TH 9835
SILICON-DIODE-ARRAY TARGET 1" VIDICON
with integral focusing coil and deflecting yokes

Compact and lightweight :

Length : 100 mm
Diameter : 37 mm
Weight : 190 g

No need for beam alignment.

Broad spectral range (400 to 1100 nm).

Low blooming.

Small dark current.

Low lag.

Highly burn-resistant.

Description

The TH 9835 is composed of a short (100 mm) sturdy 1" vidicon and an associated focusing-coil and deflecting-yokes assembly, specially matched to the camera tube.

The TH 9835 incorporates a broad spectral range, high-sensitivity silicon-diode-array (SDA) target. In addition to featuring high sensitivity, the SDA target is resistant to image burn-in and the THOMSON-CSF proprietary technologies used also reduce blooming effects. The sensitivity of the TH 9835 is not dependent on the target voltage, which is low as compared to photoconductive-target vidicons. This results in a very small dark current.

Since the tube has a broad spectral response (400 to 1100 nm), it is advisable to use the correct filters to select the useful spectral range (visible or infrared), depending on the applications considered. The TH 9835's unity gamma allows obtaining high image contrast, especially at low light levels. The high signal current leads to a wide operating dynamic range.

The TH 9835, easy to install and to operate, is designed for use in compact, ruggedized TV cameras having high sensitivity, high resolution and good uniformity of the video output signal.

Its performance is optimized by factory adjustment of the tube and the associated components, which are permanently attached to the tube.

The printed-circuit, low-impedance yokes yield good deflection linearity and make the TH 9835 suitable for use in professional or military cameras requiring high image quality and good reliability.

The TH 9835 can be optionally provided with a soldered target lead, potted base and connection leads, depending on the specific application.

Main Applications

The sensitivity of the TH 9835 in the near infrared makes it suitable for surveillance cameras operating at low light levels and using artificial light sources (an incandescent lamp at 2854 °K, for example). An input face illumination as low as 0.1 lux is sufficient, which represents a gain on the order of 10 as compared to a convential vidicon. Furthermore, this sensitivity allows the tube to be used in applications where the light-source spectrum includes little or no visible radiation.

GENERAL CHARACTERISTICS

Electrical

– VIDICON

Cathode	Unipotential, indirectly heated, oxide-coated	
Heater :		
- voltage	6.3	V
- current at 6.3 V	0.10 A ± 10 %	
Minimum preheating time	60	s
Output capacitance (target to all other electrodes)	6.5	pF
Focusing method	Electromagnetic	
Deflecting method	Electromagnetic	

– FOCUSING COIL - DEFLECTING YOKES

Focusing coil :		
- resistance	70 ± 7	Ω
Horizontal deflecting yoke :		
- resistance	12 ± 4	Ω
- self-inductance	360 ± 30	μH
Vertical deflecting yoke :		
- resistance	12 ± 4	Ω
- self-inductance	350 ± 30	μH

Optical

Target :		
- maximum useful diameter (format 4 x 3)	17	mm
- nominal image dimensions	12.7 x 9.5	mm
Spectral response	See Figure 1	

Mechanical

Maximum overall length	103.6	mm
Maximum outer diameter	37.0	mm
Base (Ditetrar - 8 pins) (see the Outline Drawing)	UTE 9 C 15 (JEDEC No. E8-11)	
Socket (Note 1)	THOMSON-CSF No. 8192138	
Operating position	Any	
Weight, approx.	190 g	

OPERATING CONDITIONS

(All potentials are referred to the cathode)

Maximum Ratings (absolute values)

– VIDICON

Electrode g4 voltage (post-acceleration)		350	V
Electrode g3 voltage (wall)		350	V
Electrode g2 voltage (acceleration)		350	V
Electrode g1 voltage (for picture cutoff) :			
- negative bias value		150	V
- positive bias value		0	V
Heater voltage	max.	6.6	V
	min.	6	V
Peak heater-to-cathode voltage :			
- heater negative with respect to cathode		125	V
- heater positive with respect to cathode		10	V
Target voltage (Note 2)		300	V
Peak target current (Note 3 - Figure 2)		750	nA

