



AEROSOL
MAGEE SCIENTIFIC

ONLINE SPECIATION OF CARBONACEOUS AEROSOLS



CASS

CARBONACEOUS AEROSOL
SPECIATION SYSTEM

Continuous
analysis of
Carbonaceous
Aerosols

KEY FEATURES

- Online determination of OC/EC
- Online determination of TC, BC, BrC, %BB
- Sampling time 20 min to 24 hours
- Uses ambient air as carrier gas
- Rugged, all-steel construction
- Unattended operation of 1 month minimum

APPLICATIONS

- Air Quality monitoring
- Health Effects, Climate Change research
- Field measurement projects
- Emissions testing



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PRODUCT SPECIFICATIONS

BASIC DESCRIPTION

Real time/online TC/BC/EC/OC and BrC analysis with the Carbonaceous Aerosol Speciation System - CASS.

The Magee Scientific CASS is a revolutionary scientific instrument that measures TC/BC/EC/OC and BrC in near-Real-Time.

The equipment contains **no fragile glassware** and requires **no special gas** supplies.

In contrast to existing methods, the CASS offers greater reliability, greater flexibility, and very substantial operational cost savings for aerosol analysis.

MEASUREMENT PRINCIPLE

Optical Analysis of BC with continuous collection of aerosol on filter and simultaneous measurement of attenuation of transmitted light at wavelengths 370, 470, 520, 590, 660, 880 and 950 nm.

Thermal Analysis of TC with flash-heating of sample collected on a quartz filter to convert all Carbon to CO₂.

The mathematical principle is simple:

Total Carbon (TC) =

Black (or Elemental) Carbon (BC, EC) + Organic Carbon (OC).

Measure TC with the TCA08;

Measure BC/EC with the AE33 Aethalometer®;

Derive OC immediately in near-Real Time by subtraction:

OC = TC - EC.

The AE33 Aethalometer® also identifies 'Brown Carbon' (BrC) by multi-wavelength optical analysis, to separate Biomass Smoke from Diesel Emissions.

AE33 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 in Aethalometer AE33.

SPECIFIED PERFORMANCE OF AE33

Analytical sensitivity of BC - proportional to time-base and sample flow rate settings: $\approx 0.03 \mu\text{g}/\text{m}^3$ @ 1 min, 5 LPM (or $0.015 \mu\text{g}/\text{m}^3$ in HS mode)

Detection limit of BC (1 hour) $<0,005 \mu\text{g}/\text{m}^3$

Detection range of BC: <0.01 to $>100 \mu\text{g}/\text{m}^3$

SPECIFIED PERFORMANCE OF TCA08

Analytical sensitivity of TC: $<0.5 \mu\text{g C}$

Detection limit of TC: $<0.1 \mu\text{g C}/\text{m}^3$ for 1-h timebase,

16.7 SLPM flow

Detection range of TC: $<0.03 \mu\text{g}/\text{m}^3$ to $> 300 \mu\text{g}/\text{m}^3$

Total Carbon

SAMPLING FLOW RATES

AE33 sampling flow rate of BC/EC adjustable from 2 to 5 LPM, provided by closed-loop stabilized internal pump and two mass flow sensors.

Sampling flow rate for TC of 16.7 SLPM ($1 \text{ m}^3/\text{h}$), provided by closed-loop stabilized internal pump.

OPERATOR INTERFACE

Display

8.4" color touch-screens with status indicator LED's. Graphical User Interface with basic data display and control, advanced screens for detailed reporting and parameter setup. Network ready for remote management and data transfer.

DATA OUTPUT & STORAGE

• Output

Digital data via RS-232 COM port and Ethernet.

Network ready for remote management and data transfer.

• Timebase

BC/EC: 1-second (1 Hz) or 1 minute

TC/OC: 20 minutes to 24 hours

• 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. Validation of optical performance using kit of neutral density filters. Pre-programmed built-in zero air test - clean air test for TC and BC.

PHYSICAL SPECIFICATIONS

• Dimensions: $78 \times 48 \times 57 \text{ cm}$

• Weight: 89 kg

• Electrical Power supply: 100-230VAC, 50/60Hz (auto-switching)

CARBONACEOUS AEROSOL SPECIATION SYSTEM CASS

- Power consumption: 625 W
 - Internal Vacuum Pump
 - Modular hardware, constructed in a fully-enclosed 19" rack
- Mount chassis, hermetically sealed

ACCESSORIES

Neutral Density Optical Filter validation kit

Ambient meteorological sensor

PM2.5 inlet ($2.5 \mu\text{m}$ @ 5 LPM)

ALICAT FP-25 flow calibrator with communication cable

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Keeping an Eye on the Air

European Patent EP19213028.4 and other

patents pending

US Patent 8,411,272, and US Patent 9,018,583, and other patents pending.

Manufactured in EU by Aerosol d.o.o.

CASS specification version 2.2 / 01 2025

Specifications are subject to change without notice.