

Betafine™ PEG Series

Pleated Polypropylene Graded-Porosity Filter Cartridges

Featuring Advanced Pleat Technology Construction for Extended Service Life

The 3M Purification Inc. Betafine™ PEG series filter cartridge represents a major advance in pleated filter technology and performance. Building on 3M Purification's history of filter design innovation, this absolute-rated, graded-porosity 100% polypropylene pleated filter cartridge features Advanced Pleat Technology (APT) that increases the usable filtration surface area while maintaining standard cartridge dimensions. The result is a filter cartridge that has dramatically enhances service life.

Advanced Pleat Technology

The service life of a pleated cartridge is often dictated by the accessible surface area. Conventional pleated filters may offer a large gross surface area, but when the media is packed too tightly into the cartridge, only part of the surface area is usable resulting in both flow restrictions and limited contaminant holding capacity. The "blind" or unusable area commonly occurs near the inside diameter (see Figure 1) where the pleats are packed most tightly. The Betafine PEG series filter cartridge is manufactured using a staggered pleat configuration that, when combined with a novel support material, provides more open space between the pleats.

The APT staggered pleats with increased open area allow for greater contaminant loading between pleats at the inside diameter, while the reduced length pleats take advantage of existing open space closer to the cartridge's outside diameter. The result is a fully used surface area that provides superior service life.

Features & Benefits

Advanced Pleat Technology Construction for High Surface Area as compared to competitive filters

- Higher product throughputs for prolonged service life
Lower total filtration operating costs
- Lower pressure drops for higher flow rates

Absolute-rated Filter Performance

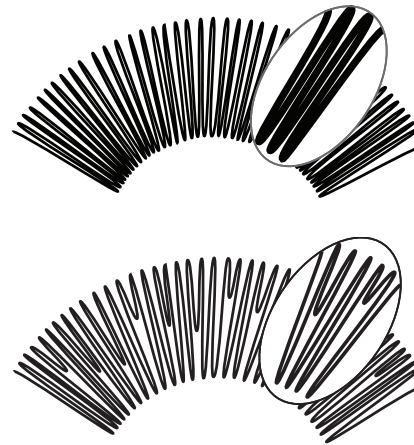
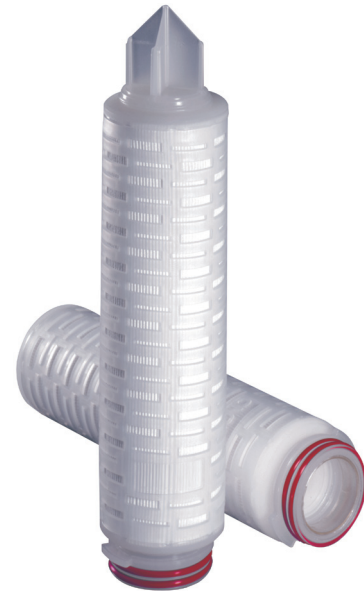
- Higher product quality and yields

Graded-porosity Multi-layer Filter Media

- Capture of contaminant throughout the filter media to help maximize filter life
- Higher contaminant holding capacity

Polypropylene Cartridge Components Free of Adhesives & Surfactants

- Very low extractable levels for optimum filtrate purity
- Broad chemical compatibility for most aggressive process applications



Conventional pleat designs, with full-depth densely packed pleats, fill the upstream pleat surface with contaminant that quickly constrict flow at the pleat's inside diameter.

The Betafine™ PEG series filter cartridge's Advanced Pleat Technology utilizes a configuration designed to increase the accessible surface area for significantly greater filter media use.

Figure 1. Advanced Pleat Technology Provides Increased Surface Area vs. Conventional Pleat Designs

Applications

Betafine™ PEG Series filter cartridges are ideal for a wide array of applications for electronics manufacturing and chemical production. Contact 3M Purification or your local distributor for assistance with your specific applications.

