Reuter-Stokes
a Baker Hughes business

Fission Counters/Chambers

RS-C3-2510-114

For reactor control (wide range)

The RS-C3-2510-114 has proven itself as the standard high-sensitivity fission counter/chamber for wide range reactor instrumentation.

It is designed for measurement of the neutron flux levels from shutdown to full power of a nuclear reactor. The detector can be used to detect individual neutrons (counting mode) to 10^6 nv in the presence of an incident gamma flux of 10^6 R/hr.

It can also be used as a wide range neutron sensor in conjunction with mean-square-voltage (MSV) type circuitry over a range of 10^4 to 10^{10} nv in the presence of an incident gamma flux of 10^6 R/hr.

Operation, as specified here, is greatly dependent on associated electronics. All data presented here is based on measurement using a wide band pre-amplifier.

Concentric cylinders with uranium coatings provide the neutron sensitive area. Aluminum alloy 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 and are designed to assure stable, long-term noise-free operation of the chambers even at elevated temperature.

Accessories

This chamber can be supplied with integral cable detector housing and cable seals for minimum interference from external noise. The sketch on the next page shows this design which is designated Reuter-Stokes model RS-E1-0050. Another version of this chamber has a 40" sensitive length for core flux averaging in power reactors and is designated model RS-C3-2540-102.

Specifications

Mechanical

- Maximum diameter: 8.02 cm
- Maximum overall length: 33.18 cm
- Connectors: Type HN
- Net weight: 2.3 kg

Material

- Outer shell and inner electrodes: 1100 Aluminum
- Connector: Magnesium
- Insulation:
  - Detector: Alumina ceramic
  - Connector: Alumina ceramic
- Neutron sensitive material: Uranium enriched >93% in U-235.
- Total quantity U-235: 1.8 gm

Capacitance (See Note 1)

- Signal electrode to shell: 140 pf
- High voltage electrode to shell: 250 pf

Resistance @ 25°C

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

Maximum ratings

- Inter electrode voltage: 1000 volts
- Temperature: 300°C
- Burn-up life:
  for 10% decrease in sensitivity: 1.6×10^{20} nvt (thermal)

Specifications continued

Typical operating characteristics

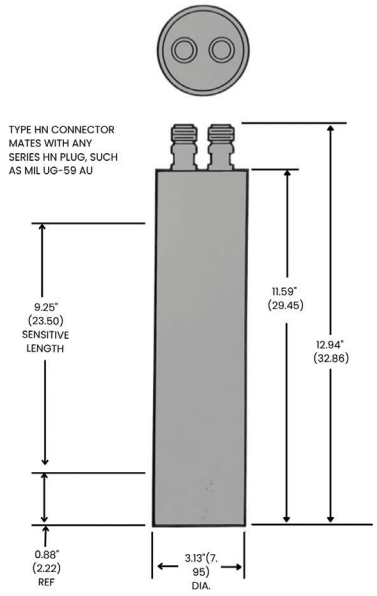
- AC thermal neutron sensitivity: >1 x 10^{-10} V^2/nv
- DC thermal neutron sensitivity: >1.2 x 10^{-13} amp/nv ± 20%
- Counting sensitivity @ alpha cutoff: 0.7 cps/nv
- AC gamma sensitivity: <1 x 10^{-10} V^2/R/hr
- DC gamma sensitivity: <5 x 10^{-11} amp/R/hr
- DC alpha current: <8 x 10^{-9} amp
- AC alpha and noise component: 10^4 nv equivalent
- Voltage range: 200 to 800 volts
- Thermal neutron flux range:
  - In counting mode: to 10^6 nv
  - In MSV mode: 10^4 to 10^{10} nv

NOTE 1: With other electrode grounded.
NOTE 2: Operating characteristics are greatly dependent on electronics. All data presented here is based on measurement using a wide band preamplifier.

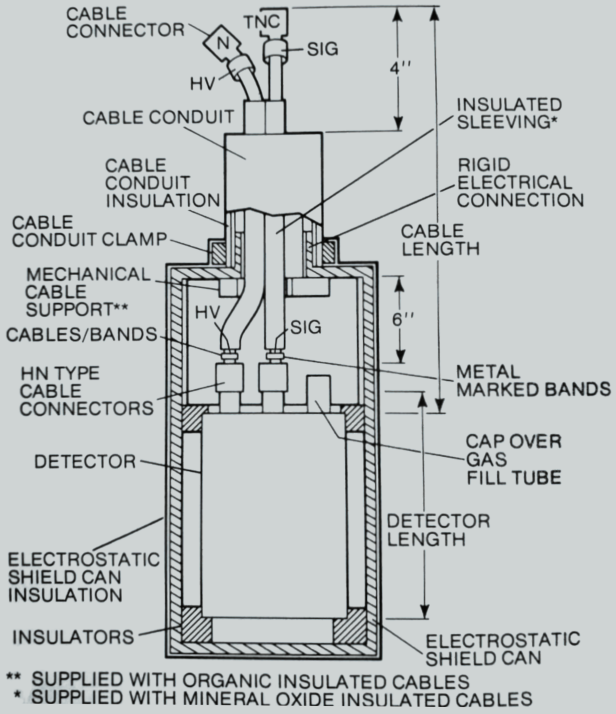
Customizable solutions

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.

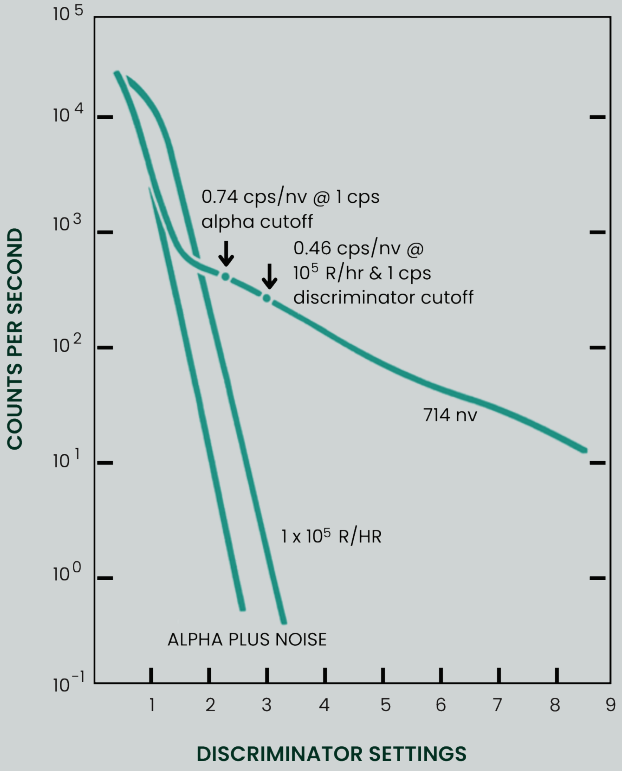
Fission counter/chamber dimensions



RS-E1-0050 RDT standard fission type neutron detector assembly



Integral bias curve



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