

A standard, 12-stage, 51mm (2") tube

| | | | |
|---|--------------|-------------------------|----------------|
| Applications : High and medium energy physics experiment and industrial applications. This tube is the low cost solution for a good single electron spectrum resolution. | | | |
| Description : | Window : | Material : | lime glass |
| | | Photocathode : | bi-alkali |
| | | Refr. index at 400 nm : | 1.54 |
| | Multiplier : | Structure : | linear focused |
| | | Nb of stages : | 12 |
| | Mass : | 110 g | |

Photocathode characteristics

| | | | | |
|-------------------------------------|----------------------|-----------|----------|--------|
| Spectral range : | | | 290-650 | nm |
| Maximum sensitivity at : | | | 400 | nm |
| Sensitivity ① : | | | | |
| <input checked="" type="checkbox"/> | Luminous : | | typ.: 70 | μA/lm |
| | Blue : | min.: 8.5 | typ.: 10 | μA/lmF |
| | Radiant, at 400 nm : | | typ.: 75 | mA/W |

Characteristics with voltage divider A

| | | | | |
|--|---|------------|-------------------|-------|
| Gain slope (vs supp. volt., log/log) : | | | 9 | |
| For an anode blue sensitivity of : | | | 300 | A/lmF |
| <input checked="" type="checkbox"/> Supply voltage : | max.: 2400 | typ.: 1900 | | V |
| | min.: 1500 | | | |
| Gain : | | | 3x10 ⁷ | |
| <input checked="" type="checkbox"/> Anode dark current ② : | | typ.: 15 | | nA |
| Background noise ③ : | max.: 10 ⁴ | typ.: 1500 | | cps |
| Single electron spectrum peak to valley ratio ④ : | | typ.: 2 | | |
| Pulse height resolution ¹³⁷ Cs ⑤ : | | typ.: 7.2 | | % |
| Mean anode sensitivity deviation ⑥ : | | | | |
| | long term (16 h) : | | 1 | % |
| | after change of count rate : | | 1 | % |
| | vs temperature between 0 and +40 °C at 420 nm : | | - 0.2 | %/K |
| Gain halved for a magnetic field of : | | | | |
| | perpendicular to axis "n" : | | 0.2 | mT |
| | parallel to axis "n" : | | 0.1 | mT |

Characteristics with voltage divider B

| | B | A | |
|---------------------------------------|---------------------------|-------------------|----|
| For a supply voltage of : | 2000 | 1900 | V |
| Gain : | 7x10 ⁶ | 3x10 ⁷ | |
| Linearity (2%) of an. current up to : | 250 | 100 | mA |
| Anode pulse ⑦ : | | | |
| | Rise time : | 4 | ns |
| | Duration at half height : | 8 | ns |
| | Transit Time : | 36 | ns |
| Capacitance | anode to all : | 5 | pF |

Recommended voltage divider

Type A for maximum gain

| K | D1 | D2 | D3 | D4 | D5 | D6 | D7 | D8 | D9 | D10 | D11 | D12 | A | |
|---|----|----|----|----|----|----|----|----|----|-----|-----|-----|---|-------------|
| 4 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | (total :16) |

Type B for best timing / linearity compromise

| K | D1 | D2 | D3 | D4 | D5 | D6 | D7 | D8 | D9 | D10 | D11 | D12 | A | |
|---|----|----|----|----|----|----|------|------|-----|------|------|------|-----|----------------|
| 4 | 1 | 1 | 1 | 1 | 1 | 1 | 1.25 | 1.25 | 1.5 | 2.25 | 1.75 | 2.75 | 2.5 | (total :22.25) |

K: photocathode Dn: dynode A: anode

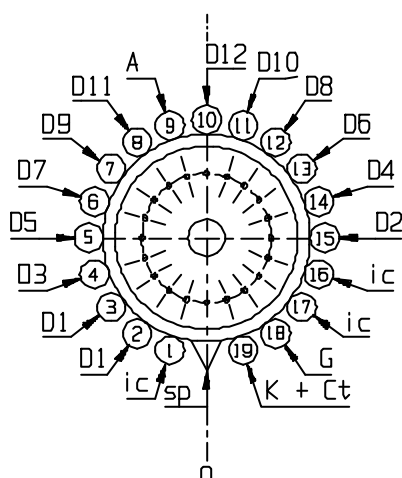
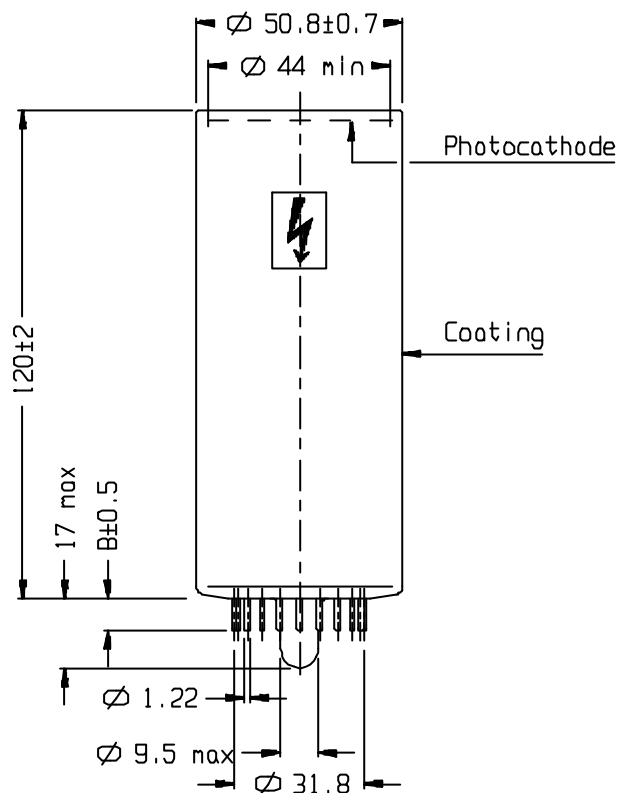
Limiting values

