25 mm (1") encapsulated photomultiplier
9110V19 series data sheet (provisional)

ET Enterprises electron tubes

1 description

The 9110V19 encapsulated photomultiplier comprises a 25mm (1") diameter, compact, rugged, end window photomultiplier with a plano-concave window, high temperature blue-green sensitive bialkali photocathode and 10 BeCu dynodes of circular focused design.

The photomultiplier is encapsulated, together with a voltage divider, in a mumetal* sleeve.

This type will operate up to 125°C and has a minimum plateau length of 150 V at 125°C.

2 applications

- oil well logging including measuring while drilling (MWD)
- x-ray and gamma ray spectroscopy in harsh environments

3 features

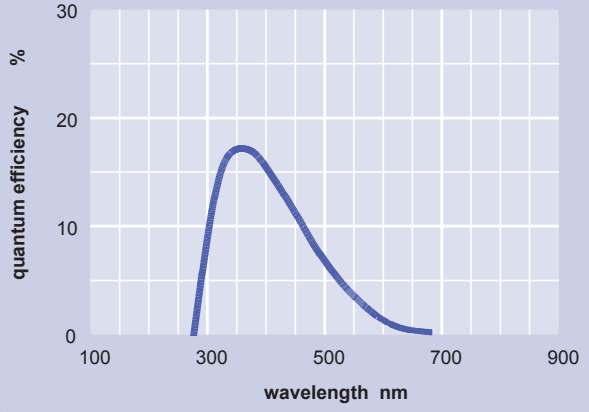
- rugged
- high temperature operation
- encapsulated in a mu-metal sleeve with an integral voltage divider

4 window characteristics

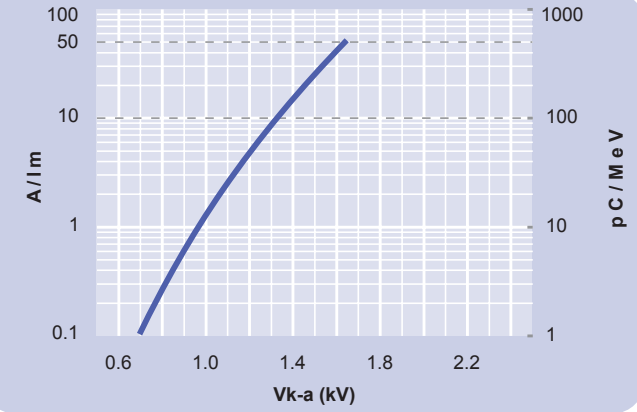
	9110V19 borosilicate
spectral range* (nm)	280 - 630
refractive index (n_d)	1.49
K (ppm)	300
Th (ppb)	250
U (ppb)	100

* wavelength range over which quantum efficiency exceeds 1 % of peak

5 typical spectral response curves



6 typical voltage gain characteristics



6 characteristics

	unit	min	typ	max
photocathode:				
high temperature bialkali				
active diameter	mm		22	
quantum efficiency at peak	%		17	
luminous sensitivity	µA/lm		50	
with CB filter		4	6	
with CR filter			5	
dynodes: 10CFBeCu				
anode sensitivity:				
nominal anode sensitivity	A/lm		10	
max. rated anode sensitivity	A/lm		50	
overall voltage for nominal A/lm	V		1350	1600
overall voltage for max. rated A/lm	V		1650	
gain at nominal A/lm	x 10^6		0.2	
dark current at 20 °C:				
DC at nominal A/lm	nA		0.1	1
DC at max. rated A/lm	nA		0.5	
pulsed linearity (-5 % deviation):				
divider A	mA		20	
resolution:				
^{137}Cs with 1.0 " dia x 1.5 " NaI(Tl)			10	
temperature coefficient:	% °C^{-1}		-0.5	
timing:				
multi-electron rise time	ns		2	
multi-electron fwhm	ns		4	
single electron rise time	ns		1.8	
transit time	ns		15	
weight:	g		64	
maximum ratings:				
anode current	µA			100
cathode current	nA			20
gain	x 10^6			1
sensitivity	A/lm			50
	pC/MeV			500
temperature	°C	-55		125
V (k-a)[1]	V			2300
V (k-d1)	V			450
V (d-d)[2]	V			300
ambient pressure (absolute)	kPa			202

