



*Our most sensitive WCPC detects particles down to 2.5 nm at an incredible aerosol flow rate of 0.3 L/min!*

### Features and Benefits

- Fast response to rapid changes in aerosol concentration
- High aerosol flow rate (0.3 L/min) for great counting statistics
- Sheath-air-flow design that minimizes diffusion losses and produces a sharp lower cut-off point
- Single particle counting with continuous, live-time coincidence correction for maximum accuracy
- Built-in SMPS compatibility
- Removable wick for easy transport and maintenance

### Ultrafine Water-based Condensation Particle Counter Model 3786

The Model 3786 Ultrafine Water-based Condensation Particle Counter (UWCPC) is designed primarily for researchers interested in airborne particles that are smaller than 20 nm. With the capability to detect particles down to 2.5 nm, this WCPC is ideally suited for atmospheric and climate research, particle formation and growth studies, environmental monitoring, nanotechnology research, and mobile aerosol studies. It is also compatible with TSI Scanning Mobility Particle Sizer™ (SMPS™) spectrometers.

### 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-cleaner testing
- Atmospheric and climate studies
- Particle formation and growth studies
- Combustion and engine exhaust studies
- Inhalation or exposure chamber studies
- Health effects studies

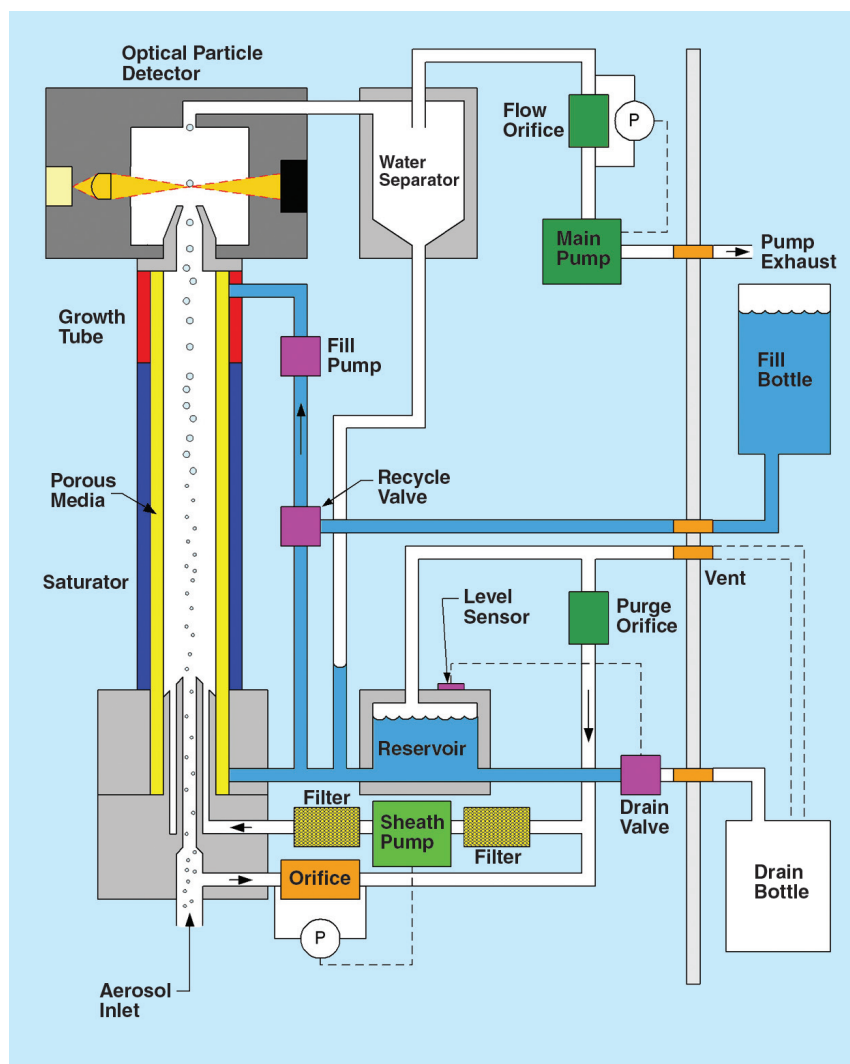


## Operation

In general, TSI CPCs operate on the principle of enlarging small particles using a condensation technique to form droplets that are large enough to be detected optically. The Model 3786 brings the convenience of using water to the measurement of submicrometer aerosol particles. Using a patented technique<sup>1</sup>, 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, which produces supersaturated conditions. Particles that are present in the sample stream (and larger than the minimum activation size) serve as condensation nuclei 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 UWPC counts single particles with continuous, live-time coincidence correction to provide accurate concentration measurements in the range from 0 to  $10^5$  particles/cm<sup>3</sup>.

