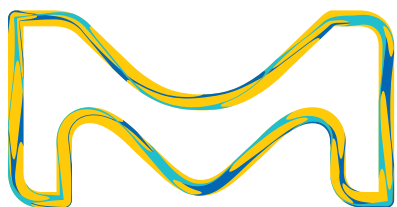


# Filters and Supporting Hardware

The path to new discoveries must be laid on a solid foundation. Backed by decades of research, our exhaustive portfolio of fundamental filters and supporting hardware has helped generations of scientists reach new milestones. With the needs of today's scientist at the top of our minds, we have continued to evolve, ensuring our products can continue to serve as the cornerstone for your latest innovation.



The life science business of Merck operates as MilliporeSigma in the U.S. and Canada.

**Millipore®**

Preparation, Separation, Filtration & Monitoring Products

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# 1.1 Membrane Filter Characteristics

Selecting the ideal filter begins with understanding their basic characteristics. Matching characteristics to sample properties and the desired filtration outcome can provide guidance on the utility of a given membrane filter in your application.

## Membrane Filters

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Produced by the precipitation or stretching of polymeric materials, membrane filters are one of the most commonly utilized items within both industry and research. Properties of membrane filters vary widely with differences in composition, surface treatments, and pore size.

### Chemical Compatibility

The filter material must be compatible with the chemical nature of the substance being filtered to avoid structural failure. The chemical compatibility of liquid samples is commonly focused solely on the liquid, but dissolved solutes could also interact with the membrane in an undesirable manner.

### Wettability

For liquid filtration, the membrane must be wettable with the fluid being filtered, which is based upon the chemical properties of the membrane surface. Resistance can occur if the membrane is not wettable, causing back pressure and increasing the risk of membrane failure. Hydrophobic membranes can be wetted with alcohols (e.g., methanol) prior to use in the filtration of aqueous solutions.

### Pore Size

For membrane filters, pore size provides an indication of largest pore diameter and can be related to the membrane's ability to filter out particles of a certain size. As membrane pores can be non-uniform, using the pore size rating alone is an unreliable measure of filter effectiveness. Bubble point and bacterial retention testing are two commonly used methods for measuring membrane pore size.

### Flow Rate

Defined as the time required for the flow stream to pass through the filter, flow rate is critical in determining how rapidly a filtration can be completed. Flow rate generally decreases with smaller pore size, but altering the membrane material, thickness, porosity, and pore architecture can all lead to differences in flow rate.

## Prefiltration and Depth Filters

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Prefiltration utilizes large pore membrane filters to remove large particulates, such as dirt or sediment, from samples prior to filtration with a smaller pore membrane filter. Using prefiltration in sample preparation can prevent premature filter clogging or fouling, extending the filter lifespan. Depth filters differ from membrane filters as depth filters retain particles internally, rather than solely on the filter surface. Due to their high particle retention capacity, depth filters are frequently used for prefiltration.

### Analyte Binding

Analyte binding refers to the loss of analytes during filtration, resulting in a filtrate with a different molecular composition than expected. With an internal surface area 100 to 600 times greater than the frontal surface area, polymeric microporous membranes provide a vast infrastructure for the non-specific binding of analytes. In addition to surface area, the presence of functional groups determines binding characteristics of membranes. Membranes with limited functionality (e.g., PVDF, PTFE) show very low analyte binding, whereas membranes with higher functionality (e.g., nylon, MCE) show a high level of analyte binding.

### Optical Properties

When visually analyzing retentates, the membrane optical properties must be compatible with the imaging method, such that the membrane provides a consistent background over the entire sample surface and does not impart additional noise during testing. Four technique-specific parameters are commonly considered: reflectance, transmittance, chemiluminescence, and fluorescence.

### Extractables

Extractables are contaminants present in the final filtrate that originate in the filter or device. Filter extractables occur as three different types: the shedding of filter materials or particulate extractables, residual chemicals from the manufacturing process, and surface modification chemistries washing off the filter. The presence of extractables can also be related to the chemical compatibility of the membrane with the solution being filtered. Generally, if a membrane is not chemically compatible with the solution, a higher level of extractables are observed in the filtrate.

### Retentiveness

Retentiveness is the ability of a membrane to retain the particle or molecule of interest. Depending on the criticality of retentiveness in the final application (e.g. sterilizing-grade membranes), the manufacturer may not undergo retention testing for each membrane type.

### Binders

Commonly used in non-woven, fiber-based materials, binders provide shape and strength to the final product. While binders are routinely used in glass fiber filters, these additives reduce thermal stability and can result in sample contamination by extractables.

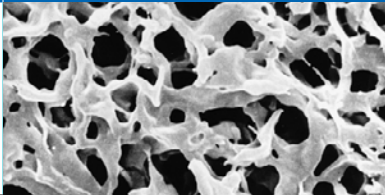
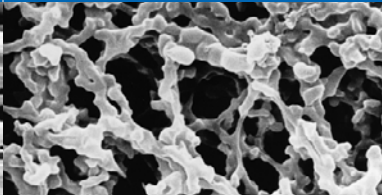
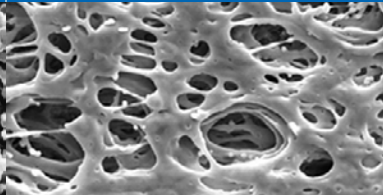
### Net Filters

With large and uniform pores, the net-like structure of net filters is used to remove large particulates, such as cells, proteins, or dirt, for solution clarification or particulate analysis.

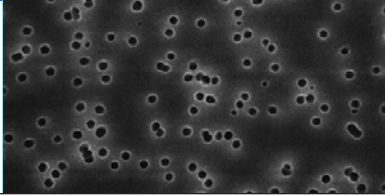
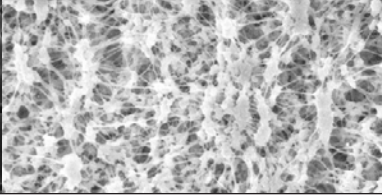
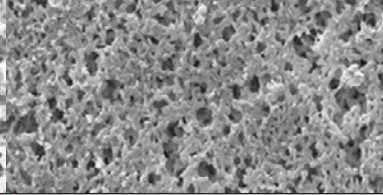
# 1.2 Filter Types by Characteristics

## Membrane Filters

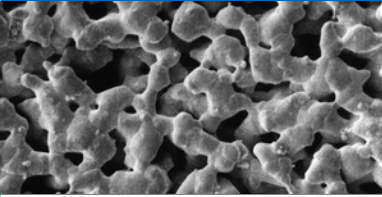
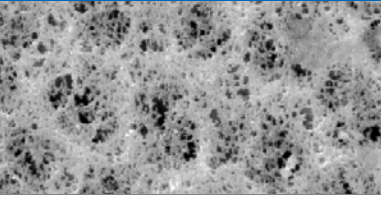
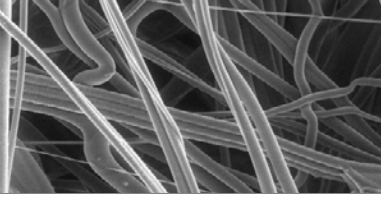
Membrane filter properties differ markedly based upon their composition, fabrication method, surface treatment, and pore size. The table below organizes membrane filters by composition, providing general characteristics for each membrane type. Product groups belonging to each membrane type can be found in the last row of each column.

Composition	Polyvinylidene Fluoride (PVDF)	Mixed Cellulose Ester (MCE)	Polyethersulfone (PES)
			
<b>Chemical Compatibility</b>	High	Medium	Low
<b>Wettability</b>	Hydrophilic or Hydrophobic	Hydrophilic	Hydrophilic
<b>Pore Size</b>	0.1 – 5 µm	0.025 – 8 µm	0.22 – 0.45 µm
<b>Flow Rate</b>	Slow to Medium	Medium	Fast
<b>Protein Binding</b>	Hydrophilic: Very Low Hydrophobic: High	Medium	Low
<b>Optical Properties</b>	<ul style="list-style-type: none"> <li>• White</li> <li>• Plain surface</li> </ul>	<ul style="list-style-type: none"> <li>• High-contrast</li> <li>• Available in black and white</li> <li>• Gridded and non-gridded surface</li> </ul>	<ul style="list-style-type: none"> <li>• White</li> <li>• Plain surface</li> </ul>
<b>Extractables</b>	<ul style="list-style-type: none"> <li>• Low</li> </ul>	<ul style="list-style-type: none"> <li>• Medium</li> </ul>	<ul style="list-style-type: none"> <li>• Low</li> </ul>
<b>Sterilization</b>	<ul style="list-style-type: none"> <li>• Ethylene oxide</li> <li>• Gamma irradiation</li> <li>• Autoclave</li> </ul>	<ul style="list-style-type: none"> <li>• Ethylene oxide</li> <li>• Gamma irradiation</li> <li>• Autoclave</li> </ul>	<ul style="list-style-type: none"> <li>• Ethylene oxide</li> <li>• Gamma irradiation</li> <li>• Autoclave</li> </ul>
<b>Product Groups</b>	<ul style="list-style-type: none"> <li>• Durapore® membrane filters</li> </ul>	<ul style="list-style-type: none"> <li>• MF-Millipore™ membrane filters</li> <li>• <b>Millipore® reinforced with polyester</b></li> <li>• Reinforced (RW) membrane filters</li> <li>• <b>Support pads</b></li> <li>• Cellulose support pads</li> </ul>	<ul style="list-style-type: none"> <li>• Millipore Express® PLUS membrane filters</li> </ul>

