# CV4048

VALVE ELECTRONIC

ADMIRALTY SURFACE WEAPONS ESTABLISHMENT

| | |
|---|---|
| Specification AD/CV.4048<br>Issue No. 2, Reprint A<br>dated 1st December, 1962.<br>To be read in conjunction with K1001<br>excluding clauses 5.2 and 5.8,<br>→ BS448 and BS1409 | **SECURITY**<br>Specification: Unclassified<br>Valve: Unclassified |

→ Indicates a change

| | | |
|---|---|---|
| TYPE OF VALVE: | Reliable, Gas-filled Voltage Reference Tube | **MARKING**<br>See K1001/4 |
| CATHODE: | Cold | |
| ENVELOPE: | Glass | **BASE** |
| PROTOTYPE: | VX8098 | |
| EQUIVALENT FLYING LEAD VALVE: | CV4054 | See BS448/B7G ← |

## RATINGS

(All limiting values are absolute)

| | | | Note |
|---|---|---|---|
| → Min. Supply Voltage | (V) | 115 | A |
| Recommended Operating Current | (mA) | 6.0 | |
| Max. Cathode Current | (mA) | 10 | |
| Min. Cathode Current | (mA) | 1.0 | |
| → Max. Starting Current | (mA) | 40 | B |
| Max. Acceleration (continuous operation) | (g) | 2.5 | |
| Max. Shock (short duration) | (g) | 500 | |
| → Max. Operating Bulb Temp. | (°C) | 90 | C |
| → Max. Ambient Storage Temp. | (°C) | 70 | D |
| Min. Ambient Temperature | (°C) | -55 | |

## CONNECTIONS

| Pin | Electrode | |
|---|---|---|
| 1 | Anode | a |
| 2 | cathode | k |
| 3 | internally connected | ic |
| 4 | cathode | k |
| 5 | anode | a |
| 6 | internally connected | ic |
| 7 | cathode | k |

## CHARACTERISTICS

| | | | Note |
|---|---|---|---|
| Nominal Maintaining Voltage | (V) | 85 | E |
| Max. Incremental Resistance | (ohms) | 450 | |
| → Nominal Incremental Resistance | (ohms) | 350 | |
| → Max. Regulation Voltage (1-10 mA) | (V) | 4 | |
| → Max. Jump Voltage (1-10 mA) | (mVpk) | 100 | |
| → Typical Random Noise Voltage (30 c/s to 10 Kc/s) | (μVrms) | 75 | F |
| Nominal Temperature Co-efficient | | | |
| (a) -55°C to +25°C | (mV/°C) | -7 | |
| (b) +25°C to +90°C | (mV/°C) | -3 | |
| Max. Percentage Drift of Maintaining Voltage | | | |
| (a) 0-300 hours | (%) | 0.3 | G |
| (b) 300-1300 " | (%) | 0.2 | G |
| Typical Percentage Drift of Maintaining Voltage per 1000 hours after 1300 hours | (%) | 0.1 | G |
| Min. Life Expectancy | (hours) | 10,000 | |

## DIMENSIONS

See BS448/B7G/2.1
Size Ref. No. 2 ←

| Dimensions (mm) | Min. | Max. |
|---|---|---|
| A seater height | - | 47.5 |
| C diameter | 16.0 | 19.0 |
| D overall length | - | 54.5 |

## MOUNTING POSITION

Any

## NOTES

A. This figure is applicable in ambient light or total darkness at room temperature, during the life of the valve. In total darkness an ignition delay of up to approximately 5 seconds may occur.

B. This is to be restricted to 60 seconds once or twice in every 8 hours use if the stability is to be maintained.

C. For greater reliability the operating bulb temperature should be maintained as constant as possible and the higher temperatures should be avoided. If the tube is to be operated with a bulb temperature above 70°C the cathode current should be not less than 6.0mA.

