



Movable-in-core neutron detectors for pressurized water reactors

Designed for peak performance and reliability

Reuter-Stokes is a world leader in miniaturized fission chambers. The Reuter-Stokes MIC (movable in-core) sensor, used in pressurized water reactors (PWR), maps the thermal neutron flux in the water gap between adjacent fuel bundles and is compatible with existing installed systems. The precisely matched, machined, and bonded components increase reliability by minimizing the possibility of detector failure resulting from installation and removal. This means exact radiation readings when you need them, every time. Reuter-Stokes' MIC detectors are compatible with all equipment vendors and can perform as direct replacements for current movable in-core probes.

Accurate output signal

The unique uranium coated miniature fission chamber and mineral insulated cable technology of the MIC enables detection of the core thermal neutron radiation levels by traversing the active fuel region and producing a direct current that is proportional to the neutron flux in the water gap.

The accurate signal of the MIC, enabled by the ceramic to metal seal that isolates the detector and cable assembly, eliminates variation at temperature from gas expansion and provides a signal that is precise and repeatable over hundreds of flux scans. This allows greater confidence in the neutron monitoring system operation.

Benefits:

- Reliable, trouble-free detector operation
- Responsive engineering and technical support
- Extensive miniaturized fission chamber manufacturing experience for decades

Options:

- MIC probes available in right handed or left handed models and in custom lengths
- Part number RS-C6-0201-231 (L or R for left handed or right handed drive cable pitch).

Functional flexibility

Superior insulation resistance at temperature in the Reuter-Stokes MIC probes aids in exact flux measurement by minimizing leakage currents. This proven design permits usage of the detector over a wide range of temperatures, decreasing the need for frequent replacements. The long detector lifetime contributes to increased operational efficiency and decreased maintenance costs.

Customer-focused solutions

Reuter-Stokes is dedicated to continuous improvement in the performance of our products. By utilizing Six Sigma quality development and efficient, short cycle production, we are able to meet customer needs quickly and to provide MIC probes in an industry-leading order to delivery time.

Vast global installed base

Reuter-Stokes is committed to our customers around the globe, with experts available to meet deadlines when you need them and on your schedule. Our MIC probes are installed in more than 25 PWR plants worldwide.

Operational characteristics

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| Thermal neutron flux range | 1 E11 nv to 2 E14 nv |
| DC neutron sensitivity In PWR at 0 nvt In test reactor with 100 v applied | 8.5 E-18 A/nv \pm 20% 1.5 E-17 A/nv \pm 20% |
| Sensor gamma sensitivity (Corresponds to 10% sensitivity decrease) | 2 E-14 A/R/h max. |
| Sensor design lifetime In co-60 field with 100 v applied | 3 E20 nvt |
| Inter-electrode operating voltage | 100 VDC |
| Insulation resistance (integral cable only) Whole cable at 24°C 4.5 M of cable at 375°C, remainder at 24°C | 1 E12 Ohms min. 1 E8 Ohms min. |
| Capacitance | 110 pf/ft. |

Physical characteristics

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| Sensor element Outer diameter Sensitive length Detector length Nominal fissile coating Fill gas Anode and cathode material Insulator material | 0.188 in. max. 1.00 in. 2.17 in. max. 0.4 mg U-235 76 cm argon 304 or 304L SS Alumina |
| Drive cable Outer diameter (helical wrap, lh, or rh) Length Material | 0.191 in. max. 175 ft. (standard) Carbon steel |
| Single cable Sheath diameter Center conductor material Cable sheath Insulation | 0.041 in. max. Inconel 600 Inconel 600 Alumina |
| Connector Type | Amphenol #27-7 (standard) |

