



Data Sheet
PLUMBICON IMAGING TUBE: XQ1575A
April 2004

Camera Tube: XQ1575A

25.4 mm (1 inch) diameter Plumbicon camera tube designed specifically for high-resolution fluoroscopy and digital imaging applications where both quantum noise and subtraction characteristics are required.

Special features are:

- Ultra high-resolution photoconductive target optimized for P20 phosphor
- Variable lag using rear light bias
- Diode gun for high beam reserve and increased resolution

QUICK REFERENCE DATA

| | | |
|--|---------------------|------|
| Diameter | 25.4 mm 1.0 inch | |
| Length (approx.) | 170 mm | |
| Focusing | Magnetic | |
| Deflection | Magnetic | |
| Useful target area (diameter) | 16.2 mm | |
| Spectral response | See figure 3 | |
| Sensitivity with P20 light source (typical) | 465 μ A/lm | |
| Resolution: Modulation depth at 13 I_p /mm | 75 % | [13] |
| Heater requirements | 6.3 V 190 mA | |

Camera Tube: XQ1575A

OPTICAL DATA

| | | |
|--|---------|--|
| Dimensions of quality area on photoconductive target circle (diameter) | 16.2 mm | |
| Faceplate Thickness | 1.2 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 56605 | |
| 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 ($\pm 5\%$) V |

Camera Tube: XQ1575A

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

| | | | |
|---|-------------|--------|-----|
| 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 1 voltage, positive (max) | V_{g1} | 20 V | [2] |
| Grid 1 voltage, negative (max) | $-V_{g1}$ | 200 V | |
| Grid 1 current (\approx cathode current) (max) | I_{g1} | 10 mA | [3] |
| Cathode to heater voltage, positive peak (max) | V_{kfp} | 50 V | |
| Cathode to heater voltage, negative peak (max) | $-V_{kfp}$ | 125 V | |

Camera Tube: XQ1575A

| | | | |
|---|-----------|--------------|-----|
| Cathode heating time before drawing cathode current (min) | t_h | 1 min | |
| External resistance between cathode and heater, at $V_{kfp} > 10$ V (min) | R_{kf} | 2 k Ω | |
| Ambient temperature, storage and operation (max/min) | T_{amb} | 50/-30 °C | |
| Faceplate temperature, storage and operation (max/min) | T | 50/-30 °C | [4] |
| Faceplate illuminance (max) | E | 500 lx | [5] |

OPERATING CONDITIONS

Conditions for a scanned circular area with a diameter of 16.2mm [6]

| | | | |
|--------------------------|----------|----------|---------|
| Cathode voltage | V_k | 0 V | |
| Signal electrode voltage | V_{as} | 45 V | |
| Beam current | I_b | | [7,8,9] |
| Grid 4 voltage | V_{g4} | 960 V | [10] |
| Grid 3 voltage | V_{g3} | 600 V | [10] |
| Grid 2 voltage | V_{g2} | 300 V | |
| Grid 1 voltage | V_{g1} | 0 – 20 V | |

Camera Tube: XQ1575A

| | | | |
|---|---------------|------------|-----|
| Blanking voltage on grid 1 (peak to peak) | $V_{g1\ p-p}$ | 30 V | |
| Focusing coil current | | | [6] |
| Deflection and alignment currents | | | [6] |
| Faceplate illuminance (P20 light source) | E | 0 – 10 lx | |
| Faceplate temperature | T | 20 – 40 °C | |

Electron Gun Characteristics

| | | | |
|--|---------------|---------------|--|
| Grid 1 voltage for cut-off at $V_{g2} = 300V$ without blanking | V_{g1} | -10 – 0 V | |
| Grid 1 voltage for normal beam setting | V_{g1w} | ≤ 20 V | |
| Grid 1 current at normally required beam currents | I_{g1} | ≤ 5 mA | |
| Grid 1 current at normally required beam currents | I_{g2} | ≤ 0.1 mA | |
| Blanking voltage (peak to peak) with respect to V_{g1w} | $V_{g1\ p-p}$ | 30 V | |

Performance

| | | | |
|--------------|-------|-------|--|
| Dark current | I_d | <2 nA | |
|--------------|-------|-------|--|

