

Zeta Plus[®] ZA Series

Depth Filter Cartridges



Fluid Purification



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 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 patented,* 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. CUNO's proprietary application of positive zeta potential to 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 ZA Series Zeta Plus filters ideal for cell broth clarification and for protection of downstream membrane filters. Applications include:

- 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

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 scalable configurations from bench top to production.
■ Easy to install filter cartridges.	■ Easy to use, reduces labor costs, positive sealing mechanism.

*U.S. Patent Numbers 4,981,591; 5,085,780; and 5,085,784

Cartridge Construction

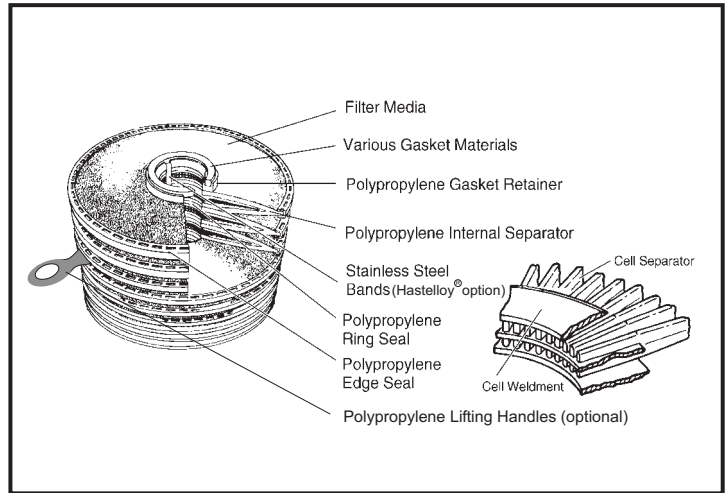
Zeta Plus ZA Series cartridges are designed for use with CUNO Zeta Plus sanitary style stainless steel filter housings. Cartridges are constructed from individual cells of Zeta Plus ZA filter medium assembled together with polypropylene separators under predetermined compression and unitized by three, 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 0.9 ft² to 45 ft² per cartridge.

Capsule Construction

Zeta Plus ZA Series filter media are available in ready to use, fully disposable BioCap™ capsules. The BioCap Series capsules are completely encapsulated disposable filters for small volume biological, bioprocess and pharmaceutical filtration. BioCap capsules are auto-clavable and available in three sizes (27, 800, 1600 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.



Cell separator - U.S. Patent Number 4,783,262

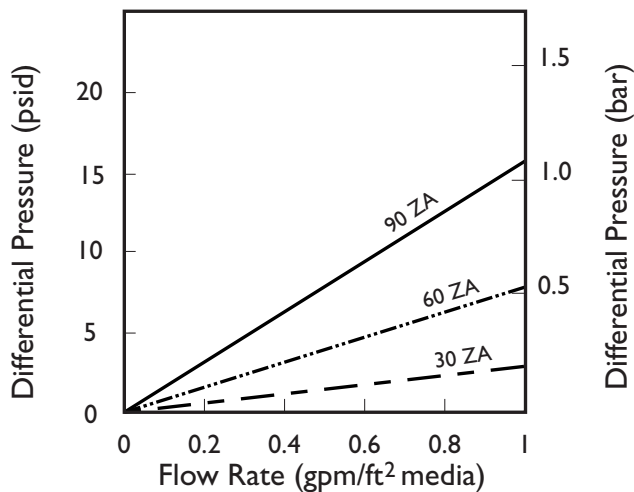
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Above: Individual cells of Zeta Plus ZA filter medium are constructed using polypropylene molded edge seals and separators for high performance.

Left: Zeta Plus BioCap filters are ideal for pilot scale and low volume applications.

Flow vs. Differential Pressure



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. CUNO recommends small-scale pilot runs with BioCap capsules to confirm grade selection prior to scale-up. CUNO'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 CUNO's laboratory facilities.

Nominal Retention Ratings

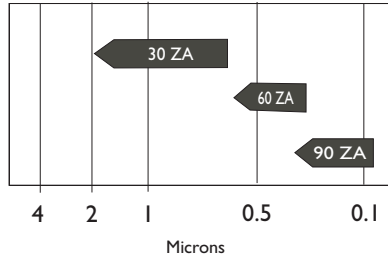


Table 1. -Application Recommendations

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.

