

TH 9839

1" VIDICON

with integral focusing coil and deflecting yokes

- **Compact and lightweight :**
 - Length : 100 mm
 - Diameter : 39 mm
 - Weight : 190 g
- **Rugged structure, meeting severe environmental specifications**
- **Focusing coil and deflecting yokes permanently assembled to the tube**
- **No need for beam alignment**
- **High resolution**
- **Low lag**



The TH 9839 is composed of a short (100 mm), sturdy 1" vidicon and an associated focusing coil and deflecting-yokes assembly, matched to the camera tube. Its rugged construction allows this tube to be used under severe conditions of temperature, pressure, shock and vibration (See Environmental Tests on page 4).

The TH 9839, easy to install and to operate, is designed for compact, ruggedized TV cameras featuring 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 also yield good deflection linearity and make the TH 9839 suitable for use in professional or military TV cameras requiring high image quality and good reliability.

GENERAL CHARACTERISTICS

Electrical

— TUBE

Cathode.	Unipotential, indirectly heated, oxide coated
Heater :	
— voltage.	6.3 V
— current at 6.3 V	0.15 A $\pm$ 10 %
Minimum preheating time.	60 s
Output capacitance (target to all other electrodes).	6.5 pF
Focusing method.	Electromagnetic
Deflection method.	Electromagnetic

— FOCUSING COIL - DEFLECTING YOKES

Focusing coil :	
— resistance	75 ± 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 I

Mechanical

Maximum overall length	108 mm
Maximum outer diameter	39 mm
Operating position	Any
Weight, approx.	190 g

OPERATING CONDITIONS

(All potentials are referred to grounded cathode)

Maximum Ratings (absolute values)

Operating and storage temperature	max. + 70 °C
	min. — 55°C

— VIDICON

Target voltage	125 V
Electrode g4 voltage (field)	750 V
Electrode g3 voltage (wall)	750 V
Electrode g2 voltage (acceleration)	350 V
Electrode g1 voltage (for picture cutoff) :	
— negative bias value	150 V
— positive bias value	0 V
Cathode k voltage	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
Dark current	0.20 μA
Peak target current (Note 2)	0.60 μA
Faceplate illumination	10 000 lux

— 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

Faceplate temperature (Note 3)	25 °C
Image dimensions on target	12.7 x 9.5 mm
Scanning standard	25 images/second, 625 interlaced lines
Electrode g4 voltage	420 V
Electrode g3 voltage	290 V
Electrode g2 voltage	300 V
Electrode g1 voltage (for picture cutoff) (Note 4)	max. - 45 V min. -110 V
Minimum peak blanking voltage :	
— applied to g1	- 75 V
— applied to cathode	+ 20 V
Average gamma for target illumination between 1 and 100 lux (Note 5)	0.65
Limiting resolution at center of image (Note 6 - Figure 3)	1000 TV lines
Limiting resolution at corners of image (without dynamic focus)	600 TV lines
MTF for 400 TV lines at center of image (Note 7 - Figure 3)	60 %
Image distortion	1 %

— 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

Typical Performance

1 — HIGH LIGHT LEVEL OPERATION

(Faceplate illumination = 100 lux)

Dark current i_0	5 nA
Target voltage (for $i_0 = 5$ nA (Note 8 - Figure 4)	10 to 25 V
Faceplate illumination (2854 °K) (Note 9)	100 lux
Signal current	300 nA
Lag : (Note 10 - Figure 5) :	
— maximum	15 %
— average	10 %

2 — AVERAGE SENSITIVITY OPERATION

(Faceplate illumination = 10 lux)

Dark current i_0	20 nA
Target voltage for $i_0 = 20$ nA (Note 8 - Figure 4)	20 to 50 V
Faceplate illumination (2854 °K) (Note 9)	10 lux
Signal current	200 nA
Corresponding sensitivity	170 $\mu\text{A/lm}$
Target illumination for 100 nA signal current	3 lux
Lag : (Note 10 - Figure 5) :	
— maximum	20 %
— average	12 %

3 — HIGH SENSITIVITY OPERATION

(Faceplate illumination = 5 lux)

Dark current i_0	50 nA
Target voltage for $i_0 = 50$ nA (Note 8 - Figure 4)	25 to 60 V
Faceplate illumination (2854 °K) (Note 9)	5 lux
Signal current	200 nA
Corresponding sensitivity	300 $\mu\text{A/lm}$
Target illumination for 100 nA signal current	1.5 lux
Lag : (Note 10 - Figure 5) :	
— maximum	20 %
— average	15 %



