DATA SHEET

Camera Tubes 83XQX (XQ3442)

30 mm (1.2 inch) diameter Plumbicon® television 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 with high beam reserve and increased resolution.
- Low output capacitance (LOC) for high signal to noise ratio.

QUICK REFERENCE DATA

"Diode" electron gun	
Diameter	30 mm (1.2 inch)
Length	approx. 215 mm
Focusing	magnetic
Deflection	magnetic
Useful target area (scanning area)	18 mm
Spectral response maximum at cut-off at	See Fig. 4
Sensitivity with P20 light source	typ. 530 μA/lm
Resolution at 400 TV lines (5MHz)	typ. 65%
Heater	6.3 V, 190 mA

®Registered Trade Mark for television camera tube

OPTICAL DATA

Quality area on photoconductive target

circle, diameter	18 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 marker line on the protecting sleeve at the base.

Faceplate

thickness	1.2 ± 0.1 mm
refractive index	n = 1.49

Standard anti-halation glass disc

thickness	6 ± 0.2 mm
refractive index	n = 1.52

ACCESSORIES

Socket	type 56021
Deflection and focusing coil unit,	AT1130S

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_{fnom}	190 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}	approx. 3 pF

These capacitances, 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	V_{g4}	max.	1100 V	
Grid 3 voltage	V_{g3}	max.	800 V	
Voltage between grid 4 and grid 3	$V_{g4/g3}$	max.	350 V	
Grid 2 voltage	V_{g2}	max.	350 V	
Grid 1 voltage, positive	V_{g1}	max.	25 V	
Grid 1 voltage, negative	$-V_{g1}$	max.	200 V	
Grid 1 current (approx. 1_K current)	I_{g1}	max.	7 mA	
Grid 1 current (peak current with DBC)	1g1p	max.	10 mA	
Cathode to heater voltage, positive peak	V_{kfp}	max.	50 V	
Cathode to heater voltage, negative peak	$-V_{kfp}$	max.	125 V	
Cathode heating time before drawing cathode current	t_h min.	1	min	
External resistance between cathode and heater at Vkfp > 10 V	R_{kf}	min.	2 kΩ	
Ambient temperature, storage and operation	T_{amb}	max. min.	50 °C -30°C	
Faceplate temperature, storage and operation	T	max. min.	50 °C -30°C	 4
Faceplate illuminance	E	max.	500 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			7, 8
Grid 4 voltage	V_{g4}	675	V	9
Grid 3 voltage	V_{g3}	600	V	9
Grid 2 voltage	V_{g2}	300	V	
Grid 1 voltage	V_{g1}	0 to 20	V	
Blanking voltage on grid 1, peak to peak with respect to Vg1w	$V_{g1\ p-p}$	30	V	
Faceplate illuminance (P20 light source)	E	0 to 10	lx	
Faceplate temperature	T	20 to 45	°C	
Electron Gun Characteristics				
Grid 1 voltage for cut-off at Vg2 = 300V	V_{g1}	-10 to 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 2 current at normally required beam currents	I_{g2}	≤ 0.1	mA	
Blanking voltage, peak to peak, with respect to Vg1w	$V_{g1\ p-p}$	30	V	

Performance

Dark current	$I_d <$	2 nA	
Sensitivity with P20 light source	min. 130	typ. 150 µA/lm	
Peak signal current with E=1 lx (P20)	min. 230	typ. 305nA	
Gamma of transfer characteristic	0.95 ± 0.05		
Spectral response:			
max. response at	approx. 450 nm		
cut -off at	approx. 650 nm		
response curves	see Fig. 1		
Resolution			12
Modulation depth i.e. uncompensated amplitude response at 400 TV lines at the centre of the picture	min 65%	typ. 70%	
Modulation transfer characteristic, see Fig. 1			
Decay lag (no light bias applied)			13
Residual signal after dark pulse of 50 ms	typ. 20%		14
Residual signal after dark pulse of 200 ms	typ. 4.5%		14
Signal current after 50 ms illumination	typ. 60%		13, 15

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 unit AT1130S. See relevant data of deflection/focusing assemblies.
   Scanning amplitude should be adjusted such that the useful target area of 18 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 AT1130S 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.

11. The peak signal currents are measured on a waveform oscilloscope and with a uniform illumination on the 18 mm φ 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 α ($\alpha = \frac{100-\beta}{100}$), 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) By a factor δ, δ being the ratio of the active target area (circle with: 18 mm φ) to the area which would correspond with the adjusted scanning amplitude (18 mm x 24 mm) this ratio amounts to δ = 0.59.
The total ratio of integrated signal current, Is, to the peak signal current, Isp, amount to α x δ = 0.44 for the CCIR system and 0.49 for NTSC system.

12. 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 65% typ. is uncorrected. Tube resolution is higher. Measured with 200 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.

13. Measured with a 20 nA signal current and a beam current just sufficient to stabilize a signal current of 300 nA.

14. Decay lag. After a minimum of 5 s 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.

15. Build up lag. After 10 s of complete darkness. Values shown relating to build-up lag represent the typical percentages of the ultimate signal obtained as a function of time, after the illumination has been applied.

Diagrams

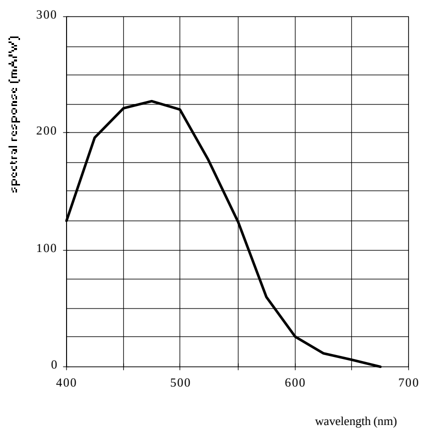

Fig. 1. Typical spectral response curve.

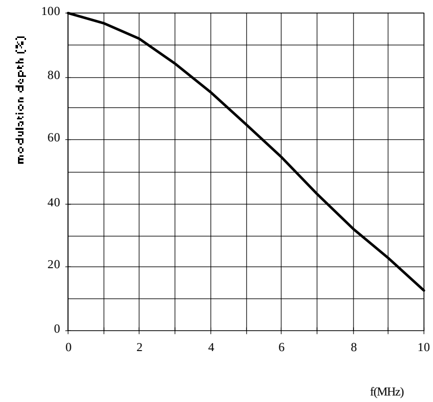

Fig. 2. Typical square-wave response curve.

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