

Separation and Purification Sciences Division

Hollow fiber membrane nano-technology: Applied to purifying the chemistries for state of the art semiconductor devices.

NanoSHIELD[™] Series Cartridges and Capsules

High Flow Rates, Low Pressure Drop, and Long Filter Lifetime

NanoSHIELD[™] hollow fiber series filters have been engineered to combine a high level of particle retention with high flow rates and low pressure drop for the most demanding applications in the latest technology node.

Peak Performance Provided by Hollow Fiber Technology (HFT)

NanoSHIELD hollow fiber series filter cartridges with HFT provide up to 2 times more surface area and higher flow rates when compared to pleated membrane cartridges. This increase to flow and decrease to pressure drop allows a typical 10" NanoSHIELD hollow fiber series filter cartridge to perform similarly to a 20" pleated filter cartridge. This significant advantage allows for the use of smaller and less costly filter housings which reduce hold-up volume, filter change-out times, and total cost-of-ownership for the life of the process. In addition, Hollow Fiber Technology offers a membrane that is up to 2 times thicker than flat sheet membranes typically used in the lithography industry which in turn maximizes the depth of filtration and particle removal efficiency.

NanoSHIELD™ Hollow Fiber Series Cartridge Construction

The Hollow Fiber membrane is available in polypropylene, polyethylene and nylon construction. This provides low metallic/ionic contamination and excellent resistance to many chemicals. Metallic or ionic contaminants can extract from surface modified and improperly manufactured filters, which may reduce shelf life and or change the photo-speed, viscosity, or molecular weight of advanced chemicals. For this reason, all NanoSHIELD hollow fiber series filters are critically cleaned and integrity tested to provide low extractables and process repeatability out of the box. The compact design of NanoSHIELD hollow fiber series filter cartridges and capsules make them ideally suited for critical applications requiring low hold-up volume with superior flow rates and high particle retention from 100 nm down to 5 nm.

Applications

ARC, BARC, TARC
Polyimide
Solvents
Developers
Etchants / Strippers



Features & Benefits

Hollow Fiber Technology.

- Up to 2 times more surface area as compared to equivalent sized pleated filters.
- Increased depth up to (2x thicker) of filtration results in improved particle retention.

Large Surface Area

- Higher flow rates when compared to pleated cartridges.
- Increased lifetime, throughput, and overall equipment effectiveness.

Compact Design.

- Allows for smaller, less costly filter housings.
- Reduces hold-up volume, exposure, and waste of expensive chemicals.

5nm to 100 nm Retention Ratings.

- Superior removal of particles, gels, and micro-bubbles.
- Reduced micro-bridge and wafer level defects.

Quality Manufacturing.

- Manufactured in a cleanroom to reduce particle adders and extractables.
- Filters are critically cleaned and tested for process repeatability.

NanoSHIELD[™] **Hollow Fiber Series Filter Cartridges**

Typical Cartridge Flow vs. Differential Pressure (1cps@25°C)

Polypropylene Graph 2: Typical Fluid Flow Rates @ 25° C

Graph 3: Typical Fluid Flow Rates @ 25° C (20" NanoSHIELD[™] Cartridge - 222 connector)



NanoSHIELD[™] Hollow Fiber Series Cartridge Specifications

Graph 1: Typical Fluid Flow Rates @ 25° C

Membrane Material	Polypropylene	Polyethylene	Nylon		
Cage and End Caps		Polyothylopo			
Potting Material		Folyethylene			
Filtration Surface Area	5" Cartridge – 10.8 ft ² (1 m ²) 10" Cartridge – 23.7 ft ² (2.2 m ²) 20" Cartridge – 47.4 ft ² (4.4 m ²)	10" Cartridge – 16.1 ft ² (1.5 m ²) 20" Cartridge – 34.5 ft ² (3.2 m ²)	10" Cartridge – 21.5 ft ² (2 m ²) 20" Cartridge – 43.1 ft ² (4 m ²)		
Cartridge Outside Diameter		2.75" (7 cm) nominal			
Length	Nominal 5, 10, and 20" Nominal 10 and 20" (12.7, 25.4, and 50.8 cm) (25.4 cm and 50.8 cm)				
Maximum Operating Pressure	5	58 psig @ 77°F (4 bar @ 25°C)			
Maximum Differential Pressure	28 psid @ 77°F (1.9 bar @ 25°C)				
Maximum Operating Temperature	104°F (40°C)				
Absolute Removal Ratings (nm)	5, 10, 20, 50, and 100 5, 10 10, 40		10, 40		
Filter Cartridge Integrity	All Filters are Tested prior to release				

