

# SP2-XR

Single Particle Soot Photometer Extended Range



## Outcome

The Single Particle Soot Photometer Extended Range (SP2-XR) directly measures black carbon in individual aerosol particles. The SP2-XR has many of the same features as the SP2-D, but with the added benefit of being able to measure smaller particles with less tedious data processing. The incandescence channel has a measurement range of 50nm-800nm and a scattering measurement range of 100nm-500nm.

Soot, i.e., black carbon (BC), is an ubiquitous particle that has a significant impact on human health, structural damage through soiling and, after carbon dioxide, is the most potent pollutant driving climate change through localized warming. Accurate measurements of BC allows us to put protective measures and regulations in place to reduce emissions from wildfires, combustion engines, micro-plastics, and industrial processing plants. As more people move out of rural areas to denser populated cities, air quality and human health become increasingly important global issues; understanding how aerosol particles affect us all, in particular those containing BC, can help to reduce common everyday health problems such as breathing issues and asthma, not to mention the considerable damage soot does to the ecosystem.

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## Overview

The Single Particle Soot Photometer-Extended Range (SP2-XR) directly measures refractory black carbon (rBC) in individual particles. It uses the same laser-induced incandescence technology as the DMT SP2-D, but with a modified optical design that allows it to be better suited for long-term monitoring applications.

In addition to a smaller footprint, the software and firmware included with the SP2-XR provides final data output in real-time without the need for two pass processing.

Its high sensitivity, fast response and specificity to absorbing aerosols along with its straightforward data analysis make it the premier instrument for researchers interested in black carbon.

## Applications

- Atmospheric and climate research
- Monitoring networks
- Air quality
- Atmospheric and climate research
- Health effects studies
- Combustion emissions

## Advantages

The SP2-XR's unique design is compact and portable making it an ideal monitoring device. Its high sensitivity, fast response and specificity to absorbing aerosols along with its straightforward data analysis make it the premier instrument for researchers interested in black carbon.

A simple toolkit is provided which allows the user to produce a look up table (based on DMA/CPMA etc. measurements), this is directly loaded into the user interface, allowing real time data processing. While raw data traces are still available, the data output will be a simple time series of BC mass and scattering particle size. A data analysis tool kit is not necessary.



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## Product Specifications

### Measured Parameters:

- Single-particle laser incandescence
- Single-particle light scattering
- Particle size range:
  - Scattering signal: 100-500 nm diameter
  - Incandescent signal: 50 nm-800 nm, assuming a black carbon density of 1.8g/cm<sup>3</sup>

### Derived Parameters:

- Single particle black carbon mass
- Single particle size distribution for purely scattering particles

### Auxiliary Parameters:

- Air, computer, and laser temperature
- Cavity and flow controller pressure
- Sample and sheath flow

### Environmental Operating Conditions:

- Temperature: 0°C to 40°C
- Relative humidity: 5 to 95% non-condensing
- IP44 rated

### Maximum Data Acquisition Rate:

- 50,000 particles / cm<sup>3</sup>
- 10% coincidence at 3,000 Particles/ cm<sup>3</sup>

### Data Storage Capacity:

- 400GB – 15 days of continuous data storage with nominal sample concentration of 1,000 particles / cm<sup>3</sup> and a standard flow rate of 100 volumetric cm<sup>3</sup>/minute.

### Weight and Dimensions:

- SP2-XR: 13kg
- 21 cm W x 21 cm H x 42 cm L

### Power Requirements:

- 90 – 230 / 50-60 Hz with DMT supplied power supply
- 18-36VDC, (24V Nominal) with direct power connection:

## Available Accessories

- Nebulizer (for ice core and water)
- Science Care Program
- 1 and 2 Year Extended Warranty
- Lifecycle Care Program

## The Droplet Guarantee

Droplet understands how the versatility and performance of an instrument can impact your research, career, and the world we live in. As you strive to provide a better understanding of our planet, we guarantee to be here to support you through your journey.

Whether you are establishing your first laboratory or are a tenured researcher; we have a team of scientists, engineers, and technical staff available to assist with application questions, technical support, data analysis, and training.



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