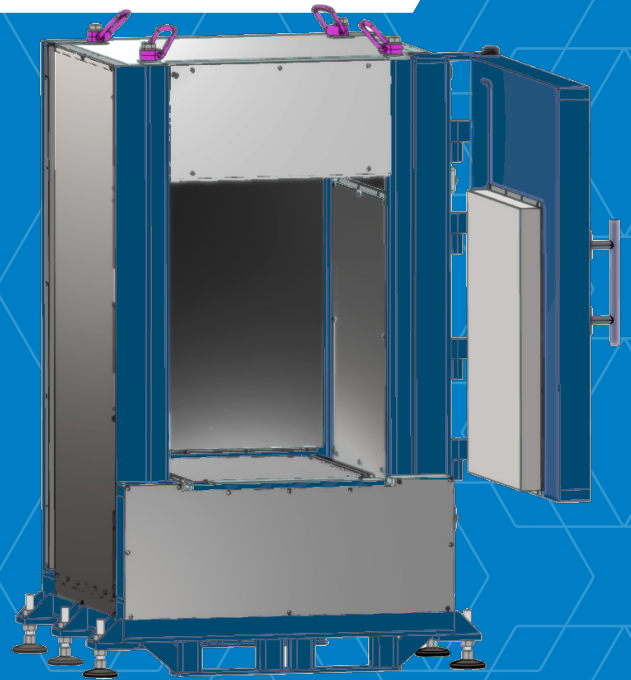




RTM662-460

Clearance Monitor



The Mirion RTM662-460 is designed for clearance measurements of large items like large waste bags, crates or drums.

DESCRIPTION

The RTM662-460 is an advanced clearance monitor for large objects. It consists of a measurement chamber with a manually operated swing door. The objects are detected and weighed by integrated scales and checked for gamma radiation by 6 state-of-the-art plastic scintillation detectors with spectroscopic read-out.

The RTM662-460 shares the common, modern Lighthouse monitor software platform with Windows 10 IoT operating system. This analysis software reports nuclide specific activity, brings lower measurement uncertainties, handles complex nuclide vectors and simplifies maintenance.

It is based on the well-proven algorithm principles and improved leading nuclide correlation method (LNC) technology as used in many Mirion RTM monitors. The state-of-the-art spectrometric detector read-out and the simulation-based object models allow an unprecedented measurement accuracy. It provides with reliable efficiency correction for all nuclides in the fingerprint. The automatic verification and optimization of the declared nuclide vector can further reduce the measurement uncertainties.

FEATURES

- **Gamma clearance monitor** compliant with Euratom 2013/59, IAEA RS-G-1.7, ISO11929:2019
- **Large Waste bags and drums:** counting chamber dimensions 70 x 70 x 95 cm³, volume 460 liters,
- **Low MDA:** 22 Bq Co-60 achieved by 6 plastic scintillator detectors in a 4 π configuration, modular lead lingot shielding of up to 75 mm on six sides,
- **Unprecedented precision and low uncertainty:** Spectrometric detector readout and signal processing, simulation-based object models, automatic efficiency and background correction,
- **Highly customizable:** Configurable fingerprints, release limits and object models,
- **Modern software platform:** Windows 10 IoT LTSC operating system and Lighthouse analysis software,
- **Simple use:** user-friendly and intuitive graphical user interface, optional remote control station, built-in weight scale,
- **Straightforward calibration and maintenance:** single source calibration, real-time spectrum display, software guided efficiency check and hardware diagnostics,
- **Robustness and safety:** Stainless steel chamber lining and external cladding, robust chassis, door hinges and position switches, fork pockets,
- **Safe transportation** by crane or forklift with full shielding installed.

RTM662-460 CLEARANCE MONITOR

The RTM662-460 comes with advanced administrator and maintenance features: the real-time energy spectrum display provides with a radiological health check of detector array on a single glance. All calibration and routine efficiency checks are user-configurable and software guided.

The comprehensive and intuitive monitor software comes with user configurable libraries for release limits, radiological fingerprints or editable standard objects like crates or waste drums.

To extend the functionality to application-specific objects or assess specific environmental conditions or nuclide vectors, validated Monte-Carlo simulations are available as a complementary service.

The self-contained results database facilitates personalized report generation, decision tracing, recalculation and interfacing to waste management systems.

RADIOLOGICAL CHARACTERISTICS

DETECTION

- 6 large-volume plastic scintillation detectors – total active volume: 113,4 litres,
- Spectrometric read-out, 256 channels,
- Lower energy threshold: 80 keV,
- Measurable activity range: 10 Bq to 1 000 000 Bq.

BACKGROUND PROCESSING

- Advanced background filter permitting the detection and suppression of transitory background variations and an accelerated adaptation to lasting changes.
- The background stability is monitored also during the measurement,
- Automatic calculation of the background reduction by the object.