(1) subject to not exceeding max. rated sensitivity (2) subject to not exceeding max rated V(k-a)

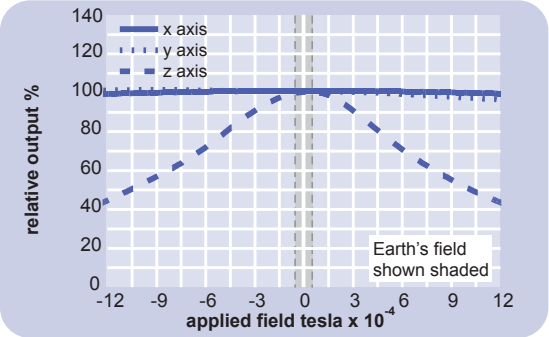
qualification shock & vibration levels (all 3 axes, non-operating)

random vibration:	
5 Hz to 100 Hz roll on	6 dB/octave
50 Hz to 500 Hz	0.89 g^2/Hz
500 Hz to 1000 Hz roll off	6 dB/octave
composite	25 g rms
duration	60 mins/axis
sine vibration:	
amplitude	30 g
frequency range	50 Hz to 2000 Hz
sweep rate	2 octaves/min
duration	60 mins/axis
shock (half sine wave):	
0.5 ms duration	1000 g peak
4 ms duration	250 g peak
shocks per axis	3 up, 3 down

microphony under random vibration (all 3 axes, operating)

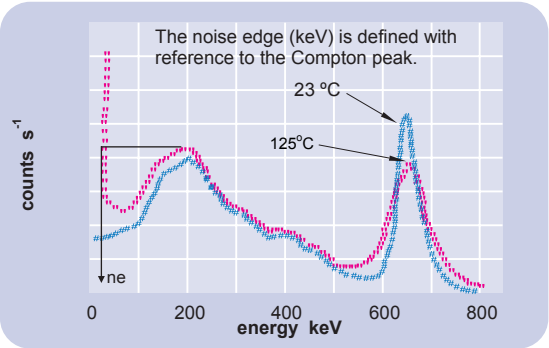
random vibration:	
20 to 100 Hz roll on	6 dB/octave
100 to 400 Hz	0.103 g^2/Hz
400 to 500 Hz roll off	6 dB/octave
composite	6.5 g rms
duration	5 mins/axis
microphony at 100 pC/MeV above a threshold of 5.5 pC (55 keV)	< 1 cps

8 magnetic field sensitivity



9 pulse height resolution with NaI(Tl) crystal

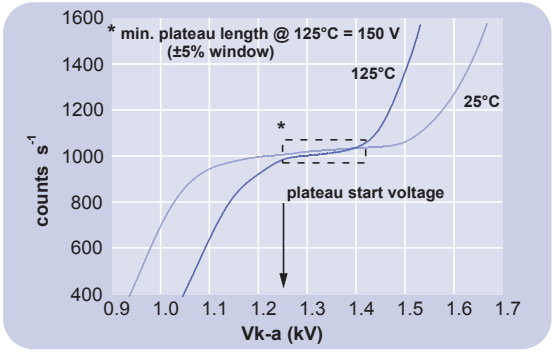
This pmt is tested for resolution at room temperature & at high temperature.



output data	unit	20 °C typ	20 °C max	125 °C typ
operating voltage for 13 pC/MeV	V	1050	1300	1200
operating voltage for 100 pC/MeV	V	1350	1600	1500
pulse height resolution	%	10		14
noise edge	keV	<10		35

