

3M Purification

Zeta Plus™ DELI and DELP

Series Filter Media



Applications

Lipid reduction from human blood plasma proteins such as albumin, coagulation factors, fibrinogen, and immunoglobulins

Provide protection, enhanced performance and extended life for chromatographic columns and ultrafilters

Reduction of residual lipids from serum, fermentation broths and cell culture fluids

Reduction of detergents and surfactants from biologicals

Separation of hydrophobic bioprocess contaminants from aqueous solutions

Zeta Plus™ DELI and DELP series comprise a family of depth filter media which incorporates lipid-specific adsorbents for selective reduction of lipids, surfactants and biological hydrophobes from human blood plasma, serum-based products, recombinant proteins and other biological fluids. These media types provide a range of lipid reduction capacity and functionality.

Applications

During protein purification processes, lipid contamination can cause an assortment of processing problems. Lipids can foul and plug expensive chromatography columns and membrane filters. Prior reduction of lipids via depth filtration promotes column and membrane performance and extends their useful life. Lipid contamination can also cause solution instability of intermediate and final protein products leading to a problematic lipoprotein haze. Zeta Plus™ DELI and DELP series products can replace bulk silica operations which are labour-intensive, messy and difficult to prepare.

Zeta Plus™ DELI and DELP series filter media may be used to separate lipids within the following lipid classes: mono-, di-, and triglycerides, fatty acids, cholesterol, phospholipids, and lipoproteins. Enhanced reduction of lipid contaminants from protein solutions is therefore highly desirable, leading to improved processing economies (extended column and membrane life), improved product purity, and enhanced final protein product stability for longer product shelf life.

Features & Benefits

Two different media formulations available for varying degrees of lipid reduction.

- Efficient reduction of undesirable lipids, lipoprotein haze, and microbial and particulate contaminants.

Depth filter media with hydrophobe and lipid specific adsorbents.

- Provides effective protection and extended life for chromatography columns and reusable membranes.

Variety of cartridge sizes, disposable capsules and filter sheets.

- Highly scaleable.
- Flexible options for all flow and batch volume requirements.

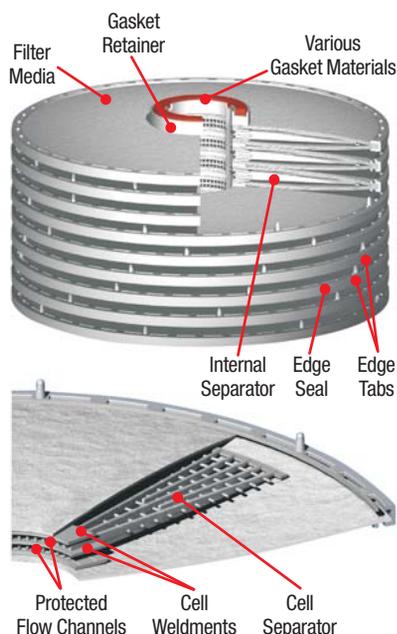
Totally-enclosed, sanitary-design systems and cartridge housings.

- Easily cleanable, no external contamination, offers rapid assembly and take down.

Tested and optimized for pharmaceutical and biological service.

- Safe for critical pharmaceutical, bioprocessing and biological applications.
- Components meet USP Class VI Biological Safety Tests and requirements of CFR 21.





All DELI and DELP filter media are available in totally-disposable BC filter capsules for lab-scale, process development or small-volume filtration. Shown are BC25 and BC1000/2000 capsule units with DELI filter media.

Zeta Plus™ Products: The Benchmark for Pharmaceutical & Biological Depth Filtration

Filters using Zeta Plus™ DELI and DELP series media are part of the Zeta Plus™ family of depth filtration products, which provide highly efficient, cost-effective clarification of turbid, difficult-to-filter biological fluids and pharmaceutical products. Zeta Plus™ cellulose-based depth filtration media are designed to retain contaminants by both size exclusion and adsorption. It is composed of high surface area filter aids embedded in a cellulose fiber matrix.

Zeta Plus™ DELI and DELP filter media incorporate added silica adsorbents, which are the active components for lipid reduction. During the manufacturing process, molecules carrying a positive charge are chemically bonded to the matrix components, forming a permanent, interconnected, rigid filter sheet with positively-charged electrokinetic capture sites. The resulting porous depth filter structure is a tortuous network of adsorptive flow channels capable of retaining bacteria, endotoxin, cell debris and submicron contaminants to a level which mechanical screening alone cannot achieve. Zeta Plus™ depth filters provide high-efficiency submicron filtration, often surpassing the performance of pleated prefilters and competitive depth filters.

