Fast Mobility Particle Sizer (FMPS) Spectrometer 3091

TSI® Knowledge Beyond Measure.

How It Works

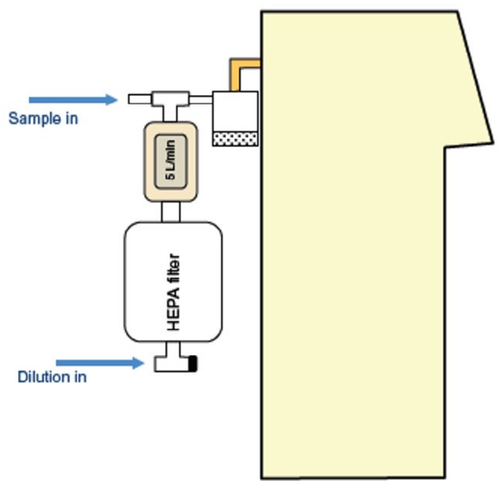
The FMPS 3091 provides real-time, high-resolution particle size distributions every second, supporting air quality compliance and research on dynamic ultrafine sources like e-cigarettes and biomass combustion.

Sample Inlet System

Purpose: Conditions the sample for accurate and repeatable measurements.

Key Features:

- Inlet cyclone removes particles > 1 µm to reduce multiple charging artifacts.
- Compatible with 3rd-party dilution systems at 10 L/min.
- Available flow balance accessory 1337021 (shown) for reduced flow rate sampling applications where dilution accuracy is not critical.

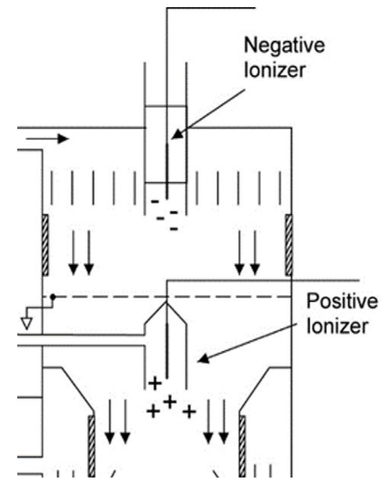


Particle Charging

Principle: TSI's exclusive pair of DC unipolar corona diffusion chargers quickly impart a predictable charge state. Chargers ionize the carrier air, mixing single-polarity ions with particles for charge exchange.

How it Works:

- **Negative Charging:** Particles first enter the negative charger, intentionally overcharging to counteract any initial positive charge.
- **Positive Charging:** They then pass through a purged positive charger, reducing and inverting the charge to a predictable net overall positive state.
- **Non-Radioactive:** The process is entirely electrical, avoiding radioactive or X-ray sources.

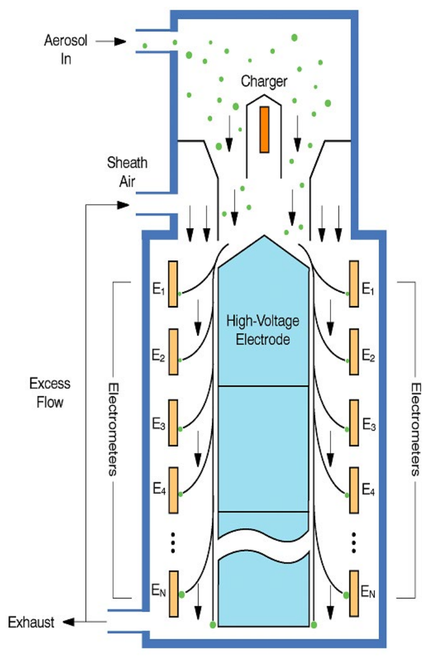


Size Classification and Detection

Purpose: Like the TSI® SMPS™ spectrometer, the FMPS classifies particles based on electrical mobility, which determines their movement in flow and electric fields.