NanoSHIELD[™] LDC Series Capsules

Typical Cartridge Flow vs. Differential Pressure (1cps @ 25°C)

Polypropylene



 Vent
 Inlet

 8.31"
 12.95"

 (211mm)
 (329mm)

 Outlet
 Outlet

NanoSHIELD™ LDC Series Hollow Fiber Filter Capsules Specifications

Membrane Material	Polypropylene Polyethylene		
Capsule Body	Polypro	pylene	
O-ring Material	Fluorocarbon En	capsulated PTFE	
Potting Material	Polyet	hylene	
Eiltration Surface Area	5" Capsule – 10.8 ft ² (1 m ²)	5" Capsule – 8.1 ft ² (0.7 m ²)	
	10" Capsule – 23.7 ft² (2.2 m²) 10" Capsule – 16.1 ft² (1.5 m²)		
Maximum Operating Pressure	58 psig @ 77°F	(4 bar @ 25°C)	
Maximum Operating Temperature	104°F	(40°C)	
Absolute Removal Ratings (nm)	5, 10, 20, 50, and 100 5 and 10		
Maximum Differential Pressure	28 psid @ 77°F (1.9 bar @ 25°C)		
Filter Capsule Integrity	All Filters are Tested prior to release		

NanoSHIELD[™] MDC **Series Capsules**

Typical Cartridge Flow vs. Differential Pressure (1cps @ 25°C)

Polyethylene

Polypropylene











Nylon

Graph 2: Typical Fluid Flow Rates @ 25° C



Graph 4: Typical Fluid Flow Rates @ 25° C (5" NanoSHIELD MDC[™] with ¹/4" Swagelok Connections) (5" NanoSHIELD[™] MDC with 1/4" Swagelok Connections)



Graph 5: Typical Fluid Flow Rates @ 25° C (5" NanoSHIELD™ MDC with 1/4" Swagelok Connections)



NanoSHIELD[™] MDC Series Hollow Fiber Filter Capsules Specifications

Membrane Material	Polypropylene Nylon		Polyethelyne	
Capsule Body		Polyethylene		
Potting Material		Polyethylene		
Filtration Surface Area	5" MDC – 4.1 ft ² (0.38 m ²) 3" MDC – 1.8 ft ² (0.17 m ²)	5" MDC – 4.8 ft ² (0.45 m ²)	5" MDC –3.8 ft ² (0.38 m ²)	
Maximum Operating Pressure	58 psig @ 77°F (4 bar @ 25°C)			
Maximum Operating Temperature	104°F (40°C)			
Absolute Removal Ratings (nm)	5, 10, 20, 50, and 100	10 and 40	5 and 10	
Maximum Differential Pressure	28 psid @ 77°F (1.9 bar @ 25°C)			
Filter Capsule Integrity	All Filters are Tested prior to release			

End	End 5" MDC		3" MDC	
Fitting	А	В	А	В
Swagelok	2.28"	5.81" (147.6 mm)	2.28"	3.88" (98.5 mm)
Flowell	(58 mm)	7.08" (180 mm)	(58 mm)	5.15" (130.8 mm)

NanoSHIELD[™] SDC Series Capsules

Typical Cartridge Flow vs. Differential Pressure (1cps @ 25°C)





NanoSHIELD[™] SDC Series Hollow Fiber Filter Capsules Specifications

Membrane Material	Hollow Fiber Polypropylene
Capsule Body	Polyethylene
Potting Material	Polyethylene
Filtration Surface Area	1.0 ft ² (0.09 m ²)
Maximum Operating Pressure	58 psig @ 77°F (4 bar @ 25°C)
Maximum Operating Temperature	104°F (40°C)
Absolute Removal Ratings (nm)	5, 10, 20, 50, and 100
Maximum Differential Pressure	28 psid @ 77°F (1.9 bar @ 25°C)
Filter Capsule Integrity	All Filters are Tested prior to release

NanoSHIELD[™] LHV Series Tubes

Tubes

NanoSHIELD[™] LHV Series Hollow Fiber Filter Tube Specifications

Membrane Material	Polyproylene	Polyethylene	
Tubing Material	Polyethyle	ene	
Potting Material	Polyethyle	ene	
Filtration Surface Area – 3/8" tube (Nominal)	17 in² (110 c	:m²)	
Outside Diameter (nominal)	³ / ₈ " (9.5 mm)		
Length (nominal)	4.1" (10.5 cm)		
Maximum Operating Pressure	58 psig @ 77°F (4 bar @ 25°C)		
Maximum Operating Temperature	104°F (40°C)		
Absolute Removal Ratings (nm)	5, 10, 20, 50, and 100 5, 10		
Maximum Differential Pressure	28 psid @ 77°F (1.9 bar @ 25°C)		
Filter Integrity	All Filters are Tested prior to release		

