



Gas-Filled Radiation Detectors Geiger-Mueller Tubes

Saint-Gobain Crystals offers a full-line of standard Geiger-Mueller detectors and probes. The design of a Geiger-Mueller tube is often optimized for a specific application; therefore, considerable differences in shape, size, gas formulations, and radiation sensitivity exist. Saint-Gobain Crystals has taken a proven technology forward to meet tomorrow's standards. Because today's Geiger-Mueller tubes need only simple electronics, are relatively rugged, and have low cost, they continue to be one of the most popular radiation detectors in use today.

Type	Energy	Benefits
Plated	β, γ	Platinum lined cathodes increase the G-M tube's sensitivity. Commonly used in high temperature, high vibration applications such as oil well logging and density gauging.
Unplated	γ	Not as high-temperature, standard operating temperature is 75°C, not as sensitive.
Thin-walled	β, γ	Thin-wall GM tubes are machined to produce cathodes with very thin cross-sectional areas. This allows high energy beta particles to enter, making these particular tubes sensitive to both gamma and high energy beta particles.
End window	α, β, γ	The window built into these GM tubes allows beta particles and high energy alpha particles, as well as low dose gamma radiation, to enter the detector.
Pancakes	α, β, γ	The Pancake GM tube provides for a larger detection area compared to a regular cylindrical GM tube. In addition to gamma radiation, the large circular mica window allows for detection of beta particles and high energy alpha particles.



Applications –

Geiger-Mueller tubes provide effective means for both detecting and measuring the following types of radiation: Alpha particles, Beta particles, X-rays and Gamma rays.

Typical applications for Geiger-Mueller tubes include:

Personal Safety

- Body Frisking
- Survey Instruments
- Area Monitors

Recording Exposure Levels

- Digital Pocket Dosimeters
- Area Monitors
- Survey Instruments

Contamination Monitoring

- Area Monitors
- Environmental Monitors
- Stack Monitors

Non-destructive Density & Thickness Gauging

- Highway asphalt and concrete aggregate measurements
- On-line density or thickness monitoring in manufacturing

Gamma & Neutron-Gamma Oil Well Logging

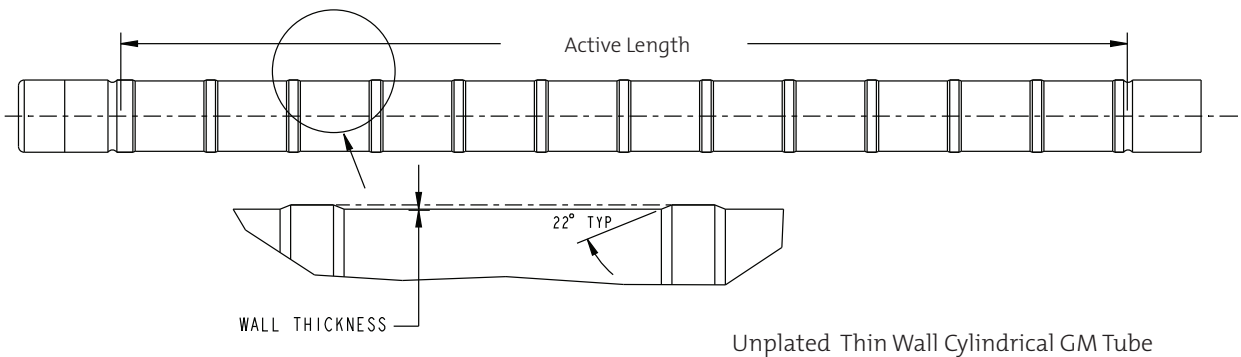
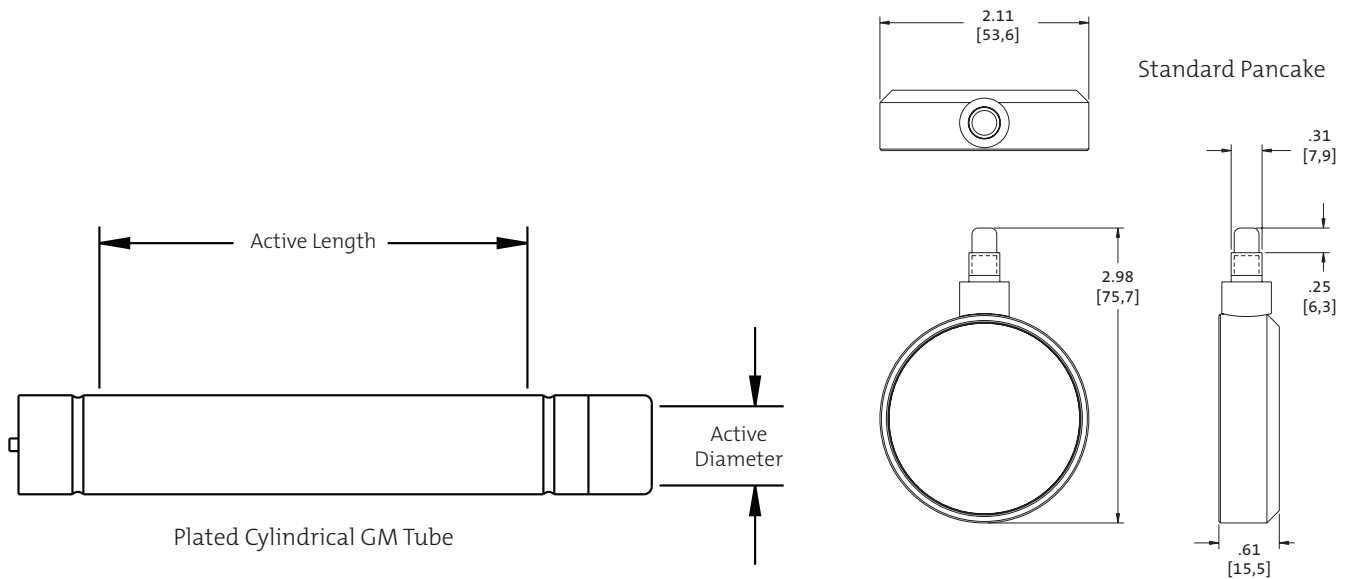
Geiger-Mueller Tubes - Typical Characteristics

