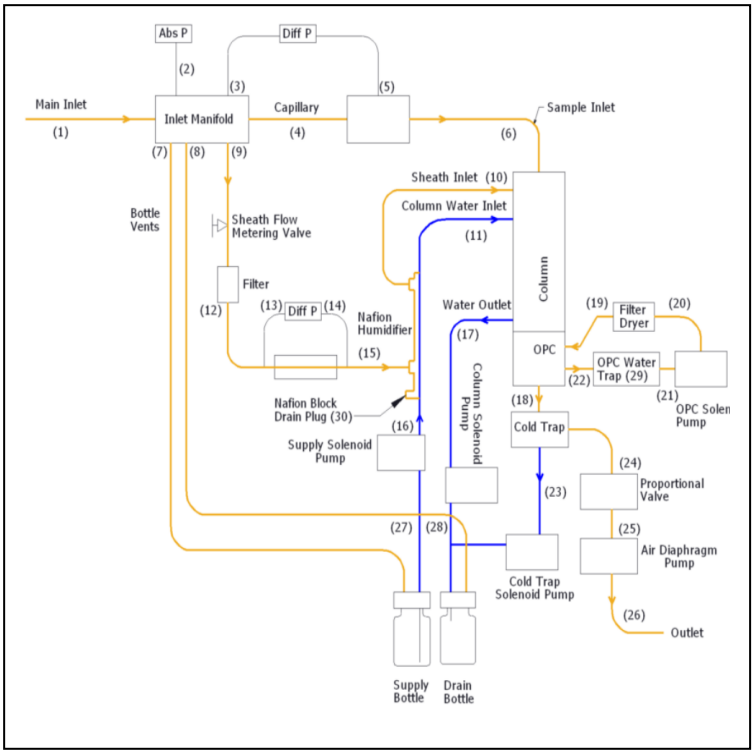
Single Column Cloud Condensation Nuclei Counter

For measurements of cloud condensation nuclei (CCN) at different supersaturation levels.

INTRODUCTION:

A Cloud Condensation Nuclei (CCN) Counter is an instrument used to measure the concentration of aerosol particles that can act as cloud condensation nuclei (CCN) at a specific supersaturation level. These particles are crucial for cloud formation, and their properties influence cloud properties and precipitation. CCN counters work by exposing an aerosol sample to a controlled supersaturated environment, where particles that are able to grow into cloud droplets are counted and sized.



OBJECTIVES:

- To understand aerosol-cloud interactions.
- Characterize the aerosol hygroscopicity.
- Examine aerosol indirect effects.

DATA OUTPUT:

- CCN Number Concentration (particles/cm^3) at different Supersaturations.
- Droplet Size Distribution from 0.75 µm to 20 µm in 20 bin sizes.

KEY SPECIFICATIONS:

- **Supersaturation Range:** 0.07% to 2.0%
- **Sample Flow Rate:** 45 VCCM (Configurable)
- **Sheath Flow Rate:** 455 VCCM (Configurable)
- **Sampling Frequency:** 1 Hz / 1 second
- **Droplet Detection Range:** 0.75 µm to 20 µm
- **Droplet Size Bins:** 20

MEASUREMENT AND WORKING PRINCIPLE:

It operates by creating a controlled water vapor supersaturation inside a temperature-controlled cylindrical chamber. A vertical temperature gradient is established along wet walls, causing water vapor to diffuse and form a supersaturated zone at the center of the flow. Aerosol-laden air is introduced into this region, where particles that can act as CCN grow into droplets. Non-activated particles remain too small and are not counted. The activated droplets are then detected by an optical particle counter (OPC) positioned downstream. The instrument can operate in either a fixed supersaturation mode or a scanning mode, where supersaturation is continuously varied. The final output is the number concentration of CCN at different supersaturation levels.

KEY FEATURES:

- Single-Column Continuous-Flow Thermal Gradient Chamber.
- Wide Supersaturation Range from 0.07% to 2.0%
- Fast time response with 1-second time resolution.
- Compact and suitable for field campaigns, laboratories, and aircraft platforms.

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