Camera Tube: XQ1575A

| | | | |
|--|-----------------|---------------------------------|------|
| Sensitivity at colour temperature of 2856K (min/typ) | | 380/465 $\mu\text{A}/\text{lm}$ | [11] |
| Sensitivity with P20 light source (min/typ) | | 80/110 $\mu\text{A}/\text{lm}$ | |
| Peak signal current with E=1 lx, P20 (min/typ) | I_{sp} | 175/215 nA | [12] |
| Peak signal current (16.2mm diameter scanning) | | 2000 nA | [8] |
| Gamma of transfer characteristic | | 0.95 \pm 0.05 | |
| Spectral response | | See figure 3 | |
| Resolution: Modulation depth at 20.3lp/mm (min/typ) | | 65/75 % | [13] |
| Resolution: Modulation depth at 12lp/mm (min/typ) | | 80/90 % | [13] |
| Modulation transfer characteristic | | See figure 4 | |
| Decay lag: Residual signal after dark pulse of 50 ms (min/typ/max) | | 16/20/25 % | [14] |
| Decay Lag: Residual signal after dark pulse of 200 ms (typ/max) | | 4.5/7.0 % | [14] |
| Blemishes | | | [15] |

MECHANICAL DATA

| | | |
|-------------------|-----|--|
| Mounting Position | Any | |
|-------------------|-----|--|

Camera Tube: XQ1575A

| | | |
|---------------|-------------------------------|--|
| Mass (approx) | 70 g | |
| Base | IEC 67-1-33a (JEDEC E8-11) | |
| Dimensions | See figures 1 and 2 | |

