



## TOOL AND OBJECT MONITOR

# CRONOS<sup>®</sup>-1PBG

*Beta/Gamma Object/Tool Monitor*



## FEATURES

- Detection of beta and gamma emitting radioactive contamination (with beta/gamma discrimination)
- Robust and ergonomic design
- Easy-to-use interface and software
- Counting chamber volume of 42,9 L (1.5 cu. ft)
- 12 large surface area thin plastic scintillation (TPS) detectors (two detectors each side)
- Removable 25 mm (~1 in.) and optional 50 mm (~2 in.) thick lead ingot shielding around the counting chamber (six sides)
- One-door or two-doors operation modes
- Radionuclide vectors/transfer function for the gamma channel
- Automatic or manual selection of transmission correction factors (with weight scale option)
- Adjustable upper level discriminator to reduce/optimize count time
- Same “industry-best” software and serial bus electronics across Cronos<sup>®</sup>-4/11, Argos<sup>™</sup>-3/5, Sirius<sup>™</sup>-5 and GEM<sup>™</sup>-5 family; no re-training needed
- Windows<sup>®</sup> 10 IoT operating system with LAN capability and USB ports
- WebRemote<sup>®</sup> enabled: provides an ergonomic and easy-to-use touch screen graphical user interface; accessible locally or via PC/tablet web browser
- Algorithm based on the Gaussian or Bayesian statistics (compliant with ISO 11929:2010 standard)

## DESCRIPTION

The Cronos-1PBG Beta/Gamma Object/Tool Monitor is an extremely sensitive instrument to detect beta and gamma emitting radioactive contamination on small objects such as notebooks, keys, tools, hard hats, and other items which can be placed in the counting chamber. Short count times and high efficiency make the Cronos-1PBG, the ideal tool for the implementation of the “Empty Pocket” policy in your facility.

Cronos-1PBG 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 included WebRemote<sup>®</sup> software provides an easy-to-use touch screen graphical user interface for improved health physics programs, better tracking of contamination and faster throughput.

Cronos<sup>®</sup>-1PBG monitors are rugged and reliable, and are designed for use in industrial environments.

## BENEFITS

- Implementation of “Empty Pocket” policy at minimum cost
- Low count times and high sensitivity provide fast throughput
- Warning when objects left behind by personnel reduces potential for lost objects
- Designed for safe installation and transportation
- Designed for reduced spare parts inventory and interchangeability of components

## ELECTRONICS

The Cronos-1PBG computer runs on Windows 10 IoT Operating System and uses USB flash for transferring data. Data may be retrieved either through USB or a LAN.

The flat touch screen color display, computer, controls, and indicator lights are located on top of the monitor. Electronic circuit boards for high voltage generation, pre-amplification, amplification, discrimination, counting, test pulse generation and other processing are mounted right on each detector. All connection cables between detectors and computer are low voltage and direct current.

## SETTING PARAMATERS

Setting parameters, testing, calibration, monitoring, measurements and maintenance screens can be accessed locally or from a remote location through WebRemote®. WebRemote® enables tablet or PC connection to the Cronos-1PBG via LAN or direct link.

Alternatively, the operator can use the standard monitor software, pre-installed in all Cronos® contamination monitors, providing local monitor access and functionality.

### Some of the adjustable parameters are:

- Detection sensitivity
- Statistical parameters (false alarm rate, detection probability, errors, etc.)
- Alarm activity levels can be set in units of Bq, dpm, or nCi,
- Weights (when applicable) can be set in units of kg, g and 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
- High Voltage adjustment using Figure-of-Merit (FOM) optimization method
- Fixed or variable count times (calculated and optimized based on the alarm activity level, local background levels, background count times and desired false alarm and detection probability)

## MONITORING ASSISTANCE VIA USER INTERFACE

### General:

The various phases of the automatic measuring/monitoring cycles 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 data log can be kept of all checks made via the hard copy printout (if a printer is connected to the computer or available in the local network) and/or via software logging. In addition, performance monitoring data (such as detector efficiency check and calibration efficiency data) can be saved to Excel-readable (\*.csv) files for easy trending analysis.

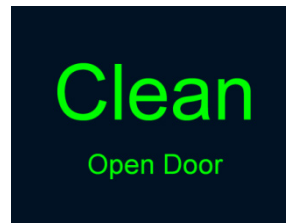
### Ease of use:

From cold startup, the monitor is operational in as little as two minutes, depending on the background conditions. To use the unit, one simply follows the messages displayed on the screen:

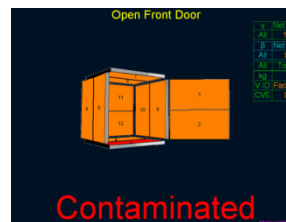
1. Open the door, place the object(s) to be monitored inside, close the door and press the Start button.