4 – VERY HIGH SENSITIVITY OPERATION

(Faceplate illumination = 1 lux)

Dark current i_o	100 nA
Target voltage for $i_o = 100$ nA (Note 8 - Figure 4)	30 to 70 V
Faceplate illumination (2854 °K) (Note 9)	1 lux
Signal current	100 nA
Corresponding sensitivity	800 μ A/lm
Target illumination for 50 nA signal current	0.3 lux
Lag : (Note 10 - Figure 5) :	
– maximum	20 %
– average	17 %

ENVIRONMENTAL TESTS

The TH 9839 is designed to withstand the following environmental tests :

Rejection Criteria

After completion of the environmental tests, the tube must meet the characteristics specified in "Typical Performance" unless otherwise stated.

OPERATING TESTS

Low pressure $p = 300$ m bar

Temperature and humidity

Temperature	: 40 °C
Relative humidity	: 93 %
Duration	: 4 days

Vibration

Sweep frequency varying from 5 Hz to 2000 Hz as follows :

5 Hz to 10 Hz	: amplitude 1 mm
10 Hz to 16 Hz	: acceleration 0.4 g
16 Hz to 96 Hz	: amplitude 0.4 mm
96 Hz to 2000 Hz	: acceleration 15 g
Duration of 1 cycle	: 15 mn.

The tube is vibrated in 3 orthogonal directions, one of which being parallel to the tube axis ; the duration is 120 minutes for each position.

NON-OPERATING TESTS

High pressure $p = 3$ bar

Low and high temperatures $t_1 = -55$ °C
 $t_2 = +70$ °C

The temperature increase or decrease rate is 2 °C/mn. The tube is held at extreme temperatures for 3 hours.

Three thermal cycles are performed.

Shock

Half-sine wave shocks : acceleration 30 g
: duration 6 ms.

The tube is submitted to 5 shocks in each of the 3 perpendicular directions, one of which being parallel to the tube axis.

BLEMISH SPECIFICATIONS

Measurement Conditions

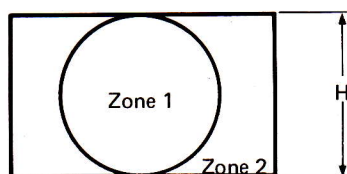
Dark current $i_0 = 20 \text{ nA}$

Signal current $i_s = 200 \text{ nA}$

The tube is adjusted to provide maximum image resolution.

The gain of the video amplifier and the monitor are adjusted to obtain the best image (Note 11).

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



Zone 1 : area inside the circle inscribed in the raster height, H.
Zone 2 : peripheral area.

Spots

Both black and white spots are counted, but actually considered as defects are only those spots having a contrast $C \geq 50 \%$, 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.

D/H* ratio (%) * D : average diameter spot H : raster height	Allowed spots			
	Zone 1	Zone 1 + Zone 2		
		a	a + b	a + b + c
a : $0.8 < D/H \leq 1$	0	1	3	6
b : $0.6 < D/H \leq 0.8$	1			
c : $0.2 < D/H \leq 0.6$	3			

Any numbers of spots having D/H up to and including 0.2 % are allowed unless concentration causes a smudged appearance.

Do not count spots of contrast $C < 50 \%$.

Other Defects

Smudges, streaks, mottled or grainy background (black and white) are not considered as defects if their contrast is $C \leq 15 \%$.

NOTES

- 1 - THOMSON-CSF - DTE, 38, rue Vauthier - 92100 BOULOGNE-BILLANCOURT - Tel. 604 81 75.
- 2 - 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 a peak target current of $1 \mu\text{A}$ in order to avoid amplifier overload or image distortions.
- 3 - All characteristics are given for a faceplate temperature of 25°C , the recommended temperature range being 20°C to 30°C .
The rise of the faceplate temperature is determined by the ambient temperature and by the thermal dissipation of surrounding components and of the tube itself.
- 4 - Without blanking pulses applied to grid g1.
- 5 - Average gamma is defined as the slope of the rectilinear part of the light transfer characteristics in logarithmic coordinates.
- 6 - Practically, the limiting resolution corresponds to the resolution measured with a twin-bar test card at 5 % amplitude response.
- 7 - In 625-lines CCIR Standard, line duration being $52 \mu\text{s}$ (line suppression period not included), 400 TV lines correspond to 5 MHz.
- 8 - Indicated range of each type of service serves only to illustrate the operating target voltage range normally encountered. The target voltage for each vidicon must be adjusted to that value which gives the designed operating dark current.
- 9 - All the above-mentioned illuminations assume a 2854°K incandescent tungsten source.
- 10 - The lag is defined as the percentage of the residual signal (measured 60 milliseconds after light excitation removal) to the initial current.
This value assumes 50 frames/second scanning rate.
- 11 - 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.

