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Health Physics and Radioprotection

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PROTECT WHAT'S NEXT

At Mirion Technologies, we partner with industry leaders to advance radiation safety and empower the next wave of critical innovation. From R&D labs, to critical nuclear facilities, and on the front lines, we provide proven radiation safety technologies that operate at the highest levels of precision, and deliver trusted expertise that empowers our customers to solve problems and enable breakthrough innovation.

Our Mission:

To harness our unrivaled knowledge of ionizing radiation for the greater good of humanity.

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Dosimetry & Telemetry Systems

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DOSIMETRY

DMC 3000™

Personal Electronic Dosimeter

Mirion Technologies provides a complete line of hardware and software products targeted to Health Physics and Radiation Protection personnel, in order to meet current Nuclear Industry challenges.

DESCRIPTION

Covering a wide range of X-ray and Gamma radiation detection, our DMC 3000 Electronic Dosimeter represents over 25 years of real-world electronic dosimetry experience, continually refined through customer feedback.

The unique, high contrast and backlit LCD display provides a clear indication of wearer's dose and ambient dose rate for deep dose equivalent. More importantly, multiple methods (audible, visual, and tactile) are utilized to alert the wearer of alarm conditions.

The DMC 3000 provides all of this protection, for over 3,000 hours of continuous use, with a single AAA alkaline battery. Best of all, connected with plug and play add-on modules the DMC 3000 offers detection and radio transmission capabilities beyond traditional use.

The DMC 3000 dosimeter offers an enhanced communication protocol for additional features and includes a compatibility mode for previous Mirion Technologies products including calibration tools, access control, turnstiles and telemetry infrastructure.

FEATURES

- ✓ Loud, vibrating and dual ultrabright LED alarm
- ✓ Highly visible backlit display
- ✓ Simple 2-button navigation
- ✓ Additional modules (Beta, Neutron, Telemetry and Neutron Telemetry)
- ✓ Superior X-ray and gamma energy response (Hp(10) and Hp(0.07))
- ✓ Exceeds applicable IEC and ANSI standards
- ✓ Excellent immunity to electromagnetic interference
- ✓ Designed for ruggedness and durability

DOSE RANGE, IEC61526 ED. 3 (DISPLAY & MEASUREMENT)	
***Hp*(10) γ**	***Hp*(0.07) γ**
• Effective range of dose: 0.01 µSv to 100 Sv (0.001 mrem to 10000 rem) • Display resolution: 0.1 µSv to 10 Sv (0.01 mrem to 1000 rem) up to four decimal places • Overload indication: from 10 Sv to > 100 Sv (1000 rem to > 10000 rem)	• Effective range of dose: 0.01 µSv to 100 Sv (0.001 mrem to 10000 rem) • Display resolution: 0.1 µSv to 10 Sv (0.01 mrem to 1000 rem) up to four decimal places • Overload indication: from 10 Sv to > 100 Sv (1000 rem to > 10000 rem)
DOSE RATE RANGE IEC61526 ED. 3 (DISPLAY & MEASUREMENT)	
***Hp*(10) γ**	***Hp*(0.07) γ**
• Effective range of dose rate: 0.05 µSv/h to 20 Sv/h (0.005 mrem/h to 2000 rem/h) • Display resolution: 1 µSv/h to 10.0 Sv/h (0.1 mrem/h to 1000 rem/h) up to three decimal places • Overload indication: from 10 Sv/h to > 50 Sv/h (1000 rem/h to > 5000 rem/h)	• Effective range of dose rate: 0.05 µSv/h to 20 Sv/h (0.005 mrem/h to 2000 rem/h) • Display resolution: 1 µSv/h to 10.0 Sv/h (0.1 mrem/h to 1000 rem/h) up to three decimal places • Overload indication: from 10 Sv/h to > 50 Sv/h (1000 rem/h to > 5000 rem/h)

ON-AXIS ENERGY RESPONSE	
Photon *Hp*(10) (Ref. ^{137}Cs)	**Photon *Hp*(0.07) (Ref. ^{137}Cs)**
• ±15% from 15 keV to 1.5 MeV • -15% to +20% from 1.5 MeV to 10 MeV	• ±30% from 20 keV to 1.5 MeV • -15% to +20% from 1.5 MeV to 10 MeV
COMBINED ENERGY AND ANGULAR RESPONSE	
Photon *Hp*(10) (Ref. ^{137}Cs)	**Photon *Hp*(0.07) (Ref. ^{137}Cs)**
• -29% to +67% from 16 keV to 10 MeV, 0° to 60°	• -29% to 67% from 24 keV to 10 MeV, 0° to 60°
ACCURACY	
Photon *Hp*(10) (Ref. ^{137}Cs)	**Photon *Hp*(0.07) (Ref. ^{137}Cs)**
±5%	±5%
DOSE RATE LINEARITY	
Photon *Hp*(10) (Ref. ^{137}Cs)	**Photon *Hp*(0.07) (Ref. ^{137}Cs)**
±10% Between 10 Sv/h (1000 rem/h) and 50 Sv/h (5000 rem/h) cumulative dose	

CHARACTERISTIC FOR PULSED RADIATION		
Characteristic	**Rated Range**	**Relative Response**
Medical X-ray, pulse width >1 ms, pulse rate mode		
Max. pulse dose rate	0.05 µSv/h to 5 Sv/h (0.005 mrem/h to 500 rem/h)	±20% for pulse width >1 ms (-40% at 10 Sv/h, (1000 rem/h))

Accessories and Options

MODULES
- Beta Module *Hp*(0.07)
- Neutron Module *Hp*(10)
- Telemetry Module
- Neutron Telemetry Module

READERS
- LDM 320D/W™
- LDM 2000™
- LDM 3200™
- LDM 1000™

SOFTWARE
- DMCUser™
- DosiFFR™
- DosiCare™
- DosiServ™
- LDMAccess™

CALIBRATOR
- IRD 2000™

TELEMETRY
- WRM2™/WRM3™
- iPAM-Tx
- RDS-31iTx - RDS-32iTx
- TeleView 3000

SIMULATION
- DMC 3000TD
- SCC (Simulation Control Center)

DMC 3000 Beta *DMC 3000 Neutron* *DMC 3000 Telemetry* *DMC 3000 Neutron Telemetry*

ELECTRICAL CHARACTERISTICS

- Battery: standard AAA (LR03) 1.5 V Alkaline
- Autonomy:
  - 12 calendar months battery life (typical, 8 h per day, 5 days per week in run mode, without excessive alarms) *(1)*
  - 3,000 h battery life in continuous mode, without excessive alarm *(1)*

(1) 0.1% of the time in alarm, with a quality industrial battery

MECHANICAL CHARACTERISTICS

- **Case:** rugged, high impact polycarbonate-ABS
- **Dimensions:** 87 x 60 x 21 mm (3.4 x 2.3 x 0.8 in) max. without clip
- **Weight:** < 88 g (3.1 oz) with alkaline battery and clip
- **Replaceable clips:** 3 back clips and 1 front-facing clip

ENVIRONMENTAL CHARACTERISTICS

- **Temperature range:** -10 °C to +50 °C (+14 °F to +122 °F)
- **Relative humidity:** < 90% at +42 °C (+108 °F)
- **Storage:** -20 °C to +71 °C (-4 °F to +160 °F) without battery
- **Shock, vibration and drop resistant** (1.5 meter on concrete)
- **Waterproof IP67:** 1 m (39 in) during 1 hour
- **EMC:** complies and exceeds standards by a large margin (CE compliant, certificate number: 153720)
  - MIL STD 461-RS103 (square wave modulation, electric field): exceeds 200 V/m from 10 kHz to 5 GHz
  - MIL STD 461-RS101 (magnetic field) 30 Hz to 100 kHz
- **Factory calibration** approved under ISO/IEC 17025, COFRAC accreditation N° 2-1663 (See www.cofrac.fr)

ALARM FEATURES

- Audible and tactile
  - Alarming speaker with level of 85 dB (A) typical (> 90 dB (C) peak) at 30 cm (11.8 in), frequency < 4800 Hz
  - Vibrating alarm
- Visual
  - High efficiency red flash LED on front
  - Three top LEDs for Alarming (Red), gamma counting (Green), and *Hp*(0.07) or Neutron counting (Blue)
- Customize
  - Adjustable dose and dose rate alarms
  - Adjustable and acknowledgeable dose and dose rate warnings
  - Configurable visual and audible alarm chirp
  - Configurable latched dose rate alarm and warning
  - Remaining time and run time alarms

DISPLAY HISTOGRAM FEATURES

- **Dose increments** with a 1 µSv (0.1 mrem) resolution and dose rate saved on non-volatile memory (EEPROM) in configurable steps (10 s, 60 s, 10 min, 1 hour, 24 hours)
- Event log (alarms, faults, changes) saved during the selected time periods
- Stores data for several consecutive workers' entries and exits (more than 2,500 steps)

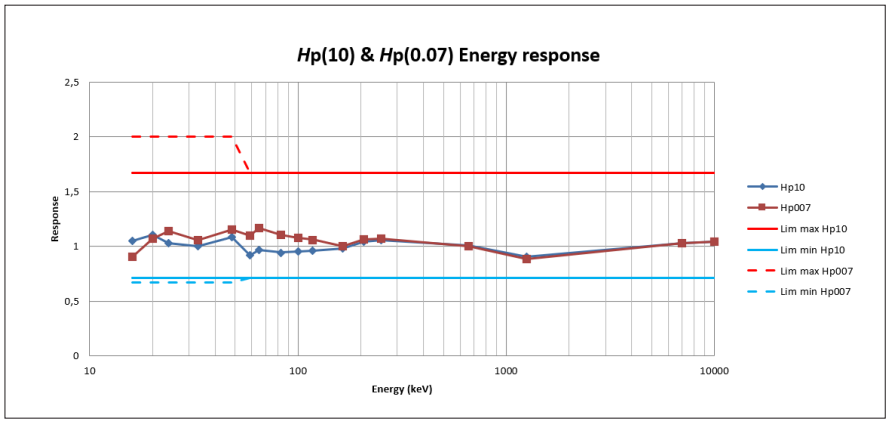
COMMUNICATION

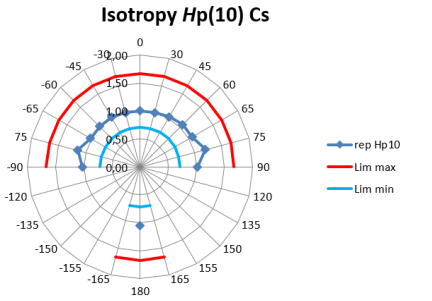
- Hands-free communication, frequency: 125 kHz
- Backward compatibility with existing readers
- Enhanced protocol to support additional features with the new readers (LDM 320D, LDM 320W, LDM 2000, LDM 3200, LDM 1000 models)

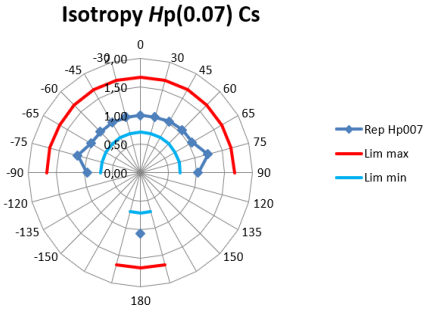
FUNCTIONAL FEATURES

DISPLAY FEATURES

- Large LCD display with high quality white backlighting
- Eight alphanumeric digit display for full name display and fix dose/ dose rate display format
- Two push buttons for an easy customized data and parameters display







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DOSIMETRY

DMC 3000™ Bluetooth® Module

Connectivity Module for DMC 3000 Dosimeter

Enhance your safety with connectivity.

DESCRIPTION

Designed to enable connectivity and enhance user safety, the Bluetooth module allows for the pairing of the DMC 3000 dosimeter to other devices and the transmission of dosimeter data to a telemetry network.

With the introduction of the Bluetooth module, Mirion Technologies is also pleased to release the MirionWatch™ device for improved alarm reporting and ConnectStudio™ software for efficient network management.
See back for an overview on how these solutions work together, and respective data sheets for additional detail.

FEATURES

- ✓ Bluetooth Low Energy compatible
- ✓ Near Field Communication (NFC) compatibility
- ✓ Low power optimized battery for long battery life
- ✓ No additional power supply
- ✓ Excellent Electromagnetic Compatibility (EMC) immunity
- ✓ Waterproof IP67 (1 m, 1 hour)

ADVANTAGES

- Seamless integration with all existing DMC 3000 dosimeters*
- Maintains current dosimeter form factor with modified battery cover
- Rugged, durable design
- Intuitive operation and device pairing
- Meets or exceeds applicable IEC and ANSI standards
- Connected with Mirion Ecosystem

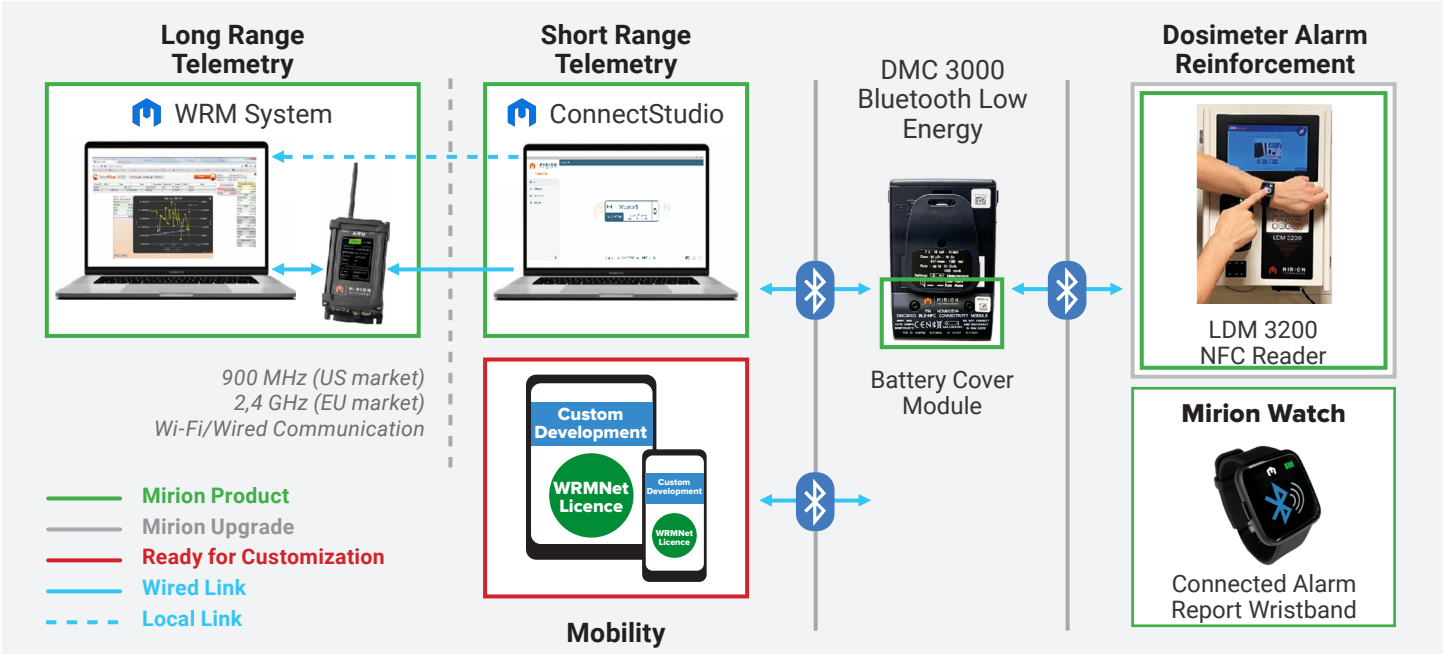
*Compatible with dosimeter firmware V7.8.6

RELATED PRODUCTS

- DMC 3000 Dosimeter
- MirionWatch Device
- Mirion ConnectStudio Software
- Mirion WRM Network Telemetry
- DMCUser™ / DosiServ™ Software
- AWM™ Adaptive Wireless Monitor
- TelemetryStudio / TeleView 3000 Software / Orion™ Real-Time Location System
- LDM 3200™ NFC Reader / LDMAccess

DMC 3000 BLUETOOTH MODULE ELECTRONIC PERSONAL DOSIMETER

NEW MIRION CONNECTED ECOSYSTEM



SHORT RANGE TELEMETRY

Transmit power output and sensitivity:
Power output

- **Sensitivity:** -106 dBm (2.4 GHz)
- **Frequencies**: 2.4 GHz
- **Transmission interval**: Adjustable 1 or 4 seconds
- **Transmission range:** (20-25 m) line of sight
  Meets the EPRI Low power guideline of <4 V/m at 1 ft

PERFORMANCE

- Bluetooth standard compliant
- NFC standard compliant
- CE: standard compliant
- FCC certification number: 2AWTM-BLE3000
- IC certification number: 26297-BLE3000

COMPATIBILITY WITH BLUETOOTH LOW ENERGY ECOSYSTEM

- DMC 3000 firmware V7.8.6 or higher
- Mirion ConnectStudio software (V1.2)
- MirionWatch device
- Mirion WRM protocol (WRM2/3)
- AWM (firmware V8.0.0 or higher)
- DosiServ 2023 and LDM Access (V2.0)
- LDM 3200 NFC reader

COMPATIBILITY WITH LOT

- WRMNet library (WRM3)
- Bluetooth protocol (V4.2)
- NFC Standard

ELECTRICAL CHARACTERISTICS

Internal power: AAA alkaline battery
Battery life: six months (4 s interval; normal use, 0.1% alarm)

MECHANICAL CHARACTERISTICS

Rugged, high impact polycarbonate-ABS case.
Dimensions (DMC 3000 + Bluetooth module):
- 60 x 88 x 21 mm (2.4 x 3.5 x 1.1 in.) with standard clip
- 86 x 56 x 21 mm (2.2 x 3.4 x 0.8 in.) without clip
Weight (Bluetooth module + dosimeter with alkaline batteries and a standard clip): <92.2 g (3.24 oz)
Weight (Bluetooth module alone): 9 g (0.31 oz)

ENVIRONMENTAL CHARACTERISTICS

Temperature range: -10 °C to 50 °C (14 °F to 122 °F) / 0 °C to 50 °C (32 °F to 122 °F) for the telemetry function
Relative humidity: <90% at 42 °C (108 °F)
Storage: -20 °C to 71 °C (-4 °F to 160 °F) without battery
Shock, vibration and drop resistant
Waterproof: IP67 1 m (39 in.) for 1 hour
EMC: complies with and exceeds standards by a large margin (CE compliant, refer to chapter §6.1 EU declaration of conformity)

- MIL STD 461 RS 103 (pulsed electric field): exceeds 200 V/m from 80 MHz to 5 GHz
- MIL STD 461 RS 101 (magnetic field 30 Hz to 100 kHz): norm of the regulation +6dB
- ETSI 301-489 -1 and 17 electromagnetic compatibility (EMC) for radio equipment
- ETSI 301-328 (harmonized European standard for access to radioelectric spectrum)

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SPC-353-EN-B – 01/2024

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DOSIMETRY

MirionWatch™

Device for DMC 3000™ Bluetooth® Module

Enhance your safety with connectivity

DESCRIPTION

The MirionWatch device strengthens alarm alerting and reporting for personnel working in challenging environments.

Paired with the DMC 3000 dosimeter via our newly-released Bluetooth module, the MirionWatch device provides a wristband-based vibrational alert when an alarm threshold is met, acting as a reinforcement of the primary dosimeter alert. The vibrational alert is easily felt by the user, and an intuitive interface on the MirionWatch device displays alert details.

The MirionWatch device can fully integrate with the Mirion connected ecosystem (software and reader), offering a complete user experience.

ADVANTAGES

- Reinforcement of the dosimeter alarm
- Designed to use and pair easily with the DMC 3000 dosimeter
- High sensitivity alarm alert vibration
- Intuitive display for user safety
- Compatible with Mirion connected ecosystem

RELATED PRODUCTS

- DMC 3000 dosimeter (from FW V7.8.6); Bluetooth Low Energy module; ConnectStudio™ software (V1.2); Mirion WRM network; DosiServ™ software 2023; LDM 3200™ reader and LDMAccess; MirionWatch charger rack

FEATURES

- ✓ Wristband vibration alerts particularly useful for more challenging environments
- ✓ Designed for ruggedness and durability
- ✓ Quickly displays information on alarm type
- ✓ Smart pairing and battery management
- ✓ Low power optimized for long battery life
- ✓ Easy to decontaminate
- ✓ Waterproof IP67 (1 m, 1 hour)
- ✓ IPS touch display (legible in direct sunlight)
- ✓ Pairing notification by vibration
- ✓ Color indicator display

MIRIONWATCH™ DEVICE FOR DMC 3000™ BLUETOOTH® MODULE

FUNCTIONALITY

DOSIMETER ALARM REINFORCEMENT FOR CHALLENGING ENVIRONMENTS

Comfortable to be worn for daily tasks, the MirionWatch unit provides additional protective awareness and reporting to the dosimeter with a wristband vibration alarm. Ideal for challenging conditions such as, hazardous situations, hot radiological tasks, or noisy environments.

NO DOSIMETERS LEFT BEHIND IN RCA

A MirionWatch device paired with a DMC 3000 dosimeter provides a connected signal between the units. If the paired distance is exceeded without both units, the MirionWatch will vibrate and remind the wearer to retrieve their dosimeter.

SMART BATTERY MANAGEMENT AND PAIRING

The MirionWatch device is designed to be easy to operate, automatically manage its battery use, and quickly pair with your DMC 3000 dosimeter via the new Bluetooth module. The device provides a minimum of 8-hour wear time to perform your tasks with confidence and safety.

In case of lost contact, the MirionWatch unit will reconnect to the most recently paired dosimeter automatically.

ELECTRICAL CHARACTERISTICS

- Battery life: Five days with normal use (eight hours/day)
  2-pin USB charging dock (USB Type A – 500 mA)
- Time required for full charge: 2 hours

MECHANICAL CHARACTERISTICS

- **Display:** square 1.3 inch 240x240 IPS color capacitive touch display
- **Solid build:**
  - Dimensions: 37.5 x 40 x 11 mm
  - Weight: 38 grams
  - Made with zinc alloy and scratch resistant

ENVIRONMENTAL CHARACTERISTICS

- Temperature range: -10 °C to 50 °C (14 °F to 122 °F) / 0 °C to 50 °C (32 °F to 122 °F) for the telemetry function
- Relative humidity: <90% at 42 °C (108 °F)
- Storage: -20 °C to 50 °C (-4 °F to 160 °F)
- Shock, vibration and drop resistant
- Waterproof IP67 1 m (39 in) for one hour

COMPATIBILITY

- Compatible with DMC 3000 firmware V7.8 or higher
- Compatible with LDM 3200 reader (NFC optional)
- Compatible with WRMNet library and Mirion WRM3™ telemetry
- Compatible with Wristband Charger Rack
- Compatible with Bluetooth/NFC Standard

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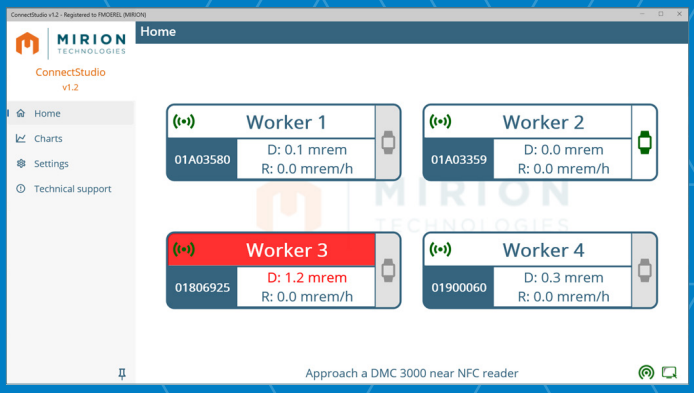
DOSIMETRY

ConnectStudio™

Connectivity Management Software



Enhance your safety with connectivity.

DESCRIPTION

ConnectStudio software helps strengthen exposure monitoring and supervision by enabling connectivity of the new DMC 3000 dosimeter with Bluetooth module, MirionWatch device, and the related ecosystem.

With ConnectStudio software, users can supervise paired dosimeters within a short-range telemetry network. An intuitive operational display supports local action based on telemetry feedback. In addition, ConnectStudio software can serve as a gateway to Mirion WRM network for a remote supervision through AWM radio.

ADVANTAGES

- Supports efficient pairing of new DMC 3000™ Bluetooth Module and MirionWatch™ device
- Enables easy connection to Mirion WRM Network for long-range telemetry
- Facilitates wireless, short-range supervision

FEATURES

- ✔ Simplified pairing management
- ✔ Operational telemetry supervision at a glance
- ✔ Data transmission to Mirion WRM network

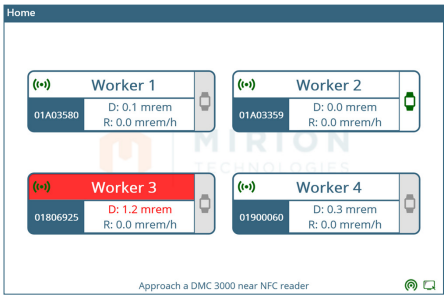
RELATED PRODUCTS

- DMC 3000 with Bluetooth cover module
- MirionWatch device
- Mirion AWM™ Adaptive Wireless Monitor
- Mirion WRM Network
- Mirion telemetry supervision software

FUNCTIONALITY

To simplify the pairing and connection with Mirion connected objects

ConnectStudio software allows for an easy pairing with the NFC reader, and to the DMC 3000 Bluetooth module and Mirion Bluetooth products. The software manages the connections, and reconnections automatically in case of a lost signal.



Gateway between Bluetooth connection and Mirion WRM network

ConnectStudio software provides a bridge to the legacy Mirion WRM system (remote supervision) through the AWM connection.

RECOMMENDED HW CONFIGURATION

- Windows 10 version 1809 minimum
- Android version 12
- 10” display
- 8 Go RAM
- BLE 4.2

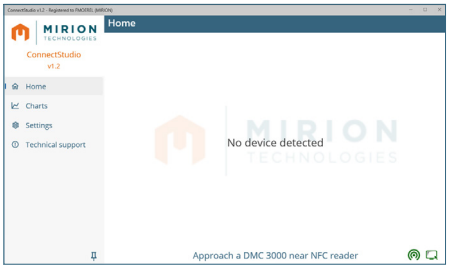
RECOMMENDED MATERIAL

The maximum number of simultaneously connected dosimeters to ConnectStudio software can vary from six to more than 15 depending on the tablet limitations.

Standard tablet: HP Pro x2, Hp Elite X2, Microsoft Surface Pro 7
Rugged Tablet: RuggON Rextorm PX501; Getac UX10

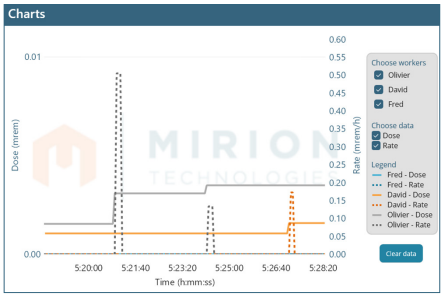
NFC reader:
- Any NFC reader configurable as a smartcard reader
- ACS ACR122U; ACS ACR1252U

Port cable to AWM connection: recommended converter
- Digi Edgeport 1 RS232 DB9 to USB converter
- (Digi part number 301 – 1001 – 15)



OPERATIONAL TELEMETRY SUPERVISION

ConnectStudio software offers a quick operational display providing dosimeter data for each wearer. The information can be displayed with a graphical view or tile view. This functioning view allows for any necessary quick action in case of an alarm or pre-alarm (dose/dose rate/time alarm). All Mirion telemetry software is compatible with ConnectStudio software for these advanced supervisory features.



COMPATIBILITY

- Compatible with DMC 3000 Bluetooth Low Energy
- Compatible with WRMNet library and Mirion WRM3™ telemetry
- Compatible with AWM (from firmware 8.00)
- Compatible with Bluetooth/NFC Standard (custom IoT)

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DOSIMETRY

Enhanced Telemetry Module (eTx)

For the DMC 3000 Dosimeter Management Software

The eTx is the last state-of-the-art telemetry module for DMC 3000.

DESCRIPTION

This enhanced module is able to transmit worker's data (worker information, gamma radiological data and setpoints) to WRM3 Telemetry System components. eTx module is also backward compatible with WRM2 Telemetry System.

The add-on eTx Module attaches to the DMC3000 dosimeter is providing a connectivity feature to transmit mesurements and wearer information to WRM2 and WRM3 telemetry systems. The module provides also a supplemental visual alarm indication (LED).

RELATED PRODUCTS

- Telemetry Systems: WRM3™ and WRM2™
- Readers: LDM 3200™, LDM 320D/W™, LDM 1000™
- Software: LDMAccess™, DMCUser™, Teleview 3000™ and TelemetryStudio™

FEATURES

- ✓ Transmits radiological information, in pre-configured intervals to WRM3 or WRM2 Telemetry receivers
- ✓ Low-power optimized for long battery life >50 h* for 900 MHZ module and >100 h* for 2,4 GHz module
- ✓ 900 MHz and 2.4 GHz Options
- ✓ Module power supply: AAA battery or micro USB connector
- ✓ Designed for ruggedness and durability
- ✓ Waterproof IP67 (1 m 1 hour)

**With Duracell industrial battery*

ENHANCED TELEMETRY MODULE FOR THE DMC 3000 DOSIMETER

PHYSICAL CHARACTERISTICS

- **Transmit power output and sensitivity:**
  - 125 mW (900MHz), 10 mW - 63 mW (2.4 GHz) locally regulated
  - Sensitivity: -106 dBm (900 MHz), -100 dBm (2.4 GHz)
- **Frequencies**: 900 (902-928) MHz or 2.4 ISM frequency range
- **Transmission interval:** user configurable

ELECTRICAL CHARACTERISTICS

- **Internal power:** AAA Alkaline Battery (LR03)
- **External power:** battery adaptor 1.5 V - 3.6 VDC, external power 100 - 220 VAC with USA and Euro adapter or through micro USB connector

MECHANICAL CHARACTERISTICS

- Rugged, high impact polycarbonate-ABS case
- Dimensions with DMC 3000:
  141 x 60 x 21 mm (5.6 x 2.4 x 0.8 in) max. without clip
  141 x 60 x 28mm (5.6 x 2.4 x 1.1 in) with standard clip
- Weight with DMC 3000 and battery: 163 g (5.74 oz)
- Weight eTx module only: 81 g (2.86 oz)
- Worn by a replaceable clip

ENVIRONMENTAL CHARACTERISTICS

- **Temperature range**: -10 °C to 50 °C (14 °F to 122 °F)
- **Storage**: -20 °C to 71°C (-4 °F to 160 °F)
- **Shock, vibration and drop resistant**
- **IP67 protection**: 1 m (39 in) during 1 hour
- **EMC**: complies and exceeds standards by a large margin (CE compliant certificate number: DOC013768)
  - MIL STD 461-RS103 (pulsed electric field): exceeds 200 V/m from 80 MHz to 5 GHz
  - MIL STD 461-RS101 (magnetic field 30 Hz to 100 kHz)
- **Agency approvals:** FCC (900 MHz) (USA), IC (Canada), and CE (Europe) (2.4 GHz)

PRODUCT CHARACTERISTICS

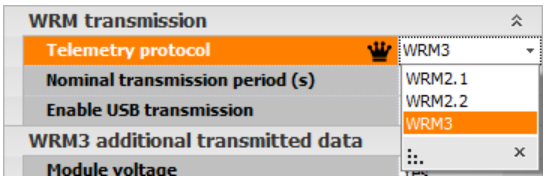
ALARM FEATURES AND COMMUNICATION

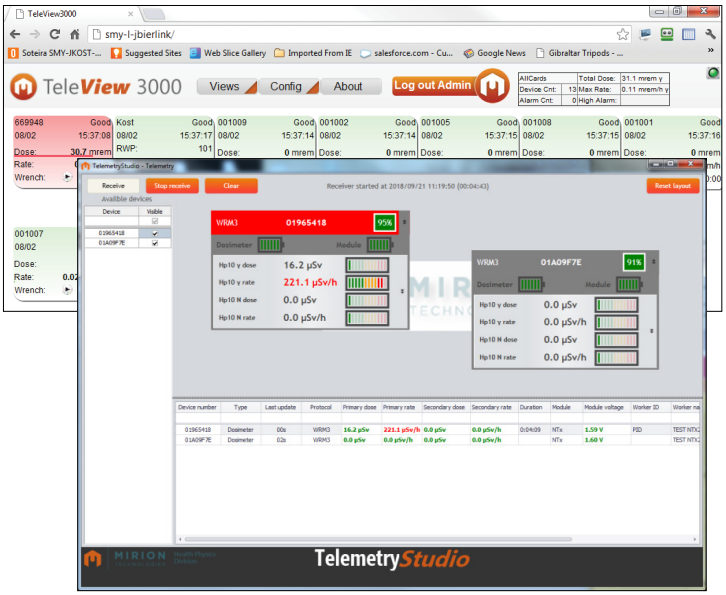
- DMC 3000 alarming speaker, vibrator, high efficiency red flash LED, 3 top LEDs and display indicators
- The DMC 3000 alarms are reported to the eTx module. The LEDs of the eTx module blink red between each transmission to the supervisor. Note that the buzzer has the same pattern

Red flashes of the left and right LED: eTx Module in alarm

COMPATIBILITY

- Compatible with DMC 3000 firmware V7.8.x or higher
- Compatible with WRM2 or WRM3 system (AWM and more)





Example of a telemetry system

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DOSIMETRY

Telemetry Module

For DMC 3000™

For US Market Only

The Telemetry Module is an accessory device for the DMC 3000 that physically integrates into the dosimeter's case.

DESCRIPTION

The Telemetry Module is an accessory device for the DMC 3000 that physically integrates into the dosimeter's case. The purpose of the Telemetry Module is to transmit a worker's radiological data (accumulated dose, dose rate and alarm status) to other WRM2 Telemetry System components (Base Station, Repeater, etc.).

Although the Telemetry Module has been specifically designed as the most advanced addition to our dosimetry family (DMC 3000), it features seamless communication with all existing WRM2 Telemetry receivers.

Additionally, the Telemetry Module provides access to a variety of accessories, including health and supplemental visual alarm indicators for high stress and noisy environments via supplied Bluetooth connectivity.

FEATURES

- Transmits radiological information, in pre-configured intervals to WRM2 Telemetry receivers
- Low-power optimized for long life
- Heart Rate Monitor
- Vibrating wristband for threshold alarms
- WRM2 900 MHz
- Battery Type: AAA (LR03 1.5v)
- External Power: 1.5V-3.6V through battery adapter
- Battery Life: >40 hours

TELEMETRY MODULE FOR DMC 3000

OPERATING CHARACTERISTICS

- **Transmit Power Output:** 100 mW (900Mhz), 10 mW - 63 mW (2.4Ghz) locally regulated
- **Receiver Sensitivity:** -106 dBm (900 Mhz), -100 dBm (2.4 Ghz)
- **Frequencies**: 900 (902-928) MHz or 2.4 ISM Frequency range
- **Over the air data stream:** 19.2k bps for WRM2 900 MHz or 250 K bps for WRMDM 2.4Ghz
- **Transmission interval**: 4 seconds or user configurable
- **Agency Approvals**: FCC (900Mhz) (USA), IC (Canada)
- **Bluetooth** V2.0: 21EDR (SPP, HFP- AG) 63 mW
- **WRM2 Range**: 1.7 mi (900Mhz), 1 mi (2.4Ghz)

ELECTRICAL CHARACTERISTICS

- Internal Power:
- AAA Alkaline Battery (LR03)
- External Power:
- 1.5v - 3.6 vDC external power
- 100 - 220 VAC with USA and Euro Adapter

MECHANICAL CHARACTERISTICS

- Height: 4.8” (121 mm)
- Width: 2.3” (58 mm)
- Thickness: 0.98” (25 mm)
- Weight: 54 g without DMC 3000 and 165 g with the DMC 3000 and AAA Battery

PHYSICAL CHARACTERISTICS

- **Case**: Blue ABS plastic
- **LED**: Red, Green, Yellow, Blue, Magenta, Cyan and White LED’s
- **Antenna Connectors:** Wired
- **PC Communications**: Micro-USB
- **Controls:** Accelerometer, tap.
- **Ruggedness**: drops on each face from 1.5m
- **Operating Temp**: -10 °C to 50 °C (14 °F to 122 °F)
- **Relative Humidity**: 10-95% Relative Humidity (without condensation)

MIRION TECHNOLOGIES

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AWM™

Adaptive Wireless Monitor

FEATURES

- Adaptable to interface with a wide range of radiation monitors and other measuring devices
- WRM2, WRM3, Ethernet and Wi-Fi capability
- Touch-screen user interface allows configuration in the field
- Power-over-Ethernet
- > 8 hour battery backup

DESCRIPTION

The Adaptive Wireless Monitor (AWM) is a dynamic new wireless remote monitor system that now represents an ALL-in-ONE solution for nuclear industry remote monitoring.

This compact system can be deployed as a base station, MESH repeater, external transmitter device, active dive repeater, etc.; which minimizes the different types of inventory that must be maintained.

The AWM includes a DB9 RS-232 communication port, USB communication port, Power-over-Ethernet (POE) or Wi-Fi. The AWM uses a colored touchscreen for on-screen defined configurations.

RELATED PRODUCTS

- DMC 3000 eTx™, DMC 3000 NTx™, DMC 3000 LTx™, DMC 3000™ Bluetooth®, TelemetryStudio™, Orion™, Teleview 3000™ Telepole, ABPM 203M™, RDS-32™

AWM™ ADAPTIVE WIRELESS MONITOR

MECHANICAL CHARACTERISTICS

- Display: on-screen configuration
- Dimensions: 7.1 x 4.1 x 2.25 in (180 x 104 x 57 mm)
- Weight: 32 oz

OPERATING CHARACTERISTICS

- WRM2, WRM3, Ethernet and Wi-Fi capable
- Power-over-Ethernet
- WRM2 Radio 900 MHz or 2.4 GHz frequency
- Communication ports:
  - 1) DB9 Serial (RS 232)
  - (1) Micro-USB
  - (1) Power-over-Ethernet (POE)

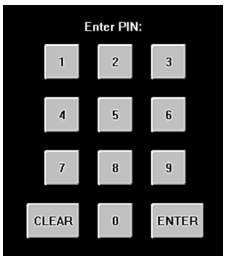
ELECTRICAL CHARACTERISTICS

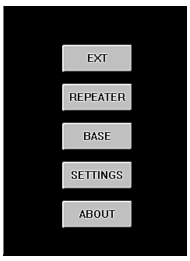
Power options

- 9V – 24V external power adapter
- Power Over Ethernet (POE) power (48V – 57V), POE 802.3af
- conformance, 0.5W typical
- USB power
- Internal 6Ah Lithium-Polymer (LiPo) battery pack (> 8h backup life)

ENVIRONMENTAL CHARACTERISTICS

- Rugged aluminum enclosure
- Operating temperature range: -13 °F to +131 °F (-25 °C to +60 °C)
- Storage Temperature range: -40 °F to +158° F (-40 °C to +70 °C)
- Relative humidity: up to 85% at 95 °F (35 °C)





AWM and Mirion Telemetry Network

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DOSIMETRY

Neutron Module *Hp*(10)

For the DMC 3000™ Dosimeter

The Neutron Module provides operational dosimetry for Military, First Responders and nuclear workers where there is a Neutron radiation risk.

DESCRIPTION

Powered by the DMC 3000, the add-on module does not require any supplementary battery and remains operational over 2400 hours in continuous use. Calibration and functionnal parameters are stored in the module.
The add-on Neutron Module for the DMC 3000 dosimeter is able to measure Hp(10) at a wide range of energy levels.
These measurements are displayed on the high contrast backlit LCD and with the different LEDs.

