

PhotoSHIELD™ Nylon Filter Capsules

Superior Gel and Particle Removal from Photoresist and Ancillary Chemicals



PhotoSHIELD™ Nylon filter capsules are highly retentive membrane filter elements designed to meet the exacting requirements of photoresist and ancillary chemical applications at point-of-use (POU). Utilizing CUNO patented* Advanced Pleat Technology™ (APT), PhotoSHIELD combines superior flow characteristics with minimal pressure drop, while maintaining filter efficiency. The resultant decrease in processing time provides lower total filtration costs – reduced energy consumption, pump wear, and labor.

The native characteristics of photoresists, ancillary chemicals, and filters vary greatly from one manufacturer to the next. A filtration solution individually matched to the unique requirements of the material being filtered is critical for peak performance. When choosing the appropriate filter, important characteristics to consider include membrane wettability, pore size, pressure drop, retention efficiency, and fluid viscosity.

The PhotoSHIELD capsule's naturally hydrophilic Nylon 6,6 pleated membrane with all polypropylene capsule construction, provides increased filter life, and superior removal of gel and hard particles when compared to other membrane

Point-of-Use (POU) Applications

- | | |
|-----------------------|------------------------|
| ▶ 157nm Photoresists | ▶ Alcohols |
| ▶ 193nm Photoresists | ▶ Bases |
| ▶ 248nm Photoresists | ▶ Developers |
| ▶ I line Photoresists | ▶ Etchants / Strippers |
| ▶ G line Photoresists | ▶ Solvents |

Feature	Benefit
<ul style="list-style-type: none"> Advanced Pleat Technology™ 	<ul style="list-style-type: none"> Provides both low operating and differential pressure across the filter which minimizes outgassing, microbubble formation, and wear on the dispense system Increased lifetime and filter throughput which lowers cost-of-ownership Superior removal of gel particles for reduced defectivity
<ul style="list-style-type: none"> Naturally Hydrophilic Nylon 6,6 Membrane 	<ul style="list-style-type: none"> No IPA pre-wetting and system flushing required - eliminates a potential source of contamination and chemical interaction, while reducing hazardous waste disposal Reduces potential for microbubble formation by not dewetting in outgassing fluids unlike naturally hydrophobic membranes such as Polypropylene, UPE, and PTFE Reduces downtime and increases overall equipment effectiveness (OEE) Economic alternative to UPE and PTFE
<ul style="list-style-type: none"> Low Cartridge Extractables 	<ul style="list-style-type: none"> No change to photospeed, viscosity, and molecular weight, unlike other filter materials which can extract ionic, organic, and metallic contaminants

* US Patent 6,315,130

capsules. PhotoSHIELD Nylon filter capsules are ideally suited for photoresist and ancillary chemical applications where high efficiency contaminant removal at 0.04 μm , 0.1 μm , or 0.2 μm is required.

Superior Gel Removal provided by APT

Normally a small amount of gel particles can be found in photoresists. Gels can form during the manufacturing and storage of photoresists. Their removal from photoresists is highly dependent on differential pressure across the filtration system. Since these gels are deformable, they can extrude through a filter at high differential pressures. At low differential pressures, the forces that would deform gels are correspondingly lower and the gels are retained by the membrane media. CUNO has been able to maximize filtration surface area, which assures both a low inlet pressure to the pump, and low differential pressure, which is optimal for gel removal. The increase in filtration surface area is achieved by using Advanced Pleat Technology.

Figure 1. - Conventional Pleating

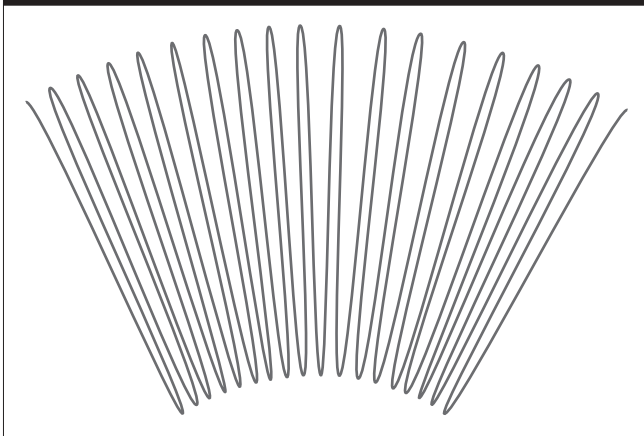
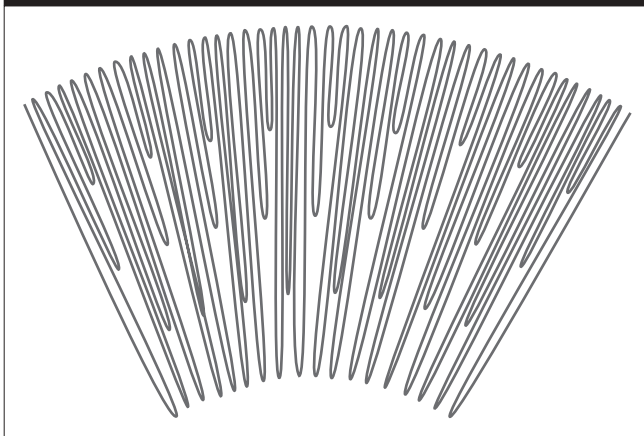


