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Zeta-Plus™ EC Series Purifier filter cartridges

Zeta Plus™ EC purifiers are high capacity purifiers designed to remove metallic ion contaminants such as Ca, Fe and Na from photoresists, solvents, ink jet and wastewater applications in a single pass.

The purifiers offer unique advantages in contaminant reduction because of enhanced electro-kinetic properties. Since most suspended particles have a negative charge, the strong positive electro-kinetic charge of Zeta Plus EC enables the adsorption of contaminants that are too small for removal by mechanical straining. The Scanning Electron Micrograph (SEM) in picture 1 illustrates the enhanced particle removal mechanism.

Superior metals reduction capacity provided by Zeta Plus EC filters

Zeta Plus EC Purifiers contain charge technology that captures trace metals (see tables 1 and 2) such as Ca, Fe and Na to low parts per billion levels in single pass or recirculation mode applications.

Unlike competitive purifiers that only contain purification technologies on the surface of the media, Zeta Plus EC Purifiers are able to capture ionic contaminants throughout the entire depth of the media. This design provides a more efficient means of purification per surface area while increasing flow and lifetime.



Features and benefits

Zeta Plus EC charged media

- Reduction trace metals to low digit ppb levels
- Superior metal reduction capacity, lower cost-of-ownership
- Reduced residence time compared to ion exchange column

Graded density construction

- Large surface area increases contact time between the fluid and reactive sites of the purifier
- Increased purifier lifetimes

Wide range of configurations

- Allows for the same purification media to be used during laboratory, pilot and full production scale-up
- Low hold-up volume disk filters allow material suppliers to perform testing in a rapid and cost-effective manner

Low cartridge extractables

- Excellent downstream cleanliness

Quality manufacturing

- ISO Quality Management System
- Repeatable and reliable performance

Applications

Photoresists

Waste water

Resins

Solvents

Ancillary chemicals

Ink jet



Picture 1
SEM illustrates the enhanced particle removal mechanism

Table 1: Single-pass metals removal from PGMEA			
Metal	Detection limit (ppb)	Influent level (ppb)	Effluent level (ppb)
Ca	10	1160	< Detection limit
Fe	10	838	< Detection limit
Na	10	902	20

Table 2: Single-pass metals removal from ECA			
Metal	Detection limit (ppb)	Influent level (ppb)	Effluent level (ppb)
Ca	10	590	< Detection limit
Fe	10	230	< Detection limit
Na	10	850	< Detection limit

Zeta Plus EC extractables

The purifier's clean materials of construction provides little to no contribution of ionic or organic contaminants to the process chemical. Ionic and organic contaminants can extract from other filter materials, which may change the photo-speed, viscosity or molecular weight of the chemical. An extractable test was performed to determine the amount of contaminants extracted from PGMEA and the results were quantified using a Graphite Furnace Atomic Absorption Spectrometer (see table 3).

Table 3 : Extractable Metals Content of Zeta Plus EC in PGMEA		
Metal	Detection limit (ppb)	Effluent level (ppb)
Ca	4.0	< Detection limit
Cr	2.0	< Detection limit
Cu	1.0	< Detection limit
Fe	5.0	< Detection limit
K	1.0	< Detection limit
Na	5.0	< Detection limit

Zeta Plus EC purifier scale-up

For laboratory and pilot scale testing, 3M offers low hold-up volume Zeta Plus EC purifier disks (47 mm, 90 mm, 142 mm) and housings to allow end users to assess parameters such as material compatibility, photo-speed and trace metals removal in a rapid and cost effective manner. The compact size allows for easy replacement and installation of purification media while reducing the waste of expensive chemicals. Zeta Plus EC purifier disks contain the same filter media as full-size Zeta Plus EC purifier cartridges, ensuring repeatable and reliable performance throughout laboratory, pilot and full production testing. This makes the scale-up process simple, linear and predictable.