RELATED PRODUCTS

- Telemetry module, Beta module
- Readers: LDM 2000™, LDM 3200™, LDM 320D/W™, LDM 1000™
- Software: LDMAccess™, DMCUser™, DosiCare™, DosiServ™

FEATURES

- ✓ Dose and dose rate Neutron *Hp*(10) displayed
- ✓ Totalized dose for gamma and neutron with *Hp*(10) displayed
- ✓ High and accurate gamma rejection in Neutron channel (Plug and Play)
- ✓ Connect and ready for use
- ✓ Full Neutron energy range coverage
- ✓ Designed for ruggedness and durability
- ✓ Exceeds applicable IEC and ANSI standards
- ✓ Excellent EMC Immunity

NEUTRON MODULE *HP*(10) FOR THE DMC 3000 DOSIMETER

PHYSICAL CHARACTERISTICS

Measurement range *Hp*(10) (DMC 3000 + module)

- Neutron energy range: 0.025 eV to 15 MeV

Dose Range, IEC 61526 Ed. 3 (Display & Measurement)

***Hp*(10) N**

- **Effective Range of Dose:**
  2 µSv to 100 Sv (0.2 mrem to 10000 rem)
- **Display Resolution:**
  0,1 µSv to 10 Sv (0.01 mrem to 1000 rem)
  up to four decimal places
- **Overload Indication:**
  from 10 Sv to >50 Sv (1000 rem to >5000 rem)

Dose Rate Range, IEC61526 Ed. 3 (Display & Measurement)

***Hp*(10) N**

- **Effective Range of Dose Rate:**
  1 µSv/h to 10Sv/h (0.1 mrem/h to 1000 rem/h)
- **Display Resolution:** 100 µSv/h to 10 Sv/h (10 mrem/h to 1000 rem/h) up to three decimal places
- **Overload Indication:**
  from 10 Sv/h to >50 Sv/h (1000 rem/h to >5000 rem/h)

Accuracy Hp(10) Neutron

- ≤ ± 10% (AmBe, 0.75 mSv/h, 75 mrem/h, target 1.3)
- Hp(10) Typical Energy response from thermal to fast Neutron (see curve)

Dose Rate Linearity Hp(10)

- < ± 20% up to 10 Sv/h, 1000 rem/h

Display Neutron measurement *Hp*(10)

ELECTRICAL CHARACTERISTICS

- Powered by DMC 3000
- Ten calendar month battery life for Neutron module and DMC 3000 (typical, 8 h per day, 5 days per week in run mode, without excessive alarms)*
- 2400 h battery life for DMC 3000 with Neutron module and DMC 3000 in continuous run, without excessive alarms*

*0.2% of the time in alarm with Duracell industrial battery

MECHANICAL CHARACTERISTICS

- Rugged, high impact polycarbonate-ABS case
- Dimensions with DMC 3000:
  131 x 60 x 21 mm (5.1 x 2.4 x 0.8 in) max. without clip
  131 x 60 x 28 mm (5.1 x 2.4 x 1.1 in) with standard clip
- Weight with DMC 3000: < 138 g (4.9 oz)
- Replaceable clip (option)

ENVIRONMENTAL CHARACTERISTICS

- **Temperature range**: -10 °C to 50 °C (14 °F to 122 °F)
- **Storage**: -20 °C to 71 °C (-4 °F to 160 °F)
- **Shock, vibration and drop resistant**
- **IP67 protection**: 1 m (39 in) during one hour
- **EMC**: complies and exceeds standards
  (CE compliant certificate number: DOC003215)
  - MIL STD 461-RS103 (pulsed electric field):
    exceeds 200 V/m from 10 kHz to 5 GHz
  - MIL STD 461-RS101 (magnetic field 30 Hz to 100 kHz)

PRODUCT CHARACTERISTICS

HISTOGRAM FEATURES

- Additional Hp(10) Neutron measurement (dose, dose rate and maximum dose rate) saved on non volatile memory (EEPROM) simultaneously with Hp(10) Gamma measurement in configurable steps (10 s, 60 s, 10 min, 1 hour, 24 hours)

DISPLAY FEATURES

- Additional Hp(10) Neutron measurement displayed on DMC 3000 high quality white backlighting LCD
- Blue LED indication for Neutron dose increment

ALARM FEATURES AND COMMUNICATION

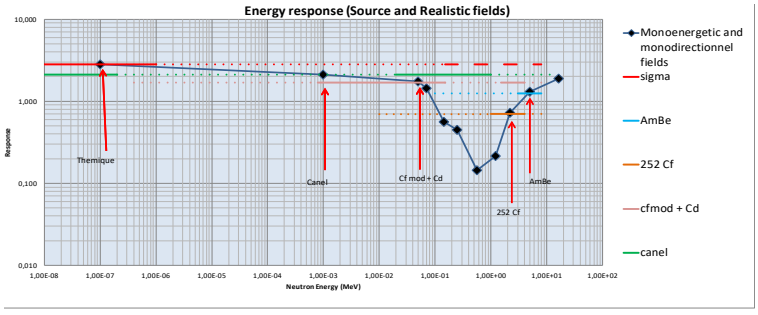
- DMC 3000 alarm speaker, vibrator, high efficiency red flash LED, three top LEDs and display indicators
- Hp(10) Neutron dose/rate alarms, adjustable over the display range
- Hp(10) Neutron dose/rate warnings, adjustable over the display range and acknowledgeable

CALIBRATION

- Factory calibration in accordance with ISO/IEC 17025
- Parameters saved into the module

COMPATIBILITY

- With all DMC 3000 (firmware upgrade needed if firmware lower than V7.x)



MIRION TECHNOLOGIES

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DOSIMETRY

Beta Module *Hp*(0.07)

For the DMC 3000 dosimeter™

The Beta Module provides operational dosimetry for hospital personnel, first responders, and nuclear workers where there is a Beta radiation risk.

DESCRIPTION

The additional Beta Module connected to the DMC 3000 dosimeter is able to measure the shallow dose equivalent (SDE) radiation at a wide range of energy levels.

The high contrast backlit LCD provides a clear indication for the display of *Hp*(0.07) measurements and alarms.

Powered by the DMC 3000, the add-on module does not require any supplementary battery and remains operational over 2000 hours in continuous use. Calibration and functionnal parameters are stored in the module.

FEATURES

- ✓ Dose and dose rate Hp(0.07) displayed
- ✓ Connect and ready for use
- ✓ High efficiency beta measurement
- ✓ Superior energy response
- ✓ Meets or exceeds applicable IEC and ANSI standards
- ✓ Excellent EMC immunity
- ✓ Designed for ruggedness and durability

RELATED PRODUCTS

- Telemetry module, Neutron module
- Readers: LDM 2000™, LDM 3200™, LDM 320D/W™, LDM 1000™
- Software: LDMAccess™, DMCUser™, DosiCare™ and DosiServ™

DOSIMETER BETA MODULE *HP*(0.07) FOR THE DMC 3000 DOSIMETER™

PHYSICAL CHARACTERISTICS

Hp(0.07) Measurement range (DMC 3000 + module)
• Beta E_{mean} > 60 keV (Emax: 0.22 MeV to 2.3 MeV)
Dose Range, IEC 61526 Ed. 3 (Display & Measurement)
***Hp*(0.07) β**
• Effective range of dose: 0.02 µSv to 100 Sv (0.002 mrem to 10000 rem) • Display resolution: 0.1 µSv to 10 Sv (0.01 mrem to 1000 rem) up to four decimal places • Overload indication: from 10 Sv to >100 Sv (1000 rem to >10000 rem)
Dose Rate Range IEC61526 Ed. 3 (Display & Measurement)
***Hp*(0.07) β**
• Effective range of dose rate: 0.05 µSv/h to 20 Sv/h (0.005 mrem/h to 2000 rem/h) • Display resolution: 1 µSv/h to 10.0 Sv/h (0.1 mrem/h to 1000 rem/h) up to three decimal places • Overload indication: from 10 Sv/h to >50 Sv/h (1000 rem/h to >5000 rem/h)
Accuracy *Hp*(0.07) Beta
• Relative Hp(0.07) Beta response of Pm-147, Kr-85 and Sr-90/Y-90 within ± 20% (*) (*) in reference to the typical curve (Beta energy response)
***Hp*(0.07) Dose Rate Linearity**
• < ± 20% up to 10 Sv/h, (1000 rem/h)

Display of *Hp*(0.07) measurement

ELECTRICAL CHARACTERISTICS

- Powered by DMC 3000
- 9 calendar months battery life for beta module and the DMC 3000 (typical, 8 h per day, 5 days per week in run mode, without excessive alarms*)
- 2000 h battery life for DMC 3000 with beta module and DMC 3000 in continuous run, without excessive alarms*

*0.2% of the time in alarm with Duracell™ industrial battery

MECHANICAL CHARACTERISTICS

- Rugged, high impact polycarbonate-ABS case
- Dimensions with DMC 3000:
  - 122 x 60 x 21 mm (4.8 x 2.4 x 0.8 in) max. without clip
  - 122 x 60 x 28 mm (4.8 x 2.4 x 1.1 in) with standard clip
- Weight with DMC 3000 < 112 g (3.9 oz) clip included
- Replaceable standard clip

ENVIRONMENTAL CHARACTERISTICS

- Temperature range: -10°C to 50°C (14°F to 122°F)
- Storage: -20°C to 71°C (-4°F to 160°F)
- Shock, vibration and drop resistant
- IP50 protection
- EMC: complies and exceeds standards (CE compliant certificate number: DOC003214)
  - MIL STD 461-RS103 (pulsed electric field): exceeds 200 V/m from 10 kHz to 5 GHz
  - MIL STD 461-RS101 (magnetic field 30 Hz to 100 kHz)

PRODUCT CHARACTERISTICS

HISTOGRAM FEATURES

- Additional *Hp*(0.07) measurement (dose, dose rate and maximum dose rate) saved on non volatile memory (EEPROM) simultaneously with Hp(10) measurement in configurable steps (10 s, 60 s, 10 min, 1 hour, 24 hours)

DISPLAY FEATURES

- Additional *Hp*(0.07) measurement displayed on DMC 3000 high quality backlighting LCD
- Blue LED indication for *Hp*(0.07) for dose increment

ALARM FEATURES AND COMMUNICATION

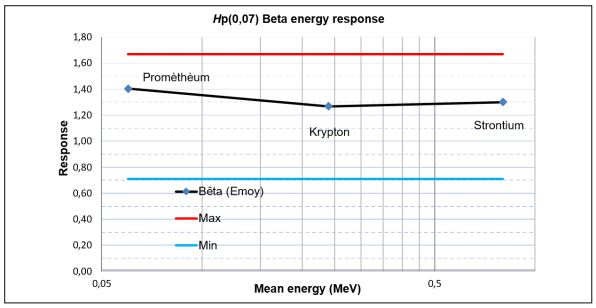
- DMC 3000 alarming speaker, vibrator, high efficiency red flash LED, 3 top LEDs and display indicator
- *Hp*(0.07) dose/rate alarms, adjustable over the display range
- *Hp*(0.07) dose/rate warnings, adjustable over the display range and acknowledgeable

CALIBRATION

- Factory calibration in accordance with ISO/IEC 17025
- Parameters saved into the module

COMPATIBILITY

- With all DMC 3000 (firmware upgraded if lower than V7.x)



MIRION TECHNOLOGIES

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DOSIMETRY

LDM 3200™

RCA Entry/Exit Reader

A reader for nuclear industrial purposes

DESCRIPTION

The LDM 3200 unit is a reader dedicated for use by workers, to manage access for entrance/exit radiological controlled areas.

At the entrance of the controlled area, the LDM 3200 reader allows the user to fill in the data required by the dosimetry system and to activate the dosimeter. At the exit of the controlled area, the reader acquires the dosimeter data and transfers it automatically to the dosimetry system.

The reader is compatible with all Mirion Technologies dosimetry systems and can be used in addition to LDM 2000 readers.

The LDM 3200 reader is equipped with a multilingual touchscreen and can get adapted to site-specific badge readers.

RELATED PRODUCTS

- LDMAccess™ software
- DMC 2000GN™, DMC 3000™ and modules
- DosiCare™ and DosiServ™ software
- LDM 1000™ reader
- Compatibility with CARD™ software

FEATURES

- ✓ Flat and rugged device
- ✓ 10.1” touchscreen
- ✓ Dosimeter sleeve
- ✓ Rugged keypad
- ✓ Configurable languages (with integrated software)
- ✓ Connection to the dosimetry system via Ethernet
- ✓ Downloadable configuration
- ✓ Offline standalone mode with local data backup
- ✓ Digital I/O allowing the control of access control devices (turnstiles/body monitor)
- ✓ Barcode reader

LDM 3200™ RCA ENTRY / EXIT READER

FUNCTIONS

- Compatible with LDM 2000™ unit: possible replacement or use within an existing base of LDM 2000 reader
- DosiServ and DosiCare software compatible for access control mode
- Displayed worker data inputs (identification/RWP/task code)
- Parameters (reader mode) are automatically loaded at connection time by dosimetry system
- Local database to store transactions made in offline mode
- Automatically restores local data when the network is available
- Dynamic language choice by each worker (six standard languages with possible customization)

MATERIAL CHARACTERISTICS

OVERALL

- Dimensions: 525 x 405 x 165 mm (20.7 x 16 x 6.5 in)
- Weight: < 13.5 kg (29.8 lb)
- Painted steel base
- IP30
- Rugged numeric metal keypad
- Dosimeter sleeve compatible with DMC 2000 and DMC 3000 (and associated modules)
- Hinged opening for an easy maintenance
- Lockable housing

PC-BASED SYSTEM

- OS: Windows 10
- 10.1” touchscreen type TFT

ELECTRICAL CHARACTERISTICS

- 100-230 V AC (50-60 Hz) or 10-36 V DC (optional)

TEMPERATURE RANGE

- 0 °C to 40 °C (32 °F to 104 °F)

INTERFACE

- Two extra USB ports for maintenance
- 10/100 BaseT network – RJ45
- RS232 port for body monitor communication (area exit)
- Four digital inputs and outputs for external devices (turnstiles/body monitor)
- Four wiring cable glands

OPTIONS

- Badge reader (customer specific)
- Barcode reader
- NFC Reader for MirionWatch™ device
- Inclined wall mount
- Integrated backup power supply (20 minutes) with automatic reader shutdown

ASSOCIATED SOFTWARE

LDM 3200 can be delivered with pre-installed software: LDMAccess or previous version LDM 3000 software

MIRION TECHNOLOGIES

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LDM 1000™

Enter or Exit Radialogical Controlled Area reader

DESCRIPTION

The LDM 1000 is a reader dedicated to the control access of radiological areas.

At the entrance of the controlled area, the LDM 1000 allows the user to fill in the data required by the dosimetry system and to activate the dosimeter. At the exit of the controlled area, the reader acquires dosimeter data and transfers it automatically to the dosimetry system.

It is compatible with Mirion technologies dosimetry systems et can be used in addition to LDM 3200™ and LDM 2000™.

The LDM 1000 is equipped with a multilingual touchscreen and can get connected to site specific badge readers.

LDM 1000 is available in two versions that cover all the needs for entrance or exit gates:

- LDM 1000i: this space-saving version is dedicated for portal integration at exit gates
- LDM 1000c: this version with a reinforced support can be installed on a wall, without integration.

RELATED PRODUCTS

- LDMAccess™ software
- DMC 2000™, DMC 3000™ and modules
- DosiCare™ and DosiServ™ software
- LDM 3200™, LDM 2000™ reader

FEATURES

- ✓ Basic and accessible device with 7” touchscreen
- ✓ Dosimeter sleeve
- ✓ Compatible with all Mirion dosimeters
- ✓ Configurable languages (with integrated software)
- ✓ Connection to the dosimetry system via Ethernet
- ✓ Downloadable configuration
- ✓ Offline standalone mode with local data backup
- ✓ Can be directly paired with turnstiles or body monitor devices

LDM 1000™ RCA EXIT READER

FUNCTIONS
- Possible replacement of a LDM 2000 by a LDM 1000 or use within an existing mix-population of MIRION readers
- DosiServ and DosiCare software compatible for access control mode
- Displayed worker data inputs (identification / RWP / task code)
- Parameters (reader mode) are automatically loaded at the connection time by the dosimetry system
- Local database to store transactions made in offline mode
- Automatically restores local data when the network is available
- Dynamic language choice by each worker (6 standard languages with possible customization) (include software options)

MECHANICAL CHARACTERISTICS

LDM 1000i
- Dimensions:
  - Height: 315 mm
  - Width: 216 mm
  - Depth: 104 mm (integrated part included: 44 mm)
- Weight: 2.1 kg
- Compatible with DMC 2000, DMC 3000, modules et SOR™

LDM 1000c
- Dimensions:
  - Height: 315 mm
  - Width: 216 mm
  - Depth: 122 mm (with fixing hooks)
- Weight: 4.2 kg
- Mounting holes : M8
- Compatible with DMC 2000, DMC 3000, modules et SOR™

ELECTRICAL CHARACTERISTICS
- Power supply 110 – 230V AC
- Input voltage range: from 85V to 264V AC
- Input voltage frequency: 50 or 60 Hz
- Power consumption @ 115 VAC: 16W typ.
- Power consumption @ 230 VAC: 17W typ.
- Minimum recommended wire section: 0.75 mm²
- Voltage regulator: 2A

ENVIRONMENTAL CHARACTERISTICS
- Operating temperature range: from 0 °C to +40 °C
- Storage temperature range: from -10 °C to +55 °C
- Humidity range: 30% to 90%, non-condensing
- IP certifications:
  - LDM 1000i: IP40 (front face only)
  - LDM 1000c: IP30
- EMC: exceeds IEC 61000-6.2 and ETSI EN301 489–1 requirements

OPTION
- Software LDMAccess

LDM 1000i

LDM 1000c

MIRION TECHNOLOGIES

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LDM 320 D™
LDM 320 W™

Hands-Free Dosimeter Readers

DESCRIPTION

The LDM 320D and LDM 320W readers operate using software packages installed on computer (PC) andcommunicate with DMC 3000, DMC 2000 and SOR families in dosimeters-free data exchange mode.

When used with the DosiCare, DosiFFR, or compatible access control software, the LDM 320 reader is used as an interface to turn on (switching into counting mode) or to switch off the dosimeter (pause mode).

When used with the DMC User software, it operates as an interface to read and write the internal data of the DMC 3000, SOR and DMC 2000 dosimeters.

FEATURES

The LDM 320D and LDM 320W are compact and low-cost dosimeter readers.

- Hertzian communication with dosimeters
- No directional alignment required
- 3 Indicator LEDs for operation and access control
- Manageable digital inputs/outputs
- DSP based digital process
- Compatible with the DMC 2000 and SOR famillies as well as the DMC 3000 dosimeter
- Compatible with software packages: DosiCare, DosiFFR, DMCUser and LDMAccess
- Wall-mounted (W) or desk versions (D)

LDM 320D™ & LDM 320W™ HANDS-FREE DOSIMETER READERS DEVICE (RID)

DESCRIPTION

- Two-color electroluminescent diode used as ON/OFF and data exchange indication
- Two-color electroluminescent diode used as READY/BUSY indication
- Two-color electroluminescent diode used as ACCESS/NO ACCESS indication
- 1 female connector, 2 x 13-pins, 1.27 mm pitch, for accessory options (four digital inputs, four digital outputs, power supply)
- Upgradeable Firmware
- Multi antennas (x3) for better (adaptative) communication with dosimeters

ELECTRICAL CHARACTERISTICS

- Self powered through USB port
- EMC: complies with and exceeds standards
- CE compliant (CE certificate: 151508)

MECHANICAL CHARACTERISTICS

LDM 320 D		
Length	109 mm	(4.3 in)
Width	100 mm	(3.9 in)
Depth	29 mm	(1.1 in)
Weight	150 g	(5.3 oz)

LDM 320 W		
Length	157 mm	(6.2 in)
Width	99 mm	(3.9 in)
Depth	75 mm	(2.9 in)
Weight	400 g	(14.1 oz)

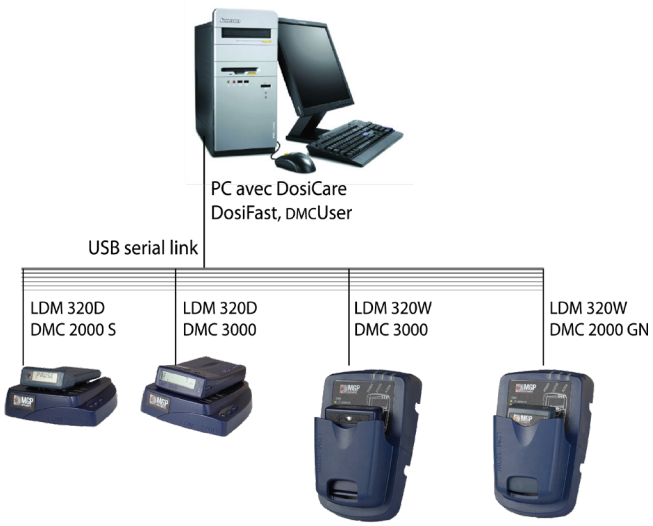
ENVIRONMENTAL CHARACTERISTICS

- Operating temperature: 0 °C to +50 °C (32 °F to 122 °F)
- Storage temperature: -10 °C to +60 °C (+14 °F to 140 °F)
- Humidity: 90% HR (without condensation)
- IP LDM 320D: IP52
- IP LDM 320W: IP30

COMMUNICATION WITH DOSIMETERS

- Short range low frequency bidirectionnal data exchange at 125 kHz
- Nominal range: LDM 320D
  - DMC 2000/SOR: 25 cm* (9.8 in) maximum
  - DMC 3000: 5 cm (1.9 in) maximum

The low range configuration reduces the range of communication of about 5 cm (1.9 in).



MIRION TECHNOLOGIES

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DOSIMETRY

DMCUser™

Electronic Dosimeters Management and Maintenance Software

DESCRIPTION

DMCUser is the companion software to support operational electronic dosimetry management and maintenance in commercial nuclear, defense, homeland security and medical applications.
It allows full customization, configuration, maintenance and diagnostic of any dosimeters belonging to the DMC/SOR product line.
DMCUser software is compatible with a wide range of Mirion products as an integrated platform.

RELATED PRODUCTS

- DMC 2000GN™, DMC 3000™ and modules, SOR™ dosimeters
- LDM 320D™ and LDM 320W™ readers
- DosiServ™, DosiCare™ and DosiFFR™ software
- IRD 2000™ Irradiator

FEATURES

- ✓ Dosimeter data management
- ✓ Dosimeter customization (including display) and configuration management
- ✓ Single dosimeter or batch configuration
- ✓ Access to historically recorded data for in-depth incident analysis
- ✓ Graphical interface
- ✓ Test of dosimeters alarming features (audio/visual/vibration) prior to activation
- ✓ Data and histories protected backup

DMCUSER ELECTRONIC DOSIMETERS MANAGEMENT AND MAINTENANCE SOFTWARE

FUNCTIONAL CHARACTERISTICS

READING AND DISPLAY OF DOSIMETER'S DATA (MEASUREMENTS)

- Clear and indication diagnostic of defaults
- Automatic detection of external modules (beta, neutron, telemetry)

READING AND DISPLAY OF DOSIMETER'S PARAMETERS

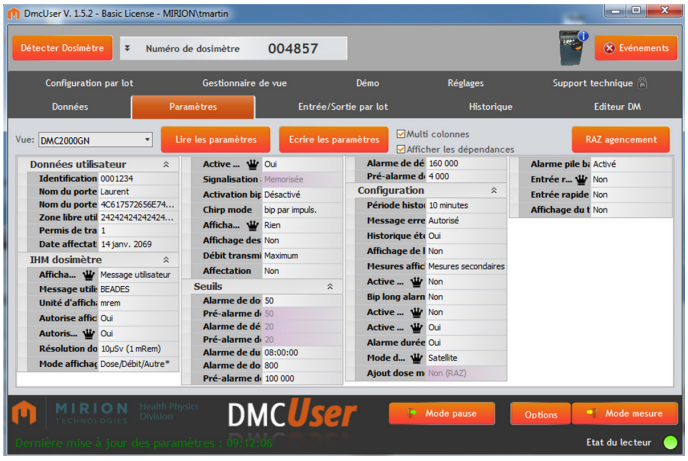
- User data displayed (configuration via access control)
- Customization of user interface including:
  - units (mrem, mSv, µSv)
  - displayed data
  - selected language (English or French)
- Ability to access and configure alarm thresholds
- Ability to access and configure dosimeter status
- Ability to access and configure selective calibration settings (gamma and connected modules)

MANAGEMENT OF DOSIMETERS IN BATCH

- Export data parameters to external files
- Personal parameter can be apply to single dosimeters or in batch

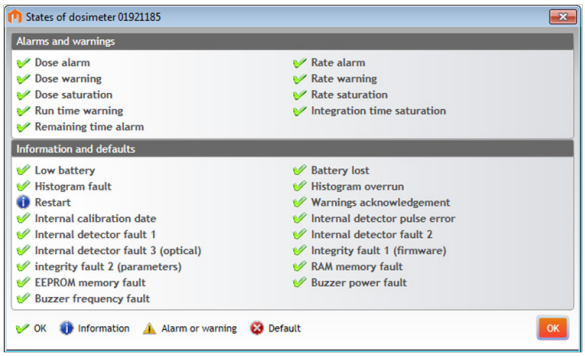
HISTORICAL DATA MANAGMENT

- Ability to retrieve last historical data recorded or all data recorded into a dosimeter
- Graphical visualisation of dosimeter measurements and alarms
- Histories backup
- Histories can be printed and exported into excel format



Dosimeters setup

Dose measurement historical



Dosimeter status

EQUIPMENT CONFIGURATION

- Standard PC Windows® 7, 8, 10, USB port to connect the reader (automatic recognition)
- Demo version available on www.mirion.com
- Registered license includes:
  - all fonctions
  - new released software upgrade (no extra cost)

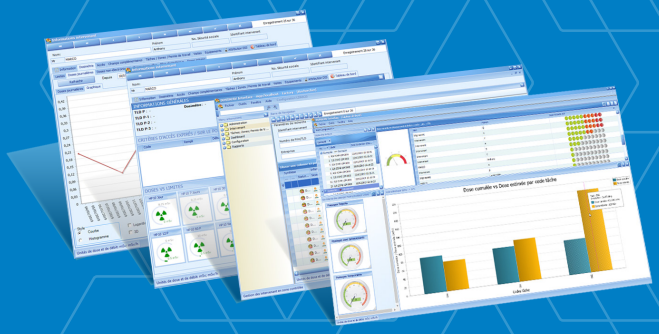
MIRION TECHNOLOGIES

SPC-233-EN-B – 04/2024

MIRION TECHNOLOGIES

DosiServ™

Health Physics
Dose Management Software



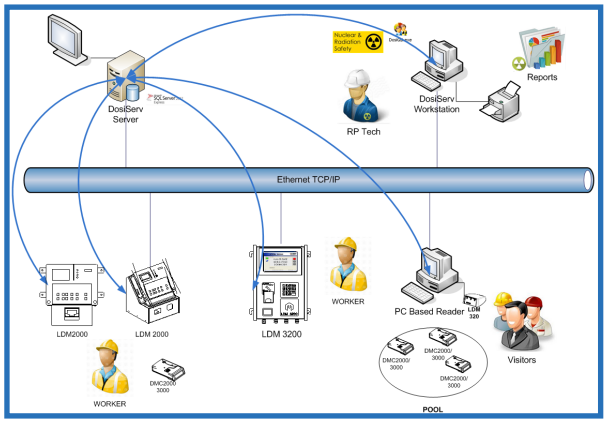
DESCRIPTION

The DosiServ dosimetry system is an integrated state-of-the-art dose management system.
It is intented to:

- Handle electronic dose data for workers (individual), Jobs (RWP Radiological Work Permit) in various controlled areas
- Offer access control capabilities through dosimeters readers.

RELATED PRODUCTS

- LDM 1000™: industrial dosimeter reader
- LDM 3200™: PC based dosimeter reader
- LDM 320™: reader heads
- DBR™: reader for DIS dosimeters
- LDM Access™: control access software
- DosiFFR™: First Fast Responder software
- DosiCal™: IRD 2000 Calibrator Management Software
- DMC 2000™, DMC 3000™: modules



FEATURES

- ✓ Real-time access control capabilities:
  - Medical/training due dates checking when connecting an electronic dosimeter
  - Control of the worker's accumulated doses versus configurable dose limits
  - Check of any other worker qualification mendatory by Radiation Protection procedure
- ✓ Electronic dosimeter configuration and reading in real time
- ✓ Storage of worker's official dose data (built-in reports are available)
- ✓ A true ALARA approach through collective dosimetry features
- ✓ Connection to body monitors to record contamination events at exit time
- ✓ Compatible with the major IT platforms

DOSISERV™ HEALTH PHYSICS DOSE MANAGEMENT SOFTWARE

FUNCTIONAL CHARACTERISTICS

NETWORK BASED SYSTEM

Readers and client stations connect to the dosimetry server via TCP/IP (Web access capability for client stations).

OFFLINE MODE

If the network becomes unavailable readers will locally store data and update automatically once the connection is restored.

REAL-TIME ACCESS CONTROL

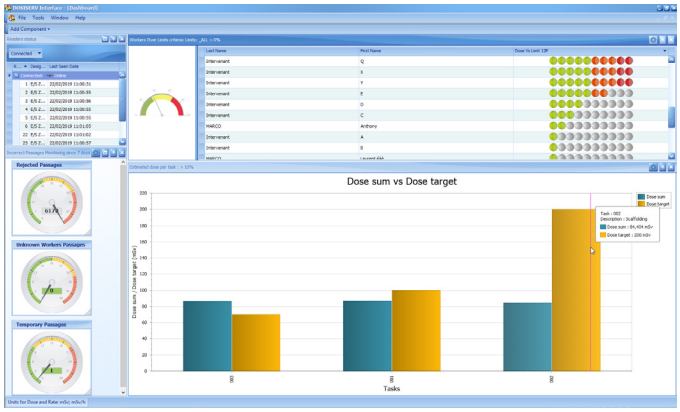
When connecting the dosimeter the system will check:

- Worker identification
- RWP, task authorization
- Area authorization
- Worker qualifications (medical, training, etc.)
- TLD dosimeter (barcode) can be verified

Once access granted the system will program the appropriate dosimeter alarm set points

DATA STORAGE

At exit time the system records transaction's details and workers data are updated



SUPERVISION

- The system is delivered with various dose reports (customer training is available to create custom report)
- Dashboard application offering a powerful and customizable overview of the dosimetry system in real time

INTERFACING

- The system is delivered with Web services in order to facilitate exchange with external systems (i.e human resources/security system)
- Connection with system dedicated to First Fast Responders (DosiFFR Software)
- Collection of dose information from DIS dosimeters (DBR reader needed)

MULTILINGUAL

- PC based reader provides up to 6 configurable languages
- Client station is delivered in French, English and Chinese, other languages can be added anytime

SECURITY

- Access to the system is password protected (MS Windows active directory support)
- Any important data modification is stored into a LogBook
- Data access can be filtered per user profile
- Encrypted Client/Server communication
- Extended Reader Features (LDM 3000/LDM Access)
- Ability to configure history data collection and store it in the DosiServ database
- Ability to configure Smart Offline Mode (Standalone Extended Access Control)
- Ability to configure the list of task/RWP codes in entry area

MANAGEMENT OF THE DOSIMETER FLEET

- Import dosimeter data and calibration dates with DosiCal software
- Import dosimeters batches and their calibration date via a LDM 320 reader
- Ability to activate dosimeter control and their calibration dates in an entry area

HARDWARE SETUP

- **Client workstation (minimum requirements)**
  - Operating system Windows Seven
  - Memory 2 GB
  - Drive 256 GB
- **Server (minimum requirements)**
  - Operating system Windows Server 2003
  - Memory 8 GB
  - Drive 1 To
- **Platforms**
  - Windows 7, 8 & 10 (32 & 64 bits)
  - Windows server 2008, 2012 & 2016
  - Citrix : XenApp 6.5 & 7,5
- **Supported databases**
  - Oracle 11g, 12c, 18, 19c
  - SQL Server -SQL express 2008 to 2019

MIRION TECHNOLOGIES

SPC-234-EN-B– 05/2024

MIRION
TECHNOLOGIES

Portable Radiation Measurement

MIRION
TECHNOLOGIES

RDS-32™

Radiation Survey Meters

The RDS-32 Survey Meters are small handheld, battery operated radiation survey instruments. Due to its versatile functions and durability it is suited for a wide range of applications in civil defense, industrial use, nuclear power plants, laboratories, etc.

The meter features excellent ergonomics; lightweight and easy handling, with visual, audible, and vibration functions. Each meter includes an additional battery cover with belt clip to make it wearable, freeing the user's hands to focus on their primary job.

With both Warning and Alarm levels users can know when they are approaching their limit without constantly monitoring their device and can act accordingly.

To extend the capabilities of the instrument, a wide variety of external Smart probes are available to meet user needs with any RDS-32 version. GMP-12/GMP-25 probes, and the full CSP™ probe range can be connected to all RDS-32 versions with an adequate cable. The selection includes probes for gamma and neutron dose rate and alpha and/or beta contamination with various detection areas and scaler counting.

FEATURES

- H*(10) dose equivalent rate according to latest standards
- External alpha, beta, gamma and neutron probes for direct connection
- RDS-32WR meter for wider dose rate range
- iTx versions for wireless monitoring
- 4-way navigation keys, practical shortcuts
- Intuitive user interface
- Large graphic screen, configurable backlight
- Automatic display rotation with tilt sensor
- High impact durable case construction, IP67 immersion proof
- Internal memory allows versatile histogram functions and the ability to manually store measurements
- Configuration and firmware upgrade done through the CSW-32™ Software with a USB cable-link
- Complies with IEC 60846 standards, designed to meet ANSI 42.17A, 42.17C standards

RDS-32 RADIATION SURVEY METERS

RDS-32 VERSIONS

STANDARD RANGE

RDS-32 **RDS-32ITx**

- ✓ GM tube
- ✓ Dose rate up to 100 mSv/h (10 rem/h)
- ✓ iTx version with internal radio

WIDE RANGE

RDS-32WR **RDS-32ITxWR**

- ✓ GM tube + Si diode
- ✓ Dose rate up to 10 Sv/h (1000 rem/h)
- ✓ iTx version with internal radio

PROBE SELECTION

- Wide selection of dose rate and contamination probes
- Quick to connect
- Compatible with full range of CSP probes
- Compatible with GMP-series GMP-25, GMP-25i, GMP-12SD/ GSD/UW probes
- Dual display to show both external and internal detector readings simultaneously

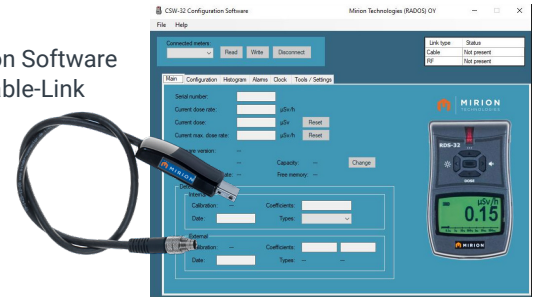
RDS-32 + GMP-25™
Alpha/Beta/Gamma Probe

RDS-32iTx + SN-D-2™
Neutron Dose Probe

ACCESSORIES

- CSW-32 Configuration Software with USB cable-link
- Telescopic pole
- Power Cradle to allow AC power option and provide multiple mounting options
- RDS-32 Holder that is fixed on CSP probe body with dedicated bracket to form a one hand operating system
- Alarm box for stationary monitoring
- Wireless telemetry capability for iTx versions

CSW-32™
Configuration Software
with USB Cable-Link



RDS-32 + SAB-100™
Alpha/Beta Probe

RDS-32 + Tele-STTC™2
Wide Range Telescopic Probe

* Change from GM tube to Si diode at 30 mSv/h in increasing field and back from Si diode to GM tube at 10 mSv/h in decreasing field

RADIOLOGICAL CHARACTERISTICS

- Radiation detected gamma and X-rays. Alpha, beta, and neutron radiation with external probes
- Operational quantity: ambient dose equivalent H*(10)

DETECTOR	
RDS-32 RDS-32iTx	one energy-compensated GM tube
RDS-32WR RDS-32iTxWR	energy-compensated GM tube and energy-compensated Si diode*
IEC ENERGY RANGE	
RDS-32 RDS-32iTx	48 keV to 1.8 MeV
RDS-32WR RDS-32iTxWR	55 keV GM tube / 65 keV* Si diode to 1.8 MeV
HIGH ENERGY RESPONSE TO Cs-137	
4.4 MeV	GM tube 220% Si diode 120%
6.7 MeV	GM tube 260% Si diode 200%
DOSE RATE MEASUREMENT RANGE	
RDS-32 RDS-32iTx	0.05 µSv/h to 100 mSv/h (5 µrem/h to 10 rem/h)
RDS-32WR RDS-32iTxWR	0.05 µSv/h to 10 Sv/h (5 µrem/h to 1000 rem/h)
IEC DOSE RATE MEASUREMENT RANGE	
RDS-32 RDS-32iTx	0.3 µSv/h to 100 mSv/h (0.03 mrem/h to 10 rem/h)
RDS-32WR RDS-32iTxWR	0.3 µSv/h to 10 Sv/h (0.03 mrem/h to 1000 rem/h)
DOSE MEASUREMENT RANGE	
RDS-32 RDS-32iTx	0.1 µSv to 10 Sv (0.01 mrem to 1000 rem)
RDS-32WR RDS-32iTxWR	0.1 µSv to 10 Sv (0.01 mrem to 1000 rem)
DOSE RATE LINEARITY	
RDS-32 RDS-32iTx	-15% to +22% 0.3 µSv/h to 0.1 Sv/h (0.03 mrem/h to 10 rem/h)
RDS-32WR RDS-32iTxWR	-15% to +22% 0.3 µSv/h to 10 Sv/h (0.03 mrem/h to 1000 rem/h)

FUNCTIONAL CHARACTERISTICS

- Four navigation keys and a select key to operate the instrument
- Three keypad direct functions: Backlight, Mute and Dose and one user-defined shortcut
- Direct access to dose/time to dose screen from keypad: level of dose in percentage of alarm level and time before reaching it
- Configurable units: Sv(/h), rem(/h), with external detectors cps, cpm, dpm, Bq and Bq/cm^2
- Audible, visual and vibration alarm with configurable levels
- Versatile histogram functions: internal and external dose rate, dose, diagnostic logging depending on configuration, time stamp, optional location control for mapping and repeating area control analysis
- Histogram data stored in XML format; allowing additional histogram analyzing capabilities when downloaded from CSW-32 software to a spreadsheet
- Real-Time Clock (RTC) function with 3 hrs battery back up
- Graphical LCD display; special symbols for alarm, external probe, battery, communication, vibration alarm, chirp and mute
- Automatic display rotation via tilt sensor (behavior setup through CSW-32 software)
- Dual display in probe mode; measurements from internal and external detector simultaneously:

Display with Gamma Probe

Display with Alpha/Beta Probe

- Scaler/time with gross or net measurement (background deduction) for improved statistics:

MECHANICAL CHARACTERISTICS

- Case: high impact durable glass fiber reinforced polymer; drop tested from 1 m height on concrete floor on each side
- Ergonomic design, rubber grip around the case
- Binder-702 series connector
- Enclosure class IP67 (IEC 60529), including battery compartment
- Dimensions: 116 x 72 x 32 mm (4.57 x 2.83 x 1.26 in)
- Weight without batteries/with batteries:
  - RDS-32: 160 g / 210 g (0.35 lb / 0.46 lb)
  - RDS-32iTx: 170 g / 220 g (0.37 lb / 0.49 lb)
  - RDS-32WR: 195 g / 245 g (0.43 lb / 0.54 lb)
  - RDS-32iTxWR: 205 g / 255 g (0.45 lb / 0.56 lb)
- Wrist strap, battery covers with and without a belt clip

Ergonomic design

Connector, charging contacts, fixing lug for wrist strap

Hands-free operation using belt clip

ELECTRICAL CHARACTERISTICS

- Power supply: Batteries 2 x AA/LR6, alkaline or NiMH
- Operation time with fresh Alkaline batteries more than 2 months
  8 h use/24 h (600 h in background radiation, radios disabled, display backlight off, LED off)
- Operation time with fully charged NiMH batteries more than 1.5 months 8 h use/24 h with 2900 mAh capacity (in background radiation, radios disabled, display backlight off, LED off)
- Contacts for external power and charging of NiMH battery
- Alarm audio level 86 dBA at 30 cm

ENVIRONMENTAL CHARACTERISTICS

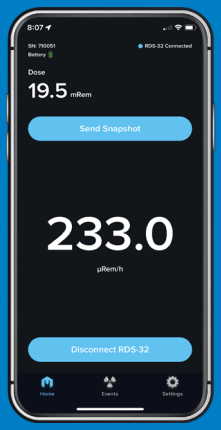
- Operating temperature:
  - RDS-32/RDS-32iTx: -25 °C to +60 °C (-13 °F to 140 °F)
  - RDS-32WR/RDS-32iTxWR: -25 °C to +50 °C (-13 °F to 122 °F)
- Storage temperature -40 °C to +70 °C (-40 °F to 158 °F)
- Relative humidity 10% to 95% at +35 °C (95 °F)
- RF-immunity: Fulfills following standards: IEC 61000-4-2 (2008), IEC 61000-4-3 (2006 +A1:2007 + A2:2010), IEC 61000-4-6 (2013), IEC 61000-4-8 (2009)
- RF Emissions: Fulfills following standards: EN 55032B
- FCC approval 2AHI8-RDS-32
- IC Approval 26167-RDS32
- IEC 60846-1 (all models), 60846-2 (WR models) compliant

COMMUNICATION PROTOCOLS

- USB communication with suitable adapter
- iTx versions: WRM radio 900 MHz or 2.4 GHz
- Maximum possible emitting Tx power:
  - 298 mW at 900 MHz
  - 86 mW at 2.4 GHz
- Bluetooth® Low Energy 4.2 protocol, Class 2 communication

ORDER CODES

1233-321	RDS-32 Survey Meter (Sv)
1233-322	RDS-32 Survey Meter (rem)
1233-323	RDS-32WR Survey Meter (Sv)
1233-324	RDS-32WR Survey Meter (rem)
1233-325	RDS-32iTx Survey Meter (2.4 GHz, Sv)
1233-326	RDS-32iTx Survey Meter (900 MHz, rem)
1233-327	RDS-32iTxWR Survey Meter (2.4 GHz, Sv)
1233-328	RDS-32iTxWR Survey Meter (900 MHz, rem)
1233-331	CSW-32 Configuration and calibration software with USB cable-link
1233-333	USB cable-link
NOM006819	RDS-32/CSP probe bracket with holder for one hand operation



Connect your RDS-32™ meter with Bluetooth Low Energy to SpirVIEW Mobile™ Supervisory Software and the RadResponder Network with our app via Bluetooth technology.

