Air Photon Integrating Nephelometers

AeroExplorer
IN102

AirPhoton 3-wavelength Integrating Nephelometers measure the light scattered by particulate matter, over the angular range 7° to 170°. Employing an innovative design, the forward and backward scattering measurements are made completely independently. LED technology is employed to make these measurements at 450 nm, 532 nm and 632 nm, and to a sensitivity < $10^{-7}m^{-1}$. Internal sensors measure and log temperature, relative humidity and pressure.

Small and compact, our Integrating Nephelometers are robust and ready for outdoor deployment in rugged conditions. Power requirements are 15W @ 120 VAC. Input power options include: 110/220 VAC, 50/60Hz with provided power supply, and regulated 12VDC from sampling station with provided power connector. Other power options can be made available upon request such as operating from batteries or solar power. Optional heaters are available at the expense of additional power consumption. Data from our Integrating Nephelometer are saved in a removable SD memory card and can be linked to an external computer via RS485 using accessories available from AirPhoton.

Our nephelometers are designed for easy integration with our AeroExplorer Filter Sampling Stations to allow for combined real time and retrospective particle analysis.

To see some of the locations around the globe where our instruments are deployed by the SPARTAN Network go to: http://spartan-network.weebly.com/

IN101

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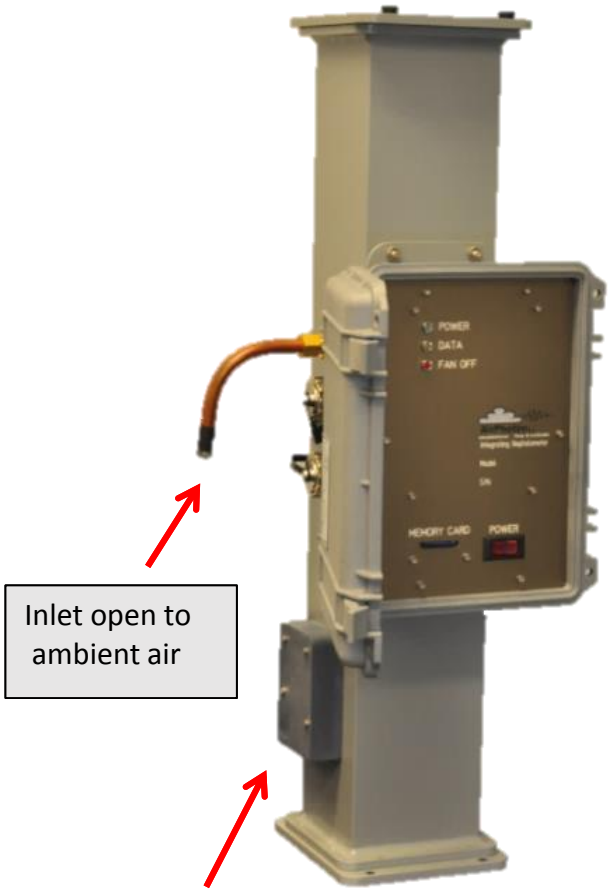
Basic Integrating Nephelometer (IN101) Fact Sheet



Inlet open to ambient air

Single speed fan draws all particles into the chamber

Integrating Nephelometer Specifications (IN101)

- Dimensions: 9" x 10" x 24”
- Mass: 6.7 Kg
- Power requirements: 15W @120VAC
- Light source: LED
- Operating temperature: -30 to +45^{o}C
- Optional external pump
- Wavelengths: 450, 532, and 632 nm
- Angular range: 7 to 90^{o} ; 90 to170^{o}
- Full scattering = forward + back scattering
- Standard range: 0.0-3,000Mm^{-1}
- Extended range: 20,000Mm^{-1} (upon request)
- Lower detectable limit: <0.15 Mm^{-1} (at 60 sec AVG)
  < 0.06 Mm^{-1} for Backscattering (60 sec AVG)
- Clean air reference option provides automatic zero for span calibration
- Data Interfaces: 4GB SD card, RS485 (optional)
- Syncs to AeroExplorer filter sampling station.
- Environmentally rugged. No need for enclosure.

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AeroExplorer Size Scanning Nephelometer (IN102) Fact Sheet

Size Scanning Nephelometer Specifications (IN102)

- Dimensions: 9" x 10" x 24”
- Mass: 6.8 Kg
- Power requirements: 15W @120VAC
- Light source: LED
- Operating temperature: -30 to +45°C
- Optional external pump
- Wavelengths: 450, 532, and 632 nm
- Angular range: 7 to 90° ; 90 to170°
- Full scattering = forward + back scattering
- Standard range: 0.0-3,000Mm^{-1}
- Extended range: 20,000Mm^{-1} (upon request)
- Lower detectable limit: <0.15 Mm^{-1} (at 60 sec AVG)
  < 0.06 Mm^{-1} for Backscattering (60 sec AVG)
- Clean air reference option provides automatic zero for span calibration
- Data Interfaces: 4GB SD card, RS485 (optional)
- Syncs to AeroExplorer filter sampling station.
- Environmentally rugged. No need for enclosure.