In full scale production, Zeta Plus EC is offered in cartridge diameter sizes of 8", 12" and 16" providing up to 3.4 m² of surface area in a single cartridge. Zeta Plus housings can vertically accommodate 1, 2, 3 or 4 Zeta Plus EC cartridges, allowing the end user to tailor the filtration system to their required flow rate.

Zeta Plus EC purifier lifetime

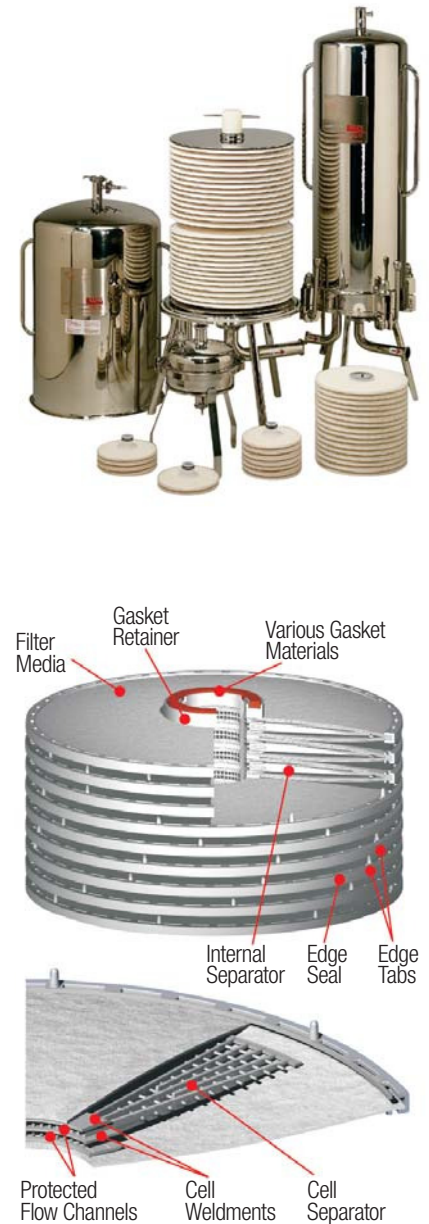
The lifetime of the purifier will vary based on the ionic contamination loading in the fluid, the batch or bath size and the desired metal effluent specification. As a result, the purifier should be sized based on the desired flow rate for the application. 3M recommends 0.95 lpm flow rate per 0.09 m² of Zeta Plus EC media for a 1 cPs fluid and 0.38 lpm flow rate per 0.09 m² of Zeta Plus EC media for 10 cPs fluids. Table 4 provides the cartridge configurations, dimensions, surface area and recommended flow rate for each Zeta Plus EC purifier cartridge.

Table 4: Extractable Metals Content of Zeta Plus™ EC in PGMEA

Catalogue number	Maximum flow rate for 1 cPs fluids (lpm)	Maximum flow rate for 10 cPs fluids (lpm)
Z8F (8" - 2-cell)	0.87	0.34
45167 (8" - 7-cell)	2.9	1.17
45109 (8" - 8-cell)	3.3	1.32
45244-01 (12" - 9-cell)	8.5	3.41
45237-01 (12" - 12-cell)	11.4	4.54
45245-01 (12" - 16-cell)	15.1	6.06
Z16P (16" - 14-cell)	35.0	14.01

Table 5: Product specifications

Catalogue number	Nominal diameter (mm)	Height (mm)	Media surface area (mm)
Z8F (8" - 2-cell)	203	88	0.08
45167 (8" - 7-cell)	203	168	0.28
45109 (8" - 8-cell)	203	170	0.32
45244-01 (12" - 9-cell)	273	195	0.84
45237-01 (12" - 12-cell)	273	273	1.1
45245-01 (12" - 16-cell)	273	273	1.5
Z16P (16" - 14-cell)	406	273	3.4
Maximum operating temperature	80 °C		