RDS-32

Download on the App Store

GET IT ON Google Play

MIRION TECHNOLOGIES

CE

MIRION TECHNOLOGIES

EASY-COUNT™

Field Smear/Filter Counter

DESCRIPTION

The Easy-Count unit is a field deployable smear counter for measurement of surface contamination. It is designed to be used with the Colibri or RDS-31/32 survey meters (specific model for each meter including dedicated holder and cable). The silicon PIPS detector with 17 cm² detection area makes it an ideal tool for direct measurement of alpha and beta emitters. PIPS technology brings numerous benefits to a field deployable smear counter.

These benefits are:

- An improved MDA (much lower gamma background compared to other technologies)
- Very good alpha/beta discrimination
- A durable entrance window (not pressure sensitive). It is also easy to clean!

The Easy-Count counter is an addition to the Canberra™ Smart Probe (CSP) family. It includes all key components of hardware circuitry (high voltage power supply, amplifier, discriminator, etc.). Also, the intelligence associated with controlling those components is located in the counter – including control and storage of key parameters, settings, calibrations, device ID, alarm settings (ten values for each unit to display with default setting), etc. Thus the counter is a fully integrated subsystem taking and transmitting the measurement to the instrument, which is used for display.

With high voltage and digitization of the data occurring in the counter, measurement quality is not dependent on external device quality (cable, host instrument). Moreover, a CSP uses a serial protocol to communicate with the host which can be an instrument or a PC.

CARACTÉRISTIQUES

- ✓ Lightweight field deployable Alpha/Beta smear counter
- ✓ Seamless operation with Colibri® or RDS-32™ survey meter (specific models)
- ✓ Alpha/Beta surface contamination measurement
- ✓ 17 cm² silicon PIPS® detector
- ✓ Excellent MDA
- ✓ High efficiency with improved sample to detector distance
- ✓ Belongs to the CSP™ family
- ✓ Calibration via PC
- ✓ Requires Colibri TTC or VLD Survey Meter (Software Version ≥ 3.1), RDS-31™ survey meter (firmware version ≥ 3.05.5) or RDS-32 with any firmware

EASY-COUNT™ FIELD SMEAR/FILTER COUNTER

Calibration and QA measurements can be performed directly with the counter, without using any instrument, by connecting the Easy-Count unit to a computer with CSPS™ (Canberra Smart Probe Software), allowing your instruments to remain deployed in the field.

Once calibrated, the Easy-Count counter is ready to be used as a plug and play "probe" to start a QA measurement in CPM, DPM, DPM/100 cm², c/s, Bqeq, Bqeq/cm². The Colibri version includes a specific bracket and CSP coiled cable, and the RDS version includes a specific holder and RDS coil cable.

Easy-Count counter accepts many different sizes of smears and planchets, which are loaded into the counter on a tray that ensures a reproducible geometry. This tray is easily accessible via a front panel door. It includes a rotating sample trap to keep the measured object in place. RDS version features an additional ring to support smear in planchet procedure and prevents the smear from damaging the internal detector.

A push-button located on the Easy-Count housing helps select the counting mode. When pressed, the probe switches to the next mode in a list of three and the LED is activated accordingly: Alpha only – LED off, Beta only – LED on and Alpha+Beta – LED blinking.

Easy-Count counter can be easily upgraded (firmware) via CSPS, a USB cable and a PC.

SPECIFICATIONS

NUCLEAR

- Display units: CPM, DPM, DPM/100 cm^2, c/s, Bq_{eq}, Bq_{eq}/cm^2
- Emitters: Alpha and Beta
- Detector: silicon 1700 mm^2 PIPS detector
- Detection area: 17 cm^2
- Measurement range: 0 to 10000 c/s, 0 to 600 kcpm. Activity equivalent range depends on calibration emitter. Conversion coefficients are factory set with ^{239}Pu for Alpha channel and with ^{60}Co for Beta channel.
- Dead time: 8 µs with digital saturation at 10000 c/s
- Energy range: Beta >100 keV, Alpha > 3 MeV
- Gamma Sensitivity for ^{137}Cs: 8 c/s per µGy/h (4800 cpm per mR/h)
- Background: ambient ≤100 nSv/h (10 µR/h): Alpha <0.01 c/s (<0.6 cpm), Beta <0.8 c/s (<48 cpm)
- Cross talk: Alpha to Beta (^{239}Pu) <5%, Beta to Alpha (^{90}Sr-^{90}Y) <0.2%

ERGONOMIC

- Display: provided by survey meter.
- Alarm setpoints: 10 values for each unit to display. Saved in probe memory and can be modified with CSPS and PC.
- Select Default alarm threshold using survey meter keypad.

ELECTRICAL

- Power: supplied by survey meter (low voltage only): +5 V
- Powered by the connected survey meter. RDS holder includes powering and/or charging capabilities when RDS-32 is loaded with rechargeable NiMH batteries.
- Consumption: 15 mA maximum
- Up to 22 hours of battery life with Colibri TTC Basic and up to 20 hours with RDS-32 meter (alkaline batteries)

MECHANICAL

- Housing: aluminium
- Dimensions: 23.4 x 17.8 x 33.7 cm (9.2 x 7.0 x 13.3 in)
- Weight: 2.1 kg (4.62 lb) without Colibri meter

ENVIRONMENTAL

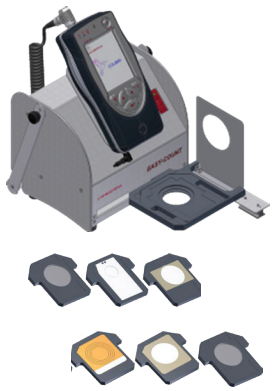
- Temperature: from -10 °C to +40 °C (+14 to +104 °F)
- Storage temperature: from -10 °C to +40 °C (+14 to +104 °F)
- Relative humidity: 40% to 85% at 35 °C
- Cleaning: housing easy to decontaminate

NORM

- CE: meets CE requirements

ORDERING REFERENCES

- EASY-COUNT/C for Colibri: NOM006476
- EASY-COUNT/RDS for RDS-31/32: NOM006960
- USB cable for EASY-COUNT/C calibration: NOM006288
- USB cable for EASY-COUNT/RDS calibration: NOM007145
- Calibration/setup software SI unit, English CSPS/E: NOM006299
- Calibration/setup software US unit, English CSPS/R: NOM006298
- Calibration/setup software SI unit, French CSPS/F: NOM006289



	Nuclide	Emitter	Typical efficiency over 2 π (%)	Guaranteed efficiency over 2 π (%)	Response to activity (c/s)/Bq	MDA (Bq)
EASY-COUNT/RDS	^{241}Am	Alpha	62	47	0.32	0.34
	^{239}Pu	Alpha	57	43	0.31	0.35
	$^{90}Sr + {}^{90}Y$	Beta	43	33	0.26	3.75
	^{36}Cl	Beta	51	39	0.32	3.05
	^{60}Co	Beta + Gamma	19	15	0.09	10.8
EASY-COUNT/C	^{241}Am	Alpha	70	53	0.35	0.31
	^{239}Pu	Alpha	63	47	0.34	0.32
	$^{90}Sr + {}^{90}Y$	Beta	44	33	0.26	3.75
	^{36}Cl	Beta	52	39	0.32	3.05
	^{60}Co	Beta + Gamma	19	15	0.09	10.8

MDA: background = 0.01 c/s (alpha) and 0.8 c/s (beta),measured during 100 s in a 0.1 µGy/h ambience.
Measuring time on source = 10 s
Statistic: false alarm = 5% and non-detection = 5%

MIRION TECHNOLOGIES

MIRION TECHNOLOGIES

AVIOR®-2

Desktop Dose Rate and Survey Meter

The AVIOR-2 unit is a versatile alarm desktop, portable or wall-mounted dose rate and survey meter for contamination control and dose-rate assessment.

DESCRIPTION

The extensive experience of Mirion in nuclear measurement combined with valuable feedback from our users, drove us to create a product that better supports situations encountered in the field such as laboratories, industrial sites, nuclear power plants, open air yards, and emergency situations.

The AVIOR-2 meter is equipped with two Canberra™ Smart Probe (CSP™) inputs and features a simultaneous display of both probes. When an Alpha/Beta CSP probe is connected, the display automatically toggles to a dual screen and provides the user with discriminated alpha from beta measurement results, allowing to check and measure for contamination twice as fast as most instruments available on the market.

A dedicated OneHand/OneFoot mode to operate with SAB-250 and SABP-525 smart probes offers an affordable system to control contamination in areas with limited footprint.

RELATED PRODUCTS

CSP Probes: SAB-250™, SABP-525™, SPAB-15™, SG-1R™, SG-2R™, SAB-100™, SAB(G)-100™, SA-100™, SB-100™, SX-2R™ probes...

FEATURES

- Measurement of contamination and dose rate
- Two simultaneous probe channels
- Dual alpha/beta display for each probe
- Customized alarm setpoint for each connected probe
- Multiple measurement modes: Frisking, Scaler-Timer and Go/No-go
- Specific OneHand/OneFoot mode with body detection and automatic background management
- Manual background deduction for net measurement of contamination
- Backlit graphical digital display
- Analog-like bar graph with digital display
- Backup built-in rechargeable battery with no memory effect
- Rugged, lightweight and easy to use
- Upgradable product through firmware upgrade

PHYSICAL CHARACTERISTICS

- Units displayed (depending on probe): c/s, Bq_{eq}, Bq_{eq}/cm^2, Sv/h, Sv_{eq}/h
- Alarm threshold:
  - CSP probe: 10 values for each unit to display, stored in probe memory. Each value is editable via PC setup Canberra Smart Probe Software (CSPS™) or directly on the AVIOR-2 meter
- Response time:
  - As fast as 1/4 s for bargraph display depending on probe, on a semi-logarithmic scale
  - 1 s for clear digital readout display

ELECTRICAL CHARACTERISTICS

- Built-in rechargeable Li-ion battery pack
- Battery Life with Backlight: (Maximum/turned off): 31/70 hours with one SAB-100 probe connected, 29/60 hours with SA-100 and SB-100 probes connected
- Built-in charger
- Universal Mains power input, 100–240 V ac, 50/60 Hz. Rear-panel IEC-type connector. Cordset included.
- Display of remaining charge with battery pictogram

ENVIRONMENTAL CHARACTERISTICS

- Operating temperature: -10 °C to +50 °C. Between -10 °C and -20 °C, the instrument remains operational but the display becomes more difficult to read.
- Storage temperature: -25 °C to + 60 °C
- Ingress protection: IP54

MECHANICAL CHARACTERISTICS

HOUSING

- Molded rugged Polycarbonate

DIMENSIONS

- 184 x 105 x 105 mm (7.2 x 4.1 x 4.1 in.) (L x W x H)

WEIGHT

- 950 g (33.5 oz), battery included
- Connector for external probes: S 104 A066 137+ Fisher socket (CSP) or equivalent

FUNCTIONAL CHARACTERISTICS

- Two simultaneous CSP probe channels
- Specific OneHand/OneFoot mode with body detection and automatic background management

DISPLAY

- Grand display: Large LCD display with constant backlight

ALARMS

- Audible: > 85 dB(A) at 30 cm (11.8 in.)
- Visual: Flashing alarm pictogram and LED for each channel (Red, orange, green)

KEYBOARD

- Ruggedized keyboard with five buttons featuring primary and secondary functions: Enter (Power on), Up arrow (Backlight), Down arrow (Audio on/off), Left arrow (Lock), Right arrow (Data Log)

OPERATING CONTROL

- Complete and automatic self-test when switching on. Periodical self-control of key operational functions when operating

WALL MOUNTING

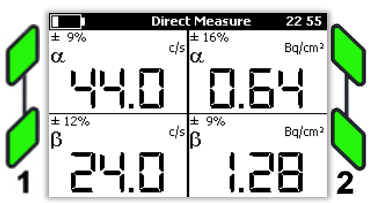
- Back panel with dedicated print for wall accessory

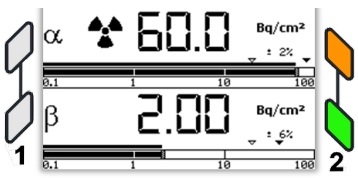
NORMS

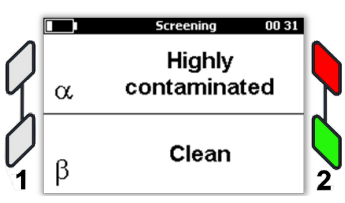
- EMC: Conform
- IEC: Conform to IEC60846-2002 and IEC60325-2006
- CE: Conform

AVIOR-2 ALARMS

- Green/Orange/Red LED
- Linked to display channel
- Audible sound
- Can be muted by pressing any button when alarming
- Visual display
- Visual display depending on window arrangement







Alarm Displays

AVIOR-2 SYSTEM CONFIGURATIONS ARE A COMPLETE RANGE OF SOLUTIONS

AVIOR-2 meters cover multiple applications with one instrument for contamination or dose rate measurements, with or without background subtraction and with minimal training requirements.

AVIOR-2H/F-S
Self-standing Hand/Foot System

- Hand/Foot monitoring
- Probes are permanently attached
- SAB-250 probe for hand, SABP-525 probe for foot
- Small footprint
- Simple to move with integrated wheels
- Dynamic background reduction

AVIOR-2H/H-S
Self-standing Hand/Hand System

- Dual hand monitoring SAB-250 probe for each hand
- Small footprint
- Simple to move with integrated wheels
- Dynamic background reduction

AVIOR-2H
Wall-mounted Hand System

- Hand frisking or counting for glove boxes
- Probe is either permanently attached or available for frisking (setup in AVIOR-2 system)
- Large area SAB-250 probe can be taken from holder after hand check in frisking mode
- Zero footprint
- Dynamic background reduction

Can be upgraded with Foot probe

AVIOR-2H/F-W
Wall-mounted Hand System

- Hand/Foot monitoring
- Minimal footprint
- Foot probe is placed at wall corner
- Fixed system
- Dynamic background reduction

Self-standing Frisking System

- Using 100 cm² probe, alpha, beta, or alpha/beta with discrimination
- Basic and economical cost
- No dynamic background reduction
- Extremely small footprint

Self-standing Hand System

- Hand counting or frisking (setup in AVIOR-2 system)
- Probe can be permanently attached
- Large area SAB-250 probe can be taken from holder after hand check in frisking mode
- Small footprint
- Simple to move with integrated wheels
- Dynamic background reduction

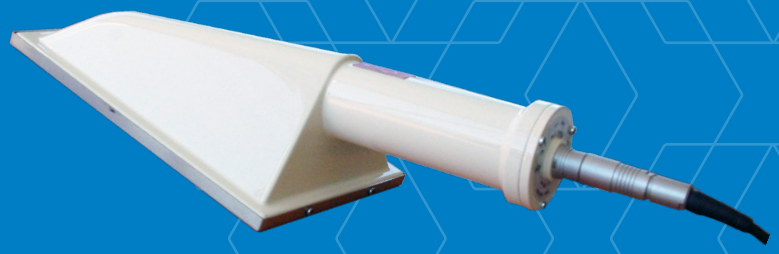
Part Number	Product Name	Description
NOM006566/ EM105053	AVIOR-2	Desktop survey meter with two CSP inputs
NOM006594/ EM105470	AVIOR-2 I/O	Desktop survey meter with two CSP inputs I/O: relay outputs, RS485 Modbus, 24 V DC input, audio jack
NOM006554/ EM104616	SAB-250	Alpha/beta external 250 cm² probe
NOM006603/ EM106271	SABP-525	Alpha/beta 525 cm² foot probe
ANT007271/ EM102034	AVIOR/Wall	Wall mounting for AVIOR-2/MIP-2
ANT007294/ EM105105	SAB-250/Wall	Wall mounting for SAB-250
ANT007293/ EM105083	AVIOR-2-SAB-250/COMBO WALL	Wall mounting combo for AVIOR-2 and SAB-250
NOM006574/ EM105118	AVIOR-2H/F-W	AVIOR-2 hand/foot complete system (wall-mounted). Includes: AVIOR-2, SAB-250 probe, SABP-525 probe, combo wall, cable-2, coil cable
NOM006575/ EM105119	AVIOR-2H	AVIOR-2 hand complete system (wall-mounted). Includes: AVIOR-2, SAB-250 probe, combo wall, coil cable
NOM006595/ EM105575	AVIOR-2H/F-S	AVIOR-2 hand/foot complete system (self-standing). Includes: AVIOR-2, SAB-250 probe, SABP-525 probe, hand/foot support, Cable-2, Cable coil
NOM006599/ EM105722	AVIOR-2H/H-S	AVIOR-2 hand/hand complete system (self-standing). Includes: AVIOR-2, two SAB-250 probes, hand/hand support, two coil cables
NOM006585/ EM105325	CSP-METER COIL CABLE	0.7 meter extends to 1.5 meters with 90 degree angle connector on one end
NOM006565/ EM105028	CSP-Meter cable 2	Generic CSP probe/monitor cable 2 m length with 90 degree connector on one end
ANT007297/ EM105378	H/F Support	Self-standing hand/foot structure for AVIOR-2, SAB-250 and SABP-525
ANT007301/ EM105819	H/H Support	Self-standing hand/hand structure for AVIOR-2 and two SAB-250
NOM006202/ EM18364	Digital stand	AVIOR-2, MIP-2 and MIP-10 Digital stand includes a hook for SBM-2D
NOM006366/ EM86510	CSP Probe holder for stand	CSP probe holder that adapts on Digital stand

MIRION TECHNOLOGIES

MIRION TECHNOLOGIES

SAB-250™

Alpha/Beta Probe



The SAB-250 probe is for measurement of surface contamination and designed to be used with any CSP™ survey meter. Its phoswich detector with 250 cm² detection area makes it an ideal tool for direct measurement of Alpha and Beta emitters covering applications like hand monitoring fixed station, workers body/clothes frisking, or large area check for dismantling operations.

DESCRIPTION

The SAB-250 probe includes a sensor for automatic background subtraction when docked on the wall mount, either in the fixed position for hand counting or in frisking mode.

The small body diameter is similar to other CSP probes and supports easy handling of the probe with less risk of dropping.

The SAB-250 probe can use two different entrance windows:

- SAB-250: Mylar 6 µm
- SAB-250/R: Mylar 6 µm with additional very thin grid to add more protection for harsh environments.

FEATURES

- ✓ Alpha/Beta surface contamination measurement
- ✓ 250 cm² Phoswich scintillation detector
- ✓ Belongs to CSP™ family
- ✓ Calibration via PC
- ✓ Easy removable grid for decontamination
- ✓ Ergonomic counting mode selector on probe body

SAB-250 probe is part of Canberra™ Smart Probe (CSP) family, that drives numerous benefits, such as plug and play capabilities and exceptional readiness for field operations. Please refer to the “hand-held probes” brochure for further details.

SAB-250™ ALPHA/BETA PROBE

PHYSICAL CHARACTERISTICS

- Display units: c/s, Bq, Bq/cm², cpm, dpm, dpm/100 x cm² (depending on survey meter)
- Emitters: Alpha & Beta
- Detector: ZnS(Ag) adhered to 0.25 mm thick plastic scintillation material
- Detection area: 249 cm². Removable aluminized Mylar entrance window on metallic frame, thickness: 6 µm
- Protection grid transparency: 83%
- Measurement range:
  - 0 to 7 000 c/s, 0 to 420 kcpm
  - Activity equivalent range depends on calibration emitter Conversion coefficients are factory set with Pu-239 for alpha channel and with Co-60 for beta channel
- Dead time: < 20 µs
- Energy range:
  - Alpha > 3 MeV
  - Beta > 150 keV
- Area response uniformity:
  - > 80% Alpha
  - ≥ 57% Beta
- Gamma sensitivity (Cs-137):
  - Alpha: < 0.3 c/s per µGy/h
  - Beta: < 70 c/s per µGy/h
- Neutron sensitivity (Cf-252):
  - Beta < 1 c/s per µSv/h
  - Alpha < 0.004 c/s per µSv/h
- Background (ambient < 100 nGy/h (10 µR/h):
  - Alpha < 0.1 c/s (< 6.0 cpm)
  - Beta < 35 c/s (< 600 cpm)
- Cross talk:
  - Alpha to Beta (Pu-239) < 15%
  - Beta to Alpha (Co-60) < 0.15%

ELECTRICAL CHARACTERISTICS

- Power: supplied by survey meter or PC (low voltage only): +5 V
- Consumption: < 30 mA

ENVIRONMENTAL CHARACTERISTICS

- Temperature: -10 °C to +50 °C (+14 °F to +122 °F)
- Relative humidity: 40% to 93% at 35 °C
- Cleaning: housing easy to decontaminate
- Ingress protection: IP20

MECHANICAL CHARACTERISTICS

- Housing: stainless steel
- Protection grid: stainless steel
- Dimensions: length x width x height: 360 x 150 x 125 mm (14.2 x 5.9 x 4.9 in)
- Weight: < 1.2 kg (2.6 lb) without cable

NORMS

- EMC: Conform
- CE: Conform
- IEC: Built to meet IEC 60325:2004
- ANSI: Built to meet ANSI N42.17A

The wall mounting of the SAB-250 probe can be used with an automatic background subtraction, either in fixed position for Hand Counting, or in Frisking mode.

The operating mode is selected on the equipment menu.

ORDERING REFERENCES

- SAB-250: NOM006554 (EM104616)
- SAB-250/R: NOM006617 (EM106702)
- CSP Cable (1.5 m length): NOM006282 (EM77336)
- CSP Cable (10 m length): NOM006513 (EM99006)
- CSP Cable (20 m length): NOM006512 (EM98830)
- CSP Coil Cable (0.7-1.5 m extensible length): NOM006283 (EM77337)
- WRDS-31 Straight Cable (1.5 m length): 1233-319
- RDS-31 Coil Cable (0.7-1.6 m extensible length): 1233-320
- CSP-PC USB Cable: NOM006288 (EM78466)
- Calibration/Setup Software (CSPS): CSPS-F: NOM006289 (EM78468), CSPS-R: NOM006298 (EM80642), CSPS: NOM006299 (EM80643)

Detection efficiencies and MDAs with 100 cm² ISO 8769 sources in contact with probe

	Nuclide	Emitter	Typical efficiency over 2π (%)	Guaranteed efficiency over 2π (%)	Response to activity (c/s)/Bq	MDA (Bq)
SAB -250	Am-241	Alpha	44	33	0.21	3.8
	Pu-239	Alpha	40	30	0.18	4.3
	Co-60	Beta	16	12	0,08	28
	Cl-36	Beta	32	25	0.2	10
	Sr-90 + Y-90	Beta	40	31	0.19	10

MDA: Background = 0.02 c/s (alpha) and 7 c/s (beta), measured during 100 s in a 0.1 µGy/h ambience. Measuring time on source = 10 s
Statistic: false alarm = 5% and non-detection = 5%.

MIRION TECHNOLOGIES

MIRION TECHNOLOGIES

SABP-525™

Foot Alpha/Beta Probe

DESCRIPTION

The SABP-525 probe for measurement of surface contamination is designed to be used with any CSP survey meter. Its phoswich detector with 525 cm² detection area makes it an ideal tool for direct measurement of Alpha and Beta emitters for workers foot check.

The SABP-525 includes a presence sensor. When it is connected to the AVIOR-2, and the worker's foot is correctly positioned on the probe, the net measurement starts.

An adequate probe angle is driven by a removable support to ensure comfortable control when probe is independently positioned on the floor.

FEATURES

- Alpha/Beta surface contamination measurement
- ZnS(Ag) 525 cm² Phoswich plastic scintillation detector
- Belongs to CSP™ family
- Calibration via PC
- Easy removable grid for decontamination
- Ergonomic counting mode selector on probe body

RELATED PRODUCTS

- MIP-10 Digital
- MIP-2
- AVIOR™-2000™
- AVIOR™-2™
- Radiagem™ 2000
- Colibri®
- Or any computer based system developed with CSP-PL programming library

SABP-525™ FOOT ALPHA/BETA PROBE

PHYSICAL CHARACTERISTICS

- Display units: c/s, Bq, Bq/cm² (depending on survey meter
- Emitters: alpha and beta
- Detector: plastic scintillator 0.25 mm thick, covered by ZnS(Ag) for alpha detection, mounted on a PMMA support 35 mm thick
- Detection area: 525 cm²
  3 layers of aluminized Mylar® 0.4-0.45 mg/cm²
- Grid transparency:
  Internal protective thin grid 0.25 mm thick: 80 %.
  External protective grid 3 mm thick: 91 %
- Measurement range: 0 to 7 000 c/s, 0 to 420 kcpm
- Activity equivalent range depends on calibration emitter.
  Conversion coefficients are factory set with ^{239}Pu for alpha channel and with ^{60}Co for beta channel
- Dead time: < 20 µs
- Energy range: alpha > 3 MeV, beta > 150 KeV
- Area response uniformity: > 60% alpha, ≥ 50% beta
- Gamma sensitivity (^{137}Cs)
  Alpha: < 0.3 c/s per µGy/h, beta: < 150 c/s per µGy/h
- Background (ambient < 100 nGy/h (10 µR/h)):
  Alpha < 0.1 c/s (< 6.0 cpm)
  Beta <20 c/s (<1200 cpm)
- Cross talk:
  Alpha to Beta (^{239}Pu) < 30%
  Beta to Alpha (^{60}Co) < 0.1%

ELECTRICAL CHARACTERISTICS

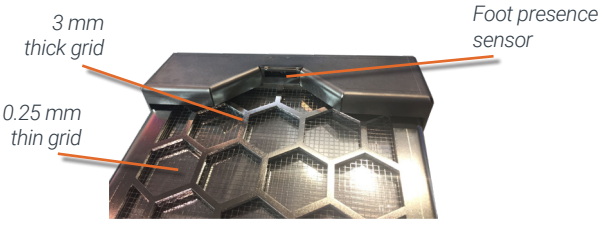
- Power: supplied by survey meter or PC (low voltage only): +5 V
- Consumption: < 100 mA

ENVIRONMENTAL CHARACTERISTICS

- Temperature: -10 °C to +45 °C (+14 °F to +113 °F)
- Relative humidity: 40% to 85% at 35 °C (+95 °F)
- Cleaning: housing easy to decontaminate
- Ingress protection: IP30

MECHANICAL CHARACTERISTICS

- Housing: painted aluminum
- Protection grid: stainless steel
- Dimensions: length x width x height: 485 x 220 x 215 mm (19 x 8.6 x 8.5 in.)
- Weight: < 10 kg (22 lb) without cable



ERGONOMIC CHARACTERISTICS

- Display: provided by survey meter
- Alarm setpoints: 10 values for each unit to display. Saved in probe memory. They can be edited with CSPS software on PC or with AVIOR-2 or Colibri.
- Default alarm threshold is chosen in the list by use of survey meter keypad.

NORMS

- EMC: conform
- CE: conform
- IEC: built to meet IEC 60325:2004
- ANSI: built to meet ANSI N42.17A

Detection efficiencies and MDAs with 100 cm² ISO 8769 sources in contact with probe

	Nuclide	Emitter	Typical efficiency over 2π (%)	Guaranteed efficiency over 2π (%)	Response to activity (c/s)/Bq	MDA (Bq)
SABP -525	^{241}Am	Alpha	19	15	0.1	5.7
	^{239}Pu	Alpha	18	14	0.09	6.4
	^{60}Co	Beta	17	14	0.09	70
	^{36}Cl	Beta	28	24	0.18	37
	^{90}Sr + ^{90}Y	Beta	32	27	0.2	32

MDA: Background = 0.02 c/s (alpha) and 7 c/s (beta) measured over 100 s in a 0.1 µGy/h ambience. Measuring time on source = 10 s

Statistic: false alarm = 5% and non-detection = 5%.

MIRION TECHNOLOGIES

MIRION TECHNOLOGIES

Tele-STTC-2™

Wide Range Gamma Telescopic Probe

The compact size, exceptionally light weight, and easy-to-deploy mechanism of the Tele-STTC-2 make this probe an ideal tool for measurement of areas that are difficult to access or require remote measurement high exposure areas.

DESCRIPTION

Tele-STTC-2 supports ALARA principles by allowing the operator to obtain measurements both quickly and at increased distances, due to its maneuverability.
Tele-STTC-2 requires minimal space when packed and the pole can be extended with secured 1/4 turn rings for each extension segment.
Molded rings are added to original locking rings to facilitate handling (except on Tele-STTC-2L/ R31 model). The unit is so lightweight that even when unfolded, it doesn't need to be offset, and the pole and meter can be used together even for short range measurements
The meter remains at the user's eye level even when the pole is opened.

A shoulder strap can be used to secure Tele-STTC-2 when used in the open position or simply to keep it attached while being carried. The unit consists of a detector integrated on a telescopic carbon fiber-based pole on which a meter is attached by a connecting clip. The meter is removable and can therefore be used independently. Tele-STTC-2 can be used with the Radiagem™.

FEATURES

- Telescopic pole with H*(10) ambient gamma dose equivalent rate measurement probe
- Gamma dose rate measurement up to 10 Sv/h (1000 rem/h)
- Energy-compensated Geiger Mueller detector
- Remote measurement up to 4.09 m (13.4 ft)
- Compact size when folded
- Extremely lightweight and rugged
- Integrated cable for meter
- Calibrated via a personal computer (PC) which enables the direct generation of electronic format calibration data. Eliminates the need for paper and transcription errors

Colibri® or RDS-31™ personal survey meters, which are not included. The detector integrated into the Tele-STTC-2 is designed for gamma dose equivalent rate measurement and extends the distance from the radiation source when used with the selected survey meter. It uses the time-to-count algorithm from CANBERRA, hence enabling a unique range of measurement with only one Geiger Mueller detector. By using only one detector, the Tele-STTC-2 offers a better angular response than any other probe with an equivalent measurement range and comes in a smaller form factor. Additionally, the multiple detector switching effect present with other instruments is not an issue for the Tele-STTC-2. The Tele-STTC probe's firmware can be upgraded via CSPS, with the USB – PC cable and a PC.

TELE-STTC-2™ WIDE RANGE GAMMA TELESCOPIC PROBE

NUCLEAR CHARACTERISTICS

- **Display units** sv/h, sv or rem, rem/h depending on
- survey meter connected
- *H**(10) ambient gamma dose equivalent rate according
- to CIPR60
- **Emitters**: gamma
- **Detector**: energy compensated geiger mueller
- **Sensitivity**: 0.74 c/s for µsv/h (Cs-137)
- **Measurement range**: 0.1 µsv/h to 10 sv/h (10 µrem/h to 1000 rem/h).
- **IEC approved measurement range**: 0.7 µsv/h to 10 sv/h (70 µrem/h to 1000 rem/h)
- **IEC energy range**: gamma 36 kev to 1.5 mev.
- **6.2 MeV response to true Dose Equivalent Rate**: 1.5
- **Background**: ambient <0.1 µgy/h (10 µr/h) 0.10 c/s
- **Maximum integrated dose**: approximately 500 sv

ERGONOMIC

- **Display**: 1 provided by survey meter or PC
- **Alarm setpoints**: 10 values for each unit to display. Saved in probe memory. They can be changed with CSPS and PC

ELECTRICAL

- **Power**: supplied by survey meter (low voltage only)
- **Consumption**: 9 mA to 40 mA depending on dose rate.

MECHANICAL CHARACTERISTICS

- **Probe housing**: aluminium.
- **Pole**: carbon fiber and stainless steel (meter stand).
- **Storage**: storage case for Tele-STTC-2 is included
- **Dimensions**:
  - Closed pole: 1080 mm (3.54 ft)
  - Opened pole: 4090 mm (13.4 ft)
- **Weight**: 11.7 kg (3.75 lb) without meter
- **Storage case**: included

ENVIRONMENT

- **Temperature**: -10 °C to +50 °C (+14 °F to +122 °F)
- **Relative humidity:** 40% to 95% at 35°C
- **Cleaning**: housing easy to decontaminate
- **Ingress protection**: IP54

NORM

- **EMC:** conform
- **CE:** meets CE requirements
- IEC: designed to meet IEC 60846

ORDERING REFERENCES

- Tele-STTC-2/R2000 (for Radiagem) NOM006621 (EM106943)
- Tele-STTC-2/C (for Colibri) NOM006620 (EM106942)
- Tele-STTC-2/R31 (For RDS-31) NOM006622 (EM106944)
- Tele-STTC-2L/R31(For RDS-31, pole without additional molded ring) NOM006673 (EM108412)
- CSP-PC USB cable NOM006288 (EM78466)
- Calibration/Setup Software (CSPS):
- CSPS-F: NOM006289 (EM78468)
- CSPS-R: NOM006298 (EM80642)
- CSPS-E: NOM006299 (EM80643)

Note: Radiagem, RDS-31 and Colibri are not included with Tele-STTC-2 and should be ordered separately.

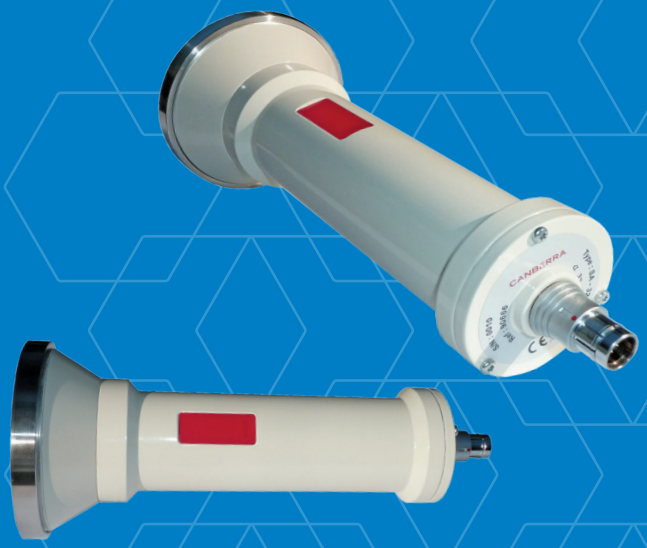
Tele-STTC-2 with Colibri

MIRION TECHNOLOGIES

MIRION TECHNOLOGIES

SA-32™

CSP Alpha Contamination Probe



FEATURES

- Alpha surface contamination measurement
- 32 cm² ZnS(Ag) scintillation detector
- Belongs to CSP™ family
- Calibration via PC software
- Robust screwed-on grid simple to decontaminate
- Easy to change scintillator
- Very low sensitivity to neutron and gamma field

DESCRIPTION

The SA-32 probe for measurement of surface contamination is designed to be used with CSP meter such as Radiagem™ meter, MIP-10 Digital™ meter, Avior® or Colibri® devices. Its ZnS(Ag) detector with 32 cm^2 detection area makes it an ideal tool for direct measurement of alpha emitters on glove boxes, small areas and for personal self control, allowing to check worker's arm in only one pass.
The sensitivity to gamma and/or neutron dose-rate has been reduced to minimize the risk of false positive alarm even in high dose rate environment. The probe body diameter has been reduced to facilitate general handling and reduce the risk of drops.

The SA-32 probe is part of the Canberra™ SMART Probe (CSP) family. It includes all key components of hardware circuitry (high voltage power supply, amplifier, discriminator, etc.) Also, the intelligence associated with controlling those components is located in the probe – that is control and storage of key parameters, settings, calibrations, probe ID, alarm settings (10 values for each unit to display with default setting), etc. Thus the probe is a fully integrated subsystem taking and transmitting the measurement to the instrument, which is used for display.

With high voltage and digitization of the data occurring in the probe rather than the instrument, measurement quality is no longer dependent on external device quality (cable, host instrument). Moreover, a CSP probe is using a serial protocol to communicate with host, which can be an instrument or a PC.

Calibration and QA measurements can be performed directly with the probe, without using any instrument, by connecting the probe to a computer with Canberra Smart Probe Software (CSPS™), allowing your instruments to remain deployed in the field.

Once calibrated, the SA-32 probe is ready to be used as a plug and play probe to start a QA measurement in CPM, DPM, DMP/100 cm^2 with a Radiagem™ 4000 meter; or c/s, Bq, Bq/cm^2 with a Radiagem 2000 meter. The SA-32 probe connects to the CSP instrument connector via a CSP cable of various length or via CSP-COM™ communication module to either a Colibri device (Bluetooth® technology) or host system (Wi-Fi, RS-485, Ethernet; RF with specific RF receiver) andbecomes a sub assembly of a larger system.

SA-32™ CSP ALPHA CONTAMINATION PROBE

The SA-32 probe includes a hand screwed protection grid that is very easy to remove for decontamination. When the grid is detached, the scintillator becomes available for replacement if necessary, reducing the time to service.

The SA-32 probe is able to store up to 1000 data points from a data-logging procedure handled via the host instrument. These data are: index, date/time, measurement value, selected unit and counting time.

The SA-32 unit can be upgraded (probe's firmware) via CSPS software, a USB cable and a PC.

NUCLEAR CHARACTERISTICS

- Display units: depending on survey meter (c/s, Bq, Bq/cm² with SI CSP instrument and CPM, DPM, DPM/100 cm² with American CSP instruments)
- Emitters: alpha
- Detector: ZnS(Ag) coating on 3 mm thick neutral plastic material
  - Detection area: 32 cm² (total diameter = 70 mm, sensitive diameter = 64 mm)
  - Adhered aluminium/Mylar film on detector entrance surface, thickness: 1.8 µm
  - Protection grid transparency: 89%
- Measurement range: 0 to 10 000 c/s, 0 to 600 kcpm. Activity equivalent range depends on calibration emitter. Conversion coefficient is factory set with ^{239}Pu
- Dead time: 50 µs
- Energy range: alpha > 3 MeV
- Surface detection uniformity: better than 50% of the highest efficiency point
- Gamma sensitivity (^{137}cs): < 0.0001 c/s/µSv/h
- Neutron sensitivity (^{252}Cf): < 0.002 c/s/µSv/h
- Background:
  - Ambient ≤ 100 nSv/h (10 µR/h) – < 0.01 c/s (<0.6 cpm)
  - Beta influence (^{90}Sr-^{90}Y) – < 0.01%

ERGONOMIC CHARACTERISTICS

- Display: provided by survey meter or host system
- Alarm setpoints: 10 values for each unit to display. Saved in probe memory. They can be changed with the CSPS platform and a PC
  Default alarm threshold is chosen in a list by use of the survey meter's keypad.

ELECTRICAL CHARACTERISTICS

- Power: +5 V supplied by host instrument (low voltage only)
- Consumption: 15 mA maximum

ENVIRONMENTAL CHARACTERISTICS

- Temperature: -10 °C to +45 °C (+14 °F to +113 °F)
- Relative humidity: 40% to 85% at 35 °C
- Cleaning: housing easy to decontaminate
- IP20

MECHANICAL CHARACTERISTICS

- Housing: painted aluminum
- Protection grid: stainless steel
- Dimensions: length (with connector) x diameter (detector) x diameter (body): 225 x 85 x 55 mm (8.8 x 3.3 x 2.2 in.)
- Weight: 678 g (24 oz) without cable

NORMS

- CEM: conforms
- CE: meets CE requirements
- IEC: designed to meet IEC 60325:2004
- ANSI: designed to meet ANSI N42.17A

ORDERING REFERENCES

- SA-32 unit: NOM006413 (EM90666)
- CSP cable (1.5 m length): NOM006282 (EM77336)
- CSP cable (10 m length): NOM006365 (EM85920)
- CSP cable (20 m length): NOM006300 (EM80653)
- CSP-PC USB cable: NOM006288 (EM78466)
- CSP coil cable (0.7 to 1.5 meter extension): NOM006283 (EM77337)
- CSPS calibration/setup software:
  - CSPS-F: NOM006289 (EM78468)
  - CSPS-R: NOM006298 (EM80642)
  - CSPS-E: NOM006299 (EM80643)

Detection efficiencies and MDAs with 100 cm² ISO 8769 sources in contact with probe

	Nuclide	Emitter	Typical efficiency over 2π (%)	Guaranteed efficiency over 2π (%)	Response to activity (c/s)/Bq	MDA (Bq)
SA-32	^{241}Am	Alpha	37	35	0.17	0.62
	^{239}Pu	Alpha	42	40	0.20	0.55

MDA: Background = 0.01 c/s measured during 100 s in a 0.1 µGy/h ambience. Measuring time on source = 10 s

Statistic: false alarm = 5% and non-detection = 5%. MDA are calculated using the formula recommended by IEC 60325-2004.

