

**A fast, low gain, 6-stage, 39 mm (1.5") round tube**

<b>Applications :</b>	For PET medical imaging, when good timing characteristics and high level sensitivities are required.		
<b>Description :</b>	Window :	Material :	borosilicate glass
		Photocathode :	bi-alkali
		Refr. index at 420 nm :	1.48
	Multiplier :	Structure :	linear focused
		Nb of stages :	6
	Mass :		80 g

**Photocathode characteristics**

Spectral range :		270-650	nm
	Maximum sensitivity at :	420	nm
Sensitivity ① :			
<input checked="" type="checkbox"/>	Luminous :		120 $\mu\text{A}/\text{lm}$
	Blue :	min.: 10	typ.: 12.5 $\mu\text{A}/\text{lmF}$
	Radiant, at 420 nm :		typ.: 100 $\text{mA}/\text{W}$

**Characteristics with voltage divider A**

	Gain slope (vs supp. volt., log/log) :		4.2	
	For an anode blue sensitivity of :		0.5	$\text{A}/\text{lmF}$
<input checked="" type="checkbox"/>	Supply voltage :	max.: 1300	typ.: 1100	V
		min.: 900		
	Gain :		$4 \times 10^4$	
<input checked="" type="checkbox"/>	Anode dark current ② :	max: 10	typ.: 1	nA
	Pulse height resolution for $^{57}\text{Co}$ ③ :		11.2	%
	Mean anode sensitivity deviation ④ :			
	long term (16 h) :		0.6	%
	after change of count rate :		1	%
	vs temperature between 0 and +40°C at 420 nm :		- 0.3	%/K
	Gain halved for a magnetic field :			
	perpendicular to axis "n" of :		0.12	mT
	parallel to axis "n":		0.3	mT
	parallel to tube axis :		0.5	mT

**Characteristics with voltage divider :**

	For a supply voltage of :		1300	V
	Gain :		$8 \times 10^4$	
	Linearity (2%) of anode current up to :		50	mA
	Anode pulse ⑤ :			
	Rise time :		2	ns
	Duration at half height :		3.5	ns
	Transit time :		23	ns
	Transit time spread :		2	ns
Capacitance	anode to all :		5	pF

# photomultiplier tubes

## preliminary product specification

# XP20L0

### Recommended voltage divider

Type A for maximum gain

K	G	D1	D2	D3	D4	D5	D6	A	
0,15	4	1	1	1	1	1	1	1	(total :10.15)

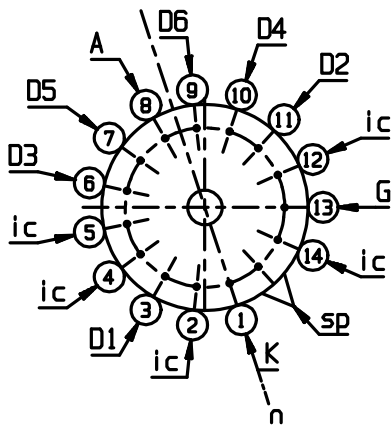
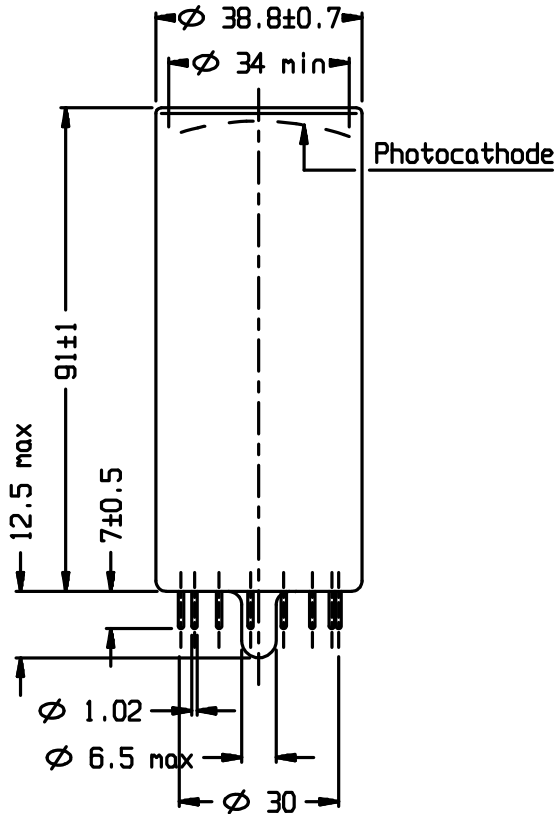
K: photocathode    G: focusing electrode    Dn: dynode    A: anode

### Limiting values

Anode luminous sensitivity :			max.:	6	A/lmF	
Supply voltage :			max.:	1800	V	
Continuous anode current :			max.:	0.2	mA	
Voltage between :	D1 and photocathode :	min.:	100	max.:	600	V
	consecutive dynodes :			max.:	300	V
	anode and D6 :	min.:	30	max.:	300	V
Ambient temperature :	short operation (< 30 mn) :	min.:	-30	max.:	+80	°C
	continuous operation & storage :	min.:	-30	max.:	+50	°C