## Membrane Filters (continued)

Composition	Polycarbonate (PC)	Polytetrafluoroethylene (PTFE)	Nylon/Polyamide
			
<b>Chemical Compatibility</b>	Medium to Low	High	Medium to High
<b>Wettability</b>	Hydrophilic	Hydrophobic or Hydrophilic	Hydrophilic
<b>Pore Size</b>	0.015 – 12 µm	0.1 – 10 µm	0.2 – 180 µm
<b>Flow Rate</b>	Slow	Slow to Medium	Medium
<b>Protein Binding</b>	Low	Low	Medium
<b>Optical Properties</b>	<ul style="list-style-type: none"> <li>• Low background interference</li> <li>• Smooth surface</li> <li>• Translucent</li> <li>• Black/brown formats reduce background fluorescence</li> </ul>	<ul style="list-style-type: none"> <li>• White</li> <li>• Gridded and non-gridded surface</li> </ul>	<ul style="list-style-type: none"> <li>• White</li> <li>• Plain surface</li> </ul>
<b>Extractables</b>	<ul style="list-style-type: none"> <li>• Medium to Low</li> </ul>	<ul style="list-style-type: none"> <li>• Low</li> </ul>	<ul style="list-style-type: none"> <li>• Medium to Low</li> </ul>
<b>Sterilization</b>	<ul style="list-style-type: none"> <li>• Ethylene oxide</li> <li>• Gamma irradiation</li> <li>• Autoclave</li> </ul>	<ul style="list-style-type: none"> <li>• Ethylene oxide</li> <li>• Autoclave</li> </ul>	<ul style="list-style-type: none"> <li>• Ethylene oxide</li> <li>• Gamma irradiation</li> </ul>
<b>Product Groups</b>	<ul style="list-style-type: none"> <li>• Isopore™ membrane filters</li> </ul>	<p><b>Hydrophobic</b></p> <ul style="list-style-type: none"> <li>• Fluoropore™ membrane filters</li> <li>• Mitex™ membrane filters</li> <li>• PTFE for PM2.5 Particle Monitoring</li> </ul> <p><b>Hydrophilic</b></p> <ul style="list-style-type: none"> <li>• Omnipore™ membrane filters</li> <li>• LCR PTFE membrane filters</li> </ul>	<ul style="list-style-type: none"> <li>• Millipore® nylon membrane filters</li> </ul>

## Membrane Filters (continued)

Composition	Silver	Polyvinyl Chloride (PVC)	Polypropylene (PP)
			
<b>Chemical Compatibility</b>	High	Low	High
<b>Wettability</b>	-	Hydrophobic	Hydrophobic
<b>Pore Size</b>	0.45 µm	0.5 µm	0.6 – 45 µm
<b>Flow Rate</b>	-	Slow	Medium to Fast
<b>Protein Binding</b>	-	Medium to High	Low
<b>Optical Properties</b>	<ul style="list-style-type: none"> <li>• Smooth, highly reflective surface</li> <li>• Low background</li> </ul>	<ul style="list-style-type: none"> <li>• White</li> <li>• Plain surface</li> </ul>	<ul style="list-style-type: none"> <li>• White</li> <li>• Plain surface</li> </ul>
<b>Extractables</b>	Very Low	Low	Medium
<b>Sterilization</b>	<ul style="list-style-type: none"> <li>• Autoclave</li> </ul>	<ul style="list-style-type: none"> <li>• Ethylene oxide</li> <li>• Gamma irradiation</li> <li>• Autoclave</li> </ul>	<ul style="list-style-type: none"> <li>• Ethylene oxide</li> <li>• Autoclave</li> </ul>
<b>Product Groups</b>	<ul style="list-style-type: none"> <li>• Millipore® silver membrane filters</li> </ul>	<ul style="list-style-type: none"> <li>• Millipore® PVC membrane filters</li> </ul>	<ul style="list-style-type: none"> <li>• Millipore® polypropylene membrane and net filters</li> </ul>

## Glass and Quartz Fiber Filters

While glass and quartz fiber filters are typically classified as depth filters, they share the fibrous architecture and determining characteristics of cellulose-based fiber paper. Due to these differences, characteristics by each product group are highlighted in the table below.

Filter	Glass fiber without binder	Glass fiber with binder	Quartz fiber
<b>Binder</b>	No	Yes; Organic, Inorganic, or Both	No
<b>Chemical Compatibility</b>	High	Moderate to High	High
<b>Retention Rating (µm)</b>	0.6 – 2.7 µm	0.2 – 8 µm	-
<b>Flow Rate</b>	Medium to Fast	Slow to Fast	Slow to Medium
<b>Product Groups</b>	<ul style="list-style-type: none"> <li>• Millipore® glass fiber filters</li> </ul>	<ul style="list-style-type: none"> <li>• Millipore® glass fiber filters with binder resin</li> </ul>	<ul style="list-style-type: none"> <li>• Millipore® quartz fiber filters</li> </ul>

## 1.3 Filter Types by Application

The tables below provide product recommendations for research, industrial, and analytical applications, based upon general physical characteristics of each product group. While this chart provides general recommendations, filter compatibility with the sample and filtration method should be verified prior to use.

### Membrane Filters

Composition	Polyvinylidene Fluoride (PVDF)	Mixed Cellulose Ester (MCE)		Polyethersulfone (PES)	Polycarbonate (PC)
Product Groups	Durapore® membrane filters	MF-Millipore™ membrane filters	Millipore® reinforced (RW) membrane filters	Millipore Express® PLUS membrane filters	Isopore™ membrane filters
<b>Lab Applications</b>					
Air sterilization†	X				
Cell cytology		X			X
Chemotaxis					X
Clarification of cell lysates and tissue homogenates	X			X	
Clarifying acids and bases	X			X	
Epifluorescence microscopy					X
Fluorescent bacteriological assays		X			X
General filtration and clarification of aqueous solutions	X	X	X	X	
Microdialysis of DNA and proteins		X			
Mycoplasma reduction†	X				X
Prefiltration			X		
SEM analysis					X
Solvent filtration	X				
Sterilizing liquid filtration†	X	X		X	X
Tissue culture media filtration	X			X	
Venting applications					
<b>Environmental Monitoring Applications</b>					
Alpha particle monitoring					
Air monitoring		X			X
Gravimetric analysis		X			X
Industrial particle monitoring	X	X			
Particle collection and analysis		X			

### Membrane Filters (continued)

Composition	Hydrophobic Polytetrafluoroethylene (PTFE)		Hydrophilic Polytetrafluoroethylene (PTFE)		Nylon
Product Groups	Fluoropore™ membrane filters	Mitex™ membrane filters	Omnipore™ membrane filters	LCR PTFE membrane filters	Millipore® nylon membrane filters
<b>Lab Applications</b>					
Air sterilization†	X				
Cell cytology					
Chemotaxis					
Clarification of cell lysates and tissue homogenates					
Clarifying acids and bases	X	X	X	X	X
Epifluorescence microscopy					
Fluorescent bacteriological assays					
General filtration and clarification of aqueous solutions					X
Microdialysis of DNA and proteins					
Mycoplasma reduction†					
Prefiltration					X
SEM analysis					
Solvent filtration	X	X	X	X	X
Sterilizing liquid filtration†					
Tissue culture media filtration					
Venting applications	X				
<b>Environmental Monitoring Applications</b>					
Alpha particle monitoring	X				
Air monitoring	X	X			
Gravimetric analysis					
Industrial particle monitoring	X	X		X	
Particle collection and analysis					

†This application only applies to specific membrane filters within the product group. Please see specific application details for the product of interest on [www.sigmaaldrich.com](http://www.sigmaaldrich.com)

## Membrane Filters (continued)

Composition	Silver	Polyvinyl Chloride (PVC)	Polypropylene (PP)
Product Groups	Millipore® silver membrane filters	Millipore® PVC membrane filters	Millipore® PP membrane and net filters
Lab Applications			
Air sterilization†			
Cell cytology			
Chemotaxis			
Clarification of cell lysates and tissue homogenates			
Clarifying acids and bases			X
Epifluorescence microscopy			
Fluorescent bacteriological assays			
General filtration and clarification of aqueous solutions			
Microdialysis of DNA and proteins			
Mycoplasma reduction†			
Prefiltration			X
SEM analysis	X		
Solvent filtration			X
Sterilizing liquid filtration†			
Tissue culture media filtration			
Venting applications			
Environmental Monitoring Applications			
Alpha particle monitoring			
Air monitoring	X	X	
Gravimetric analysis			
Industrial particle monitoring		X	
Particle collection and analysis			