Drawing No.	Cathode Wall Thickness inches [mm]	Active Diameter inches [mm]	Active Length inches [mm]	Operating Voltage (V)	Operating Temperature Range (°C)	Type of connector	
Plated							
s800-1241	0.01 [0.25]	0.61 [15.4]	2.45 [62.2]	650 - 800	-25 to 150	Flying Leads	
s800-1219			2.80 [71.1]	650 - 800		None	
s800-1220			2.80 [71.1]	650 - 800		Flying Leads	
s800-1210			4.33 [110.0]	850 - 1050		None	
s800-1209			4.33 [110.0]	850 - 1050		3-Pin	
s800-1262			4.56 [115.8]	850-1050		Flying Leads	
s800-1213			4.89 [124.2]	650 - 800		None	
s800-1214			4.89 [124.2]	650 - 800		Flying Leads	
s800-1215			6.92 [175.8]	650 - 800		None	
s800-1216			6.92 [175.8]	650 - 800		Flying Leads	
s800-1217			8.84 [224.5]	850 - 1050		Flying Leads	
s800-1218			8.84 [224.5]	850 - 1050		Cannon Plug	
s800-1212		0.73 [18.5]		4.86 [123.4]	850 - 1050	-25 to 150	3-Pin
s800-1211				4.86 [123.4]	850 - 1050	-25 to 150	Flying Leads
s800-1240				4.86 [123.4]	850 - 1050	-20 to 150	Lemo
s800-1254				5.35 [135.9]	400 - 500	-20 to 150	None
s800-1255				8.75 [222.3]	400 - 500	-25 to 150	None
Unplated							
s800-1245		0.001 [0.05]	0.31 [7.8]	1.15 [29.2]	500 - 650	-40 to +75	Solder Clip
s800-1224		0.01 [0.25]	0.57 [14.5]	1.34 [34]	450 - 650	-40 to +75	Solder Clip
s800-1225	0.01 [0.25]	0.61 [15.4]	7.93 [201.4]	500 - 750	-40 to +100	3-pin	
s800-1227	0.01 [0.25]	.73 [18.4]	7.60 [193.0]	450 - 650	-40 to +100	Pins	
Unplated Thin walled							
s800-1229	0.002 [0.051]	0.61 [15.4]	8.69 [220.8]	850 - 1000	-20 to +150	Flying Leads	
s800-1230	0.002 [0.051]	0.61 [15.4]	8.71 [221.3]	850 - 1050	-20 to +150	None	
s800-1232	0.002 [0.051]	0.61 [15.4]	8.71 [221.3]	850 - 1050	-20 to +150	3-pin	
s800-1188	0.004 [0.102]	0.73 [18.4]	2.02 [51.3]	850 - 1000	-20 to +75	BNC	

