LINE OUTPUT PENTODE

Output pentode intended for colour TV line deflection circuits.

**HEATING**: Indirect by A.C. or D.C.; series supply

Heater current

Heater voltage

<table>
<thead>
<tr>
<th>( I_f )</th>
<th>300 mA</th>
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<tbody>
<tr>
<td>( V_f )</td>
<td>40 V</td>
</tr>
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</table>

**DIMENSIONS AND CONNECTIONS**

Base: Magnoval
Top cap: Type 1
Mounting: Additional supporting of the tube at the top is required.

Dimensions in mm

**CAPACITANCES**

Grid No. 1 to filament

Anode to grid No. 1

<table>
<thead>
<tr>
<th>( C_{gf} )</th>
<th>max. 0.2 pF</th>
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</thead>
<tbody>
<tr>
<td>( C_{ag1} )</td>
<td>max. 3.0 pF</td>
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<tr>
<td>( C_{ag1} )</td>
<td>2.5 pF</td>
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</table>
TYPICAL CHARACTERISTICS (measured under pulse conditions)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
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<tbody>
<tr>
<td>Anode voltage</td>
<td>V_a</td>
</tr>
<tr>
<td>Grid No. 3 voltage</td>
<td>V_g3</td>
</tr>
<tr>
<td>Grid No. 2 voltage</td>
<td>V_g2</td>
</tr>
<tr>
<td>Grid No. 1 voltage</td>
<td>V_g1</td>
</tr>
<tr>
<td>Anode current</td>
<td>I_a</td>
</tr>
<tr>
<td>Grid No. 2 current</td>
<td>I_g2</td>
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</table>

OPERATING CONDITIONS (D.C. feedback)

Cut-off voltage

The minimum required cut-off voltage (-V_g1) during flyback at V_a = 7000 V and at line frequency is at:

\[
\begin{align*}
V_{g2} &= 150 \text{ V} : V_{g1} = -175 \text{ V} \\
V_{g2} &= 200 \text{ V} : V_{g1} = -195 \text{ V} \\
V_{g2} &= 250 \text{ V} : V_{g1} = -215 \text{ V}
\end{align*}
\]

Minimum required anode voltage during the scanning period: V_a min. See page 6

Minimum required screen grid voltage: V_g2 min. See page 4, 5

Recommended screen grid series resistor: R_g2 rec See page 4, 5

Decoupling capacitors in the grid no. 2 and/or grid no. 3 circuit

In circuits where decoupling capacitors in the grid no. 2 or the grid no. 3 circuits are applied, incidental flashover in the tube may give rise to excessive discharge currents and component or tube failure. Therefore it is recommended to limit the discharge currents from these capacitors by means of a 100 Ω resistor between g2 and the g2-bypass capacitor and a 1000 Ω resistor between g3 and the g3-bypass capacitor. The 1000 Ω resistor should be protected by a spark-gap connected between g3 and earth.

Hum

At Z_g1 = 200 kΩ (f = 50 Hz), V_{kf RMS} = 220 V and without wiring and socket capacitance, the equivalent grid hum voltage is less than 5 mV.
LIMITING VALUES

Anode voltage in cold condition
Anode peak voltage
Anode dissipation
Grid No. 3 voltage
Grid No. 2 voltage in cold condition
Grid No. 2 voltage
Grid No. 2 dissipation
Cathode current
Cathode peak current
Cathode-to-heater voltage
Grid No. 1 resistor: fixed bias stabilized circuits
Grid No. 3 circuit resistance
Bulb temperature

Anode dissipation
Grid No. 2 dissipation
Anode peak voltage
Neg. grid No. 1 peak voltage

1. Max. pulse duration is 22% of a cycle and max. 18 µs.
2. To prevent an excessive value of $W_{g2}$ the minimum $R_{g2}$ values are given in the graph below.

3. The circuit design has to be such that negative control grid currents up to 5 micro-amperes do not have any detrimental effect upon tube adjustment or circuit performance.
   Care should be taken that with 5 micro-amperes grid current the limiting values for $I_k$, $W_a$ and $W_{g2}$ are not exceeded.
4. With $R_{g3} \leq 10 \text{ kΩ}$ capacitive decoupling of $g_3$ is not required.
5. Absolute max. value.
6. The design maximum limits should not be exceeded with a nominal tube under the worst probable operating conditions at a normal picture width.
Min. required $V_{g2}$ and recommended $R_{g2}$
Non-stabilized supply voltages.

$r = \frac{i_a \text{ peak}}{i_a \text{ avg.}}$

$r \geq 2$
$r \geq 2.5$
$r \geq 3$
$r \geq 3.5$

$V_b = 315 \text{ V}$
$V_b = 280 \text{ V}$
$V_b = 265 \text{ V}$
Min. required $V_{g2}$ and recommended $R_{g2}$

Stabilized supply voltage.

The above graphs concern the design of a line-output circuit adjusted at a beam current of 1000 $\mu$A and a nominal mains voltage.

If the recommended $R_{g2}$ is used, $V_{g2}$ will be equal to higher or than the specified $V_{g2}$ min. and there will be adequate reserve in anode peak current throughout the life of the tube. (Tolerances of deflection-components and 10% mains voltage fluctuations taken into account).
Min. required anode voltage, during the scanning period.

To suppress Barkhausen interference and to ensure stability, the anode load line should not be allowed to drop below the $V_a$ line shown in the diagram. If $V_a$ min. must be low, the $V_a$ min. 1-line can be shifted over 10 V to $V_a$ min. 2, provided a D.C. voltage of at least +20 V is applied to the beam plate ($g_3$). To compensate for the influence of mains voltage fluctuations, the specified values of $V_a$ min. must be increased with 10% of the anode supply voltage when not stabilized.
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