

Zeta Plus® H Series

Depth Filter Cartridges and Capsules



ZETA PLUS® H series is a charge-modified depth filter constructed with high-tensile strength media to perform efficiently even under operating conditions requiring elevated operating temperatures or repeated hot water sanitation cycles. H series filters are available in either standard sheet or easy to use, labor saving cartridges.

Applications

The H series is ideally suited for clarification and pre-filtration in food and beverage, cosmetic, and general applications where the exceptional high wet-tensile strength media provides extended service life. These include aqueous, alcoholic, proteinaceous, and acidic solutions.

Zeta Plus Cartridges and Housings to Fit Every Need

Zeta Plus H series filters are available in 8, 12 and 16 inch diameter cartridges, providing filtration surface areas from 2.8 ft² to 39.7 ft² (0.26 m² to 3.7 m²) per cartridge. This broad range of cartridge configurations allows for easy scale-up from the bench top to pilot scale to full production. A wide variety of industrial and sanitary Zeta Plus housings are available to provide totally enclosed liquid filtration. Refer to CUNO literature number LITHSZPBC and LITZPH.1P2.

Zeta Plus Cartridge System

Vs.

Plate & Frame Filter Economics

The Zeta Plus cartridge system has a number of advantages over conventional plate and frame filters. Since the cartridge system utilizes a totally enclosed housing, there is no product leakage and no exposure of the filter media to external contamination allowing for effective use of the media, higher throughputs, and low operating costs. The plate and frame filter press design is open to the environment making both filter media and product susceptible to external contamination. The "open" design requires more frequent media change-out cycles, typically every few days. This results in lower throughputs and higher operating costs.

Plate and frame filters are labor intensive, requiring two people four to eight hours to change out the media. Zeta Plus cartridges are easy to install and remove, usually taking about 15 minutes, resulting in significant labor cost reductions. Coupled with the floor space reduction of the vertical Zeta Plus housing design and a typical 50% or greater decrease in initial capital cost when compared to a comparable plate and frame filter, the savings become substantial.

Table 1 highlights the economic advantages in capital and operating costs that the Zeta Plus system provides over conventional sheet filtration using a plate and frame filter. To complete this analysis, a generic process line running at 350 HI/hr (1,000,000 HI/yr) was used. A two stage Zeta Plus configuration is compared to a standard plate & frame system. Discounted cash flow was determined using a 10-year life period.

Features	Benefits
<ul style="list-style-type: none"> More than three times the strength of competitive media to withstand multiple steaming and hot water sanitization cycles 	<ul style="list-style-type: none"> Extended filter life resulting in high throughputs, fewer cartridge change-outs, and reduced operating costs
<ul style="list-style-type: none"> Combined depth filtration and electrokinetic adsorption 	<ul style="list-style-type: none"> Efficient haze and particle removal at micron ratings smaller than the mechanical rating alone
<ul style="list-style-type: none"> Easy-to-install cartridges for rapid change-out 	<ul style="list-style-type: none"> Reduced labor cost
<ul style="list-style-type: none"> Totally enclosed, sanitary systems and housings 	<ul style="list-style-type: none"> Zero edge leakage and external contamination
<ul style="list-style-type: none"> Variety of cartridge sizes and filtration surface areas 	<ul style="list-style-type: none"> Flexible options for all flow requirements
<ul style="list-style-type: none"> All components FDA CFR Title 21 listed 	<ul style="list-style-type: none"> Safe for all food & beverage filter applications

