

Aurora™ 4000

POLAR NEPHELOMETER



Aerosol particles in the atmosphere directly influence the earth's radiative balance by absorbing and scattering the solar radiation and indirectly, by changing the cloud's microphysical properties.

The phase function, defined as the amount of light scattered as a function of the scattering angle, is a key parameter to accurately model the influence of the aerosol scattering on the earth's radiative balance.

Polar nephelometers provide this measurement.

The Aurora™ 4000 is the first commercially available polar nephelometer in the world. The instrument provides more specific light scattering measurements for up to 18 angles between 10° and 170°, with customised resolution. This extra measurement provides comprehensive data allowing a greater characterisation of aerosol scattering than the basic backscatter measurement.

It uses the same three wavelength technology as the Aurora™ 3000 but also automatically measures the amount of light scattered in different angular sectors by varying its backscatter shutter position. The Aurora™ 4000 simultaneously measures at 525 nm (green), 450 nm (blue) and 635 nm (red), using the now proven LED light source (Mueller, 2010), to enable wide and in-depth analysis of the interaction between light and aerosols.

BENEFITS

- High powered multi-wavelength LED light-source increases measurement accuracy
- Higher flow available via the external pump option for common inlet cases
- Raw measurement counts available for customised data analysis
- Single light source and detector used for each sector measurement
- Simplified fully automatic and scheduled calibration (zero and/or span) using internal valves, ideal for remote locations
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- Robust instrument for unattended operation.
- 12 VDC operation (60 watts maximum, 15 watts nominal)
- Automatic optical reference calibration
- Fully integrated package including; internal sample pump, sample heater, internal calibration valves, zero air pump and data logger
- Internal sample heater with temperature or RH control, which can be enabled by the user to eliminate the effects of humidity (RH: < 30 to < 90 %).

LED vs flash lamp

- Our LED light source is guaranteed not to fail within 3 years and often exceeds five years
- Heat generated by the LED light source is a fraction of that generated by a flash lamp, minimising changes in sample RH
- LEDs emit light at a specific wavelength eliminating the need for band pass filters
- An LED light source uses the same light path for each wavelength ensuring consistency of measurement, eliminating the need for multiple PMTs and maximising light intensity.

SPECIFICATIONS

Measured parameters:	Light scattering coefficient (σ_{sp}) at (450, 525 and 635 nm) over 2 to 18 angular sectors
Ranges:	0 to >20,000 Mm^{-1}
Lower detectable limit:	< 0.3 Mm^{-1} over all sectors (60 second averaged data) (0.1 Mm^{-1} full scatter and backscatter)
Secondary measurements:	Sample air temperature, enclosure temperature, sample relative humidity and sample pressure
Intensity function:	9 to 170°
Angular resolution:	1 deg increments within 0.3 deg accuracy
Flow rate:	≈5 l/min
Operating temperature:	- 20 to 45 °C
Operating RH:	10 to 95 %
Calibration:	Span gas available for CO ₂ , SF ₆ , FM-200, R-12, R-22, R-134 or a user defined gas
Optics:	Reference light source measurement
Light source:	Stable LED light source (US patent 7,671,988)
Wavelength:	525 nm (green), 450 nm (blue), 635 nm (red)
Operating voltage:	12 VDC (incl 110 - 240 VAC 50/60 Hz power supply converter) 13 watts nominal, 45 watts with heater active
Dimensions:	170 x 700 x 215 mm
Weight:	11.2 kg

COMMUNICATIONS & DATA LOGGING

Outputs:	25 pin external I/O analog outputs (2 voltage & 2 current) 2 x RS232 serial ports (multi-drop, service)
Filtering:	Kalman (digital adaptive filter), or no filter
Stored parameters:	Date & time, σ_{sp} (635, 525 and 450 nm), sample air temperature, enclosure temperature, RH, barometric pressure and status for up to 18 angles, raw measurement counts or ratios
Capacity:	2000 lines of data (based on capture of all 18 angular segments)

OPTIONS

- External pump control
- Solar power panels and batteries
- Roof flange kit and rain cap with insect screen
- Gas calibration kit and wall mount bracket.

APPLICATIONS

- Studies on backscatter and forward scatter
- Scattering enhancement factor
- Scattering Ångström exponent calculations
- Determination of single scattering albedo.

