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**Data Sheet**  
**PLUMBICON IMAGING TUBE: XQ8002X**  
May 2004

**Camera Tube: XQ8002X**

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

**QUICK REFERENCE DATA**

Diameter	25.4 mm 1.0 inch	
Length (approx.)	162 mm	
Focusing	Magnetic	
Deflection	Magnetic	
Useful target area (diameter)	15 mm	
Spectral response	See figure 3	
Sensitivity with P20 light source (typical)	465 $\mu\text{A}/\text{lm}$	
Resolution: Modulation depth at 20.3 $I_p/\text{mm}$	70 %	[9]
Heater requirements	6.3 V 190 mA	

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## OPTICAL DATA

Dimensions of quality area on photoconductive target circle (diameter)	15 mm	
Faceplate Thickness	1.2 ± 0.1 mm	
Faceplate Refractive Index	1.49	

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

## 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 (±5%) V

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Heater Current (nominal at $V_f = 6.3V$ )	$I_f$	190 mA	[1]
Capacitance: signal electrode to all	$C_{as}$	3 – 5 pF	[2]

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

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

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

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External resistance between cathode and heater, at $V_{kfp} > 10$ V (min)	$R_{kf}$	2 k $\Omega$	
Ambient temperature, storage and operation (max/min)	$T_{amb}$	50/-30 °C	
Faceplate temperature, storage and operation (max/min)	T	50/-30 °C	[3]
Faceplate illuminance (max)	E	100 lx	[4]

**OPERATING CONDITIONS**


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Conditions for a scanned circular area with a diameter of 15mm [5]

Cathode voltage	$V_k$	0 V	
Signal electrode voltage	$V_{as}$	45 V	
Beam current	$I_b$		[6]
Grid 4 voltage	$V_{g4}$	960 V	
Grid 3 voltage	$V_{g3}$	600 V	
Grid 2 voltage	$V_{g2}$	300 V	
Grid 1 voltage	$V_{g1}$		[6]
Blanking voltage on grid 1 (peak to peak)	$V_{g1\ p-p}$	50 $\pm$ 10 V	
Faceplate illuminance (P20 light source)	E	~1 lx	

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Faceplate temperature	T	20 – 45 °C	
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**Electron Gun Characteristics**

Grid 1 voltage for cut-off at $V_{g2} = 300V$ without blanking	$V_{g1}$	-35 – -100 V	
Blanking voltage on grid 1 (peak to peak) at $V_{g2,4}=300V$	$V_{g1\ p-p}$	$50 \pm 10$ V	
Blanking voltage on cathode (peak to peak) at $V_{g2,4}=300V$	$V_{k\ p-p}$	25 V	
Grid 2 current at normally required beam currents	$I_{g2}$	$\leq 0.5$ mA	

**Performance**

Dark current	$I_a$	< 3 nA	
Sensitivity at colour temperature of 2856K (min/typ)		400/485 $\mu A/lm$	[7]
Sensitivity with P20 light source (min/typ)		90/115 $\mu A/lm$	
Peak signal current with $E=1$ lx, P20 (min/typ)		160/195 nA	[8]
Gamma of transfer characteristic		$0.95 \pm 0.05$	
Spectral response		See figure 3	

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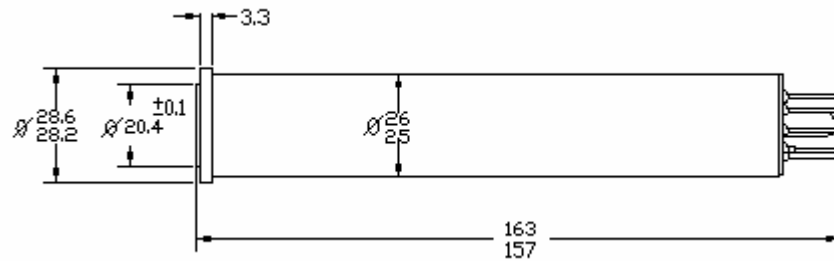
Resolution: Modulation depth at 20.3 lp/mm (typ)	70 %	[9]
Modulation Transfer Characteristic	See figure 4	
Decay lag: Residual signal after dark pulse of 50 ms (max/typ)	26/22 %	[10]
Decay Lag: Residual signal after dark pulse of 60 ms (max/typ)	24/20 %	[10]
Decay Lag: Residual signal after dark pulse of 200 ms (max/typ)	12/8 %	[10]
Blemishes		[11]

**MECHANICAL DATA**

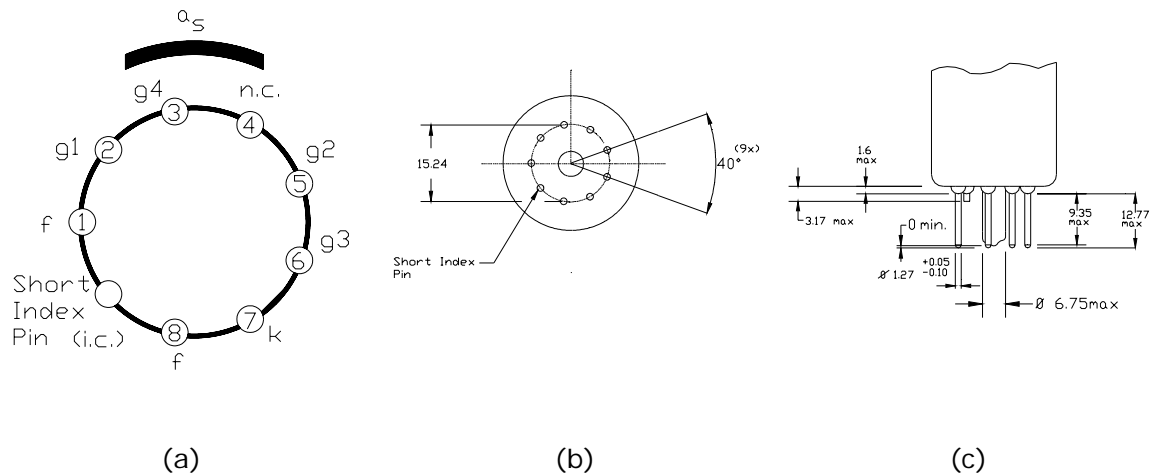
Mounting Position	Any	
Mass (approx)	60 g	
Base	IEC 67-1-33a (JEDEC E8-11)	
Dimensions	See figures 1 and 2	