Typical diameter: 0.625" [15.88] and 0.75" [19]
 Standard lengths up to 8.84" [225.5] active
Other sizes are possible

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Drawing No.	Cathode Wall Thickness inches [mm]	Active Diameter inches [mm]	Active Length inches [mm]	Operating Voltage Range (V)	Operating Temperature Range (°C)	Type of connector
Unplated End Window						
Steel 0.010"						
s800-1222	0.01 [0.25]	0.57 [14.5]	1.34 [34.0]	450 - 650	-40 to +75	Solder Clip
Mica 2 mg/sq cm						
s800-1235	0.01 [0.25]	0.57 [14.5]	1.34 [34.0]	450 - 650	-40 to +75	Solder Clip
s800-1236	0.06 [1.6]	1.125 [28.6]	2.46 [62.5]	850 - 950	-20 to +75	None
s800-1237	0.06 [1.6]	1.125 [28.6]	2.46 [62.5]	850 - 950	-20 to +75	BNC Jack
Pancake						
Mica 2 mg/sq cm						
s800-1192		1.75 [44.5]	0.5 [12.7]	850 - 1000	-55 to +75	Grid Cap
s800-1193				475 - 675		



Unplated Thin Wall Cylindrical GM Tube



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Gas-Filled Radiation Detectors Geiger-Mueller Tubes

Radiation Detected

Geiger-Mueller (GM) tubes are typically designed to detect alpha, beta, and/or gamma radiation.

¹³⁷Cs Photon Response

As a point of sensitivity reference, the photon response to a 1 mR/h ¹³⁷Cs (662 keV) field is given for all standard GM tubes listed. Energy compensated tubes have been designed for either an air KERMA response or an ambient dose equivalent response, both flat to better than +/-20%.

Maximum Shielded Background

This is the maximum permissible count rate resulting from a GM tube inside a lead chamber 2 inches thick, lined with aluminum.

Suggested Operating Voltage (Figure 1)

The Suggested Operating Voltage generally appears in the center of the plateau. One can deviate from this suggestion as long as the applied voltage is still on the plateau.

Maximum Plateau Slope (Figure 1)

The GM tube Plateau Slope is defined as the percent change in sensitivity over a change in applied voltage. In this catalog, Plateau Slope is given by the percent change in sensitivity over 100 volts (%/100V).

Maximum Dead Time

Dead Time is the period of time a GM tube is insensitive to another counting event (expressed in microseconds).

Maximum/Effective Length and Diameter

The Effective Length and Diameter are the sensitive portions of the GM tube cathode.

Mica Window and Cathode Wall Density Thickness

Density thickness (mg/cm²) is a reference to the amount of radiation attenuating material for alpha and beta detection.

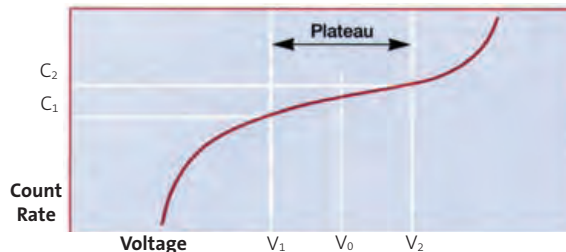
Starting Voltage

The Starting Voltage is the lowest applied voltage at which a particular GM tube will produce a minimum count rate. Starting Voltage is dependent on the input threshold of a circuit and a chosen minimum count rate.

Input Threshold

The Input Threshold or Discriminator limits the minimum pulse height to be counted. GM tubes produce relatively large voltage pulses compared to other types of radiation detectors. A typical threshold will be greater than 150 mV.

V₁ and V₂ = Plateau Voltage end points C₁ = Count Rate at V₁
 V₀ = Suggested Operating Voltage C₂ = Count Rate at V₂



$$\text{Slope (\%/100V)} = \frac{(C_2 - C_1)}{(C_2 + C_1)/2} \times \frac{100}{(V_2 - V_1)} \times 100$$

Figure 1. Geiger-Mueller Plateau Curve

Manufacturer reserves the right to alter specifications.

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