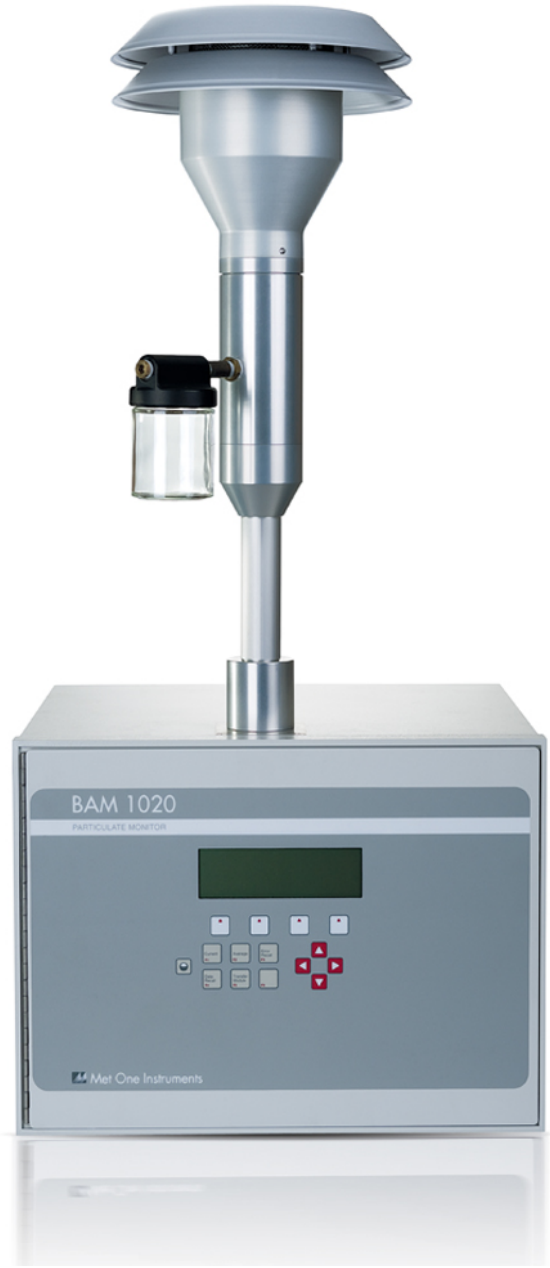
Met One Instruments, Inc.

BAM 1020 Continuous Particulate Monitor

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



Features

- U.S. EPA Equivalent Method for PM_{10}, $PM_{2.5}$, and $PM_{10\text{-}2.5}$ 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 or digital data collection systems

Designations

Met One Instruments, Inc. 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 PM_{10} monitoring. The BAM 1020 has also obtained the corresponding $PM_{2.5}$ and PM_{10} certifications in the European Union. Two BAM 1020 units can also be operated together as an EPA designated $PM_{10\text{-}2.5}$ coarse method. Met One Instruments, Inc. 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.

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 duplex RS-232 serial port using common terminal programs or Met One Instruments, Inc. 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. Optional Ethernet and USB data collection support is also available.

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.

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.

Parameter	
Operating Principle	Measures ambient particulate concentrations using beta ray attenuation
U.S. EPA Designations	Class III FEM, PM_{10} (EQPM-0798-122), $PM_{2.5}$ (EQPM-0308-170), $PM_{10\text{-}2.5}$ (EQPM-0709-185)
EU Certifications	TUV Rheinland, $PM_{2.5}$ (936/21209919/A), PM_{10} (936/21205333/A, 936/21220762/A)
Performance	
Accuracy	Exceeds U.S. EPA Class III $PM_{2.5}$ FEM standards for additive and multiplicative bias*
Measurement Cycle Time	1 hour
Flow Rate	16.7 liters per minute, actual or standard flow conditions
Filter Tape	Glass fiber filter tape, 60 days of operation per roll
Span Check	Automatic 800 µg span membrane verification with ±5% deviation alarms
Beta Source	^{14}C (carbon -14), 60 µCi ±15 µCi (2.22 MBq)
Beta Detector Type	Photomultiplier tube with organic plastic scintillator
Environmental	
Operating Temperature	0° to +50°C (inside shelter)
Ambient Temperature	-40° to +55°C (BX-596 AT sensor) -30 to +50C (BX-592). Extended range sensors available
Sensor Ambient Humidity	0 – 90% RH, noncondensing
Range Sample Humidity	Actively continuous inlet heater module, 10%-99% RH Set Point
Control Enclosure	Weatherproof enclosure or shelter is required
Interface	
User Interface	Standard 8x40 character LCD with dynamic keypad. Optional color touch screen (BX-920) Isolated
Analog Output	0 –1 VDC output standard. 0 –10 V, 4–20 mA, 0 –16 mA switch-selectable
Serial Interface	RS-232 Duplex serial port. Ethernet, USB, and expanded serial ports with BX-965 option
Printer Output Telemetry Inputs	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)
Alarm Contact Closures	Data error, tape fault, flow error, power failure, maintenance
Error Reporting	User-configurable available through serial port, display, and relay outputs
Memory	4369 records (182 days at 1 record/hr). Expanded memory with BX-965 option
Electrical	
Power Supply	Factory configured for 100/120 or 220/240 VAC and 50 or 60 Hz. Dedicated 15A service OK
Power Consumption 110V	262 W max with Medo pump and inlet heater running (642W with Gast pump)
Power Consumption 230V	312 W max with Medo pump and inlet heater running (717W with Gast pump)
Physical	
Weight	54 lbs (24.5 kg) without external accessories.
Unit Dimensions	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.

Specifications are subject to change at any time.

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-FEM2.5 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 PM_{10} configuration
- BX-10EU Accessories kit for EU PM_{10} configuration
- BX-COARSE Accessories kit for EPA $PM_{10\text{-}2.5}$ dual-unit configuration

BX-965 Report Processor Option

This upgraded back panel assembly has expanded digital communications support including Ethernet, USB serial converters, an autonomous REPORT serial port with expanded memory, and the capability to serially network two BAM 1020 monitors together in the PM-coarse configuration. BX-965 is recom-mended for all BAM 1020 Monitors where data is collected digitally.

BX-970 Touch Screen Display Option

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 1020 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 & Options

- BX-121 or BX-122 High Capacity Gast Pump
- BX-126 or BX-127 Low Noise Medo Pump
- BX-802 EPA Louvered PM_{10} Inlet
- BX-808 BGI $PM_{2.5}$ VSCC™ Cyclone
- BX-807 BGI $PM_{2.5}$ Sharp Cut Cyclone
- BX-811 BGI PM_{1} Sharp Cut Cyclone
- BX-827 or 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, or 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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