



# PGM102 Portable Gas Monitor

## Features

- Portable handcart station for convenient radiation monitoring/sampling of gases at the work site
- Sample collector systems for particulates, iodine, tritium, and noble gases
- Sensitive noble gas and tritium monitoring with 8.3 L counting chamber
- Bubbler-type tritium collectors
- Two mass flow rate-controllers; one for particulate/iodine totalization and one for tritium totalization
- Automatic gamma background subtraction
- Drift-free gain stabilization circuitry
- Flexible multi-functional electronics module for display, control, and communications
- Quick-connect fittings, isolation valves, and control valves to set flow rates
- Mating armored hoses included

## Major Assemblies

- ADM616 multi-function control and display unit
- MD455E beta/gamma extended range detector
- ILF-200 fixed filter cartridge P/I collector
- TBC100 tritium bubbler collector system
- PA-300E preamplifier
- MG-1U gas sampler

## Description

The PGM102 is a self-contained mobile monitoring/sample collection station for radioactive noble gases, particulates, iodines and tritium in a gaseous sample media. The inlet gas sample passes first through a dual charcoal cartridge and a 0.3 micron filter paper which removes iodines and particulates from the sample. It then passes through an unshielded 8.3 L counting chamber with a dual phosphor scintillation detector (plastic scintillator and BGO crystal). The BGO crystal provides a gamma activity signal with a slower rise time pulse, thus allowing it to be identified by the preamplifier and used as a compensating signal for the gamma background.

Canberra's full featured ADM616 Control and Display Unit processes the detector (logic) signals from the preamplifier and data from other sensors to provide live time digital display and alarm functions. It also functions as the control unit and display for the sample collection systems.

The PGM102 gas monitoring station provides independent sampling systems to collect quantitative samples for laboratory analysis for tritium, iodine, particulate, and noble gas activity. Air sample flow rates are controlled and measured by mass flow rate controllers for both the monitoring and sample collection channels to allow calculation of activity concentration in the gaseous media.

Functionally, the PGM102 comprises several standard Canberra instrument modules interconnected into a stand-alone system on a rugged handcart frame. Each monitoring and sampling subsystem includes the required isolation valves, flow indicators, quick connect fittings, and connecting hoses to provide job-site convenience without sacrificing the laboratory level sensitivity and accuracy of the initial instruments. Workers in protective clothing can readily move the handcart station to a selected site, connect the electrical and pneumatic systems, and activate the monitoring station functions in a fraction of the time required to set up separate monitoring and sampling systems.

The PGM102 is designed for use at locations where ac electrical power and a source of pressure or vacuum is present for transport of the sample through the monitoring system. An external vacuum pumping system may be connected to the air outlet connection if the inlet sample flow is not pressurized.



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## Specifications

### Radiation Measured

- Beta radiation from radioactive noble gases in a gaseous matrix (noble gas radionuclides and tritium). Gamma activity is simultaneously measured to provide gamma compensation for the beta measurement.

### Samples Collected

- Tritium in a tritium bubbler collector system.
- Iodine in two stacked TEDA-treated activated charcoal cartridges of 57 (dia.) x 25 mm (2.25 (dia.) x 1 in.).
- Particulates in filter paper sampler; filter paper holder for 47 mm to 57 mm diameter filter papers.
- Gas Grab Sample from port with RBE06 quick connect fixtures, isolation valves, flow control needle valve and 0.6–6.0 LPM rotameter.

### Detector(s)

- DETECTOR – Coupled dual phosphor scintillator:
- Plastic scintillator 6.35 (dia.) x 0.025 cm thick (2.5 (dia.) x 0.01 in. thick).
  - BGO crystal 0.635 cm (0.25 in.) cube.
- CHAMBER VOLUME – 8.3 L.
- CRYSTAL WINDOW – Mylar®, less than 8 mg/cm<sup>2</sup>.
- PM TUBE – Philips® XP6202.
- GAIN STABILIZATION – Automatic, using built-in LED.
- CALIBRATION – Factory calibration traceable to NIST.

