PHOTONIS
imaging sensors

Product range and data

Choosing a PMT

Searching with the Type list

If you already know the type number, the main characteristics or applications, please refer to the ***Part 1 - Type list and selection guide***.

Type numbers ending in `B' are plastic based. All-glass and based versions are however available for most types.

Searching the data tables

The published minimum, typical and maximum values are derived from measurements of tubes taken from production over a long period (up to several years for some tubes).

Other values are derived from sampling measurements.

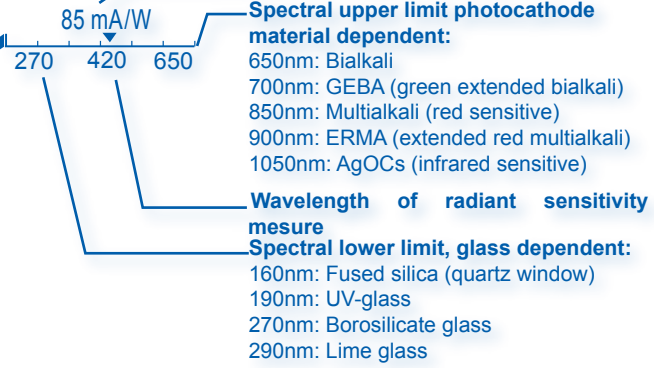
... mm (...'') tubes		**XP...**
Key features		
Dynode structure / number of stages		**b.l.:** box and linear **c.c.:** circular cage
Cathode luminous sensitivity (µA/lm)	typ.	
Cathode blue sensitivity (µA/lmF)	min	
	typ.	
Cathode radiant sensitivity (mA/W)	typ. at (nm)	85 mA/W 270 420 650 Radiant sensititvity at wavelength of peak response (420 nm), except when stated otherwise for red sensitive photocathodes.
Gain	typ.	Published gain curves and gain values are given for type A dividers unless stated otherwise.
Supply voltage	typ.	
	min. (V)	
	max. (V)	
Anode dark current	typ. (nA)	
	max. (nA)	
Anode dark counts	typ. (cps)	Anode dark counts above 0.2 photoelectron threshold.
	max. (cps)	
Max. anode pulse current for linearity 2% (mA)		Maximum anode pulse current for which the relationship between the input illumination and output current is linear to within 2%. Linearity performances are reached with a progressive B type divider.
Time response	rise (ns)	Voltage division other than indicated in the 'Voltage dividers' table may be required to reach the specified values.
	Full Width at Half Maximum FWHM (ns)	
Pulse Height Resolution PHR (%)		Energy resolution highly depends on both crystal quality and packaging.
Maximum ratings	supply voltage (V)	Maximum ambient temperature range: -30 °C to +50 °C; maximum average anode current: 0.2 mA.
	gain	
Accessories	Voltage divider	These voltage dividers optimize linearity and time response. Voltage division is different to that indicated in the 'Voltage dividers' table.
	Socket	See Accessories Part.
	Metal-shields	

The tubes listed are organised by tube diameter for historical reasons. Maintenance tubes, prototype tubes, and customer specific tubes are not listed.

For each tube, general data are given and the key features of the tube are described with the relevant measurements.

Number of stages

General-purpose tubes usually have eight or ten stages and a gain of 10^3 to 10^7 at an applied voltage of 600-1800 V. Lowering the voltage impairs fast response and linearity, so if lower gain is required, choose a tube with fewer stages. For gain higher than 10^7, choose one with more stages; the additional stages enable interdynode voltages to be kept moderate and so prevent dark current from becoming excessive. A tube with twelve stages will safely give a gain of 10^8; a higher gain limits the output current pulse range and is seldom justified. A fast-response tube operating at a gain of 10^9 with a type A voltage distribution (for maximum gain) approaches its linearity limit even with single-electron pulses.



Gain

The gain curves are typical for each tube type. To determine the actual gain curve for an individual tube, plot the gain stated on the test ticket at the indicated supply voltage, and shift the published gain curve vertically (up or down) so that it passes through the plotted point. In other words, simply draw a line parallel to the published line which passes through the plotted point.

Linearity

For applications demanding a high dynamic range, the anode charge linearity or the anode pulse peak current becomes an important parameter. Linear-focused multipliers then provide the best choice.

Response speed

If the rise time required is less than 2 ns, or the required bandwidth more than about 100 MHz, choose a fast- response tube. Such tubes also have the best time resolution.

If the rise time required is a few nanoseconds, or the required bandwidth between 50 and 100 MHz, a standard tube with linear-focusing dynodes is a good choice. Tubes with venetian-blind or foil dynodes are comparatively slow and not suitable for bandwidths of more than about 10 MHz.

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Photocathode spectral sensitivity and size

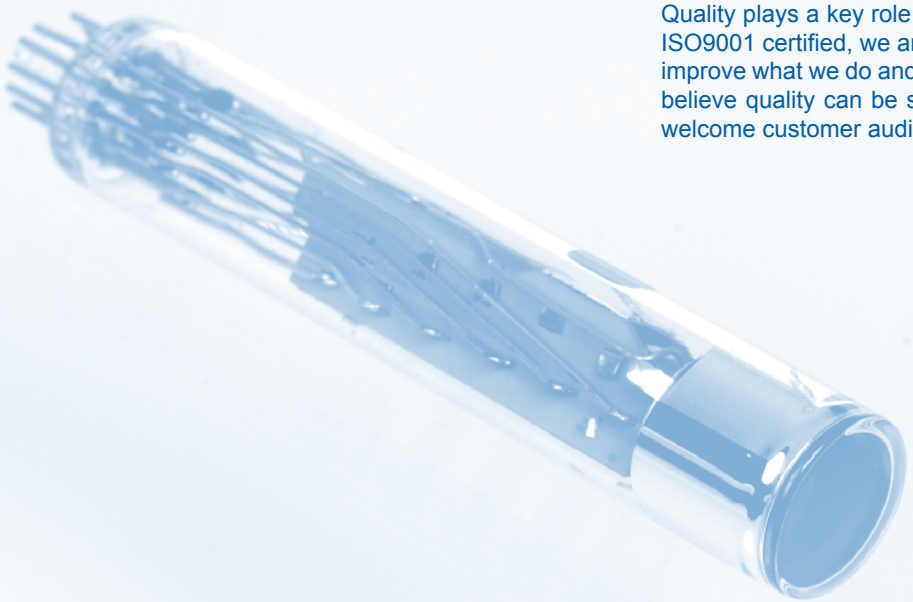
If the light to be detected is monochromatic, choose a PMT whose maximum sensitivity is as close as possible to the same wavelength. If it is not monochromatic, look for the best match between sensitivity and spectral distribution. Keep in mind that the greater the sensitivity in the red, the greater the thermionic emission. And that variations of sensitivity from tube to tube or with temperature are largest close to the photoemission threshold.

The choice of photocathode diameter depends mainly on the size of the incident light beam or source: beam or source size determines the minimum practical diameter but not the maximum. If the equipment or installation does not impose strict constraints on size or weight, tubes with large-diameter cathodes are often preferable to smaller ones (up to about 2" or 51 mm). They are generally more stable and have higher permissible anode currents, and dark current does not vary in strict proportion with cathode diameter.

Drawing keys

Dn: the final dynode of each tube.
K: photocathode.
A: anode(s).
G: accelerating/focusing electrodes.
D: dynodes.
i.c.: internally connected, do not use.
n.c.: not connected, do not use.
s.p.: short pin.
ct: coating means the glass envelope is covered with a conductive coating connected to the cathode. The black paint on top of this coating is neither guaranteed to be light-tight nor insulating.

For a better legibility, drawings are not to scale.
Please, refer to dimensions figures.



Product customisation

As part of a commitment to build ever-stronger partnerships with customers, PHOTONIS is opening up its development capability and production facilities. Starting from your product definition, our team of experts welcomes enquiries to co-design and manufacture fully optimised and integrated custom products.

Of course, this catalogue can only give an indication of our products and capabilities. We therefore look forward to discussing specific requirements with you.

Technical interface

To optimally serve our customers, we employ product specialists dedicated to each major market segment and familiar with its particular requirements. You can access them directly by phone or e-mail (details on this catalogue back cover) or on ***www.photonis.com***.

Product range

A broad range of variants can be made by composing with photocathode, window, glass, dynode materials, number of stages or configuration and pin connection scheme.

Please contact us to discuss any specific product requirements.

Selection and product optimisation

One way of obtaining a specific requirement is to select on one or more parameters from the production parameter spread for a standard tube. Although probably the easiest way to meet a requirement, there are drawbacks. The main ones are cost and delivery time (set by our production schedule for standard tubes). A better approach is to incorporate your specific requirement into our manufacturing processes. The advantages are lower cost and more flexible delivery times.

Product data

Continuous technical advances mean that product data changes quickly. We deliver test tickets or data listing and can provide electronic files when needed.

Quality

Quality plays a key role in all our business operations. Being ISO9001 certified, we are regularly audited which helps us to improve what we do and how we do it. Moreover, because we believe quality can be shared and improved by synergy, we welcome customer audits of our operations.

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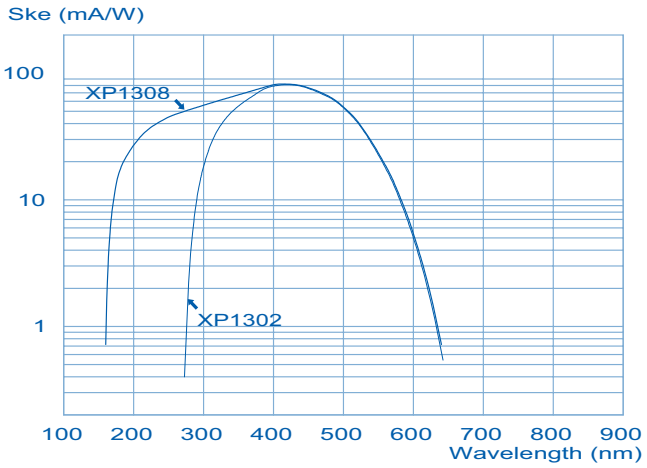
13 mm (1/2") tubes

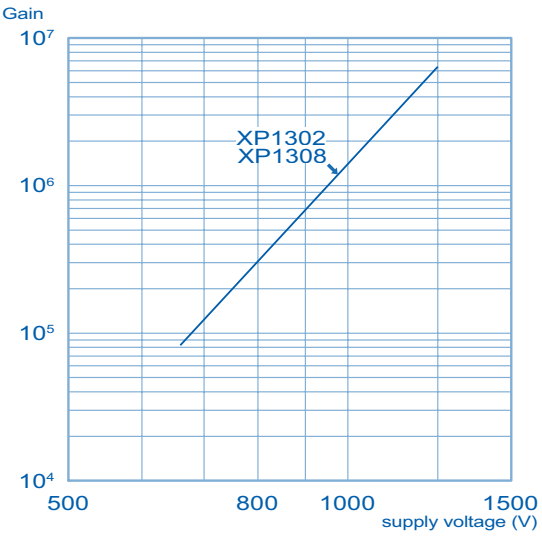
		XP1302	XP1308
Key features			UV sensitive, quartz window
Dynode structure / number of stages		linear focused/10	linear focused/10
Cathode luminous sensitivity (µA/lm)	typ.	105	105
Cathode blue sensitivity (µA/lmF)	min	9	9
	typ.	10	10
Cathode radiant sensitivity (mA/W)	typ. at (nm)	85 mA/W 270 420 650	85 mA/W 160 420 650
Gain	typ.	$1.4x10^6$	$1.4x10^6$
Supply voltage	typ.	1000	1000
	min. (V)	700	700
	max. (V)	1100	1100
Anode dark current	typ. (nA)	1	1
	max. (nA)	15	15
Anode dark counts	typ. (cps)	50	50
	max. (cps)	200	200
Max. anode pulse current for linearity 2% (mA)		20	20
Time response	rise (ns)	2.5	2.5
	FWHM (ns)	3.5	3.5
PHR (%)		16	16
Maximum ratings	supply voltage (V)	1250	1250
	gain	$1.4x10^7$	$1.4x10^7$
Accessories	Voltage divider	---	---
	Socket	FE3113	FE3113
	Metal-shields	---	---

PHR: for radiation source ^{22}Na (511 keV); BGO square scintillator, 13.5 mm x 13.5 mm, h30 mm.

Typical spectral characteristics

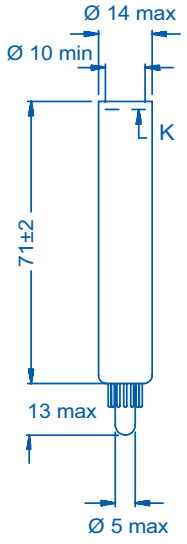


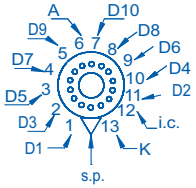
Typical gain curves



Dimensions and pinning

XP1302, XP1308





13-pin all glass

Voltage dividers

Tube	A divider type voltage ratios (for maximum gain)											
	K	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	A
XP1302, XP1308	1	1	1	1	1	1	1	1	1	1	1	

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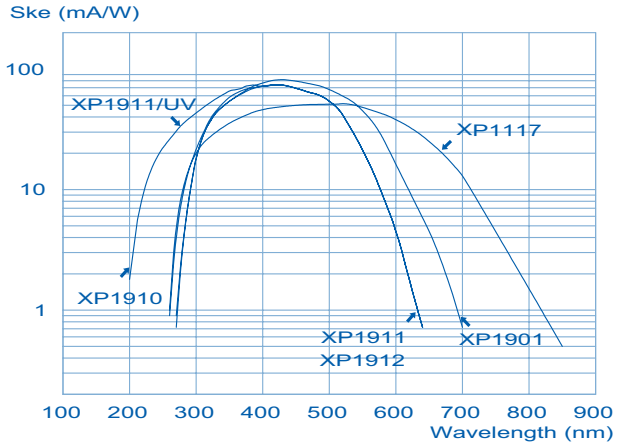
19 mm (3/4") tubes

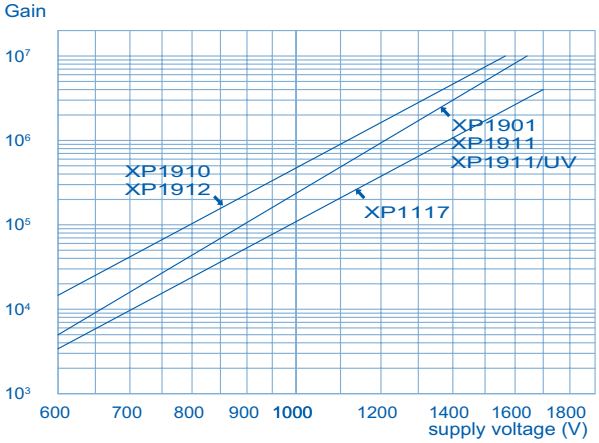
		XP1117	XP1901	XP1910	XP1911	XP1911/UV	XP1912
Key features		ruggedized red-sensitive	green-sensitive	low-voltage		UV-sensitive	low-voltage
Dynode structure / number of stages		focused/9	focused/10	focused/10	focused/10	focused/10	focused/10
Cathode luminous sensitivity (µA/lm)	typ.	140	115 (90 min)	100	100	90	100
Cathode blue sensitivity (µA/lmF)	min	---	---	9	9	9	9
	typ.	11.5	11.5	11	11	10.5	11
Cathode radiant sensitivity (mA/W)	typ. at (nm)	13 mA/W 270 700 850	90 mA/W 290 420 700	85 mA/W 270 420 650	85 mA/W 290 420 650	80 mA/W 190 420 650	85 mA/W 290 420 650
Gain	typ.	$2.1x10^5$	$8.7x10^5$	$9.0x10^5$	$9.5x10^5$	$9.0x10^5$	$9.0x10^5$
Supply voltage	typ.	1100	1200	1100	1200	1200	1200
	min. (V)	900	1 000	920	1 000	1 000	920
	max. (V)	1 400	1 350	1 280	1 350	1 350	1 280
Anode dark current	typ. (nA)	1	5	5	2	2	5
	max. (nA)	10	50	20	10	---	20
Anode dark counts	typ. (cps)	---	---	---	---	2 000	---
	max. (cps)	---	---	---	---	5 000	---
Max. anode pulse current for linearity 2% (mA)		30	80	60	80	80	60
Time response	rise (ns)	3.5	2.3	2.3	2.3	2.3	2.3
	FWHM (ns)	6	3.5	3.5	3.5	3.5	3.5
PHR (%)		7.5	7.5	16	7.5	7.5	16
Maximum ratings	supply voltage (V)	1 900	1 900	1 700	1 900	1 900	1 700
	gain	$4x10^6$	$1x10^7$	$1x10^7$	$1x10^7$	$1x10^7$	$1x10^7$
Accessories	Voltage divider	---	VD108, VD308	VD108, VD308	VD108, VD308	VD108, VD308	VD108, VD308
	Socket	FE1004, FE3112	FE1004, FE3112	FE1004, FE3112	FE1004, FE3112	FE1004, FE3112	FE1004, FE3112
	Metal-shields	MS178	MS178	MS178	MS178	MS178	MS178

PHR: for radiation source ^{137}Cs, NaI Tl scintillator, Ø 12mm, h25 mm; for XP1910 & XP1912 radiation source ^{22}Na, B.G.O. square scintillator, 19 mm x 19 mm, h30 mm.
XP1117 minimum radiant sensitivity at 700nm: 9mA/W

Typical spectral characteristics

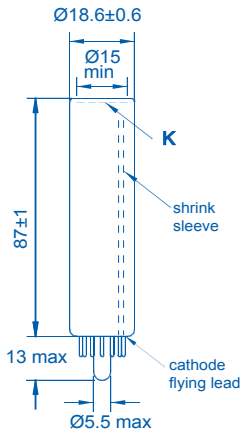


Typical gain curves

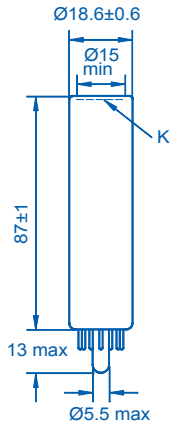


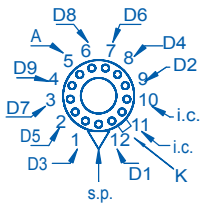
Dimensions and pinning

XP1117

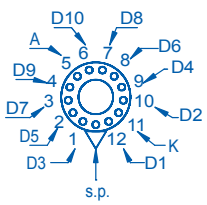


XP1901, XP1910, XP1911, XP1911/UV, XP1912





12-pin all glass



12-pin all glass

Voltage dividers

Tube	A divider type voltage ratios (for maximum gain)							
	K	D1	D2	D3	D4	...	Dn	A
XP1117, XP1901, XP1910, XP1911, XP1911/UV, XP1912	2	1	1.5	1	1	...	1	1

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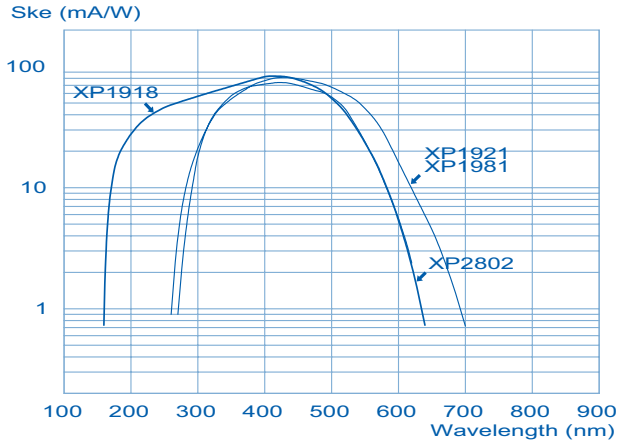
19 mm (3/4") tubes

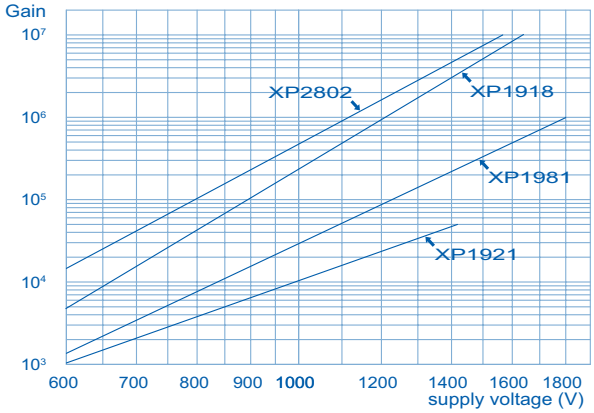
		XP1918	XP1921	XP1981	XP2802
Key features		UV-sensitive	green-sensitive	green-sensitive	low-noise
Dynode structure / number of stages		focused/10	focused/6	focused/8	focused/10
Cathode luminous sensitivity (µA/lm)	typ.	90	115 (90 min)	115 (90 min)	80
Cathode blue sensitivity (µA/lmF)	min	8.5	---	---	9
	typ.	10.5	11.5	11.5	10.5
Cathode radiant sensitivity (mA/W)	typ. at (nm)	80 mA/W 160 420 650	90 mA/W 290 420 700	90 mA/W 290 420 700	80 mA/W 270 420 650
Gain	typ.	$1.0x10^6$	$3.8x10^3$	$8.7x10^4$	$9.0x10^5$
Supply voltage	typ.	1 150	800	1 100	900
	min. (V)	1 000	650	900	700
	max. (V)	1 350	1 000	1 300	1 110
Anode dark current	typ. (nA)	3	2	2	0.3
	max. (nA)	25	20	20	3
Anode dark counts	typ. (cps)	---	---	---	50
	max. (cps)	---	---	---	200
Max. anode pulse current for linearity 2% (mA)		80	80	80	---
Time response	rise (ns)	2.3	2	2	2.2
	FWHM (ns)	3.5	3.2	3.2	5
PHR (%)		7.5	7.5	7.2	8
Maximum ratings	supply voltage (V)	1 900	1 500	1 800	1 700
	gain	$1x10^7$	$5x10^4$	$1x10^6$	$1x10^7$
Accessories	Voltage divider	VD108, VD308	---	VD108, VD308	VD1A8
	Socket	FE1004, FE3112	FE1004, FE3112	FE1004, FE3112	FE1004, FE3112
	Metal-shields	MS178	---	MS178	MS178

PHR: for radiation source ^{137}Cs, NaI Tl scintillator, Ø 12mm, h25 mm;

Typical spectral characteristics

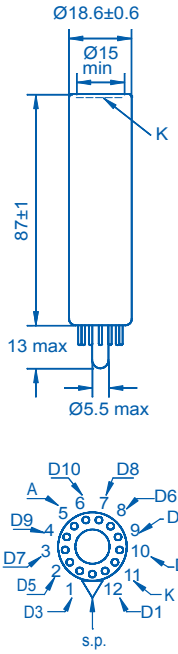


Typical gain curves



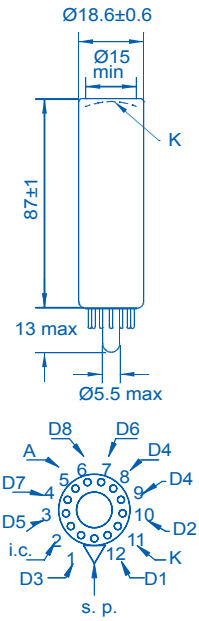
Dimensions and pinning

XP1918, XP2802



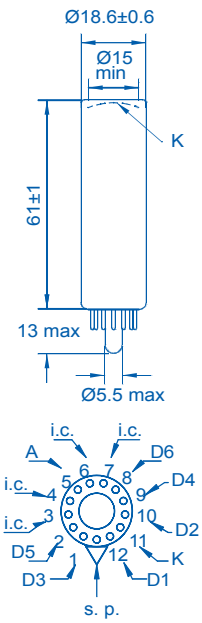
12-pin all glass

XP1981



12-pin all glass

XP1921



12-pin all glass

Voltage dividers

Tube	A divider type voltage ratios (for maximum gain)							
	K	D1	D2	D3	D4	...	Dn	A
XP1918, XP1921, XP1981	2	1	1.5	1	1	...	1	1
XP2802	2	1	1	1	1	...	1	1

