



**A general-purpose CPC that detects particles down to 4 nm at concentrations up to  $10^7$  particles/cm<sup>3</sup>!**

### Features and Benefits

- Fast response to rapid changes in aerosol concentration
- Extended single particle counting with continuous, live-time coincidence correction up to  $5 \times 10^4$  particles/cm<sup>3</sup>
- Butanol-friendly features, including anti-spill design, water-removal system, butanol odor absorber, and improved resistance to optics flooding
- Removable saturator wick for easy transport and maintenance
- Built-in data logging and storage capability with removable memory card
- Built-in SMPS compatibility
- Auto recovery from power failure

### Condensation Particle Counter Model 3775

The Model 3775 Condensation Particle Counter (CPC) is a general-purpose counter that can detect airborne particles down to 4 nm in diameter. It provides highly accurate measurements over a wide concentration range from 0 to  $10^7$  particles/cm<sup>3</sup>. As a result, this CPC is versatile and well-suited for a broad range of applications, including basic aerosol research, filter and air-cleaner testing, combustion and engine exhaust research, health effects studies, inhalation and exposure studies, atmospheric and climate studies, and nanotechnology research. Additionally, it can be used as part of a TSI Scanning Mobility Particle Sizer™ (SMPS™) spectrometer.

### Applications

TSI offers the most comprehensive line of CPCs available. Building on a CPC 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

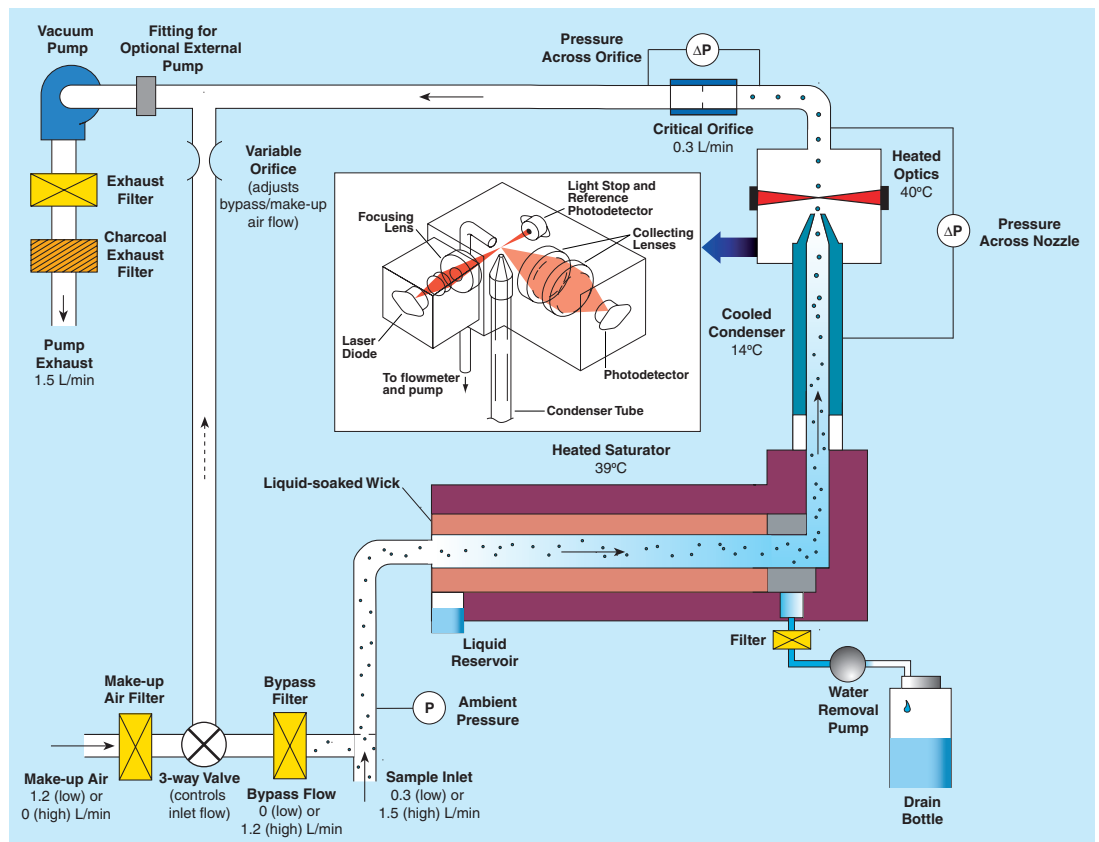
In a laminar-flow, alcohol-based CPC, an aerosol sample is drawn continuously through a heated saturator in which alcohol is vaporized and diffuses into the sample stream. Together, the aerosol sample and alcohol vapor pass into a cooled condenser where the alcohol vapor becomes supersaturated and ready to condense. Particles present in the sample stream serve as condensation nuclei. Once condensation begins, particles that are larger than a threshold diameter grow quickly into larger droplets and pass through an optical detector where they are counted easily.