Zeta Plus™ Delipid Media Choices

Two different types of delipid filter media are available to suit varying application requirements. The chart below serves as a guideline for selecting the appropriate delipid media type:

Type	Lipid Reduction Capacity	Optimized for Low Aluminum Extractable Levels	Optimized for Sensitive LAL* Test Procedures
DELI	Intermediate	No	No
DELP	High	Yes	Yes

*Limulus Amoebocyte Lysate

Media Selection

3M differentiates its DELI and DELP media offerings by varying the materials of construction used in their manufacture. Choice of silica type confers upon the media either a medium or a high capacity for lipids based upon the specific surface area (m²/g) of the silica incorporated into the filter matrix. Choice of cellulose type affects the level of apparent endotoxin or Limulus Amoebocyte Lysate-Reactive Material (LAL-RM) extractables.

LAL Reactive Material

Trace levels of cellulosic impurities (β-glucans) from several of the more useful types of cellulose interfere with some (but not all) FDA-approved LAL reagent systems designed to test for USP Bacterial Endotoxins. DELP media has been purposely formulated to alleviate this sort of interference.

Table 1: LAL Reactive Material (EU/ml)

Rinse Volume l/m ²	DELI	DELP
EU/ml including LAL-RM		
17.9	0.50	0.02
35.9	0.25	0.01
53.8	0.25	0.01

Table 2: Recommended Operating Parameters

Nominal Porosity	0.5 to 0.8 micron
Maximum Operating Pressure	2.4 bar
Maximum Operating Temperature	82°C
Recommended Rinse	54 L/m ²
25°C Clean Water Flow Rate	50 l/m ² /min/bar
<i>In situ</i> Steam Sterilization	121°C for 30 minutes-1 cycle

Table 3: Surface Area for Zeta Plus™ DELI and DELP Cartridges and Capsules

Cartridge Configuration	Surface Area
BC25 Capsule	25 cm ²
BC1000 Capsule	650 cm ²
BC2000 Capsule	1300 cm ²
45109 (8 diameter cartridge, 8-cell)	0.26 m ²
45167 (8 diameter cartridge, 7-cell, o-ring plug-in)	0.23 m ²
Z8FA2NPX (2-cell plug-in)	650 cm ²
Z8FA4NPX (4-cell plug-in)	1300 cm ²
45805 (12 diameter cartridge, 9-cell bodyfeed netted)	0.9 m ²
45211 (12 diameter cartridge, 15-cell netted)	1.4 m ²
45245 (12 diameter cartridge, 16-cell)	1.5 m ²
Z16P (16 diameter cartridge, 14-cell netted)	3.2 m ²

Single-Use Capsules, Filter Cartridges & Sanitary Housings and Filter Sheets

Zeta Plus™ DELI and DELP series filter products are highly scaleable and can be used for applications ranging from milliliter laboratory volumes to production-scale cGMP manufacturing operations. Filter media are available in the following configurations:

Single-Use Capsule Filters: Zeta Plus™ DELI and DELP filter media are available in three different sizes of BC disposable capsules for bench and pilot scale filtration: BC25, BC1000 and BC2000. The Zeta Plus Encapsulated System includes capsule filters with effective filtration areas at 170 cm², 340 cm², 1020 cm², 0.23 m², 1.6 m²*, and 2.5 m²*. They are ideal for both the scale-up studies as well as large scale production. For more information on the Zeta Plus™ Encapsulated System, contact your 3M Technical Representative.

Filter Cartridges & Sanitary Housings:

Filter cartridges are available in 8", 12" and 16" diameters, easy-to-use, disposable cartridges, providing effective filtration area from 0.06 m² to 3.2 m². A range of sanitary design Zeta Plus filter housings is available for all sizes of DELI and DELP series filter cartridges. For more information on Zeta Plus™ sanitary filter housings, contact your 3M Technical Representative.

Filter Sheets: Zeta Plus™ DELI and DELP series filter media are available in a range of filter sheet sizes to fit plate-and-frame filter presses (contact 3M for specific sheet sizes and part numbers).

