

RIM-01 and RIM-14 IODINE MONITORS



General Atomics Electronic Systems, Inc. (GA-ESI) offers RIM monitors that are real-time, continuous measuring devices based on the gamma spectrometry method using a NaI(Tl) detector. When GA-ESI's RAM aerosol monitors are provided with a gamma measuring head, they are able to detect elemental iodine, attached to particles, but are practically insensitive to gaseous radioactive iodine. Therefore, GA-ESI's RIM models are used as stand-alone monitors or as monitoring modules coupled to the aerosol equipment. RIM-01 is the single cartridge unit with manual replacement while Model RIM-14 is the multiple (14) cartridge unit. Under normal conditions, Model RIM-14 is comparable to GA-ESI's Model RAM-31/39 with the option of utilizing 92 filters. These two units are usually placed at a bottom of a rack cabinet and are controlled by a dedicated processor or by the processor included in the aerosol monitor. Iodine is sampled with a constant flow rate on a 2 1/4" D x 1" H cartridge (TEDA impregnated charcoal or silver zeolite), made of a ivory plastic, placed in front of the gamma detector. The measuring head is enclosed in a lead shield 5 cm thick together with the cartridge replacing assembly (as is done automatically in Model RIM-14). Due to its weight, it is placed at the bottom of a standard 19" cabinet. In the RIM-14, the cartridge is automatically replaced at software selectable intervals, while in the RIM-01 the cartridge is manually replaced by means of a simple tool. Sampling time and measuring times are programmable and can be automatically changed according to the measurement range. All internal housings are stainless-steel for easy decontamination.

The RIM series uses an integrated stabilized electronic assembly to ensure long term stability and temperature-independent calibration. The electronic chain allows the control of all the measurement parameters via software, including the window selection needed to evaluate the relevant peak of I-131. The net area of the peak is used with background subtraction in order to increase both sensitivity and dynamic range. I-131 gamma activity is automatically computed for each counting interval and updated with a refresh rate set at two minutes (that can be optionally shortened or made programmable). The system automatically checks each measurement against the preset alarm and alert thresholds (programmable) and any data found to be outside the thresholds is also indicated as a diagnostic. All measurements are qualified with a diagnostic indicating the current status of the system and measured values against set thresholds, with error indication. The system is factory calibrated using a source having the same geometry of the sampling cartridge whereas a check source holder may be provided with manual (cartridge mock-up) or optionally automatic/remote actuation. The Local Processor Unit (LPU) performs flow rate control and measurement, as well as the other controlling functions. The local processor and the pump are dedicated (for stand-alone Models RIM-01C1 & RIM-14C1) or are included as part of the Aerosol Monitors (such as in monitoring modules – RIM-01C2 & RIM-14C2). The management software performs: Cartridge control and changing (Model RIM-14); Flow-rate control/normalization; Real-time (3-ROI's) spectrum acquisition and readout; Gamma background management; Evaluation of the activity on the filter and the concentration in air; System parameter set-up; Control of the signals due to exceeded alert and alarm thresholds and/or failures; Alarm management; Automatic test procedures; Analog and digital outputs; and Data communication. The measuring units are defined by International Standards, but can be changed to meet the customer's specific requirements (as an option). In addition, site-specific requirements can be configured around the RIM units (such as: aerosol and iodine sections, gas section, gamma dose-rate section, meteorological section, etc.) Complete units include: inlet pipe for ambient air or connecting pipes to the RAM unit, 5 (RIM-01) or 14 (RIM-14) cartridges, tool for cartridge replacement (RIM-01), and a cartridge mock-up for check/calibration source housing.