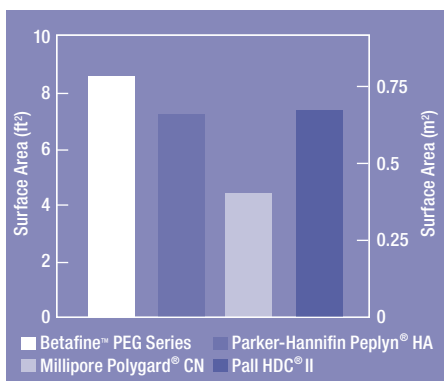
Electronics Manufacturing

Pre-reverse osmosis water filtration, plating and cleaning baths, complex multi-layer board processes.

Fine Chemical Production

Clarification of high purity chemicals, organic and inorganic chemical intermediates, various acids and bases, solvents and polymer solutions.





Graph 1. Surface Area Comparison of Betafine™ PEG Series 0.6 µm Filter Cartridge vs. Competing 0.6 µm Rated Filters

Betafine™ PEG Series Filter Cartridges for Electronics & Chemicals

Today's electronics manufacturing and chemicals processing demand ever increasing levels of filtration efficiency and filtrate purity. Betafine™ PEG series filter cartridge provide the answer for a broad range of applications.

- Pre-reverse osmosis (Pre-RO) water filtration requires robust cartridges with long life to help protect expensive RO membranes from seasonal fluctuations and process upsets. Low particle count ultrapure water is necessary at multiple points in every integral-sensitive production facility.
- Plating and cleaning baths must maintain very low particle counts, despite constant contaminant addition, to provide the highest yields. Higher flow rates allow for more frequent bath turn-over which leads to a cleaner, more stable process.
- Complex multi-layer board processes need an economical filter capable of high throughputs and extended lifetimes. Heavy contaminant loads must be handled without premature plugging of the filter.

Table 1. Betafine™ PEG Series 0.6 µm Filter Cartridge Flow Rate, Surface Area & Lifetime vs. Competitor

Absolute Rating	Pall HDC® II 0.6 µm Filter	Betafine™ PEG Series 0.6 µm Filter Cartridge	Percent Advantage
Flow @ 1 psid	0.8 gpm	4.2 gpm	400%
Media Area	6.6 ft²	8.8 ft²	60%
Lifetime*			22%

* Based on testing using a model challenge (ACFTD) in water.

- Fine chemical production demands economical, rigorous filter cartridges with long service life. Betafine PEG series filter cartridges are compatible with a wide range of process chemicals.

Durable polypropylene construction provides superior chemical and mechanical compatibility under the most severe service conditions. Proper cartridge selection for individual process conditions sized for low initial pressure drop may ultimately extend cartridge lifetime and compatibility.

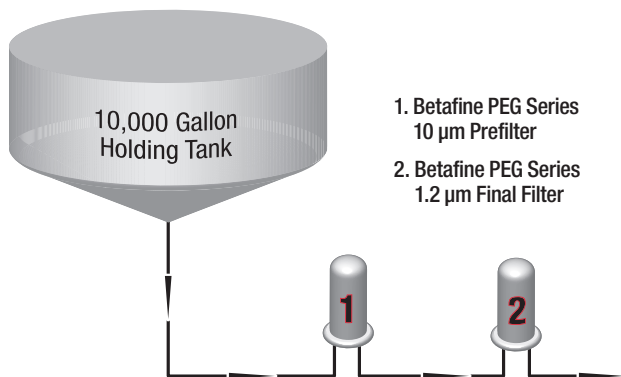


Figure 2. Acid Transfer Processing with Betafine™ PEG Series Filter Cartridges

The Betafine™ PEG Series Filter Cartridge Advantage

A recirculating electroless nickel plating bath can be optimized with Betafine PEG series filter cartridges. For high porosity memory devices, particle defects can be reliably controlled with in-line 0.6 µm filtration. By replacing a 0.6 µm absolute rated competitive cartridge with an equally retentive Betafine PEG series filter cartridge, the pressure drop can be reduced by one half, providing the flexibility to increase the flow through the bath by a factor of 4. With the Betafine PEG series filter cartridges, the bath may clean up more efficiently after the high density devices are introduced into the plating solution. Betafine PEG series filter cartridges effectively reduce the contaminating particles while maintaining or increasing process yields. Product throughput in this critical process step can be increased, and filter change-out frequency reduced, a direct result of the 60% surface area increase — only available with the Betafine PEG series filter cartridge's innovative APT technology.