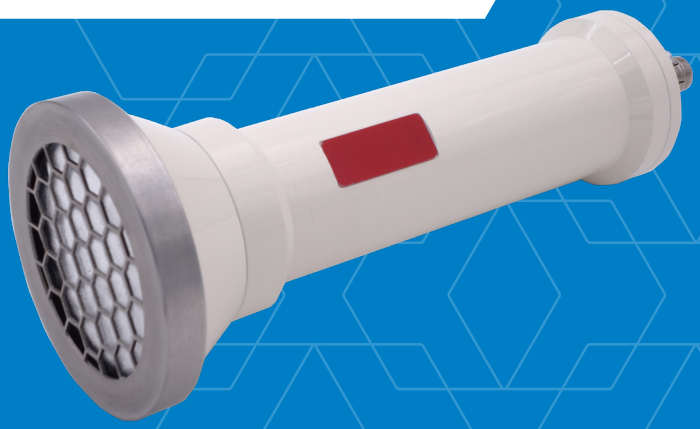
MIRION TECHNOLOGIES

MIRION TECHNOLOGIES

PORTABLE RADIATION MEASUREMENT

SB-32™

Beta Contamination Probe



FEATURES

- Beta surface contamination measurement
- 32 cm^2 Plastic/ZnS Phoswich scintillation detector
- Calibration via PC software
- Robust screwed-on grid simple to decontaminate
- Easy to change scintillator

The SB-32 probe for measurement of surface contamination is designed to be used with any CSP™ survey meter or any computer-based system developed within CSP environment. The plastic scintillation detector has a 32 cm^2 detection area.

DESCRIPTION

The SB-32 probe is the ideal tool for direct measurement of beta emitters on glove boxes, small areas and for personal self control, allowing to check worker's arm in one pass only. Such a well-defined detection area helps to reduce the background noise and improves the Minimal Detectable Activity to better localize contamination spots. The probe body diameter has been reduced to facilitate general handling and reduce the risk of drops.

Entrance grid has been optimized with ideal balance between open area and detector to grid distance to allowing good efficiency and best detector protection. It is hand screwed on the probe body and very easy to remove for decontamination or Aluminium window foil replacement.

Calibration and QA measurements can be performed directly with the probe, without even using any instrument, by connecting the probe to a computer with Canberra Smart Probe Software (CSPS™), allowing your instruments to remain deployed in the field. It can also be connected via CSP-COM modules to integrate third party system and behave as a contamination sensor sub-assembly.

SB-32 probe can be upgraded (probe's firmware) via CSPS™ software, a USB cable and a PC.

SB-32 probe is part of Canberra™ Smart Probe (CSP™) family, that drives numerous benefits, such as plug and play capabilities and exceptional readiness for field operations. Please refer to the "hand-held probes" brochure for further details.

Specifications and Performance

NUCLEAR

Unit to display: depending on survey meter (c/s, Bq_{eq}, Bq_{eq}/cm^2 with SI CSP instrument and CPM, DPM, DPM/100cm^2 with American CSP instruments)
Emitter: Beta
Detector: Plastic scintillator of 0.25 mm thickness
Detection area: 32 cm^2 (total diameter = 70 mm, sensitive diameter = 64mm)
Aluminium window made of two layers of 12 µm placed on detector entrance surface, total thickness: 24 µm
Protection grid transparency: 89 %
Measurement range: 0 to 10,000 c/s, 0 to 600 kcpm. Activity equivalent range depends on calibration emitter. Conversion coefficient is factory set with Co-60.
Dead time: 2 µs
Energy range: Beta >150 KeV
Surface detection uniformity: ≥60 % of the highest efficiency point
Gamma sensitivity (^{137}cs) : Beta : ≤10 c/s/µSv/h
Neutron sensitivity (^{252}Cf) : Beta ≤1,0 c/s/µSv/h
Background : ambient ≤ 100 nGy/h (10 µR/h): < 3 c/s (<180 cpm)
Alpha influence (^{239}Pu) : ≤ 1%

ERGONOMIC

Display : provided by survey meter or host system
Alarm setpoints : 10 values for each unit to display. Saved in probe memory. They can be changed with CSPS and PC.
Default alarm threshold is chosen in a list by use of survey meter keypad.

ELECTRICAL

Power: +5V supplied by host instrument (low voltage only)
Consumption: 15 mA maximum.

MECHANICAL

- **Housing:** painted aluminium
- **Protection grid:** Stainless steel
- **Dimensions:** Length (with connector) x diameter (detector) x diameter (body): 225 x 85 x 55 mm (8.8 x 3.3 x 2.2 in.)
- **Weight:** 678 g (24 oz) without cable

ENVIRONMENTAL

- **Temperature:** -10 °C to + 45 °C
- **Relative humidity** : 40% to 85% at 35°C
- **Cleaning:** housing easy to decontaminate
- **Ingress protection:** IP20

NORMS

- **EMC:** conform
- **CE:** meets CE requirements
- **IEC:** designed to meet IEC 60325:2004
- **ANSI:** designed to meet ANSI N42.17A

ORDERING REFERENCES

- SB-32 : NOM006499 (EM97330)
- CSP Straight Cable (1.5 m length) : NOM006282 (EM77336)
- CSP Straight Cable (10 m length): NOM006513 (EM99006)
- CSP Straight Cable (20 m length): NOM006512 (EM98830)
- CSP Coil Cable (0.7-1.5 m extensible length): NOM006283 (EM77337)
- RDS-31/32 Straight Cable (1.5 m length):1233-319
- RDS-31/32 Coil Cable (0.7-1.6 m extensible length: 1233-320
- CSP-PC USB cable : NOM006288 (EM78466)
- Calibration/Setup Software (CSPS) :
  - CSPS-F: NOM006289 (EM78468)

Detection efficiencies and MDAs with 100 cm2 ISO 8769 sources in contact with probe

	Nuclide	Emitter	Typical efficiency over 2π (%)	Guaranteed efficiency over 2π (%)	Response to activity (c/s)/ Bq	MDA
SB-32	Co-60	Beta + Gamma	17	13	0.09	13.6
	Cl-36	Beta	41	31	0.26	4.90
	Sr-90/Y-90	Beta	41	31	0.26	4.77

MDA: Background = 0.7 c/s (Beta) and 0.01 c/s (Alpha) measured during 100s in a 0.1 µGy/h ambience.
Measuring time on source = 10s.
Statistic: false alarm = 5% and non-detection = 5%
MDA are calculated using the formula recommended by IEC 60325-2004

MIRION TECHNOLOGIES

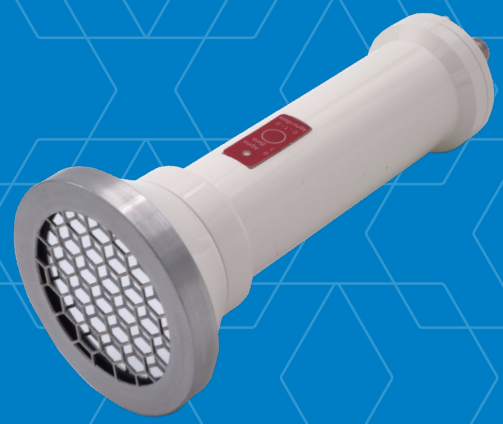
ISO 9001 SYSTEM CERTIFIED MERIDEN CT ATLANTA GA OAK RIDGE TN CONCORD ON

CANBERRA

MIRION TECHNOLOGIES

SAB-32™

Alpha/Beta Contamination Probe



The SAB-32 probe for measurement of surface contamination is designed to be used with any CSP™ survey meter or any computer-based system developed within CSP environment. Its plastic/ZnS phoswich scintillation detector has a 32 cm² detection area.

DESCRIPTION

The SAB-32 probe is the ideal tool for direct measurement of alpha and beta emitters on glove boxes, small areas and for personal self control, allowing to check worker's arm in one pass only. Such a well-defined detection area helps to reduce the background noise and improves the Minimal Detectable Activity to better localize contamination spots. The probe body diameter has been reduced to facilitate general handling and reduce the risk of drops.

A push-button located on the probe housing selects the counting mode. When pressed, the probe switches to the next mode in a list of three and the LED is activated accordingly: alpha only – LED off, beta only – LED on and Alpha+beta – LED blinking. It is a powerful feature for the user to avoid the need to look back on the instrument when changing the mode.

Entrance grid has been optimized with ideal balance between open area and detector to grid distance to allowing good efficiency and best detector protection. It is hand screwed on the probe body and very easy to remove for decontamination or Mylar window foil replacement.

Calibration and QA measurements can be performed directly with the probe, without even using any instrument, by connecting the probe to a computer with Canberra Smart Probe Software (CSPS™), allowing your instruments to remain deployed in the field. It can also be connected via CSP-COM modules to integrate third party system and behave as a contamination sensor sub-assembly.

SAB-32 probe can be upgraded (probe's firmware) via CSPS™ software, an USB cable and a PC.

FEATURES

- Alpha/beta surface contamination measurement
- 32 cm² plastic/ZnS Phoswich scintillation detector
- Ergonomic counting mode selector on probe body
- Calibration via PC software
- Easy to change scintillator
- Robust screwed-on grid simple to decontaminate

SAB-32 probe is part of Canberra™ Smart Probe (CSP™) family, that drives numerous benefits, such as plug and play capabilities and exceptional readiness for field operations. Please refer to the "hand-held probes" brochure for further details.

SAB-32™ ALPHA/BETA CONTAMINATION PROBE

PHYSICAL CHARACTERISTICS

- Unit to display: depending on survey meter (c/s, Bq, Bq/cm^2 with SI CSP instrument and CPM, DPM, DPM/100 cm^2 with American CSP instruments)
- Emitter: alpha and beta
- Detector: ZnS(Ag) adhered to 0.25 mm thick plastic scintillation material
  - Detection area: 32 cm^2 (total diameter = 70 mm, sensitive diameter = 64 mm)
  - Mylar window made of two layers of 3 µm placed on detector entrance surface, total thickness: 6 µm
  - Protection grid transparency: 89%
- Measurement range: 0 to 10,000 c/s, 0 to 600 kcpm. Activity equivalent range depends on calibration emitter. Conversion coefficient is factory set with ^{60}Co for beta and ^{239}Pu for alpha.
- Energy range: beta above 150 KeV and alpha above 3 MeV
- Dead time: 2 µs
- Surface detection uniformity: better than 60% of the highest efficiency point
- Gamma sensitivity (^{137}Cs):
  - Beta < 10 c/s/µSv/h
  - Alpha < 0.005 c/s/µSv/h
- Neutron sensitivity (^{252}Cf):
  - Beta < 5.0 c/s/µSv/h
  - Alpha < 0.05 c/s/µSv/h
- Background:
  - Ambient ≤ 100 nGy/h (10 µR/h):
  - Beta < 1 c/s (60 cpm)
  - Alpha < 0.01 c/s (0.6 cpm)
- Cross talk:
  - Alpha to Beta (^{239}Pu) < 5%
  - Beta to Alpha (^{90}Sr, ^{90}Y) < 0.1%

ELECTRICAL CHARACTERISTICS

- Power: +5V supplied by host instrument (low voltage only)
- Consumption: 15 mA maximum

ERGONOMIC CHARACTERISTICS

- Display: 1 provided by survey meter or host system
- Alarm setpoints: 10 values for each unit to display. Saved in probe memory. They can be changed with CSPS and PC.
- Default alarm threshold is chosen in a list by use of survey meter keypad

ENVIRONMENTAL CHARACTERISTICS

- Temperature: -10 °C to +45 °C (+14 °F to +113 °F)
- Relative humidity: 40% to 85% at 35 °C
- Cleaning: housing easy to decontaminate
- Ingress protection: IP20

MECHANICAL CHARACTERISTICS

- Housing: painted aluminium
- Protection grid: stainless steel
- Dimensions: length (with connector) x diameter (detector) x diameter (body): 225 x 85 x 55 mm (8.8 x 3.3 x 2.2 in)
- Weight: 1678 g (24 oz) without cable

NORMS

- EMC: conform
- CE: meets CE requirements
- EC: designed to meet IEC 60325:2004
- ANSI: designed to meet ANSI N42.17A

ORDERING REFERENCES

- SAB-32: NOM006514 (EM99378)
- CSP straight cable (1.5 m length): NOM006282 (EM77336)
- CSP straight cable (10 m length): NOM006513 (EM99006)
- CSP straight cable (20 m length): NOM006512 (EM98830)
- CSP coil cable (0.7-1.5 m extensible length): NOM006283 (EM77337)
- RDS-31 straight cable (1.5 m length): 1233-319
- RDS-31 coil cable (0.7-1.6 m extensible length): 1233-320
- CSP-PC USB cable: NOM006288 (EM78466)
- Calibration/setup software (CSPS):
  - CSPS-F: NOM006289 (EM78468)
  - CSPS-R: NOM006298 (EM80642)
  - CSPS-E: NOM006299 (EM80643)

Detection efficiencies and MDAs with 100 cm^2 ISO 8769 sources in contact with probe

	Nuclide	Emitter	Typical efficiency over 2π (%)	Guaranteed efficiency over 2π (%)	Response to activity (c/s)/Bq	MDA (Bq)
SAB -32	^{241}Am	Alpha	48	36	0.20	0.50
	^{239}Pu	Alpha	48	36	0.22	0.49
	^{60}Co	Beta + Gamma	15	11	0.08	10
	^{36}Cl	Beta	35	26	0.22	3.8
	^{90}Sr +^{90} Y	Beta	35	26	0.22	3.8

MDA: Background = 1.5 c/s measured during 100s in a 0.1 µGy/h ambience. Measuring time on source = 10 s

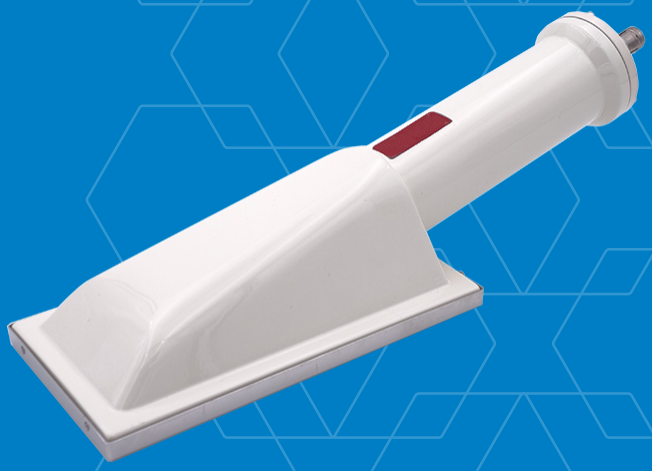
Statistic: false alarm = 5% and non-detection = 5%. MDA are calculated using the formula recommended by IEC 60325-2004

MIRION TECHNOLOGIES

MIRION TECHNOLOGIES

SA-100™

Alpha Probe



The SA-100 probe for measurement of surface contamination is designed to be used with any compatible CSP survey meter. Its ZnS(Ag) detector with 100 cm² detection area makes it an ideal tool for direct measurement of alpha emitter, covering applications like working station contamination check, workers body/clothes frisking or large area check for free release approval. The probe body diameter has been reduced to facilitate general handling and reduce the risk of drops.

FEATURES

- ✓ Alpha surface contamination measurement
- ✓ 100 cm² ZnS(Ag) scintillation detector
- ✓ Belongs to CSP™ family
- ✓ Calibration via PC
- ✓ Easy removable grid for decontamination

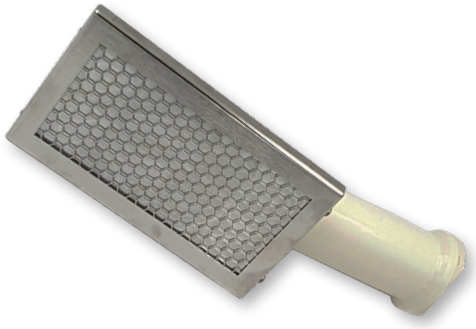
DESCRIPTION

Calibration and QA measurements can be performed directly with the probe, without using an instrument, by connecting the probe to a computer with CANBERRA Smart Probe Software (CSPS™), allowing your instruments to remain deployed in the field. It can also be connected via CSP-COM modules to integrate third party system and behave as a contamination sensor sub-assembly.

Once calibrated, SA-100 probe is ready to be used as a plug and play probe to start a QA measurement in CPM, DPM, DPM/100 cm² with US units survey meters; or c/s, Bq, Bq/cm² with SI units survey meters.
A SA-100 probe includes a protection grid that is very easy to remove for decontamination purpose. Even with the grid detached, the probe remains operational and the whole assembly stays light tight. The entrance window is attached on a removable metallic frame that is fixed on the probe body with flat screws and is quickly changed, reducing the service time.

The SA-100 probe can be upgraded (probe's firmware) via CSPS, a USB cable and a PC.

SA-100 probe is part of Canberra™ Smart Probe (CSP™) family, that drives numerous benefits, such as plug and play capabilities and exceptional readiness for field operations. Please refer to the "hand-held probes" brochure for further details.



SPECIFICATIONS

NUCLEAR

- **Unit to display:** Depending on survey meter (c/s, Bq, Bq/cm² with SI units survey meters and CPM, DPM, DPM/100 cm² with US units survey meters).
- **Emitters:** Alpha
- **Detector:** ZnS(Ag) adhered to 0.25 mm thick neutral plastic material
- **Detection area:** 102 cm² (68 x 150 mm)
- Removable aluminized MylarR entrance window on metallic frame, thickness - 6 µm
- Protection grid transparency - 83 %
- **Measurement range:** 0 to 10000 c/s, 0 to 600 kcpm. Activity equivalent range depends on calibration emitter. Conversion coefficient is factory set with ^{239}Pu
- **Dead time:** 2 µs
- **Energy range:** Alpha > 3 MeV
- **Background:** Ambient ≤100 nSv/h (10 µR/h): <0.01 c/s (< 0.6 cpm)
- **Sunlight effect:** No effect up to 80 000 lux.
- **Crosstalk:** Beta to Alpha (90Sr-90Y) < 0.01%.

ERGONOMIC

- **Display:** provided by survey meter
- **Alarm Setpoints:** 10 values for each unit to display. Saved in probe memory. They can be edited with CSPS and PC.
- **Default alarm threshold** is chosen in a list by use of survey meter's keypad.

ELECTRICAL

- **Power:** supplied by survey meter or PC (low voltage only): +5 V.
- **Consumption:** 15 mA maximum.

MECHANICAL

- **Housing:** painted aluminum
- **Dimensions:** length (with connector) x width (detector) x height (detector): 318.5 x 99 x 102 (12.5 x 3.9 x 4 in)
- **Weight:** 710 g (25 oz) without cable

ENVIRONMENT

- **Temperature:** -20 °C to +50 °C (-4 °F to 122 °F)
- **Relative humidity:** 10% to 93% at 35°C
- **Cleaning:** housing easy to decontaminate
- **IP20**

NORM

- **EMC:** conforms
- **CE:** meets CE requirements.
- **IEC60325:** meets standard requirements

ORDERING REFERENCES

- SA-100 - NOM006273 (EM75863)
- CSP Cable (1.5 m lenght) - NOM006282 (EM77336)
- CSP Cable (10 m lenght) - NOM006513 (EM99006)
- CSP Cable (20 m lenght) - NOM006512 (EM98830)
- CSP Coil Cable (0.7-1.5 m extensible length): NOM006283 (EM77337)
- RDS-31 Straight Cable (1.5 m length): 1233-319
- RDS-31 Coil Cable (0.7-1.6 m extensible length): 1233-320
- CSP-PC USB Cable - NOM006288 (EM78466)
- Calibration/Setup Software (CSPS) - CSPS-F: NOM006289 (EM78468), CSPS-R: NOM006298 (EM80642), CSPS-E: NOM006299 (EM80643)

Detection efficiencies and MDAs with 100 cm² ISO 8769 sources in contact with probe

Nuclide	Emitter	Typical efficiency over 2π (%)	Guaranteed efficiency over 2π (%)	Response to activity (c/s)/Bq	MDA (Bq)
Am-241	Alpha	44	33	0.14	0.77
Pu-239	Alpha	44	33	0.16	0.70

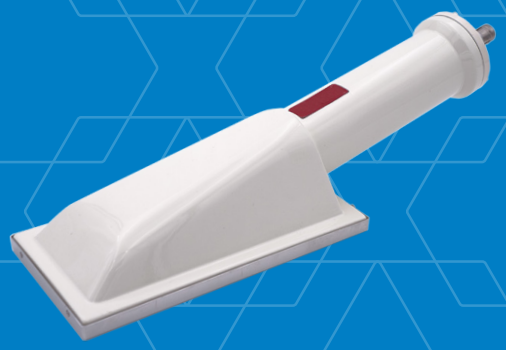
MDA: Background = 0.01 c/s measured over 100 s in a 0.1 µGy/h ambience.
Measuring time on source = 10 s.
Statistic: false alarm = 5% and non-detection = 5%.

MIRION TECHNOLOGIES

MIRION TECHNOLOGIES

SB-100™

Beta Probe



The SB-100 probe for measurement of surface contamination is designed to be used with any CSP survey meter. Its thin plastic scintillation detector with 100 cm² detection area makes it an ideal tool for direct measurement of beta emitters, covering applications like working station contamination check, workers body/clothes frisking or large area check for free release approval. The probe body diameter has been reduced to facilitate general handling and reduce the risk of drops.

DESCRIPTION

Calibration and QA measurements can be performed directly with the probe, without using an instrument, by connecting the probe to a computer with CANBERRA Smart Probe Software (CSPS™), allowing your instruments to remain deployed in the field. It can also be connected via CSP-COM modules tointegrate third party system and behave as a contamination sensor sub-assembly.

Once calibrated, the SB-100 unit is ready to be used as a plug and play probe to start a QA measurement in CPM, DPM, DPM/100 cm^2 or c/s, Bq, Bq/cm^2. The SB-100 probe connects to the survey meter via a 1.5 meter to 20 meter CSP cable.

SB-100 unit includes a protective grid that is very easy to remove for decontamination. Once the grid is detached, the probe remains operational and the whole assembly stays light tight. The entrance window is attached on a removable metallic frame that is fixed on probe body with flat screws, making it easy to change, reducing the time to service.

The SB-100 probe can use 3 different entrance windows:

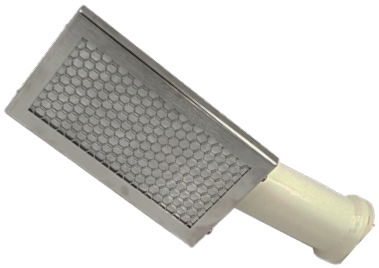
- SB-100/B: Aluminum that guarantees a very good alpha rejection
- SB-100/A: Mylar that improves beta efficiency but also detects alpha particles
- SB-100/AR: Mylar with additional very thin grid to add more protection for harsh environment.

The SB-100 probe can be upgraded (probe's firmware) via CSPS software, a USB cable and a PC.

FEATURES

- Beta surface contamination measurement
- 100 cm² thin plastic scintillation detector
- Belongs to CSP™ family
- Calibration via PC
- Easy removable grid for decontamination
- Rugged version for harsh environments

SB-100 probe is part of Canberra Smart Probe (CSP™) family, that drives numerous benefits, such as plug and play capabilities and exceptional readiness for field operations. Please refer to the "hand-held probes" brochure for further details.



SB-100™ BETA PROBE

NUCLEAR CHARACTERISTICS

- Display units: depending on survey meter (c/s, Bq, Bq/cm² or CPM, DPM, DPM/100 cm²)
- Emitters: beta
- Detector: 0.25 mm thick plastic scintillation detector adhered to 3 mm thick neutral plastic material (PMMA).
  - Detection area: 102 cm² (68 x 150 mm)
  - Removable entrance window:
  - SB-100/A: aluminized Mylar window on metallic frame, thickness: 9 mm
  - SB-100/B: aluminium window on metallic frame, thickness: 24 µm
  - SB-100/AR: mylar window with additional thin grid on metallic frame, thickness: 9µm
  - Protection grid transparency: 83%
- Measurement range: 0 to 10000 c/s, 0 to 600 kcpm. Activity equivalent range depends on calibration emitter. Conversion coefficient is factory set wityh ^{60}Co.
- Dead time: 2 µs
- Energy range: SB-100/A(R): beta > 50 keV, SB-100/B: beta > 150 keV
- Gamma sensitivity for ^{137}Cs ≤ 25 c/s/ µGy/h
- Background:
  - Ambient ≤100 nSv/h (10 µR/h): < 4 c/s (<24 cpm)
  - Alpha influence (^{239}Pu): SB-100/B < 1%, SB-100/A

ELECTRICAL CHARACTERISTICS

- Power: supplied by survey meter (low voltage only)
- Consumption: 15 mA maximum.

ERGONOMIC CHARACTERISTICS

- Display: provided by survey meter
- Alarm setpoints: ten values for each unit to display. Saved in probe memory. They can be changed with CSPS software and PC. Default alarm threshold is chosen in a list by use of survey meter's keypad.

ENVIRONMENTAL CHARACTERISTICS

- Temperature: -20 °C to +50 °C (-4 °F to 122 °F) use and storage
- Relative humidity: 10% to 93% at 35° C
- Cleaning: Housing easy to decontaminate
- IP20

MECHANICAL CHARACTERISTICS

- Housing: painted aluminum
- Dimensions: length (with connector) x width (detector) x height: 318.5 x 99 x 102 (12.5 x 3.9 x 4 in)
- Weight: 710 g (25 oz) without cable

NORMS

- EMC: conforms
- CE: meets CE requirements
- IEC 60325: meets standard requirements

ORDERING REFERENCES

- SB-100/A: NOM006272 (EM75862)
- SB-100/B: NOM006309 (EM82069)
- SB-100/AR: NOM006388 (EM87891)
- CSP cable (1.5 m length): NOM006282 (EM77336)
- CSP cable (10 m length): NOM006513 (EM99006)
- CSP cable (20 m length): NOM006512 (EM98830)
- CSP coil cable (0.7-1.5 m extensible length): NOM006283 (EM77337)
- RDS-31 straight cable (1.5 m length): 1233-319
- RDS-31 coil cable (0.7-1.6 m extensible length): 1233-320
- CSP-PC USB cable: NOM006288 (EM78466)
- CSPS calibration/setup software:
  - CSPS-F: NOM006289 (EM78468)
  - CSPS-R: NOM006298 (EM80642)
  - CSPS-E: NOM006299 (EM80643)

Detection efficiencies and MDAs with 100 cm² ISO 8769 sources in contact with probe

	Nuclide	Emitter	Typical efficiency over 2π (%)	Guaranteed efficiency over 2π (%)	Response to activity (c/s)/Bq	MDA (Bq)
SB-100/A	^{14}C	Beta	9.8	7.4	0.026	68
	^{60}Co	Beta + Gamma	28	21	0.10	17
	^{36}Cl	Beta	41	31	0.17	9.9
	^{90}Sr + ^{90}Y	Beta	41	31	0.36	4.9
SB-100/AR	^{60}Co	Beta + Gamma	15	11	0.057	37
	^{36}Ci	Beta	30	23	0.15	16
	^{90}Sr + ^{90}Y	Beta	29	22	0.29	8
SB-100/B	^{60}Co	Beta + Gamma	15	11	0.057	38
	^{36}Cl	Beta	34	25.5	0.15	15.5
	^{90}SR + ^{90}Y	Beta	33	25	0.29	7.5

MDA: Background = 4 c/s measured over 100 s in a 0.1 µGy/h ambience. Measuring time on source = 10 s Statistic: false alarm = 5% and non-detection = 5%.

MIRION TECHNOLOGIES

MIRION TECHNOLOGIES

SAB-100™

Alpha/Beta Probe

FEATURES

- Alpha/Beta surface contamination measurement
- 100 cm^2 Phoswich scintillation detector
- Belongs to CSP™ family
- Calibration via PC
- Easy removable grid for decontamination
- Ergonomic counting mode selector on probe body
- New probe angle for hands contamination free

DESCRIPTION

The SAB-100 probe for measurement of surface contamination is designed to be used with any CSP survey meter. Its phoswich detector with 100 cm^2 detection area makes it an ideal tool for direct measurement of alpha and beta emitters.

A push-button located on the probe housing selects the counting mode. When pressed, the probe switches to the next mode in a list of three and the LED is activated accordingly: alpha only – LED off, beta only – LED on and Alpha+beta – LED blinking. It is a powerful feature for the user to avoid the need to look back on the instrument when changing the mode.

SAB-100 includes a protection grid that is very easy to remove for decontamination purpose. Once this grid is detached, the probe remains operational and the whole assembly stays light tight. The entrance window is attached on a removable metallic frame that is fixed on the probe body with flat screws and does not need very long to be exchanged, reducing the time to service.

The SAB-100 probe can use two different entrance windows:

- SAB-100: Mylar Window
- SAB-100R: Mylar window with additional very thin grid to add more protection for harsh environment.

SAB-100 can be upgraded (probe's firmware) via CSPS, a USB cable and a PC. SAB-100 connects to CSP compatible survey meters via a 1.5 meter, 10 meter or 20 meter CSP cable.

SAB-100 is part of Canberra's Smart Probe (CSP™) family, that drives numerous benefits, such as plug and play capabilities and exceptional readiness for field operations. Please refer to the "hand-held probes" brochure for further details.

SAB-100™ ALPHA BETA PROBE

NUCLEAR CHARACTERISTICS

- **Unit to display:** depending on survey meter c/s, Bq, Bq/cm² or CPM, DPM, DPM/100 cm²
- **Emitters:** Alpha and Beta
- **Detector:** ZnS(Ag) adhered to 0.5 mm thick plastic scintillation material
- **Detection area:** 102 cm² (68 x 150 mm)
- **Removable aluminized Mylar® entrance window on metallic frame, thickness:** 6 µm
- **Protection grid transparency:** 83%
- **Measurement range:** 0 to 10 000 c/s, 0 to 600 kcpm.
  - Activity equivalent range depends on calibration emitter. Conversion coefficients are factory set with Pu-239 for alpha channel and with Co-60 for beta channel.
- **Dead time:** 2 µs
- **Energy range:** Alpha > 3 MeV, Beta > 150 KeV
- **Gamma sensitivity for Cs-137:** <35c/s per µGy/h
- **Background - ambient ≤ 100 nSv/h (10 µR/h):**
  - Alpha < 0.05 c/s (<3.0 cpm)
  - Beta < 5.0 c/s (<300 cpl)
- **Sunlight effect:** no effect up to 80 000 lux
- **Cross talk:**
  - Alpha to Beta (Pu-239) < 5%
  - Beta to Alpha (Sr-90, Y-90) < 0.1%

ERGONOMIC

- **Display:** provided by survey meter
- **Alarm Setpoints:** 10 values for each unit to display. Saved in probe memory. They can be edited with CSPS and PC.
- Default alarm threshold is chosen in a list by use of survey meter keypad.

ELECTRICAL

- **Power:** supplied by survey meter or PC (low voltage only): +5 V
- **Consumption:** 15 mA maximum.

MECHANICAL CHARACTERISTICS

- **Housing:** painted aluminium steel
- **Dimensions:**
  length (with connector) x width (detector) x height (detector): 318.5 x 99 x 102 (12.5 x 3.9 x 4 in)
- **Weight:** < 710 g (25 oz) without cable

ENVIRONMENT

- **Temperature:** -20 °C to +50 °C (-4 °F to 113 °F) use and storage
- **Relative humidity:** 10% to 93% at 35 °C
- **Cleaning:** housing easy to decontaminate
- **IP20**

NORM

- **EMC:** conform.
- **CE:** meets CE requirements.
- **IEC60325:** meets standard requirements

ORDERING REFERENCES

- SAB-100: NOM006274
- SAB-100R - Version with rugged grid: NOM006500
- CSP Cable (1.5 m length): NOM006282
- CSP Cable (10 m length): NOM006513
- CSP Cable (20 m length): NOM006512
- CSP Coil Cable (0.7-1.5 m extensible length): NOM006283
- Carrying Case for Radiagem Emergency Response Kit: NOM006277
- CSP-PC USB Cable: NOM006288
- Calibration/Setup Software (CSPS):
  - CSPS-F: NOM006289
  - CSPS-R: NOM006298
  - CSPS-E: NOM006299

Nuclide	Emitter	Typical efficiency over 2π (%)		Guaranteed efficiency over 2π (%)		Response to activity (c/s)/Bq		MDA (Bq)	
		SAB-100R	SAB-100	SAB-100R	SAB-100	SAB-100R	SAB-100	SAB-100R	SAB-100
Am-241	Alpha	27.5	48	20.5	36	0.089	0.22	1.23	0.50
Pu-239	Alpha	28	48	21	36	0.090	0.22	1.21	0.50
Sr-90 + Y-90	Beta	36	43	27	32	0.317	0,30	5.8	7.3
Cl-36	Beta	36	40	27	30	0.155	0.28	12.2	7.8
Co-60	Beta + Gamma	12	15	9	11	0.043	0.09	42.8	24.3

Detection efficiencies and MDAs with 100 cm² ISO 8769 sources in contact with probe

MIRION TECHNOLOGIES

MIRION TECHNOLOGIES

SABG-100™

Alpha/Beta/Gamma Probe

The SABG-100 probe for measurement of surface contamination is designed to be used with any CSP survey meter or any other device able to handle CSP™ protocol. Its phoswich detector with 100 cm² detection area makes it an ideal tool for direct measurement of alpha, beta and gamma emitters.

DESCRIPTION

Calibration and QA measurements can be performed directly with the probe, without even using any instrument, by connecting the probe to a computer with CANBERRA Smart Probe Software (CSPS™), allowing your instruments to remain deployed in the field. It can also be connected via CSP-COM modules to integrate third party system and behave as a contamination sensor sub-assembly.

Once calibrated, SABG-100 is ready to be used as a 'plug and play' probe to start a QA measurement in CPM, DPM, DPM/100 cm^2 or c/s, Bq, Bq/cm^2. The SABG-100 probe connects to survey meter using a 1.5 meter, 10 meter or 20 meter CSP cable. A push button and LED located on the probe housing selects the counting mode. When pressed, the probe switched to the next mode in a list of three and the LED is activated accordingly: alpha only - LED off, beta-gamma only - LED on and Alpha+beta+gamma - LED blinking. It is a poverful feature for the user to avoid the need to look back on the instrument when changing the mode.

The SABG-100 includes a protection grid that is very easy to remove for decontamination purposes. Once this grid is detached, the probe remains operational and the whole assembly stays light-tight. The entrance window is attached on a removable metallic frame that is fixed on the probe body with flat screws and does not need very long to be exchanged, reducing the setup time.

The SABG-100 unit can be upgraded (probe's firmware) via CSPS software, a USB cable and a PC.

FEATURES

- Alpha/Beta/Gamma surface contamination measurement
- 100 cm² ZnS(Ag) scintillation detector
- Belongs to CSP™ family
- Calibration via PC
- Easy removable grid for decontamination
- Ergonomic counting mode selector on probe body

SABG-100 probe is part of Canberra™ Smart Probe (CSP™) family, that drives numerous benefits, such as plug and play capabilities and exceptional readiness for field operations. Please refer to the "hand-held probes" brochure for further details.

SABG-100™ ALPHA/BETA/GAMMA PROBE

NUCLEAR CHARACTERISTICS

- Unit to display: depending on survey meter (c/s, Bq, Bq/cm² or CPM, DPM, DPM/100 cm²)
- Emitters: alpha and beta-gamma
- Detector: ZnS(Ag) adhered to 1.5 mm thick plastic scintillation material
  - Detection area: 102 cm² (68 x 150 mm)
  - Removable aluminized Mylar® entrance window on metallic frame, thickness: 6 µm
  - Protection grid transparency: 83 %
- Measurement range: 0 to 10000 c/s, 0 to 600 kcpm. Activity equivalent range depends on calibration emitter. Conversion coefficients are factory set with ^{239}Pu for alpha channel and with ^{60}Co for beta channel
- Dead time: 2 µs
- Energy range: beta > 150 keV, alpha > 3 MeV, gamma > 100 keV
- Gamma sentitivity in dose rate for ^{137}Cs: > 70 c/s per µGy/h (42 kcpm per mR/h)
- Gamma sensitivity activity: sealed source positioned at 20 mm from the protection grid:

Radionuclide	Gamma sensitivity in c/s per kBq
^{137}Cs	2.7
^{60}Co	9.0
^{57}Co	1.4
^{241}Am	0.01

- Background: ambient < 100 nSv/h (10 µR/h): alpha < 0.05 c/s (< 3.0 cpm), beta < 10.0 c/s, (<600 cpm)
  - Sunlight effect: No effect up to 80 000 lux
- Cross talk: alpha to beta (^{239}Pu) < 12%, beta to alpha (^{90}Sr-^{90}Y) < 0.1 %
- In probe memory. They can be edited with CSPS and a PC. Default alarm threshold is chosen from a list by use of the survey meter's keypad

ELECTRICAL CHARACTERISTICS

- Power: supplied by survey meter or PC (low voltage only): +5 V
- Consumption: 15 mA maximum

ERGONOMIC CHARACTERISTICS

- Display: provided by survey meter
- Alarm setpoints: ten values for each unit to display. Saved in probe memory. They can be edited with CSPS an PC. Default alarm threshold is chosen in a list by use of survey meter keypad.

ENVIRONMENTAL CHARACTERISTICS

- Temperature: -20 °C to +50 °C (-4 °F to 122 °F) use and storage
- Relative humidity: 10% to 93% at 35 °C
- Cleaning: housing easy to decontaminate
- IP20

MECHANICAL CHARACTERISTICS

- Housing: painted aluminium
- Dimensions: length (with connector) x width (detector) x height (detector): 318.5 x 99 x 102 (12.5 x 3.9 x 4 in)
- Weight: 710 g (25 oz) without cable

NORMS

- EMC: conforms
- CE: meets CE requirements
- IEC 60325: meets standard requirements

ORDERING REFERENCES

- SABG-100: NOM006306 (EM81933)
- CSP cable (1.5 m length): NOM006282 (EM77336)
- CSP cable (10 m length): NOM006513 (EM99006)
- CSP cable (20 m lengh): NOM006512 (EM98830)
- CSP coil cable (0.7-1.5 m extensible length): NOM006283 (EM77337)
- RDS-31 straight cable (1.5 m length): 1233-319
- RDS-31 coil cable (0.7-1.6 m extensible length): 1233-320
- CSP-PC USB cable: NOM006288 (EM78466)
- Calibration/setup software:
  - CSPS-F: NOM006289 (EM78468)
  - CSPS-R: NOM006298 (EM80642)
  - CSPS-E: NOM006299 (EM80643)

Detection efficiencies and MDAs with 100 cm² ISO 8769 sources in contact with probe

	Nuclide	Emitter	Typical efficiency over 2π (%)	Guaranteed efficiency over 2π (%)	Response to activity (c/s)/Bq	MDA (Bq)
SABG -100	^{241}Am	Alpha	46	34.5	0.147	0.74
	^{239}Pu	Alpha	46	34.5	0.151	0.72
	^{60}Co	Beta+Gamma	18	13.5	0.061	44.1
	^{36}Cl	Beta	42	31.5	0.181	14.8
	^{90}Sr + ^{90}Y	Beta	44	33	0.384	6.98

MDA: Background = 0.01 c/s measured over 100 s in a 0.1 µGy/h ambience. Measuring time on source = 10 s Statistic: false alarm = 5% and non-detection = 5%.

MIRION TECHNOLOGIES

MIRION
TECHNOLOGIES

SABG-15+™

Alpha/Beta/Gamma Probe

FEATURES

- ✓ Alpha/Beta/Gamma surface contamination measurement
- ✓ Geiger-Mueller detector with a 15 cm^2 and 2.0 mg/cm^2 end window
- ✓ Belongs to CSP™ family
- ✓ Units available: cps, CPM, Bq, Bq/cm^2, DPM, DPM/100 cm^2
- ✓ Compliant with IEC 60325 and ANSI N42.17A
- ✓ Efficiency over 2π
- • ^{14}C: 17%
- • ^{90}Sr + ^{90}Y: 51%
- • ^{60}Co: 31%
- • ^{241}Am: 35%

DESCRIPTION

The SABG-15+ probe is designed for the measurement of surface contamination. Its good sensitivity makes it ideal to detect alpha, beta and gamma emitters for initial survey applications.
The SABG-15+ unit is part of the Canberra™ SMART Probe (CSP) family. As part of the CSP Family it is compatible with all CSP survey meters.

The SABG-15+ device includes all key components of hardware circuitry (high voltage power supply, amplifier, discriminator, etc.). Also, the intelligence associated with controlling those components is located in the probe – that is control and storage of key parameters, settings, calibrations, probe ID, alarm settings (10 values for each unit to display with default setting), etc. Thus, the probe is a fully-integrated subsystem communicating the measurement to the instrument.

With high voltage and acquisition of the data occurring in the probe rather than the instrument, measurement quality is no longer dependent on external device quality (cable, host instrument). Moreover, a CSP probe is using a serial protocol to communicate with the host that can be an instrument or a PC.

Calibration and QA measurements can be performed directly with the probe, without even using an instrument, by connecting the probe to a computer with Canberra Smart Probe Software (CSPS™), allowing your instruments to remain deployed in the field.

Once calibrated, the SABG-15+ unit is ready to be used as a 'plug and play' probe to start a QA measurement in c/s, Bq, Bq/cm^2, CPM, DPM, DPM/100 cm^2 depending on the connected survey meter. The SABG-15+ probe connects to the CSP survey meter via a 1.5 meter or 20 meter CSP cable.