| | | | | | |
|------------------------------|----------------------------------|-------|-----|--------------------------|----|
| Anode luminous sensitivity : | | | | max.:2.0X10 ⁸ | |
| Supply voltage : | | | | max.: 2500 | V |
| Continuous anode current : | | | | max.: 0.2 | mA |
| Voltage between : | | | | | |
| | D1 and photocathode : | min.: | 300 | max.: 800 | V |
| | consecutive dynodes : | | | max.: 400 | V |
| | anode and D12 : | min.: | 80 | max.: 600 | V |
| Ambient temperature : | | | | | |
| | short operation (< 30 mn) : | min.: | -30 | max.: +80 | °C |
| | continuous operation & storage : | min.: | -30 | max.: +50 | °C |

Notes :

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

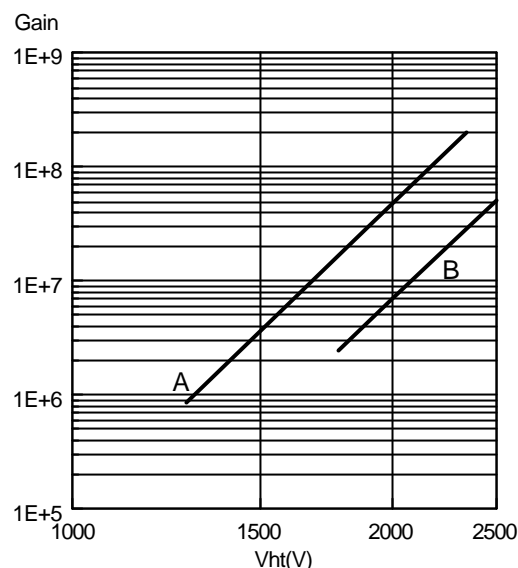
- ① Luminous sensitivity is measured with a tungsten filament lamp with a colour temperature of 2856 ± 5 K. The blue sensitivity, expressed in A/lmF ("F" as in Filtered) is measured with a tungsten filament lamp with a colour temperature of 2856 ± 5 K. Light is transmitted through an interference filter. 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 Noise is measured at ambient temperature. After having been with its protection hood, the tube is placed in darkness with V_d set to give a value of $3.0 \cdot 10^7$. After a 30mn stabilisation period, noise pulses with a threshold of 1 pC (corresponding to 0.2 photoelectron) are recorded.
- ④ Peak to valley ratio is defined as the single electron peak value divided by the minimum value on the left of the peak.
- ⑤ Pulse amplitude resolution for ^{137}Cs is measured with NaI(Tl) cylindrical scintillator with a diameter of 50 mm and a height of 50 mm. The count rate used is 10^4 c/s.
- ⑥ 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}Cs source at a distance from the scintillator such that the count rate is $\sim 1.E+04$ c/s, corresponding to an anode current of ~ 300 nA. The mean pulse amplitude deviation after change of count rate is measured with a ^{137}Cs source at a distance from the scintillator such that the count rate can be changed from $1.E+04$ to $1.E+03$ 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.
- ⑦ Measured with a pulse light source, with a pulse duration (FWHM) of approximately 1ns., 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 $(V_{ht})^{-1/2}$.



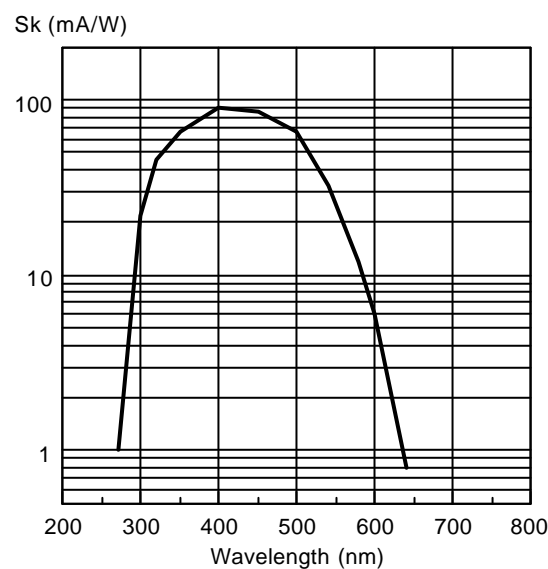
Ref.: 87500017
sp: short pin
ic: internal connection
n: plane of symmetry of the multiplier

K: cathode Dn: dynode
A: anode

Typical gain curve



Typical spectral characteristics



Accessories

Socket: FE2019
Mu-metal shield: MS152