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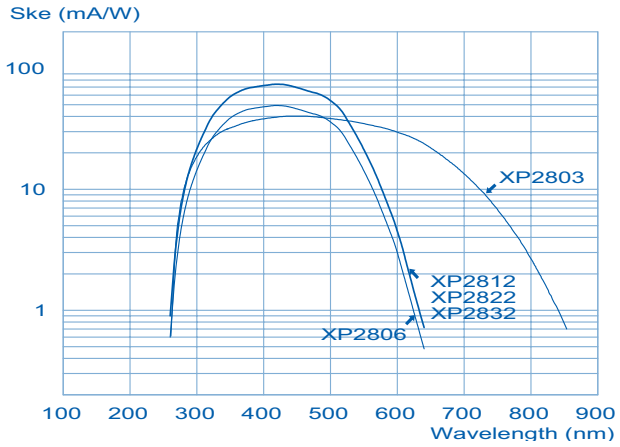
19 mm (3/4") tubes

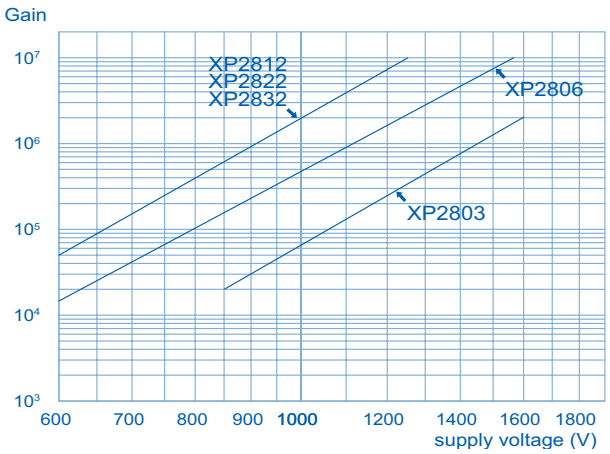
		XP2803	XP2806	XP2812	XP2822	XP2832
Key features		red-sensitive	high-temperature tube	fast, low noise	low noise	low-profile, fast (small transit time spread), low noise
Dynode structure / number of stages		focused/10	focused/10	focused/10	focused/10	focused/10
Cathode luminous sensitivity (µA/lm)	typ.	180	40	80	80	80
Cathode blue sensitivity (µA/lmF)	min	---	4	10,5	10,5	10,5
	typ.	---	6	9	9	9
Cathode radiant sensitivity (mA/W)	typ. at (nm)	20mA/W 270 700 850	50mA/W 270 400 650	80 mA/W 270 400 650	80 mA/W 270 400 650	80 mA/W 270 400 650
Gain	typ.	$3x10^5$	$2.5x10^5$	$9.0x10^5$	$9.0x10^5$	$9.0x10^5$
Supply voltage	typ.	1 300	1 300	900	900	900
	min. (V)	1 000	1 000	700	700	700
	max. (V)	1 600	1 600	1 100	1 100	1 100
Anode dark current	typ. (nA)	1	1	0.5	0.5	0.5
	max. (nA)	10	10	5	5	5
Anode dark counts	typ. (cps)	---	---	100	100	---
	max. (cps)	---	---	250	250	---
Max. anode pulse current for linearity 2% (mA)		---	---	---	---	50
Time response	rise (ns)	2.2	2.2	1.8	2.2	1.8
	FWHM (ns)	5	5	3	5	3.0
PHR (%)		7	---	7.5	8	7.5
Maximum ratings	supply voltage (V)	1 700	1 700	1 700	1 700	1 700
	gain	$3x10^6$	$2x10^6$	$1x10^7$	$1x10^7$	$1x10^7$
Accessories	Voltage divider	VD1A8	VD1A8	VD1A8	VD1A8	VD108, VD308
	Socket	FE1004, FE3112	FE1004, FE3112	FE1004, FE3112	FE1004, FE3112	FE1004, FE3112
	Metal-shields	---	---	MS178	---	---

PHR: for radiation source ^{137}Cs, NaI Tl scintillator, Ø 12mm, h25 mm.
Maximum ratings: maximum ambient temperature range for XP2806 -85°C to +130°C.
XP2803 minimum radiant sensitivity at 700nm: 10mA/W

Typical spectral characteristics

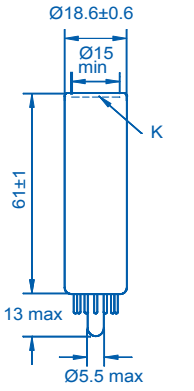


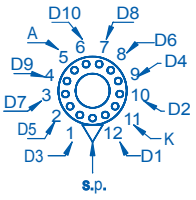
Typical gain curves



Dimensions and pinning

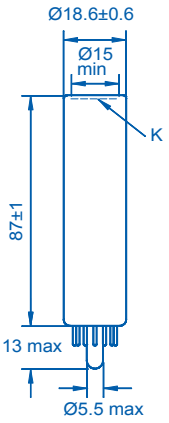
XP2803, XP2806, XP2822

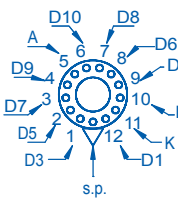




12-pin all glass

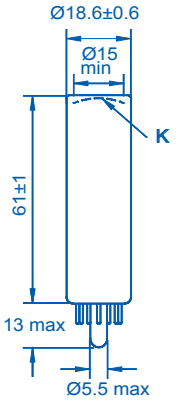
XP2812

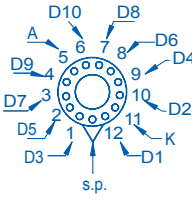




12-pin all glass

XP2832





12-pin all glass

Voltage dividers

Tube	A divider type voltage ratios (for maximum gain)							
	K	D1	D2	D3	D4	...	Dn	A
XP2803, XP2806, XP2812, XP2822, XP2832	2	1	1	1	1	...	1	1

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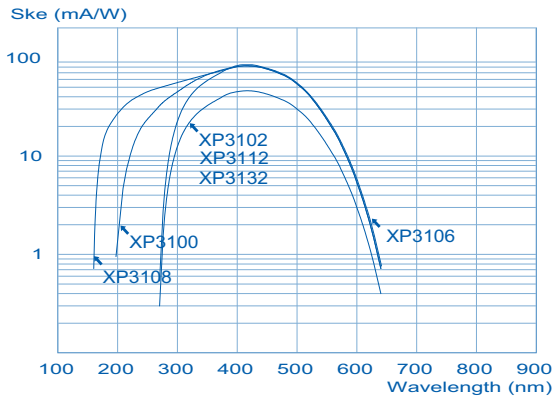
PHOTONIS imaging sensors

25 mm (1’’) tubes

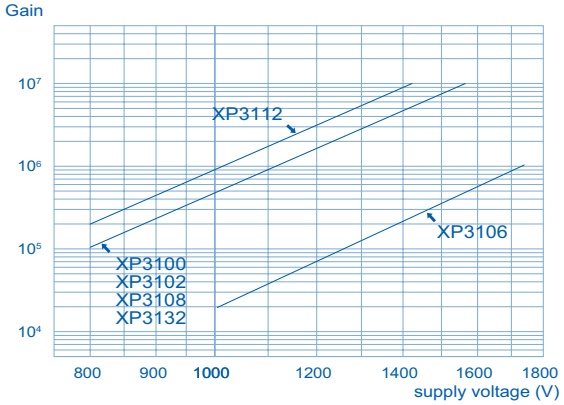
		XP3100	XP3102	XP3106	XP3108	XP3112	XP3132
Key features		fast, UV-sensitive	fast	low- profile, high-temperature, ruggedized	fast, UV-sensitive	low-profile, low noise	low noise
Dynode structure / number of stages		focused/10	focused/10	c.c./10	focused/10	c.c./10	focused/10
Cathode luminous sensitivity (µA/lm)	typ.	90	90	40	90	90	90
Cathode blue sensitivity (µA/lmF)	min	9	9	4	9	9	9
	typ.	11	11	6	11	11	11
Cathode radiant sensitivity (mA/W)	typ. at (nm)	85 mA/W 270 400 650	85 mA/W 270 400 650	50 mA/W 270 400 650	85 mA/W 160 400 650	85 mA/W 270 400 650	85 mA/W 270 420 650
Gain	typ.	$9.1x10^5$	$9.1x10^5$	$2.5x10^5$	$9.1x10^5$	$9.1x10^5$	$9.1x10^5$
Supply voltage	typ.	1 100	1 100	1 450	1 100	1 000	1 100
	min. (V)	900	900	1 300	900	800	900
	max. (V)	1 300	1 300	1 600	1 300	1 200	1 300
Anode dark current	typ. (nA)	1	1	1	1	1	1
	max. (nA)	5	5	10	5	5	5
Max. anode pulse current for linearity 2% (mA)		30	30	30	30	30	30
Time response	rise (ns)	2	2	1.8	2	2	2
	FWHM (ns)	3.1	3.1	3.5	3.1	3.1	3.1
PHR (%)		7.7	7.7	---	7.7	7.7	7.7
Maximum ratings	supply voltage (V)	1 800	1 800	1 800	1 800	1 800	1 800
	gain	$1x10^7$	$1x10^7$	$3x10^6$	$1x10^7$	$1x10^7$	$1x10^7$
Accessories	Voltage divider	VD101T/A	VD101T/A	---	VD101T/A	VD1A1T/A	VD101T/A
	Socket	FE3214/W, FE3214/PC	FE3214/W, FE3214/PC	FE3214/W, FE3214/PC	FE3214/W, FE3214/PC	FE3214/W, FE3214/PC	FE3214/W, FE3214/PC

PHR: for radiation source ^{137}Cs, NaI Tl scintillator, Ø 25 mm, h25 mm;
Maximum ratings: maximum ambient temperature range for XP3106 -85°C to +130°C.

Typical spectral characteristics

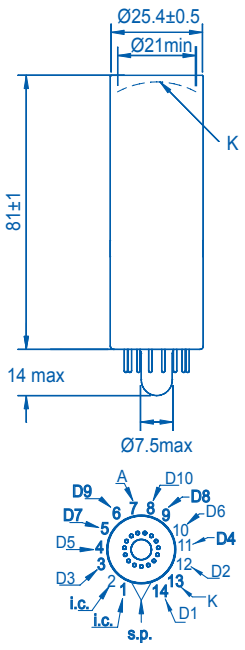


Typical gain curves



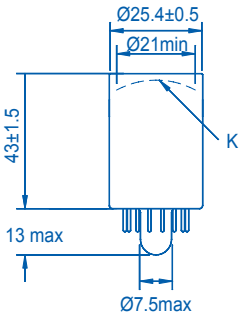
Dimensions and pinning

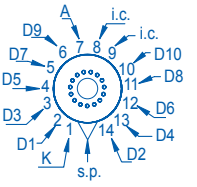
XP3100, XP3102
XP3108



14-pin all glass

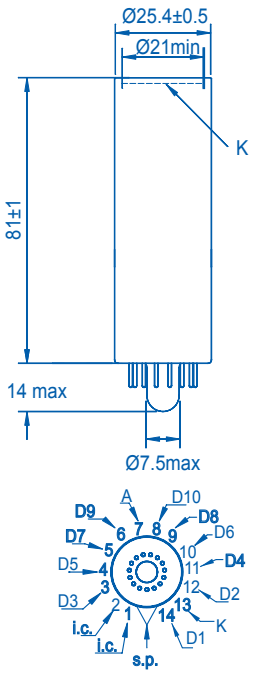
XP3106, XP3112





14-pin all glass

XP3132



14-pin all glass

Voltage dividers

Tube	A divider type voltage ratios (for maximum gain)							
	K	D1	D2	D3	D4	...	Dn	A
XP3100, XP3102, XP3132	2	1	1.5	1	1	...	1	1
XP3106, XP3112	3	1	1	1	1	...	1	1

PHOTONIS imaging sensors
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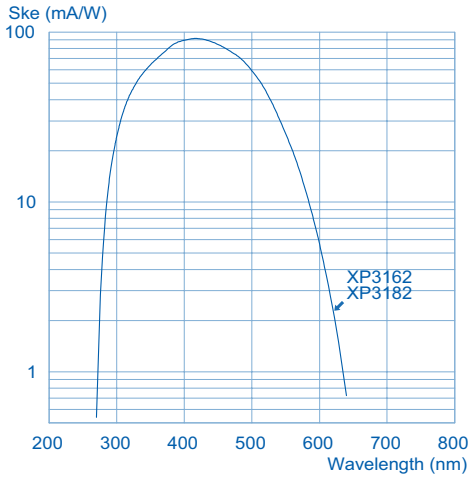
25 mm (1'') tubes

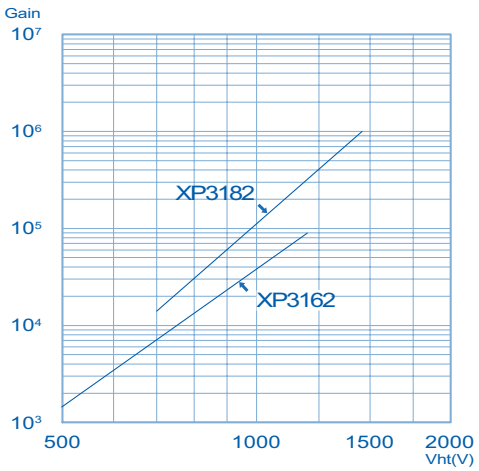
		XP3162	XP3182
	Key features	---	---
	Dynode structure / number of stages	focused/6	focused/8
Cathode luminous sensitivity (µA/lm)	typ.	90	90
Cathode blue sensitivity (µA/lmF)	min	9	9
	typ.	11	11
Cathode radiant sensitivity (mA/W)	typ. at (nm)	85 mA/W ▼ 270 400 650	85 mA/W ▼ 270 400 650
Gain	typ.	$9.1x10^3$	$5x10^4$
Supply voltage	typ.	700	870
	min. (V)	600	700
	max. (V)	800	1 100
Anode dark current	typ. (nA)	1	0.2
	max. (nA)	5	1
Max. anode pulse current for linearity 2% (mA)		10	40
Time response	rise (ns)	2.9	2.9
	FWHM (ns)	4.5	4.5
Maximum ratings	supply voltage (V)	1 200	1 200
	gain	10^5	10^6
Accessories	Socket	FE3214	FE3214

PHR: for radiation source ^{137}Cs, NaI Tl scintillator, Ø 25 mm, h25 mm;

Typical spectral characteristics

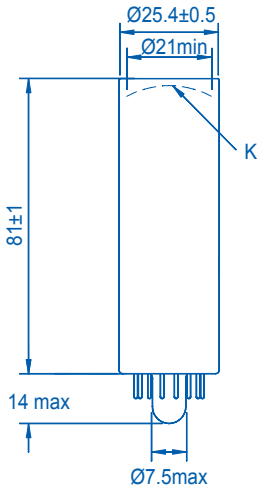


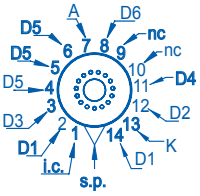
Typical gain curves



Dimensions and pinning

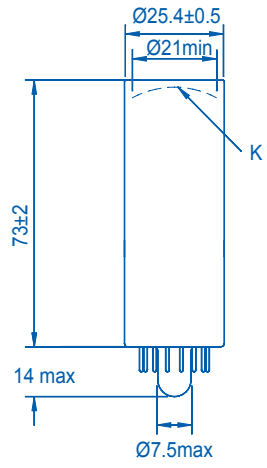
XP3162

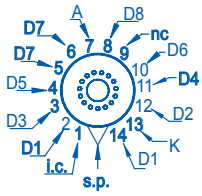




14-pin all glass

XP3182





14-pin all glass

Voltage dividers

Tube	Voltage divider ratios							
	K	D1	D2	D3	D4	D5	D6	A
XP3162 (typeA)	2	1	1.5	1	1	1	1	

	K	D1	D2	D3	D4	D5	D6	D7	D8	A
XP3182 (typeB)	3	1	1,5	1	1,5	2	2,5	5	2,5	

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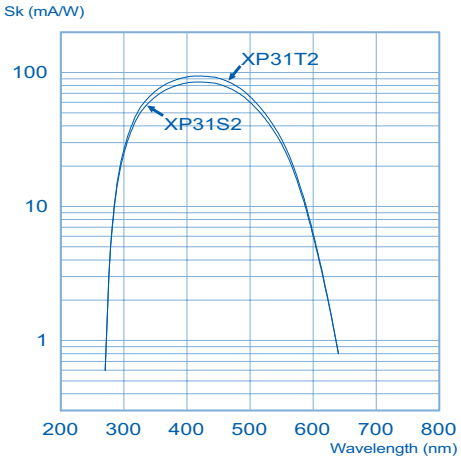
PHOTONIS imaging sensors

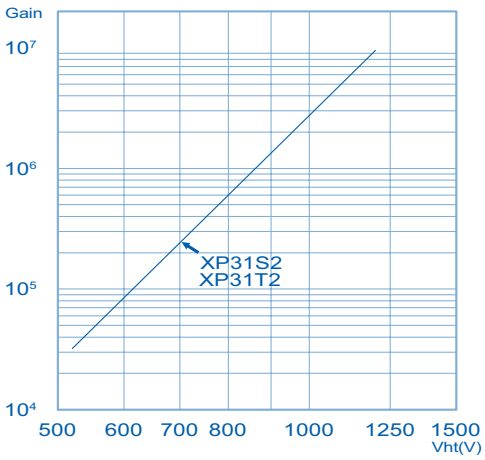
25 mm (1’’) tubes

		XP31S2	XP31T2
Key features		fast, low profile, 2π hemispherical	fast, 2π hemispherical
Dynode structure / number of stages		focused/10	focused/10
Cathode luminous sensitivity (µA/lm)	typ.	90	100
Cathode blue sensitivity (µA/lmF)	min	9	12
	typ.	11	11
Cathode radiant sensitivity (mA/W)	typ. at (nm)	85 mA/W 270 420 650	95 mA/W 270 420 650
Gain	typ.	$9.1x10^5$	$9.1x10^5$
Supply voltage	typ.	850	850
	min. (V)	650	650
	max. (V)	1 050	1 050
Anode dark current	typ. (nA)	0.3	0.3
	max. (nA)	1	1
Anode dark counts	typ. (cps)	100	120
	max. (cps)	250	300
Max. anode pulse current for linearity 2% (mA)		10	10
Time response	rise (ns)	2	2
	Width FWHM (ns)	3.1	3.1
Maximum ratings	supply voltage (V)	1 500	1 500
	gain	$1x10^7$	$1x10^7$
Accessories	Voltage divider	VD1A1T/A	VD1A1T/A
	Socket	FE3214	FE3214

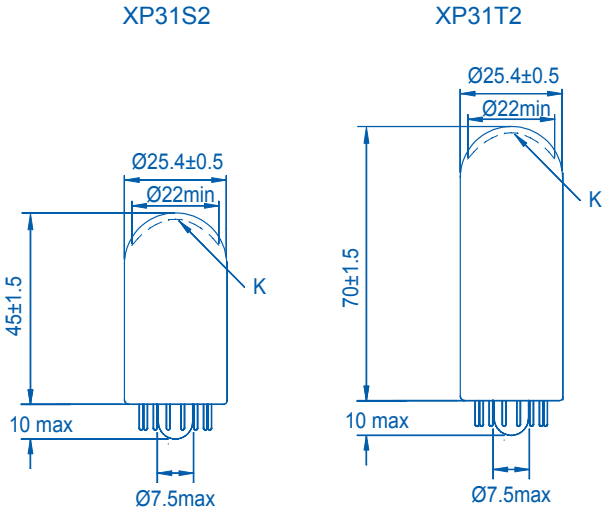
Typical spectral characteristics



Typical gain curves



Dimensions and pinning



14-pin all glass

14-pin all glass

Voltage dividers

Tube	A divider type voltage ratios (for maximum gain)							
	K	D1	D2	D3	D4	...	Dn	A
XP31S2, XP31T2	3	1	1	1	1	...	1	1

PHOTONIS imaging sensors

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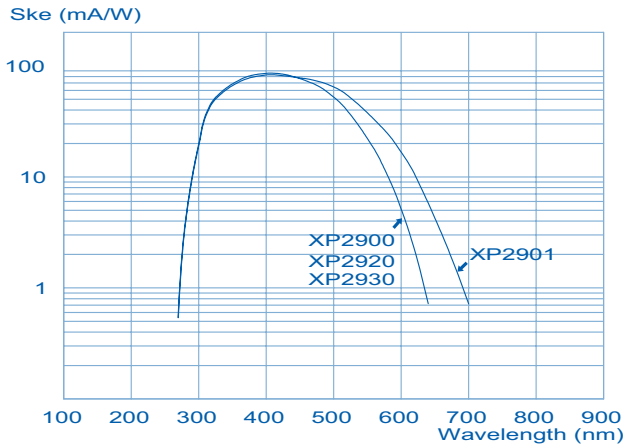
29 mm (1 1/8'') tubes

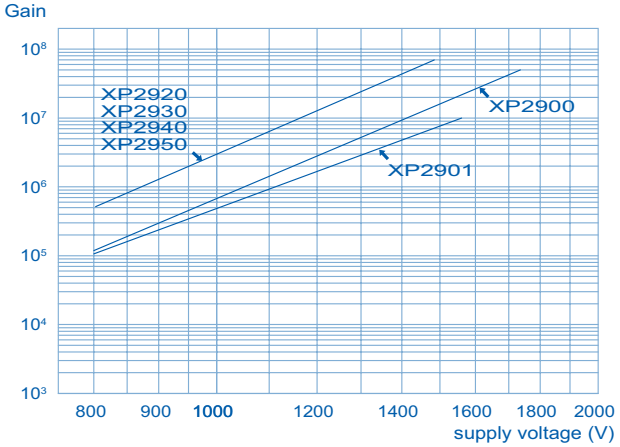
		XP2900	XP2901	XP2920	XP2930	XP2940	XP2950
Key features		low-voltage, fast	low-voltage, fast green-extended	low-voltage, low-noise	low-voltage, low-noise, low-profile	low-noise	low-voltage, low-noise
Dynode structure / number of stages		focused/10	focused/10	focused/11	focused/11	focused/11	focused/11
Cathode luminous sensitivity (µA/lm)	typ.	85	115 (90min)	80	80	80	80
Cathode blue sensitivity (µA/lmF)	min	9	---	9	9	9	9
	typ.	11	11.5	11	11	11	11
Cathode radiant sensitivity (mA/W)	typ. at (nm)	85 mA/W (270 400 650)	90 mA/W (270 400 700)	85 mA/W (270 400 650)	85 mA/W (270 400 650)	85 mA/W (270 400 650)	85 mA/W (270 400 650)
Gain	typ.	$9.1x10^5$	$8.7x10^5$	$2.7x10^6$	$2.7x10^6$	$2.7x10^6$	$2.7x10^6$
Supply voltage	typ.	1 100	1 100	1 000	1 000	1 000	1 000
	min. (V)	900	900	850	850	850	850
	max. (V)	1 300	1 300	1 100	1 100	1 100	1 100
Anode dark current	typ. (nA)	1	2	0.5	0.5	0.5	0.5
	max. (nA)	5	20	5	5	5	5
Anode dark counts	typ. (cps)	---	---	100	100	100	100
	max. (cps)	---	---	250	250	250	250
Max. anode pulse current for linearity 2% (mA)		80	80	---	---	---	---
Time response	rise (ns)	1.9	1.9	3.4	3.4	3.4	3.4
	FWHM (ns)	3	3	5	5	5	5
PHR (%)		7.7	7.5	7.7	7.7	7.7	7.7
Maximum ratings	supply voltage (V)	1 800	1 800	1 600	1 600	1 600	1 600
	gain	$1x10^7$	$1x10^7$	$5x10^7$	$5x10^7$	$5x10^7$	$5x10^7$
Accessories	Voltage divider	VD109	VD109	VD1A9	VD1A9	VD1A9	VD1A9
	Socket	FE1114, FE3114	FE1114, FE3114	FE1114, FE3114	FE1114, FE3114	FE1114, FE3114	FE1114, FE3114
	Metal-shields	MS179	MS179	MS179	---	---	---

