

Zeta Plus™ ZA Series

Depth Filter Cartridges & Capsules

Zeta Plus ZA Series filter media are a family of advanced depth filters designed to provide optimal clarification of bioprocess, biological and pharmaceutical fluids. Zeta Plus ZA Series filter medium is composed of pre-extracted inorganic filter aid, cellulose and a proprietary resin system that imparts a strong positive charge to the filter matrix, aiding its adsorption of negatively charged contaminants. This premium-grade medium has been specifically designed for processes that require a high degree of filtration and low metal ion extractables.

Applications

Zeta Plus ZA Series filter media are optimized for clarification of bioprocess cell culture fluids and for removal of negatively charged contaminants. In solution, cells and cellular debris, endotoxins and contaminating nucleic acids (DNA, RNA) carry a negative charge. 3M Purification Inc.'s proprietary application of positive zeta potential to Zeta Plus ZA Series filter media creates a filter matrix that enhances the capture of negatively charged contaminants for maximum filtration performance. The strong positive charge over a broad pH range make Zeta Plus ZA Series filters ideal for cell broth clarification and for protection of downstream membrane filters.

Superior Particle Removal

Zeta Plus ZA filter medium offers unique advantages in contaminant removal because of its strong electrokinetic properties. In addition to the mechanical exclusion of particles by its depth loading feature, Zeta Plus ZA filter medium adsorbs contaminants too small for removal by mechanical straining. Because most particles in suspension are negatively charged, virtually all contaminants can be removed with proper grade selection.

Features & Benefits

Broad pH range of strong, positively charge-modified depth filter media.

- Economical, efficient removal of negatively charged contaminants such as cell debris, colloidal material, endotoxin, DNA, RNA, and bacteria.

Pre-extracted inorganic filter aid.

- Low extractables, fast rinse up.

FDA Drug Master File and USP Class VI Biological Safety.

- Eases validation and regulatory submissions by providing vital documentation and traceability.

Full range of cartridge and capsule configurations.

- Full range of scaleable configurations from bench top to production.

Easy to install filter cartridges.

- Easy to use, reduces labor costs, positive sealing mechanism.



Applications

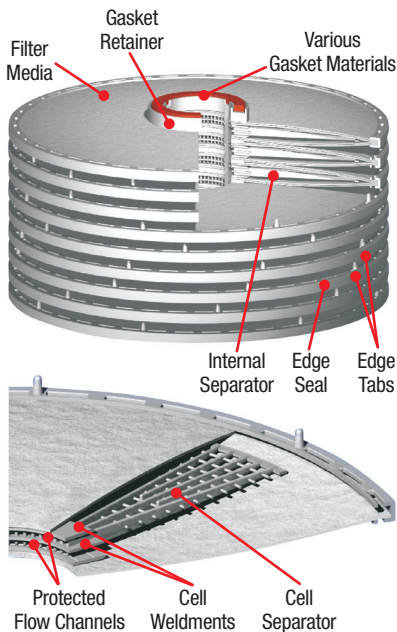
Clarification of cell culture process fluids

Clarification of bacteria and yeast cell lysates

Protection of downstream processes including membrane (0.2, 0.1 micron) filters, TFF systems and chromatography columns

Endotoxin and nucleic acid removal

Clarification of colloidal and haze forming contaminants

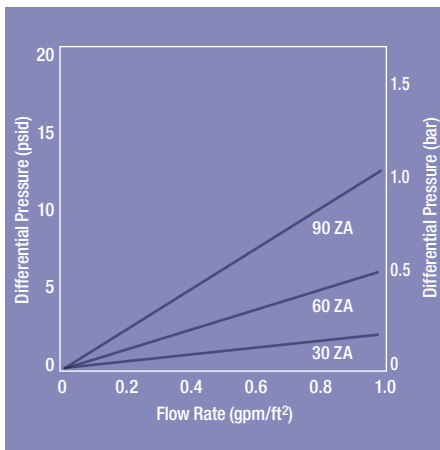


Above: Individual cells of Zeta Plus ZA Series filter medium are constructed using polypropylene molded edge seals and separators for high performance.



