The Model 3772-CEN Condensation Particle Counter (CPC) is fully compliant to the new CEN* Technical Specification CEN/TS 16976:2016. This Technical Specification defines the performance characteristics of instruments to be used in a standard method for determining the particle number concentration in atmospheric aerosol. This CPC counts airborne ultrafine particles (UFP) from 7 nm in diameter at an aerosol flow rate of 1.0 L/min. It employs single particle counting to measure concentrations up to 50,000 particles/cm³. The 3772-CEN is easy to setup and operate, and data are automatically output to the CEN data string. The 3772-CEN is designed for 24/7 operation in monitoring stations to provide reliable and quantitative data on ambient ultrafine particle concentration.

**Features and Benefits**
- CEN/TS 16976:2016 compliance
- UFP counting from 7 nm
- Pulse height monitor to ensure data accuracy
- Single particle counting up to 50,000 particles/cm³
- Advanced instrument diagnostics
- 1 second sampling, 1 minute reporting interval
- Easy to operate and install
- 24/7 operation
- Unattended monitoring, low maintenance
- Auto recovery from power failure
- CEN data record

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* CEN stands for European Committee for Standardization. CEN is an association officially recognized by the European Union and by the European Free Trade Association that brings together the National Standardization Bodies of 33 European countries. CEN is committed to develop European Standards for various kinds of products, materials, services and processes.

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**Application**
- Ultrafine particles with diameters d < 0.1 µm contribute insignificantly to the mass of atmospheric particles yet are emitted in high numbers from combustion and other processes. In order to assess the impact to human health it appears necessary to supplement gravimetric air quality measurements - PM2.5 or PM10 - with a time resolved measurement of particle number concentration.
- The 3772-CEN CPC is built on the experience from using the Model 3772 CPC but improved for this application of ambient monitoring.
- The 3772-CEN CPC is verified and calibrated by the World Calibration Centre for Aerosol Physics, Leibniz Institute for Tropospheric Research (TROPOS).
- A CEN/TS 16976 compliant sampling system that ensures representative sampling of the aerosol regardless of wind speed, wind direction, or humidity is offered as an accessory.
The 3772-CEN is a laminar-flow, alcohol-based condensation particle counter (CPC). Aerosol particles which are too small to scatter enough light to be detected by a conventional optical method are grown to larger size droplets by condensing alcohol on them. While these droplets can then be detected optically through light scattering the size information is lost.

In this instrument, an air sample is continuously drawn through the inlet via an external pump where the volumetric flow rate is controlled accurately and reliably using an internal critical orifice.

While passing through the instrument the aerosol particles are counted in a 3-step process:

**Saturation**
The aerosol sample is drawn continuously through a heated saturator. In this saturator, alcohol from a liquid reservoir soaks a wick. Due to the high temperature the alcohol in the wick is vaporized and diffuses into the sample stream.

**Condensation**
The aerosol sample and alcohol vapor pass into a cooled condenser where the alcohol vapor becomes super saturated and ready to condense. Particles present in the sample stream serve as condensation nuclei. Once condensation begins, particles that are larger than the activation diameter grow quickly into larger, micron sized droplets.

**Optical Detection**
The droplets pass through a laser beam. As each droplet passes through the sensing zone it scatters the light which is detected by a photo detector as individual pulse and counted. In this technique particle concentration is measured by counting every single particle in a known volume of air stream.

The height of the pulses correlate to the size of the grown droplets. In normal operation the particles grow to about the same droplet size, and as a result the pulse height is almost the same for all droplets. Under certain conditions (e.g. not enough alcohol in the wick that is vaporized) particles do not grow to this droplet size and as a result the pulse height is decreased. The pulse height analyzer in the model 3772-CEN CPC sets an error flag when pulse height decreases enough to indicate a problem with the measurement.

A high signal-to-noise ratio and continuous, live-time coincidence correction provide great measurement accuracy, from very low to very high concentrations.
As a result of many years of experience with the Model 3772 being used in ambient monitoring, feedback from expert researchers, and rigorous testing, the new Model 3772-CEN CPC offers proven features and noticeable improvements:

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<th>Design Feature</th>
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<td>Flow Rate Stability</td>
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<td>Easy to integrate into centralized data acquisition systems</td>
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References

- CEN/TS 16976:2016 Ambient air - Determination of the particle number concentration of atmospheric aerosol
SPECIFICATIONS

CONDENSATION PARTICLE COUNTER
MODEL 3772-CEN

Particle Size Range
Min. Detectable Particle (D50) 7 nm ± 0.7 nm, calibrated with sintered silver particles
Max. Detectable Particle 4 µm

Particle Concentration Range
0 to 50,000 particles/cm³, single particle counting with continuous, live-time coincidence correction

Concentration Response
Slope 1 ± 0.05
Linearity All residuals < 4% of the measured value
Detection efficiency > 95% within the particle size range
Response Time < 2 seconds to 90% 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 nozzle and critical orifice is monitored ensuring ≤ 2% variation of flow to factory-certified flow rate

Zero Count Rate
< 1 count per minute based on 12-hr average (equal to false background counts < 0.001 particle/cm³)

Aerosol Medium
Intended 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)

Communications
Protocol Command set based on ASCII characters, measurement data can be output to CEN data string
Interfaces RS-232 9-pin, D-sub connector
Data Logging and Storage USB Type B connector, USB 2.0 compatible at 12 MB
SD/MMC flash memory card 1.0 ± 34 ns wide
RS-232 serial interfaces

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)
Digital Data download using USB, Ethernet or RS-232 serial interfaces
Pulse BNC connector, TTL level pulse, nominally 350 nanoseconds wide

Software
No software included as this model is intended for use with data acquisition systems. Parameters are set through instrument’s user interface or with serial commands. SMPS instrument manager support offered at a future date.

Calibration
Recommended annually

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

Physical Features
Front Panel Aerosol sample inlet (1/4” or 6mm ID tubing), 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 (1/4”), fill bottle and bracket

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

Weight 5.5 kg (12 lbs)

TO ORDER
3772-CEN Condensation Particle Counter
Specify Description
3772-CEN Condensation Particle Counter compliant to CEN/TS 16976 for UFP ambient monitoring with calibration by the World Calibration Centre for Aerosol Physics (TROPOS)

Optional Accessories
Specify Description
3032-EC Vacuum Pump, 230 V (Europe only)
3032-1 Vacuum Pump, 230 V/50 Hz
3032 Vacuum Pump, 115 V
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)

Environmental Enclosure Please contact for details

Accessories must be ordered separately

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

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