



Aurora™ Integrating Nephelometers



acoem

ECOTECH

REDUCE YOUR ENVIRONMENTAL IMPACT



WORLD-CLASS AEROSOL MONITORING & MEASUREMENT

Today, right around the world, atmospheric scientists and environmental agencies rely on ACOEM Ecotech's range of Aurora™ integrating nephelometers. They've been proven to not only be accurate, flexible and easy to use, but also transportable, and designed to cope with the demands of use in remote locations.

- Comprehensive range of nephelometers; from single or three wavelength integrating nephelometers to a polar three wavelength integrating nephelometer
- The Aurora™ range offers total remote control including calibration
- Rugged and robust. Proven capability in remote, unattended locations for long term monitoring
- Fully integrated with Ecotech's Airodis™ - the data collection, validation and reporting software
- User friendly and easy to maintain in the field
- Uncompromising performance with low cost of ownership.

VISIBILITY APPLICATION

Visibility can be impaired by anything present in the air that reduces the amount of light reaching the observer, through scattering or absorption.

Common visibility deterioration is due to high particulate concentration or high humidity. Particles can be of natural or anthropogenic origin, for example, from car emissions, wood burning, sandstorms, volcanic eruptions or smog.

Aurora™ integrating nephelometers are an ideal solution to help us in understanding, identifying and planning ways to control pollution and the imbalance in or degradation of the environment. This is why governments and Environmental Protection Authorities (EPA's) use our Aurora™ in visibility applications.



Severe dust storm in Sydney, Australia

AUTOMOBILE APPLICATION

Emissions from diesel exhaust is a known source of health deterioration. This is why reliable environmental monitoring is absolutely crucial for the automobile industry for whom compliance with regulatory standards is non-negotiable.

The Aurora™ meets the specific requirements for measuring diesel exhaust particulate emissions, by addressing some of the monitoring concerns such as:

- **Linearity** - The Aurora™ gives a linear response with emissions at extremely high particulate concentrations due to the use of optical measurement principle
- **Clogging** - No filter used preventing clogging of the sample system
- **Hot sampling** - Robust design of the instrument; dilution possible due to instrument being free of filter and pump.

Affordable excellence

AURORA™ 1000

Clear choice for visibility monitoring

The Aurora™ 1000 is the perfect choice for any air quality monitoring system. It is a highly cost-effective entry level instrument uncompromised in its reliability and designed to run in extreme conditions.

Multiple options, features and accessories are available to be used in conjunction with the Aurora™ range. Refer to matrix table on page 7 for a list of options and compatibility.



FEATURES

Single wavelength, available in 525 nm, 450 nm or 635 nm

Wide measurement range (0.3 to 20,000 Mm⁻¹)

Fully automatic calibration using internal valves; ideal for remote locations.

Better correlation

AURORA™ 2000

Real-time mass concentration

Using a single wavelength nephelometer (525 nm, 450 nm or 635 nm) to measure aerosol light scattering in conjunction with a Spirant™ BAM*, the Aurora™ 2000 uses the reading from the Spirant™ BAM's hourly average to calculate a correlation factor to derive real-time PM_{2.5} concentrations. When the Spirant™ BAM is not connected, the user can manually derive and enter a correlation factor.

**The Spirant™ BAM measures and records airborne particulate concentrations using a β ray attenuation method.*



FEATURES

Enables real-time PM_{2.5} concentration measurement in conjunction with a Spirant™ BAM

12V DC (110-240 VAC, 50/60 Hz power converter included) 13 watts nominal, 45 watts max.

All-round capability

AURORA™ 3000

Proven results for long term monitoring

The Aurora™ 3000 is the favoured choice of researchers as it facilitates simultaneous measurement across three wavelengths, enabling wide and in-depth analysis of the interaction between light and aerosols. Its capabilities include integrating measurements of full scatter and backscatter, making it a perfect instrument for climate change research.

Like its siblings, the Aurora™ 3000 has a range from 0.3 to 20,000 Mm^{-1} . A high-precision option is also available, with a lower detectable limit of 0.1 Mm^{-1} .



FEATURES

Multi-wavelength LED light source for long term stable measurements at 635 nm, 525 nm and 450 nm

Integrating measurements of full scatter & backscatter

Used in conjunction with the ACS™ 1000 for a light scattering enhancement factor measurement (optional)

Automatic ball valve option: protect against contamination of a common sampling manifold, bypassing the instrument during calibration

Mass flow control option enables flow to be controlled in conjunction with an external pump.

