

## SAM12

Small Articles  
and Tools Monitor



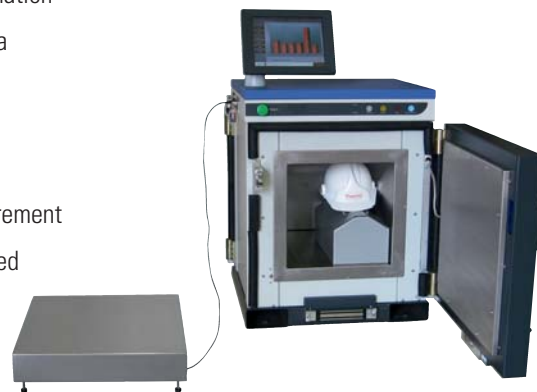
The SAM12 replaces the complexity of using hand held probes by providing:

- Complete coverage
- Precise, computerized, measurement control
- Background shielding and compensation to reduce shine and scatter effects
- Simple operation
- Ruggedness and reliability

**SAM12 - Small Articles and Tools Monitor**

The SAM12 builds on the rugged capabilities of the SAM11 to monitor articles for gamma emitting radionuclides. Readily measures down to clearance levels less than 5000 dpm (83 Bq), but adds sophisticated new electronics allowing dynamic discrimination between natural and man-made radiations, as well as a unique feature for Co-60 monitoring.

- Measures fixed, smearable, internal and external gamma contamination simultaneously
- Measures down to 5000 dpm independent of methodology
- Excellent uniformity of response across the chamber
- Fast, easy and thorough with no special training or supervision required
- Equally effective for single particles or distributed contamination
- Discrimination of Natural Occurring Radioactive material via Natural Background Reduction (NBR)
- Cobalt coincidence monitoring - optional
- Reduced time to count
- Ability to check for changing background during the measurement
- Large touch-screen colour LCD display - no keyboard required
- Automated calibration and checking routines
- Easy upload and download via USB
- Viewpoint compatibility



Thermo Scientific SAMs are operating on a large number of power station sites worldwide, demonstrating why using a SAM, or "SAMMING", is the ideal method of monitoring for unrestricted release.

Articles used in radiation controlled areas of nuclear facilities should undergo monitoring to confirm they are free of contamination. In the US, this clearance limit is 5000 dpm, which is easily achievable by the SAM12 for higher energy gamma emitters such as Cs-137 and Co-60.

The external weigher option enables the SAM12 to show contamination results in specific activity (eg: Bq/g or nCi/lb ). The user is reminded to weigh the sample before locating it inside the measuring vault.

The inclusion of the Natural Background Reduction (NBR) feature minimises the possibility of false alarms due to the presence of naturally occurring radioactive material (NORM). Using NBR, the SAM12 discriminates between NORM and man-made radiations even in a fluctuating natural background.

Where Co-60 contamination is present, the SAM12 can monitor specifically for this radionuclide using Cobalt Coincidence monitoring (CCM). This technique is particularly insensitive to fluctuating gamma background radiation, even from a source of Co-60. In this way, the performance of this monitor is superior to monitors without this feature but with thicker shielding.

The use of the Reduced Time to Count (QuickScan) algorithm significantly reduces the counting time when articles clearly exceed, or are well below the alarm level. The monitor is constantly checking for changing background radiation conditions, both during background monitoring, and during the measurement cycle.



Status, instructions and results are clearly shown on the large colour LCD touchscreen, making the monitor especially easy to use. This monitor does not require any peripherals to set up or configure; it is completely self contained. The low power consumption means there is no need for a cooling fan which might suck in dust and dirt. The modular 'X-channel' platform, with common controller boards and simple cabling, provides for easy, low cost maintenance. It also provides detector intelligence and powerful controller functionality - such as the automated calibration and source checking routines.

Sophisticated voltage scanning software is included which clearly displays the optimum voltage settings in order to optimize discrimination between man-made and NORM.

EXISTING SAM11 users can readily UPDATE their complete instruments with our new advanced electronics too!! Just contact our sales office for details of economical upgrade kits. Why not ask our service engineers to convert your monitors on your site ? Remember that the highly sensitive SAM11 detectors, the existing doors and lead shielding can ALL be reused at no extra cost. Our brilliant new SAM is helping to protect our loyal customers' investment into the future too!!

Mechanical Specification	
Dimensions:	1114 H x 687 W x 837 D mm (45" H x 27" W x 33" D*); *922 mm (36.3") for 6 detector, 2 door option.
Weights:	670 kg (1480 lb) nett; 770 kg (1700 lb) packed (1" lead); 1380 kg (3040 lb) nett; 1480 kg (3270 lb) packed (2" lead)
Detectors:	4 or 6, plastic scintillation detectors, 1451 cm <sup>2</sup> (225 in <sup>2</sup> ) each. The 4 detector SAM12s have detectors in the base, top and two sides. The 6 detector variant has additional detectors in the front and at the back. Detectors are fitted with a magnetic shield.
Detection Areas:	4 detectors, 5776 cm <sup>2</sup> (900 in <sup>2</sup> ); 6 detectors, 8664 cm <sup>2</sup> (1350 in <sup>2</sup> )
Detection Volumes:	4 detectors, 32923 cm <sup>3</sup> (2025 in <sup>3</sup> ); 6 detectors, 49385 cm <sup>3</sup> (3037 in <sup>3</sup> )
Lead Shielding:	2.5 or 5 cm (1" or 2") lead shielding may be specified as standard
Measuring Volume:	381 H x 381 W x 457 D mm; (15" H x 15" W x 18" D)
Doors:	One or two doors may be specified
Switches:	Door switch for rolling average background collection; Push-button to activate count cycle
Weigher Option:	0.5 to 60 kg Synetic strain gauge 570mm x 570mm (24" x 24") external platform scale (0.1kg resolution)

