Amperex announces a new family of Plumbicon® tubes with 37% less lag*

When we first introduced the Plumbicon, its obvious superiority made it seem like the "ultimate" TV pickup tube. But in the dozen years since then we have produced a steady stream of advances in technology that have vastly improved its performance.

Now, with the new XQ1410 family of Plumbicons, we bring you the next step forward in pickup tubes for broadcast color: Internal bias lighting—resulting in a dramatic reduction in lag **that conquers even the toughest low-key lighting conditions.**

No more color fringing...vastly reduced picture smear ...even better dynamic resolution than before—and all with the traditional Plumbicon's spectacular color performance.

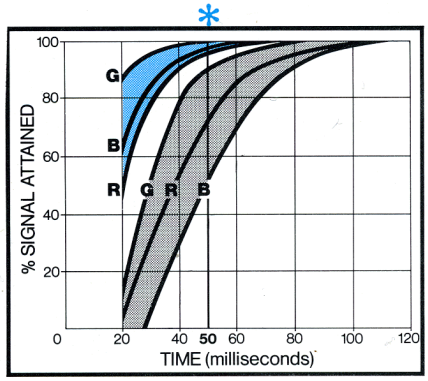
Bias lighting has been offered before...as in our XQ1080, available for the past four years...but never in a fully integrated line of variable- and fixed-bias light tubes. The XQ1410 family is physically and electrically interchangeable with our industry-standard XQ1020 family. Only a minor field change is required to permit adjustment of bias light intensity if you use variable-bias tubes. (We supply complete instructions, of course.)

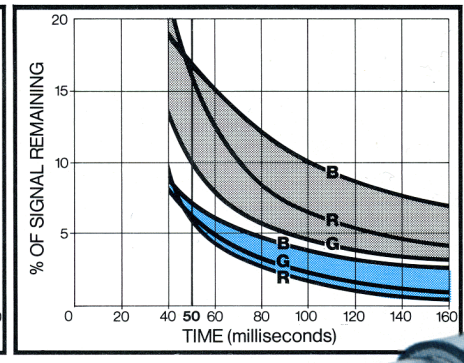
With bias lighting, the Plumbicon's near-zero dark current rises to a few nanoamperes to modify the target's beam-acceptance characteristics. The effect is to sharply decrease both rise time (signal buildup lag) and decay lag in all three channels. As shown below, the result of optimizing all three bias currents, in a "typical" camera, is a 37% reduction in lag.

Since the bias light intensity can be externally adjusted in each of the XQ1410 tubes...luminance (XQ1410L), red channel (XQ1410R), green channel (XQ1410G), and blue channel (XQ1410B)...all channels can be matched within the camera for identical lag characteristics, thus optimizing overall camera performance at levels never before achievable. The result: A new plateau in the quality of broadcast color. You'll have to see it to believe it.

For detailed information on our latest advance in the technology of the Plumbicon...the pickup tube used by 90% of all TV broadcasters...write or telephone: Amperex Electronic Corporation, Slatersville Division, Slatersville, Rhode Island 02876. Telephone: 401-762-3800.

*





IMPROVEMENT IN XQ1410 RISE TIME LAG PERFORMANCE with bias-light-induced dark current

At 50 ms, average % signal attained rises from 71.7% to 98.5%—a 37% overall improvement in rise time lag performance

Selecting optimum dark currents (e.g. Red = 4nA, Blue = 8nA, Green = 3nA) reduces spread in % signal attained from 39.5% to 3%—a 13X improvement in "incremental rise time lag."

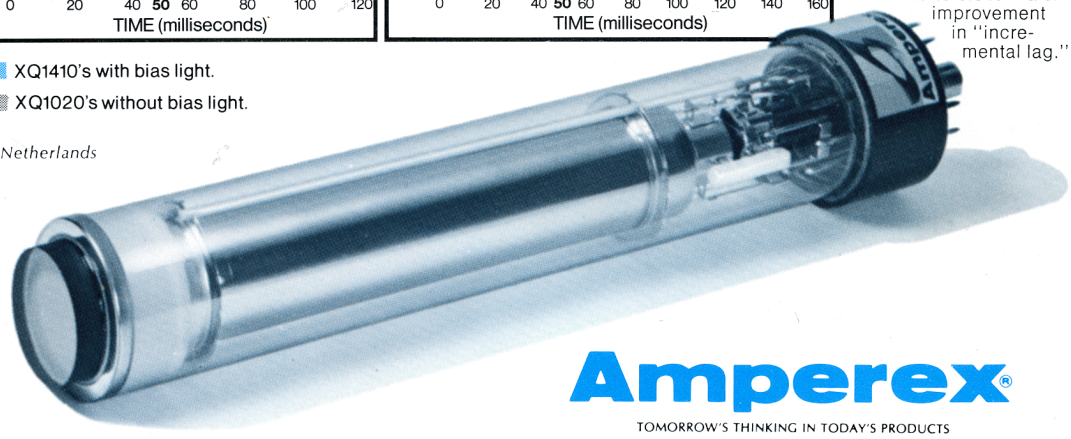
REDUCTION IN XQ1410 DECAY LAG with bias-light-induced dark current

