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843-251/252

Process Geiger-Mueller (GM) Detector and Preamplifier

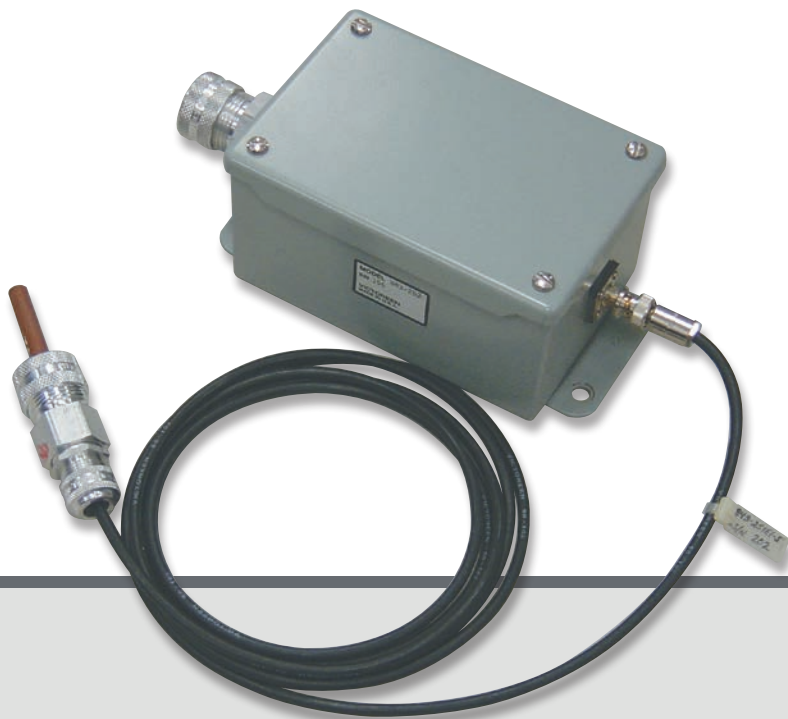
The 843-251 Series Process GM Detectors are designed for the direct measurement of noble gas activity. These tools allow conformity to Regulatory Guide 1.97, which requires operating nuclear power plants to measure noble gas activity from release points, including main steam relief or atmospheric dump valves, at activity levels up to $1 \times 10^3 \mu\text{Ci/cc}$. The GM detector is a thin-walled gas-filled radiation detector. The detector may be mounted into an existing particulate or noble gas monitor shield to increase the range of measurement to the levels specified in Regulatory Guide 1.97. It may also be installed into an 841-7 On-Line Detector Shield to measure fission product activity in the main steam line. The efficiency of this detector is a function of the sampling geometry used, and ranges from

approximately 1×10^3 to 1×10^7 CPM/ $\mu\text{Ci/cc}$.

When connected to an 843-252 Preamplifier and a 942A Universal Digital Ratemeter (UDR) or 960 Digital Radiation Processor Controller, the 843-251 detector provides an extended range radiation monitoring system for applications where the direct measurement of ionizing radiation in a release

path is required. When used as a main steam monitor, pressurized water reactor (PWR) primary to secondary leakage may also be detected.

The 843-251 GM detector consists of a GM tube detector and a radioactive bias source mounted in a phenolic tube. The bias source is a small chip of ^{238}U added to provide a 10 to 15 CPM output to verify detector opera-



Key features

- Small diameter GM tube detector
- Low or high sensitivity versions available
- Local pulse conditioning and driving preamplifier
- Off-line and on-line sampling geometries available
- For use with off-line or on-line shields
- Operates from 15 in Hg to + 15 psig
- Provides up to 5,200 CPM/mR/h, ^{137}Cs
- Drives up to 1,500 feet of cable
- Used with 942A UDR or 960 System



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tion. The phenolic tube protects the thin-walled, glass-sealed GM tube from physical damage when handling. An integral six-foot coaxial cable with mating connector is provided to connect the GM tube to its associated preamplifier. The detector is available for high, medium, or low sensitivity applications, as specified by an alpha suffix added to the detector model number.

In the event the radiation field is greater than the maximum range of the detector, the tube can saturate, resulting in a relatively constant output from the preamplifier. This 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, maintaining the output and resultant readout display at full scale.

The preamplifier is designed for mounting within six (6) feet of the detector. The waterproof preamplifier enclosure provides a mating connector for the detector cable and includes an internal terminal strip for connecting the detector high voltage (HV), signal and power conductors from the control room readout. Field calibration of the detector is accomplished through secondary transfer button sources and an 843-5 Series fixed geometry source holder.

Technical specifications

Detector

Tube type

- 843-251A: Saint-Gobain G1320
- 843-251B: Saint-Gobain G1310
- 843-251C: Saint-Gobain G1300

Dimensions

- 843-251A:
2.9 in (l) in x 0.5 in \emptyset
(7.29 cm x 1.27 cm)
- 843-251B:
3.5 in (l) in x 0.34 in \emptyset
(8.89 cm x 0.86 cm)
- 843-251C:
3.5 in (l) in x 0.34 in \emptyset
(8.89 cm x 0.86 cm)

Wall thickness

- 843-251A: 30 to 40 mg/cm³
- 843-251B: 80 to 100 mg/cm³
- 843-251C: 80 to 100 mg/cm³

Sensitivity

- 843-251A:
475 CPM/mR/h, ¹³⁷Cs
- 843-251B:
85 CPM/mR/h, ¹³⁷Cs
- 843-251C: 1
9 CPM/mR/h, ¹³⁷Cs

Fission product efficiency

Varies with composition; 1.0 x 10² to 5.0 x 10², typical

Background

- 843-251A: 10 CPM
- 843-251B: 20 CPM
- 843-251C: 30 CPM

Housing

Phenolic tube

Operating voltage

550 V dc to 575 V dc (nominal),
700 V dc (maximum)

Pulse polarity

Negative (-)

Plateau length

100 V, minimum

Plateau slope

- 843-251A: 10% / 100 V, max
- 843-251B: 15% / 100 V, max
- 843-251C: 30% / 100 V, max

Cable

6 ft integral cable with MHV connector

Overrange limit

1.0 x 10⁵ counts per minute

Weight

4.4 oz (125 g) approx.

Environmental

- Maximum pressure: + 15 psig
- Maximum vacuum: 15 in Hg
- Calibration: 844 Series Button Sources and a Fixed Geometry 1 in Diameter Source Holder

Preamplifier

Dimensions (l x w x d)

8.6 in x 4.2 in x 3.2 in
(2.19 cm x 1.06 cm x 8.1 cm)

Housing

NEMA 4, weatherproof

Supply voltage

+ 15 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
(0.9 V dc to 1.45 V dc, typical)

Anti-jam frequency

50 KHz (approx.)

Cable drive

1,500 ft (457 m)

Connections

Low voltage, seal grip cable
entry and terminal blocks, triax
GM tube connector

Recommended cable

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

Weight

2.4 lb (1.2 kg) approximate

**Detector and
Preamplifier****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

Recommended readout

Model 942A Series UDR or Model
960 System

Ordering information**Model**

843-251/252: 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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