Picture 2
Zeta Plus™ EC construction

US Zeta Plus™ EC purifier filter cartridge series - Ordering guide

Zeta Plus™ - SOE cartridge	O-ring material	Packaging	Media grade
Z8FA2NP (8" - 2-cell plug-in)	A - Silicone	2 - 2 per pack	020EC - 0.2 µm
	B - Fluorocarbon		050EC - 0.5 µm
	C - EPR		080EC - 0.8 µm
	D - Nitrile		150EC - 1.5 µm
	K - PTFE-encapsulated fluorocarbon		

Zeta Plus™ - SOE cartridge	O-ring material	Media grade
45167-21 (8" - 7-cell)	A - Silicone	020EC - 0.2 µm
	B - Fluorocarbon	050EC - 0.5 µm
	C - EPR	080EC - 0.8 µm
	D - Nitrile	150EC - 1.5 µm
	K - PTFE-encapsulated fluorocarbon	

Zeta Plus™ - DOE cartridge	O-ring material	Media grade
45109-21 (8" - 8-cell)	A - Silicone	020EC - 0.2 µm
	B - Fluorocarbon	050EC - 0.5 µm
	C - EPR	080EC - 0.8 µm
	D - Nitrile	150EC - 1.5 µm
	E - PTFE	

Zeta Plus™ - DOE cartridge	O-ring material	Media grade
45244-01 (12" - 9-cell)	A - Silicone	020EC - 0.2 µm
45237-01 (12" - 12-cell)	B - Fluorocarbon	050EC - 0.5 µm
45245-01 (12" - 16-cell)	C - EPR	080EC - 0.8 µm
Z16P (16" - 14-cell)	D - Nitrile	150EC - 1.5 µm
	E - PTFE	

US Zeta Plus™ EC purifier disk series - Ordering guide

Configuration	Media grade
B0204 (47 mm disk)	020EC - 0.2 µm
B0406 (90 mm disk)	050EC - 0.5 µm
B0611 (142 mm disk)	080EC - 0.8 µm
	150EC - 1.5 µm

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B0204 020EC	45244-01-A-020EC	Z16P-A-020EC
B0204 050EC	45244-01-A-050EC	Z16P-A-050EC
B0204 080EC	45244-01-A-080EC	Z16P-A-080EC
B0204 150EC	45244-01-A-150EC	Z16P-A-150EC
B0406 020EC	45244-01-B-020EC	Z16P-B-020EC
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B0406 080EC	45244-01-B-080EC	Z16P-B-080EC
B0406 150EC	45244-01-B-150EC	Z16P-B-150EC
B0611 020EC	45244-01-C-020EC	Z16P-C-020EC
B0611 050EC	45244-01-C-050EC	Z16P-C-050EC
B0611 080EC	45244-01-C-080EC	Z16P-C-080EC
B0611 150EC	45244-01-C-150EC	Z16P-C-150EC
	45244-01-D-020EC	Z16P-D-020EC
Z8FA2NP A 2	45244-01-D-050EC	Z16P-D-050EC
Z8FA2NP B 2	45244-01-D-080EC	Z16P-D-080EC
Z8FA2NP C 2	45244-01-D-150EC	Z16P-D-150EC
Z8FA2NP D 2	45244-01-E-020EC	Z16P-E-020EC
Z8FA2NP E 2	45244-01-E-050EC	Z16P-E-050EC
45167-21-A 020EC	45244-01-E-080EC	Z16P-E-080EC
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45167-21-C 150EC	45237-01-C-050EC	
45167-21-D 020EC	45237-01-C-080EC	
45167-21-D 050EC	45237-01-C-150EC	
45167-21-D 080EC	45237-01-D-020EC	
45167-21-D 150EC	45237-01-D-050EC	
45167-21-K 020EC	45237-01-D-080EC	
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45167-21-K 150EC	45237-01-E-050EC	
45109-21 A 020EC	45237-01-E-080EC	
45109-21 A 050EC	45237-01-E-150EC	
45109-21 A 080EC	45245-01-A-020EC	
45109-21 A 150EC	45245-01-A-050EC	
45109-21 B 020EC	45245-01-A-080EC	
45109-21 B 050EC	45245-01-A-150EC	
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