At 50 ms, average % signal remaining falls from 15% to 7%—a 50% overall reduction in decay lag.

Same optimum dark currents reduce spread in % signal remaining from 7% to 0.8%—a 9X improvement in "incremental lag."

XQ1410's with bias light.

XQ1020's without bias light.



® Reg. T.M. of N.V. Philips of the Netherlands

For further details and applications information, send for Bulletin No. 31.

Amperex®

TOMORROW'S THINKING IN TODAY'S PRODUCTS

A NORTH AMERICAN PHILIPS COMPANY

Amperex Electronic Corporation
A NORTH AMERICAN PHILIPS COMPANY
SLATERSVILLE DIVISION
Providence Pike
Telephone: 401/762-3800
Slatersville, R.I. 02876
TWX: 710/382-6332

TYPE XQ1410 SERIES
PLUMBICON® CAMERA TUBE

® T.M. N.V. Philips of Holland

ADVANCE DATA

The Amperex XQ1410 Series is a 30mm (1.2 in.) diameter Plumbicon television camera tube with high resolution lead oxide photoconductive target, seperate mesh construction, magnetic deflection and magnetic focusing. Special features of this series include an anti-halation disc and internal light bias.

The XQ1410 type is intended for use in monochrome cameras, and the XQ1410L, XQ1410R, XQ1410G, XQ1410B types in color cameras, in broadcast, educational and high quality industrial applications.

The XQ1410 Series is interchangeable with the XQ1020 series, however, the XQ1410 series has increased resolution and internal light bias for reduction of lag under low-key conditions.

GENERAL CHARACTERISTICS

MECHANICAL

Focusing Method		Magnetic
Deflection Method		Magnetic
Dimensions and Basing		see outline drawing
Mounting Position		any
Weight		3.5 oz
Accessories		
Socket		56021
Variable Light Bias Adaptor (Note 1a)		56106
Fixed Light Bias Adaptor (Note 1b)		
	XQ1410	56122
	XQ1410L	56124
	XQ1410R	56123
	XQ1410G	56124
Deflection and Focus Coil Assembly	monochrome	AT1132, AT1132/01 or equiv.
	color	AT1113, AT1113/01 or equiv.

OPTICAL

Dimensions of quality area of target (note 2)	12.8mm X 17.1mm (.51" X .68")
Image orientation	Vertical scan parallel to plane of tube axis and mark on tube base.

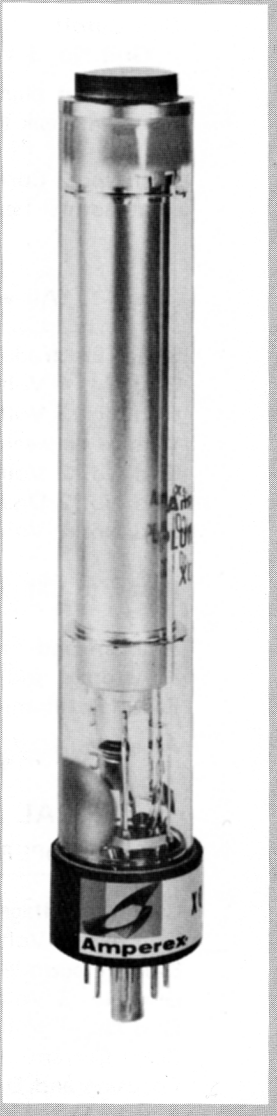
Faceplate

Total Thickness, including anti-halation glass disc	7.2 ± 0.2 mm
Refractive index	n = 1.49
Refractive index of anti-halation glass disc	n = 1.52

Sensitivity

(Illumination = 4.54 lx (.42 f.c.) at black body color temperature of 2856°K)
(measured with filter specified.)

