



AEROSOL
MAGEE SCIENTIFIC

SETTING THE STANDARD FOR TOTAL CARBON MEASUREMENT



TCA09

TOTAL CARBON ANALYZER

Total carbon.
Measured right.

KEY FEATURES

- Continuous analysis of total carbon
- Rugged design
- No gas, no glass, no catalyst
- Calibration with sucrose (EN 16909), KHP, and filters
- Automated QA/QC procedures
- Automated clean air test CEN/TR 18076
- Integrates with Aethalometer for analysis of carbonaceous aerosols
- 30-day operation on a single quartz filter set
- High resolution: 10-minute time base
- Remote access and data download via RAS

KEY BENEFITS

- Flexible calibration and compliance
- Simplified installation and use
- Long autonomy
- Improved safety and security
- Compatibility and flexibility
- Data validation and connectivity

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The Total Carbon Analyzer TCA09 is an online instrument for total carbon measurements. Its rugged design supports long-term, unattended operation in demanding monitoring environments. TCA09 applies an equivalent OC/EC measurement method according to CEN/TR 18076. Calibration of the total carbon constant using sucrose follows EN 16909 procedures.

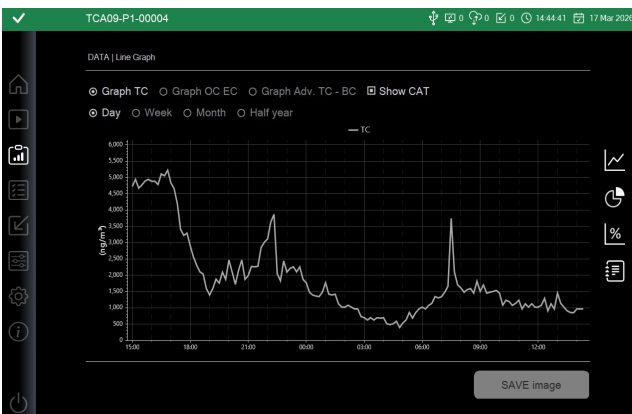
The TCA09 offers a high-time resolution of 10 minutes, providing more detailed and accurate data. Compatibility with Aethalometer AE33, AE36, and AE36s, as well as inlet tubes from the TCA08, ensures seamless integration with existing systems. The TCA09 supports auto data validation and is Remote Access System (RAS) compatible. With its innovative features and user-friendly design, the TCA09 sets a new standard in total carbon analysis, making it an essential tool for air quality measurements and climate research.

TO MEASURE IS TO KNOW



AUTOMATED QA/QC PROCEDURES

The TCA09 combines traceable calibration of total carbon with automated control of VOC artifacts to ensure standardized, high-confidence results. Primary calibration of carbon constants is supported using sucrose in compliance with EN 16909, with additional flexibility provided by KHP or proprietary filters. Complementing this, the automated Clean Air Test according to CEN/TR 18076 quantifies and corrects VOC interferences without manual intervention. Together, these features deliver accurate, artifact-corrected, and regulation-ready data for both scientific research and regulatory monitoring.



HIGH TIME RESOLUTION

The TCA09 offers high time resolution with a 10-minute time base, enabling detailed observation of short-term pollution events. Beyond ambient air quality monitoring, the TCA09 is suitable for applications requiring fast response and continuous measurement, such as exhaust emission measurements, stack emission monitoring, and chamber experiments. This enables researchers and monitoring stations to capture the dynamic behavior of aerosols and investigate emission sources and atmospheric processes across a wide range of use cases.



30-DAY OPERATION ON ONE FILTER SET

The TCA09 is designed for extended measurement periods, allowing up to 30 days of continuous operation with a single set of quartz filters. This feature significantly reduces the frequency of filter changes and maintenance interventions, making the instrument ideal for long-term, unattended monitoring campaigns. Maximizing operational uptime and minimizing manual workload, the TCA09 ensures reliable, high-quality data collection for various application areas.