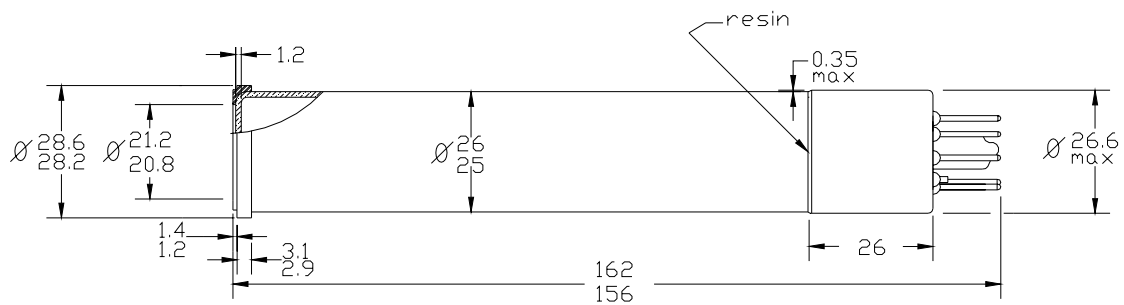
FIGURES


Figure 1. Mechanical data for XQ1575A camera tube

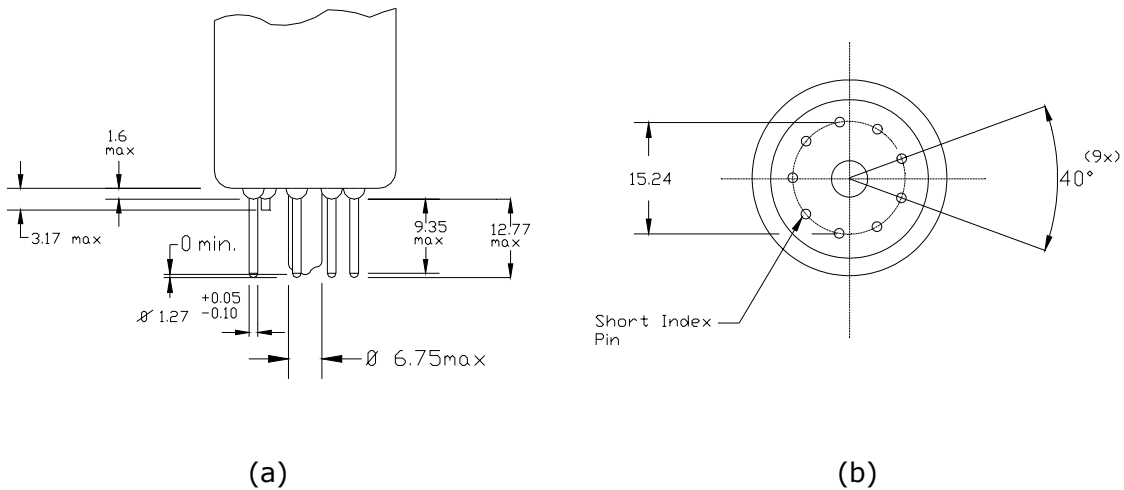


Figure 2. Mechanical data for XQ1575A camera tube

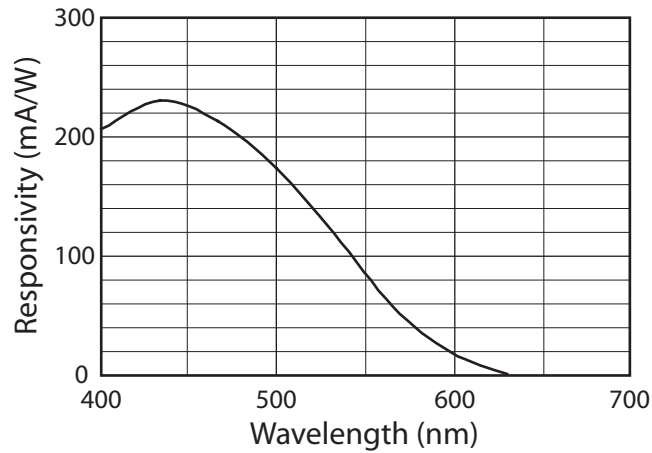
Camera Tube: XQ1575A

Figure 3. Typical spectral response curve for XQ1575A camera tube

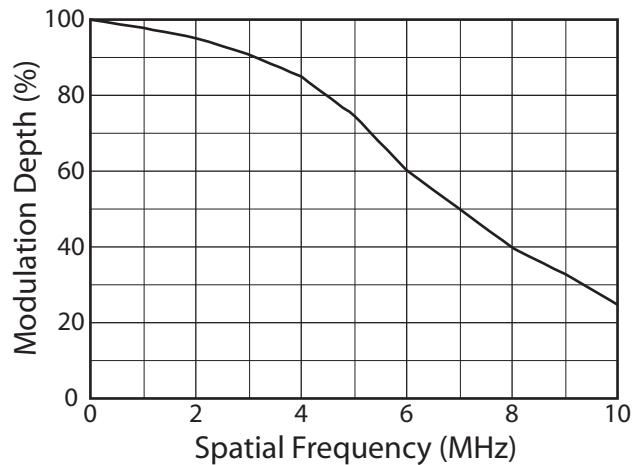


Figure 4. Typical Square-wave response curve for XQ1575A camera tube

NOTES

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

Camera Tube: XQ1575A

- [2] The 'diode' gun operates with a positive grid 1 voltage and hence draws some grid current. The grid 1 voltage (d.c.) must be adjusted for correct beam current as described in [7].
- [3] A current limiter must be incorporated to limit total cathode current to a maximum of 10mA.
- [4]. The tube can withstand short excursions up to 70°C without any damage or irreversible degradation in performance.
- [5] 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
- [6] 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 16.2mm is displayed on a standard monitor as a circular area with a diameter equal to the raster height.
- [7] 'Diode' gun is a triode gun operating in a diode mode, providing a very high beam reserve. Continuous operation with a high beam setting is to be avoided since this will shorten tube life. High I_b settings should be used under high light intensity conditions only. All other modes of operation should be normal I_b settings or have then cut off.
- [8] The maximum peak signal which can be handled is 3 μ A. Video amplifiers should be designed to accommodate this.

Camera Tube: XQ1575A

- [9] The beam current I_b as obtained by adjusting the control grid voltage (grid 1) is set to at 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. In the performance figures, e.g. for resolution and lag, the signal and beam current conditions are given (e.g. as $I_s/I_b = 20/300\text{nA}$). This means: with a signal current of 20nA and a beam setting which just allows a signal current of 300nA.
- [10] The optimum voltage ratio V_{g4}/V_{g3} to minimize beam-landing error (preferably $\leq 1V$) depends on the type of coil unit used. For types At1116 and AT1126 a ratio of 1.6 is recommended. Under no circumstances should grid 4 (mesh) be allowed to operate at a voltage below that of grid 3 as this might damage the target.
- [11] Measuring conditions: illuminance level 4.54lx at a color temperature of 2856K with Schott VG9 and Calflex B1/K1 filters inserted in the light path.
- [12] The peak signal currents are measured on a waveform oscilloscope and with a uniform illumination on the 16.2mm diameter target area. When measured with an integrating instrument connected to the signal-electrode lead the average signal currents will be smaller by:
- a) A factor α ($\alpha = [100-\beta]/100$), β being the total blanking time in %. For the CCIR system α amounts to 0.75; for the NTSC system α amounts to 0.83.
- b) A factor δ , where δ is the ratio of the active target area (circle with a diameter of 16.2mm) to the area which would correspond with the adjusted scanning amplitude (16.2mm x 21.6mm). 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 NTSC system.

Camera Tube: XQ1575A

- [13] Modulation depth is defined as the uncompensated amplitude response at 20.3lp/mm (scanned area 9.6×12.8 mm) or 12lp/mm (scanned area 16.2mm diameter) 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 75% (typical) is uncorrected. Tube resolution is higher. Measured with 200nA 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.
- [14] After a minimum of 5s of illumination of the target. Values shown relating to decay lag represent the residual signal currents in percentages of the original signal current as a function of time, after the illumination has been removed. Measured with a 20nA signal current and a beam current just sufficient to stabilize a signal current of 30nA.
- [15] For details of test procedures for determining blemishes, see Narragansett Imaging document PLUMBICON IMAGING TUBES: TEST SPECIFICATION.