XQ1410, XQ1410L	No Filter	400μA/lm typ.
XQ1410R	Filter 0G570 (3mm Thickness)	85μA/lm typ.
XQ1410G	Filter VG9 (1mm Thickness)	165μA/lm typ.
XQ1410B	Filter BG12 (3mm Thickness)	38μA/lm typ.



Amperex®

XQ1410 SERIES

ELECTRICAL

Heater	Indirect AC or DC, parallel supply
Heater Voltage	6.3V ± 5%
Heater Current	300mA
(To avoid registration errors in color cameras, stabilization of heater voltage is recommended)	
Capacitance, target to all other electrodes	3 pF to 6 pF
(This capacitance increases when tube is inserted in a coil assembly)	
Gun Cutoff	
Grid No. 1 voltage at V_{g2} = 300V	V_{g1} = -30V to -100V
(without blanking applied)	
Blanking, peak-to-peak, on grid No. 1	50V ± 10V
on cathode	25V
Grid No. 2 Current	
at normal beam currents	I_{g2} = 1mA max.

MAXIMUM RATINGS

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

Signal Electrode Voltage	50V
Grid No. 4 Voltage	1100V
Grid No. 3 Voltage	800V
Voltage between Grid No. 3 and Grid No. 4	350V
Grid No. 2 Voltage	350V
Grid No. 2 Dissipation	1W
Grid No. 1 Voltage, positive	0V
negative	125V
Heater to Cathode Voltage, peak, positive	50V
peak, negative	50V
Ambient and Faceplate Temperature (storage and operation)	-30 to +50°C (-22 to + 122° F)
Faceplate illumination (Note 3)	500 lx (46.5 f.c.)

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

TYPICAL OPERATING CONDITIONS AND PERFORMANCE

TYPICAL OPERATING CONDITIONS

Cathode Voltage	0V
Grid No. 2 Voltage	300V
Signal Electrode Voltage	45V
Grid No. 3 Voltage	600V
Grid No. 4 Voltage	675V
Beam Current	See Note 4
Focusing and Deflection Coil Current (see also note 5) with V_{g3} = 600V, V_{g4} = 650 to 700V	
Monochrome coil assemblies AT1132, AT1132/01	
Focus Current*	≈ 25mA
Line Current (p–p)	≈ 235mA
Frame Current (p–p)	≈ 35mA
Color coil assemblies AT1113, AT1113/01	
Focus Current*	≈ 100mA
Line Current (p–p)	≈ 235mA
Frame Current (p–p)	≈ 35mA
*adjusted for correct electrical focus.	
Faceplate Temperature	20 to 45°C (60 to 113°F)
Blanking Voltage, peak–to–peak, Grid No. 1	50V

PERFORMANCE

Dark Current (without light bias)	≤ 3nA
Gamma of Transfer Characteristic (Gamma stretching circuitry is recommended)	0.95 ± 0.05
Spectral Response, max	500nm
cutoff	650nm
Limiting Resolution	≥ 750 TV Lines
Spurious Signal – refer to Amperex Spurious Signal spec publication	

Resolution:

	XQ1410 XQ1410L	XQ1410R	XQ1410G	XQ1410B
Highlight Signal Current I_S	300nA	150nA	300nA	150nA
Beam Current I_b	600nA	300nA	600nA	300nA
Modulation Depth (Uncompensated amplitude response at 400 TV Lines)	55%	50%	55%	60%

LAG (TYPICAL VALUES):

LOW KEY CONDITIONS (WITH LIGHT BIAS)

Typical effect of light bias on both build–up and decay lag under low key signal current and beam current settings are shown in figures 3 to 8. (See also note 8)

HIGH KEY CONDITIONS (WITH AND WITHOUT LIGHT BIAS)

	BUILD–UP LAG (Note 6)				DECAY LAG (Note 7)			
	I_s/I_b=150nA/300nA		I_s/I_b=300nA/600nA		I_s/I_b=150nA/300nA		I_s/I_b=300nA/600nA	
	50ms	200ms	50ms	200ms	50ms	200ms	50ms	200ms
XQ1410 XQ1410L XQ1410G	––	––	99	100	––	––	1.6	0.4
XQ1410R	98	100	––	––	2.5	0.5	––	–––
XQ1410B	96	100	––	––	4	2	––	––

SHADING OF LIGHT–BIAS INDUCED DARK CURRENT = 12.5% (See Note 9)

NOTES:

1a Variable Bias Lighting

The light bias lamp assembly supplied with each tube (P/N 56106) fits into the metal cylinder cemented to the pumping stem of the tube. The tube and the light bias assembly will properly fit into the standard 56021 socket.

