



Model 1000XP

Wide-Range Particle Spectrometer™



Combines laser light scattering, differential mobility analysis, and condensation particle counting to automatically count and size aerosol particles from 10nm to 10,000nm (0.01µm to 10µm) and up to 120 particle-size channels

HIGHLIGHT

The Wide-range Particle Spectrometer, or WPS™, is a revolutionary new instrument combining laser light scattering, electrical mobility and condensation particle counting technologies into a single, compact particle size spectrometer that seamlessly measures the concentration and size distribution of aerosol particles from 10nm to 10,000nm (0.01µm to 10 µm) in diameter.

The WPS™ combines the latest advances in aerosol sensor technology and analog and digital electronics to provide one of the most advanced and user-friendly aerosol instruments ever developed. The WPS™ is small and light in weight, easy to transport and setup in the laboratory or in the field. It is a must-have instrument for the modern aerosol and environmental research laboratory.

FEATURES

- Miniature high-performance aerosol sensors
 - High resolution Differential Mobility Analyzer (DMA)

- Dual-Reservoir Condensation Particle Counter (CPC)
- Wide-Angle Laser Spectrometer (LPS)
- 24, 32, 48, 64, 96 or 120 channels of size resolution
- NIST traceable particle size calibration
- Pulse-width modulated control for accurate temperature and flow rate settings
- Recipe control of instrument settings
- Five (5) user selectable modes of instrument operation
- Powerful, built-in computer
- Easy-to-use software for data analysis
- Self-contained flow system (no external pump needed)

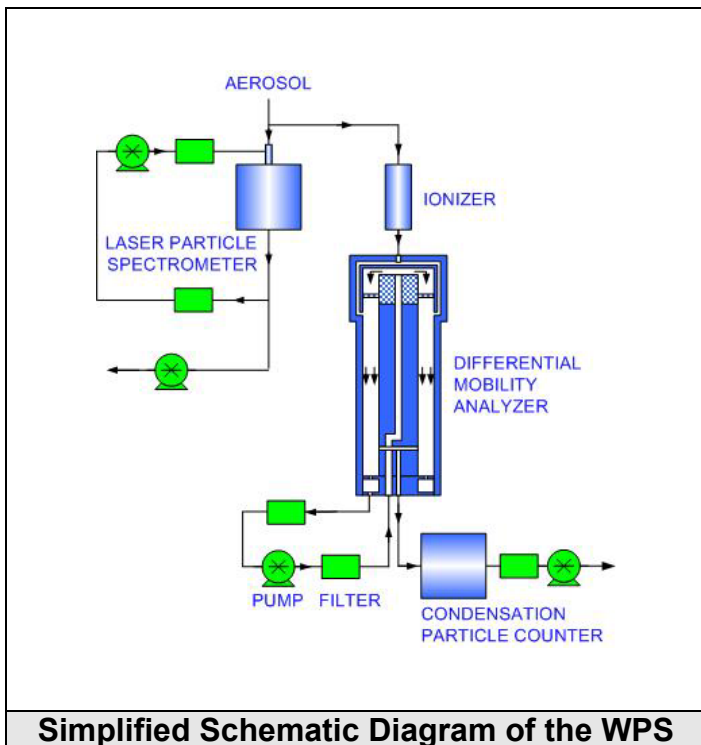
APPLICATIONS

- Atmospheric aerosol measurement
- Indoor air quality research
- Characterization of emission source particles
- Particle characterization for semiconductor, computer disk drive and microcontamination studies

- Aerosol characterization for inhalers, atomizers, nebulizers for drug delivery and medical research

DESCRIPTION

The WPS™ is based on the well-known principles of aerosol particle sizing and counting by laser light scattering, and electrical mobility and condensation particle counting. Light-scattering particle counters, usually referred to as Laser Particle Counters (LPC) or Laser Particle Spectrometers (LPS), are generally limited to 0.1 to 10µm in particle diameter. Particle sizing and counting by a Differential Mobility Analyzer (DMA) and a Condensation Particle Counter (CPC), referred to here as a Differential Mobility Spectrometer, or DMS™, is usually limited to 10nm to 500nm in diameter. The WPS™ combines these instruments into a single device to measure aerosols over the entire 10nm-to-10,000nm diameter range.



