PHILIPS

Data handbook

PHILIPS

Electronic components and materials

Electron tubes

Part 5b May 1975

Camera tubes

Image intensifier tubes

Image converter tubes

Deflection assemblies for camera tubes

ELECTRON TUBES

Part 5b **May 1975**

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CARACAS

DATA HANDBOOK SYSTEM

Our Data Handbook System is a comprehensive source of information on electronic components, subassemblies and materials; it is made up of three series of handbooks each comprising several parts.

ELECTRON TUBES	**BLUE**
SEMICONDUCTORS AND INTEGRATED CIRCUITS	**RED**
COMPONENTS AND MATERIALS	**GREEN**

The several parts contain all pertinent data available at the time of publication, and each is revised and reissued periodically.

Where ratings or specifications differ from those published in the preceding edition they are pointed out by arrows. Where application information is given it is advisory and does not form part of the product specification.

If you need confirmation that the published data about any of our products are the latest available, please contact our representative. He is at your service and will be glad to answer your inquiries.

December 1972

ELECTRON TUBES (BLUE SERIES)

This series consists of the following parts, issued on the dates indicated.

Part 1a Transmitting tubes for communications **April 1973**
and Tubes for r.f. heating Types PB2/500 ÷ TBW15/125

Part 1b Transmitting tubes for communication **August 1974**
Tubes for r.f. heating
Amplifier circuit assemblies

Part 2 Microwave products **October 1974**

Communication magnetrons
Magnetrons for micro-wave heating
Klystrons
Traveling-wave tubes
Diodes
Triodes
T-R Switches
Microwave Semiconductor devices
Isolators Circulators

Part 3 Special Quality tubes; **January 1975**
Miscellaneous devices

Part 4 Receiving tubes **March 1975**

Part 5a Cathode-ray tubes **April 1975**

Part 5b Camera tubes; Image intensifier tubes **May 1975**

Part 6 Products for nuclear technology **January 1974**
Photodiodes

Photomultiplier tubes
Channel electron multipliers
Geiger-Mueller tubes
Neutron tubes
Photodiodes

Part 7 Gas-filled tubes **February 1974**

Voltage stabilizing and reference tubes
Counter, selector, and indicator tubes
Trigger tubes
Switching diodes
Thyratrons
Ignitrons
Industrial rectifying tubes
High-voltage rectifying tubes

Part 8 T.V. Picture tubes **May 1974**

SEMICONDUCTORS AND INTEGRATED CIRCUITS (RED SERIES)

This series consists of the following parts, issued on the dates indicated.

Part 1a Rectifier diodes and thyristors **June 1974**

Rectifier diodes
Voltage regulator diodes (> 1,5 W)
Transient suppressor diodes
Thyristors, diacs, triacs
Rectifier stacks

Part 1b Diodes **July 1974**

Small signal germanium diodes
Small signal silicon diodes
Special diodes
Voltage regulator diodes (< 1,5 W)
Voltage reference diodes
Tuner diodes

Part 2 Low frequency transistors **July 1974**

Part 3 High frequency and switching transistors **October 1974**

Part 4a Special semiconductors **November 1974**

Transmitting transistors
Microwave devices
Field-effect transistors
Dual transistors
Microminiature devices for thick- and thin-film circuits

Part 4b Devices for opto-electronics **December 1974**

Photosensitive diodes and transistors
Light emitting diodes
Photocouplers
Infra-red sensitive devices
Photoconductive devices

Part 5 Linear integrated circuits **March 1975**

Part 6 Digital integrated circuits **April 1974**

DTL (FC family)
CML (GX family)
MOS (FD family)
MOS (FE family)

COMPONENTS AND MATERIALS (GREEN SERIES)

These series consists of the following parts, issued on the dates indicated.

Part 1 Functional units, Input/output devices, Electro-mechanical components, Peripheral devices — **June 1974**

High noise immunity logic FZ/30-Series
Circuit blocks 40-Series and CSA70
Counter modules 50-Series
Norbits 60-Series, 61-Series
Circuit blocks 90-Series
Input/output devices
Electro-mechanical components
Peripheral devices

Part 2a Resistors — **September 1974**

Fixed resistors
Variable resistors
Voltage dependent resistors (VDR)
Light dependent resistors (LDR)
Negative temperature coefficient thermistors (NTC)
Positive temperature coefficient thermistors (PTC)
Test switches

Part 2b Capacitors — **November 1974**

Electrolytic and solid capacitors
Paper capacitors and film capacitors
Ceramic capacitors
Variable capacitors

Part 3 Radio, Audio, Television — **February 1975**

FM tuners
Loudspeakers
Television tuners, aerial input assemblies
Components for black and white TV
Components for colour television
*)

Part 4a Soft ferrites — **April 1975**

Ferrites for radio, audio and television
Beads and chokes
Ferroxcube potcores and square cores
Ferroxcube transformer cores

Part 4b Piezoelectric ceramics, Permanent magnet materials — **May 1975**

Part 5 Ferrite core memory products — **January 1974**

Ferroxcube memory cores
Matrix planes and stacks
Core memory systems

Part 6 Electric motors and accessories — **March 1974**

Small synchronous motors
Stepper motors
Miniature direct current motors

Part 7 Circuit blocks — **September 1971**

Circuit blocks 100 kHz-Series
Circuit blocks-1-Series
Circuit blocks 10-Series
Circuit blocks for ferrite core memory drive

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*) Deflection assemblies for camera tubes are now included in handbook series "Electron tubes", Part 5b.

Plumbicon tubes

SURVEY PLUMBICON* TUBES

Abbreviations used in the tables:

- **Photoconductive layer**

S	= standard	cut-off ≈ 650 nm
SHR	= special high resolution	cut-off ≈ 650 nm
ER	= with extended red response	cut-off ≈ 900 nm
ER(F)	= with extended red response and IR reflecting filter on anti-halation glass disc	cut-off ≈ 750 nm

- **Quality grade**

Br = broadcast

Ind = industrial

Med = medical

- **Applications**

B/W = for black and white cameras

L = for luminous channel of colour cameras

R = for red chrominance channel of colour cameras

G = for green chrominance channel of colour cameras

B = for blue chrominance channel of colour cameras

- **NOTES**

1) Without anti-halation glass disc.

2) With IR reflecting filter on anti-halation glass disc.

3) Integral mesh type. Heater current 95 mA at V_f = 6, 3 V.

4) With fibre-optic faceplate, anti-comet tail electron gun, and provisions for light bias.

5) Lens-coupled to X-ray image intensifier.

6) Without anti-halation glass disc: add suffix /01 to typenumber.

7) As rear-loading type to fit into AT1115/AT1119 coil units: add suffix /02 to typenumber.

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* Registered Trade Mark for television camera tube.

1 1/4 in dia. tubes, magnetic focusing and deflection, separate mesh construction. Heater current 300 mA at V_f = 6,3 V.												
Preferred types	length	photoconductor type	Quality grade			Applications						Notes
			Br	Ind	Med	B/W	L	R	G	B	Sc	
XQ1020	220	S	•			•	•	•	•	•		
XQ1021	220	S		•		•		•	•	•		
XQ1022	214	S			•	See note 5						1)
XQ1023	220	ER	•			•	•	•				
XQ1024	220	ER		•		•		•				
XQ1025	220	ER(F)	•			•	•	•				2)
XQ1026	220	ER(F)		•		•		•				
Maintenance types												
55875	220	S	•			•	•	•	•	•		3)
55875-IG	220	S		•		•		•	•	•		3)
55876	214	S			•	See note 5						1) 3)
XQ1230	214	S		•							•	4)
XQ1233	214	S		•							•	4)
5/8 in dia. tubes, electrostatic focusing, separate mesh construction. Heater current 300 mA at V_f = 6,3 V												
Maintenance types												
XQ1213	128	ER	•			•		•	•	•		
XQ1214	128	ER		•		•		•	•	•		

1 in dia. tubes, magnetic focusing and deflection, separate mesh construction. Heater current 95 mA at Vf = 6,3 V.												
Preferred types front loading	Special Versions	length	photoconductor type	Quality grade			Applications					Notes
				Br	Ind	Med	B/W	L	R	G	B	
XQ1070	6) 7)	163	SHR	•			•	•	•	•	•	
XQ1071	6) 7)	163	SHR		•		•		•	•	•	
XQ1072		158	SHR			•	See note 5					1)
XQ1073	6) 7)	163	ER	•			•		•			
XQ1074	6) 7)	163	ER		•		•		•			
XQ1075	6) 7)	163	ER(F)	•			•		•			2)
XQ1076	6) 7)	163	ER(F)		•		•		•			2)

1 in dia. tubes, magnetic focusing and deflection, separate mesh construction, anti-comet electron gun, provisions for light bias. Heater current 95 mA at Vf = 6,3 V.												
rear loading	front loading											
XQ1080	XQ1090	163	SHR	•			•	•	•	•	•	
XQ1081	XQ1091	163	SHR		•		•		•	•	•	
	XQ1100 1)	158	SHR	•			•	•	•	•	•	
	XQ1101 1)	158	SHR		•		•		•	•	•	
	XQ1102 1)	158	SHR				See note 5					
XQ1083	XQ1093	163	ER	•			•		•			
XQ1084	XQ1094	163	ER		•		•		•			
XQ1085	XQ1095	163	ER(F)	•			•		•			2)
XQ1086	XQ1096	163	ER(F)		•		•		•			2)
	XQ1103 1)	158	ER	•			•		•			
	XQ1104 1)	158	ER		•		•		•			

ACCESSORIES FOR PLUMBICON* TUBES

		1 1/4 in dia. tubes (all magnetic)		1 in dia. tubes (all magnetic)				5/8 in dia.tubes (hybrid)
		standard types	fibre optic ACT light bias	standard types	/02 versions	ACT + lightbias types		
		rear loading		front loading	rear loading	rear loading	front loading	rear loading
coil unit	bl/wh	AT1132/03		AT1102/01 AT1103 AT1116	AT1119/01		AT1116/06	AT1117
	colour	AT1113/01		AT1116/06	AT1115/01		AT1116/06	
socket		56021	56025	56098		56026		56047
light bias lamp			56027			56027		
mask		56029		56028				

*) Registered Trade Mark for television camera tube.

GENERAL NOTES PLUMBICON* TUBES

1. During transport, handling and storage the axis of the Plumbicon must be either vertical, with faceplate up, or horizontal: the faceplate should be covered with the hood provided.

2. To avoid damage to the basepins, the Plumbicon should be inserted into its socket with care. Shocks, undue force, and bending loads on the pins are to be avoided.

3. During long-term storage the ambient temperature should not exceed 30 °C

4. In isolated cases the properties of a Plumbicon may deteriorate slightly when it is kept idle for long periods such as may occur:
   - between the factory's pre-shipment test and the actual delivery to the customer;
   - between receipt of the tube and its installation;
   - when the camera is not used for a long time.

   Although the chances of such deterioration are remote it is advisable to operate the tubes for some hours at intervals not more than 4 weeks apart.

   The following procedure and conditions are recommended:
   - Set grid no. 1 bias control to maximum negative bias (beam cut-off).
   - Allow a heating-up time of the cathode of at least 1 minute before turning up the grid no. 1 bias control to produce a beam.
   - Set scanning amplitudes to overscan condition.
   - Apply an even illumination to the target to obtain a signal current of approx. 0, 15 μA and adjust the beam current for correct stabilization.

5. The signal electrode connection is made by a spring contact, which is part of the focusing coil assembly, and is kept pressed against the signal electrode ring.

6. Electrostatic shielding of the signal electrode is required to avoid interference effects in the picture. Effective shielding is provided by one grounded shield inside the focusing coil at the faceplate end, and one inside the deflecting yoke.

7. The light transfer characteristic of the Plumbicon tube having a gamma near unity, it may be desirable to incorporate a gamma correcting circuitry in the video-amplifier system with an adjustable gamma of 0, 5 to 1.

   The Plumbicon tube not generating noise to any noticeable extent, the signal-to-noise ratio will be determined mainly by the input noise of the video amplifier system. The high sensitivity of the Plumbicon tube warrants pictures with excellent signal-to-noise ratio under normal lighting conditions provided its output is fed into a well-designed input stage of the video-amplifier system. In such a system an aperture correction may be incorporated to ensure an attractive gain in resolving power without visually impairing the signal-to-noise ratio.

INSTRUCTIONS FOR USE are packed with each tube.

More comprehensive "General notes" are in preparation.

* Registered Trade Mark for television camera tube.

RATING SYSTEM

ABSOLUTE MAXIMUM RATING SYSTEM

Absolute maximum ratings are limiting values of operating and environmental conditions applicable to any electronic device of a specified type as defined by its published data, which should not be exceeded under the worst probable conditions.

These values are chosen by the device manufacturer to provide acceptable serviceability of the device, taking no responsibility for equipment variations, environmental variations, and the effects of changes in operating conditions due to variations in the characteristics of the device under consideration and of all other electronic devices in the equipment.

The equipment manufacturer should design so that, initially and throughout life, no absolute maximum value for the intended service is exceeded with any device under the worst probable operating conditions with respect to supply voltage variation, equipment component variation, equipment control adjustment, load variations, signal variation, environmental conditions, and variations in characteristics of the device under consideration and of all other electronic devices in the equipment.

Spurious signal specification for Plumbicon* tubes

(with plain glass faceplate)

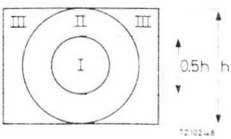
SECTION A

Test conditions

Spurious signal tests on Plumbicon tubes are carried out in the manufacturer's test channel under the following conditions:

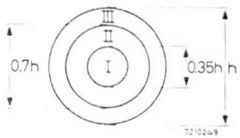
1. Light source: 2856 K colour temperature (broadcast and industrial tubes);
   P20 light distribution (tubes for medical X-ray equipment).
2. Filter: inserted in the light path for chrominance tubes (see published data for required filter characteristics).
3. Test transparency, back-illuminated, projected onto the target by means of a high quality lens, producing an even illumination on the specified scanned area.
   The test transparency has an aspect ratio of 3 : 4 for the evaluation of broadcast and industrial quality tubes. The area of the chart is divided into three quality zones by two concentric circles as shown in Fig. 1.

Fig. 1



The test transparency is of a circular shape for the evaluation of tubes for medical X-ray equipment. The area of the chart is divided into three quality zones by two concentric circles as shown in Fig. 2.

Fig. 2



4. The video amplifier frequency response is essentially flat to 5 MHz, with a sharp fall-off to 6 MHz.
5. No gamma correction or aperture correction are applied in the video amplifier.
6. The light level on the Plumbicon tube target is adjusted to produce a peak signal current I_s in accordance with Table I.
7. The electrical settings of the tube are in accordance with its published data and the "Instructions for use".
8. The beam current of the Plumbicon tube is adjusted to just stabilize a peak signal current of magnitude I_b in accordance with Table I.
9. Monitor. The obtained picture is observed on a monitor producing a non-blooming white.

*) Registered Trade Mark for TV camera tube.

Table I
I_s and I_b settings

			Tube diameter 30 mm ($1\frac{1}{4}$ in)		Tube diameter 25 mm (1 in)		Tube diameter 16 mm (5/8 in)	
			Scanned area 12,8 x 17,1 mm^2		Scanned area 9,6 x 12,8 mm^2		Scanned area 6 x 8 mm^2	
			I_s µA	I_b µA	I_s µA	I_b µA	I_s µA	I_b µA
Broadcast quality tubes	Black and white		0,30	0,60	0,2	0,4	0,15	0,30
	Luminance	L	0,30	0,60	0,2	0,4	0,15	0,30
	Chrominance tubes	Red R	0,15	0,30	0,1	0,2	0,075	0,15
		Green G	0,30	0,60	0,2	0,4	0,15	0,30
		Blue B	0,15	0,30	0,1	0,2	0,075	0,15
Industrial quality tubes	Black and white		0,30	0,60	0,2	0,4	0,15	0,15
	Chrominance tubes	Red R	0,15	0,30	0,1	0,2	0,075	0,15
		Green G	0,30	0,60	0,2	0,4	0,15	0,30
		Blue B	0,15	0,30	0,1	0,2	0,075	0,15

		Scanned area [1]) 18 mm circular		Scanned area [1]) 16,2 mm circular	
X ray medical tubes (for use in combination with an X-ray image intensifier)	P20 light source				
		0,15	0,30	0,1	0,2

[1]) Scanning amplitude controls adjusted such that the circular quality area of the target is displayed on a standard monitor as a circular area with a diameter equal to the raster height.

SECTION B

Definition

Blemishes. Both spots (sharply defined) and smudges (with vague contours) are termed blemishes.
Blemishes are small areas producing uneven modulation of any signal current between black level (black current) and white level (peak signal current).

SECTION C

Broadcast quality tubes

The degrading effect caused by a blemish on the quality of the picture as observed on the monitor is expressed in its Spot Nuisance Value (S.N.V.).

The S.N.V. of a blemish is basically defined as the product of its size (measured in % of the picture height, with a special test transparency) and its contrast (or modulation depth) in % of the peak signal current produced by the circular area of the target, having a diameter of 5% of the picture height, which encircles this blemish.

The contrast is measured on a waveform oscilloscope provided with a line selector.

Tables II show which blemishes are to be neglected, because of their small size or contrast, and how the actual S.N.V. is determined per type of tube for dark and white blemishes (see also the addendum to this section).

Tables III define the maximum number of blemishes and the maximum sum of S.N.V.'s per tube type, per zone, and the total which are allowed.

Tubes with 30 mm or 25 mm diameter

Table II

		Black and white Luminance L Green G	Red R	Blue B
To be neglected	size	≤ 0,2 % 2)	≤ 0,2 % 2)	≤ 0,2 % 2)
	contrast	≤ 5 %	≤ 8 %	≤ 8 %
S.N.V. of	white blemish	2 x M.V. 3)	1 x M.V. 3)	
	dark blemish	1 x M.V. 3)		
Max. S.N.V.	per blemish	20	20	20

Table III

	bl/wh, L, G, R 4)				B 4)			
Zone	I	II	III	tot.	I	II	III	tot.
Max. number	0	2	3	4	1	3	4	6
Max. sum of S.N.V. 5)	0	30	50	60	20	45	80	90

Tubes with 16 mm diameter

Table II 1)

		Black and white Green G	Red R	Blue B
To be neglected	size	≤ 0,2 % 2)	≤ 0,2 % 2)	≤ 0,2 % 2)
	contrast	≤ 6 %	≤ 8 %	≤ 10 %
S.N.V. of	white blemish	2 x M.V. 3)	1 x M.V. 3)	
	dark blemish	1 x M.V. 3)		
Max. S.N.V.	per blemish	20	20	20

Notes see page 4

Table III	Black and white [4] Green G				Red R [4]				Blue B [4]			
Zone	I	II	III	tot.	I	II	III	tot.	I	II	III	tot.
Max. number	1	2	3	4	1	3	4	6	2	4	6	8
Max. sum of S.N.V. [5]	10	30	50	60	15	45	80	100	20	50	90	110

Notes

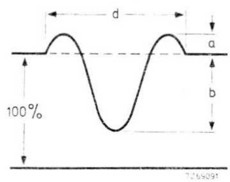
1. No blemishes > 0,2% shall be visible when the lens is capped.
2. Blemishes of this size are not counted unless their concentration causes a smudged appearance. Such concentrations are evaluated as blemishes and as contrast, the average contrast of the concentration is taken.
3. M.V. = measured value (size x contrast).
4. The minimum distance as measured in any direction between any two blemishes with S.N.V. $\geq$ 10 shall be 5% of picture height.
5. Arithmetic sum of individual S.N.V.'s.

ADDENDUM

Black blemishes with a white surrounding and white blemishes with a black core.

On the oscilloscope the general shape of such a blemish will be as shown in Fig. 3.

Fig. 3



To determine the S.N.V. the blemish shall be considered to be either a black blemish (S.N.V. = b x d), or a white blemish (S.N.V.= 1 x a x d, or 2 x a x d, in accordance with Tables II).

The highest value is taken as S.N.V. of the blemish.

SECTION D

Industrial quality tubes

Number, size, and location of blemishes allowed. [1)]

Dimensions of blemishes in % of picture height	Permitted number of blemishes			
	Zone I	Zone II	Zone III	Total
≤ 2% but > 1% [2)]	0	1	2	2
≤ 1% but > 0, 7%				
≤ 0, 7% but > 0, 45%	1	2	4	4
≤ 0, 45% but > 0, 2%	2	4	6	6
≤ 0, 2%	[3)]	[3)]	[3)]	[3)]
Total permitted number of blemishes	2	4	6	6 [4)]

Notes

1. Blemishes with contrast ≤ 10% shall not be counted.
2. Blemishes of these dimensions are not allowed when their contrast exceeds 20%.
3. Blemishes of this size are not counted unless their concentration causes a smudged appearance. Such concentrations are evaluated as blemishes and as contrast, the average contrast of the concentration is taken.
4. The distance between any two blemishes with dimensions > 0, 45% shall be greater than 5% of picture height as measured in any direction.

SECTION E

Tubes for medical X-ray equipment

Number, size, and location of blemishes allowed [1]

Dimensions of blemishes in % of picture height	Permitted number of blemishes		
	Zone I	Zone II	Zone III
> 0,7%	0	0	0
≤ 0,7% but > 0,45%	0	1	3
≤ 0,45% but > 0,2%	2	3	6
≤ 0,2%	[2]	[2]	[2]
Total permitted number of blemishes	2	6	

Notes

1. Blemishes with contrast ≤ 6% (if black) and ≤ 3% (if white) are neglected.
2. Blemishes of this size are not counted unless their concentration causes a smudged appearance. Such concentrations are evaluated as blemishes and as contrast, the average contrast of the concentration is taken.

CAMERA TUBE

Plumbicon *, sensitive high-definition pick-up tube with photoconductive target and low velocity stabilization.
The XQ1020 is intended for use in black and white, the L, R, G, and B versions for use in four and three tube colour studio cameras.

QUICK REFERENCE DATA			
Focusing	magnetic		
Deflection	magnetic		
Diameter	approx.	30	mm
Heater	6,3 V ,	300	mA

OPTICAL

Dimensions of quality rectangle on photoconductive layer (aspect ratio 3:4)	12,8 mm x 17,1 mm	1)
Orientation of image on photoconductive layer	by means of mark on tube base	2)
Sensitivity at colour temperature of illumination = 2856 K		
type : XQ1020, XQ1020L	400 μA/lm	3)
XQ1020R	85 μA/lm	3)
XQ1020G	165 μA/lm	3)
XQ1020B	38 μA/lm	3)
Gamma of transfer characteristic	0,95 ± 0,05	4)
Spectral response; max. response at	≈ 500 nm	
cut-off at	≈ 650 nm	
response curve	see page 8	

HEATING

Indirect by a.c. or d.c. ; parallel supply

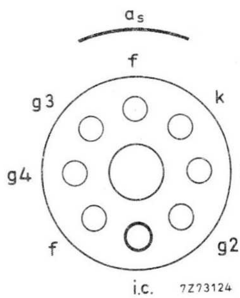
Heater voltage	V_f	6,3	V
Heater current	I_f	300	mA

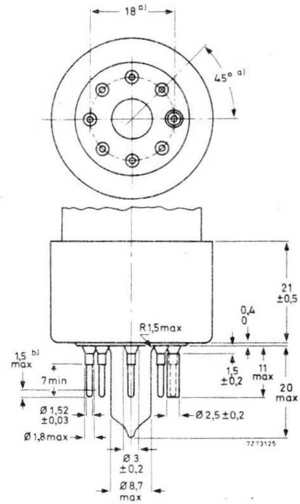
* Registered Trade Mark for T V camera tube

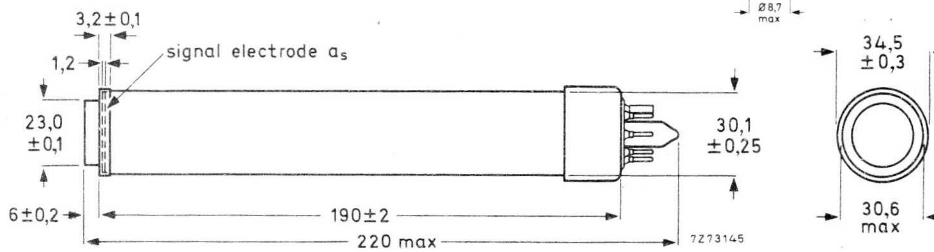
Notes: see page 6

MECHANICAL DATA Dimensions in mm

Distance between axis of anti-reflection glass disc and geometrical centre of signal electrode ring, measured in plane of faceplate: max. 0, 2 mm.
Total glass thickness: 7, 2 ± 0, 2 n = 1, 5







a) The base passes a flat gauge with a centre hole 9, 00 ± 0, 01 ϕ and holes for passing the pins with the following diameters: 7 holes of 1, 750 ± 0, 005 ϕ and one hole of 3, 000 ± 0, 005 ϕ. The holes may deviate max. 0, 01 from their true geometrical position. tickness of gauge 7 mm.

b) The ends of the pins are tapered and/or rounded but not brought to a sharp point.

Mounting position: Any

Net mass : ≈ 100 g

ACCESSORIES

Socket	type 56021
Focusing and deflection coil assembly	
for XQ1020	type AT1132 or 3122 108 68300
for XQ1020L, R, G, B	type AT1112 or type AT1113/01

For optimal screening of the target from the live end of the line deflection coils the use of 3122 108 68300 or AT1113/01 is recommended.

CAPACITANCE

Signal electrode to all	C_{as}	max.	3 to 6	pF	5)

FOCUSING magnetic 6)

DEFLECTION magnetic 6)

CHARACTERISTICS

Grid no. 1 voltage for cut-off at V_{g2} = 300 V	V_{g1}		−30 to −100	V	7) 8)
Blanking voltage, peak to peak on grid no. 1	V_{g1p-p}		50 ± 10	V	
on cathode	V_{kp-p}		25	V	
Grid no. 2 current at normally required beam currents	I_{g2}	≤	1	mA	
Dark current at V_{as} = 45 V	I_{as}	≤	0,003	μA	

LIMITING VALUES (Absolute max. rating system)

Signal electrode voltage	V_{as}	max.	50	V	8)
Grid no. 4 voltage	V_{g4}	max.	1100	V	8)
Grid no. 3 voltage	V_{g3}	max.	800	V	8)
Voltage between grid no. 4 and grid no. 3	$V_{g4/g3}$	max.	350	V	8)
Grid no. 2 voltage	V_{g2}	max.	350	V	8)
Grid no. 2 dissipation	W_{g2}	max.	1	W	
Grid no. 1 voltage, positive	V_{g1}	max.	0	V	
negative	$-V_{g1}$	max.	125	V	
Cathode heating time before drawing cathode current	T_h	min.	1	min.	
Cathode to heater voltage, positive peak	V_{kf_p}	max.	50	V	
negative peak	$-V_{kfp}$	max.	50	V	
Ambient temperature, storage and operation	t_{amb}	max.	50	°C	
		min.	−30	°C	
Faceplate temperature, storage and operation	t	max.	50	°C	
		min.	−30	°C	
Faceplate illumination		max.	500	lx	9)

Notes: see page 6

OPERATING CONDITIONS AND PERFORMANCE

Conditions

Cathode voltage	V_k	0 V	
Grid no. 2 voltage	V_{g2}	300 V	
Signal electrode voltage	V_{a_s}	45 V	10)
Beam current	I_b	See note 11	
Focusing coil current at given values of grid no. 4 and grid no. 3 voltages		See note 12	
Line coil current and frame coil current		See note 12	
Faceplate illumination		See notes 13 and 14	
Faceplate temperature	t	20 to 45 °C	

Performance

Resolution

Modulation depth i.e. uncompensated horizontal amplitude response at 400 TV lines, at centre of picture.

The figures shown represent the typical horizontal amplitude response of the tube as obtained with a lens aperture of f 5, 6 15)

		XQ1020 XQ1020L	XQ1020R	XQ1020G	XQ1020B
Highlight signal current	I_s	0, 3 μA	0, 15 μA	0, 3 μA	0, 15 μA
Beam current	I_b	0, 6 μA	0, 3 μA	0, 6 μA	0, 3 μA
Modulation depth at 400 TV lines		40 %	35 %	40 %	50 %

Limiting resolution ≥ 600 TV lines

Lag (typical values)

Light source with a colour temperature of 2856 K.
Appropriate filter inserted in the light path for the chrominance tubes R, G, and B.

Notes : see page 6.

Low-key conditions

	build-up lag 16)				decay-lag 17)			
	Is/Ib = 20/300 nA		Is/Ib = 40/600 nA		Is/Ib = 20/300 nA		Is/Ib = 40/600 nA	
	60 ms	200 ms	60 ms	200 ms	60 ms	200 ms	60 ms	200 ms
XQ1020 XQ1020L XQ1020G			95	≈ 100			9	3
XQ1020R	85	≈100			12	3, 5		
XQ1020B	70	≈100			14, 5	5		

	build-up lag 16)				decay-lag 17)			
	Is/Ib = 150/300 nA		Is/Ib = 300/600 nA		Is/Ib = 150/300 nA		Is/Ib = 300/600 nA	
	60 ms	200 ms	60 ms	200 ms	60 ms	200 ms	60 ms	200 ms
XQ1020 XQ1020L XQ1020G			99	100			1, 2	0, 4
XQ1020R	98	100			2	0, 5		
XQ1020B	97	100			3, 5	2		

Notes: see page 6

NOTES

1) Underscanning of the specified useful target area of 12,8 mm x 17,1 mm, or failure of scanning, should be avoided since this may cause damage to the photoconductive layer.

2) For correct orientation of the image on the photoconductive layer the vertical scan should be essentially parallel to the plane passing through the mark on the tube base.

3) Measuring conditions:

Illumination 4,54 lx at black body colour temperature of 2856 K; the appropriate filter inserted in the light path. The signal current obtained in nA is a measure of the colour sensitivity expressed in μA per lumen of white light before the filter.
Filters used:

XQ1020R	Schott	OG570	thickness	3 mm
XQ1020G	Schott	VG9	thickness	1 mm
XQ1020B	Schott	BG12	thickness	3 mm

See page 8 for transmission curves.

4) The use of gamma-stretching circuitry is recommended.

5) The capacitance C_{as} to all, which effectively is the output impedance, increases when the tube is inserted into the deflecting/focusing coil assembly.

6) For focusing/deflection coil assembly, see under "Accessories".

7) Without blanking voltage on grid no. 1.

8) At $V_k = 0$ V.

9) For short intervals. During storage the tube shall be covered with the plastic hood provided; when the camera is idle the lens shall be capped.

10) The signal electrode voltage shall be adjusted to 45 V. To enable the tube to handle excessive highlights in the scene to be televised the signal electrode voltage may be reduced to a minimum of 25 V, this will, however, result in some reduction in performance.

11) The beam current I_b, as obtained by adjusting the control grid (grid no. 1) voltage is set to 300 nA for R and B tubes, 600 nA for black and white, L and G tubes.

I_b is not the actual 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 hence 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 on the scanned area. The peak signal currents as measured on a wave-form oscilloscope will be a factor α larger.
($\alpha = \frac{100}{100 - \beta}$, β being the total blanking time in %, for the CCIR system α amounts to 1,33).

12)

	Focus current * mA	Line current$_{pp}$ mA	Frame current$_{pp}$ mA
Black and white coil assembly AT1132, AT1132/01	25	235	35
Colour coil assemblies AT1112, AT1113/01	100	235	35

(approx. values)

* Adjusted for correct electrical focus. The direction of the focusing current shall be such that a north-seeking pole is repelled at the image end of the focusing coil.

13) Typical faceplate illumination level for the XQ1020 and XQ1020L to produce 0,3 μA signal current will be approx. 4 lx. The signal currents stated for the colour tubes XQ1020R, G, B respectively will be obtained with an incident white level (2856 K) on the filter of approx. 10 lx. These figures are based on the filters described in note 3, for filter BG12 however a thickness of 1 mm is chosen.

14) In the case of a black/white camera the illumination on the photoconductive layer, B_{ph}, is related to scene illumination, B_{sc}, by the formula:

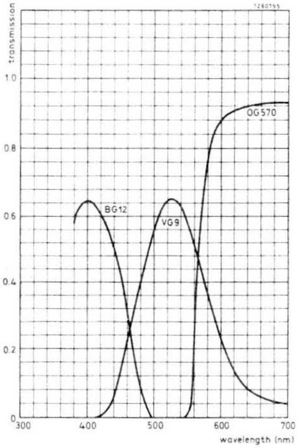
$$B_{ph} = B_{sc} \frac{R.T.}{4F^2 (m+1)^2}$$

in which R represents the average scene reflectivity or the object reflectivity, whichever is relevant, T the lens transmission factor. F the lens aperture, and m the linear magnification from scene to target.
A similar formula may be derived for the illumination level on the photoconductive layers of the R, G, and B tubes in which the effects of the various components of the complete optical system have been taken into account.

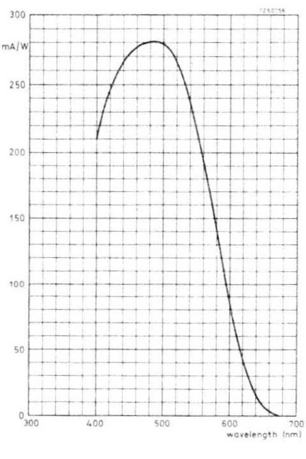
15) The horizontal amplitude response can be raised by the application of suitable correction circuits, which affects neither the vertical resolution, nor the limiting resolution.

16) After 10 s of darknes. The figures given represent typical percentages of the ultimate signal current obtained 60 ms respectively 200 ms after the illumination has been applied.

17) After a minimum of 5 s of illumination on the target. The figures given represent typical residual signal in percents of the original signal current 60 ms respectively 200 ms after the illumination has been removed.



Transmission of filters
BG 12, VG9 and OG570
See note 3.



Typical spectral response curve.

CAMERA TUBE

Plumbicon*, sensitive pick-up tube with lead oxide photoconductive target and low velocity stabilization. Provided with sepatate mesh construction.

The tubes of this series are mechanically and electrically identical to the tubes of the XQ1020 series, the only difference being the degree of freedom from blemishes of the photoconductive target.

The tubes are intended for industrial and educational black and white and colour cameras. The series comprises the following versions:

XQ1021	for black and white cameras
XQ1021R XQ1021G XQ1021B	for use in the chrominance channels of colour cameras

For all further information see data of the XQ1020 series.

* Registered Trade Mark for TV camera tube.

CAMERA TUBE

Plumbicon *, sensitive high definition pick-up tube with lead-oxide photoconductive target and low velocity stabilisation.
Provided with separate mesh construction.
The XQ1022 is exclusively intended for use with X-ray image intensifiers in medical equipment.

QUICK REFERENCE DATA			
Focusing	magnetic		
Deflection	magnetic		
Diameter	approx.	30	mm
Heater	6,3 V,	300	mA
Without anti-halation glass disc			

OPTICAL

Dimensions of quality area on photoconductive layer	circle of 18 mm diameter [1] [2]		
Orientation of image on photoconductive layer	by means of mark on tube base [2]		
Sensitivity, measured with a fluorescent light source having P_{20} distribution		275	μA/lumen
Gamma of transfer characteristic		0,95 ± 0,05	[3]
Spectral response; max. response at	≈	500	nm
cut-off at	≈	650	nm
response curve	see Fig. 1		

HEATING

Indirect by a.c. or d.c.; parallel supply

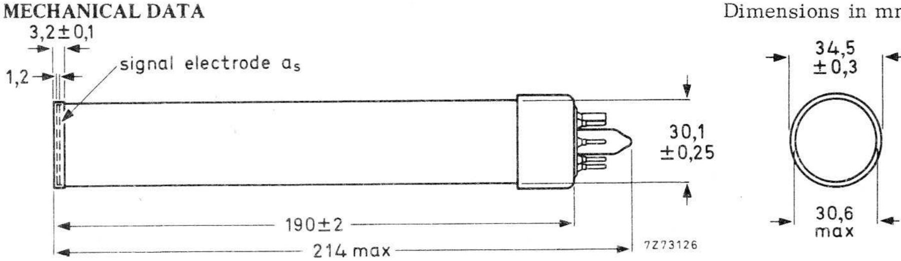
Heater voltage	V_f	6,3	V ± 5%
Heater current	I_f	300	mA

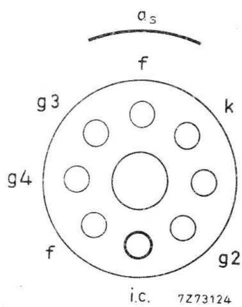
* Registered Trade Mark for TV Camera tube

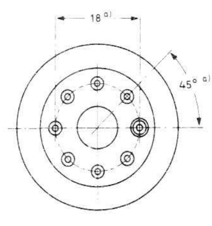
Notes see page 5

MECHANICAL DATA

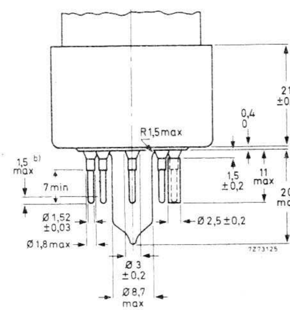
Dimensions in mm







bottom view



a) The base passes a flat gauge with a centre hole 9,00 ± 0,01 ϕ and holes for passing the pins with the following diameters: 7 holes of 1,750 ± 0,005 ϕ and one hole of 3,000 ± 0,005 ϕ. The holes may deviate max. 0,01 from their true geometrical position. Thickness of gauge 7 mm.

b) The ends of the pins are tapered and/or rounded but not brought to a sharp point.

Mounting position: any

Net mass : ≈ 100 g

ACCESSORIES

Socket	type 56021
Focusing and deflection coil assembly	AT1122, AT1132, AT1132/01 [4]

CAPACITANCE

Signal electrode to all C_{as} 3 to 6 pF [5]

FOCUSING magnetic [6]

DEFLECTION magnetic [6]

Notes: see page 5

CHARACTERISTICS

Grid no. 1 voltage for cut-off at V_{g_2} = 300 V	V_{g_1}		-30 to -100	V	7) 8)
Blanking voltage, peak to peak on grid no. 1	$V_{g_{1p-p}}$		50 ± 10	V	
on cathode	$V_{k_{p-p}}$		25	V	
Grid no. 2 current at normally required beam currents	I_{g_2}		1	mA	
Dark current	I_{a_s}		3	nA	*)

LIMITING VALUES (Absolute max. rating system)

Signal electrode voltage	V_{a_s}	max.	50	V	8)
Grid no. 4 voltage	V_{g_4}	max.	1100	V	8)
Grid no. 3 voltage	V_{g_3}	max.	800	V	8)
Voltage between grid no. 4 and grid no. 3	V_{g_4/g_3}	max.	350	V	8)
Grid no. 2 voltage	V_{g_2}	max.	350	V	8)
Grid no. 2 dissipation	W_{g_2}	max.	1	W	
Grid no. 1 voltage, positive	V_{g_1}	max.	0	V	
negative	$-V_{g_1}$	max.	125	V	
Cathode heating time before drawing cathode current	T_h	min.	1	min	
Cathode to heater voltage, positive peak	V_{kf_p}	max.	50	V	
negative peak	$-V_{kf_p}$	max.	50	V	
Ambient temperature, storage and operation	t_{amb}	max.	50	^oC	
		min.	-30	^oC	
Faceplate temperature, storage and operation	t	max.	50	^oC	
		min.	-30	^oC	
Faceplate illumination		max.	500	lx	9)

*) Target voltage adjusted to the value indicated by the tube manufacturer in the test sheet as delivered with each individual tube.

Notes: see page 5

OPERATING CONDITIONS AND PERFORMANCE

Conditions

Cathode voltage	V_k	0	V
Grid no. 2 voltage	V_{g2}	300	V
Grid no. 3 voltage	V_{g3}	600	V
Grid no. 4 voltage	V_{g4}	675	V
Signal electrode voltage	V_a	15-45	V [11])
Beam current	I_b	See note 12	
Focusing coil current Line coil current and frame coil current		See note 13	
Highlight signal electrode current	I_{a_s}	0,1 to 0,5	μA
Average signal output		≈ 0,06	μA [14])
Faceplate temperature	t	25 to 45	°C
Faceplate illumination		≈ 2	lx [15])

Performance

Resolution

Modulation depth, i.e. uncompensated horizontal amplitude response at 5 MHz (625 lines, 50 field system) in picture centre	> 30	% [16]) [17])

Decay (or lag)

Measured with 100% video signal current of 0,1 μA which has been flowing through the layer for a minimum of 5 s. Beam adjusted for correct stabilisation. Fluorescent light source having P_{20} distribution.

Residual signal after dark pulse of 60 ms	< 10 %	typ. 5 %
Residual signal after dark pulse of 200 ms	< 4 %	typ. 2 %

Notes: see pages 5 and 6

NOTES

1) All underscanning of the specified useful target area of 18 mm diameter or failure of scanning should be avoided since this may cause permanent damage to the photoconductive layer.
The area beyond the 18 mm optical image preferably to be covered by a mask.

2) For correct orientation of the image on the photoconductive layer the vertical scan should be essentially parallel to the plane passing through the tube axis and the mark on the tube base.

3) The near unity gamma of the XQ1022 ensures good contrast when televising low contrast X-ray image-intensifier pictures as encountered in radiology. Further contrast improvement may be obtained when an adjustable gamma expansion circuitry is incorporated in the video amplifier system.

4) For optimal screening of the target from the live end of the deflection coils the use of AT1132/01 is recommended.

5) C_{as} which effectively is the output impedance, increases when the tube is inserted into the deflection/focusing coil assembly.

6) See "Accessories".

7) With no blanking voltage on g_1.

8) At V_k = 0V

9) For short intervals. During storage the tube face shall be covered with the plastic hood provided.

10) The optimum voltage ratio V_{g4}/V_{g3} depends on the type of focusing/deflection coil used: for types AT1112, AT1132, AT1132/01 a ratio of 1, 1 : 1 to 1, 5 : 1 is recommended.

11) The target voltage should be adjusted to the value indicated by the tube manufacturer on the test sheet accompagnying each tube.

12) Operation of the tube with beam currents I_b not sufficient to stabilize the brightest picture elements must be carefully avoided to prevent loss of highlight detail and/or "sticking" effects. The incorporation of a separate mesh construction allows excess beam currents I_b up to 0, 6 μA to be applied without appreciable loss in resolution.

13) For AT1122, AT1132, AT1132/01, at V_{g3} = 600 V, V_{g4} = 675 V

* Focus current	25	mA	
Line deflection current, p-p	250	mA	for 18 mm x 18 mm scanning
Frame deflection current, p-p	50	mA	

* Adjusted for correct electrical focus. The direction of the focusing current shall be such that a north-seeking pole is repelled at the image end of the focusing coil.

14) Substraction of the dark current is unnecessary because of the extremely low value.

15) In the case of a black/white camera the illumination of the photoconductive layer, B_{ph}, is related to scene illumination, B_{sc}, by the formula:

$$B_{ph} = B_{sc} \frac{R.T.}{4F^2 (m+1)^2}$$

in which R represents the average scene reflectivity or the object reflectivity, whichever is relevant, T the lens transmission factor, F the lens aperture, and m the linear magnification from scene to target.

16) With a signal current of 0, 1 μA and a beam current of 0, 5 μA.

17) Horizontal amplitude response can be raised by the application of aperture correction. Such compensation, however, does not affect the vertical resolution, nor does it influence the limiting resolution.

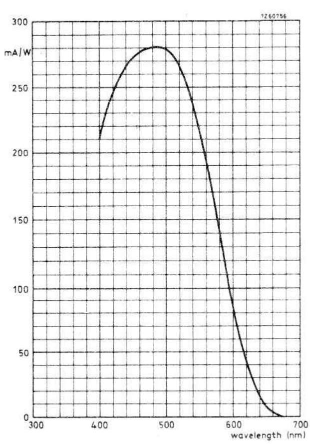


Fig. 1 Spectral response curve

CAMERA TUBE

Plumbicon *, sensitive pick up tube, with lead-oxide photoconductive target with extended red response and high resolution.
Low velocity target stabilization. Provided with separate mesh construction for good uniformity of signal and resolution and good highlight handling.
The XQ1023 is intended for use in black and white cameras, the XQ1023L for use in the luminance channel of four tube colour cameras, the XQ1023R for use in the red channel of both three and four tube colour cameras.

QUICK REFERENCE DATA			
Focusing	magnetic		
Deflection	magnetic		
Diameter	≈	30	mm
Heater	6,3 V,	300	mA
Spectral response, cut-off	>	850	nm
Provided with anti-halation glass disc			

OPTICAL

Dimensions of quality rectangle on target (aspect ratio 3 : 4) — 12,8 x 17,1 mm [1]

Orientation of image on target — by means of mark on tube base. [2]

Sensitivity (colour temperature of light source 2856 K)

	notes	XQ1023	XQ1023L	XQ1023R
white	[3], [4]	450 μA/lmF	450 μA/lmF	
red	[5]			150 μA/lmF

Gamma of transfer characteristic — 0,95 ± 0,05 [6]

Spectral response — See page 8
max. response at — ≈ 500 nm

* Registered Trade Mark for TV camera tube.

Notes: see page 6

HEATING

Indirect by a.c. or d.c.; parallel supply

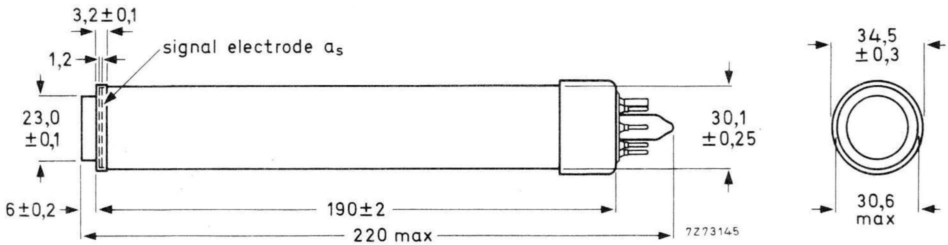
Heater voltage	V_f	6,3 V ± 5%
Heater current	I_f	300 mA

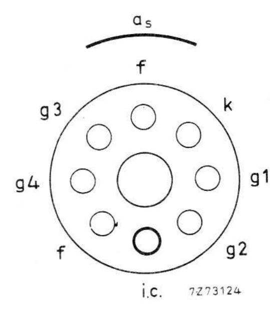
MECHANICAL DATA

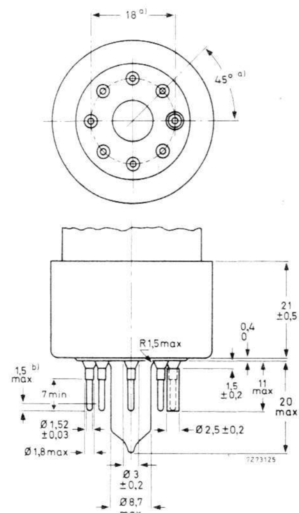
Dimensions in mm

Distance between axis of anti-reflection glass disc and geometrical centre of signal electrode ring, measured in plane of faceplate: max. 0,2 mm.

total glass thickness: 7,2 ± 0,2 n = 1,5.







Mounting position: any

Net mass : ≈ 100 g

a) The base passes a flat gauge with a centre hole 9,00 ± 0,01 Ø and holes for passing the pins with the following diameters: 7 holes of 1,750 ± 0,005 Ø and one hole of 3,000 ± 0,005 Ø.
The holes may deviate max. 0,01 from their true geometrical position. Thickness of gauge 7 mm.

b) The ends of the pins are tapered and/or rounded but not brought to a sharp point.

ACCESSORIES

Socket	type 56021			
Focusing and deflection coil assembly for XQ1023	AT1132, AT1132/01 [7]			
for XQ1023L, XQ1023R	AT1112 AT1113 AT1113/01 [7]			

CAPACITANCES

Signal electrode to all	C_a		3 to 6	pF [8]

FOCUSING magnetic [9]

DEFLECTION magnetic [9]

CHARACTERISTICS

Grid no. 1 voltage for cut-off at V_{g2} = 300 V	V_{g1}		−30 to −100	V [10]
Blanking voltage peak to peak on grid no. 1	V_{g1pp}		50 ± 10	V
on cathode	V_{kpp}		25	V
Grid no. 2 current at normally required beam currents	I_{g2}	max.	1	mA
Dark current at V_{a_s} = 45 V	I_{a_s}	max.	0,003	µA

LIMITING VALUES (Absolute max. rating system)

Signal electrode voltage	V_{a_s}	max.	50	V [11]
Grid no. 4 voltage	V_{g4}	max.	1100	V [11]
Grid no. 3 voltage	V_{g3}	max.	800	V [11]
Potential difference between grid no. 4 and no. 3	$V_{g4/g3}$	max.	350	V
Grid no. 2 voltage	V_{g2}	max.	350	V [11]
Grid no. 2 dissipation	W_{g2}	max.	1	W
Grid no. 1 voltage positive	V_{g1}	max.	0	V
negative	$-V_{g1}$	max.	125	V
Cathode to heater voltage, positive peak	V_{kf_p}	max.	50	V
negative peak	$-V_{kf_p}$	max.	50	V
Cathode heating time before drawing cathode current	T_h	min.	1	min [12]

Ambient temperature, storage and operation	t_{amb}	max.	50	°C	
		min.	−30	°C	
Faceplate temperature, storage and operation	t	max.	50	°C	
		min.	−30	°C	
Faceplate illumination		max.	100	lx	[13]

OPERATING CONDITIONS AND PERFORMANCE

Conditions

Cathode voltage	V_k	0	V	
Grid no. 2 voltage	V_{g2}	300	V	
Signal electrode voltage	V_{a_s}	45	V	[14]
Grid no. 3 voltage	V_{g3}	600	V	
Grid no. 4 voltage	V_{g4}	675	V	
Beam current	I_b	see note [16]		
Focusing coil current		see note [15]		
Line and frame deflection coil current		see note [15]		
Faceplate illumination		see note [17] and [18]		
Faceplate temperature		20 to 45	°C	

Performance

Resolution

Modulation depth, i.e. uncompensated horizontal amplitude response at 400 TV lines (note 19). The figures shown represent the typical horizontal amplitude response as obtained with a lens aperture of f 5,6 [16]

	XQ1023, XQ1023L	XQ1023R
Highlight signal current I_s	0,3 µA	0,3 µA
Beam current I_b	0,6 µA	0,6 µA
Picture centre	55%	[19]

Limiting resolution ≥ 700 TV lines

Lag (typical values)

Light source with a c.t. of 2856K, filter B_1/K_1 inserted in the light path for the black and white and L versions, filter OG570 additionally inserted for R version.

Notes: see pages 6, 7 and 8.

Low key conditions

	build-up lag [20]				decay-lag [21]			
	I_s/I_b = 40/600 nA		I_s/I_b = 20/300 nA		I_s/I_b = 40/600 nA		I_s/I_b = 20/300 nA	
	60 (ms)	200 (ms)	60 (ms)	200 (ms)	60 (ms)	200 (ms)	60 (ms)	200 (ms)
XQ1023, XQ1023L	85	100			14	3, 5		
XQ1023R			75	98			16	4, 5

High key conditions

	build-up lag [20]				decay lag [21]			
	I_s/I_b = 300/600 nA		I_s/I_b = 150/300 nA		I_s/I_b = 300/600 nA		I_s/I_b = 150/300 nA	
	60 (ms)	200 (ms)	60 (ms)	200 (ms)	60 (ms)	200 (ms)	60 (ms)	200 (ms)
XQ1023, XQ1023L	98	100			3	1, 5		
XQ1023R			96	100			5	2

Notes: see page 8

NOTES

1) Underscanning of the specified target area of 12, 8 x 17, 1 mm^2 or failure of scanning, should be avoided since this may cause damage to the photoconductive target.

2) For proper orientation of the image on the photoconductive layer the vertical scan direction should be parallel to the plane passing through the tube axis and the mark on the tube base.

3) All measurements are made with an infrared reflecting filter, Balzers, Calflex B1/K1 interposed between light source and target. For typical transmission curve of this filter see page 8.

4) Measured with 4, 54 lux on the specified target area, when the infrared absorbing filter is removed. The signal current obtained in nA equals the sensitivity in μA per filtered lumen (μA/lmF).

5) Measured as indicated in notes 3 and 4 but with additional filter interposed between light source and target. Filter used is : Schott, OG570(3 mm). For transmission curve see page 9.

6) The use of gamma-stretching circuitry is recommended.

7) For optimal screening of target from live end of line deflection coils type AT1113/01 and type AT1132/01 are recommended.

8) Capacitance C_{as} to all, which effectively is the output impedance, increases when the tube is inserted into the deflecting/focusing assembly.

9) For focusing/deflecting coil assembly, see under "Accessories"

10) With no blanking voltage on g_1.

11) At $V_K = 0$ V.

12) A minimum of 1 minute heating-up time for the heater is to be observed before drawing cathode current.

13) For short intervals. During storage and idle periods of the camera the tube-face shall be covered with the plastic hood provided, respectively the lens be capped.

14) The signal electrode voltage shall be adjusted to 45 V. To compete with excessive highlights in the scene to be televised the signal electrode voltage may be reduced to a minimum of 25 V, this will however result in some reduction in performance.

		* focus current mA	line deflection current mA_{pp}	frame deflection current mA_{pp}
15) Black and white coil assemblies AT1132, AT1132/01 V_{g3} = 600 V V_{g4} = 675 V	approx.	25	235	35
Colour assemblies AT1112, AT1113, AT1113/01 V_{g3} = 600 V V_{g4} = 675 V	approx.	100	235	35

* Adjusted for correct electrical focus.
The direction of the current through the focusing coil should be chosen such that a north seeking pole will be repelled at the faceplate end of the coil.
The optimum voltage difference between grid no. 4 and grid no. 3 is depending on the type of focusing/deflection assembly used.

16) The beam current I_b, as obtained by adjusting the control grid (grid no. 1) voltage is set to 300 nA for R-tubes, to 600 nA for black and white and L tubes.
I_b is not the actual 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 hence 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 on the scanned area. The peak signal currents as measured on a wave-form oscilloscope will be a factor α larger.

($\alpha = \frac{100}{100 - \beta}$, β being the total blanking time in %, for the CCIR system β amounts to 1, 33).

17) Faceplate illumination level for the XQ1023 and XQ1023L typically needed to produce 0, 3 μA signal current will be approx. 3 lux. The signal stated for the XQ1023R will be obtained with an incident light-level (2856 K) on the filter of approx. 10 lux.
The figures stated for modulation depth are based on the use of the filter described in note 5.

18) Illumination on the photo-conductive layer, B_{ph}, in the case of a black and white camera is related to scene illumination, B_{sc}, by the formula:

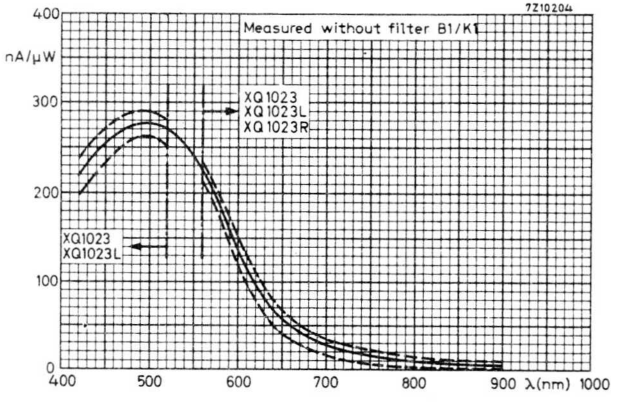
$$B_{ph} = B_{sc} \frac{R.T.}{4F^2 (m+1)^2}$$

in which R represents the scene-reflexivity (average or the object under consideration, whichever is relevant), T the lens transmission factor, F the lens aperture and m the linear magnification from scene to target.
A similar formula may be derived for the illumination level on the photo-conductive layer of the XQ1023L, XQ1023R tubes in which the effects of the various components of the complete optical system have been taken into account.

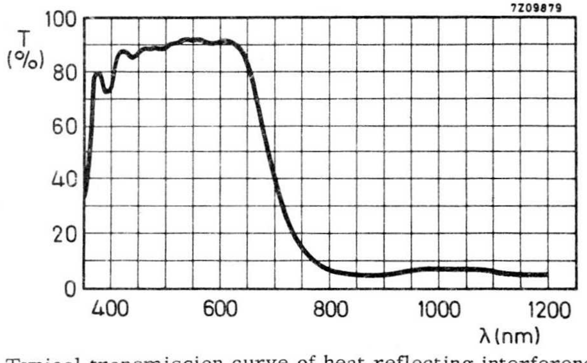
19) Horizontal amplitude response can be raised by the application of suitable correction circuits. Such compensation, however, does not affect vertical resolution, nor does it it influence the limiting resolution.

20) After 10 s of complete darkness. The figures given represent typical percentages of the ultimate signal current obtained 60 ms respectively 200 ms after the illumination has been applied.

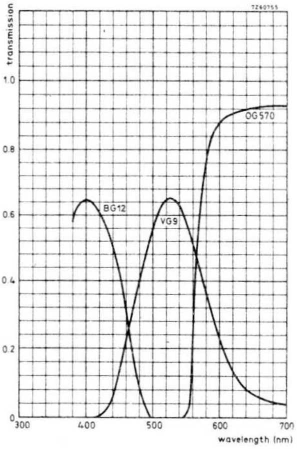
21) After a minimum of 5 s of illumination on the target. The figures represent typical residual signals in percents of the original signal current 60 ms respectively 200 ms after the illumination has been removed.



Spectral sensitivity characteristic measured at a constant signal output of 50 nA from 12,8 mm x 17 mm. (except at low sensitivity values).



