



Measurement Principle

Real-time analysis by measuring the rate of change in absorption of transmitted light due to continuous collection of aerosol deposit on filter. Measurement at 880 nm interpreted as concentration of Black Carbon ('BC').

AE22 2-Wavelength:

Additional measurement at 370 nm designated as 'UVPM', interpreted as an indicator of aromatic organic compounds such as are found in tobacco smoke, wood and biomass-burning smoke, etc.

AE31 7-Wavelength:

Simultaneous measurement at 7 wavelengths for studies of aerosol light absorption, atmospheric optics, radiative transfer, etc.: 370, 470, 520, 590, 660, 880 and 950 nm.

Specificity

No other aerosol species absorbs light even 0.001 times as much as Black Carbon in the visible range.

Timebase (User setting)

AE22: 1 hour to 5 seconds

AE31: 1 hour to 2 minutes

Intercomparison

Readings compare 1:1 with chemical analysis for Elemental Carbon ('EC') on parallel filter samples.

Sensitivity

Proportional to flow rate, inversely proportional to time resolution; approximately $0.1 \mu\text{g}/\text{m}^3$ @ 1 minute resolution @ 3 LPM flow rate.

Flow Rate (User setting)

Internal pump provides 2 to 5 LPM, monitored by mass flow meter and stabilized by closed-loop control. Rear panel connector for optional external pump.

Sampling

Aerosol sample collected on reinforced quartz fiber tape. Tape advances 1 cm automatically when user selectable loading threshold is reached, typically once every few hours depending on concentration and flow rate. 10 meter roll of tape usually lasts from months to years at most locations. Size-segregating inlets (impactors, cyclones etc.) may be attached.

Note: In almost all situations, the vast majority of BC aerosol is in the PM_{2.5} aerodynamic size range (i.e. less than 2.5 μm).

Sample Retention

Aerosol is collected on quartz fiber tape. Subsequent analysis can be performed on the sample spots following collection.

Sample Collection Area

Sample is collected on a defined spot on the filter tape.

- 'High Sensitivity' option provides a small, concentrating spot for optimal performance at locations of low concentration.
- 'Extended Range' option provides a larger, dispersing spot for optimal performance in areas of high concentration.

Internal Control

All functions controlled by embedded single-board computer. Program and operating parameters stored in flash memory.

Data Output

Digital data is available via rear RS-232 (COM) port. Analog data is available via rear panel terminals representing Black Carbon data as 0~5 volt DC signal, scalable in software.

Data Storage

Data are written to removable CompactFlash® card once every timebase period.

Display and Interface

4-line display screen with keypad and status indication color LED's.

Attention Required

Instrument is completely automatic. No user attention is required during operation. Starts and runs automatically upon switching on. Recovers automatically from power interruptions.

Consumables

Filter tape roll: approximately 1 to 4 rolls per year, depending on BC concentrations.

Cartridge filter: approximately 1 per year, depending on BC concentrations (bypass for flow meter protection).

Periodic Maintenance

Recommended flow rate verification every three months, and cleaning the inlet assembly and analytical chamber once per year.

Reliability

Aethalometers have been operating at hundreds of urban, regional, rural and remote locations on all continents, continuously since 1986.

Dimensions

Instrument constructed in fully-enclosed 19" rack mount 6U chassis:

10.5 in (267 mm) H x 19 in (483 mm) W x 12 in (305 mm) D

Weight

Approximately 40 lbs (18.1 kg).

Power

100~240 VAC 50/60 Hz, autoswitching.

Consumption approximately 40 watts.

Temperature

0 ~ 40 °C operating, non-condensing.

Initialization

Approximately 15 minutes required from power-up to valid data.

Specifications are subject to change without notice.



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