PHILIPS COMPONENTS

DATA SHEET

Camera Tubes XQ9002X

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 Saticon XQ1575

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 μA/lmF
Resolution	typ. 70%
Heater	6.3 V, 95 mA

®Registered Trade Mark for television camera tube

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 Vf = 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 1 voltage, positive	V_{g1}	max.	20 V	1
Grid 1 voltage, negative	$-V_{g1}$	max.	200 V	
Grid 1 current (≈ cathode current)	I_{g1}	max.	10 mA	3
Cathode to heater voltage, positive peak	V_{kfp}	max.	50 V	
Cathode to heater voltage, negative peak	$-V_{kfp}$	max.	125	

				notes
Cathode heating time before drawing cathode current	t_h	min.	1 min	
External resistance between cathode and heater at V_{kfp} > 10 V	R_{kf}	min.	2 kΩ	
Ambient temperature, storage and operation	T_{amb}	max.	50°C	
		min.	-30°C	
Faceplate temperature, storage and operation	T	max.	50°C	
		min.	-30°C	4
Faceplate illuminance	E	max.	100 lx	5

OPERATING CONDITIONS AND PERFORMANCE			notes
Conditions			6
Cathode voltage	V_k	0 V	
Signal electrode voltage	V_{as}	45 V	
Beam current	I_b		2,7,8
Grid 4 voltage	V_{g4}	960 V	9
Grid 3 voltage	V_{g3}	600 V	9
Grid 2 voltage	V_{g2}	300 V	
Grid 1 voltage	V_{g1}	0 to 20V	
Blanking voltage on grid 1, peak to peak	$V_{g1\ p\text{-}p}$	30 V	
Focusing coil current			6
Deflection and alignment currents			6
Faceplate illuminance (P20 light source)	E	0 to 10 lx	
Faceplate temperature	T	20 to 40°C	

Electron Gun Characteristics			
Grid 1 voltage for cut-off at Vg2 = 300V	V_{g1}	-10 to 0V	
Grid 1 voltage for normal beam setting	V_{g1w}	≤ 20 V	
Grid 1 current at normally required beam currents	I_{g1}	≤ 5 mA	
Grid 2 current at normally required beam currents	I_{g2}	≤ 0,1 mA	
Blanking voltage, peak to peak, with respect to V_{g1w}	$V_{g1\ p\text{-}p}$	30 V	

Performance

Dark current	I_d <	3 nA	
Sensitivity at colour temperature of 2856K	min. 400	typ. 485µA/Im	
Sensitivity with P20 light source	min. 90	typ. 115µA/ImF	5
Peak signal current with E=1 lx (P20)	min. 160	typ. 195 nA	6
Gamma of transfer characteristic		0.95 ± 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 "Diode" gun operates with a positive grid 1 voltage, hence draws some grid current. The grid 1 voltage (d.c.) must be adjusted for correct beam current as described in note 8.

2. "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 Ib settings or have then cut off.

3. A current limiter must be incorporated to limit total cathode current to 10 mA maximum.

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 AT1116 or AT1126. See relevant data of deflection/focusing assemblies.
   Scanning amplitude should be adjusted such that the useful target area of 16.2 mm dia. is displayed on a standard monitor as a circular area with a diameter equal to the raster height.

7. The maximum peak signal which can be handled is 3 μA. Video amplifiers should be designed to accommodate this.

8. The beam current I_b as obtained by adjusting the control grid voltage (grid 1) is set at 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.
   In the performance figures, e.g. for resolution and lag, the signal current and beam current conditions are given, e.g. as I_s/I_b = 20/300 nA. This means: with a signal current of 20 nA and a beam setting which just allows a signal current of 300 nA.

   N.B. The signal currents are measured with an integrating instrument connected in the signal electrode lead and a uniform illumination of the scanned area. See note 11.

9. The optimum voltage ratio Vg4/Vg3 to minimize beam landing error (preferable ≤1 V) depends on the type of coil unit used. For types AT1116 and AT1126 a ratio of 1.6 is recommended. Grid 4 (mesh) should under no circumstances be allowed to operate at a voltage below that of grid 3 as that might damage the target.

10. Measuring conditions: illuminance level 4.54 lx at a colour temperature of 2856K and filters. Schott VG9 and Calflex B1/K1 inserted in the light path.

