Model *p*DR-1000AN

*personal*DataRAM™ Hand-Held and Fixed-Point Real-Time Aerosol Monitor/Data Logger

Indoor Air Quality Monitoring • Walk-Through Surveys
Personal Exposure Monitoring • Time and Motion Studies • Workplace and Plant Monitoring
Fixed-Point Continuous Monitoring • Remediation Personnel Surveillance • Remote Alarming
Mobile Monitoring in Vehicles and Aircraft • Toxicology and Epidemiology Studies

The World's Smallest, Most Vers

Measures Airborne Particulates Concentration in Real Time

With conventional air quality monitoring methods, you won't find out until tomorrow that you have reached dangerous levels or are out of compliance today. In contrast, the *personal*DataRAM™ alerts you to a problem within seconds and allows you to take immediate corrective action. It then stores this information in detail for subsequent retrieval/printout/graphing through a computer.

The world's smallest and most versatile direct reading personal aerosol monitor, the *personal*DataRAM measures mass concentrations of dust, smoke, mists, and fumes in real time, and sounds an on-board audible alarm whenever a user-defined level is exceeded. Integral large-capacity data logging capability permits storage of 13,000 data points in up to 99 discrete tags. Any tag can store up to 13,000 averages plus tag maximum and STEL values. When you begin a run, the instrument automatically tags and time stamps the data collected.

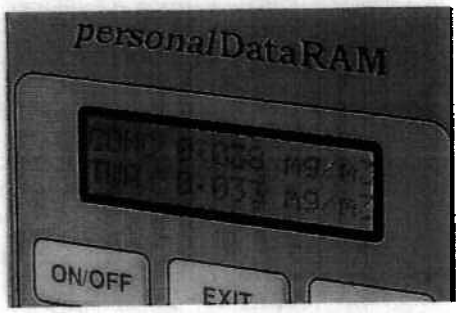
The *personal*DataRAM is ideal for personal/breathing zone monitoring, plant walk-through surveys, remediation site worker exposure monitoring, and indoor air quality monitoring.

Fixed Point Monitoring

In addition, the *personal*DataRAM operates as a fixed point sensor/monitor for in-plant continuous monitoring (single-or multi-point installations), e.g., connected to a central data processing/alarming station. For such permanent installations, its AC adapter is used to power the monitor, and an optional wall-mounting bracket is available.

Highest Performance of Any Real-Time Personal Particulate Monitor

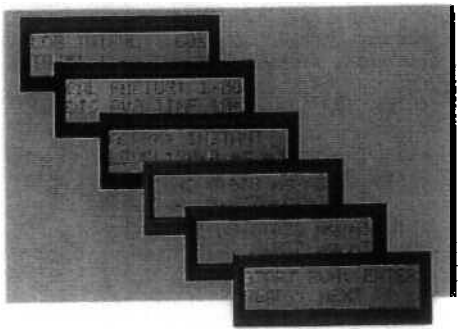
With a measurement range from 0.001 to 400 mg/m³ (auto-ranging), an optically feedback-stabilized sensing system, ultra-low power consumption (negligible



internal heating), and rigid all-metal construction, the *personal*DataRAM sets new standards for sensitivity, long-term stability, and reliability. These capabilities allow its use in many applications where such compact monitors were previously considered unsuited.

Easy-to-Read Two-Line Display

The *personal*DataRAM's two-line LCD readout continuously displays both real-time and time-averaged (TWA) concentration values, updated every second. Other screens are easily selected by



scrolling through a simple user-friendly menu and following prompts. Self-diagnostics continually monitor the unit's operation and flag any problems. LCD screens which indicate remaining memory, battery status, optical background level, as well as any electronic malfunctions can also be selected.

Only four tactile-feedback keys (including ON/OFF) are required to perform all operations and commands.

Extremely Compact and Rugged Design

Palm-sized, the *personal*DataRAM weighs only ½ kilogram (18 oz) and can be attached to a belt or a shoulder strap (see Accessories), hand held, operated on a table top, or mounted on a tripod.

The *personal*DataRAM's rugged, yet attractive, brushed extruded aluminum case is designed to protect the unit's optics and electronics in even the harshest industrial environments. Heavy-duty molded bumpers shield the monitor from inadvertent mishandling and moderate impact. The absence of any moving parts (e.g. pumps, motors, valves, etc.) and the use of low-power semiconductor components throughout ensures long life and failure-free operation.

Sensing Principle Achieves High Correlation With Gravimetric Measurements

The *personal*DataRAM is a light-scattering photometer (i.e. nephelometer), which incorporates a pulsed, high output, near-infrared light emitting diode source, a silicon detector/hybrid preamplifier, collimating optics, and a source reference

tile Real-Time Aerosol Monitor

feedback PIN silicon detector. The intensity of the light scattered over the forward angle of 45° to 95° by airborne particles passing through the sensing chamber is linearly proportional to their concentration. The *personal*DataRAM's optical configuration produces optimal volume response to particles in the size range of 0.1 to 10 μm, achieving high correlation with standard gravimetric measurements of the respirable and thoracic fractions.

Passive Air Sampling Is Silent and Reliable

The *personal*DataRAM's passive air sampling technique has been thoroughly field-proven since 1980 by thousands of MIE MINIRAMs, the unit's precursor. Air surrounding the monitor circulates freely through the open sensing chamber by natural convection, diffusion, and background air motion. With this passive nephelometric sampling method, concentration measurements do not depend on the air velocity through the sensing chamber.

Interfaces With a PC for Easy Programming and Downloading

The *personal*DataRAM is easily programmed from any IBM-compatible personal computer. Using the *p*DR-COM software provided with the unit, operating

parameters such as logging period, display averaging time, alarm level and mode, etc., can be changed before the next run.