PHR: for radiation source ^{137}Cs, NaI Tl scintillator, Ø 25 mm, h25 mm;

Typical spectral characteristics

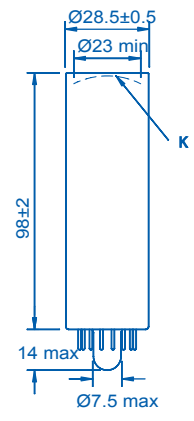


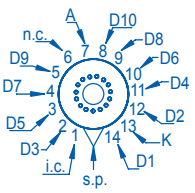
Typical gain curves



Dimensions and pinning

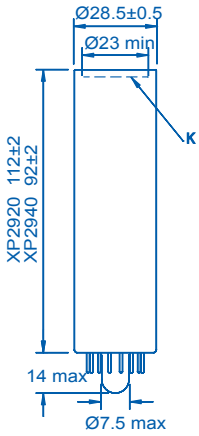
XP2900, XP2901

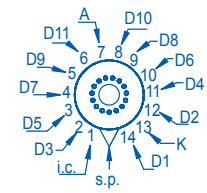




14-pin all glass

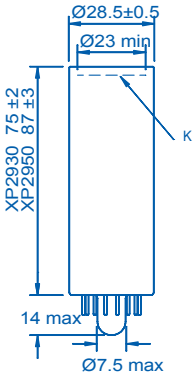
XP2920, XP2940

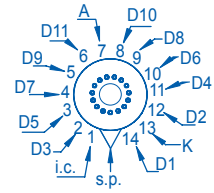




14-pin all glass

XP2930, XP2950





14-pin all glass

Voltage dividers

Tube	A divider type voltage ratios (for maximum gain)								
	K	D1	D2	D3	D4	...		Dn	A
XP2900, XP2901	2	1	1.5	1	1	...	1		1
XP2920, XP2930, XP2940, XP2950	2	1	1	1	1	...	1		1

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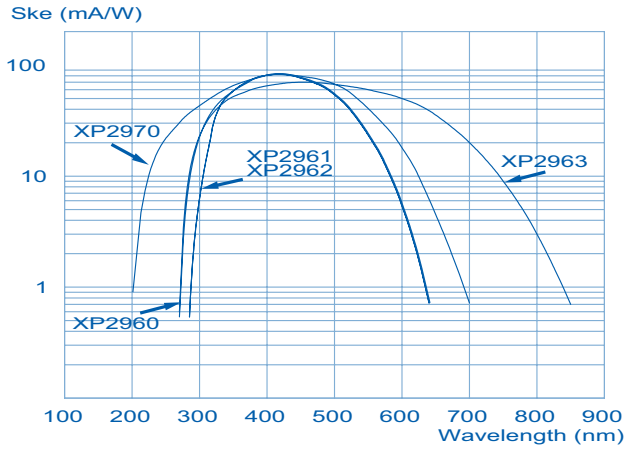
PHOTONIS imaging sensors

29 mm ($1^{1/8''}$) tubes

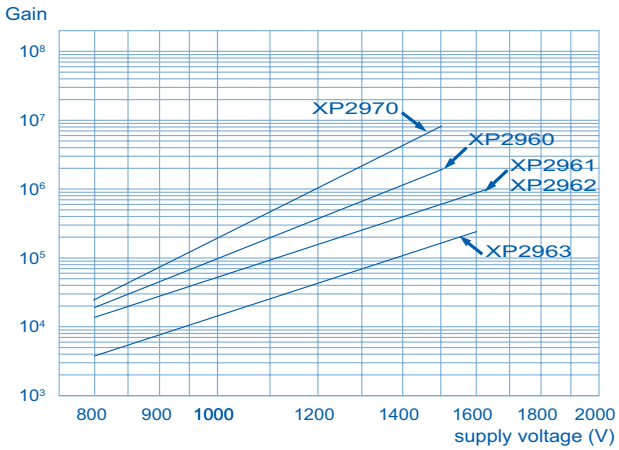
		XP2960	XP2961	XP2962	XP2963	XP2970
Key features		fast, low-voltage	fast, green-extended	fast	fast, red-sensitive	fast, low voltage, UV-sensitive
Dynode structure / number of stages		focused/8	focused/8	focused/8	focused/8	focused/10
Cathode luminous sensitivity (µA/lm)	typ.	85	115 (90min)	90	200	85
Cathode blue sensitivity (µA/lmF)	min	9	---	9	---	9
	typ.	11	11.5	11	---	11
Cathode radiant sensitivity (mA/W)	typ. at (nm)	85 mA/W ▼ 270 400 650	90 mA/W ▼ 290 400 700	85 mA/W ▼ 290 400 650	20 mA/W ▼ 270 700 850	85 mA/W ▼ 190 420 650
Gain	typ.	$9.1x10^5$	$9.0x10^4$	$9.0x10^4$	$3.0x10^4$	$9.1x10^5$
Supply voltage	typ.	1 350	1 100	1 100	1 100	1 100
	min. (V)	1 100	900	900	900	900
	max. (V)	1 500	1 350	1 350	1350	1 300
Anode dark current	typ. (nA)	2	2	1	5	1
	max. (nA)	10	10	5	20	5
Max. anode pulse current for linearity 2% (mA)		80	80	80	80	80
Time response	rise (ns)	1.9	1.8	1.8	1.8	1.9
	FWHM (ns)	3	2.8	2.8	2.8	3
PHR (%)		7.7	7.5	7.7	7.7	7.7
Maximum ratings	supply voltage (V)	1 600	1 600	1 600	1 600	1 800
	gain	$1x10^6$	$1x10^6$	$1x10^6$	$6x10^5$	$1x10^7$
Accessories	Voltage divider	VD189	VD189	VD189	VD189	VD1B9
	Socket	FE1114, FE3114	FE1114, FE3114	FE1114, FE3114	FE1114, FE3114	FE1114, FE3114
	Metal-shields	MS179	MS179	MS179	MS179	MS179

PHR: for radiation source ^{137}Cs, NaI Tl scintillator, Ø 25 mm, h25 mm;
XP2963 minimum radiant sensitivity at 700nm: 10mA/W

Typical spectral characteristics

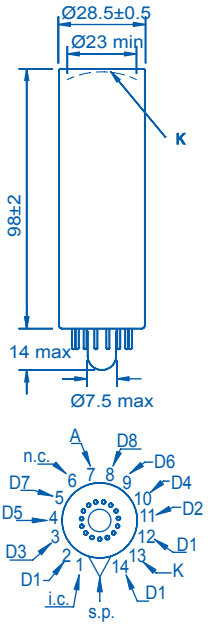


Typical gain curves



Dimensions and pinning

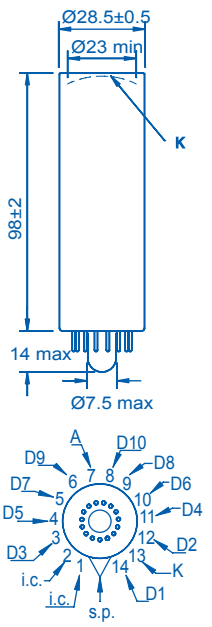
XP2960, XP2961, XP2962, XP2963



14-pin all glass

For XP2960, pin 2 is not connected to D1. Use pin 14.

XP2970



14-pin all glass

Voltage dividers

Tube	A divider type voltage ratios (for maximum gain)							
	K	D1	D2	D3	D4	...	Dn	A
XP2960, XP2961, XP2962, XP2963, XP2970	2	1	1.5	1	1	...	1	1

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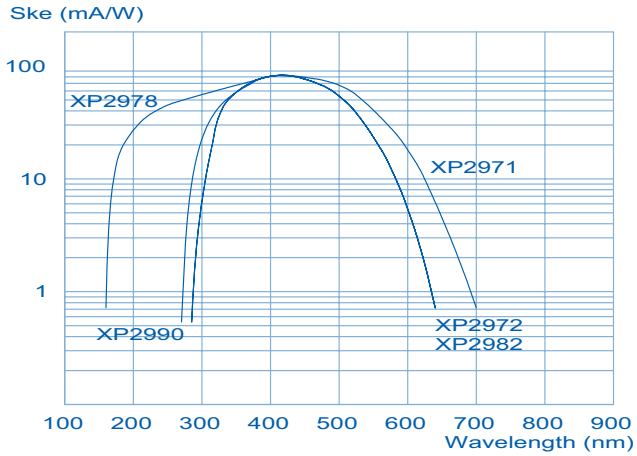
29 mm (1 1/8'') tubes

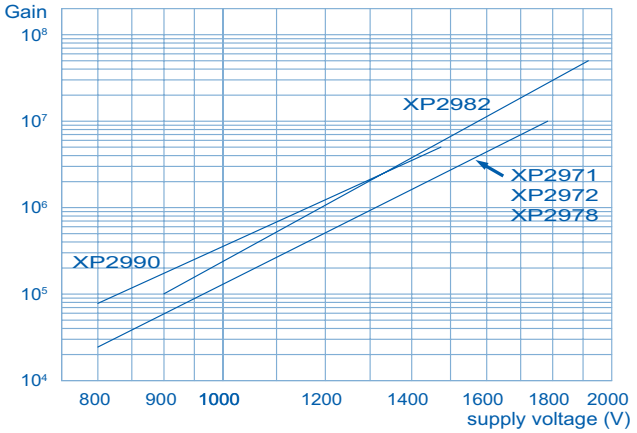
		XP2971	XP2972	XP2978	XP2982	XP2990
Key features		fast, green-extended	fast	fast, low voltage, UV-sensitive	fast	low voltage, low noise, good PHR
Dynode structure / number of stages		focused/10	focused/10	focused/10	focused/11	focused/9
Cathode luminous sensitivity (µA/lm)	typ.	115 (90 min)	90	85	90	100
Cathode blue sensitivity (µA/lmF)	min	---	9	9	9	9
	typ.	11.5	11	11	11	11
Cathode radiant sensitivity (mA/W)	typ. at (nm)	90 mA/W ▼ 290 420 700	85 mA/W ▼ 290 420 650	85 mA/W ▼ 160 420 650	85 mA/W ▼ 290 420 650	85 mA/W ▼ 270 420 650
Gain	typ.	8.7×10^5	9.3×10^5	9.3×10^5	2.8×10^6	6.8×10^5
Supply voltage	typ.	1 300	1 300	1 200	1 350	1 100
	min. (V)	1 000	1 000	900	1 000	1 000
	max. (V)	1 500	1 500	1 300	1 600	1 300
Anode dark current	typ. (nA)	3	5	1	3	2
	max. (nA)	30	20	5	30	10
Max. anode pulse current for linearity 2% (mA)		80	80	80	80	80
Time response	rise (ns)	1.9	1.9	1.9	1.9	3.0
	FWHM (ns)	3	3	3	3.3	5.2
PHR (%)		7.5	7.7	7.7	7.7	7.3
Maximum ratings	supply voltage (V)	1 800	1 800	1 800	1 900	1 700
	gain	1×10^7	1×10^7	1×10^7	5×10^7	5×10^6
Accessories	Voltage divider	VD109	VD109	VD109	VD119	---
	Socket	FE1114, FE3114	FE1114, FE3114	FE1114, FE3114	FE1114, FE3114	FE1114, FE3114
	Metal-shields	MS179	MS179	MS179	MS179	---

PHR: for radiation source ^{137}Cs, NaI Tl scintillator, Ø 25 mm, h25 mm;

Typical spectral characteristics

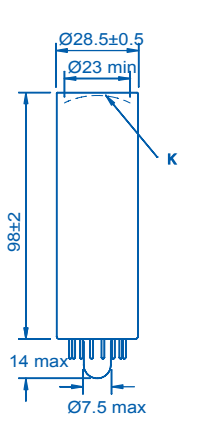


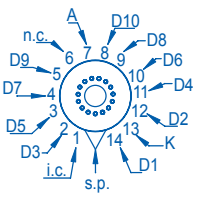
Typical gain curves



Dimensions and pinning

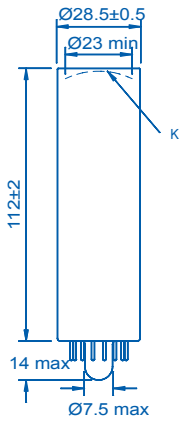
XP2971, XP2972, XP2978

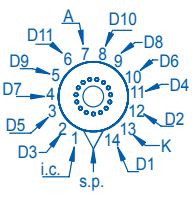




14-pin all glass

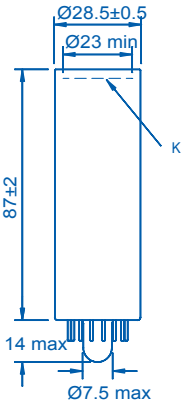
XP2982

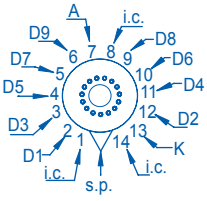




14-pin all glass

XP2990





14-pin all glass

Voltage dividers

Tube	A divider type voltage ratios (for maximum gain)							
	K	D1	D2	D3	D4	...	Dn	A
XP2971, XP2972, XP2978, XP2982, XP2990	2	1	1.5	1	1	...	1	1

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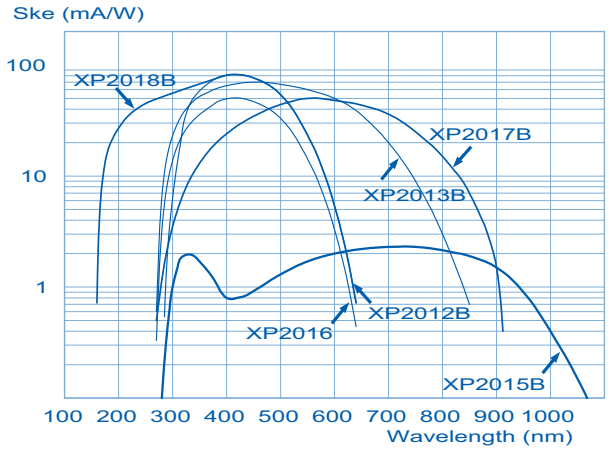
PHOTONIS imaging sensors

39 mm (1 1/2'') tubes

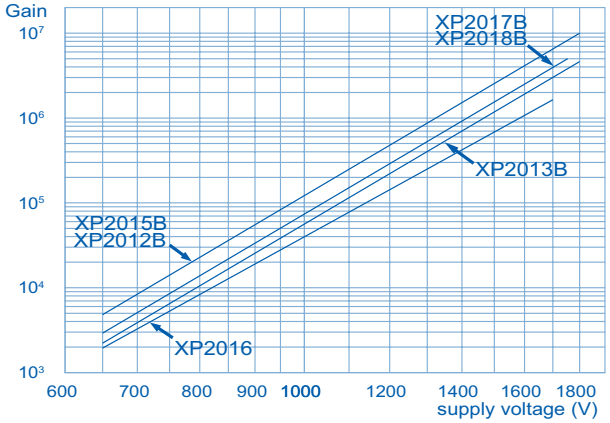
		XP2012B	XP2013B	XP2015B	XP2016	XP2017B	XP2018B
Key features			red-sensitive	infrared-sensitive	high-temperature	extended-red-sensitive	UV-sensitive
Dynode structure / number of stages		focused/10	focused/10	focused/10	focused/10	focused/10	focused/10
Cathode luminous sensitivity (µA/lm)	typ.	85	200	20	40	210	85
Cathode blue sensitivity (µA/lmF)	min	9	---	---	4	---	9
	typ.	11	---	---	7	---	11
Cathode radiant sensitivity (mA/W)	typ. at (nm)	85 mA/W: 290 420 650	20 mA/W: 270 700 850	0,12 mA/W: 270 1050 1050	50 mA/W: 270 400 650	6,5 mA/W: 270 860 950	85 mA/W: 160 420 650
Gain	typ.	$6.5x10^5$	$3.0x10^5$	$5.0x10^5$	$2.1x10^5$	$2.9x10^5$	$8x10^5$
Supply voltage	typ.	1 250	1 250	1 200	1 300	1 200	1 350
	min. (V)	1 050	1 000	1 000	1 000	1 000	1 150
	max. (V)	1 450	1 600	1 500	1 600	1 500	1 600
Anode dark current	typ. (nA)	1	2	2000	1	2	5
	max. (nA)	10	50	10000	10	20	20
Max. anode pulse current for linearity 2% (mA)		200	200	200	200	200	200
Time response	rise (ns)	2.5	2.5	3	3.5	2.5	2.5
	FWHM (ns)	6	6	4	7	6	6
PHR (%)		7.5	---	---	---	---	7.5
Maximum ratings	supply voltage (V)	1800	1800	1600	1700	1800	1800
	gain	$1x10^7$	$5x10^6$	$5x10^6$	$2x10^6$	$5x10^6$	$1x10^7$
Accessories	Voltage divider	VD200K	VD200K	VD200K	---	VD200K	VD200K
	Socket	FE1012	FE1012	FE1012	---	FE1012	FE1012
	Metal-shields	MS170	MS170	MS170	MS170	MS170	MS170

PHR: for radiation source ^{137}Cs, NaI Tl scintillator, Ø 32 mm, h25 mm; Maximum ratings : maximum average anode current 0.02 mA for XP2015B; Maximum ambient temperature range -85°C to +130°C for XP2016.
XP2013B, minimum radiant sensitivity at 700nm: 10mA/W. XP2017B minimum radiant sensitivity at 860nm: 1.5mA/W.

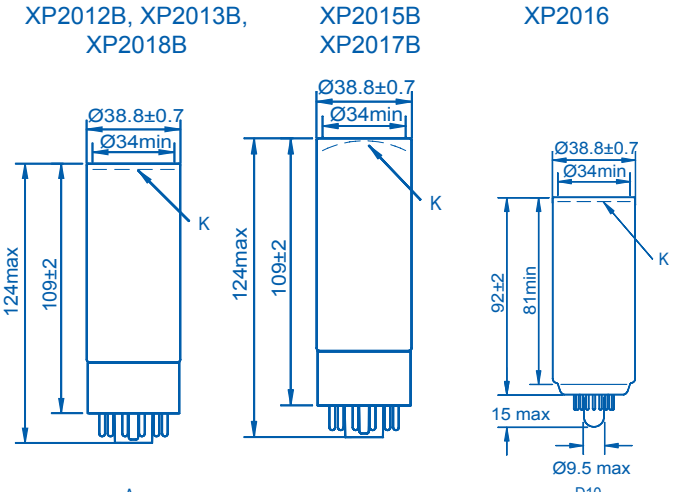
Typical spectral characteristics

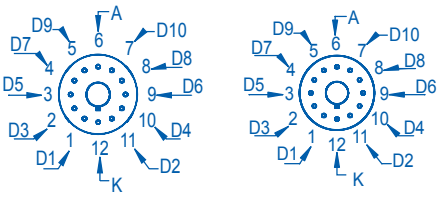


Typical gain curves



Dimensions and pinning





Plastic JEDEC B12-43 | Plastic JEDEC B12-43 | 14-pin all glass

Voltage dividers

Tube	A divider type voltage ratios (for maximum gain)							
	K	G/D1	D2	D3	D4	...	Dn	A
XP2012B, XP2013B, XP2015B, XP2016B, XP2017B, XP2018B	2	1	1	1	1	...	1	1

XP2016 has a separate focusing electrode

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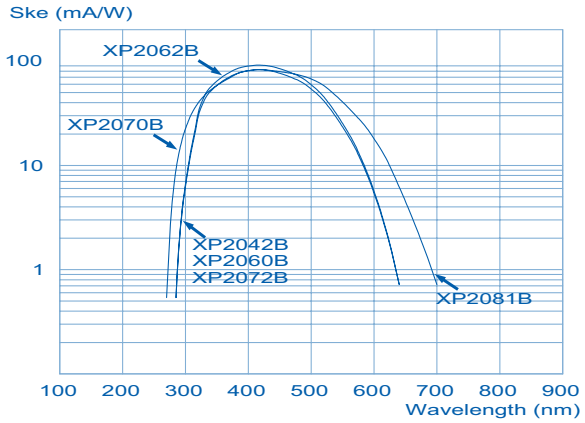
39 mm (1 1/2'') tubes

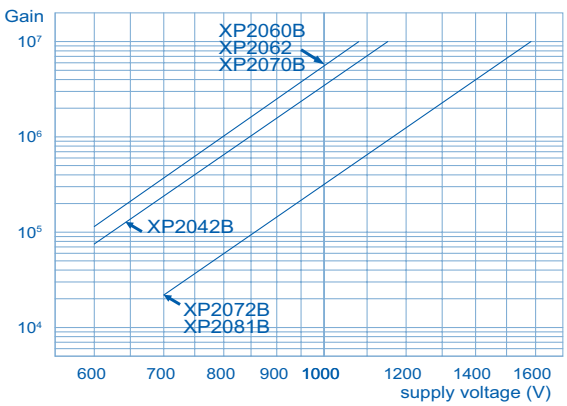
		XP2042B	XP2060B	XP2062	XP2070B	XP2072B	XP2081B
Key features		low-voltage, good PHR	low-voltage, good PHR	low-noise, low-voltage, good PHR	low-noise, low-voltage	good PHR	green-sensitive
Dynode structure / number of stages		focused/10	focused/10	focused/10	focused/10	focused/10	focused/10
Cathode luminous sensitivity (µA/lm)	typ.	90	90	100	80	85	115 (90 min)
Cathode blue sensitivity (µA/lmF)	min	9	11.5	12	9	9	---
	typ.	11	10	10	10.5	11	11.5
Cathode radiant sensitivity (mA/W)	typ. at (nm)	90 mA/W 290 420 650	90 mA/W 290 420 650	100 mA/W 290 420 650	85 mA/W 270 420 650	85 mA/W 290 420 650	90 mA/W 290 420 700
Gain	typ.	$6.5x10^5$	$6.5x10^5$	$6.5x10^5$	$6.5x10^5$	$6.5x10^5$	$6.5x10^5$
Supply voltage	typ.	800	750	750	750	1 100	1 100
	min. (V)	700	600	600	600	900	900
	max. (V)	950	900	900	900	1250	1250
Anode dark current	typ. (nA)	2	2	0.1	0.1	2	5
	max. (nA)	10	10	3	3	10	30
Anode dark counts	typ. (cps)	---	---	300	300	---	---
	max. (cps)	---	---	500	500	---	---
Max. anode pulse current for linearity 2% (mA)		80	80	80	80	150	150
Time response	rise (ns)	3	3	3	3	2.8	2.8
	FWHM (ns)	6	6	7	7	7	6
PHR (%)		7.5	7.5	7.5	7.7	7.2	7.2
Maximum ratings	supply voltage (V)	1400	1 400	1 400	1400	1600	1600
	gain	$1x10^7$	$1x10^7$	$1x10^7$	$1x10^7$	$1x10^7$	$1x10^7$
Accessories	Voltage divider	VD200K	VD200K	---	VD200K	VD200K	VD200K
	Socket	FE1012	FE1012	FE3114	FE1012	FE1012	FE1012
	Metal-shields	MS170	MS170	---	MS170	MS170	MS170

