Contamination Monitors
Innovations & Applications

Tobias Baer Product Line Manager – Contamination & Clearance

Ralph Bose Product Manager – Contamination & Clearance

Mirion Connect | Annual Users' Conference 2025

Orlando, Florida

Tobias Baer Product Line Manager – Contamination & Clearance

Ralph Bose Product Manager – Contamination & Clearance

Agenda

- Whole Body Contamination Monitors
- Hand Foot Monitors
- Gamma Portal Monitors
- Tool & Object Monitors
- Conveyor Monitors
- Vehicle Monitors
- Connectivity Solutions
- Upgrades to Existing Equipment

Agenda

- **Whole Body Contamination Monitors**
- Hand Foot Monitors
- Gamma Portal Monitors
- Tool & Object Monitors
- Conveyor Monitors
- Vehicle Monitors
- Connectivity Solutions
- Upgrades to Existing Equipment

MIRION
Connect 25
Annual Users' Conference

Innovation at Work

Argos™-3/-5 Whole Body Contamination Monitors

Applications

Whole body surface contamination monitors to clear personnel from Radiological Controlled Areas (RCAs) and Boundary Zones in nuclear facilities, such as nuclear power plants, laboratories, etc.

Key Features

- **Alpha, Beta and/or Gamma Monitoring** (including discrimination)
- **Gas Flow or Gasless detectors**
- **Resolving Issues with Radon Progeny**
- **Outstanding body coverage** and radiological performance

NEW **Comprehensive Monitor Software** v10.00 based on Windows 11 IoT LTSC now available

Recent functional improvements include: **new outlier filter** to reduce aborted occupant measurements due to "Background is Changing" (caused by spurious outliers, e.g. microphonics).

Over **2000 Argos-3/5** monitors delivered worldwide.

Innovation at Work

Argos versions

Argos™ Standard Product
Versions & Detector Configurations

		Argos-5	**Argos-3**	**Argos-3 Compact**	**Argos-3 Modular**
Gas Flow	**AB** LFP-579 Three Chamber Low Flow Proportional Detectors	25 x α/β Detectors	18 x α/β Detectors	15 x α/β Detectors Compact Footprint	N/A
Thin Plastic Scintillation (Gasless)	**PAB** TPS-AB-579 Gasless Thin Plastic Scintillation Detectors	25 x α/β Detectors	18 x α/β Detectors	15 x α/β Detectors Compact Footprint	19 x α/β Detectors Modular Design
	PB TPS-B-579 Gasless Thin Plastic Scintillation Detectors	25 x β Detectors	18 x β Detectors	15 x β Detectors Compact Footprint	19 x β Detectors Modular Design
	PBG TPS-BG-579 Gasless Thin Plastic Scintillation Detectors	25 x β/γ Detectors	18 x β/γ Detectors	15 x β/γ Detectors Compact Footprint	19 x β/γ Detectors Modular Design

Additional detectors can easily be added to Argos-3 and Argos-3 Compact

Innovation at Work

LFP & TPS Detector Technology

Low Flow Proportional (LFP) Detectors

- **α/β** monitoring with discrimination, best efficiency and Minimum Detectable Activity for the **shortest count times overall**
- Exceptional detection capability resulting from patented* triple zone detector design
- A variety of gas mixtures can be used (P-5, P-7.5, P-10, Ar/CO2 etc.)
- Uniform response across detector face

Thin Plastic Scintillation (TPS) Detectors

- Gas-free - no cost or worry associated with handling gas
- **α/β**, **β/γ** or **β** monitoring with discrimination
- Reduced count time even in high γ background environment compared to other gasless detectors.
- In addition: TPS-BG detectors feature unique **β/γ anti-coincidence** processing → outstanding β measurement performance in elevated gamma backgrounds
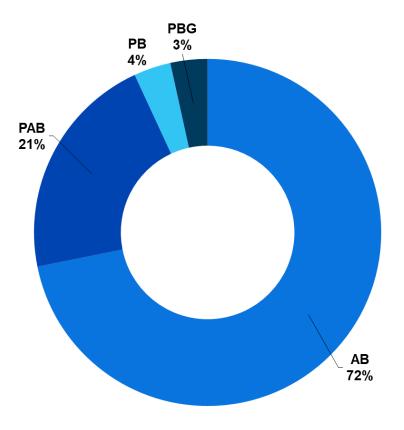
Innovation at Work