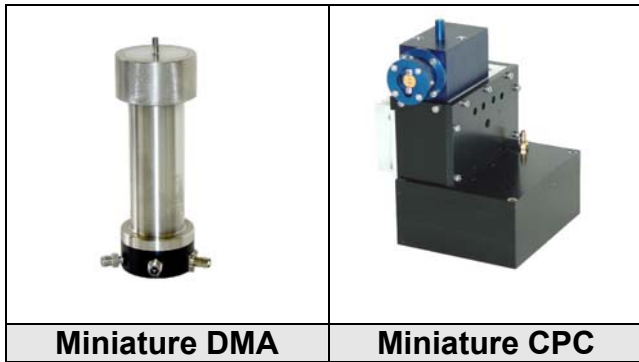
The WPS™ samples aerosol at a rate of 1.0 liter per minute. 0.7 L/min of this flow is directed through a LPS for particle sizing and counting in the 350nm to 10,000nm diameter range. The remaining 0.3

L/min is directed through a miniature DMS™ system comprised of a miniature High-Resolution DMA and an advanced technology, Dual-Reservoir CPC to count and size aerosol particles in the 10nm-to-500nm diameter range.

New DMA & CPC Technology - The WPS™ uses MSP's miniature, high-resolution DMA, which operates at a sampling flow rate of 0.3 L/min and a nominal sheath flow rate of 3.0 L/min. The overall length of the DMA is 8"; about 1/3 of the overall length of the conventional DMA. The shorter design reduces the particle loss by diffusion. The new miniature CPC is based on the porous-metal saturator, dual reservoir technology (patent pending). In this Dual-Reservoir CPC, aerosol is pre-heated by passing through a heated passageway before it is saturated by the working fluid (n-butyl alcohol) to achieve a high degree of stability in saturating conditions. This saturated aerosol is then passed through a condenser to cause vapor condensation and droplet growth. A light-scattering droplet counter then counts the individual droplets formed.

In older CPC designs, the condensed working fluid as well as condensed water vapor is returned to the same working fluid reservoir. Under moderate to high humidity conditions, the condensed water would flood the working fluid reservoir to displace the working fluid from the saturator pores. In the Dual-Reservoir CPC technology of MSP, the condensate is collected in a separate condensate reservoir thereby avoiding possible erroneous reading that may result from instrument operation under moderate to high humidity conditions.

Both the DMA and CPC are miniaturized making it possible to greatly reduce the overall size of the WPS™. Control of the WPS™ is by a powerful on-board computer along with analog and digital electronics. User-friendly software easily makes the WPS™ one of the most advanced and easy-to-use instruments ever developed for aerosol field measurement.



- Diameter range: 10nm – 10,000nm
- Five (5) operational modes: SWPST™, WPS™, SMST™, DMS™, and LPS

Configuration B (optional)

For customers wishing to measure aerosols in the 10 to 500 nm diameter range only, Configuration B may be selected. The device then functions as a SMST™ (Scanning Mobility Spectrometer) with more limited measurement capabilities:

- Diameter range: 10nm – 500nm
- Two (2) operational modes: SMST™ and DMS™

Configuration B is upgradeable to Configuration A by adding the LPS hardware and associated software modifications. Such an upgrade must be made at the factory.

Custom Configurations

MSP has the expertise to provide special configurations of the WPS™ to meet your individual measurement needs. For example, two DMA's may be configured as a Tandem Differential Mobility Analyzer (TDMA) and parallel DMS systems can also be provided for high-speed continuous particle size measurement. The WPS™ can also be configured as a monodisperse aerosol generator. Contact MSP to discuss your specific applications.