The wires should be connected to a source supplying a maximum of 110mA at 5V. Considerations and recommendations for the choice of such a source, depending on the application, are supplied with each tube. The light bias lamp projects its light via a blue–green transmitting filter on the pumping stem where it is conducted to the target to cause a bias illumination. The desired amount of light bias can be obtained by adjusting the filament current of the small bulb.

1b Fixed Bias Lighting

A color coded lamp assembly is supplied with each tube together with instructions for fitting. It is fitted onto tube pins prior to the socket. With this arrangement the bias lamp and integral series resistor is automatically connected to heater pins and supply. The camera should be capable of supplying a total of 420 mA to heater plus bias lamp per tube.

2. Underscanning of the specified target area (12.8 mm x 17.1 mm), or failure of scanning, should be avoided since damage to the target may occur.

3. 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.

4. The beam current, obtained by adjusting the control grid (grid No. 1) voltage, is set to 300nA for R and B tubes, 600nA for monochrome, L 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.

5. 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.

6. Build–up Lag. After 10 seconds of complete darkness. Values and curves 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.

7. Decay Lag. After a minimum of 5 seconds of illumination on the target. Values and curves 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.

8. a) For monochrome operation a light bias, corresponding to 5nA extra dark current is usually adequate for excellent speed of response.

   b) In a color camera the speeds of response of the tubes can be balanced by adjusting the amount of light bias per tube.

   In a three tube R, G, B camera for instance, it is recommended to first adjust the tubes to their normal highlight signal current and beam current settings and then point the camera at a dark scene comprising a metronome. The moving hand of the metronome carries a small white square.

   The illumination should be chosen such that the square produces a peak signal of approximately 50nA in the green chrominance channel. A maximum of 3nA artificial dark current shall then be induced in the green chrominance tube. Subsequently, light bias shall be applied to the tubes in the red and blue channels, until the lag of the three tubes is neutralized.

   A typical setting for correct speeds of response in a three tube R, G, B camera with a prism color splitter would be 2 to 3nA (R), 1 to 3nA (G) and 6 to 8nA (B).

9. Maximum deviation of the level of any of the four corners, i.e. 10% inwards in H and V direction from the level in picture center.

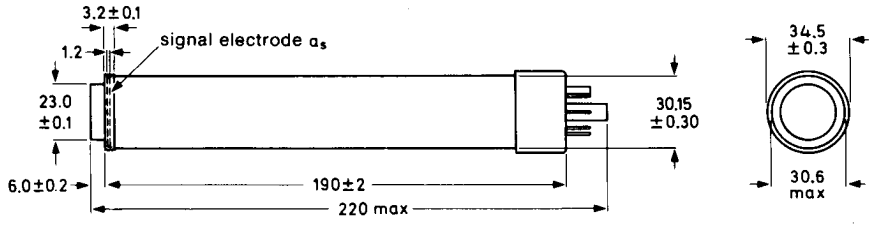
   With the settings suggested in note 8 black shading compensation in the camera video processing amplifier will not normally be required. Further improvement in lag can be obtained by applying still higher light bias levels.

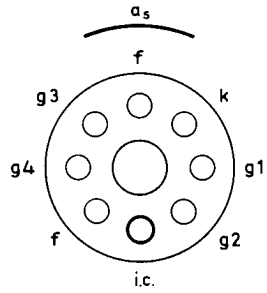
   It may then be necessary to use black shading compensation in the video processing amplifier.

