

Previous model number: 2072

Sample Decommissioning Piece Monitor

N2072

Introduction

The N2072 Passive Neutron Decommissioning Piece Monitor is a high efficiency passive neutron counter designed for the measurement of plutonium contaminated size reduced pieces arising from the decommissioning of nuclear plant and equipment. The system can also be used to measure plutonium bearing material in storage containers.

The N2072 performs passive neutron counting of the correlated neutrons arising from spontaneous fission of the even Pu nuclides, principally ^{240}Pu . The measurement chamber can be installed outside of any Modular Containment System or similar exclusion zone. This can be adjacent to a convenient baggage port through which size reduced pieces are introduced for measurement. A closure plug is provided for the top of the measurement chamber.

Plant measured isotopic ratios can be used by the software in order to convert $^{240}\text{Pu}_{\text{effective}}$ mass to total Pu mass. Alternatively a suitable germanium gamma-ray detector can be conveniently installed through the base polyethylene shield plug to interrogate the sample and determine the Pu isotopic ratios independently using PC-FRAM or other isotopic code.

The neutron detection system consists of 72 ^3He tubes arranged in two concentric rings of 36 tubes embedded in a polyethylene moderator; 18 sets of 4 tubes are connected to a high voltage junction box containing an Amptek charge sensitive amplifier/discriminator circuit and connections for high voltage, low voltage and signal cables. The detectors are embedded in a polyethylene moderator, which includes a thickness of 230 mm back shielding for operation in relatively high neutron background environments. The outer surface is covered in stainless steel cladding. The internal and external moderator surfaces are covered in cadmium to prevent thermalised neutrons from re-entering the sample measurement cavity.

The N2072 can be used with either a Multiplicity Shift Register with INCC-32 software or the N2000 Universal Neutron Counter with A2000-15 LVDS. In either case the system can be operated in conventional shift register coincidence counting (reals) mode (with a calibration function), multiplicity counting list mode, or totals counting mode.

The chamber is portable and housed on a robust trolley with locking castors for safety and stability.

Features

- Large measurement chamber
- Shielded chamber designed to operate in relatively high neutron background environments
- Internal chamber cladding to make decontamination easier
- Top opening to ease the introduction of size reduced pieces
- Stand-alone workstation containing counting electronics, computer and printer
- Bespoke software for drum filling QA procedures



Benefits

- Optimised for use with the chamber mounted vertically
- Designed for operation in controlled area environments (free breathing zones)
- Can be combined with a conventional high resolution gamma-ray system for the independent determination of Pu isotopic ratios
- Provides a complete passive neutron assay system when used with either a Shift Register with INCC-32 software or the N2000 Universal Neutron Counter with ANTECH Analysis Software or INCC-32 Software.
- Can operate in conventional shift register (coincidence counting), multiplicity or totals neutron counting modes

Specification

External dimensions (H x W x D) (including handle and frame)		1400 mm x 900 mm x 1100 mm (55.11 in x 35.43 in x 43.31 in)
Internal dimensions (H x diameter)		400 mm x 671 mm (15.75 in x 26.42 in)
Weight (approx.)		400 kg (881.85 in)
Detectors		72 ³ He detector tubes
Detector dimensions		25.4 mm x 100 mm at 4 atm pressure (1 in x 3.94 in)
Detection efficiency		~28% (for shorter measurement times)
Minimum detection limit	²⁴⁰ Pu _{effective} in coincidence (reals) mode	10 - 50 mg
	Total Pu (military grade)	~0.2 - 1.0 g
Operating voltage		~1650 V
Die-away time		~40µs
Electrical connections	High voltage	SHV
	5 V supply for head amps	BNC
	Signal output	BNC
	LVDS output	38 W male 'D' - cable supplied