

# SPECIAL QUALITY R.F. PENTODE

# 5636

Special quality subminiature r.f. pentode for use in equipment where high ambient temperatures, mechanical vibration and shocks are unavoidable and where statistically controlled major electrical characteristics are required.

This data should be read in conjunction with GENERAL NOTES—SPECIAL QUALITY VALVES which precede this section of the handbook, and the index numbers are used to indicate where reference should be made to a specific note.

## HEATER

|         |     |    |
|---------|-----|----|
| $V_h^1$ | 6.3 | V  |
| $I_h$   | 150 | mA |

## MOUNTING POSITION

Any

**Note**—Direct soldered connections to the leads of this valve must be at least 5mm from the seal and any bending of the valve leads must be at least 1.5mm from the seal.

## CAPACITANCES<sup>2</sup> (measured with external shield)

|              |      |     |
|--------------|------|-----|
| $C_{a-g1}$   | <20  | mpF |
| $C_{a-g3}$   | <1.1 | pF  |
| $C_{g1-g3}$  | <150 | mpF |
| $C_{in(g1)}$ | 4.0  | pF  |
| $C_{in(g3)}$ | 3.7  | pF  |
| $C_{out}$    | 3.4  | pF  |

## CHARACTERISTICS<sup>3</sup>

|                           |      |          |
|---------------------------|------|----------|
| $V_a$                     | 100  | V        |
| $V_{g3}$                  | 0    | V        |
| $V_{g2}$                  | 100  | V        |
| $V_{g1}$                  | -1.4 | V        |
| $I_a$                     | 5.3  | mA       |
| $I_{g2}$                  | 4.1  | mA       |
| $g_m(g1-a)$               | 3.2  | mA/V     |
| $g_m(g3-a)$               | 1.15 | mA/V     |
| $\mu_{g1-g2}$             | 25   | ←        |
| $R_k$                     | 0    | $\Omega$ |
| $V_{g1} (I_a < 100\mu A)$ | -7.5 | V        |
| $V_{g3} (I_a < 100\mu A)$ | -8.0 | V        |

## LIMITING VALUES<sup>4</sup> (absolute ratings)

|                                             |     |            |
|---------------------------------------------|-----|------------|
| $V_h$ max.                                  | 6.6 | V          |
| $V_h$ min.                                  | 6.0 | V          |
| $V_{a(b)}$ max.                             | 330 | V          |
| $V_a$ max.                                  | 165 | V          |
| $p_a$ max.                                  | 550 | mW         |
| $+V_{g3}$ max.                              | 30  | V          |
| $V_{g2(b)}$ max.                            | 310 | V          |
| $V_{g2}$ max.                               | 155 | V          |
| $p_{g2}$ max.                               | 450 | mW         |
| $I_{g2}$ max.                               | 7.0 | mA         |
| $+V_{g1}$ max.                              | 0   | V ←        |
| $-V_{g1}$ max.                              | 55  | V          |
| $I_k$ max.                                  | 16  | mA         |
| $V_{h-k}$ max.                              | 200 | V          |
| $R_{g1-k}$ max.                             | 1.1 | M $\Omega$ |
| Maximum acceleration (continuous operation) | 2.5 | g          |
| Maximum shock (short duration)              | 500 | g          |
| $T_{bulb}$ max.                             | 220 | °C         |

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## TEST CONDITIONS (unless otherwise specified)

|       |           |            |            |            |              |             |           |
|-------|-----------|------------|------------|------------|--------------|-------------|-----------|
| $V_h$ | $V_{a-e}$ | $V_{g2-e}$ | $V_{g1-e}$ | $V_{g3-k}$ | $R_k$        | $C_k$       | $V_{h-k}$ |
| (V)   | (V)       | (V)        | (V)        | (V)        | ( $\Omega$ ) | ( $\mu F$ ) | (V)       |
| 6.3   | 100       | 100        | 0          | 0          | 150          | 1000        | 0         |

## TESTS

## GROUP A

|                                                           | A.Q.L. <sup>5</sup> | Individuals <sup>6</sup> |          |          | Lot average <sup>7</sup> |          | Lot standard deviation <sup>8</sup> |              |
|-----------------------------------------------------------|---------------------|--------------------------|----------|----------|--------------------------|----------|-------------------------------------|--------------|
|                                                           | (%)                 | Bogey <sup>9</sup>       | Min.     | Max.     | Min.                     | Max.     | Max.                                |              |
| Heater current                                            | { 0.65<br>—         | 150<br>—                 | 140<br>— | 160<br>— | —<br>144                 | —<br>156 | —<br>4.2                            | mA<br>mA     |
| Heater-to-cathode leakage current<br>$V_{h-k} = \pm 100V$ | 0.65                | —                        | —        | 5.0      | —                        | —        | —                                   | $\mu A$      |
| Reverse grid current $R_{g1} = 1.0M\Omega$                | 0.65                | —                        | 0        | 0.3      | —                        | —        | —                                   | $\mu A$      |
| Anode current                                             | { 0.65<br>—         | 5.3<br>—                 | 3.7<br>— | 6.9<br>— | —<br>4.6                 | —<br>6.0 | —<br>0.7                            | mA<br>mA     |
| Anode current $V_{g1} = -7.5V$ , $R_k = 0\Omega$          | 0.65                | —                        | —        | 100      | —                        | —        | —                                   | $\mu A$      |
| Mutual conductance                                        | { 0.65<br>—         | 3.2<br>—                 | 2.7<br>— | 4.0<br>— | —<br>2.9                 | —<br>3.5 | —<br>0.31                           | mA/V<br>mA/V |
| Sub-group quality level <sup>10</sup>                     | 1.0                 | —                        | —        | —        | —                        | —        | —                                   |              |
| Inoperatives <sup>16</sup>                                | 0.4                 | —                        | —        | —        | —                        | —        | —                                   |              |