†This application only applies to specific membrane filters within the product group. Please see specific application details for the product of interest on [www.sigmaaldrich.com](http://www.sigmaaldrich.com)

## Glass and Quartz Fiber Filters

Grade/Filter type	Millipore® glass fiber filters with binder			Millipore® glass fiber filters						Millipore® quartz fiber filters
	AP15	AP20	AP25	APFA	APFB	APFC	APFD	APFF	AP40	AQFA
Particle type										
Coarse particles										
Medium particles										
Fine particles				X		X		X		
Applications										
Air monitoring										X
Analytical testing						X				X
Cell collection				X		X				
Environmental monitoring								X	X	
Liquid/Solution clarification	X	X	X	X	X		X	X		
Particle collection				X	X	X				
Prefiltration	X	X	X							
Scintillation measurements					X					

# 1.4 Filter Product Tables

The product tables below have grouped our comprehensive filtration offering by material, providing more specific application recommendations, specific product characteristics, and dimensions. While these charts provide recommendations, filter compatibility with the sample and filtration method should be verified prior to use.

## Cellulose

### MF-Millipore™ Membrane Filters

Produced from biologically inert cellulose acetate and cellulose nitrate, MF-Millipore™ mixed cellulose ester membranes are a versatile choice for biological, analytical, environmental monitoring, and research applications. With a consistent thickness, uniform pore structure, and smoother surface than pure nitrocellulose membranes, hydrophilic MF-Millipore™ membranes are available in a variety of pore sizes, colors, surfaces, and diameters. MF-Millipore™ membranes without Triton® surfactant contain minimum amounts of wetting agent and have a lower water extractable content than standard MF-Millipore™ filters.



Applications	Pore Size	Color	Surface	Filter Diameter	Pack Size	Catalog Number
<ul style="list-style-type: none"> <li>Microdialysis of DNA and proteins</li> </ul>	0.025 µm	White	Plain	13 mm	100	VSWP01300
				25 mm	100	VSWP02500
				47 mm	100	VSWP04700
				90 mm	25	VSWP09025
				142 mm	50	VSWP14250
	0.05 µm	White	Plain	13 mm	100	VMWP01300
				25 mm	100	VMWP02500
				47 mm	100	VMWP04700
				90 mm	25	VMWP09025
	0.1 µm	White	Plain	13 mm	100	VCWP01300
				25 mm	100	VCWP02500
				47 mm	100	VCWP04700
				90 mm	25	VCWP09025
				142 mm	50	VCWP14250
	<ul style="list-style-type: none"> <li>Sterilizing filtration</li> <li>Bioassays</li> </ul>	0.22 µm	White	Plain	13 mm	100
25 mm					100	GSWP02500
37 mm					100	GSWP03700 <sup>1</sup>
47 mm					100	GSWP04700
90 mm					100	GSWP09000
142 mm					50	GSWP14250
<ul style="list-style-type: none"> <li>Biological solutions</li> <li>Cell contact</li> <li>Very small volumes requiring surfactant-free surfaces</li> </ul>	0.22 µm	White	Plain, Triton®-free	13 mm	100	GSTF01300
				25 mm	100	GSTF02500
				47 mm	100	GSTF04700
				90 mm	100	GSTF09000
				142 mm	50	GSTF14250
<ul style="list-style-type: none"> <li>Bioassays</li> <li>Air monitoring</li> <li>Particle monitoring</li> <li>Particle removal</li> </ul>	0.3 µm	White	Plain	25 mm	100	PHWP02500
				47 mm	100	PHWP04700
				90 mm	25	PHWP09025
				142 mm	50	PHWP14250
<ul style="list-style-type: none"> <li>Clarification of aqueous solutions</li> <li>Particle removal</li> <li>Particle analysis</li> <li>Microbiology analysis</li> </ul>	0.45 µm	White	Plain	13 mm	100	HAWP01300
				24 mm	100	HAWP02400
				25 mm	100	HAWP02500
				37 mm	100	HAWP03700 <sup>1</sup>
				47 mm	50	HAWP0470M <sup>2</sup>
				47 mm	100	HAWP04700
				50 mm	100	HAWP05000
				90 mm	100	HAWP09000
				142 mm	50	HAWP14250
				Gridded	13 mm	100
			25 mm		100	HAWG02500
			37 mm		100	HAWG03700 <sup>1</sup>
			47 mm	100	HAWG04700	
500	HAWG04705					

<sup>1</sup>Monitor refills with thin absorbent pads for aerosol monitoring

<sup>2</sup>Matched weight filter pairs



## MF-Millipore™ Membrane Filters (continued)

Applications	Pore Size	Color	Surface	Filter Diameter	Pack Size	Catalog Number
<ul style="list-style-type: none"> <li>Biological solutions</li> <li>Cell contact</li> <li>Very small volumes requiring surfactant-free surfaces</li> </ul>	0.45 µm	White	Plain, Triton®-free	13 mm	100	HATF01300
				25 mm	100	HATF02500
				47 mm	100	HATF04700
				82 mm	50	HATF08250 <sup>6</sup>
				85 mm	50	HATF08550 <sup>6</sup>
				90 mm	25	HATF09025
				100 mm	50	HATF10050 <sup>6</sup>
<ul style="list-style-type: none"> <li>Fluorescent bacteriological assays</li> <li>Particle monitoring</li> <li>Bioassays</li> <li>Particle monitoring</li> </ul>	0.45 µm	Black	Plain	25 mm	100	HABP02500
				47 mm	100	HABP04700
			Gridded	13 mm	100	HABG01300
				25 mm	100	HABG02500
				47 mm	100	HABG04700
<ul style="list-style-type: none"> <li>Particle removal</li> <li>Dairy microbiology</li> <li>Retention of yeasts, molds, and algae</li> </ul>	0.65 µm	White	Plain	13 mm	100	DAWP01300
				25 mm	100	DAWP02500
				47 mm	100	DAWP04700
				90 mm	25	DAWP09025
				142 mm	50	DAWP14250
<ul style="list-style-type: none"> <li>Air monitoring</li> <li>Particle monitoring</li> <li>Particle removal</li> <li>Bioassays</li> </ul>	0.8 µm	White	Plain	13 mm	100	AAWP01300
				25 mm	100	AAWP02500
				37 mm	50	AAWP037PM <sup>4</sup>
				37 mm	100	AAWP03700 <sup>1</sup>
				37 mm	100	AAWP037P0 <sup>3</sup>
				47 mm	50	AAWP0470M <sup>2</sup>
				47 mm	100	AAWP04700
				90 mm	50	AAWP09050
				90 mm	100	AAWP09000
				142 mm	50	AAWP14250
			Gridded	13 mm	100	AAWG01300
				25 mm	100	AAWG0250C <sup>5</sup>
				37 mm	100	AAWG03700 <sup>1</sup>
				47 mm	100	AAWG04700
<ul style="list-style-type: none"> <li>Fluorescent assays</li> <li>Particle monitoring</li> <li>Air monitoring</li> </ul>	0.8 µm	Black	Plain	25 mm	100	AABP02500
				47 mm	100	AABP04700
			Gridded	13 mm	100	AABG01300
				25 mm	100	AABG02500
				37 mm	100	AABG03700 <sup>1</sup>
				47 mm	100	AABG04700
<ul style="list-style-type: none"> <li>Clarification of aqueous solutions</li> </ul>	1.2 µm	White	Plain	13 mm	100	RAWP01300
				25 mm	100	RAWP02500
				37 mm	100	RAWP03700
				47 mm	100	RAWP04700
				90 mm	25	RAWP09025
				142 mm	50	RAWP14250
			Gridded	25 mm	100	RAWG02500
				25 mm	100	RAWG0250C <sup>5</sup>
				47 mm	100	RAWG04700
<ul style="list-style-type: none"> <li>QC of fluid holding tanks</li> <li>Fluid monitoring</li> <li>Air monitoring</li> <li>Particle collection</li> <li>Particle analysis</li> </ul>	3.0 µm	White	Plain	13 mm	100	SSWP01300
				25 mm	100	SSWP02500
				47 mm	100	SSWP04700
				90 mm	25	SSWP09025
				142 mm	50	SSWP14250
				<ul style="list-style-type: none"> <li>QC of fluid holding tanks</li> <li>Fluid monitoring</li> <li>Particle collection</li> <li>Particle analysis</li> </ul>	5.0 µm	White
19 x 42 mm	100	SMWP0190R				
25 mm	100	SMWP02500				
37 mm	100	SMWP03700 <sup>1</sup>				
47 mm	100	SMWP04700				
90 mm	25	SMWP09025				
142 mm	50	SMWP14250				
<ul style="list-style-type: none"> <li>QC of fluid holding tanks</li> <li>Fluid monitoring</li> <li>Air monitoring</li> <li>Particle collection</li> <li>Particle analysis</li> </ul>	8.0 µm	White	Plain	13 mm	100	SCWP01300
				19 x 42 mm	100	SCWP0190R
				25 mm	100	SCWP02500
				47 mm	100	SCWP04700
				90 mm	25	SCWP09025
				142 mm	50	SCWP14250