PHR: for radiation source ^{137}Cs, NaI Tl scintillator, Ø 32 mm, h25 mm;

Typical spectral characteristics

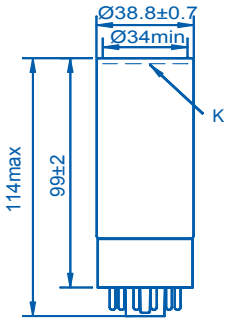


Typical gain curves

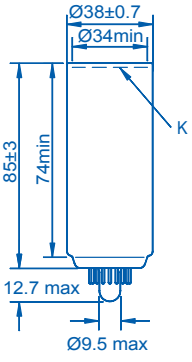


Dimensions and pinning

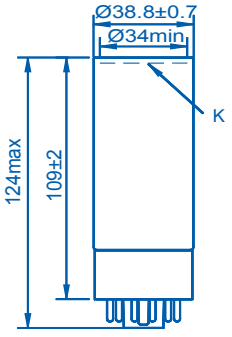
XP2042B, XP2060B

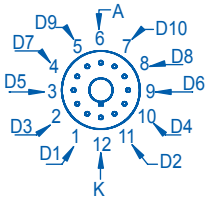


XP2062



XP2070B, XP2072B, XP2081B





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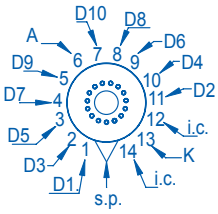
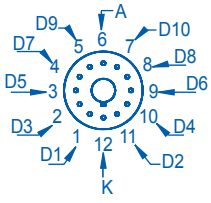


14-pin all glass



Plastic JEDEC B12-43

Voltage dividers

Tube	A divider type voltage ratios (for maximum gain)							
	K	D1	D2	D3	D4	...	Dn	A
XP2042B	2	2	1	1	1	...	1	1
XP2060B, XP2062B, XP2070B, XP2072B, XP2081B	2	1	1	1	1		1	1

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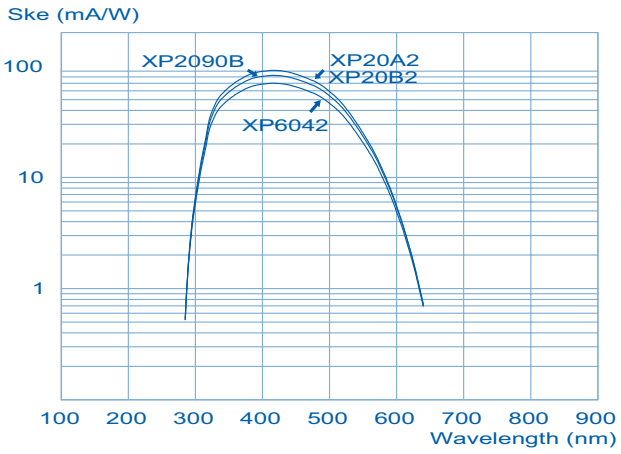
39 mm (1 1/2'') tubes

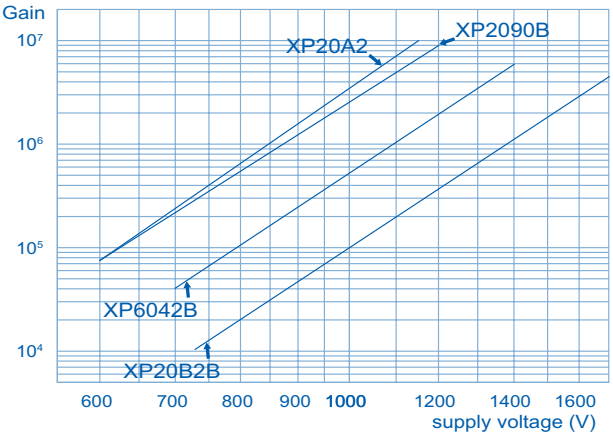
		XP2090B	XP20A2	XP20B2	XP6042
Key features		fast	low profile, low noise, high PHR	low profile, low noise, high PHR	low profile, high PHR
Dynode structure / number of stages		focused/10	focused/10	focused/10	focused/10
Cathode luminous sensitivity (µA/lm)	typ.	90	100	100	100
8Cathode blue sensitivity (µA/lmF)	min	10	10	10	10
	typ.	11.5	12	12	11
Cathode radiant sensitivity (mA/W)	typ. at (nm)	90 mA/W (270 420 650)	100 mA/W (270 420 650)	100 mA/W (270 420 650)	80 mA/W (270 420 650)
Gain	typ.	$6.5x10^5$	$6.5x10^5$	$6.3x10^5$	$2.7x10^5$
Supply voltage	typ.	850	800	1 250	900
	min. (V)	700	700	1 050	700
	max. (V)	950	900	1 450	1 100
Anode dark current	typ. (nA)	2	0.1	1	2
	max. (nA)	10	3	5	10
Anode dark counts	typ. (cps)	---	300	300	---
	max. (cps)	---	---	---	---
Max. anode pulse current for linearity 2% (mA)		80	80	200	---
Time response	rise (ns)	2.9	3	2.5	4
	FWHM (ns)	6.0 12)	6	6	---
PHR (%)		7.5	7.5	7.5	7
Maximum ratings	supply voltage (V)	1 500	1 400	1 800	1 500
	gain	$1x10^7$	$1x10^7$	$5x10^6$	$5x10^6$
Accessories	Voltage divider	VD200K	---	---	---
	Socket	FE1012	FE1114, FE3114	FE1114, FE3114	FE1112
	Metal-shields	MS170	---	---	---

PHR: for radiation source ^{137}Cs, NaI Tl scintillator, Ø 32 mm, h25 mm; Transit time spread at 1250V for XP2090B: 2 ns.

Typical spectral characteristics

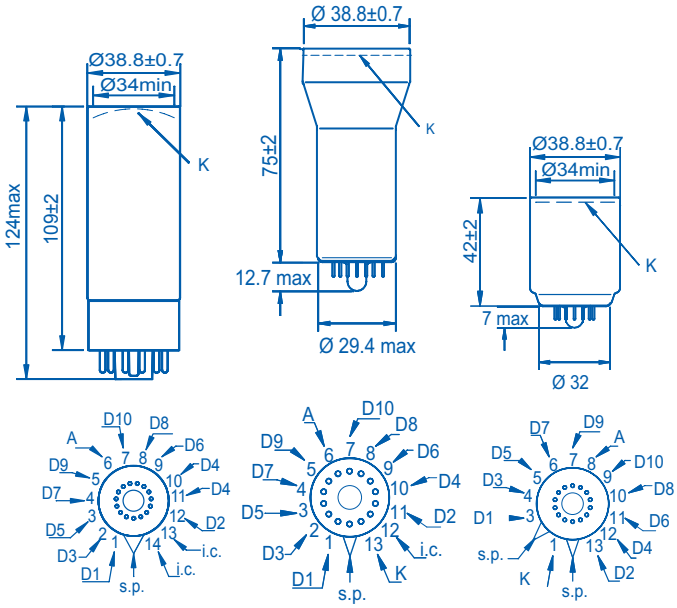


Typical gain curves



Dimensions and pinning

XP2090B | XP20A2, XP20B2 | XP6042



Plastic JEDEC B12-43 | 14-pin all glass | 14-pin all glass

Voltage dividers

Tube	A divider type voltage ratios (for maximum gain)							
	K	D1	D2	D3	D4	...	Dn	A
XP2090B, XP20A2, XP20B2, XP6042	2	1	1	1		...		1
XP6042	1.5	1.5	1	1		...		1

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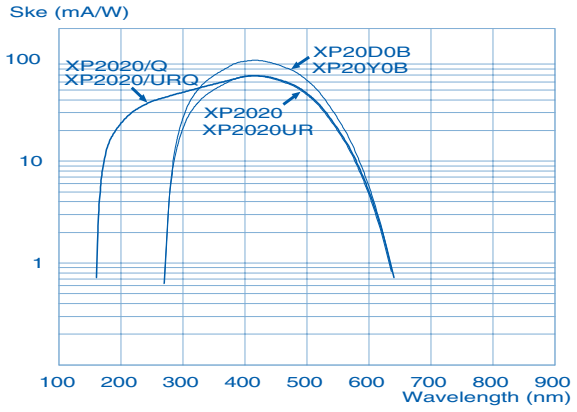
51 mm(2'') tubes

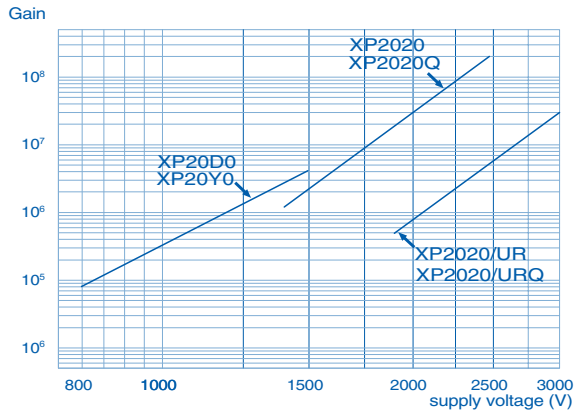
		XP2020	XP2020/Q	XP2020/UR	XP2020/URQ	XP20D0B	XP20Y0B
Key features		very fast, high gain, low noise	very fast, high gain, UV sensitive	ultra fast, high gain	ultra fast, high gain, UV sensitive	very fast, high PHR	very fast, high PHR
Dynode structure / number of stages		focused/12	focused/12	focused/12	focused/12	focused/8	focused/8
Cathode luminous sensitivity (µA/lm)	typ.	70	70	70	70	80	80
Cathode blue sensitivity (µA/lmF)	min	7.5	7.5	7.5	7.5	10	10
	typ.	10	10	10	10	12.5	12.5
Cathode radiant sensitivity (mA/W)	typ. at (nm)	80 mA/W ▼ 270 420 650	80 mA/W ▼ 160 420 650	80 mA/W ▼ 270 420 650	80 mA/W ▼ 160 420 650	100 mA/W ▼ 270 420 650	100 mA/W ▼ 270 420 650
Gain	typ.	$3x10^7$	$3x10^7$	$3x10^7$	$3x10^7$	$2.4x10^5$	$2.4x10^5$
Supply voltage	typ.	2 000	2 000	3 000	3 000	1 000	1 000
	min. (V)	1 750	1 750	2 200	2 200	800	800
	max. (V)	2 600	2 600	3 200	3 200	1 200	1 200
Anode dark current	typ. (nA)	10	10	20	20	1	1
	max. (nA)	100	100	100	100	20	20
Anode dark counts	typ. (cps)	900	900	15 000	15 000	---	---
	max. (cps)	2 500	2 500	25 000	25 000	---	---
Max. anode pulse current for linearity 2% (mA)		280	280	70	70	---	---
Time response	rise (ns)	1.5	1.5	1.4	1.4	2.5	2.5
	FWHM (ns)	2.4	2.4	2.3	2.3	6	6
PHR (%)		7.2	7.2	7.2	7.2	3	3
Maximum ratings	supply voltage (V)	3000	3000	3300	3300	1 500	1 500
	gain	$2x10^8$	$2x10^8$	$1x10^8$	$1x10^8$	$5x10^6$	$5x10^6$
Accessories	Voltage divider	VD124K/T	VD124K/T	VD127K/T	VD127K/T	---	---
	Socket	FE1120	FE1120	FE1120	FE1120	FE1120	FE1120
	Metal-shields	MS172	MS172	MS172	MS172	MS172	MS172

PHR: for radiation source ^{137}Cs, NaI Tl scintillator, Ø 51 mm, h51 mm; XP20Y0 and XP20D0: FWHM with ^{60}Co at 1.33 MeV, $LaCl_3$ scintillator, Ø 25 mm, h25 mm.
XP2020 (Q): center-edge transit time difference 0.25 ns; transit-time spread σ 0.25 ns (type C divider, 2500 V supply). Both values are down to 0.2 ns for XP2020/UR (Q).

Typical spectral characteristics

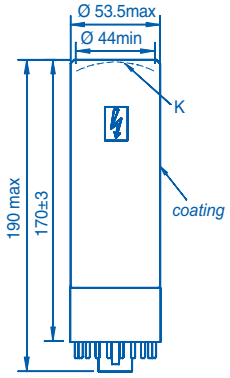


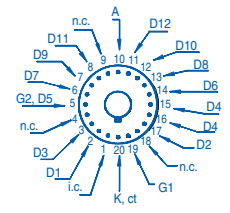
Typical gain curves



Dimensions and pinning

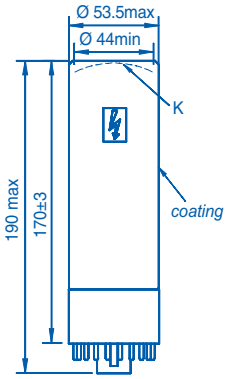
XP2020, XP2020/Q
XP2020/UR,
XP2020/URQ

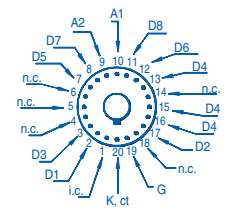




Plastic JEDEC
B20-102

XP20D0B

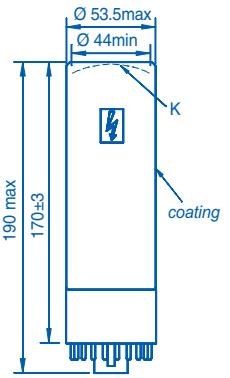


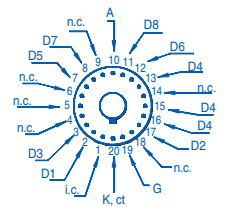


A1: Anode signal - A2: Grid

Plastic JEDEC
B20-102

XP20Y0B





Plastic JEDEC
B20-102

Voltage dividers

Tube	A divider type voltage ratios (for maximum gain)							
	K	G	D1	D2	D3	...	Dn	A
XP2020, XP20D0, XP2020/Q, XP20Y0	1.2	2.8	1.2	1.8	1	...	1	1
XP2020/UR, XP2020/URQ	2	8	2	1.5	1	....	1	1

XP2020 family: two non-inductive resistors of 51 Ω are wired in series with D11 and D12 in the plastic base.

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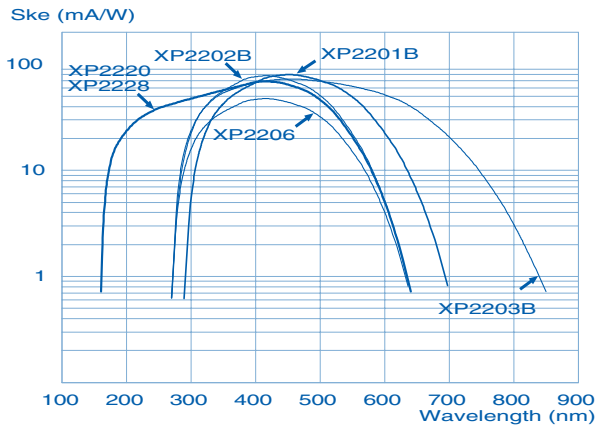
51 mm(2'') tubes

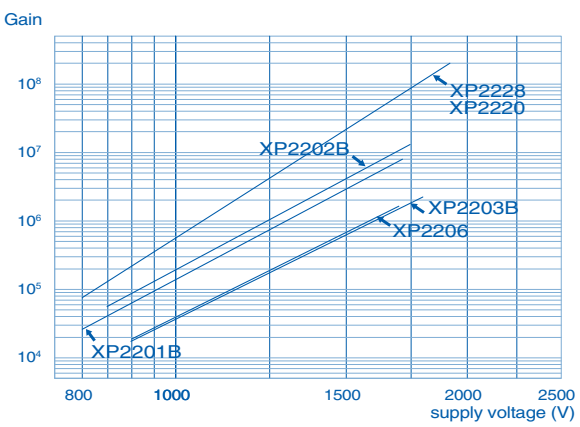
		XP2201B	XP2202B	XP2203B	XP2206	XP2220	XP2228
Key features		green-sensitive	---	red-sensitive	high temperature	low-noise, fast, high gain	low-noise, fast, high gain, UV-sensitive
Dynode structure / number of stages		focused/10	focused/10	focused/10	focused/10	focused/12	focused/12
Cathode luminous sensitivity (µA/lm)	typ.	120 (90 min)	70	165	40	70	70
Cathode blue sensitivity (µA/lmF)	min	---	9	---	5	9	9
	typ.	12.5	10	---	7	11	11
Cathode radiant sensitivity (mA/W)	typ. at (nm)	95 mA/W (290 440 700)	75 mA/W (290 400 650)	16 mA/W (270 700 850)	50 mA/W (270 400 650)	90 mA/W (270 400 650)	90 mA/W (160 400 650)
Gain	typ.	$8x10^5$	$10x10^6$	$3x10^5$	$2.1x10^5$	$3x10^7$	$3x10^7$
Supply voltage	typ.	1 250	1 250	1 350	1 300	1 700	1 700
	min. (V)	1 100	1100	1100	1000	1 400	1 400
	max. (V)	1 500	1500	1500	1600	2 300	2 300
Anode dark current	typ. (nA)	10	3	3	1	5	5
	max. (nA)	50	20	50	10	---	---
Anode dark counts	typ. (cps)	---	---	---	---	300	300
	max. (cps)	---	---	---	---	1 000	1000
Max. anode pulse current for linearity 2% (mA)		200	200	200	200		100
Time response	rise (ns)	4	4	4	4	3	3
	FWHM (ns)	8	8	8	8	5	5
PHR (%)		7.5	7.5	---	8.5	---	---
Maximum ratings	supply voltage (V)	1 800	1 800	1 800	1 700	2 500	2 500
	gain	$8x10^6$	$8x10^7$	$4x10^6$	$2x10^6$	$2x10^8$	$2x10^8$
Accessories	Voltage divider	VD202K	VD202K	VD202K	---	---	---
	Socket	FE1014	FE1014	FE1014	FE2019	FE2021	FE2021
	Metal-shields	MS152	MS152	MS152	MS152	MS152	MS152

PHR: for radiation source ^{137}Cs, NaI Tl scintillator, Ø51 mm, h51 mm.
XP2203 minimum radiant sensitivity at 700nm: 10mA/W

Typical spectral characteristics

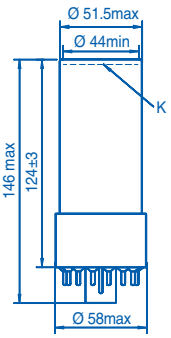


Typical gain curves

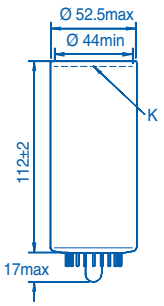


Dimensions and pinning

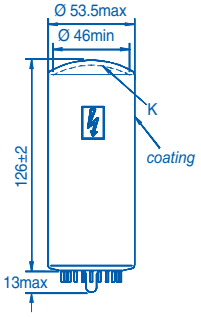
XP2201B, XP2202B, XP2203B

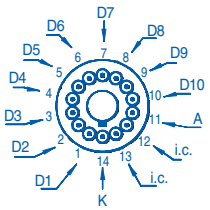


XP2206

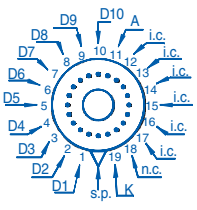


XP2220, XP2228

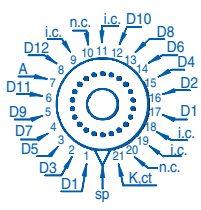




Plastic JEDEC B14-38



19-pin all glass



21-pin all glass

Voltage dividers

Tube	A divider type voltage ratios (for maximum gain)						
	K	D1	D2	D3	...	Dn	A
XP2201B, XP2202B, XP2203B, XP2206	2	1	1	1	...	1	1
XP2220, XP2228	4	2	1	1	...	1	1

XP2201B has no grid

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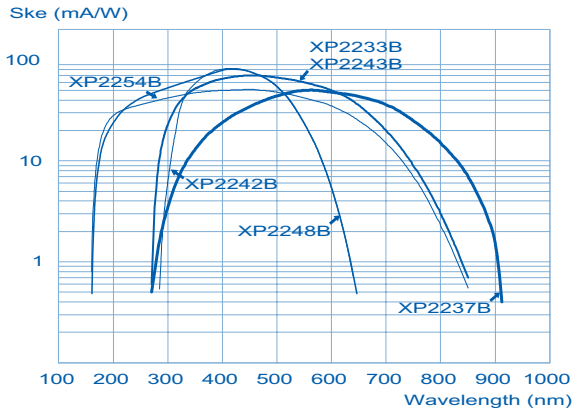
51 mm(2'') tubes

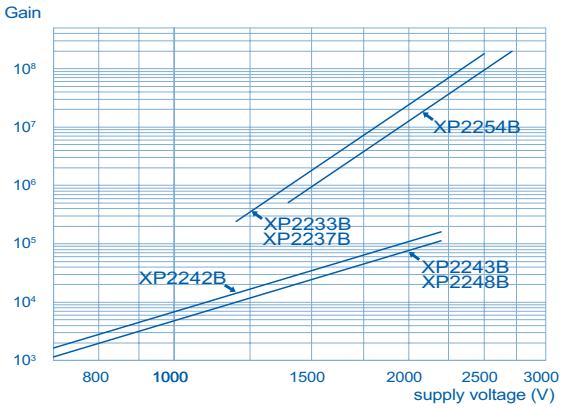
		XP2233B	XP2237B	XP2242B	XP2243B	XP2248B	XP2254B
Key features		fast, red sensitive, high gain	extended red sensitive	fast	fast, red sensitive	fast, UV sensitive	very fast, UV to red sensitive
Dynode structure / number of stages		focused/12	focused/12	focused/6	focused/6	focused/6	focused/12
Cathode luminous sensitivity (µA/lm)	typ.	150	160	90	160	90	160
Cathode blue sensitivity (µA/lmF)	min	---	---	8	9	8	---
	typ.	---	---	10.5	15	10.5	---
Cathode radiant sensitivity (mA/W)	typ. at (nm)	15 mA/W 270 700 850	8 mA/W 270 853 900	80 mA/W 290 420 650	15 mA/W 270 700 850	80 mA/W 160 420 650	15 mA/W 150 700 850
Gain	typ.	$3x10^7$	$3x10^7$	$1x10^4$	$1x10^4$	$1x10^4$	$3x10^7$
Supply voltage	typ.	2 050	2 050	1 100	1 200	1 100	2 200
	min. (V)	1 600	1 600	800	1 000	800	1 750
	max. (V)	2 500	2 500	1 400	1 600	1 400	2 700
Anode dark current	typ. (nA)	60	500	1	2	1	60
	max. (nA)	1 500	5 000	5	10	5	1 500
Max. anode pulse current for linearity 2% (mA)		250	250	350	250	350	280
Time response	rise (ns)	2	2	1.6	1.3	1.3	1.5
	FWHM (ns)	3.2	3.2	2.4	1.9	1.9	2.4
PHR (%)		7.2	---	---	---	---	7.2
Maximum ratings	supply voltage (V)	2 500	2 500	2 200	2 200	2 500	3 000
	gain	$2x10^8$	$2x10^8$	$2x10^5$	$2x10^5$	$2x10^5$	$2x10^8$
Accessories	Voltage divider	VD122K	VD122K	VD162K	VD162K	VD162K	VD124K/T
	Socket	FE1120	FE1120	FE1120	FE1120	FE1120	FE1120
	Metal-shields	MS172	MS172	MS152	MS152	MS152	MS172

