

SELF POWERED NEUTRON DETECTOR

Self-Powered Neutron Detectors has been used effectively as in-core flux monitors in nuclear power reactors world-wide. The basic properties of these radiation sensors include nuclear, electrical and mechanical characteristics. The proper choice of the self-powered detector emitter to provide the proper response time and radiation sensitivity desired for use in an effective in-core radiation monitoring system.

SPND can be of many types. The typical inconel type SPND is a coaxial cable consisting of an inner electrode of inconel (the emitter), surrounded by insulation and an outer electrode of inconel (the collector).



SPND Cable

Preferably, the lead cable and detector sections are integral, i.e. the signal wire of the lead cable mates directly to the emitter; the insulation of both sections are identical and the collector of the detector section is also the outer sheath of the lead cable section. Other type of SPNDs are Vanadium SPND, Rhodium SPND etc, in which only the emitter material is of Vanadium and Rhodium respectively.

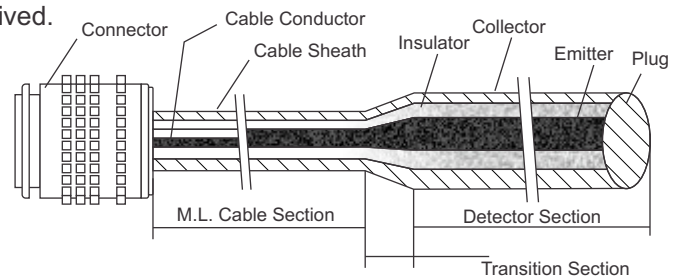
In Self-Powered Neutron Detectors (SPNDs), the interactions of neutrons and atomic nuclei are used to produce a current which is proportional to the neutron fluence rate (flux).

Application of SPND

- It is used for core flux measurement in Nuclear reactor.
- The design of SPND is rugged, simple, flexible and long lived.
- It is used for high flux-high temperature.
- Indication or control.
- It is used for mapping or permanent installation.

Advantages of SPND

- SPND doesn't require power supply.
- SPND structure is simple and robust.
- SPND has small mechanical size which is desired for in-core installation.
- The stability of SPND is good under temperature and pressure condition.
- SPND generates a reproducible linear signal.



Technical Specification of Inconel type SPND

For Detector :

Emitter Material	Inconel 600/Vanadium/Rhodium/Any other Material
Emitter Diameter	As per Customer Request
Sensitive Length	As per Customer Request
Insulator	MgO/Al ₂ O ₃
Collector Material	Inconel 600
Outer Diameter of detector	As per Customer Request

For Cable :

Length of Cable	As per Customer Request
Insulator	MgO/Al ₂ O ₃
Sheath Material	Inconel 600
Outer Diameter of Cable	As per Customer Request

Connector :

Connector Type	LEMO Connector
Metal Seal	Ceramic to metal Seal

Characteristics :

Measured Quantity	Neutron Flux
Insulation resistance(at room temperature)	$\geq 1 \times 10^{12} \Omega.m$ at 250 VDC
Insulation Resistance (at 300°C)	$\geq 5 \times 10^8 \Omega.m$ at 250 VDC