MIRION TECHNOLOGIES

Argos™ TPS Family: Argos "PAB" Whole Body Contamination Monitors for α/β Detection

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 provides the ultimate in (two-step) contoured body coverage
- The Argos-3PAB 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 allows for easy maintenance access from front and side of the unit
- WebRemote enabled: 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
- Same "industry-best" software and serial bus electronics across CANBERRA 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)

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

Description

The CANBERRA 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 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 of 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. CANBERRA has successfully addressed the challenges of this gasless detector technology, minimizing the trade-off between operating costs and performance.

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.

With CANBERRA 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.

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.

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

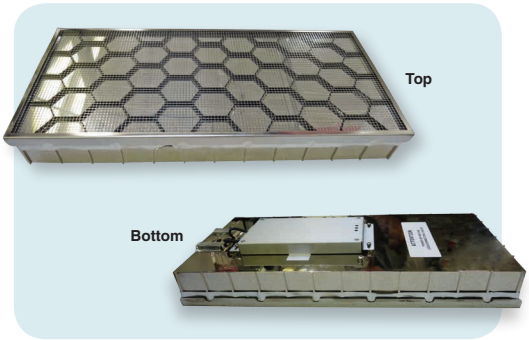
Additionally, the radon progeny rejection feature of the software in CANBERRA Alpha/Beta contamination monitors is a useful tool to help reduce radon interference and minimize false alarms.

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.

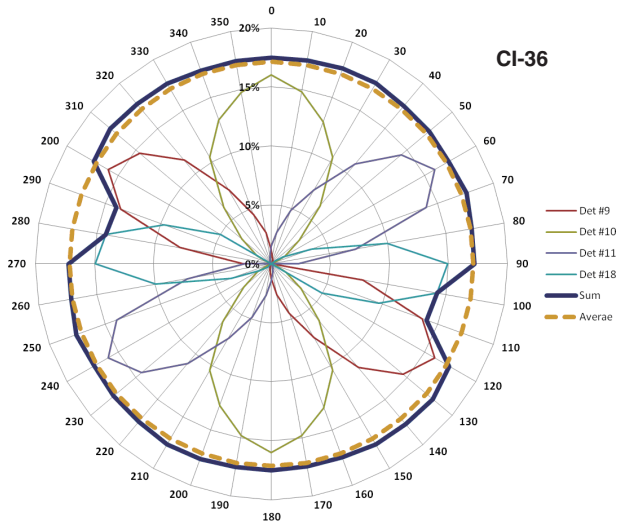
BODY COVERAGE

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 to the right.

The Argos-3PAB provides the very best option for cost effective whole body coverage in the industry by encompassing all of the excellent features of the Argos-5PAB except that it has 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 the budget is limited. The Argos-3PAB is upgradeable to the Argos-5PAB by simply installing additional detectors.



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 just 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 7 Embedded 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 CANBERRA WebRemote. WebRemote enables Tablet or PC connection to the Argos-PAB 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).

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Argos monitor with Zeus option

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 self-shielding effects

Other Options

Consult the CANBERRA 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. or some combinations thereof).

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.

MAINTENANCE
The Argos family of Whole Body Surface Contamination Monitors were engineered to simplify maintenance with easy access from 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 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%

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Whole Body Contamination Monitors for α/β Detection

Plastic Scintillator Detectors	TPS
Quantity	Argos-5PAB: 25
Quantity	Argos-3PAB: 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	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 CANBERRA affiliate for further information).

CERTIFICATION

- IEC 61098 compliant.
- ISO 11929:2010 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:	160 VA
Argos-5PAB:	170 VA
Argos-3/5 with Door/Barrier options*:	+90 VA

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

Ordering Information:

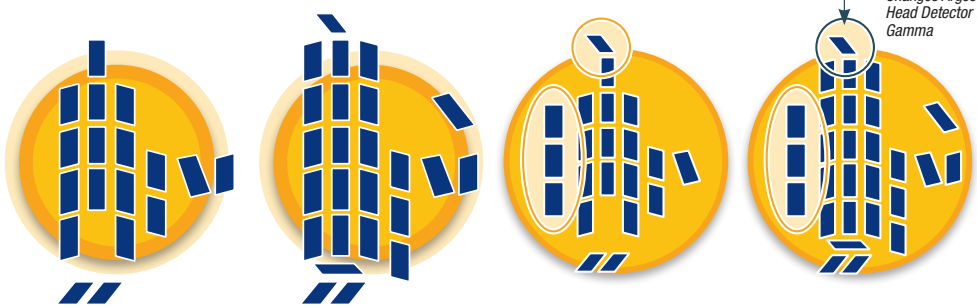
- Argos-3PAB – 2-Step Whole Body Mon. TPS-Alpha/Beta (18 detectors).
- Argos-5PAB – 2-Step Whole Body Mon. TPS-Alpha/Beta (25 detectors).
- 7062229 – Zeus3G, Gamma Capability for Argos-3.
- 818002 – Zeus5G, Gamma Capability for Argos-5.

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.
- CANBERRA's contamination monitors can be integrated with Horizon Supervisory Software to provide an integrated solution with CANBERRA instruments. Horizon complements the functionality of the WebRemote Contamination Monitor Interface.
- Consult the CANBERRA 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

ISO 9001 SYSTEM CERTIFIED

CANBERRA