2/3” Resistron® – Camera Tube

XQ 1371 SF and XQ 1372 SF

Antimonytrisulfide – photoconductive layer (Sb_2S_3)
Separate mesh connection (grid-4-electrode)
High sensitivity – good resolution

Description

Camera Tubes are the key component of High Performance TV systems for harsh radiation environment. The increasing quality demands in nuclear surveillance applications initiated the development of well adopted generations of Camera Tubes. The Resistron® camera tubes XQ 1371 SF and XQ 1372 SF are a 2/3” diameter small image tube with magnetic focusing and magnetic deflection method for industrial TV application. The SF-type uses a radiation resistant faceplate for long life under radiation. Image tubes are suited for applications with pick-up of fast moving images.

Features and Benefits

- High Sensitivity
- Video High-resolution
- Radiation resistant Face plate for quality images under radiation
- Small camera design possible using 2/3” Image Tube
- Shock proof and vibration resistant

Applications

- Process monitoring
- Robotic operations
- Surveillance in low to moderate radiation environments for all nuclear and high energy physics applications
- Nuclear Fuel reprocessing

PerkinElmer® precisely.

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Physical Dimensions of XQ 1371 SF and XQ 1372 SF

(All dimensions in mm)

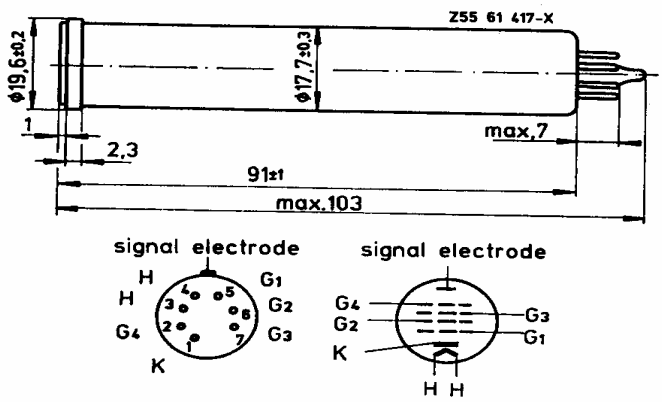

Figure 1
Image Tube dimensions

Description	Parameter
Max. length	103 mm
Max. diameter	19.8 mm
Weight	Approx. 25 g
Base	7 pin special type
Socket	1033 (with solder tags)
Focusing and deflection assembly:	B 12 SH, BV 100
Mounting position	Any

Typical Operating Data and Characteristics XQ 1371 SF and XQ 1372 SF

Description	Parameter
Heather voltage	6.3 V (1)
Heather current	95 mA (1) Indirect by AC or DC, series or parallel supply
Grid no. 1 voltage	See operating instruction 2.5
Grid no. 1 cut-off voltage	-50 V … -100 V
Grid no. 2 voltage	300 V
Grid no. 3 voltage	260V … 300 V (2)
Grid no. 4 voltage	400 V (2)
Blanking voltage applied to grid no. 1	75 V p-p
Blanking voltage applied to cathode	25 V p-p
Focussing method	Magnetic
Deflection method	Magnetic
Inter-electrode capacitance - Signal electrode to all other electrodes	2 pF (3)
Scanned area with 3:4 aspect ratio	6.6 mm x 8.8 mm
Useful diameter of the photocathode layer	Approx. 11 mm
Signal electrode voltage	> 20 V (4)
Spectral response	See diagram
Gamma value	0.7 ± 0.15
Resolution of center picture (grid 3 = 300 V, grid 4 = 400 V)	> 650 TVL (5)

Maximum Ratings (absolute values)

Full size scanning of the 6.6 mm x 8.8 mm area of the photoconductive layer must be assured.