Figure 2. - Advanced Pleat Technology

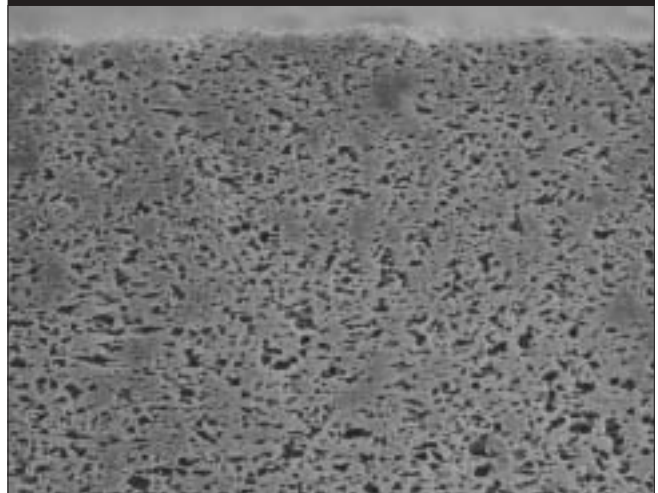


The service life of a pleated capsule filter is often dictated by the accessible surface area. Conventional pleated filters may offer a large gross surface area, but when the media is packed into the capsule, only part of the surface area is used resulting in both flow restrictions and limited contaminant holding capacity. The “blind” or unused area commonly occurs near the inside diameter (Figure 1) where the pleats are most tightly compressed. The PhotoSHIELD capsule filter is manufactured using a staggered and stepped configuration (Figure 2), which reduces open space between the outside pleats. This novel technology maximizes capacity by increasing the open area which allows for greater particle loading at the inside diameter, while the shorter stepped pleats take advantage of existing open space closer to the outside diameter of the capsule. The result is a fully used surface area that provides superior filter life.

PhotoSHIELD Capsule Construction

PhotoSHIELD filter capsules are constructed of high efficiency naturally hydrophilic Nylon 6,6 membrane (Figure 3). The membrane supports are made from high density polyethylene (HDPE). All capsule components are made of polypropylene and vent o-rings are available in fluorocarbon and EPR. No adhesives, binders, or surfactants are used in the manufacturing process. Capsules are manufactured and double-bagged in a clean environment under ISO certified quality systems using the most advanced non-contact thermoplastic welding techniques to ensure superior downstream cleanliness out of the package. All PhotoSHIELD filter capsules are integrity tested.

Figure 3. - SEM Nylon 6,6 Membrane



PhotoSHIELD Capsule Extractables

The filters Nylon 6,6, HDPE, and polypropylene materials of construction ensure that ionic, organic, and metallic contaminants are not being added back into the process chemical. Ionic, organic, and metallic contaminants can extract from other filter materials, which may change the photospeed, viscosity, or molecular weight of the process chemical.

Table 1. - Typical Metals Analysis*

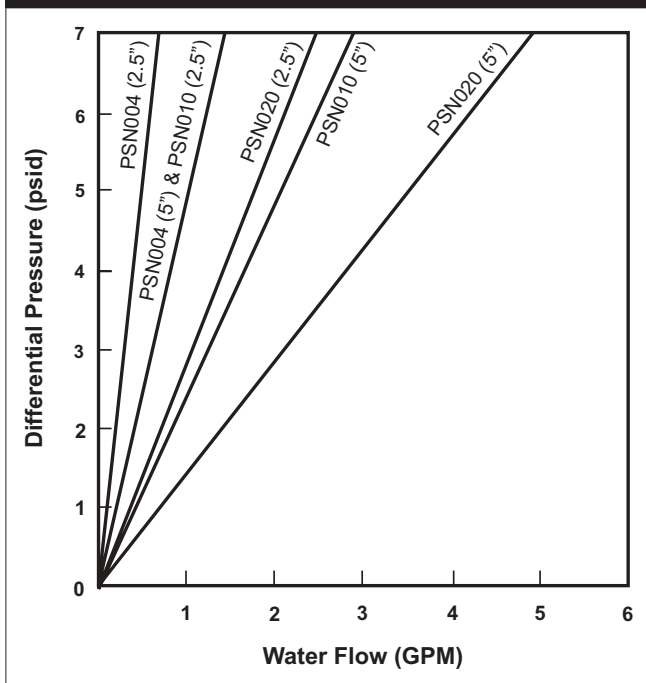
Metal	Detection Limit (ppb)	24 Hour Extraction	120 Hour Extraction
Ca	0.9	< D.L	< D.L
Cr	0.3	< D.L	< D.L
Cu	0.9	< D.L	< D.L
Fe	0.9	< D.L	< D.L
K	0.9	< D.L	< D.L
Na	3.0	< D.L	< D.L

* Analysis using Graphite Furnace Atomic Absorption, extraction using PGMEA.

