

## Single Particle Soot Photometer (SP2) Specifications

Measured Parameters	Single-particle laser incandescence Single-particle light scattering
Auxiliary Parameters	Temperature Pressure Relative Humidity
Derived Parameters	<ul style="list-style-type: none"> <li>• BC mass distribution as function of particle diameter</li> <li>• Particle number distribution as a function of particle size</li> <li>• Dew Point</li> </ul>
Number Concentration Range	<ul style="list-style-type: none"> <li>• 16,000 particles/second</li> <li>• 0 – 8,000 particles/cm<sup>3</sup> at standard flow rate of 120 volumetric cm<sup>3</sup>/minute</li> </ul>
Particle Size Range	<ul style="list-style-type: none"> <li>• Scattering signal: 200 – 400 nm diameter (this range encompasses the accumulation mode of most particles, i.e. range where most mass is found)</li> <li>• Incandescent signal: depends on particle density, but 70 – 500 nm mass-equivalent diameter assuming a black carbon density of 1.8 g/cm<sup>3</sup></li> </ul>
Aerosol Medium	Air, 0 - 40 °C (0 - 104°F)
Lasers	<ul style="list-style-type: none"> <li>• Nd:YAG Laser: 1064 nm, 1 MW/cm<sup>2</sup> intracavity circulating power</li> <li>• Pump Laser: 808 nm, 4 W</li> </ul> <p>The pump laser can be controlled either through the SP2 software or through the touch-screen on the SP2 front panel.</p>
Sample Flow	30 – 180 volumetric cm <sup>3</sup> /minute (typically 120)
Flow Control	Electronic flow control with a laminar flow element (LFE) and a solenoid valve
Pump	Dual-head diaphragm
Minimum Black Carbon Detection Limit	<ul style="list-style-type: none"> <li>• 10 ng/m<sup>3</sup></li> <li>• 0.3 fg/particle</li> </ul>
Routine Maintenance	<p><i>Weekly:</i></p> <ul style="list-style-type: none"> <li>• Refreshing or replacing the desiccant in the drying cartridge on the purge line</li> <li>• Conducting PSL size check to monitor laser power</li> </ul> <p><i>Monthly and around field campaigns:</i></p> <ul style="list-style-type: none"> <li>• Conducting zero check with high-efficiency filtered air sample</li> </ul> <p><i>Annually (more frequently for high-BC environments):</i></p> <ul style="list-style-type: none"> <li>• Checking calibration of the laminar flow element on the sample inlet</li> </ul>
Recommended Service	Annual cleaning and calibration at DMT service facility
Front Panel Display	System power switch, computer switch, pump switch, Slo-Blo fuses for each circuit, hard drive activity light, 1/8 in. Swagelok® sample inlet, OSTech laser diode and temperature controller

Rear Panel Connections	Keyboard port, mouse port, video port, Ethernet, RS-232 communications port, 2 USB 2.0 ports, ¼ in. Swagelok® purge line, ¼ in. Swagelok® exhaust line, intake vent, exhaust vent, system and pump power connections
Computer System	On-board Intel®Core™2 CPU 2 GB RAM 320 GB hard drive for data storage NI PCI-6133 DAQ interface card NI PCI-6036E housekeeping data card User interface via standard keyboard, mouse, and 19" monitor (included)
Software	<ul style="list-style-type: none"> <li>• SP2 Executable program written in LabVIEW</li> <li>• PAPI program written in Igor</li> </ul>
Data Storage Capacity	Depends on number of particles; at a concentration of 1,000 #/cm <sup>3</sup> and a standard flow rate of 120 volumetric cm <sup>3</sup> /minute, the SP2 computer has the capacity to store 24 hours of continuous data
Communications Output	Gigabyte Ethernet interfaced through an Intel® PC82573V PCIe GbE controller
Power Requirements SP2 (specify voltage when ordering)  External Pump	<ul style="list-style-type: none"> <li>• 115 V, 60 Hz, 300 W</li> <li>• 230 V, 50 Hz, 300 W</li> <li>• 220 V, 60 Hz, 300 W</li> </ul> 200 W
Dimensions SP2 Pump 19" Monitor	48 cm W x 61 cm L x 26 cm H 25 cm W x 13 cm L x 13 cm H 37 cm W x 22 cm L x 39 cm H
Weight SP2 Pump Monitor	28 kg 7 kg 3 kg
Shipping Container	Durable Atlas Case Corporation ATA Transit Case that conforms to the Air Transport Association's Specification 300 Category 1 standards
Environmental Operating Conditions: Temp RH	0 – 40°C (32 – 104 °F) 0 – 100% RH non-condensing

Specifications are subject to change without notice. The SP2 is a Class I Laser Product with U.S. Patent # 5,920,388.



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