

## Thermo Scientific TEOM 4200 Carbon-in-Ash Monitor

The Thermo Scientific TEOM 4200 Carbon-in-Ash Monitor provides an automatic measurement of unburned carbon in fly ash in coal-fired power plants.



### Key Features/Benefits

- Directly measures unburned carbon in fly ash
- Insensitive to changes in coal/ash chemistry
- Unattended continuous operation
- Adaptable data output formats
- Report Generator

### Application

The Thermo Scientific TEOM 4200 Carbon In Ash Monitor provides the data necessary to optimize combustion efficiency in real time. This industrially hardened analyzer accomplishes its task by automatically measuring the amount of residual carbon in fly ash, and makes this information available to plant personnel. The carbon in ash test performed by the monitor is similar to methods carried out in plant laboratories.

### Technology

Carbon-in-ash is a key indicator of combustion efficiency at coal-fired power plants. The 4200 provides a direct, efficient approach to automating this type of measurement through its sampling and analysis procedures. The sampling of particulate matter from the flue is performed isokinetically. The analysis uses direct mass and carbon measurement techniques to determine the fly ash carbon content. The

analysis results are independent of coal type of combustion additives, generated with high reliability and minimal maintenance.

### Benefits and Opportunities

Applying the data generated by the 4200 Monitor, users can realize the following benefits:

- Lower fuel consumption and ash generation rates
- Improved heat rate
- Optimized mill performance
- Increased fly ash sales

The 4200 Monitor offers substantial advantages over the manual sampling and analysis methodology, including quick turnaround time and consistency.

## Specifications

### Measurement Method

- The monitor performs the following steps to determine the carbon-in-ash level: sample collection, sample mass determination, sample oxidation within an open volume, measurement of released CO<sub>2</sub>, calculation of the carbon-in-ash value, reporting of results, and preparation for the next cycle. The measurement cycle time range is 12 minutes under most conditions.

### Accuracy

- The carbon-in-ash resolution is  $\pm 0.5\%$  based upon a series of comparisons with isokinetically-drawn manual samples from the monitor's Manual Sample Probe.

### Operating Range

- Flue temperature: 250 °F (120 °C) to 800 °F (425 °C).
- Ambient temperature (sensor unit): 65 °F (18 °C) to 140 °F (60 °C). An enclosure is required for temperatures outside of this range.
- Distance between sensor unit and data reporting computer: up to 1,000 feet (300 m).

### Sampling System

- The standard sampling system includes the 4200 sample tube, manual sample tube, "S"-type pitot tube, and "K"-type thermocouple.
- The 4200 sample tube and manual sample tube are 8 ft, 2 in (2.5 m) long, and made of 316 thickwall stainless steel tubing.
- Optional dual point configuration allows alternating sampling of to sampling points in the same or different duct. Sampling locations can be up to 16 ft (4.8 m) from the monitor.
- Automatic purge of pitot tubes and sample probe.

### Dimensions

- Enclosure dimensions: height 33" (83.8 cm), width 32" (81.3 cm), and depth 15.9" (40.4 cm).
- Weight: 250 lb (115 kg).
- Height on stand: bottom position 68.6" (174.2 cm), top position 88.6" (225 cm).
- Wheels: 6" (15 cm) diameter wheels for transportability.

### Windows® Reporting Interface

- MS Windows XP compatible PC-based software generates reports in tabular or graphical format in MS Excel. Data are computed in metric units.

### Features

- Open loop CO<sub>2</sub> measurement system using standard non-dispersive infrared (NDIR) CO<sub>2</sub> sensor.
- Industrial grade mass transducer.
- Remote starting/stopping of the instrument cycle.
- Automatically starts/stops based on boiler condition.
- Logs 2 user-supplied 0-5 VDC analog inputs.
- Built-in self-tests and diagnostics.

### Data Analysis Subsystem

- Embedded processor running Thermo-designed firmware.
- Integrated keypad terminal/display.
- Displays current and recent results for percent carbon-in-ash in tabular or graphical form.

### Data Output

- 2 user-definable analog outputs (4-20 mA, 0-1, 0-5 or 0-10 VDC).
- Serial (RS-232) Output of Carbon Level and up to 11 other user-selected parameters
- Screen Output (graphical and scalar)
- Memory/Storage (ASCII format) for up to 1,152 cycles.

### System Requirements

- Instrument air: 80 to 100 PSI (5.4 to 6.8 atm), 45 CFM (0.57 m<sup>3</sup>/min) peak for approximately 1 minute.
- Power:
  - Single Probe: 120 VAC/60 Hz: 20A; 240 VAC/50-60 Hz: 20A
  - Dual Probe: 120 VAC/60 Hz: 20A; 240 VAC/50-60 Hz: 20A
- Sample port: 3" modified bushing attached directly to the boiler. Usually placed 86" (215 cm) above the floor.
- Installation of data transmission cable and sample port.

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