PHR: for radiation source ^{57}Co, NaI Tl scintillator, Ø 51 mm, h51 mm;
XP2233B minimum radiant sensitivity at 700nm: 10mA/W ; XP2237B minimum radiant sensitivity at 860nm: 5mA/W
XP2243B minimum radiant sensitivity at 700nm: 10mA/W ; XP2254B minimum radiant sensitivity at 700nm: 10mA/W

Typical spectral characteristics

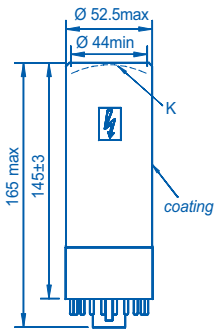


Typical gain curves

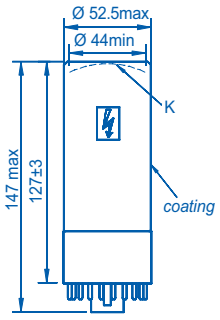


Dimensions and pinning

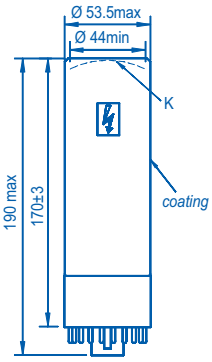
XP2233B, XP2237B

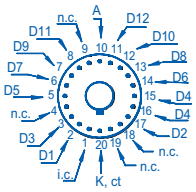


XP2242B, XP2243B, XP2248B

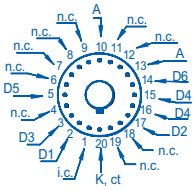


XP2254B

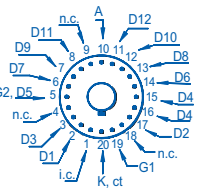




Plastic JEDEC B20-108



Plastic JEDEC B20-108



Plastic JEDEC B20-108

Voltage dividers

Tube	A divider type voltage ratios (for maximum gain)							
	K	G	D1	D2	D3	...	Dn	A
XP2233B, XP2237B	3		0.9	1.1	1	...	1	1
XP2242B, XP2243B, XP2248B	3		1	1	1	...	1	1
XP2254B	1.2	2.8	1.2	1.8	1	...	1	1

XP2233B, XP2237B, XP2254B: two non-inductive resistors of 51 Ω are wired in series with Dn-1 and Dn in the plastic base. XP2242B, XP2243B :Both anode contacts must be connected to prevent ringing of the anode pulse signal. Only XP2254B has a grid

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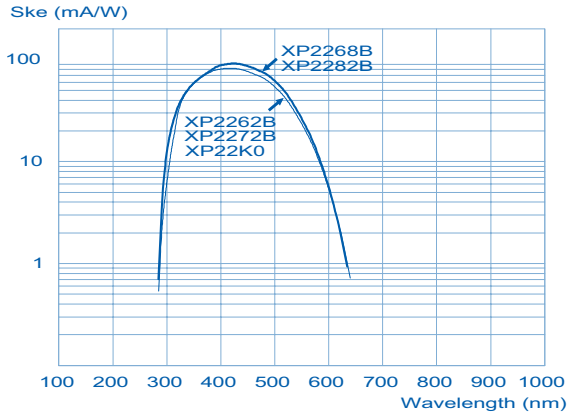
51 mm(2'') tubes

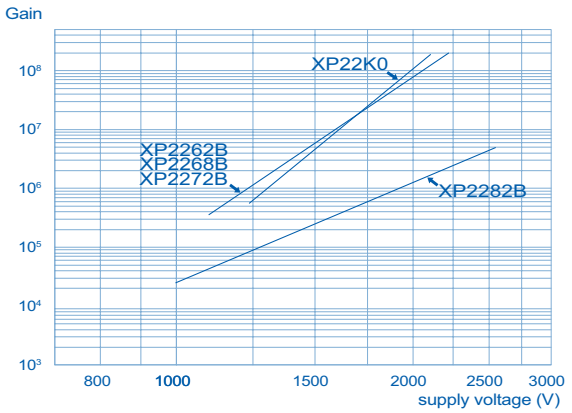
		XP2262B	XP2268B	XP2272B	XP2282B	XP22K0
Key features		fast high gain	fast high gain, UV sensitive	semi-fast high gain, high PHR	fast	very low noise, high gain
Dynode structure / number of stages		focused/12	focused/12	focused/12	focused/8	focused/12
Cathode luminous sensitivity (µA/lm)	typ.	70	70	70	90	70
Cathode blue sensitivity (µA/lmF)	min	9	9	9	9	9
	typ.	11	11	11	11	11
Cathode radiant sensitivity (mA/W)	typ. at (nm)	90 mA/W 290 400 650	90 mA/W 290 400 650	90 mA/W 290 400 650	90 mA/W 290 400 650	90 mA/W 290 400 650
Gain	typ.	$2x10^8$	$2x10^8$	$2x10^8$	$5x10^6$	$3x10^7$
Supply voltage	typ.	1 800	1800	1 800	1 900	1 700
	min. (V)	1 500	1 500	1 500	1 600	1 400
	max. (V)	2 400	2 400	2 400	2 200	2 300
Anode dark current	typ. (nA)	10	10	10	10	5
	max. (nA)	---	---	---	20	---
Anode dark counts	typ. (cps)	1 000	1 000	1 000	---	300
	max. (cps)	6 000	6 000	6 000	---	1 000
Max. anode pulse current for linearity 2% (mA)		250	250	250	180	50
Time response	rise (ns)	2	2	2.7	1.5	3
	FWHM (ns)	3	3	4	2.2	5
Maximum ratings	supply voltage (V)	2 500	2 500	2 500	3 000	2 500
	gain	$2x10^8$	$2x10^8$	$2x10^8$	$5x10^6$	$2x10^8$
Accessories	Voltage divider	VD122K	VD122K	VD122K	VD182K	---
	Socket	FE1120	FE1120	FE1120	FE1120	FE2021
	Metal-shields	MS172	MS172	MS172	MS172	MS152

PHR: for radiation source ^{57}Co, NaI Tl scintillator, Ø 51 mm, h51 mm; Center to edge time difference (type C divider, 2500V supply): 0,5 ns.

Typical spectral characteristics

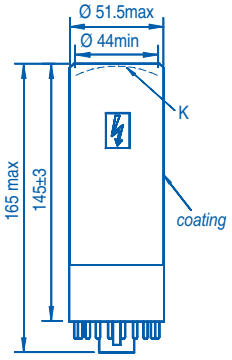


Typical gain curves

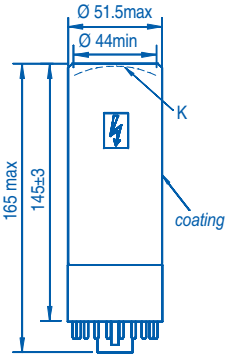


Dimensions and pinning

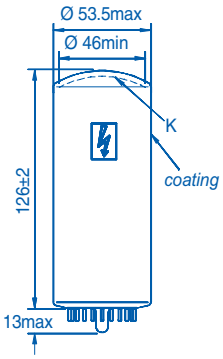
XP2262B, XP2268B, XP2272B

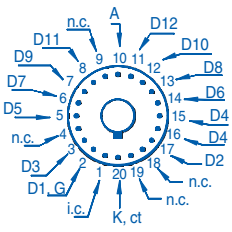


XP2282B

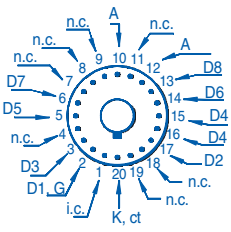


XP22K0



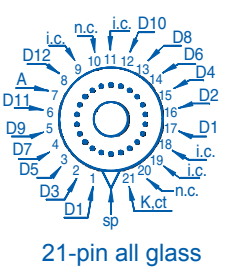


Plastic JEDEC B20-108



Plastic JEDEC B20-108

XP2282B: both anode contacts must be connected to prevent ringing of the anode pulse signal.



21-pin all glass

Voltage dividers

Tube	A divider type voltage ratios (for maximum gain)						
	K	D1	D2	D3	...	Dn	A
XP2262B, XP2268B	4	1.1	0.9	1	...	1	1
XP2272B, XP22K0	4	2	0.9	1	...	1	1
XP2282B	3	1	1	1	...	1	1

Except XP22K0: two non-inductive resistors of 51 Ω are wired in series with Dn-1 and Dn in the plastic base.

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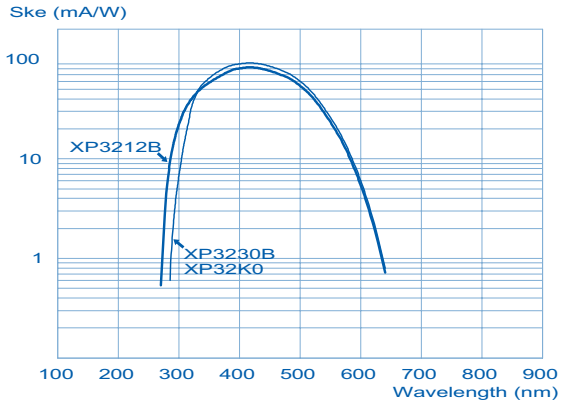
51 mm(2'') tubes

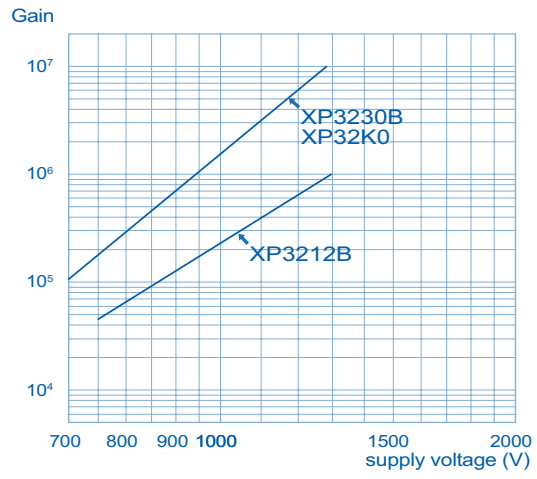
		XP3212B	XP3230B	XP32K0
Key features		high PHR	high PHR, low noise	very low noise, high PHR
Dynode structure / number of stages		b.l./8	b.l./10	b.l./10
Cathode luminous sensitivity (µA/lm)	typ.	100	75	75
Cathode blue sensitivity (µA/lmF)	min	10	9	9
	typ.	12.5	11	11
Cathode radiant sensitivity (mA/W)	typ. at (nm)	100 mA/W (290 420 650)	85 mA/W (270 420 650)	85 mA/W (270 420 650)
Gain	typ.	$2.5x10^5$	$7x10^5$	$7x10^5$
Supply voltage	typ.	1 000	900	900
	min. (V)	800	700	700
	max. (V)	1 200	1 100	1 100
Anode dark current	typ. (nA)	1	0.5	0.5
	max. (nA)	20	2	2
Anode dark counts	typ. (cps)	---	300	300
	max. (cps)	---	1 000	1 000
Max. anode pulse current for linearity 2% (mA)		15	15	15
Time response	rise (ns)	5	5	5
	FWHM (ns)	11	11	11
PHR (%)		8.6	7.5	7.5
Maximum ratings	supply voltage (V)	1 500	1 500	1 500
	gain	$3x10^6$	$1x10^7$	$1x10^7$
Accessories	Voltage divider	VD182K/B	VD202K	---
	Socket	FE1120	FE1014	FE2019
	Metal-shields	MS152	MS152	MS152

PHR: for radiation source ^{137}Cs, NaI Tl scintillator, Ø 51 mm, h51 mm; ^{57}Co for XP3212.

Typical spectral characteristics

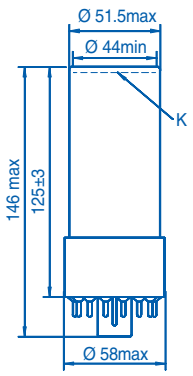


Typical gain curves

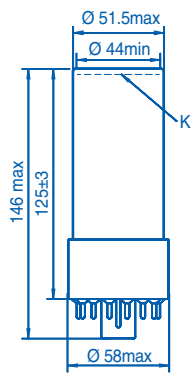


Dimensions and pinning

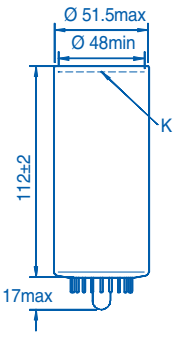
XP3212B

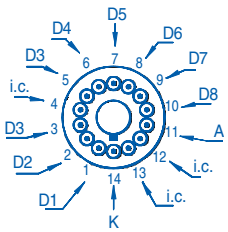


XP3230B

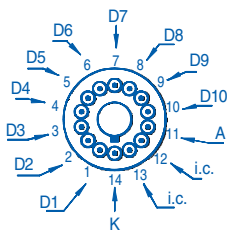


XP32K0

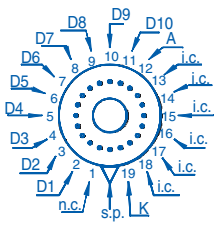




Plastic JEDEC B14-38



Plastic JEDEC B14-38



19-pin all glass

Voltage dividers

Tube	A divider type voltage ratios (for maximum gain)							
	K	D1	D2	D3	D4	...	Dn	A
XP3212B	2	1.5	1.5	1.5	1	...	1	0.5
XP3230B, XP32K0	2	1	1	1	1	...	1	1

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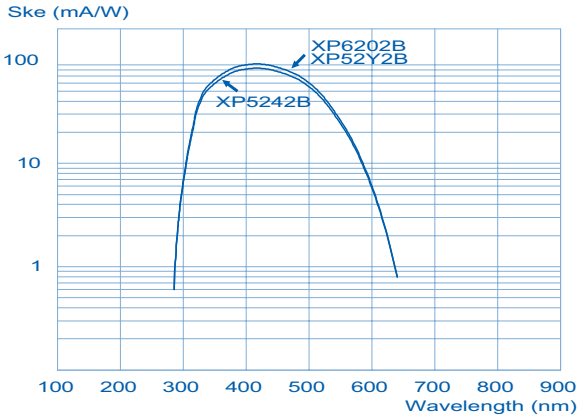
51 mm(2'') tubes

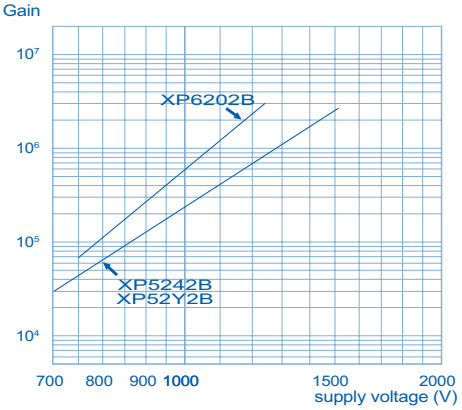
		XP5242B	XP52Y2B	XP6202B
Key features		low profile, high PHR	fast, low profile, high PHR	low profile, high PHR
Dynode structure / number of stages		b.l./9	b.l./8	foil/10
Cathode luminous sensitivity (µA/lm)	typ.	100	100	100
Cathode blue sensitivity (µA/lmF)	min	10	10	10
	typ.	12	12	12
Cathode radiant sensitivity (mA/W)	typ. at (nm)	95 mA/W (290 420 650)	100 mA/W (290 420 650)	90 mA/W (290 420 650)
Gain	typ.	$2.5x10^5$	$2.5x10^5$	$2.5x10^5$
Supply voltage	typ.	1 000	1 000	900
	min. (V)	800	800	700
	max. (V)	1 200	1 200	1 050
Anode dark current	typ. (nA)	1	1	2
	max. (nA)	20	20	20
Max. anode pulse current for linearity 2% (mA)		---	---	10
Time response	rise (ns)	5.5	2	5
	FWHM (ns)	13	3	11
PHR (%)		8.7	9.5	8.8
Maximum ratings	supply voltage (V)	1 500	1 500	1 500
	gain	$3x10^6$	$3x10^6$	$3x10^6$
Accessories	Voltage divider	VD202K/01	---	VD202K
	Socket	FE1014	FE2019	FE1014
	Metal-shields	MS132	MS132	MS132

PHR: for radiation source ^{57}Co, NaI Tl scintillator, Ø 51 mm, h51 mm.

Typical spectral characteristics

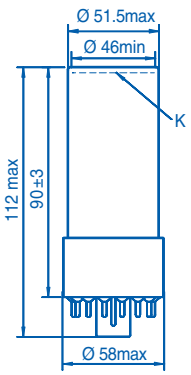


Typical gain curves

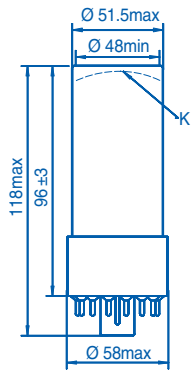


Dimensions and pinning

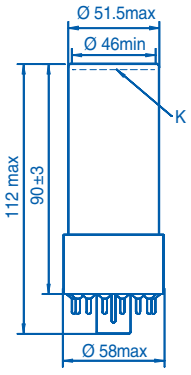
XP5242B

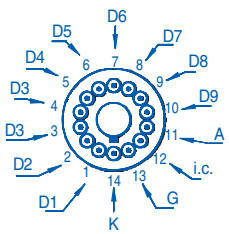


XP52Y2B

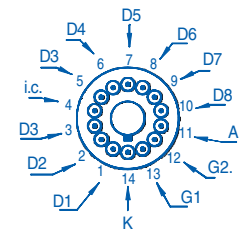


XP6202B

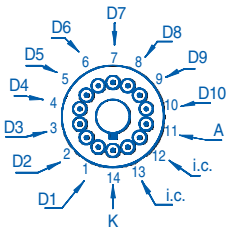




Plastic JEDEC B14-38



Plastic JEDEC B14-38



Plastic JEDEC B14-38

Voltage dividers

Tube	A divider type voltage ratios (for maximum gain)							
	K	G1	G2	D1	D2	...	Dn	A
XP5242B	2	2		1	1	...	1	1
XP52Y2B	0.15	1.85	2	1	1	...	1	1
XP6202B	2			1	1	...	1	1

XP5242B has only one grid.
XP6202B has no grid.

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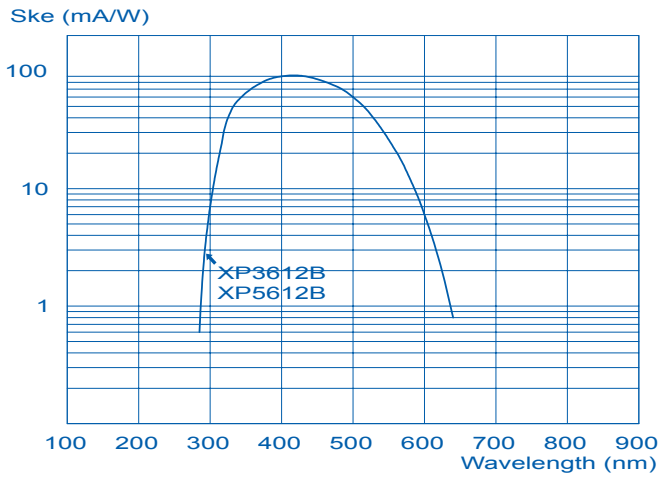
60 mm (2 1/2'') tubes

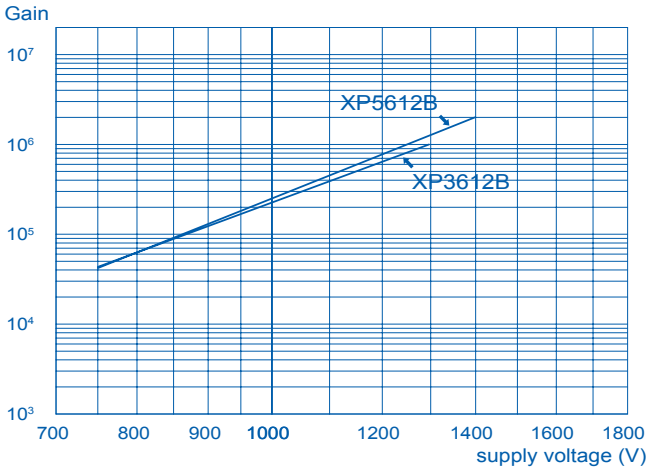
		XP3612B	XP5612B
	Key features	high PHR	high PHR, low-profile
	Dynode structure / number of stages	b.l./8	b.l./9
Cathode luminous sensitivity (µA/lm)	typ.	100	100
Cathode blue sensitivity (µA/lmF)	min	10	10
	typ.	12	12
Cathode radiant sensitivity (mA/W)	typ. at (nm)	100 mA/W 290 420 650	100 mA/W 290 420 650
Gain	typ.	$2.4x10^5$	$2.4x10^5$
Supply voltage	typ.	1 000	1 000
	min. (V)	800	800
	max. (V)	1200	1200
Anode dark current	typ. (nA)	1	1
	max. (nA)	20	20
Max. anode pulse current for linearity 2% (mA)		10	10
Time response	rise (ns)	5	5.5
	FWHM (ns)	11	13
PHR (%)		8.5	8.5
Maximum ratings	supply voltage (V)	1500	1500
	gain	$3x10^6$	$3x10^6$
Accessories	Voltage divider	VD202K	VD202K/01
	Socket	FE1014	FE1014

PHR: for radiation source ^{57}Co, NaI Tl scintillator, Ø 51 mm, h51 mm;

Typical spectral characteristics

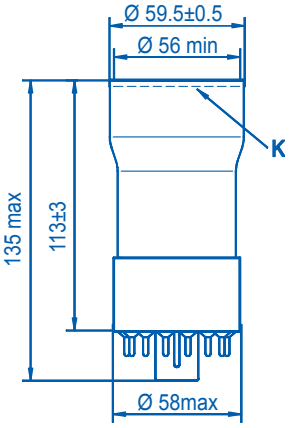


Typical gain curves

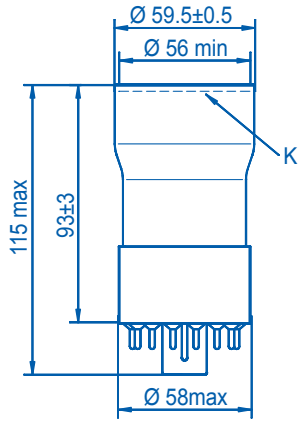


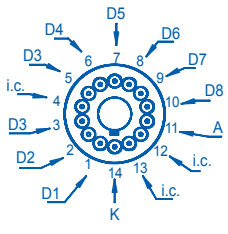
Dimensions and pinning

XP3612B

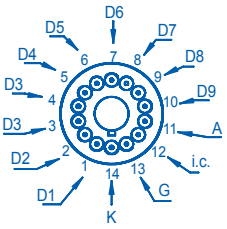


XP5612B





Plastic JEDEC B14-38



Plastic JEDEC B14-38

Voltage dividers

Tube	A divider type voltage ratios (for maximum gain)									
	K	G	D1	D2	D3	D4	D5	..	Dn	A
XP3612B	2		1.5	1.5	1.5	1	1	..	1	0.5
XP5612B	2	2	1	1	1	1	1	..	1	1

XP3612B has no grid

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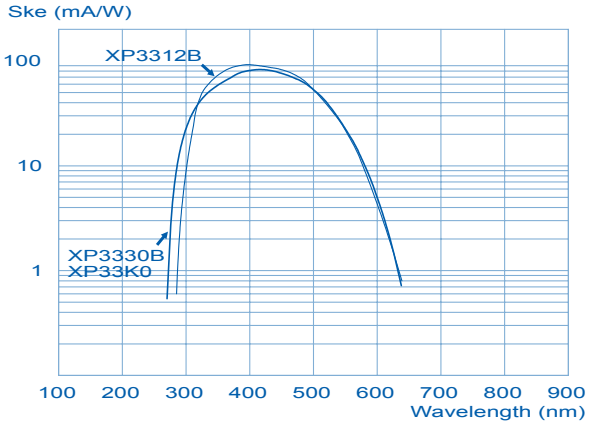
PHOTONIS imaging sensors

76 mm (3'') tubes

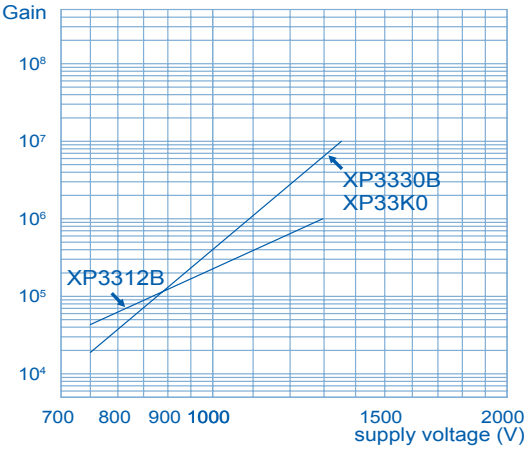
		XP3312B	XP3330B	XP33K0
Key features		high PHR	high PHR, low-noise	high PHR, very low-noise
Dynode structure / number of stages		b.l./8	b.l./10	b.l./10
Cathode luminous sensitivity (µA/lm)	typ.	100	75	75
Cathode blue sensitivity (µA/lmF)	min	11	9	9
	typ.	13	11	11
Cathode radiant sensitivity (mA/W)	typ. at (nm)	100 mA/W 290 420 650	80 mA/W 270 420 650	80 mA/W 270 420 650
Gain	typ.	$2{,}4 \times 10^5$	7.0×10^5	7.0×10^5
Supply voltage	typ.	1 000	900	900
	min. (V)	800	700	700
	max. (V)	1200	1100	1100
Anode dark current	typ. (nA)	1	0.5	0.5
	max. (nA)	20	5	2
Anode dark counts	typ. (cps)	500	500	500
	max. (cps)	2000	2000	2000
Max. anode pulse current for linearity 2% (mA)		15	15	15
Time response	rise (ns)	5	6.5	6.5
	FWHM (ns)	11	16	16
PHR (%)		8.6	7.5	7.5
Maximum ratings	supply voltage (V)	1500	1500	1500
	gain	3×10^6	1×10^7	1×10^7
Accessories	Voltage divider	VD282K	VD202K	---
	Socket	FE1014	FE1014	FE2019
	Metal-shields	MS153	MS153	MS132

PHR: for radiation source ^{137}Cs, NaI Tl scintillator, Ø76 mm, h76 mm; ^{57}Co for XP3312B.

