

# ADVANTEC®



MICRO FILTRATION  
TECHNOLOGY  
FOR LABORATORY  
& PROCESS SYSTEMS





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## FILTRATION MEDIA & FILTRATION SYSTEMS

## CATALOG•Volume15



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**A**dvantec MFS, Inc. is a wholly owned subsidiary of Toyo Roshiki Kaisha, Ltd. (Japan), a major producer of filtration media and related scientific products since 1916. This US-based operation was originally founded in 1979 as Toyo Roshiki International, Inc., a California corporation. Two of the three original divisions (Main Office and Micro Filtration Systems) were merged in 1995 to become Advantec MFS, Inc.



We aim to serve the pharmaceutical, public health, food and beverage, health care, life sciences and electronics industries with high quality products for separation science. Our product range includes membrane filters, prefiltration media, glass fiber and cellulose filters, qualitative and quantitative filter papers, specialty test papers, and an extensive range of filter holders in stainless steel, plastic, and glass for laboratory and process applications.

Customers have the right to expect the highest quality products we can produce. We manufacture our filter products to exacting standards and have established quality control specifications to assure you of product consistency, reproducibility, uniform performance and

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Our Customer Service Department prides itself on its excellent service and prompt accurate deliveries. Orders will ship the same day they are placed for stock on hand. In the case of back ordered supplies, we can give you an accurate lead time and suggest alternatives that may meet your needs. Should you have any questions about any of our products, our Technical Service department will provide you with current, application-specific information. We value our customers large and small and we strive to support them in every way possible.

Our goal continues to be what we have done for over 90 years: to manufacture consistent, reproducible quality products at the lowest possible cost and to provide the best possible service in their delivery.

# HOW TO ORDER

Contact us for pricing and ordering information on the items in this catalog and for assistance with custom orders.

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## Terms

FOB warehouse, Dublin, CA 94568  
Net 30 days with prior approved credit  
Credit cards accepted: VISA, MasterCard  
COD available  
Drop Shipments made without additional charge

## Prices

Prices are subject to change without notice. When ordering from a quotation, please reference the quotation number. Acceptance of any order is at the sole discretion of Advantec MFS, Inc.

## Returned Goods Policy

Products shipped may not be returned without proper prior authorization from Advantec MFS, Inc. and is subject to a 15% restocking fee. Authorization may be obtained by writing or calling our Customer Service Department. Goods must be in the original container, and in saleable condition to be considered for re-stocking. Orders can only be cancelled 48 hours after placed.

## Warranty

Advantec MFS, Inc. warrants its products against defects in material or workmanship for a period of one year from the date of delivery when used in accordance with the instructions provided in this catalog or with the product. The liability of Advantec MFS, Inc. is limited to replacement, or repair, at its option of any product.

Advantec MFS, Inc. makes no other warranty, expressed or implied.

Specifications listed in this catalog represent values in effect at the time of printing and are subject to change without notice.

## Technical Assistance

Please contact us if you have any questions about our products or wish to request a sample. Instruction manuals are available for many of our assemblies.

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## Introduction

Membrane filters or “membranes” are microporous plastic films with specific pore size ratings. Also known as screen, sieve or microporous filters, membranes retain particles or microorganisms larger than their pore size primarily by surface capture. Some particles smaller than the stated pore size may be retained by other mechanisms.

Advantec membranes are produced by three different processes. Mixed Cellulose Esters and Cellulose Acetate, are reverse phase solvent cast membranes, where controlled evaporation or removal of the complex solvent system forms the porous structure. Both hydrophilic and hydrophobic PTFE are made by a patented process where the membranes are stretched biaxially to form the porous structure. Polycarbonate membranes are track etched.

## Performance Characteristics of Advantec Membranes

- **Strong:** Advantec membranes are monitored for both burst (longitudinal) and tensile (lateral) strength.
- **Chemically and biologically clean:** As part of a comprehensive quality program, only high purity reagents and raw materials are used to produce Advantec membranes. Once cast, the membranes are handled in a class 1000 clean room to minimize ambient contamination. While some membranes require a small amount (0.1–3 weight %) of an aqueous wetting agent, Cellulose acetate has the lowest aqueous extractables (0.1 weight %). All Advantec membranes are Triton-free except Nylon.
- **Thin membranes with high porosity:** Uniformly thin membranes (typically 150  $\mu\text{m}$ ) with high porosity (about 80%) provide high gas and liquid flow per unit area. High porosity also provides high surface area for adsorption or binding
- **Thermostable:** All Advantec membranes can be sterilized by autoclaving. Operating temperatures of up to 180°C can be achieved depending upon the membrane polymer (see individual membrane specifications for details). Advantec membranes exhibit minimal shrinkage at elevated temperatures

## Quick Guide to Selecting Membrane Filters

- **Determine** what liquid or gas will be filtered
- **Check** which membranes are chemically compatible (following and appendix)
- **Determine** the maximum pore size required to achieve the results you want
- **Check** the membrane specifications for any unusual process conditions that might otherwise limit your choice of membrane (e.g. temperature)

For more detailed information on how to design a filtration system see the appendix, page 126.



## Properties of Membrane Filters

### MEMBRANE COMPARISON

Membrane polymer	Sample applications	General compatibility	Hydrophilic	Hydrophobic	Pore size range available (µm)							
					0.1	0.2	0.45	0.8	1.0	3.0	5.0	8.0
Mixed Cellulose Esters (MCE)	General purpose Microbiology Particle Analysis	Aqueous solutions	✓									
Cellulose Acetate	General filtration Cytology Binding studies	Aqueous solutions	✓									
Coated Cellulose Acetate	Clarify solutions Prefilter	Aqueous solutions	✓									
Hydrophilic PTFE	HPLC solutions Clarify or sterilize aqueous/organic mixtures	Aqueous and organic solutions	✓									
Hydrophobic PTFE	Gas venting Clarify or sterilize	Non-aqueous solvents										
Hydrophobic PTFE with supported PP net	strong acids or solvents		✓									
Nylon	Filter sterilization Vacuum degassing HPLC solutions	Aqueous and organic solutions	✓									
Polycarbonate	Microscopy Beverage testing	Aqueous solutions	✓									

### ORDERING INFORMATION: MEMBRANE FILTER NOMENCLATURE

The membrane filter nomenclature specifies the required information for correctly ordering membranes. The nine digit code specifies type, pore size, surface/type, diameter and packaging as illustrated below.

**EXAMPLE**      **020**      **A**      **293**      **C**

**Quantity per Package**  
 A = 100      E = 5      R = 1 roll  
 B = 50\*      H = 25 with 60 mm center hole      Y = 200  
 C = 25      K = HE ind pack WG, 100      W = 1000  
 D = 10      J = HE ind pack WP, 100

\*B = Opticlear MF, 100

Diameter (mm)		Sheets/Rolls (cm)			
13 = 013	47 = 047	142 = 142	20 x 20 = 204	30 x 30 = 304	
25 = 025	82 = 082	293 = 293	22 x 22 = 224	33 cm x 3 m = 330	
37 = 037	90 = 090				

Surface/Type	Non-Sterile Packages				Pre-Sterilized Packages					
	10 x 10 (Autoclavable)		10 x 10		Individually Wrapped					
Packaging	No Pad	No Pad	Pad	Pad	Pad	No Pad	Pad	No Pad		
Surface	Plain	Grid	Plain	Grid	Plain	Grid	Plain	Grid		
MF Color										
White	A, X**	B, X**	S	T	C	D***	E	G	F	H
White HE*	J	K								
Black	N	P					Q	M	R	
Green	U	V							W	

\*HE = Hydrophobic Edge      \*\*Opticlear MF      \*\*\*D Type: 10 x 20, No pad

Membrane Pore Size (µm)			Y = Coated Cellulose Acetate (Nominal µm)	
5.00 = 500	1.00 = 100	0.50 = 050	0.20 = 020	10 = 100
3.00 = 300	0.80 = 080	0.45 = 045	0.10 = 010	2 = 020
	0.65 = 065	0.30 = 030		0.8 = 008

**Type of Filter**  
 A = Mixed Cellulose Esters      H = Hydrophilic PTFE      K = Polycarbonate  
 C = Cellulose Acetate      J = Hydrophobic PTFE, polypropylene backing      N = Nylon, supported  
 S = Cellulose Nitrate      T = Hydrophobic PTFE      Y = Coated Cellulose Acetate

## Mixed Cellulose Esters (MCE)

- **Composition:** Mixed cellulose esters including cellulose nitrate and cellulose acetate, also known as nitrocellulose
- **High porosity** provides superior flow rates
- **High protein binding** can be blocked by pretreatment or utilized in applications
- **High purity:** Triton-free
- **Autoclavable:** Withstands autoclaving temperatures up to 130°C without adversely affecting bubble point, flow rate or microbiological recovery
- **Rapid wetting time:** <3 seconds to wet a 47 mm diameter disc with aqueous 1% methylene blue

## APPLICATIONS

- Standard membranes for many laboratory applications including filter sterilizing biological fluids, microbiology, contamination analysis and air monitoring
- Can be transparentized to view collected particles
  - using compatible liquid (immersion oil, toluene),
- OR
  - select Opticlear membranes for the “hot block” acetone vapor method
- Gridded filters available for quantifying microbial growth
- Available non-sterile or sterilized by ethylene oxide (EtO)

## SPECIFICATIONS FOR MIXED CELLULOSE ESTERS (MCE), CODE A

Pore Size µm	Color	Surface	Bubble Point <sup>1</sup>		Flow Rate <sup>2</sup>		Porosity <sup>3</sup> (%)	Thickness (µm)
			MPa	psi	Water (mL/min/cm <sup>2</sup> )	Air (L/min/cm <sup>2</sup> )		
0.10	White	Plain	≥0.24	≥35.3	2.7	0.67	65	110
0.20	White	Plain	≥0.37	≥54.5	17.5	2.4	73	133
0.30	White	Plain	≥0.28	≥41.2	30	3.7	75	140
0.45	White	Plain	≥0.24	≥35.0	45	5.0	78	145
0.45	White	Grid	≥0.16	≥24.2	80	8.0	79	142
0.65	White	Plain	≥0.14	≥21.3	120	11.2	79	150
0.80	White	Plain	≥0.11	≥16.4	165	15.0	80	150
1.00	White	Plain	≥0.096	≥13.9	220	20.4	80	150
3.00	White	Plain	≥0.070	≥10.2	300	28.3	81	155
5.00	White	Plain	≥0.058	≥8.5	400	40.9	81	160
0.45	Black	Grid	≥0.22	≥32.7	50	5.0	78	135
0.80	Black	Grid	≥0.10	≥14.9	170	15	80	145
0.45	Green	Grid	≥0.22	≥32.7	50	5.0	78	135
0.80	Green	Grid	≥0.10	≥14.9	170	15	80	145

- Refractive index = 1.50
- Maximum operating temperature = 130°C
- Ash Content 2 ~ 5 µg/cm<sup>2</sup>

### Definitions:

1. Bubble point is the minimum pressure required to force air through a membrane which has been prewet with water (0.1 µm membranes prewet with isopropanol)
2. Flow Rate indicates initial flow rate at 10 psi using a KGS 47 filter holder
  - Water: using water prefiltered to 0.1 µm pore size
  - Air: using prefiltered nitrogen at 10 psi
3. Porosity refers to the percent open area

### Protein Binding of Membrane Filters

Membrane	Catalog code	Protein Absorbed (µg/cm <sup>2</sup> ) At pH 7.0	
		BSA*	γ-globulin
Mixed Cellulose Esters, 0.20 µm	A020...	100.8	206.2
Cellulose Acetate, 0.20 µm	C020...	26.8	24.3

\*Bovine Serum Albumin

**Metal Content of White Plain MCE Membrane Filters (ppm)**

Al	<2.0	K	6.0	Ni	<5.0
Ca	140.0	Li	<1.0	Pb	<1.0
Cd	<0.5	Mg	10.0	Si	<20.0
Cr	8.0	Mn	<0.5	Sn	<5.0
Cu	<1.0	Mo	<1.0	Ti	<1.0
Fe	<5.0	Na	10.0	Zn	<1.0

**ORDERING INFORMATION: MIXED CELLULOSE ESTERS – NON-STERILE****Plain White, package of 100 discs**

Pore Size ( $\mu\text{m}$ )	Diameter			
	13 mm	25 mm	37mm	47 mm
0.10	A010A013A	A010A025A	A010A037A	A010A047A
0.20	A020A013A	A020A025A	A020A037A	A020A047A
0.30	A030A013A	A030A025A	A030A037A	A030A047A
0.45	A045A013A	A045A025A	A045A037A	A045A047A
0.65	A065A013A	A065A025A	A065A037A	A065A047A
0.80	A080A013A	A080A025A	A080A037A	A080A047A
1.00	A100A013A	A100A025A	A100A037A	A100A047A
3.00	A300A013A	A300A025A	A300A037A	A300A047A
5.00	A500A013A	A500A025A	A500A037A	A500A047A



Mixed Cellulose Esters

**Plain White, package of 25 discs**

Pore Size ( $\mu\text{m}$ )	Diameter		
	90 mm	142 mm	293 mm
0.10	A010A090C	A010A142C	A010A293C
0.20	A020A090C	A020A142C	A020A293C
0.30	A030A090C	A030A142C	A030A293C
0.45	A045A090C	A045A142C	A045A293C
0.65	A065A090C	A065A142C	A065A293C
0.80	A080A090C	A080A142C	A080A293C
1.00	A100A090C	A100A142C	A100A293C
3.00	A300A090C	A300A142C	A300A293C
5.00	A500A090C	A500A142C	A500A293C

## ORDERING INFORMATION (CONTINUED): MIXED CELLULOSE ESTERS – NON-STERILE

## Gridded White, package of 100 discs

Pore Size (µm)	Diameter			
	13 mm	25 mm	37 mm	47 mm
0.45	A045B013A	A045B025A	A045B037A	A045B047A
0.80	A080B013A	A080B025A	A080B037A	A080B047A

0.8 µm MF has green grid lines on white background, 0.45 µm has black grid lines.

## Sheets, Gridded White

Pore Size (µm)	Qty/pkg	Size
		300 mm x 300 mm
0.45	25	A045B304C

## Hydrophobic Edge, 47 mm discs, package of 100 discs

Pore Size (µm)	Surface	
	Plain	Grid
0.20	A020J047A	A020K047A
0.45	A045J047A	A045K047A

## Opticlear, package of 100 discs

Pore Size (µm)	Surface	Diameter		
		25 mm	37 mm	47 mm
0.80	Plain	A080X025A	A080X037A	A080X047A
	Grid	A080X025B	A080X037B	A080X047B

## Black, package of 100 discs

Pore Size (µm)	Surface	Diameter			
		13 mm	25 mm	37 mm	47 mm
0.45	Plain	A045N013A	A045N025A	A045N037A	A045N047A
0.45	Grid	A045P013A	A045P025A	A045P037A	A045P047A
0.80	Plain	A080N013A	A080N025A	-	A080N047A
0.80	Grid	A080P013A	A080P025A	-	A080P047A

## Green, package of 100 discs

Pore Size (µm)	Surface	Diameter		
		13 mm	25 mm	47 mm
0.45	Plain	A045U013A	A045U025A	A045U047A
0.45	Grid	A045V013A	A045V025A	A045V047A
0.80	Grid	-	-	A080V047A

Additional sizes available by special order.

Also available in:

- Sterile packaging for microbiology.
- Disposable syringe units.

For Pure Nitrocellulose for Blotting, see page 38.

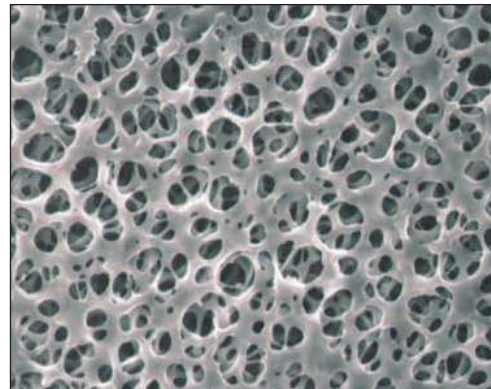
MSDS available for all the products.



MCE membrane filters

## Cellulose Acetate

- **Composition:** Mixture of cellulose triacetate and diacetate
- **Characteristics:** Low static charge and high strength
- **Autoclavable:** Withstands autoclaving temperatures up to 130°C without adversely affecting bubble point, flow rate or microbiological recovery
- **Clean:** Lowest aqueous extractables (0.1 wt%) of all Advantec membranes
- Relative to MCE (Mixed Cellulose Esters, Nitrocellulose):
  - improved solvent resistance to low molecular weight alcohols
  - better heat resistance
  - lower protein binding



Cellulose Acetate

## APPLICATIONS

- Enhanced recovery of fastidious gram positive organisms
- Filtration of enzyme solutions
- Diagnostic cytology
- Receptor binding studies

Note: Should not be prewet prior to loading into a holder and autoclaving.

## SPECIFICATIONS: WHITE PLAIN CELLULOSE ACETATE, CODE C

Pore Size (µm)	Bubble Point <sup>*1</sup>		Flow Rate <sup>*2</sup>		Porosity <sup>*3</sup> (%)	Thickness (µm)
	MPa	psi	Water (mL/min/cm <sup>2</sup> )	Air (L/min/cm <sup>2</sup> )		
0.20	≥0.25	≥37.1	16	2	66	125
0.45	≥0.17	≥25.9	35	4	68	125
0.80	≥0.068	≥10.0	160	14	72	125
3.00	≥0.034	≥5.0	500	54	78	135

- Wetting time: <3 seconds to wet a 47 mm diameter disc with aqueous 1% methylene blue
- Refractive index = 1.47
- Maximum operating temperature = 180°C
- Ash content 1.5–3.5 µg/cm<sup>2</sup>

### Definitions:

- \*1. Bubble point is the minimum pressure required to force air through a membrane which has been prewet with water
- \*2. Flow Rate indicates initial flow rate at 10 psi using a KGS 47 filter holder  
Water: using water prefiltered to 0.1 µm pore size  
Air: using 25°C air at 10 psi
- \*3. Porosity refers to the percent open area

## Metal Content of White Plain Cellulose Acetate Membrane Filters (ppm)

Al	<5.0	K	2.0	Ni	<0.5
Ca	36.4	Li	<0.5	Pb	<0.5
Cd	<0.1	Mg	1.9	Si	7.8
Cr	2.2	Mn	<0.5	Sn	<0.5
Cu	1.2	Mo	<0.5	Ti	<5.0
Fe	1.6	Na	5.9	Zn	0.6

## ORDERING INFORMATION: CELLULOSE ACETATE – NON-STERILE

### Plain White, package of 100 discs

Pore Size (µm)	Diameter			
	13 mm	25 mm	37mm	47 mm
0.20	C020A013A	C020A025A	C020A037A	C020A047A
0.45	C045A013A	C045A025A	C045A037A	C045A047A
0.80	C080A013A	C080A025A	C080A037A	C080A047A
3.00	C300A013A	C300A025A	C300A037A	C300A047A

### Plain White, package of 25 discs

Pore Size (µm)	Diameter		
	90 mm	142 mm	293 mm
0.20	C020A090C	C020A142C	C020A293C
0.45	C045A090C	C045A142C	C045A293C
0.80	C080A090C	C080A142C	C080A293C
3.00	C300A090C	C300A142C	C300A293C

### Rolls, Plain White, 330 mm x 3 m

Pore Size (µm)	Roll
0.20	C020A330R
0.45	C045A330R
0.80	C080A330R

Also available in:

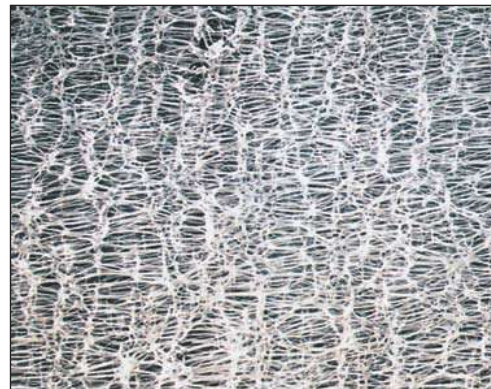
- Cartridge format (TCR)
- Disposable syringe filter units

## Hydrophobic PTFE

- **Properties:** Thin, highly porous, behaves as an absolute retentive membrane
- **Inert** to most chemically aggressive solvents, strong acids and bases
- **Operating Temperature Range:** -120 ~ 260°C
- **Autoclavable**

### APPLICATIONS

- Sterilize gases: traps aqueous aerosols
- Air and gas venting: allows gases to pass freely while blocking aqueous liquids, protect vacuum pumps and critical samples
- Sterilize and clarify strong acids and many other solvents incompatible with other membranes



Hydrophobic PTFE

### SPECIFICATIONS: HYDROPHOBIC PTFE MEMBRANE, CODE T

Pore Size (µm)	Bubble Point <sup>*1</sup>		Flow Rates <sup>*2</sup>	Porosity <sup>*3</sup> (%)	Maximum Operating Temperature (°C)	Thickness (µm)
	MPa	psi	Acetone (mL/min/cm <sup>2</sup> )			
0.10	≥0.12	≥17.4	27.0	68	260	70
0.20	≥0.091	≥13.2	55.0	74	260	80
0.50	≥0.063	≥9.1	100	78	260	75
0.80	≥0.039	≥5.7	200	76	260	75
1.00	≥0.031	≥4.5	300	79	260	75
3.00	≥0.013	≥1.9	750	83	260	75

#### Definitions:

\*1. Bubble point is the minimum pressure required to force air through a membrane which has been prewet with isopropylalcohol

\*2. Flow rates determined under constant vacuum 0.7 kg/cm<sup>2</sup> (10 psi)

\*3. Porosity refers to the percent open area

### ORDERING INFORMATION: HYDROPHOBIC PTFE – NON-STERILE

#### Plain White discs

Pore Size (µm)	Diameter					
	13 mm	25 mm	47 mm	90 mm	142 mm	293 mm
	Package of 100			Package of 25		Package of 10
0.10	T010A013A	T010A025A	T010A047A	T010A090C	T010A142C	T010A293D
0.20	T020A013A	T020A025A	T020A047A	T020A090C	T020A142C	T020A293D
0.50	T050A013A	T050A025A	T050A047A	T050A090C	T050A142C	T050A293D
0.80	T080A013A	T080A025A	T080A047A	T080A090C	T080A142C	T080A293D
1.00	T100A013A	T100A025A	T100A047A	T100A090C	T100A142C	T100A293D
3.00	T300A013A	T300A025A	T300A047A	T300A090C	T300A142C	T300A293D

#### Metal Content (ppm)

Al	0.001	K	<0.1
Ca	0.001	Mg	0.005
Cr	0.001	Mn	<0.001
Cu	0.01	Na	<0.05
Fe	<0.001	Ni	0.005

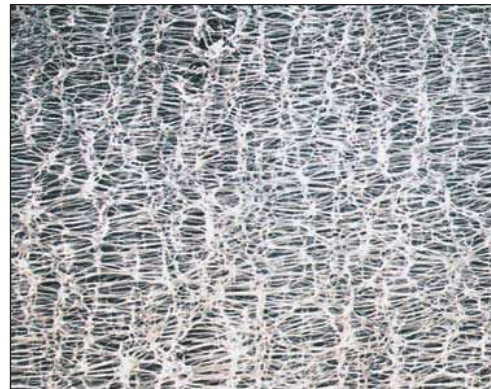


## Hydrophobic PTFE with Polypropylene Net Support

- **Properties:** Thin, highly porous, behaves as an absolute retentive membrane
- **Supported:** Hydrophobic PTFE laminated with polypropylene to improve handling.
- **Inert** to most chemically aggressive solvents, strong acids and bases
- **Operating Temperature Range:** -35 ~ 130°C
- **Autoclavable**

### APPLICATIONS:

- **Sterilize gases:** traps aqueous aerosols
- **Air and gas venting:** allows gases to pass freely while blocking aqueous liquids, protect vacuum pumps and critical samples
- **Sterilize and clarify** strong acids and many other solvents incompatible with other membrane



Hydrophobic PTFE

### SPECIFICATIONS: HYDROPHOBIC PTFE MEMBRANE, SUPPORTED, CODE J

Pore Size (µm)	Bubble Point <sup>*1</sup>		Flow Rates <sup>*2</sup>		Porosity <sup>*3</sup> (%)	Maximum Operating Temperature (°C)	Thickness (µm)
	MPa	psi	Acetone (mL/min/cm <sup>2</sup> )	Air (L/min/cm <sup>2</sup> )			
0.10	≥0.14	≥20.3	39.1	2.5	72	130	130
0.20	≥0.097	≥14.1	61.4	4.5	72	130	130
0.50	≥0.058	≥8.5	110	7.5	74	130	120
1.00	≥0.029	≥4.3	445	17	76	130	90

#### Definitions:

\*1. Bubble point is the minimum pressure required to force air through a membrane which has been prewet with isopropylalcohol

\*2. Flow rates determined under constant vacuum 0.7 kg/cm<sup>2</sup> (10 psi)

\*3. Porosity refers to the percent open area

### ORDERING INFORMATION: HYDROPHOBIC PTFE, SUPPORTED – NON-STERILE

#### Plain White discs

Pore Size (µm)	Diameter					
	13 mm	25 mm	47 mm	90 mm	142 mm	293 mm
	Package of 100			Package of 25		Package of 10
0.10	J010A013A	J010A025A	J010A047A	J010A090C	J010A142C	J010A293D
0.20	J020A013A	J020A025A	J020A047A	J020A090C	J020A142C	J020A293D
0.50	J050A013A	J050A025A	J050A047A	J050A090C	J050A142C	J050A293D
1.00	J100A013A	J100A025A	J100A047A	J100A090C	J100A142C	J100A293D

Also available in:

- Cartridge format
- Capsule format
- Disposable syringe filter units

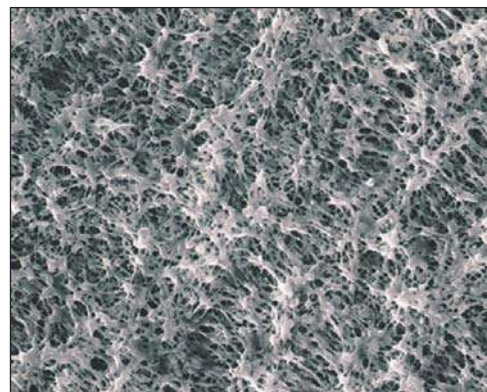
## Hydrophilic PTFE

- **Characteristics:** Maximum chemical and pH resistance
- **High flow rates** with minimal aqueous extractables (<0.3 wt%)
- **Optically clear** when wet with water
- **Non-supported**
- **Thermostable:** can be used up to 100°C

### APPLICATION

- Ideal for HPLC and other mixtures of aqueous and organic solvents

Note: Hydrophilic PTFE membrane filters are not autoclavable.  
Allowing the membrane to dry will render it hydrophobic.



Hydrophilic PTFE

### SPECIFICATIONS: HYDROPHILIC PTFE MEMBRANE, CODE H

Pore Size (µm)	Bubble Point <sup>*1</sup>		Flow Rates <sup>*2</sup>		Porosity <sup>*3</sup> (%)	Thickness (µm)	Maximum Operating Temperature (°C)
	MPa	psi	Water (mL/min/cm <sup>2</sup> )	Air (L/min/cm <sup>2</sup> )			
0.10	≥0.38	≥55.1	14	1.6	71	35	100
0.20	≥0.24	≥34.8	21	2.1	71	35	100
0.50	≥0.14	≥20.3	39	2.9	79	35	100
1.00	≥0.083	≥12.0	73	5.7	83	35	100

#### Definitions:

- \*1. Bubble point is the minimum pressure required to force air through a membrane which has been prewet with water
- \*2. Flow rate indicates initial flow rate at 10 psi using a KGS 47 filter holder  
Water: using water prefiltered to 0.1 µm pore size  
Air: using 25°C air at 10 psi
- \*3. Porosity refers to the percent open area

#### Metal Content (ppm)

Al	15	K	8
Ca	13	Mg	1
Cr	<1	Mn	0.1
Cu	0.5	Na	20
Fe	<10	Ni	0.9

### ORDERING INFORMATION: HYDROPHILIC PTFE – NON-STERILE

#### Plain White discs

Pore Size (µm)	Diameter					
	13 mm	25 mm	47 mm	90 mm	142 mm	293 mm
	package of 100			package of 25		package of 10
0.10	H010A013A	H010A025A	H010A047A	H010A090C	H010A142C	H010A293D
0.20	H020A013A	H020A025A	H020A047A	H020A090C	H020A142C	H020A293D
0.50	H050A013A	H050A025A	H050A047A	H050A090C	H050A142C	H050A293D
1.00	H100A013A	H100A025A	H100A047A	H100A090C	H100A142C	H100A293D

Also available in:

- Cartridge format
- Capsule format
- Disposable syringe filter units

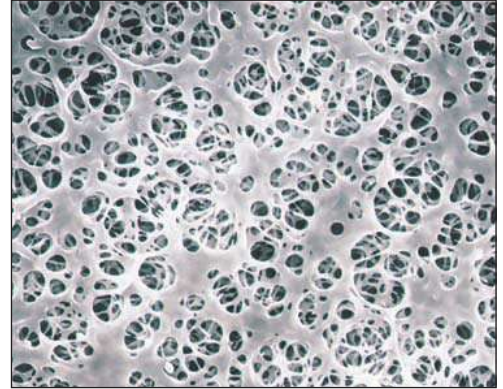


## Coated Cellulose Acetate

- **Composition:** Cellulose acetate cast onto a non-woven polyester support
- **Characteristics:** Non-fiber releasing
- **Low protein binding** relative to nitrocellulose
- **Low static charge** matrix with enhanced chemical compatibility to low molecular weight alcohols
- **Maximum operating temperature:** up to 180°C
- **Autoclavable**

### APPLICATION

- Use as a clarifying filter or prefilter



Coated Cellulose Acetate

### SPECIFICATIONS: COATED CELLULOSE ACETATE (CMF), CODE Y

Nominal Rating (µm)	Bubble Point* <sup>1</sup>		Flow Rate* <sup>2</sup>		% Latex Particle Retention (particle size in µm)							
	MPa	psi	Water (mL/min/cm <sup>2</sup> )	Air (L/min/cm <sup>2</sup> )	0.48	0.65	0.80	1	2	3	5	10
0.80	≥0.088	≥12.8	100	10	99	99	>99.9	-	-	-	-	-
2.00	≥0.049	≥7.1	290	32	96	99	99	99	>99.9	-	-	-
10.00	≥0.017	≥2.6	750	80	-	-	-	-	98	99.9	99.9	>99.9

#### Definitions:

\*1. Bubble point is the minimum pressure required to force air through a membrane which has been prewet with water.

\*2. Flow Rate indicates initial flow rate at 10 psi using a KGS-47 filter holder.

Water: using water prefiltered to 0.1 µm pore size

Air: using 25°C air at 10 psi

### ORDERING INFORMATION: COATED CELLULOSE ACETATE – NON-STERILE

#### Plain White, package of 100 discs

Nominal Rating (µm)	Diameter							
	35 mm	47 mm	76 mm	90 mm	124 mm	142 mm	257 mm	293 mm
0.80	Y008A035A	Y008A047A	Y008A076A	Y008A090A	Y008A124A	Y008A142A	Y008A257A	Y008A293A
2.00	Y020A035A	Y020A047A	Y020A076A	Y020A090A	Y020A124A	Y020A142A	Y020A257A	Y020A293A
10.00	Y100A035A	Y100A047A	Y100A076A	Y100A090A	Y100A124A	Y100A142A	Y100A257A	Y100A293A

Also available in:

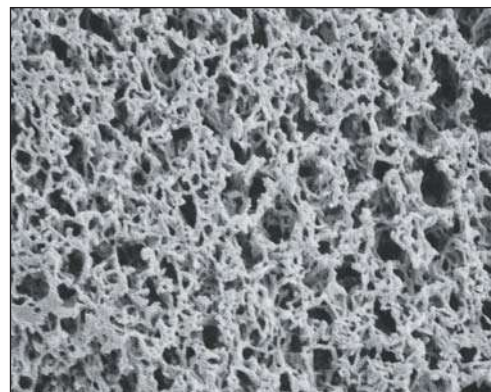
- Cartridge format (TCY and TCYE)

## Nylon

- **Composition:** Very strong, heat resistant membranes are manufactured by impregnating a polyester web with the nylon polymer
- **Inherently hydrophilic**
- **Compatible** with aqueous and alcoholic solutions and solvents
- **Pure:** negligible organic extractables
- **Binds** proteins, DNA and RNA

### APPLICATIONS

- Suitable for HPLC sample preparation
- Filter sterilize and clarify aqueous and organic solvent solutions including buffers, microbiological and tissue culture solutions
- Vacuum degassing



Nylon

### SPECIFICATIONS: NYLON MEMBRANE, CODE N

Pore Size ( $\mu\text{m}$ )	Bubble Point <sup>1</sup>		Flow Rates <sup>2</sup>	
	MPa	psi	Water (mL/min/cm <sup>2</sup> )	Air (L/min/cm <sup>2</sup> )
0.10	$\geq 0.48$	$\geq 70$	4.0	0.6
0.22	$\geq 0.34$	$\geq 50$	9.9	1.7
0.45	$\geq 0.20$	$\geq 30$	26.9	3.2
0.65	$\geq 0.12$	$\geq 18$	59.3	4.5
0.80	$\geq 0.089$	$\geq 13$	80.5	14
1.20	$\geq 0.075$	$\geq 11$	180	18
5.00	$\geq 0.041$	$\geq 6$	331	34

- Wetting time: <3 seconds to wet a 47 mm diameter disk with aqueous 1% methylene blue
- Maximum Operating Temperature = 180°C
- Thickness: 65–125  $\mu\text{m}$
- Extractables: <0.2%
- BSA Protein Binding 120 $\mu\text{g}/\text{cm}^2$

#### Definitions:

1. Bubble point is the minimum pressure required to force air through a membrane which has been prewet with water
2. Flow rate indicates initial flow rate at 10 psi

### ORDERING INFORMATION: NYLON – NONSTERILE

#### Plain White disks

Pore Size ( $\mu\text{m}$ )	13 mm	25 mm	47 mm	90 mm	142 mm	293 mm
	100 per package			25 per package		
0.10	N010A013A	N010A025A	N010A047A	N010A090C	N010A142C	N010A293C
0.22	N022A013A	N022A025A	N022A047A	N022A090C	N022A142C	N022A293C
0.45	N045A013A	N045A025A	N045A047A	N045A090C	N045A142C	N045A293C
0.65	N065A013A	N065A025A	N065A047A	N065A090C	N065A142C	N065A293C
0.80	N080A013A	N080A025A	N080A047A	N080A090C	N080A142C	N080A293C
1.20	N120A013A	N120A025A	N120A047A	N120A090C	N120A142C	N120A293C
5.00	N500A013A	N500A025A	N500A047A	N500A090C	N500A142C	N500A293C

Also available in:

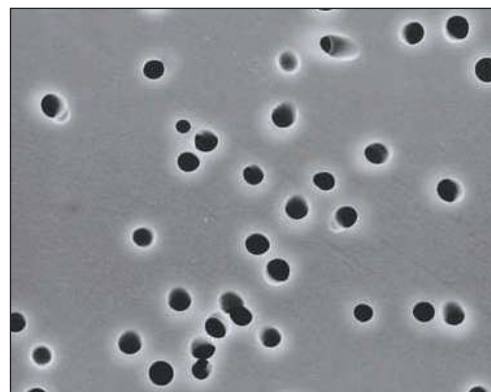
- Disposable syringe filter units

## Polycarbonate

- **Characteristics:** Low non-specific binding and optically translucent, extremely uniform, cylindrical pores
- **Thin screen-type membranes** minimize entrapment within the filter structure; resulting in surface capture of particles on the membrane
- **Stable:** excellent chemical resistance, good thermal stability, non-hygroscopic and extremely weight stable
- **Autoclavable:** at 121°C, 30 min.

## APPLICATIONS

- Epifluorescence microscopy: available in black for this method
- Electron microscopy: smooth surface is ideal for observing captured particles
- Light microscopy: easily transparentized for optical illumination
- Beverage and sterility testing



Polycarbonate

## SPECIFICATIONS: POLYCARBONATE MEMBRANE, CODE K

Pore Size (µm)	Bubble Point <sup>1</sup>		Flow Rate <sup>2</sup>		Nominal Thickness (µm)
	MPa	psi	Water (mL/min/cm <sup>2</sup> )	Air (L/min/cm <sup>2</sup> )	
0.10	≥0.21	≥30	2.5	1.5 <sup>3</sup>	6
0.20	≥0.14	≥20	10	3 <sup>3</sup>	10
0.40	≥0.083	≥12	33	7.5 <sup>3</sup>	10
0.80	≥0.048	≥7	90	18 <sup>3</sup>	9
1.00	≥0.041	≥6	130	20 <sup>4</sup>	11
3.00	≥0.014	≥2	440	37.5 <sup>4</sup>	9
8.00	≥0.0048	≥0.7	1000	30 <sup>4</sup>	7

Maximum operating temperature = 140°C

### Definitions:

1. Bubble point is the minimum pressure required to force air through a membrane which has been prewet with isopropylalcohol
2. Initial flow rates using prefiltered water at 10 psid (0.7 kg/cm<sup>2</sup>)
3. Initial flow rates using prefiltered air at 10 psid (0.7 kg/cm<sup>2</sup>)
4. Initial flow rates using prefiltered air at 5 psid (0.35 kg/cm<sup>2</sup>)

## ORDERING INFORMATION: POLYCARBONATE – NONSTERILE

### Plain White, package of 100 disks

Pore Size (µm)	13 mm	25 mm	47 mm
0.10	K010A013A	K010A025A	K010A047A
0.20	K020A013A	K020A025A	K020A047A
0.40	K040A013A	K040A025A	K040A047A
0.80	K080A013A	K080A025A	K080A047A
1.00	K100A013A	K100A025A	K100A047A
3.00	K300A013A	K300A025A	K300A047A
8.00	K800A013A	K800A025A	K800A047A

### Plain Black, package of 100 disks

Pore Size (µm)	25 mm	47 mm
0.20	K020N025A	K020N047A
0.40	K040N025A	K040N047A

Please ask customer service for other pore size (0.60, 2.00, 5.00, 10.0, 12.0 µm) and disk diameter (37, 43, 76, 90, 142 mm).

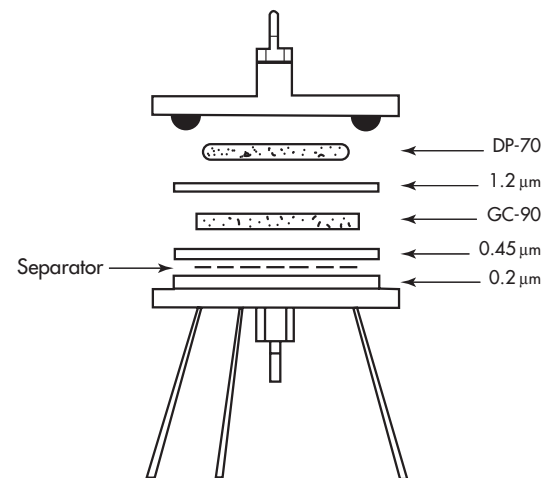
## Prefilters for Membrane Filters

The term “prefilter” refers to any type of filter that precedes the final barrier. This type of filter is often prepared from depth-type media, a random matrix of glass, cellulose, quartz or PTFE fibers. This fiber matrix may or may not include binder to maintain integrity. Because these filters trap particles within the matrix, they have a very high particle loading capacity. However, this type of filter does not have a clearly defined pore rating, only a nominal designation.

Not all depth-type filters are used as prefilters: these can be used in a wide variety of applications, such as water and air pollution analysis, liquid clarification, and cell harvesting.

Generally, a prefilter should be slightly smaller than the membrane filter it is preceding, but full sized prefilters are recommended if used alone.

Filter Holder Model	Recommended Prefilter Diameter (mm)	
	used upstream of membrane	used alone
<b>Vacuum Type:</b>		
KG-25, KGS-25	16	25
KG-47, KGS-47, KSF-47, KGS-47-TF	35	47
KG-90, KGS-90	70	90
<b>Pressure Type:</b>		
KS-13	8	13
KS-25, KS-25F, PP-25	21	25
KS-47, KST-47, KS-47F	35	47
PP-47, PFA-47	42	47
LS-25	25	25
LS-47	47	47
LS-47-HP	38	47



A typical serial stack incorporating Prefilters, Membranes and Polyester Mesh Separators.

## Polyester Mesh Separators

- **Prevent pore blinding** by placing a polyester mesh separator between two membranes in series
- **Improve performance:** Increase liquid flow rate and throughput
- **Mesh Size:** 28 mesh

Note: Order same size recommended for prefilters.

## ORDERING INFORMATION: POLYESTER MESH SEPARATORS

Grade	DS35	DS76	DS124	DS257
Diameter (mm)	35	76	124	257
Catalog No.	48141035	48141076	48141124	48141257
Quantity per package	50	25	25	25

## Disposable Syringe Filter Units – DISMIC/LABODISC

- **Minimum sample hold-up:** Unit housings are specifically designed to maximize sample recovery
- **High purity:** Non-pigmented housing and integral filter sealing assure that filtrates will not be adulterated due to pigment, dye, or adhesives leaching into the filtrate
- **Convenient:** Each unit is clearly marked with an identifying code to denote pore size, membrane material and housing polymer
- **Sterile:** Units can be purchased pre-sterilized and individually packaged, or non-sterile in bulk pack
- All polypropylene can be autoclaved  
Acrylic can not be autoclaved



3, 13, 25, and 50 mm disposable syringe filter units.

## SPECIFICATIONS

Diameter		DISMIC					LABODISC
		3 mm	13 mm	25 mm		30 mm	50 mm
Housing material	-	PP	PP	PP	Acrylic	PP	PP
Filtration Area	cm <sup>2</sup>	0.06	0.9	4.0	4.0	4.8	19.6
Hold-up Volume	mL	≤0.01	≤0.03	≤0.1	≤0.1	≤0.1	≤3.0
Suggested capacity per filter unit	mL	<2 mL	<10 mL	<100 mL	<100 mL	<120 mL	>100 mL
Pressure limit	MPa	0.51	0.51*	0.51*	0.51	0.88	0.34
	psi	74	74*	74*	74	128	49
Maximum Operating Temperature	°C	60	60	60	45	180	60
	°F	140	140	140	113	356	140
Connections	-	Inlet: female luer-lock outlet: male luer slip					7–13.5 mm hose barb with male luer slip

\*13HP, 25HP, 13NP, 25NP; Pressure Limit = 0.39 MPa (57 psi)

### Mixed Cellulose Esters (MCE)

- Properties: A hydrophilic membrane
- Higher protein binding than cellulose acetate for most proteins
- High porosity provides a high flow rate

### Cellulose Acetate (Acetate)

- Standard: A commonly used hydrophilic membrane
- Low protein binding, suitable for aqueous protein solutions
- Nitrate-free, suitable for groundwater filtration
- Housing material: polypropylene (3, 13, 50 mm) or styreneacrylonitrile (25 mm)

### PTFE, hydrophilic

- Versatile: Good chemical resistance
- Compatible with many solvent mixtures used in HPLC, e.g. Acetonitrile/Water
- Model for Ion Chromatography with the lowest levels of extractables is available.

### PTFE, hydrophobic

- Application: use as vent

### Nylon

- Properties: Naturally hydrophilic membrane
- Low extractables without wetting agent

### PES

- Low protein binding & extractables
- Pre-sterilized by Gamma irradiation

For ordering information, see page 16.