Diagrams

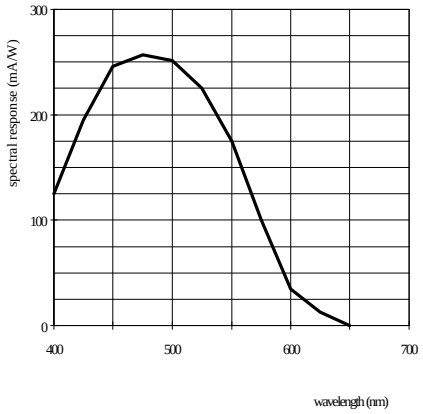

Fig. 3 Typical spectral response curve.

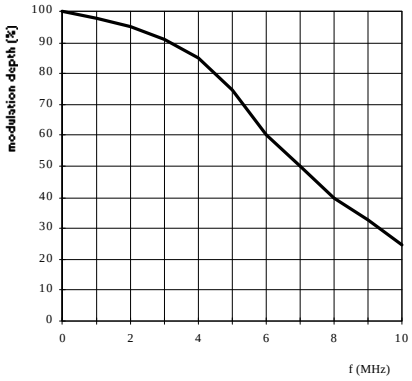

Fig. 4 Typical square-wave response curve.

Mechanical Data

Mounting Position: any
Mass: approx. 60 g
Base: IEC 67-I-33a (JEDEC E8-11)

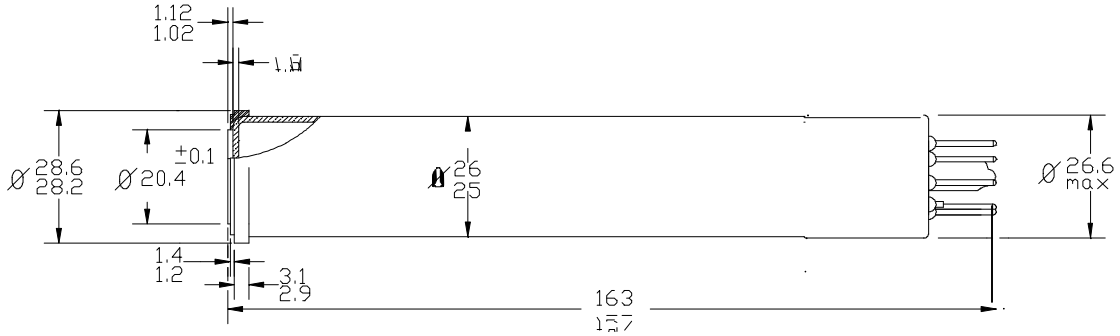

Figure 1.

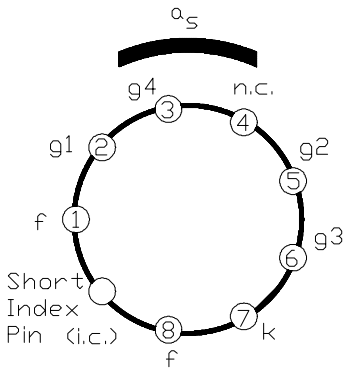

Fig. 2a.

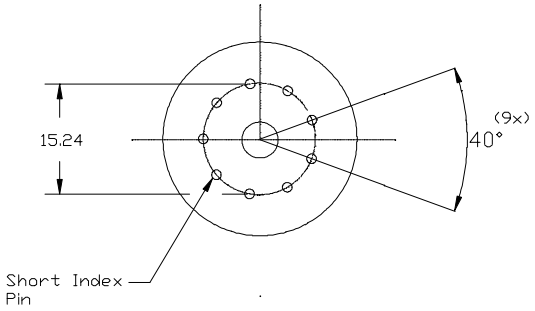

Fig 2b.

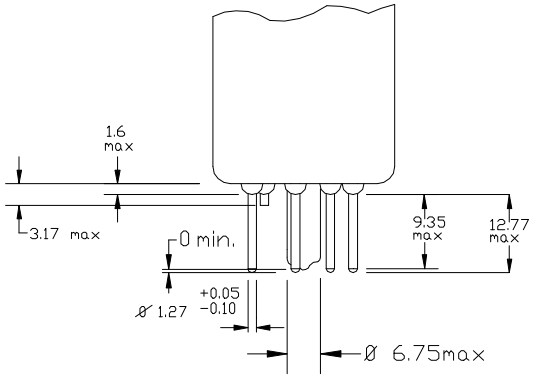

Fig 2c.

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