

ELECTRONIC ZOOM LIGHT IMAGE INTENSIFIER TUBE TH 9463

- FOR LOW LIGHT LEVEL APPLICATIONS
 - HIGH ENERGY GAIN
 - HIGH RESOLUTION
- LARGE INPUT FIELDS = 22 cm to 18 cm

The TH 9463 is a light image intensifier tube providing an important brightness gain from very low light level image. The photocathode is of S20 type with a spectral response in visible spectrum extended to the near ultra-violet.

A large area photoemissive layer located behind the front end of the tube converts the incident light into electrons. The photoelectrons thus produced are accelerated and focused by appropriate electric fields before impinging on a fluorescent screen which delivers an inverted image of smaller dimensions and considerably higher brightness than the input image.

The image provided by the tube may be observed through an optical system, recorded onto a photographic support or transferred to a T.V. monitor.

Magnification can be adjusted from 1/9 to 1/11 by proper choice of voltage applied to focusing electrodes ; thereby, input image diameter being of 22 cm, corresponding output image diameter varies from 24.5 to 20 mm respectively. Alternatively, the output image being kept to the fixed diameter of 20 mm, the input field can be varied from 22 cm to 18 cm.

Due to its high brightness gain, and to the low dark emission of its photocathode, the TH 9463 is designed for low light level examination. It is especially suitable for nuclear medicine when used with an external scintillator coupled to the faceplate.



GENERAL CHARACTERISTICS

Mechanical

Dimensions		see drawing
Mounting position		any
Operating temperature	min.	+ 5 °C
	max.	+35 °C
Storage temperature	min.	+ 5 °C
	max.	+50 °C
Net weight, approximate		4 kg



Optical

Input field diameter	max.	22	cm		
Output image diameter	min.	19.5	mm		
	max.	25	mm		
Electronoptic magnification		1/11 to 1/9			
Corresponding input resolution (note 1)					
- central		30	40	lp/cm	
- peripheral		20	30	lp/cm	
Photocathode					
- type			S20		
- wavelength at maximum sensitivity			420	nm	
- minimum sensitivity (2854 °K light source)			120	μA/lumen	
Viewing screen					
- type	P 11	P 16	P 24		
- persistence (note 2)	max.	100	0.2	2	μs
Energy gain (note 3)	min.	100	45	25	watts/watt
Conversion index at 1/11 magnification (2854 °K)					
(note 4)	min.	1300	105	900	$\frac{\text{cd/m}^2}{\text{lux}}$
Equivalent photocathode dark emission (note 5) max.			200		$\frac{\text{electrons}}{\text{cm}^2 \text{ s}}$

MAXIMUM RATINGS AND TYPICAL OPERATION

Maximum ratings

Photocathode C voltage	0	V
Electrode g1 voltage	0.3	kV
Electrode g2 voltage	2	kV
Electrode g3 voltage	5	kV
Anode A voltage	28	kV
Action getter voltage : anode g4	3.5	kV
cathode E	0	V
Photocathode C maximum current	0.5	μA
Electrode g1 maximum current	1	μA
Electrode g2 maximum current	1	μA
Electrode g3 maximum current	1	μA
Electrode g4 maximum current	10	μA
Anode A maximum current	2	μA



Typical operation (note 6)

Magnification	1/11	1/9	
Photocathode C voltage	0	0	
Electrode g1 voltage	100 ± 50	100 ± 50	V
Electrode g2 voltage	700 ± 300	450 ± 200	V
Electrode g3 voltage	3 ± 0.5	4 ± 0.5	kV
Anode A voltage	25	25	kV
Active getter voltage : anode g4	2.5 to 3	2.5 to 3	kV
cathode E	0	0	

NOTES

- 1 - The resolution is determined with a pattern consisting of alternate transparent and opaque lines of equal width, positioned on the input glass-window. Any two adjacent lines are designated as a line pair. The central zone is within a circle having a diameter equal to 70 % of the input field diameter. Peripheral zone is within circles 70 % and 90 % of the input field diameter.
- 2 - Defined as the time for initial luminance to decay to 10 % point.
- 3 - The energy gain is the ratio of the total power radiated by the output screen to the input power of a monochromatic radiation at a wavelength corresponding to the maximum of sensitivity of the photocathode.
- 4 - The conversion index is the ratio of the luminance of the output screen (in candelas per square meter) to the illumination of the input glass-window (in lux).
- 5 - The equivalent dark emission of the photocathode is calculated from the measurement of the output screen background luminance, the tube being operated with no input illumination. The equivalent dark emission of the photocathode (in electrons per square centimeter and per second) is the value required to produce the same output luminance.
- 6 - g1 electrode controls the brightness homogeneity for the whole field. g2 electrode (or focus electrode) controls the image sharpness. Ripple voltage must not exceed 0.5 %.
It is necessary to let work the active getter when tube is under operation.



