3M Science. Applied to Life.™

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.

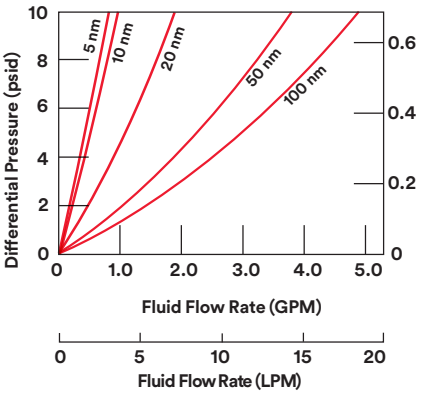
- Manufactured in a cleanroom to reduce particle adders and extractables.
- Filters are critically cleaned and tested for process repeatability.

NanoSHIELD™ Hollow Fiber Series Filter Cartridges

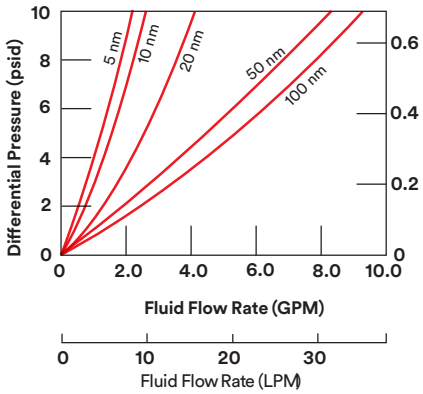
Typical Cartridge Flow vs. Differential Pressure (1cps @ 25°C)

Polypropylene

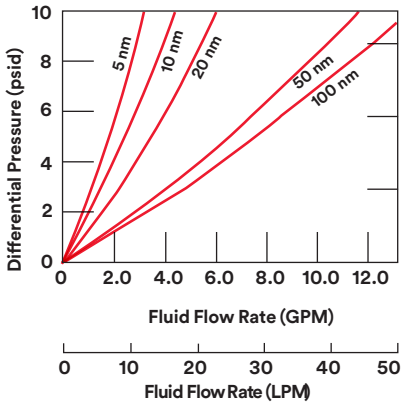
Graph 1: Typical Fluid Flow Rates @ 25° C (5" NanoSHIELD™ Cartridge - 222 connector)



Graph 2: Typical Fluid Flow Rates @ 25° C (10" NanoSHIELD™ Cartridge - 222 connector)

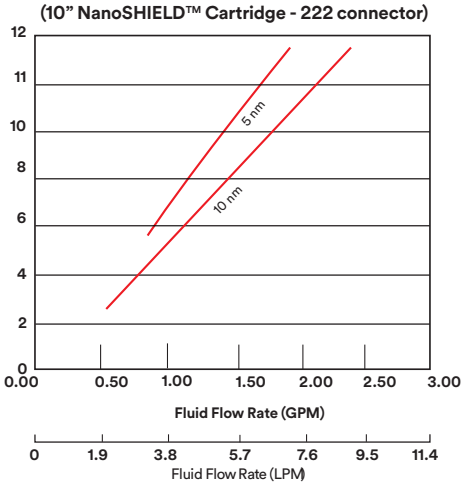


Graph 3: Typical Fluid Flow Rates @ 25° C (20" NanoSHIELD™ Cartridge - 222 connector)



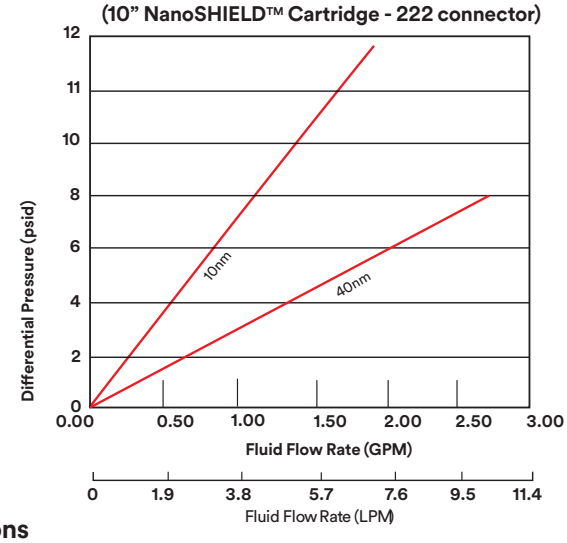
Polyethylene

Graph 4: Typical Fluid Flow Rates @ 25° C (10" NanoSHIELD™ Cartridge - 222 connector)



