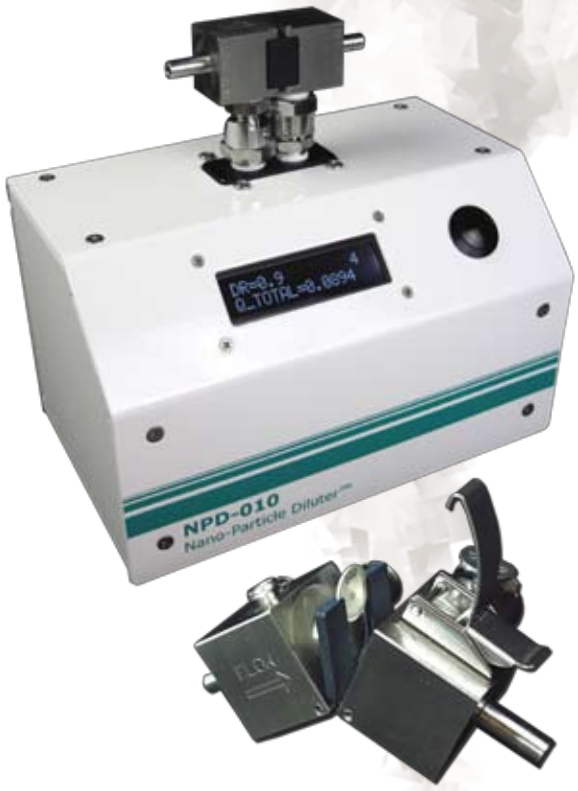
NPD-010 Nano-Particle Diluter ™

- Simple inline dilution
- Integrated flow meter provides real time dilution ratio monitoring
- Easily adjustable dilution ratio from 2.5 - 100:1
- Minimal particle loss for particle diameters less than 300 nm



The first diluter designed specifically for use with ultrafine aerosols (d_p<300µm) to limit particle loss within the diluter and provide accurate measurements of high concentration aerosols with traditional counters and newer mobility classification systems. With minimal partilce loss for diameters less than 100nm this system provides accurate measurements of high concentration aerosols without modification to the size distribution, providing accurate peak diameter and total number count to down stream insturements. Pairing the diluter with industry standard high speed mobility analyzers allows for per channel concentrations to exceed $1x10^8$(#/cm^3) and reducing the need for complex secondary or tertiary dilution systems.

With simple use in a laboratory setting as a key design principle, Nebulae Scientific engineers set out to provide a fast and efficient method to change the dilution ratio. Changing the dilution is as simple as removing the diluter body using the quick change fittings, opening the latch to remove the orifice and replacing it with a new one featuring a larger or smaller orifice to increase or decrease the dilution ratio. All orifices are also laser marked to enable quick identification of size, as well as robust enough to stand up to tough solvent based cleaners as well as ultrasonic baths. The integrated high resolution flow meter, which provides 0.0001 LPM resolution, enables the Nano-Particle Diluter™ to provide real time dilution ratio monitoring up to 80:1 dilution. This coupled with the quick change orifice design also enables users to fine tune the desired dilution ratio using the flow meter provided dilution ratio as a feedback control.

Theory of Operation

The Nano-Particle Diluter™ uses a simple bifurcated diluter design, in which a majority of the flow passes through a HEPA capsule filter, which removes greater than 99.999% of the particles present, and provides the large bulk flow for dilution. A small portion of incoming aerosol

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bypasses this filter, typically referred to as the byass flow, which re-combines with the now filtered dilution flow reducing the total aerosol concentration. This ratio of bypass flow to dillution flow dictates the dilution ratio, and is controlled using an orifice in the bypass flow to restrict flow through this branch and drive a majority of the flow through the filter.

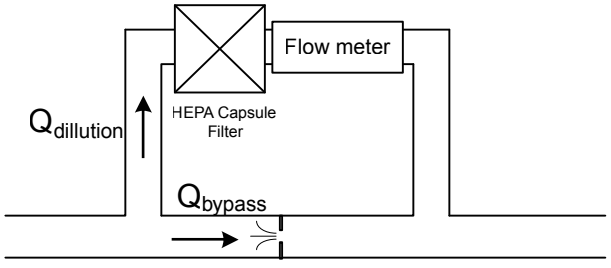

Figure 1-1

Nano-Particle Diluter™ Flow Schematic

Why an orifice?

The use of an orifice is predicated by particle diffusion loss in the bypass flow. In a laminar flow system, particle loss is simply proportional to flow channel length. The shortest possible flow channel, while still providing the necessary flow restriction, is that of an orifice with its near zero length. This design feature minimizes particle loss in the bypass flow and enables the ultra-low particle loss feature of this diluter when used with ultrafine aerosols. Typical loss is less than 10% for particle sizes greater than 10nm.

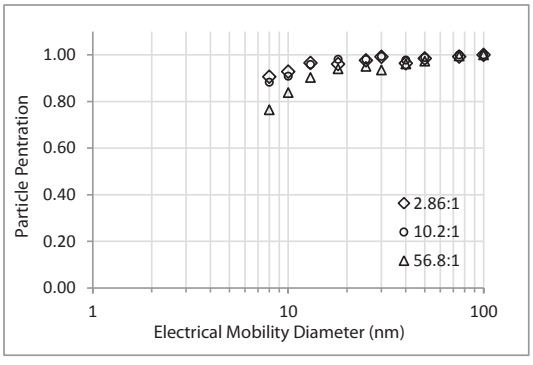

Figure 1-2

Typical Particle Loss in Nano-Particle Diluter™

Specifications(subject to change):

Flowrate:	0.5-1.5LPM *Other flow rates available consult factory*
Dilution Ratio:	2.5:1 to 100:1
Particle Size Range:	<500nm
Flow Meter:	Proprietary temperature and absolute pressure corrected flow rate
Aerosol Medium:	Air or N_2
Ambient Temperature Range:	10 to 40 °C 41 to 104 °F
Ambient Humidity Range	0 – 90% RH, non -condensing
Inlet Pressure Absolute	75-107 kPa
Dimensions:	4.7 x 7.8 x 7.0 in 119 x 198 x 178 mm
Weight:	3.1 lbs 1.4 kg
Front Panel Display:	16x2 Character LCD Display
Input Power:	9V DC, <1A