D. In order to retain the best reference stability during prolonged storage the ambient temperature should be kept as near to room temperature as possible and the limit rating must never be exceeded.

E. These are all measured at Ik=6mA and normal room temperature unless otherwise stated.

F. This is a random variation of the maintaining voltage, which is generated solely within the valve, due to the discrete nature of the ion current. The energy is uniformly distributed over the frequency spectrum.

G. After an initial warming-up period of 3 minutes.

H. Caution to Electronic Equipment Design Engineers

Special attention should be given to the temperature of valves to be operated in service equipment. Reliability will be seriously impaired if the maximum bulb temperature is exceeded. The life expectancy may be reduced if conditions other than those specified for life tests are imposed on the valve and will be reduced appreciably if absolute maximum ratings are exceeded.

# CV4048

## TESTS

To be performed in addition to those applicable in K1001.

Tests are to be performed in the specified order unless other-wise agreed with the Inspecting Authority.

Test Conditions - Unless Otherwise Stated

Rlim (Kohms) 5 to 20 — Ik(mA) 6

| K1001 Ref | Test | Test Conditions | AQL % | Insp. Level | Symbol | Limits Min. | Limits Max. | Units |
|---|---|---|---|---|---|---|---|---|
| | **Group A** | | | | | | | |
| 5G13 | Leakage Current | V Supply = 55V<br>Rlim = 1Mohm | | 100% | | - | 5 | uA |
| | Pin Continuity | | | 100% | | - | - | |
| 5G1.1 | Striking Time (1) | Va = 115V | | 100% | ts | - | 5 | secs. |
| | **Group B** | | | | | | | |
| 5G3 | Maintaining Voltage | Note 1 | 0.65 | II | Vm | 83 | 87 | V |
| 5G4 | Regulation (1) | Ik=5.8mA, Ik=6.2mA | 0.65 | II | ΔVm | - | 0.18 | V |
| 5G7 | Voltage Jumps | Ik varied between 10mA and 1.0mA<br>Note 2 | 0.65 | II | | - | 100 | Mvpk |
| 5G8 | Microphonic Noise | Note 3 | 0.65 | II | | - | 15 | mV pk-pk |
| | **Group C** | | | | | | | |
| 5G1.1 / 5G2 | Striking Time (2) | Va=115V Note 4 | 2.5 | I | ts | - | 5 | secs. |
| 5G4 | Regulation (2) | Ik=1.0mA<br>Ik=10mA | 2.5 | I | ΔVm | - | 4 | V |
| | **Group D** | | | | | | | |
| 5G10 | Temp.Coefficient (1) | T.Bulb -55°C&+25°C | | T.A. | | - | 12 | -mV/°C |
| 5G10 | Temp.Coefficient (2) | T.Bulb 25°C&+90°C | | T.A. | | - | 5 | -mV/°C |
| 5G1.2 | Striking Voltage (1) | T.Bulb -55°C | | T.A. | Vs | - | 120 | V |
| 5G1.2 | Striking Voltage (2) | T.Bulb +90°C | | T.A. | Vs | - | 115 | V |
| 5G4 | Regulation (3) | Ik=1.0mA<br>Ik=10mA<br>T. Bulb = +90°C | | T.A. | ΔVm | - | 4 | V |
| 5G4 | Regulation (4) | Ik=1.0mA<br>Ik=10mA<br>T. Bulb = -55°C | | T.A. | ΔVm | - | 5 | V |
| 5G6 | Oscillation | Ik varied between 10mA and 1mA<br>Time of sweep<br>$5^{+2}$ sec. Note 5 | | T.A. | | - | 5 | mV pk.pk |

TESTS (Cont'd.)