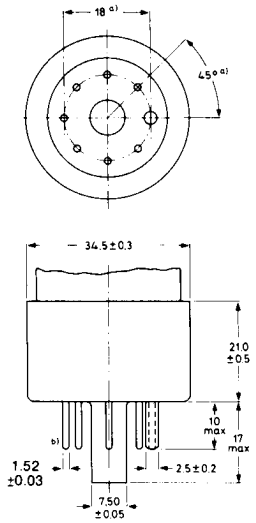
OUTLINE DRAWING

Dimensions in mm

mm	inch
0.03	0.001
0.05	0.002
0.1	0.003
0.15	0.005
0.2	0.007
0.30	0.011
0.5	0.019
1.2	0.047
1.52	0.06
2.0	0.078
2.5	0.098
3.2	0.125
6.0	0.236
7.50	0.295
10.0	0.393
17.0	0.669
18.0	0.708
21.0	0.826
23.0	0.905
30.6	1.204
30.15	1.187
34.5	1.358
190.0	7.480
220.0	8.661







a) The base passes a flat gauge with a center hole 9.00 ± 0.01 mm diameter and holes for passing the pins with the following diameters: 7 holes of 1.750 ± 0.005 mm and one hole of 3.000 ± 0.005 mm.
The holes may deviate max. 0.01 mm 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.