<sup>1</sup>Monitor refills with thin absorbent pads for aerosol monitoring

<sup>2</sup>Matched weight filter pairs

<sup>3</sup>Monitor refills with thick absorbent pads for liquid monitoring

<sup>4</sup>Matched-weight monitor refills with thick absorbent pads for liquid monitoring

<sup>5</sup>Minimal fiber contamination. For asbestos monitoring applications

<sup>6</sup>Immobilon®-NC Transfer Membrane for Western blotting

## Reinforced Cellulose

Reinforced cellulose membranes (or RW filters) are rigid screen filters featuring a mixed cellulose ester membrane reinforced by a polyester web. Their rigidity, high-capacity, and low pressure drop make RW filters ideal for the removal of contaminants from heavily contaminated liquids and gasses, particularly for prefiltration. While traditional prefilter materials contain asbestos or fiberglass, reinforced cellulose membranes are produced from non-shedding materials, making them ideal for prefiltration prior to the use of sterilizing-grade ( $\leq 0.2 \mu\text{m}$ ) filters.

Applications	Retention Rating ( $\mu\text{m}$ )	Color	Surface	Filter Diameter	Pack Size	Catalog Number
• Prefiltration before 0.22 $\mu\text{m}$ membrane filtration	0.2	White	Plain	47 mm	100	RW0304700
				90 mm	100	RW0309000
• Prefiltration before 0.45 $\mu\text{m}$ membrane filtration	0.5	White	Plain	47 mm	100	RW0604700
				90 mm	100	RW0609000
				142 mm	50	RW0614250
• Prefiltration before 1.2 $\mu\text{m}$ membrane filtration	1.2	White	Plain	47 mm	100	RW1904700
				142 mm	50	RW1914250

## Support Pads for Fluid and Air Sampling

Cellulose support pads are used to reinforce filters in monitors for contamination analysis, specifically during high pressure or fast flow conditions. When saturated with growth medium, they can also be used for microorganism culture. Woven mesh spacers are placed between filters during serial filtration to prevent the downstream screen filter from “blinding” the upstream filter pores, increasing flow rate and throughput.

Applications	Product Description	Filter Diameter	Pack Size	Catalog Number
• Air monitoring • Environmental monitoring • Aerosol contamination monitoring • Protecting membrane filters during high pressure or fast flow conditions	Absorbent pad, cellulose	13 mm	100	AP1001300
		25 mm	100	AP1002500
		37 mm	100	AP1003700
		47 mm	100	AP1004700
• Combining multiple filtration steps • Preventing upstream and downstream filters from blinding	Thick absorbent pad, cellulose	34 mm	100	AP30034P0
	Dacron® woven mesh spacer	124 mm	50	AP3212450

# Polyvinylidene Fluoride (PVDF)

## Durapore® Membrane Filters

Due to their solvent and heat resistance, Durapore® polyvinylidene fluoride (PVDF) membranes are utilized in a variety of biomedical research applications. Available in both hydrophilic and hydrophobic formats, Durapore® membrane filters provide high flow rates and throughput, low extractables, and broad chemical compatibility. Hydrophilic Durapore® membranes exhibit very low protein binding and have been shown to bind less protein than nylon, nitrocellulose, or PTFE membranes. Conversely, hydrophobic Durapore® membranes exhibit high protein binding, as seen with Immobilon® PVDF membranes for Western blotting.



### Hydrophilic Durapore® Membranes

Applications	Pore Size	Color	Surface	Filter Diameter	Pack Size	Catalog Number				
• Mycoplasma reduction in biological solutions†	0.1 µm	White	Plain	13 mm	100	VVLP01300				
				25 mm	100	VVLP02500				
				47 mm	100	VVLP04700				
				63.5 mm	25	VVLP06225				
				76 mm	25	VVLP07625				
				90 mm	50	VVLP09050				
				142 mm	50	VVLP14250				
• Sterilizing filtration of biological solutions†	0.22 µm	White	Plain	1 x 10 ft roll	1	GVWP00010				
				13 mm	100	GVWP01300				
				25 mm	100	GVWP02500				
				47 mm	100	GVWP04700				
				63.5 mm	25	GVWP06225				
				76 mm	25	GVWP07625				
				90 mm	50	GVWP09050				
				100 mm	50	GVWP10050				
				142 mm	50	GVWP14250				
				• Clarifying filtration of biological solutions	0.45 µm	White	Plain	1 x 10 ft roll	1	HVLP00010
								13 mm	100	HVLP01300
25 mm	100	HVLP02500								
47 mm	100	HVLP04700								
63.5 mm	25	HVLP06225								
76 mm	25	HVLP07625								
90 mm	50	HVLP09050								
142 mm	50	HVLP14250								
Gridded	47 mm	100	HWVG04700							
• Clarifying filtration of biological solutions	0.65 µm	White	Plain					1 x 10 ft roll	1	DVPP00010
							13 mm	100	DVPP01300	
				25 mm	100	DVPP02500				
				47 mm	100	DVPP04700				
				82 mm	50	DVPP08250				
				90 mm	50	DVPP09050				
				142 mm	50	DVPP14250				
• Clarifying filtration of biological solutions • Particle monitoring	5.0 µm	White	Plain	13 mm	100	SVLP01300				
				25 mm	100	SVLP02500				
				47 mm	100	SVLP04700				
				75 mm	50	SLVP07550				
				90 mm	50	SVLP09050				
			Gridded	47 mm	100	SWVG04700				

### Hydrophobic Durapore® Membranes

Applications	Pore Size	Color	Surface	Filter Diameter	Pack Size	Catalog Number
• Air sterilization† • Gas sterilization†	0.1 µm	White	Plain	47 mm	100	VVHP04700
				• Air sterilization† • Gas sterilization† • Solvent filtration	0.22 µm	White
13 mm	100	GVHP01300				
25 mm	100	GVHP02500				
47 mm	100	GVHP04700				
90 mm	50	GVHP09050				
142 mm	50	GVHP14250				
• Air clarification • Gas and solvent filtration	0.45 µm	White	Plain	13 mm	100	HVHP01300
				25 mm	100	HVHP02500
				47 mm	100	HVHP04700
				90 mm	50	HVHP09050
				142 mm	50	HVHP14250

†This application only applies to specific membrane filters within the product group. Please see specific application details for the product of interest on [www.sigmaldrich.com](http://www.sigmaldrich.com)

# Polyethersulfone (PES)

## Millipore Express® PLUS Membrane Filters

Known for their thermal stability, durability and resistance to acidic and alkaline solutions, Millipore Express® PLUS hydrophilic polyethersulfone (PES) membranes are commonly used as an alternative to cellulose membranes. Millipore Express® PLUS membranes offer fast flow, high filter capacity and low protein binding, while remaining bacterially retentive. The unique asymmetric structure of Millipore Express® PLUS membranes extends filtration capacity and lifetime, allowing them to tolerate higher particle loads and protein concentrations.

Applications	Pore Size	Color	Surface	Filter Diameter	Pack Size	Catalog Number
<ul style="list-style-type: none"> <li>• Sterile filtration*</li> <li>• Buffer filtration</li> <li>• Tissue culture media filtration</li> </ul>	0.22 µm	White	Plain	13 mm	100	GPWP01300
				25 mm	100	GPWP02500
				47 mm	100	GPWP04700
				90 mm	50	GPWP09050
				142 mm	50	GPWP14250
<ul style="list-style-type: none"> <li>• Buffer filtration</li> <li>• Tissue culture media filtration</li> </ul>	0.45 µm	White	Plain	13 mm	100	HPWP01300
				25 mm	100	HPWP02500
				47 mm	100	HPWP04700
				90 mm	50	HPWP09050
				142 mm	50	HPWP14250

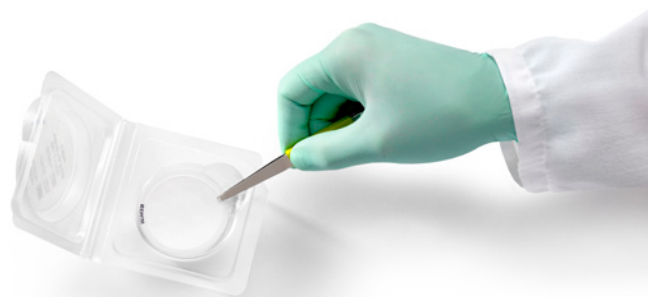
\*This application only applies to specific membrane filters within the product group. Please see specific application details for the product of interest on [www.sigmaldrich.com](http://www.sigmaldrich.com)

# Polytetrafluoroethylene (PTFE)

Polytetrafluoroethylene (or PTFE) is a chemical-resistant, flexible, thermally resistant, non-adherent, high-strength fluoropolymer produced from the free-radical polymerization of tetrafluoroethylene. Due to its strength and broad chemical compatibility, PTFE is commonly used in membrane filters. Hydrophilic PTFE membranes are typically used in filtering aqueous solutions, while hydrophobic PTFE membranes are typically used for filtering organic solvents and gases, as well as particle monitoring. While PTFE is known for its high strength, the addition of a high-density polyethylene (HDPE) backing offers improved filter handling characteristics.