Using the *p*DR-COM software, logged data can be downloaded to a PC for direct tabular and graphic display, and/or printout. These data can also be imported into most common spreadsheet programs by following the instructions provided.

Simple Zeroing and Calibration

Each *personal*DataRAM comes gravimetrically calibrated (NIST traceable) in mg/m³ using standard SAE Fine (ISO Fine) test dust. Zeroing with particle-free air is accomplished quickly and effectively under field conditions using the zeroing kit included. Special firmware controls an automatic calibration check referenced to the optical background set at the factory. Gravimetric field calibration can be performed by comparison with a filter sampler and by programming of the calibration constant.

Several Power Options

The *personal*DataRAM can be powered by:

- A replaceable 9 V alkaline "transistor" battery which provides up to 20 hours of operation, or a replaceable 9 V lithium battery which runs for over 40 hours.
- AC line power and a universal power supply (included) for long-term continuous monitoring.
- An optional rechargeable, sealed nickel-metal-hydride battery pack that attaches rigidly to the *personal*DataRAM's base, providing about 72 hours of operation between charges (no "memory" effects).
- Any external DC source (7 to 9 V), such as a lantern battery.

For maximum flexibility, power sources can be changed even while operating the unit.

Maintenance, Service, and Factory Support

The *personal*DataRAM has no moving parts to wear out. (Only the 9 V battery needs to be replaced.) Instructions for simple and easy periodic cleaning of the sensing chamber are provided. Routine factory check-out and calibration are recommended on a 2-year cycle.

MIE's experienced technical/applications support can provide expert advice and practical solutions to aerosol-related problems. This invaluable resource is available to customers for the life of our instruments, many of which have been in field use for more than a quarter of a century.

Accessories for Enhanced Functionality and Performance

The *personal*DataRAM comes with several standard accessories. They include:

- Universal voltage power supply/charger
- Digital communications cable
- *p*DR-COM software disk
- Zeroing kit
- Belt clip kit
- Instruction manual
- Carrying case

Optional accessories include:

- Rechargeable (NiMH) battery pack
- Shoulder strap
- Alarm relay unit
- Wall mounting bracket (for fixed-point use)
- *p*DR-1200 conversion kit
- Pump unit (for use with *p*DR-1200)

Active Sampling Option

A *p*DR-1200 conversion kit is available for active sampling applications such as aerodynamic particle size-selective measurements (e.g., respirable, $PM_{2.5}$, etc.), duct or chamber monitoring. This conversion kit, for integral mounting to the *p*DR-1000 AN, includes a state-of-the-art metal cyclone and a 37mm filter holder for concurrent particle collection for additional gravimetric and/or chemical analysis. (See *p*DR-1200 brochure.)

Safety Approvals and Certifications

The *personal*DataRAM complies with US FCC rules (Part 15) and has received CE certification.

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Specifications

Concentration measurement range (auto-ranging)[1]: 0.001 to 400 mg/m³

Scattering coefficient range: 1.5 x 10^{-6} to 0.6 m^{-1} (approximately) @ λ=880 nm

Precision/repeatability (2-sigma)[2]:
±3% of reading or ±0.003 mg/m³, whichever is greater (1-second averaging)

±1% of reading or ±0.001 mg/m³, whichever is greater (10-second averaging)

Long-term zero concentration stability (at least 180 days)[2]:
±0.003 mg/m³ (1-second averaging)

±0.001 mg/m³ (10-second averaging)

Accuracy[1]: ±5% of reading ± precision

Resolution: 0.1% of reading or 0.001 mg/m³, whichever is greater

Particle size range of maximum response: 0.1 to 10 μm

Concentration display updating interval: 1 second

Alarm level adjustment range[3]: selectable over entire measurement range

Alarm averaging time[3]: real-time (1 to 60 seconds) or STEL (15 minutes)

Data logging averaging periods[3]: 1 second to 4 hours

Total number of data points in memory:
13,000 (stored in 1 to 99 data sets or tags)

Logged data:
- Each data point: average concentration, time/date, and data point number
- Run summary: overall average and maximum concentrations, time/date of maximum, total number of logged points, start time/date, total elapsed time (run duration), STEL concentration and time/date of STEL, averaging (logging) period, calibration factor, and tag number

Elapsed time readout range: 0 to 100 hours (resets to 0 after 100 hours)

Time keeping and data retention: > 10 years

Readout display: LCD 16 characters (4 mm height) x 2 lines

Serial interface: RS232, 4800 baud

Computer requirements: IBM-compatible PC, 486 or higher; Windows™ '95 or higher; 8 MB memory or more; hard drive; 3.5" floppy drive; VGA or higher monitor

Analog signal output: 0 to 5 V and 4 to 20 mA, with selectable full scale ranges between 0.1 and 400 mg/m³

Power:
- Internal battery: 9 V alkaline, 20-hour run time (typical)
  9 V lithium, 40-hour run time (typical)
- AC source: universal voltage adapter (included) 100-250 volts, 50-60 Hz (CE marked)
- Optional battery pack: rechargeable NiMH, 72-hour run time (typical)

Operating environment: -10° to 50°C (14° to 122°F), 10 to 95% RH, noncondensing

Storage environment: -20° to 70°C (-4° to 158°F)

Dimensions: 153 mm (6.0 in) H x 92 mm (3.6 in) W x 63 mm (2.5 in) D

Weight: 0.5 kg (18 oz)

Standard accessories included: zeroing kit, belt clip set, PC communications software disk, RS232 communications cable, universal voltage AC adapter, carrying case, and manual

[1] Referred to gravimetric calibration with SAE Fine test dust (mmd = 2 to 3 μm, σg = 2.5, as aerosolized)
[2] At constant temperature
[3] User selectable

CE

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Printed in USA