



VF NUCLEAR



NUCLEAR
POWER PLANTS



WASTE
MANAGEMENT



CALIBRATION
LABORATORIES



RESEARCH
CENTRES



INDUSTRY
& MANUFACTURING



NUCLEAR
MEDICINE

FRM-02

FREE RELEASE MONITOR



MAIN ADVANTAGES

- High sensitivity
- Short measuring time
- Excellent throughput
- 32 detectors with integrated MCA
- Automatic operation, low operating costs
- User friendly
- Automatic background measurement
- Graphical display of activity distribution allows localization of hot spots
- Easy decontamination
- Application of radionuclide vectors (fingerprints)
- Calibration for different radionuclides
- High degree of mechanical safety

PURPOSE

FRM-02 monitors are designed to measure and analyze gamma-emitting radionuclides in material which is being evaluated for free release from nuclear facilities to the environment.

Based on the measurement results, it is possible to decide whether the material can be free-released into the environment, or has to be decontaminated, or stored as radioactive waste.

FRM-02 monitors are offered as customized solutions for specific customer conditions. The basic part is a measuring chamber with plastic scintillation detectors, shielded by lead. The chamber has one entrance door as standard.

The monitor is equipped with large-volume detectors, which are located on all six walls of the measuring chamber in 4pi geometry.

Depending to the model, the monitor has one door (input and output together) or two doors (separate input and output). The configuration with one door delivers the measured package with material to and from the chamber by means of a rail conveyor. The rail conveyor can have one or two loading platforms, which significantly speeds up the handling time. The two-door design allows the loading platform to be positioned in the controlled area and the unloading platform in the clean zone.

The standard delivery includes:

- The FRM-02 monitor with shielded measuring chamber, container loading and unloading mechanism, control switchboard and PC with monitor
- A fixture for quick check of the monitor's function - a tripod for placing the point radiation source at the center of the chamber
- Cs-137 point radiation source for quick check of the monitor's function



FRM-02A with a pallet container in the loading position

FREE RELEASE MONITOR

The operation of FRM monitors is controlled by the FRMS application software, which has the following functions:

- Performing quality and calibrations checks
- Starting new measurements
- Acquiring of data about measured material
- Control of the FRM-02
- Archiving of performed measurements
 - Measurement result
 - Crate type
 - Material type
 - Weight
 - Crate filling level
 - Radionuclide vectors (fingerprints) and/or scaling factors
- Archiving of performed checks
- Archiving status and error messages
- Printing of reports of crate measurements
- Printing of FRM-02 calibration reports
- Database of measurable and non-measurable (difficult to measure) radionuclides
- Database of radionuclide vectors (fingerprints) and / or scaling factors

SPECIFICATION

Detectors	plastic scintillator, 50 mm
Energy range	from 100 keV to 2,5 MeV
Geometry	4π
Shielding (Pb)	50 mm
Chamber inner dimensions (W × H × D)	925 x 1070 x 1370 mm
Overall chamber dimensions w/o conveyors and switchboards (W × H × D)	1450 x 1570 x 1900 mm
Monitor weight	app. 15 000 kg
Standard crate dimensions (W × H × D)	855 x 1000 x 1245 mm
Max. weight of the measured material	1,000 kg
Power supply	230 V
Operating temperature	from 5 to 45 °C
Humidity	max. 90%, non-condensing
Operating pressure	86 – 106 kPa

SELECTED RADIOMETRIC PARAMETERS

Radionuclide	Material density [kg/m ³]	Level of filling [%]	Detection limit [Bq/kg]
¹³⁷ Cs	500	40	1,74
¹³⁷ Cs	500	100	0,79
¹³⁷ Cs	1000	40	1,20
¹³⁷ Cs	1000	100	0,60
¹³⁷ Cs	2500	40	0,93
¹³⁷ Cs	2500	100	0,49
⁶⁰ Co	500	40	0,60
⁶⁰ Co	500	100	0,26
⁶⁰ Co	1500	40	0,31
⁶⁰ Co	1500	100	0,16
⁶⁰ Co	2500	40	0,27
⁶⁰ Co	2500	100	0,14