TOTAL CARBON ANALYZER TCA09

APPLICATIONS

The Total Carbon Analyzer provides real-time measurements of the total carbon. This data is used for:

- Urban planning applications
- Climate research
- Pollution source identification
- Air quality monitoring compliance
- Carbonaceous material speciation
- Health effects studies
- Dynamic atmospheric processes
- Chamber experiments

ABOUT TCA09

THE TCA09 MEASUREMENT PRINCIPLE

The Aerosol Magee Scientific Total Carbon Analyzer collects a sample of atmospheric aerosols on a quartz fiber filter enclosed in a small stainless-steel chamber at a controlled sampling flow rate of 16.7 LPM. The default sampling time is 60 minutes but can be set from 10 minutes to 24 hours, depending on the ambient aerosol concentrations.

The instrument has two identical parallel channels, with the air flows being controlled by ball valves and solenoids. While one channel is collecting its sample, the other channel analyzes the sample collected during the previous period. At the end of the period, the valves switch over to provide continuous operation and continuous data.

After collecting the filter, two flash-heating elements combust the sample instantaneously in a small analytic flow of filtered ambient air. This converts all the carbonaceous compounds into CO₂ and creates a short, but large-amplitude pulse of CO₂ in the analytic flow passed to the NDIR CO₂ detector. The background level of CO₂ in ambient air during the heating cycle is determined before, and after the heating cycle, the provide the baselines against which the combustion pulse is measured. The CO₂ concentration over the baseline is integrated to give the total carbon content of the sample.

The chamber and combustion elements are cooled after analysis. At the end of the time-base period, the flow system of ball valves and solenoids switches over. The first

channel collects the next period's sample, while the second channel analyzes the previously collected sample.

CALIBRATION OF CARBON CONSTANTS WITH SUCROSE (EN 16909 STANDARD), KHP, OR PROPRIETARY FILTERS

The TCA09, as a primary calibration method, supports calibration of carbon constants using sucrose, ensuring full compliance with the EN 16909 standard for total carbon analysis. In addition to sucrose, calibration can be performed with potassium hydrogen phthalate (KHP) or proprietary calibration filters, providing flexibility and traceability for various research and regulatory needs. These robust calibration approaches ensure accurate and reliable standardized measurements of carbonaceous aerosols, supporting scientific studies and regulatory monitoring.

AUTOMATED CLEAN AIR TEST (CEN/TR 18076)

The TCA09 features automatic measurement of VOC artifacts in accordance with CEN/TR 18076.

This procedure identifies and corrects interferences caused by volatile organic compounds during carbon analysis. This automated process enhances the reliability and traceability of measurement results, reduces manual intervention, and supports compliance with the latest European technical guidelines for monitoring carbonaceous aerosols. Following these standardized procedures, the TCA09 delivers high-quality, artifact-corrected data essential for regulatory and scientific applications.

HIGH TIME RESOLUTION WITH A 10-MINUTE TIME BASE

The TCA09 offers high time resolution with a 10-minute time base, enabling the monitoring of pollution events on a small time scale. This enhanced temporal resolution enables more precise tracking of rapid changes in air quality and facilitates advanced analysis of short-term pollution events. As a result, researchers and monitoring stations can capture the dynamic behavior of aerosols and gain deeper insights into emission sources and atmospheric processes.

Integrates with Aethalometer for online OC/EC analysis and Carbonaceous Aerosol Fingerprint
It is easy to use, requires minimal resources with no analytic gas and no glass constituent parts.

PRODUCT SPECIFICATIONS

MEASUREMENT PRINCIPLE

Two identical flow channels for sampling and analysis. Sample is collected on 47-mm quartz fiber filter in stainless-steel combustion chamber. At end of sampling timebase, collection flow is switched to second channel while first channel is analyzed.

Collected sample is flash-heated to convert all Carbon to CO₂.

Ambient air is used as "analytical" carrier gas at low flow rate. The baseline level of CO₂ in ambient air is determined before and after the heating cycle. Large pulse of CO₂ in analytical flow is integrated over ambient baseline to determine Total Carbon content of sample.

