MIRION
TECHNOLOGIES

RTM662-460C

Clearance Monitor

The Mirion RTM662-460C is designed for clearance measurements of 200 liters drums or other large items like waste bags.

DESCRIPTION

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

The RTM662-460C shared 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, automatizes loading and simplifies maintenance.

It is based on the well-proven algorithm principles and the improved leading nuclide correlation (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 reliable efficiency correction for all nuclides in the fingerprint. The automatic verification and optimization of the declared nuclide vector can reduce the measurement uncertainties further.

FEATURES

- **Gamma clearance monitor** compliant with Euratom 2013/59, IAEA RS-G-1.7, ISO11929:2019
- **Large Waste bags and 200 liters drums:** counting chamber dimensions 70 x 70 x 95 cm³, volume 460 L,
- **Low MDA:** 22 Bq Co-60, achieved by 6 plastic scintillator detectors with spectroscopic read-out in a 4 π configuration, modular lead lingot shielding of up to 75 mm on six sides,
- **Unprecedent precision and low uncertainty:** Spectrometric detector readout and signal processing, simulation-based object models, automatic efficiency and background correction,
- **Highly customizable:** 1 or 2 doors configuration, selectable conveyor length, container installation; Configurable fingerprints, release limits and objects,
- **Modern software platform:** Windows 10 IoT LTSC operating system and state-of-the-art Lighthouse analysis software
- **Simple use:** user-friendly and intuitive graphical user interface, software-controlled door and conveyor operation, remote control station, built-in weigh scale,
- **Straightforward calibration and maintenance:** single source calibration, real-time spectrum display, software guided efficiency check and hardware diagnostics,
- **Robustness and ergonomics:** Stainless steel chamber lining and external cladding,
- **Safe transportation** by crane lifting eyelets or forklift pockets

RTM662-460C CLEARANCE MONITOR

The RTM662-460C 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 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.

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

RADIOLOGICAL CHARACTERISTICS

DETECTION

- 6 large-volume plastic scintillation detectors – total active volume: 113,4 litres,
- Spectrometric read-out with 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_{α}=1.65, detection safety quantile k_{β}=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**	**86 Bq**	**64 Bq**	**43 Bq**

MECHANICAL CHARACTERISTICS

- Chamber: 70 x 70 x 95 cm³ (LxWxH), 460 liters,
- External dimensions: 115 x 158 x 235 cm³ (LxWxH),
- Conveyor: length 250 cm, max. object diameter 63 cm,
- Built-in weight scale, maximum 500 kg, 0.1 kg resolution,
- 50 to 75 mm lead shielding, in-field installation possible from the outside, transportable by crane or forklift with shielding installed,
- Total weight with shielding:

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

FUNCTIONAL CHARACTERISTICS

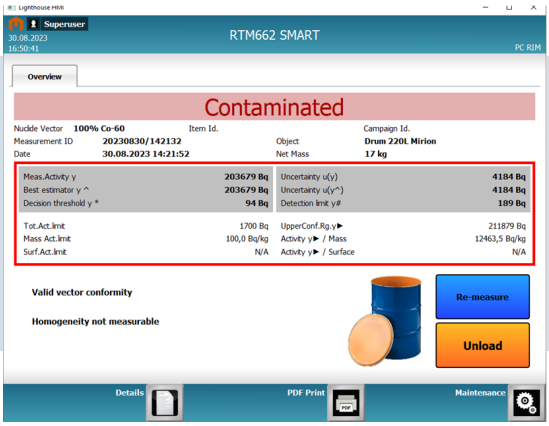
- Single door with chain conveyor, motorized operation with PLC,
- Up to 2 still cameras, triggered by position sensors,
- Automatic object loading, integrated in measurement software, object detection by the weight scale,
- Remote user interface with colour screen, keyboard and pointing device, single 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 module for configurable quality assurance system check procedures
- Software assisted monitor diagnosis and calibration,
- Preconfigurable 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
- Detailed, configurable PDF report generator,
- 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: 220 / 380 V, 3 phases, 50-60 Hz
- Nominal current 10 / 5 A
- UPS backup autonomy (computer only): 60 min
- 2 external USB connectors, 1 LAN connection
- 2 floating-contact outputs