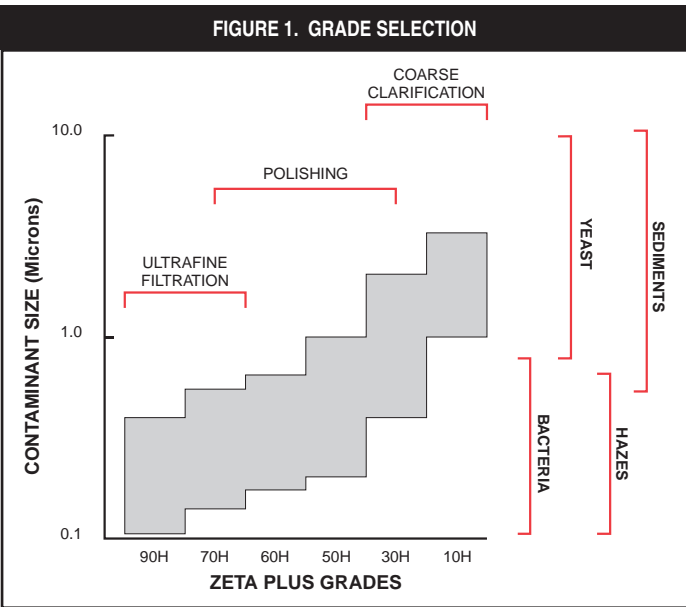
TABLE 1. ZETA PLUS CARTRIDGES VS. PLATE & FRAME FILTERS		
	Plate & Frame Filter (U.S. Cents/HL)	Zeta Plus Cartridge System (U.S. Cents/HL)
Capital Cost	8.5	1.3
Media Cost	6.8	12.0
Labor - Media Change-out	1.1	0.1
Losses - Leakage	1.3	-
Regeneration and Sanitization Costs	2.8	0.4
Spare Parts and Maintenance	1.5	0.2
Total Costs /HL	22.0	14.0

Superior Particle Removal

Zeta Plus filter media offer unique advantages in contamination removal because of its electrokinetic properties. In addition to the mechanical exclusion of particles by its depth loading feature, Zeta Plus filter media adsorbs contaminants too small for removal by mechanical straining alone. Since most particles in suspension have been shown to exhibit a negative charge, virtually all contaminants can be removed with proper grade selection.

Grade Selection

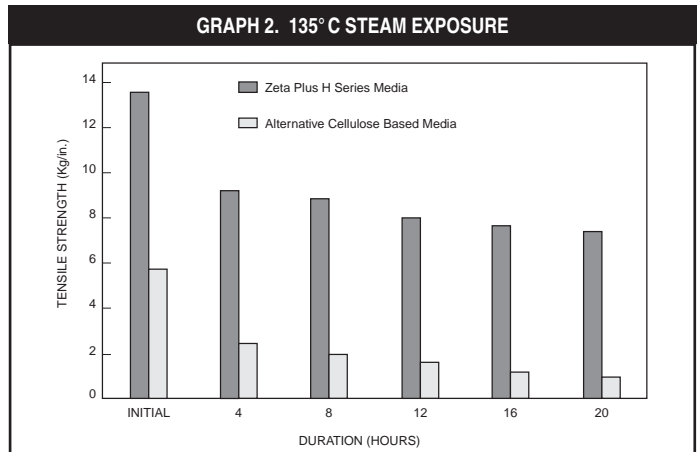
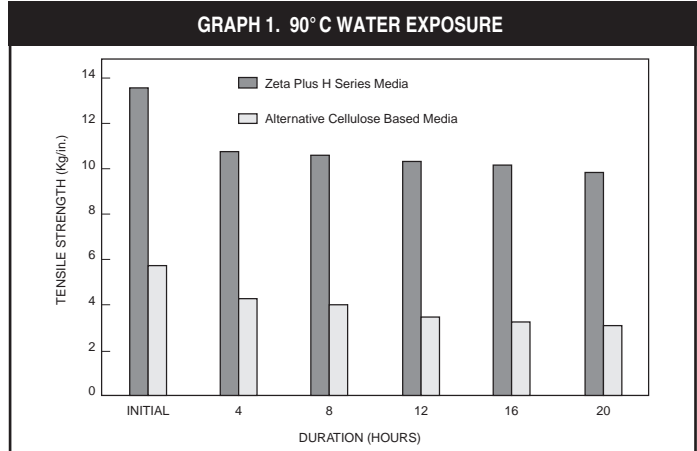
H series filter media are available in a broad range of grades. Mechanical straining alone, as determined by mean-flow pore analysis, is indicated in Figure 1. Particles smaller than the rated pore size will be removed by H series Zeta Plus filter media because of electrokinetic adsorption. Actual operating conditions and the product to be filtered should be considered in grade selection. Technical support in optimal grade selection is provided by your local Master Representative/Distributor or by the CUNO Scientific Applications Support Services (SASS) team.