STARTING PROCEDURES

Tube mounting

The tube should be protected against external stray fields by a magnetic shield. A 1 mm thickness of highly magnetic metal (mumetal) must be used around the cylindrical part of the tube.

The dark container in which the tube is set must be waterproof and dehydrated. The waterproofing is necessary to eliminate all moisture which could facilitate sparking detrimental to the proper tube operation. It is necessary, moreover to prevent any dust on the viewing face of the tube.

The tube may be held by its cylindrical part or between two flanges mounted on the metallic front collar and the glass shoulder. In any case very low hardness rubber gaskets shall be interposed.

Connections

Voltage on the different electrodes should be properly set. The connection to the electrostatic screen E should not be forgotten.

A 10 M Ω minimum resistance should be connected between the anode A of the tube and the high voltage power supply in order to protect the tube in case of electric discharge in the feeding circuits.

Voltage application

Check insulation of the anode high voltage conductor and connecting terminal of the tube to any sharp edged object at earth potential (distance greater than 15 mm).

Apply the high voltage progressively : anode voltage should be set in about 10 seconds to avoid any discharge inside the tube.

Tube adjustment

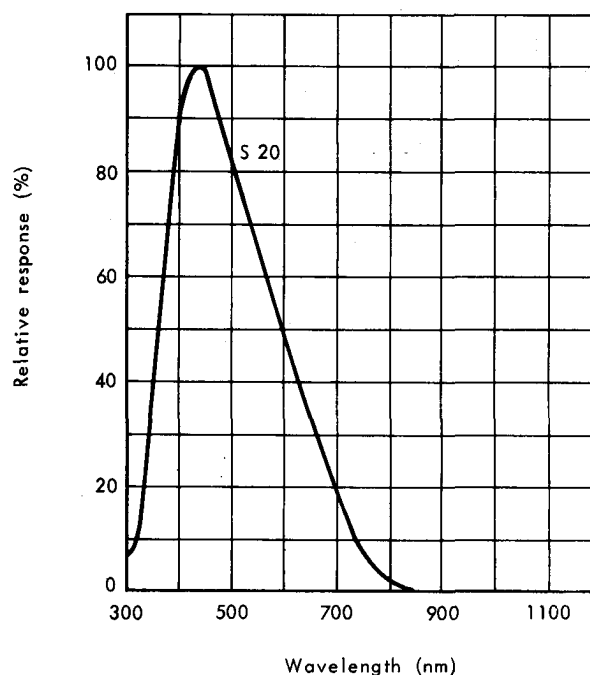
Focus a low brightness image on the input faceplate of the tube.

- 1 - Adjust the g1 voltage in order to obtain an image as homogeneous as possible in brightness.
- 2 - Adjust the g2 voltage in order to obtain a maximum resolution.
- 3 - Optimize the g1 voltage is necessary.

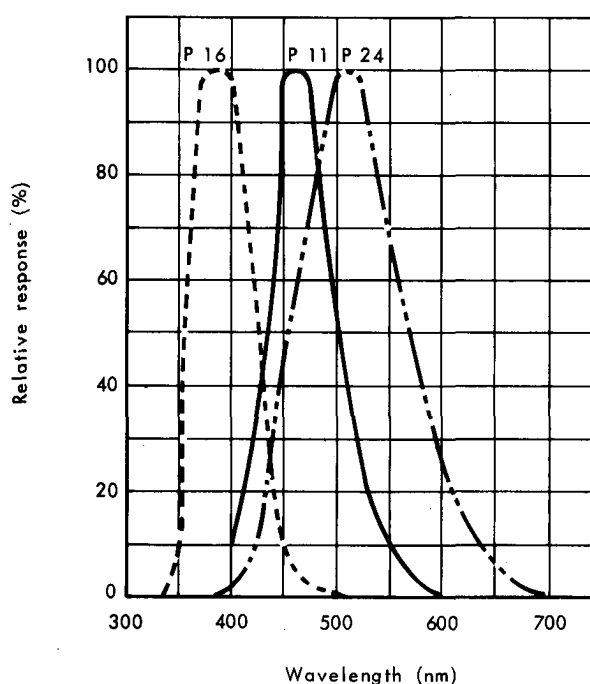
After adjustment is made it is possible to vary linearly the electrode voltages of the tube without changing the focusing of the picture.