| K1001 Ref | Test | Test Conditions | AQL % | Insp. Level | Symbol | Limits Min. | Limits Max. | Units |
|---|---|---|---|---|---|---|---|---|
| | Group E | | | | | | | |
| AIX/ 2.4.2.1. | Glass Strain | No Voltages | 6.5 | I | | | | |
| AIX/ 2.4.2.2 | Base Strain | No Voltages | 6.5 | IA | | | | |
| 5G9 ) AIX/ 2.4.2.4.1) | Resonance Search (1) | Rlim = 27kohms Freq.25-500c/s | 2.5 | IA | | - | 15 | mV pk-pk ← |
| 5G9 ) AIX/ 2.4.2.1 ) | Resonance Search (2) | Rlim = 27kohms Freq.500-2500" | 2.5 | IA | | - | 45 | mV pk-pk ← |
| AIX/ 2.4.2.4.2 | Fatigue | No Voltages Duration 30 + 30 + 39 hours Accln = 5g Freq. = 170c/s | | IA | | | | |
| | Post Fatigue Tests | Combined AQL Note 6 | 4.0 | | | | | |
| 5G3 | Change in Maintaining Voltage | Notes 1 and 7 | 2.5 | | Δ Vm | - | ±0.7 | V |
| 5G8 | Microphonic Noise | Note 3 | 2.5 | | | - | 30 | mV pk-pk |
| AIX/ 2.4.2.4.3 | Shock | No Voltages Hammer Angle 30° | | IA | | | | |
| | Post Shock Tests | Combined AQL Note 6 | 4.0 | | | | | |
| 5G3 | Change in Maintaining Voltage | Notes 1 and 7 | 2.5 | | Δ Vm | - | ±0.7 | V |
| 5G8 | Microphonic Noise | Note 3 | 2.5 | | | - | 30 | mV pk-pk |
| | Group F | | | | | | | |
| AIX/ 2.4.3 | Life Test | Note 8 | | IA | | | | |
| | End Point Tests | | | | | | | |
| | 1000 hours | Note 6 | | | | | | |
| 5.14 | Inoperatives | | 2.5 | | | | | |
| 5G1.1 | Striking Time (1) | Va = 115V | 2.5 | | ts | - | 5 | secs. ← |
| 5G3 | Change in Maintaining Voltage | Notes 1 & 7 | 2.5 | | Δ Vm | - | 0.4 | V |
| 5G4 | Regulation (1) | Ik = 5.8mA IK = 6.2mA | 2.5 | | Δ Vm | - | 0.18 | V |

TESTS (Cont'd.)

| K1001 Ref | Test | Test Conditions | AQL % | Insp. Level | Symbol | Limits Min. | Limits Max. | Units |
|---|---|---|---|---|---|---|---|---|
| | Group G | | | | | | | |
| AIX/ 2.5 | Electrical Retest after 28 days Holding Period | | | 100% | | | | |
| 5.14 | Inoperatives | | 0.5 | | | | | |
| 5G1.1 | Striking Time (1) | Va = 115V | 0.5 | | ts | - | 5 | secs. ← |
| 5G3 | Maintaining Volt | Note 1 | | | Vm | 83 | 87 | V |
| 5G4 | Regulation (1) | Ik=5.8mA<br>Ik=6.2mA | | | Δ Vm | - | 0.18 | V |

NOTES

1. After the valve has ignited, (in the striking time or striking voltage tests) it shall be operated at Ik=6mA for 3 minutes before any other characteristic is measured. ←

2. The time of sweep shall be 5±2 seconds. The sweep may be made with either increasing or decreasing current. ←

3. The valve shall be tapped 3 times in each of two mutually perpendicular lateral directions using an approved device and the noise shall not exceed the specified limit. ←

4. This test is to be conducted in total darkness after the valve has been held inoperative in total darkness for at least 24 hours.

5. Any oscillation which persists over a current range of less than 1.0mA shall be considered as a voltage jump. ←

6. Where a valve fails more than one end point test, that test occurring first in the list of end point tests shall be deemed to be the cause of failure. ←

7. This is the change in maintaining voltage from the initial value. ←

8. This life test shall be run continuously for the specified period. A Stability Life Test is not required. ←