Superior Strength and Resistance

Zeta Plus H series filters are specifically designed for applications requiring numerous hot water sanitization cycles or extended exposure to high service temperatures. The superior wet tensile strength of Zeta Plus H series media combined with a highly durable cartridge design ensures integrity under flow and pressure variations where poorly designed competitive products suffer media erosion, deformation and bypass.

Graphs 1 and 2 depict the significant media strength advantage that Zeta Plus H series media holds over alternative cellulose based media in resistance to 90°C water and 135°C steam.



High Performance in Microbial Reduction

Zeta Plus H series media demonstrate excellent microbial reduction as noted in Table 2. No organisms were detected downstream of the Zeta Plus media after filtration. This confirms the effectiveness of Zeta Plus H series media in protection of final membrane filters and in producing a microbiologically stable product when used alone.

TABLE 2. MICROBIAL REDUCTION			
ZETA PLUS H SERIES MEDIA GRADE	MICROORGANISM USED FOR CHALLENGE	REMOVAL (CFU/cm ² of Media)	ORGANISMS IN FILTRATE
30H	<i>Saccharomyces cerevisiae</i> (ATCC-36026)	4.1 x 10 ⁸	0
50H		6.8 x 10 ⁸	0
60H		6.0 x 10 ⁸	0
60H	<i>Oenococcus oeni</i> (ATCC-23279)	5.5 x 10 ⁸	0
90H		7.2 x 10 ⁸	0
60H	<i>Brevundimonas diminuta</i> (ATCC-19146)	9.7 x 10 ⁸	0
90H		1.3 x 10 ⁹	0

Challenge conditions used in these tests:
 microbial concentration: 10⁸ - 10⁷ organisms/ml
 flow rate: 0.25 gpm/ft² (10 lpm/m²)

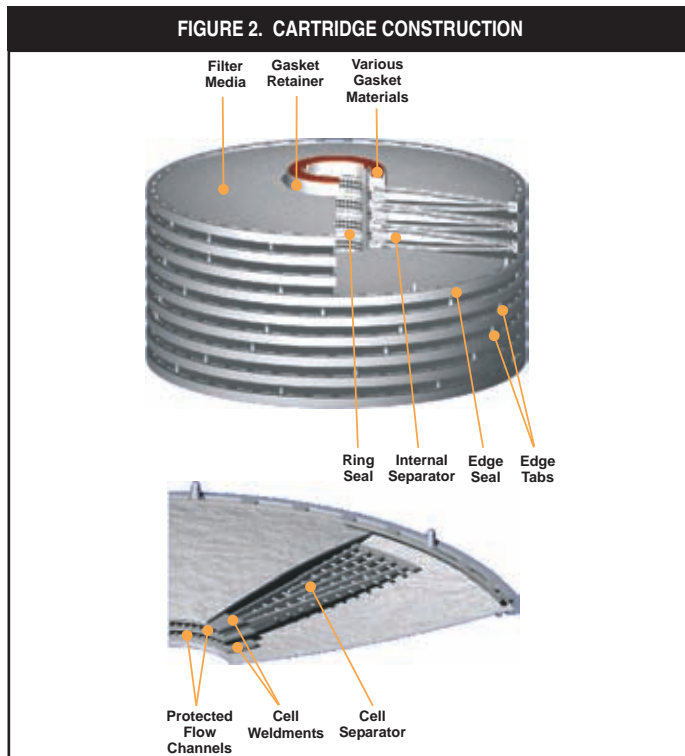
Low Extractables

Calcium and iron extractable concentrations of Zeta Plus H media in a variety of solutions are shown in Table 3. The data represent a static soak of the media in the listed fluid at a ratio of 10ml of fluid/1gram of media (approximately 1.2 liter/ft²). Even at this high ratio of media weight to soak volume, the results show extremely low extractable levels. As a Good Manufacturing Practice, CUNO recommends a 1.25 gallon/ft² (50 l/m²) flush of H series media with either filtered water or product prior to use. Moreover, specific rinsing procedures can be developed on-site for special applications to reduce these levels even further.