Unique size scanning capability!

- User sets flow rate protocols that run autonomously
- Internal flow measurement recorded
- 1.5 to 20 lpm feedback stabilized
- Cycling through up to 4 flow rates controls size of particles entering measurement chamber
- Automatic scan of light scattering by up to 4 particle sizes
- Particle Size Range: PM 1 to PM 10

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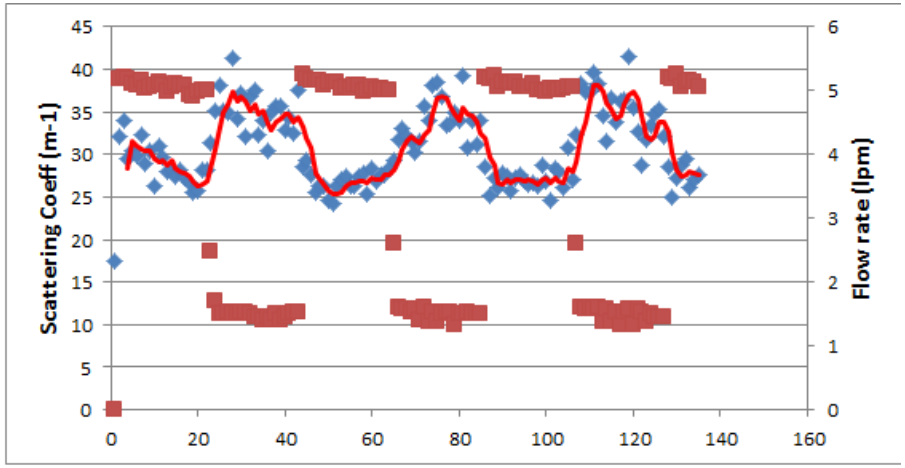
AeroExplorer Size Scanning Nephelometer's (IN102) Unique Data Collection Capability



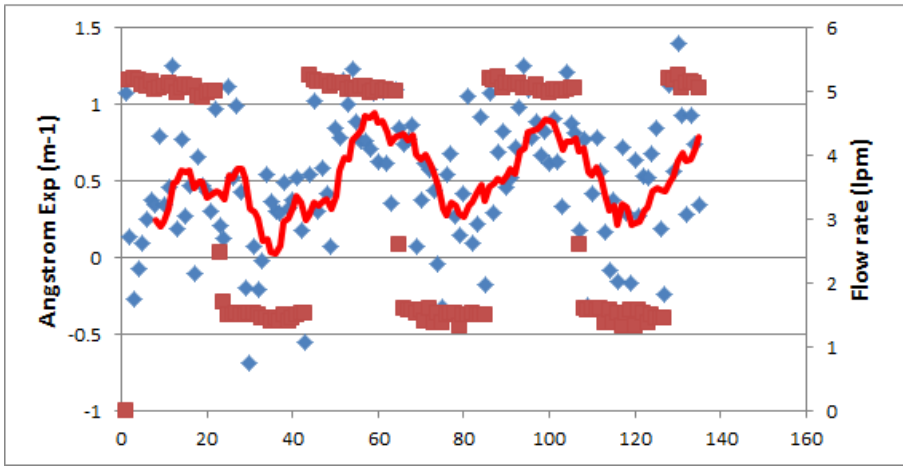


Figure shows time series of total scattering of 532 nm (top) and Angstrom Exponent (bottom) denoted by blue dots, with an 8-point running average through the blue dots denoted by the continuous red curve. The red squares denote the time series of the measured flow rate, with values shown on the right hand y-axis. As the flow toggles between 5 and 1 lpm, allowing smaller and larger particles, respectively, the total scattering jumps between 25 and 35 m^{-1}, and Angstrom Exponents of 0.8 and 0.25, respectively. Confirming that the particles with the smaller cutoff size are scattering less and with a higher Angstrom Exponent than the particles with the larger cutoff size (that also include the smaller particles).