Typical spectral characteristics

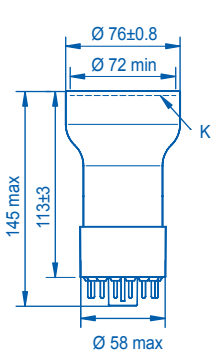


Typical gain curves

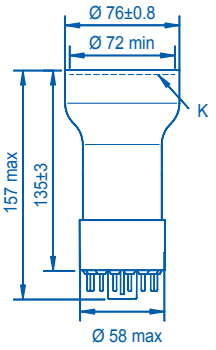


Dimensions and pinning

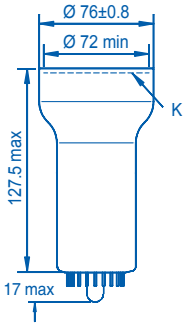
XP3312B

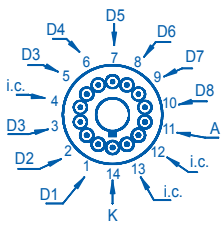


XP3330B

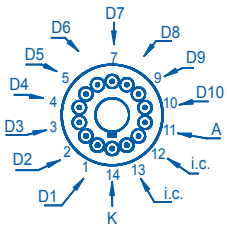


XP33K0

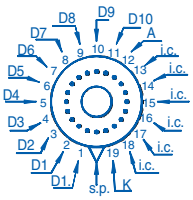




Plastic JEDEC B14-38



Plastic JEDEC B14-38



19-pin all glass

Voltage dividers

Tube	A divider								
	K	D1	D2	D3	D4	D5	...	Dn	A
XP3312B	2	1.5	1.5	1.5	1	1	...	1	0.5
XP3330B, XP33K0	2	1	1	1	1	1	...	1	1

PHOTONIS imaging sensors

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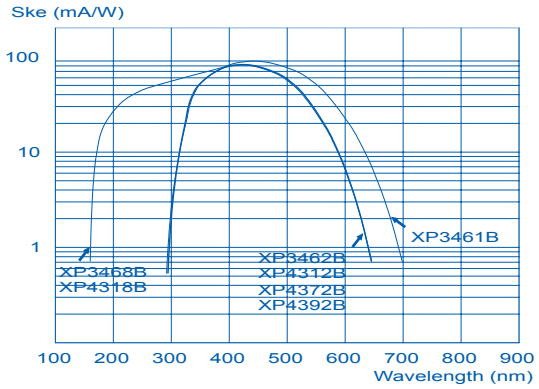
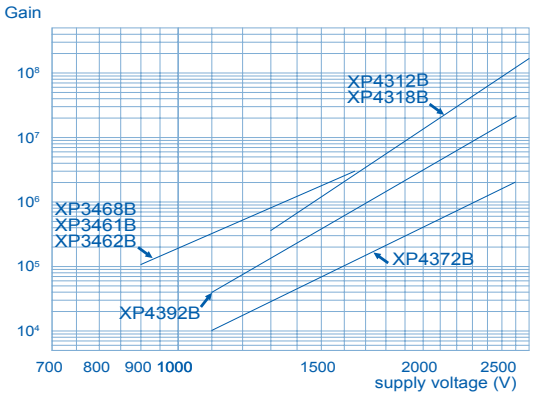
76 mm (3") tubes

		XP3461B	XP3462B	XP3468B	XP4312B	XP4318B	XP4372B	XP4392B
Key features		fast, green-sensitive	fast	fast, UV-sensitive	fast, high gain	fast, high gain UV-sensitive	fast,lime glass	fast, high PHR
Dynode structure / number of stages		focused/8	focused/8	focused/8	focused/12	focused/12	focused/8	focused/10
Cathode luminous sensitivity (µA/lm)	typ.	140 (100 min)	100	80	100	100	100	100
Cathode blue sensitivity (µA/lmF)	min	---	9	9	9	9	9	9
	typ.	14	12	10	11	11	11	11
Cathode radiant sensitivity (mA/W)	typ. at (nm)	105 mA/W ▼ 290 420 700	95 mA/W ▼ 290 420 650	80 mA/W ▼ 160 420 650	90 mA/W ▼ 290 420 650	90 mA/W ▼ 160 420 650	90 mA/W ▼ 290 420 650	90 mA/W ▼ 290 420 650
Gain	typ.	$1x10^6$	$1x10^6$	$1x10^6$	$3x10^7$	$3x10^7$	$3x10^5$	$3x10^6$
Supply voltage	typ.	1 350	1 350	1 350	2 200	2 200	1900	2000
	min. (V)	1150	1150	1150	2000	2000	1700	1800
	max. (V)	1600	1600	1600	2700	2700	2200	2500
Anode dark current	typ. (nA)	10	2	2	60	60	60	60
	max. (nA)	40	20	20	250	250	250	250
Anode dark counts	typ. (cps)	5000	5000	5000	---	---	---	---
	max. (cps)	20000	10000	10000	---	---	---	---
Max. anode pulse current for linearity 2% (mA)		200	200	200	150	150	150	150
Time response	rise (ns)	3	3	3	2.2	2.2	2.2	2.2
	FWHM (ns)	4	4	4	3.5	3.5	3.5	3.5
Maximum ratings	supply voltage (V)	2000	2000	2000	3000	3000	2800	2800
	gain	$3x10^6$	$3x10^6$	$3x10^6$	$2x10^8$	$2x10^8$	$2x10^6$	$2x10^7$
Accessories	Voltage divider	VD183K	VD183K	VD183K	VD123K	VD123K	VD123K	VD123K
	Socket	FE1014	FE1120	FE1120	FE1120	FE1120	FE1120	FE1120
	Metal-shields	MS153	MS153	MS153	MS153	MS153	MS153	MS153

Typical spectral characteristics



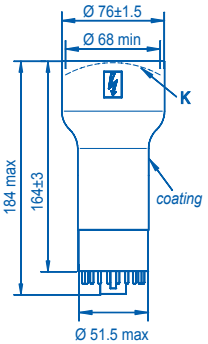
Typical gain curves



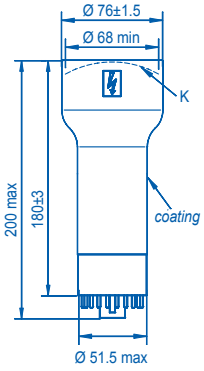
XP43xx have only 1 grid.
Their grid voltage has to be adjusted for maximum output with full cathode illumination.
Two non-inductive resistors of 51 Ω are wired in series with Dn-1 and Dn in plastic base.

Dimensions and pinning

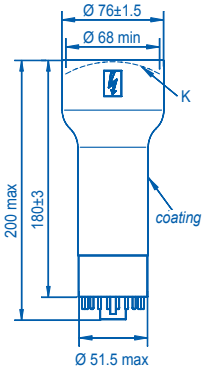
XP3461B, XP3462B, XP3468B

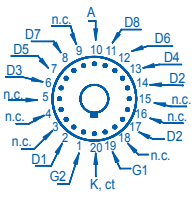


XP4312B, XP4318B,

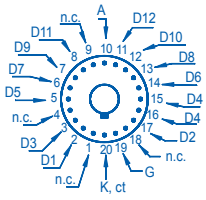


XP4372B, XP4392B

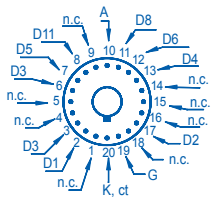




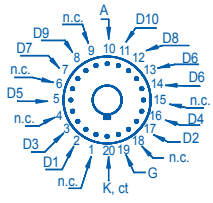
Plastic JEDEC B14-38



Plastic JEDEC B20-108



XP4372B



XP4392B

Voltage dividers

Tube	A divider for XP34xx. B divider for XP45xx												
	K	G1	G2	D1	D2	D3	...	Dn-4	Dn-3	Dn-2	Dn-1	Dn	A
XP3461B, XP3462B, XP3468B	0.12	0.7	2.3	1.5	1	1	...	1	1	1	1	1	1
XP4312B, XP4318B, XP4372B, XP4392B,	2		~8	2	1	1	...	1	1.5	2	2.5	3	2.5

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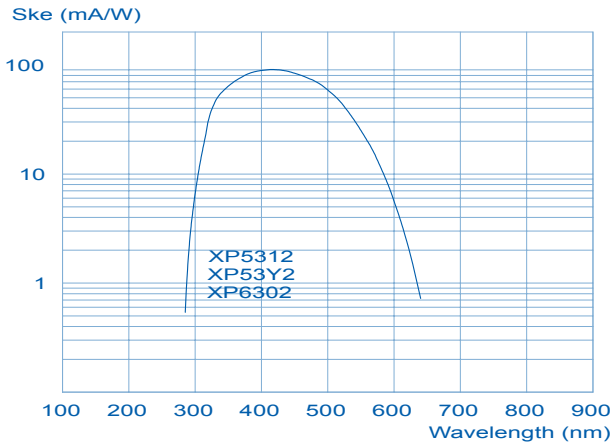
PHOTONIS imaging sensors

76 mm (3'') tubes

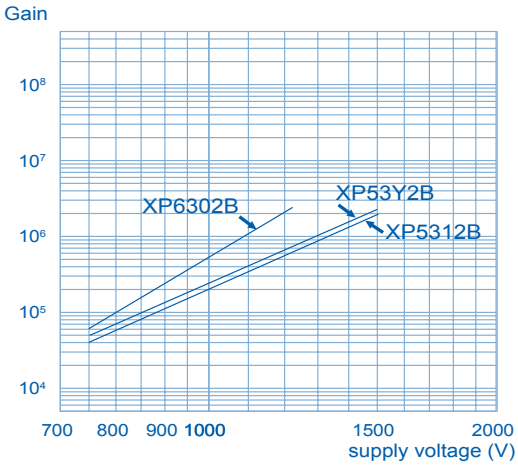
		XP5312B	XP53Y2B	XP6302B
Key features		low-profile, high PHR	fast, high PHR	low-profile, high PHR
Dynode structure / number of stages		b.l./9	b.l./8	b.l./10
Cathode luminous sensitivity (µA/lm)	typ.	100	100	100
Cathode blue sensitivity (µA/lmF)	min	11	11	11
	typ.	12.5	12.5	12.5
Cathode radiant sensitivity (mA/W)	typ. at (nm)	100 mA/W 290 420 650	100 mA/W 290 420 650	100 mA/W 290 420 650
Gain	typ.	$2.4x10^5$	$2.4x10^5$	$2.4x10^5$
Supply voltage	typ.	1 000	1 000	900
	min. (V)	800	800	700
	max. (V)	1200	1200	1050
Anode dark current	typ. (nA)	1	1	2
	max. (nA)	20	20	20
Max. anode pulse current for linearity 2% (mA)		10	10	10
Time response	rise (ns)	6	3	7
	FWHM (ns)	16	4	15
PHR (%)		8.6	---	8.7
Maximum ratings	supply voltage (V)	1500	1 500	900
	gain	$3x10^6$	$3x10^6$	$2x10^6$
Accessories	Voltage divider	VD202K/01	---	VD202K
	Socket	FE1014	FE1014	FE1014
	Metal-shields	MS133	MS133	MS133

PHR: for radiation source ^{57}Co, NaI Tl scintillator, Ø76 mm, h76 mm.
XP6302B has a focused first dynode.

Typical spectral characteristics

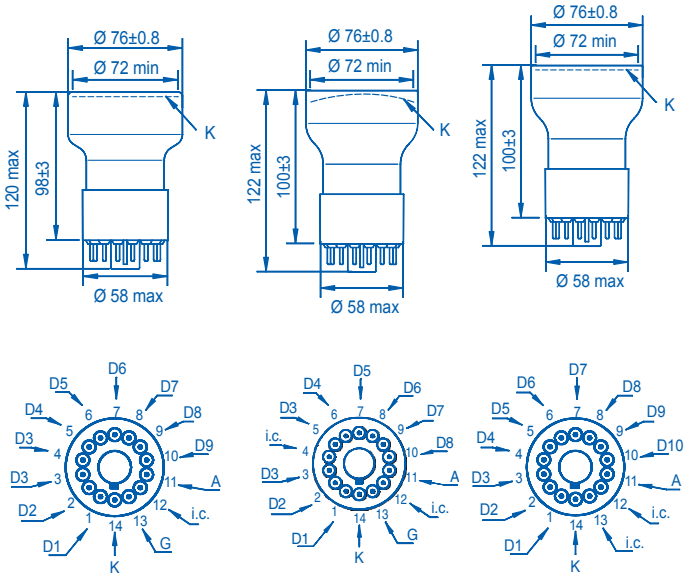


Typical gain curves



Dimensions and pinning

XP5312B XP53Y2B XP6302B



Plastic JEDEC B14-38

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Voltage dividers

Tube	A divider type voltage ratios (for maximum gain)									
	K	G1	G2	D1	D2	D3	...	Dn-1	Dn	A
XP5312B	2		2	1	1	1	...	1	1	1
XP53Y2B	0.15	1.85	2	1	1	1	...	1	1	1
XP6302B	2			2	1	1	...	1	1	1

XP5312B has only 1 grid.
XP6302B has no grid.

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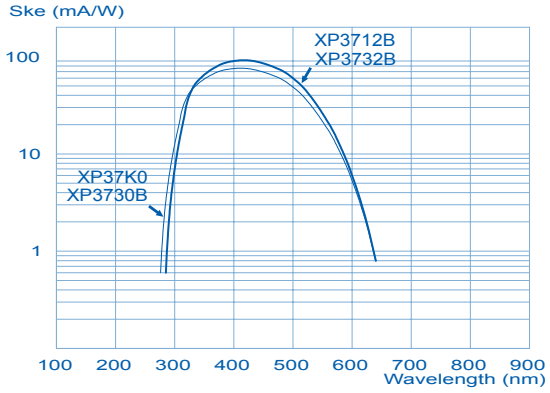
90 mm (3 1/2") tubes

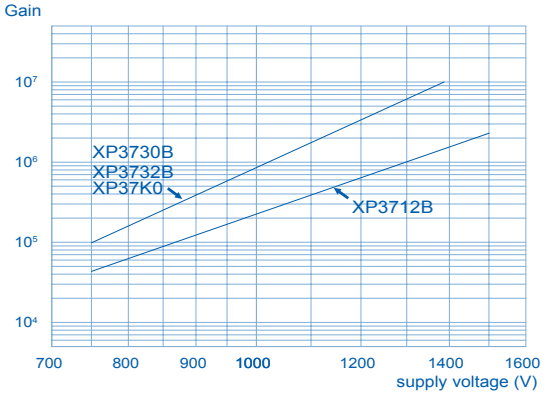
		XP3712B	XP3730B	XP3732B	XP37K0
Key features		high PHR	high PHR, low noise	high PHR	high PHR, very low noise
Dynode structure / number of stages		b.l./8	b.l./10	b.l./10	b.l./10
Cathode luminous sensitivity (µA/lm)	typ.	100	75	100	75
Cathode blue sensitivity (µA/lmF)	min	11	9	11	9
	typ.	13	11	13	11
Cathode radiant sensitivity (mA/W)	typ. at (nm)	100 mA/W 290 420 650	85 mA/W 270 420 650	100 mA/W 290 420 650	85 mA/W 270 420 650
Gain	typ.	$2.3x10^5$	$7x10^5$	$7x10^5$	$7x10^5$
Supply voltage	typ.	1 000	1 000	1 000	1 000
	min. (V)	800	800	800	800
	max. (V)	1200	1200	1200	1200
Anode dark current	typ. (nA)	1	1.5	2	1.5
	max. (nA)	20	6	20	6
Anode dark counts	typ. (cps)	---	1 000	---	1 000
	max. (cps)	---	3 000	---	3 000
Max. anode pulse current for linearity 2% (mA)		10	70	70	70
Time response	rise (ns)	5	5	5	5
	FWHM (ns)	11	11	11	11
PHR (%)		7	7	7	7
Maximum ratings	supply voltage (V)	1500	1500	1500	1 500
	gain	$1x10^6$	$1x10^7$	$1x10^7$	$1x10^7$
Accessories	Voltage divider	VD282K	VD202K/01	VD202K/01	---
	Socket	FE1014	FE1014	FE1014	FE2019

PHR: for radiation source ^{137}Cs, NaI Tl scintillator, Ø76 mm, h76 mm; Ø51 mm, h51 mm for XP3730B, XP37K0.

Typical spectral characteristics

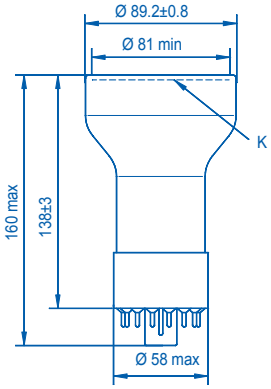


Typical gain curves

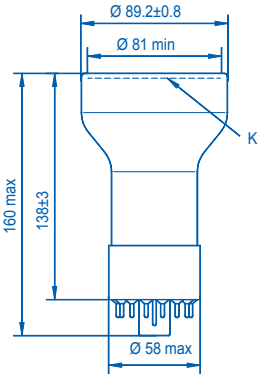


Dimensions and pinning

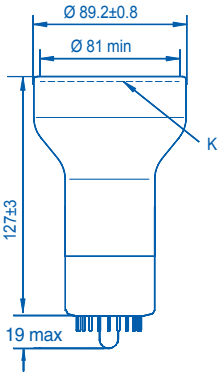
XP3712B

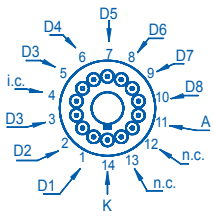


XP3730B, XP3732B

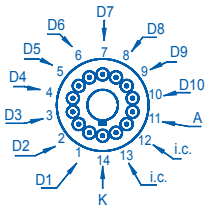


XP37K0

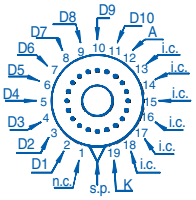




Plastic JEDEC B14-38



Plastic JEDEC B14-38



19-pin all glass

Voltage dividers

Tube	A divider type voltage ratios (for maximum gain)						
	K	D1	D2	D3	...	Dn	A
XP3712B, XP3732B, XP3730, XP37K0	4	1	1	1	...	1	1

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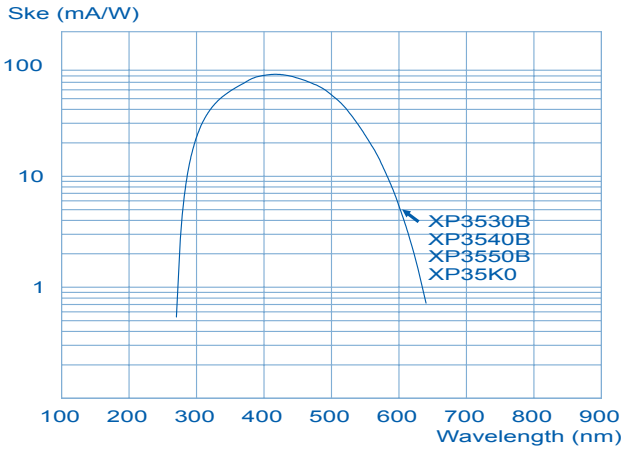
130 mm (5’’) tubes

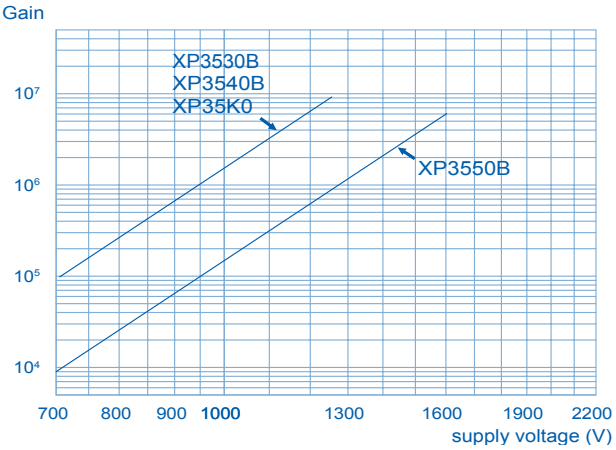
		XP3530B	XP3540B	XP3550B	XP35K0
Key features		high PHR, low-noise, high gain	high PHR, low-noise, high gain	high PHR, low-noise,	high PHR, very low-noise,
Dynode structure / number of stages		b.l./10	b.l./10	b.l./10	b.l./10
Cathode luminous sensitivity (µA/lm)	typ.	90	90	90	90
Cathode blue sensitivity (µA/lmF)	min	9	9	9	9
	typ.	11.5	11.5	11.5	11.5
Cathode radiant sensitivity (mA/W)	typ. at (nm)	90 mA/W 270 420 650	90 mA/W 270 420 650	90 mA/W 270 420 650	90 mA/W 270 420 650
Gain	typ.	$6.5x10^5$	$6.5x10^5$	$6.5x10^5$	$6.5x10^5$
Supply voltage	typ.	900	900	1250	900
	min. (V)	700	700	900	700
	max. (V)	1 100	1 100	1 500	1 100
Anode dark current	typ. (nA)	1	1	1	1
	max. (nA)	5	5	5	5
Anode dark counts	typ. (cps)	1 200	1 200	1 200	1 200
	max. (cps)	5 000	5 000	5 000	5 000
Max. anode pulse current for linearity 2% (mA)		50	50	100	50
Time response	rise (ns)	9.5	9.5	9.5	9.5
	FWHM (ns)	23	23	23	23
PHR (%)		6.7	6.7	6.7	6.7
Maximum ratings	supply voltage (V)	1 700	1 700	1 700	1 700
	gain	$1x10^7$	$1x10^7$	$1x10^7$	$1x10^7$
Accessories	Voltage divider	VD202K/01	VD202K/01	VD202K/01	---
	Socket	FE1014	FE1014	FE1014	FE2019

PHR: for radiation source ^{137}Cs, NaI Tl scintillator, Ø76 mm, h76 mm.