## PTFE Membrane Filters

- Hydrophobic: Fluoropore™ membranes and Mitex™ membranes
- Hydrophilic: Omnipore™ membranes and LCR membranes
- With or without backing
- Solvent-compatible
- LCR membranes have low extractables for analytical applications



## Fluoropore™ membrane filters (hydrophobic)

Applications	Pore Size	Color	Backing	Surface	Filter Diameter	Pack Size	Catalog Number				
<ul style="list-style-type: none"> <li>• Clarifying acids, bases, and solvents</li> <li>• Filtering or venting gases</li> <li>• UV spectroscopy</li> <li>• Particle monitoring</li> </ul>	0.22 µm	White	HDPE	Plain	13 mm	100	FGLP01300				
					25 mm	100	FGLP02500				
					47 mm	100	FGLP04700				
					90 mm	50	FGLP09050				
					142 mm	50	FGLP14250				
	0.45 µm	White	HDPE	Plain	13 mm	100	FHLP01300				
					25 mm	100	FHLP02500				
					37 mm	100	FHLP03700				
					47 mm	100	FHLP04700				
					90 mm	50	FHLP09050				
					142 mm	50	FHLP14250				
						None	Plain	47 mm	100	FHUP04700	
1.0 µm	White	HDPE	Plain	13 mm	100	FALP01300					
				25 mm	100	FALP02500					
				47 mm	100	FALP04700					
				90 mm	50	FALP09050					
				142 mm	50	FALP14250					
3.0 µm	White	HDPE	Plain	25 mm	100	FSLW02500					
				47 mm	100	FSLW04700					
				90 mm	25	FSLW09025					
				142 mm	10	FSLW14200					
<ul style="list-style-type: none"> <li>• Air monitoring</li> </ul>	1.0 µm	White	HDPE	Plain, with pads	37 mm	100	FALP03700				
					3.0 µm	White	HDPE	Plain, with pads	37 mm	100	FSLW03700

## PTFE for PM2.5 particle monitoring

Applications	Pore Size	Color	Backing	Surface	Filter Diameter	Pack Size	Catalog Number
<ul style="list-style-type: none"> <li>PM 2.5 particle monitoring</li> </ul>	2.0 µm	White	None	Plain, with polypropylene ring, sequential serial numbering	47 mm	50	PM2547050

## Mitex™ membrane filters (hydrophobic)

Applications	Pore Size	Color	Backing	Surface	Filter Diameter	Pack Size	Catalog Number
<ul style="list-style-type: none"> <li>Clarifying acids, bases and cryogenic fluids</li> <li>Clarifying propellants</li> <li>Isolating RNA</li> <li>Air monitoring</li> </ul>	5.0 µm	White	None	Plain	13 mm	100	LSWP01300
					25 mm	100	LSWP02500
					37 mm	100	LSWP03700 <sup>1</sup>
					47 mm	100	LSWP04700
					90 mm	25	LSWP09025
	10.0 µm	White	None	Plain	142 mm	50	LSWP14250
					13 mm	100	LCWP01300
					25 mm	100	LCWP02500
					47 mm	100	LCWP04700
					90 mm	25	LCWP09025
142 mm	50	LCWP14250	Gridded	25 mm	100	LSWG02500	
				47 mm	100	LSWG04700	
				25 mm	100	LCWG02500	
				47 mm	100	LCWG04700	
				25 mm	100	LCWG02500	

<sup>1</sup>Monitor refills with thin absorbent pads for aerosol monitoring

## Omnipore™ membrane filters (hydrophilic)

Applications	Pore Size	Color	Backing	Surface	Filter Diameter	Pack Size	Catalog Number
<ul style="list-style-type: none"> <li>Filtration of aqueous solutions</li> <li>Clarifying acidic and alkaline solutions</li> </ul>	0.1 µm	White	None	Plain	13 mm	100	JVWP01300
					25 mm	100	JVWP02500
					47 mm	100	JVWP04700
					90 mm	25	JVWP09025
					142 mm	25	JVWP14225
	0.2 µm	White	None	Plain	13 mm	100	JGWP01300
					25 mm	100	JGWP02500
					47 mm	100	JGWP04700
					90 mm	25	JGWP09025
					142 mm	25	JGWP14225
	0.45 µm	White	None	Plain	13 mm	100	JHWP01300
					25 mm	100	JHWP02500
					47 mm	100	JHWP04700
					90 mm	25	JHWP09025
					142 mm	25	JHWP14225
	1.0 µm	White	None	Plain	13 mm	100	JAWP01300
					25 mm	100	JAWP02500
					47 mm	100	JAWP04700
					90 mm	25	JAWP09025
					142 mm	25	JAWP14225
	5.0 µm	White	None	Plain	13 mm	100	JMWP01300
					25 mm	100	JMWP02500
					47 mm	100	JMWP04700
					90 mm	25	JMWP09025
					142 mm	25	JMWP14225
	10.0 µm	White	None	Plain	13 mm	100	JCWP01300
					25 mm	100	JCWP02500
					47 mm	100	JCWP04700
					90 mm	25	JCWP09025
					142 mm	25	JCWP14225

## LCR membrane filters (hydrophilic)

Applications	Pore Size	Color	Backing	Surface	Filter Diameter	Pack Size	Catalog Number
<ul style="list-style-type: none"> <li>HPLC mobile phase filtration</li> <li>Clarifying acids, bases, and dilute protein solutions</li> <li>Isolating RNA</li> </ul>	0.45 µm	White	None	Plain	13 mm	100	FHLC01300
					25 mm	100	FHLC02500
					47 mm	100	FHLC04700

# Polycarbonate (PC)

## Isopore™ Membrane Filters

Produced from a smooth, glass-like polycarbonate film, Isopore™ membrane filters are recommended for all analyses in which the sample is viewed on the surface of the membrane, such as optical or electron microscopy. The unique membrane manufacturing process (track-etching) ensures a precise and consistent pore diameter for accurate sample separation by size.

Applications	Pore Size	Color	Surface	Filter Diameter	Pack Size	Catalog Number			
<ul style="list-style-type: none"> <li>• Chemotaxis</li> <li>• Bioassays</li> <li>• Cytology</li> <li>• Air monitoring</li> </ul>	0.1 µm	White	Plain	13 mm	100	VCPT01300			
				25 mm	100	VCPT02500			
				47 mm	100	VCPT04700			
				142 mm	50	VCPT14250			
<ul style="list-style-type: none"> <li>• Chemotaxis</li> <li>• Bioassays</li> <li>• Cytology</li> <li>• Air monitoring</li> <li>• SEM analysis</li> <li>• Sterility testing</li> </ul>	0.22 µm	White	Plain	13 mm	100	GTTP01300			
				25 mm	100	GTTP02500			
				37 mm	100	GTTP03700			
				47 mm	100	GTTP04700			
				90 mm	30	GTTP09030			
				142 mm	50	GTTP14250			
<ul style="list-style-type: none"> <li>• Epifluorescent microscopy</li> <li>• Particle monitoring</li> <li>• Air monitoring</li> </ul>	0.22 µm	Brown	Plain	13 mm	100	GTBP01300			
				25 mm	100	GTBP02500			
				47 mm	100	GTBP04700			
<ul style="list-style-type: none"> <li>• Absorbable organic halides (AOX)</li> <li>• Particle monitoring</li> <li>• Air monitoring</li> </ul>	0.4 µm	White	Plain	13 mm	100	HTTP01300			
				25 mm	100	HTTP02500			
				37 mm	100	HTTP03700			
				47 mm	100	HTTP04700			
				90 mm	30	HTTP09030			
				142 mm	50	HTTP14250			
<ul style="list-style-type: none"> <li>• Fluorescent microscopy</li> <li>• Particle monitoring</li> <li>• Air monitoring</li> </ul>	0.4 µm	Brown	Plain	13 mm	100	HTBP01300			
				25 mm	100	HTBP02500			
				47 mm	100	HTBP04700			
<ul style="list-style-type: none"> <li>• Reflective light microscopy</li> <li>• SEM analysis</li> <li>• Gravimetric analysis</li> <li>• Air monitoring</li> </ul>	0.6 µm	White	Plain	13 mm	100	DTTP01300			
				25 mm	100	DTTP02500			
				47 mm	100	DTTP04700			
<ul style="list-style-type: none"> <li>• Reflective light microscopy</li> <li>• SEM analysis</li> <li>• Gravimetric analysis</li> <li>• Air monitoring</li> <li>• Asbestos monitoring</li> </ul>	0.8 µm	White	Plain	13 mm	100	ATTP01300			
				25 mm	100	ATTP02500			
				37 mm	100	ATTP03700			
				47 mm	100	ATTP04700			
				142 mm	50	ATTP14250			
				13 mm	100	RTTP01300			
<ul style="list-style-type: none"> <li>• Chemotaxis</li> <li>• Bioassays</li> <li>• Cytology</li> <li>• Air monitoring</li> </ul>	1.2 µm	White	Plain	25 mm	100	RTTP02500			
				47 mm	100	RTTP04700			
				142 mm	50	RTTP14250			
				25 mm	100	TTTP02500			
	2 µm	White	Plain	47 mm	100	TTTP04700			
				3 µm	White	Plain	13 mm	100	TSTP01300
							25 mm	100	TSTP02500
							47 mm	100	TSTP04700
							142 mm	50	TSTP14250
				<ul style="list-style-type: none"> <li>• Parasitology</li> <li>• Chemotaxis</li> <li>• Bioassays</li> <li>• Cytology</li> <li>• Air monitoring</li> </ul>	5 µm	White	Plain	13 mm	100
25 mm	100	TMTP02500							
47 mm	100	TMTP04700							
90 mm	30	TMTP09030							
142 mm	50	TMTP14250							
<ul style="list-style-type: none"> <li>• Chemotaxis</li> <li>• Bioassays</li> <li>• Cytology</li> <li>• Air monitoring</li> </ul>	8 µm	White	Plain					13 mm	100
				25 mm	100	TETP02500			
				47 mm	100	TETP04700			
	10 µm	White	Plain	13 mm	100	TCTP01300			
				25 mm	100	TCTP02500			
				47 mm	100	TCTP04700			
				142 mm	50	TCTP14250			