Faceplate :			
- illumination		6 x 10^8	lux
- temperature (operation and storage)	min.	−40	°C
	max.	+ 70	°C
– COIL AND YOKES			
Voltages between coils		250	V
Voltage between coils and ground		250	V
Current in the focusing coil		300	mA
Direct current in each deflecting yoke		0. 5	A
Peak current in each deflecting yoke		1	A

Operational Conditions

– VIDICON

Operating temperature : 25 °C (Note 4)
Scanning standard : 25 images/second - 625 interlaced lines
Image dimensions on target : 12. 7 mm x 9. 5 mm

Target voltage (see note in Operating Instructions)		8	V
Electrode g4 voltage (Note 5)		340	V
Electrode g3 voltage		220	V
Electrode g2 voltage		300	V
Electrode g1 voltage (picture cutoff) (Note 6)	max.	−40	V
	min.	−100	V
Minimum blanking pulse amplitude :			
- added to electrode g1 voltage		−75	V
- applied to cathode		+ 20	V

– COIL AND YOKES

Current in the focusing coil	110 ± 10	mA
Peak-to-peak current in deflecting yokes :		
- horizontal deflection	290 ± 30	mA
- vertical deflection	220 ± 20	mA

Electrooptical Performances

Tube operated under the same conditions as those given in "Operational Conditions"

Radiant sensitivity at 730 nm (Figure 1)	380	mA/W
Dark current (Figure 3)	4	nA

– SENSITIVITY TO LIGHT SOURCE AT 2854 °K (Note 7 - Figure 4)

Faceplate illumination	1	lux
Sensitivity	5750	µA/lm
Signal current	700	nA

– SENSITIVITY TO VISIBLE LIGHT (Figure 4)

Illumination from 2854 °K light source incident on SCHOTT-KG3 filter (Note 8)	1	lux
Sensitivity (depending on filter thickness) :		
- 1-mm thickness	2480	µA/lm
- 2-mm thickness	1640	µA/lm
- 3-mm thickness	1400	µA/lm
- 4-mm thickness	1060	µA/lm
- 5. 5-mm thickness	825	µA/lm
Corresponding signal current :		
- 1-mm thickness	300	nA
- 2-mm thickness	200	nA
- 3-mm thickness	170	nA
- 4-mm thickness	125	nA
- 5. 5-mm thickness	100	nA

– SENSITIVITY TO INFRARED LIGHT (Figure 5)

Illumination from 2854 °K light source incident on 3-mm thick SCHOTT-RG 715 filter (Note 9)	1	lux
Corresponding signal current	340	nA
Illumination from 2854 °K light source incident on CORNING-CS 7. 56 filter (Note 10)	1	lux
Corresponding signal current	65	nA
Average gamma for a signal current between 1 and 700 nA (Note 11)	1	
Typical blooming characteristics at 2854 °K (Note 12)	See Figure 6	
Limiting resolution at center of image (Note 13 - Figure 7)	700 TV lines	
MTF for 400 TV lines at center of image (Note 14 - Figure 7)	40	%
Lag : ratio of residual signal on the 3rd frame to initial signal current of 200 nA after illumination is removed (Note 15 - Figure 8)	6	%

SPURIOUS-SIGNAL TEST

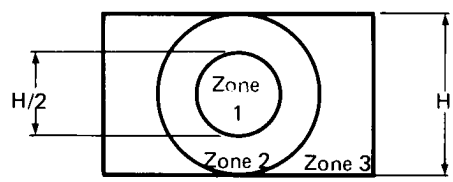
Measurement Conditions

Target voltage V_c = 8 V

Signal current i_s = 200 nA

The gain of the video amplifier and the monitor are adjusted so as to obtain the best image (Note 16).

The test is performed using a uniformly diffused white test pattern that shows 3 zones as indicated in the following drawing.



The different zones are defined as follows :

H = raster height
Zone 1 = diameter H/2
Zone 2 = diameter H
Zone 3 = peripheral area

Spots

Both black and white spots are counted, but actually considered as defects are only those spots having a contrast C ⩾ 15 %, in light or in darkness.

The contrast is defined as $C = 100 \times \frac{i_{sb}}{i_s}$ %,

where : i_{sb} = increment in video current due to the spot,
i_s = normal signal current.