The Model 3786 UWPC detects particles as small as 2.5 nanometers in diameter using a unique sheath-air-flow design that confines the aerosol flow path near the centerline of the condenser. This exposes particles to the region of the highest level of supersaturation and uniformity of water vapor. The incoming flow (0.6 L/min) is split 50:50. Half of the flow is HEPA-filtered and then recombined with the aerosol sample as sheath air. This unique design and a high aerosol flow rate of 0.3 L/min greatly enhance measurement response time, produce a sharply defined lower size-detection limit (counting efficiency curve), and minimize diffusion losses of ultrafine and nanoparticles.

Real-time particle concentration, totalizer function, and operating parameters, as well as a graph of concentration versus time, are all viewable on the front-panel display. Data are directly accessible via standard interfaces. Records include concentration, particle count, sample time, and status information. These can be reported at an interval ranging from 0.1 to 3600 seconds.



<sup>1</sup> Technology from Aerosol Dynamics, Inc., U.S. Patent Number 6,712,881

## Software and Built-in SMPS Compatibility

Every Model 3786 is supplied with 32-bit Aerosol Instrument Manager® software designed for use with Microsoft® Windows® operating systems. The Aerosol Instrument Manager software is used for instrument control and provides data collection, management, and export capabilities, as well as several choices for data display.

The Model 3786 comes standard with built-in compatibility for use in TSI Series 3936 Scanning Mobility Particle Sizer (SMPS) systems. Collectively, SMPS systems configured with a Model 3786 provide size-distribution measurements from 0.0025 to 1.0 µm. Specific size ranges vary depending on the Differential Mobility Analyzer (DMA) used. Ask your TSI representative for additional information on SMPS spectrometers.

## To Order

### Ultrafine Water-based Condensation Particle Counter

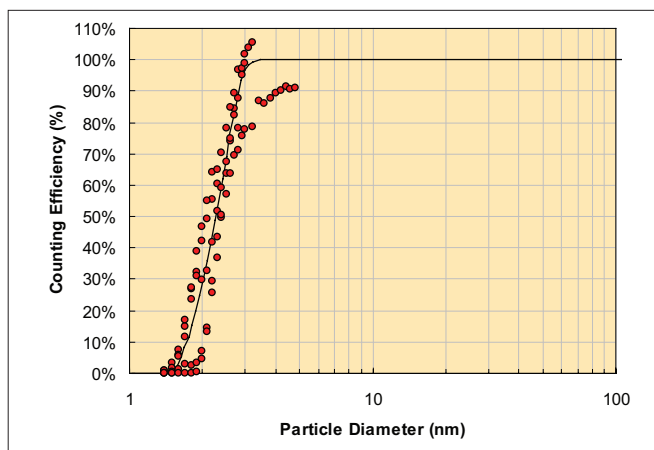
Specify	Description
3786	Ultrafine Water-based Condensation Particle Counter with TSI Aerosol Instrument Manager software