# Nylon

With their broad compatibility, strength, flexibility, and hydrophilicity, nylon filters are routinely used for the filtration of aqueous and organic solutions.

## Nylon Membrane and Net Filters

Nylon membrane filters and nylon net filters are made from the same material but utilize two different processing methods. Due to this difference, nylon net filters possess a uniform, large pore structure (similar to a mesh), a pore size  $\geq 5.0 \mu\text{m}$ , and a reduced thickness in comparison to nylon membrane filters.

### Nylon membrane filters

Applications	Pore Size	Color	Surface	Filter Diameter	Pack Size	Catalog Number
<ul style="list-style-type: none"> <li>Sterilizing filtration†</li> <li>Bioassays</li> <li>Solvent filtration</li> </ul>	0.20 $\mu\text{m}$	White	Plain	25 mm	100	GNWP02500
				47 mm	100	GNWP04700
<ul style="list-style-type: none"> <li>Clarification of solutions</li> <li>Particle removal</li> <li>Particle analysis</li> </ul>	0.45 $\mu\text{m}$	White	Plain	25 mm	100	HNWP02500
				47 mm	100	HNWP04700
<ul style="list-style-type: none"> <li>Air monitoring</li> <li>Particle removal</li> <li>Particle analysis</li> </ul>	0.8 $\mu\text{m}$	White	Plain	25 mm	100	ANWP02500
				47 mm	100	ANWP04700
<ul style="list-style-type: none"> <li>Clarification of aqueous and organic solutions</li> </ul>	1.2 $\mu\text{m}$	White	Plain	25 mm	100	RNWP02500
				47 mm	100	RNWP04700
<ul style="list-style-type: none"> <li>Collection of algae and cells</li> <li>Particle analysis</li> <li>Large particulate filtration</li> <li>Toxicology and drug screening on <i>C. elegans</i> and zebrafish</li> <li>Background filter for particle imaging systems</li> <li>Prefiltration of solvents</li> <li>Paint monitoring</li> </ul>	5.0 $\mu\text{m}$	White	Plain	25 mm	100	NY0502500
				47 mm	100	NY0504700
				90 mm	50	NY0509050
				25 mm	100	NY1002500
	10.0 $\mu\text{m}$	White	Plain	47 mm	100	NY1004700
				90 mm	50	NY1009000
				30 cm x 3 m roll	1	NY1100010
	11.0 $\mu\text{m}$	White	Plain	25 mm	100	NY1102500
				47 mm	100	NY1104700
				90 mm	50	NY1109000
				30 cm x 3 m roll	1	NY2000010
	20.0 $\mu\text{m}$	White	Plain	25 mm	100	NY2002500
47 mm				100	NY2004700	
90 mm				50	NY2009000	
25 mm				100	NY3002500	
30.0 $\mu\text{m}$	White	Plain	47 mm	100	NY3004700	
			90 mm	50	NY3009000	
			30 cm x 3 m roll	1	NY4100010	
41.0 $\mu\text{m}$	White	Plain	25 mm	100	NY4102500	
			47 mm	100	NY4104700	
			90 mm	50	NY4109000	
			30 cm x 3 m roll	1	NY6000010	
60.0 $\mu\text{m}$	White	Plain	25 mm	100	NY6002500	
			47 mm	100	NY6004700	
			90 mm	50	NY6009000	
			25 mm	100	NY8002500	
80.0 $\mu\text{m}$	White	Plain	47 mm	100	NY8004700	
			90 mm	50	NY8009000	
			30 cm x 3 m roll	1	NY1H00010	
100.0 $\mu\text{m}$	White	Plain	25 mm	100	NY1H02500	
			47 mm	100	NY1H04700	
			90 mm	50	NY1H09000	
			25 mm	100	NY2H02500	
120.0 $\mu\text{m}$	White	Plain	47 mm	100	NY2H04700	
			90 mm	50	NY2H09000	
			25 mm	100	NY4H02500	
140.0 $\mu\text{m}$	White	Plain	47 mm	100	NY4H04700	
			90 mm	50	NY4H09000	
			30 cm x 3 m roll	1	NY6H00010	
160.0 $\mu\text{m}$	White	Plain	25 mm	100	NY6H02500	
			47 mm	100	NY6H04700	
			90 mm	50	NY6H09000	
			25 mm	100	NY8H02500	
180.0 $\mu\text{m}$	White	Plain	47 mm	100	NY8H04700	
			90 mm	50	NY8H09000	

†This application only applies to specific membrane filters within the product group. Please see specific application details for the product of interest on [www.sigmaldrich.com](http://www.sigmaldrich.com)

# Polypropylene (PP)

## Polypropylene Prefilters and Net Filters

Millipore® polypropylene membrane and net filters feature both solvent-compatibility and thermal stability. Constructed from pristine polypropylene material, these filters are ideally suited for general solution clarification and prefiltration applications, including bioburden reduction. Millipore® polypropylene membrane and net filters provide high particle retention and dirt holding capacity, as well as a low pressure drop. While these filters are designed for use with organic solvents, they can also be used for the filtration of aqueous solutions, after wetting with an alcohol (e.g., methanol).

Applications	Filter Type	Pore Size	Color	Surface	Filter Diameter	Pack Size	Catalog Number
<ul style="list-style-type: none"> <li>Clarification of aqueous solutions</li> <li>Prefiltration upstream of membrane filters with pore sizes of 0.2 – 0.6 µm</li> </ul>	Prefilter	0.6 µm	White	Plain	47 mm	100	AN0604700
<ul style="list-style-type: none"> <li>Clarification of aqueous solutions</li> <li>Prefiltration upstream of membrane filters with pore sizes of 0.5 – 2.0 µm</li> </ul>		1.2 µm	White	Plain	47 mm	100	AN1204700
<ul style="list-style-type: none"> <li>Clarification of aqueous solutions</li> <li>Prefiltration upstream of membrane filters with pore sizes of 0.8 – 8.0 µm</li> </ul>		2.5 µm	White	Plain	47 mm	100	AN2504700
<ul style="list-style-type: none"> <li>Collection of cells and precipitates</li> </ul>		5 µm	White	Plain	47 mm	100	AN5004700
<ul style="list-style-type: none"> <li>Collection of cells and protein precipitates</li> </ul>		10 µm	White	Plain	47 mm	100	AN1H04700
<ul style="list-style-type: none"> <li>Clarification of aqueous and organic solutions</li> <li>Collection of cells and protein precipitates</li> </ul>	Net filter	25 µm	White	Plain	47 mm	100	PP2502500
					25 mm	100	PP2502500
					142 mm	50	PP2514250
<ul style="list-style-type: none"> <li>Large particle removal</li> <li>Contamination analysis</li> </ul>		45 µm	White	Plain	25 mm	100	PP4502500
					47 mm	100	PP4504700
					90 mm	30	PP4509030

# Silver

## Silver Membrane Filters

Constructed from pure silver, silver membranes are highly resistant to thermal stress and aggressive chemicals, while providing a low background for sensitive X-ray diffraction analysis. Silver membranes are specified in many standardized air monitoring methods from government organizations (e.g., NIOSH, OSHA) for monitoring carbon black, coal tar products, coke oven emissions, and silica.