The SABG-15+ probe is able to store up to 1000 data points from a data logging procedure handled via the host instrument. These data are: index, date/time, measurement value, selected unit and counting time.
The SABG-15+ firmware can be upgraded via CSPS software, a CSP/USB cable and a PC.

SABG-15+™ ALPHA/BETA/GAMMA PROBE

NUCLEAR CHARACTERISTICS

- Unit to display: depending on survey meter (c/s, Bq, Bq/cm^2 with SI units version survey meter and CPM, DPM, DPM/100 cm^2 with US version survey meter)
- Emitters: alpha, beta and gamma
- Detector: Geiger-Mueller with halogen quench thin mica end window 1.8 to 2.0 mg/cm^2
  - Detection area: 15.5 cm^2
  - Protection grid transparency: 76%
- Measurement range: 1 to 9999 c/s, 60 to 600 000 CPM (display: 0.1 to 9999 c/s, 0.1 CPM to 600 kCPM)
- Activity equivalent range depends on calibration emitter. Conversion coefficient is factory set with ^{60}Co
- Gamma sensitivity for ^{137}Cs: 6.4 c/s per µGy/h (3840 CPM per mR/h)
- Dead time: detector = 50 µs, probe = 50 µs
- Energy: alpha > 2.6 MeV, beta > 30 keV, gamma > 5 keV

ERGONOMIC CHARACTERISTICS

- Display: provided by survey meter
- Alarm setpoints: 10 values for each unit to display. Saved in probe memory. They can be changed with CSPS software and a PC.

BACKGROUND CHARACTERISTICS

- Ambient: 1 c/s in < 0.1 µGy/h ambiance (typical = 0.8 c/s)
- Detection efficiencies and MDAs with 100 cm^2 ISO 8769 sources in contact with probe

ELECTRICAL CHARACTERISTICS

- Power: supplied by host instrument (low voltage only)
- Consumption: 8 mA maximum

ENVIRONMENTAL CHARACTERISTICS

- Temperature: -10 °C to +50 °C (+14 °F to +122 °F)
- Relative humidity: 40% to 85% at 35 °C
- Cleaning: housing is easy to decontaminate

MECHANICAL CHARACTERISTICS

- Housing: ABS polycarbonate molded
- Dimensions: length (with connector) x diameter (detector) x diameter (body): 205 x 70 x 42 mm (8.1 x 2.8 x 1.7 in)
- Weight: 310 g (10.9 oz) without cable

NORMS

- INGRESS protection: IP20
- CEM: conforms
- IEC: meets IEC 60325:2004 standard
- ANSI: meets ANSI N42.17A-2003 standard
- CE: meets CE requirements

ORDERING REFERENCES

- SABG-15+ Unit: NOM006364 (EM85916)
- CSP cable (1.5 m – 60 ft): NOM006282 (EM77336)
- CSP cable (10 m - 400 ft): NOM006365 (EM85920)
- CSP cable (20 m – 800 ft): NOM006300 (EM80653)
- CSP coil cable (0.7 to 1.5 meter extension): NOM006283 (EM77337)
- CSP-PC cable: NOM006288 (EM78466)
- CSPS (calibration software):
  - CSPS-E (English SI units): NOM006299 (EM80643)
  - CSPS-R (English US units): NOM006298 (EM80642)
  - CSPS-F (French SI units): NOM006289 (EM78468)

	Nuclide	Emitter	Typical efficiency over 2π (%)	Guaranteed efficiency over 2π (%)	Response to activity (c/s)/Bq	MDA (Bq)
SABG -15+	^{241}Am	Alpha	35	31	0.12	4.7
	^{239}Pu	Alpha	25	24	0.12	4.5
	^{60}Co	Beta+Gamma	31	29	0.16	3.3
	^{36}Cl	Beta	50	42	0.32	1.7
	^{14}C	Beta	17	15	0.07	8.0
	^{90}Sr + ^{90}Y	Beta	51	45	0.65	0.9

MDA: Background = 0.5 c/s measured during 100 s in a 0.1 µGy/h ambience. Measuring time on source = 10 s Statistic: false alarm = 5% and non-detection = 5%.

MIRION TECHNOLOGIES

MIRION TECHNOLOGIES

SABP-525™

Foot Alpha/Beta Probe

DESCRIPTION

The SABP-525 probe for measurement of surface contamination is designed to be used with any CSP survey meter. Its phoswich detector with 525 cm² detection area makes it an ideal tool for direct measurement of Alpha and Beta emitters for workers foot check.

The SABP-525 includes a presence sensor. When it is connected to the AVIOR-2, and the worker's foot is correctly positioned on the probe, the net measurement starts.

An adequate probe angle is driven by a removable support to ensure comfortable control when probe is independently positioned on the floor.

FEATURES

- Alpha/Beta surface contamination measurement
- ZnS(Ag) 525 cm² Phoswich plastic scintillation detector
- Belongs to CSP™ family
- Calibration via PC
- Easy removable grid for decontamination
- Ergonomic counting mode selector on probe body

RELATED PRODUCTS

- MIP-10 Digital
- MIP-2
- AVIOR™-2000™
- AVIOR™-2™
- Radiagem™ 2000
- Colibri®
- Or any computer based system developed with CSP-PL programming library

SABP-525™ FOOT ALPHA/BETA PROBE

PHYSICAL CHARACTERISTICS

- Display units: c/s, Bq, Bq/cm² (depending on survey meter
- Emitters: alpha and beta
- Detector: plastic scintillator 0.25 mm thick, covered by ZnS(Ag) for alpha detection, mounted on a PMMA support 35 mm thick
- Detection area: 525 cm²
  3 layers of aluminized Mylar® 0.4-0.45 mg/cm²
- Grid transparency:
  Internal protective thin grid 0.25 mm thick: 80 %.
  External protective grid 3 mm thick: 91 %
- Measurement range: 0 to 7 000 c/s, 0 to 420 kcpm
- Activity equivalent range depends on calibration emitter.
  Conversion coefficients are factory set with ^{239}Pu for alpha channel and with ^{60}Co for beta channel
- Dead time: < 20 µs
- Energy range: alpha > 3 MeV, beta > 150 KeV
- Area response uniformity: > 60% alpha, ≥ 50% beta
- Gamma sensitivity (^{137}Cs)
  Alpha: < 0.3 c/s per µGy/h, beta: < 150 c/s per µGy/h
- Background (ambient < 100 nGy/h (10 µR/h)):
  Alpha < 0.1 c/s (< 6.0 cpm)
  Beta <20 c/s (<1200 cpm)
- Cross talk:
  Alpha to Beta (^{239}Pu) < 30%
  Beta to Alpha (^{60}Co) < 0.1%

ELECTRICAL CHARACTERISTICS

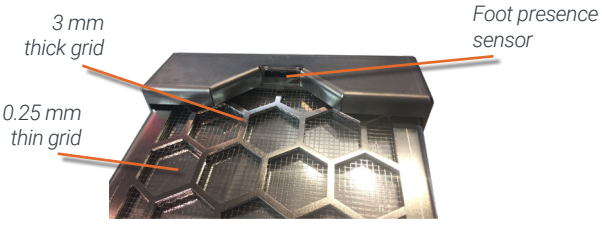
- Power: supplied by survey meter or PC (low voltage only): +5 V
- Consumption: < 100 mA

ENVIRONMENTAL CHARACTERISTICS

- Temperature: -10 °C to +45 °C (+14 °F to +113 °F)
- Relative humidity: 40% to 85% at 35 °C (+95 °F)
- Cleaning: housing easy to decontaminate
- Ingress protection: IP30

MECHANICAL CHARACTERISTICS

- Housing: painted aluminum
- Protection grid: stainless steel
- Dimensions: length x width x height: 485 x 220 x 215 mm (19 x 8.6 x 8.5 in.)
- Weight: < 10 kg (22 lb) without cable



ERGONOMIC CHARACTERISTICS

- Display: provided by survey meter
- Alarm setpoints: 10 values for each unit to display. Saved in probe memory. They can be edited with CSPS software on PC or with AVIOR-2 or Colibri.
- Default alarm threshold is chosen in the list by use of survey meter keypad.

NORMS

- EMC: conform
- CE: conform
- IEC: built to meet IEC 60325:2004
- ANSI: built to meet ANSI N42.17A

Detection efficiencies and MDAs with 100 cm² ISO 8769 sources in contact with probe

	Nuclide	Emitter	Typical efficiency over 2π (%)	Guaranteed efficiency over 2π (%)	Response to activity (c/s)/Bq	MDA (Bq)
SABP -525	^{241}Am	Alpha	19	15	0.1	5.7
	^{239}Pu	Alpha	18	14	0.09	6.4
	^{60}Co	Beta	17	14	0.09	70
	^{36}Cl	Beta	28	24	0.18	37
	^{90}Sr + ^{90}Y	Beta	32	27	0.2	32

MDA: Background = 0.02 c/s (alpha) and 7 c/s (beta) measured over 100 s in a 0.1 µGy/h ambience. Measuring time on source = 10 s

Statistic: false alarm = 5% and non-detection = 5%.

MIRION TECHNOLOGIES

MIRION TECHNOLOGIES

SG-1R™

Gamma Probe

FEATURES

- Gamma sensitive measurement
- 1” x 1” NaI(Tl)
- Belongs to CSP™ family
- Calibration via PC
- Dynamic energy discriminator button

DESCRIPTION

The SG-1R probe for gamma measurement is designed to be used with any CSP survey meter. Its good sensitivity makes it ideal to detect gamma emitters starting from background level.

The SG-1R unit is part of the Canberra™ SMART Probe (CSP) family. It includes all key components of hardware circuitry (high voltage power supply, amplifier, discriminator, etc.).
Also, the intelligence associated with controlling those components is located in the probe – that is control and storage of key parameters, settings, calibrations, probe ID, alarm settings (10 values for each unit to display with default setting), etc. Thus the probe is a fully integrated subsystem talking and transmitting the measurement to the instrument, which is used for display.

With high voltage and digitization of the data occurring in the probe rather than the instrument, measurement quality is no longer dependent on external device quality (cable, host instrument). Moreover, a CSP probe is using a serial protocol to communicate with the host which can be an instrument or a PC.

Calibration and QA measurements can be performed directly with the probe, without even using any instrument, by connecting the probe to a computer with Canberra Smart Probe Software (CSPS™), allowing your instruments to remain deployed in the field.
Once calibrated, the SG-1R probe is ready to be used as a plug and play probe to start a QA measurement in CPS, R, R/h with US units survey meter; or c/s, Sveq, Sveq/h with IS units survey meter. The SG-1R probe connects to the CSP survey meter via a 1.5 or 20 meter CSP cable.

A push-button located on the probe housing triggers a high energy threshold. When depressed and held, an LED is activated and the probe measures only gamma above the preset threshold. It is a powerful feature to detect the presence of a specific isotope like ^{60}Co. Energy threshold is set through the CSPS platform and a PC.

SG-1R probe is able to store up to 1000 data points from a data-logging procedure handled via the host instrument. These data are: Index, date/time, measurement value, selected unit and counting time. The SG-1R probe can be upgraded (probe’s firmware) via the CSPS platform, a USB cable and a PC.

SG-1R™ GAMMA PROBE

NUCLEAR CHARACTERISTICS

- Unit to display: depending on survey meter (c/s, Sveq, Sveq/h or CPS, R, R/h)
- Emitters: gamma and X
- Detector: NaI(Tl) scintillator 1" x 1"
- Measurement range: 0 to 200 µSv/h (0 to 20 mR/h); 0 to 55 kc/s (0 to 3300 kcpm)
- Energy range: 40 keV to 1.5 MeV
- Gamma sensitivity for ^{137}Cs: 291 c/s per µGy/h (174.6 kcpm per mR/h)
- Dead time: 50 µs
- Background: ambient ≤ 100 nSv/h (10 µR/h): 25 c/s – 1500 CPM

ERGONOMIC CHARACTERISTICS

- Display: provided by survey meter
- Alarm setpoints: ten values for each unit to display. Saved in probe memory. They can be edited through the CSPS platform and PC Default alarm threshold is chosen in a list by use of survey meter keypad

ELECTRICAL CHARACTERISTICS

- Power: supplied by survey meter or PC (low voltage only); +5 V
- Battery life: does not reduce survey meter's battery life
- Consumption: 15 mA maximum

ENVIRONMENTAL CHARACTERISTICS

- Temperature: -10 °C to +50 °C (+14 °F to +122 °F)
- Relative humidity: 40% to 85% at 35 °C
- Cleaning: housing easy to decontaminate

MECHANICAL CHARACTERISTICS

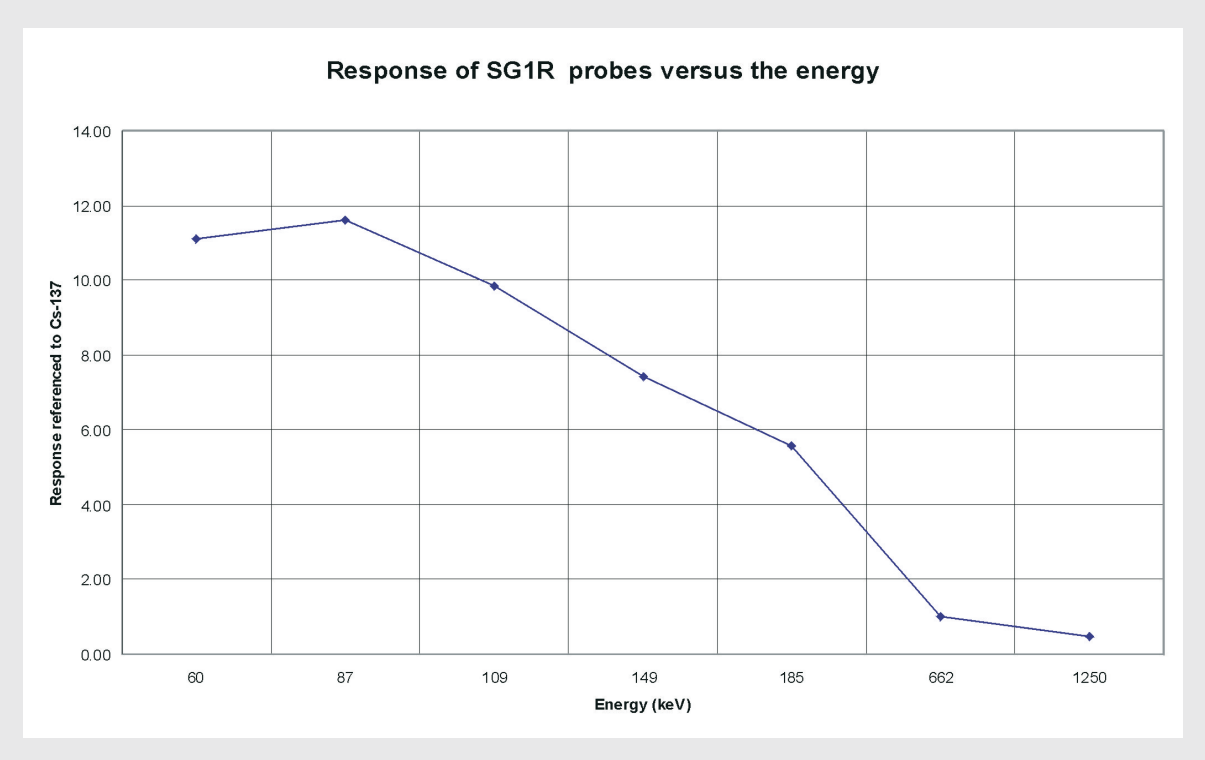
- Housing: painted aluminum
- Dimensions: length (with connector) x diameter: 233 x 55 mm maximum (9.2 x 2.2 in)
- Weight: 520 g (18 oz) without cable

NORMS

- CEM: conform
- CE: meets CE requirements

ORDERING REFERENCES

- SG-1R unit: NOM006270 (EM75860)
- CSP cable (1.5 m length): NOM006282 (EM77336)
- CSP cable (20 m length): NOM006300 (EM80653)
- Carrying case for Radiagem™ Emergency Response Kit: NOM006277 (EM76287)
- CSP-PC USB cable: NOM006288 (EM78466)
- CSPS calibration/setup software:
  - CSPS-F: NOM006289 (EM78468)
  - CSPS-R: NOM006298 (EM80642)
  - CSPS-E: NOM006299 (EM80643)



MIRION TECHNOLOGIES

MIRION TECHNOLOGIES

SG-2R™

Gamma Probe

FEATURES

- High sensitivity gamma measurement
- 2” x 2” NaI(Tl)
- Belongs to CSP™ family
- Calibration via PC
- Dynamic energy discriminator button

DESCRIPTION

The SG-2R probe for gamma measurement is designed to be used with any CSP survey meter. Its very good sensitivity makes it ideal to detect gamma emitters starting from very low background levels.

The SG-2R unit is part of the Canberra™ SMART Probe (CSP) family. It includes all key components of hardware circuitry (high voltage power supply, amplifier, discriminator, etc.). Also, the intelligence associated with controlling those components is located in the probe – that is control and storage of key parameters, settings, calibrations, probe ID, alarm settings (10 values for each unit to display with default setting), etc. Thus the probe is a fully integrated subsystem talking and transmitting the measurement to the instrument, which is used for display.

With high voltage and digitization of the data occurring in the probe rather than the instrument, measurement quality is no longer dependent on external device quality (cable, host instrument). Moreover, a CSP probe is using a serial protocol to communicate with the host which can be an instrument or a PC.

Calibration and QA measurements can be performed directly with the probe, without even using any instrument, by connecting the probe to a computer with Canberra Smart Probe Software (CSPS™), allowing your instruments to remain deployed in the field.
Once calibrated, the SG-2R probe is ready to be used as a plug and play probe to start a QA measurement in CPS, R, R/h with US units survey meter; or c/s, Sveq, Sveq/h with IS units survey meter. The SG-2R probe connects to the CSP survey meter via a 1.5 or 20 meter CSP cable.

A push-button located on the probe housing triggers a high energy threshold. When depressedand held, an LED is activated and the probe measures only gamma above the preset threshold. It is a powerful feature to detect the presence of a specific isotope like 60Co. Energy threshold is set through the CSPS platform and a PC.

SG-2R probe is able to store up to 1000 data points from a data-logging procedure handled via the host instrument. These data are: index, date/time, measurement value, selected unit and counting time. The SG-2R probe can be upgraded (probe’s firmware) via the CSPS platform, a USB cable and a PC.

SG-2R™ GAMMA PROBE

NUCLEAR CHARACTERISTICS

- Unit to display: depending on survey meter (c/s, Sveq, Sveq/h or CPS, R, R/h)
- Emitters: gamma and X
- Detector: NaI(Tl) scintillator 2” x 2”
- Measurement range: 0 to 50 µSv/h (0 to 5 mR/h); 0 to 90 kc/s (0 to 5400 kcpm)
- Energy range: 40 keV to 1.5 MeV
- Gamma sensitivity for ^{137}Cs: 1501 c/s per µGy/h (900.6 kcpm per mR/h)
- Dead time: 50 µs
- Background: ambient ≤ 100 nSv/h (10 µR/h): 120 c/s – 7200 CPM

ERGONOMIC CHARACTERISTICS

- Display: provided by survey meter
- Alarm setpoints: 10 values for each unit to display. Saved in probe memory. They can be changed through the CSPS platform and PC Default alarm threshold is chosen in a list by use of survey meter keypad

ELECTRICAL CHARACTERISTICS

- Power: supplied by survey meter or PC (low voltage only); +5 V
- Battery life: does not reduce survey meter’s battery life
- Consumption: 15 mA maximum

ENVIRONMENTAL CHARACTERISTICS

- Temperature: -10 °C to +50 °C (+14 °C to +122 °F)
- Relative humidity: 40% to 85% at 35 °C
- Cleaning: housing easy to decontaminate

MECHANICAL CHARACTERISTICS

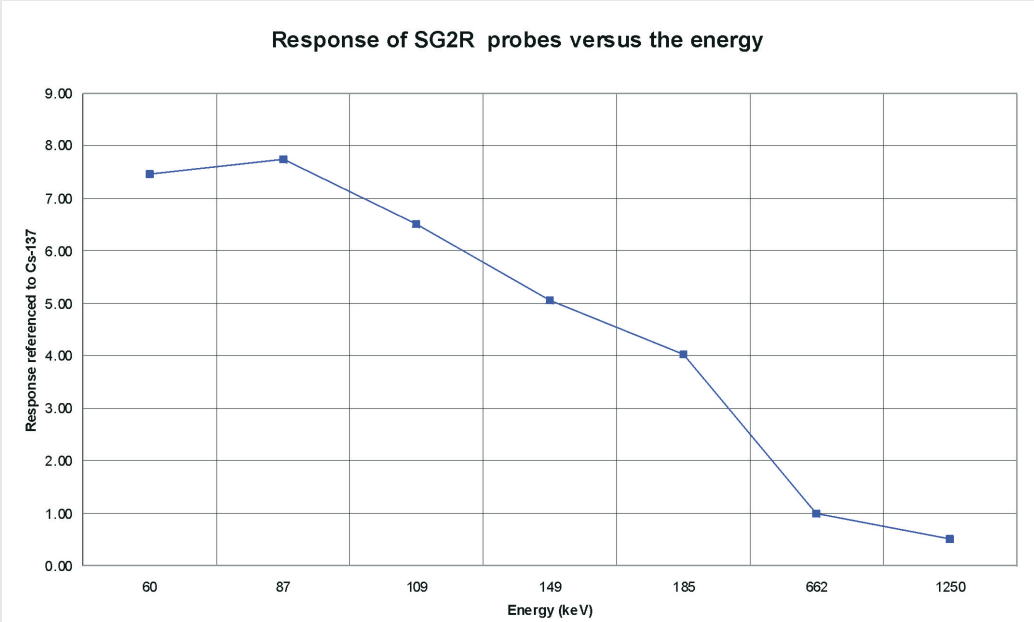
- Housing: painted aluminum
- Dimensions: length (with connector) x diameter: 263 x 66 mm maximum (10.4 x 2.6 in)
- Weight: 1000 g (35 oz) without cable

NORMS

- CEM: conform
- CE: meets CE requirements

ORDERING REFERENCES

- SG-2R unit: NOM006271 (EM75861)
- CSP cable (1.5 m length): NOM006282 (EM77336)
- CSP cable (20 m length): NOM006300 (EM80653)
- Carrying case for Radiagem™ Emergency Response Kit: NOM006277 (EM76287)
- CSP-PC USB cable: NOM006288 (EM78466)
- CSPS calibration/setup software:
  - CSPS-F: NOM006289 (EM78468)
  - CSPS-R: NOM006298 (EM80642)
  - CSPS-E: NOM006299 (EM80643)



MIRION TECHNOLOGIES

MIRION TECHNOLOGIES

SX-2R™

X-Ray Probe

DESCRIPTION

The SX-2R probe for measurement of leakage and surface contamination is designed to be used with any CSP survey meter. Its 1.5 in. NaI(Tl) detector with 3 mm thickness and Beryllium window makes it an ideal tool for direct measurement of x-ray emitters. The SX-2R instrument is a probe of choice for Homeland Security application since it is able to detect most contaminations (including alpha and beta) based on x-ray emission. It is also very useful for precise X-ray leakage monitoring on accelerators, X-ray generators and containers.

The SX-2R unit is part of the Canberra™ SMART Probe (CSP) family. It includes all key components of hardware circuitry (high voltage power supply, amplifier, discriminator, etc.). Also, the intelligence associated with controlling those components is located in the probe – that is control and storage of key parameters, settings, calibrations, probe ID, alarm settings (10 values for each unit to display with default setting), etc. Thus the probe is a fully integrated subsystem taking and transmitting the measurement to the instrument, which is used for display.

With high voltage and digitization of the data occurring in the probe rather than the instrument, measurement quality is no longer dependent on external device quality (cable, host instrument). Moreover, a CSP probe is using a serial protocol to communicate with host, which can be an instrument or a PC.

Calibration and QA measurements can be performed directly with the probe, without using an instrument, by connecting the probe to a computer with Canberra Smart Probe Software (CSPS™), allowing your instruments to remain deployed in the field. Once calibrated, the SX-2R probe is ready to be used as a plug and play probe to start a QA measurement in CPM, DPM, DPM/100cm^2 or c/s, Bq, Bq/cm^2. The SX-2R probe connects to a survey meter via a 1.5 meter or 20 meter CSP cable.

A push-button located on the probe housing triggers an energy threshold. When depressed and held, an LED is activated and the probe measures only X-rays below the preset threshold. It is a powerful feature to reduce influence coming from gamma of higher energy and to improve the x-ray MDA. Energy threshold is set with through the CSPS platform and a PC.

FEATURES

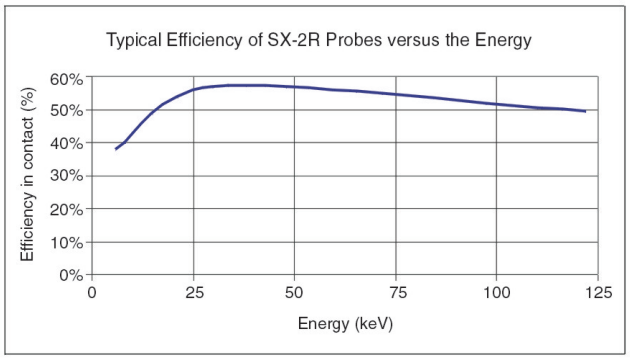
- X-ray and gamma measurement
- Low energy starting from 5 keV
- Belongs to CSP™ family
- Calibration via PC
- Ideal for Homeland Security applications
- Dynamic energy discriminator button

SX-2R™ X-RAY PROBE

The SX-2R probe includes a plastic protective cap that is very easy to remove to take measurements and helps ensure that the beryllium window stays in good shape during transportation.

The SX-2R probe is able to store up to 1000 data points from a data-logging procedure handled via the host instrument. These data are: Index, date/time, measurement value, selected unit and counting time.

The SX-2R probe can be upgraded (probe's firmware) via CSPS software, a USB cable and a PC.



Response of SX-2R Probes versus the Energy.

NUCLEAR CHARACTERISTICS

- Display units: depending on survey meter (c/s, Bq, Bq/cm^2 or CPM, DPM, DPM/100 cm^2)
- Emitters: X-ray and low energy Gamma
- Detector: NaI(Tl) 1.5 in. (38 mm) dia x 3 mm
  - Detection area: 8 cm^2
  - Beryllium entrance window 37 mg/cm^2, thickness: 0.2 mm
- Measurement range: 0 to 10 000 c/s, 0 to 600 kcpm. Activity equivalent range depends on calibration emitter. Conversion coefficient is factory set with ^{129}I
- Dead time: 50 µs
- Energy range: 5 keV to 200 keV
- Gamma sensitivity for ^{137}Cs: 160 c/s per µGy/h (96 kcpm per mR/h)
- Background: ambient ≤ 100 nSv/h (10 µR/h): < 12 c/s (< 720 cpm)

ERGONOMIC CHARACTERISTICS

- Display: provided by survey meter
- Alarm setpoints: 10 values for each unit to display. Saved in probe memory. They can be edited through the CSPS platform and PC Default alarm threshold is chosen in a list by use of survey meter keypad.

ELECTRICAL CHARACTERISTICS

- Power: supplied by survey meter (low voltage only)
- Battery life: does not reduce survey meter's battery life
- Consumption: 15 mA maximum

ENVIRONMENTAL CHARACTERISTICS

- Temperature: -10 °C to +50 °C (+14 °F to +122 °F)
- Relative humidity: 40% to 85% at 35 °C – IP40
- Cleaning: housing easy to decontaminate

MECHANICAL CHARACTERISTICS

- Housing: painted aluminum
- Dimensions: length (with connector) x diameter:225 x 59 mm (8.9 x 2.3 in.)
- Weight: 590 g (21 oz) without cable

NORMS

- CEM: conform
- CE: meets CE requirements

ORDERING REFERENCES

- SX-2R unit: NOM006290 (EM78627)
- CSP cable (1.5 m length): NOM006282 (EM77336)
- CSP cable (20 m length): NOM006300 (EM80653)
- Carrying case for Radiagem™ Emergency Response Kit: NOM006277 (EM76287)
- CSP-PC USB cable: NOM006288 (EM78466)
- CSPS calibration/setup software:
  - CSPS-F: NOM006289 (EM78468)
  - CSPS-R: NOM006298 (EM80642)
  - CSPS-E: NOM006299 (EM80643)

Detection efficiencies and MDAs with 100 cm^2 ISO 8769 source in contact with probe

Nuclide	Emitter	Typical efficiency over 2π (%)	Guaranteed efficiency over 2π (%)	Response to activity (c/s)/Bq	MDA (Bq)
^{129}I	X-Ray	57	51	0.14	24

MDA: Background = 10 c/s measured during 100 s in a 0.1 µGy/h ambience. Measuring time on source = 10 s Statistic: false alarm = 5% and non-detection = 5%.

MIRION TECHNOLOGIES

MIRION TECHNOLOGIES

iPIX™

Ultra Portable Gamma-Ray Imaging System

iPIX instrument is a unique gamma imager that quickly locates and identifies low level radioactive sources from a distance while estimating the dose rate at the measurement point in real time.

DESCRIPTION

It is the ideal tool to map a radioactive area before entering the zone, thus reducing the dose exposure (ALARA) during standard operation or decommissioning.

iPIX imager is also the appropriate instrument to detect any suspicious radioactivity in security and safeguard applications, as well as for emergency situations such as Fukushima.

iPIX instrument can be complemented with options that connect directly on its back panel requiring no additon cable to the remote computer.

RELATED PRODUCTS

- Flashlight and handle
- iPIX-NID (Nuclide Identification)
- Automatic laser meter
- Motorized tripod including New Pan & Tilt, tripod cable and case for remote operations and panoramic automatic mode

FEATURES

- ✓ Complete tool for in situ gamma imaging, saving time, cost and dose
- ✓ Real-time acquisition and immediate display
- ✓ Very lightweight 2.5 kg
- ✓ Excellent spatial resolution for localization of gamma-ray emitters
- ✓ High detection sensitivity even at low energies
- ✓ IP65 rated, fully decontaminable
- ✓ Battery, PoE or AC powered
- ✓ Remote control and operation
- ✓ Single Ethernet cable between tablet PC and camera (up to 80 m long)

IPIX™ ULTRA PORTABLE GAMMA-RAY IMAGING SYSTEM

PHYSICAL CHARACTERISTICS

- **Energy range – 30 keV to 1332 keV**
  - Pixelized CdTe detector with 256x256 acquisition matrix
- **Detector sensitivity**
  - Less than 30 seconds to detect Am-241 generating 25 nSv/h incremental dose-rate above background at iPIX position
  - Less than 30 seconds to detect Cs-137 generating 2 µSv/h incremental dose-rate above background at iPIX position.
- **Field of view**
  - 48.8° with rank 13/2 mm thickness blue mask
  - 46.4° with rank 7/4 mm thickness yellow mask
  - 41.4° with rank 7/8 mm thickness red mask
- **Spatial resolution**
  - 2.5° with rank 13/2 mm thickness blue mask
  - 6.0° with rank 7/4 mm thickness yellow mask
  - 5.0° with rank 7/8 mm thickness red mask
- **Maximum dose rate (Cs-137)**
  - Performance linear up to 10 Sv/h (1000 R/h)
  - Battery life – up to 4 hours per replaceable batteries

ENVIRONMENTAL CHARACTERISTICS

- **Shocks**
  - Resist to 60 cm/2 ft vertical drop
- **Vibrations**
  - 2 g between 10 Hz and 33 Hz during 15 minutes
- **Operating temperature**
  - -10 °C to 45 °C (14 °F to 113 °F)
- **Humidity**
  - 0 to 93% at 35 °C
- **IP65**

- **Dimensions and weight**
  - 2.5 kg (6.2 lb) with battery
  - Length – 188.5 mm (7.4 in)
  - Height – 90 mm (3.5 in)
  - Width – 90 mm (3.5 in)
- **Power supply – choice of:**
  - Direct power supply 90-260 V, 47-63 Hz
  - Rechargeable battery
  - Power over Ethernet (POE)
- **Communication 10/100 Mbps Ethernet**

FUNCTIONAL CHARACTERISTICS

- **Functional system includes:**
  - Real-time portable gamma-ray imaging system
  - Mask #2 yellow (rank 7/4 mm thick) for medium-low energies and background < 10 µSv/h
  - 2 m (6 ft) and 10 m (32 ft) Ethernet cables
  - Software
  - Fully rugged convertible notebook
  - Manual tripod
  - Dedicated transport case
  - USB key
  - Bumpers and handle
  - User manual
  - Power cables

- **Computer**
  - Standard software – Based on Windows 64-bit operating system
  - Data recording – Gamma/video images may be stored on disk, printed or transferred via a network
  - AC adapter (90 W, 100-240 V ac, 50/60 Hz)

IPIX™ ULTRA PORTABLE GAMMA-RAY IMAGING SYSTEM

DESCRIPTION

iPIX instrument is a real-time ultra-portable gammaray imaging system mostly designed for in situ gamma measurements to locate radioactivity at nuclear sites. When planning for maintenance or decommissioning operations, it can be used to provide radiation intensity maps of the area.

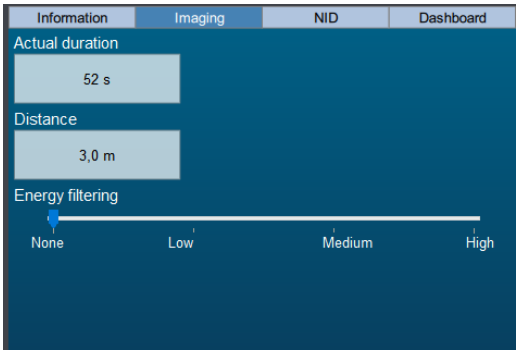
During radiological accidents, reactor outages or even routine area surveys where radiological conditions are subject to change (e.g., near piping), iPIX imager can help find radiological hot spot locations and quickly determine the boundaries of contaminated areas.

iPIX instrument requires very little shielding while maintaining an excellent signal-to-noise ratio, thanks to the rotating coded mask able to subtract background in the field of view. This translates into a lightweight device with a compact design that can easily be deployed and transported in the field.

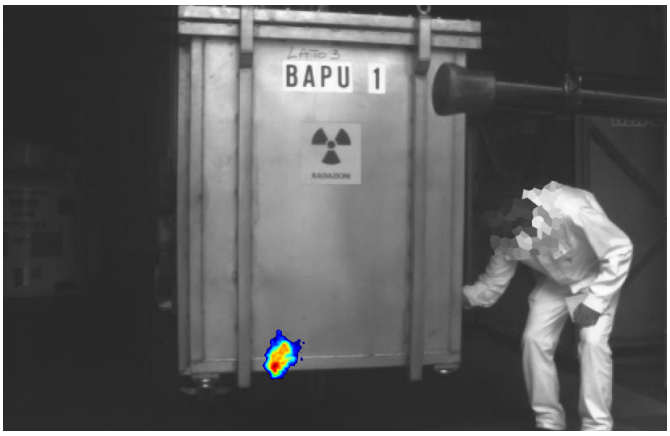
The camera can be installed on a standard or motorized tripod that allows remote positioning of the iPIX imager to focus on the area of interest.

iPIX software includes a 3-Band energy discriminator that can be used in re-processing mode to generate focused imaging and differentiate energies related to multiple hot spots.

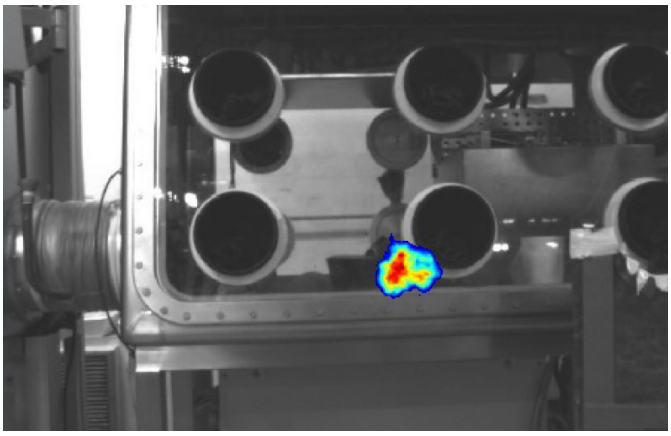
This greatly helps to position adequately bio protection with just the necessary quantity and where it is really needed minimizing the overall preparation workload.



EXAMPLES OF REAL LIFE APPLICATIONS WITH IPIX IMAGER

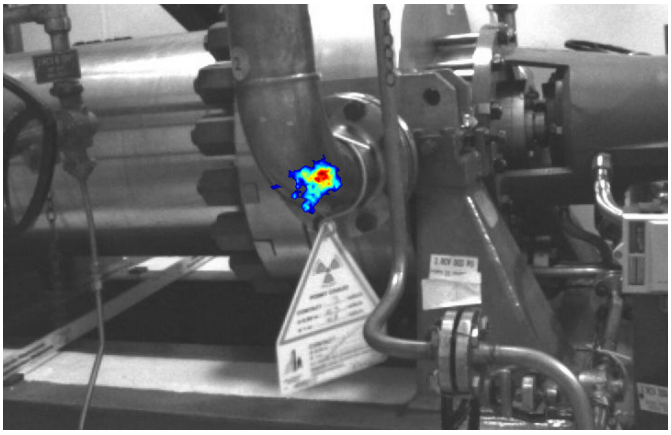


Container contamination check



Contamination check on glove box

Hot spot localization on drums



Hot spot detected while surveying piping

IPIX™ ULTRA PORTABLE GAMMA-RAY IMAGING SYSTEM

OPTIONS AND ACCESSORIES

ADDITIONAL MASKS

Mask #1 - Blue, rank 13 / 2 mm thick for very low energies and low background < 500 nSv/h

Mask #3 - Red, rank 7 / 8 mm thick for high energies and background > 10 µSv/h

ADDITIONAL CABLES

Ethernet cable: 50 m (160 ft) or 80 m (256 ft) on a reel

ADDITIONAL RECHARGEABLE BATTERY FOR IPIX IMAGER

Provides additional 4 hours battery life per battery

AUTOMATIC LASER METER

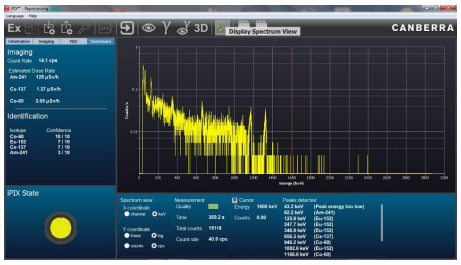
Add-on industrial meter that measures distances from 0.5 to 10 meters with 0.1 meter accuracy. It automatically feeds the software with distance between measured object and camera. It is either permanently attached to side of iPIX imager or temporarily clipped via accessories plate with iPIX-NID.

- Operating temperature: -10 °C to +50 °C
- IP65
- Weight: 400 g or 510 g depending on mounting system

IPIX-NID (NUCLIDE IDENTIFICATION)

It consists of a 1 cc CZT with DENAL open collimator that mimics iPIX Field of View. iPIX-NID is fixed and secured to iPIX imager via accessories plate without the need of any tool. Thus, it can be used only when necessary and it facilitates transport to location of use.

It communicates via iPIX back panel and provides the user with a comprehensive list of identified radionuclides with a level of confidence. Software integrates a dedicated window that displays the spectrum for users who require a bit more than a simple NID list. Radionuclides libraries can be edited to define appropriate list toward application to serve.



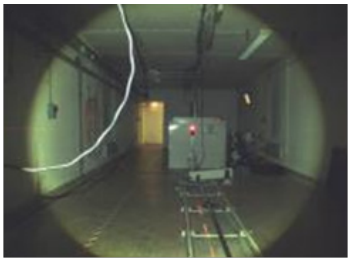
IPIX-NID (NUCLIDE IDENTIFICATION)

- Detector:
  - CZT 10x10x10 mm with 30 keV to 3.0 MeV energy range
  - Resolution: < 2.5% FWHM at 662 keV
  - Maximum throughput: 30,000 c/s
  - Channel number: 4096
  - Differential non linearity: < +/-1%
- Operating temperature: 0 °C to +40 °C with slightly degraded performances in -10 °C to 0 °C range
- IP54
- Weight: 2.5 kg

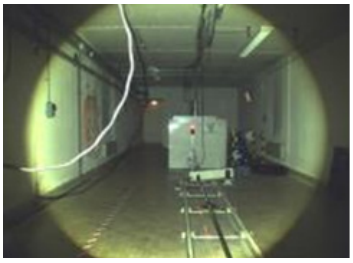
FLASHLIGHT & HANDLE

Handle is mounted on accessories plate and helps to carry iPIX imager with iPIX-NID and accessories. Flashlight is mounted on handle. It is self-powered with four AAA alkaline batteries or NiMH rechargeable batteries. It supports acquisitions in dark areas with two modes: ECO (250 lm – 220 meters) and POWER (450 lm – 300 meters)

- Operating temperature: -20 °C to +40 °C with slightly degraded performances in -10 °C to 0 °C range
- IPX4
- Weight: 175 g with batteries



ECO mode



Full power

Flashlight & handle

NEW PAN & TILT

Able to support additional iPIX-NID weight

Mandatory for Panoramic mode in which user can simply select the range of angle needed for imaging coverage and iPIX software automatically defines acquisition steps to ensure good overlap between each measurement.