AEROSOL LIGHT SCATTERING APPLICATION

The Aurora™ integrating nephelometer measures the light scattering coefficient of ambient aerosol particles with high sensitivity and time resolution, in a wide range of monitoring and research applications, related to air pollution and climate.

LONG TERM MONITORING

The direct and indirect radiative effects of aerosol particles constitute the largest uncertainty in current radiative forcing estimates of the Earth's climatic system. In order to reduce the uncertainties associated with atmospheric aerosols in climate systems, detailed information on the temporal and spatial variability of different aerosol properties is required. Such information can be obtained from a combination of model simulations, remote sensing and continuous in-situ aerosol measurements.

Lasskso et al, 2010 'South African EUCAARI measurements: seasonal variation of trace gases and aerosol optical properties.' Atmospheric Chemistry and Physics.

LIGHT SCATTERING IN REMOTE LOCATIONS

The Aurora™ range is widely used in remote and unattended locations, examples include:

- Research on aerosol optical properties at high-altitude in the Mediterranean Basin conducted by the Institute of Environmental Assessment and Water Research (IDAEA-CSIC) in Montseny, Spain
- Research on aerosol optical properties conducted by Paul Scherrer Institute (PSI) as part of the CATCOS project across Indonesia, Chile, Vietnam and Kenya
- Research on various aerosol properties at high altitude conducted by Observatoire de Physique du Globe, France in Puit De Dôme, France.

Best in class

AURORA™ 4000 — POLAR

Measuring scattering by angular sector

The Aurora™ 4000 builds on the same three wavelength capabilities as the Aurora™ 3000. This device provides measurements of light scattering up to 18 user selectable angular sectors, using varied backscatter shutter positioning. This can contribute to determining the phase function of aerosols, which is crucial to climate research and modelling.

Despite its sophisticated capabilities, the Aurora™ 4000 maintains the same ease of use, maintenance and calibration as the rest of the Aurora™ range.



FEATURES

Wide measurement range (0.1 to 20,000 Mm⁻¹)

18 angular sectors; full integrated scattering, as well as integrated scattering of up to 17 different angular sectors from 10° to 90° through to 170°

Raw measurement counts available for customised data analysis

Automatic ball valve option: protect against contamination of a common sampling manifold, by passing the instrument during calibration

Mass flow control option enables flow to be controlled in conjunction with an external pump.

AIRCRAFT MEASUREMENTS APPLICATION

The Aurora™ is intended to meet the following critical requirements expected for aircraft measurements:

- Compact and light weight
- Flow control with no restrictions
- Very low LDL
- Small cell volume
- Fast data acquisition (down to three seconds)
- Low power consumption
- Can be operated at -40 °C and at altitudes of up to 15,000 metres.



AEROSOL LIGHT SCATTERING RESEARCH

Optical closure studies:

Atmospheric aerosols play an important role in determining direct radiative transfer by scattering and absorbing solar radiation. Refractive indices are also necessary to determine the optical parameters relevant to radiative transfer such as single scatter albedo, asymmetry factor and specific absorption using the Mie–Lorenz theory. Additionally, reliable phase function and polarisation information is essential for the interpretation of satellite and aircraft measurements to infer aerosol optical depth, size and single scatter albedo.

H. Kim & S. E. Paulson 2013, 'Real refractive indices and volatility of secondary organic aerosol generated from photooxidation and ozonolysis of limonene, a pinene and toluene.' Atmospheric Chemistry and Physics.

The perfect complement

ACS™ 1000

Innovation in hygroscopic study

Ecotech's Aerosol Conditioning System (ACS™ 1000) can be used with most aerosol monitoring instruments, adjusting relative humidity with minimal particle loss to measure the effect of water uptake on the properties of aerosols. The ACS™ 1000 simultaneously controls differing relative humidity levels in two sample channels, allowing real-time measurement by parallel instruments for comparison.

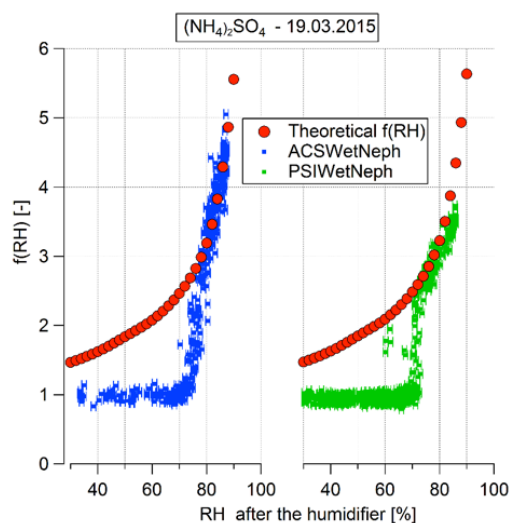
FEATURES

Sample RH controllable between 40 % and 90 % with minimal particle loss

Customisable flow and humidograms

Autoranging power supply 110-250 VAC, 50/60 Hz

Controls RH within $\pm 0.2\%$ (1σ)



“ Ammonium sulfate particles light scattering enhancement ($f(RH)$) calculated (red markers) and measured by the ACS™ 1000 (blue dots) and the WetNeph developed by the Paul Scherrer Institute (green dots). The errors bars represent the precision of the RH measurements according to the manufacturer. ”

Laborde et al. 2015, in prep.

