S.Q. TUBE

Special quality double triode with neutralisation screen, designed for use as V.H.F. amplifier (max. freq. 300 Mc/s) in a cascode circuit without external neutralisation, e.g. aerial amplifier for band III and frequency multiplier.

### QUICK REFERENCE DATA

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td>Life test</td>
<td>10000 hours</td>
</tr>
<tr>
<td>Low interface resistance</td>
<td></td>
</tr>
<tr>
<td>Mechanical quality</td>
<td>Shock and vibration resistant</td>
</tr>
<tr>
<td>Base</td>
<td>10 pin miniature with gold plated pins</td>
</tr>
<tr>
<td>Heating</td>
<td>Indirect</td>
</tr>
<tr>
<td>A.C. or D.C.; parallel supply</td>
<td></td>
</tr>
<tr>
<td>Heater voltage</td>
<td>$V_f \ 6.3 \ V$</td>
</tr>
<tr>
<td>Heater current</td>
<td>$I_f \ 335 \ mA$</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Input section</th>
<th>Output section</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anode voltage</td>
<td>90</td>
<td>90 V</td>
</tr>
<tr>
<td>Anode current</td>
<td>15</td>
<td>15 mA</td>
</tr>
<tr>
<td>Mutual conductance</td>
<td>13 17.5</td>
<td>17 22 mA/V</td>
</tr>
</tbody>
</table>

### DIMENSIONS AND CONNECTIONS

Base: 10 pin miniature

Dimensions in mm

Dimensions in mm

max 22

max 49.2

max 56.3

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## CHARACTERISTICS

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Value 1</th>
<th>Value 2</th>
<th>Unit 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heater voltage</td>
<td>V_f</td>
<td>6.3</td>
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<td>335</td>
<td></td>
<td>mA</td>
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<td><strong>Input section (unit a', g', k')</strong></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Anode voltage</td>
<td>V_a'</td>
<td>90</td>
<td>90</td>
<td>V</td>
</tr>
<tr>
<td>Neutralization screen voltage</td>
<td>V_Sn'</td>
<td>0</td>
<td>0</td>
<td>V</td>
</tr>
<tr>
<td>Grid voltage</td>
<td>-V_g'</td>
<td>2.1</td>
<td>1.4</td>
<td>V</td>
</tr>
<tr>
<td>Anode current</td>
<td>I_a'</td>
<td>15</td>
<td>27</td>
<td>mA</td>
</tr>
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<td>Mutual conductance</td>
<td>S</td>
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<td>17.5</td>
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<tr>
<td>Amplification factor</td>
<td>( \mu )</td>
<td>27</td>
<td>27</td>
<td></td>
</tr>
<tr>
<td>Equivalent noise resistance</td>
<td>R_{eq}</td>
<td>250</td>
<td>200</td>
<td>( \Omega )</td>
</tr>
<tr>
<td><strong>Output section (unit a, g, k)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td>V</td>
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<td>-V_g</td>
<td>2.0</td>
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<td>17</td>
<td>22</td>
<td>mA/V</td>
</tr>
<tr>
<td>Amplification factor</td>
<td>( \mu )</td>
<td>28</td>
<td>28</td>
<td></td>
</tr>
<tr>
<td>Equivalent noise resistance</td>
<td>R_{eq}</td>
<td>200</td>
<td>150</td>
<td>( \Omega )</td>
</tr>
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</table>

### Insulation resistance between electrodes

- **Initial**: \( R_{ins} \) max. 100 M\( \Omega \)
- **End of life**: min. 20 M\( \Omega \)

### Leakage current between cathode and heater

- **Voltage between cathode and heater** \( V = 150 \text{ V} \)
  - **Cathode positive**
    - **Initial** \( I_{kf} \) max. 15 \( \mu \text{A} \)
    - **End of life** max. 20 \( \mu \text{A} \)
  - **Cathode negative**
    - **Initial** \( I_{kf} \) max. 15 \( \mu \text{A} \)
    - **End of life** max. 20 \( \mu \text{A} \)

