AEROSOL GENERATION
MODEL 3940A

SUBMICROMETER MONODISPERSE AEROSOL GENERATION SYSTEM

Features and Benefits
+ Generates a highly monodisperse aerosol in the size range from 0.01 to 1.0 micrometer
+ Operator simply selects the operating parameters required to produce a known particle size
+ Operation is based on first principles, so no calibration is necessary

Applications
This complete aerosol generation system is useful anywhere a precise, monodisperse, submicrometer aerosol is needed. Specific applications include:
+ Calibrating submicrometer counting and sizing instruments (condensation particle counters and optical particle counters) as described in JIS B 9921
+ Testing HEPA, ULPA, and other high-efficiency filters as described in IES RP-CC007.1 and RP-CC021.1, and DIN 24183
+ Studying nucleation, condensation, and diffusion
+ Studying particle charge and electrical mobility
+ Enhancing the monodispersity of PSL and other aerosols

Using an Electrostatic Classifier (TSI Model 3082), the Model 3940A extracts a narrow monodisperse size range from polydisperse aerosol produced with an atomizer. The resulting monodisperse aerosol will typically have a geometric standard deviation of 1.05 micrometer or better.
**Model 3940A**

**Operation Overview**

**Operation**
Compressed air first passes through a Filtered Air Supply, where the air is cleaned and dried. This conditioned air is used to power a Constant Output Atomizer. The atomizer generates an aerosol of polydisperse droplets with a count median diameter of 0.3 micrometer. It works with oils such as DOP and DEHS, most solutions with a volatile solvent, or suspensions such as PSL spheres in water. The aerosol droplets pass through a Diffusion Dryer where any volatile components evaporate off. The remaining particles then pass through Kr-85 bipolar chargers to establish a low-level charge equilibrium.

The Electrostatic Classifier used in the system contains a differential mobility analyzer (DMA). Inside the DMA, particles are subjected to an electric field. The field deflects the particles from their flowpath according to their electrical mobility, which is inversely proportional to particle size. By adjusting voltage levels, particles of a narrow size range are steered into a small exit. The particles leave the classifier as a monodisperse aerosol. Aerosol concentration is changed simply by adjusting valves so that a portion of the aerosol passes through high-efficiency filters. (For more information, see the Model 3082 Electrostatic Classifier product information sheet.)

**Bibliography**


Kinney PK, DYH Pui, GW Mulholland, and NP Bryner, Use of the Electrostatic Classification Method to Size 0.1μm SRM Particles—A Feasibility Study, *Journal of Research of the National Institute of Standards and Technology* 96(2), March/April 1991. (TSI paper A74)


Liu BYH, DYH Pui, and KY Rubow, Performance of HEPA and ULPA Filters, Proceedings of the 1985 annual technical meeting of the Institute of Environmental Sciences. (TSI paper A47)
Optional Configuration

The standard Model 3940A system uses two neutralizers to ensure that particle charge is fully reduced to a Fuch’s equilibrium before aerosol enters the DMA. By itself, the 3077A may not be adequate if the high-concentration aerosol generated by the atomizer is also highly charged.
SPECIFICATIONS
SUBMICROMETER MONODISPERSE AEROSOL GENERATION SYSTEM
MODEL 3940A

Refer to separate product sheets for descriptions and specifications of individual system components.

Equipment included
3082 Electrostatic Classifier Platform
3081A Long DMA
3077A Aerosol Neutralizer
3012 Aerosol Neutralizer
3074B Filtered Air Supply
3076 Constant Output Atomizer
3062 Diffusion Dryer

Particle material
Solid or nonvolatile liquid

Particle size range
0.005 to 1 µm

Particle concentration
Adjustable from 0 to 10⁵ particles/cm³

Charger
Bipolar, Krypton-85, 2 millicurie, half-life of 10.4 years*

Aerosol flow rate
0.2 to 3.5 L/min

Aerosol pressure range at classifier outlet
1 ± 0.2 atm

Monodispersity
±5% of mean size for singly charged particles

Compressed-air requirements
25 L/min at 35 psi

Specifications are subject to change without notice.

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To Order
Submicrometer Monodisperse Aerosol Generation System
Specify Description
3940A Submicrometer Monodisperse Aerosol Generation System

Optional Accessories
Specify Description
3001788 Conductive tubing, 1/4-inch inside diameter
3001789 Conductive tubing, 3/8-inch inside diameter
3068B Aerosol Electrometer
3708 Flow Splitter
3772 Condensation Particle Counter*

*Other CPCs may be used