

PORTABLE MONITOR/DATA LOGGER

DataRAM™ Model: DR-2000

*The World's Most Precise and Versatile Real-Time
Aerosol Monitor*

Real-Time measurement of Airborne particulate Concentrations

With the DataRAM™, you'll never again have to wait for laboratory results to assess whether airborne pollutants have reached dangerous levels. The DataRAM Real-Time Aerosol Monitor measures mass concentrations of airborne dust, smoke, mists, haze, and fumes and provides continuous real-time readouts. Large capacity onboard data logging capability lets you save concentration data for future analysis. With optional accessories, the DataRAM can also provide respirable, PM-2.5, or PM-10 correlated measurements. For exposure sampling or continuous unattended indoor air, ambient, duct, or process monitoring, no other aerosol monitor is as fast, accurate, and easy to use as the DataRAM.



Designed for High Sensitivity

A high-sensitivity nephelometric monitor, the DataRAM samples the air at a constant, regulated flow rate by means of a built-in diaphragm pump. The DataRAM's light scattering configuration is optimized for the measurement of airborne particle concentrations, maximizing the unit's sensitivity. The detected signal is processed by state-of-the-art lock-in circuitry followed by high-resolution digitization, achieving ultimate detectability of atmospheric Rayleigh scattering fluctuations.



The Widest Measurement Range of Any Real-Time Particulate Monitor

In addition to its high sensitivity, the DataRAM has the widest measurement range of any real-time aerosol monitor—from 0.0001 mg/m^3 ($0.1 \mu\text{g/m}^3$) to 400 mg/m^3 . With a total span of almost 7 decades, the DataRAM is capable of effectively, measuring mass concentrations of airborne particles in industrial and ambient environments ranging from exceptionally pristine to extremely polluted. The instrument can also be used for atmospheric visibility measurements over a wide range of scattering coefficients. (0.00015 to 600 km^{-1}). The DataRAM's auto-ranging digital display provides both real-time and time averaged concentrations.



DataRAM with Omnidirectional Sampling Inlet for ambient monitoring

Exceptional Long-Term Stability

The DataRAM incorporates several technological advances, which guarantee exceptional long-term stability. Near infrared source output feedback control provides drift-free operation and excellent temperature stability. For either manual or preprogrammed/automatic zeroing of the monitor, an electronically controlled latching solenoid valve diverts the entire filtered air stream through the optical sensing stage in order to achieve "zero" air reference. In addition, instrument span checks (secondary calibration) can be performed simply by turning a knob on the DataRAM's back panel, which inserts a built-in optical scattering/diffusing element into the filtered air stream. On-screen diagnostic indicators and automatic shut-off for low battery conditions also help ensure the monitor's correct operation and data storage.

Maintenance-Free Operation

After passing through the optical sensing stage, all the particles are retained on a HEPA filter. Part of the filtered air stream is then continuously diverted through and over all optically sensitive areas (lens, light traps, etc.) to form a continuous air curtain, which protects against particle deposition. This design, in conjunction with a highly reliable diaphragm pump, ensures long-term maintenance-free operation. A membrane filter (with special holder included) can be substituted for the HEPA cartridge for gravimetric and/or chemical analysis of the particles collected downstream of the sensing stage.



*DataRAM with Cyclone
Precollector for respirable
particle measurements*

Menu-Driven Information Displays

In addition to the auto-ranging real-time concentration readout, the DataRAM provides users with a variety of informational displays on its 8-line LCD screen. Real-time and date, time-weighted average concentrations, elapsed run times, and other information are easily viewed by selecting the appropriate screen using a scroll-through menu. Operating parameters and diagnostic information displays can also be easily accessed through the menu using only 6 keys on the front of the instrument.

Integral Large-Capacity Data Logger

The DataRAM has built-in large-capacity data logging capabilities. Stored information includes time and date, average concentrations, maximum and minimum values over selected periods, STEL concentration, and tagging codes. Logged information can be retrieved either by scrolling through the DataRAM's display or by downloading to an external device such as a personal computer or printer.



Digital, Analog, and Alarm Outputs

The DataRAM provides continuous digital output (by means of an RS232C data port) as well as analog output, and a switched output for selectable high-level alarm with a built-in audible signal.