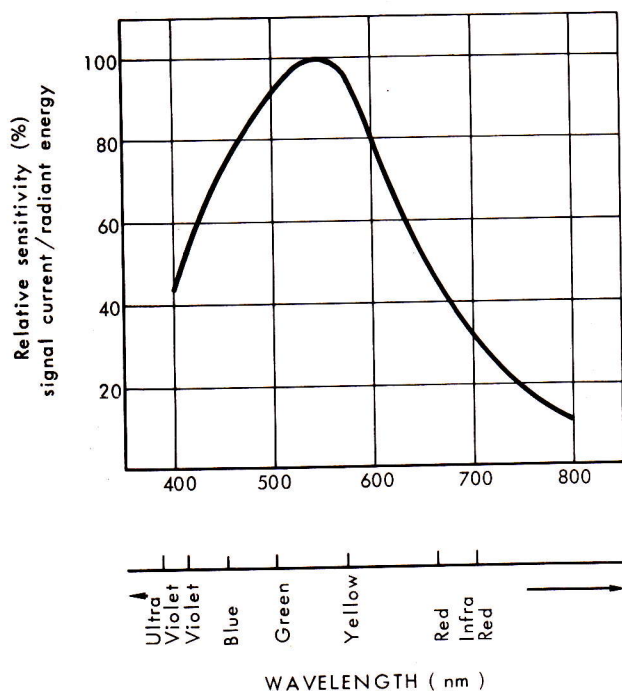


Fig. 1 - Typical spectral sensitivity characteristics

For equal values of signal current at all wavelengths
($0.2 \mu\text{A}$ signal current and $0.02 \mu\text{A}$ dark current
for scanned area of $12.7\text{mm} \times 9.5\text{mm}$)

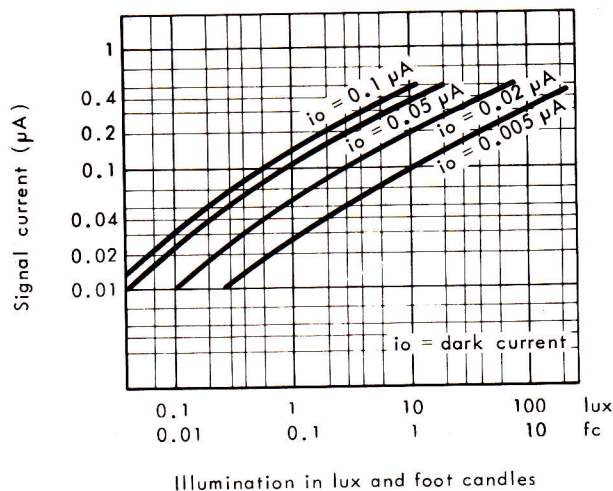


Fig. 2 - Light transfer characteristics

Illumination uniform over photoconductive layer-scanned
area $12.7\text{mm} \times 9.5\text{mm}$ - faceplate temperature 25°C