		MEDIA GRADE					
		10H	30H	50H	60H	70H	90H
D.I. WATER	Calcium (ppm)	0.18	0.1	0.12	0.13	0.011	0.15
	Iron (ppm)	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
8% Ethanol	Calcium (ppm)	0.26	0.09	< 0.08	< 0.08	< 0.08	0.09
	Iron (ppm)	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
50% Ethanol	Calcium (ppm)	0.10	< 0.08	< 0.08	< 0.08	< 0.08	< 0.08
	Iron (ppm)	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005

Cartridge Construction

A single Zeta Plus cartridge is composed of an assembly of Zeta Plus cells. Each cell is composed of two Zeta Plus H series media discs on either side of a polypropylene "stiff cell" separator. The stiff-cell separator, as depicted in Figure 2, is a CUNO innovation. It provides a more durable cartridge with enhanced flow characteristics resulting in longer service life. The discs are sealed together at the circumference by an injection molded polypropylene edge seal. The cells are then unitized into a cartridge using set compression that results in a rugged, durable cartridge (Figure 2). The cells are held in place by three stainless steel bands in the core of the cartridge.



All components of Zeta Plus H series filter cartridges are listed in CFR 21 by the US Food and Drug Administration as safe for food contact.

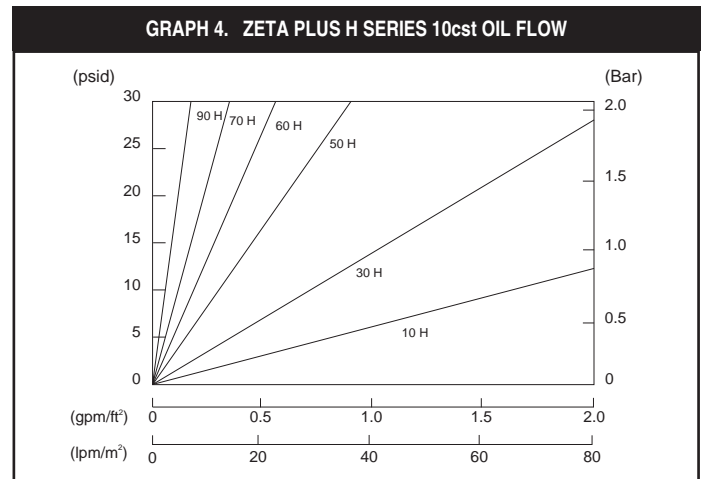
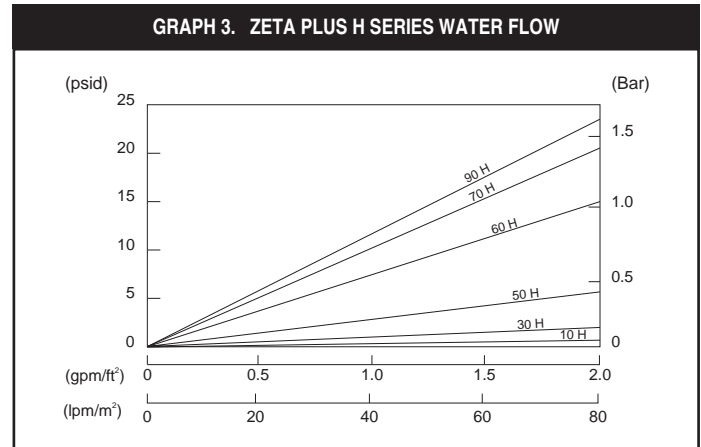
Cartridge Configurations

Zeta Plus cartridges are available in a variety of size and number of cell combinations. Table 6 lists information about H series configurations.