Typical spectral characteristics

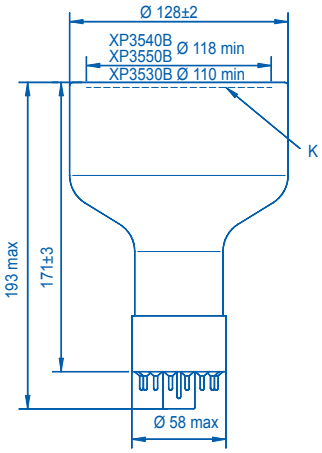


Typical gain curves

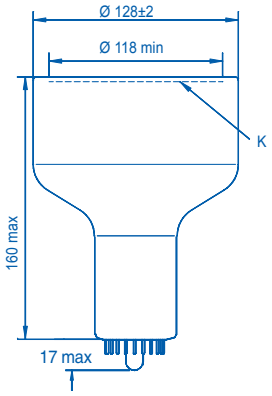


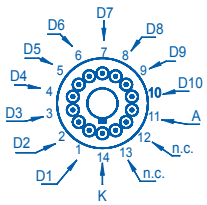
Dimensions and pinning

XP3530B, XP3540B, XP3550B

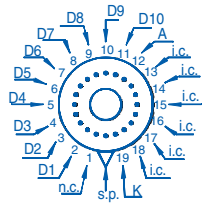


XP35K0





Plastic JEDEC B14-38



19-pin all glass

Voltage dividers

Tube	A divider type voltage ratios (for maximum gain)								
	K	D1	D2	D3	D4	D5	....	Dn	A
XP3530B, XP3540B, XP3550B, XP35K0	4	1	1	1	1	1	....	1	1

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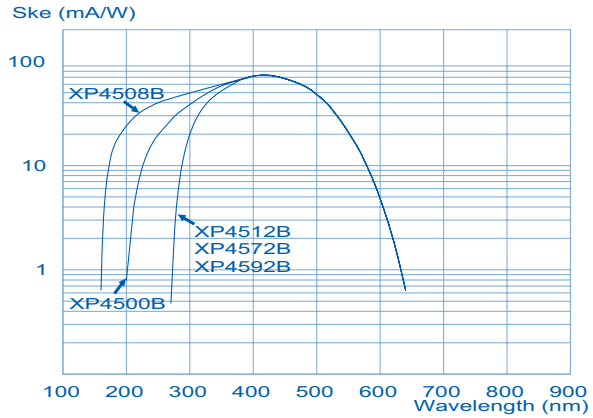
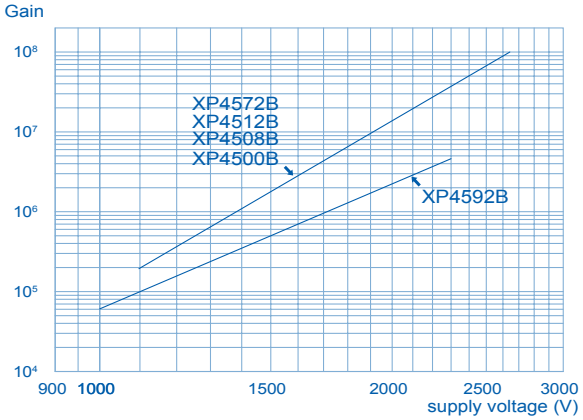
130 mm (5'') tubes

		XP4500B	XP4508B	XP4512B	XP4572B	XP4592B
Key features		fast, with concave-convex UV-transmitting window	fast, UV-sensitive	fast	semi-fast, high PHR	fast
Dynode structure / number of stages		focused/10	focused/10	focused/10	b.l./10	focused/8
Cathode luminous sensitivity (µA/lm)	typ.	70	65	70	70	70
Cathode blue sensitivity (µA/lmF)	min	9	8	8	8	8
	typ.	10.5	10	10	10	10
Cathode radiant sensitivity (mA/W)	typ. at (nm)	80 mA/W 190 420 650	80 mA/W 160 420 650	80 mA/W 270 420 650	80 mA/W 270 420 650	80 mA/W 270 420 650
Gain	typ.	$2.0x10^7$	$2.0x10^7$	$2.0x10^7$	$2.0x10^7$	$5.0x10^5$
Supply voltage	typ.	2 100	2 100	2 100	2 100	1 500
	min. (V)	1800	1450	1450	1450	1100
	max. (V)	2500	2500	2500	2600	2000
Anode dark current	typ. (nA)	90	30	90	90	5
	max. (nA)	400	600	400	400	20
Max. anode pulse current for linearity 2% (mA)		80	80	80	80	80
Time response	rise (ns)	2.5	2.1	2.5	4.3	2.5
	FWHM (ns)	3.8	3	3.8	5.5	3.8
Maximum ratings	supply voltage (V)	2700	2700	2700	2700	2300
	gain	$1x10^8$	$1x10^8$	$1x10^8$	$1x10^8$	$1x10^7$
Accessories	Voltage divider	VD105K, VD305K	VD105K, VD305K	VD105K, VD305K	VD105K, VD305K	VD105K/02
	Socket	FE1120	FE1120	FE1120	FE1120	FE1120
	Metal-shields	MS175	MS175	MS175	MS175	MS175

Typical spectral characteristics

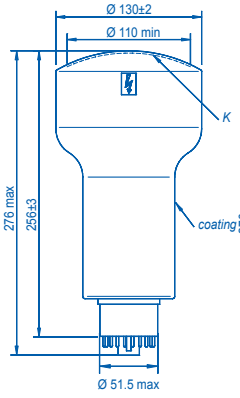


Typical gain curves

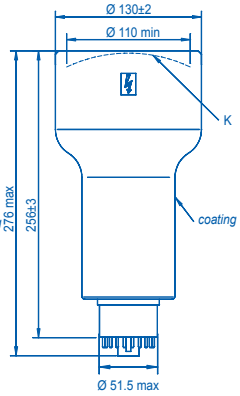


Dimensions and pinning

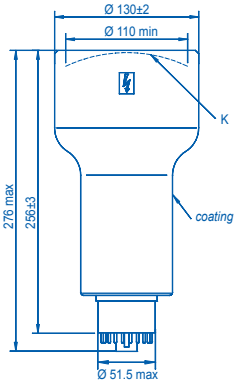
XP4500B

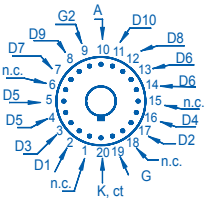


XP4508B, XP4512B, XP4572B

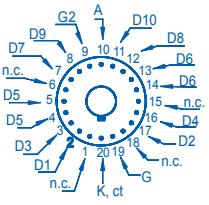


XP4592B

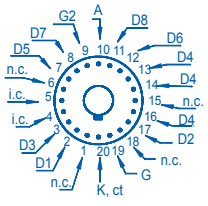




Plastic JEDEC B20-108



Plastic JEDEC B20-108



Plastic JEDEC B20-108

Voltage dividers

Tube	A divider type voltage ratios										
	K	G	D1	D2	...	Dn-4	Dn-3	Dn-2	Dn-1	Dn	A
XP4500B, XP4508B, XP4512B, XP4572B, XP4592B	~4	7	2	1	...	1	1.5	2	2.5	3	2.5

Grid voltage has to be adjusted for maximum output with full cathode illumination
XP4592B : G2 to be connected to D5.
XP4500B, XP4508B, XP4512B, XP4572B: G2 to be connected to D6.

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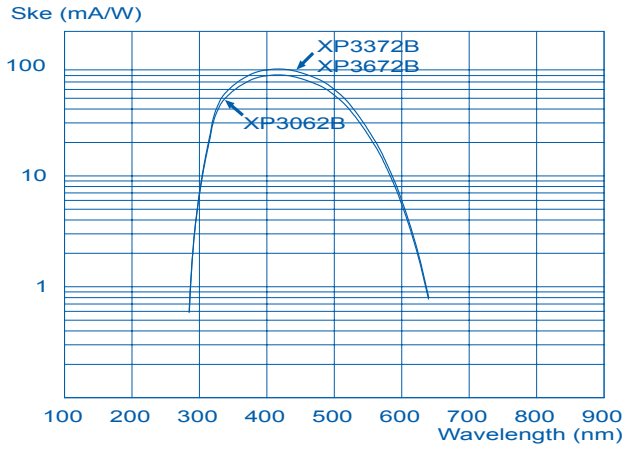
PHOTONIS imaging sensors

Hexagonal faceplate tubes

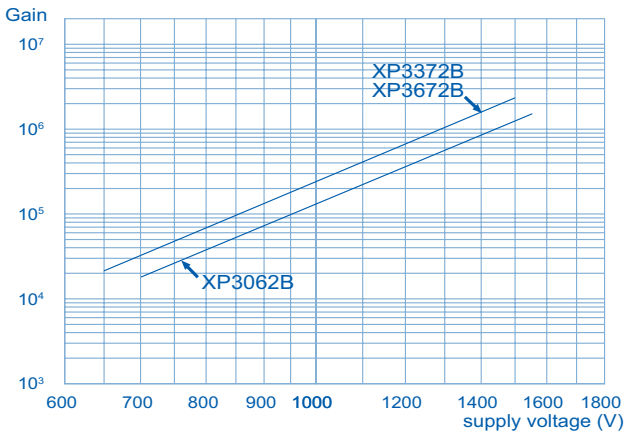
		XP3062B	XP3372B	XP3672B
Key features		40 mm, cosmic-ray air shower telescope PMT	76 mm, high PHR	60mm, high PHR
Dynode structure / number of stages		focused/8	b.l./8	b.l./8
Cathode luminous sensitivity (µA/lm)	typ.	90	100	100
Cathode blue sensitivity (µA/lmF)	min	9	11	11
	typ.	11.5	13	12
Cathode radiant sensitivity (mA/W)	typ. at (nm)	90 mA/W 290 420 650	100 mA/W 290 420 650	100 mA/W 290 420 650
Gain	typ.	$2.6x10^5$	$2.3x10^5$	$2.3x10^5$
Supply voltage	typ.	1 100	1 000	1 000
	min. (V)	900	800	800
	max. (V)	1300	1200	1200
Anode dark current	typ. (nA)	1	1	1
	max. (nA)	20	20	20
Max. anode pulse current for linearity 2% (mA)		80	15	15
Time response	rise (ns)	3	5	5
	FWHM (ns)	4.5	11	11
PHR (%)		12	8.5	8.5
Maximum ratings	supply voltage (V)	1 600	1 500	1 500
	gain	$2x10^6$	$3x10^6$	$3x10^6$
Accessories	Voltage divider	---	VD282K	VD282K
	Socket	FE1113	FE1014	FE1014

PHR: for radiation source ^{57}Co, NaI Tl scintillator, Ø51 mm, h51 mm; Ø76 mm, h76 mm for XP3372B.

Typical spectral characteristics

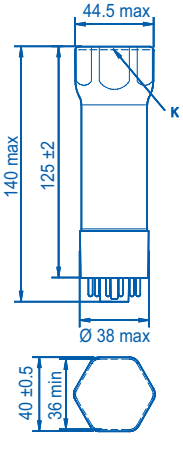


Typical gain curves

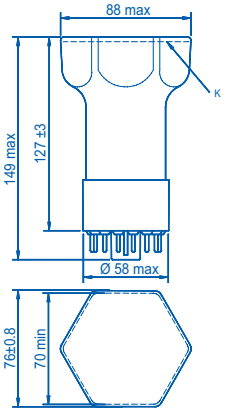


Dimensions and pinning

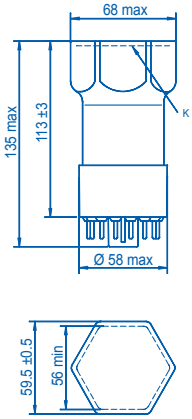
XP3062B

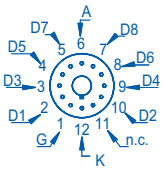


XP3372B

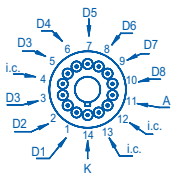


XP3672B

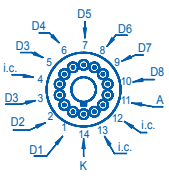




Plastic JEDEC B12-43



Plastic JEDEC B14-38



Plastic JEDEC B14-38

Voltage dividers

Tube	A divider type voltage ratios (for maximum gain)									
	K	G	D1	D2	D3	D4	D5	...	Dn	A
XP3062B	0.05	3	1	1	1	1	1	...	1	1
XP3372B, XP3672B	2		1.5	1.5	1.5	1	1	...	1	0.5

Only XP3062B has a grid

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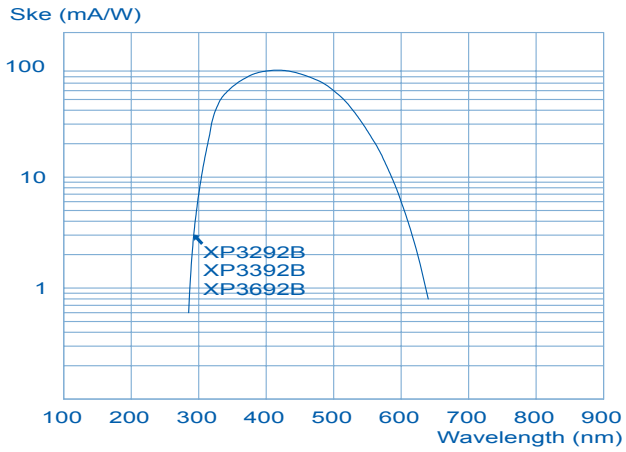
Square, single-channel tubes

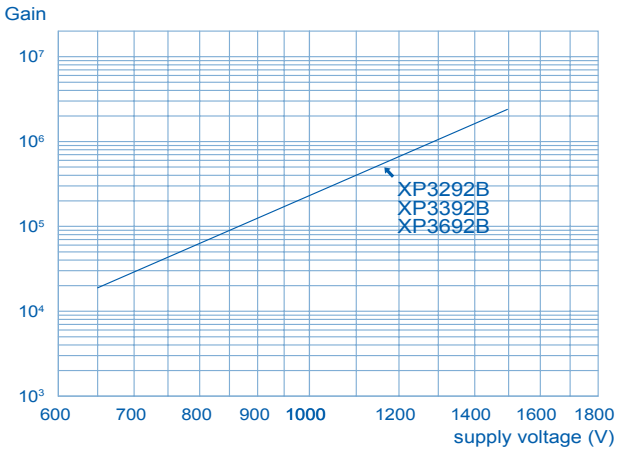
		XP3292B	XP3392B	XP3692B
Key features		51 mm, high PHR	76 mm, high PHR	60 mm, high PHR
Dynode structure / number of stages		b.l./8	b.l./8	b.l./8
Cathode luminous sensitivity (µA/lm)	typ.	100	100	100
Cathode blue sensitivity (µA/lmF)	min	11	11	11
	typ.	13	13	13
Cathode radiant sensitivity (mA/W)	typ. at (nm)	100 mA/W 290 420 650	100 mA/W 290 420 650	100 mA/W 290 420 650
Gain	typ.	$2.3x10^5$	$2.3x10^5$	$2.3x10^5$
Supply voltage	typ.	1 000	1 000	1 000
	min. (V)	800	800	800
	max. (V)	1200	1200	1200
Anode dark current	typ. (nA)	1	1	1
	max. (nA)	20	20	20
Max. anode pulse current for linearity 2% (mA)		15	15	15
Time response	rise (ns)	4	5	4.5
	FWHM (ns)	8	11	10
PHR (%)		8.6	8.5	8.6
Maximum ratings	supply voltage (V)	1500	1500	1500
	gain	$2x10^6$	$2x10^6$	$2x10^6$
Accessories	Voltage divider	VD282K	VD282K	VD282K
	Socket	FE1014	FE1014	FE1014

PHR: for radiation source ^{57}Co, NaI Tl scintillator, Ø51 mm, h51 mm; Ø76 mm, h76 mm for XP3392B.

Typical spectral characteristics

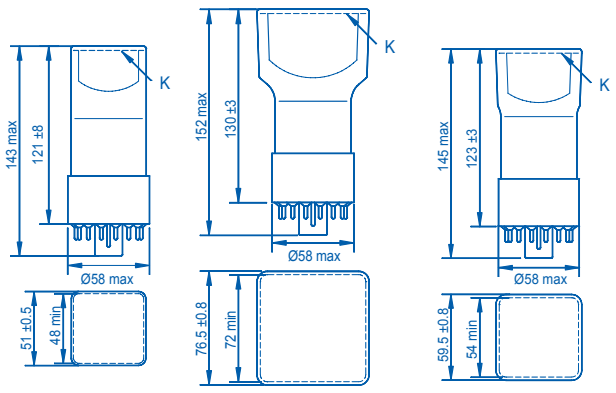


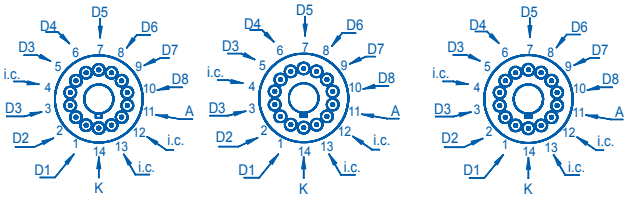
Typical gain curves



Dimensions and pinning

XP3292B XP3392B XP3692B





Plastic JEDEC B14-38 | Plastic JEDEC B14-38 | Plastic JEDEC B14-38

Voltage dividers

Tube	A divider type voltage ratios (for maximum gain)								
	K	D1	D2	D3	D4	D5	...	Dn	A
XP3292B, XP3392B, XP3692B	2	1.5	1.5	1.5	1	1	...	1	0.5

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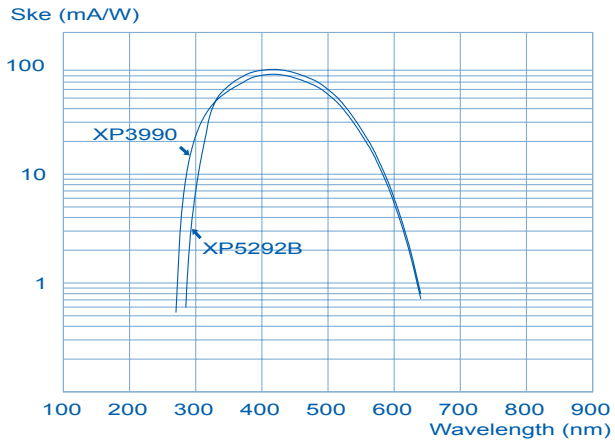
PHOTONIS imaging sensors

Square, single-channel tubes

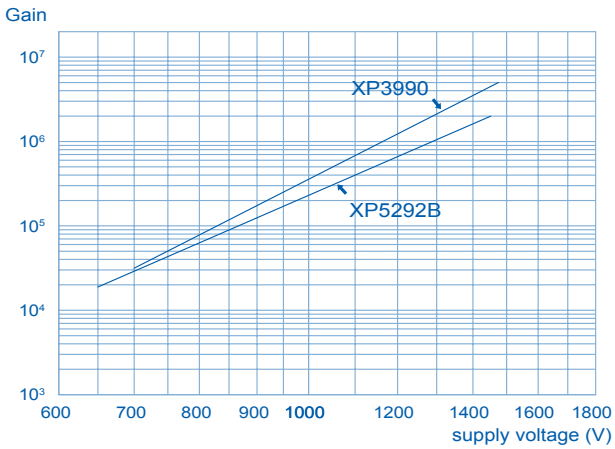
		XP3990	XP5292B
Key features		29 mm	51 mm, low-profile
Dynode structure / number of stages		focused/9	b.l./ 9
Cathode luminous sensitivity (µA/lm)	typ.	85	100
Cathode blue sensitivity (µA/lmF)	min	9	11
	typ.	11	13
Cathode radiant sensitivity (mA/W)	typ. at (nm)	85 mA/W 270 420 650	100 mA/W 290 420 650
Gain	typ.	6.8×10^5	2.3×10^5
Supply voltage	typ.	1 100	1 000
	min. (V)	1 000	800
	max. (V)	1 300	1 200
Anode dark current	typ. (nA)	2	1
	max. (nA)	10	20
Max. anode pulse current for linearity 2% (mA)		20	30
Time response	rise (ns)	3	6
	FWHM (ns)	5.2	14
PHR (%)		7.3	8.6
Maximum ratings	supply voltage (V)	1 700	1 500
	gain	6×10^6	2×10^6
Accessories	Voltage divider		VD202K/01
	Socket	FE1114, FE3114	FE1014

PHR XP5292B: for radiation source ^{57}Co, NaI Tl scintillator, Ø51 mm, h51 mm; Ø25 mm, h25 mm for XP3990B.
PHR XP3990: for radiation source ^{137}Cs, NaI Tl scintillator, Ø25 mm, h25 mm

Typical spectral characteristics

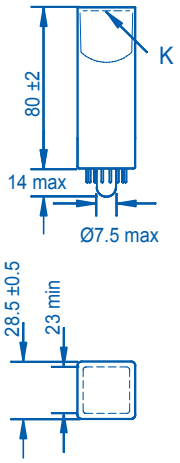


Typical gain curves

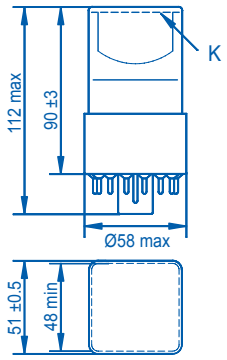


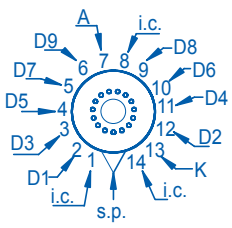
Dimensions and pinning

XP3990

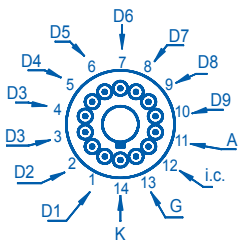


XP5292B





14-pin all glass



Plastic JEDEC B14-38

Voltage dividers

Tube	A divider type voltage ratios (for maximum gain)									
	K	G	D1	D2	D3	D4	D5	...	Dn	A
XP3990	2		1	1	1	1	1	...	1	1
XP5292B	2	2	1	1	1	1	1	...	1	1

Only XP5292B has a grid

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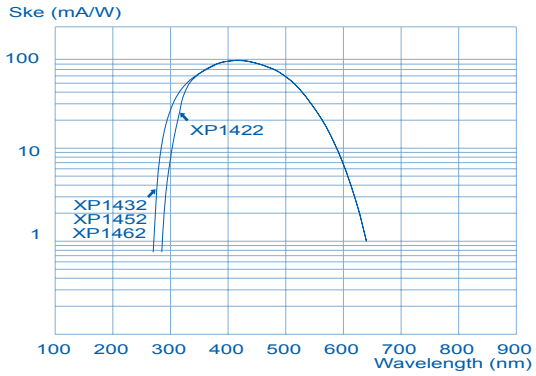
Multipixel tubes

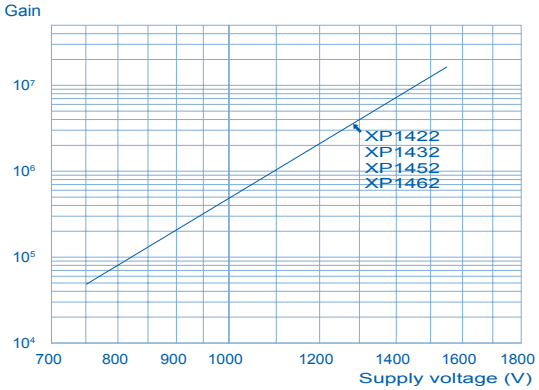
		XP1422	XP1432	XP1452	XP1462
Key features		25 mm, square, 2-channel	32mm, square, 4-channel,	38 mm, 4-channel, square, with individual channel gain adjustment	38 mm, 4-channel, square, low profile tube with individual channel gain adjustment
Dynode structure / number of stages		foil/11	foil/11	foil/11	foil/11
Cathode luminous sensitivity (µA/lm)	typ.	100 (80min)	90 (70min)	100 (70min)	100 (70min)
Cathode blue sensitivity (µA/lmF)	min	10	10	10	10
	typ.	11	11	11	11
Cathode radiant sensitivity (mA/W)	typ. at (nm)	100 mA/W 290 420 650	100 mA/W 270 420 650	100 mA/W 270 420 650	100 mA/W 270 420 650
Gain	typ.	$1.5x10^6$	$1.5x10^6$	$1.5x10^6$	$1.5x10^6$
Supply voltage	typ.	1 150	1 150	1 150	1 150
	min. (V)	900	900	900	900
	max. (V)	1 450	1 450	1 450	1 450
Anode dark current	typ. (nA)	5	30	30	30
	max. (nA)	40	100	100	100
Channel characteristics gain ratio between channel	typ.	1.3	---	---	---
	max.	2	---	---	---
Channel characteristics cross-talk	typ. (%)	15	5 (10max)	5 (10max)	5
Time response	rise (ns)	4	4.5	4.5	4.5
	FWHM (ns)	6	6	6	6
PHR per channel (%)		17	---	19	19
Maximum ratings	supply voltage (V)	1 550	1 550	1 550	1 550
	gain	$2x10^7$	---	$2x10^7$	$2x10^7$
Accessories	Socket	FE3117	---	FE3123	FE3123

PHR: for radiation source511 keV Gamma Ray (^{22}Na); B.G.O. scintillator. XP1422: 2-pixel crystal of w13, l24.5, h30 mm; XP1432: 4-pixel of w16, l16, h30 mm; XP1452, XP1462: 4-pixel of w20, l20, h30 mm.

