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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 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 optimised 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's 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 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 electro-kinetic 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 and 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.

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 labour costs, positive sealing mechanism.



Applications

Clarification of cell culture process fluids

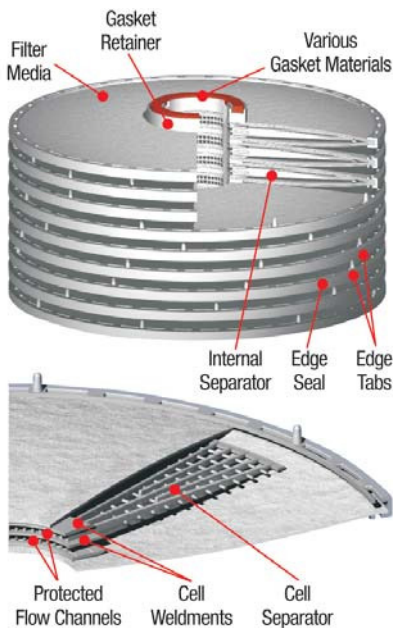
Clarification of bacteria and yeast cell lysates

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

The 3M logo, consisting of the letters '3M' in a bold, red, sans-serif font.



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

Cartridge Construction

Zeta Plus ZA Series cartridges are designed for use with 3M Purification 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 unitised by three, 316 stainless steel bands. Each cell is constructed using polypropylene moulded 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 0.065 m² (0.7 ft²) to 3.9 m² (42.2 ft²) per cartridge.

Capsule Construction

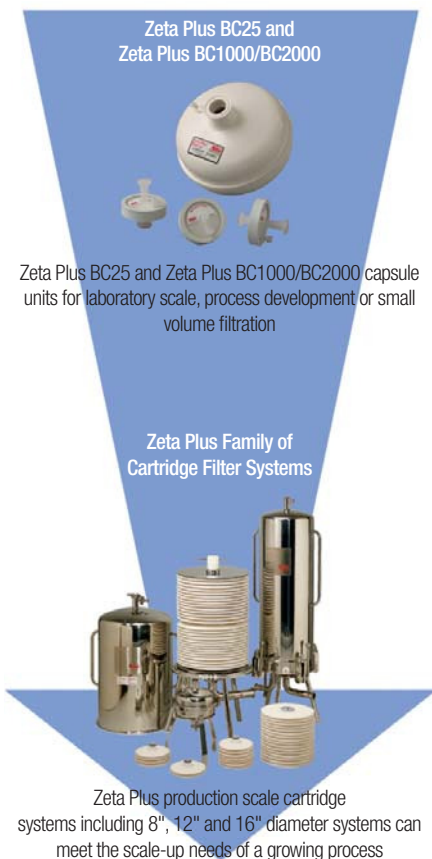
Zeta Plus ZA Series filter media are available in ready to use, fully disposable BC capsules. The BC Series capsules are completely encapsulated disposable filters for small volume biological, bioprocess and pharmaceutical filtration. BC capsules are autoclavable and available in three sizes (25, 650,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

Flow Rates

The flow rate graph on page 3 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 10 l/min/m² (0.25 gpm/ft²) 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 recommends small-scale pilot runs with BC capsules to confirm grade selection prior to scale-up. 3M Purification's Scientific Applications Support Services (SASS) staff can assist in grade selection as well as assist in on-site evaluations. Filter system optimisation can also be conducted at 3M's laboratory facilities.



Zeta Plus BC25 and Zeta Plus BC1000/BC2000 capsule units for laboratory scale, process development or small volume filtration

Zeta Plus Family of Cartridge Filter Systems

Zeta Plus production scale cartridge systems including 8", 12" and 16" diameter systems can meet the scale-up needs of a growing process

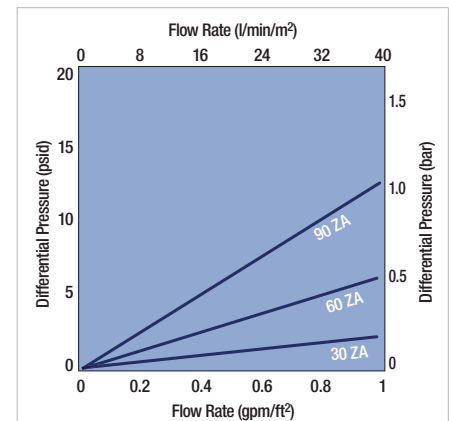
| Application | Recommended Grades |
|---------------------------------|---------------------|
| Mammalian cell separation | 30 ZA, 60 ZA, 90 ZA |
| Bacteria, yeast cell separation | 30 ZA, 60 ZA |
| TFF, membrane protection | 30 ZA, 60 ZA |
| Endotoxin, nucleic acid removal | 60 ZA, 90 ZA |
| General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

