

**High gain, high PHR, low profile, 10-stage, 39mm (1.5") round tube**

<b>Applications :</b> All photometry and scintillation applications where a good energy resolution is required and a limited supply voltage is available.			
<b>Description :</b>	Window :	Material :	low K borosilicate glass [ <sup>40</sup> K 3 cpm; <sup>137</sup> Cs, <sup>238</sup> U, <sup>226</sup> Ra, <sup>228</sup> Ra, <sup>228</sup> Th < 0.3 cpm ]
		Photocathode :	bi-alkali
		Refr. index at 420 nm :	1.48
	Multiplier :	Structure :	linear focused
		Nb of stages :	10
	Mass :		44 g

**Photocathode characteristics**

Spectral range :				290-650	nm	
Maximum sensitivity at :				420	nm	
Sensitivity ① :	Luminous :			100	μA/lm	
<input checked="" type="checkbox"/>	Blue :	min.:	10	typ.:	12	μA/lmF
	Radiant, at 420 nm :			typ.:	100	mA/W

**Characteristics with voltage divider A**

Gain slope (vs supp. volt., log/log) :				7.5	
For an anode blue sensitivity of :				7.5	A/lm
<input checked="" type="checkbox"/> Supply voltage :	max.:	900	typ.:	800	V
	min.:	700			
Gain :				6.5x10 <sup>5</sup>	
<input checked="" type="checkbox"/> Anode dark current ② :	max.:	3	typ.:	0.1	nA
Pulse height resolution for <sup>57</sup> Co			typ. :	10	%
Pulse height resolution for <sup>137</sup> Cs ③ :			typ. :	7.5	%
<input checked="" type="checkbox"/> Pulse height resolution for <sup>55</sup> Fe ③ :	max.:	40	typ.:	38	%
Peak to valley ratio for <sup>55</sup> Fe :				40	
Noise :			typ. :	300	cps
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 :	most sensitive direction :			0.5	mT

**Characteristics with voltage divider ⑤ :**

	<b>B</b>	<b>A</b>	
For a supply voltage of :	1000	800	V
Gain :	10 <sup>6</sup>	6.5x10 <sup>5</sup>	
Linearity (2%) of anode current up to :	80	30	mA
Anode pulse ⑥ :	Rise time :	3	ns
	Duration at half height :	6	ns
	Transit Time :	34	ns
Capacitance	anode to all :	5	pF

product specification

Recommended voltage divider

Type A for maximum gain

K	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	A	
2	1	1	1	1	1	1	1	1	1	1	1	(total :12)

Type B for best timing / linearity compromise

K	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	A	
2	1	1	1	1.25	1.25	1.5	2.25	2.5	3	2.75		(total : 19.5)

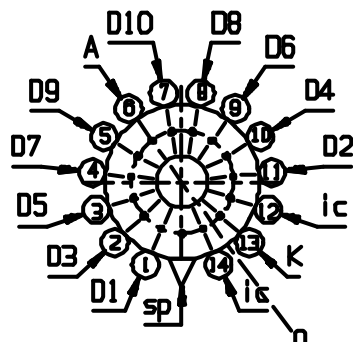
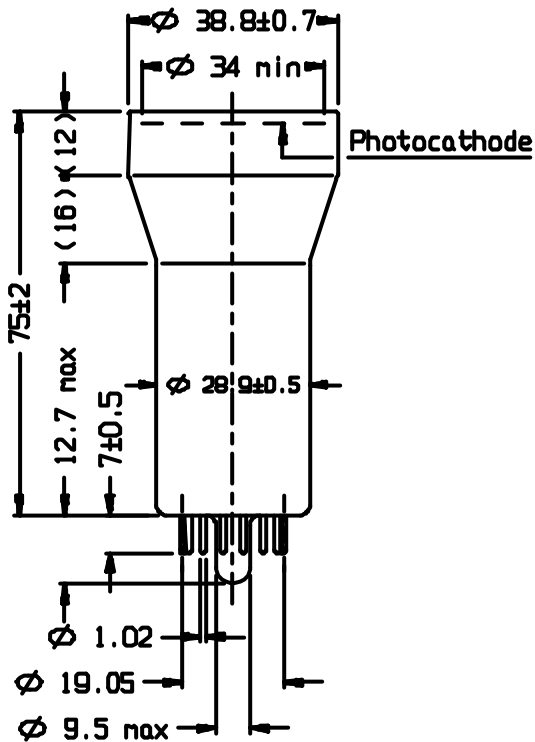
K: photocathode      Dn: dynode      A: anode