Typical transmission curve of heat reflecting interference filter type CALFLEX-B1/K1.



Transmission curve of filters

CAMERA TUBE

Plumbicon*, sensitive pick-up tube with lead-oxide photoconductive target with extended red response and high resolution. Low velocity target stabilization. Provided with separate mesh construction.

The tubes of this series are mechanically and electrically identical to the tubes of the XQ1023 series, the only difference being the degree of freedom from blemishes of the photoconductive target.

The tubes are intended for industrial and educational black and white and colour cameras. The series comprises the following versions:

XQ1024	for black and white cameras
XQ1024R	for use in the red channel of colour cameras

For all further information see data of XQ1023.

* Registered Trade Mark for T.V. camera tube.

CAMERA TUBE

Plumbicon *), sensitive pick-up tube with lead-oxide photoconductive target with extended red response and high resolution.

Low velocity target stabilization. Provided with separate mesh for good uniformity of signal and resolution and good highlight handling.

The tubes of the XQ1025 series are identical to the tubes of the XQ1023 series but incorporate an infra-red reflecting filter on the anti-halation glass disc.

QUICK REFERENCE DATA			
Focusing :	magnetic	Heater:	6,3 V, 300 mA
Deflection :	magnetic	Cut-off of	
Diameter :	approx. 30 mm	spectral response :	750 nm [1])
Provided with anti-halation glass disc with infra-red reflecting filter.			

The infra-red reflecting filter eliminates the need for additional filters in the colour splitting systems when the XQ1025L and XQ1025R are applied in colour cameras originally designed for tubes of the XQ1020 series.

The manufacturer selects the filters per individual tube such, that the spreads in spectral responses in the long wavelength region as published for the XQ1023 tubes (See data XQ1023) are greatly reduced, warranting minimum differences in colour rendition between colour cameras of identical manufacture.

The XQ1025 will provide black and white pictures with true tonal rendition of colours, the spectral response approaching very nearly the relative spectral sensitivity of the human eye.

The XQ1025L is intended for use in the luminance channel of four tube colour cameras, the XQ1025R for use in the red channel of both three and four tube colour cameras.

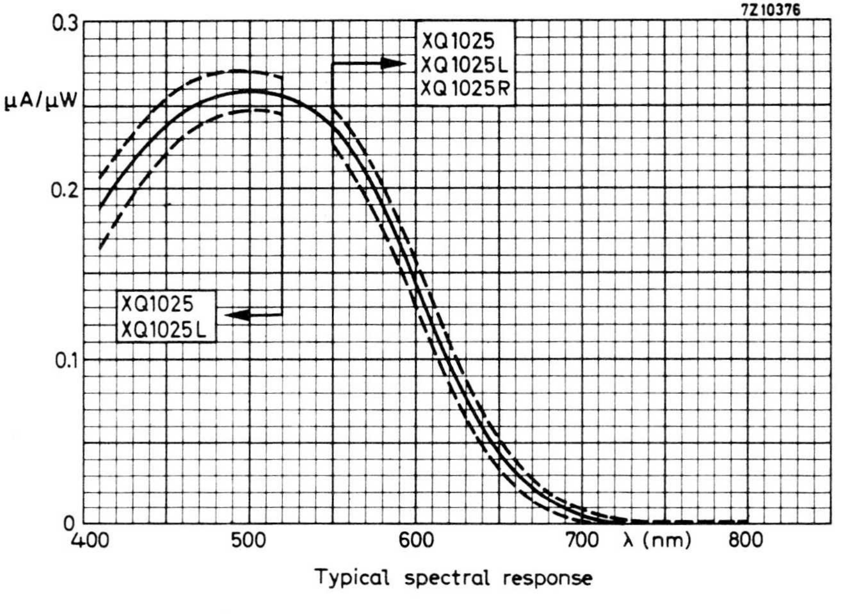
*) Registered Trade Mark for T.V. camera tube.

OPTICAL

Spectral response	see below	
Max. response at	approx. 500	nm
Cut-off	~ 750	nm [1]

Filter: Hard coating on anti-halation glass disc. Care in handling to avoid scratches is strongly recommended.

For all further data revert to the Published Data of the tubes of the XQ1023 series, Febr. 1969 issue. Note 3, page 5 of these data, referring to the Balzers B1/K1 filter, does not apply.



Typical spectral response

[1]) Defined as the wavelength at which the spectral response has dropped to ≤ 1% of the peak response (~ 500nm).

[2]) An infra-red absorbing filter for wavelengths in excess of 900 nm is assumed to be incorporated in the optical system of the camera.

CAMERA TUBE

Plumbicon*, sensitive pick-up tube with lead-oxide photoconductive target with extended red response and high resolution. Low velocity target stabilization.

Provided with separate mesh construction and anti-halation glass disc with I.R. filter.

The tubes of this series are mechanically and electrically identical to the tubes of the XQ1025 series, the only difference being found in the degree of freedom from blemishes of the photoconductive target.

The tubes are intended for industrial and educational black and white and colour cameras. The series comprises the following versions:

XQ1026	for black and white cameras
XQ1026R	for use in the red channel of colour cameras

For all further information see data of the XQ1025 series.

* Registered Trade Mark for T.V. camera tube.

CAMERA TUBE

Plumbicon*) television camera tube with high resolution lead-oxide photoconductive target, low heater power, separate mesh construction, magnetic focusing, magnetic deflection and 25,4 mm (1 in) diameter.
The tubes of the XQ1070 and XQ1070/01 series produce the same resolving power as the 30 mm diameter tubes like the XQ1020. They are mechanically interchangeable with 1 in diameter vidicons with separate mesh, and have the same pin connections. The XQ1070 and XQ1070/01 are intended for use in black-and-white cameras, the XQ1070L, R, G, b and XQ1070/01L, R, G, B in colour cameras in broadcast, educational and high quality industrial applications.

QUICK REFERENCE DATA	
Separate mesh	
Focusing	magnetic
Deflection	magnetic
Diameter	25,4 mm (1 in)
Length	158 mm (6,25 in)
Provided with anti-halation glass disc :	XQ1070L, R, G, B
Without anti-halation glass disc :	XQ1070/01L, R, G, B
Heater	6,3 V, 95 mA
Resolution	≥ 750 T.V. lines

OPTICAL

Quality rectangle on photoconductive target (aspect ratio 3 : 4) — $9,6 \times 12,8\ mm^2$ 1)

Orientation of image on photoconductive target
For correct orientation of the image on the target the vertical scan should be essentially parallel to the plane through the tube axis and the marker line on the metal sleeve on the base end of the tube.

Faceplate

Refractive index	n 1,49
Refractive index of anti-halation glass disc	n 1,52

Notes: see page 7

*) Registered Trade Mark for television camera tube.

ELECTRICAL

Heating: Indirect by A.C. or D.C.; parallel or series supply

Heater voltage	V_f	6,3 V ± 5%
Heater current	I_f	95 mA

When the tube is used in a series heater chain, the heater voltage must not exceed 9,5 V_{rms} when the supply is switched on.
To avoid registration errors in colour cameras, stabilization of the heater voltage is recommended.

Electron gun characteristics

Cut-off

Grid no. 1 voltage for cut-off at V_{g2} = 300 V	V_{g1}		−35 to −100	V
Blanking voltage, peak to peak				
on grid no. 1	V_{g1p-p}		50 ± 10	V
on cathode	V_{kp-p}		25	V
Grid no. 2 current at normally required beam currents	I_{g2}	max.	0,5	mA

Focusing — magnetic [2])

Deflection — magnetic [2])

Capacitance

Signal electrode to all	C_{as}	3 to 5 pF

This capacitance, which is effectively the output impedance, increases when the tube is inserted in the coil unit.

LIMITING VALUES (Absolute max. rating system)

All voltages are referred to the cathode, unless otherwise stated

Signal electrode voltage	V_{as}	max.	50	V [3]
Grid no. 4 voltage	V_{g4}	max.	1100	V
Voltage between grid no. 4 and grid no. 3	$V_{g4/g3}$	max.	450	V
Grid no. 3 voltage	V_{g3}	max.	800	V
Grid no. 2 voltage	V_{g2}	max.	350	V
Grid no. 1 voltage, positive	V_{g1}	max.	0	V
negative	$-V_{g1}$	max.	125	V
Cathode to heater voltage, positive peak	V_{kf_p}	max.	125	V
negative peak	$-V_{kf_p}$	max.	50	V
Impedance between cathode and heater at $-V_{kf_p} > 10$ V	Z_{kf}	min.	2	kΩ
Ambient temperature, storage and operation	t_{amb}	max.	50	°C
		min.	−30	°C
Faceplate temperature, storage and operation	t	max.	50	°C
		min.	−30	°C
Cathode heating time before drawing cathode current	T_h	min.	1	min
Faceplate illumination	E	max.	500	lx [4]

ACCESSORIES

Socket — type 56098 or equivalent

Deflection and focusing coil unit for bl/wh cameras AT1102/01, AT1103 or equivalent
for colour cameras AT1116 or equivalent

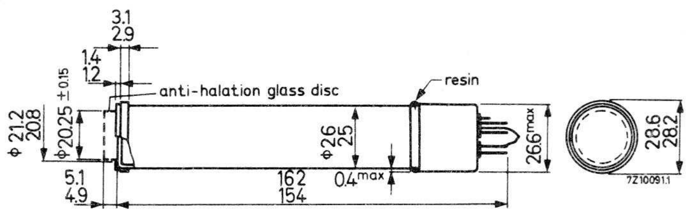
Notes: see page 7.

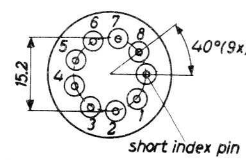
MECHANICAL Dimensions in mm

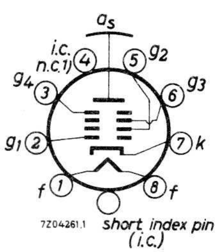
Mounting position : any

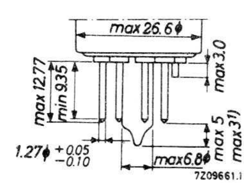
Mass : approx. 60 g

Base : JEDEC E8-11, IEC 67-I-32a, except length of stem









1) For serial number 90000 and up (see pin 4 and pumping stem).

OPERATING CONDITIONS AND PERFORMANCE

Conditions (scanned area 9,6 x 12,8 mm^2)

Cathode voltage		V_k	0 V	
Grid no. 2 voltage		V_{g2}	300 V	
Signal electrode voltage		V_{as}	45 V	5)
Beam current		I_b	see note 6)	
Focusing coil current at given values of grid no. 4 and grid no. 3 voltages			see note 7)	
Deflection and alignment currents			see note 7)	
Faceplate illumination			see note 8)	
Face plate temperature		t	20 to 45 °C	

	low voltage mode	high voltage mode	
Grid no. 4 voltage	600	960 V	9)
Grid no. 3 voltage	370	600 V	9)
Grid no. 1 voltage	see note 6		

Blanking voltage on grid no. 1, peak to peak	V_{g1pp}	50	V

Performance

Dark current		≤ 3	nA
Sensitivity at colour temperature of illumination = 2856 K			10)
XQ1070	XQ1070/01	400	μA/lm
XQ1070L	XQ1070/01L	400	μA/lm
XQ1070R	XQ1070/01R	80	μA/lm
XQ1070G	XQ1070/01G	165	μA/lm
XQ1070B	XQ1070/01B	38	μA/lm
Gamma of transfer characteristic		0,95 ± 0,05	11)
Spectral response:	max. response at	approx. 500	nm
	cut-off at	approx. 650	nm
	response curve	see page 11	

Resolution

Modulation depth i.e. uncompensated amplitude response at 400 T.V. lines at the centre of the picture. The figures quoted refer to the conditions in the high voltage mode.
The figures typically obtained in the low voltage mode will be 2 to 3 absolute percents lower.

The figures shown represent the typical horizontal amplitude response of the tube as obtained with a lens aperture of 5.6. [6] [12] [13].

	XQ1070 XQ1070/01 XQ1070L XQ1070/01L	XQ1070R XQ1070/01R	XQ1070G XQ1070/01G	XQ1070B XQ1070/01B
Highlight signal current I_s	0,2 μA	0,1 μA	0,2 μA	0,1 μA
Beam current, I_b	0,4 μA	0,2 μA	0,4 μA	0,2 μA
Modulation depth at 400 T.V. lines in % typical	40	35	40	45

Limiting resolution 750 T.V. lines

Modulation transfer characteristics see page 12

Lag (typical values)

Light source with a colour temperature of 2856 K
Appropriate filter inserted in the light path for the chrominance tubes R,G and B.

Low key conditions

	build-up lag [14]				decay lag [15]			
	I_s/I_b = 20/200 nA		I_s/I_b = 40/400 nA		I_s/I_b = 20/200 nA		I_s/I_b = 40/400 nA	
	60 (ms)	200 (ms)	60 (ms)	200 (ms)	60 (ms)	200 (ms)	60 (ms)	200 (ms)
XQ1070R, XQ1070/01R XQ1070B, XQ1070/01B	90	98			11	4		
XQ1070, XQ1070/01 XQ1070L, XQ1070/01L XQ1070G, XQ1070/01G			95	99			7	2,5

High key conditions

	build-up lag 14)				decay lag 15)			
	I_s/I_b = 100/200 nA		I_s/I_b = 200/400 nA		I_s/I_b = 100/200 nA		I_s/I_b = 200/400 nA	
	60 (ms)	200 (ms)	60 (ms)	200 (ms)	60 (ms)	200 (ms)	60 (ms)	200 (ms)
XQ1070R, XQ1070/01R XQ1070B, XQ1070/01B	97	≈ 100			2,5 3,5	1 2		
XQ1070, XQ1070/01 XQ1070L, XQ1070/01L XQ1070G, XQ1070/01G			98	≈ 100			1,5	0,6

NOTES

1) Underscanning of the specified useful area of 12,8 mm x 9,6 mm, or failure of scanning, should be avoided since this may cause damage to the photoconductive layer.

2) For focusing/deflection coil unit see under "Accessories".

3) Plumbicon tubes do not permit automatic sensitivity control be means of regulation of the signal electrode voltage. Adequate control is therefore to be achieved by other means (iris control and neutral density filters).
If the tube is applied in cameras originally designed for vidicon tubes, the automatic sensitivity control circuitry should be made inoperative and the signal electrode voltage set to the value indicated in note 5).

4) 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.

5) The signal electrode voltage shall be adjusted to 45 V. To enable the tube to handle excessive highlights in the scene to be televised the signal electrode voltage may be reduced to a minimum of 25 V, this will, however, result in some reduction in performance.

6) The beam current I_b, as obtained by adjusting the control grid (grid no. 1) voltage is set to 200 nA for R and B tubes, 400 nA for bl/wh, L and G tubes.

I_b is not the actual 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 = 20/200 nA. This hence means: with a signal current of 20 nA and a beam setting which just allows a signal current of 200 nA.

N.B. The signal currents are measured with an integrating instrument connected in the signal electrode lead and a uniform illumination on the scanned area.
The peak signal currents as measured on a wave-form oscilloscope will be a factor α larger.
($\alpha = \frac{100}{100-\beta}$, β being the total blanking time in %, for the CCIR system α amounts to 1,33)

7)

		Focusing current * (mA)		Line current (mA_{pp})		Frame current (mA_{pp})	
Coil units	V_{g4}/V_{g3}	600/375	960/600	600/375	960/600	600/375	960/600
AT1102/01		18	23	200	250	27	34
AT1103		20	26	200	250	29	38
AT1116		83	105	260	330	38	48
		Approx. values for scanned area of 9,6 x 12,8 mm^2					

*Adjusted for correct electrical focus. The direction of the focusing current shall be such that a north-seeking pole is attracted towards the image end of the focusing coil. Line and frame alignment coil currents max. 21 mA (AT1103) resp. 15 mA (AT1116) corresponding to a flux density of approx. 4 x 10^{-4} T (4 Gs).

8) In the case of a black/white camera the illumination on the photoconductive layer, B_{ph}, is related to scene illumination, B_{sc}, by the formula :

$$B_{ph} = B_{sc}\,\frac{R.T.}{4F^2\,(m+1)^2}$$

in which R represents the average scene reflectivity or the object reflectivity, whichever is relevant, T the lens transmission factor, F the lens aperture, and m the linear magnification from scene to target.
A similar formula may be derived for the illumination level on the photoconductive layers of the R, G, and B tubes in which the effects of the various components of the complete optical system have been taken into account.

9) The optimum voltage ratio V_{g4}/V_{g3} to obtain minimum beam landing errors (preferably ≤ 1 V) depends on the type of coil unit used. For types AT1102/01/AT1103 and AT1116 a ratio of 1,5 : 1 to 1,6 : 1 is recommended.

10) Measuring conditions :
Illumination 4 lx (luminous flux = 0,5 mlm) from a tungsten light source with a c.t. of 2856 K, the appropriate filter inserted in the light path.

Filters used:

XQ1070R, XQ1070/01R	Schott	OG570	thickness	3 mm
XQ1070G, XQ1070/01G	Schott	VG9	thickness	1 mm
XQ1070B, XQ1070/01B	Schott	BG12	thickness	3 mm

For transmission curves see page 10.

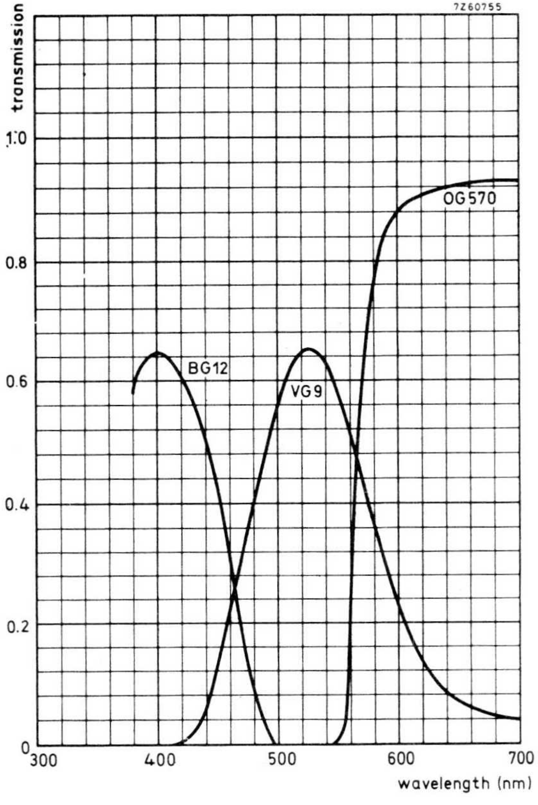
11) Gamma-stretching circuitry is recommended.

12) Typical faceplate illumination level for the XQ1070 and XQ1070/01 to produce 0,2 μA signal current will be approx. 4 lx. The signal currents stated for the colour tubes R, G, B will be obtained with an incident white light level (c.t. = 2856 K) on the filter of approx. 10 lx. These figures are based on the filters described in note 10). For filter BG12, however, a thickness of 1 mm is chosen.

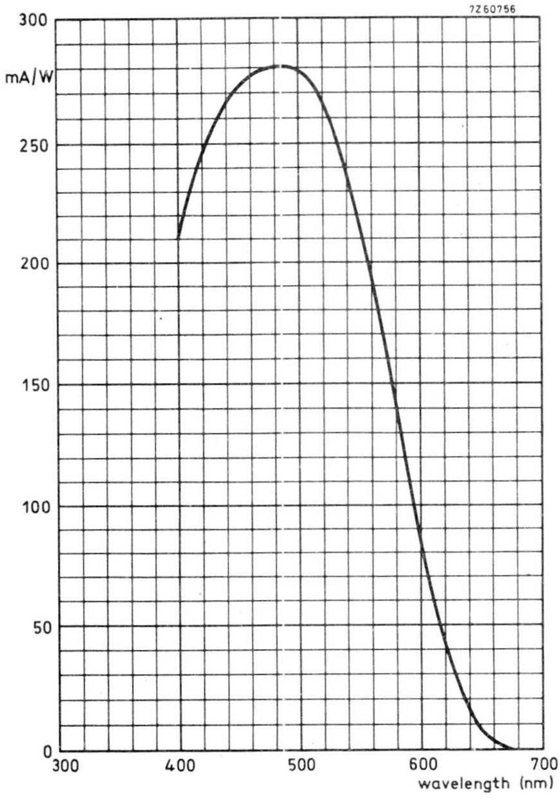
13) The horizontal amplitude response can be raised by the application of suitable correction circuits, which affect neither the vertical resolution nor the limiting resolution.

14) After 10 s of complete darkness. The figures given represent typical percentages of the ultimate signal current obtained 60 ms respectively 200 ms after the illumination has been applied.

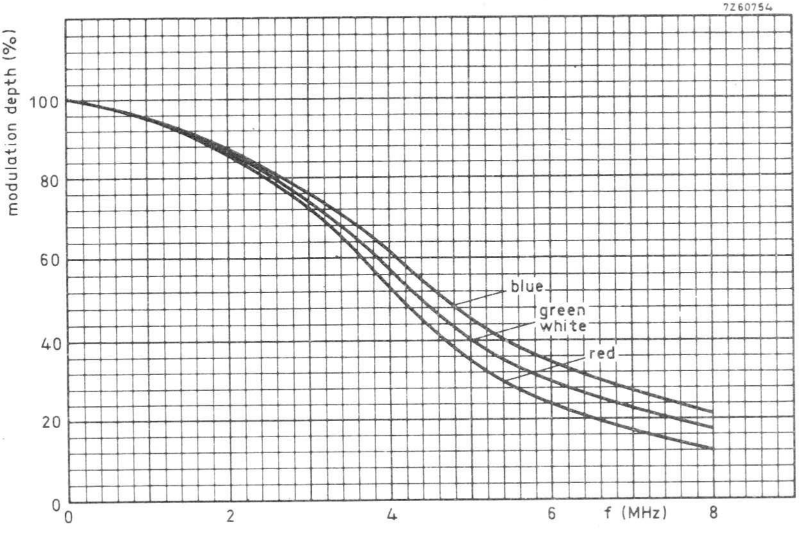
15) After a minimum of 5 s of illumination on the target. The figures given represent typical residual signals in percents of the original signal current 60 ms respectively 200 ms after the illumination has been removed.



Transmission of filters BG12, VG9 and OG570. See note 10



Typical spectral response curve



Typical square-wave modulation transfer characteristics

CAMERA TUBE

Plumbicon*, television camera tube with high resolution lead-oxide photoconductive target, low heater power, separate mesh construction, magnetic focusing, magnetic deflection and 25.4 mm (1 in) diameter.

The tubes of these series are mechanically and electrically identical to the tubes of the XQ1070 and XQ1070/01 series, the only difference being the degree of freedom from blemishes of the photoconductive target.

The tubes are intended for industrial and educational black-and-white and colour cameras. The series comprise the following versions:

with anti-halation glass disc	without anti-halation glass disc	
XQ1071	XQ1071/01	for bl/wh cameras
XQ1071R	XQ1071/01R	for use in the chrominance channels of colour cameras
XQ1071G	XQ1071/01G	
XQ1071B	XQ1071/01B	

For all further information see data of the XQ1070/XQ1070/01 series.

* Registered Trade Mark for television camera tube.

CAMERA TUBE

Plumbicon* television camera tube with high resolution lead-oxide photoconductive target, low power heater, separate mesh construction, magnetic focusing, magnetic deflection, and 25.4 mm (1 in) diameter.

The XQ1072 produces the same resolving power as the 30 mm diameter tube type XQ1022 and is exclusively intended for use with an X-ray intensifier in medical equipment.

The XQ1072 is mechanically interchangeable with 1 in diameter vidicons with separate mesh construction and has the same pin connections.

QUICK REFERENCE DATA	
Separate mesh	
Focusing	magnetic
Deflection	magnetic
Diameter	25.4 mm (1 in)
Length	158 mm (6.25 in)
Without anti-halation glass disc	
Heater	6.3 V, 95 mA
Resolution	≥ 35 lp/mm

OPTICAL

Dimensions of quality area on photoconductive target — circle of 15 mm diameter [1])

Orientation of image on photoconductive target

For correct orientation of the image on the target the vertical scan should be essentially parallel to the plane through the tube axis and the marker line on the metal sleeve on the base end of the tube.

Faceplate

Thickness		1.2	mm
Refractive index	n	1.49	

* Registered Trade Mark for television camera tube

ELECTRICAL

Heating: Indirect by A.C. or D.C.; parallel or series supply

Heater voltage	V_f	6.3	V±5%
Heater current	I_f	95	mA

When the tube is used in a series heater chain, the heater voltage must not exceed 9.5 V_{rms} when the supply is switched on.

Electron gun characteristics

Cut-off

Grid no. 1 voltage for cut-off at V_{g_2} = 300 V	V_{g_1}	-35 to -100	V
Blanking voltage, peak to peak			
on grid no. 1	$V_{g_{1p-p}}$	50± 10	V
on cathode	$V_{k_{p-p}}$	25	V
Grid no. 2 current at normally required beam currents	I_{g_2}	max. 0.5	mA

Focusing — magnetic 2)

Deflection — magnetic 2)

Capacitance

Signal electrode to all	C_{a_s}	3 to 5	pF

This capacitance which is effectively the output impedance, increases when the tube is inserted in the coil unit.

LIMITING VALUES (Absolute max. rating system)

All voltages, are referred to the cathode, unless otherwise stated.

Signal electrode voltage	V_{as}	max.	50	V	[3])
Grid no. 4 voltage	V_{g4}	max.	1100	V	
Grid no. 3 voltage	V_{g3}	max.	800	V	
Voltage between grid no. 4 and grid no. 3	$V_{g4/g3}$	max.	450	V	
Grid no. 2 voltage	V_{g2}	max.	350	V	
Grid no. 1 voltage, positive	V_{g1}	max.	0	V	
negative	$-V_{g1}$	max.	125	V	
Cathode to heater voltage, positive peak	V_{kf_p}	max.	125	V	
negative peak	$-V_{kf_p}$	max.	50	V	
Impedance between cathode and heater at $-V_{kf_p} > 10$ V	Z_{kf}	min.	2	kΩ	
Ambient temperature, storage and operation	t_{amb}	max.	50	^{o}C	
		min.	-30	^{o}C	
Faceplate illumination	E	max.	500	lx	[4])
Cathode heating time before drawing cathode current	T_h	min.	1	min	←

ACCESSORIES

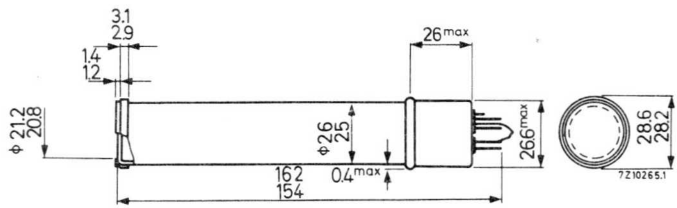
Socket	type 56098 or equivalent ←
Deflection and focusing coil unit	AT1102/01, AT1103, AT1116 or equivalent

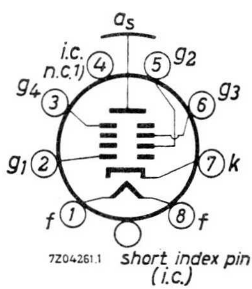
MECHANICAL Dimensions in mm

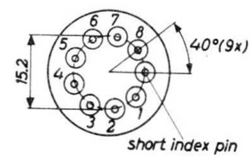
Mounting position : any

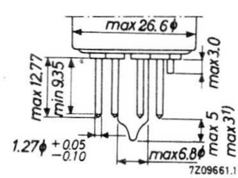
Net mass : approx. 60 g

→ Base : IEC 67-I-33a (JEDEC E8-11) except for stem









1) For serial number 90 000 and up. (see pin 4 and pumping stem)

OPERATING CONDITIONS AND PERFORMANCE

Conditions [5]

Cathode voltage		V_k	0	V
Grid no. 2 voltage		V_{g2}	300	V
Signal electrode voltage		V_{a_s}	20 to 45	V [3] [8]
Beam current		I_b	see note [6a]	
Focusing coil current at given values of grid no. 4 and grid no. 3 voltages			see note [9]	
Deflection and alignment currents			see note [9]	
Faceplate illumination (P20 light source)		E	2	lx
Faceplate temperature		t	20 to 45	°C

		low voltage mode	high voltage mode [7]	
Grid no. 4 voltage	V_{g4}	600	960	V
Grid no. 3 voltage	V_{g3}	375	600	V

Grid no. 1 voltage — see note [6a]

Blanking voltage on grid no. 1, peak to peak	$V_{g1_{p-p}}$	50	V

Performance

Dark current		≤	3	nA
Signal current, peak	I_{sp}	min.	175	nA [6a] [6b]
		typ.	225	nA [6a] [6b]
Gamma of transfer characteristic			0.95 ± 0.05	[10]
Spectral response: max. response at		approx.	500	nm
cut-off at		approx.	650	nm

Resolution

Modulation depth i.c. uncompensated amplitude response at 13 lp/mm (5.0 MHz) at the centre of the picture

low voltage mode	high voltage mode [11a]
65%	70%

Modulation transfer characteristic — see page 8 [11b]

Decay
Measured with a peak signal current of 0.2 μA

Residual signal after dark pulse of 60 ms	max. 6 %, typ. 4 % 12)
Residual signal after dark pulse of 200 ms	max. 2.5%, typ. 1.5 % 12)

NOTES

1) Underscanning of the specified useful target area of 15.0 mm ϕ or failure of scanning should be avoided since this may cause damage to the photoconductive layer. The area beyond the 15.0 mm ϕ area preferably to be covered by a mask.

2) For focusing/deflection coil unit see under "Accessories".

3) Plumbicon tubes do not permit automatic sensitivity control by means of regulation of the signal electrode voltage.
If the tube is applied in cameras originally designed for vidicon tubes, the automatic sensitivity control circuitry should be made inoperative and the signal electrode voltage set to the value indicated in note 8.

4) For short intervals. During storage the tube face shall be covered with the plastic hood provided.

5) Scanning amplitude controls adjusted such that the 15 mm ϕ quality area of the target is displayed on a standard monitor as a circular area with a diameter equal to the raster height.

6a) Grid no. 1 (control grid) voltage adjusted to produce a beam current, I_{bp}, which will allow a maximum peak signal current I_{sp} of 500 nA.
N.B. The peak signal currents are measured on a waveform oscilloscope and with a uniform illumination on the 15 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.
b) by a factor δ, δ being the ratio of the active target area (circle with 15 mm ϕ) to the area which would correspond with the adjusted scanning amplitudes (15 x 20 mm^2), see note 5, this ratio amounts to $\delta = 0.59$.
The total ratio of integrated signal current, I_s, to the peak signal current, I_{sp}, amounts to $\alpha \times \delta = 0.44$.

6b) The peak signal currents stated relate to a target sensitivity to light with P20 distribution of min. 200 μA/lm, typical 275 μA/lm.

7) The optimum voltage ratio V_{g4}/V_{g3} to obtain minimum beam landing errors (preferably $\leq$ 1 V) depends on the type of coil unit used. For types AT1102/01, AT1103, AT1116 a ratio of 1.5:1 to 1.6:1 is recommended.

8) Target voltage, V_{as}, adjusted to the value indicated by the tube manufacturer on the test sheet as delivered with each tube.

9)

	Focusing current* (mA)		Line current (mA_{pp})		Frame current (mA_{pp})	
V_{g4}/V_{g3}	600/375	960/600	600/375	960/600	600/375	960/600
AT1102/01	18	23	310	390	42	53
AT1103	20	26	310	390	46	59
AT1116	83	105	400	510	59	75
	Approx. values for scanning amplitudes corresponding to 15 x 20 mm^2 scanned area					

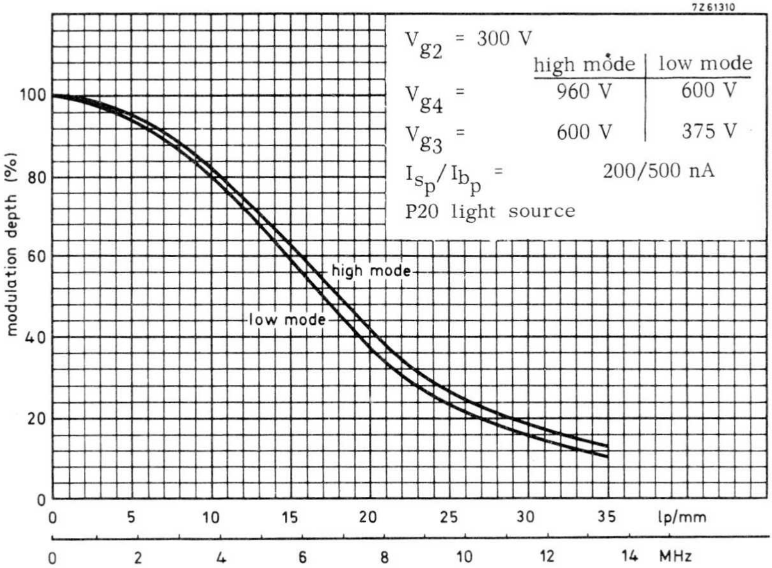
*Adjusted for correct electrical focus. The direction of the focusing current shall be such that a north-seeking pole is attracted towards the image end of the focusing coil.
Line and frame alignment coil currents max. 21 mA (AT1103) resp. 15 mA (AT1116) corresponding to a flux density of approx. 4 x 10^{-4} T (4 Gs).

10) The near unity gamma of the XQ1072 ensures good contrast when televising low contrast X-ray image-intensifier pictures as encountered in radiology. Further contrast improvement may be obtained when an adjustable gamma expansion circuitry is incorporated in the video amplifier system.

11a) Measured with a transparency with a square wave test pattern with vertical bars. The figures given relate to a low frequency reference obtained from a square wave pattern of 1.0 lp/mm (385 kHz).
The aperture of the lens system adjusted for f 5.6

11b) As in 11a). Bandwidth of the video amplifier system and the waveform oscilloscope 15 MHz (−3 dB point).

12) After a minimum of 5 s of illumination on the target. The figures given represent the residual signals in % of the original signal current 60 ms respectively 200 ms after the illumination has been removed.



Modulation transfer characteristic

CAMERA TUBE

Plumbicon * television camera tube with high resolution lead-oxide photoconductive target with extended red response, low heater power, separate mesh construction, magnetic deflection and 25,4 mm (1 in) diameter.
The tubes of the XQ1073 and the XQ1073/01 series respectively are mechanically interchangeable with 1 in diameter vidicons with separate mesh and have the same pin connections. The XQ1073 and XQ1073/01 are intended for use in black and white cameras, the XQ1073R and XQ1073/01R for use in the red chrominance channel of colour cameras in broadcast, educational and high-quality industrial applications.

QUICK REFERENCE DATA	
Separate mesh	
Focusing	magnetic
Deflection	magnetic
Diameter	25,4 mm (1 in)
Length, excluding 5 mm anti-halation glass disc	158 mm (6,25 in)
Provided with anti-halation glass disc	XQ1073, XQ1073R
Without anti-halation glass disc	XQ1073/01, XQ1073/01R
Cut-off of spectral response	850 to 950 nm
Heater	6,3 V, 95 mA
Resolution	≥ 750 TV lines

OPTICAL DATA

Quality rectangle on photoconductive target
(aspect ratio 3:4) — $9,6 \times 12,8\ mm^2$ [1])

Orientation of image on photoconductive 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 metal sleeve on the base end of the tube.

Faceplate
Refractive index — n 1,49
Refractive index of anti-halation glass disc — n 1,52

Notes: see page 6

* Registered Trade Mark for television camera tube.

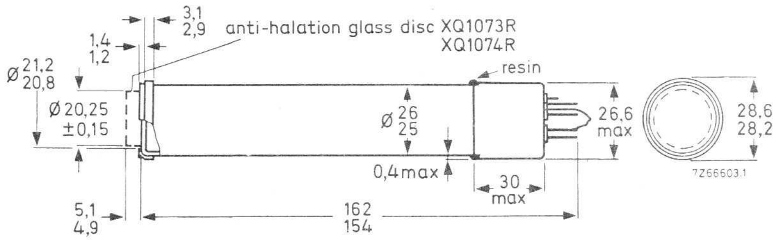
MECHANICAL DATA

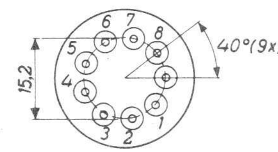
Dimensions in mm

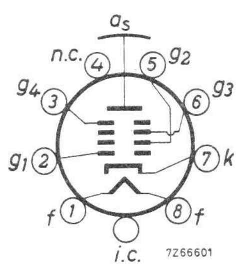
Mounting position: any

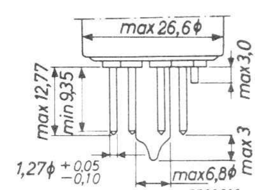
Mass: approx. 60 g

Base: JEDEC E8-11, IEC67-I-33a, except length of stem.









ACCESSORIES

Socket	type 56098	or equivalent
Deflection and focusing coil unit for bl/wh cameras	AT1102/01, AT1103,	or equivalent
for colour cameras	AT1116	or equivalent
Mask on anti-halation disc (for flare reduction)	supplied with each tube (see Instructions for use)	

ELECTRICAL DATA

Heating: indirect by a.c. or d.c. ; parallel or series supply

Heater voltage	V_f	6,3 V ± 5%
Heater current	I_f	95 mA

When the tube is used in a series heater chain, the heater voltage must not exceed an r.m.s. value of 9,5 V when the supply is switched on.

To avoid registration errors in colour cameras, stabilization of the heater voltage is recommended.

Electron gun characteristics

Cut-off				
Grid no.1 voltage for cut-off at V_{g2} = 300 V	V_{g1}	-35 to	-100	V
Blanking voltage, peak to peak				
on grid no.1	$V_{g1_{pp}}$		50 ± 10	V
on cathode	$V_{k_{pp}}$		25	V
Grid no.2 current at normally required beam currents	I_{g2}	max.	0,5	mA
Focusing		magnetic		2)
Deflection		magnetic		2)
Capacitance				
Signal electrode to all	C_{a_s}		3 to 5	pF

This capacitance, which is effectively the output impedance, increases when the tube is inserted in the coil unit.

LIMITING VALUES (Absolute max. rating system)

All voltages are referred to the cathode, unless otherwise stated.

Signal electrode voltage	V_{as}	max.	50	V	3)
Grid no.4 voltage	V_{g4}	max.	1100	V	
Voltage between grid no.4 and grid no.3	$V_{g4/g3}$	max.	450	V	
Grid no.3 voltage	V_{g3}	max.	800	V	
Grid no.2 voltage	V_{g2}	max.	350	V	
Grid no.1 voltage, positive	V_{g1}	max.	0	V	
negative	$-V_{g1}$	max.	125	V	
Cathode to heater voltage, positive peak	V_{kf_p}	max.	125	V	
negative peak	$-V_{kf_p}$	max.	50	V	
Impedance between cathode and heater at $-V_{kf_p}$ 10 V	Z_{kf}	min.	2	kΩ	
Ambient temperature storage and operation	t_{amb}	max.	50	°C	
		min.	-30	°C	
Faceplate temperature storage and operation	t	max.	50	°C	
		min.	-30	°C	
Faceplate illumination	E	max.	100	lx	4)
Cathode heating time before drawing cathode current	T_h	min.	1	min	

Notes: see page 6

OPERATING CONDITIONS AND PERFORMANCE

Conditions (scanned area 9, 6 x 12, 8 mm^2)

Cathode voltage	V_k	0	V	
Grid no. 2 voltage	V_{g_2}	300	V	
Signal electrode voltage	V_{a_s}	45	V	5)
Beam current	I_b	see note		6)
Focusing coil current at given values of grid no. 4 and grid no. 3 voltages		see note		7)
Deflection and alignment currents		see note		7)
Faceplate illumination		see note		8)
Faceplate temperature	t	20 to 45	°C	

		low voltage mode	high voltage mode		
Grid no. 4 voltage	V_{g_4}	600	960	V	9)
Grid no. 3 voltage	V_{g_3}	375	600	V	9)
Grid no. 1 voltage		see note 6			
Blanking voltage on grid no. 1, peak to peak	$V_{g_{1pp}}$	50		V	

Performance

Dark current	≤ 3	nA	
Sensitivity at colour temperature of illumination = 2856 K			10)
XQ1073, XQ1073/01	400	μA/lm	
XQ1073R, XQ1073/01R	115	μA/lm	11)
Gamma of transfer characteristic	0, 95 ± 0, 05		12)
Spectral response: max. response at	approx. 500	nm	
cut-off at	850 to 950	nm	13)
response curve	See page 9		

Resolution

Modulation depth i.e. uncompensated amplitude response at 400 T V. lines at the centre of the picture. The figures quoted refer to the conditions in the high voltage mode.
The figures typically obtained in the low voltage mode will be 2 to 3 absolute percents lower.

The figures shown represent the typical horizontal amplitude response of the tube as obtained with a lens aperture of 5,6. 6) 14).

	XQ1073 XQ1073/01	XQ1073R XQ1073/01R
Highlight signal current I_s	0,2 μA	0,1 μA
Beam current, I_b	0,4 μA	0,2 μA
Modulation depth at 400 T V lines in % typical	50	45

Limiting resolution ≥ 750 T.V. lines

Modulation transfer characteristics see page 9

Lag (typical values)
Light source with a colour temperature of 2856 K
Appropriate filter inserted in the light path for the chrominance tubes XQ1073R, XQ1073/01R.

Low key conditions

	build-up lag 15)				decay lag 16)			
	I_s/I_b = 20/200 nA		I_s/I_b = 40/400 nA		I_s/I_b = 20/200 nA		I_s/I_b = 40/400 nA	
	60 (ms)	200 (ms)	60 (ms)	200 (ms)	60 (ms)	200 (ms)	60 (ms)	200 (ms)
XQ1073 XQ1073/01	-	-	95	≈ 100	-	-	7,5	3
XQ1073R XQ1073/01R	85	98	-	-	11	4	-	-

High key conditions

	build-up lag 15)				decay lag 16)			
	I_s/I_b = 100/200 nA		I_s/I_b = 200/400 nA		I_s/I_b = 100/200 nA		I_s/I_b = 200/400 nA	
	60 (ms)	200 (ms)	60 (ms)	200 (ms)	60 (ms)	200 (ms)	60 (ms)	200 (ms)
XQ1073 XQ1073/01	-	-	98	≈ 100	-	-	2	1
XQ1073R XQ1073/01R	98	≈ 100	-	-	3	1,5	-	-

Notes: see pages 6 and 7

NOTES

1) Underscanning of the specified useful area of 12,8 mm x 9,6 mm, or failure of scanning, should be avoided since this may cause damage to the photoconductive layer.

2) For focusing/deflection coil unit see under "Accessories".

3) Plumbicon tubes do not permit automatic sensitivity control by means of regulation of the signal electrode voltage. Adequate control is therefore to be achieved by other means (iris control and neutral density filters).
If the tube is applied in cameras originally designed for vidicon tubes, the automatic sensitivity control circuitry should be made inoperative and the signal electrode voltage set to the value indicated in note 5).

4) 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.

5) The signal electrode voltage shall be adjusted to 45 V. To enable the tube to handle excessive highlights in the scene to be televised the signal electrode voltage may be reduced to a minimum of 25 V, this will, however, result in some reduction in performance.

6) The beam current I_b, as obtained by adjusting the control grid (grid no. 1) voltage is set to 200 nA for XQ1073 respectively XQ1073/01R, to 400 nA for XQ1073 respectively XQ1073/01.
I_b is not the actual 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 = 20/200 nA. This hence means: with a signal current of 20 nA and a beam setting which just allows a signal current of 200 nA.

N.B. The signal currents are measured with an integrating instrument connected in the signal electrode lead and a uniform illumination on the scanned area. The peak signal currents as measured on a wave-form oscilloscope will be a factor α larger.
($\alpha = \frac{100}{100-\beta}$, β being the total blanking time in %, for the CCIR system α amounts to 1,33).

7)

Coil units V_{g4}/V_{g3}	Focusing current * (mA)		Line current (mA_{pp})		Frame current (mA_{pp})	
	600/375	960/600	600/375	960/600	600/375	960/600
AT1102/01	18	23	200	250	27	34
AT1103	20	26	200	250	29	38
AT1116	83	105	260	330	38	48
	Approx. values for scanned area of 9,6 x 12,8 mm^2					

*Adjusted for correct electrical focus. The direction of the focusing current shall be such that a north-seeking pole is attracted towards the image end of the focusing coil.

Line and frame alignment coil currents max. 21 mA (AT1103) resp. 15 mA (AT1116) corresponding to a flux density of approx. 4×10^{-4}T (4 Gs).

8) In the case of a black/white camera the illumination of the photoconductive layer, B_{ph}, is related to scene illumination, B_{sc}, by the formula:

$$B_{ph} = B_{sc} \frac{R.T.}{4F^2 (m+1)^2}$$

in which R represents the average scene reflectivity or the object reflectivity, whichever is relevant, T the lens transmission factor, F the lens aperture, and m the linear magnification from scene to target.
A similar formula may be derived for the illumination level on the photoconductive layer of the R tubes, in which the effects of the various components of the complete optical system have been taken into account.

9) The optimum voltage ratio V_{g4}/V_{g3} to obtain minimum beam landing errors (preferably $\leq$ 1 V) depends on the type of coil unit used. For types AT1102/01, AT1103 and AT1116 a ratio of 1,5:1 to 1,6:1 is recommended.

10) All measurements are made with an infra-red reflecting filter interposed between light-source and target. Balzers Calflex B1/K1 filter is chosen for this purpose since, for accurate colour reproduction in a colour camera, a similar I.R. reflecting filter will be required. For typical transmission curve of this filter see page 10.

11) With an additional filter (see note 10) interposed between light source and target. Filter used is: Schott OG570 (3 mm).
For transmission curve see page 8.

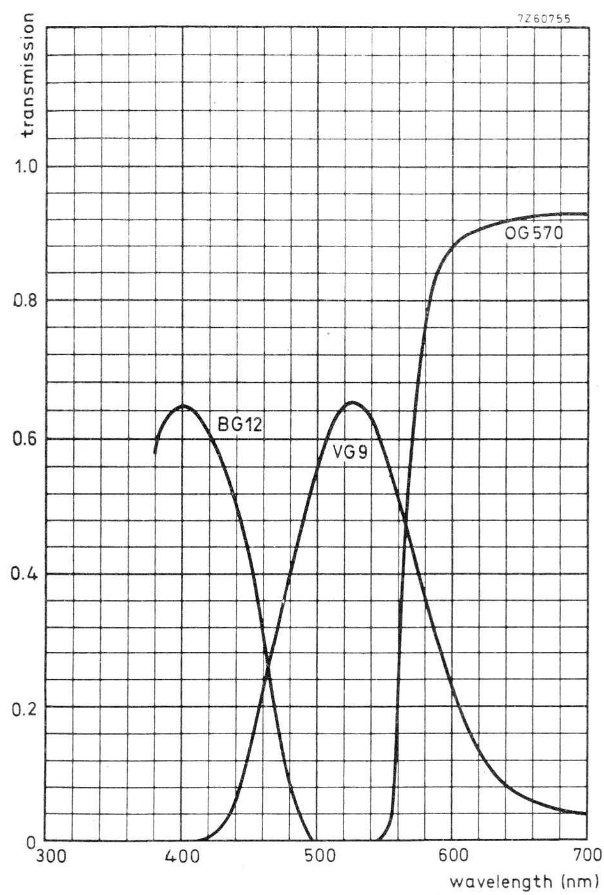
12) Gamma stretching circuitry is recommended.

13) Defined as the wavelength at which the spectral response has dropped to 1 % of the peak response. ($\approx$ 500 nm)

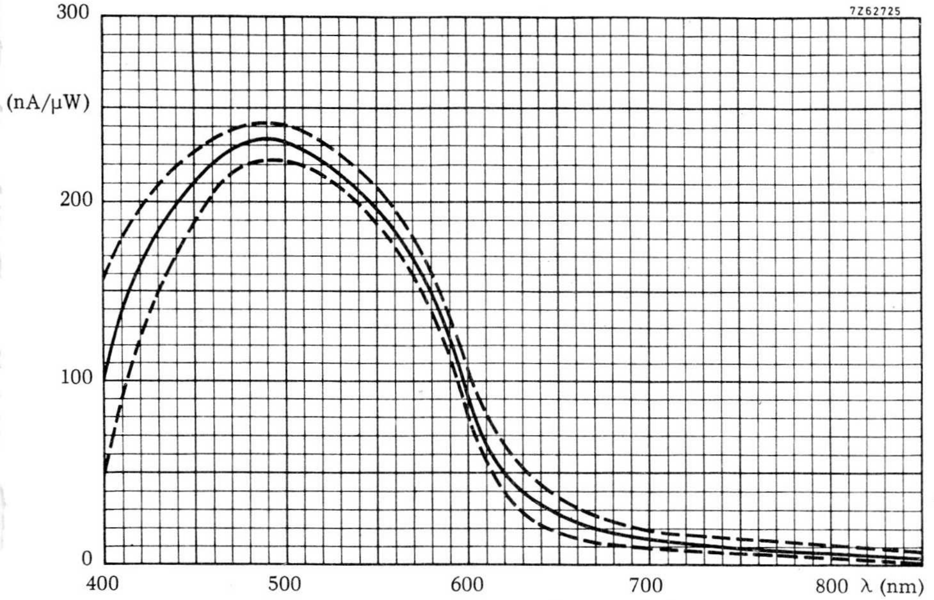
14) The horizontal amplitude response can be raised by the application of suitable correction circuits.

15) After 10 s of complete darkness. The figures given represent typical percentages of the ultimate signal current obtained 60 ms respectively 200 ms after the illumination has been applied.

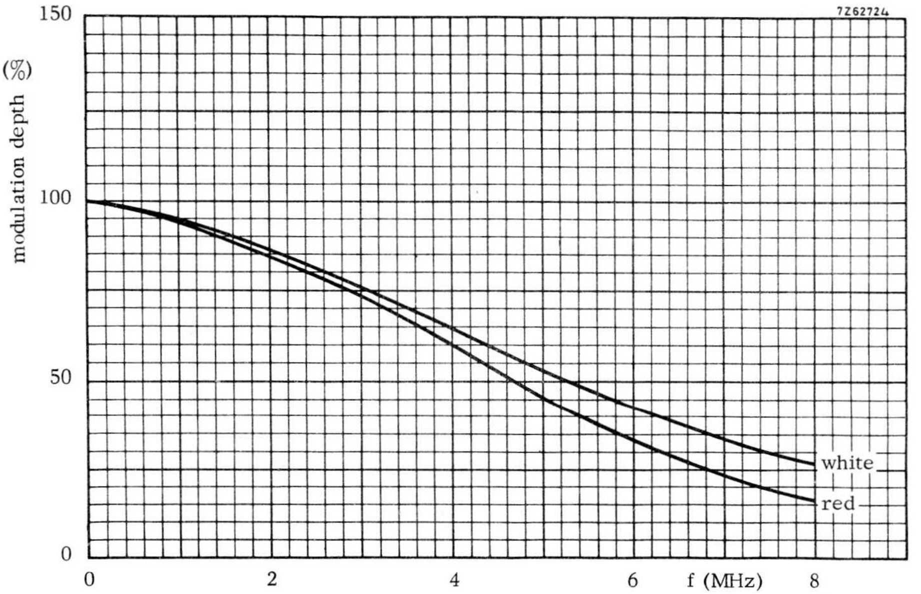
16) After a minimum of 5 s of illumination on the target. The figures given represent typical residual signals in percents of the original signal current 60 ms respectively 200 ms after the illumination has been removed.



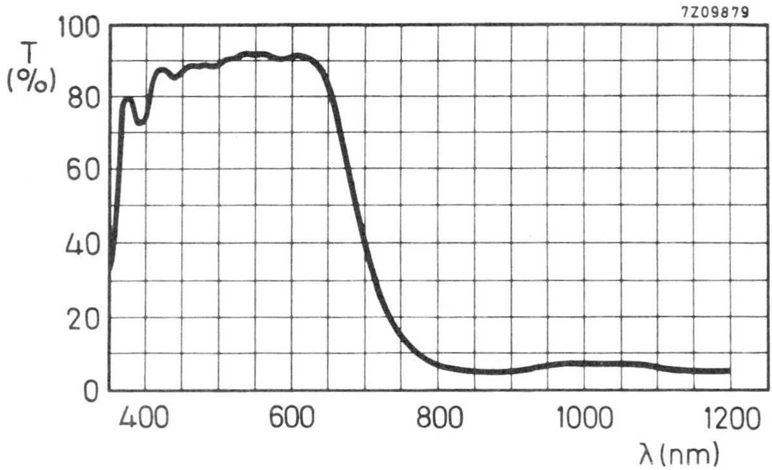
Transmission of filters BG12, VG9 and OG570 See note 11



Spectral sensitivity characteristic



Typical square-wave modulation transfer characteristic



Typical transmission curve of heat-reflecting interference filter, Type CALFLEX B1/K1

CAMERA TUBE

Plumbicon*, sensitive pick-up tube with lead oxide photoconductive target with extended red response, high resolution, low heater power, separate mesh construction, magnetic focusing, magnetic deflection and 25,4 mm (1 in) diameter.

The tubes of this series are mechanically and electrically identical to the tubes of the XQ1073 and XQ1073/01 series, the only difference being the degree of freedom from blemishes of the photoconductive target.

The tubes are intended for industrial and educational black and white and colour cameras. The series comprises the following versions:

XQ1074 , with anti-halation glass disc XQ1074/01, without anti-halation glass disc	for use in black and white cameras
XQ1074R , with anti-halation glass disc XQ1074/01R, without anti-halation glass disc	for use in the red channel in colour cameras

For all further information see data of XQ1073, XQ1073/01 series.

* Registered Trade Mark for television camera tube.

CAMERA TUBE

Plumbicon*, sensitive pick-up tube with lead-oxide photoconductive target with extended red response, high resolution, low heater power separate mesh construction, magnetic focusing, magnetic deflection and 25,4 mm (1 in) diameter.

The tubes of the XQ1075 series are identical to the tubes of the XQ1073 series but incorporate an infra-red reflecting filter on the anti-halation glass disc.

QUICK REFERENCE DATA		
Separate mesh		
Focusing	magnetic	
Deflection	magnetic	
Diameter	25,4 mm (1 in)	
Length, excluding 5 mm of anti-halation glass disc	158 mm (6,25 in)	
Cut-off of spectral response	750	nm
Heater	6,3 V , 95	mA
Provided with anti-halation glass disc with infra-red reflecting filter.		

The infra-red reflecting filter eliminates the need for additional filters in the optical systems when the XQ1075 and XQ1075R are applied in black and white and colour cameras originally designed for tubes of the XQ1070 series.

The spread in spectral responses in the long wavelength region as published for the XQ1073 and XQ1073R tubes is greatly reduced, warranting minimum differences in colour rendition between cameras of identical manufacture.

The XQ1075 will provide black and white pictures with true tonal rendition of colours, the spectral response approaching very nearly the relative spectral sensitivity of the human eye.

The XQ1075R is intended for use in the red chrominance channel of colour cameras in broadcast, educational and high-quality industrial applications.

* Registered Trade Mark for television camera tube.

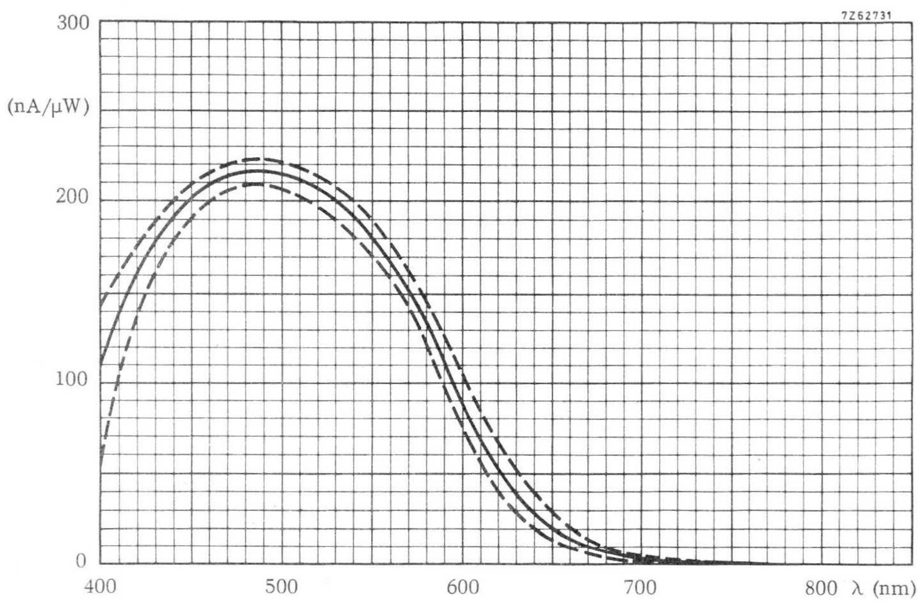
OPTICAL DATA

Spectral response	see curve below	
Maximum response at	500	nm
Cut-off	750	nm [1]

Filter Hard coating on anti-halation glass disc. Care in handling to avoid scratches is strongly recommended.

For further information refer to data of the XQ1073 series.

Note [10] of these data referring to Balzers B1/K1 filter does not apply.



Typical spectral sensitivity characteristic

[1] Defined as the wavelength at which the spectral response has dropped to 1 % of the peak response (≈ 500 nm).

CAMERA TUBE

Plumbicon*, sensitive pick-up tube with lead oxide photoconductive target with extended red response, high resolution, low heater power, separate mesh construction, magnetic focusing, magnetic deflection and 25,4 mm (1 in) diameter. Provided with anti-halation disc with I.R. filter.