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

Filter Area

| Cartridge Configuration | Surface Area |
|---|---|
| BC25 Capsule | 25 cm ² (3.9 in ²) |
| BC1000 Capsule | 650 cm ² (0.7 ft ²) |
| BC2000 Capsule | 1300 cm ² (1.4 ft ²) |
| 45109 (8" diameter cartridge, 8-cell) | 0.26 m ² (2.8 ft ²) |
| 45167 (8" diameter cartridge, 7-cell, o-ring plug-in) | 0.23 m ² (2.5 ft ²) |
| Z8FA2NPX2 (8" diameter, 2-cell plug-in) | 650 cm ² (0.7 ft ²) |
| Z8FA4NPX2 (8" diameter, 4-cell plug-in) | 1300 cm ² (1.4 ft ²) |
| 45237 (12" diameter cartridge, 12-cell) | 1.1 m ² (12.3 ft ²) |
| 45245 (12" diameter cartridge, 16-cell) | 1.5 m ² (16.4 ft ²) |
| Z16P (16" diameter cartridge, 14-cell) | 3.2 m ² (34.7 ft ²) |
| Z16H* (16" diameter cartridge, 17-cell) | 10.2 m ² (42.2 ft ²) |

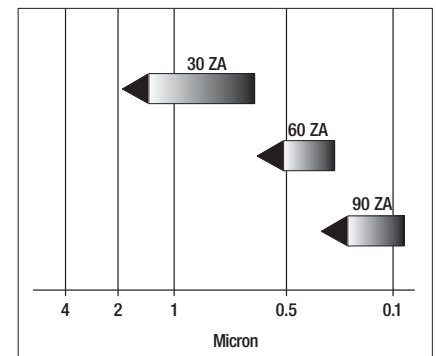
* 60, 90 grades only



Above: Graph Flow versus Differential Pressure

Operating Parameters

| | Maximum Operating Pressure | Maximum Operating Temperature | Recommended Flush | Sterilisation Parameters | Maximum Flow Rate (FLUX) (in l/min per m ²) |
|--|--|-------------------------------|--|--|---|
| Standard and Special pre-coat Zeta Plus Cartridges | 2.4 bar | 82 °C | 54 l/m ² at 20 lpm/m ² | autoclave or <i>in-situ</i> steam sterilisation for 1 hour at 121 °C | 4.9 |
| Zeta Plus BC25 Capsules | Inlet pressure: 2.75 bar Media pressure: 2.4 bar | 40 °C | 54 l/m ² at 20 lpm/m ² | Autoclave for 30 minutes at 121 °C (1 cycle) | 0.003 to 0.3 |
| Zeta Plus BC1000 and BC2000 Series Capsules | Inlet pressure: 5.5 bar at 25 °C 2.75 bar at 60 °C Media pressure: 2.4 bar | 60 °C | 54 l/m ² at 20 lpm/m ² | Autoclave for 30 minutes at 121 °C (up to 3 cycles) | BC1000: 0.4 BC2000: 0.8 |



Above: Chart Nominal Retention Rates

Sanitary Housings

3M Purification 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 Zeta Plus Cartridge Lifting Device.



Zeta-Plus™ ZA Series

Depth Filter Cartridges & Capsules

US Zeta Plus ZA Series Ordering Guide

8" Diameter Cartridges

| Catalogue 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 | |

8" Diameter Cartridges

| Catalogue 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 |

12" Diameter Cartridges

| Catalogue 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 |

16" Diameter Cartridges

| Catalogue 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

Zeta Plus BC Capsules

| Catalogue 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 |

Important Notice

3M Purification MAKES NO WARRANTIES, EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. Since a variety of factors can affect the use and performance of a 3M Purification product in a particular application, some of which are uniquely within the user's knowledge and control, user is responsible for determining whether or not the 3M Purification product is fit for a particular purpose and suitable for user's method of application.

Limited Warranty

3M Purification warrants this product to be free from defects in material and workmanship during normal use for a period of one (1) year from the date of shipment from the factory. If the Product(s) is (are) defective within this warranty period, your exclusive remedy and 3M Purification's sole obligations shall be, at 3M Purification's option, to replace or repair the Product(s) or refund the original purchase price of the Product(s). This warranty does not apply to failures that result from abuse, misuse, alteration or damage not caused by 3M Purification or failure to properly follow installation and use instructions.