IPIX™ ULTRA PORTABLE GAMMA-RAY IMAGING SYSTEM

ORDERING REFERENCES

- **Base models**
  - EM106849: iPIX KIT (French)
  - EM106850: iPIX KIT (Europe)
  - EM106851: iPIX KIT (USA)
  - EM106852: iPIX KIT (UK)

- **Includes**
  - Real-time portable gamma-ray imaging system
  - Mask #2 (rank 7/4 mm thick)
  - 2 m (6 ft) and 10 m (32 ft) Ethernet cables
  - Software
  - Fully rugged convertible notebook
  - Manual Tripod
  - Dedicated transport case
  - USB key
  - Bumpers and handle
  - User manual
  - Power cables

iPIX-NID full option

- **Options and Accessories**
  - EM96796: mask #1, rank 13/2 mm thick for low energies
  - EM96798: mask #3, rank 7/8 mm thick for high energies
  - EM96797: mask #2, rank 7/4 mm thick for low-medium energies
  - EM107723: iPIX-POE injector for Europe
  - EM107724: iPIX-POE injector for UK
  - EM107725: iPIX-POE injector for US
  - EM98505: 50 m (160 ft) Ethernet cable
  - EM98504: 80 m (256 ft) Ethernet cable
  - EM106383: motorized tripod including Pan & Tilt, tripod, cable and case for Europe
  - EM107810: motorized tripod including Pan & Tilt, tripod, cable and case for UK
  - EM107809: motorized tripod including Pan & Tilt, tripod, cable and case for US
  - EM106384: iPIX-NID including Collimated CZT detector, iPIX-Rugged-Handle, accessories plate, cables and case
  - EM106385: iPIX-Rugged-Handle
  - EM106386: iPIX-Flashlight
  - EM106387: iPIX-Laser meter including iPIX adaptor jig
  - EM106848: iPIX-Laser meter-NID including iPIX-NID adaptor jig
  - EM95555: additional battery for iPIX imager

MIRION TECHNOLOGIES

MIRION
TECHNOLOGIES

Contamination and Clearance Monitors

MIRION
TECHNOLOGIES

PREVENTION

GEM™-5

Gamma Exit Monitor

DESCRIPTION

The Mirion highly sensitive GEM-5 gamma exit monitor provides power plants and nuclear facilities the very latest gamma detection capability to monitor pedestrians leaving areas of potential radioactive contamination. Operation of the monitor is straightforward and reliability is assured with both audible and visual aids to support monitoring activities. The easy to see color LCD screen provides visual cues and readily displays contaminated areas. Additionally, users are guided through the monitor with a voice annunciator, which provides clear voice prompts necessary for dependable unassisted operation during normal conditions. With Mirion WebRemote® software, easy-to-use touch screen graphical user interface for industrial PC-based operation results in improved health physics programs, better tracking of contamination and faster, more thorough personnel throughput at boundary points.

Access to the installed computer is through a single convenient panel on the front of the monitor. The computer includes built in USB and LAN ports, and is located inside a lockable door.

The GEM-5 is rugged, reliable and extremely easy to use.

OVERVIEW

The monitor is designed to be operated in one of three different modes depending upon the level of detection capability needed.

These are:

1. Walkthrough (monitor determines MDA based on user settable parameters).
2. Pause-and-count (enter the monitor, wait for a length of time specified by the user, then exit).
3. Two-step (stand facing the detectors for a short period (time user settable or calculated by monitor), turn 180° and repeat count, then exit).

The contamination level at which the monitor can be set to accurately alarm is different for each of these modes.

The sensitivity will differ depending upon the radionuclides, background and count times.

FEATURES

- ✓ Rugged and reliable for high traffic areas
- ✓ "Best in Industry" sensitivity
  - ✓ Eight identical large plastic scintillators
  - ✓ Three per side
  - ✓ One top/bottom
- ✓ 25 mm (1 in.) side detector lead shielding standard
  - ✓ Lead is provided as epoxy coated ingots for easy field installation and improved safety
- ✓ Optional 25 mm (1 in.) of additional lead available for side panels (can be added integral to the unit, no exterior attachments needed) for higher background conditions. Optional top and bottom detector lead kits in 25 mm (1 in.) increments are available for a total of 50 mm (2 in.) of added lead
- ✓ WebRemote enabled: provides an ergonomic and easy-to-use touch screen graphical user interface; accessible locally or via PC /tablet web browser
- ✓ Windows 7 10 IoT operating system with LAN capability and USB ports
- ✓ Same "industry-best" software and serial bus electronics as the Mirion Argos™-3/5, Sirius™-5 and Cronos®-1/4/11 monitor families no re-training needed
- ✓ Sophisticated "fast following" background trending and release-limit algorithm provides the best possible performance in any type of radiation field
- ✓ Fully compliant with IEC61098 Standard requirements
- ✓ Algorithm based on Gaussian or Bayesian statistics (compliant with the ISO 11929:2019 Standard requirements)

SETTING PARAMETERS

Parameter settings, testing, calibration and maintenance is accomplished locally or from a remote location using Mirion WebRemote. WebRemote enables tablet or PC connection to the GEM-5 via LAN or direct link.

Alternatively, the operator can use the standard monitor software, pre-installed on all GEM-5 contamination monitors, to provide local monitor access and functionality.

The following types of parameters are available for adjustment:

- Sensitivity of detection by zone
- Gamma alarm activity levels set in units of Bq, Bq/cm^2, dpm, dpm/cm^2, nCi, nCi/cm^2, pCi, pCi/cm2, µCi or µCi/cm^2
- False alarm non-detection and alarm confidence probabilities
- HV Optimization using Figure-of-Merit (FOM) calculations
- Fixed or variable count times (calculated and optimized as a function of the alarm level set, the background and the desired accuracy of measurement)

MONITORING ASSISTANCE VIA USER INTERFACE

Indicator lights at the entry show the monitor is ready to use. While the occupant is being monitored, messages and a countdown are given both on the LCD screen and audibly (multiple languages are available). Verification of proper occupant positioning is ensured with the help of infrared sensors. All positioning sensors are non-mechanical solid state types for enhanced reliability. Visible and audible alarms are given if contamination is detected. The display shows the type (gamma), the quantity and the location (alarming detector flashing on a figure). The system records data and date/time stamped logs showing the number of times the unit was used, parameters used, calibration settings, fault messages etc.

Up to four contact closure relays are available for remote signaling of the monitor's status (e.g. "In Operation", "Contaminated", "Clean", "Fault" etc. or some combinations there of).

MAINTENANCE

The GEM-5 monitors were engineered to simplify maintenance with easy access to the unit; as well as easy replacement and repair of the detectors.

For ease of diagnostics, numerous test screens are available to enable precision monitoring, and changing of parameters including high voltage and discrimination thresholds for each detector. To provide further assistance rate meters show counts seen by each detector in real-time.

Calibration of all detectors and alarm testing can each be done in less than ten minutes.

REMOTE STATUS MONITORING

A user friendly dashboard enables the status monitoring (in service, contaminated, out of service, maintenance) of multiple contamination monitors over the LAN. The dashboard is accessible from a tablet or PC web browser and requires no proprietary software installation.

SPECIFICATIONS

PARAMETER ENTRY

- Parameters may be entered with the touch of a finger using the capability of the built-in touch screen and WebRemote software. Additionally, a USB connected keyboard/mouse may be used to enter parameters.

SENSITIVITY

- The unit will detect a point source located anywhere on the monitored person, in a standard background of 80 nGy/h (8 µrad/h), using the following modes:
- Walkthrough: 830 Bq (22.5 nCi) ^{60}Co; 1850 Bq (50 nCi) ^{137}Cs
- Pause (4 s) and Count: 555 Bq (15 nCi) ^{60}Co; 830 Bq (22.5 nCi) ^{137}Cs
- Two-Step: 370 Bq (10 nCi) ^{60}Co, 8 s; 370 Bq (10 nCi) ^{137}Cs, 18 s

DETECTORS

- Configuration: Eight identical plastic scintillators; 24 sum zones
- Total scintillator volume: 86 196 cm^3; (5260 in^3)
- Total scintillator surface area: (16 968 cm^2; 2630 in^2)

ELECTRONICS

- The High Voltage (HV), preamplification, amplification, discrimination, counting, test pulse generation and other processing electronics are mounted right on the detectors. The cables between the detectors and computer are all direct current and low voltage.

EFFICIENCIES

- Typical 4π efficiency, rounded to the nearest whole number, measured with a point source placed in the center of the detector 50 mm (2 in.) from the surface and optimized using a 137Cs source and the standard Figure-of-Merit (FOM) technique for reducing signal-to-noise ratios.

Isotope	Efficiency
^{60}Co (Gamma)	24%
^{37}Cs (Gamma)	12%

PHYSICAL

- The cabinet is steel, with a rugged powder coat finish. The thin aluminum cover in front of each detector provides both protection and sensitivity.

DIMENSIONS:

- Exterior: 224.8 x 88.9 x 76.2 cm (88.4 x 35 x 30 in.) (H x W x D)
- Portal opening: 205.4 x 61.0 x 76.2 cm (80.9 x 24 x 30 in.) (H x W x D)

WEIGHT:

- Weight without lead installed: 452.5 kg (995 lb)
- Weight with one layer of side detector lead shielding installed: 975 kg (2145 lb)
- Weight with two layers of side detector lead shielding installed: 1497.5 kg (3295 lb)

COMPUTER:

- The GEM-5 computer operates on Windows 10 IoT Operating System and uses USB flash for transferring data. Data may be retrieved either via USB or a LAN
- High-quality digitized sound for prompts, with dual speakers

DISPLAY SCREEN:

- ~23.4 cm (10.4 in) touch screen LCD display, integrated onto top of unit

CERTIFICATION

- IEC 61098 compliant
- ISO 11929:2019 compliant

ENVIRONMENTAL

- Temperature range: operating (meets IEC61098): 0 to 40 °C (32 to 104 °F)
- Temperature range: storage: 0 to 50 °C (32 to 122 °F)
- Relative humidity: Operating (per IEC61098): ≤85% non-condensing at 35 °C (95 °F) maximum
- Relative humidity: storage: ≤95% non-condensing

POLLUTION DEGREE

- Mirion contamination monitors are designed for Pollution Degree 2 (IEC 664-1) and are intended for indoor use only

OVERVOLTAGE CATEGORY

- Mirion contamination monitors are designed for Overvoltage Category II (IEC 664-1)

INGRESS PROTECTION

- Mirion contamination monitors are designed to meet the IP30 rating standard

POWER

- Power requirements: 220 V ac/50 Hz/ 1.0 A or 110 V ac/60 Hz/2.0 A mains 3 m (~10 ft) IEC standard cable (supplied; specify voltage and any special cable requirements on order; contact local Mirion affiliate for further information)
- Power Consumption: standard: 110 VA and With Door /Barrier options: 200 VA (If installed)

AVAILABLE ON REQUEST

- Remote annunciators or beacons
- Custom personnel traffic barriers and/or doors (manual or electric)
- External uninterruptible power supply
- Choice of four different inner widths
- Access ramps
- Top and/or Bottom Detector Shielding available (using 25 mm (1 in) lead ingots)
- Second layer of 25 mm (1 in) lead ingots
- Shadow shielding kit with 25 mm (1 in) lead ingots
- Consult the Contamination Monitor Configuration Guide for additional options that will enhance the use of the GEM-5 system.

USER BADGE/BAR CODE IDENTIFICATION

- User identification is available using industry standard card readers to provide employee ID for the health physics database. Magnetic stripe card readers, bar code readers or proximity badges are available.

LOCAL DATABASE SUPPORT OPTION (SOFT-LDB)

- The Local Database Option facilitates quick monitoring of the effectiveness of your contamination control programs. See separate specification sheet for full details.

ORDERING INFORMATION

Part Number	Description: Monitors
816002	GEM-5, Gamma Exit Monitor, 1” Pb, Serial, 61 cm (24”) inner width.
GEM-5M	GEM-5, Gamma Exit Monitor, 1” Pb, PC-side access doors.
7063219	GEM-5W80, Gamma Exit Monitor, 80 cm inner width.
GEM-5W93	GEM-5W93, Gamma Exit Monitor, 1” Pb, 93 cm inner width.
GEM-5W100	GEM-5W100, Gamma Exit Monitor, 1” Pb, 1 m inner width.
7061572	GEM-5 SIMULATOR.

OPTIONS: Factory installation of these options represents the best value for the customer

Part Number	Description
WebRemote-Kit#Y	WebRemote Software and Rugged / Pro / Basic Hardware. FOR Rugged Y=1; FOR Pro Y=2; FOR Basic Y=3.
7062157	MAGNETIC CARD READER FOR ARGOS, GEM & CRONOS.
816100	BARCODE READER FOR ARGOS, GEM & CRONOS.
7062147	PROXIMITY READER FOR ARGOS, GEM & CRONOS.
816174	GEM-5 MANUAL SWING RETURN DOOR.
GEM5-ADX	GEM-5 AUTOSWING DOOR; EXIT ONLY.
816161	ELECTRICAL BARRIER; ENTRY/EXIT, GEM-5.
GEM5-NF	GEM-5NF, GEM5 NO FLOOR OPT., 7 DETECTORS.
GEM5-BECL	GEM5 TOP BEACON, LIGHT ONLY.
GEM5-BECS	GEM5BECS, GEM5 TOP BEACON, LIGHT/SOUNDER.
7062269	GEM5-IPCAM212, IP CAMERA KIT FOR GEM-5.
SOFT-LDB	Loc.Database Support;Factory Installed.

OPTIONS: Can be ordered any time

Part Number	Description
201240	USB KEYBOARD/TOUCHPAD FOR ARGOS, SIRIUS & GEM-5.
816032	GEM5RP61-80, SET OF EXIT/ENTRANCE RAMPS.
816087	TOP PAN/EXTRA LEAD KIT FOR GEM-5.
GEM5-RP100	GEM5RP100, SET OF ENTRY/EXIT RAMPS 100 cm.
GEM5-PbTOP100	Top PAN/EXTRA LEAD KIT, GEM-5W100.
GEM5-PbTOP93	Top PAN/EXTRA LEAD KIT, GEM-5W93.
GEM5-PbTOP80	Top PAN/EXTRA LEAD KIT, GEM-5W80.
7062330	BOTTOM EXTRA LEAD KIT, GEM-5.
GEM5-2Pb	2nd Layer of 1” Lead Shielding for GEM-5.
816153	SHADOW SHIELD KIT FOR GEM-5.
81614	GEM5CJIG, GEM-5 CALIBRATION JIG.
7063341	GEM-5 WOOD SHIPPING CRATE.
GEM5-CRATE	GEM-5 WOOD SHIPPING CRATE, REUSABLE.
SOFT-CREMOTE	CRemote, Remote Control Data Access LAN SW.
7062263	CRemote, Remote Data Access LAN SW – Additional License.
SOFT-LDB-KIT	Loc.Database Support;Field Install. Kit
SOFT-LDB-KITPC-G	Loc.Datab.Supp.;Field Inst.Kit w/PC;-GEM5.PC;GEM5.

MIRION TECHNOLOGIES

MIRION TECHNOLOGIES

MONITORING

Argos™ PAB

Whole Body Contamination Monitors

Argos TPS Family: Argos “PAB” Monitors for α/β Detection

The Mirion Argos-PAB family of Whole Body Surface Contamination Monitors provides the ultimate user-friendly operation with thorough and reliable detection of external contamination on personnel working in nuclear environments. The Argos-5 PAB and Argos-3 PAB monitors feature our most advanced gasless, Thin Plastic Scintillator (TPS) detectors optimized for the best possible alpha /beta response (along with minimizing the gamma response).

Until recently, the elimination of counting gas has been the only advantage of using plastic scintillation detectors over traditional gas flow detectors in whole body monitors. The sacrifice for this advantage was in detector performance (low efficiency, bad uniformity) leading to longer count times. Mirion has successfully addressed the challenges of this gasless detector technology, minimizing the trade-off between operating costs and performance.

FEATURES

- The first gasless alpha/beta Whole Body Contamination Monitor
- Fast personnel throughput with exceptional coverage due to optimized counting geometry and shielding
- The Argos-5PAB unit provides the ultimate in (two-step) contoured body coverage
- The Argos-3PAB unit provides contoured body coverage with strategic positioning of detectors in an economical configuration
- Alpha and Beta discrimination capability for unequivocal contamination status
- Space-saving design minimizes overall clearance requirements and enables easy maintenance access from front and side of the unit
- WebRemote® software enabled: ergonomic and easy-to-use touch screen graphical user interface; accessible locally or via PC/tablet web browser
- Windows 10 IoT operating system with LAN capability and USB ports
- Same “industry-best” software and serial bus electronics across the Mirion Argos-TPS/AB, Cronos®-1/4 /11, Sirius™-5 and GEM™-5 family; no re-training needed
- Compliant with IEC61098 Standard requirements
- Algorithm based on Gaussian or Bayesian statistics (compliant with the ISO 11929:2010 Standard requirements)

The Argos-3 /-5PAB gasless monitors offer the same industry-best contour geometry as the Argos-3 /-5AB gas flow monitors. The need for counting gas is eliminated by using scintillation detectors with an embedded PMT to minimize dead space between detectors. This arrangement provides optimal contour geometry and coverage for the occupant.

All Argos monitors use a sophisticated "fast following" background trending and release-limit algorithm to provide the best performance in a stable or varying radiation field.

Mirion WebRemote software, an easy-to-use touch screen graphical user interface for industrial PC-based operation, supports improved health physics programs, with better tracking of contamination and faster, more thorough personnel throughput at boundary points.

Excellent detector protection, modularity of components, and extensive diagnostics result in direct reductions in maintenance, repair, and operation costs.

OVERVIEW

The design of the TPS-AB-579 detectors, used in the Argos-PAB monitors, has been optimized to provide excellent signal-to-noise ratios and furthermore, the detection capability both across and along the detectors is extremely uniform. There is virtually zero edge effect degradation (typical non-uniformity of response is <1.20).

The Thin Plastic Scintillation detectors, TPS-AB-579, are identical in form factor to the gas flow detectors from the Argos-3 /-5AB family. Therefore, the current generation of Argos-3 /-5AB family can be field upgraded to the TPS-AB-579 detector technology*.

The TPS-AB-579 detectors are designed to operate without gas and their windows can be easily field repaired.

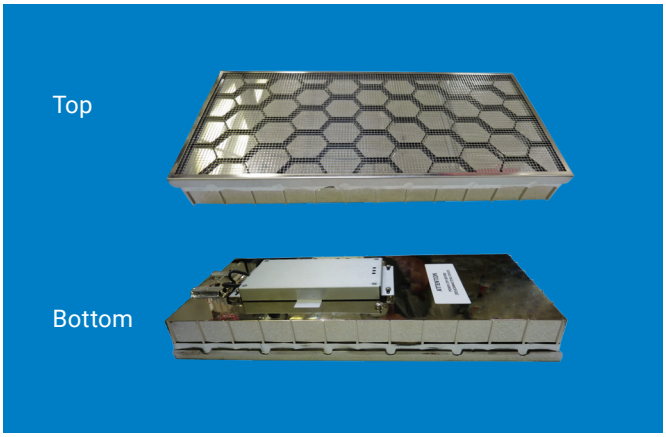
The overall benefit of Mirion detector geometry and detector design is that count times will be significantly reduced compared to other competitive systems.

Additionally, the radon progeny rejection feature of the software in Mirion Alpha/Beta contamination monitors is a useful tool to help reduce radon interference and minimize false alarms.

When gamma detection capability is needed, the Zeus™ option (consisting of a shadow shield and three large plastic scintillators) can be added to the Argos-PAB unit. There is no difference between the Zeus option for Argos-3 /-5 AB and Argos-3 /-5 PAB units.

BODY COVERAGE

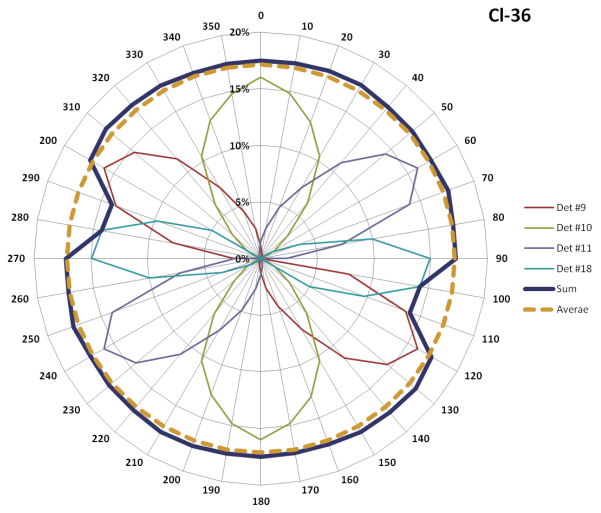
The Argos-5 detector design has been configured to contour the human body as closely as possible while paying particular attention to those parts of the body most likely to be contaminated. Gaps between detectors have been minimized. The benefit of this design is clearly shown by the horizontal scan on the next page.



The Argos-3PAB monitor provides the very best option for cost effective whole body coverage in the industry by encompassing all of the features of the Argos-5PAB unit but with fewer detectors (18 versus 25, respectively). The removed detectors are replaced by blank plates and have been strategically chosen to cover areas of the body least likely to be contaminated. This version provides the best value in a surface contamination monitor when budget is limited. The Argos-3PAB unit is upgradeable to the Argos-5PAB unit by simply installing additional detectors.

*Applies to Argos-3/-5AB units manufactured since February 2008 (contact factory to confirm)

The following scan was done in accordance with the IEC 61098 Standard, which specifies a ^{36}Cl source moved around a phantom positioned 5 cm uniform from the front detector. It shows how uniform the body coverage is when compared to the scans published in the literature of competitive monitors.



Argos-3/-5PAB Horizontal Scan Efficiency for ^{36}Cl,
IEC 61098 Phantom test 5 cm from center detector.

ELECTRONICS

The Argos-PAB computer operates on Windows 10 IoT Operating System and uses USB flash for transferring data. Data may be retrieved either via USB or a LAN.

The High Voltage (HV), preamplification, amplification, discrimination, counting, test pulse generation and other processing electronics are mounted right on the detectors. The cables between the detectors and computer are all direct current and low voltage.

SETTING PARAMETERS

Parameter settings, testing, calibration and maintenance functions are accomplished locally or from a remote location using Mirion WebRemote software. The WebRemote software enables Tablet or PC connection to the Argos-PAB monitor via LAN or direct link.

Alternatively, the operator can use the standard Monitor Software, pre-installed on all Argos-PAB Contamination Monitors, to provide local Monitor access and functionality.

The following types of parameters are available for adjustment:

- Sensitivity of detection by detector and/or detection zone.
- Alpha, Beta, and Gamma alarm activity levels can be set in units of Bq, Bq/cm^2, dpm, dpm/cm^2, µCi, µCi/cm^2, nCi, nCi/cm^2, pCi, pCi/cm^2.
- False alarm and alarm confidence probability.
- HV Optimization using Figure-of-Merit calculations.
- Fixed or variable count times (calculated and optimized as a function of the alarm level setpoint, local background levels and desired accuracy of measurement).

GAMMA DETECTION (ZEUS) OPTION

- The Zeus option adds full gamma detection capability
- Three large plastic scintillators monitor body contamination
- Smaller scintillator monitors the head
- Scintillators are shielded with 10 mm (~0.4 in.) of lead
- A 25 mm (~1.0 in.) lead curtain minimizes selfshielding effects

Zeus gamma detectors

Argos monitor with Zeus option

OTHER OPTIONS

Consult the Mirion Contamination Monitor Configuration Guide for details of options that will enhance the use of this monitor.

MONITORING ASSISTANCE VIA USER INTERFACE

Indicator lights at the entry show when the monitor is ready to use. While the occupant is being monitored, messages and a countdown are delivered audibly (multiple languages are available) and visually on the LCD screen.

Occupant positioning is verified and corrected with the aid of photoelectric sensors, visual messages and voice prompts.

Visible and audible alarms are given if contamination is detected. A “CONTAMINATED” result is shown on a large color LCD display with voice reinforcement and an LED lights up beside each contaminated detector.

The display shows the type (alpha, beta or gamma if applicable), the quantity and the location of the contamination based on which detector(s) is alarming. The system records data and date/time stamped logs showing the number of times the unit was used, parameters used, calibration settings, fault messages, etc.

Up to four contact closure relays are available for remote signaling of the monitor’s status (e.g. “In Operation”, “Contaminated”, “Clean”, “Fault”, etc.).

REMOTE STATUS MONITORING

A user friendly dashboard enables status monitoring (in service, contaminated, out of service, maintenance) of multiple contamination monitors over the LAN. The dashboard is accessible from a tablet or PC web browser and requires no proprietary software installation.

MAINTENANCE

The Argos family of Whole Body Surface Contamination Monitors simplify maintenance with easy access from front and center of the unit; as well as easy replacement and repair of detectors.

A separate LED on each detector shows which detector is alarming and/or being addressed on the LCD screen.

For ease of diagnostics, numerous test screens are available to enable precision monitoring and changing of parameters including high voltage and discrimination thresholds for each detector. To provide further assistance, rate meters show counts seen by each detector in real-time.

Calibration and alarm testing of all detectors can be done in less than 30 minutes. It can be easily executed by just one person and is highly automated.

EFFICIENCY

Typical 4π efficiency, rounded to the nearest whole number, measured with a 10 cm x 10 cm plate source placed in the center of the detector and optimized using a ^{60}Co source and the standard Figure of Merit (FOM) technique for reducing signal-to-noise ratios. For comparison with instruments specifying 2π efficiency or % of emission surface rate, multiply the efficiencies shown below by 2.

Typical efficiencies	TPS-AB-579 detectors, on contact, with 0.25 mm fine mesh	TPS-AB-579 detectors, on contact, with 0.5 mm fine mesh	TPS-AB-579 detectors, on contact, with foot grill on 0.25 mm fine mesh
^{14}C (β)	2%	2%	1%
^{99}Tc (β)	10%	9%	6%
^{60}Co (β)	11%	10%	8%
^{137}Cs (β)	20%	18%	13%
^{36}Cl (β)	22%	20%	16%
^{90}Sr / ^{90}Y (β)	27%	25%	18%
^{241}Am (α)	14%	13%	7%
^{235}U (α)	11%	10%	4%
^{239}Pu (α)	12%	11%	6%

Typical 4π efficiency, rounded to the nearest whole number, measured with a point source placed in the center of the detector and optimized using a ^{137}Cs source and the standard Figure of Merit (FOM) technique for reducing signal-to-noise ratios (for Zeus option).

Isotope	Body Detector Efficiency at ~5 cm (2”) from fine mesh
^{60}Co (γ)	15%
^{137}Cs (γ)	7%

Plastic Scintillator Detectors	TPS
Quantity	Argos-5PAB unit: 25
Quantity	Argos-3PAB unit: 18
Type	Plastic Scintillation
Window (Note that the window assembly is field replaceable)	Multilayer Aluminized Mylar at 1.2 mg/cm^2
Radiation Monitored	Alpha/Beta

SPECIFICATIONS

Physical	Model	
	Argos-5PAB unit	Argos-5PAB Zeus
SIZE (w x h§ x d)*:	91.5 x 225.7 x 99.1 cm (36.0 x 88.9 x 39.0 in.)	91.5 x 225.7 x 104.3 cm (36.0 x 88.9 x 41.1 in.)
WEIGHT**:	333.3 kg (733.3 lb)	895.8 kg (1970.8 lb); add 528 kg (1161.6 lb) for removable lead brick ingots

§ ...feet fully extended add 6.8 cm (2.7 in.)
* ...Argos-3PAB and Argos-3PAB Zeus are the same size as their Argos-5 counterparts
** ...or less for Argos-3 configurations

ELECTRICAL
Power Requirements:

- 220 V ac/50 Hz/1.0 A or 110 V ac/60 Hz/2.0 A mains 3 m (~10 ft) IEC standard cable (supplied; specify voltage and any special cable requirements on order; contact local Mirion affiliate for further information)

CERTIFICATION

- IEC 61098 compliant
- ISO 11929:2012 compliant

ENVIRONMENTAL
Temperature Range:

- Operating (meets IEC61098): 0 – 40 °C (32–104 °F)
- Storage: 0 – 50 °C (32–122 °F)

Relative Humidity:

- Operating (per IEC61098): ≤85% non-condensing at 35 °C (95 °F) maximum
- Storage: 95% non-condensing

Power Consumption:

Model	Power Consumption
Argos-3PAB unit:	160 VA
Argos-5PAB unit:	170 VA
Argos-3/5 unit with Door/Barrier options*:	+90 VA

*If installed and applicable; add this value to the above numbers.

ORDERING INFORMATION

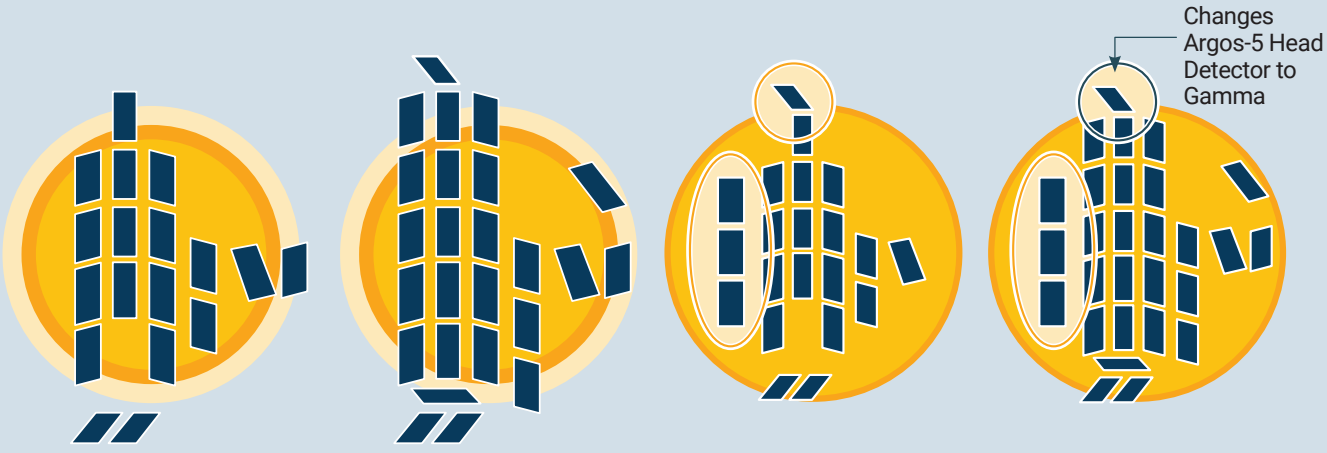
- Argos-3PAB unit: 2-Step Whole Body Mon. TPS-Alpha/Beta (18 detectors)
- Argos-5PAB unit: 2-Step Whole Body Mon. TPS-Alpha/Beta (25 detectors)
- 7062229: Zeus3G, Gamma Capability for Argos-3 unit
- 818002: Zeus5G, Gamma Capability for Argos-5 unit

OPTIONS

WebRemote-Kit Options (For Rugged, Y=1; For PRO Y=2; For Basic, Y=3)

- WebRemote-Kit#Y – WebRemote Software and Rugged/Pro/Basic Hardware
- The Mirion contamination monitors can be integrated with Horizon® Supervisory Software to provide an integrated solution with Mirion instruments. Horizon complements the functionality of the WebRemote Contamination Monitor Interface
- Consult the Mirion Contamination Monitor Configuration Guide for additional options that will enhance the use of this monitor

TYPICAL DETECTOR CONFIGURATION ARRANGEMENTS FOR ARGOS-3/-5PAB MONITORS



- Argos-3PAB Configuration
  18 Detectors
- Argos-5PAB Configuration
  25 Detectors
- Argos-3PAB Configuration with Zeus-3G Gamma capability added
- Argos-5PAB Configuration with Zeus-5G Gamma capability added

MIRION TECHNOLOGIES

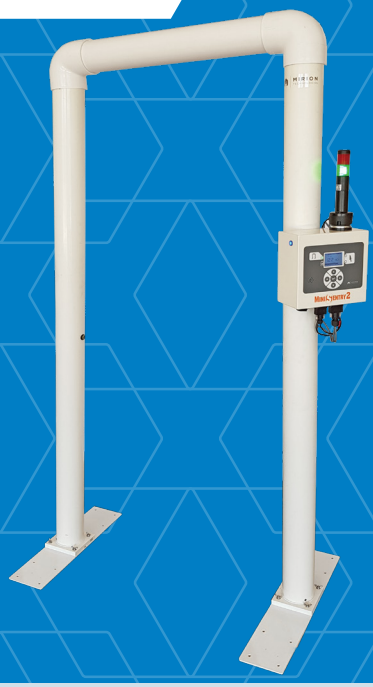
ISO 9001 SYSTEM CERTIFIED
MERIDEN CT
ATLANTA GA
OAK RIDGE TN
CONCORD ON

SPC-124-EN-A – 10/2023

MIRION TECHNOLOGIES

MiniSentry™2

Transportable Gamma Portal Monitor



DESCRIPTION

The MiniSentry 2 is a portal monitor for screening of pedestrians or vehicles for gamma radiation. It is designed to be quickly set up and operated with very little training or expertise in radiation detection technology. This portable system is well-suitable for emergency scenarios and security applications.

The monitor provides intuitive clean/contaminated status indication via the integrated LCD screen, LEDs, loud-speaker and an optional LED light tower. The modern firmware is simple to use and provides at the same time a comprehensive password protected expert settings menu. Three different measurement modes (walk-through, enter-wait, count-rate) are available to support various applications. All measurement data can be easily exported to a Microsoft Excel-readible *.csv files for further analysis.

The background is automatically subtracted and constantly monitored if the light barrier does not sense a person or vehicle occupying the portal. Emphasis has been placed on self-diagnostics both on start-up and during operation to guarantee correct operation.

The MiniSentry 2 is designed to meet the requirements of the US Federal Emergency Management Agency (FEMA-REP-21) as well as the IEC 62244:2021 standard.

FEATURES

QUICK AND EASY SETUP AND OPERATION

- Gamma portal monitor for rapid deployment and emergency response
- Quick and easy setup with automatic start-up and operation
- Simple clean/contaminated status indicator
- Very little training or expertise in radiation detection needed
- Weight less than 43 kg (95 lb)

FLEXIBLE SOLUTION

- Suitable for in- and outdoor operation in adverse weather conditions (IP54, -30°C to +55°C)
- Three different measurement modes available (walk-through, enter-wait, count-rate)
- Powered by battery (>65 hours autonomy1), USB or 100 - 240V
- Ready for connection of additional CSP probe (for example α/β frisker probe SAB100 or neutron probe SN-S)
- Many options and accessories available

STATE-OF-THE-ART RADIOLOGICAL PERFORMANCE

- Detection of 1 µCi 137Cs (according to FEMA-REP-21)
- Based on high sensitivity plastic scintillation detectors with 2x 5.3 litres active volume
- Wide energy range: 30 keV – 2 MeV

MINISENTRY™2 TRANSPORTABLE GAMMA PORTAL MONITOR

SPECIFICATIONS

RADIOLOGICAL

- Two 182.9 x 7.6 x 3.8 cm (72 x 3 x 1.5 in.) gamma plastic scintillation detectors.
  Total detector volume: 10.6 litres (648.1 $in.^3$)
- Detection performance exceeds FEMA-REP-21 and IEC 62244:2021
- **Minimum detectable activity:** <1 µCi Cs-137 at walking speed (in regular background of 100 nSv/h)
- **Energy range:** 30 keV to 2 MeV

MECHANICAL

- **Dimensions (H x W x D):** 216 x 112 x 45 cm (85 x 44 x 17.8 in.) assembled
- **Pedestrian internal opening:** 203 x 76 cm (80 x 30 in.)
- **Weight:** 43 kg (95 lb), heaviest component: 16 kg (35 lb)
- **Transport case:** hard transport case with wheels for easy storage and transportation.

FUNCTIONAL

- **Alarm indication:** green/red LED, LCD display and audible alarm (> 85 dB(A) at 30 cm, volume adjustable)
- **Measurement units:** cps, Bq, µCi, cpm, dpm
- **Measurement modes:** Walk-through, Enter-wait, Count-rate
- **Data export and import to USB stick:** export of measurement log files to Microsoft Excel-readible *.csv. Export and import of parameter settings.

ELECTRICAL

- **Battery:** Integrated rechargeable Li-ion battery 5300 mAh, 3.7V for approx. 13 h autonomous operation (depending on configuration). Built-in charger
- **Power Requirements:** 100 – 240 V or via USB (Type A) for continuous operation and charging of integrated battery
- **Occupancy sensor:** adjustable infrared light barrier

ENVIRONMENTAL

- **Water and dust:** IP54
- **Operating temperature:** –30°C to +55°C (–13 °F to 122 °F)
- Weather resistant for outdoor operation in adverse weather conditions

CONFIGURATION OPTIONS

- **Battery Extension Module**: Additional battery module to extend the time of autonomous operation to >65 hours.
- **Kit for Extended Passage Width:** Extends the passage width to 91.5 cm to allow for example the monitoring of persons in wheelchairs.
- **Vehicle Monitoring Kit:** This kit allows to extend the internal opening width of the MiniSentry 2 to 2.4 m. In this configuration the MiniSentry 2 is set-up without the top part of the monitor, and the two detector posts are free standing. A cable connection between the two detector posts is established for data transfer. The kit includes the required cable sets, cable protection and additional baseplates for the two detector posts.
- **Light tower:** Additional visual indication of contamination result in all directions by red/green lights.
- Connector for CSP probe: Adds a connector to the MiniSentry™ 2 to allow the connection of a CSP probe. Including mechanical holder for CSP probe.
- Any CSP probe, for example α/β frisker probe SAB-100 or neutron probe SN-S

CERTIFICATION AND COMPLIANCE CE

- Alignment: Line seems to start with a blank space
- Meets the requirements of the 1995 FEMA standard for portal monitors (FEMA-REP-21), “Contamination Monitoring Standard for a Portal Monitor Used for Radiological Emergency Response”
- Exceeds the requirements of IEC 62244:2021 “Radiation protection instrumentation – Installed radiation monitors for the detection of radioactive and special nuclear materials at national borders for monitoring of pedestrians.

1- in configuration with battery extension module.

Readout unit with Light tower

MIRION TECHNOLOGIES

MIRION
TECHNOLOGIES

HAND FOOT MONITORING

HandFoot-Fibre™

Hand Foot Clothing Monitor

DESCRIPTION

The HandFoot-Fibre monitors are used for contamination screening of hands, feet and clothes for alpha, beta and gamma radiation. Due to their weight and agility these monitors are used in circumstances which do not require a full body monitor or for mobile monitoring purposes.

The monitor's eight detectors are based on the state-of-the-art Mirion fibre detector technology, enabling a fast and reliable measurement process, even in high or fluctuating background conditions. There are three versions available:

HandFoot-Fibre™ XL with alpha and beta sensitive RFD485 fibre detectors for the use in all nuclear environments.

HandFoot-Fibre™ A+ with RFD485 A+ detectors, featuring a discrimination of alpha and beta radiation.

HandFoot-Fibre™ MED featuring HybridFibre™ detectors, which are sensitive to alpha, beta and gamma radiation and particularly well suited for medical applications.

FEATURES

- Outstanding detector sensitivity and homogeneity
- Economic and robust operation and maintenance
- 100% gas-free
- Very short measurement time
- Easy and intuitive usage
- Touch screen and audio interface
- Detachable probe for monitoring of clothing
- Wheels for easy transport
- Available in different versions for alpha/beta, alpha+beta and beta+gamma measurement

HANDFOOT-FIBRE™ HAND FOOT CLOTHING MONITOR

MIRION FIBRE DETECTORS

For the highest performance requirements, the state-of-the-art Mirion fibre detector technology utilizes scintillating fibre detectors that feature some of the industry's lowest area of dead zones. This results in an outstanding sensitivity with an exceptionally high measurement homogeneity.

The clever detector design allows quick and easy repairs, for an economic and robust operation with minimal downtime.

MEDICAL APPLICATION

HandFoot-Fibre MED has been developed for medical applications. The HybridFibre™ detectors are detecting alpha, beta, and gamma radiation with a particularly high sensitivity for low energy radiation (up to 30 keV).

In handling medical isotopes like Co-57, Tc-99m, or I-125 the HandFoot-Fibre MED is an expert. A nuclide database is provided, and can be extended with user's own entries. The monitor applies to the EMC requirements of laboratory medicine.