## ORDERING INFORMATION DISPOSABLE SYRINGE FILTER UNITS

Diameter	Membrane material	Housing material	Pore size	Filter surface	Sterile
50 ··· 50mm	A ··· Mixed Cellulose Esters(MCE)	S ··· Acrylic	010 ··· 0.10µm	A ··· White Plane	S ··· Pre-Sterilized
30 ··· 30mm	C ··· Cellulose Acetate	P ··· Polypropylene	020 ··· 0.20µm	C ··· Ion Chromatography	N ··· Non-Sterile
25 ··· 25mm	H ··· PTFE, hydrophilic		045 ··· 0.45µm	R ··· Gamma irradiated	
13 ··· 13mm	J ··· PTFE, hydrophobic		050 ··· 0.50µm		
03 ··· 3mm	N ··· NYLON		080 ··· 0.80µm		
	S ··· PES		120 ··· 1.20µm		
			500 ··· 5.00µm		

## DISMIC

Diam.	Membrane material	Pore size (µm)	Housing material	Quantity per package	Non-Sterile	Sterile
3	Cellulose Acetate	0.20	Polypropylene	100	03CP020AN	03CP020AS
		0.45	Polypropylene	100	03CP045AN	03CP045AS
	PTFE, Hydrophobic	0.50	Polypropylene	100	03JP050AN	-
13	Cellulose Acetate	0.20	Polypropylene	100	13CP020AN	13CP020AS
		0.45	Polypropylene	100	13CP045AN	13CP045AS
	PTFE, Hydrophilic	0.20	Polypropylene	100	13HP020AN	-
		0.45	Polypropylene	100	13HP045AN	-
	PTFE Hydrophilic for Ion Chromatography	0.20	Polypropylene	50	13HP020CN	-
		0.45	Polypropylene	50	13HP045CN	-
	PTFE, Hydrophobic	0.20	Polypropylene	100	13JP020AN	-
		0.50	Polypropylene	100	13JP050AN	-
	NYLON	0.20	Polypropylene	100	13NP020AN	-
		0.45	Polypropylene	100	13NP045AN	-
25	MCE	0.20	Acrylic	50	25AS020AN	25AS020AS
		0.45	Acrylic	50	25AS045AN	25AS045AS
	Cellulose Acetate	0.20	Acrylic	50	25CS020AN	25CS020AS
		0.45	Acrylic	50	25CS045AN	25CS045AS
		0.80	Acrylic	50	25CS080AN	25CS080AS
	PTFE, Hydrophilic	0.20	Polypropylene	100	25HP020AN	-
		0.45	Polypropylene	100	25HP045AN	-
	PTFE, Hydrophobic	0.20	Polypropylene	50	25JP020AN	-
		0.50	Polypropylene	50	25JP050AN	-
	NYLON	0.20	Polypropylene	100	25NP020AN	-
		0.45	Polypropylene	100	25NP045AN	-
	PES	0.20	Acrylic	50	-	25SS020RS
		0.45	Acrylic	50	-	25SS045RS
	30	Nylon	0.10	Polypropylene	100	30NP010AN*
0.10			Acrylic	100	-	25NS010AS
0.22			Polypropylene	100	30NP022AN*	-
0.22			Acrylic	100	-	25NS022AS
0.45			Polypropylene	100	30NP045AN*	-
0.45			Acrylic	100	-	25NS045AS
1.20			Polypropylene	100	30NP120AN*	-
1.20			Acrylic	100	-	25NS120AS
		5.00	Polypropylene	100	30NP500AN*	-

## LABODISC

Diam.	Membrane material	Pore size (µm)	Housing material	Quantity per package	Non-Sterile	Sterile
50	Cellulose Acetate	0.20	Polypropylene	10	50CP020AN	50CP020AS
		0.45	Polypropylene	10	50CP045AN	50CP045AS
	PTFE, Hydrophobic	0.20	Polypropylene	10	50JP020AN	-
		0.50	Polypropylene	10	50JP050AN	-

※Bulk pack of 13mm, 25mm and 30mm diameter (Non-Sterile) is available.

ADVANTEC®

3mm



13mm



25mm Acrylic



25mm PP



50mm



# MICROBIOLOGY SUPPLIES

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Whirl-Pak® Sampling Bags	23



## Membranes for Microbiology – Introduction

- **Made from Mixed Cellulose Esters (MCE) or Cellulose Acetate:** MCE is a mixture of nitrocellulose and other cellulose esters.
- **Available with grid lines:** Contrasting grid lines facilitate counting colonies on the filter surface and are tested to assure freedom from grid line inhibition. 3.1 mm squares represent 1/100 of the filtration area of a 47 mm diameter filter (9.6 cm<sup>2</sup>)
- **Convenient packaging:** Membranes are available individually wrapped for optimum sterility and also in 10-packs
- **Specially tested for microbiology:** All 0.45 µm white gridded membranes are tested for Coliform, Fecal Streptococci and *Serratia marcescens*. All 0.65 µm white gridded membranes are tested for complete retention and optimal recovery of Fecal Coliform and *Saccharomyces cerevisiae*. Black and Green membranes are tested for optimal recovery of yeast and total bacteria. All membranes are also tested for uniform wetting, freedom from grid line inhibition and optimal color reactions on appropriate test media
- **Membrane certification** for individual lot numbers is available on request.

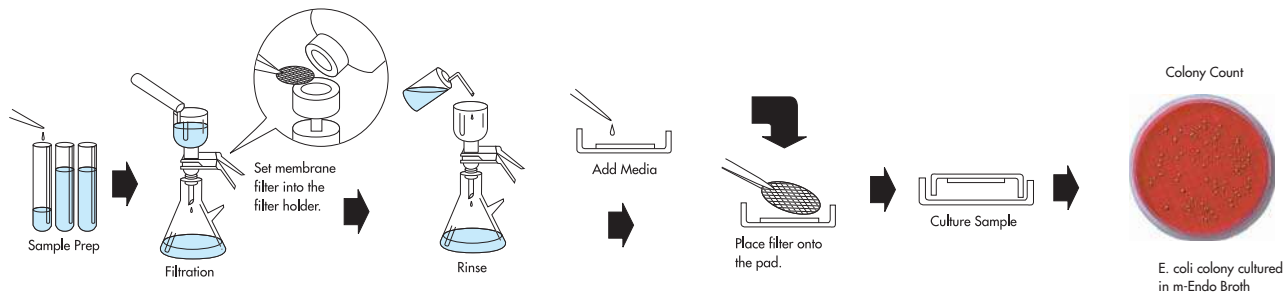


Membrane Filters for Microbiology

## APPLICATIONS

- **Applications** include microbiological analysis of water, wastewater, pharmaceuticals and beverages

## Sample Filtration and Growth Procedures



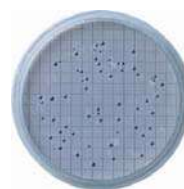
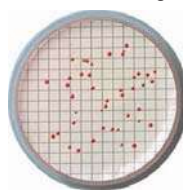
## Sample Growth Results

A045H047A  
*E. coli* cultured in  
m-Endo Broth



A045W047A  
Lactic acid bacteria  
cultured in growth media

A045H047A  
Fecal *Streptococcus*  
cultured in KF-Agar



A045F047A  
Fecal *E. coli* cultured  
in m-FC media

A080R047A  
*Saccharomyces* cultured  
in m-Green Yeast and  
Mold Broth





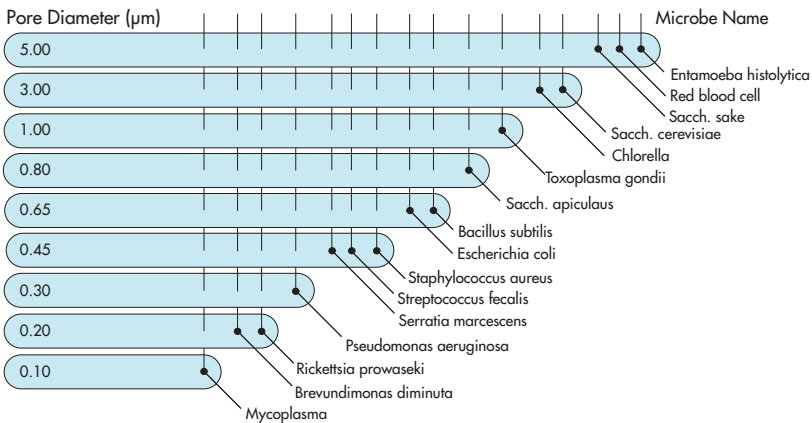
### White Mixed Cellulose Esters

- **Standard** for microbiological analysis of water, wastewater, and beverages
- **Convenient:** Available in individual or 10-pack, pre-sterilized by EtO or autoclavable

Available in plain or gridded discs, package of 100 (except where noted)

Pore Size (µm)	Diameter (mm)	Plain or Grid	Individual Pack with Pad (Pre-Sterilized)	Individual Pack without Pad (Pre-Sterilized)	Multipack 10 Packs of 10 Membranes per Pack with Pad (Pre-Sterilized)	Multipack 20 Packs of 10 Membranes per Pack without Pad (Pre-Sterilized)	Multipack 10 packs of 10 Membranes per pack with pad (Autoclavable)	Pleated band Membrane 100 per Pack without Pad (Pre-Sterilized)
0.20	47	Plain	-	A020G047A	A020C047A	-	A020S047A	-
		Grid	A020F047A	A020H047A	-	-	-	-
0.45	47	Plain	A045E047A	A045G047A	A045C047A	-	A045S047A	-
		Plain-HE	-	A045G047J	-	-	-	-
		Grid	A045F047A	A045H047A	A045D047A	A045D047Y	A045T047A	A045H047A-P
			A045F047W (1,000/pk)	A045H047W (1,000/pk)				
	Grid-HE	-	A045H047K	-	-	-	-	
	50	Plain	-	A045G050A	-	-	-	-
		Grid	-	A045H050A	-	-	-	-
	82	Grid	-	A045H082A	-	-	-	-
85	Grid	-	A045H085A	-	-	-	-	
0.65	47	Plain	-	A065G047A	-	-	-	-
		Grid	A065F047A	A065H047A	-	-	-	-
0.8	47	Plain	-	A080G047A	-	-	-	-
		Grid	A080F047A	A080H047A	-	-	-	A080H047A-P
1.0	47	Grid	-	A100H047A	-	-	-	-
3.0	50	Plain	-	A300G050A	-	-	-	-

### Relationship of Pore Size and Microbe Retention to Membrane Filters



### Combination of colors of membrane filter and grid line

MF Color	Pore Size	Grid Line Color
White	0.20, 0.45, 0.65 µm	Black
White	0.80 µm	Green
Black	0.45, 0.80 µm	Black
Green	0.45, 0.80 µm	Green

## Black Mixed Cellulose Esters – Sterile

- **Maximum** contrast between colonies and the filter without counterstaining
- **Applications:** Use to enumerate yeast and bacteria in carbonated beverages, wines and water

Available in gridded 47 mm discs, package of 100

Pore Size (µm)	Diameter (mm)	Individual Pack with Pad	Individual Pack without Pad	Pleated band membrane without Pad
0.45	47	-	A045Q047A	
		A045M047A	A045R047A	A045R047A-P
0.80	47	-	A045R070A	
		-	A080Q047A	
		A080M047A	A080R047A	A080R047A-P

## Green Mixed Cellulose Esters – Sterile

- **Pale green background** enables viewing of black, white, and colorless particles on one filter
- **Minimizes eye fatigue**

Available in gridded 47 mm discs, package of 100

Pore Size (µm)	Diameter (mm)	Individual Pack without Pad
0.45	47	A045W047A

## Cellulose Acetate (White) – Sterile

- **Lower protein binding** (relative to MCE)
- **Improved solvent resistance** to low molecular weight alcohols (relative to MCE)
- **Application:** May enhance recovery of fastidious gram positive organisms in culture

Available in plain 47 mm discs, package of 100

Pore Size (µm)	Diameter (mm)	Individual Pack without Pad
0.20	47	C020G047A
0.45	47	C045G047A
	82	C045G082A
	85	C045G085A

### Petri Dishes

- **Polystyrene dishes** suitable for culturing microorganisms on 47 mm diameter membrane filters
- **Convenient:** Snug fit prevents drying during incubation. Squared edges and a raised ridge for ease of handling and secure stacking
- **Available with or without pad:** 47 mm absorbent cellulose pad (0.85 ± 0.17 mm thick, absorbs 1.8-2.2 mL liquid)
- **Manufacturer's certification of compliance** available upon request
- **Sterile:** sterilized by gamma irradiation



Petri Dishes

Model	Description	Catalog No.	Size	Package
PD-1	Sterile Petri Dishes	800100	OD54 X 11mm	100 / pack ( 5 sleeves of 20 )
		800500		500 / pack ( 25 sleeves of 20 )
PD-2	Sterile Petri Dishes with Pads	800101		100 / pack ( 5 sleeves of 20 )
		800501		500 / pack ( 25 sleeves of 20 )

### Pre-Sterilized Absorbent Pads

- **Cellulose pads:** 47 mm plain white discs fit into standard petri dishes
- **Routinely tested** for absorption of 1.8 – 2.2 mL of Culture media, pH neutral
- **Convenient Packaging:** 100 individual pre-sterilized packages per box

Model	Package
B200G047A	Box of 100 Individual Sterile Packages

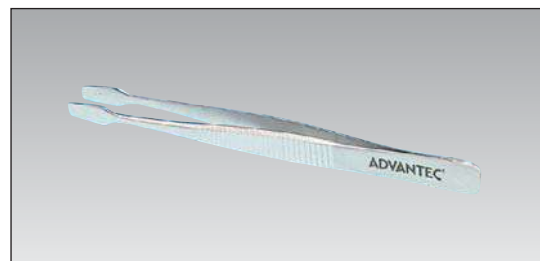


Pre-sterilized Absorbent Pads

### Filterceps

- **Forceps** of polished type 304 stainless steel are ideally designed for handling membranes
- **Tips are beveled and unserrated** to minimize the risk of damaging membrane filters
- **Non-slip handle** allows Filterceps to be held securely and flamed without risk of burning one's fingers

Model	Length	Material
18800000	115 mm	SUS 304



Filterceps

## 37 mm Monitors for Microbial and Contamination Analysis

Pre-assembled 2- and 3-piece units contain a built-in membrane filter and a support pad. Monitors are suitable for field collection and transportation of samples as well as analysis in the laboratory. Samples collected on the press-fit membrane can then be cultured in place or removed for further analysis.

Monitor Sets include a 2-piece monitor, plugs, sampling tube, and 3-way connector. Individually packaged sets are pre-sterilized and are ideal for field sampling.

### SPECIFICATIONS

Monitor Type	2-piece	3-piece
Housing	Styrene Acrylonitrile	
Membrane	Mixed Cellulose Esters (Nitrocellulose)	
Support Pad	Pure Cotton Cellulose	
Internal Dimensions	ø34 x 9 mm	ø34 x 18 mm
External Dimensions	ø42 x 29 mm	ø42 x 39 mm
Filtration Area	9.0 cm <sup>2</sup> (6.7 cm <sup>2</sup> for Hydrophobic Edge Type)	
Internal Volume	8 mL	16 mL
Maximum Operating Temperature	45°C	

### ORDERING INFORMATION

#### 3-Piece Monitors

Pore Size (µm)	Color	Surface	Quantity	Sterile	Non-Sterile
0.45	White	Plain	50/pk	-	37AS345AN
0.45	White	Gridded	50/pk	37AS345BS	-
0.45	Black	Gridded	50/pk	37AS345PS	-
0.80	White	Plain	50/pk	-	37AS380AN
0.80	White	Gridded	50/pk	37AS380BS	37AS380BN
0.80	Black	Gridded	50/pk	-	37AS380PN

#### 2-Piece Monitors

Pore Size (µm)	Membrane		Quantity	Sterile	Sterile Hydrophobic Edge
	Color	Surface			
0.45	White	Gridded	50/pk	37AS245BS	37AS245BS-HE
0.45	Black	Gridded	50/pk	37AS245PS	37AS245PS-HE

#### 2-Piece Monitor Sets

Pore Size (µm)	Membrane		Quantity	Sterile Hydrophobic Edge
	Color	Surface		
0.45	White	Gridded	20/pk	37ASA45BS-HE
0.45	Black	Gridded	20/pk	37ASA45PS-HE

#### 2-Piece, 3-Piece Monitor, Without Membrane

Monitor Type	Quantity	Catalog, No.
2-piece	50/pk	370S200ON
3-piece	50/pk	370S300ON



37 mm Monitors.



37 mm Monitor Sets.

### Culture Media

- **Applications:** Used with membrane filters to culture bacteria, yeasts, and molds
- **Available Ready-to-Use:** 2 mL ampoules contain enough media to saturate one standard absorbent pad in a petri dish. 50 mL bottles contain enough media for 25 tests
- **Sterile:** Bottles can be aseptically opened and closed repeatedly. Single use ampoules assure sterility
- **High Quality:** Each product is lot tested and certified to comply with established test criteria. Quality certificates are included with each shipment and packages are clearly marked with an expiration date



Sterile media is available in 2 mL ampoules and 50 mL bottles.

Ready to Use Media		Catalog No.
Media	Target Organism	2 mL Ampoules (50/box)
m-Endo	Total Coliform Bacteria, Water	COLI200
m-FC	Fecal Coliform Bacteria	MFC200
m-FC with Rosolic Acid	Fecal Coliform Bacteria	MFCR200
m-PA	Pseudomonas aeruginosa	MPA200
m-TGE	Total Bacteria	TCM200
m-TGE with indicator	Total Bacteria	TCI200
m-Green Yeast and Mold	Yeast and Mold, pH 4.6	YMM200
m-HPC	Heterotrophic organisms with indicators	MHPC200

### Whirl-Pak® Sampling Bags

- **Sterile** sampling bags for collecting and transporting liquid, semi-solid, and solid samples
- **Composition:** Blended polyethylene contains ethyl vinyl acetate for transparency and strength
- **Convenient:** Bags close easily and securely by whirling or folding, use puncture-proof tabs to seal
- **Approved** by the FDA and USDA for food sampling



Sterile Whirl-Pak sampling bags.

Capacity		Dimensions	Qty/box	Catalog No.
Ounces	mL			
4	120	3 x 7.25 inches	500	WP006ZWS
18	540	4.5 x 9 inches	500	WP018ZWS
27	810	5 x 12 inches	500	WP027ZWS
<b>Whirl-Pak with Sponge: sterile sponge free from growth inhibitors</b>				
18	540	4.5 x 9 inches	100	WP1254WSP
<b>ThioBag®: contains a sodium thiosulfate tablet for use when sampling chlorinated water</b>				
4	120	3 x 7.25 inches	100	WP100MWT





## Qualitative Filter Papers

- **100% cotton linter cellulose**
- **pH tolerant:** 0 to 12
- **Thermostable:** up to 120°C
- **Wide selection** – seven types
- **Ash Content:** 0.1%

### APPLICATIONS

- Clarify and remove precipitates
- Preparation for qualitative analysis

### ORDERING INFORMATION

See page 28.



Qualitative filter papers

## CHARACTERISTICS AND APPLICATIONS: CONVERSIONS – QUALITATIVE PAPERS

Grade	Comments	Weight (g/m <sup>2</sup> )	Thickness (mm)	Flow Time* <sup>1</sup> (sec)	Absorption speed* <sup>2</sup> (cm)	Wet Strength* <sup>3</sup> (kPa)	Nominal Rating (µm)	Collection Efficiency (%; 0.3 µm DOP)	Conversion* <sup>4</sup>	
									Whatman	ex-Schleicher & Schuell
No. 1	Retains large crystalline particles and gelatinous precipitates. Fast flow rate, smooth surface, normal hardness	90	0.20	45	9.0	7	6 (Coarse)	65	4	410 or 1450cv
No. 2	Retains medium crystalline precipitates, fast flow rate, smooth surface, normal hardness	125	0.26	80	8.0	8	5 (Medium)	80	-	604
No. 231	Retains crystalline precipitates, moderate flow rate, smooth surface, normal hardness	95	0.18	130	7.5	-	(Medium)	-	2	-
No. 232	Retains medium to medium-fine particulates, slow flow rate, smooth, normal hardness	90	0.18	250	5.0	-	(Med./Med.-Fine)	-	6	-
No. 131	High retention efficiency for fine crystalline precipitates like barium sulfate, slow flow rate, smooth surface, normal hardness	140	0.25	240	6.0	8	3 (Med.-Fine)	90	3	597
No. 235	Highest retention efficiency, retains very fine particulates, very slow flow rate, smooth	95	0.17	1,200	4.0	-	(Very Fine)	-	5	-
No. 101	Seed germination, retains large particles	80	0.21	50	8.0	34	5 (Coarse and gelatinous)	-	91	-

\*1. Flow time is the time in seconds required to filter 100 mL of distilled water at 20°C under pressure supplied by a 10 cm water column through a 10 cm<sup>2</sup> section of filter paper.

\*2. Absorption speed is the distance in cm that water will travel in an upright strip of filter paper in ten (10) minutes at 20°C.

\*3. Wet strength is the pressure measured by Mullen Burst Strength Tester after soaking in water.

\*4. Conversions between manufacturers are not absolute. Use these conversions as a guideline.



## Quantitative/Hardened Filter Papers

- **100% cotton linter cellulose**
- **Ash Content:** 0.01% (Except No. 4A 0.025%)
- **Acid washed:** Double acid washed in hydrochloric then hydrofluoric acid (No. 3, 5A, 5B, 5C, 6, 7), then rinsed with ultrapure water to neutralize. No. 4A is further treated with nitric acid before washing

## APPLICATIONS

- Gravimetric analysis
- Environmental monitoring



Quantitative filter papers

## CHARACTERISTICS AND APPLICATIONS: CONVERSIONS – QUANTITATIVE PAPERS

Grade	Comments	Weight (g/m <sup>2</sup> )	Thickness (mm)	Flow Time* <sup>1</sup> (sec)	Absorption speed* <sup>2</sup> (cm)	Wet Strength* <sup>3</sup> (kPa)	Nominal Rating (µm)	Collection Efficiency (%; 0.3 µm DOP)	Conversion* <sup>4</sup>	
									Whatman	ex-Schleicher & Schuell
<b>No. 3</b> Ashless	Medium retention (5-10 µm), fast flow rate Analysis of soils, fertilizers, cement, and minerals	113	0.23	130	7.5	12	5 (Medium)	80	43	593-A
<b>No. 5A</b> Ashless	Fast flow rate, retains coarse particulates and gelatinous precipitates (>10 µm). Filter hydroxides and metallic aerosols, environmental monitoring, determine silica content in steel	97	0.22	60	9.5	10	7 (Coarse and gelatinous)	75	41	589-IH
<b>No. 5B</b> Ashless	Retains medium particles (5-10 µm) such as CaCO <sub>3</sub> , PbSO <sub>4</sub> , CaCO <sub>4</sub> , MnCO <sub>3</sub> , ZnCO <sub>3</sub> , ZnS, AgCl	108	0.21	195	7.0	12	4 (Medium)	90	40	589 / 6 Green
<b>No. 5C</b> Ashless	Collect fine precipitates (<5 µm) such as SrSO <sub>4</sub> , BaSO <sub>4</sub> , HgCrO <sub>4</sub> , and colloidal dispersions; gravimetric analysis	118	0.22	570	6.0	12	1 (Fine)	93	44	589 / 3 Blue
<b>No. 6</b> Ashless	Retains medium-fine particulates (2-10 µm), trace and precious metals	103	0.20	300	6.0	12	3 (Medium Fine)	90	-	589 / 2 White
<b>No. 7</b> Ashless	Highest purity for retaining medium particles (5-10 µm), precise gravimetric analysis	87	0.18	200	7.0	10	4 (Medium)	85	-	-
<b>No. 4A</b> Hardened	High wet strength, suitable for use under high pressure, high chemical and pH resistance, retains fine crystalline precipitates (<5 µm), slow flow	96	0.12	915	4.0	52	1 (Very Fine)	90	50	-

Footnotes: See facing page

**Ash content of Quantitative Papers (mg per disc)**

mm	No. 3	No. 5A	No. 5B	No. 5C	No. 6	No. 7
55	0.03	0.02	0.03	0.03	0.02	0.02
70	0.04	0.04	0.04	0.05	0.04	0.03
90	0.07	0.06	0.07	0.08	0.07	0.06
110	0.11	0.09	0.10	0.11	0.10	0.08
125	0.14	0.12	0.13	0.15	0.13	0.11
150	0.20	0.17	0.19	0.21	0.18	0.15
185	0.30	0.26	0.29	0.32	0.28	0.23

**Metal Content**

(µg/g)	Si	Na	K	Ca	Mg	Fe	Pb	Cu	Mn	Ni	Al	Zn	Cd
Qualitative	46	62	3	140	17	<5	<1	<1	<1	<1	<2	1	<0.5
Quantitative	32	<10	<2	<10	<1	8	<1	<1	<0.5	<1	2	<1	<0.5

**ORDERING INFORMATION: QUALITATIVE PAPERS**

- Available in discs in the following diameters (mm): 55, 70, 90, 110, 125, 150, 185, 240, 285, 300, 330, 360, 400, 500, 600
- Additional sizes available upon request.
- Order by specifying first the grade of filter then the diameter, e.g. (NO112. 5CM), (NO2325. 5CM)
- Package of 100

**ORDERING INFORMATION: QUANTITATIVE PAPERS**

- Available in discs in the following diameters (mm): 55, 70, 90, 110, 125, 150, 185, 240, 285, 300, 330, 360, 400, 500
- Additional sizes available upon request.
- Order by specifying first the grade of filter then the diameter, e.g. (No.5A, 125 mm), (No.6, 55 mm)
- Package of 100

**Chromatography Papers**

- **High quality papers** are carefully tested for spot formation, capillary action, water flow rate and absorption speed to assure uniformity and reproducibility
- **Better resolution** with slower flow rate papers

**APPLICATIONS**

- Chromatography
- Electrophoresis and blotting
- Separation of heavily loaded solutes

**SPECIFICATIONS AND CONVERSION GUIDE**

Grade	Weight (g/m <sup>2</sup> )	Thickness (mm)	Absorption Speed* <sup>1</sup> (cm)	Wet Strength* <sup>2</sup>	Ash (%)	Whatman equivalent
No. 50	140	0.25	6.0	8	0.1	20 Chr
No. 51A	87	0.18	7.5	7	0.01	4 Chr
No. 51B	87	0.17	7.0	5	0.06	1 Chr
No. 514A	185	0.32	7.5	8	0.06	3MM Chr
No. 526	325	0.70	11.0	29	0.1	17 Chr
No. 590	285	0.93	18	10	0.1	17 Chr

\*1. Absorption speed is the distance in cm that water will travel in an upright strip of filter paper in ten (10) minutes at 20°C.

\*2. Wet Strength is the pressure measured by Mullen Burst Strength Tester after soaking in water.

**ORDERING INFORMATION**

All grades above are available in the following size (mm) and quantities:

Size	Qty / Pkg
20 x 400	100 / Pkg
200 x 200	50 / Pkg
600 x 600	50 / Pkg

Order by specifying first the grade of paper then the size, e.g. (NO51A20MMX400MM)

## Extraction Thimbles

High purity, seamless filters with a characteristic thimble shape. Applications include analysis of fats, oils, grease, pesticides, pollutants, other organics and additives in plastics and rubber materials.

### Cellulose Thimbles – No. 84

- Suitable for Soxhlet extractions of organic components
- Dust sampling
- Lipid content <0.1% by weight

### Glass Fiber Thimbles – No. 86R

- Borosilicate glass
- High temperature extractions or dust monitoring ( $\leq 500^{\circ}\text{C}$ )
- Acid resistant (except hydrofluoric)

### Quartz Fiber Thimbles – No. 88R and 88RH

- Use up to  $1,000^{\circ}\text{C}$
- No. 88RH is treated at  $900^{\circ}\text{C}$  to stabilize the weight prior to use

### PTFE Fiber and PTFE/Quartz Fiber Thimbles – No. 89 and 89S

- Durable, temperature-resistant
- Non-adsorptive with respect to acid gases
- PTFE is inherently hydrophobic
- Little or no trace metal contamination



Thimbles

## SPECIFICATIONS

Grade	Material	Nominal Rating ( $\mu\text{m}$ )	Thickness (mm)	Weight (g per 25 x 90 thimble)	Pressure drop (kPa at 5L/min.)	Collection Efficiency (% 0.3 $\mu\text{m}$ DOP)	Max. operating temp ( $^{\circ}\text{C}$ )	Heating loss rate (%)	Conversion	
									Whatman	ex-Schleicher & Schuell
No. 84	Cellulose	8	1.5	3.6	0.25	89	120	-	2800	603
No. 86R	Glass Fiber	1	1.6	1.8	0.30	>99.9	500	0.2	2814	603G
No. 88R	Quartz Fiber	-	2.2	1.6	0.44	>99.9	1,000	-	-	-
No. 88RH	Quartz Fiber	-	2.2	1.6	0.44	>99.9	1,000	0.1	2812	-
No. 89	PTFE Fiber	-	1.8	11.0	4.5	>99.9	260	-	-	-
No. 89S	PTFE/Quartz Fiber	-	1.6	6.0	0.54	>99.9	400	0.07	-	-

## ORDERING INFORMATION

### INTERNAL DIAMETER (mm) X EXTERNAL DIAMETER (mm) X HEIGHT (mm). 25 THIMBLES PER PACKAGE (Former internal dia. product)

Size Grade	19 x 22 x 90	22 x 25 x 65	22 x 25 x 90	25 x 29 x 60	25 x 29 x 80	25 x 29 x 90	25 x 29 x 100	28 x 32 x 100	30 x 34 x 80	30 x 34 x 100	33 x 37 x 80	33 x 37 x 100	43 x 47 x 123	80 x 86 x 250
No. 84	○	○	○	○	○	○	○	○	○	○	○	○	○	○
No. 86R	○ (19 x 23 x 90)	-	-	-	-	○ (25 x 30 x 90)	○ (25 x 30 x 100)	-	○	○	○ (33 x 39 x 80)	-	○	-
No. 88R	-	-	-	-	-	-	○	-	○	○	-	-	-	-

### INTERNAL DIAMETER (mm) X EXTERNAL DIAMETER (mm) X HEIGHT (mm). 25 THIMBLES PER PACKAGE (Former external dia. product)

Size Grade	18 x 20 x 90	20 x 22 x 90	21 x 25 x 90	25 x 28 x 100	26 x 30 x 100	30 x 33 x 120	31 x 35 x 120	36 x 40 x 150	40 x 45 x 150	48 x 53 x 150	54 x 60 x 200	68 x 75 x 210
No. 84	○	○	○	○	○	○	○	○	○	○	○	○
Size Grade	17 x 20 x 90	19 x 22 x 90	21 x 25 x 90	24 x 28 x 100	26 x 30 x 100	29 x 33 x 120	30 x 35 x 120	34 x 40 x 150	38 x 45 x 150	45 x 53 x 150	53 x 60 x 200	68 x 75 x 210
No. 86R	○	○	○	○	○	○	○	○	○	○	○	○
Size Grade	17 x 20 x 90	19 x 22 x 90	22 x 25 x 90	24 x 28 x 100	25 x 30 x 100	29 x 33 x 120	30 x 35 x 120	35 x 40 x 150	39 x 45 x 150	48 x 53 x 150	55 x 60 x 200	68 x 75 x 210
No. 88R	○	○	-	○	○	○	○	○	○	○	○	○

### INTERNAL DIAMETER (mm) X EXTERNAL DIAMETER (mm) X HEIGHT (mm). 10 THIMBLES PER PACKAGE (Former external dia. product)

Size Grade	22 x 25 x 90
No. 88RH	○
No. 89	○
No. 88R	○
No. 89S	○

## Glass Fiber Filters

- **Highly resistant** to chemical attack, biologically inert
- **Autoclavable**
- **Thermostable:** Can be used up to 500°C for non-binder type.
- **Store indefinitely:** Unaffected by humidity

## APPLICATIONS

- Use as a prefilter to extend membrane life
- Water/air pollution analysis
- Liquid clarification



## ORDERING INFORMATION

Size	DP70	GA55	GA100	GA200	GB100R	GB140	GC50	GC90	GD120	GF75	GS25
	Quantity/package										
21–150 mm diameter discs	50	100	100	50	100	100	100	100	50	100	100
300 x 300 mm sheets	10	10	10	10	10	10	10	10	10	10	10
8 x 10 inch sheets	-	100	50	-	50	-	100	50	50	100	-

Available in discs in the following diameters (mm): 21, 24, 25, 26, 37, 45, 47, 55, 70, 90, 110, 125, 150.

Order by specifying first the grade of filter then the diameter, e.g. GC5090MM, GA5547MM.

## Quartz Fiber Filters

- **Highly resistant** to chemical attack, biologically inert
- **High Purity:** Very low trace metal content, does not adsorb NO<sub>x</sub> and SO<sub>x</sub> dioxides; Grade QR100 is pre-fired at 1,000°C for 2 hours to reduce organic contamination
- **Easily sterilized:** Can be baked or autoclaved
- **Store indefinitely:** Unaffected by humidity

### APPLICATIONS

- Sample acidic gases at high (>500°C) temperatures
- Air pollution analysis

### ORDERING INFORMATION

Size	QR200	QR100
	Quantity/package	
21 – 150 mm diameter discs	50	100
8 x 10 inch sheets	S	50

S = Special order

Available in discs in the following diameters (mm): 21, 24, 26, 37, 45, 47, 55, 70, 90, 110, 125, 150.

Order by specifying first the grade of filter then the diameter, e.g. QR200125MM, QR10021MM.



Quartz fiber filters

## Composite Filter

- **Composite Filter PG60** is specially developed for the measurement of dust concentration in the air
- **PTFE coated:** Naturally hydrophobic and unaffected by humidity

### APPLICATIONS

- Air pollution analysis
- Air dust analysis

Note: Cannot be used for liquid filtration

### ORDERING INFORMATION

Size	Quantity/package
21 – 70 mm diameter discs	100
90 – 150 mm diameter discs	50
300 x 300 mm sheets	10

Available in discs in the following diameters (mm): 21, 24, 25, 26, 37, 45, 47, 55, 70, 90, 110, 125, 150

Order by specifying first the grade of filter then the diameter, e.g. PG6090MM, PG60125MM.



Composite filters

## SPECIFICATIONS: GLASS/QUARTZ FIBER FILTERS

Grade	Applications/Characteristics	Weight (g/m <sup>2</sup> )	Thickness (mm)	Nominal Rating (µm)	Water Flow Time* <sup>1</sup> (sec)
GA55	Thin filter recommended for clarifying filtration Air pollution monitoring	55	0.21	0.6	23
GF75	Highest collection efficiency grade offered Collection of very fine particles	75	0.35	0.3	84
GA100	Faster filtration speed recommended for filtering viscous fluids	110	0.44	1.0	11
GA200	Thick filter with high dust holding capacity recommended for filtering viscous fluids	175	0.74	0.8	15
GB100R	High and low volume aerosols for airborne dust and metal contaminants Low trace metal contents	95	0.38	0.6	15
GB140	High dust holding capacity recommended for SS(Suspended Solid) analysis	140	0.56	0.4	58
GC50	Thin filter with high collection efficiency Prefilter for membrane filter Scintillation counting	48	0.19	0.5	28
GC90	Filter with organic binder recommended for fine particles and aerosols Prefilter for membrane filter	100	0.30	0.5	20
GD120	Medium collection efficiency grade Prefilter for membrane filter	123	0.51	0.9	14
GS25	Filter with organic binder recommended for SS(Suspended Solid) analysis Higher strength and lower released fibers compared with no-binder grades	70	0.21	0.6	15
DP70	Filter with organic binder recommended for high concentrated liquid of protein and other substances Prefilter for membrane filter	170	0.52	0.6	20
QR200	Thick quartz fiber filter with inorganic binder Low adsorption Monitor airborne particulates	200	1.0	-	-
QR100	Quartz fiber filter without binder Superior chemical resistance, does not adsorb acid gases	85	0.38	-	-

\*1. Flow time is the time in seconds to filter 1,000 mL of distilled water at 20 °C under differential pressure of 39 kPa through a 9.6 cm<sup>2</sup> section of filter.

Collection Efficiency (% 0.3 µm DOP)	Pressure Drop (kPa at 5 cm/sec)	Binder*	Maximum Operating Temperature (°C)	Conversion				
				Whatman	ex-Schleicher & Schuell	Pall	Millipore	Ahlstrom
99.9	0.33	None	500	GF/A (934AH)	31		APFA	111
99.999	1.67	None	500	GF/F	20		GFCP	151
96	0.20	None	500					
99.9	0.35	None	500					
99.99	0.30	None	500	EPM2000	1HV	A/E (Use for air)	AP40	
99.99	1.11	None	500	GF/B	32		APFB	121
99.99	0.52	None	500	GF/C	30/25	A/E (Use for water)	AP40/APFC	131
99.99	0.42	Organic	120				AP15	
97	0.17	None	500	GF/D	40		APFD	141
99.9	0.32	Organic	120	-			AP20	164
-	0.52	Organic	120	-			AP25	
99.9	0.34	Inorganic	1,000					
99.99	0.45	None	1,000	QM-A		Micro Quartz		

\*Binder 1. Organic – Acrylic Acid Ester Emulsion

2. Inorganic – Alumina

## PTFE Filters

- **Pure PTFE fibers are sintered** to improve handling characteristics and to minimize fiber slough-off for minimal downstream contamination
- **Hydrophobic**
- **Porosity:** High air permeability with minimal pressure drop
- **Operating temperature range:** -120°C~260°C
- **Autoclavable**

## APPLICATIONS

- Filter hot oils and strong solvents
- Venting air and gases
- Collection of airborne particulates



PTFE filters

## SPECIFICATIONS

Grade	Weight (g/m <sup>2</sup> )	Thickness (mm)	Porosity (%)	Pressure Drop (kPa at 5cm/sec.)	Pressure Drop (psi)	Collection Efficiency (%; 0.3µm DOP)	Nominal Rating (µm)
PF100	500	1.00	77	0.059	0.00856	70	10
PF060	240	0.50	75	0.069	0.01001	75	6
PF050	210	0.36	73	0.26	0.0377	85	5
PF040	500	0.95	75	0.21	0.03045	95	4
PF020	500	0.54	54	1.6	0.232	99.9	2

## ORDERING INFORMATION: PTFE FILTERS

Size	PF100	PF060	PF050	PF040	PF020
	Quantity/package				
55 – 90 mm diameter discs	20	20	20	10	10
110 – 150 mm diameter discs	10	10	10	5	5
300 x 300 mm sheets	5	5	5	5	5

- Discs: Available in the following diameters (mm): 55, 70, 90, 110, 125, 150
- Sheets: Available in 300 x 300 mm sheets
- Additional sizes available upon request
- Order by specifying first the grade of filter then the size, e.g. PF04055MM.

See also Phase Separating Filters on page 37.



## SPECIALTY PRODUCTS

Paper Discs	36
Milk Sediment Discs	36
Blaine Test Paper	36
Blood Sampling Paper (Nobuto Filter)	37
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## PAPER DISCS

- Made of pure cellulose fibers
- High absorbency
- Three types are available for following applications
  - Antibiotic assay
  - Detection of Antimicrobial substances in Carcass
  - Detection of Benzylpenicillin in meat

## ORDERING INFORMATION

	Catalog No.	Diameter(mm)		Package
Paper Disc for Antibiotic Assay	49005010	Thick	8	1,000
	49005020	Thin	8	1,000
	49005040		6	1,000



Paper Discs

	Catalog No.	Diameter (mm)	Thickness (mm)	Absorbing Capacity (mL/disc)	Package
Paper Disc for Antimicrobial Substances	49006010	10	1.1	0.07~0.08	1,000
Paper Disc for Benzylpenicillin	49007010	10	1.5	0.2	100

## Milk Sediment Discs

- Made of long refined cotton fibers

## APPLICATION

- Detection of contaminant in dairy products

Grade	Catalog No.	Diameter	Color	Package
No. 1026	49015010	33 mm	White	50
No. 1026-B	49015020	33 mm	Black	50



Milk Sediment Discs

## Blaine Test Paper

- Standard for testing cement using the Blaine air permeation test
- 12.7 mm diameter discs

## ORDERING INFORMATION

	Catalog No.	Package
Blaine Test paper	01511012	250



Blaine Test Papers

## Blood Sampling Paper (Nobuto Filter)

- Collect blood on the narrow end of the strip and allow to dry on the convenient drying rack for easy and efficient sample handling
- Strip holds approximately 0.1 mL of blood or 0.04 mL of serum
- High purity cellulose paper yields a fine, textile like structure ideal for uniform sampling
- Dried samples can be analyzed, stored, or mailed without refrigeration

### Typical blood collection applications:

- Toxoplasmosis (HA)
- Hanta Virus
- New Castles Disease (HI)
- Canine Distemper (VN)
- Measles (Rubeola) (HI)
- Japanese Encephalitis (HI, VN)
- Mycoplasmosis (AG)
- Hog Cholera (VN)

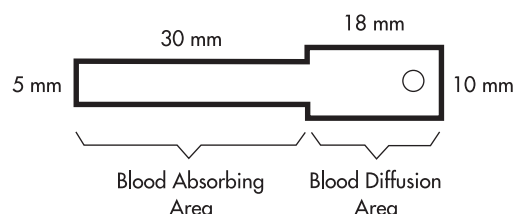
### ORDERING INFORMATION

	Catalog No.	Package
Blood Sampling Paper (Nobuto's)	49010010	100
Filter Strip Drying Rack	49010520	Each



Nobuto Blood Filter Strips and Drying Rack.

Nobuto Strip: Actual Size



## Phase Separating Filters

- **Separate** aqueous and non-aqueous phases of mixtures
- **Hydrophobic** filters retain aqueous phase while non-aqueous phase passes through
- **Choice of materials:** Grade No. 2S is silicone treated cellulose  
Grade PF is pure PTFE

### SPECIFICATIONS

Grade	Substrate	Weight (g/m <sup>2</sup> )	Thickness (mm)	Nominal Rating (μm)	Collection Efficiency (%; 0.3 μm DOP)
No. 2S	Silicone Treated Cellulose	120	0.26	5	-
PF020	PTFE	500	0.54	2	99.9
PF040	PTFE	500	0.95	4	95.0
PF050	PTFE	210	0.36	5	85.0
PF060	PTFE	240	0.50	6	75.0
PF100	PTFE	500	1.00	10	70.0

### ORDERING INFORMATION

#### Grade No. 2S:

- Available in discs in the following diameters (mm): 55, 70, 90, 110, 125, 150, 185, 240, 270
- Packages of 100
- Order by specifying first the grade of paper then the diameter, e.g. (NO2S11.0CM)

#### PTFE Filter – all grades:

- Available in discs in the following diameters (mm): 55, 70, 90, 110, 125, 150
- Available in sheets: 300 x 300 mm

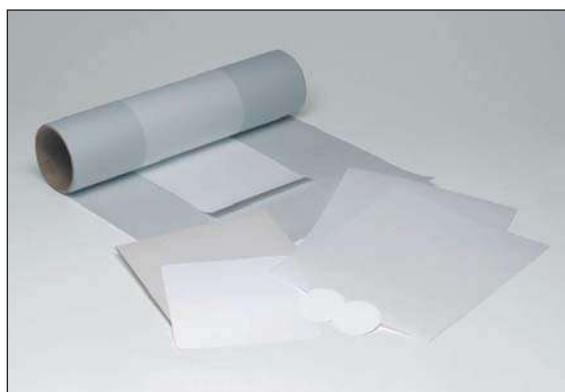
Order by specifying first the grade of paper then the diameter, e.g. PF04055MM.

## Pure Nitrocellulose for Blotting and Hybridization

- **Pure esters of nitrocellulose**, free of acetate and other esters
- **Maximal protein/nucleic acid binding**, up to 80-100 µg/cm<sup>2</sup>
- **Low background**
- **Two pore sizes** available: 0.45 µm is suitable for most blotting applications, 0.20 µm sizes for lower molecular weights

### ORDERING INFORMATION: NITROCELLULOSE

	Quantity per package	0.20 µm	0.45 µm
Sheets (Dimensions in mm)			
220 x 220	10	-	S045A224D
300 x 300	10	S020A304D	S045A304D
Rolls			
330 mm x 3 m	1	-	S045A330R
Discs (Diameter in mm)			
82	25	-	S045A082C



Pure Nitrocellulose and Blotting Paper.

