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LifeASSURE™ PSN Series Cartridge and Capsule Filters

Superior Gel and Particle Removal from Photoresist and Ancillary Chemicals

LifeASSURE PSN Nylon filter cartridges and capsules, formerly known as PhotoSHIELD, are highly retentive membrane filter elements designed to meet the exacting requirements of photoresist and ancillary chemical applications. Utilising 3M Purification's Advanced Pleat Technology (APT), LifeASSURE PSN combines superior flow characteristics with minimal pressure drop, while maintaining filter efficiency. This results in a decrease in processing time thus providing lower total filtration costs – reduced energy consumption, pump wear and labour.

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 naturally hydrophilic Nylon 6,6 pleated membrane in an all high density polyethylene (HDPE) cartridge or an all polypropylene capsule construction, provides increased filter life and superior removal of gel and hard particles when compared to other membrane cartridges or capsules. LifeASSURE PSN Nylon filter cartridges and 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.

Features and Benefits

Advanced Pleat Technology

- Provides both lower operating and differential pressure to minimise outgassing and microbubble formation
- A lower pressure drop increases the rate of recirculation which allows particle counts to be achieved more rapidly while reducing energy and wear on the pumps
- Increased throughput and filter lifetime which lowers cost-of-ownership
- Superior removal of gel particles for reduced defectivity

Naturally Hydrophilic Nylon 6,6 Membrane

- 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

Low Extractables

- No change to photospeed, viscosity and molecular weight, unlike other filter materials which can extract ionic, organic and metallic contaminants

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.



Applications

Point of Use (POU) applications are:

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

3M

Figure 1: Conventional pleat design

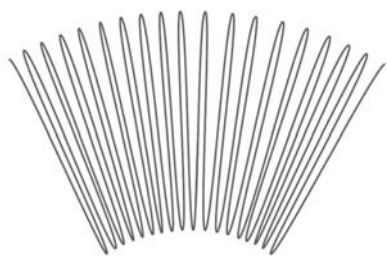


Figure 2: APT Construction

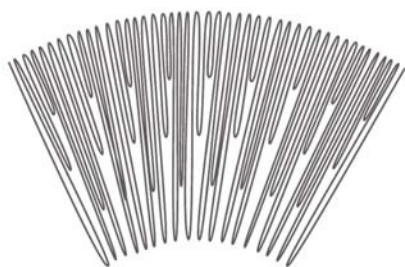


Figure 3: SEM Nylon 6,6 Membrane

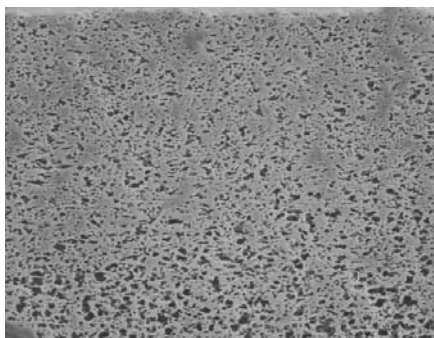
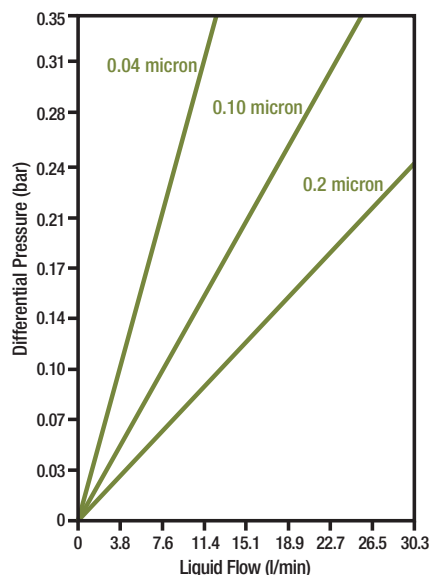


Figure 4: Typical Liquid Flow vs. Pressure Drop
10" LifeASSURE PSN Cartridge at 1 cp at 25 °C



At low differential pressures, the forces that would deform gels are correspondingly lower and the gels are retained by the membrane media. 3M Purification has been able to maximise 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.

The service life of a pleated cartridge and 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 cartridge or 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 LifeASSURE PSN cartridge and capsule filter is manufactured using a staggered and stepped configuration (Figure 2), which reduces open space between the outside pleats. This technology maximises 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 cartridge and capsule. The result is a fully used surface area that provides superior filter life.

LifeASSURE PSN Cartridge and Capsule Construction

LifeASSURE PSN filter cartridges and capsules are constructed of high efficiency, naturally hydrophilic, Nylon 6,6 membrane (Figure 3). The cage, core, end cap of the cartridge and membrane supports of cartridge and capsule are made of high-density polyethylene (HDPE) which has low extractables. 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. Cartridges and capsules are manufactured and double-bagged in a clean environment under an ISO certified quality system using the most advanced non-contact thermoplastic welding techniques which ensure filter integrity and superior downstream cleanliness out of the package. All LifeASSURE PSN filters are integrity tested in both membrane subassembly and final cartridge forms, unlike other filter manufacturers who only integrity test the membrane subassembly.

