

BAM-1020

Continuous Particulate Monitor



Features

- U.S. EPA Federal Equivalent Method for PM₁₀ and PM_{2.5} monitoring
- Long term unattended remote operation of up to 60 days between site visits
- Very low operating costs
- Automatic hourly span checks
- Fast and easy field audits using common FRM audit tools
- Bench top or equipment rack mounting in mobile or stationary shelters
- Rugged anodized aluminum, stainless steel, and baked enamel construction
- Highly accurate, reliable, and mechanically simple flow system
- Hourly filter advances minimize effects on volatile compounds
- Advanced Smart Heater technology precisely controls sample relative humidity
- Integrated datalogger allows the connection of up to six additional meteorological sensors
- Internal memory provides up to 182 days of digital data storage
- Data retrieval through RS-232 serial ports using direct PC connections, modems, printers, or digital data collection systems

Designations

The Met One Instruments Model BAM-1020 has longstanding U.S. EPA designation as a Federal Equivalent Method (FEM) for continuous PM₁₀ particulate monitoring. In addition, the BAM-1020 is the world's first instrument to obtain U.S. EPA FEM designation for continuous PM_{2.5} monitoring, when configured with the specified settings and accessories. The BAM-1020 has also obtained corresponding certifications in other countries and regions.

Principle

The BAM-1020 automatically measures and records airborne particulate concentration levels (in milligrams or micrograms per cubic meter) using the industry-proven principle of beta ray attenuation. Thousands of BAM-1020 units are currently deployed worldwide, making the unit one of the most successful air monitoring platforms in the world.



Operation

Each hour, a small ^{14}C (carbon-14) element emits a constant source of high-energy electrons (known as beta rays) through a spot of clean filter tape. These beta rays are detected and counted by a sensitive scintillation detector to determine a zero reading. The BAM-1020 automatically advances this spot of tape to the sample nozzle, where a vacuum pump then pulls a measured and controlled amount of dust-laden air through the filter tape, loading it with ambient dust. At the end of the hour this dirty spot is placed back between the beta source and the detector thereby causing an attenuation of the beta ray signal which is used to determine the mass of the particulate matter on the filter tape and the volumetric concentration of particulate matter in ambient air.



Data Collection

All data files are accessible via an industry standard two-way RS-232 serial port using common terminal programs or Met One Instruments software such as MicroMet Plus[®] and Comet.™ The data is available in a variety of formats including daily reports, last record, all data, and new records since last download. Configuration files, error logs, and flow statistics are also available. Digital dataloggers may obtain data from the unit using serial port commands or by recording the automatic hourly serial output.

Error Handling

The BAM-1020 performs continuous user selected evaluation of a variety of criteria for data validation

including flow statistics and a comprehensive set of error codes including power failures, flow failures, hardware failures, tape errors, nozzle errors, span check errors, beta count errors, and more.

Maintenance

The BAM-1020 is designed to run continuously with only monthly or bi-monthly scheduled maintenance—a single roll of filter tape will last more than 60 days. The BAM-1020 also contains a comprehensive self-test function which allows the unit to preemptively test itself for any mechanical failures in the tape control system.

PARAMETER

Operating Principle
 U.S. EPA Designations
 Approvals

SPECIFICATION

Measures ambient particulate concentrations using beta ray attenuation
 PM₁₀: FEM (EQPM-0798-122), PM_{2.5}: Class III FEM, (EQPM-0308-170)
 CE, NRC, TUV, California ARB, ISO 9001

PERFORMANCE

Accuracy
 Measurement Resolution
 Display Resolution
 Lower Detection Limit
 (2σ) 1 hour
 Lower Detection Limit
 (2σ) 24 hour
 Standard Range
 Optional Ranges
 Measurement Cycle Time
 Flow Rate
 Filter Tape
 Span Check
 Beta Source
 Beta Detector Type

Exceeds US-EPA Class III PM_{2.5} FEM standards for additive and multiplicative bias
 0.1 µg/m³
 1 µg/m³
 < 4.8 µg/m³ (less than 4.0 µg/m³ typical)