## Blotting/Chromatography Paper

### APPLICATIONS

- Chromatography
- Electrophoresis and blotting
- Separation of heavily loaded solutes

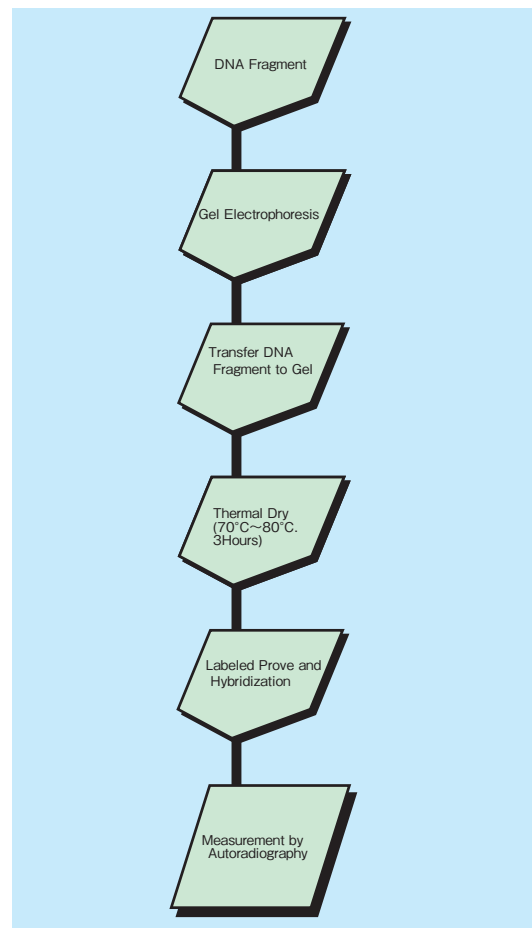
### SPECIFICATIONS AND CONVERSION GUIDE

Grade	Weight (g/m <sup>2</sup> )	Thickness (mm)	Absorption Speed* <sup>1</sup> (cm)	Wet Strength* <sup>2</sup> (kPa)	Ash (%)	Whatman equivalent
No. 50	140	0.25	6.0	8	0.1	20 Chr
No. 51A	87	0.18	7.5	7	0.01	4 Chr
No. 51B	87	0.17	7.0	5	0.06	1 Chr
No. 514A	185	0.32	7.5	8	0.06	3MM Chr
No. 526	325	0.70	11	29	0.1	17 Chr

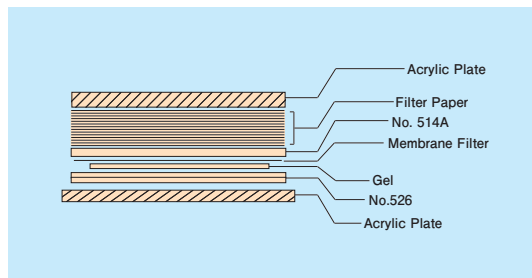
\*1. Absorption speed is the distance in cm that water will travel in an upright strip of filter paper in ten (10) minutes at 20°C.

\*2. Wet strength is measured by Mullen Burst Strength tester after soaking the sample with water in accordance with JIS P8112.

## SOUTHERN BLOTTING



## EXAMPLE OF TRANSFER METHOD



## Disposable Ultrafilter Units

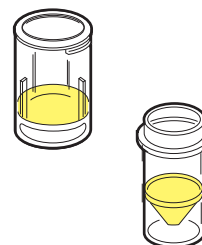
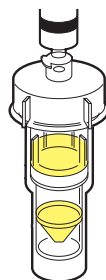
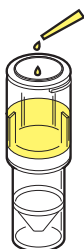
- **Concentrate** samples with built-in polysulfone ultrafilter
- **Easy to use** units require only syringe pressurization and do not require a centrifuge
- **Clear** housings enable visual confirmation of the filtration process
- **Low adsorption** for maximum sample recovery
- **Disposable** units for simple operation and clean-up

## SPECIFICATIONS

- Molecular weight cut off 10,000(USY-1), 50,000(USY-5) and 200,000(USY-20)
- Filter diameter: 16mm
- Cell capacity: 2mL
- Maximum temperature: 50°C
- Material: Polysulfone (Filter), Acrylic(Cells) and Polypropylene(Caps)
- Sterilization: 25% Ethanol or 5% Formalin
- Effective filtration area: 2.0cm<sup>2</sup>
- Minimum Sample volume: 0.5mL
- Maximum pressure: 0.29MPa

## OPERATION INFORMATION

1. Prepare unit for use. Dispense sample (approx. 1-2 mL) into the retentive cell by pipet.
2. Place cap on the retentive cell. Using a syringe, pressurize the unit with air.
3. Disassemble unit when filtration is complete: concentrated sample and/or filtrate can be analyzed.



## SAMPLE COLLECTION DATA

Grade		USY-1	USY-5	USY-20
Molecular Weight Cut Off		10,000	50,000	200,000
Solute	Molecular weight			
Lysozyme	14,800	>98	50	-
Myoglobin	16,800	>95	40	-
α-Chymotrypsin	24,500	>98	85	-
β-Lactoglobulin	35,000	>98	85	10
Ovalbumin	44,000	>98	95	60
Albumin (0.01%)	64,000	>98	>98	-
Bovine Albumin	67,000	>98	>90	60
β-Globulin	110,000	>98	>98	>95
γ-Globulin	160,000	>98	>98	>90

## ORDERING INFORMATION

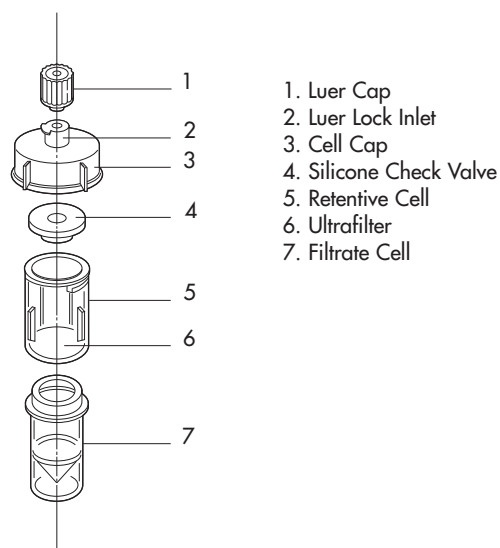
Grade	USY-1	USY-5	USY-20
Catalog No.	39651001	39651005	39651020
Quantity per Package*	24	24	24

\*Luer cap, Cell Cap and Silicone Check Valve are contained 4 each.



USY Series Ultrafilter Units

## USY Series Unit Assembly



## Centrifugal Filter Holders

- **Durable, reusable** unit for concentrating, desalting or purifying samples by centrifuge
- **Compatible** with most  $\phi 13$  mm filters and  $\phi 30$  mm centrifuge tubes (both sold separately)
- **Easy to use** units assemble quickly for repeated use

Unit diagram below.

### SPECIFICATIONS

- Housing: Acrylic, Polyacetal, Polypropylene
- Cell cup: Polypropylene
- Locking nut: Polyacetal.
- Effective filtration area:  $0.65 \text{ cm}^2$
- Maximum sample volume: 2 mL
- Minimum sample volume: 0.15 mL
- Maximum RCF:  $19.6 \times 10^3 \text{ m/s}^2$  (2,000 x g)
- Dead Volume: 0.01 mL



UHP-13C Ultrafilter Unit

### ORDERING INFORMATION

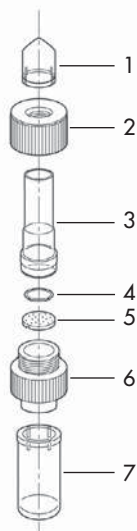
Grade	UHP-13C
Compatible filter size	$\phi 13$ mm
Quantity per package	1

\*Each unit includes 1 main body assembly, 12 cell caps, 12 filtrate caps, and 3 silicone O-rings.

### ACCESSORIES

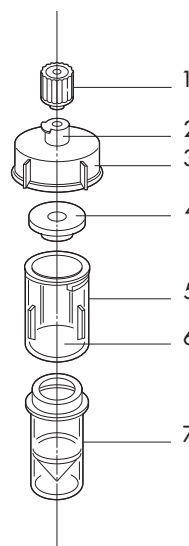
FPM O-ring	UHP-13C-FPM
Quantity per package	1

### UHP-13C Unit Assembly



1. Cell Cap
2. Locking Nut
3. Filter Cell
4. Filter Holder O-ring
5. Support Screen
6. Base Body
7. Filtrate Cup

### USY Series Unit Assembly



1. Luer Cap
2. Luer Lock Inlet
3. Cell Cap
4. Silicone Check Valve
5. Retentive Cell
6. Ultrafilter
7. Filtrate Cell

# TEST PAPERS

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## pH Test Papers

Various types of pH test papers are available to cover the wide range

Type	Measuring Range pH									Color Changes																		
										Acidity←Neutrality→Alkalinity																		
										1	2	3	4	5	6	7	8	9	10	11	12	13	14					
C R	0.4	0.6	0.8	1.0	1.2	1.4	1.6	1.8	2.0	Red	Orange																	
	7.2	7.4	7.6	7.8	8.0	8.2	8.4	8.6	8.8									Yellow	Red-purple									
T B	1.4	1.6	1.8	2.0	2.2	2.4	2.6	2.8	3.0		Red-purple	Orange																
	8.0	8.2	8.4	8.6	8.8	9.0	9.2	9.4	9.6											Yellow	Blue-purple							
B P B	2.8	3.0	3.2	3.4	3.6	3.8	4.0	4.2	4.4				Yellow	Blue														
P B	3.2	3.6	4.0	4.2	4.4	4.6	4.8	5.2	5.6				Yellow	Blue														
P P	3.4	3.8	4.2	4.6	5.0	5.2	5.6	6.0	6.4				Yellow	Red-purple														
B C G	4.0	4.2	4.4	4.6	4.8	5.0	5.2	5.4	5.6				Yellow-Green	Blue														
C P R	5.0	5.2	5.4	5.6	5.8	6.0	6.2	6.4	6.6						Yellow	Red-purple												
M R	5.4	5.6	5.8	6.0	6.2	6.4	6.6	6.8	7.0						Red	Yellow												
B C P	5.6	5.8	6.0	6.2	6.4	6.6	6.8	7.0	7.2						Brown	Purple												
B T B	6.2	6.4	6.6	6.8	7.0	7.2	7.4	7.6	7.8							Yellow-Green	Blue											
P R	0.0	0.2	0.4	0.6	0.8	1.0	1.2	1.4	1.6	Orange	Yellow																	
	6.6	6.8	7.0	7.2	7.4	7.6	7.8	8.0	8.2									Yellow	Red									
A Z Y	10.0	10.4	10.8	11.0	11.2	11.4	11.6	11.8	12.0											Yellow	Red							
A L B	11.0	11.4	11.8	12.2	12.6	12.8	13.0	13.2	13.6													Blue	Purple	Brown				
No. 20	5.0	5.2	5.4	5.6	5.8	6.0	6.2	6.4	6.6								Red	Yellow	Green									
	6.8	7.0	7.2	7.4	7.6	7.8	8.0																					
UNIV	1	2	3	4	5	6	7	8	9																			
	10	11																										
WR	0	2	4	5	6	7	8	9	10																			
	12	14									Red	Orange	Yellow															

These color changes are based on the standard pH buffer solution

### pH Test Paper-Rolls

- Plastic dispenser with color chart
- High sensitivity and sharp color change

#### UNIV (Universal) Test Paper

- Measuring Range : pH1~11
- pH Unit Graduation : 1

#### WR (Whole Range) Test Paper

- Measuring Range : pH0~14
- pH Unit Graduation : pH4~10...1  
pH0~4 & pH10~14...2

#### BCG (Bromocresol Green) Test Paper

- Measuring Range : pH4.0~5.6
- pH Unit Graduation : 0.2

#### BTB (Bromothymol blue) Test Paper

- Measuring Range : pH6.2~7.8
- pH Unit Graduation : 0.2

Type		Catalog No.	Measuring Range pH	Size
UNIV	Universal (Spare Roll)	07011030	1~11	9mm x 6m
		07011050		
WR	Whole Range	07011040	0~14	9mm x 5.5m
BCG	Bromocresol Green	07011010	4.0~5.6	9mm x 6m
BTB	Bromothymol blue	07011020	6.2~7.8	9mm x 6m

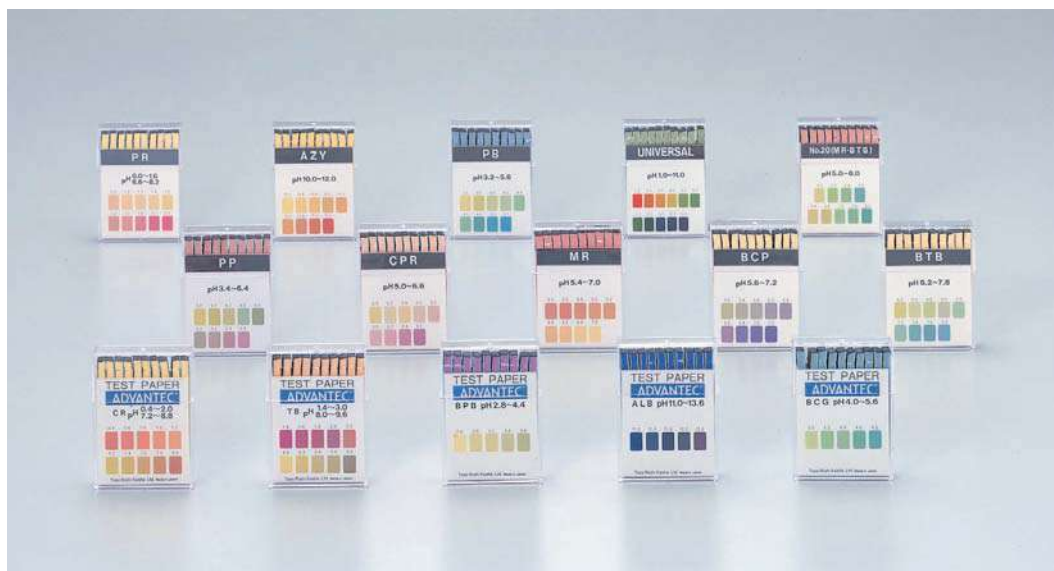




## pH Test Paper-Booklets

- Narrow pH Unit Graduation: 0.2~0.4 (except UNIV)
- Can be used for severe pH measuring (except UNIV)
- Size: 7x70mm (20 leaves/booklet, 10 booklets/box)

Type		Catalog No.	Measuring Range pH
CR	Cresol red	07010010	0.4 ~ 2.0, 7.2 ~ 8.8
TB	Thymol blue	07010020	1.4 ~ 3.0, 8.0 ~ 9.6
BPB	Bromophenol blue	07010030	2.8 ~ 4.4
PB	Phenol blue	07010090	3.2 ~ 5.6
PP	Phenol purple	07010130	3.4 ~ 6.4
BCG	Bromocresol green	07010040	4.0 ~ 5.6
CPR	Chlorophenol red	07010100	5.0 ~ 6.6
MR	Methyl red	07010050	5.4 ~ 7.0
BCP	Bromocresol purple	07010140	5.6 ~ 7.2
BTB	Bromothymol blue	07010060	6.2 ~ 7.8
PR	Phenol red	07010150	0.0 ~ 1.6, 6.6 ~ 8.2
AZY	Alizarin yellow	07010070	10.0 ~ 12.0
ALB	Alkali blue	07010080	11.0 ~ 13.6
UNIV	Universal	07010120	1.0 ~ 11.0
No.20	MR & BTB	07010110	5.0 ~ 8.0



## pH Test Paper-Strips

- Packed in Plastic Bottle
- Size: 7mm x 40mm  
(PB: 200 strips/bottle, BTB and AZY: 300 strips/bottle)

Type		Catalog No.	Measuring Range pH
PB	Phenol blue	08001040	3.2 ~ 5.6
BTB	Bromothymol blue	08001100	6.2 ~ 7.8
AZY	Alizarin yellow	08001120	10.0 ~ 12.0



## Litmus Paper-Booklets

- Detecting Acid (Blue) and Alkali (Red)
- High sensitivity

Type		Catalogue No.	Size (mm)	Package
Litmus Paper (Red)	Book type	07020020	7 x 70	20 leaves/booklet, 10 booklets/box
	Box type	07020040	9 x 85	100 leaves/box, 10 pack/box
Litmus Paper (Blue)	Book type	07020010	7 x 70	20 leaves/booklet, 10 booklets/box
	Box type	07020030	9 x 85	100 leaves/box, 10 pack/box



book type



box type

## Ion Test Papers

- Detecting Ion and its concentration
- Measuring pH

Type	Measuring for	Measuring Range	Color	pH	Catalog No.	Package (strips/box)
Almi Check	$Al^{3+}$	0 ~ 100mg/L	Peach to Red	3 ~ 6	07030010	100
Copper Check	$Cu^{2+}$	0 ~ 500mg/L	Bark to Black and Blue	3 ~ 5	07030020	100
Copper Check A	$Cu^+, Cu^{2+}$	0 ~ 50mg/L	White to Purple	1 ~ 6	07030030	100
Chrome Check	$Cr^{6+}$	0 ~ 200mg/L	Light peach to Purple	1 ~ 4	07030041	25
Chrome Check A	$Cr^{6+}$	0 ~ 50mg/L	Light peach to Purple	1 ~ 9	07030051	25
Iron Check	$Fe^{2+}$	0 ~ 1,000mg/L	White to Red	1 ~ 6	07030060	100
Nickel Check	$Ni^{2+}$	0 ~ 1,000mg/L	Grey to Red	2 ~ 7	07030070	100
Cyanogen Check	$CN^-$	0 ~ 1,000mg/L	White to Bark	7 ~ 9	07030100	100

## Chlorine Test Papers

- Detecting the concentration of residual chlorine in sodium hypochlorite solution ( $NaClO$ ) or hypochlorous acid ( $HClO$ )
- Two types are available

Type	Catalogue No.	Size (mm)	Package (Strips/box)
Chlorine Test Paper (1 ~ 10ppm)	08010005	5 x 5 Indicator part	50
Chlorine Test Paper (10 ~ 50ppm)	08010010	7 x 40	300
Chlorine Test Paper (25 ~ 200ppm)	08010020		

Note: Cannot be used for the detection of Chlorine Ion.





Advantec Industrial Filter Papers are versatile, strong, and cost-effective. 6 types are available classified by strength, thickness, retentivity, creping, and holding capacity. Please refer to the application guide for additional information.

## Standard Filter Papers

### Features and Applications

- Standard filter papers for a wide variety of applications
- Use for qualitative filtration analysis, efficient retention of 1-6  $\mu\text{m}$  particles in horizontal and vertical flow systems, and suitable for applications in many fields

## Grades

- No. 1** • Qualitative filter paper, for coarse filtration
- No. 2** • Qualitative filter paper, for mid-grade filtration
- No. 131** • Qualitative filter paper, for fine particle filtration
- No. 26** • Standard grade for general purpose
- No. 27** • For mid-fine filtration
- No. 28** • For fine filtration

## Fine Particle Filter Papers

### Features and Applications

- Highest particle retention of industrial filter papers
- Fibers won't separate or slough off suitable for removal of fine particles

## Grades

- No. 1640** • 0.4 mm thick, retaining 1 $\mu\text{m}$  particles while preserving a fast flow rate
- No. 1650** • Highest grade filter paper

## Creped Filter Papers

### Features and Applications

- Uniformly creped surface with cellulose fiber pre-coat for a larger, more effective surface area
- Increased surface area for higher flow rates than standard filters
- High flow rates can be maintained while effectively filtering, so filtration of high viscosity or high particle concentration fluids can be performed

## Grades

- No. 101** • Qualitative filter paper useful for many applications
- No. 102** • Grade with highest flow rate; useful for airborne particle retention
- No. 107** • Reduced thickness filter
- No. 126** • Increased thickness for more strength; especially good for viscous liquids

Grade	Standard Filter Paper						Fine Particle Filter		Creped Filter Paper			
	No. 1	No. 2	No. 131	No. 26	No. 27	No. 28	No. 1640	No. 1650	No. 101	No. 102	No. 107	No. 126
Weight (g/m <sup>2</sup> )	90	125	140	320	325	360	170	300	80	100	80	300
Thickness (mm)	0.20	0.26	0.25	0.74	0.68	0.70	0.40	0.57	0.21	0.3	0.21	0.9
Flow Time (s)*1	45	80	240	80	220	350	90	810	50	28	50	35
Burst Strength (kPa)*2	79	122	147	378	370	445	196	286	127	122	127	364
Nominal Rating ( $\mu\text{m}$ )*3	6	5	3	3	1.5	1	3	0.8	5	3	5	4
Surface	Smooth								Creped			
Color	White											
Max. Operating Temperature (°C)	120											

\*1. Flow Time is the time in seconds required to filter 100mL of distilled water at 20°C under pressure supplied by a 10cm water column through a 10 cm<sup>2</sup> section of filter paper measured by Herzberg Tester in accordance with JIS P3801.

\*2. Burst Strength is determined by Mullen Burst Strength Tester in accordance with JIS P8112.

\*3. Nominal Rating is determined by the particle size of the precipitated Barium Sulfate through the filter by gravity filtration in accordance with JIS P3801.

\*4. Maximum operating temperature shall be varied depending on filtration conditions.

## Wet Strength Filter Papers

### Features and Applications

- For special applications requiring high wet strength
- For high pressure filtration or filter press, use to perform filtration on a variety of liquids
- No. 26-3, 28-3, 126-3, and 424-3 are reduced thickness filters

### Grades

- No. 26-3** • Thinner and higher wet strength compared with No.26, but retention efficiency is equal to No.26
- No. 28-3** • Thinner and higher wet strength compared with No.28, but retention efficiency is equal to No.28
- No. 126-3** • Thinner and higher wet strength compared with No.126, but retention efficiency is equal to No.126
- No. 327** • Comparable to No. 27; good for maintaining high flow rates
- No. 408** • Mid-grade wet strength filter
- No. 412** • Comparable to No. 2; high wet strength
- No. 424** • Comparatively thick filter paper; good for quick filtration of high viscosity fluids
- No. 424-3** • Comparable to No. 424; high wet strength, good for filtering high viscosity fluids
- No. 431** • Comparable to No. 131; high wet strength, good for applications requiring fine particle retention
- No. 434** • Creped light brown filter with soft surface; high filtration rate
- No. 436** • Creped brown filter with high wet strength

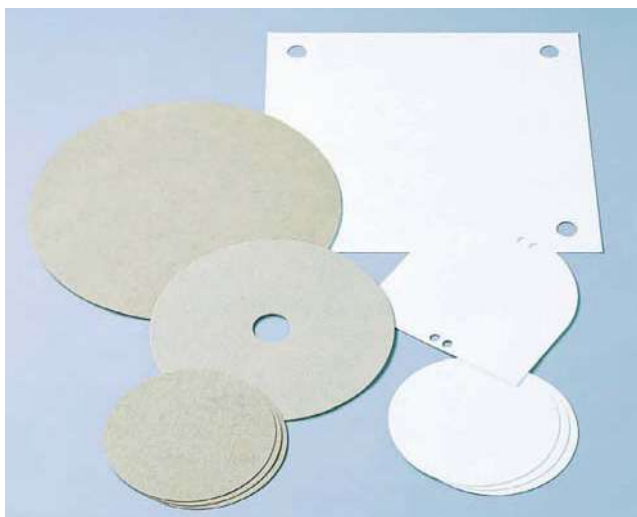
Grade	Wet Strength Filter Paper										
	No. 26-3	No. 28-3	No. 126-3	No. 327	No. 408	No. 412	No. 424	No. 424-3	No. 431	No. 434	No. 436
Weight (g/m <sup>2</sup> )	260	310	250	285	92	120	380	325	140	290	250
Thickness (mm)	0.58	0.60	0.75	0.60	0.27	0.25	1.00	0.83	0.25	0.95	0.80
FlowTime (s)* <sup>1</sup>	80	350	35	220	15	80	50	50	250	30	70
Burst Strength (kPa)* <sup>2</sup>	299	382	326	401	50	109	687	670	124	212	294
Nominal Rating (µm)* <sup>3</sup>	3	1	4	1.5	8	5	4	4	3	5	2
Surface	Smooth		Creped	Smooth						Creped	
Color	White									Lt.Brown	Brown
Max. Operating Temperature (°C)	120										

\*1. Flow Time is the time in seconds required to filter 100mL of distilled water at 20°C under pressure supplied by a 10cm water column through a 10 cm<sup>2</sup> section of filter paper measured by Herzberg Tester in accordance with JIS P3801.

\*2. Burst Strength is determined by Mullen Burst Strength Tester in accordance with JIS P8112.

\*3. Nominal Rating is determined by the particle size of the precipitated Barium Sulfate through the filter by gravity filtration in accordance with JIS P3801.

\*4. Maximum operating temperature shall be varied depending on filtration conditions.



## High Purity Filter Papers

### Features and Applications

- Use for quantitative filtration analysis
- Contains low ash content and very low levels of pyrogens: especially good for high purity filtration applications
- Retains fine particles without affecting filtration speed

### Grades

- No. 5A** • For high speed, relatively coarse filtration
- No. 5B** • For medium-fine quantitative filtration
- No. 5C** • For fine filtration

## High Viscosity Fluid Filter Papers

### Features and Applications

- Thick, high and low-density filter papers designed for fast filtration of viscous fluids

### Grades

- No. 63** • 1 mm thick filter paper; standard type for a variety of filtration applications
- No. 63F** • 1.35 mm thick, high density filter for increased particle retention than No. 63
- No. 63G** • For filtration of high viscosity liquids with fine particle suspensions; can be used in high pressure systems
- No. 60, 65, 462** • Thinner, lower density filter papers for gentle filtration of high viscosity fluids

Grade	High Viscosity Filter Paper						High Purity Filter Paper		
	No. 63	No. 63F	No. 63G	No. 60	No. 65	No. 462	No. 5A	No. 5B	No. 5C
Weight (g/m <sup>2</sup> )	350	525	525	125	143	168	97	108	118
Thickness (mm)	1.00	1.35	1.35	0.56	0.55	0.53	0.22	0.21	0.22
Flow Time (s)* <sup>1</sup>	26	25	90	7	9	15	60	195	570
Burst Strength (kPa)* <sup>2</sup>	196	139	218	49	59	98	61	75	92
Nominal Rating (µm)* <sup>3</sup>	4	3	1.5	25	15	8	7	4	1
Surface	Smooth								
Color	White								
Max. Operating Temperature (°C)	120								

\*1. Flow Time is the time in seconds required to filter 100mL of distilled water at 20°C under pressure supplied by a 10cm water column through a 10 cm<sup>2</sup> section of filter paper measured by Herzberg Tester in accordance with JIS P3801.

\*2. Burst Strength is determined by Mullen Burst Strength Tester in accordance with JIS P8112.

\*3. Nominal Rating is determined by the particle size of the precipitated Barium Sulfate through the filter by gravity filtration in accordance with JIS P3801.

\*4. Maximum operating temperature shall be varied depending on filtration conditions.



**Application Guide for Industrial Filter Papers**

Application	Grade			STANDARD			HIGH WET STRENGTH			FINE		CREPED			HIGH VISCOSITY														
	HIGH PURITY																												
	No. 5A	No. 5B	No. 5C	No. 1	No. 2	No. 131	No. 26/26-3	No. 27	No. 28/28-3	No. 327	No. 408	No. 412	No. 424/424-3	No. 431	No. 434	No. 436	No. 1640	No. 1650	No. 101	No. 102	No. 107	No. 126/126-3	No. 63	No. 63F	No. 63G	No. 60	No. 65	No. 462	
<b>FERMENTED PRODUCTS</b>																													
Sake			o	o	o	o	o	o	o	o													o						
Fruit Liquors			o				o	o		o																			
Whiskey, Brandy								o		o																			
Soy Sauce											o	o		o					o										
<b>FOOD &amp; BEVERAGE</b>																													
Soft Drink Syrup							o												o			o							
Carbonated Beverages						o	o	o		o												o							
Mineral Water			o		o	o	o	o	o																				
Fruit Juices							o					o										o							
Cooking and Salad Oils	o				o	o	o	o	o			o	o									o	o						
Concentrated Fructose							o															o							
<b>CHEMICALS</b>																													
Industrial Organic Solvents							o		o	o	o		o	o			o	o	o										
Food Coloring	o	o	o	o	o		o							o		o			o	o									
Galvanizing Liquids				o	o					o		o							o										
Photographic Sensitizer				o	o				o											o			o	o					
Photographic Fixer									o	o									o	o			o						
Photographic Developer									o	o									o	o			o						
Photo Resists																							o						
Synthetic Resins					o	o	o		o			o	o	o					o	o				o					
Silicone									o			o	o									o	o	o					
Paints, Varnishes				o	o	o	o		o			o	o	o										o	o				
Ink				o	o							o	o						o	o			o	o	o				
Rayon (viscose)							o															o	o	o		o	o	o	
Liquid Cellulose Acetate																							o	o	o	o	o	o	o
<b>PHARMACEUTICALS</b>																													
Cod Liver Oil							o					o	o									o							
Cough Syrups	o						o						o						o			o							
Eye Drops			o		o	o																o	o						
Infusions			o		o	o																o	o						
Medical Saline			o		o	o																o	o						
Culture Media	o	o		o	o																	o	o						
Oils for Pharmaceuticals	o			o	o	o						o	o	o															
Antibiotics			o		o	o																o	o						
Serum			o		o																	o							
<b>COSMETICS</b>																													
Hair Care Products						o									o								o				o	o	o
Moisturizer				o		o						o								o							o	o	o
Toner	o	o	o	o		o						o	o	o								o							
<b>PETROLEUM PRODUCTS</b>																													
Light Oil				o		o						o											o						
Heavy Oil				o		o						o		o								o	o						
Kerosene							o	o	o			o		o	o							o	o						
Lubricants					o	o	o	o				o		o									o		o		o		
Hydraulic Oil					o	o						o		o									o	o	o				
Transformer Oil					o	o	o	o	o			o														o			
Wax				o										o													o	o	o

## Industrial Filter Pads

These pads are produced from refined cellulose fibers and diatomaceous earth. The diatomaceous earth has been treated to improve absorption which, in combination with the depth retention characteristics of cellulose fibers, increases overall retention efficiency. These pads can be sterilized by autoclave or in-line within a system by steam, hot water, or chemical sterilization. Primary uses of standard pads are sterilization and clarification of fluids, but are also well suited to applications requiring good surface and depth retention.

### NA Standard Filter Pads

#### Features and Applications

- Zeta-Potential Plus filter pads exhibiting high surface and internal retention efficiency
- Suited for filtering beer, wine, sake and other fluids such as fermented beverages with high particle loads

### Grades

- NA-10** • For fast filtration retaining 1  $\mu\text{m}$  particles
- NA-12** • Medium grade pad retaining 0.8  $\mu\text{m}$  particles
- NA-16** • Standard type
- NA-17** • High grade pad suitable as a final filter

### NA Long-Life Filter Pads

#### Features and Applications

- Increased thickness, density and strength for comparatively longer life than NA Standard Types
- For filtering fluids with high particle loads over an extended period of time

### Grades

- NA-050** • High flow rate filter for retention of relatively coarse particles
- NA-100** • Long-life filter comparable to the NA-10 for fast filtration
- NA-300** • Long-life filter comparable to the NA-12 for medium grade pad
- NA-500** • High retention efficiency pad for fine filtration
- NA-600** • Long-life filter comparable to the NA-16 for fine filtration
- NA-900** • Highest density and particle retention efficiency among NA filter pads

Grade	NA Standard Type				NA Long-Life Type					
	NA-10	NA-12	NA-16	NA-17	NA-050	NA-100	NA-300	NA-500	NA-600	NA-900
Weight (g/m <sup>2</sup> )	1,300	1,340	1,310	1,500	1,340	1,290	1,220	1,410	1,490	1,700
Thickness (mm)	3.5	3.5	3.5	3.5	3.6	3.6	3.5	3.7	3.6	3.8
Water Flow Rate (kL/h·m <sup>2</sup> )* <sup>1</sup>	4.9	2.8	1.1	0.7	11.4	8.1	5.1	1.8	0.8	0.4
Burst Strength (MPa)* <sup>2</sup>	0.58	0.29	0.29	0.39	0.49	0.49	0.49	0.49	0.39	0.29
Nominal Rating ( $\mu\text{m}$ )* <sup>3</sup>	1	0.8	0.4	0.3	3	1	0.8	0.5	0.4	0.2
pH Range* <sup>4</sup>	1 ~ 12				1 ~ 12					

\*1. Water Flow Rate is determined by the filtration of 0.20 $\mu\text{m}$  membrane filter passed water at 25°C under 10kPa differential pressure.

\*2. Burst Strength is determined by Mullen Burst Strength Tester in accordance with JIS P8112.

\*3. Nominal Rating is determined by the particle size of the precipitated Barium Sulfate through the filter by gravity filtration in accordance with JIS P3801.

\*4. pH range : May vary by changes in pressure, duration of filtration, or temperature, so please make adjustments accordingly.

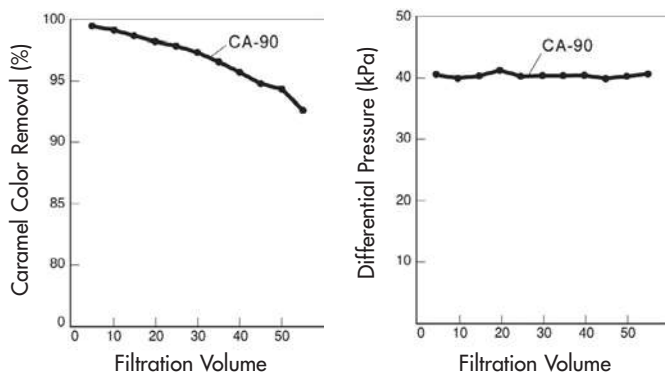


## Activated Carbon Filter Pads

Activated carbon filter pads can be used to remove most organic and some inorganic contaminants from the fluid being filtered. Made of cellulose fibers impregnated with activated carbon particles.

### General Grade

- For decolorization and deodorization of gasses or liquids
- CA-90** • High density and thickness for high-pressure applications



### Pharmaceutical Grade

- Specially made for high purity applications
- CA-1000** • Very high density and thickness for applications requiring high levels of purity

#### Example of Pyrogen Removal Ability

Vol. L.P.S. added (ng / mL)	0.9% NaCl	5% Glucose
100	( - )	( - )
150	( - )	( - )
200	( - )	( - )
600	( + )	( + )

L.P.S. Test : E-coli UKT-B strain was filtered at 2 mL/min·cm<sup>2</sup>, over an effective filtration area of 50 cm<sup>2</sup>. Detection was by LAL Test method.

## Cellulose Filter Pads for Support and Purification

### Features and Applications

- Made of natural cellulose fibers
- Most useful as a support for diatomaceous earth
- Pad thickness increases depth retention efficiency resulting in pure liquid filtrates

### Grades

- No. 1034-2** • 1.8 mm thick, lightweight and low density pad
- No. 1034-3A** • 3.2 mm thick, for maintaining a fast flow rate
- No. 1034-3B** • 3.2 mm thick, for high pressure resistance. Washable

Grade	Activated Carbon		Cellulose for Purification & Support		
	CA-90	CA-1000	No. 1034-2	No. 1034-3A	No. 1034-3B
Weight (g/m <sup>2</sup> )	1,130	2,500	700	950	1,000
Thickness (mm)	4.0	8.0	1.8	3.2	3.2
Water Flow Rate (KL/h.m <sup>2</sup> )* <sup>1</sup>	7.2	-	46.9	3.16	29.8
Burst Strength (MPa)* <sup>2</sup>	0.39	0.019	0.58	1.17	1.27

\*1. Water Flow Rate is determined by the filtration of 0.20µm membrane filter passed water at 25°C under 10kPa differential pressure.

\*2. Burst Strength is determined by Mullen Burst Strength Tester in accordance with JIS P8112.

## Application guide for Industrial Filter Pads

Grade  Application	STANDARD				LONG-LIFE					ACTIVATED CARBON		PUR/SUPP CELLULOSE			
	NA-10	NA-12	NA-16	NA-17	NA-050	NA-100	NA-300	NA-500	NA-600	NA-900	CA-90	CA-1000	No. 1034-2	No. 1034-3A	No. 1034-3B
<b>FERMENTED PRODUCTS</b>															
Beer								○	○				○	○	○
Sake	○	○	○			○	○	○					○	○	○
Water for Dilution	○				○										
Fruit Liquors		○	○	○		○	○	○	○	○				○	○
Brandy		○	○			○	○	○	○						
Vinegar		○	○			○	○		○	○			○	○	○
Soy Sauce	○				○	○							○	○	○
<b>FOOD &amp; BEVERAGE</b>															
Soft Drink Syrup	○	○			○	○	○	○	○		○	○			
Mineral Water	○				○	○	○				○	○	○	○	○
Fruit Juices					○	○	○	○							
Cooking and Salad Oils	○	○	○		○	○					○				
Concentrated Fructose	○	○	○		○	○	○				○	○		○	○
<b>CHEMICALS</b>															
Industrial Organic Solvents	○	○			○	○		○			○		○	○	○
Food Coloring		○	○					○	○					○	○
Galvanizing Fluids	○				○								○	○	○
Synthetic Resins	○	○			○	○								○	○
Silicone					○	○								○	○
Paints, Varnishes	○	○			○	○							○	○	○
Ink					○	○	○								
<b>PHARMACEUTICALS</b>															
Cod Liver Oil	○	○			○	○	○								
Cough Syrups	○				○									○	○
Eye Drops											○				
Infusions	○	○	○	○		○	○	○	○	○	○	○			
Medical Saline			○	○				○	○	○	○	○			
Culture Media	○	○				○	○	○	○					○	○
Oils for Pharmaceuticals		○	○					○	○			○			
Antibiotics			○	○				○	○	○					
Serum	○		○	○			○	○	○	○					
<b>COSMETICS</b>															
Hair Care Products	○				○	○								○	○
Moisturizer	○	○			○	○									
Toner	○	○	○				○	○	○		○				
<b>PETROLEUM PRODUCTS</b>															
Heavy Oil	○				○	○								○	○
Kerosene	○				○	○								○	○
Lubricants	○	○					○							○	○
Hydraulic Oil	○	○			○	○	○							○	○
Transformer Oil	○				○	○								○	○

# CAPSULES AND CARTRIDGES

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## Capsules – Introduction

- All-polypropylene housing is sturdy and chemically compatible
- Three membrane-type media and two depth-type media
- Wide range of retentive pore sizes
- All types available in three different lengths
- Diameter is a standard 78 mm
- Selected media available pre-sterilized by ethylene oxide (EtO)

## APPLICATIONS

- Filter tissue culture media, fermentation broth, and ground water
- Can be set in serial mode to maximize throughput volumes
- Point-of-use sterile filtration
- Use capsules for pilot/prototype studies, scale up to the same media in the cartridge format
- Cannot be used for Air filtration

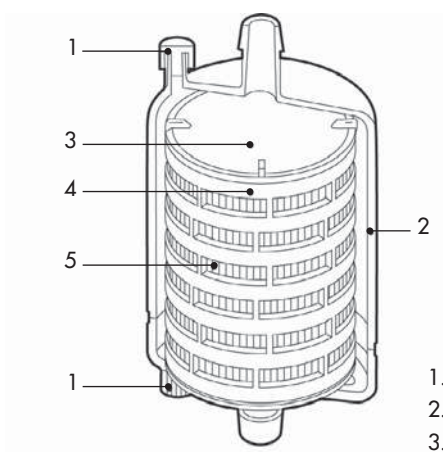


Five different filter media are available in the capsule format.

Model	Media	Characteristic	Media Type	Pore Size or Nominal Rating ( $\mu\text{m}$ )	Membrane Layers	Filtration Area per Capsule ( $\text{cm}^2$ )
CCS	PES	Hydrophilic	Membrane	0.20 – 0.45	Double	Up to 1,800
CCF	PTFE	Hydrophobic	Membrane	0.05 – 1.0	Single/Double	Up to 3,600
CCFH	PTFE	Hydrophilic	Membrane	0.20	Single	Up to 3,600
CCP	Polypropylene	Hydrophobic	Depth-type	0.8 – 30	N/A	Up to 2,600
CCG	Glass	-	Depth-type	0.45 – 1.0	N/A	Up to 1,200

For detailed chemical compatibility information, see page 132.

When ordering length code "C", end fixture code "D" is not available.



1. Vent/drain ( $1/8$ " NPT)
2. Housing
3. End cap
4. Outer sleeve
5. Pleated filter media



B  
1/4" NPTM



D  
1/2" NPTM



H  
3/8" hose barb  
(O.D.13mm)



N  
1-1/2" sanitary fitting

## PES Capsule Filter (CCS)

- Can be sterilized by autoclaving (121°C, 30 min) or treatment with ethylene oxide (EtO)
- Available pre-sterilized (EtO) or pre-rinsed (recommended when filtering high purity water)

### APPLICATIONS

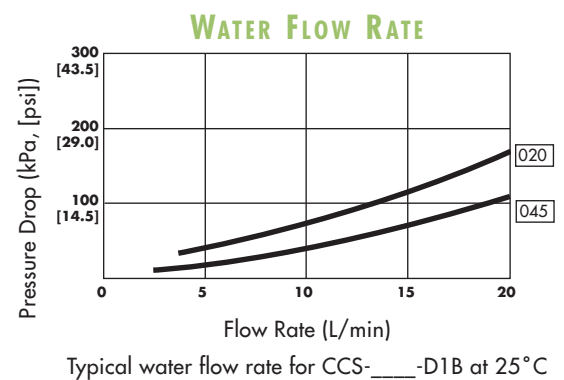
- Filter pure water, high purity chemicals, pharmaceuticals, cosmetics, and tissue culture media
- Remove bacteria or sub-micron particulates
- Cannot be used for Air filtration

### SPECIFICATIONS

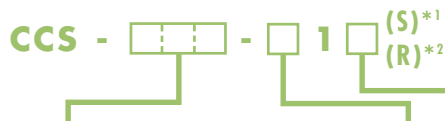
Maximum Inlet Pressure	0.39 MPa (57 psi)
Maximum Operating Temperature	60°C (140°F)

		CCS-020	CCS-045
Layers		Double	Double
Pore Size (µm)		0.20	0.45
Bubble Point (water)		≥0.39 MPa (57 psi)	≥0.29 MPa (43 psi)
LRV / Organism		≥7 B. diminuta	≥7 S. marcescens
Length Code	Length (mm)*	Filtration Area (cm <sup>2</sup> )	
C	102	450	
D	129	900	
E	201	1,800	

\*Length given is for capsule with end fixture H.



### ORDERING INFORMATION



Pore Size (µm)	Pore Size Code	Length (mm)	Length Code	End Fixture (Inlet and Outlet)	End Fixture Code
0.20	<b>020</b>	102	<b>C</b>	1/4" NPTM	<b>B</b>
0.45	<b>045</b>	129	<b>D</b>	1/2" NPTM	<b>D</b> <sup>*3</sup>
		201	<b>E</b>	3/8" hose barb	<b>H</b>
				1 1/2" sanitary fitting	<b>N</b>

\*1. When ordering sterile units, specify "S" in the last position of the catalog number.

\*2. When ordering Pre-rinsed units, specify "R" in the last position of the catalog number.

\*3. When ordering length code "C", end fixture code "D" is not available.

## PTFE Capsule Filters – Hydrophobic (CCF) and Hydrophilic (CCFH)

- Compatible: solvent and pH-resistant
- Hydrophobic:
  - Supported membrane except CCF-A10 and CCF-005
  - Single layer except CCF-A10 and CCF-005 which has double layer
  - 5 pore sizes
  - Can be sterilized by autoclaving (121°C, 30 min) or treatment with ethylene oxide (EtO).

- Hydrophilic:
  - Polyester membrane support
  - Single layer
  - 0.2 µm pore size

Note: Autoclaving or allowing membrane to dry will render it hydrophobic.

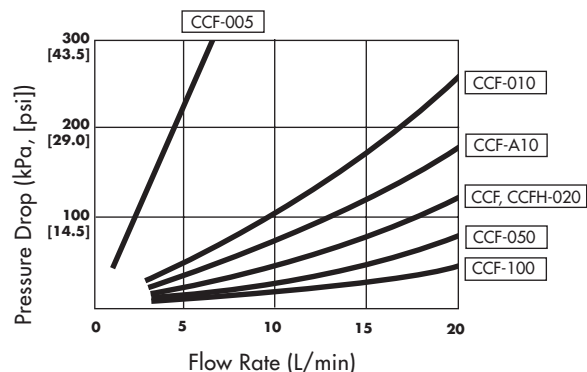
### APPLICATIONS

- Use serially as prefilter and final filter
- Corrosive fluids and gases, photoresists, and both alkalis and acids
- Hydrophobic:
  - Solvent filtration
- Hydrophilic:
  - Solvents with higher surface tension
  - Heterogeneous fluid mixtures
- Cannot be used for Air filtration

### SPECIFICATIONS

Maximum Inlet Pressure	0.39 MPa (57 psi)
Maximum Operating Temperature	60°C (140°F)

### WATER FLOW RATE

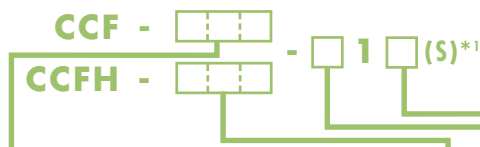


Typical water flow rate for CCF/CCFH-\_\_\_-D1B at 25°C

	CCF-005	CCF-A10	CCF-010	CCF-020	CCF-050	CCF-100	CCFH-020	
	Hydrophobic						Hydrophilic	
Layers	Double	Double	Single	Single	Single	Single	Single	
Pore Size (µm)	0.05	0.10	0.10	0.20	0.50	1.0	0.20	
Bubble Point (IPA) MPa (psi)	≥0.16 (23)	≥0.15 (22)	≥0.13 (20)	≥0.09 (13)	≥0.05 (7)	≥0.03 (4)	-	
Length Code	Length* (mm)	Filtration Area (cm <sup>2</sup> )						
C	102	900	900	570	570	570	570	900
D	129	1,800	1,800	1,150	1,150	1,150	1,150	1,800
E	201	3,600	3,600	2,300	2,300	2,300	2,300	3,600

\*Length given is for capsule with end fixture H.