2. After the measuring period and if the set alarm level has not been reached, the message "Clean" is displayed and the operator can then remove the object by opening the same door (in one-door operating mode), or the other door (in two-doors operating mode).



3. If the 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 measured count rate and the location of the contamination based on which of the 12 detectors is/are alarming. The operator opens the door, removes the object(s) and closes the door.

Cronos®-1PBG will then perform automatically a detector contamination check to ensure there is no detectable amount of radioactivity remaining in the monitor.

The measurement results can be saved and printed. This includes: time/date stamps, "BKG" background count rate, "Net" count and decision of measurement ("CLEAN" or "CONTAMINATED" etc.).

Once the object(s) has been removed from the unit and the doors closed, the unit automatically switches to continuous background acquisition mode.

**DETECTOR GEOMETRY AND BACKGROUND COMPENSATION**

The Cronos-1PBG cubic shaped measurement chamber can be accessed through one door or two doors. Twelve large area thin plastic scintillation (TPS) detectors surround all sides of the counting chamber providing a highly sensitive measuring volume. The effect of the ambient background radiation is reduced by one (standard) or two (optional) layers of 25 mm (~1 in.) thick lead shielding.

The lead shielding ingots do not affect the internal or external dimension of the monitor.

**TEST SCREENS**

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.

**MAINTENANCE**

Convenient access to the computer and electronics through the top cover makes maintenance easy.

The monitor records data and time/date stamped logs showing the number of times the unit was used, parameters used, calibration settings, fault messages, etc.



**CANBERRA WebRemote®** (User: Auto-Login) Place in Service

|                   |                     |                           |                                  |                                  |
|-------------------|---------------------|---------------------------|----------------------------------|----------------------------------|
| Model             | Cronos-1PBG         | Display Last Contaminated | Maintenance Log                  | Recent Events Log                |
| Monitor Version   | 9.04B (180629)      | Faults                    | Monitor History                  | Service History                  |
| Computer Name     | CANBERR-Q409BKJ     | Background Trend          | Monitor Time vs. Background Rate | Monitor Time vs. Background Time |
| Monitor ID        | mon 1               | Reports                   | Monitor Time vs. Alarm Activity  | Monitor Zone Status              |
| Location ID       | doel 12             | Printouts                 | System Status                    | Datalog Files                    |
| Serial Number     | 44444               | Configuration             |                                  |                                  |
| Calibrated        | 2018-06-27 15:30:45 | Calibration               |                                  |                                  |
| Last Alarm Test   | 2018-06-27 15:59:23 | Diagnostics               |                                  |                                  |
| Last Contaminated | 2018-11-16 08:18:26 | Advanced                  |                                  |                                  |
| Last Fault        | 2018-11-16 08:16:18 |                           |                                  |                                  |
| WebRemote Version | 3.2.0 (180626)      |                           |                                  |                                  |

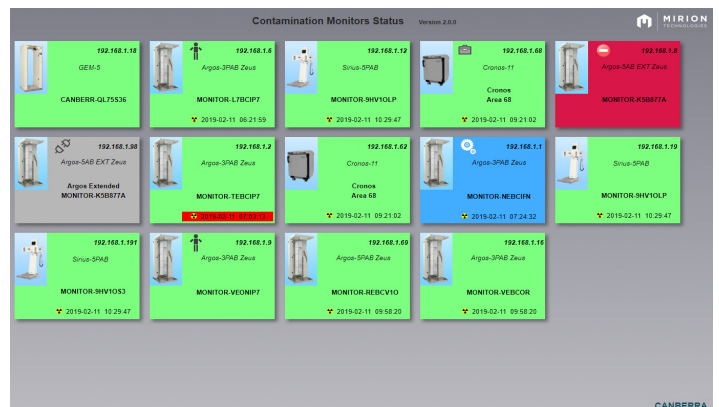
Live View of Monitor Program

Please Wait  
Initializing Background

The monitor will also take itself out of service if the calibration interval is exceeded or other operational conditions exist, which prevents the unit from achieving the 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.