PhotoSHIELD™ Cartridge Flow Rates

Figures 4 & 5 depict typical flow rates for the two style capsules available for 1 cp fluids at 25°C.

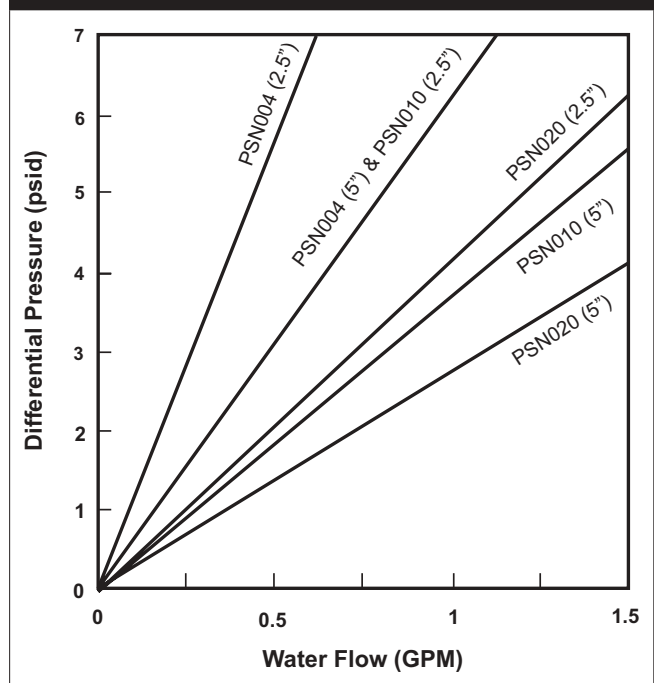
Figure 4. - Typical 1.5" Sanitary Capsule Fluid Flow



PhotoSHIELD Capsule Specifications

Capsule Component	Material of construction	
Cage, Core, End-Caps and Capsule Housing	Polypropylene	
Membrane Support Layers	High Density Polyethylene (HDPE)	
Membrane	Naturally Hydrophilic Nylon 6,6	
Capsule Dimensions (see ordering guide)		
	2.5" Capsule	5" Capsule
Filtration Surface Area	1.7 ft ² (0.16 m ²)	3.6 ft ² (0.33 m ²)
Outside Diameter (Nominal)	3.0" (7.6 cm)	
Length (Nominal)	see ordering guide	
Operating Parameters Specification		
Maximum Capsule Operating Pressure	75 psig	
Maximum Forward Differential Pressure	60 psid @ 104°F (4.1 bar @ 40°C)	
Recommended Change-out Differential Pressure	35 psid (2.4 bar)	
Maximum Operating Temperature	104°F (40°C)	
Removal Ratings (µm)	0.04, 0.1, 0.2	

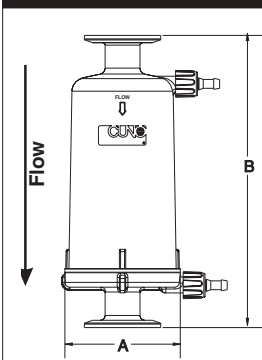
Figure 5. -Typical 1/4" MNPT Capsule Fluid Flow



PhotoSHIELD™ Filter Capsule Ordering Guide

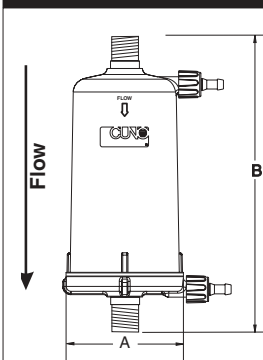
Capsule	Removal Rating (µm)	Configuration	Length (Inches)	End Modification	Gasket/O-ring Material	Packaging
PSN	004 - 0.04	C	01 - 2.5	A - 1.5" Sanitary Flange	B - Fluorocarbon	01 - Single Pack
	010 - 0.1		02 - 5.0	C - 1/4" MNPT	C - EPR	02 - 3 Pack
	020 - 0.2					

Dimensions of A style end modification



Nominal Capsule Length (Inches/cm)		
	-01 (2.5")	-02 (5.0")
A	3.0" (7.6 cm)	
B	5.1" (13.0 cm)	7.6" (19.3 cm)

Dimensions of C style end modification



Nominal Capsule Length (Inches/cm)		
	-01 (2.5")	-02 (5.0")
A	3.0" (7.6 cm)	
B	5.0" (12.7 cm)	7.5" (19.1 cm)

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 the 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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