### Performance

- NOBLE GAS RANGE – 18 kBq/m<sup>3</sup> to 37 GBq/m<sup>3</sup> (0.5 to 10<sup>6</sup> µCi/m<sup>3</sup>).
- ACCURACY – ±10% of known concentration above second decade.
- STABILITY – ±6% per 24 hr; ±15% over 30 days.
- BACKGROUND COMPENSATION – Gamma, equivalent to ±0.56 MBq/m<sup>3</sup> (±15 µCi/m<sup>3</sup>).
- RESPONSE TIME – First decade <60 s; second decade <15 s; all other decades <2 s.
- PARTICLE FILTER EFFICIENCY – 99.999% efficient for particles ≥3 µm.

### Displays and Alarms

(See ADM616 specification sheet for details.)

MAIN DISPLAY – 10 x 2.5 cm (4 x 1 in.) (W x H). 2-line x 20 characters, vacuum fluorescent digital or bar graph display, data format X.XXE±X (units).

STATUS LIGHTS – 2.5 cm (1 in.) diameter, incandescent lamp.

- NORMAL – Green.
- FAIL – White.
- ALERT – Amber.

FAILURE CONDITIONS – ROM test, backup RAM test, EEPROM test, low sample flow, high sample flow, TAM100 link, power failure and background count absent.

HIGH RADIATION ALARM LIGHT – Top-mounted 360° red beacon light, 7.6 (dia.) x 5.1 cm (3 (dia.) x 2 in.).

AUDIBLE ALARM – Sonalert® audio alarm, 90 dB at 0.6 m (2 ft).

### Electrical Controls

- KEYLOCK SWITCH – Three-position key switch.
- OFF – ac power off (key in or out).
  - KEYPAD – Operate or set parameters (key in only).
  - ON – ac power on, operate-only mode (key in or out).
- KEYPAD – Six-button flat panel membrane switch keypad for control of operating and display functions.

### Communications Ports

SERIAL PORTS – One RS-232C port accessible through 9-pin female connector on front panel of ADM616. Three isolated/non-isolated RS-485 ports accessible on terminal block in user interface junction box.

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## Analog and Digital I/O

ANALOG INPUTS – Eight 1–10 V dc inputs total, five configurable for 4–20 mA, two configurable as isolated/non-isolated accessible to user.

ANALOG OUTPUT – One 4–20 mA port on front panel isolated to 400 V dc; configurable as 1–10 V dc outputs.

DIGITAL – Six digital lines configurable as inputs or outputs; CMOS signal levels.

RELAYS – Five DPDT relays, one SPDT relay, contacts rated at 5 A at 110 V ac.

## Sample Transport System

PUMP TYPE – None; sample flow requires pressure or vacuum from facility sources.

MINIMUM PRESSURE DIFFERENTIAL – 0.34 bar (5 psig).

PRESSURE – Regulator on input sample line; input to regulator: 0.34–10 bar max. (5–145 psig); internal system pressure: 0–0.68 bar (0–10 psig); design maximum system pressure: 0.68 bar (10 psig).

FLOW REGULATION – Two solid state electronic thermal mass flow controllers.

- Tritium bubbler flow rate – 0–5 SLPM set at 1 SLPM.
- Gas chamber flow rate – 0–70 SLPM set at 60 SLPM.

SAMPLE TEMPERATURE – +5 °C to +50 °C (+41 °F to +122 °F).

## Power

AC POWER – 110/220 V ac  $\pm 10\%$ , 50/60 Hz, 2 A.

MEMORY BACKUP – Lithium battery for data retention; system parameters in non-volatile EEPROM memory.

## Physical

WEIGHT – Approximately 60 kg (130 lb).

MOUNTING DETAILS – All components are integrated on to a two-wheel upright handcart with 25.4 cm (10 in.) diameter by 5.1 cm (2 in.) wide semi-pneumatic rubber tires. The self-contained unit is stable in the upright position.

## Environmental

AMBIENT OPERATING TEMPERATURE – +5 °C to +50 °C (+41 °F to +122 °F).