ALGORITHM

- Calculation of the mass or surface specific activity per nuclide,
- Bayesian statistics based, compliant with the ISO11929:2019 for calculation and clearance decision,
- Simulation based object models, valid for all nuclides in the library,
- Single nuclide efficiency calibration, no dummy objects needed for geometry correction,
- Automatic correction of the detection efficiency and background attenuation for mass, density and geometry of the objects,
- Compensation of NORM contributions by nuclide including automatic density correction,
- Configurable nuclide vectors (fingerprints) and release limits.

SPECIAL

- Verification and optimization of the declared nuclide vector during clearance measurements,
- Residual chamber contamination checks,

DETECTION LIMITS

- Point source in chamber centre,
- Background (BKG) count-rate 900 cps (approx.100 nSv/h, 75 mm lead),
- False alarm safety quantile $k_{\alpha}=1.65$, detection safety quantile $k_{\beta}=1.65$, $T_{BKG}=300$ s

Measurement time (s)	10	30	60	180
Co-60	75 Bq	44 Bq	33 Bq	22 Bq
Cs-137	151 Bq	89 Bq	67 Bq	44 Bq
Ba-133	146 Bq	96 Bq	64 Bq	43 Bq

MECHANICAL CHARACTERISTICS

- Chamber: 70 x 70 x 95 cm³ (LxWxH), 460 litres,
- Ext. chassis dimensions: 115 x 158 x 235 cm³ (LxWxH),
- Built-in weight scale, maximum 500kg, 0.1 kg resolution,
- 25mm, 50mm or 75mm lead shielding, transportable by crane or forklift with the shielding installed,
- Total weight with shielding:

Shielding	Without (only bottom)	25 mm	50 mm	75 mm
Weight	2150 kg	3692 kg	5534 kg	7376 kg

FUNCTIONAL CHARACTERISTICS

- Single door, manual operation,
- Automatic object detection by the weight scale,
- Optional software controlled cameras,
- Remote user interface with colour screen, keyboard and pointing device, single RJ45 cable connection,
- Visual and audible contamination alarm,
- Report and label printing, optional barcode reader, user-configurable PDF report generator,
- Hierarchical password protected administrator access,
- Software assisted monitor diagnosis and calibration,
- Software module for configurable quality assurance system check procedures,
- Software libraries of
 - Objects (drums, bags, clothes, toolboxes etc.),
 - Nuclide vectors / Fingerprints,
 - Nuclides,
 - Release limits etc.
- Self-contained results database with raw spectra and object data for reporting, tracing and recalculation,
- Network capability with interface to waste-management system.

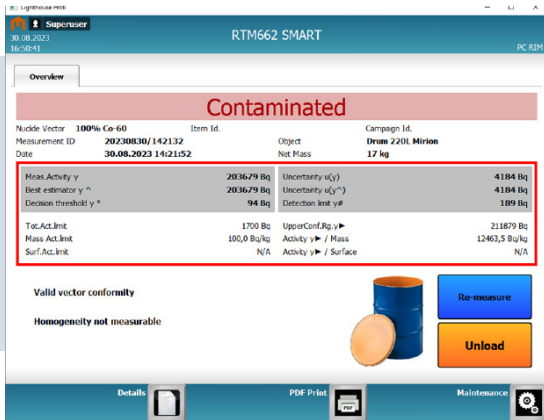
ENVIRONMENTAL CHARACTERISTICS

- Operating temperature range +5°C to +45°C
- Storage temperature range -25°C to +60°C
- Relative humidity (non-condensing) 40% to 100%

ELECTRICAL CHARACTERISTICS

- Operating voltage: 110-230 V, 50-60 Hz
- Nominal current 5 / 3 A
- UPS backup autonomy (computer only): 60 min
- 2 external USB connectors, 1 LAN connection
- 2 floating-contact outputs