Above: Zeta Plus BC Capsule filters are ideal for pilot scale and low volume applications.

Flow vs. Differential Pressure



Cartridge Construction

Zeta Plus ZA Series cartridges are designed for use with Zeta Plus sanitary style stainless steel filter housings. Cartridges are constructed from individual cells of Zeta Plus ZA Series filter medium assembled together with polypropylene separators under predetermined compression and unitized by three, 316 stainless steel bands. Each cell is constructed using polypropylene molded edge seals and separators for high performance. Various gasket materials are available depending upon application. Filter cartridges are available in 8, 12 and 16-inch diameters, with surface area ranging from 0.7 ft² to 42.2 ft² per cartridge.

Capsule Construction

Zeta Plus ZA Series filter media are available in ready to use, fully disposable BC capsules. The BC Series capsules are completely encapsulated disposable filters for small volume biological, bioprocess and pharmaceutical filtration. BC capsules are auto-clavable and available in three sizes (25, 650, 1300 cm² filtration area) to provide a high degree of application flexibility.

Flow Rates

The flow rate graph below displays flow rates obtained with 20°C clean water.

Optimum flow rates vary by application, but in general, the flow rate per unit area (flux) should not exceed 0.25 gpm/ft² (10 lpm/m²) of filter media for best performance. Lower flux rates often result in longer service life, greater throughputs and superior system economics.

Grade Selection

Zeta Plus ZA Series filter media are available in three grades. The chart on the facing page is provided as a guide to proper grade selection based on nominal retention ratings and can be used in conjunction with the recommendations in Table 1 to determine the appropriate filter grade for your application. Operating conditions and the fluid being filtered, impact retention performance. 3M Purification Inc. recommends small-scale pilot runs with BC capsules to confirm grade selection prior to scale-up. 3M Purification Inc.'s Scientific Applications Support Services (SASS) staff can assist in grade selection as well as assist in on-site evaluations. Filter system optimization can also be conducted at 3M Purification Inc.'s laboratory facilities.

Table 1: Application Recommendations

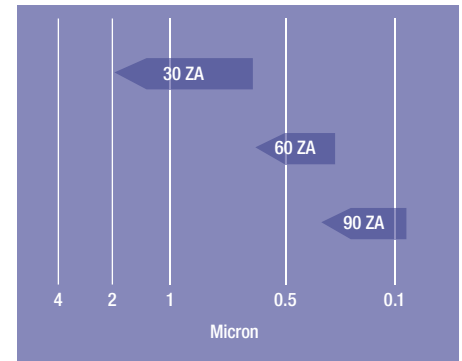
Application	Recommended Grades
Mammalian cell separation	30 ZA, 60 ZA, 90 ZA
Bacteria, yeast cell separation	30 ZA, 60 ZA
TFF, membrane protection	30 ZA, 60 ZA
Endotoxin, nucleic acid removal	60 ZA, 90 ZA
General clarification	30 ZA, 60 ZA

Table 1 is intended as a guide. Grade selection and performance should be confirmed with small-scale pilot trials.

Recommended Operating Parameters

Maximum Operating Pressure	BC25 Capsules: 40 psig maximum inlet pressure, 35 psi maximum capsule pressure drop BC1000/2000 Capsules: 80 psig @25°C, 40 psig @ 60°C maximum inlet pressure; 35 psid maximum capsule pressure drop. Standard Zeta Plus Cartridges: 35 psid maximum cartridge pressure drop
Maximum Operating Temperature	BC25 Capsules: 40°C BC1000/2000 Capsules: 60°C Standard Zeta Plus Cartridges: 82°C
Recommended Pre-use Rinse	1.3 gal/ft² at 0.5 gpm/ft², 54 l/m² at 20 lpm/m²
Sterilization Parameters	BC25 Capsules: autoclave, 30 minutes @121°C (1 cycle) BC1000/2000 Capsules: autoclave, 30 minutes @121°C (up to 3 cycles) Standard Zeta Plus Cartridges: autoclave or <i>in-situ</i> steam sterilization, 1 hour @121°C
Recommended Flow Rates	BC25 Capsules: 3-30 ml/min BC1000 Capsules: 0.1 gpm (0.4 lpm) BC2000 Capsules: 0.2 gpm (0.8 lpm) Standard Zeta Plus Cartridges: 0.25 gpm/ft² (10.2 lpm/m²)