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**FIGURES**

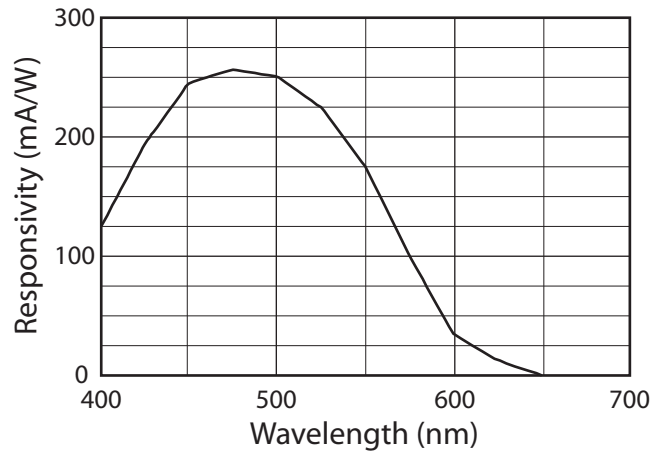


*Figure 1. Mechanical data for XQ8002X camera tube*

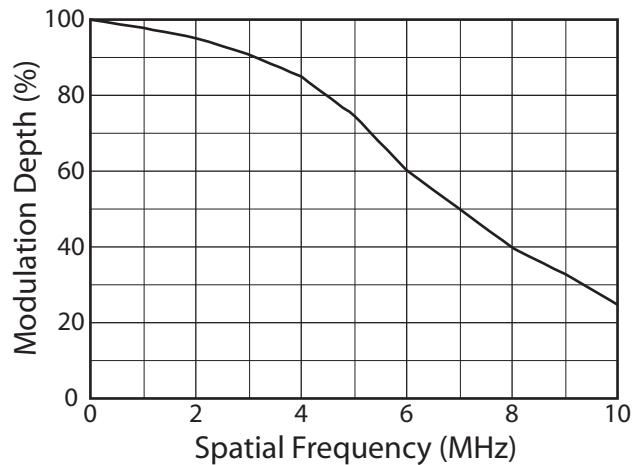


*Figure 2. Mechanical data for XQ8002X camera tube*

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**Figure 3.** Typical spectral response curve for XQ8002X camera tube



**Figure 4.** Typical Square-wave response curve for XQ5002 camera tube

**NOTES**

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

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- [2] This capacitance, which is effectively the output impedance, increases when the tube is inserted in the coil unit.
- [3]. The tube can withstand short excursions up to 70°C without any damage or irreversible degradation in performance.
- [4] 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
- [5] 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 15mm is displayed on a standard monitor as a circular area with a diameter equal to the raster height.
- [6] The beam current  $I_b$  as obtained by adjusting the control grid voltage (grid 1) is set to max. 400nA.  $I_b$  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 8.
- [7] Measuring conditions: illuminance level 4.54lx at a color temperature of 2856K and a filter Schott VG9 inserted in the light path.
- [8] The peak signal currents are measured on a waveform oscilloscope and with a uniform illumination on the 15-mm diameter target area. When measured with an integrating instrument connected to the signal-electrode lead the average signal currents will be smaller by:

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a) A factor  $\alpha$  ( $\alpha = [100-\beta]/100$ ),  $\beta$  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) A factor  $\delta$ , where  $\delta$  is the ratio of the active target area (circle with a diameter of 15mm) to the area which would correspond with the adjusted scanning amplitude (15mm x 20mm). This ratio amounts to  $\delta = 0.59$ .

The total ratio of integrated signal current,  $I_s$ , to the peak signal current,  $I_{sp}$ , is  $\alpha \times \delta = 0.44$  for the CCIR system and 0.49 for EIA system.

[9] Modulation depth is defined as the uncompensated amplitude response at 20.3lp/mm (scanned area circle 15 mm) at the center of the picture (5Mhz, 400 TV lines). As measured with a 50mm Leitz Summicron lens having a sine response of approximately 85% at 400 TV lines at f: 5.6. The published 70% (typical) is uncorrected. Tube resolution is higher. Measured with 100nA signal current and a beam current just sufficient to stabilize a signal current of 400nA. The horizontal amplitude response can be raised by means of suitable correction circuits, which affect neither the vertical resolution nor the limiting resolution.

[10] Decay lag is defined using a P20 light source, measured with a signal current of 200nA, beam adjusted for correct stabilization after the target has been illuminated for at least 5s.

[11] For details of test procedures for determining blemishes, see Narragansett Imaging document PLUMBICON IMAGING TUBES: TEST SPECIFICATION.