## GROUP B

|                                                                                                                                                                                                |         |   |     |     |   |   |                |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|---|-----|-----|---|---|----------------|
| Insulation                                                                                                                                                                                     |         |   |     |     |   |   |                |
| a-rest, measured at -300V                                                                                                                                                                      | } 2.5 { | — | 100 | —   | — | — | MΩ             |
| g <sub>1</sub> -rest, measured at -100V                                                                                                                                                        |         | — | 100 | —   | — | — | MΩ             |
| Change in mutual conductance $V_h = 5.7V$                                                                                                                                                      | 2.5     | — | —   | 15  | — | — | %              |
| Screen-grid current                                                                                                                                                                            | 2.5     | — | 2.8 | 5.4 | — | — | mA             |
| Anode current $V_{g3-e} = -8.0V$                                                                                                                                                               | 2.5     | — | —   | 100 | — | — | μA             |
| Mutual conductance $(g_{3-a}) V_{g3-e} = -1.0V$                                                                                                                                                | 2.5     | — | 0.5 | 1.8 | — | — | mA/V           |
| Reverse grid current $V_h = 7.5V, V_{g1} = -7.5V,$<br>$R_{g1} = 1.0MΩ, R_k = 0Ω.$ Measured after 5<br>minutes preheat under standard test con-<br>ditions, except $V_h = 7.5V, R_{g1} = 1.0MΩ$ | 2.5     | — | 0   | 0.5 | — | — | μA             |
| †A.F. noise at anode, $V_{g2-e} = 19V, R_{g1} = 100kΩ,$<br>$R_{g2} = 1.0kΩ, R_a = 200kΩ$                                                                                                       | 2.5     | — | —   | 70  | — | — | mV             |
| Capacitances <sup>2</sup> (shielded). No applied voltages                                                                                                                                      | 6.5     | — | —   | —   | — | — | —              |
| $C_{in}$                                                                                                                                                                                       | —       | — | 3.5 | 4.5 | — | — | pF             |
| $C_{out}$                                                                                                                                                                                      | —       | — | 2.9 | 3.9 | — | — | pF             |
| $C_{g3-a11}$                                                                                                                                                                                   | —       | — | 3.5 | 4.5 | — | — | pF             |
| $C_{a-g1}$                                                                                                                                                                                     | —       | — | —   | 20  | — | — | mpF            |
| $C_{a-g3}$                                                                                                                                                                                     | —       | — | —   | 1.1 | — | — | pF             |
| $C_{g1-g3}$                                                                                                                                                                                    | —       | — | —   | 150 | — | — | mpF            |
| Low pressure voltage breakdown                                                                                                                                                                 |         |   |     |     |   |   |                |
| Pressure = $55 \pm 5$ mm Hg                                                                                                                                                                    |         |   |     |     |   |   |                |
| Voltage = 300V r.m.s. No other applied<br>voltages                                                                                                                                             | 6.5     | — | —   | —   | — | — | —              |
| Microphonic noise at the anode at 50 c/s,<br>15g min. peak acceleration, $R_a = 10kΩ$                                                                                                          | 2.5     | — | —   | 60  | — | — | mV<br>(r.m.s.) |

†The valve is tapped with a specified hammer and the output observed on a meter of specified dynamic response.

