



AEROSOL
MAGEE SCIENTIFIC

ADVANCED PORTABLE MEASUREMENT OF BLACK CARBON



AE43

AETHALOMETER®

Advanced
Portable
Black Carbon
Instrument

KEY FEATURES

- Light-weight & Portable
- Full Spectrum 7-Wavelength analysis: UV – IR, 1 Hz data rate
- DualSpot™ Technology for filter loading effect compensation
- Real-time source apportionment
- NIST-traceable Calibration and Validation by ND optical kit
- Real time graphical data display

APPLICATIONS

- Mobile measurements, mobile labs
- Wildfire smoke monitoring
- Vertical profiling – aircraft, balloons
- Emissions testing
- Pollution Hot-spot identification
- Health effects research
- Pollution mapping

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PRODUCT SPECIFICATIONS

MEASUREMENT PRINCIPLE

Continuous collection of aerosol on filter with simultaneous measurement of attenuation of transmitted light at wavelengths of 370, 470, 520, 590, 660, 880 and 950 nm. Black Carbon concentration measurement is defined by the absorption measurement at 880 nm. Multiple wavelength analysis for source apportionment (identification of biomass smoke), studies of aerosol light absorption, radiative transfer, atmospheric optics. High data rate capability for source and emissions testing.

DUALSPOT™ TECHNOLOGY

Simultaneous analysis of light absorption by aerosol deposits collected on 2 spots in parallel at different loading rates. Mathematical combination of data yields Black Carbon result independent of spot loading effects and provides additional information about aerosol composition.

SOURCE APPORTIONMENT

Discrimination of Black Carbon from fossil fuel versus biomass combustion possible with built-in analysis by a two-component model.

SENSITIVITY

Proportional to time-base and sample flow rate settings: approximately 0.03 µg/m³ @ 1 min, 5 LPM.

DETECTION

Detection Limit (1 hour): <0.005 µg/m³
Range: <0.01 to >100 µg/m³ Black Carbon
Resolution: 0.001 µg/m³ or 1 ng/m³

SAMPLING

Aerosol sample collected on filter tape consisting of PTFE-coated glass fibers, supported by a reinforcement backing. Tape advances automatically when user selectable loading threshold is reached, typically once every few hours depending on concentration and flow rate. Size selective inlets (impactor, cyclone) may be attached.

- Time-base 1 second or 1 minute, post-processing to any time resolution
- Flow-rate 2 to 5 LPM provided by internal pump.
- Flow measured by two mass flow sensors and stabilized by closed-loop control.

OPERATOR INTERFACE

Display
10.1" color touch-screen (1280 x 800 px) with status indicator LED's.
Interface
Graphical User Interface with basic data display and control, advanced screens for detailed reporting and parameter setup.
Charts
Charting of most relevant data (BC1, BC6, BB%, BCff and BCbb) for Instant identification of sources.
Charting of wind speed and direction related to BC measurements (applicable with Wind speed and direction sensor (PN M5520-A)).
Remote management
Network ready for remote management and data transfer.

STORAGE

Data are written to internal memory once every time-base period. Stored data may be transferred over a network or to a manually inserted USB drive.

DATA OUTPUT

- 5 x USB (1x charge only)
- 6 x RS232
- 1 x Ethernet
- 1 x HDMI (service only)

QUALITY CONTROL AND ASSURANCE

Automatic or manual sample flowrate calibration using an externally-attached calibrator. Verification of optical performance using a set of NIST-traceable neutral density optical filters. Automatic or manual Dynamic Active Zero and stability tests may be programmed to occur at specified time intervals.

PHYSICAL SPECIFICATIONS

- Dimensions (HxWxD): 22 x 40 x 23 cm
- Weight: 11.5 kg
- Electrical Power supply:
 - AC: 100-230VAC, 50/60Hz (auto-switching)
 - DC: 12 V
 - External battery power supply offered as an optional accessory
- Power consumption: 25 W average
- Internal Vacuum Pump:
 - dual diaphragm, brushless motor
- Modular hardware, hermetically sealed

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RELATED PRODUCTS

Battery Lithium, LiFePo4 chemistry
Weight: 5.4 kg (in chassis with LED indicators)
Run time @ 2 LPM flow rate: up to 15h
AEccessor remote access from PC

INSTALLATION REQUIREMENTS

- Temperature: 5°C - 55°C
- Rel. humidity: 5% - 95% (non-condensing)
- Operating altitude: Sea Level to 3000 m (Operating range can be extended to 5000 m a.s.l. with an external air pump – optional accessory)

ACCESSORIES

External power supply with indicators (PN AE43-BAT) Neutral Density Optical Filter validation kit (PN M7662) Ambient meteorological sensor with 10-m cable (PN M5550-A or M5530-A) Wind speed and direction sensor (PN M5520-220V-A) Sample stream dryer (PN M5610) PM2.5 inlet (2.5 µm @ 5 LPM) (PN M4110-A) PM1 inlet (1 µm @ 5 LPM, 2.5 µm @ 2 LPM) (PN M4114-A)

CO2 sensor integrated with AE33 airflow & data (PN M5710)
Flow Calibrator ALICAT FP-25 (0.1-25 LPM)
Includes communication cable (PN M7925-A)
Insect Screen Assembly with Water Trap (PN M9556-A)
Tape Sensor Calibration Disc kit (PN M3410)
GPS module (PN AE33-GPS)
External pump for high-altitude operation (PN AETH-HA-PUMP)

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