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

Comparison of Detector Technologies

	AB (LFP-579)	PB (TPS-B-579)	PAB (TPS-AB-579)	PBG (TPS-BG-579)
Gas required	Yes	No	No	No
Radiation measured	α/β with disc. (γ with ZEUS)	β (γ with ZEUS)	α/β with disc. (γ with ZEUS)	β/γ with disc.
Radiological performance (for beta)	Overall best radiological performance	Optimized for beta, but slightly less than AB	Optimized alpha and beta, slightly less than PB	Good in elevated gamma background
Sensitivity to gamma background	Best	Optimized by use of thin plastic scintillator	Optimized by use of thin plastic scintillator	Better than PB or PAB by β/γ anti-coincidence processing
Radon progeny rejection	Yes	No	Yes	No
Long-term stability	Very High	High	High	High
Pricing				

Argos detector configuration delivered to users in North America 2022 - 2024
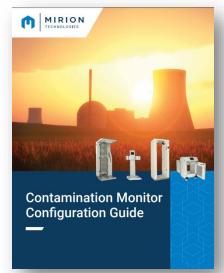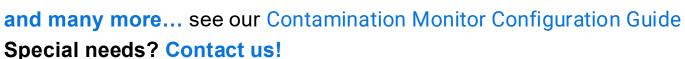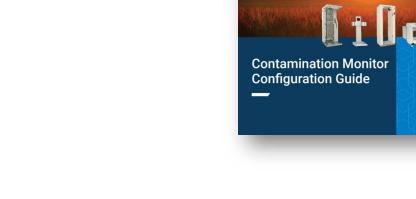
- PBG 3%
- PB 4%
- PAB 21%
- AB 72%

Options

- **Moveable Head Detector**
- **ZEUS option** gamma detection capability
- **Gamma foot** or **gamma head detector** options
- **Small item monitors**
- **Uninterruptible Power Supply**
- **Camera Option**
- **Casters/wheels**
- **Dosimetry Reader Integration for DMC3000**
- **Frisker probes**
- **Card/Barcode readers**
- **Beacon Tower**
- **Purge Detector**
- **CeMoSys™ Client License**

and many more… see our Contamination Monitor Configuration Guide

Special needs? Contact us!

Moveable
Head Detector

Gamma Plastic
Scintillator Detector

Zeus gamma detectors are mounted behind
TPS detectors in an Argos-PB or Argos-PAB or
behind LFP detectors in an Argos-3/-5AB.
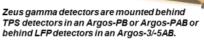
**Contamination Monitor
Configuration Guide**

Argos-3 Modular

NEW

Applications

Transportable body contamination monitoring with requirements for easy movability and **quick assembly/disassembly** into subcomponents:

- **Use on nuclear vessels** (submarines, aircraft carriers) during maintenance.
- **Emergency Response** where β/γ, β or α/β contamination detection is required.
- **Temporary work-sites/check-points** in nuclear facilities where it is difficult to maneuver and fit any of the other Argos-3/-5 (or even the Compact!) models.

Key Features

- All elements are transportable in only three (3) separate optional transport cases
- **Quick assembly/disassembly (<15 minutes)**
- Available with 19x gas-free TPS alpha/beta, beta or beta/gamma detectors
- Uses comprehensive and well-proven Monitor Program software platform, including WebRemote® and Dashboard (identical to Argos™-3/-5, Sirius™-5, Cronos®-1/4/11 and GEM™-5)

Innovation at Work

Argos-3 Modular Optional Cases

Key Benefits
- Quick and straightforward set-up and disassembly (<15 minutes)
- No tools required.
- Safe storage and transportation in optional ~~~ort cases

See Argos-3 Modular set-up live in dedicated Spotlight Session: Thursday 3:00pm

Innovation at Work

Argos-3 Compact

Application

(Mobile) Contamination monitor for locations with size constraints.