OPERATIONAL MODES

The WPS™ is comprised of a LPS (Laser Particle Spectrometer) and a DMS™ (Differential Mobility Spectrometer). The DMS™ can also operate in the rapid “scanning” mode as a SMST™ (Scanning Mobility Spectrometer). These individual aerosol spectrometers can operate singly, or in combination, to provide the following five operational modes for the WPS™

- LPS (Laser Particle Spectrometer)
- DMS™ (Differential Mobility Spectrometer)
- SMST™ (Scanning Mobility Spectrometer)
- WPS™ = DMS + LPS
- SWPST™ = SMS + LPS

AVAILABLE CONFIGURATIONS

Configuration A (standard)

In Configuration A, the Model 1000XP WPS™ provides a full range of measurement capabilities including:

SPECIFICATIONS

Subject to change without notice

Wide-Range Particle Spectrometer (WPS™)

1	Sample Flow Rate	1.0 L/min
2	Particle Size Range	10nm to 10,000nm
3	Size Resolution	User-selectable, up to 128 channels from 10nm to 10,000nm
4	Differential Mobility Analyzer (DMA)	Miniature high resolution DMA
5	Condensation Particle Counter (CPC)	Continuous flow Advantaged-Technology Dual-Reservoir CPC
6	Laser Particle Spectrometer (LPS)	High-resolution, wide-angle LPS, 350nm to 10,000nm

7	Sample Interval Time	60 sec to 24 hrs, user selectable
8	Sampling Average	2-999 scans
9	Instrument Modes	Five mode of operation
	Scanning Wide-Range Particle Spectrometer (SWPS™)	SWPS™ = SMS™ + LPS
	Wide-Range Particle Spectrometer (WPS™)	WPS™ = DMS + LPS
	Scanning Mobility Spectrometer (SMS™)	SMS
	Differential Mobility Spectrometer (DMS™)	DMS
	Laser Particle Spectrometer (LPS)	LPS
10	Ambient Pressure Range	800 to 1050 mbar absolute pressure
11	Ambient Temperature Range	10 to 35 °C
12	Ambient Humidity Range	0-90% RH, non-condensing
13	Power	90-264 VAC, 47-67 Hz, single phase, 100 W steady state, 140 W start up
14	Dimensions	12.5" (318 mm) H, 20.5" (521 mm) D, 17.0" (432 mm) W
15	Weight	47 lbs (21.4 kg)

Scanning Mobility Spectrometer (SMS™)

1	Sample Flow Rate	DMA and CPC, 0.3 L/min
2	DMA Sheath Air Flow Rate	Recirculating mode, 3.0 L/min
3	Particle Size Range	DMA, 10-500 nm; CPC 10 nm to 2 µm
4	DMA Sizing Accuracy	Mean Mobility Diameter: ±3% of NIST Traceable PSL (Standard Reference Materials, 100.7 and 269 nm)
5	CPC Count Accuracy	± 10% (compared to standard MSP CPC); Single particle counting mode
6	CPC Concentration Range	0 to 10 ⁴ particles/cm ³ ; (single particle counting mode)
7	CPC Working Fluid	n-butyl alcohol (butanol)
8	CPC Response Time (95% response)	< 10 sec
9	DMA-CPC Aerosol Concentration Range	500 to 10 ⁷ particles/cm ³ (total aerosol concentration)
10	Measurement Cycle Time	60 to 300 seconds, user selectable
11	Size Resolution	12, 24, 32, 48, or 96 channels, log scale in the SMS Mode; 1-96 channels, log or linear scale in the DMS Mode
12	Sample Interval Time	60 sec to 24 hrs, user selectable
13	Sampling Average	2-999 scans

Laser Particle Spectrometer (LPS)

1	Sample Flow Rate	0.7 L/min
2	Sheath Flow Rate	3.0 L/min
3	Particle Size Range	300nm to 10,000nm
4	Particle Concentration Range	500 particles per cm ³
5	Size Resolution	16 channels per decade; 24 channels total
6	Light Source	Laser diode, 635nm, 5 mW
7	Light Collection	20 to 100 degrees
8	Detector	Infrared enhanced photomultiplier tube



Innovative technology and products for aerosol measurement and environmental monitoring

*MSP Corporation
5910 Rice Creek Parkway
Suite 300
Shoreview, MN 55126*

*Tel: 651-287-8100
Fax: 651-287-8140
sales@mspcorp.com
www.mspcorp.com*

U S Patent #6,639,671; US and Foreign Patent Pending; Copyright © 2004 MSP Corporation (MSP1000XP-R5-WPS, 2/04)