

# PHILIPS COMPONENTS

## DATA SHEET

### Camera Tubes

**XQ8002X**

25.4 mm (1 inch) diameter Plumbicon® television camera tubes with high resolution lead-oxide photoconductive target, exclusively for use with X-ray image intensifiers with P20 output phosphor in medical equipment. This tube is intended to be a replacement for the Primicon TH9957, TH9951, and the Saticon XQ1570

### QUICK REFERENCE DATA

|                                           |                                   |
|-------------------------------------------|-----------------------------------|
| Diameter                                  | 25.4 mm (1 in)                    |
| Length                                    | approx. 162 mm                    |
| Focusing                                  | magnetic                          |
| Deflection                                | magnetic                          |
| Useful target area, circle diameter       | 15 mm                             |
| Spectral response                         | see Fig. 3                        |
| Sensitivity at color temperature of 2856K | typ. 465 $\mu\text{A}/\text{lmF}$ |
| Resolution                                | typ. 70%                          |
| Heater                                    | 6.3 V, 95 mA                      |

®Registered Trade Mark for television camera tube

Philips Components  
Slatersville, RI  
August 1997



**OPTICAL DATA**

Dimensions of quality area on photoconductive target circle, dia 15 mm.

Orientation of image on target

For correct orientation of the image on the target the vertical scan should be essentially parallel to the plane passing through the tube axis and the mark on the tube base.

Faceplate

thickness 1.2 ± 0.1 mm

refractive index n= 1.49

**ACCESSORIES**

Socket type 56098

Deflection and focusing coil unit type AT1116S

**ELECTRICAL DATA**

Deflection magnetic

Focusing magnetic

Heating

Indirect by a.c. or d.c.

Heater voltage  $V_f$  6.3 V ± 5%

Heater current, at  $V_f = 6.3$  V  $I_f$  nom 95 mA

The heater voltage must not exceed 9.5 V r.m.s. For optimum performance stabilization of the heater voltage is recommended.

**Capacitance**

Signal electrode to all  $C_{as}$  3 to 5 pF

This capacitance, which is effectively the output impedance, increases when the tube is inserted in the coil unit.

**LIMITING VALUES** (Absolute maximum rating system)

All voltages are referred to the cathode, unless otherwise stated.

notes

|                                          |             |      |        |
|------------------------------------------|-------------|------|--------|
| Signal electrode voltage                 | $V_{as}$    | max. | 50 V   |
| Grid 4 voltage (mesh)                    | $V_{g4}$    | max. | 1100 V |
| Grid 3 voltage                           | $V_{g3}$    | max. | 800 V  |
| Voltage between grid 4 and grid 3        | $V_{g4/g3}$ | max. | 450 V  |
| Grid 2 voltage                           | $V_{g2}$    | max. | 350 V  |
| Grid 2 dissipation                       | $W_{g2}$    | max. | 1W     |
| Grid 1 voltage, positive                 | $V_{g1}$    | max. | 0V     |
| Grid 1 voltage, negative                 | $-V_{g1}$   | max. | 125V   |
| Cathode to heater voltage, positive peak | $V_{kfp}$   | max. | 125V   |
| Cathode to heater voltage, negative peak | $-V_{kfp}$  | max. | 50 V   |

notes

|                                                                       |           |              |               |   |
|-----------------------------------------------------------------------|-----------|--------------|---------------|---|
| Cathode heating time before drawing cathode current                   | $t_h$     | min.         | 1 min         |   |
| External resistance between cathode and heater<br>at $V_{kfp} > 10$ V | $R_{kf}$  | min.         | 2 k $\Omega$  |   |
| Ambient temperature, storage and operation                            | $T_{amb}$ | max.<br>min. | 50°C<br>-30°C |   |
| Faceplate temperature, storage and operation                          | $T$       | max.<br>min. | 50°C<br>-30°C | 1 |
| Faceplate illuminance                                                 | $E$       | max.         | 100 lx        | 2 |

**OPERATING CONDITIONS AND PERFORMANCE**

## Conditions

3

For a scanned circular area with a diameter of 15mm

|                                          |                      |             |   |
|------------------------------------------|----------------------|-------------|---|
| Cathode voltage                          | $V_k$                | 0 V         |   |
| Signal electrode voltage                 | $V_{as}$             | 45 V        |   |
| Beam current                             | $I_b$                |             | 4 |
| Grid 4 voltage                           | $V_{g4}$             | 960 V       |   |
| Grid 3 voltage                           | $V_{g3}$             | 600 V       |   |
| Grid 2 voltage                           | $V_{g2}$             | 300 V       |   |
| Grid 1 voltage                           | $V_{g1}$             |             | 4 |
| Blanking voltage on grid 1, peak to peak | $V_{g1 \text{ p-p}}$ | 50±10V      |   |
| Faceplate illuminance (P20 light source) | E                    | approx.1 lx |   |
| Faceplate temperature                    | T                    | 20 to 45 °C |   |