Key Features

- **Compact dimensions: ~30.8 x 86.0 x 33.3 in.³** (W x H x D)
- 15 detectors for coverage of body, head, legs, arms, hands & feets.
  Potential to **add detectors up to a total of 24** for improved body coverage.
- Various detector combinations possible:
  - Argos-3AB Compact with LFP-579 **alpha/beta gas-flow detectors**
  - Argos-3PB Compact with TPS-B-579 **beta plastic detectors**
  - Argos-3PAB Compact with TPS-AB-579 **alpha/beta plastic detectors**
  - Argos-3PBG Compact with TPB-BG-579 **beta/gamma plastic detectors**
- Can be equipped with casters for easy transportation
- Integrated 8.4" touch display
- Featuring the identical comprehensive monitor software platform used on other Argos-3/5, Sirius™-5, Cronos®-1/4/11 and GEM™-5 contamination monitors
- Based on Windows 11 IoT operating system

Advanced Dosimetry Integration

Mirion is proud to present a direct integration of LDM320 dosimeter reader for DMC3000 into Argos and Sirius contamination monitors

- **Proof** that individuals have been properly monitored for contamination

- **Save time** at exit of RCA (read-out & switch-off dosimeter in parallel to contamination monitoring)

- **Save space** (combination of dosimetry and contamination monitoring stations)

- **Identify potential sources/areas for contamination** (through analysis of job-code vs. contamination events)
  → **Understand & reduce contamination events**

Innovation at Work

Advanced Dosimetry Integration

Key Features

- User ID is stored with contamination measurement result
- Result of contamination monitoring (contam/clean) available in DosiServ
→ Allows reports based on job-code and contamination events
- Management of sequences including configuration possibilities
- LDMAccess software for control of dosimeter reader is running on Argos embedded computer

Miscellaneous

- Advanced C&C-Dosimetry integration requires **DosiServ** dose management software
- Upgrade kits for Argos and Sirius are available

Innovation at Work

Agenda

- Whole Body Contamination Monitors
- **Hand Foot Monitors**
- Gamma Portal Monitors
- Tool & Object Monitors
- Conveyor Monitors
- Vehicle Monitors
- Connectivity Solutions
- Upgrades to Existing equipment

Sirius-5 Compact

NEW

Applications

Detection of radioactive contamination on hands, cuff and feet.
Suitable for confined locations. Easily movable.

Key Features

- **Compact Footprint**
  H × W × D: approx. 1465 mm × 640 mm × 844 mm (57.7" × 25.2" × 33.2")

- **Excellent radiological measurement performance** with various detector combinations possible:
  - Sirius-5AB Compact with LFP-579 **alpha/beta gas-flow detectors**
  - Sirius-5PB Compact with TPS-B-579 **beta plastic scintillation detectors**
  - Sirius-5PAB Compact with TPS-AB-579 **alpha/beta plastic scintillation detectors**
  - Sirius-5PBG Compact with TPB-BG-579 **beta/gamma plastic scintillation detectors**

- **Integrated casters and handle** for easy transport

- Uses **comprehensive** and **well-proven Monitor Program software platform,** including **WebRemote®** and **Dashboard** (identical to Argos™-3/-5, Sirius™-5, Cronos®-1/4/11 and GEM™-5)

- Based on Windows® 11 IoT LTSC operating system

- Designed for **365/24/7 operation for high uptime** and **minimum maintenance** with several common spare parts shared with Argos™-3/5, Sirius™-5, Cronos®-1/4/11 and GEM™-5 contamination monitors.

Innovation at Work

Options

- **Alpha/Beta** LIGHT**Link**® **Frisker** 100 cm² alpha/beta frisker probe
  → see presentation by Frederic Meyer
- **Uninterruptible Power Supply** Li-ion UPS for ~30 minutes autonomous operation
- **Dosimetry Reader Integration for DMC3000**
- **Beacon/Light Tower**
- **Purge Detector**
- **Gas Pressure Monitor**
- **Barcode Card Reader**
- **Magnetic Card Reader**
- **Proximity Card Reader**
- **CeMoSys™ Client License**
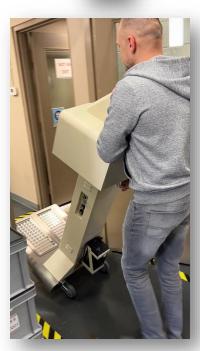 for interfacing with CeMoSys™ Central Monitoring System.

and many more… contact us!