Table 2. Initial Particle Counts

Particle Size	Particles Per Gallon*		
	Raw Acid	After 10 µm Prefiltration	After 1.2 µm Final Filtration
≥ 10 µm	390	0	0
≥ 5 µm	3,125	1,500	0
≥ 1.2 µm	200,000	190,000	190

* All calculations are based on in-house testing of Betafine™ PEG series filter cartridge with controlled inlet particle challenges suspended in water.

Serial filtration was employed in this ambient temperature acid transfer, with a 10 µm Betafine PEG series prefilter prior to a 1.2 µm Betafine PEG series final filter (see Figure 2). The low initial pressure drop and graded-porosity construction of the Betafine PEG series filter cartridge allowed the process to run for extended periods before filter plugging. This optimized filtration scheme delivered premium quality acid with very low particle counts (see Table 2).

Graded-Porosity — the Key to Longer Life

The Betafine™ PEG series filter cartridge's graded-porosity media structure reduces particles sequentially by size — the larger particles by the more open, outer medium and the smaller particles by the tighter, inner medium (see Figure 3). The outer medium acts as a prefilter, while the inner provides the absolute removal specified by the cartridge rating. This construction effectively spreads the contaminant through the depth of the filter media resulting in high contaminant capacity with lower pressure drop for longer service life as compared to competitive filters.

Chemical Compatibility

Polypropylene construction provides chemical compatibility in many demanding process fluid applications. Compatibility is influenced by process operating conditions; in critical applications, cartridges should be tested under actual conditions to determine the correct selection.

Flow Characteristics & Sizing Options

Flow vs. differential pressure for clean water is depicted in Graph 2 for each Betafine PEG series filter cartridge grade. Ideally, filter systems should be sized at an initial differential pressure of 0.5 to 1 psid (0.04 to 0.07 bar). Low flow rates further extend the life of the filter system. In most applications, doubling the filter area (reducing the flow rate per unit area by one-half) results in two and one-half times the throughput.

- Reduced cartridge change-out frequency — for a given process flow rate, the graded-porosity structure and maximum filter area decrease filter cartridge change-out frequency by 30 to 50 percent or more depending on the application.
- Reduced filter housing costs — for new applications, the low pressure drops of the Betafine PEG series filter cartridge allow smaller or fewer housings to be specified. Fewer filter cartridges and smaller housings help provide lower capital and consumables costs, year after year.

The Betafine PEG series filter cartridge is specifically designed, manufactured, and quality engineered for the requirements of the electronics and fine chemical processing industry.

Operating Parameters & Specifications

Materials of Construction		
Filter Media	Graded-porosity Pleated Polypropylene	
Media Support Layers	Polypropylene	
Inner Core, Outer Cage, End Cap Adapters	Polypropylene	
Gasket & O-ring Options	Silicone, Fluorocarbon, EPR, Nitrile	
Operating Conditions		
Maximum Operating Temperature	130 °F (60 °C) continuous, 175 °F (80 °C) short term	
Maximum Forward Pressure Differential	60 psid at 77 °F (4 bar at 25 °C)	
Maximum Reverse Pressure Differential	60 psid at 77 °F (4 bar at 25 °C)	
Cartridge Dimensions		
Filtration Surface Area	Grades 060, 120 & 250	8.8 ft ² (0.82 m ²)
	Grade 020	8.1 ft ² (0.75 m ²)
	Grade 500	8.6 ft ² (0.80 m ²)
	Grade 10C	5.5 ft ² (0.51 m ²)
Outer Diameter	2.80" (7.1 cm)	
Nominal Length	10", 20", 30" & 40"	