**Notes :**  Characteristics measured and mentioned on the test ticket of each tube.

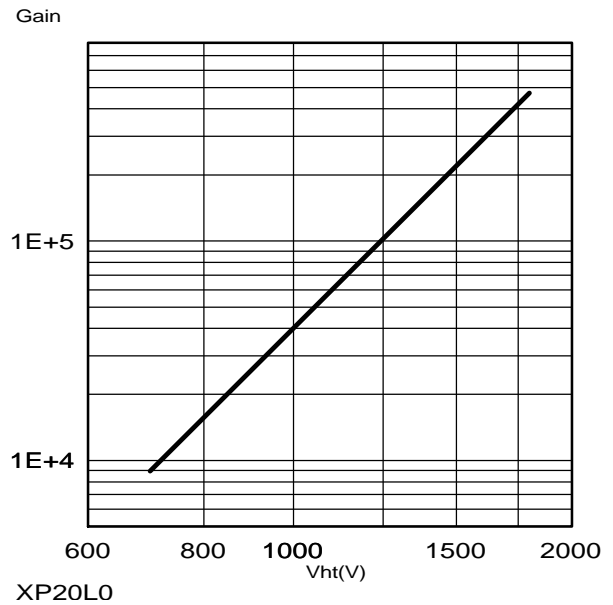
- ① Luminous sensitivity is measured with a tungsten filament lamp with a colour temperature of  $2856 \pm 5$  K. The blue sensitivity, expressed in A/lmF ("F" as in Filtered) is measured with a tungsten filament lamp with a colour temperature of  $2856 \pm 5$  K. Light is transmitted through a blue filter Corning CS no.5-58, polished to half stock thickness. The radiant sensitivity is measured with a tungsten filament lamp with a colour temperature of  $2856 \pm 5$  K. Light is transmitted through an interference filter. Radiant sensitivity at 420 nm, expressed in mA/W, can be estimated by multiplying the blue sensitivity, expressed in  $\mu\text{A/lmF}$ , by 7.5 for this type of tube.
- ② Dark current is measured at ambient temperature, after the tube has been in darkness for approximately 1 min. Lower value can be obtained after a longer stabilisation period in darkness (approx. 30 min.).
- ③ Pulse amplitude resolution for  $^{57}\text{Co}$  is measured with NaI(Tl) cylindrical scintillator with a diameter of 2" and a height of 2". The count rate used is  $\sim 10^4$  c/s.
- ④ The mean pulse amplitude deviation is measured by coupling a NaI(Tl) scintillator to the window of the tube. Long term (16h) deviation is measured by placing a  $^{137}\text{Cs}$  source at a distance from the scintillator such that the count rate is  $\sim 10^4$  c/s, corresponding to an anode current of  $\sim 300$  nA. The mean pulse amplitude deviation after change of count rate is measured with a  $^{137}\text{Cs}$  source at a distance from the scintillator such that the count rate can be changed from  $10^4$  to  $10^3$  c/s, corresponding to an anode current of  $\sim 1$   $\mu\text{A}$  and  $0.1$   $\mu\text{A}$  respectively. Both tests are carried out according to ANSI-N42-9-1972 of IEEE recommendations.
- ⑤ Measured with a pulse light source, with a pulse duration (FWHM) of approximately 1 ns., the cathode being completely illuminated. The rise time is determined between 10% and 90% of the anode pulse amplitude. The signal transit time is measured between the instant at which the illuminating pulse of the cathode becomes maximum, and the instant at which the anode pulse reaches its maximum. Rise time, pulse duration and transit time vary with respect to high tension supply voltage  $V_{ht}$  as  $(V_{ht})^{-1/2}$ .



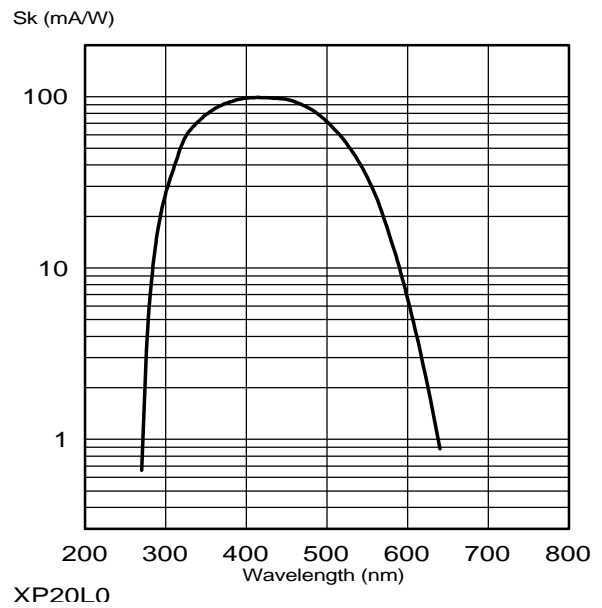
ref.: 99902763  
 sp: short pin  
 n: plane of symmetry of the multiplier  
 ic: internal connection

K: cathode  
 Dn: dynode  
 G: focusing electrode  
 A: anode

Typical gain curve



Typical spectral characteristics



Accessories

Socket for wires : FE1115  
 Mu-metal shield : MS170