

EMPS (Electrical Mobility Particle Spectrometer) Particle Sizing + Counting

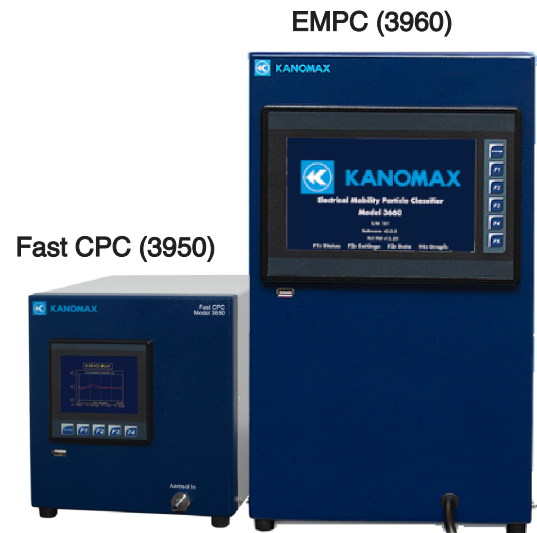
The Kanomax FMT EMPS system combines a state of the art Electrical Mobility Particle Classifier (3960) and Fast Condensation Particle Counter (3950) to quickly and efficiently provide the size distribution and concentration of particles. The system has two main size ranges, from 5.62nm to 316nm and OR the 10nm to 562nm. The system is modular and offers integrated classifier column and the selection of butanol or water based CPC systems.

System Benefits

- Small Footprint
- No calibration requirements for sizing
- Particle size measurement are independent of optical properties
- Stable and repeatable operation over extended time periods.
- Ease of operation.
- Ultra Fast CPC for standalone discrete particle counting (20ms)
- Integrated classifier and charge conditioner
- Non flammable and AMC free operation capable with water CPC
- High Resolution and Speed

NEW KEY FEATURES:

Kanolysis software now offers full system and individual component control to maximize overall performance. Fully automated control and analysis allows maximum benefits.



Applications:

- Indoor/Outdoor Environmental Monitoring
- Atmospheric Studies
- Particle Emission: (Combustion, Automotive Exhaust / Brakes, etc.)
- Nucleation / Condensation Studies
- Health Science
- Nanotechnology Materials Research



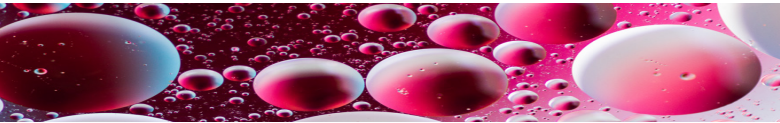
Advanges in charge conditioning

The Kanomax EMPS system utilizes a patented charge conditioner (nueutralizer) which has significant benefits with better transmission and residence time. It is better for time-dependent aerosol measurements on a single channel (especially for small particles). Other applications can also benefit from better time dependent prop.

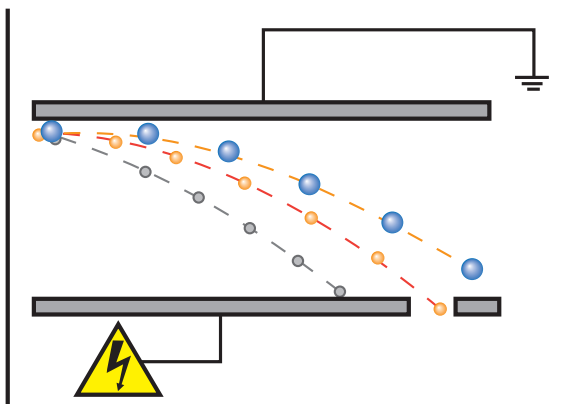
Size / Performance Matter

The EMPS has a small footprint and simple interface which allows easy integration. The EMPS performs has high performance and overall ease of use.

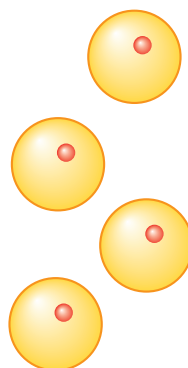
Particle Size Distribution Measurement Process



