VF NUCLEAR

CALIBRATION LABORATORIES

RESEARCH CENTRES

NI-07

NEUTRON IRRADIATOR

MAIN ADVANTAGES

- Irradiator for 7 different sealed neutron radiation sources, optionally also for gamma sources
- Fully automated irradiation process
- Multi-layer shielding
- Integrated safety system

PURPOSE

The NI-07 Neutron Irradiator, fitted with appropriate sealed radionuclide sources, serves as a reference source of the neutron flux, optionally also gamma.

Usually, it is a part of neutron dose and dose rate meters calibration laboratories.

The irradiator consists of a rotary carousel for up to 7 sources with a vertical source-lifting mechanism, which moves a selected source to the exposure position. Surrounding this is multi-layer shielding containing polyethylene, boron enhanced polyethylene, lead, and iron. The equipment is controlled from a control box.

The irradiator is installed on a supporting frame on the floor of the irradiation room. The carousel is equipped with 7 nests for sealed radionuclide sources and one empty nest (the parking position), which is selected to ensure additional shielding safety when the sources are not being used.

For source exposure, the carousel rotates until the selected source is placed at the lifting mechanism, which then lifts it through the guide tube to the exposure position above the floor level of the irradiation room. All the time the source remains in a protective capsule.

The stroke of the source (the length of the guide tube) can be adjusted within limits to the height of the room.

The irradiator is equipped with the safety system enabling automatic exposure termination in case of abnormal or emergency situations.

In case of an electrical power failure any exposed source automatically returns to the shielded position.

SPECIFICATION

Total number of nests	8
Number of nests for the sources	7
Max. dimensions of sources (ø × h)	44 × 65 mm
Transport of sources from nests to the working position	pneumatic
Time of the transport of a source from a nest to the working position	approx. 10 s
Power supply	110 / 230 VAC
Operating temperature	from 10 to 45 °C
Communication interface	Ethernet

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MODELS

Model	Radionuclide	Maximum recommended emission / activity of one source*	Dose rate in 1m during irradiation **	Dose rate on the surface **	Dose rate at 30 cm from the surface**	Weight [kg]	Container dimensions without base and guide tube (h x w x d) [cm]
	Am/Be-241	3.6E+8 n/s	4 mSv/h	10 μSv/h	4.3 μSv/h		
K1827-01	Cf-252	1.3E+9 n/s	14.3 mSv/h	10 μSv/h	4.7 μSv/h	6,100	(146 x 170 x 170) cm
	Cs-137	200 GBq	15 mSv/h	0.02 μSv/h	0.01 μSv/h		
	Am/Be-241	9.7E+7 n/s	1.1 mSv/h	10 μSv/h	4.2 μSv/h		
K1828-01	Cf-252	3.2E+8 n/s	3.5 mSv/h	10 μSv/h	3.8 μSv/h	3,800	(116 x 141 x 141) cm
	Cs-137	50 GBq	3.8 mSv/h	0.02 μSv/h	0.01 μSv/h		
	Am/Be-241	4.4E+7 n/s	0.5 mSv/h	10 μSv/h	3.9 μSv/h		
K1829-01	Cf-252	1.5E+8 n/s	1.7 mSv/h	10 μSv/h	3.3 μSv/h	3,500	(112 x 137 x 137) cm
	Cs-137	25 GBq	1.9 mSv/h	1.2 μSv/h	0.5 μSv/h		

** Activities of inserted radiation sources may be higher than maximum recommended activities if a higher dose rate in the vicinity of the irradiator is acceptable than is indicated in the table for the respective model and source.*
*** The dose rate values are approximate, in practice they may vary slightly depending on the specific radiation source used.*

OPTIONAL FEATURES

A Circular Turntable for placement of instruments being calibrated instruments (typically dosimeters)

A **Moderating Sphere** made of deuterium or polyethylene to slow down fast neutrons to achieve the energy of thermal neutrons.

Shadow Cones used to determine the proportion of scattered neutrons in the laboratory

Safety System preventing any unacceptable exposure of the personnel.

Shadow cone

RELATED PRODUCTS

Name	Description
NI-03	Neutron Irradiator for three radionuclide sources
CB-60	Calibration Bench for the accurate positioning of a meter being calibrated within the ionizing radiation field.
DARS	Data and Control System, which manages completely the calibration laboratory operation.

VF NUCLEAR

VF, a.s. Czech Republic
T:+420 516 428 611
E: sales@vfnuclear.com

www.vfnuclear.com