Applications	Pore Size	Surface	Filter Diameter	Pack Size	Catalog Number
<ul style="list-style-type: none"> <li>Air monitoring for asbestos, lead sulfide, crystalline and amorphous silica</li> <li>Crystalline silica analysis by x-ray diffraction</li> </ul>	0.45 µm	Plain	25 mm	50	AG4502550



## Polyvinyl chloride (PVC)

### PVC membrane filters

Due to their low weight and low water adsorption, Millipore® polyvinyl chloride (PVC) membrane filters are preferentially used with gravimetric analysis to quantify silica, carbon black, or quartz air particulates. Millipore® PVC membrane filters are produced from high-quality PVC and have been developed for use with ASTM, NIOSH, and OSHA air monitoring methods.

Applications	Pore Size	Color	Surface	Filter Diameter	Pack Size	Catalog Number
<ul style="list-style-type: none"> <li>Air monitoring</li> <li>Particle analysis</li> <li>Silica particle analysis</li> </ul>	5.0 µm	White	Plain	25 mm	100	PVC502500
				37 mm	100	PVC503700
				47 mm	100	PVC504700

## Glass and Quartz Fiber Filters

### Glass Fiber Filters

Produced from borosilicate glass fibers, glass fiber filters are typically used to filter large particles or viscous solutions. In addition to a wide variety of flow rates and capacities, we also offer filters both with and without binder resin. While the addition of binder resin improves the wet strength for filtering heavily contaminated solutions, the resin renders the filter unsuitable for gravimetric analysis or hot gas filtration due to mass loss upon heating. Glass fiber filters without a binder resin can be heated up to 500 °C without mass loss.

#### Millipore® glass filter fibers, with binders

Binder	Applications	Grade/Filter Code	Filter Diameter	Pack Size	Catalog Number
Resin	<ul style="list-style-type: none"> <li>Prefiltration for 0.2 to 0.6 µm filters</li> <li>Qualitative analysis</li> <li>Clarification of aqueous solutions</li> </ul>	AP 15	25 mm	100	AP1502500
			42 mm	100	AP1504200
			47 mm	100	AP1504700
			75 mm	100	AP1507500
			90 mm	100	AP1509000
			124 mm	50	AP1512450
	<ul style="list-style-type: none"> <li>Prefiltration for 0.8 to 8.0 µm filters</li> <li>Qualitative analysis</li> <li>Clarification of aqueous solutions</li> </ul>	AP 20	13 mm	100	AP2001300
			25 mm	100	AP2002500
			42 mm	100	AP2004200
			47 mm	100	AP2004700
			55 mm	100	AP2005500
			75 mm	100	AP2007500
			90 mm	100	AP2009000
			124 mm	50	AP2012450
	<ul style="list-style-type: none"> <li>Prefiltration for 0.9 to 8.0 µm filters</li> <li>Qualitative analysis</li> <li>Clarification of aqueous solutions</li> </ul>	AP 25	10 mm	100	AP2501000
			13 mm	100	AP2501300
			22 mm	100	AP2502200
			25 mm	100	AP2502500
			42 mm	100	AP2504200
			47 mm	100	AP2504700
			75 mm	100	AP2507500
			90 mm	100	AP2509000
			124 mm	50	AP2512450
			142 mm	50	AP2514250

## Millipore® glass fiber filters, without binders

Applications	Grade/Filter Code	Filter Diameter	Pack Size	Catalog Number
<ul style="list-style-type: none"> <li>Fine particle retention</li> <li>Monitoring wastewater</li> <li>Collecting suspended particles in gases</li> <li>Collection of cells</li> <li>Filtration of protein or nucleic acid precipitates</li> </ul>	APFA	37 mm	100	APFA03700
		47 mm	100	APFA04700
		90 mm	50	APFA09050
<ul style="list-style-type: none"> <li>Liquid clarification</li> <li>Quantification of solids in suspensions of fine particles</li> <li>Scintillation counting</li> </ul>	APFB	25 mm	100	APFB02500
		37 mm	100	APFB03700
		47 mm	100	APFB04700
		150 mm	50	APFB15050
<ul style="list-style-type: none"> <li>Removal of fine particles and microorganisms</li> <li>Determining total suspended solids</li> <li>Filtering proteins or nucleic acid TCA precipitates</li> <li>Collecting cells and microorganisms</li> </ul>	APFC	25 mm	100	APFC02500
		37 mm	100	APFC03700
		47 mm	100	APFC04700
		90 mm	50	APFC09050
<ul style="list-style-type: none"> <li>Clarifying suspensions containing particulates &gt;1.0 µm</li> </ul>	APFD	25 mm	100	APFD02500
		47 mm	100	APFD04700
		90 mm	50	APFD09050
<ul style="list-style-type: none"> <li>Filtering extremely fine precipitates</li> <li>Filtration of protein, nucleic acids, or serum precipitates</li> <li>EPA method 1311 for TCLP analysis</li> </ul>	APFF	25 mm	100	APFF02500
		47 mm	100	APFF04700
		90 mm	50	APFF09050
		124 mm	50	APFF12450
		142 mm	50	APFF14250
<ul style="list-style-type: none"> <li>Total Suspended Solids 2540D</li> <li>EPA method 1311 for TCLP analysis</li> <li>Determining volatile suspended matter in wastewater and industrial effluents</li> </ul>	AP40	8 x 10 in	50	AP408X105
		10 mm	100	AP4001000
		24 mm	500	AP4002405
		25 mm	100	AP4002500
		37 mm	500	AP4003705
		47 mm	100	AP4004700
			500	AP4004705
		70 mm	100	AP4007000
		90 mm	100	AP4009000
		142 mm	50	AP4014250

## Quartz Fiber Filters

Quartz fiber filters are manufactured from pure quartz fibers, preventing any surface filter reaction with acidic gases. Due to their inertness, quartz fiber filters are well suited for measuring heavy metal concentrations and small particle quantities. Quartz fiber filters also exhibit good weight and form stability.

Applications	Grade	Filter Diameter	Pack Size	Catalog Number
<b>Millipore® quartz fiber filters</b>				
<ul style="list-style-type: none"> <li>Measuring heavy metal concentrations and small amounts of particles</li> <li>EPA PM10 monitoring</li> <li>PM2.5 monitoring</li> </ul>	AQFA	8 x 10 in	50	AQFA8X105
		37 mm	100	AQFA03700
		47 mm	100	AQFA04700
		90 mm	50	AQFA09050
		110 mm	50	AQFA11050

## 1.5 Supporting Hardware, Vacuum Pumps, and Pressure Vessels






























Complementing our comprehensive filter offering, our supporting hardware, vacuum pumps, and pressure vessels provide robust solutions for a variety of filtration applications and conditions. Each section provides product specifications and recommendations for each category of filtration accessories.



# Supporting Hardware

## Filter Holders

Regardless of the scale or method, membranes must be housed in a device during filtration. Filter housings provide structural support and create a seal around the membrane, preventing filtrate contamination. Reusable housings, (i.e. filter holders) are constructed from either glass, plastic, or metal and must be matched to the diameter of the filter. The table below organizes our filter holders by material, filter diameter, and filtration conditions.

Material	Glass		Stainless Steel (SS)		Plastic	
	Vacuum		Vacuum	Pressure	Vacuum	Pressure
13 mm			Epifluorescence Filter Holder 	Swinny Filter Holder 		Swinnex® Filter Holder 
			Analytical Filter Holder 			
25 mm	Microanalysis filter holder 	Analytical Filter Holder 	High-Pressure Filter Holder 	1225 Sampling Manifold 	Swinnex® Filter Holder 	
			Microsyringe Filter Holder 			
			Solvent Filtering Dispenser 			
			Filterjet™ Solvent Dispenser 			
47 mm	All-Glass Filter Holder 	Analytical Filter Holder 	SS Pressure Filter Holder 	Millicup-FLEX™ Filtration Unit 	Swinnex® Filter Holder 	
	Classic Glass Filter Holder 	Hydrosol™ Filter Holder 	High-Pressure Filter Holder 	Pressure Vessel 	In-Line Filter Holder 	
	MilliSolve™ Kit, Bottle-to-Bottle Filtration System 		Filter Holder 	Sterifil® Filter Holder 		
90 mm	All-Glass Filter Holder 		Standing SS Filter Holder 			
142 mm	All-Glass Filter Holder 		Standing SS Filter Holder 			

## Glass Filter Holders

Due to their inert nature and broad chemical resistance, borosilicate glass filter holders are commonly used for research and small-scale filtrations. Depending on the application and sample volume, there are several different glass filter holder formats. Recent design improvements to our glass filter holders have included the addition of an alignment guide, enabling quick assembly and protecting glassware from damage.