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| | |
|-------------------|---------------|
| 45109 11 30 ZA | Z16P A 30 ZA |
| 45109 11 60 ZA | Z16P A 60 ZA |
| 45109 11 90 ZA | Z16P A 90 ZA |
| 45109 13 30 ZA | Z16P B 30 ZA |
| 45109 13 60 ZA | Z16P B 60 ZA |
| 45109 13 90 ZA | Z16P B 90 ZA |
| 45109 14 30 ZA | Z16P C 30 ZA |
| 45109 14 60 ZA | Z16P C 60 ZA |
| 45109 14 90 ZA | Z16P C 90 ZA |
| 45109 22 30 ZA | Z16P D 30 ZA |
| 45109 22 60 ZA | Z16P D 60 ZA |
| 45109 22 90 ZA | Z16P D 90 ZA |
| 45167 01 30 ZA | Z16R A 30 ZA |
| 45167 01 60 ZA | Z16R A 60 ZA |
| 45167 01 90 ZA | Z16R A 90 ZA |
| 45167 02 30 ZA | Z16R B 30 ZA |
| 45167 02 60 ZA | Z16R B 60 ZA |
| 45167 02 90 ZA | Z16R B 90 ZA |
| 45167 03 30 ZA | Z16R C 30 ZA |
| 45167 03 60 ZA | Z16R C 60 ZA |
| 45167 03 90 ZA | Z16R C 90 ZA |
| 45167 04 30 ZA | Z16R D 30 ZA |
| 45167 04 60 ZA | Z16R D 60 ZA |
| 45167 04 90 ZA | Z16R D 90 ZA |
| Z8FA2NP A 2 30 ZA | Z16H A 30 ZA |
| Z8FA2NP A 2 60 ZA | Z16H A 60 ZA |
| Z8FA2NP A 2 90 ZA | Z16H A 90 ZA |
| Z8FA2NP B 2 30 ZA | Z16H B 30 ZA |
| Z8FA2NP B 2 60 ZA | Z16H B 60 ZA |
| Z8FA2NP B 2 90 ZA | Z16H B 90 ZA |
| Z8FA2NP C 2 30 ZA | Z16H C 30 ZA |
| Z8FA2NP C 2 60 ZA | Z16H C 60 ZA |
| Z8FA2NP C 2 90 ZA | Z16H C 90 ZA |
| Z8FA2NP D 2 30 ZA | Z16H D 30 ZA |
| Z8FA2NP D 2 60 ZA | Z16H D 60 ZA |
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| Z8FA4NP A 2 30 ZA | Z16T A 30 ZA |
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| Z8FA4NP C 2 30 ZA | Z16T C 30 ZA |
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| Z8FA4NP D 2 30 ZA | Z16T D 30 ZA |
| Z8FA4NP D 2 60 ZA | Z16T D 60 ZA |
| Z8FA4NP D 2 90 ZA | Z16T D 90 ZA |
| 45244-01-A 30 ZA | BC0025L 30 ZA |
| 45244-01-A 60 ZA | BC0025L 60 ZA |
| 45244-01-A 90 ZA | BC0025L 90 ZA |
| 45244-01-B 30 ZA | BC0025S 30 ZA |
| 45244-01-B 60 ZA | BC0025S 60 ZA |
| 45244-01-B 90 ZA | BC0025S 90 ZA |
| 45244-01-C 30 ZA | BC1000A 30 ZA |
| 45244-01-C 60 ZA | BC1000A 60 ZA |
| 45244-01-C 90 ZA | BC1000A 90 ZA |
| 45244-01-D 30 ZA | BC1000B 30 ZA |
| 45244-01-D 60 ZA | BC1000B 60 ZA |
| 45244-01-D 90 ZA | BC1000B 90 ZA |
| 45237-01-A 60 ZA | BC2000A 30 ZA |
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| 45237-01-B 30 ZA | BC2000A 90 ZA |
| 45237-01-B 60 ZA | BC2000B 30 ZA |
| 45237-01-B 90 ZA | BC2000B 60 ZA |
| 45237-01-C 30 ZA | B2000B 90 ZA |
| 45237-01-C 60 ZA | |
| 45237-01-C 90 ZA | |
| 45237-01-D 30 ZA | |
| 45237-01-D 60 ZA | |
| 45237-01-D 90 ZA | |
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| 45245-01-A 90 ZA | |
| 45245-01-B 30 ZA | |
| 45245-01-B 60 ZA | |
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| 45245-01-C 30 ZA | |
| 45245-01-C 60 ZA | |
| 45245-01-C 90 ZA | |
| 45245-01-D 30 ZA | |
| 45245-01-D 60 ZA | |
| 45245-01-D 90 ZA | |