 < 1.0 µg/m³

 0 – 1.000 mg/m³ (0 - 1000 µg/m³)
 0 – 0.100, 0.200, 0.250, 0.500, 2.000, 5.000, 10.000 mg/m³ (special applications)
 1 hour
 16.7 liters/minute adjustable 0–20 LPM range actual or standardized flow
 Continuous glass fiber filter tape, 30mm x 21m roll > 60 days/roll
 Automatic 0.800 mg (typical) span foil, verified hourly
¹⁴C (carbon-14), 60 µCi ±15 µCi (< 2.22 x 10⁶ Beq), half-Life 5730 years
 Photomultiplier tube with organic plastic scintillator

ENVIRONMENTAL

Operating Temperature
 Ambient Temperature
 Ambient Humidity
 Sample Humidity Control
 Enclosure

0 to +50°C
 -30° to +60°C
 0–90% RH, noncondensing
 Active Smart Heater module, 10–99% RH setpoint
 Weatherproof enclosure or shelter is required

INTERFACE

User Interface
 Analog Output
 Serial Interface
 Printer Output
 Telemetry Inputs
 Alarm Contact Closures
 Error Reporting
 Memory

Menu-driven interface with 8-line 40-character LCD display and dynamic keypad
 Isolated 0–1 VDC output standard. 0–10 V, 4–20 mA, 0–16 mA switch-selectable
 RS-232 two-way serial port for PC or modem communications
 Output-only serial port for data or diagnostic output to a PC or serial printer
 Clock reset (voltage or contact closure), telemeter fault (contact closure)
 Data error, tape fault, flow error, power failure, maintenance
 User-configurable available through serial port, display, and relay outputs
 4369 records (182 days at 1 record/hr)

ELECTRICAL

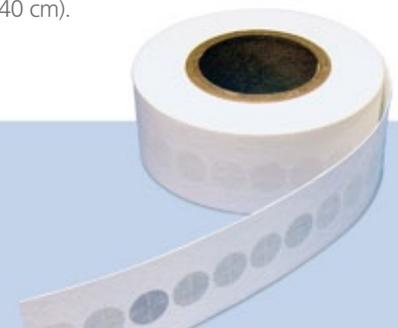
Power Supply
 Power Consumption

100–230 VAC, 50/60 Hz. Factory configured.
 Less than 0.4 kw, 3.4 A, worst case with pump and smart heater running.

PHYSICAL

Weight
 Unit Dimensions

54 lbs (24.5 kg) without external accessories.
 Height = 12.25" (31 cm) Width = 17" (43 cm) Depth = 16" (40 cm).



Standard Equipment

- Operation Manual
- Automatic Span Membrane
- Internal Flow Sensor
- Internal Flow Controller
- Internal Filter Temperature, Pressure, and RH Sensors
- Six-Channel Datalogger for Accessory Sensors
- Serial Communications Cable
- Universal Power Cable
- Pump Control Cable and Air Tubing
- Rack Mounting Hardware
- Reusable Packing Materials
- Comet™ Data Collection Software
- Glass Fiber Filter Tape, One Roll

Required Accessories

- BX-802 EPA PM₁₀ Inlet (all units)
- BGI Inc. VSCC™ PM_{2.5} Cyclone (PM_{2.5} FEM units)
- BX-596 Ambient AT/BP Combo Sensor (PM_{2.5} FEM units)
- BX-302 Zero Filter Calibration Kit, with leak test valve (PM_{2.5} FEM units)
- BX-827 or BX-830 Smart Inlet Heater (PM_{2.5} FEM units)
- BX-801 Inlet Tube Kit, with roof flange and support struts (most installations)
- Medo Linear Piston, or Gast Rotary Vane Vacuum Pump

Optional Accessories

- BX-305 Leak Test Valve
- BX-308 Service Tool Kit
- BX-803 TSP Inlet, with Debris Screen
- BX-344 Inlet Cleaning Kit
- BX-592 Ambient Temperature Sensor
- BX-996 Modem Kit
- Custom-length inlet tubes and extension kits, max 16'
- Communications options including radio, cell, and satellite systems
- Weatherproof Outdoor Mini Enclosures BX-902 and BX-903
- Ambient RH, BP, WS, WD, and solar sensors



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