Catalog Number	Nominal Diameter		Height		Effective Filtration Area		Number of Cells
	In.	mm	In.	mm	ft ²	m ²	
45109	8	203	6 11/16	170	2.8	0.26	8
45167	8	203	6 5/8	168	2.5	0.23	7
45237	12	304	10 3/4	273	12.3	1.1	12
45245	12	304	10 3/4	273	16.4	1.5	16
Z16P	16	406	10 3/4	273	34.7	3.2	14

Flow Characteristics

Graphs 3 and 4 show initial differential pressure values for Zeta Plus H series media versus specific flow rates in water and a 10 cst viscosity oil, respectively.



Recommended Operating Parameters

Maximum Temperature: 180°F (80°C)

Change-out Pressure: 35 psid (2.4 bar)

Recommended Flow Rate*: 0.25 - 0.5 gpm/ft (10 - 20 lpm/m)

Maximum Flow Rate: 1.0 gpm/ft (40 lpm/m)

Rinse Volume: 1.25 gallons/ft (50 liters/m)

*Consult CUNO for the best flow rate for your application.

ZETA PLUS H SERIES ORDERING GUIDE

BIOCAP® SERIES 30 DISPOSABLE CAPSULES	NOMINAL FILTER AREA	PACKAGING OPTIONS	MEDIA GRADE	MEDIA FORMULATION
BC - BioCap Capsule	0030 - 3.7 in ² (24 cm ²)	A - Single Pack B - 10 Pack	05, 07, 10, 20, 30, 40, 50, 60, 70, 90	H - Inorganic Filter Aid & Cellulose

BIOCAP® SERIES 1000/2000 DISPOSABLE CAPSULES CAPSULE DESIGNATION	NOMINAL FILTER AREA	PACKAGING OPTIONS	MEDIA GRADE	MEDIA FORMULATION
BC - BioCap Capsule	1000 - 0.7 ft ² (650 cm ²) 2000 - 1.4 ft ² (1300 cm ²)	A - Single Pack B - 3 Pack (same media)	05, 07, 10, 20, 30, 40, 50, 60, 70, 90	H - Inorganic Filter Aid & Cellulose

CARTRIDGE CATALOG NUMBER	GASKET	MEDIA GRADE	MEDIA FORMULATION
45109 (8" - 8 Cell)	11 - Nitrile 13 - Fluorocarbon 14 - EPR	05, 07, 10, 20, 30, 40, 50, 60, 70, 90	H - Inorganic Filter Aid & Cellulose
45167 (8" - 7 Cell O-ring Plug-in)	01 - Nitrile 02 - EPR 03 - Fluorocarbon 04 - Silicone		

CARTRIDGE CATALOG NUMBER	GEOMETRIC VARIATION	GASKET	MEDIA GRADE	MEDIA FORMULATION
45237 (12" - 12 Cell)	01 - Standard polypropylene 02 - Talc filled polypropylene	A - Silicone B - Fluorocarbon C - EPR D - Nitrile	05, 07, 10, 20, 30, 40, 50, 60, 70, 90	H - Inorganic Filter Aid & Cellulose
45245 (12" - 16 Cell)				

CARTRIDGE CATALOG NUMBER	GASKET	MEDIA GRADE	MEDIA FORMULATION
Z16P (16" - 14 Cell)	A - Silicone B - Fluorocarbon C - EPR D - Nitrile	05, 07, 10, 20, 30, 40, 50, 60, 70, 90	H - Inorganic Filter Aid & Cellulose
Z16H (16" - 17 Cell) see note*			

*Z16H design contains 17 cells (42.2 ft²/3.9 m²) for 90H, 70H, & 60H grades, and 16 cells (39.7 ft²/3.7 m²) for 30H, 40H, & 50H grades.

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 of 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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