# Advanced Portable Measurement of Black Carbon


## Aethalometer® Model AE43

### KEY FEATURES

- Full Spectrum 7-Wavelength analysis: UV – IR, 1 Hz data
- DualSpot™ Technology* for filter "loading effect" compensation
- Real-time source apportionment
- NIST-traceable Calibration/Validation by ND optical kit
- Lightweight/Portable Aethalometer (based on AE33 architecture)

*United States Patent 8,411,272, United States Patent 9,018,583, other patents pending

### APPLICATIONS

- Vertical profiling
- Real-time source apportionment
- Emissions testing
- Pollution Hot-spot identification
- Health Effects research
- Pollution mapping

MAGEE SCIENTIFIC

Manufactured in Europe by Aerosol d.o.o., Ljubljana, Slovenia

# 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.

*United States Patent 8,411,272, United States Patent 9,018,583, other patents pending

## 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/m$^3$ @ 1 min, 5 LPM.

## DETECTION

Detection Limit (1 hour): <0.005 µg/m$^3$
Range: <0.01 to >100 µg/m$^3$ Black Carbon
Resolution: 0.001 µg/m$^3$ or 1 ng/m$^3$

## SAMPLING

Aerosol sample collected on *Borosilicate glass microfibers reinforced with woven glass cloth and bonded with PTFE* filter tape.
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.
• Tape advances automatically on aerosol loading or at predefined Times or time intervals.

## 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 anc BCbb) for Instant identification of sources.
Charting of wind speed and direction related to BC measurements (applicable with Ambien Meteorological sensor (PN 5510).
**Remote management**
Network ready for remote management and data transfer.

## DATA OUTPUT & STORAGE

**Output**
• 5 x USB (1x charge only)
• 6 x RS232
• 1 x Ethernet
• 1 x HDMI (service only)
**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.

## 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 (battery powered) – battery not included
• Power consumption: 25 W average
• Internal Vacuum Pump: dual diaphragm, brushless motor
• Modular hardware, 19'' rack compatible, mount 5U chassis, hermetically sealed

## RELATED PRODUCTS

**Battery:** Lithium, LiFePo4 type
Mass: 3kg (in chassis with LED indicators)
Running autonomy @ 5 LPM: 9h
**AEccessor** remote access from PC, tablet, phone
**AethAlerts** status reporting and system alert service by email
**AethNET** networking solution that connects Aethalometers to a data center where the data is analyzed, stored and made available to users

## ACCESSORIES

**Battery (LiFePo4) with indicators** (AE43-DC)
**Neutral Density Optical Filter validation kit** (PN 7662)
**Ambient meteorological sensor**, with 10-m cable (PN 5510)
**PM2.5 inlet** (2.5 µm @ 5 LPM) (PN 4110)
**PM1 inlet** (1 µm @ 5 LPM, 2.5 um @ 2 LPM) (PN 4114)
**CO2 sensor**, integrated with AE33 airflow&data (PN 5710)
**Flow Calibrator**, with cable for automatic/manual use (PN 7900)
**Insect Screen Assembly with Water Trap** (PN 9556)
**Tape Sensor Calibration Disc kit** (PN 3410)
**GPS module** (PN AE33-GPS)

**GENERAL INQUIRIES:**

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