FRM-02

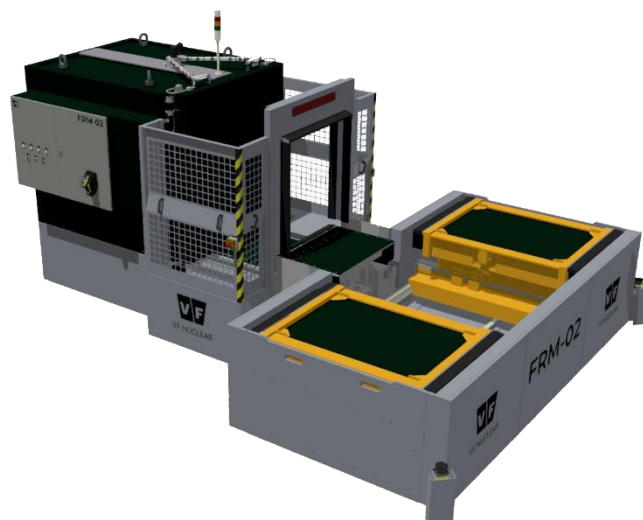
FREE RELEASE MONITOR

MODELS OF MONITORS

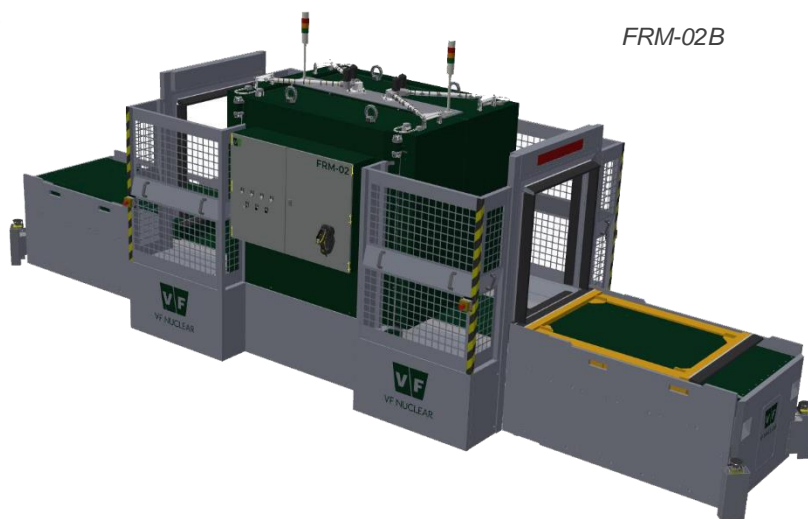
	FRM-02A	FRM-02B	FRM-02C
Rail conveyor for crate loading	✓	✓	✓
Phantom crate and drum	✓	✓	✓
Max. crate throughput per hour	4	5	5
Doors	One (input/output)	One (input/output)	Two (input and output)
Unloading and loading positions	1	2	2
Optical sensors for crate size control	✓	✓	✓



FRM-02A



FRM-02B



FRM-02C



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Specification subject to change without prior written notice.

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FREE RELEASE MONITOR

OPTIONAL FEATURES

Label printer

Air conditioning chamber for very bad climatic conditions

Barcode readers

Safety barriers around the FRM-02

OPTIONAL ACCESSORIES

Set of irradiation sources for metrological tests (Ba-133, Cs-137, Co-60)

Pallet containers for measured material

Fixture for setting of the FRM-02 detectors using radionuclide sources

Calibration set with irradiation sources (without phantoms)

Calibration set with radionuclide sources, pallet container, and with phantoms for tests with the container filling of 20 / 40 / 60%

Calibration set with radionuclide sources, pallet container, and with phantoms for tests with the container filling of 20 / 40 / 60 / 80 / 100%

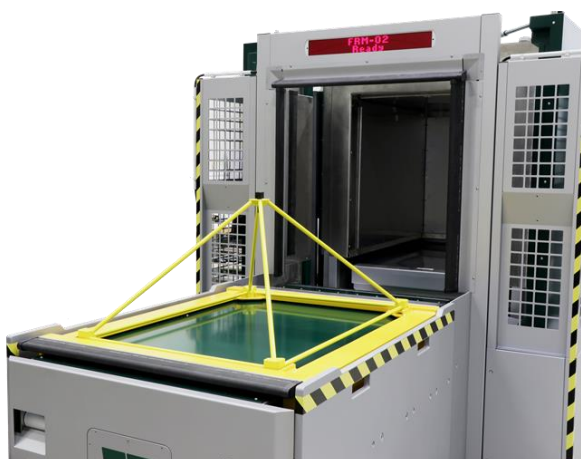
RELATED PRODUCTS

FRM-06 Free Release Monitor for Large-Volume Material

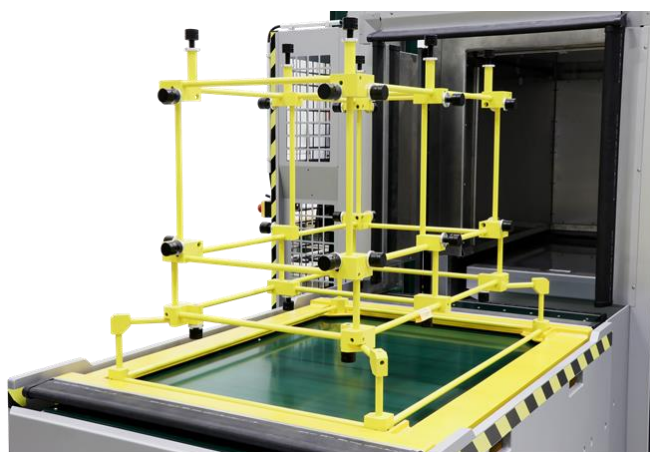
FRM-24 Free Release Monitor

WAM Waste Assay Monitors

MCM-300 Tools and Materials Contamination Monitor



Fixture for quick check of the monitor's function



Fixture for setting of the FRM-02 detectors using radionuclide sources