Electronic Specification	
Power:	Integral 12 V power pack, 8 hours operation if AC supplies are lost. Integral continuous Dual State Float Charger, 85 to 264 VAC, 47 to 63 Hz 65VA
Display:	Colour LCD, with 31 cm (12.1") diagonal viewing area and touch sensitive overlay
EMC & LVD:	EMC Compliances: EN61326, EN55022 (emissions), EN61000-4 (immunity), LVD Compliances: EN 61010
Digital I/O connections:	Ethernet and 4 USB
Pulse Height Thresholds:	Five thresholds with programmable setting, used for NBR and CCM Top threshold used for setting best signal over background ratio

Radiological Specification		
Typical 4π Efficiency in centre of chamber:	6 detector version:	Co-60: 57%; Cs-137: 28%; Ba-133 34%; Co-57: 12%
	4 detector version:	Co-60: 40%; Cs-137: 16%; Ba-133 26%
Minimum Detectable Activity where Probability of false alarm is 0.1% (3.1σ), Probability of Detection is 95% (1.65σ) and 10 s monitoring time, with 5 cm (2") lead shielding		
In a 0.1 μSv/h (10 μR/h) background:	6 detector version:	Co-60: 56 Bq (3400 dpm), Cs-137: 120 Bq (6900 dpm)
	4 detector version:	Co-60: 70 Bq (4200 dpm), Cs-137: 180 Bq (11000 dpm)
In a 5 μSv/h (0.5 mR/h) background:	6 detector version:	Co-60: 160 Bq (9600 dpm), Cs-137: 330 Bq (20000 dpm)
	With Quicksan period set to 10 s, and alarm levels set to 83 Bq (5000 dpm) of Co-60, the majority of samples can be monitored in the 10 s Quicksan period	
Energy Range:	50 keV to 2 MeV	
Spatial Uniformity of Response:	±22% at 68% confidence, for Cs-137	
Linearity:	Linear response in excess of 5 MBq (130 μCi) of Cs-137	

Environmental Specification	
Operational temperature:	0°C to +45°C
Storage temperature:	-10°C to +60°C
Humidity:	Up to 95% RH non-condensing

Parameters Settings	
Activity Units:	Bq, kBq, dpm, pCi, nCi, $\mu$ Ci, mCi, Ci
Mass Units:	mg, g, kg, lb - for use with weigher option
Article monitoring time:	3 to 300 s
Probability of False Alarm:	0.1 to 10 sigma
Probability of Detection:	0 to 10 sigma

User Options	
Language:	Various languages available, including changes to date format
Quickscan:	Faster monitoring for articles which are either clearly clean or clearly contaminated
CCM:	Alarms may be set on the basis of a separate counting channel that monitors coincidences due to Co-60
NBR:	A Natural Background Reduction assessment is undertaken when pulse height criteria are met
Changing background:	The user may specify the minimum count rate deviation (in sigma) that will trigger a full reassessment of the background count rate
Changing conditions:	The user may specify the minimum count rate deviation (in sigma) during the monitoring period, that will abort article monitoring and trigger a full reassessment of the background count rate
Residual contamination check:	A Residual contamination check may be undertaken after a contaminated article is removed from monitor
Calibration integrity checking:	The monitor takes itself out of service if the required calibration interval is exceeded
Background Monitoring:	The background count rates on each detector are logged to the database at a frequency prescribed by the user

Applications	
The Clean Tool Shop	The Hot Tool Shop
The Green Tag Table	The Health Physics Control Point
As an active barrier at the RCA Boundary	At unsupervised locations, using SAM12 and Viewpoint monitoring system
At containment exits	At boot barriers / step-off pads
For monitoring laundry and garment bags	For segregation
For free release surveys during dismantling	For contamination control during outage
Monitoring for incoming Naturally Occurring Radioactive Material (NORM) at 5000 dpm.(e.g., flash-light batteries can exceed 5000 dpm)	

Order Codes	
SAM12A-6C-2D-2L	6 detectors, 2 inches of lead shielding and 2 doors
SAM12A-6C-1D-2L	6 detectors, 2 inches of lead shielding and 1 door
SAM12A-4C-2D-2L	4 detectors, 2 inches of lead shielding and 2 doors
SAM12A-4C-1D-2L	4 detectors, 2 inches of lead shielding and 1 door
SAM12AUP6C2D	Electronics upgrade for a 6 detector, 2 door SAM11
SAM12AUP6C1D	Electronics upgrade for a 6 detector, 1 door SAM11
AE0208A	CCM option

Accessories	
AE0181B	SAM12 mounting stand for floor bolting
AE0210A	USB Dot matrix printer
AE0218A	External weighscale kit with USB cable connection
AE0209A	SAM12 security USB dongle [two supplied FOC with each new SAM12 or upgrade kit]
AE0219A	Ticket/label printer for SAM12/LAM12 –USB
702829KM	Barcode scanner for SAM12/LAM12
SAM11 2DR JIG CO-60 SAM11 1DR JIG CO-60	Jigs available for both 1 and 2 door SAM12s

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