### ORDERING INFORMATION



Pore Size (µm)	Pore Size Code	Pore Size (µm)	Pore Size Code	Length (mm)	Length Code	End Fixtures (Inlet and Outlet)	End Fixture Code
0.05	005	0.2	020	102	C	1/4" NPTM	B
0.10	A10			129	D	1/2" NPTM	D <sup>*2</sup>
0.10	010			201	E	3/8" hose barb	H
0.20	020					1 1/2" sanitary fitting	N
0.50	050						
1.00	100						

\*1. When ordering sterile units, specify "S" in the last position of the catalog number.

\*2. When ordering length code "C", end fixture code "D" is not available.

## Polypropylene Capsule Filter (CCP)

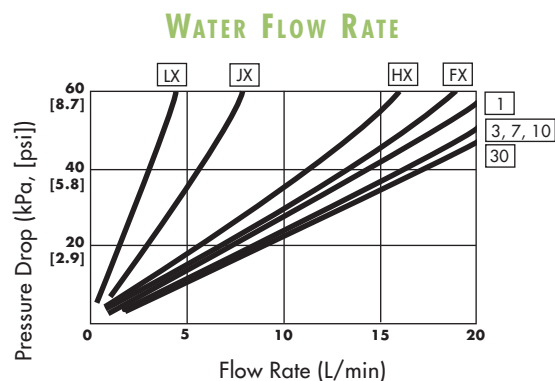
- Depth-type matrix: high dirt holding capacity, superior retention
- Compatible with aqueous solutions and solvents
- Thermally welded to prevent fiber slough-off and minimize changes in pore size during filtration
- Wide range of particle size cut-offs
- Can be sterilized by autoclaving (121°C, 30 min) or treatment with ethylene oxide (EtO).

### APPLICATIONS

- High purity water filtration
- Prefiltration to a final membrane filter such as PES or PTFE (CCS, CCF, or CCFH)
- Ultracleaning
- Filtration of process chemicals
- Cannot be used for Air filtration

### SPECIFICATIONS

Maximum Inlet Pressure	0.39 MPa (57 psi)
Maximum Operating Temperature	60°C (140°F)



Typical water flow rate for CCP-\_\_\_\_-D1B at 25°C.

		CCP-								
		LX	JX	HX	FX	1	3	7	10	30
Particle Retention	Particle Size (µm)	0.8	1.0	2.0	3.0	2 - 5	5 - 10	10 - 20	10 - 20	20 - 30
	(%)	>99	>99	>99	>99	94	98	98	92	97
Length Code	Length* (mm)	Filtration Area (cm <sup>2</sup> )								
C	102	400	500	500	550	500	600	500	550	650
D	129	800	1,000	1,000	1,100	1,000	1,200	1,000	1,100	1,300
E	201	1,600	2,000	2,000	2,200	2,000	2,400	2,000	2,200	2,600

\*Length given is for capsule with end fixture H.

### ORDERING INFORMATION



Retention Characteristic Code	Length (mm)	Length Code	End Fixtures (Inlet and Outlet)	End Fixture Code
LX	102	C	1/4" NPTM	B
JX	129	D	1/2" NPTM	D
HX	201	E	3/8" hose barb	H
FX			1 1/2" sanitary fitting	N
1				
3				
7				
10				
30				

\*. When ordering length code "C", end fixture code "D" is not available.

## Glass Fiber Capsule Filter (CCG)

- Depth-type matrix of borosilicate glass fiber
- Large dirt holding capacity
- Resistant to most fluids except strong acids
- Contains a small amount of acrylic resin binder to enhance wet strength
- Can be sterilized by autoclaving (121°C, 30 min) or treatment with ethylene oxide (EtO).

### APPLICATIONS

- Sea water filtration
- Aquaculture
- Prefiltration to a final membrane filter such as PES or PTFE (CCS, CCF, or CCFH)
- Cannot be used for Air filtration

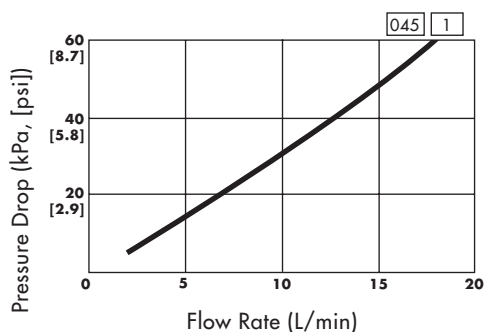
### SPECIFICATIONS

Maximum Inlet Pressure	0.29 MPa (43 psi)
Maximum Operating Temperature	60°C (140°F)

		CCG-045	CCG-1
Particle Retention	Particle Size (µm)	1 – 1.5	1.5 – 2.0
	(%)	99.9	
Length Code	Length* (mm)	Filtration Area (cm <sup>2</sup> )	
C	102	300	
D	129	600	
E	201	1,200	

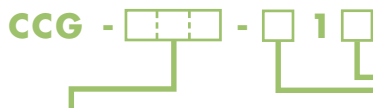
\*Length given is for capsule with end fixture H.

### WATER FLOW RATE



Typical water flow rate for CCG-\_\_\_\_-D1B at 25°C.

### ORDERING INFORMATION



Nominal Rating (µm)	Nominal Rating Code	Length (mm)	Length Code	End Fixtures (Inlet and Outlet)	End Fixture Code
0.45	045	102	C	1/4" NPTM	B
1.0	1	129	D	1/2" NPTM	D
		201	E	3/8" hose barb	H
				1 1/2" sanitary fitting	N

\*. When ordering length code "C", end fixture code "D" is not available.



## Cartridges – Introduction

- Available in a wide variety of media and end fixture configurations
- Media can be mixed and configured in serial format to maximize throughput volumes, flow rates, and cartridge life
- Fit many commercially available filter housings

## APPLICATIONS

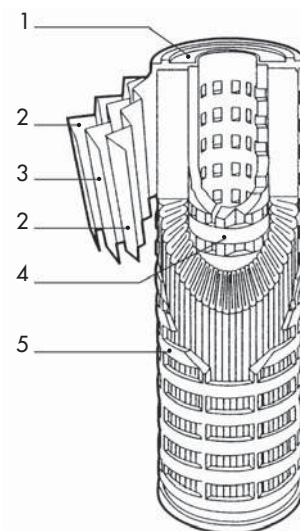
- Large surface area permits large throughput volumes and higher flow rates
- Suitable for both prefiltration and final filtration of fluids in chemical, food, beverage, and electronics industries
- Wide choice of media and core enables use in many chemical and thermal conditions



Eleven different filter media are available in cartridge format.

## SPECIFICATIONS

Model	Material	Media type	Format	Absolute/ Nominal	Pore Size or Rating (µm)
TCR	Cellulose Acetate	Membrane	Pleated, Internal Prefilter	Absolute	0.20 – 0.80
TCS	Polyethersulfone (PES)	Membrane	Pleated, Internal Prefilter	Absolute	0.20 – 0.45
TCS-G	Polyethersulfone (PES)	Membrane	Pleated, Internal Prefilter	Absolute	0.20 – 0.65
TCS-E	Polyethersulfone (PES)	Membrane	Pleated, Internal Prefilter	Absolute	0.20 – 0.45
TCF	Hydrophobic PTFE	Membrane	Pleated	Absolute	0.05 – 1.0
TCFH	Hydrophilic PTFE	Membrane	Pleated	Absolute	0.10 – 1.0
TCY	Coated Cellulose Acetate	Membrane	Pleated, Dual Layer	Nominal	0.21 – 2.0
TCYE	Coated Cellulose Acetate	Membrane	Pleated, Single Layer	Nominal	0.21 – 10
TCP	Polypropylene	Non-woven	Pleated, Multiple Layers	Nominal	0.8 – 3.0
TCP/TCPE	Polypropylene	Non-woven	Pleated, Single Layer	Nominal	1 – 30
TCPD	Polypropylene, Multigrade	Non-woven	Spirally Wound	Nominal	1 – 70
TC	Cellulose with Epoxy Resin	Filter Paper	Pleated	Nominal	1 – 30
TCG	Glass Fiber	Glass Fiber Filter	Pleated	Nominal	0.45 – 1
TCW	Polypropylene, Cotton	Yarn	Wound	Nominal	0.5 – 150



1. End cap
2. Support media
3. Final membrane
4. Core tube
5. Outer sleeve

Gasket/O-ring Polymer	Gasket/O-ring Code	Autoclavable	Max Temp. (°C)
EPR	E	○	150
EPDM	D	○	150
Chloroprene	N	X	120
NBR	B	X	130
Silicone	S	○	230
FPM	V	○	260
PTFE (Gasket only)	H	○	260
FEP Encapsulated (O-ring only)	F	○	260

○ – Recommended    X – Not recommended

For detailed chemical compatibility information, see page 134.  
Filter housings are available – call to discuss your particular needs.

## End Fixture Configurations



**H** Size 222 Heat-Resistant O-ring,  
Flat Closed  
Standard O-ring: Silicone  
Note: Autoclavable



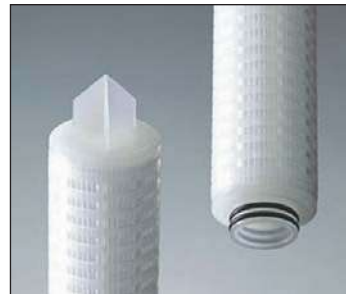
Size 222 O-ring, Flat Closed  
Standard O-ring: EPR  
Note: Non-Autoclavable



**C** Flat Gasket  
Standard Gasket: NBR



**K** Size 222 Heat-Resistant O-ring,  
Spear Closed  
Standard O-ring: Silicone  
Note: Autoclavable



**R** Size 222 O-ring, Spear Closed  
Standard O-ring: EPR  
Note: Non-Autoclavable



**J** Size 226 Heat-Resistant O-ring  
with Tabs, Spear Closed  
Standard O-ring: Silicone  
Note: Autoclavable



**P** Size 226 O-ring with Tabs,  
Spear Closed  
Standard O-ring: EPR  
Note: Non-Autoclavable



**F** Flat Gasket  
Standard Gasket: EPR  
Note: Non-Autoclavable



**N** Size 120 O-ring  
Standard O-ring: Silicone  
Note: Autoclavable

## Cellulose Acetate Membrane (TCR)

- Dual cellulose acetate membranes provide internal prefiltration by placing a larger pore size membrane upstream of final rated pore size membrane
- Polyester membrane support is almost no fiber releasing
- Low protein binding

### APPLICATIONS

- Filter ultra-pure water, rinse water, cosmetics, and beverages (beer and wine)

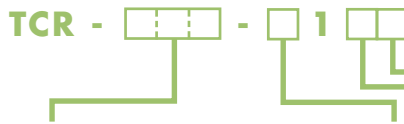
### SPECIFICATIONS

	TCR-020	TCR-045	TCR-080
Pore Size (µm)	0.20	0.45	0.80
Dual Membranes:			
Upstream (µm)	0.80	0.80	5.0
Downstream (µm)	0.20	0.45	0.80
Challenge Organism	<i>B. diminuta</i>	<i>S. marcescens</i>	<i>S. cerevisiae</i>
LRV (Log Reduction Value)	≥7	≥7	≥7
Bubble Point (MPa)	≥0.294	≥0.235	≥0.088
Filtration Area per Single Length	5,400 cm <sup>2</sup>		
Max. Differential Pressure (25°C)	0.39 MPa (57 psi)		
Max. Operating Temperature	80°C (176°F)		

### Materials:

End Cap	Polypropylene
Sealing Material	Polypropylene
Support Media	Polypropylene
Prefilter Membrane	Cellulose Acetate
Final Membrane	Cellulose Acetate
Core Tube	Polypropylene
Outer Sleeve	Polypropylene

### ORDERING INFORMATION



Pore Size (µm)	Pore Size Code
0.20	<b>020</b>
0.45	<b>045</b>
0.80	<b>080</b>

Length (mm)	Length Code
250 (single)	<b>S</b>
500 (double)	<b>D</b>
750 (triple)	<b>T</b>
1,000 (quad)	<b>Q</b>

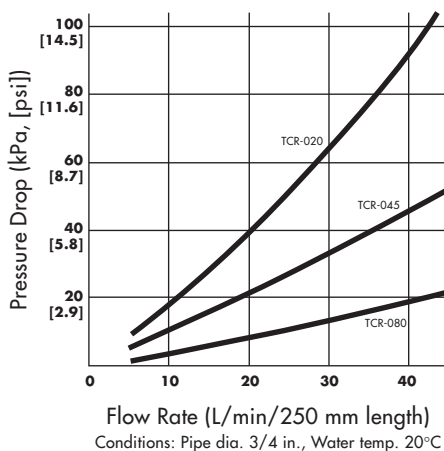
End Fixture Code	
<b>F</b>	<b>R</b>
	<b>K</b>
<b>M</b>	<b>P</b>
<b>H</b>	<b>J</b>

Note: Codes H, K and J are autoclavable at 121°C, 30 min.

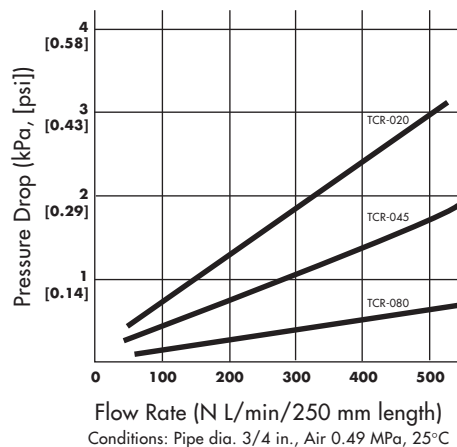
Gasket/O-ring Polymer	Gasket/O-ring Code
EPR	<b>E (standard)</b>
EPDM	<b>D</b>
Chloroprene	<b>N</b>
NBR	<b>B</b>
Silicone	<b>* S</b>
FPM	<b>V</b>

\* Standard O-ring for code H, K and J.

### TYPICAL WATER FLOW RATE



### TYPICAL AIR FLOW RATE



## Polyethersulfone (PES) Membrane (TCS)

- Dual Polyethersulfone (PES) membranes provide internal prefiltration by placing a larger pore size membrane upstream of final rated pore size membrane
- Low extractables
- Enhanced chemical compatibility
- Quick rinse down
- Low protein binding
- 100% integrity tested during manufacturing

## APPLICATIONS

- Filtration for electronics, cosmetics, and beverage industries

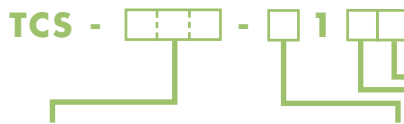
## SPECIFICATIONS

	TCS-020	TCS-045
Pore Size	0.20 µm	0.45 µm
Dual Membranes:		
Upstream	0.45 µm	0.65 µm
Downstream	0.20 µm	0.45 µm
Challenge Organism	B. diminuta	S. marcescens
LRV (Log Reduction Value)	≥7	≥7
Filtration Area per Single Length	4,000 cm <sup>2</sup>	
Max. Differential Pressure (25°C)	0.39 MPa (57 psi)	
Max. Operating Temperature	80°C (176°F)	

## Materials:

End Cap	Polypropylene
Support Media	Polypropylene
Prefilter Membrane	Polyethersulfone (PES)
Final Membrane	Polyethersulfone (PES)
Core Tube	Polypropylene
Outer Sleeve	Polypropylene

## ORDERING INFORMATION



Pore Size (µm)	Pore Size Code
0.20	<b>020</b>
0.45	<b>045</b>

Length (mm)	Length Code
250 (single)	<b>S</b>
500 (double)	<b>D</b>
750 (triple)	<b>T</b>
1,000 (quad)	<b>Q</b>

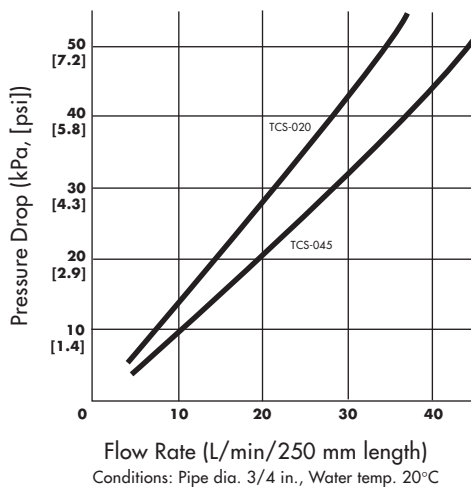
End Fixture Code	
<b>F</b>	<b>R</b>
<b>N</b>	<b>K</b>
<b>M</b>	<b>P</b>
<b>H</b>	<b>J</b>

Gasket/O-ring Polymer	Gasket/O-ring Code
EPR	<b>E (standard)</b>
EPDM	<b>D</b>
Chloroprene	<b>N</b>
NBR	<b>B</b>
Silicone	<b>* S</b>
FPM	<b>V</b>

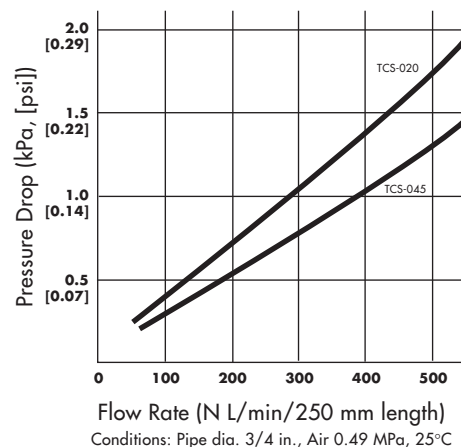
Note: Codes H, J, K, and N are autoclavable at 121°C, 30 min.

\* Standard O-ring for code H, K and J.

## TYPICAL WATER FLOW RATE



## TYPICAL AIR FLOW RATE



## Polyethersulfone (PES) Membrane for the Food and Beverage Industries (TCS-G)

- Dual Polyethersulfone (PES) membranes provide internal pre-filtration by placing a larger pore size membrane upstream of final rated pore size membrane
- Low extractables
- Enhanced chemical compatibility
- Quick rinse down
- Low protein binding
- 100% integrity tested during manufacturing
- Selected types can be hot water sanitized

### APPLICATIONS

- Food and beverage industries

### SPECIFICATIONS

	TCS-G020	TCS-G045	TCS-G065
Pore Size	0.20 µm	0.45 µm	0.65 µm
Challenge Organism	B.diminuta	S.marcescens	S.cerevisiae
LRV (Log Reduction Value)	≥7	≥7	≥7
Max. Differential Pressure (25°C)	0.39 MPa [57 psi]		
Max. Operating Temperature	80°C (176°F)		
Filtration Area (with 250 mm)	6,600 cm <sup>2</sup>		
Diffusion Rate (with 250 mm)	≤55 mL/min at 0.326 MPa	≤53 mL/min at 0.206 MPa	≤40 mL/min at 0.100 MPa

### Materials:

End Cap	Polypropylene
Support Media	Polypropylene
Prefilter Membrane	Polyethersulfone (PES)
Final Membrane	Polyethersulfone (PES)
Core Tube	Polypropylene
Outer Sleeve	Polypropylene

### ORDERING INFORMATION

TCS-G



Pore Size (µm)	Pore Size Code
0.20	<b>020</b>
0.45	<b>045</b>
0.65	<b>065</b>

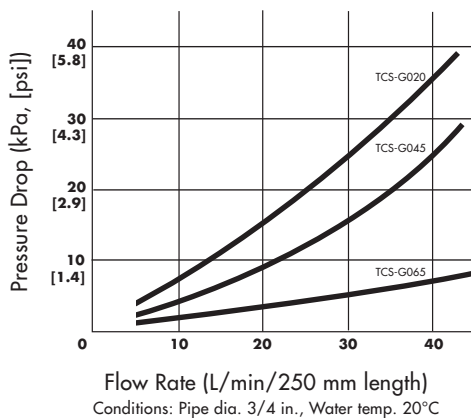
Length (mm)	Length Code
250 (single)	<b>S</b>
500 (double)	<b>D</b>
750 (triple)	<b>T</b>
1,000 (quad)	<b>Q</b>

End Fixture Code	
<b>F</b>	<b>R</b>
<b>M</b>	<b>K</b>
<b>H</b>	<b>P</b>
	<b>J</b>

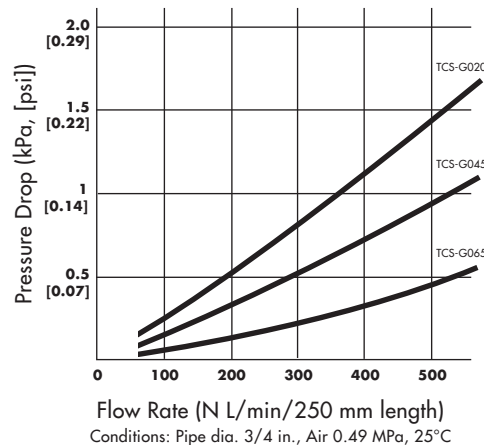
Gasket/O-ring Polymer	Gasket/O-ring Code
EPR	<b>E</b>
EPDM	<b>D</b>
Chloroprene	<b>N</b>
NBR	<b>B</b>
Silicone	<b>S (standard)</b>
FPM	<b>V</b>

Note: Codes H, K, and J can be hot water sanitized at 85°C for 30 min, up to 100 times.

### TYPICAL WATER FLOW RATE



### TYPICAL AIR FLOW RATE



## Polyethersulfone (PES) Membrane for the Electronics Industry (TCS-E)

- Dual Polyethersulfone (PES) membranes provide internal prefiltration by placing a larger pore size membrane upstream of final rated pore size membrane
- Low extractables
- Enhanced chemical compatibility
- Quick rinse down
- 100% integrity tested during manufacturing
- Superior recovery of resistivity and TOC since cartridges are individually flushed with pure water in the manufacturing process

### APPLICATIONS

- Filtration for electronics industry

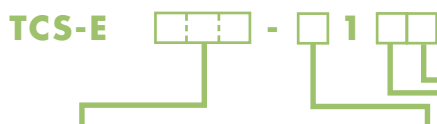
### SPECIFICATIONS

	TCS-E020	TCS-E045	TCS-E045S
Pore Size	0.20 $\mu\text{m}$	0.45 $\mu\text{m}$	0.45 $\mu\text{m}$
Filtration Area (with 250 mm)	6,700 $\text{cm}^2$		8,800 $\text{cm}^2$
Max. Differential Pressure (25°C)	0.39 MPa [57 psi]		
Max. Operating Temperature	80°C (176°F)		

### Materials:

	TCS-E-020/045	TCS-E-045S
End Cap	Polypropylene	Polypropylene
Support Media	Polypropylene	Polypropylene
Prefilter Membrane	Polyethersulfone (PES)	-
Final Membrane	Polyethersulfone (PES)	Polyethersulfone (PES)
Core Tube	Polypropylene	Polypropylene
Outer Sleeve	Polypropylene	Polypropylene

### ORDERING INFORMATION



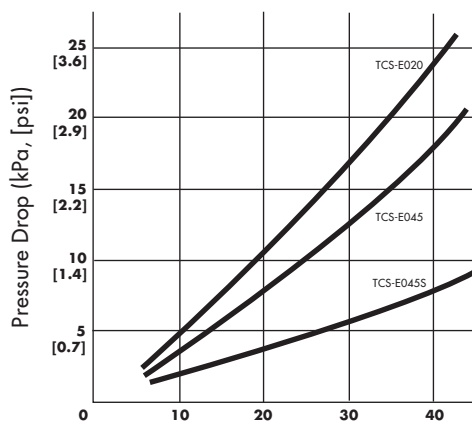
Pore Size ( $\mu\text{m}$ )	Pore Size Code
0.20	<b>020</b>
0.45	<b>045</b>
0.45	<b>045S</b>

Length (mm)	Length Code
250 (single)	<b>S</b>
500 (double)	<b>D</b>
750 (triple)	<b>T</b>
1,000 (quad)	<b>Q</b>

End Fixture Code	
<b>F</b>	<b>R</b>
<b>M</b>	<b>P</b>

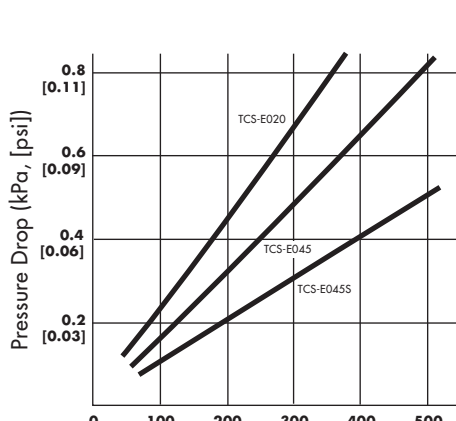
Gasket/O-ring Polymer	Gasket/O-ring Code
EPR	<b>E (standard)</b>
EPDM	<b>D</b>
Chloroprene	<b>N</b>
NBR	<b>B</b>
Silicone	<b>S</b>
FPM	<b>V</b>

### TYPICAL WATER FLOW RATE



Flow Rate (L/min/250 mm length)  
Conditions: Pipe dia. 3/4 in., Water temp. 20°C

### TYPICAL AIR FLOW RATE



Flow Rate (N L/min/250 mm length)  
Conditions: Pipe dia. 3/4 in., Air 0.49 MPa, 25°C

## Hydrophobic PTFE Membrane (TCF)

- Enhanced chemical resistance
- Selected types can be in-line steam sterilized (126°C, 30 min) or autoclaved (121°C, 30 min)

### APPLICATIONS

- Filtration of photo resists and organic solvents
- Uses in the electronics industry and in chemical manufacturing
- Filtering gases and venting tanks

Note: Process fluids must have a surface tension of <32 mN/m (dyne/cm) to properly wet the filter and to achieve optimized flow rates and performance characteristics. For fluids with a surface tension ≥32 mN/m (dyne/cm), use hydrophilic PTFE (TCFH-type cartridges).

### SPECIFICATIONS

	TCF-005	TCF-010	TCF-020	TCF-050	TCF-100	TCF-050L	TCF-020L
Pore Size	0.05 µm	0.10 µm	0.20 µm	0.50 µm	1.00 µm	0.50 µm	0.20 µm
Filtration Area per Single Length	9,200 cm <sup>2</sup>	9,200 cm <sup>2</sup>	7,000 cm <sup>2</sup>	7,000 cm <sup>2</sup>	7,000 cm <sup>2</sup>	17,600 cm <sup>2</sup>	16,400 cm <sup>2</sup>
Max. Differential Pressure (25°C)	0.39 MPa (57 psi)					0.25 MPa (36 psi)	
Max. Operating Temperature	80°C (176°F)					40°C (104°F)	

### ORDERING INFORMATION

TCF - 020L - \*1 3 \*2  
 TCF - [ ] - [ ] 1 [ ]

Pore Size (µm)	Pore Size Code
0.05	005
0.10	010
0.20	020
0.50	050
1.00	100
0.50	050L

Length (mm)	Length Code
250 (single)	S
500 (double)	D
750 (triple)	T
1,000 (quad)	Q

\*1 Available with length codes S, D, and T.

End Fixture Code	
F	R
*3 N	K
M	P
H	J

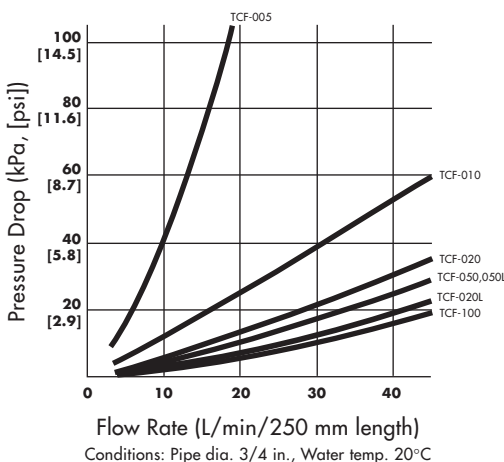
Note: Codes H, J, K, and N are autoclavable at 121°C, 30 min., or can be steam sterilized at 126°C for 30 min.

\*2 Available with end fixture codes F, M, R, and P.

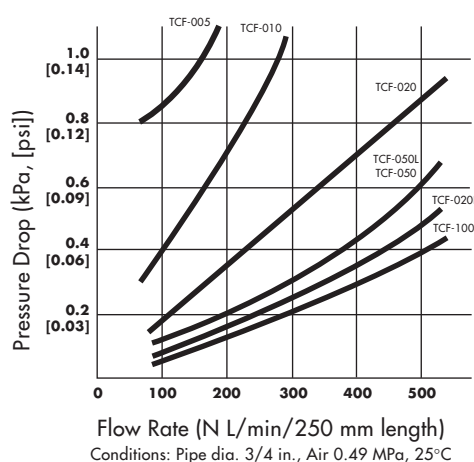
\*3 N code is not available in TCF-050L.

Gasket/O-ring Polymer	Gasket/O-ring Code
EPR	E (standard)
EPDM	D
Chloroprene	N
NBR	B
Silicone	S
FPM	V
PTFE	H (Gasket only)
FEP Encapsulated	F (O-ring only)

### TYPICAL WATER FLOW RATE



### TYPICAL AIR FLOW RATE



### Materials:

	TCF	TCF-020L
End Cap	Polypropylene	High Density Polyethylene
Support Media	Polypropylene	High Density Polyethylene
Membrane	PTFE	
Core Tube	Polypropylene	High Density Polyethylene
Outer Sleeve	Polypropylene	High Density Polyethylene

## Hydrophilic PTFE Membrane (TCFH)

- Unsupported PTFE membrane has been treated to render the matrix hydrophilic

Note: This cartridge is not autoclavable.

## APPLICATIONS

- Strong acid and strong alkali solutions
- Photo resists
- Chemically aggressive liquids with a surface tension  $\geq 32$  mN/m (dyne/cm)

## SPECIFICATIONS

	TCFH-010	TCFH-020	TCFH-050	TCFH-100	TCFH-020L
Pore Size	0.10 $\mu\text{m}$	0.20 $\mu\text{m}$	0.50 $\mu\text{m}$	1.00 $\mu\text{m}$	0.20 $\mu\text{m}$
Filtration Area per Single Length	9,800 $\text{cm}^2$				21,600 $\text{cm}^2$
Max. Differential Pressure (25°C)	0.39 MPa (57 psi)				0.39 MPa (57 psi)
Max. Operating Temperature	80°C (176°F)				60°C (140°F)

## Materials:

End Cap	Polypropylene
Support Media	Polypropylene
Membrane	Hydrophilic PTFE
Core Tube	Polypropylene
Outer Sleeve	Polypropylene

## ORDERING INFORMATION

TCFH - [ ] - [ ] [ ] [ ]

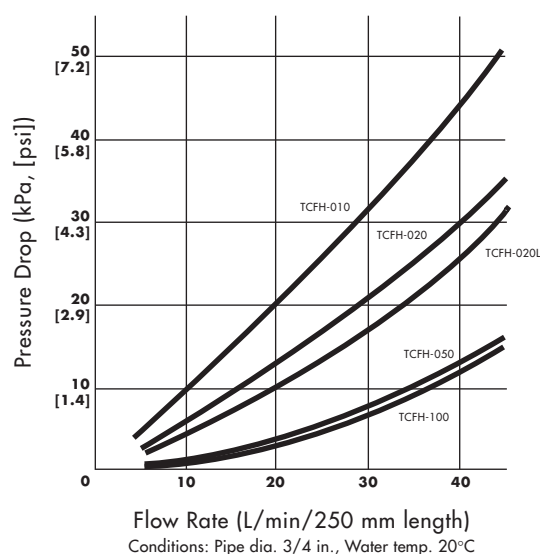
Pore Size ( $\mu\text{m}$ )	Pore Size Code
0.10	010
0.20	020/020L
0.50	050
1.00	100

Length (mm)	Length Code
250 (single)	S
500 (double)	D
750 (triple)	T
1,000 (quad)	Q

End Fixture Code	
F	R
N	P
M	

Gasket/O-ring Polymer	Gasket/O-ring Code
EPR	E (standard)
EPDM	D
Chloroprene	N
NBR	B
Silicone	S
FPM	V
PTFE	H (Gasket only)
FEP Encapsulated	F (O-ring only)

## TYPICAL WATER FLOW RATE





## Coated Cellulose Acetate Membrane (TCY)

- Dual layer of coated cellulose acetate membrane
- Low protein binding
- Excellent dirt holding characteristics, superior particle retention
- Excellent water and air flow rates

### APPLICATIONS

- Use as a prefilter to a final membrane cartridge
- Filter protein-containing solutions for the food, cosmetic and pharmaceutical industries
- Purify process waters

### SPECIFICATIONS

	TCY-ND, -LD, -HD
Filtration Area per Single Length	5,500 cm <sup>2</sup>
Max. Differential Pressure (25°C)	0.49 MPa (71 psi)
Max. Operating Temperature	80°C (176°F)

### Materials:

End Cap	Polypropylene
Support Media	Polypropylene
Prefilter Membrane	Coated Cellulose Acetate
Final Membrane	Coated Cellulose Acetate
Core Tube	Polypropylene
Outer Sleeve	Polypropylene

Model	Particle Size						
	0.21 µm	0.3 µm	0.48 µm	0.65 µm	0.8 µm	1.0 µm	2.0 µm
	Particle Retention (%)						
TCY-ND	99.9	99.9	99.9	>99.9			
TCY-LD		99	99.9	99.9	>99.9		
TCY-HD			99	99.9	99.9	99.9	>99.9

Test Criteria: Single length (250 mm) cartridge, flow rate 10 L/min.

### ORDERING INFORMATION

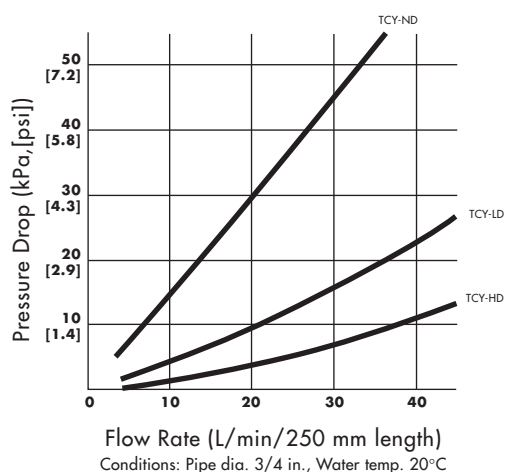


Retention Characteristic Code	Length (mm)	Length Code	End Fixture Code		Gasket/O-ring Polymer	Gasket/O-ring Code
ND	250 (single)	S	F	R	EPR	E (standard)
LD	500 (double)	D	N	K	EPDM	D
HD	750 (triple)	T	M	P	Chloroprene	N
	1,000 (quad)	Q	H	J	NBR	B
					Silicone	* S
					FPM	V

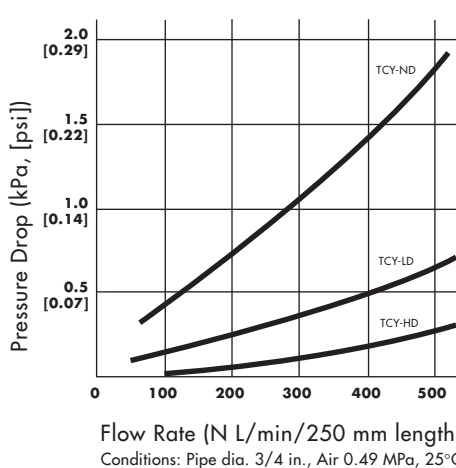
Note: Codes H, J, K, and N are autoclavable at 121°C, 30 min.

\* Standard O-ring for code H, K and J.

### TYPICAL WATER FLOW RATE



### TYPICAL AIR FLOW RATE



## Single Layer Coated Cellulose Acetate Membrane (TCYE)

- High efficiency single layer of coated cellulose acetate
- Economical
- Excellent particle retention
- Low protein binding
- Excellent water and air flow rates

### APPLICATIONS

- Filter process waters for the food, cosmetic and pharmaceutical industries

### SPECIFICATIONS

	TCYE-NS, -LS, -HS, -BS
Filtration Area per Single Length	6,200 cm <sup>2</sup>
Max. Differential Pressure (25°C)	0.49 MPa (71 psi)
Max. Operating Temperature	80°C (176°F)

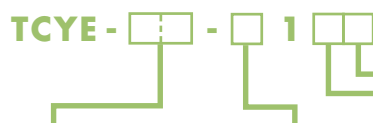
### Materials:

End Cap	Polypropylene
Support Media	Polypropylene
Membrane	Coated Cellulose Acetate
Core Tube	Polypropylene
Outer Sleeve	Polypropylene

Model	Particle Size									
	0.21 µm	0.3 µm	0.48 µm	0.65 µm	0.8 µm	1.0 µm	2.0 µm	3.0 µm	5.0 µm	10 µm
	Particle Retention (%)									
TCYE-NS	99	99.9	99.9	>99.9						
TCYE-LS		98	99	99	>99.9					
TCYE-HS			96	99	99	99	>99.9			
TCYE-BS							98	99.9	99.9	>99.9

Test Criteria: Single length (250 mm) cartridge, flow rate 10 L/min.

### ORDERING INFORMATION



Retention Characteristic Code	Length (mm)	Length Code
NS	250 (single)	S
LS	500 (double)	D
HS	750 (triple)	T
BS	1,000 (quad)	Q

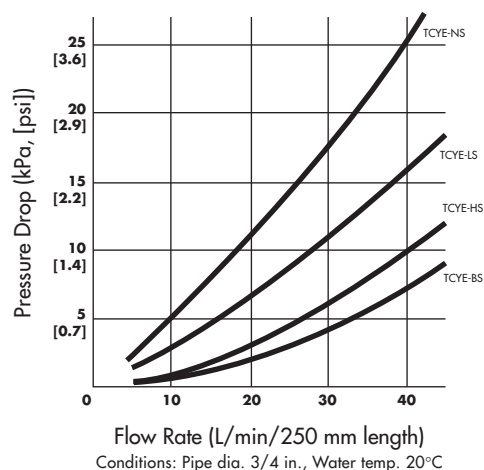
End Fixture Code	
F	R
N	K
M	P
H	J

Gasket/O-ring Polymer	Gasket/O-ring Code
EPR	E (standard)
EPDM	D
Chloroprene	N
NBR	B
Silicone	* S
FPM	V

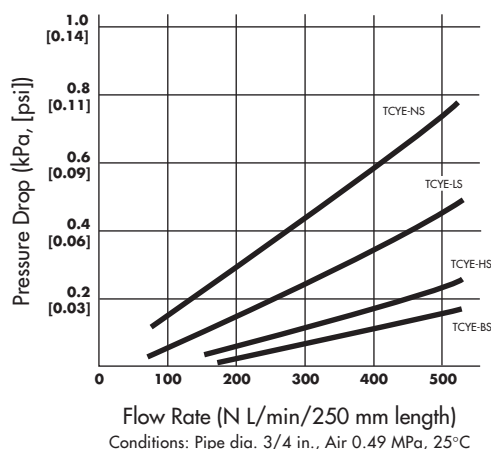
Note: Codes H, J, K, and N are autoclavable at 121°C, 30 min.

\* Standard O-ring for code H, K and J.

### TYPICAL WATER FLOW RATE



### TYPICAL AIR FLOW RATE



## Polypropylene (TCP)

- Multiple layers of nonwoven polypropylene maximize filtration efficiency
- Maximal throughput volumes and retention ratings
- Thermally bonded to minimize fiber releasing
- Minimize extractables
- Supported both upstream and downstream (TCP-HX, FX only)

## APPLICATIONS

- Filter process waters for the food, cosmetic and pharmaceutical industries

## SPECIFICATIONS

	TCP-LX	TCP-JX	TCP-HX	TCP-FX	TCP-020AM
Filtration Area per Single Length	3,300 cm <sup>2</sup>	4,500 cm <sup>2</sup>	4,200 cm <sup>2</sup>	5,100 cm <sup>2</sup>	2,900 cm <sup>2</sup>
Max. Differential Pressure (25°C)	0.49 MPa (71 psi)				
Max. Operating Temperature	80°C (176°F)				

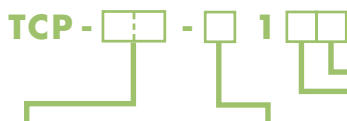
## Materials:

End Cap	Polypropylene
Support Media	Polypropylene
Membrane	Polypropylene
Core Tube	Polypropylene
Outer Sleeve	Polypropylene

Model	Particle Size							% Retention (0.3 µm DOP)
	0.2 µm	0.48 µm	0.65 µm	0.8 µm	1.0 µm	2.0 µm	3.0 µm	
	Particle Retention (%)							
TCP-LX	45	90	98	>99				99.9999
TCP-JX		60	80	94	>99			99.999
TCP-HX				70	93	>99		99.99
TCP-FX				30	60	95	>99	99.84
TCP-020AM				43	77	>99		-

Test Criteria: Single length (250 mm) cartridge, flow rate 10 L/min.

## ORDERING INFORMATION

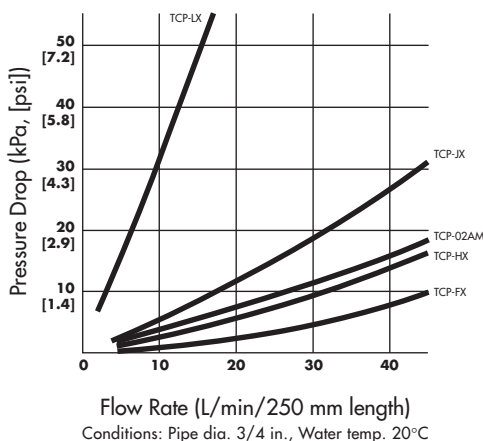


Retention Characteristic Code	Length (mm)	Length Code	End Fixture Code		Gasket/O-ring Polymer	Gasket/O-ring Code
			F	R		
LX	250 (single)	S	F	R	EPR	E (standard)
JX	500 (double)	D	N	K	EPDM	D
HX	750 (triple)	T	M	P	Chloroprene	N
FX	1,000 (quad)	Q	H	J	NBR	B
020AM					Silicone	* S
					FPM	V
					PTFE	H (Gasket only)
					FEP Encapsulated	F (O-ring only)

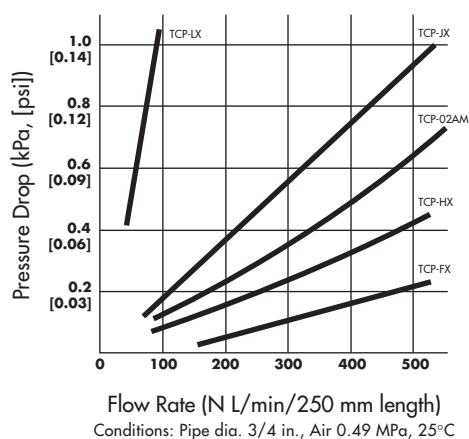
Note: Codes H, J, K, and N are autoclavable at 121°C, 30 min., or can be steam sterilized at 126°C for 30 min.

\* Standard O-ring for code H, K and J.