No glass. Chambers constructed entirely from stainless steel. Rugged FeCrAl alloy heating elements.

No gas. Uses ambient air as carrier: does not need any specialty gas supplies.

No catalyst. No requirements for using MnO₂ during OC/EC analysis

Standard compliant. TCA09 supports the calibration procedure according to EN 16909 standard for the OC/EC measurements.

COMPATIBLE WITH AE33, AE36 and AE36 AETHALOMETER®

Cable connection: TCA09 receives Aethalometer data through serial connection.

BC data from Aethalometer® is used to derive EC. OC is obtained by simple subtraction: OC = TC - EC. The relationship between BC and EC depends on aerosol composition and the thermal protocol used for 'EC' assignment. The connection with AE36 or AE36s also offers the advanced and comprehensive carbon measurements.

SAMPLING

Standard flow rate of 16.7 LPM (1 m³/h), provided by closed-loop stabilized internal pump.

TIME RESOLUTION

Timebase for sampling and analysis is adjustable from 10 minutes to 24 hours. Default setting is 1 hour.

TOTAL CARBON ANALYZER TCA09

ANALYTICAL PERFORMANCE

Limit of Detection: 100 ng C/m³ (1 h timebase, 16.7 LPM flow)

Range: 100 ng C/m³ to 1,000,000 ng C/m³ of Total Carbon (1 h timebase, 16.7 LPM flow)

OPERATOR INTERFACE

Display

10.1" color touchscreen 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 in real-time. Option of advanced source apportionment in real-time (available for CASS only)

Remote management

Network ready for remote management and data transfer

MODULAR DESIGN

Modular for easy servicing, routine replacement of quartz sampling filter, or exchange of heating elements. Automated Clean Air Test for automatic check of the VOC background artefacts and denuder performance.

PHYSICAL SPECIFICATIONS

- Constructed in standard 19" rack-mount chassis.
- Dimensions (H x W x D): 32 x 48 x 52 cm (12" x 19" x 20")
- Weight: 38 kg (84 lbs)
- Electrical supply: 100-240 VAC, Voltage range: 85-264 V AC, 50/60 Hz
- Power consumption (maximum): max 1200 W; typical 100 W
- Internal sampling pump: dual diaphragm, brushless speed-controlled DC motor, stabilized flow.
- Modular internal hardware for rapid servicing.
- Constructed in fully-enclosed, self-contained rack-mount chassis.

INSTALLATION REQUIREMENTS

- Indoor or laboratory use, rack or benchtop
- Temperature: from 5°C - 45°C
- Humidity: 5% - 95%, non-condensing
- Operating altitude: up to 3000 m.
- Input / output connections:
 - Sampling air inlet: Stainless Steel Swagelok Tube Fitting, Union, 1/2 inch Tube OD
 - Sampling air outlet: standard 1/4" NTPF threaded connector
 - Analytical carrier air inlet: standard 1/4" NTPF threaded connector

ACCESSORIES

- Sharp cut cyclone inlet PM10 @ 16.7 LPM
- Sharp cut cyclone inlet PM2.5 @ 16.7 LPM
- Sharp cut cyclone inlet PM1 @ 16.7 LPM
- Shockproof and waterproof transit case
- Flow Calibrator ALICAT FP-25 (0.1-25 LPM) includes communication cable includes communication cable
- Ambient meteorological sensor GMX 300 (P, T, RH)
- Ambient meteorological sensor GMX 200 (wind speed and direction)
- Ambient meteorological sensor GMX 500 (P, T, RH, wind speed and direction)
- Sample inlet direct vertical installation for TCA09
- Inlet installation kit
- Sampling tube insulation
- Insect and water trap assembly
- Swagelok sampling tubing (various length) with different adapters
- Air splitter
- Static dissipative flexible inlet tube for analytic air

(1) The heating chamber is covered by patents EP3832302, US2021164950 and other.

(2) The Automated Clean Air Test - patent pending.

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Specifications are subject to change without notice.

Keeping an Eye on the Air