Nylon

Graph 5: Typical Fluid Flow Rates @ 25° C (10" NanoSHIELD™ Cartridge - 222 connector)



NanoSHIELD™ Hollow Fiber Series Cartridge Specifications

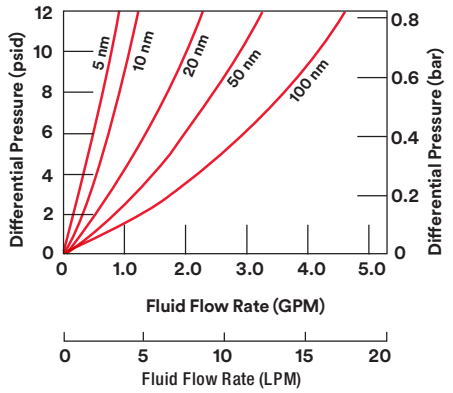
Membrane Material	Polypropylene	Polyethylene	Nylon
Cage and End Caps	Polyethylene		
Potting Material			
Filtration Surface Area	**5" Cartridge** – 10.8 ft² (1 m²) **10" Cartridge** – 23.7 ft² (2.2 m²) **20" Cartridge** – 47.4 ft² (4.4 m²)	**10" Cartridge** – 16.1 ft² (1.5 m²) **20" Cartridge** – 34.5 ft² (3.2 m²)	**10" Cartridge** – 21.5 ft² (2 m²) **20" Cartridge** – 43.1 ft² (4 m²)
Cartridge Outside Diameter	2.75" (7 cm) nominal		
Length	Nominal 5, 10, and 20" (12.7, 25.4, and 50.8 cm)	Nominal 10 and 20" (25.4cm and 50.8 cm)	
Maximum Operating Pressure	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
Filter Cartridge Integrity	All Filters are Tested prior to release		

NanoSHIELD™ LDC Series Capsules

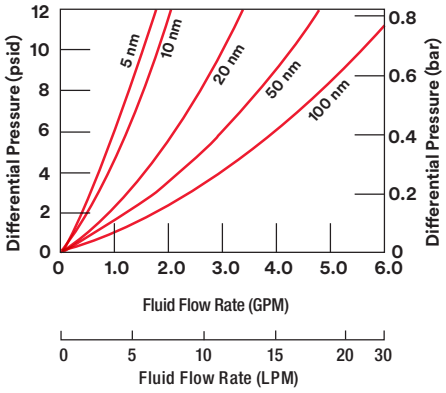
Typical Cartridge Flow vs. Differential Pressure (1cps @ 25°C)

Polypropylene

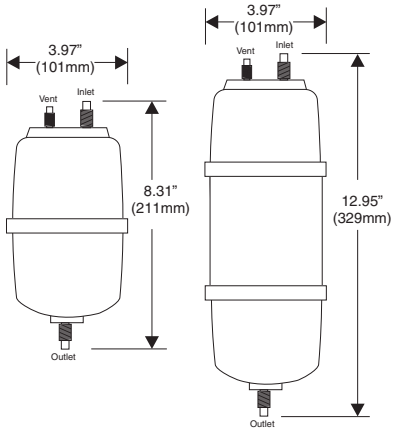
Graph 1: Typical Fluid Flow Rates @ 25° C
(5" NanoSHIELD™ LDC with 1/2" Flowell Connections)



Graph 2: Typical Fluid Flow Rates @ 25° C
(10" NanoSHIELD LDC™ with 1/2" Flowell Connections)



Dimensions



NanoSHIELD™ LDC Series Hollow Fiber Filter Capsules Specifications

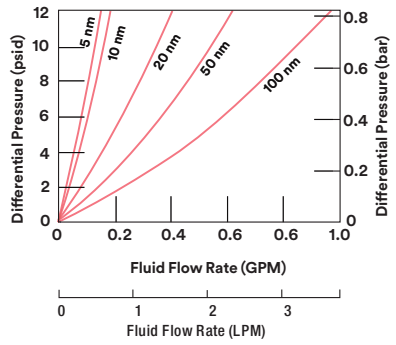
Membrane Material	Polypropylene	Polyethylene
Capsule Body	Polypropylene	
O-ring Material	Fluorocarbon Encapsulated PTFE	
Potting Material	Polyethylene	
Filtration Surface Area	**5" Capsule** – 10.8 ft² (1 m²)	**5" Capsule** – 8.1 ft² (0.7 m²)
	10" Capsule – 23.7 ft² (2.2 m²)	**10" Capsule** – 16.1 ft² (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