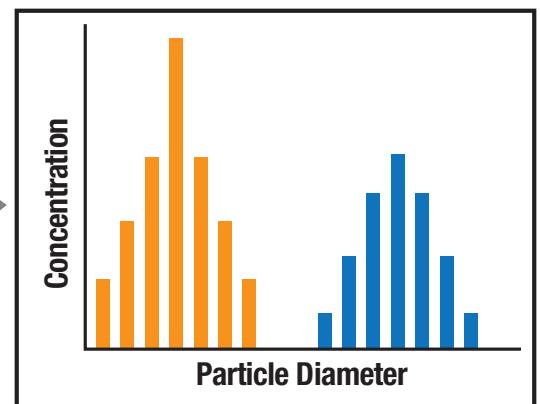
- Nueutralizer A soft x-ray aerosol charge conditioner that places a known low-level distribution of charge on the particles.
- EMPC (3960+) An Electrical Mobility Particles Classifier (Model 3660+) that acts as a particle diameter “bandpass filter.” The EMPS spatially separates aerosol particles based on their electrical mobility (a function of particle diameter). Only particles within a narrow size band can leave the EMPC. The selected size is adjusted by varying the electric field (voltage) within the EMPC and a size distribution can then be generated by scanning through a range of voltages.
- Fast Condensation Particle Counter (Model 3650+ FastCPC) to measure the number concentration of the particles leaving the EMPS.



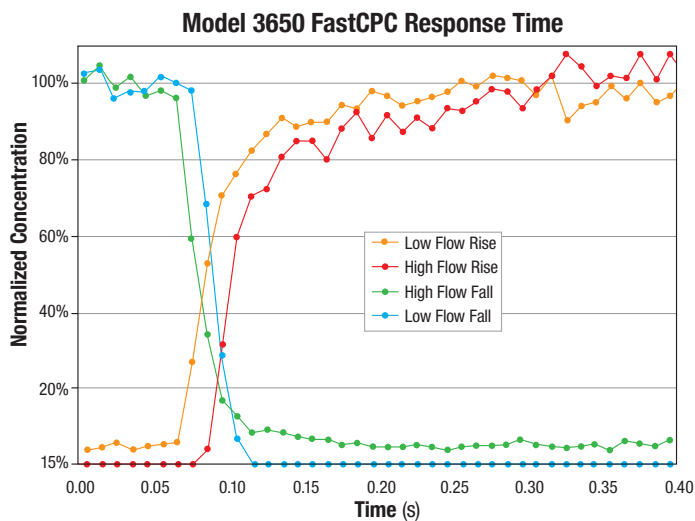
Charge Conditioning, Electrical Mobility-based Particle Size Classification (EMPC)



Condensation Particle Counter (CPC)



Ultra Fast CPC Acquisition Time For Discrete Particle Counting Mode (20ms)



FastCPC response time to a step change in concentration at high and low inlet flow.

- Ultrafast response time $\tau \sim 20$ msec
- Small particle detection down to 1.9 nm
- Integrated, compact design

The Model 3650 Fast Condensation Particle Counter (FastCPC) pushes aerosol nanoparticle measurement performance to new heights. Using the classical approach of enlarging particle size through condensational growth from a supersaturated alcohol vapor, particles as small as 1.9 nanometers grow into micron-sized droplets that are individually counted with a laser droplet sensor. Vapor-diffusive, laminar-flow operation provides a stable detection efficiency.

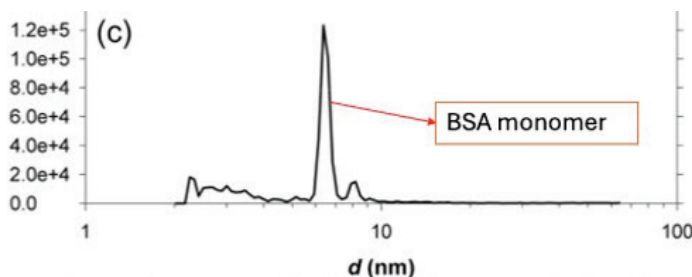
The FastCPC's compact package includes internal sheath and transport pumps with critical orifice flow control. A patent-pending parallel-plate flow geometry shortens the aerosol flow path for faster response time and lower diffusion losses.

A robust active working fluid transport system reduces flooding and reliability problems common with competing products. With no internal alcohol reservoir, the instrument is more tolerant to tipping, vibration, and rapid pressure fluctuations at the inlet making it suitable for applications in mobile transportation studies.

With faster response than any competing CPC on the market, the FastCPC is the ideal detector for rapidly changing aerosol systems and electrical mobility size distribution measurements.

