CHOOSING THE RIGHT AEROSOL NEUTRALIZER

APPLICATION NOTE AN-001 (A4)

Model 348002

Model 3088

MSP 1090

Model 3012/3012A

Model 3054/3054A

Model 3077/3077A

Overview

Aerosol particles dispersed by nebulization, combustion, or powder dispersion are usually electrostatically charged. A high level of electrical charge can

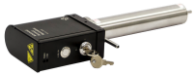
- increase the particle loss to the walls of transport and sampling systems, or
- affect filter-efficiency measurements, or
- distort particle size distribution measurements.

An aerosol neutralizer ensures that particles reach an equilibrium charge distribution.

This short guide compares the specifications of the aerosol neutralizers and offers examples of their applications to assist you in choosing the correct neutralizer for your application. For more information on the theory, safety considerations, and use of the neutralizers, please consult the appropriate product manual, available from your TSI sales representative, or visit:

https://www.tsi.com/products/aerosol-neutralizers/

Table 1. Neutralizer Specification Comparison

Specifications	3088	MSP 1090	348002*	3012/3012A**	3054/3054A**	3077/ 3077A**
						
Source	Soft X-ray	Electrical	Po-210	Kr-85		
Emission	X-ray	Corona Discharge	Alpha Decay	Beta Decay		
Radioactivity	N/A	N/A	185 MBq (5 mCi)	74/370 MBq (2/10 mCi)	370/740 MBq (10/20 mCi)	74/370 MBq (2/10 mCi)
Life Expectancy, Continuous Use* **	8760 hours	5000 hours	138 days	10.7 years		
Maximum Flow Rate	5 L/ min	2.5 L/ min	N/A	50 L/ min	150 L/ min	5 L/ min
Maximum Temperature	33°C (91°F)	40°C (104°F)	150°C (302°F)	50°C (122°F)		
Maximum Pressure	70 kPa (10 psig)					
Maximum Concentration	The maximum recommended concentration for all neutralizers is 10^7 #/cm^3. Aerosols with a high charge level may require a concentration limit for satisfactory performance.					
Housing Material	Stainless Steel	Steel	Aluminum	Anodized Aluminum	Stainless Steel	
Inlet Diameter	0.64 cm (0.25 in.)	0.64 cm (0.25 in.)	N/A	1.27 cm (0.5 in.)	2.46 cm (0.97 in.)	0.64 cm (0.25 in.)
Outlet Diameter	0.64 cm (0.25 in.)	0.64 cm (0.25 in.)	N/A	1.27 cm (0.5 in.)	3.50 cm (1.38 in.)	0.64 cm (0.25 in.)
Overall Size (LWH)	35.3 × 5.0 × 12.4 cm (13.9 × 2.0 × 4.9 in.)	25.5 × 23.2 × 15.5 cm (10.04 × 9.13 × 6.10 in.)	3.20 × 3.20 × 0.97 cm (1.26 × 1.26 × 0.38 in.)	7.72 × 7.72 × 52.86 cm. (3.04 × 3.04 × 20.81 in.)	8.94 × 8.94 × 64.14 cm (3.52 × 3.52 × 25.25 in.)	3.89 × 3.89 × 21.44 cm (1.53 × 1.53 × 8.44 in.)
Weight	1.6 kg (3.5 lb)	5.4 kg (11.9 lb)	0.014 kg (0.031 lb)	1.0 kg (2.2 lb)	3.5 kg (7.7 lb)	0.4 kg (0.9 lb)
Power Requirements	12 VDC, 2.5 A	115/ 230 VAC, 0.2/0.1 A, 50 or 60 Hz	None			
Classifier Compatible	3082	No				3082
User Cleanable	Yes		No	Yes		
User Serviceable	No	Yes	No			

* Used exclusively in the Model 3480 Electrospray

** The "A" designation indicates that the neutralizer has higher activity than the "non-A" neutralizer model: double the activity for the 3054 A, and five times more activity for the 3012A and 3077A.

***In other words, the half-life for radioactive sources, and the continuous-use life for non-radioactive sources.

Neutralizer Selection Criteria

Neutralizer	Description
3088	The 3088 is a non-radioactive alternative to the 3077/3077A models. The 3088 uses electricity to stimulate "soft" x-ray emissions. The 3088 is powered directly from the Model 3082 (Electrostatic Classifier) or Model 3938 (Scanning Mobility Particle Sizer™ Spectrometer), but also includes an external power adapter for applications not involving one of these instruments (e.g., the Model 3150 and Model 3160). The 3088 has a safety key switch and external power button to prevent accidental activation. Turning the neutralizer off when not in use greatly extends its useable lifetime.
MSP 1090	The MSP 1090 is a non-radioactive, user-serviceable, general-purpose aerosol neutralizer for low-flow rate aerosol generation and measurement applications. It uses a high-voltage AC corona discharge to impart an equilibrium charge distribution to the aerosol.
348002	The 348002 is used exclusively in Model 3480 Electrospray Aerosol Generator. It is an alpha (α) particle emitter (helium-4 nuclei), particles with charge +2e. Po-210 is the parent nuclide.
3012	The Model 3012 neutralizer is TSI's mid-range offering. It is suited for moderate flow rates and aerosol concentrations, and is very often used in aerosol generation applications. The inlet and outlet have screens to prevent ingress of debris or very large particles during aerosol generation. The 3012 neutralizer is a beta (β^-) emitter, meaning that it produces free electrons (charge -1e). Krypton-85 is the parent nuclide.
3012A	The 3012A has five times the activity of the 3012, and so is best suited for applications with high concentrations and/or charge states, or applications in the upper end of the flow range of the 3012. The 3012a is also a beta emitter.
3054	The 3054 is the largest flow capacity neutralizer in TSI's lineup. It is best suited for aerosol generation applications with high concentrations and/or very high flow rates. Like the 3012/3012A, it is also a beta emitter.
3054A	The 3054A has twice the activity of the 3054, and so is best suited for applications with very high concentrations and/or charge states, or applications in the upper end of the flow range of the 3054. Like the 3054, it is a beta emitter.
3077	This model is designed to fit the Model 3082 Electrostatic Classifier, all Model 3938 Scanning Mobility Particle Size Spectrometers, and the model 3150 and 3160 automated filter testing systems. The 3077 is best suited to low flow rate applications with moderate aerosol concentrations. The 3077 neutralizer is also a beta emitter.
3077A	The 3077A has five times the activity of the 3077, and so is best suited for applications with high concentrations and/or charge states, or applications in the upper end of the flow range of the 3077. Like the 3077, it is a beta emitter.

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