

Aerosol Neutralizers

Models 3012, 3012A, 3054, 3054A, 3077, 3077A, 348002

Minimize particle losses and coagulation caused by electrostatic charges, or charge particles properly for Scanning Mobility Particle Sizer analysis and air-filter measurements



Aerosol particles dispersed by nebulization, combustion, or powder dispersion are usually electrostatically charged. Normally, a high level of electrical charge is undesirable. It increases the particle loss to the walls of transport and sampling systems, or it can affect filter-efficiency measurements. To ensure that instruments operating on the electrostatic principle work properly, aerosol particles entering these instruments must be neutralized.

Operation

TSI Aerosol Neutralizers use a radioactive source (Kr-85 or Po-210) to perform this function. The radioactive source ionizes the surrounding atmosphere into positive and negative ions.

Particles carrying a high charge can discharge by capturing ions of opposite polarity. After a short time, the particles reach charge equilibrium such that the aerosol carries a bipolar distribution as described in the literature by Fuchs.

In the longer, cylindrical neutralizers (shown at top), inert Kr-85 gas is sealed completely inside a stainless-steel tube with wall thickness of 0.05 mil-

limeters. The tube is shielded by a metal outer housing. As described by Liu and Pui, aerosol passes through the space between the stainless-steel tube and the outer housing. Regarding the Model 348002 shown at lower left, aerosol does not pass through the neutralizer. Instead, the Model 348002 is placed adjacent to an aerosol stream.

Applications

Models 3054 and 3054A are designed to fit onto a TSI Model 3450 Vibrating Orifice Aerosol Generator. Models 3077 and 3077A are designed to fit into TSI Model 3080-series Electrostatic Classifiers and all Scanning Mobility Particle Sizer spectrometers. Model 348002 is designed to fit into a TSI Model 3480 Electro Spray Aerosol Generator.

TSI Aerosol Neutralizers may be used for general-purpose neutralization. If your aerosol carries higher charge levels or if your aerosol flow rate is in the upper half of the specified range, TSI recommends the 3012A, 3054A, or 3077A. See flow rate ranges and other specifications on the reverse side of this document.



Specifications

Aerosol Neutralizers

Model	3012	3012A	3054	3054A	3077	3077A	348002
Source	Kr-85						Po-210
Emission	Beta decay						Alpha decay
Radioactivity [MBq (mCi)]	74 (2)	370 (10)	370 (10)	740 (20)	74 (2)	370 (10)	185 (5)
Half-life	10.7 years						138 days
Maximum Flow Rate	50 liters/min		150 liters/min		5 liters/min		NA
Maximum Temperature	50°C (122°F)						150°C (302°F)
Maximum Pressure	35 kPa (5 psig)						NA
Outer Housing Material	Anodized aluminum		Stainless steel			Aluminum	
Dimensions							
Inlet Diameter	1.27 cm (0.5 in.)		2.46 cm (0.97 in.)		0.64 cm (0.25 in.)		NA
Outlet Diameter	1.27 cm (0.5 in.)		3.50 cm (1.38 in.)		0.64 cm (0.25 in.)		NA
Housing Diameter	7.72 cm (3.04 in.)		8.94 cm (3.52 in.)		3.89 cm (1.53 in.)		3.20 cm (1.26 in.)
Overall Length	52.86 cm (20.81 in.)		64.14 cm (25.25 in.)		21.44 cm (8.44 in.)		0.97 cm (0.38 in.)
Weight	1.0 kg (2.2 lb)		3.5 kg (7.7 lb)		0.4 kg (0.9 lb)		14 g (0.5 oz)

NA = not applicable

To Order

Aerosol Neutralizers

Specify	Description
3012	For general-purpose aerosol applications with high flow rates; has screened inlet and outlet
3012A	For general-purpose aerosol applications with high flow rates, has screened inlet and outlet and five times the activity of Model 3012
3054	For use with Model 3450 Vibrating Orifice Aerosol Generators
3054A	For use with Model 3450 Vibrating Orifice Aerosol Generators; has twice the activity of Model 3054
3077	For general-purpose applications involving moderately charged aerosols or low flow rates; lower activity reduces regulatory concerns compared to Model 3077A
3077A	For general-purpose applications involving highly charged aerosols and/or high flow rates; used with Model 3034 Scanning Mobility Particle Sizer and other TSI instruments; has five times the activity of Model 3077
340082	For use with Model 3480 Electro Spray Aerosol Generators

Relocation and Disposal

Aerosol Neutralizers contain a radioactive source that requires special handling. Government regulations require that you notify TSI Incorporated if you wish to dispose of this product or transfer it to a different facility. TSI is required by law to assist you with this process. There is a fee for this service. Please contact TSI customer service for additional information.

Bibliography

Fuchs NA, "On the Stationary Charge Distribution on Aerosol Particles in Bipolar Ionic Atmosphere," *Geophys. Pura Appl.* **56**:185 (1963).

Liu BYH, and DYH Pui, "Electrical Neutralization of Aerosols," *J. Aerosol Sci.* **5**:465-472 (1974).

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