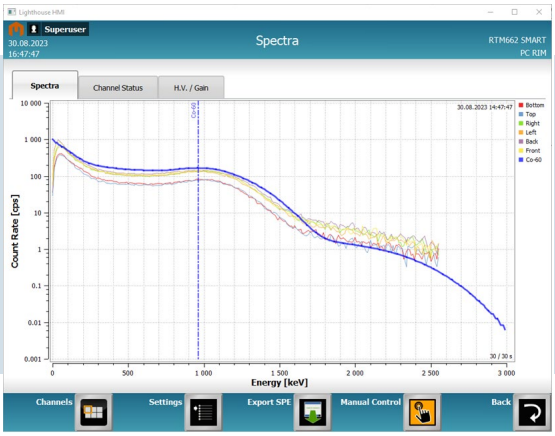
RESULTS SCREEN

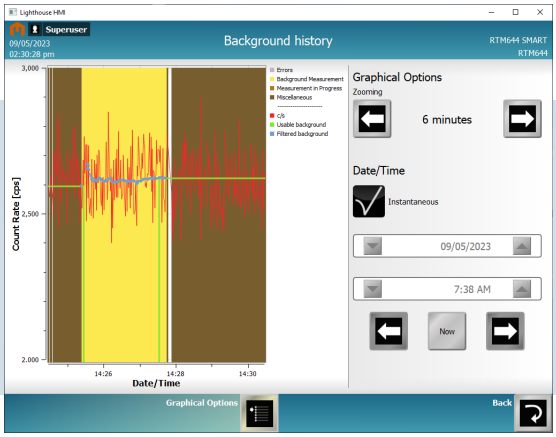
Detailed display of measurement conditions and results for a case where the alarm level is exceeded.

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.

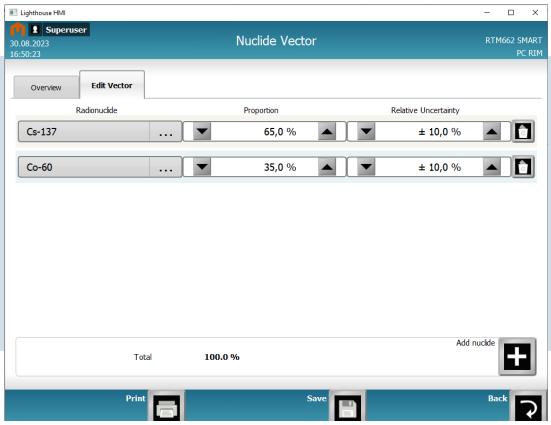




BACKGROUND DIAGNOSTICS

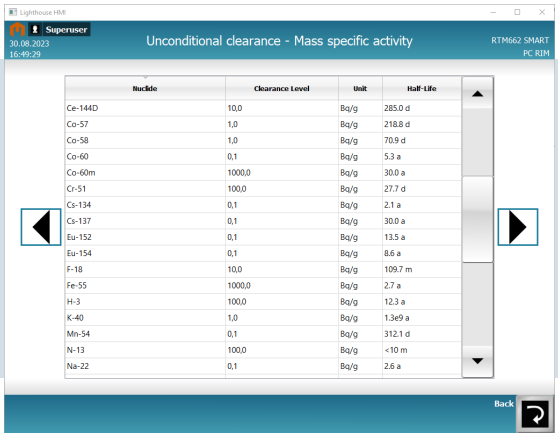
Graphical display of the background history including the count-rate, the filtering process and the refence background. The background history is stored for 3 months with a resolution of 1 s for 3 days and 60 s for the remaining time.

RTM662-460C CLEARANCE MONITOR



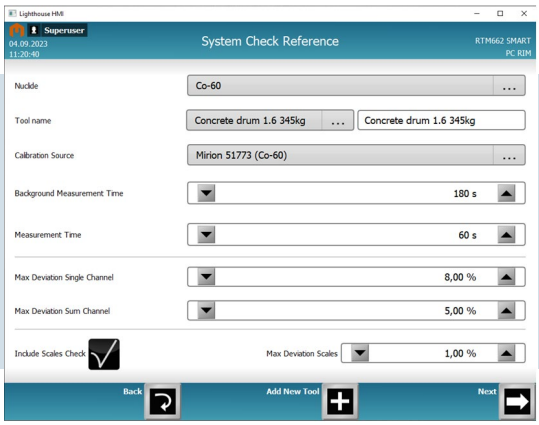
NUCLIDE VECTORS

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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