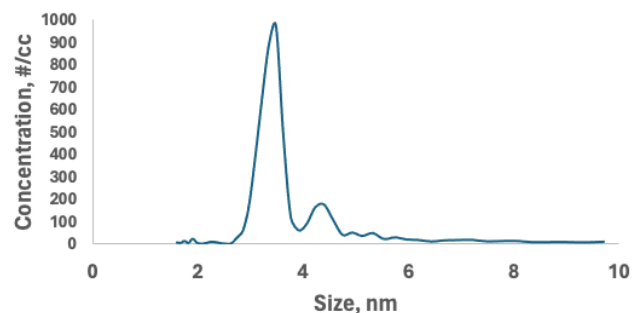
Precision Size Profiling Across a Broad Capable Range

6.4nm Protein (BSA)



Sakurai and Murashima, *Aerosol and Air Quality Research*, 18: 549–554, 2018

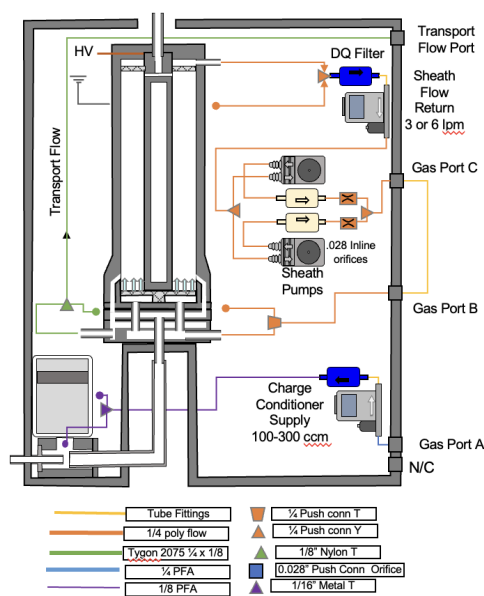
3.3nm Protein Cytochrome C



EMPS Specifications:

Concentration Range	1 to 1E6 #/cc
Particle Size Range	5.62 – 316 nm (High Resolution Mode) 10 – 562 nm (Wide Range Mode)
Measurement Time	1 - 3 seconds/bin (High Resolution Mode) 1 - 3.5 seconds/bin (Wide Range Mode)
Resolution	64 bins/decade (High Resolution Mode) 32 bins/decade (Wide Range Mode)
Sheath Flow	6 liters/minute (High Resolution Mode) 1.5 - 3 liters/minute (Wide Range Mode)
Sample Flow	1.5 lpm less Charge Conditioner Purge Flow
Charge Conditioner Flow	100 to 300 ccm, user selectable
Gas Requirements	100-300 ccm clean dry air (dewpoint <-40C) Minimum to 10 psi
Aerosol Temperature	10-40 °C
Inlet Pressure	+/- 20 mbar relative to ambient
Maximum Sample Dewpoint	14 °C
I/O	Pulse input (5 V) Analog Input (0-10 V) USB port (for data download and firmware updates) D89 (not currently used)
Software	Kanolysis
Dimensions and Weight	23 in (9 cm) x 46 in (18 cm) X 35.5 in (14 cm) 6.8 kg (15 lb)
Power Requirements	50/60 Hz, 100-220 VAC, 75 Watts

EMPC Schematic

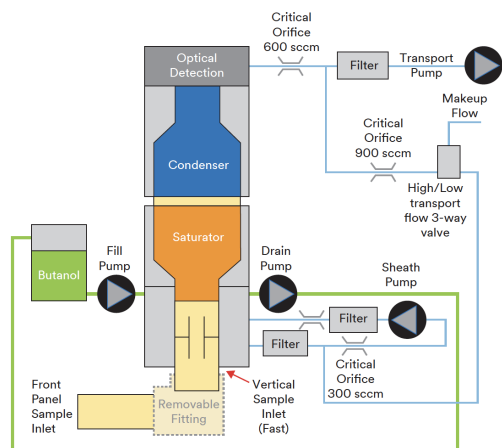


Fast CPC Specifications:

Particle size detection	1.9 nm to >3 µm
Concentration range	1 to 100,000 particles/cm³
Response time	50% response time ~ 80 ms, 10-90% response time ~ 35 ms, time constant (τ) ~ 20 ms
Working condensing fluid	n-butyl alcohol and water
Flow control	Critical orifices with internal pumps
Aerosol sample flow	300 cm³/min
Inlet flow	600 or 1500 cm³/min (user selectable)
Aerosol inlet	Front panel, or vertical from the bottom (user selectable, fitting access on right side of instrument)
Dimensions LWH cm (inches)	8.5" × 7.5" × 8.5" (21.6 cm × 19 cm × 21.6 cm)
Weight Kg (lbs)	15 lbs (6.8 kg)
Power requirements	50/60 Hz, 100-220 VAC, 75 Watts
I/O	RJ-45 with Ethernet, 9-pin D-subminiature connector with RS-232 serial communications, pulse output and user selectable analog output

Specifications subject to change without notice.

Fast CPC Schematic



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