Description	Paramater XQ 1371 SF / XQ 1372 SF
Grid no. 1 voltage positive	Max. 0 V
Grid no. 1 voltage negative	Max. -150 V
Grid no. 2 voltage	Max. 350 V
Grid no. 2 load	Max. 0.8 VA
Grid no. 3 voltage	Max. 750 V
Grid no. 4 voltage	Max. 750 V
Peak heater – cathode voltage (Heater negative with respect to cathode)	Max. 125 V
Illumination with moving pictures	Max. 1000 lx
Faceplate temperature	Max. 70 C

(1) If the maximum variation of the heater voltage exceeds the absolute limit of ± 5 % the operating performance of the tube will be impaired and its life shortened. If series connection is applied the heater voltage may not exceed 9.5 V. It is recommended to use a current limiter. The preheating time of the tube should be 1 minute minimum with beam current off.

(2) Optimum focusing of the electron beam is obtained by adjusting either the focusing coil current or varying grid no. 3 voltage. Grid no. 3 voltage should be more than 260 V and between 65 and 75 % of the voltage applied to grid no. 4 voltage. Higher grid no. 4 voltage requires an increase of deflection current. If grid no. 3 voltage is increased a higher focusing current will be necessary. The optimum ratio of grid no. 4 to grid no. 3 voltage depends on the type of focusing and deflection assembly. An improper voltage ratio may produce brightening or darkening in the faceplate corners. Generally, grid no. 4 voltage must be higher than grid no. 3 voltage.

(3) This capacitance which is the effective output impedance of the tube (resistive component approx. 100 MΩ) increases if the tube is mounted in the deflection assembly.

(4) The upper limit of the signal electrode voltage must be adjusted to the value indicated in the test sheet. This value applies to a faceplate temperature of 30 ± 2°C. To obtain an optimum life time the dark current should not exceed the value of 20 nA.

(5) Measured with video amplifier of suitable bandwidth.

(6) At a color temperature of 2856 K.

(7) The signal current is the target output current, measured with an integral measuring instrument, minus dark current. During the measurement the scanned area is uniformly illuminated.

(8) Non-uniformity of the signal current depends on the quality of focusing and deflection assembly, deflection linearity and beam alignment. The black to white transition in the middle of the test pattern is set as 100 % value. The maximum signal deviations at the corners of the scanned area (1.0 mm distance from the edges) are measured.

(9) The modulation depth is measured at the faceplate center at 5 MHz in comparison with 0.5 MHz. The modulation depth depends on the signal current. The signal current amounts to 200 nA, the beam current is adjusted for stabilising a signal of 300 nA.

(10) The decay lag is measured in percent of the signal current, which is preset at 200 nA. The beam current is adjusted for stabilising a signal of 300 nA.

Blemish Specification

- Test Conditions

The tube shall be centred and focused according to the operating and adjusting instructions for optimum performance.
Illumination (colour temperature 2856 K) should be adjusted to a signal current of 200 nA (100 % white signal) at a beam current for stabilising a signal of 300 nA.

- Target Zone

A uniformly illuminated field with an aspect ratio of 3:4 and a scanned area of 6.6 mm x 8.8 mm shall be displayed on the target of the camera tube. According to the following drawing the scanned area is divided into two zones 1 and 2.

The blemish size is measured in percent of the picture height. The equivalent numbers of TV-lines are indicated for comparison purposes only. Black and white spots are equally weighted.
Measurement of blemishes will be performed with and without target illumination. The minimum separation between two target spots must be greater than the diameter of the larger one, otherwise the combination is considered as a whole. Target spots with a diameter ≤ 0.2 % of the picture height as well as blemishes with a modulation depth ≤ 10 % for XQ 1371 SF and ≤ 20 for XQ 1372 SF are not counted, unless an accumulation causes a smudged appearance.
Blurred spots, streaks, stripes, mesh defects and mottled or grainy background are only permitted up to a noise amplitude of 10 % for XQ 1371 SF and 20 % for XQ 1372 SF.