Nominal Retention Ratings



Effective Filtration Area

Cartridge Configuration	Surface Area
BC25 Capsule	3.9 in² (25 cm²)
BC1000 Capsule	0.7 ft² (650 cm²)
BC2000 Capsule	1.4 ft² (1300 cm²)
45109 (8" diameter cartridge, 8-cell)	2.8 ft² (0.26 m²)
45167 (8" diameter cartridge, 7-cell, o-ring plug-in)	2.5 ft² (0.23 m²)
Z8FA2NPX2 (8" diameter, 2-cell plug-in)	0.7 ft² (650 cm²)
Z8FA4NPX2 (8" diameter, 4-cell plug-in)	1.4 ft² (1300 cm²)
45237 (12" diameter cartridge, 12-cell)	12.3 ft² (1.1 m²)
45245 (12" diameter cartridge, 16-cell)	16.4 ft² (1.5 m²)
Z16P (16" diameter cartridge, 14-cell)	34.7 ft² (3.2 m²)
Z16H* (16" diameter cartridge, 17-cell)	42.2 ft² (3.9 m²)

*60, 90 grades only

Sanitary Housings

3M Purification Inc. provides a wide array of standard and specially designed sanitary filter housings to hold Zeta Plus ZA Series filter cartridges. All housings are designed with the pharmaceutical and bioprocessing industries in mind and feature 316L mirror-polished surfaces and easy-to-clean components, along with accessories such as CIP spray-balls and the innovative Zeta Plus Lifting Device.



Zeta Plus™ ZA Series Ordering Guide

8" Diameter Cartridges

Catalog Number	Gasket Material	Grade
45109 (8" 8-cell)	11 - Nitrile 13 - Fluorocarbon 14 - EPR 22 - Silicone	30 ZA 60 ZA 90 ZA
45167 (8" 7-cell, O-ring plug-in)	01 - Nitrile 02 - EPR 03 - Fluorocarbon 04 - Silicone	

12" Diameter Cartridges

Catalog Number	Geometric Variation	Gasket Material	Grade
45244 (12" 9-cell) 45237 (12" 12-cell) 45245 (12" 16-cell)	01 - Standard polypropylene	A - Silicone B - Fluorocarbon C - EPR D - Nitrile	30 ZA 60 ZA 90 ZA

BC Capsules

Catalog Number	Grade
BC0025L (Luer) BC0025S (Sanitary) BC1000A (Single Filter) BC1000B (3 Filter Pack) BC2000A (Single Filter) BC2000B (3 Filter Pack)	30 ZA 60 ZA 90 ZA

8" Diameter Cartridges

Catalog Number	Gasket Material	Package Code	Grade
Z8FA2NP (8" 2-cell plug-in) Z8FA4NP (8" 4-cell plug-in)	A - Silicone B - Fluorocarbon C - EPR D - Nitrile	2	30 ZA 60 ZA 90 ZA

16" Diameter Cartridges

Catalog Number	Gasket Material	Grade	Opt. Lifting Handle*
Z16P (16" 14-cell)	A - Silicone B - Fluorocarbon C - EPR D - Nitrile	30 ZA 60 ZA 90 ZA	H
Z16R (16" 14-cell) Hastelloy® bands			
Z16H (16" 17-cell)	A - Silicone B - Fluorocarbon C - EPR D - Nitrile	30 ZA (16 cells) 60 ZA (17 cells) 90 ZA (17 cells)	H
Z16T (16" 17-cell) Hastelloy® bands			

*Omit "H" from part number if lifting handle is not required

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