Agenda

- Whole Body Contamination Monitors
- Hand Foot Monitors
- **Gamma Portal Monitors**
- Tool & Object Monitors
- Conveyor Monitors
- Vehicle Monitors
- Connectivity Solutions
- Upgrades to Existing equipment

Innovation at Work

GEM-5

Applications

Gamma contamination monitoring in nuclear facilities, such as nuclear power plants, laboratories, radiopharma production, etc. Passive monitoring for internal contamination.

Key Features

- Bi-directional operation: Walkthrough, Wait-in and two step.

- 8 large volume gamma plastic scintillation (side, top and bottom)

- Opening widths of 61 cm (24 in.), 80 cm (31.5 in.), 93 cm (36.6 in.), and 100 cm (39.4 in.)

- Comprehensive lead-shielding options available

- Based on the identical comprehensive monitor software platform used on Argos-3/5, Sirius-5 and Cronos®-1/4/11 contamination monitors

- Similar spare parts as Argos-3/5, Cronos®-1/4/11 and GEM™-5 contamination monitors

MiniSentry 2

Application

Screening of pedestrians or vehicles for gamma emitting radiation in **emergency scenarios** or for **security applications**

Key Features

- **Quick and Easy Setup and Operation**
  - Weight: <43kg / 95 lb
  - Rapid deployment and set-up: Single person 5 Minutes
  - Automatic start-up and operation / Very little training needed
- **Flexible Solution**
  - In- and outdoor operation (IP54, -25°C to +50°C / -13°F – 122°F)
  - Powered by battery (up to >65 hours autonomy[1]), USB or 110 / 240V
  - Connection of CSP probes possible (e.g. for AB-100 or SN-S)
  - Options: vehicle monitoring kit, extended passage width, etc.
- **State-of-the-art Radiological Performance**
  - Detection: 1 µCi (37kBq) ^{137}Cs in walk-through mode
  - High sensitivity plastic scintillation detectors with 10.6 litres active volume
  - Wide energy range: 30keV – 2 MeV
  - Compliant with FEMA-REP-21 from US Federal Emergency Management Agency and IEC 62244

[1] with optional battery extension module

Agenda

- Whole Body Contamination Monitors

- Hand Foot Monitors

- Gamma Portal Monitors

- **Tool & Object Monitors**

- Conveyor Monitors

- Vehicle Monitors

- Connectivity Solutions

- Upgrades to Existing equipment

MIRION
Connect 25
Annual Users' Conference

Innovation at Work

Tool & Object Monitors

Cronos® Family

- **Cronos-1** Gamma Object/Tool Monitor
  - 43 L (1.5 cu. ft.) internal volume
- **Cronos-1PBG** Beta /Gamma Object/Tool Monitor
  - 42 L (1.4 cu. ft.) internal volume
- **Cronos-4**, Gamma Object/Tool Monitor
  - 129 L (4.5 cu. ft.) internal volume
- **Cronos-11**, Gamma Object/Tool Monitor
  - 345 L (12 cu. ft.) internal volume

Cronos Family and Options

Key Features

- 6x large volume gamma plastic scintillation detector (Cronos-1/-4/-11)

- 25mm or 50mm epoxy-coated lead shielding (removable)

- 2 doors (for single of dual side operation)

- Weight scale for activity/mass measurements* and mass attenuation correction

- Heavy duty casters, fork lift channels

- Calibration fixture

- Large full color LCD display and annunciator lights

- Digitized voice prompts and visual prompts on the LCD display

- Camera option for picture and object detection

- Based on the identical comprehensive monitor software platform used on
  Argos-3/5, Sirius-5 and GEM™-5, including management of nuclide vectors, weight-specific activity limits, etc.