## TYPICAL WATER FLOW RATE



## TYPICAL AIR FLOW RATE



## Single Layer Polypropylene (TCP/TCPE)

- All-polypropylene construction, medium is single layer of thermally bonded polypropylene
- Pore size range 1 – 30  $\mu\text{m}$
- TCP
  - Upstream and downstream support
  - Larger effective filtration area
- TCPE
  - Thicker grade of polypropylene is stronger and does not require support
  - Less effective filtration area

## APPLICATIONS

- Filter process waters for the food, cosmetic and pharmaceutical industries
- Use as a prefilter in series upstream of a final membrane to clarify solutions
- Applications that require chemical resistance

## SPECIFICATIONS

	TCP-1	TCP-3	TCP-7	TCP-10	TCP-30	TCPE-3	TCPE-10	TCPE-30
Nominal Rating	1 $\mu\text{m}$	3 $\mu\text{m}$	7 $\mu\text{m}$	10 $\mu\text{m}$	30 $\mu\text{m}$	3 $\mu\text{m}$	10 $\mu\text{m}$	30 $\mu\text{m}$
Filtration Area per Single Length	4,200 $\text{cm}^2$	5,600 $\text{cm}^2$	4,200 $\text{cm}^2$	5,000 $\text{cm}^2$	6,200 $\text{cm}^2$	3,700 $\text{cm}^2$		
Max. Differential Pressure (25°C)	0.49 MPa (71 psi)							
Max. Operating Temperature	80°C (176°F)							

## ORDERING INFORMATION

TCP - [ ] - [ ] 1 [ ] [ ]

TCPE - [ ] - [ ] 1 [ ] [ ]

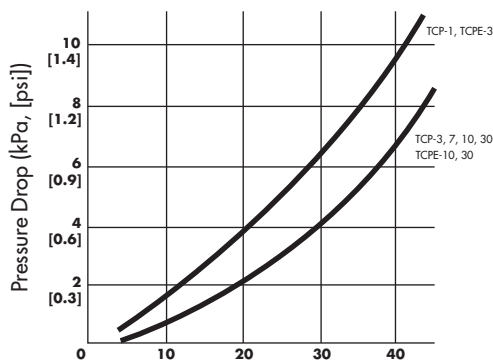
### Materials:

End Cap	Polypropylene
Support Media (TCP)	Polypropylene
Membrane	Polypropylene
Core Tube	Polypropylene
Outer Sleeve	Polypropylene

Nominal Rating Code (TCP)	Nominal Rating Code (TCPE)	Length (mm)	Length Code	End Fixture Code		Gasket/O-ring Polymer	Gasket/O-ring Code
1	3	250 (single)	S	F	R	EPR	E (standard)
3	10	500 (double)	D	N	K	EPDM	D
7	30	750 (triple)	T	M	P	Chloroprene	N
10		1,000 (quad)	Q	H	J	NBR	B
30						Silicone	* S
						FPM	V
						PTFE	H (Gasket only)
						FEP Encapsulated	F (O-ring only)

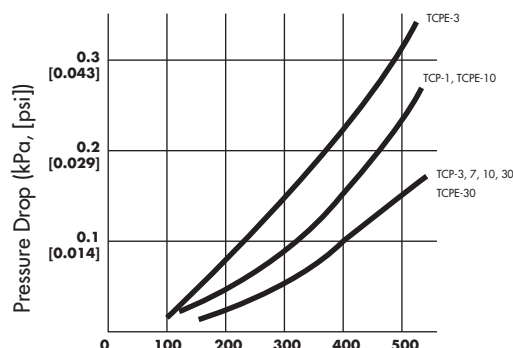
Note: Codes H, J, K, and N are autoclavable at 121°C, 30 min., or can be steam sterilized at 126°C for 30 min.

### TYPICAL WATER FLOW RATE



Flow Rate (L/min/250 mm length)  
Conditions: Pipe dia. 3/4 in., Water temp. 20°C

### TYPICAL AIR FLOW RATE



Flow Rate (N L/min/250 mm length)  
Conditions: Pipe dia. 3/4 in., Air 0.49 MPa, 25°C

\* Standard O-ring for code H, K and J.

## Multigrade Polypropylene (TCPD)

- Spirally wound multigrade all-polypropylene construction
- Increasing depth retention gradient: as fluid flows through the cartridge, retention efficiency increases

## APPLICATIONS

- Ideal for viscous fluids and fluids that have a heterogeneous particle population
- Prefilter or clarifying filter
- Filtration of pure or rinse waters, magnetized paint coatings, synthetic resins, high viscosity resins, plating solutions, etching solutions and strong alkali solutions

## SPECIFICATIONS

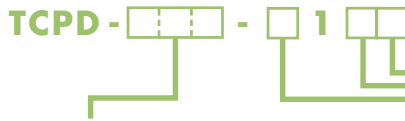
	<b>TCPD-01A, -02A, -03A, -05A, -1, -3, -7, -10, -30</b>
Max. Differential Pressure (25°C)	0.49 MPa (71 psi)
Max. Operating Temperature	80°C (176°F)

## Materials:

End Cap	Polypropylene
Support Media	Polypropylene Net
Filter	Polypropylene
Core Tube	Polypropylene

Model	Particle Size									
	0.6 µm	1.0 µm	2 µm	3 µm	5 µm	10 µm	20 µm	30 µm	40 µm	70 µm
	Particle Retention (%)									
TCPD-01A	90	>99.9								
TCPD-02A		>99	>99.9							
TCPD-03A		95	>99	>99.9						
TCPD-05A			95	>99	>99.9					
TCPD-1			90	95	>99					
TCPD-3				70	90	>99				
TCPD-7					40	80	>99			
TCPD-10						60	90	95	>99	
TCPD-30							60	90	95	>99

## ORDERING INFORMATION



Nominal Rating Code	
01A	1
02A	3
03A	7
05A	10
	30

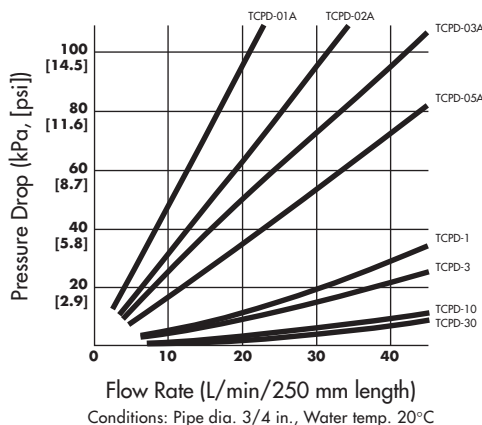
Length (mm)	Length Code
250 (single)	S
500 (double)	D
750 (triple)	T
1,000 (quad)	Q

End Fixture Code	
F	R
N	K
M	P
H	J

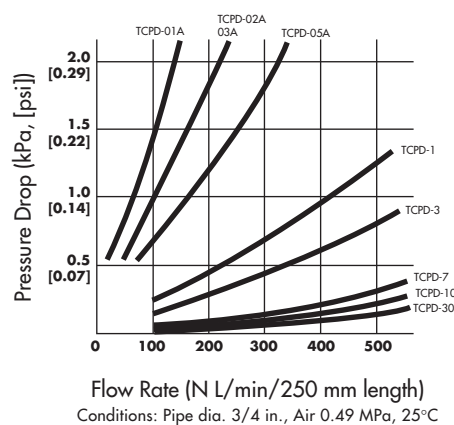
Gasket/O-ring Polymer	Gasket/O-ring Code
EPR	E (standard)
EPDM	D
Chloroprene	N
NBR	B
Silicone	* S
FPM	V
PTFE	H (Gasket only)
FEP Encapsulated	F (O-ring only)

Note: Codes H, J, K, and N are autoclavable at 121°C, 30 min., or can be steam sterilized at 126°C for 30 min.

### TYPICAL WATER FLOW RATE



### TYPICAL AIR FLOW RATE



\* Standard O-ring for code H, K and J.

## Epoxy Cellulose (TC)

- Cellulose fiber filter paper saturated by epoxy resin to minimize fiber release
- Available with standard polypropylene core or with stainless steel core (type 304, single length only) for high temperature applications
- See Glass Fiber (TCG) for smaller nominal pore sizes

## APPLICATIONS

- Filter high viscosity liquids such as syrups
- Filter fuels, oils, cutting oils and resins
- Purify industrial and rinse water

Note: TC-type are not autoclavable.

## SPECIFICATIONS

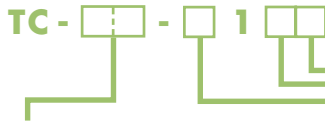
	TC type				TC- _ -S4C_			
Molded Material	Polypropylene				Stainless Steel			
	1	3	10	30	1	3	10	30
Nominal Rating	1 µm	3 µm	10 µm	30 µm	1 µm	3 µm	10 µm	30 µm
Filtration Area per Single Length	4,000 cm <sup>2</sup>				3,400 cm <sup>2</sup>			
Max. Differential Pressure (25°C)	0.49 MPa (71 psi)				0.49 MPa (71 psi)			
Max Temperature	80°C (176°F)				150°C (302°F)			

## Materials:

End Cap	Polypropylene Stainless Steel (Seal Material: Silicone)
Filter	Epoxy Cellulose
Core Tube	Polypropylene or Stainless Steel

## ORDERING INFORMATION

### Polypropylene molded material



Nominal Rating (µm)	Nominal Rating Code
1	1
3	3
10	10
30	30

Length (mm)	Length Code
250 (single)	*S
500 (double)	D
750 (triple)	T
1,000 (quad)	Q

End Fixture Code	
F	R
N	P
M	

Gasket/O-ring Polymer	Gasket/O-ring Code
EPR	E
Chloroprene	N (standard)
NBR	B
Silicone	S
FPM	V

\*250 mm with code F is available without sleeve.

## ORDERING INFORMATION

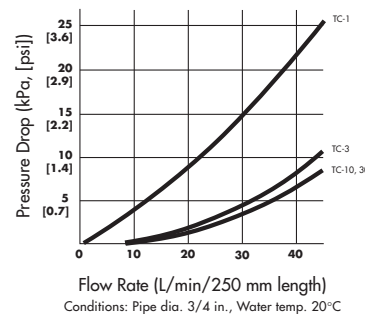
### Stainless steel molded material



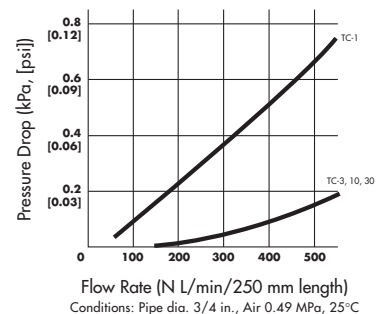
Nominal Rating (µm)	Nominal Rating Code
1	1
3	3
10	10
30	30

Gasket/O-ring Polymer	Gasket/O-ring Code
NBR	B (standard)
EPR	E
Silicone	S
FPM	V

## TYPICAL WATER FLOW RATE



## TYPICAL AIR FLOW RATE



## Glass Fiber (TCG)

- A glass fiber filter with acrylic resin supported by Polypropylene
- For larger pore size retention see Epoxy Cellulose (TC)

## APPLICATIONS

- Filter high viscosity liquids such as syrups
- Filter fuels, oils, cutting oils and resins
- Purify industrial and rinse water

Note: TCG-type cartridges are not autoclavable.

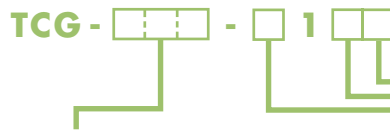
## SPECIFICATIONS

	TCG-045	TCG-1
Nominal Rating	0.45 $\mu\text{m}$	1 $\mu\text{m}$
Filtration Area per Single Length	3,300 $\text{cm}^2$	
Max. Differential Pressure (25°C)	0.49 MPa (71 psi)	
Max. Operating Temperature	80°C (176°F)	

## Materials:

End Cap	Polypropylene
Upstream Support	Polypropylene
Filter	Glass Fiber
Downstream Support	Polypropylene
Core Tube	Polypropylene
Outer Sleeve	Polypropylene

## ORDERING INFORMATION



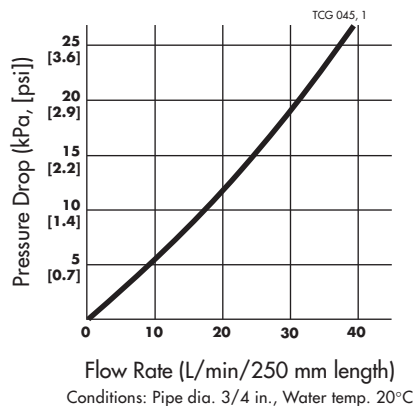
Nominal Rating ( $\mu\text{m}$ )	Nominal Rating Code
0.45	045
1	1

Length (mm)	Length Code
250 (single)	S
500 (double)	D
750 (triple)	T
1,000 (quad)	Q

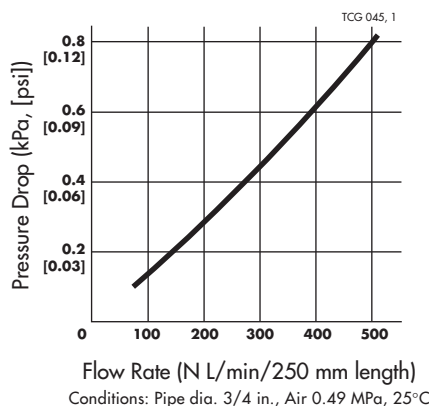
End Fixture Code	
F	R
N	P
M	

Gasket/O-ring Polymer	Gasket/O-ring Code
EPR	E
EPDM	D
Chloroprene	N (standard)
NBR	B
Silicone	S
FPM	V

## TYPICAL WATER FLOW RATE



## TYPICAL AIR FLOW RATE



## Wound-Polypropylene (TCW)

- All-polypropylene construction: melt blown polypropylene filaments are spun into a gradient density media, maximizing particle retention
- Excellent flow rates
- Double open end: Compression seal eliminates the need for O-rings or gaskets

## APPLICATIONS

- Prefilter upstream of a final pleated cartridge
- Moderate differential pressures and temperatures

## SPECIFICATIONS

		TCW- □N-PP	TCW- □N-PS
Nominal Rating (µm)		0.5, 0.8, 1, 3, 5, 10, 25, 50, 75, 100, 150	
Max. Operating Pressure (25°C)		0.49 MPa (71 psi)	
Max. Operating Temperature		80°C (176°F)	
Material	Media	Polypropylene	
	Core Tube	Polypropylene	SUS304

## ORDERING INFORMATION

TCW- □ □ □ □ N - P □ □

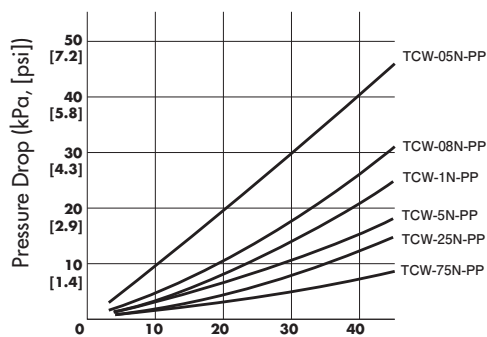
Nominal Rating (µm)	Nominal Rating Code
0.5	05
0.8	08
1	1
3	3
5	5
10	10
25	25
50	50
75	75
100	100
150	150

Core	Core Code
Polypropylene	P
SUS304	S*

\*not available in length code D and T

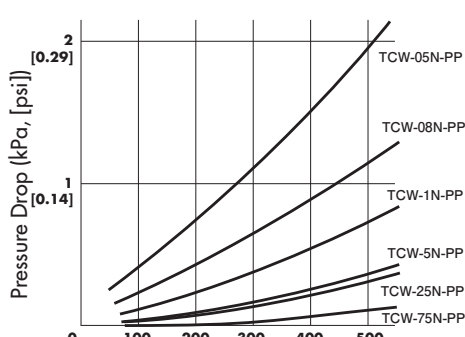
Length (mm)	Length Code
250(single)	S
500(double)	D
750(triple)	T

## TYPICAL WATER FLOW RATE



Flow Rate (L/min/250 mm length)  
Conditions: Pipe dia. 3/4 in., Water temp. 20°C

## TYPICAL AIR FLOW RATE



Flow Rate (N L/min/250 mm length)  
Conditions: Pipe dia. 3/4 in., Air 0.49 MPa, 25°C



## Wound - Cotton (TCW)

- All-polypropylene construction: melt blown polypropylene filaments are spun into a gradient density media, maximizing particle retention
- Excellent flow rates
- Double open end: Compression seal eliminates the need for O-rings or gaskets

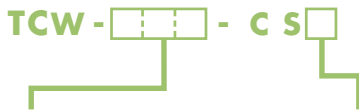
## APPLICATIONS

- Prefilter upstream of a final pleated cartridge
- Moderate differential pressures and temperatures

## SPECIFICATIONS

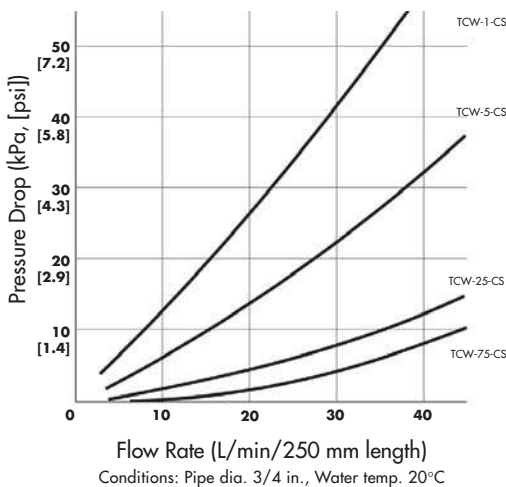
		TCW-□-CS
Nominal Pore Size (µm)		1,3,5,10,25,50,75,100,150
Max. Operating Pressure (25°C)		0.49 MPa (71 psi)
Max. Operating Temperature		150°C (Wet)
Material	Media	Cotton
	Core Tube	SUS304

## ORDERING INFORMATION

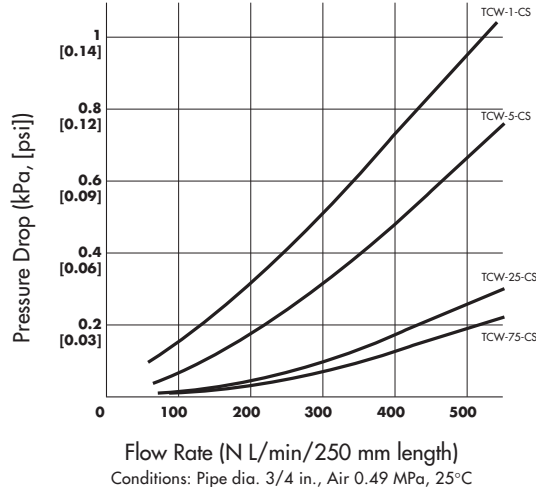


Nominal Rating (µm)	Nominal Rating Code	Length (mm)	Length Code
1	1	250(single)	S
3	3	500(double)	D
5	5	750(triple)	T
10	10		
25	25		
50	50		
75	75		
100	100		
150	150		

### TYPICAL WATER FLOW RATE



### TYPICAL AIR FLOW RATE



## Melt blown – Polypropylene (TCM)

- 100% melt blown polypropylene having low extractive.
- Dual layer structure composed by coarse outer layer and fine inner layer maximizing the filtration life.

## APPLICATIONS

- Electroplating solution
- Electroplating solution, etching solution and photo-resist for printed circuit board
- Industrial water & wastewater and steam condensate
- Pre filter for ion exchange and RO filter
- Solvent and low viscous liquid for chemical industry

## SPECIFICATIONS

	TCM-□B-PPS	TCM-□B-PPD	TCM-□B-PPT
Nominal Ratings (µm)	1,5,10,25,50,75,100		
Max. Operating Pressure (25°C)	0.44 MPa		
Max. Operating Temperature	80 °C		
Filter Material	Polypropylene		

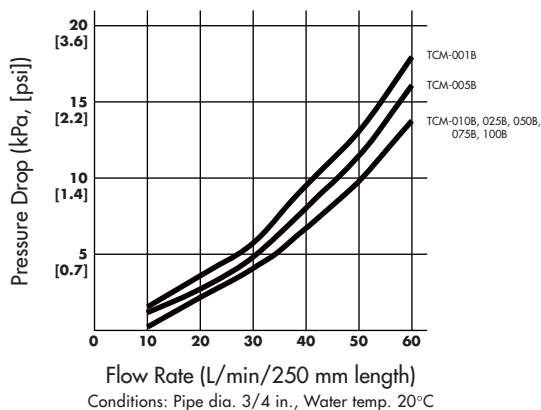
Note: Max operating pressure is determined based on the filtration test of glycerine solution, therefore it is fluctuated depending on the kind of the liquid.

## ORDERING INFORMATION

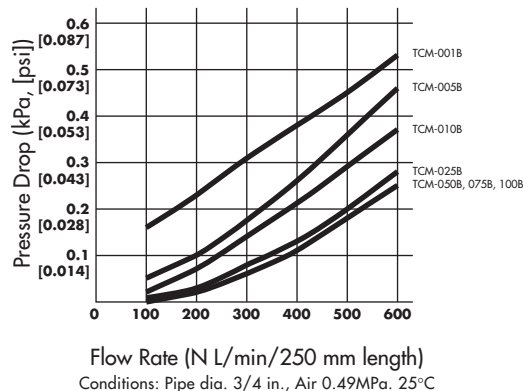
TCM-□□□ B-PP □

Nominal Rating (µm)	Nominal Rating Code	Length (mm)	Length Code
1	001	250(single)	S
5	005	500(double)	D
10	010	750(triple)	T
25	025		
50	050		
75	075		
100	100		

### TYPICAL WATER FLOW RATE



### TYPICAL AIR FLOW RATE



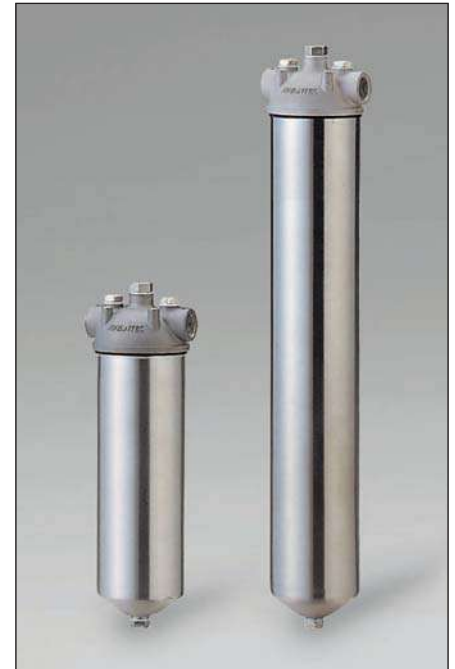
### Stainless Steel Cartridge Housing – ITS Type

- Stainless steel housing for 1 pc cartridge filter, consisting of body and head with center post
- Easily perform cartridge filter replacement by loosening the cap nut and removing the housing head
- Choose from 3/4" PT or 1" PT inlet/outlet
- Designed for use with end fixture codes F, C and TCW
- Mounting accessories available

### SPECIFICATIONS

Model		ITS	ITS-2	ITS-B	ITS-2B
Cartridge Capacity		250 mm x 1	500 mm x 1	250 mm x 1	500 mm x 1
Cartridge Compatibility		End Fixture Codes: F, C and TCW			
Inlet/Outlet		3/4" PT		1" PT	
Dimensions (mm)	Height	366	619	369	622
	Diameter	121	121	123	123
Max. Operating Pressure		0.69 MPa (100 psi)			
Composition		Head: SCS14		Body: SUS316	
				Gasket: FPM, PTFE	
Weight (kg)		2.0	4.0	2.4	4.4

Note: Use thread-sealing tape on tapered inlet and outlet.



ITS, ITS-2

### ORDERING INFORMATION

Model	ITS	ITS-2	ITS-B	ITS-2B
Catalog No.	26804010	26804020	26804040	26804030

### OPTIONAL ACCESSORIES

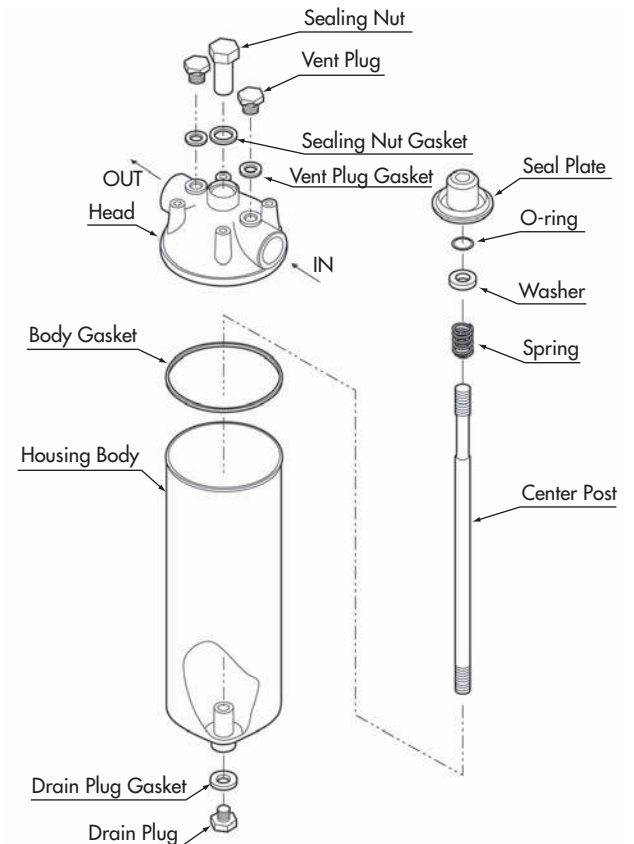
Model	ITS, ITS-B Stand	Mounting Kit
Composition	SUS304	Galvanized Steel
Catalog No.	28804030	28804055



Stand



Unit with Mounting Kit



## Stainless Steel Cartridge Housing – 1TM Type

- 2-part stainless steel housing for 1 pc cartridge filter, consisting of body and head with clamp
- Easily perform cartridge filter replacement by loosening the sealing clamp and removing the housing head
- Few components allows for simple maintenance, and easy operation
- Lightweight housing can be cleaned by a washing machine
- Designed for use with end fixture codes M, H, and L

### SPECIFICATIONS

Model		1TM-1S-MV	1TM-2S-MV
Cartridge Capacity		250 mm x 1	500 mm x 1
Cartridge Compatibility		End Fixture Codes: M, H, L	
Inlet/Outlet		1" PT	
Dimensions (mm)	Height	451	704
	Diameter	181	
Max. Operating Pressure		0.49 MPa (71 psi)	
Composition		O-ring: FPM	Head, Body: SUS304
Weight (kg)		1.8	2.2

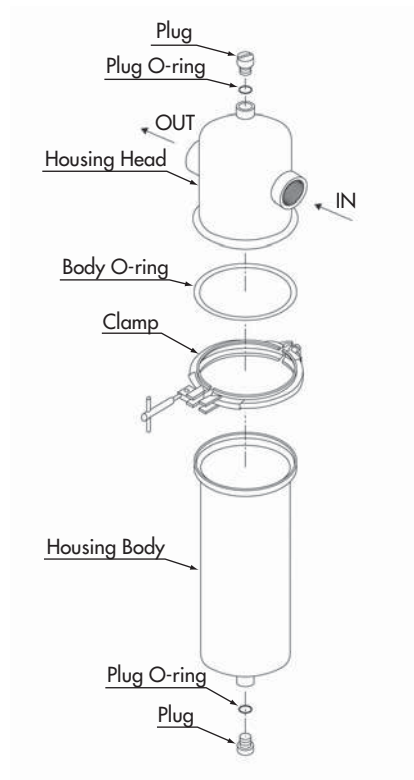
Note: Use thread-sealing tape on tapered inlet and outlet.

### ORDERING INFORMATION

Model	1TM-1S-MV	1TM-2S-MV
Catalog No.	26805010	26805020



1TM-1S-MV, 1TM-2S-MV



### Sanitary Stainless Steel Cartridge Housing – 1TVA Type

- Sanitary stainless steel housing for 1 pc cartridge filter, with sanitary ferrule type inlet, outlet, and seal for easy inspection and cleaning
- 3 1/2 S-clamp wraps around body and base sections, which can be easily removed for disassembly
- Designed for use with end fixture codes F, C and TCW
- 1TVA Type is compatible with applications that require vented housings

### SPECIFICATIONS

Model		1TVA-1S-FS	1TVA-2S-FS	1TVA-3S-FS
Cartridge Capacity		250 mm x 1	500 mm x 1	750 mm x 1
Cartridge Compatibility		End Fixture Codes: F, C and TCW		
Inlet/Outlet		1S Sanitary Fitting		
Dimensions (mm)	Height	408	658	908
	Diameter	200		
Max. Operating Pressure		0.49 MPa (71 psi)		
Composition		Gasket: Silicone, PTFE    Ball Valve: SUS316 Body, Base, Clamp: SUS304		
Weight (kg)		3.5	5.0	6.5

Note: Ball valve cannot be sterilized by autoclave.  
Use thread-sealing tape on tapered inlet and outlet.

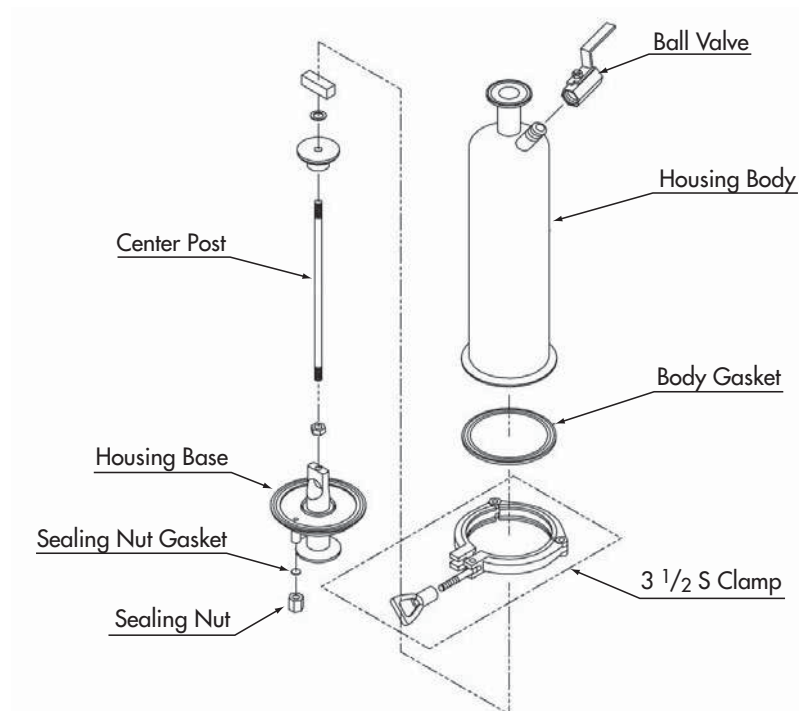
\* Please contact us for information on sanitary housings compatible with other filter cartridge end fixture codes.

### ORDERING INFORMATION

Model	1TVA-1S-FS	1TVA-2S-FS	1TVA-3S-FS
Catalog No.	26980101	26980102	26980103



1TVA-1S-FS



## Sanitary Stainless Steel Cartridge Housing – 1TWA Type

- Sanitary stainless steel housing for 1 pc cartridge filter, with sanitary ferrule type inlet, outlet, and seal for easy inspection and cleaning
- 4S-clamp wraps around body and base sections; 3/2S-nut seals the top plate and body
- Designed for use with end fixture codes F, C and TCW
- Inlet/outlet base of 1TWA Type allows unit be placed on short, straight sections of piping

### SPECIFICATIONS

Model		1TWA-1S-FS	1TWA-2S-FS	1TWA-3S-FS
Cartridge Capacity		250 mm x 1	500 mm x 1	750 mm x 1
Cartridge Compatibility		End Fixture Codes: F, C and TCW		
Inlet/Outlet		1S Sanitary Fitting		
Dimensions (mm)	Height	412	667	917
	Diameter	183		
Max. Operating Pressure		0.49 MPa (71 psi)		
Composition		Gasket: Silicone Top Plate, Body, Base, Clamp: SUS304		
Weight (kg)		5.4	6.9	9.2

Note: Ball valve cannot be sterilized by autoclave.  
Use thread-sealing tape on tapered inlet and outlet.

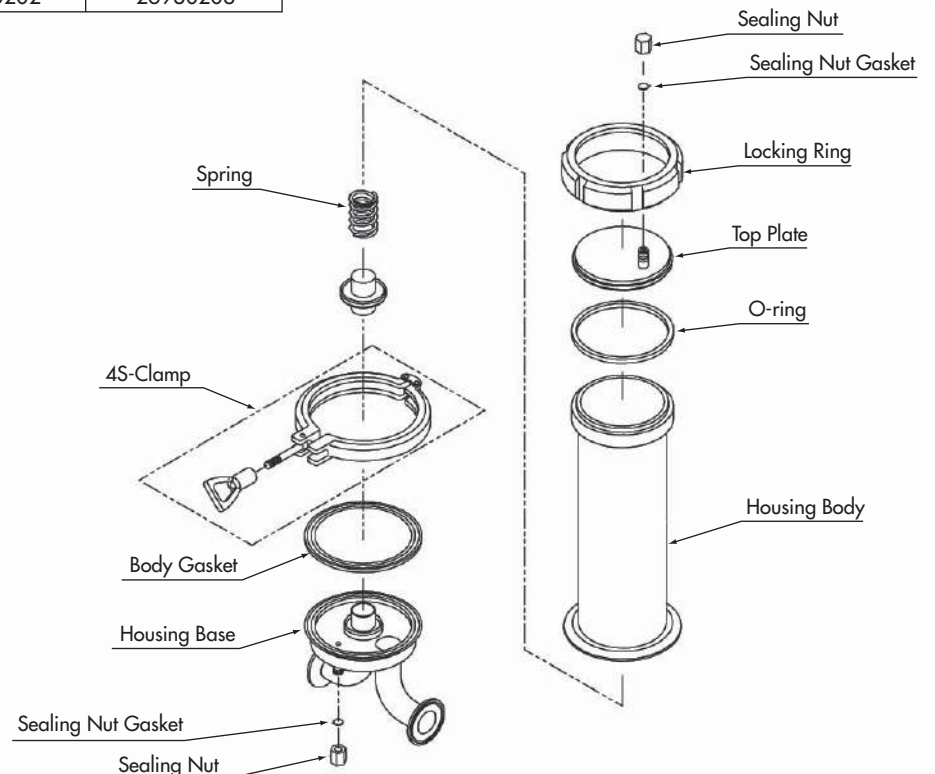
\* Please contact us for information on sanitary housings compatible with other filter cartridge end fixture codes.

### ORDERING INFORMATION

Model	1TWA-1S-FS	1TWA-2S-FS	1TWA-3S-FS
Catalog No.	26980201	26980202	26980203



1TWA-1S-FS



### Polypropylene Cartridge Housing – 1PP Type

- Polypropylene housing for 1 pc cartridge filter, with 3/4" PTF (PT nipple) type inlet and outlet; high quality and economical
- Suitable for sanitary applications, such as pharmaceutical or high purity water filtration; smooth inner walls of housing deter adhesion and accumulation of microbes and minute particles
- Designed for use with end fixture codes F, C and TCW
- Several accessories for mounting the unit are available
- Unit head available with push-button vent

### SPECIFICATIONS

Model		1PP-1-FS	1PP-2-FS
Cartridge Capacity		250 mm x 1	500 mm x 1
Cartridge Compatibility			
End Fixture Codes: F, C and TCW			
Inlet/Outlet			
3/4" PTF (PT nipple)			
Dimensions (mm)	Height	340	594
	Width	200	
Max. Operating Temperature		60°C / 140F	
Max. Operating Pressure		0.49 MPa (71 psi) at 25°C, 0.19 MPa (28 psi) at 60°C	
Composition		Head, Body, Adapter, Drain Cap, Nipple: Polypropylene O-ring: Silicone, FPM, Ethylene-propylene Vent, Adapter Spring: SUS304	
Weight (kg)		0.84	1.3

Note: 1PP Type units are made for liquid filtration only and are not suitable for air filtration.  
1PP Type units cannot be sterilized by autoclave.  
Use thread-sealing tape on tapered inlet and outlet.

\* Please contact us for information on polypropylene housings compatible with other filter cartridge end fixture codes.

### ORDERING INFORMATION

Model	1PP-1-FS-000	1PP-2-FS-000
Catalog No.	43011000	43021000

### OPTIONAL ACCESSORIES

Description		Catalog No.
Housing Stand (SUS304)	1PP-1K (for 1PP-1)	44801010
	1PP-2K (for 1PP-2)	44801020
Mounting Kit (SUS304)		44801030
Tightening Tools (PVC)	1PP-H (for head)	44801040
	1PP-B (for body)	44801050

Customize the unit with:

- Silicone, FPM, or Ethylene-propylene O-rings
- Inlet/outlet pressure gauges
- SUS304, PE-coated SUS304, or titanium adapter springs
- Housing available with SUS304 push-button vent or polypropylene vent (with O-ring seal).

Contact us for more information on these options.



1PP-1, 1PP-2

## Acrylic Cartridge Housing – 1PA Type

- Acrylic housing for a single cartridge filter, with  $\frac{3}{4}$ " PF type inlet and outlet; high quality and economical
- Transparent housing permits observation of filtration process
- Lightweight yet strong construction; can be assembled by hand
- Designed for use with end fixture codes F, C and TCW

### SPECIFICATIONS

Model		1PA
Cartridge Capacity		250 mm x 1
Cartridge Compatibility		End Fixture Codes: F, C and TCW
Inlet/Outlet		$\frac{3}{4}$ " PF ( $\frac{3}{4}$ " PFM x $\frac{3}{4}$ " PTM Changeable)
Dimensions (mm)	Height	345
	Width	170
Max. Operating Temperature		38°C / 100F
Max. Operating Pressure		0.5 MPa (73 psi) at 38°C
Composition		Head: Polypropylene Body: Acrylonitrile Styrene Resin (acrylic) Body O-ring: Silicone Connector O-ring: NBR
Weight (kg)		1.0

Note: - 1PA Type units are made for aqueous filtration only and are not suitable for air or organic solvent filtration.  
- 1PA Type units cannot be sterilized by autoclave.  
- Units include hand-tightening tool as standard accessory.  
- Use thread-sealing tape on tapered inlet and outlet.

### ORDERING INFORMATION

Model	1PA
Catalog No.	26807000

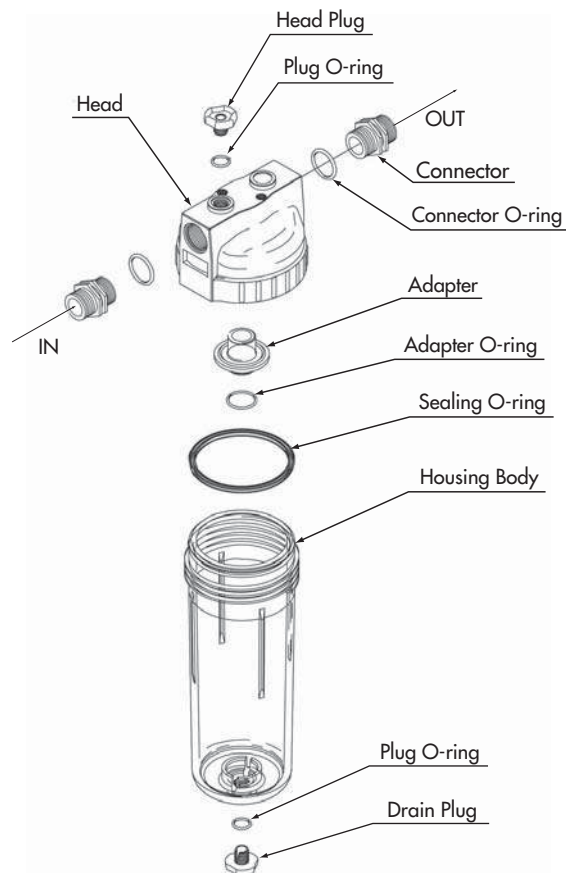
### OPTIONAL ACCESSORIES



Model	15mm Hose Adapter	L-shape Mounting Kit	Housing Stand
Composition	Polypropylene	SUS304	SUS304
Catalog No.	28801011	28801022	28801012



1PA





# VACUUM FILTRATION

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## Introduction

Vacuum filtration is used primarily in microbiological and analytical procedures that involve collecting a particulate (bacteria, precipitate, etc.) from a liquid suspension. Liquid poured into a funnel passes through a filter, which retains the particulate, and filtrate can be collected into a filter flask, directly or via a vacuum manifold. Applying vacuum reduces process time compared to gravity flow.

Advantec supplies a wide range of vacuum filter holders and accessories. Select from glass, polysulfone, or stainless steel assemblies with funnels holding from 15 to 1000 mL. See facing page for more details on supports.

Typical Applications	DNA/RNA hybridization, protein binding, receptor binding studies and gravimetric analysis	Coliform, yeast, mold, total bacteria, sterility testing	Colony hybridization, procedures requiring larger filtration area	
<b>Recommended Models</b>				
Glass with glass frit	KG 13	KG 25	KG 47	KG 90
Glass with stainless steel support	-	KGS 25	KGS 47	KGS 90
Glass with PTFE support	-	-	KGT 47	-
Glass with all-PTFE seal	-	-	KGT 47 TF	-
All-glass assembly	-	GFA 25 GFS 25	GFA 47 GFS 47 GFT 47	-
Phase/Fraction collector	-	-	P/FC 1 P/FC 2	-
Polysulfone	-	-	KP 47	-
Stainless steel	-	-	KSF 47	-
<b>Filter Specifications</b>				
Membrane diameter	25 mm	25 mm	47 mm	90 mm
Filtration area	1.2 cm <sup>2</sup>	2.1 cm <sup>2</sup>	9.6 cm <sup>2</sup> *	43.2 cm <sup>2</sup>

\* See individual models for exceptions.

## Glass Microfiltration: Support Systems

### Sintered Glass Support (Glass Frit)

- Glass frit (nominal retention 30-50 microns)
- Recommended when filtering highly acidic (low pH) solutions or when slower flow rates are preferred to maximize contact with the filter or reagent
- Ground glass seal

Diameter	Funnel Size						
	13/100 mL	15 mL	100 mL	150 mL	300 mL	500 mL	1000 mL
13 mm	311100	-	311000	-	-	311050	311110
25 mm	-	311200	-	311280	311290	-	-
47 mm	-	-	311480	-	311400	311490	314110
90 mm	-	-	-	-	-	-	352100

### Stainless Steel Support

- Stainless steel screen (Type 316, 100 mesh)
- PTFE gasket
- Maximize flow rate with proteinaceous or viscous solutions
- Will not shed particles into the filtrate
- Ground glass seal

Diameter	Funnel Size					
	15 mL	100 mL	150 mL	300 mL	500 mL	1000 mL
25 mm	311300	-	311380	311390	-	-
47 mm	-	311580	-	311500	311590	315110
90 mm	-	-	-	-	-	352200

### PTFE Support

- PTFE support (0.05 inch / 1.3 mm diameter holes)
- Filter acidic solutions at a higher flow rate
- PTFE support is interchangeable with stainless steel support
- Ground glass seal

Diameter	Funnel Size			
	100 mL	300 mL	500 mL	1000 mL
47 mm	311680	311540	311690	316110



Glass frit, stainless steel support, PTFE support

### All-PTFE Seal

- All-PTFE seal prevents sticking and tearing that can occur when membrane is autoclaved in place in a ground glass assembly
- PTFE flange seals to PTFE coated funnel

Diameter	Support	Funnel, 300 mL
47 mm	PTFE	351620
	Stainless Steel	351600



All PTFE seal

## 13 mm Glass Microanalysis Holders

- **Filter small volumes** of liquid
- **Concentrate samples** in a small area (1.2 cm<sup>2</sup>)
- **KG 13 AA features a two-part funnel** (13 mL/100 mL) connected by a ground glass joint
- KG 13 available in three different funnel sizes

### SPECIFICATIONS

<b>Materials:</b>	
Support	Sintered glass
Funnel, base	Borosilicate glass
Stopper	Silicone rubber
Clamp	Anodized aluminum
<b>Connection:</b>	
Included	#5 stopper adapts to standard 125 mL vacuum filter flask
Optional	#8b stopper adapts to 1 L flask or standard manifold
<b>Pressure:</b>	Vacuum
<b>Weight:</b>	0.37 kg (0.88 lb)
<b>Membrane Filter Compatibility:</b>	
Filter size	25 mm
Prefilter size	Not Recommended
Filtration area	1.2 cm <sup>2</sup>



KG 13 A (311000)



KG 13 AA (311100)



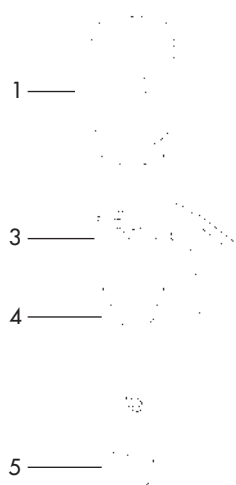
500 mL and 1 L funnels for 13 mm holders are available in complete assemblies or as accessory parts.