Nominal Cartridge Surface Area

BioCap 30 Capsule	4.2 in ² (27 cm ²)
BioCap 1000 Capsule	0.9 ft ² (800 cm ²)
BioCap 2000 Capsule	1.7 ft ² (1600 cm ²)
45109 (8" diameter cartridge, 8-cell)	3.5 ft ² (0.32 m ²)
45167 (8" diameter cartridge, 7-cell O-ring plug-in)	3.0 ft ² (0.28 m ²)
Z8FA2NPX2 (8" diameter, 2-cell plug-in)	0.9 ft ² (0.08 m ²)
Z8FA4NPX2 (8" diameter, 4-cell plug-in)	1.7 ft ² (0.16 m ²)
45237 (12" diameter cartridge, 12-cell)	12 ft ² (1.1 m ²)
45245 (12" diameter cartridge, 16-cell)	16 ft ² (1.5 m ²)
Z16P (16" diameter cartridge, 14-cell)	37 ft ² (3.4 m ²)
Z16H (16" diameter cartridge, 17-cell)	45 ft ² (4.1 m ²) 60, 90 grades only

Recommended Operating Parameters

Maximum Operating Pressure	BioCap 30 Capsules: 50 psig maximum inlet pressure, 35 psig maximum capsule pressure drop
	BioCap 1000/2000 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	BioCap 30 Capsules: 40°C
	BioCap 1000/2000 Capsules: 60°C
	Standard Zeta Plus Cartridges: 82°C
Recommended Pre-use Rinse	1.3 gal/ft ² at 0.5 gpm/ft ² , 50 l/m ² at 20 lpm/m ²
Sterilization Parameters	BioCap 30 Capsules: autoclave, 30 minutes @121°C (1 cycle)
	BioCap 1000/2000 Capsules: autoclave, 30 minutes @121°C (up to 3 cycles)
	Standard Zeta Plus Cartridges: autoclave or in-situ steam sterilization, 1 hour @121°C
Recommended Flow Rates	BioCap 30 Capsule: 0.123 gpm/ft. ² , 14 ml/min
	BioCap 1000 Capsule: 0.1 gpm (0.4 lpm)
	BioCap 2000 Capsule: 0.2 gpm (0.8 lpm)
	Standard Zeta Plus Cartridges: 0.25 gpm/ft ² (4.9 lpm/m ²)

Sanitary Housings

CUNO 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-Grip™ cartridge lifting device.



Zeta Plus ZA Series Ordering Guide

8" Diameter Cartridges

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

8" Diameter Cartridges

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

12" Diameter Cartridges

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

16" Diameter Cartridges

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

BioCap Series Ordering Guide

Catalog Number	Grade
BC0030A (Single Filter)	30 ZA
BC0030B (10 Filter Pak)	60 ZA
BC1000A (Single Filter)	90 ZA
BC1000B (3 Filter Pak)	
BC2000A (Single Filter)	
BC2000B (3 Filter Pak)	

*Omit "H" from part number if lifting handle is not required
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Your local CUNO distributor is:

WARRANTY

Seller warrants its equipment against defects in workmanship and material for a period of 12 months from date of shipment from the factory under normal use and service and otherwise when such equipment is used in accordance with instructions furnished by Seller and for purposes disclosed in writing at the time of purchase, if any. Any unauthorized alteration or modification of the equipment by Buyer will void this warranty. Seller's liability under this warranty shall be limited to the replacement or repair, F.O.B., point of manufacture, of any defective equipment or part which, having been returned to the factory, transportation charges prepaid, has been inspected and determined by Seller to be defective. THIS WARRANTY IS IN LIEU OF ANY OTHER WARRANTY, EITHER EXPRESSED OR IMPLIED, AS TO DESCRIPTION, QUALITY, MERCHANTABILITY, FITNESS FOR ANY PARTICULAR PURPOSE OR USE, OR ANY OTHER MATTER. Under no circumstances shall Seller be liable to Buyer or any third party for any loss of profits or other direct or indirect costs, expenses, losses or consequential damages arising out of or as a result of any defects in or failure of its products or any part or parts thereof or arising out of or as a result of parts or components incorporated in Seller's equipment but not supplied by the Seller.

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about CUNO Products or the location of your local sales office



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