The Model 3775 is able to measure a wide concentration range because it employs both single particle counting and photometric modes of operation. In single particle counting mode, the detector counts individual pulses produced as each particle (droplet) passes through the sensing zone. Continuous, live-time coincidence correction is provided in this single count mode to maximize measurement accuracy. Higher concentrations up to  $10^7$  particles/cm<sup>3</sup> are measured by detecting total light scattered by all particles in the sensing zone at any one time and comparing the intensity of the scattered light with calibration levels (photometric mode).

An internal pump draws the aerosol sample into the Model 3775. The inlet flow can be configured for either high-flow mode operation (1.5 L/min) to improve response time and minimize particle transport loss, or low-flow mode operation (0.3 L/min) to provide flexibility when used as part of an SMPS spectrometer. In high-flow mode, 1.2 L/min of the inlet

flow is diverted as a bypass flow. In both high and low-flow modes, 0.3 L/min of the inlet flow passes through the saturator, condenser, and optics regions of the instrument. The volumetric flow rate of this 0.3 L/min aerosol flow is controlled accurately using a critical orifice, which also allows the use of an external vacuum source without change in flow control.

Real-time graphs of particle concentration versus time, concentration, totalizer function, and operating parameters are all viewable on the front-panel color display. Data are directly accessible via standard serial and USB interfaces at a maximum time resolution of 0.1 second. Instrument reading and status can be monitored through Ethernet in real-time.



## Software and Built-in SMPS Compatibility

Every Model 3775 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, and export capabilities, as well as several choices for data display.

The Model 3775 comes standard with built-in compatibility for use in TSI Series 3936 Scanning Mobility Particle Sizer (SMPS) spectrometers.

Collectively, SMPS spectrometers configured with a Model 3775 CPC provide size-distribution measurements from 0.004 to 1.0 micrometer. Specific size ranges vary depending on the Differential Mobility Analyzer (DMA) used and DMA/CPC flow rate settings. Ask your TSI representative for additional information on SMPS spectrometers.

### Selectable Size

#### Limits

The optional Model 376060 Particle Size Selector (PSS) lets you choose any of eleven cutoff sizes between 0.032 and 0.267 micrometer. 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 0.6 micrometer.

Diffusion screens	Particle size cut, $\mu\text{m}$ (50%)*	
	Flow 0.3 L/min	Flow 1.5 L/min
0	0.004	0.004
1	0.032	0.014
2	0.056	0.024
3	0.079	0.033
4	0.102	0.042
5	0.123	0.050
6	0.147	0.058
7	0.170	0.066
8	0.192	0.074
9	0.216	0.081
10	0.240	0.089
11	0.267	0.096