### ORDERING INFORMATION

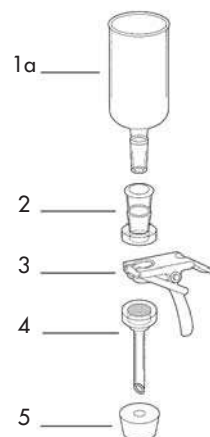
Funnel capacity	100 mL	500 mL	1000 mL	13/100 mL
<b>Model</b>	<b>KG 13 A</b>	<b>KG 13 B</b>	<b>KG 13 C</b>	<b>KG 13 AA</b>
Catalog No.	311000	311050	311110	311100

### Replacement Parts

1	Funnel, 100 mL	311001
1	Funnel, 500 mL	311005
1	Funnel, 1000 mL	311010
1a	Funnel, 100 mL with 14/20 Male	311101
2	Microfunnel (13/100 mL)	311105
3	Clamp	311003
4	Base (glass frit)	311002
5	Stopper, #5	311004
5	Stopper, #8B	311008



KG 13 \_

KG 13 AA  
(311100)

## 25 mm Glass Microanalysis Holders

- **Use for filtering small volumes** for biological or particulate contamination
- Available with sintered glass or stainless steel support
- **Use stainless steel screen** when producing ultraclean filtrate or when filtering proteinaceous solutions

### SPECIFICATIONS

	KG 25	KGS 25
<b>Materials:</b>		
Support	Sintered glass	Stainless steel screen
Funnel, base	Borosilicate glass	
Stopper	Silicone rubber	
Clamp	Anodized aluminum	
<b>Connection:</b>		
Included	#5 stopper adapts to standard 125 mL vacuum filter flask	
Optional	#8b stopper adapts to 1 L flask or standard manifold	
<b>Pressure:</b>	Vacuum	
<b>Weight:</b>	0.19 kg (0.45 lb)	
<b>Membrane Filter Compatibility:</b>		
Filter size	25 mm	
Prefilter size	16 mm	
Filtration area	2.1 cm <sup>2</sup>	



150 mL and 300 mL funnels for 25 mm holders are available in complete assemblies or as accessory parts.



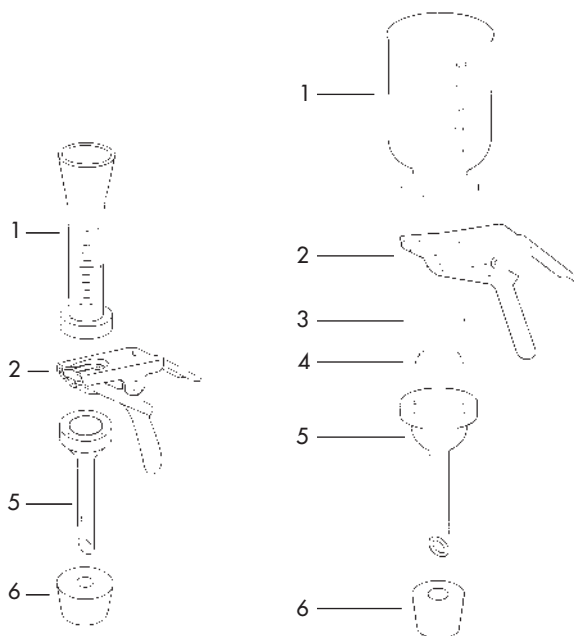
KG 25 (311200)

### ORDERING INFORMATION

Funnel capacity		15 mL	150 mL	300 mL
Glass frit support	<b>Model</b>	<b>KG 25</b>	<b>KG 25 A</b>	<b>KG 25 B</b>
	Catalog No.	311200	311280	311290
Stainless steel support	<b>Model</b>	<b>KGS 25</b>	<b>KGS 25 A</b>	<b>KGS 25 B</b>
	Catalog No.	311300	311380	311390

### Replacement Parts

	KG 25	KGS 25
1 Funnel, 15 mL	311201	
1 Funnel, 150 mL	311208	
1 Funnel, 300 mL	311209	
2 Clamp	311003	
3 Screen (stainless steel)	-	311304
4 Gasket (PTFE)	-	311305
5 Base	311202	311302
6 Stopper, #5	311004	
6 Stopper, #8b	311008	



KG 25  
(311200)

KGS 25  
(311390)

## 47 mm Glass Microanalysis Holders

- **Standard size** for microbiology and particulate analysis
- Filter up to 1000 mL
- Available with sintered glass, stainless steel, or PTFE support

### SPECIFICATIONS

	KG 47	KGS 47	KGT 47
<b>Materials:</b>			
Support	Sintered glass	Stainless steel screen	PTFE
Funnel, base	Borosilicate glass		
Stopper	Silicone rubber		
Clamp	Anodized aluminum		
<b>Connections</b> (included):	#8 stopper adapts to standard 1 L vacuum filter flask or vacuum manifold cup		
<b>Pressure:</b>	Vacuum		
<b>Weight:</b>	0.6 kg (1.2 lb)		
<b>Membrane Filter Compatibility:</b>			
Filter size	47 mm		
Prefilter size	35 mm		
Filtration area	9.6 cm <sup>2</sup>		

### ORDERING INFORMATION

Support Type	Model	Funnel Capacity			
		100 mL	300 mL	500 mL	1000 mL
Glass Frit Support	<b>KG 47</b>	<b>A</b>	-	<b>B</b>	<b>C</b>
Glass Frit Support	<b>KG 47</b>	311480	311400	311490	314110
Stainless Steel Support	<b>KGS 47</b>	311580	311500	311590	315110
PTFE Support	<b>KGT 47</b>	311680	311540	311690	316110

### Replacement Parts

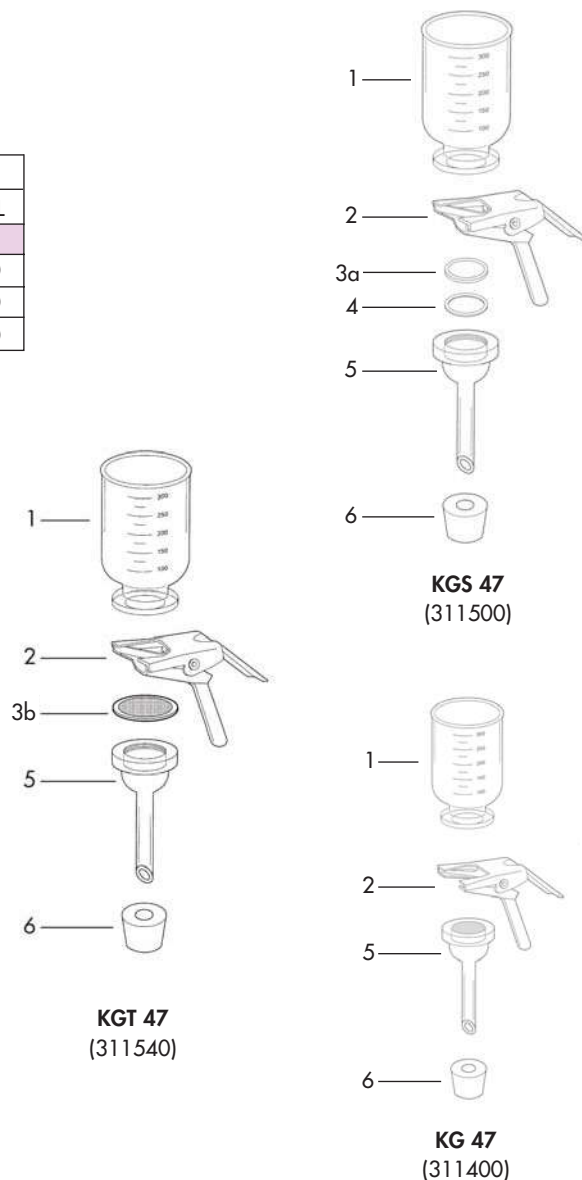
	KG 47	KGS 47	KGT 47
1 Funnel, 100 mL	311408		
1 Funnel, 300 mL	311401		
1 Funnel, 500 mL	311409		
1 Funnel, 1000 mL	311410		
2 Clamp	311403		
3a Screen (stainless steel)	-	311504	-
3b PTFE support	-	-	311604
4 Gasket (PTFE)	-	311505	-
5 Base	311402	311502	
6 Stopper, #8	311404		
- Optional extension (2")	311450		



311450  
The 2 inch extension provides physical separation of the two filters that set up in series.



47mm Glass Microanalysis Holder



### 47 mm Glass Microanalysis Holders – With All-PTFE Seal

**• Filter sealed between PTFE surfaces:**

- Bottom of funnel is coated with PTFE
- PTFE flange covers contact surface on glass base (except for glass frit base)

#### SPECIFICATIONS

As for corresponding basic model (Page 88) with the addition of PTFE coating on bottom of funnel and PTFE flange for KGS 47 TF and KGT 47 TF.

#### ORDERING INFORMATION

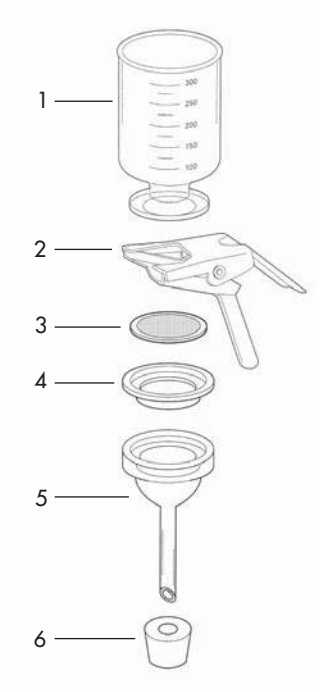
Funnel capacity		300 mL
Glass frit support	<b>Model</b>	<b>KG 47 TF</b>
	Catalog No.	311600
Stainless steel support	<b>Model</b>	<b>KGS 47 TF</b>
	Catalog No.	351600
PTFE support	<b>Model</b>	<b>KGT 47 TF</b>
	Catalog No.	351620



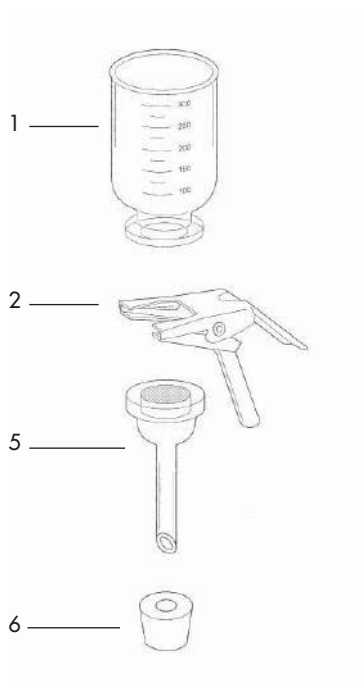
All PTFE seal

#### Replacement Parts

		KG 47 TF	KGS 47 TF	KGT 47 TF
1	Funnel coated with PTFE, 300 mL	351601		
2	Clamp	311403		
3	Screen (stainless steel)	-	311504	-
3	PTFE support	-	-	311604
4	Flange (PTFE)	-	351603	351603
5	Base	311402	311602	
6	Stopper, #8	311404		



**KGS 47 TF (351600)**  
**KGT 47 TF (351620)**



**KG 47 TF (311600)**

## 47 mm Glass Microanalysis Holder – Sterility Test Unit

- **Complete filter assembly for sterility testing** of antibiotics and pharmaceuticals
- **Use with the sterility test manifold** (Page 100)

### SPECIFICATIONS

As for corresponding basic model (Page 88) with additional components as listed below.

### ORDERING INFORMATION

Funnel capacity	300 mL
<b>Model</b>	<b>STU 1A</b>
Catalog No.	314100

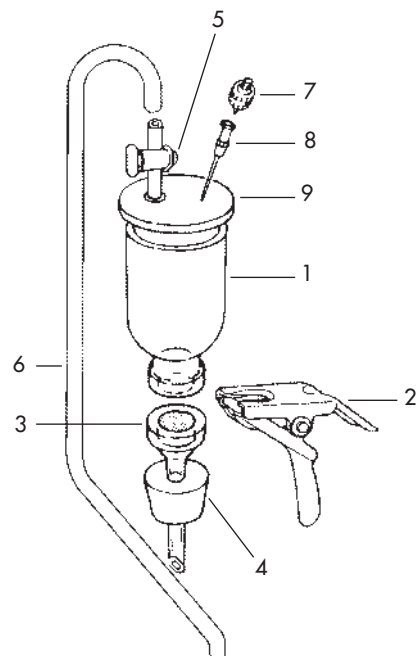
### Replacement Parts

1	Funnel, 300 mL	311401
2	Clamp	311403
3	Base (glass frit)	311402
4	#8 Stopper	311404
5	Stopcock	313902
6	Silicone tubing 53 cm (21") 1/4"ID, 3/8"OD	313903
7	KS 13 filter holder*	301000
8	Injector needle	313901
9	Silicone cover	313904

\* 13 mm Hydrophobic PTFE membrane filter is recommended (Page 9).



Sterility test unit



**STU 1A**  
(314100)



## 90 mm Glass Microanalysis Holders

- **Larger filtration area** for filtering larger volumes (>500 ml)
- **Use for viscous samples** or those with a heavy particle or bioburden that would clog a 47 mm filter
- **Available with sintered glass or stainless steel support**

### SPECIFICATIONS

	KG 90	KGS 90
<b>Materials:</b>		
Support	Sintered glass	Stainless steel screen
Funnel, base	Borosilicate glass	
Stopper	Silicone rubber	
Clamp	Anodized aluminum	
<b>Connection (Included):</b>	#8 stopper adapts to standard 1 L vacuum filter flask or vacuum manifold cup	
<b>Pressure:</b>	Vacuum	
<b>Weight:</b>	1.2 kg (2.82 lb)	
<b>Membrane Filter Compatibility:</b>		
Filter size	90 mm	
Prefilter size	70 mm	
Filtration area	43 cm <sup>2</sup>	



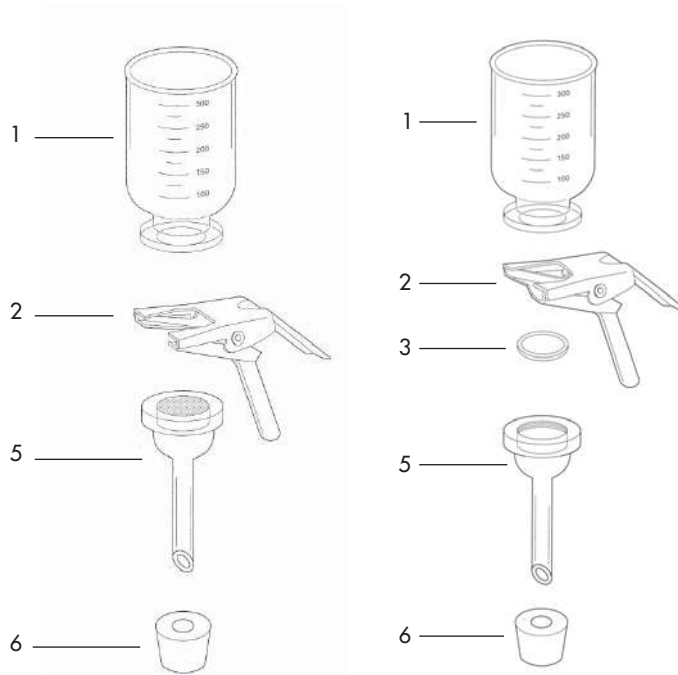
KG 90 (352100)

### ORDERING INFORMATION

Funnel capacity	1000 mL graduated (1100 mL max.)	
Glass frit support	<b>KG 90</b>	352100
Stainless steel support	<b>KGS 90</b>	352200

### Replacement Parts

	KG 90	KGS 90
1 Funnel, 1000 mL	352101	
2 Clamp	352103	
3 Screen (stainless steel)	-	352204
5 Base	352102	352202
6 #8 Stopper	311404	



KG 90 (352100)

KGS 90 (352200)

## Filter Flasks and Stoppers

- Borosilicate filter flasks and silicone rubber stoppers are compatible with Advantec filter holders
- Use flasks to collect filtrate or to act as a trap to prevent liquid from damaging pump or vacuum line
- #5 and #8b stoppers adapt 13 mm, 25 mm and KP 47 filter holders to 125 mL flask (#5) and 1 L/2 L flasks and standard manifold
- #8 stopper adapts 47 mm (except KP 47) and 90 mm filter holders to the 1 L/2 L flasks and standard manifold
- Side arm connection 3/8"
- Flasks with ground glass joint fit holders with female joint (GFA, P/FC 2)



Flasks and stoppers compatible with Advantec filter holders

### Borosilicate Glass Filter Flasks

Volume	Opening	Catalog No.
125 mL	Fits #5 stopper, side arm	311230
1 L	Fits #8 stopper, side arm	311430
2 L	Fits #8/8b stopper, side arm	311440
250 mL	19/22 male joint (ground glass)	311225
1 L	40/35 male joint (ground glass)	311425
2 L	40/35 male joint (ground glass)	311426

### Silicone Rubber Stoppers

Size	Opening	Catalog No.
#5	3/8"	311004
#8b	3/8"	311008
#8	5/8"	311404

## All-Glass Filtration Assemblies

- **All-glass design** restricts contact with reactive surfaces such as steel or rubber to minimize contamination of sample or filtrate
- **Standard 25 and 47 mm filtration funnels** mount on filtration flask using a ground glass joint
- Outlet of support base drip tube is positioned below the side arm connection to prevent sample aspiration into vacuum line
- **All wetted surfaces are borosilicate glass** with the exception of stainless steel and PTFE support options

## SPECIFICATIONS

	25 mm Holder	47 mm Holder
<b>Materials:</b>		
Funnel, base unit and flask	Borosilicate glass	
Support	Sintered glass, stainless steel screen, or PTFE	
<b>Connections:</b>		
Ground glass joint	14/20 female	40/35 female
Side arm	6 mm (1 <sup>9</sup> / <sub>22</sub> inch)	6 mm (3 <sup>7</sup> / <sub>8</sub> inch)
<b>Capacity:</b>		
Funnel	15 mL	300 mL
Receiver flask	250 mL	1 L
<b>Membrane filter size</b>	25 mm	47 mm
<b>Prefilter size</b> (if used with membrane)	16 mm	35 mm
<b>Filtration area</b>	2.1 cm <sup>2</sup>	9.6 cm <sup>2</sup>



GFA 25 (311220)

## ORDERING INFORMATION

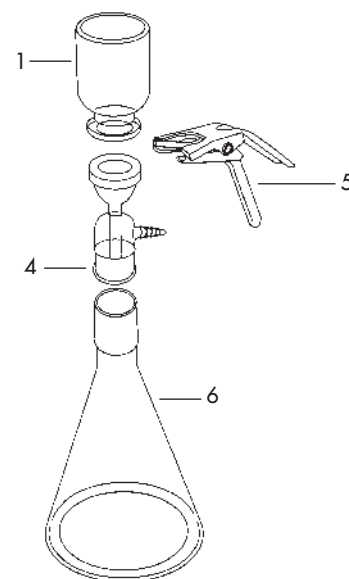
	25 mm Holder		47 mm Holder	
Support type:	Model	Catalog No.	Model	Catalog No.
Glass frit	GFA 25	311220	GFA 47	311420
Stainless steel	GFS 25	311320	GFS 47	311520
PTFE	-	-	GFT 47	311620

## Replacement Parts

		25 mm Holder		47 mm Holder		
Model		GFA 25	GFS 25	GFA 47	GFS 47	GFT 47
Catalog No.		311220	311320	311420	311520	311620
1	Funnel	311201		311401		
-	Support	-	311304	-	311504	311604
-	PTFE Gasket	-	311305	-	311505	-
4	Support base	311222	311322	311422	311522	
5	Clamp	311003		311403		
6	Receiver flask	311225		311425		

## Optional Accessories

	25 mm Holder	47 mm Holder
Funnel, 100 mL	-	311408
Funnel, 150 mL	311208	-
Funnel, 300 mL	311209	-
Funnel, 500 mL beveled	-	311409
Funnel, 1 L graduated	-	311410
Receiver flask, 2 L	-	311426



GFA

## Phase/Fraction Collectors

- **Collect aliquots of filtrate** during the filtration process using the 2-way Y bore PTFE valve
- **Prevents venting** of hazardous sample or solvents to atmosphere
- **Collect multiple samples** with additional receiver sample tubes
- **Two mounting options:** P/FC 1 mounts on standard manifold or 1 L flask using a #8 stopper, P/FC 2 has female 40/35 joint to mount on an extraction manifold (Page 99) or 1 L flask
- Available with sintered glass, stainless steel, or PTFE support

## SPECIFICATIONS

	P/FC 1	P/FC 2
<b>Materials:</b>		
Funnel, base unit, and receiver tube	Borosilicate glass	
Support	Sintered glass, stainless steel screen, or PTFE	
<b>Connections:</b>		
Base to outlet	#8 Stopper	40/35 ground glass joint
Alternate outlet to receiver tube	Ground glass joint	
<b>Capacity:</b>		
Funnel	300 mL	
<b>Membrane Filter Compatibility:</b>		
Membrane filter size	47 mm	
Prefilter size	35 mm	
Filtration area	9.6 cm <sup>2</sup>	

## ORDERING INFORMATION

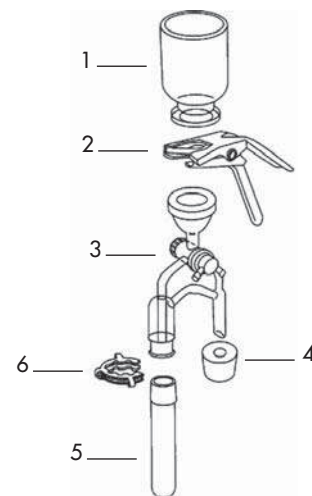
Model	P/FC 1	P/FC 2
Outlet type	#8 Stopper	40/35 glass joint
Glass frit support	311700	311800
Stainless steel support	311750	311850
PTFE support	311760	311860

## Replacement Parts

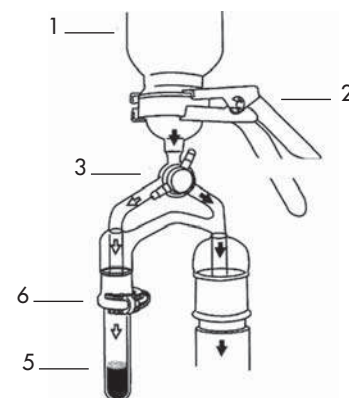
Model	P/FC 1	P/FC 2
Outlet type	#8 Stopper	40/35 glass joint
1 Funnel	311401	
2 Clamp	311403	
3 Base assembly – glass frit	311702	311802
3 Base assembly – SS or PTFE support	311752	311852
- Support – stainless steel screen	311504	
- Support – PTFE	311604	
- PTFE gasket (for stainless support)	311505	
4 #8 Stopper	311404	-
5 Receiver tube	311705	
6 Clip	311706	



P/FC 2 (311800)



P/FC 1



P/FC 2

### Stainless Steel Filter Holders – KSF 47

- **Nonbreakable stainless steel unit** may be flame sterilized to sanitize the holder between samplings
- **Set pins and a locking nut** on the funnel to help prevent twisting and tearing of the membrane
- **Autoclavable** with membrane in place

### SPECIFICATIONS

KSF 47	
<b>Materials:</b>	
Support	Type 304 stainless steel screen
Funnel, base	Type 304 stainless steel
Stopper	Silicone rubber
Gasket	PTFE
<b>Connections (included):</b>	#8 stopper adapts to standard 1 L vacuum filter flask or vacuum manifold cup
<b>Capacity:</b>	
Funnel	500 mL
<b>Pressure:</b>	Vacuum (21 in Hg recommended)
<b>Weight:</b>	0.5 kg (1.17 lb)
<b>Membrane Filter Compatibility:</b>	
Filter size	47 mm
Prefilter size	35 mm
Filtration area	9.3 cm <sup>2</sup>



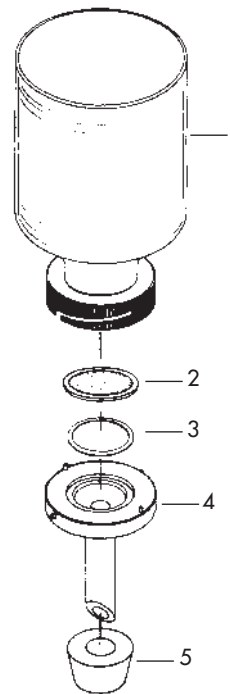
KSF 47 (352600)

### ORDERING INFORMATION

Model	KSF 47
Catalog No.	352600

### Replacement Parts

		KSF 47
1	Funnel	352601
2	SS support screen	311504
3	PTFE gasket	311505
4	Base	312602
5	#8 Stopper	311404



KSF 47  
(352600)

## Polysulfone Filter Holders

- **Can be used aseptically**
- **Recessed filter support** provides sufficient clearance so that the membrane will not twist or tear when the funnel is secured
- **Graduated funnel** in 300 mL (standard), 500 mL (wide mouth) or 800 mL (large) capacities
- **Receiver flask** (KP 47S) is interchangeable with all other models
- **Funnel cover** can be vented aseptically using disposable syringe filter (13JP050AN, see page 16)



KP 47H



KP 47U



KP 47W



KP 47S



KP 47T

## SPECIFICATIONS

	KP 47H	KP 47U	KP 47W	KP 47S	KP 47T
<b>Materials:</b>					
Support screen	Polypropylene				
Funnel and base	Polysulfone				
Receiver flask	-	-	-	Polysulfone	-
Stopper, O-rings	Silicone rubber				
Caps	-	Silicone rubber	-	Silicone rubber	-
Vacuum adapter	-	-	-	Polypropylene	-
<b>Connection:</b>					
Outlet	#8B stopper adapts to standard 1 L vacuum filter flask or vacuum manifold cup; KP-47S screws onto receiver flask				
Receiving flask port	-	-	-	Luer slip	-
Funnel cover port	-	Luer slip	-	Luer slip	-
<b>Capacity:</b>					
Funnel	300 mL	300 mL	500 mL	300 mL	800mL
Receiver	-	-	-	300 mL	-
<b>Pressure:</b>					
Vacuum (25 in Hg maximum)					
<b>Max. Operating Temperature</b>					
80°C/176F (autoclavable at 121°C, 20min)					
<b>Weight:</b>	0.15 kg (0.33 lb.)	0.16 kg (0.36 lb.)	0.15 kg (0.33 lb.)	0.26 kg (0.58 lb.)	0.20kg (0.44lb)
<b>Membrane Filter Compatibility:</b>					
Filter size	47 mm				
Prefilter size	41 mm				
Filtration area	13.5 cm <sup>2</sup>				

## ORDERING INFORMATION

Model	Description	Main Components	Catalog No.
KP 47H	Polysulfone Filter Holder	Funnel, base	43301030
KP 47U	Polysulfone Aseptic Filter Unit	Funnel, base, cover	43301020
KP 47W	Wide Mouth Polysulfone Filter Holder	Funnel, base	43301050
KP 47S	Polysulfone Aseptic Filter System	Funnel, base, cover, receiver	43301010
KP 47T	Polysulfone Filter Holder with 800mL Funnel	Funnel, base	43301040

**Replacement Parts – Funnel assembly**

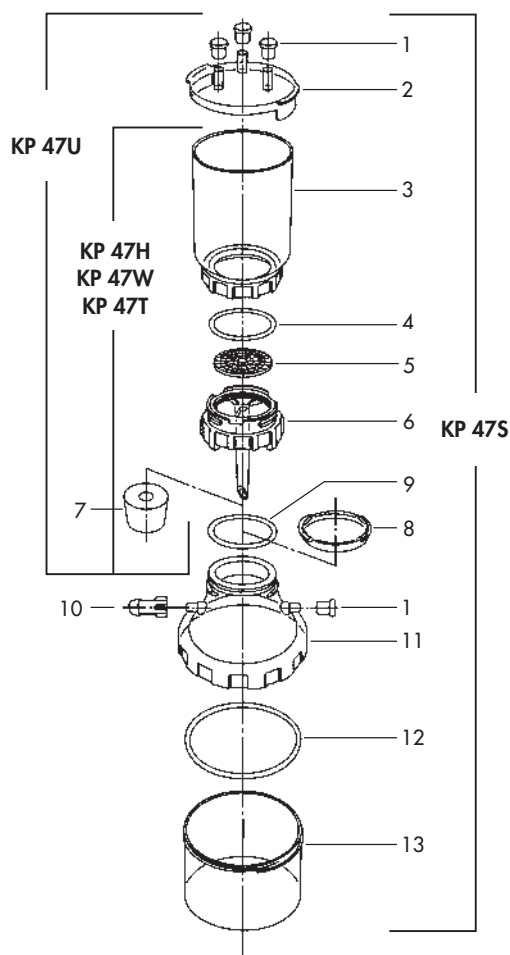
Model		KP 47H	KP 47U	KP 47W	KP 47S	KP 47T
Catalog No.		43301030	43301020	43301050	43301010	43301040
1	Rubber cap	-	44501010	-	44501010	-
2	Funnel cover	-	44501001	-	44501001	-
3	Funnel	44501002		44501102	44501002	44501103
4	Funnel O-ring					44501008
5	Support screen					44501004
6	Base					44501003
7	#8B Stopper					19311008

**Replacement Parts – Receiver flask**

Model		KP 47S
8	Receiver cover	44501005
9	Receiver adapter O-ring	44501009
10	Vacuum adapter	44501013
11	Receiver adapter	44501007
12	Receiver O-ring	44501015
13	Receiver flask	44501006

**Optional Accessories**

4	Funnel O-ring, FPM	501011
9	Receiver adapter O-ring, FPM	501012
12	Receiver O-ring, FPM	501016



## PVC Vacuum Manifold – Standard Cup

- **Lightweight**
- **Resistant to acids**
- **Standard cup** accepts a #8 and #8b stopper to adapt microanalysis units and other devices
- **2-way** valve with PTFE stopcock in PVC body
- Not autoclavable

### SPECIFICATIONS

<b>Materials:</b>	
Body and branches	Polyvinylchloride (PVC)
Valves	PTFE stopcock, PVC body
<b>Connections:</b>	
Outlet	1/4" male NPT to hose barb fitting connects main manifold to 3/8" i.d. vacuum tubing
Standard cup	Accepts #8 and #8b stopper
<b>Temperature:</b>	
Maximum	60°C (140°F)



**KMP 6** (313600)  
**KMP 3** (313400)

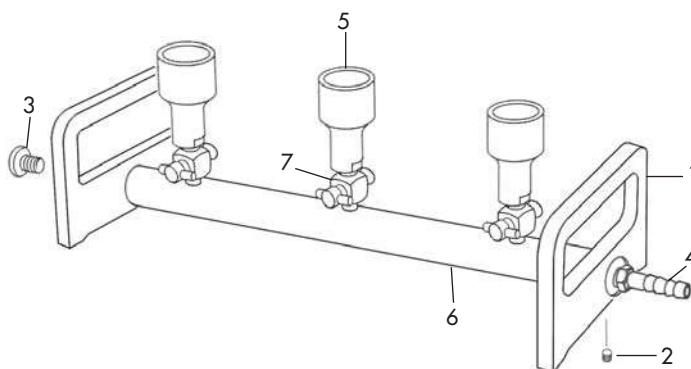
Dimensions:	L x W x H		Distance between stations (center to center)		Weight	
	in	cm	in	cm	lb	kg
3 station	17 <sup>3</sup> / <sub>4</sub> x 4 <sup>3</sup> / <sub>4</sub> x 7	45.1 x 12 x 17.8	5 <sup>1</sup> / <sub>2</sub>	14	3.3	1.5
6 station	34 <sup>1</sup> / <sub>2</sub> x 4 <sup>3</sup> / <sub>4</sub> x 7	87.6 x 12 x 17.8	4 <sup>3</sup> / <sub>4</sub>	12	5.5	2.5

### ORDERING INFORMATION

		Standard cup
3 station	<b>KMP 3</b>	313400
6 station	<b>KMP 6</b>	313600

### Replacement Parts

1	Handle	313401
2	Handle set screw	313015
3	Pipe plug	373412
4	PVC Hose barb	373411
5	Branch (Standard cup)	313410
6	Main manifold:	
	3 station	313403
	6 station	313603
7	Stopcock assembly, 2-way	313430



**KMP 3**  
(313400)



## PVC Extraction Manifold – Exterior Taper

- **Exterior taper** accepts a 40/35 female joint
- **3-way valve** with luer slip vent port accepts disposable syringe filters (see page 16)
- **Lightweight and resistant to acids**
- **Broad base** for extra stability
- **Ideal for EPA Method 1664** oil and grease analysis
- Not autoclavable, can be sanitized with ethanol or formaldehyde



KMX 3 (373330)

### SPECIFICATIONS

<b>Materials:</b>	
Body and branches	Polyvinylchloride (PVC)
Valves	PTFE stopcock, PVC body
<b>Connections:</b>	
Outlet	1/4" male NPT to hose barb fitting connects main manifold to 3/8" ID vacuum tubing
Exterior taper	40/35 male joint
<b>Temperature:</b>	
Maximum	60°C (140°F)

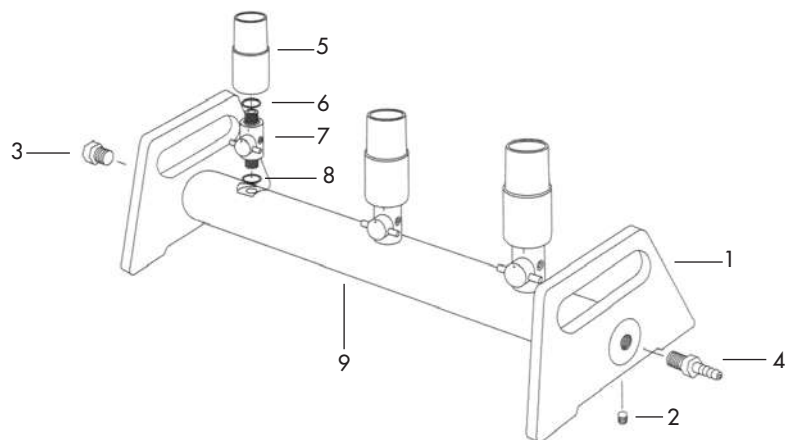
Dimensions:	L x W x H		Distance between stations (center to center)		Weight	
	in	cm	in	cm	lb	kg
Single	10 x 6 <sup>5</sup> / <sub>8</sub> x 8	25.4 x 16.8 x 20.3	-	-	4	1.8
3 station	21 <sup>1</sup> / <sub>2</sub> x 6 <sup>5</sup> / <sub>8</sub> x 8	54.6 x 16.8 x 20.3	6 <sup>1</sup> / <sub>2</sub>	16.5	6	2.7

### ORDERING INFORMATION

		Exterior Taper
Single	<b>KMX 1</b>	373130
3 station	<b>KMX 3</b>	373330

### Replacement Parts

1	Handle	373401
2	Socket cap screw	373015
3	Pipe plug	373412
4	PVC Hose barb	373411
5	Branch (Male taper)	713010
6	Branch O-ring (EPR)	373017
7	Stopcock assembly, 3-way	373430
8	Branch Gasket (Buna)	373018
9	Main manifold:	
	1 station	373103
	3 station	373303



KMX 3 (373330)

## Stainless Steel Vacuum Manifolds

- **Autoclavable**
- **2-way or 3-way valve available**, use a 3-way valve when the manifold is used under closed conditions and must be vented to atmosphere without breaking the vacuum connection. 3-way valve vent is female luer slip, accepts standard disposable syringe filter (Page 16) or stainless steel syringe filter holder (KS 13, page 105)
- **Standard cup** accepts a #8 stopper to adapt microanalysis units and other devices
- **Exterior taper** accepts a 40/35 female joint
- **Sterility Test Manifold** features rear mounted flushing manifold for use in USP bacteria retentive method



Vacuum Filter Manifold Family

## SPECIFICATIONS

Materials:	
Body and branches	Type 304 stainless steel
Valves	PTFE stopcock, chrome plated brass body
Connections:	
Outlet	1/4" male NPT to hose barb fitting connects main manifold to 3/8" ID vacuum tubing
Standard cup	Accepts #8 and #8b stopper
Exterior taper	40/35 male joint

### Standard Cup

Dimensions:	L x W x H		Distance between stations (center to center)		Weight	
	in	cm	in	cm	lb	kg
Single	8 x 4 <sup>3</sup> / <sub>4</sub> x 7	20.3 x 12 x 17.8	-	-	5.5	2.5
3 station	18 x 4 <sup>3</sup> / <sub>4</sub> x 7	45.7 x 12 x 17.8	5 <sup>1</sup> / <sub>2</sub>	14	9.9	4.5
6 station	28 <sup>1</sup> / <sub>2</sub> x 4 <sup>3</sup> / <sub>4</sub> x 7	72.4 x 12 x 17.8	4 <sup>3</sup> / <sub>4</sub>	12	14.3	6.5

### Exterior Taper

Dimensions:	L x W x H		Distance between stations (center to center)		Weight	
	in	cm	in	cm	lb	kg
Single	8 x 4 <sup>3</sup> / <sub>4</sub> x 8	20.3 x 12 x 20.3	-	-	5.5	2.5
3 station	18 x 4 <sup>3</sup> / <sub>4</sub> x 8	45.7 x 12 x 20.3	5 <sup>1</sup> / <sub>2</sub>	14	10.4	4.7
6 station	28 <sup>1</sup> / <sub>2</sub> x 4 <sup>3</sup> / <sub>4</sub> x 8	72.4 x 12 x 20.3	4 <sup>3</sup> / <sub>4</sub>	12	16.9	7.7



Exterior taper for a 40/35 glass joint. 3-way valve.



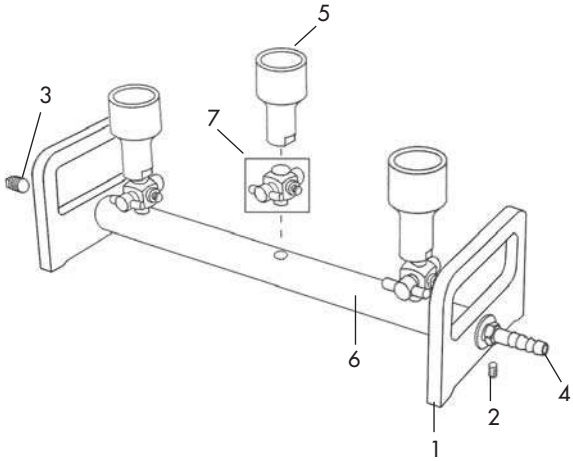
Standard branch accepts a #8 or #8b stopper, 2-way valve.

## ORDERING INFORMATION

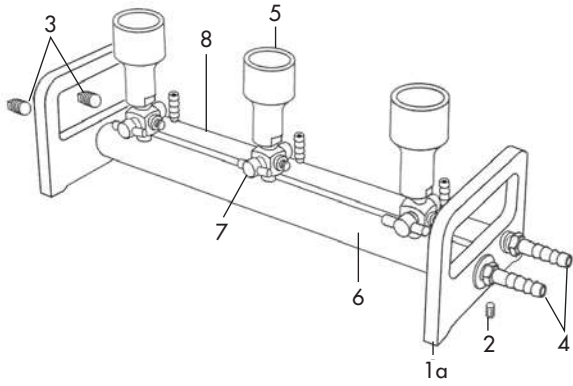
	Standard cup		Exterior taper		Sterility Test (standard cup)
	2-way	3-way	2-way	3-way	3-way
Valve type:					
Single	<b>SS 2X</b>	<b>SS 3X</b>	<b>SS SPE/2</b>	<b>SS SPE/3</b>	-
	351120	351130	361120	361130	-
3 station	<b>KM3N</b>	<b>KM3NV</b>	<b>KM3N XT/2</b>	<b>KM3N XT/3</b>	<b>KM3</b>
	353100	353130	363120	363130	313000
6 station	<b>KM6N</b>	<b>KM6NV</b>	<b>KM6N XT/2</b>	<b>KM6N XT/3</b>	<b>KM6</b>
	353300	353330	363320	363330	313200

Replacement Parts

1	Handle standard	313101
1a	Handle (sterility test)	313001
2	Handle set screw	313015
3	Pipe plug	313012
4	Hose barb	304507
5	Branch:	
	Standard cup	313010
	Exterior taper	613010
6	Main manifold:	
	Single	361103
	3 station	313003
	6 station	313203
7	Stopcock assembly:	
	2-way	613005
	3-way	313005
8	Flushing manifold (sterility test):	
	3 station	313004
	6 station	313204



KM3NV  
(353130)



KM3  
(313000)

## Vacuum Pressure Pump

- Maintains continuous vacuum for filtration
- Also can be used for positive pressure filtration (<60 psi)
- Oil free operation minimizes aerosol contamination
- Quiet operation
- Easy to maintain
- Portable compact design

## SPECIFICATIONS

<b>Materials:</b>	
Wetted parts	Aluminum, stainless steel, and Nordell Normax
Valves	Reed type
Power cord	6' long, 3-wire
<b>Connections:</b>	
Inlet and outlet ports	1/4" NPTF to hose barb fitting connects vacuum pump to 3/8" ID vacuum tubing
Power requirements	115 V, 60 Hz, 4.2 A or 220 V, 50 Hz, 1.9 A
<b>Pressure:</b>	
Maximum pressure	0.41 MPa (60 psi)
Maximum vacuum	81 kPa (24Hg") from atm
<b>Temperature:</b>	
Maximum inlet	37.8°C (100°F)
<b>Free air capacity:</b>	
	34 L/min (1.2 cfm)
<b>Weight:</b>	
	9.1 Kg (20 lb)



VP-24 Vacuum Pressure Pump

## ORDERING INFORMATION

Model	Description	Catalog No.
VP-24	Vacuum pressure pump, 115 V	800800
	Vacuum pressure pump, 220 V	800801

## Replacement Parts

Service kit:	Catalog No.
Replacement head gasket, filter, muffler elements, leaf valves, screws and valve retainers	800810
Vacuum gauge and regulator assembly	800820
Pressure gauge and regulator assembly	800830
Hose barb 3/8"	800840

# PRESSURE FILTRATION

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## Introduction

Pressure type filter holders can be used for ultracleaning or sterilizing liquids and gases. Advantec holders have been designed to maximize flow rates and to minimize holder resistance and can be used in either batch or continuous filtration procedures.

## Advantages of Pressure Filtration

- Higher differential pressures are possible, resulting in higher flow rates. The pressure differential across the membrane is not limited to atmospheric pressure ( $\geq 14.7$  psi)
- Unintentional contamination downstream of the membrane is minimized
- Denaturation of proteins and other biological polymers due to foaming downstream of the membrane is avoided
- Vapor accumulation and possible explosion can be avoided using an inert gas to pressurize solvents and combustible or flammable liquids

## RECOMMENDED PRESSURE FILTER HOLDERS FOR TYPICAL APPLICATIONS AND VOLUMES

	Volume to be Filtered					
	<10 mL	<50 mL	<1 liter	<5 liters	<20 liters	>20 liters
Typical Applications	Enzymes, Radiolabelled samples	Proteins, enzymes, Radiolabelled samples, gases	Biological media, electrolyte solution for counters, gases	Biological media, ultrapure water, serum, gases	Biological media, ultrapure water, serum, gases	Pharmaceuticals, cosmetics, large scale biologicals
<b>Recommended Models</b>						
Luer Connection	KS 13	KS 25 PP 25 PFA 25	PP 47	-	-	-
Threaded Connection	-	LS 25	KS 47 LS 47 LS 47 HP PP 47 PFA 47	KS 90 KS 90 UH	KS 142 KS 142 UH	KS 293 KS 293 UH
Sanitary Connection	-	KS 25 F	KS 47 F	KS 90 ST	KS 142 ST	KS 293 ST
Holders with Reservoir	-	-	KST 47	KST 90	KST 142	-
<b>Filter Specifications</b>						
Membrane Diameter (mm)	13	25	47	90	142	293
Prefilter Diameter <sup>1</sup> (mm)	8	21 or 25	35, 38, 42.5, or 47	76	124	257
Filtration Area (cm <sup>2</sup> )	0.9	3.8	11.2, 12.5, or 13.5	45.3	113	530
Liquid Flow Rate <sup>2</sup> (L/min)						
0.20 $\mu$ m	0.016	0.07	0.22	0.8	2.0	9.3
0.45 $\mu$ m	0.04	0.17	0.6	2.0	5.1	23.9
1.00 $\mu$ m	0.20	0.84	2.8	10.0	24.9	116.6
5.00 $\mu$ m	0.40	1.5	5.0	18.1	45.2	212.0

1. Prefilter size varies with model – refer to individual model specifications before choosing a prefilter.

2. Liquid flow rates represent typical initial water flow rates at 0.7 kg/cm<sup>2</sup> (10 psi) differential pressure at 20°C using clean water filtered to 0.1  $\mu$ m using MCE membrane.

