AEROSOL
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SMARTEST WAY TO MONITOR BLACK CARBON: TRAFFIC AND BIOMASS BURNING POLLUTION

AE36

AETHALOMETER®

KEY FEATURES

- 7λ, 370 – 950 nm, real-time aerosol analysis
- BC Index®
- DualSpot™ technology
- Real-time source apportionment
- Robustness to relative humidity changes
- Real-time data visualization
- Self-cleaning procedure
- Connectivity
- Automatic data validation

KEY BENEFITS

- Data you can trust
- Easy to use
- Comprehensive data
- Low maintenance
- Decades of experience

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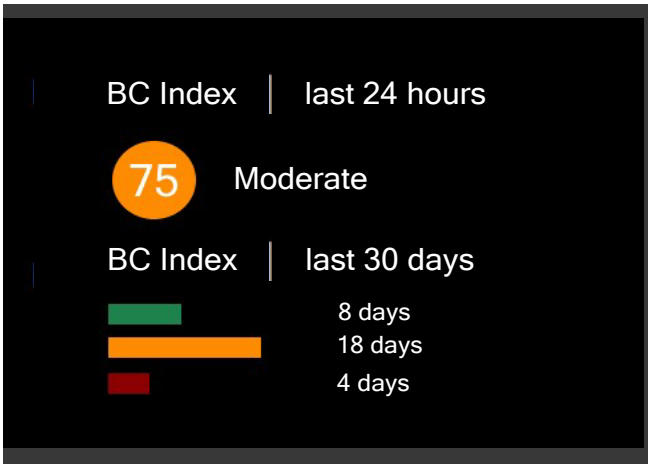
AE36 helps Air Quality specialists increase understanding of particulate matter (PM) air pollution. Gain insights into Black Carbon. Get accurate data you can trust, with less workload.

Receive accurate real-time data on Black Carbon, an important particulate matter component, that causes serious environmental and health-related risks. AE36 enables identification of Black Carbon sources and provides an assessment of air quality with the BC Index. Access AE36 and receive valid data remotely, without data post-processing. AE36 with a new user interface is easy to use and can run unattended for almost a year. Built on four decades of scientific work and real-world experience for robust and reliable operation, ensuring data continuity for long-term trend analysis.

TO MEASURE IS TO KNOW.

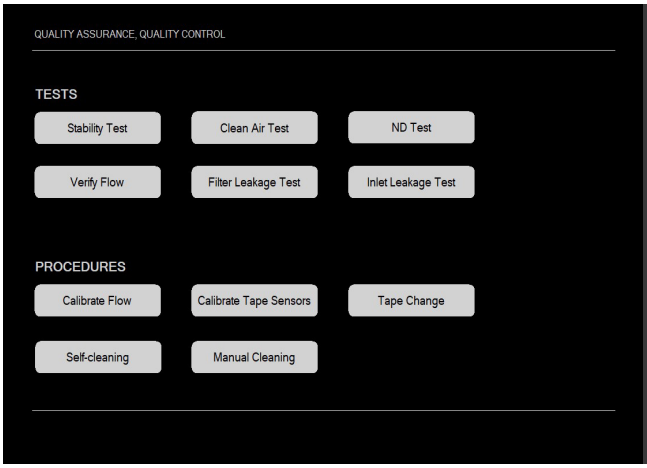


BC INDEX

BC Index is a proprietary measure of air quality based on Black Carbon concentrations. It helps organizations to monitor and communicate the level of air polluted with Black Carbon. BC Index provides a convenient way to track air quality levels in real-time and can help make decisions to protect human health. AE36, the first in the world, helps authorities to follow WHO 2021 recommendations in developing standards or targets for ambient Black Carbon concentrations. BC Index is adjustable to accommodate to area specific Black Carbon concentration ranges and regional PM2.5 standards.

SUPREME AUTONOMY

AE36 runs unattended for a long time. **Self-cleaning procedure** reduces maintenance and ensures accurate readings over extended period. Using a proprietary technology to clean the optical chamber and internal tubing, AE36 reduces buildup of dirt and other contaminants that may affect the data quality. It features **2-times longer filter tape**, resulting in fewer site visits, and greater assurance data are of highest quality - with less workload. AE36 is **robust to relative humidity changes** e.g., due to air conditioning.



EASY TO USE, ROBUST PERFORMANCE

AE36 provides essential insightful data, while requiring minimal resources, starting with an easy-to-use **graphical user interface**. **Real-time data visualization** enables fast overview of the most important data for the last week. **Self-cleaning procedure** reduces buildup of dirt and other contaminants. Automatic **safety and diagnostic features** make sure the instrument is running optimally. New status control is implemented for **automatic data validation**, providing reliable and accurate data analysis and reporting. AE36 is connected using the RAS module in CAAT software.

APPLICATIONS

The Aethalometer provides real-time monitoring, quantitation and speciation of **Black and Brown Carbon** aerosols and is the best instrument for:

- Ambient air quality monitoring
- Community monitoring
- Long-term stationary monitoring
- Fence line monitoring
- Near-road monitoring
- Black carbon source apportionment
- Stationary source emissions
- Public and occupational health
- Marine and air transport pollution
- Biomass, fossil fuel burning, forest fire smoke monitoring
- Wildfires monitoring

ABOUT AE36

THE AETHALOMETER MEASUREMENT PRINCIPLE

The Aethalometer collects and analyzes aerosol particles continuously. The aerosol-laden air stream is drawn through a spot on a filter tape at a measured flow rate. Simultaneously, the tape is illuminated by light: sensitive detectors measure the intensities of light transmitted through an un-exposed portion of the tape, acting as a reference; versus the collecting spot. As optically absorbing material accumulates on the spot, the intensity of light transmitted through it gradually decreases. The decrease in light intensity from one measurement to the next is interpreted as an increase in collected material. This increased amount is divided by the known air-flow volume to calculate the concentration.