USER BENEFITS

EASY AND ECONOMIC OPERATION AND MAINTENANCE

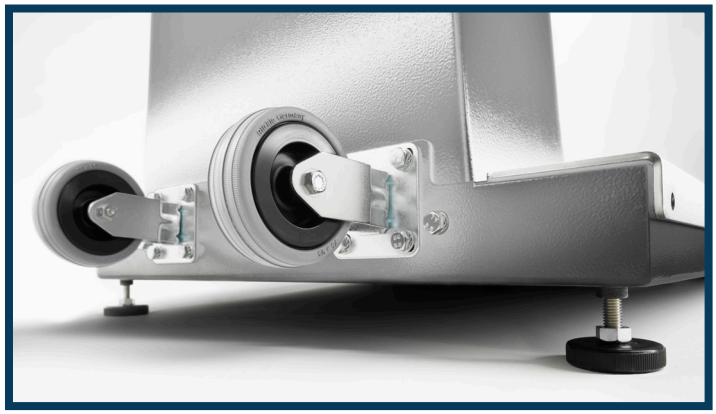
- Short measurement time thanks to outstanding detector sensitivity and simultaneous measurement of hands and feet
- P2-accelerator reduces measurement time by up to 30%
- Automatic background subtraction
- Rigorous standardization for reduced pool of spare parts
- Comprehensive user interface based on Mirion's innovative Lighthouse software platform and Windows 10 IoT operating system
- Detachable frisker probe for measuring of cloths/body

MOBILE MONITORING

- Lightweight
- Easy to move thanks to wheels and handle. Larger wheels for transport on rough ground available (optional)

ABILITY TO NETWORK

- Connect to CeMoSys™ software for centralized monitoring (optional)



TECHNICAL SPECIFICATIONS

Dimensions

- Height: 1660 mm
- Width: 478 mm
- Depth: 750 mm

Weight

- 57 to 63 kg, depending on version

Detectors

- Eight scintillating fibre detectors

Detection limit

- 30 Bq/hand, 45 Bq/foot (Co-60) for XL version
- 33 Bq/hand, 45 Bq/foot (Co-60) for MED version

MIRION
TECHNOLOGIES

MIRION TECHNOLOGIES

HAND FOOT MONITORING

Sirius™-5

Hand, Cuff and Foot Surface Contamination Monitors

Sirius-5AB monitor with four hand /cuff detectors, two foot detectors and optional frisker.

The Mirion Sirius-5 provides thorough and reliable detection of external contamination on the hands and feet of personnel working in nuclear environments. Depending on your monitoring needs, Sirius monitors are designed to use either plastic scintillator (TPS) gasless detectors or patented* gas flow proportional detectors (LFP-579).

With Mirion WebRemote® software, an easy-to-use touch screen graphical user interface for industrial PC-based operation results in improved health physics programs, better tracking of contamination and faster, more thorough personnel throughput at boundary points.

Excellent detector protection, modularity of components, and extensive diagnostics result in direct reductions in maintenance, repair, and operation costs.

Sirius monitors use a sophisticated “fast following” background trending and release-limit algorithm to provide the best performance in a stable or varying radiation field.

*Patent US 7,470,913 B1 High Efficiency and High Homogeneity Large-Area Gas-Filled Detectors

FEATURES

- Rugged and reliable for high traffic areas
- Optimized counting geometry to measure both sides of the hands /cuffs and bottom of feet in one step operation
- Easy access for maintenance from the top, front and sides. No access to the rear of the unit is required
- All positioning sensors are solid state devices for increased reliability
- Superior detector protection, modularity, and diagnostics result in direct reductions in maintenance, repair and operation costs
- WebRemote enabled: ergonomic and easy-to-use touch screen graphical user interface; accessible locally or via PC / tablet web browser
- Windows 10 IoT operating system with LAN capability and USB ports
- Same “industry-best” software and serial bus electronics across Mirion Argos™-3/-5, GEM™-5 and Cronos® -1/- 4 /-11 monitor families; no re-training needed
- Compliant with IEC61098 Standard requirements
- Algorithm based on Gaussian or Bayesian statistics (compliant with the ISO 11929:2010 Standard requirements)

Sirius-5 monitors provide the optimum balance between cost and coverage, monitoring the palms, backs of the hands, cuffs and feet in a single step, with a very close counting geometry for the best sensitivity. The detectors are vertically oriented to minimize the possibility of detector contamination.

The Sirius-5 is available with either six gas flow proportional detectors optimized for alpha and beta detection or six gasless thin plastic scintillator detectors optimized for beta, alpha/beta or beta/gamma capability. Gasless and gas flow proportional detectors are identical in form factor. As a result, changing between gasless and gas flow proportional operations on the monitor is as simple as changing between TPS and LFP-579 style detectors and pre-amplifiers. Additionally, both detector styles are interchangeable between Sirius-5 hand , cuff and foot monitors and the Mirion Argos-3 /-5 whole body monitors, minimizing management of spares and reducing maintenance costs for facilities where both hand, cuff and foot and whole body monitors are required.

ELECTRONICS

The High Voltage (HV), preamplification, amplification, discrimination, counting, test pulse generation and other processing electronics are mounted right on the detectors. The cables between the detectors and computer are all direct current and low voltage.

SETTING PARAMETERS

Parameter settings, testing, calibration and maintenance is accomplished locally or from a remote location using Mirion WebRemote software. The WebRemote platform enables Tablet or PC connection to the Siirius-5 unit wvia LAN or direct link.

Alternatively, the operator can use the standard Monitor Software, pre-installed on all Sirius-5 Contamination Monitors, to provide local monitor access and functionality.

The following types of parameters are available for adjustment:

- Sensitivity of detector by zone
- Alpha, beta, and/or gamma alarm activity levels set in units of Bq, Bq/cm^2, dpm, dpm/cm^2, nCi, nCi/cm^2, pCi, pCi/cm^2, µCi or µCi/cm^2
- False alarm and alarm confidence probability
- HV Optimization using Figure-of-Merit (FOM) calculations
- Fixed or variable count times (calculated and optimized as a function of the alarm level setpoint, local background levels and desired accuracy of measurement)

Table 1. Model-specific information

RADIOLOGICAL (TYPICAL)

Model	Sirius-5AB	Sirius-5PB/PAB/PBG
Detector Type and Quantity	LFP-579 x6	TPS x6
Two Moveable Hand Detectors	Yes	
Frisker Option Available	Mirion Gas Flow Proportional Detector (LFP-100DHP)	Mirion CSP™ SMART probes (SB/SAB/SABG-100)*
Detector Type (Hands, Cuff & Foot)	Gas Flow Proportional	Plastic Scintillator
Radiation Monitored	Alpha/Beta	Beta (PB), Alpha/Beta (PAB) or Beta/Gamma (PBG)
Window Area Per Detector	~579 cm^2	
Window	0.8 (±12%) mg/cm2 (Mylar); window assembly is field replaceable	1.2 mg/cm^2 (Multilayer Aluminum coated Mylar); window assembly is field replaceable
Typical Gas Flow Rate	10 cm^3/min	Not applicable as external gas is not required
Possible Gas Mixtures	P5, P7.5, P-10 (Argon-Methane), or Argon/CO_2 (90/10)%	

Table 2. Typical 4π efficiencies, measured with 10 cm x 10 cm plate source placed in the center of the detector. For comparison with instruments specifying 2π efficiency or % of emission surface rate, multiply these figures by 2. § No Alpha/Beta discrimination for TPS-B-579 and no Alpha/Beta separation for TPS-BG-579.

Typical efficiencies:	LFP-579 detectors, on contact, with 0.5 mm fine mesh	LFP-579 detectors, on contact, with foot grill on 0.25 mm fine mesh	TPS-B-579 detectors, on contact, with 0.5 mm fine mesh	TPS-B-579 detectors, on contact, with foot grill on 0.25 mm fine mesh	TPS-AB-579 detectors, on contact, with 0.5 mm fine mesh	TPS-AB-579 detectors, on contact, with foot grill on 0.25 mm fine mesh	TPS-BG-579 detectors, on contact, with 0.5 mm fine mesh	TPS-BG-579 detectors, on contact, with foot grill on 0.25 mm fine mesh
^{14}C (beta)	8%	6%	4%	3%	2%	1%	2%	2%
^{99}Tc (beta)	16%	14%	13%	10%	9%	6%	9%	7%
^{60}Co (beta)	14%	14%	15%	11%	10%	8%	7%	6%
^{137}Cs (beta)	25%	22%	21%	18%	18%	13%	15%	12%
^{60}Co (gamma)	–	–	–	–	–	–	16%	17%
^{137}Cs (gamma)	–	–	–	–	–	–	7%	7%
^{36}Cl (beta)	25%	23%	23%	20%	20%	16%	14%	13%
$^{90}Sr/^{90}Y$ (beta)	32%	26%	29%	23%	25%	18%	17%	14%
^{241}Am (alpha)§	17%	13%	15%	9%	13%	7%	12%	7%
^{235}U (alpha)§	16%	11%	11%	4%	10%	4%	7%	2%
^{239}Pu (alpha)§	16%	12%	12%	7%	11%	6%	10%	5%

*See separate specification sheets for the CSP Family smart probes.

MONITORING ASSISTANCE VIA USER INTERFACE

Indicator lights at the entry show the monitor is ready to use. While the occupant is being monitored, messages and a countdown are given both on the LCD screen and audibly (multiple languages are available). Verification of proper occupant positioning is ensured with the help of infrared sensors. All hand and foot positioning sensors are non-mechanical solid state types for enhanced reliability. Visible and audible alarms are given if contamination is detected. The display shows the type (alpha or beta), the quantity and the location (alarming detector flashing on a figure). The system records data and date /time stamped logs showing the number of times the unit was used, parameters used, calibration settings, fault messages etc.

A relay closure is available for remote signaling of the monitor's status (e.g. "In Operation", "Contaminated", "Clean", "Fault", etc.

MAINTENANCE

The Sirius-5 monitors simplify maintenance with easy access from the front and center of the unit; as well as easy replacement and repair of the detectors. A separate LED on each detector shows which detector is alarming and/or being addressed on the LCD screen.

For ease of diagnostics, numerous test screens are available to enable precision monitoring, and changing of parameters including high voltage and discrimination thresholds for each detector. To provide further assistance rate meters show counts seen by each detector in real-time.

Calibration of all detectors and alarm testing can each be done in less than ten minutes.

REMOTE STATUS MONITORING

A user-friendly dashboard enables the status monitoring (in service, contaminated, out of service, maintenance) of multiple Contamination Monitors over the LAN. The dashboard is accessible from a Tablet or PC web browser and requires no proprietary software installation.

SPECIFICATIONS

PARAMETER ENTRY

- Parameters may be entered with the touch of a finger using the capability of the built-in touch screen and WebRemote software. Additionally, a USB connected keyboard/mouse may be used to enter parameters

MECHANICAL

Cabinet:

- Steel with rugged powder coat finish for column and top, stainless steel base and foot pan cover provide for ease of decontamination and minimum maintenance
- Dimensions for any of the Sirius-5 models is approximately (W x H x D): 78.0 x 179.3 x 91.9 cm (33.5 x 70.6 x 36.2 in.)
- Approximate weights are (with no options installed):

Model	Weight
Sirius-5AB	125.0 kg (275.0 lb)
Sirius-5PB /PAB/PBG	135.8 kg (298.8 lb)

ELECTRONICS

Computer:

- The Sirius-5 computer operates on Windows 10 IoT operating system with LAN capability and USB ports for transferring data. Data may be retrieved either via USB or a LAN
- High-quality digitized sound for prompts, with dual speakers

Display Screen:

- ~23.4 cm (10.4 in.) touch screen LCD display, integrated onto top of unit

Easy access Input/Output and Power Entry Ports panel at foot of pedestal in rear:

- Six USB ports and one Ethernet port (RJ-45)
- IEC standard AC receptacle
- Sirius-5AB also includes a gas connector

Environmental:

- Temperature Range:
  - Operating (meets IEC 61098) – 0-40 °C (32-104 °F)
  - Storage – 0-50 °C (32-122 °F)
- Relative Humidity:
  - Operating (per IEC 61098) – ≤ 85% non-condensing at 35 °C (95 °F) maximum
  - Storage – ≤ 95% non-condensing

Power Requirements:

- 220 V ac/50 Hz /1.0 A or 110 V ac /60 Hz/2.0 A mains 3 m (~10 ft). IEC standard cable (supplied; other cables are available; specify special cable requirements; contact local Mirion affiliate) for further information

Power Consumption:

- 110 VA

Certifications:

- IEC 61098 compliant
- ISO 11929:2010 compliant

OPTIONS

Gas Flow Hand-Held Tool/Body Frisker (Sirius5-FSKAB)

The Sirius-5AB unit can be fitted with the optional Model LFP-100DHP frisker (100 cm^2, 0.8 (±12%)mg/cm^2) that has excellent response to alpha/beta radiation. It comes with a retractable cable (incorporating the gas flow in the same cable) which provide up to 3 m (10 ft) of frisking range. An integral flow proportional frisker is available to enhance the monitoring capabilities. The frisker body incorporates an amber LED to indicate count rate, a beeper for audible indication and a red LED for alarm. The LCD displays the digital/analog rate meter results plus the current background level, alarm point and highest count rate achieved during current frisk. When not in use, the frisker continuously monitors background.

Gasless Hand-Held Tool/Body Friskers (Sirius5-FSKPAB, Sirius5-FSKPB and Sirius5-FSKPBG)

The Sirius-5 gasless units can be fitted with the Mirion SB/SAB/SABG-100 CSP 100 cm^2 plastic scintillation probe to provide beta/ alpha-beta/or alpha, beta-gamma capabilities.

Horizon 2.0 Compatibility

The Mirion contamination monitors can be integrated with Horizon® Supervisory Software to provide an integrated solution with Mirion instruments. Horizon software complements the functionality of the WebRemote Contamination Monitor Interface.

Local Database Support Option (SOFT-LDB)

The Local Database Option facilitates quick monitoring of the effectiveness of your contamination control programs. See separate specification sheet for full details.

SIRIUS™-5 HAND, CUFF AND FOOT SURFACE CONTAMINATION MONITORS

Model	Description	Number if Detector Positions
Sirius-5AB	1-STEP HAND/CUFF/FOOT MON.; ALPHA/BETA	6
Sirius-5PB	1-STEP HAND/CUFF/FOOT MON.; PLAS. BETA	6
Sirius-5PAB	1-STEP HAND/CUFF/FOOT MON.; PLAS. ALPHA/BETA	6
Sirius-5PBG	1 STEP HAND/CUFF/FOOT MONITOR PLAS. BETA/GAMMA	6
Sirius-5 SIM	1-STEP HAND/CUFF/FOOT MON.; SIMULATOR	6 (no actual detectors; blank-off plates)

Option	Description
WebRemote-Kit#Y	WebRemote Software and Rugged / Pro / Basic Hardware. FOR Rugged Y=1; FOR Pro Y=2; FOR Basic Y=3.
Sirius5-FSKAB	FRISKER OPT.; SIRIUS-5AB
Sirius5-FSKPB	FRISKER OPTION; SIRIUS-5PB
Sirius5-FSKPAB	FRISKER OPTION; SIRIUS-5PAB
Sirius5-FSKPBG	FRISKER OPTION; SIRIUS-5PBG
Sirius5-MAG	MAGNETIC CARD READER FOR SIRIUS
Sirius5-BAR	BARCODE CARD READER FOR SIRIUS
Sirius5-PROX	PROXIMITY CARD RDR FOR SIRIUS
SOFT-LDB	Loc.Database Support;Factory Installed. Provides local database support for a new Mirion Contamination monitor: • Factory Installed. • Includes latest Mirion SOFT-MON-SERIAL application software (Version 8.01 or above).
Sirius-5 Casters Kit	Casters with Integrated Leveling Feet to facilitate installation at final location. Includes: • Four 50 mm swivel casters. • Associated hardware to mount to Sirius-5.
Sirius-5 Wood Shipping Crate, Reusable	• For use with Sirius-5 only. • Field installable (contact local Mirion Service affiliate for assistance). • Includes custom foil vacuum bag to reduce moisture effects during shipping.

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HAND & FOOT MONITORING

Sirius™-5 Compact

Compact Hand, Cuff and Foot Contamination Monitors

Efficient hand, cuff and foot monitoring in areas with size constraints.

The Sirius-5 Compact is an evolution of the well-proven Sirius-5 and delivers the same exceptional performance in a compact form.

The Sirius-5 Compact provides thorough and reliable detection of external contamination on the hands and feet of personnel working in nuclear environments. The Sirius-5 Compact monitor is rugged and reliable for high traffic areas, compact for areas with size constraints and maneuverable with integrated casters and handle. Depending on your monitoring needs, Sirius monitors are designed to use either plastic scintillator (TPS) gasless detectors or patented* gas flow proportional detectors (LFP-579).

*Patent US 7,470,913 B1 High Efficiency and High Homogeneity Large-Area Gas-Filled Detectors

FEATURES

- ✓ Compact footprint: suitable for confined locations, and maximizing available space
- ✓ Rugged and reliable: for high traffic areas – minimal downtime and service required
- ✓ Integrated casters and handle: easily movable. Can set up temporary stations, responding to situations quickly
- ✓ Excellent radiological performance: various detector combinations possible
- ✓ Optimized counting geometry: Measure both sides of the hands/cuffs and bottom of feet in one step operation – time saving and increased throughput
- ✓ Comprehensive and well-proven Monitor Program software platform, including WebRemote® software and Dashboard: Ergonomic and easy to use, touch screen software, intuitive – users with limited experience can easily locate parameter settings
- ✓ Designed for 365/24/7 operation: high uptime and minimum maintenance
- ✓ Same components and spare parts as for Argos™-3/-5, Sirius-5, GEM™-5 and Cronos®-1/-4/-11 contamination monitors
- ✓ Windows 10 IoT operating system with LAN capability and USB ports
- ✓ Compliant with IEC 61098 and ISO 11929:2019

Sirius-5 Compact

WebRemote software offers an intuitive touch screen graphical user interface for industrial PC-based operation, as well as comprehensive remote monitoring and remote management capabilities. Users can easily locate parameter settings for improved health physics programs, better tracking of contamination, and faster, more thorough personnel throughput at boundary points.

As a common software platform for many Mirion contamination products, including Argos, Cronos, GEM-5 and Sirius monitors, no re-training is needed to learn the software.

Sirius monitors use a sophisticated “fast following” background trending and release-limit algorithm to provide the best performance in a stable or varying radiation field.

Excellent detector protection, modularity of components, and extensive diagnostics result in direct reductions in maintenance, repair, and operation costs. Furthermore, the Sirius-5 Compact features the same components and spare parts from all contamination monitors of the same family (Argos-3/-5, Sirius-5, GEM-5 and Cronos-1/-4/-11 contamination monitors). The Sirius-5 Compact will therefore not require a separate inventory of spare parts or service management, resulting in reduced cost of ownership.

DETECTOR CONFIGURATIONS

The Sirius-5 Compact is equipped with six detectors. It is available in four different configurations, which feature different detector technologies:

LFP-579 Gas Flow Detectors

LFP-579 gas flow detectors provide highly sensitive alpha and beta measurement capability with separate alpha and beta measurement channels for each detector. The patented detector design makes use of three independent counting sections which reduce background for an optimal detection capability. This design further enhances uniform detector response. The Sirius-5AB Compact is designed to inherently minimize gas usage. Therefore, no “gas management system” is required.

The overall benefit of the detector geometry and patented detector design is the reduction of count times by as much as 25% compared to similar systems.

TPS-B-579 Thin Plastic Scintillation Detectors

TPS-B-579 thin plastic scintillation detectors are gas-free detectors, specifically designed for best possible beta response and minimal sensitivity to gamma background radiation.

The need for counting gas is eliminated by using plastic scintillation detectors. The design of the TPS-B-579 detectors provides excellent signal-to-noise ratios and furthermore, the detection capability both across and along the detectors is extremely uniform. There is virtually zero edge effect degradation.

TPS-AB-579 Thin Plastic Scintillation Detectors

TPS-AB-579 thin plastic scintillation detectors are state-of-the-art gas-free detectors with alpha and beta measurement capability with separate alpha and beta measurement channels for each detector.

The detectors do not require any counting gas and feature an extremely uniform detector response.

TPS-BG-579 Plastic Scintillation Detectors

TPS-BG-579 plastic scintillation detectors are unique gas-free detectors with beta and gamma measurement capability with separate beta and gamma measurement channels for each detector. Additionally, the beta channels work in anticoincidence mode with the gamma channels, which significantly reduces the sensitivity of the beta channel to elevated background. This allows for excellent measurement performance for beta radiation, also in elevated gamma background.

MODULARITY

All detector types are identical in form factor. They are interchangeable between Sirius-5 hand, cuff and foot monitors and the Mirion Argos-3/-5 whole body monitors, minimizing management of spares and reducing maintenance costs for facilities where both hand, cuff and foot and whole body monitors are required.

READ-OUT ELECTRONICS

The High Voltage (HV) preamplification, amplification, discrimination, counting, test pulse generation and other processing electronics are mounted right on the detectors. The cables between the detectors and computer are all direct current and low voltage.

The digital signal processing and alarm evolution is performed by a computer, which operates on Windows 10 IoT and uses SSD for data storage. Data may be retrieved either via USB or a LAN.

MAINTENANCE

The Sirius-5 Compact monitors simplify maintenance with easy access from the front and center of the unit and improved accessibility to the top part of the unit. Detectors can easily be replaced and repaired.

For ease of diagnostics, numerous test screens are available to enable precision monitoring, and changing of parameters including high voltage and discrimination thresholds for each detector. To provide further assistance, rate meters show counts seen by each detector in real time.

Calibration of all detectors and alarm testing can each be done in less than ten minutes.

SETTING PARAMETERS

Parameter settings, testing, calibration and maintenance is accomplished locally or from a remote location using Mirion WebRemote software. The WebRemote platform enables tablet or PC connection to the Sirius-5 Compact via LAN or direct link.

Alternatively, the operator can use the standard Monitor Software, pre-installed on all Sirius-5 Compact Contamination Monitors, to provide local monitor access and functionality.

The following types of parameters are available for adjustment:

- Sensitivity of detector by zone
- Alpha, beta, and/or gamma alarm activity levels set in units of Bq, Bq/cm^2, dpm, dpm/cm^2, nCi, nCi/cm^2, pCi, pCi/cm^2, µCi or µCi/cm^2
- False alarm and alarm confidence probability
- HV Optimization using Figure-of-Merit (FOM) calculations
- Fixed or variable count times (calculated and optimized as a function of the alarm level setpoint, local background levels and desired accuracy of measurement)

MONITORING ASSISTANCE VIA USER INTERFACE

The LCD touch screen display indicates when the monitor is ready to use. While the occupant is being monitored, messages and a countdown are delivered both audibly (multiple languages available) and visually on the LCD touch screen. Occupant positioning is verified and corrected with the aid of photoelectric sensors, visual messages and voice prompts. Visible and audible alarms are given if contamination is detected.

A “Contaminated” result is shown on the color touch screen display with voice reinforcement. The display shows the type (alpha or beta), the quantity and the location of the contamination based on which detector(s) is alarming. The system records data and date/time stamped logs showing the number of times the unit was used, parameters used, calibration settings, fault messages, etc. A relay closure is available for remote signaling of the monitor’s status (e.g. “Contaminated”, “Out of Service”, “Fault”, “Clean”, etc.).

REMOTE STATUS MONITORING

A user-friendly dashboard enables the status monitoring (in service, contaminated, out of service, maintenance) of multiple contamination monitors over the LAN. The dashboard is accessible from a tablet or PC web browser and requires no proprietary software installation.

Table 1. Model-specific information

RADIOLOGICAL (TYPICAL)

Model	Sirius-5AB	Sirius-5PB/PAB/PBG
Detector Type and Quantity	LFP-579 x6	TPS x6
Two Moveable Hand Detectors	Yes	
Frisker Option Available	Mirion 100 cm² alpha/beta CSP™ SMART probe*	
Detector Type (Hands, Cuff & Foot)	Gas Flow Proportional	Plastic Scintillator
Radiation Monitored	Alpha/Beta	Beta (PB), Alpha/Beta (PAB) or Beta/Gamma (PBG)
Window Area Per Detector	~579 cm^2	
Window	0.8 (±12%) mg/cm^2 (Mylar); window assembly is field replaceable	1.2 mg/cm^2 (Multilayer Aluminum coated Mylar); window assembly is field replaceable
Typical Gas Flow Rate	10 cm^3/min	Not applicable as external gas is not required
Possible Gas Mixtures	P5, P7.5, P-10 (Argon-Methane), or Argon/CO_2 (90/10)%	

Table 2. Typical 4π efficiencies, measured with 10 cm x 10 cm plate source placed in the center of the detector and in contact with the detector mesh. For comparison with instruments specifying 2π efficiency or % of emission surface rate, multiply these figures by 2.

Typical efficiencies:	LFP-579 detectors, on contact, with 0.5 mm fine mesh	LFP-579 detectors, on contact, with foot grill on 0.25 mm fine mesh	TPS-B-579 detectors, on contact, with 0.5 mm fine mesh	TPS-B-579 detectors, on contact, with foot grill on 0.25 mm fine mesh	TPS-AB-579 detectors, on contact, with 0.5 mm fine mesh	TPS-AB-579 detectors, on contact, with foot grill on 0.25 mm fine mesh	TPS-BG-579 detectors, on contact, with 0.5 mm fine mesh	TPS-BG-579 detectors, on contact, with foot grill on 0.25 mm fine mesh
^{14}C (beta)	8%	6%	4%	3%	2%	1%	2%	2%
^{99}Tc (beta)	16%	14%	13%	10%	9%	6%	9%	7%
^{60}Co (beta)	14%	14%	15%	11%	10%	8%	7%	6%
^{137}Cs (beta)	25%	22%	21%	18%	18%	13%	15%	12%
^{60}Co (gamma)	–	–	–	–	–	–	16%	17%
^{137}Cs (gamma)	–	–	–	–	–	–	7%	7%
^{36}Cl (beta)	25%	23%	23%	20%	20%	16%	14%	13%
$^{90}Sr/^{90}Y$ (beta)	32%	26%	29%	23%	25%	18%	17%	14%
^{241}Am (alpha)§	17%	13%	15%	9%	13%	7%	12%	7%
^{235}U (alpha)§	16%	11%	11%	4%	10%	4%	7%	2%
^{239}Pu (alpha)§	16%	12%	12%	7%	11%	6%	10%	5%

*See separate data sheets for CSP smart probes.

§ No Alpha/Beta discrimination for TPS-B-579 and no Alpha/Beta separation for TPS-BG-579.

SPECIFICATIONS

PARAMETER ENTRY

- Parameters may be entered with the touch of a finger using the capability of the built-in touch screen and WebRemote software. Additionally, a USB connected keyboard/mouse may be used to enter parameters

MECHANICAL

Cabinet:

- Steel with rugged powder coat finish for column and top, stainless steel base and foot pan cover provide for ease of decontamination and minimum maintenance
- Approximate dimensions:
  (H x W x D)1465 mm x 640 mm x 844 mm (57.7" x 25.2" x 33.2")
- Approximate weight is 110 kg (242.5 lb) without options

ELECTRONICS

Computer:

- The computer of the Sirius-5 Compact operates on Windows 10 IoT operating system with LAN capability and USB ports for transferring data. Data may be retrieved either via USB or a LAN
- High-quality digitized sound for prompts

Display Screen:

- ~23.4 cm (10.4 in.) touch screen LCD display, integrated onto top of unit

Easy access Input/Output and Power Entry Ports panel at foot of pedestal:

- Two USB ports and one Ethernet port (RJ-45)
- Standard three-prong IEC 60320 power inlet socket (C14)
- Sirius-5AB Compact also includes a gas connector

Environmental:

- Temperature Range:
  - Operating (exceeds IEC 61098): 0 to +45 °C (+32 to +113 °F)
  - Storage – 0-50 °C (32-122 °F)
- Relative Humidity:
  - Operating (per IEC 61098): ≤ 85% non-condensing at 35 °C (95 °F) maximum
  - Storage: ≤ 95% non-condensing

Power Requirements:

- 115/230 (±10%) VAC, 50/60 Hz, 2/1 A nominal mains
- 3 m (~10 ft) standard cable with IEC 60320 C13 plug supplied (other mains cables are available; specify any special cable requirements - contact local Mirion Service/Sales affiliate for more information).

Power Consumption:

- Average: 35 W
- Maximum: 60 VA (Typical)

Certifications:

- IEC 61098 compliant
- ISO 11929:2019 compliant

CE

OPTIONS

Alpha/Beta Tool/Body Frisker Probe

The Sirius-5 Compact can be fitted with the optional 100 cm² external alpha/beta CSP frisker probe. The plastic scintillation probe provides gas-free monitoring in two separate measurement channels with discrimination between alpha and beta radiation.

Uninterruptible Power Supply (UPS)

The UPS allows autonomous operation for up to 30 minutes without external power. The UPS is mounted on a mounting bracket on the back of the Sirius-5 Compact. Please note: Default options are intended for the North American region only; contact local Mirion affiliate for other regions.

Dosimetry Reader Integration for DMC 3000™ Dosimeter

- Integration of LDM 320D dosimeter reader for use with DMC 3000 dosimeters
- Direct data-exchange between contamination monitor and DosiServ™ Dose Management Software (Requires DosiServ dose management system)

Card/Barcode Readers

This monitor includes integration of a barcode, magnetic card or proximity card reader. Information on card is stored together with measurement results from each measurement to allow identification of the person being monitored. Mirion recommends sending a sample of card to the factory to ensure compatibility.

CeMoSys™ Software Compatibility

Mirion contamination monitors can be integrated with the CeMoSys central monitoring system (version 2.0 or above) to provide comprehensive supervisory functionalities for all connected contamination monitors.

SIRIUS™-5 COMPACT HAND, CUFF AND FOOT CONTAMINATION MONITORS

Part Number	Description
SIRIUS-5ABCOMP	Sirius-5AB Compact: One step compact hand/cuff/foot monitor, with Alpha/Beta Discrimination, Gas Flow Proportional Detectors
SIRIUS-5PBCOMP	Sirius-5PB Compact: One step compact hand/cuff/foot monitor, for Beta, Thin Plastic Scintillator Detectors
SIRIUS-5PABCOMP	Sirius-5PAB Compact: One step compact hand/cuff/foot monitor, with Alpha/Beta Discrimination, Thin Plastic Scintillator Detectors
SIRIUS-5PBGCOMP	Sirius-5PBG Compact: One step compact hand/cuff/foot monitor, with Beta/Gamma Discrimination, Plastic Scintillator Detectors
SIRIUS-COMP-FSKPAB	Frisker with 100cm² alpha/beta CSP frisker probe
SIRIUS5-COMP-UPS	Uninterruptible Power Supply (UPS) with a mounting bracket (shelf) for Sirius-5 Compact (for North America only)
7098537	Integrated LDM 320D dosimeter reader with direct data-exchange between contamination monitor and DosiServ. Requires DosiServ Dose Management System
0009CVMS0002	CeMoSys™ Client License for interfacing with CeMoSys™ Central Monitoring System (version 2.0 or above)
SIRIUS-COMP-BECS	Beacon/Light tower with sounder
SIRIUS5-PURGE-DET	Factory installed LFP-579 Purge Detector for Sirius-5AB Compact
SIRIUS5-COMP-BAR	Barcode card reader
Sirius5-MAG	Magnetic card reader
Sirius5-PROX	Proximity card reader
SIRIUS5-GASMON	Gas pressure monitor for low gas pressure check
7098218	Wood shipping crate

Many additional upgrade options are available for in-field upgrades to existing Sirius-5 Compact Monitors.
Contact your Mirion sales and service affiliate for more information.

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RTM644-Smart™

Large Clearance Monitor

The Mirion RTM644-Smart Gamma Clearance Monitor is designed for measurements of large items like EPAL crates, 400 or 200 liters drums, palettes or big-bags with a measurement chamber size of 1870 liters.

DESCRIPTION

The RTM644-Smart is the most advanced clearance monitor and key monitoring equipment for every major clearance campaign. 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 24 state-of-the-art plastic scintillation detectors with spectroscopic read-out.

The RTM644-Smart 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, automatizes loading and simplifies maintenance.

It is based on the well-proven algorithm principles and 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 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
- Palettes, EPAL crates, 200 L, 400 L drums, big-bags: maximum weight 1000 kg; counting chamber 138 x 112 x 121 cm³ (LxWxH), volume 1870 liters.
- High throughput: up to 16 tons per hour
- Low MDA: 24Bq or 34 Bq Co-60, achieved by 24 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,
- Improved handling of inhomogeneities: optional analysis software module,
- 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 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, protection fences and oversize sensors,
- Safe transportation by crane with full shielding installed.

RTM644-SMART™ LARGE CLEARANCE MONITOR

The RTM644-Smart comes with advanced administrator and maintenance features: the realtime 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 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 customized report generation, decision tracing and recalculation.

RADIOLOGICAL CHARACTERISTICS

DETECTION

- 24 large-volume plastic scintillation detectors – total active volume: 303 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 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 2400 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	**116 Bq**	**69 Bq**	**51 Bq**	**34 Bq**
Cs-137	**234 Bq**	**139 Bq**	**103 Bq**	**69 Bq**
Ba-133	**226 Bq**	**134 Bq**	**99 Bq**	**66 Bq**

MECHANICAL CHARACTERISTICS

- Chamber: 138 x 112 x 121 cm³ (LxWxH), 1870 liters,
- Ext. chassis dimensions: 191 x 186 x 229 cm³ (LxWxH),
- Conveyor lenght :
  - Conveyor : default lenght 300 cm
  - External chain conveyor, standard length 1.9 m
- Built-in weight scale, maximum 1000kg, 0.1 kg resolution,
- 50 or 75 mm lead shielding, transportable by crane with the shielding installed,
- Total weight with shielding:

Shielding	50 mm	75 mm
Weight	**13 500 kg**	**17 600 kg**

FUNCTIONAL CHARACTERISTICS

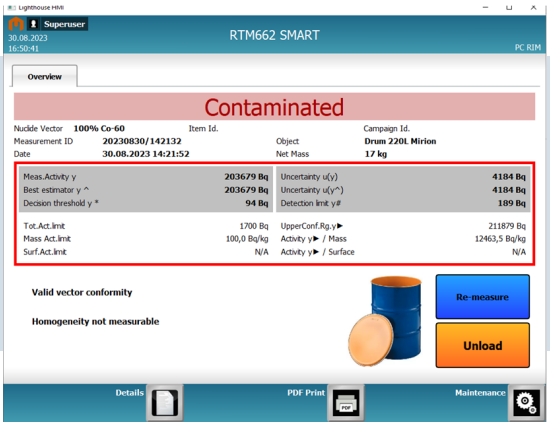
- Single/double doors, single/double chain conveyors, motorized operation with PLC,
- Automatic object loading, integrated in measurement software, object detection by the weight scale,
- Up to 2 still cameras, triggered by position sensors,
- Remote user interface with colour screen, keyboard and pointing 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
- 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,
- 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: 5 A
- UPS backup autonomy (computer only): 60 min
- 2 external USB connectors, 1 LAN connection
- Configurable logical outputs available on request



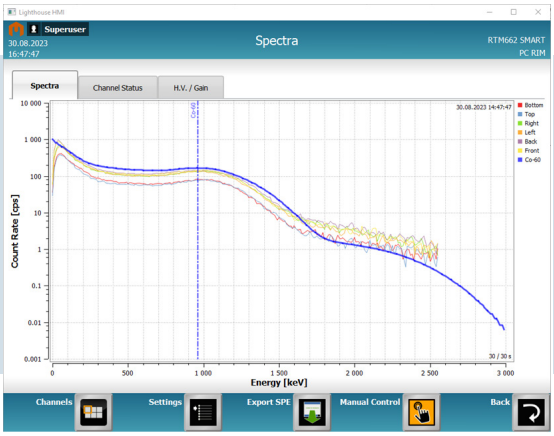
RESULTS SCREEN

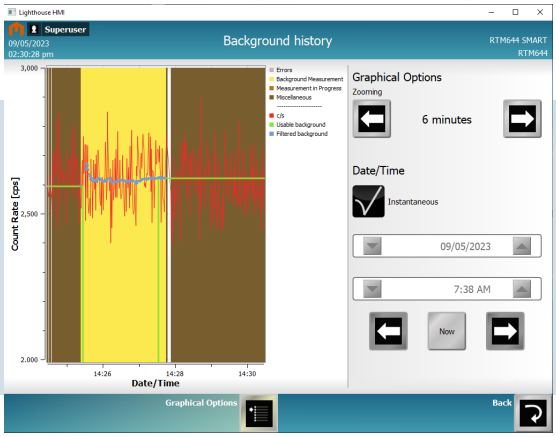
Detailed display of measurement conditions and results for a case where the alarm level is exceeded.

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.

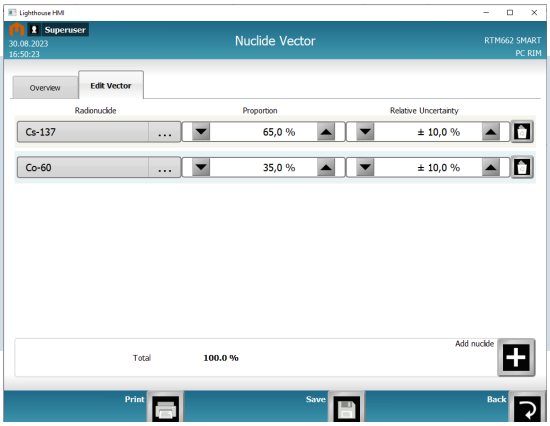




BACKGROUND DIAGNOSTICS

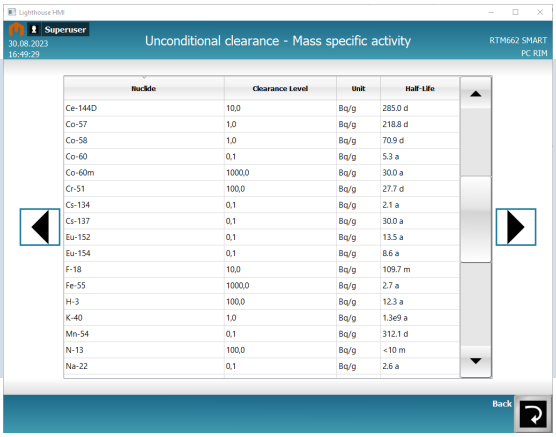
Graphical display of the background history including the count-rate, the filtering process and the refence background. The background history is stored for 3 months with a resolution of 1 s for 3 days and 60 s for the remaining time.

RTM644-SMART™ LARGE CLEARANCE MONITOR



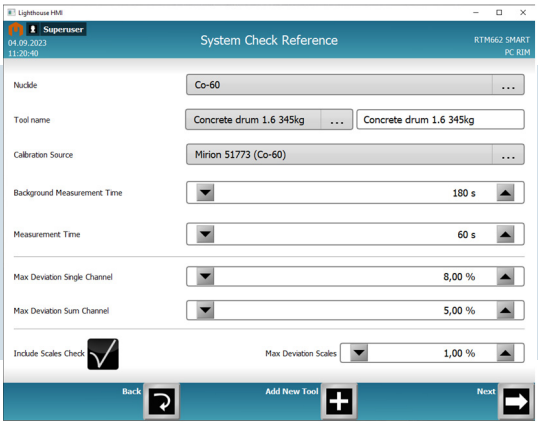
NUCLIDE VECTORS

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.

MIRION
TECHNOLOGIES

MIRION
TECHNOLOGIES

RTM662-300

(CGO-Smart™ LNC)

Clearance Monitor

The Mirion RTM662-300 Gamma Clearance Monitor is designed for Clearance measurements of average sized items like waste bags, toolboxes or 100 liters drums.

DESCRIPTION

The RTM662-300 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 RTM662-300 is based on an advanced 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
- **Average Waste bags and 100 drums:** counting chamber dimensions 60.8 x 60.1 x 84 cm³, volume 307 liters,
- **Low MDA:** 18 Bq Co-60 achieved by 6 plastic scintillator detectors in a 4π configuration, modular lead lingot shielding of up to 50 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,
- **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.