How it Works:

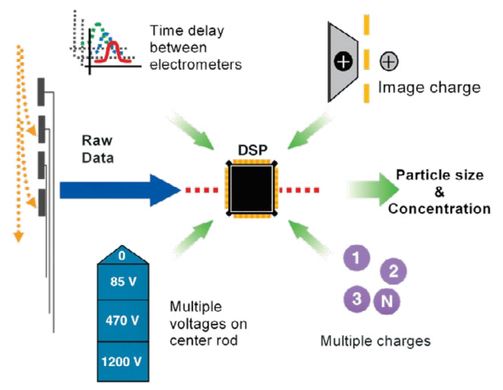
- **Electrical Analyzer:** Consists of concentric cylinders—three voltage-controlled inner sections and an outer cylinder with 24 electrometer rings (22 used for detection).
- **Particle Movement:** Charged particles enter the annular section, surrounded by a laminar sheath flow. Smaller, highly mobile particles are deflected to upper electrometers, while larger, less mobile ones travel further downstream.
- **Detection:** When particles land on electrometer rings, they generate tiny currents, used to infer particle concentration.



Real-Time Detection & Signal Processing

How it Works:

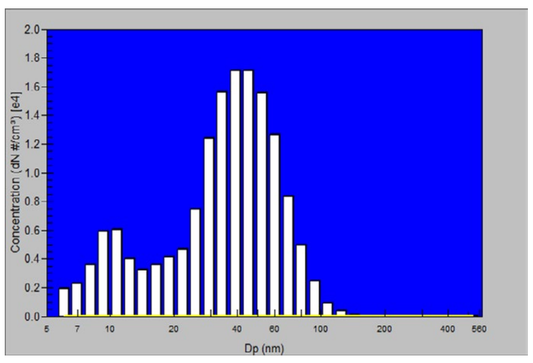
- A high-speed onboard digital signal processor uses a proprietary TSI-developed inversion matrix to convert electrometer currents, time, and locations to a physical size distribution in real time.
- A plethora of factors, such as the time delay between electrometers, the predicted aerosol charge distribution, and induced image charges are automatically taken into consideration during the inversion.
- A size distribution consisting of 32 size channels (16 per decade) ranging from 5.6 nm to 560 nm is produced every 1 s.

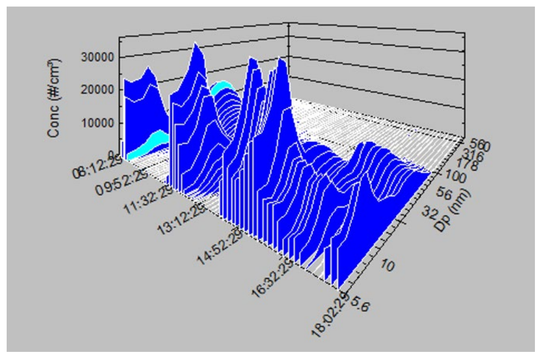


Output: High-Resolution Particle Size Distribution

Data Insights with TSI® FMPS Software:

- See particle number concentration (PNC) for each size bin.
- Monitor real-time changes in particle size distributions during transient conditions.
- Multiple data presentation options, including .csv file export, contour plot, 3D graph, and table.
- Calculate estimated surface area, volume and mass distributions with user-defined channel-specific densities.





Why Choose the FMPS 3091?

- **Speed:** 1 Hz size distributions for capturing transient events.
- **Accuracy:** Excellent agreement with reference SMPS™ systems.
- **Ease of Use:** Intuitive software for visualization and analysis. Serial command set provided for custom program development.
- **Flexibility:** Compatible with a variety of aerosol types, with TSI® or user-provided dilution systems.

Example Applications:

- Near-road emissions monitoring
- 3D printer emissions
- Biomass combustion
- E-cigarette emissions
- Fundamental aerosol research
- Ultrafine and nanoparticles in transient processes

Key Specifications:

- **Size Resolution**
  32 channels (16/decade)
- **Particle Size Range**
  5.6 nm to 560 nm
- **Time Resolution**
  1 Hz
- **Concentration Range**
  Up to 10^7 particles/cm³

For more information, visit tsi.com/FMPS

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