Limiting values

Anode luminous sensitivity :		max.:	100	A/lm		
Supply voltage :		max.:	1400	V		
Continuous anode current :		max.:	0.2	mA		
Voltage between :	D1 and photocathode :	min.:	100	max.:	400	V
	consecutive dynodes :			max.:	300	V
	anode and D10 :	min.:	30	max.:	300	V
Ambient temperature :						
	short operation (< 30 mn) :	min.:	-30	max.:	+80	°C
	continuous operation & storage :	min.:	-30	max.:	+60	°C

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

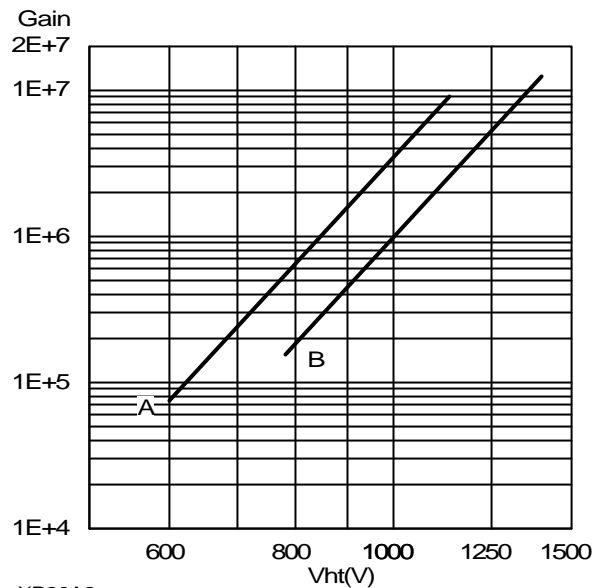
- ① Luminous sensitivity is measured with a tungsten filament lamp with a colour temperature of 2856 ± 5 K. The blue sensitivity, expressed in A/lmF ("F" as in Filtered) is measured with a tungsten filament lamp with a colour temperature of 2856 ± 5 K. Light is transmitted through a blue filter Corning 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 ± 5K. 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 µA/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 <sup>137</sup>Cs and <sup>57</sup>Co is measured with NaI(Tl) cylindrical scintillator with a diameter of 32 mm and a height of 25 mm. The count rate used is ~ 10<sup>4</sup> c/s.  
The pulse amplitude for <sup>55</sup>Fe is measured with a NaI(Tl) cylindrical scintillator with a diameter of 25 mm and a height of 1 mm provided with a beryllium window. The count rate used is ~ 10<sup>4</sup> 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 <sup>137</sup>Cs source at a distance from the scintillator such that the count rate is ~ 10<sup>4</sup> c/s, corresponding to an anode current of ~ 300 nA. The mean pulse amplitude deviation after change of count rate is measured with a <sup>137</sup>Cs source at a distance from the scintillator such that the count rate can be changed from 10<sup>4</sup> to 10<sup>3</sup> c/s, corresponding to an anode current of ~ 1 µA and 0.1 µA respectively. Both tests are carried out according to ANSI-N42-9-1972 of IEEE recommendations.
- ⑤ To obtain a peak pulse current greater than that obtainable with divider A, it is necessary to increase the inter-dynode voltage progressively. Divider circuit C is an example of a progressive divider, giving a compromise between gain, speed and linearity. Other dividers can be conceived to achieve other compromises. It is generally recommended that the voltage ratio between two successive stages is less than 2.
- ⑥ 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 Vht as (Vht)<sup>-½</sup>.



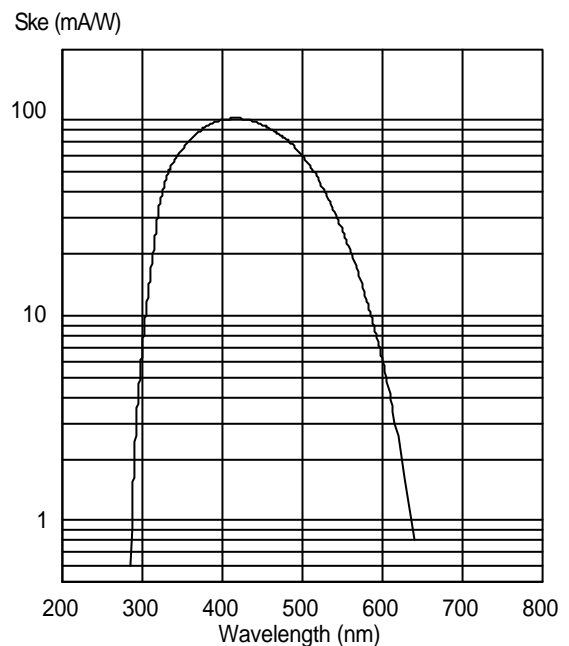
ref.: 99902410  
 sp: short pin  
 ic: internal connection  
 n: plane of symmetry of the multiplier

K: cathode      Dn: dynode  
 A: anode

Typical gain curve



Typical spectral characteristics



Accessories

Socket for wires.: FE3114  
 Mu-metal shield.: MS170