\*Calculated using efficiencies for 3775 CPC and diffusion screen

## To Order

### Condensation Particle Counter

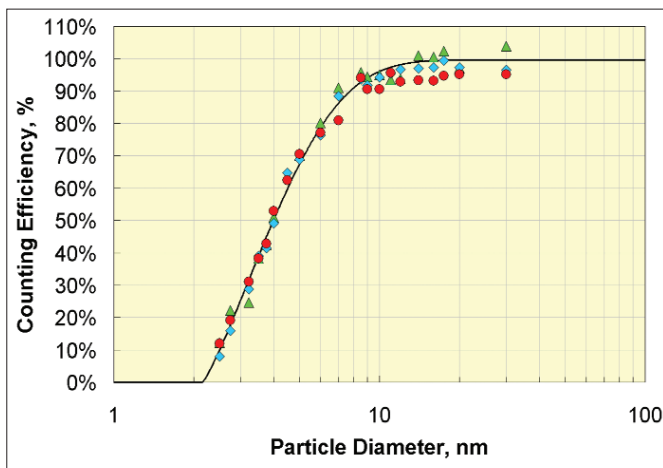
Specify	Description
3775	Condensation Particle Counter with TSI Aerosol Instrument Manager software

### Accessories

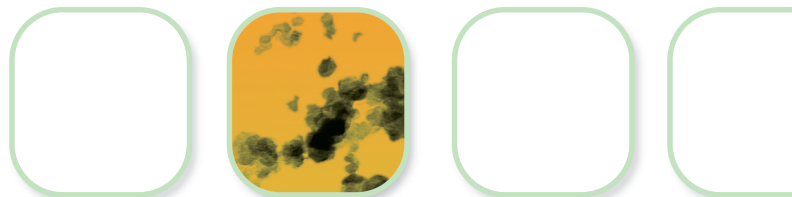
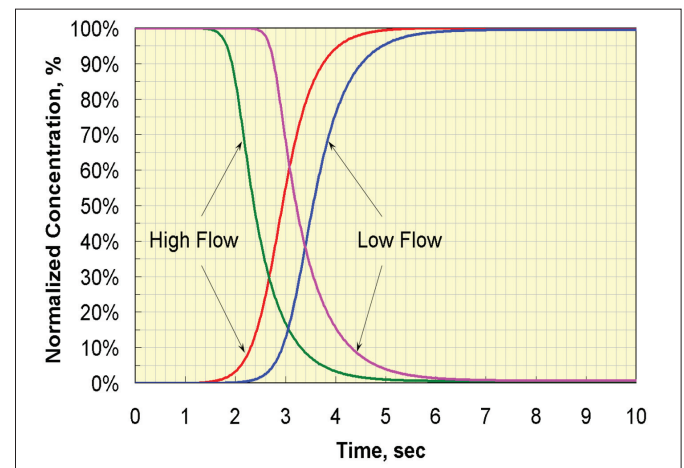
Specify	Description
376060	Particle Size Selector with 11 screens
376061	Additional screens for Particle Sizer Selector, set of 12
1031558	Inlet Cyclone (calculated cut-points: 5.90 $\mu\text{m}$ @ 0.3 L/min; 1.53 $\mu\text{m}$ @ 1.5 L/min)
1031497	Maintenance Kit for 3775 CPC (includes 1 reservoir cover, 3 O-rings, screws, ten 0.50" diameter plugs, ten 0.7" diameter plugs, 3 aerosol flow control orifices, 5 small charcoal filters, 2 micropump filters, 2 makeup air/butanol fill filters, 2 exhaust/bypass air filters and 2 saturator wicks)
1031494	Replacement Saturator Wick Kit for 3775 CPC (includes 2 saturator wicks)

Accessories must be ordered separately

TSI Model 3775 Efficiency, Sucrose Particles



TSI Model 3775 Response Time



# Condensation Particle Counter

## Specifications

### Model 3775 Condensation Particle Counter

#### Particle Size Range

**Min. Detectable Particle (D<sub>50</sub>)** 4 nm, verified with DMA-classified sucrose particles  
**Max. Detectable Particle** >3 μm

#### Particle Concentration Range

**Single Particle Counting** 0 to 5 × 10<sup>4</sup> particles/cm<sup>3</sup> with continuous, live-time coincidence correction  
**Photometric** 5 × 10<sup>4</sup> to 10<sup>7</sup> particles/cm<sup>3</sup>

#### Particle Concentration Accuracy

±10% at <5 × 10<sup>4</sup> particles/cm<sup>3</sup>, ±20% at <10<sup>7</sup> particles/cm<sup>3</sup>

