

Model 42-49 Series Neutron Detector

Model 42-49 Part Number: 47-4057
Model 42-49B Part Number: 47-4307
Model 42-49B-1 Part Number: 47-4307-01

Features

- Portable Neutron Detector
- Small & Light 19.5 cm (7.7 in.) REM Ball
- Provides Similar Readings as Standard REM-Ball in the Following Ludlum Meters:
 - Model 30-7 Family
 - Model 12-4-7 Family
 - Model 3007 Family

Introduction

The Model 42-49, 42-49B, and 42-49B-1 Neutron Detectors are designed for detection of thermal and fast neutrons (0.025 eV to approximately 12 MeV). Neutrons are detected indirectly through nuclear reactions which result in energetically charged particles, such as alpha particles. In many instances, intense fields of gamma rays are also found with neutrons. Therefore, it is important to choose a method of neutron detection with the ability to discriminate against these gamma rays in the detection process.

These detectors are designed to be used with portable counting instruments and have a top bracket that allows for convenient mounting of a portable instrument, such as a Ludlum Model 30. Each detector consists of a 2 atm ³He detector (1.6 cm diameter x 2.5 cm thick), surrounded by a high density polyethylene sphere, 19.6 cm (7.7 inches) in diameter. This outer sphere moderates the incoming neutrons and helps provide a near-rem response.

The Model 42-49 and 42-49B differ by the boron concentration in the internal borated layer. The Model 42-49 has a lower boron concentration and offers greater sensitivity, typically 10 cpm per $\mu\text{Sv/h}$ (100 cpm per mrem/hr), but tends to overrespond in the 5 keV range. The Model 42-49B has a higher boron concentration and a lower sensitivity, typically 4.5 cpm per $\mu\text{Sv/h}$ (45 cpm per mrem/hr), but does not have the same overresponse issue as the Model 42-49.

The Model 42-49B-1 is a variant of the Model 42-49B with a 10 atm detector (HAZMAT) that provides increased sensitivity, typically 7.6 cpm per $\mu\text{Sv/h}$ (76 cpm per mrem/hr).



Specifications

INDICATED USE: neutron detection, area monitoring
DETECTOR:

42-49 & 42-29B: 2 atm ³He tube, LND 25185 or equivalent
42-49B-1: 10 atm ³He tube (HAZMAT)

MODERATOR: 19.6 cm (7.7 in.) diameter high density polyethylene sphere

COMPATIBLE INSTRUMENTS: typically used with portable counting instruments (capable of achieving -2 mV input sensitivity)

SENSITIVITY (bare ²⁴¹AmBe):

42-49: 10 cpm per $\mu\text{Sv/h}$ (100 cpm per mrem/hr)

42-49B: 4.5 cpm per $\mu\text{Sv/h}$ (45 cpm per mrem/hr)

42-49B-1: 7.6 cpm per $\mu\text{Sv/h}$ (76 cpm per mrem/hr)

GAMMA REJECTION: 10 cpm or less at 100 mSv/h (10 R/hr) (¹³⁷Cs)

DETECTION RANGE: thermal to approx. 12 MeV

ENERGY RESPONSE: thermal to 12 MeV, follows the radiation protection guide curve for neutron dose

INPUT SENSITIVITY: -2 mV

OPERATING VOLTAGE: approx. 1200 V

CONNECTOR: series "C" (others available)

CONSTRUCTION:

Brackets: aluminum with black powder-coat

Ball: polyethylene

TEMPERATURE RANGE: -20 to 50 °C (-4 to 122 °F)

SIZE (H x W x D): 22.5 x 19.6 x 19.6 cm (10 x 7.7 x 7.7 in.), including brackets

WEIGHT: 4.6 kg (10.2 lb)