

BAM-1020

Continuous Particulate Monitor



Met One Instruments, Inc.

Features

- U.S. EPA Equivalent Method for PM₁₀, PM_{2.5}, and PM_{10-2.5} monitoring
- Long term unattended remote operation of up to 60 days between site visits
- Very low operating costs
- Automatic Span Calibration 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 meteorological sensors
- 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 was the first instrument to obtain U.S. EPA Federal Equivalent Method (FEM) designation for continuous PM_{2.5} monitoring, in addition to its longstanding EPA designation for PM₁₀ monitoring. The BAM-1020 has also obtained the corresponding PM_{2.5} and PM₁₀ certifications in the European Union. Two BAM-1020 units can also be operated together as an EPA designated PM_{10-2.5} coarse method. Met One Instruments supplies complete sampling accessory kits for compliance with each designation.

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

At the beginning of each sample 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 then advances this spot of tape to the sample nozzle, where a vacuum pump pulls a measured and controlled amount of outside air through the filter tape, loading it with ambient dust. At the end of the sample hour, this dust 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. This mass is used to calculate 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 Air 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. Optional Ethernet and USB data collection support is also available.

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
 EU Certifications

SPECIFICATION

Measures ambient particulate concentrations using beta ray attenuation
 Class III FEM, PM₁₀ (EQPM-0798-122) PM_{2.5} (EQPM-0308-170) PM_{10-2.5} (EQPM-0709-185)
 TUV Rheinland, PM_{2.5} (936/21209919/A) PM₁₀ (936/21205333/A, 936/21220762/A)

PERFORMANCE

Accuracy
 Measurement Resolution
 Data Resolution
 Data Interval
 Hourly Detection Limit (2σ)
 24 Hour Detection Limit
 Range
 Measurement Cycle Time
 Flow Rate
 Filter Tape
 Span Check
 Beta Source
 Beta Detector Type

Exceeds U.S. EPA Class III PM_{2.5} FEM standards for additive and multiplicative bias*
 0.24 µg in 1mg range, 2.4 µg in 10mg range, 12 bit resolution
 1 µg/m³
 Hourly concentration values. Met sensor averages from 1 to 60 min
 < 4.8 µg/m³ (3.6 µg/m³ typical)
 < 1.0 µg/m³
 1 mg (1000 µg) default setting. Settable from 0.1 mg to 10 mg
 1 hour
 16.7 liters per minute, actual or standard flow conditions
 Glass fiber filter tape, 60 days of operation per roll
 Automatic 0.8 mg span membrane verification with ±5% deviation alarms
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 (inside shelter)
 -40° to +55°C (BX-596 AT sensor) -30 to +50C (BX-592). Extended range sensors available
 0 – 90% RH, noncondensing
 Active inlet heater module with internal filter RH and temperature sensors
 Weatherproof enclosure or shelter is required

INTERFACE

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

Standard 8x40 character LCD with dynamic keypad. Optional color touch screen
 Isolated 0 –1 VDC output standard. 0 –10 V, 4–20 mA, 0 –16 mA switch-selectable
 RS-232 serial port with USB converter. Ethernet and expanded serial ports with BX-965 option
 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). Expanded memory with BX-965 option

ELECTRICAL

Power Supply
 Power Consumption 110V
 Power Consumption 230V

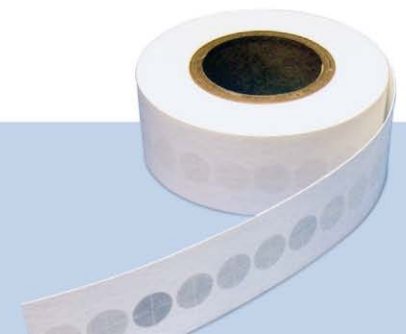
Factory configured for 100/120 or 220/240 VAC and 50 or 60 Hz. Dedicated 15A service OK
 262W max with Medo pump and inlet heater running (642W with Gast pump)
 312W max with Medo pump and inlet heater running (717W with Gast pump)

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).

*Slope and offset bias in linear regression with reference method samplers at low concentrations.
 See 40 CFR part 53.



Standard Equipment

- Operation Manual and Quick Setup Guide
- Internal Automatic Span Membrane
- Internal Flow Sensor and Flow Controller
- Internal Filter Temperature, Pressure, and RH Sensors
- Six Channel Data Logger for Accessory Sensors
- Serial Data Cable and Modular Power Cable
- Pump Control Cable and Air Tubing
- Rack Mounting Brackets and Hardware
- Comet™ Data Collection Software
- One Roll of 460130 Glass Fiber Filter Tape

Complete Sampling Accessories Kits (Pumps Separate)

- BX-FEM_{2.5} Accessories kit for EPA PM_{2.5} configuration
- BX-2.5EU Accessories kit for EU PM_{2.5} configuration
- BX-2.5 Accessory kit for non-regulatory PM_{2.5}
- BX-10 Accessories kit for EPA PM₁₀ configuration
- BX-10EU Accessories kit for EU PM₁₀ configuration
- BX-COARSE Accessories kit for EPA PM_{10-2.5} dual-unit configuration

BX-965 Report Processor Option

This upgraded back panel assembly has expanded digital communications support including Ethernet, an autonomous REPORT serial port with expanded memory, and the capability to serially network two BAMs together in the PM-coarse configuration. BX-965 is recommended for all BAMs where data is collected digitally.

BX-970 Touch Screen Display

This upgraded front door assembly consists of a high visibility color touch screen display with simplified menu navigation. The system also allows BAM-1020 data to be transferred to a USB flash drive. All touch screen units also come with a BX-965 Report Processor back panel.

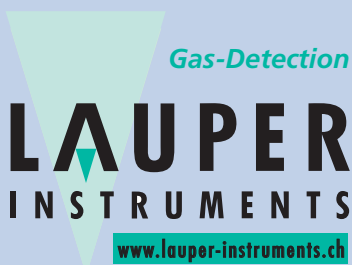
BX-894 Real-Time Module Option

This add-on light scatter module allows the BAM to log real-time particulate trending levels on any unused met sensor input channel, without interfering with the high accuracy beta system measurements in any way.

Individual Sampling Accessories and Options

- BX-121 & BX-122 High Capacity Gast Pump
- BX-126 & BX-127 Low Noise Medo Pump
- BX-802 EPA Louvered PM₁₀ Inlet
- BX-808 BGI PM_{2.5} VSCC™ Cyclone
- BX-807 BGI PM_{2.5} Sharp Cut Cyclone
- BX-811 BGI PM₁ Sharp Cut Cyclone
- BX-827 & BX-830 Smart Inlet Heater
- BX-803 TSP Inlet with Debris Screen
- BX-302 Zero Filter Audit Kit with Leak Valve
- BX-305 Leak Check Valve with Hose Barb
- BX-344 Inlet Cleaning Kit
- BX-308 Service Tool Kits
- BX-590 Wind Direction Sensor
- BX-591 Wind Speed Sensor
- BX-592 Ambient Temperature Sensor
- BX-593 Ambient RH sensor
- BX-594 Barometric Pressure Sensor
- BX-595 Solar Radiation Sensor
- BX-596 Ambient Temperature and Pressure Sensor
- BX-902B, BX-903, & BX-906 Weatherproof Mini Shelter Kits
- BX-801 Standard 8' Inlet Tube Kit With Roof Flange
- 8112-X Custom length inlet tubes, up to 8 feet per segment
- Inlet tube extension kits, up to 16 feet total
- Phone, cellular, radio, and satellite modem kits

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