The real-time analysis is performed at 7 optical wavelengths from the near-ultraviolet (370 nm) to the near-infrared (950 nm), which enables source apportionment – see below - to separate traffic or diesel exhaust from biomass burning (woodsmoke, forest fires, cook stoves...), and provides simple Brown Carbon calculations with CAAT software.

DUALSPOT PATENTED AUTOMATIC COMPENSATION FOR FILTER LOADING EFFECT [1]

Sample collection and analysis is performed on two filter spots simultaneously at different flow rates. Mathematical combination of the data eliminates the Filter Loading Effect and provides continuously- corrected data in real time with no discontinuities at filter advances.[2]
This compensation depends critically on the aerosol composition and properties. It must be determined in real time from the measurement data, as it cannot be predicted in advance. The parameters derived from this analysis also offer additional insights into aerosol composition and aging.

REAL-TIME SOURCE APPORTIONMENT

The Aethalometer analyses the sample at 7 optical wavelengths from UV (370 nm) to IR (950 nm). Optical absorption by different aerosol components may have different variations across the spectrum: most notably, the differences between diesel exhaust and emissions from biomass burning. The 7-wavelength data allows for a separation of these components, providing a real-time speciation of the aerosol sources and a determination of their origins.
The Aethalometer source apportionment algorithm uses filter loading compensated data (DualSpot) considering different loading effect across wavelengths, resulting in true and accurate real-time source apportionment.[3]

[1] Patents US9671324, EP2937680, and other cover aspects of the proprietary technology embodied in the Aethalometer.

[2] Drinovec et al., Atmos. Meas. Tech., 8, p.1965 1979, 2015.

[3] Zotter et al., Chem Phys., 17, p.4229 4249, 2017.

The Aethalometer is the instrument most-used in the world for real-time monitoring and speciation of Black Carbon. Thousands of instruments have been installed on all seven continents starting in 1986.

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PRODUCT SPECIFICATIONS

AETHALOMETER AE36

SENSITIVITY
Proportional to time-base and sample flow rate settings: <10 ng/m³ @ 1 min, 5 LPM

DETECTION
Detection limit (1 hour): <0.001 µg/m³
Range: <0.01 to >100 µg/m³
Black Carbon resolution: <1 ng/m³

SAMPLING
Aerosol sample collected on reinforced glass-fiber/ PTFE filter tape. Tape advances automatically on aerosol loading or at predefined times or intervals. Size selective inlets (impactor, cyclone) may be attached.

- Filter tape length: 20 m
- Time-base 1 min and 5 min, post-processing to any time resolution
- Flow-rate 2 and 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 × 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
- Charting of most relevant data (BC_6, BB%, BC_{ff}, BC_{bb}) for instant identification of sources.
- BC Index chart
Remote management
Network ready for remote management and data transfer

RH ROBUSTNESS
RH sensitivity <1 ng BC/(%/min)

SENSORS
- Inlet RH sensor
- Tape compartment RH sensor
- Door sensor

DATA OUTPUT & STORAGE
Output
- Digital data via RS-232 COM port and Ethernet
- 4x USB, 1x USB (power only), 6x RS232, 1x Ethernet
Storage
- Database: 6 GB (30 years of 1 min data)
- All data are written to internal memory once every time-base period. Stored and autovalidated data may be transferred over a network or to a manually inserted USB drive

QUALITY CONTROL AND ASSURANCE
- Stability test
- Clean air test
- ND test for optical performance verification
- Flow verification
- Filter leakage test
- Inlet leakage test
- Flow calibration
- Tape sensor calibration
- Self cleaning procedure

PHYSICAL SPECIFICATIONS
- Dimensions (H x W x D): 27 × 43 × 32 cm
- Weight: 17.5 kg
- Electrical power supply: AC: 100-230VAC, 50/60Hz (auto-switching)
- Power consumption: 30 W average
- Internal vacuum pump: dual diaphragm, brushless motor
- Modular hardware, constructed in a fully-enclosed 19'' rack mount 6U chassis, hermetically sealed to be protected from external environmental conditions

RELATED PRODUCTS
- **RAS module in CAAT** for remote access and support
- **Sample Stream Dryer** including external pump
- **Upgrade with a TCA08**: AE36s can be ugraded into a CASS instrument - an online OC/EC analyzer

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

ACCESSORIES
- **Neutral density optical filter validation kit**
- **Ambient meteorological sensor**
- **Wind speed and direction sensor**
- **Sample Stream Dryer**
- **PM2.5 Inlet** (2.5 µm @ 5 LPM)
- **PM1 Inlet** (1 µm @ 5 LPM, 2.5 um @ 2 LPM)
- **CO_2 sensor**
- **Flow calibrator ALICAT FP-25** (0.1-25 LPM)
- **Insect screen assembly with water trap**
- **Tape sensor calibration disc kit**
- **GPS module**
- **External pump for High-Altitude operation**

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Keeping an Eye on the Air

Manufactured in EU by Aerosol d.o.o.

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