RTM662-460 CLEARANCE MONITOR



RESULTS SCREEN

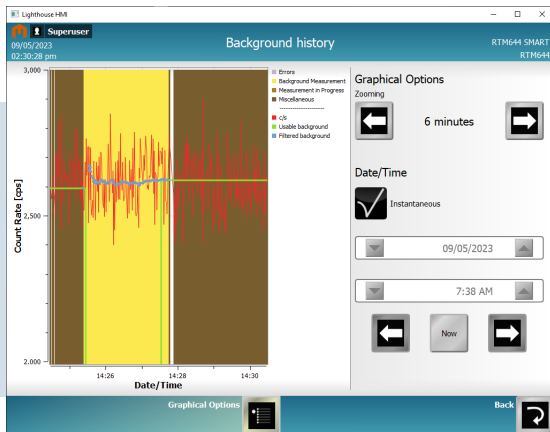
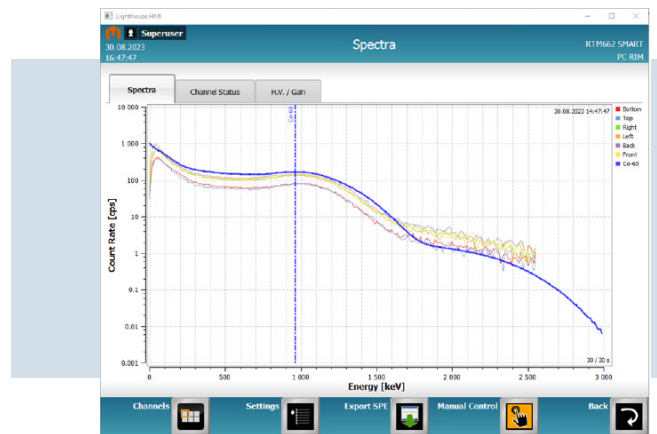
Detailed display of measurement conditions and results for a case where the alarm level is exceeded.

The screen contains all information about the measured activity, its uncertainty as well as the decision and detection limit, as required by ISO11929.

REAL-TIME SPECTRA DISPLAY

The radiological health check is simplified by comparing visually an actual Co-60 spectrum with a reference.

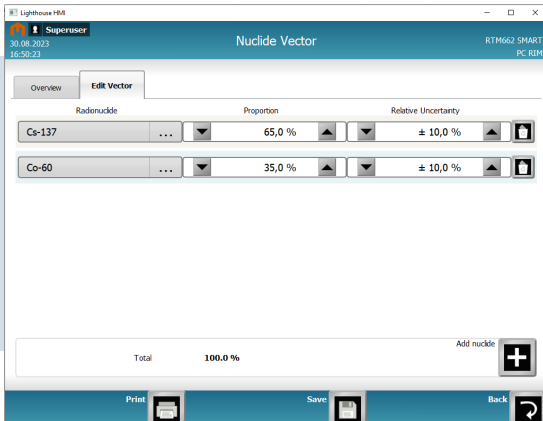
With the spectrum in the accurate position, the detection efficiency will also have the expected value. Any deviations can be analysed and corrected in dedicated menus.



BACKGROUND DIAGNOSTICS

Graphical display of the background history including the count-rate, the filtering process and the reference background. The background history is stored for 3 months with a resolution of 1 s for 3 days and 60 s for the remaining time.

RTM662-460 CLEARANCE MONITOR



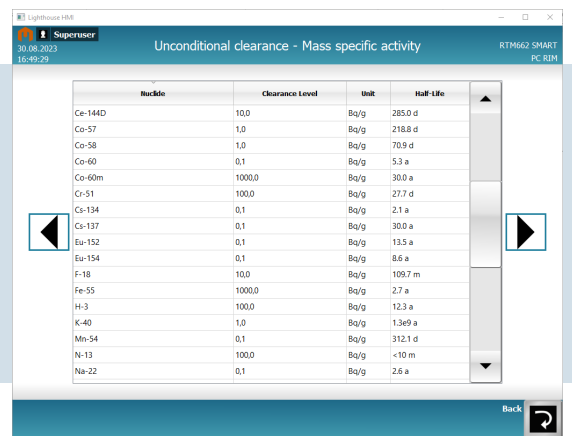
NUCLIDE VECTORS

Configuration screen for the nuclide vectors. The declared abundance of the nuclides is used to calculate the release limits and the expected detection efficiency.

The uncertainty is included in the calculation of the total coverage range according to ISO11929.

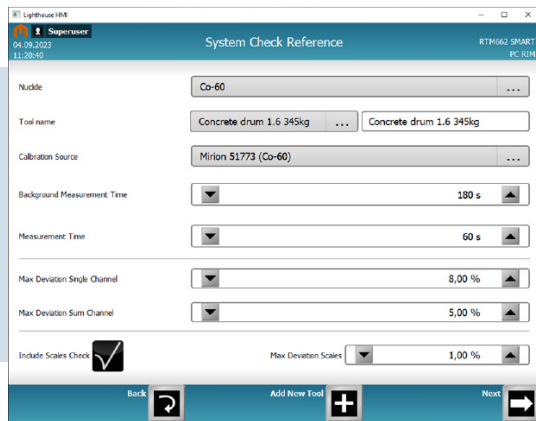
RELEASE LIMITS

Library of the nuclide specific release limits. Different, user-configurable datasets can be selected.



SYSTEM CHECK

Quality assurance procedures require periodic verification of the detection efficiency and correct operation of the system. The System Check module provides comprehensive functionalities to simplify periodic quality assurance.



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