The tubes of this series are mechanically and electrically identical to the tubes of the XQ1075 series, the only difference being found in the degree of freedom from blemishes of the photoconductive target.

The tubes are intended for industrial and educational black and white and colour cameras. The series comprises the following versions:

XQ1076	for use in black and white cameras
XQ1076R	for use in the red channel of colour cameras

For all further information see data of XQ1075 and XQ1073 series.

* Registered Trade Mark for television camera tubes.

CAMERA TUBE

Plumbicon *, 25, 4 mm (1 in) diameter television camera tube with high resolution lead-oxide photoconductive target, magnetic deflection, magnetic focus. The tubes of the XQ1080 series are provided with a separate mesh and a 0, 6 W heater and feature:

- Anti-Comet-Tail electron gun for highlight handling.
- Extremely low lag.
- Provisions for adjustable lightbias to minimize lag under low-key conditions.
- Same resolving power as the 30 mm tubes such as the XQ1020.
- Ceramic centring ring for precise optical alignment.
- Electrode system with precision construction.
- Low output capacitance for optimal S/N ratio.

The tubes of the XQ1080 series are rear-loading tubes, i.e. to be inserted at the rear end of a special coil unit and they have slightly different dimensions and pin connections than other 1 in diameter Plumbicon tubes like e.g. XQ1070.

The XQ1080 is intended for use in black and white cameras, XQ1080L, R, G and B are intended for use in colour cameras in broadcast, educational and high quality industrial applications in which high contrast ratios may occur.

QUICK REFERENCE DATA	
Focusing	magnetic
Deflection	magnetic
Diameter	25, 4 mm (1 in)
Length	158 mm ($6\frac{1}{4}$ in)
Special features:	Anti-Comet-Tail gun Light bias Anti-halation glass disc Ceramic centring ring Rear loading construction
Heater	6, 3 V, 95 mA
Resolution	≥ 750 TV lines
Cut-off of spectral response	approx. 650 nm

* Registered Trade Mark for television camera tube.

OPTICAL

Quality rectangle on photoconductive target (aspect ratio 3:4)		9,6 x 12,8	mm^2 [1])

Orientation of image on photoconductive 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. [2a])

Optical alignment		see note 2b	
Faceplate			
Thickness		1,2	mm
Refractive index	n	1,49	
Refractive index of anti-halation disc	n	1,52	

HEATING

Indirect by a.c. or d.c.; parallel or series supply.

Heater voltage	V_f	6,3	V ± 5%
Heater current	I_f	95	mA

When the tube is used in a series heater chain, the heater voltage must not exceed a r.m.s. value of 9,5 V when the supply is switched on. To avoid registration errors in colour cameras, stabilization of the heater voltage is recommended.

CAPACITANCE

Signal-electrode to all	C_{as}	2,5 to 3,5	pF

This capacitance, which is effectively the output impedance, increases when the tube is inserted in the coil unit.

DEFLECTION magnetic

FOCUSING magnetic

ACCESSORIES

Socket		type 56026
Light bias lamp in holder		type 56027
Deflection, focusing and alignment coil unit	black/white	type AT1119
	colour	type AT1115 *

* AT1115 is a computer selected triplet of AT1119 units.

Mask	type 56028

Notes see page 8

ELECTRON-GUN CHARACTERISTICS

Cut-off Grid no. 1 voltage for cut-off at $V_{g2,4}$ = 300 V, without blanking nor ACT pulses	V_{g1}		−45 to −110 V
Blanking voltage, peak to peak at $V_{g2,4}$ = 300 V, on grid no. 1	V_{g1p-p}		50 ± 10 V [3]
Grids no. 2 and 4 current (d.c. values)	$I_{g2,4}$		< 0,2 mA [4]
Grids no. 3, 5 and 6 currents			see note 4
Pulse timing and amplitude requirements (ACT)			see note 10

LIMITING VALUES (Absolute max. rating system)

All voltages are referred to the cathode, unless otherwise stated.

Signal electrode voltage	V_{a_s}	max.	50 V [5]
Grid no. 6 (mesh) voltage	V_{g6}	max.	1100 V
Grid no. 5 (collector) voltage	V_{g5}	max.	800 V
Voltage between grid no. 6 and grid no. 5	$V_{g6/g5}$	max.	350 V
Grid no. 4 (limiter) and grid no. 2 (accelerator, or first anode) voltage	$V_{g2,4}$	max.	350 V
Grid no. 3 (auxiliary grid) voltage	V_{g3}	max.	350 V
Grid no. 1 (control grid) voltage, positive	V_{g1}	max.	0 V
negative	$-V_{g1}$	max.	200 V
Cathode heating time before drawing cathode current	T_h	min.	1 min.
Cathode to heater voltage, positive peak	V_{kf_p}	max.	125 V
negative peak	$-V_{kf_p}$	max.	50 V
Impedance between cathode and heater at $-V_{kf_p}$ > 10 V	Z_{kf}	min.	2 kΩ
Ambient temperature, storage and operation	t_{amb}	max.	50 °C
		min.	−30 °C
Faceplate temperature, storage and operation	t	max.	50 °C
		min.	−30 °C
Faceplate illumination	E	max.	500 lx [6]

Notes see page 8

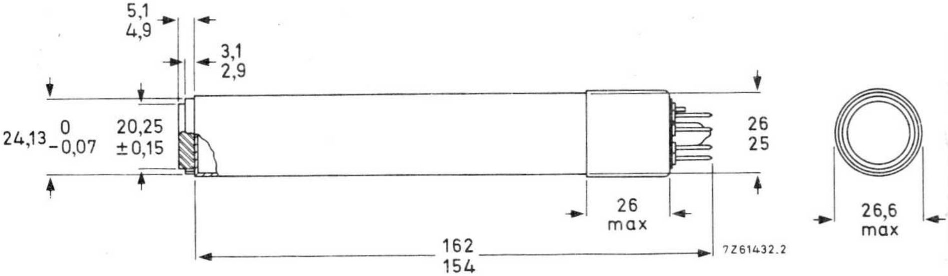
MECHANICAL

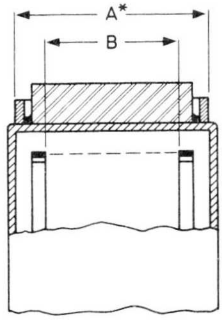
Dimensions in mm

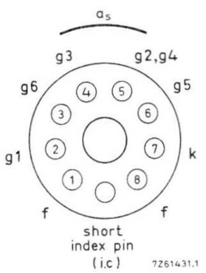
Mounting position: any

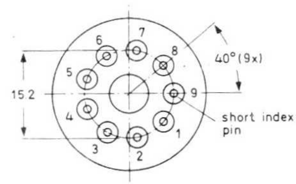
Mass: $\approx$ 70 g

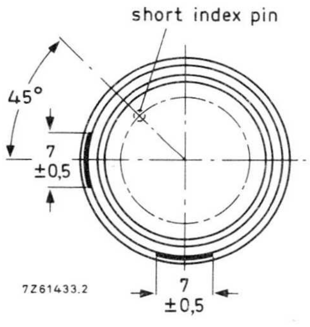
Base: IEC67-I-33a (JEDEC E8-11)

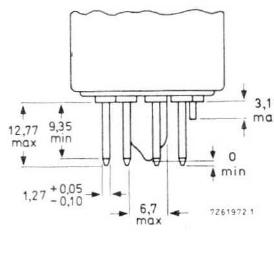












see note 2a

* The distance between the geometrical centres of the diameter A of the reference ring and the diameter B of the mesh-electrode ring is < 100 μm.

OPERATING CONDITIONS AND PERFORMANCE

Conditions (with ACT action) [7]

For a scanned area of 9, 6 x 12, 8 mm^2. All voltages are specified with respect to the cathode potential during the read-out mode, unless otherwise indicated. See notes 8, 9, 10.

Cathode voltage,				
during read-out mode	V_k	0	V	
during ACT mode	V_k	0 to 15	V	
Signal electrode voltage	V_{a_s}	45	V	[5]
Grid no. 6 (mesh) voltage	V_{g6}	750	V	[11] [12]
Grid no. 5 (collector) voltage	V_{g5}	475	V	[11] [12]
Grid no. 4 (limiter) and grid no. 2 (accelerator, or first anode) voltage	$V_{g2,4}$	300	V	
Grid no. 3 (auxiliary grid) voltage,				
during read-out mode	V_{g3}	see note 10		
during ACT mode	V_{g3}			
Grid no. 1 (control grid) voltage,				
during read-out mode	V_{g1}	see note 13		
during ACT mode	V_{g1}	see note 10		
blanking on grid no. 1, peak	V_{g1_p}	50	V	

Typical beam current, signal current and pulse settings [10]

		XQ1080 XQ1080L	XQ1080R	XQ1080G	XQ1080B
	I_{sp}	200 nA	100 nA	200 nA	100 nA
	I_{bp}	400 nA	200 nA	400 nA	200 nA
ACT level (peak)		280 nA	140 nA	280 nA	140 nA
Cathode pulse	V_{k_p}	8 V	4 V	8 V	4 V
Grid no. 1 pulse	V_{g1_p}	28 V	24 V	28 V	24 V
Grid no. 3 pulse	V_{g3_p}		see note 10		

Faceplate illumination		see note 14
Light bias		see note 15
Temperature of faceplate		20 to 45 °C
Deflection, focusing and alignment coil unit	AT1119 [16]	

Deflection, focusing and alignment currents

V_{g6}/V_{g5} (V)	focus current (mA)	line current$_{p-p}$ (mA)	frame current $_{p-p}$ (mA)
750/475	32	290	35

Line and frame alignment currents max. 15 mA, corresponding to a flux density of approx. 4 x 10^{-4}T (4 Gs).

Notes see pages 8, 9 and 11

Performance

Dark current	≤ 3 nA
Sensitivity at colour temperature of illumination = 2856K	[17]
XQ1080	400 μA/lm
XQ1080L	400 μA/lm
XQ1080R	85 μA/lm
XQ1080G	165 μA/lm
XQ1080B	38 μA/lm
Gamma of transfer characteristic	0,95 ± 0,05 [18]
Light transfer characteristics with ACT	see page 16
Highlight handling	≥ 5 lens stops [19]
Spectral response: max. response at	≈ 500 nm
cut-off at	≈ 650 nm
curve	see page 12

Resolution

Modulation depth i.e. uncompensated amplitude response at 400 TV lines at the centre of the picture. The figures represent the typical horizontal amplitude response as measured with a lens aperture of f 5,6 [13], [20], [21].

	XQ1080 XQ1080L	XQ1080R	XQ1080G	XQ1080B
Highlight signal current I_{sp}	0,2 μA	0,1 μA	0,2 μA	0,1 μA
Beam current I_{bp}	0,4 μA	0,2 μA	0,4 μA	0,2 μA
Modulation depth at 400 TV lines in %	40	35	40	45

Modulation transfer characteristics	see page 13
Limiting resolution	≥ 750 TV lines

Notes see page 11 and 12

Lag (typical values)
Light source with a colour temperature of 2856K
Appropriate filter inserted in the light path for the chrominance tubes R, G and B

Low key conditions (without light bias)

	build-up lag [22]				decay lag [23]			
	$I_s/I_b = 20/200$ nA		$I_s/I_b = 40/400$ nA		$I_s/I_b = 20/200$ nA		$I_s/I_b = 40/400$ nA	
	60 (ms)	200 (ms)	60 (ms)	200 (ms)	60 (ms)	200 (ms)	60 (ms)	200 (ms)
XQ1080, L, G			98%	≈ 100%			5%	2%
XQ1080R, B	> 95%	≈ 100%			8%	3%		

Low key conditions (with light bias) [24]
See curves on pages 14 and 15

High key conditions

<table>
<tr><td rowspan="3"></td><td colspan="4">build-up lag [22]</td><td colspan="4">decay lag [23]</td></tr>
<tr><td colspan="2">$I_s/I_b = 100/200$ nA</td><td colspan="2">$I_s/I_b = 200/400$ nA</td><td colspan="2">$I_s/I_b = 100/200$ nA</td><td colspan="2">$I_s/I_b = 200/400$ nA</td></tr>
<tr><td>60 (ms)</td><td>200 (ms)</td><td>60 (ms)</td><td>200 (ms)</td><td>60 (ms)</td><td>200 (ms)</td><td>60 (ms)</td><td>200 (ms)</td></tr>
<tr><td>XQ1080, L, G</td><td></td><td></td><td>98%</td><td>≈ 100%</td><td></td><td></td><td>1,5%</td><td>0,6%</td></tr>
<tr><td>XQ1080R</td><td rowspan="2">> 97%</td><td rowspan="2">≈ 100%</td><td></td><td></td><td>2,5%</td><td>1%</td><td></td><td></td></tr>
<tr><td>XQ1080B</td><td></td><td></td><td>3,5%</td><td>2%</td><td></td><td></td></tr>
</table>

Shading of lightbias induced dark current ≤ 20 % [25]

Notes see page 12

NOTES

1) Underscanning of the specified useful area of 9,6 x 12,8 mm^2, or failure of scanning, should be avoided so as not to damage the photoconductive layer.

2) a. The position of this marker line corresponds to the position of one of the small area contacts on the ceramic centring ring. The spring contact in the coil units AT1115 (or AT1119) is located accordingly in the plane of the vertical scan, preferred for the construction of colour cameras with a horizontal spider design.
A second small area contact at 90° with the first is provided on the ceramic centring ring for operation of the tube with a contact spring in the plane of the horizontal scan, as preferred for the construction of colour cameras with a vertical spider design.
Total possible rotation of the tube while maintaining contact is approx. 35°.

b. The outer periphery of the ceramic centring ring is concentric with the inner periphery of the mesh ring (grid no. 6).
In the AT1115 (AT1119) coil units the tube is centred with this ring as a reference; this ensures proper optical alignment of the tube in the optical system of the camera.

3) Blanking can also be applied to the cathode:
- without ACT action: required cathode pulse approx. 25 V.
- with ACT action: timing, polarity and amplitudes of the ACT pulses will have to be adapted.

4) The d.c. voltage supply and/or pulse supply to these electrodes should have a sufficiently low impedance to prevent distortion caused by the peak currents drawn during the ACT mode.
These peak currents may amount to:

cathode	2 mA
grid no. 1	0 mA
grids no. 2 and no. 4	1 mA
grid no. 3	150 μA
grid no. 5	300 μA
grid no. 6	300 μA

The cathode impedance should preferably be chosen $\leq$ 300 Ω.

5) Plumbicon tubes do not permit automatic sensitivity control be means of regulation of the signal electrode voltage. Adequate control is therefore to be achieved by other means (iris control and neutral density filters).
If the tube is applied in cameras originally designed for vidicon tubes, the automatic sensitivity control circuitry should be made inoperative and the signal electrode voltage set at 45 V.

6) 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.

7) When the tube is to be used without Anti-Comet-Tail action, grid no. 3 (auxiliary grid) should be connected to grids no. 2 and no. 4 and no ACT pulses should be applied to the cathode and grid no. 1 (control grid). The performance of the tube will then be as described herein with the exception of the highlight handling.

8) a. For proper ACT action the d.c. voltage supply and/or pulse supply to the various electrodes should have sufficiently low impedance. See note 4.

b. Video pre-amplifier. In the presence of highlights, peak signal currents of the order of 15 to 45 μA may be offered to the pre-amplifier during flyback. Special measures have to be taken in the pre-amplifier to prevent temporary overloading.

9) a. Read-out mode: defined as the operating conditions during the active line scan (full line period-line blanking interval).
For the CCIR system this will amount to 64 µs - 12 µs = 52 µs.

b. ACT mode: defined as the operating conditions during that part of the line blanking interval during which the ACT electrode gun is fully operative.
The ACT interval is equal to or slightly within the line flyback time.

10) Pulse timing (CCIR) and amplitudes for ACT action

(blanking applied to grid no. 1) [3]

a. For proper operation and setting up of the ACT electron gun three electrodes have to be pulsed:

- Cathode A positive going pulse, V_{kp}, with an adjustable amplitude of 0 to 20 V. This pulse can be chosen to coincide with the camera blanking period ($\approx$ 11 µs).

  The amplitude of this pulse determines the ACT cutting level and may in general be preset to 8, 4, 8, 4 V, respectively, for black/white, R, G, B application. An amplitude of 20 V should be available to preset the I_s/I_b (see note 13).

- Grid no. 1 A positive going pulse, V_{g1_p}, with such an amplitude that during the ACT mode the grid no. 1 bias is effectively reduced by 20 V, (V_{g1_p} = 20 V + V_{k_p}), to produce an extra amount of cathode current. The duration of this pulse should be so chosen that it is just within the flyback period ($\approx$ 5 µs).

- Grid no. 3 A negative going pulse, V_{g3_p}, timing and duration coinciding with V_{g1_p},
  - with either an adjustable amplitude and superimposed on a fixed grid no. 3 voltage of 250 to 300 V.
  - or with fixed amplitude and superimposed on an adjustable grid no. 3 voltage of 250 to 300 V.

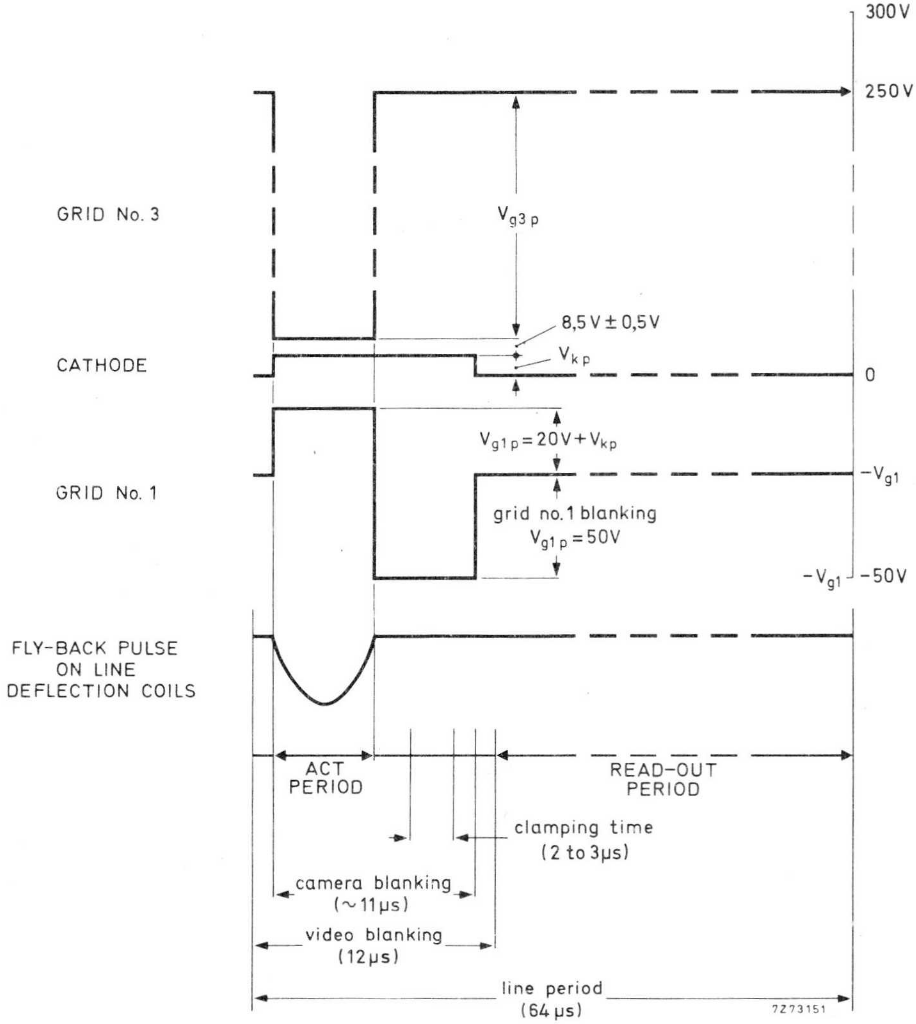
  in either case adjusted to result in a grid no. 3 voltage of 8,5±0,5 V w.r.t. the cathode voltage during the ACT mode.

  This pulse ensures that an adequate amount of beam current is drawn from the cathode current.

b. A suggested pulse timing and amplitude diagram is shown on page 10.

11) The optimum voltage ratio V_{g6}/V_{g5} to minimize beam landing errors (preferably $\leq$ 1 V) depends on the type of coil unit used. For type AT1115 a ratio of 1,5 : 1 to 1,6 : 1 is recommended.

12) Operation with ACT at V_{g6} > 750 V is not recommended since this may introduce dark current.


300 V
250 V
GRID No. 3
$V_{g3\,p}$
8,5 V ± 0,5 V
CATHODE
V_{kp}
0
$V_{g1\,p} = 20\,V + V_{kp}$
GRID No. 1
$-V_{g1}$
grid no. 1 blanking
$V_{g1\,p} = 50\,V$
$-V_{g1}$ $-50\,V$
FLY-BACK PULSE
ON LINE
DEFLECTION COILS
ACT
PERIOD
READ-OUT
PERIOD
clamping time
(2 to 3 μs)
camera blanking
(~ 11 μs)
video blanking
(12 μs)
line period
(64 μs)
7Z73151

13) Adjusted with the ACT made inoperative, e.g. by setting the cathode pulse to 20 V. The control grid voltage is adjusted to produce a beam current just sufficient to allow a peak signal current of twice the typical value, I_{sp}, as observed and measured on a waveform oscilloscope. This amount of beam current is termed I_{bp}.
N.B. The signal current, I_s, and beam current, I_b, conditions quoted with the performance figures for e.g., lag, relate to measurements with an integrating instrument connected in the signal-electrode lead and a uniform illumination on the scanned area.
The corresponding peak currents, I_{sp} and I_{bp}, as measured on a waveform oscilloscope will be a factor α larger (α = 100/100-β), β being the total blanking time in %; for CCIR system α amounts to 1,33.

14) In the case of a black/white camera the illumination on the photoconductive layer, B_{ph}, is related to scene illumination, B_{sc}, by the formula:

$$B_{ph} = B_{sc} \frac{R.T.}{4F^2 (m + 1)^2}$$

in which R represents the average scene reflectivity or the object reflectivity, whichever is relevant, T the lens transmission factor, F the lens aperture, and m the linear magnification from scene to target.
A similar formula may be derived for the illumination level on the photoconductive layers of the R, G, and B tubes in which the effects of the various components of the complete optical system have been taken into account.

15) The lightbias lamp in its holder fits into the socket type 56026 and requires maximum 5 V, 110 mA. Its light is projected onto the pumping stem via a blue-green transmitting filter and is conducted to cause a bias illumination on the target. The required amount of lightbias can be obtained by adjusting the filament current of the lamp.

16) Focus current adjusted for correct electrical focus. The direction of the focusing current shall be such that a north seeking pole is attracted towards the image end of the focusing coil, with this pole located outside of and at the image end of the focusing coil.

17) Measuring conditions:
Illumination ≈ 4 lx (luminous flux = 0,5 mlm) at a colour temperature of 2856K the appropriate filter inserted in the light path.

Filter used:

XQ1080R	Schott	OG570	thickness	3 mm
XQ1080G	Schott	VG9	thickness	1 mm
XQ1080B	Schott	BG12	thickness	3 mm

For transmission curves see page 13.

18) Below the "knee" caused by ACT operation.
Gamma stretching circuitry is recommended.

19) With pulses applied as indicated in note 10, the tube will properly handle a highlight with a diameter of 10% of picture height and with a brightness corresponding to 32 times peak signal white, I_{sp}.

20) Typical faceplate illumination level for the XQ1080 to produce 0, 2 μA signal current will be approx. 4 lx. The signal current stated for the colour tubes R, G, B will be obtained with an incident white light level (c.t. = 2856K) on the filter of approx. 10 lx. These figures are based on the filters described in note 17). For filter BG12, however, a thickness of 1 mm is chosen.

21) The horizontal amplitude response can be raised by the application of suitable correction circuits, which affects neither the vertical resolution nor the limiting resolution.

22) After 10 seconds of darkness. The figures given represent typical percentages of the ultimate signal current obtained 60 ms and 200 ms respectively after the illumination has been applied.

23) After a minimum of 5 s of illumination on the target. The figures given represent typical residual signals in % of the original signal current 60 ms and 200 ms respectively after the illumination has been removed.

24) For black/white operation a light bias corresponding to 2 to 3 nA extra dark current is usually adequate for excellent speed of response.
In a colour camera the speeds of response of the tubes can be balanced by adjusting the amount of light bias per tube. A typical setting in a 3-tube colour camera could be R, G, B: 3, 5, 8 nA.

25) Maximum deviation of the level of any of the four corners, i.e. 10% inwards in L. and V. direction, from the level in picture centre. The observed shading is composed of slight parabolic and saw tooth components in both line and frame direction which can be sufficiently compensated by suitable black shading compensation circuitry.

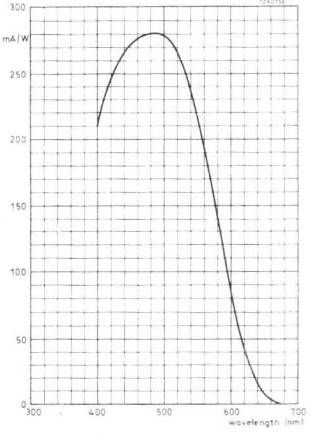


Fig. 1 Typical spectral response curve

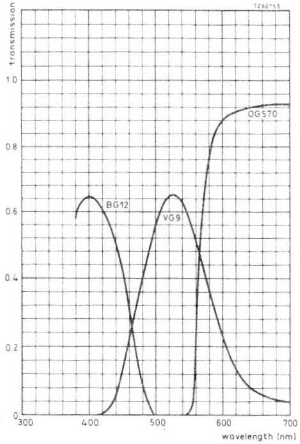


Fig. 2
Transmission of filters OG570, VG9 and BG12. See note 17

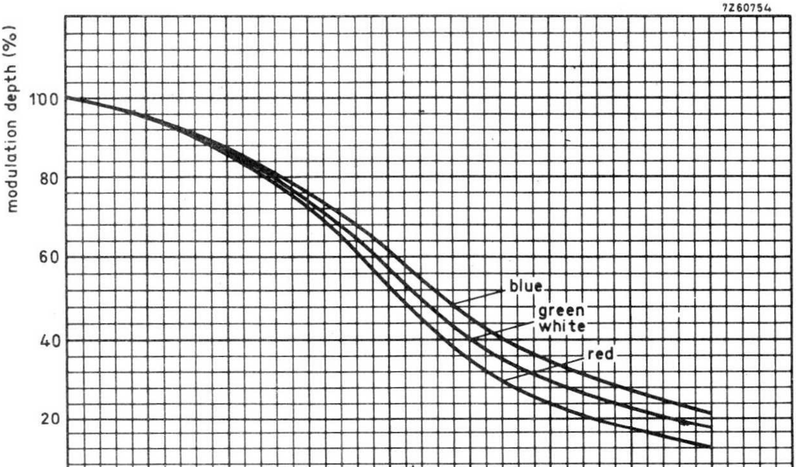


Fig. 3 Square wave modulation transfer characteristics

$V_{g2, g4} = 300$ V, $V_{g5} = 475$ V, $V_{g6} = 750$ V

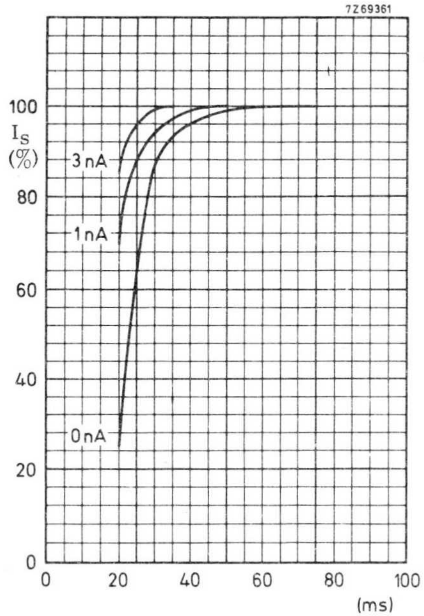


Fig. 4

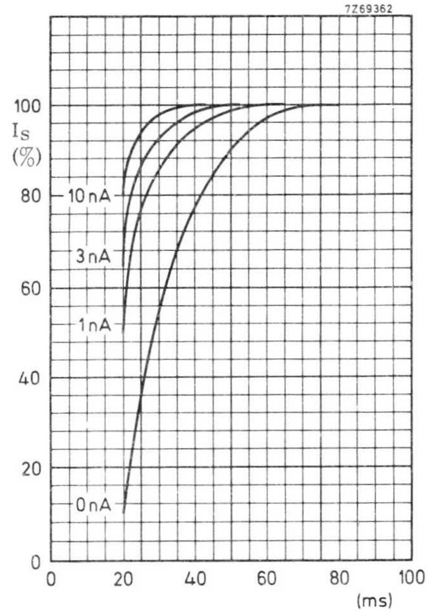


Fig. 5

Build-up lag 22)

Light-bias induced dark current as parameter.

Fig. 4 XQ1080, XQ1080L, XQ1080G
I_S/I_b = 40/400 nA

Fig. 5 XQ1080R
I_S/I_b = 20/200 nA

Fig. 6 XQ1080B
I_S/I_b = 20/200 nA

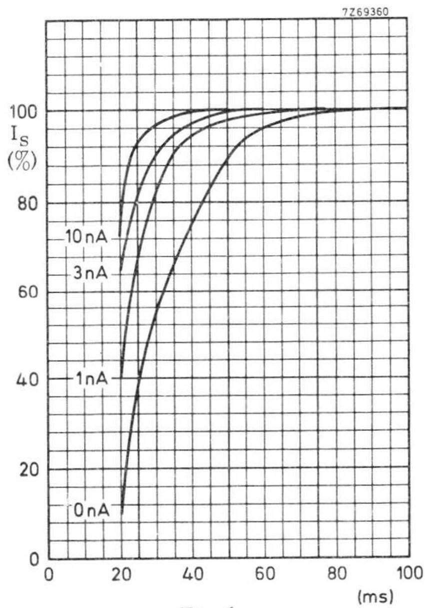


Fig. 6

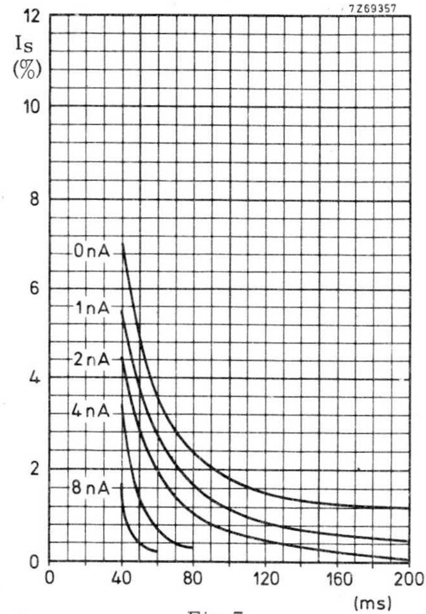


Fig. 7

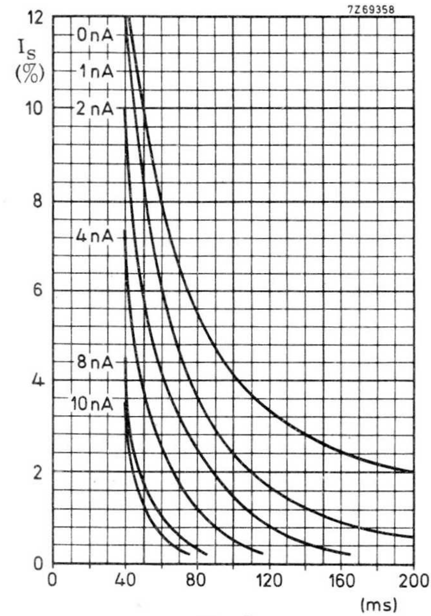


Fig. 8

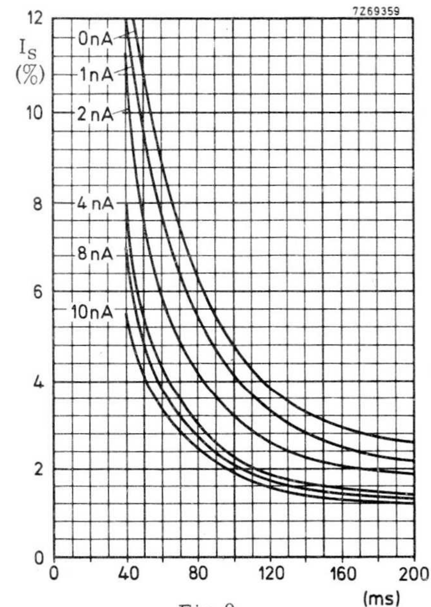


Fig. 9

Decay lag [23])

Light-bias induced dark current as parameter.

Fig. 7 XQ1080, XQ1080L, XQ
XQ1080G
I_S/I_b = 40/400 nA

Fig. 8 XQ1080R
I_S/I_b = 20/200 nA

Fig. 9 XQ1080B
I_S/I_b = 20/200 nA

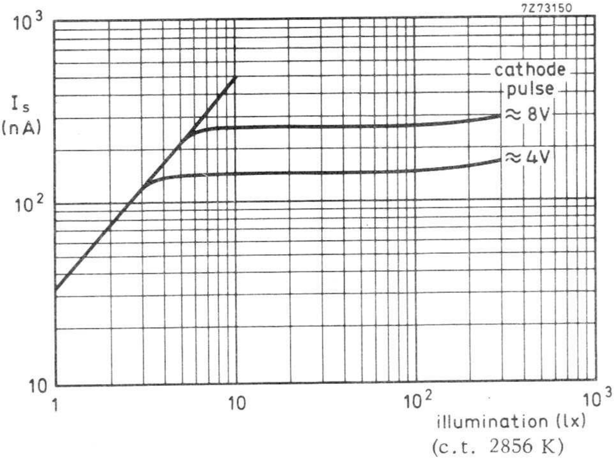


Fig. 10 Typical light transfer characteristics with ACT applied

CAMERA TUBE

Plumbicon*, television camera tube with high resolution lead-oxide photoconductive target, low heater power, separate mesh construction, magnetic focusing, magnetic deflection and 25,4 mm (1 in) diameter.

The tubes of the XQ1081 series are provided with an A C T electron gun and a light-pipe and are electrically and mechanically identical to the tubes of the XQ1080 series, the only difference being the degree of freedom from blemishes of the photoconductive target.

The tubes are intended for industrial and educational black-and-white and colour cameras.

The series comprises the following versions:

XQ1081	for bl/wh cameras
XQ1081R	for use in the chrominance
XQ1081G	channels of
XQ1081B	colour cameras

For all further information see data of the XQ1080 series.

* Registered Trade Mark for television camera tube.

CAMERA TUBE

Plumbicon * television camera tubes identical to the tubes of the XQ1080 series, hence provided with an ACT electron gun; provisions for light bias, and a ceramic centring ring, but with a high resolution lead-oxide photoconductive target with extended red response as used in the XQ1073 series.

The XQ1083 series comprise two versions: the XQ1083 intended for use in black and white cameras, and the XQ1083R for use in the red chrominance channel of colour cameras in broadcast, educational and high quality industrial applications in which high contrast ratios may occur.

QUICK REFERENCE DATA	
Focusing	magnetic
Deflection	magnetic
Diameter	25, 4 mm (1 in)
Length	158 mm ($6\frac{1}{4}$ in)
Special features	Anti-Comet Tail gun Light bias Anti-halation glass disc Ceramic centring ring Rear loading construction
Heater	6, 3 V, 95 mA
Resolution	≥ 750 TV lines
Cut-off of spectral response	850 to 950 nm

Data based on pre-production tubes.

* Registered Trade Mark for television camera tube.

OPTICAL

Quality rectangle on photoconductive target (aspect ratio 3 : 4)		9,6 x 12,8	mm^2 1)

Orientation of image on photoconductive 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. 2a)

Optical alignment		see note 2b	
Faceplate			
Thickness		1,2	mm
Refractive index	n	1,49	
Refractive index of anti-halation disc	n	1,52	

HEATING

Indirect by a.c. or d.c.; parallel or series supply.

Heater voltage	V_f	6,3	V
Heater current	I_f	95	mA

When the tube is used in a series heater chain the heater voltage must not exceed an r.m.s. value of 9,5 V when the supply is switched on. To avoid registration errors in colour cameras, stabilization of the heater voltage is recommended.

CAPACITANCE

Signal-electrode to all	C_{as}	2,5 to 3,5	pF

This capacitance, which is effectively the output impedance, increases when the tube is inserted in the coil unit.

DEFLECTION magnetic

FOCUSING magnetic

ACCESSORIES

Socket		type 56026
Light bias lamp in holder		type 56027
Deflection, focusing and alignment coil unit	black/white	type AT1119
	colour	type AT1115 *

* AT1115 is a computer selected triplet of AT1119 coil units.

Mask	type 56028

Notes see page 8

ELECTRON GUN CHARACTERISTICS

Cut-off Grid no. 1 voltage for cut-off at $V_{g2,4}$ = 300 V, without blanking nor ACT pulses	V_{g1}		-45 to -110	V	
Blanking voltage, peak to peak at $V_{g2,4}$ = 300 V, on grid no. 1	V_{g1p-p}		50 ± 10	V	3)
Grids no. 2 and 4 current (d.c. values)	$I_{g2,4}$	max.	0,2	mA	4)
Grids no. 3, 5, and 6 currents		see note 4			
Pulse timing and amplitude requirements (ACT)		see note 10			

LIMITING VALUES (Absolute max. rating system)

All voltages are referred to the cathode, unless otherwise stated.

Signal electrode voltage	V_{as}	max.	50	V	5)
Grid no. 6 (mesh) voltage	V_{g6}	max.	1100	V	
Grid no. 5 (collector) voltage	V_{g5}	max.	800	V	
Voltage between grid no. 6 and grid no. 5	$V_{g6/g5}$	max.	350	V	
Grid no. 4 (limiter) and grid no. 2 (accelerator, or first anode) voltage	$V_{g2,4}$	max.	350	V	
Grid no. 3 (auxiliary grid) voltage	V_{g3}	max.	350	V	
Grid no. 1 (control grid) voltage, positive	V_{g1}	max.	0	V	
negative	$-V_{g1}$	max.	200	V	
Cathode heating time before drawing cathode current	T_h	min.	1	min	
Cathode to heater voltage, positive peak	V_{kf_p}	max.	125	V	
negative peak	$-V_{kf_p}$	max.	50	V	
Impedance between cathode and heater at $-V_{kf_p}$ > 10 V	Z_{kf}	min.	2	kΩ	
Ambient temperature, storage and operation	t_{amb}	max.	50	^oC	
		min.	-30	^oC	
Faceplate temperature, storage and operation	t	max.	50	^oC	
		min.	-30	^oC	
Faceplate illumination	E	max.	100	lx	6)

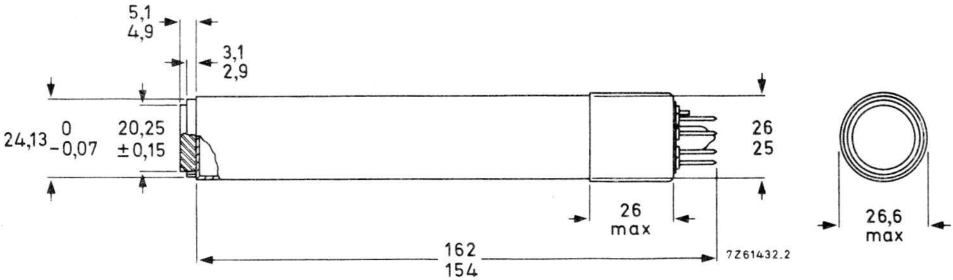
Notes: see page 8

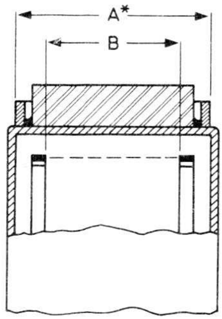
MECHANICAL DATA Dimensions in mm

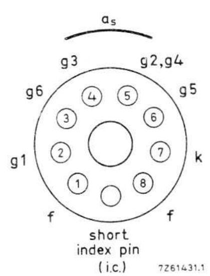
Mounting position: any

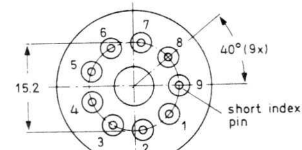
Mass: ≈ 70 g

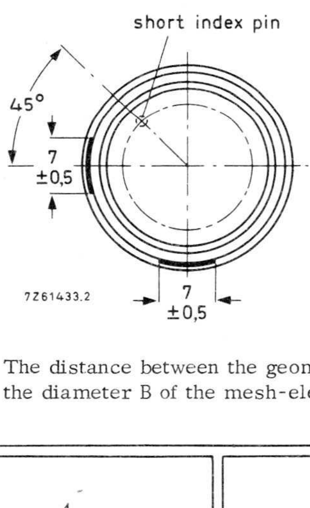
Base: IEC67-I-33a (JEDEC E8-11)

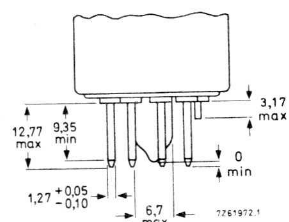












* The distance between the geometrical centres of the diameter A of the reference ring and the diameter B of the mesh-electrode ring is < 100 μm.

OPERATING CONDITIONS AND PERFORMANCE

Conditions (with ACT action) [7]
for a scanned area of 9,6 x 12,8 mm^2. All voltages are specified with respect to the cathode potential during the read-out mode, unless otherwise indicated. See notes 8, 9, 10.

Cathode voltage,				
during read-out mode	V_k	0	V	
during ACT mode	V_k	0 to 15	V	
Signal electrode voltage	Va_s	45	V	[5]
Grid no. 6 (mesh) voltage	V_{g6}	750	V	[11] [12]
Grid no. 5 (collector) voltage	V_{g5}	475	V	[11] [12]
Grid no. 4 (limiter) and grid no. 2 (accelerator, or first anode) voltage	$V_{g2,4}$	300	V	
Grid no. 3 (auxiliary grid) voltage,				
during read-out mode	V_{g3}	see note 10		
during ACT mode	V_{g3}	see note 10		
Grid no. 1 (control grid voltage,				
during read-out mode	V_{g1}	see note 13		
during ACT mode	V_{g1}	see note 10		
blanking on grid no. 1, peak	V_{g1_p}	50	V	

Typical beam current, signal current and pulse settings [10]

		XQ1083	XQ1083R
	I_{sp}	200 nA	100 nA
	I_{bp}	400 nA	200 nA
ACT level (peak)		280 nA	140 nA
Cathode pulse	V_{kp}	6 V	3 V
Grid no. 1 pulse	V_{g1p}	26 V	23 V
Grid no. 3 pulse	V_{g3p}	see note 10	

Faceplate illumination	see note 14		
Light bias	see note 15		
Temperature of faceplate	20 to 45	^{o}C	
Deflection, focusing and alignment coil unit	AT1119		[16]

Deflection, focusing and alignment currents

V_{g6}/V_{g5} (V)	focus current (mA)	line current p-p (mA)	frame current p-p (mA)
750/475	32	290	35

Line and frame alignment currents max. 15 mA, corresponding to a flux density of approx. 4 x 10^{-4}T (4 Gs).

Notes: see pages 8, 9, and 11

Performance

Dark current (without light bias)	≤ 3	nA	
Sensitivity at colour temperature of illumination = 2856K			
XQ1083	400	μA/lm	17a)
XQ1083R	115	μA/lm	17b)
Gamma of transfer characteristic	0,95 ± 0,05		18)
Light transfer characteristic with ACT	see page 16		
Highlight handling	≥ 5 lens stops		19)
Spectral response: max. response at	≈ 500	nm	
cut-off (= 1% of peak response)	≈ 850 to 950	nm	20)
curve	see page 12		

Resolution

Modulation depth i.e. uncompensated amplitude response at 400 TV lines at the centre of the picture. The figures represent the typical horizontal amplitude response as measured with a lens aperture of f5.6 13), 21), 22).

	XQ1083	XQ1083R
Highlight signal current I_{sp}	0,2 μA	0,1 μA
Beam current I_{bp}	0,4 μA	0,2 μA
Modulation depth at 400 TV lines in %	50	45

Modulation transfer characteristics	see page 13
Limiting resolution	≥ 750 TV lines

Notes see pages 11 and 12

Lag (typical values), without light bias
Light source with a colour temperature of 2856K
Appropriate filter inserted in the light path for the chrominance tube.

Low key conditions, without light bias

	build-up lag 23)				decay lag 24)			
	I_s/I_b = 20/200 nA		I_s/I_b = 40/400 nA		I_s/I_b = 20/200 nA		I_s/I_b = 40/400 nA	
22) 23)	60 (ms)	200 (ms)	60 (ms)	200 (ms)	60 (ms)	200 (ms)	60 (ms)	200 (ms)
XQ1083			98	100			7	2,5
XQ1083R	95	100			8	2,5		

Low key conditions, with light bias [25]

See curves in figures 5, 6, 7, and 8

High key conditions

	build-up lag 23)				decay lag 24)			
	I_s/I_b = 100/200 nA		I_s/I_b = 200/400 nA		I_s/I_b = 100/200 nA		I_s/I_b = 200/400 nA	
	60 (ms)	200 (ms)	60 (ms)	200 (ms)	60 (ms)	200 (ms)	60 (ms)	200 (ms)
XQ1083			98	100			2	1
XQ1083R	98	100			3	1,5		

Shading of light bias induced dark current $\leq$ 20 % [26]

Notes see page 12

NOTES

1) Underscanning of the specified useful area of 9,6 x 12,8 mm^2, or failure of scanning, should be avoided so as not to damage the photoconductive layer.

2) a. The position of this marker line corresponds to the position of one of the small area contacts on the ceramic centring ring. The spring contact in the coil units AT1115 (or AT1119) is located accordingly in the plane of the vertical scan, preferred for the construction of colour cameras with a horizontal spider design.
A second small area contact at 90^o with the first is provided on the ceramic centring ring for operation of the tube with a contact spring in the plane of the horizontal scan, as preferred for the construction of colour cameras with a vertical spider design.
Total possible rotation of the tube while maintaining contact is approx. 35 ^{o}.

b. The outer periphery of the ceramic centring ring is concentric with the inner periphery of the mesh ring (grid no. 6).
In the AT1115 (AT1119) coil units the tube is centred with this ring as a reference; this ensures proper optical alignment of the tube in the optical system of the camera.

3) Blanking can also be applied to the cathode:
- without ACT action: required cathode pulse approx. 25 V.
- with ACT action: timing, polarity and amplitudes of the ACT pulses will have to be adapted.

4) The d.c. voltage supply and/or pulse supply to these electrodes should have a sufficiently low impedance to prevent distortion caused by the peak currents drawn during the ACT mode.
These peak currents may amount to:

cathode	2 mA
grid no. 1	0 mA
grids no. 2 and no. 4	1 mA
grid no. 3	150 μA
grid no. 5	300 μA
grid no. 6	300 μA

The cathode impedance should preferably be chosen ≤ 300 Ω.

5) Plumbicon tubes do not permit automatic sensitivity control by means of regulation of the signal electrode voltage. Adequate control is therefore to be achieved by other means (iris control and neutral density filters).
If the tube is applied in cameras originally designed for vidicon tubes, the automatic sensitivity control circuitry should be made inoperative and the signal electrode voltage set at 45 V.

6) 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.

7) When the tube is to be used without Anti-Comet-Tail action, grid no. 3 (auxiliary grid) should be connected to grids no. 2 and no. 4 and no ACT pulses should be applied to the cathode and grid no. 1 (control grid). The performance of the tube will then be as described herein with the exception of the highlight handling.

8) a. For proper ACT action the d.c. voltage supply and/or pulse supply to the various electrodes should have sufficiently low impedance. See note 4.

b. Video pre-amplifier. In the presence of highlights, peak signal currents of the order of 15 to 45 μA may be offered to the pre-amplifier during flyback. Special measures have to be taken in the pre-amplifier to prevent temporary overloading.

9) a. Read-out mode: defined as the operating conditions during the active line scan (full line period-line blanking interval).
For the CCIR system this will amount to 64 μs - 12 μs = 52 μs.

b. ACT mode: defined as the operating conditions during that part of the line blanking interval during which the ACT electron gun is fully operative.
The ACT interval is equal to or slightly within the line flyback time.

10) Pulse timing (CCIR) and amplitudes for ACT action

(blanking applied to grid no. 1) 3)

a. For proper operation and setting up of the ACT electron gun three electrodes have to be pulsed:

- Cathode A positive going pulse, V_{k_p}, with an adjustable amplitude of 0 to 20 V. This pulse can be chosen to coincide with the camera blanking period (≈ 11 μs).

  The amplitude of this pulse determines the ACT cutting level and may in general be preset to 8, 4, 8, 4 V, respectively, for black/white, R, G, B application. An amplitude of 20 V should be available to preset the I_s/I_b (see note 13).

- Grid no. 1 A positive going pulse, V_{g1_p}, with such an amplitude that during the ACT mode the grid no. 1 bias is effectively reduced by 20 V, (V_{g1_p} = 20 V + V_{k_p}), to produce an extra amount of cathode current. The duration of this pulse should be so chosen that it is just within the flyback period (≈ 5 μs).

- Grid no. 3 A negative going pulse, V_{g3_p}, timing and duration coinciding with V_{g1_p},
  - with either an adjustable amplitude and superimposed on a fixed grid no. 3 voltage of 250 to 300 V,
  - or with fixed amplitude and superimposed on an adjustable grid no. 3 voltage of 250 to 300 V,

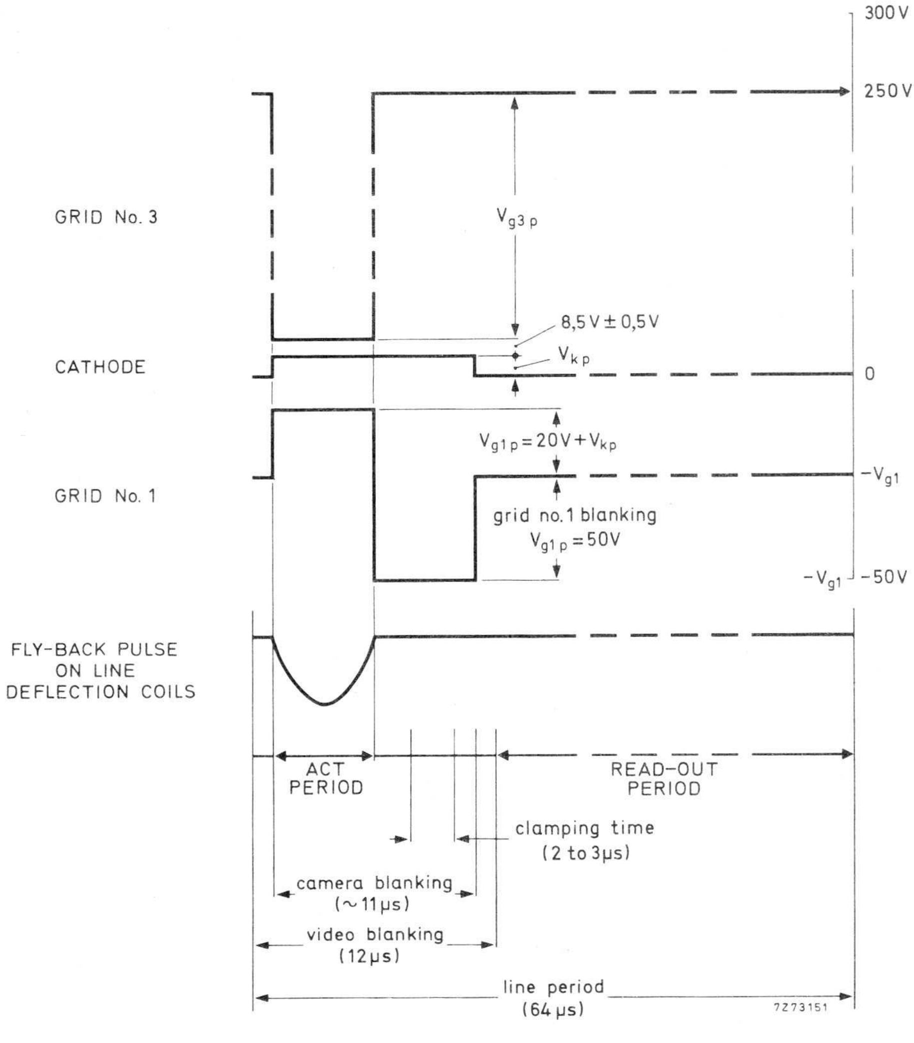
  in either case adjusted to result in a grid no. 3 voltage of 8,5 ± 0,5 V w.r.t. the cathode voltage during the ACT mode.

  This pulse ensures that an adequate amount of beam current is drawn from the cathode current.

b. A suggested pulse timing and amplitude diagram is shown on page 10.

11) The optimum voltage ratio V_{g6}/V_{g5} to minimize beam landing errors (preferably ≤ 1 V) depends on the type of coil unit used). For type AT1115 a ratio of 1,5 : 1 to 1,6 : 1 is recommended.

12) Operation with ACT at V_{g6} > 750 V is not recommended since this may introduce dark current.


300 V
250 V
GRID No. 3
$V_{g3\,p}$
8,5 V ± 0,5 V
CATHODE
$V_{k\,p}$
0
$V_{g1\,p} = 20\,V + V_{kp}$
GRID No. 1
$-V_{g1}$
grid no. 1 blanking
$V_{g1\,p} = 50\,V$
$-V_{g1}$
-50 V
FLY-BACK PULSE
ON LINE
DEFLECTION COILS
ACT
PERIOD
READ-OUT
PERIOD
clamping time
(2 to 3 µs)
camera blanking
(~ 11 µs)
video blanking
(12 µs)
line period
(64 µs)
7273151

13) Adjusted with the ACT made inoperative, e.g. by setting the cathode pulse to 20 V. The control grid voltage is adjusted to produce a beam current just sufficient to allow a peak signal current of twice the typical value, I_{sp}, as observed and measured on a waveform oscilloscope. This amount of beam current is termed I_{bp}.
N.B. The signal current, I_s, and beam current, I_b, conditions quoted with the performance figures for e.g., lag, relate to measurements with an integrating instrument connected in the signal-electrode lead and a uniform illumination on the scanned area.
The corresponding peak currents, I_{sp} and I_{bp}, as measured on a waveform oscilloscope will be a factor α larger ($\alpha = 100/100\text{-}\beta$), β being the total blanking time in %; for CCIR system α amounts to 1,33.

14) In the case of a black/white camera the illumination on the photoconductive layer, B_{ph}, is related to scene illumination, B_{sc}, by the formula:

$$B_{ph} = B_{sc} \quad \frac{R.T.}{4F^2\ (m+1)^2}$$

in which R represents the average scene reflectivity or the object reflectivity, whichever is relevant, T the lens transmission factor, F the lens aperture, and m the linear magnification from scene to target.
A similar formula may be derived for the illumination level on the photoconductive layer of the R chrominance tube in which the effects of the various components of the complete optical system have been taken into account.

15) The lightbias lamp in its holder fits into the socket type 56026 and requires maximum 5 V, 110 mA. Its light is projected on to the pumping stem via a blue-green transmitting filter and is conducted to cause a bias illumination on the target. The required amount of lightbias can be obtained by adjusting the filament current of the lamp.

16) Focus current adjusted for correct electrical focus. The direction of the focusing current shall be such that a north seeking pole is attracted towards the image end of the focusing coil, with this pole located outside of and at the image end of the focusing coil.

17) a. All measurements are made with an infra-red reflecting filter interposed between light-source and target. Balzers Calflex B1/K1 filter is chosen for this purpose since, for accurate colour reproduction in a colour camera, a similar I.R. reflecting filter will be required. For typical transmission curve of this filter see page 13

b. with an additional filter (see note 17a) interposed between light source and target. Filter used is: Schott OG570 (3 mm).
For transmission curve see page 13

18) Below the "knee" caused by ACT operation.
Gamma stretching circuitry is recommended.

19) With pulses applied as indicated in note 10, the tube will properly handle a highlight with a diameter of 10% of picture height and with a brightness corresponding to 32 times peak signal white, I_{sp}.

20) Without infra-red reflecting filter B1/K1.

21) Typical faceplate illumination level for the XQ1083 to produce 0, 2 μA signal current will be approx. 4 lux.

The signal current stated for the chrominance tube XQ1083R will be obtained with an incident white level (c.t. 2856K) on the filter - Schott OG570 - of approx. 8 lux.

22) The horizontal amplitude response can be raised by the application of suitable correction circuits, which affects neither the vertical resolution nor the limiting resolution.

23) After 10 seconds of complete darkness. The figures given represent typical percentages of the ultimate signal current obtained 60 ms respectively 200 ms after the illumination has been applied.

24) After a minimum of 5 s of illumination on target. The figures given represent typical residual signals in % of the original signal current 60 ms respectively 200 ms after the illumination has been removed.

25) For black/white operation a light bias corresponding to 2 to 3 nA extra dark current is usually adequate for excellent speed of response.
In a colour camera the speeds of response of the tubes can be balanced by adjusting the amount of light bias per tube. A typical setting in a 3-tube colour camera could be for XQ1083R, XQ1080G, XQ1080B respectively, 4, 3, 8 nA.

26) Maximum deviation of the level of any of the four corners, i.e. 10% inwards in L and V direction, from the level in picture centre. The observed shading is composed of slight parabolic and saw tooth components in both line and frame directions which can be sufficiently compensated by suitable black shading compensation circuitry.

