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TUBE TYPE
XQ1427 SERIES
PLUMBICON® CAMERA TUBE
®T.M. N.V. Philips of Holland

The Amperex XQ1427 described here is an improved version of the original 2/3" Plumbicon®camera tube introduced in 1974. It is totally interchangeable with the original tube, but has significant improvements in a number of parameters:

-Improved registration and geometry

-Improved flare (reduced by a factor of 3)

-Improved resolution (typical response 60% in green at 4MHz)

The tube retains the excellent sensitivity and lag performance that made the original XQ1427 instrumental in the success of Electronic News Gathering and small field production cameras. It has excellent highlight handling capabilities and burn-in resistance characteristics.

The XQ1427 is a 17.7mm (2/3 in.) diameter Plumbicon® television camera tube with high resolution lead-oxide photoconductive target, separate mesh construction, low heater power, magnetic deflection and magnetic focusing.

The XQ1427R, XQ1427G and XQ1427B types are intended for use in color cameras in Field Production, Broadcast Studio, Electronic News Gathering, educational and high quality industrial applications while the XQ1427 type is intended for monochrome cameras in these same applications.

GENERAL CHARACTERISTICS

MECHANICAL

Focusing Method		Magnetic
Deflection Method		Magnetic
Dimensions and basing		See outline drawing
Mounting Position		any
Weight		0.8 oz.
Base		JEDEC E7-1, with pumping stem
Accessories		
Socket		56049
Deflection and Focus Coil Assembly	monochrome	KV12 or equivalent
	color	AT1106 or AT1105

OPTICAL

Dimensions of Quality Area of Target (note 1)		6.6mm X 8.8 mm (.26" X .35")
Image Orientation		Horizontal scan parallel to plane of tube axis and gap between pins 1 and 7.
Faceplate		
Refractive index		n = 1.49
Refractive index of antihalation glass disc		n = 1.52
Sensitivity (note 2)		
at color temperature of illumination = 2856°K	XQ1427	375 μA/lm
	XQ1427R	115μA/lm
	XQ1427G	140μA/lm
	XQ1427B	42μA/lm

Amperex®

ELECTRICAL

Heater	Indirect AC or DC, parallel or series supply
Heater Voltage	6.3V ± 5%
Heater Current	95mA
(When the tube is used in a series heater chain, the heater voltage must not exceed an RMS value of 9.5V when the supply is switched on). (To avoid registration errors in color cameras, stabilization of the heater voltage is recommended.)	
Capacitance, target to all other electrodes (This capacitance increases when tube is inserted in a coil assembly)	1.5pF to 3pF
Gun Cut-off Grid No. 1 voltage for picture cut-off at V_{g2} = 300V without blanking	-30V to -80V
Blanking Voltage, peak-to-peak	
on grid No. 1	50V ± 10V
on cathode	25V
Grid No. 2 Current at normally required beam currents	0.5mA max.

MAXIMUM RATINGS

(All voltages are referred to the cathode, unless otherwise stated)

Signal Electrode Voltage (note 3)	50V
Grid No. 4 Voltage	1000V
Grid No. 3 Voltage	750V
Voltage between Grid No. 4 and Grid No. 3	400V
Grid No. 2 Voltage	350V
Grid No. 1 Voltage, positive	0V
negative	200V
Heater to Cathode Voltage, peak, positive	125V
peak, negative	50V
Ambient and Faceplate Temperature (storage and operation)	-30 to + 50°C (-22 to + 122°F)*
Faceplate Illumination (note 4)	500 lx (46.5 f.c.)

At all times, $V_{g4} \geq V_{g3} \geq V_{g2}$

(Allow a minimum of one minute cathode heating time before drawing cathode current.)

*This tube can withstand short excursions to 70°C (160°F) without any damage or irreversible degradation in performance.

TYPICAL OPERATING CONDITIONS AND PERFORMANCE

TYPICAL OPERATING CONDITIONS

(using coil unit AT1105)

Signal Electrode Voltage	45V
Grid No. 4 Voltage (note 5)	750V
Grid No. 3 Voltage (note 5)	475V
Grid No. 2 Voltage	300V
Cathode Voltage	0V
Beam Current	see note 6
Focusing and Deflection Coil Current	
Color coil assembly AT1105	
Focus Current	40mA
Line Current (P-P)	320mA
Frame Current (P-P)	120mA
Alignment Flux Density	0 - 2.5 Gs
Faceplate Temperature	20 to 45°C (68 to 113°F)
Geometric Distortion (see note 9)	< 1%
Blanking Voltage, peak-to-peak, grid No. 1	50V

