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Trusted radiation protection.

Technical Data

977 Series

Wide Range Ion Chamber Detectors

Ion Chamber detectors are similar to capacitors, with two electrodes separated by a volume of air. In order to operate, an electrical potential is applied between the electrodes. Thus, one electrode will have a positive charge and the other a negative charge (relative to each other). Incident ionizing radiation will cause the air in the volume between the electrodes to dissociate into positive and negative ions. Each ion will be attracted to the electrode of opposite polarity. Ions that reach the electrode result in charge transfer. The charge transfer causes a current to flow in the connecting wiring, representing the measured amount of radiation intensity experienced by the ion chamber.

The detector is a gamma sensitive radiation detection device, which measures radiation in the range of 1 x 10^{-1} mR/h to 1 x 10^{7} mR/h with an energy dependence of less than ± 10 % from 60 keV to 3 MeV. The preamp is housed in a gasket sealed enclosure. Interconnection between the detector and preamplifier is accomplished via two five foot cables, encased in a flexible conduit.

The wide range ion chamber detector design includes a single ion chamber with a volume of approximately 1000 cc. The chamber walls are made of tissue equivalent plastic. An outer wall, made of aluminum, is provided to protect the ion chamber and to mechanically interface with the 848-8 Field Test Source. The ion chamber is biased at a nominal 500 volts and produces an output current proportional to radiation absorbed in the chamber. The current is approximately 8 x 10^{-11} A/R/h.

The ion chamber assembly makes use of a double seal design, where the actual ion chamber is back filled with nitrogen at atmospheric pressure. The connector area is sealed against moisture and particulates through the use of a sealed, liquid tight flexible conduit between the detector and preamplifier electronics.

The preamplifier contains a microprocessor controlled, auto-zeroing, integrating electrometer, a programmable gain amplifier, an analog-to-digital

Key features

- Wide range ion chamber/preamp
- Range: 10^{-1} to 10^{7} mR/h
- Energy response: ± 10 % from 60 keV to 3 MeV
- Three twisted pair with overall shield connection to remote readout recommended
  NOTE: Consult factory for use with existing cable
- No local power supply required
- With preamp shielding, life expectancy can be extended to approximately 10^{7} rads
- For use with the 945A monitoring system

converter, an asynchronous serial communications interface, an electronic check source, and the detector high voltage power supply. Communication with the Universal Digital Ratemeter (UDR) is accomplished via the optically isolated serial communication loop driver/receiver circuitry.

Applications

Area monitoring is used for the detection of X-ray or gamma radiation in a selected area. The monitor should be used in any location where personnel may be exposed to an adverse amount of radiation. Applications include nuclear reactors, accelerators, hot cells, irradiators, and any area where radiation sources are handled. These monitors can be used as single channel monitors or grouped together as a multichannel area monitoring system.

Technical specifications

Physical

Detector type
Coaxial ion chamber

Dimensions *(w x d x h)*
- Chamber assembly 10.25 in x 10.25 in x 10.38 in (26 cm x 26 cm x 26.4 cm)
- Preamplifier assembly 8.9 in x 10.7 in x 4.1 in (22.7 cm x 27.3 x cm 10.5 cm)

Chamber volume
1000 cc

Weight
- Chamber assembly: 11 lb (5 kg)
- Preamplifier assembly: 8 lb (3.6 kg)

Housing material
- Chamber assembly: Outer cover is aluminum; inner chambers are conductive, tissue equivalent plastic
- Preamplifier assembly: Painted steel with a NEMA 4 type rating (stainless steel available)

Inner chamber gas
Dry nitrogen at atmospheric pressure

Electronics life expectancy
Approximately 10^4 rads or 1 hour at full scale (unshielded)

Radiation detected
Gamma rays and X-rays

Environmental
- Operating Temperature: 0 to 122 °F (–16 °C to 50 °C)
- Storage Temperature: 0 to 122 °F (–16 °C to 50 °C)
- Relative Humidity: 0 to 95 %, non-condensing

Maximum external pressure
15 psig

Mounting
Wall bracket

Preamplifier
Separated from ion chamber housing to enable shielding. 5 ft standard, up to 100 ft optional

Electrical

Radiation detected
Gamma rays and X-rays

Range
10^{-1} to 10^7 mR/h

Typical energy dependence
< ± 10 % from 60 keV to 3 MeV

Check source type
Solid state electronic check source

Power requirements
± 15 V dc

Preamplifier output signal
High noise immunity "VICO LOOP" communications

Output coupling
DC

Maximum remote capability
3000 ft with 16 AWG communications cable

Ordering information

Model

977-210: Wide Range Ion Chamber Detectors

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