TH 9835 "IND"

Allowed spots

D/H* ratio in % * D : average diameter of the spot H : raster height	Zone 1		Zones 1 + 2		Zones 1 + 2 + 3	
	White	Total	White	Total	White	Total
D/H > 1. 6	0	0	0	0	0	0
1. 6 ⩾ D/H > 1. 2	0	0	0	2	0	4
1. 2 ⩾ D/H > 0. 8	0	1	0	6	0	10
0. 8 ⩾ D/H > 0. 2	1	6	3	22	6	30
0. 2 ⩾ D/H	5	+	+	+	+	+

TH 9835 "AMR"

Allowed spots

D/H* ratio in % * D : average diameter of the spot H : raster height	Zone 1		Zone 1 + 2		Zones 1 + 2 + 3	
	White	Total	White	Total	White	Total
D/H > 3.2	0	0	0	0	0	0
3.2 ⩾ D/H > 2.4	0	0	0	0	0	1
2.4 ⩾ D/H > 1.6	0	0	0	2	0	4
1.6 ⩾ D/H > 1.2	0	1	0	5	0	9
1.2 ⩾ D/H > 0.8	0	3	0	11	0	19
0.8 ⩾ D/H > 0.2	4	11	9	31	15	51
0.2 ⩾ D/H	+	+	+	+	+	+

\+ Any number of spots of this size are allowed, unless concentration causes a smudged appearance.
Do not count spots of contrast C < 15 %.

Other Defects

Smudges, streaks, mottled or grainy background (black and white) are not considered as defects if their contrast is C ⩽ 5 %.

NOTES

1 - THOMSON-CSF - DTE 38, rue Vauthier - 92100 BOULOGNE-BILLANCOURT - Tel. 604 81 75.

2 - In normal operation, the target voltage will not exceed 15 V. See the note on target voltage in the "Operating Instructions".

3 - The target current is the total current drawn in the load resistance connected to the target : signal current + dark current ; the dark current is the component existing when the illumination is removed.
The video amplifiers must be designed to handle target currents of 1 μA in order to avoid amplifier overloads or image distortions.

4 - All characteristics are given for a faceplate temperature of 25 °C to 30 °C. The rise of the faceplate temperature is determined by the ambient temperature, by the thermal dissipation of surrounding components and of the tube itself.
A faceplate temperature rise of 10 °C will result in the dark current being multiplied by a factor of 2.

5 - In all cases, the grid g4 voltages should be higher than the g3 and g2 voltages.

6 - Without blanking pulses applied to grid g1.

7 - The light source is a tungsten lamp at 2854 °K color temperature.

8 - The SCHOTT-KG3 filters, of 1-mm, 2-mm, 3-mm, 4-mm and 5. 5-mm thickness, are placed between the light source and the tube faceplate (see Figure 9). SCHOTT and GEN-128 Bd. Haussmann - 75008 PARIS.

9 - The 3-mm thick SCHOTT-RG 715 filter is placed between the light source and the tube faceplate (see Figure 10).

10 - The CORNING CS-7. 56 filter is placed between the light source and the tube faceplate (see Figure 10).
CORNING GLASS WORKS, CORNING, N.Y. 14830.

11 - Average gamma is defined as the slope of the rectilinear part of the light transfer characteristics in logarithmic coordinates.

12 - Saturation is defined as that value of incident light on the tube faceplate at which blooming just becomes evident ; the light source is a tungsten filament at 2854 °K.

13 - Practically, the limiting resolution corresponds to the resolution measured with a twin-bar test card at 5 % amplitude response.

14 - In 625-lines CCIR Standard, line duration being 52 μs (line suppression period not included), 400 TV lines correspond to 5 MHz.

15 - The lag is defined as the percentage of the residual signal (measured on the n^{th} field after illumination is removed) to the initial signal. This value assumes 50 frames/second scanning rate.

16 - The monitor is adjusted as follows :

- for the pedestal level (black), the luminance of the screen is set at cutoff.
- for the maximum level (white), the gain of the monitor is adjusted to obtain an optimum image depending on image content and ambient light.

OPERATING INSTRUCTIONS

1 - The deflection voltages must be applied before any electrode voltages are applied.

For shutdown, the deflection voltages must be switched off only after all electrode voltages have been turned off.