S 20 PHOTOCATHODE SPECTRAL RESPONSE

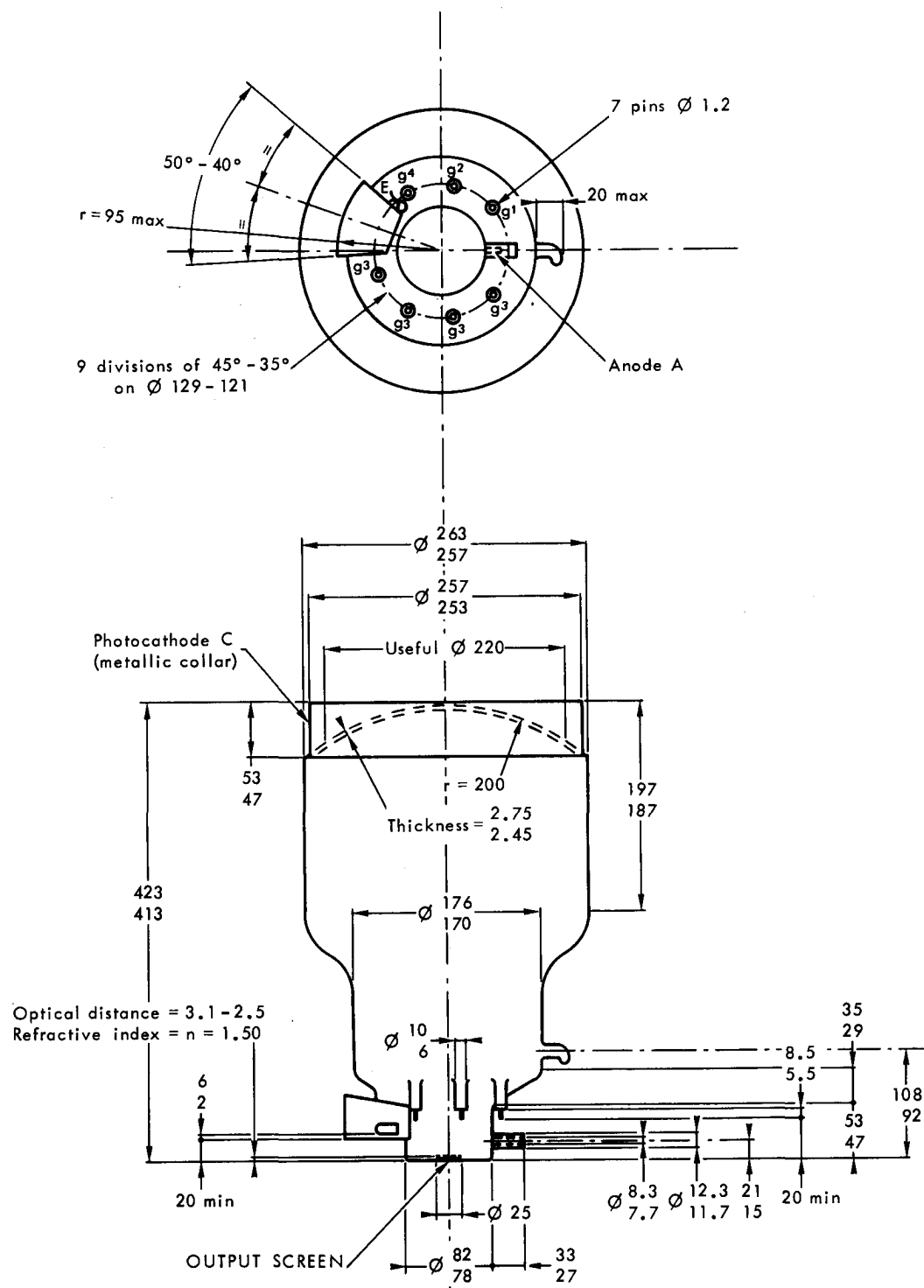


RELATIVE SPECTRAL RESPONSE OF
P 11 - P 16 - P 24 PHOSPHORS





OUTLINE DRAWING



Dimensions in mm.