TECHNICAL SPECIFICATIONS

Models:	RIM-01 Single cartridge for stand alone (C1) or coupled to Aerosol Monitor (C2). RIM-14 Multiple cartridge for stand alone (C1) or coupled to Aerosol Monitor (C2).
Detector/electronics:	NaI(Tl) 2"x2" with integrated PMT base, preamplifier, amplifier/shaper, three channel analyzer for measurement, two added channels used for stabilization.
Measuring Range:	10^{-1} to 10^{+5} Bq/m ³ ($2.7 \cdot 10^{-3}$ to $2.7 \cdot 10^3$ pCi/l) for I-131 (others on request).
Typical Sensitivity (MDL):	< 0.3 Bq/m ³ ($8 \cdot 10^{-3}$ pCi/l) for standard unit at 95% confidence level. (5 m ³ /h (3 cfm) flow rate, 0.2 uSv/h (20 uR/h) gamma background, 60 min. sampling time)
Calibration:	programmable, resident on HD.
Accuracy:	± 15% typically.
Stability:	± 10% over 500 h.
Measuring Units:	Bq and Bq/m ³ . (other units available on request – option: Model I0114-6)
Flow Rate:	2 - 8 m ³ /h (1 – 5 cfm) normal - with 2% accuracy of flow rate measurement and 4% accuracy of flowrate based on an orifice meter & processor-driven motorized valve
Pump:	(C1 models only) rotating, oil free, 14 or (optional) 18 m ³ /h (8 or 10 cfm) - free air.
Alarms:	Alert and alarm levels can be preset on the entire measuring ranges. Free contact relays for alert, alarm and failure outputs (optional). Display, visual & acoustic indicators for normal operation and equipment failure, alert, alarm.
Data Outputs:	Readout, storage & communication include: air flow rate, sample volume, # of the measured cartridges (RIM-14), total I-131 activity (Bq or pCi) on cartridge, I-131 concentration in air (Bq/m ³ or pCi/l with error), etc. Archived data contains cartridge ID, measuring interval ID, start date/time, stop date/time, ROI's counts, concentration with errors, collected activity on cartridge, flow rate, sampled volume, programmed parameters, alarm thresholds, etc. for remote data display & processing. Log files contain abnormal events including failures/alarms
Analog Output:	0 or 4 - 20 mA or 0 - 1V (option: Model I0114-3).
Serial interface:	RS232 or RS422 or RS485.
Network interface:	RJ-45 100/10 BASE-T Fast Ethernet (option: Model I0114-4)
Retention of Data:	System parameters are retained in case of power failure. More than 500K of archived data (up to 1 year's record) can be retained on the system's hard disk.
Test Routines:	self-diagnostic routines are automatically performed and failure messages displayed
System Composition:	The Sampling/Measuring Unit consists of 5 cm lead shield covering the scintillation detector and the measuring chamber composed of a SST vessel containing the activated charcoal cartridge, the detector head with optimized geometry. & pneumatic system for air confinement plus the cartridge replacing assembly (Model RIM-14) consisting of two vertical cartridge moving/storing units for 14 new or sampled cartridges, a horizontal device for cartridge translation, interfacing electronics for all movements implemented with low voltage AC motors and optoelectronic sensors, NaI(Tl) detector with the associated electronics, and airflow rate measuring/regulating device, absolute and differential pressure sensors, actuator for pump or vacuum system & oil-less pump.
Local Processing Unit:	(C1 models only) includes industrial grade x86 CPU with auxiliaries & service memories, 32 MB RAM, 1.44 MB FD and ≥ 20 GB HD, 10" b/w LCD display (color as option I0114-5), keyboard, mouse. power supply, communication interfaces, main on/off, access controls etc.
Connectors:	All the electrical and pneumatic connectors can be customized.
Operating Environment:	0°C to 40°C (32 to 104 °F), 0 - 90% RH non-condensing.
Protection:	IP43 (higher available on request).
Power Supply:	220 or 110 Vac – 50 or 60 Hz.
Dimensions:	19" module 12U (C2) or 54.3" x 22.2" x 31.5 " rack wheeled cabinet (C1).
Weight:	150 (C2) to 220 (C1) kg (330 to 485 lbs).
IEC Reference Std.:	60761-1/4, 61171, 61306.