2 - The tube must not be exposed to lighting conditions exceeding those given in the "Maximum Ratings", in order to avoid an excessive increase of target temperature.

3 - Note relative to target voltage :

The dark current and spurious signals increase with a target voltage increase.
The tube sensitivity is not dependent on target potential.
The optimum value of target voltage is the one that yields a maximum signal current and a minimum dark current. This value is approximately 8 to 10 V. When the target voltage is set a value higher than 15 V, target destabilization can eventually occur, with the result that is becomes impossible to recharge the target with the beam.

In such case, follow this recommended procedure :

a) Shut the optics.

b) Scan the whole target.

c) Set V_{g1} at about −5 V.

d) Raise target voltage V_c to 300 V for 1 or 2 seconds

e) Cut the beam off completely (V_{g1} at cutoff).

f) Reset target voltage to normal operating voltage : 8 to 10 V.

g) Increase beam current to normal target discharge by adjusting V_{g1}.

The tube can then be operated normally.

Remark

The variation of the target voltage can not be used for automatic control of the sensitivity, as in conventional vidicons having an $Sb_2 S_3$ photoconductor.

Automatic control of the sensitivity requires the use of an iris, either automatic or slaved to the video signal, and, for large variations of illumination, the use of proper filters.

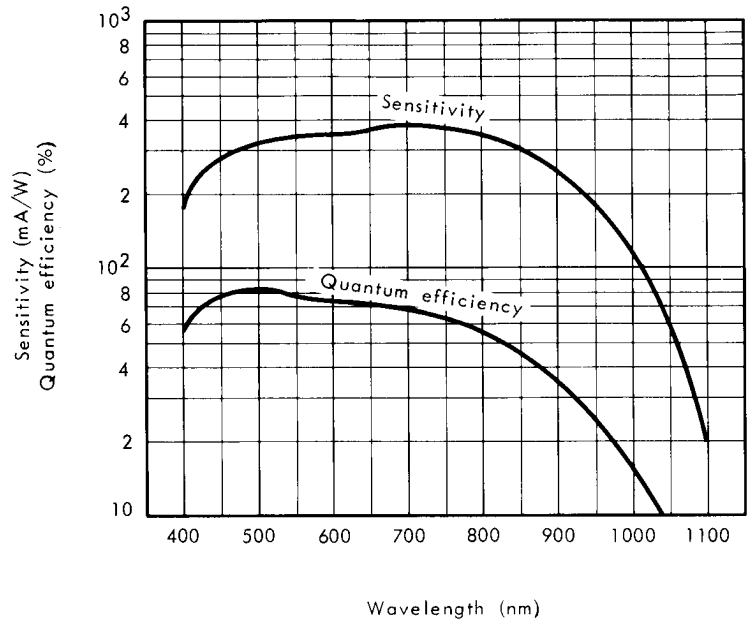


Figure 1 - Typical spectral-response characteristics.

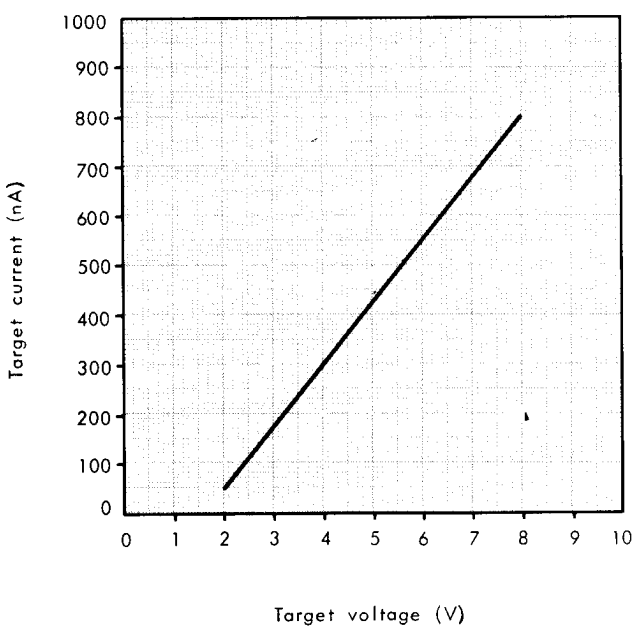


Figure 2 - Saturation target current characteristics.