### Optional Accessories

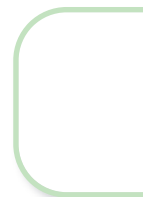
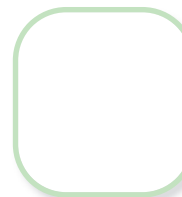
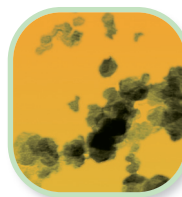
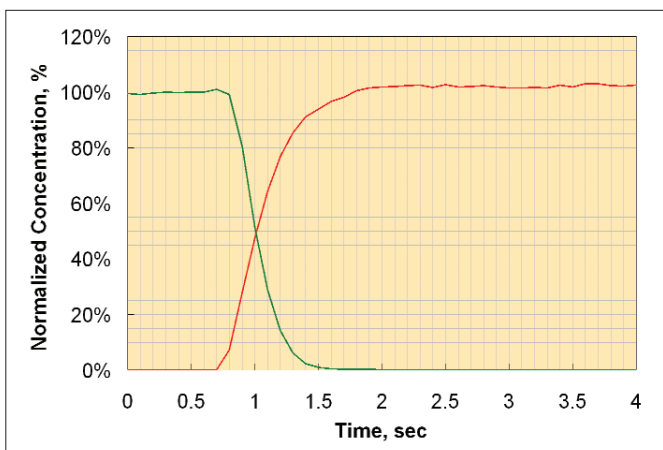
Specify	Description
1031558	Inlet Cyclone (calculated cutpoints: 3.3 µm @ 0.6 L/min; 2.15 µm @ 1.0 L/min)
1031519	Maintenance Kit for model 3786 UWPCs (includes 5 wicks, 2 inline filters, 1 HEPA filter, and 1 set of reservoir O-rings)
4029003	Wick for models 3782, 3785, and 3786 WCPC (box of 10)

Accessories must be ordered separately

TSI Model 3786 Efficiency



TSI Model 3786 Response Time



## Specifications

### Model 3786 Ultrafine Water-based Condensation Particle Counter

#### Particle Size Range

Min. Detectable Particle ( $D_{50}$ ) 2.5 nm, verified with DMA-classified particles  
 Max. Detectable Particle >3  $\mu\text{m}$

#### Particle Concentration Range

0 to  $1 \times 10^5$  particles/cm<sup>3</sup> single particle counting with continuous, live-time coincidence correction

#### Particle Concentration Accuracy

$\pm 12\%$  at  $<10^5$  particles/cm<sup>3</sup>

#### Response Time

<2 seconds to 95% in response to step change

#### Flow

Aerosol Flow Rate 0.3 L/min (nominal)  
 Sheath Flow Rate  $0.3 \pm 0.03$  L/min  
 Total Flow Rate  $0.6 \pm 0.03$  L/min  
 Flow Source Two internal diaphragm pumps  
 Flow Control Two internal pumps controlled to calibrated pressure drop across orifices with inlet pressure correction

#### False Background Counts

<0.01 particle/cm<sup>3</sup>, 1-hr 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 50 to 110 kPa (0.5 to 1.1 atm)  
 Inlet Pressure (Gauge)  $\pm 2.5$  kPa ( $\pm 10$  in. of water)

#### Condensing Liquid

Water (distilled water recommended)

#### Filling System

Internal liquid-injection pump with water-recycling capability, source-water container located externally

#### Communications

USB Type B connector, USB 2.0 compatible at 12 MB  
 RS-232 9-pin, D-sub connector

#### Analog Output

0 to 10 V proportional to concentration (log scaling) or DMA voltage control



#### Front Panel Display

140  $\times$  32-pixel VF display provides output of particle concentration, bar-graph history of particle concentration, particle totalizer, sample flow rate, and operating parameters

#### LEDs

Particle, Status, Flow, and Liquid

#### Buttons

Display, Totalizer, Pump, Drain/Prime

#### Rear-Panel Connections

USB, com port, power, water source, vent, water drain, pump exhaust, aerosol inlet (1/4" OD SS tube), analog output BNC

#### Software

Supplied with TSI Aerosol Instrument Manager software

#### Calibration Check

Recommended annually

#### Power Requirements

100 to 230 VAC, 50/60 Hz, 125 VA

#### Dimensions (HWD)

31  $\times$  16  $\times$  28 cm (12  $\times$  6  $\times$  11 in.), not including fill bottle or bracket

#### Weight

5.5 kg (12 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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