#### Response Time

**High-flow Mode** About 4 sec to 95% in response to concentration step change  
**Low-flow Mode** About 5 sec to 95% in response to concentration step change

#### Flow

**Aerosol Inlet Flow Rate** 0.3 ± 0.015 L/min  
**High-flow Inlet** 1.5 ± 0.05 L/min  
**Low-flow Inlet** 0.3 ± 0.015 L/min  
**Flow Source** Internal high-vacuum diaphragm pump with brushless DC motor (15,000-hr rated lifetime); option to use external vacuum source, but this requires change to internal plumbing  
**Flow Control** Volumetric flow control of aerosol flow by internal critical orifice; differential pressure across critical orifice is monitored

#### Operating Temperatures

**Saturator** 39 ± 0.2°C  
**Condenser** 14 ± 0.2°C  
**Optics** 40 ± 0.2°C

#### False Background Counts

<0.01 particle/cm<sup>3</sup>, based on 12-hr average

#### Aerosol Medium

Recommended for use with air; safe for use with inert gases such as nitrogen, argon, and helium (performance specifications are for air)

#### Environmental Operating Conditions

**Ambient Temperature** 10 to 35°C (50 to 95°F)  
**Ambient Humidity** 0 to 90% RH, noncondensing  
**Ambient Pressure** 75 to 105 kPa (0.75 to 1.05 atm)

#### Condensing Liquid

**Working Fluid** Reagent-grade n-butyl alcohol (not included)  
**Filling System** Electronic liquid-level sensor initiates automatic filling as needed, requires connection to fill bottle (included with instrument)

#### Water Removal

All condensate is collected and removed automatically by a constant-flow-rate micropump, may be switched on for use in humid environments

#### Communications

**Protocol** Command set based on ASCII characters



#### Interfaces

RS-232  
 USB  
 Ethernet

9-pin, D-Sub connector  
 Type B connector, USB 2.0 compatible at 12 MB  
 8-wire RJ-45 jack, 10/100 BASE-T, TCP/IP

#### Data Logging and Storage

SD/MMC flash memory card

#### Averaging Interval

1, 2, 3, 4, 5, 6, 10, 12, 15, 20, 30, or 60 seconds (set from front panel), software provides more averaging options

#### Analog Inputs

Two BNC connectors, 0 to 10 V (data recording for external sensors)

#### Outputs

##### Digital Display

Graph of concentration vs. time, concentration, time and total counts, status (temperatures, pressures, laser power, aerosol flow, etc.)  
 BNC connector, 0 to 10 V, user-selectable function output (linear/log concentration or DMA voltage control)  
 BNC connector, TTL level pulse, nominally 2.5 microsec wide

##### Analog

##### Pulse

#### Software

Supplied with TSI Aerosol Instrument Manager® software

#### Calibration

Recommended annually

#### Power Requirements

100 to 240 VAC, 50/60 Hz, 335 W maximum

#### Physical Features

##### Front Panel

LCD TFT QVGA (320×240 pixel) 5.7-in. color display, sample inlet, LED particle indicator light, rotate/select control knob, flash memory card slot  
**Rear Panel** Power connector, USB, Ethernet, two 9-pin D-sub serial connectors, two BNC inputs, two BNC outputs, fan, butanol-fill connector, butanol drain connector, makeup-air port, pump-exhaust port, fill bottle and bracket  
**Side Panel** Butanol-level viewing window

#### Dimensions (HWD)

25 × 32 × 37 cm (10 × 13 × 15 in.), not including fill bottle and bracket

#### Weight

9.9 kg (22 lbs)

*Specifications are subject to change without notice. The technique of using a Condensation Particle Counter with diffusion screens to select specific size ranges is covered in U.S. Patent Number 5,072,626. TSI, the TSI logo, Scanning Mobility Particle Sizer, SMPS, and Aerosol Instrument Manager are trademarks of TSI Incorporated. Microsoft and Windows are trademarks of Microsoft Corporation.*

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