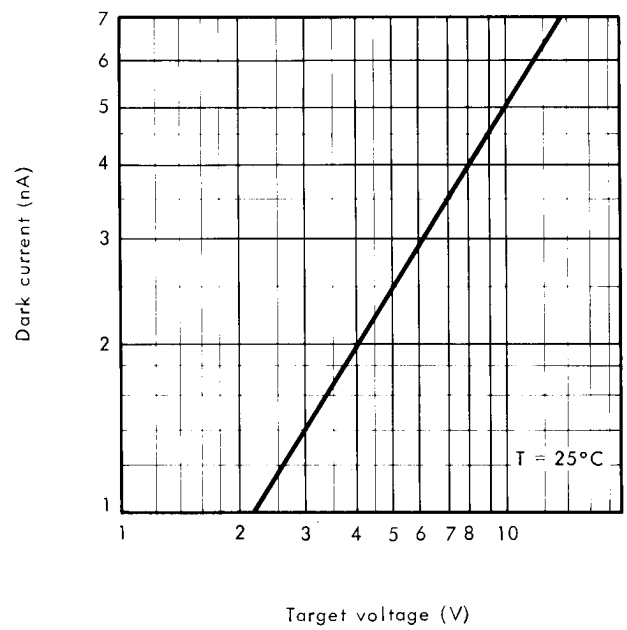


Figure 3 - Dark-current characteristics.