Cartridge and Capsule Extractables

The filter’s Nylon 6,6 and HDPE materials of construction ensure that ionic, or ganic 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.

LifeASSURE PSN Compatibility Guide

This listing is intended as a guide for selecting the appropriate 3M Purification filter based on compatibility with most common chemicals. This information is based on technical publications, laboratory experiments, data from material suppliers and field tests. It is recommended that compatibility of the filter with these chemicals be established in the specific chemical application because actual performance may differ as a result of variations in temperature, concentration, exposure time, or other factors. Consideration must also be given in selection of a suitable gasket material to assure complete compatibility.

Chemical	LifeASSURE PSN Nylon	Chemical	LifeASSURE PSN Nylon	Chemical	LifeASSURE PSN Nylon
Acetone	R	Ethanol	R	MMP	R
Ammonium Fluoride (40%)	R	ECA	R	NMP	R
Ammonium Hydroxide (conc)	LR	EGMEA	R	NOE	R
Anisole	R	Ethyl Acetate	R	P-Etch	N
Aquatar	R	Ethyl Lactate	R	PEGMEA	R
Aquatar 2	N	Ethyl Pyruvate	R	PGMEA	R
Butanol	R	Ethyl 3 - Ethoxy Propionate	R	Piranha	N
Butyl Acetate	R	Ethylene Glycol	R	Potassium Hydroxide (conc)	LR
Butyl Alcohol	R	Glycerol	R	Propylene Glycol	R
BOE	R	2-Heptanone	LR	RCA Etch	N
Cyclohexanone	LR	2-Hexanone	LR	SC1	N
Cyclopentanone	LR	Isobutanol	R	SC2	N
DIGLYME	R	IPA	R	Silicone Oils	R
Dimethylsulfoxide (DMSO)	R	Methanol	R	Sodium Hydroxide (conc)	LR
DMC	R	MAK	R	TMAH (5%)	LR
DMF	R	MEK	N	Xylene	N

R = Recommended

N = Not Recommended

LR = Limited Recommendation*

* Please consult your 3M Purification office or distributor for specific concentrations.

LifeASSURE PSN Cartridge and Capsule Flow Rates

Figures 4, 5, 6 & 7 depict typical flow rates for cartridges for 1 and 50 cp fluids and for the two style capsules available for 1 cp fluids at 25 °C.

LifeASSURE PSN Cartridge and Capsule Specifications

Component and Material of Construction	
Cartridge Cage, Core and End-Caps	High Density Polyethylene (HDPE)
Capsule Housing, Cage, Core and End-Caps	Polypropylene
Membrane Support Layers	High Density Polyethylene (HDPE)
Membrane	Naturally Hydrophilic Nylon 6,6
Dimensions (see also Ordering Guide)	
Cartridge Filtration Surface Area	1.04 m ²
Capsule Filtration Surface Area	2.5" Capsule: 0.16 m ² - 5" Capsule: 0.33 m ²
Cartridge Outside Diameter (Nominal)	7 cm
Capsule Outside Diameter (Nominal)	7.6 cm
Cartridge Length (Nominal)	10, 20 and 30 inches (25.4, 50.8 and 76.2 cm)
Capsule Length (Nominal)	see ordering guide
Operating Parameters	
Maximum Cartridge Operating Temperature	50 °C
Maximum Capsule Operating Temperature	40 °C
Maximum Cartridge Forward Differential Pressure	4.1 bar at 25 °C
Maximum Capsule Forward Differential Pressure	4.1 bar at 40 °C
Maximum Capsule Operating Pressure	5.1 bar
Recommended Capsule Change-out Differential Pressure	2.4 bar
Removal Ratings (µm)	0.04, 0.1 and 0.2

Figure 5: Typical Liquid Flow vs. Pressure Drop 10" LifeASSURE PSN Cartridge at 50 cp at 25 °C

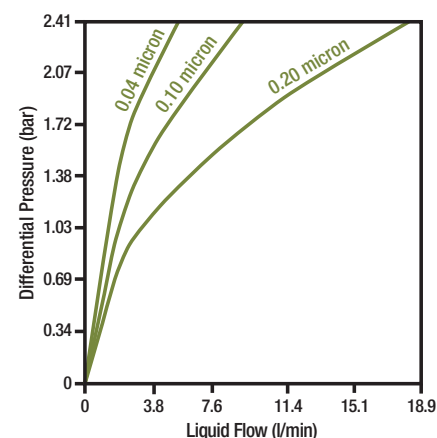


Figure 6: Typical Liquid Flow vs. Pressure Drop 1.5" LifeASSURE PSN Sanitary Capsule at 25 °C