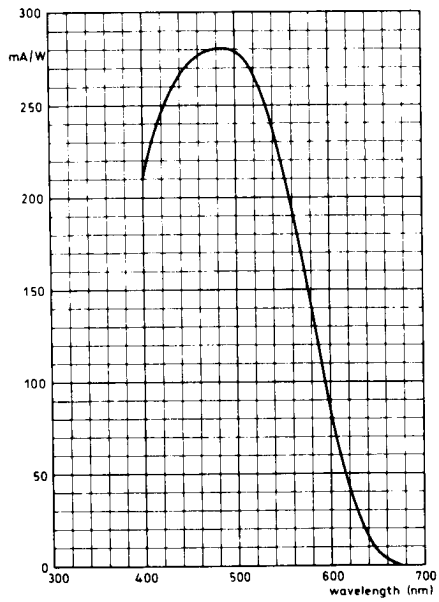


Fig. 1 Spectral response curve

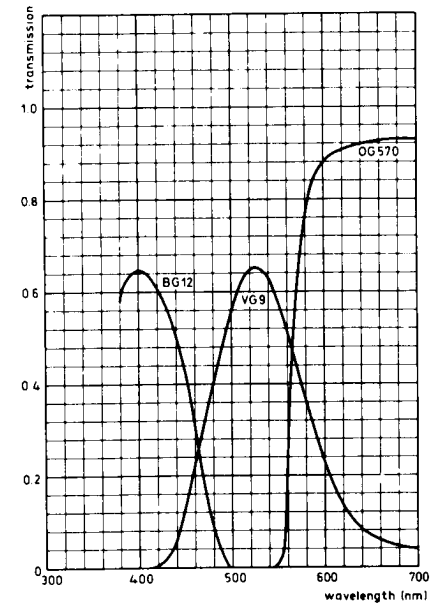


Fig. 2 Transmission of filters BG12, VG9, and OG570

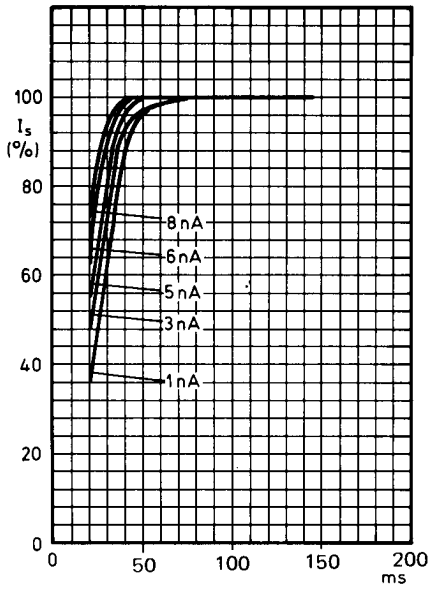


Fig. 3 XQ1410–R
I_s/I_b = 20/300nA

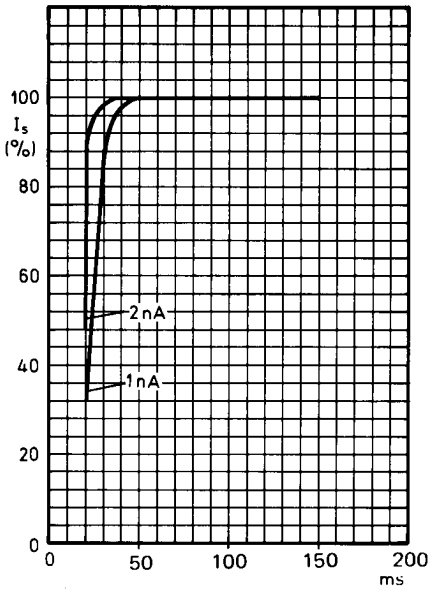


Fig. 4 XQ1410, XQ1410–L, XQ1410–G
I_s/I_b = 40/600nA

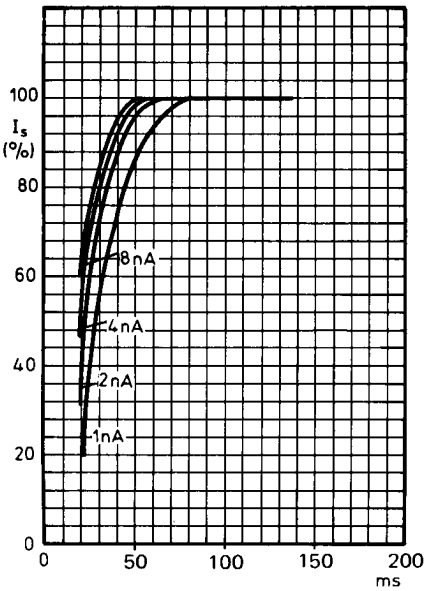


Fig. 5 XQ1410–B
I_s/I_b = 20/300nA

Fig. 3,4,5 – Build–up Lag, with light bias induced dark current

(I_s = Percentage of signal current attained)

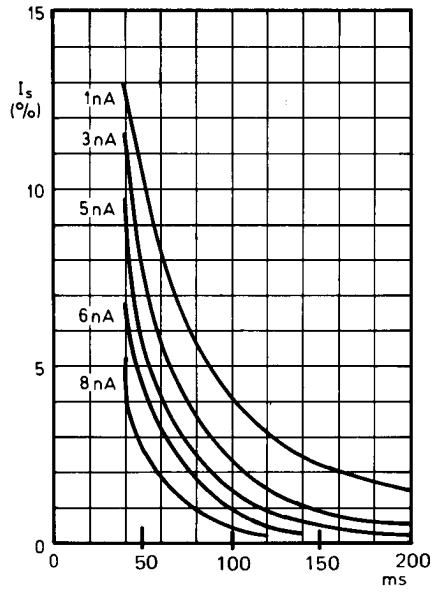


Fig. 6 XQ1410–R
I_s/I_b = 20/300nA

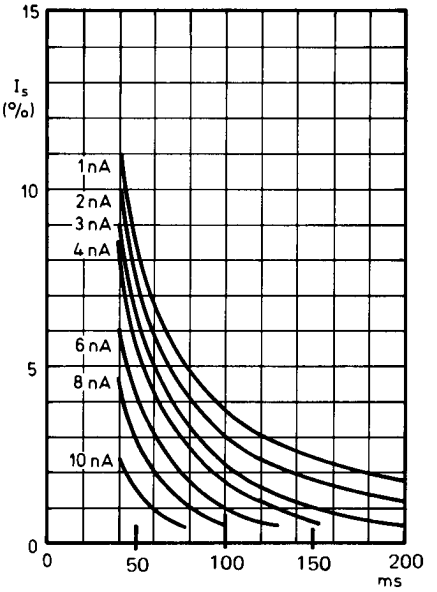


Fig. 7 XQ1410, XQ1410–L, XQ1410–G
I_s/I_b = 40/600nA

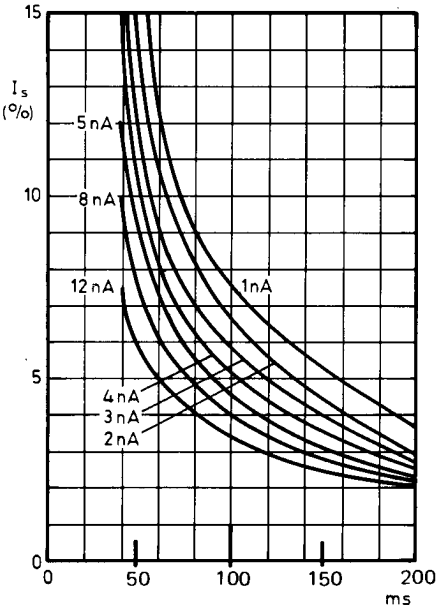


Fig. 8 XQ1410–B
I_s/I_b = 20/300nA

Fig. 6,7,8 – Decay Lag, with light bias induced dark current

(I_s = Percentage of signal current remaining)