RTM662-300 CLEARANCE MONITOR

The RTM662-300 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 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, 50 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	**63 Bq**	**37 Bq**	**28 Bq**	**18 Bq**
Cs-137	**127 Bq**	**75 Bq**	**56 Bq**	**36 Bq**
Ba-133	**123 Bq**	**72 Bq**	**54 Bq**	**35 Bq**

MECHANICAL CHARACTERISTICS

- Chamber: 60.8 x 60.1 x 84 cm³ (LxWxH), 307 liters,
- Ext. chassis dimensions (LxWxH): 109.9 x 91.2 x 154.1 cm³, Without cladding and handles : 95.0 x 89.9 x 154.1 cm³
- Built-in weight scale, maximum 150kg, 0.1 kg resolution,
- 25 or 50 mm lead shielding, transportable by crane or forklift with the shielding installed,
- Total weight with shielding:

Shielding	Without (only bottom)	25	50
Weight	**1250 kg**	**2221 kg**	**3414 kg**

FUNCTIONAL CHARACTERISTICS

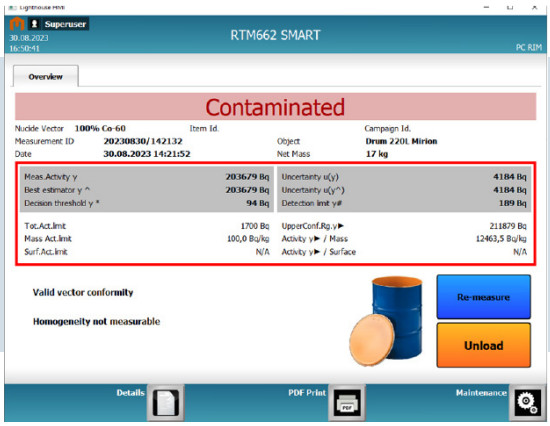
- Double / single sided, manual doors operation,
- Automatic item detection by weigh scale, still-camera in the measuring chamber,
- User interface by two 10”, colour touchscreens, remote control station possible,
- Visual and audible contamination alarm,
- Report and label printing, optional barcode 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



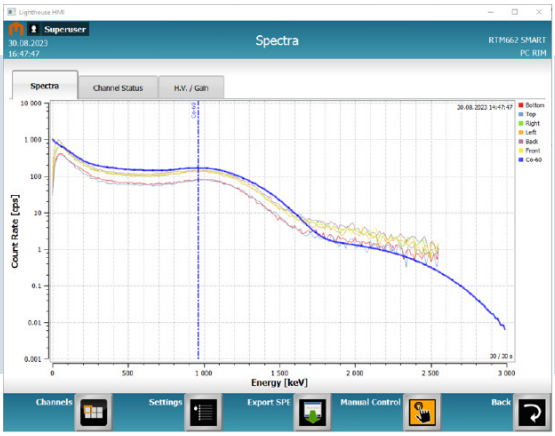
RESULTS SCREEN

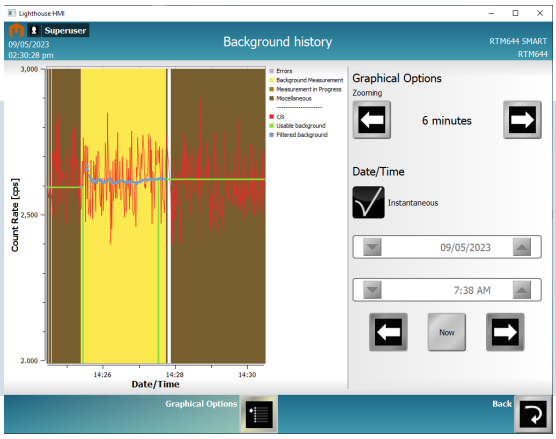
Detailed display of measurement conditions and results for a case where the alarm level is exceeded.

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*

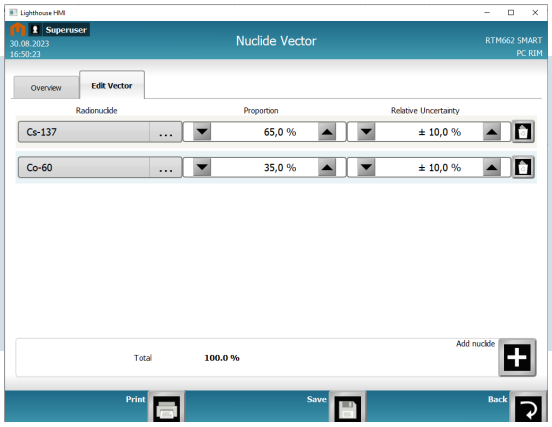




BACKGROUND DIAGNOSTICS

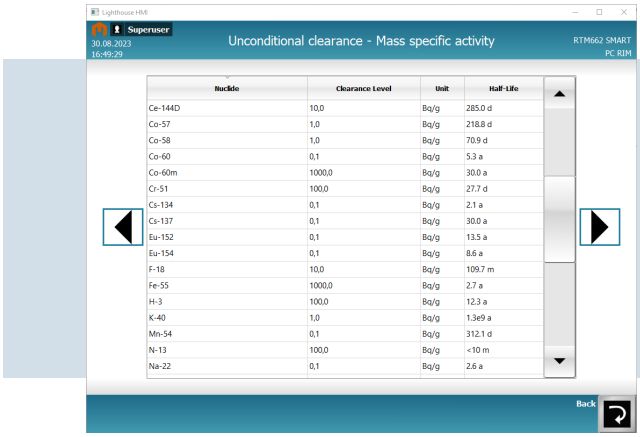
Graphical display of the background history including the count-rate, the filtering process and the refence background.
The background history is stored for 3 months with a resolution of 1 s for 3 days and 60 s for the remaining time*

RTM662-300 CLEARANCE MONITOR



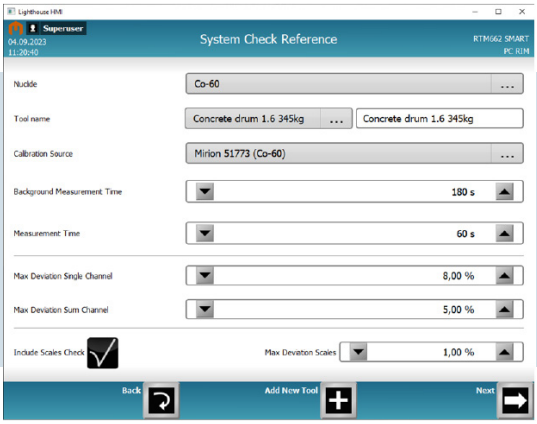
NUCLIDE VECTORS

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*

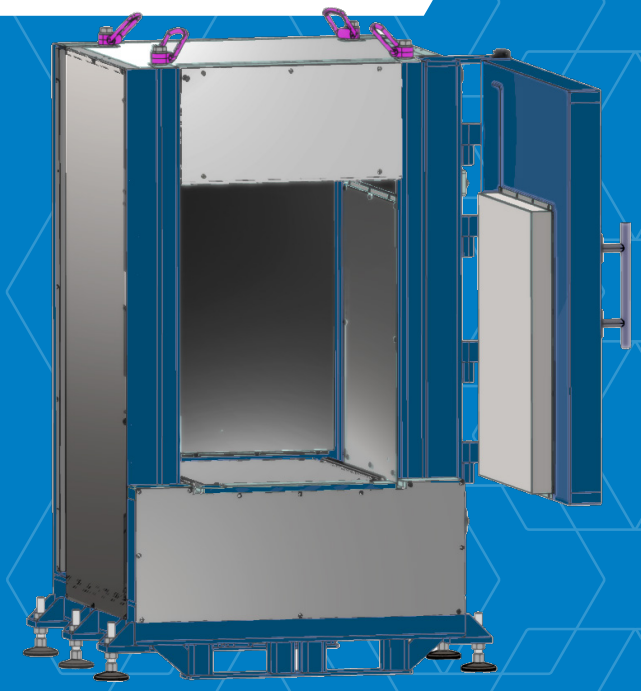
**All Mirion products are subject to continuous improvement and replacement of outdated components. This may lead to occasional design changes. Screenshots are for illustration purposes only, details depend on the ordered configuration.*

MIRION TECHNOLOGIES

MIRION
TECHNOLOGIES

RTM622-460

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 4π 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_{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**	**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

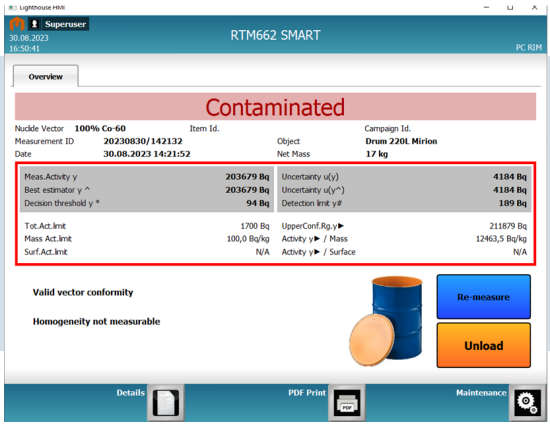
- Single door, manual operation,
- Automatic object detection by the weight scale,
- Optional software controlled cameras,
- Remote user interface with colour screen, keyboard and pointing device, single RJ45 cable connection,
- Visual and audible contamination alarm,
- Report and label printing, optional 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: 60 min
- 2 external USB connectors, 1 LAN connection
- 2 floating-contact outputs



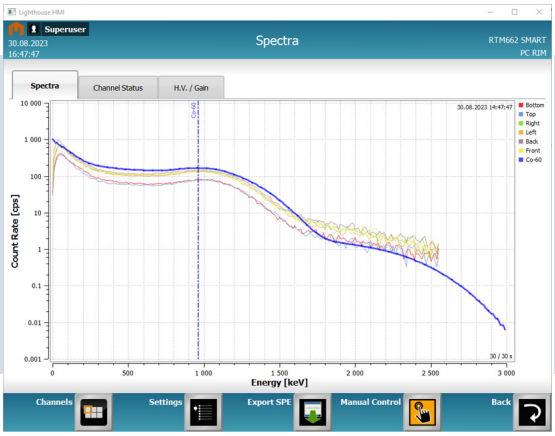
RESULTS SCREEN

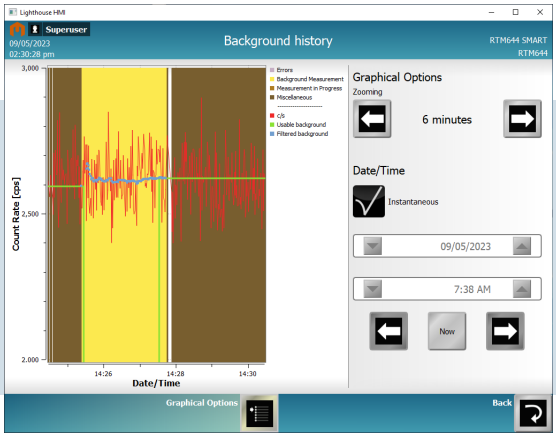
Detailed display of measurement conditions and results for a case where the alarm level is exceeded.

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.

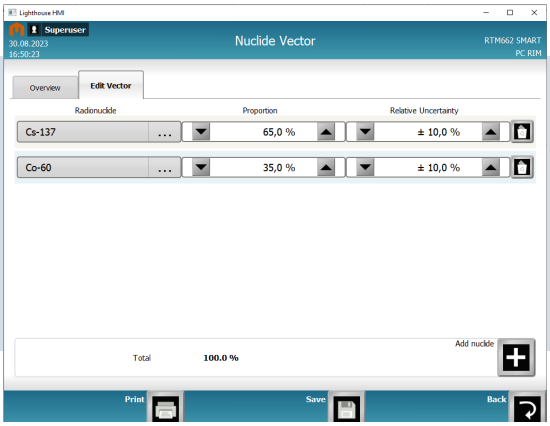




BACKGROUND DIAGNOSTICS

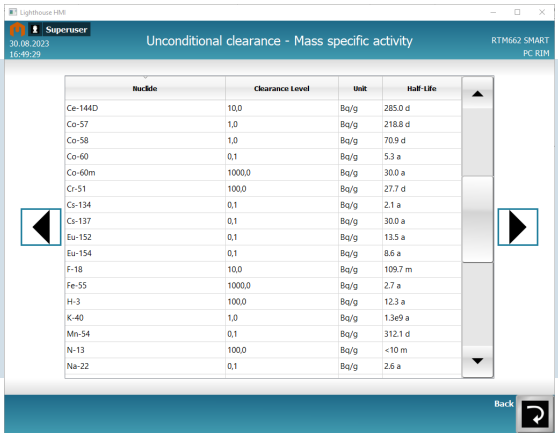
Graphical display of the background history including the count-rate, the filtering process and the refence background. The background history is stored for 3 months with a resolution of 1 s for 3 days and 60 s for the remaining time.

RTM662-460 CLEARANCE MONITOR



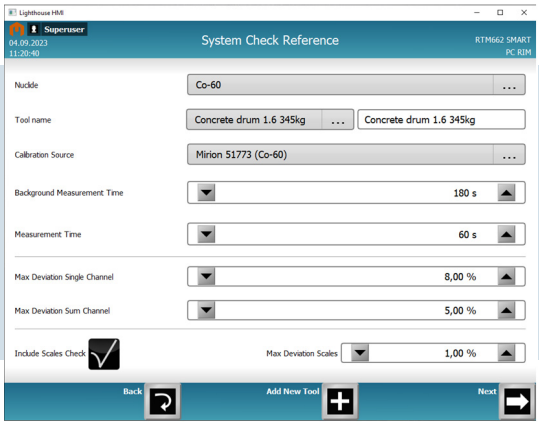
NUCLIDE VECTORS

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.

MIRION
TECHNOLOGIES

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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 teh 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 24 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

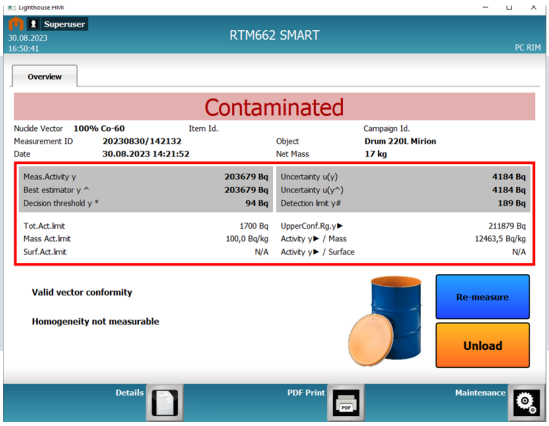
- Single door with chain conveyor, motorized operation with PLC,
- Up to 2 still cameras, triggered by position sensors,
- Automatic object loading, integrated in measurement software, object detection by the weight scale,
- Remote user interface with colour screen, keyboard and pointing device, single 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



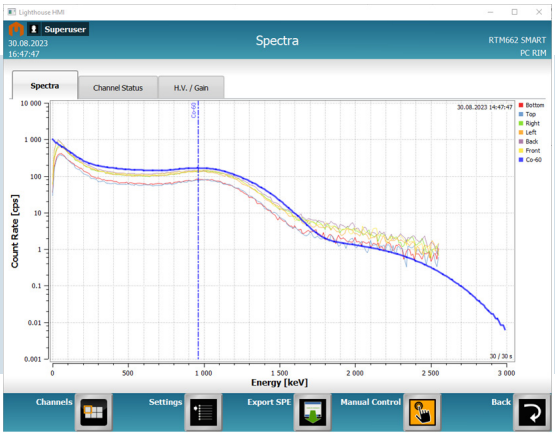
RESULTS SCREEN

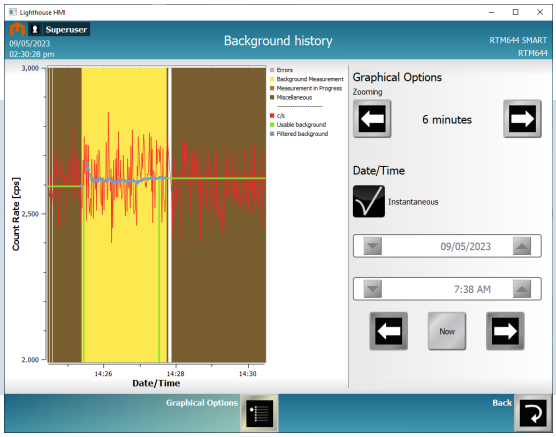
Detailed display of measurement conditions and results for a case where the alarm level is exceeded.

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.

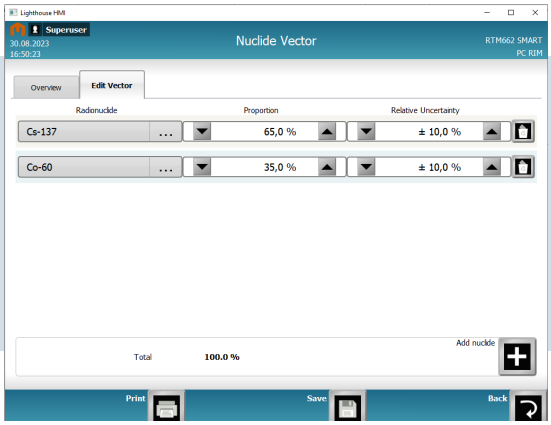




BACKGROUND DIAGNOSTICS

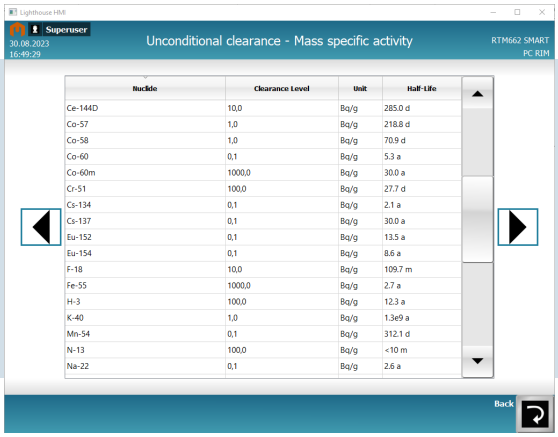
Graphical display of the background history including the count-rate, the filtering process and the refence background. The background history is stored for 3 months with a resolution of 1 s for 3 days and 60 s for the remaining time.

RTM662-460C CLEARANCE MONITOR



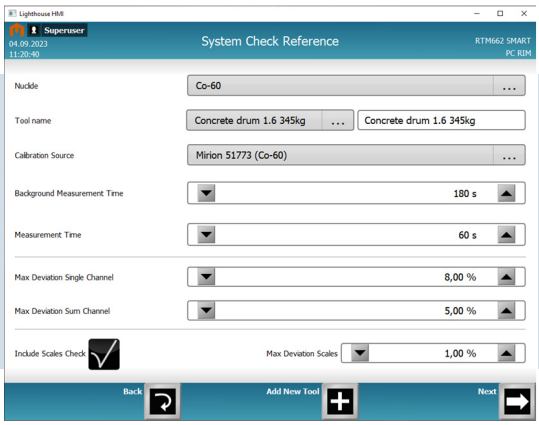
NUCLIDE VECTORS

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.

MIRION TECHNOLOGIES

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GAMMA WASTE ASSAY SYSTEMS

Cronos®-4 and Cronos®-11

Gamma Object/Tool Monitors

DESCRIPTION

The Cronos-4 and Cronos-11 Gamma Object/Tool Monitors are extremely sensitive instruments used to detect gamma radiation in/on articles such as waste bags, tools, briefcases, hard hats, and other miscellaneous objects. Measurements which ensure that objects have no detectable radioactivity can result in significant cost savings in waste processing and/or storage.

By taking all the best features of Mirion contamination monitors together with new technology and input from health physicists and radiation protection workers worldwide, Mirion has produced a monitor that significantly outperforms any previous monitors in its class.

All Cronos monitors use a sophisticated “fast following” background trending and release-limit algorithm to provide the best performance in a stable or varying radiation field.
The very low detection threshold is optimized by the quantity and sensitivity of the detectors, the thickness of the lead shielding and the measuring time, so that stringent user requirements can be met.

With Mirion WebRemote® software, an easy-to-use touch screen graphical user interface for industrial PC-based operation results in improved health physics programs, better tracking of contamination and faster, more thorough personnel throughput at boundary points.
The devices are rugged and reliable; and they are extremely easy to use.

FEATURES

- ✓ Cronos-4 counting chamber volume: 128.7 L (4.5 cu. ft)
- ✓ Cronos-11 counting chamber volume: 345.5 L (12.2 cu. ft)
- ✓ Amongst the lowest MDA/largest counting chamber volume combinations
- ✓ Robust, ergonomic and easy-to-use and to decontaminate
- ✓ Counts gamma photons with energy >50 keV
- ✓ Six 50 mm (~2 in.) thick large surface area plastic scintillator detectors
- ✓ Six sides of removable 25 mm (~1 in.) thick lead ingot shielding standard
- ✓ Built-in 100 kg (~220 lb) range, 0.1 kg (0.22 lb) resolution, weigh scale
- ✓ Single or dual door operation
- ✓ Automatic or manual selection of transmission correction factors
- ✓ Alarms/messages provided audibly and visually
- ✓ Same “industry-best” software and serial bus electronics consistent with Mirion Argos™-3/5, GEM™-5 and Sirius™ family; no re-training needed
- ✓ WebRemote enabled: provides an ergonomic and easy-to-use touch screen graphical user interface; accessible locally or via PC/tablet web browser
- ✓ Windows 7 Embedded operating system with LAN capability and USB ports
- ✓ Algorithm based on Gaussian or Bayesian statistics (compliant with the ISO 11929:2010 Standard requirements)

DETECTOR GEOMETRY AND BACKGROUND COMPENSATION

The Cronos' large cubic shaped measurement cavities are accessed through one or two doors. Six large area plastic scintillator detectors surround all sides of the cavities providing highly sensitive measuring volumes. Ambient background in the cavities is minimized by one (standard) or two (optional) 25 mm (~1 in.) thick layers of lead shielding. Adding the second layer of lead ingots does not change any internal dimensions or volume.

ELECTRONICS

The Cronos' computer operates on Windows 7 Embedded Operating System and uses USB flash for transferring data. Data may be retrieved either via USB or a LAN.
The flat color display screen(s), the computer and the controls and optional indicator lights are located on top of the instrument. The High Voltage (HV), preamplification, amplification, discrimination, counting, test pulse generation and other processing electronics are mounted right on the detectors – therefore, no HV cabling exists.

SETTING PARAMETERS

Parameter settings, testing, calibration and maintenance is accomplished locally or from a remote location using Mirion WebRemote. WebRemote enables Tablet or PC connection to the Cronos-4/11 via LAN or direct link. Alternatively, the operator can use the standard Monitor Software, pre-installed on all Cronos Contamination Monitors, to provide local Monitor access and functionality. The following types of parameters are available for adjustment:

- Sensitivity of detection.
- Alarm activity levels can be set in units of Bq, dpm, or nCi.
- Weights (when applicable) in units of kg, g, lb.
- Specific Activities (when applicable) in units of Bq/kg, dpm/kg, nCi/kg, pCi/kg, Bq/g, dpm/g, nCi/g, pCi/g, Bq/lb, dpm/lb, nCi/lb and pCi/lb.
- False alarm non-detection and alarm confidence probabilities.
- HV Optimization using Figure-of-Merit (FOM) calculations.
- Fixed or variable count times (calculated and optimized as a function of the alarm level setpoint, the background and the desired accuracy of measurement).

MONITORING ASSISTANCE VIA USER INTERFACE

GENERAL

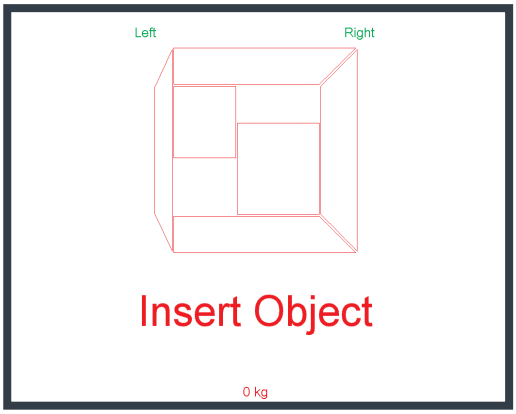
The various stages of the automatic measuring cycle are displayed on the screen(s) and a voice prompt will warn the user when a particular threshold has been exceeded (multiple languages are available). A trace can be kept of all checks made via the hard copy printout (if a printer is attached) and/or via software logging. In addition, performance monitoring data (such as detector efficiency check and calibration efficiency data can be saved to comma separated value (CSV) files for easy trending analysis with spreadsheet programs.

EASE OF USE

From cold startup to operation in as little as two minutes depending upon background conditions.

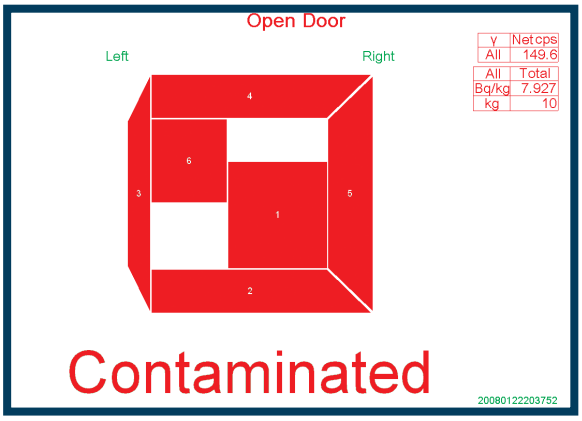
To use the unit, one simply follows the messages displayed on the screen:

1. Open the door, place the object(s) to be monitored inside, close the door and press the Start button.



2. After the measuring period (and if the alarm threshold has not been reached), the message “Clean” is displayed and the operator can then remove the object by opening the door (or secondary door if in two-door operating mode).

3. If a pre set alarm threshold is exceeded, an audible alarm warns the operator and the red indicator “Contaminated” appears on the screen.



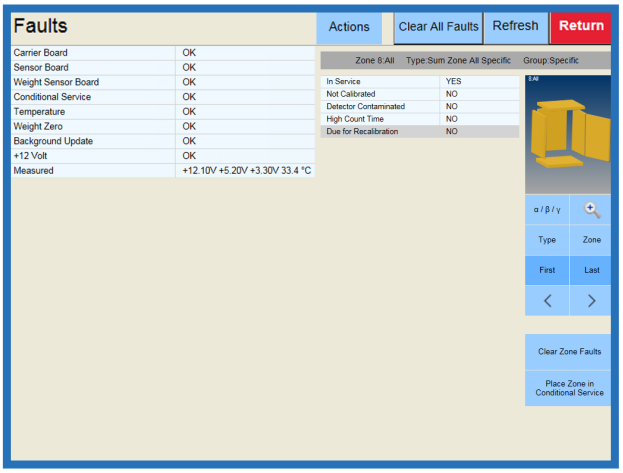
This display will show the quantity and location of the contamination based on which of the detectors is alarming, unless alarm is set on sum zone only. The operator opens the door, removes the object(s) and closes the door. The Cronos-1 will then perform a detector contamination check automatically to ensure there is no detectable amount of radioactivity remaining in the unit.
The measurement results can be printed out. This includes: time/date stamps, “BKG” background value, “Net” count and result of check (“CLEAN” or “CONTAMINATED” etc.).
Once the object(s) has been removed from the unit and the doors closed, the device automatically switches to continuous background acquisition.

MAINTENANCE

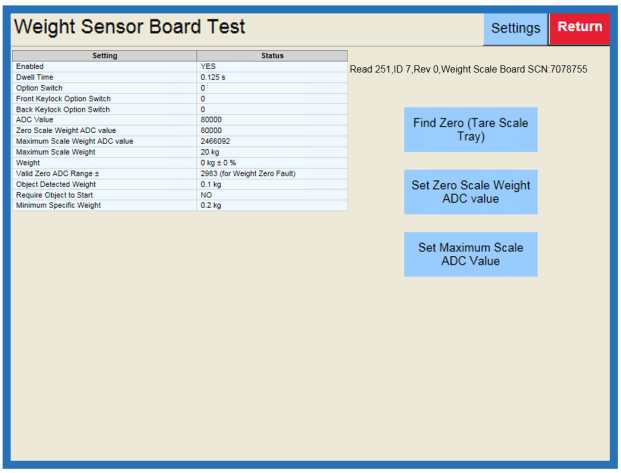
The system records data and time /date stamped logs showing the number of times the unit was used, parameters used, calibration settings, fault messages, etc. The system will also take itself out of service if the calibration interval is exceeded or other operational conditions exist which prevent the unit from achieving its desired sensitivity. These conditions can be configured by the user. Calibration can be easily executed by just one person and is highly automated.

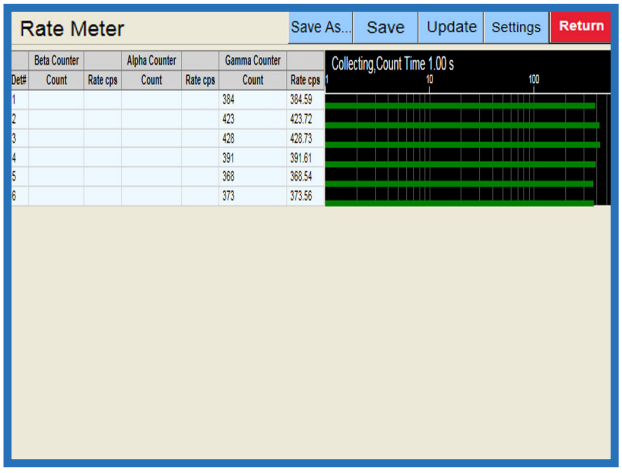
REMOTE STATUS MONITORING

A user friendly dashboard enables the status monitoring (in service, contaminated, out of service, maintenance) of multiple contamination monitors over the LAN. The dashboard is accessible from a tablet or PC web browser and requires no proprietary software installation.



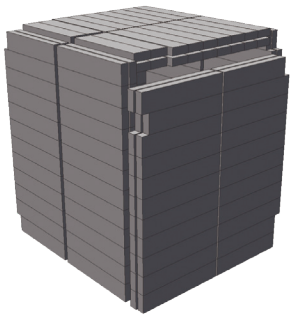
For ease of diagnostics numerous test screens are available to enable precision monitoring, and changing of parameters including high voltage and discrimination thresholds for each detector.

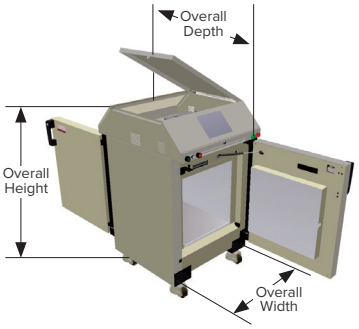
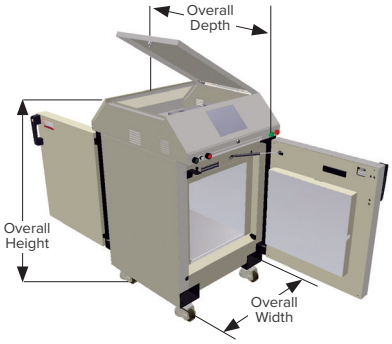
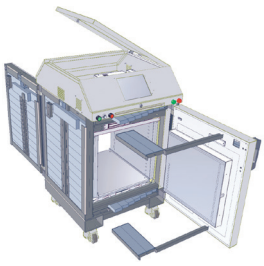




SPECIFICATIONS

MODEL-SPECIFIC

TYPE	DESCRIPTION/ NOTES	Cronos-4	Cronos-11
RADIOLOGICAL			
Time to reach MDA:	Calculated count times for MDA = 83 Bq (5000 dpm) 80 nSv/h background, 1" lead shielding, α = 0.15% and 1-β = 97.5% confidence intervals.	• For ^{137}Cs: 48 seconds • For ^{60}Co: 10 seconds	• For ^{137}Cs: 130 seconds • For ^{60}Co: 22 seconds
Detectors:		• For doors and main unit: six 45.7 x 45.7 x 5.1 cm (18 x 18 x 2 in.) plastic scintillators with built-in photomultiplier tubes. • 65.1 L (2.3 cu. ft) total detector volume.	• For doors: two 61 x 61 x 5.1 cm (24 x 24 x 2 in.) plastic scintillators with built-in photomultiplier tubes. • For main unit: four 61 x 74.9 x 5.1 cm (24 x 29.5 x 2 in.), plastic scintillators with built-in photomultiplier tubes. • 130.5 L (4.6 cu. ft) total detector volume.
Shielding:	Top and bottom 25 mm (~1 in.) lead shielding (or optional 50 mm (~2 in.) shielding) around the six sides of the measurement cavity for nearly 4π counting geometry.		
MECHANICAL			
Internal Dimensions:	Width	46.5 cm (18.3 in.)	63.5 cm (25.0 in.)
	Depth	57.9 cm (22.8 in.)	87.2 cm (34.3 in.)
	Height	47.8 cm (18.8 in.)	62.4 cm (24.6 in.)
	Internal Volume	~128.7 L (`4.5 cu. ft)	~345.5 L (~12.2 cu. ft.)

TYPE	DESCRIPTION/ NOTES	Cronos-4	Cronos-11
External Dimensions:			
	Overall Width	73.2 cm (28.8 in.)	88.4 cm (34.8 in.)
	Overall Depth	85.5 cm (33.7 in.) for body 95.2 cm (37.5 in.) for body and door handles	114.7 cm (45.2 in.) for body 124.4 cm (49.0 in.) for body and door handles
	Overall Height (including leveling feet flush with bottom of Casters)	129.1 cm (50.8 in.)	145.7 cm (57.4 in.)
	Door Thickness	7.0 cm (2.7 in.)	7.0 cm (2.7 in.)
Weight:	Unit with No Lead	445 kg (981 lb)	563 kg (1241 lb)
	Lead (1 layer)	751 kg (1656 lb)	1264 kg (2787 lb)
	Lead (2 layers)	1503 kg (3314 lb)	2529 kg (5575 lb)
	Total (with 1 layer of lead)	1207 kg (2661 lb)	1841 kg (4059 lb)
	Total (with 2 layers of lead)	1958 kg (4317 lb)	3105 kg (6845 lb)
Accessibilty:			

COMMON RADIOLOGICAL

RADIATION DETECTED

Gamma photons with energy over 50 keV: ^{241}Am, ^{133}Ba, ^{137}Cs, ^{60}Co, etc.

GENERAL

OPERATING MODES

The unit can be used with a two door operating mode (entrance and exit doors) or with one door operation only (the exit door is locked and only the entrance/front door is used for control). In either mode, doors are interlocked such that they must be closed to initiate a count.

Automatic weighing of packages 100 g to 100 kg (~0.2 lb. to ~220.5 lb.) and calculation of the specific activity for a given radioisotope or mixture with transmission correction factor(s) is also available via software and/or rotary dial switch.

PARAMETER ENTRY

Parameters may be entered with the touch of a finger using the capability of the built-in touch screen and WebRemote software. Additionally, a keyboard/trackball combo placed in a drawer in the top of the device is provided for entering parameters.

SPECIFICATIONS

UTILITY DEVICES

Lockable Keyboard Drawer:

- Houses special keyboard/trackball combo human interface device, integrated in top of unit for easy access

Rotary Switch:

- Used to manually select special preset user-defined parameter options (such as transmission correction factors) during normal operation without need to access keyboard

Display Screen:

- ~ 233.9 mm (10.4 in.) touch screen LCD display, integrated in top of unit (second display kit optionally available for exit side)

Bottom-mounted Input/Output and Power Entry Ports Box:

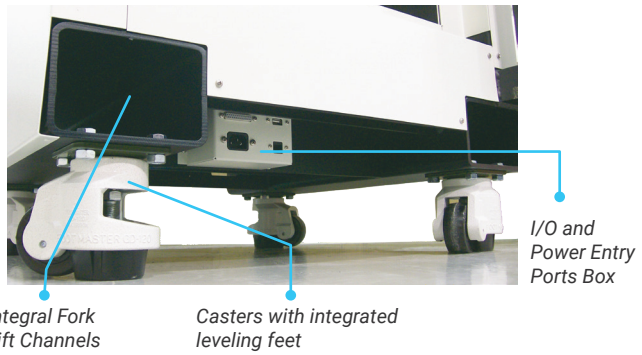
- Parallel (Centronics) printer port, printer not supplied
- One USB port and one Ethernet port (RJ45)
- IEC standard AC receptacle

Handling:

- Four casters: swiveling with integrated leveling feet (optional)
- Two integral fork lift channels to ease transportation

Internal Lining:

- Removable aluminum plate on top of load sensors for easy decontamination



ELECTRICAL

Power Requirements:

- 220 V ac/50 Hz/1 Amp or 110 V ac/60 Hz /2 Amp mains 3 m (~10 ft) IEC standard cable (supplied; specify and special cable requirements on order)

CERTIFICATION

- IEC 61098 compliant
- ISO 11929:2010 compliant

ENVIRONMENTAL

Temperature:

- Operating temperature range 0 to +45 °C (+32 to +113 °F)

Humidity:

- 85% non-condensing

ORDERING INFORMATION

- Cronos-4 (SCN 817800) – 128.7 L (4.5 cu. ft) internal volume. Internal Dimensions (W x D x H): 46.5 cm x 57.9 cm x 47.8 cm (18.3 in. x 22.8 in. x 18.8 in.)
- Cronos-11 (SCN 817900) – 345.5 L (12.2 cu. ft) internal volume. Internal Dimensions (W x D x H): 63.5 cm x 87.2 cm x 62.4 cm (25.0 in. x 34.3 in. x 24.6 in.)

OPTIONS (FOR CRONOS-4, X=4; FOR CRONOS-11, X=11)

- CrnsxPB: Secondary layer of 25 mm (~1 in.) lead ingot shielding for Cronos-x; (to bring total thickness to ~50 mm (2 in.))
- CrnxJIG: Source Calibration jig for Cronos-x (source not supplied)
- CrnsxLR: Removable, non-metal Cronos-x liners kit with preprinted center points for decon./calibration
- Crnsx2D: Secondary color LCD display kit for exit side of unit for Cronos-x
- CrnsMAG: Magnetic Strip Reader
- CrnsBAR: Bar Code Reader
- CrnsPROX: Proximity Card Reader
- Crns4TAB: Stand/Plinth table to elevate Cronos-4 only
- CrnxLFT: Lifting Sling Arrangement for Cronos-x
- CRemote: Centralized Remote Control & Data Access Software for use with Mirion Argos, Sirius, GEM and Cronos contamination monitors
- 817885 (Cronos-4), 817985 (Cronos-11) – Secondary color touch screen LCD kit for exit of unit

WebRemote-Kit Options (For Rugged, Y=1; FOR PRO Y=2; FOR basic, Y=3):

- WebRemote-Kit#Y – WebRemote Software and Rugged/Pro/Basic Hardware. Includes Dashboard, WebRemote, and Monitor 9.0 Software. Includes Rugged, Pro, or Basic hardware, and applicable accessories.
- The Mirion contamination monitors can be integrated with Horizon® Supervisory Software to provide an integrated solution with Mirion instruments. Horizon complements the functionality of the WebRemote Contamination Monitor Interface.

MIRION TECHNOLOGIES

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RTM750™

Laundry and Small-Items Conveyor Monitor

Detection of radioactive contamination on clothing and other small and/or long items such as tubes, poles and valves.

DESCRIPTION

The laundry and small items RTM750 monitor is used for detection of radioactive contamination on clothing and other small and/or long items such as tubes, poles and valves.

Detector arrays above and below the stainless-steel mesh belt guarantee high sensitivity. The detector arrangement ensures measurements without any dead zones. The gap between the belt and upper detector array is adjustable to achieve as low detection limits as possible, monitored by light barriers.

The RTM750 monitor can be equipped with various detector combinations to meet specific requirements.

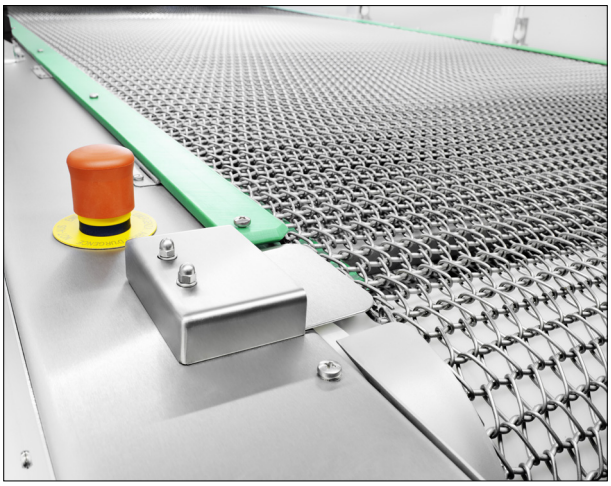
FEATURES

- High sensitivity, no dead zones
- Beta plastic, gamma plastic, gas detectors, or combinations
- Belt available in various dimensions
- Automatic speed control
- Height adjustment (2 - 18 cm; optionally more)
- Automatic background subtraction
- Selectable alarm levels in cps, cpm, Bq, Bq/cm^2
- Audible and visible alarm indication
- Alpha/beta discrimination (optional)
- Second conveyor for automated sorting of items (optional)
- Uninterruptible power supply (optional)

RTM750™ LAUNDRY AND SMALL-ITEMS CONVEYOR MONITOR

FUNCTIONALITY

The belt speed is calculated and set automatically in a range between 0.6 and 12 m/min dependent on measurement mode, current background, alarm threshold, detection safety and false alarm rate (acc. to ISO 11929). In case of alarm the belt reverses its movement to the start and stops. An alarm message is displayed on the screen. A high contamination alarm, e.g., in case of hot spots, triggers an additional acoustic alarm. All contaminations are clearly indicated by visual and audible alarm. The results are stored in a measurement database. To avoid puncturing detectors by the measured goods a plastic belt can be utilized (optional). An additional conveyor allows for automatic sorting of the measured goods according to the measurement result (optional).



USERS BENEFITS

- High throughput: up to 375 overall/h
- Contamination measurement from below and above
- Adjustable height of upper detectors (2 - 18 cm; optional up to 40 cm)
- Large TFT 19” color display (touch screen optional)
- Automatic system check
- Uninterruptible power supply (optional)

TECHNICAL SPECIFICATIONS

- Standard dimensions:
  - Length: 2000 - 3400 mm
  - Width: 900 - 1400 mm
  - Height: 1730 - 1980 mm
- Detectors: beta plastic scintillation or gas-flow detectors or gamma plastic scintillation or combinations
- Detection limit: 45 Bq (Co-60, 1.2 m/min)
- Belt speed: 0.6 m/min - 12 m/min
- Energy range: 50 keV - 3 MeV

OPTIONS

- Impermeable plastic conveyor belt
- Additional conveyor for sorting clothes according to measurement result
- Mechanical height adjustment for whole RTM750 monitor
- Tray and trackball, plus finger protection
- Alpha/beta discrimination
- ISO 11929 implementation

MIRION TECHNOLOGIES

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Notes

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