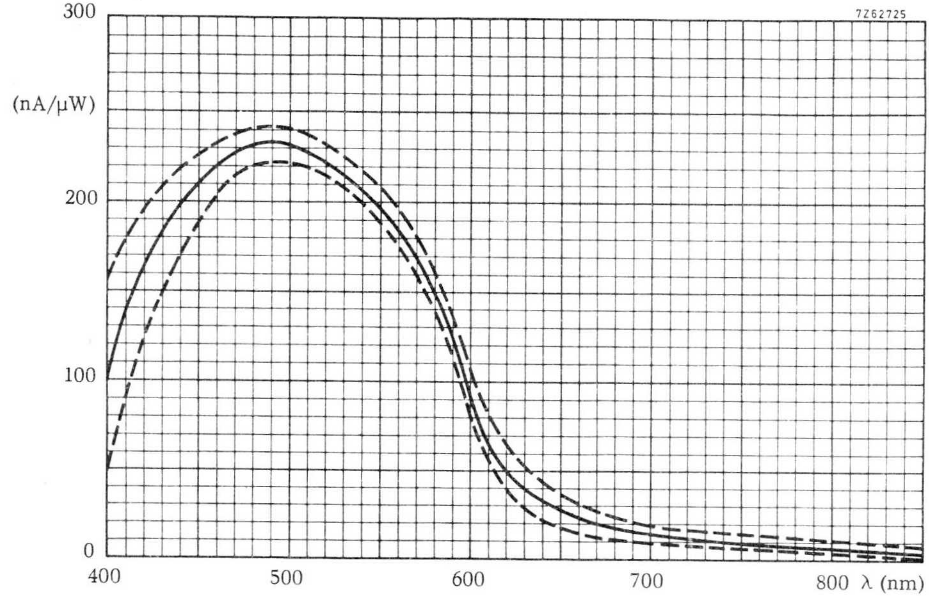


Fig. 1 Typical spectral sensitivity characteristic

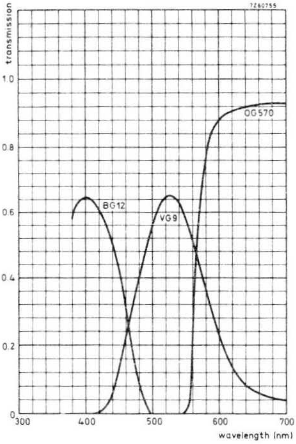


Fig. 2
Transmission curve of filter OG570
See note 17b

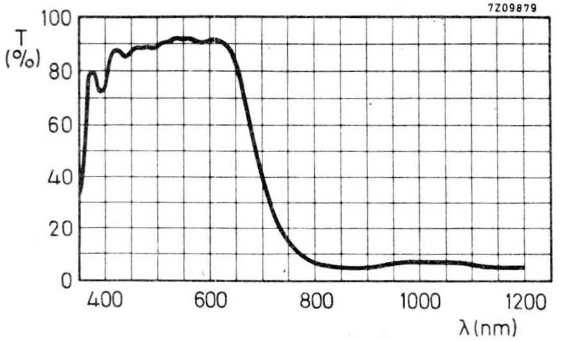


Fig. 3
Typical transmission curve of heat reflecting interference filter CALFLEX B1/K1. See note 17a

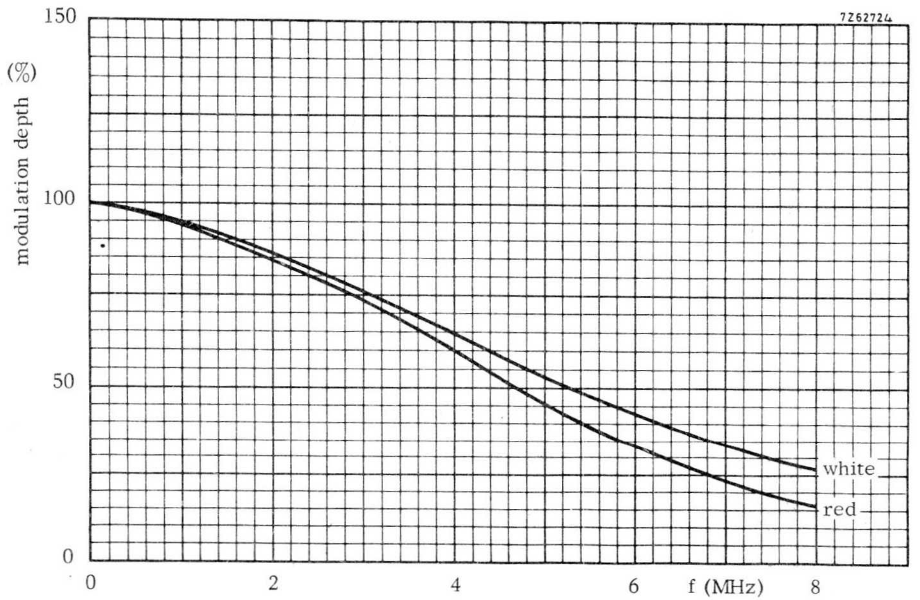


Fig. 4 Square wave modulation transfer characteristic

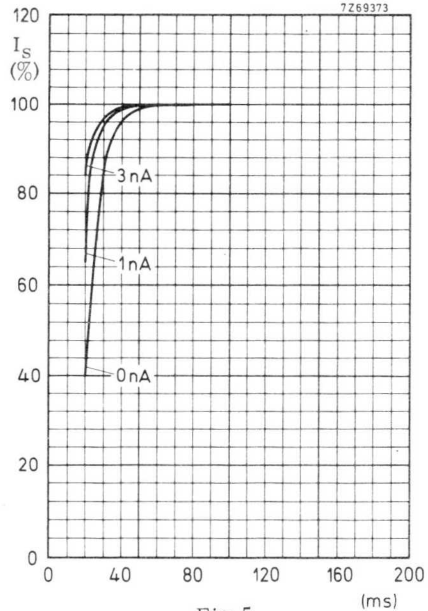


Fig. 5

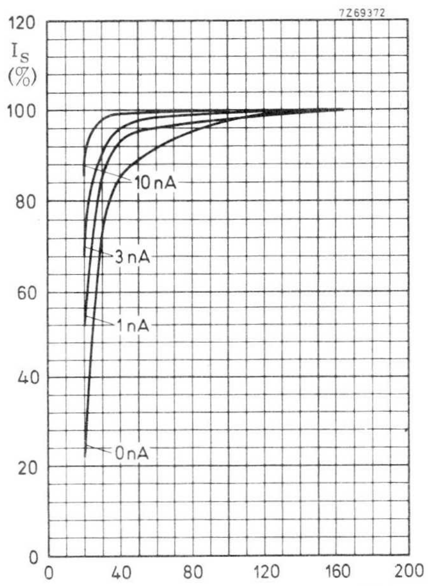


Fig. 6

Build-up lag [23])

Light-bias induced dark current as parameter

Fig. 5
XQ1083 I_s/I_b = 40/400 nA

Fig. 6
XQ1083R I_s/I_b = 20/200 nA

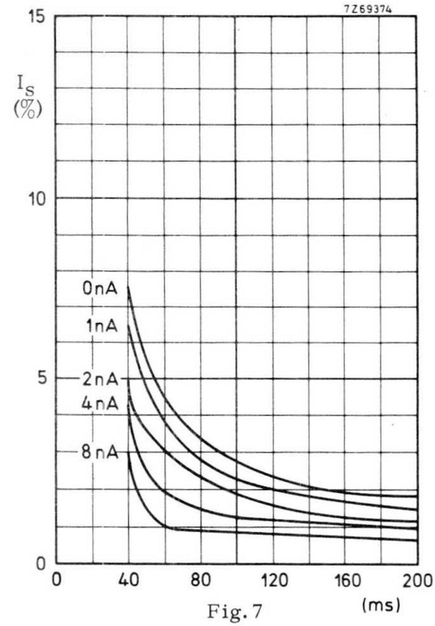


Fig. 7

Decay lag [24]

Fig. 7
XQ1083 I_s/I_b = 40/400 nA

Fig. 8
XQ1083R I_s/I_b = 20/200 nA

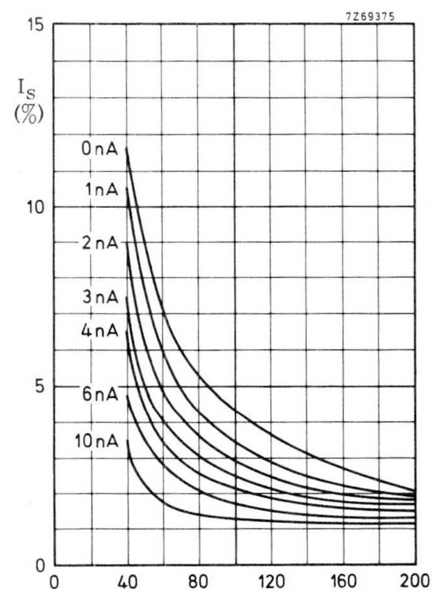


Fig. 8

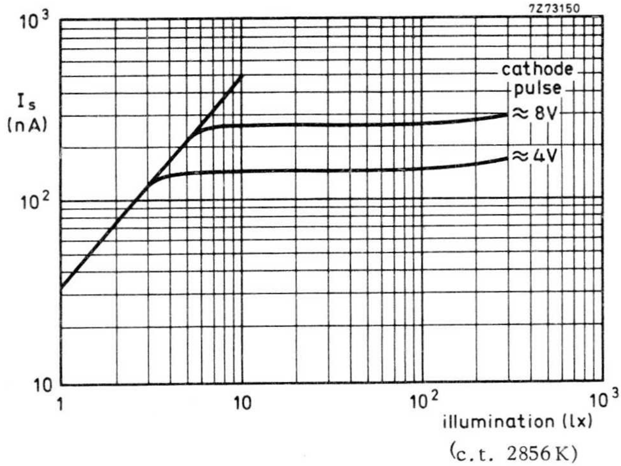


Fig. 9 Typical light transfer characteristics with ACT applied

CAMERA TUBE

Plumbicon * television camera tubes mechanically and electrically identical to the tubes of the XQ1083 series, the only difference being the degree of freedom from blemishes of the photoconductive target.
The tubes are intended for industrial and educational black and white and colour cameras.

The series comprises the following versions:

XQ1084 for use in black and white cameras

XQ1084R for use in the red channel in colour cameras.

For all further information see data of XQ1083 series.

* Registered Trade Mark for television camera tube.

CAMERA TUBE

Plumbicon * television camera tubes identical to the tubes of the XQ1083 series, hence provided with an ACT electron gun, provisions for lightbias, ceramic centring ring and a lead-oxide photoconductive target with extended red response. However, these tube types incorporate an infra-red reflecting filter on the anti-halation glass disc.

QUICK REFERENCE DATA	
Focusing	magnetic
Deflection	magnetic
Diameter	25,4 mm (1 in)
Length	158 mm ($6\frac{1}{4}$ in)
Special features	Anti-Comet-Tail gun Provisions for light bias Anti-halation glass disc Ceramic centring ring Rear loading construction
Heater	6,3 V, 95 mA
Resolution	≥ 750 TV lines
Spectral response, cut-off	750 nm
Provided with anti-halation glass disc with infra-red reflecting filter.	

The infra-red reflecting filter eliminates the need for additional filters in the optical systems when the XQ1085 and XQ1085R are applied in black and white and colour cameras originally designed for tubes of the XQ1070 series.

The spread in spectral responses in the long wavelength region as published for the XQ1083 and XQ1083R tubes is greatly reduced, warranting minimum differences in colour rendition between cameras of identical manufacture.

The XQ1085 will provide black and white pictures with true tonal rendition of colours, the spectral response approaching very nearly the relative spectral sensitivity of the human eye.

The XQ1085R is intended for use in the red chrominance channel of colour cameras in broadcast, educational and high-quality industrial applications.

* Registered Trade Mark for television camera tube.

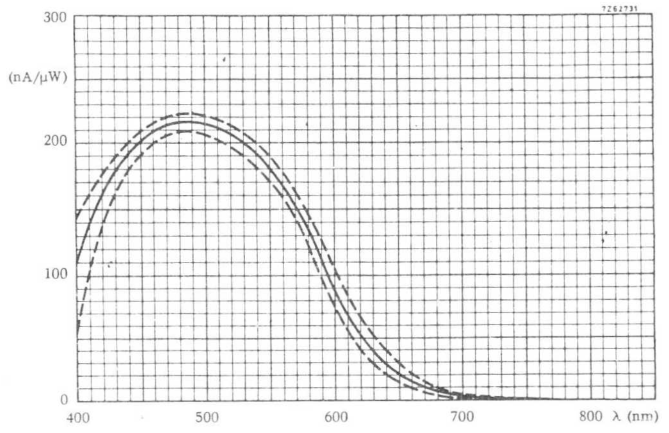
OPTICAL DATA

Spectral response	see curve below	
Maximum response at	500	nm
Cut-off	750	nm [1]

Filter Hard coating on anti-halation glass disc. Care in handling to avoid scratches is strongly recommended.

For further information refer to data of the XQ1083 series.

Note [10] of these data referring to Balzers B1/K1 filter does not apply.



Typical spectral sensitivity characteristic

[1] Defined as the wavelength at which the spectral response has dropped to 1% of the peak response (≈500 nm).

CAMERA TUBE

Plumbicon * television camera tubes mechanically and electrically identical to the tubes of the XQ1085 series, the only difference being the degree of freedom from blemishes of the photoconductive target.

The tubes are intended for industrial and educational black and white and colour cameras.

The series comprises the following versions:

XQ1086	for use in black and white cameras
XQ1086R	for use in the red channel of colour cameras

For all further information see data of XQ1085 and XQ1083 series.

* Registered Trade Mark for television camera tube.

CAMERA TUBE

Plumbicon* , television camera tube with high resolution lead-oxide photoconductive target, low heater power, separate mesh construction, magnetic focusing, magnetic deflection and 25,4 mm (1 in) diameter.

The tubes of the XQ1090, XQ1091 series and of the XQ1100, XQ1101 series are provided with an A.C.T. electron gun and provisions for light bias like the tubes of the XQ1080, XQ1081 series but are front loading types and hence without ceramic centring ring.

The tubes of the XQ1100, XQ1101 series are moreover not provided with an anti-halation glass disc.

The series comprise the following versions:

	with anti-halation glass disc	without anti-halation glass disc
For use in bl/wh and colour cameras in broadcast applications	XQ1090 L R G B	XQ1100 L R G B
For use in bl/wh and colour cameras in industrial applications	XQ1091 R G B	XQ1101 R G B

The electrical and mechanical data of the tubes are identical to those of the XQ1080 or XQ1081 respectively, with the following exceptions:

ELECTRICAL DATA

Capacitance

Signal electrode to all	C_{as}	3 to 5	pF

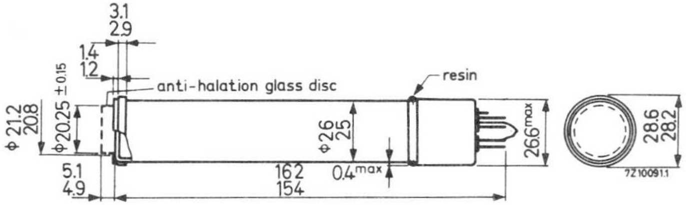
ACCESSORIES

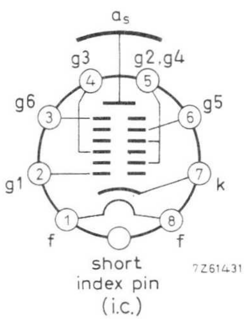
Deflection and focusing coil unit — for colour and bl/wh cameras AT1103, AT1116 or equivalent

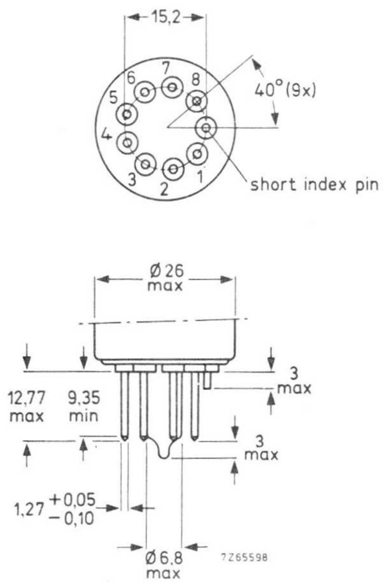
* Registered Trade Mark for camera tube.

MECHANICAL DATA

Dimensions in mm







CAMERA TUBE

Plumbicon * television camera tube with high resolution lead-oxide photoconductive target, low heater power, separate mesh construction, magnetic focusing, magnetic deflection and 25,4 mm (1 in) diameter.

The tubes of these series are provided with an ACT electron gun and provisions for light-bias like the tubes of the XQ1083 and XQ1084 series but are front-loading types without ceramic centring ring.

The series comprise the following versions:

	with anti-halation glass disc	and IR filter	without anti-halation disc and IR filter
For use in black/white and colour cameras in broadcast applications	XQ1093 XQ1093R	XQ1095 XQ1095R	XQ1103 XQ1103R
For use in black/white and colour cameras in industrial applications	XQ1094 XQ1094R	XQ1096 XQ1096R	XQ1104 XQ1104R

The electrical and mechanical data of the tubes are identical to those of the XQ1083 or XQ1085 series with the following exceptions:

ELECTRICAL DATA

Capacitance

Signal electrode to all $\quad C_{a_s} \quad$ 3 to 5 pF

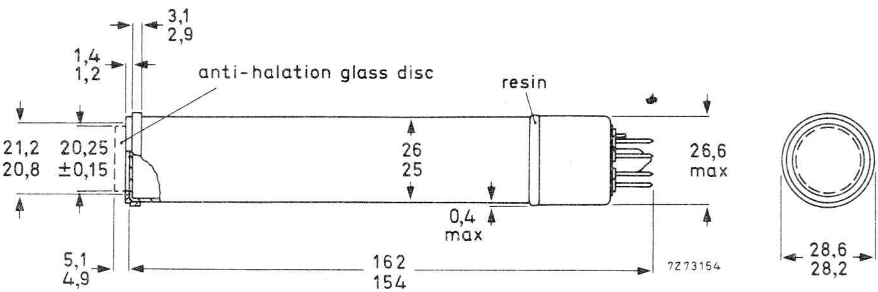
ACCESSORIES

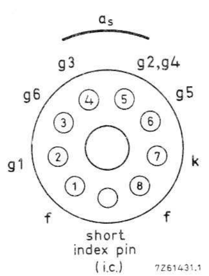
Deflection and focusing coil unit	for colour and black/white cameras: AT1103, AT1116 or equivalent
Socket	type 56026
Biaslight lamp in holder	type 56027

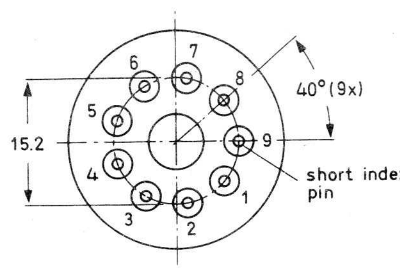
* Registered Trade Mark for television camera tube.

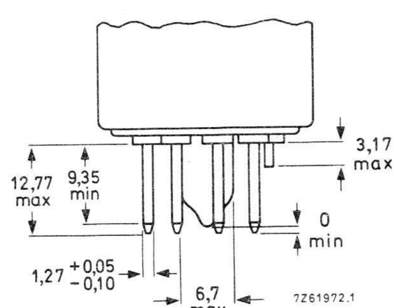
MECHANICAL DATA

Dimensions in mm









CAMERA TUBE

Small-size Plumbicon* television camera tube with lead-oxide photoconductive target with extended red response and high resolution.
Hybrid gun construction, i.e. electrostatic focusing and magnetic deflection.
The XQ1213 is intended for use in compact broadcast black and white cameras, the R, G and B versions are intended for use in the red, green, and blue chrominance channels in compact three-tube broadcast colour cameras.

QUICK REFERENCE DATA	
Focusing	electrostatic
Deflection	magnetic
Diameter	15,9 mm (5/8 in)
Length	approx. 135 mm (5 5/16 in)
Provided with anti-halation glass disc	
Cut-off of spectral response	approx. 850 nm
Heater	6,3 V, 300 mA
Resolution	≥ 600 TV lines

OPTICAL

Quality rectangle on photoconductive target
(aspect ratio 3:4) 6 x 8 mm^2 [1])

Orientation of image on photoconductive 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 white marker line on the base.

Faceplate
Refractive index n 1,49
Refractive index of anti-halation glass disc n 1,52

[1]) See page 6

* Registered Trade Mark for television camera tubes.

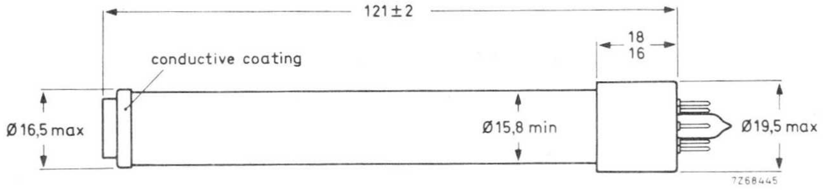
MECHANICAL DATA

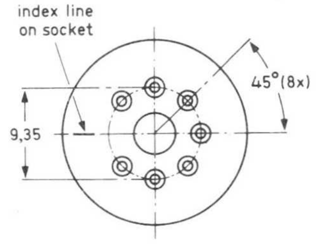
Dimensions in mm

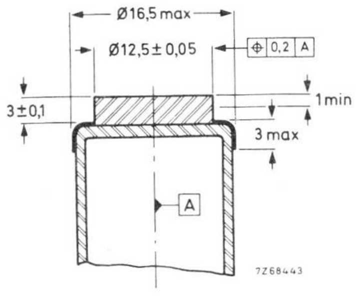
Mounting position: any

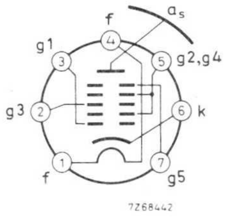
Weight : approx. 30 g

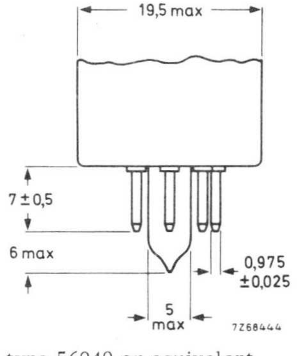
Base : 7-pin miniature with pumping stem and modified pin length.











ACCESSORIES

→ Socket:	type 56049 or equivalent
Deflection unit	AT1117

ELECTRICAL DATA

Heating: indirect by a.c. or d.c.; parallel supply

Heater voltage	V_f	6,3	V ± 5%
Heater current	I_f	300	mA

To avoid registration errors in colour cameras, stabilization of the heater voltage is recommended.

Electron gun characteristics

Cut-off					
Grid no. 1 voltage for cut-off at V_{g2} = 300 V	V_{g1}		-30 to -100	V	2)
Blanking voltage, peak to peak					
on grid no. 1	$V_{g1_{pp}}$		50	V	
on cathode	$V_{k_{pp}}$		25	V	
Grid no. 2 current at normally required beam currents	I_{g2}	max.	0,5	mA	

Focusing — electrostatic

Deflection — magnetic 3)

Capacitance

Signal electrode to all	C_{as}	1,5 to 3,0	pF	

This capacitance, which is effectively the output impedance, increases when the tube is inserted in the deflection coil unit.

LIMITING VALUES (Absolute max. rating system)

All voltages are referred to the cathode, unless otherwise stated.

Signal electrode voltage	V_{as}	max.	50	V	
Grid no. 5 voltage	V_{g5}	max.	750	V	
Grid no. 4 and grid no. 2 voltage	V_{g4+2}	max.	350	V	
Grid no. 1 voltage, positive	V_{g1}	max.	0	V	
negative	$-V_{g1}$	max.	125	V	
Voltage between grid no. 4 and grid no. 3	$V_{g4/g3}$	max.	350	V	
Voltage between grid no. 5 and grid no. 4	$V_{g5/g4}$	max.	400	V	
Cathode to heater voltage, positive peak	V_{kf_p}	max.	50	V	
negative peak	$-V_{kf_p}$	max.	50	V	
Cathode heating time before drawing cathode current	T_h	min.	1	min.	4)
Ambient temperature, storage and operation	t_{amb}	max.	50	^{o}C	
		min.	-30	^{o}C	
Faceplate temperature, storage and operation	t	max.	50	^{o}C	
		min.	-30	^{o}C	
Faceplate illumination	E	max.	100	lx	5)

Notes see page 6 .

OPERATING CONDITIONS AND PERFORMANCE

Conditions (scanned area 6 x 8 mm^2)

Cathode voltage	V_k	0	V	
Grid no. 4 and grid no. 2 voltage	V_{g4+2}	300	V	
Grid no. 3 (beam focus) voltage	V_{g3}	60 to 80	V	6)
Grid no. 5 voltage	V_{g5}	575	V	
Signal electrode voltage	V_{as}	45	V	7)
Beam current	I_b	see note		8)
Grid no. 1 voltage	V_{g1}	see note		8)
Line coil current and frame coil current		see note		9)
Faceplate illumination		see note		10)
Faceplate temperature	t	20 to 45	^oC	
Blanking voltage on grid no. 1, peak to peak	$V_{g1_{pp}}$	50	V	

Performance

Dark current		≤ 3	nA	
Sensitivity at colour temperature of illumination = 2856 K 11)				
	XQ1213	360	μA/lm	
	XQ1213R	95	μA/lm	
	XQ1213G	140	μA/lm	
	XQ1213B	30	μA/lm	
Gamma of transfer characteristic		0,95 ± 0,05		12)
Spectral response: max. response at		approx. 500	nm	
cut-off at		approx. 850	nm	
response curve		see page . 9		

Resolution

Modulation depth, i.e. uncompensated amplitude response at 320 TV lines, at the centre of the picture. The figures shown represent the typical amplitude response of the tube as obtained with a lens aperture of F 5,6 8) 13).

	XQ1213	XQ1213R	XQ1213G	XQ1213B	
Highlight signal current I_s	0,15	0,075	0,15	0,075	μA
Beam current I_b	0,3	0,15	0,3	0,15	μA
Modulation depth at 320 TV lines, typ.	35	30	35	50	%

Notes see page 6 .

Limiting resolution ≥ 600 TV lines

Modulation transfer characteristics see page 10

Lag (typical values)

Light source with a colour temperature of 2856K.
Appropriate filter inserted in the light path for the chrominance tubes R, G, and B.

Low-key conditions

	build-up lag [8] [14]				decay lag [8] [15]			
	I_s/I_b = 20/300 nA		I_s/I_b = 20/150 nA		I_s/I_b = 20/300 nA		I_s/I_b = 20/150 nA	
	60 (ms)	200 (ms)	60 (ms)	200 (ms)	60 (ms)	200 (ms)	60 (ms)	200 (ms)
XQ1213, G	95	≈ 100			9	3		
XQ1213R, G			> 95	≈ 100			9	3

High-key conditions

	build-up lag [8] [14]				decay lag [8] [15]			
	I_s/I_b = 150/300 nA		I_s/I_b = 75/150 nA		I_s/I_b = 150/300 nA		I_s/I_b = 75/150 nA	
	60 (ms)	200 (ms)	60 (ms)	200 (ms)	60 (ms)	200 (ms)	60 (ms)	200 (ms)
XQ1213, G	98	100			3, 5	1		
XQ1213R, G			98	100			3, 5	1

Notes see page 6

NOTES

1. Underscanning of the specified useful target area of 6 x 8 mm^2 or failure of scanning, should be avoided since this may cause damage to the photoconductive layer.

2. Without blanking on grid no. 1.

3. For deflection coil unit see under "Accessories".

4. Ensure that before the camera is switched on the grid no. 1 controls are set at maximum bias.

5. For short intervals. During storage the tube shall be covered with the plastic hood provided; when the camera is idle the lens shall be capped.

6. Adjusted for optimal electrical focus.

7. The signal electrode voltage shall be adjusted at 45 V. To enable the tube to handle excessive highlights in the scene to be televised the signal electrode voltage may be reduced to a minimum of 25 V. This will, however, result in some reduction of performance, especially in terms of sensitivity.

8. The beam current I_b, as obtained by adjusting the control grid (grid no. 1) voltage is set at 150 nA for R and B tubes, 300 nA for bl/wh, and G tubes.
I_b is not the actual 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 on the scanned area. The peak signal currents as measured on a waveform oscilloscope will be a factor α larger.

($\alpha = \frac{100}{100-\beta}$, β being the total blanking time in %, for the CCIR system α amounts to 1, 33).

9. Deflection unit: AT1117

Line deflection current, peak to peak	125	mA
Frame deflection current, peak to peak	20	mA

10. In case of a black/white camera the illumination on the photoconductive layer, B_{ph}, is related to scene illumination, B_{sc}, by the formula:

$$B_{ph} = B_{sc} \frac{R.T.}{4F^2 (m+1)^2}$$

in which
R = the average scene reflectivity or the object reflectivity whichever is relevant
T = lens transmission factor
F = lens aperture
m = linear magnification from scene to target.
A similar formula may be derived for the illumination level on the photoconductive layers of the R, G, and B tubes in which the effects of the various components of the complete optical system have been taken into account.

11. All measurements are made with an infrared absorbing filter, Balzers, Calflex B1/K1 interposed between light source and the target. Illumination level approx. 10,5 lx (luminous flux: 0,5 mlm) when this filter is removed. In the case of chrominance tubes the appropriate filters are inserted.
Filters used

R	Schott	OG570	thickness	3 mm
G	Schott	VG9	thickness	3 mm
B	Schott	BG12	thickness	1 mm

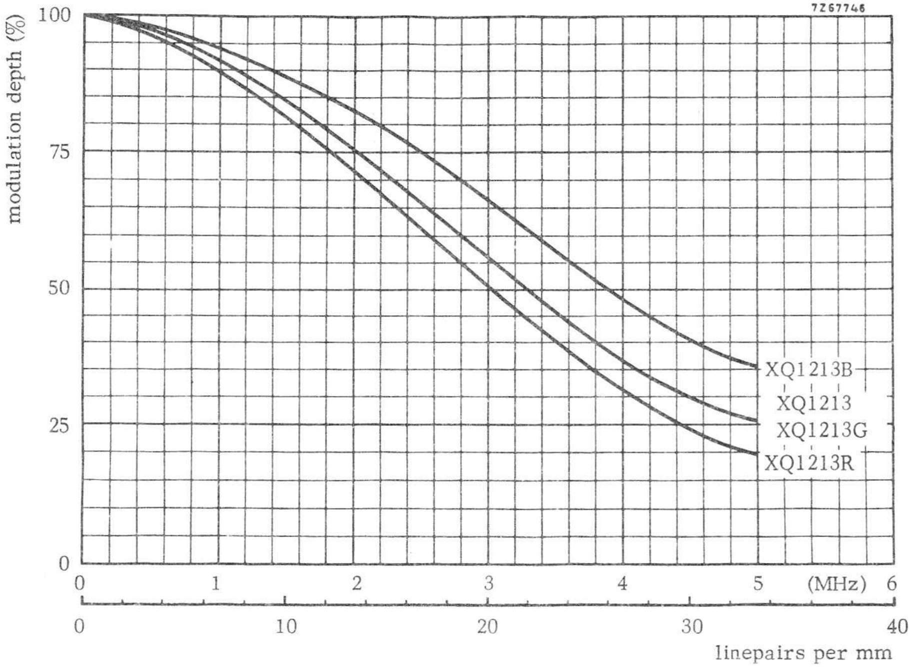
For transmission curves see page 10

12. Gamma-stretching circuitry is recommended.

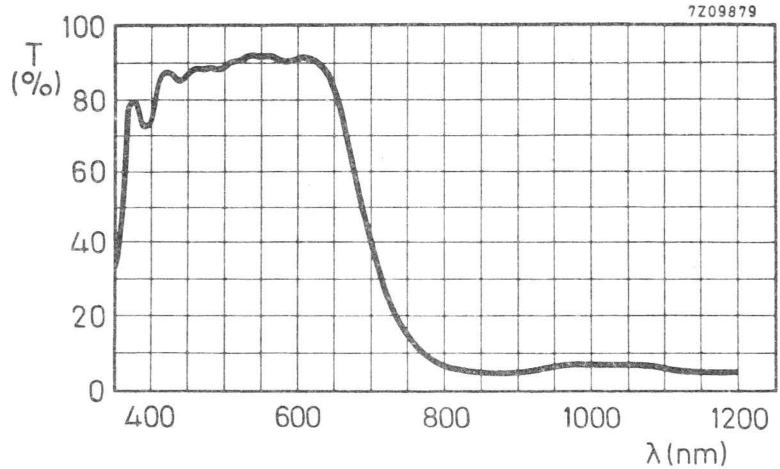
13. The horizontal amplitude response can be raised by means of suitable correction circuits, which affects neither the vertical resolution nor the limiting resolution.

14. After 10 s of darkness. The figures given represent typical percentages of the ultimate signal current obtained 60 ms or 200 ms respectively after introduction of the illumination.

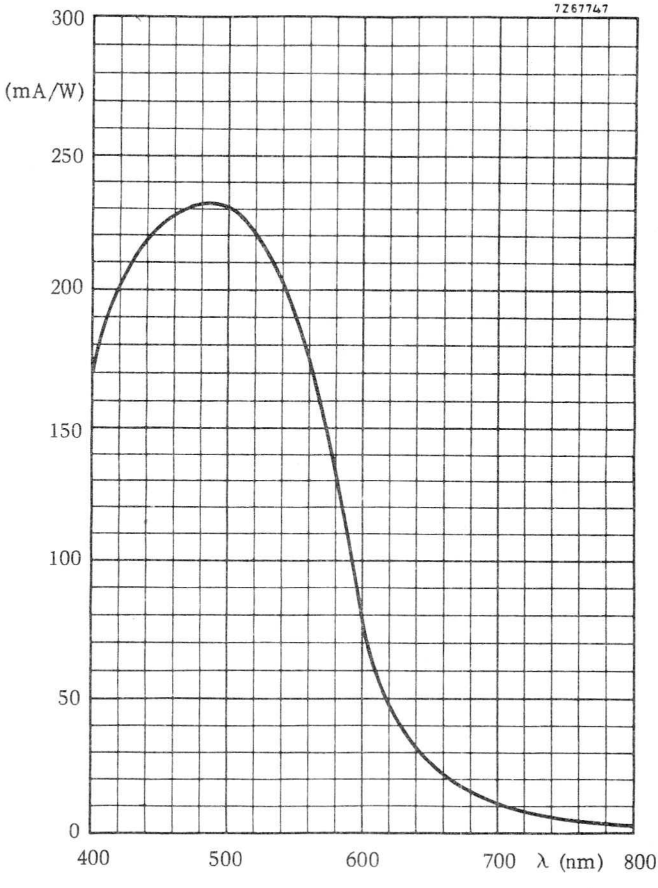
15. After a minimum of 5 s of illumination on the target.
The figures represent typical residual signals in percentage of the original signal current 60 ms or 200 ms respectively after removal of the illumination.



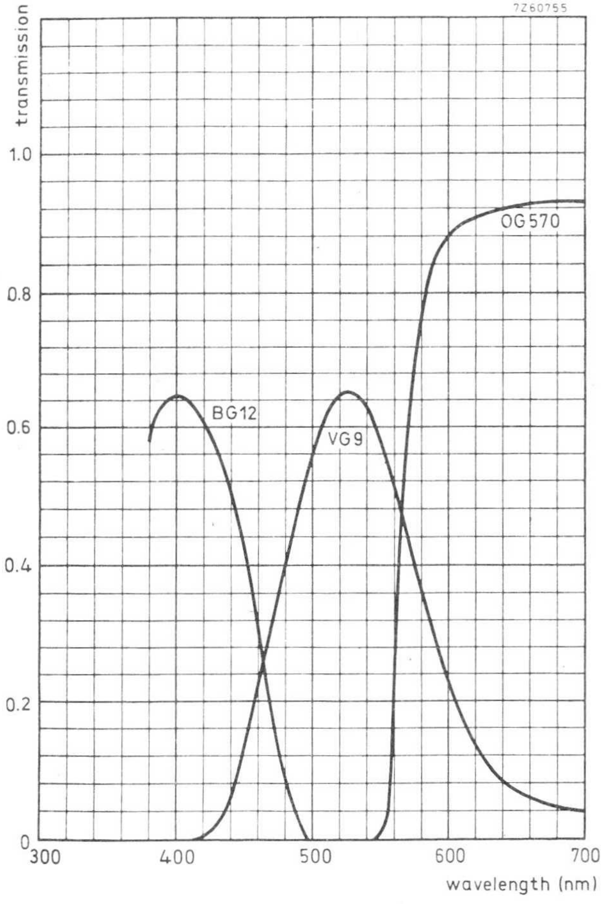
Typical square-wave modulation transfer characteristics



Typical transmission curve of heat-reflecting interference filter, type CALFLEX B1/K1



Typical spectral response curve



Transmission of filters BG12, VG9 and OG570. See note 11

CAMERA TUBE

Plumbicon *, sensitive high definition pick up tube with lead-oxide photoconductive target. Separate mesh construction, anti-comet tail electron gun, provisions for light bias, magnetic focus and deflection and a fibre optic faceplate.
The tubes are intended for use in medical, scientific and LLLTV systems in which they can be coupled direct to e.g. X-ray image intensifiers and light intensifiers with fibre optic output windows.

Replacement types for XQ1220series : XQ1230series

* Registered Trade Mark for television camera tube.

CAMERA TUBE

Plumbicon*, sensitive high-definition pick-up tube with lead-oxide photoconductive target. Provided with: separate mesh construction for good resolution; Anti-Comet Tail electron gun for improved highlight handling; provision for light bias for reduced lag under low-key conditions; fibre-optic faceplate.
The tubes of the XQ1230 series can be used in medical, scientific and low level TV systems in which they can be coupled direct to, e.g. X-ray image intensifiers and light intensifiers with fibre optic output windows.

QUICK REFERENCE DATA

Fibre optic faceplate		
ACT electron gun		
Light bias		
Focusing		magnetic
Deflection		magnetic
Diameter	approx.	30 mm
Length	approx.	210 mm

Available types : [1]

Quality area	12,8 x 17,1 mm^2		18 mm ϕ		21 mm ϕ	
Grade	A	B	A	B	A	B
	XQ1230	XQ1233	XQ1231	XQ1234	XQ1232	XQ1235

Resolution	$\geq$	25 lp/mm
Heater		6,3 V, 300 mA
Cut-off spectral response	$\approx$	650 nm

[1] XQ1230 and XQ1233 are preferred types; XQ1231, XQ1232, XQ1234 and XQ1235 can be supplied on request.

*) Registered Trade Mark for television camera tube.

OPTICAL

Quality rectangle on photoconductive target (aspect ratio 3:4)		12,8 x 17,1	mm^2 [1]

Orientation of image on photoconductive 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 mark on the tube base.

Faceplate			
Diameter of fibres		approx. 7	μm
Flat within		1	μm

ELECTRICAL

Heating: Indirect by a.c. or d.c.; parallel supply

Heater voltage	V_f	6,3	V ± 5%
Heater current	I_f	300	mA

Electron gun characteristics

Cut-off			
Grid no. 1 voltage for cut-off at $V_{g2,4}$ = 300 V, without blanking nor ACT pulses		-45 to -110	V
Blanking, peak to peak			
Applied to grid no. 1, at $V_{g2,4}$ = 300 V		50 ± 10	V [6][9]
Grid no. 2 and no. 4 current		max. 0,2	mA [7]

Focusing (see under Accessories)

Deflection (see under Accessories)

Capacitance

Signal-electrode to all	C_{as}	3 to 6	pF

This capacitance, which is effectively the output impedance, increases when the tube is inserted in the coil unit.

Notes: see page 6

LIMITING VALUES (Absolute max. rating system)

All voltages are referred to the cathode, unless otherwise stated.

Signal electrode voltage	V_{as}	max.	50	V	
Grid no. 6 (mesh) voltage	V_{g6}	max.	1100	V	
Grid no. 5 (collector) voltage	V_{g5}	max.	800	V	
Voltage between grid no. 6 and grid no. 5	$V_{g6/g5}$	max.	350	V	
Grid no. 4 (limiter) and grid no. 2 (accelerator, or first anode) voltage	$V_{g2,4}$	max.	350	V	
Grids no. 4 and no. 2 dissipation	$W_{g2,4}$	max.	1	W	
Grid no. 3 (auxiliary grid) voltage	V_{g3}	max.	350	V	
Grid no. 1 (control grid) voltage, positive	V_{g1}	max.	0	V	
negative	$-V_{g1}$	max.	125	V	
Grid no. 1 ACT pulse, peak		max.	40	V	6)
Cathode heating time before drawing cathode current	T_h	min.	1	min	
Cathode to heater voltage, positive peak	V_{kfp}	max.	50	V	
negative peak	$-V_{kfp}$	max.	50	V	
Faceplate temperature, storage and operation	t	max.	50	°C	
		min.	-30	°C	
Faceplate illumination	E	max.	500	lx	2)

ACCESSORIES

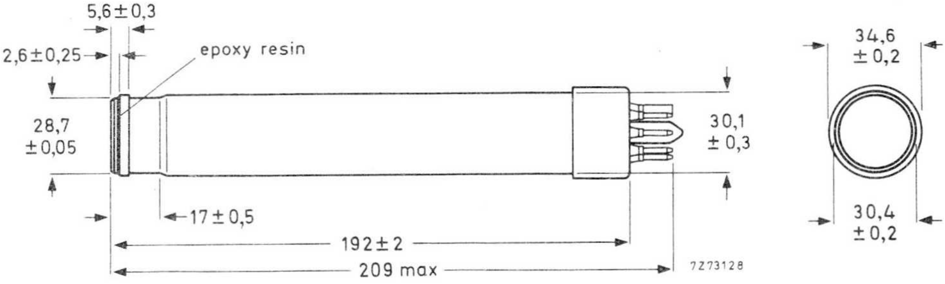
Coil unit	AT1132, AT1132/01	3)
Socket	type 56025	
Biaslight lamp in holder	type 56027	

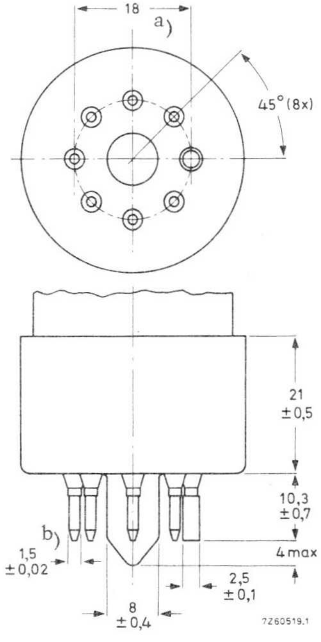
Notes: see page 6

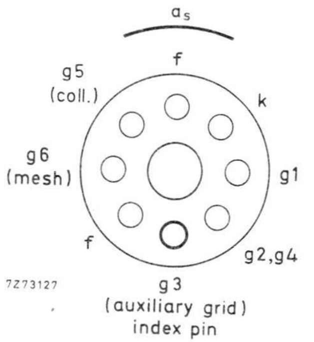
MECHANICAL DATA Dimensions in mm

Mounting position : any

Mass : ≈ 110 g







a) The base passes a flat gauge with a centre hole 9,00 ± 0,01 ϕ and holes for passing the pins with the following diameters : 7 holes of 1,750 ± 0,005 ϕ and one hole of 3,000 ± 0,005 ϕ. The holes may deviate max. 0,01 from their true geometrical position. Thickness of gauge 7 mm.

b) The ends of the pins are tapered and/or rounded but not brought to a sharp point.

OPERATING CONDITIONS AND PERFORMANCE

Conditions (with Anti-Comet Tail action) [4]
All voltages are specifeid with respect to cathode

Cathode voltage,			
during read-out mode	V_k	0	V [5][6][7]
during ACT mode	V_k	0 to 10	V
Signal electrode voltage	V_{as}	45	V
Grid no. 6 (mesh) voltage	V_{g6}	675	V [7]
Grid no. 5 (collector) voltage	V_{g5}	600	V [7]
Grid no. 4 (limiter) and grid no. 2 (accelerator, or first anode) voltage	$V_{g2,4}$	300	V [7]
Grid no. 3 (auxiliary grid) voltage,			
during read-out mode	V_{g3}	240 to 260	V [7]
during ACT mode	V_{g3}	0 to 10	V
Grid no. 1 (control grid) voltage	V_{g1}	see note [8]	
Blanking voltage to grid no. 1	V_{g1_p}	50	V [6][9]
Scanned area on target		12,8 x 17,1	mm^2
Temperature of faceplate		20 to 45	^oC
Coil unit		AT1132/01	

Deflection, focusing and alignment currents

Focus current (adjusted for correct electrical focus) (mA)	Line deflection $current_{pp}$ (mA)	Frame deflection $current_{pp}$ (mA)
25	235	35

Line and frame alignment coil currents max. 5 mA, corresponding to a flux density of approx. 4×10^{-4} T (4 Gs)

Performance

Dark current (without light bias)	<	3	nA
Sensitivity			
to white light of c.t. 2856 K		250	μA/lm
to light with P11 distribution		10×10^{-3}	μA/μW [10]
to light with P20 distribution		$7,5 \times 10^{-3}$	μA/μW [10]

Notes: see page 6

Transfer characteristic	see page 9
Gamma of transfer characteristic below knee	0,95 ± 0,05
Spectral response	
Max. response at	approx. 550 nm
Cut-off at	approx. 650 nm
Response curve	see page 10

Resolution (I_s/I_b = 150/300 nA) [8,11]
at 15 lp/mm (385 TV lines)

P11	P20	
45	40	%

Modulation transfer characteristic — see page 10

Lag (typical values), white light (2856 K), P11, and P20

	build-up lag [12]				decay lag [13]			
	I_s/I_b = 20/300 nA		150/300 nA		20/300 nA		150/300 nA [8]	
	60 (ms)	200 (ms)	60 (ms)	200 (ms)	60 (ms)	200 (ms)	60 (ms)	200 (ms)
without light bias	70	100	98	100	16	5	3,5	1,2
with 2,5 nA light bias [14]	98	100	99	100	11	2,5	2,8	0,9
with 5 nA light bias [14]	99	100	100	100	8	2	2,4	0,7

NOTES

1) All figures quoted in these data sheets refer to a scanned area of 12,8 x 17,1 mm^2. Underscanning of the once chosen area or failure of scanning should be avoided since this may cause damage to the photoconductive target.

2) For short intervals. During storage and idle periods the tube face must be covered with the plastic hood provided for the purpose, or the lens be capped.

3) For optimal screening of the signal-electrode from the live end of the line deflection coils the AT1132/01 is recommended.

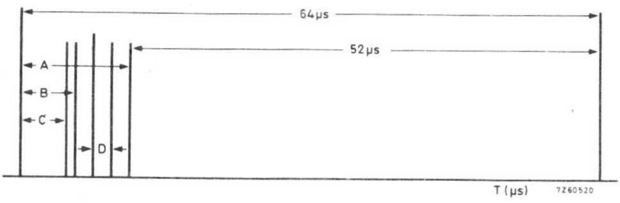
4) When the tube is to be used without Anti-Comet Tail action, grid no. 3 (auxiliary grid) should be connected to grids no. 2 and no. 4 and no ACT pulses should be applied to the cathode and grid no. 1 (control grid). The performance of the tube will then be as described herein with the exception of the highlight handling.

5) a. Read-out mode: defined as the operating conditions during the active line scan (full line period - line blanking interval).
For the CCIR system this will amount to 64 µs - 12 µs = 52 µs.

b. ACT mode: defined as the operating conditions during that part of the line blanking interval during which the ACT electrode gun is fully operative.
The ACT interval is equal to or is slightly within the line flyback time.

6) Pulse timing and amplitudes for ACT action (CCIR system) (blanking on grid no. 1)
For proper operation of the ACT electrode gun three pulses are required, being:
a. - a positive-going pulse on the cathode with an adjustable amplitude of 0 to 10 V.
b. - a positive-going pulse on grid no. 1 (control grid) of fixed amplitude of 30 to 35 V. The duration of this pulse should be chosen such that it just includes the flyback period (≈ 5 μs) of the line deflection.
c. - a negative-going pulse on grid no. 3 (auxiliary grid) with an amplitude of approx. 240 V, adjusted for a V_{g3} voltage during the ACT interval of 0 to 10 V. Duration and timing of this pulse should be equal to those of the grid no. 1 pulse.

The timing diagram is as follows:



A = Line blanking period: ≈ 12 μs, V_k pulse
B = ACT period: ≈ 6 μs, grids no. 1 and no. 3 pulses
C = Line flyback period: ≈ 5 μs
D = Clamping time: 2 to 3 μs

7) The d.c. voltage supply and /or pulse supply to these electrodes should have a sufficiently low impedance to prevent distortion caused by the peak currents drawn during the ACT mode.
These peak currents may amount to:

grid no. 1	0 mA
grids no. 2 and no. 4	1 mA
grid no. 3	150 μA
grid no. 5	300 μA
grid no. 6	300 μA

8) Adjusted, with the ACT switched off, to produce a beam current I_b = 300 nA. I_b is not the actual 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 as I_s/I_b = 20/300 nA.
This hence 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 integrated instrument connected in the signal-electrode lead, and an uniform illumination on the scanned area. The peak signal currents as measured on a waveform oscilloscope will be a factor α larger ($\alpha = \frac{100}{100-\beta}$), β being the total blanking time in %; for CCIR system α amounts to 1,33).

9) Blanking can also be applied to the cathode:
 a. - without ACT action (see note 4): required cathode pulse approx. 25 V
 b. - with ACT action: timing, polarity and amplitudes of the ACT pulses will have to be adapted.

10) The figures shown represent the signal output current in μA obtained per μW of electrical input power into a P11 or P20 phosphor on a fibre optic output window of e.g. an image intensifier or a converter tube.

The figures were obtained as the product S x T_1^2 x η (see table below)

		symbol	P11	P20	unit
Plumbicon tube target	Sensitivity of photoconductive target		1800	290	μA/lm
	Conversion factor Watt to lumen		140	480	lm/W
	Sensitivity of photoconductive target	S	0,25	0,14	μA/μW
Fibre optics	Transmission of a fibre plate	T_1*	60	60	%
Phosphor	Luminous efficiency of phosphor	η**	10	14	%

* For the sake of simplicity it is assumed that the fibre optics in the output window and in the Plumbicon tube faceplate are identical.

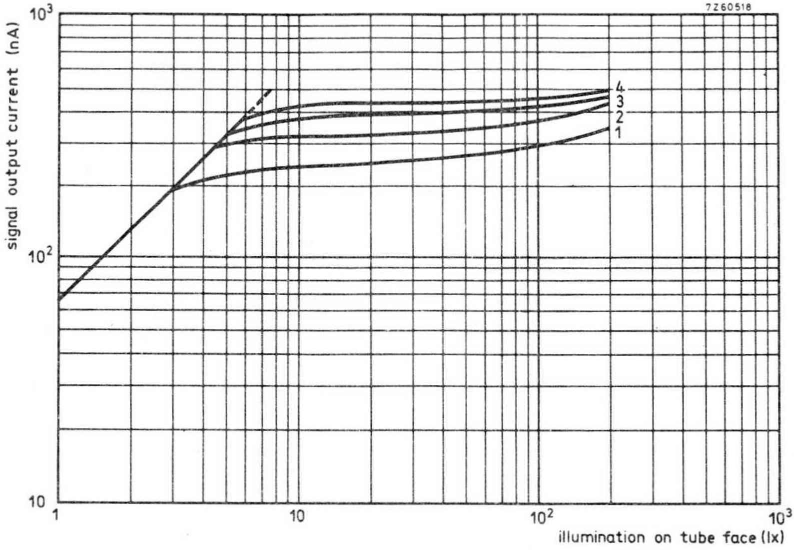
** The phosphors being usually metal-backed, the figures for the luminous efficiencies have been corrected for the effects of the backing.

11) Measured with a test transparency with the emulsion side in direct contact with the faceplate and which is illuminated with diffused light (lambertian illumination).
The test transparency has square wave patterns in a white background.
The figures given relate to a low frequency reference obtained from a square wave pattern of 1,0 lp/mm (330 kHz).

12) After 10 seconds of complete darkness. The figures given represent typical percentages of the ultimate signal current obtained 60 ms respectively 200 ms after the illumination has been applied.

13) After a minimum of 5 s of illumination on the target. The figures given represent typical residual signals in % of the original signal current 60 ms respectively 200 ms after the illumination has been removed.

14) The special socket incorporates a small incandescent light bulb (5 V; 0,6 W), which projects its light on the pumping stem via a blue-green transmitting filter. The light is conducted to cause a bias illumination on the target.
The desired amount of light bias can be obtained by adjusting the current through the filament of the small bulb.

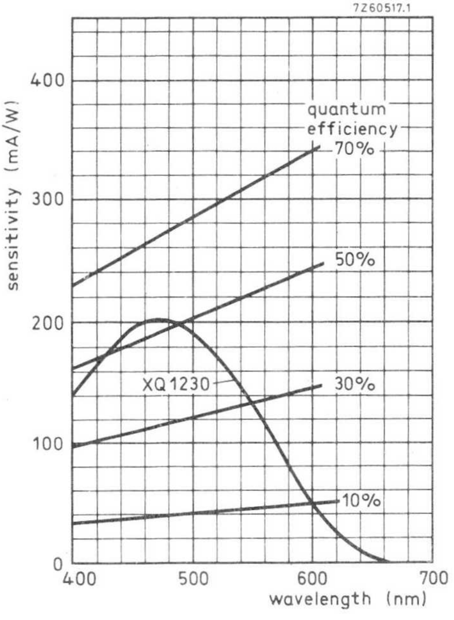


Typical signal output characteristics in ACT operation

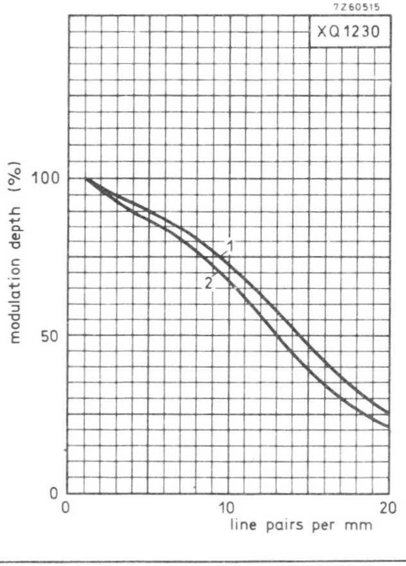
Scanning area : 12, 8 x 17, 1 mm^2

Beam current : just sufficient to stabilize 500 nA signal current

Cathode voltage during flyback :
curve 1 : 4, 5 V
curve 2 : 6 V
curve 3 : 7, 5 V
curve 4 : 9 V



Typical spectral response characteristic



Typical square wave modulation transfer characteristic in tube centre
(1) for blue light (P11)
(2) for green light (P20)
Measuring conditions : see note 11

CAMERA TUBE

Plumbicon *, sensitive high-definition pick-up tube with photoconductive target and low velocity stabilization.
The 55875 is intended for use in black and white, the L, R, G, and B versions for use in four and three tube colour studio cameras.

QUICK REFERENCE DATA	
Focusing	magnetic
Deflection	magnetic
Diameter	approx. 30 mm
Heater	6,3 V, 95 mA

OPTICAL

Dimensions of quality rectangle on photoconductive layer (aspect ratio 3:4)	12,8 mm x 17,1 mm			1)
Orientation of image on photoconductive layer	by means of mark on tube base			2)
Sensitivity at colour temperature of illumination = 2856 K				
type: 55875, 55875L		400	μA/lm	3)
55875R		85	μA/lm	3)
55875G		165	μA/lm	3)
55875B		38	μA/lm	3)
Gamma of transfer characteristic		0,95 ± 0,05		4)
Spectral response; max. response at	≈	500	nm	
cut-off at	≈	650	nm	
curve	see page 8			

HEATING

Indirect by a.c. or d.c.; parallel or series supply

Heater voltage	V_f	6,3	V ± 5%
Heater current	I_f	95	mA

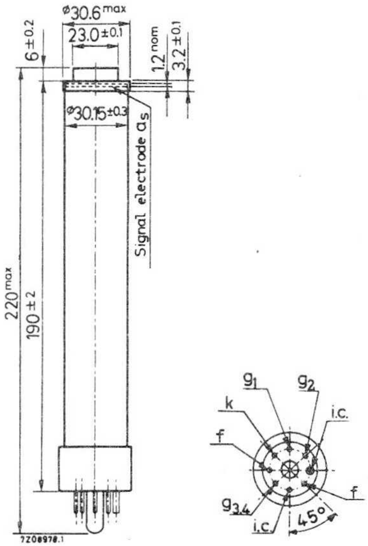
When the tube is used in a series heater chain, the heater voltage must not exceed an r.m.s. value of 9,5 V when the supply is switched on.
To avoid registration errors in colour cameras, stabilization of the heater voltage is recommended.

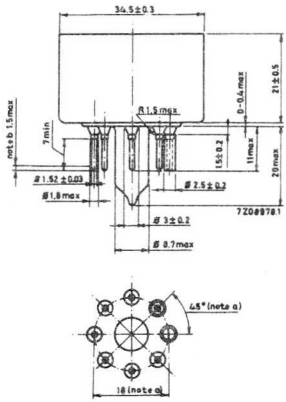
*) Registered Trade Mark for TV camera tube.

Notes see page 5.