PERFORMANCE

Dark Current	$\leq$ 1.5nA
Gamma of Transfer Characteristic	0.95 ± 0.05
(Gamma stretching circuitry is recommended)	
Spectral Response, max	≈ 500nm
cut-off, XQ1427, G, B	≈ 650 to 850nm
XQ1427R	≈ 850nm
Limiting Resolution	$\geq$ 700 TV Lines

RESOLUTION:

	XQ1427	XQ1427R	XQ1427G	XQ1427B
HIGHLIGHT SIGNAL CURRENT I_S	150nA	75nA	150nA	75nA
BEAM CURRENT I_b	300nA	150nA	300nA	150nA
MODULATION DEPTH AT 320 TV LINES	60%	55%	60%	65%

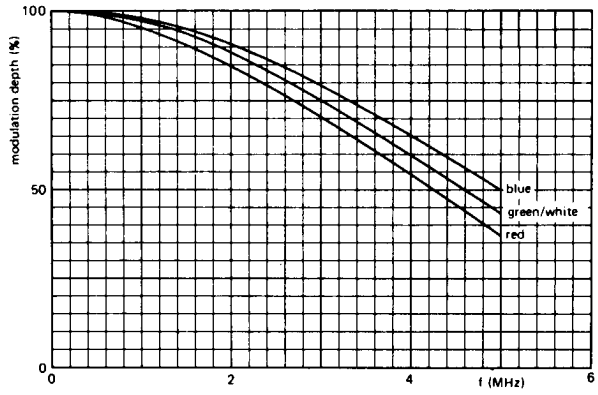


Fig. 1 Modulation Transfer Characteristics

Spurious Signals (Blemishes) - Refer to the Amperex Spurious Signal Specification for Broadcast Quality Plumbicon® TV Camera Tubes.

LAG (TYPICAL VALUES):

LOW KEY CONDITIONS (Zero Bias Light)

	BUILD-UP LAG (NOTE 7)				DECAY LAG (NOTE 8)			
	I_S/I_b =50nA/300nA		I_S/I_b =50nA/150nA		I_S/I_b =50nA/300nA		I_S/I_b =50nA/150nA	
	50ms	200ms	50ms	200ms	50ms	200ms	50ms	200ms
XQ1427	95%	≈100%	–	–	4%	2%	–	–
XQ1427G	95%	≈100%	–	–	4%	2%	–	–
XQ1427R	–	–	95%	≈100%	–	–	3.5%	1%
XQ1427B	–	–	95%	≈100%	–	–	4%	1.5%

HIGH KEY CONDITIONS (Zero Bias Light)

	BUILD-UP LAG (NOTE 7)				DECAY LAG (NOTE 8)			
	I_S/I_b = 150nA/300nA		I_S/I_b = 75nA/150nA		I_S/I_b = 150nA/300nA		I_S/I_b = 75nA/150nA	
	50ms	200ms	50ms	200ms	50ms	200ms	50ms	200ms
XQ1427	96%	100%	–	–	< 2%	1%	–	–
XQ1427G	96%	100%	–	–	< 2%	1%	–	–
XQ1427R	–	–	96%	100%	–	–	< 2%	1%
XQ1427B	–	–	96%	100%	–	–	< 2%	1%

XQ1427

Decay Lag: (Low Key Conditions, 50nA I_s)

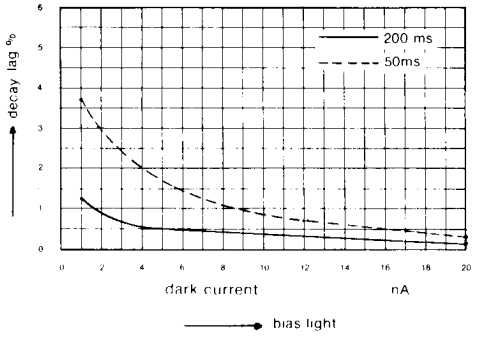


Fig. 2 XQ 1427 R

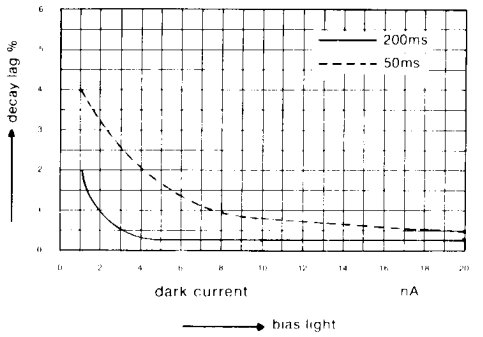


Fig.3 XQ 1427 G

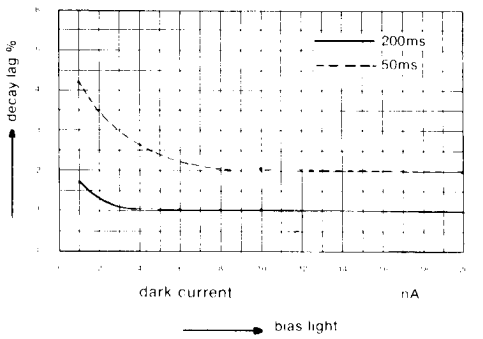


Fig. 4 XQ 1427 B

Fig. 2, 3, 4 Variation of Decay Lag with Bias Light

Build-Up Lag:

