

Thermo Scientific Neutron Flux Monitoring Systems

Reliable Reactor Power Level Monitoring
and Control for Nuclear Power Plants

Our neutron flux monitoring systems offer you reliable and low maintenance solutions to address common operating issues:

- Unreliable or noisy channels
- Obsolescence issues
- Frequent detector change-outs

Features

- Source Range Neutron Flux Monitoring Systems
- Intermediate (Wide) Range Neutron Flux Monitoring Systems
- Power Range Neutron Flux Monitoring Systems
- Gamma Flux Monitoring Systems
- Qualified for Safety Grade Class 1E and US NRC RG 1.97
- Post-Accident Monitoring Applications
- 10CFR50 Appendix R Remote Shutdown Monitoring Systems
- Audible Count Rate, Scaler-Timer and other miscellaneous drawers
- Shutdown Margin Monitors (for boron dilution detection)
- Cabinets
- 40 year life under normal full-power operating conditions
- 10CFR50 Appendix B Quality Assurance Program



You know it is time to upgrade when equipment obsolescence and safety concerns demand excessive time to maintain the reliability and qualification of your reactor instrumentation. With minimal impact and cost, nuclear power plants can easily upgrade their existing ex-core neutron flux monitoring systems (detectors, cables and electronics) to the simpler and more reliable Thermo Scientific NIS line of products.

By installing the Thermo Scientific NIS, peace of mind is achieved from higher reliability, lower maintenance costs, better accuracy, and satisfying all pertinent regulatory guides. Our nuclear instrumentation systems have successfully completed EMI/RFI testing per RG 1.180 requirements. Since 1981, we have installed the majority of nuclear instrumentation systems in pressurized water reactors throughout the United States and Korea. Our nuclear instrumentation systems are also being provided to new plants under construction in Korea, United Arab Emirates, and China.

Rugged, field-proven components and a streamlined design give the Thermo Scientific NIS superior reliability and qualify it to last the life of the reactor. No longer must nuclear power plants be forced to routinely replace short-lived detectors or continually service obsolete electronics.

Plants began to replace aging, failure-prone systems to comply with new regulations in the early 1980s. Since then, more than 150 reactors in 18 countries have chosen our nuclear instrumentation systems because of their high reliability, low maintenance costs, high immunity to electromagnetic interference, ease of installation, and ease of testing.

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Thermo Scientific Neutron Flux Monitoring Systems

General Specifications — Source Range

Sensitivity	20 cps/nv (thermal)
Flux Range	10^{-2} nv to 10^4 nv
Output Range	0.1 cps to 10^6 cps
Linearity	$\pm 2\%$ (percent of equivalent linear full scale)

General Specifications — Intermediate (Wide) Range

Sensitivity	1 V/decade
Flux Range	1 nv to 10^{10} nv
Output Range	10^{-8} to 200%
Linearity	$\pm 1\%$ (percent of equivalent linear full scale)

General Specifications — Power Range

Output Range	0 to 200%
Linearity	$\pm 1\%$ (percent of equivalent linear full scale)

Mechanical Specifications

Dimensions

Weight

SR/IR Detector Housing	152 cm (60 in) x 14.3 cm (5.625 in) O.D.	36 kg (80 lb)
PR Detector Housing	As required	
Cables	Up to 305 m (1,000 ft)	
Amplifier	61 cm (24 in) x 51 cm (20 in) x 25 cm (10 in)	23 kg (50 lb)
Wall Mount Isolator	51 cm (20 in) x 41 cm (16 in) x 23 cm (9 in)	27 kg (60 lb)
Wall Mount Signal Processor	61 cm (24 in) x 51 cm (20 in) x 25 cm (10 in)	23 kg (50 lb)
Cabinets	As required	
Rack Mount Signal Processors	As required	
Audible Count Rate Drawer	18 cm (7 in) x 48 cm (19 in) x 30 cm (12 in)	10 kg (21 lb)
Audible Count Rate Drawer with Scaler-Timer	36 cm (14 in) x 48 cm (19 in) x 30 cm (12 in) 1	4 kg (30 lb)
Shutdown Margin Monitor	18 cm (7 in) x 48 cm (19 in) x 28 cm (11 in)	5 kg (10 lb)

Temperature Specifications

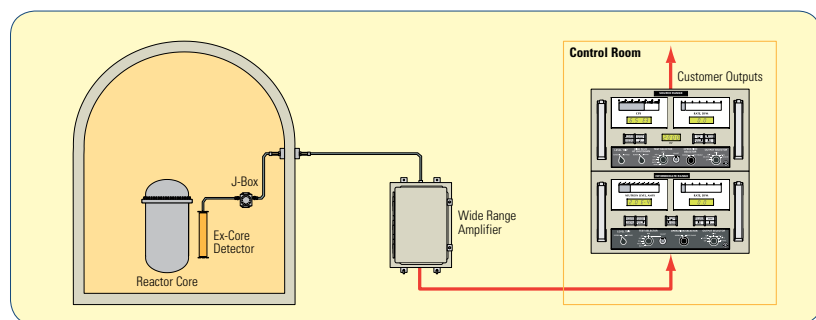
The Neutron Flux Monitoring Channel is designed to operate under normal service conditions and to operate through a design basis event (DBE)

Detector	Normal: 0°C to $+93^{\circ}\text{C}$ ($+32^{\circ}\text{F}$ to $+200^{\circ}\text{F}$); 10% to 100% RH DBE: LOCA profile
Amplifier	Normal: $+5^{\circ}\text{C}$ to $+60^{\circ}\text{C}$ ($+41^{\circ}\text{F}$ to $+140^{\circ}\text{F}$); 10% to 95% RH DBE: $+5^{\circ}\text{C}$ to $+60^{\circ}\text{C}$ ($+41^{\circ}\text{F}$ to $+140^{\circ}\text{F}$); 10% to 100% RH
Signal Processor	Normal: $+5^{\circ}\text{C}$ to $+60^{\circ}\text{C}$ ($+41^{\circ}\text{F}$ to $+140^{\circ}\text{F}$); 10% to 95% RH DBE: Normal

Electrical Specifications

Power Requirements	120 VAC $\pm 10\%$, 60 Hz, 1.0 A/unit; 220 VAC $\pm 10\%$, 50 Hz, 0.5 A/unit
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Typical Ex-Core Neutron Flux Monitoring System Channel



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