DataRAM can be powered by a rechargeable internal battery or an external power source

Accessories Expand Versatility and Enhance Accuracy

Several optional accessories are available for use with the DataRAM for a wide range of sampling applications. A cyclone precollector allows respirable particle measurements. An omnidirectional air-sampling inlet (with or without a PM-10/2.5 head) is available for ambient monitoring. Isokinetic inlet nozzles are available for duct sampling. An in-line heater module allows accurate monitoring of solid particles in high humidity/fog conditions. A sample dilution accessory permits elevated temperature and/or very high concentration monitoring. To download data to a PC or laptop any standard serial communications software package (e.g. Microsoft Windows™ 3.1) can be used. Standard spreadsheet packages (such as Microsoft Excel™, Lotus™, and others) can easily access and analyze data log files transmitted to a PC for review and archiving. A portable battery-powered printer and cabling accessories are also available.



DataRAM with In-Line Heater for monitoring in high humidity or fog

Specifications

Concentration measurement ranges (auto-ranging)¹:

0.1 to 999.9 $\mu\text{g}/\text{m}^3$ (resolution: $0.1\mu\text{g}/\text{m}^3$)
1.00 to 39.99 $\mu\text{g}/\text{m}^3$ (resolution: $0.01\text{mg}/\text{m}^3$)
40.0 to 399.9 mg/m^3 (resolution: $0.1\text{mg}/\text{m}^3$)

Scattering coefficient range: 1.5×10^{-7} to $6 \times 10^{-1} \text{ m}^{-1}$ (approximate) @ $\lambda = 880 \text{ nm}$

Concentration display averaging/updating interval²:

1 or 10 seconds

Precision/repeatability over 1 hour (2-sigma)³:

$\pm 0.3 \mu\text{g}/\text{m}^3$ for 10 second averaging
 $\pm 1.0 \mu\text{g}/\text{m}^3$ for 1 second averaging

Accuracy¹: $\pm 5\%$ of reading \pm precision

Particle size range of maximum response : 0.1 to $10\mu\text{m}$

Sampling flow rate²: 1.7 to 2.3 liters/minute

Alarm level adjustment range²: $0.1 \mu\text{g}/\text{m}^3$ to $399.9 \text{ mg}/\text{m}^3$

Alarm averaging time : real time (1 or 10 seconds), or STEL (15 minutes)

Data logging averaging periods²: 1 second to 4 hours

Total number of data points in memory: 10,000 (each point: average, minimum, and maximum concentrations)

Logged data:

- For each data point: average, minimum, and maximum concentrations; time/date; and data point number
- Run summary: tag number of logged points; start time/date; total elapsed run time; averaging time; data logging averaging period; calibration factor; STEL concentration; STEL occurrence time after start; overall average concentration; overall maximum and minimum concentrations with data point number

Number of data tags: 10

Real time and date data: seconds; minutes; hours; day of month; month and year (with leap year compensation)

Clock accuracy: ± 1 minute/month, or better

Elapsed time range: 1 second to 99 days

Time keeping and data storage duration: > 10 years

Readout display: LCD 120 x 64 dots, 15 characters x 8 lines, 57.6 x 38.4 mm active area

Internal battery: rechargeable sealed lead-acid; 6.5 Ahr; 6 V nominal

Operating time with new and initial full battery charge⁴: 24 hours

Operating time with DataRAM charger: continuous and unlimited

Charging input power: 115/230 VAC, 50/60 Hz, 50 VA

External DC power (optional): 6 V @ 3 A

Analog output (auto ranging)⁵:

0 to 5 V, for 0 to $4 \text{ mg}/\text{m}^3$
0.5 to 5 V, for 4 to $40 \text{ mg}/\text{m}^3$
0.5 to 5 V, for 40 to $400 \text{ mg}/\text{m}^3$

Digital output: RS232C, 9600 baud; 8 data bits, 1 stop bit; parity: none

Alarm output: switched. 1 A @ 10 V maximum, resistance $< 0.1 \Omega$

Alarm sound intensity: 90 dB @ 1 m

Fuse: 1 A, fast

Operating environment: 0° to 40° C (32° to 104° F), 0 to 95% RH, noncondensing

Storage environment: -20° to 60° C (-4° to 140° F)

Dimensions:

134 mm (5.28 in) H x 184 mm (7.25 in) W x 346 mm (13.63 in) D

Weight: 5.3 kg (11.7 lbs)

Standard accessories included:

universal voltage battery charger, standard HEPA filter cartridge, analytical filter holder, PC communications software disk, digital output cable, carrying case, and instruction manual



¹ referred to gravimetric calibration with AC Fine test dust

² User selectable

³ At constant temperature

⁴ At 25° C

⁵ Range identified on LCD screen