## Stainless Steel Syringe Holders

- **Can be sterilized** by standard procedures including autoclaving
- **Luer fittings** fit typical syringes
- **Can be tightened securely**, wrench set included

### APPLICATIONS

- Filter or clean small volumes of liquid such as eyewash or photoresist
- Clear turbid solutions such as serum
- Purify virus solutions

### SPECIFICATIONS

	KS 13	KS 25
<b>Materials:</b>		
Body and support screen	Type 304 Stainless Steel	
Gasket	PTFE	
O-ring	PTFE	
<b>Connections:</b>		
Inlet	Female Luer-lock	
Outlet	Male Luer slip	
Dead volume	0.2 mL	0.4 mL
<b>Pressure:</b>		
Inlet	0.68 MPa (99 psi)	
Differential	0.29 MPa (42 psi)	
<b>Membrane Compatibility:</b>		
Filter size	13 mm	25 mm
Prefilter size	8 mm	21 mm
Filtration area	0.9 cm <sup>2</sup>	3.8 cm <sup>2</sup>
<b>Dimensions:</b>		
Diameter	16 mm (0.6")	32 mm (1.25")
Length	39 mm (1.54")	36 mm (1.42")
<b>Weight:</b>	0.1 kg (0.25 lb)	0.2 kg (0.38 lb)

### ORDERING INFORMATION

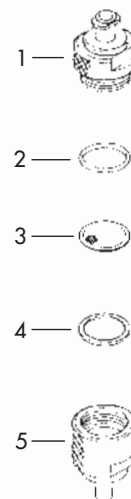
Model	KS 13	KS 25
Catalog No.	301000	301200

### Replacement Parts

		KS 13	KS 25
1	Inlet, male	301001	301201
2	O-ring (PTFE)	301004	301204
3	Screen (304 SS)	301003	301203
4	Gasket (PTFE)	301002	301202
5	Outlet, female	301005	301205
-	Universal wrenches (2/pk)	301006	301006



Stainless steel syringe holders



KS 13

## Stainless Steel Gas Line Holders

- **Female threaded locking ring** enables filter changes without removing the holder from connecting gas lines
- **Dual support screens** protect the membrane filter from reverse pressure surges and allow forward and reverse flow from either inlet or outlet
- Tighten by hand only, Hand torque maximum is 1.69 N.m (15 lbs/in)

### APPLICATIONS

- Ultraclean and sterilize air and other gases including compressed gases
- In-line between pressurizing source (pump or gas cylinder) and dispensing vessel



Stainless Steel Gas Line Holders

### SPECIFICATIONS

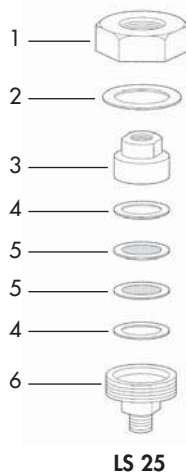
	LS 25	LS 47
<b>Materials:</b>		
Body and support screen	Type 304 Stainless Steel	
Locking ring	Nickel-plated brass	
Gaskets	PTFE	
O-ring (standard)	PTFE	Silicone
<b>Connections:</b>		
Inlet	1/4" NPTF, comes with hose barb fitting (3/8")	
Outlet	1/4" NPTM, comes with hose barb fitting (3/8")	
<b>Pressure:</b>		
Inlet	0.49 MPa (71 psi)	
Differential	0.20 MPa (29 psi)	
<b>Filter Specifications:</b>		
Filter size	25 mm	47 mm
Prefilter size	25 mm	47 mm
Filtration area	3.8 cm <sup>2</sup>	12.5 cm <sup>2</sup>
<b>Dimensions:</b>		
Diameter	38 mm (1.5")	69 mm (2.7")
Length	50 mm (2.0")	57 mm (2.2")
<b>Weight:</b>	0.3 kg (0.63 lb)	0.8 kg (1.75 lb)

### ORDERING INFORMATION

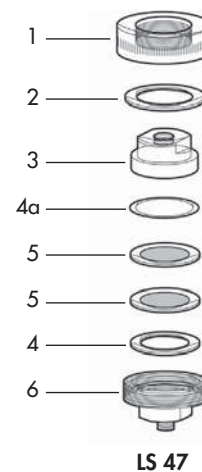
Model	LS 25	LS 47
Catalog No.	304500	304700

### Replacement Parts, Accessories, and Optional O-rings

	LS 25	LS 47
-	Hose barb (1/4" NPTM)	
-	304507	
1	304501	304701
2	304504	304704
3	304505	304710
4	301202	304702
4a	-	357210
4a	-	304714
4a	-	304716
5	301203	304703
6	304506	304711
-	Hose barb (1/4" NPTF)	
-	304508	



LS 25



LS 47



### High Pressure Stainless Steel Holder

- **Operate at high pressure**, up to 9.8 MPa (1420 psi)
- **Standard Viton O-rings** compatible with many aggressive liquids and gases
- **Back pressure support screen available** to prevent membrane rupture and deflect flow at very high pressures

### APPLICATIONS

- Filter liquids or gases under high pressure

### SPECIFICATIONS

		LS 47 HP
<b>Materials:</b>		
Body and support screen	Body:SUS304 Support screen:SUS316	
O-rings	FPM	
<b>Connections:</b>		
Inlet and Outlet	1/4" NPTF	
<b>Pressure:</b>		
Inlet	9.8 MPa (1422 psi)	
Differential	1.9 MPa (276 psi)	
<b>Dead volume:</b>		
Upstream	3 mL	
Downstream	6.5 mL	
<b>Membrane Compatibility:</b>		
Membrane filter size	47 mm	
Prefilter size	38 mm	
Filtration area	12.5 cm <sup>2</sup>	
<b>Dimensions:</b>		
Diameter	88 mm (3.5")	
Height (including adapters)	94 mm (3.7")	
<b>Weight:</b>	2.7 kg (6.0 lb)	

### ORDERING INFORMATION

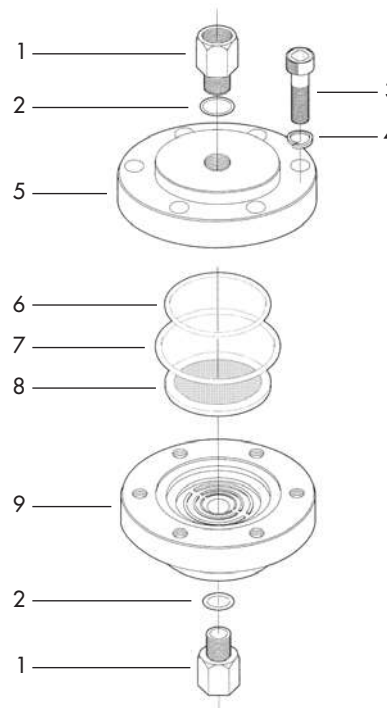
Model	LS 47 HP
Catalog No.	17304900

### Replacement Parts and Accessories

		LS 47 HP
1	Inlet/outlet adapter	
2	Adapter O-ring	19304905
3	Hex cap screw, M-8	
4	Cap screw washer	
5	Inlet plate	
6	Inner O-ring	19304906
7	Outer O-ring	19304910
8	Support screen (SUS316)	19304903
9	Outlet plate	



LS 47 HP



LS 47 HP

## Polypropylene In-Line and Aerosol Holders

- **Compatible** with a wide range of chemicals and temperatures
- **Exterior locking ring** design allows the unit to be assembled quickly and efficiently without tearing the membrane
- Used by membran filter only

### APPLICATIONS

- Ultraclean and sterilize liquids
- Aseptic sampling of liquids or gases at point-of-use
- Environmental air sampling (PPO 47)



Polypropylene In-Line and Aerosol Holders

### SPECIFICATIONS

	PP 25	PP 47	PPO 47
<b>Materials:</b>			
Body and support screen	Polypropylene		
O-rings (standard)	Silicone		Silicone/PTFE
<b>Connections:</b>			
Inlet	Female Luer-Lock	Combination 1/4" NPTM, Female Luer slip	Open Face
Outlet	Male Luer slip	Combination 1/4" NPTM, Female Luer slip	Combination 1/4" NPTM, Female Luer slip
<b>Pressure:</b>			
Maximum operating	0.29 MPa (42 psi)	0.49 MPa (71 psi)	-
<b>Temperature:</b>			
Maximum operating	80°C (176°F)		
Autoclave	121°C (250°F), 15 psi, 20 min slow exhaust only		
<b>Filter Specifications:</b>			
Filter size	25 mm	47 mm	
Prefilter size	21 mm	42 mm	-
Filtration area	3.5 cm <sup>2</sup>	13.5 cm <sup>2</sup>	
Recommended volume	<50 mL	Up to 1 liter	-
<b>Dimensions:</b>			
Diameter	30 mm (1.2")	65 mm (2.6")	
Height	30 mm (1.2")	50 mm (2.0")	40 mm (1.6")
<b>Weight:</b>	0.41 oz (12g)	1.2 oz (47g)	1.4 oz (40g)

### ORDERING INFORMATION

Model	PP 25	PP 47	PPO 47
Catalog No.	43303010	43303020	43305010
Package (pc/box)	6	1	

**Typical initial liquid flow rates (in mL/min)**

Membrane Pore size (µm)	PP 25	PP 47
0.20	35	250
0.45	80	600
1.00	320	1,700
3.00	740	2,800

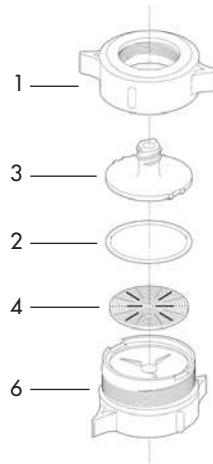
Conditions: Initial flow rates of water being filtered through a mixed cellulose esters (MCE) at a differential pressure of 1 kg/cm<sup>2</sup> (14 psi) at 20°C.

**Replacement Parts and Optional O-rings**

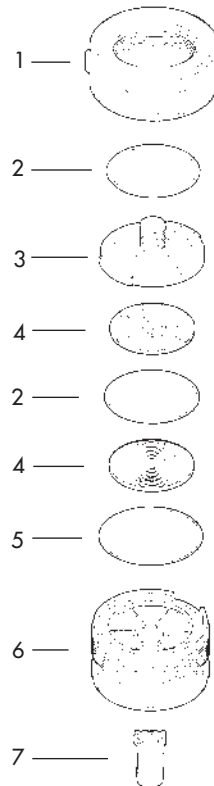
		PP 25
1	Locking ring, outer	44540101
2	Inlet cap O-ring (silicone)	44540106
2	Inlet cap O-ring (FPM)	540107
2	Inlet cap O-ring (EPR)	540108
3	Inlet cap	44540102
4	Support screen	44540104
6	Outlet base	44540103

		PP 47
1	Locking ring, outer	44501201
2	Inlet cap O-ring (silicone)	44501204
2	Inlet cap O-ring (FPM)	530108
2	Inlet cap O-ring (EPR)	530109
3	Inlet cap	44501202
4	Support screen	44501004
5	Outlet base O-ring (silicone)	44501208
5	Outlet base O-ring (FPM)	501210
5	Outlet base O-ring (EPR)	501211
6	Outlet base	44501203
7	Outlet adapter (male luer slip to hose barb)	44501013

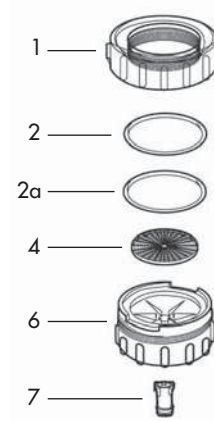
		PPO 47
1	Locking ring, outer	44501201
2	Inlet cap O-ring (silicone)	44501204
2a	Sealing O-ring (PTFE)	44501301
4	Support screen	44501004
6	Outlet base	44501203
7	Outlet adapter (male luer slip to hose barb)	44501013



PP 25



PP 47



PPO 47

## PFA In-Line Filter Holders

- **Superior chemical compatibility** – can be used with chemically aggressive liquids
- **Dual support screens** allow for flow in either direction
- **Exterior locking ring** for quick assembly without tearing the membrane
- Used by membrane filter only

### APPLICATIONS

- Sterilize and ultraclean liquids under positive pressure
- Ideal for filtering small volumes of high purity acids, alkalis or organic solvents

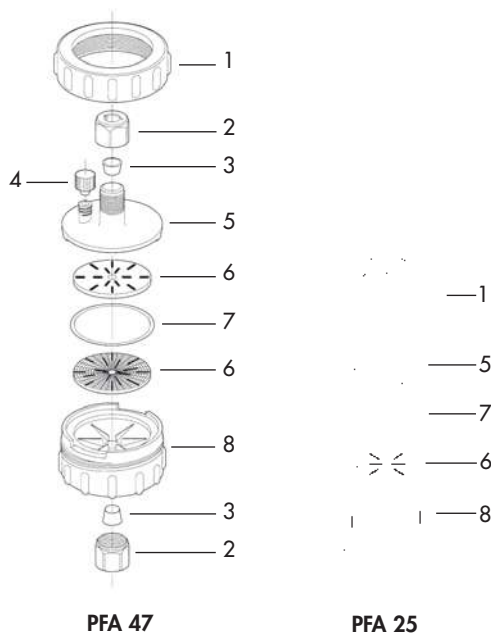
Note: PFA 47 unit has an air/bleed vent



PFA 25, PFA 47

### SPECIFICATIONS

	PFA 25	PFA 47
<b>Materials:</b>		
Body and support screen	PFA Locking ring on PFA 47: ETFE glass fiber filled PFA	
O-ring (standard)	Perfluoroelastomer	
<b>Connections:</b>		
Inlet	Female Luer-Lock	Combination 1/4" NPTM, 1/4" tubing adapter
Outlet	Male Luer slip	
<b>Pressure:</b>		
Maximum operating	0.29 MPa (42 psi)	
<b>Temperature:</b>		
Maximum operating	121°C (250°F)	
Autoclave	121°C (250°F), 15 min	
<b>Weight:</b>	0.8 oz (22g)	5.2 oz (120g)
<b>Dimensions:</b>		
Diameter	32 mm (1.3")	65 mm (2.6")
Height	32 mm (1.3")	70 mm (2.8")
<b>Membrane Compatibility:</b>		
Filter size	25 mm	47 mm
Prefilter size	21 mm	42 mm
Filtration area	3.5 cm <sup>2</sup>	13.5 cm <sup>2</sup>
<b>Flow Rate:</b>		
Pore size (PTFE membrane)	Typical methanol flow rate at 1 kg/cm <sup>2</sup> , 20°C	
0.2 µm (T020)	60 mL/min	400 mL/min
0.5 µm (T050)	150 mL/min	700 mL/min
1.0 µm (T100)	350 mL/min	1200 mL/min



### ORDERING INFORMATION

Model	PFA 25	PFA 47
Catalog No.	43307010	43307020

### Replacement Parts

		PFA 25	PFA 47
1	Locking ring	44530201	44530101
2	Inlet/Outlet adapter	-	44530111
3	Tubing adapter	-	44530110
4	Vent cap	-	44530105
5	Inlet cap	44530202	44530102
6	Support screen	44530204	44530104
7	Inlet O-ring	44530206	44530106
8	Outlet	44530203	44530103

### Sanitary In-Line Stainless Steel Holders

- **Sanitary inlet and outlet connections** are non-threaded and can be completely disassembled for thorough cleaning
- **47 mm holder features vent** to allow air venting on upstream side of the membrane at any time during filtration

### APPLICATIONS

- Point of use filtration on sterile filling machines
- Flow decay studies for scale up to larger filtration systems
- Liquid or gas



KS 25F



KS 47F

### SPECIFICATIONS

	KS 25F	KS 47F
<b>Materials:</b>		
Body and support screen	Body:SUS304 Support screen:SUS316	
O-rings	FPM and Silicone	
Gasket	PTFE	
<b>Connections:</b>		
Inlet/Outlet	6 mm (0.24") OD barb	8 mm (0.32") OD barb
<b>Pressure:</b>		
Inlet	0.49 MPa (71 psi)	
Differential	0.29 MPa (42 psi)	
<b>Weight:</b>	0.45 kg (1 lb)	0.9 kg (2 lb)
<b>Dimensions:</b>		
Diameter (without clamp)	50 mm (2.0")	64 mm (2.5")
Length (with vent valve)	72 mm (2.8")	78 mm (3.1")
<b>Membrane Compatibility:</b>		
Filter size	25 mm	47 mm
Prefilter size	21 mm	35 mm (47 mm)*
Filtration area	3.8 cm <sup>2</sup>	12.5 cm <sup>2</sup>

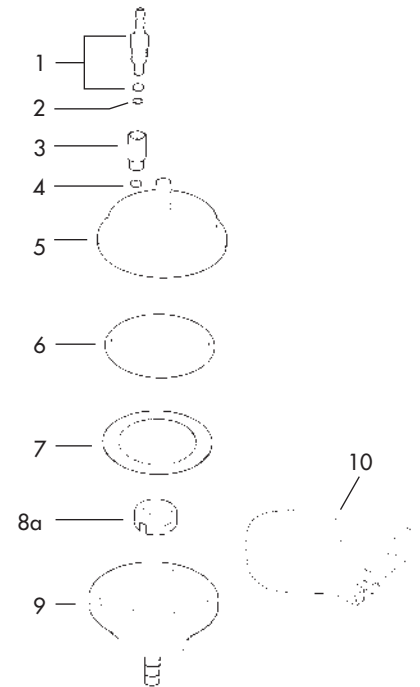
\* If a membrane filter is used as a prefilter, use a 47 mm filter and place a polyester mesh separator between the 2 membranes (See page 14).

### ORDERING INFORMATION

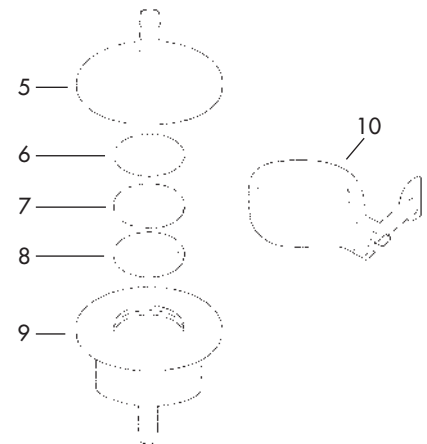
Model	KS 25F	KS 47F
Catalog No.	17307000	17307200

### Replacement Parts

	KS 25F	KS 47F
1		
2	-	19307220
3		
4		
4	-	19307208
5	/	
6	19307003	19304712
7	19301203	19304703
8	19307004	-
8a	-	19307204
9	/	
10	19306000	19306300



KS 47F



KS 25F

## Vented In-Line Stainless Steel Holder

- **Support screen is PTFE coated** to prevent membrane sticking during autoclaving
- **Back pressure support screen** prevents membrane rupture during reverse pressure surges
- **Vent valve** in inlet body enables venting at any time during filtration
- Available in type 304 or type 316 stainless steel

### APPLICATIONS

- Sterilize and ultraclean liquids or gases under positive pressure
- Sterilize with a membrane in place for microbiological studies
- Install for point of use filtration on filling machines

Note: When using the KS 47 inline to filter gases, a second support screen should be used upstream of the membrane

### SPECIFICATIONS

		KS 47
<b>Materials:</b>		
Body and support screen	Type 304 or 316 stainless steel	
O-rings (standard)	FPM and silicone	
Support screen	PTFE coated stainless steel	
Gasket	PTFE	
<b>Connections:</b>		
	1/4" NPTM to hose barb (9.5 mm)	
<b>Pressure:</b>		
Inlet	0.68 MPa (99 psi)	
Differential	0.29 MPa (42 psi)	
<b>Dead Volume:</b>		
Upstream	5 mL	
Downstream	2 mL	
<b>Weight:</b>		
	0.8 kg (1.8 lb)	
<b>Membrane Compatibility:</b>		
Filter size	47 mm	
Prefilter size	35 mm (47 mm)*	
Filtration size	12.5 cm <sup>2</sup>	

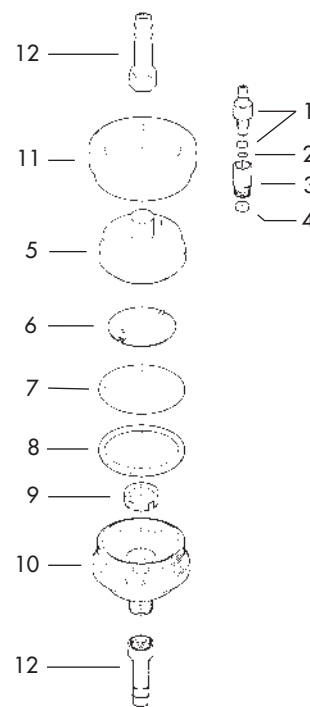
\* If a membrane filter is used as a prefilter, use a 47 mm filter and place a polyester separator (DS type) between the 2 membranes (See page 14).

### Replacement Parts

		KS 47	
		Type 304 SS	Type 316 SS
1	Vent valve with PTFE packing	357205	
2	Vent valve O-ring (FPM)	357206	
3	Valve body, female	357207	
4	Gasket (PTFE)	357208	
5	Inlet body	357401	357501
6	Back pressure support	357404	357504
7	O-ring (silicone)	357210	
8	Support screen	304715	304815
9	Underdrain support	357204	357304
10	Outlet body	357402	357502
11	Locking ring	357405	357505
12	Inlet/outlet adapter	304508	304608



KS 47



KS 47

### ORDERING INFORMATION

		KS 47
304 SS	357400	
316 SS	357500	

### Accessories and Optional O-rings

7	O-ring (PTFE encapsulated)	304706	
7	O-ring (FPM)	304714	
8	Support screen (order second for upstream support, see note above)	304715	304815

## Large Standard Stainless Steel Holders – 90, 142, 293 mm

- **Seal membrane by hand tightening** locking wing nuts
- **Optimal holder design** minimizes resistance and maximizes flow rate
- **Available in either type 304 or type 316 stainless steel**
- **Each unit labeled** with identifying serial numbers on the outside of both the inlet and outlet plates

### APPLICATIONS

- Use in-line for filtering gases or liquids
- Use with pressure vessel (see page 121) for batch type operations



KS 90, KS 142, KS 293

### SPECIFICATIONS

	KS 90	KS 142	KS 293
<b>Materials:</b>			
Body	Type 304 or 316 stainless steel		
Support screen	PTFE coated photoetched stainless steel		
O-rings (standard)	Silicone		
Gasket	PTFE		
<b>Connections:</b>			
Inlet, 3/4" NPTF to:	11 mm (3/8") hose barb		16 mm (5/8")
Outlet, 3/4" NPTM to:			hose barb
<b>Pressure:</b>			
Inlet	0.68 MPa (99 psi)		
Differential	0.29 MPa (42 psi)		
<b>Weight:</b>	4 kg (8.8 lb)	6 kg (13 lb)	19 kg (42 lb)
<b>Membrane Compatibility:</b>			
Membrane filter size	90 mm	142 mm	293 mm
Prefilter size	76 mm	124 mm	257 mm
Filtration area	45 cm <sup>2</sup>	113 cm <sup>2</sup>	530 cm <sup>2</sup>

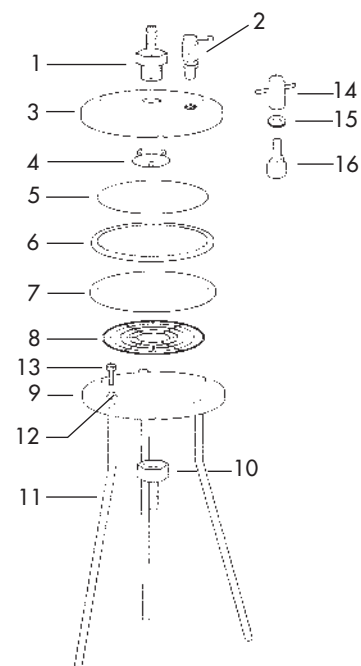
Supplied with aluminum wrench (spanner) and 6 mm allen wrench (hex key).

### ORDERING INFORMATION

	KS 90	KS 142	KS 293
304 SS	300800	301900	302500
316 SS	300900	302000	302600

Replacement Parts

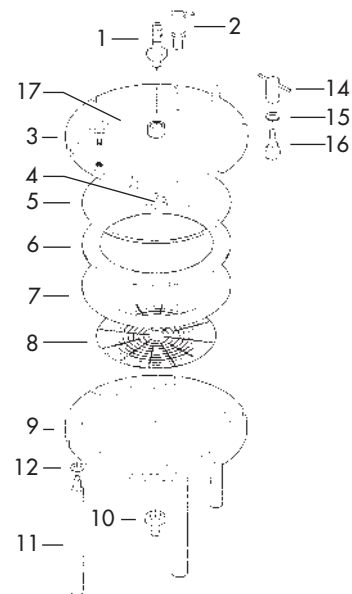
Inlet and Outlet Assemblies				
		KS 90	KS 142	KS 293
1	Inlet adapter (304 SS)	300813		302513
1	Inlet adapter (316 SS)	300913		302613
2	Vent relief valve	301825		
3	Inlet plate (304 SS)	300809	301909	302509
3	Inlet plate (316 SS)	300909	302009	302609
9	Outlet plate (304 SS)	300801	301901	302501
9	Outlet plate (316 SS)	300901	302001	302601
10	Outlet adapter (304 SS)	300817		302517
10	Outlet adapter (316 SS)	300917		302617
Filter Support System				
		KS 90	KS 142	KS 293
4	Flow deflector (316 SS)	301808		
5	O-ring (silicone)	301705	301905	302505
6	Support screen (PTFE coated SS)	301804	302004	302604
7	Gasket (PTFE)	301703	301903	302503
8	Underdrain support (316 SS)	301802	302002	302602
Sealing and Support Assemblies				
		KS 90	KS 142	KS 293
11	Leg	301719	301919	302519
12	Leg washer		301720	302518
13	Leg bolt	301718		
14	Sealing wing nut	301914		302514
15	Sealing washer	301916		302516
16	Sealing bolt	301915		302515



KS 90, KS 142

Accessories and Optional O-rings

		KS 90	KS 142	KS 293
5	O-ring (FEP-encapsulated silicone)	301706	301906	302506
5	O-ring (FPM)	301707	301907	302507
6	Support Screen (316 SS)	301835	302035	302635
-	Back pressure support screen (304 SS)	301726	301926	302530
-	Back pressure support screen (316 SS)	301728	301928	302532
-	Back pressure support screen (PTFE coated 304 SS)	301727	301927	302531
-	Back pressure support screen (PTFE coated 316 SS)	301729	301929	302533
-	Allen wrench (hex key) 6 mm	301721		-
-	Spanner (wrench) 142 mm	301922		



KS 293



## Large Sanitary Stainless Steel Holders – 90, 142, 293 mm

- **Sanitary connections** are threadless and can be completely disassembled for thorough cleaning
- **Designed for minimal resistance and maximal flow**
- **Available in either type 304 or 316 stainless steel**
- **Removable wing nuts** tighten easily by hand to seal membrane
- **Both inlet and outlet plates clearly marked** with identifying serial number

### APPLICATIONS

- Ultraclean or sterilize gases or liquids
- Use with a pressure vessel for large volumes and batch type operations

### SPECIFICATIONS

<b>Materials:</b>	
Body	Type 304 or 316 stainless steel
Support screen	PTFE coated photoetched stainless steel
O-ring (standard)	Silicone
Gaskets (standard)	PTFE and Silicone
<b>Connections:</b>	
Inlet and Outlet	1 1/2" sanitary fitting to 14.3 mm hose barb
<b>Pressure:</b>	
Inlet	0.68 MPa (99 psi)
Differential	0.29 MPa (42 psi)

Supplied with aluminum wrench (spanner) and 6 mm allen wrench (hex key).

### ORDERING INFORMATION

	KS 90 ST	KS 142 ST	KS 293 ST
304 SS	-	302100	302700
316 SS	351800	302200	302800

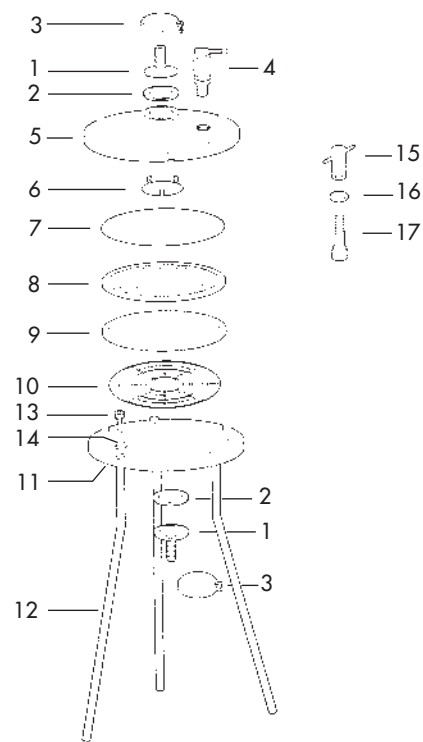
Assemblies are available with PTFE coating by special order.



KS 142 ST

Replacement Parts

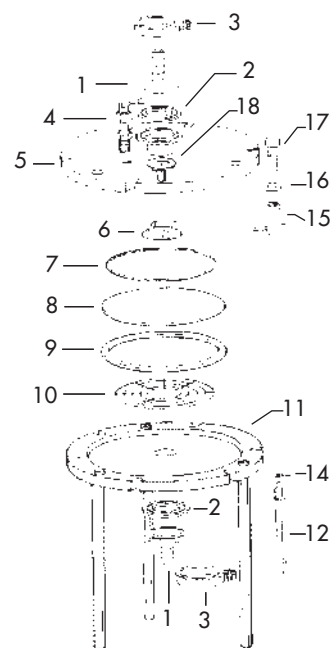
Inlet and Outlet Assemblies				
		KS 90 ST	KS 142 ST	KS 293 ST
1	Inlet/Outlet adapter (304 SS)	306203		
1	Inlet/Outlet adapter (316 SS)	306204		
2	Inlet/Outlet gasket (silicone)	306108		
3	Clamp, 1.5 Tri-Clamp	306000		
4	Vent relief valve	301825		
5	Inlet plate (304 SS)	-	302109	302801
5	Inlet plate (316 SS)	351809	302209	302709
11	Outlet plate (304 SS)	-	302101	302809
11	Outlet plate (316 SS)	351801	302201	302701
Filter Support System				
		KS 90 ST	KS 142 ST	KS 293 ST
6	Flow deflector (316 SS)	302208		302808
7	O-ring (silicone)	301705	301905	302505
8	Support screen (PTFE coated SS)	301804	302004	302604
9	Gasket (PTFE)	301703	301903	302503
10	Underdrain support (316 SS)	301802	302002	302602
Sealing and Support Assemblies				
		KS 90 ST	KS 142 ST	KS 293 ST
12	Leg	301919		302519
13	Leg bolt	301718		-
14	Leg washer	301720		302518
15	Sealing wing nut	301914		302514
16	Sealing washer	301916		302516
17	Sealing bolt	301915		302515
18	Handle	-	-	302520



KS 90 ST  
KS 142 ST

Accessories and Optional O-rings

		KS 90 ST	KS 142 ST	KS 293 ST
7	O-ring (FEP-encapsulated silicone)	301706	301906	302506
7	O-ring (FPM)	301707	301907	302507
8	Support Screen (316 SS)	301835	302035	302635
-	Back pressure support screen (304 SS)	301726	301926	302530
-	Back pressure support screen (316 SS)	301728	301928	302532
-	Back pressure support screen (PTFE coated 304 SS)	301727	301927	302531
-	Back pressure support screen (PTFE coated 316 SS)	301729	301929	302533
2	Inlet/Outlet gasket (PTFE)	306109		
2	Inlet/Outlet gasket (FPM)	306110		
-	Allen wrench (hex key), 6 mm	301721		-
-	Spanner (wrench), 142 mm	301922		-



KS 293 ST

## Large Stainless Steel Holders with Reservoirs

- **Designed for filtering small batches** of liquid without having to use a separate pressure vessel
- **Separate ports** for pressurizing the reservoir and for adding additional sample
- **Membrane sealed internally** by hand-tightening locking wing nuts
- **Available in either type 304 or 316 stainless steel**

## APPLICATIONS

- Sterilizing, ultracleaning, and flow decay tests for pilot studies
- Suitable for hazardous toxicity testing and TCLP
- Optional back pressure screen recommended for intermittent fill operations



KST 47



KST 90

## SPECIFICATIONS

	KST 47	KST 90	KST 142
<b>Materials:</b>			
Body	Type 304 SS	Type 304 or 316 SS	
Support screen	Photoetched 304 SS	PTFE coated photoetched 304 SS	
O-rings (standard)	Silicone		
Gasket (standard)	Silicone/PTFE	PTFE	
<b>Connections:</b>			
Inlet	1/4" NPTM		
Inlet adapter	11 mm hose barb	Ball valve with stepped hose barb (7 mm, 10.5 mm, 13 mm)	
Outlet	1/4" NPTM	3/4" NPTM	
Outlet adapter	10 mm hose barb	11 mm hose barb	
<b>Pressure:</b>			
Inlet	0.49 MPa (71 psi)		
Differential	0.29 MPa (42 psi)		
Vent relief valve	0.44 ± 0.04 MPa (64 ± 6 psi)		
<b>Weight:</b>	1 kg (2.2 lb)	5 kg (11 lb)	6 kg (13 lb)
<b>Capacity:</b>	200 mL	750 mL	1.5 L
<b>Membrane Compatibility:</b>			
Membrane filter size	47 mm	90 mm	142 mm
Prefilter size	35 mm	76 mm	124 mm
Filtration area	12.5 cm <sup>2</sup>	45.3 cm <sup>2</sup>	113 cm <sup>2</sup>

Supplied with aluminum wrench (spanner) and 6 mm allen wrench (hex key).

**ORDERING INFORMATION**

	KST 47	KST 90	KST 142
304 SS	301500	361600	302300
316 SS	-	361700	302400

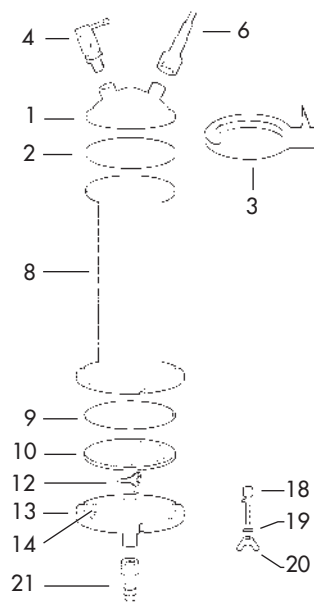
Assemblies are available with PTFE coating by special order.

**Replacement Parts**

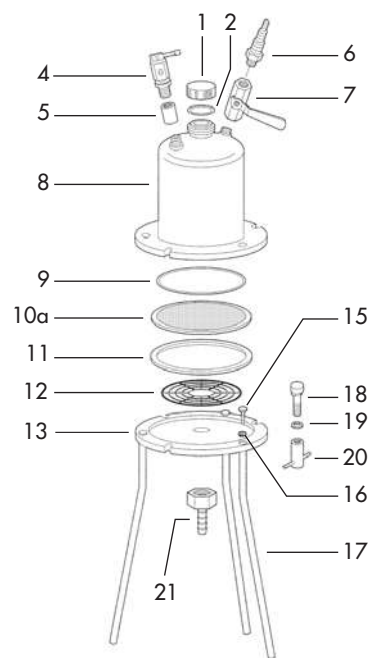
Inlet Assembly				
		KST 47	KST 90	KST 142
1	Inlet cap	301508	301610	302310
2	Inlet cap gasket/O-ring (silicone)	306108	301609	302309
3	Clamp, 1.5 TC	306000	-	-
4	Vent relief valve	301826		
5	Vent socket	-	302313	
6	Inlet adapter (304 SS)	301515	351624	
6	Inlet adapter (316 SS)	-	361624	
7	Valve (304 SS)	-	351625	
7	Valve (316 SS)	-	361625	
Holder Body and Filter Support System				
		KST 47	KST 90	KST 142
8	Reservoir (304 SS)	301507	351608	302308
8	Reservoir (316 SS)	-	361708	302408
9	O-ring (silicone)	357210	301705	301905
10	Support screen (304 SS)	304703	-	-
10a	Support screen (316 SS)	-	301835	302035
10b	Support screen (PTFE coated SS)	-	301804	302004
11	Gasket (PTFE)	-	301703	301903
12	Underdrain support (316 SS)	301517	301802	302002
13	Outlet plate (304 SS)	301501	300801	301901
13	Outlet plate (316 SS)	-	300901	302001
Sealing and Support Assemblies				
		KST 47	KST 90	KST 142
14	Guide pins	301511	-	-
15	Sealing bolt (leg)	-	301718	
16	Locking washer (leg)	-	301720	
17	Leg	-	301719	301919
18	Wing-type bolt	301512	301915	
19	Sealing washer	301514	301916	
20	Wing-type nut	301513	301914	
21	Outlet adapter (NPTF to hose barb)	301515	300817	300917

**Accessories and Optional O-rings/Gaskets**

		KST 47	KST 90	KST 142
2	Inlet cap O-ring (FEP-encapsulated silicone)	-	302328	-
2	Inlet cap gasket (FPM)	306110	-	
2	Inlet cap gasket (PTFE)	306109	-	
9	O-ring (FEP-encapsulated silicone)	-	301706	301906
9	O-ring (PTFE)	301505	-	
9	O-ring (FPM)	301506	301707	301907
-	Back pressure support screen (304 SS)	-	301726	301926
-	Back pressure support screen (316 SS)	-	301728	301928
-	Back pressure support screen (PTFE coated 304 SS)	-	301727	301927
-	Back pressure support screen (PTFE coated 316 SS)	-	301729	301929
-	Allen wrench (hex key) 6 mm	-	301721	
-	Spanner (wrench) 142 mm	-	301922	



**KST 47**



**KST 90  
KST 142**

## Multi-Media Pressure Sealing Holders

- **Dual sealing system** compresses the filter between the inside wall of the outlet plate and the O-ring on the outer edge
- **Broad range of media thickness**, including pads, can be used without compromising sealing up to 3 mm
- **Multiple layers of media** can be used in a single holder without lateral wicking

### SPECIFICATIONS

	KS 90 UH	KS 142 UH	KS 293 UH
<b>Materials:</b>			
Body	Type 304 stainless steel		
Support screen	PTFE coated photoetched stainless steel		
O-ring	Silicone		
<b>Connections:</b>			
Inlet/Outlet	3/4" NPTF/ 3/4" NPTM		
Adapter	11 mm hose barb	16 mm hose barb	
<b>Pressure:</b>			
Inlet	0.68 MPa (99 psi)		
Differential	0.29 MPa (42 psi)		
<b>Weight:</b>	4.5 kg (9.9 lb)	7 kg (15.4 lb)	21 kg (46 lb)
<b>Membrane Compatibility:</b>			
Membrane filter size	90 mm	142 mm	293 mm
Prefilter size	76 mm	124 mm	257 mm
Filtration area	45.3 cm <sup>2</sup>	113 cm <sup>2</sup>	530 cm <sup>2</sup>

### ORDERING INFORMATION

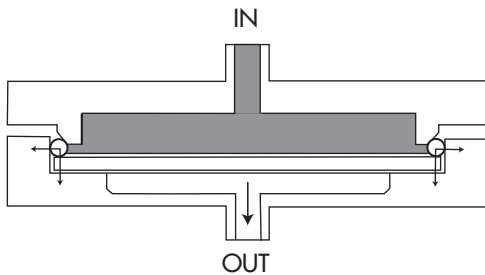
Model	KS 90 UH	KS 142 UH	KS 293 UH
Catalog No.	301790	301990	302590



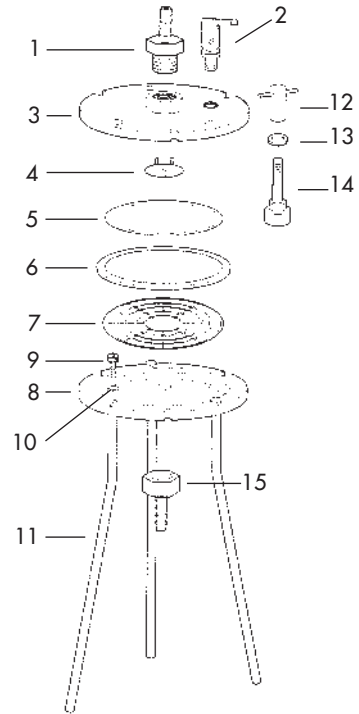
KS 142 UH

Replacement Parts

Inlet Assembly				
		KS 90 UH	KS 142 UH	KS 293 UH
1	Inlet adapter	300813		302513
2	Vent relief valve	301825		
3	Inlet plate	301799	301999	302599
Holder Body and Filter Support System				
		KS 90 UH	KS 142 UH	KS 293 UH
4	Flow deflector	301708		
5	O-ring (silicone)	301795	301995	303704
6	Support screen (PTFE coated SS)	301794	301994	302594
7	Underdrain support (316 SS)	301702	301902	302502
8	Outlet plate	301791	301991	302591
Sealing and Support Assemblies				
		KS 90 UH	KS 142 UH	KS 293 UH
9	Leg bolt	301798		-
10	Locking washer (leg)	301720		-
11	Leg	301709	301919	302597
12	Sealing wing nut	301723	301914	302515
13	Sealing washer	301716	301916	302516
14	Sealing wing bolt	-	301695	302595
15	Outlet adapter	300817		302517



Sealing mechanism



KS 90 UH

## Pressure Vessels

- **Stainless Steel Type 304 or 316L**
- **1 gallon to 10 gallon sizes** (3.8 to 38 liters)
- **Standard or Wide Mouth openings** available for ease of cleaning
- **ASME certified:** a certificate of analysis is available upon request

### SPECIFICATIONS

Materials:	
Vessel	Type 304 or type 316L stainless steel
Skirt: 1 – 5 gallon	Molded neoprene rubber
Skirt: 8 – 10 gallon	Stainless steel
Connections:	
Inlet/outlet	1/4" NPTF
Standard closure	3 7/8" x 3 1/4"
Wide mouth closure	5 7/8" x 4 7/8"
Pressure:	
Max. operating	See table below
Optional relief valve	0.69 MPa (100 psi)
Max. negative	95 kPa (29" Hg)
Temperature:	
Max. operating	See table below

- **Electropolished finish** provides a smooth, releasable, cleanable surface
- **Disassemble completely** for thorough cleaning
- **Molded rubber base** protects the vessel against rough handling (available with steel base for continuous operation at high temperatures)
- **Use under positive or negative pressure**
- **Optional vacuum closure available** when working with negative pressure or when operating at low pressures (<30 psi/2.1 bar) or with stiffer O-rings (FPM)
- **Special orders available** (coatings, additional sizes)

### APPLICATIONS

- Contain process fluids for filtration through pressure type membrane filter holders
- Type 316/316L stainless complies with current good manufacturing practices and are recommended for low pH and high salt applications

Volume:					
U.S. gallons	1 gal	3 gal	5 gal	8 gal	10 gal
Liters	3.78 L	11.3 L	18.9 L	30.2 L	37.8 L
Dimensions:					
Overall height	21.6 cm	38.7 cm	57.2 cm	52.9 cm	63.4 cm
	8.5"	15.25"	22.5"	20.8"	24.9"
Inside diameter	22.9 cm (9")			30.5 cm (12")	
Weight:	3.6 kg	5 kg	6.8 kg	11.1 kg	12.5 kg
	8 lb	11 lb	15 lb	24.5 lb	27.5 lb
Recommended for use with:					
Pressure Filter Holders	KS 90	KS 142		KS 293	
	KS 90 ST	KS 142 ST		KS 293 ST	
	KS 90 UH	KS 142 UH		KS 293 UH	

### MAXIMUM OPERATING TEMPERATURE AND PRESSURE

Type of Stainless Steel	Maximum Operating Temperature		1, 3, 5 gallon models				8 and 10 gallon models			
			Standard Opening		Wide Mouth		Standard Opening		Wide Mouth	
	°F	°C	psi	MPa	psi	MPa	psi	MPa	psi	MPa
Type 304	100	38	175	1.21	140	0.97	130	0.90	129	0.89
	150	66	170	1.17	135	0.93	130	0.90	125	0.86
	200	93	165	1.14	130	0.90	120	0.83	120	0.83
	250	121	160	1.10	130	0.90	120	0.83	115	0.79
Type 316L	300	149	155	1.07	125	0.86	115	0.79	110	0.76
	100	38	155	1.07	130	0.90	115	0.79	115	0.79
	150	66	155	1.07	130	0.90	115	0.79	115	0.79
	200	93	155	1.07	130	0.90	115	0.79	115	0.79
	250	121	155	1.07	130	0.90	115	0.79	110	0.76
	300	149	150	1.03	125	0.86	110	0.76	110	0.76

Note: O-rings containing silicone rubber should not be operated extensively at temperatures over 250°F (121°C).



Pressure Vessels



With an opening 2¼ times larger, the Wide Mouth vessel is easy to clean and inspect.