- Similar spare parts as Argos-3/5, Sirius-5 and GEM™-5 contamination monitors

* Optional for Cronos-1

Innovation at Work

Clearance and Waste Monitors

NEW

RTM662-460

Volume: 460 liters / 16.2 cu. ft.

- Measurement of, large objects, tools, bags
- Innovative Smart Technology, with gamma spectrometry based on plastic scintillators
- Improved "Leading Nuclide Correlation" for easy handling of complex nuclide vectors

NEW

RTM662-460C

Volume: 460 liters / 16.2 cu. ft.

- Measurement of 200l drums
- 6 gamma plastic detectors
- Automatic Conveyor system

RTM644-Smart™

Volume: 1870l / 66 cu. ft.

- Measurement of grid boxes, palettes
- 24 large volume gamma plastic detectors with spectroscopic read-out
- Improved "Leading Nuclide Correlation"
- High throughput: 16 tons per hour
- High precision: <50 Bq (Co-60 in 30s)
- Many options: Integration in container, cameras, analysis software, etc.

Agenda

- Whole Body Contamination Monitors
- Hand Foot Monitors
- Gamma Portal Monitors
- Tool & Object Monitors
- **Conveyor Monitors**
- Vehicle Monitors
- Connectivity Solutions
- Upgrades to Existing equipment

Conveyor Monitors

RTM750

- Measurement of laundry, small items and scaffolds

- 2 detector trays (below and above belt)

- Height of upper detector tray adjustable

- Automatic speed control

- Various detector types/combinations available:
  beta gas-flow, beta plastic, gamma plastic

- Optional transverse sorting conveyor

- Optional configuration **for scaffolding and heavier items**

- Based on Lighthouse software and Windows 10 IoT operating system

Agenda

- Whole Body Contamination Monitors
- Hand Foot Monitors
- Gamma Portal Monitors
- Tool & Object Monitors
- Conveyor Monitors
- **Vehicle Monitors**
- Connectivity Solutions
- Upgrades to Existing equipment

FastTrack-Vehicle™

Application

Screening of vehicle, cars, trucks, trains, bicycles and/or pedestrians for gamma emitting radiation

Key Features

- Available in two versions:
  - **FastTrack-Vehicle XL:** 6x GammaFibre™ detectors per monitor cabinet with 8 litres active volume each (total active volume: **96l**)
  - **FastTrack-Vehicle:** 3x GammaFibre detector per cabinet
- Advanced FastTrack algorithm to avoid false alarms **well-proven in millions of real-life measurements**
- High sensitivity: 40kBq (Co-60, FTV XL)
- Constant performance up to 20 km/h
- Neutron detector (optional)
- Web server interface for remote services
- Source localization within vehicle
- Mirion Lighthouse user software based on Windows 10 IoT operating system
- Many options and accessories available

Agenda

- Whole Body Contamination Monitors
- Hand Foot Monitors
- Gamma Portal Monitors
- Tool & Object Monitors
- Conveyor Monitors
- Vehicle Monitors
- **Connectivity Solutions**
- Upgrades to Existing equipment

WebRemote®

Application

- WebRemote® allows to connect to a specific Argos/Sirius/Cronos/GEM monitor in order to access all functionalities of the Monitor Software (measurement re~~...~~
- Available for rem~~...~~

Intuitive

- Find your setting~~...~~
- See the main me~~...~~

Modern and clean design

- Large buttons
- Easy selection of detector on the monitor layout
- Touch-screen friendly

WebRemote is included by default in every Argos-3/-5, Sirius-5, GEM-5 and Cronos-1/-4/-11 (with Monitor Software 9.00 or above)
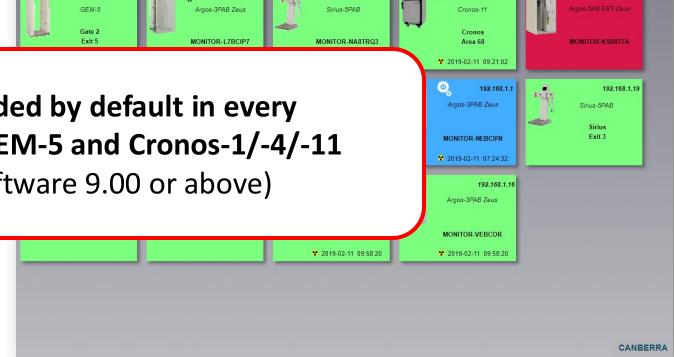
Dashboard