Typical spectral characteristics



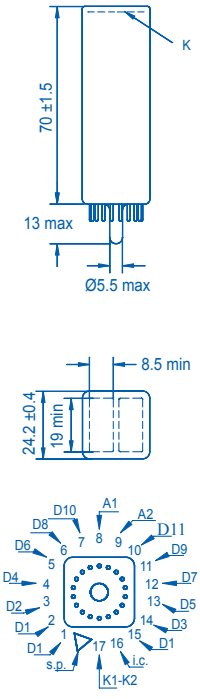
Typical gain curves



XP1452 et XP1452: the channel gain adjustment is operated as follows.
The G1, G2, G3 and G4 electrodes voltages are set to D6 dynode voltage. A parallel light beam illuminates the whole photocathode area, resulting in 4 different anode currents flowing through the 4 anodes.
The lowest anode current is taken as a reference. The 3 other gain electrode voltages are adjusted so that the 4 anode currents are equal.

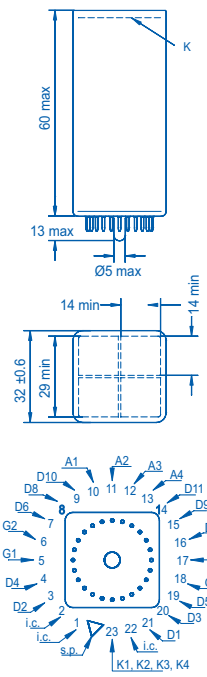
Dimensions and pinning

XP1422



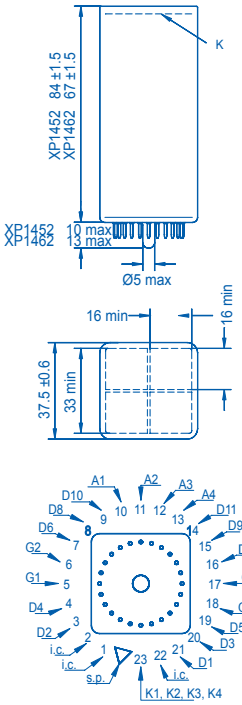
17-pin all glass

XP1432



23-pin all glass

XP1452, XP1462



23-pin all glass

Voltage dividers

Tube	A divider type voltage ratios (for maximum gain)						G1 to G4 individual channel gain adjustement			
	K	D1	D2	...	Dn	A_1 to A_n	D6 to G1	D6 to G2	D6 to G3	D6 to G4
XP1422	3	1	1		1	2.5				
XP1432, XP1452, XP1462	3	2	1	...	1	1	0 to 0.3	0 to 0.3	0 to 0.3	0 to 0.3

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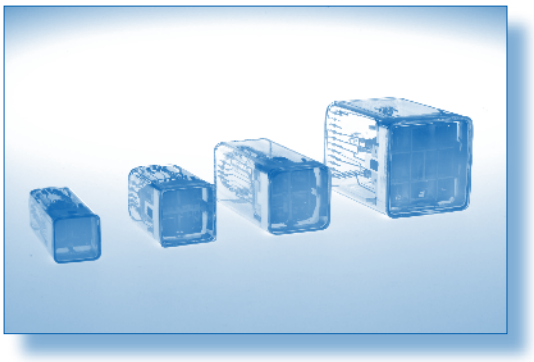
Multipixel tubes

XP1472

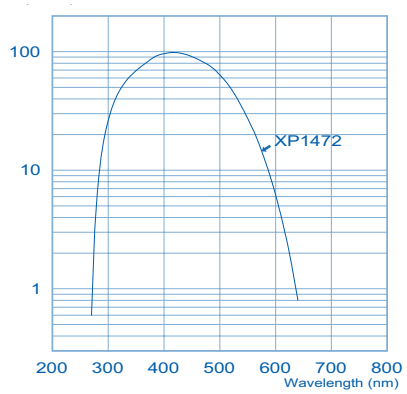
	Key features	57mm, 9 channel, square
Dynode structure / number of stages		foil/11
Cathode luminous sensitivity (µA/lm)	typ.	90 (70 min)
Cathode blue sensitivity (µA/lmF)	min	10
	typ.	11
Cathode radiant sensitivity (mA/W)	typ. at (nm)	100 mA/W 270 420 650
Gain	typ.	$1.5x10^6$
Supply voltage	typ.	1 150
	min. (V)	900
	max. (V)	1 250
Anode dark current	typ. (nA)	30
	max. (nA)	100
Channel characteristics gain ratio between channel	typ.	2.5
	max.	4
Channel characteristics cross-talk	typ. (%)	10
Time response	rise (ns)	4.5
	FWHM (ns)	6
PHR per channel(%)		20 max
Maximum ratings	supply voltage (V)	1 550
	gain	$2x10^7$
Accessories	Socket	FE3139



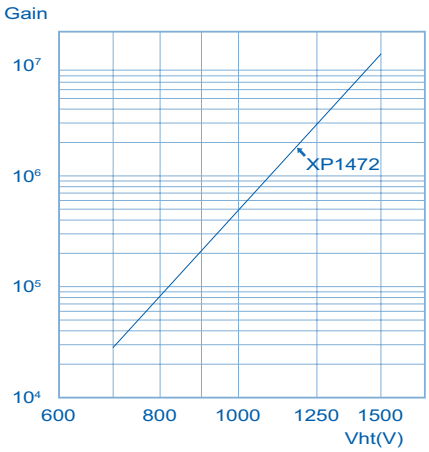
A parallel light beam illuminates fully one of the photocathode elements. The currents at the corresponding anode and the other elements are recorded. The cross-talk is calculated as the ratio for each adjacent anode between the current at this anode and the current to the illuminated anode. This is made by illuminating each of the photocathode elements one after the other.

PHR: for radiation source511 keV Gamma Ray (^{22}Na); B.G.O. scintillator.
XP1472: 9-pixel crystal of w19, l19, h30 mm.

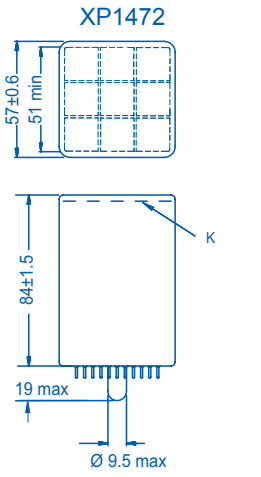
Typical spectral characteristics

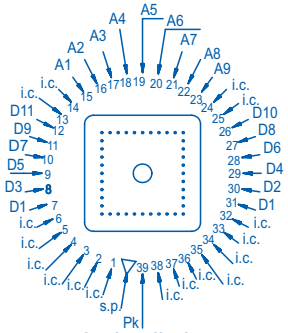


Typical gain curves



Dimensions and pinning





40-pin all glass

Voltage dividers

Tube	A divider type voltage ratios (for maximum gain)							
	K	D1	D2	D3	D4	...	Dn	A
XP1472	3	2	1	1	1	...	1	2

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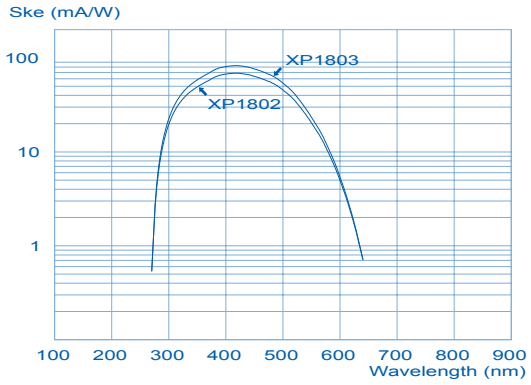
Hemispherical tubes

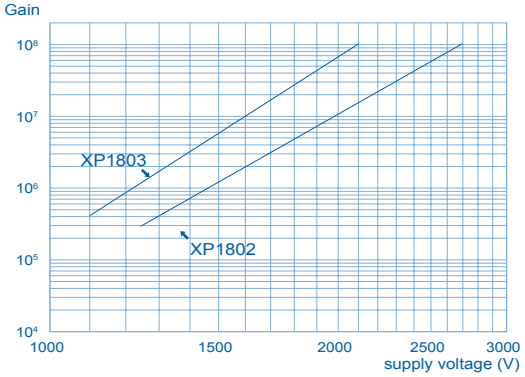
		XP1802	XP1803
	Key features	230 mm (9''), fast	130 mm (5''), fast
	Dynode structure / number of stages	focused/11	focused/11
Cathode luminous sensitivity (µA/lm)	typ.	60	60
Cathode blue sensitivity (µA/lmF)	min	9	8
	typ.	10	10
Cathode radiant sensitivity (mA/W)	typ. at (nm)	75 mA/W 270 420 650	80 mA/W 270 420 650
Gain	typ.	$1x10^7$	$1x10^7$
Supply voltage	typ.	2 000	1 600
	min. (V)	1 700	1 300
	max. (V)	2 500	2 100
Anode dark current	typ. (nA)	10	30
	max. (nA)	50	100
Anode dark counts	typ. (cps)	2 000	1 000
	max. (cps)	10 000	5 000
Single electron spectrum	Peak to valley ratio (typ)	1.5	2.3
Max. anode pulse current for linearity 2% (mA)		120	150
Time response	rise (ns)	3	5
	Width FWHM (ns)	6	7
	TTS [8] FWHM (ns)	3.3	2.4
Maximum ratings	supply voltage (V)	3 000	2 300
	gain	$1x10^8$	$1x10^8$
Accessories	Socket	FE2021	FE2019

Peak to valley ratio is defined as the single electron peak value divided by the minimum value to the left of the peak.

Typical spectral characteristics

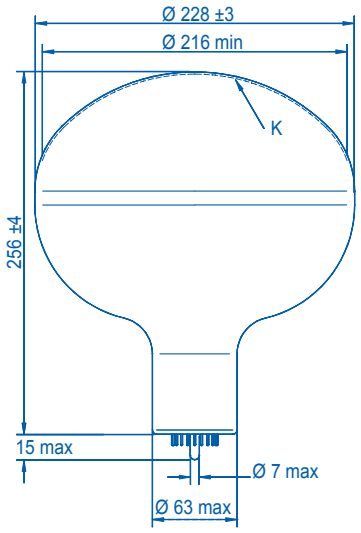


Typical gain curves

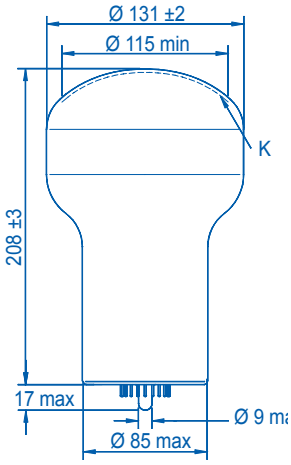


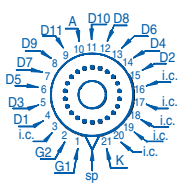
Dimensions and pinning

XP1802

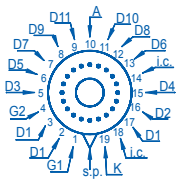


XP1803





21-pin all glass



19-pin all glass

Voltage dividers

Tube	Voltage divider ratios												
	K	G1	D1	G2	D2	D3	...	D7	D8	D9	D10	D11	A
XP1802 (Type A divider)	10		1	3	1	1	1	1	1	1	1	1	
XP1803 (Type B divider)	20	0.07	0.025	4	4	1	1	1.5	2	2.5	3	2.5	

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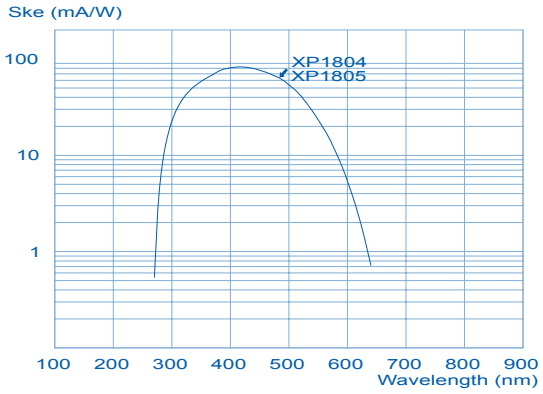
Hemispherical tubes

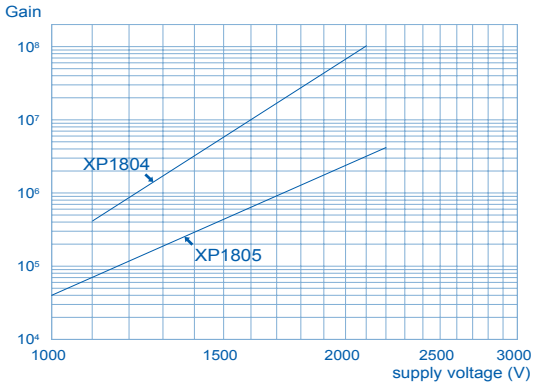
		XP1804	XP1805
	Key features	270 mm (10.6"), fast	230 mm (9"), fast
	Dynode structure / number of stages	focused/11	focused/11
Cathode luminous sensitivity (µA/lm)	typ.	60	60
Cathode blue sensitivity (µA/lmF)	min	8	9
	typ.	10	10
Cathode radiant sensitivity (mA/W)	typ. at (nm)	80 mA/W (270 420 650)	75 mA/W (270 420 650)
Gain	typ.	$1x10^7$	$1x10^6$
Supply voltage	typ.	1 600	1 600
	min. (V)	1 300	1 300
	max. (V)	2 100	1 950
Anode dark current	typ. (nA)	30	15
	max. (nA)	100	50
Anode dark counts	typ. (cps)	3 000	2 000
	max. (cps)	15 000	10 000
Single electron spectrum	Peak to valley ratio (typ)	2.3	1.4
Max. anode pulse current for linearity 2% (mA)		150	60
Time response	rise (ns)	5	---
	Width FWHM (ns)	7	---
	TTS [8] FWHM (ns)	2.4	---
Maximum ratings	supply voltage (V)	2 300	2 000
	gain	$1x10^8$	$3x10^6$
Accessories	Socket	FE2019	FE2019

Peak to valley ratio is defined as the single electron peak value divided by the minimum value to the left of the peak.

Typical spectral characteristics

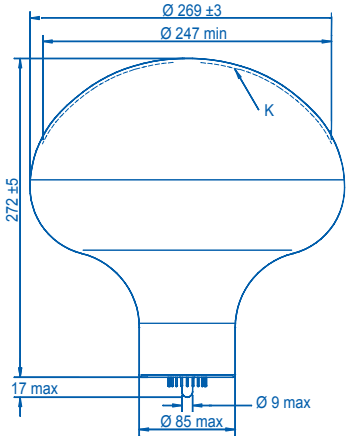


Typical gain curves

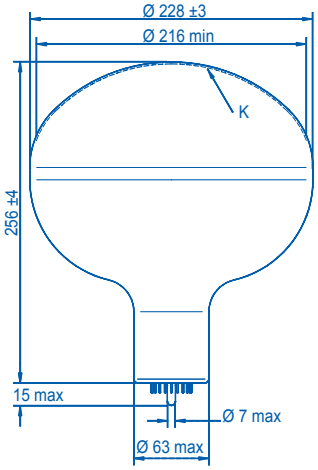


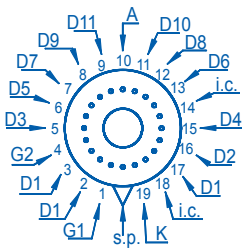
Dimensions and pinning

XP1804

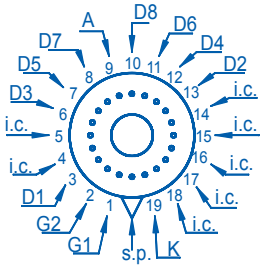


XP1805





19-pin all glass



19-pin all glass

Voltage dividers

Tube	Voltage divider ratios														
	K	G1	D1	G2	D2	D3	D4	D5	D6	D7	D8	D9	D10	D11	A
XP1804	20	0.07	0.025	4	4	1	1	1	1	1.5	2	2.5	3	2.5	
XP1805	10	0.2	1	3	1.25	1.25	1.5	2.25	2.5	3	2.75				

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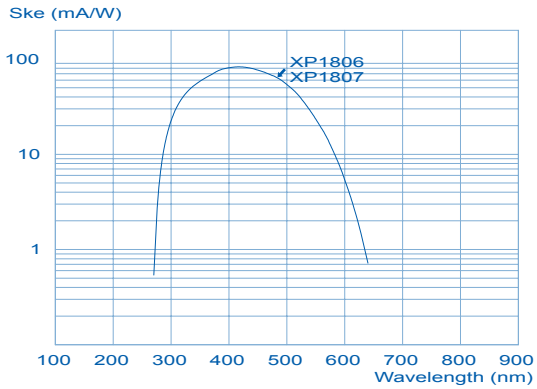
Hemispherical tubes

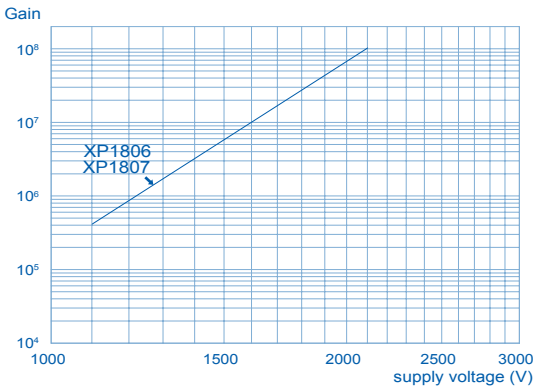
		XP1806	XP1807
	Key features	203 mm (8''), fast	300 mm (12''), fast
	Dynode structure / number of stages	focused/11	focused/11
Cathode luminous sensitivity (µA/lm)	typ.	60	60
Cathode blue sensitivity (µA/lmF)	min	8	8
	typ.	10	10
Cathode radiant sensitivity (mA/W)	typ. at (nm)	80 mA/W (270 420 650)	80 mA/W (270 420 650)
Gain	typ.	$1x10^7$	$1x10^7$
Supply voltage	typ.	1 600	1 600
	min. (V)	1 300	1 300
	max. (V)	2 100	2 100
Anode dark current	typ. (nA)	30	30
	max. (nA)	100	100
Anode dark counts	typ. (cps)	1 600	3 500
	max. (cps)	10 000	15 000
Single electron spectrum	Peak to valley ratio (typ)	2.3	2.3
Max. anode pulse current for linearity 2% (mA)		150	150
Time response	rise (ns)	5	5
	Width FWHM (ns)	7	7
	TTS [8] FWHM (ns)	2.4	2.4
Maximum ratings	supply voltage (V)	2 300	2 300
	gain	$1x10^8$	$1x10^8$
Accessories	Socket	FE2019	FE2019

Peak to valley ratio is defined as the single electron peak value divided by the minimum value to the left of the peak.

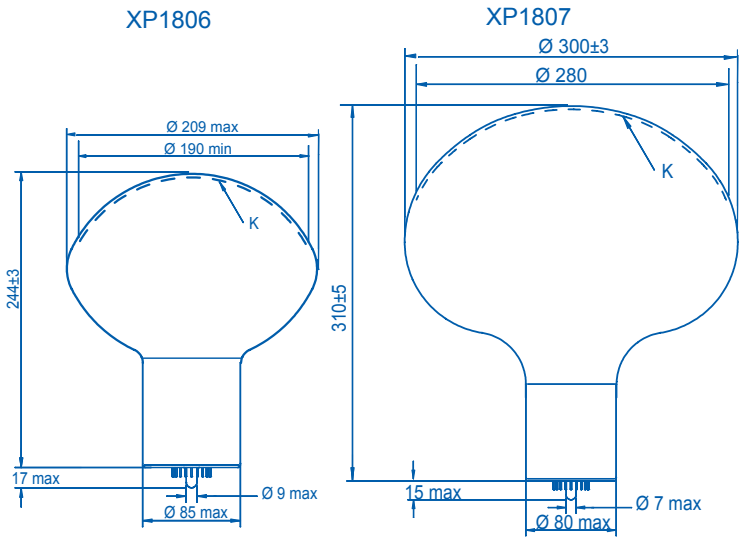
Typical spectral characteristics

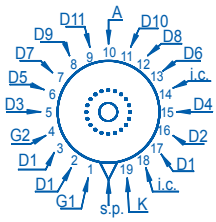


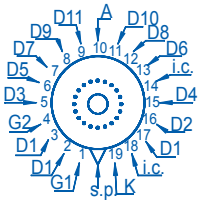
Typical gain curves



Dimensions and pinning







Voltage dividers

Tube	Voltage divider ratios (typeB)														
	K	G1	D1	G2	D2	D3	D4	D5	D6	D7	D8	D9	D10	D11	A
XP1806, XP1807	20	0.07	0.025	4	4	1	1	1	1	1.5	2	2.5	3	2.5	

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