# CONDENSATION PARTICLE COUNTER MODEL 3772


The Condensation Particle Counter (CPC) Model 3772 is a compact, rugged, and full-featured instrument. It detects airborne particles down to 10 nm in diameter at an aerosol flow rate of 1.0 L/min, over a concentration range from 0 to $10^4$ particles/$cm^3$. This CPC is ideally suited for applications that do not require measurement of high concentrations, such as basic aerosol research, filter and air cleaner testing, particle counter calibration, environmental monitoring, mobile aerosol studies, particle shedding and component testing, and atmospheric and climate studies. 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 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

**Features and Benefits**

+ Fast response to rapid changes in aerosol concentration
+ Butanol-friendly features, including anti-spill design, water-removal system, 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

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## 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.

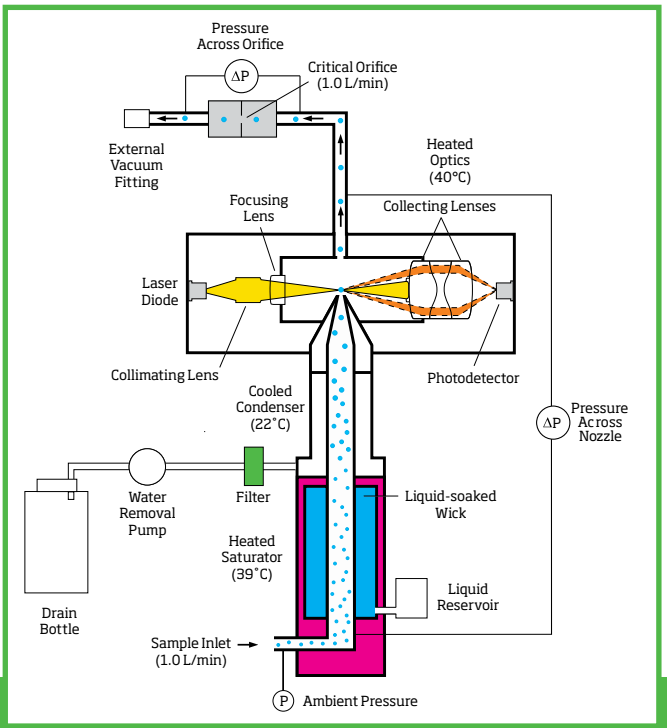
The Model 3772 employs single-particle-count mode operation to measure concentrations up to $10^4$ particles/$cm^3$. The detector counts individual pulses produced as each particle (droplet) passes through the sensing zone. A high signal-to-noise ratio and continuous, live-time coincidence correction provide great measurement accuracy, even at very low concentrations. An external vacuum pump is required to draw the aerosol sample through the Model 3772. The volumetric flow rate is controlled accurately and reliably using an internal critical orifice.

Real-time concentration, totalizer function, operating parameters, and user settings are all viewable via the front panel LCD display. Data are directly accessible via standard USB and RS-232 serial 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 3772 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 3772 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 3772 CPC provide size-distribution measurements from 0.01 to 1.0 µm. 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.

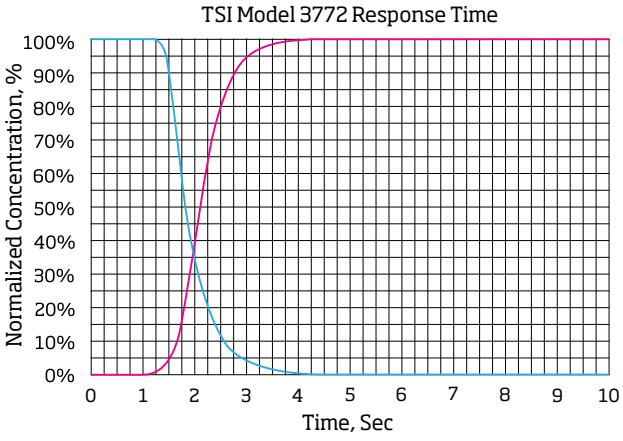


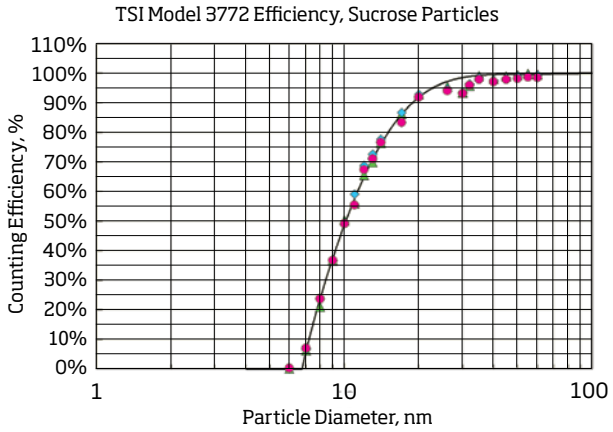
### Selectable Size Limits

The optional Model 376060 Particle Size Selector (PSS) lets you choose any of eleven cutoff sizes between 0.020 and 0.122 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 0.25 micrometer.

