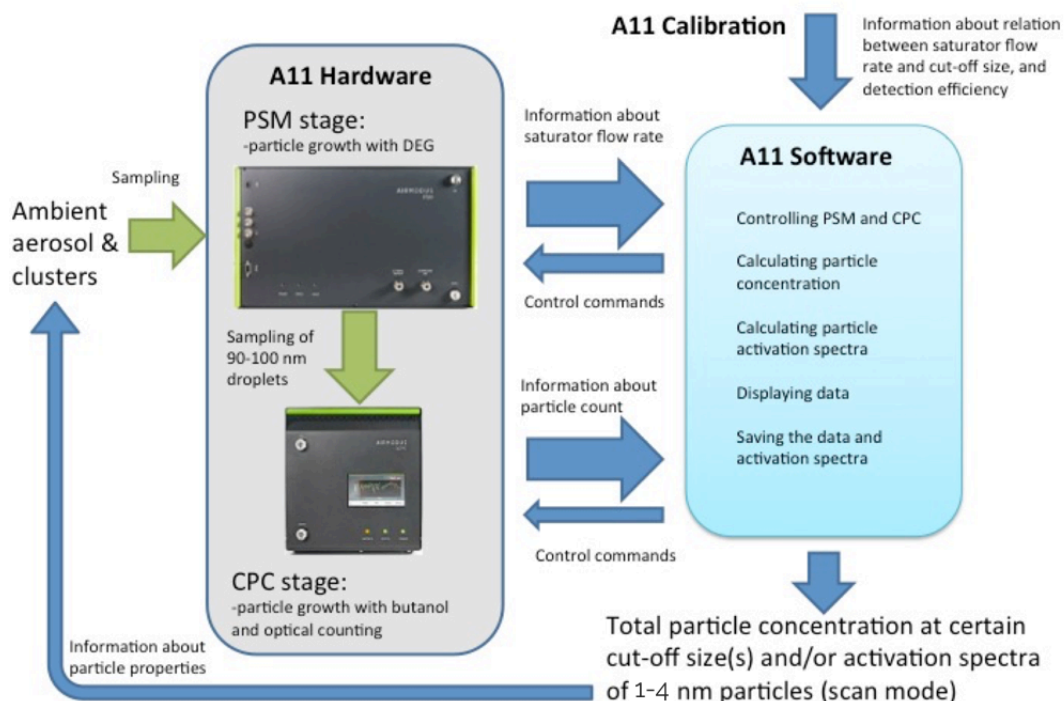# A11 nCNC System

Study and monitor particles smaller than the detection threshold of any CPC. **Airmodus A11 Nano Condensation Nucleus Counter system** measures particles as small as 1 nm in diameter. It is a complete system consisting of a particle size magnifier, a particle counter and operation software. Airmodus A11 can be used to measure the total number concentration of sub-micron particles, or to learn about characteristics and dynamics of the 1-4 nm particles in real time.

A11 Nano Condensation Nucleus Counter system

A11 Calibration — Information about relation between saturator flow rate and cut-off size, and detection efficiency

A11 Hardware

PSM stage:
-particle growth with DEG

Sampling

Ambient aerosol & clusters

Information about saturator flow rate

A11 Software

Control commands

Controlling PSM and CPC

Calculating particle concentration

Calculating particle activation spectra

Displaying data

Saving the data and activation spectra

Sampling of 90-100 nm droplets

CPC stage:
-particle growth with butanol and optical counting

Information about particle count

Control commands

Information about particle properties

Total particle concentration at certain cut-off size(s) and/or activation spectra of 1-4 nm particles (scan mode)

Benefits of the A11

- Detect particles as small as 1 nm in diameter in real time
- Also the electrically neutral particles
- Study the formation and growth of 1-4 nm particles
- Activation spectrum can be used for size or composition information.
- Data inversion in real time

Three operation modes

- Fixed mode: One fixed cut-off[*] for monitoring the appearance of nanoparticles.
- Stepping mode: Steps through several user-defined cut-offs[*]. Use to observe pre-defined size classes.
- Scanning mode: The activation spectrum of 1 – 4 nm[*] particles in less than 5 minutes

AIRMODUS

Measurement range	1 - 1000 nm. 50% cut-off selectable: 1.3 – 3.5 nm[*]
Concentration	Calibrated: 0 – 100 000 #/cm^3 We recommend using in single particle counting mode: Up to 30 000 #/cm^3 in single particle counting mode with coincidence <10%; higher concentrations with Total Scattering Mode Correction
Aerosol sample flow	2.5 lpm (sample flow to CPC 1 lpm)
Working fluid	Diethylene Glycol (>99%) n-Butanol (>99%)
Sample conditions	Pressure: 90 to 105 kPa Relative humidity: 0 to 95% non-condensing[**]
Environmental conditions	Temperature: 15°C to 30°C Pressure: 90 to 105 kPa Relative humidity: 0 to 95% non-condensing
Communication	**Airmodus A10:** *Serial:* RS-232 *USB:* type B connector *Analog out:* BNC connector 0 to 10 V for external devices, e.g. controlling of a DMA or ion filter. **AirmodusA20:** *Analog in:* BNC connector, 0 to 10 V (reading data of external sensor) *Analog out:* BNC connector 0 to 10 V, user-selectable function output (linear concentration, also DMA voltage control) *Pulse out:* BNC connector *Serial:* RS-232 *Ethernet:* RJ45 *USB:* type B connector **Both instruments:** All communication based on ASCII character-encoding scheme.
Fittings	**Airmodus A10:** *External vacuum:* fitting for 1/4 in. tubing *External compressed air:* fitting for 1/4 in. tubing *Inlet:* 1/4 in. stainless steel tube *Outlet:* 1/4 in. stainless steel tube **Airmodus A20:** *External vacuum:* 1/4 in. stainless steel tube *Inlet:* 1/4 in. stainless steel tube
Software	Airmodus A1X software for online data inversion and data acquisition (for Microsoft Windows)
External vacuum requirement	100 - 350 mbar pressure at NTP
External compressed air requirement	1.5 - 2.5 bar at NTP The air should be free of particles, oil and water (dew point below 0°C); maximum operating pressure is 3.0 bar at NTP.
Power requirements	For both instruments: 100 - 240 VAC max. 320 W universal AC input/full range
Dimensions and weight	**Airmodus A10:** 290x450x465 (height x width x depth in mm), 17.0 kg **Airmodus A20:** 260x230x400 (height x width x depth in mm), 10.5 kg
Shipping conditions	Temperature: 0 - 40°C Relative humidity: <95% non condensing The instrument should be shipped in upright position and should be protected against tremor and blows.

[*] Nickel Chromium equivalent activation diameter
[**] Above 40% please dry the sample to avoid excess water condensation inside the instruments
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