Contamination Monitor Status Overview

- Dashboard provides a simple overview of your contamination monitors' status

- Easy drill [details]

- Ability to [interface]

- No centra[l] (one cont[roller])

Dashboard is included by default in every Argos-3/-5, Sirius-5, GEM-5 and Cronos-1/-4/-11
(with Monitor Software 9.00 or above)

Innovation at Work

CeMoSys™ 2.0

Sirius-5 (Compact)

Argos-3/-5

TOM

Cronos-1/-4/-11

TwoStep™-Exit II⁺

RTM644Inc

HandFoot-Fibre™

CeMoSys™

FastTrack-Fibre™

FastTrack-Vehicle™ XL

GEM-5

RTM750

"

CeMoSys is the Central Monitoring and Supervisory System for all Mirion Contamination & Clearance Monitors

and many more...

CeMoSys™ 2.0

Application

Centralized supervisory, data analysis and reporting for contamination monitors

Key Features

- Central database for all Mirion contamination monitors:
  - Multi-layer status overview dashboard
  - Detailed state-of-health data
  - Measurement results
- Comprehensive analysis & export functionalities
- Remote access per web-browser
- Support for (almost) all C&C products: Argos-3/-5, Sirius-5, GEM-5, Cronos, TSE, HFF, FTF, TOM, RTM644Inc, RTM661, RTM750, FTV, RTM91x, RTM662, RTM644-Smart

Agenda

- Whole Body Contamination Monitors
- Hand Foot Monitors
- Gamma Portal Monitors
- Tool & Object Monitors
- Conveyor Monitors
- Vehicle Monitors
- Connectivity Solutions
- **Upgrades to Existing equipment**

MIRION **25**
Connect
Annual Users' Conference

Upgrade Kits

Typical lifetime of contamination monitors: 15-20 years (sometimes also longer).

→ Typically requires upgrades of computers, operating system, software (and certain electronic components) throughout operational life

Why Upgrade?

- **Equipment Upgrade is required to ensure long-term support and availability of spare parts**
  Obsolescence of computers, OS, electronic components, and/or other spare parts
  (e.g. no more computers for QNX operating system available)
- **Cyber security**
  Upgrades are required to maintain up-to-date cyber security resilience
- **New functionalities**
  C&C software is continuously improved
- **Compliance with new standards**
  e.g. evolutions of ISO11929
- **Simplified OS maintenance**
  based on Windows 11 IoT
- **Remote-connectivity**
  Possibility to connect to C&C monitor remotely (e.g. WebRemote, Dashboard, CeMoSys compatibility)
- **Improved compatibility with external devices**
  printers, USB-sticks, etc.

Computer & Software

Argos/Sirius/GEM/Cronos are based on a computer specifically designed for Mirion contamination monitors and an OEM version of Windows 11 IoT LTSC.

New Computer

NEW

- Previously used computer is NOT compatible with Windows 11
  A new computer for Argos/Sirius/Cronos/GEM has been developed and is now available.
  - Mirion part number 7098137 for Argos/Cronos/Sirius, p/n 7098135 for GEM-5
  - **Compatible with Windows 11 IoT LTSC**
  - Requires Win 10 or Win 11 and Monitor Program v.10.00 or above.
  → Default production is currently transitioning to new computer.
- Previous computer remains **available** as spare part during **a transition period**.

Monitor Software and Windows OS

NEW

Windows 11 IoT LTSC and Monitor Software v.10.0 are now available.

Upgrades to new computer, Windows 11 and latest Monitor Software are available.
Always verify compatibility before upgrading to new computer, software or OS.
→ **please contact the Mirion service team in case of interest.**

Thank you

Dr. Tobias Baer
Product Line Manager
Contamination & Clearance
tbaer@mirion.com

Ralph Bose
Product Manager
Contamination & Clearance
rbose@mirion.com