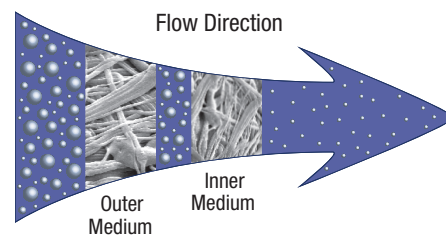
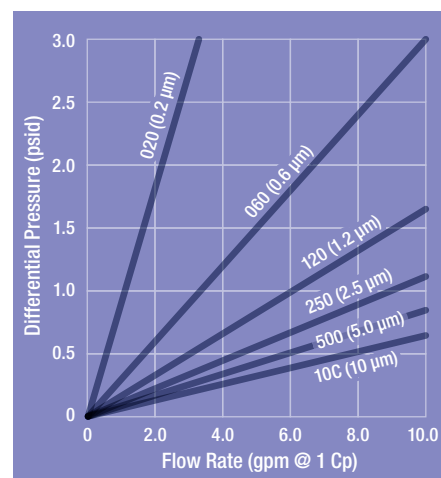
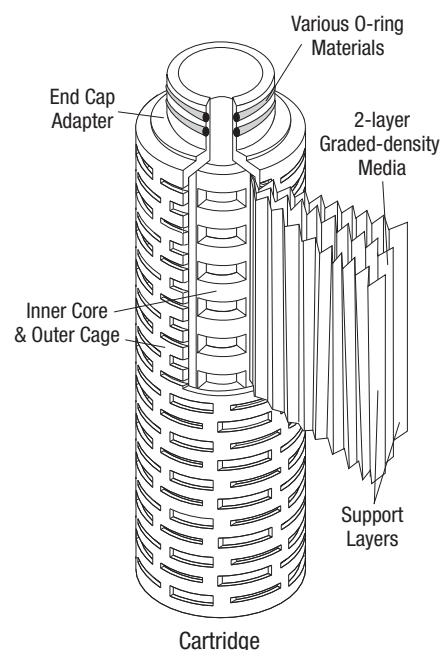


Figure 3. Graded-porosity Reduces Particles Sequentially by Size



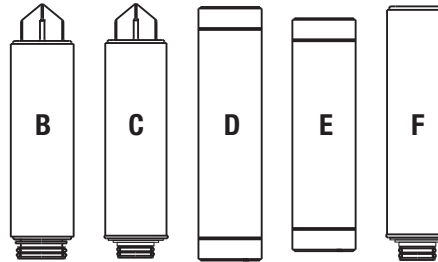
Graph 2: Clean Water Flow per 10" Betafine™ PEG Series Filter Cartridge at Ambient Temperature (20 °C)



Betafine™ PEG Series Filter Cartridge Ordering Guide

Cartridge Code	Grade Code/ Absolute Rating*	Configuration Code	Nominal Length Code	End Modification Code	Gasket/O-ring Material Code
PEG	020 (0.2 µm)	B Cartridge	01 10"	B — 226 O-ring & Spear	A — Silicone
	060 (0.6 µm)		02 20"	C — 222 O-ring & Spear	B — Fluorocarbon
	120 (1.2 µm)		03 30"	D — Double Open End (DOE), Flat Gasket — 10"	C — EPR
	250 (2.5 µm)		04 40"	E — DOE, Flat Gasket — 9.75"	D — Nitrile
	500 (5.0 µm)			F — 222 O-ring & Flat Cap	H — Clear Silicone
	10C (10.0 µm)				

* Retention ratings determined by 3M Purification Inc. test method TP. The 0.2 µm rating has been extrapolated. For more information, contact your 3M Purification Inc. representative.



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