The 50 ms Build-Up Lag is essentially 98-100% with any bias light induced dark current above 4 nA. (It is recommended that a Schott KG 3 or equivalent filter be inserted in Bias Light Optics)

NOTES:

1. Underscanning of the specified target area (6.6mm X 8.8mm), or failure of scanning, should be avoided since damage to the target may occur.

2. All measurements are made with an infrared reflecting filter, Balzers Calflex B1/K1, interposed between light source and the target.

   The illumination level is approximately 10.5 lx (.97f.c.) when this filter is removed. For chrominance tubes the appropriate filters are inserted.

   Filters used:

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

3. Plumbicon tubes do not permit automatic sensitivity control by means of regulation of the signal electrode voltage. Therefore, adequate control is to be achieved by other means such as iris control and neutral density filters.

   If the tube is used in cameras originally designed for vidicon tubes, the automatic sensitivity control circuitry should be made inoperative and the signal electrode voltage set to 45V.

4. This rating is for short intervals only. During storage the tube must be covered (a plastic hood is provided for this purpose) and when the camera is idle the lens must be capped. If camera is in standby operation, the lens must be capped and the beams turned off.

5. The optimum voltage ratio V_{g4}/V_{g3} to minimize beam landing errors (preferably $< 1V$) depends on the type of coil unit used. In the KV12 unit a ratio of 1.5 to 1.6 is recommended, whereas the coil unit AT1105 will require a ratio of 1.6 to 1.7.

6. The beam current, obtained by adjusting the control grid (grid No.1) voltage, is set to 150nA for R and B tubes, 300nA for monochrome and G tubes. Note that this beam current is not the actual current available in the scanning beam, but is defined as the maximum amount of signal current that can be obtained with this beam.

7. Build-up Lag. After 10 seconds of complete darkness. Values shown relating to build-up lag represent the typical percentages of the ultimate signal obtained as a function of time, after the illumination has been applied.

8. Decay Lag. After a minimum of 5 seconds. Values shown relating to decay lag represent the residual signal currents in percentages of the original signal current as a function of time, after the illumination has been removed.

