NanoEngineering Corporation
1204 Main Street, #262
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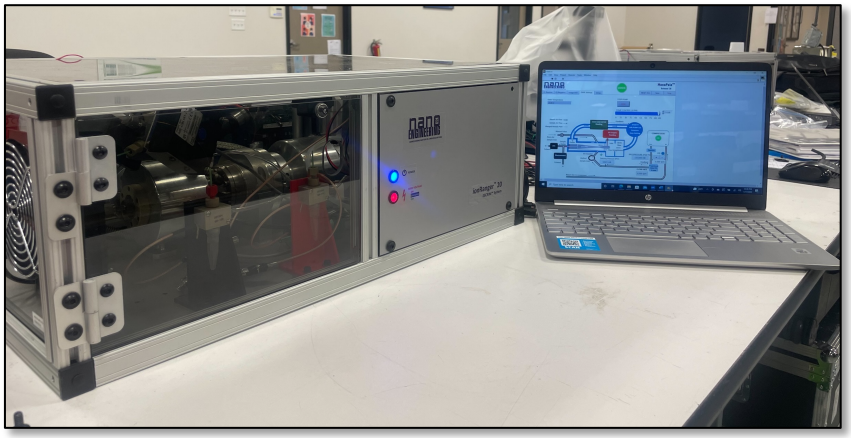
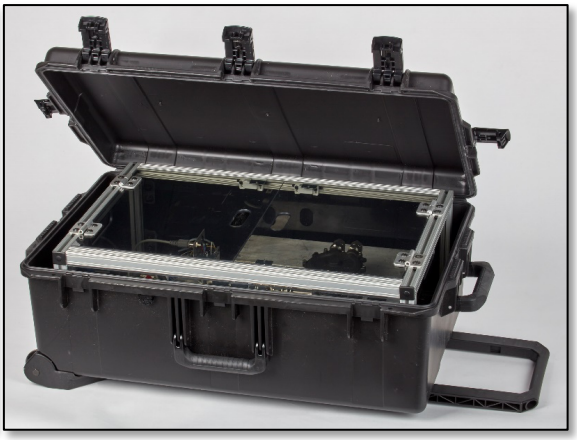
IONRANGER™ ES-DMA VERSION 0.6
Specifications

IonRanger™ is a high resolution, transportable and programmable Electro-spray Differential Mobility Analyzer (ES-DMA) system designed for research in instrumentation, particle detection, environmental studies and proteomics. IonRanger is optimized for high resolution characterization of particles with mobility size of 1-20 nm, with demonstrated capability to distinguish between particles in this range differing by 3% or less. The system comes with a choice of electro-spray emitters to address a variety of applications. IonRanger™ v0.6 features three separate inputs (Eppendorf vial, capillary*, and external air), is compatible with multiple particle detectors (CPC, Electrometer) and pairs with mass spectrometers ("ES-DMA-MS"). IonRanger™ is 100% computer controlled with industry leading test algorithms and digital camera-assisted electro-spray tuning.



IonRanger Front View with Laptop Control S/W



IonRanger in Pelican Transport Case

IonRanger v0.6 features the "Half-Mini" DMA. The Half-Mini incorporates patented technology and designs developed by Prof. Juan Fernandez de la Mora of Yale University, with demonstrated industry-leading resolution (FWHM) in its particle size range. IonRanger also features the industry's highest DMA voltage range (-10KV to +10KV).

IonRanger v0.6 is offered in three electro-spray configurations depending on researchers' needs for liquid sample handling:

IonRanger v0.6D	IonRanger v0.6M	IonRanger v0.6N
Duo-pole Electro-spray	**Mono-pole Electro-spray**	**No Electro-spray nor liquid sample input**
Ionizes and neutralizes liquid samples[1]	Ionizes liquid samples	Externally ionized air samples and/or external electro-spray
Ideal for 1-50 nm particles	Best for <20nm particles that do not benefit materially from neutralization	Best for testing air samples when no calibration of liquid samples is required

[1] Our patented Duo-pole electro-spray neutralization method features a second electro-spray emitting negative ions. Neutralization increases the proportion of +1 charged particles for better resolution. Our Duo-pole electrospray is high yield, easy to handle, and gentle for biological samples. It replaces other neutralizers such as radioisotopes and soft x-ray.

*Denotes new for v0.6

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Commercial	
Availability	Summer 2023
Order lead time	90-120 days
List price	Quote available upon request
Software included	Electro-spray Ionization Process Closed Loop Control High Resolution DMA Spectrum collection and recording

General	
External dimensions	L= 66 cm; W= 46 cm; H= 25.4 cm.
Weight	23 kg
Power	AC Input Range 80~264Vac, usage ~ 120 watts
Control interface	USB-3 connection to PC running Windows 10.0 or later
Bio-Safety	Total airtight sample containment
Electrical Safety	Safety door high voltage interlocks
Regulatory	Research Use Only. Not FDA approved

Sample Inputs and handling	
Vials	Standard 0.5 mL screw-top microcentrifuge vials
External capillary*	Accommodates 0.360 mm OD capillaries
External air	6.35 mm OD tube compression fitting with ¼ turn manual valve[2]
Sample cooling	5 degrees Celsuis via external water circulator

ES-DMA Measurement Process Controls - programmable closed loop	
+/- ES vial air-over-liquid pressure	0-1000 mB
+/- ES vials Pt electrode voltage	+2.5 kV to -2.5kV DC*
ES sample air flow	0-5 l/min
DMA air flow (recirculated)	0-220 l/min[3]
DMA voltage	+5 kV to -5 kV*
Detector air flow	0-5 l/min (controllable to support CPC operation)
Real time Imaging of Taylor cones	10 MP monochrome telescopic digital camera for each electrospray emitter, plus a third camera to position emitter tips

[2] Air samples can be ionized with secondary electrospray or a third-party ionizer such as corona discharge, radioisotope, or soft x-ray.

[3] Inquire about options to increase DMA (sheath) air flow rate to approximately 400 l/min or 800 l/min.

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Compatible External Detectors and Collectors [4]	
Condensation Particle Counter	Aerosol Dynamics Model 9001* Kanomax FCPC 3650* Any other CPC with BNC pulse out port
Electrometer	Amperical Instruments 1 TOhm TSI Model 3068B
Post-DMA CGT Collector	Aerosol Devices Spot Sampler, BioSpot-GEM and BioSpot-VIVAS

Software features	
Real-time controls	Sample and neutralizer vial pressure Sample and neutralizer voltage ES air flow DMA air flow Detector air flow Digital camera viewing screen and frames/sec (for Taylor cones)
Programmable testing*	All real-time controls, plus: • Unlimited separate spectra per sample • Programmable across full range of all voltages and airflows* • 1 V minimum DMA voltage step • 1 V minimum Sample voltage step • 0.1 l/min minimum ES (sample) airflow step • 0.1 l/min minimum DMA (sheath) airflow step • 1 millisecond minimum dwell time.
Digital data captured	Date/Time Sequence # DMA voltage DMA (sheath) air flow rate (Q) Detector particle count Electro-spray settings* Sample air flow rate (q)* Room temperature* Relative humidity* Ambient pressure* Operator name*

[4] Inquire about other detector and post-separation sample collection options.

*Denotes new for v0.6