MECHANICAL DATA Dimensions in mm

Distance between axis of anti-reflection glass disc and geometrical centre of signal electrode ring, measured in plane of faceplate: max. 0,2 mm.
total glass thickness 7,2 ± 0,2 n = 1,5.





a) The base passes a flat gauge with a centre hole 9,00 ± 0,01 θ and holes for passing the pins with the following diameters: 7 holes of 1,750 ± 0,005 θ and one hole of 3,000 ± 0,005 θ.
The holes may deviate max. 0,01 from their true geometrical position. Thickness of gauge 7 mm.

b) The ends of the pins are tapered and/or rounded but not brought to a sharp point.

Mounting position: any

Net mass	approx. 100 g

ACCESSORIES

Socket	type 56021
Focusing and deflection coil assembly	
for 55875	type AT1132/01
for 55875L, R, G, B	type AT1112 or type AT1113/01

CAPACITANCE

Signal electrode to all	C_{as}		3 to 6	pF	5)

FOCUSING magnetic 6)

DEFLECTION magnetic 6)

CHARACTERISTICS

Grid no. 1 voltage for cut-off at V_{g2} = 300 V	V_{g1}		−30 to −100	V	7) 8)
Blanking voltage, peak to peak on grid no. 1	V_{g1p-p}		50 ± 10	V	
on cathode	V_{kp-p}		25	V	
Grid no. 2 current at normally required beam currents	I_{g2}	≤	0,5	mA	
Dark current at V_{as} = 45 V	I_{as}	≤	0,003	μA	

LIMITING VALUES (Absolute max. rating system)

Signal electrode voltage	V_{as}	max.	50	V	8)
Grid no. 4 and no. 3 voltage	V_{g4}, V_{g3}	max.	750	V	8)
Grid no. 2 voltage	V_{g2}	max.	450	V	8)
Grid no. 1 voltage, positive	V_{g1}	max.	0	V	
negative	$-V_{g1}$	max.	125	V	
Cathode heating time before drawing cathode current	T_h	min.	1	min	
Cathode to heater voltage, positive peak	V_{kfp}	max.	125	V	
negative peak	$-V_{kfp}$	max.	10	V	
Ambient temperature, storage and operation	t_{amb}	max.	50	°C	
		min.	−30	°C	
Faceplate temperature, storage and operation	t	max.	50	°C	
		min.	−30	°C	
Faceplate illumination		max.	500	lx	9)

Notes see page 5.

OPERATING CONDITIONS AND PERFORMANCE

Conditions

Cathode voltage	V_k	0	V	
Grid no. 2 voltage	V_{g2}	300	V	
Signal electrode voltage	V_{as}	45	V	10)
Beam current	I_b	see note 11		
Grid no. 4 and grid no. 3 voltage	$V_{g4,g3}$	600	V	
Blanking on grid no. 1, peak to peak	V_{p1p-p}	50	V	
Focusing coil current at given values of grid no. 4 and grid no. 3 voltage		see note 12		
Line coil current and frame coil current		see note 12		
Faceplate illumination		see notes 13 and 14		
Faceplate temperature	t	20 to 45	°C	

Performance

Resolution

Modulation depth i.e. uncompensated horizontal amplitude response at 400 TV lines, at centre of picture.

The figures shown represent the typical horizontal amplitude response of the tube as obtained with a lens aperture of f 5,6 11) 15)

		55875 55875L	55875R	55875G	55875B
Highlight signal current,	I_s	0,3 μA	0,15 μA	0,3 μA	0,15 μA
Beam current	I_b	0,6 μA	0,3 μA	0,6 μA	0,3 μA
Modulation depth at 400 TV lines in %	typ.	40	35	40	50

Limiting resolution ≥ 600 TV lines

Lag (typical values)

Light source with a colour temperature of 2856K.
Appropriate filter inserted in the light path for the chrominance tubes R, G, and B.

Low key conditions

	build-up lag 16)				decay lag 17)			
	I_s/I_b = 20/300 nA		I_s/I_b = 40/600 nA		I_s/I_b = 20/300 nA		I_s/I_b = 40/600 nA	
	60 ms	200 ms	60 ms	200 ms	60 ms	200 ms	60 ms	200 ms
55875 55875L 55875G			85	≈ 100			9	3
55875R	80	≈ 100			12	4,5		
55875B	60	≈ 100			15	6		

High key conditions

	build-up lag 16)				decay lag 17)			
	I_s/I_b = 150/300 nA		I_s/I_b = 300/600 nA		I_s/I_b = 150/300 nA		I_s/I_b = 300/600 nA	
	60 ms	200 ms	60 ms	200 ms	60 ms	200 ms	60 ms	200 ms
55875 55875L 55875G			99	100			1,2	0,4
55875R	98	100			2	0,5		
55875B	97	100			3,5	2		

NOTES

1) Underscanning of the specified useful target area of 12,8 mm x 17,1 mm, or failure of scanning, should be avoided since this may cause damage to the photoconductive layer.

2) For correct orientation of the image on the photoconductive layer the vertical scan should be essentially parallel to the plane passing through the tube axis and the mark on the tube base.

3) Measuring conditions:

Illumination 4,54 lx at black body colour temperature of 2856 K; the appropriate filter inserted in the light path. The signal current obtained in nA is a measure of the colour sensitivity expressed in μA per lumen of white light before the filter.
Filters used:

55875R	Schott	OG570	thickness	3 mm
55875G	Schott	VG9	thickness	1 mm
55875B	Schott	BG12	thickness	3 mm

See page 8 for transmission curves.

4) The use of gamma stretching circuitry is recommended.

5) The capacitance C_{as} to all, which effectively is the output impedance, increases when the tube is inserted into the deflecting/focusing coil assembly.

6) For focusing/deflection coil assembly, see under "Accessories".

7) Without blanking voltage on grid No. 1.

8) At $V_k = 0$ V.

9) 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.

10) The signal electrode voltage shall be adjusted to 45 V. To enable the tube to handle excessive highlights in the scene to be televised the signal electrode voltage may be reduced to a minimum of 25 V, this will, however, result in some reduction in performance.

11) The beam current I_b, as obtained be adjusting the control grid (grid no. 1) voltage is set to 300 nA for R and B tubes, 600 nA for black- and white, L, and G tubes. I_b is not the actual 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 conditions are given, e.g. as I_s/I_b = 20/300 nA. This hence 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 on the scanned area. The peak signal currents as measured on a waveform oscilloscope will be a factor α larger.
($\alpha = \frac{100}{100-\beta}$, β being the total blanking time in %, for the CCIR system α amounts to 1,33).

12)

	Focus current mA *	Line current$_{pp}$ mA	Frame current$_{pp}$ mA
Black/white coil assembly AT1132/01 V_{g4}, V_{g3} = 600 V	25	235	35
Colour coil assemblies AT1112, AT1113/01 V_{g4}, V_{g3} = 600 V	100	235	35

(approx. values)

*) Adjusted for correct electrical focus. The direction of the focusing current shall be such that a north-seeking pole is repelled at the image end of the focusing coil.

13) Typical faceplate illumination level for the 55875 and 55875L to produce 0,3 μA signal current will be approx. 4 lx. The signal currents stated for the colour tubes 55875R, G, B respectively will be obtained with an incident white light level (2856 K) on the filter of approx. 10 lx. These figures are based on the filters described in note 3, for filter BG12 however a thickness of 1 mm is chosen.

14) In the case of a black/white camera the illumination on the photoconductive layer, B_{ph}, is related to scene illumination, B_{sc}, by the formula :

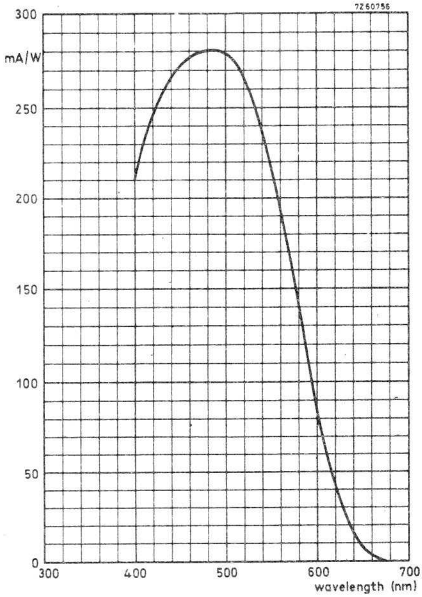
$$B_{ph} = B_{sc} \frac{R.T}{4F^2 (m + 1)^2}$$

in which R represents the average scene reflectivity or the object reflectivity, whichever is relevant, T the lens transmission factor, F the lens aperture, and m the linear magnification from scene to target.
A similar formula may be derived for the illumination level on the photoconductive layers of the R, G, and B tubes in which the effects of the various components of the complete optical system have been taken into account.

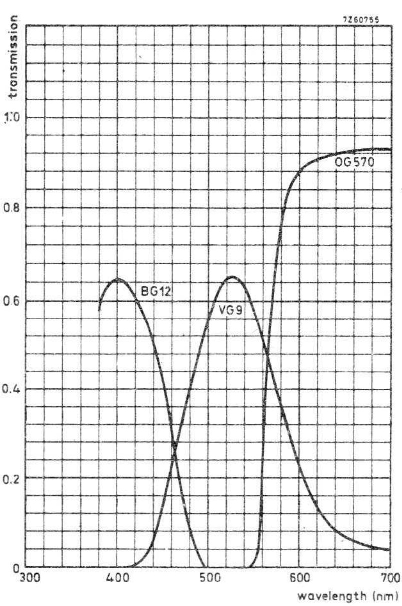
15) The horizontal amplitude response can be raised by the application of suitable correction circuits, which affects neither the vertical resolution, not the limiting resolution.

16) After 10 s of darkness. The figures given represent typical percentages of the ultimate signal current obtained 60 ms respectively 200 ms after the illumination has been applied.

17) After a minimum of 5 s of illumination on the target. The figures represent typical residual signals in percents of the original signal current 60 ms respectively 200 ms after the illumination has been removed.



Typical spectral response curve



Transmission of filters BG12, VG9, and OG570. See note 3

CAMERA TUBE

Plumbicon*, sensitive pick-up tube with lead-oxide photoconductive target and low velocity stabilization.

The tubes of this series are mechanically and electrically identical to the tubes of the 55875 series, the only difference being the degree of freedom from blemishes of the photoconductive target.

The tubes are intended for industrial and educational black and white and colour cameras. The series comprises the following versions:

55875-IG	for black and white cameras
55875R-IG 55875G-IG 55875B-IG	for use in the chrominance channels of colour cameras

For all further information see data of the 55875 series.

* Registered Trade Mark for T.V. camera tube.

CAMERA TUBE

Plumbicon *), pick-up tube with photoconductive target and low velocity stabilisation exclusively intended for use with X-ray image intensifier in medical equipment.

QUICK REFERENCE DATA	
Focusing	magnetic
Deflection	magnetic
Diameter	30 mm
Heater	6,3 V, 95 mA
Without anti-halation glass disc	

OPTICAL

Image dimensions on photoconductive layer	circle of 18,0 mm diameter	1) 2) 3)
Sensitivity, measured with a fluorescent light source having P20 distribution	275 μA/lumen	
Gamma of transfer characteristic	0,95 ± 0,05	4)
Spectral response, max. response	500 nm	
cut-off	≈ 650 nm	
response curve	see 55875 data	

HEATING

Indirect by a.c. or d.c.; parallel or series supply.

Heater voltage	V_f	6,3	V ± 5%
Heater current	I_f	95	mA

When the tube is used in a series heater chain, the heater voltage must not exceed value of 9,5 V when the supply is switched on.
an r.m.s. value of 9,5V when the supply is switched on.

1) All underscanning of the specified useful target-area of 18,0 mm diameter or failure of scanning, should be carefully avoided, since this may cause permanent damage to the photoconductive layer.

2) The area beyond the 18,0 mm circular optical image preferably to be covered by a mask.

3) Direction of vertical scan should be essentially parallel to the plane passing through the tube axis and the mark on the tube base.

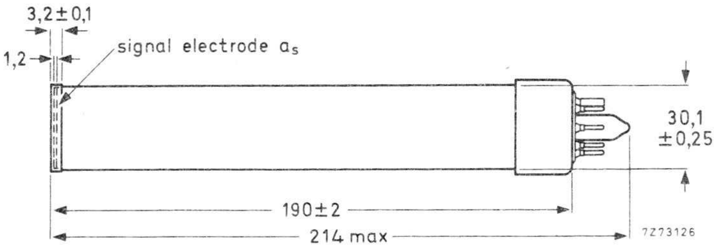
4) The near unity gamma of the 55876 ensures good contrast when televising low contrast X-ray image-intensifier pictures as encountered in radiology. Further contrast improvement may be obtained when an adjustable gamma expansion circuitry is incorporated in the video amplifier system.

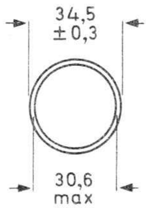
*) Registered T.M. for TV camera tube.

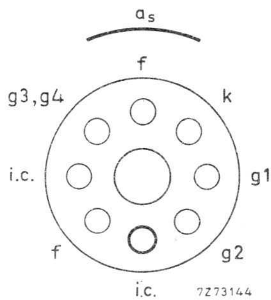
CAPACITANCES

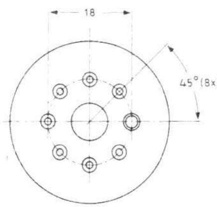
Signal electrode to all | C_{a_s} | 3 to 6 pF [1])

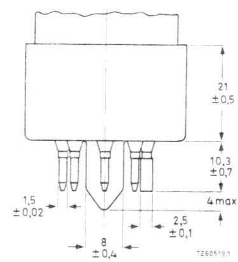
MECHANICAL DATA Dimensions in mm











Mounting position: any

Net mass: ≈ 100 g

ACCESSORIES

Socket type 56021

Focusing and deflection coil unit type AT1122, AT1132, AT1132/01

FOCUSING magnetic

DEFLECTION magnetic

[1]) Cap. a_s - all, which effectively is the output impedance, increases when the tube is inserted into the deflection/focusing coil assembly.

CHARACTERISTICS

Grid no. 1 voltage for cut-off at V_{g2} = 300 V	V_{g1}		−30 to −100	V	1)
Blanking voltage, peak to peak on grid no. 1	V_{g1p-p}		50 ± 10	V	
	V_{kp-p}		25	V	
Grid no. 2 current at normally required beam current	I_{g2}	<	0,5	mA	
Dark current	I_{as}	<	0,003	μA	2)

LIMITING VALUES (Absolute max. rating system)

Signal electrode voltage	V_{as}	max.	50	V	3)
Grid no. 4 and grid no. 3 voltage	V_{g4}, V_{g3}	max.	750	V	3)
Grid no. 2 voltage	V_{g2}	max.	450	V	3)
Grid no. 1 voltage, positive	V_{g1}	max.	0	V	3)
negative	$-V_{g1}$	max.	125	V	3)
Cathode heating time before drawing cathode current	T_h	min.	1	min	
Cathode to heater voltage, positive peak	V_{kf_p}	max.	125	V	
negative peak	$-V_{kf_p}$	max.	10	V	
Faceplate illumination		max.	500	lx	4)
Ambient temperature, storage and operation	t_{amb}	max.	50	°C	
		min.	-30	°C	
Faceplate temperature, storage and operation	t	max.	50	°C	
		min.	-30	°C	

1) With no blanking voltage on g_1

2) Target voltage adjusted to the value indicated by the tube manufacturer on the test sheet as delivered with each individual tube.

3) At V_k = 0 V.

4) For short intervals. During storage the tube face shall be covered with the plastic hood provided.

OPERATING CONDITIONS AND PERFORMANCE

Conditions

Cathode voltage	V_k	0	V	
Grid no. 2 voltage	V_{g2}	300	V	
Grid no. 4 and grid no. 3 voltage	V_{g4}, V_{g3}	600	V	
Signal electrode voltage	V_{a_s}	15 to 45	V	[1]
Blanking voltage on grid no. 1, peak to peak	V_{g1p-p}	50	V	
Beam current	I_b	see note 2		
Focusing coil current		see note 3		
Line coil and frame coil current		see note 4		
Highlight signal electrode current	I_{a_s}	0,1 to 0,5	μA	[5]
Average signal output		≈ 0,06	μA	[5]
Face-plate temperature	t	25 to 40	°C	
Face-plate illumination		≈ 2	lx	[6]

[1]) The target voltage should be adjusted to the value indicated by the tube manufacturer on the test sheet as delivered with each individual tube.

[2]) Operation of the tube with beam currents I_b not sufficient to stabilize the brighest highlight picture elements must be carefully avoided in order to prevent loss of highlight-detail and/or "sticking" effects.
Operation at excessively high beam currents will result in loss of resolution.

[3]) Adjudted for correct eletrical focus. The direction of the focusing current shall be such that a north-seeking pole is repelled at the image end of the focusing coil.

[4]) For AT1122, AT1132, AT1132/01:

Focus coil current	25 mA	approx. values at $V_{g3\,g4}$ = 600 V for 18 mm x 18 mm scanning
Line deflection current p-p :	250 mA	
Frame deflection current p-p :	50 mA	

[5]) Substraction of dark current is unnecessary because of the extremely small value.

[6]) Illumination of the photoconductive layer, B_{ph}, is related to scene-illumination, B_{sc}, by the formula:

$$B_{ph} = B_{sc} \frac{R.T.}{4.F^2.(m+1)^2}$$

in which R represents the scene-reflexivity (average or of the object under consideration, whichever is relevant). T the lens transmissionfactor, F the lens aperture and m the linear magnification from scene to target.

OPERATING CONDITIONS AND PERFORMANCE (continued)

Performance

Resolution

Modulation depth, i.e. uncompensated horizontal amplitude response (see note 1) at 5 MHz in picture centre (625 lines, 50 fields system)	> 30 %	[2]
Signal to noise ratio at signal current of 0,15 μA	≈ 200:1	[3]

Persistence (or lag)

Low persistence renders tube very suitable for medical X-ray applications in combination with X-ray image intensifier

Persistence is basically independent of illumination level

Decay

Measured with 100 % video signal current of 0,1 μA to zero signal after 5 s peak video signal. Beam current adjusted for correct stabilisation. Fluorescent light source having P20 distribution.

Residual signal after dark pulse of 60 ms	< 10%	typ. 5%
Residual signal after dark pulse of 200 ms	< 4%	2%

---

[1]) With a signal current of 0,10 μA and a beam current of 0,20 μA.

[2]) Horizontal amplitude response can be raised by the application of suitable phase-and-aperture correction circuits. Such compensation, however, does not affect vertical resolution, nor does it influence the limiting resolution.

[3]) The specified ratio represents the "visual equivalent signal-to-noise ratio", which is taken as the ratio of highlight video-signal current to r.m.s. noise-current, multiplied by a factor of 3. (Assuming an r.m.s. noise-current of the video pre-amplifier of 2×10^{-9} A, bandwidth 5 MHz).

Vidicons

SURVEY VIDICONS

Abbreviations used in the table:

I	=	integral mesh
S	=	separate mesh
Br	=	for black and white and colour broadcast cameras, telecine.
HI	=	for high-quality black and white and colour cameras in subbroadcast, medical, educational and industrial applications.
Ind	=	in black and white and colour cameras in non-critical industrial applications.
Med	=	in medical or industrial X-ray equipment, coupled with an image intensifier.
MS	=	in cameras for military, surveillance, and scientific applications.
GP	=	general purpose tube for low-cost cameras.

NOTES

1) Except for tube length.

2) Except for optimal grid no. 4 to grid no. 3 voltage ratio.

3) Except for heater current.

4) Preferred applications.

Vidicons with $Sb_2 S_3$ photoconductive targets (A and B)												
							Application 4)					
1 in dia. tubes magnetic focusing and deflection V_f = 6,3 V I_f ≈ 95 mA	length (mm)	mesh construction	photoconductor type	remarks	replacement for obsolete type(s)		Br	HI	Ind	Med	MS	GP
XQ1031	130	I	A		XQ1030	1)		•	•		•	
XQ1032	130	I	A		XQ1030	1)			•		•	•
XQ1240	159	S	A		XQ1040, XQ1041, XQ1042 XQ1050, XQ1051, XQ1052	2) 2) 3)	•	•			•	
XQ1241	159	S	A		XQ1043, XQ1044 XQ1053, XQ1054	2) 2) 3)			•		•	•
XQ1280	159	S	B							•		
XQ1285	159	S	B	fibre optic faceplate						•		
2/3 in dia. tubes V_f = 6,3 V I_f ≈ 100 mA												
XQ1270	105	I	A	magnetic focusing and deflection					•		•	•
XQ1271	105	S	A	magnetic focusing and deflection					•		•	•
XQ1272	105	S	A	electrost. focusing magnetic deflection					•		•	•
Vidicons with Si multi-diode array targets (Si)												
1 in dia. tubes magnetic focusing and deflection V_f = 6,3 V I_f ≈ 95 mA												
XQ1400	159	S	Si					•				
XQ1401	159	S	Si						•		•	
XQ1402	159	S	Si						•		•	•

Abbreviations and notes see page 1.

Tube type	Deflection (and focusing) coil unit	Socket
XQ1031, XQ1032 XQ1240, XQ1241 XQ1280, XQ1285 XQ1400, XQ1401, XQ1402	AT1102/01, AT1103 AT1116 or equivalent	56098 or equivalent
XQ1270, XQ1271	KV 12 or equivalent	56049 or equivalent
XQ1272	KV 19B or equivalent	

In preparation

RATING SYSTEM

ABSOLUTE MAXIMUM RATING SYSTEM

Absolute maximum ratings are limiting values of operating and environmental conditions applicable to any electronic device of a specified type as defined by its published data which should not be exceeded under the worst probable conditions.

These values are chosen by the device manufacturer to provide acceptable serviceability of the device, taking no responsibility for equipment variations, environmental variations, and the effects of changes in operating conditions due to variations in the characteristics of the device under consideration and of all other electronic devices in the equipment.

The equipment manufacturer should design so that, initially and throughout life , no absolute maximum value for the intended service is exceeded with any device under the worst probable operating conditions with respect to supply voltage variation, equipment component variation, equipment control adjustment, load variations , signal variation , and variations in the characteristics of the device under consideration and of all other electronic devices in the equipment.

CAMERA TUBE

Vidicon television camera tube with low heater consumption, integral mesh construction, magnetic focusing, magnetic deflection, short length (130 mm, 5 in), and 25.4 mm (1 in) diameter.

QUICK REFERENCE DATA	
Integral mesh	
Focusing	magnetic
Deflection	magnetic
Diameter	25.4 mm (1 in)
Length	130 mm (5 in)
Heater	6.3 V, 95 mA
Resolution	≥600 TV lines

The electrical and mechanical properties of the two types are essentially identical, the main difference being found in the degree of freedom from blemishes of the photoconductive layers.

XQ1031 - intended for use in industrial and broadcast applications in which a high standard of performance is required.

XQ1032 - general purpose tube for less critical industrial applications, experiments, amateur use etc.

OPTICAL

Diagonal of quality rectangle on photoconductive layer (aspect ratio 3 : 4)	max.	16	mm

Orientation of image on photoconductive layer:
The direction of the horizontal scan should be essentially parallel to the plane defined by the short index pin and the longitudinal axis of the tube, unless rotation of the tube is found necessary to minimize the number of blemishes in the picture.

Photoconductive layer	type A		
Spectral response, max. response at	approx.	550	nm

HEATING

Indirect by A.C. or D.C.; parallel and series supply

Heater voltage	V_f	6.3	V±10%
Heater current	I_f	95	mA

When the tube is used in a series heater chain, the heater voltage must not exceed 9.5 V_{rms} when the supply is switched on.

Data based on pre-production tubes.

CAPACITANCES

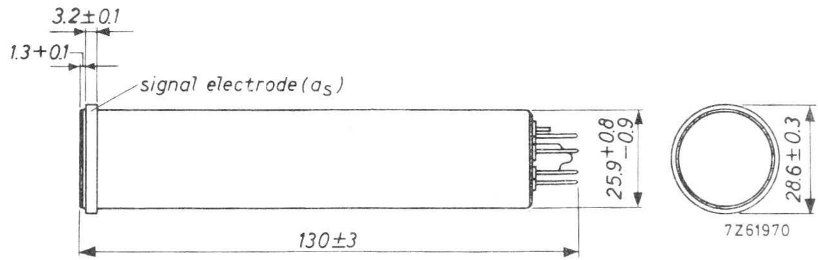
Signal electrode to all	C_{as}	4.5	pF

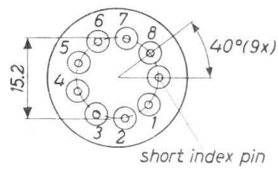
This capacitance, which effectively is the output impedance of the tube, increases when the tube is inserted into the deflection and focusing coil unit.

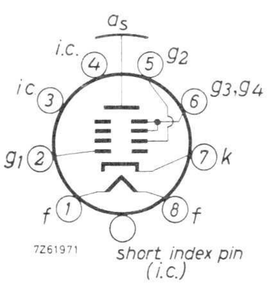
MECHANICAL DATA

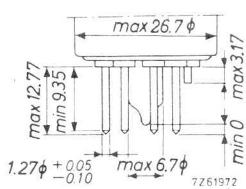
Dimensions in mm

Base: JEDEC no. E8-11, IEC 67-I-33a









Mounting position: any

Net mass	approx.	50	g

ACCESSORIES

→ Socket	type 56098 or equivalent
Deflection and focusing coil unit	AT1102/01, AT1103 or equivalent

DEFLECTION magnetic

FOCUSSING magnetic

LIMITING VALUES (Absolute max. rating system)
for scanned area of 9.6 mm x 12.8 mm (3/8 in x 1/2 in)

"Full-size scanning", i.e. scanning of a 9.6 mm x 12.8 mm area of the photoconductive layer should always be applied. Underscanning, i.e. scanning of an area less than 9.6 mm x 12.8 mm, may cause permanent damage to the specified full-size area.

Signal-electrode voltage	V_{as}	max.	100	V
Grid no. 4 voltage and grid no. 3 voltage	$V_{g4, g3}$	max.	800	V
Grid no. 2 voltage	V_{g2}	max.	450	V
Grid no. 1 voltage, negative	$-V_{g1}$	max.	125	V
positive	V_{g1}	max.	0	V
Cathode-to-heater voltage, peak positive	V_{kf_p}	max.	125	V
negative	$-V_{kf_p}$	max.	10	V
Dark current, peak	I_{dark_p}	max.	0.25	μA
Output current, peak	I_{as_p}	max.	0.6	μA 1)
Faceplate illumination	E	max.	5000	lx
Faceplate temperature, storage and operation	t	max.	70	°C 2)
Cathode heating time before drawing cathode current	T_h	min.	1	min

1) Video amplifiers should be capable of handling signal-electrode currents of this magnitude without overloading the amplifier or distorting the picture.

2) Under difficult environmental conditions a flow of cooling air directed at the faceplate is recommended. When televising flames and furnaces appropriate infrared absorbing filters should be used.

OPERATING CONDITIONS AND PERFORMANCE

for a scanned area of 9.6 mm x 12.8 mm and a faceplate temperature of 30 ± 2 °C

CONDITIONS

Grid no. 4 and grid no. 3 (beam focus electrode) voltage	V_{g4}, V_{g3}	250 to 300	V	1)
Grid no. 2 (accelerator) voltage	V_{g2}	300	V	
Grid no. 1 voltage	V_{g1}	adjusted for sufficient beam-current to stabilize highlights		
Blanking voltage, peak to peak				
when applied to grid no. 1		50	V	
when applied to the cathode		20	V	
Field strength at centre of focusing coil	H	3200 (40 Oe)	A/m	2)
Field strength of adjustable alignment coils	H	0 to 320 (0 to 4 Oe)	A/m	3)
Deflection		see note 4)		

PERFORMANCE

		min.	typ.	max.		
Signal electrode voltage for dark current of 20 nA	V_{as}	20	30	50	V	
Signal current faceplate illumination 8 lx c.t. 2856 K, dark current 20 nA	I_s	125	200		nA	5)
Decay: residual signal current 200 ms after cessation of the illumination (8 lx, c.t. 2856 K)			10	15	%	
Amplitude response at 400 TV lines in picture centre		30	40		%	6)
Limiting resolution in picture centre		600			TV lines	
Grid no. 1 voltage for picture cut-off with no blanking applied	V_{g1}	−40	−60	−100	V	
Average γ of transfer characteristic for signal currents between 0.02 and 0.2 μA			0.65			
Spurious signals (spots and blemishes)			see note 7)			

NOTES

1) Beam focus is obtained by the combined effect of grid no. 3, the voltage of which should be adjustable over the indicated range, and a focus coil having a field strength of 3200 A/m (40 Oe).

2) The polarity of the focusing coil should be such that a north-seeking pole is attracted to the image end of the focusing coil, with this pole located outside of and at the image end of the focusing coil.

3) The alignment coil unit should be positioned on the tube so that its centre is at a distance of approx. 94 mm (3 11/16 in) from the face of the tube and that its axis coincides with the axis of the tube, the deflecting yoke and the focusing coil.

4) The deflection circuits must provide sufficiently linear scanning for good black-level reproduction. The output current being proportional to the velocity of scanning, any change in this velocity will produce non-uniformity.

5) Signal current is defined as the component of the output current after the dark current has been subtracted.

6) Square-wave response. Measured with a video amplifier system having an appropriate bandwidth. 8 lux on specified target area, target voltage adjusted for a dark current of 20 nA, beam set for correct stabilization.

7) Conditions:
The camera focused on a uniformly illuminated two-zone test pattern, the diameter of the centre zone (1) being equal to the raster height. Zone (2) being defined as the remainder of the scanned area. Signal electrode voltage adjusted for a dark current of 20 nA, illumination on target 8 lx (c.t. = 2856 K).

Scanning amplitudes of the monitor adjusted to obtain a raster with an aspect ratio of 3 : 4.

Monitor set-up and contrast control adjusted for faint raster when lens of camera is capped, and for non-blooming bright raster when lens of camera is uncapped.

Under the above conditions the number and size of the spots visible in the monitor picture will not exceed the limits stated below. Both black and white spots must be counted, unless the amplitude is less than 50 % of the peak white signal.

XQ1031

Spot size in % of raster height	Maximum number of spots zone 1	zone 2
> 1	none	none
1 to 0.6	none	none
0.6 to 0.2	1	2
⩽ 0.2	*	*

XQ1032

Spot size in % of raster height	Maximum number of spots zone 1	zone 2
> 1	none	none
1 to 0.6	1	3
0.6 to o.2	3	5
⩽ 0.2	*	*
	max. 8	

* Do not count spots of this size unless concentration causes a smudgy appearance.

a) Minimum separation between any 2 spots greater than 0.3 % of raster height is limited to a distance equivalent to 4 % of raster height.

b) Tubes are rejected for smudge, lines, streaks, mottled, grainy, or uneven background having contrast ratios greater than 1.5 to 1.

CAMERA TUBE

Vidicon television camera tube with low heater consumption, separate mesh construction, magnetic focusing, magnetic deflection and 25.4 mm (1 in) diameter intended for use in black-and-white and colour television cameras in industrial, medical and broadcast applications.

QUICK REFERENCE DATA	
Separate mesh	
Focusing	magnetic
Deflection	magnetic
Diameter	25.4 mm (1 in)
Length	159 mm ($6\frac{1}{4}$ in)
Heater	6.3 V, 95 mA
Resolution	$\geq$ 1000 TV lines

The electrical and mechanical properties of the two types are essentially identical, the differences being found in the degree of freedom from blemishes of the photoconductive layers, in the sensitivity and the signal electrode voltage range.

XQ1240 - intended for use in industrial, medical and broadcast applications in which a high standard of performance is required.

XQ1241 - general purpose tube for less critical industrial applications, experiments, amateur use etc.

OPTICAL

Diagonal of quality rectangle on photoconductive layer (aspect ratio 3 : 4)	max.	16	mm

Orientation of image on photoconductive layer:
The direction of the horizontal scan should be essentially parallel to the plane defined by the short index pin and the longitudinal axis of the tube.

Photoconductive layer	type A		
Spectral response, max. response at	approx.	550	nm

HEATING

Indirect by A.C. or D.C.; parallel and series supply

Heater voltage	V_f	6.3	V±10%
Heater current	I_f	95	mA

When the tube is used in a series heater chain, the heater voltage must not exceed 9.5 V_{rms} when the supply is switched on.

CAPACITANCES

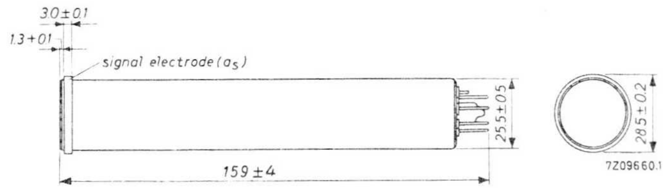
Signal electrode to all C_{as} 4.5 pF

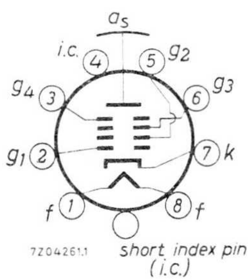
This capacitance, which effectively is the output impedance of the tube, increases when the tube is inserted into the deflection and focusing coil unit.

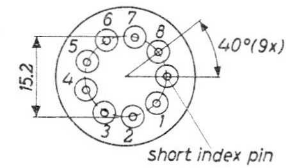
MECHANICAL DATA

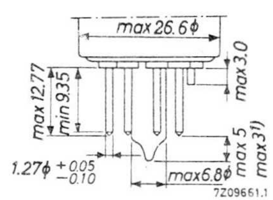
Dimensions in mm

Base: JEDEC no. E8-11 except for pumping stem
IEC 67-I-33a









Mounting position: any

Net mass approx. 55 g

ACCESSORIES

→ Socket type 56098 or equivalent

Deflection and focusing coil unit AT1102/01, AT1103 or equivalent

DEFLECTION magnetic

FOCUSSING magnetic

LIMITING VALUES (Absolute max. rating system)
for scanned area of 9.6 mm x 12.8 mm (3/8 in x 1/2 in)

"Full-size scanning", i.e. scanning of a 9.6 mm x 12.8 mm area of the photoconductive layer should always be applied. Underscanning, i.e. scanning of an area less than 9.6 mm x 12.8 mm, may cause permanent damage to the specified full-size area.

Signal-electrode voltage	V_{a_s}	max.	100	V	
Grid no. 4 voltage	V_{g4}	max.	1000	V	
Grid no. 3 voltage	V_{g3}	max.	850	V	
Grid no. 2 voltage	V_{g2}	max.	450	V	
Grid no. 1 voltage, negative	$-V_{g1}$	max.	125	V	
positive	V_{g1}	max.	0	V	
Cathode-to-heater voltage,					
peak positive	V_{kf_p}	max.	125	V	
negative	$-V_{kf_p}$	max.	10	V	
Dark current, peak	I_{dark_p}	max.	0.25	μA	
Output current, peak	$I_{a_{s_p}}$	max.	0.6	μA	1)
Faceplate illumination	E	max.	5000	lx	
Faceplate temperature, storage and operation	t	max.	80	°C	2)3)
Cathode heating time before drawing cathode current	T_h	min.	1	min	

1) Video amplifiers should be capable of handling signal-electrode currents of this magnitude without overloading.

2) Under difficult environmental conditions a flow of cooling air directed at the faceplate is recommended.

3) Under conditions of high heat irradation the use of a infra-red absorbing filter is recommended.

OPERATING CONDITIONS AND PERFORMANCE
for a scanned area of 9.6 mm x 12.8 mm and a faceplate temperature of 30 ±2 °C.

CONDITIONS

		Normal operation	Operation for high resolution	
→ Mesh voltage	V_{g4}	425 [1])	950 [1])	V
Focusing electrode voltage	V_{g3}	250 to 300	550 to 650	V
Accelerator voltage	V_{g2}	300	300	V
Grid no. 1 voltage	V_{g1}	Adjusted for sufficient beam current to stabilize highlights		
Blanking voltage, peak-to-peak				
when applied to g1		50		V
when applied to cathode		20		V
Field strength at centre of focusing coil (nominal)	H	3200 (40)	4800 [2]) (60) [2])	A/m [3]) Oe [3])
Field strength of adjustable alignment coils	H	0 to 320 (0 to 4)	0 to 320 (0 to 4)	A/m [4]) Oe [4])

PERFORMANCE

		min.	typ.	max.	
Signal electrode voltage for dark current of 20 nA	V_{as}				
	XQ1240	30	45	60	V
	XQ1241	20	40	60	V
Grid no. 1 voltage for picture cut-off, with no blanking applied	V_{g1}	-30	-55	-100	V
→ Signal current faceplate illumination 8 lx c.t. 2856 K	I_s				
	XQ1240	150	200		nA [5)6)]
	XQ1241	110	180		nA
→ Decay: residual signal current 200 ms after cessation of the illumination (8 lx, 2856 K)			8	15	% [5])

Notes: see page 5.

		Normal operation	Operation for high resolution	
Limiting resolution at picture centre		750	1000	TV lines 7)
Modulation depth at 400 TV lines at picture centre	typ.	50	65	% 8)
Average γ of transfer characteristic for signal currents between 0.01 μA and 0.3 μA		0.7	0.7	

Spurious signals (spots and blemishes) See note 9)

NOTES

1) The optimal grid no. 4 voltage for best uniformity of black and white level depends on the type of coil unit used and will be 1.6 times V_{g3} for the coil units mentioned under "Accessories".
Under no circumstances should grid no. 4 (mesh) be allowed to operate at a voltage level below the V_{g3} level, since this may damage the target.

2) Because of the higher deflecting and focusing power required to produce adequate field strength the tube temperature will increase and adequate provisions for cooling should be made.

3) The polarity of the focusing coil should be such that a north-seeking pole is attracted to the image end of the focusing coil, with this pole located outside of and at the image end of the focusing coil.

4) The alignment coil unit should be positioned on the tube so that its centre is at a distance of approx. 94 mm (3 11/16 in) from the face of the tube and that its axis coincides with the axis of the tube, the deflecting yoke and the focusing coil.

5) Signal-electrode voltage adjusted for a dark current of 20 nA.

6) Signal current is defined as the component of the output current after the dark current has been subtracted.

7) Measured with a video amplifier system having an appropriate bandwidth.

8) Square wave response. Measured with a lens aperture of f5.6, a peak signal current I_{sp} = 0.15 μA and a beam current sufficient to stabilize a signal current of 0.5 μA.

9) Conditions :
The camera focused on a uniformly illuminated two-zone test pattern, the diameter of the centre zone (1) being equal to the raster height. Zone (2) being defined as the remainder of the scanned area. Signal electrode voltage adjusted for a dark current of 20 nA, illumination on the target 8 lx, (c.t. = 2856 K).

Scanning amplitudes of the monitor adjusted to obtain a raster with an aspect ratio of 3 : 4.

Monitor set-up and contrast control adjusted for faint raster when lens of camera is capped, and for non-blooming bright raster when lens of camera is uncapped.

Under the above conditions the number and size of the spots visible in the monitor picture will not exceed the limits stated below. Both black and white spots must be counted unless the amplitude is less than 10% (XQ1240), or less than 25% (XQ1241) of the peak white signal.

XQ1240

Spot size in % of raster height	Maximum number of spots zone 1	zone 2
> 1	none	none
1 to 0.6	none	none
0.6 to 0.2	1	2
⩽ 0.2	*	*

XQ1241

Spot size in % of raster height	Maximum number of spots zone 1	zone 2
> 1	none	none
1 to 0.6	1	3
m 0.6 to 0.2	3	5
⩽ 0.2	*	*
	max. 8	

* Do not count spots of this size unless concentration causes a smudgy appearance.

a) Minimum separation between any two spots greater than 0.2% of raster height is limited to a distance equivalent to 5% of raster height.

b) Tubes are rejected for smudge, lines, streaks, mottled, grainy or uneven background having contrast ratios in excess of 10% (XQ1240), respectively 25% (XQ1241).

CAMERA TUBE

Small size vidicon television camera tube with low heater consumption, integral mesh construction, magnetic focusing and magnetic deflection. Overall length 108 mm (4-1/4 in) and diameter 17,7 mm (2/3 in).
The XQ1270 is intended for use in ultra compact TV cameras for industrial and consumer applications.

QUICK REFERENCE DATA		
Integral mesh		
Focusing	magnetic	
Deflection	magnetic	
Diameter	17,7	mm
Length	108	mm
Heater	6,3 V, 110	mA
Resolution	≥ 400	TV lines

OPTICAL

Diagonal of quality rectangle on photoconductive layer (aspect ratio 3 : 4)	max.	11	mm

Orientation of image on photoconductive layer:
The direction of the horizontal scan should be essentially parallel to the plane defined by the gap between the pins 1 and 7 and the longitudinal axis of the tube, unless rotation of the tube is found necessary to minimize the number of blemishes in the picture.

Photoconductive layer	type A		
Spectral response, max. response at	approx.	550	nm

HEATING

Indirect by a.c. or d.c.; parallel or series supply

Heater voltage	V_f	6,3	V ± 10 %
Heater current	I_f	110	mA

When the tube is used in a series heater chain, the heater voltage must not exceed a r.m.s. value of 9,5 V when the supply is switched on.

CAPACITANCES

Signal electrode to all	C_{as}	2	pF

This capacitance, which is effectively the output impedance of the tube, increases when the tube is inserted into the deflection and focusing coil unit.

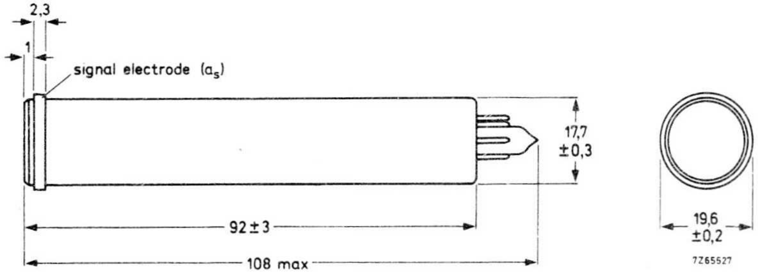
MFCHANICAL DATA

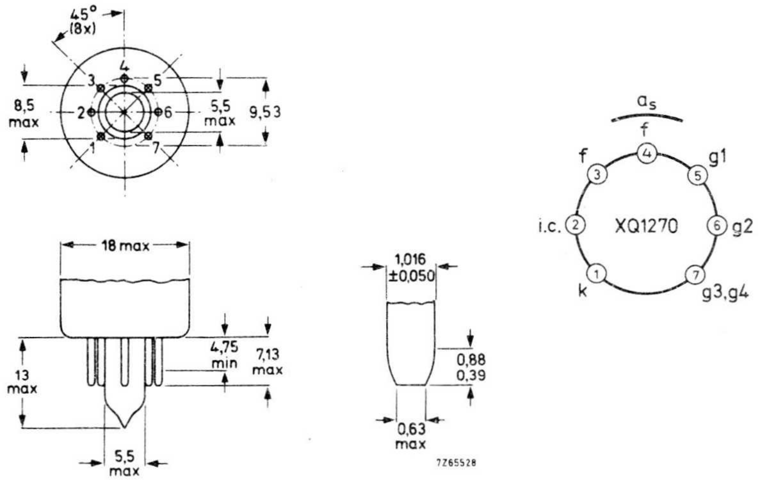
Dimensions in mm

Base: Small button miniature 7-pin (IEC 67-I-10a, JEDEC E7-1) with pumping stem.

Mounting position: any

Net mass : approx. 18 g





ACCESSORIES

Socket	special miniature 7-pin, type 56049 or equivalent
Deflection and focusing coil unit	KV12 or equivalent

DEFLECTION

magnetic

FOCUSING

magnetic

LIMITING VALUES (Absolute max. rating system)
for scanned area of 6,6 x 8,8 mm^2.

"Full-size scanning" i.e. scanning of a 6,6 x 8,8 mm^2 area of the photoconductive layer should always be applied. Underscanning, i.e. scanning of an area smaller than 6,6 x 8,8 mm^2, may cause permanent damage to the specified full-size area.

Signal electrode voltage	V_{as}	max.	80	V
Grid no.4 and grid no.3 voltage	$V_{g4,g3}$	max.	750	V
Grid no.2 voltage	V_{g2}	max.	350	V
Grid no.1 voltage, negative	$-V_{g1}$	max.	125	V
positive	V_{g1}	max.	0	V
Cathode-to-heater voltage, peak positive	V_{kf_p}	max.	125	V
peak negative	$-V_{kf_p}$	max.	10	V
Dark current, peak	I_{d_p}	max.	0,15	μA
Output current, peak	I_{as_p}	max.	0,5	μA [1]
Faceplate illumination	E	max.	5000	lx
Faceplate temperature, storage and operation	t	max.	70	°C [2]
Cathode heating time before drawing cathode current	T_h	min.	1	min

[1] Video amplifiers should be capable of handling signal-electrode currents of this magnitude without overloading the amplifier or distorting the picture.

[2] Under difficult environmental conditions a flow of cooling air directed at the faceplate is recommended. When televising flames and furnaces, appropriate infra-red absorbing filters should be used.

OPERATING CONDITIONS AND PERFORMANCE

for a scanned area of 6,6 x 8,8 mm^2 and a faceplate temperature of 30 ± 2 °C.

Conditions

Grid no.4 and grid no.3 (beam focus electrode) voltage	$V_{g4,g3}$	250 to 300	V [1]
Grid no.2 (accelerator) voltage	V_{g2}	300	V
Grid no.1 voltage	V_{g1}	adjusted for sufficient beam current to stabilize highlights	
Blanking voltage, peak to peak			
when applied to grid no.1		50	V
when applied to the cathode		20	V
Field strength at centre of focusing coil	H	3850	A/m [2]
		(50	Oe)
Field strength of adjustable alignment magnets (KV12)	H	0 to 320	A/m
		(0 to 4	Oe)
Deflection		see note 3	

Performance

		min.	typ.	max.	
Signal electrode voltage for dark current of 20 nA (see Fig.1)	V_{as}	10	25	40	V
Signal current faceplate illumination 8 lx c.t. 2856 K, dark current 20 nA	I_s	80	150		nA [4]
Decay: residual signal current 200 ms after cessation of the illumination (8 lx, c.t. 2856 K)			10		%
Limiting resolution in picture centre		400	450		TV lines [5]
Grid no.1 voltage for picture cut-off with no blanking applied	V_{g1}	-20	-60	-80	V
Average γ of transfer characteristic for signal currents between 0,02 and 0,2 μA (see Fig. 2)			0,7		
Spurious signals (spots and blemishes)		see note 6			

NOTES

[1]) Beam focus is obtained by the combined effect of grid no.3, the voltage of which should be adjustable over the indicated range, and a focus coil having a field strength of 3850 A/m (50 Oe).

[2]) The polarity of the focusing coil should be such that a north-seeking pole is attracted to the image end of the focusing coil, with this pole located outside of and at the image end of the focusing coil.

[3]) The deflection circuits must provide sufficiently linear scanning for good black-level reproduction. The output current being proportional to the velocity of scanning, any change in this velocity will produce non-uniformity.

[4]) Signal current is defined as the component of the output current after the dark current has been subtracted.

[5]) Measured with a video amplifier system having an appropriate bandwidth, 8 lx on specified target area, target voltage adjusted for a dark current of 20 nA, beam set for correct stabilization.

[6]) Conditions:
The camera focused on a uniformly illuminated two-zone test pattern, the diameter of the centre zone (1) being equal to the raster height. Zone (2) being defined as the remainder of the scanned area. Signal electrode voltage adjusted for a dark current of 20 nA, illumination on target 8 lx (c.t. 2856 K).

Scanning amplitudes of the monitor adjusted to obtain a raster aspect ratio of 3 : 4.

Monitor set-up and contrast control adjusted for faint raster when lens of camera is capped, and for non-blooming bright raster when lens of camera is uncapped.

Under the above conditions the number and size of the spots visible in the monitor picture will not exceed the limits stated below. Both black and white spots must be counted, unless the amplitude is less than 50 % of the peak white signal.

Spot size in % of raster height	Maximum number of spots zone 1	zone 2
> 1	none	none
≤ 1 to 0, 8	none	1
≤ 0, 8 to 0, 6	2	2
≤ 0, 6 to 0, 3	2	3
≤ 0, 3	*	*

* Do not count spots of this size unless concentration causes a smudgy appearance.

a) Minimum separation between any 2 spots greater than 0, 4 % of raster height is limited to a distance equivalent to 4 % of raster height.

b) Tubes are rejected for smudge, lines, streaks, mottled, grainy or uneven background having contrast ratios greater than 1, 5 to 1.

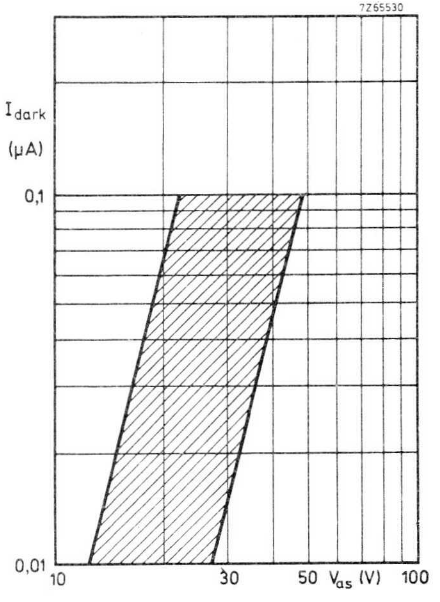


Fig. 1

Dark current range

Scanned area 6,6 x 8,8 mm^2
Faceplate temperature ≈ 30 °C

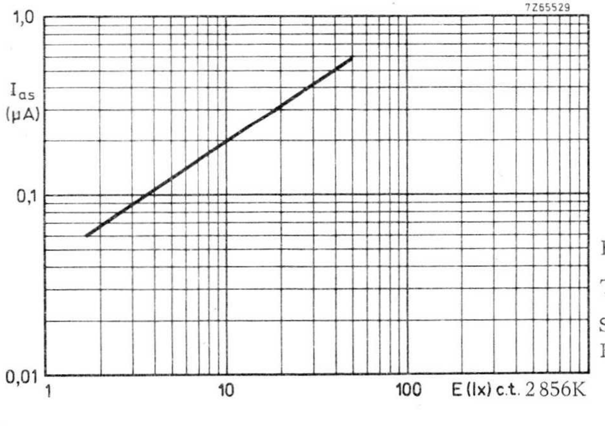


Fig. 2

Typical light transfer characteristic

Scanned area 6,6 x 8,8 mm^2
Faceplate temperature ≈ 30 °C

CAMERA TUBE

Small size vidicon television camera tube with low heater consumption, separate mesh construction for improved resolution, magnetic focusing and magnetic deflection.
Overall length 108 mm (4-1/4 in) and diameter 17,7 mm (2/3 in).
The XQ1271 is intended for use in ultra compact TV cameras for industrial and consumer applications.

QUICK REFERENCE DATA		
Separate mesh		
Focusing	magnetic	
Deflection	magnetic	
Diameter	17,7	mm
Length	108	mm
Heater	6,3 V, 95	mA
Resolution	≥ 550	TV lines

OPTICAL

Diagonal of quality rectangle on photoconductive layer (aspect ratio 3 : 4)	max.	11	mm

Orientation of image on photoconductive layer:
The direction of the horizontal scan should be essentially parallel to the plane defined by the gap between the pins 1 and 7 and the longitudinal axis of the tube, unless rotation of the tube is found necessary to minimize the number of blemishes in the picture.

Photoconductive layer	type A		
Spectral response, max. response at	approx.	550	nm

HEATING

Indirect by a.c. or d.c.; parallel or series supply

Heater voltage	V_f	6,3	V ± 10%
Heater current	I_f	95	mA

When the tube is used in a series heater chain, the heater voltage must not exceed a r.m.s. value of 9,5 V when the supply is switched on.

CAPACITANCES

Signal electrode to all	C_{as}	2	pF

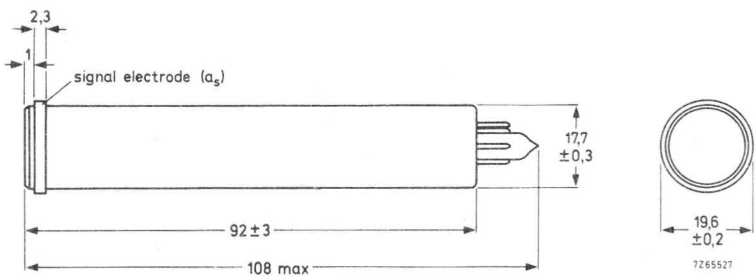
This capacitance, which is effectively the output impedance of the tube, increases when the tube is inserted into the deflection and focusing coil unit.

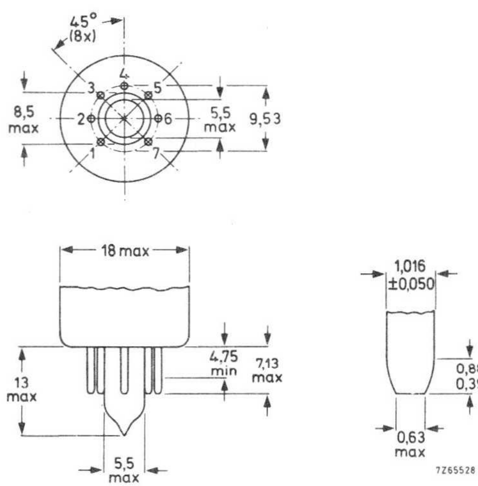
MECHANICAL DATA Dimensions in mm

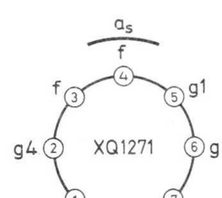
Base : Small button miniature 7-pin (IEC 67-I-10a, JEDEC E7-1) with pumping stem.

Mounting position : any

Net mass : approx. 18 g







ACCESSORIES

Socket	special miniature 7-pin, type 56049 or equivalent
Deflection and focusing coil unit	KV12 or equivalent

DEFLECTION magnetic

FOCUSING magnetic

LIMITING VALUES (Absolute max. rating system)
for scanned area of 6,6 x 8,8 mm^2.

"Full-size scanning" i.e. scanning of a 6,6 x 8,8 mm^2 area of the photoconductive layer should always be applied. Underscanning, i.e. scanning of an area smaller than 6,6 x 8,8 mm^2, may cause permanent damage to the specified full-size area.

Signal electrode voltage	V_{as}	max.	80	V
Grid no. 4 voltage	V_{g4}	max.	750	V
Grid no. 3 voltage	V_{g3}	max.	750	V
Grid no. 2 voltage	V_{g2}	max.	350	V
Grid no. 1 voltage, negative	$-V_{g1}$	max.	125	V
positive	V_{g1}	max.	0	V
Cathode-to-heater voltage, peak positive	V_{kf_p}	max.	125	V
peak negative	$-V_{kf_p}$	max.	0	V
Dark current, peak	I_{dp}	max.	0,15	μA
Output current, peak	I_{as_p}	max.	0,5	μA 1)
Faceplate illumination	E	max.	5000	lx
Faceplate temperature, storage and operation	t	max.	70	°C 2)
Cathode heating time before drawing cathode current	T_h	min.	1	min

1) Video amplifiers should be capable of handling signal-electrode currents of this magnitude without overloading the amplifier or distorting the picture.

2) Under difficult environmental conditions a flow of cooling air directed at the faceplate is recommended. When televising flames and furnaces, appropriate infra-red absorbing filters should be used.

OPERATINF CONDITIONS AND PERFORMANCE

for a scanned area of 6,6 x 8,8 mm^2 and a faceplate temperature of 30 ± 2 °C.

Conditions

Grid no. 4 voltage (beam focus)	V_{g4}	400	V	
Grid no. 3 (beam focus electrode) voltage	V_{g3}	250 to 300	V	2)
Grid no. 2 (accelerator) voltage	V_{g2}	300	V	
Grid no. 1 voltage	V_{g1}	adjusted for sufficient beam current to stabilize highlights		
Blanking voltage, peak to peak				
when applied to grid no. 1		50	V	
when applied to the cathode		20	V	
Field strength at centre of focusing coil	H	3850	A/m	2)
		(50	Oe)	
Field strength of adjustable alignment magnets (KV12)	H	0 to 320	A/m	
		(0 to 4	Oe)	
Deflection		see note 3		

Performance

		min.	typ.	max.		
Signal electrode voltage for dark current of 20 nA (see Fig. 1)	V_{as}	10	25	40	V	
Signal current faceplate illumination 8 lx c.t. 2856 K, dark current 20 nA	I_s	80	150		nA	4)
Decay: residual signal current 200 ms after cessation of the illumination (8 lx, c.t. 2856 K)			10		%	
Limiting resolution in picture centre		550	600		TV lines	5)
Grid no. 1 voltage for picture cut-off with no blanking applied	V_{g1}	-20	-60	-80	V	
Average γ of transfer characteristic for signal currents between 0,02 and 0,2 μA (see Fig. 2)			0,7			
Spurious signals (spots and blemishes)		see note 6				

NOTES

1) Beam focus is obtained by the combined effect of grid no. 3, the voltage of which should be adjustable over the indicated range, and a focus coil having a field strength of 3850 A/m (50 Oe).

2) The polarity of the focusing coil should be such that a north-seeking pole is attracted to the image end of the focusing coil, with this pole located outside of and at the image end of the focusing coil.

3) The deflection circuits must provide sufficiently linear scanning for good black-level reproduction. The output current being proportional to the velocity of scanning, any change in this velocity will produce non-uniformity.

4) Signal current is defined as the component of the output current after the dark current has been subtracted.

5) Measured with a video amplifier system having an appropriate bandwidth, 8 lx on specified target area, target voltage adjusted for a dark current of 20 nA, beam set for correct stabilization.