Options, features & accessories matrix

	AURORA™ 1000	AURORA™ 2000	AURORA™ 3000	AURORA™ 4000
Mass Flow Control Option PART NO: E011010	×	×	✓	✓
PM ₁₀ Inlet PART NO: H020449	✓	✓	✓	✓
PM _{2.5} Inlet PART NO: H020450	✓	✓	✓	✓
Automated Ball Valve Option PART NO: E011009	✓	✓	✓	✓
Upgrade LDL Option PART NO: E011007	×	×	✓	✓†
External Pump Controller Kit PART NO: E011006	✓	✓	✓	✓
External Pump Kit PART NO: H020332	✓	✓	✓	✓†
External Pump PART NO: P030004	✓	✓	✓	✓
Aerosol Conditioning System (ACS™ 1000)	✓	✓	✓	✓*
Ability to Log Raw Data	✓	×	✓	✓
Ability to Display Units in µg/m ³ Using Spirant™ BAM or User K Factor	×	✓	×	×
Calibration Kit PART NO: H020331	✓	✓	✓	✓
External 12 Volt Cable Kit PART NO: C020022	✓	✓	✓	✓
Exhaust Tube Kit PART NO: H020330	✓	✓	✓	✓
Service Kit PART NO: H020335	✓	✓	✓	✓
Wall Mounting Bracket PART NO: H020005	✓	✓	✓	✓
Roof Flange PART NO: ECO-M9003004	✓	✓	✓	✓
Rain Cap PART NO: ECO-M9003011	✓	✓	✓	✓
Black Silicone Carbon Tubing PART NO: TUB-1015	✓	✓	✓	✓
1/2" Inlet Tube (0.8 m, 1 m, 1.5 m or 2 m) PART NO: H02032N (REFER TO FOOTNOTE)	✓	✓	✓	✓

† The selected Aurora™ comes standard with this feature

* The Aurora™ 3000 & 4000 gives RH feedback to the ACS™ 1000

N = 0 (0.8 m insulated), 2 (1 m un-insulated), 3 (1.5 m un-insulated) or 4 (2 m un-insulated) for Sample Inlet Tube

TRAINING AND SUPPORT

A partnership with ACOEM Ecotech

There's a lot more to our Aurora™ range or ACS™ 1000 system than what comes in the box. ACOEM Ecotech provide continuous support for users right across the globe. Our own scientists and engineers can always be called upon for advice, knowledge and practical assistance, and they're available in any time zone.

We also facilitate user group meetings throughout the year, enabling a forum for researchers to share experiences and receive guidance from ACOEM Ecotech experts as well as peers. Our website is the hub of a virtual network, also offering firmware and software updates.

Owning an Aurora™ instrument means we are partners on your journey.

Make Aurora™ your choice

The ACOEM Ecotech range of Aurora™ nephelometers

About ACOEM: Reduce your environmental impact

The ACOEM Group is a global leader in providing sustainable solutions for the development of smart cities of the future. It is committed to helping companies and public authorities meet challenges by offering products and services that:

- Prevent and control air, noise and vibration pollution
- Increase the productivity and reliability of industrial machinery
- Contribute to the development of effective, robust & noiseless solutions
- Protect soldiers, sites and vehicles in military operations.

Across the world, ACOEM's 700+ employees innovate in the measurement, analysis and control of environmental parameters through its 01dB, ECOTECH, ONEPROD, FIXTURLASER, MEAX, VIBRALIGN, AIR MONITORS, DYNOPTICS, TUNNEL SENSORS and METRAVIB brands.

About ACOEM Ecotech:

For over 40 years, ACOEM Ecotech has pioneered innovative solutions in environmental monitoring for air, water, gas, noise, vibration, blast, meteorology, fine particulate and dust. Headquartered in Australia, and certified to internationally recognised quality standards, ACOEM Ecotech operates in more than 80 countries, managing and maintaining over 500 real-time environmental monitoring sites consisting of thousands of individual pieces of precision equipment.

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