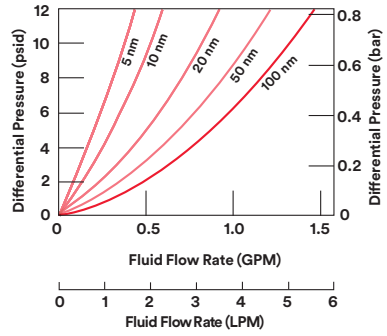
Typical Cartridge Flow vs. Differential Pressure (1cps @ 25°C)

Polypropylene

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

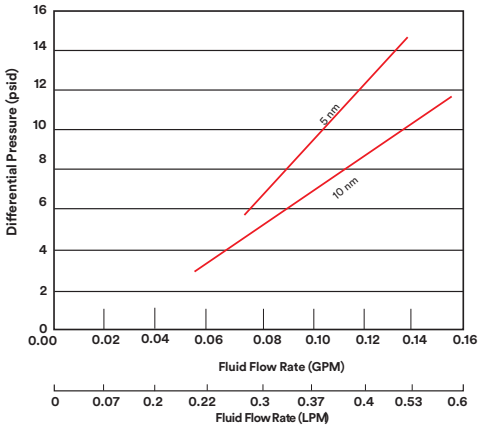


Graph 2: Typical Fluid Flow Rates @ 25° C
(5" NanoSHIELD MDC™ with 1/4" Swagelok Connections)

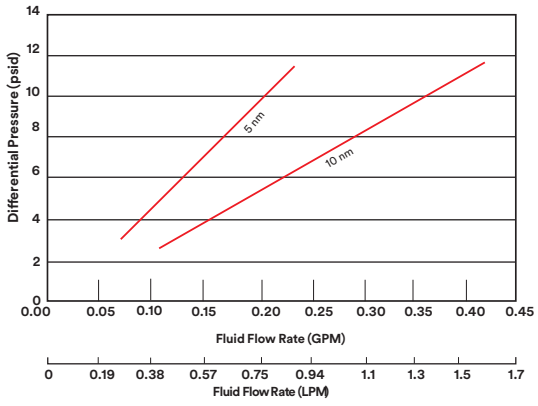


Polyethylene

Graph 3: Typical Fluid Flow Rates @ 25° C
(3" NanoSHIELD™ MDC with 1/4" Swagelok Connections)

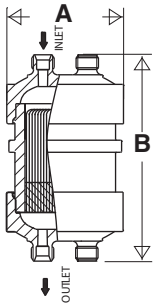


Graph 4: Typical Fluid Flow Rates @ 25° C
(5" NanoSHIELD™ MDC with 1/4" Swagelok Connections)