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CAPACITANCES

**Input system (unit a', g', k')**

Grid to cathode, filament and neutralisation screen \[ C_{g'/k'fsn'} \] 5.1 pF

Anode to cathode, filament and neutralisation screen \[ C_{a'/k'fsn'} \] 5.0 pF

Grid to neutralisation screen \[ C_{g'sn'} \] 1.4 pF

Anode to grid \[ C_{a'g'} \] 0.45 pF

Anode to neutralisation screen \[ C_{a'sn'} \] 3.4 pF

**Output system (unit a, g, k)**

Cathode to grid and filament \[ C_{k/gf} \] 6.5 pF

Anode to grid and filament \[ C_{a/gf} \] 3.2 pF

Anode to cathode \[ C_{ak} \] 180 mpF

Anode to grid \[ C_{ag} \] 1.5 pF

SHOCK AND VIBRATION RESISTANCE

The following test conditions are applied to assess the mechanical quality of the tube. These conditions are not intended to be used as normal operating conditions.

**Shock**

The tube is subjected 5 times in each of 4 positions to an acceleration of 500 g supplied by an NRL shock machine with the hammer lifted over an angle of 30°.

**Vibration**

The tube is subjected during 32 hours in each of 3 positions to a vibration frequency of 50 c/s with an acceleration of 2.5 g.

LIFE

Production samples are tested under the following conditions during 10000 hours: (each unit)

Heater voltage \[ V_f \] 6.3 V

Anode supply voltage \[ V_{ba} \] 110 V

Grid supply voltage \[ V_{bg} \] 17 V

Cathode resistor \[ R_k \] 680 Ω

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LIMITING VALUES (Absolute max. rating system)

(Each unit)

Anode voltage
\[
V_{a0} \quad \text{max. } 450 \text{ V}
\]
\[
V_a \quad \text{max. } 250 \text{ V}
\]

Anode dissipation
\[
W_a \quad \text{max. } 2.7 \text{ W}
\]

Grid voltage
\[
-V_g \quad \text{max. } 50 \text{ V}
\]

Grid peak voltage
\[
-V_{gp} \quad \text{max. } 150 \text{ V}
\]

Duty factor max. 1%

Pulse duration max. 10 \( \mu \text{s} \)

Cathode current
\[
I_k \quad \text{max. } 40 \text{ mA}
\]

Cathode peak current
\[
I_{kp} \quad \text{max. } 400 \text{ mA}
\]

Duty factor max. 10%

Pulse duration max. 200 \( \mu \text{s} \)

Grid resistor
\[
R_g \quad \text{max. } 1 \text{ M\Omega}
\]

Automatic bias

Voltage between cathode and heater

Cathode positive
\[
V_{kf (k+)} \quad \text{max. } 150 \text{ V}
\]

Cathode negative
\[
V_{kf (k-)} \quad \text{max. } 50 \text{ V}
\]

Bulb temperature
\[
\text{max. } 225 \degree \text{C}
\]
OPERATING CHARACTERISTICS
Cascode circuit, Frequency 200 Mc/s

Supply voltage

<table>
<thead>
<tr>
<th>V_b</th>
<th>200</th>
<th>200 V</th>
</tr>
</thead>
</table>

Cathode resistor

<table>
<thead>
<tr>
<th>R_k'</th>
<th>1200</th>
<th>680 Ω</th>
</tr>
</thead>
</table>

Anode current

<table>
<thead>
<tr>
<th>I_a</th>
<th>15.5</th>
<th>26.5 mA</th>
</tr>
</thead>
</table>

Input resistance

<table>
<thead>
<tr>
<th>r_g'</th>
<th>910</th>
<th>670 Ω</th>
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</thead>
</table>

Input capacitance

<table>
<thead>
<tr>
<th>C_i</th>
<th>11</th>
<th>12 pF</th>
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Noise figure

<table>
<thead>
<tr>
<th>F</th>
<th>2.5</th>
<th>2.5 kT_o</th>
</tr>
</thead>
</table>

Adapted to minimum noise
1. Output system (a, g, k) $V_a = 90V$
2. Input system (d, g, k) $V_d = 90V$
Output system (a, g, k)

\[ V_g = 90 \]
Input system \( I_a \) (mA), \( V_{G'} \) (V), \( S' \) (mA/V), \( R' \) (kΩ)

\( V_{G'} = 90V \)