## Electron Gun Characteristics

notes

### Cutoff

Grid 1 voltage for cut-off at  $V_{g2} = 300V$   
without blanking

$V_{g1}$  -35 to -100 V

Blanking voltage, peak to peak at  $V_{g2,4} = 300V$   
on grid 1  
on cathode

$V_{g1 \text{ p-p}}$  50±10 V  
 $V_{kp-p}$  25V

Grid 2 current at normally required  
beam currents

$I_{g2}$  ≤ 0.5 mA

## Performance

Dark current

$I_d$  < 3 nA

|                                                                                                                                                                        |          |                        |   |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|------------------------|---|
| Sensitivity at colour temperature of 2856K                                                                                                                             | min. 400 | typ. 485 $\mu$ A/Im    |   |
| Sensitivity with P20 light source                                                                                                                                      | min. 90  | typ. 115 $\mu$ A/ImF 5 |   |
| Peak signal current with E=1 lx (P20)                                                                                                                                  | min. 160 | typ. 195 nA            | 6 |
| Gamma of transfer characteristic                                                                                                                                       |          | 0.95 $\pm$ 0.05        |   |
| Spectral response:                                                                                                                                                     |          | see Fig. 3             |   |
| Resolution                                                                                                                                                             |          |                        | 7 |
| Modulation depth i.e. uncompensated amplitude response at 20.3 lp/mm (scanned area 9.6 mm x 12.8 mm) at the center of the picture (5 Mhz, 400 TV lines), BG 18 filter  |          | typ. 70%               |   |
| Modulation transfer characteristic                                                                                                                                     |          | see Fig. 4             |   |
| Decay lag, P20 light source, measured with a signal current of 200 nA, beam adjusted for correct stabilization after the target has been illuminated for at least 5 s. |          |                        |   |
| Residual signal after dark pulse of 50 ms                                                                                                                              | max. 26% | typ. 22%               |   |
| Residual signal after dark pulse of 60 ms                                                                                                                              | max. 24% | typ. 20%               |   |
| Residual signal after dark pulse of 200 ms                                                                                                                             | max. 12% | typ. 8%                |   |

## NOTES

1. The tube can withstand short excursions up to 70 °C without any damage or irreversible degradation in performance.
2. For short intervals. During storage the tube face shall be covered with the plastic hood provided; when the camera is idle the lens shall be capped, in stand-by also the beam will be cut-off.
3. The operating conditions and performance data quoted, relate to operation of the tube in coil units AT1116S. See relevant data of deflection/focusing assemblies. Scanning amplitude should be adjusted such that the useful target area of 15 mm is displayed on a standard monitor as a circular area with a diameter equal to the raster height.
4. The beam current  $I_b$  as obtained by adjusting the control grid voltage (grid 1) is set to max. 400 nA.  $I_b$  is not the total current available in the scanning beam, but is defined as the maximum amount of signal current  $I_s$ , that can be obtained with this beam. See note 6.
5. Measuring conditions: illuminance level 4.54 lx at a color temperature of 2856K and a filter Schott VG9 inserted in the light path.
6. The peak signal currents are measured on a waveform oscilloscope and with a uniform illumination on the 18 mm  $\phi$  target area. When measured with an integrating instrument connected in the signal-electrode lead the average signal currents will be smaller:
  - a) By a factor  $\alpha$  ( $\alpha = \frac{100-\beta}{100}$ ),  $\beta$  being the total blanking time in %; for the CCIR system  $\alpha$  amounts to 0.75; for the EIA system  $\alpha$  amounts to 0.83.
  - b) By a factor  $\delta$ ,  $\delta$  being the ratio of the active target area (circle with: 15 mm  $\phi$ ) to the area which would correspond with the adjusted scanning amplitude (15 mm x 20 mm). This ratio amounts to  $\delta = 0.59$ . The total ratio of integrated signal current,  $I_s$ , to the peak signal current,  $I_{sp}$ , amount to  $\alpha \times \delta = 0.44$  for the CCIR system and 0.49 for EIA system.
7. As measured with a 50 mm Leitz Summicron lens having a sine response of approximately 85 % at 400 TV lines at  $f : 5.6$ . The published 70% typ. is uncorrected. Tube resolution is higher. Measured with 100 nA signal current and a beam current just sufficient to stabilize a signal current of 400 nA. The horizontal amplitude response can be raised by means of suitable correction circuits, which affect neither the vertical resolution nor the limiting resolution.

