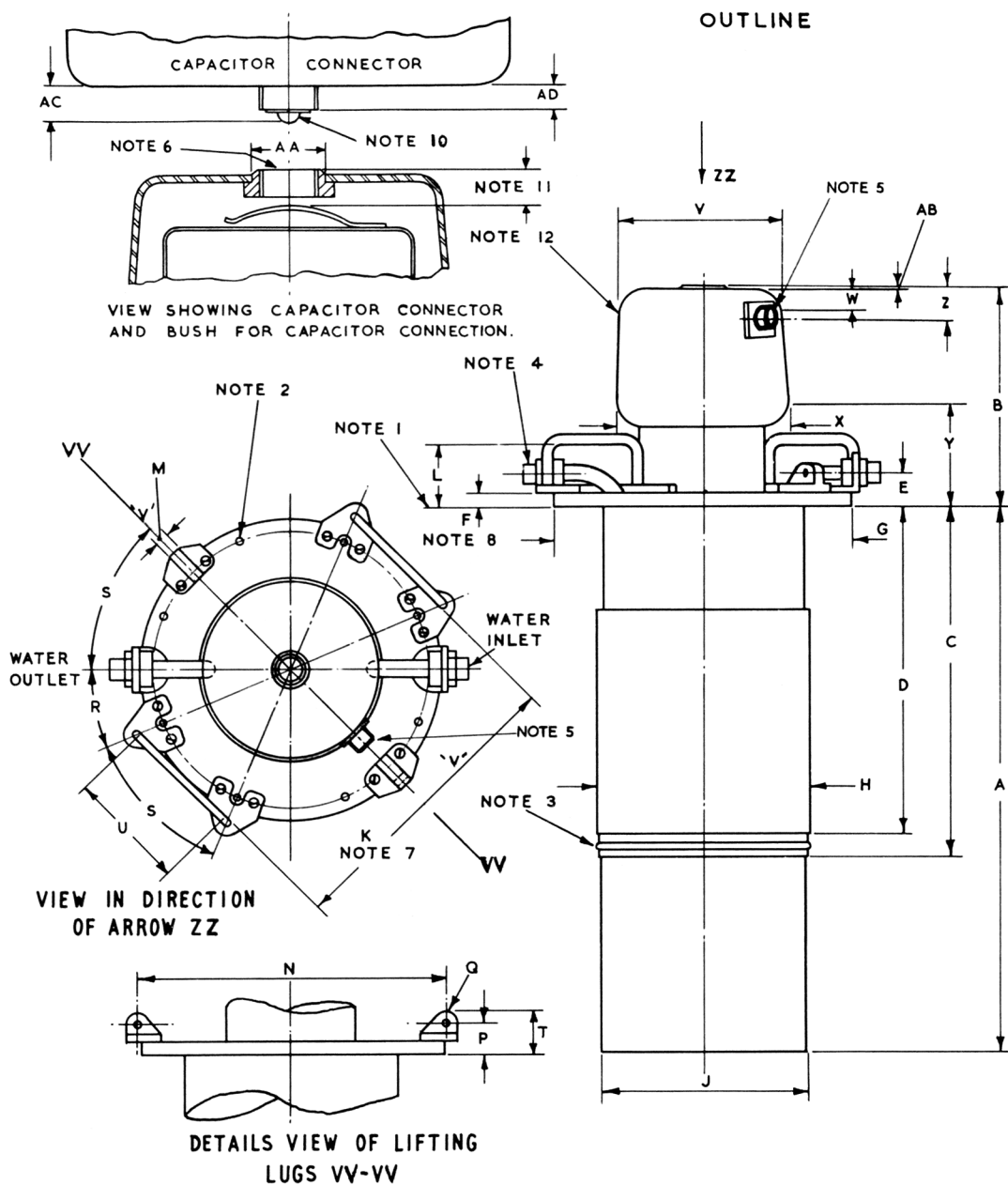
# OUTLINE CHECKING GAUGE



NOTES:-1. CONCENTRIC TOLERANCE 0.005" DIA. DATUM DIA. A. (B.S. 308:1953)