6) Conditions:
The camera focused on a uniformly illuminated two-zone test pattern, the diameter of the centre zone (1) being equal to the raster height. Zone (2) being defined as the remainder of the scanned area. Signal electrode voltage adjusted for a dark current of 20 nA, illumination on target 8 lx (c.t. 2856 K).

Scanning amplitudes of the monitor adjusted to obtain a raster aspect ratio of 3 : 4.

Monitor set-up and contrast control adjusted for faint raster when lens of camera is capped, and for non-blooming bright raster when lens of camera is uncapped.

Under the above conditions the number and size of the spots visible in the monitor picture will not exceed the limits stated below. Both black and white spots must be counted, unless the amplitude is less than 50 % of the peak white signal.

Spot size in % of raster height	Maximum number of spots zone 1	zone 2
> 1	none	none
≤ 1 to 0,8	none	1
0,8 to 0,6	2	2
0,6 to 0,3	2	3
≤ 0,3	*	*

* Do not count spots of this size unless concentration causes a smudgy appearance.
a) Minimum separation between any 2 spots greater than 0,4 % of raster height is limited to a distance equivalent to 4 % of raster height.
b) Tubes are rejected for smudge, lines, streaks, mottled, grainy or uneven background having contrast ratios greater than 1,5 to 1.

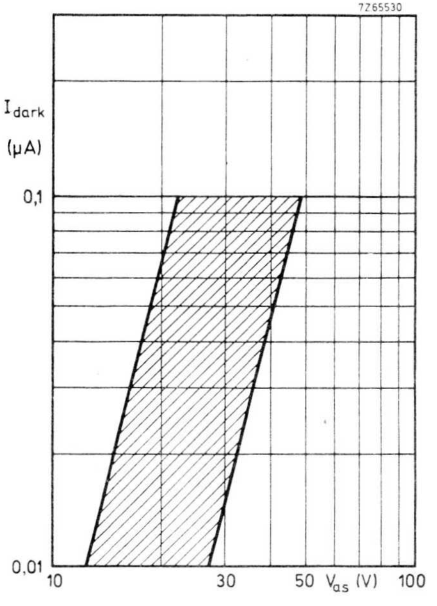


Fig. 1

Dark current range

Scanned area 6,6 x 8,8 mm^2
Faceplate temperature ≈ 30 °C

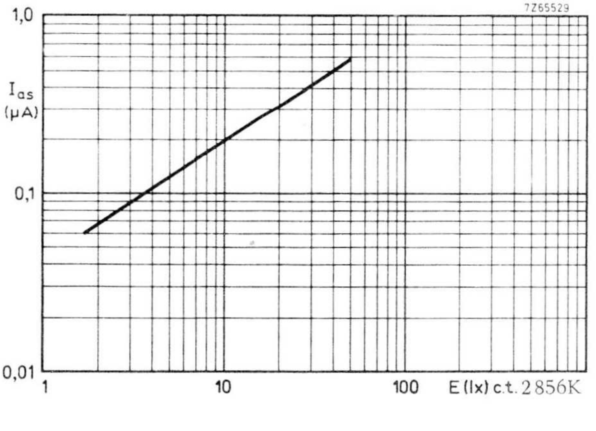


Fig. 2

Typical light transfer characteristic

Scanned area 6,6 x 8,8 mm^2
Faceplate temperature ≈ 30 °C

CAMERA TUBE

Small size vidicon television camera tube with low heater consumption, separate mesh construction, electrostatic focusing and magnetic deflection. Overall length 108 mm (4-1/4 in) and diameter 17,7 mm (2/3 in).
The XQ1272 is intended for use in ultra compact TV cameras for industrial and consumer applications in which a minimum of size, weight and power consumption is essential.

QUICK REFERENCE DATA		
Separate mesh		
Focusing	electrostatic	
Deflection	magnetic	
Diameter	17,7	mm
Length	108	mm
Heater	6,3 V, 95	mA
Resolution	≥ 400	TV lines

OPTICAL

Diagonal of quality rectangle on photoconductive layer (aspect ratio 3 : 4)	max.	11	mm

Orientation of image on photoconductive layer:
The direction of the horizontal scan should be essentially parallel to the plane defined by the gap between the pins 1 and 7 and the longitudinal axis of the tube, unless rotation of the tube is found necessary to minimize the number of blemishes in the picture.

Photoconductive layer	type A		
Spectral response, max. response at	approx.	550	nm

HEATING

Indirect by a.c. or d.c.; parallel or series supply

Heater voltage	V_f	6,3	V ± 10%
Heater current	I_f	95	mA

If the tube is used in a series heater chain, the heater voltage must not exceed a r.m.s. value of 9,5 V when the supply is switched on.

CAPACITANCES

Signal electrode to all	C_{as}	2	pF

This capacitance, which is effectively the output impedance of the tube, increases when the tube is inserted into the deflection coil unit

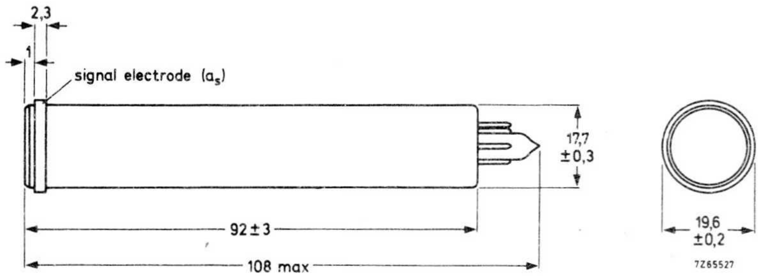
MECHANICAL DATA

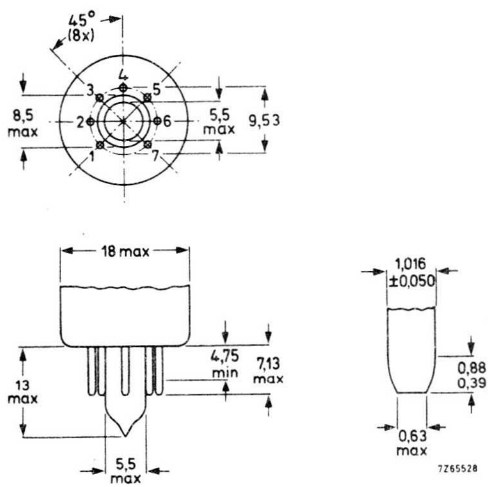
Dimensions in mm

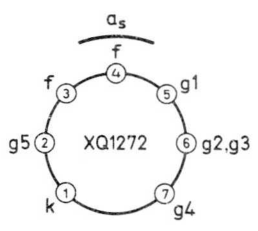
Base: Small button miniature 7-pin (IEC 67-I-10a, JEDEC E7-1) with pumping stem.

Mounting positions: any

Net mass : approx. 23 g







ACCESSORIES

→ Socket	special miniature 7-pin, type 56049 or equivalent
Defelcetion coil unit	KV19B or equivalent

DEFLECTION

magnetic

FOCUSING

electrostatic

LIMITING VALUES (Absolute max. rating system)
for scanned area of 6,6 x 8,8 mm^2.

"Full-size scanning" i.e. scanning of a 6,6 x 8,8 mm^2 area of the photoconductive layer should always be applied. Underscanning, i.e. scanning of an area smaller than 6,6 x 8,8 mm^2, may cause permanent damage to the specified full-size area.

Signal electrode voltage	V_{as}	max.	80	V
Grid no. 5 voltage	V_{g5}	max.	600	V
Grid no. 4 (beam focus electrode) voltage	V_{g4}	max.	350	V
Grid no. 3 and Grid no. 2 voltage	$V_{g3,g2}$	max.	350	V
Grid no. 1 voltage, negative	$-V_{g1}$	max.	125	V
positive	V_{g1}	max.	0	V
Cathode-to-heater voltage, peak positive	V_{kf_p}	max.	125	V
peak negative	$-V_{kf_p}$	max.	10	V
Dark current, peak	I_{d_p}	max.	0,15	μA
Output current, peak	I_{as_p}	max.	0,5	μA 1)
Faceplate illumination	E	max.	5000	lx
Faceplate temperature, storage and operation	t	max.	70	°C 2)
Cathode heating time before drawing cathode current	T_h	min.	1	min

1) Video amplifiers should be capable of handling signal-electrode currents of this magnitude without overloading the amplifier or distorting the picture.

2) Under difficult environmental conditions a flow of cooling air directed at the faceplate is recommended. When televising flames and furnaces, appropriate infra-red absorbing filters should be used.

OPERATING CONDITIONS AND PERFORMANCE

for a scanned area of 6,6 x 8,8 mm^2 and a faceplate temperature of 30 ± 2 °C.

Conditions

Grid no. 5 voltage	V_{g5}	500	V	
Grid no. 4 voltage	V_{g4}	35 to 55	V	1)
Grid no. 3 and Grid no. 2 voltage	$V_{g3,g2}$	300	V	
Grid no. 1 voltage	V_{g1}	adjusted for sufficient beam current to stabilize highlights		
Blanking voltage, peak to peak				
when applied to grid no. 1		50	V	
when applied to the cathode		20	V	
Field strength of adjustable alignment magnets (KV19B)	H	0 to 320	A/m	
		(0 to 4	Oe)	
Deflection		see note 2		

Performance

		min.	typ.	max.	
Signal electrode voltage for dark current of 20 nA (see Fig.1)	V_{as}	10	25	40	V
Signal current faceplate illumination 8 lx c.t. 2856 K, dark current 20 nA	I_s	80	150		nA 3)
Decay: residual signal current 200 ms after cessation of the illumination (8 lx, c.t. 2856 K)			10		%
Limiting resolution in picture centre		500	550		TV lines 4)
Grid no.1 voltage for picture cut-off with no blanking applied	V_{g1}	-20	-60	-80	V
Average γ of transfer characteristic for signal currents between 0,02 and 0,2 μA (see Fig. 2)			0,7		
Spurious signals (spots and blemishes)		see note 5			

NOTES

1) Adjusted for optimal beam focus.

2) The deflection circuits must provide sufficiently linear scanning for good black-level reproduction. The output current being proportional to the velocity of scanning, any change in this velocity will produce non-uniformity.

3) Signal current is defined as the component of the output current after the dark current has been subtracted.

4) Measured with a video amplifier system having an appropriate bandwidth, 8 lx on specified target area, target voltage adjusted for a dark current of 20 nA, beam set for correct stabilization.

5) Conditions:
The camera focused on a uniformly illuminated two-zone test pattern, the diameter of the centre zone (1) being equal to the raster height. Zone (2) being defined as the remainder of the scanned area. Signal electrode voltage adjusted for a dark current of 20 nA, illumination on target 8 lx (c.t. 2856 K).

Scanning amplitudes of the monitor adjusted to obtain a raster aspect ratio of 3 : 4.

Monitor set-up and contrast control adjusted for faint raster when lens of camera is capped, and for non-blooming bright raster when lens of camera is uncapped.

Under the above conditions the number and size of the spots visible in the monitor picture will not exceed the limits stated below. Both black and white spots must be counted, unless the amplitude is less than 50% of the peak white signal.

Spot size in % of raster height	Maximum number of spots zone 1	zone 2
> 1	none	none
≤ 1 to 0,8	none	1
0,8 to 0,6	2	2
0,6 to 0,3	2	3
≤ 0,3	*	*

* Do not count spots of this size unless concentration causes a smudgy appearance.

a) Minimum separation between any 2 spots greater than 0,4% of raster height is limited to a distance equivalent to 4% of raster height.

b) Tubes are rejected for smudge, lines, streaks, mottled, grainy or uneven background having contrast ratios greater than 1,5 to 1.

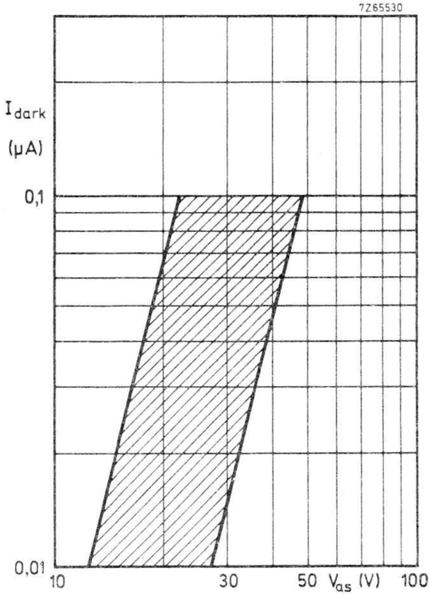


Fig. 1

Dark current range

Scanned area 6, 6 x 8, 8 mm^2
Faceplate temperature ≈ 30 ^oC

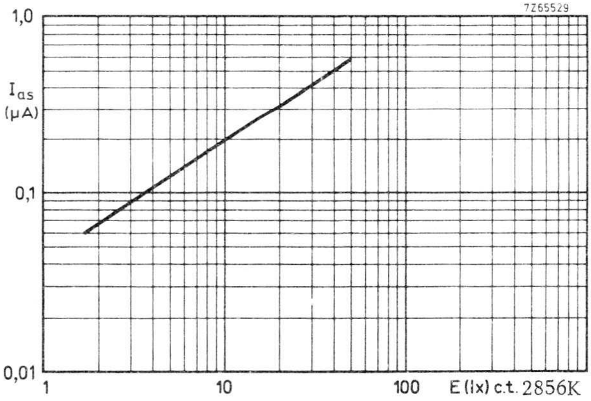


Fig. 2

Typical light transfer characteristic

Scanned area 6, 6 x 8, 8 mm^2
Faceplate temperature ≈ 30 ^oC

CAMERA TUBE

Vidicon TV camera tube with 25,4 mm (1 in) diameter, low heater power consumption, magnetic focusing and deflection, provided with a precision electron gun as in the 1 in diameter Plumbicon* tubes of the XQ1070 series.
The XQ1280 is intended mainly for use in medical or industrial X-ray equipment in which it is lens coupled to an X-ray image intensifier with a P11 or P20 output phosphor.
The tube is provided with a special photoconductive layer of high sensitivity in the 450 to 500 nm spectral region, and medium lag for proper X-ray noise integration.

QUICK REFERENCE DATA		
Separate mesh		
Focusing	magnetic	
Deflection	magnetic	
Diameter	25,4 mm (1 in)	
Length	159 mm ($6\frac{1}{4}$ in)	
Spectral response, max. at	450 to 500	nm
cut-off at	approx. 800	nm
Resolution	≥ 60	lp/mm
Heater	6,3 V, 95	mA

OPTICAL DATA

Dimensions of quality area on photoconductive target — circle of 16,2 mm dia [1]

Orientation of image on target
The direction of the horizontal scan should be essentially parallel to the plane defined by the short index pin and the longitudinal axis of the tube.

Photoconductive layer		type B	
Spectral response, max. at		approx. 475	nm
cut-off at		approx. 800	nm
Spectral response curve		see Fig. 1	
Faceplate			
Refractive index	n	1,49	
Thickness		2,3 ± 0,1	mm

[1]) See page 6

* Registered Trade Mark for TV camera tube

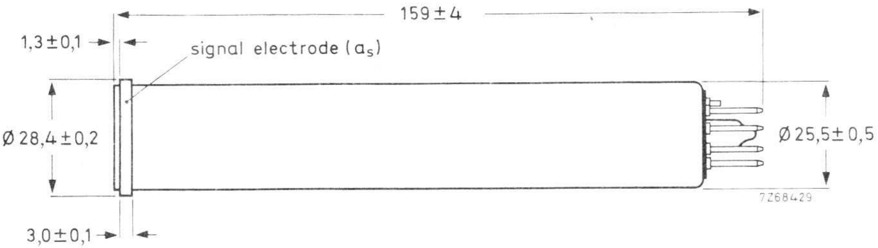
MECHANICAL DATA

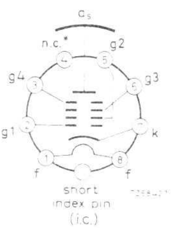
Dimensions in mm

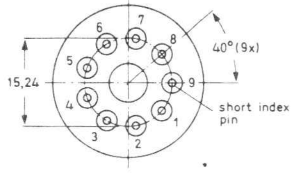
Mounting position : any

Mass : approx. 55 g

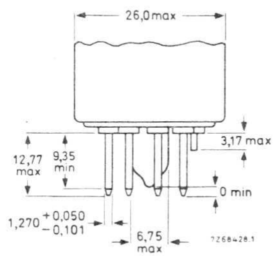
Base : IEC 67-I-33a (JEDEC E8-11)







bottom view



+ No connection, to facilitate operation of the tube in a camera designed for XQ1102 tubes (Plumbicon tube with anti-comet tail gun).

ACCESSORIES

Socket	TE1004, Cinch no. 54A18088 or equivalent
Deflection and focusing coil	AT1102/01, AT1103, AT1116 or equivalent

ELECTRICAL DATA

Heating: Indirect by A.C. or D.C. ; parallel or series supply

Heater voltage	V_f	6,3	V ± 10%
Heater current	I_f	95	mA

When the tube is used in a series heater chain, the heater voltage must never exceed an r.m.s. value of 9,5 V when the supply is switched on.

Electron gun characteristics

Cut-off			
Grid no.1 voltage for cut-off at V_{g_2} = 300 V	V_{g_1}	-30 to -100	V
Blanking voltage, peak to peak			
on grid no.1	$V_{g_{1pp}}$	50 ± 10	V
on cathode	$V_{k_{pp}}$	20	V
Grid no.2 current at normally required beam currents	I_{g_2}	max. 0,5	mA

Focusing: magnetic ; see "Accessories"

Deflection: magnetic ; see "Accessories"

Capacitance

Signal electrode to all	C_{as}	3 to 5	pF

This capacitance, which is effectively the output impedance, increases when the tube is inserted in the coil unit.

LIMITING VALUES (Absolute max. rating system)

All voltages are referred to the cathode, unless otherwise stated.

Signal electrode voltage	V_{as}	max.	100	V
Grid no.4 voltage	V_{g4}	max.	1100	V
Grid no.3 voltage	V_{g3}	max.	800	V
Voltage between grid no.4 and grid no.3	$V_{g4/g3}$	max.	450	V
Grid no.2 voltage	V_{g2}	max.	350	V
Grid no.1 voltage, negative	$-V_{g1}$	max.	125	V
positive	V_{g1}	max.	0	V

Cathode to heater voltage, positive peak	V_{kf_p}	max.	125	V
negative peak	$-V_{kf_p}$	max.	50	V
Impedance between cathode and heater at $-V_{kf_p} > 10$ V	Z_{kf}	min.	2	kΩ
Dark current, peak	I_{dark_p}	max.	0,1	μA
Output current, peak	I_{as_p}	max.	0,6	μA

The video amplifier should be capable of handling signal electrode currents of this magnitude without overloading.

Faceplate illumination	E	max.	5000	lx
Faceplate temperature, storage and operation	t	max.	80	°C

OPERATING CONDITIONS AND PERFORMANCE

For a target area of 15 mm diameter; faceplate temperature 30 ± 2 °C, All voltages are referred to the cathode, unless otherwise stated.

Typical operating conditions

		normal operation	operation for high resolution	
Grid no.1(control grid) voltage	V_{g_1}	Adjusted for sufficient beam current to stabilize a peak output current, I_{as_p}, of 600 nA		
Grid no.2 (accelerator) voltage	V_{g_2}	300	300	V
Grid no.3 (collector) voltage	V_{g_3}	375	600	V [2]
Grid no.4 (mesh) voltage	V_{g_4}	600	960	V [2]
Peak signal current	I_{s_p}	150	150	nA [8][9]
Peak dark current	I_{dark_p}	20	20	nA
Blanking voltage, peak to peak				
when applied to grid no.1	$V_{g_{1pp}}$	50		V
when applied to cathode	$V_{k_{pp}}$	20		V
Field strength at centre of focusing coil (nominal)	H	3600 (45)	4800 (60)	A/m Oe [3] [4]
Field strength of adjustable alignment coils	H	0 to 320 (0 to 4)	0 to 320 (0 to 4)	A/m Oe [5]
Deflection currents		see note 6		

Notes see pages 6 and 7

Performance

			min.	typ.	max.	
Signal electrode voltage for a peak dark current of 20 nA		V_{as}	30	40	70	V
Grid no. 1 voltage for picture cut-off, with no blanking applied		V_{g_1}	-30	-55	-100	V
Sensitivity Illumination required for a peak signal current of 150 nA						
	P20	E		2 4×10^{-7}	4 8×10^{-7}	lx W/cm^2
	P11	E		0,4 3×10^{-7}	0,8 6×10^{-7}	lx W/cm^2
Decay: Residual signal current 200 ms after cessation of the illumination				15	20	% [10]

Limiting resolution at picture centre, normal operation	≥ 50	lp/mm	[11]
operation for high resolution	≥ 60	lp/mm	[11]
Modulation transfer characteristic	see Fig.4		
Average γ of transfer characteristic for signal currents between 10 nA and 300 nA	0,7		[12]
Spurious signals	see "Spurious signal specification for XQ1280"		

Notes see pages 6 and 7

1) a. The circular quality area of 16,2 mm diameter is concentric with the faceplate.

b. The scanning amplitudes must be so adjusted that a target area of about 15 mm diameter is displayed on a standard monitor as a circular area with a diameter equal to the raster height. (15 mm x 20 mm scan).

c. The displayed circular area of approximately 15 mm diameter should fall within the quality area of 16,2 mm diameter but is generally not concentric with the latter due to excentricities of the output window of the image intensifier and the optical system.

d. Underscanning of the chosen area, or failure of scanning, should be avoided, since this may cause damage to the photoconductive layer.

2) The optimal grid no.4 voltage for best uniformity of black and white level depends on the type of coil unit used and will be 1,5 to 1,6 times V_{g_3} for the coil units mentioned under "Accessories". Under no circumstances should grid no.4 (mesh) be allowed to operate at a voltage level below that of grid no.3, as this may damage the target.

3) Focus current adjusted for optimal electrical focus.

4) The polarity of the focusing coil should be such that its image end attracts an external north-seeking pole.

5) The alignment coil unit should be so positioned that its centre is at a distance of approx. 94 mm (3 11/16 in) from the face of the tube and that its axis coincides with the axis of the tube, the deflecting yoke and the focusing coil.

	Focusing current (mA)		Line current$_{pp}$ (mA)		Frame current$_{pp}$ (mA)	
V_{g_4}/V_{g_3} (V)	600/375	960/600	600/375	960/600	600/375	960/600
AT1102/01	18	23	310	390	42	53
AT1103	20	26	310	390	46	59
AT1116	83	105	400	510	59	75
	Approx. values for scanning amplitudes corresponding to 15 x 20 mm^2 scanned area					

Line and frame alignment coil currents max. 21 mA (AT1103) resp. 15 mA (AT1116) corresponding to a flux density of approx. 4.10^{-4} T. (4 Gs)

7) The dark current is dependent on the signal electrode voltage and the temperature. This is shown in Figs. 2 and 3.

8) Signal current is output current minus dark current.

9) As measured on a waveform oscilloscope.

10) Measured with a 100% peak signal current of 150 nA.

11) Measured with a video amplifier system with suitable bandwidth and a high-quality lens adjusted to f 5,6.

12) For typical transfer characteristics with P20 and P11 light input see Fig. 5 and 6.

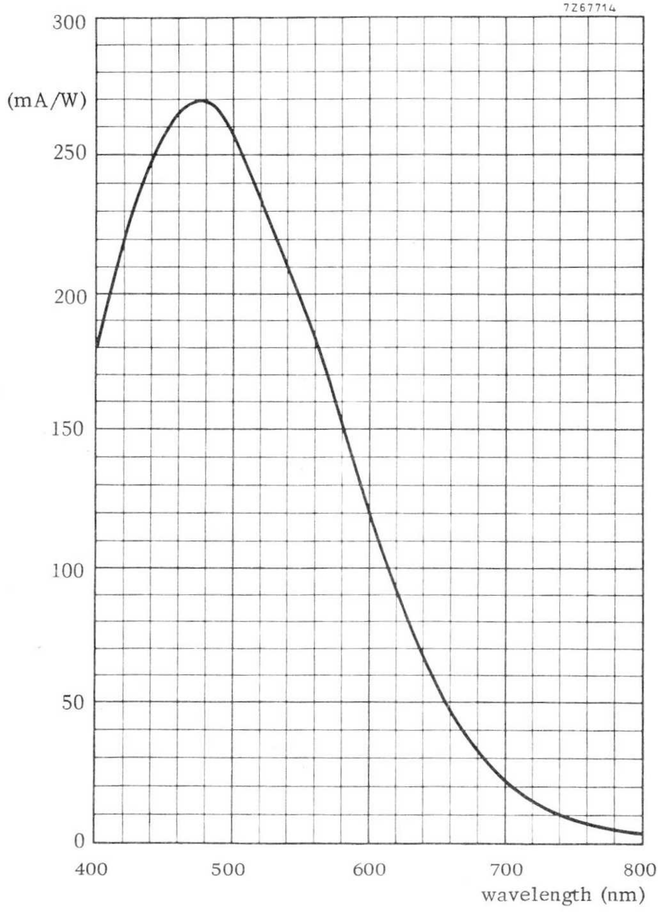


Fig. 1 Typical spectral response curve measured at constant output current I_{as} = 50 nA, with I_{dark} = 20 nA.

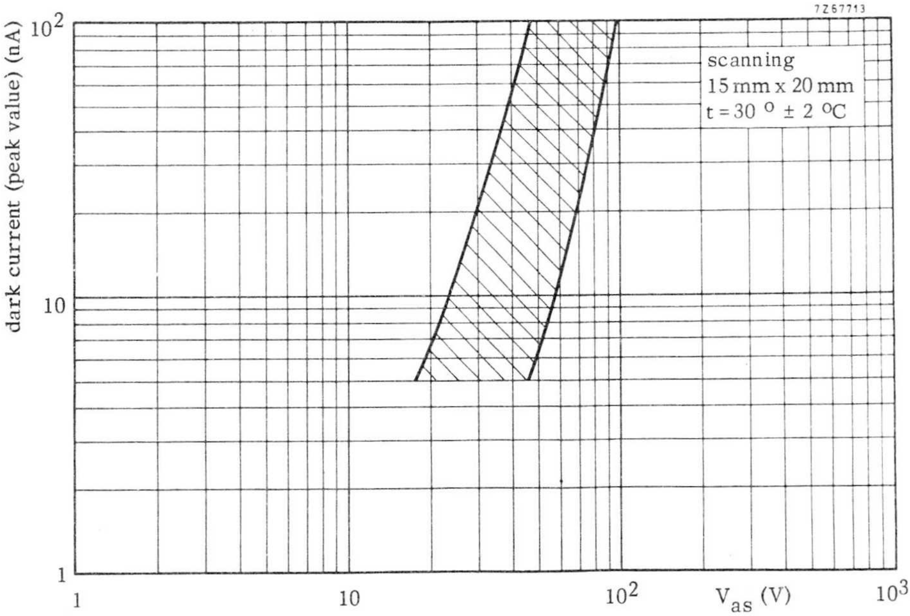


Fig.2 Dark current range / signal electrode voltage curve

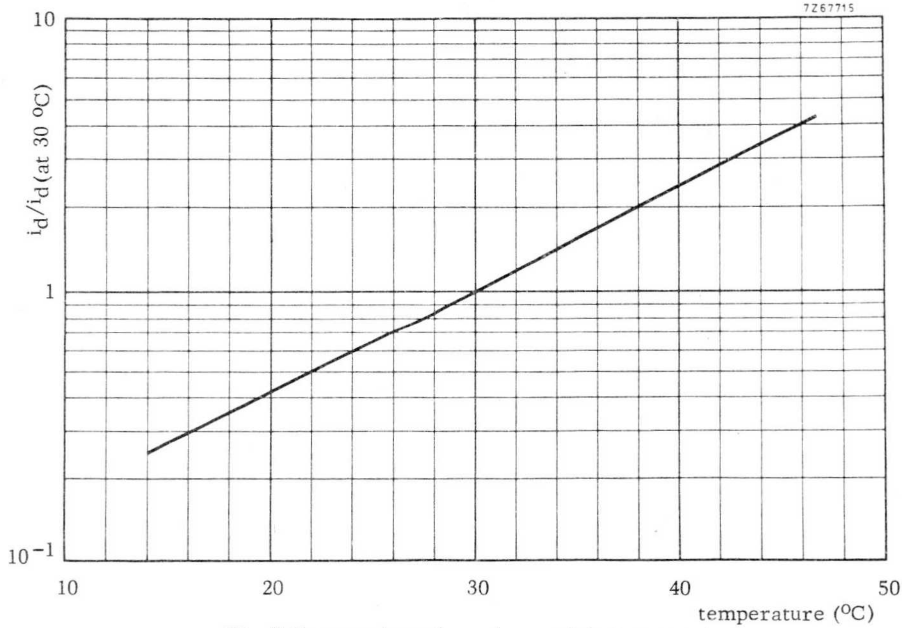


Fig.3 Temperature dependence of dark current

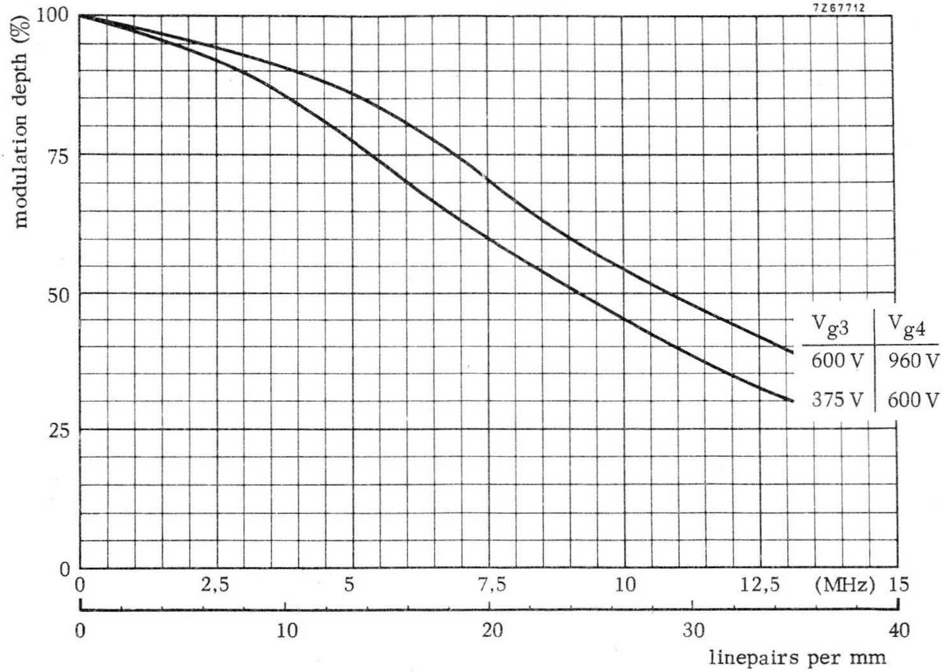


Fig. 4 Squarewave modulation transfer characteristic

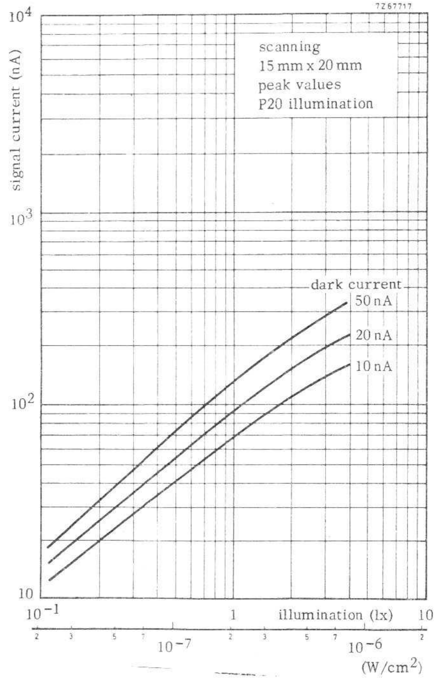


Fig.5 Typical light transfer characteristic

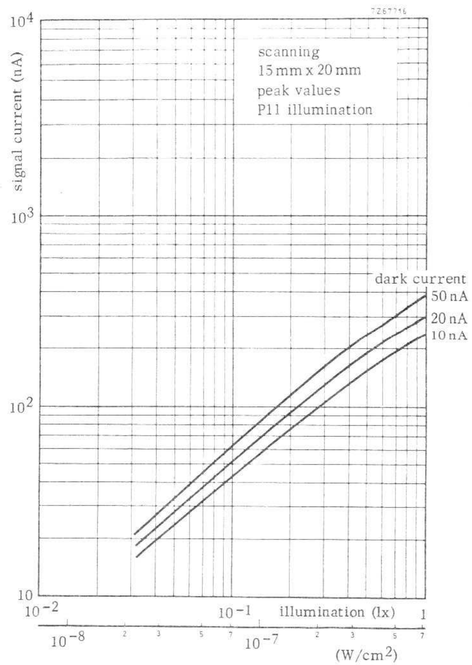
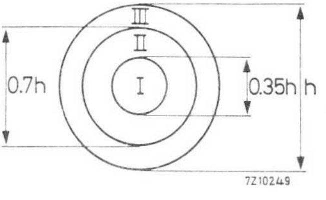


Fig.6 Typical light transfer characteristic

Spurious signal specification

Test conditions

- The tube shall be operated in a test chain under the voltage conditions as shown in the data sheet.
- The scanning amplitudes shall be adjusted to correspond to a scanned area of 16, 2 x 21, 6 mm^2.
- The tube shall be aligned and focused in accordance with the "Instructions for use".
- A back illuminated test transparency with three quality zones (see Fig. below) is projected onto the specified target area (16, 2 mm diameter circular) producing an even illumination.



- The light level shall be adjusted to produce a peak signal current of 150 nA, the beam current shall be adjusted to just stabilize a peak signal current of 600 nA,
  the signal electrode voltage shall be adjusted for a peak dark current of 20 nA,
  the temperature of the faceplate shall be 30 ± 2 °C.
- The video amplifier system shall have a bandwidth (-3 dB) of at least 7 MHz.
- The monitor shall be adjusted for a non-blooming white.

Permitted number, size and location of blemishes

Dimensions of blemishes in % of picture height (16, 2 mm)	Zone I	Zone II	ZoneIII
> 0, 7	0	0	0
≤ 0, 7 but > 0, 45	0	1	3
≤ 0, 45 but > 0, 2	2	3	6
total	2	6	

Both black and white blemishes as observed on the monitor shall be counted. Blemishes ≤ 0, 2 % of picture height [1]) and blemishes with a contrast ≤ 6 % (of 150 nA peak signal current, as measured on a waveform oscilloscope), however, shall be neglected.

---

[1]) Spots of this size are allowed unless concentration causes a smudgy appearance. The average contrast of the concentration is taken as the smudge contrast.

CAMERA TUBE

Vidicon TV camera tube with 25,4 mm (1 in) diameter, low heater power consumption, magnetic focusing and deflection, provided with a precision electron gun as in the 1 in diameter Plumbicon* tubes of the XQ1070 series.
The XQ1285 has a fibre optic faceplate and is mainly intended for use in medical or industrial X-ray equipment in which it is directly coupled to an X-ray image intensifier with a P11 or P20 phosphor on a fibre optic output window. For this purpose it is provided with a special photoconductive layer with a high sensitivity in the 450 to 500 nm spectral region and medium lag for proper X-ray noise integration.

QUICK REFERENCE DATA	
Faceplate	fibre optic
Separate mesh	
Focusing	magnetic
Deflection	magnetic
Diameter	25, 4 mm (1 in)
Length	159 mm ($6\frac{1}{4}$ in)
Heater	6, 3 V, 95 mA
Spectral response, max. at	450 to 500 nm
cut-off at approx.	800 nm
Resolution	≥ 50 lp/mm

OPTICAL DATA

Dimensions of quality area on photoconductive target — circle of 15, 8 mm dia [1])

Orientation of image on target
The direction of the horizontal scan should be essentially parallel to the plane defined by the short index pin and the longitudinal axis of the tube.

Photoconductive layer	type B
Spectral response, max. at	approx. 475 nm
cut-off	approx. 800 nm
Spectral response curve	see Fig. 1

[1]) See page 6

*) Registered Trade Mark for TV camera tube

Faceplate
- Centre to centre spacing of fibres — 7,5 µm
- Flat within — 1,5 µm
- Numerical aperture — 1,0

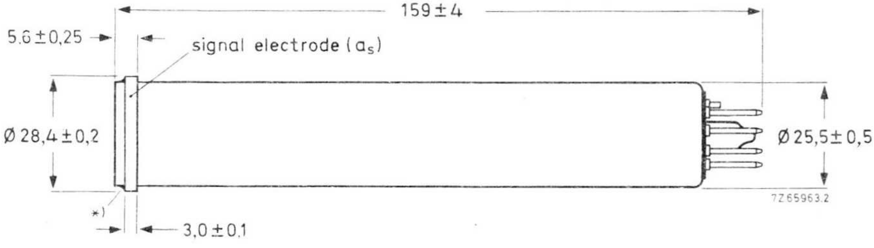
MECHANICAL DATA

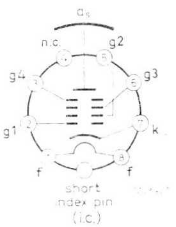
Dimensions in mm

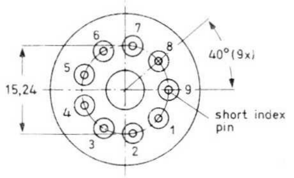
Mounting position: any

Weight : approx. 55 g

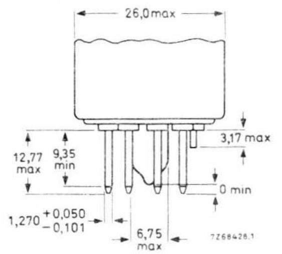
Base : JEDEC E8-11; IEC67-1-33a







bottom view



ACCESSORIES

Socket	TE1004, Cinch no. 54A18088 or equivalent
Deflection and focusing coil unit	AT1102/01, AT1103, AT1116 or equivalent

*) Epoxy resin. Proper coupling of the XQ1285 to the fibre optic output window of an image intensifier may be obtained by mechanical arrangements which either exert an evenly distributed axial forward pulling force on the signal-electrode ring or an axial forward pushing force on the base end or socket of the tube.
In either case the recommended force is in the order of 100 to 120 N.

ELECTRICAL DATA

Heating: Indirect by a.c. or d.c.; parallel or series supply.

Heater voltage	V_f	6,3	V ± 10%
Heater current	I_f	95	mA

When the tube is used in a series heater chain, the heater voltage must never exceed an r.m.s. value of 9,5 V when the supply is switched on.

Electron gun characteristics

Cut-off			
Grid no. 1 voltage for cut-off at V_{g2} = 300 V	V_{g1}	−30 to −100	V
Blanking voltage, peak to peak			
on grid no. 1	V_{g1pp}	50 ± 10	V
on cathode	V_{kpp}	20	V
Grid no. 2 current at normally required beam currents	I_{g2}	max. 0,5	mA

Focusing — magnetic; see "Accessories"

Deflection — magnetic; see "Accessories"

Capacitance

Signal electrode to all	C_{as}	3 to 5	pF

This capacitance, which effectively is the output impedance of the tube, increases when the tube is inserted into the deflection and focusing coil unit.

LIMITING VALUES (Absolute max. rating system)

All voltages are referred to the cathode, unless otherwise stated.

Signal electrode voltage	V_{as}	max.	100	V
Grid no. 4 voltage	V_{g4}	max.	1100	V
Grid no. 3 voltage	V_{g3}	max.	800	V
Voltage between grid no. 4 and grid no. 3	$V_{g4/g3}$	max.	450	V
Grid no. 2 voltage	V_{g2}	max.	350	V
Grid no. 1 voltage, negative	$-V_{g1}$	max.	125	V
positive	V_{g1}	max.	0	V
Cathode-to-heater voltage, positive peak	V_{kpf}	max.	125	V
negative peak	$-V_{kpf}$	max.	50	V
Impedance between cathode and heater at $-V_{kfp}$ > 10 V	Z_{kf}	min.	2	kΩ

Dark current, peak	I_{darkp}	max.	0,1	μA
Output current, peak	I_{asp}	max.	0,6	μA
Axial force on signal-electrode ring in forward direction (evenly distributed)		max.	200	N
Faceplate illumination	E	max.	5000	lx
Faceplate temperature, storage and operation	t	max.	80	°C
		min.	-30	°C

OPERATING CONDITIONS AND PERFORMANCE

For a target area of 15 mm diameter; faceplate temperature 30 ± 2 °C.
All voltages are referred to the cathode, unless otherwise stated.

Typical operating conditions

		normal operation	operation for high resolution		
Grid no. 1 (control grid) voltage	V_{g1}	Adjusted for sufficient beam current to stabilize a peak output current, I_{asp}, of 600 nA			
Grid no. 2 (accelerator) voltage	V_{g2}	300	300	V	
Grid no. 3 (collector) voltage	V_{g3}	375	600	V	
Grid no. 4 (mesh) voltage	V_{g4}	600	960	V	2)
Peak signal current	I_{sp}	150	150	nA	8)
Peak dark current	I_{darkp}	20	20	nA	
Blanking voltage, peak to peak					
when applied to grid no. 1	V_{g1pp}	50		V	
when applied to cathode	V_{kpp}	50		V	
Field strength at centre of focusing coil (nominal)	H	3200 (40)	4800 (60)	A/m Oe	3) 4)
Field strength of adjustable alignment coils	H	0 to 320	0 to 320	A/m	
Deflection currents		see note 6			

Notes see page 6

Performance

		min.	typ.	max.	
Signal electrode voltage for a peak dark current of 20 nA	V_{as}	30	40	75	V [7] [9]
Grid no. 1 voltage for picture cut-off, with no blanking applied	V_{g1}	-30	-55	-100	V
Sensitivity Illumination required for a peak signal current of 150 nA					
P20	E		3,5 7×10^{-7}	7 $1,4 \times 10^{-6}$	lx W/cm^2
P11	E		0,7 5×10^{-7}	1,4 $1,0 \times 10^{-6}$	lx W/cm^2
Decay: Residual signal current 200 ms after cessation of the illumination			15	20	% [10]

Limiting resolution at picture centre, normal operation	≥ 50	lp/mm [11]
operation for high resolution	≥ 60	lp/mm [11]
Modulation transfer characteristic	see Fig. 4	
Average γ of transfer characteristic for signal currents between 10 nA and 300 nA	0,7	[12]
Spurious signals	see "Spurious signal specification for XQ1285"	

Notes see pages 6 and 7.

1) a. The circular quality area of 15,8 mm diameter is concentric with the faceplate.

b. The scanning amplitudes are so adjusted that a target area of about 15 mm diameter is displayed on a standard monitor as a circular area with a diameter equal to the raster height. (15 mm x 20 mm scan).

c. The displayed circular area of approximately 15 mm diameter should fall within the quality area of 15,8 mm diameter but is generally not concentric with the latter due to eccentricities of the output window of the image intensifier and of the optical system.

d. Underscanning of the chosen target area, or failure of scanning, should be avoided, so as not to cause damage to the photoconductive layer.

2) The optimal grid no. 4 voltage for best uniformity of black and white level depends on the type of coil unit used and will be 1,5 to 1,6 times V_{g3} for the coil units mentioned under "Accessories". Under no circumstances should grid no. 4 (mesh) be allowed to operate at a voltage level below that of grid no. 3, as this may damage the target.

3) Focus current adjusted for optimal electrical focus.

4) The polarity of the focusing coil should be such that its image end attracts an external north-seeking pole.

5) The alignment coil unit should be so positioned that its centre is at a distance of approx. 94 mm (3 11/16 in) from the face of the tube and that its axis coincides with the axis of the tube, the deflecting yoke and the focusing coil.

6)

	Focusing current (mA)		Line current$_{pp}$ (mA)		Frame current$_{pp}$ (mA)	
V_{g4}/V_{g3} (V)	600/375	960/600	600/375	960/600	600/375	960/600
AT1102/01	18	23	310	390	42	53
AT1103	20	26	310	390	46	59
AT1116	83	105	400	510	59	75
	Approx. values for scanning amplitudes corresponding to 15 x 20 mm^2 scanned area					

Line and frame alignment coil currents max. 21 mA (AT1103) resp. 15 mA (AT1116) corresponding to a flux density of approx. 4.10^{-4} T. (4 Gs)

7) The dark current is dependent on the signal electrode voltage and the temperature. This is shown in Figs. 2 and 3.

8) Signal current is output current minus dark current.

9) As measured on a waveform oscilloscope.

10) Measured with a 100% peak signal current of 150 nA.

11) Obtained with a video amplifier system with adequate bandwidth.

Measured with a transparent square-wave test pattern applied directly to the face-plate and which is illuminated with P20 light of a lambertian distribution. The average transmission of the test transparency is about 50% of the transmission of the transparency's whites.
No aperture correction or gamma correction is applied.

12) For typical transfer characteristics with P20 and P11 light input see Figs. 5 and 6.

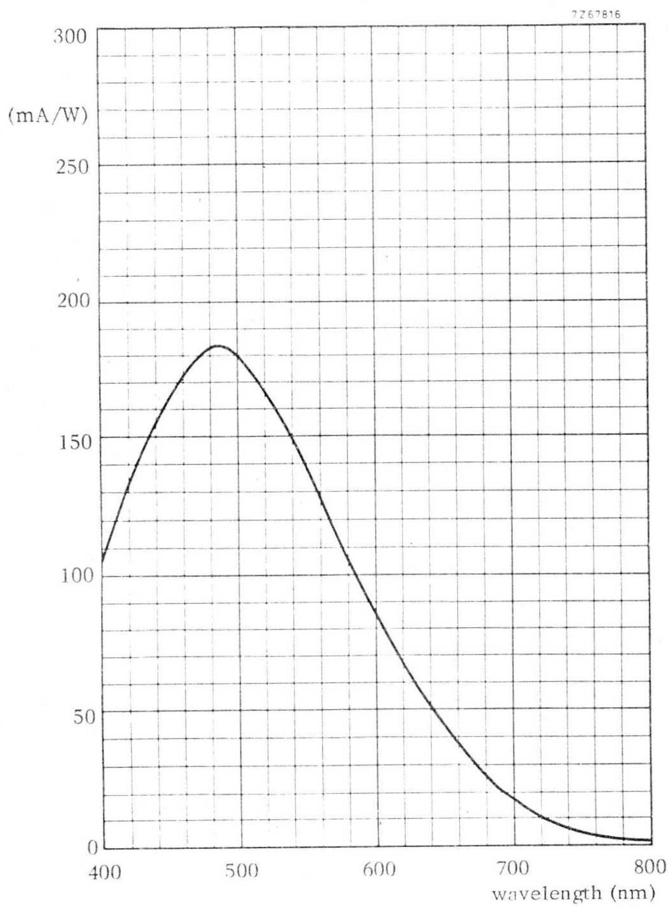


Fig. 1 Spectral response curve

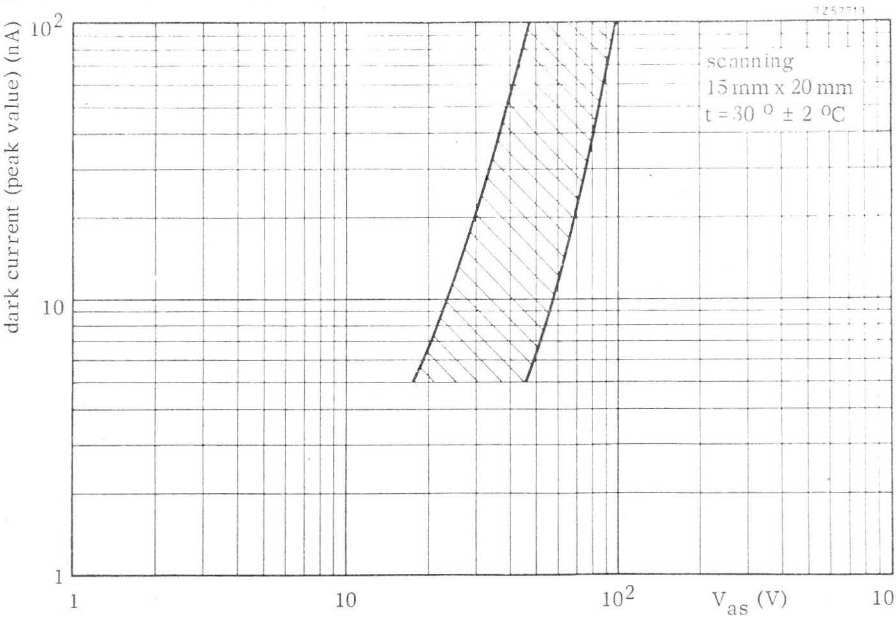


Fig.2 Dark current range versus signal electrode voltage

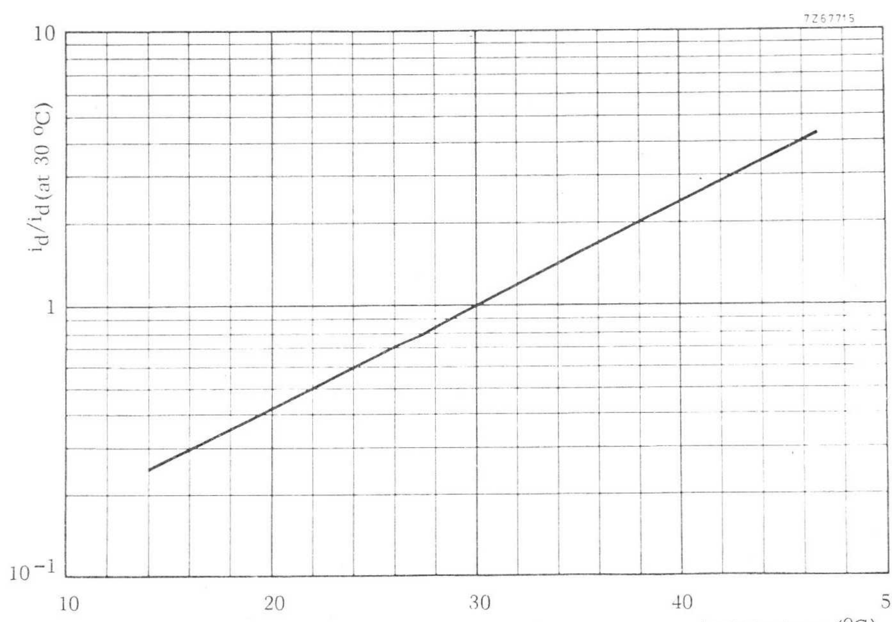


Fig.3 Temperature dependence of dark current

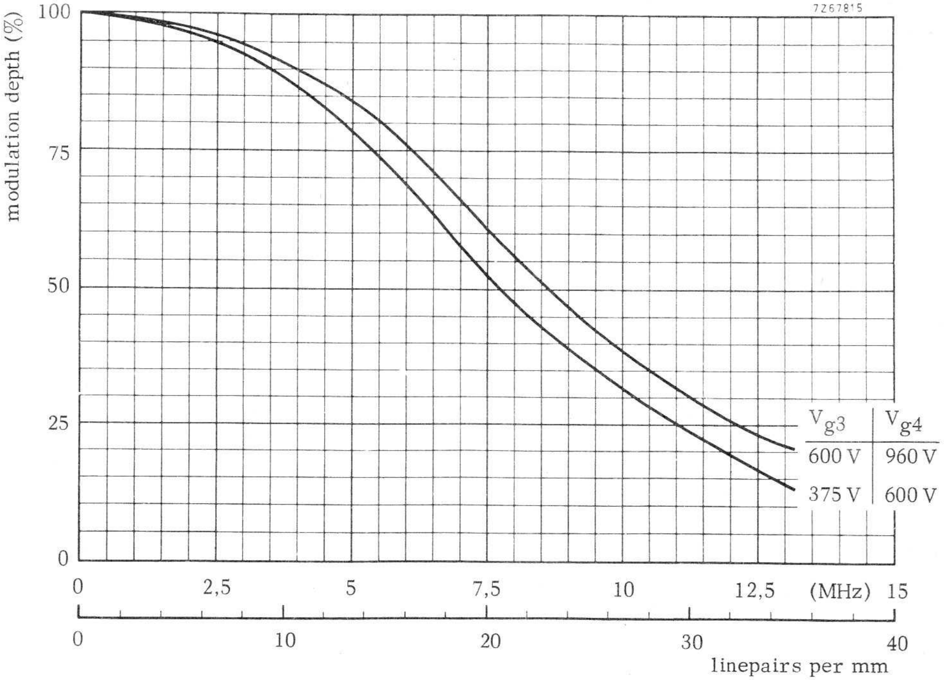


Fig.4 Square wave modulation transfer characteristic

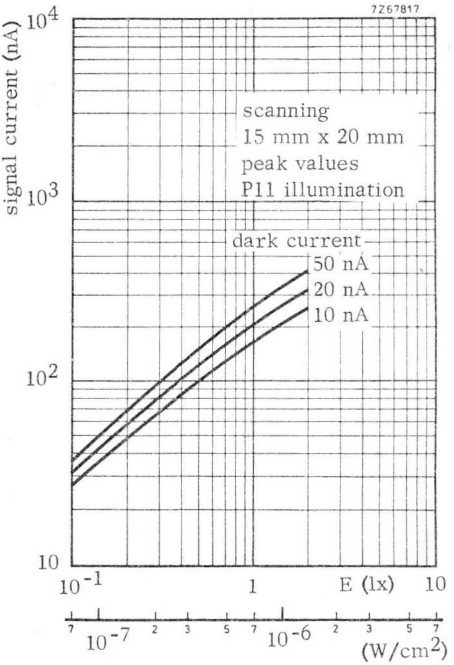


Fig.5 Typical light transfer characteristics

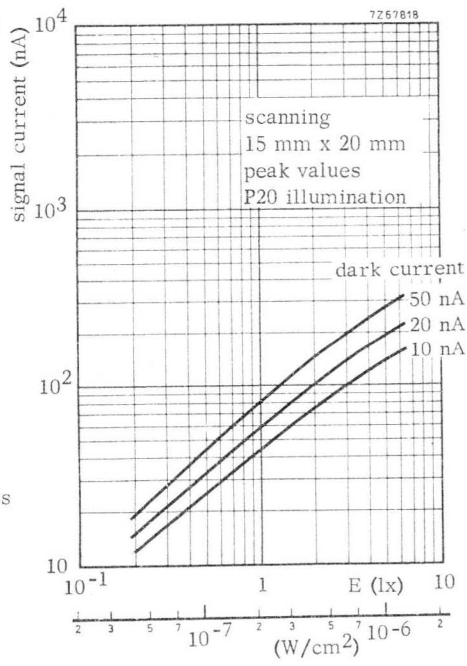
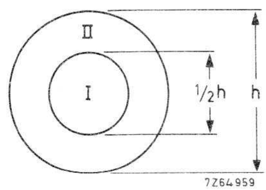


Fig.6 Typical light transfer characteristics

Spurious signal specification

Test conditions

- The tube shall be operated in a test chain under the voltage conditions as shown in the data sheet.
- The scanning amplitudes shall be adjusted to overscan the target such that it is displayed as a circle on the monitor.
- A test transparency, back illuminated with lambertian light of c.t. = 2856 K, with two quality zones(see Fig. below) is applied directly to the faceplate and positioned such that it is concentric with the target as observed on the monitor.
- The tube shall be aligned and focused.
- The scanning amplitudes shall be slightly reduced, horizontal and vertical centring controls be adjusted such that the circular area of 15, 8 mm dia just fits in the picture height of the monitor and is displayed as a circle.
- The temperature of the faceplate shall be 30 ± 2 °C.
  The signal electrode voltage shall be adjusted for a peak dark current of 20 nA.
  The light level shall be adjusted to produce a peak signal current of 150 nA, the beam current shall be adjusted to just stabilize a peak signal current of 600 nA.
- The video amplifier shall have a bandwidth (-3 dB) of at least 7 MHz.
- The monitor shall be adjusted for a non-blooming white.



h = 15, 8 mm on target

$\frac{1}{2}$ h = 7, 9 mm on target

Permitted number, size and location of blemishes

The table below shows what number of blemishes, black or white, are permitted per size, per zone and total [1] [2].

Dimensions of blemishes in % of picture height	Zone I		Zone II		Total I + II
	white	black	white	black	
> 0,8	0	0	0	0	0
≤ 0,8 but > 0,5	0	1	0	2	2
≤ 0,5 but > 0,4	1	2	2	3	4
≤ 0,4 but > 0,2	2	3	4	5	6
≤ 0,2 [3]					
total	3		6		8

Background structure (e.g. chicken wire pattern) originating from the fibre-optic faceplate shall not have a contrast exceeding 2%. [2]

Notes

[1] Both black and white blemishes as observed on the monitor shall be counted, however, blemishes ≤ 0,2% of picture height and black blemishes with a contrast ≤ 6%, and white blemishes with a contrast ≤ 3% shall be ignored.

[2] The contrast is measured as a percentage of 150 nA peak signal current on a waveform oscilloscope. The dimensions of blemishes are determined on the monitor with a transparent blemish gauge, calibrated in percent of picture height.

[3] If such blemishes form a concentration this will be evaluated as a blemish with as contrast the average contrast of the concentration.

CAMERA TUBE

Vidicon TVcamera tube with a photosensitive target consisting of a mosaic array of silicon planar diodes.

This pick-up tube features a wide spectral response (including near infra-red), high resolution, low dark current and lag, and long life with freedom from internal X-ray deterioration when operated at typical vidicon electron gun voltages. It allows electronic zoom operation with a minimum risk of raster burn.

It may be exposed to direct sunlight without image burn-in and will withstand exposure to 100 ^{o}C environments.

