

PRODUCT SPECIFICATION SHEET

SERIES 8500 FILTER DYNAMICS

MEASUREMENT SYSTEM

System Capability

The Filter Dynamics Measurement System (FDMS™ unit) provides a running record of the ambient PM mass concentration, expressed in $\mu\text{g}/\text{m}^3$. It is designed to take into account the dynamics of PM that has been deposited on the sample collection filter and how the material behaves over time. The FDMS unit automatically generates mass concentration measurements ($\mu\text{g}/\text{m}^3$) that for the first time account for both nonvolatile and volatile PM components. It provides a self-referencing, NIST-traceable true mass measurement using R&P's proven TEOM® technology.

Regulatory Designations

Designated by California Air Resources Board as a California Approved Sampler (CAS) for PM-2.5 and PM-10 under regulations promulgated in June 2003.

Safety/Electrical Designations

Designed to meet the following safety and electrical designations:

- CE: EN61326:1997 (emissions and immunity), EN61010-1:1995 (safety).
- ETL: UL- and CSA-equivalent approval.

Standard System Configuration

- FDMS kit is available as an option for the TEOM Series 1400a (Revision B) monitor, and may be added to existing instruments:
 - Instruments equipped with *first-generation mass flow controllers** require an upgrade to second-generation mass flow controllers. The FDMS kit includes the other parts required to integrate the FDMS hardware with a TEOM Series 1400a (Revision B) monitor.
 - Instruments equipped with *second-generation mass flow controllers* require only the parts included in the FDMS kit to integrate the FDMS hardware with a TEOM Series 1400a (Revision B) monitor.
 - An Enclosure Modification Kit (59-009115) is available for housing an FDMS System in R&P's Complete Outdoor Enclosure. The kit may also be suitable for installations in fixed stations that require additional height.
- FDMS operating software.
- Size-selective inlet system for PM-10, PM-2.5 or PM-1 sampling, followed by isokinetic flow splitter.
- Sample Equilibration System (SES) dryer for main flow.
- Integrated main flow humidity sensor following the SES dryer.
- Switching valve.
- Purge filter maintained at 4 °C.
- Sensor unit.
- Control unit.
- Sample pump.

Instrument Performance (3 l/min, 1σ, stable conditions)

- Measurement Range: 0 to 5,000,000 $\mu\text{g}/\text{m}^3$ (5 g/m³).
- Resolution: 0.1 $\mu\text{g}/\text{m}^3$.
- Precision: $\pm 2.5 \mu\text{g}/\text{m}^3$ (1-hour ave), $\pm 0.8 \mu\text{g}/\text{m}^3$ (24-hour ave).
- Minimum Detectable Limit for Mass Measurement: 10 nanograms, 0.06 $\mu\text{g}/\text{m}^3$ (1-hour ave).
- Accuracy for Mass Measurement: $\pm 0.75\%$.

Flow Control

- Two mass flow controllers (0-5 and 0-20 l/min) with 1% of full-scale accuracy.
- Active volumetric flow control of sample stream using ambient temperature and pressure sensors.
- Mass concentration expressed either in standard or actual terms (user selectable).

Sample Conditioning System

- Sample Equilibration System (SES) dryer contains specially-designed Nafion® tubing inlet on the main flow to minimize potential for particle loss. The dryer lowers the main flow relative humidity, and allows for mass transducer operation at 5 °C above the peak air monitoring station temperature.
- Purge Filter Conditioner contains a heat exchanger that maintains the temperature of the main air flow and particle filter at 4 °C.
- An integrated humidity sensor that follows the SES dryer measures the humidity of the main flow line to determine the drying efficiency.

Data Averaging and Output

The system computes mass concentration information as mass concentration (sample MC adjusted by purge MC), volatility coefficient, volatile mass concentration and nonvolatile mass concentration.

- Real-time Mass Concentration Averages: 1 hour running average, updated every six minutes.
- Long-Term Averaging: 1, 8 (user selectable), 12 and 24 hr, updated every hour.

Operating Range

- The temperature of the sampled air may vary between -30 and 50 °C. With the exception of the size-selective inlet, the instrument must be weather protected within the range of 8 to 25 °C.

*TEOM Series 1400a (Revision B) monitors shipped by R&P prior to February 2001, or instruments with the serial number 140AB234170011 or below may be equipped with first-generation mass flow controllers.



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- Total flow rate of 16.7 l/min (1 m³/h), with a main flow rate of 3 l/min and a bypass flow rate of 13.67 l/min.
- Bypass flow rate: 13.7 l/min.
- Temperature of mass sensor and internal sample tube: 5 °C above the peak station temperature (default 30 °C, with set point range of 30 to 40 °C).

Data Storage

- Internal data logging of 1 to 8 user-specified variables; capacity of up to 10 weeks of hourly mass concentration data.

Filter Media

- Collection filter: Pallflex TX40, 13 mm effective diameter. Must use molded-style TEOM filter cartridge.
- Purge filter: 47 mm diameter filter housed in an FRM-style molded filter cassette, maintained at 4 °C. Suitable for collecting and archiving time-integrated particulate matter samples for subsequent laboratory analysis.

Particle Size Separation

- PM-10: R&P PM-10 inlet.
- PM-2.5: R&P PM-10/PM-2.5 SCC inlet combination, or R&P PM-10/PM-2.5 VSCC™ inlet combination.
- PM-1: R&P PM-10/PM-1 SCC inlet combination.

Software and Documentation

- RPCOMM and RPDATA software downloadable from the R&P web site to retrieve and view data on a number of computer platforms.
- Operating manual.

Data Output and Input

- Four-line display on control unit.
- RS232 serial connector for two-way communication with network and computer devices using the AK protocol.
- 3 User-Defined Analog Outputs (0-1, 0-2, 0-5 or 0-10 VDC).

Dimensions and Power Requirements

- FDMS Kit: 28 cm (11") W x 17.8 cm (7") D x 55.9 cm (22") H, 10 kg (22 lb), 1 A @ 120 VAC, 0.5 A @ 240 VAC.
- Sensor unit: 35.6 cm (14") W x 28 cm (11") D x 99 cm (39") H, 18.2 kg (40 lb), power from control unit.
- Control unit: 43.2 cm (17") W x 38.1 cm (15") D x 22.9 cm (9") H, 14.6 kg (32 lb), 1 A @ 120 VAC, 0.5 A @ 240 VAC.
- Pump: 15.3 cm (6") W x 28 cm (11") D x 20.4 cm (8") H, 7.3 kg (16 lb), 4.25 A @ 120 VAC, 2.25 A @ 240 VAC.
- System height: sensor unit only is 99 cm (39") in height, total system including sensor unit and FDMS kit is 160 cm (63") in height.
- Electrical cables between FDMS Unit and TEOM control unit: 10 m valve control cable and 10 m status cable.

The above specifications are subject to change without notice.
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