NanoSHIELD[™] Series Hollow Fiber Filters and Capsules Ordering Guide

NanoSHIELD™ Cartridges					
	Removal Rating (nm)	Configuration	Length (inches)	End Connection	0-ring
NSP ⁴ - polypropylene fiber	05N -5 nm		50 ³ - 5"		
NSN ¹ - nylon fiber	001 -10 nm]	01 - 10"		K - Fluorocarbon encapsulated PTFE (FEP)
NSE ² - polyethylene fiber	002 -20 nm	H-cartridge	02 - 20"	flat cap	
	004 -40 nm				
	005 -50 nm				
	010 -100 nm				

¹NSN configuration only available in 10 nm and 40 nm removal rating.

²NSE configuration only available in 5 nm and 10 nm removal rating.

³NSP configuration only. ⁴NSP not available in 40 nm.

(Example - 5 nm polypropylene 10" cartridge, 222 O-ring (FEP) is part number NSP05NH01FK.)

NanoSHIELD™ LDC Capsules					
	Removal Rating (nm)	Configuration	Length (inches)	End Connection	
NSP - polypropylene fiber	05N -5 nm		50 - 5"		
NSE ¹ - polyethylene fiber	001 -10 nm	S - LDC capsule 01 - 10"			KH - 1/2" flowell 60
	002 -20 nm		01 10"	inlet & outlet with 1/4"	
	005 -50 nm		flowell 60 vent		
	010 -100 nm				

¹NSE configuration only available in 5 nm and 10 nm removal rating. (Example - 5 nm polypropylene 10" cartridge, Flowell[®] 60 Inlet/Outlet Fitting is part number NSP05NS01KH.)

NanoSHIELD™ MDC Capsules					
	Removal Rating (nm)	Configuration	Length (inches)	End Connection	
NSP ⁵ - polypropylene fiber	05N -5 nm		30 ³ - 3"		
NSN ¹ - nylon fiber	001 -10 nm			F - 1/4" Swagelok	
NSE ² - polyethylene fiber	002 -20 nm	P - MDC capsule			F1 - 1/4" Swagelok
	004 -40 nm		50 - 5"		
	005 -50 nm			G - 1/4" Flowell Series 60 fitting	
	010 -100 nm			oo nang	

¹NSN configuration only available in 10 nm and 40 nm removal rating.

²NSE configuration only available in 5 nm and 10 nm removal rating.

³NSP configuration only.

⁴F1 fitting available on NSN, NSE and select 5nm, 10nm, NSP and MDC capsules. See ordering guide. ⁵NSP not available in 40 nm. (Example - 50 nm polypropylene 5" capsule, Swagelok[®] Fitting is part number NSP005P50F.)

NanoSHIELD™ SDC Capsules					
	Removal Rating (nm)	Configuration	Length (inches)	End Connection	
NSP - polypropylene fiber	05N -5 nm	N - SDC capsule		J - 1/8" M-NPT	
	001 -10 nm		ıle 20 - 2"		
	002 -20 nm				
	005 -50 nm				
	010 -100 nm				

(Example - 5 nm polypropylene 2"capsule, NPT Fitting is part number NSP05N20J.)

NanoSHIELD™ LHV Tubes					
	Removal Rating (nm)	Configuration	Diameter (inches)	Quantity	
NSP - polypropylene fiber	05N -5 nm				
NSE ¹ - polyethylene fiber	001 -10 nm	T - tube	2 - 3/8"	5 - 5 tubes per package	
	002 -20 nm				
	005 -50 nm				
	010 -100 nm				

¹NSE configuration only available in 5 nm and 10 nm removal rating.

(Example - 50 nm polypropylene 0.375 in. x 4 in. tube, is part number NSP005T25.)

Product Selection and Use:

Many factors beyond 3M's control and uniquely within user's knowledge and control can affect the use and performance of a 3M product in a particular application. As a result, customer is solely responsible for evaluating the product and determining whether it is appropriate and suitable for customer's application, including conducting a workplace hazard assessment and reviewing all applicable regulations and standards (e.g., OSHA, ANSI, etc.). Failure to properly evaluate, select, and use a 3M product and appropriate safety products, or to meet all applicable safety regulations, may result in injury, sickness, death, and/or harm to property.

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