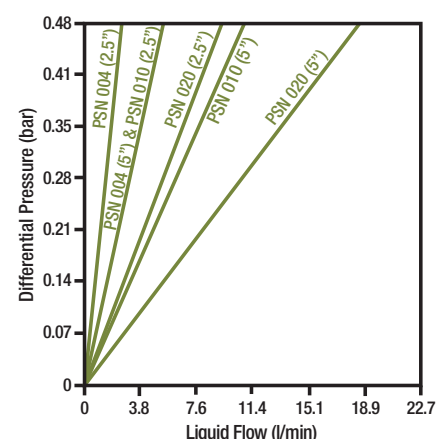
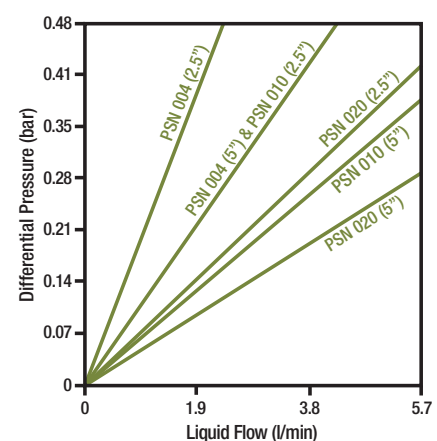


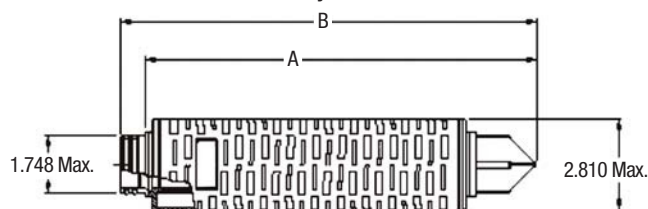
Figure 7: Typical Liquid Flow vs. Pressure Drop ¼" MNPT LifeASSURE PSN Capsule at 25 °C



LifeASSURE PSN Filter Cartridge Ordering Guide

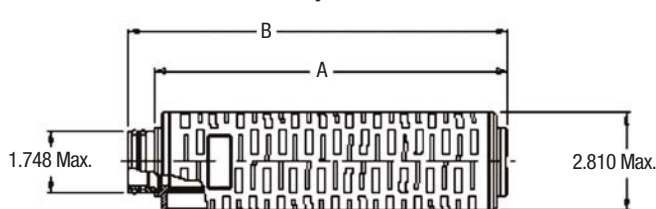
Type	Removal Rating	Configuration	Length	End Modification	Gasket / O-Ring Material
PSN	004 – 0.04 µm 010 – 0.10 µm 020 – 0.20 µm	F	01 – 10" 02 – 20" 03 – 30"	C - 222 O-Ring & Spear F - 222 O-Ring & Flat Cap	C - EPR K - PTFE Encapsulated Fluorocarbon (TEV)

Dimensions of C style end modification



Dimension	Nominal Cartridge Length (cm)		
	01	02	03
A	30	54.9	79.5
B	32	56.6	81.3

Dimensions of F style end modification

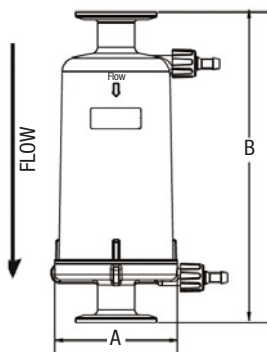


Dimension	Nominal Cartridge Length (cm)		
	01	02	03
A	25.4	50	74.9
B	27.4	52.1	76.7

LifeASSURE PSN Filter Capsule Ordering Guide

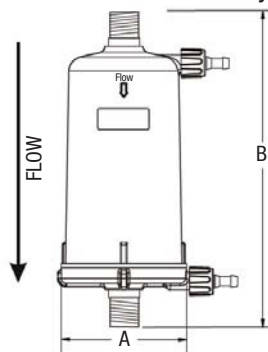
Type	Removal Rating	Configuration	Length	End Modification	Gasket / O-Ring Material	Packaging
PSN	004 – 0.04 µm 010 – 0.10 µm 020 – 0.20 µm	C	01 – 2.5" 02 – 5.0"	A - 1.5" Sanitary Flange F - 1/4" MNPT	B - Fluorocarbon C - EPR	01 – Single Pack 02 – 3-Pack

Dimensions of A style end modification



Dimension	Nominal Cartridge Length (cm)	
	2.5"	5"
A	7.6	
B	13	19.3

Dimensions of F style end modification



Dimension	Nominal Cartridge Length (cm)	
	2.5"	5"
A	7.6	
B	12.7	19.1

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 it 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 sold 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.

Limitation of Liability: 3M Purification will not be liable for any loss or damage arising from the use of the Product(s), whether direct, indirect, special, incidental, or consequential, regardless of the legal theory asserted, including warranty, contract, negligence or strict liability. Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation may not apply to you.

This warranty gives you specific legal rights and you may have other rights which vary from state to state, or country to country.

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v.3 - DOC10090
LITCTLAPSN1.EU - 0611

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