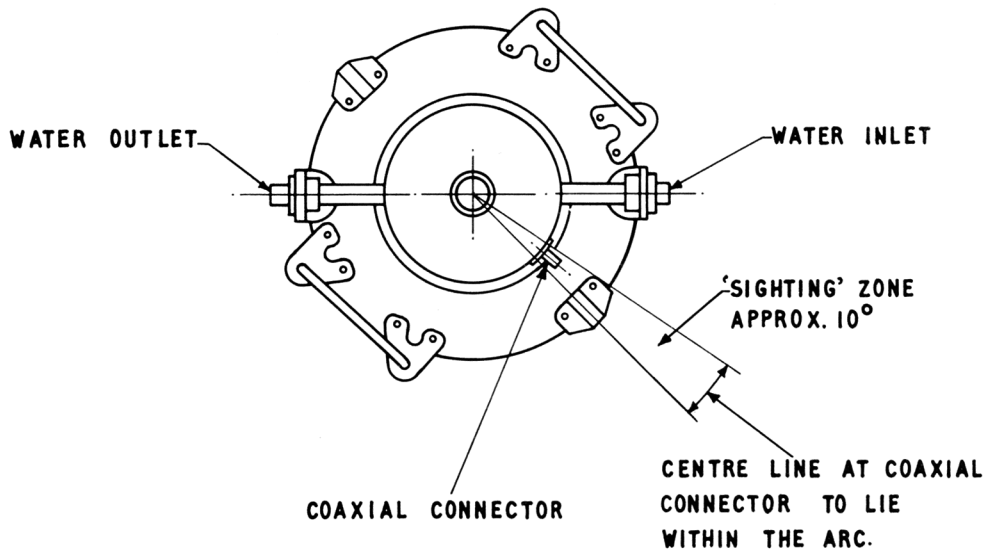
2. THE VALVE SHALL BE INSERTED INTO THIS GAUGE AND SHALL ENTER. THE PINS SHALL ENTER THE 8 HOLES IN THE VALVE FLANGE. WITH VALVE PLANE A RESTING ON THE REFERENCE PLANE, A 0.010" FEELER GAUGE SHALL NOT ENTER BETWEEN THEM. IT SHALL THEN BE DEMONSTRATED THAT THE PART OF THE VALVE BELOW PLANE C LIES WITHIN A CYLINDER DIAMETER 7.000" COAXIAL WITH THE DIAMETERS OF THE ABOVE GAUGE.
3. THE AIR LEAKAGE TEST SHALL BE MADE FROM A CHAMBER SEALED TO REFERENCE PLANE C. IN A FIXTURE SIMILAR TO THE ABOVE GAUGE.

ALL DIMENSIONS IN INCHES



## OUTLINE DRAWING

SHOWING RELATIVE POSITION OF COAXIAL CONNECTOR



ELECTRONIC VALVE SPECIFICATIONS  
SPECIFICATION MOA/CV6052-4 ISSUE 2A DATED  
12th December, 1963  
AMENDMENT No. 1

Page 7 Drawing Notes

Delete existing Note 5 and substitute. "The U.K. NATO Stock No. for the Heater Cathode Coaxial socket is 5960-99-932-5870.

The U.K. NATO Stock No. for the free plug mating with the above socket is 5960-99-940-1839.

May, 1964

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

✓MK  
23/7/64

ELECTRONIC VALVE SPECIFICATIONS

SPECIFICATION MOA/CV6052-4, ISSUE 2A DATED 12th DECEMBER 1963

AMENDMENT No.2

Page 6, Note 3, add the following:-

"(Ring, Sealing, Toroidal, NATO Stock No. 5330-99-954-  
8782)"

March 1966

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

(230079)

*AMS*  
6/7/66