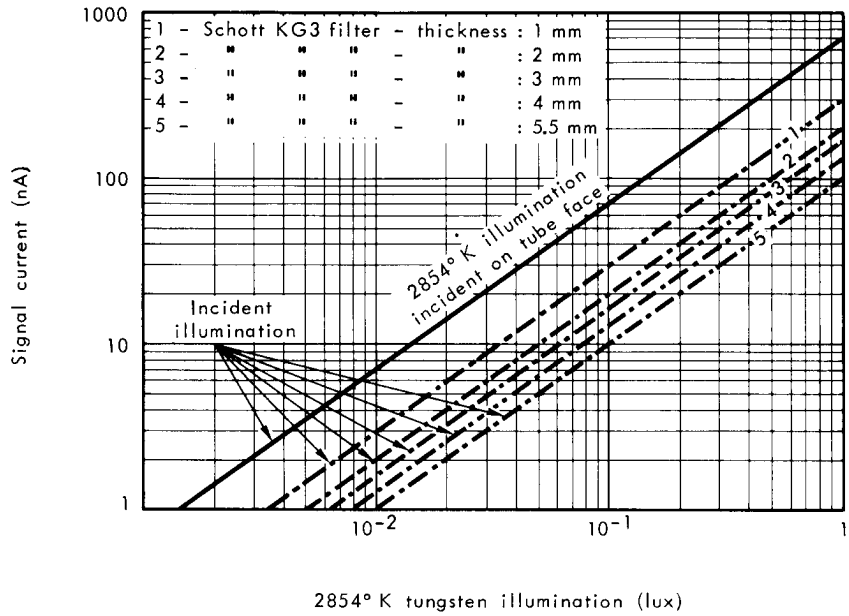


Figure 4 - Typical light-transfer characteristics at 2854°K in the visible range

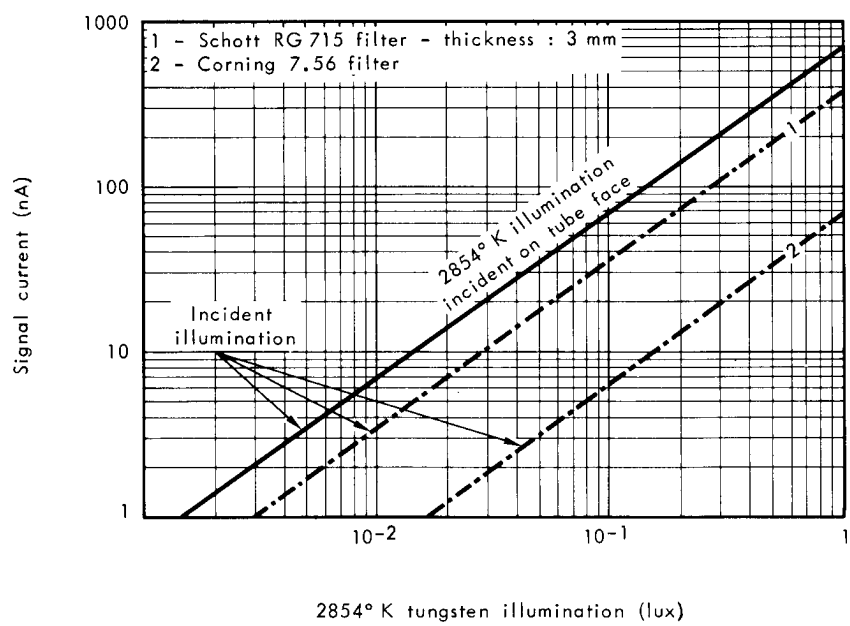


Figure 5 - Typical light-transfer characteristics in the near infrared and infrared

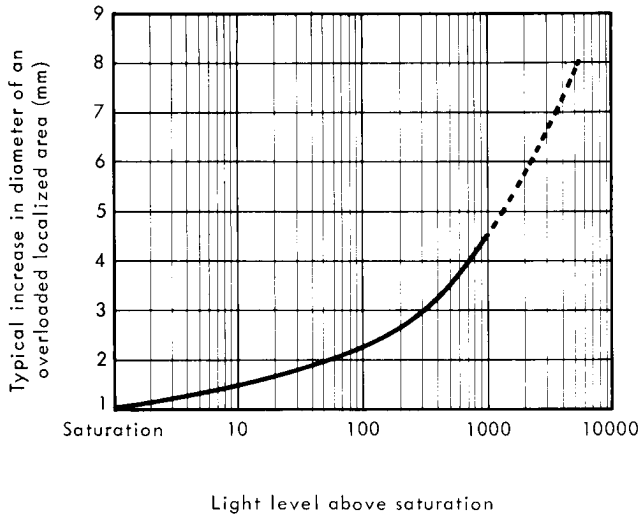


Figure 6 - Typical blooming characteristics.

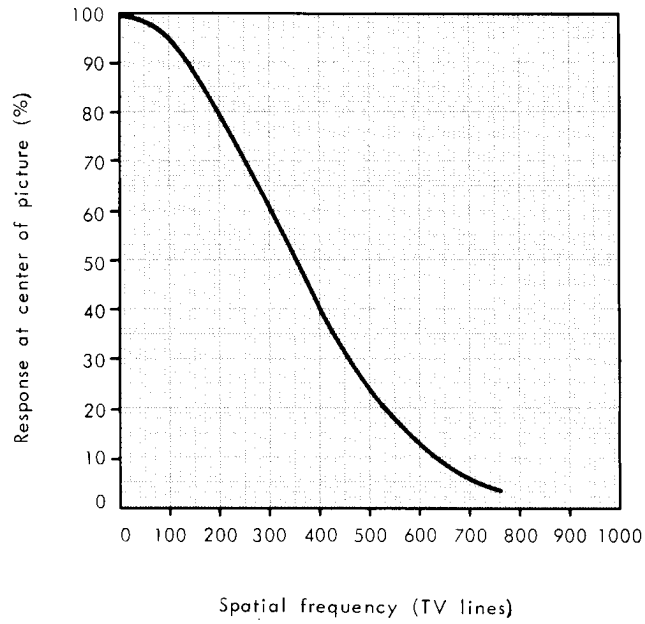


Figure 7 - Typical MTF characteristics with a 100 % contrast vertical bar test pattern.