The tube is mechanically interchangeable with any 1 in diameter vidicon tube with separate mesh construction, such as XQ1040 and XQ1240, but having been provided with a precision electron gun as in the Plumbicon* tube XQ1070, a slightly different grid no.4 to grid no.3 voltage may be required.

QUICK REFERENCE DATA

Separate mesh			
Focusing	magnetic		
Deflection	magnetic		
Diameter		25,4 mm	(1 in)
Length		159 mm	($6\frac{1}{4}$ in)
Sensitivity (2854 K tungsten)	typ.	4000	μA/lm
Cut-off of spectral response	approx. 400 and	1100	nm
Resolution	typ.	700	TV lines
Scan diagonal	max.	17,2	mm
Heater	6,3 V,	95	mA

The electrical and mechanical properties of the three types are identical, the main difference being found in the degree of freedom from blemishes of the target:

XQ1400 - for applications which require a high standard of performance

XQ1401 - for less critical applications

XQ1402 - general pupose tube for non-critical applications, equipment design and experiments

Data base on pre-production tubes.

* Registered Trade Mark for TV camera tube.

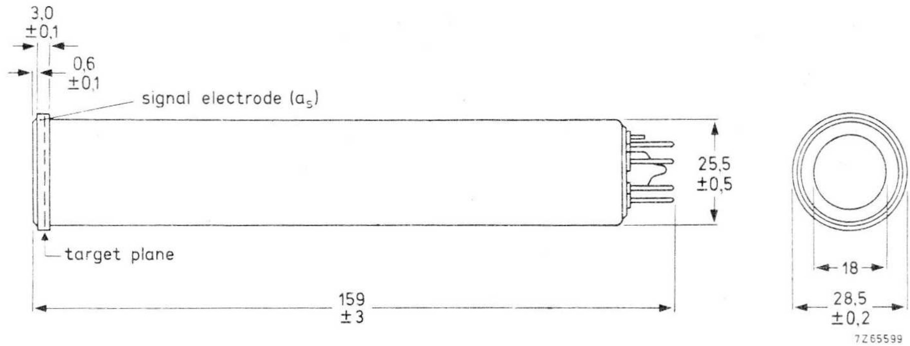
MECHANICAL DATA

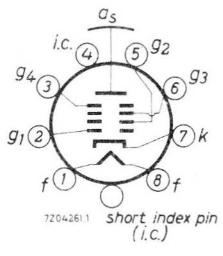
Dimensions in mm

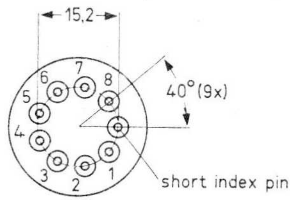
Mounting position: any

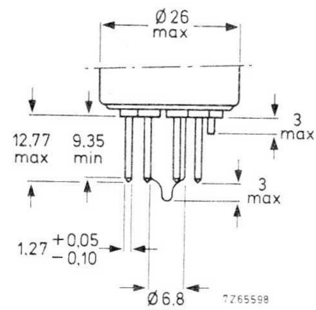
Weight : approx. 55 g

Base : JEDEC E8-11 except length of stem









OPTICAL DATA

Quality rectangle on photoconductive target (aspect ratio 3 : 4)	9,6 x 12,8	mm^2	
Diagonal of quality rectangle	16	mm	1)

Orientation of image on target

The direction of the horizontal scan should be approximately parallel to the plane defined by the short index pin and the longitudinal axis of the tube, unless some rotation of the tube or adjustment of the horizontal and vertical shift controls is found necessary to minimise the number of blemishes in the picture.

Faceplate

Refractive index	n	1,49	
Thickness		1,2 ± 0,05	mm
Optical distance from front of faceplate to target plane		2,8 ± 0,2	mm

ELECTRICAL DATA

Heating : Indirect by A.C. or D.C. ; parallel or series supply

Heater voltage	V_f	6,3	V ± 10%
Heater current	I_f	95	mA

When the tube is used in a series heater chain, the heater voltage must not exceed an r.m.s. value of 9,5 V when the supply is switched on.

Electron gun characteristics

Cut-off

Grid no.1 voltage for cut-off at V_{g2} = 300 V	V_{g1}	-30 to -100	V	
Blanking voltage, peak to peak				
on grid no.1	$V_{g1_{pp}}$	50 ± 10	V	
on cathode	$V_{k_{pp}}$	15	V	
Grid no.2 current at normally required beam currents	I_{g2}	≤ 1,5	mA	2)

Focusing — magnetic; see "Accessories"

Deflection — magnetic; see "Accessories"

Notes: see page 6

Capacitances

Signal electrode to all	C_{as}	3	to	5	pF

This capacitance, which is effectively the output impedance, increases when the tube is inserted in the coil unit.

LIMITING VALUES (Absolute max. rating system)

All voltages are referred to the cathode, unless otherwise stated.

Signal electrode voltage	V_{as}	max.	25	V	4)
Grid no.4 voltage	V_{g4}	max.	600	V	
Voltage between grid no.4 and grid no.3	$V_{g4/g3}$	max.	350	V	3)
Voltage between grid no.4 and grid no.2	$V_{g4/g2}$	min.	see note 3		
Grid no.3 voltage	V_{g3}	max.	550	V	
Grid no.2 voltage	V_{g2}	max.	350	V	
Grid no.1 voltage, positive	V_{g1}	max.	0	V	
negative	$-V_{g1}$	max.	125	V	
Cathode to heater voltage, positive peak	V_{kf_p}	max.	125	V	
negative peak	$-V_{kf_p}$	max.	10	V	
Cathode heating time	T	min.	1	min	
Faceplate temperature, storage and operation	t	max.	100	°C	
		min.	-100	°C	

Under difficult environmental conditions cooling of the faceplate is recommended.

Faceplate illumination	E	max.	10^8	lx	5)

ACCESSORIES

Socket	TE1004, Cinch no.54A18088 or equivalent
Deflection and focusing coil unit	AT1102/01, AT1103, AT1116 or equivalent

Notes: see page 6

OPERATING CONDITIONS AND PERFORMANCE

TYPICAL OPERATING CONDITIONS (scanned area 9,6 x 12,8 mm^2)

Cathode voltage	V_k	0	V	
Grid no.2 voltage	V_{g2}	300	V	3)
Grid no.3 voltage	V_{g3}	330	V	3) 6)
Grid no.4 voltage	V_{g4}	550	V	3) 6)
Signal electrode voltage	V_{as}	6 to 12	V	4)
Beam current	I_b	see note 7		
Blanking voltage, peak to peak				
when applied to grid no.1	$V_{g1_{pp}}$	50	V	
when applied to cathode	$V_{k_{pp}}$	15	V	
Focusing coil current		see note 8		
Deflection and alignment currents		see note 8		
Faceplate illumination		see note 9		
Faceplate temperature	t	30 ± 2	°C	

PERFORMANCE

	min.	typ.	max.		
Dark current		10	20	nA	10)
Grid no.1 voltage for picture cut-off, with no blanking	-30	-55	-100	V	
Sensitivity					11) 12)
Tungsten source (2854 K)	3500	4000		μA/lm	
Visible (KG3 filter)	750	1000		μA/lm	
Infra-red (RG750 filter)	1500	2000		μA/lm	
Signal handling capability	600	1000		nA	13)
Blooming	see note 14				
Limiting resolution in picture centre	600	700		TV lines	15)
Modulation depth at 400 TV lines in picture centre	30	40		%	15) 16)
Decay lag		10	15	%	17)
Non-uniformity of sensitivity		10	20	%	18)
Non-uniformity of dark current		5	10	%	18)
Average gamma of transfer characteristic		1			

Notes: see page 6

Spectral response		
cut-off at	approx. 400 and 1100	nm
max. sensitivity at	approx. 700	nm
spectral response curve	see Fig.1	
Spurious signals	see "Spurious signal specification" for XQ1400, XQ1401 and XQ1402	

NOTES

1) Electronic zoom operation by simultaneous control of both line and frame scanning amplitudes may be applied with practically no risk of raster burn when the standard raster amplitudes are restored.

The maximum scan diagonal, as dictated by the internal diameter of the mesh ring, is 17,2 mm.

All figures in these data (e.g. resolution) are based on the standard scanning conditions (9,6 x 12,8 mm^2).

2) The maximum "normally required beam current" is defined as that beam current which is just sufficient to stabilize highlights with signal currents of 750 nA (peak value).

3) Grid no.4 voltage should exceed both grid no.2 and grid no.3 voltages. Operation of grid no.4 at a less positive voltage may result in permanent target damage due to "ion burn".

4) The signal electrode voltage, V_{as}, is typically within the range 6 to 12 V with respect to the cathode and is individually selected and specified for each tube and indicated on its test sheet. This is to achieve an optimum operating point consistent with optimal beam acceptance and to optimise other performance characteristics such as dark current, blemishes, uniformity and lag (see Fig. 2).

Silicon diode camera tubes do not permit automatic sensitivity control by means of regulation of the target voltage. Adequate control can be achieved by other means, e.g. lens iris control, neutral density filters and/or automatic video gain control (A.G.C.). If the tube is to be used in cameras originally designed for vidicon tubes, the automatic sensitivity control circuitry should be made inoperative and the target voltage set to the value specified for that tube on the test sheet.

5) Illumination levels up to 100 million lux can be tolerated. This is equivalent to the image of the sun or a high intensity projection lamp being focused onto the target.
N.B. Care must be taken that the heat content of the focused radiation does not cause temperature of the target to exceed the maximum allowed level(approx. 250 ^{o}C).
A warning indication of this is the loss of all video information.
Silicon is a good heat conductor and therefore, long before the temperature of the target locally has reached the maximum allowed, the level of dark current will be so high that all video information is lost.

6) The optimum voltage ratio V_{g4}/V_{g3} required to obtain minimum beam landing errors and hence best uniformity of dark current level depends on the type of coil unit used. For types AT1102/01, AT1103, and AT1116 grid no.4 to grid no.3 voltage ratios between 1,6 and 1,5 are recommended.

7) The beam current as obtained by adjusting the grid no.1 (control grid) voltage shall be sufficient to correctly stabilize a highlight signal current of 500 nA (peak value).

8)

Coil units	V_{g4}/V_{g3}	focusing current * (mA)	line current (mA p-p)	frame current (mA p-p)
		550/330	550/330	550/330
AT1102/01		27	200	18
AT1103		29	200	20
AT1116		38	260	83
		Approx. values for scanned area of 9,6 x 12,8 mm^2		

* Adjusted for correct electrical focus. The direction of the focusing current shall be such that a north-seeking pole is attracted towards the image end of the focusing coil.
Line and frame alignment currents max. 21 mA (AT1103) resp. 15 mA (AT1116) corresponding to a flux density of approx. 4×10^{-4} T (4 Gs).

9) The illumination incident on the faceplate, B_{ph}, is related to scene illumination, B_{sc}, by the formula:

$$B_{ph} = B_{sc} \cdot \frac{R.T}{4F^2 (m+1)^2}$$

R represents the average scene reflectivity or the object reflectivity, whichever is relevant, T is the lens transmission factor, F the lens aperture, and m the linear magnification factor from scene to target.

10) Dark current, I_d, at specified target voltage (6 to 12 V) and a faceplate temperature of 30°C, throughout life: 50 nA max.

For dependence of I_d upon V_{as} see Fig. 2 , upon faceplate temperature see Fig. 3 .

11) Light source is a tungsten filament lamp in a limeglass envelope, operated at a colour temperature of 2854 K.
A lightflux of 0,1 millilumen is incident on the scanned area. An appropriate filter is inserted in the light path. The net signal current (see note 12) obtained in nA x 10 denotes the luminous sensitivity expressed in terms of μA/lm of white light incident on the filter. See Fig. 4 for filter characteristics.

Filters used	Tungsten	No filter used
	Visible	Schott KG3 thickness 4 mm
	Infra-red	Schott RG715 thickness 3 mm

12) The net signal current is defined as the component of the output current after the dark current has been subtracted.

13) Beam current increased to achieve stabilization.

Video amplifiers should be capable of handling signal output currents of this magnitude without overloading.
For dependence of the signal handling capability of a typical tube upon V_{as} see Fig 2 .

14) Increasing the faceplate illumination in a spot to a value which would otherwise produce a signal current considerably more than the normally set beam current can stabilize, can result in an apparent increase in the diameter of the spot (blooming). With a 100 times overload the spot may bloom to the value indicated below, the diameter of the spot being determined at the 50% signal level, lens halation and camera electronics overloading excluded.

Initial spot diameter		1	2	10	% of raster diagonal
Bloomed spot diameter	typ.	4	6	14	"
with 100 % overload	max.	6	8	18	"

15) The light flux incident on the target is adjusted such that a net highlight signal current of 200 nA is obtained.

Limiting resolution is defined as the resolution at a modulation depth, i.e. uncompensated horizontal amplitude response of 5%, uncorrected for lens resolution losses. The amplitude response of the camera amplifier is flat to well over 7.5 MHz; no gamma correction is used.

16) Measured with 100% contrast square wave test pattern, normalized at 50 TVL, and corrected for lens resolution losses. The bandwidth of the camera amplifiers used are flat tobeyond5 MHz. For response curve see Fig. 5 .

17) Measured with an initial net highlight signal current of 200 nA. The sequence of the measurement is as follows:
The illumination is turned off at T = 0 immediately preceding a read-out of the initial signal. This read-out is labelled the "zeroth" field. The first residual signal occurs subsequently at T = 20 ms, i.e. in the first field. The value of lag listed is the magnitude of the residual signal in the 3^{d} field, i.e. at T = 60 ms. For other signal currents, see Fig. 6 .
For dependence of decay lag upon V_{as} see Fig. 2 .

18) Measured as a percentage of a highlight signal current of 200 nA.

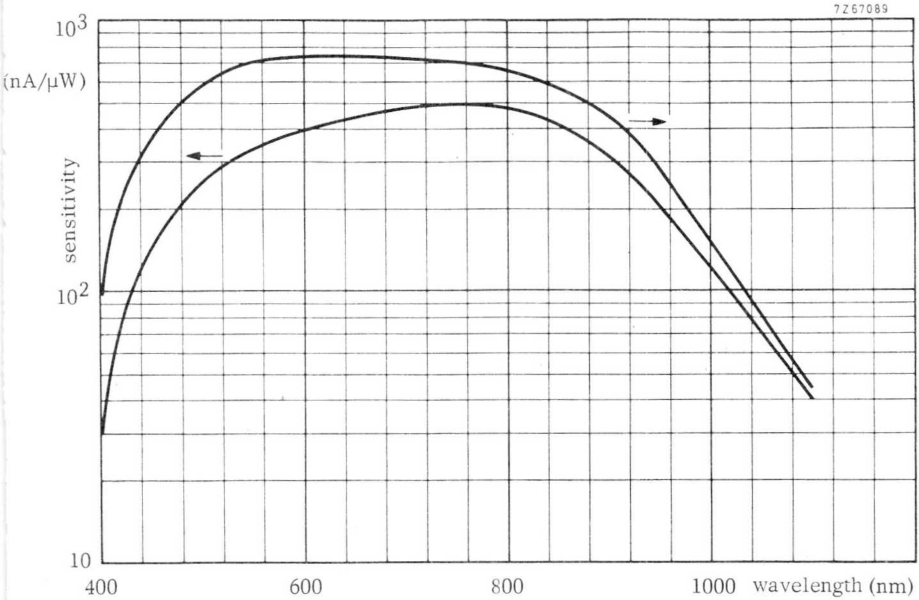


Fig. 1 Spectral response curve

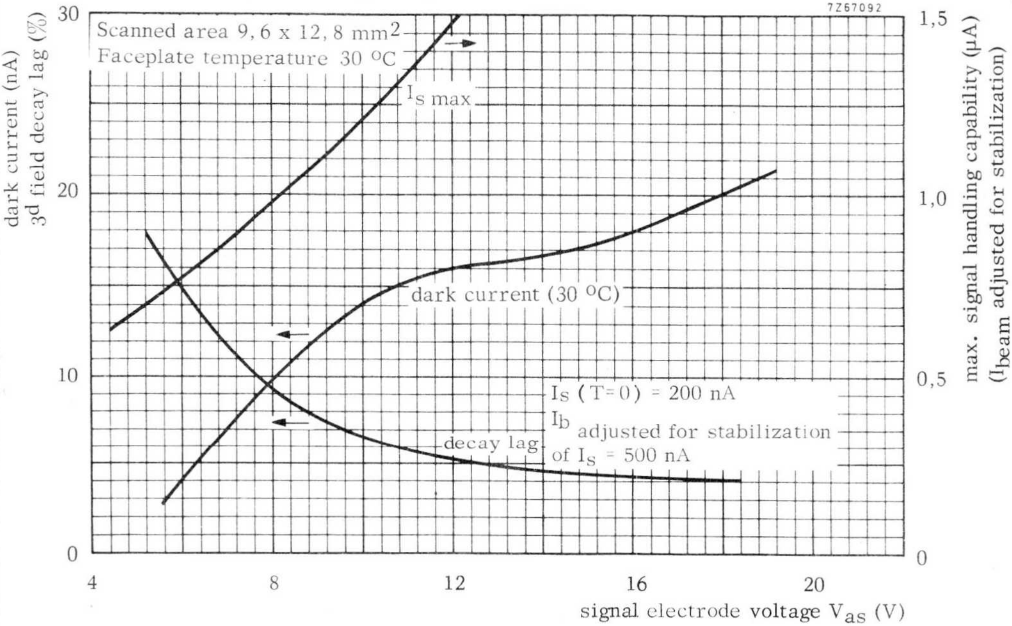


Fig. 2 Parameter dependence (typical) on signal electrode voltage

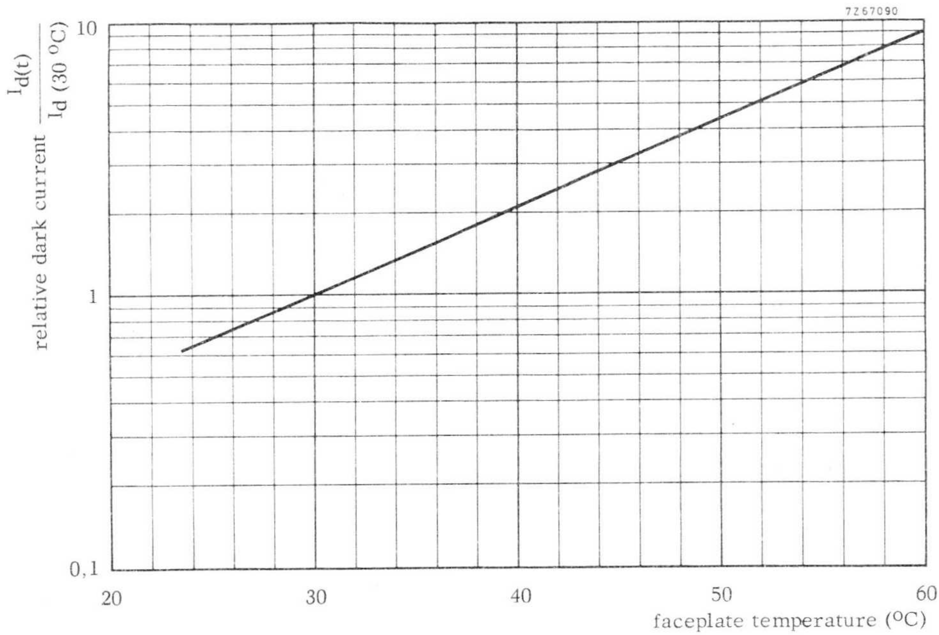


Fig. 3 Temperature dependence of dark current

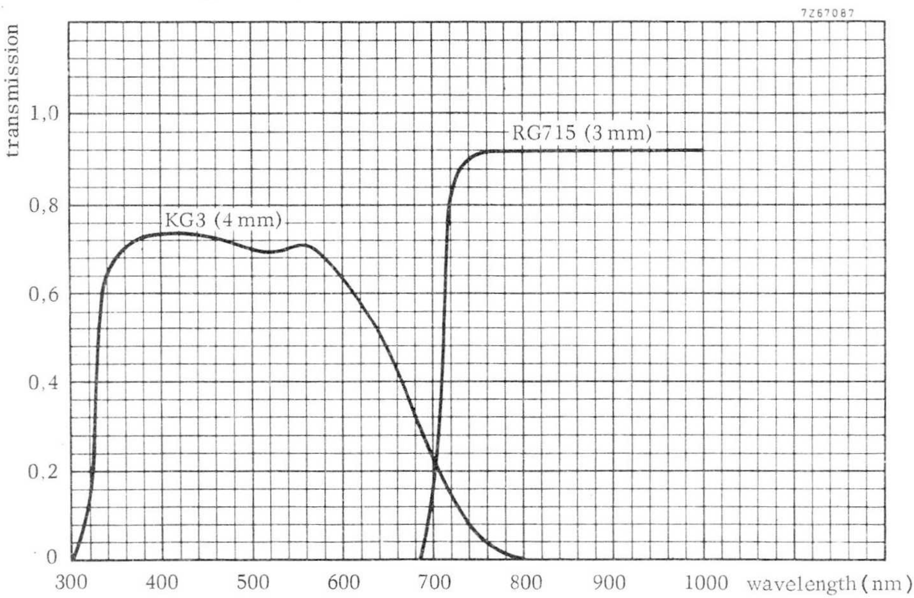


Fig. 4 Filter transmission curves

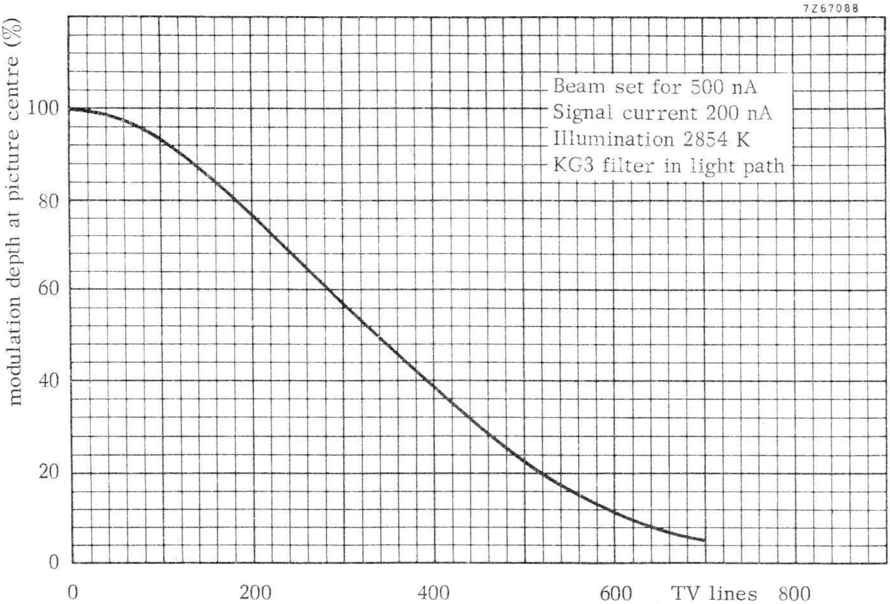


Fig. 5 Typical uncompensated horizontal square wave response - optically corrected

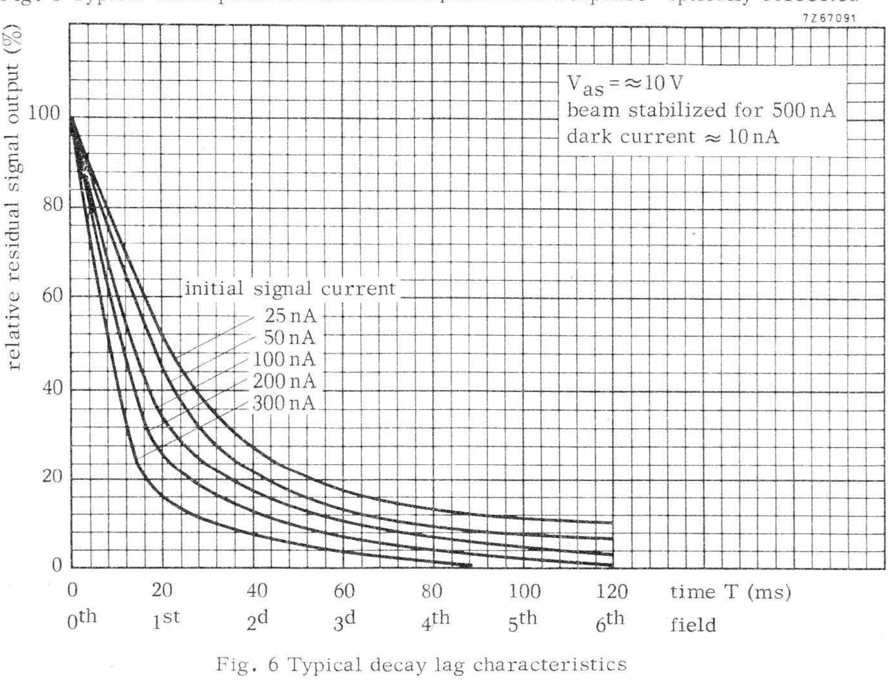


Fig. 6 Typical decay lag characteristics

Spurious signal specification XQ1400,XQ1401,XQ1402

PICTURE QUALITY (due to blemishes)

Test conditions

Test chain

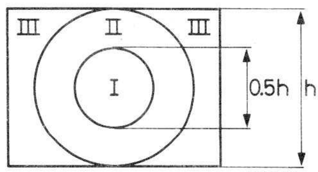
- The tube under test shall be evaluated in a test chain with a bandwidth of 5, 5 MHz.
- No aperture or gamma correction shall be applied.
- A waveform oscilloscope with a bandwidth of 5, 5 MHz shall be used to measure the contrast of blemishes as a percentage of a peak white signal current of 200 nA.
- The monitor shall be set for a just visible raster when lens capped, respectively for a non-blooming white raster when lens uncapped.

Tube settings

The picture quality is evaluated with a signal electrode voltage applied as indicated on the tube test sheet and in the following setting with respect to highlight signal current and beam current:

Highlight signal current I_s	200	0	nA
Beam current adjusted for correct stabilization of a signal current of I_b	500	500	nA
Type of blemish	black or white	white	

The specified area of 9, 6 x 12, 8 mm^2 on the target is evenly illuminated with tungsten light of 2856 K through a back illuminated test transparancy with an aspect ratio of 3 : 4. The test chart is divided in three quality zones by two concentric circles with diameters as shown below:



The obtained picture shall be observed at a monitor.

Permitted number, size and location of blemishes (see also notes 1 ÷ 5)

	Dimensions of blemishes in % of picture height	Zone 1	Zone II	Zone III	Total
XQ1400	> 1, 2	0	0	0	0
	> 0, 8	0	1	2	3
	> 0, 2	2 *	5 *	7 *	10 *
	≤ 0, 2	-	-	-	-
XQ1401	> 1, 6	0	0	0	0
	> 1, 2	0	0	1	1
	> 0, 8	0	2 *	3 *	5 *
	> 0, 2	4 *	8 *	10 *	15 *
	≤ 0, 2	-	-	-	-
XQ1402	> 1, 6	0	0	0	0
	> 1, 2	1	2	3	4
	> 0, 8	2 *	3 *	5 *	10 *
	> 0, 2	6 *	10 *	15 *	25 *
	≤ 0, 2	-	-	-	-

NOTES

1) Blemish size is determined at 5 % contrast level.

2) Blemishes ≤ 0, 2 % of picture height are not counted unless their concentration causes a smudged appearance.

3) Blemishes with less than 10 % contrast are not counted. Blemishes > 1, 6 % of picture height, however, shall not have a contrast > 5 % if black , or > 2, 5 % if white (XQ1400) respectively > 10 % if black, or > 5 % if white (XQ1401, XQ1402).

4) Theminimum separation between any two allowed blemishes > 0, 8 % of picture height shall be 5 % of picture height (XQ1400), respectively 3 % (XQ1401, XQ1402).

5) The spurious signal specification should be interpreted as follows:
Example Zone III of a XQ1401 may contain a maximum of 10 blemishes (of which max. 5 white ones) with a size > 0, 2 %. From these 10 blemishes 3 may be > 0, 8 % (including max. 1 white one), including one black blemish > 1, 2 % but < 1, 6 %.

* No more than half of these quantities may be white blemishes.

Image intensifier tubes;
image converter tubes

GENERAL

IMAGE INTENSIFIER AND IMAGE CONVERTER TUBES

1. DESCRIPTION

Image intensifier and image converter tubes are electron-optical devices in which the image of a scene or object is focused on a photocathode and is then intensified electronically.
The intensified image is visible on a luminescent screen.
The image of the scene is focused by an optical lens on to a semi-transparent photocathode. The light distribution in the optical image is converted into a similar photocurrent distribution. The photocurrent is made up of emitted electrons and these are accelerated towards the luminescent screen by an electrode system having a high positive potential relative to the photocathode. An electron lens produces a focused image on the screen.

2. DEFINITIONS

An IMAGE INTENSIFIER TUBE is a device which intensifies visible images.

An IMAGE CONVERTER TUBE is a similar device which is primarily sensitive to invisible radiation.

3. CONSTRUCTION

An image tube consists basically of a photocathode, a focusing system and a luminescent screen.

3.1 The photocathode

The properties of the photocathode are defined by the spectral response and the sensitivity. The sensitivity may be given in two ways: radiant sensitivity (mA/W) and luminous sensitivity (μA/lm).

For night vision applications, using a near infrared searchlight, one may use an image converter with an S1-type photocathode.

For high speed photography of visible scenes, one should preferably use a tube with a photocathode of S11 or S20 spectral response on a conducting substrate (to prevent a substantial voltage drop across the cathode surface during the light pulse).

Passive night vision systems require photocathodes of the highest possible response to visible light, preferably combined with an appreciable response in the near infrared region of the spectrum, for example, the S20 photocathode with enhanced red response.

3.2 Focusing

Focusing systems can be divided into two types: electrostatic and magnetic.

The majority of modern tubes are based on the electrostatic focusing properties of concentric spheres.

Magnetic focusing systems are not suited to portable apparatus due to their weight.

3.3 The luminescent screen

Image tubes can be provided with screens of different spectral light distribution and resolution, depending on the type of application. Screens for direct viewing are usually of the P20 type, which closely matches the luminous efficiency of the human eye. If the screen has to be photographed a blue violet screen (for example type P11) may be more suitable. Optical coupling of a screen to a photocathode and integration of background noise are two examples which may require special phosphors.

4. CHARACTERISTICS

4.1 Noise

With the supply voltage applied and no input illumination incident on the photocathode, the tube screen will have a finite background brightness, which may be caused by one or more of the following effects:

Thermionic emission of the photocathode. This is particularly apparent in the S1 photocathode, and is highly dependent on the cathode temperature (Richardson's law).

Field emission

Electron scintillations

Ion scintillations

Long term phosphorescence of the screen. This may have been caused by previous operation of the tube or by previous exposure of the screen to high levels of illumination of a spectral distribution which can excite phosphorescence. It is, therefore, recommended that image tubes are stored in darkness.

Noise is expressed in terms of Background Equivalent Illumination (B. E. I.)* which is the input illumination required to give an increase in screen luminance equivalent to the background luminance.

*More correctly: Background equivalent input illumination.

4.2 Gain

The gain of image tubes may be expressed in two ways: conversion coefficient and luminance gain.

Conversion coefficient is defined as the quotient of the luminous intensity in a direction normal to the screen (cd) and the luminous flux incident on the photocathode (lm) and is expressed in cd/lm.

In the case of infrared tubes the luminous flux is infrared filtered, and the conversion coefficient is expressed in cd/lm irf (infrared filtered).

Luminance gain is defined as $\frac{\pi L_o}{E_i}$

where L_o = luminance (cd/m^2) in a direction normal to the screen, measured with an eye-corrected photometer having an acceptance angle less than 2 degrees.
and

E_i = illumination (lux) incident on a specified area of the photocathode, produced by a tungsten lamp at a colour temperature of 2850 K.

Luminance gain is expressed as a number.

4.3 Resolution

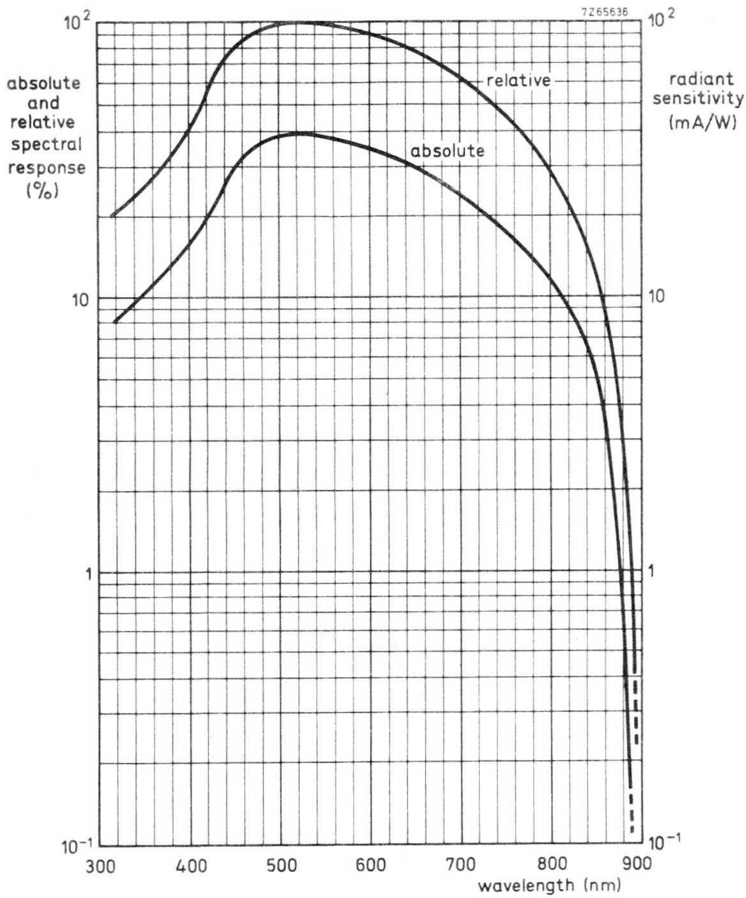
The resolution figures in the data refer to the photocathode and apply to a bar pattern (black bars on a white background with a mark/space ratio of 1 : 1 and contrast approaching 100 %). The resolution pattern is imaged on the photocathode using a high quality projection system, and the screen is observed using a microscope of x50 magnification.

5. ALTITUDE

Image tubes which are not encapsulated should not be used at pressures below 7×10^4 N/m^2 (525 torr), equivalent to a height of 3 km above sea level.

6. MOUNTING

Most tubes are provided with bearing surfaces which should be used for mounting and for electrical contacts. The tube should never bear on the cathode or screen windows, and bearing on the cylindrical metal parts should be avoided. The maximum axial force on the bearing surface of any tube must not exceed 100 N (10 kg), unless otherwise stated. Soldered connections should never be made to the metal parts of the tube.



Photocathode spectral response curve S20 with enhanced red response

RATING SYSTEM

ABSOLUTE MAXIMUM RATING SYSTEM

Absolute maximum ratings are limiting values of operating and environmental conditions applicable to any electronic device of a specified type as defined by its published data which should not be exceeded under the worst probable conditions.

These values are chosen by the device manufacturer to provide acceptable serviceability of the device, taking no responsibility for equipment variations, environmental variations, and the effects of changes in operating conditions due to variations in the characteristics of the device under consideration and of all other electronic devices in the equipment.

The equipment manufacturer should design so that, initially and throughout life, no absolute maximum value for the intended service is exceeded with any device under the worst probable operating conditions with respect to supply voltage variation, equipment component variation, equipment control adjustment, load variations, signal variation, and variations in the characteristics of the device under consideration and of all other electronic devices in the equipment.

IMAGE INTENSIFIER TUBE

Self-focusing electrostatic diode image intensifier tube with fibre-optic windows.

QUICK REFERENCE DATA			
Luminance gain	>	85	
Photocathode		S20 with enhanced red response	
Screen phosphor		P20	
Useful cathode and screen diameters	>	25	mm
Anode voltage		15	kV
Overall dimensions		60 x 50 dia	mm

PHOTOCATHODE

Surface		S20 with enhanced red response	
Wavelength at maximum response		500	nm
Useful diameter	>	25	mm
External surface of cathode window		Flat to within 2 μm over entire diameter	

SCREEN

Surface		Metal-backed P20	
Fluorescent colour		Yellow-green	
Persistence		Medium short	

The screen luminance falls to 36 % (e^{-1}) of the initial peak value 200 μs after the excitation is removed.

Useful diameter	>	25	mm
External surface of screen window		Flat to within 2 μm over entire diameter	

FOCUSING

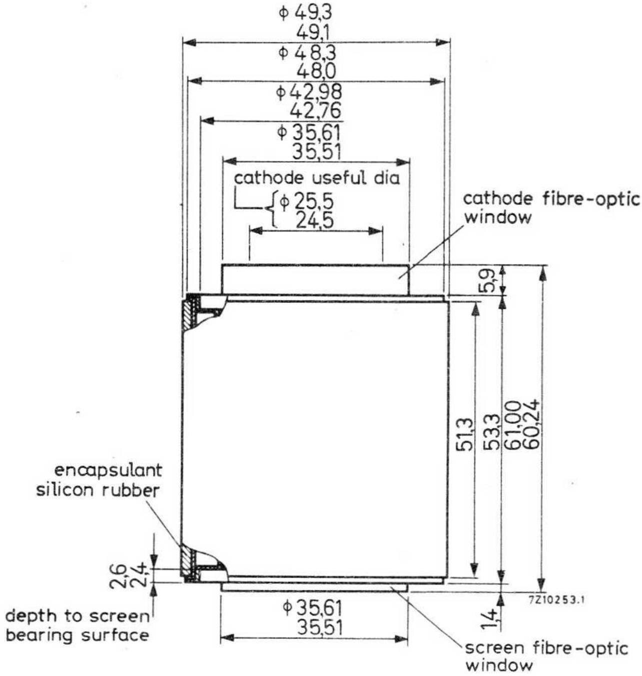
Self-focusing electrostatic with image inversion.

MECHANICAL DATA

Dimensions in mm

Mounting position : any

Net weight : approx. 145 g



Contacts to cathode and screen should be made to the respective bearing surfaces. Contact rings must be kept well clear of the fibre-optic windows. Maximum contact force must not exceed 10 N (1 kg).

CHARACTERISTICS

Measured at V_a = 15 kV t_{amb} = -50 to +30 ^{o}C

Luminance gain (see note 1)	>	85	
Photocathode sensitivity (measured using a tungsten lamp of colour temperature 2850 K)	>	175	μA/lm
Radiant sensitivity at = 800 nm	>	10	mA/W
at = 850 nm	>	3	mA/W
Centre magnification, M_c (see note 2)		0,935 ± 0,010	
Distortion (see note 3)		7,00 ± 1,65	%
Centre resolution (see note 4)	>	60	linepairs/mm
Edge resolution (see note 5)	>	50	linepairs/mm
Background equivalent illumination (see note 6)	<	0,2	μlx

Axial eccentricity

A point at the centre of the photocathode will form an image within a concentric circle of 1,5 mm diameter on the screen.

OPERATING CONDITIONS

Anode voltage (see note 7)	15	kV

Either the anode or the cathode should be connected to the instrument housing depending upon the application. It is recommended that the cathode be connected thus to obtain the lowest possible background.

LIMITING VALUES (Absolute max. rating system)

Anode voltage	max.	16	kV
Anode voltage (useful continuous operation)	min.	10	kV
Photocathode illumination, continuous (see note 8)	max.	2	lx
Ambient temperature	max.	+50	^{o}C

NOTES

1. Luminance gain is defined as $\frac{\pi . L_o}{E_i}$

   where L_o = luminance (cd/m^2) in a direction normal to the screen, measured with an eye-corrected photometer having an acceptance angle of less than 2 degrees.

   and E_i = illumination (lux) incident on a 19 mm diameter concentric area of the cathode, produced by a tungsten lamp at a colour temperature of 2850 K.

2. This is the magnification of a 2mm diameter concentric circle on the photocathode, as measured on the screen.

3. Percentage distortion = $\left\{\frac{M_d}{M_c} - 1\right\}$ x 100 , where M_d is the magnification of a 20 mm diameter concentric circle on the photocathode, as measured on the screen and M_c is

the centre magnification at a distance of 1mm from the centre of the photocathode.

4. Measured at the centre of the photocathode.
5. Measured at the photocathode at a distance of 7 mm from the centre.
6. This is the value of input illumination required to give an increase in screen luminance equivalent to the background luminance.
7. Permanent damage may result from a temporary reversal of polarity.
8. This figure assumes uniform illumination of the photocathode. Permanent damage may result if the tube is exposed to radiant power so great as to cause excessive heating of the photocathode.

IMAGE INTENSIFIER ASSEMBLY

High gain self-focusing image intensifier assemblies for night vision systems. They will operate with automatic brightness control(a.b.c.) when used with an a.c. source having a controlled regulation characteristic.

QUICK REFERENCE DATA			
Gain	XX1060/1 > 50 000	XX1060/03 > 80 000	
Photocathode		S25	
Screen phosphor		P20	
Useful cathode and screen diameters		25	mm
Supply voltage (peak-to-peak value ; f = 1,5 kHz)		2,7	kV
Overall dimensions		195 x 70 dia	mm

PHOTOCATHODE

Surface	S25	
Wavelength at maximum response	550	nm
Useful diameter	25	mm
External surface of fibre optic cathode window	flat to within 25 μm over entire useful surface	

SCREEN

Surface	metal backed P20	
Fluorescent colour	yellow-green	
Overall persistence	medium	

The screen luminance falls to 36% (e^{-1}) of the initial peak value 5 ms after the excitation is removed.

Useful diameter	25	mm
External surface of fibre optic screen window	flat to within 25 μm over entire surface	

FOCUSING

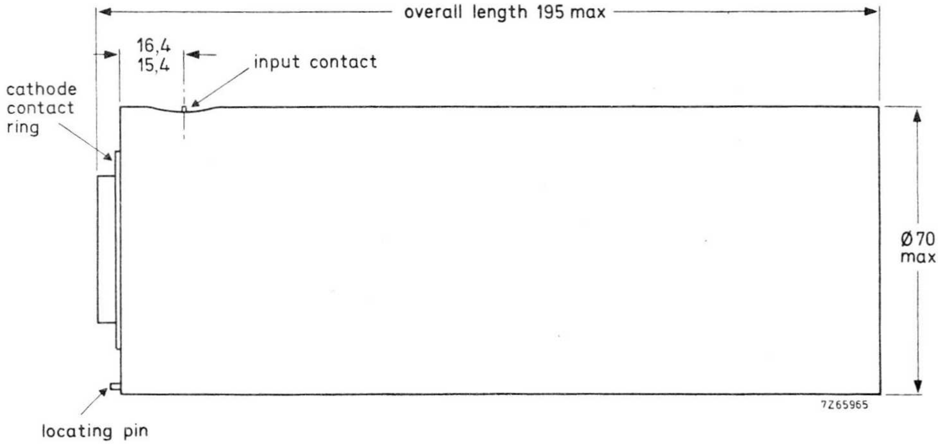
Electrostatic self-focusing with image inversion

MECHANICAL DATA Dimensions in mm

Mounting position: any

The tube may be contained in a cylindrical housing and radially positioned by the locating pin. The axial position is determined by the bearing surface. The force on the bearing surface must not exceed 100 N.

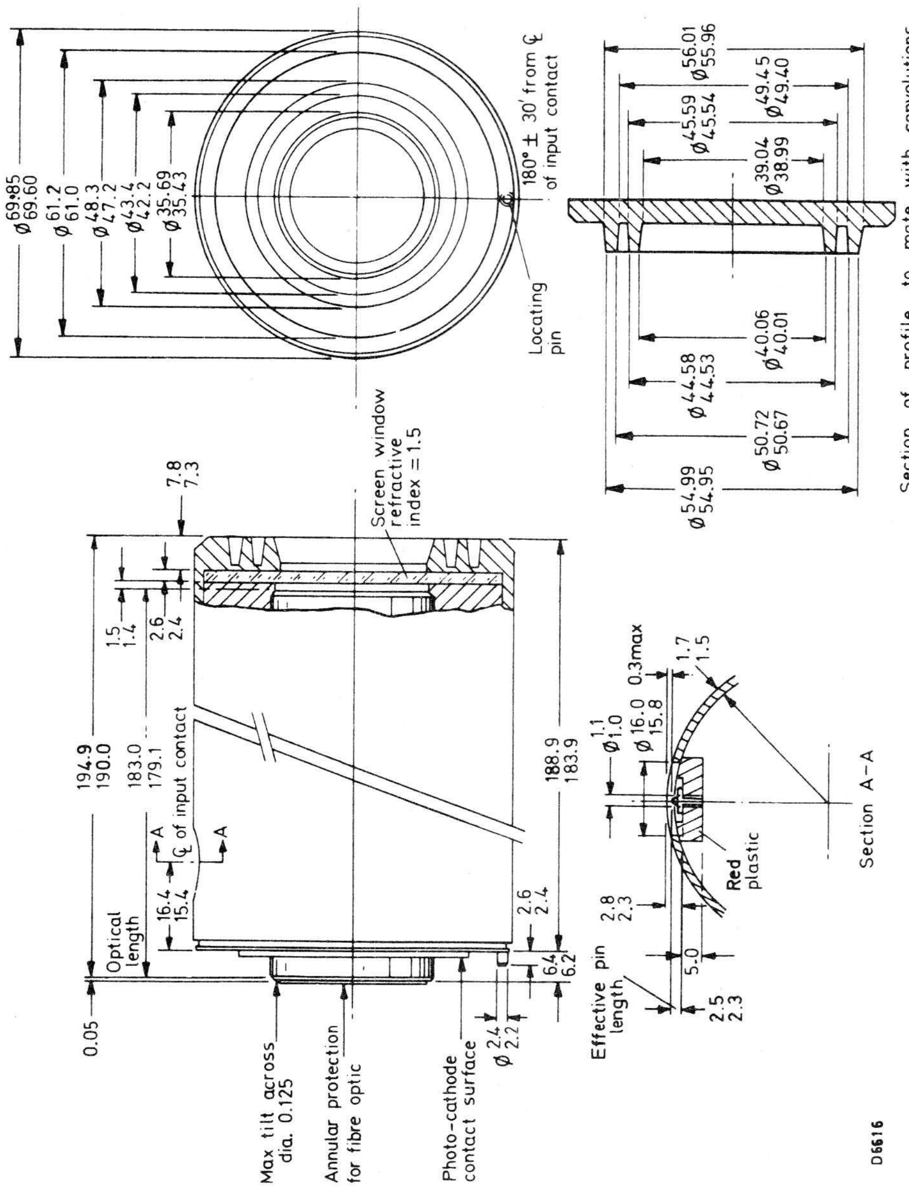
Mass : < 880 g



Simple outline drawing

MECHANICAL DATA

Dimensions in mm



CHARACTERISTICS

Measured at a p-p supply voltage = 2,7 kV±5% with a frequency of 1500±100 Hz
t_{amb} = 23 ± 4 °C

		XX1060/01	XX1060/03	
Gain	(see note 2)	> 50 000	> 80 000	
Photocathode sensitivity (measured using a tungsten lamp of colour temperature 2856 K)		> 225	> 225	µA/lm
Radiant sensitivity at λ = 800 nm		15	20	mA/W
λ = 850 nm		6	10	mA/W
Centre magnification, M_c	(see note 3)	0,85 ± 0,05		
Distortion	(see note 4)	20		%
Centre resolution	(see note 5)	> 30		line pairs/mm
Edge resolution	(see note 6)	> 28		line pairs/mm
Modulation transfer factors at cathode centre	(see note 7)			
at 2,5 cycles/mm		> 98		%
at 7,5 cycles/mm		> 75		%
at 16 cycles/mm		> 45		%
Background equivalent illumination	(see note 8)	< 0,2		µlx

Axial eccentricity
A point at the centre of the photocathode will form an image within a concentric circle of 1,25 mm diameter on the screen.

Screen luminance ratio	(see note 9)	< 5	
Input capacitance (measured with no input illumination)		10 to 20	pF

TYPICAL OPERATING CONDITIONS (see note 10)

Supply voltage, p-p	(see note 1)	2,7	kV
Supply frequency		1,5	kHz
Cathode illumination		100	µlx

The supply voltage must be applied between the a.c. input pin and the cathode contact surface. The photocathode must be connected to the metal cylindrical housing having a minimum internal diameter of 73 mm and a minimum length of 185 mm.

LIMITING VALUES (Absolute max. rating system)

Supply voltage, p-p	(see note 1)	instantaneous	max.	2,90	kV
		continuous	max.	2,85	kV
Supply frequency			max.	10	kHz
Photocathode illuminance	(see note 11)		max.	10	lx
Ambient temperature	(for 2 hours max.)		max.	68	^{o}C
Ambient temperature	(long term storage and continuous operation) (see note 12)		max.	35	^{o}C

NOTES

1. The intensifier must be supplied from an a.c. source having the following characteristics:

Load condition	Output voltage (p-p)
50 pF	2600 ± 200
50 pF in parallel with 25 MΩ	1900 ± 400

2. Gain is defined as : $\frac{\pi L_o}{E_i}$

where L_o = luminance (cd/m^2) in a direction normal to the screen, measured over a 14 mm diameter concentric area with an eye corrected photometer having an acceptance angle of less than 2 degrees.
and E_i = uniform illuminance (approx. 200 μlx), produced by a tungsten lamp at a nominal colour temperature of 2856 K, incident on the entire photocathode area.

3. The magnification of a 2 mm diameter concentric circle on the photocathode, as measured on the screen.

4. Percentage distortion = $\left\{ \frac{M_d}{M_c} - 1 \right\}$ x 100, where M_d is the magnification of a 20 mm diameter concentric circle on the photocathode, as measured on the screen and M_c is the centre magnification at a distance of 1 mm from the centre of the photocathode.

5. Measured at the centre of the photocathode.

6. Measured at the photocathode at a distance of 7 mm from the centre.

7. These values are obtained using the standard method adopted in MIL specifications whereby the m.t.f. values are normalised at approximately 1,5 cycles/mm. When the m.t.f. is measured with the values normalised at zero spatial frequency, the following results are obtained:

at 2,5 cycles/mm	>	88	%
at 7,5 cycles/mm	>	70	%
at 16 cycles/mm	>	38	%

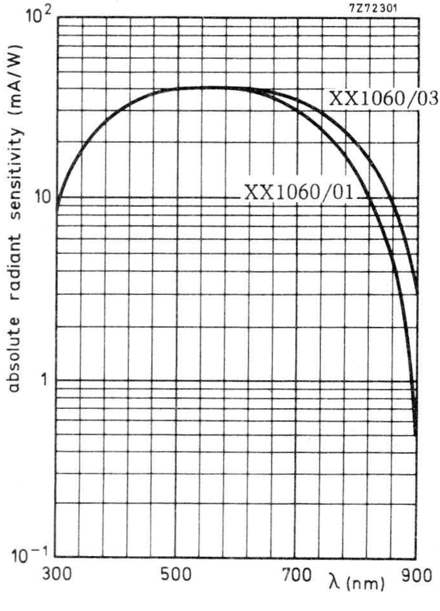
8. The value of input illuminance required to give an increase in screen luminance equivalent to the background luminance.

9. The screen luminance ratio is defined as the ratio of the maximum and minimum screen luminance over a 20 mm diameter concentric area on the screen for uniform cathode illuminance.

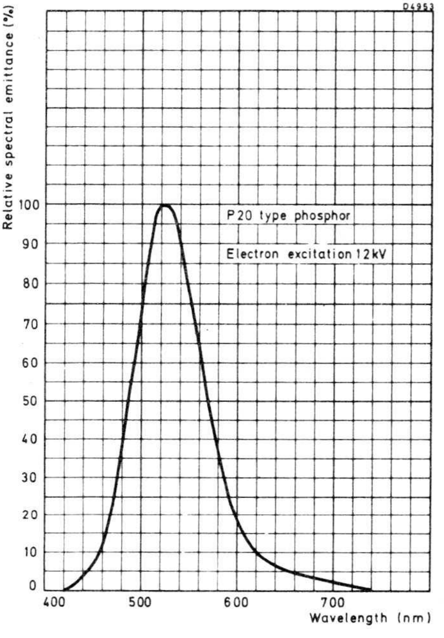
10. Warning. After switching off, the a.c. input pin may still be at a d.c. potential of a few kV. It is advisable to discharge this pin against the cathode contact ring. (not against the bearing surface).

11. Intermittent flashes producing much higher cathode illuminances are allowed. but the tube must not be used in full daylight.

12. It is recommended that the ambient temperature for long term storage is less than 5 °C.



Typical photocathode spectral response



Typical spectral emittance for a P20 phosphor

IMAGE INTENSIFIER ASSEMBLY

High gain, fast response, self-focusing image intensifier assemblies with integral power supply and automatic brightness control (a.b.c.) for night vision systems.

QUICK REFERENCE DATA			
Gain	XX1063 > 50 000	XX1064 > 80 000	
Photocathode		S25	
Screen phosphor		P20	
Useful cathode and screen diameters		25	mm
Recovery time		< 1,5	s
Supply voltage (d.c.)		6,5	V
Overall dimensions		195 x 70 dia	mm

PHOTOCATHODE

Surface	S25	
Wavelength at maximum response	550	nm
Useful diameter	> 23	mm
External fibre optic cathode window	flat to within 25 μm over entire surface	

SCREEN

Surface	metal backed P20
Fluorescent colour	yellow-green
Overall persistence	medium

The screen luminance falls to 36 % (e^{-1}) of the initial peak value 5 ms after the excitation is removed.

Useful diameter	> 25	mm
External surface of fibre optic screen window	flat to within 25 μm over entire surface	

FOCUSING

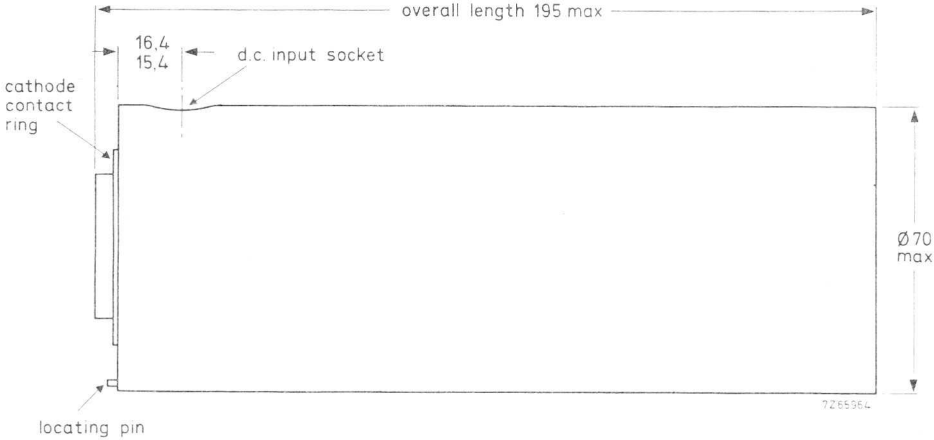
Electrostatic self-focusing with image inversion.

MECHANICAL DATA Dimensions in mm

Mounting position : any

The tube may be contained in a metal housing, connected to the chassis. It is radially positioned by the locating pin. The axial position is determined by the bearing surface. The force on the bearing surface must not exceed 100 N.