9. At a distance from the picture center equal to 0.70 times the picture diagonal.

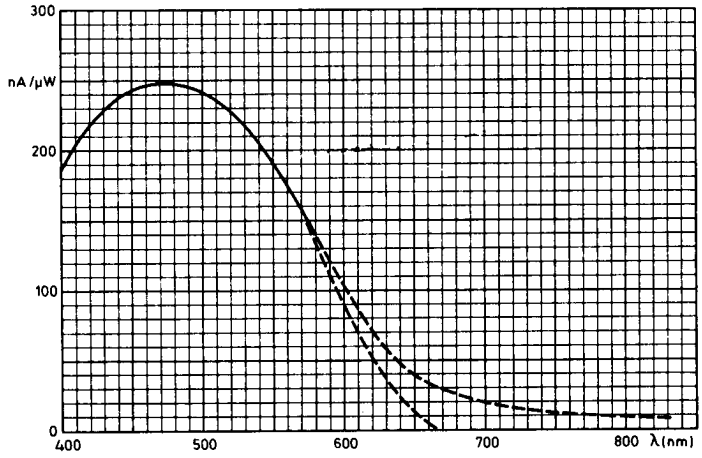


Fig. 5 Typical spectral response curve XQ1427, G, B

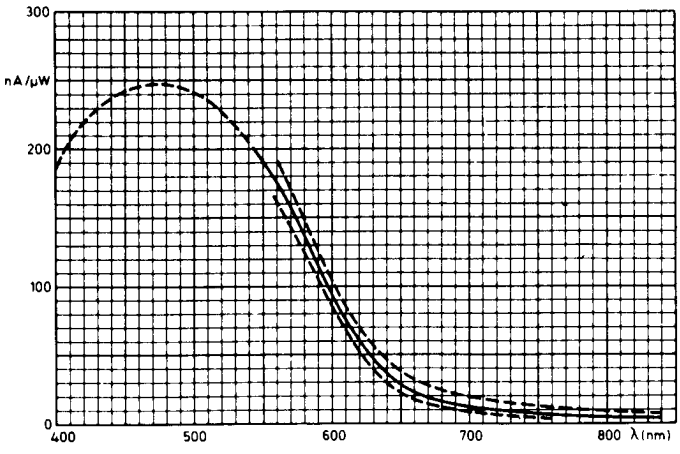


Fig. 6 Typical spectral response curve XQ1427 R

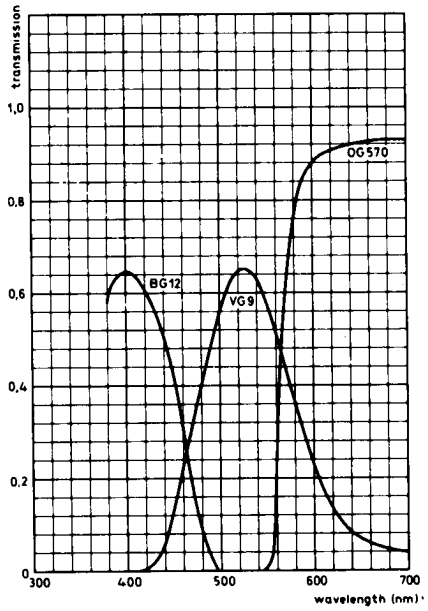


Fig. 7 Transmission of filters BG12, VG9, and OG570

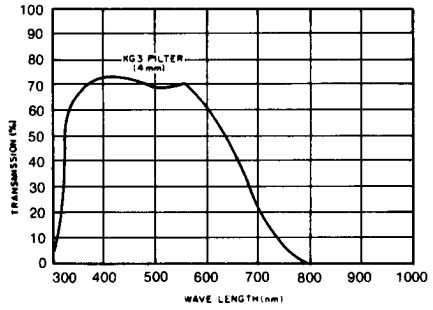


Fig. 8 KG 3 Filter Characteristics

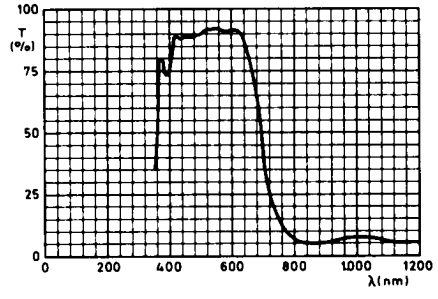
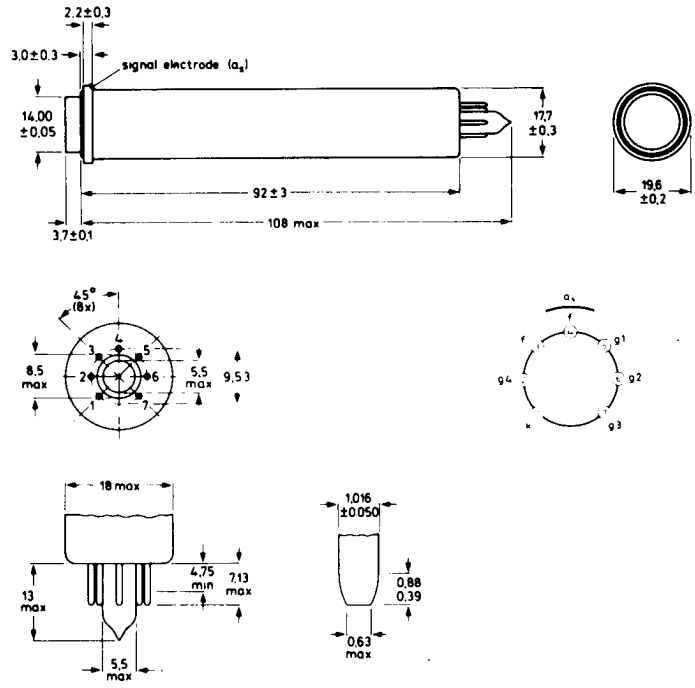


Fig. 9 Typical transmission curve of heat reflecting interference filter CALFLEX B1/K1

mm	INCH
0.050	0.001
0.2	0.007
0.3	0.011
0.39	0.015
0.63	0.024
0.88	0.034
1.0	0.039
1.016	0.04
2.3	0.090
3.0	0.118
4.75	0.187
5.5	0.216
7.13	0.280
8.5	0.334
9.53	0.375
13.0	0.511
17.7	0.696
18.0	0.708
19.6	0.771
92.0	3.622
108.0	4.252



OUTLINE DRAWING

Dimensions in mm