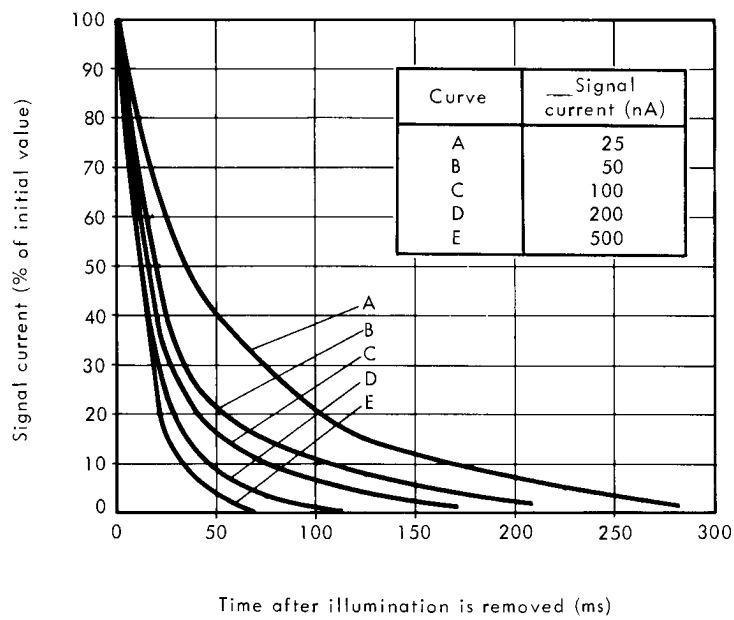


Figure 8 - Typical persistence characteristics.

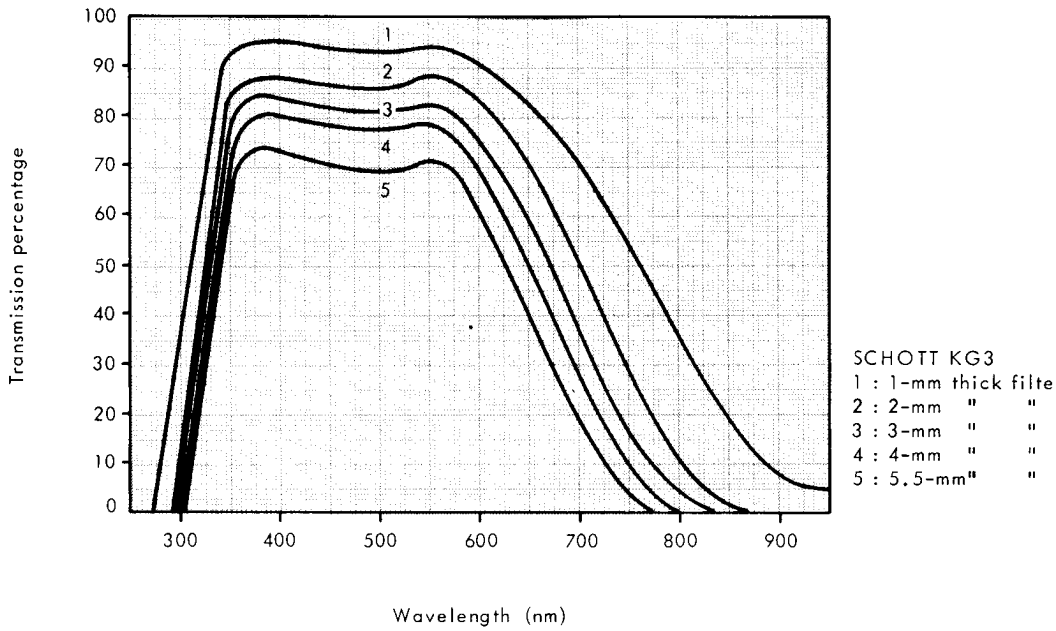


Figure 9 - Typical transmission of SCHOTT KG3 infrared absorbing filters.