|                                                                                                                                                                                | A.Q.L. <sup>5</sup> | Individuals <sup>6</sup> |      |      | Lot average <sup>7</sup> |      | Lot standard deviation <sup>8</sup> |          |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|--------------------------|------|------|--------------------------|------|-------------------------------------|----------|
|                                                                                                                                                                                | (%)                 | Bogey <sup>9</sup>       | Min. | Max. | Min.                     | Max. | Max.                                |          |
| <b>GROUP C</b>                                                                                                                                                                 |                     |                          |      |      |                          |      |                                     |          |
| Lead fragility test <sup>13B</sup> 4 arcs                                                                                                                                      | 2.5                 | —                        | —    | —    | —                        | —    | —                                   |          |
| <b>Fatigue<sup>14</sup></b>                                                                                                                                                    |                     |                          |      |      |                          |      |                                     |          |
| $V_{h-k} = 6.3V$ . No other voltages applied. 2.5g min. peak acceleration, fixed frequency $f = 25c/s$ min. 60c/s max. for 32 hours in each of 3 mutually perpendicular planes |                     |                          |      |      |                          |      |                                     |          |
| <b>Post fatigue tests</b>                                                                                                                                                      |                     |                          |      |      |                          |      |                                     |          |
| Heater-to-cathode leakage current                                                                                                                                              | } 6.5 {             | —                        | —    | 20   | —                        | —    | —                                   | $\mu A$  |
| $V_{h-k} = \pm 100V$                                                                                                                                                           |                     | —                        | —    | 20   | —                        | —    | —                                   | %        |
| Change in mutual conductance                                                                                                                                                   |                     | —                        | —    | 200  | —                        | —    | —                                   | mV       |
| Microphonic noise as in group B                                                                                                                                                |                     | —                        | —    | 200  | —                        | —    | —                                   | (r.m.s.) |
| <b>Shock<sup>15</sup></b>                                                                                                                                                      |                     |                          |      |      |                          |      |                                     |          |
| $V_{h-k} = 100V$ (cathode negative),<br>$R_{g1} = 100k\Omega$ , 500g                                                                                                           |                     |                          |      |      |                          |      |                                     |          |
| <b>Post shock tests</b>                                                                                                                                                        |                     |                          |      |      |                          |      |                                     |          |
| Heater-to-cathode leakage current                                                                                                                                              | } 20 {              | —                        | —    | 20   | —                        | —    | —                                   | $\mu A$  |
| $V_{h-k} = \pm 100V$                                                                                                                                                           |                     | —                        | —    | 20   | —                        | —    | —                                   | %        |
| Change in mutual conductance                                                                                                                                                   |                     | —                        | —    | 200  | —                        | —    | —                                   | mV       |
| Microphonic noise as in group B                                                                                                                                                |                     | —                        | —    | 200  | —                        | —    | —                                   | (r.m.s.) |
| Glass strain test <sup>11B</sup> . No applied voltages                                                                                                                         | 6.5                 | —                        | —    | —    | —                        | —    | —                                   |          |

## GROUP D

**Heater cycling life test** $V_h = 7.0V$  1 minute on, 4 minutes off $V_{h-k} = 140V_{r.m.s.}$  (continuous). No other applied voltages

2.5

— — — — — —

**Stability life test<sup>14</sup>**Running conditions  $R_{g1} = 1.0M\Omega$ , $V_{h-k} = 200V$  (cathode negative),  $T_{ambient} =$   
Room temperature**Stability life test end points**

Change in mutual conductance after 1 hour 1.0

— — 15 — — — %

**Survival rate life test<sup>14</sup>**Running conditions  $R_{g1} = 1.0M\Omega$ , $V_{h-k} = 200V$  (cathode negative), $T_{ambient} =$  Room temperature**Survival rate life test end points (100 hours)**Inoperatives<sup>16</sup> 0.65

Mutual conductance 1.0

— — — — — — mA/V

A.Q.L.<sup>5</sup>  
(%)

Min.

Max.

**Intermittent life test**Running conditions,  $R_{g1} = 1.0M\Omega$ , $V_{h-k} = 200V$  (cathode negative), $T_{bulb}$  min = 220°C**Intermittent life test end points (500 hours)**Inoperatives<sup>16</sup> .. .. . 4.0

Heater current .. .. . 6.5 138 164 mA

Heater-to-cathode leakage current  $V_{h-k} = \pm 100V$  .. .. . 6.5 — 10  $\mu A$ Reverse grid current  $R_{g1} = 1.0M\Omega$  .. .. . 4.0 0 0.9  $\mu A$ 

Change in mutual conductance (individuals) .. .. . 4.0 — 20 %

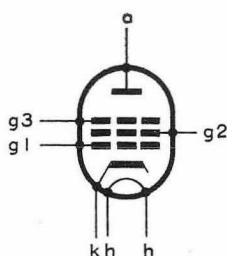
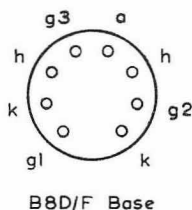
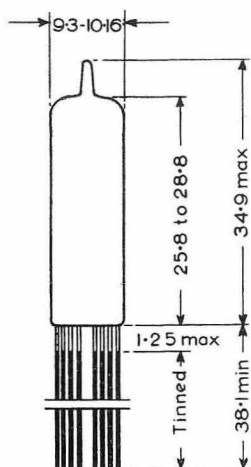
Change in mutual conductance  $V_h = 5.7V$  .. .. . 6.5 — 15 %Insulation as in group B. . . . . 6.5 50 —  $M\Omega$ 

Average change in mutual conductance .. .. . — — 15 %

Sub-group quality level<sup>10</sup> .. .. . 10 — —

# 5636

## SPECIAL QUALITY R.F. PENTODE



5325

All dimensions in mm

The bulb and base dimensions of this valve are in accordance with BS.448, Section B8D/F.