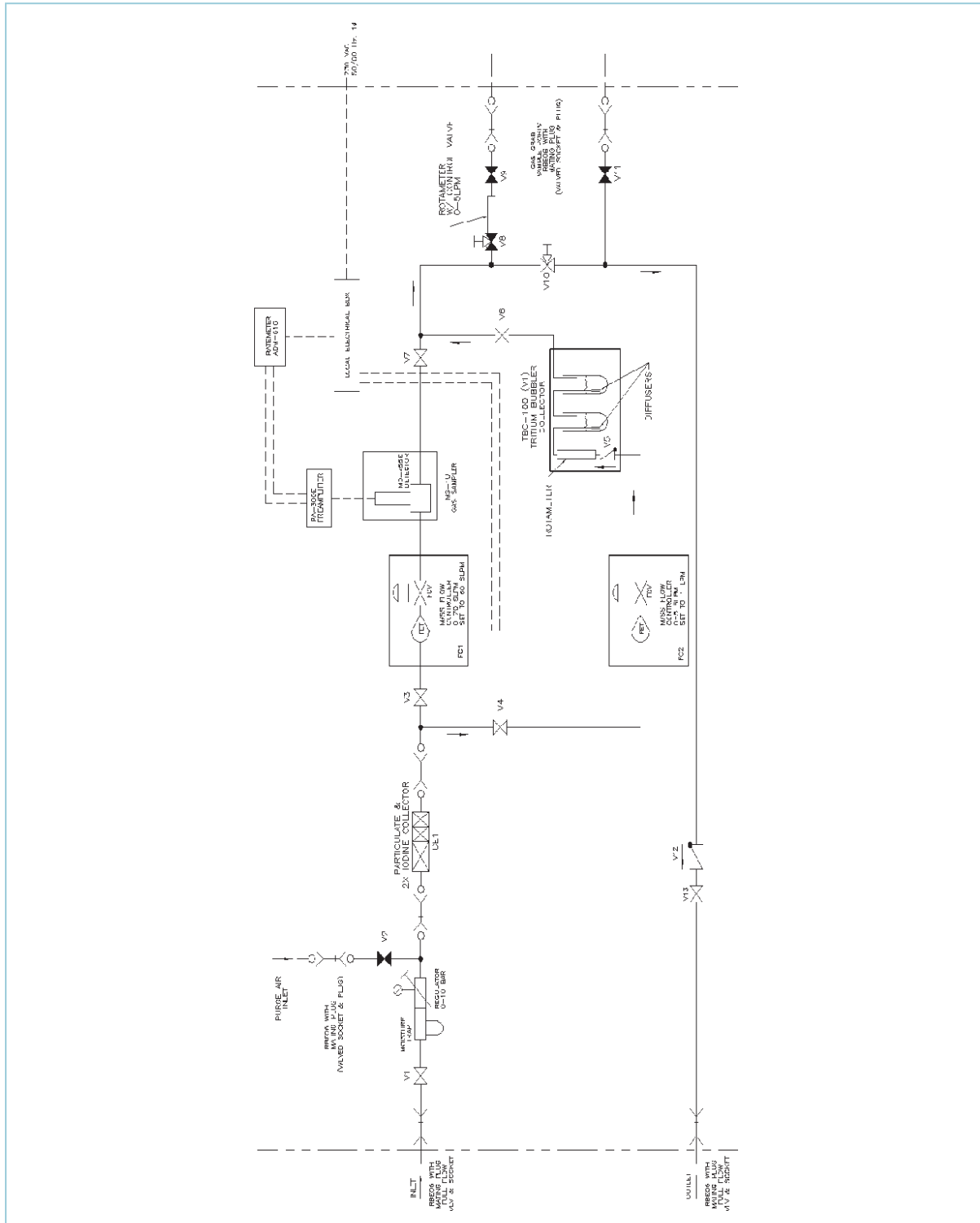
OPERATING HUMIDITY – 0 to 95% non-condensing.

OPERATING PRESSURE – Sample inlet pressure range 0.34–10 bar (5–145 psig).

AMBIENT PRESSURE – Atmospheric.

SIZE – 72 x 151 x 66 cm (28.3 x 59.5 x 26 in.) (W x H x D).

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