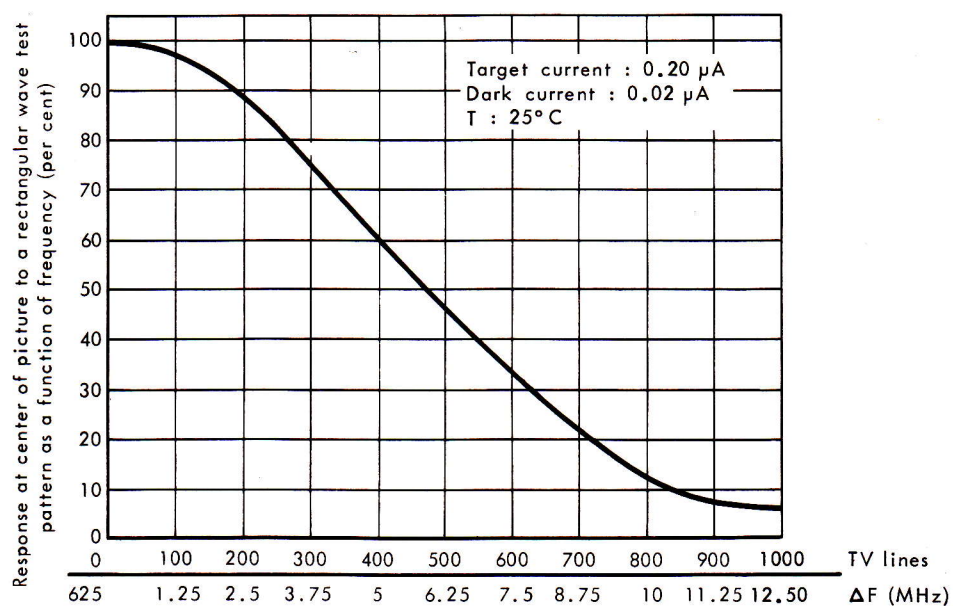


Fig. 3 - Modulation transfer function

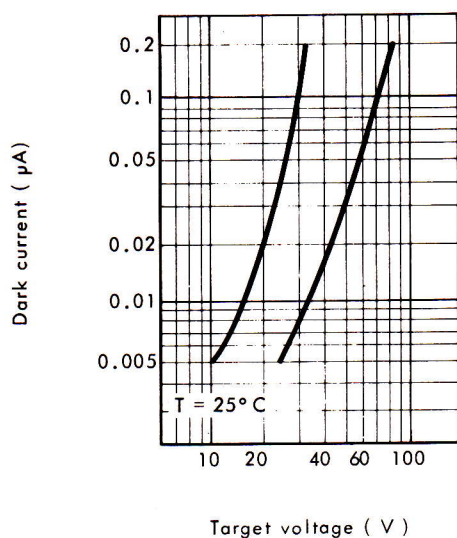


Fig. 4 - Range of dark current

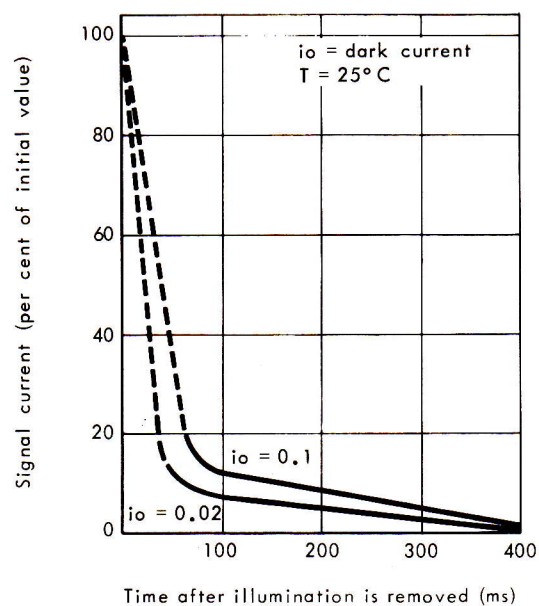
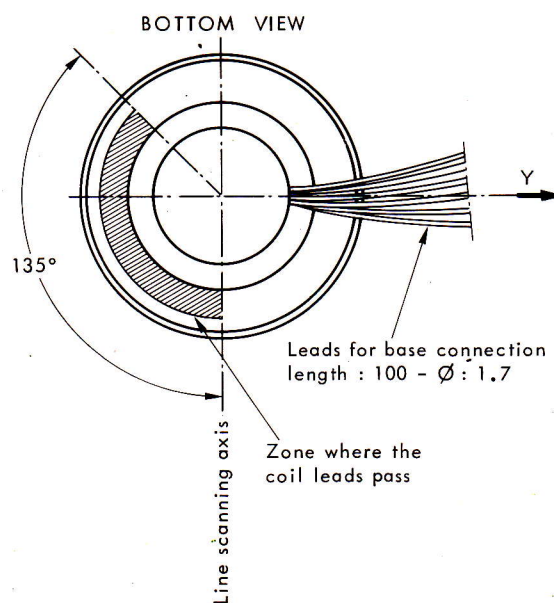
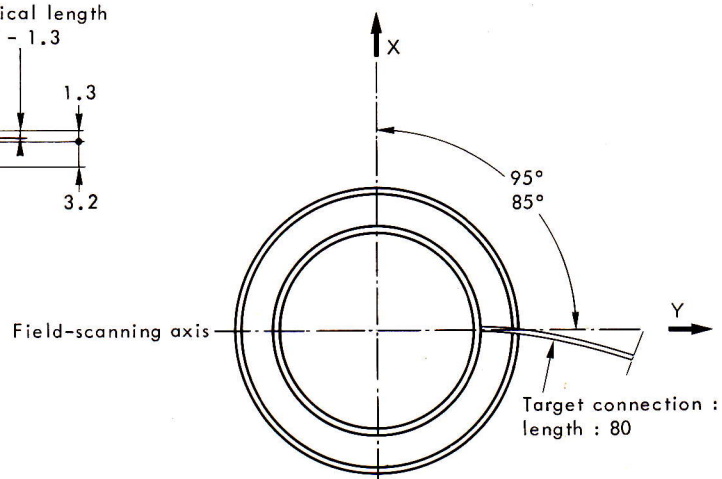
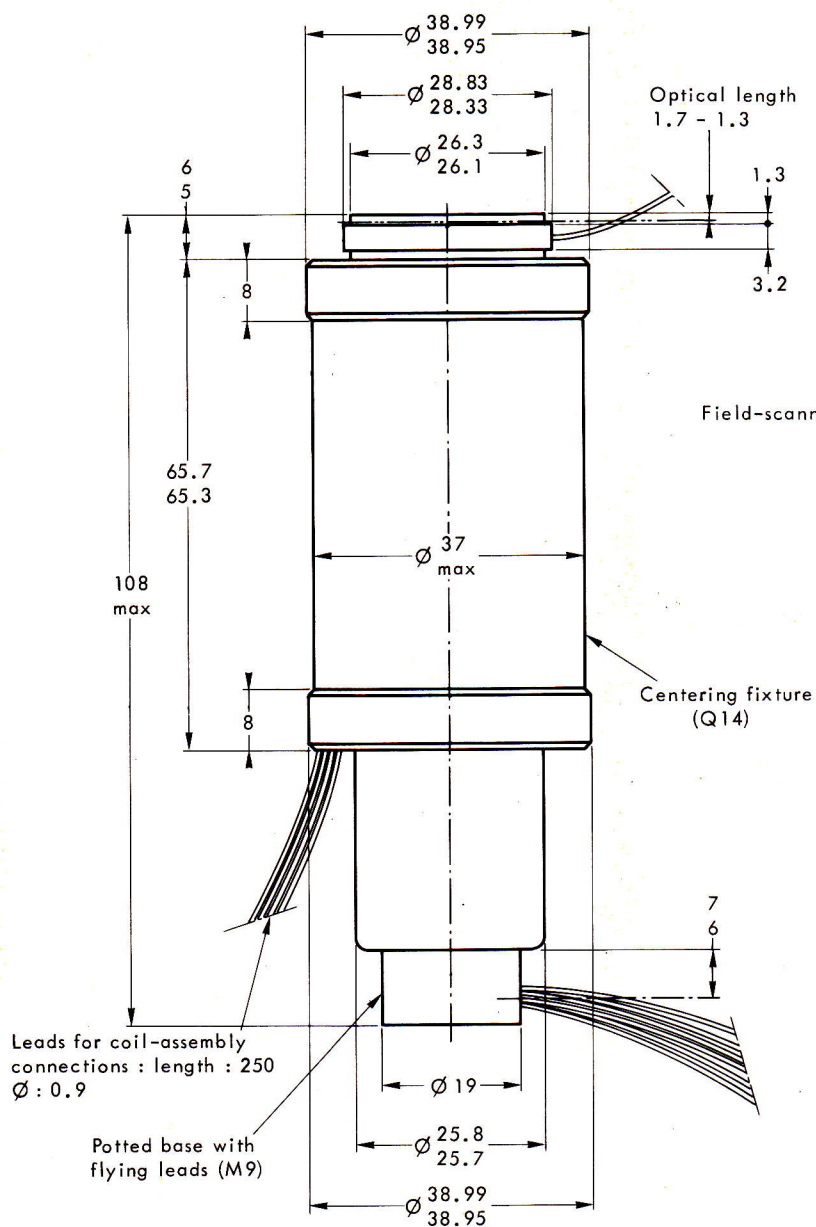


Fig. 5 - Typical persistence characteristics

Scanned area of photoconductive layer $12.7\text{mm} \times 9.5\text{mm}$ Initial highlight signal current of $0.2 \mu\text{A}$, scanned area of photoconductive layer $12.7\text{mm} \times 9.5\text{mm}$

OUTLINE DRAWING



Base electrical connections		
Flying leads		Tube electrode
Mark	Color code	
0	White	k
1	White	g1
2		g2
3		g3
4		g4
	Red	f1
		f2

Coil-assembly connections	
To be connected to	Color code
Ground	Gray
Focusing	Orange (+) Brown (-)
Line scanning	Red (+) Black (-)
Field scanning	Green (+) White (-)

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Dimensions in mm