Product Description	Applications	Funnel Volume	Filter Diameter	Membrane Support Type	Catalog Number
Microanalysis Filter Holder	<ul style="list-style-type: none"> <li>Contamination analysis</li> </ul>	15 mL	25 mm	Glass frit	XX1012500
				Stainless steel screen	XX1012530
All-Glass Filter Holder	<ul style="list-style-type: none"> <li>Particle contamination analysis</li> <li>HPLC solvent filtration</li> <li>General filtration and clarification</li> </ul>	300 mL	47 mm	Glass frit	XX1514700
		500 mL	47 mm	Glass frit	XX5514700
		1000 mL	90 mm	Glass frit	XX1019022
Classic Glass Filter Holder	<ul style="list-style-type: none"> <li>General clarification</li> <li>Bacteriological analysis</li> <li>Particulate contamination analysis of oils and hydraulic fluids</li> <li>Exfoliative cytology</li> </ul>	300 mL	47 mm	Stainless steel screen	XX1019020
				Glass frit	XX1014700
				PTFE-faced	XX1014720
		500 mL	47 mm	Stainless steel screen	XX1014730
				Glass frit	XX5014700

## Stainless Steel (SS) Filter Holders

Stainless steel filter holders feature corrosion resistance, strength, and resistance to bacterial adherence. Due to these advantages, stainless steel filter holders are most commonly used in industrial applications requiring pressure or high-pressure filtration. Stainless steel filter holders are also used for small-scale filtrations of organic or corrosive solutions, or when bacterial adherence must be avoided.



Product Description	Applications	Filter Diameter	Reservoir Capacity	Catalog Number
Epifluorescence Filter Holder	<ul style="list-style-type: none"> <li>Bacteriological analysis by epifluorescence</li> </ul>	13 mm	-	XF3001200
Analytical Filter Holder	<ul style="list-style-type: none"> <li>Bacteriological analysis</li> <li>Particle analysis</li> </ul>	13 mm	25 mL	XX3001240
		25 mm	50 mL	XX1012540
		47 mm	100 mL	XF2014710
			250 mL	XF2014725
Hydrosol™ Filter Holder	<ul style="list-style-type: none"> <li>Vacuum filtration of flammable liquids</li> </ul>	47 mm	650 mL	XX2004720
Swinny Filter Holder	<ul style="list-style-type: none"> <li>Ultracleaning or sterilization of liquids</li> </ul>	13 mm	-	XX3001200
High-Pressure Filter Holder	<ul style="list-style-type: none"> <li>In-line filtration of fluid process streams up to 700 bar</li> </ul>	25 mm	-	XX4502500
		47 mm	-	XX4504700
Microsyringe Filter Holder	<ul style="list-style-type: none"> <li>Ultracleaning or sterilization of liquids</li> </ul>	25 mm	-	XX3002500
			XX3002514	
SS Filter Holder	<ul style="list-style-type: none"> <li>In-line filtration of fluid process streams</li> </ul>	47 mm	-	XX4404700
SS Pressure Filter Holder	<ul style="list-style-type: none"> <li>Batch filtration</li> </ul>	47 mm	100 mL	XX4004700
			340 mL	XX4004740
Standing SS Filter Holder	<ul style="list-style-type: none"> <li>Ultracleaning or sterilization of liquids or gases</li> </ul>	90 mm	-	YY3009000
		142 mm	-	YY3014236

## Plastic Filter Holders

With increased durability, plastic filter holders are often sought as an alternative to glass. Depending on the polymeric material, plastic filter holders may not offer the same broad compatibility obtained with glass. Polypropylene-based filter holders, such as the Millicup-FLEX™ filtration unit, are compatible with both aqueous and organic solutions, making them an ideal alternative to fragile glass filter holders.



Product Description	Applications	Filter Diameter	Catalog Number
Swinnex® Filter Holder	<ul style="list-style-type: none"> <li>Ultracleaning or sterilization of liquids</li> </ul>	13 mm	SX0001300
		25 mm	SX0002500
		47 mm	SX0004700
1225 Sampling Manifold	<ul style="list-style-type: none"> <li>General filtration of 15 – 50 mL samples</li> <li>Preparation for scintillation counting</li> </ul>	25 mm	XX2702550
In-Line Filter Holder	<ul style="list-style-type: none"> <li>General in-line filtration</li> </ul>	47 mm	XX4304700
Millicup-FLEX™ Filtration Unit, 250 mL	<ul style="list-style-type: none"> <li>General filtration of aqueous and organic solutions</li> </ul>	47 mm	MCFLX4702
			MCFLX4710

## Solvent Dispensers

Particle and contamination monitoring methods in industrial applications often require that filtered solvent is used in analysis and rinsing containers prior to sample collection. Our solvent dispensers include an in-line filter holder to eliminate an extra step. The Millipore® solvent filtering dispenser allows the user to dispense small volumes of solvent by squeeze-bottle action, eliminating the need for an external pump. The Filterjet™ solvent dispenser connects directly to a pressure vessel, allowing the user to dispense a concentrated jet spray of ultraclean solvent or rinse solution.



Product Description	Applications	Filter Diameter	Catalog Number
Solvent Filtering Dispenser	• Solvent filtration prior to contamination analysis	25 mm	XX6602500
Filterjet™ Solvent Dispenser	• Solvent rinsing of machined parts and collection containers	25 mm	XX6702500

## Filter Forceps

To avoid damaging or contaminating membranes, filter forceps should be used to transfer membranes from the package to the filter holder. Our beveled, stainless steel forceps may be sterilized prior to use by autoclaving or flame-sterilization.



Product Description	Applications	Catalog Number
Filter forceps, blunt end, stainless steel	• Membrane handling	XX620006P

## Vacuum pumps

Our high output and chemical duty pumps support high flow rates to decrease process filtration time. The high output pump features a piston-driven design to offer greater power. The chemical duty pump has a chemically resistant head and diaphragm, allowing it to be used with corrosive chemicals and solvents. The table below highlights the specifications of each vacuum pump.



	High Output Pump	Chemical Duty Pump
Maximum Vacuum, mbar (inHg)	921 (27.2)	813 (24)
Maximum Pressure, bar (psig)	5.4 (80)	2.45 (35)
Maximum Flow Rate, L/min (CFM)	34 (1.2)	37 (1.3)
Materials (pump head, housing, regulator)	Cast aluminum	Cast aluminum
Weight, kg (lbs)	5.3 (11.7)	4.1 (9.0)
Dimensions, cm (in) H x W x L	20.3 x 22.9 x 25.4 (8 x 9 x 10)	17.8 x 17.8 x 20.3 (7 x 7 x 8)
Connections	¼ in stepped hose barb	¼ in stepped hose barb

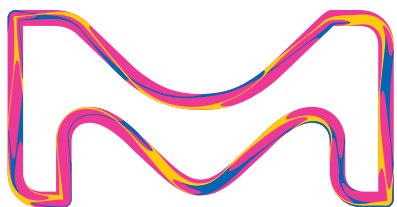
Product Description	Voltage	Catalog Number
High Output Pump	115 V / 60 Hz	WP6211560
	220 V / 50 Hz	WP6222050
	100 V / 50-60 Hz	WP6210060
Chemical Duty Pump	115 V / 60 Hz	WP6111560
	220 V / 50 Hz	WP6122050
	100 V / 50-60 Hz	WP6110060

## Pressure vessels

Dispensing pressure vessels hold solutions or solvent prior to pressure-driven filtration. To dispense, the pressure vessel must be connected to an external pressure source, providing an inlet pressure ≤6.9 bar (100 psi). All Millipore® dispensing pressure vessels meet ASME®-UM code requirements and closures are secured by a cam-lock handle.



Product Description	Application	Volume	Catalog Number
Dispensing Pressure Vessels	• Large volume filtration • Reservoir for buffer or solvent dispensing	1 gal	XX6700P01
		5 L	XX6700P05
		10 L	XX6700P10
		20 L	XX6700P20



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# Flex your choice

## Millicup™-FLEX Disposable Vacuum Filtration Unit

Millicup™-FLEX disposable vacuum filtration units provide the convenience of a disposable filtration unit with the flexibility and compatibility of a traditional, glass vacuum filtration apparatus. Our innovative, three-piece design eliminates the need for cleaning prior to filtration – saving you time, and reducing the risk of sample contamination.

### Advantages of the Millicup™-FLEX Disposable Filtration Unit

- Compatible with organic and aqueous solvents
- Ergonomic, clampless design
- Reduce contamination risk
- Filter directly into vacuum-rated storage bottles
- Easy access to membrane after filtration
- Fully recyclable components

Take filtration into your own hands.  
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## Millipore®

Preparation, Separation,  
Filtration & Monitoring Products

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