microAeth® MA450 Black Carbon monitor

The microAeth® MA450 is a real-time 5-wavelength UV-VIS-IR Black Carbon monitor housed in an insulated outdoor enclosure with an 85 sampling location automatic filter tape advance system enabling 3-12 months of continuous measurements. The instrument includes the supports the DualSpot® loading compensation method which corrects for optical loading effects and provides additional information about aerosol optical properties.

The device is a self-contained instrument with built-in brushless (BLDC) pump, closed-loop flow control, and integrated data storage. The MA450 features onboard GPS, satellite time synchronization, accelerometer, altimeter/barometer, and sensors for relative humidity and temperature. An internal active Nafion Dryer is optional.

The MA450 is designed as a network node to be installed outdoors in both urban and remote environments, for near road, outdoors on street poles, and along fence lines for extended multi-month measurement campaigns with low maintenance and infrequent site visits. The 85 location filter tape cartridge allows for long term, continuous sampling for up to a year depending on the sampling environment conditions and instrument settings.

The spectrum measurement provides insight into the composition of light absorbing carbonaceous particles to distinguish among the different optical signatures of various combustion sources such as diesel, woodsmoke, biomass, and tobacco. The built-in source apportionment provides speciation of traffic and woodburning.

Example Applications

Continuous real-time monitoring	Ambient air monitoring
Indoor air quality	Source apportionment
Woodsmoke / Biomass	Network monitoring
Fence line monitoring	Near-road monitoring
Urban environment on street poles	

**Contact AethLabs for application support.

Measurement Method	Real-time Aethalometer® method, 5 wavelength absorption analysis by measuring the rate of change of transmitted light due to continuous particle deposition on filter. Measurement at 880 nm interpreted as concentration of Black Carbon ('BC'). Measurement at 375 nm interpreted as Ultraviolet Particulate Matter ('UVPM') indicative of woodsmoke, tobacco, and biomass burning.
Measurement Wavelengths	880 nm, 625 nm, 528 nm, 470 nm, 375 nm
DualSpot® Loading Compensation	Real-time analysis by measuring the rate of change in absorption of transmitted light due to the continuous collection of aerosol on filter. Simultaneous collection on two spots in parallel at different flow rates.
Timebases	1, 5, 10, 30, 60 or 300 seconds
Flow Rates	Internal long life brushless diaphragm pump provides 100, 125, 150, 170, 200, 225, or 250 ml/min.
Measurement Range	Per sampling location, 0-1 mg BC/m^3, filter sampling location lifetime dependent on concentration and flow rate setting, decreasing proportionally with lowest wavelength optical source enabled: IR only mode, average 5 µg BC/m^3 for 24 hours at 100 ml/min IR only mode, average 100 µg BC/m^3 for 3 hours at 50 ml/min IR only mode, average 1 mg BC/m^3 for 15 minutes at 50 ml/min
Measurement Resolution	0.001 µg BC/m^3
Limit of Detection	30 ng BC/m^3, 5 min timebase., 150 ml/min flow rate, SingleSpot™
Pump Options	Internal long life brushless diaphragm pump
Flow Control	Internal mass flowmeters with closed-loop control
Filter Material / Capacity	MA600/MA450/MA350/MA300 Filter Tape Cartridge with Polytetrafluoroethylene (PTFE) material (85 sampling locations)
Sampling	3 mm diameter spot(s) created on filter tape. User selectable DualSpot® or SingleSpot™ mode.
Aerosol Conditioning	Optional Internal Nafion Aerosol Dryer - uses internal vacuum pump in reflux configuration to dry inlet sample air stream
Environmental Sensors	Accelerometer, Relative Humidity, Temperature, Altimeter/Barometer
Dimensions	L: 447.5 mm (17.62 in), W: 369.6 mm (12.07 in), D: 192 mm (5.56 in), No Inlet protection kit decreases length to 423mm (16.65 in) Without the sun shield, dimensions are: L: 405 mm (15.94 in), W: 303 mm (11.93 in), D: 160 mm (6.3 in)
Weight	3.63 kilograms (8.00 pounds)
Memory	16 GB internal flash memory, providing storage for 31,250,00 data lines; 1 second timebase: 361 days of data.
On-board Interface	Low power screen, 3 buttons
Location Services	GPS with internal antenna
Date/Time Format	ISO 8601 with satellite synchronization or manual computer synchronization
Wireless	802.11 b/g/n Wi-Fi with AES hardware encryption
Connections	M12 RS232 connector, M8 DC Power input connector, USB-C 5V Power Out Port, 10-32 Threaded Aerosol sample inlet and outlet ports, USB 2.0 on inside panel, 3.3V TTL serial on inside panel
USB Communication / Client Application	USB connectivity to cross-platform microAeth® Manager software available on macOS® and Windows®. microAeth Manager software is included and facilitates settings configuration and data download.
Serial Communication	M12 connector with RS232 communication for streaming data and polling protocols to request data, modify settings and control. Command line interface (CLI) polling protocols: AethLabs protocol and Bayern-Hessen protocol., 3.3V TTL serial connectivity for uploading new instrument firmware, flow calibration.
Power	M8 12V Power In Power Supply Adapter: Input: 100~240 VAC 50/60Hz 0.4A, Output: 12VDC / 2A, with territory-specific Type A, C, G, or I plug
Operating Environment	-15 ~ 40 °C operating, non-condensing.
Included	microAeth MA450, 1 MA600/MA450/MA350/MA300 Filter Tape Cartridge, M8 12V AC adapter with territory-specific plug, USB communication cable, AL80/MA450 Inlet Protection Kit, Cross-platform microAeth® Manager software and manual available for download via AethLabs website
Accessories & Consumables	MA600/MA450/MA350/MA300 Filter Tape Cartridge, MAx / ALx Series Flow Calibration Kit, microCyclone™ 170 PM2.5 Size-selective Inlets, M12 RS232 Serial to USB converter cable, M12 RS232 Serial to bare leads cable, Internal Aerosol Dryer, Inlet Protection Kit, AL80/MA450 Inlet Protection Kit