*Calculated using efficiencies for 3772 CPC and diffusion screen

| Diffusion Screens | Particle size cut, µm (50%)* |
|---|---|
| 0 | 0.010 |
| 1 | 0.020 |
| 2 | 0.031 |
| 3 | 0.041 |
| 4 | 0.052 |
| 5 | 0.062 |
| 6 | 0.072 |
| 7 | 0.083 |
| 8 | 0.092 |
| 9 | 0.102 |
| 10 | 0.112 |
| 11 | 0.122 |




## TO ORDER

**Condensation Particle Counter**

| Specify | Description |
|---|---|
| 3772 | Condensation Particle Counter with TSI Aerosol Instrument Manager software |

**Accessories**

| Specify | Description |
|---|---|
| 3032 | Vacuum Pump, 115 V |
| 3032-1 | Vacuum Pump, 230 V/50 Hz |
| 3032-EC | Vacuum Pump, 230 V (Europe only) |
| 3033 | Vacuum Pump, 115 V, recommended when using multiple CPCs that require an external vacuum source (North America only, customers in other parts of the world must contact TSI for model number and power ratings.) |
| 376060 | Particle Size Selector with 11 screens |
| 376061 | Additional screens for Particle Sizer Selector, set of 12 |
| 1031558 | Inlet Cyclone (calculated cut-point: 2.15 µm @ 1.0 L/min) |
| 1031515 | Maintenance Kit for 3772 and 3771 CPCs (includes 2 micropump filters, 3 butanol fill/drain filters, and 2 saturator wicks) |
| 1031514 | Replacement Saturator Wick Kit for 3772 and 3771 CPCs (includes 2 saturator wicks) |

Accessories must be ordered separately

# SPECIFICATIONS

## CONDENSATION PARTICLE COUNTER
## MODEL 3772

**Particle Size Range**

| | |
|---|---|
| Min. Detectable Particle ($D_{50}$) | 10 nm, verified with DMA-classified sucrose particles |
| Max. Detectable Particle | >3 µm |

**Particle Concentration Range**
0 to $10^4$ particles/cm$^3$, single particle counting with continuous, live-time coincidence correction

**Particle Concentration Accuracy**
±10% at <$10^4$ particles/cm$^3$

**Response Time**
About 3 sec to 95% in response to concentration step change

**Flow**

| | |
|---|---|
| Aerosol Inlet Flow Rate | 1.0 ± 0.05 L/min |
| Flow Source | External vacuum |
| 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 | 22 ± 0.2°C |
| Optics | 40 ± 0.2°C |

**False Background Counts**
<0.001 particle/cm$^3$, 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 | 9-pin, D-sub connector |
| USB | Type B connector, USB 2.0 compatible at 12 MB |
| Ethernet | 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 | Concentration, time and total counts, status (temperatures, pressures, laser power, etc.) and user settings |
| Analog | BNC connector, 0 to 10 V, user-selectable function output (linear/log concentration or DMA voltage control) |
| Pulse | BNC connector, TTL level pulse, nominally 350 nanosec wide |

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

**Calibration**
Recommended annually

**Required Utilities**

| | |
|---|---|
| Power | 100 to 240 VAC, 50/60 Hz, 200 W maximum |
| Vacuum | 60 kPa (18 in Hg) minimum gauge |

**Physical Features**

| | |
|---|---|
| Front Panel | Aerosol sample inlet, LED indicator lights (status, particle), 2-line LCD display, 6 operating buttons, 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, external vacuum port, fill bottle and bracket |

**Dimensions (H x W x D)**
26 × 18 × 25 cm (10 × 7 × 10 in), not including fill bottle and bracket

**Weight**
5.5 kg (12 lbs)

Specifications are subject to change without notice. Design specifications for the Model 3010, the predecessor of the Model 3772, are covered in U.S. patent number 4,790,650. 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.



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**TSI Incorporated** - Visit our website **www.tsi.com** for more information.

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