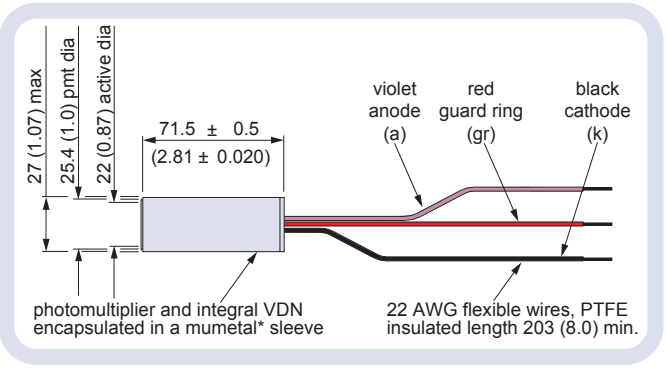
10 pulse counting with NaI(Tl) crystal

Pulse counting plateau with ^{137}Cs and NaI(Tl) crystal (1.0" dia. x 1.5")

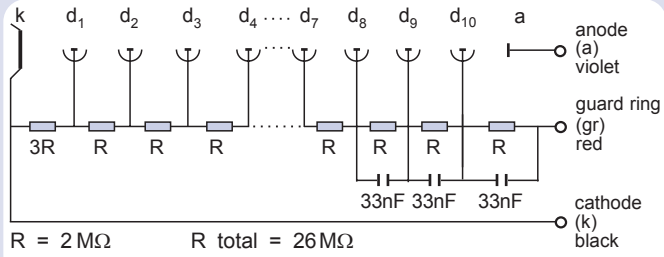


plateau data	unit	min	125°C typ	max
combined 25 °C / 125 °C:				
plateau start (1.5 pC threshold)	V		1250	1500
plateau length ±5 %	V	150		

11 external dimensions in mm (inches)



12 voltage divider distribution

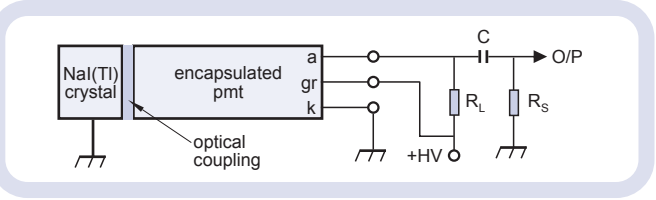


13 ordering information

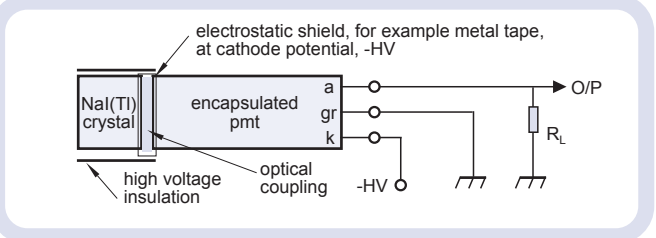
The 9110V19 meets the specification contained in this data sheet. For different specifications please discuss your requirements with us. For customer specific requirements, **ET Enterprises** will change the 2 digit numeric suffix to indicate additional tests and selection.

14 applications with NaI(Tl) crystals

The use with positive HV is recommended, as shown in the diagram below:



With negative HV, as shown in the next diagram, any material in contact with the window, for example the NaI(Tl) crystal, **must** be maintained at cathode potential and insulated for safety. The interface between the NaI(Tl) crystal and the pmt window **must** be shielded along the body of the housing.



These precautions are essential to prevent erratic behaviour.

*mumetal is a registered trademark of Magnetic Shield Corporation

choose accessories for this pmt on our website

ET Enterprises Limited
45 Riverside Way
Uxbridge UB8 2YF
United Kingdom
tel: +44 (0) 1895 200880
fax: +44 (0) 1895 270873
e-mail: sales@et-enterprises.com
web site: www.et-enterprises.com

ADIT Electron Tubes
300 Crane Street
Sweetwater TX 79556 USA
tel: (325) 235 1418
toll free: (800) 399 4557
fax: (325) 235 2872
e-mail: sales@electrontubes.com
web site: www.electrontubes.com

an ISO 9001 and ISO 14001 registered company

DS_ 9110V19 Issue 2 (13/08/20)