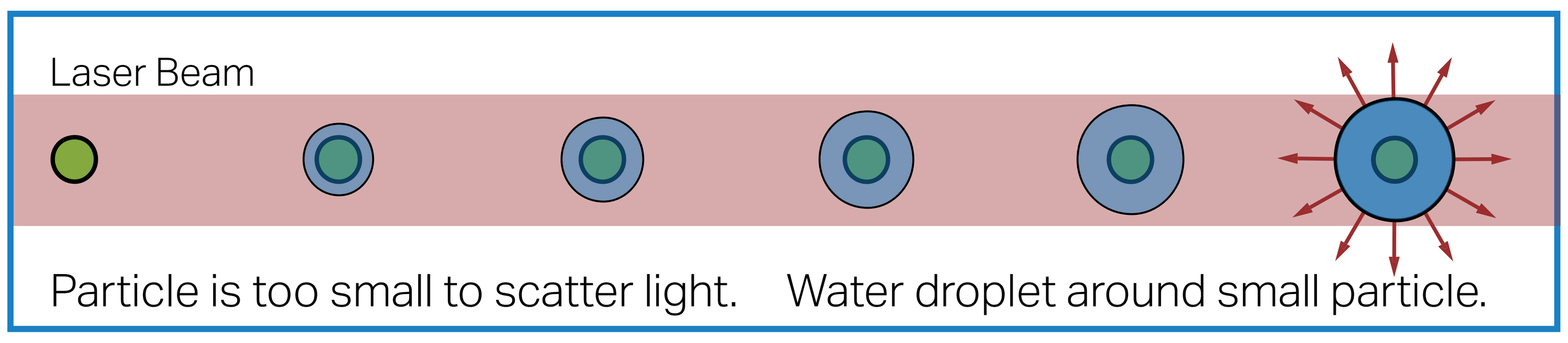
Versatile Water-Based Condensation Particle Counter

® **Knowledge Beyond Measure.**

What it does:
A Condensation Particle Counter (CPC) measures the concentration of particles suspended in air. This type of information is used in fields such as air quality, engine emissions, filter testing, aerosol research, and many other areas.

Working Principle: Some particles are too small to scatter enough light to be detected by conventional optics. These very small particles are grown to a larger, detectable size by condensing liquid onto them.



Why Water? Many other CPCs condense butanol or isopropyl alcohol onto the sampled particles. Compared to those materials, water is safe, eco-friendly, and easily available. Using water as a working fluid eliminates the potential for problems measuring high-humidity samples, which can occur when using an alcohol-based instrument. Since water and alcohol respond differently to different materials, the minimum detectable particle size may be slightly affected by particle composition.