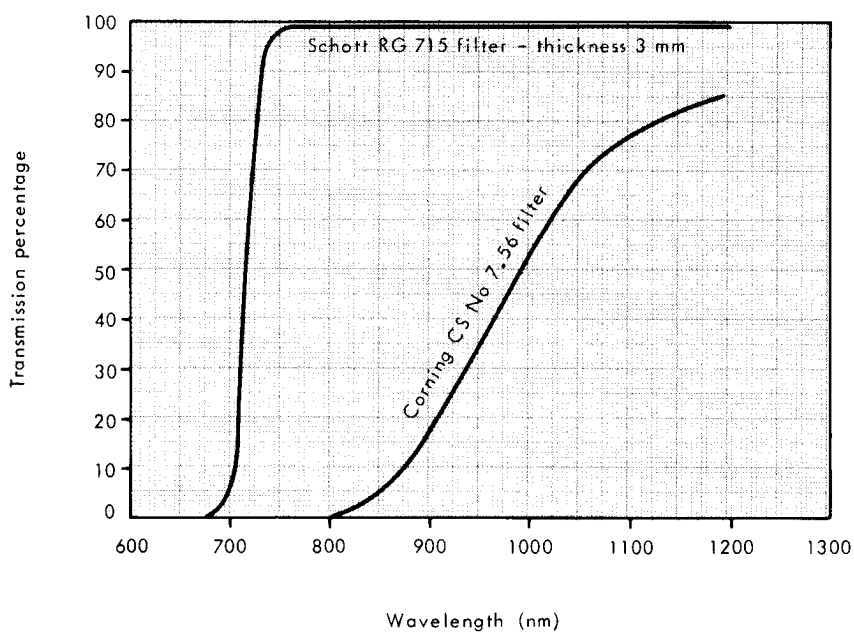
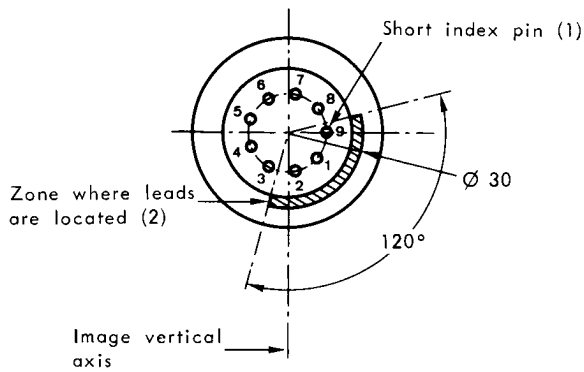
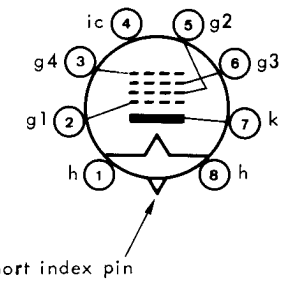


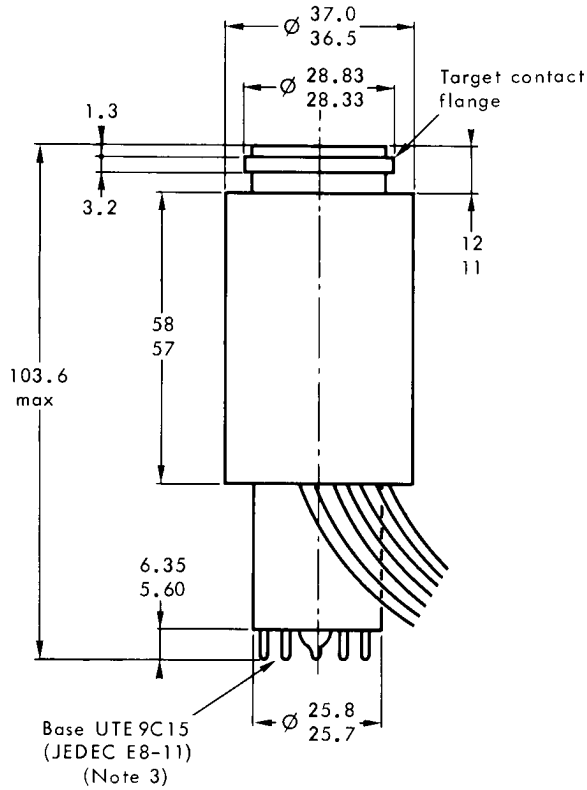
Figure 10 - Typical transmission of SCHOTT RG 715 and CORNING CS 7.56 visible-light absorbing filters.

OUTLINE DRAWING



BASING DIAGRAM
(bottom view)





1 - Heater h	5 - Electrode g2
2 - Electrode g1	6 - Electrode g3
3 - Electrode g4	7 - Cathode k
4 - Internal connection	8 - Heater h

FLYING LEAD COLOR CODE		
Ground	:	Gray
Focus coil	:	Orange (+) Brown (-)
Horizontal deflection	:	Red (+) Black (-)
Vertical deflection	:	Green (+) White (-)

Length of leads : 250

(1) - The orientation of the index pin may be in any position with respect to the image axes.

(2) - The location of this zone may be in any position with respect to the image axes.

(3) - The base complies with JEDEC standard except for pin length.

Dimensions in mm, nominal
unless otherwise indicated

THOMSON-CSF

DIVISION TUBES ELECTRONIQUES