MIRION TECHNOLOGIES

GAMMA WASTE ASSAY SYSTEMS

Cronos®-4 and Cronos®-11

Gamma Object/Tool Monitors

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)

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.

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:

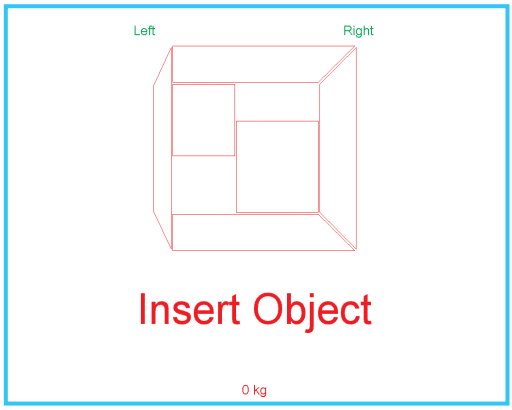
The various stages of the automatic measuring cycle are displayed on the screen(s) and a voice prompt will warn the user when a particular threshold has been exceeded (multiple languages are available). A trace can be kept of all checks made via the hard copy printout (if a printer is attached) and/or 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.

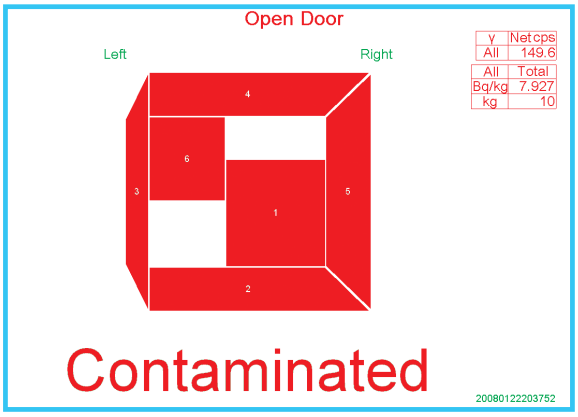
To use the unit, one simply follows the messages displayed on the screen:

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.

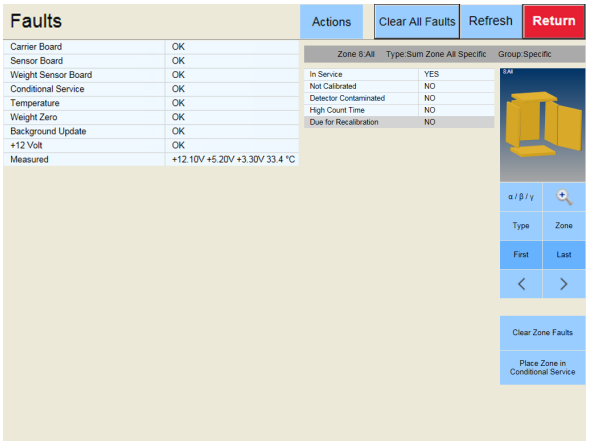
The measurement results can be printed out. This includes: time/date stamps, “BKG” background value, “Net” count and result of check (“CLEAN” or “CONTAMINATED” etc.).

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

MAINTNENANCE

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.

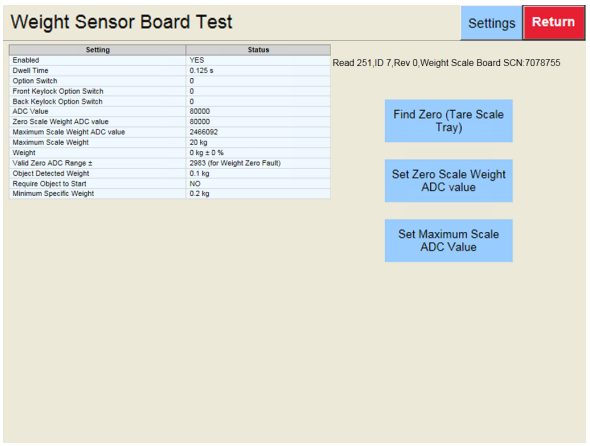
The system will also take itself out of service if the calibration interval is exceeded or other operational conditions exist which prevent the unit from achieving its desired sensitivity. These conditions can be configured by the user. Calibration can be easily executed by just one person and is highly automated.

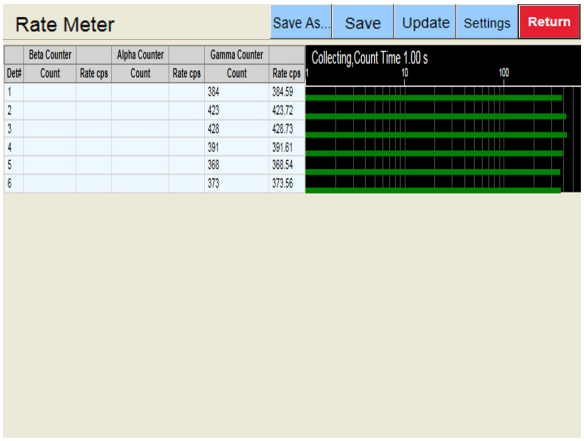


REMOTE STATUS MONITORING

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.

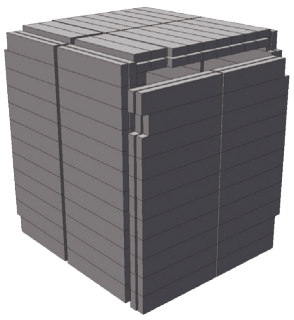
For ease of diagnostics numerous test screens are available to enable precision monitoring, and changing of parameters including high voltage and discrimination thresholds for each detector.

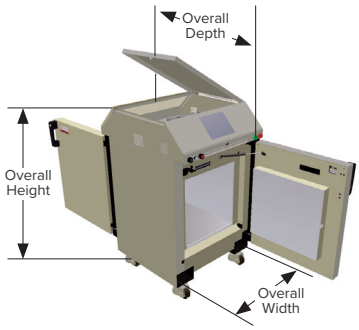
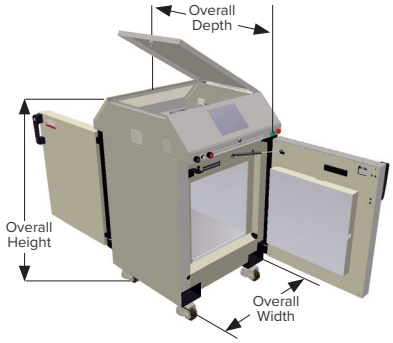
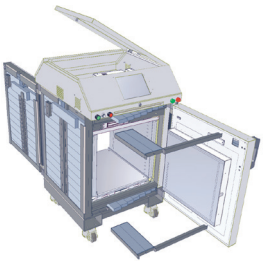




SPECIFICATIONS

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			
Ineternal 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 Dial 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

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:

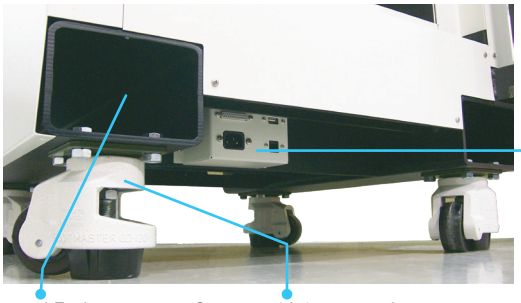
- Parallel (Centronics) printer port, printer not supplied
- One USB port and one Ethernet port (RJ45)
- IEC standard AC receptacle

Handling:

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

Internal Lining:

- Removable aluminum plate (Scale Tray) 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 complaint

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.

ISO 9001 SYSTEM CERTIFIED
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