## ORDERING INFORMATION

### Complete Assemblies

	Standard opening		Wide Mouth opening	
	304 SS	316L SS	304 SS	316L SS
Type Stainless Steel (SS)				
<b>Capacity:</b>				
1 gallon	720140	720160	740140	740160
3 gallon	720340	720360	740340	740360
5 gallon	720540	720560	740540	740560
8 gallon	730840	730860	740840	740860
10 gallon	731040	731060	741040	741060

1. Pressure vessels are available in other sizes by special order.

### Replacement Parts

		316L SS
<b>Dip tube assembly:</b>	1 gallon	720161
	3 gallon	720361
	5 gallon	720561
	8 gallon	730861
	10 gallon	731061
<b>Closure:</b>	Standard	720162
	Wide mouth	740162
<b>Plastic feet for closure assembly:</b>		720022

### Optional Parts and O-rings

	Standard opening	Wide Mouth opening
Standard closure (316 SS)	720162	740162
Vacuum closure (316 SS)	720152	740152
O-ring (EPR) <sup>2</sup>	720001	720019
O-ring (FPM)	720015	720021
O-ring (PTFE encapsulated silicone rubber)	720020	720018

2. EPR (ethylene propylene rubber) O-rings are manufactured from E300-70 EPDM and meet FDA CFR177, 2600 and ASTM D2000 specifications.

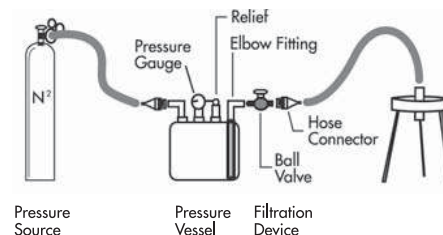
### Accessories

	¼" NPT	Type of stainless <sup>3</sup>	Catalog No.
Vent/relief valve: 7 kg/cm <sup>2</sup> , 100 psi	Male	304 SS	301825
Pressure gauge <sup>4</sup> : 0 – 160 psi	Male	- <sup>5</sup>	720002
Hose barb (11 mm)	Male	304 SS	304507
Hose barb (11 mm)	Female	304 SS	304508
Pipe plug	Male	304 SS	313012
Elbow fitting	Male/Female	316 SS	720003
Ball valve	Male/Female	316 SS	720004
Close nipple	Male/Male	316 SS	720005
Quick-connect body	Male	316 SS	720006
Quick-connect stem (hose barb)	-	316 SS	720007

3. All parts are available in (hose barb) type 316 stainless steel by special order.

4. Caution: pressure gauges should not be autoclaved.

5. All wetted parts consist of a copper alloy, and the threaded connector is made of brass.





## Stirred Cells

- **Tangential flow design** increases membrane life and sample throughput
- **PTFE stir bar** is mounted to stay clear of the membrane
- **All contact surfaces are non-metal**
- **Clear plastic reservoir** allows for fluid level and sample condition to be visually monitored
- **Removable top cap** (UHP 25, 43, and 62) and sample port (UHP 76, 90, 150) allow sample to be added during filtration
- **Pressure relief valve** supplied

## APPLICATIONS

- Desalting and concentrating proteins, enzymes, virus, and other biological samples
- Filtering fluids that contain a heavy particle burden, e.g. bacteria, silts

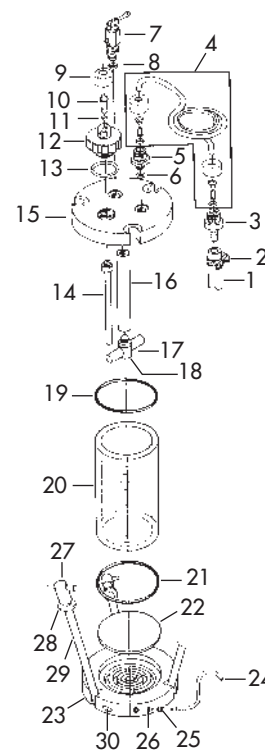
Note: Cells are not autoclavable



Stirred Cells

## SPECIFICATIONS

	UHP 25	UHP 43	UHP 62	UHP 76	UHP 90	UHP 150
<b>Materials:</b>						
End caps and stir rod	Polyacetal					
Cell barrel	Polycarbonate			Acrylic		
O-rings	Silicone					
Support screen	Polypropylene					
Stir bar	PTFE					
<b>Connections:</b>						
Pressurizing	M10					
Vent valve	10 mm screw, female					
<b>Pressure:</b>						
Maximum	0.5 MPa (73 psi)					
Vent relief valve	0.44 ± 0.04 MPa (63 ± 6 psi)					
<b>Max. Operating Temperature</b>	40°C					
<b>Dimensions:</b>						
Diameter	60 mm	68 mm	82 mm	117 mm	135 mm	198 mm
Height	138 mm	161 mm	190 mm	211 mm	230 mm	268.5 mm
<b>Weight:</b>	0.05 kg	0.18 kg	0.35 kg	0.46 kg	1.4 kg	3.1 kg
	0.11 lb	0.40 lb	0.77 lb	1.01 lb	3.08 lb	6.82 lb
<b>Volumes:</b>						
Capacity	10 mL	70 mL	200 mL	450 mL	600 mL	2000 mL
Min. recoverable upstream	0.5 mL	2.5 mL	4.5 mL	10 mL	15 mL	60 mL
Downstream holdup	1.3 mL	4.6 mL	9.1 mL	13 mL	20 mL	41 mL
<b>Membrane Compatibility:</b>						
Membrane filter size	25 mm	43 mm	62 mm	76 mm	90 mm	150 mm
Filtration area	3.5 cm <sup>2</sup>	11.5 cm <sup>2</sup>	27.0 cm <sup>2</sup>	38.5 cm <sup>2</sup>	54.5 cm <sup>2</sup>	162 cm <sup>2</sup>



UHP 76, 90, 150

## ORDERING INFORMATION

Model	UHP 25	UHP 43	UHP 62	UHP 76	UHP 90	UHP 150
Catalog No.	341000	341100	341200	341300	341400	341500

## Replacement Parts

## Inlet Assembly

		All Models
1	Pressurizing hose	341001
2	Hose clamp	341002
3	Male hose adapter	341003
4	Hose adapter assembly	341033
5	Inlet nipple adapter	341115
6	Inlet adapter O-ring (silicone)	341013
7	Vent/relief valve (with washer)	341012
8	Vent valve O-ring (silicone)	341008

## Inlet Port Assembly (UHP 76, 90, 150)

		UHP 76	UHP 90	UHP 150
9	End cap adapter		341006	
10	Inlet port adapter		341438	
11	Inlet cap O-ring		341436	
12	Sample port inlet cap	341335	341435	341539
13	Sample port adapter O-ring	341336	341432	341532
14	Sample port tube	341334	341434	341534

## Body

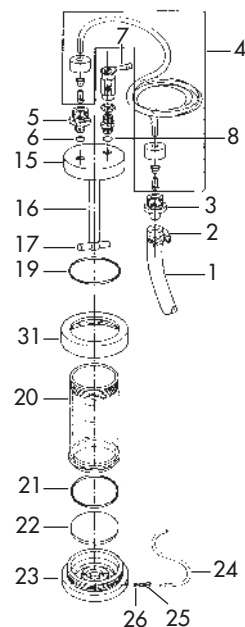
		UHP 25	UHP 43	UHP 62	UHP 76	UHP 90	UHP 150
15	Inlet end cap	341026	341126	341226	341326	341425	341525
16	Stir rod	341027	341127	341227	341327	341426	341526
17	Stir bar and adapter	341028	341128	341228	341328	341427	341527
18	Set bolt for stir bar	-	-	-	341331	341431	341531
19	Inlet cap O-ring (silicone)	341030	341130	341230	341322	341422	341522
21	Outlet cap O-ring (silicone)	341022	341122	341222			
20	Cell barrel	341024	341124	341224	341324	341424	341524
22	Support screen (polypropylene)	341021	341121	341221	341321	341421	341521
23	Outlet end cap	341020	341120	341220	341320	341420	341520
31	Locking ring	341025	341125	341225	-	-	-

## Outlet Assembly

		UHP 25, 43, 62	UHP 76	UHP 90	UHP 150
24	Outlet tubing	341019	341319	341419	341519
25	Outlet adapter	341018	341318	341418	341518
26	Outlet adapter O-ring	341016	341316	341416	341516

## Clamp Assembly (UHP 76, 90, 150)

		UHP 76	UHP 90	UHP 150
27	Nut for tie rod	341332	341441	341441
28	Washer for tie rod	341331	341440	341440
29	Tie rod	341330	341439	341543
30	Set pins	341342	341442	341546



UHP 25, 43, 62



Cell on Stirrer

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## Selecting and Designing a Filtration System

In designing or selecting a system for microporous filtration, it is worthwhile to spend some time defining a few specific parameters of the filtration problem:

- **What is to be filtered, liquid or gas?** For filtering of gases or sterile venting of vessels or gas lines, use a hydrophobic membrane such as PTFE. Chemical resistance tables can be used to help select a membrane material suitable to the liquid being filtered. Also check the compatibility of the filter holder and any O-rings with the filtrate.
- **What size are the smallest particles to be removed?** In general, a pore size just smaller than the smallest size particle to be removed is chosen. For example, 0.20  $\mu\text{m}$  pore size membrane is generally used for sterilizing culture medium, but a 0.10  $\mu\text{m}$  membrane is needed to ensure Mycoplasma removal.
- **At what pressures will the system be operated?** Check the specifications or assume a differential pressure of 2-5 psi ( $\sim 0.3 \text{ kg/cm}^2$ ) for a single holder. Be sure to account for the effects of pressure drop in a multi-holder system.
- **How will the filter holder be connected to the system?** Standard Luer, threaded, sanitary, and hose connectors are available depending on the model. Check the specifications for the product you choose.
- **What is the operating temperature?** Check the specifications for your filtration medium (membrane or other filter) and holder.
- **What size filter and holder do I need?** Estimate what volume you will be filtering and the amount of time you plan to allow for the filtration. By dividing the volume by the time in which you expect to complete this filtration you will get a desired minimum flow rate. Use the graphs at right to determine the flow rate per unit area for the differential pressure and membrane in your system (assume a pressure differential of 5 psi ( $\sim 0.3 \text{ kg/cm}^2$ ) if it is not known). Divide the desired flow rate by the flow rate per unit area to get a minimum filtration area in  $\text{cm}^2$ . Multiply this area by a factor of  $\sim 5$  to allow for clogging.

### ADJUSTMENTS

For gaseous filtrations that take place outside of standard temperature and pressure ( $20^\circ\text{C}$ , one atmosphere), correct flow rates using the following formula:

$$F = F_0 \frac{293}{273+T} \frac{P + \Delta P/2}{1.03 + \Delta P/2}$$

$F$  = Corrected flow rate  
 $F_0$  = Flow rate from chart  
 $T$  = Temperature in  $^\circ\text{C}$   
 $P$  = Exit pressure in  $\text{kg/cm}^2$   
 $\Delta P$  = Pressure drop through the system in  $\text{kg/cm}^2$

Liquid viscosity can have a significant effect on flow rate. Use this formula to correct for this effect:

$$\text{Flow rate} = \frac{A \cdot P}{V}$$

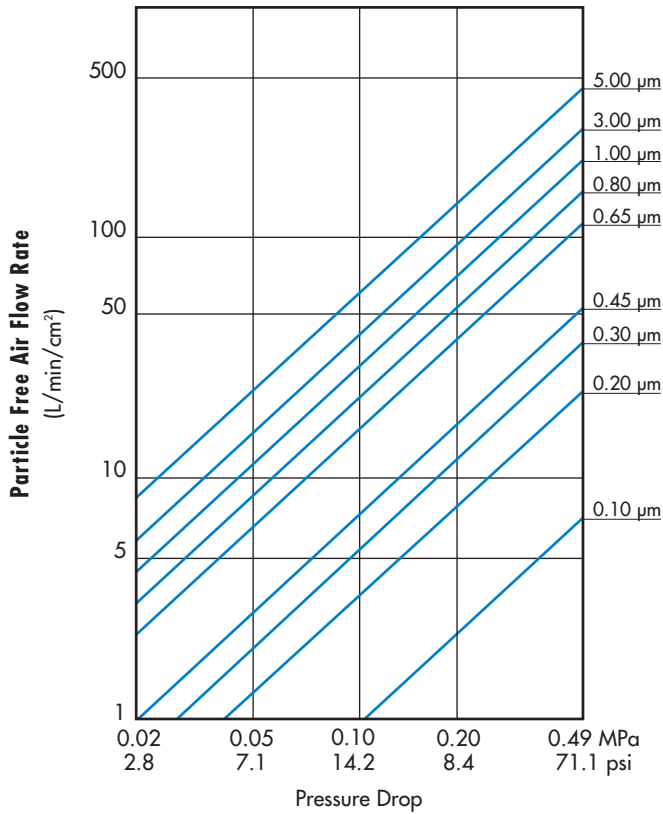
$A$  = Effective filtration area

$P$  = Differential pressure

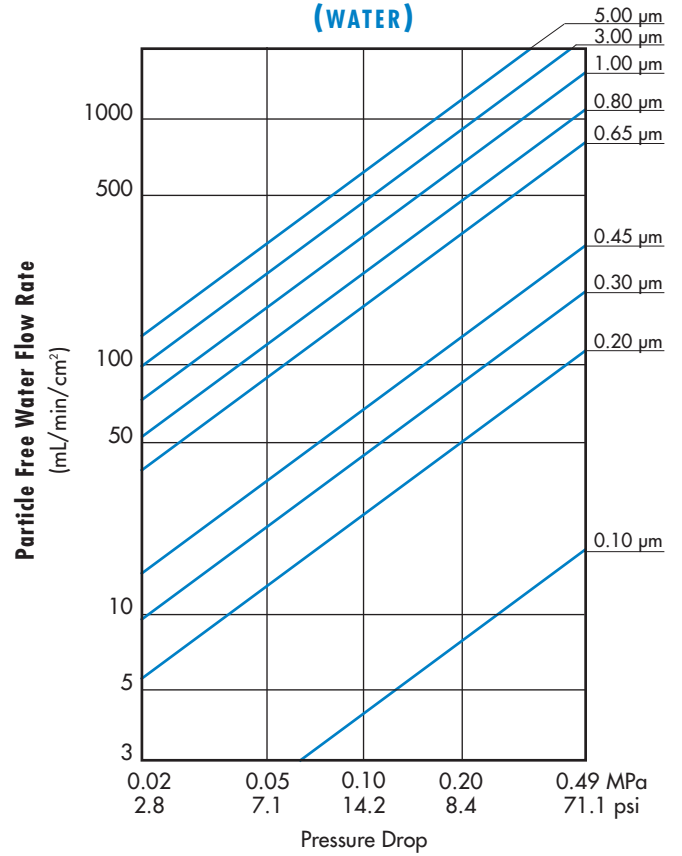
$V$  = Viscosity

GRAPHS – FLOW RATE VS. PRESSURE DROP

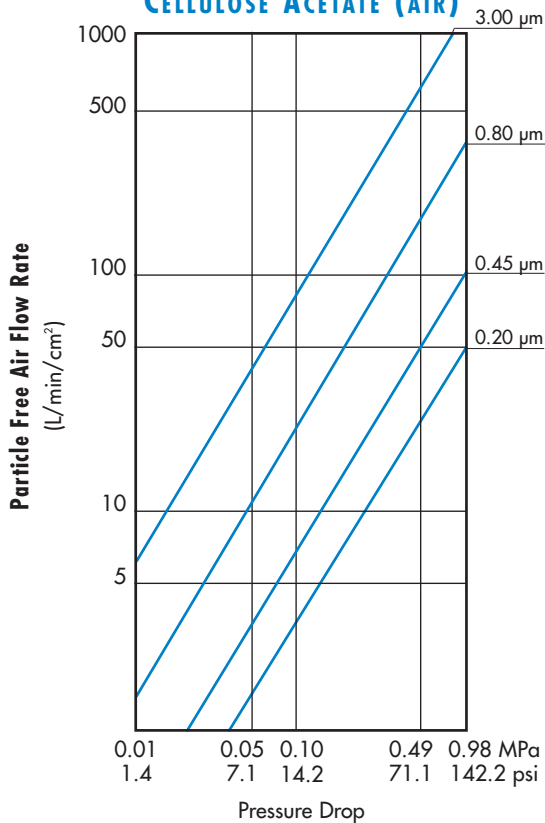
MIXED ESTER OF CELLULOSE (AIR)



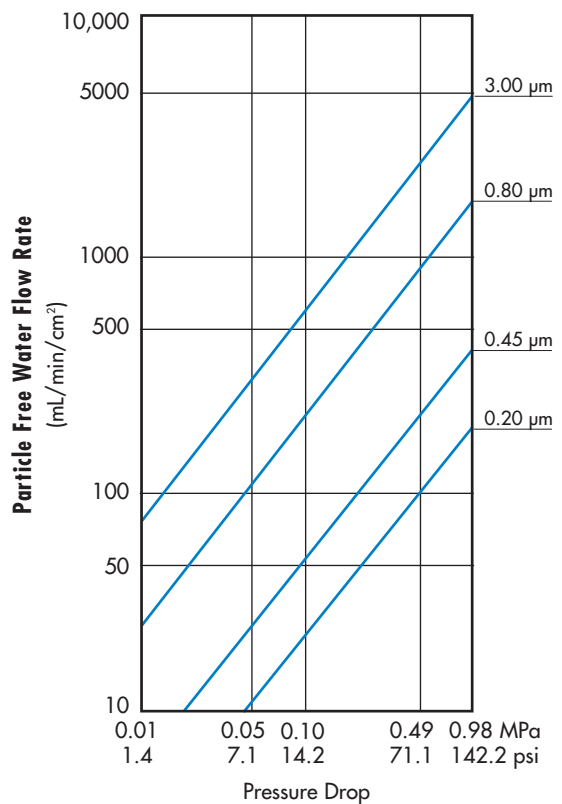
MIXED ESTER OF CELLULOSE (WATER)



CELLULOSE ACETATE (AIR)



CELLULOSE ACETATE (WATER)



## Chemical Compatibility

This guide should be used as a reference to select the proper membrane, O-ring and filter holder with regard to chemical compatibility.

Recommendations are based on a 24-hour static exposure to the test fluid at room temperature.

- O** – **Recommended.** No change in either water flow rate or bubble point will be observed.
- \*** – **Limited resistance.** Additional in-house testing is advised as swelling, discoloration or other minor changes may occur.
- x** – **Not recommended.** Significant changes in water flow rate and/or bubble point can be expected.
- – **Data not available.**

### CHEMICAL COMPATIBILITY – MEMBRANE FILTERS

Chemicals		Polymer/Product										
		MCE		CA	PCTE		PTFE	Supported PTFE	Hydrophilic PTFE	CMF Coated Cellulose acetate	37 mm monitor	37 mm monitor set
		White	Black		White	Black						
ACIDS	Glacial Acetic acid	x	x	x	o	x	o	o	o	x	x	x
	10% Acetic acid	o	o	o	o	o	o	o	o	o	*	*
	12 kmol/m <sup>3</sup> Hydrochloric acid (37%)	x	x	x	o	x	o	o	o	x	x	x
	6 kmol/m <sup>3</sup> Hydrochloric acid (19%)	o	x	x	o	o	o	o	o	x	*	*
	12 kmol/m <sup>3</sup> Nitric acid (53%)	x	x	x	o	x	o	o	o	x	x	x
	6 kmol/m <sup>3</sup> Nitric acid (26%)	o	x	x	o	x	o	o	o	x	x	x
	18 kmol/m <sup>3</sup> Sulfuric acid (96%)	x	x	x	x	x	o	o	x	x	x	x
	3 kmol/m <sup>3</sup> Sulfuric acid (16%)	o	o	x	o	o	o	o	o	x	*	*
	85% Phosphoric acid	o	o	x	o	x	o	o	o	x	*	*
	5% Boric acid	o	o	o	o	o	o	o	o	o	o	o
	50% Formic acid	*	x	x	o	x	o	o	o	x	x	x
35% Hydrofluoric acid	o	x	x	o	x	o	o	o	x	x	x	
60% Perchloric acid	x	x	x	o	x	o	o	o	x	x	x	
ALKALIS	6 kmol/m <sup>3</sup> Sodium hydroxide (26%)	x	x	x	x	x	o	o	o	x	x	x
	6 kmol/m <sup>3</sup> Potassium hydroxide (20%)	x	x	x	x	x	o	o	o	x	x	x
	6 kmol/m <sup>3</sup> Aqueous ammonia (11%)	x	x	x	x	x	o	o	o	x	x	x
ALCOHOLS	Methyl alcohol	x	x	*	o	x	o	o	o	o	x	x
	Ethyl alcohol	x	x	*	o	x	o	o	o	o	x	x
	Isopropyl alcohol	*	x	*	o	x	o	o	o	o	x	x
	Isobutyl alcohol	o	x	o	o	x	o	o	o	x	x	x
	n-Butyl alcohol	*	x	o	o	x	o	o	o	o	x	x
	Glycerin	o	o	o	o	o	o	o	o	o	o	o
	Amyl alcohol	*	x	o	o	x	o	o	o	o	*	*
	Benzyl alcohol	x	x	x	o	x	o	o	o	x	*	*
Ethylene glycol	*	x	o	o	o	o	o	o	x	*	x	

Continued on next page

## CHEMICAL COMPATIBILITY – MEMBRANE FILTERS (CONTINUED)

Chemicals		Polymer/Product										
		MCE		CA	PCTE		PTFE	Supported PTFE	Hydrophilic PTFE	CMF Coated Cellulose acetate	37 mm monitor	37 mm monitor set
		White	Black		White	Black						
ETHERS	Ethyl ether	○	○	○	*	×	○	○	○	○	*	×
	Isopropyl ether	○	○	○	○	×	○	*	○	○	×	×
	Tetrahydrofuran (THF)	×	×	×	×	×	○	*	○	×	×	×
	Dioxane	×	×	×	×	×	○	*	○	×	×	×
	Petroleum ether	○	○	○	○	○	○	○	○	○	○	×
ESTERS	Methyl acetate	×	×	×	×	×	○	*	○	×	×	×
	Butyl acetate	×	×	*	*	×	○	*	○	○	×	×
	Amyl acetate	×	×	*	○	*	○	*	○	○	×	×
KETONES	Acetone	×	×	×	×	×	○	○	○	×	×	×
	Methyl ethyl ketone (MEK)	×	×	×	×	×	○	*	○	×	×	×
	Methyl isobutyl ketone (MIBK)	×	×	×	×	×	○	*	○	×	×	×
	Cyclohexanone	×	×	×	×	×	○	○	○	×	×	×
HYDROCARBONS	Benzene	○	×	○	×	×	○	○	○	○	×	×
	Toluene	○	○	○	×	*	○	*	○	○	×	×
	Xylene	○	×	○	○	×	○	*	○	×	×	×
	n-Hexane	○	○	○	○	○	○	○	○	○	×	×
	Gasoline	○	○	○	○	○	○	*	○	○	*	×
	Kerosene	○	○	○	○	○	○	*	○	×	○	*
HALOGENATED HYDROCARBONS	Chloroform	○	○	×	×	×	○	*	○	×	×	×
	Methylene chloride	*	×	×	×	×	○	*	○	×	×	×
	Trichloroethylene	○	○	○	×	×	○	*	○	○	×	×
	Tetrachloroethylene	○	×	○	×	×	○	*	○	○	×	×
	Carbon tetrachloride	○	○	○	○	○	○	○	○	○	×	×
AMINES	Aniline	×	×	×	×	×	○	○	○	×	×	×
	Dimethyl formamide	×	×	×	×	×	○	○	○	×	×	×
	Diethyl acetamide	×	×	×	×	×	○	○	○	×	×	×
	Triethanolamine	×	×	○	○	×	○	○	○	×	×	×
CELLOSOLVES	Methyl cellosolve	×	×	×	○	×	○	○	○	×	×	×
	Butyl cellosolve	×	×	○	○	×	○	○	○	○	×	×
MISCELLANEOUS	Nitrogen	○	○	○	○	○	○	○	○	○	○	○
	Hydrogen	○	○	○	○	○	○	○	○	○	○	○
	30% Hydrogen peroxide	○	○	○	○	○	○	○	○	○	×	×
	Saline solution	○	○	○	○	○	○	○	○	○	○	○
	Dimethyl sulfate	×	×	*	×	×	○	○	○	×	×	×
	Nitrobenzene	×	×	×	×	×	○	○	○	×	×	×
	Methanol (1): Chloroform (1)	×	×	×	×	×	○	*	○	×	×	×
	Pyridine	×	×	×	×	×	○	*	○	×	×	×
	Acetonitrile	×	×	×	×	×	○	○	○	×	×	×
	Phenol	×	×	×	×	×	○	○	○	×	×	×
	Freon	○	○	○	○	○	○	*	○	○	○	○
	37% Formaldehyde	○	×	*	○	×	○	○	○	○	×	×
	Silicone oil	○	○	○	○	×	○	*	○	×	○	○
	n-Hexane (95): Ethyl acetate (5)	*	○	×	○	○	○	*	○	○	×	×
	Acetonitrile (70):Distilled water (30)	×	×	×	×	×	○	○	○	×	×	×
	Petroleum oil	○	○	○	○	×	○	○	○	○	*	×

○ - Recommended

\* - Limited resistance

× - Not recommended

- - Data not available

## CHEMICAL COMPATIBILITY: DISPOSABLE SYRINGE FILTER UNITS

Chemicals		AS Mixed cellulose esters with acrylic housing	CS Cellulose acetate with acrylic housing	CP Cellulose acetate with PP housing	HP Hydrophilic PTFE with PP housing	JP Hydrophobic PTFE with PP housing
ACIDS	3 kmol/m <sup>3</sup> Hydrochloric acid (10%)	○	*	*	○	○
	9 kmol/m <sup>3</sup> Hydrochloric acid (30%)	✗	✗	✗	○	○
	1 kmol/m <sup>3</sup> Sulfuric acid (5%)	○	○	○	○	○
	4 kmol/m <sup>3</sup> Sulfuric acid (20%)	✗	✗	✗	○	○
	1 kmol/m <sup>3</sup> Nitric acid (5%)	○	○	*	○	○
	4 kmol/m <sup>3</sup> Nitric acid (20%)	✗	✗	✗	*	*
	3.5 kmol/m <sup>3</sup> Acetic acid (20%)	○	○	○	○	○
	Glacial acetic acid	✗	✗	✗	○	○
	5 kmol/m <sup>3</sup> Hydrofluoric acid (10%)	✗	✗	✗	○	○
	19 kmol/m <sup>3</sup> Hydrofluoric acid (35%)	✗	✗	✗	○	○
	1 kmol/m <sup>3</sup> Chromic acid (10%)	*	*	*	*	*
1 kmol/m <sup>3</sup> Phosphoric acid (10%)	○	○	○	○	○	
ALKALIS	2.5 kmol/m <sup>3</sup> Sodium hydroxide (10%)	✗	✗	✗	○	○
	2 kmol/m <sup>3</sup> Potassium hydroxide (10%)	✗	✗	✗	○	○
	8 kmol/m <sup>3</sup> Aqueous ammonia (28%)	✗	○	*	○	○
ALCOHOLS	Methyl alcohol	✗	✗	○	○	○
	Ethyl alcohol	✗	*	○	○	○
	n-Propyl alcohol	*	○	○	○	○
	Isopropyl alcohol	*	○	○	○	○
	n-Butyl alcohol	*	○	○	○	○
	Amyl alcohol	*	○	○	○	○
	Benzyl alcohol	*	✗	✗	○	○
	Ethylene glycol	✗	✗	○	○	○
Glycerin	○	○	○	○	○	
ETHERS	Ethyl ether	✗	✗	*	*	*
	Isopropyl ether	✗	✗	○	○	○
	Tetrahydrofuran (THF)	✗	✗	✗	*	*
	Dioxane	✗	✗	✗	*	*
ESTERS	Methyl acetate	✗	✗	✗	*	*
	Ethyl acetate	✗	✗	✗	*	*
	Butyl acetate	✗	✗	✗	*	*
	Amyl acetate	✗	✗	*	*	*
KETONES	Acetone	✗	✗	✗	○	○
	Methyl ethyl ketone (MEK)	✗	✗	✗	*	*
	Methyl isobutyl ketone (MIBK)	✗	✗	✗	*	*
	Cyclohexanone	✗	✗	✗	*	*
HYDROCARBONS	Benzene	✗	✗	*	*	*
	Toluene	✗	✗	*	*	*
	Xylene	✗	✗	*	*	*
	n-Hexane	✗	✗	*	*	*
	Gasoline	*	*	○	○	○
	Kerosene	○	○	*	*	*

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## CHEMICAL COMPATIBILITY: DISPOSABLE SYRINGE FILTER UNITS (CONTINUED)

Chemicals		AS Mixed cellulose esters with acrylic housing	CS Cellulose acetate with acrylic housing	CP Cellulose acetate with PP housing	HP Hydrophilic PTFE with PP housing	JP Hydrophobic PTFE with PP housing
HALOGENATED HYDROCARBONS	Chloroform	X	X	X	*	*
	Methylene chloride	X	X	X	*	*
	Trichloroethylene	X	X	*	*	*
	Carbon tetrachloride	X	X	*	O	O
	Trichloroethane	X	X	X	*	*
	Perchloroethylene	X	X	X	*	*
	Freon (TMC)	X	X	*	*	*
AMINES	Aniline	X	X	X	*	*
	Dimethyl formamide	X	X	X	*	*
	Diethyl acetamide	X	X	X	*	*
	Triethanolamine	X	O	O	O	O
CELLOSOLVES	Ethyl acetate cellosolve	X	X	X	*	*
MISCELLANEOUS	Acetonitrile	X	X	X	*	*
	Pyridine	X	X	X	*	*
	1 kmol/m <sup>3</sup> Sodium Hypochloride (6%)	X	X	X	O	O
	13 kmol/m <sup>3</sup> Formaldehyde (35%)	X	*	*	O	O
	Ferric chloride	O	O	O	O	O
	Copper sulfate	O	O	O	O	O
	Mineral oil	*	O	*	*	*
	Salt water	O	O	O	O	O
	3 kmol/m <sup>3</sup> Hydrogen peroxide (10%)	X	*	O	O	O
	Nitrobenzene	X	X	X	*	*
	Phenol	X	X	X	O	O
	Silicone oil	X	X	X	O	O
	Petroleum oil	*	*	O	O	O
Acetonitrile (70): water (30)	X	X	X	O	O	

O – Recommended      \* – Limited resistance      X – Not recommended      – – Data not available

## CHEMICAL COMPATIBILITY – CAPSULES

Chemicals	CCS	CCF	CCFH	CCP	CCG	
ACIDS	1 kmol/m <sup>3</sup> Acetic acid (5%)	○	○	○	○	○
	3.5 kmol/m <sup>3</sup> Acetic acid (20%)	○	○	*	○	○
	1 kmol/m <sup>3</sup> Chromic acid (10%)	✗	○	○	○	✗
	3 kmol/m <sup>3</sup> Hydrochloric acid (10%)	○	○	○	○	○
	11 kmol/m <sup>3</sup> Hydrochloric acid (35%)	○	○	✗	○	*
	5 kmol/m <sup>3</sup> Hydrofluoric acid (10%)	○	○	○	○	✗
	1 kmol/m <sup>3</sup> Nitric acid (5%)	○	○	○	○	○
	4 kmol/m <sup>3</sup> Nitric acid (20%)	○	○	○	○	○
	1 kmol/m <sup>3</sup> Phosphoric acid (10%)	○	○	○	○	○
	1 kmol/m <sup>3</sup> Sulfuric acid (5%)	○	○	○	○	○
4 kmol/m <sup>3</sup> Sulfuric acid (20%)	○	○	○	○	○	
ALKALIS	2.5 kmol/m <sup>3</sup> Sodium hydroxide (10%)	○	○	✗	○	○
	2 kmol/m <sup>3</sup> Potassium hydroxide (10%)	○	○	✗	○	○
	5 kmol/m <sup>3</sup> Aqueous ammonia (10%)	○	○	✗	○	*
	15 kmol/m <sup>3</sup> Aqueous ammonia (28%)	○	○	✗	○	○
ALCOHOLS	Methyl alcohol	○	○	○	○	○
	Ethyl alcohol	○	○	○	○	○
	n-propyl alcohol	○	○	○	○	○
	n-butyl alcohol	○	○	*	○	○
	Ethylene glycol	○	○	○	○	○
ETHERS	Ethyl ether	*	*	*	*	✗
	Dioxane	*	○	○	○	✗
	Tetrahydrofuran (THF)	✗	✗	✗	✗	✗
ESTERS	Amyl acetate	✗	*	*	*	✗
	Methyl acetate	✗	○	○	○	○
	Ethyl acetate	✗	○	○	○	○
	Butyl acetate	✗	○	○	○	○
KETONES	Acetone	✗	○	○	○	✗
	Methyl ethyl ketone (MEK)	✗	○	○	○	✗
	Methyl isobutyl ketone (MIBK)	✗	○	○	○	✗
HYDROCARBONS	n-Hexane	*	*	-	*	*
	Cyclohexane	*	*	*	*	*
	Benzene	*	✗	✗	✗	✗
	Toluene	✗	*	*	*	✗
	Xylene	✗	*	*	*	*
HALOGENATED HYDROCARBONS	Chloroform	✗	*	✗	*	✗
	Carbon tetrachloride	-	*	*	*	*
	Freon (TMC)	✗	*	-	*	✗
	Methylene chloride	✗	*	✗	*	✗
	Trichloroethylene	✗	*	*	*	✗
	Trichloroethane	✗	○	○	○	○
AMINES	Dimethyl formamide	✗	○	○	○	○
ALDEHYDES	Acetaldehyde	-	-	-	-	-
	13 kmol/m <sup>3</sup> Formaldehyde (35%)	○	○	*	○	○

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**CHEMICAL COMPATIBILITY – CAPSULES (CONTINUED)**

Chemicals		CCS	CCF	CCFH	CCP	CCG
CELLOSOLVES	Acetic cellosolve	X	O	O	O	O
MISCELLANEOUS	Acetonitrile	X	O	O	O	X
	Pyridine	X	O	O	O	O
	Nitrobenzene	-	-	X	-	-
	1 kmol/m <sup>3</sup> Sodium hypochlorite (6%)	X	O	O	O	O
	Ferric chloride	O	O	O	O	O
	Copper sulfate	O	O	O	O	O
	Mineral oil	O	O	O	*	O
	Salt water	O	O	O	O	O
	3 kmol/m <sup>3</sup> Hydrogen peroxide (10%)	O	O	O	O	O

O – Recommended      \* – Limited resistance      X – Not recommended      - – Data not available

## CHEMICAL COMPATIBILITY – CARTRIDGES

Chemicals		TCR	TCS TCS-G TCS-E	TCF TCFH	TCY TCYE	TCP TCPE TCPD	TC	TC (SUS type with NBR Gasket)	TCG	TCG-R (NBR Gasket)
ACIDS	20% Acetic acid	O	O	O	O	O	X	X	O	O
	10% Chromic acid	X	X	O	X	O	X	X	X	X
	3 kmol/m <sup>3</sup> Hydrochloric acid (10%)	X	O	O	X	O	X	X	O	X
	9 kmol/m <sup>3</sup> Hydrochloric acid (30%)	X	O	O	X	O	X	X	O	X
	10% Hydrofluoric acid	O	O	O	X	O	O	X	X	X
	1 kmol/m <sup>3</sup> Nitric acid (5%)	X	O	O	O	O	O	X	O	O
	4 kmol/m <sup>3</sup> Nitric acid (20%)	X	O	O	X	O	X	X	O	O
	10% Phosphoric acid	O	O	O	O	O	*	X	O	O
	1 kmol/m <sup>3</sup> Sulfuric acid (5%)	X	O	O	O	O	O	O	O	O
4 kmol/m <sup>3</sup> Sulfuric acid (20%)	X	O	O	X	O	X	X	O	X	
ALKALIS	2.5 kmol/m <sup>3</sup> Sodium hydroxide (10%)	X	O	O	X	O	X	X	O	X
	2 kmol/m <sup>3</sup> Potassium hydroxide (10%)	X	O	O	X	O	X	X	O	X
	15 kmol/m <sup>3</sup> Aqueous ammonia (28%)	O	O	O	X	O	X	X	O	O
ALCOHOLS	Methyl alcohol	O	O	O	O	O	*	*	O	O
	Ethyl alcohol	O	O	O	O	O	O	O	O	O
	n-Propyl alcohol	O	O	O	O	O	O	O	O	O
	n-Butyl alcohol	O	O	O	O	O	O	O	O	O
ETHERS	Dioxane	X	X	O	X	O	X	X	X	X
	Tetrahydrofuran (THF)	X	X	X	X	X	X	X	X	X
	Ethyl ether	X	X	X	X	X	X	X	X	X
ESTERS	Amyl acetate	X	X	X	X	X	X	X	X	X
	Methyl acetate	X	X	O	X	O	O	O	O	X
	Ethyl acetate	X	X	O	X	O	*	X	O	X
	Butyl acetate	X	X	O	X	O	O	X	O	X
KETONES	Acetone	X	X	O	X	O	X	X	X	X
	Methyl ethyl ketone (MEK)	X	X	O	X	O	X	X	X	X
	Methyl isobutyl ketone (MIBK)	O	X	O	O	O	X	X	X	X
HYDROCARBONS	n-Hexane	X	X	X	X	X	X	X	X	X
	Benzene	X	X	X	X	X	X	X	X	X
	Toluene	X	X	*	*	*	*	X	X	X
	Xylene	X	X	*	*	*	O	X	*	X
HALOGENATED HYDROCARBONS	Chloroform	X	X	X	X	X	X	X	X	X
	Carbon tetrachloride	*	-	*	*	*	*	X	*	X
	Freon (TMC)	X	X	*	X	*	-	-	X	X
	Methylene chloride	X	X	X	X	X	X	X	X	X
	Trichloroethylene	X	X	X	X	X	X	X	X	X
	Trichloroethane	X	X	O	O	O	*	X	O	X
AMINES	Dimethyl formamide	X	X	O	X	O	X	X	O	X

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## CHEMICAL COMPATIBILITY – CARTRIDGES (CONTINUED)

Chemicals		TCR	TCS TCS-G TCS-E	TCF TCFH	TCY TCYE	TCP TCPPE TCPD	TC	TC (SUS type with NBR Gasket)	TCG	TCG-R (NBR Gasket)
ALDEHYDES	35% Formaldehyde	○	○	○	○	○	○	○	○	○
CELLOSOLVES	Acetic cellosolve	✗	✗	○	✗	○	*	*	○	✗
MISCELLANEOUS	Acetonitrile	✗	✗	○	✗	○	✗	✗	✗	✗
	Pyridine	✗	✗	○	✗	○	✗	✗	○	✗
	6% Sodium hypochlorite	✗	✗	○	✗	○	✗	✗	○	○
	Ferric chloride	○	○	○	○	○	✗	✗	○	✗
	Copper sulfate	○	○	○	○	○	*	✗	○	○
	Mineral oil	○	○	○	○	✗	✗	✗	○	○
	Salt water	○	○	○	○	○	○	✗	○	○
	10% Hydrogen peroxide	○	○	○	*	○	○	○	○	○

○ – Recommended

\* – Limited resistance

✗ – Not recommended

– – Data not available

## CHEMICAL COMPATIBILITY – GASKETS / O-RINGS

Chemicals		EPR EPDM	SILICONE	NBR	CHLOROPRENE	FPM	PTFE	FEP Encap- sulated
ACIDS	20% Acetic acid	○	○	*	*	○	○	○
	10% Chromic acid	*	*	x	x	*	○	○
	3 kmol/m <sup>3</sup> Hydrochloric acid (10%)	○	○	○	○	○	○	○
	9 kmol/m <sup>3</sup> Hydrochloric acid (30%)	○	x	*	*	○	○	○
	10% Hydrofluoric acid	*	x	x	○	*	○	○
	1 kmol/m <sup>3</sup> Nitric acid (5%)	○	○	x	*	○	○	○
	4 kmol/m <sup>3</sup> Nitric acid (20%)	x	x	x	x	○	○	○
	10% Phosphoric acid	○	○	○	○	○	○	○
	1 kmol/m <sup>3</sup> Sulfuric acid (5%)	○	○	○	○	○	○	○
4 kmol/m <sup>3</sup> Sulfuric acid (20%)	○	○	○	○	○	○	○	
ALKALIS	2.5 kmol/m <sup>3</sup> Sodium hydroxide (10%)	○	x	○	○	○	○	○
	2 kmol/m <sup>3</sup> Potassium hydroxide (20%)	○	*	○	○	○	○	○
	15 kmol/m <sup>3</sup> Aqueous ammonia (28%)	○	○	x	○	○	○	○
ALCOHOLS	Methyl alcohol	○	○	x	○	*	○	○
	Ethyl alcohol	○	○	*	○	○	○	○
	n-Propyl alcohol	○	○	*	○	○	○	○
	n-Butyl alcohol	○	○	x	*	○	○	○
ETHERS	Dioxane	*	*	x	x	x	○	○
	Tetrahydrofuran (THF)	x	x	x	x	x	○	○
	Ethyl ether	x	x	x	x	x	○	○
ESTERS	Amyl acetate	*	x	x	x	x	○	○
	Methyl acetate	○	*	x	x	x	○	○
	Ethyl acetate	*	*	x	x	x	○	○
	Butyl acetate	*	x	x	x	x	○	○
KETONES	Acetone	○	*	x	x	x	○	○
	Methyl ethyl ketone (MEK)	*	*	x	x	x	○	○
	Methyl isobutyl ketone (MIBK)	x	○	x	x	x	○	○
HYDROCARBONS	n-Hexane	x	x	○	*	○	○	○
	Benzene	x	*	x	x	○	○	○
	Toluene	x	x	x	x	○	*	*
	Xylene	x	x	x	x	○	○	○
HALOGENATED HYDROCARBONS	Chloroform	x	x	x	x	○	*	*
	Carbon tetrachloride	x	x	x	x	○	○	○
	Freon (TMC)	-	-	x	-	-	○	○
	Methylene chloride	x	x	x	x	○	○	○
	Trichloroethylene	x	x	x	x	○	○	○
	Trichloroethane	x	x	x	x	○	○	○
AMINES	Dimethyl formamide	○	○	x	x	x	○	○
ALDEHYDES	35% Formaldehyde	○	○	○	○	○	○	○
CELLOSOLVES	Acetic cellosolve	*	○	x	x	x	○	○
MISCELLANEOUS	Acetonitrile	○	x	x	○	x	○	○
	Pyridine	x	x	x	x	x	○	○
	6% Sodium hypochlorite	○	x	*	○	○	○	○
	Ferric chloride	○	○	○	○	*	○	○
	Copper sulfate	○	○	○	○	○	○	○
	Mineral oil	x	*	○	○	○	○	○
	Salt water	○	○	○	○	○	○	○
	10% Hydrogen peroxide	*	○	x	*	○	○	○

○ – Recommended    \* – Limited resistance    x – Not recommended    - – Data not available

## Sterile Membrane Cross Reference Conversion Guide

Advantec	Description	Millipore	Whatman	Pall	Catalog Page
A020H047A	White grid	GSWG 047 S1	7187 114	-	19
A045D047A	White grid	HAWG 047 S0	-	63077	19
A045F047A	White grid	HAWG 047 S2	7141 104	-	19
A045H047A	White grid	HAWG 047 S1	7141 114	66068, 66278	19
A045H047W	White grid	HAWG 047 S1	7141 114	66068, 66278	19
A065F047A	White grid	HCWG 047 S4	-	-	19
A065H047A	White grid	HCWG 047 S1	-	66426	19
A045R047A	Black grid	HABG 047 S1	7153 104	66378	20
A080R047A	Black grid	AABG 047 S1	-	-	20
A045W047A	Green grid	-	7155 104	66379	20

See individual listings for packaging configurations.

## Glass, Quartz, and Paper Cross Reference Conversion Guide

Advantec	Millipore	Whatman	ex-Schleicher & Schuell	Pall	Fisher	Ahlstrom	Catalog page
GA-55	APFA	GF/A	31	-	09-804-55A	111	32
GF-75	GFCP	GF/F	20	-	-	151	32
GB-100R	AP40	EPM 2000	1HV	A/E (Air)	-	-	32
GB-140	APFB	GF/B	32	-	09-804-55B	121	32
GC-50	AP40/APFC	GF/C	30/25	A/E (Water)	09-804-55C	131	32
GC-90	AP15	-	-	-	-	-	32
GD-120	APFD	GF/D	40	-	09-804-55D	141	32
GS-25	AP20	-	-	-	-	164	32
QR-100	-	QM-A	-	Micro Quartz	-	-	32
No. 1	FP105	4	410 or 1450cv	-	09-795F	631	26
No. 101	FP115	91	-	-	09-790-12F	-	26
No. 131	FP102	3	597	-	09-803-6G	238	26
No. 2	-	-	604	-	09-801-E	601	26
No. 231	FP104	2	-	-	-	-	26
No. 232	FP102	6	-	-	-	642	26
No. 235	-	5	-	-	09-803-5F	610	26

Comparisons of glass fiber filters are for those with closest similarity. Exact counterparts do not exist due to the nature of the depth type filter matrix.

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