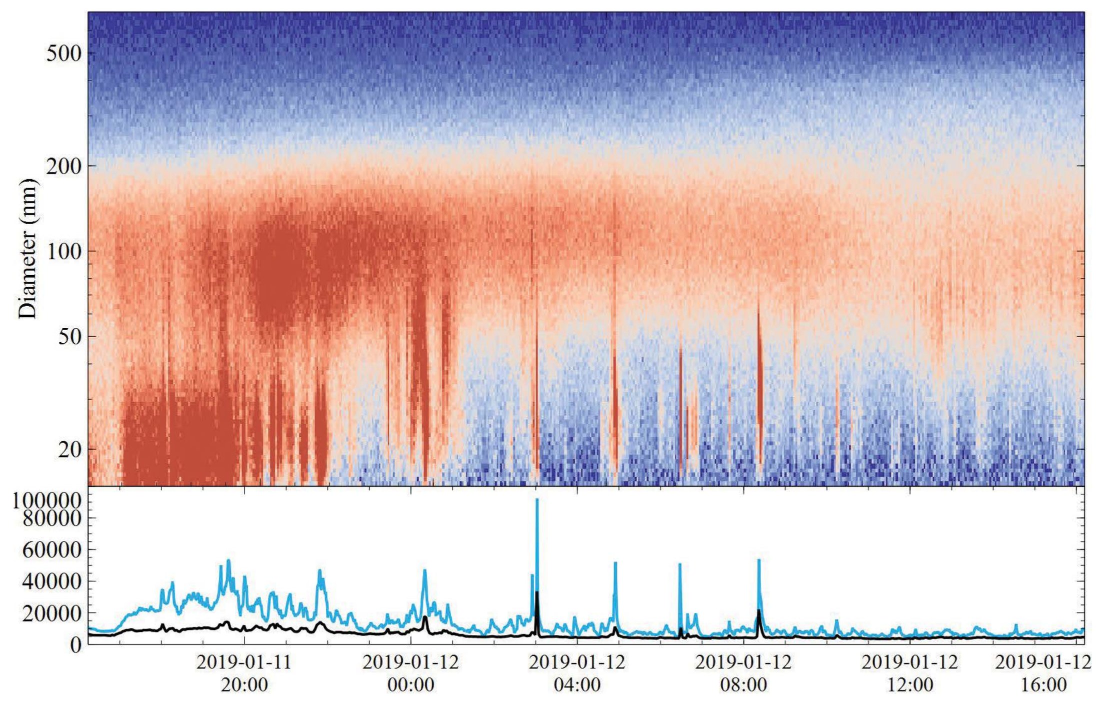
Features & Benefits

- Unprecedented reliability
- Low maintenance
- Selectable lower particle size detection limit 2.2 and 7 nm D50 setpoints (sucrose)
- Custom setting memory for user-defined counting efficiency down to near 1 nm
- Single particle counting up to 2 x 10^5 particles/cm^3
- Large internal memory for 1+ year of data

Applications

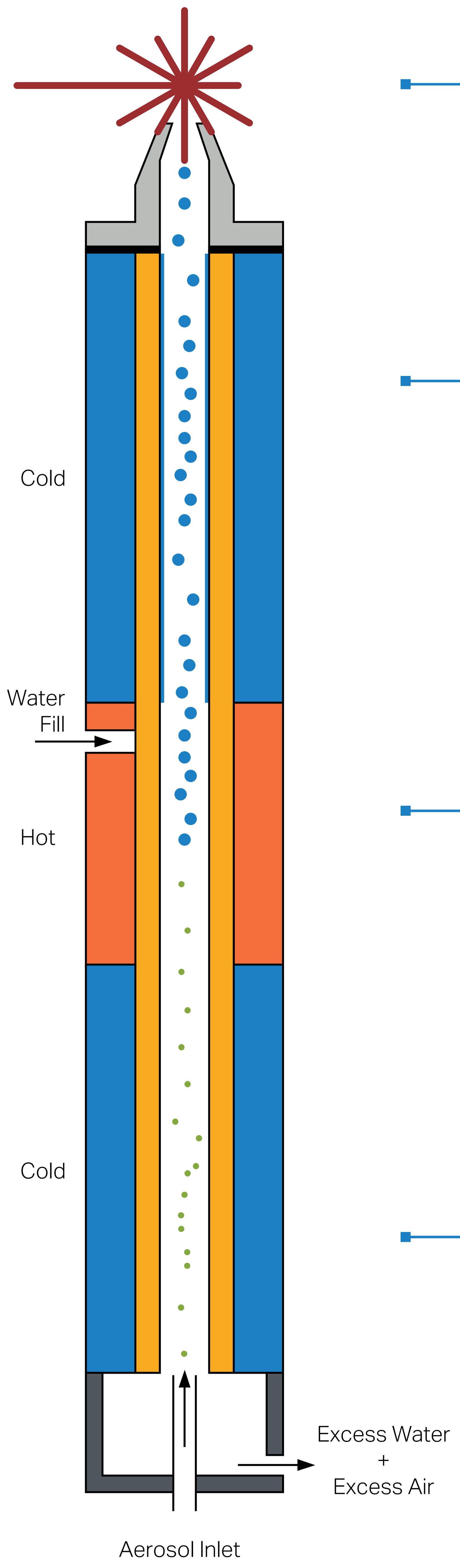
- Particle formation and growth studies
- Nanotechnology research or process monitoring
- Inhalation or exposure chamber studies
- Long-term, uninterrupted air quality monitoring

Example Results



- Top plot: particle size distribution as measured by 3938 SMPS™ using Long DMA and 3752 CPC
- Bottom plot: particle number concentrations as measured by
  ■ SMPS™ (starting at 15 nm)
  ■ 3789 VWCPC (starting at 2 nm)
- Both instruments accurately capture sudden peaks in particle number concentration
- Differences between the concentration measurements illustrate the importance of measuring sub-15 nm particles. Researchers in the fields of atmospheric science and engine emissions are increasingly paying attention to particles in this size range.

References
Susanne V. Hering, Gregory S. Lewis, Steven R. Spielman, Arantzazu Eiguren-Fernandez, Nathan M. Kreisberg, Chongai Kuang & Michel Attoui (2017) Detection near 1-nm with a laminar-flow, water-based condensation particle counter, Aerosol Science and Technology, 51:3, 354-362, DOI: 10.1080/02786826.2016.1262531



4. Counting
The enlarged particles pass through a laser beam and scatter light. Each pulse of scattered light is counted individually.

3. Moderation
Even after the condensation step in #2, some vapor-phase water remains. The moderator stage condenses this water out of the vapor phase and onto the walls of the wick. This allows that water to be re-used, and also protects the optics from condensation.

2. Growth
The sample moves through a humid chamber where it becomes supersaturated, forcing water vapor to condense onto the cooled particles. The particles are now large enough to be detected when they pass through the laser beams in #4.

1. Conditioning
The aerosol moves through a humid chamber to surround the particles with water vapor.

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