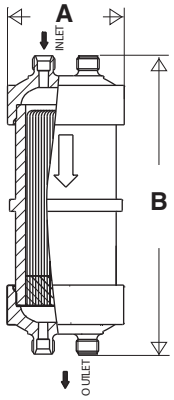


Dimensions

3 inch MDC

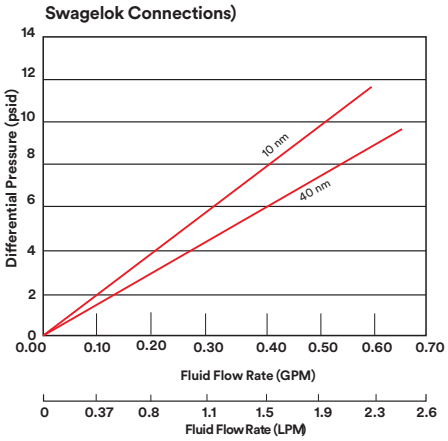


5 inch MDC



Nylon

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



NanoSHIELD™ MDC Series Hollow Fiber Filter Capsules Specifications

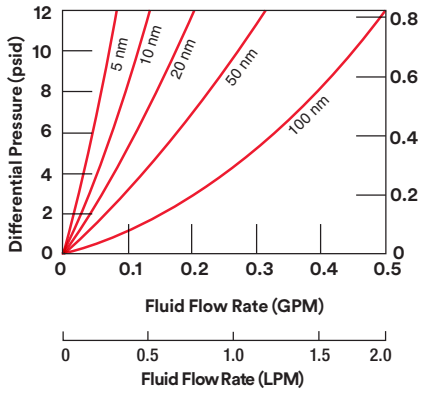
Membrane Material	Polypropylene	Nylon	Polyethelyne
Capsule Body	Polyethylene		
Potting Material	Polyethylene		
Filtration Surface Area	**5" MDC** – 4.1 ft² (0.38 m²) **3" MDC** – 1.8 ft² (0.17 m²)	**5" MDC** – 4.8 ft² (0.45 m²)	**5" MDC** –3.8 ft² (0.38 m²)
Maximum Operating Pressure	58 psig @ 77°F (4 bar @ 25°C)		
Maximum Operating Temperature	104°F (40°C)		
Absolute Removal Ratings (nm)	5, 10, 20, 50, and 100	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 Fitting	5" MDC		3" MDC	
	A	B	A	B
Swagelok	2.28" (58 mm)	5.81" (147.6 mm)	2.28" (58 mm)	3.88" (98.5 mm)
Flowell		7.08" (180 mm)		5.15" (130.8 mm)

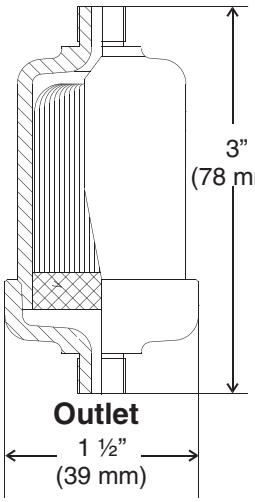
NanoSHIELD™ SDC Series Capsules

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

Graph 1: Typical Fluid Flow Rates @ 25° C (2" NanoSHIELD™ SDC with 1/8" MNPT Connections



Dimensions



NanoSHIELD™ SDC Series Hollow Fiber Filter Capsules Specifications

Membrane Material	Hollow Fiber Polypropylene
Capsule Body	Polyethylene
Potting Material	Polyethylene
Filtration Surface Area	1.0 ft² (0.09 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
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	Polyethylene	
Potting Material	Polyethylene	
Filtration Surface Area – 3/8" tube (Nominal)	17 in² (110 cm²)	
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	**H**-cartridge	**50**[3] - 5”	**F** - 222 o-ring & flat cap	**K** - Fluorocarbon encapsulated PTFE (FEP)
NSN[1] - nylon fiber	**001**-10 nm		**01** - 10”		
NSE[2] - polyethylene fiber	**002**-20 nm		**02** - 20”		
	004-40 nm				
	005-50 nm				
	010-100 nm				

[1]NSN configuration only available in 10 nm and 40 nm removal rating.
[2]NSE configuration only available in 5 nm and 10 nm removal rating.
[3]NSP configuration only. [4]NSP 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	**S** - LDC capsule	**50** - 5”	**KH** - 1/2” flowell 60 inlet & outlet with 1/4” flowell 60 vent
NSE[1] - polyethylene fiber	**001**-10 nm		**01** - 10”	
	002-20 nm			
	005-50 nm			
	010-100 nm			

[1]NSE 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	**P** - MDC capsule	**30**[3] - 3”	**F** - 1/4” Swagelok **F1** - 1/4” Swagelok fitting[4] **G** - 1/4” Flowell Series 60 fitting
NSN[1] - nylon fiber	**001**-10 nm		**50** - 5”	
NSE[2] - polyethylene fiber	**002**-20 nm			
	004-40 nm			
	005-50 nm			
	010-100 nm			

[1]NSN configuration only available in 10 nm and 40 nm removal rating.
[2]NSE configuration only available in 5 nm and 10 nm removal rating.
[3]NSP configuration only.
[4]F1 fitting available on NSN, NSE and select 5nm, 10nm, NSP and MDC capsules. See ordering guide. [5]NSP 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	**20** - 2”	**J** - 1/8” M-NPT
	001-10 nm			
	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	**T** - tube	**2** - 3/8”	**5** - 5 tubes per package
NSE[1] - polyethylene fiber	**001**-10 nm			
	002-20 nm			
	005-50 nm			
	010-100 nm			

[1]NSE 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.)

Intended Use: 3M™ NanoSHIELD™ Series products are intended for use in industrial filtration applications of aqueous fluids in accordance with the applicable product instructions and specifications. 3M NanoSHIELD Series products are also intended for use with non-aqueous fluids where materials of construction are compatible. Since there are many factors that can affect a product's use, the customer and user remain responsible for determining whether the 3M product is suitable and appropriate for the user's specific application, including user conducting an appropriate risk assessment and evaluating the 3M product in user's application.

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