



## PREVENTION

# GEM™-5

Gamma Exit Monitor



## 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)

## 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.

### 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<sup>2</sup>, dpm, dpm/cm<sup>2</sup>, nCi, nCi/cm<sup>2</sup>, pCi, pCi/cm<sup>2</sup>, μCi or μCi/cm<sup>2</sup>
- 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 thereof).

### 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  $\mu$ rad/h), using the following modes:
  - Walkthrough: 830 Bq (22.5 nCi) <sup>60</sup>Co; 1850 Bq (50 nCi) <sup>137</sup>Cs
  - Pause (4 s) and Count: 555 Bq (15 nCi) <sup>60</sup>Co; 830 Bq (22.5 nCi) <sup>137</sup>Cs
  - Two-Step: 370 Bq (10 nCi) <sup>60</sup>Co, 8 s; 370 Bq (10 nCi) <sup>137</sup>Cs, 18 s

### DETECTORS

- Configuration: Eight identical plastic scintillators; 24 sum zones
- Total Scintillator Volume: 86196 cm<sup>3</sup>; (5260 in.<sup>3</sup>)
- Total Scintillator Surface Area: (16968 cm<sup>2</sup>; 2630 in.<sup>2</sup>)

### 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 4 $\pi$  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 <sup>137</sup>Cs source and the standard Figure-of-Merit (FOM) technique for reducing signal-to-noise ratios.

Isotope	Efficiency
<sup>60</sup> Co (Gamma)	24%
<sup>137</sup> 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 $\times$ 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):  $\leq$ 85% non-condensing at 35 °C (95 °F) maximum
- Relative Humidity: Storage:  $\leq$ 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.

§ ...feet fully extended add 6.8 cm (2.7 in.)

# GEM-5 | GAMMA EXIT MONITOR

## 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.