MECHANICAL SPECIFICATIONS

CRONOS®-1PBG & CRONOS®-1 Comparison

|                     | Monitor  | Cronos-1PBG  | Cronos-1  |
|---------------------|--|--|---|
| External Dimensions | <b>Overall Width</b>   | 60 cm (23.6 in)  | 60 cm (23.6 in)   |
|                     | <b>Overall Depth</b>   | 63,4 cm (25.0 in.) for body<br>73,1 cm (28.8 in.) for body and door handles                | 63,4 cm (25.0 in.) for body<br>73,1 cm (28.8 in.) for body and door handles               |
|                     | <b>Overall Height</b><br>(Flush with bottom of casters or flush with bottom of leveling feet)  | 96,3cm (37.9 in) with standard levelling feet<br>100,4 cm (39. 5 in) with optional casters | 96,3cm (37.9 in) with standard levelling feet<br>100,4 cm (39.5 in) with optional casters |
|                     | <b>Door Thickness</b>  | 7 cm (2.7 in)  | 7 cm (2.7 in)   |
| Internal Dimensions | <b>Width</b>   | 34,1 cm (13.4 in)  | 34,1 cm (13.4 in)   |
|                     | <b>Depth</b>   | 36,5 cm (14.4 in)  | 36,5 cm (14.4 in)   |
|                     | <b>Height</b>  | 34,5 cm (13.6 in)  | 34,5 cm (13.6 in)   |
|                     | <b>Internal Volume</b>   | ~42,9L (1.5 cu. ft)  | ~42,9L (1.5 cu. ft)   |
| Shielding           | <p><b>Layout</b><br/>Top and bottom 25 mm (~1 in.) lead shielding (or optional 50 mm (~2 in.) shielding) around the 6 sides of the counting chamber for 4π counting geometry</p> |  |   |
| Weight              | <b>Unit with no Lead</b>   | 272 kg (600 lb)  | 284 kg (626 lb)   |
|                     | <b>Lead (one layer)</b>  | 401 kg (884 lb)  | 401 kg (884 lb)   |
|                     | <b>Lead (two layers) - optional</b>  | 802 kg (1768 lb)   | 802 kg (1768 lb)  |
|                     | <b>Total - unit with one layer of lead</b>   | 673 kg (1484 lb)   | 685 kg (1510 lb)  |
|                     | <b>Total - with two layers of lead</b>   | 1074 kg (2368 lb)  | 1086 kg (2394 lb)   |
|                     | <b>Plinth - optional</b>   | 91 kg (200 lb)   | 91 kg (200 lb)  |
| Weight Scale        | <b>Range</b>   | 0,01 – 20 kg (~0.02 — ~44.1 lb)  | 0,01 – 20 kg (~0.02 — ~44.1 lb)   |
|                     | <b>Resolution</b>  | 0,01 Kg (~0.02 lb)   | 0,01 Kg (~0.02 lb)  |

**DETECTORS & RADIOLOGICAL**

**CRONOS®-1PBG & CRONOS®-1 Comparison**

|  |  | <b>Cronos-1PBG</b>  | <b>Cronos-1</b>   |
|--|--|---|---|
| <b>Detector</b>                                      | <b>Dimensions</b>  | Twelve 37,2 x 17,0 x 5,8 cm (14.6 x 6.7 x 2.3 in.) thin plastic scintillation (TPS-BG-579) detectors with built-in photomultiplier tubes.<br>Total detector volume 23,4 L (0.83 cu.ft)  | Six 38,7 x 33,2 x 5,1 cm (15 x 13 x 2 in.) plastic scintillation gamma detectors with built-in photomultiplier tubes.<br>Total detector volume for main unit and door detectors (six total) 38,2 L (1.4 cu.ft). |
| <b>MDA</b><br><br><b>Minimum Detectable Activity</b> | <b>Parameters and conditions</b> <ul style="list-style-type: none"> <li>• Background radiation 80 nSV/h</li> <li>• Measurement time = 15 s</li> <li>• Background count Time = 300 s</li> <li>• Detection probability = 95% (<math>k_{t,\alpha}=1.65</math>)</li> <li>• False alarm rate = 5% (<math>k_{t,\beta}=1.65</math>)</li> <li>• Radioactive source in the center of the measurement chamber</li> </ul> | <b>MDA Gamma</b><br>25 mm (1 in.) lead shielding <ul style="list-style-type: none"> <li>• For Co-60 MDA: 52 Bq</li> <li>• For Cs-137 MDA: 110 Bq</li> </ul> 50 mm (2 in.) lead shielding <ul style="list-style-type: none"> <li>• For Co-60 MDA: 42 Bq</li> <li>• For Cs-137 MDA: 87 Bq</li> </ul> <b>MDA Beta</b><br>25 mm (1 in.) shielding <ul style="list-style-type: none"> <li>• For Cl-36 MDA: 9 Bq</li> </ul> 50 mm (1 in.) shielding <ul style="list-style-type: none"> <li>• For Cl-36 MDA: 7.6 Bq</li> </ul> | <b>MDA Gamma</b><br>25 mm (1 in.) lead shielding <ul style="list-style-type: none"> <li>• For Co-60 MDA: 56 Bq</li> <li>• For Cs-137 MDA: 70 Bq</li> </ul>  |

