

Compensated Ionization Chambers

RS-C1B-2514-115

For reactor control (intermediate/power range)

The RS-C1B-2514-115 is an electrically compensated ionization chamber for measuring thermal neutron flux over the range 2.5×10^2 to 2.5×10^{10} nv. It is designed for use in a mixed neutron and gamma flux where the gamma radiation is a significant portion of total radiation. Under this condition, the gamma current is a large portion of the total ionization current produced in the chamber, and compensation is required.

Compensation is provided by a chamber section sensitive to gamma rays only. With a negative voltage applied to the compensating electrode and positive voltage applied to the high voltage electrode, the output currents are subtracted electrically and neutron current alone is measured. The required compensating voltage is dependent upon gamma intensity and energy. Normally, it is in the range of 20 to 40 volts, but each chamber should be calibrated for compensating voltage before use.

Concentric cylinders with boron coating provide the neutron sensitive area. 1100 Aluminum is used in construction to minimize neutron absorption and residual activity. All seals are directly bonded ceramic-to-metal. Insulators are high purity alumina ceramic. Insulators have been designed to insure stable, long-term, noise-free operation of the chamber.

The detector envelope is hermetically sealed. The complete structure is a rugged assembly capable of withstanding severe shock, vibration, and temperature extremes.

Accessories

Detector housing RS-E1-0008 is a watertight unit complete with 30 feet of cable and designed for use with this chamber.

Specifications

Mechanical

- Maximum diameter: 8.02 cm
- Maximum overall length: 60.17 cm
- Connectors: Type HN
- Net weight: 3.63 kg

Material

- Outer shell and inner electrodes: 1100 Aluminum
- Connectors: Aluminum
- Insulation:
 - Detector: Alumina ceramic
 - Connectors: Alumina ceramic
- Neutron sensitive material: Boron enriched >95% B-10
- Fill gas: Nitrogen

Capacitance (See Note 1)

- Signal electrode to shell: 310 pf
- High voltage electrode to shell: 340 pf
- Compensating electrode to shell: 170 pf

Resistance @ 25°C

- Signal electrode to shell: 10^{13} ohms (minimum)
- High voltage electrode to shell: 10^{12} ohms (minimum)
- Compensating electrode to shell: 10^{12} ohms (minimum)

Specifications continued

Maximum ratings

- Inter-electrode voltage: 1500 Volts
- Temperature: 200°C
- Thermal neutron flux: 10^{11} nv
- Burn-up life:
 - for 10% decrease in sensitivity: 2.7×10^{19} nvt

Typical operating characteristics

- Thermal neutron sensitivity (unperturbed): 9.4×10^{-14} amp/nv $\pm 20\%$
- Thermal neutron flux range: 2.5×10^2 to 2.5×10^{10} nv
- Gamma sensitivity (uncompensated): 1.7×10^{-11} amp/R/hr $\pm 20\%$
- Voltage range: 300 to 800 Volts (See Note 2)
- Compensating voltage range: -10 to -80 Volts

NOTE 1: All other electrodes grounded.

NOTE 2: See Saturation Characteristics for voltage required at various neutron flux levels.

Customizable solutions

Reuter-Stokes is dedicated to providing high quality, high reliability equipment to our customers. We specialize in customizing detectors and detector assemblies to meet your specific application. This can involve dimensional, material, or performance adjustments to suit your needs.

Ionization chamber dimensions