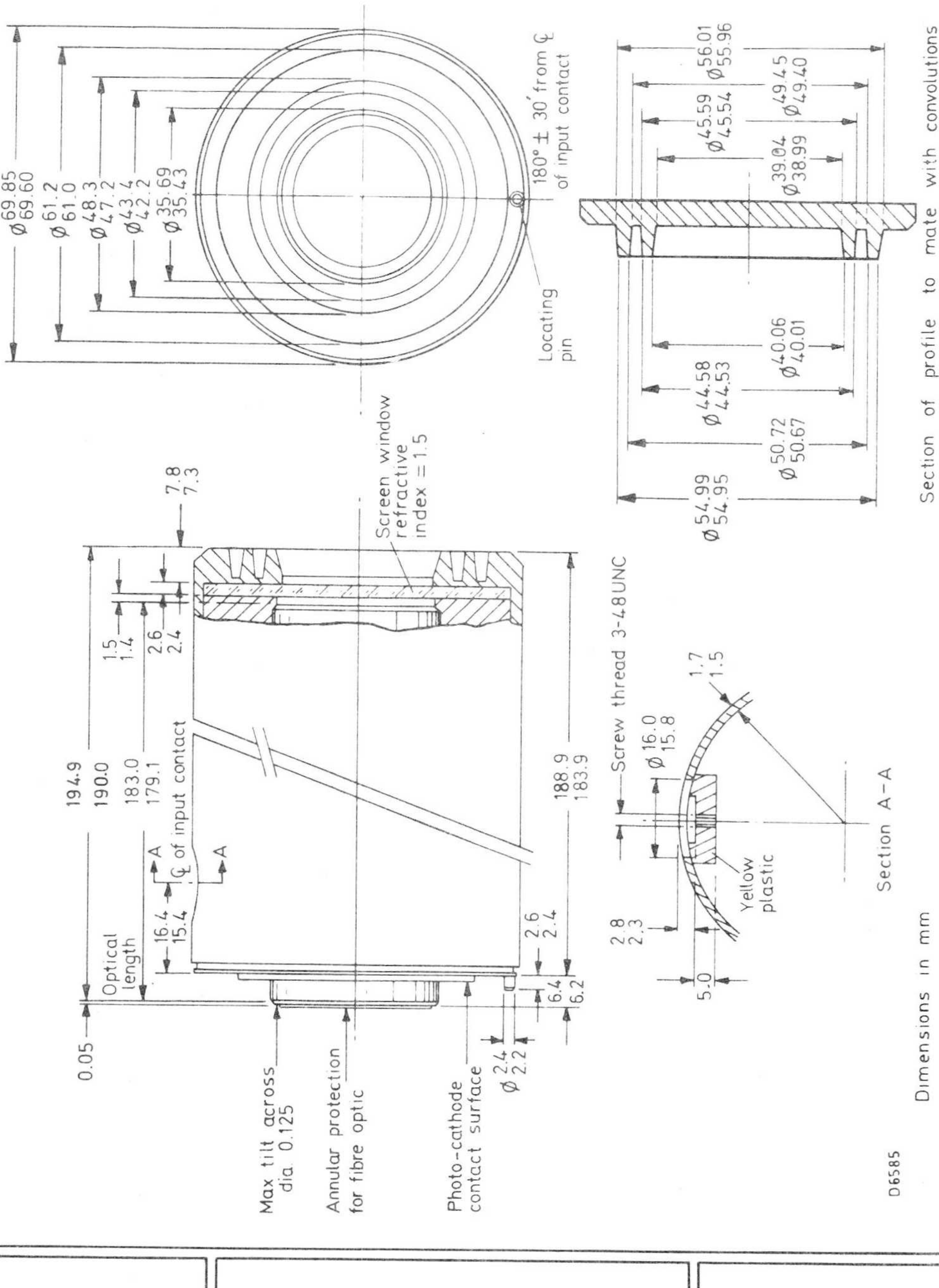
Mass : approx. 900 g



Simple outline drawing

MECHANICAL DATA

Dimensions in mm



CHARACTERISTICS

Measured at a d.c. supply voltage = 6,5 V ± 1%
Ambient temperature 23 ± 4 °C

		XX1063	XX1064	
Gain	(see note 1)	> 50 000	> 80 000	
Photocathode sensitivity, measured using a tungsten lamp of colour temperature 2856 K		225	225	μA/lm
Radiant sensitivity at = 800 nm		15	20	mA/W
= 850 nm		6	10	mA/W
Centre magnification, M_c	(see note 2)	0,85 ± 0,05		
Distortion	(see note 3)		< 20	%
Centre resolution	(see note 4)		> 30	line pairs/mm
Edge resolution	(see note 5)		> 28	line pairs/mm
Modulation transfer factors at cathode centre	(see note 6)			
at 2,5 cycles/mm			> 98	%
at 7,5 cycles/mm			> 75	%
at 16 cycles/mm			> 45	%
Background equivalent illuminance	(see note 7)		0,2	μlx

Axial eccentricity

A point at the centre of the photocathode will form an image within a concentric circle of 1,25 mm diameter on the screen.

Screen luminance for cathode illuminance of 10 lx		> 10	cd/m^2
Screen luminance ratio	(see note 8)	< 5	
Mean screen luminance, averaged over useful screen area		< 550	cd/m^2
Recovery time	(see note 9)	< 1,5	s

TYPICAL OPERATING CONDITIONS

Supply voltage, d.c.	6,5 ± 0,25	V
Power consumption	120	mW

The supply voltage must be applied between the input socket marked + and the cathode contact surface.
The photocathode should preferrably be connected to a metal cylindrical housing.

LIMITING VALUES (Absolute max. rating system)

Supply voltage, d.c.		max.	6,75	V
Photocathode illuminance	(see note 10)	max.	100	lx
Ambient temperature (for 2 hours max.)		max.	68	^oC
Ambient temperature (long term storage and continuous operation)	(see note 11)	max.	35	^oC

NOTES

1. Gain is defined as: $\dfrac{\pi . L_o}{E_i}$

   where L_o = luminance (cd/m^2) in a direction normal to the screen, measured over a 14 mm diameter concentric area with an eye-corrected photometer having an acceptance angle of less than 2 degrees.

   and E_i = uniform illuminance (approx. 200 µlx), produced by a tungsten lamp at a nominal colour temperature of 2856 K, incident on the entire photocathode area.

2. The magnification of a 2 mm diameter concentric circle on the photocathode, as measured on the screen.

3. Percentage distortion $= \left\{ \dfrac{M_d}{M_c} - 1 \right\} \times 100$,

   where M_d is the magnification of a 20 mm diameter concentric circle on the photocathode, as measured on the screen

   and M_c is the centre magnification at a distance of 1 mm from the centre of the photocathode.

4. Measured at the centre of the photocathode.

5. Measured at the photocathode at a distance of 7 mm from the centre.

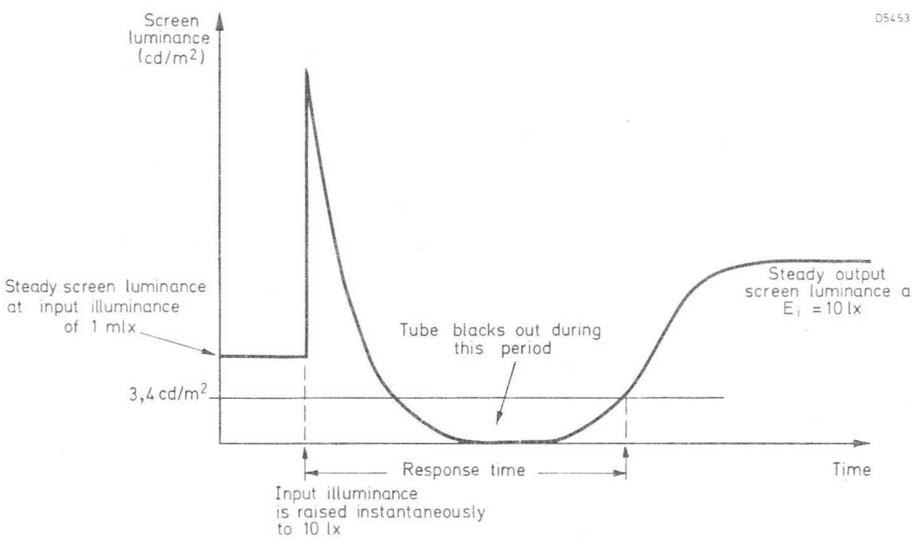
6. These values are obtained using the standard method adopted in MIL specifications whereby the m.t.f. values are normalized at approximately 1,5 cycles/mm. When the m.t.f. is measured with the values normalized at zero spatial frequency, the following results are obtained:

at 2,5 cycles/mm	88	%
at 7,5 cycles/mm	70	%
at 16 cycles/mm	38	%

7. The value of input illuminance required to give an increase in screen luminance equivalent to the background luminance.

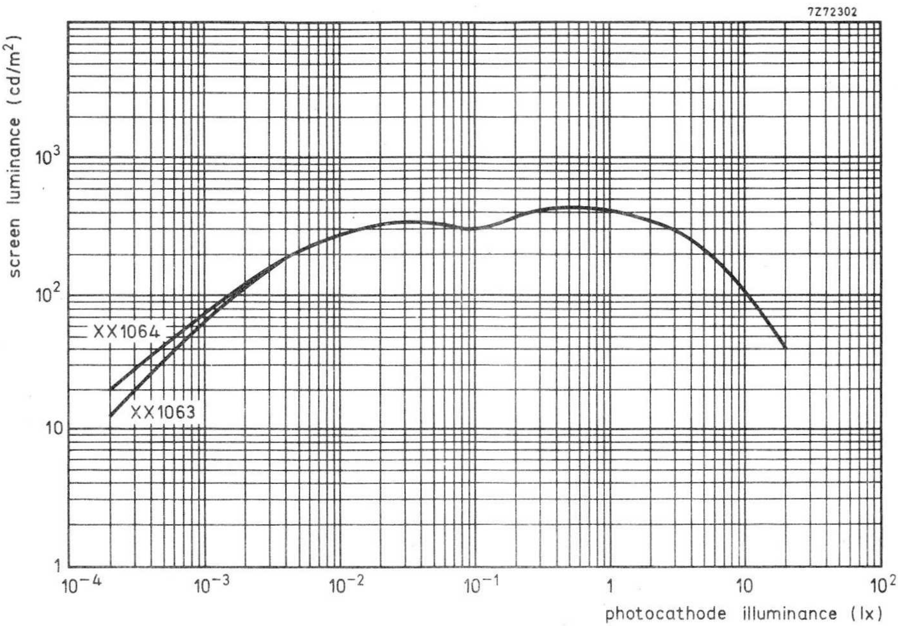
8. The screen luminance ratio is defined as the ratio of the maximum and minimum screen luminance over a 20 mm diameter concentric area on the screen, for uniform cathode illuminance.

9. With an input illuminance of $E_i = 5 \times 10^{-3}$ lx.
E_i is increased in less than 1 ms to a value of 10 lx; the screen will flash instantaneously and then black out for a brief period. Thereafter the screen luminance will increase to a steady value. The response time is defined as the interval between the instant of the increase of E_i and the instant at which the screen luminance reaches a value of 3,4 cd/m^2 following blackout, (see Fig. 1).

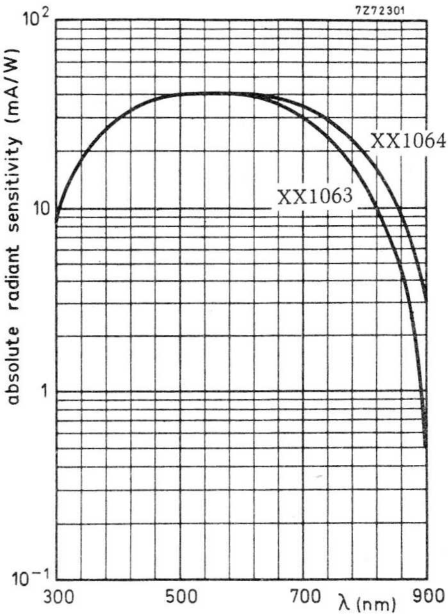


10. This applies for short periods only. Prolonged exposure to bright lights will shorten the life of the tube.

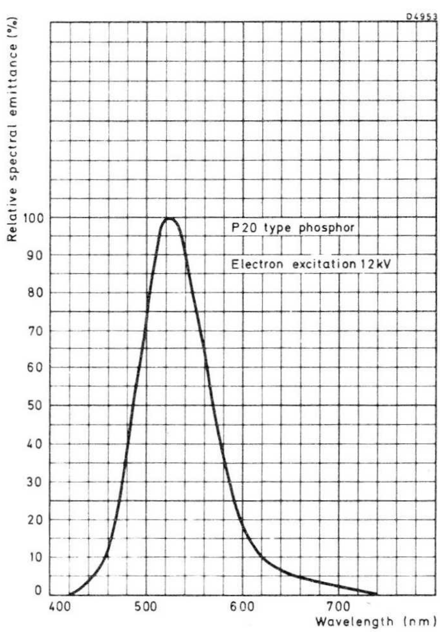
11. It is recommended that the ambient temperature for long term storage is less than 5 °C.



Typical a.b.c. transfer characteristic



Typical photocathode spectral response



Typical spectral emittance
for a P20 phosphor

Deflection assemblies for camera tubes

SURVEY

type number and cat. number	inductance (mH)		resistance (Ω)			current (mA)			tube diameter
	line deflection coils	frame deflection coils	line deflection coils	frame deflection coils	focus coil	line deflection coils	frame deflection coils	focus coil	
AT1102/01 3122 137 10580	0,95	27	2,6	84	3770	250 p-p	34 p-p	23	1 inch
AT1113/01 3122 108 84400	0,97	22	2,4	68	150	210 p-p	32 p-p	110	30 mm
AT1113/03 3122 107 10570	0,97	22	2,4	68	150	210 p-p	32 p-p	110	30 mm
AT1115/01 3122 137 12710	0,78	26	2,4	64	1760	245 p-p	34 p-p	30	1 inch
AT1116 3122 137 10970	0,78	28	2,4	62	149	330 p-p	48 p-p	105	1 inch
AT1116/06 3122 137 15040	0,78	28	2,4	62	149	300 p-p	43 p-p	105	1 inch
AT1117 3122 107 13460	0,785	13,2	10	155	-	140 p-p	25 p-p	-	5/8 inch
AT1119/01 3122 137 12700	0,78	26	2,4	64	1720	245 p-p	34 p-p	30	1 inch
AT1132/01 3122 108 87740	0,97	22,1	2,4	80	2750	210 p-p	32 p-p	25	$1\frac{1}{4}$ inch
KV12 9390 221 60000	0,86	28,7	3,2	146	55	160 p-p	25 p-p	120 p-p	2/3 inch
KV19B 9390 233 30000	0,9	23	4,6	146	-	160 p-p	25 p-p	-	2/3 inch

DEFLECTION UNIT FOR 1 inch VIDICON

QUICK REFERENCE DATA			
	inductance	resistance	current
Line deflection coils	0,95 mH	2,6 Ω	250 mA(p-p)
Frame deflection coils	27 mH	84 Ω	34 mA(p-p)
Focus coil		3770 Ω	23 mA

APPLICATION

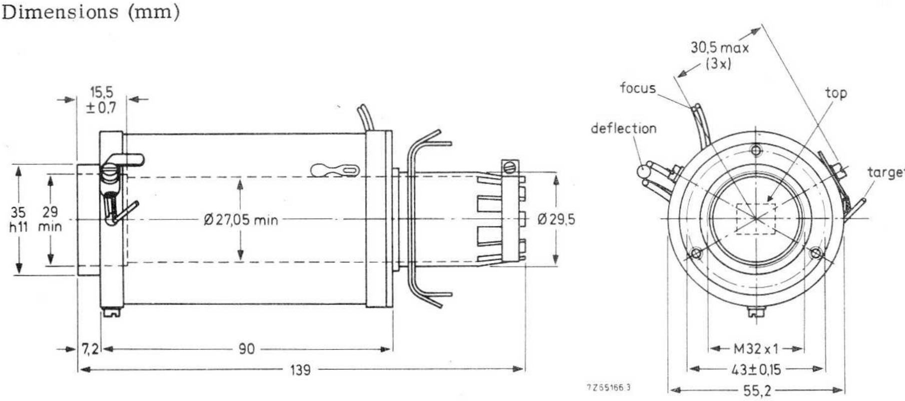
The AT1102/01 is intended for use in black and white cameras using the front-loading 1 inch Vidicons.

DESCRIPTION

The deflection unit contains the deflection and focus coils for the Plumbicon tube*) or Vidicon.

MECHANICAL DATA

Dimensions (mm)



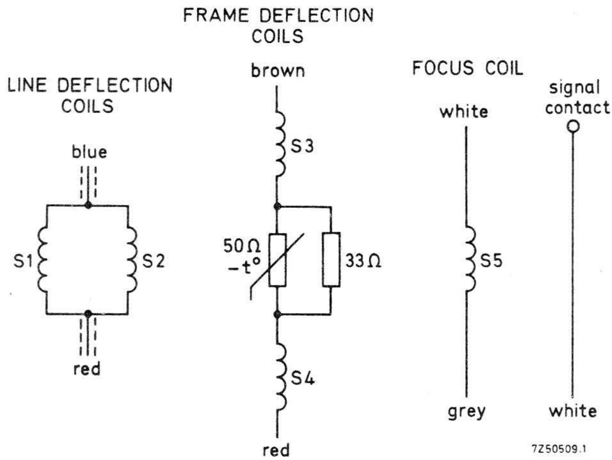
Mass per unit 536 g approx.

Body temperature

Temperature range for continuous operation -15 to +75 °C
for non-operating -25 to +85 °C

*) Registrated Trade Mark for television camera tube.

ELECTRICAL DATA (typical values)



coils	inductance (mH)	resistance (Ω)	connections
Line deflection coils	0,95 ± 3%	2,6 ± 10%	blue (screened); red (screened)
Frame deflection coils	27 ± 3%	84 ± 10%	red; brown
Focus coil		3770 ± 10%	grey (-); white (+)

Required currents for normal operation

Tube setting for Vidicon XQ1041 :

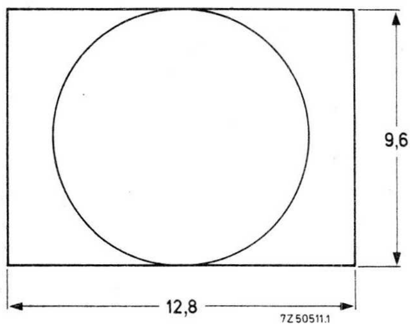
$$\left.\begin{array}{l} V_{g3} = 600\text{ V} \\ V_{g4} = 840\text{ V} \end{array}\right\} \text{with respect to the cathode potential}$$

Nominal scanning area: 9,6 x 12,8 mm

Line deflection current, p-p	250 mA
Frame deflection current, p-p	34 mA
Focus current	23 mA

Geometric distortion

Distortion	inside the circle	max. 1% of picture height
	outside the circle	max. 2% of picture height



Tolerances

The capacitance between the target and the tube electrodes increases less than 8 pF, when the tube is inserted in the deflection unit.

DEFLECTION UNIT FOR 30 mm PLUMBICON TUBE

The deflection unit AT1113/01 is one of the three units which together form the computer-selected triplet AT1113/03.

For particulars see data sheets of deflection units AT1113/03.

DEFLECTION UNITS FOR 30 mm PLUMBICON TUBE

computer-selected triplet

QUICK REFERENCE DATA	inductance	resistance	current
Line deflection coils	0,97 mH	2,4 Ω	210 mA(p-p)
Frame deflection coils	22 mH	68 Ω	32 mA(p-p)
Focus coil		150 Ω	110 mA

APPLICATION

The AT1113/03 is composed out of a computer selected triplet of deflection units, for use in broadcast colour television cameras using the rear-loader 30 mm Plumbicon tube*).

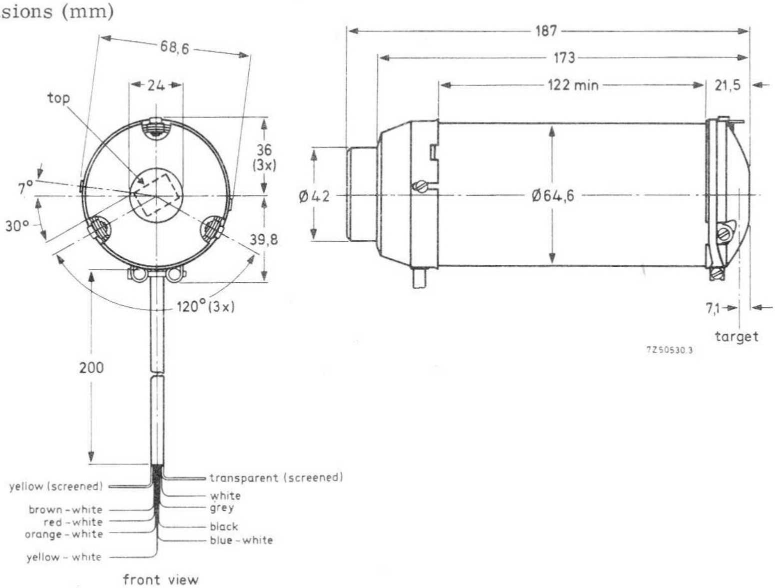
DESCRIPTION

The three deflection units contain the deflection, alignment and focus coils for the Plumbicon tubes.
The Plumbicon tube is secured in its desired position by the plastic nut ring at the rear of a unit. By turning the ring-nut the tube will automatically pushed forward until it touches the stop.

*) Registrated Trade Mark for television camera tube.

MECHANICAL DATA

Dimensions (mm)

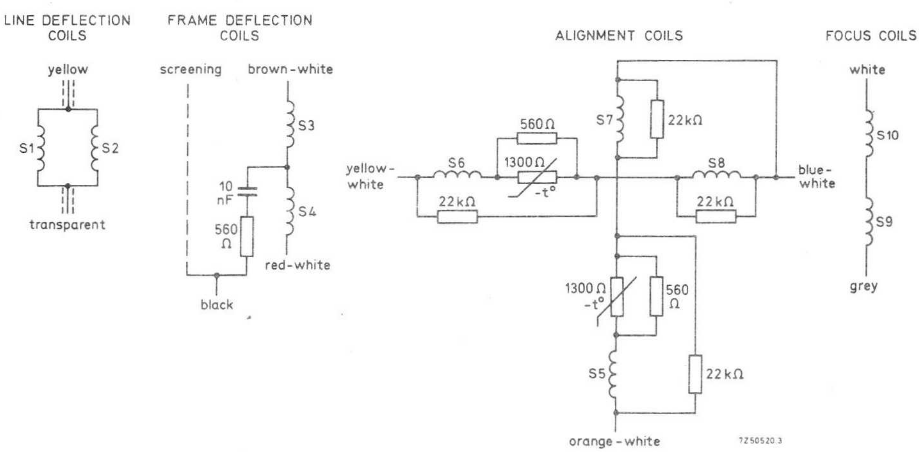


Mass per unit 1025 g approx.

Body temperature

Temperature range for continuous operation	−15 to +75 °C
for non-operating	−25 to +85 °C

ELECTRICAL DATA (typical values)



coils	inductance (mH)	resistance (Ω)	connections
Line deflection coils	0,97 ± 3%	2,4 ± 10%	yellow (screened): transparent (screened)
Frame deflection coils	22 ± 4%	68 ± 10%	brown-white; red-white
Horizontal alignment coils		2025 ± 10%	yellow-white; blue-white
Vertical alignment coils		2025 ± 10%	orange-white; blue-white
Focus coils		150 ± 10%	grey(−); white (+)

Required currents for normal operation

Tube setting for Plumbicon XQ1023:

V_{g3} = 600 V
V_{g4} = 675 V } with respect to the cathode potential.

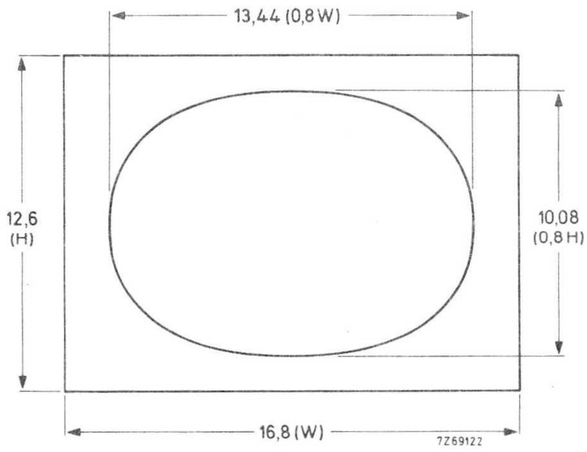
Nominal scanning area 12,6 x 16,8 mm
Dynamic focus on V_{g3}

Line deflection current, p-p	210 mA
Frame deflection current, p-p	32 mA
Focus current	110 mA
Alignment current	1 mA will cause a shift of ≥ 0,8% of picture height

Geometric distortion

Distortion, measured with dynamic focus

inside the circle	max.	0,5% of picture height
outside the circle	max.	1% of picture height



Registration

The deflection units are supplied in matched sets of three units where in the misregistration in any set is not greater than 0, 1% of picture height inside the ellipse and 0, 2% outside the ellipse.
The errors are horizontally and vertically measured.

Resolution

The resolution at the corners of the picture is not less than 75% of the resolution at the centre, measured with dynamic focus at 0, 4 of the picture diagonal out of the centre.

Tolerances

The capacitance between the target and the tube electrodes increases less than 6 pF, when the tube is inserted in the deflection unit.

DEFLECTION UNITS FOR 1 inch PLUMBICON TUBE
computer-selected triplet

QUICK REFERENCE DATA

	inductance	resistance	current
Line deflection coils	0,78 mH	2,4 Ω	245 mA(p-p)
Frame deflection coils	26 mH	64 Ω	34 mA(p-p)
Focus coil		1760 Ω	30 mA

APPLICATION

The AT1115/01 is composed out of a computer selected triplet of deflection units, for use in broadcast colour television cameras using the rear-loading 1 inch Plumbicon tube *) XQ1080-Series.

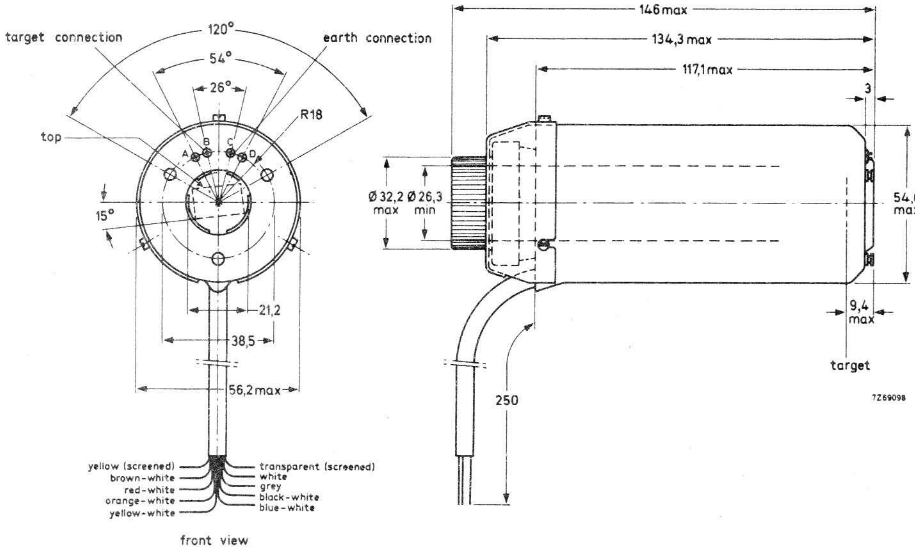
DESCRIPTION

The three deflection units contain the deflection, alignment and focus coils for the Plumbicon tubes.
Moreover each unit is provided with a locking device at the front, in which a holder for a field flattener lens can be fitted without the use of tools.
The Plumbicon tube is secured in its desired position by the plastic nut ring at the rear of a unit. By turning the ring-nut the tube will automatically pushed forward until it touches the stop. Space has been provided to built in a video pre-amplifier (connections A, C and D see dimensional drawing).

*) Registrated Trade Mark for television camera tube.

MECHANICAL DATA

Dimensions (mm)

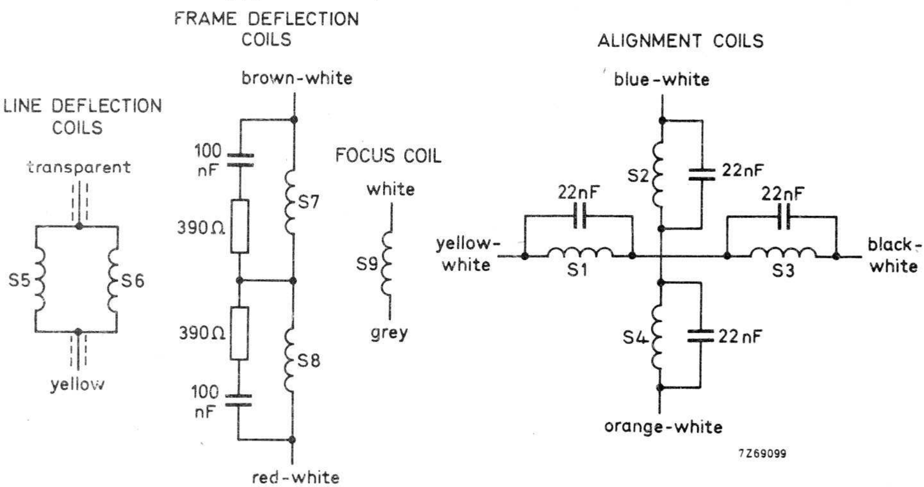


Mass per unit 560 g approx.

Body temperature

Temperature range for continuous operation	−15 to +75 °C
for non-operating	−25 to +85 °C

ELECTRICAL DATA (typical values)



coils	inductance (mH)	resistance (Ω)	connections
Line deflection coils	0,78 ± 3%	2,4 ± 5%	transparent (screened) ; yellow (screened)
Frame deflection coils	26	64 ± 8%	red-white ; brown-white
Horizontal alignment coils		550 ± 10%	yellow-white; black-white
Vertical alignment coils		550 ± 10%	orange-white; blue-white
Focus coil		1760 ± 10%	grey (+) ; white (-)

Required currents for normal operation

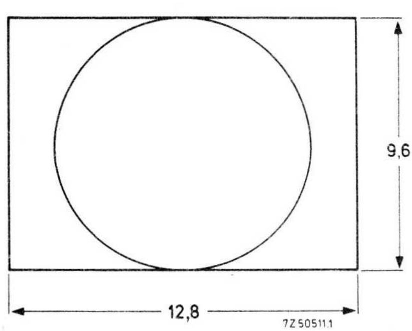
Tube setting: V_{g5} = +470 V, V_{g6} = +750 V with respect to cathode potential

Nominal scanning area: 9,6 x 12,8 mm
Dynamic focus on V_{g5}

Line deflection current, p-p	245	mA
Frame deflection current, p-p	34	mA
Focus current	30	mA
Alignment current	1	mA will cause a shift of ≥0,6% of picture height

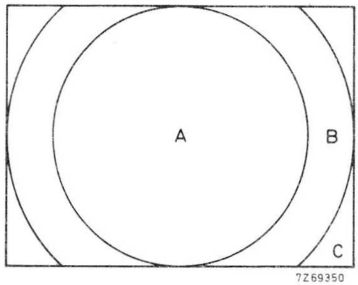
Geometric distortion

Distortion, measured with dynamic focus	
inside the circle	max. 0,5% of picture height
outside the circle	max. 1% of picture height
Skew error	max. 0,4% of picture height



Registration

The deflection units are supplied in matched sets of three units wherein the misregistration in any set is not greater than :



in zone A 25 ns

in zone B 40 ns

in zone C 80 ns

The errors are horizontally and vertically measured.

Resolution

The resolution at the corners of the picture is not less than 75 % of the resolution at the centre, measured with dynamic focus at 0, 4 of the picture diagonal out of the centre.

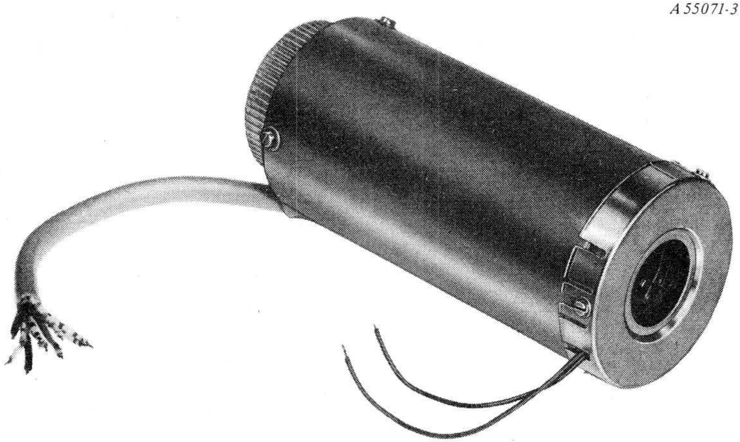
Tolerances

The difference between the focus currents of the deflection units of a selected triplet shall not exceed ± 1 %, measured at one tube as a reference.

The capacitance between the target and the tube electrodes increases less than 6 pF, when the tube is inserted in the deflection unit.

DEFLECTION UNIT FOR 1 inch PLUMBICON TUBE

A 55071-3

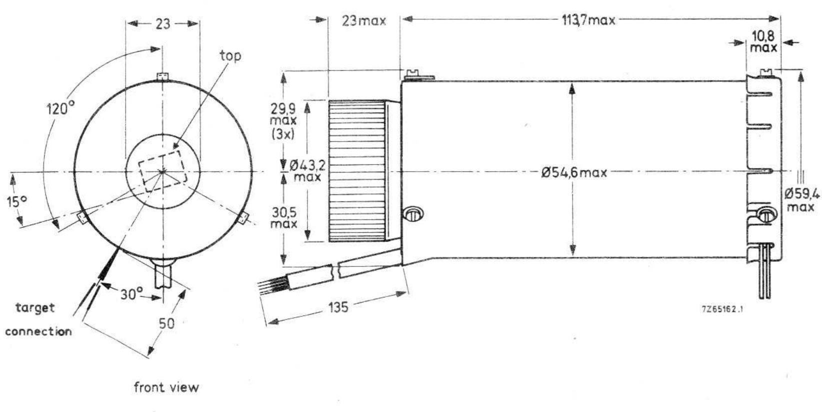


APPLICATION

Deflection unit consisting of deflection, focus and alignment coils for a front-loading 1 inch Plumbicon tube *).

MECHANICAL DATA

Dimensions (mm)



Mass per unit 615 g approx.

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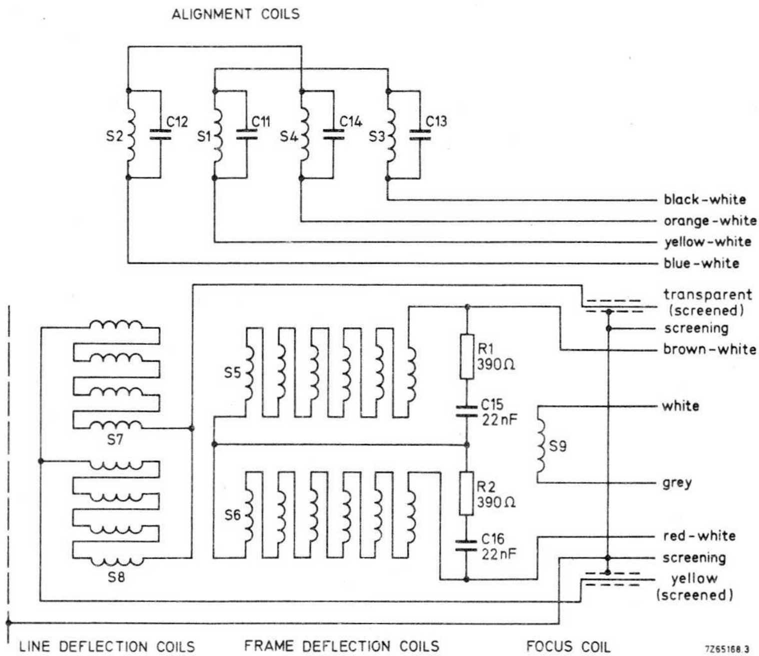
*) Registrated Trade Mark for television camera tube.

ELECTRICAL DATA

Maximum operating temperature 75 °C



coils		inductance (mH)	resistance (Ω)
line deflection coils	S7// S8	0, 78 ± 10 %	2, 4 ± 10 %
frame deflection coils	S5 + S6	28 ± 10 %	62 ± 10 %
alignment coils (horizontal)	S1 + S3		550 ± 10 %
alignment coils (vertical)	S2 + S4		550 ± 10 %
focus coil *)	S9		149 ± 10 %

Required currents for normal operation (V_{g3} = 600 V; V_{g4} = 960 V)

Line deflection current, p-p 330 mA

Frame deflection current, p-p 48 mA

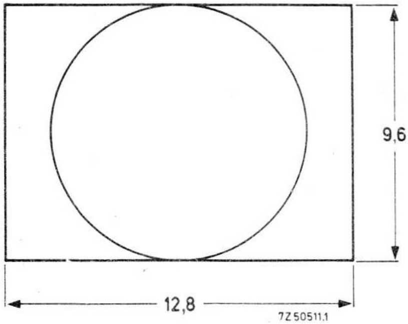
Focus current 105 mA

Alignment current 1 mA will cause a shift of 0, 6 % of picture height

*) Polarity of focus coil: grey terminal positive. The polarity of the focus coil should be such that a north-seeking pole is attracted to the image end of the coil, with this pole located outside of and at the image end of the coil.

Geometric distortion

Distortion inside the circle	max. 0,5 % of picture height
outside the circle	max. 1 % of picture height



MOUNTING

To get line scanning in horizontal position the unit has to be positioned with the signal contact 225 ° clockwise with respect to north (front view).

To avoid geometric distortion the mu -metal screening may not become deformed.

To guarantee the specification the lacquered screws may not be removed.

DEFLECTION UNITS FOR 1 inch PLUMBICON TUBE
computer-selected triplet

QUICK REFERENCE DATA

	inductance	resistance	current
Line deflection coils	0,78 mH	2,4 Ω	300 mA (p-p)
Frame deflection coils	28 mH	62 Ω	43 mA (p-p)
Focus coil		149 Ω	105 mA

APPLICATION

The AT1116/06 is composed out of a computer selected triplet of deflection units, for use in broadcast colour television cameras using the front-loading 1 inch Plumbicon tube*) XQ1070 -Series.

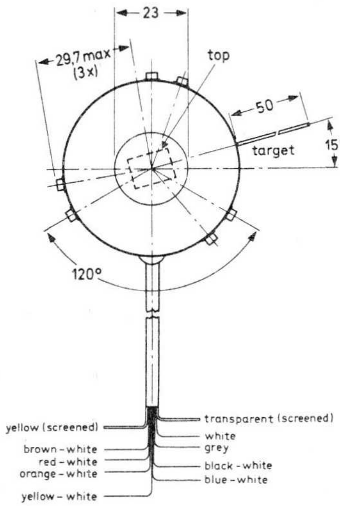
DESCRIPTION

The three deflection units contain the deflection, alignment and focus coils for the Plumbicon tubes.
The Plumbicon tube is secured in its desired position by the plastic nut ring at the rear of a unit. By turning the ring-nut the tube will automatically be pushed backward until it touches the stop.

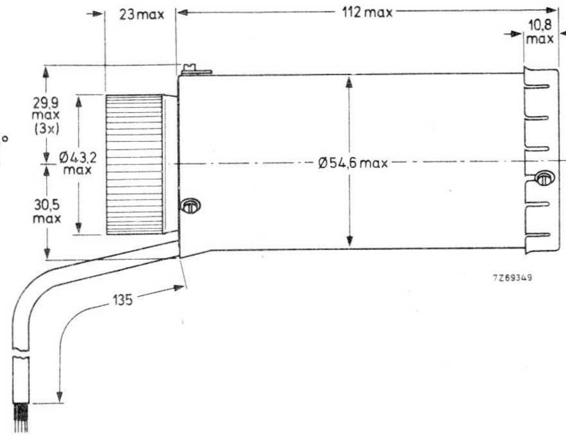
*) Registrated Trade Mark for television camera tube.

MECHANICAL DATA

Dimensions (mm)



front view

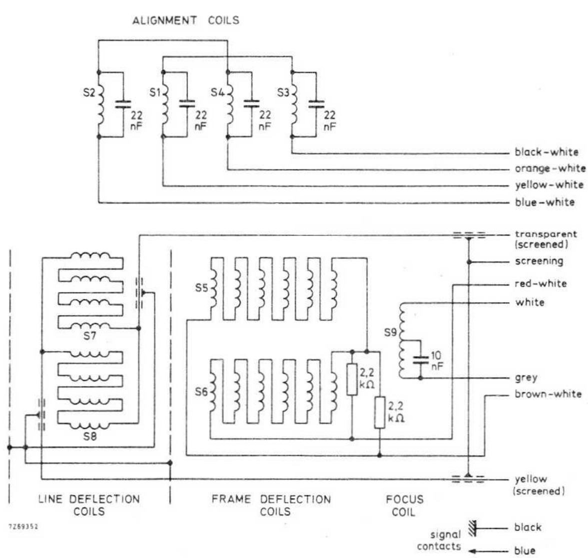


Mass per unit 615 g approx.

Body temperature

Temperature range	for continuous operation	-15 to +75 °C
	for non-operating	-25 to +85 °C

ELECTRICAL DATA (typical values)



coils	inductance (mH)	resistance (Ω)	connections
Line deflection coils	0,78 ± 5%	2,4 ± 10%	transparent (screened); yellow (screened) *)
Frame deflection coils	28 ± 5%	62 ± 10%	red-white; brown-white *)
Horizontal alignment coils		550 ± 10%	yellow-white; black-white
Vertical alignment coils		550 ± 10%	orange-white; blue-white
Focus coil		149 ± 10%	grey (+) ; white (-)

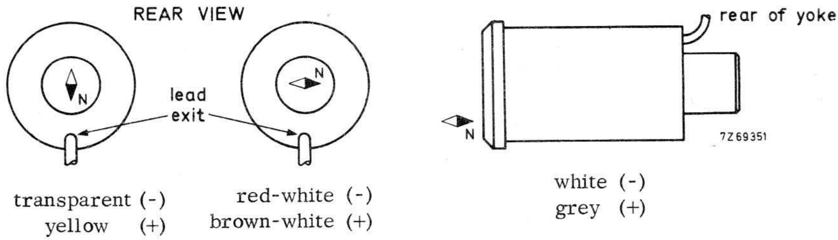
Required currents for normal operation

Tube setting: V_{g3} = +600 V, V_{g4} = +960 V } with respect to cathode potential

Nominal scanning area: 9,6 x 12,8 mm

Line deflection current, p-p	300 mA
Frame deflection current, p-p	43 mA
Focus current	105 mA
Alignment current	1 mA will cause a shift of 0,6% of picture height.

*) With the positive side of a power supply applied to the yellow, brown-white and grey leads, the north-seeking end of a compass indicates as shown.



transparent (-) yellow (+)

HORIZONTAL COIL

red-white (-) brown-white (+)

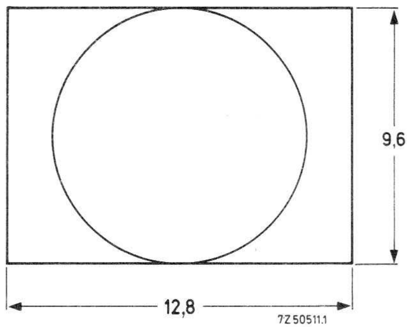
VERTICAL COIL

white (-) grey (+)

FOCUS COIL

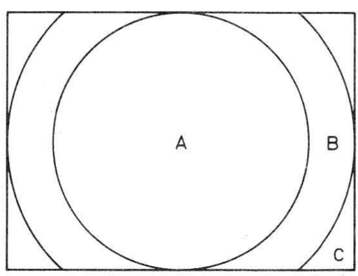
Geometric distortion

Distortion,	inside the circle	max. 0,5 % of picture height
	outside the circle	max. 1 % of picture height



Registration

The deflection units are supplied in matched sets of three units wherein the misregistration in any set is not greater than :



in zone A 25 ns

in zone B 40 ns

in zone C 80 ns

The errors are horizontally and vertically measured.

DEFLECTION UNIT FOR 5/8 inch PLUMBICON TUBE

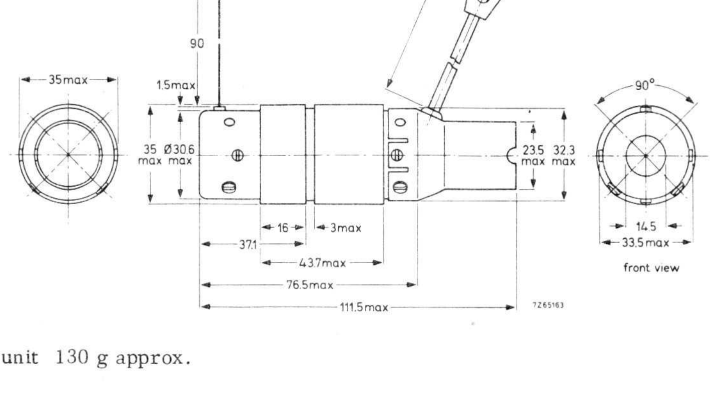
A 55071-1

APPLICATION

Deflection unit, consisting of deflection and alignment coils for a rear-loading 5/8 inch Plumbicon tube *).

MECHANICAL DATA

Dimensions (mm)



Mass per unit 130 g approx.

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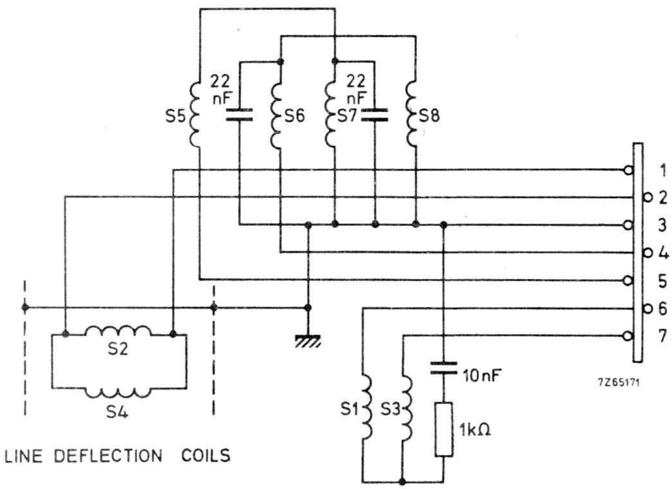
*) Registrated Trade Mark for television camera tube.

ELECTRICAL DATA



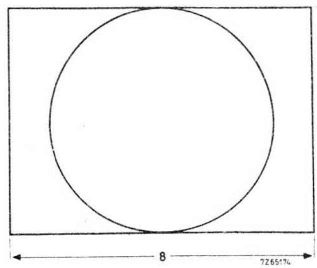
coils		inductance (mH)	resistance at 25 °C (Ω)
line deflection coils	S2 // S4	0,785 ± 10 %	10 ± 10 %
frame deflection coils	S1 + S3	13,2 ± 10 %	155 ± 10 %
alignment coils (horizontal)	S6 + S8		520 ± 10 %
alignment coils (vertical)	S5 + S7		520 ± 10 %

Required currents for normal operation (V_{g2-4} = 300 V; V_{g5} = 600 V)

Line deflection current, p-p	140 mA
Frame deflection current, p-p	25 mA
Alignment current at 0, 2 mT	7,5 mA

Geometric distortion

Distortion	inside the circle	max. 0.5 % of picture height
	outside the circle	max. 1 % of picture height



DEFLECTION UNIT FOR 1 inch PLUMBICON TUBE

The deflection unit AT1119/01 is one of the three units which together form the computer-selected triplet AT1115/01.

For particulars see data sheets of deflection units AT1115/01.

APPLICATION

Can be used where rear-loading and good magnetic screening are required, e.g. in space-craft applications.

Cameras

AT1132/01 — 50 mm

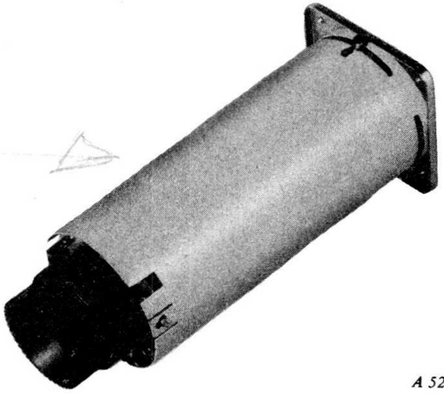
5122 100 87740
5122 112, 60312.
5122 [illegible]

AT1113/01
02
05
06.

Limit 100 to cameras
6030

23212
23212

DEFLECTION UNIT FOR 1¼ inch PLUMBICON TUBE



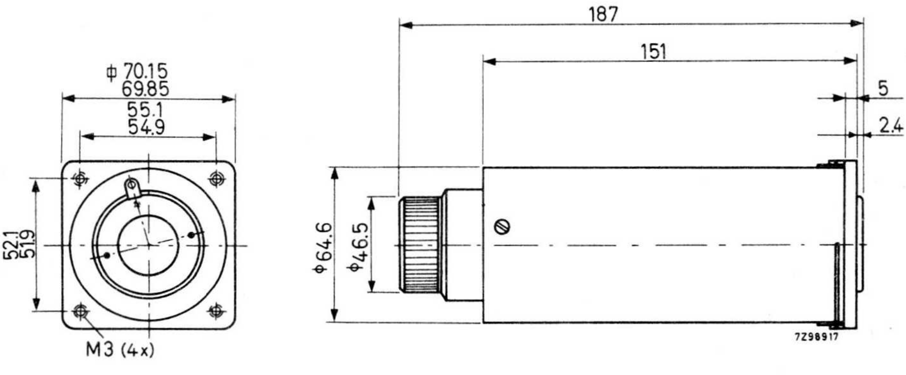
A 520 32 - 1

APPLICATION

Deflection assembly, consisting of deflection, focus and alignment coils for a Plumbicon tube *).

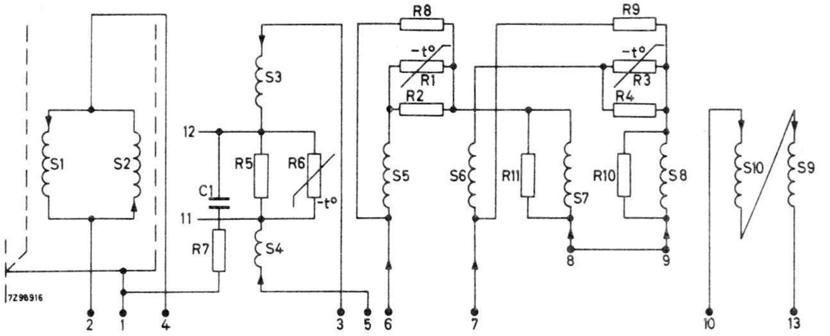
MECHANICAL DATA

Dimensions in mm

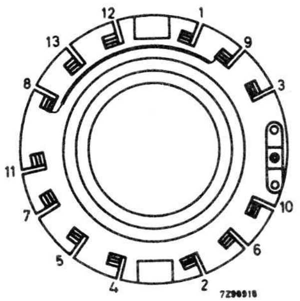


*) Registrated Trade Mark for television camera tube.

ELECTRICAL DATA (typical values)



S_1 - S_2	= line deflection coils	R_1, R_3	= 1300 Ω ± 20% at 25 °C (NTC)
S_3 - S_4	= frame deflection coils	R_2, R_4, R_7	= 560 Ω
S_5 - S_8	= alignment coils	R_5	= 33 Ω
S_9 - S_{10}	= focus coils	R_6	= 32 Ω ± 20% at 25 °C (NTC)
C_1	= 10 nF	R_8, R_9, R_{10}, R_{11}	= 22 kΩ



coils	measuring points	inductance (mH)	resistance (Ω)
$S_1 + S_2$	2 - 4	0,97 ± 3 % ✓	2,4 ± 10 % ✓
$S_3 + S_4$	3 - 5	22,1 ± 4 % ✓	80 ± 10 % 68
$S_5 + S_7$	6 - 8		2025 ± 10 % *) ✓
$S_6 + S_8$	7 - 9		2025 ± 10 % *) ✓
$S_9 + S_{10}$	10 - 13		2750 ± 10 % 150 ± 10
Internal shield	1		

*) Resistance drift between 25 and 60 °C is 0,75 %.

Required currents for normal operation

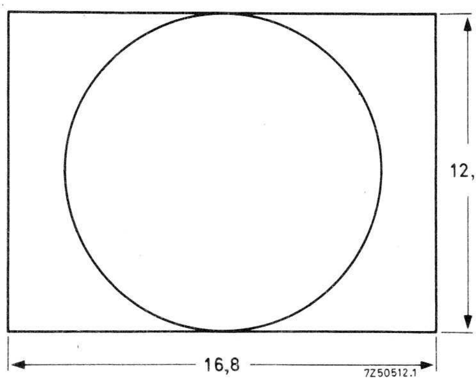
Tube setting: V_{g3} = 600 V, V_{g4} = 675 V with respect to the cathode potential

Nominal scanning area 12, 6 x 16, 8 mm

Line deflection current, p-p	210 mA
Frame deflection current, p-p	32 mA
Focus current ($S_9 + S_{10}$ in series)	25 mA
Maximum alignment currents	1 mA will cause a shift of ≥ 0, 8 % of picture height

Geometric distortion

Distortion inside the circle	max. 0, 5 % of picture height
outside the circle	max. 1 % of picture height



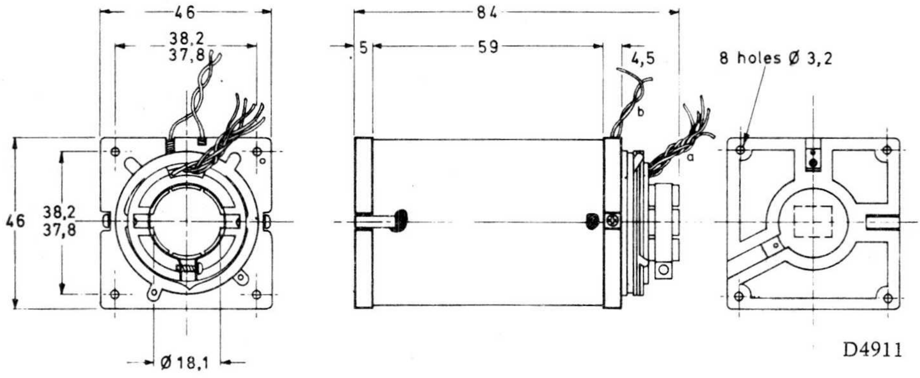
DEFLECTION UNIT FOR 2/3 inch VIDICON

APPLICATION

Deflection assembly consisting of deflection and focus coils and alignment ring magnets for 17,7 mm (2/3 in) diameter vidicon tubes, e.g. XQ1270 and XQ1271.

MECHANICAL DATA

Dimensions in mm



D4911

Mass of the unit	300 g approx.

Alignment ring magnets

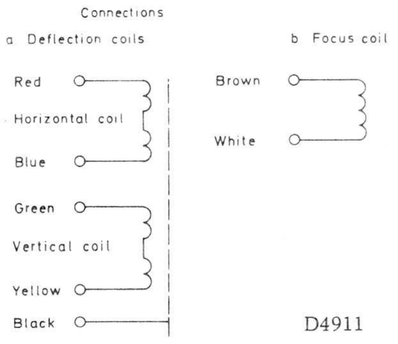
Magnet rotation torque (with one ring fixed)	0,005 to 0,15 Nm

Leads

Colour coding as shown (next page)	
Length from rear surface of focus flange	190 ± 10 mm
	5 mm

ELECTRICAL DATA

Operating temperature -10 to +60 °C



D4911

coils	inductance (mH)	resistance (Ω)
line deflection coils [1]	0,86 ± 10%	3,2 ± 10%
field deflection coils [1]	28,7 ± 10%	146 ± 10%
focus coil [2]		55 ± 5%

Required currents for normal operation (XQ1270, XQ1271, scanning 8,8 mm x 6,6 mm, $V_{g3} \approx 275$ V, $V_{g2} = 300$ V)

Line deflection current, p-p	160	mA	± 5%
Field deflection current, p-p	25	mA	± 5%
Focus current at 5 mT	120	mA	
Insulation resistance between coils and between coils and earth shield	> 50	MΩ	
Flux density (at 120 mA) of focus coil	5 ± 10%	mT	
Flux density of alignment ring magnets	0,05 to 0,5 ± 0,1	mT	

Geometric distortion

Barrel, keystone and pincushion distortions are within 2%

Rectangularity 90° ± 2°

[1] If a positive going voltage is applied to the red lead (line coils) and to the green lead (field coil) normal scanning will be obtained.

[2] If a positive voltage is applied to the brown lead, the south pole is at the front of the coil.

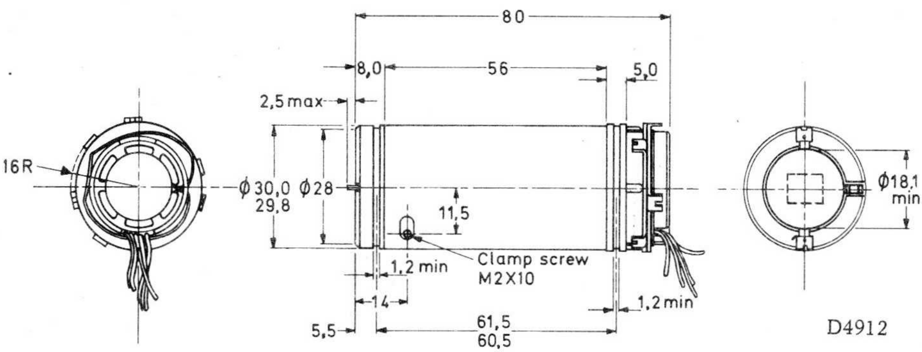
DEFLECTION UNIT FOR 2/3 inch VIDICON

APPLICATION

Deflection coil assembly consisting of deflection coils and alignment ring magnets for 17,7 mm (2/3 in) diameter vidicon tubes with magnetic deflection and electrostatic focusing, e.g. XQ1272.

MECHANICAL DATA

Dimensions in mm



Mass of the unit — 56 g approx.

<u>Alignment ring magnets</u>

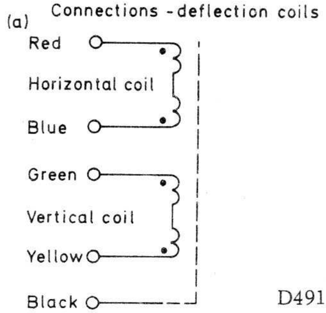
Magnet rotation torque (with one ring fixed)	0,005 to 0,15	Nm

<u>Leads</u>

Colour coding as shown (next page)		
Length from rear of deflection unit	190 ± 10	mm

ELECTRICAL DATA

Operating temperature -10 to +60 °C



D4912

coils	inductance (mH)	resistance (Ω)
Line deflection coils [1]	0,9 ± 10%	4,6 ± 10%
Field deflection coils [1]	23 ± 10%	146 ± 10%

Required currents for normal operation (XQ1272, scanning 8,8 mm x 6,6 mm, V_{g5} = 500 V, V_{g3} = V_{g2} = 300 V)

Line deflection current, p-p	160	mA	± 5%
Field deflection current, p-p	25	mA	± 5%
Insulation resistance between coils and between coils and earth shield	> 50	MΩ	
Flux density of alignment ring magnets	0,3 to 3 ± 0,1	mT	

Geometric distortion

Barrel, keystone and pincushion distortions are within 2%

Rectangularity $90^{\circ} \pm 2^{\circ}$

[1]) If a positive going voltage is applied to the red lead (line coils) and to the green lead (field coil), normal scanning will be abtained.

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