DELI and DELP Media Lipid Capacity Estimation Using Non-Ionic Surfactants

To demonstrate the ability of DELI and DELP media to reduce biological hydrophobes such as lipids, lipoproteins, and detergents, two non-ionic surfactants (Tween 80 and Triton X-100) were chosen as models to characterize adsorptive binding capacities under dynamic flow-through conditions (Figures 1 and 2). Dynamic challenge conditions: media initially rinsed with 54 L/m² water and then challenged with surfactant solution at 20°C. Methods of analysis: Isocratic RP-HPLC with UV-VIS detection.

Figure 1: DELI & DELP Plus Media Tween® 80 Capacity

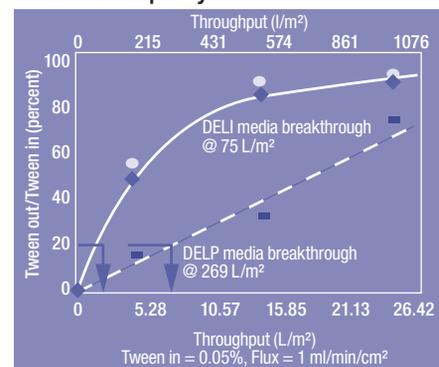
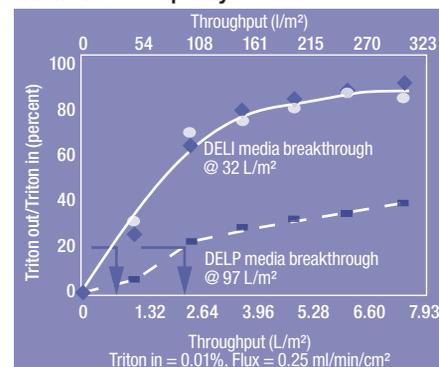


Figure 2: DELI & DELP Media Triton® X-100 Capacity



* 1.6 m² double layer and 2.5 m² for single layer.

Zeta Plus™ DELI and DELP Series Product Ordering Guide

8" Cartridges

Catalog Number	Gasket	Media Formulation
45109 (8" 8-cell)	11 - Nitrile 13 - Fluorocarbon 14 - EPR 22 - Silicone	DELI DELP
45167 (8" 7-cell, O-ring plug-in)	01 - Nitrile 02 - EPR 03 - Fluorocarbon 04 - Silicone	
Z8FA2NP (2-cell plug-in) Z8FA4NP (4-cell plug-in)	A - Silicone B - Fluorocarbon C - EPR D - Nitrile	

12" Diameter Cartridges

Catalog Number	Geometric Variation	Gasket	Media Formulation
45805 (12" 9-cell) 45211 (12" 15-cell) Netted Cartridges	01 - Standard polypropylene	A - Silicone B - Fluorocarbon C - EPR D - Nitrile	DELI DELP
45245 (12" 16-cell)	01 - Standard polypropylene	A - Silicone B - Fluorocarbon C - EPR D - Nitrile	DELP

16" Diameter Cartridges

Catalog Number	Gasket	Media Formulation
Z16P (16" 14-cell)	A - Silicone B - Fluorocarbon C - EPR D - Nitrile	DELI DELP

BC Capsules

Catalog Number	Media Formulation
BC0025L (Luer)	DELI DELP
BC0025S (Sanitary)	
BC1000A (single pack)	
BC1000B (3 pack)	
BC2000A (single pack)	
BC2000B (3 pack)	

Important Notice

The information described in this literature is accurate to the best of our knowledge. A variety of factors, however, can affect the performance of the Product(s) in a particular application, some of which are uniquely within your knowledge and control. INFORMATION IS SUPPLIED UPON THE CONDITION THAT THE PERSONS RECEIVING THE SAME WILL MAKE THEIR OWN DETERMINATION AS TO ITS SUITABILITY FOR THEIR USE. IN NO EVENT WILL 3M PURIFICATION BE RESPONSIBLE FOR DAMAGES OF ANY NATURE WHATSOEVER RESULTING FROM THE USE OF OR RELIANCE UPON INFORMATION.

It is your responsibility to determine if additional testing or information is required and if this product is fit for a particular purpose and suitable in your specific application.

Limitation of Liability

3M Purification Pty Limited will not be liable, to the extent permitted by law, for any loss or damage from the use of the Product(s), whether direct, indirect, special, or consequential, regardless of the legal theory asserted, included warranty, contract, negligence or strict liability.



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