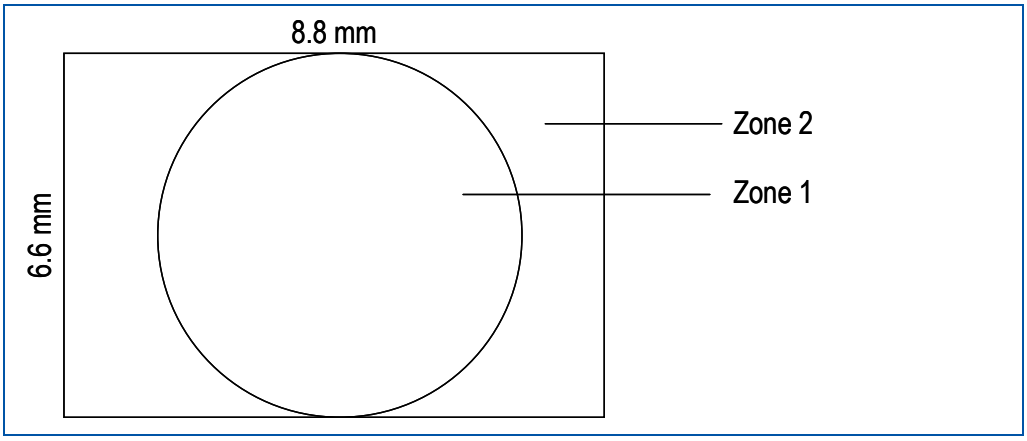

Figure 2
Target Zone of Image Tubes

Possible Number, Size and Location of Blemishes

Specification		**Maximum permissible number of blemishes**	
Blemish size in % of picture height 6.6 mm = 100 mm	Blemish size TV lines 625 line system	**XQ 1371 SF**	**XQ 1372 SF**
		Zone 1→ 2	Zone 1→ 2
> 10	> 6	0 → 0	0 → 0
> 0.6 ≤ 1.0	4 … 6	0 → 1	1 → 3
> 0.2 ≤ 0.6	1 … 3	2 → 3	3 → 5
Max. permissible total number of blemishes		4	4

Blemishes outside the zone are not counted.

Characteristics of Spectral Sensitivity. Current, Modulation Depth and Lag

Typical behaviour of the image tubes XQ 1371 SF and XQ 1372 SF are shown in the following figures:

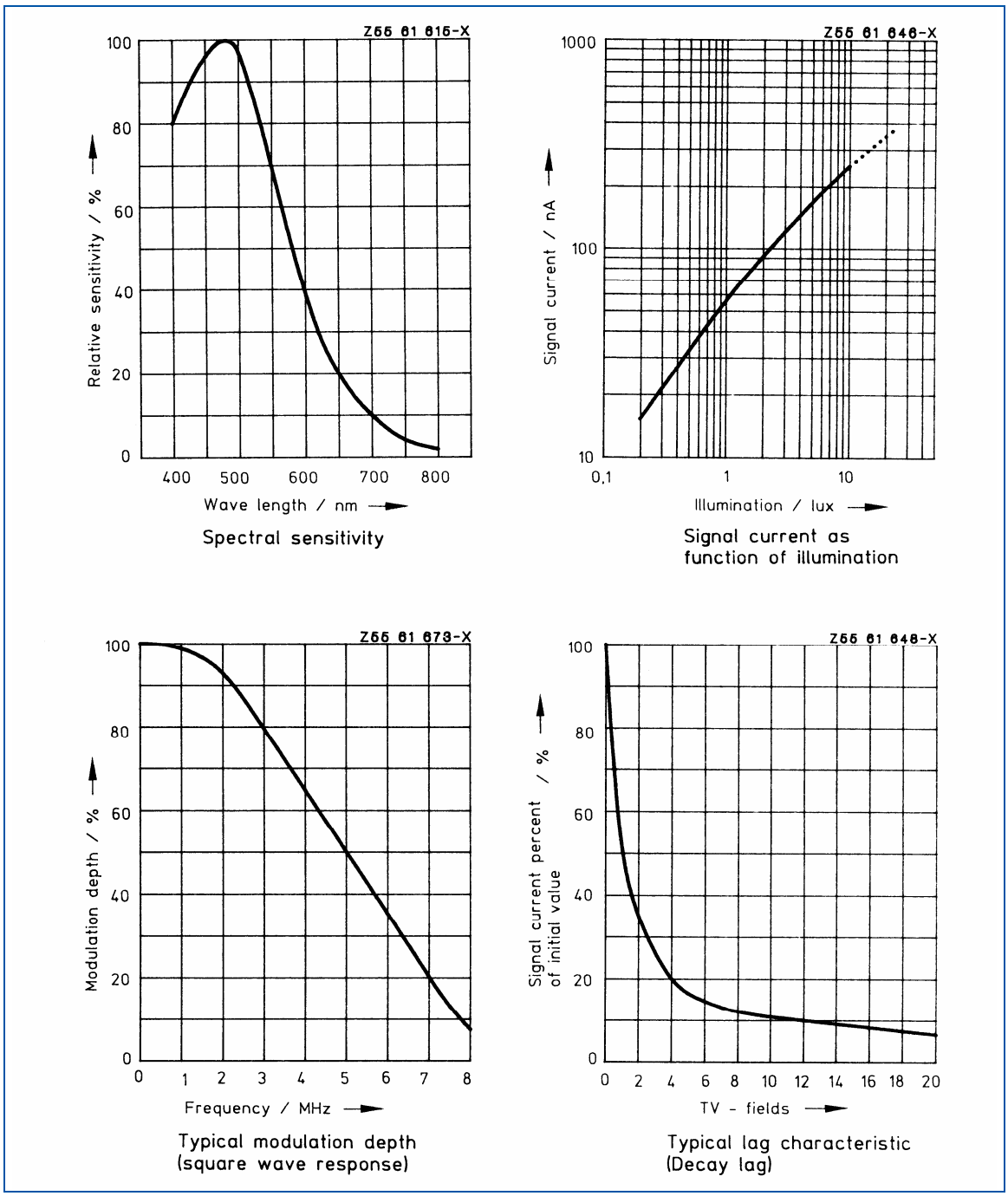

Figure 3
Key characteristics of Image Tubes

Faceplate behaviour

The face plate changes the transmission behaviour under radiation. The figure describes the change under radiation from 10 exp(5) to 10 exp(8) rad.

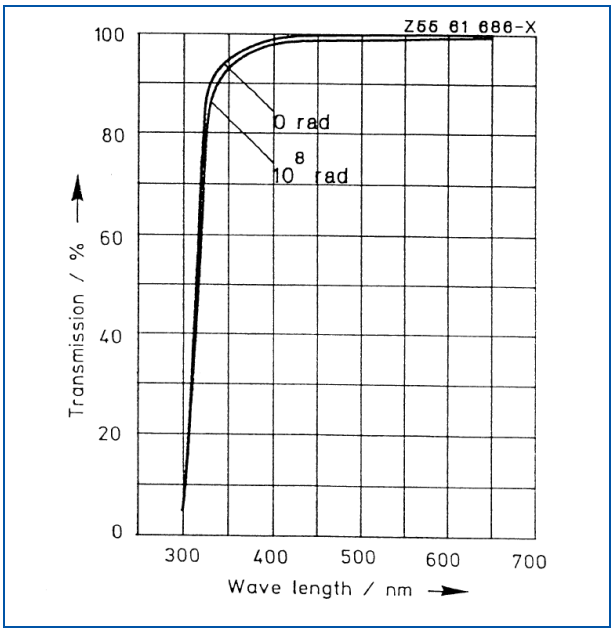

Figure 4
Transmission characteristics of radiation resistant glass after irradiation with 10 exp (5) to10 exp(8) rad

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