



Trusted
radiation
protection.

943-5

Process Geiger-Mueller (GM) Detector and Preamplifier

Federal and state regulations specify the concentration of radioactive isotopes that may be released into an unrestricted area. Facilities that use or have the potential for the generation of radioactive materials are required to monitor release points for radioactive noble gasses. The 943-5 Process GM Detector is designed for the direct measurement of beta and gamma noble gas activity in ventilation or exhaust ducts. The GM detector is a thin-walled gas-filled radiation detector. In low background areas, the GM detector may be installed directly into the duct. In higher background areas, a lead shielded in-line or off-line process radiation monitor is recommended. The efficiency of the detector is a function of the sampling geometry and detector used, and ranges from approximately 1×10^3 to 1×10^7 CPM/ μ Ci/cc.

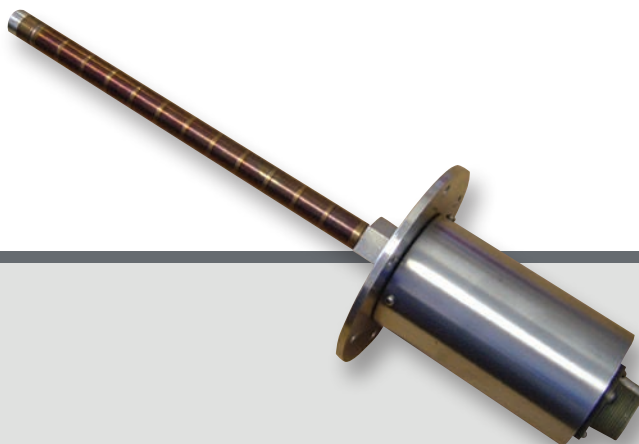
The 943-5 Process GM Detector is used in conjunction with a 940-4 In-Line Sampler or 841-334 Off-Line Sampler and a

942A Universal Digital Ratemeter (UDR) or 960 Digital Radiation Processor Controller. Together they provide a radiation monitoring system where the direct measurement of ionizing radiation in the release path is required. The 943-5 GM detector consists of a GM tube and a preamplifier. A 942A UDR or 960 Readout provides the high DC voltage necessary to operate the detector, the low DC voltage required to operate the preamplifier and the pulse-counting electronics necessary to quantify the detector output. The detector is constructed with a negative electrode (cathode) and a positive electrode (anode). A positive high voltage (HV) is applied across the anode and cathode.

The tube is filled with a mixture of halogen, or noble gasses,

and a quenching gas. When a radioactive particle penetrates the wall of the tube, an ionizing event occurs. The event produces an ion pair, which triggers the discharge of the tube, causing an avalanche of ion pairs and a current pulse. The current pulse, one per ionizing event, is independent of the energy of the initiating particle. Multiple discharges are eliminated via the use of a quenching gas in the tube. The resultant pulses are then coupled to the preamplifier.

The preamplifier receives the pulses from the GM tube and amplifies the pulses to a nominal 5 V dc level. The preamplifier also includes signal conditioning and line driver circuitry capable of driving the pulses through a 50 ohm transmission line a



Key features

- Plug-in GM tube detector
- Integral pulse conditioning and driving preamplifier
- 30 to 40 mg/cm³ wall for beta and gamma detection
- Operates from 15 in Hg to +15 psig
- Provides up to 5,200 CPM/mR/h, ¹³⁷Cs
- Drives up to 1,500 feet of cable
- Used with the 942A UDR or the 960 System

distance of 1,500 feet without degradation. In the event the radiation field is greater than the maximum range of the detector, the tube will saturate, resulting in a relatively constant output from the preamplifier. This condition can result in the display of a radiation value that is much less than the actual radiation field. To prevent understating the radiation value, an anti-jam circuit is provided in the preamplifier. When the preamplifier detects a constant output condition, a square wave with a frequency equivalent to the maximum range of the detector is sent to the readout.

The preamplifier is integrally mounted to the top of the detector. The waterproof preamplifier enclosure provides a method for connecting the detector HV, signal and power cables to the control room readout. Field calibration of the detector is accomplished through the use of optional secondary transfer button sources and a 943-5-100 Fixed Geometry Source Holder.

Technical specifications

Detector

Tube type:

- 943-5: TGM N107 (35-154)
- 943-5A: TGM N106 (35-193)

Dimensions

- 943-5: 15.88 in (l) x 4.5 in \emptyset (including preamplifier)
- 943-5A: 10.5 in (l) x 4.5 in \emptyset (including preamplifier)

Wall thickness

- 943-5: 40 to 60 mg/cm³
- 943-5A: 40 to 60 mg/cm³

Sensitivity

- 943-5: 5,200 CPM/mR/h, ¹³⁷Cs
- 943-5A: 2,200 CPM/mR/h, ¹³⁷Cs

Background

- 943-5: 60 CPM
- 943-5A: 30 CPM

Operating voltage

- + 850 V dc to 950 V dc
- + 900 V dc (nominal)

Pulse polarity

Negative (-)

Plateau length

150 V, min

Plateau slope

8% per 100 V, max

Overrange limit

1.0 x 10⁵ CPM

Weight

2 lb (0.90 kg) approx.

Calibration

Optional 844 Series Button Sources and Fixed Geometry 1 inch Diameter Source Holder

Preamplifier

Supply voltage

+ 15 V dc or + 16 V dc

Supply current

20 mA dc (approx.)

Input pulse

Negative (-)

Input impedance

100 k-ohms (approx.)

Output pulse

Negative (-)

Output signal

5 V peak (50 ohm terminated)

Output impedance

51 ohms

Discriminator

0 to + 2 V dc, adjustable
(0.2 V dc, normal)

Anti-jam level

0 to + 3 V dc, adjustable
(0.22 V dc, normal)

Anti-jam frequency

50 KHz (approx.)

Cable drive

1,500 ft (457 m)

Connections

Low voltage, MS-style connector,
MHV high voltage connector

Recommended cable

50-100, HV RG/59, signal RG/58

Environmental

- Operating temperature: 32 °F to 122 °F (0 to 50 °C)
- Storage temperature: 32 °F to 122 °F (0 to 50 °C)
- Relative humidity: 0 to 95%, non-condensing
- Maximum pressure: + 15 psig
- Maximum vacuum: 15 in Hg

Recommended readout

942A UDR or 960 System

Ordering information

Model

943-5: Process GM Tube Detector and Preamplifier

Standard Accessories

942A: Universal Digital Ratemeter (UDR)

960: Digital Radiation Monitoring System

Optional accessories

948-1: Rack Chassis



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