**RADIOLOGICAL CHARACTERISTICS**

**Radiation Detected**

- Beta with energy > 40 keV: Co-60, Tc-99, Cs-137, Sr/Y-90, etc
- Gamma photons with energy > 50 keV: Am-241, Ba-133, Cs-137, Co-60, etc

**GENERAL**

**Operating Modes**

The unit can be operate in two-doors (entrance door and exit door) or one-door operation modes (the exit door is locked and only the entrance door is used for control). In either mode, doors must be closed and interlocked to initiate a measurement cycle.

Automatic weight measurement of 0,01 kg to 20 kg (~0.02 lb to ~44.1 lb) objects and calculation of the specific activity for a given radioisotope or mixture; transmission correction factor(s) is also available through software and/or the rotary dial switch.

**PARAMETERS ENTRY**

Parameters can be entered with the touch of a finger using the capability of the built-in touch screen and WebRemote® software or through the keyboard/mouse interface

## UTILITY INTERFACES

### Weight Scale with option Switch

- Used to manually select special preset user-defined parameter options (such as transmission correction factors) during normal operation without need to access keyboard

### USB Port

- Two USB Ports: one is conveniently located on front panel and the other is under the monitor

### Display Screen

- ~ 264 mm (10.4 in.) touch screen LCD display integrated in top of unit (second display kit optionally available for exit side)

### Input/Output and Power Entry Ports Box: bottom mounted

- USB Port
- Ethernet port (RJ45)
- IEC standard AC receptacle

### Handling

- Four casters: swiveling with integrated leveling feet
- Two integral fork lift channels to ease transportation

### Internal Lining

- Stainless steel detector door cover/ frame holder detector with protective magnetic honeycomb grill to hold test jig

## ELECTRICAL

### Power Requirements

- 220 V AC / 50 Hz / 1.0 A or 110 V AC / 60 Hz / 2.0 A mains,
- Maximum power consumption is 95 VA
- 3 m (~10 ft.) IEC standard power cable supplied

## ENVIRONMENTAL CONDITIONS

### Temperature

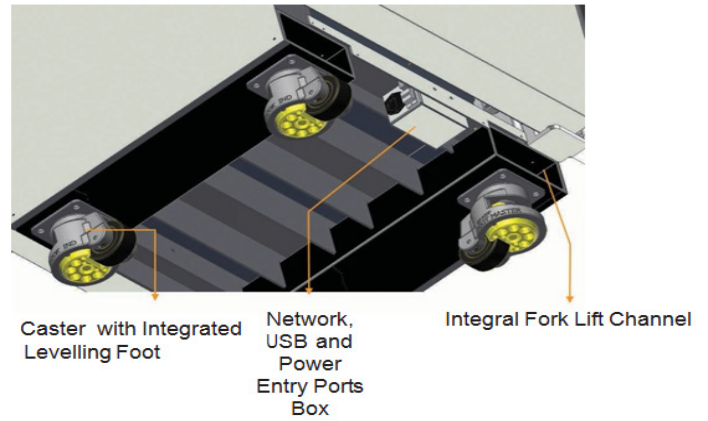
- Operating temperature range: 0 to 45 °C (32 to 113 °F)

### Humidity

- Operating humidity: ≤ 85% non-condensing

## CERTIFICATION

- CE compliant
- ISO 11929:2010 compliant
- IEC 61098 compliant



## CALIBRATION JIGS

One set of jig (CRN1JIG & 7090027) is supplied with each Cronos-1PBG unit, no calibration source are supplied with the unit

- Calibration Jig SCN CRN1JIG (for point source)
- Calibration Jig SCN 7090027, for 10 x 10 cm source

## OPTIONS

- Non-standard height stand/plinth to elevate Cronos-1PBG SCN Crn1TAB-VAR
- SOFT-CRemote - Centralized Remote Control and Data Access Software for Cronos/Argos/GEM-5/Sirius Contamination Monitors
- SOFT-LDB – Database
- Magnetic Strip Card Reader SCN 7022157
- Bar Code Card Reader SCN 816100
- HID Compatible Proximity Card Reader SCN7062147

Customized beta/gamma and gamma detector combination layouts are possible; contact us for inquiry and additional information.



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