

Choosing the Right Aerosol Charge Conditioner



Application Note AN-001 (US)



Model 3088



Model 3012/3012A



Model ACC-EL2-63



Model 348002



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 charge conditioner (historically called “neutralizer”) ensures that particles reach an equilibrium charge distribution.

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

<https://tsi.com/products/aerosol-neutralizers>

Table 1**Charge Conditioner Specification Comparison**

Specifications	3088	348002*	3012/3012A**	3077/3077A**	ACC-EL2-63
					
Source	Soft X-ray	Po-210	Kr-85		Ni-63
Emission	X-Ray	Alpha Decay	Beta Decay		
Radioactivity	N/A	185 MBq (5 mCi)	74/370 MBq (2/10 mCi)		< 100 MBq (2.7 mCi) (90-95 MBq / 2.4 – 2.6 mCi Typ.)
Life Expectancy, Continuous Use***	8760 hours	138 days	10.7 years		10 years
Maximum Flow Rate	5 L/ min	N/A	50 L/ min	5 L/ min	
Maximum Temperature	33°C (91°F)	150°C (302°F)	50°C (122°F)		
Maximum Pressure	70 kPa (10 psig)				Ambient****
Maximum Concentration	The maximum recommended concentration for all charge conditioners is 10 ⁷ #/cm3. Aerosols with a high charge level may require a concentration limit for satisfactory performance.				
Housing Material	Stainless Steel	Aluminum	Anodized Aluminum	Stainless Steel	Nickel-Plated Aluminum
Inlet Diameter	0.64 cm (0.25 in.)	N/A	1.27 cm (0.5 in.)	0.64 cm (0.25 in.)	
Outlet Diameter	0.64 cm (0.25 in.)	N/A	1.27 cm (0.5 in.)	0.64 cm (0.25 in.)	
Overall Size (LWH)	35.3 × 5.0 × 12.4 cm (13.9 × 2.0 × 4.9 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.)	3.89 × 3.89 × 21.44 cm (1.53 × 1.53 × 8.44 in.)	
Weight	1.6 kg (3.5 lb)	0.014 kg (0.031 lb)	1.0 kg (2.2 lb)	0.4 kg (0.9 lb)	
Power Requirements	12 VDC, 2.5 A	None			
Classifier Compatible	3082	No		3082	
User Cleanable	Yes	No	Yes		
User Serviceable	No				

* Used exclusively in the Model 3480 Electrospray

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

***Usually the half-life for radioactive sources, and the continuous-use life for non-radioactive sources. The exception is the ACC-EL2-63, which has a recommended service life of 10 years due to the low activity, compared to Ni-63's half life of 100.8 years.

****Slight negative pressures can be tolerated

Charge Conditioner Selection Criteria

Charge conditioner	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 3160). The 3088 has a safety key switch and external power button to prevent accidental activation. Turning the charge conditioner off when not in use greatly extends its useable lifetime.
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 charge conditioner is TSI's higher-flow 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 charge conditioner 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.
3077	This model is designed to fit the Model 3082 Electrostatic Classifier, all Model 3938 Scanning Mobility Particle Size Spectrometers, and the model 3160 automated filter testing system. The 3077 is best suited to low flow rate applications with moderate aerosol concentrations. The 3077 charge conditioner 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.
ACC-EL2-63	A drop-in replacement for the 3077 and 3077A charge conditioners for applications where regulatory burdens make Kr-85 impractical, such as for ambient monitoring. The Nickel 63 beta source is solid-state, with no moving parts or gases or liquids, has no gamma (γ) emissions, and has optimized geometry for uniform residence time across particle sizes. Designed and manufactured by Atmose, Ltd.

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