The AirPhoton AeroExplorer size scanning 3-wavelength Integrating Nephelometer (IN102) measures the light scattered by particulate matter, over the angular range 7 to 170°. Using exclusive programmable flow rates with stabilization feedback and proven cyclone inlets, the IN102 toggles between up to 4 particle sizes at selectable time periods. Employing an innovative design, the forward and backward scattering measurements are made completely independently. LED technology allows the nephelometer to make these measurements at 450 nm, 532 nm and 632 nm, and to a sensitivity $<10^{-7} m^{-1}$. Internal sensors measure and record temperature, relative humidity and pressure.

Small and compact, the 3-wavelength Integrating Nephelometer is enclosed in an environmentally protected case, ready for outdoor deployment in rugged conditions. Power requirements are 25W @ 120 VAC and input power options include: 110/220 VAC, 50/60Hz with provided power supply, and regulated 12VDC from sampling station with provided power connector. Other powering options can be made available upon request such as operating from batteries or solar power. Optional heaters are available at the expense of additional power consumption. Data from the AirPhoton IN102 Integrating Nephelometer is saved in a removable SD memory card and can be linked to an external computer via RS485 using AirPhoton optional accessories. The AeroExplorer nephelometer can be linked to the AeroExplorer filter sampling station to sync data time series.

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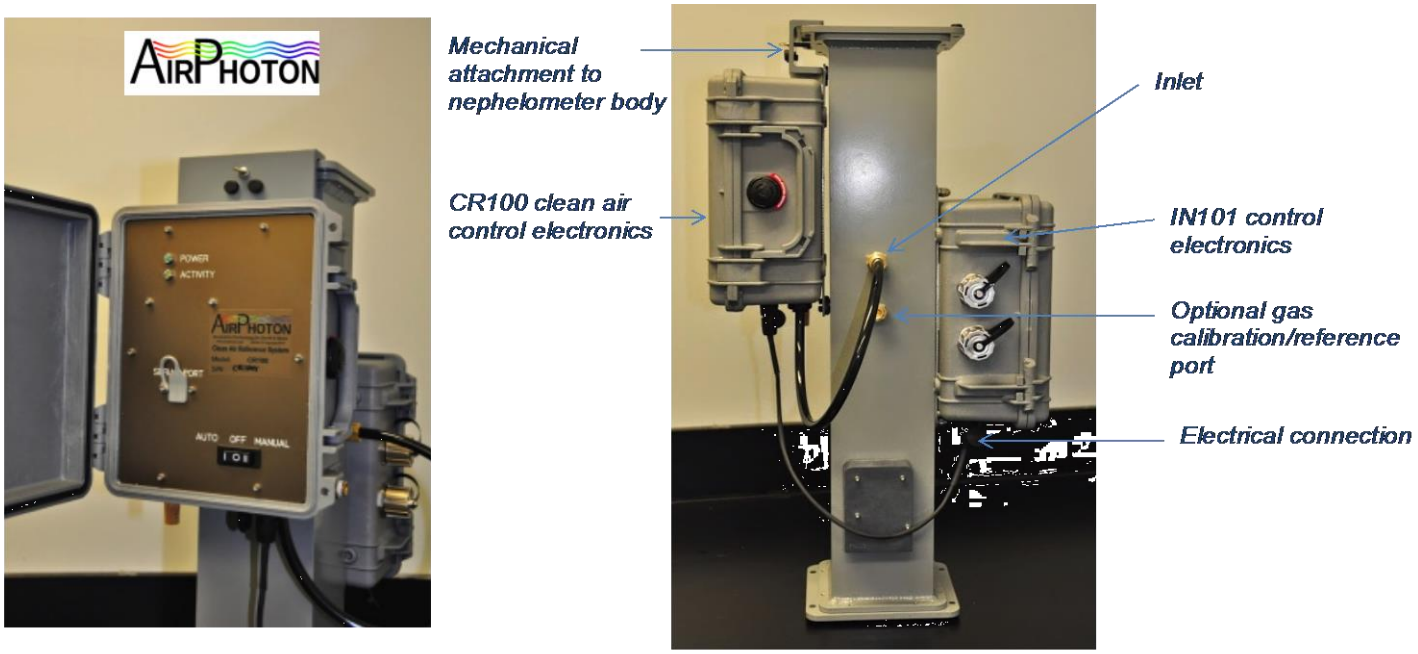
Optional Clean Air Reference System

The CR100 clean air reference system is designed to compensate for potential calibration drift of the IN101 and IN102. The CR100 pumps ambient air through a high quality HEPA filter that removes aerosol particles from the air to a level that the clean air can be used as a Rayleigh scattering reference for the nephelometer. The CR100 can be used as a semi-permanent attachment to the body of the nephelometer or as a portable bench top reference system. The figure bellow shows the CR100 system mounted on the body of a IN101 nephelometer.



Picture of the CR100 clean air reference system mounted on the body of the IN101 nephelometer.