#### Diagrams

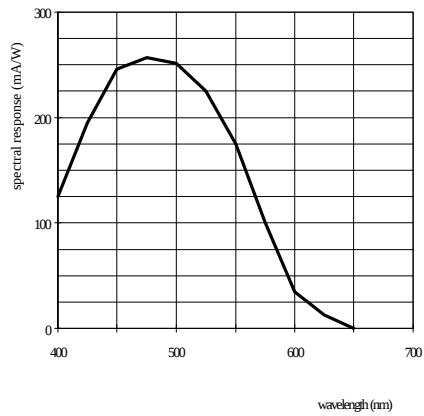


Fig. 3 Typical spectral response curve.

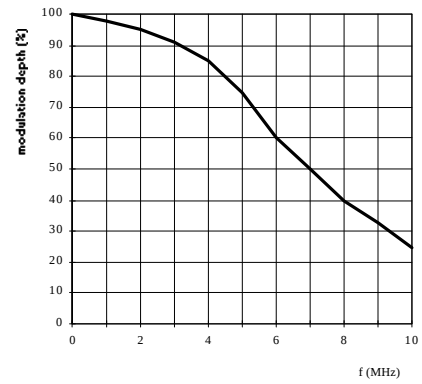


Fig. 4 Typical square-wave response curve.

## Mechanical Data

Mounting Position: any

Mass: approx. 60 g

Base: IEC 67-I-33a (JEDEC E8-11)

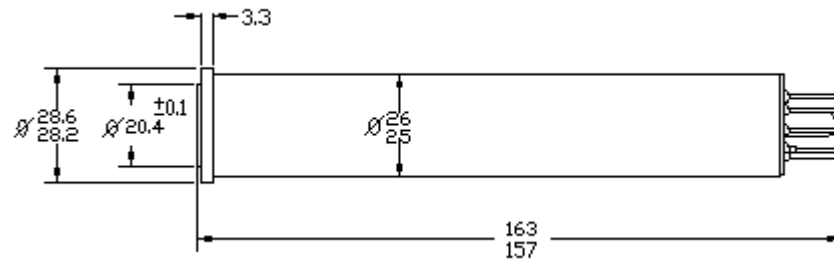


Figure 1.

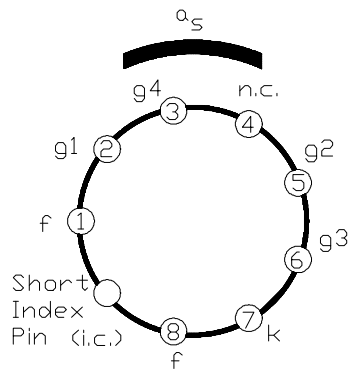


Fig. 2a.

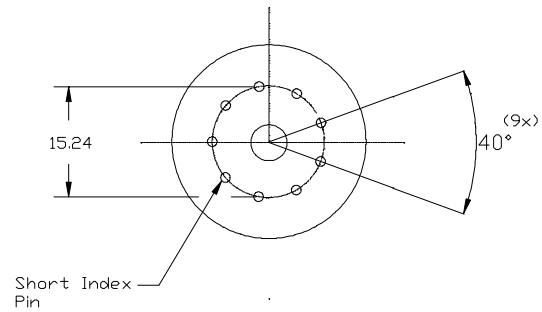


Fig 2b.

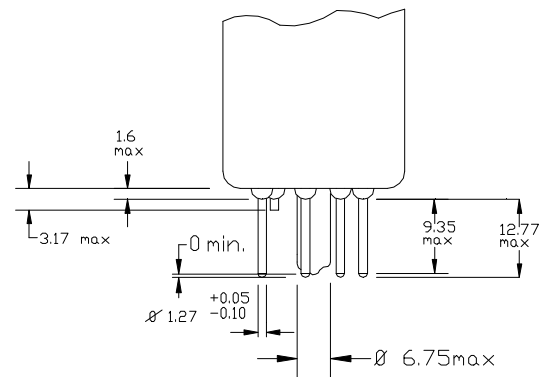


Fig 2c.

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