Micro-environment Water-based Condensation Particle Counter

**Model 3781**

The Model 3781 Micro-environment Water-based Condensation Particle Counter (ME-WCPC) can detect airborne particles down to 6 nm in diameter. Using single particle detection with live-time coincidence correction, the Model 3781 covers a wide particle concentration range up to $5 \times 10^5$ particles/cm$^3$. The ME-WCPC features small size and light weight and is an ideal choice for monitoring spatial variations of various environments with multiple units. It is well-suited for a wide range of applications, including indoor air-quality measurements, environmental monitoring, and mobile aerosol studies.

**Applications**

TSI offers the most comprehensive line of CPCs available. Building on a tradition of 30 years experience, TSI CPCs have become the standard to which all others are compared. General applications include:

- Basic aerosol research
- Filter and air-cleaning testing
- Atmospheric and climate studies
- Particle formation and growth studies
- Combustion and engine exhaust studies
- Inhalation or exposure chamber studies
- Health effects studies

**Features and Benefits**

- Fast response to rapid changes in aerosol concentration
- One week of unattended operation
- Internal data logging with user-selectable data averaging from 1 second to 1 hour
- Feedback-controlled, pressure-corrected aerosol flow rate of 0.12 L/min
- Ease of use

Our lowest-cost-per-point WCPC for indoor and outdoor monitoring applications!
Operation

In general, TSI CPCs operate on the principle of enlarging small particles using a condensation technique to a size that is large enough to be detected optically. The Model 3781 brings the convenience of using water to measure submicrometer aerosol particles. Using a patented technique,* an aerosol sample is drawn continuously through a cooled saturator and then into a heated condenser where water vapor diffuses into the sample stream. Effectively, water diffuses to the centerline of the condenser faster than heat is transferred from the warm walls, producing supersaturated conditions. Particles that are present in the sample stream (and larger than the minimum activation size) serve as condensation sites for the water vapor. Once condensation begins, particles grow quickly into larger water droplets and pass through an optical detector, where they are counted easily.

The Model 3781 ME-WCPC uses single-particle-detection with continuous, live-time coincidence correction to provide accurate concentration measurements up to $5 \times 10^5$ particle/cm$^3$. The single-path sample flow design allows for precise, pressure-corrected flow control.

The Model 3781 has fast response to changes in aerosol concentration. An additional 0.48 L/min transport flow reduces particle diffusion losses at the sample inlet. A transport bypass lever allows measurement of aerosol flow rate directly at the sample inlet.

Data can be logged internally and can be downloaded via standard interfaces. Records include time stamp, particle concentration, and instrument status. These records can be reported at an interval ranging from 1 to 3600 seconds.

*Technology from Aerosol Dynamics, Inc., U.S. Patent Number 6,712,881
Software

Every Model 3781 is supplied with Aerosol Instrument Manager® software designed for use with Microsoft® Windows® operating systems. The software is used for instrument control and provides data collection, management, download, and export capabilities, as well as several choices for data display.

Selectable Size Limits

The optional Model 376060 Particle Size Selector (PSS) lets you choose any of eleven cutoff sizes between 0.026 and 0.167 µm. The PSS uses a series of fine-mesh screens to remove small particles by diffusional capture. An additional set of diffusion screens (available separately) lets you select cutoff diameters up to 0.365 µm.

To Order

Micro-environment Water-based Condensation Particle Counter

Specify Description
3781 Micro-environment Water-based Condensation Particle Counter with TSI Aerosol Instrument Manager software

Optional Accessories

Specify Description
1031558 Inlet Cyclone (calculated cutpoint: 3.3 µm @ 0.6 L/min; 1 inline filter, 1 inlet screen, 1 transport flow orifice and 1 pump silencer)
1500230 Wick for 3781 (box of 10)
376060 Particle Size Selector with 11 screens
376061 Additional screens for Particle Size Selector, set of 12

Accessories must be ordered separately

*Calculated using efficiencies for 3781 WCPC and diffusion screen

TSI Model 3781 Efficiency, Sucrose Particles

TSI Model 3781 Response Time
Specifications

Model 3781 Micro-environment Water-based Condensation Particle Counter

**Particle Size Range**
- Min. Detectable Particle ($D_{50}$): 6 nm, verified with DMA-classified sucrose particles
- Max. Detectable Particle: >3 µm

**Particle Concentration Range**
- 0 to $5 \times 10^5$ particles/cm$^3$, single particle counting with continuous live-time coincidence correction

**Particle Concentration Accuracy**
- ±10% at $5 \times 10^5$ particles/cm$^3$

**Response Time**
- <2 sec to 95% in response to concentration step change

**Flow**
- Aerosol Flow Rate: 0.12 ±0.012 L/min
- Flow Source: Internal diaphragm pump; option to use an external vacuum source
- Flow Control: Sensor feedback controlled with absolute pressure correction, transport bypass lever allows direct measure of aerosol flow rate
- Inlet Flow Rate: 0.6 ± 0.12 L/min

**False Background Counts**
- <0.01 particle/cm$^3$, 1-hour average

**Aerosol Medium**
- Air only, 10 to 35°C (50 to 95°F)

**Environmental Operating Conditions**
- Ambient Temperature Range: 10 to 35°C (50 to 95°F)
- Ambient Humidity Range: 0 to 90% RH, noncondensing

**Inlet Pressure Operation (Absolute)**
- 50 to 110 kPa (0.5 to 1.1 atm)

**Inlet Pressure (Gauge)**
- 0 to -2.5 kPa (0 to -10 in. water)

**Condensing Liquid**
- Water (distilled water recommended)

**Water System**
- Internal reservoir for up to 2-hour operation, external 250 ml bottle for up to 1-week operation

**Filling Method**
- Reservoir fed by gravity from external bottle via fill valve, controlled by float switch

**Water Consumption**
- 250 ml/week

**Unattended Operation**
- One week between water refills or other attention

**Communications**
- **Data Logging**
  - Internal 4-Megabit data memory; data averaging interval of 1 to 3600 sec; capable of storing two weeks of one-minute data samples with date/time stamp provided by the internal, battery-sustained, real-time clock
- **Analog Output**
  - 0 to 4V proportional to concentration (log scaling)
- **Digital Output**
  - Data download using USB or RS-232 serial interfaces

**Front Panel**
- Display: 6-digit, 7-segment LCD, provides output of particle concentration
- LEDs: Particle, Status, Flow
- Button: Pump
- Inlet: 0.64 cm (0.25 in.) OD SS tube

**Side Panel**
- Transport bypass lever, serial RS-232, USB, power, fan

**Rear-Panel Connections**
- Water fill, exhaust

**Software**
- Supplied with TSI Aerosol Instrument Manager software

**Calibration Check**
- Recommended annually

**Power Requirements**
- 12 VDC, <30 W; external table-top power supply, 100 to 240 VAC, 50/60 Hz, 100 W max.

**Dimensions (HWD)**
- 18 × 13 × 18 cm (7 × 5 × 7 in.), not including fill bottle or bracket

**Weight**
- 2.3 kg (5 lbs)

Specifications are subject to change without notice. TSI, the TSI logo, Scanning Mobility Particle Sizer, and Aerosol Instrument Manager are trademarks of TSI Incorporated. Microsoft and Windows are trademarks of Microsoft Corporation.

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